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Abstracts of Posters presented at the

2010 Annual Meeting of the

International Anesthesia Research Society

Honolulu, Hawaii

March 20-23, 2010

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IARS International Anesthesia Research Society

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ANESTHESIA & ANALGESIA®

The Gold Standard in Anesthesiology

The official scientific journal of the International Anesthesia Research Society®, The Society of Cardiovascular Anesthesiologists, the Society for Pediatric Anesthesia, the Society for Ambulatory Anesthesia, the International Society for Anaesthetic Pharmacology, the Society for Technology in Anesthesia, the Anesthesia Patient Safety Foundation, the American Society of Critical Care Anesthesiologists, and the Society for Obstetric Anesthesia and Perinatology.

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Abstracts of Posters Presented at the International Anesthesia Research Society 2010 Annual Meeting Honolulu, Hawaii March 20-23, 2010

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Authors submitting abstracts have certified that if human research is reported, approval by an institutional human research committee has been obtained, or if animal research is reported, the usual standards and guidelines for animal care have been followed. Material published in this supplement has not undergone review by the Editorial Board of Anesthesia and Analgesia. Any of the abstracts in this supplement may have been transmitted by the author to IARS in various forms of electronic medium. IARS has used its best efforts to receive and format electronic submissions for publication in this supplement but has not reviewed each abstract for the purpose of textual error correction and is not liable in any way for any formatting, textual or grammatical error or inaccuracy.

IARS 2010 Annual Meeting
Abstract Presentation Schedule

Ambulatory Anesthesia – 1
- (S-01) Subramanyam, R., Saturday 7:00
- (S-02) Kaul, B., Saturday 7:00
- (S-03) Mraovic, B., Saturday 7:00
- (S-04) Funada, A., Saturday 7:00
- (S-05) Habib, A., Saturday 7:00
- (S-06) Fink, R., Saturday 7:00
- (S-07) Rade, M., Saturday 7:00

Ambulatory Anesthesia – 2
- (S-08) Morrison, D., Sunday 7:00
- (S-09) Gothgen, N., Sunday 7:00
- (S-10) Mazanikov, M., Sunday 7:00
- (S-11) Tse, J., Sunday 7:00
- (S-12) Minhaj, M., Sunday 7:00
- (S-13) Cox, W., Sunday 7:00

Ambulatory Anesthesia – 3
- (S-14) Cammarata, L., Monday 7:00
- (S-15) Dispersyn, G., Monday 7:00
- (S-16) Cohen, S., Monday 7:00
- (S-17) van den Berg, A., Monday 7:00
- (S-18) WITHDRAWN
- (S-19) Hu, M., Monday 7:00
- (S-20) Yousef, A., Monday 7:00

Bleeding / Blood Product Conservation – 1
- (S-21) Weitzel, N., Saturday 7:00
- (S-22) Irita, K., Saturday 7:00
- (S-23) Ogweno, G., Saturday 7:00
- (S-24) WITHDRAWN
- (S-25) Ono, K., Saturday 7:00
- (S-26) Wong, J., Saturday 7:00
- (S-27) Jameson, L., Saturday 7:00

Bleeding / Blood Product Conservation –2
- (S-28) Rollins, M., Sunday 11:00
- (S-29) Jameson, L., Sunday 11:00
- (S-30) Raghunathan, K., Sunday 11:00
- (S-31) Saager, L., Sunday 11:00
- (S-32) Refaat, A., Sunday 11:00

Cardiothoracic and Vascular - Basic Science – 1
- (S-33) Kinoshita, H., Saturday 9:00
- (S-34) WITHDRAWN
- (S-35) Saito, T., Saturday 9:00
- (S-36) Larmann, J., Saturday 9:00
- (S-37) Janssen, H., Saturday 9:00
- (S-38) Onishi, A., Saturday 9:00

Cardiothoracic and Vascular - Basic Science – 2
- (S-39) Drenger, B., Sunday 11:00
- (S-40) Murata, H., Sunday 11:00
- (S-41) Gross, E., Sunday 11:00
- (S-42) Stowe, D., Sunday 11:00
- (S-43) Van Aken, H., 11:00
- (S-44) Bergese, S., Sunday 11:00
- (S-45) Rosenberger, D., Sunday 11:00
- (S-46) Worah, S., Sunday 11:00

Cardiothoracic and Vascular - Clinical – 1
- (S-47) Yacouby, S., Saturday 9:00
- (S-48) Hucklenbruch, C., Saturday 9:00
- (S-49) Nemergut, E., Saturday 9:00
- (S-50) Preckel, B., Saturday 9:00
- (S-51) Kumar, K., Saturday 9:00
- (S-52) Black, R., Saturday 9:00

Cardiothoracic and Vascular - Clinical – 2
- (S-53) Zhou, S.F., Saturday 12:45
- (S-54) Wernick, M., Saturday 12:45
- (S-55) Sell, J., Saturday 12:45
- (S-56) WITHDRAWN
- (S-57) Afonso, A., Saturday 12:45
- (S-58) Bartsch, T., Saturday 12:45
- (S-59) Moitra, V., Saturday 12:45

Cardiothoracic and Vascular - Clinical – 3
- (S-60) Maracaja-Neto, L., Sunday 7:00
- (S-61) Tsuboi, S., Sunday 7:00
- (S-62) O'Connor, M.F., Sunday 7:00
- (S-63) Inagaki, Y., Sunday 7:00
- (S-64) Kakutani, T., Sunday 7:00
- (S-65) Asopa, A., Sunday 7:00
- (S-66) Parra-Sanchez, I., Sunday 7:00

Cardiothoracic and Vascular - Clinical – 4
- (S-67) Mazzeffi, M., Sunday 11:00
- (S-68) Rodriguez, Y., Sunday 11:00
- (S-69) Hudetz, J., Sunday 11:00
- (S-70) Franco, G., Sunday 11:00
- (S-71) Le, H., Sunday 11:00
- (S-72) Song, J., Sunday 11:00
- (S-73) Craft, R., Sunday 11:00
- (S-74) Fujiyoshi, T., Sunday 11:00

Cardiothoracic and Vascular - Clinical – 5
- (S-75) Kumar, K., Monday 7:00
- (S-76) Hariskov, S., Monday 7:00
- (S-77) Worah, S., Monday 7:00
- (S-78) Mazzeffi, M., Monday 7:00
- (S-79) Asano, I., Monday 7:00
- (S-80) Afonso, A., Monday 7:00
- (S-81) Brandes, I., Monday 7:00
- (S-82) Yu, S., Monday 7:00

IARS 2010 Annual Meeting
Abstract Presentation Schedule

Cardiothoracic and Vascular - Clinical – 6
- (S-83) Markovic, M., Monday 9:00
- (S-84) Kakazu, C., Monday 9:00
- (S-85) Ichizawa, M., Monday 9:00
- (S-86) Tokinaga, Y., Monday 9:00
- (S-87) Skhirtladze, K., Monday 9:00
- (S-88) Fox, C., Monday 9:00

Cardiothoracic and Vascular - Clinical – 7
- (S-89) Song, J., Monday 11:00
- (S-90) Abdelmalak, J., Monday 11:00
- (S-91) Sugasawa, Y., Monday 11:00
- (S-92) WITHDRAWN
- (S-93) Shoham, A., Monday 11:00
- (S-94) Paik, H., Monday 11:00
- (S-95) Logvin, M., Monday 11:00
- (S-96) Watabe, A., Monday 11:00

Cardiothoracic and Vascular - Clinical – 8
- (S-97) Perry T., Monday 12:45
- (S-98) Nakazawa, K., Monday 12:45
- (S-99) Smit, K., Monday 12:45
- (S-100) Perry, T., Monday 12:45
- (S-101) Hajek, R., Monday 12:45
- (S-102) Barodka, V., Monday 12:45

Critical Care Medicine and Trauma – 1
- (S-103) Cheng, S., Saturday 7:00
- (S-104) Aoi, Y., Saturday 7:00
- (S-105) James, M., Saturday 7:00
- (S-106) Abdulmomen, G., Saturday 7:00
- (S-107) Daneshrad, D., Saturday 7:00
- (S-108) Weitzel, L-R., Saturday 7:00
- (S-109) Salter, M., Saturday 7:00

Critical Care Medicine and Trauma – 2
- (S-110) James, M., Saturday 9:00
- (S-111) Li, Y-W., Saturday 9:00
- (S-112) Jin, S., Saturday 9:00
- (S-113) Kim, J., Saturday 9:00
- (S-114) IsekiI, S., Saturday 9:00
- (S-115) Abudelmomen, G., Saturday 9:00
- (S-116) Witte, J., Saturday 9:00
- (S-117) Abdulmomen, G., Saturday 9:00

Critical Care Medicine and Trauma – 3
- (S-118) Changi, W., Sunday 7:00
- (S-119) Dominguez, J., Sunday 7:00
- (S-120) Abdallah, C., Sunday 7:00
- (S-121) WITHDRAWN
- (S-122) Kor, D., Sunday 7:00
- (S-123) Queensland, K., Sunday 7:00
- (S-124) Saito, T., Sunday 7:00
- (S-125) Navarro, L., Sunday 7:00

Critical Care Medicine and Trauma – 4
- (S-126) Maile, M., Monday 9:00
- (S-127) WITHDRAWN
- (S-128) Shea, P., Monday 9:00
- (S-129) Afifi, S., Monday 9:00
- (S-130) O'Connor, M.F., Monday 9:00
- (S-131) Roby, J., Monday 9:00
- (S-132) Abdulmomen, G., Monday 9:00

Critical Care Medicine and Trauma – 5
- (S-133) Nagashima, M., Monday 12:45
- (S-134) Nakayama, S., Monday 12:45
- (S-135) Hamiel, C., Monday 12:45
- (S-136) Niederlechner, S., Monday 12:45
- (S-137) Lehmann, C., Monday 12:45
- (S-138) Fukushima, Y., Monday 12:45
- (S-139) Sun, J-Z., Monday 12:45
- (S-140) Abdulmomen, G., Monday 12:45

Economics – 1
- (S-141) Park, K., Saturday 11:00
- (S-142) Linde-Zwirble, W., Saturday 11:00
- (S-143) Dauber, B., Saturday 11:00
- (S-144) Tsai, M., Saturday 11:00
- (S-145) Park, K., Saturday 11:00
- (S-146) Apfelbaum, S., Saturday 11:00
- (S-147) Anitescu, M., Saturday 11:00
- (S-148) Coloma, M., Saturday 11:00

Economics – 2
- (S-149) Mantha, V., Sunday 7:00
- (S-150) Turan, A., Sunday 7:00
- (S-151) Gennari, L., Sunday 7:00
- (S-152) Rebello, E., Sunday 7:00
- (S-153) Clancy, T., Sunday 7:00
- (S-154) Candiotti, K., Sunday 7:00
- (S-155) Lee, M., Sunday 7:00
- (S-156) Nguyen, K., Sunday 7:00

Education and Patient Safety – 1
- (S-157) Toshniwal, G., Saturday 7:00
- (S-158) Ehrenfeld, J., Saturday 7:00
- (S-159) Minhaj, M., Saturday 7:00
- (S-160) Rothfield, K., Saturday 7:00
- (S-161) Hastings, R., Saturday 7:00
- (S-162) Wong, W., Saturday 7:00
- (S-163) Rothfield, K., Saturday 7:00
- (S-164) Rodriguez, Y., Saturday 7:00

Education and Patient Safety –2
- (S-165) Holak, E., Saturday 9:00
- (S-166) Bose, R., Saturday 9:00
- (S-167) Kramer, D., Saturday 9:00
- (S-168) Kirchen, G., Saturday 9:00
- (S-169) Rosenberg, A., Saturday 9:00
- (S-170) Bautista, A., Saturday 9:00
- (S-171) Yen, C., Saturday 9:00

IARS 2010 Annual Meeting
Abstract Presentation Schedule

Education and Patient Safety – 3
- (S-172) Russo, M., Saturday 12:45
- (S-173) Tse, J., Saturday 12:45
- (S-174) Yuasa, H., Saturday 12:45
- (S-175) Idemitsu, W., Saturday 12:45
- (S-176) Layman, R., Saturday 12:45
- (S-177) Motlani, F., Saturday 12:45
- (S-178) Dauber, B., Saturday 12:45

Education and Patient Safety – 4
- (S-179) Hucklenbruch, C., Sunday 11:00
- (S-180) Stapelfeldt, W., Sunday 11:00
- (S-181) Porter, S., Sunday 11:00
- (S-182) Kurz, A., Sunday 11:00
- (S-183) Radtke, F., Sunday 11:00
- (S-184) Batai, I., Sunday 11:00
- (S-185) Goldstein, S., Sunday 11:00

Education and Patient Safety – 5
- (S-186) Abd-Elsayed, A., Sunday 12:45
- (S-187) Kramer, D., Sunday 12:45
- (S-188) Bautista, A., Sunday 12:45
- (S-189) Baker, D., Sunday 12:45
- (S-190) Axelrod, D., Sunday 12:45
- (S-191) Burden, A., Sunday 12:45
- (S-192) Adams, J., Sunday 12:45
- (S-193) Field, L., Sunday 12:45

Education and Patient Safety – 6
- (S-194) Vigoda, M., Monday 7:00
- (S-195) Kaplan, J., Monday 7:00
- (S-196) Gay, C., Monday 7:00
- (S-197) Westenskow, D.R., Monday 7:00
- (S-198) WITHDRAWN
- (S-199) Kuppusamy, A., Monday 7:00
- (S-200) Porter, S., Monday 7:00
- (S-201) Cooper, L., Monday 7:00

Education and Patient Safety – 7
- (S-202) Falabella, A., Monday 9:00
- (S-203) Grewal, K., Monday 9:00
- (S-204) Renaud, C., Monday 9:00
- (S-205) Thiele, R., Monday 9:00
- (S-206) Yorozu, T., Monday 9:00
- (S-207) Oshima, T., Monday 9:00

Education and Patient Safety –8
- (S-208) WITHDRAWN
- (S-209) Bergese, S., Monday 9:00
- (S-210) Nakamura, R., Monday 9:00
- (S-211) Kaul, B., Monday 9:00
- (S-212) Vigoda, M., Monday 9:00
- (S-213) Park, J., Monday 9:00

Education and Patient Safety –9
- (S-214) Amato, P., Monday 11:00
- (S-215) Batai, I., Monday 11:00
- (S-216) Cooper, L., Monday 11:00
- (S-217) Wong, J., Monday 11:00
- (S-218) Kopp, S., Monday 11:00
- (S-219) Apfelbaum, S., Monday 11:00
- (S-220) WITHDRAWN

Education and Patient Safety –10
- (S-221) Guzman, C., Monday 12:45
- (S-222) Guzman, C., Monday 12:45
- (S-223) Simpao, A., Monday 12:45
- (S-224) Pitner, N., Monday 12:45
- (S-225) Wajda, M., Monday 12:45
- (S-226) Holak, E., Monday 12:45

Equipment Monitoring – 1
- (S-227) Inoue, K., Saturday 7:00
- (S-228) Suzuki, H., Saturday 7:00
- (S-229) Thiele, R., Saturday 7:00
- (S-230) Goto, H., Saturday 7:00
- (S-231) Daneshrad, D., Saturday 7:00
- (S-232) Kramer, D., Saturday 7:00

Equipment Monitoring –2
- (S-233) Batchelder, P., Saturday 9:00
- (S-234) Kurokawa, H., Saturday 9:00
- (S-235) Ishihara, H., Saturday 9:00
- (S-236) Yamada, T., Saturday 9:00
- (S-237) Toyonaga, T., Saturday 9:00
- (S-238) Kishi, M., Saturday 9:00
- (S-239) Scheib, C., Saturday 9:00
- (S-240) Cehovic, G., Saturday 9:00

Equipment Monitoring –3
- (S-241) Minhaj, M., Sunday 7:00
- (S-242) Lyons, P., Sunday 7:00
- (S-243) Yang, X., Sunday 7:00
- (S-244) Manabat, E., Sunday 7:00
- (S-245) Westenskow, D.R., Sunday 7:00
- (S-246) Hamada, Y., Sunday 7:00
- (S-247) Vigoda, M., Sunday 7:00
- (S-248) Kadono, N., Sunday 7:00

Equipment Monitoring – 4
- (S-249) Morgan, J., Monday 9:00
- (S-250) WITHDRAWN
- (S-251) WITHDRAWN
- (S-252) Hirabayashi, G., Monday 9:00
- (S-253) Sekine, K., Monday 9:00
- (S-254) Rovsing, L., Monday 9:00
- (S-255) Diaz-Gomez, J., Monday 9:00
- (S-256) Rodriguez, Y., Monday 9:00

IARS 2010 Annual Meeting
Abstract Presentation Schedule

Equipment Monitoring – 5
- (S-257) Chandler, J., Monday 11:00
- (S-258) Nakayama, Y., Monday 11:00
- (S-259) Breen, P., Monday 11:00
- (S-260) Searle, S., Monday 11:00
- (S-261) Mizushima, A., Monday 11:00
- (S-262) Modak, R., Monday 11:00
- (S-263) Sato, N., Monday 11:00

Equipment Monitoring – 6
- (S-264) Stapelfeldt, W., Monday 12:45
- (S-265) Hoshi, T., Monday 12:45
- (S-266) Westenskow, D.R., Monday 12:45
- (S-267) Kennedy, R., Monday 12:45
- (S-268) Habib, A., Monday 12:45
- (S-269) Turan, A., Monday 12:45
- (S-270) Prickett, W., Monday 12:45

Liver / Transplantation – 1
- (S-271) Xia, V., Saturday 9:00
- (S-272) Lee, HT., Saturday 9:00
- (S-273) Wagener, G., Saturday 9:00
- (S-274) Memarzadeh, M., Saturday 9:00
- (S-275) WITHDRAWN
- (S-276) Kinsella, S., Saturday 9:00
- (S-277) Bautista, A., Saturday 9:00

Liver / Transplantation – 2
- (S-278) Saner, F., Sunday 11:00
- (S-279) Njoku, D., Sunday 11:00
- (S-280) Wagener, G., Sunday 11:00
- (S-281) Arora, L., Sunday 11:00
- (S-282) Schmidt, R., Sunday 11:00
- (S-283) Schumann, R., Sunday 11:00

Liver / Transplantation – 3
- (S-284) Craig, L., Monday 11:00
- (S-285) Shah, J., Monday 11:00
- (S-286) Matsusaki, T., Monday 11:00
- (S-287) Kinsella, S., Monday 11:00
- (S-288) WITHDRAWN

Neuroanesthesia – 1
- (S-289) Kimura, T., Saturday 11:00
- (S-290) McNeer, R., Saturday 11:00
- (S-291) Lee, S., Saturday 11:00
- (S-292) Haile, M., Saturday 11:00
- (S-293) Haile, M., Saturday 11:00
- (S-294) Goldberg, M., Saturday 11:00

Neuroanesthesia – 2
- (S-295) Desai, R., Sunday 12:45
- (S-296) WITHDRAWN
- (S-297) Sittler, P., Sunday 12:45
- (S-298) Aihara, R., Sunday 12:45
- (S-299) WITHDRAWN

Neuroanesthesia – 3
- (S-300) Tao, F., Monday 7:00
- (S-301) Wang, D., Monday 7:00
- (S-302) Xiong, M., Monday 7:00
- (S-303) Rollins, M., Monday 7:00
- (S-304) Xing, Y., Monday 7:00
- (S-305) Zaky, S., Monday 7:00

Obstetric Anesthesia – 1
- (S-306) Ma, L., Saturday 9:00
- (S-307) Li, H., Saturday 9:00
- (S-308) Schultz, T., Saturday 9:00
- (S-309) Garcia, A., Saturday 9:00
- (S-310) WITHDRAWN
- (S-311) Fujita, N., Saturday 9:00
- (S-312) Okutomi, T., Saturday 9:00
- (S-313) van den Berg, A., Saturday 9:00

Obstetric Anesthesia – 2
- (S-314) Okada, H., Sunday 12:45
- (S-315) Donald, R., Sunday 12:45
- (S-316) Yoshino, J., Sunday 12:45
- (S-317) Glassenberg, R., Sunday 12:45
- (S-318) Vangura, K., Sunday 12:45
- (S-319) Yousef, A., Sunday 12:45
- (S-320) Takahashi, Y., Sunday 12:45

Pain - Basic Science – 1
- (S-321) WITHDRAWN
- (S-322) Ando, Y., Saturday 11:00
- (S-323) Shen, L., Saturday 11:00
- (S-324) Miletic, G., Saturday 11:00
- (S-325) Hasaka, M., Saturday 11:00
- (S-326) Takashi, S., Saturday 11:00

Pain - Basic Science – 2
- (S-327) Hojo, M., Sunday 12:45
- (S-328) Yang, Z., Sunday 12:45
- (S-329) Chiang, J., Sunday 12:45
- (S-330) Iwamoto, T., Sunday 12:45
- (S-331) WITHDRAWN
- (S-332) Xiujun, R., Sunday 12:45
- (S-333) Kimura, Y., Sunday 12:45
- (S-334) Khan, M., Sunday 12:45

Pain - Clinical – Acute – 1
- (S-335) Yousef, A., Saturday 11:00
- (S-336) She, S.Z., Saturday 11:00
- (S-337) Scarfo, K., Saturday 11:00
- (S-338) Refaat, A., Saturday 11:00
- (S-339) Yousef, A., Saturday 11:00
- (S-340) Fujii, H., Saturday 11:00
- (S-341) Morad, A., Saturday 11:00

IARS 2010 Annual Meeting
Abstract Presentation Schedule

Pain – Clinical – Acute – 2
- (S-342) Kim, S.Y., Sunday 7:00
- (S-343) Uchida, M., Sunday 7:00
- (S-344) Horng, H.C., Sunday 7:00
- (S-345) Yousef, A., Sunday 7:00
- (S-346) Eipe, N., Sunday 7:00

Pain - Clinical – Acute –3
- (S-347) Yoshimatsu, A., Sunday 12:45
- (S-348) Adams, T., Sunday 12:45
- (S-349) Saager, L., Sunday 12:45
- (S-350) Saager, L., Sunday 12:45
- (S-351) Joshi, G., Sunday 12:45
- (S-352) Imamachi, N., Sunday 12:45

Pain - Clinical – Chronic – 1
- (S-353) Morikawa, O., Saturday 12:45
- (S-354) Patil, S., Saturday 12:45
- (S-355) Obuchi, M., Saturday 12:45
- (S-356) Hirai, A., Saturday 12:45
- (S-357) Kim, D., Saturday 12:45
- (S-358) Clendenen, S., Saturday 12:45
- (S-359) Schultz, T., Saturday 12:45
- (S-360) WITHDRAWN

Pain - Clinical – Chronic – 2
- (S-361) WITHDRAWN
- (S-362) WITHDRAWN
- (S-363) Shibata, Y., Monday 7:00
- (S-364) Takahara, H., Monday 7:00
- (S-365) Arai, Y-C., Monday 7:00

Pain - Clinical – Chronic – 3
- (S-366) Elvir, O., Monday 9:00
- (S-367) Sumitani, M., Monday 9:00
- (S-368) Kim, D., Monday 9:00
- (S-369) Kim, D., Monday 9:00
- (S-370) McDonald, J., Monday 9:00

Pain - Clinical – Chronic – 4
- (S-371) Fujii, H., Monday 12:45
- (S-372) Ozuna, E., Monday 12:45
- (S-373) WITHDRAWN
- (S-374) Rupani, G., Monday 12:45
- (S-375) Dennis, A., Monday 12:45
- (S-376) Kurata, J., Monday 12:45
- (S-377) Payesteh, D., Monday 12:45
- (S-378) Tomotsuka, N., Monday 12:45

Pediatric Anesthesia: General Topics – 1
- (S-379) Ing, C., Saturday 11:00
- (S-380) Forde, A., Saturday 11:00
- (S-381) Rose, J., Saturday 11:00
- (S-382) Sadhasivam, S., Saturday 11:00
- (S-383) Pant, M., Saturday 11:00
- (S-384) Vigoda, M., Saturday 11:00
- (S-385) Kuo, C., Saturday 11:00
- (S-386) Abdallah, C., Saturday 11:00

Pediatric Anesthesia: General Topics – 2
- (S-387) Sadhasivam, S., Sunday 12:45
- (S-388) Chui, I., Sunday 12:45
- (S-389) Ring, L., Sunday 12:45
- (S-390) Watcha, M., Sunday 12:45
- (S-391) Verghese, S., Sunday 12:45
- (S-392) WITHDRAWN

Pediatric Anesthesia: General Topics – 3
- (S-393) Hwang, K.H., Monday 9:00
- (S-394) Husain, S., Monday 9:00
- (S-395) Wisotsky, J., Monday 9:00
- (S-396) Belani, K., Monday 9:00
- (S-397) Yamamoto, S., Monday 9:00
- (S-398) Shimada, M., Monday 9:00

Pediatric Anesthesia: General Topics – 4
- (S-399) Li, G., Monday 11:00
- (S-400) Deutsch, N., Monday 11:00
- (S-401) Istaphanous, G., Monday 11:00
- (S-402) Woloszczuk-Gebicka, B., Monday 11:00
- (S-403) Hache, M., Monday 11:00
- (S-404) Pinyavat, T., Monday 11:00

Pediatric Anesthesia: Neonatal Safety and Anesthetics – 1
- (S-405) Martynyuk, A., Saturday 7:00
- (S-406) Nasr, V., Saturday 7:00
- (S-407) Istaphanous. G., Saturday 7:00
- (S-408) Morrison, D. E., Saturday 7:00

Pharmacology - Basic Science – 1
- (S-409) Suman, A., Saturday 11:00
- (S-410) WITHDRAWN
- (S-411) Yang, J., Saturday 11:00
- (S-412) Schmidt, R., Saturday 11:00
- (S-413) WITHDRAWN
- (S-414) Hudetz, A., Saturday 11:00
- (S-415) Glassenberg, R., Saturday 11:00

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Abstract Presentation Schedule

Pharmacology – Basic Science – 2
- (S-416) Han, L., Sunday 7:00
- (S-417) WITHDRAWN
- (S-418) Nishikawa, K., Sunday 7:00
- (S-419) WITHDRAWN
- (S-420) WITHDRAWN

Pharmacology – Basic Science – 3
- (S-421) WITHDRAWN
- (S-422) Izrailtyan, I., Sunday 12:45
- (S-423) Lemoine, S., Sunday 12:45
- (S-424) Whittington, R., Sunday 12:45
- (S-425) Jafarian, N., Sunday 12:45
- (S-426) Xie, Z., Sunday 12:45

Pharmacology – Basic Science – 4
- (S-427) Dispersyn, G., Monday 11:00
- (S-428) Yoshitomi, T., Monday 11:00
- (S-429) Crowder, C.M., Monday 11:00
- (S-430) Qian, Y., Monday 11:00
- (S-431) Karcz, M., Monday 11:00
- (S-432) Kondo, I., Monday 11:00
- (S-433) WITHDRAWN

Pharmacology – Clinical – 1
- (S-434) Hidaka, S., Saturday 12:45
- (S-435) Dilly, L., Saturday 12:45
- (S-436) Habib, A., Saturday 12:45
- (S-437) Hwang, K., Saturday 12:45
- (S-438) Suzuki, T., Saturday 12:45
- (S-439) Kirino, S., Saturday 12:45
- (S-440) Kennedy, R., Saturday 12:45

Pharmacology – Clinical – 2
- (S-441) Riess, M., Monday 7:00
- (S-442) Kudo, R., Monday 7:00
- (S-443) Zhuang, L., Monday 7:00
- (S-444) LaPierre, C. D., Monday 7:00
- (S-445) Evans, T., Monday 7:00
- (S-446) Morimatsu, H., Monday 7:00
- (S-447) WITHDRAWN

Pharmacology – Clinical – 3
- (S-448) Rodriguez, Y., Monday 12:45
- (S-449) Wischmeyer, P., Monday 12:45
- (S-450) LaPierre, C., Monday 12:45
- (S-451) Sumiyoshi, K., Monday 12:45
- (S-452) Yu, H., Monday 12:45
- (S-453) Anagnostou, J., Monday 12:45
- (S-454) Miyazawa, M., Monday 12:45
- (S-455) Yousef, A., Monday 12:45

Regional Anesthesia – 1
- (S-456) WITHDRAWN
- (S-457) Rana, H., Saturday 7:00
- (S-458) Bhanot, R., Saturday 7:00
- (S-459) Bustamante, D., Saturday 7:00
- (S-460) WITHDRAWN
- (S-461) Ladlie, B., Saturday 7:00
- (S-462) Terasako, K., Saturday 7:00
- (S-463) WITHDRAWN

Regional Anesthesia – 2
- (S-464) Sheen, M., Saturday 12:45
- (S-465) Guay, J., Saturday 12:45
- (S-466) Galassi, J., Saturday 12:45
- (S-467) Zhou, J., Saturday 12:45
- (S-468) Hoenemann, C., Saturday 12:45
- (S-469) WITHDRAWN
- (S-470) WITHDRAWN

Regional Anesthesia – 3
- (S-471) Clendenen, S., Sunday 11:00
- (S-472) Zhou, J., Sunday 11:00
- (S-473) Chan, V., Sunday 11:00
- (S-474) Iida, R., Sunday 11:00
- (S-475) Harato, M., Sunday 11:00
- (S-476) Foerschler, D., Sunday 11:00
- (S-477) Takata, K., Sunday 11:00
- (S-478) WITHDRAWN

Regional Anesthesia – 4
- (S-479) Jacob, A., Monday 7:00
- (S-480) Fouad, A., Monday 7:00
- (S-481) Seif, J., Monday 7:00
- (S-482) Kim, T.E., Monday 7:00
- (S-483) Chan, V., Monday 7:00
- (S-484) Szucs, S., Monday 7:00
- (S-485) Sandhu, N., Monday 7:00
- (S-486) Kim, T.E., Monday 7:00

Regional Anesthesia – 5
- (S-487) Onuki, E., Monday 12:45
- (S-488) Lee, N., Monday 12:45
- (S-489) Chenault, K., Monday 12:45
- (S-490) Coutu, E., Monday 12:45
- (S-491) Mohamed, S., Monday 12:45

ANESTHESIA & ANALGESIA

Ambulatory Anesthesia

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S-01.

SAFETY AND EFFICACY OF LMA SUPREME™ VERSUS LMA PROSEAL™ - A RANDOMIZED CONTROLLED TRIAL

AUTHORS: R. Subramanyam, E. Seet, T. Firoz, J. Wong, D. T. Wong, F. Chung;

AFFILIATION: Anesthesia, Toronto Western Hospital, Toronto, ON, Canada.

INTRODUCTION: The Supreme™ laryngeal mask airway (LMA) is a new single-use polyvinyl chloride supraglottic device that combines the functionality of ProSeal and Fastrach airways (1). High oropharyngeal leak pressures are important as it indicates airway protection, feasibility of positive pressure ventilation, and likelihood of successful LMA placement (2). The oropharyngeal leak pressure of the LMA SupremeTM is not well established versus the LMA ProSealTM. This study was designed to compare the safety and efficacy of the LMA SupremeTM versus the LMA ProSealTM in elective ambulatory procedures.

METHOD: Hospital ethics board approval was obtained. One hundred and five patients were consented and randomly allocated to LMA SupremeTM or ProSeal™ groups. Anesthesia was induced with intravenous propofol 2-3 mg/kg, fentanyl 1-2 µg/kg and maintained with desflurane in an air-oxygen mixture. Anesthesiologists with more than five years experience performed all of the LMA insertions. Manometry was used to standardize intracuff pressure at 60 cmH20. The primary outcome was the oropharyngeal leak pressure. Secondary outcomes were the time and number of attempts for insertion, ease of insertion, and the anesthesiologist's satisfaction score of the airway device. The success on first attempt insertion was measured. Patients were interviewed postoperatively for any pharyngolaryngeal adverse events.

RESULTS: A total of 99 patients were analyzed for the primary outcome. The baseline demographic data for both groups were comparable (Table 1). The mean oropharyngeal leak pressure with LMA Supreme™ was 21 ± 5 cmH20 (95% CI 19.5-22.4). This was significantly lower than that of LMA ProSeal™ 25 ± 6 cmH20 (95% CI 23.4 - 26.8) ($p < 0.001$). The success rate of the 1st attempt insertion was higher for LMA Supreme™ as compared to LMA ProSeal™ (98% and 88% respectively) (p=0.04). There was no difference in the median (IQR) time taken for insertion with LMA Supreme™ versus LMA ProSeal™: 26 (23-45) vs 30 (20-38) sec respectively (p=0.16) (Table 2). The ease of insertion, postoperative pharyngolaryngeal adverse events, patient satisfaction scores and anesthesiologist satisfaction scores was comparable in both groups. There were no complications of aspiration or nerve injuries.

CONCLUSION: The LMA Supreme™ has lower oropharyngeal leak pressures compared to the LMA ProSeal™. The success of the 1st attempt insertion was higher for the LMA Supreme™. LMA Supreme™ is a safe, efficacious, and easy-to-use disposable supraglottic airway device in elective ambulatory procedures. The higher rate of success on first attempt insertion may make it more suitable as an airway rescue device.

Table 1: Demographic Data

	Supreme (n = 50)	ProSeal (n = 49)
Age (years)	48 ± 16	46 ± 17
Gender (Males/Females)	31/19	23/26
Body mass index (kg/m2)	27 ± 4	28 ± 5
Neck circumference (cm)	38 ± 4	37 ± 4
Duration of anesthesia (min)	61 ± 38	62 ± 31
Size of LMA (3/4/5)	11/ 21/ 18	8 / 27 / 14
Type of surgery (Ortho/Urology/Others)	33 / 13 / 4	32 / 11 / 6
Fentanyl intraop (µg)	131 ± 54	146 ± 54
PACU time (min)	56 ± 31	62 ± 36

Table 2: Safety, Efficacy and Utility Data with the use of Supreme™ and ProSeal™

	Supreme (n = 50)	ProSeal (n = 49)	P value
Oropharyngeal leak pressure (cmH2O)	21 ± 5	25 ± 6	< 0.001
1st attempt success rate (%)	98	88	0.04
Time taken for insertion (s)	26 (23 - 45)	30 (20 - 38)	0.16
Ease of insertion (Easy / Fair / Difficult)	42 / 8 / 0	40 / 6 / 3	0.16
Blood on LMA (%)	9.8	16.3	0.33
Laryngospasm (%)	7.8	10.2	0.68
Patient satisfaction score (mm)	87 ± 13	85 ± 15	0.61
Anesthesiologist satisfaction score (mm)	83 ± 12	80 ± 11	0.31

S-02.

RANDOMIZED, PROSPECTIVE, PLACEBO-CONTROLLED, DOUBLE BLIND TRIAL TO EVALUATE THE EFFICACY OF PREOPERATIVE APREPITANT IN PATIENTS AT MODERATE-TO-HIGH RISK FOR POSTOPERATIVE NAUSEA (PONV) UNDERGOING AMBULATORY PLASTIC SURGERY

AUTHORS: B. Kaul, P. Milord, M. Vallejo, R. Ryan, J. Waters;

AFFILIATION: Anesthesiology, Magee Womens Hospital & Univ. of Pittsburg h, Pittsburgh, PA.

BACKGROUND: Postoperative nausea and vomiting (PONV) is a major problem in the peri-operative setting. The baseline incidence of 20-30% can rise to 70-80% among high risk patients. Ambulatory surgery is also a known risk factor. Complications include prolonged discharge time or hospital admission, patient dissatisfaction, and delays in returning to normal daily activities. Aprepitant is the only FDA approved medication for the prevention of PONV up to 48 hours after surgery. This study aims to investigate Aprepitant's effect on PONV in ambulatory plastic surgical patients.

METHODS: High risk patients (women ≥ 3 factors; men ≥ 2) undergoing a standardized general anesthestic of ≥ 1 hour duration were randomized to one of two groups; Group A - oral aprepitant (40 mg 2 hr before procedure) plus ondansetron (4 mg IV), or Group B - oral placebo pill plus ondansetron. PONV risk factors included: female gender, PONV history, motion sickness, non-smoking status, and postoperative opioid use. Primary measured variables included nausea VAS scores and presence of emesis, collected hourly in the PACU until discharge, every 4 hrs for the first 24 hrs and every 8 hrs thereafter for 48 hrs. Patients were given daily logs and telephoned daily to ensure compliance. Interval data was analyzed with t-test, nominal with Chi-square, and ordinal with Mann-Whitney. $P<0.05$ was significant.

RESULTS: Ninety patients were studied (Aprepitant n=41; Placebo n=49). Median PONV risk factors were 3 with a range of 2-5 in both groups. There were no differences between groups with respect to demographics (age, height, weight, gender), type and duration of surgery, PACU stay, discharge time, hospital admission, pain VAS and use of pain medications and rescue anti-emetics. Nausea VAS scores over 48 hrs were less in the Aprepitant group ($P=0.0021$), with a trend toward significance at 4 hrs ($P=0.066$). In addition, the percentage of postoperative emetic episodes was less in the Aprepitant group (4.2% vs. 11.4%; $P=0.016$).

CONCLUSIONS: Aprepitant plus ondansetron is more effective than ondansetron alone in preventing postoperative nausea and emesis for up to 48 hours in ambulatory plastic surgical patients undergoing general anesthesia.

S-03.

NITROUS OXIDE ADDED AT THE END OF ISOFLURANE ANESTHESIA HASTENS EARLY RECOVERY WITHOUT INCREASING RISK FOR PONV

AUTHORS: B. Mraovic[1], T. Simurina[2], Z. Sonicki[3], J. Seric[2], N. Sulen[2], P. Kranke[4];

AFFILIATION: [1]Anesthesiology, Thomas Jefferson University, Philadelphia, PA, [2]Anesthesiology and ICU, General Hospital, Zadar, Croatia, [3]Medical Statistics, Epidemiology and Medical Informatics, University of Zagreb, Zagreb, Croatia, [4]Klinik und Poliklinik für Anästhesiologie, Universitätsklinikum Würzburg, Würzburg, Germany.

INTRODUCTION: Nitrous oxide (N2O) increases risk for post-operative nausea and vomiting (PONV).(1) This effect appears to be dose/depended.(2) To minimize risk of using N2O some anesthesiologists use N2O at the end of volatile anesthetic anesthesia. We investigated if adding N2O at the end of isoflurane anesthesia had influence on extubation and PONV.

METHODS: After obtaining IRB approval and informed consents, 64 women, ASA PS I-III, scheduled for laparoscopic assisted vaginal hysterectomy were randomized into two groups according to carrier gas: G0 - air in 30% oxygen (n=32) and G1 - the same mixture until last 30 minutes of surgery when 70% nitrous oxide and 30% oxygen was used (n=32). No PONV prophylaxis was given. Anesthesia was induced with thiopental 5 mg/kg, vecuronium 0.1 mg/kg and fentanyl 1-2 µg/kg IV, followed by 10mL/kg saline and maintained with isoflurane ~ 1MAC. Early recovery (time to extubation, eye opening, following commands, orientation) was measured by a blinded anesthesiologist. PONV and pain scores were measured at 2 h and 24 hours postoperatively. Diclofenac and meperidine was used for pain and metoclopramide for PONV. Data were analyzed using Chi-Square and Mann-Whitney test. $P<0.05$ was considered significant.

RESULTS: Average mean time of nitrous oxide administration in G1 group was 26.2 ±10.4 in minutes. There were no significant differences between two groups for age, BMI, h/o smoking, h/o motion sickness and/or PONV, duration of anesthesia and surgery. The times to extubation and eyes opening were significantly less for G1 than G0 group while differences inability to follow commands and orientation did not reach statistical significance. The incidence of PONV, rescue antiemetic usage, maximal nausea VAS score, pain VAS score at 24 hours and perioperative opioid consumption were not different between groups.(Table 1)

Discussion: Adding N2O at the end of the isoflurane anesthesia hastened extubation for 2 minutes, eyes opening for 3.5 minutes and orientation for almost 4 minutes after laparoscopic assisted gynecologic surgery. N2O may be added in last 20-30 minutes of isoflurane anesthesia without increasing risk of PONV.

REFERENCES:

1. Anesthesiology 2007; 107:221-31
2. Anesth Analg 2008; 107:818-23

Table 1: Recovery times and PONV data

	G0 (n=32) (air)	G1 (n=32) (air + N2O at the end)	P
Tracheal extubation (sec)[a]	431.5 (124-968)	296.0 (85-842)	0.037*
Open eyes (sec)[a]	780.0 (255-1725)	567.5 (180-1508)	0.014*
Follows orders (sec)[a]	903.0 (272-1745)	657.5 (240-1722)	0.061
Orientation (sec)[a]	997.5 (284-1909)	770.0 (280-2290)	0.050
PONV (24h)(n,%)	25 (78%)	21 (66%)	0.266
PONV (0-2h)(n,%)	23 (72%)	16 (50%)	0.073
PONV (2-24h)(n,%)	11 (34%)	13 (41%)	0.606
Metoclopramide (n%)	20 (63%)	13 (41%)	0.080

[a] Data presented as median and range (min-max). *P<0.05

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S-04.

COMPARISON OF RECOVERY OF PSYCHOMOTOR FUNCTION BETWEEN FENTANYL AND REMIFENTANIL AFTER TOTAL INTRAVENOUS ANESTHESIA WITH PROPOFOL IN PATIENTS UNDERGOING ELECTIVE SURGERY

AUTHORS: A. Funada[1], S. Yamaguchi[2], Y. Kimura[2], T. Kitajima[2], Y. Imai[1];

AFFILIATION: [1]Oral & Maxillofacial Surgery, Dokkyo Medical University, Mibu, Japan, [2]Anesthesiology, Dokkyo Medical University, Mibu, Japan.

INTRODUCTION: Rapid recovery of psychomotor function after general anesthesia is required for ambulatory anesthesia and enhanced recovery after surgery. The aim of this study is to compare fentanyl with remifentanil on emergence times and recovery of psychomotor function after total intravenous anesthesia (TIVA) with propofol.

METHODS: After obtaining the approval of the hospital ethics committee and informed consent from all patients, the present study was scheduled. Forty ASA I patients undergoing elective surgery were randomly divided into two groups. In the group F (n=20) or R (n=20), anesthesia was induced and maintained with propofol and fentanyl (3 μg/kg as an initial dose and 1μg/kg every 30min as an anesthetic maintenance) or continuous infusion of remifentanil (0.3μg/kg/min an initial dose and an anesthetic maintenance), respectively. Infusion rates of propofol were adjusted to maintain an appropriate level of anesthesia (bispectral index: range 40-50) using target controlled infusion system (Terufusion TCI syringe pump TE-371 TIVA, Terumo, Tokyo). The psychomotor function, as measured by the Trieger's dot test (1), was evaluated before anesthesia and 30, 60, 90, 120, 150, 180 min after the end of propofol and fentanyl or remifentanil infusion.

RESULTS: The duration of anesthesia was 146±21 min and 150±36 min in the group F and R, respectively. No differences were observed in emergence times (opened their eyes on command; 18±7 min in the group F and 15±3 min in the group R) between both groups. The recovery of psychomotor function in the group F took significantly longer compared with that in the group R from 30 min to 150 min after the end of propofol and fentanyl or remifentanil infusion (number of dots missed in Trieger's test; 23±6 and 16±7 at 60 min, 16±10 and 8±3 at 90 min, 18±8 and 9±5 at 120 min, 13±6 and 7±3 at 150 min, respectively; $p<0.05$).

DISCUSSION: Although there was no difference in emergence times between patients who received fentanyl and remifentanil in TIVA, recovery of psychomotor function in patients with remifentanil was significant faster than that in patient with fentanyl. Our results show that remifentanil may be more beneficial than fentanyl in TIVA for ambulatory anesthesia and enhanced recovery after surgery.

S-05.

THE IMPACT OF POSTOPERATIVE NAUSEA AND VOMITING ON THE QUALITY OF RECOVERY FOLLOWING ANESTHESIA

AUTHORS: A. S. Habib[1], S. D. Bergese[2], J. Gu[3], C. C. Apfel[4], M. Cantillion[5], T. J. Gan[1];

AFFILIATION: [1]Anesthesiology, Duke University Medical Center, Durham, NC, [2]Anesthesiology and Neurological Surgery, Ohio State University, Columbus, OH, [3]Clinical Trials Statistics, Duke Clinical Research Institute, Durham, NC, [4]Anesthesiology, University of California San Francisco, San Francisco, CA, [5]Anesthesiology, Schering- Plough Research Institute, Kenilworth, NJ.

BACKGROUND: There is a paucity of data regarding the impact of postoperative nausea and vomiting (PONV) on the quality of recovery (QoR) following anesthesia and surgery. The QoR 40 questionnaire provides an extensive and efficient evaluation of the patient's quality of recovery after anesthesia and surgery (1). The aim of this study is to assess the impact of PONV on QoR 40 scores in patients who were enrolled in a multicenter study to assess the effect of a range of doses of the new neurokinin-1 receptor antagonist rolapitant in women undergoing open abdominal surgery under general anesthesia.

METHODS: Following IRB approval and written informed consent women undergoing elective open abdominal surgery under general anesthesia were enrolled in this randomized, double- blind, double- dummy, dose- ranging, active- and placebo- controlled study. Patients were randomized to receive one of 4 doses of oral rolapitant, ondansetron, or placebo. Anesthesia and postoperative care were standardized. QoR-40 scores were obtained for English speaking subjects in the United States centers only at 24 hours after the end of anesthesia. The questionnaire consisted of 2 parts (A & B) and assessed 5 dimensions of the patient's recovery: emotional state, physical comfort, psychological support, physical independence, and pain. Each dimension includes a number of items for a total of 40 items. The patients' response to each item ranges from 1= none of the time or poor, to 5= all of the time or excellent. In this analysis we compared the QoR scores between patients who developed nausea or vomiting versus those who did not have any of those symptoms irrespective of group allocation. The Wilcoxon rank sum test was used for statistical analysis. $P<0.05$ was considered statistically significant.

RESULTS: 619 patients were enrolled in the study. QoR scores were available for 489 patients. Of those, 106 had both nausea and vomiting, 278 had nausea only, and 105 had no symptoms. The overall QoR scores are presented in the table. Patients who had vomiting had overall significantly lower QoR scores compared to those who did not experience vomiting. In a subanalysis of patients with nausea, only those with severe nausea had significantly lower QoR scores compared to those who did not experience nausea. Analysis of the individual dimensions of the QoR score showed that patients who had vomiting had significantly lower scores for emotional state and physical comfort compared to those who did not vomit ($p<0.0001$).

DISCUSSION: PONV have a significant negative impact on QoR following surgery particularly affecting patient comfort and emotional state.

REFERENCES:

1. Br J Anaesth 2000; 84: 11-15

	Vomiting	Nausea	Mild Nausea	Moderate Nausea	Severe Nausea
Number	106	384	59	108	204
QoR score with symptoms	158 (16.2)	165.5 (18.8)	169.0 (17.7)	168.4 (15.3)	162.4 (20)
QoR score without symptoms	166.7 (16.2)	168.7 (14.4)	168.7 (14.4)	168.7 (14.4)	168.7 (14.4)
P-value	<0.0001	0.211	0.720	0.6499	0.014

Data are mean (SD), Mild nausea= nausea score 1-3, moderate nausea= nausea score 4-6, severe nausea= nausea score 7-10.

S-06.

THE EFFECT OF ADDING DEXMEDETOMIDINE TO FENTANYL/MIDAZOLAM SEDATION FOR EYE SURGERY: A RETROSPECTIVE REVIEW OF DISCHARGE TIMES

AUTHORS: R. J. Fink, J. Schultz, W. D. White, A. S. Habib;

AFFILIATION: Anesthesiology, Duke University Medical Center, Durham, NC.

INTRODUCTION: Dexmedetomidine (Dex) is a selective alpha-2 receptor agonist that has sedative, sympatholytic, and anxiolytic effects (1). After use of Dex at our outpatient eye center, PACU staff noted a prolonged time to discharge home. Given this fast-paced outpatient setting, patient flow is important for optimal OR efficiency. The aim of this review was to determine if Dex is associated with prolonged PACU stays, and to evaluate its effect on hemodynamic variables.

METHODS: Records were reviewed from 40 adults presenting for vitrectomy and/or retinal detachment repair: 20 who received Dex (infusion, boluses, or both) with fentanyl and midazolam (fent/midaz) and 20 concurrent patients sedated with fent/midaz only. All patients received propofol before placement of a retrobulbar block. Patient data were obtained from the computerized record system from the same three-week time period and included medication dosages, PACU time, and vital signs. T-tests and multivariable regression adjusting for age and other preoperative characteristics were used to compare treatment groups. Results for continuous variables are presented as mean +/- standard error of the mean (SEM) unless otherwise indicated. Statistical significance was defined as $P<0.05$.

RESULTS: No significant difference was found with time spent in the PACU, in either unadjusted or adjusted tests: Dex group = 108 +/- 9 min, fent/midaz group = 107 +/- 7 min (p=0.98). No significant difference was found between the groups with regards to gender, preoperative MAP, preoperative HR, or amount of fentanyl or midazolam given. Patients in the Dex group were significantly younger: 56 +/- 4 years vs. 66 +/- 3 years in the fent/midaz group (p=0.03). However, age showed no association with time in the PACU (p=.57) or with change in MAP (ΔMAP) (p=.64). Overall, MAP decreased 19 +/- 5 mmHg in the Dex group, vs. 7 +/- 3 mmHg in the fent/midaz group. Multivariable analysis showed that MAP fell more and that the Dex difference was greater in the patients with higher preoperative MAP (interaction p=.0167). Our data did not show a significant difference in ΔHR between the groups (0=0.44). One patient in the Dex group (67 yo male with preoperative MAP of 125 mmHg) required treatment for hypotension and bradycardia.

DISCUSSION: This retrospective review found a significant ΔMAP with Dex in patients with higher preoperative MAP, but did not find a significant difference in PACU times to discharge home. Therefore, a delay in PACU discharge may not be a valid argument against the use of Dex in this setting. PACU staff however may need to be comfortable treating occasional hypotension and bradycardia. A larger data set is needed to refine predictors of PACU complications with Dex and thus assist in appropriate patient selection.

REFERENCES:

1. Proc (Bayl Univ Med Cent). 2000; 14(1): 13-21

S-07.

ANTIEMETIC PROPHYLAXIS FOR POSTDISCHARGE NAUSEA AND VOMITING AFTER HIP ARTHROSCOPY

AUTHORS: M. C. Rade[1], J. T. YaDeau[1], Y. Lin[1], S. H. Coleman[2], B. T. Kelly[2], D. H. Kim[1];

AFFILIATION: [1]Anesthesiology, Hospital for Special Surgery, New York, NY, [2]Orthopedic Surgery, Hospital for Special Surgery, New York, NY.

INTRODUCTION: Postoperative and postdischarge nausea and vomiting remain common complaints after ambulatory surgery.[1] Effective anti-emetic regimens can reduce the occurrence of postoperative nausea and vomiting in the hospital;[1,2] however, postdischarge nausea and vomiting (PDNV) remains problematic.[3] Prophylactic postoperative ondansetron reduced the incidence of PDNV after general anesthesia (57% to 20%).[3] There are currently no studies on postdischarge prophylactic anti-emetic regimen for patients undergoing hip arthroscopy, nor are there any studies on PDNV in ambulatory patients after regional anesthesia. This study investigated whether continuation of an anti-emetic regimen for 48 hours postoperatively would reduce the incidence of PDNV.

Methods: Following IRB approval, a prospective, randomized placebo-controlled trial of 76 patients undergoing ambulatory hip arthroscopy was initiated. All patients received a spinal anesthetic with intravenous sedation. No opioids were given intraoperatively. Postoperative pain management consisted of hydrocodone/acetaminophen and naproxen. The control group received intraoperative IV ondansetron and postoperative oral placebo (for 2 days). The study group received intraoperative IV ondansetron and postoperative oral ondansetron (8 mg each day for two days). Anti-emetic rescue consisted of intravenous metoclopramide (10mg) if needed in the PACU, and oral prochlorperazine tablets (10mg Q8hr PRN) if needed at home. Patients were contacted one and three days postoperatively and were administered a standardized questionnaire addressing postdischarge nausea/vomiting, quality of life and VAS pain scores.

Results: Thus far 52 patients followed the full protocol, 26 patients each in Group I (placebo-control) and Group II (ondansetron). Of the 52 patients, 31 (60%) were male. The majority of patients underwent a labral debridement. Average patient age was 39 years old with an average BMI of 25. On the first day following discharge, the incidence of nausea/vomiting was 58% in Group I and 46% in Group II. The difference was not significant (p=0.41). 34% of patients in the Group I reported either moderate or severe nausea in the 24 hours after surgery, compared to 20% in Group II (Table 1). Incidence rates and severity on post-operative day two and post-operative day 3, although lower, displayed similar results (Table 2-3).

Discussion: Nausea and vomiting were common on the first day following surgery. This study tested the effect of ondansetron alone on postdischarge nausea/vomiting; other anti-emetics were administered as needed only. There were no significant differences between study and control groups. A trend appeared towards decreased nausea severity though POD1; however, these differences were also found to not be statistically significant. The regimen of oral ondansetron alone appears to have no benefit on ambulatory hip arthroscopy patients. This study underscores the need to include other anti-emetics (or non-opioid analgesia) after hip arthroscopy.

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Table 1: Incidence of Postdischarge Nausea/Vomiting and Postoperative Pain – POD1

	Group I (Control)	Group II (Study)
Oral Opioid Intake* Mean/SD	5.1/2.8	6.2/3.5
Nausea Incidence	15(58%)	12(46%)
Chi-square		0.69
p-value		0.41
Nausea Severity		
No Nausea	11(42%)	14(54%)
Mild Nausea	6(23%)	7(27%)
Moderate Nausea	4(15%)	2(8%)
Severe Nausea	5(19%)	3(12%)
Chi-square		1.60
p-value		0.66
VAS Pain Score at Rest (Mean/SD)	3.4/2.1	2.3/2.2
VAS Pain Score in Motion (Mean/SD)	5.8/1.9	5.2/2.8

Table 1: Incidence of Postdischarge Nausea/Vomiting and Postoperative Pain – POD2

	Group I (Control)	Group II (Study)
Oral Opioid Intake* Mean/SD	2.1/2.6	3.3/3.7
Nausea Incidence	6(23%)	6(23%)
Chi-square		0.00
p-value		1.00
Nausea Severity		
No Nausea	20(77%)	20(77%)
Mild Nausea	4(15%)	4(15%)
Moderate Nausea	1(4%)	0(0%)
Severe Nausea	1(4%)	2(8%)
Chi-square		1.33
p-value		0.72
VAS Pain Score at Rest (Mean/SD)	2.7/1.9	1.4/1.5
VAS Pain Score in Motion (Mean/SD)	4.7/1.9	3.7/2.3

Table 1: Incidence of Postdischarge Nausea/Vomiting and Postoperative Pain – POD3

	Group I (Control)	Group II (Study)
Oral Opioid Intake* Mean/SD	0.8/1.2	1.4/2.6
Nausea Incidence	4(15%)	4(15%)
Chi-square		0.00
p-value		1.00
Nausea Severity		
No Nausea	22(85%)	22(85%)
Mild Nausea	2(8%)	2(8%)
Moderate Nausea	1(4%)	1(4%)
Severe Nausea	1(4%)	1(4%)
Chi-square		0.00
p-value		1.00
VAS Pain Score at Rest (Mean/SD)	2.3/1.9	1.4/1.7
VAS Pain Score in Motion (Mean/SD)	4.4/2.0	3.0/2.4

S-08.

RETURN OF FUNCTION IN ELDERLY PATIENTS UNDERGOING MINIMALLY INVASIVE SURGICAL PROCEDURES

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BACKGROUND: As the population ages and improvements in both surgery and anesthesia make minimally invasive surgical options available to increasingly elderly patients, assessing the postoperative return of function in such patients could be important to justifying current or optimizing future surgical, anesthesia and rehabilitative techniques.

METHODS: We enrolled patients over the age of 65 scheduled to undergo general anesthesia for minimally invasive - laparoscopic, endoscopic and cystoscopic - procedures. We measured postoperative return of function using the Activities of Daily living (ADL) and Independent Activities of Daily Living (IADL) scales. ADL and IADL scores were obtained pre-operatively and post-operatively on days one, seven and at six weeks. The primary outcome was whether or not patients exhibited decreases in their ADL or IADL scores after undergoing anesthesia and surgery. We also examined which components of ADL and IADL scores were affected in those patients who exhibited a reduction in score. Finally, outcomes with respect both surgery type and anesthetic agent were examined.

RESULTS: We enrolled 46 patients. On day one postoperatively, ten (21.7%) of the patients had a decrease in their ADL score and 15 (32.6%) had a decrease in their IADL score. By day seven, only one patient had a continuing IADL deficiency and no patient had an ADL deficiency. There were no ADL or IADL deficiencies observed at six weeks. When compared to the preoperative level, the magnitudes of decrease in ADL (25.97 to 25.09) and in IADL (23 to 20.85) seen on postoperative day one were statistically significant (p=0.02, p-0.003). The categories of ADL score most affected were dressing and ambulation and the categories of IADL most affected were transportation and shopping. There were no statistically significant differences in outcomes with respect to either the anesthetic agent used or to the surgical technique.

DISCUSSION: The elderly patients in our study showed a statistically significant decrease in ADL and IADL on postoperative day one after undergoing general anesthesia for a minimally invasive surgical procedure. This decrease in function, however, was transient with all but one patient exhibiting a full return to baseline function by postoperative day seven. This is in contrast to the prolonged decrease in ADL and IADL observed in elderly patients undergoing invasive surgical procedures[1,2,3]. Also, we believe that improvements in anesthetic and surgical techniques aimed at addressing the areas of postoperative ADL and IADL deficiency - dressing, ambulation, transportation and shopping - may lead to even quicker recovery times in elderly patients after minimally invasive surgical procedures.

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S-09.

AIRWAY COMPLICATIONS DURING IV SEDATION FOR MAXILLO FACIAL OUTPATIENT SURGERY: A CASE SERIES

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INTRODUCTION: IV sedation is sometimes needed for extraction of supernumerary teeth extraction. In our practice a combination of fentanyl and midazolam with supplementary propofol is used with a pediatric anesthesiologist. We performed an observational study including chart review to examine the dosing, depth of sedation, effectiveness, recovery time and complications over 6 months. Our aim was to evaluate the effectiveness of our sedation technique and determine the relationship of propofol to any airway complications

Methods: After IRB approval, a research assistant not involved in clinical care, observed all procedures and collected data from the pre-sedation assessment, clinic records, anesthesia record, and follow-up phone call. Sedation depth was scored using the Ramsay scale. All patients met hospital NPO guidelines and had an airway assessment. Our routine sedation regimen (midazolam 2-4 mg, fentanyl 50-100 mcg and 10 mg increments of propofol with 2l/min O2 via canula) was used. SpO2, EKG, BP were monitored before, during, and after the procedure.

RESULTS: Patient demographics are in table 1. All patients' sedation was assessed as good, the mean patient rating (follow-up phone call) was 9.6 and all surgeries were completed without difficulty. 30 of 100 patients (30%) had at least one episode of airway obstruction/desaturation to less than 92% (AWC). These events were limited in duration with no lasting effects. There was no signifcant difference between those who had an AWC and those who did not (table 2) with regard to propofol dose (mg/kg), fentanyl dose, BMI, age, midazolam dose and sedation time. Those with an AWC had a higher Ramsay score (p=0.04) and more individual doses of propofol (p=0.06) than those without. The mean time from first propofol dose and an AWV was 5 min 42s. The most recent dose of propfol was on average given 1 min 48s before the AWC. The mean propofol dose prior to AWC was 30mg (a mean dose of 0.46 mg/kg) and about 49% of the total propofol dose received. Patients with no AWC received a similar dose (0.4 mg/kg) of propofol (59% total dose), within the first 5 mins. All patients who had an AWC received additional propofol doses without further complications.

DISCUSSION: Propofol can be an effective adjutant agent for sedation of children/young adults in the maxillofacial clinic. The timing of AWC appeared to be related to use of propofol. Respiratory event were associated with a deeper sedation level. These AWC occurred even with small incremental doses of propofol. The rate of propofol use did not seem to correlate with the occurrence of an AWC. Although there were no serious consequences, there is a potential for significant airway compromise. It would be prudent to have an airway specialist present for all sedations involving propofol.

Table 1. Demographics

	Mean	SD
Age (yrs)	16.9	2.9
Weight (kg)	73.8	26.0
BMI	26.8	8.1
Previous GA	36	-
Previous Sed	7	-
Recent URTI	9	-
Psych Meds	13	-

Table 2. Comparison of Groups (airway complication)

	Airway	No comp	p value
Number (n/100)	30	70	
Mean Age (years)	16.2	17.1	0.15
Mean BMI	26.6	26.9	0.90
Mean Sedation Time (minutes)	0:06	0:06	0.80
Mean Fentanyl dose(mcg/kg)	1.5	1.47	0.80
Mean No. of Propofol boluses	9.1	6.20	0.06
Mean Propofol dose(mg/kg)	1.25	0.97	0.15
Mean Procedure Ramsay Score	4.3	4.0	0.04
Mean Procedure Time (minutes)	0:25	0:25	0.89
Mean Midazolam Dose (mg/Kg)	0.1	0.06	0.91
Percent Received Propofol (%)	100%	96%	-

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S-10.

PATIENT-CONTROLLED SEDATION WITH PROPOFOL-REMIFENTANIL VS ANESTHESIOLOGIST´S MANAGED PROPOFOL SEDATION FOR ERCP.

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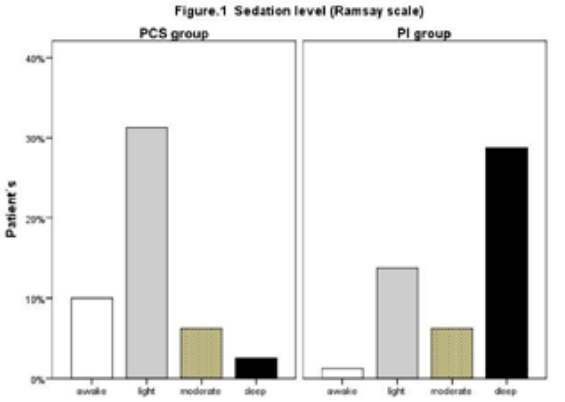
BACKGROUND: Deep sedation is believed often to be necessary for successful performance of such complex endoscopic procedures as Endoscopic retrograde cholangiopancreatograthy (ERCP). Propofol is a practical choice for these procedures due to its rapid onset and short duration of action. Delivery of propofol and ultra short-acting potent opioid remifentanil using self-administration device (Patient-controlled sedation, PCS)[1] helps the patients tolerate such difficult procedures in more lighter level of sedation. So far, we have not found any controlled studies about PCS with propofol/remifentanil for ERCP. This study was carried out in order to if PCS would be associated with a marked reduce in propofol consumption and with a higher degree of patient´s and endoscopist´s satisfaction, in comparison to anaesthesiologist's managed propofol sedation during ERCP.

Methods: 80 patients undergoing elective ERCP were randomized to anaesthesiologist's managed propofol sedation (group PI) or PCS with propofol/remifentanil (group PCS). Pharyngeal anesthesia was achieved with Lidocain 1% spray (100mg) 5 min before endoscopy. In PI-group sedation was initiated with propofol- and fentanyl boluses and maintained with propofol infusion 20-60 ml/h and incremental doses of fentanyl targeting to moderate sedation. In PCS-group 5ml of remifentanil solution (50µg/ml) was mixed to 20 ml of propofol (10mg/ml) immediately before the procedure. Arcomed® self administration device was programmed to deliver 1ml single-dose without any lockout time, background infusion or dose-limit upon to the patient's desire[2]. Standard monitoring for deep sedation was applied and sedation degree was estimated every 5 min throughout the procedure using Ramsay, OAA and Gilhams sedation scores. Total amount of propofol was calculated at the end of procedure. Endoscopists and patients assessed their satisfaction with a standard questionnaire. All statistics were performed with SPSS.

RESULTS: Patient -controlled sedation was effective in 38/40 patients(95%) Sedation degree was lighter (fig.1) and propofol consumption markedly smaller (P<005) in PCS-group (175±98mg) than in PI-group (175±98mg). Patient's and endoscopist´s satisfaction was equally high in both groups. All patients prefer the same method of sedation if ERCP would be repeated. In one case PCS was transformed to PI sedation. One patient in the PCS group was ventilated with a mask for a short time due to significant respiratory depression



DISCUSSION: Patient-controlled sedation is a safe and acceptable method for ERCP sedation. Anaesthesiologists managed propofol sedation may be associated with unnecessary deep sedation without any impact on patient's or endoscopist's satisfaction.

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S-11.

PRE-OXYGENATION WITH A TSE "MASK" PREVENTS DESATURATION IN SEDATED PATIENTS DURING RETROBULBAR BLOCK

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INTRODUCTION: Patients undergoing vitrectomy or scleral buckle receive iv sedation and O2 via nasal cannula (NC) during retrobulbar block. Moderate-deep sedation is often required for patients to cooperate with injection of local anesthetics. O2 desaturation may occur while the needle is in the retrobulbar area. A plastic sheet (TSE "Mask") has been shown to convert a NC to a face tent[1-3]. It improves oxygenation in sedated patients during upper GI endoscopy[3]. This face tent has been used in "Eye Room" and "Block Room". We would like to review its effectiveness.

METHODS: This retrospective review of patients undergoing vitrectomy or scleral buckle identified two groups. NC (n=66) patients received only NC O2 and TM (n=63) received NC O2 and a TSE "Mask" during the block. TSE "Mask" was prepared using a clean clear plastic bag to cover patient's nose and mouth[1-2]. It was removed prior to sterile preparation.

Patients received NC O2 (3-5 l/min or higher) and iv propofol prior to the block. Data collected included age, weight, height, O2 saturation (O2 Sat), the amount of propofol, FiO2, FeO2, ETCO2 and inhaled CO2. Student t-test and Chi Square test were used for statistical analysis. A p value <0.05 was considered as significant. (Mean±S.D.)

RESULTS: There were no differences in age (NC: 66±15; TM: 69±14 yrs), BMI (NC: 27.1±5.3; TM: 27.4±4.8), ASA classification (NC: 2.1±0.7; TM: 2.2±0.7), room air O2 Sat (NC: 99±1%: TM: 98±2%) and O2 Sat 5 min after O2 (NC: 99±1%; TM:100±0%). TM patients received higher amount of propofol (NC:1.15±0.42; TM: 1.32±0.36 mg/kg) and lower NC O2 flow (NC: 5.3±2.4; TM: 4.1±0.8 l/min) than NC patients. There were significant differences in O2 Sat with propofol sedation at 5-min intervals (NC: 98±2%, 96±3%, 96±3%; TM: 99±2%, 99±2%, 99±2%), the lowest O2 Sat (NC: 92±6%; TM: 98±4%) and severe O2 desaturation (O2 Sat ≤ 85%) (NC:10/66; TM: 1/63). The need for assisted ventilation was not significantly different (NC: 5/66; TM: 1/63). TM patients (n=38) had higher FiO2 (NC: 23±1; TM: 50±14%) and FeO2 (NC: 45±17; TM: 74±16%) and a lower NC O2 flow (NC: 5.4±1.3; TM: 4±0.4/min) than NC patients (n=7). There was no difference in ETCO2 (NC: 34±4; TM: 34±8 mm Hg). TM patients rebreathed a small amount of CO2 (NC: 0±0; TM: 7±5 mm Hg) during the block.

Effect of TSE "Mask" on Oxygen Desaturation during Retrobulbar Block

	Room Air 0_2 Sat	0_2 Flow (l/min)	0_2 Sat after 5 min of 0_2	Propofol dosage (mg/kg)	Lowest 0_2 Sat	Severe Desat (0_2 Sat ≤ 85%)	Assisted Ventilation
Group 1 NC (n=66)	99±1%	5.3±2.4	99±1%	1.15±0.42	92±6% #p<0.0001 vs O_2 5-min	10/66	5/66
Weight (kg)	98±2% ns	4.1±0.8 *p<0.0001	100±0%	1.32±0.36 *p<0.02	98±4% *p<0.0001vs NC #p<0.0001 vs O2 5-min	1/63 *p<0.01	1/63 n.s.

DISCUSSION: Data show that TSE "Mask" converts a NC to a face tent that increases O2 delivery without increasing O2 flow. This face tent prevents oxygen desaturation and may reduce the need for assisted ventilation in sedated patients during retrobulbar block. This simple face tent may improve patient safety at no cost and should be routinely used prior to retrobulbar block.

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2010; 110; S-1 – S-491

S-12.

ANESTHESIA PREOPERATIVE CLINICS CAN DETECT PATIENTS AT HIGH RISK FOR MODERATE-SEVERE OBSTRUCTIVE SLEEP APNEA

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INTRODUCTION: Several large population-based studies have reported a prevalence of moderate-severe obstructive sleep apnea (OSA), of 2-7% in women and 9-14% in middle-aged men.[1] OSA is higher in clinic-based populations (up to 38% of men), and it is estimated that the prevalence is even greater in surgical populations. More than 80% of patients who have moderate or severe OSA remain undiagnosed. The STOP-Bang screening tool was developed in an anesthesia preoperative clinic to screen for OSA.2 We implemented OSA screening in our Anesthesia Perioperative Medicine Clinic (APMC) using this tool and present our findings here.

METHODS: Patients presenting to the APMC were screened with the questionnaire. Those at high risk for having OSA (scores ≥3) were referred for an overnight in-laboratory polysomnogram (PSG). Patients underwent CPAP titration if moderate or severe OSA was diagnosed.

RESULTS: From March-September 2009, 141 patients at risk for OSA agreed to a referral for PSG. Of these, 71 patients underwent PSG and 55 (77%) had significant OSA: 18 (25%) with moderate and 37 (52%) with severe OSA. The mean STOP-Bang scores were 4 for mild OSA, 4.5 for moderate OSA, and 5.1 for patients with severe OSA. CPAP was recommended in 82% of patients and 68% received therapy. CPAP titration was successful in abolishing OSA in 92% of the patients.

Discussion: We have demonstrated that patients with high scores on the STOP-Bang questionnaire who were willing to undergo PSGs have a high likelihood of having moderate-severe OSA. Patients with OSA have a greater likelihood of having a difficult airway, arrhythmias, and other adverse events in the perioperative period.[1,3] The American Society of Anesthesiologists published guidelines that make several recommendations regarding the timing of the preoperative evaluation and perioperative monitoring for these patients.[3] The guidelines suggest that CPAP be considered in the perioperative management of patients with OSA (or those with a presumptive OSA diagnosis). However, because of the challenges of obtaining PSG and CPAP devices, and the limited time for preoperative diagnosis and treatment, many patients are being anesthetized without adequate diagnosis or preparation.

Our findings suggest that using the STOP-Bang questionnaire as part of routine preoperative evaluations can aid in identifying patients at high-risk for OSA. Additionally, successful implementation of CPAP therapy can be achieved before elective procedures.

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S-13.

INTEGRATED RECOVERY OF OUTPATIENTS REDUCES TIME TO DISCHARGE READINESS

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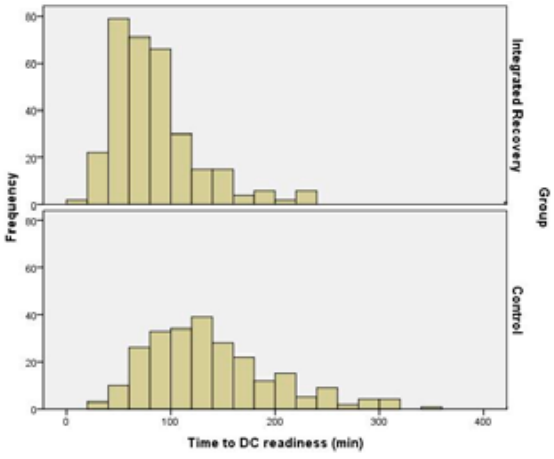
INTRODUCTION: Recovery after outpatient surgery is frequently done in two stages. “Phase 1” is focused mostly on residual anesthetic effects and control of nausea and vomiting as well as pain. “Phase 2” is focused primarily on discharge instructions and assuring that the patient is “street-ready”. Most times, different physical areas are used for the two phases. This involves two separate nursing teams, requiring additional reports and paperwork. We hypothesized therefore that integrating phase 1 and phase 2 into a single location with a single nursing team would significantly decrease the time needed before outpatients were ready to leave the building after surgery.

METHODS: We created an “integrated recovery” unit, where we admitted outpatients after procedures that should be associated with rapid discharge (target 90 min). In this unit, both phase 1 and phase 2 recovery was performed by the one nursing team in one location. After the unit had been in operation for a month, we recorded times to discharge readiness for 300 patients, and compared these data with controls from the month prior to opening the unit. Surgical procedures and discharge criteria were the same in both settings.

RESULTS: There were no differences in procedure type, surgeons, gender and age of patients. Prior to integrated recovery, time from arrival in the recovery area to discharge readiness was 140±69 min (mean±SD). Patients recovered in the integrated unit were ready for discharge after 82±46 min ($p<0.001$, two-sample t-test).

DISCUSSION: Integrated recovery, i.e. the combination of phase 1 and phase 2 recovery of outpatients into a single area and by a single nurse, reduces time to discharge by approximately one hour per patient.



S-14.

PATIENT OUTCOMES FOLLOWING AMBULATORY SURGERY

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INTRODUCTION: The demand for surgical care in the U.S. is steadily increasing, and with that increase has come a proliferation of Ambulatory Surgery Centers (ASCs).[1] Assessment of post-surgical quality of life (QOL) is an important evaluative activity for performance improvement in medical care settings, but measures suited toward ASC patients have not yet been developed. There are numerous QOL questionnaires, but they are either directed toward inpatient or non-surgical outpatient populations, are uni-dimensional, or do not have proven validity and reliability.[2] The aim of this study is to develop a psychometrically valid and reliable measure to assess the quality of recovery in patients receiving general anesthesia in the ambulatory surgery setting.

METHODS: A pilot questionnaire was constructed based on a literature review and expert opinion. After IRB approval, the 15 question survey was pilot-tested on a sample of 50 ASC patients (Phase I). Participants were under the care of various surgical specialties, receiving general anesthesia, and at least 18 years old. The questionnaire was administered one hour preoperatively and postoperatively. Analysis of Phase I data led to the development of the Phase II questionnaire, a composite of the pilot questions and those previously validated in the QOL literature. Phase II questionnaire items were grouped into the eight QOL dimensions identified in the literature.[3] It is intended to be completed one hour preoperatively and postoperatively, and on days 1, 4, and 7 postoperatively.[4]

RESULTS: The Phase I questionnaire was analyzed for validity and reliability. Content validity was confirmed by examining postoperative survey responses and change in responses from preoperative and postoperative status. Demographic variables were not available to assess construct validity, and because there is no gold standard to measure quality of recovery, criterion validity could not be tested. Reliability was assessed using Cronbach's alpha coefficient. The survey was divided into three groups based on question response type. Cronbach's alpha for each group was 0.427, 0.896, and 0.866. Removing one question increased the first group's coefficient from 0.427 to 0.784.

DISCUSSION: While many questionnaires have been used to evaluate QOL in patient populations, none have been validated for patients receiving general anesthesia in the ambulatory surgery setting. The aim of this study is to construct a psychometrically valid and reliable instrument for this purpose. Item generation and selection were conducted in Phase I testing. Phase II is presently being evaluated on 119 patients; this questionnaire evaluates eight different domains of QOL and will be evaluated on eight properties that demonstrate a psychometrically sound instrument.[5]

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S-15.

DISRUPTION OF CIRCADIAN SLEEP–WAKE RHYTHM AND BRIGHT LIGHT THERAPY: PRELIMINARY RESULTS

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INTRODUCTION: General propofol anesthesia induces a desynchronization of the circadian sleep-wake rhythm in both animal model (1,2) and ambulatory patients (3) by acting on the brain biological clock. Such an effect of short duration anesthesia on the biological clock is associated with fatigue, sleep disorders and poor cognition performance. Bright light therapy is the most proposed strategy to improve/restore the synchronization of the mammal's internal clock. Bright light therapy consists of exposure to specific wavelengths of high intensity light. The aim of the present study was to examine the efficiency of bright light therapy on the circadian sleep-wake rhythm disorders induced by general anesthesia in ambulatory patients.

METHODS: After IRB approval and written informed consent healthy patients (30-70 years old) scheduled for short duration ambulatory anesthesia (propofol 1.2 mg/kg IV) delivered for colonoscopy were included in this 2 X 2 randomized prospective study (within factor: before, after anesthesia; between factor: light). Main exclusion criteria were history of cancer, beta-blockers, psychotropic treatments (including hypnotics)and shift-work. Circadian sleep-wake rhythm was assessed by actigraphic monitoring of wrist actimetry (Actiwatch, Cambridge Neurothechnolgy) the week before anesthesia and the days after anesthesia. The sleep analysis software permitted to calculate the Interdaily Stability Index (the strength of the coupling rate to external synchronizers supposed stable), the phase shift of the circadian rhythm and the sleep parameters. At recovery from anesthesia, patients were randomly allocated to one of the different lights (Energy light, Philips): bright light therapy (1500 lux) or placebo light (lamp with minimal light, 75 lux). Patients were exposed to the lamp during 90 min in the recovery room lighted as usual (100-150 lux).

RESULTS: Data were analyzed on the initial thirty-six patients. As previously described, a short duration ambulatory propofol anesthesia is responsible for a desynchronisation of the circadian sleep-wake rhythm. The phase shift of the sleep-wake rhythm observed in control patients (placebo light) the days following anesthesia was significantly reduced by about 70% in patients receiving the bright light therapy. The decrease of the Interdaily Stability Index observed in control patients (placebo light) the days following anesthesia was no more observed in patients receiving the bright light therapy. The sleep structure during the two first nights following anesthesia was altered (increase of time in bed, sleep fragmentation, and decrease of sleep efficiency) in the control patients (placebo light). We observed a significant improvement of sleep parameters in patients receiving the bright light therapy.

CONCLUSIONS: A 90 min exposition to bright light therapy at recovery from a short duration ambulatory anesthesia is efficient to treat the circadian sleep-wake disorders and sleep disorders observed at home the days following anesthesia.

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S-16.

DOES THE ADDITION OF INTRAVENOUS MORPHINE WITH OR WITHOUT LIDOCAINE TO PROPOFOL BLUNT THE RESPONSE TO INSERTION OF AN ENDOSCOPE FOR UPPER ENDOSCOPY PROCEDURES?

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ABSTRACT: We set out to determine if the addition of IV morphine with or without lidocaine before IV propofol provides uninterrupted upper endoscopy. 112 ASA I-II patients scheduled for upper endoscopy under IV sedation were randomized to one of three groups. Group I: (n=36) received only IV propofol. Group II (n=39) received IV morphine (MS) 2.5 mg immediately before propofol. Group III (n=37) received IV morphine 2.5 mg with IV lidocaine 1mg/kg before propofol. The injection of IV MS prior to propofol for upper endoscopy reduced cough and gag, however, the addition of lidocaine further reduced IV propofol associated burning sensation and patient movement upon insertion of the endoscope.

OBJECTIVE: Involuntary reflexes during upper gastrointestinal endoscopy (UGIE) is commonly encountered. IV lidocaine is effective in blunting the response to noxious stimuli [1]. We determined whether the addition of IV morphine (MS) with or without lidocaine (L) before administration of propofol for upper endoscopy can provide uninterrupted UGIE.

METHOD: Following IRB approval, a randomized study of 112 (ASA I-II) patients scheduled for UGIE under monitored anesthesia care was performed. Standard monitoring of vital signs, telemetry and maintaining nasal O2 was performed. Patients were randomized to one of three groups. Group I (control group, n=36) received IV propofol that was titrated to achieve deep sedation as required for the endoscopic procedure. Group II (MS group, n=39) received IV MS 2.5 mg immediately before intravenous induction with propofol. Group III (MS with L, n=37) received IV MS 2.5 mg followed by IV L 1mg/kg immediately before intravenous induction with propofol. Data collected for comparison included: demographics, duration of the procedure, the total amount of propofol used, patient complaint of burning sensation upon IV propofol injection, patient movement, cough and gag upon insertion of the endoscope, and need for removal of the endoscope by the gastroenterologist. Data is expressed as mean + SD or % incidence. P< 0.05 was considered significant, and student's t test was used.

RESULTS: There were no differences among the groups with respect to demographics.

CONCLUSIONS: The injection of IV MS prior to propofol for upper endoscopy reduced cough and gag, however, the addition of L further reduced IV propofol burning sensation and patient movement upon insertion of the endoscope.

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	I: control (n=36)	II: MS (n=39)	II: MS+L (n=37)
Propofol total dose (mg)	475 ± 347	20 ± 14	520 ± 283
Patient moved (n)	21(%)	16(%)	8(%)* p<0.001
Cough (n)	17(%)	5(%)* p<0.001	8(%)* p<0.001
Gag	15(%)	11(%)	5(%)**
GI remove scope	12(%)	7(%)	p<0.05
Propofol burning sensation	14	22	7(%)
Duration (min)	28 ± 18	42 ± 29** p<0.05	6**
Propofol dosage/min (mg/min)	20 ± 14	21 ± 11	p<0.05
Mean Procedure Time (minutes)	0:25	0:25	29 ± 17
Mean Midazolam Dose (mg/Kg)	0.1	0.06	21 ± 10
Percent Received Propofol (%)	100%	96%	-

S-17.

"PATIENT-CENTRED" ANESTHESIA PLANNING RATIONALIZED BY PRE-OPERATIVE PATIENT PREFERENCES

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INTRODUCTION: Current anesthetic practice is influenced by popularization of ambulatory surgery, avoidance of 'pre-medication', nerve stimulator or ultra-sound guided local anesthesia (LA) [1] and volatile induction and maintenance of general anesthesia (GA) [2]. However, patient preferences are central to the concept of 'patient-centred' medical practice [3]. The requests by Australian adult patients for pre-medication, LA versus GA and inhaled versus intravenous induction of general anesthesia were audited to rationalize incorporation of these preferences into each patients anesthesia plan.

Methods: With institutional approval, all patients presenting to the author during a six month period for 'same-day' surgery were visited in the Day Surgery Unit pre-operatively. Each patients wishes to receive anxiolytic medication pre-operatively, LA or GA and inhaled or intravenous induction of GA were canvassed according to a printed questionnaire and confirmed verbally. Patient demographics and preferences were recorded and analyzed using Chi-squared tests (p<0.05 significance).

RESULTS: 586 ASA grade 1-2 patients (age range 17-93 years) were interviewed. 495(84%) patients had undergone anesthesia previously, of which 396(80%), 48(10%) and 52(10%) had been induced intravenously, by inhalation or by unrecalled route, respectively. Pre-medication was requested and declined by 74(13%) and 512(87%) patients (p<0.0005), and LA versus GA was preferred by 102(17%) and 426(73%), respectively, with 58(10%) patients expressing no preference or being unable to choose. Inhaled and intravenous inductions of anesthesia were chosen by 179(31%) and 257(44%) patients (p<0.0005), respectively, whilst 150(25%)) patients expressed no preference or were unable to choose.

DISCUSSION: This prospective audit of adult Australian ambulatory surgery patients revealed that about 10% of patients choose to receive anxiolytic pre-medication before surgery, about 20% of patients prefer a local anesthetic technique rather than general anesthesia, and that, of those preferring GA, about 30% of patients choose an inhaled ("mask") induction of anesthesia. These data suggest that, where facilities, equipment and expertise exist, the opinion of patients regarding these preferences be canvassed and documentd pre-operatively and used, where appropriate, to individualize each patient's 'patient-centred' anesthesia plan.

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S-18.

WITHDRAWN.

S-19.

EFFECTS OF ROPIVACAINE COMBINED WITH FENTANYL SPINAL EPIDURAL LABOR ANALGESIA

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OBJECTIVE: To evaluate effects of ropivacaine combined with different dose fentanyl for intrathecal labor analgesia.

METHODS: 120 parturients in active labor were included in this double-blind ,randomized trial. In each group, 30 patients were included.Combined spinal-epidural anesthesia was performed,and fentanyl was intrathecally administered in a dose of 0 (group A),5(group B),10(group C) or 20 g(group D) , always combined with 3mg ropivacaine .After successful spinal injection,a epidural catheter was placed . The epidural catheter was infused with a epidural solution (ropivacaine0.15%, fentanyl 2 g/ml) at a rate of 12ml/h. Pain was assessed at 5,15,30,and 60 min after the end of the spinal injection and every 60 min until delivery.VAS scores ,sensory block,motor block,maternal heart rate and blood pressure, fetal heart rate ,and the presence of pruritus and nausea and/or vomiting were recorded at the same predetermined time points as we assessed pain.

RESULTS: The onset of analgesia in group B,C and D were significantly faster than that in group A($p<0.01$). After spinal injection 30 min, Vital sign , analgesic level to cold and pinprick, motor block , nausea , vomiting ,and pain scores were no significant difference among the four groups.The duration of the first and second labor course was significantly shorter in group A ,B and C than that in group D($p<0.05$).The difference was effectively significant in the birth process and incidence of caesarean section($p<0.05$)between the group A,B ,C and the group D.The heart rates of the fetuses were significantly decreased within 30 min of analgesia in group D than that in others group($p<0.05$). However,The pruritus was significantly higher in group C and D than in group A and B($p<0.05$).

DISCUSSION: All groups of analgesia plans were safe and efficient labor pain .Spinal injection of 3mg ropivacaine plus fentanyl5 g appeared to increase the effectiveness of subsequent epidural labour analgesia,which showed better analgesia ,faster onset time ,less total dose,and easier reception for parturients and Obstetricians with higher satisfaction rate, less side-effect.

Spinal-epidural analgesia with 3mg ropivacaine plus fentanyl5 g provids superiorr analgesia and parturients satisfaction compared with other groups, less side-effect,being an ideal painless way of labor.

S-20.

THE ANALGESIC EFFECACY OF LOCAL ANESTHETIC PRE-INCISIONAL CERVICAL PLEXUS BLOCK WITH OR WITHOUT KETAMINE IN PATIENTS UNDERGOING NECK SURGERY

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INTRODUCTION: The use of regional anaesthesia in neck surgery remains controversial. Analgesic efficacy of bilateral superficial cervical plexus block (BSCPB) performed under general anaesthesia in patients undergoing neck surgery was proven.(1) Our aim is to compare the analgesic effecicy of local anesthetic or with NMDA receptor blocker. Patients and Methods: Ninety consecutive consenting patients were randomized to receive a BSCPB with saline (Group P, n = 30), ropivacaine 0.487% (Group R, n = 30), or ropivacaine 0.487% plus ketamine as NMDA receptor blocker (Group RK, n = 30). Fentanil was given during the intraoperative period for a 20% increase in arterial mean pressure or heart rate. All patients received 4 g of acetaminophen during the first 24 h after operation. The pain score was checked every 4 h and fentanyl was given for pain score >4 on a numeric pain scale. Results: During surgery, the median fentanil requirements were significantly reduced in Group RK compared with Groups R and P (32 vs 47 and 62 μg kg-1; $P < 0.0001$). After surgery, the number of patients requiring fentanil within 24 h of surgery was significantly lower in Groups R and RK than in Group P (16 and 19 vs 25; $P = 0.03$). At post-anaesthetic care unit admission, median (range) pain scores were significantly lower in Groups R [3 (0-10)] and RK [3 (0-8)] than in Group P [5 (0-8), $P = 0.03$]. No major complications of BSCPB occurred during study. Discussion: BSCPB with ropivacaine and clonidine improved intraoperative analgesia. BSCPB with ropivacaine or ropivaciane and clonidine was effective in reducing analgesic requirements after thyroid surgery.

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Bleeding/Blood Product Conservation

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S-21.

USE OF MODIFIED THROMBOELASTOGRAPHY TO MEASURE SPECIFIC PLATELET RECEPTOR ACTIVITY ASSOCIATED WITH CARDIOPULMONARY BYPASS

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INTRODUCTION: Platelet Mapping™(1) as a modified thromboelastography (TEG®) technique was introduced to evaluate the MA parameter in the presence of different activators. Thrombin(2), arachidonic acid (AA), adenosine-5-diphosphate (ADP) and collagen were used as activators in this study to compare the MA parameters before and after cardiopulmonary bypass (CPB), and correlate these data to perioperative blood loss.

METHODS: Following IRB approval, blood samples from 40 patients undergoing primary cardiac surgery were collected before and after CPB. The MA parameter was measured in heparinized blood samples in the presence either of reptilase / Factor XIIIa alone (MAfibrin) or reptilase / Factor XIIIa + Activator (MAactivator) and analyzed by thromboelastography. The normalized MAactivator parameter was introduced to measure the specific receptor activity and eliminate the effect of platelet number change before and after CPB:

Normalized MAactivator: {(MAactivator - MAfibrin) / Platelet count} x 1011 (mm)

DATA COLLECTED: demographics, CPB time, cross clamp time, laboratory and TEG results, platelet activation, transfusions, and blood loss / 24 hours. Two groups were established based on post-operative blood loss: 1) high bleeding group (blood loss > 800 ml / 24 hours) and 2) low bleeding group (blood loss < 800 ml / 24 hours).

RESULTS: The normalized MAcollagen was significantly lower in the high bleeding group pre and post CPB. CPB decreased significantly the normalized MAcollagen in both, and MAADP in the low bleeding groups. The normalized MAthrombin increased in both groups following CBP.

Table 1: Platelet receptor function normalized to platelet count

	High Bleeding Pre-bypass	High Bleeding Post-bypass	Low Bleeding Pre-bypass	Low Bleeding Post-Bypass
Normalized MA(AA)	11 ± 10	8 ± 14	15 ±7	11± 10
Normalized MA(ADP)	16 ± 4	12 ± 8	17 ± 5	12 ± 9*
Normalized MA(Collagen)	7 ± 3†	4 ± 3*‡	11 ± 5	7 ±3*
Normalized MA(thrombin)	24±7	35±10*	21±7	32±9*

*Pre-bypass compared to post - bypass $p < 0.05$.

† Pre bypass: high bleeding group vs low bleeding group $p<0.02$.

‡ Post bypass: high bleeding group vs low bleeding group $p<0.02$

CONCLUSIONS: This pilot study was designed to determine if modified TEG® could detect differences in platelet receptor activity following CPB. CPB decreased the receptor activity of AA, ADP, and collagen; but significantly increased thrombin receptor activity. Reduced platelet collagen receptor activity was measured in the high bleeding group suggesting that this receptor might play a role in CPB related blood loss. Further studies into the collagen receptor may allow for better prediction of post-CPB bleeding and potential pharmacologic therapy.

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S-22.

SURVIVAL FOLLOWING MASSIVE HEMORRHAGE DURING EMERGENCY SURGERY PERFORMED ON NIGHTS OR WEEKENDS

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INTRODUCTION: Survival from in-hospital cardiac arrest has been reported to be lower during nights or weekends compared with that during day/evening partly because of the reduced availability of medical staffing(1). We investigated whether survival from massive hemorrhage during emergency surgery is lower, when these procedures are performed on nights or weekends.

METHODS: Questionnaires regarding patients with intraoperative massive hemorrhage exceeding 5,000 ml during 2006 and 2007 were sent to 384 JSA-certified training hospitals (JSACTH) with more than 500 beds. Twenty-four hundred twenty six patients were registered, among which 856 patients were emergency cases. Of these, data from 739 patients were available for analysis of prognosis (without sequelae, with any sequelae, and death) within 30 post-operative days. There were 404 and 335 patients treated during day/evening and during nights or weekends, respectively. Hemorrhage exceeded 200 ml/kg in 76 patients during day/evening and 69 during nights or weekends. Mann-Whitney test was used for statistical analysis and $p<0.05$ was considered significant.

RESULTS: Overall survival from intraoperative massive hemorrhage during emergency surgery was not affected by time of day or day of week. However, survival was lower during nights or weekends compared with that during day/evening, when blood loss exceeded 200 ml/kg (37.7% vs. 60.5%; odds ratio 0.39 with 95% confidential interval from 0.20 to 0.77). Further analysis was performed using data from these patients only. There was no difference in the incidence of severe anemia (Hg<0.5 g/dl), that of cardiac arrest and the resuscitation rate after cardiac arrest. Although survival from cardiac arrest (0% vs. 25.0%) and that from severe anemia (18.2% vs. 54.3%) were significantly lower during nights or weekends, survival during nights or weekends was significantly lower than during day/evening even in patients without severe anemia and cardiac arrest (51.2% vs. 79.4%).

DISCUSSION: Although the availability of blood products, the overall rate of blood transfusion and the basic skills to maintain systemic circulation seemed to be almost the same during nights or weekends as during day/evening, intensive perioperative care for patients with massive hemorrhage exceeding 200 ml/kg seemed to be inadequate during nights or weekends. Senior anesthesiologists and senior intensivists should be called to care for these patients. Centralization of emergency surgical centers should be also considered to maintain adequate availability of medical staffing during nights or weekends.

CONCLUSION: When blood loss is exceeding 200 ml/kg during emergency surgery, survival rate was lower during nights and weekends than during day/evening, whether severe anemia/cardiac arrest developed or not.

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S-23.

IONIC HYPERTONIC CRYSTALLOID SOLUTIONS PROFOUNDLY IMPAIR COAGULATION COMPARED TO NON-IONIC SOLUTIONS, AS ASSESSED BY THROMBOELASTOGRAPHY(TEG) IN VITRO

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INTRODUCTION: Various hypertonic solutions are introduced into the bloodstream for therapeutic and diagnostic purposes but the effect on coagulation have not been systematically examined.

OBJECTIVE: to evaluate the effect osmolality of commonly used intravenous fluids on coagulation using TEG, and assess differences if any.

DESIGN: controlled, non blinded in vitro observational study.

SETTING: university based laboratory.

PARTICIPANTS: blood was drawn from 20 healthy human volunteers.

SOLUTIONS TESTED: 5%w/v saline(1500 mosM), 20%w/v mannitol (1098mosM), 50%dextrose, 8.4% sodium bicarbonate(1000mosM), 4.2% w/v sodium bicarbonate(500 mosM) compared with 0.9% saline(308 mosM), 5%w/v mannitol (300mosm).

MEASUREMENTS AND RESULTS: Thromboelastography was performed on native whole blood after 20% v/v dilution with above solutions.

Mannitol (20%) and dextrose (50%) both produced MA reduction but increase in k, which were dose related. No significant effect in r was seen.

In contrast, both hypertonic saline and sodium bicarbonate produced a flat trace consistent with profound hypocoagulability compared to isotonic saline which enhanced coagulation.

DISCUSSION: It appears that, hypertonic ionic solutions at 20% dilution profoundly induce a hypocoagulable state than non-ionic solutions at same osmolality. The effect of dextrose or mannitol appears to impair platelet function, rather than fibrin polymerization.

CONCLUSION: osmolality and solute content are determinants of whole blood coagulation. This may have implications on haemostatic outcomes on commonly used hypertonic solutions especially in neurosurgery and transfusion medicine. Hypocoagulabilty associated with 50% dextrose and sodium bicarbonate casts doubt on the role of hyperglycemia in pathogenesis of diabetic hypercoagulability and reversal of acid induced coagulopathy respectively. Further clinical trials are recommended before firm conclusions are drawn

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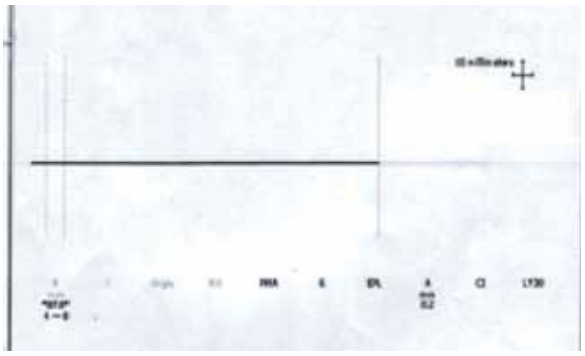
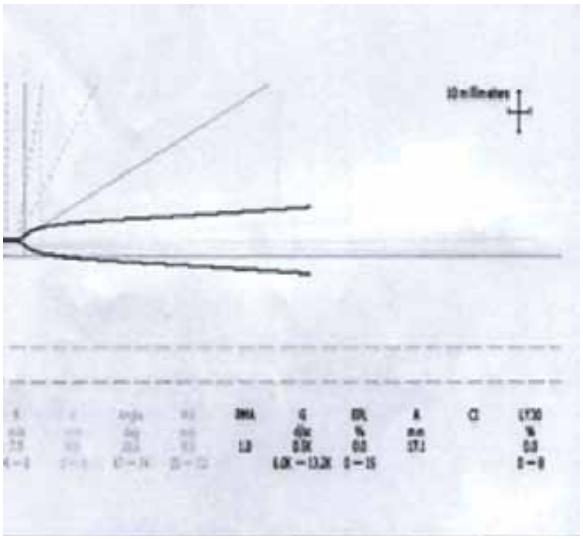
Table 1: Biodata

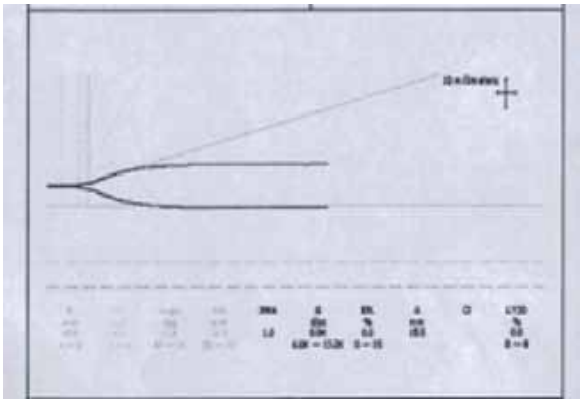
Gender	Sample size	Av. Age	Hb Conc
Males	**11**	39.7	15.7
Females	**8**	34.9	13.5
Total	**19**	**37.3**	**14.6**

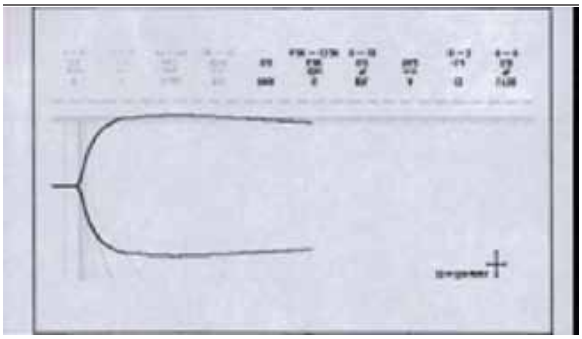
Table 2: TEG results

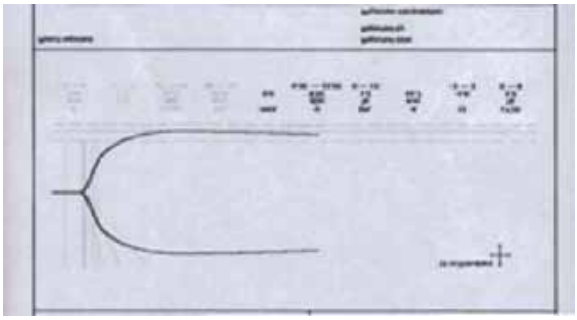
Solution	R (mins)	K (mins)	α angle (degrees)	MA (mm)
Control(undiluted)	10.1(±2.1)	3.1(±1.05)	51.8(±10.5)	60.4(±6.86)
0.9% saline (20 %v/v dilution)	15.6(±21.4)	2.6(±0.77)	53.1(±11.8)	57.4(±6.89)
20% mannitol (20% v/v dilution)	18.2 (±20.6)	12.4(±2.93)*	13.6 (±5.95)*	17.4 (±9.26)*











S-24.

WITHDRAWN.

S-25.

THE HEMORRHAGIC RISK ASSOCIATED WITH PREOPERATIVE CONTINUATION OF ASPIRIN IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

AUTHORS: K. Ono[1], H. Idani[2], H. Hidaka[1], Y. Koyama[1], S. Taguchi[1], M. Fukuda[1];

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INTRODUCTION: According to the recent guideline[1], aspirin therapy should not be interrupted in the perioperative period to reduce the risk of cerebral and coronary thrombosis. On the other hand, aspirin continuation exposes patient to the increased risk of bleeding[2]. Especially in patients undergoing laparoscopic-assisted surgery, bleeding-induced poor visualization may increase the conversion rate to open surgery and associated morbidity. To my knowledge, no consensus exists whether to continue or to withdraw aspirin therapy in patients undergoing laparoscopic-assisted major intraabdominal surgery. This study was undertaken to investigate on the hemorrhagic risk and associated morbidity in patients undergoing laparoscopic cholecystectomy on aspirin therapy.

METHODS: Consecutive adult patients scheduled to undergo laparoscopic cholecystectomy were enrolled prospectively into the study from January 1 to September 30, 2009. All the patients were divided into two groups according to the preoperative aspirin prescription. Patient on aspirin therapy were instructed to continue the drug until the day of surgery and treated otherwise in the same way as those without taking the drug. Duration of surgical procedures, amount of intraoperative blood loss, conversion rate to open surgery and length of postoperative stay were compared between the groups. Data were analyzed with Student's t-test, Chi-square test and Fisher exact test.

RESULTS: A total of 94 patients underwent laparoscopic cholecystectomy during a 9 month period. Among them 16 patients continued aspirin therapy throughout surgery. As shown in Table 1, there was no statisitically significant difference between the two groups with regard to duration of surgical procedures, intraoperative blood loss, conversion rate to open surgery or length of postoperative stay. Neither thrombotic or hemorrhagic complication was observed postoperatively in the group of patients with aspirin.

DISCUSSION: The finding of this study indicates that the risk of bleeding and associated morbidity does not differ between patients with aspirin and those without aspirin undergoing laparoscopic cholecystectomy. Considering the relatively low risk of bleeding when continued and the increased thrombotic risk after withdrawal, aspirin should not be interrupted throughout surgery in patients undergoing laparoscopic cholecystectomy.

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Table 1. Demographics

	Without Aspirin	With Aspirin
Number of Cases (Female/Male)	78 (48 / 30)	16 (7 / 9)
Duration of Surgical Procedure	81 + 36 *(min)	101 + 55 *(min)
Amount of Blood Loss	43 + 127 *(ml)	19 + 44 *(ml)
Length of Postoperative Stay	6 + 5* (days)	6 + 3 *(days)
Conversion Rate	7.7 % (6 / 78)	12.5% (2 / 16)

*: Mean + SD

S-26.

TIMING AND VOLUME OF TOPICAL TRANEXAMIC ACID ADMINISTRATION FOR POSTOPERATIVE BLOOD LOSS IN TOTAL KNEE ARTHROPLASTY

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Introduction: We have previously shown that topical administration of tranexamic acid (TA) for five minutes reduces postoperative blood loss in primary elective total knee arthroplasty[1]. However, the optimal duration of time for application of the medication in the joint is unclear. As well, the volume of study medication (100 mL) used in our previous study can be too large for some patients' joint space. Therefore, the current study was conducted to determine the efficacy and safety of a reduced volume and time of application of tranexamic acid on postoperative blood loss.

METHODS: This is a randomized, double-blind, placebo-controlled clinical trial with three arms. Research Ethics Board approval and informed consent were obtained from all participants. Adult patients undergoing unilateral primary TKA were randomized to: 1) TA 1.5 g or 2) TA 3.0 g or 3) an equivalent volume of placebo (normal saline). A tourniquet was used and standard surgical techniques were applied. After the components were cemented, a sterile solution containing TA (1.5 or 3.0 g in 50 cc normal saline) or placebo (50 cc normal saline) were applied into the open joint and left in place for 3 minutes. Excess solution was subsequently suctioned and the joint was immediately closed without any irrigation. Postoperative blood loss was calculated using the difference between pre- and postoperative day 3 hemoglobin (Hb) values. On postoperative day two or three, bilateral Doppler ultrasonography of the legs was done. Analysis of variance, Chi 2 test and non-parametric statistics were applied where appropriate. A p value less than 0.05 was considered significant.

RESULTS: Twenty-three patients were randomized. Three patients were subsequently excluded due to administrative problems (e.g. postponed surgery), therefore; 20 patients were given the medication/placebo and included in the intention-to-treat analysis. Patients' demographic and preoperative hemoglobin values were shown in (Table 1). There was no statistically significant difference between the three groups in terms of calculated blood loss (p=0.5), however, a trend in favor of the treatment groups was noted (Table 1). There was no difference between the groups in terms of other efficacy outcomes (postoperative hemoglobin change, postop pain, hospital stay, range of motion, and blood transfusion rate). There was one thromboembolic event detected by Doppler ultrasonography in a patient in the placebo group. No other complications were found in any group.

DISCUSSION: The administration of a reduced volume and shorter time of application of topical tranexamic acid in normal saline did not reduce postoperative blood loss in patients having elective primary total knee arthroplasty. However, since there is trend in favor of the treatment groups, further trials with larger sample sizes are suggested.

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Table 1: Patient characteristics of perioperative data

	TA 1.5g n=7	TA 3.0 g n=4	Placebo n=9	P value
Age (year)	67 ±9	68 ± 9	69 ±11	.856
Gender (female/male ratio)	5/2	3/1	8/1	.661
BMI (Kg/m2)	30 ± 3	27 ± 4	29 ± 6	.687
ASA (I/II/III)	0/6/1	1/1/2	0/9/0	.033
Surgery duration (min)	63 ± 11	62 ± 19	68 ± 11	.668
Tourniquet time (min)	82 ± 10	63 ± 19	71 ± 14	.608
Preop Hb (g/L)	142± 10	133 ± 17	135 ± 9	.348
Postop Hb on day 3 (g/L)	99.± 10	105 ± 10	94 ± 13	.470
% of postop Hb drop	29 ± 6 %	28 ± 10 %	29 ± 12 %	.975
Total calculated blood loss (ml)	1259 ± 272	1030 ± 432	1452 ± 816	.518
Postop day 2 pain intensity (VAS)	2.5 (0-8)	2.4 (0-8.2)	3.1 (0-8)	.507
Postop day 2 ROM°	83 (60-90)	87 (72-90)	80 (40-95)	.487
Duration of hospital stay (days)	4 (3-5)	3 (3-5)	5 (3-6)	.253

Values are mean ± SD, ratio or median (minimum-maximum), ROM: range of motion (flexion), VAS: visual analogue scale. ASA: American Society of Anesthesiologists. TA: tranexamic acid. BMI: body mass index.

S-27.

COAGULATION DIFFERENCES DURING MAJOR BLOOD LOSS BETWEEN MAJOR SPINE PROCEDURES AND GENERAL INPATIENT SURGICAL PROCEDURES

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INTRODUCTION: Large blood loss is associated with coagulopathy and transfusion of both PRBC and coagulation factors. Questions have arisen about whether the coaguolpathy seen in major spine procedures is caused by blood loss alone or by a coagulopathy induced by the traumatic nature of the surgical intervention. Using an anesthesia information system (AIMS), a retrospective comparison of post operative transfusion and coagulation profiles in patients who underwent major spine procedures (SP) with non-spine procedures (NSP) was performed. The goal is to determine if there is objective evidence of a differentially coagulopathy between SP and NSP procedures.

METHODS: Using a reporting copy of the Centricity Perioperative Anesthesia System (GE Healthcare, Arlington Heights, IL) production database, a standard SQL software query extracted all SP and NSP who had 500cc or more estimated blood loss (EBL) between 9-1-07 to 9-30-09. Patients were excluded if they received cell saver transfusion or had the following: liver resection, all organ transplant, or orthopedic procedures. Extraction included age, gender, surgical procedure, procedure time, EBL, Hb values (PREOP, PACU, and postoperative day 1), normal or abnormal PT/PTT/INR in PACU and within 12 hours of surgery and amount of factor and blood transfusion administered. Comparison Groups were SP and NSP. Blood loss categories were A:500-999, B:1000-1999, C:2000-2999, D:3000+. Statistically analysis was t test.

RESULTS: Patients analyzed were SP: 91 and NSP: 981. Demographic distribution was the same in both groups (SP: 43F/48M, 57.7+14.7 years, N=91; NSP: 428F/553M, 55.2+15.1 years, N=981). Figure 1 displays the significantly greater frequency (%) of NSP with blood loss >2000 ml. In patients receiving transfusion, transfusion occurred at a greater NSP EBL (1583+1314 ml) than SP EBL (905+491); the same number of units of factors and blood was given in both groups resulting a significantly lower PO day 1 Hb in NSP patients (SP:10.2+2.4 gm/dl; NSP: 9.1+2.7 gm/dl). NSP patients were more likely to have a normal coagulation profile despite a significantly greater blood loss than SP patients and when abnormal NSP had significantly greater EBL than SP (Table). Fewer NSP (17.9%) patients received factors than SP (27%) despite a significantly greater NSP EBL.

DISCUSSION: SP patients are transfused with PRBC and coagulation products at a substantially lower EBL than NSP patients. This lower transfusion threshold for SP reflects the concern for spinal cord perfusion injury not seen in NSP. Concerns about optic nerve injury and interstitial edema in the prone position contributes to the lower transfusion threshold. Abnormal coagulation occurs with lower EBL in SP than NSP. These data suggest a fundamental difference in these groups; different management strategies that control coagulopathy are necessary. Further investigation into mechanisms of coagulopathy in SP is necessary.

Effect on Coagulation and Factor Administration

Category			EBL (ml)	
	SpineN=91	Non-SpineN=982	SPINE	NON-SPINE
Coagulation				
Abnormal	37 (41%)	342 (34%)*	1256+909	1650+1606*#
Normal	54 (49%)	638 (66%)*	836+428*#	1048+1212*#
Factors Administered				
Given	27 (27%)*	149 (17.9%)*	1004+725	2189+1732
NOT Given	64 (73%)*	833 (82.1%)*	910+588	1064+1022#

*sign different between SP & NSP, # sign different than EBL same category

S-28.

EFFECTS OF ARTIFICIAL BLOOD SUBSTITUTES ON ORGAN TISSUE OXYGENATION IN A RAT MODEL

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INTRODUCTION: Delivery of oxygen to tissue relies on several factors including hemoglobin oxygen affinity. Current hemoglobin based oxygen carriers (HBOCs) vary in oxygen binding characteristics, and the effects of these binding characteristics require examination. Using a validated quantitative (19F) MRI method (1) to quantitatively image tissue oxygen pressure (ptO2), we compared oxygenation during isovolemic anemic hemodilution using high affinity or low affinity HBOCs or colloid control under both normoxic and hyperoxic conditions in a rat model.

METHODS: Two polymerized HBOCs matched for Hb concentration, molecular size, and oncotic pressure, but with differing P50 values of 36 (alpha) and 8 (beta), were created and donated by Sangart Inc. for the study. Rats (n=8 per group) were anesthetized and ventilated via tracheostomy. An arterial line was placed for blood pressure monitoring and arterial blood gases (ABG). Rats were euthermic and eucapnic throughout. Hexafluorobenzene (50 µl), a tracer of pO2 used in the (19F) MRI technique, was injected into each organ of interest (muscle, skin, and gut). The FiO2 (0.3 or 1.0) were administered in random order and ABG and hematocrit measured. A 7T magnet with 19F/1H dually tunable coil was used for imaging, and tissue pO2 quantified as previously described (1). The FiO2 was then changed (FiO2=1.0 or 0.3) and imaging repeated. Rats were randomly assigned to a substitute group (alpha, beta, or colloid). Each rat underwent continuous hemodilution by simultaneously withdrawing 45 ml/kg of arterial blood while infusing an equivalent substitute volume via the tail vein over 40 min. After equilibration, the rat was rescanned at FiO2 of 1.0 and 0.3, with arterial and hematocrit samples taken before and after. Wilcoxon test and Kruskal-Wallis statistic were used for analysis.

RESULTS: Mean paO2 was 114±14 mmHg (FiO2=0.3) and 538±55 mmHg (FiO2=1.0). Mean hematocrit was 39 ± 3% before hemodilution, and 12 ± 1% after. Figures show gut and muscle ptO2. The ptO2 was significantly increased with FiO2 = 1.0 compared to 0.3 under all conditions ($p<.05$). The ptO2 was variably decreased by hemodilution. There was no significant difference in ptO2 between the blood substitutes or colloid under the conditions studied.

DISCUSSION: The 19F MRI method allows quantitative measurement of decreases in tissue oxygen in multiple organs during severe anemia. Although these experiments do not support a significant effect of HBOC binding characteristics on ptO2 for conditions studied, they emphasize the need for further research in determining modifiable characteristics to optimize oxygen delivery. These findings also highlight the impact of high inspired oxygen on organ oxygen levels. In our study, the FiO2 appears to be a greater factor than oxygen carrier, despite the known small contribution of dissolved oxygen to total content.

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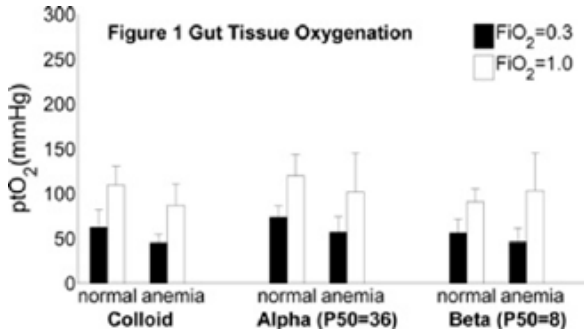

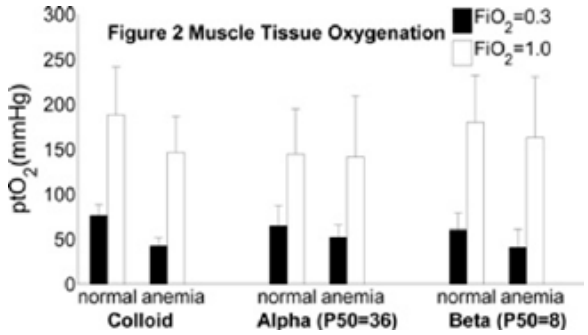

S-29.

IMPACT OF CELL SAVER BLOOD TRANSFUSION ON COAGULATION PROFILE AND TRANSFUSION IN MAJOR SPINE PROCEDURES

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INTRODUCTION: A previous case report identified cell saver blood transfusion (CS TX) as a contributing risk factor for coagulapathy and hypotension in spine surgery. This physiologic response may be due to transfusion of cell stroma and stromal free Hb (1). Using an anesthesia information system (AIMS), a retrospective comparison was performed of perioperative transfusion and coagulation profiles in patients who received CS TX or did not receive CS TX (NO CS TX).

METHODS: Using a reporting copy of the Centricity Perioperative Anesthesia System (GE Healthcare, Arlington Heights, IL) production database, a standard SQL software query extracted data for all spine procedures between 9-1 07 to 9-30-09. Extraction included age, gender, surgical procedure, procedure time, CS TX status, blood loss as estimated by the anesthesia care provider (EBL), Hb values prior to surgery, PACU, and postoperative day 1, PT/PTT/INR determination as either abnormal or normal in PACU and within 12 hours of surgery. No coagulation measurement assumed to be normal. Comparison Groups were CS TX and NO CS TX. Major spine surgery was any spine procedure an EBL of 500 ml or greater Blood loss categories were A:500-999, B:1000-1999, C:2000-2999, D:3000+ and OVERALL. Statistically analysis was performed using t test.

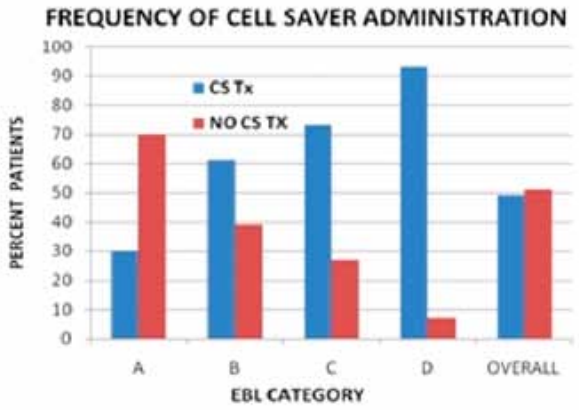
RESULTS: Demographics were 101 F/75M aged 56.8+15.0 years (N=176). Figure 1 is the frequency (%) of CS Tx /No CS TX by EBL category. CX TX values/ No CS TX in EBL category were A:27/64; B:36/23; C:8/3 D:14/1: OVERALL 86/91. In patients with abnormal coagulation profiles 22 of 59 had CS TX and in patients with normal coagulation profiles 54 of 117 had CS T. Similarly in patients requiring coagulation factor TX 17/44 had CS TX and 67/132 without. Table indicates procedure time and. In patients who received CS TX, EBL was greater (1661+1290 v. 905+491), more units were transfused (4+2.6 v. 2.4+1.4), and the day 1 Hb was lower (9.7+2 v. 10.2+2.4 gm/100 ml).

DISCUSSION: CS TX has been shown to be beneficial in Cardiac Surgery and the assumption is that the benefits transfer to all uses. This study suggests that there is an increase in blood loss, blood transfusion and decrease in PO day 1 Hb in the CS TX group. The large blood loss in this study may mask the effect of CS TX in patients who do not require the CS Tx to maintain appropriate Hb values. The reported severe coagulopathy and hypotension reported may be caused by the individual CS unit and further low cost quality testing may need to be developed to prevent these complications.

Coagulation status all spine surgery given cell saver blood

Category	Received CS TX/N	OR Time CS TX (min)	OR Time NO CS TX (MIN)	EBL CS TX (ml)	EBL NO CS TX (ml)
Coagulation					
Abnormal	22 /59 (37%)	531+153	475+142	1920+1560*#	1256+909*#
Normal	54/117 (46%)	442+126	355+137	1348+869*#	836+428*#
Factors Administered					
Given	17 /44(40%)	463+156	355+184	1655+1258*	1004+725*
NOT Given	67 /132(50%)	496+146	390+138	1748+1420*	910+588*

*sign different between CSTX & NO CS TX, # sign different than EBL same category



S-30.

CLINICAL VALUE IN CARDIAC ANESTHESIA : MORE LESSONS FROM THE BART STUDY.

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INTRODUCTION: The 'Blood Conservation Using Antifibrinolytics in a Randomized Trial' (BART)[1] is the largest head-to-head study comparing the three commonly used antifibrinolytics during high-risk cardiac surgery: aprotinin with epsilon-aminocaproic acid (EACA) and tranexamic acid (TXA). These investigators concluded that despite a modest reduction in the risk of massive bleeding, aprotinin was associated with a significant negative mortality trend. Later, Henry et al[2] in their recent meta-analysis (including BART data) also concluded that the mortality risk was higher with aprotinin. The FDA suspended marketing and distribution of aprotinin in November 2007.

Current guidelines[3] do support the use of EACA and TXA to reduce blood loss during certain cardiac surgeries. We used the BART data to compare EACA with TXA: a pair-wise comparison that has not been reported previously. We also introduce the concept of 'clinical value' as it applies to the choice of lysine analogue.

METHODS: After obtaining appropriate permission, we used data from tables in the BART supplementary appendix to perform relative risk calculations for several outcomes. We present the third pair-wise comparison (EACA versus TXA) not reported in the BART publication. The Bonferroni correction was used (corrected alpha = 0.05/3 = 0.0167) with the corresponding confidence interval of 98.33%. The Newcombe-Wilson method without continuity correction[4] was used to calculate confidence intervals.

RESULTS: Tranexamic Acid (TXA, n=770) versus Epsilon-Aminocaproic Acid (EACA, n=780).

Major Primary And Secondary Outcomes	**TXA vs. EACA**	
Weight (kg)	Relative Risk	98.33% CI
BMI	26.8	8.1
1. Massive Postoperative Bleeding (any one of below)		
Any massive bleeding	1.00	0.72 - 1.39
Bleeding from chest tubes	0.90	0.60 - 1.37
Massive transfusion	0.78	0.36 - 1.68
Death due to hemorrhage	2.03	0.47 - 8.73
Re-operation for bleeding	0.98	0.65 - 1.48
2. 30-day All Cause Mortality	0.98	0.54 - 1.79
3. Blood Products Administered		
Platelets	0.86	0.73 - 1.02
Fresh frozen plasma	**0.83**	**0.72 - 0.96**
Cryoprecipitate	0.93	0.63 - 1.37
Red Blood Cells	1.00	0.91 - 1.09

DISCUSSION: When appraising different therapies, one should evaluate several outcomes including clinical measures, functional and cost measures, and, perceived benefit. This type of 'clinical value' analysis represents a new paradigm 5, especially in this era of Comparative Effectiveness Research. The clinical value equation can be viewed as: Clinical Value = Function of {(Quality / Costs) * Volume}. In other words, clinical value may be improved by decreasing costs while holding quality constant[5].

At our institution the direct pharmacy costs for equivalent amounts of EACA and TXA, used as per the BART protocol, are $2.40 versus $540.00. Based on our table, these therapies appear largely equivalent, despite the slight reduction in FFP use with TXA (use of other blood products did not differ). Applied to 200 such operations per year, estimated annual savings may be over $100,000. Admittedly indirect costs along with the various risks and benefits of blood product utilization need to be accounted for. Also, Medicare makes reimbursements per the Diagnosis-Related Group where charge is not as important as cost.

IN CONCLUSION, the clinical value of EACA for high-risk cardiac surgery appears credible.

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S-31.

PREOPERATIVE ANEMIA IS ASSOCIATED WITH 30 DAY MORTALITY

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INTRODUCTION: Anemia is an important problem during the perioperative period and associated with numerous complications. Furthermore, patients with perioperative anemia are prone to receive blood transfusions. While transfusions may treat anemia they are associated with numerous morbidities, such as renal failure, infection, cardiovascular complications and mortality. We used the American College of Surgeons National Surgical Quality Improvement Program database to retrospectively assess the relationship between preoperative anemia and 30-day postoperative mortality in non-cardiac surgical patients.

METHODS: Each patient with preoperative anemia was matched to one without anemia using propensity matching. Logistic regression was used to evaluate the relationship between preoperative anemia and 30-day postoperative mortality. The primary hypothesis was evaluated after adjusting for covariables showing residual imbalance after matching. Additionally we modeled hematocrit as a continuous exposure using generalized non-parametric regression. SAS software version 9.2 for UNIX (SAS Institute, Cary, NC, USA) and R software version 2.8.1 for Windows (The R Foundation for Statistical Computing, Vienna, Austria) were used for all statistical analysis. The false-positive rate (Type I error rate) for all tests was controlled at 5%.

Results: From the total of 363,897 surgical cases within the database 183,786 met our inclusion criteria and of those 45,776 (24.9 %) were anemic at baseline. The unadjusted odds ratio comparing anemic patients to non-anemic patients was 4.69. Among the propensity-matched group of 71,736 patients preoperative anemia was also independently associated with an increased odds ratio of 1.19 for 30-day mortality. (Table 1)

CONCLUSION: Preoperative anemia appears highly associated with baseline diseases that markedly increase mortality. Anemia per se is only a weak independent predictor of postoperative mortality. While unadjusted odds were fivefold increased, after propensity matching the odds ratio was only 1.19. This raises the question of confounding variables and if anemia per se should be seen as a symptom or a disease, as in the vast majority of cases preoperative anemia does not exist independently but is symptom of an underlying disease.

Patients	N	# Anemic (%)	# Dead (%)	Odds Ratio [95% CI]	P-Value	C-Index
All Meeting Inclusion/Exclusion Criteria	183,786	45,776 (24.9%)	1,272 (0.8%)	4.69 [4.19, 5.25]	<0.001	0.60
Propensity-Matched Cross-Sectional Subsample	71,736	35,868 (50.0%)	823 (0.9%)	1.19 [1.02, 1.38]	0.027	0.52
Propensity-Matched Cross-Sectional Subsample, Excluding Transfused Patients	67,179	33,152 (49.3%)	623 (0.9%)	1.23 [1.04, 1.46]	0.016	0.53
Propensity-Matched Case-Control Subsample	2,190	1,213 (55.4%)	1,095 (50.0%)	1.27 [1.07, 1.51]	0.005	0.53

Table 1: Hematocrit and postoperative mortality

S-32.

EFFECT OF GENERAL AND EPIDURAL ANESTHESIA ON HEMOSTASIS IN HEPATIC PATIENTS

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INTRODUCTION: During surgery, there are major disturbances in coagulation and inflammatory systems [1]. Chronic hepatic patients can experience bleeding or thrombotic complications [2]. This study was designed to compare the effect of general anesthesia using isoflurane and epidural anesthesia using ropivacaine on hemostasis in hepatic patients to find out the best anesthetic agent and technique in such patients.

METHODS: Sixty adult patients ASA I-II scheduled for lower abdominal surgeries were randomly allocated into two groups to receive either general or epidural anesthesia which further subdivided into control and hepatic subgroups. Blood samples were collected preoperatively, immediate postoperatively and on the third postoperative day to measure haemoglobin (Hb) level, platelet (PLT) count, prothrombin time (PT), partial thromboplastin time (PTT) and thrombin time (TT). Specific hemostatic parameters were also measured; von Willebrand factor (vWF), soluble platelet selectin (sP-selectin), prothrombin fragment (PF1+2), tissue plasminogen activator (t-PA), plasminogen activator inhibitor-1 (PAI-1) and D-dimer.

RESULTS: This study showed significant postoperative decrease in Hb level and non-significant increase in PLT count. Postoperative changes of PT, PTT and TT were comparable between general and epidural anesthesia. Specific hemostatic parameters revealed immediate postoperative marked significant elevation with general anesthesia which reversed after 3 days but not to baseline. Meanwhile, modest elevation was observed with epidural anesthesia which reversed to near baseline after 3 days. Hepatic cases showed significant higher hemostatic parameters compared with control cases in similar anesthetic subgroups.

DISCUSSION: Similar to this study, de Rossi et al., [3] showed significantly higher expression of P-selectin with isoflurane. Increased its level in hepatic patients was correlated to the degree of liver disease [4]. Lo et al., [5] demonstrated that local anesthetics minimally inhibit platelet aggregation. The pronounced increase vWF with general anesthesia was also reported by Bredbacka et al. [6]. Its high level in hepatic patients may be referred to endothelial shear stress caused by portal hypertension. Contrary to this study, Bruckner et al., [7] reported non-significant increase in PF1+2 level between general and regional groups. Wang et al., [8] concluded that epidural anesthesia can preserve fibrinolytic function by the inhibitory effects on surgical stress and PAI-1. The stability of D-dimer in patients anesthetised epidurally indicates better balance between coagulation and fibrinolysis.

This study concluded that epidural ropivacaine anesthesia provided better hemostatic stability especially in hepatic patients. If regional technique is contraindicated, general anesthesia with isoflurane can be safely used as changes are transient.

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Cardiothoracic and Vascular - Basic Science

S-33.

THE ROLE OF NMDA RECEPTORS IN RAT CEREBRAL MICROVESSEL DILATION AND THE INHIBITORY EFFECT OF PROPOFOL

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INTRODUCTION: Neurotransmitters acting on N-methyl-D-aspartate (NMDA) receptors reportedly contribute to cerebral vasodilation, resulting from activation of neuronal nitric oxide synthase (NOS) (1). However, it has not been proven whether a neuron mediated vasodilator NMDA produces dilation of cerebral microvessels. In addition, it has not been studied whether propofol modulates this dilator response mediated by NMDA receptors. Therefore, the present study was designed to examine in the cerebral parenchymal arterioles whether NMDA induces dilation mediated by activation of neuronal NOS, and whether clinically relevant concentrations of propofol reduce the dilation.

METHODS: The cerebral parenchymal arterioles (internal diameters from 5 to 10 μm) embedded in the brain slices of Wister rats were monitored using a computer-assisted microscopy (2). NMDA (10-7 to 10-5 mol/L) was cumulatively applied to the brain slices. In some experiments, a NMDA receptor antagonist MK801 (10-5 mol/L), a selective neuronal NOS inhibitor S-methyl-L-thiocitrulline (SMTC, 10-5 mol/L) or propofol (3×10-7 and 10-6 mol/L) was added 10 min before the application of NMDA. Data are shown as mean ± SD. Statistical analysis was performed using repeated measures of analysis of variance, followed by Student-Newman-Keuls test.

RESULTS: Cumulative addition of NMDA induced the cerebral parenchy mal arteriolar dilation, which was similarly abolished by MK801 or SMTC (Figure). Propofol (3×10-7 and 10-6 mol/L) concentration-dependently reduced the dilation induced by NMDA (Figure).

DISCUSSION: We have firstly demonstrated that NMDA produces dilation of the cerebral parenchymal arteriole mediated by neuronal NOS activation via NMDA receptors and that clinically relevant concentrations of propofol prevent this dilation. These results suggest that NMDA receptors play a role in cerebral microvessel dilation mediated by neuronal activation, and that clinically used propofol may modulate the neuronal regulation of cerebral microvessel function.

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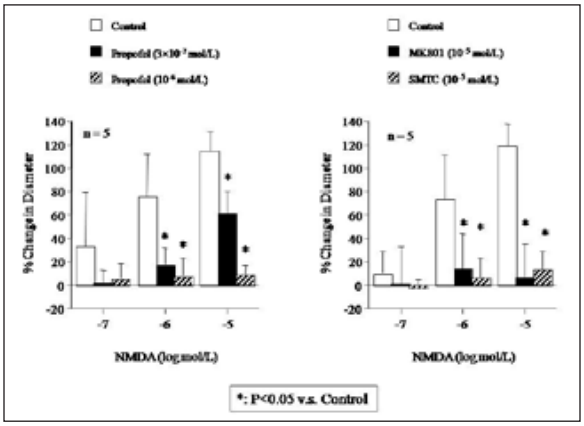

S-34.

WITHDRAWN.

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S-35.

NEUROPROTECTIVE EFFECTS OF SIMVASTATIN PRETREATMENT ON SPINAL CORD ISCHEMIA / REPERFUSION INJURY IN RATS

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BACKGROUND: To prevent paraplegia due to spinal cord ischemia developed necessarily at thoracoabdominal aortic surgery, a lot of medicines with neuroprotective action have been studied. Statins (3-hydroxy-3 methylglutary-coenzyme A (HMG-CoA) reductase inhibitors) are popular cholesterol-lowing drugs used for the treatment of hyercholesterolaemia. There is an overview of randomized clinical trials with statins reporting that statins reduce events of the stroke and myocardial infarction[1]. In a recent study, a variety of in vitro and in vivo studies of statins on neuronal protection have reported statins induce ischemic tolerance to the brain neurons[2,3]. However, to our knowledge, there is no study in which the effect of statins on reperfusion of spinal cords ischemia was investigated. In this study, we assessed the neuroprotective effects of simvastatin pretreatment on spinal cord ischemia / reperfusion in rats.

METHODS: After 14-day administration of 2mg/kg/day simvastatin (Low-dose group), 20mg/kg/day simvastatin (High-dose group) or distilled water (Control group), 12-min aortic balloon occlusion was imposed on rats. Ischemic injury was assessed by hindlimb motor function using the Motor deficit index (MDI) score 24 and 48 hours after ischemic reperfusion, and histological assessment of the spinal cord was performed 48 hours after reperfusion.

RESULTS: The MDI score was better in High-dose group than Control group ($p< 0.01$ and $p< 0.05$ at 24h and 48h, respectively). The number of normal motor neurons in Control group was significantly smaller than that in High-dose group ($p<0.05$). At 48h, the acute damage of the ventral and ventrolateral white matters was significantly less in High-dose group than Control group ($p< 0.05$). However, simvastatin in Low-dose group did not protect against ischemia / reperfusion injury.

CONCLUSION: Our results indicated that simvastatin pre-treatment provided neuroprotective effects on spinal cord ischemia / reperfusion injury in rats, but these effects might depend on the doses.

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S-36.

S1P1-RECEPTOR-ANTAGONISM RAPIDLY STABILIZES ATHEROSCLEROTIC PLAQUES BY INDUCING MACROPHAGE EGRESSION INTO REGIONAL LYMPH NODES IN APOE-/- MICE

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INTRODUCTION: Rupture of unstable atherosclerotic lesions is the underlying cause for peri-operative myocardial infarction. Lesion destabilization depends on macrophages (MØ) that are recruited to but are also capable to egress from plaques (1) offering the potential to develop new therapeutic strategies for rapid, peri-operative lesion stabilization. HDL's constituent S1P reduces leukocyte recruitment to sites of inflammation (2). We tested the effect of a four-day treatment regimen with the S1P analogue FTY720 or the S1P1-specific agonist AUY954 on MØ egression from advanced atherosclerotic plaques in ApoE-/- mice.

METHODS: ApoE-/- and WT mice were fed a high cholesterol diet for 16 weeks after animal care and use committee approval. MØ egression was quantified using non-invasive in vivo fluorescence-mediated-tomography (FMT, Visen) imaging. 5x106 DiR/GFP ex vivo labeled monocytes were injected IV to upload plaques with indicator cells. Two days later mice were started on FTY720 (1µg/g, IP, once a day), or AUY954 (10µg/g, IP, twice a day) for 4 days. Mice were FMT-imaged in a ROI covering aortic arch and brachiocephalic artery before initiation of treatment and on day 4. Results were confirmed ex vivo by 2D-fluorescence-reflectance-imaging (Kodak) of the brachiocephalic artery. Egress of indicator cells from plaques into lymphatic tissue was quantified by flow cytometric analysis of disintegrated regional aortic lymph nodes.

RESULTS: Reduction in fluorescence intensity, indicating egression of GFP/DiR-MØ was detected in vivo by FMT after FTY720 treatment and was more pronounced in FTY720 animals than AUY954-treated animals or in controls (39.51±6.19 vs. 61.5±12 vs. 132.72±17.22, % of baseline mean fluorescence intensity, FTY720 vs. contr, n=8, $p<0.01$). The ex vivo measured fluorescent signal of MØs in brachiocephalic artery plaques was significantly reduced after FTY720 or AUY954-treatment compared to controls (1.24±0.04 vs. 1.33±0.06 vs. 1.54±0.09, target-to-background-ratio, FTY720 vs. contr., n=8, $p<0.05$). MØ egression into LN was increased by FTY720 and AUY954 compared to controls (9.9±1.9 vs. 8.53±3.3 vs. 3.08±10.9; eGFP-MØ/105 cells, n=8, $p<0.05$).

DISCUSSION: Four day treatment with the unspecific S1P-receptor antagonist FTY720 or S1P1-specific antagonism with AUY954 induces egression of MØs from established atherosclerotic lesions. MØs in part emigrate into regional lymph nodes. Since S1P is contained in HDL particles, S1P1-receptor mediated effects may contribute to regression fostered by HDL. FTY720, functional S1P-antagonists or other HDL-mimetics are promising therapeutics for acute peri-operative plaque stabilization in high-risk cardiovascular patients.

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S-37.

S1P1-RECEPTOR-ANTAGONISM REDUCES HEMEOXYGENASE-1 POSITIVE MACROPHAGES IN ADVANCED ATHEROSCLEROTIC LESIONS IN MICE

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INTRODUCTION: Peri-operative myocardial infarction can be caused by rupture of unstable atherosclerotic lesions. Lesion stability depends on macrophages (MØ). Therapeutic strategies for rapid, peri-operative lesion stabilization are lacking. Heme oxygenase 1 (HO-1) is expressed in plaques and has been shown to have beneficial effects on lesions vulnerability (1). HO-1 expression is regulated in part by the S1P-receptor system (2). We tested the effect of a four-day treatment with the S1P-analogue FTY720 or the S1P1-receptor-specific functional antagonist AUY954 on HO-1-expression in atherosclerotic plaques in ApoE-/- mice.

METHODS: To induce complex atherosclerotic lesions, 15 ApoE-/- mice were fed a high cholesterol diet for 16 weeks after animal care and use committee approval. 4 days before sacrifice animals were started on FTY720 (1µg/g; IP, once a day), AUY-954 (10 µg/g; IP, twice a day) or vehicle. The brachiocephalic artery was harvested after saline perfusion and embedded in kryo-media. Four kryosections (7µm) per animal were double-stained immunefluorescently for endothelial cells (CD31 clone FA-II) or macrophages (CD68 clone MEC 13.3) and HO-1 (assay designs) followed by the respective secondary antibodies coupled to Cy2 (CD31 and CD68) or Cy5 (HO-1). Sections were analyzed using a videomicroscope (Olympus) equipped with a CCD-camera (Retiga) and morphometric software (QCapture). Sections were examined for double staining of EC or macrophages and HO-1. The percentage of HO-1-positive macrophages in the shoulder and at the base of the plaque were analyzed. Data are presented as mean±SEM and were analyzed by ANOVA followed by unpaired students t-test or paired students t-test for intraindividual comparisons.

RESULTS: HO-1, as demonstrated by colocalization was expressed at low levels in endothelial cells. Macrophages however displayed a very heterogenous expression pattern for HO-1. In control animals macrophages in the shoulders compared to macrophages at the base of the plaque were much more likely to express HO-1 at a high level (70±5.5% vs 48±8.1%, $p<0.05$)

S1P-analogue-treatment reduced plaque content of macrophages by 30% ($p<0.05$). FTY- and AUY-treated animals demonstrated significantly less HO-1 expression in shoulder macrophages than control mice (55.8±3.4% vs. 42.6±7.3% vs. 70.3±5.5%, both $p<0.05$) while HO-1-expression was not changed in macrophages at the base of the plaque (48.6±6.3%vs. 39.0±10.3% vs. 47.8±8.1%, p=ns).

DISCUSSION: Four day treatment with the non-specific S1P-receptor antagonist FTY720 or functional S1P1-specific antagonism with AUY-954 reduces the percentage of MØ expressing HO-1 in established atherosclerotic lesions. Given that HO-1 likely has anti-atherogenic properties a possible explanation for this observation could be that HO-1-expression induced by S1P1-antagonism is associated with macrophage emigration from plaques.

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S-38.

SEVOFLURANE ENHANCES MODERATE DOSE ETHANOL-INDUCED PRECONDITIONING BY AUGMENTING PHOSPHORYLATION OF GLYCOGEN SYNTHASE KINASE 3β IN ISOLATED GUINEA PIG HEARTS

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INTRODUCTION: We demonstrated that sevoflurane enhances low dose ethanol-induced preconditioning through protein kinase C (PKC), mitochondrial KATP channels and nitric oxide synthase (NOS) (1). Inhibition of mitochondrial permeability transition pore (mPTP) opening by phosphorylation of glycogen synthase kinase 3β (phospho-GSK 3β) has been implicated as a mediator of cardioprotection afforded by isoflurane (2). We investigated whether sevoflurane enhances moderate dose (5%) ethanol-induced preconditioning and phosphorylation of GSK 3β is involved in this cardioprotection.

METHODS: Isolated perfused hearts from guinea pigs were subjected to 30 min global ischemia and 120 min reperfusion (I/R) in all groups. Controls (CTL) were neither ethanol nor sevoflurane-treated. Ethanol-treated group (EtOH) received 5% ethanol in their drinking water for 8 weeks. Anesthetic preconditioning was elicited by administration of 10 min of sevoflurane (1 MAC; 2%) with 10 min washout before ischemia in hearts from non-ethanol-treated (SEVO) or ethanol-treated (EtOH+SEVO) animals. Contractile recovery was monitored using left ventricular developed (LVDP) and end-diastolic (LVEDP) pressures. Coronary flow was measured by collecting effluent. Infarct size (IS) was determined by triphenyltetrazolium chloride (TTC) stain. Tissue samples were obtained 10 min after reperfusion to determine GSK 3β and phospho-GSK 3β expression using Western blot analysis.

RESULTS: After I/R, EtOH, SEVO, and EtOH+SEVO had higher LVDP (58±4, 47±3, 59±2 vs 26±3, respectively, $p<0.05$), and lower LVEDP (17±6, 26±2, 15±3 vs 59±5, respectively, $p<0.05$) compared to CTL. Infarct size was significantly reduced in EtOH and SEVO compared to CTL (24±3%, 23±2% vs 46±4%, respectively, $p<0.05$). The addition of sevoflurane to EtOH led to further reduction of infarct size to 11±2% in EtOH+SEVO. Expression of phospo-GSK 3β (inhibited GSK 3β) was significantly increased in EtOH and SEVO. This expression was augmented in EtOH+SEVO. Coronary flow (CF) was similar among all groups throughout the experiment.

DISCUSSION: Sevoflurane enhances moderate dose (5%) ethanol-induced preconditioning by augmenting expression of phospo-GSK 3β.

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	Baseline				120min Reperfusion			IS (%)
	n	LVDP (mmHg)	LVEDP (mmHg)	CF (mL/min)	LVDP	LVEDP	CF	
CTL	8	114 ± 6	10 ± 0	28 ± 2	26 ± 3	59 ± 5	20 ± 2	46 ± 4
EtOH	8	117 ± 3	10 ± 0	31 ± 1	58 ± 4*	17 ± 6*	18 ± 1	24 ± 3*
SEVO	8	107 ± 4	10 ± 0	31 ± 2	47 ± 3*	26 ± 2*	21 ± 2	23 ± 2*
EtOH+SEVO	8	109 ± 5	10 ± 0	29 ± 1	59 ± 2†	15 ± 3†	17 ± 1	11 ± 2*†

(mean±SEM; *P<0.05 vs CTL, †P<0.05 EtOH+SEVO vs EtOH, SEVO)

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S-39.

MINOCYCLINE-INDUCED SPINAL CORD PROTECTION FROM AORTIC OCCLUSION-RELATED ISCHEMIA IN THE RABBIT MODEL

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INTRODUCTION: Ischemic injury to the spinal cord and paraplegia are known complications in descending thoracic aorta surgery. Effective therapeutic methods to prevent such injury are still under investigation. As subsequent effects of spinal cord ischemia are similar to those observed following traumatic spinal injury, we examined the role of minocycline, a 2nd-generation tetracycline, known to ameliorate secondary events of spinal cord injury, such as apoptosis and inflammation. We investigated the protective role of minocycline in attenuating the histopathological changes in the spinal cord following a period of aortic occlusion-related ischemia in the rabbit.

METHODS: With adherence to the Guide for the Care of Laboratory Animals, aortic occlusion was achieved in anesthetized NZ albino rabbits by using a 3F Fogerty catheter, introduced through femoral incision to the L2 level (one cm below left renal artery - fluoroscopic confirmation). Aortic flow occlusion was verified by disappearance of pulse oxymetry tracing and Doppler signal. Increasing I.V. doses of minocycline were given (1, 2, 5, and 10mg/kg; n=10-12 animals in each dose group) thirty minutes prior to aortic occlusion of 25 min. The modified motor Tarlov scoring (0- complete paraplegia to 3-normal movements on days 0 to 2) was correlated to histological injury in the different regions (L4 to L6) of the cord. A histopathological grading of the degree of hypoxic/ischemic damage (0- normal to 4- marked) of H&E stained sections was determined according to the degree of ventral horn disruption associated with other typical alterations (e.g. red neurons). Also, the number of intact motoneurons per 10 high power fields was counted. Statistical analysis was performed using Spearman Correlation and Chi Square test.

RESULTS: Spinal cord ischemia for 25 minutes resulted in high-grade paraplegia in the control group. Minocycline administration produced a dose-dependent, significant improvement in the post-ischemic neurological deficit (10mg/kg; 90% improvement; $p<0.001$). Minocycline administered post ischemia also produced improved neurological outcome in 40-50% of the animals (p=NS). The severity of histopathological damage was inversely related to the neurological deficit scores, with a clear reduction after minocycline administration ($p<0.003$).

DISCUSSION: Minocycline demonstrated dose-dependent neuro-protection against temporary ischemia to the spinal cord, with significant sparing of motoneurons. With the high safety profile of the drug, the functional recovery achieved with minocycline has the potential for clinical applicability.

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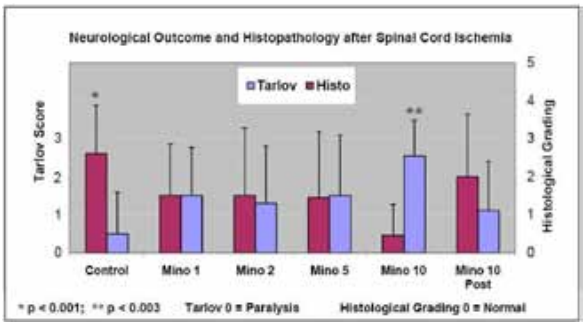

S-40.

REDOX REGULATION OF AKT IS CRUCIAL FOR ITS CARDIOPROTECTIVE EFFECT

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INTRODUCTION: The serine/threonine kinase Akt is a critical component of an intracellular signaling pathway that exerts effects on cardiomyocyte survival. It is well known and widely accepted that the unphosphorylated form of Akt is virtually inactive, and phosphorylation at Thr-308 and Ser-473 stimulates its activity. However, recent structural analysis revealed that Cys-297 of inactive Akt formed an intramolecular redox-sensitive disulfide bond with Cys-311, suggesting that Akt is a redox-sensitive protein and that free thiols of Cys-297 and Cys-311 residues play an important role in regulating the Akt kinase activity[1]). We investigated the relationship between redox status of Cys-297 and Cys-311 residues of Akt and hydrogen peroxide-induced Akt activation in rat cardiac H9c2 cells by utilizing a site-directed mutagenesis technique.

METHODS: H9c2 cells, a clonal line derived from embryonic rat heart, were obtained from American Type Culture Collection (CRL-1446). The redox states of proteins were assessed by modifying free thiol with 4-Acetamido-4'-maleimidylstilbene-2,2'-disulfonic acid. The viability of cultured cells was evaluated using 3-(4,5-dimethyl-thiazole-2-yl)-2,5-diphenyl tetrazolium bromide. Mutant expression vectors of Akt were created by converting Cys-297 and Cys-311 residues to serine in Myc-tagged Akt cDNA. Protein expression was confirmed by western blot analysis using anti-Akt and anti-Myc antibodies. Phosphorylation of Myc-tagged wild type and mutant Akt were estimated by western blot analysis using anti-phospho-Akt antibody following immnoprecipitation by anti-Myc antibody. Akt kinase activity was measured by phosphorylation of GSK3α/β, a substrate of Akt.

RESULTS: Akt activity transiently increased 10-30 min after the addition of 100 μM hydrogen peroxide and then returned to basal levels by 60 min in H9c2 cells. Akt existed in a fully reduced form in H9c2 cells, and hydrogen peroxide increased the amount of oxidized Akt in a time-dependent manner, which was accompanied by decreased cell viability. Akt developed a disulfide bond between Cys-297 and Cys-311 in the cells under oxidative stress. Myc-tagged wild type Akt protein, but not any Myc-tagged mutant Akt proteins, was phosphorylated and increased its kinase activity in H9c2 cells treated with 100 μM hydrogen peroxide for 15 minutes.

DISCUSSION: We demonstrated that the free thiols of both C297 and C311 residues of Akt are crucial for its phosphorylation and kinase activity in rat cardiac H9c2 cells treated with hydrogen peroxide. These findings indicate that redox regulation of Akt cysteine residue may play an important role in exerting its cardioprotective effect.

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S-41.

ACUTE CAPSAICIN TREATMENT REDUCES MYOCARDIAL INFARCT SIZE IN RATS VIA TRANSIENT RECEPTOR POTENTIAL VALLINOID 1 (TRPV1) ACTIVATION

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INTRODUCTION: The transient receptor potential vallinoid 1(TRPV1) is a nonselective cation channel that is a transducer of heat, pain or noxious stimuli. TRPV1 knockout mice block myocardial salvage via ischemic preconditioning1, however, whether direct activation of TRPV1 by capsaicin reduces myocardial infarct size has not been well studied. Therefore, we characterized the dose and timing of capsaicin-induced myocardial salvage and whether the mechanism of capsaicin-induced myocardial salvage is mediated by TRPV1.

METHODS: Male SD rats (n=7/group) were acutely anesthetized, instrumented to measure hemodynamics (blood pressure, heart rate, rate pressure product), and a silk suture was placed around the left anterior descending coronary artery (LAD). After surgical preparation and stabilization, rats were divided into three sets, and all underwent 30 minutes of LAD occlusion followed by 2 hours of reperfusion. The first set of rats had four groups, receiving either vehicle (DMSO) or a single dose of the TRPV1 agonist capsaicin (0.1mg/kg, 0.3mg/kg or 1.0mg/kg), given intravenously 10 minutes prior to ischemia. A second set of rats received the selective TRPV1 antagonist, capsazepine (3.0mg/kg), alone or prior to capsaicin administration. A final set of rats were given capsaicin (0.3mg/kg) either 5 minutes prior to reperfusion or 10 seconds after reperfusion. After 2 hours of reperfusion, infarct size was determined by triphenyltetrazolium staining (expressed as a percentage of infarct size/area at risk). Statistical analysis was performed by one-way ANOVA with Bonferroni correction for multiplicity using Graphpad Prism software.

RESULTS: Capsaicin administered 10 minutes prior to ischemia reduced myocardial infarct size at the three doses tested (0.1mg/kg: 46.6±1.0*%, 0.3mg/kg: 43.4±1.5*%, 1.0mg/kg: 43.4±1.5*% versus vehicle: 62.3±1.5%, respectively, *P<0.05 versus vehicle). Administration of capsazepine (3.0mg/kg) prior to capsaicin (0.3mg/kg) blocked myocardial salvage associated with capsaicin administration (62.4±1.6%; similar to vehicle treated). Administration of capsaicin 5 minutes prior to reperfusion reduced myocardial infarct size, however, capsaicin administered 10 seconds after reperfusion had no effect (44.9±1.1*% and 60.7±1.6%, respectively, *P<0.05 versus vehicle).

DISCUSSION: Direct activation of the TRPV1 channel via the selective agonist capsaicin reduces myocardial infarct size in an in vivo rat model of myocardial infarction. The infarct size sparing effects are limited to administration of capsaicin prior to reperfusion. The mechanism involved in myocardial salvage is dependent on TRPV1 activation. Further investigation into the molecular signaling pathways involved is needed.

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S-42.

TREATMENT OF GUINEA PIG HEARTS WITH RANOLAZINE PRESERVES MITOCHONDRIAL STRUCTURE AND FUNCTION AND PROTECTS AGAINST CARDIAC ISCHEMIA-REPERFUSION INJURY

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INTRODUCTION: Mitochondria produce most all the energy required for excitation and contraction of cardiac cells. A deficit of O2 and substrates (e.g. ischemia) inhibits the proton pumps and the orderly flow of electrons through the mitochondrial respiratory complexes for development of the large membrane potential necessary for ATP synthesis. Reducing respiratory complex enzyme activities and partial uncoupling before the onset of ischemia may protect the heart.[1] Ranolazine (RAN), a late Na+ current blocker and antianginal drug, is cardioprotective against experimental ischemia reperfusion (IR) injury.[2] RAN is proposed to protect mitochondrial function (e.g. to limit lipid peroxidation and to impede electron flow through complex I) during IR injury.

METHODS: We used several tools: spectrophotofluorimetry of isolated hearts with dihydroethedium (DHE, marker for superoxide radical),[3] spectrophotofluorimetry of isolated mitochondria with indo 1 (marker of mitochondrial [Ca^{2+}]), electron paramagnetic resonance (EPR),[4] blue native polyacrylamide gel electrophoresis (BN-PAGE), and Na-dodecyl-SO_4 (SDS) PAGE plus 3-nitrotryosine antibody (3-NT), to examine how RAN might preserve mitochondrial function and thus cell viability during IR injury. Guinea pig hearts were isolated, perfused with crystalloid solution (97% O_2) and treated with 10 μM RAN for 1 min just before 30 min global ischemia followed by reperfusion. A trifurcated fiberoptic probe was placed against the LV free wall and filtered excitation and emission light was used to assess free radicals.

RESULTS: RAN improved contraction (73% of control) vs. ischemia alone (50% of control) and reduced free radical production (DHE is a marker for superoxide radical) by 30% on reperfusion. Mitochondria isolated at 10 min reperfusion were subjected to several tests: EPR spectral changes at 10ºK showed that RAN partially protected against oxidative damage to specific mitochondrial Fe-S clusters and reduced free radical formation. Western blot experiments showed that RAN restored the integrity of respiratory supercomplexes (BN-PAGE) and reduced nitrative damage (e.g. nitration of tyrosine residues by peroxynitrite) to several mitochondrial proteins (SDS-PAGE, 3-NT antibody). RAN treatment increased the amount of added buffer CaCl2 and matrix [Ca^{2+}] required to induce mitochondrial permeability transition pore (MPTP) opening and apoptosis. Discussion: RAN treatment before IR injury protected mitochondria and cardiac function in a number of interconnected ways to reduce injury induced by Ca^{2+} and free radicals. Identification of selective sites of mitochondrial damage during cardiac IR injury, with knowledge of the target of therapeutic measures that reduce the damage, may furnish more rational approaches to selectively treat mitochondria with drugs that will have specific beneficial effects on mitochondria, and therefore, on cell function.

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S-43.

ENZYMATIC DISULFIDE EXCHANGE REGULATES TRANSENDOTHELIAL MIGRATION OF MONOCYTES AND PLATELET-MONOCYTE ASSOCIATES

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INTRODUCTION: The emigration of leukocytes from the circulation to sites of infection is a key event during the pathological imbalanced inflammatory response leading to sepsis and organ dysfunction. Patients with sepsis, severe trauma and multiple organ failure had increased levels of leukocyte-platelet associates in the circulation. Previously, we have shown that platelets associated with monocytes participate directly in monocytic trans-endothelial migration (1). However, the regulatory mechanisms involved in the extravasation process of monocytes with platelets remain poorly understood. We and others have found that exofacial disulfide exchange by enzymatic catalysis of protein-disulfide isomerase (PDI) control adhesive functions on the surface of platelets and leukocytes (2, 3). Therefore, the role of extracellular thiol-redox regulation on endothelial adhesion and transmigration of single and platelet-bound monocytes was investigated.

METHODS: Using isolated human peripheral blood monocytes, as single cells or in association with gelfiltered platelets, adhesion and transmigration studies were performed in vitro. Monocytes were incubated with a microvascular endothelial cell (HMEC-1) monolayer (two chamber transwell system) in the absence or presence of extracellular disulfide exchange inhibitors. Adherent monocytes were quantified by myeloperoxidase-staining. Migrated cells were identified by staining with anti-CD14-PE (monocytes)/ anti-CD42a-FITC (platelets) and counted by flow cytometry.

RESULTS: The number of adhered as well as of transmigrated single or platelet-bound monocytes was reduced significantly in a dose dependent manner (up to 60% inhibition) by the membrane impermeant free thiol blocker pCMPS. Specific inhibitors of the surface-associated PDI, bacitracin and the functional anti-PDI antibody RL90, inhibited transendothelial migration of monocytes and associates up to 80%.

DISCUSSION: An enzymatically catalysed thiol-redox system, including the PDI, on the surface of single and platelet-associated monocytes is crucial for the regulation of endothelial firm adhesion and transmigration. Identification of extracellular thiol dependent-regulatory mechanisms might be promising for new therapeutic targets to prevent inflammation that runs amok.

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S-44.

LOW DOSES OF CLEVIDIPINE HAVE AN INCREASED VASODILATORY EFFECT ON THE HYPERTROPHIC MENSENTERIC VESSEL FROM A PROFILIN-1 HYPERTENSIVE TRANSGENIC MOUSE MODEL

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INTRODUCTION: Many drugs lower BP, however, not many have the capacity to precisely control HTN and maybe decrease morbidity and mortality. Capillary leak and the tone of vascular smooth muscle play a key role in HTN. So far, a direct approach has not been proposed to assess the response of hypertrophic blood vessels to vasodilatory agents. The profilin-1 model is a novel transgenic mouse model that will allow us to determine the different responses between hypertrophic and normal vasoconstricted vessels towards vasodilator drugs such as clevidipine, labetalol and sodium nitroprusside (SNP). Clevidipine is a calcium channel blocker, with an ultra-short half life, fast onset and offset of action and minimal cardiovascular side effects. Clevidipine acts on the vessel by reducing systemic arterial resistance. We hypothesize that clevidipine may have an increased vasodilator effect on the abnormal hypertensive blood vessel and perhaps contribute to the clinical outcome of the disease.

METHODS: We performed an in vitro analysis using wire myograph with mesenteric arteries from 10 profilin-1 hypertensive transgenic and 10 control mice to measure the vasodilatory effect of clevidipine versus labetalol and SNP. We assessed the response after induced vasoconstriction with phenylephrine (5 μM). Two-way ANOVA for repeated measures was used to compare vasodilatory effects. Statistical significance was considered with a p-value <0.05.

RESULTS: There were minimal differences between the vasodilatory effects of clevidipine compared to labetalol and SNP in the control vessels. We observed that the hypertrophic abnormal vessels were less responsive to similar doses than the control. The hypertrophic vessels required increased doses of all three drugs to achieve IC50. Even so, clevidipine required the least dose increment to achieve the same inhibitory effect (IC50) than labetalol (56.67% vs. 75.00%) p<0.05 and SNP (56.67% vs. 63.22%) p<0.05. Although, SNP appears to be more potent at lower doses than clevidipine and labetalol, clevidipine required a less dose increment (Δ Dose) to achieve the same IC50 in the hypertrophic vessel.

Drug concentrations to achieve 50% reduction of the maximal vasoactive response induced with phenyle

Drug	IC50 Control	IC50 Transgenic	Δ Dose	Δ Dose %
Sodium Nitroprusside	0.32±0.061 nM	0.87±0.072 nM	0.55±0.011 nM	63.22 %
Labetolol	0.80±0.093 nM	3.2 ± 0.045 nM	2.4 ± 0.048 nM	75.00 %
Clevedipine	0.91 ± 0.59 nM	2.1 ±0.52 nM	1.19 ±0.07 nM	56.67 %

Note: IC50 is the inhibitory effect of these drugs to produce 50% reduction of maximal response

DISCUSSION: Data has shown that the pharmacodynamic and pharmacokinetic properties of clevidipine may play an important role in the precise control of BP in HTN. Our data suggests that lower doses of clevidipine have an increased vasodilatory effect and may considerably impact the abnormal hypertensive blood vessel undergoing remodeling and perhaps provide an additional vasodilatory effect. This effect on the abnormal blood vessel may provide an additional contribution to the mechanism of BP control. Furthermore, our study may provide a better understanding of its properties as an efficient vasodilator and its more precise control of blood pressure in the hypertrophic vascular smooth muscle.

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S-45.

ROLE OF HYPERHOMOCYSTEINEMIA, GAP JUNCTION PROTEINS AND NMDA NR1 RECEPTOR BLOCKADE ON CARDIAC CONDUCTION AND PERFORMANCE IN A MURINE MODEL

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INTRODUCTION: Hyperhomocysteinemia (HHcy) has been identified as a nutritional, metabolic risk factor for cerebro- and cardiovascular (1) disease in industrialized countries. We investigated the role of connexin (Cx) 40, 43 and 45, gap junction proteins critically for physiologic myocardial conduction, in HHcy. Hcy is an agonist at cardiac NMDA-NR1 receptors (2). We assessed whether NMDA-NR1 receptor blockade with MK-801, leading to blocked intracellular calcium flux, would influence Cx expression in mice with elevated Hcy levels. Blockade of intracellular calcium flux is widely used in treatment of hypertension in patients with cerebro- and cardiovascular disease, a patient group, which is also at risk for HHcy.

METHODS: Male C57BL6J mice, 12 weeks of age were fed for 12 weeks with Hcy rich diet. Animals were randomly assigned to one of four study groups (A: controls; B: Hcy diet; C: MK-801 injections, D: Hcy plus MK-801). All animals were monitored with telemetric ECG. Cardiac performance was assessed with 2D transthoracic echocardiography. Immunoblotting was used for quantification of Cx 40, 43,45 and cardiac NMDA-NR1. Hcy blood levels were measured with high pressure liquid chromatography (HPLC).

RESULTS: Animals treated with Hcy showed severe bradycardic episodes with prolonged atrioventricular conduction along with decreased left ventricular function. MK-801 and Hcy-treated animals showed no improvement in cardiac rhythm disturbances or improved ventricular performance in echocardiography. Animals treated with Hcy showed increased expression of NMDA-NR1 receptor expression compared with control animals. MK-801 treatment in combination with Hcy showed increased NMDA-NR1 receptor expression. Cx 43 and Cx 45 were significantly reduced in animals treated with Hcy as well as in animals treated with Hcy and MK-801. MK-801 treatment in presence of elevated Hcy levels did not lead to restored levels of Cx 43 or Cx 45 compared with controls.

DISCUSSION: NMDA-NR1 receptor blockade with MK-801 did not improve Cx expression in presence of elevated Hcy levels or reverse cardiac conduction related dysrhythmias or ventricular dysfunction. We assume that blockade of NMDA-NR1 post-Hcy exposure cannot improve Hcy induced damage as long as Hcy-enriched diet is continued. We conclude further that treatment with targeted receptor blockade to prevent Hcy binding is not sufficient to correct established structural changes. We conclude that it is unlikely that established structural changes in HHcy are reversible. Elevated Hcy levels are contributing to cardiac disease even if treatment to control Hcy was applied. Anesthesiologists should include HHcy as a cardiac risk factor in their preoperative assessment.

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S-46.

PERIOPERATIVE PATTERN OF INFLAMMATORY MARKER MANNOSE-BINDING LECTIN (MBL) MAY BE RELATED TO CLINICAL OUTCOME IN PATIENTS WITH PRE-EXISTING MBL DEFICIENCY UNDERGOING OPEN HEART SURGERY

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INTRODUCTION: Increasing evidence has suggested that MBL plays a role in cardiovascular disease. We previously reported that MBL increased post-operatively in a patient with pre-existing MBL deficiency who expired ten days after successful CABG surgery. Nevertheless, the correlation between MBL and clinical post-operative outcome is still unclear.

CASE REPORT: Here we report 3 more cases of patients with pre-existing MBL deficiency who underwent open heart surgery with cardiopulmonary bypass (CPB). Analysis of their blood samples from pre-, intra-, and postoperative periods showed that their MBL levels all abruptly increased more than 200% at 24 hours after surgery. However, two of these patients had an abrupt 50% drop from that level at 48 hours. Both of these patients deceased within 4 months of surgery. Such a MBL related unfavorable outcome matches the previous case we reported. In the third case, the patient's increased MBL level was sustained at 48 hours, and she went on to have a favorable outcome.

DISCUSSION: We hypothesize that the post-operative pattern of abruptly increasing and then decreasing MBL may predict an unfavorable post-operative outcome following cardiac surgery.

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Cardiothoracic and Vascular - Clinical

S-47.

LUNG REPERFUSION INJURY IN PEDIATRIC PATIENTS AFTER BALLOON ANGIOPLASTY FOR PULMONARY ARTERY STENOSIS.

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INTRODUCTION: Balloon angioplasty of the pulmonary arteries is one of the most common interventions performed in the cardiac catheterization laboratory for children with congenital heart disease (CHD) 1. However, the incidence and degree of lung reperfusion injury (RI) is not clear, and the method of diagnosis of such injury is variable2. In this study, we hypothesize that RI occurs frequently in children following pulmonary artery balloon angioplasty and, that accepted laboratory measurements of gas exchange are predictive of, and correlate with, clinical manifestations of RI.

METHODS: The records of children with biventricular CHD undergoing pulmonary artery balloon angioplasty for a 2 year period were reviewed. Data were collected retrospectively and included demographics, number of pulmonary artery segments ballooned, pre and post intervention hemodynamic variables, and arterial blood gas analysis. Markers of gas exchange were calculated using standard equations for A-aDO2 and PaO2:FiO23. In this study, we examined: the incidence of RI, the distribution of PaO2:FiO2 post intervention, the relationship of clinical and laboratory manifestations of RI and the correlation between different oxygenation indices post intervention. Criteria for RI were based on the International Society of Heart and Lung Transplant (ISHLT) grading system where a PaO2:FiO2 of 200-300 indicated acute RI and a ratio <200 indicated severe RI4. Additionally, the presence of pulmonary edema or hemorrhage, chest radiograph infiltrates, and unplanned intubation or ICU admission served as predictive features of RI in this study.

RESULTS: There were 46 patients identified in the study period. Patient age ranged from 2 months to 25 years (mean 6.2±6 years) and weight ranged from 5 to 86 kg (mean 23±18 kg). There were 18(39%) females and 28(61%) males. The primary diagnoses are summarized in Figure I. RI was identified in 10/46(22%) of the patients using clinical and ISHLT gas exchange criteria. Analysis of the ratio of right ventricle(RV) to femoral artery(FA) pressure pre and post balloon dilation revealed a statistically significant decrease from a mean of 82±34 to 71±22 mmHg (p=0.004). In Table I, patients developing RI were compared to patients with no RI post-intervention. The degree of RI was graded using the ISHLT criteria and correlated with the clinical symptoms (p=0.002) (Table II). The PaO2:FiO2 ratio had a significant correlation to A-aDO2 (r=-0.75) (Figure II) and was moderately sensitive (0.60) to clinical RI (Table III).

DISCUSSION: Pulmonary artery balloon angioplasty is safe and effective in the majority of children who undergo the procedure; however, the risk of RI is significant. The PaO2:FiO2 is a useful test to confirm clinical suspicion of RI and guide plans for post-intervention care.

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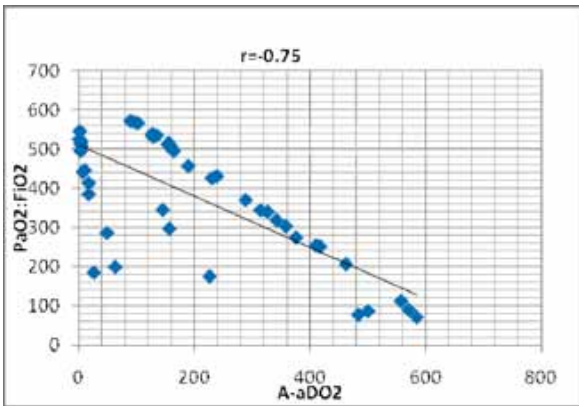

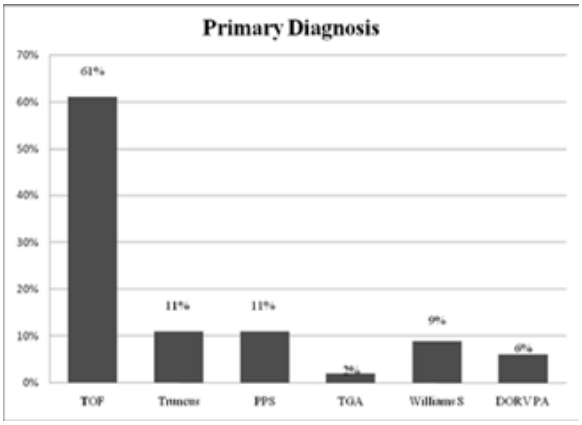

Table I: Comparison of RI to No RI patients:

Variable N=46	No RI	RI	P value
Patient number	36	10	
Age (years)	6.7 ± 5.7	4.4 ± 5.4	0.3
Weight (kg)	23 ± 15	21 ± 26	0.8
RV:FA pre (mmHg)	72 ± 30	113 ± 23	0.001
RV:FA post (mmHg)	60 ± 29	103 ± 29	0.003
% Change in RV:FA	15 ± 21	6.25 ± 26	0.45
A-aDO$_2$ post	176 ± 167	314 ± 197	0.20
PaO2:FiO2 pre	408 ± 101	274 ± 152	0.02
PaO2:FiO2 post	417 ± 143	262 ± 140	0.01
CXR Infiltrate n(%)	2(5)	10(100)	0.001
Case time (minutes)	284 ± 93	353 ± 74	0.02
Segments Dilated	1.6 ± 0.7	1.7 ± 0.7	0.6
Stent placed	13(36)	3(30)	NS

RI=Reperfusion Injuury, No RI=No Reperfusion Injury, NS=Not significant

Table II. ISHLT Grade

ISHLT Grade	Grade 0 N (%)	Grade 1 N (%)	Grade 2 N (%)	Grade 3 N (%)
RI N=10	2(20%)	2(20%)	3(30%)	3(30%)
No RI N=36	28(78%)	0(0%)	4(11%)	4(11%)
N=46	30	2	7	7

Grade 0= $PaO_2:FiO_2$>300 no chest radiograph infiltrates, Grade 1= $PaO_2:FiO_2$>300 plus infiltrates, Grade 2= $PaO_2:FiO_2$ 200-300 plus infiltrates, Grade 3 $PaO_2:FiO_2$ <200 plus infiltrates.

P=0.002 Indicates a significant difference between RI/No RI status across ISHLT grades.

Table III: Validity of $PaO_2:FiO_2$ as a marker of RI.

	RI N (%)	No RI N (%)	$PaO_2:FiO_2$ Validity
Abnormal $PaO_2:FiO_2$ N=14	6/46 (13%)	8/46 (17%)	False(+) (α)=0.22
Normal $PaO_2:FiO_2$ N=32	4/46 (9%)	28/46 (61%)	False(-) (β)=0.40
Overall	10(22%)	36(78%)	

Normal $PaO_2:FiO_2$ >300 (Grade 1 ISHLT)

Abnormal PaO2:FiO2 <200 (Grade 2 ISHLT or higher)

Sensitivity of $PaO_2:FiO_2$=0.60, Specificity of $PaO_2:FiO_2$=0.78, Power = 0.60

S-48.

RISK FACTORS FOR THE DEVELOPMENT OF PRIMARY GRAFT DYSFUNCTION AFTER PULMONARY TRANSPLANTATION SURGERY

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INTRODUCTION: Primary graft dysfunction (PGD) is the main cause of early morbidity and mortality after lung transplantation. The search for causes has thus far focused on donor/recipient variables, surgical factors and postoperative management [1, 2, 3]. It has recently been suggested that anesthetic factors may also affect the occurrence of PGD after lung transplantation [4]. Additionally, blood product utilization and fluid administration have been shown to affect respiratory outcomes in pulmonary resection surgery [5]. We therefore performed a chart review of patients who had undergone lung transplantation to examine the role of these variables.

METHODS: This retrospective cohort study included 172 patients who underwent lung transplantation between 1999 and 2008. From medical records we abstracted information regarding patient characteristics and co-morbidities, indications for transplantation, surgical factors and anesthetic variables. Logistic regression models were used to determine whether any of these potential risk factors were significantly associated with PGD.

RESULTS: Out of 172 patients 89 (52%) developed PGD (Grades 1 to 3) within 72 hours as defined by the International Society for Heart and Lung Transplantation [6]. 42 patients (25%) suffered from PGD at all four time-points (0, 24, 48, and 72 hours) over the first three postoperative days. Factors associated with an increased likelihood of developing PGD by univariate analysis included blood product transfusion (p=0.029) and the use of cardiopulmonary bypass (CPB; p=0.003). The diagnosis of cystic fibrosis was associated with a decrease in the odds of PGD (p=0.039) (Table). In a multivariable analysis cystic fibrosis (p=0.016) and CPB (p=0.041), but not total fluids or blood product transfusion were significantly associated with PGD. Patients who had cystic fibrosis were 76% less likely to develop PGD than those who did not (OR=0.24; 95% CI: 0.07-0.77). Intraoperative use of CPB was associated with a 3-fold increase in the incidence of PGD (OR=3.19; 95% CI: 1.05-9.71).

DISCUSSION: The incidence of PGD in the present study is consistent with previously published data [7], as is the finding that cystic fibrosis as an indication for transplantation is associated with a reduced risk of PDG [6]. The present study also identifies cardiopulmonary bypass as a significant risk factor for the development of PGD after lung transplantation and suggests that neither blood product nor total fluid load are associated with the development of PGD.

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Univariate logistic regression model

Variable	OR	95% CI	P
Abnormal	37 (41%)	342 (34%)*	1256+909
Anesthetic Variables:			
Transfusion of Plasma: Yes vs. No	3.08	1.28-7.37	**0.012**
Transfusion of Platelets: Yes vs. No	2.56	1.00-6.55	**0.049**
Transfusion of Packed RBCs: 2 vs. 0	1.41	1.06-1.87	**0.017**
Blood Loss: 1100 ml vs. 300 ml	1.33	0.99-1.78	0.059
Colloid: 1000 ml vs. 0 ml	1.43	0.98-1.73	0.066
Chest Tube: 150 ml vs. 50 ml	1.34	1.07-1.69	**0.011**
Total Fluid: 4500 ml vs. 2000 ml	1.29	0.93-1.78	0.127
Hypotension: Yes vs. No	1.39	0.99-3.57	0.054
Indication for Transplant:			
Cystic Fibrosis: Yes vs. No	0.32	0.11-0.94	**0.039**
Surgical Factors:			
Cardiopulmonary bypass: Yes vs. No	4.21	1.61-11.01	**0.003**

S-49.

FUNCTION OF THE INTRATHORACIC PRESSURE REGULATOR (ITPR) IN PATIENTS UNDERGOING CABG SURGERY: A HEMODYNAMIC AND TRANSESOPHAGEAL ECHOCARDIOGRAPHY-BASED STUDY

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INTRODUCTION: The ITPR (CirQLatorTM, Advanced Circulatory Systems Inc, Minneapolis, MN) is a novel device intended to increase circulation and blood pressure in hypovolemic or cardiogenic shock. It is inserted within a standard respiratory circuit between the patient and the ventilator and functions by decreasing intrathoracic pressure during the expiratory phase to sub-atmospheric levels after each positive pressure breath. The decrease in intrathoracic pressure creates a relative vacuum within the thorax thereby enhancing venous return to the heart and consequently increasing cardiac output and blood pressure. While there is robust data supporting the benefit of the ITPR in multiple animal models of shock, the device has been used sparingly in humans. We conducted a phase I pilot study in 10 patients undergoing CABG surgery.

METHODS: The study was performed with approval from the Institutional Review Board at the University of Virginia. After the induction of anesthesia and the placement of a TEE probe, hemodynamic variables (pulmonary and systemic blood pressure, central and pulmonary venous pressure, cardiac output, calculated systemic vascular resistance (SVR), etc.) were prospectively collected. In addition, indices of left ventricular performance were assessed using TEE. Once these baseline data were recorded, the ITPR was inserted in the anesthesia circuit and activated to provide -9 mmHg endotracheal pressure. After the ITPR had been active for at least two minutes, the same hemodynamic and TEE data were gathered.

RESULTS: The ITPR was well tolerated in all patients and no adverse events were observed. Patients were exposed to the ITPR for a total of at least 10 minutes. Activation of the ITPR was associated with a small, non-significant increase in systolic and mean blood pressures (data not shown). In addition, there were non-significant trends for decreases in CVP (16 vs. 15.2 mmHg, p=0.224), increases in thermodilution cardiac output (5.23 vs. 5.79 L/min, p=0.133), and increases in calculated SVR (1072 vs. 1164, p=0.267). Using TEE, a significant increase in cardiac output was observed (4.9 vs. 5.5 L/min, p=0.016). Since the device was not associated with a change in HR (68.7 vs. 69.4, p=0.708), the increase in cardiac output comes from an increase in stroke volume.

DISCUSSION: These results suggest that the ITPR can be easily applied during surgery. Application of the ITPR was not associated with any adverse effects or immediate complications. While the device was not expected to increase blood pressure and cardiac output in normovolemic patients, we observed statistically significant increases in cardiac output as measured by TEE. These data suggest that the ITPR has potential as a therapeutic intervention for relative or absolute hypovolemia-induced hypotension. Prospective studies are underway.

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S-50.

INFLUENCE OF HELIUM ON PRODUCTION OF MICROPARTICLES AND ITS RELATION TO PRECONDITIONING IN HUMAN ENDOTHELIUM

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INTRODUCTION: Microparticles (MP) are vesicles circulating in blood and are derived from different cells, e.g. from platelets, erythrocytes, lymphocytes and endothelial cells (EC). Overproduction of MP's has been associated with both, physiological and pathophysiological conditions, and production of endothelial cell derived microparticles (EMP's) has been associated with decreased endothelial function. Data showed that circulating EMP were an independent risk factor for impaired endothelial dependent vasodilation as measured by flow mediated dilation technique.(1)(2) It was shown that circulating MP from patients with acute myocardial infarction cause severe and specific endothelial dysfunction, as shown by a general impairment of vasodilator response to acetylcholine in isolated vessels.(3) From these data it could be hypothesized that EMP's, possibly originating from ischemic vessels, can cause endothelial dysfunction. We recently demonstrated that helium preconditioning was able to protect from endothelial dysfunction caused by Ischemia/Reperfusion (I/R) in healthy volunteers. We hypothesized that 20 min of forearm I/R would result in the production of circulating EMP's, and seek to investigate whether preconditioning with helium would influence production of these circulating EMP's.

Methods: Healthy volunteers were either not further treated (CON), or underwent 20 min of forearm ischemia followed by 15 min of reperfusion in the absence (I/R) or presence of helium inhalation (3*5 min; mixture of 79% helium, 21% oxygen) 15 min before ischemia (early preconditioning, EPC). Venous blood samples were taken from the non-ischemic arm at baseline, after 10 min of reperfusion and after 3 hours of reperfusion. Plasma was recovered after centrifugation (1550 g, 20 min, 20°C) and aliquots of 250 µl were snap frozen in liquid nitrogen within 30 min after withdrawal and stored at -80°C until performing the assay. We analyzed the origin of circulating MPs using flowcytometry (FACS) after labeling MP's with CD144-FITC and CD62e-PE, indicative for endothelium derived MP.

RESULTS: Forearm ischemia resulted in production of circulating EMP's (CD144+/CD62e+) during early reperfusion, while no MP were observed in controls not subjected to ischemia. The EMP's were cleared from the blood after 3 hours of reperfusion. After helium preconditioning, no circulating EMP´s were detected, indicating protection against endothelial damage.

DISCUSSION: These data implicate that 20 minutes of forearm ischemia induce production of EMP's. It seems that helium preconditioning interacts with the production of EMP's, thereby possibly protecting against endothelial dysfunction.

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S-51.

PRE-OPERATIVE BEDSIDE SCORECARD TO PREDICT SUCCESSFUL OPERATING ROOM EXTUBATION FOLLOWING CARDIAC SURGERY

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INTRODUCTION: Early extubation following cardiac surgery has been associated with reductions in ICU and hospital length of stay (LOS). Despite over ten years of this practice, there remains no predictive pre-operative tool to help identify potential candidates for early extubation. Furthermore, the novel concept of extubation in the operating room immediately following surgery (thus defining ultra-fast-track cardiac anesthesia) remains incompletely studied in a large contemporary heterogeneous cardiac surgical population. The aim of this study was to develop a bedside pre-operative assessment scorecard to identify potential candidates for extubation in the operating room following all forms of cardiac surgery.

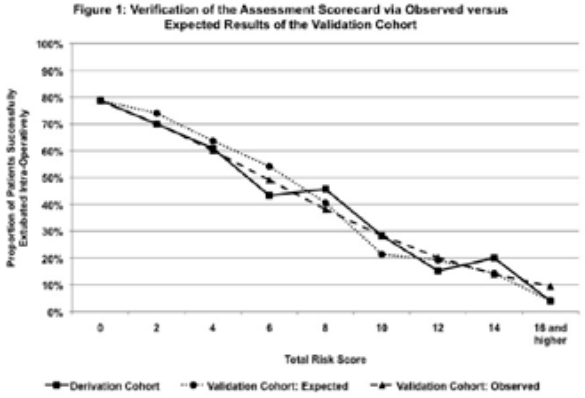
METHODS: Following a retrospective cohort analysis of consecutive patients undergoing cardiac surgery at a single tertiary center from January 2007 to January 2008 (derivation cohort), independent predictors of failure to extubate in the operating room were identified by logistic multivariable regression analysis. The predicted probability of successful extubation was calculated using the coefficients from the logistic regression model. Verification of the predictive model was initially performed using bootstrapping sampling analysis on the original derivation cohort with the model then applied to a validation cohort of patients undergoing cardiac surgery from February 2008 to September 2008.

RESULTS: 1,083 patients underwent cardiac surgery in the derivation cohort, of which 604 patients (55.8%) were successfully extubated intra-operatively. Following regression analysis, nine risk factors for failed intra-operative extubation were identified from this cohort and used to create the pre-operative assessment scorecard (Table 1). Verification of the assessment scorecard via bootstrapping produced a C-statistic of 0.76 (95% C.I. 0.72-0.79). Verification via comparison to the validation cohort (n = 792) produced an observed-to-expected ratio of 0.97 (Figure 1).

DISCUSSION: We present a validated risk model predicting successful intra-operative extubation following cardiac surgery. Utilization of this model may allow for pre-operative risk stratification of a patient's need for post-operative ventilation and could potentially guide operating room case scheduling to optimize ICU throughput.

Table 1: Pre-operative Bedside Assessment Scorecard to Predict Successful Intra-operative Extubation

RISK FACTORS	ASSIGNED SCORE
Emergent Operative Status	6
Reoperation Surgery	4
Congestive Heart Failure History	4
LVEF < 35%	4
Procedure Other then Isolated CABG	4
Female	2
BMI > 30	2
Age ≥ 70	2
COPD	2
TOTAL RISK SCORE	**PREDICTED PROBABILITY OF SUCCESSFUL INTRA-OPERATIVE EXTUBATION**
0	79.6 %
2	70.2 %
4	60.1 %
6	49.1 %
8	38.2 %
10	28.4 %
12	20.2 %
14	14.0 %
≥ 16	9.4 %



S-52.

PLATYPNEA-ORTHODEOXIA SYNDROME: A POST-PNEUMONECTOMY COMPLICATION

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INTRODUCTION: Hypoxemia is frequently encountered in the intensive care setting and typically attributable to several common conditions. Beyond increasing mean airway pressure and inspired oxygen concentration, treatment of persistent hypoxemia requires treatment of the underlying condition. We describe a patient with several risk factors for hypoxemia, unresponsive to first-line therapies, eventually diagnosed with platypnea-orthodeoxia syndrome (POS).

CASE REPORT: A 65 year old male with bronchial carcinoid underwent left lung pneumonectomy with uneventful recovery, discharged home seven days after the procedure. Seventeen days later he complained of abrupt onset dyspnea with exertion, presented to clinic and was found to be afebrile with room air S_pO_2 88%. Bronchoscopy was unrevealing and CT imaging showed patchy infiltrates without pulmonary embolus. He was admitted and received supplemental oxygen and empiric antibiotics. Over the next three days he experienced increasing dyspnea with mild exertion, maintaining S_pO_2 96% at rest but 80-84% with eating meals or short walks.

On the fourth hospital day his hypoxemia rapidly progressed, requiring 15 liters oxygen via facemask with P_aO_2 43 mmHg. He was intubated, but despite FiO2 1.0 the P_aO_2 was <40 mmHg. A pulmonary artery (PA) catheter was placed revealing PA pressure 30/17 mmHg. Transthoracic echocardiography demonstrated a large secundum-type atrial septal defect (ASD) with bidirectional but predominately right to left shunt (RLS), without evidence of elevated right heart pressure. The combination of refractory hypoxemia and new RLS post-pneumonectomy led to the diagnosis of POS. Our patient was taken emergently to the operating room for open ASD closure, where the surgeon noted a large eustachian valve. His immediate intubated postoperative P_aO_2 was 425 mmHg with F_iO_2 1.0, and was extubated within a few hours, able to maintain normal P_aO_2 with room air.

DISCUSSION: POS, first described by Burchell, is an extremely rare disorder characterized by dyspnea and hypoxemia induced with upright posture and relieved with recumbency[1]. Etiologies include interatrial shunt, vascular pulmonary or parenchymal pulmonary shunt. POS is a recognized post-pneumonectomy complication, with anatomic changes in cardiac position implicated in progression of occult ASD via direction of IVC flow to the septum[2]. Persistence of the eustachian valve, responsible for directing fetal IVC flow through a patent formen ovale, may also contribute[4]. The interatrial shunt producing POS can be found in the presence of unremarkable right heart pressures[3]. Increased right heart afterload post-pneumonectomy may also contribute to RLS. Time of onset ranges from days to months post-pneumonectomy[2].

Despite early improvement in hypoxemia with rest, our patient progressed to profound hypoxemia even after intubation. We suspect his ASD, opened by post-pneumonectomy anatomic changes and eustachian valve direction of IVC return, had dilated sufficiently to produce hypoxemia despite recumbency.

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S-53.

IMPACT OF AUTOLOGOUS PLATELET RICH PLASMA TRANSFUSION ON CLINICAL OUTCOME IN ASCENDING AORTIC SURGERY WITH DEEP HYPOTHERMIC CIRCULATORY ARREST

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INTRODUCTION: Blood transfusion is associated with negative impact on clinical outcome increasing mortality and mobility in cardiovascular surgery. Aortic arch surgery with deep hypothermic circulatory arrest (DHCA) often requires massive intra and post-operative blood transfusions to correct induced coagulopathies. Utilization of autologous platelet rich plasma (aPRP) 1 in aortic surgery is an effective, safe and simple process to improve hemostasis. In this study, we used retrospective databases to investigate the effect of aPRP transfusion on clinical outcome in ascending aorta and arch repair with DHCA.

MATERIALS AND METHODS: We retrospectively reviewed 454 cases of ascending aorta and arch repair with DHCA, patients ages 18-80, from 2003 to 2008. 200 patients received aPRP harvest and 254 patients did not. Databases were established by collecting medical information through patient medical record and 2008 ICD-9-CM Volume 1 Diagnosis Codes. The data were analyzed by mean and frequency for continuous variables and qualitative variables. Two-sample t test or Chi-Square test was used to compare the variables between groups. A p-value of <0.05 was considered significant.

RESULTS AND DISCUSSION: Demographics, surgical characteristics, pre and postoperative homeostatic, hematocrit values as well as renal function between two groups were similar (Table 1). Intra-and post-operative blood transfusions were significantly reduced in the aPRP cohort (Table 2, Fig. 1). Compared with the Non-aPRP group, the aPRP group had required less dialysis, fewer CVA's and reduced encephalopathy. Additionally, the aPRP group had a reduced risk of post operative bleeding, less requirement for FVIIa and decreased mortality (Table 3, Fig. 2). The aPRP group also was reduced ventilator time and early extubation (Table 4, Fig 3), had decreased ICU and hospital length of stay and decreased total hospital costs (Table 5).

CONCLUSION: Use of aPRP in Ascending Aorta and arch repair with DHCA surgery results in reduced blood product utilization, decreased time on mechanical ventilation, less post-operative renal failure, fewer strokes, decreased ICU LOS and reduced overall health care costs. Overall morbidity and mortality was improved.

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Table 1: Patient Demographics

Characteristics	Non-aPRP Group	aPRP Group	p-value
Age (yrs)	56.49	56.33	0.8970
Sex: Male	16.2	17.1	0.15
Female	167	26.9	0.90
87	142	0:06	0.80
58	0.2334	1.47	0.80
0.2334	9.1	6.20	0.06
Height (cm)	173.48	175.64	0.0262
Weight (kg)	84.36	87.44	0.1245
BSA (m2)	2.00	2.05	0.0643
Time (minus)			
Circuit Arrest Time	23.60	20.63	0.1202
Pump Time	162.62	152.35	0.1095
Cooling Time	23.138	24.53	0.2758
Warming Time	82.835	79.106	0.0656
Aortic Cross Clamp Time	96.688	90.658	0.1146
Lowest Body Temp. (oC)	**18.078**	**16.753**	**0.1721**
Re-do Operation	**58**	**42**	**0.6396**

Table 2: Blood Transfusion

Blood Transfusion (Unit)	Non-aPRP Group N=254	aPRP Group N=200	Difference	p-value
Intra-OP Transfusion				
PRBC	5.28	2.47	2.81	<0.0001
FFP	6.32	2.2	4.11	<0.0001
Platelets	10.52	2.99	7.53	<0.0001
Cryoprecipitate	6.65	0.70	5.95	<0.0001
Cell Saver	4.74	3.35	1.31	<0.0001
Post-OP 1-3 Days	***Transfusion***			
PRBC	9.96	5.77	4.19	<0.0001
FFP	12.42	7.12	5.30	<0.0001
Platelets	12.11	3.99	8.12	<0.0001
Cryoprecipitate	9.90	2.14	7.76	<0.0001
Administration of FVIIa **Mechanic Ventilation**	**12 Cases** **6.34 Days**	**2 Cases** **3.07 Days**	**10 Cases** **3.27 Days**	**0.0227** **<0.0001**

Table 3: Post Operative Complications

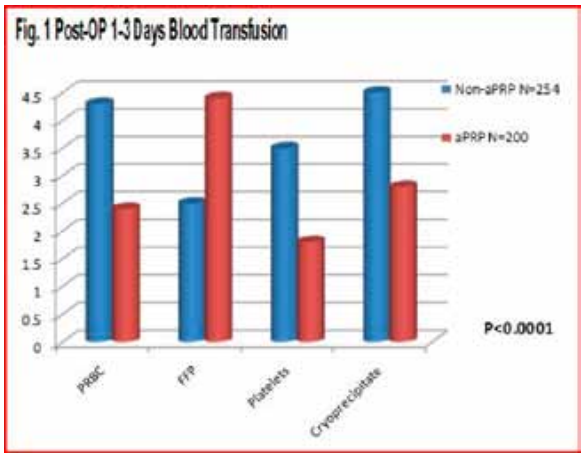
Blood Transfusion (Unit)	Non-aPRP Group N=254(%)	aPRP Group N=200(%)	Total N=454	p-value
Tracheotomy	32 (12.6%)	8 (4%)	40	0.0013
Coagulopathy	41(16.14%)	18 (9.0%)	59	0.0247
Re-Open in 24h	17 (6.69%)	6 (3.0%)	23	0.0749
Dialysis	33 (12.9%)	12 (6%)	45	0.0133
CNS CVA	21(8.27%)	5(2.5%)	26	0.0086
TIA	6(2.36%)	4(2%)	10	0.7941
Encephalopathy	32(12.6%)	10(5%)	42	0.0055
CV MI	5(1.97%)	3(1.5%)	8	0.7064
Arrhythmia(AF)	92(36.22%)	73(36.5%)	165	0.9510
Cardiac arrest	15(5.91%)	9(4.5%)	24	0.5064
Discharge Outcome				
Home	143 (56.97%)	151 (75.5%)	294	0.0002
Long Term Care	88 (35.6%)	40 (20%)	128	0.0002
Death	20 (7.97%)	9 (4.5%)	29	0.0002

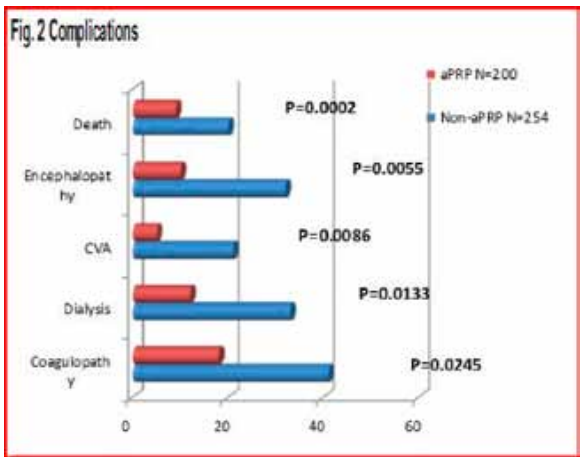
Table 4: Extubation

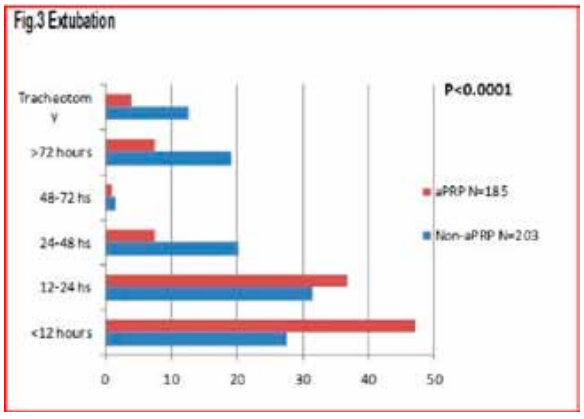
Hours	Non-aPRP Group N=203(%)	aPRP Group N=185(%)	Total N=388	p-value
< 12	56(27.59)	87(47.03)	143	p<0.0001
12-24	64(31.53)	68(36.76)	132	p<0.0001
24-48	41(20.20)	14(7.57)	55	p<0.0001
48-72	3(1.48)	2(1.08)	5	p<0.0001
>72	39(19.21)	14(7.57)	53	p<0.0001

Table 5: Overall Hospital Stays and Cost

Days	Non-aPRP Group	aPRP Group	Difference	p=value
ICU Stay	12.06	6.46	5.60	<0.0001
Hospital Stay	19.98	14.15	5.85	<0.0001
ICU Cost Index* Hospital Cost Index*	15,235 47.144	16,609 34.651	1.374 12.493	0.1607 <0.0001







S-54.

POSTOPERATIVE EFFECTS OF ADMINISTRATION OF HIGH DOSE CORTICOSTEROIDS TO ON-PUMP CORONARY ARTERY BYPASS GRAFT RECIPIENTS

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Introduction: Patients undergoing cardiac revascularization procedures display a systemic inflammatory response to the bypass circuit. Corticosteroids have been employed as a means of decreasing systemic inflammation and thus complications arising from major organ dysfunction. However, recent investigations have suggested that corticosteroids, though decreasing incidence of postoperative atrial fibrillation, may negatively impact time to extubation following surgery, postoperative blood glucose control, and incidence of sternal wound infection. The purpose of this retrospective analysis was to elucidate the effect of corticosteroids on incidence of sternal wound infection, postoperative atrial fibrillation, time to extubation and discharge from the ICU, and blood glucose levels and insulin requirements both intra and postoperatively.

METHODS: Records of all patients, ages 35-85, undergoing first-time coronary artery bypass grafting during corresponding eight month periods in 2007 and 2008 at Loma Linda University Medical Center were reviewed. Patients in the earlier group received 1 mg/kg of dexamethasone following induction of anesthesia and patients in the later group received no corticosteroids. Corticosteroid dose, peak intraoperative and postoperative glucose, time to extubation, ICU length of stay, incidence of postoperative atrial fibrillation and of infection were recorded.

RESULTS: Data from 152 patients who underwent CABG between April and November of 2007 and received corticosteroids were compared with that from 132 patients between April and November 2008 who did not receive steroids. There was no difference in the incidence of sternal wound infection between the two groups (5.9% vs. 4.5%, p = < 0.605). There was no statistically significant difference between the two groups with regard to time to extubation (10.42 hours vs. 8.5 hours, p = 0.64), length of ICU stay (5.6 days vs. 5.2 days, p = 0.55), or incidence of postoperative atrial fibrillation (15.1% vs. 12.1%, p = 0.46). Two-way ANOVA analysis of postoperative blood glucose showed a significant increase ($p < 0.001$) in postoperative blood glucose readings in the steroid group for postoperative days 1 and 2. Postoperative insulin requirements for the steroid group were correspondingly higher on postoperative day 1 ($p < 0.001$).

DISCUSSION: In this retrospective record review, we found sternal wound infection to be no more common in patients who received steroids than in those that did not. Despite the change in steroid administration, there was no change in time to extubation or ICU length of stay. In contrast to previous prospective trials, we failed to show a positive impact of corticosteroids on the incidence of postoperative atrial fibrillation. In addition, our results indicate steroid administration is associated with an increase in postoperative blood glucose and insulin requirements in the first two postoperative days, which could be deleterious in some patients.

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S-55.

THE SAFETY AND EFFICACY OF RECOMBINANT FACTOR VIIA IN PATIENTS UNDERGOING VENTRICULAR ASSIST DEVICE (VAD) IMPLANTATION OR ORTHOTOPIC HEART TRANSPLANTATION (OHT)

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INTRODUCTION: Cardiac surgery often results in substantial hemorrhage necessitating blood/blood product transfusion. A retrospective review of cardiac surgery cases at seven hospitals found that blood loss requiring ≥ 5 units of packed red blood cells (PRBC's) occurred up to 21% of the time.1 Cardiac surgery patients receiving transfusion had a 15% five year mortality versus 7% in those not transfused.2 Patients undergoing ventricular assist device (VAD) implantation or orthotopic heart transplantation (OHT) are at high risk to require transfusion.

Recombinant activated factor VIIa (rFVIIa) (NovoSeven®, NovoNordisk, Denmark) has been used in cardiac surgery to treat post surgical coagulopathy. A small observational study examined the use of rFVIIa in VAD and OHT patients but its safety and efficacy have not been fully elucidated. 3 The purpose of this study was to determine the safety and efficacy of rFVIIa in patients undergoing VAD placement or OHT.

METHODS: A retrospective review of patients who underwent VAD placement or OHT at the University of Michigan Medical Center between January 1, 2003 to October 31, 2007 was performed. Univariate comparisons between patients who received intra-operative rFVIIa versus those that did not were completed using either Pearson Chi-Square, Fischer's Exact Test, Student's T-test or Mann-Whitney U test where appropriate. The primary endpoint was blood product utilization. Secondary endpoints were new thrombotic complications (DVT, PE, CVA and MI) and new onset renal failure.

Results: A total of 269 cases were identified (144VAD and 125 OHT). Thirty eight percent of VAD patients and 26% of OHT patients received intra-operative rFVIIa. Age, gender, BMI and preoperative co-morbidities (diabetes, congestive heart failure, renal failure, and chronic pulmonary disease) did not differ between groups. Patients receiving rFVIIa were more likely to be undergoing repeat sternotomy ($p=0.03$). There was no difference between groups with regard to bypass time, aprotinin usage, intra-operative PRBC usage or platelet usage. rFVIIa patients received less intra-operative cryoprecipitate (1.1u±1.8u vs. 4.8u±8.8u, $p=0.002$) and less postoperative cryoprecipitate (0.79u±1.2u vs. 4.95u±10.9u, $p<0.001$) than non-rFVIIa patients. Total ICU hours and postoperative hours ventilated were greater in the rFVIIa group versus the non-rFVIIa group (337.2h±401.1h vs. 198.4h±223h and 116.4h±256.4h vs. 75.7h±109.3h respectively, $p<0.002$). Postoperative complications were rare and not significantly different between groups.

DISCUSSION: This retrospective analysis of rFVIIa usage in VAD and OHT patients is the largest review to date. It demonstrated that intra-operative and postoperative cryoprecipitate transfusion was significantly less in the rFVIIa group. Thromboembolic events were few and not significantly different between groups. However, patients who received rFVIIa were mechanically ventilated significantly longer and had significantly longer ICU stays than non-rFVIIa patients.

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S-56.

WITHDRAWN

S-57.

INCIDENCE AND RISK FACTORS FOR DELIRIUM FOLLOWING CARDIAC SURGERY

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INTRODUCTION: Delirium is common in surgical patients occurring in 10-60%[1,2]. Although cases of delirium following cardiac surgery were reported over 40 years ago[3], little is known regarding definitive causes and outcomes of cardiac surgical patients who develop postoperative delirium. This study sought to identify both modifiable and non-modifiable risk factors associated with postoperative delirium, as well as evaluate the clinical outcomes of patients diagnosed with delirium including length of stay and mortality.

METHODS: Prospective analysis from a single center between September-November 2008 was performed on 112 cardiac surgical ICU patients who underwent a cardiac and/or aortic surgical procedure. Upon admission to the ICU, a prospective chart review was performed and data recorded included demographic data, history/physical, surgical intra-operative data, as well as risk scoring modalities (Sequential Organ Failure Assessment -SOFA, Acute Physiology and Chronic Health Evaluation II-APACHE II, Charlson Comorbidity Index). Agitation and delirium assessment was performed once per 12-hr shift by cardiothoracic ICU nurses using the Richmond Agitation-Sedation Scale (RASS) and the Confusion Assessment Model for the ICU (CAM-ICU). Statistical analysis of data utilized Chi-square tests, Wilcoxon Rank Sum Tests and Stepwise logistic regression.

RESULTS: Incidence of delirium in our patient population was 34% (n=38). Univariate analyses showed that age ($p<.0001$), Charlson's score ($p<.001$) and duration of anesthesia ($p<.01$) were associated with postoperative delirium. Risk of delirium increased with increased cardiopulmonary bypass time, but association did not reach statistical significance ($p=.08$). Multiple logistic regression analysis confirmed age ($p<.0001$) and duration of surgery ($p=.0002$) to be independently associated with postoperative delirium. The odds of developing delirium increased by 2.5 folds for every ten year increase in age. For every 30 minute increase in surgical duration, the odds of developing delirium increased 1.3 times. Median length of hospital stay was approximately 8 days longer for patients with delirium ($p<.0001$) and ICU median length of stay was 1 day longer ($p<.001$) in our cohort. Rate of ICU and in-hospital mortality were relatively small in our cohort (2.6% and 3.5%, respectively).

DISCUSSION: This prospective study of cardiac surgical ICU patients showed that delirium is not only common following cardiac surgery, occurring in approximately 1/3 of our cardiac ICU patients, but also associated with a substantial burden on the healthcare system[4,5]. We identified that delirium was associated with increasing age and longer duration of surgery, as well as other risk factors not associated with delirium which is important when developing prevention and treatment strategies for postoperative delirium.

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S-58.

EARLY EXTUBATION IN THE OPERATING ROOM FOLLOWING CONGENITAL HEART SURGERY: A LARGE RETROSPECTIVE STUDY

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INTRODUCTION: Early extubation (EE) after pediatric cardiac surgery remains controversial. Many factors affect the length of stay after pediatric cardiac surgery.[1] Generally, extubation in the operating room[6-7], in the first 6 hours[4,8-9], or within the first 72 hours[2] has been shown to be a reliable and safe practice.10 Moreover, early extubation significantly decreases hospital and PICU length of stay[11] and is usually associated with minor complications[12] and respiratory acidosis in the first few hours postoperatively.[5,8]

Several studies have investigated risk factors and complications related to prolonged mechanical ventilation[3-10,13-18] with differing results and with many factors related to difficulties in EE.

The purpose of this study is to analyze a diverse pediatric population to elucidate and clarify the risk factors, timing, and outcomes of EE in the operating room following congenital heart surgery. This is an interim analysis of 216 patients who underwent procedures from 9/28/2007 to 12/31/2008.

METHODS: Retrospective review of patients who underwent congenital heart surgery with cardiopulmonary bypass (CPB) ages 1 month - 12 years of age. All patients < 1 month were excluded due to extremes of age and therefore not candidates for EE. Patients that were intubated prior to arrival in the OR and patients with severe pulmonary hypertension were also excluded from this review.

Average Length of Hospital Stay

Extubated in OR (n=105)	3.13
Left Intubated (n=111)	17.47

DISCUSSION: EE following cardiac surgery in pediatric patients is not clearly defined. Interim data shows that 48.6% of our patients that undergo cardiac surgery with CPB are extubated in the OR, with a re-intubation rate of 5% vs. 8-11% in other studies.[4,11] This again demonstrates the safety of EE. Reasons for reintubation included pulmonary edema (1), pacing wire malfunction (1) and post-operative bleeding (3). The length of hospital stay is significantly less for EE patients, 3.13 (±1.85) vs. 17.47 days (±33.1) (P=0.000037). This is significant when looking at cost/benefit analysis. There are more factors that need to be considered, including CPB time and complexity of the surgery before full conclusions are drawn.

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S-59.

INDICATION FOR LOWER EXTREMITY BYPASS SURGERY AND MORTALITY

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INTRODUCTION: Vascular surgery patients are at risk for perioperative cardiovascular morbidity and mortality. Given the comorbidities of this patient population, understanding perioperative and long-term risk can be essential to stratifying a patient's risk and facilitating an informed consent process. We wanted to consider whether the indication for surgery provided independent information for long-term mortality. Indications for this surgery include chronic limb ischemia (claudication, ischemic rest pain, and tissue loss) and acute indications such as aneurysm repair and graft thrombosis.

METHODS: The Mount Sinai Hospital institutional review board approved the study and a waiver of informed consent was obtained. A retrospective review was performed of all patients that underwent femoral-distal lower extremity arterial bypass procedures between January 2002 and January 2008. 603 patients were studied. The Rutherford grade classification was used to categorize symptoms of chronic limb ischemia. Patients who presented with acute limb ischemia were categorized as acute. Multiple logistic regression analysis was performed to determine independent risk factors for 1-year mortality.

RESULTS: Overall mortality in this population was 19.9% . Patients who presented with claudication, had a 1-year mortality of 2.9%. Patients who presented with rest pain had a 1-year mortality of 7%. Patients who presented with tissue loss had a 1-year mortality of 22%. Patients who presented with acute indications such as an aneurysm repair had a 1-year mortality of 20%. In our analysis, risk of death increases with increasing Lee score at each Rutherford level. The median Revised Cardiac Risk Index (RCRI) score for patients who had claudication, rest pain, and acute surgery was 1 and patients who presented with gangrene had a median RCRI score of 2. In addition to RCRI score, age, ASA classification, gender and emergency surgery, indication for surgery is an independent predictor for 1-year mortality in this patient population.

Discussion

The ACC/AHA perioperative guidelines for noncardiac surgery consider peripheral vascular surgery to be high risk. In our patient population, the overall 1-year mortality was 19.9%. This rate is slightly higher than previous data, which show that patients who undergo infrainguinal bypass surgery have a 1-year mortality of 16.3%.1 We found, however, that indication for surgery was an important consideration. In patients who presented with claudication, the overall 1-year mortality was only 2.9% in contrast to patients who presented with limb tissue loss where the overall 1-year mortality was 22 %. In the risk assessment of patients undergoing infrainguinal bypass surgery, we believe that careful consideration of the indication for surgery is a prudent first step.

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S-60.

PHARYNGEAL ULTRASOUND GUIDE EXTENDS BOUNDARIES OF TRANSESOPHAGEAL ECHOCARDIOGRAPHY - THE DEVELOPMENT OF NEW DEVICE USING ANATOMICAL TEMPLATES OF HUMAN PHARYNX AND ULTRASONIC PHANTOMS

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INTRODUCTION: Transesophageal echocardiography (TEE) is used as a diagnostic and monitoring tool during cardiac and non-cardiac surgeries. The TEE examination is possible due to the close anatomical relationship of the heart and the esophagus. A similar relationship exists between cervical vessels and the walls of the pharynx. However, the walls of the pharynx are not naturally collapsed and the air present prevents transduction of ultrasound waves. The pharyngeal ultrasound guide (PUG) is a new device which bridges the TEE probe and the walls of the pharynx with a liquid medium, allowing transmission of ultrasound waves and image acquisition of cervical structures. We describe the PUG device and the methodology of carotid flow measurement and guided central line using TEE probe.

METHODS: The PUG device sheaths the TEE in a double layer of a latex-free polymer. The compartment between the layers is connected to an external fluid-containing bulb. The inner layer has the shape of the TEE probe, the outer the shape of the human pharynx. Fluid is introduced between the inner and outer layers of the PUG, adapting it to the shape of the pharynx. Depending on the TEE probe multi-plane angle, the jugular or carotid can be scanned in transverse view or longitudinal view. Alignment for a central-line needle track can be viewed by crossing two scans at 90 degrees, one ultrasonic and other mechanical, created by metallic instruments (high acoustic density) over the skin, which we have named the Seagull Sign. This sign predicts the alignment point and direction for needle insertion, enabling a real-time view of the needle, wire guide, dilator and catheter placement. For carotid flow measurements, we use a methodology similar to that described by F. Royse [1] based on the continuity equation.

RESULTS: The methodology has been tested in ultrasonic phantoms. Further studies are necessary to demonstrate the reliability of the device in clinical practice.

DISCUSSION: Compared with surface ultrasound, central line placement aided by the TEE/PUG device has the advantages of producing same image but with both hands free (in-line technique), and might be a good option particularly in situations already requiring the TEE probe. Further potential applications of TEE/PUG include peri-operative measurement of carotid blood flow during cardiopulmonary bypass and aortic dissection, clamp placement during carotid endarterectomy (CEA), carotid angioplasties, real time guiding of cervical biopsies and oncologic cervical dissections. TEE-skilled anesthesiologists have the knowledge to use the TEE/PUG device.

CONCLUSION: The purpose of PUG device is to extend the usefulness of the TEE as a monitoring and diagnostic tool enhancing the safety during the perioperative period.

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S-61.

INTRAOPERATIVE ECHOCARDIOGRAPHIC FEATURES OF CORONARY INVOLVEMENT IN PATIENTS WITH TYPE A ACUTE AORTIC DISSECTION

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INTRODUCTION: Acute aortic dissection involving coronary artery is a relatively rare but fatal condition. We examined the feasibility and limitations of transesophageal echocardiography (TEE) for evaluating type A acute aortic dissection and coronary artery involvement.

METHODS: Between May 2007 and October 2009, we had 73 consecutive surgical patients with acute type A aortic dissection. Of these patients, those with TEE findings of either intimal flap involving the coronary ostium and/or ventricular asynergy were selected retrospectively. Videotapes of TEE and operation records were reviewed to examine the anatomical relation between the intimal flap and the coronay arteries. Also, coronary artery flows were evaluated with color Doppler TEE records.

RESULTS: Thirteen patients (17.8%; male:female=7:6; age, mean+/-S.D.=58.8+/-13.6) showed coronary artery involvement. Both arteries were visualized in all 13 cases. In all these patients, TEE showed either intimal flap extending from the Valsalva sinus just beyond coronary ostia, or intimal flap extending into the coronary arteries (coronary dissection). Hospital mortality rate was 7.6% (1 of 13 patients). Two patients could not be weaned from cardiopulmonary bypass, and one patient died of multiorgan failure in the intensive care unit. Five patients had acute myocardial ischemia due to aortic dissection before surgery, 2 patients suffered coronary malperfusion after aortic declamping, leading to additional coronary artery bypass grafting, and 2 patients showed transient ventricular asynergy during surgery. Four patients had neither ECG or echocardiographic ischemia. In review of TEE findings, the right coronary artery was involved in 7 patients, the left in 5 patients, and both coronary arteries in 2 patients. Coronary dissection (4 patients) was found only in left main truncus, whereas coronary disruption (2 patients) was found only in right coronary. TEE findings showing intimal flap only just beyond the coronary ostia were not necessarily associated with ischemic episodes. On the other hand, intimal flap extending into the coronary arteries (only LMT) were associated with ischemic episodes. Absence of coronary flow by color Doppler was also associated with ischemic episodes. Coronary revascularization was not performed in 3 patients with transient echocardiographic asynergy or preoperative ECG ischemia. In these patients, postoperative maximum CK-MB were 27, 30, 66 U/l.

DISCUSSION: TEE examination for left coronary artery is superior to right coronary artery in patients with type A aortic dissection. Coronary dissection and absence of flow in left main truncus is high specific findings of coronary malperfusion inspite of low sensitivity. LV wall motion abnormality and flap extension into coronary artery should be checked thoroughly after aortic declamping for it may reveal the necessity for additional coronary revascularization.

S-62.

CENTRAL VENOUS PRESSURE MEASUREMENT CORRELATES WITH 3 DIMENSIONAL ASSESSMENT OF RIGHT VENTRICULAR VOLUME AND FUNCTION

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INTRODUCTION: Recent research has suggested that central venous pressure (CVP) measurement may not accurately assess intravascular volume and hemodynamic response to fluid administration.[1] These data suggest that the right ventricle does not exhibit Starling behavior, and that contractility does not increase with increasing preload. We recently found that CVP did not correlate with qualitative assessment of RV function using 2D transesophageal echocardiography[2]. One reason for these findings is the difficulty in assessing volume in the irregularly shaped RV with a two dimensional tool. Real-time three-dimensional echocardiography (RT3DE) clarifies the relationship between CVP and RV function. We hypothesized that CVP would correlate with RT3DE assessment of RV function. To test our hypothesis, we correlated CVP measurements and RT3DE evaluation of the RV in patients undergoing cardiac surgery.

METHODS: After IRB approval we retrospectively reviewed the 3D transesophageal echocardiograms of 13 patients undergoing cardiac surgery. We identified those patients with a 3D flow volume loop of the right ventricle after induction and before cardiopulmonary bypass. 3D images and flow volume loops of the RV were then evaluated for RV end diastolic volume (RVEDV), RV stroke volume (RVSV), and RV ejection fraction (RVEF) using 3D RV analysis software (TomTec, Munich, Germany). CVP measurements obtained at the time of the echo exam were then recorded for comparison. Statistical analysis was performed using Microsoft Excel.

RESULTS: 13 patients were studied. 3 had CABG and valve repair or replacement and 9 underwent valve repair or replacement. 1 patient underwent left ventricular assist device placement. The mean CVP was 9.8 ± 4.1, mean RVEDV was 130 ± 54.8 cc and the mean SV was 54.2 ± 25.3 cc. Mean EF was 41 ± 6.4%. CVP correlated strongly with SV ($R=0.60$ $P<0.05$) and EF ($R=0.64$ $P<0.05$). Correlation was also significant with RVEDV ($R=0.35$ $P<0.05$).

CONCLUSIONS: We found that RT3DE assessment of RVSV, RVEF, and RVEDV correlated with simultaneous CVP measurement. Our findings suggest that 3D and 2D assessments of RV function may differ considerably, and that in some circumstances CVP may be used to assess some aspects of RV. Further research is needed to further understand the value of RT3DE with respect to RV functional assessment and the relationship between CVP and RV function.

FOOTNOTES

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S-63.

PRELIMINARY ULTRASOUND SCAN AND ANATOMICAL ABNORMALITIES IN INTERNAL JUGULAR VEIN

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INTRODUCTION: Real time Ultrasound (US) guidance for central venous catheter (CVC) insertion reduces the number of the complications 1). All CVCs have been inserted by US guidance in operation room of Asahikawa Medical College since 2005. Our purpose in the present study is to evaluate the preliminary US scan in internal jugular vein (IJV) anatomical abnormalities.

METHODS: In this retrospective clinical study, we collected the data by searching the anesthesia charts database. Patients who had undergone US guided CVC insertion by IJV from May 2005 to July 2009 were included.

RESULTS: 2973 patients were inserted CVCs; however, 657 patients were excluded because they don't have the complete data. Carotid artery puncture was 76 cases (2.5%) even in the presence of the real time US guidance. Ten cases (0.33%) of anatomical abnormalities were found in the preliminary scanning prior to the puncture. All anatomical abnormalities were found in the right IJV, and then we decide to use left IJV. There were three types of anatomical abnormalities; partial obstruction type, complete obstruction type and thin type. Four patients had a history of CVC, a patient had that of intravenous anticancer agent administration, and the other one had that of anti-phospholipids antibody syndrome. The rest three patients did not have significant history.

DISCUSSION: The present study shows that preliminary US scan is highly useful in finding anatomical abnormalities. If we find anatomical abnormality in preliminary US scan, we can select another approach for CVC before patient skin antisepsis. Clinical effect of preliminary US scan is also useful in femoral approach or subclavian approach.

Carotid artery puncture is reported 1.2-2.4% under the US guidance, our results support previous study 1), 2).

Previous study about venous thromboembolism reported the CVC as a risk factor 3), history of CVC might contribute to IJV thrombosis.

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S-64.

PREOPERATIVE PLASMA BRAIN NATRIURETIC PEPTIDE LEVEL IS SUPERIOR TO ECHOCARDIOGRAPHIC PARAMETERS IN PREDICTING SEVERE HYPOTENSION AFTER AORTIC CROS-CLAMP RELEASE

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INTRODUCTION: Preoperative brain natriuretic peptide (BNP) levels have been suggested to correlate with the incidence of postoperative myocardial morbidity in patients undergoing major non-cardiac surgery.[1,2] This study investigated that preoperative plasma BNP level might be related to major intraoperative cardiaovascular event, that is, the extent of hypotension after aortic croS-clamp release in patients with aortic aneurysm repair.

METHODS: Patients who underwent elective abdominal aortic aneurysm repair between February 2007 and August 2008 were identified, except the recent history of chronic heart failure or chronic renal failure, moderate to severe systolic dysfunction or diastolic dysfunction. These patients were assigned into two groups according to preoperative plasma BNP levels. The cut-off threshold for BNP level was defined as 40 picogram per milliliter that was previously reported. The decrease of systolic arterial pressure observed within five minutes after the release of aortic croS-clamp was compared between the two groups, including surgical characteristics and anesthetic procedure. First, we examined the correlation between plasma BNP levels and the extent of hypotension. Second, we compared preoperative echocardiographic parameters and plasma BNP levels with the extent of hypotension between the two groups.

RESULTS: A positive correlation was observed between plasma BNP levels and the extent of hypotension after the release of aortic croS-clamp ($r=0.52$; $P=0.0032$). (Figure) On the other hand, there were no significant differences in preoperative two echocardiographic parameters (EF and E/e') between the two groups. (Table)

DISCUSSION: A biomarker BNP can significantly correlate with intraoperative cardiovascular events, even if preoperative cardiac physiological examinations were within normal limits. In conclusion, preoperative high plasma BNP levels may be a good predictor of the incidence of profound hypotension after the release of aortic croS-clamp in patients undergoing abdominal aortic graft replacement.

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Figure. The result of univariate regression analysis between plasma BNP levels and the extent of hypotension after the release of aortic cross-clamp. (n=31)
Linear regression line is superimposed on the plots indicating the dependence relationship. A positive correlation was observed between two parameters. (r = 0.52; P = 0.0032)

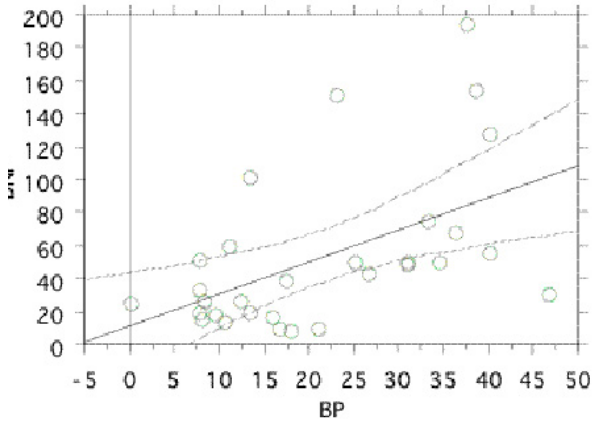

Table. Comparison of preoperative two echocardiographic parameters, plasma BNP levels and the incidence of intraoperative hypotension after the release of aortic cross-clamp between the two groups.

	Group A (n=15)	Group B (n=16)	P Value
EF (%)	58.8 ± 9.8	58.5 ± 9.9	0.95
E / e'	9.4 ± 4.0	8.3 ± 3.3	0.5
BNP (pg/ml)	85.4 ± 46.7	20.0 ± 8.8	< 0.01
hypotension (median; %)	31.0 %	12.8 %	< 0.01

S-65.

AGE AND PULSE PRESSURE PREDICT MAJOR CARDIAC EVENTS FOLLOWING OPEN ABDOMINAL AORTIC ANEURYSM SURGERY

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BACKGROUND: Preoperative pulse pressure has been shown to predict major adverse cardiac events following cardiac surgery (1). We tested this hypothesis in patients undergoing major vascular surgery.

METHODS: A prospectively collected vascular database from 2003 to 2005 was used to obtain 83 consecutive patients undergoing open Abdominal Aortic Aneurysm (AAA) surgery. After IRB approval, preoperative pulse pressure (PP) was calculated from an average of the preanesthetic record, office visit and hospital admission note.

DATA ANALYSIS: PP was divided into two groups (≤ 80 or > 80 mm of Hg) based on a previous study(1). Major adverse cardiac event (MACE) was defined as a combination of myocardial infarction, in hospital mortality or new onset congestive heart failure (2). MACE and other outcomes (renal failure, mechanical ventilation >24 hours and hospital length of stay) were analyzed by a chi-square test or Fisher exact test where appropriate. MACE was analyzed by univariate analysis with continuous and categorical variables. All variables with $p \leq 0.20$ were entered into a logistic regression model.

RESULTS: The demographics are shown in [Table 1] and [Table 2]. The incidence of MACE was significantly higher in patients with PP > 80mm of Hg with an odds ratio (OR) of 2.9 and confidence intervals (CI) [1.01-8.6]. Patients with MACE had a mean age of 75 ± 8 yrs compared to 68± 10 yrs in patients without MACE (p=0.004) and a slightly higher PP. Significance ('p' values) of other variables were SBP (0.2), DBP (0.6), MBP (0.4), PP (0.3), Cr (0.9), EF (0.3). In the final logistic regression model, age retained significance (p=0.03), whereas PP lost the statistical significnce (p= 0.15). The odds of MACE were 2.23 for every 10 years of increase in age from 40 year onwards. Pulse pressure > 80mm of Hg increased the odds of MACE by 2.3 [0.8-7]. Even though the OR crossed 1, the statistical insignificance could be because of smaller sample size and therefore a type II error.

CONCLUSION: Age is a powerful predictor of MACE in patients undergoing abdominal aortic aneurysm surgery. Pulse pressure >80mm of Hg has a good potential to predict MACE, although it was statistically insignificant(2.3 [0.8-7]). All patients with PP >80 mm of Hg had a statistically significant increased hospital length of stay 11.6[8.2] vs. 8.5[4.4] days (p=0.04).

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Demographic Data (Continuous Variables)

	PP < 80mm Hg	PP > 80 mm Hg	'P' value
AGE	68 [9]	72 [9]	0.07
SBP	132 [17]	169 [13]	0.00
DBP	70 [13]	74 [15]	0.20
MBP	91 [13]	106 [14]	0.00
SERUM CREATININE	0.99 [0.5]	1.1 [0.5]	0.50
EJECTION FRACTION	49 [16]	46 [20]	0.56

Preoperative Demographics

	PP < 80mm Hg	PP > 80 mm Hg	'P' value
GENDER [M/F]	73/27	63/37	0.35
DIABETES	34	25	0.43
HYPERTENSION	76	92	0.10
CAD	36	30	0.58
CREATININE > 2	7	8	0.80
H/O CHF	5	0	0.55
H/O CABG	12	13	0.94
H/O BETA BLOCKADE	55	58	0.79
H/O STATINS	57	54	0.82

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S-66.

INITIAL EXPERIENCE USING THE TWO OPERATOR APPROACH WITH THE GLIDESCOPE VIDEOLARYNGOSCOPE IN ADULT CARDIOTHORACIC SURGICAL PATIENTS

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INTRODUCTION: In contrast to direct laryngoscopy where the operator maintains the line-of-sight of anatomic structures, the GVL forces the operator to continuously look at the monitor. Such indirect viewing impairs eye-hand coordination, undermining the operator's ability to manipulate the ETT proficiently. Therefore, using two operators - an ETT and a videolaryngoscope operator- allows the ETT operator to have both hands available to maneuver the tube, increasing visuo-motor dexterity and potentially improving the intubation success rate. The aim of this study is to review our initial experience with this technique.

METHODS: Forty patients ASA II-IV, aged 31-86 were included. A Parker Flex-Tip™ tube was used in all intubations. Mallampati class 3-4, anterior larynx, short neck and BMI >30 were considered predictors of difficult intubation. Difficult GVL glottic view was defined as a modified Cormack and Lehane score (MCLS) 3-4. Primary outcome was time to intubation (TTI). This time started with the GVL blade at the hard palate and ended when the ETT cuff was advanced past the vocal cords. Secondary outcomes included number of intubation attempts and trauma to oro-pharygo-laryngeal structures.

RESULTS: Twenty-five males (63%) and 15 females (37%) were included. Seventeen patients (43%) had a BMI >30 (mean=33) and 23(57%) had a BMI >30 (mean=25). Six patients had Mallampati class 1 (15%); 16 class 2 (40%); 17 class 3 (43%) and 1 patient class 4 (2%).

The MCLS glottic view showed a grade 1 in 10 patients (25%); grade 2A in 23 (57%); grade 2B in 3 (8%); grade 3 in 3 (8%) and grade 4 in 1 patient (2%).

Median TTI was 41± 7.7 seconds. The TTI in the group with BMI <30 was 43±12.1 seconds and in the group with BMI >30 group the median TTI was 36±6.7. Thirty-six patients (90%) were intubated on the first attempt and 4 patients (10%) required 2 attempts. There were no complications.

DISCUSSION: Of the 18 patients (45%) expected to have difficult direct laryngoscopy by Mallampati, only 4 patients (10%) demonstrated a GVL MCLS >2B.

Using the two-operator approach resulted in an intubation success rate of 90% on first attempt achieving 100% success rate with only one additional attempt. Compared to other studies, this technique did not result in a prolonged TTI. The fact that two patients were intubated in less than 20 seconds, suggests that having a second operator available can result in faster TTI, but larger studies are necessary to confirm this hypothesis. Close communication among the two operators may have decreased the blind spot period, decreasing even more the potential risk of oropharyngeal trauma.

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S-67.

LONG TERM POSTOPERATIVE NEUROCOGNITIVE FUNCTION IN CARDIAC SURGERY AND THORACIC AORTIC SURGERY PATIENTS

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INTRODUCTION: Cardiac and thoracic aortic surgical procedures are associated with adverse neurocognitive sequelae, such as stroke, seizures, delirium, and cognitive deficits.1-2 There are few studies of cognitive outcomes in thoracic aortic surgical patients. It is likely that the incidence and/or severity of postoperative cognitive decline in these patients is greater in comparison with other cardiac surgery, because the operation often requires interruption of cerebral circulation. The aim of the current investigation was to assess the ability of a remote neurocognitive testing methodology to discriminate among patients who underwent standard cardiac versus thoracic aortic surgery. We hypothesized that we would replicate previously identified predictors of postoperative cognitive decline in a cohort of patients who had undergone cardiac or thoracic aortic surgery within the previous five years.

METHODS: Computerized neurocognitive testing was performed on 300 patients (207 CPB, 67 HCA, and 26 SCP) using the Cognitive Stability Index® (CSI) HeadMinder battery (HeadMinder, Inc., New York, NY). For each subject, four factor scores were calculated (response speed, processing speed, attention, and memory) and were compared against a normative sample of 284 patients to calculate Z-scores. Z-scores were then compared between groups to test for significant differences. Multiple regression analysis was also performed to determine what factors were associated with long term neurocognitive performance.

RESULTS: Perfusion technology classification (CPB alone; CPB with HCA; or CPB with HCA and SCP) was not associated with inter-group differences in test scores. HCA duration, however, was negatively associated with Processing Speed scores ($P<0.01$) and Memory scores ($P<0.01$). Attention scores demonstrated a marginally significant trend in the same direction ($P=0.09$). Hypothermic circulatory arrest duration greater than 21-24 minutes was negatively associated with Response Speed scores.

CONCLUSIONS: This study demonstrated that long-term post-operative assessment by remote computerized testing is feasible in this patient population. It also supports the hypothesis that longer HCA duration is associated with poorer long-term postoperative neurocognitive outcome and that SCP is an effective strategy for brain protection in aortic arch reconstruction surgery. There is a need to further assess the efficacy of HCA and other neuroprotective strategies for thoracic aortic surgery by prospective, longitudinal studies of neurocognitive outcome.

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S-68.

DON'T GET BIT: THE STRANGE STORY OF ONE TEF

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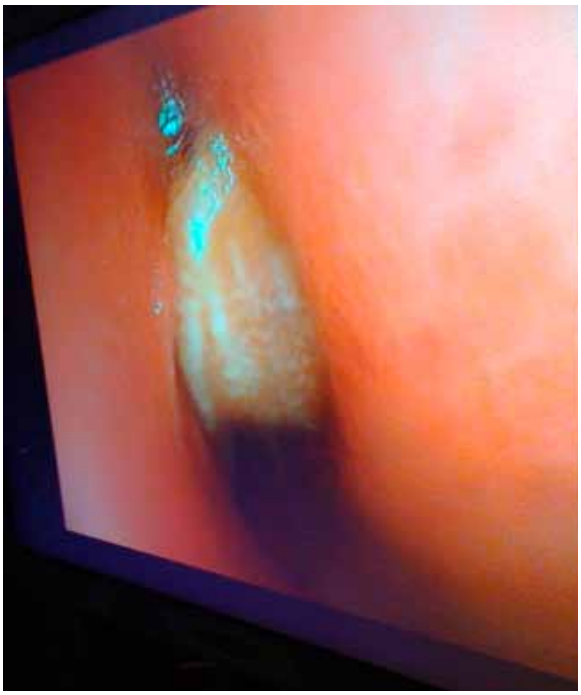
INTRODUCTION: Acquired tracheoesophageal fistulae (TEF) are commonly due to malignancy. Fewer than 10 reports describe TEF secondary to a swallowed denture.

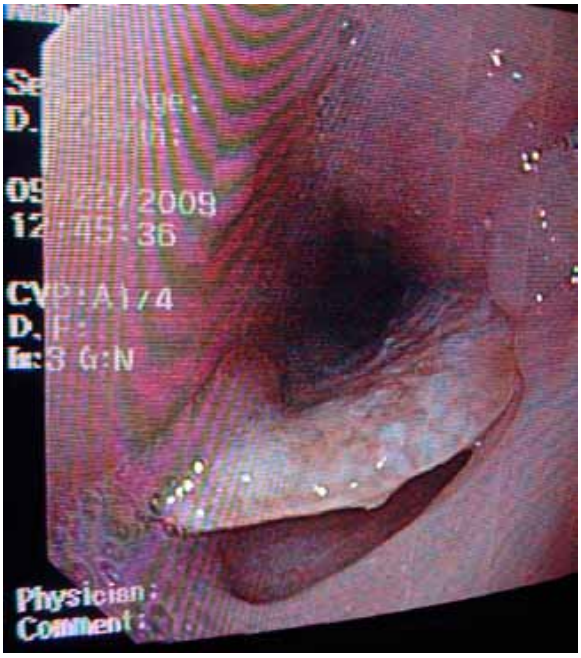
We present the case of a patient with a deceptive history for TEF and report an approach that provides adequate oxygenation, ventilation, surgical exposure and postoperative analgesia with excellent outcome.

CASE REPORT: A 45 year-old male was transferred from an outside institution with the diagnosis of TEF and the presence of a possible foreign body (FB) seen on CT scan of his chest. The patient had recurrent pneumonias in the last few months, but no history of dysphagia, hemoptysis, hematemesis or chest pain. Under sedation and spontaneous ventilation, bronchoscopy and endoscopy were performed. A disc-shaped FB was impacted in the esophagus, protruding into the lumen of the distal trachea (Picture 1,2). Gentle attempts to remove it were unsuccessful. A right thoracotomy was performed 2 days later for removal of FB and primary repair of both the trachea and the esophagus. A thoracic epidural was placed for post-operative pain. A left double lumen tube was placed and was advanced into the left mainstem bronchus. Selective left lung ventilation avoided insufflation through the fistula into the esophagus. The patient was extubated uneventfully; visual examination showed the FB was a dental plate. Later, the patient remembered that after an appendectomy 5 years ago he could not find his dental plate.

DISCUSSION: Acquired TEFs are rare and mainly described in the adult population as a result of trauma, corrosive ingestion, foreign body, inflammatory process or malignancy. The anesthetic management for repair of TEF, whether congenital or acquired, is a significant challenge for the anesthesiologist. Problems include difficulties with oxygenation and/or ventilation resulting from placement of the ETT in or above the fistula with subsequent gastric dilatation, atelectasis, or pulmonary changes caused by recurrent aspiration. Classic anesthetic management includes awake tracheal intubation and spontaneous ventilation until the fistula is repaired. The site and size of the lesion must be carefully noted as this may dictate the ETT position. Fortunately, most TEFs presenting for surgical repair are in the upper two-thirds of the trachea. Once the TEF is isolated, ventilation can continue without fear of contamination and/or gastric dilatation. Immediate extubation is the goal.

In conclusion, the swallowing of items of odontogenic origin, though infrequent, can be dangerous. If it is suspected that an anesthetized patient has swallowed a foreign body, the appropriate specialist should be consulted, as it may be necessary to identify and remove any object with sharp edges to avoid complications requiring surgical intervention. Special attention must be paid to patients at increased risk of unnoticed FB ingestion, like young children and patients with limited cognition.





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S-69.

PREOPERATIVE DISPOSITIONAL OPTIMISM CORRELATES WITH A REDUCED INCIDENCE OF POSTOPERATIVE DELIRIUM AND RECOVERY OF POSTOPERATIVE COGNITIVE FUNCTION IN CARDIAC SURGICAL PATIENTS

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INTRODUCTION: Postoperative delirium and cognitive dysfunction frequently occur after cardiac surgery[1-2] but whether preoperative psychosocial factors, including dispositional optimism, perceived social support, and perceived stress correlate with recovery of postoperative cognition is unknown.

METHODS: After IRB approval, age- and education-balanced patients (≥55 years of age) undergoing cardiac surgery (N=40) and nonsurgical controls (N=40) were recruited. A psychosocial evaluation for dispositional optimism, perceived social support, perceived stress, and depression was performed before surgery using standardized questionnaires. Delirium was assessed with the Intensive Care Delirium Screening Checklist before and for 5 consecutive days after surgery. Recent verbal and nonverbal memory and executive functions were assessed before and 1 week after cardiac surgery and at 1 week intervals in nonsurgical controls.

RESULTS: Preoperative perceived stress significantly ($p<0.01$) correlated with preoperative depression scores. Preoperative dispositional optimism significantly ($p<0.05$) correlated with preoperative perceived social support. A multiple logistic regression revealed that dispositional optimism significantly ($p<0.02$) predicted the absence of postoperative delirium within 5 days of surgery. Patients who demonstrated high levels of dispositional optimism suffered a significantly ($p<0.03$) lower incidence of postoperative delirium. Preoperative dispositional optimism also significantly ($p<0.001$) correlated with postoperative cognitive performance determined by composite Z-scores. A stepwise multiple regression analysis revealed that dispositional optimism significantly ($p<0.05$, $R2 = 35\%$) predicted preserved postoperative cognitive function.

DISCUSSION: Preoperative dispositional optimism but not perceived social support, perceived stress, or depression, positively correlated with a reduced incidence of postoperative delirium within 5 days and recovery of cognitive performance 1 week after cardiac surgery.

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S-70.

FAST-TRACK CARDIAC ANESTHESIA: A COMPARISON BETWEEN REMIFENTANIL AND DEXMEDETOMIDINE

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Current practices in cardiac anesthesia are geared towards decreasing intensive care unit (ICU) and hospital length-of-stay by fast-tracking protocols because of their lower costs without compromising mortality or major morbidity[1]. Although remifentanil is the mainstay agent used for this purpose due to its ultra-short half life, it requires the use of additional longer-acting opioids to provide adequate analgesia in the postoperative period, which could increase the incidence of respiratory depression. We hypothesized that dexmedetomidine, an 2-agonist, which has both analgesic and sedative properties but devoid of respiratory depression effects , could be use as an alternative agent.

MATERIALS AND METHODS: Following IRB approval, 40 adult patients undergoing elective cardiac surgery with preoperative ejection fraction >40% without pulmonary disease were randomized to either remifentanil (REM) or dexmedetomidine (DEX) based anesthetic protocols. Both groups received the same induction technique which included propofol 2mg/kg, pancuronium 0.08mg/kg. The DEX group received fentanil 2mcg/Kg and a continuous infusion of dexmedetomidine between 0.3 - 0.7µg/kg/h which was discontinued once sternal wires were placed. The REM group was maintained with a continuous infusion between 0.15 - 0.5µg/kg/min until the beginning of skin closure. Both groups received 50mg/kg of dipirone IV, 0.1mg/kg of morphine IV, and 40cc of 0.25% bupivacaine for surgical wound infiltration. POP pain was managed with a continuous infusion of morphine starting at 0.3mg/h. Pain VAS was measured at 2, 12, and 24 hours.

Primary outcome was time to extubation, which was defined as the time from wound dressing placement until patient extubation. Secondary outcomes included: Use of vasoactive medications, morphine consumption in the first 24 hours, PONV and ICU length of stay.

RESULTS: There was no statistically difference in extubation times and ICU days of stay between groups, there was a significant decrease in morphine consumption and PONV in the dexmedetomidine group, as well as major use of intraoperative ephedrine 26.3% vs 0% p=0.02. There were no major complications nor deaths.

CONCLUSION: To our knowledge this is the first clinical trial of dexmedetomidine in a fast-tracking protocol, showing that it is as effective as remifentanil allowing a safe and quick extubation, and might be more effective in providing better analgesia, less PONV incidence and postoperative opioid consumption.

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Main Outcomes by treatment groups.

Outcomes	Dexmedetomidine	Remifentanil	p value
Extubatión time (median)	11.7min	9.8 min	0.06
Reintubation n (%)	0	2 (9.5)	0.48
Morphine consumption (24h) mg (median)	4	15	0.0000
ICU Days (median)	1	1	0.1
PONV incidence n (%)	1(5,2)	9(42.9)	0.009
POP Bleeding n (%)	2(10.5)	0	0.2
Mean Propofol dose(mg/kg)	1.25	0.97	0.15

S-71.

CORRELATION OF CEREBRAL OXYGEN DESATURATION-TIME PROFILE DURING COMPLEX THORACIC AORTIC SURGERY WITH GLASGOW COMA SCORE AND DURATION OF ENDOTRACHEAL INTUBATION

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INTRODUCTION: Near infrared spectroscopy (NIRS) has emerged as an important noninvasive clinical adjunct for detection and early intervention of cerebral deoxygenation during cardiac surgery. This retrospective review determined whether cerebral desaturation in patients undergoing aortic surgery can predict neurologic and anesthetic outcomes.

METHODS: With IRB approval, all patients who underwent thoracic aortic surgery with intraoperative cerebral oximetry monitoring between February and September 2009 were included. Whether or not deep hypothermic circulatory arrest (DHCA) was performed determined cohort assignment. Each patient had 60 second moving average trend analysis of cerebral oxygen saturation (rSO2) . Additionally, we calculated the cumulative desaturation-time profile below baseline rSO2 at defined threshold levels (40%, 50%, 60%, 70%, 75%, 75% for greater than 60 seconds, and 75% for greater than 600 seconds) for each cerebral hemisphere using Excel. This integral is area under the curve (AUC). Patient demographics and co-morbidities were also recorded.

RESULTS: The study included thirty-one patients with one lost to continual followup secondary to transfer to an outside hospital. There were a total of 3 deaths (10%). There were no differences between groups with respect to demographics.

Among all patients, increased AUC for rSO2 below 60%, 50%, and 40% baseline correlated to increased time to stop sedation and time to extubation (Table 1). Similarly, increased AUC for rSO2 below 70%, 60%, 50%, and 40% baseline increased ICU length of stay.

Among patients who underwent DHCA (45.2%), duration of DHCA and AUC at rSO2 threshold of 60% and 50% correlated with longer time to achieve a GCS of 3 and 6, time to turn sedation off, time to extubation, and ICU length of stay (Table 2). DHCA was not associated with increased 30 day or total mortality.

TABLE 1		AUC 40%	AUC 50%	AUC 60%	AUC 70%
Hours in ICU	Pearson Correlation	.612	.621	.568	.371
	Sig. (2-tailed)	.000	.000	.001	.044
	N	30	30	30	30
Time to sedation off	Pearson Correlation	.635	.631	.527	.308
	Sig. (2-tailed)	.000	.000	.003	.098
	N	30	30	30	30
Time to extubation	Pearson Correlation	.775	.778	.692	.308
	Sig. (2-tailed)	.000	.000	.000	.104
	N	29	29	29	29

TABLE 2	Circulatory Arrest (n=14)	No Circulatory Arrest (n=17)	p value
AUC of time below rSO2 50% threshold	906	0	0.008
AUC of time below rSO2 60% threshold	2785	105	0.004
AUC of time below rSO2 70% threshold	8255	3586	0.111
AUC of time below rSO2 75% threshold	14440	7822	0.216
AUC below rSO2 75% for > 60s	13906	9485	0.289
AUC below rSO2 75% > 600s	12841	8550	0.278
Time to Sedation Off (n=30) hours-min	3336	354	0.001
Extubation Time (n=29) hours-min	4204	1601	0.002
GCS Recovery 3 hours-min	2908	812	0.003
GCS Recovery 6 (n=29) hours-min	3644	601	0.001
Hours in ICU (n=30)	151	72	0.022
LOS (n=27)	8	7	0.140

DISCUSSION: Cerebral oximetry may provide a valuable monitor in the early detection of cerebral desaturation for patients undergoing thoracic aortic surgery with or without DHCA. Severity and duration of cerebral desaturations, as demonstrated by larger AUC, correlate with longer ICU intubation time and subsequently longer ICU length of stay.

Our data also demonstrated (data not shown) that the longer the duration of DHCA did not result in larger AUC, suggesting that DHCA duration does not predict severe and prolonged cerebral desaturation. In addition, emergent cases did not correlate to larger AUC. Future prospective, randomize, double-blind trials are warranted to definitively determine the validity and benefit of NIRS in this high risk surgical cohort.

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S-72.

CEREBRAL BLOOD FLOW DURING ANESTHESIA INDUCTION PROPOFOL VS SEVOFLURANE

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INTRODUCTION: While effect of propofol and sevoflurane (< than 2 MAC) on the cerebral blood flow was well understood, vital capacity inhalation induction using high fraction of sevoflurane (VCI-S) has not been investigated yet. The purpose of the study was to determine the effect of intravenous propofol or VCI-S on cerebral blood flow (CBF) during anesthesia induction.

METHODS: Twenty two patients undergoing elective spine surgery were recruited for the study. Exclusion criteria included the presence of active respiratory disease, cardiovascular disease, diabetes, any neurological disease, or recent head injury. IV glycopyrrolate 0.2 mg was given to all patients as a premedicant. Monitoring including SpO2, EKG, non-invasive BP, BIS was started upon patent's arrival in Operation Theater. The patients were randomly allocated to get target-controlled infusion of propofol (target effect concentration 3.0 μg/ml, n = 11, Group P) or VCI-S (Fi 8.0 vol%, n = 11, Group S) for anesthesia induction. CBF velocity in the middle cerebral artery (Vmca) was measured using 2 MHz pulsed wave transcranial Doppler (TCD 100M™ monitor with FlowTrax™ M-mode Doppler, Spencer Technology, USA) (Fig. 1). After taking base data of mean Vmca and peak Vmca, MAP and HR, anesthesia induction was started with assisted and controlled ventilation of mixture of air/ O2 (FiO2 = 0.6, end-tidal CO2 = 30-40 mmHg).

Data were recorded every one minute during anesthesia induction. Data at 1 min, 2 min, 3 min after the start of anesthesia induction (T1, T2, T3) and their % of base line values were performed off-line statistical analysis (Sigma Stat™ version 3.1, SPSS, USA).

After reaching BIS score less than 60, IV rocuronium 0.7-0.8 mg/ kg was given for tracheal intubation and anesthesia was maintained by mechanical ventilation with an inspired mixture of air/ O2 (FiO2 = 0.3-0.5) and TCI of propofol and remifentanil (target plasma 1.2-2.5 μg/ml and target effect 1.5 - 6.5 ng/ml, respectively).

RESULTS: The base line data did not show significant inter-group difference (Table 1). The mean Vmca% at T1 showed significant inter group difference (*: p = 0.043, 91.2 ± 19.9 vs. 108.0 ± 17.2, Group P vs. Group S, respectively) (Fig. 2). The changes in mean or peak Vmca did not show statistically significant correlation with the change of MBP.

Discussion: The results suggest that the change of CBF according to the selection of anesthesia induction agent and their possible clinical effect should be considered at the planning of anesthesia induction.

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S-73.

CORRELATION OF COMPLICATIONS AFTER TUNNEL CATHETERIZATION WITH THROMBELASTOGRAPHY

AUTHORS: R. M. Craft[1], R. C. Carroll[1], C. C. Snider[1], O. H. Grandas[2], D. C. Cassada[2], J. H. Sherrer[1];

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Background: Thrombelastograhpy® (TEG) has proven useful for monitoring coagulation status in thrombophilic pregnancy (1), liver transplantation (2) and early trauma (3). Pre-operative TEG evaluation has not been previously correlated with peri-operative outcome except in the case of ischemic events post-interventional angioplasty (4). Tunnel catheterization to facilitate dialysis is frequently associated with clotting complications and provides another test of such a correlation.

METHODS: After obtaining IRB approval and informed consent, 90 dialysis-dependent patents were analyzed by TEG for clot strength (maximum amplitude or MA) and sensitivity to heparin anti-coagulation as measured by the change in reaction time (ΔR) to initial clot formation after addition of 0.05 unit/ml heparin. PlateletMapping was also used to evaluate platelet function and aspirin resistance. Patients were followed for 6 months to assess incidence of repeat catheterization (52%) or death (12%), and correlation of these outcomes with thrombelastography parameters was evaluated.

RESULTS: A trend towards a higher MA (66.9 ± 8.3 versus 65.4 ± 9.0 mm, P = 0.403) was associated with these complications. A slightly lower response to heparin (ΔR of 971 ± 2387 versus 1450 ± 5270 seconds) was also observed but was not significant by Mann-Whitney test (P = 0.932). Platelet function and aspirin resistance were not significantly associated with complication.

DISCUSSION: In previous studies we have noted a resistance to anticoagulation associated with various thrombophilias (1). This current study has a similar trend but without reaching significance at this point in the patient recruitment process.

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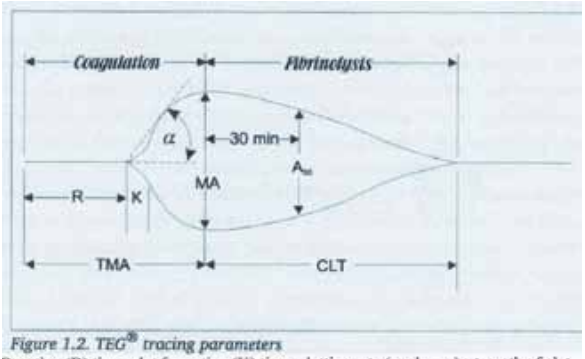

Figure 1.2. TEG® tracing parameters
Reaction (R) time, clot formation (K) time, clotting rate (angle = α), strength of clot (maximal amplitude [MA]), and percent fibrinolysis at 30 min. (A30).

S-74.

THE ESTIMATION OF CEREBRAL DESATURATION BY CENTRAL VENOUS OXYGEN SATURATION IN CARDIOPULMONARY BYPASS

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INTRODUCTION: Cardiac surgery with cardiopulmonary bypass (CPB) induces the change in supply of cerebral oxygen. It is difficult to infer whether cerebral oxygen balance is adequate. The purpose of this study was to investigate whether central venous saturation reflected cerebral desaturation in patients who had been received cardiac surgery with CPB.

METHODS: This prospective study carried out in 16 adult patients who underwent coronary artery bypass graft, valve replacement, ASD closure or VSD closure in our hospital. Infrared spectroscopic soma sensor (INVOS) were placed on the patient's left and right frontal head to continuously monitor the regional cerebral oxygen saturation (SrO_2) The internal jugular vein was cannulated for measurement of central venous oxygen saturation ($ScvO_2$) and right atrial venous saturation (SvO_2). $ScvO_2$ represents oxygen saturation of venous blood from all over the head and upper extreme mainly, and SvO_2 means venous blood oxygen saturation from whole body. The value of SrO_2, SvO_2 and mean arterial pressure (MAP) were recorded before CBP and every 15 minutes after CBP induction. The data obtained were statistically analyzed and presented by Student's t-test, ANOVA, Pearson's correlation coefficient and Simple regression

RESULTS: No significant deffirences were in age, sex, CBP time and SrO2 before CBP. There were no relationship between the changes of SrO_2, $ScvO_2$, SvO_2 and time of CBP. The decline of MAP leaded to aggravation of SrO_2 ($p < 0.05$, $R^2 = 0.31$, $Y = 55.6 + 0.093 * X$). However, there were no cases that the fatal decrease of SrO_2 were induced. There were significant correlation not between SvO_2 and SrO_2, but between $ScvO_2$ and SrO_2 ($p < 0.001$, $R^2 = 0.58$, $Y = 17.3 + 0.86 * X$)

DISCUSSION: We investigated that whether central venous saturation reflected cerebral desaturation in patients who had been received cardiac surgery with CPB. There was the relationship between SrO2 and MAP. Therefore, cerebral desaturation, SrO_2, was reflected by $ScvO_2$ compared with SvO_2. We suggest that $ScvO_2$ is available to estimate cerebral desaturation in CBP.

S-75.

ULTRA-FAST CARDIAC ANESTHESIA: THE MANITOBA EXPERIENCE OF INTRA-OPERATIVE EXTUBATION IN 3,340 CONSECUTIVE CARDIAC PATIENTS

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INTRODUCTION: Fast-track cardiac anesthesia has been associated with reductions in intensive care unit (ICU) and total hospital length of stays (LOS). These studies however were limited by relatively small numbers and to lower-risk patients. Furthermore, the concept of ultra-fast-track cardiac anesthesia remains inconsistently defined and under-studied. The objective of this study was to examine our institution's experience with ultra-fast-track cardiac anesthesia in a large contemporary patient population undergoing all forms of cardiac surgery.

METHODS: A retrospective cohort analysis of consecutive patients undergoing cardiac surgery at a single tertiary center from January 2005 to September 2008 was performed. Ultra-fast-track cardiac anesthesia was defined as those patients who were successfully extubated in the operating room immediately following their cardiac procedure. The decision to ultra-fast-track a patient postoperatively was made on a case-by-case basis in the operating room after consultation between the surgeon and the cardiac anesthesiologist. The criteria for extubation of ultra-fast-track candidates are summarized in Table 1. Anesthetic management was tailored to meet these criteria within the operating room.

RESULTS: From January 2005 to September 2008, 3,340 consecutive patients underwent cardiac surgery, of which 44.7% (n=1,492) were successfully extubated intra-operatively. Pre-operative demographics of the ultra-fast-track cohort include an age of 63.5 ± 11.1 years, 22.7% (n=339) of whom were female, a BMI of 29.0 ± 9.2 kg/m2; a smoking history was present in 68.5% (n=1,022) with COPD in 8.1% (n=121). Furthermore, 77.8% (n=1,161) of these patients had CCS Class III or IV angina, with 5.7% (n=85) having a history of congestive heart failure and 5.8% (n=86) with a LVEF <35%. Isolated CABG procedure was performed in 81.9% (n=1222) of patients. The cardiopulmonary bypass time was 93.4 ± 41.4 minutes with a croS-clamp time of 61.1 ± 31.5 minutes. Post-operative outcomes included an APACHE II score of 13.5 ± 3.8, a re-intubation rate of 2.3% (n=34), ICU recidivism rate of 1.7% (n=26), and allogenic red blood cell transfusion rate of 19.7% (n=294). ICU and hospital LOS were 0.93 [0.81 - 1.12] and 5 [4 - 7] days respectively. Lastly, ICU and 30-day mortality was 0.07% (n=1) and 0.20% (n=3), respectively.

DISCUSSION: This study represents the largest case series examining the efficacy and safety of ultra-fast-track cardiac anesthesia, defined as successful extubation in the operating room. Patient outcomes following this model of intra-operative extubation were in keeping with previously published literature on fast-track cardiac anesthesia. In conclusion, the presented clinical model of ultra-fast-track cardiac anesthesia can be successfully employed following cardiac surgery with minimal complications.

Table 1: Ultra-fast-track extubation criteria

• Hemodynamically stable on minimal to no vasopressor / inotropic support • Core body temperature >35.5 degrees Celsius
• Awake, able to obey commands • Adequate pain control
• PSV ≤ 6 cm H20 • PEEP = 5 cm H20 • FiO2 < 0.50 • Vt > 6mL / kg • pH > 7.30
• Possible coagulopathy causing minor bleeding was not a contra-indication to extubation • Difficult airway was generally not a contra-indication to early extubation

FiO2, fraction of inspired oxygen; ICU, intensive care unit; Vt, tidal volume; PEEP, positive end-expiratory pressure; PSV, pressure support ventilation

S-76.

INTRAOPERATIVE INCIDENTAL PHEOCHROMOCYTOMA; A LITERATURE REVIEW AND ANALYSIS

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INTRODUCTION: Pheochromocytomas are rare neuroendocrine tumors with a prevalence of 0.1-0.5% in the general population.1,2 The prevalence of incidental intraoperative pheochromocytomas is unknown, but historically they have been associated with a mortality rate of up to 40 %.3,4 Information regarding their intraoperative management and impact is mostly limited to case reports. We conducted a systematic review of case reports in English over the past 20 years to study and summarize perioperative demographic, management, and outcome data of incidental pheochromocytomas.

METHODS: We searched the Medline database including the years 1988 to 2009 using the following search terms: "undiagnosed pheochromocytoma" and "incidentaloma and anesthesia". Demographic, perioperative management, and outcome data including occurrence of hypertensive crisis and use of vasoactive drugs were extracted and summarized. Non-English literature was excluded. Data are reported in means + SD.

RESULTS: Twenty five case reports met inclusion criteria. Anesthetic management included 22 general anesthetics, 2 spinals and 1 combined general/epidural technique. The 15 men (60 %) and 10 women (40%) presented at an age of 49 + 16 years (range 25 - 87). Hypertensive episodes occurred most frequently during mass manipulation/intraoperatively (n=9, 36%) and during anesthetic induction/laryngoscopy (n=7, 28%). Between 1 and 6 vasoactive agents were employed to treat hypertension predominantly consisting of nitrates (n=19, 35%) and beta-blockers (n=17, 31%) (Table 1, 2). In 9 cases (36%), the diagnosis was subsequently suspected intraoperatively. Perioperative mortality was 8% (n=2), and the hospital stay was 14 days + 8.2 (n=10).

Table 1

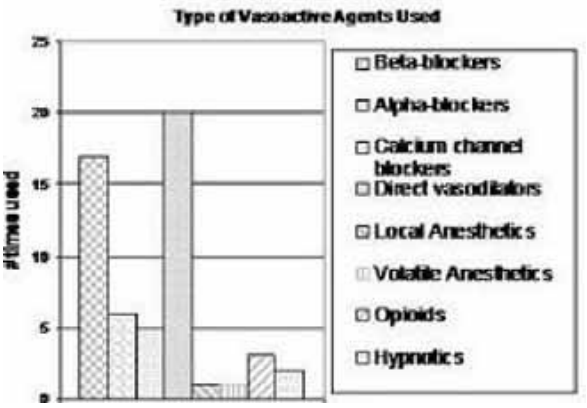
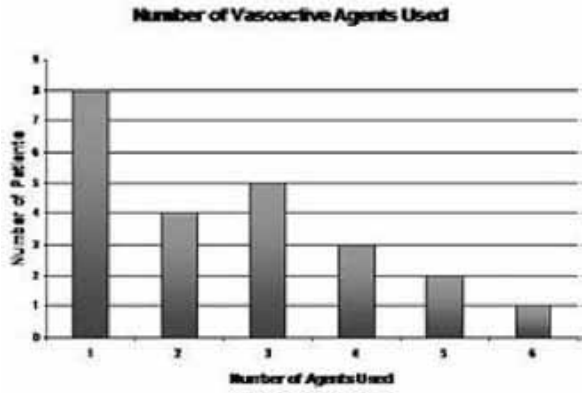


Table 2



DISCUSSION: Incidental intraoperative pheochromocytomas have been reported during general, regional and combined anesthetics. In 36% of the investigated patients, hemodynamic instability was unrelated to direct tumor manipulation/intraoperative events or anesthetic induction/laryngoscopy. Intraoperatively, nitrates were the preferred antihypertensive followed by beta-blockers and limited use of alpha-blockers (11%), questioning the importance of the latter for acute management. Eight patients (32%) received single-agent therapy. In less than 40% a diagnosis of pheochromocytoma was suspected intraoperatively. The perioperative mortality was lower than historically reported but higher than reported for elective pheochromocytoma removal. Refined anesthetic and surgical management and availability of potent, fast acting vasoactive medications may explain improved survival. A higher index of suspicion intraoperatively may improve outcomes for patients with incidental pheochromocytomas by promoting earlier and more aggressive hemodynamic management.

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S-77.

SIGNIFICANT CORRELATION BETWEEN COMPLEMENT FACTOR B AND MYOCARDIAL INJURY IN PATIENTS UNDERGOING CARDIAC SURGERY

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INTRODUCTION: Global heart ischemia occurs in the normal course of cardiac surgery during aortic croS-clamping (AXCL), and plasma level of cardiac troponin, a specific myocardial injury marker, increases during reperfusion after releasing the clamp. Earlier clinical studies also found complement C3, the common factor in three complement pathways as well as a systemic inflammatory marker, is activated during cardiac surgery. In this study, we investigated three complement pathways in the involvement of myocardial injury during cardiac surgery.

Methods: In this prospective study, 50 patients undergoing elective open heart surgery were enrolled. Coronary sinus and peripheral blood samples were collected at different peri-operative time points. Plasma levels of the initial factors in three complement pathways were analyzed by ELISA. Demographic and relevant clinical parameters were also recorded. Statistical correlations between the levels of complements and the respective levels of cardiac troponin I were analyzed by SPSS software.

Results: Cardiac troponin I levels increased significantly following cardiac surgery compared to pre-operation level (pre-operation level= 0.9 ± 3.3; immediate post-operation=7.5 ± 6.4, p=0.00000003; post-operation 8 hr level=9.9 ± 10.0, p=0.000001; post-operative day 1 level= 7.7 ± 10.0, p=0.00003; post-operative day 2 level=5.7 ± 6.8, p=0.0001). The level of complement factor B, the initial component in the alternative pathway, also increased significantly in both coronary sinus and peripheral blood at 5 minutes after release of AXCL compared to samples taken prior to AXCL. According to Spearman correlation analysis, this post-AXCL increase in factor B was significantly correlated with the troponin I level sampled immediately after the operation. The correlation was significant both in the coronary sinus (rs=0.388, p= 0.006) and in peripheral blood (rs= 0.337, p=0.019). In contrast, there was no significant correlation between the initial factors in the classical or the lectin complement pathways and post-operation troponin levels.

DISCUSSION: We studied global myocardial ischemia/reperfusion injury following release of the aortic croS-clamp (AXCL) during the normal course of cardiac surgery. Our study showed that complement factor B in the alternative pathway significantly correlates with troponin I, the standard marker of myocardial ischemic injury during open heart surgery. There are no statistically significant correlations between the levels of the initial complements in the other two complement pathways and post-operational cardiac troponin I levels. This is the first study to report that the alternative complement pathway is activated during open heart surgery and may play a role in human myocardial ischemic injury.

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S-78.

THE REVISED CARDIAC RISK INDEX PREDICTS ALL CAUSE MORTALITY AFTER INFRA-INGUINAL ARTERIAL BYPASS IN PATIENTS PRESENTING WITH LOWER EXTREMITY TISSUE LOSS

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INTRODUCTION: Patients having major vascular surgery are at high risk for perioperative morbidity and mortality. Several scoring systems have been developed which stratify patients by level of risk. One of the most widely validated scoring systems is the Revised Cardiac Risk Index (RCRI) developed by Lee and colleagues. This scoring system has been shown to be predictive of perioperative cardiac events in patient undergoing noncardiac surgical procedures.[1] In the present study we hypothesized that it would also be predictive of all cause short term and longer term mortality in patients undergoing infra-inguinal arterial bypass surgery for lower extremity tissue loss.

METHODS: A retrospective review of all patients having infra-inguinal arterial bypass for tissue loss between January 2002 and January 2008 was performed (n=426 patients). For all subjects electronic medical records were reviewed and the Revised Cardiac Risk Index was calculated. Mortality data was obtained by reviewing the Social Security Death Index. Both univariate and multivariate analysis was performed to determine if the RCRI was predictive of short term and longer term all cause mortality.

RESULTS: The RCRI was significantly associated with short term mortality (inpatient or 30 day) and longer term mortality (1 year) by univariate and multivariate analysis. 28 of 426 patients had short term mortality (6.5%). Short term mortality was the following by RCRI score: 0 (0%), 1 (4.2%), 2 (8.0%), 3 (7.5%), 4 (11.8%), 5 (33.3%). 95 of 426 patients had longer term mortality (22.3%). Longer term mortality was the following by RCRI score: 0 (6%), 1 (18%), 2 (21%), 3 (31%), 4 (38%), 5 (67%).

CONCLUSIONS: The RCRI is useful in predicting both short term and longer term all cause mortality in patients undergoing infra-inguinal arterial bypass for lower extremity tissue loss. 1 year mortality is above 30 percent for patients with a RCRI score of 3 or greater.

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S-79.

OUTCOMES OF CEREBROSPINAL FLUID DRAINAGE IN SIXTEEN PATIENTS UNDERGOING AORTIC ANEURYSM REPAIR

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INTRODUCTION: Cerebrospinal fluid drainage (CSFD) has become a widely practiced technique to reduce postoperative paraplegia in thoracic (TAA) and thoraco-abdominal (TAAA) aortic aneurysm repair. On the other hand, the complications associated with CSFD have been reported. We present the efficacy of CSFD on the incidence of neurologic deficit and the risk regarding this procedure through our experiences in sixteen patients for recent five years.

METHODS: We performed preoperative CSFD in fourteen patients, including nine patients with surgical TAAA repair, four patients with surgical descending TAA repair and one patient with thoracic endovascular aneurysm repair (TEVAR). In addition, we performed postoperative CSFD immediately after surgery in two patients who developed paraplegia. As CSFD procedure, a small (19-gauge) catheter was placed in the subarachnoid space through 17G Tuohy needle at L3-4 or L4-5. The catheter tip was positioned at T10-L1, which was confirmed on X-ray. The open CSFD system was attached to the catheter for maintaining cerebrospinal fluid (CSF) pressure of 10 cm H_2O.

RESULTS: Neurologic deficit did not occur in nine patients with preoperative CSFD and surgical TAAA repair. However, monoplegia occurred in one patient and paraplegia occurred in another patient with preoperative CSFD and surgical descending TAA repair. We postoperatively experienced paraplegia in two patients without preoperative CSFD, including one with AAA repair and another with TEVAR. We immediately placed postoperative CSFD. Their paraplegia did not improve in the former patient and gradually improved in the latter. Mild headache occurred next morning after the catheter insertion in two patients. Temporary convulsion occurred after surgery in three patients, who had not neurologic sequelae and/or intracranial hemorrhage on CT. The CSF was slightly bloody in two patients who had no evidence of intracranial hemorrhage on CT.

DISCUSSION: Preoperative CSFD was reported by Coselli et al[1] to reduce paraplegia significantly in patients undergoing TAAA repair. However, evidence does not exist to support the use of CSFD in a multicenter, randomized controlled trial[2]. In addition, there are several reports regarding complications with CSFD, such as intracranial hemorrhage, subdural hematoma and the troubles of drainage catheter[2]. Although we did not experience such complications regarding CSFD, we should weigh benefit and potential risk of this procedure when considering its use either pre- and postoperatively.

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S-80.

DOES INTRAOPERATIVE DATA PREDICT ADVERSE OUTCOME IN ISOLATED AORTIC VALVE SURGERY?

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INTRODUCTION: Aortic stenosis accounts for approximately 46% of all valvular heart surgeries1. Aortic valve surgery has become the treatment of choice for symptomatic aortic stenosis2,3. This has improved the survival up to 90% at 5 years with an 8.6% operative mortality4. The study aims to investigate preoperative and intra-operative predictors of adverse outcome5-7.

METHODS: Retrospective analysis from a single center database between 2002-2009 was performed on 218 patients to evaluate outcome after isolated aortic valve surgery. All patients presented with significant aortic valve dysfunction requiring isolated aortic valve surgery. Pre-operative, intraoperative and post-operative data was gathered from these patients and correlated with outcomes after surgery. Negative surgical outcome defined as length of stay> 10 days, or mortality (in-hospital or 30-day).

RESULTS: The overall short-term mortality was 7.3% (4.1% in hospital mortality, 3.2% 30 day mortality). Multivariate analysis revealed the following: use of an ace-inhibitor (p=.03), severe left systolic function (p=.0009), norepinephrine>50 ug (p100min correlated with an increasingly negative surgical outcome rate and hospital complication rate (p<.002) [see graph below].

DISCUSSION: Echocardiographic factors predicting negative outcome in isolated aortic valve surgery are LV hypertrophy, LV and RV systolic dysfunction. In addition, our study has shown that length of surgery/anesthesia, time on cardiopulmonary bypass, requirement of blood transfusion, certain vasopressor requirement, previous use of ace-inhibitor predicted adverse outcomes in isolated aortic valve surgery.

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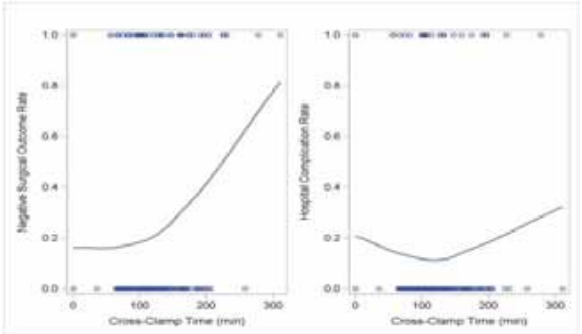

S-81.

INTENSIFIED PERIOPERATIVE TEMPERATURE MANAGEMENT FOR PATIENTS UNDERGOING TRANSAPICAL AORTIC VALVE REPLACEMENT

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INTRODUCTION: Valvular heart disease occurs in 2-3% of the general population with an increase in prevalence with advancing age. Aortic valve replacement with cardiopulmonary bypass is currently the treatment of choice for symptomatic aortic stenosis but carries a significant risk of morbidity and mortality, particularly in patients with comorbidities. Recently, transapical aortic valve replacement without cardiopulmonary bypass or sternotomy has been proposed as a viable alternative in selected patients. One problem we noted is a profound drop in temperature during the procedure without the ability to rewarm the patients by means of cardiopulmonary bypass. We therefore used forced air to warm the patients perioperatively to prevent excessive heat loss during the procedure.

METHODS: From 08-2008 to 10-2009 29 patients underwent transapical aortic valve replacement at our institution. They were divided into two groups: Group A with standard perioperative temperature management (n=14), group B with intensified perioperative temperature management (n=15). Demographic data did not differ between the two groups. The intensified temperature management consisted of a prewarming phase using forced air the moment the patient arrived at the OR and throughout the whole procedure. Temperature was measured every 15 min via a urethral catheter (Foley).

RESULTS: All data are given as mean ± standard deviation. On ICU admission the patients in group B had a higher temperature (36,4°C ± 0,7) compared to patients in group A (35,3°C ± 0,8). The incidence of hypothermia (T<36°C) was significantly higher in group A (11/14) compared to group B (4/15, p<0,01). The patients in group A needed longer to be normothermic (T≥36°C) than the patients in group B (28,0 min ± 62,8 vs. 173,1 min ± 142, p<0,001). None of the patients in group B needed mechanical ventilation on the ICU, all patients could be extubated in the OR. In group B, nine patients needed mechanical ventilation for a limited time (9,48 hrs ± 15,65), only five patients could be extubated in the OR (p<0,05).

DISCUSSION: Patients undergoing transapical aortic valve replacement benefit from an intensified perioperative temperature management. They are less likely to become hypothermic, recover faster from hypothermia and do not need mechanical ventilation.

S-82.

THE SAFETY OF ESMOLOL IN THE PERI-OPERATIVE SETTING: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RAMDONIZED CONTROLLED TRIALS

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INTRODUCTION: Beta blockers decrease perioperative MI (1); however the safety of perioperative beta blockade has been questioned. Specifically the occurrence of beta blocker related hypotension has been implicated in the occurrence of postoperative stroke and mortality (2). This systematic review was planned to assess the safety and efficacy of the β1 selective antagonist Esmolol.

METHODS: We searched available electronic databases and relevant source articles for randomized controlled trials of Esmolol in the perioperative period. We extracted data on study characteristics, patient demographics, and the incidence of hypotension, bradycardia, ischemia, and myocardial infarction. Odds ratio were calculated using Revman 5 and Stata(v11). A meta regression was performed to assess a dose response effect on these safety outcomes.

RESULTS: Our search strategy found 56 randomized controlled perioperative Esmolol trials, which included 3159 individual patients. The studies were well matched for study characteristics. The quality of the studies was generally sub-standard, and the experience with continuous infusions was extremely limited relative to the number of studies using bolus administrations. The analysis found that esmolol increased the incidence of hypotension (OR 1.89, CI(1.33,2.99) p=0.0001). A dose dependant relationship was found by meta-regression (R^2=0.4271). It was observed that patients given a bolus dose of less than 0.5mg/kg had very few episodes of hypotension. There was no evidence for an increase in bradycardia (OR 1.18, CI(0.69,2.02) p=0.493). Reductions in myocardial ischemia were observed (OR 0.27, CI(0.12, 0.61), p=0.002), primarily in studies using infusions. The analysis was underpowered to assess the effects of Esmolol on myocardial infarction.

DISCUSSION: This analysis suggests that Esmolol given in low doses and titrated to effect reduces the incidence of hypotension. Similarly, reductions in cardiac ischemia suggest the preservation of a cardio-protective effect when using continuous infusions. More safety data, in higher risk patients utilizing longer periods of infusion are needed. In conclusion the meta analysis suggests that infusions of Esmolol have the potential to be both cardio protective and safe. Further study is urgently needed.

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S-83.

PATTERN OF DIASTOLIC DYSFUNCTION IN FEMALES PRESENTING FOR HIGH RISK VASCULAR SURGERY

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INTRODUCTION: The incidence of diastolic dysfunction in general population varies from 11% to 38% and is dependent on various factors such as higher age, body mass index and hypertension.(1) Presence of perioperative diastolic dysfunction and female gender are associated with adverse postoperative outcome. (2) We report an assessment of the presence of perioperative diastolic dysfunction in females presenting for elective vascular surgery procedures.

METHODS: After obtaining Institutional Review Board approval, we reviewed the charts of 149 consecutive women who had undergone perioperative transesophageal echo (TEE) examinations for high-risk vascular surgery. The perioperative diastolic dysfunction was diagnosed utilizing transmitral flow propagation velocity (Vp), a parameter that is less dependent on rate/rhythm and loading conditions. A Vp value of >=45cm/sec was considered normal. The women were grouped in to three age groups (1= < 65yrs, 2= 65-74 yrs, 3= >75yrs) the data for co-morbidities was presented as percentage. The data was compared between groups using ANOVA test and Chi-Squared; a p-value of ≤0.05 was considered significant.

RESULTS: We found that the incidence of perioperative diastolic dysfunction as measured with Vp was significantly higher in women in group 3 (54% versus 26% in group 2 and 20% in group 1), who were >75yrs older. (Table 1) There was no significant difference preoperative renal function, systolic function, diabetes, coronary artery disease, and hypertension between these age groups.

DISCUSSION: The incidence of perioperative diastolic dysfunction in women presenting for high-risk vascular surgery seems to be age related. Older women (>75 years) have a statistically significant higher likelihood of the diagnosis of perioperative diastolic dysfunction than matched younger women.

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Vp

	>=45cm/sec	<45cm/sec
< 65 years	32%	20%
65-74 years	42%	26%
>75 years	26%	54%* *P=0.005 Chi-Squared

S-84.

AN ANESTHETIC TECHNIQUE FOR ENDOVASCULAR STENTING OF THE CAROTID ARTERY IN HIGH RISK PATIENTS: UPDATE AFTER 5 YEARS

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INTRODUCTION: Transvascular exclusion of the carotid arteries via the stenting method is a new minimally invasive alternative to an open endarterectomy (CEA) in high risk patients (1). We report our 5 year experience using the MAC (monitored anesthesia care) plus local infiltration anesthesia and ilioingual/iliohypogastric nerve blocks in the operative groin area.

METHODS: After IRB approval and patient informed consent we studied prospectively fifty consecutive patients from 2004 to 2009. Data recorded with ranges were as follows: males versus females, ages, weight, height, the amount of analgesic (fentanyl) and mean dose, blood loss, and the number of right versus left artery stenting. The surgeon used an average amount of local anesthesia (0.5% lidocaine 10cc without epi) subcutaneously (usually right groin area) plus 0.25% (10cc) Bupivicaine (Marcaine) for groin block by the anesthesia provider. Oxygen (100% was provided by face mask). All patients were monitored with BP cuff, A-line, ECG, BIS monitor (times 2), foley catheter and a "squeaky toy" placed in ipsalateral hand from side being stented for neurologic observation. The head was held in straight neutral position by tape to sides of table to prevent movement.

RESULTS: Fifty (50) patients were studied. There were 27 males and 23 females. ASA Class III (19), IV (31), ages range from 51-91 (mean 72). For additional data see Table 1).

DISCUSSION: We conclude that endovascular stenting of the carotid arteries can be easily and safely performed under MAC anesthesia using small doses of an analgesic (Fentanyl) plus groin nerve blocks in high risk patients with multiple co-morbidities.

We do not use Benzodiazepine (Versed) because it may cause cognitive dysfunction and loss of senses (2,3) which may lead to patient movement during the procedure. The operation is less invasive than an open procedure. We believe this MAC technique should be performed, especially, in high risk patients, by experienced vascular anesthesiologists, which will lead to good outcomes and affords less morbidity and mortality. Hospital stay and cost will be held to a minimum.

Table 1: Distribution of patient data

	Male	Female	Range	Average	Total
Number of patients	27	23			50
Age (yrs)			51-91	72	
Weight (Kg)			50-109	76	
Height (Inches)			59-74	66	
ASA III	14	5			19
ASA IV	17	14			31
I.V. Fentanyl (mcg) Male			50-500	175	
I.V. Fentanyl (mcg) Female			25-250	120	
Blood loss (cc)			25-900*	250	
Carotid Stents Right	18	10			28
Carotid Stents Left	9	13			22

900cc Blood loss due to surgical disruption of groin vessel

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S-85.

DIAGNOSTIC DIFFICULTY OF GRANULOMATOUS MYOCARDITIS

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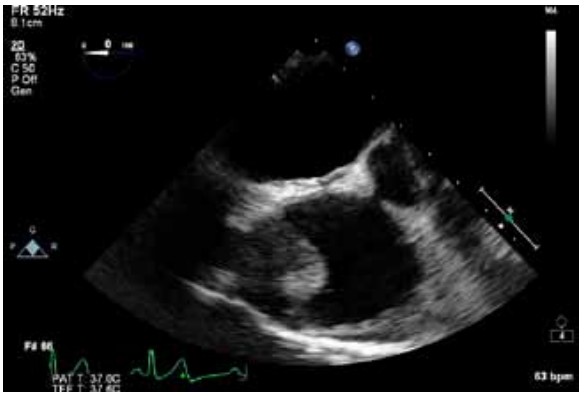
INTRODUCTION: Granulomatous myocarditis is a rare cardiac disease, occasionally found on autopsy, since patients are asymptomatic until they decease from sudden cardiac death (1,2). We present the initial transesophageal echocardiography (TEE) findings and discuss difficulty of diagnosis of this rare disorder.

CASE REPORT: A 76 year old male with history of hypertension, deep vein thrombosis, renal tumor, and left subclavian artery stenosis, presented with chest pain. CT scan revealed chronic aortic dissection originating from ascending aorta to common iliac artery and right atrial thrombus. Transthoracic echocardiography demonstrated 4.7×2.4cm hypo-echoic mass lesion. The patient was scheduled for thrombectomy and/or tumor resection with a diagnosis of thrombus and/or extended or translocated renal tumor or primary tumor. Standard anesthesia induction was followed by arterial and central line placement and insertion of transesophageal echocardiography, which revealed a sessile tumor with smooth surface and various echoic density located from the atrial wall close to superior vena cava to the middle of right atrium in the size of 4.5×2.0cm in bicaval view, and 2.3×1.6cm in mid-esophageal aortic valve short axis view. Examination of right atrium under cardiopulmonary bypass demonstrated diffuse inflammatory change in atrial wall without thrombus. Although primary tumor was suspected, only partial resection of atrial wall for biopsy was performed due to extensive lesion and chest was closed without further surgical resection. Patient was diagnosed as granulomatous myocarditis from pathohistological study and recovered fully from surgery without problem.



DISCUSSION: From view points of pathogenesis, granulomatous myocarditis can be classified into an inflammatory cardiomyopathy, caused by various conditions such as myocarditis, infections, or autoimmune diseases (3), which are not pathologically differentiated easily. Since prognosis of this disease can be varied from spontaneous recovery to sudden cardiac death secondary to fatal dysrhythmia, those patients are occasionally asymptomatic and rarely diagnosed alive. In this case, diagnosis was difficult with echocardiography, since structure with unequal echoic density projected into right atrium was similar to that of tumor or thrombus on right atrial wall. Although echocardiographic findings of chronic myocarditis generally include pericardial fluid retention, wall hypertrophy, and decreased wall motion, granulomatous myocarditis could present with a prominent lesion from hypertrophied wall which was similar to tumor and difficult to be differentiated. Because of the scarce prevalence of granulomatous myocarditis, TEE findings of this disease have never been reported. Differential diagnosis of cardiac tumor should always include these rare inflammatory changes and echocardiographic findings from this patient might also be shared as a future reference.

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S-86.

EVALUATION OF LEFT VENTRICULAR DIASTOLIC FUNCTION ON HUMAN CARDIAC SURGERY

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BACKGROUND: Anesthetic management of cardiac surgery is challenging because of hemodynamic instability caused by manipulation of heart directly, such as retraction and stabilization of the heart during off-pump coronary artery bypass graft surgery (OPCAB). Several studies have shown the systolic and diastolic function of left ventricular (LV) during cardiac surgery in regard to various hemodynamic parameters such as cardiac index (CI), pulmonary artery diastolic pressure and mitral inflow (1). The early diastolic peak tissue velocity (E') is a relatively preload-insensitive measure of LV diastolic function that is particularly useful in the perioperative period when LV filling conditions may vary considerably. Although sternotomy could increase, and retraction and stabilization of the heart during OPCAB could reduce LV diastolic function, the evaluation of LV diastolic function during cardiac surgery using E' with Doppler tissue imaging (DTI) has not been determined. The purpose of this study was to elucidate the effect of surgicalprocedures on LV diastolic function during cardiac surgery using DTI. Methods: Written informed consent was obtained from all patients undergoing elective cardiac surgery. Patients were excluded if they have atrial fibrillation or regional wall motion abnormality revealed by preoperative transthoracic echocardiogram. Continuous CI monitoring using FloTrac system (Edwards Lifesciences), and transesophageal echocardiography monitoring using a multiplane transducer and SONOS 5500 imaging system (Philips Electronics Japan) were performed in perioperative period. Tissue Doppler velocities of the basis of the lateral wall from the mid-esophageal 4-chamber view were recorded. E' and hemodynamic parameters were measured before and after sternotomy. In the case of OPCAB, those were measured after pericardiotomy as a baseline control, and several time points of the anastomoses, which were during left anterior descending artery anastomosis (LAD), during the circumflex anastomosis (LCX) and during the right coronary artery anastomosis (RCA). Wilcoxon signed rank test was applied for comparison. A P value of < 0.05 was considered statistically significant. Result: Compared with before sternotomy, significant increase in E' was observed after sternotomy ($P<0.05$, n=11) (Figure 1), whereas in the OPCAB, significant decrease in E' was observed during LAD, LCX and RCA anastomoses comparing to baseline control ($P<0.05$, n=6) (Figure 2). Conclusion: We have shown the change of LV diastolic function assessed by E' using DTI during cardiac surgery.

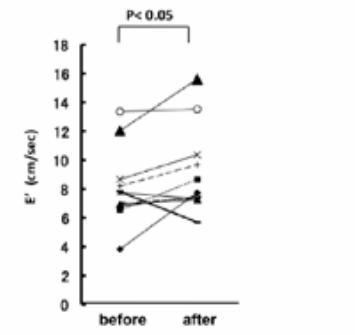

Figure 1. Measurement of E' before and after sternotomy during cardiac surgery. n=11

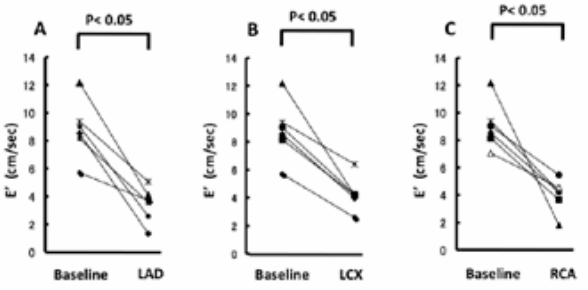

Figure 2. Measurement of E' during Off pump coronary artery graft surgery. A: during LAD anastomosis. B: during LCX anastomosis. C: during RCA anastomosis. n=6

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S-87.

CEFUROXIME TISSUE CONCENTRATIONS IN PATIENTS UNDERGOING ELECTIVE CARDIAC SURGERY: CONTINUOUS VS. BOLUS APPLICATION

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INTRODUCTION: Surgical site infections (SSI) remain a feared complication after cardiac surgery that result in significant morbidity and mortality, prolonged hospital stay and high healthcare costs (1). Cephalosporins are the standard prophylactic antibiotics for cardiac surgery. Administering an adequate dose of prophylactic antibiotics at the appropriate time is of paramount significance. Therefore, we compared two different regimens of antibiotic prophylaxis with cefuroxime in patients undergoing elective cardiac surgery.

METHODS: A total of 12 patients were investigated. Group A (n=6) received 1.5 g cefuroxime as two IV bolus infusions before surgery and 12 hours later, respectively. In group B (n=6), a continuous infusion of 1.5 g cefuroxime was started after the initial 1.5 g i.v. bolus infusion. Samples for analysis of cefuroxime tissue concentrations were collected during the following 12 hours. Bedside microdialysis, a minimally invasive sampling technique (2), was used to measure free interstitial (subcutaneous and muscle) cefuroxime concentrations. Student's t-test was used for statistical analysis. Data are presented as mean ± SD.

RESULTS: Cefuroxime concentrations in subcutis and muscle of group A reached their peak within 60 (18 ± 8 mg/L) and 20 minutes (20 ± 11 mg/L), respectively. In group B, peak concentrations in subcutis (37 ± 25 mg/L) and muscle tissue (54 ± 49 mg/L) showed a greater scatter but were not significantly higher compared to the bolus group. It took the same time as for the bolus infusion until peak values were recorded, i.e. 60 and 20 minutes, respectively. Thereafter, cefuroxime tissue concentrations decreased slowly. We did not see a total wash out during the 12-hour observation period. However, cefuroxime tissue concentrations remained at the lower level of MIC for most prevalent Gram-positive pathogens after four hours following bolus infusion.

DISCUSSION: Dosing regime and way of application does not seem to significantly affect the penetration of cefuroxime into the interstitial space of subcutis and muscle. Free concentrations of cefuroxime in both tissues were sufficiently high to prevent SSI due to common Gram-positive bacteria throughout surgery and the entire observation period.

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S-88.

HEALTH RISKS ASSOCIATED WITH USE OF INTRA-OPERATIVE NASAL PHENYLEPHRINE

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INTRODUCTION: Intra-operative use of topical vasoconstrictive α-agonists is common practice in many surgical specialties despite lack of FDA approval. Such practice, although usually safe, is not without risk if absorbed systemically and has the potential to cause severe cardiopulmonary complications. We review the literature to assess patient health risks associated with this application.

METHODS: Pubmed search and literature review.

RESULTS: Several reports document use of phenylephrine being associated with adverse intra-operative events. Each incident reveals a similar pattern of hypertensive episode (BPs > 200/100 mmHg) following administration of the α-agonist, anti-hypertensive treatment achieved by various methods and cardiopulmonary collapse resulting in pulmonary edema, pulseless electrical activity, cardiogenic shock, arrest or death. Documented cases include twelve healthy patients who received topical phenylephrine prior to ENT surgery (1). Two others involve intranasal 0.5% phenylephrine spray during awake nasal intubation (2,3). Of those whose hypertension and tachycardia was treated with β-blockers (esmolol, metoprolol), all developed pulmonary edema requiring extended intubation and ICU stays. And in three, left ventricular dysfunction, cardiac arrest, and death. The New York Phenylephrine Advisory Committee found nine more patients reacting similarly. Eight received β-blockers causing pulmonary edema and the three that had received labetalol treatment had ensuing cardiac arrest and death. Those that were treated otherwise (α-antagonist, opiates, deeper anesthesia) fared better, not developing pulmonary edema or cardiac arrest (4). Concentrations and volumes vary depending on facility and training, with little consensus, but guidelines have been recently published. Topical doses tend to exceed that given intravenously because it is minimally absorbed (5). Even ENT's practice of using phenylephrine concentrations of 0.25-1% has resulted in cardiopulmonary collapse and yet ophthalmologists consistently employ higher concentrations (6). For nasal intubation, phenylephrine spray that is employed in lower volumes than that routinely soaked into pledgets has also been documented to reach the systemic circulation having cardiopulmonary influence.

Discussion: Phenylephrine, a vasoconstrictor, is utilized intra-operatively to improve surgical fields (5). Cardiopulmonary events and ensuing shock are rare in minimally invasive surgeries but can occur if the α-agonist is absorbed. Systemic absorption of phenylephrine causes dramatic increases in vascular resistance and afterload, potentially inciting left ventricular failure and cardiogenic shock (4). The Phenylephrine Advisory Committee gives seven key recommendations, which are reviewed here. It is important to note that these guidelines are based on intravenous doses and assumes 100% absorption (4). This review emphasizes that acute awareness is needed when intra-operative α-agonists are employed, including β-blocker avoidance. The potential for severe phenylephrine-induced hypertensive response requires an understanding of the pathophysiology and appropriate treatment necessary to prevent morbidity and mortality.

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S-89.

INCREMENTS OF SEVOFLURANE CONCENTRATION REDUCES SYSTOLIC MITRAL ANNULUS VELOCITY IN TISSUE DOPPLER IMAGING IN HUMAN

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INTRODUCTION: We determined the change of systolic mitral annulus velocity wave (S') in the tissue Doppler imaging (TDI) at the increment of sevoflurane from 1.0 to 2.0 and 3.0 vol %.

METHODS: In elective cardiac surgical patients (n = 8) with LV ejection fraction (EF) > 50%, monitoring of ECG, pulse oximetry, radial arterial pressure (AP), cerebral oximetry, train-of-four and bispectral index (BIS) were started upon patients' arrival to operation suite.

After giving midazolam 0.2 mg/kg IV, anesthesia induction and tracheal intubation was performed with etomidate, remifentanil and rocuronium. pulmonary artery catheter was placed to monitor cardiac index (PA-CI), mixed venous O2 saturation (SvO2)and the transesophageal echocardiography (TEE, Vivid 7™, GE, USA) was monitored. After achieving stable hemodynamics with optimal intravascular volume status and BIS 40-60 by the target controlled infusion of remifentanil (15-20 ng/ml in target plasma) with supplemental sevoflurane (1.0 vol%), following data were determined (t1); lateral mitral annular velocity of systole (S'), early filling (E') and atrial contraction (A') by using TDI; early filling (E), deceleration time (DT) and atrial contraction (A) of mitral inflow by using pulsed-wave Doppler; LV-EF (modified Simpson's method) in the midesophageal 4-chamber view; arterial pressure-derived cardiac index (AP-CI) and stroke volume variability (SVV) by using radial arterial pressure wave (FloTrac™ and Vigilleo™, Edward Lifesciences, USA); PA catheter-derived cardiac index (PA-CI), RV end-diastolic volume index (RV-EDVI) and EF (RV-EF), BIS; mean BP, mean PAP, CVP, SvO2, and rate of phenylephrine infusion. After the 10 min-exposure to sevoflurane 2.0 and 3.0 vol% (t2 and t3, respectively), determining the data was repeated. The comparisons of the data at t2 and t3 versus those at t1 were performed by using the Oneway Repeated Measures Analysis of Variance (SigmaStat™, USA).

After the data determination, sternotomy was performed. Vasodilation and resultant BP change at the increased sevoflurane concentration was treated by increasing the rate of phenylephrine infusion.

RESULTS: S' and BIS at t2 and t3 were significantly less than that at t1 ($p < 0.001$). LV-EF at t3 was significantly greater than that at t1 ($p = 0.007$). Other data at t2 or t3 did not show any significant change from those at t1.

DISCUSSION: The increments of sevoflurane from 1.0 to 2.0 and 3.0 vol% reduces LV systolic profile while conserving preserving LV diastolic and other hemodynamic profiles. This result may be provocative an additional attention in the use of high-dose sevofolurane for the patients with LV systolic dysfunction.

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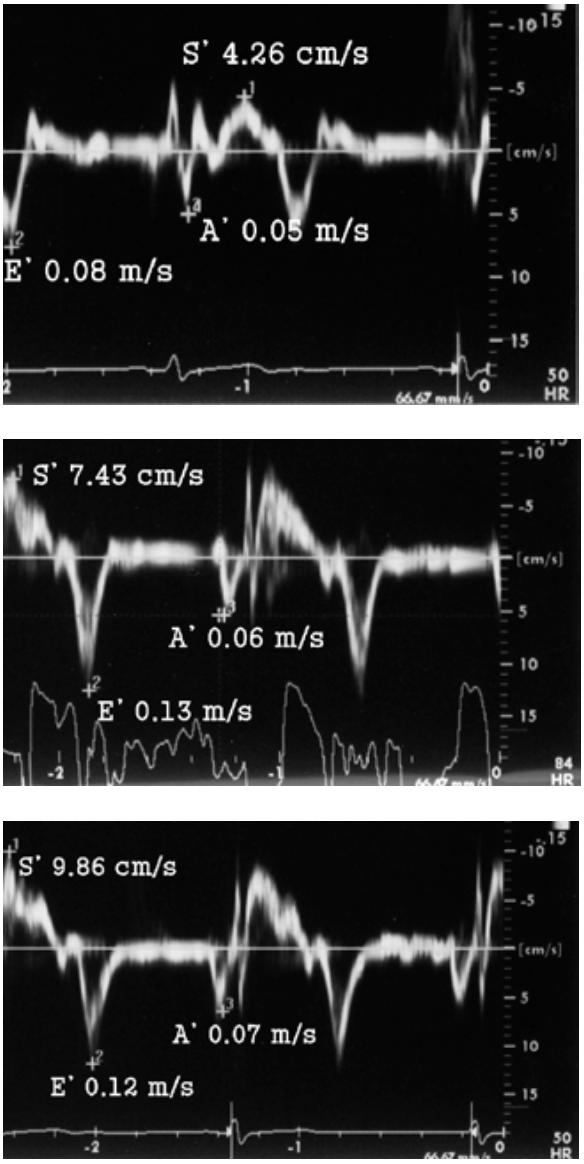

AP-CI and SVV were measured by FloTrac™ and Vigileo™ (Edward Lifesciences, USA)

S-90.

ASSOCIATION OF STATINS AND β BLOCKERS WITH PRE-OPERATIVE CRP LEVELS IN NON CARDIAC SURGERY PATIENTS

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INTRODUCTION: Mounting evidence is indicating the usefulness of elevated pre-operative CRP levels in predicting post-operative morbidity and mortality. Statins have been shown to improve postoperative morbidity and mortality presumably through anti-inflammatory effects. β blockers have been shown to improve postoperative outcomes in certain populations, a proposed mechanism is its anti-inflammatory property We hypothesized that the pre-operative CRP level is indirectly related to the administration of statins, β blockers and that their effects are additive.

METHODS: After IRB approval, patients scheduled for major non cardiac surgery under general anesthesia were enrolled in the DeLiT Trial. The Dexamethasone, Light Anesthesia and Tight Glucose control (GC) Randomized Controlled Trial (DeLiT Trial) is conducted to study the effects of these three interventions on outcomes. CRP levels were collected pre-operatively. We report on pre-operative CRP levels in patients with and without statins / β blockers treatment. The interaction between statin use and β blocker use and the main effects of each were assessed univariably and also multivariably by adjusting for other demographic and baseline variables using analysis of covariance (ANCOVA). Results were considered statistically significant when $P < 0.05$.

RESULTS: Data from 193 patients with completed records of preoperative CRP level, statins and Beta Blocker treatment were analyzed. In our sample, the median [Q1, Q3] of the pre-operative CRP levels of the patients with (N=85) and without statins treatment (N=108) were 3.65 [1.51, 9.15] mg/L, and 4.33 [2.02, 9.45] respectively. For patients with (N=88) and without (N=105) β blockers treatment the pre-operative CRP were 4.03 [1.96, 9.23], and 4.00 [1.69, 9.60] mg/L respectively. (Fig 1)

Neither statin use nor β-blocker use was related to CRP levels, either univariably or after adjusting for baseline variables (Table 1). Further, no interaction between statin use and beta-blocker use was found.

DISCUSSION: Our data indicates that there is no apparent association between statins or β-blockers on pre-operative CRP levels in this population. This is contrary to the common belief that the perioperative protective effects of statin and to a lesser extent, β blockers is through an anti-inflammatory effect. However, as we investigate other plausible mechanisms, this theory should not be excluded all together. Yet to be determined is whether statins and/ or β blockers treated patients experience less rise in their CRP post-operatively i.e. they modulate the perioperative inflammatory response, rather than improving the base-line state which they don't according to our findings, and whether that indeed correlates with better outcomes.

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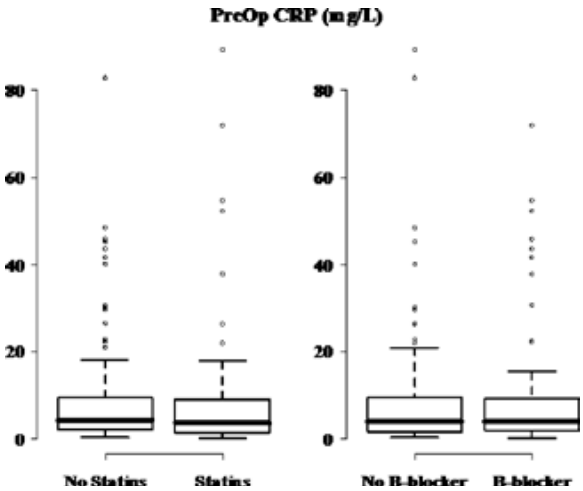
Table 1 Interaction / Main effects of statins / b-blockers on pre-operative CRP levels

Factors	Univariable		Multivariable*	
	P Value	Difference (mg/L) (95% CI)	P Value	Difference (mg/L) (95% CI
Multiplicative interaction	> 0.99	N/A	0.94	**N/A**
Statins (Y vs. N)	0.89	-0.27 [-4.26, 3.72]	0.81	**-0.54 [-5.03, 3.95]**
B-Blocker (Y vs. N)	0.81	0.48 [-3.50, 4.46]	0.99	**0.02 [-4.24, 4.28]**



S-91.

EFFECTS OF ONE-LUNG VENTILATION ON PULMONARY INFLAMMATORY RESPONSES DURING AND AFTER LUNG RESECTION

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INTRODUCTION: One-lung ventilation (OLV) is commonly used during thoracic surgery. Several clinical studies demonstrated that OLV induced pulmonary inflammatory reactions in the non-dependent lung (NDL) using bronchoalveolar lavage fluid (BALF) 1) . However, there were no clinical study that examined the inflammatory reactions of the dependent lung (DL) and compared DL to NDL. The bronchoscopic microsampling (BMS) method enabled to obtain epithelial lining fluid (ELF) from each side of lung during OLV and to examine the OLV-induced effects on two different sites of lungs in this study.

METHODS: Twenty consecutive adult patients undergoing thoracic surgery including lobectomy and partial resection with OLV were studied after IRB approval and written informed consent. Total intravenous anesthesia with propofol and remifentanil was performed. The double-lumen tube (DLT) was used to perform OLV. During OLV, the peak inspiratory pressure was maintained below 25cmH2O and FIO2 was kept between 0.6 and 1.0. Respiratory rate was adjusted to keep normocapnea. The ELF was obtained from each side of the lung using BMS method 1) before OLV (baseline) , 2) one hour after initiation of OLV, and 3) 15 minutes after termination of OLV (almost at the end of surgery) . Inflammatory mediators (tumor necrosis factor α, interleukin (IL) -1β, IL-6, IL-8, IL-10, IL-12p70) in ELF were measured using ELISA. All results were presented as mean ± SD and statistical significance ($p<0.05$) was determined by Student's t-test.

RESULTS: The ELF levels of IL-6, IL-1β, IL-8 were significantly increased in both sides of the lungs at the end of surgery compared with baseline ($p < 0.05$) . The ELF level of IL-6 in DL at the end of surgery was significantly greater than that of NDL ($p < 0.05$) . And the ELF level of IL-1β in DL at the end of surgery was also greater than that of NDL ($p = 0.1$) . The levels of other mediators were not significantly different between the lungs at each study point.

DISCUSSION: We demonstrated that OLV induced inflammatory responses of bronchial epithelium in both sides of the lungs during OLV and that the inflammatory responses were greater in DL than NDL as evidenced by the higher ELF IL-6 and IL-1β levels in DL at the end of surgery. The inflammatory reactions are probably induced by multiple factors; mechanical damage by surgical manipulation, OLV-induced atelectasis and re-expansion, damage by higher oxygen tension 2) . This study suggests that pulmonary protective anesthetic management should be aimed not only at NDL but also at DL.

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S-92.

WITHDRAWN.

S-93.

AUTOCYCLING AND THE TOTAL ARTIFICIAL HEART: OPTIMAL VENTILATOR TRIGGER FOR ASSISTED VENTILATION--CASE SERIES ANALYSIS

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INTRODUCTION: Because of advancing technology and lack of cadaveric donors, there has been an increasing number of patients receiving total artificial hearts (TAHs). Physicians must be diligent in maintaining knowledge of these devices and recognizing the complications associated with them. We have observed individual cases of post-operative mechanical ventilator autocycling with a flow trigger, and subsequent cessation of autocycling after changing to a pressure trigger. To further explore these observations, we did a retrospective case series analysis of all TAH devices placed at our institution.

METHODS: Following IRB approval, medical records of all patients with a TAH placed between August 2007 and May 2009 were reviewed. We recorded CVP, BMI, PEEP, mode of ventilation, TAH rate, and both the set and actual respiratory rate for both flow and pressure triggered settings. We used a 1-tailed equal variance student t test to compare CVP values of the autocycling and non-autocycling groups.

RESULTS: 10 patients were identified for review (Table). The TAH device used in all patients was the SynCardia CardioWest (Tucson, AZ). Mechanical ventilator used was the Puritan Bennett 840 (Pleasanton, CA). Autocycling was present in 5 of 10 patients, with immediate cessation of autocycling in all patients after changing from a flow trigger of 2 L/minute to a pressure trigger of 2 cm H2o. The autocycling group was found to have significantly higher CVP values than the non-autocycling group (P = 0.012).

DISCUSSION: TAHs have been shown to induce significant pulmonary volume displacements due to large pneumatic pressure changes with each beat.(1) These oscillations are large enough to provide sufficient alveolar ventilation during one hour of total apnea.(1) We found significantly higher CVP values in the autocycling group. This may signify a less compliant thorax; the large TAH induced pressure changes may then be more efficiently transmitted to the airway. Modern ventilators maintain PEEP and compensate for changes in circuit pressure by adjusting the exhalation valve with an active microprocessor control throughout the expiratory period.(2) The microprocessor actively adjusts the expiratory valve to maintain a set PEEP, ultimately leading to changes in circuit flow. The result is pressure maintenance at the expense altered flow. With a pressure trigger, PEEP maintenance compensates for TAH-induced pressure changes prior to a breath being triggered. With a flow trigger the microprocessor once again maintains pressure; however this is done at the expense of a change in flow, which may then trigger an autocycled breath if timed correctly. In conclusion, autocycling may be prevented by the use of a pressure trigger, rather than a flow trigger setting in patients with TAHs who require mechanical ventilation.

Autocycling Group

Case	Mode of Ventilation	CVP	BMI	RR actual/set with Flow Trigger	RR actual/set with Pressure Trigger	TAH Rate	PEEP
1	ACV	20	27.5	37/24	26/26	101	5
2	SIMV + PS	21	28.7	38/6	10/10	123	5
3	SIMV + PS	22	39.7	16/12	18/18	115	6
4	SIMV + PS	20	25.9	37/12	12/12	131	5
5	SIMV + PS	19	23.6	27/12	12/12	115	16

Nonautocycling Group

Case	Mode of Ventilation	CVP	BMI	RR actual/set with Flow Trigger	RR actual/set with Pressure Trigger	TAH Rate	PEEP
6	SIMV + PS	18	31.2		10/10	110	8
7	SIMV + PS	7	32.3	18/18	30/30	110	25
8	SIMV + PS	15	32.3	10/10		125	5
9	SIMV + PS	19	25.8	18/12	18/12	120	5
10	SIMV + PS	10	30.8	14/10	12/10	110	5

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S-94.

INDICENCE AND PREDICTORS OF DIFFICULT OR IMPOSSIBLE DOUBLE-LUMEN TUBE PLACEMENT

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INTRODUCTION: Previous studies have demonstrated the incidence and predictors of difficult single-lumen oral endotracheal intubation (SLT) (1-3). However, there are multiple settings where SLT is successful, but placement of a double-lumen oral endotracheal tube (DLT) is unsuspectedly difficult or impossible. We will report the incidence and determine potential predictors of unsuspected difficult DLT placement.

METHODS: We conducted a retrospective review using the intraoperative electronic medical records of adult patients undergoing general anesthesia with anticipated one lung ventilation from July 1, 2008 - June 30, 2009. The primary endpoint was to determine the incidence of unsuspected difficult DLT placement as defined by: 1) greater than 3 attempts at placement of a DLT with direct laryngoscopy; 2) requirement of an airway exchange catheter (AEC) to place the DLT; 3) shearing of the bronchial or tracheal cuff and/or requirement of downsizing the DLT; and 4) initial attempt of DLT placement with subsequent Univent and/or bronchial blocker (BB) use.

RESULTS: We reviewed 469 patients in which a DLT was placed or attempted. There were 31 patients (6.6%) with unsuspected difficult DLT placements. In patients with a Grade 3 Cormack-Lehane score, difficult DLT placement was 71.4% (5/7 patients), compared to 5.6% (26/459) in patients with a Grade 1 or 2 Cormack-Lehane score. Patients with modified Mallampati (MMP) (4-6) scores of 3 or 4 (odds ratio [OR] 2.7; 95% confidence interval [CI]: 1.2-5.9; p = 0.01), Extended Mallampati Scores (EMS) (6) of 3 or 4 (OR 3.0; 95% CI: 1.1-8.1; p = 0.03), and the presence of a beard or moustache (OR 2.4; 95% CI: 1.1-5.5; p = 0.03) showed statistically significant associations with difficult DLT placement, compared to those patients without difficult DLT placement.

DISCUSSION: The overall incidence of unsuspected difficult DLT placement was 6.6%. Our data suggest that MMP, EMS, and the presence of a beard or moustache may have predictive value in difficult DLT placement. Further prospective studies will be needed to validate these findings.

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S-95.

EFFECTS OF PROTECTIVE LUNG STRATEGIES ON CLINICAL OUTCOME AFTER CARDIOPULMONARY BYPASS IN PATIENTS WITHOUT PRE-EXISTING LUNG INJURY

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INTRODUCTION: A systemic inflammatory response occurs in patients following cardiac surgery(1). Multiple factors such as surgical trauma, cardiopulmonary bypass, general anesthesia with mechanical ventilation, rapid cooling and warming and blood administration contribute to that response(2). Previous studies show that ventilating the lungs with lower tidal volumes (Tv) and utilizing open lung ventilation (use of PEEP and CPAP during CPB) may attenuate this increase in inflammatory mediators(2,3,4). We hypothesize that protective lung ventilatory strategy will decrease lung inflammation and that this decrease will improve clinical outcome after CPB in patients without preexisting lung injury.

METHODS: We designed a prospective, randomized, controlled study to ascertain if implementing a 'protective lung strategy' would decrease inflammation and if this, in turn, would translate into more favorable clinical outcomes. All patients who were scheduled for cardiac surgery with cardiopulmonary bypass were randomized into one of two groups. Those in the experimental arm (Ve), once intubated were ventilated using tidal volume of 6mL/kg of ideal body weight, PEEP of 5cm H2O both before and after CPB, and CPAP during CPB. Those patients randomized to the control arm (Vc), were ventilated with a tidal volume of 10mL/kg of ideal body weight, no PEEP and no CPAP was used during CPB. The protocol was discontinued once the patient reached the ICU and ventilator management was transferred to the ICU team. Post-operative data was analyzed for clinical outcomes.

RESULTS: Interim analysis of 51 consented subjects, 47 underwent protocol dictated ventilator settings. 10 were excluded from analysis due to baseline lung injury (P/F <200), surgeon insistence, case cancellation, re-operation, and failed attempt to extubate. 18 subjects were randomized to experimental arm (Ve) and 19 randomized to control arm (Vc). Time to extubation for Ve arm vs Vc arm was 481 minutes vs. 325 minutes respectively (p=.091). Time to discharge for Ve arm vs Vc arm was 140 hours vs. 123 hours respectively (p=.217). Total CT output and presence of dysrhythmia for Ve vs Vc were 1185 mL vs. 1194 mL (p=.969) and 56% vs 42% (p=.869), respectively. Interim analysis did not capture any incidence of ALI, ARDS, Sepsis or Septic shock.

DISCUSSION: Interim analysis shows no difference thus far in clinical outcomes. Both arms had similar hospital length of stay; similar total chest tube output; similar rates of dysrhythmias and incidence of acute renal failure. We cannot comment on trends as the sample size is small and only includes about 20% of planned subjects to be randomized. We are still tabulating data and enrolling subjects.

S-96.

CHANGES IN CEREBRAL OXYGEN SATURATION DURING CONGENITAL CARDIAC SURGERY WITH CARDIOPULMONARY BYPASS IN CYANOTIC AND NON-CYANOTIC LITTLE CHILDREN

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INTRODUCTION: Cerebral injury remains a major cause of morbidity after pediatric cardiac surgery. Recently, cerebral oximetry using near-infrared spectroscopy becomes widely used for the prevention of cerebral injury in the pediatric cardiac surgery. However, clinical significance of this device has not been determined yet. One of the reasons of this may be attributable to the complexity of hemodynamics in the pediatric patients with congenital cardiac disease. In this study, accordingly, we evaluated change in the regional cerebral oxygen saturation (rSO_2) during the congenital cardiac surgery with cardiopulmonary bypass (CPB) between the cyanotic and non-cyanotic little children.

METHODS: With IRB approval and parental informed consent, the little children below 6-year-old undergoing congenital cardiac surgery with CPB for the recent 1 year were evaluated. The patients were divided into 2 groups: Group 1 consisted of 20 patients with non-cyanotic congenital cardiac diseases, including arterial septal (n=8), and ventricular septal defects (n=12), while group 2 consisted of 19 patients with cyanotic congenital heart diseases, including tetralogy of Fallot (n=5), atrio-ventricular septal defect (n=4), transposition of the great arteries (n=3), total anomalous pulmonary venous return (n=2), double-outlet right ventricle (n=2) and others (n=1 each). Changes in rSO2 was measured by INVOS 5100C (Somanetics Corp., Troy, MI, USA) at the start of surgery (T1), 5 min before induction of CPB (T2), 5 (T3) and 10 (T4) min after induction of CPB, 5 min after the end of CPB (T5) and the end of surgery (T6). Arterial blood analysis and measurement of mean blood pressure and rectal temperature were performed at those same times. The variables were compared by one way ANOVA, and Tukey test was used for post-hoc.

RESULTS: The median age was 22.5 months and the mean body weight was 11.0±4.0 (mean±SD) kg in group 1, while the former was 8 months and the latter was 7.2±3.4 kg in group 2. One way ANOVA showed significant changes in rSO_2 in both groups (Fig.). In group 1, rSO_2 significantly decreased after the induction of CPB, which was presumably related to the reduction of hemoglobin concentration. In group 2, rSO_2 was not so changed after induction of CPB, however, rSO_2 at T6 was significantly higher than that at T2. This may be related to the improvement systemic oxygenation.

DISCUSSION: Changes in rSO_2 were different according to the hemodynamic variance of congenital cardiac disease during the pediatric cardiac surgery with CPB. We should take notice of the individual anatomical and hemodynamic state when we estimate the cerebral oxygenation state during that type of surgery.

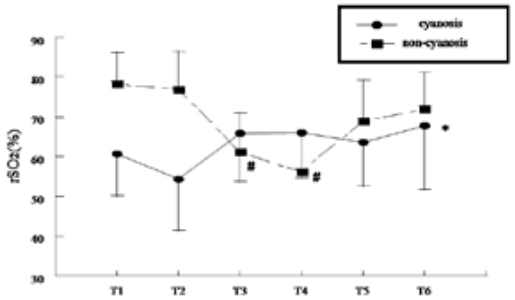

Fig. Changes in rSO_2

#; P<0.01 against T1 and T2 in non-cyanotic group
*; p < 0.05 against T2 in cyanotic group

S-97.

HUMAN COMPLEMENT SYSTEM GENES ARE DOWN REGULATED DURING CARDIOPULMONARY BYPASS IN PATIENTS UNDERGOING CARDIAC SURGERY

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INTRODUCTION: Up regulation of complement gene expression in the setting of ischemia and reperfusion has been described in both animal and human myocardium[1-3]. Using genome-wide mRNA profiling, we examined differential complement gene expression over time in apical left ventricular (LV) tissue samples from patients undergoing cardiac surgery with cardiopulmonary bypass (CPB).

METHODS: Apical LV punch-biopsies were taken at two time points; immediately after aortic cross clamping (preCPB), and immediately prior to removal of the aortic cross clamp (postCPB), in 3 patients undergoing aortic valve replacement surgery by the same surgeon using similar myocardial protection strategies. Samples were immediately placed in RNAlater® (Ambion, Inc.) for 48 hours prior to storage in an -80° freezer. The Illumina/Solexa Genome Analysis platform and digital serial analysis of gene expression (DSAGE) were used to quantify genome-wide mRNA expression. Ingenuity Pathway Analysis© 7.6 (IPA) (Ingenuity Systems) was used to identify relevant candidate complement genes associated with significant differential expression during cardiopulmonary bypass defined as a change in expression with a significance value $p \leq 0.01$.

RESULTS: Electrophoretic pattern analysis indicated high tissue quality suitable for expression analysis (RNA integrity number >7 in all six samples). IPA© identified the complement system as a differentially regulated canonical pathway in all three patients. Fold change and significance values in differential complement gene expression between preCPB and postCPB samples are reported in the Table. While the MASP1 gene was up regulated in 1 patient, C3, C1qA, and CfD were significantly down regulated in 3 patients.

Complement Gene	Patient 1 Fold Change; *P* Value	Patient 2 Fold Change; *P* Value	Patient 3 Fold Change; P Value
C2	-4.545; 1.46x10-4	No expression change	No expression change
C3	-4.762; 8.80x10-167	-1.923; 6.67x10-37	-2.381; 3.80x10-43
C6	-1.587; 9.07x10-7	No expression change	No expression change
C7	-2.041; 1.37x10-25	No expression change	No expression change
C1qA	-2.083; 9.68x10-20	-1.613; 5.99x10-10	-2.174; 9.61x10-18
C1qB	-2.041; 1.07x10-6	No expression change	-2.326; 2.00x10-6
C1qC	-2.174; 3.11x10-5	-1.613; 1.03x10-3	No expression change
C1R	-1.961; 2.36x10-7	No expression change	-1.587; 8.83x10-3
C1S	-1.389; 2.89x10-3	No expression change	No expression change
CD46	-1.316; 2.57x10-5	No expression change	No expression change
CfD	-2.439; 7.78x10-98	-1.11; 5.11x10-3	-2.632; 2.57x10-66
MASP1	1.200; 3.04x10-3	No expression change	No expression change
CfH	No expression change	-2.22; 5.88x10-3	No expression change
C5AR1	No expression detected	No expression detected	-1.887; 8.35x10-3

DISCUSSION: We provide a descriptive analysis of three patients undergoing cardiac surgery in which myocardial complement gene expression was predominantly down regulated during CPB. To our knowledge, this is the first report using genome-wide mRNA expression analysis to identify differential gene expression of the entire human complement system in the setting of CPB. Planned analysis of additional human LV samples is currently under way to validate these novel findings.

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S-98.

POLYMORPHISM OF ANGIOTENSIN CONVERTING ENZYME SERIOUSLY AFFECT CLINICAL OUTCOME AFTER CARDIAC SURGERY

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The insertion/deletion (I/D) polymorphism of angiotensin converting enzyme is closely related to many disorders such as arteriosclerosis, life-threatening hypertension, ischemic heart disease and stroke. We thus tested the hypothesis that the difference of I/D polymorphism strongly affects the clinical outcome after cardiac surgery.

METHODS: After the IRB approval and the written informed consent, we studied 98 patients undergoing elective valvular surgery under cardiopulmonary bypass. We allocated patients into one of two groups postoperatively, patients with II and those with non-II (I/D and D/D) genotypes. Anesthetic and fluid management was strictly standardized. Preoperative patients' data (e.g. age, sex, body weight, comorbid disease, medication, biochemical data), anesthetic management (e.g. blood pressure, blood loss and transfusion, cardiorespiratory complications and their treatment), and postoperative outcome (e.g. life-threatening complications, re-operation, death, duration of ICU stay and hospitalization) were recorded by our fully-automatic electric chart system. The I/D polymorphism of ACE was detected by a gel electrophoresis after the conventional polymerase chain reaction. After univariate analysis of various possible contributing factors, we used multivariate logistic regression to identify significant predictive factors. Partial r2 values were evaluated for the contribution of each factor.

RESULTS: Genotype distribution of ACE-I/D was 31%, 58%, and 11% in genotypes II, ID, DD, respectively. The intra- and postoperative blood loss was 1.5 - 2.0 times greater in patients with non-II genotypes than in those with II genotypes ($P<0.05$). Postoperative infections and blood transfusion, and reoperation were more common and the duration of ICU stay were longer in patients with non-II genotype than in those with II genotype ($P<0.05$). Partial r2 values of genotype differences were greater than those of other factors.

CONCLUSION: Our results strongly suggest that patients with non-II genotype have more serious event than those with II genotypes during and after anesthesia. The I/D polymorphism can predict subsequent development of perioperative complications better than previously proposed factors.

S-99.

HELIUM INDUCES EARLY AND LATE PRECONDITIONING IN HUMAN ENDOTHELIUM IN VIVO

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INTRODUCTION: Ischemic or anesthetic preconditioning protects human endothelium against Ischemia/Reperfusion (I/R) injury in healthy volunteers. Experimental data show that the non-anesthetic noble gas helium induced preconditioning and attenuated infarct size after coronary occlusion in animals.(1,2) We hypothesised that helium inhalation induces preconditioning in human endothelium in vivo, thereby attenuating endothelial dysfunction after I/R in the human forearm.

METHODS: 50 healthy volunteers were included and randomised in one of five groups; except for controls (group 1, CON), volunteers underwent 20 min of forearm ischemia followed by 15 min of reperfusion in the absence (group 2 I/R) or presence of helium inhalation (3*5 min; mixture of 79% helium, 21% oxygen) either 15 min (group 3, EPC) or 24 hours (group 4, LPC) before forearm ischemia. Another group received 3 x 5 min ischemic preconditioning and served as a positive control (group 5, IPC). Endothelial function was measured by venous occlusion plethysmography and endothelium-dependent and -independent vasodilatation were determined by intra-arterial infusion of acetylcholine (0.1-5.0 µg/100ml FAV/min) and nitroprussid natrium (6-600ng SNP 100ml/FAV/min) before and after ischemia, respectively.

Results: I/R of the forearm induced endothelial dysfunction and resulted in a blunted dose response curve to acetylcholine: after ischemia, flow was 182±25% (mean±SEM) from baseline after highest dosage of acetylcholine, compared to 356±48% before I/R. Helium-EPC improved postischemic endothelial function and preserved response curve to acetylcholine (after ischemia: 595±156% compared to 452±77%) . Even when administered 24 hours before I/R, Helium-LPC was able to improve postischemic endothelial function (324±38% after ischemia vs. 344±33% before ischemia). This protection is comparable to protection elicited by ischemic preconditioning. The response to nitroprussid natrium remained unaffected.

DISCUSSION: These data show for the first time that helium induces both, early and late preconditioning in this human forearm model. This protection is most likely due to an endothelium-dependent effect.

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Supported by IARS CSRA 2008

S-100.

VARIATIONS IN THE 5P13 CHROMOSOMAL REGION IS ASSOCIATED WITH POSTOPERATIVE MYOCARDIAL INJURY AFTER CORONARY ARTERY BYPASS GRAFT SURGERY

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INTRODUCTION: Complement system activation during cardiopulmonary bypass (CPB) mediates a systemic inflammatory response that has been associated with postoperative myocardial injury (PMI)1. Complement gene variation has been shown to alter complement system activity2. We describe a two-staged genotyping effort to examine the association between variation in the complement 6 (C6) and 7 (C7) genes located in the 5p13 chromosomal region, and PMI after coronary artery bypass graft (CABG) surgery.

METHODS: Using a candidate gene-association study design, we initially examined the association between 23 candidate C6 gene single nucleotide polymorphisms (SNPs) and severity of PMI defined as cardiac troponin I (cTnI) levels in the top 10th percentile on postoperative day 1 in 826 patients undergoing primary, non-emergent CABG-only surgery with CPB. Based on these results, we then examined the association between 9 additional candidate SNPs which spanned the 5p13 locus (Chr5: 40,996,719-41,235,716), as well as 3 SNPs significantly associated with PMI from the initial analysis in 200 additional cardiac surgical patients (total N=1026).

RESULTS: In the initial SNP association analysis, after adjusting for permutation-based multiple comparisons and clinical risk factors, the minor alleles of rs4957374, rs7718610 and rs10075985 were independently associated with more severe PMI (adjusted OR [95% CI]; 2.27 [1.37-3.79], P=5.8x10-3; 2.36 [1.41-3.95], P=4.6x10-3; 2.16 [1.29-3.60, P=2.4x10-2, respectively). All three SNPs were in strong linkage disequilibrium (r2>0.94). In our subsequent analysis of the 12 candidate SNPs, the minor allele of rs325835 was independently associated with less severe PMI after adjusting for multiple comparisons (adjusted OR [95% CI]; 0.33 [0.18-0.61], P=5.0x10-3). rs4957374, rs7718610 and rs10075985 remained significant after adjustment for multiple comparisons.

DISCUSSION: These preliminary data suggest a locus in the 5p13 chromosomal region associated with PMI after CABG surgery. rs325835 is an intronic SNP located in the HEATR7B2 gene known to be associated with altered complement activity3. rs4957374, rs7718610 and rs10075985 are intronic SNPs located in the C6 gene. Future efforts will be directed at prospectively validating these novel findings in a separate cohort.

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S-101.

THROMBELASTOGRAPHY IN HAEMOSTASIS MONITORING DURING CARDIAC SURGERY

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INTRODUCTION: Thrombelastography (TEG) is reliable method for detection of haemostatic abnormalities during cardiac surgery. There is still a question that TEG is better predictor of haemostatic disorders during cardiopulmonary bypass than laboratory tests (1;2) and reduces blood product administration in perioperative period (3;4)

METHODS: Prospective randomized study in university hospital setting. Two groups of elective cardiac surgery patients were evaluated. Group TEG (n=499) monitored both with TEG and laboratory tests, Group Control (n=475) monitored only with laboratory tests. The following TEG measurements were performed: 1st after induction of anesthesia (native), 2nd during cardiopulmonary bypass (CPB) after X-clamp releasing (heparinase), 3rd and 4th 10min after protamine administration (nativ, heparinase). Haemostatic profile with using TEG algorithm, changes of TEG parameters and laboratory tests before and after CPB, blood loss, number of transfusion and reexploration because of bleeding were evaluated.

RESULTS: Both groups were comparable by demographics. No significant difference in peroperative blood loss, number of transfusion, aprotinin administration and reexploration because of bleeding were recorded. The only significant difference in postoperative blood loss (819±519 vs 861±422 ml, p<0,05) was assessed. Values of PT, aPTT, TT significantly increased, fibrinogen and platelets significantly decreased during CPB. Changes of PT, aPTT and platelets correlated with CPB duration. The main hemostatic patterns according to TEG algorithm: T1: 18,0% platelet hyperfunction, 12,4% enzymatic hypercoagulability. T2: 22,8% platelet hypofunction, 19% primary fibrinolysis. T3: 9,4% platelet hypofunction, 7% primary fibrinolysis. T4: 15,0% platelet hypofunction, 8% enzymatic hypercoagulation.

Conclusions: No impact of TEG algorithm on transfusion therapy was assessed.Hypercoagulation before surgery is common. Patients with hypercoagulation after surgery can represnt a challenge due to possibility of eraly thrombotic complications.

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S-102.

EFFECTS OF PREOPERATIVE DIURETIC THERAPY ON RENAL FUNCTION AFTER CARDIAC SURGERY

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INTRODUCTION: Diuretics have been shown to be ineffectiveness in improving clinical outcomes and kidney function[1], however, a randomized clinical study found that early administration of mannitol, furosemide and dopamine decreased the need for dialysis and expedited restoration of renal function in acute renal failure following cardiac surgery[2]. Furthermore, there is a lack of studies on correlation of preoperative use of diuretics and postoperative renal function. This study was aimed at investigating whether preoperative use of diuretics including furosemide and hydrochlorothiazide could affect the incidence of renal failure in patients undergoing cardiac surgery.

METHODS: A retrospective cohort study was performed on all patients (n = 1287) receiving cardiac surgery at this institution from August 2003 to December 2007. The patients included were adult, without preexisting renal failure and scheduled for elective cardiac surgery. Based on the criteria of the Society of Thoracic Surgeons, renal failure was defined as increase of serum creatinine more than 2.0 mg/dL, doubling most recent preoperative creatinine level or a new requirement for dialysis postoperatively.

RESULTS: Of all patients from the database, 613 patients met the inclusion criteria and were divided into 2 groups: the patients using (n=168) and not using (n=445) preoperative diuretics. When comparing these 2 groups, there were no significant differences in baseline parameters including body mass index, history of diabetes, cerebrovascular disease, peripheral vascular disease and angina, preoperative use of statins and aspirin, in intraoperative perfusion time and aortic cross clamp time. However, the patients with diuretics vs. without ones were older (67.5±12.0 vs. 63.6±2.8 yr), more often female (39.8 vs. 28.9%), smoker (64.7 vs. 55.9%), with history of hypertension (85.7 vs. 73.9%), congestive heart failure (17.9 vs. 4.7%), decreased left ventricular ejection fraction (48.9 vs. 54.1%), underwent multiple coronary artery bypass graft (88.7 vs. 66.0%) and valve surgery (64.3 vs. 46.8%), slightly higher preoperative creatinine (1.1±0.28 vs. 1.01±0.25 mg/dL), and more often on beta-blockers (80.4 vs. 68.5%) and digitalis (12.7 vs. 3.2%), though with less chronic lung disease (25.1 vs. 35.1%) ($P < 0.05$, respectively). With those differences, preoperative use of diuretics was associated with increased incidence of postoperative renal failure in the patients undergoing cardiac surgery when compared with without ones: 8.3% vs. 2.7% (P=0.02), and yielded a relative risk of 1.97 (95% confidence interval 0.51-3.3), but did not have significant effects on postoperative 30-day mortality, stroke and myocardial infarction.

DISCUSSION: Preoperative use of diuretics did not show renoprotective effect in this cohort group of patients, instead was associated with increased incidence of postoperative renal failure, which was most likely secondary to more serious pre-existing diseases (older and sicker) in the patient who had been on preoperative diuretics.

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S-103.

GOAL–DIRECTED HEPARIN INFUSION, BUT NOT SUBCUTANEOUS HEPARIN, ATTENUATES THE POST–OPERATIVE HYPERCOAGULABLE STATE IN SURGICAL INTENSIVE CARE UNIT PATIENTS

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INTRODUCTION: The standard of venous thromboembolism (VTE) prophylaxis, subcutaneous heparin (SQH), is poorly absorbed in critically ill surgical patients. "Goal-directed" anticoagulation therapy may be a more appropriate method of prophylaxis against VTE than the current standard of care. This pilot study describes low-dose intravenous heparin (LDIVH) administration titrated to a specific PTT range as one potential "goal-directed" VTE prophylaxis method.

METHODS: Patients admitted to the SICU directly after abdominal surgery were included. Exclusion criteria included major bleeding risk, heparin allergy, thrombocytopenia, or prior diagnosis of heparin induced thrombocytopenia (HIT). Patients were randomized to either intravenous heparin titrated to a PTT of 40-45 seconds (IVH) or heparin 5000U SQ TID (SQH) for a duration of 5 days after surgery. Screening lower-extremity ultrasounds for DVT diagnosis were performed on postoperative days 0, 5, and 10. Blood samples were drawn pre-operatively, post- operatively prior to any heparin and then daily for 7 days and compared with blood samples from a control group (CG) of 10 healthy volunteers. Coagulation was analyzed using activated clotting time (ACT) and the rate of fibrin polymerization, or clot rate, using the Sonoclot analyzer.

RESULTS: 21 patients were randomized with 10 receiving LDIVH and 11 SQH. 1 patient randomized to IVH had a lower extremity DVT found on day 0 of the study and was therefore excluded. Groups were well-matched with regards to age, gender, surgery type, and VTE risk factors. Neither arm had study ultrasound-positive DVT. No adverse events, including major bleeding and heparin-induced thrombocytopenia, were noted in either group. IVH patients had ACT values similar to the CG (IVH :187+/-7 seconds; p=0.13 vs CG) while SQH patients had significantly shorter ACTs (SQH 149+/-5.1 seconds: p<0.001 vs CG). Clot rate in the SQH group was faster than CG (39.8+/-1.4 vs 18+/-1: p= 0.001) while IVH clotting times were only slightly elevated compared to CG (30+/- 2.4 vs 18+/-1 p= 0.040). The clot rate in the SQH group was significantly elevated compared to the IVH group (p=0.039).

DISCUSSION: Post-operative patients randomized to SQH showed a markedly hypercoagulable profile when compared to CG patients. Patients randomized to a goal-directed heparin infusion showed normalized clotting times and decreased fibrin formation rates, consistent with attenuation of the post-operative hypercoagulable state. This small prospective study suggests that "goal-directed" VTE prophylaxis may be beneficial and a larger trial is warranted.

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S-104.

AIRWAY SCOPE LARYNGOSCOPY UNDER MANUAL IN-LINE STABILIZATION AND CERVICAL COLLAR IMMOBILIZATION: A CROSS-OVER IN VIVO CINEFLUOROSCOPIC STUDY

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INTRODUCTION: For patients with suspected neck injuries, intubation using Macintosh laryngoscope along with manual in-line stabilization (MIS) is a widely accepted technique today. However, cervical collar immobilization is usually performed in the pre-hospital environment, and its removal is required before tracheal intubation under MIS. This process can occasionally be time-consuming and risky because these patients often need prompt airway protection. Enabling a non-line-of-sight view of the oral-pharyngeal-tracheal axis, Airway Scope (AWS) is now a widely accepted airway device in cases of difficult airway and restriction of neck movement. A number of papers report significantly easier intubation procedure[1] and less cervical movement[2,3,4] by AWS compared to Macintosh laryngoscope, suggesting its usability in trauma cases. Focusing on these advantages, we hypothesized that if AWS can achieve an improved intubation condition under neck collar immobilization over the conventional MIS, unnecessary risk-taking due to removal of a neck collar may be prevented.

METHODS: After institutional ethical committee approval and written informed consent, 30 patients presenting for surgery were assigned to undergo intubation using AWS. Neck was stabilized manually and by a neck collar in a random order before laryngoscopy was performed by the same anesthesiologist. Measurements include: inter-incisor distance, success rate, intubation time and fluoroscopic examination of upper and middle cervical spine.

RESULTS: Inter-incisor distance was significantly narrower after application of neck collar (Mean±SE, MIS 1.9±0.1cm, Collar 1.0±0.1cm; P<0.01). One and 9 failures were encountered in MIS and collar groups, respectively (P=0.012). Intubation time proved no statistical significance. Extension of craniocervical junction was observed in both groups, but occipital-atlantal joint was significantly more extended in the collar group (Median [range], AWS 10° [-1 to 20], Collar 14.5° [5 to 26]; P<0.01).

DISCUSSION: Contrary to our hypothesis, intubation failed in 30% of the cases in the collar group, whereas in the MIS group, only 3.3%. This is probably a direct reflection of significant difference in the limitation of mouth opening. In fact, in 7 cases out of 9 failed cases of the collar group, inter-incisor distance was less than 1cm. This was insufficient to insert the AWS's bulky 17mm-blade. Additionally, occipital-atlantal joint suffered greater extension when wearing a collar. Differences in the mean to achieve neck stabilization may be a reason.

CONCLUSION: AWS laryngoscopy along with MIS is a safer and more definite method to secure the airway of trauma patients because it limits less mouth opening and neck movement compared to a neck collar.

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S-105.

HUMAN APOE 3/3 GENOTYPE OFFERS IN NEUROPROTECTION IN A MURINE MODEL OF INTRACEREBRAL HEMORRHAGE

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INTRODUCTION: Recent evidence suggests that apolipoprotein E (apoE) influences central nervous system responses to multiple mechanisms of acute brain injury and may affect overall mortality in the critically ill patients. To address the mechanisms by which apoE influences functional outcomes after intracerebral hemorrhage (ICH), we test the hypothesis that targeted replacement (TR) mice expressing human apoE isoforms (apoE3 and apoE4) will react differently to a collagenase-induced clinically relevant murine model of intracerebral hemorrhage. METHODS: After stereotactic creation of a burr hole, high-dose clostridial collagenase (0.15 U/0.4µl NS) was injected into the left basal ganglia of APOE3TR (n=8) and APOE4TR (n=11) mice over 5 minutes. Once recovered, the mice were subjected to rotarod latency testing (seconds) and neuroseverity scoring (21-point scale) on postoperative days (POD) 1, 2, and 3. Hemorrhage size was measured by H&E histology at 72 hours after injury. Additionally, cerebral edema was determined by wet-to-dry hemispheric weight measurements at 24 hours after injury, and RT-PCR was performed for markers of inflamation at 6, 24, & 48 hours after injury. Analysis of variance was used to evaluate for functional outcomes, and student's t-test was used for edema analysis and hemorrhage size. RESULTS: Hemorrhage size at 72 hours after injury was not different between groups. APOE4TR mice rotorod latencies were shorter and neuroseverity scores were lower than for their APOE3TR counterparts ($p<0.05$ & $p<0.01$, respectively) during the 72 hours post-operatively (See Graphs 1 & 2). Additionally, APOE4TR mice exhibited increased cerebral edema ($p<0.01$) and increased eNOS and IL-6 at 6 hours after injury ($p<0.01$) when compared to APOE3TR mice (See Graphs 3 & 4). DISCUSSION: Human APOE genotype appears to exhibit an influence on functional and histochemical outcomes after collagenase-induced ICH in mice. APOE3 genotype may confer a neuroprotective effect due to a suppressed neuroinflammatory reaction resulting in decreased cerebral edema formation when compared to APOE4 genotypes.

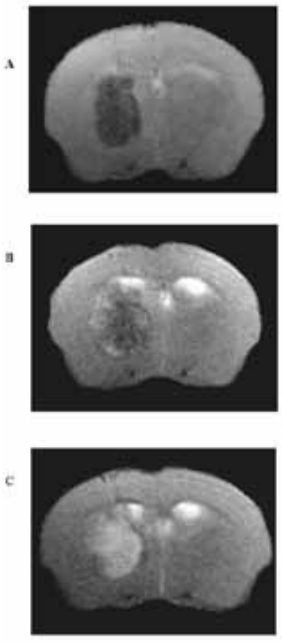

Figure 2 A-C.

MRI of APOE4TR mouse after collagenase-induced ICH at 2 h (A), 24 h (B), and 72 h (C) after injury. T2-weighted RARE spin echo images at 2 h (A) show predominantly low signal hematoma within the right basal ganglia, consistent with deoxyhemoglobin and intracellular methemoglobin. At 72 h (C), there is conversion to predominantly high signal, consistent with extracellular methemoglobin.

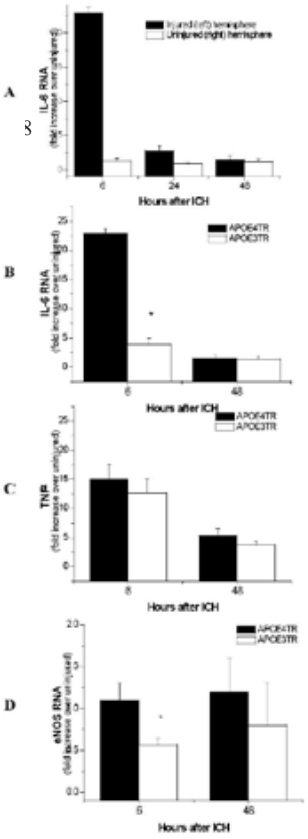

Figure 3 A-D.

Quantitative q-PCR of inflammatory markers after ICH in APOETR mice. At 6, 24, and h, IL-6 peaks and returns to normal levels in the injured hemisphere on APOE4TR mice when compared to the uninjured hemisphere (A). IL-6 (B) and eNOS (D) are significantly reduced in the injured hemispheres of APOE3TR mice compared to their APOE4TR counterparts. TNF-α was not significant (C).

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S-106.

THE ASSESSMENT OF SELECTIVE BIOMARKERS IMPROVES THE DIAGNOSIS OF CRITICALLY ILL PATIENTS

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INTRODUCTION: Severe infection and sepsis are common causes of morbidity and mortality. (1) Early diagnosis in critically ill patients is important to reduce these complications. (2&3) The present study was conducted to determine the role of leptin and procalcitonin (PCT) at early diagnosis and differentiation in critically ill patients, in comparison with C-reactive protein (CRP), interlukin-6 (IL-6) and tumor necrosis factor-α (TNF-α). Patients and method: One hundred and six adult intensive care unit (ICU) patients were observed. CRP, PCT, leptin, IL-6 and TNF-α were compared among the following groups: Sepsis group (n=40), systemic inflammatory response syndrome (SIRS) group (n=34) and non-systemic inflammatory response syndrome (non-SIRS) group (n=32). Results: Non-significant differences were observed among patients in different groups regarding biomarkers on the day of ICU admission. On the 2nd day of ICU admission, significant elevation of leptin, IL-6, TNF-α occurred in SIRS and sepsis groups but significant elevation of PCT occurred only in septic patients. Delayed elevation of CRP started on the fourth day of ICU admission in patients with sepsis. At the end of the 1st week, only CRP level was elevated in septic patients. Discussion: Serum leptin correlates well with serum level of IL-6 and TNF-α. Leptin helps to differentiate SIRS from Non-SIRS patients. CRP is a classic marker of sepsis but is of late onset. Procalcitonin plays a role in early detection of sepsis.

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S-107.

MAKING THE OPERATING ROOM MORE TRANSPARENT WITH AUTOMATIC ELECTRONIC SIGN-OUT

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INTRODUCTION: Potential for medical errors during the transition of care process is enormous[1]. As care givers change, key information is lost. In the present study we developed and implemented an intra-operative electronic reporting system. We used the transfer of patient care from the OR to the ICU as a natural obstacle for data transfer, and, a cognitive ethnographic evaluation to measure system effectiveness[2]. We hypothesized that increasing transparency of operative events would improve preadmission ICU workflow and thus lead to a more efficacious patient transfer in terms of time and situational awareness.

METHODS: After IRB approval, select data points from the operative data sources CompuRecord (Philips Clinical Information Systems, USA), ADT (EAGLE) and MSM (PICIS) were imported into a Javabase (database) to provide a secure website accessible to the ICU team and generate a real-time printed preadmission report on request. We proposed distinct study periods to contrast controls, where the system was not used, to experimental group. The first control (group1: 10/4-10/25/08, n=104) and experiment1 (group2: 10/28-11/15/08, n=160), the second control (group3: 1/3-2/20/09, n=313) and experiment2 (group4: 2/21-4/1/09, n=232) were done with a 6 week break between the two for iterative enhancement of the interface and data collection. A cognitive user evaluation was done by ethnographic methods (6/24/09-8/1/09). Time interval between skin closure and patient departure from the OR was measured in all groups as the gold standard for situational awareness. Milestone variance in a timeline format was used in the cognitive evaluation. And, user satisfaction was obtained by questionnaire. Significant differences ($P<0.05$) between conditions were judged by anova one way analysis, post hoc, and two way.

RESULTS: The time interval between skin closure and patient departure from the OR was less for the group of patients when the system was deployed. (39+3.9 minutes for group1 and 26+ 1.6 for minutes group2, respectively, P<.0004). Likewise, after the six weeks we found similar results (37+4.3 minute for group3 and 26+1,5 minutes for group4, respectively, p<.004) (Table1). There was a 94% approval of the system by ethnographic cognitive evaluation. While clinician query as to information content (clinician interaction and questions) were higher in the system group, total transport time, report time, and anesthesia ICU duration was not different. Process delays in patient transfer were indicated 29% without the use of the system and 0% during system use.

CONCLUSIONS: Consistent with our prior studies, we were able to automate, enhance, and standardize information transfer during the interactive transition of care process[2]. This automatic transmission of patient information minimizes data loss at the time of patient transfer, improves pre-admission ICU workflow, and increases clinician satisfaction.

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Table 1: The time interval between skin closure and patient departure from the operating room

	Group 1	Group 2	Group 3	Group 4
Number of Patients	104	160	313	232
Average Time (minutes)	39.42±3.99	26.03±1.68*	37.12±4.31	26.78±1.53**

	Control n=14	Experimental n=14
Total transport time (minutes)	21±.5	21±.5
Time from skin closure to arrival in the ICU (minutes)	27	33
Time from entering ICU to report time (minutes)	16.4	18
End of report to leave time (minutes)	4	2
Delay perceived by anesthesiologist (minutes)	0%	28%

Group 1: Prior to the introduction of our system, Group 2: After introduction of our system, Group3: After our system was taken off line, Group4: After the re-introduction of our system. *=P<.004 between group 1 and group 2, **=p<.004 between group 3 and group 4. Results of the Critical path evaluation by cognitive study.

S-108.

IDENTIFICATION OF BIOMARKERS PRESENT AT ICU ADMISSION TO OPTIMIZE ENROLLMENT IN CLINICAL TRIALS OF ANTI-INFLAMMATORY THERAPY

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INTRODUCTION: Many clinical trials of anti-inflammatory therapy have failed to show clinical efficacy and reduce mortality in critically ill patients with sepsis or infection. One potential cause for the repeated failure of these trials is our inability to identify patients at ICU admission who are at high risk of infection or death. The identification of a biomarker that could be measured within 24h of ICU admission and able to predict which patients are at high risk of infection or death would greatly improve the potential of anti-inflammatory therapies to show benefit in patients at risk for an adverse outcome, while at the same time minimizing risk to patients unlikely to benefit. Pediatric data has revealed that a low IL-8 level at PICU admission has a 95% negative predictive value for 28 d mortality. Thus, one would not enroll a pediatric patient with a low IL-8 level (< 220 pg/ml) in a clinical trial with a primary endpoint of reducing death, as a patient could likely only be harmed by the intervention. Our group evaluated potential biomarkers that could identify those most likely to benefit from anti-inflammatory intervention in an adult ICU population.

METHODS: 200 patients had blood drawn on day 1 of ICU stay as part of a prospective observational ICU trial. Two non-selected sub-groups were analyzed for cytokine biomarkers IL-12p70, INF-gamma, IL-10, IL-13, IL-2, IL-4, and IL-5 (n= 123) via Mesoscale® and IL-8 using ELISA (n= 115). Statistics via t-test and sensitivity/specificity analysis via SAS version 9.2.

RESULTS: All patients mechanically ventilated at admission and approximately 60% of patients in both groups diagnosed with infection during ICU stay. By chance, subgroup measured via Mesoscale experienced 25% mortality, while the IL-8 group experienced 33% mortality (difference not significant). IL-8 levels at ICU admission were significantly elevated in patients who died within 28 days post-ICU admission (mean-210.4 pg/ml +/-320.1) when compared to those still living (mean-82.5 pg/ml +/-219.9, p=0.03). Day 1 IL-8 as a biomarker for ICU mortality had 95% specificity at a cut-off of 220 pg/ml. IL-10 levels were significantly higher in those who developed an infection (32.4pg/ml +/-54.2) during their ICU stay compared to those who did not (13.01pg/ml +/-19.8, p=0.005). Day 1 IL-10 as a biomarker for ICU infection had 93% specificity at a cut-off of 20 pg/ml. No significant findings observed in the other tested biomarkers.

DISCUSSION: In our data, IL-8 stood out as a biomarker with high specificity for mortality during ICU stay; IL-10 stood out as a marker with high specificity for development of infection during ICU stay. These markers may be used to identify patients who are most likely to benefit from enrollment in trials of an anti-inflammatory intervention in the ICU.

S-109.

DECISION-ASSIST (DA) MAINTAINS BLOOD PRESSURE WHILE REDUCING EXCESS FLUID ADMINISTRATION

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INTRODUCTION: Fluid therapy remains the cornerstone in treating shock. Direct endpoints of intravascular volume are rarely used to guide volume resuscitation. Fluid is often imprecisely delivered or administered based on formulas e.g., 3:1 ratio based on estimated volume loss. Clinically, hypovolemia and hypervolemia from under and over resuscitation are not uncommon sequelae from this practice. We have demonstrated that decision-assist (DA) systems, using a variety of endpoints e.g. blood pressure, can better achieve blood pressure and reduce fluid requirements compared to standard of care resuscitation in experimental hemorrhage. Our DA systems incorporate algorithms to systematically administer fluid based on a specific blood pressure. We anticipated that DA will better achieve target blood pressure and reduce infused volume in healthy volunteers undergoing hemorrhage.

METHODS: We measured the volumetric and hemodynamic responses of two different fluid regimens in paired healthy volunteers undergoing general anesthesia and hemorrhage. Each subject (n=5) participated in two separate studies: 1) Standard of Care = fixed 30 mL/kg lactated Ringers (LR) fluid bolus over 20 min (SOC), or 2) DA = LR given based on a specific blood pressure. Baseline plasma volume was determined using indocyanine green (ICG). Serial hematocrit samples were taken over time to calculate change in plasma volume (PV). General anesthesia was induced at T-30 and maintained throughout entire study duration with propofol. Hemorrhage was initiated at T0 - T20. Fluid was administered as a fixed dose (SOC) or by DA. Effects of fluid resuscitation on PV, urinary output (UO) and extravascular volume ((EVV) (fluid in - blood out - UO + fluid in)) and hemodyamics were recorded for 120 minutes (T120). At T120, final samples were recorded and the hemorrhage blood was re-infused.

RESULTS: Blood pressure target was better achieved with DA. Other hemodynamic endpoints were similar. PV (mL/kg) was greater in SOC versus DA (18.6±1.5 and 3.0±0.0 respectively at T20) but by end of study (T120), the difference in plasma volume expansion was lessened (SOC =8.3±1.1 and D-A = 3.2±0.5). SOC was associated with a modest diuresis. Extra vascular volume was significantly greater in SOC versus DA with 50% of the infused volume in the EVV.

DISCUSSION: Formula based fluid regimen (SOC) was associated with excess volume and even reductions in blood pressure (target) when infused during mild hemorrhage. Although a higher PV was initially observed, this was transient and excess EVV (interstitial) was retained. This physiologic cost of fluid excess could be detrimental. Our data suggests that DA study can better achieve target blood pressure and normovolemia while logistically reducing volume needs in humans undergoing hemorrhage.

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Hemodynamic and Volumetric Responses

	Time (min)	-60	0	20	60	120
		Mean±SEM	Mean±SEM	Mean±SEM	Mean±SEM	Mean±SEM
CO (L/min)	SOC	4.8±0.2	4.8±0.2	5.6± 0.3	6.2±1.0	6.3±0.2
	DA	5.1±0.2	4.7±0.5	5.0± 1.0	5.4±0.6	5.5±0.2
HR (bpm)	SOC	64±6	68±5	73±6	84±7	78±7
	DA	66±5	64±1	78±8	83±9	79± 6
MAP (mmHg)	SOC	83± 5	61±4	55±0.6	61±1	67± 3
	DA	84±5	68±2	70±5	73±5	73± 5
Fluid In (mL/kg)	SOC	-	-	30.0± 0	30.0± 0	30.0± 0
	DA	-	-	1.7± 1.5	1.8±1.5	5.7±2.8
PV (mL/kg)	SOC	-	-	18.6± 1.5	8.8±0.2	8.3±1.1
	DA	-	-	3.0± 0.0	2.8±0.5	3.2± 0.5
UO (mL/kg)	SOC	-	-	1.4±1.1	5.2±1.1	7.2±1.9
	DA	-	-	0.7±0.4	1.2±.4	2.8±0.9
EVV (mL/kg)	SOC	-	-	10.0±1.5	16.1±1.5	14.5±1.8
	DA	-	-	-1.2±1.7	-0.7±1.5	-1.2±2.5

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S-110.

BRAIN NATRIURETIC PEPTIDE IMPROVES FUNCTIONAL OUTCOME AFTER ACUTE BRAIN INJURY IN MICE

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INTRODUCTION: Brain natriuretic peptide (BNP) has long been associated with the inflammatory response to acute heart failure; however, there is emerging evidence to suggest that BNP is elevated after acute CNS injury as well. Endogenous BNP may play an adaptive role in recovery from brain injury, possibly through augmentation of cerebral blood flow (CBF) during the acute phase. Through a series of experiments, we tested the hypothesis that administration of the exogenous, recombinant human BNP analog (nesiritide) would improve functional neurological outcomes by improving cerebral blood flow after different acute CNS injury mechanisms. METHODS. C57 wild-type mice (n=8/group) were exposed to either pneumatic compression-induced closed traumatic brain injury (TBI) or collagenase-induced intracerebral hemorrhage (ICH). After injury, either nesiritide (hBNP) (8μg/kg) or normal saline were administered via tail vein injection at 30 min and 4 h. Mice then underwent functional neurological testing via rotorod latency over the following 7 days and neurocognitive testing via Morris water maze from days 28 to 32. In TBI mice, cerebral blood flow (CBF) was assessed by Laser Doppler after injection of hBNP from 25 to 90 min following injury. In separate cohorts of ICH injured mice (n=6/group), real time-PCR for inflammatory cytokine mRNA (TNF-α, IL-6, and eNOS) and histochemical staining for activated microglia (F4/80) and neuronal degeneration (Flouro-jade B) were evaluated during the acute injury phase (<24 h). RESULTS. Following TBI and ICH, administration of hBNP was associated with improved functional performance as assessed by rotorod and Morris water maze latencies ($p<0.01$). Sustained cerebral blood flow was increased ($p<0.05$) after TBI in mice treated with hBNP. After ICH, inflammatory markers (TNF-α and IL-6; $p<0.05$) at 4 h, activated microglial (F4/80; $p<0.05$) at 6 and 24 h, and neuronal degeneration (Flouro-jade B; $p<0.05$) at 24 h were reduced in mice receiving hBNP. DISCUSSION. Recombinant human BNP (nesiritide) improves neurological function after injury in murine models of TBI and ICH. The beneficial effects of hBNP were associated with enhanced cerebral blood flow and down-regulation of neuroinflammatory responses with resultant decreases neuronal degeneration. Nesiritide may represent a novel treatment strategy after acute CNS injury. Further dose-response and administration timing curves remain to be clarified.

Laser Doppler CBF study over the left middle cerebral artery distribution from 25 to 90 min after TBI in mice either given nesiritide (8 μg/kg) or saline by tail vein injection at 30 min or untreated (sham) after injury. Mice given nesiritide demonstrated a significant increase in CBF over the 65 min of monitoring (* $p<0.05$). Of note, all mice demonstrated nearly 50% initial reduction of CBF when compared to uninjured animals, and CBF of nesiritide treated animals returned to near pre-injury levels within 40 min after treatment.

S-111.

ASPHYXIAL HYPOXIC PRECONDITIONING INDUCES NEUROPROTECTIVE EFFECT VIA ACTIVATION OF TOLL-LIKE RECEPTOR 4 SIGNAL PATHWAY IN RATS

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INTRODUCTION: Hypoxic preconditioning (HP) induces neuroprotective effect against cerebral ischemia, but the mechanism still remains unclear. In this study, we investigated whether Toll like receptor 4 (TLR4) signal pathway was involved in cerebral ischemic tolerance. Methods:According to the treatment of HP and asphyxial cardiac arrest (ACA), rats were assigned to ACA group, HP + ACA group, HP group and Sham group. Results:Rat mortality was 5% in HP + ACA group and 30% in ACA group ($P<0.01$); Neurofunctional scores in HP and HP + ACA group were lower than in ACA group ($P<0.05$). Compared with Sham group, TLR4 mRNA expression, NF-kB activity and the production of TNF-α and IL-6 in HP or HP+ACA or ACA group were significantly increased. The increase was progressively significant in groups (AHP < AHP + ACA < ACA) ($P<0.01$). Conclusion:HP induced mild inflammation via activating TLR4 signal pathway, and then further inhibited inflammatory response induced by ACA.

S-112.

EFFECT OF LIPOXIN A4 ON EXPRESSION OF AQUAPORIN 1 and 3 and 5 IN ALVEOLAR TYPE II CELLS OF RAT

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INTRODUCTION: Endotoxin causes acute lung injury (ALI) which results in pulmonary edema and the deterioration of gas exchange[1]. It has been appreciated that aquaporin play an important role in lung edema clearance[2]. lipoxin A4 is eicosanoid generated during inflammation via transcellular biosynthetic routes that elicit distinct anti-inflammatory and pro-resolution bioactions[3]. Our previous experiments have showed that posttreatment with lipoxin A4 significantly reduces LPS-induced pulmonary edema[4]. However,what the underlying mechanisms remain unclear. The purpose of this investigation was to study the role of Lipoxin A4(LXA4) on the expression of aquaporin (AQP)1,3,5 in ATII epithelial cells of rat treated with lipopolysaccharide (LPS).

METHODS: ATII Epithelial cells were isolated and puritfied[5]. Then ATII Epithelial cells were divided randomly into five groups :control group (PBS); vehiculum group (alcohol,0.7ul/ml); LXA4 group(LXA4,1×10-7mol/ml); endotoxin group (LPS,1ug/ml) and LXA4+LPS group(LPS 1ug/ml + LXA41×10-7mol/ml). The mRNA of aquaporin(AQP)1,3,5 in ATII cells were detected by reversal transcription poly chain reaction (RT-PCR), and the expression of AQP1,3,5 protein was detected by immunohistochemistry (IHC).

RESULTS: Compared with control group, the expression of AQP1,3,5 mRNA and protein of ATII cells were significantly descended in LPS group ($P<0.01$) after stimulation with LPS for 4 hours. However, the expression of AQP1,3,5 mRNA and protein were up-regulated in LXA4 group ($P<0.01$ vs control group). Compared with LPS group, the expression of AQP1,3,5 mRNA and protein levels in LXA4+LPS group were significantly increased ($P<0.01$ vs LPS group).

DISCUSION: The pro-resolving mediator LXA4 can up-regulate the mRNA and protein expression levels of aquaporin 1,3,5 in ATIIEpithelial cells of rat treated with LPS. These findings suggest that LXA4 plays important role in lung edema clearance in LPS-induced lung injury, and the role is likely due to up-regulate the mRNA and protein expression of aquaporin 1,3,5 in ATII Epithelial cells

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S-113.

EFFICIENT METHODS FOR TESTING THE ASSOCIATION OF INNATE IMMUNITY GENE VARIANTS WITH PEDIATRIC SEPSIS

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INTRODUCTION: Septicemia is the 10th leading cause of mortality among Americans of all ages. The fatality has improved over time, mainly from improvements in supportive and antibiotic therapy. Encouragingly, molecular and genetic research has recently implicated elements of the innate immune pathway as targets for needed translational therapeutics. However, clinical severe sepsis phenotypes can be difficult to study, for reasons including difficulty in case recruitment, suitable control selection, and the presence of confounding factors, including population stratification. Two popular study designs are unrelated case-control association and full father-mother-affected children trios. The latter are especially appealing due to freedom from population stratification bias, which can result from cases and controls that differ in allele frequencies due to population membership rather than disease. In addition, the statistical inferences from these two study designs have been well established. However, more complex statistical situations arise in case-control studies by recruiting relations of cases, or when the reality of imperfect clinical sample recruitment and collection results in missing parents and/or children. Our study utilizes a unique dataset, 75 children involved in a completed clinical trial of severe pediatric sepsis and 85 of their parents.

METHODS: In our study, we tested the association of 123 single nucleotide polymorphisms (SNPs) in innate immunity genes with severe pediatric sepsis, using the Illumina Human CVD Beadchip platform, which contains many validated tagging SNPs found in immunity, coagulation, cardiovascular disease, and inflammation pathways. Most of the known, common coding variation in 96 innate immunity genes was captured among these tagSNPs. A simple transmission equilibrium test (TDT) is a robust test of linkage and association but requires full trios. With incomplete family recruitment, as we had in our dataset, the missing data must be inferred in dyads before the test of association is performed. A variety of methods have developed recently to address these problems, and we focus our attention on four methods: a conditional likelihood (Epstein, 2005), weighted least-squares (Chen, 2008), expectation-maximization (EM) algorithm (Hsu, 2009), and EM-haplotype relative risk (Guo, 2009). Simulations were performed to evaluate which method had the optimal power for our unique dataset, which can be extended to many other possible combinations of related and unrelated cases and controls.

RESULTS: Using these methods of imputation, we have found variants that have been previously associated with sepsis, eg, lymphotoxin alpha (LTA) ($p<0.01$) as well as others, including integrin alpha M (ITGAM).

DISCUSSION: The significant associations in this study were found using newly developed statistical tools to make efficient use of limited clinical resources. These finding require additional validation in other samples.

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S-114.

INVESTIGATION THE RELATIONSHIP WITH SYETEMIC CIRCURATION AND REGIONAL CEREBRAL OXYGEN SATURATION DURING THE CARDIOPULMONARY BYPASS

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INTRODUCTION: It is important for us to estimate the cerebral oxygen supply under anesthesia, especially, during the cardiopulmonary bypass (CPB). However, the evaluation whether the sufficient oxygen are supplied is difficult. The purpose of this study was to investigate whether systemic circulation reflected cerebral desaturation in patients who had been received cardiac surgery with CPB.

METHODS: This prospective study carried out in 16 adult patients who underwent coronary artery bypass graft, valve replacement, ASD closure or VSD closure at our hospital. Infrared spectroscopic soma sensor (INVOS) were placed on the patient's left and right frontal head to continuously monitor the regional cerebral oxygen saturation (SrO_2). The internal jugular vein was cannulated for measurement of central vein pressure (CVP) and central venous oxygen saturation (SvO_2). The value of SrO_2, SvO_2 and systolic and mean arterial pressure (SAP, MAP) were recorded before CPB and every 15 minutes after CPB induction. The data obtained were statistically analyzed and presented by Student's t-test and one-factor ANOVA and two-factor factorial ANOVA.

Results: There were significant relationship with MAP and SrO2 ($p < 0.05$), not but with SAP and SrO2. Low MAP induced to decrease SrO2. When MAP were less than 40 mmHg, SrO2 decreased 6 ~ 8 % compared with the level of pre-CPB. No evident changes were seen between CVP and SrO2. There were significant correlation between SvO2 and SrO2 ($p < 0.05$). Decrease of SvO2 involved low SrO2. At the level that SvO2 was more than 70 %, the value of SrO2 kept the level of pre-CPB. However, about 10 % SrO2 decrease compared with pre-CPB had been induced at the level of less than 65 % SvO_2.

DISCUSSION: We investigated whether arterial pressure, CVP and SvO_2 reflected cerebral desaturation during CPB. Some have reported that SrO_2 reflected cerebral blood perfusion and oxygen supply. It was showed that MAP affected the cerebral oxygen supply. The significant correlation was found between MAP and SrO_2 demonstrated the importance to keep appropriate MAP during CPB. However various factors decreased SrO_2 at the proper level of MAP, it is unable to estimate the cerebral oxygen supply by only MAP. The involvement of SvO_2 and SrO_2 was proved. This study showed that SvO_2 was utility to evaluate cerebral oxygenation.

S-115.

THE VALUE OF MONITORING SERUM ANGIOPOIETIN-2 LEVEL IN CRATICALLY ILL PATIENTS

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INTRODUCTION: Angioietin (Ang)-2 ia an endothelium-specfic growth factor , regulated by pro-inflammatory stimuli, that destablizes endothelium and increase vascular leakage; consequently, Ang-2 may contribute to sepsis pathophysiology. (1) We studied serum Ang-2 levels in critically-ill patients and investigated potential relationships with inflammatory meditors e.g.tumour necrosis factor alpha (TNF-alpha) and C-reactive protien (CRP) and whether circulating Ang-2 predict survival in a cohort of critically ill medical patients with sepsis.Patients and methods: Eighty ICU patients were grouped according to their septic stageas having: no systemic inflammatorty syndrome (n=15), systemic inflammatory response syndrome(SIRS) (n=12), sepsis(n=16) severe sepsis(n=18).and septic shock (n=19). Circulating Ang-2 and TNF-alpha were prospectively measured in the sera with ELISA, C-reactive protein was measured by latex agglutination teast. Survival after 30 days of the primary outcome was studied. Results: Serum Ang-2 levels were significantly increased in sepsis as compared to patients with no systemic inflammatory response syndrome.Positve linear releation were observed with both serum tumour necrosis factor-alpha and CRP. Kaplan Meier curves of 30-days survival confirmed a strong prognostic impact of highs Ang-2 as a novel marker of survival. Discussion:Serum Ang-2 is increased in patients with SIRS, sepsis , severe sepsis , septic shock and there is strong relationship of serum Ang-2with serum TNF-alphaand CRP. Ang-2 may used as a powerful predictor of outcome in ICU septic patients.

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S-116.

DIAGNOSING DIAPHRAGMATIC PARALYSIS WITH CONTINUOUS DIAPHRAGMATIC MUSCLE ACTIVITY MONITORING DURING MECHANICAL VENTILATION

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INTRODUCTION: Neurally adjusted ventilator assistance (NAVA) is a new mode of mechanical ventilation that uses a special esophogeogastric tube with embedded electrodes to detect diaphragm contractility signals (Edi). The Edi signal improves assist trigger sensitivity and generates a customized level of pneumatic support to avoid over-assistance.[1,2] Diaphragmatic paralysis after liver transplantation (OLTX) has been described and is difficult to objectively diagnose at the bedside. As part of an ongoing assessment of NAVA, we diagnosed three cases of diaphragmatic paralysis post-OLTX.

METHODS: We identified critically ill patients who were capable of breathing spontaneously but were not ready to extubate or who had failed a previous extubation attempt. An esophogeogastric Edi catheter was inserted and Edi signals were measured and displayed on the ventilator's monitor. When an Edi signal of less than 2 μV was displayed on the monitor despite satisfactory catheter positioning, a transthoracic ultrasound was performed to assess diaphragmatic muscular activity.

RESULTS: We identified three patients who failed to remain extubated after passing a thirty minute spontaneous breathing trial with CPAP pneumatically triggered breaths. Correct Edi catheter positioning was verified but Edi signals were not detected despite the presence of patient generated pneumatic breath-cycles. Transthoracic ultrasound revealed diaphragmatic paralysis; unilateral in one case and bilateral in two.

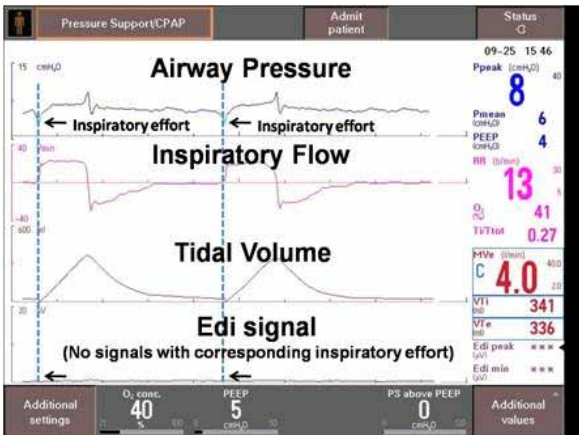

Fig. 1 (No Edi signal detected): The airway pressure scalar waveform demonstrates two patient triggered pneumatical breaths with a rise in corresponding inspiratory flow and tidal volume scalar waveforms. Airway pressure, inspiratory flow, and volume increases simultaneously with two pneumatically triggered breaths. No corresponding Edi signal is present during patient triggered breaths. Triggering of the ventilator at the beginning of inspiration is a result of accessory muscle recruitment.

DISCUSSION: Our findings reveal that patients may pneumatically trigger assisted breaths during mechanical ventilation despite having bilateral diaphragmatic paralysis. Recruitment of accessory muscles may account for why pneumatic breath triggering occurs in the presence of bilateral diaphragmatic paralysis and could partly explain failed extubation attempts in this patient population. The Edi catheter assisted in bedside observation of diaphragmatic paralysis that was then confirmed by ultrasound. Our observations confirm that diaphragmatic paralysis can be a contributing factor with failing to successfully liberate patients from mechanical ventilation despite having passed standard weaning index assessments. The NAVA catheter can be used as an assessment adjunct to evaluate diaphragm atic function in mechanical ventilated patients.

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S-117.

THE VALUE OF MONITORING SERUM LEPTIN IN CRITICALLY ILL PATIENTS

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INTRODUCTION: Severe infection and sepsis are common causes of morbidity and mortality. Early diagnosis in critically ill patients is important to reduce these complications. (1) The present study was conducted to determine the role of leptin at early diagnosis and differentiation in critically ill patients, in comparison with C-reactive protein (CRP), interlukin-6 (IL-6) and tumor necrosis factor-α (TNF-α). Patients and method: One hundred and six adult intensive care unit (ICU) patients were observed. CRP, leptin, IL-6 and TNF-α were compared among the following groups: Sepsis group (n=40), systemic inflammatory response syndrome (SIRS) group (n=34) and non-systemic inflammatory response syndrome (non-SIRS) group (n=32).Results: Non-significant differences were observed among patients in different groups regarding biomarkers on the day of ICU admission. On the 2nd day of ICU admission, significant elevation of leptin, IL-6, TNF-α occurred in SIRS and sepsis groups . Delayed elevation of CRP started on the fourth day of ICU admission in patients with sepsis. At the end of the 1st week, only CRP level was elevated in septic patients. Discussion: Serum leptin correlates well with serum level of IL-6 and TNF-α. Leptin helps to differentiate SIRS from Non-SIRS patients. CRP is a classic marker of sepsis but is of late onset.

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S-118.

EFFECTS OF HYPEROXIA ON HEME OXYGENASE-1 EXPRESSION, HEME OXYGENASE ACTIVITY, AND LUNG INJURY IN RAT PUPS

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BACKGROUND: The clinical treatment of respiratory failure often requires supplemental oxygen therapy. Prolonged exposure to an elevated oxygen tension (hyperoxia) in animal models causes acute and chronic lung injury that resembles acute respiratory distress syndrome. Although heme oxygenase-1 (HO-1) has been implicated in the pulmonary response to oxygen, the role of HO-1 in mediating acute lung injury is unclear. Therefore, the purpose of the present study is to investigate the effects of hyperoxia on HO-1 expression, HO activity, and lung injury in rat pups.

MATERIALS AND METHODS: The study used 30-d-old male Sprague-Dawley rat pups exposed to hyperoxic or normoxic conditions for 72 h as approved by the Institutional Review Board of the Animal Resource Center. The hyperoxia groups were placed in a Plexiglas chamber with continuous flow of oxygen, and oxygen concentration (> 92%) in the chamber was monitored with an oxygen monitor. The normoxic pups were housed in an open cage. A total of 24 rats were randomly assigned to three groups of eight pups as follows: 1) normoxia; 2) hyperoxia; 3) hyperoxia/HO-1 inhibitor with zinc protoporphyrin (50 μmol/kg/day, s.c.). After 72 h of exposure, the animals were compared for lung wet-to-dry weight ratio (W/D), HO activity, expression of HO-1 mRNA, HO-1 protein levels in bronchoalveolar lavage fluid (BALF) and histology.

RESULTS: Compared with those in normoxia group, lung W/D, the expression of HO-1 mRNA, the HO-1 protein levels in BALF, and the activity of HO in hyperoxia group were significantly increased. The treatment of HO-1 inhibitor decreased the activity of HO, but inreased lung W/D and augmented the extent of hyperoxic lung injury.

CONCLUSION: Hyperoxic exposure significantly increased lung W/D, the expression of HO-1, HO activity and induced histologic changes of interstitial and alveolar edema; furthermore, these hyperoxia-induced histologic changes were aggravated by the administration of HO inhibitor. We conclude that up-regulated HO-1 expression and increased HO activity during hyperoxic exposure in rat pups might be a host protective response against lung injury.

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S-119.

EPIDERMAL GROWTH FACTOR PRESERVES INTESTINAL INTEGRITY AND IMPROVES SURVIVAL IN A MURINE MODEL OF PSEUDOMONAS AERUGINOSA PNEUMONIA-INDUCED SEPSIS

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INTRODUCTION: Systemic administration of epidermal growth factor (EGF) attenuates intestinal injury and decreases mortality in peritonitis-induced sepsis[1]. However, the role of EGF in sepsis caused by extra-abdominal infection is unknown. We hypothesized that EGF preserves intestinal integrity and decreases mortality in P. aeruginosa pneumonia-induced sepsis.

METHODS: Mice were intratracheally instilled with 40 μl of P. aeruginosa (2-4 x 108 CFU) or saline, and were treated with or without EGF (150 μg/kg/d i.p.). All mice received antibiotics. At 24 hr, pulmonary pathology and myeloperoxidase (MPO) activity in lung tissue and bronchoalveolar lavage (BAL) fluid was evaluated. Intestines were evaluated for apoptosis by caspase-3 staining, proliferation by BrdU staining, and villus length. Systemic cytokines levels were measured by multiplex array. For survival studies, EGF was administered immediately postoperatively or 24 hr later and mice were followed for 7 days. To determine if EGF protection is intestine-specific, transgenic mice that overexpress EGF exclusively in enterocytes and wild-type mice were subjected to pneumonia and followed 7 days for survival.

RESULTS: Septic mice had increased lung inflammation compared to shams, as evident from histological evaluation of lungs and elevated MPO activity in lungs and BAL fluid; however, these parameters were unaffected by EGF treatment. Compared to shams, septic mice had increased intestinal apoptosis (11±1 vs. 4±1 cells/100 crypts; $p<0.001$), while EGF normalized apoptosis to shams (7±1 cells/100 crypts; p=ns). Septic mice had decreased intestinal proliferation compared to shams (672±54 cells/100 crypts vs. 1170±33 cells/100 crypts; $p<0.001$). In contrast, EGF increased intestinal proliferation compared to septic mice (858±55 cells/100 crypts vs. 672±54 cells/100 crypts; $p<0.05$); however, EGF did not result in complete restitution of the proliferative response to sham levels. Septic mice had shorter villi compared to shams (244.5 μm±7.4 vs. 422.2 μm±8.3; $p<0.001$). In contrast, EGF increased villus length compared to septic mice (386.4 μm±13.2 vs. 244.5 μm±7.4; $p<0.001$); however, EGF was not able to fully restore villus length to sham levels. The cytokines IL-6 and G-CSF were increased in septic mice compared to shams, regardless of EGF treatment. Septic mice given EGF immediately after the onset of sepsis had improved survival compared to untreated septic mice (90% vs. 35%; $p<0.001$), which was maintained even when EGF treatment was delayed for 24 hr (73%; $p<0.05$). Septic mice that overexpress EGF exclusively in enterocytes had improved survival compared to wild-type septic mice ($p<0.05$).

DISCUSSION: EGF preserves intestinal integrity and improves survival in pneumonia-induced sepsis; thus, the protective effects of EGF are not specific to the anatomical site or type of infection. Further, EGF protection appears to be mediated in an intestine-specific fashion. Therefore, EGF may be a novel therapeutic agent for the treatment of sepsis.

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S-120.

LARYNGEAL FRACTURE IN A PEDIATRIC PATIENT

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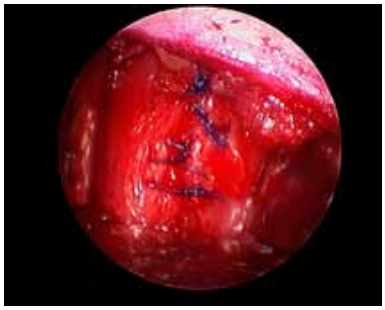
INTRODUCTION: Open or closed injuries to the larynx and trachea can occur from direct trauma but are unusual in children due to the relatively high position of the larynx in the neck. Closed injury is associated with high prehospital mortality.

CASE REPORT: A 10 year old boy had fallen onto a park bench striking his neck. He was sent home with mild pain in his neck. Later that evening, he had shortness of breath, tachypnea, voice change and episodes of non bloody emesis. He was taken to a local hospital and immediately transferred to a tertiary care academic medical center. Physical examination was notable for signs of abrasion on the anterior neck, and the presence of significant crepitus in the upper chest. A computed tomography showed laryngeal rupture with extensive subcutaneous air tracking into the mediastinum. As the pediatric laryngeal framework is cartilaginous, fractures were not able to be radiographically discerned. Cervical spine injury was ruled out. A flexible nasopharyngolarngoscopy demonstrated a patent airway. The patient was brought to the operating room, spontaneously breathing. Premedication with intravenous midazolam 0.05 mg/kg was administered. Anesthesia was initiated with sevoflurane in O2, fentanyl 1 mcg /kg and propofol 1.5 mg/kg to keep the patient spontaneously breathing and anesthetized. Anesthesia was maintained with an intravenous propofol infusion at 300 mcg/kg/min. A Parsons laryngoscope was used to cannulate the upper airway. It was grade 1 view. Topical lidocaine was sprayed. There was massive edema of the left vocal fold with hematoma and ecchymosis in the ventricle. Bronchoscopy and rigid esophagoscopy did not show evidence of esophageal injury or trauma. The patient was atraumatically intubated with a 5 mm ID endotracheal tube. The neck was explored, there was a fracture extending from the laryngeal prominence of the thyroid cartilage inferiorly, extending approximately 2 cm and deviating towards the left side. Approximation of the fractured wound edges was made (Fig. 1) and a Penrose drain placed. A conscious decision was made not to place a tracheostomy at this time. The patient tolerated the procedure well and was transferred intubated to the intensive care unit. A successful tracheal extubation after a direct laryngoscopy and bronchoscopy was done on post-operative day four. There were no complications.

DISCUSSION: Blunt trauma to the larynx is an uncommon, often fatal injury. Conventional management consists of awake tracheostomy (1). Spontaneous ventilation while maintaining adequate level of anesthesia and careful handling of the airway allowed direct repair of this laryngeal trauma. Excessive positive pressure by face mask, coughing, struggling, nitrous oxide, cricoid pressure, and overzealous attempts at intubation may result in further airway damage and should be avoided as were done in this case.



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S-121.

WITHDRAWN.

S-122.

PREOPERATIVE INHALED STEROIDS DID NOT PROTECT AGAINST EARLY POSTOPERATIVE ACUTE LUNG INJURY (ALI)

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INTRODUCTION: Acute lung injury (ALI) is a devastating postoperative complication with an estimated mortality exceeding 45% in certain surgical populations [1,2]. The pathogenesis of ALI is believed largely mediated by activation of the inflammatory cascade[3]. Systemic corticosteroids may attenuate this inflammatory process, but their risk/benefit ratio in ALI remains a matter of debate[4]. Inhaled corticosteroids are an attractive alternative as they may afford similar efficacy with an improved safety profile by delivering medication to the organ of interest while avoiding the associated systemic immunosuppressive effects[5]. The objective of this study was to evaluate inhaled steroids as a potential ALI prevention measure in patients undergoing elective high-risk surgery.

METHODS: After IRB approval, we performed an unmatched case control evaluation of preoperative inhaled steroids as potential risk modifiers for early postoperative ALI. The study population included consecutive patients undergoing elective high-risk surgery under general anesthesia with an expected duration > 3 hours. Postoperative ALI was considered present if American-European Consensus Conference criteria for ALI were met within the first 5 postoperative days[6]. The use of inhaled steroids prior to surgical procedure was determined by an independent investigator. Univariate analysis was performed to evaluate the association between preoperative inhaled steroids and postoperative ALI. Subgroup analysis was performed after stratification by the presence of chronic obstructive pulmonary disease (COPD).

RESULTS: Out of 4377 surgical patients, 113 developed post-operative ALI (cases). Cases were compared to 4264 controls. Fourteen cases (12%) and 227 controls (5%) were receiving inhaled steroids at the time of their surgical procedure. Initial univariate analysis suggested an association between preoperative inhaled steroids and postoperative ALI (odds ratio - OR = 2.5, 95% CI 1.4 to 4.4, p = 0.001). COPD was also associated with postoperative ALI ($p < 0.001$). After stratifying patients by the presence of COPD, no association between preoperative inhaled corticosteroids and early postoperative ALI was found (OR = 0.9, 95% CI 0.3 to 2.7, p = 0.87).

DISCUSSION: After adjusting for the presence of COPD, the use of preoperative inhaled steroids was not associated with early postoperative ALI. COPD was strongly associated with the development of postoperative ALI. This association warrants additional evaluation.

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S-123.

HEAT SHOCK PROTEIN 70 PREDICTS OUTCOME IN ADULT INTENSIVE CARE UNIT PATIENTS

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INTRODUCTION: Heat Shock Protein 70 (HSP70) is a stress response protein vital to cellular survival following injury and illness. Increased HSP70 levels have been associated with improved outcome in experimental myocardial and lung injury models, as well as in vivo experimental sepsis. As the relationship between HSP70 expression and clinical outcome in an adult ICU population is currently unknown, our hypothesis was that increased plasma HSP70 expression during ICU admission would correlate with improved 28-day survival post-ICU admission.

METHODS: 82 critically ill patients had blood collected for seven days during their ICU stay for plasma HSP70 (pHSP70) levels. These patients came from a non-selected subgroup of 200 patients enrolled in a prospective observational ICU trial. Plasma was analyzed for HSP70 using MesoScale Descovery technology (Gaithersburg, MD). All data was analyzed via t-test for significance, and all percent change data is given as a ratio of day seven post-ICU admission to the day of admission.

RESULTS: Patients alive 28 days post-ICU admission showed lower admission pHSP70 than patients who expired during this time (46.716 ng/mL vs 102.19 ng/mL, p=0.01) but showed increasing pHSP70 levels during the first seven days (111.39% of baseline vs 88.77%, p=0.05). pHSP70 as a biomarker to predict mortality had a specificity of over 90%. Additionally, patients who developed an infection during the 28 days of observation had an increase in pHSP70 from day 1 to day 7 post-ICU admit while non-infected patients had a decrease (115.09% of baseline vs 69.74%, p=0.0003). Of the infected patients, those who were still alive on day 28 post-ICU admission had an increase in pHSP70, while those patients who expired showed a decrease (121.17% of baseline vs 90.34%, p=0.03). Patients remaining in the hospital on day 14 post-ICU admission had lower pHSP70 concentrations than patients who had been discharged (45.38 ng/mL vs 93.88 ng/mL, p=0.03).

DISCUSSION: Our data reveals that increasing levels of pHSP70 over time are beneficial to survival and survival post-infection. It also shows HSP70 may be a very early marker of increased risk of infection and death, as plasma concentrations upon admission to the ICU are higher in patients who ultimately expire. This may be a useful tool for early prediction of ICU survival. Finally, this data indicates that pharmacologic enhancement of HSP70 expression in ICU patient may lead to improved clinical outcomes.

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COMPARISON OF AIRWAYSCOPE® AND VIDEOLARYNGOSCOPE PORTABLE VLP100® IN THE PRESENCE OF A NECK COLLAR -A MANIKIN STUDY

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INTRODUCTION: When the patients with unstable cervical spine goes in operation room, they often requires a neck collar. We reported that the Airwayscope® (AWS) is more effective than the Standard Macintosh laryngoscope (ML) for tracheal intubation in patients with restricted neck movements before.(1) We compared ML, AWS , and coopdeck videolaryngoscope portable VLP-100® (VLP-100) in a manikin model with the presence of a neck collar .

METHODS: After obtaining the approval of the hospital ethics committee and informed consent from healthy volunteers , the present study was scheduled. We conducted a prospective study in 20 medical residents with little prior airway management experience. They inserted the AWS, VLP100 and ML, in turn, in a Laerdal Airman manikin® with neck collar and the view of the glottis at laryngoscopy was graded, using a classification reported by Cormack and Lehane. Tracheal intubation time and the success rate of tracheal intubation (with in 120sec) was also recorded.

RESULTS: All residents successfully intubated (100%) and the glottis was always clearly seen (grade1) with AWS. The average time taken for tracheal intubation was 21 s with AWS. The view of the glottis was significantly better with the VLP-100 than with the ML. VLP-100 resulted in a higher percentage of successful intubation than ML. For the ML, 2 residents obscured grade 2, 12 residents obscured grade 3, 6 residents obscured grade 4 in the view of glottis. Tracheal intubation using the ML was successful in 2 resident (20%). The average time taken for tracheal intubation was 75 s with ML. Whereas for VLP-100, 8 residents obscured grade 2, 8 residents obscured grade 3 , 4 resident obscured grade 4 in the view of glottis. The average time taken for tracheal intubation was 51 s with VLP-100. Tracheal intubation using the VLP-100 was successful in 8 resident (40%). The AWS provided a best view of the glottis, a most shortest tracheal intubation time and a higher success rate of tracheal intubation, compared with VLP-100 and Macintosh laryngoscope.

DISCUSSION: The AWS may possess advantages over conventional direct laryngoscopes in patient with restricted neck movement.

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S-125.

TRADITIONAL VITAL SIGNS VERSUS MUSCLE O_2 (StO_2) VERSUS CENTRAL VENOUS O_2 ($ScvO_2$) AS EARLY INDICATORS OF HYPOVOLEMIA IN A SWINE MODEL

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BACKGROUND: Early hypovolemia with ongoing blood loss can rapidly decompensate to inadequate perfusion and circulatory shock. The challenge is that the early diagnosis of hypovolemia is difficult in the absence of measurements that reflect the physiologic responses associated with the compensatory mechanisms of shock. Hypothesis: A measure that includes a continuous indicator of changes in oxygenation is a better tool for the early detection of hypovolemia than standard hemodynamic measurements. The aim of this study was to determine the predictive power of non-invasive and minimally invasive monitoring to detect early hypovolemic status during acute hemorrhage.

METHODS: We evaluated the predictive power of traditional vital signs - heart rate (HR), mean arterial pressure (MAP), and systolic blood pressure (SBP), together with continuous pulmonary end-tidal CO_2 ($ETCO_2$), dynamic indices - continuous cardiac output (CO), and oxygenation indices - central venous saturation ($ScvO_2$), and muscle oxygenation (StO_2) - in seven propofol-anesthetized swine. Swine were instrumented with arterial and venous catheters that were connected to HP vital signs monitor (MAP, HR, and SBP), and Edwards VigileoTM monitor (CO and $ScvO_2$). $ETCO_2$ was recorded using a Capnostream 20TM (Oridion) and StO_2 using recorded from an InspectraTM (Hutchinson). After 30 minutes of baseline period, each pig underwent 15 ml/kg hemorrhage over 30 minutes. We analyzed data from each progressive 2 ml/kg increment of hemorrhage until 12ml/kg and at 15ml/kg hemorrhage, using Receiver Operating Characteristic (ROC) curve to assess the variables versus hemorrhage or no hemorrhage. Prism Software was used to calculate the ROC curves. All variables were analyzed by three different methods: actual values, % change from baseline, and Δ change from baseline. The immediate prehemorrhage time point data was compared to randomized baseline data and the hemorrhage time-points data. Area Under the Curve (AUC), an estimate of the probability of correctly identifying an injured case, greater than 0.9 was chosen as the threshold level to predict blood loss in this study.

RESULTS: The majority of the variables were significantly predictive of a large hemorrhage (15 ml/kg), but only a subset had significant predictive power with smaller hemorrhages. Table shows AUC for traditional vital signs and other indices (ROC curves analysis). Sensitive and specific predictive power for detection of early hypovolemia (2-4 ml/kg) was achieved by %SBP, followed by $\Delta ScvO_2$ and $\%ScvO_2$, ΔStO_2 and $\%StO_2$. The changes (Δ and %) of all variables were generally better predictors than the actual value in early hypovolemia.

DISCUSSION AND CONCLUSIONS: Diligent monitoring of specific variables could provide earlier recognition of occult hypovolemia, allowing intervention before the onset of significant impairment on vital organ perfusion.

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Variables \ Volume		2ml/kg	4ml/kg	6ml/kg	8ml/kg	10ml/kg	12ml/kg	15ml/kg
MAP	Actual	0.602	0.520	0.582	0.653	0.653	0.813	0.898
	Δ	0.837	0.837	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
	%	0.837	0.837	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
SBP	Actual	0.551	0.612	0.674	0.745	0.816	0.878	**0.929**
	Δ	0.878	0.898	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
	%	**0.908**	**0.929**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
HR	Actual	0.643	0.674	0.745	0.745	0.735	0.694	0.684
	Δ	0.837	0.816	0.796	0.796	0.755	0.755	0.755
	%	0.827	0.816	0.796	0.796	0.755	0.755	0.745
CO	Actual	0.582	0.684	0.735	0.684	0.898	**0.940**	**0.940**
	Δ	0.571	0.745	0.837	0.735	**0.918**	**1.0**	**1.0**
	%	0.582	0.745	0.837	0.745	0.898	**0.980**	**0.980**
$ETCO_2$	Actual	0.582	0.622	0.633	0.633	0.653	0.674	0.714
	Δ	0.622	0.674	0.730	0.725	0.796	0.827	0.878
	%	0.622	0.674	0.730	0.725	0.796	0.827	0.878
$ScvO_2$	Actual	0.582	0.571	0.634	0.622	0.694	0.714	0.816
	Δ	0.674	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
	%	0.674	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
StO_2	Actual	0.520	0.634	0.633	0.643	0.663	0.704	0.725
	Δ	0.776	**0.980**	**0.980**	**1.0**	**1.0**	**1.0**	**1.0**
	%	0.745	**0.970**	**0.970**	**1.0**	**1.0**	**1.0**	**1.0**

S-126.

IMPACT OF ACUTE LUNG INJURY ON POSTOPERATIVE MORTALITY

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INTRODUCTION: Patients with hypoxia due to a variety of reasons, including acute lung injury (ALI), may require anesthesia for surgery. It is unclear if ALI is an independent risk factor for surgery or if all causes of hypoxia contribute equally to surgical risk. Also, it has been shown that low tidal volume ventilation strategies improve outcome in ALI [1] and that anesthesiologists do a poor job of using small tidal volumes for patients with ALI undergoing surgery [2]. We sought to determine if ALI is a risk factor for death relative to other hypoxic patients undergoing surgery.

METHODS: Electronic patient data was screened for ABGs that had a PaO_2/FiO_2 ratio < 300 prior to going to the OR. An institutional perioperative data system was used to obtain patient history and intraoperative management data. These data were merged with an institutional ALI registry to determine if these patients had a preoperative diagnosis of ALI. Dates of death were incorporated from the Social Security Death Database. Univariate, multivariate, and propensity scored analysis were completed to determine preoperative and intraoperative predictors of death within 90 days.

RESULTS: 635 patients met criteria for inclusion. 159 had a preoperative diagnosis of ALI. Univariate analysis demonstrated that preoperative predictors of death included predicted body weight, age, ASA status, history of diabetes, hypertension, coronary artery disease, congestive heart failure, renal failure, liver disease, chronic obstructive pulmonary disease (COPD), preoperative P/F ratio, and ALI. Intraoperative predictors of mortality included urine output, median peak inspiratory pressure (PIP), median tidal volumes, and median FiO2. Evaluation of intraoperative management showed that patients with ALI preoperatively had significantly less crystalloid given, decreased urine output, required higher peak inspiratory pressures and inspired oxygen concentrations. Multivariate analysis found significant predictors of death to be age, ASA status and diabetes. Propensity scoring demonstrated several variables as independent predictors of 90 day mortality as shown in table 1.

DISCUSSION: As demonstrated in this study, many factors increase patient risk of 90 day mortality for patients undergoing surgery. Interestingly, patients with ALI have increased surgical risk when compared to patients with hypoxia from other causes. This suggests that the pathophysiology of ALI impacts more than just oxygenation. Knowing that use of low tidal volumes have been shown to improve patient outcome in patients with ALI, it would be reasonable to expect patient outcome to be dependent on intraoperative ventilator management. This effect was not demonstrated in this study.

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Table 1: Independent risk factors for 90 day mortality in patients with preoperative PaO2/FiO2 ratio

Preoperative comorbidity	Odds ratio	P value
Diabetes	9.866	<0.001
Hypertension	3.777	<0.001
Coronary artery disease	6.365	<0.001
Congestive heart failure	9.398	<0.001
Renal failure	28.361	<0.001
Liver disease	8.078	<0.001
COPD	4.997	<0.001
Pre-operative ALI	2.154	0.003
Sleep apnea	2.651	0.011

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WITHDRAWN.

S-128.

METHODS OF VENTILATION IN PATIENTS WITH SEVERE HYPOXIA UNDERGOING GENERAL ANESTHESIA

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INTRODUCTION: ARDS is a complex respiratory condition for which lung protective ventilation has been shown to reduce mortality[1]. In severe ARDS or severe hypoxia the PaO_2/FiO_2 (P/F) ratio is < 100. Often, lung-protective ventilation strategies may not provide sufficient oxygenation to support normal organ function and "salvage strategies" are often implemented. We sought to characterize the intraoperative ventilation of patients with severe hypoxia and ARDS.

METHODS: We queried an electronic database of patients that went to the OR and combined it with electronic lab data to find patients that went to the OR having a P/F ratio of < 100. We then performed an observational study of the preoperative, intraoperative, and postoperative ventilation strategies implemented on each of these patients. We compared these values using the T-test. We also examined the duration of ventilation, length of ICU stay, and length of hospital stay. Additionally we examined ICU and hospital mortalities.

RESULTS: Overall, the average preoperative P/F ratio was 80 with a pH of 7.36. Significant differences in ventilation were found in the amount of PEEP and peak inspiratory pressures used intraoperatively compared to those after the OR course. Additional results are shown in table 1 below.

DISCUSSION: It appears that ventilator settings prior to and after the OR trend towards lower tidal volumes and statistically significant higher PEEP settings than those implemented intraoperatively. The increased tidal volumes appear to continue after the OR for up to 72 hours; however, PEEP values are increased immediately after the OR course. Intraoperative P/F ratios are considerably higher than those prior to the OR. It appears anesthesiologists avoid lung protective ventilation in favor of increased oxygenation. Further research is required to determine if this strategy impacts survival.

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Table 1

Vnetilation Settings	Mean	N	Std. Deviation	p-value
Preop cc/kg pbw vs.	7.81	52	2.53	0.13
Intraop cc/kg pbw	8.45	52	2.57	
Preop cc/kg pbw vs.	8.19	45	2.25	0.33
Postop cc/kg pbw 24	8.46	45	2.18	
Preop cc/kg pbw vs.	8.09	40	2.18	0.18
Postop cc/kg pbw 48	8.48	40	1.99	
Preop cc/kg pbw vs.	7.77	7	1.82	0.81
Postop cc/kg pbw 72	7.74	7	3.49	
Preop PEEP vs.	8.91	51	4.04	<0.01
Intraop PEEP median	6.53	51	4.81	
Preop PEEP vs.	8.79	46	3.86	0.38
Postop PEEP 24	9.39	46	3.64	
Preop PEEP vs.	8.91	42	3.92	0.83
Postop PEEP 48	9.04	42	3.81	
Preop PEEP vs.	8.90	37	3.94	0.99
Postop PEEP 72	8.92	37	5.41	
Preop PIP vs.	32.46	48	10.78	0.42
Intraop PIP	30.92	48	8.13	
Preop PIP vs.	32.46	42	9.61	0.03
Postop PIP 24	29.12	42	7.37	
Preop PIP vs.	32.33	36	9.56	<0.01
Postop PIP 48	28.33	36	5.70	
Preop PIP vs.	31.61	28	7.92	.12
Postop PIP 72	29.29	28	5.87	

S-129.

IMPACT OF EARLY TRACHEOTOMY ON HOSPITAL COURSE AND PATIENT SURVIVAL

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INTRODUCTION: Studies have shown benefit of early tracheotomies for critically ill patients. Most report improved patient comfort; however, there are conflicting results on mortality. We report length of stay (LOS) and mortality outcomes related specifically to tracheotomies performed at the bedside.

HYPOTHESIS: Earlier tracheotomy will decrease ICU and hospital LOS and improve hospital survival.

METHODS: Following IRB approval, a retrospective review examined patients who underwent bedside tracheotomies in surgical and medical ICU's of a tertiary teaching hospital over a 12 month period. Cases performed in the operating room and those with incomplete data were excluded. Patients were categorized in 2 groups: tracheotomy < 7 days from initial intubation and tracheotomy in >7 days. ICU and hospital LOS were measured. Differences between median LOS were calculated using Mann-Whitney U test (two sided p-value). Hospital mortality was compared using Fisher's Exact Test ($p < 0.05$).

RESULTS: Preliminary analysis included 147 patients who received bedside tracheotomies. Compared to patients who underwent tracheotomies >7days from intubation (N=127), patients who underwent tracheotomies <7 days (N=20) had shorter median ICU LOS (11 vs. 26, $p<0.0001$) and shorter median hospital LOS (25 vs. 32, $p< 0.0047$). However, no statistical difference in survival was noted between both groups ($p=0.473$). (Table 1)

CONCLUSIONS: Early tracheotomy decreases ICU & hospital LOS; however, may not improve patient survival. Judicious selection of mechanically ventilated patients for early tracheotomy would alleviate scarce resources in the ICU.

Comparison of Early vs. Late Tracheotomy

	Tracheotomy < 7 days	Tracheotomy > 7 days	p-value
ICU LOS (median days)	11	26	0.0001
Hospital LOS (median days)	25	32	0.004
Survival	5%	14.2%	0.473

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S-130.

3 DIMENSIONAL ASSESSMENT OF RIGHT VENTRICULAR FUNCTION DOES NOT PREDICT POSTOPERATIVE RENAL FUNCTION IN CARDIAC SURGERY PATIENTS

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INTRODUCTION: Preoperative right ventricular (RV) function increases perioperative morbidity and mortality and correlates strongly with postoperative renal failure in patients undergoing cardiac surgery.[1,2] However, accurate 2 dimensional echocardiographic assessment of RV function is difficult due to irregular RV geometry. Real-time three-dimensional echocardiography (RT3DE) may allow better quantification of RV function. We hypothesized that intra-operative RT3DE assessment of RV function would correlate negatively with changes in serum creatinine after cardiac surgery. To test our hypothesis we examined perioperative renal function and RT3DE assessment of RV function in patients undergoing cardiac surgery.

METHODS: After IRB approval we retrospectively reviewed 3D transesophageal echocardiograms of 13 patients undergoing cardiac surgery. 3D transesophageal echocardiography was used to image the right ventricle after induction and before cardiopulmonary bypass. RV images and flow volume loops were then analyzed using 3D RV analysis software (TomTec, Munich, Germany). Baseline, post-operative and the highest post-operative creatinine for each patient were then recorded for comparison to RV function. Statistical analysis was performed using Microsoft Excel.

RESULTS: 13 patients were studied. 3 had CABG and valve repair or replacement, 9 underwent valve repair or replacement, and 1 received a left ventricular assist device. The mean preoperative creatinine was 1.1± 0.4 and the largest postoperative change ranged from -0.5 to 0.4 with a mean of 0.1 ± 0.3. The mean EF was 41 ± 6.7 %. RV ejection fraction did not correlate with baseline creatinine (r=-0.34) or change in creatinine (r=0.00)

CONCLUSION: When measured by 3D TEE, pre-operative RV function did not correlate with baseline creatinine or with increases in creatinine post-operatively. Our findings suggest that RT3DE adds little to 2 dimensional assessment of RV function when predicting postoperative renal failure in cardiac surgery patients. Further research is needed to understand the role of RT3DE imaging of the RV in risk stratification and prognostic evaluation in cardiac surgery.

FOOTNOTES:

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S-131.

25 YEARS EXPERIENCE WITH KETAMINE IN A CANCER ICU

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INTRODUCTION: Ketamine is an NMDA receptor antagonist that has been a well-known anesthetic agent for many years. In small doses it also has analgesic effects while having minimal effects on respiration and hemodynamics, making it a useful adjunct in the treatment of patients in ICU settings. For the last 25 years at the Norris Cancer Hospital ICU, we have used ketamine in the vast majority of our cases, consisting mainly of urologic patients as well as general surgery and gynecology-oncology patients. We attribute to ketamine our improved outcome relating to pain relief, early extubation, and stable hemodynamics, which results in decreased morbidity.

METHODS: We retrospectively studied data from the Urology department data bank and the hospital pharmacy for the use of ketamine. 85% of the patients had undergone extensive urologic resections including radical cystectomy, pelvic exenteration, radical nephrectomies, and radical retroperitoneal lymph node dissections; other procedures included Whipple, hepatectomy, abdominoperineal resection, and major gynecological cancer procedures. A combination infusion of ketamine (500 mg) and fentanyl (1250 mcg) in 250cc normal saline was used in patients that were extubated. Initially, patients received 2-4 mg of intravenous morphine before the mixture began to take effect. In cases of ventilated patients midazolam (25 mg) was added to the combination. Clinical parameters of pain and sedation were evaluated by the ICU resident and nurses and the infusions were titrated accordingly.

RESULTS: Most surgical patients were extubated on an average of 1-2 days postoperatively. The average dose requirement was 3-7cc/hr, ranging from 2cc/hr to 10cc/hr, titrated to pain relief. No changes in hemodynamics were noted with the dose range and combination; there was no incidence of hypotension or tachycardia. Respirations were unaffected. Analgesia was observed to be superior to each of the drugs on its own, indicating a synergistic rather than additive effect. Less than 1% of patients complained of visual dreams, slightly lower than those receiving only morphine. There were no cases of prolonged ileus attributable to the combination. There was a very low incidence of depression, both immediate and delayed, and the incidence of PTSD and anxiety states were negligible.

DISCUSSION: Ketamine has many beneficial effects in addition to analgesia and amnesia. It is a bronchodilator and has minimal effects on respiration, making it easier to wean patients off respirators. Its cholinergic agonist properties have a positive effect on postoperative ileus. Ketamine also has been shown to be effective for preemptive analgesia and in minimizing opioid-induced hyperalgesia. It has anti-kinin and anti-inflammatory properties, as it decreases TNF levels. It affords CNS protection by increasing cerebral blood flow and via its NMDA receptor blockade, which protects patients from glutamate-induced brain injury. Ketamine in low doses also appears to have minimal effect on cognitive function.

S-132.

THE VALUE OF MONTORING TRIGGERING RECEPTOR EXPRESSED ON MYELOID CELL(TREM)-1 IN CRITICALLY ILL PATIENTS

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AFFILIATION: [1]Anesthesia, Faculty of Medicine, Tanta University, Tanta, Egypt, [2]Clinical Pathology, Faculty of Medicine, Tanta University, Tanta, Egypt.

INTRODUCTION: Triggering receptor expressed on myeloid cells (TREM)-1 is a recently identified molecule that is involved in monocytic activation and in the inflammatory response. It belongs to a family related to the natural killer cell receptors and is expressed on neutrophils, mature monocytes and macrophages. The inflammatory response mediated by Toll-like receptor-2 and -4 stimulation is amplified by the engagement of TREM-1. The expression of membrane-bound TREM-1 is greatly increased on monocytes during sepsis. (1) The role of procalcitonin in diagnosing bacterial infection has mainly been studied in patients with severe infections. (2) Our aim to evaluate the accuracy of plasma TREM-1 in predicting infection, and adverse outcome in a population of adults with in intensive care unite. Patients and methods: Seventy six adult intensive care unit (ICU) patients were observed. CRP, PCT, TREM-1 were compared among the following groups: Sepsis group (n=26), systemic inflammatory response syndrome (SIRS) group (n=27) and non-systemic inflammatory response syndrome (non-SIRS) group (n=23). Results: Non-significant differences were observed among patients in different groups regarding biomarkers on the day of ICU admission. On the 2nd day of ICU admission, significant elevation of PCT occurred only in septic patients. Serum TERM-1 correlates well with serum level of Procalcitonin. Delayed elevation of CRP started on the fourth day of ICU admission in patients with sepsis. At the end of the 1st week, only CRP level was elevated in septic patients.Discussion: Serum TERM-1 correlates well with serum level of Procalcitonin. CRP is a classic marker of sepsis but is of late onset. TERM-1could plays a role in early detection of sepsis.

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S-133.

SKELETAL MUSCLE ATROPHY IS ASSOCIATED WITH THE AUTOPHAGY-LYSOSOMAL PATHWAY AND IMPAIRS NEUROMUSCULAR FUNCTION IN IMMOBILIZED HINDLIMB OF MICE

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INTRODUCTION: Patients immobilized in bed following trauma, burns, or critical illness suffer muscle atrophy, which leads to difficulties in weaning-off mechanical ventilation, prolonged hospitalization and rehabilitation. Therefore it is clinically important to elucidate the mechanism of muscle atrophy. Immobilization of muscle leads to atrophy of muscle with decreased force and endurance capacity. Autophagy is an inherent cellular survival mechanism that involves degradation and recycling of cytoplasmic components. The contribution of autophagy to disuse atrophy (immobilization) has not yet been clearly investigated. In this study, we immobilized one hindlimb and investigated the effect of hindlimb immobilization on muscle function, expression of nicotinic acetylcholine receptors (nAChR), and whether autophagy is involved in disuse muscle atrophy after immobilization.

METHODS: Adult male C57BL6 mice were studied. Mice were casted using external plastic casing and adding n-butyl cyanoacrylate (Histoacryl Blue Topical SkinAdhesive, B|BRAUN) to prevent movement of the hindlimb between the thigh and toe. After 10 days of hindlimb immobilization, the neuromuscular function was investigated by train-of-four (TOF) and tetanic (50Hz 5sec) stimulation of sciatic nerve and recording of the resultant contraction of the tibialis muscle. The contralateral side served as control. After muscle function study, tibialis anterior (TA) muscles, soleus (SO) muscles, and gastrocnemius (GC) muscles were harvested and their respective wet weights were determined. Expression of nAChR (alpha1, alpha7 subunits), autophagy related proteins (p62/SQSTM, and LC3), and ubiquitin-proteasome system protein (Skp1) were assayed by western blotting. Data are presented as mean ±SD.

RESULTS: The muscle weight of TA, SO, and GC muscles in immobilized leg significantly reduced by 15±11%, 43±8%, and 20±7%, respectively, compared with contralateral leg after 10 days hindlimb immobilization The single twitch tension and tetanic muscle tension were significantly reduced by 28±9% and 31±9%, respectively, compared with that of contralateral TA muscle The protein expression of nAChR alpha1 subunit and alpha7 subunit protein of immobilization TA muscle was more than 6-fold increased compared with contralateral TA muscle. In our immobilization model, the protein expression of LC3-II and total LC3 significantly increased 284±141% and 190±42%, compared with that of contralateral muscle, respectively. The protein expression of p62/SQSTM1 and Skp1 significantly increased.

DISCUSSION: The decrease of evoked muscle tension, tetanic muscle tension, and muscle weight, and increase of AChR protein expression suggests that the immobilization method used in this study had definitive neuromuscular effects. The increased expression of Skp1 protein means that hindlimb immobilization activates ubiquitin-proteasomal pathway. In this study we show that autophagy related proteins (p62/SQSTM1 and LC3) increase after hindlimb immobilization. Our study confirms that autophagy-lysosomal pathway and ubiquitin-proteasomal pathway is involved in disuse muscle atrophy after immobilization. Further studies will be necessary to extend our understanding of the physiological role of autophagy in muscle atrophy.

ANESTH ANALG
2010; 110; S-1 – S-491

S-134.

CONIVAPTAN, A SELECTIVE ARGININE VASOPRESSIN V1A&V2 RECEPTOR ANTAGONIST ATTENUATES CEREBRAL EDEMA AFTER EXPERIMENTAL MICE CARDIAC ARREST VIA PERIVASCULAR AQUAPORIN 4

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INTRODUCTION: Cerebral edema is a major cause of morbidity and mortality following cardiac arrest (CA). Aquaporin 4 (AQP4), the most abundant water channel in brain, has been implicated in the pathogenesis of cerebral edema. The perivascular domain of AQP4 is critical in both influx and efflux of water brain brain. Recent studies show that the AQP4-mediated water flux is facilitated via the arginine vasopressin (AVP) V1a receptor; V1a receptor antagonists attenuate cerebral edema following traumatic brain injury and focal ischemia. Conivaptan, a selective AVP V1a and V2 receptor antagonist is utilized for the treatment of euvolemic hyponatremia. In this study, using a well-characterized animal model, we examined if conivaptan attenuates regional cerebral edema following CA in wild type (WT) mice as well as mice with targeted disruption of the α-syntrophin (α syn-/-) that lack the perivascular pool of AQP4.

METHODS: Isoflurane-anesthetized (2%) adult male WT and α syn-/- mice (20-26 g) were subjected to CA induced by intravenous (IV) KCL. During CA, cranial temperature was raised to 38.8 ± 0.2ºC, and body temperature decreased from 37ºC to 28ºC. After 8 min of CA, CPR was initiated with IV epinephrine (8µg in 0.5 ml 0.9% saline), ventilation with 100% oxygen and chest compressions (rate 300/min). Sham-operated mice in both strains served as controls. At 1 hr after return of spontaneous circulation, mice were treated with either bolus IV injection (0.3 mg/kg) followed by continuous infusion of conivaptan (0.3 mg/kg/day) or vehicle infusion for 48 hr. Regional brain water content by wet-to-dry ratio was determined at the end of the experiment. Statistical analysis was performed using one-way ANOVA.

RESULTS: All values are presented as mean ± SEM. In WT mice, conivaptan treatment significantly attenuated regional water content in the caudoputamen (81.0 ± 0.5% versus 82.5 ± 0.5% in controls) and cortex (78.8 ± 0.2% versus 79.4 ± 0.2% in controls) [figure1]. In α syn-/- mice, conivaptan had no effect on regional brain water content compared to controls [figure2].

CONCLUSION: Treatment with conivaptan, selective V1a and V2 receptor antagonist attenuates cerebral edema following CA via the perivascular pool of AQP4. These findings suggest that there is a link between AVP receptors and the perivascular pool of AQP4 and may serve potential targets for the treatment of cerebral edema.

Figure 1

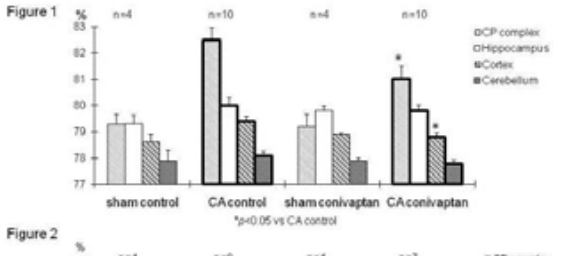
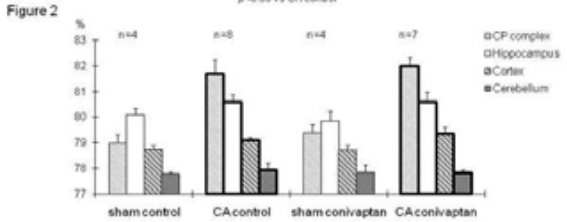


Figure 2



S-135.

CELLULAR OSMOSENSING PATHWAY INHIBITION ATTENUATES GLUTAMINE MEDIATED HEAT SHOCK PROTEIN EXPRESSION AND CELLULAR PROTECTION

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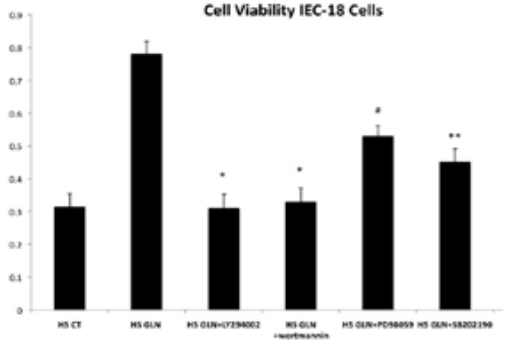
INTRODUCTION: Glutamine (GLN) administration has been shown to be protective in both experimental and clinical settings of critical illness and injury. The mechanism of protection is complex and remains to be elucidated. Cellular osmosensing pathways can induce protection against stress and injury. The mediators of this protection involve signaling via phosphoinositide 3-kinase (PI3-K), mitogen activated protein kinases (MAPK), cytoskeletal rearrangement, and heat shock protein expression (HSPs). The purpose of this study was to determine if GLN-mediated cellular protection in intestinal epithelial-18 cells (IEC-18) subjected to lethal heat stress (HS) involves cellular osmosensing signaling pathways.

METHODS: LY29400215 (50uM), wortmannin (10uM) (PI3-K inhibitors), PD98059 (10uM) (MAPK kinase (MEK) inhibitor), or SB202190, (1uM) (P38 MAPK inhibitor), were added to IEC-18 cells for 45 minutes. Cells were then treated with and without GLN (10mM), and subsequent lethal HS injury (44 degrees C for 50 minutes). Cells were allowed to recover for 24 hours and MTS assays were performed to evaluate cell survival. All HS groups were normalized to their non-HS controls (CT). The effect of GLN on cell size (evaluated via microscopy), and HSP70 expression (evaluated via western blot) was investigated to determine if there was a correlation between the two. Cells were treated with or without GLN, P38 inhibitors, and HS. All statistics were done via t-tests.

RESULTS: GLN increased cell survival in heat stressed IEC-18 cells more than 3 fold ($p<0.001$ vs. HS CT). PI3-K inhibition with LY29400215 and also wortmannin completely attenuated GLN's protection (*$p<0.01$ vs. HS GLN) (see figure). Downstream inhibition of MEK with PD98059 decreased GLN's effect by 50% (#$p<0.001$ vs. HS GLN), and further downstream inhibition of P38 MAPK with SB202190 also attenuated GLN mediated cellular protection (by 70%, **$p=0.03$ vs. HS GLN). Microscopy showed GLN increased cell size by 46% ($p=0.0007$) at 15 min HS, and 52% ($p=0.0008$) at 30 min HS. P38 inhibition decreased GLN's effect on cell swelling by 50% ($p=0.04$) at both time points. HSP70 increased by 66% with GLN in HS cells ($p<0.05$ vs. HS CT) but only 5.3% and 11.4% when pretreated with P38 inhibitors, SB203580 or SB202190, (respectively) ($p< 0.03$ vs. 8 mM GLN).

DISCUSSION: PI3-K and MAPK pathway inhibition prevented GLN mediated cellular protection in HS cells. P38 MAPK inhibition, decreased GLN mediated cell swelling, HSP70 expression, and cell survival. Thus, GLN's effects on cellular osmosensing may be a key mechanistic pathway in GLN-mediated HSP expression and protection against critical illness and injury.



S-136.

INTEGRIN CELL VOLUME SENSING PATHWAY INHIBITION ATTENUATES GLUTAMINE-MEDIATED ACTIVATION OF THE O-LINKED-N-ACETYLGLUCOSAMINE PATHWAY IN INTESTINAL EPITHELIAL CELLS

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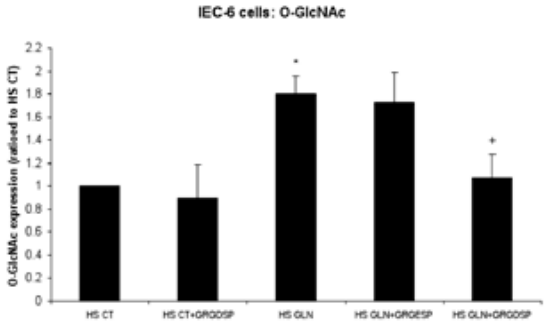
INTRODUCTION: Glutamine (GLN) administration has been shown to be protective in both experimental and clinical settings of critical illness and injury. Our laboratory has shown previously that GLN enhances activation of the O-linked-N-acetylglucosamine (O-GlcNAc) pathway, which is protective during cellular injury and stress. The integrin cell volume sensing pathway has also been shown to be a key protective pathway following stress. However, no direct connection between GLN`s effect on cell swelling and activation of the O-GlcNAc pathway was ever proven. We hypothesized that GLN activates the O-GlcNAc pathway and protects IEC-6 cells via the integrin pathway.

METHODS: The integrin inhibitor, GRGDSP (50 μM), the control peptide, GRGESP (50 μM) or control media, were added to specified groups of IEC-6 cells for 2 hours. Cells were then treated for 15 min with or without 10 mM GLN and subjected to non-lethal heat stress (HS) (43°C for 45 min). Cells were allowed to recover for 30 min. O-GlcNAc levels were evaluated in whole cell lysates via western blotting. Cell survival was also evaluated for each treatment group specified above. For survival experiments, cells were subjected to lethal HS (44°C for 50 min), and allowed to recover for 24 hours. MTS assays were performed and all HS groups were normalized to their non-HS controls (n=3).

RESULTS: Western blots showed increased O-GlcNAc modified proteins following HS and an 80 % increase with GLN treatment ($p < 0.05$ vs. HS controls). Integrin inhibition with RGDSP attenuated GLN's effect on O-GlcNAc protein modification by 95% ($p < 0.05$ vs. HS GLN). Control peptide GRGESP did not affect O-GlcNAc levels at all. Survival experiments showed 10mM GLN increased cell survival in HS cells by 84% ($p < 0.001$ vs. HS CT). Integrin inhibition with GRGDSP attenuated GLN's protective effect by 87% ($p < 0.001$ vs. 10mM GLN). GRGESP control peptide did not effect GLN mediated cellular protection.

DISCUSSION: Cell volume sensing pathway inhibition with GRGDSP blocked GLN-mediated cellular protection and enhanced O-glycosylation. Thus, the integrin cell volume sensing pathway is an essential component of GLN's molecular mechanism of cellular protection.



S-137.

ACTIVATED PROTEIN C IMPROVES ENDOTOXEMIC PIAL MICROCIRCULATION IN RATS

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INTRODUCTION: Activated protein C (APC) is a physiologic anticoagulant, which has additionally multiple cytoprotective effects, including anti-inflammatory activity and may support endothelial barrier function (1). Recombinant human APC reduces mortality in severe sepsis patients (2). Encephalopathy is an early clinical indicator of sepsis (3). However, the changes within the cerebral microcirculation that may be responsible for the organ dysfunction are not yet completely elucidated and specific therapies are not established.

OBJECTIVES: The goals of the study were to evaluate leukocyte-endothelial interactions, capillary perfusion and plasma extravasation within the pial microcirculation during experimental endotoxemia in rats and to study the effects of APC in this setting by intravital microscopy (IVM).

METHODS: A prospective, randomized, controlled animal study was conducted with 40 male Lewis rats. The groups consisted of the animals that (A) were untreated (controls), (B) had induced colon ascendens stent peritonitis (CASP; (4)), (C) received endotoxin bolus (5 mg/kg lipopolysaccharide, LPS, i.v.), and (D) received endotoxin bolus (5 mg/kg LPS i.v.) accompanied by APC (2 mg/kg i.v.). After 2 hours of observation, IVM through two cranial windows (5) was performed and leukocyte-endothelial interactions, functional capillary density (FCD) and plasma extravasation were determined within the pial microcirculation.

RESULTS: During CASP sepsis and endotoxemia (groups B & C), leukocyte adherence and plasma extravasation in the pial microcirculation were significantly increased. FCD was significantly reduced because of a high number of dysfunctional or non-perfused capillaries ($P<0.05$, versus group A). The APC treatment (group D) reduced leukocyte adherence significantly as compared to untreated LPS animals (group C). In addition, a significant increase of the FCD was found in group D compared to group C ($P<0.05$).

DISCUSSION: The APC treatment reduced sepsis-associated impairment of the pial microcirculation in rats.

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ANESTH ANALG
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S-138.

INOS INHIBITOR REVERSED BURN INJURY-INDUCED HYPOPHOSPHORYLATION OF AKT/PKB AND GSK-3B IN RATS SKELETAL MUSCLE

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INTRODUCTION: Critical illness is associated with metabolic alterations. Insulin resistance is a key denominator of derangements in metabolism associated with critical illness. The mechanisms underlying streS-induced insulin resistance remain to be investigated. We have shown that inducible nitric oxide synthase (iNOS) plays an important role in stress (burn injury, LPS)-induced insulin resistance as well as obesity-related insulin resistance. iNOS is a major mediator of inflammation and induced by cytokines, burn injury and obesity. However, it remains to be clarified how iNOS causes and/or exacerbates insulin resistance. Therefore, we investigated the effects of iNOS inhibitor on insulin signaling in skeletal muscle following burn injury.

MATERIALS AND METHODS: Male Sprague-Dawley rats (160-190g) were anesthetized with an intraperitoneal injection of pentobarbital sodium (60 mg/kg, IP). Full thickness third degree burn injury comprising 55% of total body surface area was produced by immersing the back of trunk for 15 seconds and abdomen for 8 seconds in 80°C water. After burn or sham-burn, rats were injected with physiologic saline (20% of BW ml, IP) to prevent them from dehydration. After burn or sham-burn, rats were treated with L-NIL (60 mg/kg, b.i.d., IP) or phosphate-buffered saline for 3 days. At 3 days after burn or sham-burn, follwing an overnight fasting, rectus abdominis was taken for biochemical analyses. Akt/PKB activity was assessed by phosphorylation status of Akt/PKB (serine 473) and GSK-3b (serine 9), an endogenous substrate of Akt/PKB.

RESULTS: Burn injury resulted in decreased basal phosphorylation of Akt/PKB and GSK-3b in skeletal muscle, in parallel with the induction of iNOS. iNOS inhibitor, L-NIL, reversed burn injury-induced hypophosphorylation of Akt/PKB and GSK-3b in skeletal muscle. The protein expression of Akt/PKB and GSK-3b was unaltered by burn injury or iNOS inhibitor.

DISCUSSION: These results clearly demonstrated that burn injury induced reduced Akt/PKB activity in skeletal muscle, and that iNOS inhibitor, L-NIL, prevented burn injury-induced attenuated Akt/PKB. Our findings, therefore, indicate that iNOS plays an important role in decreased activity of Akt/PKB and increased activity of GSK-3b in skeletal muscle following burn injury. Burn injury resulted in decreased phosphorylation of GSK-3b in skeletal muscle, as compared with sham-burn. iNOS inhibitor, L-NIL, prevented burn injury-induced decreased GSK-3b phosphorylation. The protein expression of GSK-3b was not affected by burn injury or iNOS inhibitor.

S-139.

GENERAL ANESTHESIA REDUCES FAT EMBOLISM INDUCED MORTALITY IN RATS: COMPARISON WITH SPINAL OR NO ANESTHESIA

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INTRODUCTION: Fat embolism syndrome (FES) often occurs as a complication of trauma or surgery when a significant amount of fat enters the circulatory system. Treatment is supportive and mortality is high, while the preventive measure is largely unknown.1 Therefore this study is to determine whether general anesthesia could provide protecitve effects and reduce the death in FES.

METHODS: The studies were performed in adult Spargue-Dawley rats (male, weighing 280-300g). First, sequential tests based on Karber method were done to determine the half lethal dose (LD50) of fat emboli in rats (6 rats per group x 7). Second, three groups of rats (125 rats per group) were randomly assigned to receive general (GA, with pentobarbital 50mg/kg, ip and tracheal intubation with 100% O2), spinal (SA, 25 micro-liter 0.75% bupivacaine injected into the subarachnoid space) or no anesthesia (C, control). Twenty minutes into GA, SA or C, the dose of LD50 fat was injected iv to the rats; GA and SA were maintained for 90 minutes and all rats were observed for mortality for 24 hours. Statistical analysis was performed using Chi square test with a significance level set at $p < 0.05$.

RESULTS: The LD50 of fat in the rat model was established and found to be 0.807 ml/kg, with 95% confidence interval 0.683 ~ 0.933 ml/kg. The typical pathologic characteristics of FES were found in the lung, brain and kidney tissues by autopsy, including pulmonary edema, hemorrhage and orange drops (fat globules stained with oil red O). After received an intravenous injection of LD50 fat, the mortality of rats in the group of GA, SA or C was 7.4%, 16.4% and 14.8% at the end of 2hr ($P<0.05$ GA vs. SA); 13.2%, 31.1% and 27.0% at the end of 8hr ($P<0.01$ GA vs. SA or C); 21.5%, 42.6% and 36.9% at the end of 12 hr ($P<0.01$ GA vs. SA or C); and 35.5%, 53.3% and 48.4% for total 24 hr ($P<0.05$ GA vs. SA or C), respectively. No difference was found between SA vs. C at any time interval throughout 24 hr observation ($P>0.05$).

DISCUSSION: This study provides a valuable animal model of LD50 for FES. More importantly, the results of this study demonstrate that prior GA with tracheal intubation and 100% O2 significantly decreases mortality in rats suffered late FAS compared with SA or no anesthesia, indicating GA may be a preferred anesthesia method for the patients with high-risk of FAS either in trauma or surgery conditions. Further studies are needed for underlying mechanisms responsible for beneficial effects of GA.

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S-140.

VALUE OF ESTIMATION OF 20 S PROTEOSOME AND ACCELERATED LYMPHOCYTE DEATH IN CRITICALLY ILL PATIENTS

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AFFILIATION: [1]Anesthesia, Faculty of Medicine, Tanta University, Tanta, Egypt, [2]Clinical Pathology, Faculty of Medicine, Tanta University, Tanta, Egypt.

INTRODUCTION: Sepsis in critically ill patients is usually associated with bad prognosis and its early detection improves the diagnosis, but it is still difficult to monitor the immunological status of the patients depending upon the traditional markers of infection or inflammation . Thus, accelerated lymphocyte death may provide a good idea (1) especially when combined with another recently grown marker for muscle degradation that is the 20 S Proteosom, (2) which is one of the proteosom complex present inside of the nuclei of all eukoryotic cells. Patients and methods: 67 ICU patients were included in the study , 32 patients septic patients (group 1) and 35 non-septic patients (group 2) . Another 33 subjects were included as a control group among apparently healthy subjects from outpatients clinic, they were tested for values of 20 S Proteosom using Elisa technique and also for the percent of apoptotic lymphocytes using flow cytometery. Results:Serume level of 20 S proteosom was significantly increased in septic patients.Also, there was significant increase in the percent of apoptotic lymphocytes in septic patients compared to the other groups, however , non significant increase in non -septic patients in comparision to control group. The combination of the two estimate 20 S Proteosom and accelerated l\ymphocyte death showed positive correlation with prognostic outcome of both septic and non septic patients. Discussion: Elevated 20 SProteosome in critically ill patients is related to musclre breakdown and partly due to altered immune state of these patients together with another immune marker of immunosuppression which is increased percent of apoptotic lymphocytes giving a better idea about the immune state and thus correlate with the prognosis.

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Economics

S-141.

USE OF THE PREOPERATIVE ASSESSMENT CLINIC IS ASSOCIATED WITH A REDUCED CANCELLATION RATE ON THE DAY OF SURGERY

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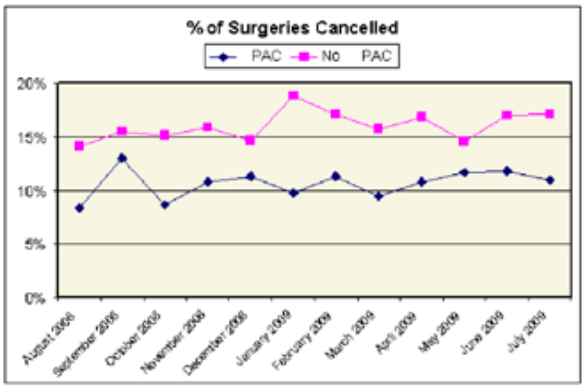
AFFILIATION: [1]Perioperative Services, The Ohio State University Medical Center, Columbus, OH, [2]Administration, The Ohio State University Medical Center, Columbus, OH, [3]Management Engineering, The Ohio State University Medical Center, Columbus, OH.

INTRODUCTION: Services provided at a preoperative anesthesia clinic (PAC) may not be separately reimbursable, unless conducted as a consultation. Cost effectiveness of a PAC can, however, be measured in terms of its operational impact on the throughput of the operating room (OR). In this study, we measured the effect of a PAC visit on cancellations on the day of surgery.

Methods: From 8/08 to 7/09, we compared monthly surgical cancellation rates at the University Hospital between those who visited the PAC and those who did not. Their demographics and ASA status were also compared. Statistical significance was tested by chi-square or t-test as appropriate and taken at $P < 0.05$.

RESULTS: Patients who visited the PAC were more likely to be females (53.4 % vs. 49.0 %), older (57.4 +/- 14.6 vs. 51.5 +/- 16.8) and more likely to have an ASA status of III or higher (72.6 % vs. 52.1 %) (all $P < 0.01$) than those who did not visit the PAC. But the cancellation rate was significantly and consistently lower among those who visited the PAC (420/3921=10.7%) than those who did not (2294/14301=16.0%) (Figure 1, $P < 0.001$).

DISCUSSION: If those who did not visit the PAC could have had the same cancellation rate as those who did, the number of avoidable cancellations would have been 758 (14301*5.3%). In our experience, each cancellation leads to a minimum of 1 hour of nonproductive disruption in the OR schedule. Since our cost of running the OR is ~ $1300 per hour, the potential economic impact of the PAC on OR cancellations could have been ~$985,000. Avoidable costs like this must be considered in assessing the cost effectiveness of the PAC.



S-142.

POST-OPERATIVE PULMONARY COMPLICATIONS IN THE US 2008

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INTRODUCTION: Post-operative pulmonary complications (PPCs) are known to be associated with adverse outcomes and added resource use. While this has been examined in a number of single center studies and administrative databases using International Classification of Diseases codes (ICD-9-CM), there is no current national data on the total cost of PPCs. We hypothesized that PPCs are common and associated with a high incidence of adverse outcomes in post-operative patients.

METHODS: We selected all surgical discharges from the Premier Hospital discharge database for 2008. Both detailed daily itemized resource use and ICD-9-CM codes were used to identify PPCs. The conditions identified were: postoperative pulmonary complication (997.3); pneumonia (481, 482, 485, 486); respiratory failure (518.81, 518.84, mechanical ventilation after the day of surgery); bronchospasm (post-operative inhalation therapy in those with no diagnosis of COPD or asthma); tracheobronchitis (494.1, 466, 464.1, sputum cultures in the absence of other respiratory conditions); pleural effusion (511.1, 511.8, 511.9, thoracentisis); pulmonary collapse (518.0); ARDS (518.5); and pneumothorax (512.0, 512.1, 512.8). Complications were only counted in cases where there was no respiratory resource use prior to the day of surgery. We examined incidence, hospital and ICU length of stay (LOS), hospital mortality, and total cost. National projections for 2008 were made using Premier supplied projection weights. We calculated incremental resource use and outcomes by comparing cases with and without PPCs for each surgical condition and summarizing across all conditions.

RESULTS: There were 1,383,828 (19,046 deaths) surgical discharges from 414 hospitals, with 1,233,475 (10,943 deaths) discharges without respiratory resource use prior to surgery. PPCs were present in 160,984 (13.1%) of these cases. PPCs were associated with 70.3% of all deaths in post-operative patients who had no respiratory resources use prior to surgery. The PPC rate varied greatly by surgical procedure and was highest for coronary bypass surgery (73%) and lowest for Cesarean section (1.3%). There was no association between quartiles of hospital surgical volume and the rate of PPCs (12.0-13.4%). The PPC rate varied greatly among hospitals (min 0.7%, max 49.2%, interquartile range 8.9%-15.7%). Projecting to national levels there were 1,062,000 PPC cases in the US in 2008. PPC cases were associated with 46,200 added deaths, 2.9 million added floor days, 1.9 million added ICU days and $ 11.9 billion in added costs.

DISCUSSION: PPCs are very common, occurring in more than one in eight post-operative patients and associated with more than two-thirds of all post-operative hospital deaths. Better strategies for the prevention and management of PPCs could lead to greatly improved outcomes and substantial savings.

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S-143.

WHAT GALL!: A COMPARISON OF QUANTITATIVE AND QUALITATIVE MEASURES OF QUALITY IN GALL BLADDER SURGERY

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INTRODUCTION: "Quality" continues to be an important driver of decision -making by healthcare consumers, providers, and payers. Some of the quality measures used are quantitative. These include mortality rates, complication rates, and measured indices of quality like those promulgated by the CMS. Other measures of quality are more qualitative like the annual ranking of medical centers by US News and World Report (USNWR). Unlike purely quantitative measures the USNWR "honor roll" of the top 50 hospitals in a wide range of medical specialties is a reputational score based on physician surveys. The purpose of this study was to determine the extent to which these quantitative measures and qualitative measures coincided or diverged.

METHODS: The top 50 hospitals from the USNWR for digestive disorders were found at the USNWR website. Quality data for gall bladder operations were taken from the Hospital Compare (HC) database accessed through the publicly available Blue Cross Blue Shield website (www.bcbsil.com). These data included mortality rates, complication rates, and five CMS quality standards labeled QS1-QS5 (preventative antibiotic(s) one hour before incision, right kind of antibiotic to prevent infection, antibiotic(s) discontinued 24 hours after incision, doctors ordered treatments to prevent blood clots, and treatment to prevent blood clots within 24 hours). The CMS quality metrics were converted to a 1, 0, -1 scale that corresponded to the top 25%, middle 50%, or bottom 25% of all HC hospitals. The USNWR top 50 centers and the quality data were croS-referenced and the quantitative quality metrics of the USNWR top 50 were compared with the other hospitals that were in the HC database. Differences were assessed using the Student's t test.

RESULTS: The results are shown in the table. The complication scores were similar for the 28 hospitals that were on both the USNWR list and in the HC database and the remaining 1580 HC medical centers that were not on the USNWR list. On the other hand, three of the five CMS quality measures were significantly higher in the group that was on the USNWR list. Mortality rates were low at all sites.

	n	Comp	QS1	QS2	QS3	QS4	QS5
Top 50	28	113.4	0.43	0.21	0.14	0.64	0.57
QoR score with symptoms	1580	114.6	0.08	0.01	0.01	0.08	0.02
QoR score without symptoms		NS	<0.05	NS	NS	<0.05	<0.05

CONCLUSION: Although the HC database only included 28 of the 50 hospitals on the USNWR honor roll for digestive diseases, it seems that the reputations of the USNWR hospitals may be well-deserved as this group had higher scores for the CMS quality metrics in all five categories with statistically significant differences in three of the metrics. However, the most meaningful quality metric, the complication index, was not significantly different in the two groups.

S-144.

PATIENT SATISFACTION WITH A TELEPHONE-BASED PREOPERATIVE ASSESSMENT AND SCREENING SYSTEM AT AN ACADEMIC MEDICAL CENTER.

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INTRODUCTION: Outpatient preoperative clinics are common, but the optimal model of patient assessment for surgery and anesthesia is unknown, and may depend on the setting. Patient satisfaction surveys can be utilized to determine the customer's perspective for quality improvement in such settings. Our institution utilizes a telephone-based preoperative evaluation system staffed by nurses trained to systematically review pertinent aspects of a patient's medical history in preparation for all scheduled surgeries, regardless of ASA classification and with the exception of high-risk obstetrical and cardiothoracic cases. Our nurses review patients' medical records, coordinate communication with other health care providers/specialists, and flag patients that meet specific criteria for further review by a staff anesthesiologist. If further tests are required, the staff anesthesiologist coordinates the consultant evaluation or diagnostic tests with the patient's local physician, who then transmits the information to our institution. The goal of this study was to measure patient satisfaction with a preoperative assessment system at a rural academic health center.

METHODS: A 2-page, 20-item written questionnaire was created based on previously validated elements and then administered to 607 consecutive patients over 6 weeks.

RESULTS: The mean distance a patient traveled for surgery was 39.5 miles (median 25.0, SD = 46.1 miles, range 1-354 miles). Scores on a 5-point Likert scale ranged from a low of 4.12 (SD 0.76) for ease of making appointment for phone interview to a high of 4.49(SD 0.75) for courtesy displayed by the nurse. Interestingly, being further away from the hospital did not influence a patient's interest in traveling to an actual outpatient preoperative clinic. Interest in an Internet-based preoperative evaluation was highest in the youngest patients.

DISCUSSION: Despite fundamental differences in our preoperative evaluation system, our patient surveys demonstrated a high degree of satisfaction and our current data suggests that our surgical mortality rates are comparable to other institutions participating in the UHC consortium (Figure 1). Further studies need to focus on the efficacy of this telephone-based preoperative assessment and screening system to properly educate the patient, to minimize complications, and to maximize surgical suite functioning through low cancellation rates and delays. The telephone-based preoperative evaluation system could integrate multiple hospitals from different regions and permit health care savings through increased efficiencies and economies of scale. This may further streamline the preoperative evaluation process, allowing physician and health care resources to focus more time on patients with significant medical co-morbidities that necessitate careful management.

Figure 1. Risk-pooled (e.g. size, academic institution, residency programs, case severity index) data from comparable institutions participating in the UHC Consortium. Our institution is the focus hospital. Time Period: 2009 Quarter 2,2009 Quarter 1,2008 Quarter 4,2008 Quarter 3,2008 Quarter 2,2008 Quarter 1,2007 Quarter 4,2007 Quarter 3.

Hospital		Cases Reported (5)		Mean Cost (Obs)			
Focus	11,830	11,830		(106)	14,961		
Comparison	1,400,590	1,312,901		(11,903)	21,681		
Hospital	**Cases**	**Mean LOS (Obs)**	**LOS Index**	**LOS Variance (Days)**	**% ICU Cases**	**Mean ICU Days**	**% Deaths (Obs)**
Focus	11,830	5.48	1.10	5,635	19.92	3.57	1.44
Comparison	1,400,590	5.90	1.12	903,531	20.96	4.40	1.57
Hospital	**Cases**	**Readmit Rate Denom Cases**	**Mean LOS (Obs)**	**LOS % 30 Day Readmit**	**% 14 Day Readmit**	**% 7 Day Readmit**	
Focus	11,830	10,545	5.08	4.81	3.17	1.79	
Comparison	1,400,590	1,294,374	5.68	5.50	3.63	2.15	

S-145.

ASSESSMENT OF SURGICAL VOLUME OF NEW AND ESTABLISHED SURGEONS FOR OR CAPACITY PLANNING

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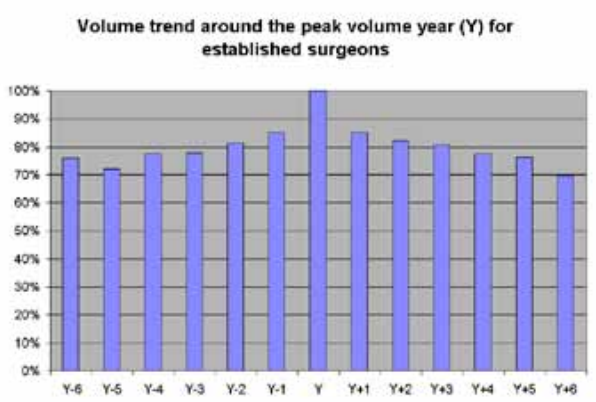
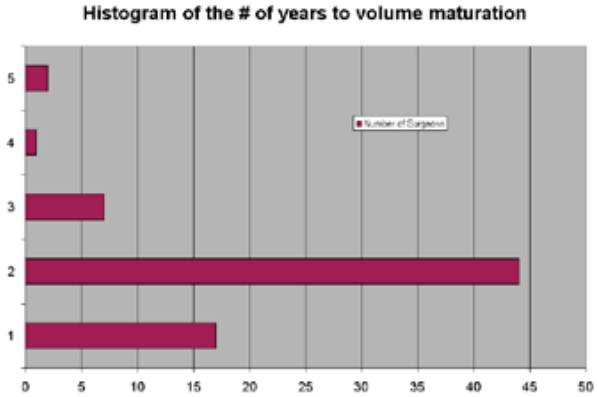
INTRODUCTION: Long-range planning for operating room (OR) capacity depends on accurate forecast of the volume and types of surgical procedures. Although it is a common practice to budget some degree of "organic growth" of surgical volume from year to year, the validity of that practice has not been substantiated. In this study, we examined our institutional experience of surgical volume changes for established surgeons and for new recruits to determine if there is such organic growth for established surgeons and how long it takes for new recruits to reach the established level.

METHODS: Yearly surgical volumes of all surgeons working at our institution were examined from fiscal year (FY) 2003 to FY 2009. For each surgeon, the peak surgical volume was noted during the study period. A surgeon was considered "established" if his/her surgical volume in FY2003 was at least 70 % of his/her peak and the surgical volume in any year was not less than 50 % of the peak. Surgical volume was then measured as % of the peak relative to the peak year. A surgeon was considered a new recruit if he had no cases in FY 2003 and then reached at least 70 % of his/her peak volume and maintained it for 2+ years. The number of years to reach 70+ % was measured.

RESULTS: Thirty-nine surgeons met the criteria for being "established." Prior to reaching the peak year, they had an average growth in surgical volume of 1.8 % per year. However, following the peak year, the volume declined by an average of 3.0 % per year. (Figure 1). Seventy-one surgeons were new recruits who reached and maintained at least 70 % of their peak volumes during the study period. It took them an average of 2.0 years (median 2, mode 2) to reach that threshold. (Figure 2).

DISCUSSION: OR demand may be measured by forecasting individual surgeons' surgical volumes and adding them up. For an established surgeon, there may or may not be an incremental growth from one year to the next, depending on whether he/she is before or after his/her peak year. An automatic "organic growth" should not be assumed. For new recruits, it takes an average of 2 years to reach at least 70 % of their peak volumes. The first two years of new recruits may account for substantial growth. Surgical growth strategy needs to be based on recruitment of new surgeons, rather than growth of existing surgeons.





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S-146.

YOUR HEART'S JUST NOT IN IT!: SUBJECTIVE AND QUANTITATIVE MEASURES OF QUALITY IN HEART VALVE SURGERY

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INTRODUCTION: Quality measures are increasingly used in contemporary healthcare practice to determine what hospitals are paid, where patients are referred, and how physicians are reimbursed. Although many different quality standards have been developed, little consensus exists regarding a "gold standard" for health care quality. Both quantitative metrics (mortality, complication rate, or CMS sponsored quality metrics evaluating antibiotic use, DVT prophylaxis, and blood sugar control) and qualitative metrics (US News and World Report (USNWR) Honor Roll) exist. The purpose of this work was to compare the quantitative measures of quality in the hospitals listed on the USNWR top 50 heart hospitals to the quantitative measures of quality of the other 620 hospitals that perform heart valve surgery in the Hospital Compare (HC) database.

METHODS: The top 50 medical centers for managing heart disease from the USNWR rankings were identified from the USNWR website. Quantitative quality data on all the hospitals that perform cardiac valve procedures in the HC database were collected from Blue Cross Blue Shield (www.bcbsil.com). CMS quality measures were assigned values of 1, 0, and -1 corresponding to rankings of top 25%, middle 50%, and bottom 25%. Mean quality data for the 33 USNWR top 50 heart centers included in the HC database were then compared to quality measures for the other 620 (non-USNWR) centers. Comparisons were performed using the Student's t test. A p value of <0.05 was considered significant.

RESULTS: USNWR top 50 heart centers had lower mortality and statistically higher scores on three of the six CMS quality measures than non-USNWR top 50 centers. The mortality rate and complication index are listed as are the six CMS quality metrics: preoperative antibiotic(s) administration within one hour of incision (QS1), correct antibiotic type (QS2), timely antibiotic(s) discontinuation (QS3), orders to prevent postoperative venous thrombosis (Q4S), timely treatment to prevent venous thrombosis (QS5), and postoperative blood glucose control (QS6).

	N	Mort	Comp	QS1	QS2	QS3	QS4	QS5	QS6
Top 50	33	3.7%	102.5	0.31	0.31	0.14	0.53	0.47	0.25
Others	620	4.7%	88.5	0.15	0.22	0.04	0.16	0.08	0.04
p		<0.05	<0.05	NS	NS	NS	<0.05	<0.05	NS

DISCUSSION: Members of the USNWR top 50 heart centers had lower mortality rates but higher scores on only half the CMS quality measures compared to the other hospitals in the HC database that perform heart valve surgery. Furthermore, USNWR top 50 hospitals had higher complication rates than the other hospitals. Whether this finding resulted from lower quality care, a sicker patient population, or more accurate reporting of complications is unclear. However, relationships between quantitative and qualitative quality metrics must be clarified before quality metrics can be used for meaningful decision-making.

S-147.

INDIVIDUALIZED, CLINIC-SPECIFIC SELECTION CRITERIA IN CHOOSING A BUSINESS PARTNER FOR RANDOM URINE DRUG TESTING: A PAIN CLINIC EXPERIENCE

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INTRODUCTION: The purpose of this study is to identify business model variables necessary in choosing a business partner to provide random urine drug testing for the clinic patients. We hypothesized that those selection criteria are pain clinic specific and are chosen based on matching companies offers to pain clinic necessities.

METHODS: Clinic manager interview with physicians in the practice identified 7 common variables considered essential for the pain clinic business model improvement plan. The plan aimed the introduction of random urine drug testing. The variables were: panel of drugs tested, accessibility of patients to the drug testing through their insurance, availability of financial aid, easiness of urine collection and processing, data confidentiality, test results reporting time, company support and availability. We reviewed also health insurance distribution for our patients in order to minimize the additional service cost. Services offered by available testing companies were assigned 1 when matched with pain clinic variables and 0 when no match was identified. The company with the highest score, identified by added column numbers, was chosen for the service.

RESULTS: Pain clinic health insurance data, collected and averaged for 4 years (2005-2009), identified the following distribution for our patients: 40% Medicare, 24% Medicaid/Uninsured and 36% Private, equally distributed between HMO and PPO. Our top variable became access of all insured and uninsured patients to the services provided. This was true for 1 out of the 4 companies considered. All companies had similar detecting panels. One company failed to detect oxycodone. Same company was unable to arrange urine collection in the pain clinic which raised the concern of the test accuracy (possible specimen switch). Only one company provided a specialized worker who collected and processed the samples. All companies respected the confidentiality agreement (password protected reporting of test results). All 4 companies reported the results within 48 hours and provided useful support to the pain clinic.

Choosing drug testing company based on pain clinic specific selection criteria

Variables	Subsets of variables	Company A	Company B	Company C	Company D
Drug panel tested	Common prescribed drug (number of drugs tested)	0 (9)	1 (14)	1 (21)	1 (12)
Patient insurance covered	Medicare/Medicaid	1/0	1/1	1/0	1/0
	HMO/PPO	0/1	1/1	0/1	0/1
Financial aid for uninsured		0	1	1	1
Specimen collection	Extra person/pain clinic collection	0/0	1/1	0/1	0/1
	Decrease pain clinic personnel workload	0	1	0	0
Confidential data/ quick reporting		1/1	1/1	1/1	1/1
Company availability		0	1	1	0
Total score		4	12	8	7

DISCUSSION: Pain clinics across the country are challenged with an increased number of patients suffering from debilitating chronic pain syndromes. Opioid analgesics, as useful as they are in treating many of those conditions, may also contribute to the prevalence of drug abuse, illicit or prescribed. The use of urine drug testing can assist physicians in monitoring the complex pain management treatment plan. We believe that each pain clinic needs to be specifically matched with an appropriate drug testing company. In our case, the accessibility of insured and uninsured patients to the services provided was considered the most important variable. Our study may offer input in identifying variables to be considered when choosing and developing a long term business model involving random urine drug testing.

Reference: Pain Physician.2006; 9:123-129; Journal of Pain and Symptom Management.2004; 27:260-267

S-148.

OPEN CHOLECISTECTOMY UNDER SPINAL ANESTHESIA. A COMMON PRACTICE IN ECUADORIAN HOSPITALS

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INTRODUCTION: Although laparoscopic cholecystectomy has become the standard of care for symptomatic cholelithiasis and cholecystitis (1), in some third world countries' small community hospitals, 100% of cholecystectomies are still performed in open fashion. In the current cost-conscious environment, it is important to acknowledge the impact of anesthetic techniques on the cost of patient care (2). Schuster et al. (3) in a retrospective comparison of costs for regional and general anesthesia (GA) techniques concluded that, even in a teaching hospital setting, spinal anesthesia (SA) has economic advantages over GA. SA has been widely used in surgical procedures involving lower abdomen and lower extremities; however it has been less commonly applied in procedures involving the upper abdomen, such as open cholecistectomies, where GA has been the common practice. The objective of this study was to assess the feasibility and safety of performing open cholecistectomies under SA.

METHODS: After obtaining IRB approval, we prospectively collected data from 134 spinal blocks performed on 134 consenting, ASA physical status I and II patients, ages 18-65, scheduled to undergo an open cholecistectomy in a third level Ecuadorian hospital. SA was performed under strict aseptic conditions with a 25-gauge pencil point needle at the L1-2 intervertebral space with the patient in the sitting position. A mixture of 15-20 mg of 0.5% heavy bupivacaine and 25 ug of fentanyl was administered. Sedation was achieved with the intravenous administration of midazolan at a dose of 0.03 mg/kg and fentanyl 1 ug/kg. Supplement oxygen was administered at 3 l/min. Vital signs, block efficacy, rate of acute complications and overall patient satisfaction were assessed.

RESULTS: 69% of the patients were female, 31% were male. The average age was 46.2. Brief hypotension occurred in 15% of patients after achieving the block at T4 level. It was treated with intravenous administration of fluids and ephedrine. An excellent block level was obtained in all patients. There was a low incidence of minor postoperative side effects such as urinary retention (0.74%), nausea (8%) and vomiting (5%). One case had to be converted to GA because of its long duration (165 min) due to an inadvertent injury of the common bile duct. Patient satisfaction was high, and surprisingly, "surgeon satisfaction" was high, also.

DISCUSSION: We conclude that open cholecistectomies are feasible and safe under SA especially in small hospitals from third world countries where economic restraints have high impact in the anesthesia practice.

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S-149.

WASTAGE OF OXYGEN IN THE OPERATING ROOM SUITE

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INTRODUCTION: Talk of ever increasing health care costs and the need to decrease them has once again come into the national focus. One way to decrease costs is to prevent unnecessary wastage. In the anesthesia care setting, wastage of oxygen is common. At our institution, oxygen is turned up to 10-12 liters/minute during emergence from general anesthesia. After extubation, oxygen is given by face mask using the auxiliary flow meter on the anesthesia machine. When the patient is moved out of the operating room, both the oxygen flow meters may be left running between cases, which typically is 15-30 minutes. This study was conducted to obtain objective data of such wastage.

MATERIALS AND METHODS: This study was done from Monday through Friday of a typical week. The hands-on anesthesia providers were unaware of this study. When the anesthesia technologists were called to "turn over" a room at the end of a case, they noted the flow rate(s) of the oxygen left running. They also noted the time intervals between cases. This information was collected for our 15 operating rooms on each day of the study. At the end of the week, the total amount of oxygen wasted was calculated. The oxygen price was obtained from the distributors, and the dollars wasted was calculated.

RESULTS: About 19,000 liters (approx. 670 cubic feet) of oxygen were wasted during the study period, extrapolating to an annual wastage of about 34,500 cubic feet, representing about 23% of our hospital's total annual usage. In dollar terms, it translates to a wastage of $ 13,000.

DISCUSSION: The above data do not include wastage in our busy obstetric operating rooms, and of the oxygen left running from transport cylinders when the patients are dropped off in the post anesthesia recovery room. If all these are taken into consideration and the wastage prevented, the cost savings to the hospital could be even more. We think that such wastage occurs also in other hospitals in the country, and paying attention to the simple act of turning off oxygen when not necessary could save a substantial amount of money.

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S-150.

DURATION OF A "TRIPLE LOW" OF BLOOD PRESSURE, BIS & ANESTHETIC CONCENTRATION IS ASSOCIATED WITH PROLONGED HOSPITAL LENGTH OF STAY AND READMISSION

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INTRODUCTION: Previous studies indicate that a "Triple Low" including low mean arterial pressure (MAP), low Bispectral Index (BIS) values and low minimum anesthetic concentrations (MAC) have worsened postoperative recovery and increased risk of postoperative mortality [1,2]. We now evaluate whether the duration of triple low state is associated with prolonged clinical length of stay and increased hospital readmissions within 30 days after discharge.

METHOD: With IRB approval, surgical cases were obtained from a non-cardiac perioperative registry (PHDS, Cleveland Clinic, Cleveland, OH; n=84,508). PHDS includes demographic, diagnostic and procedure data (ICD-9-CM), real time hemodynamic parameters, BIS and end-tidal volatile anesthetic concentrations, all other intraoperative medications and patient outcomes. BIS, MAP and end-tidal volatile anesthetic concentrations in MAC-equivalents were extracted from our perioperative registry as well as length of stay and readmission. Average MAC, MAP, and BIS were calculated for each adult non-cardiac surgical patient given volatile anesthesia. We defined Low MAC as <0.7; Low BIS as < 45; Low MAP as < 75 mmHg; the simultaneous combination of each defined a "Triple Low." Equality of mean outcomes per time block were tested using ANOVA and Kruskal-Wallis as appropriate with $p<0.005$ as significant.

RESULTS: Increasing duration at "Triple Low" low MAP, low BIS and low anesthetic concentration was associated with prolonged length of stay and readmissions to hospital within 30 days after discharge (Table 1).

CONCLUSION: Hospital readmissions are a matter of concern due to their implications for both cost and quality of hospital care, and an additional burden for patients and families. Earlier mean hospital discharge of 0.5 days provides a substantial economic benefit to institutions, typically about $500. Recognition of this "Triple Low" state may allow adjustments in anesthetic or medical management that could improve hospital discharge and decrease readmissions to hospital.

Table 1: Outcome Measures

Duration of "Triple Low"	Number of patients	Length of stay (days)	Readmission to hospital
0-4	12856	3.9+6	0.064+0.24
5-9	2966	4.3+5.8	0.059+0.23
10-14	1933	4.5+7.8	0.062+0.24
15-19	1488	4.6+6.6	0.063+0.24
20+	4756	5.9+10.4	0.078+0.26
Total	23999	4.6+7.3	0.066+0.24

S-151.

COST EFFECTIVE MANAGEMENT OF VOLATILE ANESTHETIC USE

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INTRODUCTION: The cost of volatile anesthetics accounts for 20% of drug expense in an anesthesia department[1]. At 1L/min gas flow the cost per MAC hour of desflurane, sevoflurane and isoflurane cost about $11/hour, $5/hour and $2/hour respectively, depending on the local cost of drug acquisition.[2] At our hospital in 2008 desflurane accounted for 60% of the volatile anesthetic consumption (by bottles of agent consumed), sevoflurane 20% and isoflurane 20%. Isoflurane, sevoflurane and desflurane are routinely stocked, however our anesthesia machines allow only two mounted functional vaporizers. A department survey determined isoflurane was infrequently used because sevoflurane and desflurane vaporizers were routinely mounted on each machine and it was difficult to obtain and mount an isoflurane vaporizer. We added an additional mounting bracket to each machine so that vaporizers for all three inhalation agents were readily accessible. At a departmental grand round our staff was informed about the relative costs of the three volatile anesthetic agents and the benefit of low fresh gas flows. Monthly volatile anesthetic expenses were analyzed over a 6 month period.

METHODS: An extra mounting bracket was installed on each machine so that the three inhalation agents were readily available. Records were analyzed on a monthly basis for a 6 month period from January 2009 until June 2009. The number of bottles of each anesthetic used per month was tallied and the percentage of each calculated. The total cost for the volatile anesthetic was determined by multiplying the number of bottles of each agent used times the cost per bottle. The total cost of all 3 volatile agents was divided by our number of billable anesthesia units to calculate the cost per unit of the volatile agents. The net savings for the 6 months was determined by subtracting the cost for the first 6 months of 2009 from half of the 2008 volatile anesthetic cost.

RESULTS: The percentage of sevoflurane bottles consumed decreased from 20% to 15%, desflurane decreased from 59% to 46% and isoflurane increased from 21% to 39% (Table 1). The cost of inhalation agents per a unit of anesthesia was decreased from the average in 2008 of $1.40 to a low of $0.46 in February 2009 (Figure 1). The net savings over the 6 months was $138,808.

DISCUSSION: The addition of an extra vaporizer mounting bracket allowed our anesthesia providers to choose between the agents. This allowed our departmental staff to significantly reduce the volatile anesthetic cost. A separate study would have to be done to determine if the change in volatile anesthetic usage resulted in any secondary effects such as case turn over time and PACU discharge time.

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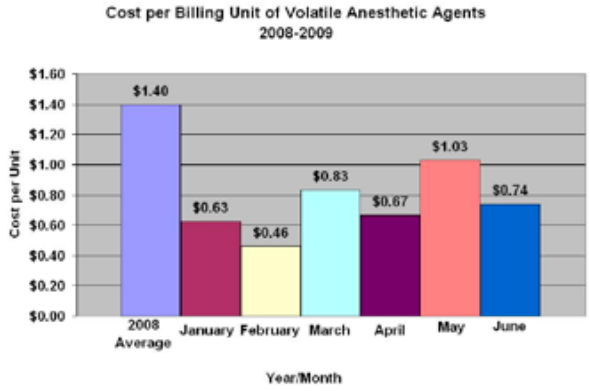
Percentage (by bottles consumed) For Each Volatile Anesthetic Agent

AGENT	2008	2009 (6 MONTHS)
SEVOFLURANE	20%	15%
DESFLURANE	60%	46%
ISOFLURANE	20%	39%

Figure 1



S-152.

EVALUATION AND IMPLEMENTATION OF AN AUTOMATED MEDICATION DISPENSING SYSTEM INTO ANESTH ESIA WORKSITES AT A LARGE UNIVERSITY HOSPITAL

AUTHORS: E. Rebello[1], C. Cowles[1], S. Kee[1], M. Hernandez[2], K. Sapire[1];

AFFILIATION: [1]Anesthesiology and Perioperative Medicine, MD Anderson Cancer Center, Houston, TX, [2]Biostatistics, MD Anderson Cancer Center, Houston, TX.

INTRODUCTION: Healthcare cost-reduction, patient safety, and improved documentation are three reasons for adopting an automated medication dispensing system, (Pyxis®, Pyxis Medstation 3500, Cardinal Health). Institutions focus on cost-reduction benefits of such devices whereas anesthesia care providers focus on safety and workflow efficiency to provide quality patient care. Prior to implementation, there is often little input from anesthesia providers, and no published studies have examined anesthesia providers' preferences. The purpose of this study was to introduce an automated medication dispensing system into our practice and to ascertain anesthesia provider preference in contrast to the current system of retrieving individual case trays from a central pharmacy located within the operating room suite.

METHODS: A pilot program of Pyxis® was introduced in 4 of 36 operating rooms and 1 of 9 off-site locations in our institution for six weeks. Two weeks prior to the pilot program, the vendor and institutional pharmacy department provided one-to-one instruction for 57 M.D. and 63 CRNA participants. In addition, 12 anesthesiologists and 7 CRNA's were identified as "superusers" and given additional training to assist in troubleshooting and to provide supplemental instruction as requested. Participants were asked to complete a 12 question survey within the first week of using the Pyxis® (Phase I) and a 20 question survey at the end of the pilot program (Phase II). Survey responses were summarized with descriptive statistics. The association between comfort level with the Pyxis® system and duration since completion of training was examined using a chi-square trend test.

RESULTS: Participants' response rate in Phase I was 48% (57/120) and 60% in Phase II (72 /120). Of Phase I respondents, 58% had used the Pyxis® at another institution. The majority of respondents used the Pyxis® between 1-8 times during the pilot (Figure 1).

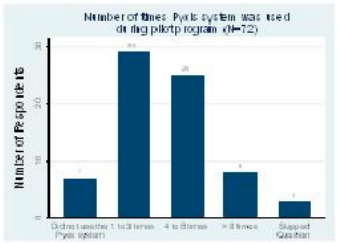


Figure 1. Among respondents, 43 % percent considered the Pyxis® better than the current system and 50% considered the retraining time required to use the Pyxis® worthwhile. An inverse relationship was reported between comfort level with the Pyxis® and years since completion of training as shown in Table 1 and Figure 2.

Table 1

	Years since completing training					
	<2		2-5		>5	
Comfort level	N	%	N	%	N	%
Low	0	0.0	3	20.0	15	37.5
Medium/High	13	100.0	12	80.0	25	62.5

p-value = 0.005 for chi-square test of trend

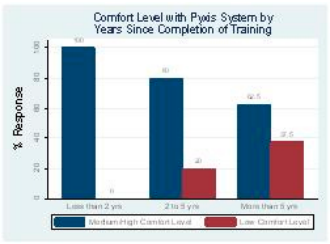


Figure 2. The majority of respondents favored having Pyxis® at off-site locations (Figure 3).

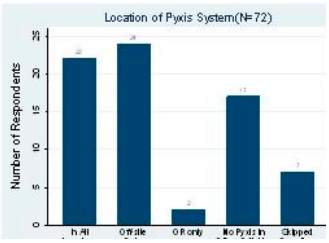


Figure 3. Discussion: Most respondents favored the Pyxis® for use in off-site anesthesia locations. An inverse relationship was noted between the comfort level of using an automated medication dispensing system and the length of time since completion of an anesthesia training program. Our institution examined both the cost of implementation and anesthesia provider preferences prior to placing Pyxis® at off-site anesthesia locations.

S-153.

COMPUTER SIMULATION MODEL OF THE ECONOMICS OF A REUSABLE FABRIC TECHNOLOGY WARMING BLANKET COMPARED TO A DISPOSABLE FORCED AIR WARMING BLANKET

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INTRODUCTION: Maintaining normothermia in surgical patients avoids certain complications and is being considered as a measure of anesthesia quality by national bodies like Medicare. A recently developed warming system (HotDog®, Augustine Biomedical, Eden Prairie, MN) uses an electric current to heat a reusable conductive fabric heater encased in a polyvinylchloride shellt.1 The aim of this computer simulation study was to evaluate the economics of such a reusable warming blanket compared to forced air disposable blankets, assuming clinical efficacy for both is equivalent.

METHODS: The baseline analysis assumed a hospital with 28 combined preanesthesia/Phase 2 recovery rooms, 14 ORs, and 16 Phase 1 PACU beds. The cost model for the FAW disposable blanket (acquisition cost=$12 for preop, $7 for intraop, 7$ postop) assumed 58 blower units (one for each pre, intra and postop location + 2 replacements) at no additional acquisition cost to hospital. The cost model for the reusable blanket product assumed a hospital acquisition cost of $1,249 for each preop/Phase 2 location, $1,449 for each OR, $1,599 for each PACU bed, 5 replacements, and a maintenance contract at $23,188/year. Labor costs were also included: nurse ($41/hr), OR assistant ($20/hr), materials management ($20/hr), custodian ($18/hr), and accounts payable clerk ($25/hr). Patient time in preop was assumed to be 109 mins (SD 22), intraop=75 mins (SD=54), and PACU=60 min (SD 18). Using these variables a Markov chain Monte Carlo simulation model (Arena, Rockwell Automation) was constructed and run using either disposable or reusable warming blankets to meet the existing needs of the surgical suite. Sensitivity analysis revealed key parameters.

RESULTS: For the baseline case hospital, at an annual case volume of 6000 (approximately 1.71 cases/OR/day for 250 working days/yr) with 20% blanket utilization pre-operatively, 70% intra-operatively and 35% post-operatively the per use costs of reusable ($13.89, +/- .10) and disposable ($13.76, +/- .21) blankets are not significantly different ($p < 0.001$). As case volumes/yr increased above 6000, or patient use stayed above a combined average of 41% in each area, the per patient warming costs favored reusable blankets compared to disposable blankets. At the specific hospital studied, for its 9,332 total cases, the predicted per patient cost for disposable blankets equaled $13.79, +/- .18 and reusable was $9.94, +/- .23 ($p<0.001$). .

DISCUSSION: The economics of a reusable warming blanket hinge on the number of cases performed in the surgical suite, and how frequently blankets are used in the preop, intraop, and PACU segments. As the number of surgical cases increases, or the use rate increases, the fixed cost of reusable warming technology is spread among more cases.

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S-154.

COST IMPLICATIONS OF PALONOSETRON USED FOR THE PREVENTION OF PONV

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PURPOSE: Post-operative nausea and vomiting (PONV) occurs in up to 30% of surgeries performed in the US. Consensus guidelines recommend prophylaxis to avoid the consequences of PONV (Gan et al [2007]). However, there is a paucity of cost-effectiveness information available, especially with newer agents such as palonosetron. The purpose of this study was to determine the net costs to avoid a PONV event using prophylactic palonosetron versus no prophylaxis.

METHODS: An economic analysis from a hospital perspective was conducted using number needed to treat (NNT) to avoid a PONV event and the cost per event of PONV. The risk of developing PONV was extracted from two clinical trials for palonosetron (Kovac et al. [2008] and Candiotti et al. [2008]). The risk of PONV was pooled from both studies. The cost of a PONV event was calculated using a cost-accounting methodology: frequency of resource utilization (rescue medications, use of post-discharge antiemetics, physician visits, emergency department visits, hospitalizations, and intensive care unit utilization) obtained from an observational study of PONV (White et al. [2008]); associated costs were obtained from published fee schedules. The average cost per patient for a PONV event was $310.78. The cost for palonosetron was based on the Wholesale Acquisition Cost (Redbook 2009), of $44 per 0.075 mg dose. The net cost to avoid a PONV event was calculated using these three main inputs as follows: the NNT (1/difference in risk of PONV) times the cost of palonosetron per patient minus the cost of one PONV event.

RESULTS: Based upon the probability of a PONV event, the NNT to prevent one event is 5.4 patients in the first 24 hours after surgery (0-24 hours), 7.8 patients from 24-72 hours, and 6.5 patients over 0-72 hours. In the individual clinical trials, the NNTs were 5.0 and 5.9 patients during the 0-24 hour period. Based on NNT from the pooled studies, the cumulative cost to treat patients with palonosetron to prevent one PONV event was $285.60 during the 72-hour period (cost of palonosetron multiplied by the NNT of 6.5). The net cost per PONV event avoided during the 72-hour period was -$25.18 (cost of a PONV event that may occur at any time during the 72 hour interval studied [$310.78] minus the cost to treat [$285.60]). Subanalyses calculated the net costs using the probability of a PONV event from each of the two clinical trials independently. The net cost per PONV event avoided during the 72-hour period after surgery was -$35.78 and -$17.45.

CONCLUSIONS: This study demonstrated that the costs of a PONV event are substantial. Use of palonosetron reduces the risk of PONV vs placebo, and may result in a net cost savings of $25.18 over the total 72-hour period.

S-155.

ECONOMIC ADVANTAGE OF ADDING GLIDESCOPE® TO DIFFICULT AIRWAY MANAGEMENT

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INTRODUCTION: Fiberoptic endotracheal intubation has been accepted as the key component in difficult airway management over the past three decades. Since the introduction of GlideScope® (Saturn Biomedical Systems Inc.), however, increasing reports pertaining to its efficacy and safety comparable to fiberoptic bronchoscopes are available.[1,2,3] As a large university setting academic institution, over 34,000 anesthetic cases are delivered by over 180 anesthesia providers. Despite our aggressive efforts to preserve special equipments such as fiberoptic bronchoscopes, the cost for repairs and replacements became alarmingly high. Three GlideScopes® were initially purchased as educational tools and within a few months, the cost for repairs on fiberoptic scopes decreased significantly. We evaluated the fiberoptic scope repair and replacement costs prior to and after the purchase of GlideScope®.

METHODS AND RESULTS: We performed the cost analysis of the GlideScope purchase and the repair cost of fiberoptic scope for the period of 2004 to 2008. Prior to the purchase of glidescope, the repair cost for 10 fiberoptic scopes were over 35,080 dollars in 2004. On the average, each repair costs $3,100 and takes 7 weeks. Three GlideScopes were purchased at an undisclosed price in late 2004, and the cost of repair and replacement of both fiberoptic and GlideScope dropped to about $12,600 in 2005 and $17,000 (Lost GlideScope handle) in 2006. Between 2007 and 2008, four additional GlideScope units were purchased and a pediatric handle was purchased. By 2007 and 2008, the fiberoptic scope repair cost dropped to $3500 and $3400, respectively. The cost for the cleaning the Glidescope and the fiberoptic scope was comparable and we did not include in the analysis.

DISCUSSION: The detailed accounting and the specific pricing were not included in this abstract because the pricing of the unit is not released by the manufacturer to the public. It is the authors' understanding that the initial unit price, which includes the handle and the base with a monitor, is within 20-30% difference from a new fiberoptic scope. The ten-fold decrease in repair cost from 35,080 dollars in 2004 to 3,400 dollars in 2008 is significant in any means. Depreciation cost and the longevity of Glidescope are not included because of the stated reasons. The lost Glidescope handle was replaced in 2007 and we have not had any other loss with the staff education. Additional benefit of adding GlideScopes to our operating rooms was the fiberoptic scopes are more readily available when they are needed. Based on our quality assurance review, we did not identify any significant change to the quality of our patient care with the addition of GlideScope.

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S-156.

WASTE OPTIMIZATION IN THE LABOR AND DELIVERY SUITE

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INTRODUCTION: In the current medical climate savings made through waste reduction has been recognized as valuable economically and ecologically. We identified waste disposal practices in the labor and delivery operating suites that were inappropriate. We evaluated if educating the hospital staff about proper waste management would result in improved waste disposal as regulated by OSHA and NYDOH while decreasing cost and inappropriate waste disposal.

METHODS: Two weeks prior to the educational program we collected the waste from three operating suites on the labor and delivery floor. The routine OR waste will be weighed. Cost of OR waste will be based on current prices for disposal of the waste. For complete waste estimates we will include evaluation of the sharps containers. As per previous work (1), the contents of containers will be separated into appropriate and inappropriate waste. True sharps will be disposed into the appropriate place and the non-sharp waste will be used to estimate cost savings from this area of OR waste. After initial baseline data collection, we will initiate the educational program consisting of PowerPoint presentations. After proper waste instruction, we will provide the appropriate waste receptacles, and visual reminders of proper technique. After 3 months, we will repeat the waste assessment from the three operating suites and compare that data to baseline. Any savings will be calculated based on the difference in the waste assessments.

RESULTS: Initial waste assessments have been done and comparison data is pending.

DISCUSSION: Systems based practice requires demonstration of awareness and responsiveness to the larger context and system of health care (2). The ability of education to effect a significant change in waste disposal practice will serve as a template for further improvements in our waste practice.

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S-157.

ASSESSMENT OF DIFFICULTY IN AIRWAY MANAGEMENT IN OBESE PATIENTS

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INTRODUCTION: Obstructive sleep apnea (OSA) is one of the several clinical predictors which have been proven to be associated with difficult airway in obese patients. STOP-BANG questionnaire has been validated for diagnosing OSA with significant degree of sensitivity[1]. In this study, patients at high risk for OSA, based on STOP-BANG questionnaire, are hypothesized to have difficult airway compared to low risk patients. Also, the nature of difficulty in airway management will be assessed in this study.

METHODS: 55 patients who under went bariatric surgery were enrolled in this study after informed written consent was obtained. The STOP-BANG questionnaire was filled up by a resident or RN in the pre-operative evaluation clinic. These patients were divided into 4 groups, based on STOP-BANG questionnaire and any previous sleep study. All the patients were pre-oxygenated and induced with 1-1.5mg/kg of propofol. Once jaw relaxation was achieved, oral airway was placed and mask ventilation was attempted. After two breaths, succinylcholine 2mg/kg was given. After 1.5min of mask ventilation with oxygen and isoflurane, laryngoscopy was attempted and appropriate size endotracheal tube was placed. The following airway parameters were noted in the airway questionnaire: mask ventilation without or with muscle relaxation, difficulty in insertion of laryngoscope blade, Cormack-Lehan grade and ease of intubation. This questionnaire was entered by the resident who perform the intubation. The person who entered the intubation questionnaire was blind for the STOP-BANG questionnaire.

	Number of patients	BMI	Difficult mask ventilation without muscle relaxation	Difficult mask ventilation with muscle relaxation	Difficult Blade insertion	High C-L grade	Difficulty in intubation
Group 1 (OSA patients using CPAP as recommended)	8	43.6	62.5% (5/8)	25% (2/8)	12.5% (1/8)	37.5% (3/8)	25% (2/8)
Group 2 (OSA patients not using CPAP as recommended)	7	52.4	57% (4/7)	42.8% (3/7)	42.8% (3/7)	57% (4/7)	42.8% (3/7)
Group 3 (Low Risk)	12	43.2	0	0	0	0	0
Group 4 (High Risk)	28	43.1	32.1% (9/28)	14.3% (4/28)	10.7% (3/28)	10.7% (3/28)	17.86% (5/28)

RESULTS: 9/18 (50%) patients with difficult mask ventilation without muscle relaxation showed improvement in mask ventilation after succinylcholine was administered.

DISCUSSION: Patients at high risk for OSA, based on STOP-Bang questionnaire, are at high risk for difficult airway compared to low risk patients. These patients have a comparable difficulty in mask ventilation when compared to patients diagnosed with OSA. Muscle relaxation tends to improve the mask ventilation and this could be explained by improved compliance of the chest after muscle relaxation. The difficulty in insertion of laryngoscope blade in group 2 patients could be due to excessive soft tissue in the pharynx[2].

CONCLUSION: Patients who are not diagnosed to have OSA but at high risk for OSA are still at same risk for difficult airway. Patients with OSA not using CPAP as recommended are at highest risk for difficult airway. Muscle relaxation does not improve mask ventilation in those patients not using CPAP as recommended in comparison to other group of patients.

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S-158.

MODIFIED RAPID SEQUENCE INDUCTION: A SURVEY OF U.S. CURRENT PRACTICE

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AFFILIATION: [1]Anesthesia, Critical Care, and Pain Medicine, Massachusetts General Hospital, Boston, MA, [2]Medical School, University of Connecticut, Farmington, CT.

INTRODUCTION: Rapid sequence induction (RSI) is performed to prevent aspiration and protect the airway. Typically, RSI consists of: denitrogenation, avoidance of mask ventilation, and cricoid cartilage pressure.[1] In certain clinical circumstances, the RSI technique is modified.[2,3] Differences may include: choice of paralytic drugs, timing of paralytic administration, and 'tests' of positive pressure ventilation prior to muscle relaxation.[1,2] The term "modified RSI" remains undefined in the literature. To establish clarity of definition, we surveyed attendings and residents across the U.S. about what constituted a modified RSI in their practice.

METHODS: With IRB approval, we sent ten surveys (adapted from Schlesinger & Blanchfield, 2001) to each of the 131 U.S. anesthesiology residency programs. Five were to be completed by attending physicians and five by residents. Returned survey data were coded and summary analyses were conducted to determine the 'consensus' definition of modified RSI.

RESULTS: The response rate was 42% (468 surveys from 55 programs; see Table 1).

Table 1 - Summary Data

Total Surveys Returned	468
Total Institutions Represented	55
Response Rate	42%
Attending Physicians	53% (n=246)
Resident Physicians	47% (n=222)
Percent Using RSI	99%
Percent Using Modified RSI	93%

The most common indications for a modified RSI were: moderate obesity (58%, n=254), morbid obesity (58%, n=254), GERD (51%, n=223), hiatal hernia (41%, n=178), or recent trauma (40%, n=174) (see Figure 1).

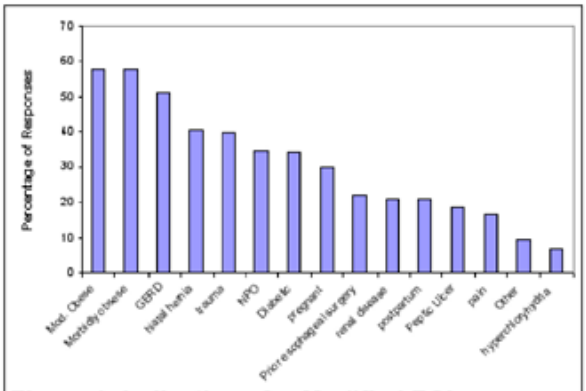
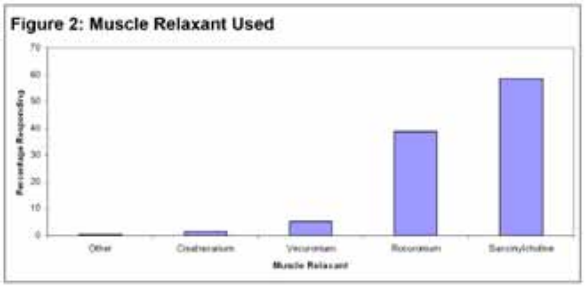


Figure 1: Indications for Modified RSI

Paralytic use was common: 58% (n=256 respondents) reported using succinylcholine and 39% (n=170) reported rocuronium (see Figure 2).



There was not consensus about timing of paralysis: 46% (n=200) paralyzed concomitant with induction agent, but 30% (n=133) paralyzed after mask ventilation. All but one respondent reported denitrogenating prior to induction. A large majority of respondents (90%, n=376) reported using cricoid pressure during modified RSI. Of those who reported using cricoid pressure, the majority (57%, n=205) reported applying cricoid pressure concomitant with the induction agent.

Most respondents (77%, n=322) reported attempting to establish face mask ventilation. Of those who reported using a face mask to ventilate, 64% (n=208) attempted ventilation before paralysis.

DISCUSSION: There is general agreement on the indications for modified RSI: obesity, a history of GERD, hiatal hernia, and experience of trauma. In descending order of frequency, the consensus definition of a modified RSI includes: (1) denitrogenation prior to induction; (2) concomitant application of cricoid pressure and induction agent; and (3) attempted face mask ventilation prior to paralysis. There is not consensus about the timing of paralysis or choice of paralytic.These results allow construction of a meaningful definition of a modified RSI. However, we observed considerable variation in the definition between clinicians. This should form the basis of future research.

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S-159.

RESULTS OF SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN AN ANESTHESIA PREOPERATIVE CLINIC

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INTRODUCTION: The surgical population with obstructive sleep apnea (OSA) measures in the millions.[1] The American Society of Anesthesiologists (ASA) has issued guidelines for the perioperative care of patients with or suspected of having OSA, which challenges our profession to alter practice for these individuals.[2] We describe our process of OSA screening implementation in the Anesthesia Perioperative Medicine Clinic (APMC).

METHODS: In collaboration with the Sleep Disorders Center we developed a process to streamline appointments for in-laboratory polysomnogram (PSG) for patients identified preoperatively as high-risk for having OSA. Patients were screened by self-completing the STOP-Bang questionnaire.[3] Physicians or physician assistants discussed the findings with the patients. Those at high-risk of OSA were referred to a sleep lab or chose to defer care to their primary provider.

RESULTS: During a six-month period, 1886 patients were given questionnaires, 1030 (55%) of whom had STOP-Bang scores of ≥3, indicating high-risk for OSA (Figure 1). Of these high-risk patients, 141 (15%) agreed to a sleep lab referral, and 91 were scheduled for a PSG. Of those referred to our sleep lab, 50 (36%) refused a PSG. The STOP-Bang score was significantly higher in the group willing to schedule a PSG (4.5 vs. 3.9, p=0.009). In the group refusing a PSG, 23% had a STOP-Bang score ≥ 5 vs 47% of those scheduled for a PSG. Twenty patients (23%) did not show up or cancelled their PSG. Therefore, 71 (50%) of 141 patients completed the PSG. The mean intervals between patients' APMC visit and their scheduled PSG (8±9 days) and their day of surgery (DOS) (13±15 days) are reported in Table 1. Moderate (n=18) or severe (n=37) OSA was found in 77% of patients, and 47 were successfully treated with CPAP.

DISCUSSION: The prevalence of OSA in our pre-anesthesia population was almost double that which has been previously reported.1 Despite educating our APMC providers and patients regarding the risks of OSA and implementing screening to identify patients at risk, our data suggests the overwhelming majority refuse a PSG in the perioperative period. The full implementation of OSA screening in pre-anesthesia patients remains a challenge, but screening and preoperative PSGs can be performed in a timely fashion as shown here. Further studies are needed to increase patient compliance with anesthesiologists' recommendations to undergo PSG in order to obtain a definitive diagnosis and potential treatment.

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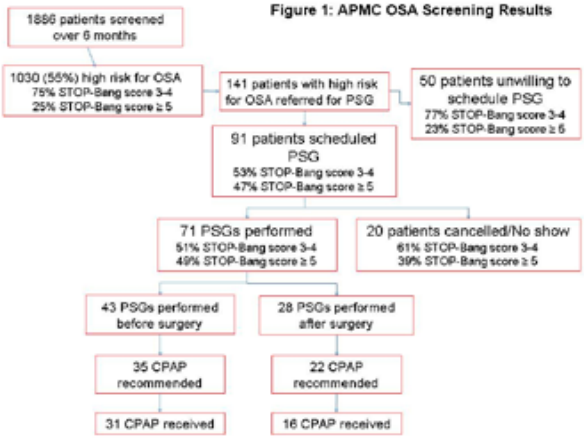
Table 1: Interval between APMC visit, DOS, and PSG

	Mean(SD)	IQR	n
Interval between APMC and DOS	13±15	11 (6-16)	141
Interval between date of PSG and DOS (PSG Done)	-4±29	3 (-21-8)	71
Interval between APMC visit and PSG done before surgery	20±22	16 (10-20)	43
Interval between APMC visit and PSG scheduled before surgery	8±9	6 (2-12)	47

Figure 1: APMC OSA Screening Results



S-160.

AIRWAY QUALITY ASSURANCE USING THE GLIDESCOPE DVR: ANALYSIS OF INITIAL EMERGENCY INTUBATION FAILURES

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INTRODUCTION: Video analysis of individuals performing emergency intubation has been previously utilized for teaching and performance improvement.[1-2] The Glidescope Digital Video Recorder (DVR) (Verathon, Bothell, WA) is a new device that automatically stores airway images during each Glidescope intubation. The purpose of this study was to use these stored videos to identify and analyze failed initial emergency intubation attempts in our ICU and hospital floors.

METHODS: An IRB approved prospective, descriptive study was initiated to compare the efficacy of Glidescope (GS) versus Conventional Laryngoscopy (CL) for emergency intubations outside the OR. Any adult patient requiring emergency intubation for cardiac arrest, respiratory insufficiency, or airway protection was included. Intubations were performed primarily by attending emergency room physicians and intensivists, medical and surgical residents, and respiratory therapists. Shortly following initiation of this study, the GS DVR was introduced to record the attempts and video records were collected at each intubation in which the GS was utilized. All intubations that failed to place the endotracheal tube on first attempt were reviewed by two of the authors (KR & JP), and a primary reason for intubation failure was determined.

RESULTS: A total of 55 intubations were performed with the GS and DVR and 13 initial intubation failures were documented. Reasons for initial intubation failure with GS included the need for muscle relaxation (n=7), inadequate visualization secondary to excessive secretions (n=2) and inadequate visualization secondary to poor technique (n=4). Patients who required muscle relaxation thwarted efforts at intubation with coughing and vocal cord closure, despite adequate visualization and ETT alignment. The impact of airway secretions may have been lessened by more timely suctioning during GS placement. Technique issues included inability to guide the GS imager around the base of the tongue, or too forward insertion of the GS blade, resulting in inability to pass the ETT through the vocal cords. These videos were subsequently compiled for use in a multidisciplinary quality assurance conference with the goal of improving initial success by avoiding these previously identified pitfalls.

DISCUSSION: This study suggests that the GS DVR provides a unique capability not only for documenting a procedure that was previously invisible to observers, but also for airway management performance improvement activities.

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S-161.

COMPUTER-GENERATED LARYNGOSCOPY PROFILES TO ASSESS EXPERTISE

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BACKGROUND: A method to discern a trainee's expertise with direct laryngoscopy would be useful for following progress and determining readiness for call or advanced assignments. We have developed methodology to record laryngoscopy motion and performance. The goal of this study was to determine whether laryngoscopy skill could be evaluated by electronic assessment of technique.

METHODS: Three anesthesia faculty with three to 23 years experience performed laryngoscopy five times each on a Medical Plastics Intubation Mannequin. Blade path and force were measured with a Mini-Bird magnetic position sensor (Ascension, Burlington, VT) and a 6-axis force transducer (ATI, Apex, NC), respectively, attached to the laryngoscope handle and recorded on a laptop computer. A MATLAB (Mathworks, Natick, MA) program digitally aligned the separate laryngoscopy trajectories and a virtual curvilinear tube was calculated within the mannequin airway that encompassed all the expert trajectories. Twelve residents were studied on the first day of their anesthesia residency. They performed laryngoscopy three times on the Medical Plastics mannequin with the instrumented handle. The percentage of each laryngoscopy that fell within the expert tube and the length of the path were measured. Residents were divided into groups with greater or less than 20 previous laryngoscopy attempts in an airway model and into upper and lower 50th percentiles based on laryngoscopy success in their first 10 patient attempts. Trajectory percentages, force and torque were compared between groups by T-test.

RESULTS: A trajectory from one expert generally fell within the tube derived from the other two experts. Resident laryngoscopies fell within the expert tube an average 68% ± 4% (mean ± SE) of the path length ($P < 0.001$ vs. 100%). Conformity to the expert path was greater in the upper third of the airway (97% ± 1%) than near the larynx (46% ± 9%, $P < 0.01$). The residents in the upper 50th percentile for patient laryngoscopy success stayed within the expert tube more closely than classmates with worse success, 71% ± 17% vs. 42% ± 16% of path length, respectively ($P < 0.05$). Trajectories did not appear to differ among residents as a function of previous experience. The average path length of expert laryngoscopies was 156 ± 4 cm while the resident average was 204 ± 8 cm ($P = 0.058$). Path length did not differ among residents as a function of experience or outcome. Laryngoscopy force and torque did not differ among the groups.

DISCUSSION: Digital analysis of laryngoscopy trajectories with engineering technology is a novel and objective way to measure skill. Beginners and experts can be differentiated with the methods described here. Cross sectional and longitudinal studies will be necessary to determine whether assessment of technique can distinguish finer differences in skill as trainees develop expertise.

S-162.

EVALUATION OF A NOVEL, ADJUSTABLE AIRWAY SIMULATOR FOR ENDOTRACHEAL INTUBATION

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INTRODUCTION: A major issue with learning on current commercial airway manikins is poor transfer of direct laryngoscopy and endotracheal intubation (ETI) skills from model to patient (1). We developed a novel, life-like airway model that better simulates human tissue tension and allows adjustment of anatomic features. To determine whether the tissue modification or adjustability improved skills transfer, we compared successful intubation rates between paramedics trained on our model and a commercial model.

METHODS: With IRB approval and written informed consent, 52 ETI-naive paramedic students were randomly assigned to one of three models: novel model with static features (mouth opening > 6 cm, easy prognath, normal occlusion), Laerdal Adult Intubation airway manikin, and novel model with variable features. Each subject performed 25 direct laryngoscopy/endotracheal intubations, using 6.0mm endotracheal tubes and MacIntosh size 3 blade. For variable training, the configuration increased in difficulty after every five attempts (edentulous, normal, overbite, 'inability to prognath', and a combination of long face and short mandible). Intubation success was defined as endotracheal tube insertion between the vocal cords within 30 seconds. After training, every subject completed a skills transfer test comprised of 5 attempts on a Medical Plastics airway trainer, a commercial model. Success rates were analyzed with one way ANOVA and chi-square tests.

RESULTS: The cumulative success rate over the 25 trials was 93-96% with no difference among groups. Most common reason for failure was esophageal intubation. Cumulative success rates in the skills transfer test showed no significant intermodel difference (commercial - 88%, novel static - 75%, novel variable - 84%; $p > 0.05$) (see figure). However, success on the first laryngoscopy attempt in the skill transfer test differed significantly among the groups (94% for the commercial model vs. 59% for the novel static group, $p = 0.046$). For novel variable and commercial model groups, final cumulative success rates for training dropped by 8% on the skills transfer test whereas the novel static model group experienced a 20% decrease.

DISCUSSION: Our results indicated that ETI success rates were comparable among the three groups. However, ETI skills transfer was better achieved in the commercial and novel variable model groups than in the novel static model group. This suggests that proficiency on one model does not guarantee similar success rates on another. When learning direct laryngoscopy and ETI, there may be other factors involved in successful ETI skills transfer than model realism.

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S-163.

COMPARISON OF GLIDESCOPE TO CONVENTIONAL LARYNGOSCOPY FOR EMERGENCY INTUBATION BY NON-ANESTHESIA PROVIDERS

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INTRODUCTION: Emergency intubation outside the O.R. may be associated with a high rate of complications.[1] Although the utility of videolaryngoscopy in anesthesiology has been demonstrated, its role in emergency airway management by non-anesthesia providers remains incompletely characterized. The purpose of this study was to evaluate the efficacy of the Glidescope Cobalt (Verathon, Bothell, WA) for emergency intubation throughout our institution, including the ICU, ER, and hospital floors.

METHODS: After IRB approval was obtained, a total of 92 subjects (70 Glidescope (GS); 22 Conventional Laryngoscopy (CL)) were enrolled in this prospective, descriptive study. Any adult patient requiring emergency intubation for cardiac arrest, respiratory insufficiency, or airway protection was included. Although respiratory therapists used GS exclusively, attending or resident physicians could choose between GS and CL. Groups were designated by which laryngoscopy method was chosen on initial attempt. A respiratory therapist was in attendance at each intubation and collected data using a standardized data collection tool. Prior to implementation of this study all personnel (physicians and RT) were trained in the use of the GS.

RESULTS: There were no significant differences between groups in relation to demographic variables, reasons for intubations, place of intubations, or the time of day intubations were performed. Intubations were primarily performed by attending emergency room physicians and intensivists (44%), medical and surgical residents (31%), and respiratory therapists (RT) (25%). Reasons for the use of Conventional Laryngoscopy over Glidescope included physician preference (n=18), failure to place ETT via Glidescope (n=2) and unavailability of Glidescope at time of intubation (n=2). Time to place ETT was 202 ± 297 seconds in the GS group as compared to 560 ± 544 seconds in the CL group ($p<.001$). ETT placement was more successful in one attempt in the GS group (79%) as compared to the CL group (50%) ($p=.009$), and no differences were noted when the GS initial success rates were analyzed among staff physicians (80%), resident physicians (76%) and RT personnel (89%). Aspiration before intubation (n=5) and esophageal intubation (n=1) were the only intubation complications noted in this study and were not attributable to either the CL or the GS group. One patient (CL) was not successfully intubated and required an emergency cricoidthyrotomy, and was not included in final analysis.

DISCUSSION: This study suggests that GS enables a wide range of providers to perform emergency intubation with a higher likelihood of initial success than is achievable with CL. Avoidance of multiple intubation attempts promotes favorable patient outcomes.[2] GS may therefore be useful for emergency airway management in facilities lacking 24 hour anesthesia coverage.

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S-164.

SNORING AND BMI IN PERIOPERATIVE SLEEP APNEA SCREENING

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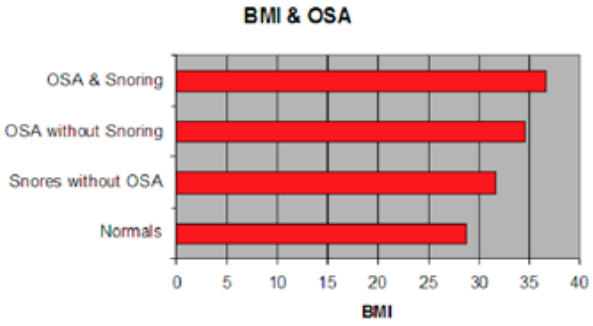
INTRODUCTION: Patients with obstructive sleep apnea (OSA) have an increased incidence of multiple co-morbidities including coronary artery disease, hypertension, congestive heart failure, cerebrovascular accidents, and gastroesophageal reflux which influence their perioperative risk during surgery [1,2]. OSA patients also have a substantially higher incidence of post-operative complication [3]. Studies suggest that 9% of women and 24% of men in the US general population have OSA, however, as many as 82-92% of cases with at least moderate OSA may be undiagnosed at the time of surgery [1,4,5]. There are numerous screening tools which attempt to identify patients at risk for OSA, often using reports of loud snoring and body mass index (BMI) as important components [1]. Using data obtained from our preoperative screening database, we describe the relationship between BMI, patient reports of loud snoring, and reported OSA.

METHODS: We queried our preoperative screening database for a sample of patients scheduled to receive anesthesia at Jackson Memorial Hospital. Within these cases, we extracted data concerning OSA history, snoring history and BMI. The patients were separated into 4 groups: snoring without OSA, OSA without snoring, snoring and OSA, and normal. We then analyzed the BMI in these groups.

RESULTS: 8,943 anesthetic records were analyzed. 681 (7.6%) reported loud snoring without OSA, 116 (1.4%) reported OSA without snoring, 114 (1.4%) reported loud snoring in combination with OSA, and 8032 (89.9%) denied OSA and snoring. The average BMI for patients denying OSA/Snoring was 28.8, Snoring without OSA 31.8, OSA without Snoring 34.6, and combined Snoring & OSA 36.7. 49.6% of patients reporting OSA also reported snoring.



DISCUSSION: Our analysis demonstrated that the BMI is elevated in patients who report snoring or symptoms of OSA, with a substantial increase when snoring and OSA are reported together. This study supports the association between increased BMI, snoring and OSA. This study does not appear to support the association of snoring with OSA.

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S-165.

A WEEKEND EDUCATIONAL CURRICULUM ENHANCES ACQUISITION AND LONG-TERM RETENTION OF BUSINES-OF-MEDICINE KNOWLEDGE IN PGY3 ANESTHESIOLOGY RESIDENTS

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BACKGROUND: Anesthesiology residents must develop the clinical skills needed to provide independent patient care, but also should be familiar with the business aspects of the modern health care system. Unfortunately, practice management education is largely neglected during anesthesiology residency because of a primary emphasis on clinical care and education, the limitations imposed by the ACGME-mandated eighty-hour resident workweek, and the relative isolation of residents from administrative, legal, and reimbursement issues during training. The authors designed, implemented, and evaluated the effectiveness of a weekend curriculum in busineS-of-medicine education for PGY3 anesthesiology residents. We tested the hypothesis that this educational method enhances acquisition and long-term retention of practice management principles.

METHODS: Presentation of busineS-related information relevant to anesthesiology practice was the central objective of the curriculum design following ACGME guidelines. Experts from the community were recruited to discuss interviewing skills, contract law and negotiation, billing and reimbursement, insurance, malpractice, and financial planning. A strict lecture didactic format was avoided, and presentations were designed to encourage speaker-audience interaction. Measures of initial acquisition (before and immediately after retreat participation) and long-term retention (one year after participation) of knowledge were conducted using an evaluation tool. Resident satisfaction was also quantified. Statistical analysis of test results between groups was performed using analysis of variance (ANOVA) for repeated measures followed by Bonferroni's modification of Student's t test.

RESULTS: Resident participation significantly ($P<0.05$) increased comprehension of practice management principles (test scores of 54±11% before compared to 76±9% after the program; n=37; data are mean±standard deviation). Retesting of a subset of graduating residents one year after the retreat indicated a significant retention of knowledge (test score of 72±11%; n=15). No differences ($P>0.05$) in test scores were observed one year compared with immediately after the retreat. Resident evaluations of the retreat were very positive; scores ranged from 4.6±0.5 to 4.8±0.4 on a modified five-point Likert scale among eight categories evaluated. Residents indicated that the curriculum should become a mandatory component of the residency educational program.

CONCLUSION: The results indicated that the current weekend educational curriculum significantly enhances anesthesiology residents' acquisition and long-term retention of knowledge of busineS-related topics pertinent to practice. The program was relatively simple to design and implement, satisfied several ACGME core competencies for anesthesiology education, and may be altered as practice management evolves.

S-166.

LEARNING BY DOING : UTILITY OF TRANSESOPHAGEAL ECHOCARDIOGRAPHY SIMULATOR AS A TEACHING TOOL FOR ECHO NAïVE CA1 ANESTHESIA RESIDENTS

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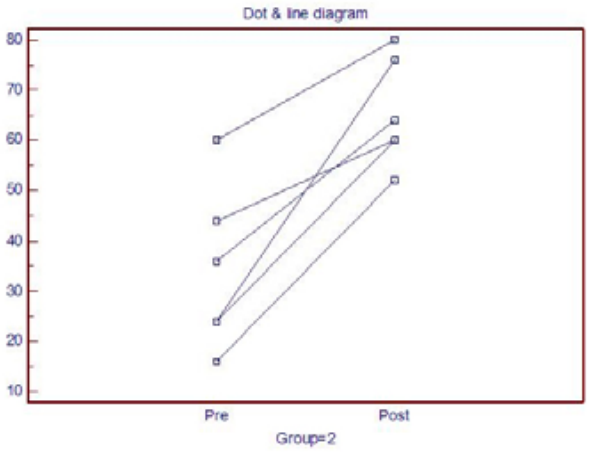
INTRODUCTION: Transesophageal echocardiography simulator is a new innovative teaching tool that has made it possible to effectively teach the basic concepts of echocardiography which constitute the cornerstone of understanding the more complex principles of echocardiography. Although this appears to be common knowledge but no studies have been conducted to test this hypothesis. This study was designed to compare two different modes of learning, hands on simulator based learning and traditional text based learning, focusing on the very basic concepts of image orientation. The aim was to ascertain if simulation can be an important adjunct to the traditional methods of training in transesophageal echocardiography.

MATERIAL AND METHODS: After obtaining IRB approval, anesthesia residents of the first year categorical class were recruited for the study. They were randomized to each of the two arms of the study. A written pretest designed to test basic knowledge of image orientation was administered to both groups. Residents of the article arm were asked to review the ASE SCA guidelines for performing a comprehensive intraoperative multiplane transesophageal echocardiography examination. Post test was administered when the residents felt confident about the concepts outlined in the article. The residents of the simulator arm underwent one session each of training with the TEE simulator, overseen by two senior residents with a month of training in intraoperative transesophageal echocardiography. A written post test was administered thereafter.

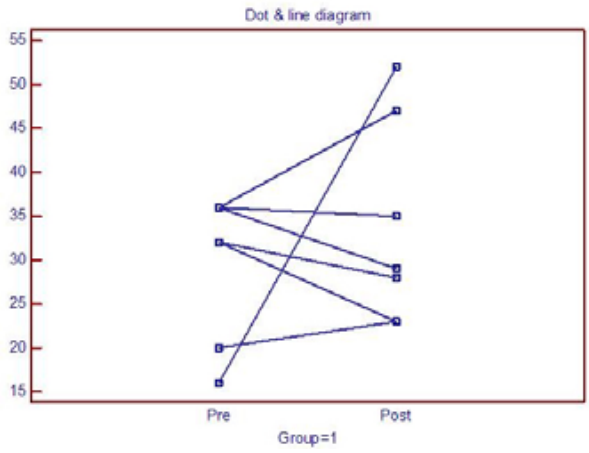
RESULTS: The pretest scores were similar in both the groups. The post test scores however showed a significant difference between the two groups .There was a marked improvement in the post test scores of the simulator group as compared to the article group . Even with a small sample size, a very significant difference was seen between the article group changes and simulator group changes P=0.007

DISCUSSION: The TEE simulator is a new innovative tool which is effective in understanding the basic concepts of transesophageal echocardiography in a short period of time. The time tested method of education in the operating room is by no means lacking but is undeniably fraught with constraints of time and patient care issues. This can distract and often confuse the novice learner trying to understand the basic concepts of image orientation and acquisition .Although the landmark guideline paper is lucid and comprehensive in its explanation, it can be challenging for a new resident with no experience. Our study demonstrates that the transesophageal echocardiography simulator is an effective tool to help understand the basic concepts and can be a valuable adjunct to the existing methodology of teaching transesophageal echocardiography.

Simulator group



Article group



S-167.

DESIGN AND IMPLEMENTATION OF NARRATIVE-BASED TEE INTERNET TEACHING PROGRAM

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INTRODUCTION: Transesophageal echocardiography (TEE) has been used intraoperatively for over twenty years. In 1999 the ASE/SCA formalized and published competency-based guidelines for performing intraoperative TEE . Since that time, the educational and certification requirements for anesthesiologists have been proposed and adopted. Familiarity with these guidelines and the twenty views required for a comprehensive intraoperative TEE exam are the requisite to learning TEE and performing a complete study. Viewing material, which is solely textual or illustrative may be limited and confusing to the inexperienced echocardiographer . By supplementing the views of a normal study with narrative teaching, this browser application allows the user to acquire knowledge and skills necessary to complete a comprehensive TEE exam. These narrative explanations are intended to simulate the intraoperative experience and guide the participants through the interpretation of the study.

METHODS: After reviewing the ASA/SCA guidelines, a basic schema was developed to illustrate the relationship and transposition of the twenty recommended TEE views. Internet sites pertaining to TEE teachings that are nonpaid were reviewed to determine the presence of voice narration. The authors used Adobe Photoshop CS4 and Autodesk 3ds Max to render internal structures of the heart and demonstrate probe position and scan plans. These images were imported into Adobe Flash CS4, where an interactive viewer was developed using Adobe Actionscript 3.0 Programming Language. Voice narratives of each of the views were recorded in Apple Garageband version 5.03 and postproduction was completed using Apple Final Cut Pro and Apple Soundtrack Pro. The voice was then integrated into the Flash application using Actionscript. Postproduction of echo video was completed in Final Cut Pro and integrated into Flash, where a preloader was developed to facilitate rapid loading of narrations and illustrations.

RESULTS: The authors could not find a nonpaid public acess Internet site that presented a narrative-based presentation of images encompassing the ASE/SCA guidelines. The Adobe Flash application was well received by staff and residents, and is used in departmental workshops on Intraoperative TEE.

DISCUSSION: This application differs from prior published presentations in that each view includes probe position, scan plan, unlabeled anatomic structures, echo video, and an interactive labeling features which allows the viewer to test their knowledge of echocardiographic anatomy. Each illustration/video is narrated to highlight salient teaching points. This implementation proves proof-of-concept that a narrative-based echo program could be developed and deployed easily and inexpensively within an Anesthesiology residency program. Teaching of this basic module can be expanded in the future to include more complex views and pathologies to address varying level of echo proficiency.

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S-168.

INTRAOPERATIVE MRI ELECTRICAL NOISE AFFECTS ECG ARRHYTHMIA DETECTION

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INTRODUCTION: Most electrical equipment in the modern operating room (OR) radiates electrical noise (EN) which can interfere with patient monitors. We have demonstrated and described the EN that the intraoperative magnetic resonance imaging (iMRI) system emits and have shown that this high energy EN diminishes the quality of the ECG waveform during iMRI scans in our neurosurgical OR (1,2). We have also shown that the ECG signal filters in our iMRI-compatible patient monitor reduce this interference but also disturb the true morphology of the waveform. This follow-up simulation study evaluates how iMRI-generated EN affects the ability of the anesthetist to detect and identify ECG arrhythmias and attempts to identify the most effective ECG signal filter in our particular monitor to use during an iMRI scan.

METHODS: Using an ECG simulator, we generated Lead II and V5 ECG tracings that contained either no arrhythmia (NA) or one of four specific cardiac arrhythmias - ischemia (I), right bundle branch block (RB), left bundle branch block (LB) and atrial fibrillation (AF). We mixed into the tracings simulated iMRI EN that had the characteristics we described previously (1,2). We filtered the simulated ECG tracings with four filters available on the iMRI-compatible monitor (Veris MR, MEDRAD Inc., Indianola, PA USA) used in our iMRI neurosurgical OR. The manufacturer designates these filters as No Filter (NF; not selectable clinically), Monitor (M), MR5, MR6 and MR7. With institutional approval and written informed consent, board-certified anesthesiologists reviewed the tracings, determined if an arrhythmia was present and identified the arrhythmia. We conducted the study anonymously. We reported the data as percents correct arrhythmia detection and correct arrhythmia identification.

RESULTS: Twenty-eight anesthesiologists completed the study. The results for all combinations of filters and arrhythmias are given in the table. Overall, the participants correctly detected 78.1% of the arrhythmias and correctly identified 72.4% of the arrhythmias, regardless of EN. The M5 Veris MR filter optimized both detection (79.1%) and identification of arrhythmias (76.8%) for our participants, in the presence of EN.

DISCUSSION: In the neurosurgical OR, the anesthesiologist must be able to effectively monitor a patient in the presence of iMRI-generated EN. Depending on the OR design, the patient may be enclosed in an electromagnetic shield during an iMRI scan and out of visual sight from the anesthesiologist. The clinician must rely on monitored physiologic parameters to assess the status of the patient during this extended period. Most patient monitors are equipped with signal filters that improve ECG signal quality in the presences of EN. The anesthesiologist should adjust these filters to achieve the best compromise between minimized EN and maximized ECG signal quality.

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	Arrhythmia Detection (%)									
	No iMRI EN					iMRI EN Present				
	NF*	M	M5	M6	M7	NF*	M	M5	M6	M7
Correct	78.5	79.6	82.1	76.8	79.9	73.4	76.8	**79.1**	78.4	76.4
Incorrect	21.5	20.4	17.9	23.2	20.1	26.6	23.2	20.9	21.6	23.6
	Arrhythmia Identification (%)									
	No iMRI EN					iMRI EN Present				
	NF*	M	M5	M6	M7	NF*	M	M5	M6	M7
Correct	76.1	73.0	76.9	71.6	70.7	80.4	75.9	**76.8**	71.6	70.3
Incorrect	23.9	27.0	23.1	28.4	29.3	19.6	24.1	23.2	28.4	29.7

*Not a clinically selectable filter. Included for comparison only.

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S-169.

SELF ASSESSMENT OF PHYSICIANS' ABILITY AFTER EDUCATION ON AN ULTRASOUND REGIONAL ANESTHESIA SIMULATOR

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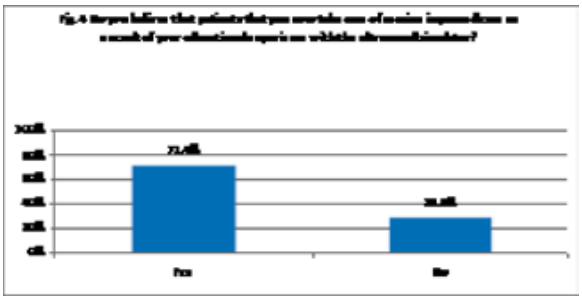
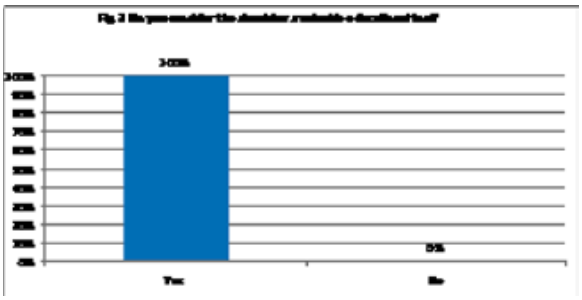
INTRODUCTION: Simulation is becoming an increasingly important component of medical education. We assessed the value of education with an ultrasound guided simulator for regional anesthesia.

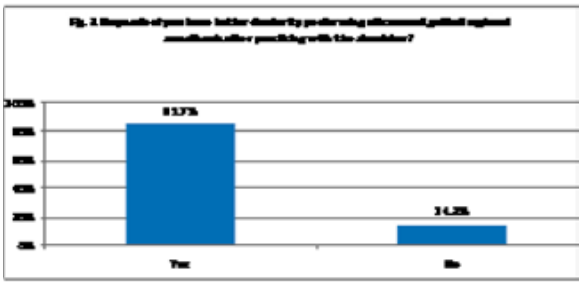
METHODS: After completing a regional anesthesia rotation, including educational experience using an ultrasound simulator of the upper extremity, anesthesiology residents completed a questionnaire on their experience with an ultrasound simulator and its effect on their education and patient care. Questions included prior experience with ultrasound guided regional anesthesia (USGRA) time practicing with the simulator, whether they felt they have better dexterity and improved ability to guide a needle after practicing with the simulator, if they consider the simulator a valuable educational tool and if they believe that their patients receive improved care as a result of their educational experience with the ultrasound simulator.

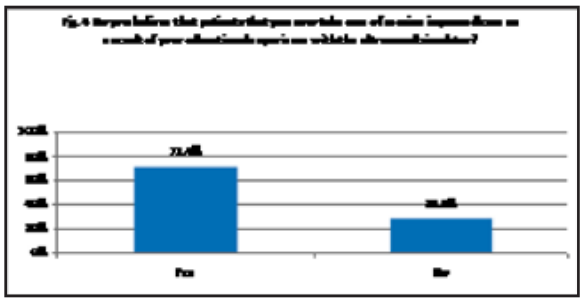
RESULTS: Seven anesthesiology residents completed the self assessment questionnaire. Prior experience varied with 1 (14.3%) having no prior USGRA experience, 2 (28.6%) having performed 1-10 prior USGRA blocks, 1 (14.3%) 11-20 blocks, 1 (14.3%) 41-50 blocks and 2 (28.6%) 51-100 USGRA blocks before practicing on the simulator. A majority, 4 people, spent 15-30 min of educational time on the simulator with others spending less or more. 85.7% feel they have better dexterity (Fig.1) and 71.4% feel they have improved their ability to guide a needle using USGRA after practicing with the simulator (Fig.2). 100% (p=0.008) believe the simulator is a valuable educational tool (Fig.3). Five of seven (71.4%) believed they now take better care of patients as a result of their educational experience with the ultrasound simulator (Fig.4). Of interest is that the 2 who did not believe it improved their care of patients had significant prior USGRA experience (1 having performed 51-100 prior USGRA blocks and the other 41-50)

DISCUSSION: By self assessment, anesthesiology residents indicate that the ultrasound simulator is a valuable educational tool (p=0.008) and they have improved their skills as a result of their educational experience with the simulator. Dexterity and ability to guide a needle were increased in 85.7% and 71.4% respectively. A majority indicate that their experience with the simulator has translated into improved patient care.









S-170.

ACQUISITION OF BASIC FIBEROPTIC DEXTERITY SKILL USING VIRTUAL REALITY SIMULATOR: FIRST STEP TO BECOME AN EXPERT

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INTRODUCTION: The importance of fiberoptic intubation (FOI) is well established in anticipated and unanticipated difficult airway. [1] Acquisition of fiberoptic dexterity skill is the first step to become an expert in manipulation of fiberoptic bronchoscope (FOB). Previous investigators have demonstrated that virtual reality (VR) AccuTouch Bronchoscopy Simulator (Immersion Medical, Gaithersburg, MD) is an effective tool in teaching FOB dexterity and skill transfer to actual patients [2] [3]. However, number of attempts and time required to train a novice to become an expert is still unanswered. This study aims to determine what constitutes an "expert" and how much time and how many attempts are required for a novice to reach an "expert" in FOB dexterity.

METHODOLOGY: Twenty three participants (15 medical students as novice; 8 attending anesthesiologists as expert) were enrolled in the study. The novice group underwent pre-training testing followed by training to achieve the "expert level". Teaching included watching a 10 minute video on FOI followed by performing FOB on VR Simulators under direct supervision of an expert. In establishing "expert level", expert group performed 4 FOB on VR Simulator and their 4th attempt was recorded. Data included the time required to pass the fiberoptic scope from the nose through the cords until the carina was visualized, number of tip collisions with the mucosa and time spent viewing the mucosa. The mean values were used as the "expert level" required by novice to achieve during their training. The number of attempts and time required to achieve "expert level" on VR Simulators were recorded. Two consecutive performances equal or better than the expert level were considered an appropriate level of skill. Paired t-Test was used to compare pre and post training performances. Data were expressed as mean ± SD.

RESULTS: Within 9 attempts (SD 5.50) in 8.35 minutes (SD 5.7) novices achieved "expert level". There was a significant improvement in the total number of airway collisions (9.80 ± 15.06 vs. 0 ± 0, p = 0.03), total time of FOB (1.77 ± 0.95 vs. 0.41± 0.08, P < 0.01), time spent in hypopharynx (0.66 ± 0.74 vs. 0.12 ± 0.06, P=0.02), nasal passage (0.36 ± 0.23 vs. 0.11 ± 0.37, P<0.01), nasopharynx (0.03 ± 0.02 vs. 0.01 ± 0.01, p<0.02), and trachea (0.17 ± 0.11 vs. 0.08 ± 0.04, P <0.01) after training.

CONCLUSION: Our results showed the number of attempts and time required to achieve expert level in manipulating FOB by novices on VR simulator setting which is significantly lower than suggested in the literature.

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S-171.

RESPONSE TIMES TO PEER-TO-PEER ALERTS VERSUS ALPHANUMERIC PAGING AT AN ACADEMIC MEDICAL CENTER

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INTRODUCTION: Effective communication in the operating room and intensive care unit are critical to patient safety. In the past, pagers have been the cornerstone of hospital communications. Recently, there has been a proliferation of cellular phones for the following purported advantages: 1) mobile telephones provide rapid, two-way communication; 2) permit greater information exchange; 3) allow discussion of information; and 4) allow acknowledgment of messages. With rising demands for anesthesia care outside of the operating room, coupled with larger anesthesiology group practices, the necessity for efficient communication becomes paramount. Since 2001, this academic department has utilized PTP(peer-to-peer) technology for all communications between anesthesiologists, residents, and mid-level providers. We believe that the cellular phones equipped with PTP technology are the next logical progression because they simplify the process of communication. Our study investigated the response times of anesthesia providers to notification via pager versus PTP cellular telephones.

METHODS: Anesthesiologists were randomized to be contacted at various times, and by a randomly selected method_i.e. PTP, pager to an internal hospital line (may only be called from a hospital land line), or external hospital line (may be called from any telephone). Response time was examined using a survival analysis approach, and right censored at 600 seconds. A chi-square test for equality of the distribution across the three cell frequencies was conducted using a 5% Type I error level, and indicated that the number of probes conducted in each arm did not appear to be different. We used a log-rank test to compare the three probe types, and Kaplan-Meier plots were constructed for each.

RESULTS: PTP notifications had a 100% response rate, compared to 77.4% and 75% for the internal and external pager notifications, respectively. Median response times for PTP, internal page, and external page were 7.1seconds, 76 seconds, and 91seconds, respectively. PTP response times differed significantly from pager response times, as confirmed by the log-rank comparison resulting in a p-value < 0.0001.

DISCUSSION: Response times to PTP notification were significantly shorter than those to pagers, as illustrated in Figure 1. In a study of 869,483 patients, Arbous et al concluded that, "direct availability of the anesthesiologist decreases the risk of postoperative mortality and coma"[i]. Based on this, the ability of members of the anesthesiology team to instantly communicate, and have confirmation of receipt of information has the potential to positively contribute to patient care and outcomes. The institution of PTP technology will likely facilitate communication and improve patient care. Future investigations may evaluate provider satisfaction with PTP technology as well as alterations in morbidity/mortality upon institution of PTP communication.

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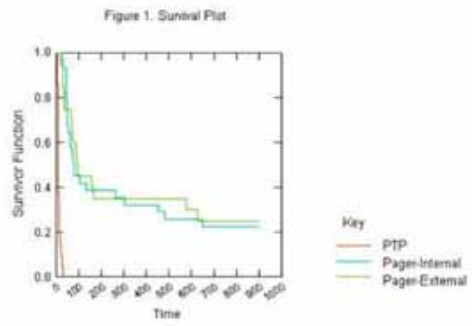

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S-172.

COMPARISON OF TRACHEAL AND ESOPHAGEAL COMPLIANCE CURVES IN HUMAN CADAVERIC SUBJECTS

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INTRODUCTION: Esophageal intubation can be catastrophic for patients if undetected. Rapid and reliable confirmation of proper endotracheal tube placement is currently achieved by a combination of several methods. Unfortunately, none of these methods alone is sensitive and specific enough to ensure proper placement, particularly in the emergency setting without continuous end-tidal CO2 monitoring. Structural differences in the trachea and esophagus provide a differential compliance during cuff inflation as demonstrated in porcine models. This could be the basis of a new method of rapidly and accurately confirming tube placement. We seek to extend this investigation to human cadaveric models by measuring and comparing esophageal and tracheal compliance curves.

METHODS: 16 fresh, non-embalmed cadavers were used for this study. The cadavers were originally used for an airway educational course for which all proper procedures were followed for obtaining human cadaveric subjects. The length of time from death to instrumentation was less than 48 hours for each subject. A cuffed endotracheal tube was placed in the trachea under direct visualization by an experienced laryngoscopist. A syringe was attached to the pilot balloon with a three-way stopcock and then to a digital manometer. The cuff was then inflated at a constant rate and pressures were digitally recorded by the manometer. The endotracheal tube was then placed in the esophagus at the same depth and pressures were measured in the same manner. P-values comparing differences in pressure at equal volumes were calculated using a Wilcoxon signed-rank test.

RESULTS: The difference in compliance was statistically significant for cuff volumes less than 4 mL with $P<0.05$. Volumes greater than 4 mL did not have a significant difference. Furthermore, this difference decreased with increasing cuff volumes.

DISCUSSION: Despite convincing data from porcine models in the literature, we were unable to replicate these findings in human cadaveric subjects. While there was a statistical difference in cuff pressures at low volumes, the trend quickly disappeared at higher cuff volumes. Since standard adult endotracheal tube cuffs are typically inflated with volumes greater than 4 mL of air, the difference would not be appreciated in a clinical setting. Without a strong and consistent difference between esophageal and tracheal compliance curves, a method of tube placement confirmation based on this property would neither displace nor add much to existing methods.

Esophageal and Tracheal Pressures at Equal Cuff Volumes

Volume (mL)	N	Esophagus Mean	Standard Devioation	Tracheal Mean	Standard Deviation	p-value
1	16	5.25	1.95	3.44	1.97	0.002
2	16	11.44	5.94	6.94	3.45	0.008
3	**16**	**16.8**	**10.35**	**10.00**	**5.23**	**0.006**
4	**16**	**23.00**	**14.30**	**18.25**	**18.21**	**0.050**
5	**16**	**29.81**	**18.4**	**19.63**	**10.40**	**0.054**
6	**16**	**37.19**	**22.36**	**27.38**	**13.12**	**0.271**
7	**16**	**45.94**	**26.38**	**36.25**	**16.79**	**0.490**
8	**16**	**52.56**	**32.74**	**46.31**	**20.19**	**0.849**
9	**16**	**62.50**	**34.63**	**57.63**	**24.48**	**0.653**

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S-173.

NO-COST TSE "MASK" IMPROVES OXYGENATION IN SEDATED PATIENTS DURING COLONOSCOPY.

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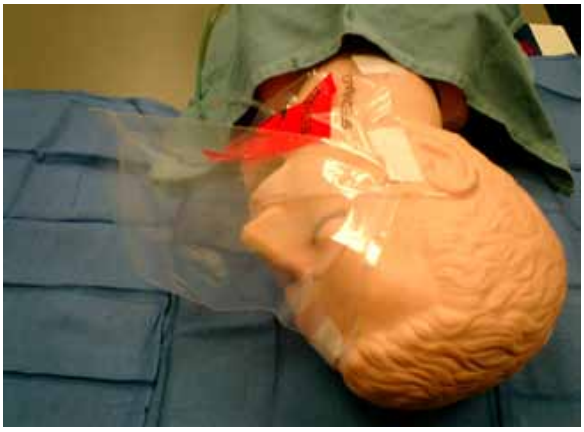
INTRODUCTION: A plastic sheet has been shown to convert a nasal cannula to a face tent (TSE "Mask") at no cost.1-3 It improves oxygenation in deeply sedated patients during lengthy upper GI endoscopic procedures by increasing O2 delivery.1-3 Patients routinely receive O2 via nasal cannula (NC) (3-5 l/min) during colonoscopy. Oxygen desaturation is common in patients receiving moderate-deep sedation. This simple face tent has been used in Endoscopy Suite. We wished to confirm its effectiveness in improving oxygenation while ascertaining FiO2 during colonoscopy.

METHODS: This retrospective review of 180 patients undergoing colonoscopy identified two groups. Group 1 patients received only NC O2 (NC, n=59). Group 2 patients received NC O2 and a TSE "Mask" (TM, n=121). A TSE "Mask" was prepared using a clean plastic specimen bag (n=88) 1-3 or a plastic fluid-shield surgical mask (n=33).3 It covered the patient's eyes, nose and mouth.



Monitors included ECG, BP cuff, pulse oximetry, capnography and oximetry measuring FiO2 and FeO2. All patients received NC O2 (3-5 l/min, or higher) and iv propofol. Data collected included age, weight, height, room air (RA) O2 saturation (Sat), O2 Sat at 5 min intervals, the lowest O2 Sat, the need for assisted ventilation, the amount of propofol and the procedure duration. Data were presented as Mean±S.D. Student's t-test and Chi Square test were used for statistical analysis. A p value < 0.05 was considered as significant.

RESULTS: There were no differences in age (yrs) (NC: 56±16; TM: 57±14), BMI (NC: 27.1±4.1; TM: 27.6±5.8), ASA physical classification (NC: 2.0±0.6; TM: 2.2±0.7), RA O2 Sat (NC: 99±1%: TM: 98±2%), the procedure duration (min) (NC: 26±13; TM: 28±12) and the overall dosages of propofol (ug/kg/min) (NC: 206±61; TM: 206±74). There were small differences in the highest O2 flow (l/min) (NC: 5.4±1.8; TM: 4.5±1.2) and O2 Sat after 5 min with supplemental O2 (NC: 99±3%; TM: 100±1%). Sedation with propofol significantly decreased O2 Sat in both groups (NC: 99±3 to 94±7%; TM: 100±1% to 97±3%). There were significant differences in the lowest O2 Sat (NC: 94±7%: TM: 97±3%), severe O2 desaturation (O2 Sat ≤ 85%) (NC: 6/59; TM: 0/121) and the need for assisted ventilation (NC: 3/59; TM: 0/121) between groups. Five NC patients experienced severe O2 desaturation (O2 Sat: 82±12%) with sedation and their O2 Sat greatly improved to 99±1% with a TSE "Mask". The Fe O2 (79±14%) was slightly higher than FiO2 (68±14%) in 40 TM patients who received NC O2 at the flow rate of 4.4±0.8 l/min.

Effect of TSE "Mask" on Oxygen Saturation during Colonscopy

	Room Air O2 Sat	O2 Flow (l/min)	O2 Sat after 5 min of O2	Overall Propofol dosage (ug/kg/min)	Lowest O2 Sat	Severe Desat (O2 ≤85%)	Assisted Ventilation
Group 1 NC (n-99)	99±1%	5.4±1.8	99±3%	206±61	94±7% p<0.0001 vs 0_2 5-min	6/59	**3/59**
Group 2 TM (n=121)	98±2% n.s.	45±1.2*	100±1%* p<0.001	206±74 n.s.	97±3% *p<0.0001 vs NC #p<0.0001 vs O2 5-min	0/121* p<0.001	0/121* p<0.02

DISCUSSION: Data show that TSE "Mask" improves oxygenation and prevents severe desaturation in sedated patients by increasing O2 delivery. This simple face tent may improve patient safety at no cost.

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S-174.

INTLOCK ASSISTED OROTRACHEAL FIBREOPTIC INTUBATION IN RANDOMIZED MANIKIN STUDY

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INTRODUCTION: Orotracheal fiberoptic intubation (OFI) remains one of the most important methods of intubating the trachea. However, OFI cannot achieve intubate rapidly, as the pharynx collapses leaving little free space to see through. The INTLOCK (IL: HOYA-Pentax Tokyo Japan), which is a blade of the Airway Scope, guides the tracheal tube into glottis, to ensure sufficient space in the pharynx. In this study, we hypothesized that IL-assisted OFI can achieve intubation more easily and more rapidly than the standard OFI procedure.

METHODS: [Designs] Randomized croS-over trial using a manikin. [Participants] Twenty-five anesthesiologists with at least 2 years clinical experience, who had never performed IL-assisted OFI. [Intervention] Group A: The first procedure using the IL for OFI and the second using the standard procedure for OFI, Group B: The first procedure using the standard procedure for OFI and the second using the IL for OFI. [Outcomes] The primary outcome measure was intubation time. The secondary outcome measure was visual analogue scale for difficulty.

RESULTS: Data are shown in the table as Mean (SD) [range]. *P<0.05

	IL-assisted OFI	Standard Procedure
Intubation time (sec)	31.9*(17.8) [9.5-76.3]	46.2(30.1) [21.0-120.0]
Visual analogue scale	1.6(0.63)[1-3]	5

Using a visual analogue scale, the difficulty of IL-assisted OFI was compare with that of the standard procedure (from 0 = Easy, 5 = standard procedure, to 10 = Difficult). There was a significant difference in intubation time between IL-assisted OFI and the standard OFI procedure.

DISCUSSIONS: Using the IL achieved intubation faster than the standard procedure. Furthermore, all participants considered the IL-assisted OFI easier to perform than the standard OFI procedure.

CONCLUSIONS: The IL-assisted OFI was faster and easier to perform than the standard OFI procedure. We concluded that the INTLOCK facilitates orotracheal fiberoptic intubation.

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S-175.

EVALUATION OF THE COOPDECHR VLP-100, A NEW VIDEO LARYNGOSCOPE IN A SIMULATED DIFFICULT AIRWAY

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INTRODUTION: COOPDECH® Video laryngoscope portable (VLP;Daiken Medical, Osaka, Japan) consists of a Macintosh-type laryngoscope with a built-in charge-coupled devise (CCD) camera and a color liquid crystal display (LCD) screen to obtain an indirect view of the glottis.TheVLP was developed mainly as an educational alternative to a teaching scope for conventional direct laryngoscopy. In fact,the CCD axis of the VLP was installed on the tip of the laryngoscope blade at an angle of 8 degree upwards from the direct sight line. Consequently, the CCD will provide a better and extended laryngeal view on the LCD screen than direct sight. Therefore the aim of our study was to compare the direct sight and the CCD image from the standpoint of the percentage of glottis opening (POGO) score in a simulated difficult airway situation.

METHODS:

A rigid cervical collar was attached LeardalR Airway Management Trainer manikin(LaerdalR, Stavanger, Norway) to simulated a difficult airway of Cormack's Grade 2b-3. Before each trial, one reviewer assessed to confirm the Cormack's Grade of the manikin during conventional direct laryngoscopy. Thereafter, twenty investigators performed laryngoscopy with the VLP; all investigators were experienced in the performance of conventional direct larynfoscoy but not trained in the use of the VLP. In every trial, video clips of direct laryngoscope view and CCD image were simultaneously captured and stored on a PC for later analysis. Subsequently, the reviewer selected the best possible views of glottis from each video clips to determine POGO scores for both direct laryngoscope view and CCD image. The Wilcoxon signed rank test was used to compare POGO scores for direct laryngoscope view and LCD screen. P values were two-tailed and $P<0.05$ was considered to indicate statistical significance. SPSS(version11; SPSS Inc.,Chicago,IL) software was used for the amalysis.

RESULTS: Every assessement of direct laryngoscope view before trials was granded as Cormack's Grade 2b-3 by the reviewer. The median POGO scores for direct laryngoscope view and CCD image were 23.5 (range;7.1-45.7)% and 65.7 (range;32.8-89.1)%, respectively;p=0.01. The LCD screen view was therefore significantly better than the direct sight.

DISCUSSION: LCD screen on the VLP was proved to provide a better and extended laryngeal view. Meanwhile, the impact of the CCD image on the ease of intubation was not evaluated in this study: the intubation time and the success rate of intubation because the POGO score was assumed as the main outcome instead. However, an improved laryngeal view may not aid intubation itself. Therefore, further study is needed to determine whether CCD image of the VLP will make difficult endotracheal intubation easier. In conclusion, a new video laryngoscope, VLP provided an improved view of glottis, as compared with direct sight in a simulated difficult airway situation.

S-176.

PERIOPERATIVE LUNG EXAMINATION BY ANESTHESIOLOGISTS

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INTRODUTION: Tube malpositioning after intubation can compromise patient oxygenation and can be associated with increased morbidity and mortality (1). Lung auscultation is a key determinant in order to assess correct endotracheal tube position and is part of resident education in anesthesia. Quality improvement initiatives have become a standard practice in many departments (2). Through examining anesthesia perioperative patient assessment and care, this study provides information designed to inform residents and faculty, of quality assurance issues within our department and identify areas for improvement, along with educational programs and purposes.

METHODS: Adult non-trauma patients were selected at random by case availability and followed into the OR where stethoscope availability and usage were observed for five minutes after intubation or until auscultation was witnessed. Non-observational data, consisting of ASA classification, vital signs, Mallampati class, and lung examination, were also collected.

RESULTS: Amongst all providers, auscultation was observed in 50% of cases within 5 minutes after intubation. Of the remaining 50%, auscultation was documented on the anesthesia record 97% of the time. Auscultation performed within 5 minutes after intubation was observed twice as often by Faculty and CRNAs (both 60%) compared to CA2 and CA3 residents (32% and 35%). T-moders and CA1 residents exhibited statistically equivalent stethoscope usage, 47% and 50% respectively. ASA classifications were documented on 94% of all cases. Of documented ASA classifications, 98% of providers recorded correct ASA status. Twenty percent of CA1 residents incorrectly identified ASA status. Amongst all providers, vital signs, Mallampati airway, and Lung examination were documented 93%, 83%, and 52% of the time, respectively.

CONCLUSION: Improving quality of patient care for the anesthesiologist should focus on more attentive preoperative and intraoperative lung evaluation. Data revealed that lung examination after intubation was conducted in only about half of all cases across all providers. The study also demonstrated that as residents progress through their residency, their auscultation performed decreases. Observed auscultations decreased from 47% by CA1 residents to 35% by CA3 residents. More emphasis of the procedure should be placed at the beginning of residency and exercised throughout the remainder.

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S-177.

HAS MEDIA PORTRAYAL OF PROPOFOL PROPAGATED PUBLIC PANIC?

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INTRODUCTION: Several studies demonstrate that news media can sway public opinion about health-related issues (1,2). The recent death of the singer Michael Jackson was an unfortunate and highly publicized event. Significant media attention was devoted to the culprit of Mr. Jackson's untimely demise; specifically, the reported implication of Propofol. The authors sought to objectively investigate whether the media portrayal of Propofol resulted in patient panic at the prospect of receiving this medication for anesthetic purposes. We hypothesized that those subjects aware of a potential association between Propofol and Michael Jackson's death, were more likely to express greater anxiety preoperatively and possibly even refuse administration.

METHODS: A survey was administered to patients scheduled for various surgical procedures in the ambulatory setting. Currently, 303 subjects have been enrolled. The questionnaire assessed participants' knowledge of Michael Jackson's death and the implication of Propofol. Preoperative and postoperative anesthesia associated anxiety scores were determined utilizing a modified Hamilton Anxiety Scale (HAS). Any patients' concerns relating to Propofol or refusal of administration were also documented. The data was analyzed using the Chi-square test and the Mann-Whitney U test.

RESULTS: The subjects were assigned to one of two groups dependent on their responses. Group Aware (N=110), consisted of individuals who were cognizant of the reported connection between Propofol and Michael Jackson's death. Group Unaware (N=193), participants were not knowledgeable about this linkage. Average preoperative anxiety scores were higher for the Aware group: 20 out of a maximum of 28, suggestive of moderate to high level of anxiety. In the Unaware group, the average HAS score was 16, indicating moderate concern for the ensuing anesthesia. Fifty-one subjects (46%) in the Aware group specifically inquired about Propofol administration, and 3 patients (2%) refused administration. No patients in the Unaware group discussed or declined Propofol administration.

DISCUSSION: The grandiosity of Michael Jackson resulted in a reciprocal level of media coverage of his passing. It is apparent from our study that those individuals familiar with the singer's use of Propofol are more likely to garner greater anesthesia related concerns, and perhaps even an aversion. Potential extensions of our study may include comparison of regional variations of patient opinions that may exist. Furthermore, utilizing a control group that is not faced with the prospect of imminent surgery may be a worthwhile consideration to offset potential confounds related to preoperative anxiety level. The tragic consequence of the inappropriate application of Propofol is highlighted by Michael Jackson's death. The moral must be stressed to both patient and practioner that Propofol is a safe and effective agent when used by trained anesthesia providers.

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S-178.

ENGLISH: WHAT A FOREIGN CONCEPT?! REVERSION TO NATIVE LANGUAGE SPEEDS EMERGENCE IN IMMIGRANTS

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INTRODUCTION: Nearly 38 million people in the US are foreign born, and more than 57 million speak a language other than English at home. Additionally, 52% of the foreign born population speak English less than "very well."(1) During emergence from anesthesia this lack of English proficiency may compromise the safety of this population, as they must respond to verbal commands from the anesthesiologist. From patients' responses to commands, anesthesiologists can safely evaluate extubation criteria, determine neurologic functioning, and the level of pain of patients. (2) Studies show that bilingual speakers revert back to their native language when in pain, when dreaming, and when feeling tired, which are characteristics similar to anesthesia emergence period. (3) The goal of this study was to determine if foreign language speakers respond earlier and more effectively to their native language than they do to English, during anesthesia emergence. We used commands recorded by a family member of the patient in both English and their native tongue to compare the response times and evaluate which language provided a safer and more communicative environment for patients who either do not speak English or who speak it as a second language.

METHODS: After IRB approval, patients whose language skills were better in a foreign language than in English were enrolled. With a laptop computer we recorded three commands in English and in the native language from a family member of each patient. Additionally, each patient was asked a set of questions to assess their English and foreign language understanding skills and the age they started learning English. During emergence from general anesthesia, the English and native language commands were played alternatively pausing to allow for a response. The order would alternate for each successive command.

RESULTS: 11 patients participated in this study. There were 26 total responses: 2 to English, 12 to the foreign language, and 12 to both languages. Those who started learning English after age 12 only responded to their foreign language. Also, those who assessed their English skills to be weak only responded to the foreign language. Those who assessed their English skills to be good responded to the commands in English and in the foreign language. The two responses to English only came from patients whose English and foreign language skills were equivalent. The age at immigration did not influence the patients' responses.

DISCUSSION: For patients who learned English after age 12 or for those with self-assessed poor English skills, optimizing anesthetic management at emergence may require that we utilize the patient's native language to improve the level of communication between anesthesiologist and patient.

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S-179.

ADMISSION BLOOD GLUCOSE LEVEL PREDICTS THE MAGNITUDE OF INTRAOPERATIVE HYPERGLYCEMIA IN NON-DIABETIC PATIENTS

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INTRODUCTION: Hyperglycemia is known to increase morbidity and mortality in surgical patients. Particulary hyperglycemic patients with no prior diagnosis of diabetes mellitus seem to be at higher risk than diabetic patients [1, 2]. In addition, patients with newly diagnosed hyperglycemia on hospital admission have increased mortality and decreased functional outcome as compared with normoglycemic patients or diabetic patients. [3]. It is not known if pre-surgical blood glucose level (BGL) in non-diabetics predicts the degree of stress hyperglycemia during surgery. We therefore determined the response of BGL to surgical stress and general anesthesia in patients with no prior diagnosis of diabetes. We also determined the proportion presenting with hyperglycemia or an elevated HbA1c-level (≥ 6%) on admission.

METHODS: This is a prospective observational cohort trial including 143 patients with no prior diagnosis of diabetes mellitus undergoing major surgery under general anesthesia. Baseline-BGL and HbA1c-level were determined before surgery. BGL were measured one, two and three hours after induction of general anesthesia as well as immediately before the end of surgery (average: 4.5 h post induction).

RESULTS: Elevated HbA1c-level on admission was present in 21% of patients. 52% of the study population became hyperglycemic (at least one BGL ≥ 126 mg/dl during or before surgery). Patients with a BGL ≥ 100 mg/dl ("HIGH") at baseline had higher BGL during surgery and were more likely to develop BGL ≥ 200 mg/dl (8.2% vs. 1.1%, p<0.05) than did patients whose BGL was < 100 mg/dl ("LOW"). After an initial increase in BGL after one hour in both groups there was no significant further change in the LOW-group. In contrast, BGL in the HIGH-group continued to rise over time. By the end of surgery BGL in the HIGH-group was significantly greater than the value measured after 1 h of surgery.

Discussion: 21% of the patients in the present study had elevated HbA1c-levels on admission, comparable with results recently reported by Wexler et al. [4]. As these patients represent a high-risk-group for unrecognized diabetes, appropriate follow-up might prevent subsequent diabetes-related complications.

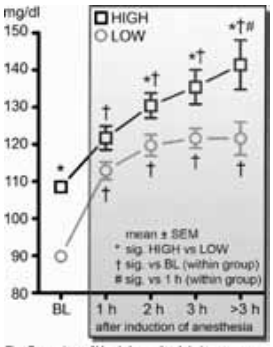

Fig. Comparison of blood glucose levels between groups and over time
BL: Baseline, BGL: Blood glucose level, HIGH: BGL ≥ 100 mg/dl at BL, LOW: BGL < 100 mg/dl at BL

As of now BGL are not routinely checked intraoperatively in patients with no prior history of diabetes. However, 3.5% of those patients in this study developed BGL exceeding 200 mg/dl during surgery. Admission-BGL could therefore be a tool to stratify patients by their risk of developing intraoperative hyperglycemia.

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S-180.

FREQUENCY OF "TRIPLE LOW" ALERTS IDENTIFIES PATIENTS AT RISK FOR POOR POSTOPERATIVE OUTCOMES: A PROSPECTIVE EVALUATION

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INTRODUCTION: Recent work demonstrated that increasing duration of a 'Triple Low' combination of low mean arterial pressure (MAP), low BIS, and low anesthetic concentration was associated with poor postoperative outcomes (i.e., increases in: time for PostOp pain ≤ 7, excess length of hospital stay, complications, 30-day readmission rate, 30-day and 1-yr mortality) [1]. In preparation for a decision support alarm trial, we prospectively evaluated the association between the frequency of alarm conditions for Triple Low events and postoperative outcomes.

METHODS: With IRB approval, BIS, MAP, and end-tidal volatile anesthetic concentrations in MAC-equivalents (MAC) were extracted for each minute of adult general surgical procedures from our perioperative registry. The Triple Low condition had been defined previously as the simultaneous combination of MAC < 0.7, BIS < 45, and MAP < 75 using a database of patients treated prior to 07/01/08. We now prospectively evaluated the Triple Low condition using patients monitored in the subsequent 6 months, yet followed for less than 1 year. The incidence and frequency of alarm notifications were modeled by generating a notification for every 5 contiguous minutes of Triple Low. Postoperative pain scores (measured using 10-cm Visual Analog Score and obtained ≈Q4 h), duration of hospitalization, serious complications, and 30-day mortality were collected for each case. Length of Stay (LOS) was considered excessive when the actual duration exceeded DRG-predicted LOS. Frequency of Triple Low alarm conditions was related to each outcome measure. Equality of mean outcomes among alarm frequencies was tested using ANOVA and Kruskal-Wallis as appropriate with p<0.005 as significant. Equality of mean values of baseline measures previously identified as predictors of mortality (i.e., age, BMI, gender, race, ASA Physical Status, composite risk derived from ICD-9 codes) was tested using independent t-tests and Chi-Square tests as appropriate.

RESULTS: A total of 1,021 (17.5%) of the 5,841 available non-cardiac procedures had at least one Triple Low event (Table 1). The frequency of alarm conditions was associated with longer time until postoperative pain ≤7 cm, longer excess LOS, and excess 30-day mortality (p<0.005). Complications and 30-day readmission rate were not statistically significantly different among alarm groups (p=0.807 and p=0.422, respectively.) Baseline age, BMI, race, ASA Physical Status, and composite risk, but not gender, were significantly different between patients who had alarms versus those who did not (p<0.005).

Outcomes per Alarm Frequency
(* p<0.05 compared to 0 Alarms, Bonferroni adjusted)

Triple Low Alarm Condition (present for 5 contiguous min)	0 Alarms	1 Alarm	2 Alarms	3 Alarms	4+ Alarms
Number of Pts(% of total)	4820 (82.5%)	399 (6.8%)	196 (3.4%)	96 (1.6%)	330 (5.6%)
Time until PostOp Pain <= 7 (hrs)	5.7 ± 16.0	6.5 ± 18.5	7.9 ± 22.1	4.8 ± 8.5	14.9 ± 32.3*
Excess LOS (days)	-0.9 ± 4.7	-0.3 ± 6.2	-0.7 ± 4.9	-0.6 ± 5.0	0.6 ± 8.5*
Complications N (%)	694(14.4%)	62(15.5%)	31(15.8%)	11(11.5%)	51(15.5%)
30-day Re-admission (N%)	395(8.2%)	33(8.3%)	14(7.1%)	10(10.4%)	36(10.9%)
30-Day Mortality N (% died within Alarm Group	36 (0.7%)	6 (1.5%)	1 (0.5%)	5 (5.2%)	10 (3.0%)

DISCUSSION: Increasing frequency of "TripleLow" alarm conditions was associated with poorer postoperative recovery (pain, excess LOS), and 30-day postoperative mortality. Patients who were older, had lower BMI, Caucasian, and had higher ASA Physical Status were more likely to have Triple Low alarms and poor outcomes. These findings provide justification for a prospective study to evaluate the clinical impact of a decision support system incorporating Triple Low alerts.

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S-181.

INTRAOPERATIVE CARBON DIOXIDE MANAGEMENT AND OUTCOMES

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BACKGROUND: Intraoperative hyperventilation is a common practice and results in hypocapnia. Hypocapnia may result in decreases in cardiac output, arterial blood pressure, cerebral blood flow, lung compliance, oxygen unloading from hemoglobin, as well as other effects. In contrast, hypercapnia may improve cognitive function, increase subcutaneous (e.g., surgical site) tissue oxygen tension, and attenuate lung injury. Since these effects may influence post-operative recovery, we attempted to examine clinical outcomes associated with variations in intraoperative carbon dioxide management.

METHODS: Data were extracted from an anesthesia information management system for all day-of-surgery admission elective colon resections and hysterectomies done under general anesthesia at a large urban academic medical center from 2002 to 2008. Cases were divided into four groups based on surgical procedure and use of laparoscopic technique. Parameters extracted for analysis included those in Tables 1 & 2, with physiologic data for each case averaged from the time of skin incision to skin closure. Hospital length-of-stay (LOS) was determined from administrative records and LOS over 75th percentile or in-hospital mortality was used as the independent outcome variable. For each group, logistic regression analysis using forward selection was performed to find factors that were independently associated with the outcome of interest.

RESULTS: A total of 3,421 cases were included in the analysis. Median EtCO2 was 31 mmHg (range 22 to 56). There was a statistically significant association between higher EtCO2 and shorter LOS, independent of other factors, for colon resection (Table 1) and open hysterectomy (Table 2). The relative risk of a prolonged LOS for each 5 mmHg increase in EtCO2 was 0.60, 0.45 and 0.57 for open and laparoscopic colon resection, and open hysterectomy, respectively.

CONCLUSIONS: There is a statistically and clinically significant association between higher intraoperative EtCO2 and shorter LOS after colon resection and open hysterectomy. The common practice of inducing hypocapnia may be detrimental, and maintaining normocapnia or permitting hypercapnia may improve clinical outcomes. Further study is warranted to demonstrate causality and determine the best ventilation strategy for these and other procedures.

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TABLE 1 - Perioperative Factors in Colon Resection Outcome

	OPEN TECHNIQUE			*LAPROSCOPIC TECHNIQUE*	
VARIABLE	Median (Range) or # (%)	Relative Risk*		Median (Range) or # (%)	Relative Risk*
n (#)	991	NA		741	NA
Length of Stay (LOS)	7 (1-152)	NA		5 (1-35)	NA
Age (per 10 yr)	51 (14-94)			56 (14-91)	
Male Gender	512 (52%)			361 (49%)	
Body Mass Index (per 5 units)	25 (14-67)			24 (14-66)	
ASA Class 3/4	305 (31%)	3.23		196 (26%)	5.02
Colitis (vs. Non-Inflammatory Diagnosis)	515 (52%)	0.67		325 (44%)	
Pre-Incision Antibiotics	925 (93%)			696 (94%)	
Rectal Surgery	280 (28%)			53 (7%)	2.70
Ostomy	533 (54%)	1.86		363 (49%)	
Procedure Duration (per hr)	181 (40-716)	1.15		172 (41-511)	1.32
Estimated Blood Loss (mL)	250 (10-5000)			100 (5-1550)	
Crystalloid (per L)	3600 (500-16000)	1.16		3000 (700-8600)	1.28
Transfusion	156 (16%)	1.61		33 (4%)	
Mean Arterial Pressure (per 10 mmHg)	83 (59-116)			87 (62-121)	
FiO2 (per 10%)	55 (24-97)			62 (28-97)	
Core Temperature (per deg C)	36 (33.7-37.9)			36.2 (33.6-37.5)	
Respiratory Rate (freq/min)	10 (6-15)			10 (7-17)	
Tidal Volume (mL/kg)	8.3 (3.1-15.3)			8.5 (3.3-19.2)	
Peak Inspiratory Pressures (per 5 cmH2O)	19 (10-48)			23 (11-43)	0.70
PEEP (cm H2O)	3 (1-8)			4 (1-10)	
EtCO2 (per 5 mmHg)	31 (22-43)	0.60		32 (23-47)	0.45

* Relative risk of LOS > 75th percentile or in-hospital mortality, p<0.05

TABLE 2 - Perioperative Factors in Hysterectomy Outcome

	OPEN TECHNIQUE			*LAPROSCOPIC TECHNIQUE*	
VARIABLE	Median (Range) or # (%)	Relative Risk*		Median (Range) or # (%)	Relative Risk*
n (#)	1119	NA		570	NA
Length of Stay (LOS)	3 (1-50)	NA		2 (1-13)	NA
Age (per 10 yr)	50 (23-89)	1.74		53 (25-94)	1.45
Male Gender	NA			NA	
Body Mass Index (per 5 units)	27 (15-85)			25 (17-78)	
ASA Class 3/4	212 (19%)	4.28		97 (17%)	
Colitis (vs. Non-Inflammatory Diagnosis)	NA			NA	
Pre-Incision Antibiotics	966 (86%)	0.62		536 (92%)	0.40
Rectal Surgery	NA			NA	
Ostomy	NA			NA	
Procedure Duration (per hr)	122 (29-641)	1.35		138 (28-513)	1.69
Estimated Blood Loss (mL)	250 (10-3000)			150 (5-1450)	
Crystalloid (per L)	2000 (200-11000)	1.41		2000 (200-9100)	
Transfusion	63 (6%)			7 (1%)	
Mean Arterial Pressure (per 10 mmHg)	88 (64-124)			90 (67-122)	
FiO2 (per 10%)	49 (25-99)			55 (27-99)	0.80
Core Temperature (per deg C)	36.2 (33.5-38.4)			36.1 (33.5-37.7)	
Respiratory Rate (freq/min)	9 (6-19)	0.87		10 (7-22)	
Tidal Volume (mL/kg)	7.8 (2.7-21.4)			8.1 (2.4-14.1)	
Peak Inspiratory Pressures (per 5 cmH2O)	22 (8-39)			24 (8-52)	
PEEP (cm H2O)	3 (1-11)			3 (1-8)	
EtCO2 (per 5 mmHg)	30 (22-50)	0.57		32 (25-56)	

* Relative risk of LOS > 75th percentile or in-hospital mortality, p<0.05

S-182.

PREOPERATIVE CHRONIC STEROID USE IS ASSOCIATED WITH INCREASED WOUND AND SYSTEMIC INFECTION IN NON-CARDIAC SURGICAL PATIENTS

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Steroids are the primary treatment for number of diseases and have also been used to moderate the inflammatory responses in patients undergoing elective surgery (1,2) and septic shock (3). Available studies suggest that corticosteroid use is associated with immune depression; therefore we aimed to evaluate preoperative chronic steroid use on wound and systemic infections after surgery in adult patients undergoing non-cardiac surgery.

METHODS: This study evaluated 363,897 patient records in the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database between 2005 and 2007. We excluded patients with current pneumonia, ventilator dependence, coma, tumor involving the central nervous system, disseminated cancer, preoperative open wound/wound infection, bleeding disorders. Each steroid user was matched to a non-steroid user based on two variables: propensity score and type of surgery. The propensity score, defined for the present study as the estimated probability of preoperative steroid use, was modeled as a function of all clinically-relevant and available potential confounding variables using multivariable logistic regression with backward stepwise selection of predictors (significance-to-enter and significance-to-stay criteria each set at 0.01). Type of surgery was categorized using CPT codes. Successful steroid user/non-steroid user matches were then restricted to patients with common (aggregated) CPT categorizations (as well as patients with estimated propensity scores within 0.001 units of one another).

The primary outcomes were 30-day systemic infection (including sepsis and septic shock) and wound infection (including superficial and deep surgical site).

RESULTS: Among the 363,897 surgical cases in the NSQIP database, 296,059 patients (81.4%) met our inclusion criteria of whom 7,760 (2.6%) were taking steroids preoperatively. Among the 7,760 patients taking steroids, 6,350 (81.8%) were successfully matched to a control patient not taking steroids. Excellent covariable balance between matched steroid users and matched non-steroid users was achieved, as evidenced by the fact that the maximum ASD between groups on any covariable was 0.08.

Adjusting for the correlation among outcomes within a patient as well as the number of intraoperative RBC units transfused within a generalized linear mixed model, the odds ratios [Bonferroni-adjusted 95% CI] for 30-day postoperative systemic infection and wound infection - comparing steroid users to non-users - were 1.24 [1.02, 1.49] and 1.21 [1.03, 1.41]. The Bonferroni-adjusted P-values for these comparisons, respectively, were 0.02 and 0.01 (Wald test). Systemic and wound infection risks were thus significantly increased in patients who took preoperative steroids.

CONCLUSION: Our results suggest that chronic corticosteroid use increases both systemic and wound infections in a large patient population. Recent recommendations suggest continuing perioperative steroids but we must be aware of possible serious infectious complications related to steroid usage.

S-183.

INADEQUATE EMERGENCE AND EARLY POSTOPERATIVE DELIRIUM AFTER ANESTHESIA

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INTRODUCTION: Inadequate emergence after anesthesia in the adult patient may be distinguished in regard to patients' activity level into two subtypes, hyperactive emergence and hypoactive emergence. Aim of this study was to investigate if the incidence of inadequate emergence in its different forms and the incidence of early postoperative delirium during the first 24 hours after surgery were associated.

METHODS: In this prospective observational study 649 non-intubated adult patients who had been admitted to the recovery room were analyzed. Inadequate emergence was classified in its different forms according to the Richmond agitation and sedation scale (RASS) 10 minutes after admission to the recovery room. Emergence delirium was defined as a RAS-Score > +1 and hypoactive emergence as a RAS-Score < -2. Early postoperative delirium was assessed before discharge of the recovery room and on the first postoperative day with the Nursing Delirium Screening Scale (Nu-DESC). Nu-DESC score ≥ 2 was defined as delirious. Statistics: Chi-Square Test, ANOVA

RESULTS: Of 649 patients, 51 (7.8%) displayed symptoms of inadequate emergence: 30 patients (4.6%) screened positive for hyperactive emergence and 21 patients (3.2%) showed hypoactive emergence. In the first 24h 68 (10.5%) patients showed early postoperative delirium. 24 of 51 (47%) patients with inadequate emergence continued to display early postoperative delirium.

DISCUSSION: Inadequate emergence after anesthesia is a strong predictor for early postoperative delirium.

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S-184.

THE IMPACT OF SUGAMMADEX ON BACTERIAL GROWTH

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INTRODUCTION: Contaminated intravenous medications pose a serious infection risk if the drug supports bacterial growth (1). The in use contamination rate of syringes in anesthetic practice can be as high as 18% (2). The new, long acting muscle relaxant antidote sugammadex (Bridion®) is a modified γ-cyclodextrin that exerts its effect by forming water-soluble complexes with steroidal neuromuscular blocking drugs (3). In this study we investigated bacterial growth in sugammadex (Bridion®) kept at room temperature or at 4oC.

METHODS: The growth of Staphylococcus aureus (ATCC 25923), Escherichia coli (ATCC 25922), and Pseudomonas aeruginosa (ATCC 27853) in sugammadex 100 mg mL-1 (Bridion®, Schering-Plough) were investigated. Five µL bacterial suspensions were inoculated into 500 µL of the above medication. The initial bacterial count was 5 x 103 colony forming units (cfu) mL-1. During the first experiment the contaminated sugammadex was kept at room temperature. At 1, 2, 3, 6, 24, and 48 hours 10µL was plated on Mueller - Hinton (MH) agar. Having incubated for 24 hours at 37oC the cfu was counted. During the second experiment the contaminated sugammadex was kept at 4oC for 48 hours. Ten µL samples were taken at 24, and 48 hours and plated on MH agar. Then the samples were incubated for 24 hours at 37oC and the cfu was counted. The method was described in details elsewhere (4). Saline 0.9% and MH broth controls were also applied. Two-way analysis of variance served as the statistical method.

RESULTS: The cfu number of the examined strains remained unchanged in sugammadex during the first 24 hours at room temperature. The cfu of E. coli and P. aeruginosa slightly increased after 48 hours. Keeping the contaminated sugammadex at 4oC for 48 hours did not decrease bacterial viability.

DISCUSSION: Most of the medications used in anesthesia kill bacteria if contaminated (1). On the other hand, sugammadex belongs to medications in which bacteria can survive for at least 48 hours. All efforts should be made to keep it sterile during preparation and administration and residual medication should not be left for another patient, despite its high cost.

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2010; 110; S-1 – S-491

S-185.

INITIAL EVALUATION OF A TEE EDUCATION PROGRAM

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INTRODUCTION: As the number of anesthesiologists trained in Transesophageal Echocardiography (TEE) has risen, its use during noncardiac surgery has increased. Studies and numerous case reports have reported that TEE provides valuable information in patients undergoing noncardiac surgery, (1,2) even cases in which information gained via TEE was considered vital for the patients' survival. (3,4) Anesthesia residents are exposed to TEE during rotation(s) in cardiac anesthesia and intensive care. However, performance of TEE requires a significant amount of training, and most anesthesiologists complete residency with minimal expertise in TEE. The goal of this study is to determine whether a formal training program during three years of residency can effectively teach TEE to anesthesia residents.

METHODS: After IRB approval, CA-I (n = 16), CA-II (n = 19) and CA-III (n=17) resident volunteers were enrolled. The curriculum included weekly a) assigned reading b) key points c) 5 question quiz d) DVD-based education session from the Society of Cardiovascular Anesthesiologists 11th Comprehensive Review and Update of Perioperative Echo 5) TEE-experienced attending at the DVD-based session to clarify key points and/or answer questions. An exam, created in-house, was reviewed by a nationally recognized TEE expert to ensure the quality of the exam. Residents took the exam (form A) prior to the year of TEE education and after (form B) the year of education. Mean changes in exam scores were compared with t tests, $p < 0.05$ significant. After 3 years of TEE education a score of 70% will be considered passing.

RESULTS: Mean exam scores improved significantly in all 3 years of training. The largest improvement occurred in the CA-II year (12.5 points; 30.3%), followed by the CA-I year (10.2 points; 27.5%), with the least improvement in the CA-III year (6.5 points; 14.5%), $p < 0.05$ all years.

DISCUSSION: Preliminary results indicate that after participation in the 40 week didactic TEE program, residents' exam scores improved in all 3 years of residency training. The program is ongoing. Prior to graduation, residents will complete a practical TEE exam. We plan to administer the written exam to graduating anesthesia residents and graduating cardiac anesthesia fellows in another training program, to serve as negative and positive control groups. The negative control group will verify that the described program improves TEE knowledge as compared to graduating residents who do not receive TEE training during residency. The positive control group will determine whether three years of education will allow residents to achieve a level of TEE knowledge comparable to graduating cardiac anesthesiologists.

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S-186.

A NOMOGRAM FOR PREDICTING SURGICAL COMPLICATIONS IN BARIATRIC SURGERY PATIENTS

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INTRODUCTION: Worldwide, approximately 1.7 billion people are overweight or obese. Obesity is associated with diabetes, hypertension, cardiac disease, sleep apnea syndrome, and degenerative skeletal disease. Annually, about 2.5 million obese people die from these complications. Bariatric surgery is recognized as an effective treatment for the morbid obesity. The number of bariatric surgeries is predicted to reach 200,000 annually in the United States and 500,000 worldwide.1 It is a high risk procedure, and very little has been published regarding the risks of surgery and subsequent outcomes.

The primary aim of our study is to develop a nomogram that would provide a prediction of the probability of composite surgical morbidity/mortality among the United States bariatric surgery population.

METHODS: We analyzed data from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database; 18,457 bariatric surgery patients treated between 2006 and 2007 with preoperative body mass index (BMI) > 25 kg/m2 were identified. We created a nomogram for predicting surgical complications in bariatric surgery patients.

INSTRUCTIONS FOR PHYSICIAN: Locate the patient's age on the 'Age (yr)' axis by interpolating between the displayed values (10, 20, 30, 40, 70), then draw a straight line upwards to the 'Points' axis to determine how many points toward major morbidity/mortality the patient receives for his/her age. Repeat this process for the other comorbidities listed, then sum all the points to get his/her total points. Locate his/her total points on the 'Total Points' axis, and draw a straight line down to the 'Predicted Probability (%)' axis. This is the predicted probability of 30-day major morbidity/mortality for the patient.

RESULTS: The nonlinear effects for age and BMI are evident in the nomogram; age-associated risk increases steadily to about age 40 and then levels off, while risk associated with BMI reaches a minimum at about 40 kg/m2. Low levels of serum album are associated with increased probability of morbidity/mortality, as well as functional dependence. Variations in chronic hypertension, smoking status, gender, diabetes mellitus, race, and history of COPT have relatively little impact on the predicted probability of morbidity/mortality.

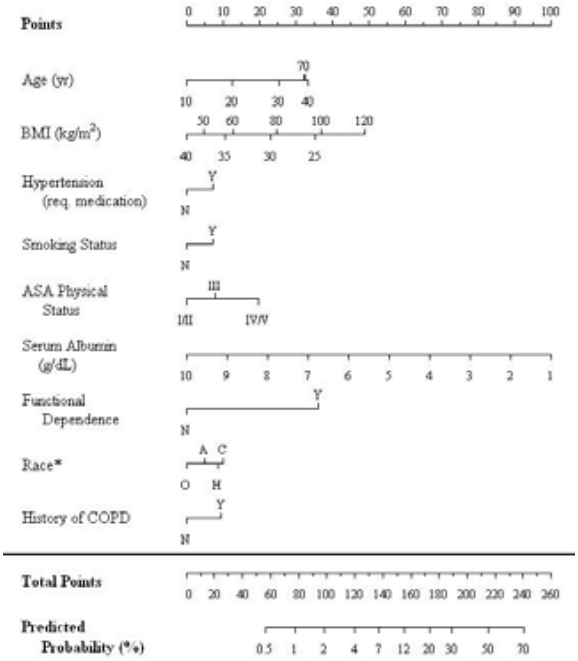

FIGURE 1: Nomogram for predicting operative (30-day) major morbidity/mortality in U.S. bariatric surgery patients based on demographic, morphometric, and preoperative variables.

DISCUSSION: Low levels of serum albumin are associated with increased probability of morbidity/mortality, as well as functional dependence. Chronic hypertension, smoking status, gender, diabetes mellitus, race, and history of COPD have relatively little impact on the predicted probability of morbidity/mortality. Our nomogram appears to be a useful tool in guiding the decisions of physicians and patients with regard to bariatric surgery.

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S-187.

DEVELOPMENT AND IMPLEMENTATION OF A DAILY RESIDENCY EVALUATION PROGRAM (RESEVAL) DEVELOPED IN ACCORDANCE WITH ACGME GUIDELINES

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INTRODUCTION: Since 1997, the Accreditation Council for Graduate Medical Education (ACGME) has required that all residency training programs must evaluate residents in six areas of competence: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice . Failure to document resident competence in these specific areas may result in loss of accreditation of the program . Other criteria set up by the ACGME include: feedback from multiple examiners, documentation of resident performance improvement, accessibility for review by the resident and summarization of the evaluations at six month intervals to be presented to the resident. The literature reveals great variability in the success of Anesthesiology residency programs to address these evaluation mandates . We have designed and implemented a computer based daily residency evaluation application designed to specifically address ACGME guidelines.

METHODS: After reviewing the published ACGME guidelines for residency evaluation we developed and implemented computer based residency evaluation program (ResEval). The application was developed using Microsoft Visual Basic for interface implementation and Microsoft Access as a normalized back-end database. ResEval is divided into two modules, an evaluation module and a resident review module. Key features specific to each of these modalities are:

EVALUATION MODULE-

(1) Specific ordinal evaluation of key competencies

(2) Definitions of each of these competencies integrated into the user interface.

(3) User directed feedback integration of strongest and weakest aspects of resident's clinical activities.

(4) An Alert feature- that allows users to texturally contact residency director should resident have a significant poor daily performance.

RESIDENT REVIEW MODULE-

(1) Interface design that allows daily and aggregate review of each of the competencies.

(2) Individual and aggregate tabulations of residency performance compared to aggregate for other resident's in his/her year of training.

(3) Evaluator open and blinded review of evaluations.

(4) Review of Alert Notifications.

RESULTS: Over a 5-month period ResEval has been implemented with very good compliance and satisfaction. It has facilitated periodic review of resident's performance. It has also allowed timely notification of significant performance deviations. The interface has reinforced review of six key competences by attendings.

DISCUSSION: ResEval is an example of an implementation of an interface design driven by administrative mandate. Its daily use by anesthesia staff provides for excellent continued feedback on residence performance. This abstract is presented to severe as an example of inexpensive, efficient implementation to address these mandates.

S-188.

THE EFFECTIVENESS OF DIDACTIC TRAINING AND PATIENT SIMULATOR IN IMPROVING KNOWLEDGE AND COMFORT LEVELS ON ULTRASOUND GUIDED CENTRAL VENOUS CATHETER PLACEMENT

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INTRODUCTION: Innate anatomic variations of the internal jugular vein may result in complications or death following central venous catheter (CVC) insertion when using the landmark technique alone. [1] Previous studies have shown that the addition of ultrasound (U/S) reduces complications and increases the success rate in CVC placement.[2, 3] However, U/S is not widely used by anesthesia care providers for this purpose[4].

HYPOTHESIS: An increase in knowledge of internal jugular anatomy, principles of U/S, and aseptic technique, accompanied by skills practice on a CVC anatomy simulator will increase health care providers' comfort level in their ability to place a CVC using U/S.

METHODS: 54 subjects (29 residents and 25 student nurse anesthetists) answered pre- and post-training surveys and completed pre- and post-training quizzes consisting of 12 MCQs (5 on anatomy, 5 on principles of U/S and 2 on aseptic technique). Pre- and post-training perceptions were evaluated using a 7-point Likert scale. Didactic training included a PowerPoint presentation on anatomy and principles and functions of U/S, plus a video on U/S guided CVC placement technique. Subjects also received hands-on training using Seldinger technique (20G VYGON arterial catheter) on CVC anatomy simulators (Blue Phantom). The Wilcoxon signed ranks test compared pre- and post- training scores. Data are expressed as Mean ± SD.

RESULTS: There was a 2.5-fold increase in quiz scores ($p<0.001$) from pre- to post- training (pre, 4.56 ± 1.48; post, 11.37 ± 0.81) including a 2-fold increase in anatomy (2.41 ± 1.00; 4.83 ± 0.47); a 3-fold increase in ultrasound (1.56 ± 0.88; 4.57 ± 0.63), and a 3-fold increase in aseptic technique (0.59 ± 0.66; 1.96 ± 0.19) scores.

A statistically significant increase in confidence ($p<0.001$) was noted between pre- and post-training in understanding the principles of ultrasound (pre, 2.83 ± 1.40; post, 5.31 ± 0.91) and its functions (pre, 2.00 ± 1.03; post, 5.11 ± 0.98); comfort level with central venous access (pre, 2.33 ± 1.18; post, 5.04 ± 1.13); use of ultrasound guided central venous catheter insertion (pre, 1.81 ± 1.18; post, 5.17 ± 1.01), and belief that simulators are good substitutes for an actual patient when practicing procedural skills (pre, 4.20 ± 1.37; post, 4.87 ± 1.18).

CONCLUSION: Teaching U/S guided CVC insertion is of paramount importance to medical care providers. Our study showed that simulation-based with didactic training can improve the knowledge of anatomy, principles of ultrasound and aseptic technique resulting to increased comfort levels among residents and student nurse anesthetists to perform U/S guided CVC insertion.

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S-189.

THE EFFICACY OF A NOVEL, FOCUSED TRANSTHORACIC ECHOCARDIOGRAPHY TRAINING PROGRAM FOR ANESTHESIOLOGY RESIDENTS

AUTHORS: D. L. Baker, G. Desjardins;

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INTRODUCTION: While the use of focused transthoracic echocardiography (TTE) has increased amongst emergency and critical care physicians, anesthesiology residents traditionally have limited exposure to this useful diagnostic tool. Thanks to advanced ultrasound technology and improved software interfacing, TTE no longer needs to remain solely in the domain of cardiology fellowship training. The Department of Anesthesiology at the University of Utah has recently introduced a first of its kind TTE training program as part of a perioperative medicine curriculum.

METHODS: This prospective comparison study aims to determine whether anesthesiology residents gain knowledge from undergoing such a training program. The program is embedded within a two-week perioperative medicine rotation, which residents complete twice during their first two years of residency. TTE training consists of a focused, four-view examination on paid models with known normal cardiac function and anatomy for one hour each morning prior to daily clinical duties. Multiple-choice tests were developed to assess residents' knowledge in key areas of competency before and after completing the TTE training. Each test consists of 20-30 questions, containing the same content but rearranged in order so as to minimize both confounding factors in score differences and ordering bias. Echocardiography clips from de-identified patient records were incorporated as examples of characteristic anatomy and disease states.

RESULTS: Areas of key competency were identified for the training program.

To date, 20 residents have completed the training, many of whom did so prior to initiation of this study. We have received overwhelmingly positive feedback from participating residents. Data gathering is in process to determine whether focused TTE training will enhance the learning of anesthesiology residents.

Imaging technique for a focused, four-view examination
Confidence in ability to acquire and interpret TTE images
Identification of key structures: Aortic, mitral, and tricuspid valves Chamber orientation and size Chamber wall thickness Global function
Ability to discern normal from abnormal structure: Transvalvular flow as a correlate for right and left filling pressures
Recognition of key diagnoses: Pericardial effusion +/- tamponade Low ejection fraction/systolic failure Hypovolemia Low afterload/SVR Severe valvular abnormality Diastolic failure
Recent URTI
Psych Meds

DISCUSSION: The synthesis of ultrasound technology with traditional physical examination has been widely regarded as the future of patient management (1,2); however, a rate-limiting step is the implementation of effective training in image acquisition and interpretation (3,4). Preliminarily, our program demonstrates that focused TTE training in an anesthesiology curriculum is possible and may yield improved diagnosis, understanding, and management of cardiac disease in the perioperative period. Future studies will include evaluation of image acquisition skills as well as long-term retention of knowledge.

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S-190.

RESIDENT PERCEPTIONS OF 24-HOUR CALL ELIMINATION

AUTHORS: M. Harris, **D. Axelrod;**

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INTRODUCTION: Meeting the 2003 ACGME-mandated residency work-hour restrictions did not present a challenge to our residency program. However, we found it increasingly difficult to ignore the growing body of evidence that shifts in excess of 16 hours are detrimental to judgment, technical acumen, and learning (1,2). Thus, we developed a residency schedule that eliminated 24-hour call, and sought to explore residents' perceptions of and responses to this change.

METHODS: We anonymously surveyed all anesthesiology residents for their opinions and expectations both immediately prior to and 6 months after the implementation of a new call system. The survey consisted of 26 scaled questions and 4 free-text questions.

RESULTS: Overall, 66% of our 35 anesthesiology residents completed the surveys. In general, after the implementation of a new call system residents found themselves to be subjectively safer, healthier, and to have more positive outlooks on their residencies.

Discussion: Our findings support the idea that working shorter shifts positively impacts anesthesiology residents' perceptions about their clinical safety and judgment, their personal health, and their department's concern for their well-being. We feel that our data can serve as an encouraging template as residencies attempt to comply with increasingly stringent ACGME guidelines and simultaneously improve both the safety and happiness of their trainees.

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S-191.

OBSERVED FAILURES OF AN EMERGENCY RESPONSE TEAM DURING MANAGEMENT OF A SIMULATED RARE EVENT

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INTRODUCTION: Obstetric crises are unexpected catastrophic events that require prompt performance of emergency procedures to assure survival of the parturient and fetus. Patient survival requires a rapid and efficient response by a team of emergency personnel (1). Resident education is often conducted in specialty-specific lectures and clinical sessions, with little emphasis on team management (2). Our aim was to identify strengths and weaknesses of traditional education for management of an obstetric emergency. A patient simulator was used to assess Anesthesiology (AN) and Obstetric (OB) resident physicians.

METHODS: 13 OB and 9 AN resident physicians all BLS/ACLS certified consented for this IRB approved study. All participants completed obstetric rotations, were provided with standard training material, attended a lecture on obstetric emergencies, and were introduced to the simulator prior to testing. Subjects read a description of the patient prior to entering the room. They were required to recognize patient distress, call for help, and manage the resuscitation team. Evaluation was based on the subject instructing the team to perform critical actions (LUD, Airway, CPR, diagnosis and treatment of the Rhythm, and performing the Emergent Hysterotomy). Sessions were videotaped and reviewed independently by two experts. Performance variables were timed and scored with physiologic variables recorded for later analysis. Statistical tests used were ANOVA and Chi-square with $p<0.05$ considered statistically significant.

RESULTS: All subjects recognized distress and checked vital signs, but a majority of subjects in both resident groups failed to instruct the responding team to perform other required emergency management tasks, and in all cases the simulated patient died. Observed trends and videotape review showed that AN residents were more likely to apply oxygen, address airway issues, and diagnose the rhythm, while OB residents were more likely to perform CPR, apply fetal monitors, and perform the emergent c-section (See figure). None of these tasks were performed within the desired time, and simulated patient saturation deteriorated from delays in action.

DISCUSSION: Video review of simulated sessions demonstrated that resident physicians misunderstood elements of the resuscitation and experienced difficulty in team management of parturient arrest, with OB and AN residents each stressing different aspects of resuscitation. Residents may benefit from education using multi-disciplinary team training and simulation to manage rare events.

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1. Report on confidential enquiries into maternal deaths in the United Kingdom. London: RCOG Press; 2004.

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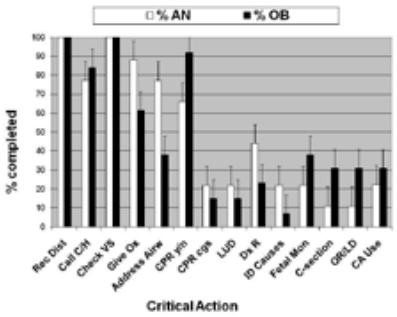


S-192.

WEB BASED EVALUATIONS AND BOARD CERTIFICATION OF FOREIGN MEDICAL GRADUATES AS COMPARED TO U.S. MEDICAL GRADUATE PEERS

AUTHORS: J. Adams, E. Okonkwo, D. Nakata, J. Butterworth, N. Hamrick, R. Funk;

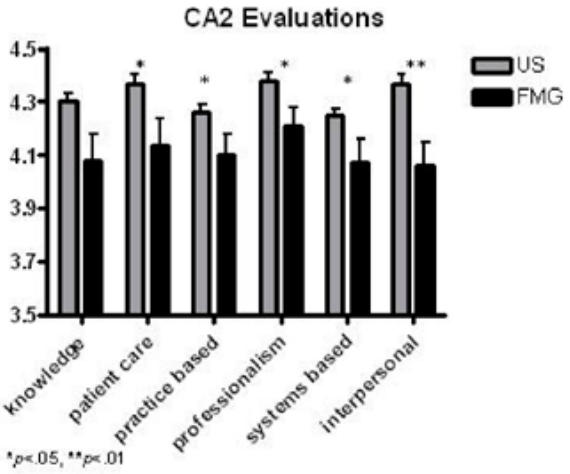
AFFILIATION: Anesthesia, IU School of Medicine, Indianapolis, IN.

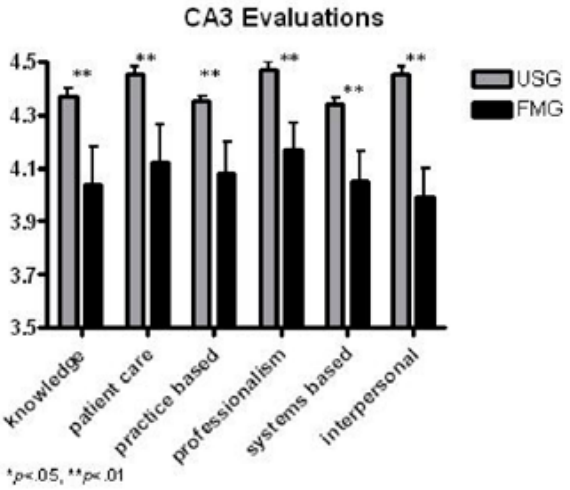
INTRODUCTION: The ACGME requires residents be evaluated on 6 core competencies. We use a web based competency evaluation system (WBCES) to evaluate our residents monthly. We hypothesized evaluation scores would differ between foreign medical graduates (FMGs) and US graduates (USMGs), and that these differences would presage a differing rate of ABA certification.

METHODS: We retrospectively reviewed WBCES data from December 2005 - May 2008, ABA board certification rates within two years of residency, and in-training exam (ITE) scores. Residents were evaluated in the 6 competencies using a web-based 5-point Likert scale. Evaluations were completed by the 3 physicians with whom a resident most frequently worked in each rotation. Our data included 15 FMGs and 115 USMGs. We compared WBCES scores between the two groups using ANOVA, and rates of board certification via chi square.

Results: CA1 FMGs were rated significantly lower in interpersonal skills when compared to USMGs, but were equivalent on other competencies ($p<.01$). CA2 FMGs were rated significantly lower on all competencies except knowledge ($p<.05$). FMGs were rated significantly lower on all competencies during the CA3 year ($p<.01$). There were no differences in written testing ability (USMLE step 1, ITEs, or written boards). ABA certification data was available for 42 US grads and 7 FMGs. FMGs were significantly less likely to obtain ABA certification within 2 years of completing residency ($p<.05$)

DISCUSSION: We conclude that FMGs possess the knowledge necessary to be a competent physician but may not perform as well clinically during the second and third years of residency and may have difficulty becoming board certified. Our WBCES demonstrated perceived differences in FMG clinical performance, and thus helped identify individuals at risk for not becoming board certified. Language and/or cultural barriers may be explanations for the less favorable evaluations and oral ABA examination performance of FMGs. Furthermore, faculty may be less engaged with FMGs or potentially have an existing bias against foreign medical graduates consequently resulting in FMGs failure to perform as well as their peers. FMGs may exhibit similar clinical skills during the first year of residency but may begin to lag behind USG peers during the 2nd and 3rd years of residency when they are expected to perform more complex duties and hone their skills, both of which are often directed by verbal communication. It is possible that our findings are unique to our center or may be the result of small sample size. On the other hand, residency programs should consider providing additional oral examination preparation for FMGs and should intervene early for those who perform below average on competency evaluations.





S-193.

A NOVEL COGNITIVE AID CARD IMPROVES RESIDENT AND STUDENT VFIB MANAGEMENT THREE MONTHS AFTER INITIAL ACLS TRAINING

AUTHORS: L. Field, J. Smalley, B. Cobb, C. Furse, H. Rieke, M. D. McEvoy;

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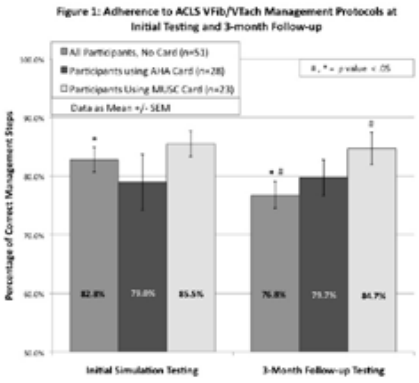
INTRODUCTION: Adherence to Advanced Cardiac Life Support (ACLS) guidelines during cardiac arrest is associated with improved outcomes. The best educational methodology to increase ACLS adherence remains unknown. We performed a randomized trial testing whether a novel cognitive aid (MUSC card) improves protocol adherence during American Heart Association MegaCode simulation of Ventricular Fibrillation and Pulseless Ventricular Tachycardia.

METHODS: 51 anesthesia residents, interns, and medical students were randomized to MUSC (N=28) or AHA (N=23) card groups. Participants received baseline simulator testing, the standard AHA ACLS training course as well as training regarding the AHA or MUSC card, and simulation post-testing. The scenario stems were altered between testing sessions to prevent repetition bias. Each participant managed 2 similar scenarios with a standardized code team. One scenario was managed with a card and the other without. At 3 months from initial intervention, participants re-tested with and without cards. Simulation sessions were videoed and graded using checklists derived from ACLS/AHA training manuals. Data was analyzed by ANOVA or t-test and presented as Mean ± SEM.

RESULTS: There were no intragroup or intergroup differences in demographics or baseline simulator performance. At 3-month follow-up testing without card, there was a decrease in protocol adherence, demonstrated by a decreased percentage of correct steps performed and an increased number of errors committed. However, in the MUSC group, use of the card at 3 months improved participants' percentage of correct actions to levels equivalent to their performance immediately after ACLS training (Figure 1). The MUSC card also demonstrated benefit for number of errors committed at follow-up. At initial testing, participants averaged 1.3 (+/- 0.21) errors per session, then at follow-up without a card, participants averaged 3.4 (+/- 0.41) errors per session. At follow-up with the MUSC card, performance improved to 2.0 (+/- 0.46) errors per session (p value no card to MUSC card = 0.032). The AHA card did not provide a significant benefit for percentage correct or number of errors.

DISCUSSION: There is a loss of skill at ACLS management at 3 months after initial training. A novel cognitive aid card improved adherence to ACLS protocols for Ventricular Fibrillation at 3 month follow-up simulation testing. Re-testing at 6 months and 12 months from initial training will be performed to assess retention of skill and effect of cognitive aids on team leader performance.



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S-194.

A DECISION SUPPORT TOOL FOR PERIOPERATIVE CARDIOVASCULAR EVALUATION FOR NONCARDIAC SURGERY

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INTRODUCTION: The "2007 ACC/AHA Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery" (1) is a multi-page document that can be challenging to incorporate into one's practice, especially for inexperienced clinicians, occasional users and those working in a busy preoperative screening clinic.

The starting point for preoperative evaluation is the "cardiac evaluation and care algorithm" - a step-wise approach based on 5 steps (i.e., urgency of surgery, presence of active cardiac conditions, surgical risk or type of surgery, functional capacity and presence of risk factors).

A survey at the 2009 Society for Ambulatory Anesthesia (SAMBA) conference demonstrated that even experienced preoperative anesthesia consultants have difficulty applying the algorithm.

We designed a web-based decision support tool that guides the user to the proper recommendation simply by answering up to 6 questions.

METHODS: We developed software that incorporates the algorithm specified in the flowchart "Cardiac evaluation and care algorithm for noncardiac surgery based on active clinical conditions, known cardiovascular disease, or cardiac risk factors for patients 50 years of age or greater." (1)

RESULTS: When presented at the 2009 SAMBA conference, attendees enthusiastically approved the concept and were eager to incorporate the tool in their clinical environment. A sample display is listed below.

Discussion: There are several potential benefits of using a decision support tool to assist in the preoperative evaluation of patients including implementation of evidence-based medical care, reduced frustration in recalling the ACC guidelines, possible reduction in the level of preoperative testing, and reduced time to complete the evaluation.

The tool is currently being evaluated as part of a multi-center study to determine how well anesthesiology residents can apply the ACC guidelines. Upon completion of that study, implementation of the tool in actual practice settings will follow.

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S-195.

RELIABILITY OF CELL PHONE TEXT MESSAGING FOR EVENT NOTIFICATION USING DATA FROM AN ANESTHESIA INFORMATION MANAGEMENT SYSTEM

AUTHORS: J. Kaplan, A. Ekbatani, R. H. Epstein;

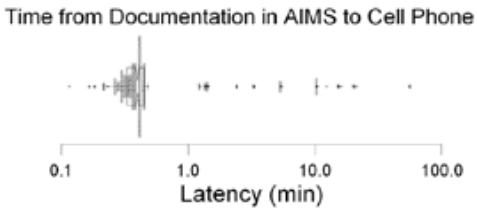
AFFILIATION: Department of Anesthesiology, Jefferson Medical College, Philadelphia, PA.

INTRODUCTION: To try to improve patient flow on the day of surgery, we recently implemented a pilot cell phone text messaging system using our anesthesia information management system (AIMS). The system automatically alerts attendings opting in when their next patient arrives in the holding area (HA), so they can begin their OR preparation, and when surgery ends in a case they are supervising, so they can be present for extubation. Before considering expansion of the system, we desired to examine the latency of event documentation and arrival of the message to determine its suitability for timely notification.

METHODS: A stored procedure executing every min was written in our AIMS that finds cases where the Surgery End event was recently documented and patients arriving in the HA. The query determines the attending assigned to the patient and sends a message to his or her cell phone using the short message service (SMS) protocol. Messages are time stamped and logged on the AIMS server with the text, the event time, the AIMS documentation time, and the message transmission time. Records were aligned with 200 messages received by one user over 4 months and total latency from event documentation to message receipt was determined. Thirty seconds was added to each receipt time noted on the phone, as arrival times are truncated to the minute and would have arrived randomly 0:00 to 0.59 seconds following the listed time. The interval from AIMS documentation to server transmission was also determined. Pearson's correlation coefficient was calculated between time of day (min from midnight) and total latency.

RESULTS: 75% of messages were received within 30 sec of documentation, but 10% of messages took >5 min and 5% >10 min (Fig). Latency was not correlated with time of day (R=0.12). Mean (SD) latency from event documentation to the time the text message was transmitted was 24 (22) sec with 99% of values within 85 sec. Attendings using the system confirmed the occasional occurrence of prolonged notification delays.

DISCUSSION: Despite the rapid delivery of text messages following documentation in most circumstances, the relatively high incidence of prolonged delays casts doubt on the the reliability of SMS text messaging for notification of time-sensitive events. For adminstrative events such as HA arrival, performance is probably satisfactory. However, there would be an unacceptablely high incidence of attending absence at extubation if SMS texting were the only method of notification. Thus, residents and CRNAs continue to page their attendings manually when surgery ends, although attendings using the system often arrive before being paged. Based on our results, we recommend against use of SMS texting to cell phones for the sole method of transmission of time-sensitive messages.



S-196.

EVALUATING THE EFFICACY OF A NOVEL PATIENT SAFETY CURRICULUM

AUTHORS: C. Gay, D. Jones, B. Egan;

AFFILIATION: Anesthesiology and Pain Medicine, NY Presbyterian/Columbia University, New York, NY.

INTRODUCTION: The purpose of this study was to evaluate the efficacy of a novel patient safety course designed by our department as part of the PGY1 curriculum in anesthesia. In an effort to continually improve resident education, we developed a standardized four-week curriculum which included formal instruction in patient safety based on ACGME core competencies. This course replaced an already in place longitudinal approach to patient safety that consisted of rotation specific lectures, journal clubs and faculty guidance. To evaluate the efficacy of the new course, we created and administered a web-based survey to assess the baseline knowledge of all residents and the knowledge gained by PGY1 residents after course completion.

METHODS: After obtaining IRB exempt status, all residents (80) in our four-year anesthesia program were invited to complete a 50 question survey about important topics in patient safety. Of 72 CA1-3's, 57 completed the survey in addition to 8 PGY1's. None of the participating residents had received formal patient safety training prior to completing the survey. Our PGY1 residents then underwent formal training in patient safety via completion of a 1 month rotation after which they again completed the survey. Utilizing commercially available testing software, we were able to assess resident knowledge of patient safety through the use of multiple choice and true/false style questions. The questions were based on the content of the lectures and general overarching principles of patient safety. As part of the survey, we also collected self-evaluation data regarding resident beliefs about their own proficiency in patient safety.

RESULTS: Of a potential 72 CA1-3 residents, 59 (79%) completed the survey and scored an average of 52%. The score ranges in percent correct (avg) by class were CA1: 41-68% (51%), CA2: 34-68% (55%) and CA3: 29-76% (50%). The PGY1 average was higher on the baseline survey (60% correct) as well as the post-test (74.4% correct).

DISCUSSION: At baseline, our PGY1 residents scored better than our more advanced residents on the survey. This supports our belief that Our belief that early implementation of a patient safety course would improve resident's knowledge of patient safety issues. The average improvement was approximately 23% after completion of the course. It was assumed that the longitudinal approach to patient safety would translate into improvement in scores as residents increased in post-graduate year, however, there was no linear association between baseline knowledge and year of residency. Despite positive results, future studies will be required to assess whether the increase in knowledge imparted by the course is sustainable over time as well as whether any associated decrease in departmental errors occurs.

Resident Survey Scores by Class

Class (# completing)	Average Baseline Score	Post-test Score (if applicable)	% Change
CA1 (19/24)	51%	-	-
CA2 (18/24)	55%	-	-
CA3 (20/24)	50%	-	-
Avg CA1-3 Score (57/72) 79%	52%	-	-
PGY1 Group A (2/8)	69%	79.5%	+15.2%
PGY1 Group B (2/8)	68.5%	79%	+15.3%
PGY1 Group C (2/8)	53%	79%	+49%
PGY1 Group D (2/8)	50%	60%	+20%
Avg PGY1 Score (8/8)			
100%	60.1%	74.4%	+23%

REFERENCES: Not applicable.

S-197.

MEASURING THE EFFECTS OF PEEP ON CHEST RISE HEIGHTS AND PEAK INSPIRATORY PRESSURES DURING MECHANICAL VENTILATION OF THE METI HPS, METI ECS, AND LAERDAL SIMMAN SIMULATORS

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INTRODUCTION: Mechanical lung models are often used to help teach respiratory physiology and management [1], such as avoiding barotrauma at excessively high positive end-expiratory pressure (PEEP) settings [2]. Our aim was to determine whether the patient simulators at our institution would be suitable for scenarios involving the administration of PEEP.

METHODS: We measured the mannequins' response to PEEP using a 3x4 repeated-measures experimental design. The independent variables were Simulator (METI ECS, METI HPS, Laerdal SimMan) and Set PEEP (0, 5, 10, 15 cm H_2O). The dependent variables were the Chest rise height (mm) and Peak inspiratory pressure (cm H_2O) during each breath. Three simulators at the Queensland Health Skills Development Centre were intubated and mechanically ventilated using a Datex AS/3 ventilator at 10 bpm x 500 mL for 10 consecutive breaths at each PEEP setting. The simulators were set to default values with the exception of 100% neuromuscular blockade or RR=0 bpm. Data were recorded on video and with a Respironics NICO®2 respiratory monitor. Differences were tested for significance using repeated-measures ANOVAs.

RESULTS: There was a significant interaction between Simulator and Set PEEP for both the Chest rise height ($p<0.001$) and Peak inspiratory pressure ($p<0.001$). Chest rise height increased with the presence of PEEP on the ECS, decreased on the SimMan, but was absent on the HPS. Larger dynamic ranges of peak inspiratory pressures were measured on the ECS and SimMan compared to the HPS.

DISCUSSION: The ECS and SimMan exhibited peak inspiratory pressures greater than the 35 cm H2O associated with an increased risk of barotrauma in human patients [3] when they were ventilated with a PEEP of 10 or 15 cm H2O. Peak inspiratory pressures were relatively low on the HPS even during high PEEP conditions, but this can potentially be addressed by decreasing the simulator's lung compliance factor. The lack of visible chest rise and fall on the HPS when PEEP is present may limit scenario fidelity. The present study's findings suggest that the ECS and SimMan may be suitable for training scenarios involving PEEP titration.

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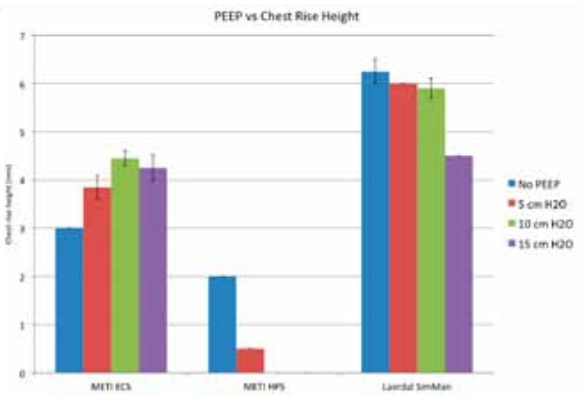

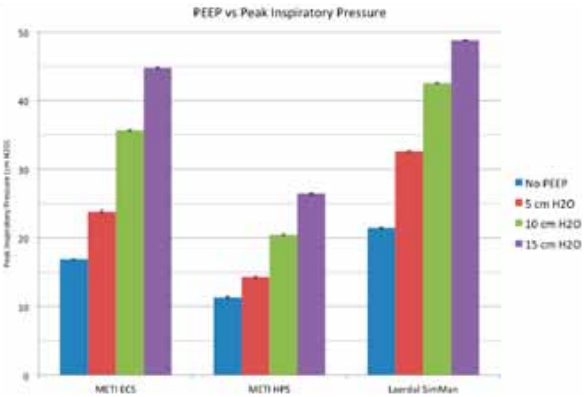

S-198.

WITHDRAWN.

S-199.

STRICT COMPLIANCE WITH THE PRE-PROCEDURE "TIME OUT"? IN ANESTHESIA TRAINING FACILITIES - NOT SO MUCH

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INTRODUCTION: The Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) has established a Universal Protocol (UP) to ensure accredited hospitals follow an algorigthm to verify correct person, site and procedure (1). This has been an ongoing issue in the media with wrong-site surgery incidents continuing to occur and be publicized up to the time of this writing (2). In our institution, we have noted strict compliance for surgical procedures but variability in other venues involving anesthesia services. Therefore, we wished to determine to what extent other anesthesia residency training facilities are in compliance with the JCAHO UP.

METHODS: After receiving IRB approval, in October 2009 we surveyed the 132 ACGME-accredited anesthesia residency training programs regarding the application of the JCAHO UP in various procedural venues where anesthesia services are provided. Surveys were mailed once and one follow-up email was sent. Survey questions focused on whether the institution always performed an immediate pre-procedure "time out" (PPTO) in areas that anesthesia services are provided. These included surgical operating rooms, obstetrical locations, and other off-site locations such as GI endoscopy, cardiac cath lab, radiology special procedures, etc.

RESULTS: We mailed 132 surveys; one was undeliverable and we received 44 responses, (approximately 33%), which is typical for physician surveys (3). We found fairly strict adherence to the UP in surgical and obstetrical surgical venues (SEE TABLE). However, in off-site anesthetizing locations compliance trended lower. As an example, for labor epidurals we found only 76% of responding institutions always adhered to PPTO. For off-site endoscopy there was 73% institutional adherence to PPTO. Also, for cath labs there was only 73% compliance. Finally, for interventional radiology there was only 69% institutional compliance.

DISCUSSION: This survey was initiated after we observed in our institution that the UP PPTO was not routinely followed in some off-site locations. We also have previously reported widespread disregard of other JCAHO standards involving perioperative removal of dentures, jewelry and body piercings (4,5). All responding institutions are JCAHO participating facilities. Since these hospitals are training future anesthesiologists, consideration should be given to either modifying practice patterns or advocating a change of standards. In this instance and considering ongoing negative media attention being given to this issue, strict compliance with the UP PPTO is advised, with particular attention to off-site anesthetizing locations.

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Are Pre-Procedure Time Outs Performed...

	Always	Not Always
Surgery	95%	5%
Obstetrical Surgery	87%	13%
Labor Epidurals	76%	24%
Endoscopy	73%	27%
Cardiac Cath Lab	73%	27%
Interventional Radiology	69%	31%

S-200.

CASE CANCELLATIONS IN THE OPERATING ROOM

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INTRODUCTION: Case cancellation after a patient has been brought into the operating room (OR) is a safety concern given the late stage of discovery of a problem, and may also waste resources. Previous studies have examined the causes of day-of-surgery cancellations, but not specifically cancellations in the OR.[1] We investigated the reasons for in-OR cancellations.

METHODS: All cases from 2002 to 2008 in an anesthesia information management system (AIMS) at a large academic medical center were screened for indicators of in-OR case cancellations. Each cancelled case was reviewed and the primary cause and timing (i.e., pre- vs. post-induction of anesthesia), of cancellation was agreed upon by the investigators. The reasons for cancellation were categorized. For the most common cause of cancellations, additional pertinent data were extracted from the AIMS.

RESULTS: A total of 209,985 cases were screened, revealing 438 cancellations in the OR. Table 1 shows the distribution of reasons for cancellation, with 34% of cancellations occurring after induction of anesthesia (but before the planned surgical procedure). Although difficult to determine based on available data, many of the cancellations seemed potentially preventable by more thorough pre-operative patient assessment. The most common reason for cancellation was asymptomatic severe hypertension. Further investigation of these cases showed that the mean blood pressure prior to cancellation was 203/111 mmHg (range SBP 159-246 / DBP 75-138). Of the 69 cancellations for hypertension, 42 patients returned to the OR after a time interval ranging from several hours to two years and had mean pre-induction blood pressure of 192/102 mmHg. A total of 1,592 elective cases were found in our AIMS with mean pre-induction diastolic blood pressure greater than 110 mmHg, suggesting that less than 5% of such cases are cancelled.

CONCLUSIONS: Most case cancellations in the OR were due to cardiovascular issues and occurred prior to anesthesia induction. Since many reasons for cancellation seemed potentially discoverable/avoidable prior to arrival in the OR, further analysis of such cases may assist in modifying pre-operative processes to prevent recurrence. Hypertension was the single most frequent reason for cancellation. However, these cases represented only a small proportion of all cases with similar blood pressures that fit published criterias[2] for cancellation but were not cancelled. In addition, most patients who had their surgery cancelled for hypertension and then returned to the operating room at a later date still had stage 2-3 hypertension, suggesting that cancellation does not typically lead to optimization of blood pressure. Therefore, further research and/or education are warranted to solidify guidelines for addressing perioperative hypertension.

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TABLE 1: Reasons for Case Cancellations in the Operating Room

Category	Count	%
Hemodynamic Problem	87	20%
New Physical/Imaging Finding	56	13%
Dysrhythmia/ECG Changes	50	11%
Respiratory Problem	39	9%
Unknown/Unclear Reason	35	8%
New Lab Finding	28	6%
Airway Problem	27	6%
Access/Monitoring Problem	25	6%
Transplant/Graft Problem	15	3%
Supply/Equipment Problem	15	3%
Consent/Administrative Problem	14	3%
New History/Symptom	14	3%
Patient Anxiety/Refusal	12	3%
Adverse Drug Reaction	10	2%
Failed MAC/Regional Anesthesia	6	1%
Blood on Neuraxial Procedure	5	1%

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S-201.

TRANSITION TO PRACTICE: A NEW PARADIGM IN ANESTHESIOLOGY RESIDENT TRAINING

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INTRODUCTION: ACGME-approved residency programs have specific core competencies that must be mastered, in order for a resident to advance to the next level of training and graduate from the program.1 The core competencies address specific issues related to the clinical care of patients, as well as interpersonal and professionalism skills required to practice medicine. However, there is currently no established curriculum or recommendation that addresses preparing the resident to transition into practice, focused on practice management skills, supervision of mid-level providers, regulatory issues, malpractice/litigation, negotiations, or types of employment available.

METHODS: A curriculum was designed that addresses practice management topics not typically covered in a traditional anesthesiology residency program, needed for the successful practice of anesthesiology. A "Transition-to-Practice" rotation, for PGY-4 residents, combining operating room clinical and management experience, daily mock oral exams, weekly didactic lectures, online learning exercises, and daily discussions with faculty members on practice management topics was instituted. All PGY-4 residents are required to complete the rotation and requirements prior to graduating from the program. The curriculum is divided into eight modules that focus on specific practice-related topics (Table 1). At the beginning of the rotation, each resident receives a syllabus of the structure, goals, objectives, and curriculum, with assigned readings and online learning exercises for each module. Each module was derived from current literature, national organization websites, and a University of Miami online educational resource. Each week, one resident is designated "Resident Assistant Clinical Director", working under direct supervision of the anesthesiologist clinical director, managing the OR, while medically directing up to four CRNAs simultaneously. One resident is assigned the same role at our cancer center (same faculty members and OR management). The remaining residents are assigned to cases in the OR. On the first day of the rotation, six 10-question examinations are administered, corresponding to several of the modules. After each module, the corresponding examination is repeated.

RESULTS: Residents have consistently rated their experience highly on confidential evaluations. Residents, who have yet to be assigned the rotation, eagerly anticipate starting. Faculty members have volunteered to participate in the lecture series. CRNAs have become more comfortable interacting with residents, and OR nurses see residents taking a more active role in OR management.

DISCUSSION: The Transition to Practice rotation has been a positive experience thus far. Analysis of the 10-question examination results will show objective data of resident learning. Incorporating a practice management curriculum into anesthesiology residency training will facilitate the transition of residents into private or academic practice of anesthesiology.

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8-Week Curriculum of Learning Modules

Week 1	Introduction to Operating Room Management and Metrics	Part I
Week 2	Introduction to Operating Room Management and Metrics	Part II
Week 3	Medical Direction/Medical Supervision	Anesthesia Care Team Model, Working with Difficult People, Intimidating Physicians
Week 4	Billing and Collections	RVU and CPT vs. ICD-9, Billing records, CMS Requirements, Concurrency
Week 5	The Joint Commission, Compliance, Regulations	Medical Liability/Risk Management
Week 6	Contracts, Negotiations, and Credentialing	Negotiating employment contracts, salary, hospital credentialing and licensure
Week 7	Easing the Transition: Personal Finances and Insurance	Life, Health, Disability, Malpractice, Career Goals, Lifestyle issues: Preventing Burn-out, Job stagnation, and maintaining motivation, Setting Goals
Week 8	Applying for a Job	Where, When, How, What Type?

S-202.

USE OF THE AMERICAN SOCIETY OF ANESTHESIA CLASSIFICATION TO PREDICT OUTCOMES FOR PATIENTS UNDERGOING ROBOTIC-ASSISTED LAPAROSCOPIC RADICAL PROSTATECTOMY

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INTRODUCTION: Previous studies have evaluated the prognostic value of several comorbidity classifications for predicting survival in patients who underwent open radical prostatectomy. However, there are no reports on the use of comorbidity classifications for men after robotic-assisted laparoscopic radical prostatectomy (RALRP), despite widespread application of this surgical technique. We evaluated the American Society of Anesthesiologists classification (ASA) as a predictor of outcomes and overall survival in men who underwent RALRP.

METHODS: We reviewed the records of 2074 patients who underwent RALRP from June 2003 to October 2008 at our institution. Each patient was stratified according to his ASA score. Factors assessed in this analysis included patient age, body mass index, prostate specific antigen, Gleason score, pathological stage, margin status, operative time, blood loss, length of hospital stay, intra-operative complications, post-operative complications, and overall survival.

RESULTS: Patients were stratified according to their ASA score: ASA 2 - 1364 patients, ASA 3 - 620 patients, ASA 4 - 90 patients. ASA 4 patients were older (mean age 66.8 years), had a higher body mass index (mean 30.4 kg/m2), and higher pre-operative Gleason score. ASA 4 patients also had a higher pathologic stage, higher surgical Gleason score, and increased rate of extracapsular extension (23%). Surgical margin rates were similar across all groups. Although operative time and blood loss was similar between all three groups, ASA 4 patients had an increased length of hospital stay (mean 2.4 days), with 28% of patients requiring hospitalization > 3 days. A higher rate of post-operative ileus for ASA 4 patients (4.5%) was the only significant complication different amongst the three groups. ASA 4 patients had comparable overall survival compared to ASA 2 and 3 patients up to 48 months from their RALRP (> 90%). at which time a large number of non-prostate cancer related deaths occurred in the ASA 4 group so that overall survival at 60 months was 45%.

DISCUSSION: RALRP for management of prostate cancer in men with high ASA scores is a reasonable option. However, these patients can expect an increased length of hospital stay, delayed return of bowel function. The ASA classification therefore has prognostic relevance in men selected for RALRP.

S-203.

GENDER AND POSTOPERATIVE MORTALITY IN PATIENTS UNDERGOING NON-CARDIOVASCULAR SURGERY

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INTRODUCTION: Gender (female) inequality in cardiovascular surgery is recognized. However, there are few studies examining the influence of gender on mortality following non-cardiovascular surgery.

METHODS: We conducted an observational study of consecutive non-cardiovascular inpatient surgery from 2003 to 2008 at a large academic hospital to determine risk factors for 30 day in-hospital mortality. Data was retrieved from the institutional Electronic Data Warehouse (EDW) integrating information from the surgical management system with other patient data management systems. This allowed us to determine whether the patient died within 30 days of surgery, gender, age, American Society of Anesthesiologists (ASA) Physical Status Classification, Revised Cardiac Risk Index (RCRI), Charlson Co-morbidities (CC) and whether the procedure was emergent/urgent (EU). Multivariate analysis was performed using logistic regression to determine predictors of mortality.

RESULTS: There were 59,029 non-cardiovascular inpatient procedures with a 30 day mortality rate of 1.50%. Male mortality was 42% higher than female mortality (see Table). Age (OR: 2.12, 95% CI: 1.84-2.45), RCRI (OR: 1.74 95% CI: 1.18-2.56), number of CC (OR: 2.93 95% CI: 2.34-3.65), ASA (OR: 6.53 95% CI: 5.58-7.69) and EU status (OR: 3.96 95% CI: 3.38-4.64) were independent predictors of mortality (ROC = 0.89). After adjustment for these factors, the odds ratio (OR) for gender and mortality was reduced. Subgroup analysis on major surgical services without gender specific procedures showed similar results, with the exception of orthopedic surgery. Unlike the other services, males and females had similar unadjusted mortality, and after adjustment for risk factors, the odds ratio increased. This may be explained by the fact that females undergoing orthopedic surgery were on average 8.5 years older than males, while in the other services the ages were similar or males were older.

	N	Mortality	% Male	Unadjusted Odds ratio (95% CI)	Adjusted Odds ratio (95% CI)
All cases	59,029	1.50%	51%	1.42 (1.24-1.62)	1.16 (1.01-1.34)
ENT	5,365	0.69%	54%	2.36 (1.14-4.89)	1.65 (0.78-3.51)
General	10,591	2.54%	52%	1.26 (0.99-1.61)	1.00 (0.77-1.30)
Neuro	6,490	4.11%	52%	1.36 (1.06-1.75)	1.26 (0.97-1.64)
Orthopedic	9,172	0.95%	46%	1.07 (0.70-1.63)	1.77 (1.12-2.79)
Spinal	3,589	0.81%	54%	5.38 (1.87-15.5)	4.25 (1.42-12.7)
Thoracic	4,918	2.36%	55%	1.50 (1.02 -2.21)	1.36 (0.91-2.01)

DISCUSSION: After adjustment for preoperative risk factors, the risk associated with male gender is reduced, but remains a risk factor for mortality. The fact that males come to surgery with higher ASA classification, higher RCRI scores, more comorbidities and more often emergently, partially explains the difference in mortality. We hypothesize the gender difference in preoperative risk factors may be related to the tendency for males to have fewer contacts with the primary health care system, resulting in surgery at a later and more urgent stage of the disease.

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S-204.

PATIENT SURVEILLANCE SYSTEMS IN THE EARLY DETECTION OF ADVERSE EVENTS: A RETROSPECTIVE COHORT STUDY

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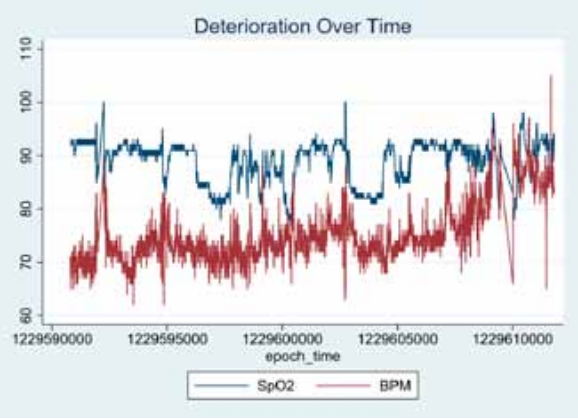
INTRODUCTION: Unrecognized physiologic deterioration of unmonitored in-patients is a significant contributor to morbidity and mortality.(1) Studies indicate that patients show signs of deterioration in the 6-8 hours prior to a cardiac or respiratory arrest and early recognition of deterioration and intervention have been identified as primary determinants of rescue event success.(2-4) We have studied the prevention of adverse events in the in-patient setting via a patient surveillance system (PSS) using pulse oximetry and heart rate data in the twenty four hours preceding an event. Data was identified and collected in 1-second intervals for 20 in-patients with adverse events.

METHODS: In January 2008 a Patient Surveillance System was implemented on several surgical wards. Pulse oximetry provides oxygen saturation and heart rate data on each patient in 1-second intervals. The current system notifies nursing staff via a pager when preset thresholds for monitored parameters are violated. This commercially available system has been modified for analysis of individual and collective patterns of deterioration and identification of adverse event characteristics. All data are permanently stored in a searchable research server for offline analysis. Twenty patients with adverse events were selected. For each patient, the presenting signs/symptoms, time to response, diagnostics, treatment/transfer to higher level care, and mortality was documented. For each patient, we pulled up to 24-hours of pre-event data (less if the patient spent less time on the monitored floor). Data was analyzed and plotted with Mat Lab and Stata.

RESULTS: 24 hour heart rate and oxygen saturation data was collected for each patient. Each had aberrancies of heart rate and/or oxygen saturation during at least one time point in the 24 hours preceding the event. In the examples below, a respiratory event was preceded by a phasic pattern in oxygen saturation, whereby a cardiac arrest was preceded by an acute tachycardia. Presenting signs/symptoms included respiratory distress, mental status changes, tachycardia, and cardiac arrest.



DISCUSSION: We have previously (5) shown that continuous patient surveillance can decrease transfers to the intensive care unit and rescue events. We think that the system can be optimized by customizing alarm settings based on the underlying distribution (6) as well as by trend analysis. Our results may suggest specific patterns of decline, which may further allow early detection of adverse events.

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S-205.

RANDOMIZED TRIAL COMPARING GOOGLE, OVID, PUBMED, AND UPTODATE IN MEDICAL STUDENTS AND RESIDENT PHYSICIANS

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INTRODUCTION: It is increasingly important for physicians to acquire a working knowledge of biomedical informatics. Medline contains references to over 16 million articles [1]. Bates estimates that a single medical interaction generates, on average, at least one unanswerable clinical question [2], yet an observational study of 2467 patient visits found that physicians spend less than two minutes searching for answers that require a formal biomedical search [3]. We therefore tested both the accuracy, speed, and confidence associated with four commonly used means of obtaining biomedical information - Ovid, PubMed, Google/GoogleScholar, and UpToDate

METHODS: Fifty six third and fourth year medical students, resident physicians, and attending physicians were randomized to a set of four (out of eight) anesthesia and/or critical care-based questions, which they were asked to answer in succession (under the supervision of the study coordinator). Users were allowed to use any of the aforementioned search tools, but were not allowed to use multiple tools in answering the same question. They were given five minutes to search for each answer. At the end of each search, participants rated their results on a 0-3 confidence scale (3 points being the highest). One week after answering the initial four questions, users were then randomized to one of the four search tools, and asked to answer all eight questions, again and under the supervision of the study coordinator. Primary outcome was defined as a correct answer with confidence level of 3. For data analysis, PubMed was arbitrarily chosen to be the "gold standard." Comparisons to PubMed were made by an independent statistician who used logistic regression, multinomial logistic regression, and linear mixed models as appropriate.

RESULTS: UpToDate was chosen most commonly, followed by Google, PubMed, and Ovid. Users of UpToDate were 2.76 times more likely (OR) than users of PubMed to achieve the primary outcome ($p = 0.0015$, logistic regression). Users or Google (OR 1.67) and Ovid (OR 1.64) were also more likely to achieve the primary outcome as compared to PubMed, however these differences did not achieve statistical significance ($p = 0.105$, 0.209, respectively). Both UpToDate and Google (average search times 3.31 and 3.36 minutes, respectively) were faster than PubMed (4.36 minutes). The time differences between Ovid and PubMed were not statistically significant.

DISCUSSION: When given the choice between UpToDate as opposed to Google/Google Scholar, PubMed, or Ovid to answer anesthesia or critical care-based questions, medical students and physicians are more likely to choose UpToDate. Furthermore, they are more likely to answer questions correctly, more quickly, and more confidently if they use UpToDate as opposed to Google/ Google Scholar, PubMed, or Ovid.

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S-206.

ULTRASOUND GUIDED CENTRAL VENOUS CATHETER INSERTION COULD BE HAZARDOUS BY INEXPERIENCED OPERATORS

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INTRODUCTION: There are many reports that ultrasound guided central venous catheter insertion reduces mechanical complication1, 2). Therefore our hospital committee for safety management of central venous catheter (CVC) insertion introduced and recommended to the doctors in our hospital using ultrasound devices (US) for placing CVC. The purpose of our study is to evaluate the efficacy of using US to reduce the complications of CVC insertion at our hospital.

METHODS: Certifications for CVC insertion were given to the doctors after they took the educational course of ultrasound guided CVC insertion in our hospital. Operators were mandatory to submit observation sheets, including information about patient's risk factors for insertions, use of US, puncture attempts more than three and mechanical complications. The observation sheets of CVC insertion over 19 months were analyzed with Chi square tests.

RESULTS: A total of 2623 observation sheets were collected. US were used in 18.4% of all cases. Junior residents used them more than senior doctors (24.7% vs. 15.3%, $p<.05$). Complication rate was more in the cases using US than those without using them (6.8% vs. 4.5%, $p<.05$). Hematoma and arterial puncture occurred more with US than those without them (2.4% vs. 0.9%, $p<.05$, 3.9% vs. 1.6%, $p<.05$, respectively). The rate of puncture attempts more than three was 13.6% with US and 10.2% without US ($p<.05$). Complications were more in the cases of puncture attempts more than three (25.8%), compared with the cases of attempts within three times (2.3%, $p<01$). The rate of puncture attempts more than three was 14.3% by junior residents and 8.7% by senior doctors ($p<.05$). Junior residents had accidental arterial puncture more than senior doctors (4.5% vs. 2.1%, $p<.05$). Arterial punctures increased when the junior residents used US (11%), compared with without them (4.1%, $p<.05$), whereas those differences were not found in senior doctors.

DISCUSSION: Despite the expectation of reducing mechanical complications, the use of US was shown to increase complications of CVC insertion in our study. Instinctively it seems to be safer to use US as for visualizing locations of vein. However, as our study showed, ultrasound guided CV insertion could be hazardous especially when the operators are not well trained. The benefit of US was not shown even in the insertions by experienced doctors, possibly because they also lack an adequate training2). Therefore, in order to facilitate safety management of CV insertion with US, establishment of standard training course of US guided CV insertion is urgent. Ultrasound guided CVC insertion failed to indicate significant advantage to reduce mechanical complications. Further strategy for education to unskilled operators of ultrasound guided CVC insertion is necessary.

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S-207.

WHAT PERSONALITY TRAITS ARE NEEDED AT JAPANESE ACADEMIC INSTITUTIONS NOW?

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BACKGOUND: The five-factor model (FFM) is comprised of five personality dimensions: extraversion, agreeableness, conscientiousness, emotional stability and openness to experience, which are held to be a complete description of personality. Using the FFM, we compared the personality traits of anesthesiologists working at academic and non-academic institustions in Japan.

METHODS: Using the data processing and analyzing software (the Big-Five examination of personality traits, Gakugei Tosyo, Japan), we examined the self-reported data obtained from 50 anesthesiologists working in Tokyo. According to the affiliation to which they belong, these subjects were divided into two groups of 25 each: the academic institutions, e.g. the university hospital (A-group), the non-academic hospital (N-group). Data were analyzed by means of analysis of variance. In all tests, a value of $p < 0.05$ was considered statistically different.

RESULTS: Agreeableness was higher in the A-group than in the N-group ($p = 0.026$). No statistical differeces were observed between two groups in terms of the other four personality trait dimensions.

DISCUSSIONS: This preliminary study suggests that, now in Japan, agreeableness is one of the most important factors among the personality traits for working at academic institutions.

S-208.

WITHDRAWN.

S-209.

IS BMI A GOOD PREDICTOR FOR DIFFICULT INTUBATION IN OVERWEIGHT MALES?

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Introduction: Difficult intubations (DI) can negatively impact morbidity and mortality. The ability to predict difficult intubation is an extremely valuable tool for improving patient outcomes. There is contradicting evidence supporting the use of body mass index (BMI) as a predictor for DI. Most studies use small sample sizes, a skewed gender distribution of subjects and lack an analysis by gender. Several studies have found that the difference between fat distribution in males versus females has a more powerful predictive value of difficult airways than BMI or obesity. We hypothesize that BMI is a better indicator of DI for males than it is for females.

METHODS: We retrospectively reviewed 2680 aleatory charts of patients undergoing surgery under general anesthesia at the OSUMC during the year 2007, only 1668 subjects were included. We collected demographics, height, weight, length of stay in the PACU, history of sleep apnea, Mallampati score, and the ASA score. DI was considered if more than two attempts for successful endotracheal intubation, if recorded as difficult in the anesthesia record or if awake fiberoptic intubation was performed. Hosmer and Lemeshow Chi-Square test were used to test the goodness of fit for the final model with selected influential predictors. All statistical tests were two-sided. A p-value <0.05 was considered significant.

RESULTS: With a total of 752 (45%) males and 916 (55%) females, our analysis showed that male subjects with BMI >35 (16.13%) had a higher incidence of DI compared to the female subjects (5.08%) p<0.05. Additionally, we observed that a high proportion of underweight males with BMI < 18.5 also presented with higher frequency of DI (17.65%) compared to females (9.09%) p≥ 0.05. Age and Mallampati scores were also found to be positively correlated to difficult intubations; finally, no correlation between DI and ASA score, length of PACU stay and history of sleep apnea was noted.

DISCUSSION: DI can be a potential cause of death or brain damage during induction of anesthesia or even in emergency situations. Some studies have shown obesity to be a risk factor for DI yet other studies found that the incidence of DI in morbidly obese subjects is no more frequent than in normal subjects. This study proposes that BMI could be significantly correlated with higher incidents of DI. Old age, male sex, and higher Mallampati scores are found to be independent variables for difficult intubations. We believe that general knowledge and awareness of what contributes to difficult intubation can significantly reduce the risk of morbidity and mortality associated with the inability to properly perform endotracheal intubations in clinical settings.

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BMI and Difficult Intubation

	Difficult Intubation			
BMI	No	Yes	Total	Yes/ Total %
<18.5	34	5	39	12.82%
18.5-24.9	460	10	470	2.13%
25-29.9	512	18	530	3.40%
30-34.9	278	22	300	7.33%
>35	302	27	329	8.21%
Total	1586	82	1668	4.92%
P value for Chi-square is 0, implying that BMI and difficult intubation are highly correlated.				

BMI and Difficult Intubation by Gender

		Difficult Intubation			Difficult Intubation	
	NO	Difficult	YES		% YES	Intubation
Gender/BMI	Male	Female	Male	Female	Male	Female
<18.5	14	20	3	2	17.65%	9.09%
18.5-24.9	217	243	5	5	2.25%	2.02%
25-29.9	274	238	10	8	4.03%	2.84%
30-34.9	1.24	1.54	14	8	10.14%	4.94%
>35	78	2.24	15	12	16.13%	5.08%
Total	707	879	45	37	5.98%	4.04%
Males with BMI >35 (16.13%) and <18.5 (17.65%) had the highest incidence of difficult intubation.	707	879	45	37	5.98%	4.04%

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S-210.

ANESTHESIA AND POSTOPERATIVE SERIOUS ADVERSE EVENTS AFTER MAJOR SURGERY

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INTRODUCTION: There are emerging evidences that anesthetic management could affect patients' long-term outcomes. It has been reported that intra- and post-operative pain management could affect the risk of cancer recurrence, and that peri-operative beta-blocker therapy could affect the incidence of post-operative cardiac events.

In the area of Critical Care, rapid response system was introduced in many centers to reduce serious adverse events (SAEs) in a hospital. Around these efforts, it has been reported that post-operative serious adverse events after major surgery was as high as 15%. However, there is no report examining the relationship between anesthesia and post-operative SAEs.

Accordingly, we have conducted a retrospective study to examine whether anesthetic managements would affect the incidence of post-operative SAEs, and to explore the strategy to reduce post-operative SAEs.

METHODS: We retrospectively studied 523 patients underwent major surgery in a teaching hospital. Major surgery was defined as craniotomy, neck surgery, thoracotomy, laparotomy, hip or pelvic surgery, and spinal surgery. We excluded patients < 20 years old age and operation < 2 hrs. Patients' and surgical characteristics were collected from our anesthetic database. In addition, we also collected details of anesthetic managements including TIVA or SEVO, remifentanil or fentanyl, epidural or not, and fluid and transfusion status during operation. Twelve SAEs were prospectively defined such as cardiac arrest, unscheduled ICU admission, and reintubation for respiratory failure etc. The risk ratios of SAEs were calculated using Mantel-Haenszel method. Data were expressed as means with 95% confidence intervals (CI). A p value < 0.05 was considered statistically significant.

RESULTS: Among 523 patients studied, 66 (12.6%) patients suffered from SAEs, including 26 severe sepsis, 21 ICU readmission, and 14 deaths during hospitalization. Pre-operaitve physical status and emergency surgery were significant pre-operative predictors of post-operative SAEs. None of three anesthetic choices (TIVA, opioids, and epidural) did not have any impacts on the risk ratio of SAEs. The amount of bleeding, urine output, and crystalloid given were also not associated with the risk ratio of SAEs. However, colloids and packed red blood cell (PRBC) use significantly increased the risk ratio of post-operative SAEs (colloids use: risk ratio 1.79, 95% CI 1.07-3.01; p=0.025, PRBC use: 2.42, 95% CI 1.45-4.04; p=0.0005).

DISCUSSION: The incidence of post-operative SAEs in Japanese teaching hospital was 12.6%. Pre-operative physical status and emergency surgery were significant predictors of post-operative SAEs. The Choices of anesthetic modalities were not associated with the risk ratio of SAEs. However, colloids and PRBC uses significantly increased the risk ratio of SAEs. More and more precise managements of fluid and blood product administration would be required to reduce post-operative serious adverse events.

S-211.

DENTAL INJURY AT A TERTIARY CARE HOSPITAL SYSTEM; AN EIGHT YEAR AUDIT

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BACKGROUND: Among all complications of airway management, dental injury is the most common cause of patient complaints with medico-legal consequences. The purpose of this audit is to determine factors associated with peri-operative dental injury.

METHODS: We performed an eight year audit from January 1, 2000 - December 31, 2008 at UPMC, which performs approximately 100,000 anesthetic cases per year. Data was collected & cross referenced using three independent QA databases. Primary measured variables included date of dental injury, anesthetic type, pre-existing dental condition, and standard demographic information. Rates were reported as percentages; interval data was analyzed with t-test, nominal with Chi-square. P<0.05 was significant.

RESULTS: A total of 397 iatrogenic dental injury cases were identified (TABLE). Individuals over 50 years of age had the highest risk of injury with the risk being highest during induction of anesthesia. While the risk of injury was highest during general anesthesia (GA, 81.1%) with endotracheal intubation (87.6%), it was occurred during GA with a mask. Dental injury also occurred during monitored anesthesia care (MAC) (1.3%). Most patients who had dental injury did not have a difficult airway and were not emergent cases.

CONCLUSIONS: Patients above 50 years of age, with dental restoration (cap/crown/partial dentures) undergoing induction of general anesthesia via endotracheal intubation are most at risk of dental injury, with the maxillary incisors being the most commonly injured teeth. The vast majority of patients who had dental injuries did not have a difficult airway nor were they emergent cases. Use of teeth guards during routine intubation seems to be indicated.

TABLE 1 N=397

Gender	Men (42.8%)	Women (54.2%)	Not Reported (3%)
Age (yrs)	Men 54.5 ± 17.8 Women 55.3 ± 18.5 P=0.66	9.8 min	0.06

Type of Anesthetic P=0.000, χ2 General 81.1% MAC 1.3% Not Reported 17.7%
Type of General P=0.000, χ2 Endotracheal intubation 87.6% LMA 3.7% Other (mask, etc.) 8.7%
Emergent case 4.8% Non-Emergent case 95.2% Difficult airway 8.5% Non-Difficult airway 91.5% Oropharynx 7.1%
Time of discovery* during anesthesia P=0.000, χ2 Induction 58.5% Extubation/Emergence 12.8% PACU 18.3% Floor 10.4%
Location* of Injury: P=0.000, χ2 Maxillary central & lateral incisors 62.6%
Other than maxillary anterior teeth 37.4%
Type* of Dental Restoration P=0.000, χ2 Cap/Crown 57.7% Partial/Denture 32.1% Fillings 10.2%
Result* of Injury: P=0.000, χ2 Loosened Tooth 19.4% Chipped Tooth 41.6% Avulsed Tooth 39.0%
$$table_{D777E3CD-098F-4E98-8C40-6AE08110ED01}$$

*when specified

S-212.

LACK OF AGREEMENT AMONG CONSULTANT ANESTHESIOLOGISTS REGARDING PERIOPERATIVE CARDIOVASCULAR EVALUATION

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INTRODUCTION: The practice of evidence-based medicine assumes that clinicians are familiar with and apply clinically based guidelines. The goal of this study was to determine the level of adherence to the 2007 ACC/AHA guidelines for perioperative evaluation of patients with pre-existing cardiac disease.

METHODS: As part of a Society for Ambulatory Anesthesia (SAMBA) workshop in May '09 on preoperative cardiac evaluation, we presented 5 common clinical scenarios to 45 anesthesiologists who regularly worked in preop clinics.

Each attendee used an audience participation device to register their recommendation. Results were displayed in real time and recommendations were discussed.

RESULTS: N = number of respondents, % = percentage of respondents with the correct recommendation per ACC/AHA guidelines.

1. 60 yo male smoker, hypertension, hypercholesterolemia, diabetes for an ACL repair (injured playing basketball) Meds: aspirin, lisinopril, metoprolol, simvastatin, HCTZ, metformin BP 150/80, HR 80. Does the patient need an ECG? (N=36, 9%)

2. 60 yo male, MI 5 weeks ago (no stents), running on treadmill in cardiac rehab without CP, for an inguinal hernia repair. Meds: aspirin, lisinopril, metoprolol, simvastatin BP 150/80, HR 80. Should this case be postponed? (N=38, 34%)

3. 60 yo female for diagnostic pelvic laparoscopy for follow up of ovarian cancer (treatment completed) (N=43). No medications. BP 150/80, HR 115 Exam: irregularly, irregular heart rate. Should this case be postponed? (N=43, 56%)

4. 74 yo male with diabetes and CAD. Walks 1 mile daily without symptoms scheduled for total shoulder arthroplasty (N=37), Meds: aspirin, lisinopril, metoprolol, simvastatin, metformin. Does this patient need a preop stress test? (N=37, 67%)

5. 60 yo male obese, smoker (40 pk-yrs) with hypertension, hypercholesterolemia, FH of heart disease (father and 2 brothers died of MIs in their 40s), scheduled for a lap chole. ECG: LBBB Does this patient need a preop stress test? (N=36, 17%)

DISCUSSION: We observed significant variations in recommendations among consultant anesthesiologists. For some clinical scenarios, less than 20% of attendees recommended a course of action that was in accordance with ACC guidelines. In general, attendees proposed evaluations that were more aggressive than those suggested by the ACC guidelines.

Further research is needed to determine if clinicians are unfamiliar with the guidelines or whether they feel that the Perioperative Cardiovascular Evaluation algorithm is insufficient to adequately stratify patients.

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S-213.

SMOOTH EMERGENCE FROM GENERAL ANESTHESIA: COMPARISON OF COUGH SUPPRESSION EFFECT BETWEEN REMIFENTANIL AND LIDOCAINE

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INTRODUCTION: Coughing due to tracheal irritation from endotracheal tube is common event during emergence from general anesthesia. Though coughing during emergence is physiologic protective response, it may cause more serious complication such as myocardial ischemia, increase of intracranial or intraocular pressure, or surgical complication. Intravenous lidocaine has been widely used for suppression of emergence cough. Opioids have centrally antitussive effect also, and remifentanil can be a good alternative for preventing emergence cough. However, it is uncertain whether remifentanil is as effective as or superior to lidocaine for preventing cough during anesthetic emergence. The purpose of this study was to compare the effectiveness of cough suppression during emergence from sevoflurane anesthesia between remifentanil effect-site (Ce) target controlled infusion (TCI) and lidocaine bolus administration.

METHODS: Thirty-three female patients aged 20 to 60 yr were enrolled. They were planed to elective thyroidectomy under general anesthesia with sevoflurane and remifentanil. All patients were premedicated with midazolam and glycopyrrolate. Anesthesia was induced with propofol, remifentanil Ce-TCI and rocuronium, and tracheal intubation was performed in all patients using a 7.0 mm endotracheal tube. A commercial TCI pump operated by Minto model was used for Ce-TCI of remifentanil. Anesthesia was maintained with sevoflurane 1.5 - 2 % and remifentanil 2 - 4 ng/ml. Before 15 min of end of operation, sevoflurane was reduced to 1%; in lidocaine group, remifentanil was discontinued; in remifentanil group, remifentanil 2 ng/ml was maintained until extubation. At the end of surgery, sevoflurane was discontinued and neuromuscular block was reversed in both groups; in lidocaine group lidocaine 1.5 mg/kg was injected intravenously, and in remifentanil group normal saline was injected. During emergence (from sevoflurane discontinuation to 5 min after extubation) following variables were recorded: cough number and grade (0 - 3), MBP, HR, RR, and Ramsay sedation sale. Duration between sevoflurane off and extubation (extubation time) was also recorded.

	Lidocaine group	Remifentanil group
Age	45 ± 7.5	42 ± 12.3
Height (cm)	157.23 ± 3.8	157.6 ± 5.5
Weight (kg)	57.78 ± 7.1	55.2 ± 6.1
ASA (I/II)	14/3	13/3
Duration of anesthesia (min)	112.5 ± 13.2	117.3 ± 29.4
Cough incidence*	11/17	2/16
Cough grade (median, min~max)*	2 (1~3)	0 (0~2)
Extubation time (min)	9.1 ± 1.7	8.4 ± 2.8
Sedation level at 5 min after extubation	3 (1~3)	2 (2~3)
Respiratory rate at 5 min after extubation	12.4±2.9	13.5±3.6
duration of PACU administration (min)	35.0±5.8	38.1±10.1

RESULTS: Cough incidence (12.5% vs. 64.7%, p = 0.002) and grade (p = 0.002) were significantly less in remifentanil group compared to lidocaine group. MBP during emergence were higher in lidocaine group (p = 0.02), and HR and extubation time were similar between two groups (p = 0.055).

DISCUSSION: remifentanil Ce TCI suppresses cough effectively without delaying emergence. Though lidocaine bolus administration has been widely used for cough suppression during emergence, maintaining and predicting certain plasma or effect-site concentration by a single bolus administration is difficult and unreliable. In contrast, remifentanil effects are short-lived and remifentanil Ce TCI can predict and maintain the target concentration safely so can be maintained during emergence. From our result, Remifentanil Ce TCI is a more reliable method of abolishing cough compared to lidocaine.

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S-214.

EMOTIONAL IMPACT OF PERIOPERATIVE CATASTROPHES ON ANESTHESIOLOGISTS

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INTRODUCTION: Several British studies have examined the emotional impact of a perioperative death or serious injury on practicing anesthesiologists (1, 2, 3). Very little, however, is known about how these events affect United States anesthesiologists. The purpose of this study was to assess the emotional impact of perioperative catastrophes on anesthesiologists in the United States.

METHODS: An anonymous, self-administered mail questionnaire was sent out to 1200 ASA resident and attending members. The questions included number and types of perioperative events encountered, emotional responses to a particularly memorable event, and recovery following the event. Response percentages were calculated based on total number of respondents per question and adjusted to correct for omissions.

RESULTS: 659 surveys were returned (55.6%). 84.3% were involved in at least one unanticipated perioperative death or serious injury over their career. Mean number of lifetime events encountered was 4.43 (std dev 6.32). The following table shows frequencies of selected experiences regarding a "most memorable" perioperative event.

Experiences during the most memorable perioperative event	Adjusted Percentage of respondents
Felt personally responsible	70.3
Felt blamed	37.6
Felt guilt	72.2
Felt depression	63.2
Felt anxiety	73.1
Felt anger	49.5
Felt defensiveness	44.5
Experienced sleeplessness	51.7
Fear of litigation	63.8
Fear of judgment by colleagues	49.5
Experienced loss of reputation	24.2
Experienced professional self-doubt	49.0
Experienced reliving event	73.5
Used alcohol or drugs	5.0
Took at least a day or longer to recover emotionally	88.0
Have never fully recovered emotionally	18.9
Considered career change	11.7

DISCUSSION: This is the first survey studying the impact of perioperative catastrophes on American anesthesiologists. Results of this large, national survey provide compelling evidence that the perioperative death or serious injury of a patient has a profound emotional impact on the anesthesiologist involved. Many require time for emotional recovery, and over one in ten consider career change. Our findings echo results from survey studies conducted within anesthesiology abroad (1, 2, 3).

To promote the wellness of Anesthesiologists and to ensure that no "patient will be harmed", health care systems, both public and private, must turn their attention to developing protocols for handling the aftermath of perioperative catastrophes and further research must be conducted examining the impact of adverse events on physician functioning.

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3. Catastrophes in Anaesthetic Practice, dealing with the aftermath. Available at: http://www.aagbi.org. Accessed 1/28, 2008.

S-215.

THE SURVIVAL OF MULTIRESISTANT BACTERIA ON INTENSIVE CARE STAFF HANDS AND CLOTHS

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INTRODUCTION: The emergence of multiresistant bacteria is responsible for increased mortality and morbidity on intensive care units (1). These bacteria may survive on hospital material for a long period of time (2). Recently multiresistant Acinetobacter baumannii strains are frequently recovered from High Dependency and Intensive Care Unit samples of our University Teaching Hospital. In this study we cultured the hands, the top cloths, and the pockets of those cloths of ICU staff.

METHODS: Fifty seven members of ICU staff were involved in the study. Samples were taken with sterile swabs from the hands, the side of the upper ICU top cloth and from the pockets of the top cloth. Then the swabs were inoculated into Brain-Heart Infusion Broth (BHI) (Oxoid, UK) which contained the appropriate concentration of cefotaxime to serve as a selective media for multiresistant bacteria. Having incubated for 48 hours at 37oC 10 µL was plated on blood agar, Eosin Methylene Blue agar, and chocolate agar plates. Colonies were identified by standard microbiological methods and the antibiotic resistance was determined. The strains recovered from staff samples were compared with that of cultured from patient samples by antibiotic resistance and RAPD-PCR.

RESULTS: Multiresistant A. baumannii was cultured from 7 staff members (1 from hand, 5 from the outer surface of the top cloths and 2 from the upper pocket of the cloths). One methicillin resistant Staphylococcus aureus grew from a pocket swab. All recovered multiresistant strains were identical with the strains cultured from patient samples.

DISCUSSION: Our results suggest that multiresistant A. baumannii survives on hospital cloths. Not only the outer surfaces, but the pockets can be contaminated as well. Besides meticulous hand hygiene attention must be paid to our cloths and its pockets to help preventing hospital acquired infections. In view of our results the use of protective aprons or more than once a day change of staff cloths is advised.

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S-216.

TRANSITION-TO-PRACTICE: NEW TRAINING PARADIGM IMPROVES RESIDENT PERFORMANCE OF PRACTICE MANAGEMENT SKILLS

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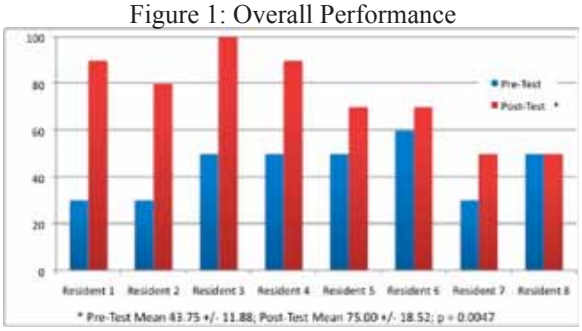
INTRODUCTION: Traditional methods of teaching anesthesiology residents have focused on didactic lectures, hands-on workshops with mannequins, anesthesia simulators, simulation sessions(1), and clinical practice in the operating room. These methods do not adequately address practice management topics or teach skills that are specific to managing an operating room. A new training paradigm was introduced at the University of Miami Hospital to prepare residents for the transition from their role as resident to that of a consultant anesthesiologist.

METHODS: We designed an 8-week "Transition-to-Practice" rotation, for PGY-4 residents, combining operating room clinical and management experience, daily mock oral exams, weekly didactic lectures, online learning exercises, and daily discussions with faculty members on practice management topics. The topics are organized into weekly learning modules, which include Introduction to OR Management and Metrics, Introduction to the Anesthesia Care Team Model, Billing and Collections, The Joint Commission and Surgical Care Improvement Project, Insurance and Negotiations, Personal Welfare and Finances, and Employment. At the beginning of the rotation, each resident receives a syllabus of the structure, goals, objectives, and curriculum, with assigned readings and online learning exercises for each module. Each module was derived from current literature, national organization websites, and a University of Miami online educational resource. Each week, one resident is designated "Resident Assistant Clinical Director", working under the direct supervision of the anesthesiologist clinical director, managing the OR, while medically directing up to four CRNAs simultaneously. One resident is assigned the same role at our cancer center (same faculty members and OR management). The remaining residents are assigned to cases in the OR. For baseline level of knowledge, a 10-question examination (Table 1) is administered for each module, on the first day of the rotation (pre-test). After the corresponding module is completed, the same examination is repeated (post-test), to determine knowledge gained during the rotation.

RESULTS: All residents improved their test scores. The average increase in performance was 42.1%, over pre-test performance. The residents showed better understanding of practice management terminology, acquisition of personnel management and communication skills, and greater confidence in the role as manager.

Figure 1: Overall Performance



DISCUSSION: A new teaching paradigm that focuses on topics residents should master, prior to entering practice, has improved resident performance on objective tests of practice management topics. A breakdown of resident performance on the individual modules, and objective data measuring resident assessment of the new teaching paradigm is warranted.

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Table 1: Introduction to Operating Room Management and Metrics – Weeks 1 and 2 – Pre-Test /Post-Test

1. Which of the following is NOT an indictor of OR efficiency? (Reference: Anesthesiology 2006;105(2):237-240)	a) Case cancellation rate b) PACU admission delays c) Excess staffing costs d) Start time tardiness e) Induction of anesthesia time
1. Successful strategies to improve operating room efficiency include all of the following, EXCEPT (Reference: Anesth Analg 1998;86:896-906)	a) Personal accountability b) Streamlining of procedures c) Interdisciplinary team work d) Accurate data collection e) Using short-acting medications
3. Operating Room efficiency (Reference: Current Opinion in Anethesiology 2006;19:171-176)	a) Will not affect cost of care b) Can increase despite the practice of evidence-based medicine c) Is independent of continuous quality improvement d) Is not of concern to Joint Commission on Accreditation of Healthcare Organization (The Joint Commission) e) Increases quality of patient care
4.Examples of parallel processing include all of the following, EXCEPT (Reference: Anesthesiology 2008;109:3-4)	a) Providing two operating rooms for one surgeon b) Performing a peripheral nerve block on the the next patient c) Using an induction room d) Inducing anesthesia during final stages of surgical technician set-up e) Providing prompt and efficient care in the PACU
5. Tardiness from scheduled start times is determined by (Reference: Anesth Analg 2009;108(6):1889-1901)	a) Prolonged turnovers b) Surgeons following themselves c) Concurrency d) The duration of individual cases e) Total time of preceding cases in an operating room
6. The following Joint Commission standards regarding operating room medication management relate to the anesthesiologist, EXCEPT (Reference: Cooper L, Merry A. "Medication Management", Anesthesia Informatics, Ed. Stonemetz J, Ruskin K, Springer Medical Publishing. 2008)	a) Patient-specific information readily accessible to those involved in the medication management system b) Emergency medication/supplies consistently available, controlled, and secured c) Only medications needed to treat the patient''s condition are ordered, provided, or administered d) Self-administered medications (PCA, PCEA) are safely and accurately administered e) Only the anesthesiologist can develop processes for managing high-risk or high-alert medications in the OR
7. On-time starts is always defined as:	a) Entering the room at the scheduled time b) Entering the room within 5 minutes of the scheduled time c) Incision within 30 minutes of administering the antibiotic d) The time you start evaluating the patient e) Whatever definition your institution chooses to use
8. What percent of a hospital''s revenue is generatied by the operating room?	a) 10% b) 20% c) 30% d) 40% e) 50%
9. Turnover time is defined as:	a) The time it takes to clean an operating room b) The time it takes to get the next patient ready c) The time it takes from last stitch on the previous patient and the next incision on the following patient d) The time between leaving the operating room and giving the report in PACU e) The time between the previous patient''s departure from the OR and the next patient''s arrival in the OR 10. Optimum OR utilization is:
10. Optimum OR utilization is:	a) 100% b) 95-99% c) 85-90% d) 75% e) 66%

S-217.

PREVALENCE OF SMOKING AND STAGE OF READINESS FOR SMOKING CESSATION AMONG SURGICAL PATIENTS

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BACKGROUND: Patients facing surgery are more likely to be receptive to advice regarding smoking cessation[1]. The objective of this study was to determine the prevalence of smoking among surgical patients and to evaluate their readiness for smoking cessation.

METHODS: This study is part of an on-going randomized controlled trial on a smoking cessation program which includes standard counseling and pharmacotherapy. The Hospital Research Ethics Board's approval was obtained. We screened all patients in the preoperative clinic at two hospitals. Consenting patients were interviewed using two standard questionnaires (Fagerstrom Test[2], Prochaska Model[3]).

RESULTS: In 13 months, we screened 5039 consecutive patients in the preoperative clinic. Of them, 563 patients (11.2%) were smokers. After excluding non-eligible patients and those who did not consent, 145 patients were included in the study. The demographic data of the patients are shown in Table 1. As for baseline smoking habits (Table 2), 50.7% of the patients had medium to high nicotine dependence with a median (range) of 16 (3-30) cigarettes /day. In terms of readiness for smoking cessation, 2% of the patients were not currently considering cessation, whereas 35.7%, 56.4 % and 5.9% were at the "contemplation", "preparation " and "action" stage, respectively. Also, 35.6% had at least two previous attempts of smoking cessation.

DISCUSSION: A significant number of surgical patients are smokers who are willing to give up smoking. These findings show that surgical patients comprise a suitable target population for long-term smoking cessation programs in the preoperative clinic.

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Table 1. Demogr Table- 1: Demographic data (n = 145)

	Mean ± SD	Median (range)
Age	53 ± 14	55 (25 - 87)
Height (cm)	166 ± 8	167 (135-188)
Weight (Kg)	77 ± 17	77 (44 - 115)
BMI (Kg.m-1)	27.8 ± 6	25.0 (17.2-43.0)
	Frequency	%
Male/Female ratio	77/68	53%/47%
ASA	36	-
- II	113	77.8%
- III	32	22.2%
Ambulatory surgery	48	33.1%
In-patient surgery	97	66.9%
Type of surgery		
- Orthopedics	46	31.7%
- General	35	24.1%
- Spine	22	15.1%
- Ophthalmic	13	8.9%
- Plastic	6	4.1%
- Urology	6	4.1%
- Others	17	11.7%
ASA: American Society of Anethesiologists' class		

Table 2- Baseline smoking status of the patients

	Mean ± SD	Median (range)
No. of cigarettes/day	18 ± 10	16 (3-30)
Fagerstrom Score	4.9 ± 1.5	5 (3-9)
Start age of smoking	18 ± 6.0	16 (8-48)
No of previous quit attempts	2 ± 2.3	2 (0-10)
Stage of change	2.6 ± 0.6	3 (1-4)
E_{CO} level (ppm)	16.3 ± 6	15 (6-36)

Fagerstrom Score	**Stage of change:**
0-2: Very low dependence 3-4: Low dependence 5: Medium dependence 6-7: High dependence 8-10: Very high dependence	1- Precontemplating 2- Contemplating 3- Preparation 4- Action stage 5- Maintenance 6- Termination
E_{CO}: Exhaled carbon monoxide	
Start age of smoking	18 ± 6.0
No of previous quit attempts	2 ± 2.3
Stage of change	2.6 ± 0.6
E_{CO} level (ppm)	16.3 ± 6

S-218.

PERIOPERATIVE SEIZURES IN PATIENTS WITH A HISTORY OF A SEIZURE DISORDER

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INTRODUCTION: The occurence of perioperative seizures in patients with a preexisting seizure disorder is unknown. There are several factors unique to the perioperative period that may increase a patient's risk of perioperative seizure, including medications administered, timing of medication administration, missed doses of antiepileptic medications, and sleep deprivation.[1,2] This retrospective chart review was designed to evaluate the frequency of perioperative seizures in patients with a preexisting seizure disorder.

METHODS: We retrospectively reviwed the medical records of all patients with a documented history of a seizure disorder who received an anesthetic between January 1, 2002 and December 31, 2007. The first hospital admission of at least 24 hours, during which an anesthetic was provided, was identified for each patient. Patient demographics, character of the seizure disorder, details of the surgical procedure, and seizure activity in the perioperative period (within three days following the anesthetic) were recorded.

RESULTS: During the 6-year study period, 641 patients with a documented seizure disorder were admitted for at least 24 hours and underwent an anesthetic. Twenty-two patients (3.4%) experienced perioperative seizure activity (2.2-5.2% CI). The frequency of preoperative seizures ($P < 0.001$) and the timing of the most recent seizure ($P < 0.001$) were both found to be significantly related to the likelihood of experiencing a perioperative seizure. As the number of antiepileptic medications increased so did the frequency of perioperative seizures in this patient population ($P < 0.001$). Neither the type of surgery nor the type of anesthetic appeared to impact the frequency of perioperative seizures in this patient population.

DISCUSSION: We conclude that the majority of seizures occuring in the perioperative period in patients with a preexisting seizure disorder are likely related to the patient's underlying condition. The surgical procedure or type of anesthesia does not negatively influence the frequency of seizures. This finding is similar to a recent review of a similar patient population undergoing a regional anesthetic technique that concluded local anesthetic admnistration is not contraindicated.[3] Because patients who seize frequently are likely to seize in the perioperative period, it is essential to be prepared to treat seizure activity regardless of the surgical procedure or anesthetic used.

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S-219.

DOES SIZE MATTER?: THE RELATIONSHIP OF CASE VOLUME AND QUALITY IN HEART VALVE AND GALL BLADDER SURGERIES

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INTRODUCTION: Current data suggest that adequate patient volume is necessary to develop and maintain high quality care (1). We previously examined the top 100 hospitals by Medicare surgical volume for prostatectomy, craniotomy, and heart valve replacement and found no correlation between surgical volume and mortality, complications, length of stay, or quality metrics (2). To examine performance among a wider hospital cohort, we assessed surgical volume and mortality for heart valve (HV) and gall bladder (GB) surgery for all hospitals in the Hospital Compare (HC) database.

METHODS: Quality data were obtained from the HC database for both HV and GB surgery. Data collected included hospital volume and mortality, complications, and six perioperative CMS quality standards: (antibiotic timing (QS1) and type (QS2), antibiotic discontinuation 24 hours after incision (QS3), DVT prevention (QS4, QS5) and postoperative glucose control (for heart surgery) (QS6)). Performance was recorded as top 25%, middle 50%, or bottom 25% for each CMS measure and scaled to +1, 0, or -1 for data analysis. Hospitals were then divided into quartiles based on volume. Mean quality performances for each quartile were then compared. Statistical analysis was performed using Microsoft Excel.

RESULTS: Hospitals performing 10 or more cases per year were included in the dataset. The Hospital Compare database contained 653 hospitals for HV and 1600 for GB surgery.

For HV surgery, there were statistically significant differences between the top and bottom quartiles in all 6 CMS quality measures (Table 1). In contrast, for GB surgery there was no consistent relationship between quality measure performance and surgical volume (Table 2).

Table 1

	n	Mort	Comp	QS1	QS2	QS3	QS4	QS5	QS6
Quart1	165	4.05%	93.55	0.30	0.42	0.30	0.43	0.30	0.15
Quart2	160	4.55%	87.95	0.11	0.27	0.07	0.17	0.09	0.13
Quart3	165	4.83%	87.99	0.12	0.13	-0.12	0.08	0	0
Quart4	163	5.27%	87.47	0.13	0.07	-0.07	0.02	-0.01	-0.09
p 1v.4		NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Table 2

	n	Comp	QS1	QS2	QS3	QS4	QS5
Quart1	406	110.0	0.17	0.16	-0.01	0.13	0.04
Quart2	400	113.9	0.19	0.11	0.03	0.16	0.09
Quart3	402	111.7	0.05	0.14	0.03	0.11	0.06
Quart4	400	122.8	-0.06	0.04	-0.01	-0.04	-0.05
P 1v.4		<0.05	<0.05	<0.05	NS	<0.05	NS

DISCUSSION: Interquartile differences in quality measure performance in the HC database were significant for HV but not GB surgery. Our findings support earlier data (1) demonstrating increased quality with increased surgical volume and suggest greater correlation with more complex procedures. The mechanism by which volume appears to associate with higher quality is unknown. Further research is required to understand the relationship between increased surgical volume and quality.

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S-220.

WITHDRAWN.

S-221.

ASSESSMENT OF THE GERIATRIC ANESTHESIOLOGY MEDICAL KNOWLEDGE BASE OF ANESTHESIOLOGY RESIDENTS: IMPACT OF THE IMPLEMENTATION OF A GERIATRIC ANESTHESIOLOGY DIDACTIC BLOCK.

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AFFILIATION: Anesthesiology, Boston University Medical Center, Boston, MA.

INTRODUCTION: On May 2009, our anesthesiology department implemented a structured geriatric anesthesiology didactic block .We propose that the implementation of such academic curriculum, will increase our anesthesiology residents' awareness and medical knowledge base of this important subspecialty topic.

METHODS: Nineteen, anesthesiology residents of three different levels of training (CA-1, CA-2 and CA-3), took a geriatric anesthesiology medical knowledge assessment test, before and after the implementation of a didactic block and curriculum on such topic. A series of paired samples t-tests were conducted to examine if there was a statistically significant increase in scores from pre-test to post-test.

RESULTS: There was a statistically significant increase from pre-test to post-test for the entire sample, irrespective of level of training $t(18) = 4.87$, $p < .001$. When the data was analyzed by level of training, there was a statistically significant increase observed from pre-test to post-test for the CA-2 and CA-3 training level [$t(4) = 11.00$, $p < .001$, and $t(6) = 3.06$, $p = .02$]. There was no statistically significant change from pre-test to post-test for the CA-1 training level ($t(6) = 1.80$, $p > .05$).

DISCUSSION: The implementation of a geriatric anesthesiology didactic block and curriculum improves the geriatric anesthesia medical knowledge of our anesthesiology residents as a group, irrespective of level of training, and individually at the CA-2 and CA-3 level of training. The lack of improvement on medical knowledge of geriatric anesthesia at the CA-1 level of training could be explained by the lack of experience and their focused learning of the basics of anesthesiology.

T-test: Entire sample (CA1,CA2 and CA3). Paired samples statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pre-test score	64.4300	19	13.07641	2.99993
Post-test score	77.4342	19	12.27912	2.81702

T-test: Entire sample (CA1,CA2 and CA3). Paired samples test

	Pairing	----------	----------	----------	Differences			
				95% Confidence----	----Inverval			
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pre test score - post test score	-13.00421	11.63047	2.66821	-18.60992	-7.39850	-4.874	18	.000

T-test: CA1. Paired samples statistics

	Mean	N	Std. Deviation	Std. Error Mean
	Mean	N	Std. Deviation	Std. Error Mean
Pre test score	66.6671	7	11.05542	4.17855

T-test: CA1. Paired samples test

	Paired-----	----------	----------	----------	Differences			
				95% Confidence----	-----Interval			
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pre test score - Post test score	-11.19000	16.46246	6.22223	-26.41524	4.03524	-1.798	6	.122

T-test: CA2. Paired samples statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pre-test score	57.0000	5	10.95445	4.89898
Post-test score	76.2500	5	9.60143	4.29389

T-test: CA2. Paired samples test

	Paired-----	----------	----------	----------	Differences			
				95% Confidence	-----Interval			
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pre test score - Post test score	-19.25000	3.91312	1.75000	-24.10878	-14.39122	-11.000	4	.000

T-test: CA3. Paired samples statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pre-test score	67.5000	7	15.74537	5.95119
Post-test score	77.8571	7	14.96026	5.65445

T-test: CA3. Paired samples test

	Paired-----	----------	----------	----------	Differences			
				95% Confidence	-----Interval			
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pre test score - Post test score	-10.35714	8.94760	3.38187	-18.63229	-2.08199	-3.063	6	.022

S-222.

ANESTHESIOLOGY RESIDENTS PERFORMANCE ON ULTRASOUND GUIDED REGIONAL ANESTHESIA TESTING STATIONS AT THE OBJECTIVE STRUCTURED CLINICAL EXAMINATION (OSCE): THE IMPACT OF THE IMPLEMENTATION OF ULTRASOUND GUIDED PERIPHERAL NERVE BLOCK TRAINING WORKSHOPS

AUTHORS: C. R. Guzman[1], S. Shah[2], R. J. Azocar[1];

AFFILIATION: [1]Anesthesiology, Boston University Medical Center, Boston, MA, [2]Anesthesiology, Children's Hospital Orange County (CHOC), St. Joseph's Hospital, Orange County, CA.

INTRODUCTION: During the course of the 2008-2009 academic year, our anesthesiology department implemented a series of Ultrasound (U/S) guided regional anesthesia training workshops as part of the anesthesiology residents' didactic series. We propose that the implementation of such training workshops will improve the anesthesiology residents' performance on the (U/S) guided regional anesthesia test station of the 2009 Objective Structured Clinical Examination (OSCE), which is given every year to CA-2 and CA-3 anesthesiology residents in our program.

METHODS: An independent samples t-test was used to compare the 2008 CA-2 residents' performance on the OSCE (whom have not participated in U/S guided regional anesthesia didactics/workshops yet) vs. the 2009 CA-2 residents' performance on the OSCE (after having participated in such U/S training workshops).

RESULTS: There was an increase in the combined mean OSCE scores between the 2008 examinees [mean scores = 2.625(CA2) and 2.571(CA3), (combined M = 2.60)] and the 2009 examinees [mean scores = 3.25(CA2) and 4.16(CA3),(combined M = 3.88)]. However, there was no statistically significant difference in OSCE residents' performance between the 2008 CA-2 residents (N = 8, M = 2.625) and the 2009 CA-2 residents (N = 4, M = 3.25), t (10) = 1.50, p > .05.

DISCUSSION: The increase in combined mean scores between all residents taking the OSCE in 2008 vs. 2009, suggests a benefit of having U/S guided regional anesthesia training workshops on residents' OSCE performance. The lack of statistical significance when comparing the CA-2 OSCE residents' performance on 2008 vs. 2009, after the implementation of U/S training workshops, may be related to a low statistical power due to a small sample size.

T-test: Group statistics

Group	N	Mean	Std. Deviation	Std. error mean
OSCE score 2008 CA-2	8	2.6250	.74402	.26305
OSCE score 2009 CA-2	4	3.2500	.50000	.25000

T-test: Independent samples test

			t-test-	for---	equality	---------	---------	of-------	means
	Levene's	Equality of Variances						95%----	------CI
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. error difference	Lower	Upper
OSCE score (Equal variances assumed)	1.778	.212	-1.5010	10	.164	-.62500	.41646	-1.55293	.30293
OSCE score (Equal variances not assumed)			-1.72200	8.733	.120	-.62500	.36290	-1.44978	.30293

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S-223.

CAN A WIKIPEDIA-STYLE WEB SITE BE ADAPTED TO DEVELOP THE SIX ACGME COMPETENCIES WITHIN THE CURRICULUM OF AN ANESTHESIOLOGY PROGRAM?

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INTRODUCTION: The Accreditation Council for Graduate Medical Education (ACGME) mandates six core competencies for residency programs. A Wikipedia-style web site1 was created and developed by anesthesiology residents and faculty. The web site supplemented curriculum development in all six ACGME competencies.

METHODS: A Wikipedia-style web site was created and developed by residents and faculty in an open format with no positive or negative incentives to participate. After approximately one year of content development, the site was assessed as to the total number of pages (excluding links to outside sources) and the number of pages devoted to each of the six competencies. We reviewed the six ACGME core competencies (Patient Care, Knowledge, Practice-Based Learning and Improvement [PBLI], Professionalism, and Systems-Based Practice [SBP], and Interpersonal Skills and Communication) and then assigned one or more relevant competencies to each page.

RESULTS: On October 29, 2009, the Wikipedia-style site consisted of 174 pages. Five pages consisted solely of links to other pages, (e.g. Class of 2008) and four pages were the wiki site's functional pages (e.g. sidebar, frontpage); these nine pages were not assigned an ACGME competency. Sixty-four residents' pages that had not been updated since their creation were not counted. Three pages were empty and subsequently deleted. The 98 remaining pages are summarized in Table 1. Eight pages satisfied more than one competency.

DISCUSSION: A Wikipedia-style web site was used to supplement curriculum development in all of the six ACGME competencies. Development of content, however, was not equally distributed. This may be due to initial resident interest in pages that were devoted primarily to the knowledge and patient care competencies (e.g. board review questions and anesthetic care plans).

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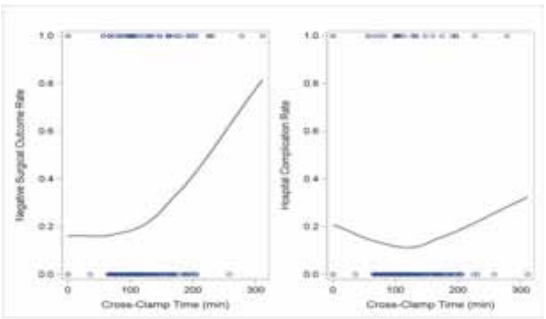
Table 1. Number of pages devoted to each ACGMEpetency.

Patient Care	45	(42.45%)
Knowledge	28	(26.48%)
PBLI	10	(9.43%)
Professionalism	4	(3.77%)
SBP	5	(4.72%)
Interpersonal Skills	14	(13.21%)
POP Bleeding n (%)	2(10.5)	0



S-224.

ORGANIZING A SUCCESSFUL JOURNAL CLUB IN AN ANESTHESIOLOGY RESIDENCY PROGRAM: LESSONS LEARNED AFTER ONE YEAR

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AFFILIATION: [1]Anesthesiology, Medical College of Wisconsin, Milwaukee, WI, [2]Anesthesiology and Physiology, Medical College of Wisconsin and VA Medical Center, Milwaukee, WI.

INTRODUCTION: Journal clubs are a vital component of residency training [1-3]. We re-surveyed anesthesiology residents one year after its implementation to aid in structuring a more successful journal club in our program.

METHODS: An IRB-approved voluntary survey was conducted initially for the 69 anesthesia residents at our institution [4], then repeated after one year of monthly meetings. Results from the follow-up (F/U) survey are expressed as mean±SEM or percentages (initial data in parentheses). Statistics: Kruskal-Wallis and Chi-square; * P<0.05; § no difference between initial and F/U results.

RESULTS: 30 residents participated in the initial survey; 21 completed the F/U survey. Between 1 (not useful) and 5 (extremely useful), having a journal club was rated 3.3±0.2 (3.5±0.2§). 62% (70%§) recommended monthly, 38% (17%§) quarterly, 0% (13%§) weekly meetings. 57% (36%§) suggested mandatory, 43% (64%§) voluntary attendance. 38% (53%§) preferred to meet before, 29% (40%§) after work; 57% (57%§) preferred their workplace, 33% (40%§) did not. 5% (23%§) preferred primary studies only, 24% (30%§) reviews only, 71% (43%§) both. Between 1 (not comfortable) and 5 (extremely comfortable), residents judged their ability to search literature 3.2±0.2 (2.8±0.2§), to present a manuscript 3.1±0.2 (2.6±0.1*), to critically appraise literature 3.0±0.1 (2.3±0.2*), and their statistical knowledge 2.3±0.2 (1.9±0.2§). In the F/U survey, 76% suggested CA-2 residents, 52% faculty, 48% CA-3s, 33% CA-1s, 33% fellows, and 5% medical students be involved in presenting; 52% preferred different faculty moderators each meeting, 33% one faculty for the entire year, and 14% multiple faculty per meeting.

DISCUSSION: Anesthesiology residents at our institution continue to consider journal club a useful component of residency training. After one year, a majority continues to support meetings before work on a monthly basis at the workplace and article presentation by CA-2 residents, which is the current practice at our institution. Interestingly, there was a trend from preference for voluntary toward mandatory attendance, which aligns with recommended practice [1,3]. Additionally, a majority suggests a change from having the same faculty moderator for the entire year to having a different faculty for each meeting. Our residents strongly prefer a mixture of review articles with a high yield for clinical practice and primary articles for improving critical appraisal skills. Implementation of the journal club led to higher confidence in how to present a manuscript and critically appraise literature and a trend toward improvement in statistical knowledge and ability to search the literature. In summary, we report the successful implementation of a monthly journal club in our residency program that continues to be well received by residents and led to increased confidence in skills essential for practicing evidence-based medicine.

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S-225.

GEOGRAPHIC DISTRIBUTION OF ANESTHESIA RESIDENTS : NO ANIMALS USED IN MY WORK

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INTRODUCTION: The popularity of anesthesiology as a specialty in medicine has been increasing over the past 10 years. Anesthesia programs are faced with as many as 1000 applicants on the electronic resident application service(ERAS) that are eligible for the match. Geographical mapping and trend interpretation of the residents that matched a program, can be a valid tool to help programs screen which applicants are more likely to match based on their medical school's geographic location.

METHODS: With IRB approval, the location of the residents medical school from 1999-2009 were obtained. The data was broken down to the north east, west, midwest, south and international medical graduates. The number and percentages of each group were calculated per year and statistical analysis was performed. The percentage of matched applicants from each geographical region was plotted for each year.

RESULTS: The number of international applicants that matched our program has been decreasing over the past 10 years. The slope is -0.873 for the international group. In contrast, the northeast applicants that have matched our program has been steadily increasing over the past ten years with a slope of 0.855. The slopes for the midwest, south and west applicants that matched our program over the past ten years are 0.2545, 0.5091, and 0.0364 respectively. A chi square analysis was performed on the data and results were significant ($p<.001$) demonstrating regional variability to matching the program.

DISCUSSION: As anesthesia residency programs are faced with an increasing number of qualified applicants each year, screening of those applicants must occur. Applicants are applying to more anesthesia programs to increase their chances of matching a program and interview sessions for programs are a huge use of resources and time. Geographical trends of those residents that matched individual programs can be determined to aid these programs in their interview selection process. This can be helpful to decrease the number of medical students interviewed and increase their likelihood of matching applicants.

S-226.

TEACHING SURGICAL AIRWAY MANAGEMENT TO ANESTHESIOLOGY RESIDENTS: A SURVEY OF METHODS USED IN UNITED STATES TRAINING PROGRAMS

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AFFILIATION: Anesthesiology, Medical College of Wisconsin, Milwaukee, WI.

BACKGROUND: Surgical or percutaneous cricothyrotomy or tracheostomy is the final step in the emergency pathway (ventilation not adequate, intubation unsuccessful) of the American Society of Anesthesiologists Practice Guidelines for Management of the Difficult Airway1. Teaching surgical airway management to anesthesiology residents may be difficult because a cricothyrotomy or tracheostomy is very infrequently required to secure the airway in clinical practice, most likely because of the advent of alterative airway management devices (e.g., laryngeal mask airway, video laryngoscopy). We surveyed United States anesthesiology training programs to identify the methods used to teach surgical airway management to residents.

Methods: Electronic mail surveys were distributed to ACGME-accredited anesthesiology residency program coordinators. Each coordinator was asked whether their program provided formal instruction in surgical airway management, and if so, what methods were used: lectures or reading materials alone, mannequin training, simulator experience, or participation in a cadaver workshop or a large animal laboratory. The number of residents trained in each program was also quantified. Statistical analysis of data was performed using analysis of variance (ANOVA) for repeated measures followed by Bonferroni's modification of Student's t test.

RESULTS: The survey response rate was 63% (82 of 130). Responding programs trained 40±20 (mean±standard deviation; median = 39; range 9 to 93) residents in the PGY2 through PGY4 years. Seventy-two of the respondents (88%) reported that education in surgical airway management was part of their curriculum, whereas ten programs (12%) stated that this topic was not formally addressed. Forty-seven programs (65%) teaching surgical airway management used a single method, whereas the remainder (n=25; 35%) incorporated more than one approach. Among respondents who reported using a single teaching method, practice on a mannequin was the most common experience (55%), followed in descending frequency by lectures alone (23%), a cadaver workshop or a large animal laboratory (17%), simulator training (4%), and supply of subject-specific reading material (2%). Programs that trained more residents than the median were significantly ($P<0.05$) more likely to use simulator training (60%) with or without a cadaver laboratory or a large animal workshop (52%) as part of a multimodal approach compared with programs of smaller size. Two larger programs also reported that their residents completed an otolaryngology rotation or participated in a formal tracheostomy service.

CONCLUSION: The current results indicate that the vast majority of ACGME-accredited anesthesiology residency programs provide some type of formal instruction in surgical airway management. Mannequin training and classroom didactics were identified by program directors as the most common teaching methods. The results further suggested that larger residency programs are more likely to use multiple teaching approaches and incorporate simulator training, a cadaver laboratory, or a large animal workshop into their curricula.

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ANESTHESIA & ANALGESIA

Equipment Monitoring

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S-227.

UNEXPECTED LOWER EFFICACY OF THE CONVECTION OF WARMED AIR PROVIDED BY THE COMBINATION OF BOTH UNAPPROVED AIR WARMING BLANKETS AND BAIR HUGGER® WARMING BLOWER -COMPARISON OF THE AIR STREAM AND SURFACE TEMPERATURE VARIANCE-

AUTHORS: K. Inoue, T. Koitabashi, T. Ouchi, E. Takano, H. Agata, R. Serita;

AFFILIATION: Anesthesiology, Ichikawa General Hospital, Tokyo Dental College, Chiba, Japan.

INTRODUCTION: It is well recognized that forced-air warming systems are effective in preventing intraoperative hypothermia. Because the warming efficacy is based on the power of the warming devices, an unapproved blanket might be as effective as an approved blanket. We have already presented that the unapproved blanket (Warmtouch CareDrap®), which needs an adaptor, cannot provide the same efficacy as the approved blanket (1), however, other blankets can be attached to the Bair Hugger® warming duct without an adaptor, and this combination has never been tested. In this study, we compared the temperatures of both the air stream and the patient's side surface between the approved and unapproved blankets.

METHODS: In the laboratory, we measured temperature within the blanket and temperature at four points where the blanket surface contacted the patient's body at four distinct locations: A: at the outlet of forced-air nozzle, B: at the center of the blanket (35 cm distant from the outlet), C: at half point of the left side of the blanket (70 cm distant from the outlet), D: at the end of left side of the blanket (105 cm distant from the outlet). Ten approved blankets (Model 522 Upper Blanket, Arizant Healthcare, USA) and 10 unapproved blankets (SW-2003, Level 1® Snuggle Warm® Upper Body Blanket, Smiths Medical ASD, MA, USA) were compared using a Bair Hugger forced warming unit with its temperature setting at high (43°C). (Model BH750, Arizant Healthcare, USA). The ambient temperature was maintained at 21-22°C. Data was expressed as mean ± SD. Statistical analysis was performed using SPSS (version 16.0). ANOVA and un-paired t-test was employed and $P<0.05$ was considered statistically significant.

RESULTS: Both inside and surface temperatures were significantly higher in the approved blanket than those of the unapproved blanket. The differences of patient's side surface temperatures between the two groups increased significantly with increases in the distance from the outlet of the warmed air.

DISCUSSION: This study clearly demonstrates that the unapproved blanket cannot provide the same efficacy as the approved blanket. Although the detailed disposition and structure of the blankets are not evaluated, the unapproved blanket may have some disadvantage for the convection of warmed air. We conclude that the approved blanket should be used to transfer the power of the forced-air warming system effectively.

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Inside temperature changes between the groups (°C)

	A	B	C	D
Approved blanket	41.9±0.2	39.0±0.3*	37.7±0.4*	36.3±0.4*
Unapproved blanket	42.3±0.3	36.5±0.6	35.9±0.3	33.8±0.7

Patient Side Surface temperature changes between the groups (°C)

	A	B	C	D
Approved blanket	40.2±0.1*	36.6±0.2*	36.2±0.2*	35.5±0.2*
Unapproved blanket	39.5±0.5	35.8±0.7	34.0±0.9	32.1±0.9

A: at the outlet of forced-air nozzle, B: 35 cm, C: 70 cm, D: 105 cm distant from the outlet versus unapproved blanket: *<0.05

S-228.

EXAMINATION OF ANESTHETIC MANAGEMENT OF PATIENTS WITH PULMONARY ARTERIAL HYPERTENSION (PAH)

AUTHORS: H. Suzuki, T. Terada, K. Yoshida, N. Sato, R. Ochiai;

AFFILIATION: Department of Anesthesiology, Toho University, Tokyo, Japan.

BACKGROUND: Pulmonary arterial hypertension (PAH) is associated with significant perioperative risk due to the severity of cardiac dysfunction, which is related with the RV index greater than 0.83. We evaluated the cardiovascular function during anesthesia to elucidate the characteristics of severity of PAH. In addition, baroreflex sensitivity (BRS) was measured.

METHODS: Nine patients undergoing central venous catheterization under general anesthesia (seven patients) and local anesthesia with sedation (two patients) were studied. RV index of five patients were > 0.83 (severe) and four patients with RV index ≤ 0.83 (moderate). Bioimpedance method was used to determine stroke volume (SV) and cardiac output (CO) non-invasively throughout anesthesia. The correlation between the changes in SV and CO was evaluated by using least squares method. In addition, BRS was measured by the spontaneous sequence analysis method. RESULTS : 5 patients whose RV index > 0.83; mean age 16.8 years old, height 145.3 cm and weight 38.7 kg. 4 patents with RV index ≤ 0.83; mean age 16.3 years old, height 150.5 cm and weight 42.1 kg. Correlation coefficient of SV and CO in severe cardiac dysfunction was 0.0~0.6 while moderate cardiac dysfunction was 0.49~0.92. Three patients (two patients under general anesthesia and a patient under local anesthesia with sedation) underwent the analyses. BRS was depressed with two patients under general anesthesia.

CONCLUSION: In patients with severe PAH, it was demonstrated that CO is maintained by the change in heart rate (HR) but not by SV. It is suggested that the control of HR in patients with PAH is of clinical importance in order to maintain CO, if RV index is greater than 0.83. In addition, BRS was depressed during general anesthesia with PAH.

S-229.

INTRAOPERATIVE EARPLUGS LOWER THE INCIDENCE OF BIS® SCORES ASSOCIATED WITH AWARENESS

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AFFILIATION: Anesthesiology, University of Virginia, Charlottesville, VA.

INTRODUCTION: The overall incidence of intraoperative awareness under general anesthesia approaches 1% in high-risk patients. The BIS monitor was developed to monitor the depth of anesthesia in these patients with the implicit goal of reducing the incidence of awareness.

The two largest, randomized, controlled studies of the BIS monitor noted an auditory component in 16 of 17 confirmed cases of awareness (four of which had only an auditory component to awareness).[1,2] Two additional studies have documented a significant effect of noise on BIS scores during monitored anesthesia care.[3,4]

We hypothesized that reduction of auditory stimulation through the use of earplugs may provide cost-effective strategy to lower BIS scores under general anesthesia and potentially reduce the potential for intraoperative awareness.

METHODS: Eight patients receiving total intravenous general anesthesia for reconstructive spinal procedures were consented. After consent was obtained, but prior to induction, a Tenma DT-8851 industrial noise level meter was placed on the anesthesia machine and a BIS monitor was placed on the patients' foreheads.

After induction and positioning were complete, foam earplugs (rated to reduce noise by 29 decibels) were placed in patients' ears and, every ten minutes, replaced or removed. Noise levels were recorded in decibels every 0.125 seconds (subsequently processed to average and maximum decibels at one minute intervals). Average and maximum BIS scores were recorded every minute.

RESULTS: Six patients completed the study (two were removed because of a malfunctioning BIS monitor [inability to retrieve data]). A total of 1101 minutes of intraoperative data were analyzed. The average ambient noise level in patients without earplugs was 63.77 dB, versus 64.01 dB when earplugs were in place.

For any given minute of data recorded, earplugs reduced the likelihood of experiencing BIS scores > 45, 50, and 55 by 15%, 24%, and 43%, respectively (p = 0.0307, 0.0085, and 0.007, Z-test) with a statistically insignificant trend towards decreasing the incidence of BIS scores > 60 (22% reduction, p = 0.362, Z=test).

DISCUSSION: Our study suggests that under total intravenous general anesthesia, the incidence of elevated BIS scores can be reduced by intraoperative placement of earplugs. The results of our study, combined those of Avidan1 (multiple incidences of awareness at BIS levels between 50 and 60), suggest that earplugs may reduce the risk of awareness at a relatively modest cost.

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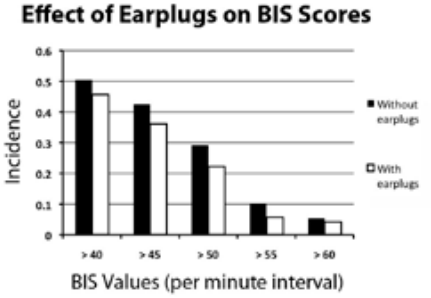


S-230.

UTILIZATION OF DESFLURANE VAPORIZERS TO WARM ECG ELECTRODES

AUTHORS: H. Goto, A. Pichoff;

AFFILIATION: Anesthesiology, University of Kansas Medical Center, Kansas City, KS.

INTRODUCTION: The purpose of the study was to find out whether or not warming ECG electrodes with the surface of desflurane vaporizers is effective and safe in order to minimize the unpleasant experience of having cold ECG electrodes placed.

METHODS: A strip of ECG pads consisting of five electrodes was secured over the top front surface of the desflurane vaporizer (TEC 7 plus Datex Ohmeda) in two different operating room temperatures(15.6º C = 60º F and 21.1º C=70º F). The surface temperature of the adhesive side of the middle electrode was measured every 1 min for 10 min using an infrared thermometer (n=8). The ECG pad was then removed from the surface of the vaporizer and the temperature of the electrode was measured every 30 sec for 2 min.

RESULTS: Time course changes of temperature are shown in Figures 1 and 2.

DISCUSSION: The baseline electrode temperature was close to each room temperature as had been expected (Fig. 1). The electrode temperature increased quickly but never to a critically high point (Fig.1). Figure 2 shows that the electrode temperature was well above each room temperature at 30 sec so that patients felt warmth when they were applied. It is conceivable that we could place all five electrodes within 30 seconds. The data suggests that warming ECG electrodes with the surface of a desflurane vaporizer is easy, effective, and safe for patients and adds to their comfort when promptly applied.

Figure 1. Time Course Change of ECG Pads Temperature During Warming (ºC)

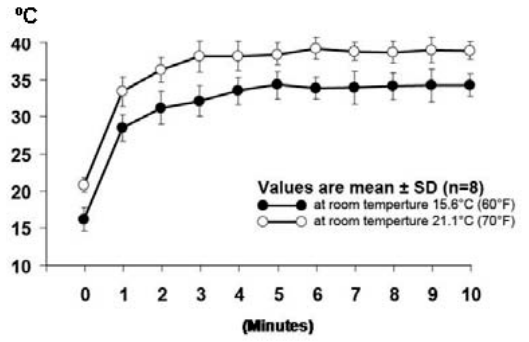
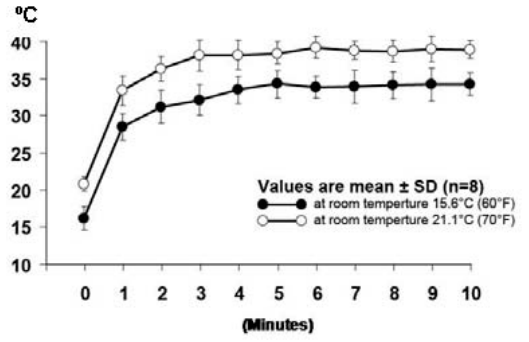


Figure 1. Time Course Change of ECG Pads Temperature During Warming (ºC)



S-231.

SEX-BASED DIFFERENCES IN PRESENCE OF EXTRA HEART SOUNDS DURING INDUCTION OF GENERAL ANESTHESIA

AUTHORS: D. Daneshrad[1], S. E. Rose[2], D. Jordan[3], J. Schwarzenberger[4];

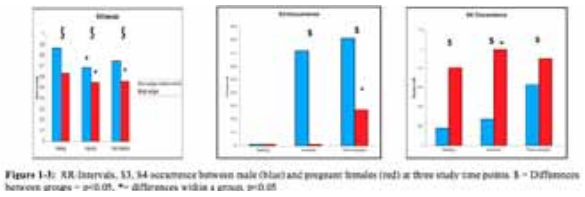
AFFILIATION: [1]Anesthesiology, Memorial Sloan Kettering Cancer Center, New York, NY, [2]School of Medicine, Cornell University, New York, NY, [3]Anesthesiology, Columbia University, New York, NY, [4]Anesthesiology, UCLA, Los Angeles, CA.

INTRODUCTION: Years ago, continuous cardiac auscultation by anesthesiologist during a surgical case was considered standard of care.[1] It was well appreciated that alterations in heart sounds (development of gallops or muffled heart sounds) signaled impending cardiovascular instability. An S3 is generated in adult patients of all ages and ASA status during induction of general anesthesia and is caused by the mid-diastolic oscillation of the blood against the ventricular walls. The S4 is caused by a sudden limitation of longitudinal expansion of the left ventricular wall at atrial contraction[2] There is a preponderance of S3 in males versus females. To increase clinical awareness and develop a more robust simulation model of the heart sound changes heard by anesthesiologists, we evaluated sexual dimorphism in myocardial structure and function using the auditory development of S3 and S4 gallops in two distinct population types. We hypothesized that pregnant women, whose ventricular compliance increases during pregnancy, would not develop an S3 during anesthetic induction as compared to age matched men, and would develop and S4 due to their high volume state.

METHODS: Following IRB approval, 20 patients with age matched controls were studied. The patient groups were women at 16-23 weeks gestation undergoing GA for dilation and evacuation, and men who were given GA for a variety of non-cardiac surgeries. Heart sounds, continuous wav files obtained at Erb's point, were recorded preoperatively, one, and five minutes post induction. The recordings were transferred to EXP studio Audio Editor. Noise reduction was set to a gate level of -38 dB. RR interval, intensity of S2 (dB) and presence of a third heart sound (S3,S4) were analyzed by Fourier analysis, simple t-test, and analysis of variance.

RESULTS: The RR interval was shorter in women versus men. The male control group developed an S3 following induction and 5 minutes post-induction. 27% of the women developed an S3 five minutes post induction. Pregnant women, the high estrogen group, had more S4s at rest, one, and at the five minute time point.

CONCLUSIONS: Compared to the male subjects, S3 was absent at all three study points in pregnant women ($P<0.05$) and the S4 was more prominent. The loss of the S3 could be due to increased ventricular compliance and decreased ventricular oscillations during. S4 occurrence in the female group might be explained by the ultimate restriction to filling and the increase in ventricular mass during pregnancy.[3] Thus, estrogen effects may be a major determinant of the sexual dimorphism observed in heart sound characteristics during GA. Further correlation of gonadal status, diastolic function and LV mass, as measured by echo, will be necessary.



male, F= female, RR interval of one cardiac cycle, dB = decibel level, *= change from resting

	R-R inverval(s)	R-R inverval(s)	S3 occurrence (%)	S3 occurrence (%)	S4 occurrence (%)	S4 occurrence (%)	S1 intensity (db)	S1 intensity (db)	S2 intensity (db)	S2 intensity (db)
Sex	M	F	M	F	M	F	M	F	M	F
Resting	0.87	0.63	0.01	0.01	0.18	0.81*	-16.75±4	12.07±3.7	-14±3.5	-13.3±3.5
Induction	0.69	0.55	0.72	0.01*	0.27	1*	-11.1±2.9	11.6±4.53	-10.3±3.9	-12.6±4.2
Post-Induction	0.75	0.56	0.81	0.27*	0.63	0.9	-14.9±3.3	-10.1±2.8	-15.9±2.9	-14±4.6

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S-232.

DEVELOPMENT OF ANESTHI*LABEL- A NEW SYRINGE LABELING PROGRAM AND ITS IMPLEMENTATION

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AFFILIATION: Anesthesiology, St. Luke's Roosevelt Hospital, New York, NY.

INTRODUCTION: The problem of inappropriate drug administration during the intra-operative and peri-operative periods is not uncommon. Literature reviews reveal the incidence of anesthetic drug-error in teaching hospitals may be as high as 1/274 anesthetics. Mislabeling or non-labeling of medication syringes represent greater than 20% of these events,[1] 5% of which resulted in major morbidity or death.[2] A review of evidence-based strategies for preventing drug administration errors during anesthesia advocates for clear labeling of syringes. Hospital oversight agencies have increasingly required appropriate labeling of syringes. Consequently, we set out to produce Anesthi*Label, a readily implemented application to print syringe labels. The implementation required that each label contain a distinct color-coded background, medication name, date, concentration, and practitioner's initials.

METHODS: After a review of Joint Commission guidelines (Medication Management Standard: MM 05.01.09, National Patient Safety Goal 01.01.01, National Patient Safety Goal 03.04.01), a set of criteria was established for the appropriate content of the labels (see above). A search of labels available from Avery Labels (Avery Dennison Corporation, Brea, California) was undertaken. It was decided that a 80 label per sheet, with dimensions of 0.5 by 1.75 inches would be appropriate for labeling three, five and ten ml syringes. A Xerox Phaser 6280 (Xerox Corporation, Wilsonville, OR 97070) was purchased as a test machine to ascertain color-fastness of the labels. Ten sheets of the Avery Print Sheets were produced and placed on syringes. Two ml of water was placed on each syringe and after 1 minute and three minutes, attempts to smudge the color ink or displace the labels were made.

Using Microsoft Access we developed a back-end database. Microsoft Visual Basic was used to author a three-form application consisting of a splash screen, a medication selection interface, and a full-color print preview screen. Three basic default modules where developed for general anesthesia, regional anesthesia, and obstetrical anesthesia. The program allows for one set of 20 labels or 4 sets of 20 labels to be produced with each printing.

RESULTS: Anesthi*Label has been implemented for over two months at a tertiary care center with an Anesthesiology residency. Anesthi*Label has been enthusiastically received and is being used by the > 90% of our staff. The labels are 100% water-fast and adhere well to syringes.

DISCUSSION: Anesthi*Label proves that a Joint Commission compliant, non-commercial program, can be produced at low-cost and with high staff acceptance. Presentation of this abstract is intended to discuss implementation of such a product to a general Anesthesiology audience and improve patient safety.

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S-233.

SEAL EFFECTIVENESS OF SEVEN ENDOTRACHEAL TUBE CUFF DESIGNS: A STUDY USING AN IN VITRO MODEL TRACHEA

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AFFILIATION: Research, Clinimark Labs, Golden, CO.

INTRODUCTION: Aspiration of potentially infectious subglottic secretions around the endotracheal tube cuff in intubated patients has been associated with ventilator associated pneumonia. [1]

Low-pressure cuffs have been shown to have wrinkling of the cuff which can create longitudinal folds or Micro capillary channels when inflated within the trachea. [2] These channels may allow secretions to migrate along the path.

Many low-pressure cuffs utilize a version of a 'barrel' or 'oval' shape. When fully inflated - while not in the trachea - these cuffs have a larger diameter than the trachea, thus when placed in the airway the excess cuff material may form longitudinal folds that may allow secretions to migrate into the lungs. [3]

Recently, a newly designed low-pressure cuff that utilizes a tapered shape has been developed which, at the distal tip, has a smaller diameter than that of the trachea.

The theory is that the cone shape of the taper will present a non-folded surface to the tracheal tissue at the portion of the cuff where the diameter transitions from smaller than the trachea to larger.

METHODS: Using an in vitro test fixture we investigated the ability of seven cuff designs from several manufacturers to prevent fluid leakage past the tube cuff. (Figures 1-4) In this test ten identical tubes from each of the seven different designs were tested 5 times each for a total of 50 trials per cuff type.

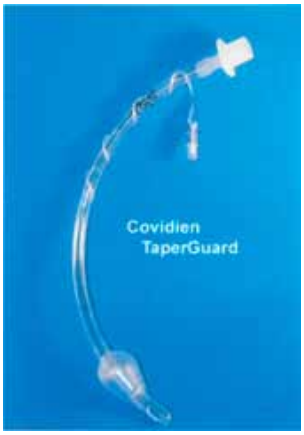

Figure 1

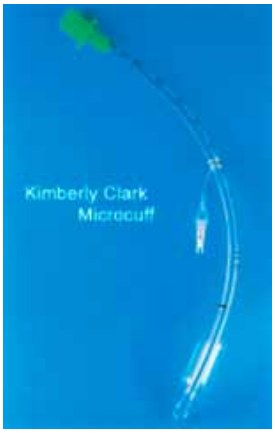

Figure 2

Figure 3

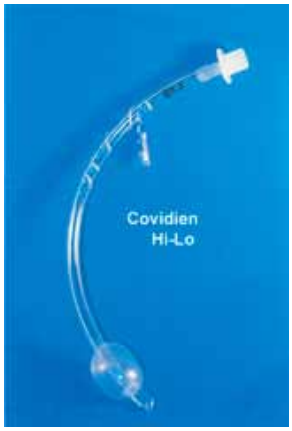

Figure 4

An artificial trachea (21mm I.D. clear acrylic tube) was mounted vertically. The ET tube was suspended in the trachea. The cuff was then inflated to 25cmH2O. Ten milliliters of water were introduced over the top of the cuff in the trachea. Any water that dripped past the cuff was measured and a leak rate was calculated.

RESULTS: There were considerable differences in tracheal sealing among the cuff designs. The tapered cuff had an average leak rate of 0.59 grams of water over a 5 minute period, while other cuff shapes resulted in an average leak rate ranging from 11.19 to 59.18 grams of water over a 5 minute period. (Table 1)

Table 1. Leak Rate ml/5min

Tracheal Tube	Avg Leak Rate	Leak Std Dev.
Covidien TaperGuard	0.59	0.99
Covidien Hi-Lo	11.19	4.73
Hudson BCI Sheridan HVT	31.31	18.88
Smiths Portex Soft-Seal	38.17	19.29
Bard Agento	38.18	13.68
Smiths Portex Soft-Seal SACETT	42.21	21.61
Kimberly Clarke MicroCuff	59.18	83.96

DISCUSSION: The data clearly show that the tapered cuff design is more successful at sealing the artificial trachea in this test protocol. Longitudinal folding was seen with the cuff of several ET cuff designs in the artificial trachea in this test. (Figure5.) The novel shape of the tapered cuff may be the primary reason for this performance. In vivo studies should be conducted to confirm these findings.

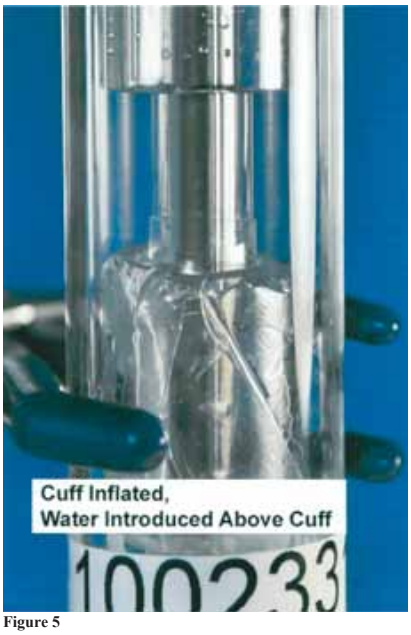

Figure 5

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S-234.

EXTERNAL REFERENCE POINT FOR SUPERIOR VENA CAVA IN CT IMAGE OF ADULT IN SUPINE POSITION

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INTRODUCTION: For proper pressure in a fluid filled chamber, hydrostatic pressure is eliminated by setting the zero point at the highest position. Zero-level measurements of cardiac chambers using echocardiography or computed tomography (CT) have been proposed, such as four-fifths of the thorax anteroposterior (AP) diameter for the right atrium and 5 cm below the left sternal border at the fourth intercostal space for the left ventricle in a supine position. The superior vena cava (SVC) is commonly used for measuring central venous pressure, however, its uppermost level is not well elucidated. We investigated the uppermost SVC level in the supine position using CT and propose a clinical external reference point.

METHODS: Protocol 1. Neck and chest CT was performed in 20 adult surgery patients (10 males, 10 females; mean 66±11 years) in a supine position, and the vertical distances of the uppermost SVC level from the skin on the back (SVCmax) and AP diameter of the thorax (AP diameter) were measured. We also determined vertical distances for the anterior and middle axillary lines from the back skin. Next, we measured the anterior thoracic wall height (AP height), and anterior and middle axillary lines from the operating table surface. Those were compared with the CT measurements. Protocol 2. Neck and chest CT was performed in 100 consecutive adult patients (56 males, 44 females; mean 67±14 years) in a supine position. SVCmax and AP diameter were determined, and the distance between the uppermost SVC level and anterior thoracic wall surface was calculated. Data are expressed as the mean±SD. A Wilcoxon signed rank test was used to compare measurements. $P<0.05$ was considered significant.

RESULTS: 1. With CT scanning, SVCmax and AP diameter were 13.4±2.0 and 20.7±2.8 cm, respectively. We could not confirm the anterior and middle axillary lines by CT. The anterior thoracic wall height, and anterior and middle axillary lines from the table surface were 16.9±2.4, 8.9±1.7, and 5.7±1.6 cm, respectively. There were significant differences between AP diameter by CT and AP height from the table (3.7±2.0 cm, $P<0.05$) 2. SVCmax and AP diameter were 13.4±1.5 and 20.9±2.1 cm, respectively. The vertical distance between the uppermost SVC level and anterior thoracic wall surface was 7.6±1.2 cm.

DISCUSSION: The difference between AP diameter by CT and AP height from the table was about 3.7 cm. For deriving an external SVC reference point, the ratio of SVC height to largest thorax AP diameter is inaccurate, whereas the distance from the chest wall anterior surface to SVCmax may be valid. Our results showed the external SVCmax reference point to be approximately 7.5 cm below the anterior chest surface.

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S-235.

NOVEL NON-INVASIVE CONTINUOUS CARDIAC OUTPUT MEASUREMENT METHOD: CARDIAC SURGERY VERSUS THORACIC AORTIC SURGERY

AUTHORS: H. Ishihara[1], E. Hashiba[1], H. Okawa[1], T. Tsubo[1], K. Hirota[1], Y. Sugo[2];

AFFILIATION: [1]Department of Anesthesiology, Hirosaki University Graduate School of Medicine, Hirosaki-Shi, Japan, [2]Monitoring Technology Center, Nihon Kohden Corporation, Tokyo, Japan.

INTRODUCTION: A novel non-invasive continuous cardiac output (CO) measurement method utilizing routine clinical monitors based on pulse contour analysis combined with pulse wave transit time was devised [1]. We compared this estimated continuous CO (esCCO) with intermittent bolus thermodilution CO using a pulmonary artery catheter (ICO) following cardiac surgery and thoracic aortic surgery, and tested whether the surgical procedure itself has an impact on the results of esCCO measurement.

METHODS: A total of 100 patients without continued arrhythmias (38 CABG, mostly OPCAB; 44 valve surgery; and 18 thoracic aortic surgery, mostly total arch replacement) were studied. We computed esCCO using an ECG monitor, an arterial pressure monitor and a pulse oximetry system. As esCCO consistently requires a reference CO value utilizing another CO measurement system, a corresponding bolus thermodilution CO value was used as a reference when relatively stable cardiovascular states were achieved after admission to the ICU. Thereafter, esCCO and ICO were compared at 10 a.m. on subsequent postoperative days until discontinuation of thermodilution CO measurement. ANOVA followed by Tukey's test and correlation analysis were used for statistical comparisons.

RESULTS: A total of 196 paired sets of data were compared. Four data sets were excluded from the study; 3 due to failure of R wave detection, and 1 due to cardiac tamponade. The difference between esCCO and ICO results was 0.37±0.97 (SD) L/min for CABG (n=60), 0.18±0.90 (SD) L/min for valve surgery (n=88), and -0.09±0.72 (SD) L/min for thoracic aortic surgery (n=44). The difference between CABG and thoracic aortic surgery was statistically significant (p=0.036). A linear correlation was obtained between the two CO measurement methods for each surgical procedure(Figure).

DISCUSSION: Although measurement of ICO is more accurate than continuous thermodilution CO (CCO), the results of each surgical procedure in this study were comparable with that of a previous report [1], in which the difference between esCCO and CCO was -0.06±0.82 (SD) L/min. However, in this study, thoracic aortic surgery showed a smaller difference between esCCO and ICO when compared with CABG, even though the pathophysiology remains unclear. **The results suggest that esCCO measurement method is useful,irrespective of surgical procedure, although greater accuracy was seen with thoracic aortic surgery than with CABG.**

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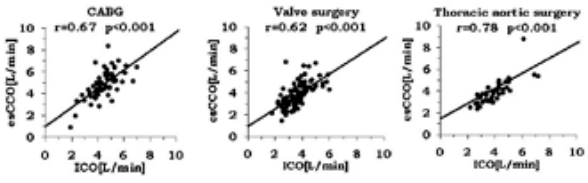

S-236.

THE USEFULLNESS OF PERFUSION INDEX TO ASEESS THE VASOCONSTRICTIVE RESPONSE TO TRACHEAL INTUBATION DURING REMIFENTANIL ANESTHESIA

AUTHORS: T. Yamada, C. Hagiwara, M. Tsuchiya, A. Asada;

AFFILIATION: Anesthesiology, Osaka City University Graduate School of Medicine, Osaka, Japan.

INTRODUCTION: The effect-site concentration of remifentanil blunting sympathetic responses to tracheal intubation is supposed to be above 5 ng/ml. We investigated the change of hemodynamics using Perfusion Index (Radical 7TM, Masimo Co, Irvine, CA) to a vasoconstrictive stimulus for tracheal intubation in this situation.

METHODS: We selected randomly ASA I-II patients undergoing elective abdominal surgery. We simulated fast and consistent administration modes of remifentanil reaching 6 ng/ml in the effect-site with Tivatrainer© program and perfomed the continuous infusion of 1 μg/kg/min for 2 min and consequently 0.5 μg/kg/min. All patients were monitored with Perfusion Index and Bispectral Index (BIS) using (BIS XP A2000TM, Aspect Medical Systems Inc, Natick, MA). They received a bolus injection of 1.5 mg/kg propofol with remifentanil. Then 0.9 mg/kg rocuronium was administered and tracheal intubation was conducted. We measured values of hemodynamics, Perfusion Index, and BIS at 1 min before and after tracheal intubation. The value, $P<0.05$ was considered to be statistically significant and data were expressed as mean±SD.

RESULTS: Sixteen patients received this study. Tracheal intubation was completed at 5.2±1.1 min from infusion of remifentanil. BIS values maintained below 60 after induction of anesthesia without significant changes of BIS values due to tracheal intubation. Perfusion Index decreased significantly (4.2±1.8 vs. 2.5±1.2, $P<0.001$), heart rate and mean arterial pressure increased significantly after tracheal intubation.

DISCUSSION: The effect-site concentration of remifentanil reached 6 ng/ml 2 min after infusion in this study. As the effect-site concentration of remifentanil in 50% cases (Ce50) for blockade of sympathetic responses was regarded as 5 ng/ml, cardiovascular responses to tracheal intubation could not be attenuated sufficiently in this study. Perfusion Index might serve to detect a vasoconstricive response to tracheal intubation and to obtain the appropriate depth of anesthesia than a measurement of hemodynamics.

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S-237.

THE CORRELATION BETWEEN PAO_2/FIO_2(P/F) RATIO AND EXTRAVASCULAR LUNG WATER INDEX(EVLWI) DURING PEDIATRIC RENAL TRANSPLANTATION ON MEASUREMENTS BY THE TRANSPULMONARY THERMODILUTION TECHNIQUE ;PICCO

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INTRODUCTION: Aggressive fluid management is essential during pediatric renal transplantation to provide enough filling pressure for the graft. Hemodynamic monitoring during the operation is very important for circulation and respiratory management because a large amount of infusion solution may lead to pulmonary edema and worsening of oxygenation. The pulse-induced continuous cardiac output (PiCCO) system is a relatively less invasive method that can measure continuous cardiac output, stroke volume variation, intrathoracic blood volume index (ITBVI), and extravascular lung water index (EVLWI), while the normal values in children have not been defined. The purpose of the present paper was therefore to evaluate the correlation between PaO_2/FiO_2 (P/F) ratio and parameters of blood volume using brachial arterial thermodilution system in pediatric renal transplantation.

METHODS: After approval from the institutional ethic committee, we studied 3 chronic renal failure patients (1 male, 2 females; age 3-9, mean 6 yr) who had received a clinically indicated 3F arterial catheter (PV2013L07, Pulsion Medical Systems, Germany), which was connected to a monitor (PiCCOplus, Pulsion Medical Systems, Germany). Hemodynamic measurements were performed by central venous injection of saline (5 mL×2or3 times, <8 degrees C) during renal transplantation. The measurements were performed at three points: (1. After induction of anesthesia, 2. Clamping the vessels to the graft when enough intravascular volume was loaded, 3. After revascularization to the graft and blood volume was fill up for new vascular bed of the graft .) We estimated the correlation between P/F ratio and ITBVI, P/F ratio and EVLWI. The association between two quantitative variables was evaluated with Pearson's correlation coefficient.

RESULTS: EVLWI ranged between 8 and 14 ml/kg, ITBVI between 468 and 807ml/m2. P/F ratio were correlated with EVLWI (Correlations -0.8492, p=0.0021). The correlation between P/F ratio and ITBVI was not significant ITBVI (Corrlations -0.425 , p=0.2666).

DISCUSSION: Our data suggested that respiratory management during pediatric renal translation had relevant effect on measurement of EVLWI.

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S-238.

USEFULNESS OF ULTRASOUND FOR DIAGNOSTIC PNEUMOTHORAX AFTER CENTRAL VENOUS CATHETER INSERTION

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INTRODUCTION: Use of the ultrasound (US) is now became a strong tool to achieve safer central venous catheter (CVC) insertion. Although pneumothorax is a rare complication related to CVC placement, it cannot be avoided even with the US guided technique, particularly when the vascular access was chosen via the subclavian vein. Recently, many techniques using US to detect occult pneumothorax have been proposed in the field of critical care medicine. Not only performing US before and during CVC insertion, but after the procedure to rule out pneumothorax is also important. We evaluated the normal lung signs after routine CVC insertion.

METHODS: After institutional approval and written informed consent, thirty eight patient requiring CVC insertion for cardiovascular and thoracic anesthesia were enrolled. Before CVC insertion, anatomical structure of the vessels where CVC will be attempted were scanned. In addition, anterior chest wall where accessible was quickly scanned with portable echograph (MicroMax, Sonosite, Bothell, WA, with a linear 5-10 MHz probe).

Normal lung is diagnosed with one or more of the following four signs: "lung sliding" is a to-and-fro motion of the pleural line synchronized with respiration, "comet tail" is a roughly vertical artifact arising from pleural line, "lung pulse" is a perception of heart activity at the pleural line, and "power sliding" is the lung sliding enhanced with the power color doppler. When the sign above was not recognized, or when the reverberation artifact was seen, it was diagnosed as pneumothorax. Incidences of normal and abnormal signs were recorded. In all cases, chest XP was taken postoperatively to confirm catheter position and to detect pneumothorax.

RESULTS: Inserted sites were: 32 patients via right internal jugular vein, 1 patient via left, and 5 patients via the right subclavian vein. None was diagnosed as pneumothorax by chest radiograph after CVC insertion. There was one case of pneumothorax, diagnosed preoperatively, who require thoracoscopic intervention.

Disappearance of "lung sliding" was observed in 3 patients (5%), "comet tail" in 8 patients (21%), "lung pulse" in 3 patients (9%), and "power sliding" in 14 patients (37%). In the pneumothorax case, all these normal signs were disappeared and the reverberation artifact was recognized. These signs were not changed before and after CVC insertion, and there was no case of iatrogenic pneumothorax after CVC insertion.

CONCLUSION: Our result indicates that each normal lung signs were not always recognized with the US. Therefore, depending on sole normal sign may lead misdiagnosis there fore they should be used in combination. With this technique, it is possible to exclude at least anterior pneumothorax when the multiple signs were used.

S-239.

COMPARISON OF BISPECTRAL INDEX (BIS) TO A NOVEL METHOD OF EEG SPECTROGRAM ANALYSIS (LOG2)TM DURING AROUSAL RESPONSES UNDER GENERAL ANESTHESIA

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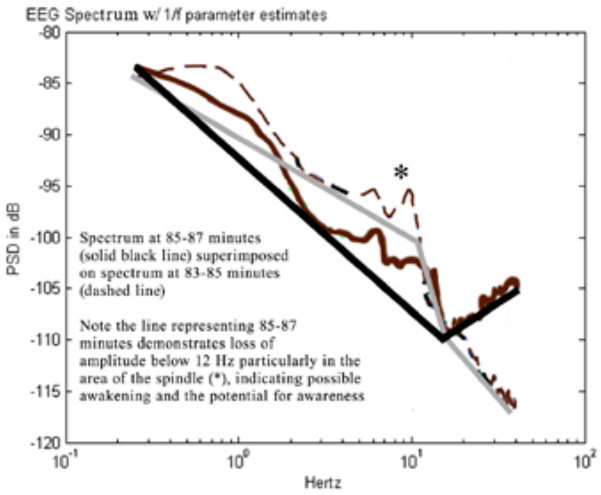
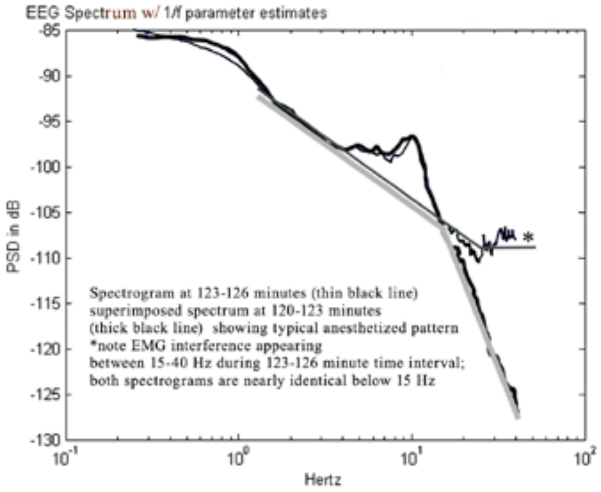
INTRODUCTION: The Bispectral Index (BIS) has been promoted as a method to measure the probability of awareness or the "depth of anesthesia". One problem encountered with the use of (BIS) is EMG activity can result in high BIS readings. The anesthesiologist is then uncertain whether the patient is aware, "lightly anesthetized", or if the high BIS reading is merely the result of EMG artifact while the patient remains adequately anesthetized. Analysis of the entire EEG spectrogram could indicate specific patterns typical of awareness versus light anesthesia, or EMG extending down into the EEG range, in order to pinpoint the significance of the high BIS reading. Displaying the EEG spectrogram with both the power and frequency on a log scale (Log 2)™ results in a graph with one or more segments that are straight lines. These lines and the spectral peaks combine to produce a pattern that varies with the end-tidal concentration of anesthetic agent. The pattern typical of an awake state prior to induction of anesthesia is very different from the patterns seen under general anesthesia.

METHODS: Anesthesia was induced in 15 patients with thiopental and succinylcholine, then the patients were intubated. Desflurane 1.4 MAC was administered. After incision, the Desflurane concentration was decreased until either 0.7 MAC was reached or the patient showed clinical signs of arousal. No opiates or non-depolarizing muscle relaxants were administered prior to signs of arousal. EEG parameters and raw signals from bilateral frontal leads were recorded on a computer hard drive together with end tidal agent and CO2 concentration, and heart rate. The data was entered into Excel spreadsheets and any periods during which high BIS readings occurred were identified. The raw EEG signal from periods leading up to and during the high BIS readings were analyzed using the Log2™ method.

RESULTS: Ten arousal responses with a BIS reading greater than 75 were noted. Analysis of the EEG signal with the Log 2™ method showed six of the spectrogram patterns during arousals were similar to those recorded in adequately anesthetized patients but with the additional factor of EMG activity extending into the 30 and 40 Hz range of the spectrogram. Three spectrogram patterns were consistent with very light anesthesia. One spectrogram pattern was identical to an awake pattern for a one minute period. All patients were queried in the post operative period regarding intraoperative awareness. None reported any recall or awareness.

DISCUSSION: The Log 2™ method of evaluating the EEG spectrogram appeared to be able to distinguish EMG artifact superimposed on a spectrogram of adequate anesthesia from the very different patterns of both light anesthesia and the state of being awake (both with the potential for awareness).





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S-240.

INTUBAID, A COST-EFFECTIVE ALTERNATIVE TO A FIBEROPTIC SCOPE

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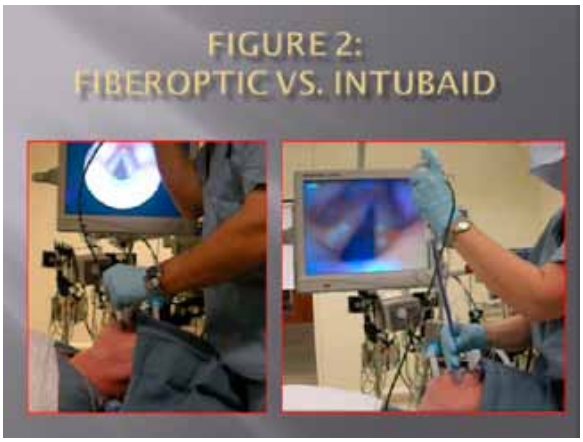
INTRODUCTION: Since its first reported usage in 1967, the fiberoptic scope has been an indispensable tool in airway management for many providers (Anesthesiologists / ER physicians and other personnel) (1), leading to it's incorporation in the ASA Difficult Airway algorithm in 1993 (2). However its superiority is hindered by periods of times with its availability is limited such as when it is sent for repair, maintenance or cleaning. Furthermore, the fiberoptic scope carries a financial burden: the initial purchase investment + the cost of the sterilization process (both human and material) + the cost of maintenance (4). Arguably, this can be a strong deterrent to its purchase in different locations and in third world countries, where the Intubaid constitutes a cheaper alternative.

DESCRIPTION: The Intubaid consists of a flexible stylet with 2 LEDs (as light source) and a camera chip in its tip. The flexibility allows for anteflexion of >90o. The camera chip is positioned at the tip to minimize fogging, and enables direct visualization of the laryngeal inlet during intubation. The only preparatory step required is to pre-load the endotracheal tube. In a modern operating room, many monitors can display the image on a larger screen. Otherwise an iPod or a small low-cost hand-held portable monitor can also display images (Figure 1).



DISCUSSION: As illustrated in Figure 2, the view of the laryngeal inlet with the Intubaid is very similar to the one obtained with a Fiberoptic scope, rendering the usage of the Intubaid very intuitive and easy to adopt.

At a modest cost of ≈ US$70 (3), this makes its acquisition a compelling argument not only for third-world providers (where its sterilization can theoretically allow multiple usages) but also for locations where the long-term availability of a fiberoptic scope may not be a cost-effective purchase. These locations may include ambulatory surgical centers, distantly located anesthesia locations, or office-based anesthetic practices, where one rarely encounters the need to secure a difficult airway. The potential need for such a device may constitute a sound investment strategy.

CONCLUSION: The Intubaid can bridge the gap where cost-issues prevent the purchase of a fiberoptic scope, such as in third-world countries, in ambulatory surgical centers and off-site anesthesia locations.

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S-241.

RESULTS OF POLYSOMNOGRAMS IN PATIENTS WITH MODERATE-SEVERE OBSTRUCTIVE SLEEP APNEA REFERRED TO A SLEEP DISORDERS CENTER FROM AN ANESTHESIA PREOPERATIVE CLINIC

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INTRODUCTION: Moderate-severe obstructive sleep apnea (OSA), defined as an apnea-hypopnea index (AHI) ≥ 15 per hour, is thought to have a prevalence of 2-7% in women and 9-14% in middle-aged men. The prevalence is thought to be even higher in surgical patients and it is estimated that up to 80% of patients with moderate-severe OSA remain undiagnosed.1 We implemented screening for OSA in our anesthesia perioperative medicine clinic (APMC) using the STOP-Bang questionnaire which has previously been described as being effective as a tool to screen for OSA.2 We present our findings in patients who were found to be at high risk for OSA with a specific focus on those subsequently diagnosed with moderate-severe OSA.

METHODS: Patients presenting to the APMC were screened with the questionnaire. Those with scores ≥3 were considered high-risk for having OSA and were referred for an overnight in-laboratory polysomnogram (PSG) in our Sleep Disorders Center (SDC). During the PSG if moderate-severe OSA was diagnosed, CPAP therapy was initiated and an auto-CPAP device was provided to patients with instructions to begin therapy including usage on the day of surgery.

RESULTS: Of the 141 patients who were considered high-risk and referred to the SDC, 71 underwent a PSG. In total, 55 patients (77%) had significant OSA: moderate OSA was diagnosed in 18 patients (25%) and severe OSA in 37 patients (52%). Patients with severe OSA had a median AHI of 46 (IQR 37-73), spent a median of 6% (IQR 3-20) of their total sleep time with oxygen saturations < 90%, and had a median of 50 incidents of at least 3% oxygen desaturations per hour (3% ODI). Additionally, nadir SpO2 values were significantly lower in patients with moderate (86%±5) and severe (82%±8) OSA. (Table 1) CPAP was recommended in 82% of patients and 68% received this therapy.

Table 1: Results of PSG studies in high risk patients

	All patients	Mild OSA	Moderate OSA	Severe OSA	P-VALUE
n (%)	71 (100)	14 (20)	18 (25)	37 (52)	
AHI, median (IQR)		9 (7-12)	22 (19-26)	46 (37-73)	<0.001
SpO2 nadir during sleep		87±5	86±5	82±8	0.03
Total sleep time with SpO2 <90%, min		5±10	4±6	13±18	0.2
% of total sleep time with SpO2 <90%, median (IQR)		0 (0-5)	1 (0-5)	6 (3-20)	0.04
3% oxygen desaturation index, median (IQR)		6 (4-10)	17 (13-26)	50 (32-67)	<0.001
CPAP received, %	68	50	61	81	0.1

Discussion: In addition to having significantly higher AHI scores, patients with moderate-severe OSA had significantly lower nadir SpO2 values and spent a significantly greater amount of time hypoxic during their PSG compared to patients who had mild OSA. CPAP therapy was recommended in the vast majority (82%) of patients and successfully abolished OSA in 92% of patients in whom it was initiated. We have demonstrated that patients identified as being high-risk for OSA via preoperative screening have a high likelihood of being diagnosed with moderate-severe OSA and that CPAP is successful in abolishing their OSA. Further studies are needed to determine if initiation of CPAP perioperatively can reduce morbidity in this patient population.

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S-242.

BIS AND TIMING OF MEMORY FORMATION AFTER PRE-OPERATION DOSE OF MIDAZOLAM

AUTHORS: P. G. Lyons[1], M. F. O'Connor[1], L. Karl[1], M. S. Avidan[2], D. B. Glick[1];

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INTRODUCTION: The Bispectral Index (BIS), a processed electroencephalograph used to monitor anesthetic depth, may have value in decreasing the incidence of awareness under general anesthesia and consequent explicit recall.[1,2] Little work has been done, however, on the use of BIS as a predictor of memory formation in wakeful yet sedated patients. To determine if BIS could be used to assess levels of consciousness at which patients are able to form memories, we examined the association between BIS scores and midazolam-dependent decreases in patients' ability to recall cued words.

Methods: Forty-two patients were screened within the larger BAGRECALL study using criteria from the B-Unaware trial[2] specific for patients at risk for anesthesia awareness. Each patient had a BIS Quatro™ Sensor (Aspect Medical Systems, Norwood, MA) placed on his or her forehead attached to a BIS Vista™ monitor (Aspect Medical Systems). Cued words were provided to patients one minute before, and one minute after, the administration of midazolam, and BIS scores were recorded at these times. After surgery, word recall was assessed.

RESULTS: The mean BIS value recorded one minute prior to midazolam administration was 96, while the mean BIS value recorded one minute after midazolam was delivered was 95 (Figure 1). These values were not significantly different from each other. However, while the correctly recalled proportion of words delivered one minute before midazolam administration was 0.66 (N = 29), the correctly recalled proportion of words delivered one minute after midazolam administration was 0.32 (N = 31). Chi-square analysis revealed this trend to be significant at the $p < 0.01$ level.

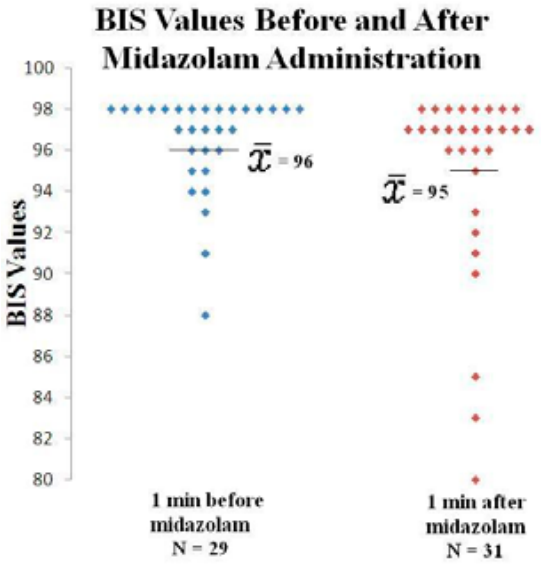

Figure 1. Comparison of mean BIS scores recorded one minute before administration of midazolam (N = 29, SD 2.4) and those recorded one minute after midazolam was given (N = 31, SD 4.6). The difference between these mean values was not significant; the p-value was calculated with use of the two-tailed independent T-test for equal variances.

DISCUSSION: Although mean BIS scores one minute before midazolam administration were not significantly different than those one minute after the drug's administration, the proportion of words correctly recalled was significantly lower after midazolam. This trend may suggest that midazolam has fast-acting physiological consequences for memory formation which take effect before BIS is able to detect them; in other words, BIS may be a lagging monitor of the ability to form memories. Alternatively, it is possible that midazolam has multiple simultaneous pathways of action, such that one, undetected by BIS, hinders memory formation while another exerts inhibitory effects on consciousness. Regardless, the degree to which BIS can act as a monitor of memory formation has yet to be determined.

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S-243.

DETERMINATION OF THE PRECISION ERROR OF THERMODILUTION CATHETERS BY IN-VITRO TESTING

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INTRODUCTION: Thermodilution cardiac output, measured using a pulmonary artery catheter and cardiac output monitor, is the reference standard against which all new methods of cardiac output measurement are judged. However, thermodilution lacks precision, and has a quoted error (95% confidence interval for reading variation) of ±20%, a value that relates to data collected over 25-years ago [1]. Lack of precision of this reference standard, and uncertainty about its true values, causes difficulty when validating new cardiac output technology. Thus, the aim of this project was to reappraise the precision error of thermodilution by testing currently available catheters in a steady flow test rig.

METHODS: A test rig consisting of 1.6cm diameter plastic tubing, a water reservoir (10-litres), a high volume water pump with flow regulator and ports to insert thermodilution catheters into a flow chamber was assembled on a laboratory bench. Flow in the test rig was measured using an externally placed transonic flow probe and flow meter. The meter was first calibrated by timing the filling of a glass cylinder. Circulating water temperature was 36.5oC. Five Baxter (Edwards Lifesciences, US) 7Fr thermodilution catheters, connected to a Siemens SC9000 cardiac output monitor, were tested. Thermodilution cardiac out readings were made by injecting 5ml of ice cold water. The calibration of each catheter was compared by plotting the test rig reading against the thermodilution reading. Flow rates from 0 to 8 L/min were used and a calibration (regression) line drawn for each catheter. Inter reading variability was measured by taking ten readings at flows from 0 to 8 L/min for one catheter.

RESULTS: The calibration of the catheters varied from an offset of -9.5% to +5.2% for the five catheters. At a flow rate of 5 L/min the thermodilution reading ranged from 4.6 to 5.2 L/min. The estimated precision error at this flow was ±8.0% (Figure). The inter-reading variability (coefficient of variation) was 4.8%, with an estimated precision error of ±9.6% (Figure)

DISCUSSION: This study showed that individual Baxter catheter could vary significantly in their calibration, introducing measurement errors of ±8.0%. Individual reading could also vary as much as ±9.6%. The combined error was ±12.5% (adding variances). Considering that the study was a well controlled laboratory bench experiment, and additional in-vivo errors related to pumping nature of the heart (rather than steady-flow), physiological / respiratory variations in cardiac output and the clinical setting are not included, it would not be unreasonable to suggest that up to ±20% is still a realistic estimate of the error for thermodilution measurement. Our data was limited to only 5-catheters and steady-state in-vitro testing. Further, animal testing is still needed to confirm our findings.

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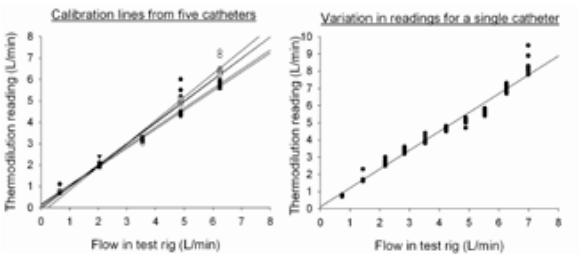

S-244.

INADVERTENT RESPIRATORY ACIDOSIS DUE TO DAMAGED WATER TRAP OF CAPNOGRAPH BY ISOFLURANE

AUTHORS: E. R. Manabat, G. C. Hsu, R. A. Berman, Y. Kang;

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INTRODUCTION: A few reports have documented isoflurane leakage causing damage to the water trap in the Dräger Apollo anesthesia machine. This case describes an abnormal capnograph tracing yielding falsely normal end-tidal carbon dioxide tension (EtCO2) after breakage of the water trap by isoflurane.

CASE REPORT: Patient is a 55-year-old male with esophageal adenocarcinoma, undergoing thoracoscopic robotic-assisted esophageal mobilizaton and laparoscopic total esophagectomy with cervical esophagogastrostomy. Five hours into the surgery, isoflurane vaporizer was refilled and liquid isoflurane spilled into the water trap. Subsequently, the patient became tachycardic and hypertensive despite adequate level of anesthesia. An unusual capnograph tracing showing EtCO2 of 40-45 mmHg and the damaged water trap were then identified. Arterial blood gas (ABG) sample revealed respiratory acidosis (pH 7.16, pCO2 83). Upon replacement of the water trap, the capnograph shape returned to normal with EtCO2 concentrations consistent with subsequent ABG samples. Ventilation was adjusted to restore normocarbia. No arrhythmias or other complications were noted. Patient was extubated uneventfully at the end of the case in a stable condition.

DISCUSSION: Isoflurane, a powerful organic solvent, has been reported to damage the polycarbonate water trap body. The clinical significance of this report is that the damaged water trap of the capnograph registered inaccurate ETCO2, leading to severe hypercarpnia and acidosis. Only after the patient showed signs of hypercarbia was the EtCO2 discrepancy discovered along with the cracked water trap. Room air entrainment through the cracks resulted in falsely normal concentrations of carbon dioxide in the expired gas analyzer.[1]

Although most anesthesia machines are configured with the water trap above the vaporizers, the Dräger Apollo machines are designed with the water trap placed directly below the vaporizers.2 This design renders the water traps vulnerable to drippings during the filling process. Exposure to sevoflurane and desflurane has not resulted in similar damage.[2] Therefore, it is recommended to position the isoflurane vaporizer furthest away from the water trap. Secondly, only the appropriate Dräger filling adaptor should be fastened hand tight inside the vaporizer's filling system.[3] Thirdly, cardboards can be placed under the vaporizer during the filling process to avoid exposure of the water trap to isoflurane droplets.1 Finally, immediate recognition of abnormal capnograph tracing caused by water trap damage such as shown in this case could prevent adverse complications to patients under anesthesia.

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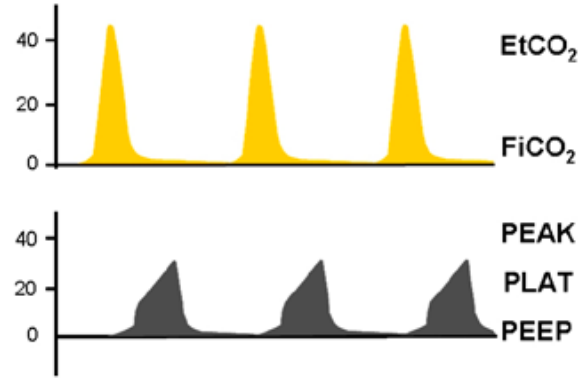

Figure 1

Figure 2

S-245.

DESIGN AND PROTOTYPE OF A NEW USER INTERFACE FOR SYRINGE INFUSION PUMPS

AUTHORS: D. Liu[1], J. Agutter[2], N. D. Syroid[1], K. B. Johnson[1], M. R. Dowdle[1], **D. R. Westenskow[1];**

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INTRODUCTION: Medication errors and patient safety incidents are often associated with the use of intravenous infusion pumps [1]. Prior research suggests that improving the user interface of infusion pumps can lead to a reduction in programming errors and time required to program infusions [2]. However, these studies have only been conducted using desktop simulations and screen-based prototypes. Our aim was to design and develop a working prototype of a new user interface for syringe infusion pumps that can be evaluated in a simulated operating room environment.

METHODS: We performed Failure Modes and Effects Analyses (FMEA) of common infusion-related tasks with two infusion pumps (syringe and volumetric) used at our institution to identify potential errors and aspects of the user interface that could be improved [3]. A new user interface was developed iteratively using human factors principles; feedback from a team of human factors experts, bioengineers, computer scientists, and clinicians; and usability tests with anesthesiologists. A working prototype pump was developed using an Atlanta Biomedical Corporation syringe infusion pump connected to a touch-screen tablet computer running custom Java software.

RESULTS: The new user interface was successfully implemented in a functional infusion pump. Improvements over the existing user interfaces were focused on (1) providing pump status feedback to the user more effectively, (2) reducing the incidence of programming errors, and (3) streamlining the pump programming process. The new interface was designed for large, color, touch-screen displays with salient indicators of pump operation. An additional touch-screen display was provided on the anesthesia workstation for wireless, remote control of the bedside pump. A graphical "slider" was used for dose entry instead of the standard numeric keypad to eliminate "factor of 10" errors, whereas automatic unit conversion buttons eliminated the need for manual calculations. Decreasing the number of steps required to start infusions resulted in shorter programming times.

DISCUSSION: Our prototype pump demonstrates the feasibility of implementing the new user interface design. In future work, the new interface and prototype pump will be evaluated with anesthesiologists in a simulated operating room environment to determine whether it can reduce the incidence of programming errors compared to existing infusion pumps.

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Figure 1

Figure 2

S-246.

UPPER TYPE FORCED-AIR WARMING BLANKET WITH THE TEMPERATURE SETTING OF 38 ºC MIGHT BE A BETTER CHOICE FOR MAINTAINING NORMOTHERMIA

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INTRODUCTION: Hypothermia commonly occurs during major surgery and can be associated with perioperative complications, such as postoperative myocardial ischemia and an increased rate of surgical wound infections. The use of forced-air warming systems has been shown to be an effective method to prevent hypothermia (1). We previously demonstrated that the initial temperature decrease caused by redistribution of the heat following the induction of anesthesia could be also prevented by newly introduced warming system (2), (3). However, the body temperature showed significant increases after approximately 2 hours from induction of anesthesia, when we chose 43 ºC as the temperature setting and used an "upperbody blanket", which covered the upper extremity of patients from the anterior side of the body (3). In this investigation, we compared the efficacy of two temperature settings, 38ºC and 43 ºC, with "upperbody blanket."

METHODS: Twenty patients undergoing elective upper abdominal surgery were enrolled following written consent and were randomized into two groups with different temperature settings, 43ºC group and 38ºC group. Anesthesia was maintained with combined thoracic epidural and sevoflurane anesthesia, and Bair Hugger® (Model 750 - Arizant Healthcare) with upperbody blanket (Model 522® - Arizant Healthcare) was used in both groups. Esophageal temperature was measured continuously and recorded shortly after the induction of general anesthesia and at 15-minutes intervals for 180-minutes following induction. Ambient temperature in the operating room was set to 24ºC during the trial. Data was expressed as mean ± SD. Statistical analysis was performed using repeated measures ANOVA and post hoc analysis was corrected using theBonferroni/Dunn technique. $P<0.05$ was considered significant.

RESULTS: There were no significant differences in age, weight, height, and body mass index of patients between two groups. The changes in esophageal temperature were significantly different between the groups. In the 38ºC group, the esophageal temperature did not show any change compared to 0-minute, and the maximum decrease was 0.3 ± 0.4 ºC. In the 43ºC group, the maximum decrease was 0.1 ± 0.3 ºC, but following this slight decrease, temperature rose significantly with an increase in 0.6 ± 0.3 ºC for 120 ± 23 minutes. (Fig 1)

DISCUSSION: We demonstrated that forced-air warming system using "upperbody blanket" with either temperature setting was effective in preventing hypothermia during upper abdominal surgery. With the setting of 43ºC, body temperature increases after 2 hours of surgery, while no change was observed with 38 ºC. Therefore, we concluded that the initial temperature setting of 38 ºC would be recommended to prevent hyperthermia at a few hours later, when we use upperbody blanket with Bair Hugger® (Model 750).

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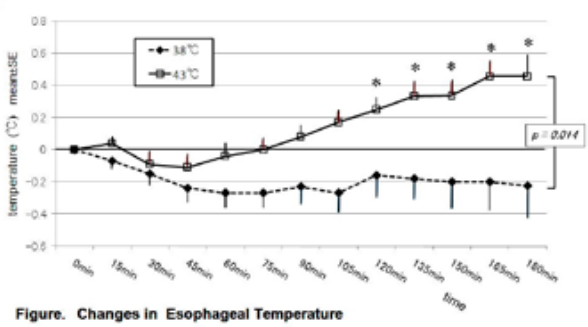

Figure. Changes in Esophageal Temperature

- * p < 0.05 vs. 0min
- Statistical analysis was done by ANOVA and Bonferroni/Dunn test for post hoc

S-247.

MEDICAL MALPRACTICE LIABILITY AS A RESULT OF A CHARTING ERROR: IMPLICATIONS FOR SYSTEM DESIGN

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INTRODUCTION: The significance of electronic medical records (EMR) in medical malpractice liability claims has been the subject of much speculation. Feldman (1) surveyed first adopters of anesthesia information systems (AIMS) in 2004 to determine their medicolegal experience with electronic anesthesia records.

Two-thirds of respondents "viewed this technology as valuable for risk management, and three viewed it as essential." However, objective data supporting this position is lacking, owing to a dearth of publicly available case law regarding medical malpractice liability claims.

Green (2) reported the failure of the printed version of the electronic anesthesia record to accurately reflect a significant change in ETidalCO2. Epstein (3) surveyed institutions with AIMS experience reporting significant variation in implementation policies.

We have reported two instances (4,5) where liability claims were heavily based on documentation entries (or lack thereof) that occurred with an electronic anesthesia record - and were unlikely to have occurred with a paper-based record.

We report a medical liability claim against one of our attending physicians who had no involvement in the care of the plaintiff.

Our AIMS requires users to designate anesthesia care-team members using a drop-down menu. Rows designated for anesthesiologists/surgeons/residents/CRNAs have drop-down menus containing the individuals belonging to specific groups. Although our AIMS associates electronic signature (e-sig) with each documentation event, care-team members are designated by manual selection using the drop-down menu as opposed to e-sig.

In this instance, a CRNA selected the attending immediately following the actual supervising attending. Both anesthesiologists were named as defendants in a legal action. The anesthesiologist not caring for the patient was required to prepare a legal defense and was deposed. Although there was no e-sig in the record and there was no further evidence of participation in the patient's care, plaintiff's counsel included the individual as part of "due diligence". The uninvolved anesthesiologist was required to report the suit when applying for medical licenses and hospital privileges. Following deposition, a motion for dismissal of the claim against him was entered.

RESULTS: The uninvolved anesthesiologist's participation in legal defense incurred a cost over $10, 000, lost academic time and inconvenience involved in subsequent application for medical licenses and credentials.

DISCUSSION: Poor system design contributed to faulty identification of a supervising anesthesiologist, with resultant costs. Rather than requiring manual specification of care-team members, members could be derived from e-sig entries.

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S-248.

OXYGEN SATURATION BY CONTINUOUS PULSE OXYMETRY MONITORING HAS GOOD ACCURACY WHEN COMPARING TO ARTERIAL BLOOD GAS ANALYSIS IN CRITICAL PATIENTS

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INTRODUCTION: We confirmed the accuracy of pulse oximetry continuous arterial saturation (SpO2) comparing to arterial oxygen saturation in vivo (SaO2). We compared SpO2 values to SaO2.

PATIENTS AND METHODS: 100 patients in ICU with SpO2 monitor (NIHON KOHDEN BSM-9101) were enrolled in the study. The SpO2 and SaO2 were determined by both the continuous oxygen saturation monitoring method and in vivo in radial artery. Both of SpO2 and SaO2 were measured at 1 point. Linear regression analysis was performed by calculation of the correlation coefficient (r) between SpO2 and SaO2. After normality was confirmed by normal distribution plots and histogram for the variables, the differences between the means of SpO2 and SaO2 were assessed by Bland-Altman analysis. Bias was represented by the mean of differences between SpO2 and SaO2. Precision was represented by standard deviation (SD) of the differences. A percentage error between the measurements of SpO2 and SaO2 was calculated.

RESULTS: A total 100 points of SpO2 and SaO2 were analyzed. At each point, bias and precision between SpO2 and SaO2 were -0.74 % and 2.96% respectively. The percentage error between SpO2 and SaO2 was 6%.

CONCLUSIONS: Oxygenation saturation monitoring provides accurate continuous SpO2 monitoring in critical patients.

S-249.

COST - EFFECTIVENESS OF PATIENT SURVEILLANCE SYSTEMS

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INTRODUCTION: Unrecognized deterioration of unmonitored in-patients is a significant contributor to morbidity and mortality for in-hospital patients.[1] Patients show signs of deterioration in the 6-8 hours prior to a cardiac or respiratory arrest,[2-4] however the current standard of care, which is intermittent vital sign sampling and physical examination, is not adequate for detecting deterioration. Recently, the use of continuous monitoring via patient surveillance systems (PSS) has demonstrated improvement in outcomes in early recognition of deterioration and intervention.[5] However, the costs of implementing PSS in a hospital setting can be quite significant. In this study, the cost-effectiveness of PSS was analyzed in a postoperative in-hospital patient population.

METHODS: PSS was implemented in a 36-bed orthopedic unit with 10,938 patient days and 3,207 patient discharges per year. PSS includes wireless communications connecting bedside oximetry monitors to a server computer and a radio transmitter, which notifies nurses via pager when preset physiological limits are violated. ICU transfers, length of stay (LOS), mortality, and financial costs were available for 2007 as well as after installation of the system in 2008. Using this data, a decision tree model was applied to evaluate the cost-effectiveness of this system for the hospital.[6]

RESULTS: Implementation of the PSS decreased average LOS from 3.6 to 3.4 days, decreased ICU transfers per 1,000 patient days from 5.2 to 2.7 (p=0.02), and decreased the average LOS of those who transferred to ICU from 7.67 to 5.87 days. Mortality risk decreased from 0.47 to 0.39% per patient (NS).

Cost savings per patient were $255 per patient for the implementation year and are projected to be $404 for subsequent years. Annual cost savings were about $817,000 in the first year and are projected to be $1,295,000 thereafter. Sensitivity analysis showed that cost-effectiveness was driven by reduced ICU transfers.

DISCUSSION: Current standard of care for hospital inpatients is the sampling of intermittent vital signs and clinical examinations with additional monitoring for patients considered to be at high risk for adverse events. PSS can potentially improve outcomes and save costs. In this study, results suggest that PSS implementation is cost-effective in its initial year, with the cost savings driven largely by the reduction in ICU transfer rate. The cost-benefit increases significantly in subsequent years. These findings could aid hospital administrators and physician leadership in their decision to deploy patient surveillance systems.

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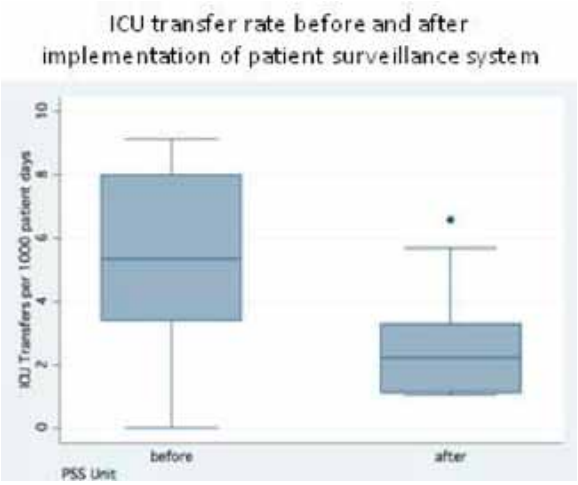

S-250.

WITHDRAWN.

S-251.

WITHDRAWN.

S-252.

INADEQUATE GAS SUPPLY WITH AN ADJUSTABLE PRESSURE-LIMITING VALVE IN THE OPENED POSITION

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INTRODUCTION: With spontaneous respiration, slight exhaust resistance with the APL valve fully open ensures that the reservoir bag fills and adequately supplies gas to patients. A lack of exhaust resistance with the APL valve fully open caused inadequate gas supply to patients, in four types of anesthesia machines; SA2 (Dräger), Excel-210 SE (GE), Fabius (Dräger) and Cato (Dräger).

Case reports: Inadequate gas supply to patients using SA2, Excel-210 SE, Fabius and Cato occurred with each of the machines due to a similar phenomenon. During spontaneous breathing, 6 l/min of oxygen as fresh gas was supplied to the anesthesia circuit with a non-adhering face mask and the APL valve in the fully opened position. However, oxygen saturation of hemoglobin (SaO_2) decreased to less than 90% despite adequate chest wall movement and breath sounds. The gas monitor sampling from the Y-piece showed only a 16% inspired oxygen fraction (FIO_2), which was less than that of the room air, and CO_2 concentration ranged continuously between 20 and 30 mm Hg. These phenomena indicated that oxygen was not adequately supplied to the patient and that exhalation gas at the face mask could not be washed out. When the APL valve was set to the closed position, FIO_2 increased to more than 95%, CO_2 concentration decreased to baseline (zero) and SaO_2 increased smoothly. After the cases, examination of the APL valve revealed that there was no exhaust resistance when the APL valve was in the fully opened position.

DISCUSSION: Mechanically, the APL valve systems of the SA2 and Excel-210 SE, which are of the spring-loaded disc type and are arranged horizontally, cannot maintain slight exhaust resistance when the APL valve is in the fully opened position.

In the Fabius and cato, the exhaust valve is set between the APL valve and the exhaust port. The exhaust valve is independent from the APL valve and should maintain slight exhaust resistance continuously. However, accumulation of viscous substances on the thin membrane of the exhaust valve causes disturbance of the closing membrane, leading to inadequate gas supply to patients. Exchanging the exhaust valve allowed adequate use of the Fabius with the APL valve in the opened position.

There is no check list concerning exhaust resistance with the APL valve in the fully opened position in the Recommendations for Pre-Anesthesia Checkout Procedures1. We must be aware of the risk that old-type APL valve or inappropriately maintained anesthesia machines may cause inadequate gas supply to patients due to lack of exhaust resistance with the APL valve fully open.

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S-253.

THE COMPARISON OF EFFECT-SITE CONCENTRATION OF REMIFENTANIL THAT SUPPRESSES CARDIOVASCULAR RESPONSES TO TRACHEAL INTUBATION USING MACINTOSH LARYNGOSCOPE AND AIRWAY SCOPE

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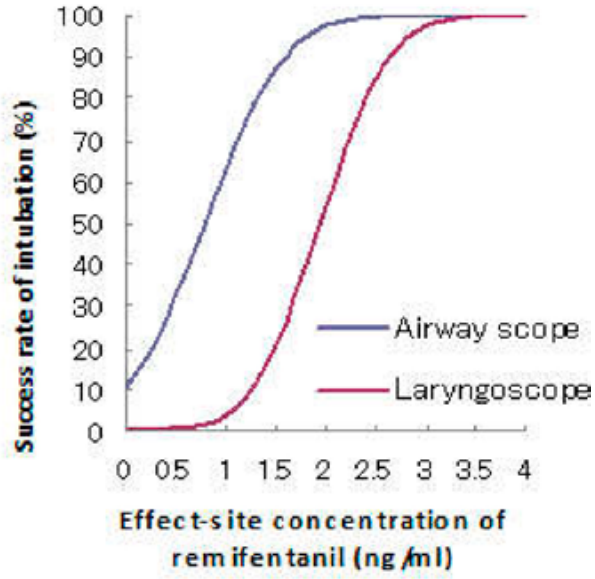
INTRODUCTION: Airway scope (AWS, AWS-S100, Hoya-Pentax, Tokyo, Japan) is a recently introduced video laryngoscope which does not require the alignment change of the oropharyngeal axis to visualize the vocal cords, unlike the conventional laryngoscope. We hypothesized that AWS-assisted intubation may be less stimulating compared with Macintosh laryngoscope, and may also reduce the depth of anesthesia required for intubation. We compared the remifentanil concentrations required for intubation between Macintosh laryngoscope and AWS, at a constant plasma concentration of propofol with muscle relaxant.

METHODS: Eighty ASA Ior II patients were randomly assigned to either Macintosh or AWS group (40 per group). Anesthesia was performed using TCI for administering 3 μg/ml of propofol. 0.6mg/kg of rocronium was administered after patients fell asleep. The target concentration of remifentanil for each patient was determined by the responses of previous patient, and was either increased or decreased 0.5ng/ml. Remifentanil was administered using the IV assist function of the TIVA trainer software, and the pharmacokinetics variables were based on the model of Minto et, al. Intubation was conducted 4 minutes after the induction when the blood concentration and the effect-site concentration became equilibrium. Pulse oximetry, heart rate, noninvasive arterial pressure and BIS value were recorded at induction, and every minute after induction until 5 minutes after intubation. The intubation was said to be successful when both heart rate and MAP only increased less than 20% of the values measured 1 minute before tracheal intubation. When the values increased more than 20%, but the systolic blood pressure was below 130mmHg after the intubation, we also graded it successful. Statistical analysis was made by using probit regression model (up-and-down sequential allocation method) to compare the ED50 between the two groups, and a cumulative dose-response curve was obtained.

RESULTS: The ED50 concentration of remifentanil required for intubation with the Macintosh laryngoscope was 1.95ng/ml (1.62 -2.23:95% confidence interval) and that of the AWS was 0.79ng/ml (0.40 -1.10: 95% CI).

DISCUSSION: To the best of our knowledge, no previous studies have compared the required remifentanil concentration for tracheal intubation with muscle relaxants using different devices. Our study shows strong evidence that the effect-site concentration of remifentanil that suppresses the sympathetic responses is lower when using the AWS. A previous study has shown that under the condition without muscle relaxant, 6-8 ng/ml effect-site concentration of remifentanil is needed for ideal tracheal intubation[1]. Our data shows that the effect-site concentration of remifentanil required for intubation with muscle relaxant for Macintosh group was lower than the previous study without muscle relaxant, and AWS is a less stimulating device for intubation. This result also indicates that AWS could be a useful device for awake intubation.



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S-254.

INTUBATION IN MORBIDLY OBESE PATIENTS. A RANDOMISED CONTROLLED STUDY COMPARING THE GLIDESCOPE® VIDEOLARYGOSCOPE AND MACINTOSH DIRECT LARYNGOSCOPE.

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INTRODUCTION: Morbidly obese patients (Body Mass Index (BMI) >35 kg/m²) are at increased risk during tracheal intubation due to an increased frequency of difficult mask ventilation, a high Cormack-Lehane grade (1), and a decreased apnoea tolerance (2). Consequently theese patients are especially dependant on a fast and safe airway management.

The GlideScope® videolaryngoscope is a fiberoptic device with an intubation blade connected to a screen. It has been shown to improve the laryngoscopic view especially in patients with a high Cormack-Lehane grade (3).

The purpose of our study was to compare the GlideScope® videolaryngoscope and the Macintosh direct laryngoscope as to time spent, Cormack-Lehane grade and intubation difficulty in morbidly obese patients.

METHODS: One hundred consecutive patients, BMI >35 kg/m², scheduled for bariatic surgery, were randomised to group GS (GlideScope) or group M (Macintosh). All patients were intubated placed in the ramped position, 30° anti Trendelenburg after being preoxygenated for 5 minutes. All intubations were performed by one of five anaesthetists experienced in using both laryngoscopes. Time from griping the laryngoscope to successful intubation (confirmed by capnography), number of attempts, desaturation (SATO2 < 95%), Cormack-Lehane grade, significant bleeding in the upper airway, validated Intubation Difficulty Scale (IDS), postoperative sore throat and hoarseness were registered.

RESULTS: There were no differences in sex, age, BMI, Mallampati score, neck circumference and history of sleep apnoea between the groups.

The two groups differed significantly in three parameters. The GS/M mean intubation time was 51/38 sec, SD± 23/24 (range 22 - 148/17 - 148) (p=0.0001). The Cormack-Lehane grade 1/2/3/4 (n) for GS/M was 35/13/3/0 / 23/13/10/4 (p=0.003). The median IDS for GS/M was 2/1 (p=0.03).

No other significant differences were registered. However, two cases of failed intubation were registered in the M group. Both patients were intubated with the GlideScope without problems.

DISCUSSION: Our study showed that intubation using the Macintosh laryngoscope is slightly faster compared to the GlideScope® videolaryngoscope. However, intubation using the videolaryngoscope did not cause any incidents of desaturation. We found that the GlideScope® videolaryngoscope provided a lower Cormack-Lehane grade and a slightly decreased Intubation Difficulty Scale score.

In most morbidly obese patients a standard Macintosh laryngoscope seems to be a safe first choice. However the GlideScope® videolaryngoscope seems to be preferable especially for patients with an expected or known high Cormack-Lehane grade. This might prove a statistically significant association in future studies with greater statistical power.

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S-255.

STANDARD CLINICAL PREDICTORS OF DIFFICULT INTUBATION MAY NOT BE USEFUL FOR INTUBATION WITH THE GLIDESCOPETM VIDEO LARYNGOSCOPE

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INTRODUCTION: The GlideScope™ is a videolaryngoscope that has demonstrated improved visualization of the glottis and facilitated tracheal intubation in patients with an anticipated difficult airway. [1] We tested the hypothesis that there is no difference on the first attempt tracheal intubation rate in patients with and without clinical predictors of difficult intubation using the GlideScope.™

METHODS: Patients undergoing elective surgery under general anesthesia with predictors of difficult intubation were identified retrospectively during the pre-anesthesia clinic evaluation. To identify a potentially difficult airway, we utilized variables defined by the American Society of Anesthesiologists as pre-operative risk factors for a difficult intubation. All tracheal intubations using the GlideScopeTM were performed by first year (CA-1) through third year (CA-3) anesthesiology residents and staff anesthesiologists. We recorded the number of attempts for tracheal intubation using the GlideScope™ as well as direct-related complications with the intubation technique.

RESULTS: Among patients intubated with the GlideScope,™ 183 and 174 patients with Mallampati class 3 or 4 and 1 or 2 (controls) respectively were included in the analysis. The cumulative percent of successful intubation with the GlideScope™ after the first, second, third and fourth attempt 85%, 90.4%, 95.8%, and 99.7%, respectively. In univariable analysis, the percent with first attempt successful GlideScopeTM intubation was 83% in patients with Mallampati score 3 or 4 compared to 88% for Mallampati score 1 or 2, with estimated univariable odds ratio (95% CI) of 0.67 (0.37, 1.2), P=0.19. There was no difference in first attempt intubation success rate by attending anesthesiologists as compared to anesthesia residents: 0.74 (0.4, 1.4), P=0.36; a BMI > 35 did not affect the intubation success rate on the first attempt: 1.1 (0.61, 2.0), P=0.76. There was evidence of decreasing likelihood of successful intubation as American Society of Anesthesiologists physical status classification increases from 1-2, 3, 4, (P=0.033). The results of a multivariate model assessing the relationships of all predictors together versus intubation success on first attempt show that none of the predictors are significantly associated with outcome after adjusting for other predictors.

Discussion: In this investigation, we showed that even when there was a potential difficult airway (e.g., high Mallampati Class), the GlideScope™ could be utilized and offers a moderately high first attempt success rate. Furthermore, we found no statistical difference suggesting that first attempt intubation success rate would be any different between morbidly obese and non-morbidly obese patients. This was also true when comparing inexperienced trainees against experienced anesthesiologists. The GlideScope can be a useful asset that can be utilized to obtain a tracheal intubation on a potential difficult airway. We demonstrated it usefulness in patients with standard clinical predictors of difficult intubation under direct laryngoscopy.

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S-256.

NEAR-INFRARED SPECTROSCOPY IN A CRITICALLY UNSTABLE PATIENT: MUSCLE VERSUS BRAIN.

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INTRODUCTION: Near-infrared spectroscopy (NIRS) based technology has been increasingly used to monitor the perfusion of various vascular beds, guide hemodynamic support and transfusion therapy in critically ill patients. Conflicting claims have been made regarding the relative utility of these devices. The goal of this case report is to present the relative sensitivity and reliability of 2 different perfusion monitors utilized at 2 different locations, cerebral oximetry (INVOS) and STO2 (tissue oximetry, Hutchinson Labs) in a hemodynamically unstable patient undergoing an open heart procedure.

CASE REPORT: A 50 year-old patient presented for coronary reconstruction due to severe coronary artery disease, ischemic cardiomyopathy with an ejection fraction of 45%. The procedure was initially planned to be performed off bypass. During the attempt to anastomose the left internal mammary artery to the left anterior descending artery the patient developed severe ST elevations, accompanied by hemodynamic instability. The decision was made to emergently go on cardiopulmonary bypass (CPB).

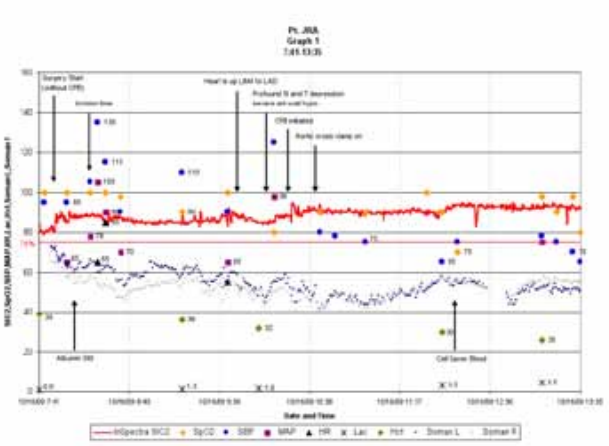
After the completion of the revascularization an attempt was made to separate from CPB. The patient required massive inotropic support to maintain hemodynamic stability. Severe ST elevation persisted, along with severe anterior wall and apical hypokinesis. Despite intraaortic balloon counterpulsation (IABP) 1:1 and maximal inotropic support, the patient continued to deteriorate, and developed severe biventricular failure. Extracorporeal membrane oxygenation (ECMO) was initiated at 4 l/min with restoration of the blood pressure (BP). The patient was brought to ICU. ECMO was weaned off after 72 hours. Severe left ventricular apical and anterior wall hypokinesis persisted. During the intraoperative course STO2 and INVOS values were continuously recorded, collected and charted.

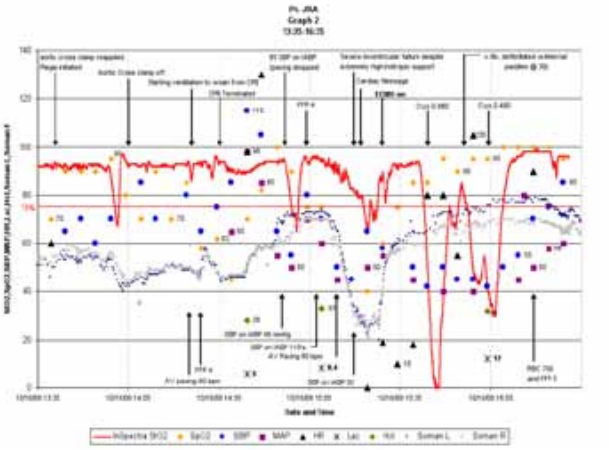
DISCUSSION: During the prebypass period, when the patient was hemodynamically stable, STO2 and INVOS values were stable, close to baseline. During the first episode of hypotension (MAP 50 mmHg), approximately 30 min after the termination of bypass and preceding the initiation of IABP, INVOS values were noted to not change significantly, however, STO2 dropped by 30%.

The second hypotensive episode took place at the peak of severe biventricular failure, when, despite maximal inotropic support, the BP decreased, MAP 40 mmHg. That incident was noted on both monitors as a decrease of greater than 35%. That episode precipitated placement of ECMO support.

Despite the inotropic, transfusion and ECMO support, the MAP remained close to 45 mmHg for the next 45 min. During that time INVOS values were close to baseline, however, the STO2 values exhibited a variable pattern with multiple decreases to values indicating hypoperfusion. Once the hemodynamic stability was achieved, both INVOS and STO2 continued to be stable.

We concluded that cerebral autoregulation and mild hypercapnia were possible etiologies of the decreased INVOS sensitivity as compared to STO2 during extremely instability.





S-257.

ARE RESPIRATORY INDUCED CHANGES IN PULSE PRESSURE AND PULSE OXIMETER PLETHYSMOGRAPH WAVE AMPLITUDE RELATED IN VENTILATED CHILDREN?

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INTRODUCTION: The variations induced by mechanical ventilation in the arterial pulse pressure and plethysmographic waveforms have been investigated in adults as surrogates of changes in stroke volume (1). Pulse pressure variation (PPV) measured from the arterial waveform was shown to correlate significantly with manually calculated plethysmograph variation (PlethV) and an automated plethysmograph variability index (PVI) (2,3). The aim of our study was to investigate the relationship between PPV, PlethV and PVI in mechanically ventilated children in two age groups (< 2 years and 2-10years).

METHODS: Following institutional review board approval, a prospective study was performed. We studied mechanically ventilated children less than 11 years of age, with arterial catheters placed as part of planned medical management in the intensive care unit (ICU) or in the operating room (OR). Exclusion criteria included: rhythm other than sinus, presence of spontaneous breaths, known intracardiac shunts, ventilation at tidal volumes <8ml/kg and unstable blood pressure or heart rate. Two additional oxygen saturation probes were placed on the fingers of one hand and connected to separate monitors (Novametrix Oxypleth® 520a and Massimo® Radical 7™). A laptop computer was used to collect real time waveforms (arterial pressure, endtidal CO_2, ECG, plethysmograph), PVI values were downloaded from the Massimo oximeter following completion of the study. Patient characteristics, ventilator tidal volume, medical diagnoses and administration of vasoconstrictor medications were recorded. PPV and PlethV were manually calculated for three consecutive breaths and compared using Bland-Altman analysis and Pearson correlation. PPV and PlethV were individually compared to PVI using Pearson Correlations.

RESULTS: 38 children were recruited (19 subjects in each group); three were excluded for poor quality plethysmograph waveforms. Median age was 5.25 years (range: 2 days - 10.5 years) and median weight was 22.25 kg (range: 1.2 - 43 kg). PPV and PlethV were strongly correlated (r=0.8, p<0.01) and showed good agreement (bias = 0.58+/- 6.8%) (figures 1&2). PVI was found to correlate significantly with PPV (r=0.66, p<0.01) and PlethV (r = 0.71, p<0.01). In comparison with the younger age group there was a reduced correlation between PVI with both PPV and PlethV in the older age group. The relationship between PPV and PlethV was unchanged across the two groups.

DISCUSSION: This study demonstrates that in children as has been shown in adults, there is good agreement between ventilation-induced changes in arterial pressure and pulse oximeter plethysmograph amplitude.

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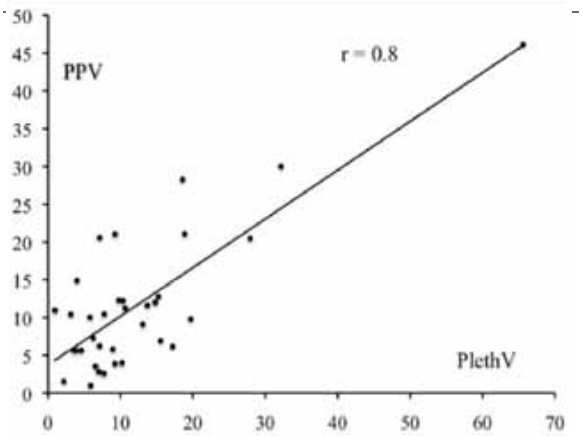

Figure 1: PPV % vs PlethV %

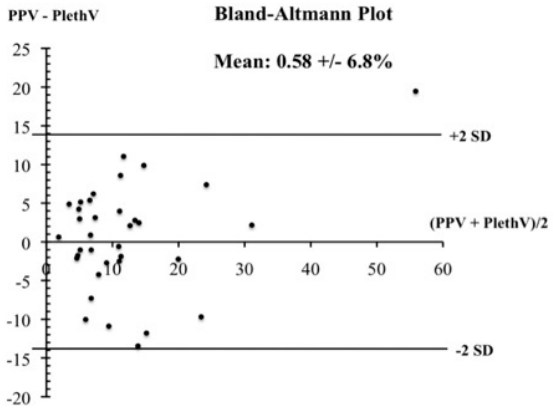

Figure 2: Bland-Altman plot of PPV % and PlethV %

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S-258.

AN EVALUATION OF DOUBLE LUMEN TUBE PLACEMENT USING AIRWAY SCOPE, GLIDESCOPE OR MACINTOSH LARYNGOSCOPE

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INTRODUCTION: The Airway Scope (AWS, Pentax co., Tokyo, JAPAN) and the Glidescope (GS, Verathon Medical Inc., Bothell, WA, USA) are video laryngoscope developed for direct laryngoscopy and are designed to provide a view of the glottis without requiring alignment of the oral, pharyngeal, and tracheal axes. Placement of double lumen tubes (DLTs), especially in difficult airways, may be considerably more difficult than intubation using standard tracheal tubes. Usefulness of AWS for placement of DLTs have already been reported1, on the other hand, there has been only few case reports about DLT intubation using GS. In this study we have evaluated the efficacy and safety of intubation in patients undergoing thoracic procedures requiring DLTs using AWS, GS, and the traditional Macintosh Laryngoscope (ML).

METHODS: We studied 240 ASA physical status I - III patients scheduled for elective video-assisted thoracoscopic surgery (VATS) for pulmonary resection requiring left-sided DLT intubation. During general anesthesia, the tracheas were intubated randomly using either the AWS with Intlock for DLTs1 (group AWS, n=80), the GS (group GS, n=80) or the ML (group ML, n=80). Failure to intubate was defined as lack of successful intubation after three attempts. The total time to intubation (TTI) was recorded as the time from insertion of the device into the oropharynx to the time when accuracy of the DLT placement was assessed by using fiberoptic bronchoscopy. Complications, such as dental injury, mucosal bleeding, lacerations, and sore throat, were recorded. Statistical comparisons of values were performed by analysis of variance (ANOVA). $P<0.05$ was considered to be statistically significant. Data were expressed as mean ± SD.

RESULTS: The TTI was significantly less with the AWS compared with the GS and the ML (53.6 ± 11.6, 69.4 ± 28.4 and 74.2 ± 39.7 s, respectively, $P < 0.05$). There was no failure case with the AWS and GS, and 100% of intubations were successful on the first attempt, compared with a 4% failure rate and an 88% success rate on the first attempt with the ML ($P < 0.05$). All failures were followed by successful intubation using the alternate device. Complications did not significantly differ among three groups.

DISCUSSION: The success rate of DLT placement was significantly higher in group AWS and group GS than group ML. On the other hand, DLT placement using the AWS proved to be significantly less requiring time for intubation compared with intubation using the GS and the ML. Therefore, we concluded that the Airway Scope and the Glidescope appear to be an effective and safe intubating device for placement of DLTs, meanwhile, the Airway Scope rather than the Glidescope might be recommended because the Airway Scope offers faster intubation.

REFERENCE:

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S-259.

NUMERICAL ANALYSIS MODEL EXPLAINS PENDELUFT DURING PARTIAL RIGHT MAIN BRONCHIAL INTUBATION

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INTRODUCTION: In a clinical case of partial right main bronchus intubation by the ETT, we observed paradoxical rise of the left chest during inspiratory pause of ventilation. We hypothesized that the position of the ETT in the right main bronchial orifice created significant airflow resistance (R) to the left lung, which directed more inspired flow into the right lung. Thus, at end-inspiration, right lung pressure (P) was higher than left lung P. Then, during the inspiratory pause, the right lung expired into the left lung (pendeluft). To test this theory, we developed a numerical analysis model.

METHODS: The model utilizes object oriented programming principles in which each airway or airspace segment is an independent object that passes P, flow, and volume (V) to its adjacent segments. Equations addressed pressure, flow, resistance and compliance (C) to closely mimic real physiology. Iterative routines execute when downstream conditions are not known by the segment (e.g. distribution of flow down bifurcations). In this study, the respiratory system was modeled with the trachea attached to two bronchi, each attached to a lung (Figure). Tracheal R was 2.0 cm H_2O•sec/L. The left bronchus was assigned 10 times more resistance than the right bronchus (3.0 cm H_2O•sec/L) and the two lungs had equal C (20 ml/cm H_2O). The system was driven by a virtual volume-controlled ventilator (respiratory rate, 10; tidal volume, 700 ml; I:E ratio, 1:2; and inspiratory pause, 25% of inspired time).

RESULTS: During inspiration, the right lung inspired more (V, 412 ml; P, 20.6 cm H_2O) compared to the left lung (V, 288 ml; P, 14.4 cm H_2O) (Figure). Then, during the inspiratory pause, the right lung exhaled into the left lung. However, equilibration was not reached by the end of the inspiratory pause (i.e., right lung P > left lung P). During exhalation, the left lung emptied slower (3 sec) due to the higher bronchial R, compared to the right lung (1 sec).

DISCUSSION: The numerical analysis model drove more V and P into the right lung due to the higher R of the left bronchus. Then, during the inspiratory pause, the right lung exhaled into the left lung (pendeluft) and caused expansion of the left chest. The model can interrogate parameters that cannot be measured: Right bronchial inspiratory flow peaks early due to low right bronchial R. As the right lung V and P increase, the driving P and flow progressively decrease down the right bronchus. At the end of inspired flow (1.5 sec), bronchial flows were about equal. The object-oriented construct has great potential to mate cyclical ventilation model with our current constant ventilation and perfusion respiratory-metabolic computer model (1).

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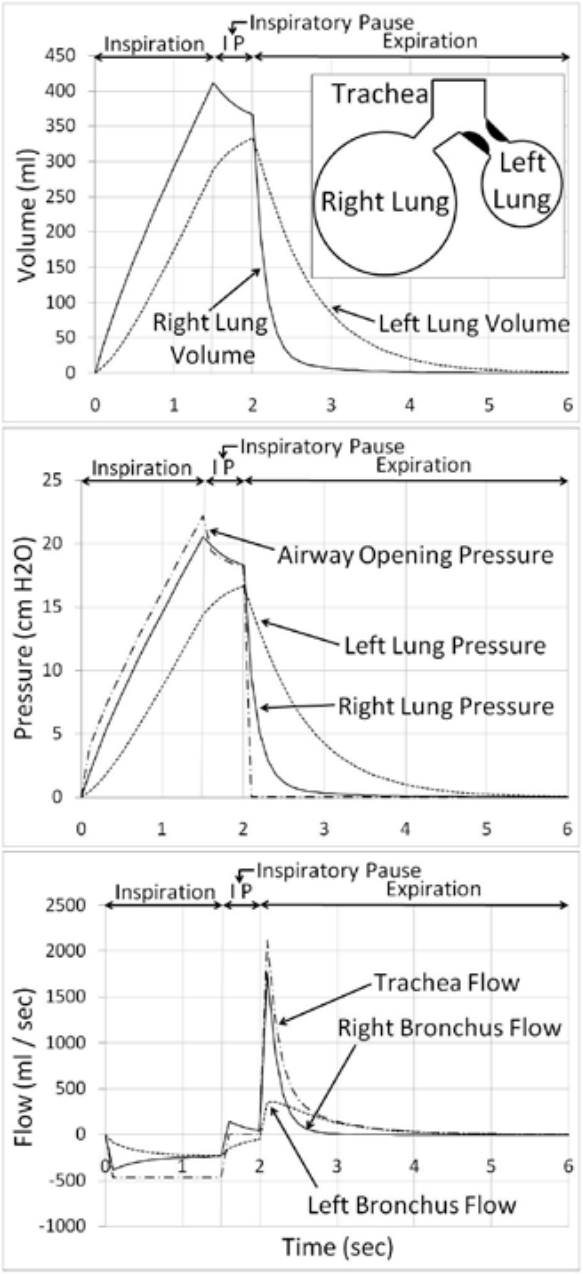
1. Anesth Analg 2007; 104: S-134.

SUPPORT: NIH grant HL-42637.



S-260.

COMPARATIVE LEARNING CURVES OF TRACHEAL INTUBATION BY NOVICE USING DIFFERENT LARYNGOSCOPES IN MANIKINS; PRELIMINARY RESULTS

AUTHORS: S. D. Searle[1], T. Mc Carvill[1], S. Launcelott[1], K. MacQuarrie[1], J. Mills-Flemming[2], O. Hung[1];

AFFILIATION: [1]Department of Anesthesia, Dalhousie, Halifax, NS, Canada, [2]Department of Mathematics and Statistics, Dalhousie, Halifax, NS, Canada.

INTRODUCTION: The Macintosh laryngoscope (MAC) has been considered to be the gold standard in tracheal intubation. Although it is a safe and effective device, MAC is not an easy technique to master. One alternative intubation device is the McGrath (MCG) video laryngoscope. However, the relative ease of use of the MCG and MAC laryngoscopes and their comparative learning curves have not been studied. The goal of this study is to assess the learning curves of these two devices by novices with no prior experience in airway management.

METHODS: After obtaining REB approval, novice first year medical students were recruited and randomized to MAC or MCG groups. Each group received a standardized instruction (video demonstration) before performing ten consecutive intubations in CPR manikins using the study device. The participants were allowed to review the training video between each attempt, but no verbal feedback or instruction was offered. Each intubation attempt was assigned a random ID number and videotaped. The taped attempts were compiled, randomized again and reviewed by an independent staff anesthesiologist not involved with data collection. Each attempt was scored based on the following criteria: 1) tracheal intubation achieved; 2) time to intubation; 3) a score assigned by the reviewer based on six objective criteria for proper intubation; and 4) a subjective score based on whether the reviewer would allow the novice performing the intubation on himself. We defined a successful attempt as a tracheal intubation, achieved in less than 60 seconds and considered acceptable by the reviewer. Success rates for each technique were calculated and learning curves were predicted using a generalized estimating equations approach.

RESULTS: Forty-one participants (48% female) have been recruited in this on-going study. Demographics of the study subjects and preliminary results of the study are summarized in the Table. Analysis predicts an intubation to be 90% successful on the 44th attempt with the MAC and on the 23rd attempt with the MCG. The learning curves of these techniques were significantly different ($p<0.05$).

DISCUSSION: Our results indicate that tracheal intubation using McGrath Laryngoscope is easier to learn by novice medical students compared to Macintosh laryngoscope. Our MAC learning curve in manikins is in agreement with the a previous study in patients (47th attempt with the MAC)1.

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Table

	Laryngoscope	
	Macintosh (N=20)	McGrath (N=21)
Age (SD), years	23.7 (±1.6)	25.0 (±3.49)
% Female	60	38
% Right Handed	100	93.3
Weight (SD), kg	68.6 (±10.4)	74.5 (±12.2)
Predicted Attempt with 90% Success rate	44th	23rd

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S-261.

CLINICAL EVALUATION OF THE DIFFERENCES ON TRANSCUTANEOUS MEASUREMENTS OF CARBON DIOXIDE TENSION AT VARIOUS BODY SITES DURING GENERAL ANESTHESIA (2ND REPORT)

AUTHORS: A. Mizushima, S. Katashima, Y. Kawauchi, A. Nakamura, Y. Kamiyama;

AFFILIATION: Department of Anesthesiology, Juntendo University Urayasu Hospital, Urayasu, Japan.

INTRODUCTION: The measurement of transcutaneous carbon dioxide tension (PtcCO2) allows useful estimation of PaCO2. Very little has been published, however, about the differences of PtcCO2 measurement at various body sites. The aim of this study was to evaluate the differences at the various body sites of PtcCO2 measurements during general anesthesia in adult patients undergoing abdominal surgery with or without CO2 pneumoperitoneum.

METHODS: With approval of ethical committee and informed consent from each subject, 38 (ASA 1 or 2) adult patients aged 20 to 72 years for elective abdominal surgery with (Grope A; laparoscopic surgery) or without (Grope B; laparotpmy) CO2 pneumoperitoneum under sevoflurane anesthesia were studied. The heated (42 degrees centigrade) miniaturized PtcCO2/SpO2 single ear sensor (TOSCA monitor; Linde Medical Sensors, Switzerland) was applied at the ear lobe with a special low ear clip and at the chest with a special attachment ring. The heated (42 degrees centigrade) combined PtcCO2/PtcO2 sensor (9900MK2; Kohken Medical, Japan) was also applied on the chest, forearm or abdomen. Endotidal CO2 tension (PetCO2) measurements were compared with the values displayed by a standard capnometry (AS5; Datex-Ohmeda, Finland). PaCO2 values were measured by a calibrate blood-gas analyzer (288Blood Gas System; Ciba-Corning, USA). The simultaneously obtained PtcCO2, PetCO2 and PaCO2 values were compared by linear regression analysis and Bland-Altman bias analysis. Data were analyzed by Friedman test and Wilcoxon test.

RESULTS: In Grope A (n=20, sixty paired measurements), PtcCO2 were highly correlated with PaCO2 in the PaCO2 range of 2.9 to 8.7 kPa. In Grope B (n=16, 48 paired measurements), PtcCO2 were also highly correlated with PaCO2 in the PaCO2 range of 2.9 to 8.7 kPa. No skin lesions occurred. The bias (mean difference between values) and precision (standard deviation of bias) are shown in the Table.

CONCLUSION: Although the blood gas analysis is a gold standard for evaluation of ventilation, PtcCO2 monitor is a helpful add-on to non-invasive respiratory monitoring, even in adult patients in each group. In this study, there is no significant relationship between PtcCO2 values and with or without CO2 pnemoperitoneum. The PtcCO2 measurements at the ear lobe showed relatively high values compared with those at the chest. The PtcCO2 measurements by the PtcCO2/SpO2 sensor showed relatively high values compared with those by the PtcCO2/PtcO2 sensor.

The bias (mean difference between values) and precision (standard deviation of bias)

	Group A (laproscopic surgery with CO2 pneumoperitonium)		**Group B (laparotomy; without CO2 pneumoperitonium)**	
	bias	precision	bias	precision
PtcCO2 (TOSCA ear) - PaCO2; (kPa)	0.84	0.76	0.81	0.77
PtcCO2(TOSCA chest) - PaCO2; (kPa)	0.56	0.66	0.52	0.60
PtcCO2(9900MK2 chest) - PaCO2; (kPa)	0.33	0.55	0.31	0.56
PtcCO2(9900MK2 forearm) - PaCO2; (kPa)	0.29	0.53	0.29	0.50
PtcCO2(9900MK2 abdomen) - PaCO2; (kPa)	0.37	0.66	0.35	0.60
PetCO2 - PaCO2; (kPa)	- 0.40	0.52	- 0.44	0.48

S-262.

WORK AND POWER CHARACTERISTICS OF BREATHING DISPLAYED USING DYNAMIC 3-D RESPIRATORY LOOPS INDUCED BY ETOMIDATE

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INTRODUCTION: Dynamic respiratory loops have proven difficult to apply to the real-time analysis of intubated patients. Actual values of Work of breathing (WOB) and Power of breathing (POB), derived from dynamic pressure-volume and pressure-flow loops respectively, have had limited success intraoperatively. The aim of this study is to visually represent while calculating WOB and POB without the use of an esophageal balloon using the differences in respiratory data collected from intravenous inductions with etomidate.

METHODS: After obtaining IRB approval, respiratory data of circuit pressure, volume and flow were measured before and after the induction of anesthesia with etomidate (0.3-0.4mg/kg) in 20 patients undergoing surgery with general anesthesia. Post-induction data was collected prior to intubation while the patients were still spontaneously breathing. All patients had a nasal trumpet as a method to relieve upper airway obstruction once induced. No other medications were administered during the induction. A selection of 3-5 sequential tidal pre-/post-induction breaths were made from the raw respiratory data. 3D loop images were constructed to revealed single-breath WOB and POB. Combined loop and rate data gave tidal pre- and post-induction: minute-WOB and POB.

RESULTS: See TABLE 1. Pre- and post-inductional changes in WOB (Joules), POB (Watts), and respiratory rate based on single breath patterns vs. minute calculations. N=20. and FIGURE 1. 3D loop image: pressure (X-axis), volume (Y-axis), and flow (Z-axis). The letters represent the direction of the curve in time from start inhalation (a), end inhalation (b), start exhalation(c), and end exhalation (d). The small and large loops represent pre-(pre)and post-(post) induction respectively.

DISCUSSION: Obvious visual changes could be observed in some of the pressure-volume(x-y axis) aspect of the loops between pre- and post-induction. Post-induction minute-WOB and POB were associated with larger single-breath tidal pressure and flow changes at a faster minute rate. It seems reasonable to suggest that 3D spirometry loops can be created from acquired respiratory data of pressure, volume and flow. Representation of data in this fashion can show meaningful visual changes in WOB and POB as represented in 3D spirometry loops. Calculations and trends of single-breath and minute-WOB and POB may be obtained simultaneously by using this technique without the use of an esophageal pressure monitor.

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Table 1. Pre- and post-inductional changes in WOB (Joules), POB (Watts), n=20

	Single Breath		Single Breath (Rate Breaths/min)		Minute	
	Mean Pre-Post	Pre-Post %Change	Mean Pre-Post	Pre-Post %Change	Mean Pre-Post	Pre-Post %Change
WOB(Joules)	0.1570	5.91(p=n.s)	9.5	39.49(p<0.0001)	5.7411	43.62(p<0.01)
POB(Watts)	0.0401	13.23(p<0.04)	9.5	39.49(p<0.0001)	1.4435	44.57(p[<0.001)

S-263.

USE OF MICRO WIRELESS IMAGE TRANSMITTER FOR VIDEO LARYNGO SCOPE IN STUDENT TRAINING

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AFFILIATION: Anesthesiology, Toho University, Tokyo, Japan.

INTRODUCTION: AirView video image transmitter (MPI Inc., Tokyo; JAPAN) is a small, ultra-portable image transmitter. It is the size of 65mm x 43mm x 20mm and weight 70g. It has 3.5mm mini-plug and connect to micro video output. We use this device with video laryngoscope (Airway scope; AWS; Pentax, Tokyo; JAPAN) and evaluate the efficacy for medical students training. Methods: Toho university medical students with no prior experience of laryngoscopy were included in this study. They watched pre-recorded image of video laryngoscopy with this device and learned anatomy of the pharynx. The students then observed the tracheal intubation with AWS in the operating room. They were interviewed and evaluated the understanding of tracheal intubations. Results: Usually, the visual field of flat panel may be restricted with AWS. With video monitor, the students could easily watch intubation. Some students interested in tracheal intubation with AWS using this novel video transmitter.

DISCUSSION: We assume this device may useful to maintain the motivation of medical students.

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S-264.

DESIGN OF A PERIOPERATIVE DECISION SUPPORT SYSTEM (DSS)

AUTHORS: W. H. Stapelfeldt, M. R. Reynolds, G. F. Takla, B. M. Magdalla, M. T. Petre;

AFFILIATION: Anesthesiology Institute, Cleveland Clinic, Cleveland, OH.

INTRODUCTION: Successful perioperative patient management often requires the interpretation of intraoperative events and vital sign trends within the context of a patient's pertinent medical history and the best available evidence for managing such patient's conditions. Yet, neither of these key elements is usually readily available to the practitioner in the operating room without having to divert time and attention away from the patient to access and retrieve such information. The present abstract describes a custom application which makes pertinent information readily available to anesthesia providers within the operating room through the electronic anesthesia recordkeeping system and remotely over the Institutional intranet, including via PDAs.

METHODS: The DSS system was designed as a separate, secure, web-based application (using the .NET framework and Monorail architecture) which interfaces with other systems such as the proprietary AIMS system (ARKS) and the enterprise EMR system (EPIC) to obtain information about intraoperative events, vital sign trends, prevailing patient diagnoses/problem lists (ICD-9 codes) as well as inpatient and outpatient medications. Information on guidelines and best available evidence is accessed via dynamically-encoded HTML links passing user-selectable combinations of patient-specific search terms. The knowledge base includes indexed PDF documents hosted on a Microsoft SharePoint server as well as major electronic text books and drug formulary information on the intranet. In addition to providing direct access to such passive patient-specific content, the DSS system also issues active alerts (via a flashing DSS button, alphanumeric display pages and/or e-mail messages) to events or developments that warrant provider attention based on sets of active guidelines (adverse vital sign trends, 'Triple Low' conditions[1] etc.). An example of a screen shot of the ARKS user interface with the DSS window open is shown in Figure 1.

RESULTS: The new DSS application provides real-time access to pertinent patient information and scientifically-supported guidelines as well as real-time assistance in the recognition of adverse developments such as episodes of clinically significant hypotension (meaning less than sufficient blood pressure) as encountered during 'Triple Low' conditions[1]. Future studies will determine the potential impact of DSS implementation on patient outcome (complication rate, length of hospital stay, 30 day mortality, 1 year mortality etc.).

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1. Anesthesiology 2009;111:A880

Figure 1

S-265.

ASSESSMENT OF THREE DIFFERENT DYNAMIC INDICATORS AS A PREDICTOR OF FLUID RESPONSIVENESS

AUTHORS: T. Hoshi, H. Takahashi, M. Tanaka;

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INTRODUCTION: Pulse pressure variation (PPV)1, stroke volume variation (SVV)2 and pleth variability index (PVI)3 are all dynamic indicators for predicting volume responsiveness in mechanically ventilated patients. According to past studies1,2,4 the values of these variables which predict increases in cardiac output or stroke volume were similar, but there is not any study to compare these three parameters in same patients.

METHODS: With approval of ethical committee of Tsukuba University Hospital and written informed consent, twenty five adult patients who underwent elective abdominal surgery were studied. All patients were inducted propofol TCI (Dipurifuser), remifentanil and rocuronium. At least five minutes after tracheal intubation, baseline measurement was done. Thereafter 6% Hydroxyethylated starch 500ml was administrated in 20 minutes. Heart rate, systolic and diastolic blood pressure, PPV(Philips IntelliVue MP70), SVV, cardiac output(Edwards Lifesciences FloTrac and Vigileo Monitor) and PVI(Masimo Radical7) were recorded every five minutes until fluid load challenge was done.

RESULTS: Twenty three patients completed this study. Thirteen patients(Responders) increased cardiac output more than 15% from the baseline after fluid load challenge. Baseline value of PPV and SVV for responders are significantly higher than non-responders(16.9+/-1.3 vs 12.7+/-0.9 and 17.8+/-1.7 vs 11.6+/-0.9), but no significant difference was found for PVI(18.1+/-1.5 vs 15.1+/-1.7). The optimal threshold values given by the receiver operating characteristic curves were 16% for PPV, 14% for SVV and 13% for PVI.

DISCUSSION: Compared with previous results, slightly greater values for threshold of fluid challenge responsiveness for PPV were obtained in our study. The discrepancy may be attributed to the fact that our study was performed during general anesthesia as opposed to ICU settings in the previous studies.

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S-266.

COLLECTION OF VITAL SIGNS DATA FOR ANESTHESIA MONITORING RESEARCH

AUTHORS: D. Liu[1], M. Görges[2], S. A. Jenkins[3], **D.R. Westenskow[2];**

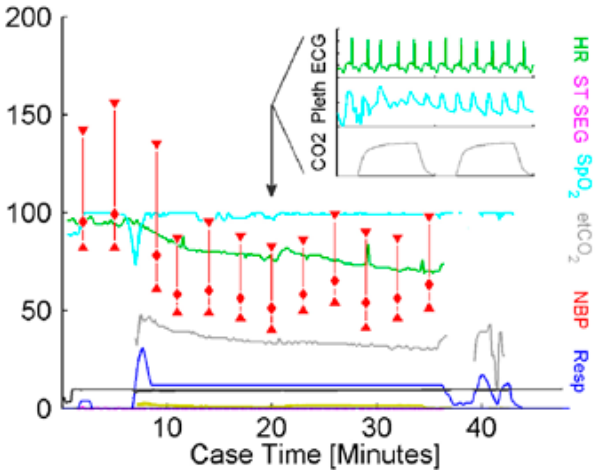
AFFILIATION: [1]School of ITEE, The University ofs Queensland, Brisbane, Australia, [2]Department of Anesthesiology, University of Utah, Salt Lake City, UT, [3]Department of Anaesthesia and Intensive Care, Royal Adelaide Hospital, Adelaide, Australia.

INTRODUCTION: Patient vital signs data are often used in research, such as designing novel anesthesia monitoring displays [1], improving alarm systems [2], and developing decision support algorithms [3]. Researchers have access to vital signs data from either clinical databases or patient simulation software. Databases such as PhysioBank [4], MIMIC [5], and IMPROVE [6] provide vital signs data recorded from patients in Intensive Care Units, but data from patients undergoing anesthesia are seldom available. Patient simulators, such as the Advanced Simulation Corporation Body Simulation or METI Human Patient Simulator, provide realistic representations of vital signs during steady states, but they are less realistic during transitional phases and do not simulate artifacts such as noise, sensor disconnections, and interference [7]. The aim of the present study was to create a repository of vital signs data from patients undergoing a range of anesthetics.

METHODS: A laptop running custom software was used to collect monitoring data from four ORs at the Royal Adelaide Hospital. The software interfaced with Philips IntelliVue MP70 monitors, MP30 monitors, and Datex-Ohmeda Aestiva/5 ventilators to collect numerical, waveform and alarm data. Modules used on the MP70 monitor included anesthetic gases, Y-piece spirometry, and BIS. Monitoring data was saved in four formats: (1) all parameters recorded in 10 millisecond intervals as CSV text files, (2) numerical parameters and alarms recorded in 1 second intervals as CSV text files, (3) graphical plots of waveforms such as ECG, and (4) graphical plots of numerics such as HR across the entire case.

RESULTS: Monitoring data was recorded from 32 cases ranging in duration from 13 minutes to 5 hours (median 105 minutes). The 32 cases included 25 general anesthetics (20 with an ETT, 5 with an LMA), 3 spinal anesthetics, and 4 sedation cases. Most cases included ECG, pulse oximetry, capnography, non-invasive blood pressures and airway monitoring data. Y-piece spirometry data was available in 3 cases, BIS in 5 cases, and arterial blood pressure in 4 cases.

DISCUSSION: The present repository's accessible CSV file format provides researchers with non-technical backgrounds (such as clinicians or human factors experts) access to vital signs data for a range of situations that frequently occur during normal anesthesia. Data collected in the present study can be used in human factors research such as the prototyping of novel anesthesia displays. Future work includes collecting data from a larger variety of cases, "playing back" the vital signs data into simulators and clinical monitors, and developing tools for searching and navigating the database.



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S-267.

A DISPLAY OF FORWARD PREDICTIONS OF END-TIDAL AND EFFECT SITE SEVOFLURANE LEVELS LEADS TO MORE USE OF OVERPRESSURE

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INTRODUCTION: Various devices that provide the user with information on, or control, plasma and effect-site levels of intravenous agents have been described. Our overall aim is to apply these principles to inhalational anesthesia. We have developed a model based system which provides real time forward prediction of end-tidal and effect site (Ceff) levels of inhalational agents. Previously we showed that anesthesiologists made step changes in end-tidal sevoflurane more rapidly when this system was present. In this study we explore the effect of the predictive display on step changes in Ceff and on the way anesthesiologists adjusted vapor concentration.

METHOD: Regional Ethical Committee approval. Patients and anesthesiologists where anesthesia was expected to last >120min were recruited. The anesthesiologists were asked to make step changes of 0.3vol% in Ceff-sevo as rapidly and accurately as possible. The changes made were increases and decreases with and without the predictive display with the order of changes randomized. Total fresh gas flow was maintained at 1.5l/min. Monitored data and Ceff were automatically recorded every 10s. Data was analyzed for the speed (10-90% rise time) and accuracy (overshoot and stability during the following five min) and also the maximum vaporisor dial excursion and maximum change in end-tidal concentration. Results were compared with paired t-tests.

RESULTS: 30 subjects were recruited and 91 changes were available for analysis. Results are summarized in the table. There

	Increase		Decrease	
	Prediction shown	Prediction hidden	Prediction shown	Prediction hidden
Number of changes	22	23	24	22
10-90% change (s)	192 (94)	194 (61)	237 (84)	248 (93)
% time outside 10%	11.7 (20.9)	16.4 (25.6)	8.1 (17.1)	7.9 (17.8)
Overshoot (vol%)	0.10 (0.18)	0.15 (0.31)	0.10 (0.18)	0.16 (0.31)
Max dial change (%)	4.3 (1.6)	3.5 (1.7)	3.3 (1.0)	2.8 (1.1)
Max end-tidal change(%)	1.3 (0.5)	1.1 (0.4)	1.0 (0.3)	0.9 (0.4)

was no difference in the speed of change (95%CI of difference -51 to 32s), or in measures of the accuracy of the change. With the predictive display users made larger vaporizer dial changes (95%CI diff -1.3 to -0.01%, p=0.046) resulting in larger ET changes (95%CI diff -0.009 to -0.34vol%, p=0.06). Increases occurred faster than decreases (95%CI diff 18-86s, p=0.004) and in the "increase" group significantly greater ET changes were seen (95%CI diff 0.05 to 0.40%, p=0.012) when predictions were present.

DISCUSSION: The predictive display had no effect on the speed or accuracy of a specified (0.3vol%) change in Ceff-sevo. Differences between increases and decreases are expected from inhalational kinetics. Users did use more "overpressure" to achieve the specified objectives when the predictive display was present suggesting the system is of value to anesthesiologists.

REFERENCE: Anesth Analg 2004;99:1159-63.

S-268.

THE EFFECT OF "TRIGGERED NOTES" ON THE COMPLETENESS OF FREE-TEXT-ENTRY REMARKS FOLLOWING AN UPGRADE TO THE INNOVIAN ANESTHESIA INFORMATION MANAGEMENT SYSTEM (AIMS)

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INTRODUCTION: Based on a report of high omission rates for free-text remarks in the Saturn anesthesia information management system (AIMS) (1), we studied the completion of free-text-entry notes following an upgrade from Saturn to Innovian (Drager Medical Inc.). Our Innovian and Saturn systems differed in two ways: the use of "triggering" notes (which place several notes in the record when one is selected) and a restructuring of "favorites" lists (commonly used notes for each environment). Triggers were created for "start of record", intubation, invasive lines, and regional blocks. Triggering precludes entering remarks at the time of note selection, therefore we hypothesized that triggered notes would be present more but completed less than in Saturn, and untriggered notes would have similar rates of entry and completion.

METHODS: We collected all records from one site for 12 months before (Saturn) and 6-18 months after (Innovian) the upgrade. Each case was checked for the presence of free-text-entry notes (Table 1) and a corresponding remark. "Triggered" notes were triggered in at least one Innovian environment. "Present" is the proportion of cases containing the note; "complete" is the proportion of present notes with a remark. Given confounders that would make it difficult to infer effect size, no statistical comparisons were made.

RESULTS: Some notes were present at different rates in Innovian because of changes to "favorites" lists, so these differences are not attributable solely to triggering. Of remaining notes, "Intubation attempts:" and "EKG rhythm:" (both triggered) were present much more often in Innovian, and "IV gauge/site:" (not triggered) was present significantly less. Despite being present more often, "EKG rhythm:" was both present and complete less in Innovian (45.9%) than in Saturn (49.9%).

Completion rates for many other notes, whether triggered or not, were reduced in Innovian as well. Airway notes are an exception: although completion was rarely higher than 90%, it was usually similar in Saturn and Innovian. "Intubation attempts:" (triggered) was completed less although it was present more, with a net positive effect (assuming similar rates of intubation based on presence of "ETT size:"). See Table 1 for details.

DISCUSSION: Triggering notes allows for easier entry of multiple notes but requires an extra step to complete free-text remarks. The documentation of some elements was decreased in Innovian, while others increased. Although triggered notes were likely to be present more often, it appears that users were less likely to complete remarks. User interface changes that improve ease of use may affect the quality of documentation.

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Table 1: Proportions present and complete for free-text-entry notes

	Present		Complete	
	Saturn	Prediction hidden	Prediction shown	Prediction hidden
Triggered				
Airway:				
Intubation grade*	8.9%	58.1%	77.0%	84.4%
Intubation attempts	10.7%	59.8%	91.3%	89.9%
Cuffed ETT Size	54.1%	55.8%	90.5%	89.4%
ETT secured (cm)	59.3%	60.1%	89.1%	88.2%
Blade type*	17.1%	57.6%	85.2%	89.0%
LMA Size	10.5%	12.0%	91.9%	85.3%
EKG rhythm	61.2%	73.9%	81.6%	62.2%
Intensive lines:				
A-line (ga/site)	23.9%	21.3%	87.4%	76.4%
Central line (ga/site)	7.8%	9.3%	86.9%	77.6%
Regional techniques:				
Catheter threaded to (cm)	7.5%	7.0%	91.9%	83.7%
Interspace	2.9%	6.8%	90.9%	81.0%
Not triggered				
Airway:				
Uncuffed ETT size	7.0%	5.1%	91.9%	93.4%
ETT leak (cmH2O)	5.4%	3.9%	88.6%	84.8%
Curved blade size**	38.8%	3.2%	89.2%	85.3%
Straight blade size**	14.1%	1.6%	86.2%	90.2%
IV (ga/site)	58.7%	43.9%	86.8%	85.1%

*Not in "favorites" list in Saturn

**Removed from "favorites" list in Innovian

S-269.

OPTIMIZING ANESTHETIC TITRATION: BISPECTRAL INDEX, VOLATILE ANESTHETICS DOSE (MAC),OR HEMODYNAMIC TARGETS?

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INTRODUCTION: Clinicians adjust anesthetic administration based on multiple inputs, such as surgical stimulation, blood pressure, heart rate, movement and somatic responses. BIS-guided adjustment of anesthetic dose has resulted in lower anesthetic use, less PONV, and faster recovery. The integration of automatic anesthesia record keeping with comprehensive electronic medical records provides an opportunity to explore links between anesthetic management strategies and patient outcomes in large patient data sets. We thus sought to examine the comparative effectiveness of three different anesthetic guidance strategies.

METHODS: With IRB approval, surgical cases were obtained from a non-cardiac perioperative registry in Cleveland Clinic (n=84,508). Registery demographic, diagnostic and procedure data (ICD-9-CM), real time hemodynamic parameters, BIS and end-tidal volatile anesthetic concentrations, all other intraoperative medications and patient outcomes. Subjects undergoing emergency surgery, younger than 16 years of age or without a clear survival status were excluded, resulting in a data set of 58,863 cases. End-tidal volatile anesthetic concentrations in MAC-equivalents (MAC), mean arterial pressure (MAP), and Bispectral Index (BIS) were extracted. The dataset was further limited to subjects receiving an average MAC of at least 0.2 of sevoflurane, desflurane or isoflurane between incision and the end of the case. Subjects receiving more than one of these agents were excluded. Average MAC, MAP, and BIS w ere calculated for each adult general surgical patient given volatile anesthesia during the intraoperative period from incision to end-of-surgery.

To examine the impact of MAP, MAC or BIS as titration targets, the d ataset was median split into high and low groups around each of these parameters. From these groups, a stepwise logistic propensity model was developed to generate similar matched groups. Patients were matched using a ranked propensity score which controlled for multiple factors (demographics, ASA physical status, baseline vital signs, procedure duration and type, and ICD-9 based diagnostic and procedural risk). Outcome measures (length of stay and time to postoperative VAS pain score <7 cm, <5 cm and <3 cm) were compared using t-tests with significance criteria adjusted for multiple comparisons.

RESULTS: Results for each of the 3 propensity-matched treatment groups are in the tables. Patients maintained at higher BIS levels experienced faster post-operative pain relief and were discharged significantly earlier.(*p< 0.001)

CONCLUSIONS: Propensity matching was unable to identify a benefit from maintaining a higher or lower MAP or MAC as a titration target. In contrast, patients maintained at average BIS level 50 experience faster pain relief and earlier hospital discharge compared to patients maintained at a lower BIS level of 40. Anesthetic management aimed at titrating anesthesia to a BIS level of 50 may thus be more helpful than titrating to MAP or MAC goals.

Group Characteristics

	Group	N Matched	BIS	MAP	MAC
BIS	BIS-High	6,924	50 ± 5	86 ± 10	0.65 ± 0.18
	BIS-Low	6,952	39 ± 5	89 ± 11	0.67 ± 0.18
MAP	MAP-High	6,277	44 ± 7	95 ± 7	0.67 ± 0.18
	MAP-Low	6,295	46 ± 8	79 ± 5	0.64 ± 0.17
MAC	MAC-High	5,696	44 ± 7	88 ± 11	0.79 ± 0.10
	MAC-Low	5,712	45 ± 8	86 ± 11	0.53 ± 0.10

Outcome Measures

	Group	Length of Stay (Days)	Time (hr) to Pain ≤ 7 cm	Time (hr) to Pain ≤ 5 cm	Time (hr) to Pain ≤3 cm
BIS	BIS-High	4.2 ± 5.4*	10.1 ± 20.2*	17.1± 32.2*	37.1± 55.3*
	BIS-Low	4.8 ± 7.9	11.7 ± 24.6	19.8± 37.7	41.0± 58.5
MAP	MAP-High	4.4 ± 6.6	10.9 ± 23.0	18.8 ± 35.8	40.0 ± 57.7
	MAP-Low	4.5 ± 7.0	10.7 ± 22.2	17.8 ± 33.9	38.0 ± 56.5
MAC	MAC-High	4.5 ± 7.1	10.9 ± 22.9	18.8 ± 36.2	40.3 ± 58.2
	MAC-Low	4.6 ± 7.2	11.5 ± 23.1	19.3 ± 36.2	39.4 ± 57.4

S-270.

ACHIEVING PERIOPERATIVE NORMOTHERMIA IN COLORECTAL SURGERY PATIENTS

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INTRODUCTION: Perioperative normothermia reduces post-anesthetic recovery time, infectious complications, and length of stay[1,2,3]. The Centers for Medicare and Medicaid Services (CMS) have identified normothermia in colorectal surgery patients as a quality improvement core measure due to improved patient outcomes and predicted cost savings[4]. We evaluated the frequency of hypothermia (<36°C) in colorectal surgery patients as well as a possible intervention to increase CMS normothermia compliance.

METHODS: Colorectal surgery patients were identified based on their ICD-9CM Principal Procedure Code. Per the Surgical Care Improvement Project's (SCIP) guidelines, excluded populations included: patients less than 18 years old, patients with a length of stay >120 days, patients with a principal diagnosis suggestive of perioperative infection, burn patients, patients with entirely laparoscopic procedures, patients in clinical trials and patients who expired perioperatively. A data sheet was added to the qualifying patients' hospital record that included: an initial temperature measurement upon the patient's arrival to the preoperative holding area, surgical incision temperature, surgical closure temperature and temperature upon arrival to the post anesthesia care unit (PACU). The form also recorded if any active or passive warming technique was used preoperatively or intraoperatively. Warming techniques included: forced air warming blanket, humidifying air filter, reflective hats or warmed surgical blankets. Foley catheters with temperature probes were designated as the preferred mode of core temperature measurement. Following analysis of recorded temperatures from the observational period, a pilot trialing preoperative forced air warming blankets was implemented. If a patient's initial oral temperature in the preoperative holding area was less than 36°C, a forced air warming blanket was applied.

Table 1: Number of Patients With A Temperature <36°C By Location

Temperature Location <36°C	Observational Period: Number of Patients	Pilot Period with Forced Air Warming Blanket: Number of Patients
Preoperative	17 (28%)	19 (31%)
Intraoperative-Incision	18 (30%)	15 (25%)
Intraoperative-Close	13 (22%)	12 (19%)
PACU	12 (20%)	15 (25%)

Discussion: A retrospective medical record analysis of patients undergoing colorectal surgery from 2007-2008 revealed that only 34% of colorectal patients were normothermic in the PACU at our institution. Our data suggest that implementing a standardized method of core temperature measurement has the greatest impact on increasing postoperative normothermia compliance rates. At our institution 80% of patients are normothermic when a standardized foley temperature measurement is used. In our pilot, the application of a forced air warming device preoperatively did not result in an increased rate of postoperative normothermia as only 75% of patients were normothermic in the PACU. This decrease in PACU normothermia rates contradicts some published reports[5].

Recently, CMS requirements for surgical normothermia have changed to include all patients receiving general or neuraxial anesthesia greater than or equal to sixty minutes[4]. We are currently evaluating the effects of mandatory intraoperative active warming

when possible and increased PACU nursing awareness on the rate of PACU normothemia.

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Liver / Transplantation

S-271.

ACUTE KIDNEY INJURY BY THE RIFLE CRITERIA FOLLOWING LIVER TRANSPLANTION IN PATIENTS WITH NORMAL PREOPERATIVE RENAL FUNCTION

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Acute kidney injury (AKI) occurs commonly after liver transplantation (LT) and is associated with increased long-term mortality and morbidity. Recently the RIFLE criteria have been proposed to define kidney risk, injury, failure, loss, and end-stage kidney disease. Although AKI has been studied extensively, few studies have applied the RIFLE criteria and focused on the patients who have normal preoperative renal function. The aims of our study were to identify the incidence, risk factors, and long-term impact of the newly development AKI after LT in adult patients who had normal preoperative renal function.

METHODS: After IRB approval, medical records of adult patients undergoing LT at our center between November 2005 and December 2008 were reviewed. Patients who had normal preoperative renal function (serum creatinine (Cr) ≤1.5mmol/L) were identified. Postoperative AKI was determined by the RIFLE criteria as a two-fold increase in Cr or glomerular filtration rate decrease by 50% compared to pre-LT values. The patients were divided into two groups: AKI and non-AKI according to their postoperative renal status. Then the two groups were matched by same sex, similar preoperative Cr concentration and body mass index. Perioperative variables were compared between the two groups and independent risk factors were determined by multivariate logistic regression. Patient and graft survivals were evaluated by Kaplan-Meier analysis.

RESULTS: Among 334 patients who met the study criteria during the study period, 236 were matched, leaving 118 patients in each group. Overall, AKI occurred in 38.6% and 13.3% in the first week and the first month after OLT respectively. Among variables examined, three variables (transfusion of red blood cell (RBC) > 10 units, OR 4.1, 95% CI 2.3 to 7.5, p <0.001, pre-LT albumin < 3.5 mg/dL, OR 2.9, 95% CI 1.5 to 5.7, p=0.001, and use of large dose of vasopressors OR 2.3, 95% CI 1.2 to 4.7, p=0.018) were identified as independent risk factors. Patients with immediate postoperative AKI had significantly decreased patient and graft survivals (1293±23 vs 1183±38 days, p=.025, 1227±29 vs 1085±46 days, p=0.017 respectively).

DISCUSSION: In this study, we demonstrated that even in patients with normal preoperative renal function, AKI occurred frequently following LT. We further demonstrated that pre-LT hypoalbuminemia, increased intraoperative RBC transfusion, and use of large dose vasopressors were significantly associated with postoperative AKI. Patients with postoperative AKI had significantly decreased survivals for both patients and grafts.

S-272.

PLASMA SPHINGANINE 1-PHOSPHATE DECREASES AFTER CADAVERIC HUMAN LIVER TRANSPLANTATION

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INTRODUCTION: Liver transplantation is a life saving procedure for patients with end stage liver disease. However, significant complications including postoperative liver dysfunction and acute kidney injury (AKI) are frequent (1). Complication after liver transplantation is due to the obligatory liver ischemia and reperfusion injury secondary to prolonged cold storage and subsequent warm reperfusion. Recent study in mice demonstrated that after liver ischemia and reperfusion, plasma levels of sphinganine 1-phosphate but not sphingosine 1-phosphate fell significantly and exogenous sphinganine 1-phosphate treatment significantly protected against acute liver and kidney injury (3). In this study, we aimed to determine whether the plasma levels of sphinganine 1-phosphate in humans also decrease after liver transplantation.

METHODS: After institutional review board approval, we collected plasma samples from patients subjected to cadaveric (N=24) or living-related (N=8) liver transplantation before surgery, immediately after reperfusion of the liver graft and then 3-72 hours later. Plasma sphinganine 1-phosphate and sphingosine 1-phoshate levels were analyzed utilizing high pressure liquid chromatography as described (2, 3). We also identified patients who developed AKI defined by Risk, Injury, Failure, Loss, End-stage (RIFLE) kidney disease criteria suggested by the Acute Dialysis Quality Initiative (increase of serum creatinine by more than 50%) and the Acute Kidney Injury Network (AKIN) criteria (serum creatinine increase by more than 0.3 mg/dL within 48 hours) and compared patients undergoing living related and cadaveric liver transplants.

RESULTS: The average cold cold-ischemic times in cadaveric- and living-related liver transplant recipients were 8.2+0.45 and 0.58+0.11 hours, respectively. AKI was frequent in our study as 58.3% (14/24) of cadaveric and 37.5% (3/8) of living related liver transplant recipients met either the RIFLE or AKIN criteria. Plasma levels of sphinganine 1-phosphate fell significantly and early (<3 hours) in cadaveric liver transplant recipients but not in living related liver transplant recipients (Figure 1). Plasma levels of sphingosine 1-phophate levels did not change in either group.

CONCLUSIONS: We confirm a high incidence of AKI in patients subjected to liver transplantation after prolonged cold-storage of the liver. We also demonstrate that patients subjected to prolonged cold ischemia and warm reperfusion of the liver show significantly reduced plasma levels of sphinganine 1-phosphate during early reperfusion period. Future studies will examine whether early postoperative sphinganine 1-phosphate levels can predict the development of AKI and whether exogenous sphinganine 1-phosphate therapy can reduce the degree and incidence of AKI after orthotopic liver transplantation in humans.

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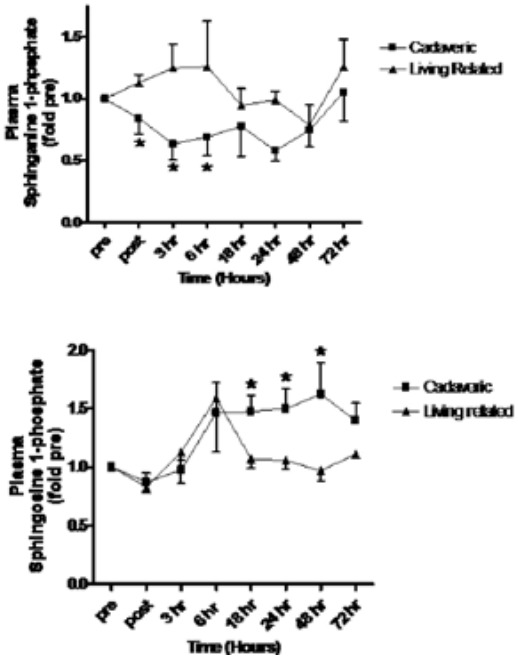
Figure 1. Plasma levels of sphinganine 1-phosbate and sphingosine 1-phophate levels in patients subjected to cadaveric- (N=24) or living related (N=8) liver translation. P<0.05 vs. living related liver transplant recipients.



S-273.

ACUTE KIDNEY INJURY AFTER LIVER TRANSPLANTATION - A REVIEW OF 803 CASES

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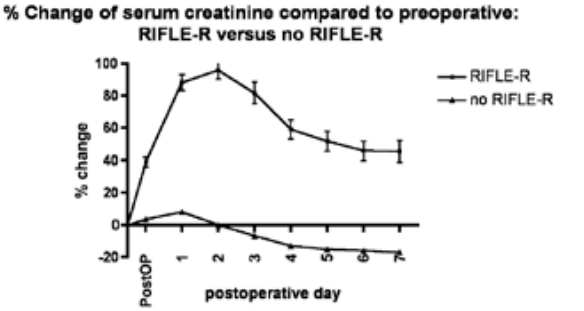
INTRODUCTION: Acute kidney injury (AKI) after liver transplantation is a serious complication that can substantially alter mortality and morbidity. The Risk, Injury, Failure, Loss, End-stage kidney disease (RIFLE) criteria suggested by the Acute Dialysis Quality Initiative (ADQI) and the AKIN criteria recommended by the Acute Kidney Injury Network (AKIN) are the most frequently used definitions but little is known about the utility of these definitions after liver transplantation.

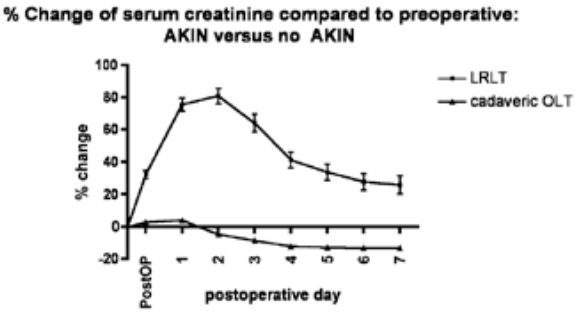
METHODS: We retrospectively collected data of all adult liver transplants done at our institution from January 2001 to May 2009. We collated patients who developed acute kidney injury defined by RIFLE-risk criteria (increase of serum creatinine by more than 50%) and AKIN criteria (increase of serum creatinine by more than 0.3 mg/dL within 48 hours) and compared patients undergoing living related liver transplant (LRLT) with cadaveric transplants.

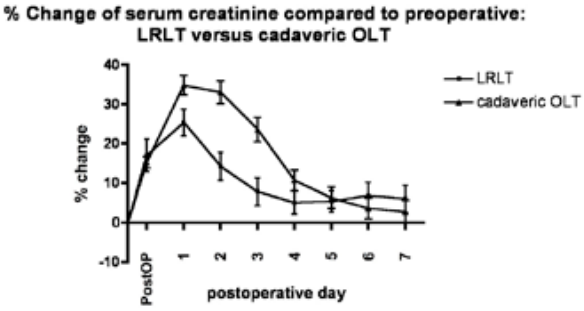
RESULTS: There were 803 adult liver transplants performed, 101 LRLT and 602 cadaveric. 334 patients developed AKI defined by AKIN criteria (41.6%) and 257 (32.1%) by RIFLE-R (risk) criteria. Percent change but not absolute values of serum creatinine were higher on postoperative day 0 in patients with AKI (either definition) compared to patients without AKI. Serum creatinine and delta % serum creatinine peaked on postoperative day 2 (either definition, see figure).

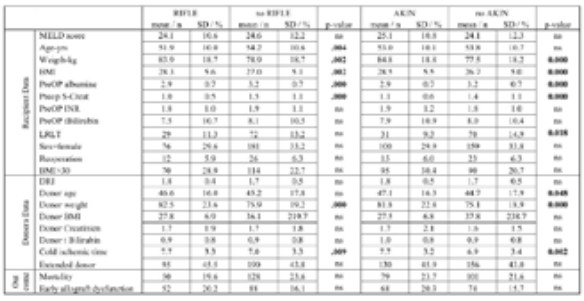
Independent of the definition patients with postoperative AKI had higher preoperative serum creatinine values and body mass indices and lower preoperative albumine levels. Liver donors of recipients with postoperative AKI were older, heavier and the graft sustained longer cold ischemic times. Cadaveric liver transplants had higher postoperative change of serum creatinine on postoperative day 1-4 and were more likely to develop AKI defined by AKIN but not AKI defined by RIFLE-R (see table).

DISCUSSION: This study confirms the previously reported high incidence of acute kidney injury after liver transplantation in a large single-center population. AKI defined by AKIN was more frequent than AKI defined by RIFLE. In addition to known risk factors such as preoperative serum creatinine or cadaveric transplant we found that low plasma albumine, prolonged cold ischemic time and recipient obesity increased the risk of obesity. Surprisingly AKI was not associated with increased mortality or increased incidence of early allograft dysfunction defined by total serum bilirubin > 5 mg/dL on postoperative day 5 despite the large number of patients enrolled in this study. AKIN and RIFLE-R criteria may not have a substantial effect on long-term outcome and therefore may not appropriate to define acute kidney injury after liver transplantation.









S-274.

INCREASED DURATION OF RED BLOOD CELL STORAGE IS ASSOCIATED WITH ELEVATED POTASSIUM CONCENTRATIONS DURING LIVER TRANSPLANTATION IN ADULTS

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BACKGROUND: Increased potassium (K+) concentration poses serious perils to patients undergoing orthotopic liver transplantation (OLT). Although there are several interventions that can be used to lower serum K+, prevention remains most effective in the management of intraoperative hyperkalemia. Previous studies have shown that increased duration of red blood cell (RBC) storage is associated with higher mortality and risk of complications in patients receiving RBC transfusions.1 Moreover, it is well known that stored RBCs undergo progressive structural and functional changes after 2 to 3 weeks that reduces their viability and functionality. We tested the hypothesis that increased duration of red blood cell (RBC) storage in transfused blood is associated with significantly higher K+ concentrations during OLT.

METHODS: After receiving IRB approval, we retrospectively studied 602 adult patients who underwent OLT at a major transplant referral center between January 2004 and April 2007. RBCs were categorized into two groups based on the mean storage duration (newer RBC ≤14 and older RBC >14 days). The relationship between serum K+ and duration of RBC storage was analyzed at multiple time points of OLT using Student t test or chi-square analysis. The incidence of hyperkalemia in these groups was also recorded. Hyperkalemia was defined as a serum K+ ≥5.5 mmol/L. Recipient, donor and intraoperative variables of patients receiving newer and older blood were compared as well.

RESULTS: 258 patients received fresh RBCs (mean RBC age of 9.3 days) and 397 patients received older RBCs (mean RBC age of 21.7 days). Baseline demographics including age, gender, MELD scores, K+, and creatinine were similar in both groups. Patients in both groups received similar amounts of RBCs, insulin and furosemide. However, patients in the older blood group had significantly higher serum K+ at 1 hour pre-reperfusion and at 15 minutes, 1 hour, 2 hours and 3 hours post-reperfusion (Table 1, all $p<0.02$). Patients in this group also had a significantly higher incidence of hyperkalemia at 1 hour pre-reperfusion and at15 minutes, 2 hours and 3 hours post-reperfusion (all $p<0.05$).

DISCUSSION: Our results indicate that increased duration of RBC storage is associated with higher intraoperative serum K+ during OLT. This information can be used to better prepare anticipatory interventions in patients at increased risk for developing hyperkalemia during OLT. These results may also be applicable to other operations requiring massive blood transfusions, such as trauma surgery or ruptured aortic aneurysm repair. They may also warrant efforts to assign relatively newer blood to patients at particularly high risk of intraoperative hyperkalemia during OLT, such as those with renal failure or high preoperative serum K+.

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Table 1: Mean Serum K^+ at Multiple Time Points during OLT

	Newer Blood (≤14 days)		Older Blood (≤14 days)		p value
	Mean	±SD	Mean	±SD	
Baseline K	3.98	0.70	3.94	0.60	0.454
3 hours prior	4.07	0.72	4.07	0.73	0.955
2 hours prior	4.17	0.68	4.28	0.84	0.171
1 hour prior	4.22	0.70	4.52	0.82	0.000
15 minutes after	4.58	0.86	4.90	1.15	0.008
1 hour after	4.44	0.84	4.73	0.88	0.000
2 hours after	4.12	0.63	4.39	0.74	0.000
3 hours after	4.15	0.96	4.35	0.70	0.020

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S-275.

WITHDRAWN.

S-276.

ANALYSIS OF INHALED ANESTHETIC AGENTS IN CLINICAL LIVER TRANSPLANTATION

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INTRODUCTION: Recent anesthesia research suggests that certain inhaled anesthetic agents have an improved capacity to ameliorate ischemia-reperfusion injury in transplanted organs. This study compares three primary inhaled agents isoflurane, desflurane, and sevoflurane in clinical liver transplantation. Primary outcomes included early graft loss and perioperative serum AST and ALT levels, as well as late graft survival.

METHODS: Data were extracted using a retrospective review of all deceased donor liver transplant recipients between 2001 and 2009, with an extensive review of all recipient and donor demographics, as well as post-transplant outcomes. The choice of primary inhaled anesthetic agent did not follow any protocol and was strictly at the discretion of the anesthesiologist. Early graft loss included loss of graft function for any reason within 7-30 days of transplant. Serum AST and ALT and total bilirubin levels were measured daily in the immediate post-transplant period. Median follow-up was 45 months.

RESULTS: There were 1013 transplants included in the analysis, with three primary inhaled anesthetic agents: isoflurane (84%), desflurane (9%) and sevoflurane (6%). In the first week post-transplant, the iosflurane group had the highest AST and ALT levels but all groups were similar by post-operative day 7. There was no difference among the groups in total bilirubin level up to 30 days. The risk of 7-day and 30-day graft loss did not differ among the groups, not did 1-year graft survival.

DISCUSSION: The results suggest that desflurane and sevoflurane abrogate the severity of ischemia-reperfusion injury better than isoflurane in deceased donor liver transplantation. The study groups do not differ with regard to early or late graft survival.

S-277.

ANESTHESIA FOR RENAL TRANSPLANTATION IN PATIENT WITH MITOCHONDRIAL ENCEPHALOMYOPATHY

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INTRODUCTION: Patients presenting with mitochondrial disease will be subjected to surgical procedures and anesthetic implications need to be addressed. However, little information about anesthetic management of these diseases has been known.

CASE REPORT: A 36 year old female, previously diagnosed to have End Stage Renal Disease secondary to Chronic Glomerulonephritis, Mitochondrial Disease documented by skeletal muscle biopsy presented for renal transplantation. Pre-transplant workups were done. Preoperative preparation included the procurement of Dantrolene IV, preparation of the anesthesia machine and appropriate monitors, and cooling of IV fluids to be used intra-operatively. The anesthetic plan was to do a general endotracheal anesthesia under total intravenous anesthesia with continuous Propofol infusion-Fentanyl-Rocuronium.

Anesthesia was maintained with propofol infusion (4-8 mg•kg-1•hr-1 with a total of 920 mg) and intermittent boluses of fentanyl (total 300 µg). Supplemental rocuronium (10 mg) was given when TOF reading was 1. Systolic blood pressure was maintained at 110-150 mm Hg and 70-80 mm Hg diastolic. Oxygen saturation ranged from 98-100%, end tidal carbon dioxide at 30-35 mm Hg and tympanic temperature at 34.1-36.5 ºC. Total anesthesia time was 180 minutes with unremarkable peri-operative course.

She was given paracetamol + tramadol 1 tablet every 6 hours. The rest of the hospital stay was unremarkable. She was discharged with a creatinine of 0.9 mg/dL and adequate urine output.

DISCUSSION: Mitochondrial diseases are a group of uncommon disorders with variable clinical presentations and the potential for multisystem involvement Biochemically, the diseases are characterized by defects of mitochondrial substrate utilization and transport, defects in the respiratory chain, and defects of energy conservation and transduction.

The neurologic findings and limb weakness are indicative of muscle wasting, arousing concerns for succinylcholine-induced hyperkalemia, and sensitivity to neuromuscular blocking drugs. The existence of a myopathy should raise concerns of malignant hyperthermia.

We planned an anesthetic technique avoiding triggers of malignant hyperthermia and potential respiratory complications. This was addressed by using propofol infusion as general anesthetic and the absence of analgesic property warrants supplementation with fentanyl and rocuronium for muscle relaxation.

There is no doubt that patients with mitochondrial disease can undergo general anesthesia safely. The dilemma with these types of patients is how to further decrease the risk of complications. Strict attention should be made to monitor the respiratory function and capacity, hence vigorous respiratory physiotherapy should be a standard post-operative care. Providing a balanced anesthesia in these patients requires knowledge of drugs that may precipitate malignant hyperthermia and potential aggravating factors to preexisting mitochondrial sequelae.

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S-278.

INFECTIOUS COMPLICATIONS IN LIVER TRANSPLANT RECIPIENTS IN THE MELD ERA

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INTRODUCTION: Pulmonary and blood stream infections (BSI) are a significant cause of morbidity and mortality following liver transplantation (1). Since December 2006 organ allocation for liver transplantation in Germany is based on the model for end-stage liver disease (MELD). This policy serves the sickest patients first. We evaluated the incidence and microbial pattern of BSI and pulmonary infections (PI) and compared these patients' data with a pre-MELD control group.

METHODS: This IRB approved study included adults following deceased donor liver transplantation in our ICU before (pre-MELD group) and after MELD introduction (MELD group). Data analyzed were severity of acute physiology score II (SAPS), incidence of BSI, PI, and microbial pattern. Data are reported in median, ranges and percentages. The Chi-Square and Mann-Whitney-U tests were used for statistics; a p-value of < 0.05 was considered as significant.

RESULTS: 173 patients in the pre-MELD group and 130 recipients in the MELD group were identified. SAPS II and MELD scores were significantly higher in the MELD group (SAPS II: 42; 12-88 vs 33; 4-92, p=0.04 and MELD: 25; 7-40 vs 13; 8-36, p= 0.03) (Septic episodes were significantly more frequent in the MELD group (42% versus 21%, p = 0.003). Sepsis related mortality increased significantly from 15% pre-MELD to 44% in the MELD era (p=0.01). The pulmonary infection incidence and overall mortality from PI was not different between groups (5.2% vs 8.5%, p = 0.96 and 58% vs 54%, p = 0.26 in pre-MELD and MELD groups respectively). Aspergillus caused 37 % of PI in both groups and lead to 100% mortality.

In the MELD group, BSI were caused by gram positive cocci in 56%, by Candida in 9%, by extended spectrum β Lactamase (ESBL) bacteria in 4%, by vancomycin resistant enterococci (VRE) in 3.6 % and by oxacillin-resistant staphylococcus aureus (ORSA) in 1.8%. The rate of MRSA, ESBL, and VRE infections did not increase in the MELD-era.

CONCLUSION: Liver transplant recipients are at high risk for postoperative BSI and PI. The BSI related mortality increased significantly since the introduction of MELD for organ allocation in Germany favoring sicker patients to receive a transplant. However, multidrug resistant bacterial infections and aspergillus related PI mortality was unchanged between the pre-MELD and MELD era in our single-center study. Our results underscore the importance of early detection and aggressive management of BSI and pulmonary infections in liver transplant recipients when organ allocation is MELD based.

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S-279.

SEX BIAS IN DRUG-INDUCED HEPATITIS IN BALB/C MICE: A ROLE FOR NKT CELLS

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INTRODUCTION: Many autoimmune diseases are more prevalent in women. Drug - induced, hepatitis from halogenated volatile anesthetics, antibiotics or carbamazepine is also more prevalent in women. However, precise mechanisms responsible for sex bias are unclear. We have formulated a model of anesthetic hapten-induced hepatitis where hepatitis develops three weeks after immunizing BALB/c mice with a drug hapten-autoantigen conjugate, trifluoroacetyl chloride-hepatic S100. We have demonstrated sex bias in our model where female BALB/c mice develop more hepatitis and TFA antibodies than males. We have previously reported that sex bias is caused, in part, by elevated induced foxp3+CD25+CD4+ regulatory T cells in male mice. However, roles of innate immune responses in this form of sex bias have not been investigated. NKT cells are components of the innate immune system that have critical roles in maintenance of immune tolerance in mice and humans. We hypothesize that NKT cells have a critical role in the development of sex bias in experimental drug - induced hepatits.

METHODS: To discover if NKT - dependent mechanisms significantly contribute to sex bias in experimental drug - induced hepatitis in BALB/c mice, we immunized CD1d-/- (NKT deficient) female and male mice on a BALB/c background with the trifluoroacetyl chloride - hepatic S100 conjugate. After three weeks we measured hepatitis by histology, serum anti - TFA antibodies and assessed liver and spleen supernatant cytokines and chemokines. Female and male BALB/c (WT) mice were used as controls and immunized and analyzed as described.

RESULTS: We found that male CD1d-/- mice developed significantly more hepatitis and hepatic cytokines than male WT mice. This finding abolished sex differences in severity of experimental drug - induced hepatitis between male and female CD1d-/- mice. Since our model is characterized by neutrophilic inflammation we focused on hepatic expression of the neutrophil chemoattractant KC. We expectedly found increased hepatic KC expression in female BALB/c mice when compared to males ($p<0.05$). However, when we examined hepatic KC expression in CD1d-/- mice we found elevated expression in male mice and not females ($p<0.05$). Similar to our findings by histology, we discovered that sex bias in anti-TFA antibodies was also abolished.

DISCUSSION: Our data suggests that NKT cells play a sex - dependent role in the development of hepatitis where NKT cells may be protective in male BALB/c mice, while the contribution to hepatitis in female mice is less clear. We demonstrate complex regulatory roles for NKT cells in the development of drug-induced, immune - mediated hepatitis and support the notion that multiple immune mechanisms have a role in this phenomenon in mice and humans. These mechanisms may explain why some men are susceptible to this form of liver injury.

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Exp Mol Path 78(2)87-100.

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S-280.

PROTEIN C LEVELS AFTER LIVER TRANSPLANTATION AND EARLY GRAFT DYSFUNCTION

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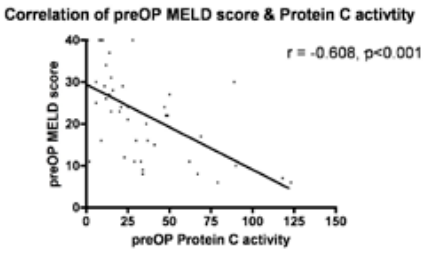
INTRODUCTION: Protein C (PC) is a natural thrombin antagonist that inactivates factors Va and VIIIa; it is produced in hepatocytes via a vitamin-K dependent pathway (1). Decreased plasma PC activity occurs in hepatic failure (2) and may confer a prothrombotic diathesis. Little is known about the pattern and significance of the recovery of PC activity after orthotopic liver transplantation (OLT).

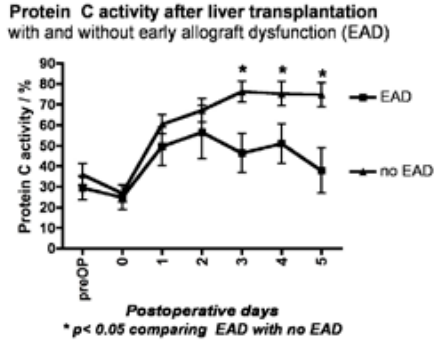
METHODS: After IRB approval and written informed consent, plasma was collected in 45 patients undergoing OLT preoperatively and then daily for 5 days. PC activity was measured by Eli Lilly & Co using the Staclot Protein C kit from Stago Diagnostica (Asnieres-Sur-Seine, France). Levels were expressed as % of normal activity (normal range 70 - 130%). We calculated preoperative MELD scores, and defined early allograft dysfunction (EAD) as a total bilirubin (TB) level > 5 mg/dL on postoperative day (POD) 5. Preoperative PC activity was compared with the MELD score, and postoperative activity between patients with and without EAD.

RESULTS: Plasma PC activity was low prior to surgery (34.3 ±4.3%), decreased immediately after surgery (26.2 ±3.4%), increased significantly on POD 1 (58.0 ±4.2%), and then remained significantly elevated above preoperative levels through POD 5. There was an inverse correlation between the preoperative MELD score and preoperative PC activity (Spearman's $r = -0.608$, $p<0.001$; Fig. 1). Compared with patients without EAD after OLT ($n = 35$), patients with EAD ($n = 10$) had significantly lower PC activity from POD 1, and did not achieve normal activity by POD 5. (Fig. 2).

DISCUSSION: Impairment of preoperative PC activity correlated with the severity of liver failure as indicated by the MELD score prior to OLT. Plasma PC activity recovered rapidly in patients with good graft function but remained significantly lower in patients with EAD. This preliminary study suggests that PC activity may be a useful indicator of EAD after OLT. Further research is required to establish whether early low PC activity is predictive of long-term poor outcome, or whether low PC activity predisposes to graft thrombosis or systemic sepsis, and whether administration of activated PC in these situations might be beneficial.

The study was supported by a grant from Eli Lilly and Grant Number UL1 RR024156 from the National Center for Research Resources (NCRR). Assays were performed blind by Eli Lilly.





S-281.

DONOR AGE MAY ACCOUNT FOR DECREASED GRAFT SURVIVAL IN GENDER DISPARATE LIVER TRANSPLANTATION

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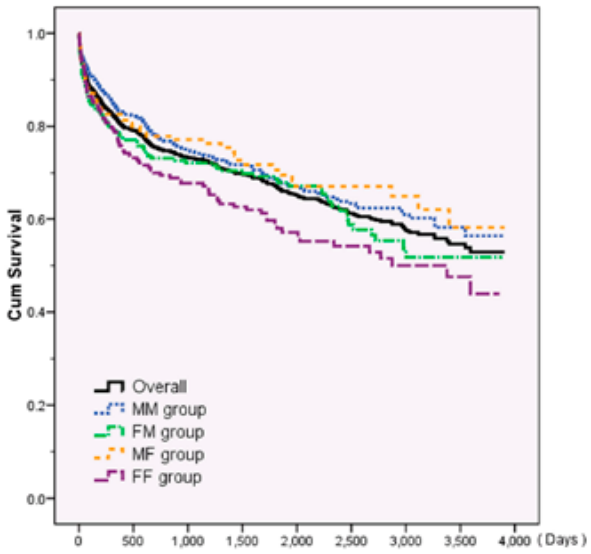
INTRODUCTION: In orthotopic LT, donor to recipient organ matching is primarily based on blood type and size rather than gender. However, research studies have shown that gender disparity affects graft survival in LT.1 The underlying causes for decreased graft survival in gender disparate matches are unclear. Therefore, we sought to investigate risk factors for graft survival in gender disparate LT.

METHODS: We retrospectively analyzed data of patients who underwent LT between 1997 and 2008 in our institution, and grouped them into four donor-recipient gender pairs: Male to Female (M-F); Female to Male (F-M); Male to Male (M-M); and Female to Female (F-F). We compared demographics of donors and recipients, as well as recipient intra-operative and post-operative data. We analyzed data using ANOVA, post hoc Tukey, Kaplan-Meier survival (11 years), and Cox proportional hazard analysis.

RESULTS: Our study cohort consisted of 1218 LT patients: 164 in the M-F; 276 in the F-M; 562 in the M-M, and; 216 in the F-F groups. Overall graft survival was 52.9% (range: 43.9% F-F - 58.2% M-F) and significantly lower in F-M (M-M vs. F-M; 56.4%, 51.8%, p=0.002) and F-F match cases (M-F vs. F-F; 58.2%, 43.9%, p<0.001) [Figure]. Donor grafts from females were significantly older than male donor grafts (M-M vs. F-M 40.1±0.7, 44.6±1.0, p=0.002 and M-F vs. F-F 36.6±1.5, 43.9±1.2 p<0.001). Hazard analysis revealed that donor age rather than gender was a significant risk factor for graft survival (hazard ratio 1.006, p=0.016). There were no other significant differences among paired groups, including other known donor risk factors such as: size mismatch, preoperative total bilirubin, cold/warm ischemia time or cause of death.

DISCUSSION: Female donors in our cohort of LT cases tended to be significantly older than male donors. Findings showed that, irrespective of gender, for every year increase in donor age above 30 years old graft survival decreased by 1 %. We conclude that graft survival in gender disparate LT cases may be explained on the basis of donor age rather than gender disparity, size mismatch or any other known risk factor.



S-282.

UP-REGULATION OF HEME OXYGENASE-1 BY SEVOFLURANE IS NOT DEPENDENT ON KUPFFER CELLS AND ASSOCIATES WITH ERK 1/2 AND AP-1 IN THE RAT LIVER

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INTRODUCTION: The volatile anesthetic sevoflurane (SEVO) is a potent non-toxic inducer of hepatic heme oxygenase-1 (HO-1) gene expression. We could previously show that administration of volatile anesthetics protects the liver from ischemia/reperfusion injury by up-regulation of hepatic HO-1.1 The activation of kupffer cells could lead to an increase in reactive oxygen species, which may account for hepatic HO-1 induction. Therefore, the aim of this study was to clarify the mechanism of SEVO induced HO-1 gene expression in the liver and in particular to elucidate the role of kupffer cells in this context.

METHODS: Male Sprague-Dawley rats were randomized into two groups: 1: PEN (pentobarbital sodium, 40mg/kg/BW/h i.v.) 2: SEVO (4 Vol%). A tracheotomy was performed and animals were mechanically ventilated for 5 hours. Liver tissue was analysed for HO-1 mRNA and protein expression as well as HO activity. Transcription factor analyses were performed by electrophoretic mobility shift assays and MAP kinase phosphorylation by western blotting. To evaluate the role of Kupffer cells in HO-1 induction, in vivo depletion of this cell type was achieved by intraperitoneal administration of clodronate containing liposomes in an additional set of experiments.

RESULTS: SEVO anesthesia profoundly up-regulated HO-1 gene expression in hepatocytes. This was associated with an activation of ERK1/2 and AP-1. No differences could be observed in DNA binding of NFkB, HSF, and HIF-1alpha. In addition, JNK and p38 MAP kinase showed no differences after SEVO treatment. Administration of clodronate containing liposomes led to a complete depletion of kupffer cells as demonstrated by immunohistochemistry. However, SEVO induced up-regulation of HO-1 in hepatocytes was not affected by kupffer cell depletion in vivo.

DISCUSSION: SEVO induced HO-1 gene expression in hepatocytes is not dependent on kupffer cells and associates with activation of ERK 1/2 MAP kinase and the transcription factor AP-1. This observation may have an impact on the development of strategies for hepatic organ protection.

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S-283.

AVAILABILITY OF ANESTHETIC EFFECT MONITORING: INFLUENCE ON UTILIZATION, INTRAOPERATIVE MANAGEMENT AND OUTCOME IN LIVER TRANSPLANTATION

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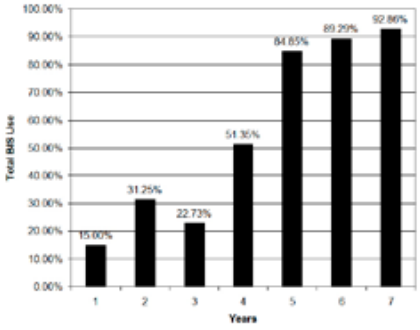
INTRODUCTION: Anesthetic effect monitoring may facilitate use of lower inhalational anesthetic doses during general anesthesia unrelated to liver transplantation(1,2). Information on utilization of this technology when made available and a possible influence on intraoperative management and time to extubation is limited. To fill this knowledge gap we conducted a retrospective study in liver transplant (LT) recipients with and without such monitoring.

METHODS: Following institutional review board approval, records of 83 randomly selected patients undergoing LT were analysed after bispectral index (BIS™) monitoring became available. Annual BIS utilization in our program was evaluated, and we compared 41 BIS monitored patients to 42 controls, all received an isoflurane/air/oxygen and opioid-based balanced anesthetic with planned postoperative ventilation. Data collection included age, BMI, gender, MELD score and time to extubation (TtE) prior to implementation of an early extubation protocol. Mean, preanhepatic, anhepatic and postanhepatic end-tidal isoflurane concentrations (etISO) were compared, as well as BIS values for each phase of LT using the Kruskall-Wallis and Wilcoxon signed-rank test, respectively. P- values <0.05 were considered significant .

RESULTS: The use of BIS increased from 15% in the first year of availability to almost 93% of cases by year 7 (Fig.1).



There was no significant difference in age, gender, BMI, MELD or time to extubation between groups (Table 1).

Table 1	BIS group (n=41)	Control (n=42)	p- value
Age	51.8 + 9	51.3 + 8	0.39
BMI	28.3 + 4	27.8 + 5	0.32
MELD	20.6 + 7	19.7 + 7	0.27
Gender % Male	70.7 %	71.4 %	0.48
TtE (days)	4.9 + 11	2.4 + 3	0.08

The mean BIS was 38.74 + 5.25 with no significant difference between phases of transplantation. EtISO during the anhepatic stage was significantly different between groups (table 2).

Table 2	% End-tidal insoflurane			
LT Stage	BIS	Control	All	p-Value
Preanhepatic	0.62	0.70	0.66	0.12
Anhepatic	0.52	0.65	0.59	0.026
Neohepatic	0.61	0.70	0.66	0.06
All	0.58	0.68	0.63	0.03

DISCUSSION: When available, use of anesthetic effect monitoring for LT rapidly increases even in the absence of a protocol for early extubation, possibly reflecting the anesthesia teams desire for advanced intraoperative patient surveillance. Although significantly less isoflurane administration occurred in the BIS group during the anhepatic phase, the clinical difference was small and the time to extubation in this group was not different from control. Unless integrated into an intraoperative algorithm and early extubation protocol for fast tracking of LT recipients, availability of anesthetic effect monitoring during LT does not appear to provide a clinical benefit but instead drives cost.

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S-284.

POSTREPERFUSION SYNDROME DURING ORTHOTOPIC LIVER TRANSPLANTATION FOR CIRRHOSIS: VENO-VENOUS BYPASS VERSUS PIGGYBACK TECHNIQUE

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INTRODUCTION: Postreperfusion syndrome (PRS) has been defined as a marked decrease in the mean arterial blood pressure (MAP), by < 30% of baseline, following unclamping of the portal vein and liver reperfusion during orthotopic liver transplantation (OLT)(S.Aggarwal, 1989). Little is known about the predictors of PRS or their association with veno-venous bypass (VVBP) during OLT. The goals of this study were to identify and compare predictors of PRS in patients undergoing veno-venous bypass (VVBP) or piggyback technique during orthotopic liver transplantation.

METHODS: In a retrospective, matched case-control study, 100 consecutive OLT patients, from 2005-2008, were evaluated. Only patients with end-stage liver failure secondary to liver cirrhosis were studied. Patients were excluded from data analysis because of combined liver/kidney transplant, intraoperative death secondary to excessive hemorrhage, or limited data available. Variations between predictors of PRS and VVBP versus piggyback technique were evaluated using students t-test.

RESULTS: Of the 100 patients included in the study, 2 patients were excluded because of combined liver/kidney transplant, 2 patients were excluded because of intraoperative death, and 18 patients were excluded due to limited data available. Of the remaining 78 patients, 38 underwent VVBP and 40 underwent piggyback technique. Of the 38 VVBP patients, 26 patients (68%) developed PRS. Of the 40 piggyback technique patients, 15 patients (37.5%) developed PRS. Using students t-test, presence of PRS ($P = 0.002$); intraoperative Platelet administration ($P = 0.007$); VVBP or portocaval shunt time ($P < 0.0001$); total intraoperative Phenylephrine administration ($P = 0.036$); total intraoperative Dopamine administration ($P = 0.036$) were significantly different between VVBP and piggyback technique patients.

DISCUSSION: The rationale for using VVBP during OLT has been to maintain hemodynamic stability, preserve cardiac blood flow, and reduce the need for blood product transfusion (Hamidreza Fonouni, 2008). In this study, however, patients who underwent VVBP experienced higher rates of PRS; increased intraoperative amounts of Platelets, Phenylephrine, Dopamine; higher VVBP versus portocaval shunt times. While previous studies have evaluated the intraoperative and postoperative effects of PRS, none have studied the association between VVBP and PRS. In conclusion, in this study, patients undergoing VVBP experienced significant adverse intraoperative hemodynamic changes during OLT. These results provide a clinical target when evaluating veno-venous bypass or piggyback technique during orthotopic liver transplantation.

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S-285.

COMPARISON TWO POST OPERATIVE ANALGESIA TECHNIQUES FOR LIVER SEGMENT DONORS

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INTRODUCTION: We reviewed the charts of living liver segment donor patients (n=77) to gauge the effectiveness of pain relief with two post-operative pain control methods: Epidural (EPI n=42)vs On-Q pump (OQP n=35). Both groups had IV PCA with dilaudid and local anesthetic (LA) 0.25% Marcaine either in epidural or in the wound via catheter placed in the wound by the surgeon. In this small retrospective study, we noted the OQP technique to be less effective for the first 24 hours compared to the "gold standard" of epidural analgesia.

METHOD: The tracking tool recorded the effectiveness of pain relief at several post-operative time points by pain scale (1-10), mg. of dilaudid administered, and several physiologic parameters.

RESULTS: The groups had similar profiles pre-operatively. The PS (Epi 1.8 vs 3.3) and mg. dose of dilaudid (Epi 3.3 vs. 6.0) was almost double in the first 24 hours. We compared the two techniques considering all the variances using student t test $p= 0.009$ which demonstrated significant differences in the profile of day 1. The repeat analysis with more dynamic details over time for both groups $p= 0.032$, again showing significant differences. We did not compare LA as it was similar in both groups. We did not compare the intra operative fluid in this study.

DISCUSSION: Epidural pain relief for living liver segment donors has been proven effective, but removal of the epidural catheter is controversial due to early DVT prophylaxis and the potential for impaired coagulation in these patients. The OQP is a self-deflating balloon inserted at each end of the wound, set to deliver LA at a constant rate in the post-operative period. The EPI group had consistently lower pain scores and reduced need for rescue medications for 48 hours, but did require almost double the amount of intra-operative fluid. The OQP group required frequent rescue narcotic and non narcotic medications over 48 hours to control pain. On day 2, both groups had higher narcotic requirements, possibly due to early ambulation and but were otherwise similar. The OQP group had more post-operative events, i.e. reintubation, prolonged PACU stay, & hypertension possibly related to ineffective use of adjuncts with the OQP in early post operative period. The study points main difference were found on first 24 hours.Pre-operative eduaction for the staff with emphasis on adjuvantive therapy may be needed.This small retrospective study suggests the present OQP approach was inferior to EPI for post-operative analgesia for upper abdominal surgery. But with the morbidity associated with EPI, lack other alternatives, the OQP technique with modification has an edge for liver segment donation surgey. The success of the OQP technique depends on the ability to use targeted adjunctive therapy in conjunction with OQP.

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S-286.

TWO CASES OF FULMINAT HEPATITIS DUE TO EPSTEIN BAR VIRUS

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INTRODUCTION: The main causes of fulminant hepatitis in pediatrics are most of unknown. Primary Epstein-Barr virus infection is usually a benign, self-limited disease in pediatrics but can exceptionally be fatal. Liver transplantation is known to be a final method, but this modality is still contravertial. We have experienced two cases of fluminant Epstein-Barr virus (EBV) infection, one could not survive with urgent living donor liver transplantation, and the other case could survive by conservative treatment including low-dose immunosuppression and anti-cancer therapy, without liver transplantation.

CASE 1: A 4-years-old girl had fever, nausea and diarrhea following sudden deteriorated consciousness and liver function test. Her serum AST 8231 IU/L, ALT 6230 IU/L and PT-INR 3.2, and her pediatric end-stage liver disease (PELD) was 30 points. She had to receive urgent living donor liver transplantation in order to rescue her life because her condition had deteriorated rapidly, although her unknown diagnosis. However, her AST and ALT had continued to increase in spite of liver transplantation. At postoperative day 1 her etiology was confirmed by detection of specific antibodies to EBV-DNA in patient's serum and liver tissues. She started to have low-dose immunosuppressant and anti-cancer therapy, and her liver function could recover temporally. However she was died of her graft dysfunction at postoperative day 65.

CASE 2: The patient was a 15-year-old man who presented to the clinic initially with nonspecific symptoms of fatigue, fever and cough. Past medical history was noncontributory. His serum AST 16180 IU/L, ALT 8610 IU/L and PT-INR 2.3, and his model for end-stage liver disease (MELD) was 36 points. The medical team was in the process of preparing him for transport to receive a liver transplant but his diagnosis was confirmed by detection of EBV-DNA in his laboratory exam. His general condition rapidly deteriorated and urgent liver transplantation was suspended. In addition to conventional physiological supports including renal and respiratory therapy, low dose immunosuppressant and anti-cancer therapy were given to him after immediately his diagnosis, his liver and renal function could gradually recover. After 56 days he could go out of intensive care unit without receiving liver transplantation.

DISCUSSION: Sporadic cases of acute liver failure caused by primary EBV infection have been reported in the literature, with an overall mortality of 87% . A survivor case was reported, after treatment with an association of emergency orthotopic liver transplantation and low-dose immunosuppression, a pooled gammaglobulin preparation containing anti-EBV antibodies, and anti-viral therapy. This observation emphasizes that EBV must be known as a possible cause of fulminant hepatitis. Urgent liver transplantation is known to be probably the unique therapeutic option to avoid a fatal course, but we have to take into full consideration about the timing and indication of liver transplantation.

S-287.

TRANSITION FROM APROTININ TO EPSILON-AMINOCAPROIC ACID IN LIVER TRANSPLANTATION

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INTRODUCTION: Aprotinin was used previously at our center to minimize blood loss during liver transplantation, but was replaced with epsilon-aminocaproic acid (EACA) when aprotinin was removed from the market in November 2007. This study compares clinical outcomes for patients receiving these two antifibrinolytic agents or no agent.

METHODS: The operative and post-transplant records for all deceased donor liver transplants from 2001-2008 were reviewed. Extracted anesthesia data included use of antifribinolytic agent, blood loss, blood product usage, operative urine output, early graft function, and post-operative complications including graft thrombosis, change in renal function, stroke, deep venous thrombosis (DVT), and myocardial infarction (MI). Study groups included low dose aprotinin (apro-low), high dose aprotinin (apro-high), or no agent.

RESULTS: Data were included for 1013 consecutive deceased donor liver transplants. Study groups included apro-low (n=324, 32%), apro-high (n=308, 30%), EACA (n=79, 8%), and none (n=302, 30%). Study group demographics and clinical data differed only with retransplantation being higher in the group with no agent and warm ischemia time was lowest for EACA. The groups did not differ in blood loss (800-1000 cc) or required blood transfusions (4 - 5 units), though apro-high received significantly more fresh frozen plasma than the other groups (8 versus 4 to 6 units). Peri-operative graft loss did differ among the groups, and 90-day and 1-year survival were significantly higher in the apro-low and EACA groups. There were no differences in intraoperative urine output or post-operative stroke, DVT or MI.

DISCUSSION: These results suggest that the transition from aprotinin to EACA resulted in negligible changes in clinical or operative outcomes. There were improved transplant outcomes, with better 1-year survival, for patients who received EACA or apro-low.

S-288.

WITHDRAWN.

Neuroanesthesia

S-289.

NEUROPROTECTVE EFFECTS OF A RHO-KINASE INHIBITOR ALONE OR COMBINED WITH AN α2 ADRENOCEPTOR AGONIST IN A RAT TRANSIENT FOREBRAIN ISCHEMIA-REPERFUSION MODEL

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INTRODUCTION: We examined the combined neuroprotective effects of fasudil (Rho-kinase inhibitor) and dexmedetomidine (α2 agonist) using a rat transient forebrain ischemia-reperfusion model in terms of neurological and histological outcomes, since both agents are known to provide neuroprotective effects (1,2).

METHODS: After approval by the animal research committee, 38 adult normothemic (temporal muscle temperature of 37.5 C) male Sprague-Dawley rats (300-400 g) were randomly divided into control (C), fasudil (F), dexmedetomine (D), or fasudil plus dexmedetomine (FD) group (n=9-10 for each group). Groups F and FD received intraperitoneal injection of fasudil 10 mg/kg, while groups C and D saline 1 ml/kg, at 1 and 2 days before cerebral ischemia. Following surgical preparation under anesthesia with fentanyl (25 μg/kg/h), pancuronium and nitrous oxide (66%) in oxygen, groups D and FD received intraperitoneal injection of dexmedetomine 10 μg/kg, while groups C and F saline 1 ml/kg, at 30 min before cerebral ischemia. Forebrain ischemia was induced with hemorrhagic hypotension (mean arterial pressure of 40-50 mmHg) and bilateral carotid artery occlusion for 10 min, and was confirmed by isoelectric EEG. Then, the brain was reperfused. The neurological score was evaluated at 1, 2 and 3 days after ischemia (no damage = 18 points, worst = 0 point). Then, the brains were removed, and 6 mm-coronal sections were stained with hematoxylin and eosin for histological evaluation of hippocampal CA1 region. Data (median or mean ±SD) were analyzed by analysis of variance or Kruskal-Wallis analysis for comparisons among groups, with $P<0.05$ being significant.

RESULTS: The median neurological score was significantly higher in the group F than the group D at 2 days after ischemia ($P<0.05$; C: 11.5 points, F: 16 points, D: 11 points, FD: 14 points). The percentage of intact neurons in the hippocampal CA1 region was significantly greater in the group F than the group C ($P<0.01$; C: 24±17%, F: 52±13%, D: 26±15%, FD: 26±16%).

DISCUSSION: Our results suggest that pretreatment with fasudil 10 mg/kg, but not with dexmedetomidine 10 μg/kg provides a neuroprotective effect after transient forebrain ischemia in rats. The neuroprotective effect of fasudil is likely to be attenuated by dexmedetomidine.

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S-290.

RECORDING OF THE 20-HZ AUDITORY STEADY-STATE RESPONSE DURING GENERAL ANESTHESIA

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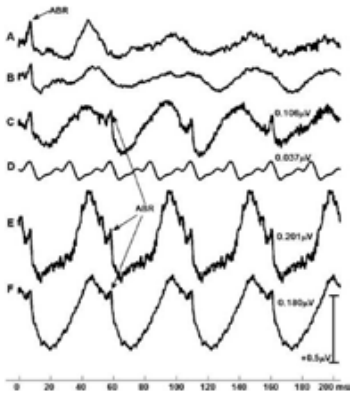
INTRODUCTION: The amplitude of the auditory steady-state response obtained with 40-Hz stimulation (40-Hz ASSR) correlates with anesthetic depth. However, 40-Hz ASSR amplitude relates to anesthetic depth in a non-monotonic manner,1 and this non-monotonicity is explained by how the auditory middle-latency potential or transient response is convolved or overlapped in the brain.2 In awake patients, 40-Hz ASSR amplitude is larger than that of the 20-Hz ASSR. However, since 20-Hz oscillations were recently observed in 5- and 40-Hz transient responses in surgical patients,2 we hypothesized that the 20-Hz ASSR amplitude would be greater than that of the 40-Hz ASSR during general anesthesia.

METHODS: Electrodes (Fz, Cz, and mastoid) were placed on a patient scheduled for elective surgery. During the maintenance period (sevoflurane, 1.6%), isochronic clicks (5-, 20-, and 40-Hz) , and jittered clicks (~40-Hz) were presented to the right ear. The different click stimuli were presented in an interlaced fashion. Electroencephalographic (EEG) recordings were obtained with a SmartEP device and analyzed to obtain the 20- and 40-Hz ASSR and the 5- and 40-Hz transient response. The 5- and 40-Hz transient responses were then convolved to predict the 20- and 40-ASSRs.

RESULTS: The figure shows transient responses (A and B), recorded ASSRs (C and D), and predicted ASSRs (E and F). Qualitative differences are observed in the 5- and 40-Hz transient responses (A and B, respectively), consistent with literature reports. The 20-Hz ASSR (C) appears to have larger deflections than the 40-Hz ASSR waveform (D). The root-mean-square values were 0.106 uV (20-Hz) and 0.037 uV (40-Hz). The predicted 20-Hz ASSR waveforms from the 5-Hz (E) and 40-Hz (F) transients have larger deflections than those of the actual recorded 20-Hz ASSR, though the brainstem response (ABR) labeled with arrows is accurately predicted. These results suggest that the 20-Hz transient (not recorded here) must be different than the 5- and 40-Hz transients, and that this difference likely results from the differential responses to click rate of the sub-cortical and cortical neurophysiologic generators during general anesthesia.



DISCUSSION: These preliminary data suggest that during general anesthesia, the relation between 20-Hz and 40-Hz ASSR amplitudes is reversed relative to that normally observed in the awake state. Since this experiment involved one lower rate (20-Hz), there may be other rates that also show this reversed relation. However, 20-Hz is in the beta frequency range and power in this EEG region (spontaneous electrical activity) is known to be increased during anesthesia. Together with a prior study2 that showed evoked 20-Hz oscillations in transient responses, these data preliminarily suggest that under anesthesia, populations of neurons are more responsive to beta frequencies and that with stimulation that they may become entrained.

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S-291.

OSTEOPONTIN PROTECTS BRAIN TISSUE AND IMPROVES NEUROLOGIC OUTCOME AFTER SURGICALLY INDUCED BRAIN INJURY IN RATS

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INTRODUCTION: Osteopontin, a provisional matrix protein naturally produced by the body, has been shown to have neuroprotective effects mediated by antioxidant1, anti-inflammatory,[1] and antiapoptotic[2] pathways (Figure 1). Brain injury due to the neurosurgical procedure itself can lead to post operative complications such as brain edema and altered neurologic function. The objective of this study was to evaluate whether Osteopontin pretreatment reduces brain edema by preventing blood brain barrier (BBB) disruption and improves neurologic status after surgically-induced brain injury (SBI).

METHODS: 42 Male Sprague Dawley rats weighing between 275 and 325g were divided randomly into 3 groups: sham surgery(n=10), vehicle(n=16), and Osteopontin 0.1ug(n=16). Animals were pretreated with vehicle or Osteopontin by intraventricular injection immediately prior to SBI. The SBI model involves a partial right frontal lobectomy that incorporates brain resection and damage due to electrocautery. Neurologic evaluation was done at 24 hours post SBI and the animals were sacrificed for brain water content (BWC) calculation, BBB evaluation, histologic assessment, and pathway protein analysis. Significance was set at $p<0.05$.

RESULTS: SBI significantly increased BWC in the right frontal lobe (Vehicle: 82.34+0.86%; Osteopontin 0.1ug: 81.53+0.95%) as compared to the left frontal lobe (Vehicle: 80.49+0.70%; Osteopontin 0.1ug: 80.31+0.59%). Osteopontin significantly reduced BWC in the right frontal lobe as compared to vehicle (Vehicle: 82.34+0.86%; Osteopontin 0.1ug: 81.53+0.95%; Figure 2). Evans blue testing showed a significantly greater disruption of the BBB between vehicle and Osteopontin groups (Vehicle: 116.59+28.55 ug dye/g brain; Osteopontin 0.1ug: 80.57+18.00 ug dye/g brain; Figure 3). Vibrissae forelimb placement test showed significant improvement in the Osteopontin group compared to the vehicle group (Vehicle Lt Ipsilateral: 0.88+1.46; Osteopontin Lt Ipsilateral: 5.13+1.46; Vehicle Lt Contralateral: 0.50+0.93; Osteopontin Lt Contralateral: 4.63+2.26; Figure 4). Western blot analysis of IKK deactivation and IKB degradation showed significant activation of the antiapoptotic pathway in the OPN group (Figure 5). MMP-2 and MMP-9 analysis showed a trend in reduction of inflammatory protein mediators in the treatment group (Figure 6). ZO-1 analysis showed the preservation of BBB protein in the OPN group (Figure 7).

DISCUSSION: Osteopontin significantly reduces brain edema, protects the BBB, and improves neurologic scores after SBI. It appears that its actions are mediated through antiapoptotic and anti-inflammatory pathways as shown by Western Blot analysis. These properties appear to preserve the BBB by protecting the ZO-1. This novel compound may significantly reduce the edema resulting from brain resection and thus reduce the morbidity and mortality associated with neurosurgery. Future studies are needed to further evaluate the specific pathways involved in neuroprotection and the potential for clinical application of osteopontin.

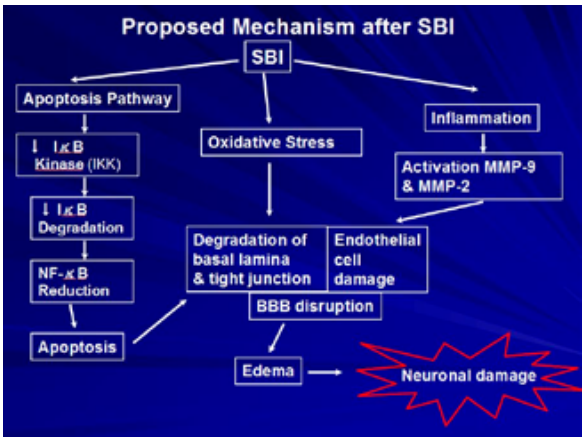

Figure 1

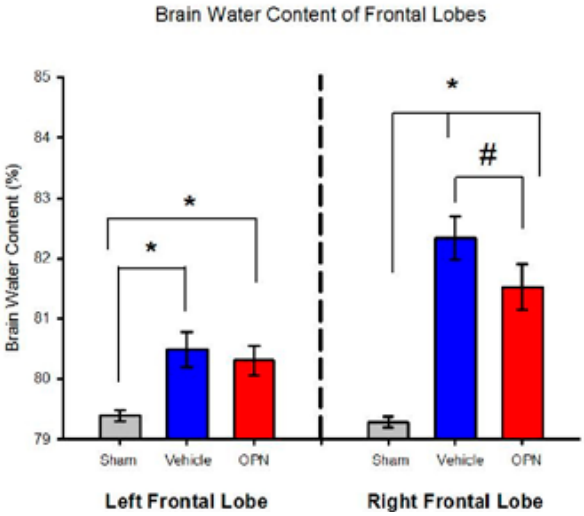

Figure 2

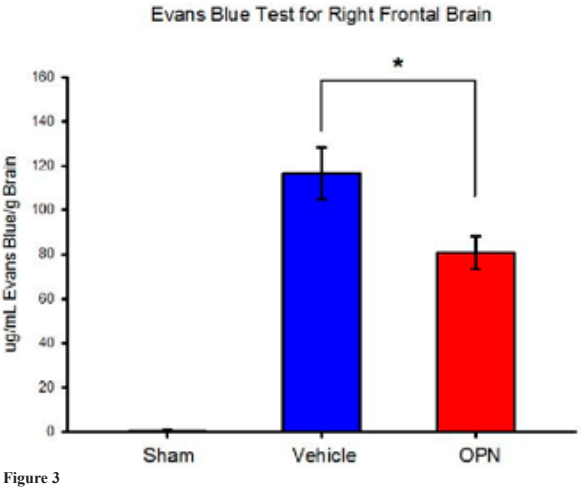

Figure 3

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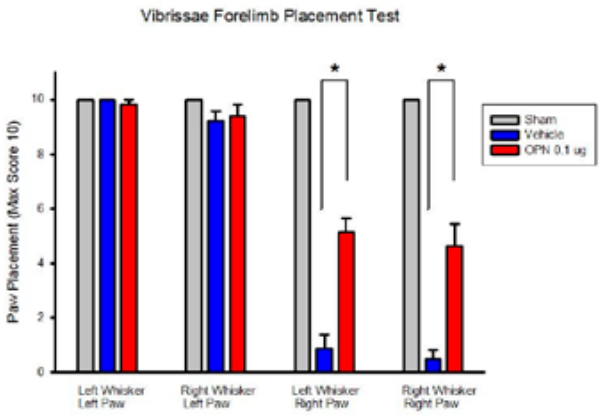

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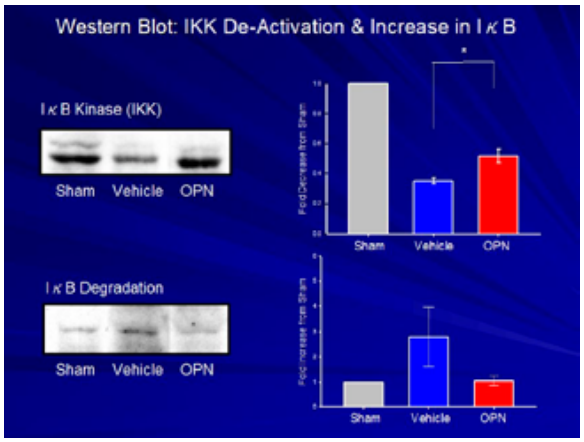

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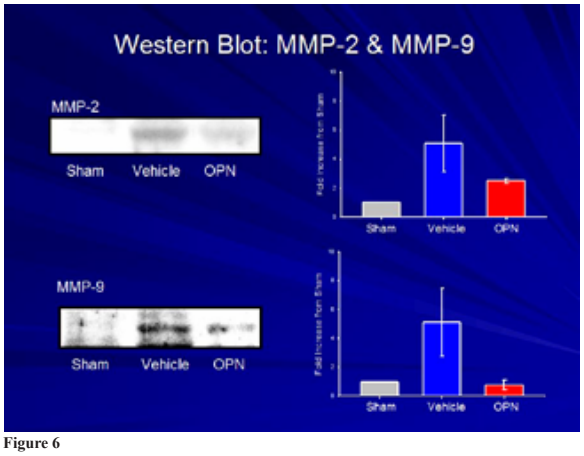

Figure 6

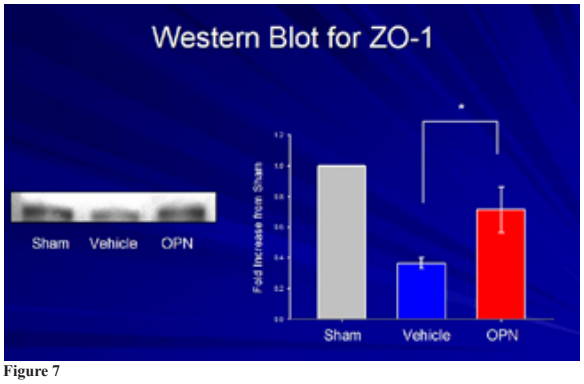

Figure 7

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TIME COURSE EXPRESSION OF PLASMA CYTOKINE LEVELS FOLLOWING ACUTE HYPOTENSION AND ASSOCIATED COGNITIVE DYSFUNCTION IN MICE

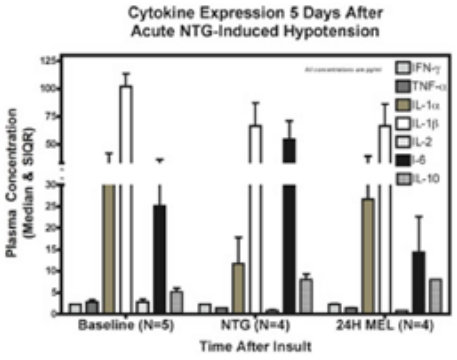
AUTHORS: E. Garcia[1], **M. Haile[1],** J. D'Urso[1], D. Quartermain[2], S. Galoyan[1], A. Bekker[1];

AFFILIATION: [1]Anesthesiology, New York University, New York, NY, [2]Neurology, New York University, New York, NY.

INTRODUCTION: Hypotension has been implicated in the development of cognitive dysfunction (CD). Nitroglycerin induced hypotension (NTG-IH) to below the range of cerebral autoregulation causes a transient delayed impairment of short-term memory that was attenuated by the NSAID Meloxicam (MEL) given at 24h1. Mice had intact memory on day 1, impaired memory on day 5, and recovered memory on day 9. We tested the hypothesis that plasma cytokine levels would be associated with CD.

METHODS: After IACUC approval, 30 SwiS-Webster, 30-40 g mice (6-8 weeks) were randomized into six groups: 1) no treatment; 2) i.p. NTG (60 mg/kg) tested at 8h; 3) NTG at 24h; 4) NTG at 72h 5) NTG on Day 5; 6) NTG then i.p. MEL (60mg/kg) at 24h tested on Day 5; 6) NTG on Day 9. Subjects were anesthetized with i.p. Ketamine (90mg/kg)/Xylazine (10mg/kg) before cardiac puncture with powdered-heparin syringes (Smiths, UK). Plasma levels of TNF-α, INF-γ, IL-1α, IL-1β, IL-2, IL-6, and IL-10 were determined by ELISA with MILLIPLEX Multi-Analyte Profiling (Billerica, MA). Data was analyzed using Kruskal-Wallis One-Way ANOVA and compared against baseline using Mann-Whitney post-hoc tests with Bonferonni correction. Concentration values below or above the assay standards were assigned their respective min or max detectable value.

RESULTS: After box-plot adjustment for outliers, 1 sample each from groups 2; 5; 6 and 2 samples from group 4 were excluded from analysis. There were no significant differences in any markers for NTG and 24h delayed MEL treatment groups at day 5 compared to baseline.



A time course analysis of cytokine expression following NTG-IH showed that at 8h IL-1β is down-regulated while IL-10 is up-regulated ($p < .00167$); IL-6 showed trends of up-regulated expression at 8h, albeit not significant ($p = .286$). At 24h cytokine expression returned to basal levels and did not significantly differ from baseline at tested intervals up to day 9. At day 9 a significant down-regulation of IL-1β and IL-6, and an up-regulation of IL-10 was observed compared to baseline ($p < .00167$). No significant changes were observed in TNF-α, INF-γ, IL-1α, or IL-2 at any time

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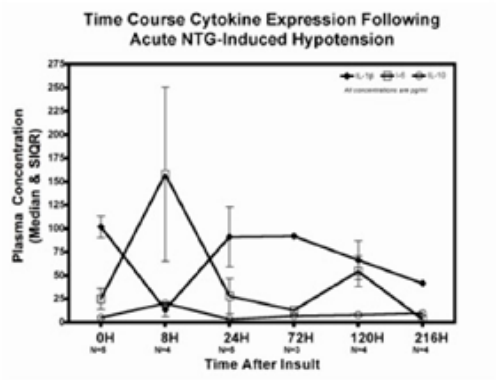

Conclusion: CNS inflammation and cytokine expression have been implicated in the development of cognitive dysfunction2. The observed time course expression pattern of IL-1β, IL-6, and IL-10 are strongly suggestive of inflammation and resolution brought on by acute hypotension. However, we did not observe any conclusive evidence of cytokine-dependent short-term memory function associated with Meloxicam treatment or NTG-IH at any interval. This suggests that secondary mechanisms dependent on cytokine expression might be involved with cognitive function in the setting of inflammation.

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S-293.

MINOCYCLINE PREVENTS THE IMPAIRMENT OF LONG-TERM ASSOCIATIVE MEMORY RETRIEVAL CAUSED BY LIPOPOLYSACCHARIDE INDUCED INFLAMMATION IN MICE

AUTHORS: K. Howell[1], **M. Haile[1],** E. Garcia[1], S. Galoyan[1], D. Quartermain[2], A. Bekker[1];

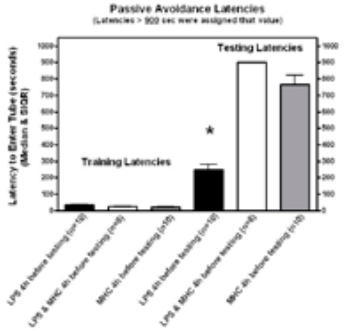
AFFILIATION: [1]Anesthesiology, New York University, New York, NY, [2]Neurology, New York University, New York, NY.

INTRODUCTION: Both systemic and local inflammatory responses may result in neuro-inflammation and subsequent central nervous system dysfunction. Lipopolysaccharide (LPS) induced inflammation produced a significant impairment of long-term associative memory retrieval but not consolidation in a passive avoidance retention paradigm (PA)1. In this study, Minocycline Hydrochloride (MHC), an antibiotic with anti-inflamamtory properties, was investigated as a treatment.

METHODS: Following IACUC approval, 30 SwiS-Webster, 30-40 g mice (6-8 weeks) were randomized into 3 groups for intraperitoneal injection of: 1) LPS (830µg/kg isolated from E.coli 055:B5 4h before testing; 2) LPS & MHC (50mg/kg) 4h before testing; 3) MHC 4h before testing. PA training latencies (sec) were recorded for entry from a suspended platform into a Plexiglas tube where a shock (0.3mA; 2 sec duration) was automatically delivered. 48hrs later latencies were recorded during a testing trial during which no shock was delivered. Latencies greater than 900 sec were assigned this value. Lower testing latency is indicative of an impairment of long-term associative memory.

RESULTS: After box-plot adjustment for outliers, 2 samples from group 2 were excluded from analysis. There were no differences in training latency between the groups. A Kruskal-Wallis one-way ANOVA indicated significant differences in testing latency ($H = 13.48$; $df = 2$; $p < .005$) between the groups. Post hoc comparisons using the Mann-Whitney U test with Bonferroni correction to $*p < .0167$ significance showed that concurrent MHC treatment with LPS 4h before testing significantly preserved PA retention ($U= 8.00$; $r = -.39$). MHC alone did not impair retrieval.

CONCLUSION: LPS-induced inflammation produced a significant



impairment of long-term associative memory retrieval in a PA paradigm while MHC treatment prevented that impairment. MHC decreases pro-inflammatory cytokine output by acting upon microglia signal transduction and activation. MHC is known to attenuate LPS induced neuroinflammation and its sequelae3. These results suggest that an acute-phase inflammatory response may disrupt the ability to retrieve long-term associative memory. Inflammation in the immediate and post-operative setting may have important consequences in the etiology and treatment of POCD.

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S-294.

SPATIAL MEMORY IN AN ACTIVE ALLOTHETIC PLACE AVOIDANCE TASK IN ADULT MALE SPRAGUE DAWLEY RODENTS SUBJECTED TO ISOFLURANE ANESTHESIA

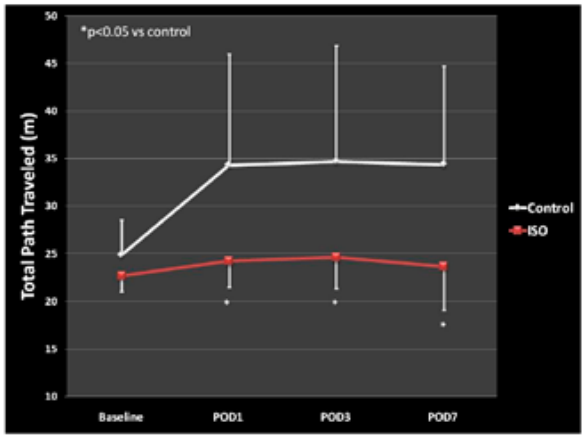
AUTHORS: M. E. Goldberg, Z. J. Carr, K. Manu, M. C. Torjman;

AFFILIATION: Anesthesiology, Cooper Universtity Hospital, The Robert Wood Johnson Medical School - UMDNJ, Camden, NJ.

INTRODUCTION: Animal models are important for studying postoperative cognitive dysfunction (POCD). Active allothetic place avoidance (AAPA) tasks assess spatially associated learned behavior involving the hippocampus, learning, and memory in rats. Such complex behavioral tasks can assess an animal's ability to efficiently organize goal directed behavior and may be a useful model to test POCD. In this study, we investigated the effect of isoflurane general anesthesia on spatial memory using the AAPA model.

METHODS: The AAPA system consists of an 80 cm circular arena with an invisible 60 degree arc sector designated as the shock zone. Animals were trained using 4 X 10 min daily sessions for 4 consecutive days. Location of the shock sector was fixed and determined by the subject's spatial relationship to the extramaze cue as arena rotation reduces the influence of intramaze cues. A mild electric shock was administered when the animal entered the shock sector with an intershock interval of 0.5 sec. 15 adult male Sprague Dawley rats were divided into a control (n=8) and intervention group (n=7). Animals in the intervention group were subjected to general endotracheal anesthesia maintained with isoflurane (1.2-1.5 MACrodent) for a period of 120 minutes with full monitoring. On post-anesthesia days 1, 3, and 7, experimental and control animals underwent two trials on the AAPA to evaluate retention of learning and memory. The variables examined per session were Number of Entrances into the shock zone, Number of Shocks, Latency to 2nd Shock, Total Pathlength Traveled, Path to 2nd Entrance, Maximum Time of Avoidance, and Maximum Path of Avoidance. Data were analyzed using ANOVA with repeated measures, followed by post-hoc analysis when deemed appropriate. Statistical significance was set at $p<0.05$.

RESULTS: All 15 animals were excellent respondents demonstrating nearly complete avoidance of the shock zone on the 4th day of training. Following isoflurane anesthesia and retesting of all animals, the Number of Shocks into the shock zone was not significantly different between groups ($p=0.26$), nor was the Maximum Time of Avoidance ($p=0.37$). Interestingly, Total Path traveled was significantly ($p=0.03$) decreased in the isoflurane treated animals (figure). Maximum Path of Avoidance and Path to 2nd Entrance were also decreased (p=ns).



DISCUSSION: The planning and execution of the active allothetic place avoidance task involves highly disciplined cognitive organization, planning and execution. A 2 hr isoflurane anesthetic showed no significant deterioration in some of the performance variables measured by the AAPA, compared to control, however Total Path traveled was significantly reduced in ISO animals, with corresponding reductions in Maximum Path of Avoidance, and Path to 2nd Entrance. We therefore cannot overlook the possibility of some effect from ISO on hippocampal place cell mapping and place navigation based on these data.

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S-295.

POSTOPERATIVE RECALL AND LEARNING AFTER MODAFINIL IN OLDER PATIENTS HAVING ISOFLURANE GENERAL ANESTHESIA

AUTHORS: R. Desai[1], M. E. Goldberg[2], M. C. Torjman[1], Z. Carr[3], M. Salah-Umer[1], R. Tarpley[1];

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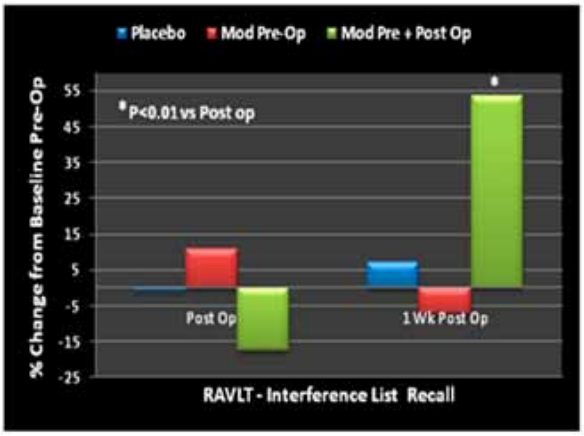
INTRODUCTION: Post operative cognitive dysfunction (POCD) has been shown in older adults after cardiac, and major non-cardiac surgery. (1) Investigations in this patient population have reported that this problem is associated with a higher mortality in the first post surgical year. A previous study demonstrated that Modafinil, administered by mouth, was superior to placebo in hastening recovery from residual anesthetic effects, and improved alertness and energy in postoperative patients. (2) This study investigated the effect of Modafinil vs. Placebo in the prevention and/or treatment of POCD in older patients using well tested learning and memory measures.

METHODS: 27 ASA I-III patients (65-85yrs.) scheduled for elective non-cardiac surgery were recruited in this prospective, double blind, placebo controlled IRB approved protocol. 3 groups were randomized as follows: placebo PO pre and post procedure, Modafinil 200mg PO pre-procedure and placebo post-procedure, and Modafinil 200mg PO pre and immediately post procedure. 5 successive trials of the Rey Auditory Verbal Test (RAVLT) with an interference list were administered 1 hr preoperatively, and 24 hr and 1 week post surgery. The anesthetic was standardized and up to 1.2 MAC Isoflurane was used for maintenance. Data were analyzed using Chi Square.

RESULTS: There were no significant differences in demographic data among the 3 groups. There was a significant ($p<0.01$) increase (~50%) from baseline to week 1 post-op in the RAVLT interference measure of memory in the patients administered Modafinil pre and post procedure (fig). This change was not seen in the placebo group nor the group that received Modafinil pre procedure. The 5 trial repeat performance showed improvement in recall for all subjects at the one week postoperative time point. This reflected learning was more pronounced in the Modafinil treated patients with inter trial increases of approximately 10-25% from the preoperative baseline as well as versus control ($p=0.07$).



DISCUSSION: Monk et al (1) have demonstrated a correlation with age (>59 yrs) and POCD 3 months after surgery, as well as a correlation between POCD and death at 1 year. Cottrell (3) has suggested that activation of neurons (perhaps through dopamine receptors) may play a role in preventing this dysfunction. Modafinil's dopaminergic activity may prevent the POCD seen with exposure to Isoflurane. In this limited number of subjects, performance in RAVLT measures was improved after administration of Modafinil, an interesting observation that may be supported by Modafinil's role as a potential inducer of hippocampus substrate utilization (4), suggesting activation of this center.

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S-296.

WITHDRAWN.

S-297.

BILATERAL BIS MONITORING TO DETECT CEREBRAL VASOSPASM IN THE ICU

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INTRODUCTION: Subarachnoid hemorrhage (SAH) is a prevalent and morbid condition which affects 30,000 Americans each year (1). It is initially fatal in 33- 50% of cases (2,3). However, a large percent of patients have late complications either due to rebleeding or cerebral vasospasm causing permanent neurologic disability or death. Early diagnosis of cerebral vasospasm is critical to prevent ischemic brain tissue from becoming infarcted (4). Recognition of clinical neurologic deterioration in the absence of hydrocephalus or rebleeding is the first objective sign leading to a diagnosis of vasospasm (1). Current methods to detect cerebral vasospasm include transcranial doppler (TCD), angiography, and several different CT and MRI techniques (1). Some of the exams are invasive, require special training to administer, and are not continual. There is EEG evidence that blood flow related changes of vasospasm precedes clinical deterioration by as much as two days (5). In this study we propose using bedside monitoring with bilateral Bispectral Index (BIS) (Aspect Medical Systems Inc., Newton, MA) to monitor real time changes in processed EEG patterns in SAH patients.

METHODS: All patients received standard ICU care. The bilateral BIS monitors were applied within 48 hours of SAH. BIS, GCS score and focal neurologic deficits were recorded every 12 hours. Tests for vasospasm including TCD, angiography, MRI and CT scans were documented. Bilateral BIS data was analyzed for trends and correlated with clinical and radiographic evidence of vasospasm.

RESULTS: Six patients were enrolled. The number of days in the ICU ranged from 2 to 15. Two patients had vasospasm confirmed by angiography. At the time of vasospasm, there was a large discrepancy between right and left BIS scores. During angiography, selective injection of calcium channel blockers was associated with a resolution of the discrepancy in right and left BIS scores. Elevated TCDs were also associated with divergent BIS scores.

DISCUSSION: Our data suggests clinically significant vasospasm is associated with a difference between left and right sided BIS scores. BIS score discordance between left and right correlates with development of flow changes in SAH patients. A larger study will determine the magnitude of the difference associated with vasospasm. Additionally, the BIS data may give insight to clinical outcomes related to detectable cerebral blood flow changes seen with bilateral BIS monitoring.

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S-298.

TYMPANIC MEMBRANE TEMPERATURE IS USEFUL MONITORING DURING CAROTID ENDARTERECTOMY

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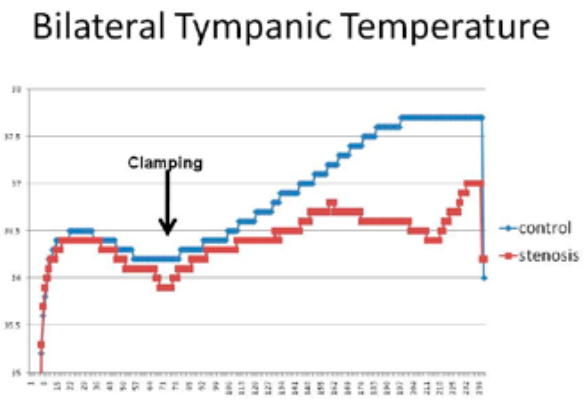
AFFILIATION: Anesthesiology, Tokyo Women's Medical University, Shinjuku Tokyo, Japan.

INTRODUCTION: The effect of carotid endarterectomy in lowering the risk of stroke ipsi-lateral to severe atherosclerotic carotid-artery stenosis is off set by complications during or soon after surgery. One of the monitoring for ischemic in brain is noninvasive measurement of cerebral hemoglobin oxygen saturation using two near infrared spectroscopy approaches (INVOS). However, the monitor that was the most sensitive was SEP (Somatosensory Evoked Potentials). Tympanic artery blood flow affects the tympanic membrane temperature. Our hypothesis is that tympanic membrane temperature monitoring is good monitor as well as SEP, rather than INVOS.

METHODS AND SUBJECTS: With approval from the Human Research Ethics Committee in our hospital and after obtaining informed consent 20 patients undergoing elective, first carotid endarterectomy. Bilateral tympanic membrane temperatures were recorded at one minute intervals from beginning operation until the end of operation. The tympanic temperature can be obtained instantaneously using an infrared emission detection (IRED) thermometer. Its accuracy has been documented in a variety of clinical settings.It was recorded also SEP, MEP (Motor Evoked Potentials) and INVOS simultaneously. We checked rate of stenosis in bilateral carotid artery before surgery.

RESULTS AND DISCUSSION: Carotid artery was clamped for a few minutes in stenosis site. At that time, temporarily clamping the carotid artery decreased the number of INVOS, with dependence on the stenosis rate. It was decreased the tympanic membrane temperature as the same time. Good correlation between SEP changing and tympanic membrane temperature, and also good correlation between INVOS and tympanic membrane temperature. Otherwise, tympanic membrane temperature in stenosis site cannot be recovered recovered at a point immediately before clamping.

CONCLUSION: Tympanic membrane temperature is a convenient and useful response-monitoring method for the blood flow of a carotid endartectomy.



S-299.

WITHDRAWN.

S-300.

DIFFERENTIAL ROLES OF GABA RECEPTORS IN INHALATIONAL ANESTHESIA IN MICE

AUTHORS: F. Tao, J. Skinner, R. A. Johns;

AFFILIATION: Anesthesiology and Critical Care Medicine, Johns Hopkins University School of Medicine, Baltimore, MD.

INTRODUCTION: γ-aminobutyric acid (GABA) is the major inhibitory neurotransmitter in the mammalian brain, and as many as one-third of all synapses are GABAergic1. Recent studies have implicated GABA receptors as one of primary anesthetic target2-6. In the central nervous system (CNS), GABA acts on two distinct types of GABA receptor: an "ionotropic" receptor permeable to Cl− and HCO3− (GABAA subtype) and a G-protein coupled "metabotropic" receptor that is linked to various effector mechanisms (GABAB subtype). To date, most studies focused on the role of GABAA subtype in anesthesia mechanism. However, similar to GABAA subtype, GABAB subtype also has broad distribution in the CNS. It is not well known whether GABAB subtype contributes to inhalational anesthesia. In the present study, we used GABA receptor agonists and antagonists for different subtypes and investigated their effects on inhalational anesthesia induced by halothane, isoflurane, or sevoflurane.

METHODS: 1) Animal preparation: Male C57BL/6J wild-type mice weighing 25-30 g were housed up to four per cage on a standard 12-h light/dark cycle, with water and food pellets available ad libitum. 2) Intraperitoneal injection of GABA receptor agonists and antagonists: The mice in five groups received intraperitoneal injection of the following drugs in different doses, respectively. Group I: saline (10 ml/kg; vehicle control); Group II: muscimol (0.5 mg/kg, 1 mg/kg, or 2 mg/kg; GABAA receptor agonist); Group III: hydrastine (1 mg/kg, 2 mg/kg, or 4 mg/kg; GABAA receptor antagonist); Group IV: baclofen (10 mg/kg, 20 mg/kg, or 40 mg/kg; GABAB receptor agonist); Group V: hydroxysaclofen (1 mg/kg, 2 mg/kg, or 4 mg/kg; GABAB receptor antagonist). 3) Measurement of minimum alveolar anesthetic concentration (MAC): At 10 min after injection, MAC was measured as described previously7. 4) Determination of righting reflex ED50 (RRED50): Following the measurement of MAC, RRED50 was measured as described previously7. 5) Statistical analysis: Data are expressed as mean ± S.E.M. One-way and two-way analysis of variance followed by Student-Newman-Keuls method was used for statistical analysis. Statistical significance was set at $P < 0.05$.

RESULTS: GABAA and GABAB receptor agonists showed dose-dependent effect on inhaled anesthetic MAC and RRED50. Compared to GABAA receptor agonist muscimol, GABAB receptor agonist baclofen showed more reduction of halothane and isoflurane MAC and RRED50. However, muscimol reduced more sevoflurane MAC compared to the effect of baclofen. On the other hand, GABAA and GABAB receptor antagonists at current dose range had no significant effects on inhaled anesthetic MAC and RRED50.

DISCUSSION: Both GABAA and GABAB subtypes of GABA receptors contribute to action of inhaled anesthetics. Different subtypes of GABA receptors play differential roles in inhalational anesthesia.

S-301.

INTRA-VENTROLATERAL PREOPTIC AREA INJECTION OF L-GLUTAMIC ACID PROMOTES WAKEFULNESS IN RATS

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INTRODUCTION: The ventrolateral preoptic nucleus (VLPO) plays a critical role in regulating and maintaining sleep-awake cycle. Recent studies indicate that the sedative effects of GABAergic anesthetic agents involve the activation of VLPO neurons. Previous in vitro studies have also shown that VLPO neurons receive excitatory glutamate synaptic afferents. However, a behavioural role of VLPO glutamate receptors has not been demonstrated.

METHODS: In vivo locomotion assessment: Each Sprague-Dawley rat underwent stereotaxic surgery to receive implantation of double-lumen guide cannula in the VLPO area under anesthesia. After recovery for 7 days, rats were randomly assigned to receive microinjections of normal saline (NS), 4mM norepinephrine (NE), 0.1mM and 10mM L-glutamic acid (L-Glu) through the cannula. Locomotive activity was used to evaluate rat wakefulness. At the end of experiment, cannula placement was confirmed by examining coronal brain slices under the microscope. The misplaced rates were grouped as negative control (NC). In vitro electrophysiological recordings: Brain slides containing VLPO neurons were prepared from a new set of rats. Patch-clamp technique was used to record whole cell membrane potentials from brain slices before and after bath application of L-Glu solutions (10, 30, 100 and 300 μM).

RESULTS: In vivo: Locomotive activity in each rat was normalized to its own baseline. Rats treated with 10 mM L-Glu demonstrated sustained movement activity, most significantly during the 20-25th min period (vs. NS, $p<0.001$; vs. NC, $p=0.009$). Rats treated with 0.1mM L-Glu showed similar but less significant changes. NE treatment maintained rats movement activity, most significantly during the 10-25th min period (vs. NS $p<0.01$). In vitro: Bath-applied glutamate (300 μM, 300 s) induced significant changes in membrane potentials: depolarization, repolarization, and hyperpolarization before returning to the resting levels. These changes were accompanied with changes in firings: an initial brief increase (~20s), followed with long cease of firing (~470s). These changes increased with glutamate concentrations.

CONCLUSION: First, this animal model is validated by reproducing sustained rat wakefulness with NE treatment. Second, injection of L-Glu in the VLPO area dose-dependently maintains rat locomotive activity over time, reflecting sustained wakefulness. This result suggests exogenous glutamate may lead to VLPO neuron inhibition. This deduction is supported by the in vitro finding that glutamate application inhibited VLPO neuron firing after initial depolarization, by inducing a very prolonged hyperpolarization state. As a result, the downstream neurons are free from the VLPO inhibitory control and wakefulness is thus sustained. Taken together, above results suggest that VLPO glutamate receptors contribute to the regulation of sleep-awake cycle.

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S-302.

PROPOFOL INDUCES THE ADDICTIVE SIGNALING MOLECULE DELTAFOSB IN RAT NUCLEUS ACCUMBENS VIA DOPAMINE RECEPTOR D1

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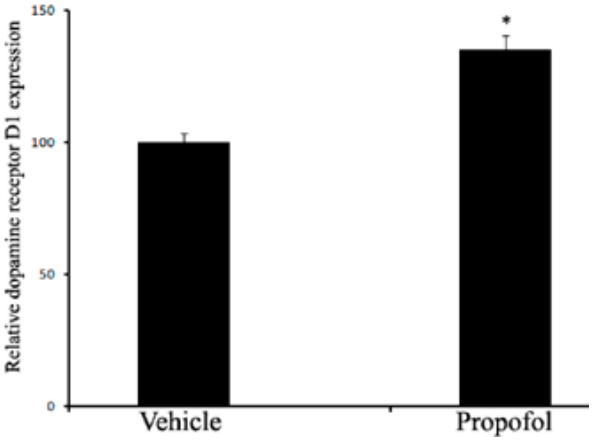
INTRODUCTION: There is considerable evidence that all drugs of abuse converge on a common circuitry and induce addiction by modulating gene expression such as DeltaFosB in the nucleus accumbens (NAc) (1, 2). Although propofol, the most widely used drug in anesthesia, is traditionally considered as a safe and non-addictive drug, recent clinical evidences suggest that it might have abuse potential (1). The current study is to determine the effect of propofol on DeltaFosB expression in NAc and its potential mechanism.

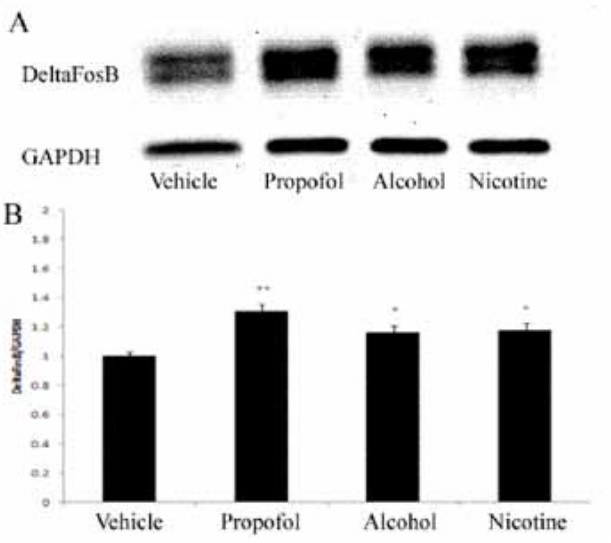
METHODS: To determine whether propofol is additive, we examined the effect of propofol on the expression of DeltaFosB. Two well-known addictive agents, alcohol (ethanol) and nicotine were used as positive controls. Experiments were conducted on thirty-six male Sprague-Dawley rats (150-200 g). These animals were divided into four treatment groups: vehicle (saline), propofol (10 mg/kg), ethanol (1 g/kg), and nicotine (0.5 mg/kg). All drugs were administered by intraperitoneal injection twice per day for seven days. The animals were then sacrificed and their NAc were isolated for protein measurements using western blot analysis.

RESULTS: As expected, both ethanol and nicotine significantly increased DeltaFosB expression (Fig. 1). Intriguingly, propofol elicited a robust increase in DeltaFosB expression similar to that of ethanol and nicotine (Fig. 1). Moreover, the dopamine receptor D1, an upstream molecule of DeltaFosB was also significantly increased by propofol (Fig. 2).

DISCUSSION: Propofol is able to induce the addictive signaling molecule DeltaFosB in the nucleus accumbens via D-1 dopamine receptor D1. The result suggested that popofol has abuse potential. Although the study is in its initial stage, the final confirmation that popofol is an additive drug will have a huge impact on the entire biomedicine and social community. First, propofol is widely used in and out of the operating rooms. Moreover, the air in the operating rooms contains propofol that may be harmful to the health care staff. New administrative regulations and methods to monitor and control the use of propofol will be warranted as new addictive evidences are accumulated.

REFERENCES:





S-303.

EFFECTS OF IONOTROPES ON MOTOR EVOKED POTENTIAL RESPONSE IN A SWINE HEMORRHAGE MODEL

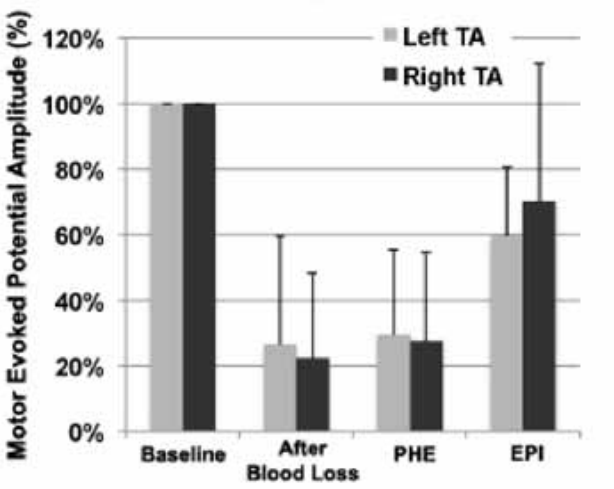
AUTHORS: M. D. Rollins[1], R. Lyon[1], A. Gibson[2], S. Burch[2], J. Lieberman[1];

AFFILIATION: [1]Anesthesiology, University of California, San Francisco, San Francisco, CA, [2]Orthopedic Surgery, University of California, San Francisco, San Francisco, CA.

INTRODUCTION: The incidence of neurologic injury is between 5% and 30% for complex spine surgeries. Transcranial motor-evoked potentials (TcMEPs) are frequently used to monitor the spinal cord and nerve root function, and response amplitudes may decrease during hemorrhage. In addition to volume and transfusion resuscitation following surgical blood loss, inotropes are frequently used to increase arterial pressure in hopes of restoring perfusion. There is limited data to guide the resuscitation effort after hemorrhage in order to minimize nerve root or spinal cord injury. We seek to better understand the effects of two vasoactive agents, phenylephrine and epinephrine, on tcMEP responses following hemorrhage in order to guide future research to improve the outcome of patients undergoing procedures frequently associated with significant blood loss.

METHODS: Following IACUC approval, five 50Kg swine were maintained under anesthesia on fentanyl, propofol, and ketamine. No neuromuscular relaxants were used. An arterial line and pulmonary artery catheter were placed. Each animal was kept euthermic and eucarbic throughout. Using a previously described swine model of tcMEPs (1), transcranial stimulation was delivered through electrodes over the motor cortex. TcMEPs were recorded in vastus lateralis (VL) and tibialis anterior (TA) bilaterally. After baseline measurements, animals were hemorrhaged at a rate of 10% blood volume every 20 minutes until tcMEP amplitude decreased >60% or the hemorrhage reached 50% blood volume. Measurements were taken after each period. Following the hemorrhage, a phenylephrine infusion was started and increased at a rate of 25 mcg/min every 5 minutes until mean arterial pressure (MAP) surpassed baseline values or a maximum of 200 mcg/min was reached. The infusion was stopped and the animal was allowed to equilibrate. An epinephrine infusion was then started and increased by 0.2 mcg/kg/min every 5 minutes until MAP surpassed baseline values or a maximum of 2 mcg/kg/min was reached. Data were compared using nonparametric repeated measures (Friedman's test).

RESULTS: Compared to baseline, bilateral VL and TA tcMEPs decreased significantly following hemorrhage in all muscle groups ($p<.05$) and remained significantly decreased with phenylephrine ($p<.05$). Epinephrine significantly increased bilateral VL and TA tcMEPS ($p<.05$) compared to both hemorrhage and phenylephrine. Results of TA tcMEPs are shown in figure. CO decreased significantly from baseline (5.3±1.1 L/min) following hemorrhage (2.6±0.8 L/min) ($p<.05$) and remained significantly decreased with phenylephrine (3.2±0.5 L/min) ($p<.05$). Use of epinephrine significantly increased CO above both conditions to (4.0 ± 1.0 L/min) ($p<.05$).



DISCUSSION: Our results validate the depressive effect of hemorrhage on tcMEPs in multiple myotomes in pigs. The improvement in tcMEPs with the use of epinephrine compared to phenylephrine (despite similar MAP) suggests potentially different nervous system perfusion characteristics of the pressors and highlights the potential role of CO in maintaining spinal cord integrity.

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S-304.

APPRECIATION AND ANALYSES THE FEASIBILITY OF I-GEL LMA IN NEUROINTERVENTIONAL SURGERY

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Introduction: Compare and analyses the I-gel LMA with ProSeal LMA, For appreciate the safety and feasibility of i-gel, a new single-use supraglottic airway device with a noninflatable cuff, be used to neurointerventional surgery.

METHODS: 40 ASA physical status I~II patients aged 20~60yr, scheduled for interventional embolization were randomly divided into 2 groups: group P (ProSeal LMA, n=20) and group I (i-gel LMA, n=20). General anesthesia was performed with propofol and remifentanil by TCI. Standard monitoring was applied by BIS,ECG,MAP,SpO2,HR. Observe the easy or difficult degree of insertion, effective of ventilation, close tightly of LMA in throat and rate of complication in each group. Appreciate the safety and feasibility of i-gel LMA in clinical practice.

RESULTS: In group I, insertion success rate was 100%, insertion was scored very easy in 16 cases(70%) or easy in 5 others(30%). The times of insertion was 13.2±6.9s. The leak pressure of I-group(27±9cmH2O) was lower than P-group(33±7cmH2O) significantly; the end inspiration peak pressure was no significantly difference in two groups; the differention of leak pressure and peak pressure in group I was distinguished lower than group P. After pull out the LMA, there are 3 cases of patients have blood stain at throat in group P and 1 case in group I. With vision after operation, there are 5 cases of patients have pharyngalgia in group P and 3 cases in group I.

DISCUSSION: Compare to ProSeal LMA, i-gel LMA have features of more conveniently in manipulation and adhesiveness is better. This kind of airway device is a safety and lower complication incidence rate which can be widely used for surgery requiring general anesthesia.

S-305.

ANESTHETIC MANAGEMENT OF PATIENTS UNDERGOING LASER BRAIN TUMOR TREATMENT

AUTHORS: S. S. Zaky[1], A. Kurz[1], G. H. Barnett[2], R. Avitsian[1], E. Farag[1];

AFFILIATION: [1]Anesthesia Institute, Cleveland Clinic, Cleveland, OH, [2]Neurological institute, Cleveland Clinic, Cleveland, OH.

INTRODUCTION: Focused laser interstitial thermal therapy (AutoLITT™ system) is an emergent technology for the treatment of brain tumors. The AutoLITT™ system delivers heat to induce direct thermal cell death or apoptosis.

METHODS: After IRB approval the anesthetic medical records of five patients undergoing AutoLITT™ therapy using MRI thermometric monitoring for glioblastoma was reviewed. In this procedure, a LASER probe is inserted into the tumor through a burr hole. The probe emits laser energy radially to heat tissue in one direction while cooling to remove heat from all other directions, thus allowing neurosurgeons to steer and monitor tumor heating and avoid damage to neighboring healthy tissue.

Five patients (2 women and 3 men) had AutoLITT™ therapy. All patients had balanced general anesthesia. Induction was achieved with fentanyl, propofol and rocuronium for endotracheal intubation. Anesthesia was maintained with propofol and remifentanil infusion.

Maintaining normothermia is crucial for the effectiveness of LASER treatment to avoid heat dissipation. Patients were pre-warmed and the temperature of the operating room is raised to avoid hypothermia during the procedure. The patients were wrapped with nylon sheath to maintain core body heat while transporting them to the MRI scanner and during the LASER treatment in the MRI. Preheated fluids were given when the patient was in the MRI due to unavailability of MRI-compatible fluid warmers.

RESULTS: The average surgery duration was 662.4 +/- 234 minutes. The mean times where patients had a temperature lower than 35oC was 66 min., between 35.1oC and 36oC was 42 min., between 36.1oC and 37oC was 180 min., between 37.1oC and 38oC was 210 min. and higher than 38.1oC was 24 min. The mean amount of fluids received during surgery was 3660 +/- 1659 mL of crystalloids and 400 +/- 223 mL of colloids. No significant hemodynamic complications were found and only one patient developed significant bradycardia. After surgery, 3 patients were extubated in the operating room and the other 2 were transferred intubated to the intensive care unit.

DISCUSSION: This is the first report about the anesthetic management in patients undergoing AutoLITT™ surgery. During most of the surgery patients remain either normothermic or mildly hyperthermic. The maintenance of normothermia or mild hyperthermia is crucial for the success of LASER treatment. If the temperature of the brain is low, that will lead to heat dissipation which decreases the lethal effect of the LASER treatment on the malignant cells.

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Obstetric Anesthesia

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S-306.

MANAGEMENT FOR PARTURIENTS WITH PULMONARY HYPERTENSION-10 YEARS EXPERIENCE FROM PEKING UNION MEDICAL COLLEGE HOSPITAL IN CHINA

AUTHORS: L. Ma, W. Liu, Y. Huang;

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INTRODUCTION: Pregnancy with pulmonary hypertension (PH) is considered to be associated with increased maternal and neonatal mortality. We assessed the anesthetic and obstetric management and outcome of pregnancy with PH in our hospital.

METHODS: Form the period of January 1999 to December 2008, we reviewed the charts of all parturients with pulmonary hypertension in our hospital. Information about patient characteristics, including maternal age, gravida and para, PH category, NYHA functional class, pulmonary artery pressure, mode of delivery and type of anesthesia, use of anticoagulation and advanced therapy (Nitric oxide, prostacyclin analogus, bosentan or sildenafil) were collected and presented separately for each group.

RESULTS: Thirty parturients with pulmonary hypertension were management during this period: 8 cases of idiopathic pulmonary artery hypertension (iPAH), 7 cases of congenital heart disease with PAH (CHD-PAH), 10 cases of rheumatic heart disease with PAH(RH-PAH) and 5 cases of PAH of other etiology(oPAH). Only one patient had vaginal delivery without analgesia. 18 cases had Caesarean section (CS) with regional anesthesia while the rest with general anesthesia. Overall maternal mortality was 16.7% (n=5) in puerperium, there are four fetal/neonatal deaths, all secondary to delivered prematurely. No relationship was found between primigravidae and higher mortality. All dead cases had CS with general anesthesia, but these parturients had severe hemodynamic instability and cardiac lesion (three with Eisenmenger syndrome and two with severe mitral stenosis). Only four parturients had anticoagulant therapy during pregnancy and another five started until post-partum. Because of economic reason, only 2 parturients(6.7%) were receiving advanced therapy.

CONCLUSION: Pregnancy in women with pulmonary hypertension was found to be significantly associated with maternal and neonatal complication. Scheduled Caesarean section seemed to be a reasonable approach, and anesthetic decision should be made depending on parturients' cardiac lesion and NYHA class. Pre-pregnancy counseling and multidisciplinary care are also recommended.

Table 1. Characteristic, management and outcome of parturients with pulmonary hypertension

	idiopathic PAH(iPA)(n=8)	secondary PAH			
		CHD-PAH(n=7)	RH-PAH (n=10)	O-PAH(n+5)	
Characteristics					
age(years)		28	27	28	31
NYHA class before pregnancy		I: 8(100%)	I:3(43%) II:4(57%)	I:7(70%) II:2(20%) III:1(10%)	I:4(80%) III:1(20%)
NYHA class during pregnancy		I:4(50%) II:1(12.5%) IV:3(37.5%)	II:2(29%) III:4(57%) IV:1(14%)	I:2(20%) II:2(20%) III:3(30%) IV:3(30%)	II:2(40%) III:1(20%) IV:2(40%)
PAP(mmHg)	moderate	7(87.5%)	2(29%)	4(40%)	3(60%)
	severe	1(12.5%)	5(71%)	6(60%)	2(40%)
Heart failure	during pregnancy	3(37.5%)	1(14%)	6(60%)	3(60%)
	during labor	-	2(28%)	3(30%)	1(20%)
	post partum	-	1(14%)	1(10%)	-
Management					
Mode delivery	Caesarean section	8(100%)	6(86%)	10(100%)	5(100%)
	Vaginal	-	1(14%)	-	-
Anesthetic choice	regional	7(87.5%)	2(29%)	6(60%)	3(60%)
	general anesthesia	1(12.5%)	4(57%)	4(40%)	2(40%)
Antithrombotic therapy	during pregnancy	-	-	3(30%)	1(20%)
	post partum	2(25%)	2(29%)	4(40%)	1(20%)
Advanced therapy		-	2(29%)	-	-
Outcome					
Maternal death(early post partum)		0	3(29%)	2(20%)	0
Premature delivery		4(50%)	4(57%)	4(40%)	4(80%)
Neonatal death		0	3(43%)	0	1(20%)

S-307.

IMPACT OF RESTRICTED FLUID THERAPY ON THE PHYSIOLOGICAL CONDITION OF NEWBORNS DURING CESAREAN SECTIONS UNDER SPINAL ANESTHESIA

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INTRODUCTION: Determining the adequacy of volume of fluid resuscitation during cesarean sections can be challenging for the anesthesia provider. Currently, about 20 to 48 ml/kg of Lactated Ringer's solution (LR) is administrated for an uncomplicated cesarean section at our institution (1). Clinical studies have shown that intraoperative fluid restriction, rather than the current "standard" fluid regimen, improves clinical outcome after intra-abdominal surgery (2-4). As part of an ongoing prospective study of fluid management and maternal clinical outcomes during cesarean sections under spinal anesthesia, we are also evaluating the impact of different volumes of intraoperative fluid therapy on the physiological condition of newborns during these procedures.

METHODS: We hypothesize that restricting IV fluid for mothers during cesarean sections will not adversely affect the physiological condition of newborns. Patients scheduled for a cesarean section are randomly assigned to one of two groups, a restricted volume of fluid (RVF: n=35) and a standard volume of fluid (SVF: n=27) group. Patients are treated with either 10 ml/kg in RVF or 35 ml/kg in SVF group. LR is administrated at a constant rate to patients over a period of 70 minutes (average) with 1/3 administered during induction of spinal anesthesia, 1/3 during section delivery, and 1/3 during closure of the abdomen. Successful fluid therapy will be achieved when a patient has received 100 ± 10% of the targeted volume for her treatment group. Newborn apgar score, and both umbilical cord venous and arterial blood gas reports are collected for analytical comparison. IRB approval and patient consent were received before the study.

RESULTS: The apgar scores for RVF and SVF groups are 7.97 (mean) ± 1.23 (SD) vs 7.96 ± 1.37 at 1 minute and 8.97 ± 0.19 vs 8.88 ± 0.44 at 5 minutes. The umbilical cord blood pH and acid-base balance of both venous and arterial cord blood gases from RFV and SFV groups are comparable to each other without any significant difference. The pHs of venous blood are 7.30 ± 0.05 vs 7.31 ± 0.06 in RFV vs SFV groups, respectively (Figure 1-5).

DISCUSSION: While studying "Fluid Management and Clinical Outcomes during Cesarean Sections under Spinal Anesthesia", we have also investigated whether restricted fluid infusion to mothers during cesarean sections has an impact on the newborn's general condition. The apgar scores from both treatment groups are almost identical, which suggests that restricted fluid therapy during cesarean sections has no detrimental effects on the newborn's physical condition after delivery. Also, comparable results from blood gas analysis suggest that restricted fluid therapy does not compromise fetal perfusion and general physiologic status.

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S-308.

ANESTHETIC MANAGEMENT OF CESAREAN SECTION IN PATIENT WITH SEVERE PREECLAMPSIA AND ACUTE INTRACRANEAL HEMORRHAGE

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INTRODUCTION: Severe preeclampsia, due to its multisystem involvement and its urgent nature, poses a great challenge to anesthesia providers. Risks and benefits analysis of regional vs. general anesthesia for C-section is difficult and often counter-intuitive(1).

CASE REPORT: A18 y/o nulliparous woman, 37 weeks IUP, complicated by mild preeclampsia, presented with complaints of headache and abdominal pain starting 1 hour prior to admission. Blood pressure (BP) 204/109 mmHg, HR 61, and the presence of +3 protein in her urine was noted. The remainder of her exam was unremarkable. Upper airway exam was favorable. Two doses of hydralazine 5mg IV was administered 20 minutes apart and 4g of magnesium sulfate over 15 minutes followed by infusion of 1g/hour. BP decreased to 141/73mm Hg and Cesarean delivery was deferred until laboratory results became available. Shortly after the second dose of hydralazine, the patient developed generalized tonic/clonic seizures, lasting for about 1 minute. Patient became awake, but remained mildly lethargic with no focal neurological deficit. Preliminary CT scan of the brain with IV contrast was negative for bleeding or midline shift. Laboratory tests were remarkable for AST 240u/L, ALT 125u/L, platelets 116x10^9/L. Spinal anesthesia was used for emergent Cesarean delivery. After placement of arterial line, 27ga Whitacre needle was placed. Pink CSF was noted and was not clearing after several drops passed. Hyperbaric bupivacaine 10.5mg and morphine sulfate 0.2mg were injected. Patient remained awake and stable throughout the case. Final report of CT scan, which was available at the end of the surgery, demonstrated left frontal subarachnoid hemorrhage, mild hydrocephalus and possible acute left basal ganglia infarction. CT brain repeated on POD 5 showed complete resolution of the subarachnoid hemorrhage, mild persistent hydrocephalus. Patient was discharged home on POD 6, on labetalol 200mg BID.

DISCUSSION: Our choice of subarachnoid anesthesia was based on a number of factors. Despite negative head CT scan, we believed that patient's somnolence could be a sign of cerebrovascular accident. At time of intervention, there was no evidence of abnormal hemostatic function. We felt that avoiding hemodynamic response to intubation and surgical stimulation was more reliably achieved with the use of regional anesthesia. Level of consciousness is the best intraoperative monitor of patient's possible neurological deterioration. Emergence from general anesthesia is often plagued by hyperdynamic cardiovascular response and can lead to catastrophic intracranial bleeding. Should this patient have developed increased ICP, small dural puncture with a spinal needle is much less risky than potentially larger dural tear from epidural needle. Lastly, recent studies demonstrated cardiovascular stability of severely preeclamptic patients under spinal anesthesia (2, 3).

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S-309.

A 23-YEAR-OLD PARTURIENT WITH EISENMENGER SYNDROME PRESENTS INITIALLY AT OUR INSTITUTION AT 38 WEEKS GESTATION

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INTRODUCTION: Eisenmenger's syndrome (ES) is one condition where pregnancy should be highly discouraged. As an entity onto itself, patients with ES tend to not survive beyond the third decade of life and the progression is associated with significant fetal and maternal morbidity and mortality. Maternal mortality with vaginal delivery is 30-50% and up to 65% with cesarean section.1 Fetal mortality is even greater, reaching as high as 75%.1

CASE REPORT: A 23-year-old G3 P2002 with ES presented at 36 weeks gestation for anesthetic evaluation for delivery. The patient was experiencing increasing dyspnea on exertion with walk test revealing oxygen desaturation at 800 feet. A right heart catheterization revealed a 1.5 cm atrial septal defect with bidirectional shunting, severe right heart enlargement and dysfunction, and pulmonary hypertension with PAP 71/18 mmHg. Antepartum, she was managed with oxygen, sildenafil and enoxaparin, with her pulmonologist, obstetrician, and anesthesiologist keeping in constant communication for optimal management. She was admitted to labor and delivery at 37 weeks gestation with her last dose of enoxaparin administered the day prior. A fentanyl-only epidural was placed for labor analgesia to avoid the risk of hypotension. Monitoring included arterial and central line. Epoprostenol was made readily available. The patient delivered successfully with no untoward complications and was transferred to the surgical intensive care unit for 24 hours postpartum. Her postpartum course remained uneventful.

DISCUSSION: This case outlines some exceedingly challenging aspects in the management of a parturient with ES. With the extremely high maternal mortality rate, knowledge of pathophysiology is paramount in formulating successful management. The impaired hemodynamics, superimposed on the cardiovascular demands of pregnancy and poorly compliant pulmonary vasculature, lead to poor patient outcomes. Any decrease in systemic vascular resistance or increase in pulmonary vascular resistance will worsen the right-to-left shunt inciting a progressive hypoxemia. Recommendations for anesthetic management include maintenance of systemic vascular resistance, minimization of blood loss and intravascular volume depletion, and prevention of paradoxical embolization.3 Thromboembolic events account for 43% of maternal deaths2 so anticoagulation status must be investigated before neuraxial anesthetic is considered and must be precisely coordinated with further anticoagulation therapy. Constant communication between the cardiologist, pulmonologist, obstetrician, and anesthesiologist is paramount for optimal outcome.

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S-310.

WITHDRAWN.

S-311.

THE DISTRIBUTION OF EPIDURAL SALINE UPON INJECTION IN PREGNANT WOMEN USING MAGNETIC RESONANCE IMAGING

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INTRODUCTION: The epidural venous plexus is enlarged in pregnant women, which may enhance the distribution of epidural anesthesia. We previously demonstrated in healthy men that saline injected into the epidural space spreads freely through the epidural space and coats the cylindrical dural sac while partly passing out of the foramina. In late-stage pregnant women, however, the engorged epidural venous plexus could potentially interfere with the coating of the dural sac and decrease leakage from the foramina, which would explain the facilitation of the spread of local anesthetic in pregnant women. This study was designed to investigate the distribution of epidural saline upon injection in pregnant women using MR imaging.

METHODS: Epidural puncture was performed at the L3/4 level in 5 full-term (>39 weeks) parturients during labor and 3 nonpregnant women, using the loss of resistance technique with saline. An epidural catheter was advanced 3 to 5 cm into the epidural space. Low thoracic and lumbosacral axial MR images were obtained before and after injection of 10 ml saline into the epidural space through the catheter.

RESULTS: In all 5 pregnant patients, MR images before saline injection revealed enlargement of the epidural venous plexus, which was not observed in the 3 nonpregnant women. Saline injected into the epidural space coated the dura in 3 of the 5 pregnant women, despite the engorged epidural venous plexus, similar to the findings observed in the nonpregnant women. In the other 2 pregnant women, however, the engorged epidural venous plexus seemed to interfere with coating of the dural sac, resulting in only posterior accumulation of saline injected into the epidural space. In the intervertebral foramen and disc levels, saline partly passed out of the intervertebral foramina in the nonpregnant women. On the other hand, saline injected into the epidural space did not pass out the intervertebral foramina in any of the 5 pregnant women.

DISCUSSION: Although there was no single pattern of saline spread in the parturients, the absence of leakage from the foramina was a common finding in the present study, which was consistent with our hypothesis. The decreased leakage from the foramina may explain, at least in part, the facilitation of epidural anesthesia in pregnant women. The number of subjects examined in this study, however, was small. Additional studies are needed to evaluate the distribution of local anesthetics or saline injected epidurally in pregnant women.

S-312.

THE EFFECT OF ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCKS ON THE DURATION OF THE FIRST ANALGESIC REQUIREMENT FOLLOWING CESAREAN DELIVERY

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INTRODUCTION: Effective postoperative pain relief in patients undergoing cesarean section is very important factor to facilitate early ambulation, neonatal care and prevention of postoperative morbidity. The transversus abdominis plane (TAP) blocks have become more popular as a postoperative pain relief (1,2) because they do not produce motor nerve impairments while systemic regimen or epidural analgesia may affect ambulation.In this study, we analyzed the effect of ultrasound guided TAP blocks on the duration of the first parenteral analgesic requirement as well as the analgesic consumption.

METHODS: Fifty-two patients who underwent cesarean section under regional anesthesia between 07/2009 and 09/2009 were reviewed retrospectively in terms of postoperative analgesic requirement within 24 hours following operation. When the parturient required postoperative pain relief with nerve block, ultrasound guided (Prosound II Ultrasound System, ALOKA, CO., Japan) TAP blocks with 0.375% ropivacaine 20mL to each side were performed with blockade needle (22G x 100mm, Hakko Co., Japan). All patients received a standard postoperative regimen consisting of flurbiprofen and pentazocine in our hospital if the parturient required postoperative analgesic, irrespective of TAP blocks.

RESULTS: Thirty-five patients received TAP blocks and seventeen received a standard postoperative pain relief only (control group). Twelve patient (40%) did not require the parenteral analgesic except TAP blockade, while thirteen (68%) required parenteral analgesic in the control group. Among the parturients who required parenteral analgesic, the number of analgesic requirement in the TAP group (1.4 ± 0.5 times) was smaller than in the control group (2.2 ± 1.0 times) and the duration of the first analgesic requirement in the TAP group (13hrs0min ± 6hrs15min) was significantly longer than in control group (4hrs50min ± 4hrs7min).

DISCUSSION: In this study, the TAP blocks prolonged the interval of the first parenteral analgesic requirement following cesarean delivery. In addition, they decreased the parenteral analgesic consumption. There were a lot of biased factors such as a variety of intrathecal anesthetic agents, directions of skin incision and our standard parenteral postoperative analgesic in the study. Therefore, it remains determined what is the minimum supplemental analgesic requirement under TAP blocks. In conclusion, the TAP blocks following cesarean section may be effective postoperative pain relief, facilitating ambulation.

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S-313.

DYSESTHESIA, NOT PARESTHESIA, OCCURS MOST COMMONLY DURING THECAL PENETRATION BY SPINAL NEEDLES WHEN PERFORMING COMBINED SPINAL EPIDURAL ANALGESIA (CSEA)

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INTRODUCTION: About 37% of parturients experience paresthesia or dysesthesia during thecal penetration during 'needle through needle' performance of CSEA (1). In anesthesia, paresthesia is defined as "an abnormal sensation (burning, pricking, tingling, 'pins and needles'), whether spontaneous or evoked" and dysesthesia as "an unpleasant abnormal sensation (numbness, tingling,burning or pain), whether spontaneous or evoked" (2,3). We audited which term most accurately describes the sensation experienced during thecal penetration.

METHODS: With institutional approval, 68 consenting parturients receiving CSEA for labour analgesia or elective cesarean section were audited. A standardized CSEA technique (injection of lidocaine at the L2/3 or L3/4 interspace, insertion of 18/16G Tuohy needle, loss of resistance to air, 'needle through needle' insertion of 27G Whitacre pencil-point needle) was used. At the moment of 'click' or 'give' (4,5) of dural puncture, involuntary patient responses (movement, grimace, vocalization) were recorded by a nurse, and patients asked by the anesthesiologist "did you feel that?" Those responding affirmatively were asked "was the feeling normal or abnormal?" and "was the feeling pleasant or unpleasant?" Analysis used the Chi-squared and Fischers Exact tests ($p<0.05$ significance).

RESULTS: Of 68 parturients, responses to or sensation during dural puncture occurred in 21 of 54 (39%) labouring and 10 of 14 (71%) elective cesarean patients ($p<0.025$), yielding an overall incidence of sensation in 31 (46%) of 68 patients. Of these, 4 (13%) and 26 (84%) patients ($p<0.005$) described the sensation as normal and abnormal, respectively, with one patient unable to decide, and no patient (0%) described the sensation as pleasant, whilst 25 (81%) patients described the sensation as unpleasant ($p<0.0005$), with 6 (19%) patients unable to decide.

DISCUSSION: The sensation experienced by parturients at the moment of dural puncture during 'needle through needle' insertion of spinal needle is described as abnormal and unpleasant in the majority of complainants. This suggests that" dysesthesia", rather than "paresthesia" more correctly describes this complaint. Incidental findings were lesser incidences of dysesthesia during such dural puncture in labor, probably related to higher endorphin levels during labour, and higher incidences of dysesthesia in elective surgical patients, which should be anticipated and communicated to patients.

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S-314.

THE FACTORS ON INTRATHECAL DRUG SPREAD AT THE INITIATION OF LABOR ANALGESIA

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INTRODUCTION: Spinal anesthesia has the definitive advantage that profound nerve block can be produced in a large part of the body by the relatively simple injection of a small amount of local anesthetics. However, the great challenge of the technique is to control the spread of the local anesthetic through the cerebrospinal fluid (CSF). Moreover, pregnancy affects the intrathecal spread of local anesthetic. We hypothesized that the pressure of intrathecal space may influence the extensive local anesthetic spreads. However, we do not routinely measure the pressure in clinical practice. Therefore, we supposed that the pressure may be correlated with the speed of outflow of CSF. So, we measured the speed of outflow as well as intrathecal drug spread in parturients who requested labor analgesia.

METHODS: Thirty three laboring women receiving labor analgesia were enrolled. After 17 G Touhy needle was placed at L3/4 intervertebral epidural space in the sitting position, dural puncture was performed with 27 G Whitacre needle using needle-through-needle method (Durasafe™ Epidural Lock CSE Needle Set, Becton Dickinson Medical Systems, Franklin Lakes, NJ, USA). Duration of CSF outflow through the needle was measured with a stopwatch. Two mg hyperbaric bupivacaine, 20 mcg fentanyl mixed with 1.6 mL saline was injected into intrathecal space for 20 seconds. After inserting and securing epidural catheter, the patient was laid on one side. Assessment of intrathecal drug spread was tested using loss of cold sensation with ice cube every 5 minutes for 30 minutes. Bromage Score, blood pressure, and heart rate were also checked every 15 minutes. Distance from skin to epidural space and epidural space to dura mater were also recorded.

RESULTS: There was no correlation between the intrathecal drug spread and duration of CSF outflow, height, present body weight, body weight prior to pregnancy, body mass index, weight gain during pregnancy, estimated distance from skin to epidural space, or epidural space to dura mater. Motor blockade was less likely with this regimen.

DISCUSSION: It is possible that various factors, such as height, weight, and intraabdominal pressure affect intrathecal spread of local anesthetics during surgery(1,2). However this study revealed that the spread of local anesthetic in labor analgesia had no correlation with those factors. This may be due to the small dose of local anesthetic, presuming that the intrathecal dose in labor analgesia almost equally spread in the spinal canal, irrespective of those factors.

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S-315.

MORBIDLY OBESE COMPLEX OBSTETRICAL PATIENT WITH UNDIAGNOSED PERIPARTUM CARDIOMYOPATHY AND DEVELOPMENT OF FLASH PULMONARY EDEMA IN PACU

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INTRODUCTION: Peripartum cardiomyopathy (PPCM) is a rare disorder of unkown cause that occurs during peripartum period. The relationship between heart failure and pregnancy was first recognized in 1870's by Virchow and Porack who noted myocardial degeneration in patients who died in the postpartum period. However, it was first described by Gouley et al as a distinctive form of cardiomyopathy in 1937. Incidence in United States is 1 per 3000 to 4000 live births. Reported mortality rates are between 18 to 56%. A latent form of PPCM has also been described in the literature. We report here a case of latent PPCM in a morbidly obese patient who developed dramatic flash pulmonary edema in postanesthesia care unit (PACU).

CASE REPORT: 31-year-old morbidly obese African American female (BMI 53) vaginally delivered twins uneventfully under epidural analgesia. Same epidural was used next day to provide epidural anesthesia for tubal ligation. Intraoperative course was uneventful. Initially patient was stable in PACU, but soon developed dyspnea and suddenly progressed into flash pulmonary edema requiring emergency intubation. Cardiac consult was obtained. Echocardiogram demonstrated severely decreased left ventricular systolic function, LVEF 25%, without other significant findings. After excluding other possible causes, diagnosis of peripartum cardiomyopathy was made. Patient was aggressively treated in ICU and was extubated on second postoperative day. Patient was discharged in stable condition after four days.

DISCUSSION: PPCM is a form of dilated cardiomyopathy in which other causes of heart dysfunction are excluded. Identified risk factors include advance maternal age (>30 years), multiparity, multiple gestation, obesity, nutritional disorder, preeclampsia, gestational hypertension and African American race. PPCM is diagnosed by presence of four criteria: (1) development of cardiac failure in the last month of pregnancy or within five months of delivery; (2) absence of an identifiable cause for cardiac failure; (3) absence of recognizable heart disease prior to the last month of pregnancy; and (4) left ventricular systolic dysfunction demonstrated by echocardiogram as depressed ejection fraction. The etiology of PPCM remains unknown. Proposed causes include myocarditis, abnormal immune response to pregnancy, viral infections, maladaptive response to the hemodynamic stresses of pregnancy and autoantibodies against myocardial proteins. Management goals include preload reduction, afterload reduction and increased inotropy. Anticoagulation may be considered. In postpartum patient ACE-Inhibitors are utilized. Prognosis depends on recovery of LV systolic function, which usually recovers within 6-12 months after delivery. Patients who fail medical management may be considered for heart transplant. Counseling is required concerning the risk of subsequent pregnancy.

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S-316.

ANALYSIS OF THE RISK FACTORS FOR INCREASED BLOOD LOSS DURING CESAREAN SECTION IN PATIENTS WITH PLACENTA PREVIA

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INTRODUCTION: The incidence of placenta previa has been increasing recently because of the rise in the number of cesarean sections and the advanced maternal age. Cesarean section in patients with placenta previa carries an increased risk of massive intraoperative bleeding. The aim of this study was to identify preoperative factors that might have predictive value for increased blood loss during cesarean section for patients with placenta previa.

METHODS: We reviewed retrospectively all women with placenta previa who underwent cesarean delivery during the period April 1, 2003, to March 31, 2008. Multiple linear regression analysis was used to identify the risk factors for increased blood loss. The following factors were examined: maternal age at the time of delivery, prior cesarean section, type of placenta previa, mode of cesarean section (emergency or elective), total volume of blood loss, and Apgar score. We also investigated the effect of anesthetic technique (general or regional) on Apgar score and blood loss. The results were recorded as the mean ± standard deviation. A level of $P<0.05$ was considered significant.

RESULTS: Placenta previa was found in 54 women among 1200 deliveries during the study period. Maternal age and type of placenta previa did not affect significantly the amount of intraoperative hemorrhage. General anesthesia was used for delivery in 19 women and regional anesthesia was used for 35. There was no significant difference in blood loss between general and regional anesthesia (1384±814 ml vs. 1395±771 ml, respectively). Apgar score at 1 and 5 min was similar in the general and regional anesthesia groups. Twenty-eight cases were classified as either emergency or urgent. Elective and emergent deliveries did not differ in the estimated blood loss (1330±816 ml vs. 1410±753 ml, respectively). The risk factors for increased intraoperative bleeding, confirmed by multiple linear regression analysis, were uterine myoma (β coefficient=413; 95% confidence interval 40 to 787, $p=0.03$) and prior cesarean section (β coefficient=444; 95% confidence interval 86 to 803, $p=0.02$). The patients with prior cesarean section required a significantly higher dose of oxytocin compared with those without prior cesarean section (18±8 U vs. 12±4 U; $P<0.05$).

CONCLUSIONS: Our results demonstrate that uterine myoma and prior cesarean section were risk factors for increased blood loss. Regional anesthesia might be safe for cesarean section in patients with placenta previa without uterine myoma or no history of cesarean section. However, the anesthesiologist should be aware of the possibility of massive hemorrhage in patients with placenta previa who have uterine myoma or a history of cesarean section. General anesthesia could be a good choice for such patients who are at risk for increased blood loss. The requirement of higher-dose oxytocin in patients with previous cesarean section appears to reflect the decrease in uterine contraction.

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TANDEM LIDOCAINE AND MONOCYLE MACROCYCLES

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INTRODUCTION: Significant systemic local anesthetic toxicity occurs in 10 per 10,000 peripheral nerve blocks and 4 per 10,000 epidurals leading to cardiac arrest. In a recent closed claims analysis of anesthetic related maternal mortality, 10/69 or 14% of the deaths involved accidental intrathecal injection of local anesthetic through an epidural catheter with a resulting high spinal.1 A "chelatable" local anesthetic would give anesthesiologists a new method to reverse the negative sequelae of a misplaced local anesthetic.

METHODS: A lidocaine dimer was synthesized by inserting a six chain carbon linker. The affinity of the dimer to series of macrocyles (calixarenes and cucurbiturils) was measured using ITC (Isothermal titration calorimetry).

RESULTS: Lidocaine dimer has a very high affinity for sulfocalixarene (Ka=61,000 M-1) and cucurbit[7]uril(Ka=200,000 M-1) compared to the monomer(Ka= 2500M-1)

DISCUSSION: Currently only two dimers are used in anesthesia practice, succinylcholine and cis atracurium. Cucurbiturils have a structure that mimics sodium and potassium channels, a central pore surrounded by carbonyl groups that have a high affinity for tertiary diamines. They may function, in addition to Intralipid ,as a rescue agent for local anesthetic toxicity.

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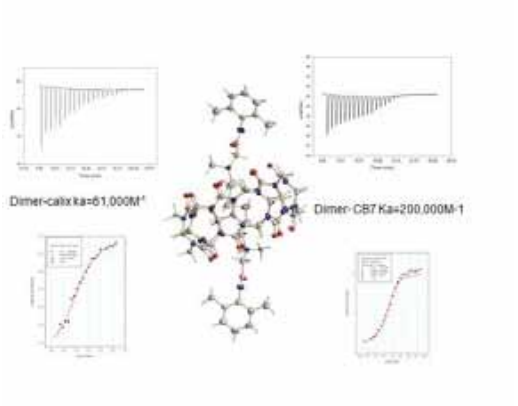

S-318.

ENGLISH AND SPANISH VIDEO-ASSISTED INFORMED CONSENT FOR LABOR EPIDURAL: A COMPARATIVE TRIAL

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INTRODUCTION: This study determines whether an educational video is superior to routine discussion for informing English or Spanish speaking patients in labor about risks, benefits, and alternatives to labor epidural anesthesia.

METHODS: This is a prospective randomized controlled trial on a sample of English and Spanish speaking women in early labor for labor epidural consent. Patients are randomized to watch a 5-minute long video in their primary language explaining the procedure, risks, benefits and alternatives. The control group undergoes routine informed consent via a discussion with an anesthesiologist for English speaking patients or via telephone translation for Spanish speaking patients. After their educational sessions, all patients are able to ask questions. The informed consent process is confirmed via teach-back method. Patient comprehension is quantified via a 10-question knowledge test in the patient's primary language. One additional question rates satisfaction with the informed consent process. Mean scores are compared to assess whether video-assisted consent is superior to routine informed consent discussion for educating patients about labor epidural, risks, benefits and alternatives. Secondary outcomes include the proportion of patients who receive or refuse a labor epidural as well as the satisfaction scores with the informed consent process for each group.

RESULTS AND CONCLUSIONS: We expect the final results of this study by February 2010.

S-319.

THE USE OF GLUCOSE 5% AS AN IRRIGATING FLUID DURING HYSTEROSCOPIC FIBROID RESECTION DECREASES PERIOPERATVE COMPLICATION. DOUBLE BLINDED TRAIL.

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INTRODUCTION: Uterine fibroids are the most common benign tumours of the uterus. Surgical management of uterine fibroids has changed from laparotomy to minimally invasive surgery. Women with submucous fibroids receive myomectomy by hysteroscopy. Most fibroids can be managed endoscopically either by laparoscopy or hysteroscopy. (1) Excess absorption of liquid distending media is one of the most frequent complications of operative hysteroscopy. Absorption of hypotonic fluid causes an osmotic imbalance between extracellular fluid and brain cells. Water moves into brain cells, causing cerebral edema, which can lead to pressure necrosis and progress to brain stem herniation and death. (2) Our aim is to compare peri-operative complication durin hysteroscopic resection of endometrial fibroid using glycine1.5% solution in comparison to glucose 5% solution. Patients and Methods: One hundred twenty patients with endometrial fibroid were randomized into two irrigation modalities. Sixty patients used glycine 1.5% solution as irrigating fluid (glycine group) and 60 patients used glucose 5% solution (glucose group). Patient's demographics, operative time, hospital stay, postoperative amino acid glycine assay, postoperative serum cardiac troponin I and perioperative complications were noted. Results: No difference was found between both groups in the immediate postoperative levels of serum sodium, hemoglobin, hematocrite. A high glycine level was associated with the hypontraemia. Five patients had perioperative complication; all were in glycine group and they had the highest postoperative amino acid glycine levels. Transient Hyperglycemia and hypokalemia occurred in the immediate postoperative period in the glucose group. Glucose 5% irrigation was associated with better homeostasis, lower incidence of perioperative complications. Discussion: Glycine is an endogenous amino acid. It is transparent and inexpensive. However, the solution is un-physiological because it lacks electrolyte and excessive absorption leads to hypontraemia. It has direct and indirect cardio-toxic effects. Hyponatraemia leads to cerebral edema, which manifest by restlessness, agitation, confusion, seizures and coma. Glucose 5% is more physiological because it can be given intravenously and with lower incidence of complication. Normal serum osmolality is ≈ 290 mosmol/kg. The osmolality of 5% glucose is 285 mosmol/kg, as opposed to the osmolality of 1.5% glycine, which is 190 mosmol/kg. This higher osmolality provided by 5% glucose solution may be beneficial in reducing the possible side-effects of cerebral edema.

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S-320.

CONVERSION OF LABOR ANALGESIA WITH CSEA TO ANESTHESIA FOR CESAREAN SECTION

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BACKGROUND: Epidural abor analgesia has been widely accepted because it can be used to avioid general anesthesia when emergent cesarean section is required during the delivery. For this pupose, labor analgesia with combined spinal epidural analgesia has been criticized because an epidural catheter may not be used for cesarean section until a reliabilty of epidural catheter is confirmed after spinal effect's disappearance. Recent guidelines suggest the rate of general anesthesia for Caesarean section in parturients with pre-existing epidural analgesia for labour should be <3%. However, the rate has not been studied at the hospital where CSEA is mainly used for labor analgesia. The aim of the study was to determine the rate of successful epidural for cesarean section during labor analgesia at the hospital where CSEA is mainly used for labor analgesia.

METHODS: Health records of all parturients who received neuraxial labor analgesia and who underwent intrapartum cesarean delivery during the 2-year period from September 01, 2007 to August 31, 2009 were manually reviewed.

RESULTS: One hundred twenty-eight cases (13 with EDB and 115 with CSEA) were identified. One hundred eleven patients were succsessfully managed by EDB during the cesarean section. Subarachnoid block was used in 10 cases. But in 5 cases epidural catheter was not used at all for cesarean section as attending anesthesiologists other than obstetric anesthesiologists were not confident that he could manage epidural catheter for cesarean section.

General anesthesia was used in 7 cases. But in 2 cases, epidural catheter was not used at all as an urgent cesarean sectiion was proposed.

DISCUSSION: In the present study, successful epidural ratio was 87%. However, by excluding grey cases, which were attributable to anesthesiologist's skill and urgent obstetric indication, it was calculated as upto 92%. It is implied that successful epidural ratio during CSEA for labor analgesia is acceptable in comparison with epidural only, if indication was carefully selected.

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Pain – Basic Science

S-321.

WITHDRAWN.

S-322.

INTERNALIZATION AND RECYCLING PROFILES OF μ- AND DIMERIZED μ-δ OPIOID RECEPTORS INDUCED BY REMIFENTANIL: IMPLICATION OF ACUTE TOLERANCE OF REMIFENTANIL

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INTRODUCTION: Remifentanil, a short-acting opioid with a predictable and rapid recovery, has been commonly used in general anesthesia. However, it occasionally develops acute tolerance and hyperalgesia especially when infused at large dose1. Recently, it has been shown that internalization and recycling profiles of opioid receptors are closely related to the development of opioid tolerance. Furthermore, recent progress has shown that μ-opioid receptors (μOR) and δ-opioid receptors (δOR) could form heterodimers, which have distinct pharmacological properties compared with their parental receptors. We thus investigated the effects of small- and large-doses of remifentanil on the internalization and recycling profiles of both μOR and dimerized μ-δOR.

METHODS: A yellow fluorescent protein (Venus) and a cyan fluorescent protein (Cerulean) were fused to the C-terminus of μOR (μOR-V) and δOR (δOR-Ce), respectively. Colocalization, internalization, recycling and heterodimerization of each opioid receptor were determined in baby hamster kidney (BHK) cells with confocal microscopy and fluorescence resonance transfer (FRET) analyses. In BHK cells expressing μOR-V or dimerized μOR-V/δOR-Ce, remifentanil at 10nM, 100nM or 1μM was applied for 30min, and then the internalization (30min after stimulation) and recycling profiles (180min after stimulation) of each receptor were determined.

RESULTS: Confocal microscopy and FRET analyses revealed colocalization and heterodimerization of μOR-V and δOR-Ce on the plasma membranes. Both internalized (in cytosol, 30min after stimulation) and recycled (on the plasma membrane, 180min after stimulation) μOR-V and δOR also formed heterodimers. To determine the internalization and recycling profiles of μOR and dimerized μ-δOR, we counted cells in which most of receptors existed on the plasma membrane or in cytosol. There was no significant differences among the rate of internalized μOR-V by remifentanil at any concentratons (10nM: 77%, 100nM: 71%, 1μM: 82%). The percentages of internalized μ-δOR by remifentanil increased in a concentration-dependent manner (10nM: 60%, $p<0.01$ vs. 100nM, 100nM: 73%, $p<0.01$ vs. 1μM, 1μM: 87%). Furthermore, μ-δOR was less internalized at small dose than did μOR. On the other hand, the rate of recycled μOR by remifentanil decreased in a concentration-dependent manner (10nM: 75%, $p<0.0001$ vs. 100nM, 100nM: 49%, $p<0.001$ vs. 1μM, 1μM: 35%). The percentage of recycled μ-δOR at 1μM (60%) was significantly less than that at 100nM (78%, $p<0.001$), and 10nM (75%, $p<0.01$). In addition, μ-δOR internalized by 100nM or 1μM of remifentanil were recycled more than μOR internalized at the same concentrations.

DISCUSSION: The rate of recycling of μOR and dimerized μ-δOR was decreased when stimulated by remifentanil at large doses. Further, internalization rate of μ-δOR was accelerated by remifentanil in a concentration-dependent manner. These findings may in part account for the acute tolerance and hyperalgesia induced by large-doses of remifentanil.

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ANESTH ANALG S-323
2010; 110; S-1 – S-491

S-323.

MICROARRAY ANALYSIS OF MICRORNA EXPRESSION IN THE SPINAL CORD OF NEUROPATHIC PAIN RATS

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INTRODUCTION: MicroRNAs (miRNAs) are small endogenous noncoding RNAs of 20~24 nucleotide long, that induces translational repression or degradation of target mRNAs upon imperfect base pairing to its 3' untranslated region. Many miRNAs have been detected in the nervous system for their function in neuronal development, plasticity and disease. Neuropathic pain that develops upon variational nervous system gene expression, can alter or be altered by miRNAs. In our work, sciatic nerve chronic constriction injury (CCI) induced neuropathic pain rats were used for microarray and real-time PCR analysis of spinal cord miRNAs expression profiling.

METHODS: 24 male SD rats, weighing 200-250g were randomly divided into 3 groups (n=8 for each): Naïve, SHAM and CCI. All the rats were sacrificed under ether anesthesia on 7th postoperative day of SHAM or CCI, as was followed by lumbar spinal cord isolation and preservation. Total RNA of rat spinal cord were harvested using TRIzol (Invitrogen) and RNeasy mini kit (QIAGEN) according to manufacturers' instructions. After having passed RNA measurement on the Nanodrop instrument, the samples were labeled using the miRCURY™ Hy3™/Hy5™ Power labeling kit and hybridized on the miRCURY LNA™ microRNA Array (v.11.0). Scanning was performed with the Axon GenePix 4000B microarray scanner. GenePix pro V6.0 was used to read the raw intensity of the image. The statistically significance was analyzed by Fold Change and t-test. The threshold value we used to screen up and down regulated miRNAs was Fold Change over 1.40 and below 0.71 respectively, with t-test $p \leq 0.05$. Those selected differentially expressed miRNAs were further validated through real-time PCR.

RESULTS: All the CCI rat exhibited significant decreased nociceptive threshold of both mechanical and thermal stimulation on 7th postoperative day, when compared with Naïve or SHAM. Lumbar spinal cord miRNAs microarray indicated that altogether 9 miRNAs were up regulated and 34 miRNAs were down regulated. We selected some characteristic miRNAs (Table 1) for further real-time PCR validation, as agreed on microarray well.

Table 1. Differentially expressed miRNAs in the spinal cord of neuropathic pain rats.

Table 1. Differentially expressed miRNAs in the spinal cord of neuropathic pain rats

miRNA names	miRNA clone sequence	Fold Change	p-value	Reference
Up Regulated				
rno-miR-99b	CACCCGUAGAACCGACCUUGCG	1.58	<0.01	1, 2, 4
Down regulated				
rno-miR-349	CAGCCCUGCUGUCUUAACCUCU	0.60	0.012	1
rno-miR-34b	UAGGCAGUGUAAUUAGCUGAUUG	0.58	0.034	3
rno-miR-674-3p	CACAGCUCCCAUCUCAGAACAA	0.45	<0.01	4
rno-miR-879	AGAGGCUUAUAGCUCUAAGCC	0.56	<0.01	4
rno-miR-325-5p	CCUAGUAGGUGCUCAGUAAGUGU	0.54	<0.01	1, 2, 4

DISCUSSION: We applied TargetScan 5.1 to predict the target genes of these selected miRNAs, with the possible targets including: membrane ion channels, glutamate receptors, PDZ domain proteins, postsynaptic scaffold proteins, cytoskeleton proteins, kinases (CaMKII, PKC, MAPK, etc.) and transcriptional factors. Thus, neuropathic pain associated spinal cord miRNAs expression alteration probably contributed to modulate synaptic transmission, synaptic plasticity and nociceptive signalling.

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S-324.

DIVERGENT CHANGES IN CALCINEURIN GENE EXPRESSION, ENZYME ACTIVITY AND PROTEIN CONTENT IN THE SPINAL DORSAL HORN ACCOMPANY THE DEVELOPMENT OF NEUROPATHIC PAIN FOLLOWING CHRONIC CONSTRICTION INJURY OF THE RAT SCIATIC NERVE

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INTRODUCTION: Synaptic plasticity in the spinal dorsal horn (DH) is thought to underlie the development of neuropathic pain. Calcineurin (CaN, protein phosphatase 3) plays an important role in synaptic plasticity. We examined whether the onset (3 days) and full expression (7 days) of neuropathic pain due to chronic constriction injury (CCI) were associated with changes in calcineurin gene expression, enzyme activity, and protein content of the CaN Aα isoform in the DH. We also investigated whether intrathecal pretreatment with MK-801, an NMDA receptor antagonist that blocks synaptic plasticity, would modify any CCI-associated changes in CaN or pain behavior.

METHODS: Baseline weight-bearing and thermal withdrawal latencies were obtained for male Harlan-Sprague-Dawley rats before they were assigned to control (uninjured), sham-operated or CCI groups. Three or 7 days after sciatic exposure or ligation the behavioral tests were repeated before the animals were anesthetized, euthanized, and their spinal cords collected for RT-PCR, enzyme activity or Western immunoblot assays. ANOVA was used for data analysis. Significance was inferred at the $p \leq 0.05$ level. Analysis was based on 6 animals in CCI and control groups and 4 in sham-operated groups.

RESULTS: CCI animals exhibited both a shift in weight bearing and a reduction in paw withdrawal latencies as signs of pain behavior. At 3 days the pain behavior was associated with a significant increase in CaN gene expression (2.6±1-fold), enzyme activity (126±19%) and CaN Aα content (131±13%) in the ipsilateral DH. In contrast, while the pain behavior persisted at 7 days, CaN gene expression returned to normal (1.6±0.4-fold) and enzyme activity (63±18%) and protein content (74±6%) decreased. A single intrathecal injection of MK-801 (20μg in 10μl) 15 min before the ligation attenuated the thermal, but not the weight-bearing, pain behavior at 3 and 7 days post-CCI. Ongoing data analysis will establish whether MK-801 also modified CCI-associated changes in CaN. There were no changes in CaN message, enzyme activity or protein content in the DH of sham-operated animals at 3 or 7 days. The injection of MK-801 had no effect on their behavior.

DISCUSSION: These data suggest an involvement of CaN in CCI-elicited neuropathic pain. It is intriguing that the onset of pain behavior was accompanied by an increase in CaN while the full development of neuropathic pain was associated with a loss of CaN. These divergent changes in CaN may be critical components of the transition from acute to chronic pain. The increase in CaN may be necessary for the initial synaptic plasticity that underlies the induction of neuropathic pain. In contrast, the loss of CaN may allow neuropathic pain to be maintained because the phosphatase cannot then dephosphorylate numerous kinases to prevent the long-lasting synaptic plasticity that seems to underlie fully developed neuropathic pain.

S-325.

EFFECTS OF GENERAL ANESTHETICS ON P2X4 RECEPTORS IN MICROGLIA

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INTRODUCTION: Microglia, immune cells widely distributed in the brain and the spinal cord, play important roles in the pathogenesis of neuropathic pain.[1] In rat peripheral nerve injury model, increased expression of P2X4 receptors (P2X4Rs) and their stimulation in spinal microglia are involved in establishing allodynia.[2] Therefore, microglial P2X4Rs are recognized as a key target for treatment of neuropathic pain. Persistent chronic pain such as postthoracotomy pain occasionally occurs after the major surgical procedures,[3] where the participation of microglial P2X4Rs is conceivable. However, little is known how general anesthetics act on microglial P2X4Rs. In the present study, we examined the effects of general anesthetics on microglia P2X4Rs.

METHODS: Currents induced by application of ATP via a U-tube system were recorded using the whole-cell patch-clamp technique in cultured rat microglial cell line (MG-5). Isoflurane, sevoflurane, ketamine, thiopental, and propofol were coapplied with ATP.

RESULTS: ATP induced two distinct types of inward currents in MG-5 cells as observed in the previous reports;[4,5] slow-desensitizing and non-desensitizing currents. Slow-desensitizing currents, activated by low concentrations of ATP (< 100 μM), were markedly enhanced by ivermectin (2 μM), an P2X4Rs selective enhancer, but were not blocked by brilliant blue G (3 μM), P2X7Rs antagonist, indicating the currents were mostly mediated via P2X4Rs. Non-desensitizing currents, activated by high concentrations of ATP (> 1 mM), exhibited characteristically pharmacological properties of P2X7Rs. Dose-response relationship for P2X4Rs revealed that the EC50 was ~11 μM. The concentration dependent effects of general anesthetics were tested on the currents induced by 20 μM ATP. Isoflurane and sevoflurane had no effect on the P2X4Rs currents at doses up to those corresponding to 3 minimum alveolar concentrations (n = 5). Ketamine decreased the currents only at considerably high concentrations (IC50 7.5 mM, n = 6), and thiopental had no effect at any concentrations tested (n = 5). Differing from other general anesthetics, propofol showed dual effects, namely, the significant potentiation of the P2X4Rs currents at low concentrations (300 nM, 1 μM, and 3 μM) ($p < 0.05$, n = 6) and the inhibition at high concentrations (> 30 μM). The maximum enhancement was observed at 1 μM propofol (126 ± 22 % of control, n = 6).

DISCUSSION: The present study demonstrated that propofol potentiated the P2X4Rs-mediated currents at clinically relevant concentrations. Our results may suggest that propofol can affect the incidence of chronic pain after surgery via enhancing microglial P2X4Rs response.

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2010; 110; S-1 – S-491

S-326.

A LONG-TERM EFFECT OF SLOW RELEASING LIDOCAINE SHEET AND PARTICLE IN A RAT MODEL OF POSTOPERATIVE PAIN

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BACKGROUND: Postoperative pain management is important for preventing perioperative complications. In a recent meta-analysis, however, about 40% of all surgical patients still experience moderate to severe acute postoperative pain. We made control released lidocaine and use it for a sciatic nerve block or epidural injection in the rat model of postoperative pain.

METHODS: We made a novel slow releasing lidocaine sheet (SRLS) and particle (SRLP) with polylactic-co-glycolicacid (PLGA). They were used for all experiments. We made a hind paw incision using male Sprague-Dawley rats (postoperative pain model), and SRLS, lidocaine itself, or PLGA only (control) was applied near the ipsilateral sciatic nerve just before the paw incision. The development of mechanical hypersensitivity was assessed using von Frey filaments. We also examined c-fos expression in the spinal dorsal horn of segments L4-5 in each group.

SRLP or lidocaine solution was injected into epidural space also in a rat model of postoperative pain. Their mechanical hypersensitivity and thermal hyperalgesia were assessed.

RESULTS: We could prepare a SRLS (30%, w/w), which continuously release lidocaine for a week. In the behavioral studies, withdrawal threshold in the SRLS-treated group was higher than that in the control group at all time point measured (2 h-7 days). In contrast, withdrawal threshold in the lidocaine-treated group was higher than that in the control group only at 2 h after paw incision. The numbers of c-fos positive neurons in the SRLS-treated group were smaller than that of control group at 2 h, 5 h, 48 h after paw incision. The numbers of c-fos positive neurons in the SRLS-treated group was also smaller than that of lidocaine-treated group at 5 h, 48 h after paw incision.

We prepared SRLS that contained 10% lidocaine and 25% lidocaine (w/w). They showed continuous release of lidocaine for days in vitro (10%-7days, 25%-3days). Withdrawal threshold in the SRLP-injected group was higher than that in the control groups.

CONCLUSIONS: Single treatment with this SRLS or SRLP inhibited nociceptive behavior and c-fos expression in the spinal cord dorsal horn for a week. Slow releasing technique of local anesthetics might be a promising method for management of postoperative pain.

S-327.

CELLULAR SIGNALING AND INTERNALIZATION PROFILES OF HETERODIMERIZED CANNABINOID CB1 AND OPIOID μ RECEPTORS: IMPLICATION OF CANNABINOID AND OPIOID INTERACTION AT THE RECEPTOR LEVELS

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INTRODUCTION: μ-Opioid receptors (μOR) and cannabinoid CB1 receptors (CB1R) colocalize in certain area of the CNS; μOR and CB1R have been reported to have a croS-talk property each other including analgesic efficacy. We recently reported that μOR and CB1R form functional heterodimer determined by fluorescence resonance energy transfer (FRET), co-immunoprecipitation and functional electrophysiological assay that detects only heterodimer activation. In the present study we further examined signal transduction pathways and receptor internalization profiles of heterodimerized μOR/CB1R.

METHODS: A yellow (Venus) and a cyan fluorescent protein (Cerulean) were fused to the C-terminus of μOR (μOR-Venus) and CB1R (CB1R-Cerulean). Heterodimerization of μOR and CB1R was determined with FRET assay. For internalization assay we used laser confocal microscopy in BHK cells expressing μOR/CB1R-Cerulean, μOR-Venus/CB1R or μOR-Venus/CB1R-Cerulean. For heterodimer functional assays we measured G protein-activated inward rectifying K+ (GIRK) currents in μOR/CB1R-coexpressed Xenopus oocytes. Extracellular regulated kinase (ERK) assay was also determined in BHK cells coexpressing mOR/CB1R.

RESULTS: In BHK cells expressing CB1R-Cerulean, CB1R agonist CP55, 940 (CP) at 3x10-7M for 30 min internalized CB1R-Cerulean from plasma membrane to cytosol, whereas μOR agonist DAMGO at 10-7M did not. In contrast, DAMGO but not CP for 30 min internalized μOR-Venus in cells expressing μOR-Venus. In cells coexpressing μOR/CB1R-Cerulean supposed to form heterodimer, DAMGO as well as CP internalized CB1R-Cerulan. Similarly, both DAMGO and CP internalized μOR-Venus in cells coexpressing μOR-Venus/CB1R. In cells coexpressing μOR-Venus/CB1R-Cerulean, either CP or DAMGO internalized μOR-Venus/CB1R-Cerulean; internalized μOR-Venus and CB1R-Cerulean showed heterodimer complex. In oocytes coexpressing μOR/CB1R, coapplication of DAMGO and CP strongly elicited GIRK currents than that caused by each of the agonist alone. On the contrary, coapplication of both agonists elicited ERK phosphorylation to a lesser extent than that caused by each agonist alone in μOR/CB1R-coexpressed cells.

DISCUSSION: We demonstrated that μOR agonist internalized CB1R, and CB1R agonist also internalized μOR, provided that both receptors formed heterodimer, suggesting that each agonist affects internalization profile of another heterodimerized receptor. GIRK and ERK signaling pathways were positively and negatively regulated in cells expressing μOR/CB1R heterodimer. Morphine and cannabinoids have been reported to possess positive or negative cooperativity when administrated together. The altered cellular signaling and distinct internalization profiles through μOR/CB1R heterodimer could explain such phenomena.

SUMMARY:

Heterodimerized μOR and CB1R elicit different cellular signaling and internalization profiles distinct from those activated by their parental receptors alone.

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J Pharmacol Sci. 108:308-19.2008

S-328.

HBO ALLEVIATES CCI-INDUCED NEUROPATHIC PAIN AND REDUCES TNF-α, BUT NOT IL-1β PRODUCTION IN SCIATIC NERVE OF RAT

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INTRODUCTION: TNF-α and IL-1β are hypothesized to be implicated in the induction and maintenance of neuropathic pain. Recently, hyperbaric oxygenation (HBO) has been suggested to have a beneficial effect in the treatment of pain disorders. The present study examined our hypothesis that 1) chronic constriction injury (CCI)-induced neuropathic pain may be associated with increased production of TNF-α and IL-1β in the sciatic nerve; 2) HBO may alleviate CCI-induced neuropathic pain; and 3) the alleviated neuropathic pain may be associated with reduced production of TNF-α and IL-1β in the sciatic nerve.

MATERIALS AND METHODS: Male rats (250-300 g) were anesthetized and right sciatic mononeuropathy was induced by CCI. Mechanical allodynia was tested by determining the hind-paw withdrawal response to von Frey hair filaments stimulation of the plantar surface of the footpad. Cold allodynia was tested by determining the hind-paw withdrawal response after the spread of acetone over the plantar surface of the paw. Study rats (n=18) were exposed to 100% oxygen for 1 hour at 2.5 ATA once a day following the CCI procedure. Control rats (n=18) and Sham rats (n=12) were placed in an HBO chamber, breathing air. Sciatic nerves were harvested, pooled (n=3) and homogenized. TNF-α and IL-1β were assayed in duplicate with ELISA. A concentration of TNF-α and IL-1 β was expressed as pg/mg of protein. Data are expressed as Mean±SD. Student's t-test was used to analyze differences between groups.

RESULTS: CCI-induced significant cold and mechanical allodynia on day 4 and day 7. HBO significantly reduced cold allodynia response frequency (20±1.6% vs. 50±4.5% on day 4 and 40±4.6 % vs. 70±4.5% on day 7, $p < 0.05$). HBO significantly increased the threshold of mechanical allodynia compared with the Control group. The threshold value of von Frey measurement was 26.0±0 g vs. 16.8±1.6 g on day 4 and 15.2±0 g vs. 7.2±0.1 g on day 7. TNF-α was significantly higher in Control rats than in Sham rats (17.9±0.8 vs. 10.7±1.1 on day 4 and 19.0±1.6 vs. 9.1±1.5 pg/mg on day 7, $p<0.05$). HBO significantly decreased CCI-induced TNF-α production compared with the Control group (10.9±2.8 and 11.3±3.0 pg/mg on day 4 and 7 respectively, $p<0.05$). IL-1β was significantly higher in Control rats than in Sham rats (636±74 vs. 256±31 on day 4 and 687±89 vs. 288±35 pg/mg, on day 7, $p<0.05$). HBO did not significantly decreased CCI-induced IL-1 β production compared with the Control group, (671±85 and 672±75 pg/mg on day 4 and 7 respectively, p=ns).

CONCLUSION: 1) HBO alleviates CCI-induced neuropathic pain. 2) HBO inhibits the production of TNF-α, but not IL-1β, in CCI-induced neuropathic pain. 3) This reduced TNF-α production may be, at least in part, attributed to the beneficial effect of HBO.

S-329.

KETAMINE AND HSP70 PROTECTION EFFECT IN MYOCARDIUM AND BRAIN TISSUE IN SEVERELY BURNED RATS

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INTRODUCTION: Ketamine involved in heat shock protein (HSP-70) has been hypothesized to confer cellular protection and reduce animal mortality; (1) however, the mechanisms of its effect are not unclear. (2-3) We investigated the ketamine on the expression of HSP-70 in myocardium and brain in severely burned rats, and explored its possible mechanisms.

METHODS: We randomly divided 124 male Wistar rats into a control group (group C, n=20), burned group (group B, n=52) and burned +ketamine group (group K, n=52). Rat groups B and K had 30% of their total body surface burned. Group K were treated with ketamine (40 mg/kg, i.m.) at 15 minutes after injury and group B were injected with saline at the same volume. After the rats were euthanized, we examined HSP-70 blot analysis. Survival status was evaluated for the rats not euthanized.

RESULTS: Our results showed that the level of HSP-70 was higher in groups B and K than in group C at 3h, 6h, 12h and 24h ($P<0.05$). HSP-70 levels were peaked in myocardium at 24h and in the brain at 12h in group K. Expression of HSP-70 at 3h and 6h in group K was much higher than group B ($P<0.05$). All animals in group C survived within the first 10d. The survival rate of severely burned rats in group B was 95% (19/20 rats), 90% (18/20), 80% (16/20), 75% (15/20), 70% (14/20), 55% (11/20), 40% (8/20) and 30% (6/20) at 3h, 6h, 12h, 24h, 2d, 4d, 8d and 10d respectively. Survival in group K was 100% (20/20 rats), 100% (20/20), 95% (19/20), 85% (17/20), 80% 16/20), 80% (16/20), 75% (15/20), and 70% (14/20) a 3h, 6h, 12h, 24h, 2d, 4d, 8d and 10d respectively. The differences of survival rates between group K and group B were statistical significant at 10d ($P<0.05$).

DISCUSSION: Our findings showed Ketamine mediates a cellular protective mechanism in the myocardium and brain of rats after severe burns and prolongs survival after burn injury. HSP-70 may be one of the expression mechanisms of ketamine's myocardial and cerebral protection after severe burns. Further studies are required to discover the exact molecular mechanisms by which ketamine exerts its effects, and might lead to therapeutic approaches in clinical practice.

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S-330.

ANTINOCICEPTIVE ACTION OF CARBAMAZEPINE ON THERMAL HYPERSENSITIVE PAIN IN A RAT MODEL OF ADJUVANT-INDUCED CHRONIC INFLAMMATION

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INTRODUCTION: Inflammatory pain is most often associated with chronic clinical conditions such as osteoarthritis, chronic low back pain, and rheumatoid arthritis. The anticonvulsant carbamazepine, a voltage-gated sodium channel (VGSC) blocker used for the treatment of neuropathic pain, has been reported to reduce inflammatory hyperalgesia in a dose-dependent manner.[1,2] However, the antinociceptive effects of carbamazepine on the spinal cord in inflammatory conditions remain unclear. The aim of the present study was to evaluate the antinociceptive effects of carbamazepine on the spinal cord in comparison with those of tetrodotoxin, a selective VGSC blocker, in intact rats and adjuvant-induced chronic inflammatory rats.

METHODS: Sprague-Dawley rats were utilized for the experiments. A chronic inflammatory condition was induced by complete Freund's adjuvant (CFA) inoculation into the rat tail. For lumbar intrathecal drug administration, the subarachnoid space was cannulated with a polytetrafluoroethylene-lined polyethylene tube by application of the modified method of Jensen and Yaksh.[3] Carbamazepine was administered at doses of 3, 10, 30 and 100 mg/kg i.p. to intact rats and 3, 10 and 30 mg/kg i.p. to inflamed rats. Carbamazepine and tetrodotoxin for intrathecal administration were prepared at concentrations of 0.1, 0.4, 1.3 and 4.2 nmol/20 µl, and 0.6, 2 and 6 pmol/20 µl, respectively. Tail flick latencies were measured according to the method of Takasugi et al.,[4] for 60 min at 10-min intervals, following either intraperitoneal carbamazepine, or intrathecal carbamazepine or tetrodotoxin injection in intact or chronic inflammatory rats. From the values of TF latency at 60 min after drug injection, ED50 of each drug was derived.

RESULTS: Carbamazepine attenuated thermal responses with both systemic and intrathecal administration. The effect was more evident in chronic inflammation than intact rats. Intrathecal tetrodotoxin also clearly inhibited the response in rats with chronic inflammation. Intrathecal low dose carbamazepine attenuated the thermal response in a comparable manner to that of tetrodotoxin in the inflamed condition. The relative potencies of intrathecal carbamazepine for inhibition were approximately 1:150 - 300 times those of intrathecal tetrodotoxin in intact and inflamed rats.

DISCUSSION: These results indicate that the inhibition of tetrodotoxin-sensitive channels may largely contribute to the antinociceptive effect of carbamazepine on CFA-induced inflammatory pain, since low doses of intrathecal carbamazepine attenuated more thermal responses in inflamed than in intact rats in a comparable manner to that of tetrodotoxin. This suggests the therapeutic efficacy of intrathecal carbamazepine for the treatment of inflammatory pain.

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WITHDRAWN.

S-332.

REGIONAL HOMOGENEITY ANALYSIS ON ACUPOINT SPECIFICITY WITH RESTING-STATE FUNCTIONAL MAGNETIC RESONANCE IMAGING

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INTRODUCTION: UB 63(Jinmen), LV 3 (Tai chong), ST36(Zusanli), GB 40 (Qiuxu) are acupoints used to relieve pain for craniotomy in China. The theoretical basis for electing acupoints remained to be studied. In this study, the differences of central nervous responses to transcutaneous electrical stimulation (TEAS) on acupoints and non-acupoints were detected with functional magnetic resonance imaging (fMRI).

METHOD: 12 healthy volunteers were enrolled in this study. The fMRI of blood oxygen level-dependent (BOLD) signal of the brain was performed for 306 seconds before and 30 min with TEAS stimulating on acupoints UB 63, LV 3, ST36 and GB 40 together. The procedure was repeated after one week with stimulating on non-acupoints. The regional homogeneity analysis (ReHo) [1] method was used to analyze the differences of central nervous responses.

RESULT: The regional homogeneity in the acupoint group is increased in the left thalamus, caudate, putamen, lentiform nucleus(BA19, 30, 39), postcentral gyrus, precentral gyrus(BA3, 4, 30, 32), calcarine fissure, middle temporal gyrus(BA30), right superior temporal gyrus, inferior temporal gyrus(BA38), cuneus, precuneus(BA7, 19)than that in the non acupoint group. The regional homogeneity of acupoint group was decreased in the left cerebellum posterior lobe, middle frontal gyrus(BA10), double-side precuneus(BA7), postcentral gyrus(BA40). Most different regions are ipsilateral pain-related brain regions.

DISCUSSION: Transcutaneous electrical acupoint stimulation can relieve pain through pain related regions. Acupoint stimulation cause different central nervous responses compared with non-acupoint stimulation with regional homogeneity analysis of BOLD fMRI.

KEYWORD: Acupoint specificity; Functional magnetic resonance imaging; Regional homogeneity

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FOOTNOTES

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S-333.

SYMPATHETIC VASOCONSTRICTOR RESPONSE AT MYOFASCIAL TRIGGER POINTS.

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INTRODUCTION: Myofascial trigger points (MTrPs) are a major cause of musculoskeletal pain. It has been reported that stimulation of a latent MTrP increases motor activity and facilitates muscle pain via activation of the sympathetic nervous system. However, the magnitude of the sympathetic vasoconstrictor response following stimulation of MTrP has not been studied in healthy volunteers. The aims of this study were 1) to evaluate the magnitude of the vasoconstrictor response following a nociceptive stimulation (intramuscular glutamate) of MTrPs and a breath-hold maneuver (activation of sympathetic outflow), and 2) to assess whether the vasoconstrictor response can be further modulated by combining a nociceptive stimulation of MTrPs and breath-hold.

METHODS: Fourteen healthy subjects were recruited in this study. This study consisted of four sessions (normal breath group as control, breath hold group, glutamate MTrP injection group and glutamate MTrP injection + breath-hold group). Skin blood flow and skin temperature in both forearms were measured with laser Doppler flowmetry and infrared thermography respectively in each session (before the treatment, during the treatment, and after the treatment).

RESULTS: Glutamate injection into MTrPs decreased skin temperature and blood flow in the peripheral area. The magnitudes of the reduction were comparable to those induced by the breath-hold maneuver, which has been used to induce sympathetic vasoconstrictor response.

CONCLUSION: The combination of glutamate injection into latent MTrPs together with the breath-hold maneuver did not result in further decrease in skin temperature and blood flow, indicating that sympathetic vasoconstrictor activity is fully activated by nociceptive stimulation of MTrPs.

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NON-SURGICAL METHOD OF HINDLIMB IMMOBILIZATION: A LABORATORY MOUSE MODEL OF SARCOPENIA

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INTRODUCTION: Muscle wasting is an important clinical consequence of immobilization which mimics a condition of muscle aging or "Sarcopenia". In sarcopenia progressive muscle wasting occurs with aging due to multiple reasons including loss of alpha-motor neuron input, changes in protein metabolism. Several possible methods of hind limb immobilization that induce muscle wasting in rodents have been described, however these methods always donot reflect exact clinical scenario of sarcopenia-like muscle wasting. Therefore, we describe a new method of limb immobilization that uses an external plastic casing (EPC) around the knee and ankle joint. This method resulted in significant loss of muscle mass and function.

METHODS: Five C56Bl/6J male young 10 week old mice were used to immobilize the lower limb by applying EPC for 14 days. The plastic cylinder used in this instance was the proximal end of a pipette tube with a diameter of 1.2 and 0.8 cm at the proximal and distal ends respectively, cut to 3-4 cm in length, to extend from the upper thigh to foot. At first, a piece of nylon surgical suture was glued on to the ventral side of the metatarsal followed by pulling the string gently through the tube. This places the foot in plantarflexion position. The femoral end and metatarsal end were coated with tissue adhesive to attach inner surface of the plastic tube to the limb to prevent any movement. The contralateral side was used as a control.

RESULTS: EPC-induced immobilization impaired neuromuscular function and increased muscle wasting. Typical evoked and tetanic muscle tension responses in tibialis muscle were impaired significantly after 14 days. On the immobilized side, T1 and Tetanus were 27.48+1.0 and 72.08+2.4 ($P<0.05$) compared to 36.8+1.2 and 97.6+1.5 ($P<0.05$) those on contralateral side, respectively. The weight of soleus, gastrocnemius and tibialis muscles were also reduced significantly from 8.04 +0.8, 137.2+9.1 and 43.84+2.6 ($P<0.05$) to 5.02 +0.9, 112.78+9.5 and 36.38+1.4 ($P<0.05$) respectively, in comparison with contralateral limb. As expected, the loss of muscle mass was correlated with neuromuscular dysfunction associated with significant increase in expression of $\alpha 7$ and $\alpha 1$ AChRs on the muscle membrane by three fold in the gastrocnemius muscle on the immobilized side relative to control after 14 days.

DISCUSSION: There are reasonable animal models to demonstrate muscle wasting, but these models have some disadvantages and limitations. However, we described here a simple, reversible and non-surgical method that significantly reduced muscle mass by 38, 18 and 17% in soleus, gastrocnemius and tibialis respectively, with a significant decline in evoked single (25%) and tetanic (26%) muscle tension responses in tibialis muscle. These data together indicate that the non-surgical method of immobilization using EPC is effective, efficient and reversible that will serve as a "Laboratory Model of Sarcopenia".

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S-335.

PREEMPTIVE CAUDAL NMDA RECEPTOR BLOCKERS AND LOCAL ANESTHETIC COMBINATION IN PEDIATRICS IMPROVES THE QUALITY OF POST-OPERATIVE ANALGESIA, DECREASES ANALGESIC REQUIREMENTS AND REDUCES SIDE EFFECTS.

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INTRODUCTION: Caudal block is a wide spread regional anesthetic technique for postoperative analgesia in pediatric lower abdominal surgeries. Various drugs are added to local anesthetics to prolong the duration and improve the quality of caudal epidural analgesia(1).The dissociative anesthetic agent ketamine is a NMDA receptor blocker. Blockade of NMDA receptor might reduce the central sensetization to pain caused by surgically induced tissue trauma and inflammation(2). Ropivacaine is a long acting local anesthetic agent with wide margin of safety regarding central nervous system and cardiovascular side effects(3). Our aim is to compare the quality of analgesia using ropivacaine or ketamine either alone or in combination in pedetric patients submitted for lower abdominal surgery. Methods: Sixty child ASA I of both sex, aged 2-10 years, they were allocated into 3 groups. Ropivacaine group (group 1) recieved 0.25% 2mg/kg, ketamine group (group2) recieved ketamine 0.5mg/kg and ropivacaine-ketamine group (group3) recieved 0.25% 2mg/kg mixed with ketamine 0.5mg/kg via caudal route. Result: The mean time to first analgesic rescue dose was found to be significantly prolonged in ropivacaine-ketamine group. There was no difference regarding sedation score or hemodynamic parameters in the studied groups. Fourteen patients (70%) in ropivacaine-ketamine group (group3) had a 24-hour of pain free post-operative analgesia, no patients in the other groups had a 24-hour of pain free post-operative analgesia. Discussion: Pre-surgical caudal ketamine improves the quality of postoperative analgesia, decreases analgesic consumption and reduces side effects.

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S-336.

PATIENT CONTROLLED SUFENTANIL TARGET CONTROLLED INFUSION FOR POSTOPERATIVE ANALGESIA IN ELDERLY PATIENTS AFTER TRANSURETHRAL RESECTION OF BENIGN PROSTATIC HYPERPLASIA

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Introduction Sufentanil(Suf) is increasingly used as the analgesic component during general anaesthesia, and Suf target-controlled infusion (TCI) with a low target concentration had showed better analgesia effects after cardiac surgery[1]. Here, we tested patient-controlled Suf TCI for postoperative analgesia in elderly patients after transurethral resection of benign prostatic hyperplasia (TURP) in Chinese people.

METHODS: After obtained institutional ethics committee approval and written informed consent, 30 elderly patients (ASAI~II, aged 65~90 yrs) received patient-controlled Suf TCI for pain control after TURP. After surgery, the patients were given a handset to increase the Suf plasma target concentration (CP). Suf initial CP was 0.08μg/L with an induction time of 30min. An effective demand of patient by handset increases Suf CP 0.005μg/L with a 15-min lockout interval. If analgesia was not demanded within a 60min period, the computer reduced the CP by 0.005μg/L. The maximum allowed CP was 0.16μg/L, and the minimum allowed CP was 0.05μg/L. Suf CP showed in the computer, analgesic effects assessed with 1-10 visual analogue scale(VAS), systolic blood pressure(SBP), diastolic blood pressure(DBP), heart rate(HR), pulse oximetry (SpO2), respiratory rate(RR) and patients' satisfaction with the patient-controlled Suf TCI device were monitored and recorded at 0h before the device started and 1, 2, 4, 8, 16, 24h after the device started.

RESULTS: Suf CP at 1~4h (0.079-0.080μg/L) was significantly higher than that of 8h and later(0.050-0.058μg/L) ($p<0.05$). All patients were satisfied with the analgesic device,and the VAS of patients was lower than 4. All patients' SBP, DBP were in normal range. 2 cases of skin itch and bradycardia were recorded respectively. No oversedation, nausea and vomiting, no hypoxaemic (<94%) and lower RR episode was found.

DISCUSSION: Patient-controlled Suf TCI is a safe and effective way for postoperative analgesia in elderly patients after TURP.

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S-337.

HEALTH CARE RESOURCE UTILIZATION: A COMPARISON OF 3 ANALGESIC MODALITIES FOR TOTAL KNEE ARTHROPLASTY

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INTRODUCTION: Allocation of health care resources is an increasing concern in this cost conscious environment. PACU time is a major cost drive in the perioperative arena, second only to OR time. The purpose of this retrospective review was to determine if different modalities of acute pain management in patients undergoing primary total knee arthroplasty (TKA) had an effect on block room time, intra-operative time and the time patients spent in the PACU.

METHODS: Following IRB approval, we conducted a retrospective chart review of patients having TKA from a two month period beginning in July 2009 through August 2009. Of these, patients were divided into one of three groups (epidural catheter infusion, femoral nerve block or morphine sulfate extended-release liposome injection (EREM)[DepoDurTM]) depending on which modality the patients received for post operative pain control for primary total knee replacement. All patients in the study received spinal anesthesia and monitored anesthesia care during the intra-operative period. There were no significant demographic differences among the 3 groups. (Table 1). Charts were reviewed for time spent in the block room, intra-operative time, time spent in the PACU, common post-operative side effects (nausea, vomiting, pruritus) and length of stay. Statistical analysis of block room time, intra-operative time, time spent in the PACU was perform using analysis of variance (ANOVA) and Bonferroni post hoc analysis.

Table 1 Patient Demographics

_	n=	Average Age	Surgical Procedure
Epidural catheter	20	67.25	Total Knee Arthroplasty
Femoral nerve block	20	67.45	Total Knee Arthroplasty
Morphine sulfate extended-release liposome injection	20	58.05	Total Knee Arthroplasty

RESULTS: Patients who received an epidural catheter, femoral nerve block, or EREM had average block room times of 11.8, 9.1 and 13.2 minutes (P=0.05), respectively. Patients who received an epidural catheter, femoral nerve block, or EREM had average intra-operative times of 70.25, 77.1, and 80.95 minutes (P=0.19), respectively. When comparing patients who received an epidural catheter, femoral nerve block, or EREM the average time spent in the PACU was 272.1, 238.8 and 166.8 respectively. This represents a statistical difference (P=0.008) when comparing patients who received EREM to patients who received an epidural catheter but not femoral nerve block (P=0.195) although there was a trend toward significance.

DISCUSSION: Morphine sulfate extended-release liposome injection significantly reduced PACU times when compared to epidural catheter (by 105.3 minutes) and femoral nerve block (by 72 minutes) in this retrospective study. Although the time comparison with femoral nerve block did not rise to statistical significance, a time difference of 72 minutes is clinically and economically significant. EREM may reduce PACU length of stay compared to other analgesic techniques used for TKA. There was no significant difference in common side effects among the three groups such as nausea, vomiting, pruritus. Hospital length of stay, block room and OR times was similar among all three groups. This study is limited by its retrospective nature. Further detailed economic analyses are warranted to determine the total cost considerations of these techniques.

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EFFICACY OF EPIDURAL DEXAMETHASONE VERSUS FENTANYL ON POSTOPERATIVE ANALGESIA

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INTRODUCTION: Dexamethasone has been used as a prophylaxis of postoperative nausea(1). Dexamethasone administration has been reported to reduce post-operative pain through oral and intravenous routes(3). The postoperative analgesic effect of epidural steroids has not been efficiently evaluated. Dexamethasone has a local anti-inflammatory action and has cell biology action through glucocorticoid receptors(4). Opoids provide good pain control but are associated with many side effects(5). Thus, this prospective, randomized, double blinded, controlled study was designed to evaluate the efficacy of adding dexamethasone versus fentanyl to epidural bupivacaine on postoperative analgesia.

METHODS: Ninety adult patients ASA I-II scheduled for lower abdominal surgeries were randomly allocated equally into three groups to receive total 10mL of epidural plain bupivacaine 0.25% in the control group (group B), with either 50 μg fentanyl in group (BF) or 4 mg dexamethasone in group (BD). Then patients received general anesthesia. Postoperatively, sedation and satisfaction scores were assessed. Visual analogue score (VAS) for pain assessment was measured and meperidine was administrated when VAS >4 or on demand. Any side effect was recorded. The cumulative intraoperative fentanyl dose, postoperative meperidine consumption in 24 hours and time to first analgesic requirement were recorded.

RESULTS: The cumulative intraoperative fentanyl requirements were comparable among the three groups. The time to the first analgesic requirement was significantly prolonged (5.2 times) in BF group and (4.7 times) in BD group than analgesic duration in B group. There was significant percent reduction in meperidine consumption during the first 24 hours (64.6%) in BF group and (62.5%) in BD group compared to B group. All patients of B group required analgesia but only 50% in BF group and 60% in BD group were in need. VAS scores were significantly lower and patient's satisfaction score was significantly higher in BF and BD groups when compared to B group. Sedation score was comparable among the three groups. The frequencies of postoperative nausea and urinary retention were lower in BD group in comparison with B and BF groups. No other side effect was recorded.

DISCUSSION: This study showed that epidural dexamethasone reduced overall pain scores and analgesic requirements in the postoperative period without significant adverse events. These Results go in accordance with other investigators who administered preoperative dexamethasone by oral,(2) intravenous(3) and epidural(5) routs. This study also revealed that epidural bupivacaine-dexamethasone admixture provided almost the same potency of analgesic effect as bupivacaine- fentanyl with opoid sparing and antiemetic effects. Further studies are required to evaluate the optimum dose of epidural dexamethasone.

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S-339.

EFFICACY OF CONTENIOUS INTRAVENOUS VERSUS EPIDURAL INFUSION USING EITHER MORPHINE OR TRAMADOL IN PATIENTS WITH POST-THORACTOMY PAIN

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INTRODUCTION: Post-thoractomy pain is a potent trigger to stress response, activates the autonomic nervous system and is thought to be an indirect cause of adverse effect on various organ systems(1). Our goal is to develop an analgesic regimen that provide effective pain relief to allow Post-thoractomy patients to maintain their functional residual capcity, to prevent hypoxia, atelectasis and infection(2). Epidural morphine has the highest incidence of delayed respiratory depression, nausea and urinary retention(3). Tramadol is an alternative analgesic with different side effect profile and low dependency potential(4). The aim of the study is to compare tramadol with morphine by continuous infusion either by intravenous or epidural routes on post-thoractomy pain.

METHODS: Eighty patients admitted for open thoractomy. Patients were divided into four groups according to the type of analgesia started at the time of rib approximation, 20 patients recieved thoracic epidural morphine as a loading dose of 2mg then, 0.2mg/h by continous epidural infusion **(group1)**, 20 patients recieved continuous epidural tramadol infusin at a loading dose of 100mg then, 5mgl/h by continous epidural infusion**(Group 2),** 20 patients recieved intravenous morphine 10mg as a loading dose then, 1.5mg/h by continous intravenous infusion **(group 3)**, and 20 patients recieved intravenous tramadol 100mg as a loading dose then, 15mg/h by continous intravenous infusion **(group 4).**

RESULTS: No significant difference among the groups regarding pain score, stress response. Higher incidence of nausea and vomiting in morphine groups.

DISCUSSION: Tramadol when used in a proper dose provides adequate analgesia in postthoractomy pain without the adverse effects associted with morphine intravenous or epidural infusion.

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S-340.

THE EFFICACY OF INTRAVENOUS LIDOCAINE FOR ACUTE HERPETIC PAIN -PLACEBO CONTROLLED TRIAL-

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BACKGROUND: Acute herpetic pain (AHP) which is considered not only nociceptive pain but also neuropathic pain, is often severe and intractable. Although there have been reported the efficacy of intravenous lidocaine (IVL) for neuropathic pain, the efficacy of lidocaine for AHP is not known. Therefore, the effect of IVL for AHP was examined.

METHODS: The study included 43 patients, who consulted to our pain management office within 90 days after skin eruption of herpes zoster. This study was a randomized, placebo-controlled design. In group A, a continuous infusion of saline of 100 ml for 30min was given followed by a continuous infusion IVL 3mg•kg-1 for 30min. In group B, IVL of 3mg•kg-1 for 30min was given followed by saline of 100ml for 30min. A pain relief score (PRS) was assessed at the end of each infusion.

RESULTS: In group A, PRS decreased significantly with saline (8.5±1.5) and decreased furthermore with IVL (2±2.1)($P<0.01$). In group B, PRS decreased significantly with IVL (2.4±2.3)($P<0.01$) and did not change with saline (2.1±2.3). A reduction of PRS with IVL in group B was significantly greater than that with saline in group A ($P<0.01$).

CONCLUSION: This study demonstrates that IVL has a significant analgesic effect in patients with AHP. Thus, IVL as routine treatment in AHP should be advocated.

S-341.

IVPCA EFFECTIVELY TREATS SUBOCCIPITAL CRANIOTOMY PAIN: A PROSPECTIVE RANDOMIZED CONTROLLED TRIAL

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BACKGROUND: Opioid administration following major intracranial surgery is often limited by a presumed lack of need and a concern that opioids will adversely affect the postoperative neurologic examination. A recent study reported that 2/3 of craniotomy patients suffer moderate to severe pain postoperatively.1 Suboccipital craniotomy was also found to cause more intense pain than supratentorial surgery. We hypothesized that intravenous patient controlled analgesia (IVPCA) would more effectively treat postoperative suboccipital craniotomy pain than conventional IV "as needed" (IVPRN) therapy.

METHODS: Following IRB approval and written informed consent, 49 adult patients who underwent elective infratentorial craniotomy were studied. Following a standardized intraoperative general anesthetic including fentanyl (up to 5 mcg/kg on induction, and 2 mcg/kg/hr thereafter), propofol (1-2 mg/kg), isoflurane, N20, and vecuronium, patients were randomized to receive either IVPRN fentanyl 25-50 mcg q 30 minutes or IVPCA fentanyl 0.5 mcg/kg q 15 minutes (max 4 doses/hour) postoperatively while in the Neurosurgical ICU. We measured pain (0-10, self report), sedation (Ramsay Sedation Score and Glasgow Coma Scale), amount of fentanyl used, side effects (pruritus, nausea, vomiting), and major adverse events (respiratory depression, emergency imaging studies) hourly.

RESULTS: 49 Patients(34:15 F:M) averaging 44 ± 13 years and 81 ± 22 kg were randomized to IVPCA (n=25) or IVPRN (n=24) fentanyl. The IVPCA group had significantly lower pain scores than the IVPRN fentanyl group, 3.7 ± 2.3 vs 5.1 ± 2.3 respectively, $p < 0.001$.[figure1]IVPCA patients also received significantly more fentanyl throughout their ICU stay than the IVPRN group (73 ± 81 vs 34 ± 33 mcg/hr respectively), $p < 0.001$. There were no statistically significant differences in sedation scores, side effects, or major adverse events between the 2 groups.

DISCUSSION: IVPCA more effectively treats the pain of suboccipital craniotomy surgery than IV PRN therapy. Although we did not observe any major adverse effects, a larger study will be necessary to establish safety.

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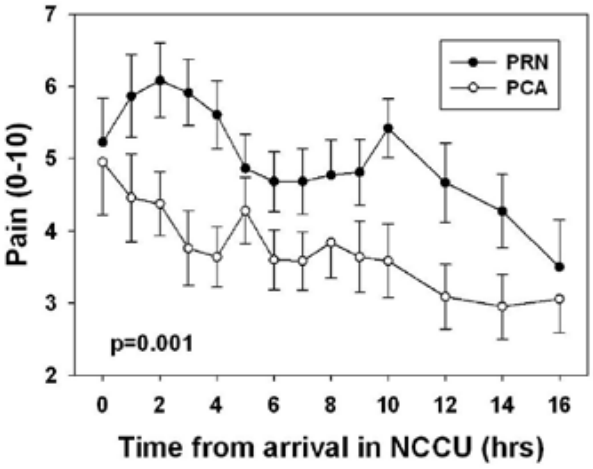

Figure 1

	IVPRN (Mean + SD)	IVPCA (Mean + SD)	p
Average Pain Score	5.1 (2.3)	3.7 (2.3)	0.001
Average Fenanyl Use (mcg/hr)	34 (33)	73 (81)	<0.001
Nausea or Vomiting	16/23	19/25	0.749
Average Respiratory Rate (b/min)	16.6 (6.1)	15.1 (7.0)	0.124
Average Heart Rate (b/min)	76 (16)	75 (17)	0.124
Average Systolic Blood Pressure	132 (24)	130 (23)	0.668
Average Oxygen Saturation	98.5 (1.6)	97.5 (2.0)	0.006
Average Ramsay Sedation Score (1-6)	2.0 (0.5)	2.1 (0.4)	0.144
Average Glasgow Coma Score (3-15)	14.2 (0.4)	14.4 (0.5)	0.170

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S-342.

PERIOPERATIVE ADMINISTRATION OF PREGABALIN FOR PAIN AFTER MASTECTOMY

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INTRODUCTION: Pregabalin was originally developed as anti-epileptic drug with a pharmacological profile similar to that of its developmental predecessor gabapentin. Although gabapentin and pregabalin were first identified as treatments for neuropathic pain, many studies showed postoperative analgesic efficacy of pregabalin. The aim of this trial was to investigate the efficacy and safety of pregabalin for reducing acute postoperative pain in patients undergoing mastectomy.

METHODS: Sixty patients undergoing elective mastectomy for breast cancer were randomized to receive pregabalin 75 mg (n = 30) or placebo (n = 30) 1 h before surgery and the dose was repeated after 12 h. The assessment of pain and side effects such as nausea and vomiting, headache, dizziness, sedation, blurred vision were made at 1, 6, 24, and 48 h postoperatively. Pain was evaluated using an 11-point verbal numerical rating scale (VNRS) at rest and with movement. When VNRS $\geq$ 5 or patients wanted analgesics, additional intravenous analgesics were allowed. Nausea and vomiting was graded on a four-point scale, where 0 = no nausea, 1 = mild nausea, 2 = severe nausea requiring antiemetics, and 3 = retching and/ or vomiting. Grade 2 and 3 were grouped together as postoperative nausea and vomiting (PONV). We recorded the sedation score on a four-point scale, where 0 = awake, 1 = mild sedation, 2 = sleepy but awakable, 3 = very sleepy. After discharge from hospital, patients were telephoned and recorded VNRS with movement at postoperative 1week.

RESULTS: VNRS at rest was lower in pregabalin group at 24 h and 48 h postoperatively ($P < 0.05$). VNRS with movement was lower in pregabalin group at postoperative 24 h and 1 week ($P < 0.05$). However, the number of additional intravenous analgesics was not different between two groups during postoperative 48 h. Incidence and severity of sedation were higher in pregabalin group ($P < 0.05$). There were no differences in other side effects between two groups.

DISCUSSION: Perioperative administration of pregabalin (75 mg twice a day orally) was effective in reducing early postoperative pain in patients undergoing mastectomy. However, pregabalin didn't reduce the number of additional intravenous analgesics. Caution should be taken about sedation during pregabalin administration.

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S-343.

THE EFFECT OF REMIFENTANIL AND KETAMINE ON TOURNIQUET-INDUCED BLOOD PRESSURE INCREASE IN PROPOFOL-BASED ANESTHESIA

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INTRODUCTION: The precise mechanism of tourniquet-induced blood pressure increase (TIBPI) is unknown.Satsumae et.al. reported that preoperative IV ketamine >=0.25mg/kg,an NMDA (N-metyl-D-asparate) receptor antagonist,prevented TIBPI under general anesthesia (1).We previously reported that remifentanil,a μ-opioid,more than 0.3μg/kg/min could attenuate TIBPI not only before TIBPI was formed but also after TIBPI was once formed,however IV ketamine (0.5mg/kg+0.5mg/kg/h) plus 0.1-0.2μg/kg/min remifentanil could not attenuate TIBPI (2).The purpose of this study is to confirm this results and investigate which drug,ketamine or remifentanil,has a stronger effect to attenuate TIBPI.

METHODS: After getting ethical approval,the study was performed in a randomized,prospective fashion.Fourteen patients undergoing upper or lower limb surgery with ASA I or II were included in this study.Patients were divided into three groups.In K group (n=9),patients were given IV ketamine (0.5mg/kg+0.5mg/kg/h).In KR group (n=7),7 of 9 patients of K group,0.3μg/kg/min remifentanil was started after 60 min of tourniquet inflation(TI). In R group (n=5),patients were given 0.3μg/kg/min remifentanil throughout anesthesia.Anesthesia was maintained with air in 50% oxygen.Propofol was infused in target-controlled fashion with Diprifusor.Systolic blood pressure (SBP),diastolic blood pressure (DBP),and heart rate (HR) were measured in every patient. Statistical comparison was made between valunes which were measured at 30 and 60 min after TI in K and R groups,and values which were measured at 30 min after TI and 10-15 min after 0.3μg/kg/min remifentanil was started in KR group by using Student's t-test.$P<0.05$ was considered stastically significant.

RESULTS: In K group,SBP showed statistically significant increase between 30 and 60 min after TI,however DBP and HR did not show stastically significant change between 30 and 60 minn after TI.In KR group,SBP,DBP and HR did not show stastically significant change between 30 min after TI and 10-15 min after 0.3μg/kg/min remifentanil was started.In R group,SBP,DBP and HR did not show statistically significant change between 30 and 60 min after TI.Ketamine could not attenuate TIBPI,however remifentanil could attenuate TIBPI not only before TIBPI was formed but also after TIBPI was once formed.

DISCUSSION: In this study,it was shown again that remifentanil had a stronger effect to attenuate TIBPI than ketamine.Abbadie et.al. reported that remifentanil (90μg/kg+30μg/kg/min) could decrease c-fos expression derived from subcutaneous formaline injection into the plantar surface of hindpaw of rats only by 39.4% in laminae V-VI of dorsal horn(3).At the same time,Shinohara et.al. reported that remifentanil decresed HR and mean arterial blood pressure by its central vagotonic effect and by stimulating peripheral μ-opioid receptors(4).It might be suspected that remifentanil can attenuate TIBPI by both central and peripheral effect.This might be the reason why remifentanil has a stroger attenuating effect to TIBPI.However the reason why ketamine cannot attenuate TIBPI is not clear.It looks as if propofol might inhibit ketamine's attenuating effect to TIBPI.

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S-344.

FACTORS ASSOCIATED WITH NAUSEA AND VOMITING IN SPINE SURGERY PATIENTS RECEIVING INTRAVENOUS TRAMADOL PATIENT-CONTROLLED ANALGESIA

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INTRODUCTION: Nausea and vomiting are the common side effects of tramadol 1, 2. This retrospective study was to identify the risk factors associated with nausea and vomiting induced by intravenous tramadol patient-controlled analgesia (PCA).

METHODS: Four hundred and sixty one patients who received postoperative intravenous tramadol PCA after spine surgery were enrolled for study retrospectively. Patient's demographics, total consumptive doses of tramadol, and types of adjuvant agents, including metoclopramide pretreatment, addition of ketoralac to the PCA solution were registered. Associations between individual variables and the intravenous tramadol PCA-induced nausea and vomiting were analyzed statistically. Further logistic regression analysis was used to determine the independent risk factors of each variable.

RESULTS: The independent risk factor associated with intravenous tramadol PCA-induced nausea and vomiting was female gender (adjusted OR, 2.5; 95 % confidence interval, 1.4-4.6) and the addition of ketoralac to PCA solution could decrease nausea and vomiting (adjusted OR, 0.4; 95 % confidence interval, 0.2-0.7).

DISCUSSIONS: Our study demonstrated that, after spine surgery, female gender could be associated with the intravenous tramadol PCA-induced nausea and vomiting, and the addition of ketoralac to PCA solution might decrease the incidence. However, the subjects of our study were limited to the patients who underwent spine surgery, thus the result might not be representable for general population. The further studies are warranted to investigate other explanatory variables associated with nausea/vomiting such as smoking status, history of postoperative nausea and vomiting, etc.

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TABLE I. Demographic characteristics and anesthetic/ analgesic technique-related findings of patients with and without nausea/ vomiting

Demographic characteristics	Patients with N/V (n=133)	Patients without N/V (n=328)	P value
Age (yr)	54.7 ± 19.3	54.0 ± 17.9	0.710
Male/ female Female	29/ 104 104(78.2 %)	153/ 175 175(53.3 %)	<0.001
Height(cm)	157.0 ± 8.9	159.9 ± 10.0	0.004
Weight(kg)	59.0 ± 9.0	60.9 ± 9.1	0.042
Body mass index(kg/m2)	24.0 ± 3.7	23.9 ± 3.6	0.789
Metoclopramide pretreatment	78(58.6 %)	256(78.0 %)	<0.001
Total tramadol consumption(mg)	573.5 ± 217.8	556.2 ± 202.7	0.417
Ketoralac-containing PCA solution	32(24.1 %)	152(46.3 %)	<0.001
Intraoperative tramadol loading	130(97.8 %)	321(97.9 %)	0.762
N/V, nausea/vomiting; PCA, patient-controlled analgesia			

TABLE II. Crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) of potential factors related to nausea/vomiting

Possible risk factors	Crude OR (95% CI) P value	Adjusted OR (95% CI) P value
Age (yr)	1.002 (0.991-1.013) 0.700	0.999 (0.998-1.000) 0.943
Female	2.842 (1.800-4.487) <0.001	2.546 (1.404-4.619) 0.002
Height(cm)	0.969 (0.948-0.990) 0.004	0.985 (0.831-1.169) 0.866
Weight(kg)	0.976 (0.954-0.999) 0.039	1.009 (0.801-1.272) 0.939
Body mass index(kg/m2)	1.007 (0.953-1.064) 0.812	0.932 (0.529-1.639) 0.806
Total tramadol consumption(mg)	1.000 (0.999-1.001) 0.443	0.999 (0.998-1.000) 0.090
Metoclopramide pretreatment	0.473 (0.309-0.724) 0.001	0.605 (0.361-1.014) 0.056
Ketoralac-containing PCA solution	0.367 (0.233-0.577) <0.001	0.376 (0.216-0.654) 0.001
Intraoperative tramadol loading	1.083 (0.283-4.148) 0.907	2.584 (0.638-10.464) 0.183
OR, odds ratio; CI, confidence intervals; PCA, patient-controlled analgesia.		

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S-345.

THE ROLE OF INTRA-ARTICULAR INJECTION OF NMDA-BLOCKERS TO LOCAL ANESTHETIC, OPIOID AND STEROID COMBINATION IN ARTHROSCOPIC KNEE SURGERY

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INTRODUCTION: Arthroscopic knee surgery is commonly performed on day-case basis . However, post-operative pain may be an obsticle for discharge and early rehabilitation. (1) Intra-articular drug adminstration has gained popularity because of its simplicity and efficacy in achieving anesthesia for diagnostic and operative arthroscopy and for post-operative analgesia. (2) Intrarticular morphine has a better analgesic effect in surgeries with a higher inflammatory response while, intra-articular bupivacaine has a better analgesia in low inflammatory response. (3) Corticosteroids have a potent local anti-inflammatory effects and can reduce local stress response to surgical trauma. (4) Recent evidence support that NMDA receptor blocker may provide superior analgesia. (5) Our aim is to evaluate the efficacy of combination of bupivacaine, morphine and betamethasone with or without magnesium sulphate when administered intra-articularly after arthroscopic knee surgery for post-operative analgesia and peroid of hospital stay.

METHODS: Sixty patients of both sex undergoing arthroscopic knee surgery, randomally allocated into two groups. Thirty patients recieved recieved 5mg morphine, 20mg bupivacaine 0.5% and 1ml betamesthasone which was adminstered intra-articularly through the surgical port after discontinuation of general anesthesia at the end of surgery **(group1),** while , thirty patients recieved 5mg morphine, 20mg bupivacaine 0.5%, 1ml betamesthasone and 1gm magnesium sulfate which were adminstered intra-articularly through the surgical port after discontinuation of general anesthesia at the end of surgery **(group2).** Visual analogue scale (VAS), heart rate , blood pressure, respiratory rate , duration of analgesia, time to ambulation and time to discharge were evaluated in patients in both groups in the post-operative peroid. Results: Visual analogue scale (VAS) was significantly lower in group 2 patients. Mean value of heart rate, blood pressure, respiratory rate were significantly lower in group 2 patients. Duration of analgesia was prolonged, time to ambulation and time to discharge were shorter in group 2 patients.

DISCUSSION: The combination of bupivacaine, morphine and betamethasone when administered intra-articularly after arthroscopic knee surgery prolong the post-operative analgesia and shorten the peroid of hospital stay due to the combinations of the mechanisms of action of the different drugs.

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S-346.

POSTOPERATIVE RESPIRATORY DEPRESSION-PREGABALIN OR OPIOID?

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INTRODUCTION: Pregabalin is widely prescribed in the perioperative period for its well known opioid sparing effect and its usefulness in treating neuropathic pain1. While its role in the management of acute pain is still being evaluated in a number of clinical trials2-5, little has been published on its side- effect profile.

We report the perioperative course of three patients who received pregabalin and had significant respiratory depression in the postoperative period. All three patients have consented to the report and publication of this Case Series.

CLINICAL FEATURES: The first patient was elderly with borderline renal dysfunction and had undergone a craniotomy for tumor excision and had a respiratory arrest in the immediate postoperative period. The second patient presented with severe respiratory depression 12 hours after a spinal anesthetic for joint replacement, was later found to have clinically significant obstructive sleep apnea. The third patient, who was elderly and otherwise healthy and on benzodiazepines for anxiety; had a respiratory arrest in the PACU after an uneventful anesthetic for lumbar spine decompression. All these patients were treated successfully with standard resuscitation measures. While we considered other causes of respiratory depression in these patients, there appears to be a definite association of pregabalin with this complication.

DISCUSSION: We review the indications and contraindications for the perioperative use of pregabalin. Based on this case series, our experience and the available evidence, we have developed a clinical algorithm to guide the preoperative prescription of pregabalin. We believe this algorithm may be helpful in increasing the safety of perioperative pregabalin use. (Words 250)

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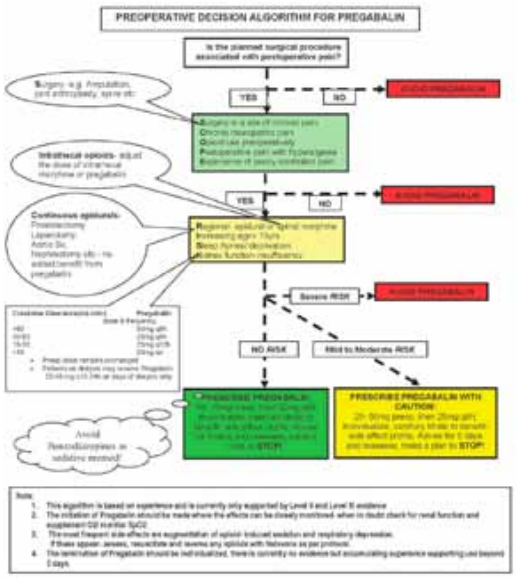

S-347.

EFFECT OF INTRAOPERATIVE PERIPHERAL NERVE BLOCK ON POSTOPERATIVE PAIN MANAGEMENT USING PCA

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INTRODUCTION: Recently epidural analgesic technique has become less available because of patients' related limitation such as patients' anticoagulating condition and extreme obesity. On the other hand, peripheral nerve blocks have been increasingly used in practice in part due to the progression of ultrasound technology. But it has not been clear how single shot intraoperative peripheral nerve blocks may affect postoperative pain relief (1,2). In this study, we evaluated if an one shot intraoperative peripheral nerve block might preferably affect postoperative pain relief in surgical patients.

METHODS: After obtaining the approval of the study protocol by the hospital ethical committee, this study was carried out retrospectively using the accumulated perioperative patients', surgical, and anesthetic database. From the database two groups patients data sets were obtained. One group (Block group, n=71) was the group of the patients who underwent surgery under general anesthesia with single shot of peripheral nerve block for surgical site, and the other group (Control group, n=188) was the patients who underwent surgery under general anesthesia alone. All of the patients were given an intravenous patient-controlled analgesia (PCA) using fentanyl postoperatively. The parameters included were patients' demographic data, intraoperative surgical and anesthetic data, and postoperative PCA data. Postoperative pain was recorded using Prince Henry score and postoperative nausea and vomiting (PONV) was recorded as 0=no PONV, 1=nausea only, and 2=vomiting. The relation between PCA data between the 2 groups was statistically evaluated using student t-test. $P<0.05$ was considered significant.

RESULTS: The main results were shown in Table 1 (figures are mean+/-SD, * indicates statistical significance). The 2nd POD basal flow, the cumulative fentanyl dose, and the incident of PONV in Block group was significantly smaller than those in Control group, respectively.

DISCUSSIONS: The effect of single shot peripheral nerve block may last short period not enough to be satisfactory for postoperative pain relief, but the results of this study show the shorter duration of PCA but also the lower incidence of PONV. In Block group.

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S-348.

REVIEW OF RECENT STUDIES OF FACIAL GRIMACING IN THE UNCONSCIOUS HUMAN SURGICAL PATIENT

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INTRODUCTION: Grimacing, the facial expression of pain, is specific and universal across cultures. Facial EMG responses can be recorded with up to 95% NMB. FACE is a multi-channel EMG that quantifies the ratio of corrugator and orbicularis oculi muscle area activity to that in the frontalis muscle area and is used as an indicator of pain registration termed RATIO2.

METHODS AND RESULTS: Study 1: High and Low Fentanyl: 32 patients undergoing elective surgery randomly received either 50 mcg or 250mcg of fentanyl on induction. The high fentanyl induction group experienced 69% and 62.5% less activity in the corrugator and orbicularis oculi muscles respectively. The RATIO2 grimace response to surgical incision increased 96% in the low dose fentanyl group compared to the high dose. BIS values did not vary between the two groups.

Study 2: Relationship to BIS: 16 patients undergoing elective surgery were monitored with both FACE and BIS monitors with no restrictions on anesthetic technique other than maintenance of NMB <95%. RATIO2 grimace responses were observed in 63% surgeries and bore no correlation to BIS response.

Study 3: Facial grimacing relationship to pupillary dilation: 64 patients undergoing lower abdominal surgery were monitored every 15 minutes with pupillometry. Additional pupillometry was also performed if: Condition 1: RATIO2 > +20 for more than one minute, i.e. active grimacing, or, Condition 2: RATIO2 increased by 20, but absolute RATIO2 value remained under the zero point, i.e. no active grimacing. Pupillometry revealed increases in pupil size only when Condition 1 parameters were met (p=0.03).

Study 4: Facial grimacing to incision as a function of clinical fentanyl dosing and desflurane concentration: 48 patients undergoing abdominal surgery were monitored with FACE. RATIO2 grimace data at incision were compared to desflurane concentration and fentanyl dosing. Quartile analysis was performed for a) induction fentanyl dosing and b) end-tidal desflurane. No significant differences were found between high and low quartiles. A separate quartile analysis of degree of RATIO2 grimace responses to surgical incision was performed for fentanyl and end tidal desflurane. No significant differences were observed. Individual patient variability to FACE grimace response to surgical incision appears to be only modestly related to fentanyl induction dosing and end tidal desflurane at time of incision.

DISCUSSION: We will examine whether facial grimacing during anesthesia contributes to post-operative exhaustion/malaise one week after general anesthesia.

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S-349.

DURATION OF A "TRIPLE LOW" OF BLOOD PRESSURE, BIS AND ANESTHETIC CONCENTRATION IS ASSOCIATED WITH POSTOPERATIVE PAIN SCORES

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INTRODUCTION: Previous studies found a "Triple Low" of low mean arterial pressure (MAP), low Bispectral Index (BIS) and low minimum alveolar concentration (MAC) values to be associated with increased postoperative mortality and morbidity [1]. Prolonged duration of a "Triple Low" State worsened outcomes even further [2]. We sought to determine the association of "Triple Low" duration with postoperative pain scores.

METHODS: With IRB approval, BIS, MAP, and end-tidal volatile anesthetic concentrations in MAC-equivalents, as well as postoperative pain scores (obtain ≈Q4 h) were extracted from our perioperative registry. Average MAC, MAP, and BIS were calculated for each adult general surgical patient given volatile anesthesia. We defined Low MAC as <0.7; Low BIS as < 45; Low MAP as < 75 mmHg; the simultaneous combination of each defined a "Triple Low." Duration of "Triple Low" was calculated as total time in condition per case. Post-operative pain was assessed by numeric rating scale. Equality of mean outcomes per time block were tested using ANOVA with p<0.005 considered significant.

RESULTS: 18,982 (79%) of the 23,999 available non-cardiac procedures had complete data for the analysis. Table 1 summarizes the mean time until pain scores as a function of time spent with MAP <75, BIS <45 and MAC <0.70.

DISCUSSION: Increased duration at low arterial pressure, low Bispectral index and low anesthetic concentration worsened postoperative recovery as measured by pain scores. Earlier recognition and treatment of a "Triple Low" state may allow for adjustments in anesthetic management that could improve outcomes.

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Duration of Triple Low (min.)	Number of Patients(%)	Time PostOp Pain ≤7 NRS (hrs)*	Time PostOp Pain ≤5 NRS (hrs)*	Time PostOp Pain ≤3 NRS (hrs)
0-4	10144 (54)	9 ± 20	16 ± 34	39 ± 57
5-9	2313 (12)	10 ± 21	17 ± 34	39 ± 57
10-14	1518 (8)	10 ± 21	16 ± 33	36 ± 55
15-19	1176 (6)	11 ± 25	18 ± 34	38 ± 56
20+	3831 (20)	14 ± 28	22 ± 33	41 ± 58

Table 1: *p<0.005; Data presented as mean ± SD; NRS=Numeric Rating Scale.

S-350.

POSTOPERATIVE PAIN SCORES ARE INCREASED BY A "TRIPLE LOW" OF LOW BLOOD PRESSURE, LOW BIS AND LOW ANESTHETIC CONCENTRATION

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INTRODUCTION: Previous studies found that low mean arterial pressure (MAP) and duration at low Bispectral Index (BIS) values are independent risk factors for one-year postoperative mortality [1,2]. We were able to demonstrate a "Triple Low" of low MAP, low BIS and low minimum alveolar concentration (MAC) values to be associated with increased postoperative mortality and morbidity [3]. With this study we sought to determine the association of a "Triple Low" with postoperative pain scores.

METHODS: With IRB approval, BIS, MAP, and end-tidal volatile anesthetic concentrations in MAC-equivalents, as well as postoperative pain scores were extracted from our perioperative registry. Average MAC, MAP, and BIS were calculated for each adult general surgical patient given volatile anesthesia. We defined a reference state consisting of patients whose average BIS, MAP and MAC values were within ≈20% of the population means. The remaining patients were classified to a clinical state characterized by whether their average BIS, MAP, and MAC values were higher or lower relative to the reference state. Post-operative pain was assessed by numeric rating scale ≈Q4 h. ANOVA was used to test for equality of means among the nine states.

RESULTS: 18,982 (79%) of the 23,999 available non-cardiac procedures had complete data for the analysis. Table 1 summarizes the mean time until pain scores as a function of high/low states.

DISCUSSION: In addition to the risks of increased mortality and morbidity, this data suggests that patients experiencing a "Triple Low" of low MAC, low MAP and low BIS intraoperatively require more time to gain control over postoperative pain. Future studies should investigate if early recognition a "Triple Low" could identify patients at high risk allowing for modifications in analgesic management.

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3. Anesthesiology 2009; 111:A6.

MAC State	MAP State	BIS State	N	%	Time until Pain ≤ 7 NRS (hrs.)	Time until Pain ≤ 5 NRS (hrs.)	Time until Pain ≤ 3 NRS (hrs.)
REF	REF	REF	3380	17.8	10 ± 21	17 ± 33	36 ± 54
Low	**Low**	**Low**	**1303**	**6.9**	**15 ± 30**	**24 ± 44**	**45 ±63**
Low	Low	High	1851	9.8	11 ± 25	17 ± 34	36 ± 57
Low	High	Low	1604	8.5	11 ± 25	18 ± 37	39 ± 59
High	Low	Low	1045	9.7	12 ± 26	22 ± 40	46 ± 62
Low	High	High	1400	7.4	9 ± 22	15 ± 31	33 ± 56
High	Low	High	2217	11.6	9 ±18	18 ± 34	40 ± 57
High	High	Low	3132	16.5	11 ± 22	19 ± 35	43 ± 59
High	High	High	2250	11.8	8 ± 16	14 ± 27	34 ± 53

Table 1: Triple Low State and postoperative pain

S-351.

EVIDENCE-BASED GUIDELINES FOR MANAGEMENT OF PAIN AFTER HEMORROIDECTOMY

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BACKGROUND: Hemorrhoidectomy is associated with intense postoperative pain, but there is no systematic review of pain management approaches after hemorroidectomy. Here we provide evidence-based, consensus recommendations for the effective management of postoperative pain after hemorroidectomy, developed from a procedure-specific systematic review, transferable evidence from relevant procedures, and clinical practice observations.

METHODS: Systematic literature review using the Cochrane protocol was performed. Only randomized studies in English, assessing analgesic, anesthetic and surgical interventions in hemorrhoid surgery in adults, and reporting pain on a linear analogue, verbal or numerical rating scale published between 1966 and June 2006 were included. Primary outcome measures were postoperative pain scores and secondary outcome measures were supplemental analgesic requirements and other recovery outcomes (e.g., adverse effects, functional recovery).

RESULTS: A total of 207 studies were identified of which 106 studies were included. The most common reasons for exclusion were that the method of hemorrhoid removal was not surgical (35 studies), or pain scores were not reported (24 studies), or the study was not a randomized controlled trial (29 studies).

CONCLUSIONS: For the management of post-hemorrhoidectomy pain, preoperative laxatives, oral metronidazole, and parenteral glucocorticoids are recommended. With regards to pain management, no recommendations can be made regarding the choice of anesthetic between a) local infiltration anesthesia alone or b) spinal anesthesia with local infiltration or nerve block or c) general anesthesia with local infiltration or nerve block. A surgical technique using staples is recommended if indicated. Conventional NSAIDs or COX-2-selective inhibitors combined with acetaminophen administered in time to provide sufficient analgesia in the early recovery period and combined with weak opioids for moderate pain or strong opioids for severe pain are recommended. Laxatives and oral metronidazole should be continued in the postoperative period. Adjunct analgesics such as ketamine, gabapentinoids, dextromethorphan are not recommended for post-hemorrhoidectomy pain relief at this time due to a lack of procedure-specific evidence.

S-352.

HEMODYNAMIC EFFECTS OF SPINAL ADMINISTRATION OF THE NON-NMDA RECEPTOR ANTAGONIST IN RATS

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INTRODUCTION: It is well known that non-NMDA (N-methyl-D-aspartate) receptor antagonists produce antinociceptive effects in physiologic states (1) and postoperative pain model in rats (2). Our previous studies showed synergistic antinociceptive effects when non-NMDA receptor antagonist and local anesthetic were spinally administered. Ideal spinal analgetics should have effective analgesia without hemodynamic changes and neurotoxicity. It is reported that the spinally administration of the non-NMDA receptor antagonist reduced the neurotoxicity caused by spinally administration of local anesthetic (3). However, there is not much information regarding hemodynamic effects of non-NMDA receptor antagonists. This study tested the hemodynamic effects of spinal administration of non-NMDA receptor antagonist, enough to produce antinociceptive effects in rats.

METHODS: The protocol for this experiment was approved by our animal care and use committee. Under halothane anesthesia, male Sprague-Dawley rats weighing 250-350 g were catheterized intrathecally at L4-5. 18 rats with an intrathecal catheter were randomly divided into 3 groups to receive normal saline (n=6), non-NMDA receptor antagonist, 6-cyano-7-nitroquinoxaline- 2, 3-dione (CNQX) 5μg / 20μl (n=6), or 3% lidocaine hydrochloride 20μl (n=6). The tail flick (TF) test was performed to measure thermal tail withdrawal response after intrathecal injection. Mean blood pressure (mBP) and heart rate (HR) values were measured in the conscious state by using the unheated and non-invasive tail-cuff blood pressure monitor. Measurements of thermal latency, mBP and HR were taken 5, 10, 15, 20, 30, and 60 minutes after injection. The results were analyzed by ANOVA with repeated measures followed by the Dunnett test. Differences were considered to be significant at $P < 0.05$.

RESULTS: Both CNQX and lidocaine produced significant antinociceptive effects until 20 minutes after intrathecal injection compared with saline in the TF. Lidocaine induced a marked decrease in mBP from 10 to 25 minutes as measured by the unheated and non-invasive blood pressure monitor. Lidocaine also showed an increase in HR 5 minutes after intrathecal injection compared with baseline and saline. However, intrathecal CNQX did not induce a decrease in mBP and an increase in HR.

DISCUSSION: Intrathecally, lidocaine that produced antinociceptive effects showed unstable hemodynamics. But, CNQX administration enough to produce antinociceptive effects, did not present hemodynamic changes. Therefore, intrathecal administration of CNQX is hemodynamically safer than lidocaine. These data suggest that intrathecal administration of the non-NMDA receptor antagonist CNQX can be useful analgetics, due to its stable hemodynamic property.

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S-353.

DUAL LEAD SPINAL CORD STIMULATION FOR UNILATERAL PAIN.-IS THE ELECTRICAL FIELD AFFECTED BY THE DISTANCE BETWEEN TWO ELECTRODE ARRAYS?

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INTRODUCTION: Spinal cord stimulation (SCS) is a therapeutic method applied in a variety of chronic pain states, such as failed back surgery syndrome, peripheral vascular disease, complex regional pain syndrome, herpes zoster pain (HZP) and postherpetic neuralgia (PHN), etc. An important requirement for the success of SCS therapy is that the paresthesia generated by electrical stimulation of the spinal cord must completely and constantly cover the painful area.

So far we have tried to treat unilateral pain by single electrode SCS. The painful region often includes severe and slight painful regions. If the strength of stimulation was adjusted to the severe painful region, the paresthesia in slight or no pain region was too intense to be satisfied and regarded as discomfort sense. If adjusted to the slight painful region, the paresthesia in the severe pain region was too weak. There have been a dilemma but patients expected the paresthesia to cover whole painful area and more concentrate to the severe painful area.

METHODS: 23 patients (14 HZP and 9 PHN) showed painful area in unilateral and the extent was severe. Two parallel quadripolar electrode arrays were placed on unilateral side at a distance from each other (0~4mm) with the tips of each array placed with staggering the electrodes.

RESULTS: The results were that the paresthesia covered the whole painful area and was concentrated to severe painful area not a wide range in all cases. 10 cases in HZP and 3 cases in PHN were successful with SCS therapy with decrease in pain scale and 3 cases in PHN were satisfied with their trial followed by implantation.

DISCUSSION: The distance between two leads should be small (0~2mm) to avoid the stimulation of dorsal root and to produce the further limited electrical field using the guarded cathode method. The electrical field has a limited extent in tripolar stimulation, further in "guarded cathode" stimulation (+, -, +). In our hypothesis, this limited extent is more concentrated by using "double guarded cathode" stimulation to form a triangle overlapped by two guarded cathode stimulation.

On the other hand, in case of thoracic or abdominal painful region, if the paresthesia needs to be spread more distal (anterior center of the body), the position of the outside lead should be more outer and the distance between two leads should be 2~4mm.

There have been no reports that the idea of the formation of triangle overlapped by two triangles produced by two guarded cathode of SCS to limit the electrical field and the possibilities of more distal stimulation by changing the distance between two leads. We will introduce this technique as a new approach for SCS therapy.

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S-354.

EFFICACY OF OUTPATIENT KETAMINE INFUSIONS IN REFRACTORY CHRONIC PAIN SYNDROMES: A FIVE-YEAR RETROSPECTIVE ANALYSIS

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INTRODUCTION: Chronic pain affects over 76 million people in the United States.[1] Longstanding intractable pain can be particularly challenging to treat and resistant to multiple treatment modalities available in pain clinics. Shown to be effective in patients with complex regional pain syndrome[2] (CRPS), ketamine, an NMDA receptor antagonist, has been sparsely studied for its effectiveness with other pain syndromes.[3] We hypothesize that, in cases of failed conventional treatments, outpatient intravenous infusions of ketamine provide satisfactory pain relief for patients suffering from various chronic intractable pain syndromes.

METHODS: Following IRB approval, we retrospectively analyzed a database of all outpatient ketamine infusions done over a period of 5 years (2004 to 2009). Data reviewed included: doses of intravenous ketamine, infusion duration, pain scores on visual analog scale (VAS) pre- and post-procedure, previous pain clinic interventions, and side effects. All patients were pretreated with midazolam and ondansetron.

RESULTS: 49 patients undergoing a total number of 369 outpatient ketamine infusions were identified through the retrospective analysis. 36 infusions were excluded from analysis secondary to missing data. 18 (37%) patients carried a diagnosis of CRPS. From the remaining 31 (63%) patients with intractable pain syndromes, 8 had refractory headache and 7 had severe back pain.

Patient subgroups by diagnosis

Diagnosis	Number of patients
CRPS	18
Intractable headache	8
Chronic back pain	7
Visceral pain	5
Fibromyalgia	4
Central neuropathic pain	4
Postherpetic neuralgia	2
Cervical radiculopathy	1

Ketamine infusions were administered for an average of 49 minutes (range 30 minutes-8 hours). Mean number of infusions per patient was 6.8 (range 1-33). Mean total ketamine dose per infusion was 1.08 mg/kg (range 0.04 mg/kg over 30 min - 4 mg/kg over 8 hrs). Mean length between infusions was 48 days (range 4-680). The change in VAS was computed using a mixed effects model that took into account the repeated measures per patient. All patients reported a significant reduction in VAS score of 5.84 (std. error 0.35). CRPS patients reported a higher reduction in VAS score of 7.17 (std. error 0.52) and non-CRPS patients reported a reduction of 5.04 (std. error 0.41). The difference of 2.13 between the two groups was significant (std. error 0.66, $p < .003$). In all cases, the side effects were minimal.

Infusion Data

Diagnosis	Number of patients	Number of infusions	Start VAS	End VAS	Mean change in VAS	Mean dose (mg/kg)	Mean infusion length (min)
CRPS	18	141	7.94	1.04	7.17	1.01	49.4
Non-CRPS	31	192	7.30	1.71	5.04	1.13	49.0

DISCUSSION: For patients suffering from intractable chronic pain syndromes, alternative pain regimens may prove valuable. Our retrospective data analysis demonstrates that for patients with severe, refractory pain of multiple etiologies, intravenous infusions of ketamine may significantly improve VAS scores with minimal side effects. These infusions are particularly useful for patients who have failed all other pain clinic interventions.

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S-355.

SPINAL CORD STIMULATION AMELIORATES NEUROPATHIC PAIN-RELATED SLEEP DISORDERS

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INTRODUCTION: Undeniably, sleep disorders have been known as one of the serious complications of drug-resistant chronic pain. Although insomnia certainly impairs a patient's quality of life, thorough assessment of that related to chronic pain has not been reported thus far. Moreover, insomnia has commonly been assessed only on the basis of patients' subjective descriptions. Therefore, we aimed to objectively evaluate the degree of sleep disturbances in patients with severe chronic pain. We investigated the sleep efficiency of such patients before and after the introduction of spinal cord stimulation(SCS), using an actigraph, a wrist watch-typed medical equipment widely utilized to analyze sleep/wake patterns.

METHODS: Subjects were required to wear an actigraph from 8:00 PM until they woke up, everyday starting from the day before the introduction of SCS to 6 days after the insertion(n=5). We daily determined the sleep efficiency, in other words, the percentage of the actual time spent asleep. Additionally, the intensity of pain before and after the introduction of SCS was evaluated with the use of the 11-point numerical rating scale(NRS), which ranges from 0(no pain) to 10(pain as severe as it could be). We extracted the data for the day of the introduction of SCS since wound pain was anticipated to affect sleep considerably.

RESULTS: All cases demonstrated the improvement of sleep after the introduction of SCS(before, 62.8%±28.1; after, 73.3±24.5; Wilcoxon rank test, $p<0.05$). In four out of five cases, we observed the improvement of sleep efficiency as well as NRS(before, 6.0±0.8; after, 2.0±1.4; Wilcoxon rank test, $p<0.01$). However, one of them indicated the amelioration of sleep even though SCS failed in alleviating pain(NRS=7).

DISCUSSION: With the use of actigraphs, we succeeded in objectively assessing the severity of sleep disorders. Regarding patients whose pain was effectively treated with SCS, we concluded that the improvement of sleep efficiency occurred subsequent to the reduction of pain, since sleep disturbances are apparently symptoms that commonly result from obstinate pain. Interestingly, we experienced one case in which sleep efficiency improved without the reduction of pain. Thus, SCS may not have raised the quality of sleep simply because of the palliation of pain; previous studies represent the possibility that the electric signal that runs up through the spinal cord may positively affect the neural activities of the brainstem or the hypothalamus responsible for stimulating sleep. SCS has recently been proposed as a feasible treatment for various disorders other than those that cause pain, including ischemic heart diseases and asthma. Our result suggests that sleep disorders irrelevant to pain may also be treated with SCS as well.

S-356.

SIMILARITIES OF NEUROPATHIC PAIN DESCRIPTIONS IN THE MCGILL PAIN QUESTIONNAIRE BETWEEN PATIENTS WITH 'CLASSIC' NEUROPATHIC PAIN AND THOSE WITH RADICULOPATHY

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INTRODUCTION: Neuropathic pain (NeP) has recently been redefined as "pain arising as a direct consequence of a lesion or a disease affecting the somatosensory system," and simultaneously, a diagnostic flow chart for NeP has been proposed. Although the diseases initially responsible for causing NeP vary, there seems to be some underlying pathophysiological mechanisms in common. According to the current diagnostic flow chart, radiculopathy caused by vertebral disc herniation or spinal canal stenosis is currently classified as NeP. However, some specialists have been suggesting that radiculopathy may be clinically different from other NeP diseases, since specific treatments such as NSAIDs and nerve blockades are apparently much more effective for radiculopathy than other NeP diseases. Therefore, we examined the differences between 'classic' NeP (e.g., nerve-injured pain and severe neuropathy) and radiculopathy by comparing and assessing the characteristics of the pain, using the McGlii Pain Questionnaire (MPQ).

METHOD: From July, 2003 to January, 2008, patients with 'classic' NeP due to nerve injury (n=362) and with radiculopathy (n=100) answered MPQ at the time of the first consultation. Using the factor analysis in order to assess 20 elements of MPQ, we investigated the characteristics of pain in each patient-group. Coherent subsets of variables identified by the factor analysis were compared and evaluated for determining the clinical consistency.

RESULT: There was no significant difference between these two patient-group in concerns of pain intensity and the hospital anxiety depression scale (HADS) [pain intensity: NeP=6.3+/-2.4, radiculopathy=6.0+/-2.4, p=0.21; hospital anxiety depression scale (anxiety: NeP=8.2+/-4.8, radiculopathy=7.3+/-4.8, p=0.13; depression: NeP=8.6+/-5.1, radiculopathy=7.6+/-4.6, p=0.07)]. The total score of MPQ was not significantly different (Nep=18.5+/-15.4, radiculopathy=18.4+/-13.8, p=0.49). There was no significant difference in the scores of each element of MPQ, except 'dullness' ($p<0.05$). Using factor analysis, 14 elements were extracted as significant for patients with 'classic' NeP, and another 14 elements were extracted for patients with radiculopathy as well. Among these extracted elements, 11 elements were observed to being common in both patient-groups.

DISUCUSSION: MPQ is consisted of 20 elements and can illustrate pain from a perceptual, emotional and discriminate view. In this study, most elements of MPQ extracted for 'classic' NeP and radiculopathy patients were common, suggesting that pain descriptions regarding 'classic' NeP and radiculopathy are similar. Concerning the origin of pain, it has been speculated that the variability of patients' pain descriptions suggests different underlying pain mechanisms. Because the possible treatments of NeP changes as the characteristics of pain differ, evaluation of the features of the pain is clinically important when considering treatment strategies. Our results suggest that radiculopathy should be classified as NeP, and therefore, applying treatment strategies for classic NeP on radiculopathy might de adequate when treating radiculopathy patients.

radiculopathy

	因子1	因子2	因子3
20 affective-evaluative miscellaneous	0.7927	0.1507	0.2580
15 affective miscellaneous	0.6602	0.1478	0.3984
14 punishment	0.5908	0.2355	0.2993
10 sensory miscellaneous 1	0.5853	0.4492	0.1883
11 tension	0.5634	0.2784	0.1348
12 autonomic	0.5024	0.1010	0.3095
17 sensory miscellaneous2	0.3822	0.6380	0.2112
2 spatial	-0.0166	0.5509	0.1847
8 brigtness	0.3401	0.5463	0.2126
9 dullness	0.1943	0.5401	0.2802
6 traction pressure	0.2930	0.0750	0.6888
4 incisive pressure	0.3493	0.2148	0.6278
5 constructive pressure	0.0930	0.2190	0.5094
3punctate pressure	0.1943	0.2357	0.5085

NeP

	因子1	因子2
9 dullness	0.6548	0.2478
16 evaluative	0.6056	0.3462
11 tension	0.5844	0.4112
8 brigtness	0.5776	0.2695
17 sensory miscellaneous2	0.5396	0.3590
2 spatial	0.5374	0.1719
12 autonomic	0.5233	0.3792
10 sensory miscellaneous 1	0.5110	0.1784
13 fear	0.1952	0.7408
6 traction pressure	0.2073	0.6975
14 punishment	0.2788	0.6397
19 sensory	0.3269	0.5437
4 incisive pressure	0.1523	0.5308
20 affective-evaluative miscellaneous	0.4838	0.5156

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S-357.

RATES OF LEAD MIGRATION AND STIMULATION LOSS IN NEUROMODULATION: A RETROSPECTIVE COMPARISON OF LAMINOTOMY VERSUS PERCUTANEOUS IMPLANTATION

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INTRODUCTION: Spinal Cord Stimulators (SCS) have been implanted via laminotomy (L) and percutaneous (P) routes. L was shown to have lower lead migration rates compared with P, which were reported as high as 68% (1-2). Recently, however, Medtronic (Minneapolis MN) Titan anchors have been introduced for the P route. This study retrospectively compares rate of migration and stimulation loss between these techniques using the improved anchors and also whether unilateral/bilateral symptoms, lead type, implant level, or diagnosis was associated with these complications.

METHOD: SCSs implanted in the thoracolumbar spine (2006-2008) were included for review of the following: age, sex, diagnosis, lead type, implant method/level, symptom laterality, stimulation loss, radiographic lead migration, and time to loss. Loss of capture and migration in the laminotomy/percutaneous groups were compared using Fisher's exact test. Variables within each group such as lead type, level, symptom laterality, and diagnosis were compared for the migration and stimulation loss using Fisher's exact test.

RESULTS: Laminotomies and percutaneous implants were performed by a single neurosurgeon or pain physician using Medtronic (Minneapolis MN) neurostimulators and Titan anchors. In the laminotomy group (N=71), 29.5% were male and 70.5% female, average age 55.36. In the percutaneous group (N=22), 22.7% were male and 77.3% female, average age 62.12. In the laminotomy group, diagnoses were varied: 84.5% post-laminectomy, 11.27% CRPS, 2.82% neuropathy, and 1.41% post-herpetic neuralgia. In the percutaneous group, diagnoses were: 63.63% lumbar radiculopathy, 9.09% neuralgia, 4.545% each (neuropathy, CRPS, post-laminectomy, post-thoracotomy). Laminotomy leads were 33.80% Specify hinged, 22.53% Specify 565, 22.35% Specify, 12.57% Resume TL. Percutaneous leads were 54.54% Quad and 45.45% Octad. Laminotomy group had 54.93% bilateral symptoms with most implanted at the T10 level. Percutaneous group had 59.09% bilateral symptoms with most implanted at the T8 level. Loss of capture was 23.94% laminotomy and 22.72% percutaneous with no significant difference between the groups (p=0.787). Radiographic migration was 12.67% laminotomy and 13.63% percutaneous with no significant difference (p=0.999). Average time to stimulation loss for laminotomy versus percutaneous was 124.8 versus 323.6 days (p=0.06). There were no significant difference between bilateral and unilateral symptoms in terms of loss of capture within either group (p=0.263,p=0.326). Comparisons of loss of capture based on electrode type was not significant in either group (p=0.687, p=0.371).There were not enough data for comparisons by implant level or diagnosis.

DISCUSSION: Stimulation loss and lead migration were similar for both laminotomy and percutaneous implantation. Loss of concordant stimulation occurred earlier in the L group compared to the P route. Laterality of symptoms and lead type do not affect lead migration.

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S-358.

REAL-TIME THREE DIMENSIONAL ULTRASOUND-ASSISTED PLACEMENT OF INTRATHECAL CATHETER: IMPLICATIONS OF NEW TECHNOLOGY

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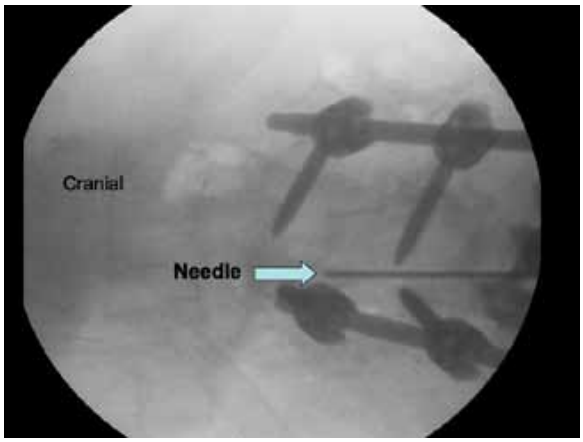
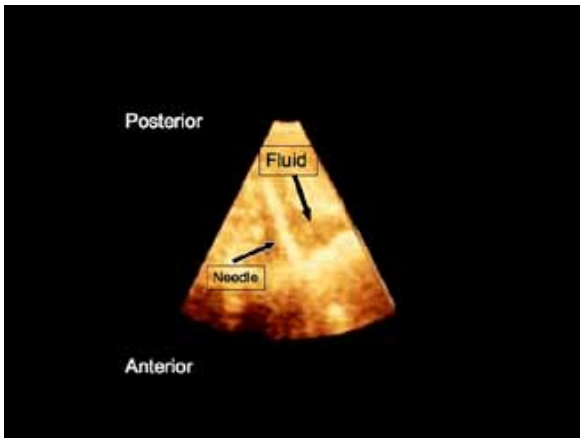
INTRODUCTION: The most common technique for guidance of intrathecal catheter placement is fluoroscopy, which is limited by two dimensional views of three dimensional structures, to identify anatomy of the spine and direct needle placement. Ultrasound guidance is superior to fluoroscopy in its ability to image complex structures and provide depth information. In this case we present the utility of 2-D and real-time 3-D ultrasound in accurately guiding cannula and catheter placement into the intrathecal space, without the orthogonal views needed for conventional fluoroscopy.

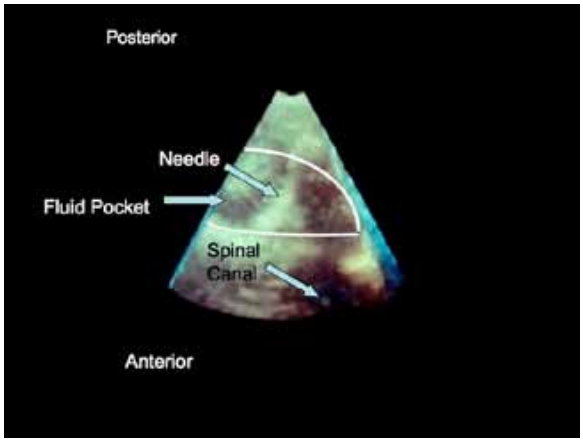
CASE REPORT: A 65-year-old male with metastatic cancer to his spine demonstrated significant enlargement of a lumbar lesion, urgent lumbar decompression and pedicle screw fixation of L1 - L5 was undertaken. After one month of uncontrolled lumbar and lower extremity pain, a difficult fluoroscopy-guided trial of intrathecal morphine injection (following aspiration of hemeachromatous CSF) was inconclusive, but with the patient's clinical condition a pump placement was scheduled. After induction of general anesthesia the patient was placed in the lateral decubitus position. Fluroscopy was used to identify the appropriate interspace but the indwelling hardware added difficulty in guiding the introducer needle.(Fig1) Real-time 3-D ultrasound (X 3-1 Philips Medical, Andover, MA) was used to identify the needle in the center of a fluid canal with positive aspiration of hemeachromatous fluid.(Fig2)The three-dimensional ultrasound image was rotated 180° in real-time to identify the true spinal canal with the needle in a fluid pocket posterior and lateral to the spinal canal. (Fig. 3) Two-dimensional ultrasound was used to successfully guide correct intrathecal needle and catheter placement which was confirmed with 3-D ultrasound and fluoroscopy.

DISCUSSION: In this case, two-dimensional (2-D) and 3-D ultrasound were able to identify the intrathecal space, guide the cannula placement while avoiding the lumbar fusion construct, and confirm placement of the intrathecal catheter without the necessity of orthogonal views needed with fluoroscopic guidance. The utility of ultrasound guidance is underscored by its ability to image complex structures at depth and in spatial relationship. The suboptimal intrathecal trial under fluoroscopic placement may represent injection of the medication into a seroma and not cerebral spinal fluid.

The comparison between 2-D and 3-D ultrasound are analogous to that of plain X-ray and computer tomography. Ultrasound, and in particular 3-D ultrasound, can identify structural elements in real-time and provide information of the entire anatomic region in 360 -degree spatial relationships. The introduction of real-time 3-D ultrasound into chronic pain therapy is a technique with great potential for improving patient care.







S-359.

PERIPHERAL NEUROMODULATION FOR FACIAL PAIN: A REPORT OF SUCCESSFUL TREATMENT FOR INTRACTABLE TRIGEMINAL NEURALGIA.

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INTRODUCTION: Patients with refractory trigeminal neuralgia who have failed medical and surgical management represent a therapeutic challenge. Historically, options for further treatment were limited. Recently, however, the use of peripheral neuromodulation has been successfully applied to these patients. We describe a patient with intractable trigeminal neuralgia who received long-term relief following neuromodulation of the supraorbital and infraorbital nerves.

CASE REPORT: A 38 year-old female with refractory trigeminal neuralgia was initially referred to our pain clinic for a Gasserian ganglion radiofrequency rhiztomy following a successful local anesthetic block. She had previously undergone microvascular decompression, Gamma Knife, as well as percutaneous balloon compression without relief. On presentation, the patient complained of pain located in the left side of her face, especially the forehead and maxillary region. She described a constant pain of low intensity with periods of severe lancinating, electrical, and stabbing pain. The patient was on an exhaustive medical regimen consisting of Carbamazepine, Topiramate, Baclofen, OxyContin, and Hydrocodone. After explanation of the therapeutic options, risks, and benefits; the patient elected to pursue peripheral neuromodulation as the next step in her management.

A trial of peripheral nerve stimulation was then undertaken in the operating room using monitored anesthesia care. After sterile preparation and drape, a small incision was made posterior to the point of temporal artery palpation. Using fluoroscopic guidance, a standard Touhy needle was then advanced in the epifascial plane to the vicinity overlying the supratrochlear and supraorbital nerves. A Boston Scientific octrode (model SC-2218-50cm Linear ST) was left in place while the Touhy needle was removed. Sedation was lightened and following a test of stimulation, the area of coverage was deemed acceptable. This protocol was then repeated for the infraorbital nerve.

The patient underwent a 5-day trial period, at the end of which she reported significant pain relief, approximating 50%. She decided to proceed with permanent IPG implantation, which was accomplished under general anesthesia. 6 months post-procedure, the patient reported lasting relief and was overall satisfied with her treatment.

DISCUSSION: Although both surgical and medical treatments for trigeminal neuralgia report a high success rate, there is a subset of patients who experience a persistence or recurrence of their pain. Intractable trigeminal neuralgia was previously treated with neurodestructive procedures that also risked pain recurrence as well as anesthesia dolorosa, which can be even more disabling. Peripheral neuromodulation may be an attractive alternative for these reasons, but is still a relatively new therapy. We hope our experience lends further credence to the use of this modality for this often difficult to treat patient population.

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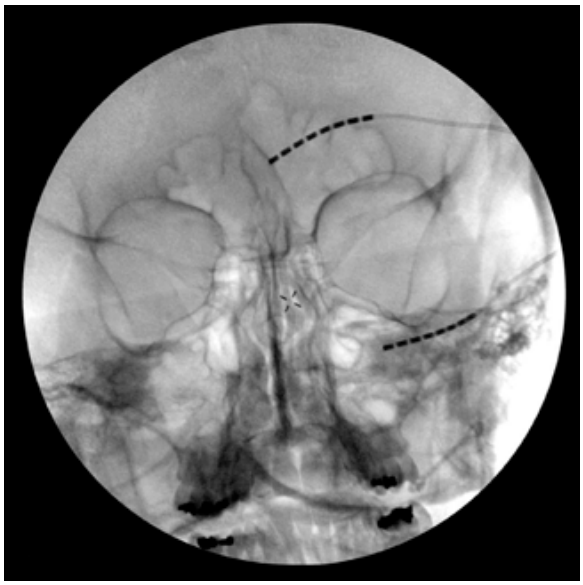

S-360.

WITHDRAWN.

S-361.

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S-362.

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S-363.

ULTRASOUND-GUIDED INTRANEURAL PHENOL INJECTION INTO THE TERMINAL BRANCHES OF THE SCIATIC NERVE IN PATIENTS WITH FONTAINE'S STAGE IV PERIPHERAL ARTERIAL DISEASE

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INTRODUCTION: In 1930, Smithwick RH et al., reported a technique for open alcohol injection into the terminal branches of the sciatic nerve at the lower third level of a leg in order to relieve the uncontrollable ischemic pain in patients with peripheral arterial disease (PAD) (1). The technique produced complete sensory block of the lower half of the leg and foot without loss of ankle motor function. We have been performing this sensory technique using phenol, not under direct vision but under ultrasound guidance. The aim of this study was to retrospectively evaluate the efficacy of ultrasound-guided intraneural phenol injection into the terminal branches of the sciatic nerve at the lower third level of the leg in patients suffering from intractable ischemic pain in foot due to Fontaine's stage IV PAD.

METHOD: With IRB approval, retrospective reviews of charts were performed on patients undergoing ultrasound-guided intraneural phenol injection into the terminal branches of the sciatic nerve at the lower third level of the leg due to Fontaine's stage IV PAD during the period of September 2007 to March 2009. Phenol injections into the superficial and deep peroneal nerves and the tibial nerve were performed in patients complaining of ischemic pain of toe. The sural nerve injection was also added in patients complaining of ischemic pain on heel. Efficacy of sensory block, ankle motor function after phenol injection, duration of sensory block, complications, and the outcome were collected.

RESULT: A series of twelve patients was enrolled in this study. Eight patients underwent phenol injection into the unilateral leg. Four patients underwent it into the bilateral legs. A total of 16 phenol injections was performed. The complete sensory block last more than 6 months in 11 phenol injections. Five phenol injections necessitated a second injection due to the recurrence of foot ischemic pain, the median duration of which between a first and a second injection was 19 days (interquartile range=11 to 78 days). Loss of ankle motor function did not occur in any patients after phenol injection. No complications such as skin slough, muscle necrosis, wound infection caused by phenol block occurred. Eight patients were discharged after treatment of necrosis on their foot without leg amputation. Four patients underwent leg amputation after phenol injection.

DISCUSSION: We found that ultrasound-guided intraneural phenol injection into the terminal branches of the sciatic nerve at the lower third level of the leg provided good sensory block to Fontaine's stage IV PAD patients without complications. This technique may be an alternative therapy for these patients before leg amputation is carried out.

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S-364.

THORACIC LEVEL SPINAL CORD STIMULATION (SCS) MAKES A GREAT EFFECT FOR THE SEVERE PAIN OF THE INTERSTITIAL CYSTITIS : A CASE REPORT

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INTRODUCTION: Interstitial cystitis(IC) often causes an intractable severe pain, but the mechanism is still controversial problem.

During the treatment of IC pain, after the failure of another treatment, sacral neuromodulation is widely used.

But there are no reports about the efficacy of the dorsal column stimulation at the thoracic level for the IC.

We will show a case of thoracic level stimulation for IC, and the difference of paresthesia according to the lead position during operation.

CASE REPORT: 60 years old male

He was performed a hydrodistention 1 year ago, but pain relief was obtained only 1 month.

We made SCS puncture trial using dual PISCES-QUAD lead at T11 level for 14 days.

His pain was reduced, and 2 month after the trial, his pain is still reduced without nothing particular therapies.

DISCUSSION: In the treatment of pelvic pain, Leonard Kapural et.al reported the efficacy of thoracic level SCS. But the sweet spot is very narrow to stimulate the lumbosacral enlargement area because of the anatomic specificity.

In this case, after effect of SCS continues more over 2 months.

One of the mechanisms of pain caused by IC, the participation in the same mechanism of neuropathic pain is reported.

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Leonardo K et.al :PAIN MEDICINE Volume 7 • Number 5 • 2006

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S-365.

LOW DOSE GABAPENTTIN AS USEFUL ADJUVANT TO OPIOIDS FOR NEUROPATHIC CANCER PAIN WHEN COMBINED WITH LOW DOSE IMIPRAMINE

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INTRODUCTION: Painful neuropathic conditions of cancer pain often show little response to non-opioid and opioid analgesics, but may be eased by antidepressant and anticonvulsants. Although gabapentin is effective in the treatment of neuropathic pain in patients with cancer, some patients experience intolerable side effects sufficient to warrant discontinuation of gabapentin. The aim of the present study was to see whether low-dose gabapentin is effective in the treatment of cancer-related neuropathic pain when combined with low-dose imipramine.

METHODS: Forty cancer patients diagnosed as having neuropathic pain were allocated into three groups: G-I group took gabapentin 200 mg and imipramine 10 mg every 12 hours orally; G group took gabapentin 200 mg every 12 hours orally; I group took imipramine 10 mg every 12 hours orally.

RESULTS: Low-dose gabapentin-imipramine significantly decreased the global pain score and the daily paroxysmal pain episodes. Although several patients developed mild adverse symptoms in the three groups, no patients discontinued treatment due to adverse events.

DISCUSSION: Low-dose gabapentin-antidepressant combination with opioids was effective in the management of neuropathic cancer pain without severe adverse effects.

The global pain score, daily paroxysmal pain episodes

		G-I	G	I	p
Global pain score	T0	7(5-8)	7(5-8)	7(5-8)	0.962
	T1	2(2-3)*	4(2.75-6)	5(2-6.25)	0.009
Pain episodes	T0	4.5(3-6)	4(4-5)	4(4-6)	0.936
	T1	1(0-2)†	3(3-4)	4(3-5.25)	<0.001

S-366.

ANALGESIC EFFICACY OF TENS IN CHRONIC LOW BACK PAIN: EFFECT OF FIXED VS VARIABLE-RATE STIMULATION

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INTRODUCTION: Management of chronic low back pain (LBP) remains a challenge for practitioners. Given the well-known side effects of both opioid and non-opioid analgesics, use of alternative 'non-pharmacologic' therapies like transcutaneous electrical nerve stimulation (TENS) have been evaluated (1,2). This sham-controlled study was designed to evaluate the effect of a fixed versus variable-rate stimulation on clinically-relevant patient outcome measures related to chronic LBP.

METHODS: Following IRB-approval, 90 consenting patients with chronic LBP (1-6 yrs.) were randomly assigned to one of three treatment groups (n=30/ea): Group 1 (sham) received TENS treatments 3 times/wk for 4 wks using an intensity of 1-2 mA and frequency of 4 Hz, Group 2 (fixed) received TENS treatments 3 times/wk for 4 wks using an intensity of 12-15 mA and frequency of 4 Hz, and Group 3 (variable) received TENS treatments 3 times/wk for 4 wks using a maximum intensity of 12-15 mA and variable frequencies from 4 to 100 Hz ('dense-disperse' mode). Outcome assessments were performed using 11-point verbal rating scales (VRS), with scores of 0 = lowest and 10 = highest, to assess low back pain, quality of sleep, functionality (activity) level, and patient satisfaction at weekly intervals. Use of 'rescue' analgesic medications were recorded.

RESULTS: The three groups did not differ with respect to their demographic characteristics (Table). Both Groups 2 and 3 were superior to Group 1 with respect to decreases in pain scores and overall satisfaction with the TENS therapy (Table). However, there were no significant differences in the quality of sleep or functionality among the three groups. Group 3 had great satisfaction than Groups 1 and 2 at the end of the study period.

DISCUSSION: Use of TENS therapy at an intensity level of 12-15 mA was effective in improving pain control in patients with chronic LBP. The use of a variable-rate frequency of stimulation (4-100 Hz) was consistently more effective than a fixed frequency (4 Hz).

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Table: Demographic data and verbal rating scale scores for the three TENS treatment groups (0= worst to 10= best)*.

	Group 1 (n= 30)	Group 2 (n= 30)	Group 3 (n= 30)
Age (yr)	54±15	52±16	50±14
Gender (M/F) (n)	6/24	11/19	8/22
Type of pain symptoms			
Localized to low back region only	25	25	21
Radicular pain radiating to the foot	24	26	26
Pain VRS scores (0-10)			
Baseline	6.3 (1.5)	5.8 (2.2)	6.3 (1.9)
End of 4 wk treatment period	3.7 (1.2)	2.2 (1.3)#	1.1 (0.5)#$
Quality of sleep (VAS scores (0-10)			
Baseline	6.1 (2.3)	6.9 (1.3)	6.6 (1.1)
End of 4 wk treatment period	7.3 (2.2)	8.0 (1.2)	8.0 (0.8)
Level of activity('functionality') (0-10)			
Baseline	6.8 (1.4)	7.1 (1.5)	7.1 (1.0)
End of 4 wk treatment period	8.0 (1.2)	7.7 (1.0)	8.1 (0.9)
Overall satisfaction with TENS therapy over the 4 wk treatment period (0-10)			
at end of 1st wk	6.7 (2.1)	8.0 (2.5)$	8.3 (2.0)$
at end of 2nd wk	7.4 (1.4)	8.7 (1.8)$	8.9 (1.2)$
at end of 3rd wk	8.0 (1.6)	8.7 (1.4)	9.1 (1.0)$
at end of 4th wk	8.4 (1.3)	8.6 (1.5)	9.4 (0.9)$

Table: Demographic data and verbal rating scale scores for the three TENS treatment groups (0= worst

	Group 1 (n= 30)	Group 2(n= 30)	Group 3(n= 30)
Age (yr)	54±15	52±16	50±14
Gender (M/F) (n)	6/24	11/19	8/22
Type of pain symptoms Localized to low back region only Radicular pain radiating to the foot	25 24	25 26	21 26
Pain VRS scores (0-10) Baseline End of 4 wk treatment period	6.3 (1.5)3.7 (1.2)	5.8 (2.2)2.2 (1.3)#	6.3 (1.9)1.1 (0.5)#$
Quality of sleep (VAS scores (0-10) Baseline End of 4 wk treatment period	6.1 (2.3)7.3 (2.2)	6.9 (1.3)8.0 (1.2)	6.6 (1.1)8.0 (0.8)
Level of activity('functionality') (0-10) Baseline End of 4 wk treatment period	6.8 (1.4)8.0 (1.2)	7.1 (1.5)7.7 (1.0)	7.1 (1.0)8.1 (0.9)
Overall satisfaction with TENS therapy over the 4 wk treatment period (0-10) at end of 1st wk at end of 2nd wk at end of 3rd wk at end of 4th wk	6.7 (2.1) 7.4 (1.4) 8.0 (1.6)8.4 (1.3)	8.0 (2.5)$ 8.7 (1.8)$ 8.7 (1.4)8.6 (1.5)	8.3 (2.0)$ 8.9 (1.2)$ 9.1 (1.0)$9.4 (0.9)$

* Mean values (standard deviation)

Significantly different from Baseline value

$ Significantly different from Group 1

VRS = verbal rating scales: Pain scores: 0 = lowest to 10 = highest

Quality of sleep scores: 0= least to 10 = highest

Functionality scores: 0 = lowest to 10= highest

Patient satisfaction scores: 0= lowest to 10 = highest

S-367.

DEVELOPMENT OF COMPREHENSIVE DIAGNOSTIC CRITERIA FOR COMPLEX REGIONAL PAIN SYNDROME IN THE JAPANESE POPULATION

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INTRODUCTION: Complex regional pain syndrome (CRPS) is a syndrome that describes a broad spectrum of sensory, motor and autonomic-like features with unproven etiology. The International Association for the Study of Pain (IASP) diagnostic criteria of CRPS in 1994 shows high sensitivity but poor specificity. Using statistical pattern recognition methods, American researchers have suggested a new set of criteria offering acceptable sensitivity and high specificity by using statistical pattern recognition methods (Harden et al. 1999 & Bruehl et al. 1999). However, it has been revealed that non-American CRPS patients present distinct subsets of CRPS-related signs/symptoms from those of American patients.

METHOD: The present study was a multi-site between-subjects design comparing patients with CRPS to those with non-CRPS persistent pain disorders. We followed a series of American studies to develop a set of CRPS diagnostic criteria that would be most suitable for the Japanese population. A standardized sign/symptom checklist was used in patient-evaluations to obtain data on CRPS-related signs/symptoms in 195 CRPS patients meeting the IASP criteria (34.9% men; mean age: 47.8+/-16.0 years; 21.5% type 2 with overt nerve injury)and 146 non-CRPS patients with chronic (> 3 months) pain in one limb (48.6% men; mean age: 56.8+/-16.6 years; etiology: neuropathic pain 56.2%, inflammatory disease 11.1%, post-traumatic pain syndrome 4.8%, others 4.8%). Data collection was performed in departments of anesthesiology (75.9% of the sample) and orthopedics (24.1%). We used the statistical pattern recognition methods (factor analysis and discriminant function analysis) to test the validity of internal and external CRPS diagnostic criteria. Results of discriminant function analysis were used to develop optimal decision rules of the empirical subsets derived from factor analysis, discriminating between CRPS and non-CRPS patients, on the basis of the three indicators (i.e., sensitivity, specificity and discriminant accuracy).

RESULT: Using factor analysis, we grouped CRPS-related signs/symptoms into five distinct subgroups (trophic change, motor dysfunction, abnormal pain processing, asymmetric sudomotor activity and asymmetric edema). Discriminant function analysis of these subgroups, regarding their ability to discriminate between CRPS and non-CRPS etiology, indicated that modifying the IASP criteria could increase clinical diagnostic accuracy in the Japanese population (sensitivity 0.83, specificity 0.79 and discriminant accuracy 0.81).

DISCUSSION: Our diagnostic criteria are not exactly the same as the American criteria, indicating a need for more regionally based CRPS diagnostic criteria. Different sets of CRPS diagnostic criteria could lead to dissimilar patients being diagnosed as CRPS, however, presenting problems for translation of therapeutic effects found in various studies. Therefore, we further recognize a need for a global set of common CRPS diagnostic criteria.

ACKNOWLEDGE: This study was funded by Japanese Health Labour Sciences Research Grant (H17-kokoro-022).

S-368.

FAMILY HISTORY OF CHRONIC BACK PAIN

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INTRODUCTION: Low back pain is one of the most common reasons for chronic pain as well as disability (1). The etiologies of back pain are myriad in nature including, but not limited to, the facets, intervertebral discs, spinal nerve roots, vertebral bodies, and soft tissues. A familial predisposition toward discogenic low back pain has been reported in the literature (2). However, a relationship between chronic low back pain, of any etiology, in patients with a family history of chronic low back pain who sought treatment, has not been studied. Our goal was to determine if there is a relationship between patients with chronic back pain and a family history of a first-degree relative seeking treatment for chronic back pain.

METHODS: After IRB approval, a survey was given to patients presenting to the Pain Center for consultation regarding low back pain. Patients completed the survey, which was returned to a dedicated receptacle upon discharge. Each survey was anonymous and asked if the patient was presenting for treatment of chronic back pain (defined as back pain for more than six weeks) and if the patient had a first-degree relative with a history of chronic back pain for which that person sought treatment. If the patient did have a first-degree relative with a history of chronic back pain requiring treatment, the patient was asked to circle which relative(s) were involved. After a six-month time period the surveys were gathered and the data was analyzed. The percent of patients with a reported family history of back pain, and the percent of respondents by type of family member were calculated with 95% confidence intervals.

RESULTS: Two hundred three patients with chronic low back pain responded.

Forty three percent (CI 36.4-50.5) had at least one first-degree relative with a history of chronic low back pain who sought treatment. The percent respondents for individual family members is as follows: Mother 28.4% (CI 19.3-39.0), Father 25.0% (CI 16.4-35.4), Sister 36.4% (CI 26.4-47.3), Brother 27.3% (CI 18.3, 37.8), Son 3.5% (CI 1.40-6.98), Daughter 5.4% (CI 2.74-9.49).

DISCUSSION: Low back pain remains a significant source of disability and can be difficult to treat secondary to a wide array of pathogenesis. Our study does show a relationship between chronic low back pain and a family history of low back pain despite the fact that there are causes that do not have a familial relationship (trauma). Our patients had pathology not limited to discogenic back pain and suggests a possible hereditary role in other common causes of low back pain such as spinal stenosis, spondylosis, and radiculopathy. Further study with a larger sample size is warranted.

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S-369.

RELIABILITY OF PLACEMENT OF LUMBAR INTERLAMINAR EPIDURAL STEROID INJECTIONS USING A SPRING LOADED LOSS OF RESISTANCE SYRINGE

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INTRODUCTION: The loS-of-resistance (LOR) technique is most commonly relied upon to confirm needle placement in the epidural space. Additionally, in the chronic pain setting, there is general consensus to utilize radiological guidance to ensure accurate position. Recently, a LOR syringe with an internal spring which applies constant pressure on the plunger was developed. This prospective study was undertaken to determine the reliability of epidural needle placement, in the pain clinic setting, using a spring loaded LOR syringe.

METHODS: Following IRB approval and informed consent, 100 patients (67 women and 33 men) scheduled for lumbar interlaminar epidural steroid injection were enrolled. Patients were placed in the prone position and the target lumbar interspace was identified with spot fluoroscopy. A 20 gauge Touhy needle was advanced to reach ligamentous structures, the stylet was removed, and a spring loaded EpisureTM syringe filled with 3cc of saline was attached. The needle/syringe combination was advanced until the saline filled plunger automatically depressed. Contrast dye was injected to confirm placement with the use of AP/lateral fluoroscopy. Anthropometric data, length of procedure, placement success, and complications were recorded. Association between result and baseline variables of race, sex, age, and BMI was tested using a chi-square test and two-sample t-test. BMI was also analyzed as a categorical variable including obese (BMI>30) vs. non-obese, and morbidly obese (BMI>40) vs. non-morbidly obese using Fisher's exact test. Length of procedure (LOP) was compared using Wilcoxon's two-sample test.

RESULTS: Of the 100 patients, 84% had proper placement of the epidural needle (95% CI:75.3%, 90.6%) The distribution of race and sex was not statistically different between positive and negative results (p=0.96). Those with a negative result were slightly older (62.7 vs. 56.6) (p=0.118). The mean BMI for all patients was 30.9 (range of 18.2-61.4). Amongst those who were obese (N=45), 75.5% had correct placement vs. 91% who were non-obese (p=0.054). A significantly lower proportion of morbidly obese patients (61.5%) had a positive result compared to the non-morbidly obese group (87.4%) (p=0.033). Those patients who had correct placement had a significantly lower mean BMI compared to those with a negative result (p=0.039). LOP was considerably shorter (1.6 vs 4.7 mins) for patients who had epidural placement (p<0.001). There were 2 dural punctures and a subdural and intravascular placement.

DISCUSSION: This study revealed that the use of a spring-loaded LOR syringe in the non-obese pain population was extremely reliable. The utilization of x-ray in pain medicine has become commonplace, and the risks to the physician have been described (1). Further study to determine if this LOR syringe can lower radiation exposure to the pain care team is indicated.

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S-370.

CHRONIC PELVIC PAIN - CLOAKED AS AN ENIGMA AND LACED WITH MYSTERY - IS NOW CHALLENGED

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AFFILIATION: Anesthesiology, harbor-ucla, torrance, CA.

INTRODUCTION: The medical riddle of chronic pelvic pain is being challenged by a specialist in Los Angeles who has unique training in both anesthesiology and obstetrics and gynecology, offering possibilities of pain relief for chronic pelvic pain sufferers. Pain is the most common reason for a patient to seek medical attention. Estimates suggest that most visits to primary care physicians are because of pain.

Recent research studies have been able to identify better management of chronic pelvic pain giving hope to pelvic pain patients. This includes physical therapy, psychology, and neural blockade offering patients periods of relief, and providing them hope and control.

COMMON CAUSES OF PELVIC PAIN: Many patients with CPP carry multiple diagnoses. There is overlap with common core symptoms, including abdominal distension and pain, headache, fatigue, bowel and bladder dysfunction, sexual disorders, adhesions, functional ovarian cysts, dysmenorrhea, and endometriosis.

Endometriosis is often the leading diagnosis for CPP. It may be prudent for the Ob/Gyn to refer these patients before surgery to see if the possibility of pudendal neuropathy may co-exist; and will its treatment result in pain relief.

A frequent cause of pelvic pain, pudendal neuropathy, is not taken into serious consideration until other causes have been investigated.

PUDENDAL NEUROPATHY: Pudendal neuropathy is a frequent neuropathy of the pelvic region in both males and females. It is suggested that in women, prolonged labor, complexities of the second stage of labor, and endometriosis may be involved. Some of the more common symptoms of pudendal neuropathy include pelvic floor dysfunction with pain on sitting, pain from the inferior hypogastric plexus with urinary urgency and frequency, and involvement of the branches of the pudendal nerve that triggers pain from bowel movements and pain during and after intercourse.

My initial clinical study of pudendal neuropathy was published in 2000 and involved CT guidance for a more accurate drug delivery in special circumstances (1). The stimulus for this study was the past treatment failures, that encouraged exploration of other possibilities for treatment.

This study and data from our basic science clinical research team enabled us to initiate a new treatment method that included multiple treatment levels involving dorsal root ganglions that control the pain in the involved area. This treatment allowed erasing of some of the painful signals at multiple sites of origin previously not considered. Results of this study were published in January of 2008 (2).

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S-371.

THE EFFECT OF PULSED RADIOFREQUENCY TREATMENT OF DORSAL ROOT GANGLIA ON LUMBOSACRAL RADICULAR PAIN : A COMPARATIVE STUDY WITH SELECTIVE NERVE BLOCK

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INTRODUCTION: Although pulsed radiofrequency (PRF) applied adjacent to dorsal root ganglia for lumbosacral radicular pain is reportedly effective, there are no randomized studies with a control using selective nerve block (SNB). We aimed to assess the efficacy of PRF treatment of dorsal root ganglia for lumbosacral radicular pain as compared with SNB.

METHODS: The study included 44 patients, who suffered from lumbosacral radicular pain due to spinal disorders. The design of this study was randomized with a SNB control. In the PRF group, the PRF current was applied for 120 seconds after SNB. In the SNB group, the patients received SNB only. Visual analogue scale (VAS) was assessed immediately before, and immediately, 2 hours, 1 day, and 1week after the procedure. The data tested statistically using repeat-measure ANOVA and Scheffe's F test. $P < 0.05$ was regarded as denoting statistical significance.

RESULTS: In the PRF group, VAS scores were 62 ± 22, 0 ± 0, 0 ± 0, 15 ± 24 and 35 ± 29 immediately before, and immediately, 2 hours, 1 day, and 1 week thereafter, respectively. In the SNB group, the VAS scores at corresponding time points were 63 ± 19, 0 ± 0, 6 ± 18, 24 ± 26 and 37 ± 28. In both groups, VAS at immediately, 2 hours, and 1 day after the procedure were significantly decreased as compared with that before treatment ($P<0.01$). VAS at 1 week after treatment was significantly decreased as compared with that before the procedure in the PRF group ($P<0.01$). However, there was no significant difference between VAS before and 1 week after treatment in the SNB group. There were no significant differences in VAS between the two groups at the same time points.

CONCLUSION: This study indicates that PRF adjacent to the dorsal root ganglia can markedly reduce lumbosacral radicular pain as compared with SNB. Further studies are needed to assess the long-term effects of PRF.

S-372.

A CHALLENGING CASE REPORT: PLACEMENT OF A SPINAL CORD STIMULATOR IN A PATIENT WITH ASYMPTOMATIC CERVICAL SPINAL CANAL NARROWING

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INTRODUCTION: Spinal cord stimulators (SCS) are used to treat several types of chronic pain syndromes. There are no requirements for evaluating the size of the epidural space prior to SCS placement. We report a case of the placement of a cervical SCS for Complex Regional Pain Syndrome II (CRPS II) in a patient with asymptomatic cervical spinal canal narrowing.

CASE REPORT: A 45 year-old female presented to our pain clinic for evaluation and treatment of right arm and hand pain after a traumatic blood draw in her right antecubital fossa. One week later, she noticed edema, mottling, and increased pain in her right forearm and hand with an occasional sharp stabbing pain over her thenar eminence radiating to her mid forearm. A physical examination revealed a dusky appearance to her right thumb and index finger with decreased skin temperature, and allodynia in the distribution of her right median nerve. A diagnosis of CRPS II of the right median nerve was made. Over the ensuing months, the patient had multiple right stellate ganglion blocks as well as trials of various medications which provided 50 - 80% pain relief for several weeks. The decision was made to perform a SCS trial. Before the trial, a cervical MRI was performed secondary to concern over the presence of an osteophyte at the C5 vertebrae previously diagnosed by CT. The MRI revealed an asymptomatic posterior disc osteophyte complex at C5-C6 which caused spinal canal narrowing to a diameter of 11.7 mm. This level was the intended position of the SCS lead. The narrowed canal raised concerns that placement of the SCS leads would cause iatrogenic spinal stenosis if the lead's diameter was too large. The diameter of the leads was found to be 1.3 mm. This lead size would cause further canal narrowing, but not enough to create a stenotic diameter of < 10 mm. A successful trial was performed with the tip of the lead placed below C5-C6 without any intra-operative or post-operative complications.

DISCUSSION: This case illustrates the potential for worsening spinal stenosis or creating iatrogenic spinal stenosis with SCS placement. Even though imaging of the spinal canal prior to SCS placement is not mandated, it should be considered prior to placement to help prevent any complications.

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WITHDRAWN.

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S-374.

FAILURE OF BLOOD PATCH TO PREVENT DEVELOPMENT OF SIXTH NERVE PALSY AFTER INTRATHECAL PUMP

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INTRODUCTION: The aim of this abstract is to present a case of diplopia due t o bilateral abducent nerves palsy after intrathecal pump placement for chronic pain management despite blood patch.

CASE: 43 yr old man was consulted for pain management. He had upper abdominal pain requiring frequent hospital admission. The pain was attributed to pancreatic disease. He failed oral narcotic therapy. Intrathecal pump offered and pateint consented. Intrathecal catheter was placed under flouro in single attempt using 18 gauge needle and 20g catheter. Patient developed postdural puncture headache on day 1 of the trial requiring him to be bed bound. Patient was taken to OR on day 3 of trial for pump implant and epidural blod patch.CSF access required two attempts with poor CSF flow via the catheter which was intrathecal as confirmed by flouro and on dye test. Rest of the procedure was uneventful. EBP done at the end of the case under flouro using 15 ml of blood. Patient headache improved a lot. He was discharged home with practically no pain and no oral analgesics. He came to the pain clinic for follow up. He was complaining of HA and diplopia which began 5 days after the trail and 3 days after the intrathecal implant. Physical exam revealed loss of abduction in the left eye. Left sixth nerve palsy due to CSF leak was diagnosed. After informed consent second EBP done in the clinic under flouro using 20 ml of blood and follow up with neuro-ophthalmology arranged the next day. Head CT was contemplated but left to the discretion of ophthalmology. Ophthalmology evaluation revealed 40% loss of abduction in the left eye and 5% in the right eye. Vision was ok. No further testing was requested. He was diagnosed with bilateral nerve palsy. Patient was followed serially. Recovery of nerve took almost 8 weeks.

DISCUSSION: Cranial nerve palsy is a known complication after intrathecal puncture. Its exact incidence is unknown but has been reported to be 1/140 to 1/4000. Few cases have been reported after IT pumps implant. Blood patch helps HA but not diplopia. In this case blood patch was done to treat headache which improved but palsy could not be prevented. Management is mostly conservative. It recovers in 90% of cases which may take up to 8 months after which it would need surgical intervention.

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S-375.

CHRONIC MORPHINE AND BACLOFEN THERAPY VIA A NEURAXIAL INFUSION CATHETER IN THE THORACIC EPIDURAL SPACE

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INTRODUCTION: Chronic neuraxial opioid and baclofen administration is an accepted therapy for chronic pain.[1-3] Intrathecal administration of analgesics can be associated with various complications related to catheter placement, catheter or pump malfunction, drug overdose, chronic tissue changes, and infection.[1,2] Chronic epidural analgesic administration has been shown to have higher rates of complications and therapeutic failure.[1] Here we discuss sequelae of chronic opioid and baclofen infusion via a malpositioned catheter in the thoracic epidural space.

CASE REPORT: A 35-year-old woman with failed back surgery syndrome was scheduled for permanent intrathecal infusion system placement after successful intrathecal opioid trial. Despite cerebral spinal (CSF) fluid return initially, the intrathecal catheter failed to produce CSF. Cathetergram produced an intrathecal spread pattern. Infusion system was implanted and continuous opioid infusion therapy was administered. During subsequent infusion pump replacement five years later, repeat cathetergram produced an intrathecal spread pattern. Increasing doses of morphine and addition of high doses of intrathecal baclofen were required with poor pain control throughout her treatment course. In the ninth year of neuraxial infusion, the patient developed worsening thoracic pain. Thoracic magnetic resonance imaging showed a T8-9 epidural mass and epidurally placed catheter. Epidural exploration at T8-9 revealed granuloma encasing the catheter tip posterior the dura mater in the epidural space. Catheter was removed, and new catheter was inserted in the L1-2 intrathecal space producing CSF. Infusion of morphine and baclofen at one-fifth the previous concentration was initiated. Post-operatively, the patient developed signs of baclofen withdrawl including hypocalcemia, hypokalemia, spasm, and Chvostek's sign. Oral baclofen supplement was increased and patient discharged with improved pain and spasm control.

DISCUSSION: Malpositioning of neuraxial catheters can be associated with spinal cord injury, inadequate analgesia, and catheter obstruction or dislodgement.[1,2] Prolonged epidural analgesic infusion is often less predictable with higher complication rates, including epidural fibrosis.[1] Chronic administration of neuraxial opioids has been associated with granuloma formation.1 Protocols designed to ensure adequate intrathecal location of the infusion catheter during placement should be followed.[2]

Intrathecal baclofen infusion is an accepted therapy for spasticity and chronic spasm.[2,3] The epidural pharmacodynamics of baclofen are poorly described.[3] Baclofen, a lipid soluble compound, has been theorized to readily cross the dura matter; however, data supporting this is absent.[3] This patient's course supports effective baclofen activity at low infusion rates when administered epidurally.

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S-376.

THE EFFECTS OF VIBRATORY THERAPY ON CHRONIC PAIN AFTER MEDIAN NERVE INJURY - A BEHAVIORAL AND FMRI STUDY

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INTRODUCTION: We report a case of chronic limb pain that was effectively treated with a vibratory stimulus, and a piece of neuroimaging evidence for the contribution of cerebral hyperactivity to allodynia.

METHODS: A 45-year old male patient had his left forearm injured by a chain saw. Despite immediate surgical repair followed by repeated nerve blocks and motor rehabilitation for a year, he suffered from persistent pain and allodynia at the left forearm in the area innervated by the median nerve. We started a new regimen including a vibratory stimulus at 250Hz and coordinated motor tasks. We also evaluated pain behavior using a pain rating score (0-10) and McGill Pain Questionnaire Short Form (MPQ-SF), and examined for a possible abnormal cerebral response to tactile stimulus using functional magnetic resonance imaging (fMRI) with a 3-Tesla MRI scanner.

RESULTS: After 12 weeks, the pain rating score decreased from 8.5 to 4.5, although MPQ-SF did not show a significant change. A tactile stimulus at the left hand, causing allodynia, induced exaggerated activation of the somatosensory and pain-related regions across both hemispheres (right panel, Figure), in contrast to normal, localized response at the left primary somatosensory cortex by an innocuous right-sided stimulus (left panel, Figure). Such pattern of brain activation persisted over 9 weeks after starting the regimen.

DISCUSSION: The present results imply effectiveness of vibratory therapy in relieving chronic pain from deafferentation. Exaggerated cerebral activation by an innocuous stimulus may imply possible contribution of cerebral hyperactivity to allodynia.

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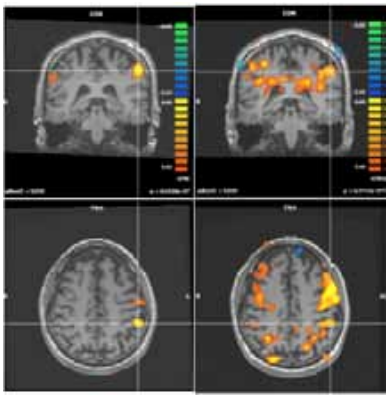

S-377.

A PAIN IN THE REAR - WHAT DO WE KNOW ABOUT HYALUROINDASE?

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INTRODUCTION: Adhesiolysis is a common therapeutic modality for chronic back pain after spinal surgery. Hyaluronidase is often used with spinal steroid injection to decrease pain and improve spread of steroid. To date, there is limited data on the drug's adverse effects.

CASE REPORT: A 70 year old man with chronic low back pain had received multiple caudal epidural steroid injections. The last injection consisted of 2 mL Hyaluronidase (300 units), 4 mL 0.25% Bupivicaine, and 1 mL Traimcinolone (40 mg). The patient had no known anatomical abnormalities, a normal coagulation status, and the procedure was performed without any noted complications. One week following the procedure, the patient noted intense pain of the sacral spine. The patient had no neurological deficits, bowel or bladder dysfunction, or signs of infection. However, the patient had excruciating pain to palpation at the injection site and an urgent MRI showed epidural inflammation in the sacral and lumbar epidural space and sacral soft tissue edema. The patient denied fever or chills and labs showed no leukocytosis. The only significant finding was a slightly elevated CRP 1.4 (0-1.0). The patient was placed prophylactically on Cephalexin 500 mg every 8 hours for one week. Repeat MRI showed no abscess or osteomyelitis. The patient continued to have focal pain without deficits or changes in activity level. He was given NSAIDS to treat his pain.

DISCUSSION: Hyaluronidase is derived from bovine testes and used to degrade components of the extracellular matrix, such as hyaluronic acid, chondroitin-4 and -6-sulfate, which commonly form adhesions. The lack of systemic symptoms such as fever, chills, motor or neurological symptoms, and bowel or bladder dysfunction in the presence of back pain following an epidural injection does not rule out an abscess or hematoma as seen in previous case reports. Although hyaluronidase has been shown to be effective in adhesiolysis, too little is known regarding possible complications. The continued use of hyaluronidase warrants a close inspection of how it interacts with other drugs and effect on the epidural space.

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S-378.

THE PROPORTION OF TRAUMATIC CEREBROSPINAL FLUID LEAK AND PROGNOSTIC FACTORS IN PATIENTS WITH WHIPLASH-ASSOCIATED DISORDER.

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INTRODUCTION: Whiplash-associated disorder (WAD) is generally a self-limited clinical entity with several months conservative treatments. However, some patients need long-term treatments more than several months. We have already reported that chronic WAD patients may include traumatic cerebrospinal fluid (CSF) leak. In this study, we investigated the proportion of traumatic CSF leak in patients with WAD grade 1-3 (having neck pain without fracture and dislocation of bone), and their prognostic factors after motor vehicle accident (MVA), retrospectively.

METHODS: From a total of 338 acute WAD patients in consequent three years, we identified a subgroup with only WAD grade 1-3 patients, who were able to be treated continuously from their initial visit to the end of claimant in our hospitals (n=143). Characteristics, backgrounds and symptoms were recorded and analyzed. In some cases of lasting a bilateral orthostatic headache over three months after MVA, patients underwent head MRI and RI cisternography to check their CSF leak.

RESULTS: All of 143 patients had pain or discomfort of their neck. 110 (77%), 128 (90%) and 142 (99%) patients were recovered within 3, 6 and 12 months after MVA, respectively. In 143, twenty patients had headaches and/or Barre-Lieou like sympathetic symptoms such as nausea, dizziness and tinnitus. Of the 20 patients, 12 improved within 4 months after MVA, 4 had radicular pain due to cervical spondylosis, and the remained 4 patients had a bilateral headache. The 4 patients with a bilateral orthostatic headache underwent RI cisternography and 2 had CSF leak on RI findings. Statistically, a period of the treatment in patients with headaches and Barre-Lieou like symptoms was longer than that with only neck pain.

DISCUSSION: In WAD grade 1-3, the patients with CSF leaks were so rare that their dural fragility probably causes CSF leaks after MVA, but chronic WAD patients with a bilateral orthostatic headache may have CSF leak as a factor of delay to recover. Furthermore, in this study, headaches and Barre-Lieou like symptoms were associated with chronicity of WAD.

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MORTALITY IN PRIMARY PULMONARY HYPERTENSION IN THE PEDIATRIC POPULATION

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INTRODUCTION: Primary pulmonary hypertension (PPH) is a rare disease with a very poor prognosis in children. As anesthesiologists, we are frequently involved in the care of these patients in perioperative and intensive care settings. Population studies have found mortality to be increased in elderly patients, with only information from small cohort studies available in the pediatric population (1-4). The objective of this study was to determine in-hospital mortality of PPH in a large pediatric inpatient sample.

METHODS: The Kid's Inpatient database (KID) (5) is a national inpatient care database for children up to age 20 years in the United States. Our cohort consisted of admissions in the KID from the years 2003 and 2006. We compared mortality of patients with the diagnosis "primary or idiopathic pulmonary hypertension" (ICD 9 code 416.0) to mortality of all patients in the cohort database. Study variables included age, gender, race, hospital size by bed number (small, medium, large), and admission type (elective vs. nonelective). Statistical analysis included univariate analysis and standard mortality ratios (SMR) with 95% confidence intervals calculated. All analysis was performed using the Statistical Analysis System 9.2 (SAS).

RESULTS: Overall inhospital mortality for children with PPH was significantly higher 7.5% (114 out of 1517), which was nearly 13 times the rate for the general pediatric inpatient population (0.6%; SMR 12.9, 95% confidence interval 10.7 - 15.5). Inhospital mortality of PPH varied markedly by age, with the highest mortality (12.8%) being found in neonates. Inhospital mortality for non-elective admissions was significantly higher than for elective admissions (9.2% vs. 2.6%, $p<0.05$).

		PPH Mortality	95% Confidence Interval
Overall Mortality		**0.075**	**0.062 - 0.088**
Age			
	Less than 1 month	0.128	0.085-0.171
	1 month-<12 months	0.103	0.067-0.139
	1 year to 9 years	0.040	0.020-0.060
	10+ years	0.061	0.039-0.083
Admission type			
	Non-elective	0.092	0.075-0.109
	Elective	0.026	0.010-0.042

DISCUSSION: Inhospital mortality in children with PPH remains high when compared to other pediatric in-patients. Neonates with PPH are at a particularly heightened risk of mortality.

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S-380.

COMORBIDITIES IN PEDIATRIC DOWN SYNDROME PATIENTS

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INTRODUCTION: Down syndrome (DS) is the most common chromosomal abnormality found among liveborn infants and is often accompanied by other comorbid conditions. Due to the high frequency of co-existing medical conditions in DS children, they often require hospitalization, and intervention requiring sedation and anesthesia.[1][2] In earlier studies, these comorbidities have been shown to result in an increased rate of mortality in children[3] particularly with congenital cardiac disease, which is present in half of children with DS.[4] However, more recent data on DS children and the frequency of comorbid conditions are unknown. We analyzed the frequency of major organ system comorbid conditions in DS, which was compared to the general database population.

METHODS: The Kid Inpatient Database (KID), a Healthcare Cost and Utilization Project (HCUP) sponsored by the Agency for Healthcare Research and Quality (AHRQ) was used to identify 8,632,286 unweighted discharge records for the years 2000, 2003 and 2006[5]. The relationship between diagnosis and comorbidity was assessed for 37,906 patients ≤ 20 years of age with a diagnosis of DS (ICD-9 code 758.0). ICD9 codes were used to group diagnoses by specific organ systems. We calculated the proportional morbidity ratios (PMRs) and 95% confidence intervals (CIs) for these diagnostic groups. The PMR is the ratio of the observed number of these medical conditions, divided by the expected number of conditions based on the prevalence among all patients in the KID database. All analysis was performed using the Statistical Analysis System 9.2 (SAS).

RESULTS: DS patients were found to have a higher inpatient mortality rate than the general population (1.4%, 95% confidence interval: 1.3-1.6 vs. 0.58% CI: 0.58-0.59). The most prevalent coexisting conditions are diseases of the respiratory (40.2% prevalence, PMR: 2.20, 95% confidence interval: 2.17-2.23), gastrointestinal (18.6%, PMR: 1.62, CI: 1.58-1.65), and cardiovascular systems (17.8%, PMR: 4.96, CI: 4.82-5.06), as well as neoplasms (6.93%, PMR: 2.47, CI: 2.38-2.57). The increased prevalence of infectious, hematologic, and endocrine disease was also found.

COMORBIDITY and ICD9 CODES	PMR	Confidence Interval
Respiratory Diseases (460-519)	2.20	2.16-2.24
Endocrine and Metabolic Disorders (240-279)	1.78	1.74-1.82
Gastrointestinal Diseases (520-579)	1.62	1.58-1.65
Cardiovascular Diseases (390-459)	4.94	4.82-5.06
Infectious Diseases (001-139)	1.29	1.26-1.33
Central Nervous System Diseases (320-389)	1.53	1.48-1.57
Hematologic Diseases (280-289)	1.38	1.33-1.42
Neoplasms (140-239)	2.48	2.38-2.57

DISCUSSION: DS patients have a higher inpatient mortality rate and excess comorbidities in many different organ systems compared to the general population, particularly respiratory, cardiovascular, and gastrointestinal disease. More detailed analysis is needed to determine the frequency of specific diagnosis within the cardiovascular, respiratory and gastrointestinal systems, the associated inpatient mortality, and possible risk factors for increased inpatient mortality.

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S-381.

ADVERSE NEUROLOGICAL EVENTS FOLLOWING PLACEMENT OF EPIDURAL CATHETERS IN ANESTHETIZED PEDIATRIC PATIENTS.

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INTRODUCTION: Adverse neurological events (ANEs) are feared complications of epidural placement in anesthetized pediatric patients. Few studies regarding the safety of epidural catheter placement in anesthetized children exist.[1,2] This abstract summarizes the preliminary findings of our study of ANEs in children who had epidural catheters placed during general anesthesia.

METHODS: This study was approved by our IRB. All adverse events (AEs) are recorded prospectively in the Pain Management Service Registry (PMSR) by a member of the Pediatric Pain Management Service after making daily rounds on each patient. The PMSR was queried from its inception on 12/1/2001 through 9/17/2009 for all patients less than 21 years old who had epidural catheters placed under general anesthesia and all complications were tabulated.

RESULTS: Between 12/1/2001 and 9/17/2009, a total of 2237 epidural catheters were placed under general anesthesia in 2233 children < 21 years old. Epidural catheters were inserted at the thoracic (n=627 patients, 28%), lumbar (n=789 patients, 35%), and at the caudal (n=821 patients, 37%) levels. No AEs were reported in 1460 (65%) patients. In 720 patients (32%), 923 miscellaneous AEs (i.e. nausea, vomiting, and pruritus) were reported. ANEs (n=117) were reported in 106 (4.7%) patients. Reported ANEs include: motor block or weakness (n=31, 1.4%), sedation (n=29, 1.3%), muscle spasm or myoclonus (n=14, 0.6%), paresthesias/dysesthesias (n=13, 0.5%), Horner's syndrome (n=8, 0.4%), headache (n=8, 0.4%), wet tap (n=6, 0.3%), post-dural puncture headache (n=3, 0.1%), back pain (n=1, <0.1%), seizure (n=2, <0.1%), and foot drop (n=2, <0.1%). Note 53 patients had both miscellaneous and neurological adverse events. There were no spinal cord injuries or epidural hematomas. Five patients with paresthesias/dysesthesias and one with foot drop were due to the surgical procedure and not related to epidural placement. Another patient who developed foot drop after a 12 hour procedure in the lateral position for resection of osteogenic sarcoma in the contralateral lower extremity had a peroneal nerve injury related to positioning. Eight patients had transient paresthesias/dysesthesias not attributed to surgery that resolved within 72 hours. One of these patients had severe burning pain on the sole of her right foot immediately upon emerging from general anesthesia. Her symptoms resolved immediately upon repositioning her epidural catheter. All other ANEs resolved.

DISCUSSION: Transient neurological AEs were not uncommon, occurring in nearly 5% of all children who had epidural catheters placed during general anesthesia. However, there were no epidural hematomas, spinal cord injuries, or traumatic injury to any neural structures and no permanent neurological complications occurred which could be attributed to placement of epidural catheters in anesthetized children.

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S-382.

REAL-TIME ASSESSMENT OF PERIOPERATIVE BEHAVIORS IN CHILDREN AND PARENTS: DEVELOPMENT AND VALIDATION OF THE PERIOPERATIVE ADULT CHILD BEHAVIORAL INTERACTION SCALE (PACBIS)

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INTRODUCTION: Perioperative anxiety and distress during outpatient pediatric surgery can contribute to postoperative maladaptive behaviors such as temper tantrums, nightmares, bed wetting, attention seeking, and fear of being alone. Currently available perioperative behavioral assessment tools have limited utility in guiding interventions to ameliorate maladaptive behaviors because they cannot be used in real-time, are only intended to be used during one phase of the perioperative experience (e.g., preoperative), or provide only a static assessment of the child (e.g., level of anxiety). A simple, reliable, real-time tool is needed to appropriately identify children and parents whose maladaptive behaviors in response to distressful events at any point in the perioperative continuum could benefit from timely behavioral intervention. The specific aims of this study were to 1) develop Perioperative Adult Child Behavioral Interaction Scale (PACBIS) to reliablyidentify adaptive and maladaptive perioperative behaviors and 2) validate the PACBIS against several established instruments measuring similar behavioral constructs.

METHODS: The PACBIS was used to assess the perioperative behaviors of 89 children ages 3-12 years presenting for adenotonsillectomy and their parents. Assessments using the PACBIS were made during perioperative events likely to prove distressing to children and/or parents (preoperative measurement of blood pressure, induction of anesthesia, and removal of the intravenous catheter before discharge). Static measurements of preoperative anxiety and behavioral compliance during anesthetic induction were made using the modified Yale Preoperative Anxiety Scale (mYPAS) and the Induction Compliance Checklist (ICC). Each event was videotaped for later scoring using the Child-Adult Medical Procedure Interaction Scale-Short Form (CAMPIS-SF) and Observational Scale of Behavioral Distress (OSBD). Inter-rater reliability of the PACBIS was assessed with linearly weighted Kappa (κw); validity of the PACBIS against the other scales was assessed using Spearmen's correlation coefficient.

RESULTS: The PACBIS demonstrated good to excellent inter-rater reliability, with κw ranging from 0.62 to 0.94. The Child Coping and Child Distress sub-scores of the PACBIS demonstrated strong, appropriate concurrent correlation with all four concurrent measures (mYPAS, ICC, CAMPIS-SF, and OSBD). The Parent Positive sub-score of the PACBIS demonstrated appropriate correlation with the CAMPIS-SF and OSBD instruments, while the Parent Negative sub-score showed significant correlation only with the ICC. The PACBIS has strong construct and predictive validities.

CONCLUSIONS: The PACBIS is a simple, easy to use, real-time instrument to evaluate both adaptive and maladaptive perioperative behaviors of both children and their parents. It has demonstrated good to excellent inter-rater reliability and strong concurrent validity. The PACBIS offers a means to identify maladaptive child or parental behaviors in real-time, making it possible to intervene to modify such behaviors in a timely fashion. Further research will be required to determine if timely identification and modification of maladaptive behaviors will lead to improved outcomes in children having outpatient surgery.

S-383.

SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN PEDIATRIC AMBULATORY SURGERY PATIENTS

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INTRODUCTION: The identification of obstructive sleep apnea (OSA) is vitally important to perioperative physicians as a number of case studies and retrospective chart reviews have associated adverse perioperative events with OSA. The prevalence of OSA has been estimated as high as 30% in adults, and 1-3% in children. Additionally, the risk of perioperative respiratory difficulty in children with OSA has been reported to be as high as 20 fold that of children without the disorder (1, 2). Because of this, there is greater emphasis on perioperative management of patients with sleep apnea, as well as the most appropriate way to screen for this disease. Screening for OSA is particularly difficult in children as manifestations of OSA in children (hyperactivity and growth delay) differ markedly from those in adults (daytime somnolence and metabolic syndrome). Expert consensus and ASA Practice Guidelines recommend screening for OSA in both adults and children prior to surgical procedures (2, 3). To date, there are no studies evaluating the likelihood that children will be screened for OSA symptoms prior to outpatient surgical procedures. The aim of this study was to determine whether questions screening for possible OSA symptoms were being asked in the preoperative anesthesia assessment.

METHODS: After institutional review board approval, an observational single blinded study was carried out over 3 months in a tertiary care center associated ambulatory surgery center. The study included pediatric patients (0-17 years of age) undergoing outpatient otolaryngologic and non-otolaryngologic procedures.

Anesthesia provider history and physical exams were observed; providers were not aware of the observation. Previously identified OSA screening phrases and questions were identified and recorded. A validated pediatric OSA screening questionnaire, the OSA18, was also completed by the patient's parent. Statistical analysis included descriptive statistics, Spearman's regression and Fischer's exact test and was dichotomized into ENT versus non-ENT procedures. OSA18 scores were used to determine the likelihood of OSA.

RESULTS: 37% (38/102) of observed patients were screened for OSA. Of the patients screened, 56% were undergoing ENT procedures, and 44% other procedures. 20% (1/5) of patients who scored above 59 on the OSA-18 (which correlates with moderate/severe OSA) were screened for OSA. Patients undergoing ENT procedures were 2.2 times more likely to be screened for OSA than those undergoing non-ENT surgeries (p=0.0616). For those children who were screened, the most common questions referred to snoring (82%), OSA history (24%), history of large tonsils/adenoids (16%) and increased work of breathing during sleep (13%). The prevalence of moderate to severe OSA by screening tool was 5% in this population.

DISCUSSION: Anesthesia providers are not consistently screening for OSA in pediatric patients in our ambulatory surgery center.

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S-384.

CAN CHILDREN UNDERGOING EXAMINATIONS UNDER ANESTHESIA BE SAFELY ANESTHETIZED WITHOUT USING AN IV?

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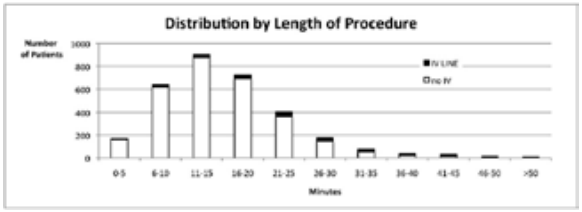
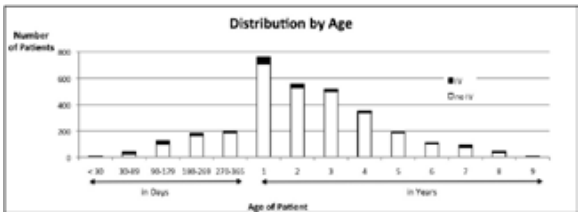
BACKGROUND: Children are rarely anesthetized without placement of an IV. We describe our institution's experience anesthetizing children without using an IV for patients undergoing retina examinations under anesthesia.

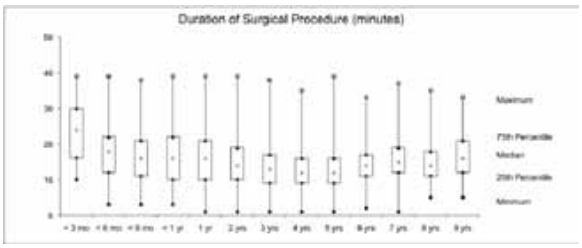
METHODS: Data collected from our operating room information system includes but is not limited to diagnosis, anesthesiologist, surgeon, location of IV catheter (if applicable), patient's date of birth, actual procedure, and anesthesia/procedure times. We reviewed the OR and anesthetic records of children under the age of 10 years old who underwent an examination under anesthesia (EUA) between January 1, 2003 and May 31, 2009. We determined the percentage of children who were anesthetized without planned placement of an IV, as well as the incidence of any adverse events that required placement of an IV, intraoperatively.

RESULTS: We analyzed data from 3,196 procedures during a 77-month period. Patient's age ranged from 1 month to 10 years. Overall, 92% of children were anesthetized without using an IV for procedures lasting between 1-39 minutes. No child had an intraoperative adverse event requiring IV insertion.

CONCLUSIONS: The standard of care for anesthetizing children includes placement of an IV, either prior to or immediately after induction. Our data suggest that for ophthalmologic EUAs it is possible to anesthetize children without IV placement. Good communication between the surgical and anesthesia teams is a key component in ensuring appropriate anesthetic care.







S-385.

A SINGLE INSTITUTION'S EXPERIENCE WITH PEDIATRIC REGIONAL ANESTHESIA AND ITS COMPLICATIONS

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INTRODUCTION: Few epidemiologic studies of pediatric regional anesthesia (RA) practices are available.[1,2] In France, Giaufre found 28.6% of pediatric procedures were performed with RA and the complication rate was 0.9 per 1000 RA.1 The Pediatric Regional Anesthesia Network (PRAN) recently reviewed its database and concluded RA in the United States has a low complication rate.[2] We investigated our institution's usage and complication rate of pediatric RA and compared that to our overall operating room anesthesia practice.

METHODS: We used data on all RA performed at *Hospital* (*Hospital acronym*) collected for PRAN from 10/2008-6/2009, data from our quality assurance surveillance database, and billing information to identify operating room cases. Patient data included age, gender, and ASA status. RA information included block type, medications, technique, and complications: positive test dose, dural or vascular puncture, unsuccessful block, respiratory or cardiovascular or neurologic complications, unintentional unilateral or prolonged block, excessive motor block, drug reaction, catheter problem, hematoma and infection.

RESULTS: There were 4499 OR cases. 205 regional anesthetics were performed in 199 (4.4%) OR cases. 92.7% (n=190) of RA were placed as adjuncts to general anesthesia or for postoperative pain control. Patients 1-3 years-old accounted for 17.9% (n=806) of our *Hospital* OR patient population but were 28.6% (n=57) of our RA recipients (Table 1). All RA patients were ≤ ASA III (Table 1). There were 173 single injection blocks (SIB) and 32 catheter placements. SIB included neuraxial (n=111), lower extremity (n=26) and trunk (n=23). Ultrasound was used in all of the SIB of upper extremity and two-thirds of trunk and lower extremity blocks.

Ten RA-related complications were identified by PRAN definition (4.8 complications per 100 RA). All six intraoperative complications were unsuccessful caudal blocks. The four postoperative complications were catheter-related and involved excessive motor block (n=2), paresthesia (n=1) or a dislodged catheter (n=1). Upon follow-up, all complications resolved without sequelae prior to discharge.

DISCUSSION: We perform fewer RA (4.4 per 100 OR cases) compared to France (28.6 per 100 procedures). The rate of RA in US children's hospitals is unknown, thus a comparison is not possible. All complications occurred with neuraxial blocks, as they did in Giaufre's study. The higher complication rate compared to Giaufre's estimate may be secondary to differing definitions of complications and/or method of identifying complications. Our complications were identified through a combination of self-report and chart review, whereas Giaufre's study relied on self-report. The RA complication rate is slightly higher than *Hospital's* overall OR anesthesia complication rate of 3.7%, which may reflect our preference to perform RA in a younger group of patients.[3]

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Table 1. Characteristics of patients who received anesthesia in *Hospital*

	Received regional anesthesia (n=199)	All OR patients (n=4499)
Sex		
Male	144 (72.4%)	2722 (60.5%)
Female	55 (27.6%)	1777 (39.5%)
Age		
<1 y/o	51 (25.6%)	887 (19.7%)
1-3 y/o	57 (28.6%)	806 (17.9%)
3-10 y/o	38 (19.1%)	1535 (34.1%)
≥10 y/o	53 (26.6%)	1271 (28.3%)
ASA		
1	109 (54.8%)	1472 (33.8%)
2	63 (31.7%)	1633 (36.3%)
3	27 (13.6%)	1130 (25.1%)
4	0 (0.0%)	250 (5.6%)
5	0 (0.0%)	10 (0.2%)
6	0 (0.0%)	2 (0.0%)

S-386.

DECISIONS IN TRACHEAL INTUBATION AND PEDIATRIC ANESTHESIA

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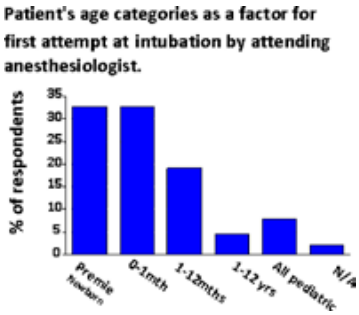
INTRODUCTION: Rapid sequence induction (RSI) is a well-established practice in anesthesia, but is not without possible risks to the patient. In different situations, and in the presence of a trainee, the anesthesia staff may elect to be the first attempting the tracheal intubation. The purpose of this study was to research the attitude of pediatric anesthesiologists, and the factors affecting their practice.

MATERIALS AND METHODS: This descriptive study consisted of a survey of pediatric anesthesiologists who have completed training and are active members of the Society for Pediatric Anesthesia. The survey included basic questions related to the anesthesiologist's experience, practice setting and teaching of tracheal intubation during rapid sequence (RSI) or modified rapid sequence induction (MRSI). Responses were compiled and analyzed to identify the frequency of a first attempt at tracheal intubation by the attending anesthesiologist, and to document if the age of the patient, expected airway difficulties or the level of training are determining factors in the decision making of the attending anesthesiologist.

RESULTS: The mean ± SD years in practice of the 228 respondents was 14.9 ± 8.16 years with pediatric patients representing 77% ± 33% of their practice. 76.8 % completed a fellowship in pediatric anesthesia. 60 % of the respondent's practice setting was at a Children's Hospital. 51% of respondents would have the first attempt at tracheal intubation if there are suspected airway difficulties. 41% of respondents considered the age of the patient as a factor for first attempt at tracheal intubation by the attending anesthesiologist. 32.6 % will favor a first attempt at intubation when anesthetizing neonates. 84.3% of the respondents would have first attempt at intubation during RSI or MRSI in the presence of a resident on his first pediatric anesthesia rotation.



DISCUSSION: Tracheal intubation may be associated with serious complications. Supervision by an attending anesthesiologist has been shown to decrease the complications rate (1). While formal courses can significantly enhance self-assessment concerning ability to perform rapid sequence intubation (2), workplace-based training of tracheal intubation may enhance better outcomes (3).

CONCLUSION: Hands-on training of tracheal intubation in more "critical" situations varies between attending anesthesiologists. Suspicion of airway difficulty, the level of training and the age of the patients may play a determinant role in the decision making of the attending anesthesiologist in performing the first attempt at intubation and securing the airways of a pediatric patient.

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S-387.

PHARMACOGENETICS OF MORPHINE AND PERSONALIZING PERIOPERATIVE ANALGESIA IN CHILDREN

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INTRODUCTION: Inadequate pain relief and serious side effects from perioperative opioids occur frequently in about 50% of children. In the United States alone, each year approximately 5 million children undergo painful surgery, many of them experience inadequate pain relief and serious side-effects with opioids. Morphine, the most commonly used "gold standard" perioperative opioid, has a narrow therapeutic index, large inter-patient variation in analgesic response and serious side-effects such as respiratory depression significantly increasing economical burden. For morphine, there is a fine balance in dosing regimen between optimal pain control and safety in terms of decreasing morphine's side effects. Frequent genetic variations in response to morphine are clinically significant with inadequate pain relief at one end of the spectrum of responses and serious side effects such as respiratory depression at the other. Much of the inter-individual variability in response to morphine can be explained by single nucleotide polymorphisms (SNPs) in genes involved in pain perception (COMT), opioid transport (ABCB1) and opioid receptor signaling (OPRM1). The overall aim is to evaluate the role of genetic factors on postoperative pain relief and adverse effects with morphine. The specific aims are 1. To identify genetic profiles that will predict children's pain sensitivity and pain relief from morphine, and 2. To identify children who are genetically predisposed to risk of serious side-effects from morphine.

METHODS: After obtaining IRB approval and informed consent/assent, 108 children, 6-15 years of age, ASA physical status 1 and 2 undergoing adeno-tonsillectomy were recruited; their genetic profiles and perioperative outcomes were analyzed.

RESULTS: COMT genes had strong associations with perioperative morphine requirement and rescue analgesic interventions. COMT rs6269 (AG and GG genotypes) and rs4818 (CC genotype) and rs4633 (TT genotype) are 3 times more likely to require analgesic interventions compared to other genotypes. ABCB1 gene had strong associations with opioid induced respiratory depression and PONV. The odds of respiratory depression and PONV in TT genotype of ABCB1 SNP, rs1045642 are >2 compared to TC and CC genotypes.

CONCLUSION: Genetic factors play a significant role in inter-individual variations in responses to morphine when treating perioperative pain in children. Genetic information can help clinicians to identify children at higher risk of having serious side-effects and inadequate pain control from morphine. These strong and clinical significant genotype-outcome associations are expected to become foundation for personalized pain management and enable clinicians to individualize the use of morphine to maximize pain relief while minimizing the likelihood of adverse effects in children.

S-388.

AN ANALYSIS OF PERIOPERATIVE REINTUBATION IN CHILDREN

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INTRODUCTION: Reintubation in the perioperative period is considered a serious adverse event. The incidence, causes, and morbidity of perioperative reintubation have not been examined systematically. The objective of this study was to determine the incidence of reintubation, and analyze the causes and associated morbidity and mortality of reintubation at our institution.

METHODS: Following IRB approval, we reviewed 21,465 quality assurance records from 28,208 anesthesia cases from May 2006 to May 2009. Reintubation was defined as the need for reintubation intraoperatively or within 2 hours of extubation. We identified 25 cases of reintubation. The medical records of these patients were reviewed by two pediatric anesthesiologists. All data are reported as means ±SD, analyzed using Fisher exact, unpaired t test as indicated, and $P < 0.05$ was deemed significant.

RESULTS: The incidence of reintubation was 0.09%. 20/25 received anesthesia in the OR and 5/25 in non-OR locations. Patients ranged in age from 2 days to 16 years (age =4.0 ± 5.05 years). 11/25 were 12 months or younger and 16/25 were <3 years. Thirteen were male and 12 were female. 5/25 were ASA 1 and 2, 16/25 ASA 3, and 4/25 ASA 4. 16/25 had pre-existing cardiac disease and 11/25 had pre-existing pulmonary disease.

Reintubations followed planned extubations in 16/25 (64%). Causes of failed extubations included obstruction, laryngospasm, respiratory failure and pulmonary edema. Reintubation due to unplanned displacement of endotracheal tubes occurred in 9/25 (36%). Causes for displacement were procedure-related (4/25) (TEE, upper endoscopy, and bronchoscopy) and positioning-related (5/25). Reintubations occurred in the anesthetizing area (20/25), the PACU (4/25), and PICU (1/25). No mortality was reported in reintubated patients. Adverse events reported during reintubation included oxygen desaturation (12/25). Of these, 6/12 had hemodynamic changes including bradycardia, tachycardia, hypotension or hypertension. 3/6 required treatment with atropine and epinephrine, and 2/6 received chest compressions. 16/25 were admitted to the PICU. 14/25 remained intubated 24 hours or less, and 1/25 remained intubated >3 days.

DISCUSSION: The incidence of perioperative reintubation has been reported in several studies(1,2,3), ranging from 0.47% to 0.18%. Our incidence of reintubation, 0.09%, is low. Reintubation occurred more commonly in younger patients with higher ASA status. Physiological and mechanical causes were the most common causes of reintubation. Adverse respiratory events were the most prevalent physiological cause for reintubation. Mechanical causes were related to patient positioning or sharing the airway with the surgeon/proceduralist, and could be preventable. Thus, incidence of reintubation could be reduced through securing the airway during positioning and procedures such as TEE. Further analysis is needed to determine the optimal approach to reduce adverse respiratory events leading to extubation failures.

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S-389.

A MURINE MODEL ADDRESSING CHILDHOOD OBESITY: THE DIMINISHING REQUIREMENT OF HYPOTHALAMIC LEPTIN SIGNALING IN REGULATING ENERGY HOMESOSTASIS

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INTRODUCTION: As the prevalence of adult obesity in the United States has drastically risen, so too has the prevalence of childhood obesity. Now estimated to affect >30% of children, childhood obesity has been associated with increasing occurrence of diseases previously rare in childhood including type 2 diabetes, hypertension and atherosclerosis; children as young as 16 are undergoing bariatric surgery at some centers. Research efforts in the past have identified many molecules, including leptin and its receptor, and brain nuclei, including locations within the hypothalamus, midbrain and brainstem, which regulate food intake and body weight, however, the vast majority of these studies have been performed in mature animals. A murine model with loss of leptin receptor function limited to the hypothalamus was employed to assess the role of hypothalamic leptin signaling from weaning to adulthood.

METHODS: Mice expressing Cre recombinase under the control of the Nkx2.1 promoter, which is active in a near pan-hypothalamic pattern, were crossed to mice homozygous for a floxed mutant allele of the leptin receptor. The resultant double transgenic offspring, LeprNkx2.1KO, express a non-functional leptin receptor in cells that have ever expressed the Nkx2.1 gene. Mice were followed with respect to several metabolic phenotypes from the time of weaning to well into adulthood.

RESULTS: From weaning, LeprNkx2.1KO mice exhibit phenotypes nearly identical to those resulting from global loss of leptin signaling including increased weight gain and adiposity, hyperphagia, decreased metabolic rate, cold intolerance and insulin resistance. Unlike global loss of function models in which these phenotypes are exacerbated with age, in LeprNkx2.1KO mice most of these conditions attenuate or abate; fat deposition becomes proportionate to weight gain, normalized food intake and metabolic rate approach levels seen in controls, and normal cold tolerance is developed.

DISCUSSION: These findings lead us to hypothesize that leptin signaling in the hypothalamus is critical in establishing early patterns of energy intake and expenditure. The findings further imply that with maturity, separate neural networks are able to stabilize many of the early metabolic deficits. Despite this stabilization, however, persistent effects on phenotypes related to body size and composition are observed. This study suggests that cellular and molecular mechanisms of obesity may be different in young and old animals and, as such, may represent promising targets for novel strategies in the prevention and treatment of childhood obesity.

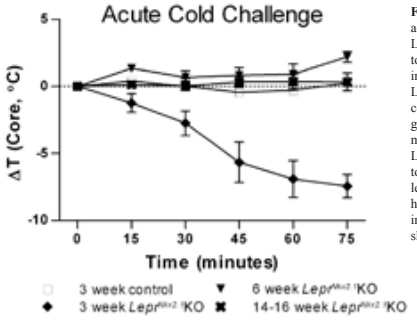

Figure. Dysregulation of acute thermogenesis in young LeprNkx2.1KO mice. Response to acute cold challenge in 3-, 6- and 14-16- week LeprNkx2.1KO and 3-week control mice. N=3-6 for each group. Results are given as mean ± SEM. Only 3-week LeprNkx2.1KO mice are found to be cold intolerant. Global leptin receptor knockout mice have been found to be cold intolerant at all ages (not shown).

S-390.

VALIDATION OF THE BAXTER ANIMATED RETCHING FACES (BARF) SCALE FOR MEASURING NAUSEA IN CHILDREN

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BACKGROUND: Nausea management in children has been limited by the absence of a valid pictorial rating scale analogous to faces scales used for pain such as the Faces Pain Scale - Revised (FPS-R) (1). The Baxter Animated Retching Faces (BARF) scale, a six-item faces scale with a neutral face as the zero "no nausea" anchor and a retching face as the 100% or "most nausea" anchor, has been developed (figure 1). (2) The aim of this study was to validate this scale as a reliable method to quantify the intensity of nausea in children.

METHODS: With IRB approval and written parental consent, 169 children aged 7-18 yr were recruited from 2 centers- 97 with gastro-intestinal symptoms in the emergency department (ED) and 72 healthy ASA 1-2 children undergoing day surgery. All patients rated their pain and nausea before and after receiving anti-emetic or analgesic therapy, using a 10 cm visual analog scale (VAS) and a pictorial scale (FPS-R and BARF), presented in a random order.

RESULTS: There was a strong correlation between the nausea scores on the visual analog (VAS-Nausea) and the BARF scales (Spearman correlation 0.83), and between pain scores on the VAS (VAS-Pain) and FPS-R scales (Spearman correlation 0.78). There was a weaker correlation between the VAS -Pain and VAS-Nausea scales (Spearman correlation 0.27) and between the faces pain (FPS-R) and BARF scales (Spearman correlation 0.49). The pretreatment VAS -Nausea and BARF scores were higher in children receiving antiemetics compared to others (VAS-Nausea 5.08 ± 3.13 vs. 1.48 ± 2.46, BARF 2.65 ± 1.44 vs.0.85 ± 1.27, $p < 0.0001$ for patients receiving antiemetic Rx vs. no Rx respectively). These nausea scores significantly decreased after antiemetic therapy. (VAS-Nausea 5.08 ± 3.13 vs. 2.34 ± 2.29, $p = 0.0002$, BARF 2.65 ± 1.44 vs. 1.27 ± 1.07, $p < 0.0001$, for pre-treatment vs. post-treatment respectively). However, VAS-Pain and FPS-R pain scores were not significantly changed after antiemetic medications.

DISCUSSION: The results support the validity of the BARF scale as an instrument for measuring nausea in 7-18 year old children under the study conditions. The BARF has convergent validity with the VAS for nausea, the current standard for measuring subjective symptoms in adults. The weaker correlation between BARF and FPS -R compared to those between BARF and VAS-nausea may reflect discriminant validity. BARF has content validity as shown by higher scores in patients requiring antiemetics. A reduction in BARF but not pain scores following antiemetic therapy suggests this instrument has discriminant validity also. Future studies will determine the clinical benefits of measuring nausea on the BARF scale and treating those with high scores before the onset of postoperative vomiting in children.

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S-391.

DOES THE AGE OF THE NEWBORN AND THE BICARBONATE LEVEL HAVE ANY IMPACT ON POST-OP LENGHT OF STAY AFTER PYLOROMYOTOMY? -A RETROSPECTIVE REVIEW OF 253 NEWBORNS AND YOUNG INFANTS AT A TERTIARY HOSPITAL

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INTRODUCTION: Traditional recommendation regarding the best time to operate on a child with Congenital Hypertrophic Pyloric Stenosis (CHPS) is after complete correction of hypochloremic, hypokalemic metabolic alkalosis in order to reduce perioperative apnea. We sought to determine the impact of age and preoperative laboratory values on delay in extubation and postoperative length of stay.

METHODS: This was a 4-year retrospective review of newborns and young infants with CHPS. Demographics, symptoms, vital signs, diagnostic laboratory values, resuscitation, operative and anesthetic complications and outcome data were collected. The primary outcome of time to extubation; classified as extubation greater than 10, 15 and 20 minutes. Pearson Correlation Coefficients, chi-square and logistic regression analysis were used. Data are Mean±SD.

RESULTS: 260 patients underwent pyloromyotomy between 2004 and 2008 for CHPS.253 patients (84% male, 7% preterm, mean age 39.2 ±16 days) were included for analysis. Admission CO2 were (26.0±5.4, range 14-48) and chloride (98.7±7.5 range) 73-116) required resuscitation for 20.8±13.8 hours and resulted in correction of alkalosis (CO2 23.6±3.5 range 15-41 and Cl 103.1±4.2 range 90-116, $p>0.05$).

Anesthetic complications were rare, apnea = 1(0.4%) and laryngospasm =1 (0.4%). Average time to extubation was 17.4±12.4 mins and greater than 10 mins in 65.3%(n=158) 15 mins in 42.9% (n=104) 20 mins in 23.9% (n=58) and 30 mins in 11.6%(n=28), Logistic regression analysis did not reveal any relationship between preoperative laboratory values (Cl-, CO2, Ca++ and K+) and delay in extubation. Length of stay (LOS) was 3.1±1.0 days and post surgical LOS (PLOS) was 1.3±0.7 days. Higher CO2 and lower ages were associated with greater LOS and PLOS ($p<0.02$, Pearson coefficient +0.2 and -0). Delay in extubation after surgery seems to have a close association with post-conceptual age (PCA) less than 45 weeks and with the use of a second dose of muscle relaxant and propofol as well as the use of more than 1.5 micrograms per kg of fentanyl. All patients had infiltration of the wound with 0.25% bupivacaine (1ml/kg body weight) by the surgeon prior to skin closure.

CONCLUSION: In this review delay in extubation was not associated with any specific preoperative laboratory parameter but appear to have an association with younger age- PCA less than 45 weeks and the use of a second dose of muscle relaxant and/or propofol and more than 1.5 micrograms per kg of fentanyl. Analgesic requirement after pyloromyotomy has been reported to be minimal in a study of newborns (1). However, higher CO2 levels preoperatively were associated with extended post-operative length of stay. Incomplete preoperative correction of metabolic alkalosis and younger age predict an extended post-operative length of stay.

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WITHDRAWN.

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S-393.

WHICH IS PREFERABLE FOR LMA REMOVAL IN CHILDREN; APPROPRIATE ANESTHETIC STATE OR FULLY AWAKE STATE?

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INTRODUCTION: LMA removal can be performed while children are awake or anesthetized; it has remained a matter of concern which state is more preferable to minimize any untoward complications. In LMA removal in anesthetic state, the depth of anesthesia should be well controlled for suppressing airway reflex and not delaying recovery after removal. However, the anesthetic depth used in previous studies was neither precisely defined nor uniform among each other. So the recommendations of previous studies are confusing. Effective concentration of sevoflurane for LMA removal has been studied (1), and this can be considered as 'adequate anesthetic depth for LMA removal'. For evaluation of better condition for LMA removal in children, we therefore attempted to compare the incidence of respiratory adverse events during and after LMA removal, either under adequately anesthetic state or awakening state.

METHODS: 55 children between 2 yr and 6 yr of age, ASA 1, undergoing elective inguinal hernia repair were enrolled. Anesthesia was induced and maintained with sevoflurane, and caudal block with 1.5% ropivacaine 1 ml/kg was performed for postoperative analgesia. Spontaneous respiration was maintained throughout operation. At the end of surgery, LMA was removed according to the group-specific guideline; In ANESTH group, LMA was removed in anesthetic state; the end-tidal sevoflurane concentration was maintained at 1.8%, which is estimated EC95 of sevoflurane for LMA removal without adverse airway complication in children. Sevoflurane was discontinued just after LMA removal. In AWAKE group, sevoflurane maintained at 1.8% was discontinued at the end of surgery and LMA was removed when the patients were satisfied the criteria of recovery; facial grimace, spontaneous eye opening, and purposeful arm movement. During and within 5 min of LMA removal, respiratory complications such as upper airway obstruction, hypersalivation, teeth clenching, coughing, breath holding, and laryngospasm were recorded and compared. Emergence durations defined as the time length from sevoflurane discontinuation to return of consciousness were also compared.

RESULTS: The incidence of hypersalivation, teeth clenching, cough, laryngospasm were significantly less in ANESTH group. There was no difference emergence duration between two groups.

Discussion: Adequate anesthetic state was more preferable for LMA removal without adverse respiratory event in children, and did not prolong the emergence duration. Young children do not respond to verval commands as adult, so it is difficult to judge whether the child is awake or lightly anesthetized; therefore anesthetic state can be more beneficial for safe LMA removal in children, as apposed to adult. Anesthetic state for LMA removal should be well controlled because light anesthesia cannot suppress airway reflex effectively and too deep anesthesia may delay emergence and return of airway protective reflex, and cause upper airway obstruction.

Table 1

	AWAKE group (n = 28)	ANESTH group (n = 27)	P value
Airway obstruction	4	6	0.446
Hypersalivation*	22	2	< 0.001
LMA Biting*	6	1	0.049
Coughing*	19	0	< 0.001
Breath holding	1	1	0.979
Laryngospasm*	7	1	0.025
Vomiting	3	1	0.317
Emergence duration	5.6 ± 2.0 min	5.4 ± 1.9 min	0.827

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S-394.

THE USE OF THE SINGLE-SHOT THORACIC EPIDURAL IN THE PEDIATRIC PATIENT UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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INTRODUCTION: Nationally there has been an increase in adolescent cholecystectomies, primarily done laproscopically. Average time to discharge following a laparoscopic cholecystectomy performed under general endotracheal anesthesia (GETA) is 1 to 2 days postoperatively. Adult laparoscopic procedures including cholecystecomies have been done successfully as outpatient procedures. We hypothesized that adequate pain control would allow this procedure to be done as an outpatient basis for the pediatric population as well.

METHODS: This was a retrospective case control study, evaluating 16 pediatric patients undergoing a laparoscopic cholecystectomy by a single surgeon with variable anesthesia techniques over a 16 month period (April 2008-July 2009). The inclusion criteria were ASA I-II pediatric patients. All 16 patients were offered a single-shot thoracic epidural (SSTE): 8 patients refused, 8 accepted. In our sample, the control group consisted of 8 females and 0 males, mean age 14.8 years; in the treatment group, there were 8 females and 0 males as well, mean age 14.3 years. All 16 patients received GETA, 8 had narcotic used under GETA and PCA for post operative pain control, 8 were administered a SSTE consisting of 0.25% bupivicaine with 1 microgram/kg clonidine prior to incision. The outcome variable assessed was time to discharge.

RESULTS: This study evaluated all ASA I-II who had a laparoscopic cholecystectomy performed by a single pediatric surgeon. Six patients were excluded from the study secondary to their ASA classification (due to either sickle-cell disease, MRCP, pregnancy, cystic fibrosis, morbid obesity). No patients returned to the hospital after discharge.

SSTE	Home POD0	Home POD1	Home POD 2
8	5	2	1
%	62.5	25	12.5
No SSTE			
8	1	5	2
%	12.5	62.5	25

DISCUSSION: Adolescent cholecystectomy incidence is increasing across the country; some studies report a three-fold rise1. We utilized a SSTE to facilitate this as an outpatient procedure for ASA I and II patients. We believe neuroaxial techniques can improve post operative pain control allowing for same day discharge.

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S-395.

INHOSPITAL MORTALITY OF CHILDREN WITH DOWN SYNDROME

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INTRODUCTION: Down Syndrome (DS) is the most common autosomal chromosomal disorder in humans, occurring in approximately 1 in 800 births. Advances in diagnosis and treatment have improved survival rates in children with DS.[1] However, recent data regarding mortality of the DS pediatric population is limited.[2] The objective of this study was to assess the inhospital mortality in children with DS in the United States.

METHODS: Data for this study came from the Kids' Inpatient Database (KID) from 2000, 2003 and 2006. KID is an inpatient care database of children under 20 years of age in the United States.[3] The DS cohort was identified by ICD-9 diagnosis code 758.0. Excess inhospital mortality in children with DS was estimated using the standardized mortality ratio (SMR) method. All analysis was performed using the Statistical Analysis System 9.2.

RESULTS: Using unweighted data, the KID data system for 2000, 2003 and 2006 contained a total of 8,629,376 hospital discharges, of which 37,896 had DS. The inhospital mortality was 1.44% for children with DS and 0.58% for children in the general population ($p<0.05$). Univariate analysis of DS mortality rates showed significant difference between age groups with the highest mortality in patients less than 1 month old and the lowest mortality in the 1 to 4 year olds and 5 to 10 year olds. There was no mortality difference between racial groups or sexes. Given hospitalization, children with DS were more than twice as likely to die as the general pediatric inpatient population (SMR 2.47, 95% confidence interval 2.27-2.69). The excess inhospital mortality in children with DS existed across age and racial groups, and in both sexes.

	DS Mortality Rate	95% Confidence Interval
Less Than 1 Month	0.0236	0.0204-0.0267
1-12 Months	0.0134	0.0107-0.0160
1-4 Years	0.0067	0.0050-0.0084
5-9 Years	0.0071	0.0043-0.0098
10-20 Years	0.0148	0.0114-0.0182

DISCUSSION: This study provides a current pediatric population-based analysis of inhospital mortality in DS patients. Despite the reported improvement in survival, children with DS continue to be at a significantly higher risk of dying than the general pediatric population. Further research is warranted to understand the major causes contributing to the excess mortality in children with DS.

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S-396.

ANESTHESIA CARE AND PERIOPERATIVE OUTCOMES IN INFANTS AND YOUNG CHILDREN UNDERGOING STRABISMUS SURGERY

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INTRODUCTION: Anesthesia care for young children needing ophthalmic surgery can be challenging[1]. In this report we analyzed the anesthesia perioperative outcomes in children ≤ 0-2 years undergoing strabismus surgery.

METHODS: Following Institution Review Board approval a cohort perioperative review was conducted of all children ≤ 2 years of age that underwent strabismus surgery during the most recent 5-year period at a single tertiary care pediatric hospital.

RESULTS: The results are summarized in the Figure. They all presented to the hospital on the day of surgery.

CONCLUSIONS: We did not find nausea and vomiting to be problematic in this age group. Life-threatening respiratory problems, prematurity and co-existing disease prevented same-day discharge in 7% of our population. The incidence of emergence agitation was quite high and warrants further investigation.

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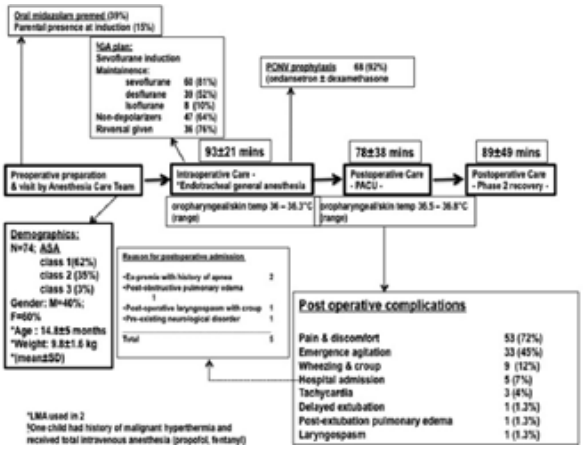

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S-397.

THE VARIATION OF CARDIAC OUTPUT DURING PEDIATRIC RENAL TRANSPLANTATION

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INTRODUCTION: Aggressive fluid management is essential during pediatric renal transplantation to provide enough filling pressure for the graft and to diminish the incidence of acute tubular necrosis. Hemodynamic monitoring during the operation is very important, especially when the reperfusion to a large adult kidney graft may decrease systemic vascular resistance and require to fill up for new vascular bed.

The pulse-induced continuous cardiac output (PiCCO) system is a relatively less invasive method that can measure continuous cardiac output, stroke volume variation, global end-diastolic volume (GEDV), and extravascular lung water index. The purpose of this report was therefore to evaluate the variation of cardiac output and other hemodynamic parameters using brachial arterial thermodilution system during pediatric renal transplantation.

METHODS: After approval from the institutional ethic committee, we studied 3 chronic renal failure patients (1 male, 2 females; age 3-9, mean 6 yr). Anesthesia was induced with propofol and vecuronium, and maintained with sevoflurane. Thoracic epidural catheter was inserted after induction of anesthesia, and local anesthetics was administered. A central venous catheter was inserted through the right internal jugular vein, and a clinically indicated 3F arterial catheter (PV2013L07, Pulsion Medical Systems, Germany) was inserted through brachial artery at cubital fossa. They were connected to a monitor (PiCCOplus, Pulsion Medical Systems, Germany) and hemodynamic measurements were performed by central venous injection of saline (5 mL, <8 degrees C) during renal transplantation: (1. After induction of anesthesia as baseline. 2. Clamping the vessels to the graft when intravascular volume was loaded. 3. After reperfusion to the graft and blood volume was fill up for new vascular bed of the graft.) Arterial blood pressure and central venous pressure were recorded, and transesophageal echocardiogram test was performed during the operation.

Prior to reperfusion to the graft, infusion volume was loaded to a CVP<15mmHg. If systemic arterial pressure remained under 120mmHg, continuous infusion of dopamine was started at a dose of 3μg/kg/min. After reperfusion new blood bed of the graft was filled up with rapid volume loading to maintain systemic blood pressure greater than 120mmHg.

RESULT: Cardiac index at baseline was 3.58 l/min/m2, that at clamping the vessel was increased to 4.95, and that after reperfusion was 5.37. GEDV at each point were 278, 333, and 382ml. There was no abnormal finding with the TEE examination.

DISCUSSION: Cardiac index and GEDV was increased with volume loading. Monitoring of these parameter was useful and desirable for pediatric renal transplantation.

S-398.

DIFFICULT AIRWAY MANAGEMENT IN PEDIATRIC CASES

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INTRODUCTION: Intubation is difficult in most children with head and neck/facial anomalies related to congenital disorders. However, few clinical studies have examined this issue. Difficulty in intubation in children is associated with the presence of congenital anomalies, absence of strategies to manage such difficulty, and a limited number of devices for intubation. In this study, we surveyed patients in whom intubation was difficult in our center, and investigated congenital disorders, devices for intratracheal intubation, the time required for intratracheal intubation, and complications.

METHODS: The subjects were infants/children aged 0 to 15 years who required intratracheal intubation for general anesthesia in the operating room of our center between November 1, 2007 and October 30, 2008. We defined patients in whom the tracheal orifice was invisible on laryngeal development, or in whom intubation was unsuccessful despite the routine intubation method attempted 3 times or more, as having difficulty in intubation. For intubation, no strategies were established. Intubation methods were selected based on each anesthesiologist's evaluation (stylet, GEB, bronchial fiberscope intubation below the LMA, bronchial fiberscope intubation, and intratracheal McCoy's laryngoscope intubation), and intratracheal intubation was performed. In addition, we investigated the time required for intratracheal intubation and complications.

RESULTS: The subjects were 1,114 patients. Intubation was difficult in 18 patients (16 infants, 1.6%). Finally, intratracheal intubation was possible. In the 18 patients, we reviewed the mean time required for intubation with respect to disorders. It was 13 minutes in 3 patients with Crouzon disease, 13 minutes in 1 patient with Treacher Collins syndrome, 10 minutes in 1 patient with first/second branchial syndrome, 13 minutes in 1 patient with Goldenhor syndrome, 15 minutes in 1 patient with CHARGE syndrome, 14.5 minutes in 2 patients with congenital cleft palate, 13 minutes in 2 patients with Larsen's syndrome, 15 minutes in 1/18 patients with CATCH syndrome, 40 minutes in 1 patient with Triello-Carey syndrome, and 16 minutes in 5 patients with others. In the 18 patients, intubation with a stylet achieved the highest success rate (44%), followed by bronchial fiberscope intubation below the LMA (22%). In most patients aged over 10 years, GEB was employed. As an intratracheal intubation-related complication, laceration of the lips was frequent.

DISCUSSION: The frequency of difficulty in intratracheal intubation in children is similar to that in adults. Such difficulty was frequent in patients with cephalic/cervical/facial anomalies. Usually, anesthesiologists less frequently experience difficulty in intubation in children in comparison with adults. In addition, the number of devices is limited. Therefore, it may be important to prepare a manual for management. Lastly, we reported the usefulness of GEB for children, which we experimentally prepared.

S-399.

EXCESS COMORBIDITIES ASSOCIATED WITH MALIGNANT HYPERTHERMIA IN CHILDREN

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INTRODUCTION: Mutations in the ryanodine receptor (RYR1) gene are recognized as the dominant genetic markers of malignant hyperthermia (MH), accounting for perhaps 70% of anesthetic-triggered MH cases. Several other medical conditions related to RYR1 gene mutations, such as central core disease, have been linked to MH susceptibility through experimental studies and case reports. Epidemiologic research on the associations of MH with other diseases, however, is lacking. This study aims to identify major comorbidities that are excessively represented in children with MH.

METHODS: Data for this study came from the Kids' Inpatient Database (KID). Part of the Healthcare Cost and Utilization Project and sponsored by the Agency for Healthcare Research and Quality, KID includes an 80% random sample of non-newborn pediatric discharges from US short-term, non-federal hospitals with up to 19 diagnoses recorded for each discharge. We screened the 5.9 million hospital discharge records captured in the 2000, 2003 and 2006 KID datasets to identify MH cases using the International Classification of Diseases, Ninth Edition code 995.86 (malignant hyperthermia due to anesthesia). We calculated the standardized prevalence ratios (SPRs) and 95% confidence intervals (CIs) for major disease groups and specific diagnoses. For a given morbidity, the SPR is the ratio of the observed MH cases with the diagnosis of this medical condition, divided by the expected number of MH cases with this medical condition based on the prevalence of this medical condition among all patients in the KID datasets.

RESULTS: The KID data system recorded a total of 175 MH cases, representing a prevalence of 3.0 per 100,000 hospitalizations and 3.9 per 100,000 in-hospital surgical patients. Of the 175 MH cases, 50 (28.6%) had at least one diagnosis with diseases of the musculoskeletal system and connective tissue, with an estimated SPR of 7.84 (95% CI 5.82- 10.33). Diseases of the circulatory system, congenital anomalies, and disease of the nervous system were also significantly more prevalent than expected in MH cases. The medical condition that was most strongly associated MH was muscle ligament disease (SPR 128.44, 95% CI 68.39-219.65), followed by muscular dystrophies (SPR 31.35, 95% CI 12.6-64.59), scoliosis (SPR 12.56, 95% CI 6.02-23.10) and hypokalemia (SPR 5.18, 95% CI 2.67-9.04).

DISCUSSION: Diseases of the musculoskeletal system and connective tissue, particularly muscle ligament disease and scoliosis, are significantly associated with MH susceptibility in children. Excess comorbidities identified in this study might be used as clinical markers in combination with genetic markers to improve the assessment of MH risk.

S-400.

THE USE OF TISSUE OXIMETRY TO DETECT THE EFFECT OF CAUDAL ANESTHESIA ON SPINAL CORD OXYGENATION

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INTRODUCTION: Local anesthetics disrupt oxidative phosphorylation in mitochondria and reduce oxygen consumption while sympathetic blockade results in increased regional blood flow and oxygen delivery (1-3). Increased oxygen supply in the setting of decreased oxygen consumption results in increased regional saturation (rSO2). Thus, local anesthetics could be developed as a novel method to provide protection to tissues and organs at risk of ischemic or hypoxic injury. It is unknown if epidural bupivacaine reduces spinal cord oxygen consumption or increases regional oxygen delivery in infants and children. We hypothesized that epidural bupivacaine will increase lumbar spinal cord rSO2. We aimed to demonstrate that spinal cord rSO2 increases following single shot caudal injection of bupivacaine using regional near-infrared spectroscopy (NIRS).

METHODS: We evaluated 5 children aged 21 months to 5 years undergoing general anesthesia for infraumbilical surgery with caudal bupivacaine as part of their routine care. General endotracheal anesthesia was maintained with either sevoflurane or desflurane and 0.50 FiO2 (air and oxygen). NIRS sensors were placed over the thoracolumbar vertebrae (T10-L2) to measure spinal cord oximetry and across the forehead to measure cerebral oximetry as a control. The sensors were connected to the INVOS system (Somanetics Corp, Troy, MI) and baseline rSO2 was obtained and recorded. Spinal and cerebral oxygenation were recorded every 5 minutes following injection of caudal bupivacaine (0.25% without epi, 1 mL/kg up to 20 mL) for 25 minutes. Each patient served as their own control and mean rSO2 values at each time point were assessed with ANOVA. Significance was set at $P<.05$.

RESULTS: Spinal rSO2 increased significantly at 5, 10, and 15 minutes post caudal bupivacaine injection compared to baseline ($P<0.03$). Spinal rSO2 returned toward baseline values 20 and 25 minutes post injection (See Figure 1). Cerebral rSO2 remained unchanged at all time points examined.

DISCUSSION: Caudal bupivacaine significantly increased thoracolumbar spinal cord regional oxygenation between 5 and 15 minutes after injection. Because cerebral oxygenation remained unchanged, these changes in spinal rSO2 did not reflect global changes in cardiac output. It is likely that the increase in spinal rSO2 was due to bupivacaine-induced reduction of spinal cord and related tissue oxygen consumption, increased local blood flow, or both. Future studies will further elucidate the exact mechanisms. Importantly, these observations may provide the basis to develop epidural bupivacaine as a method to induce spinal cord protection during certain high risk procedures. In addition, NIRS technology may be developed as a tool to assess successful placement of a regional nerve block.

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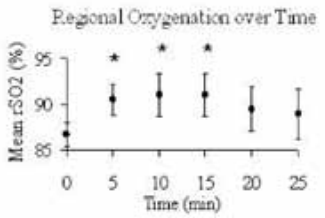

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S-401.

ABSOLUTE AND TREND ACCURACY OF CONTINUOUS AND NONINVASIVE HEMOGLOBIN IN PEDIATRIC SURGERY PATIENTS

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INTRODUCTION: Total hemoglobin concentration (tHb) is frequently ordered during surgery to detect blood loss and assess the effects of transfusion or fluid administration, but is only intermittent and requires invasive blood sampling and time-consuming lab analysis. A new device (Rainbow SET® Pulse CO-OximeterTM, Masimo Corporation, Irvine, CA, USA) provides continuous and noninvasive hemoglobin concentration (SpHb), which may provide earlier indication of bleeding and aid transfusion management decisions. The purpose of this study was to compare SpHb and a point-of-care (POC) tHb test device to standard laboratory measurements.

METHODS: After IRB approval and patient consent, SpHb monitoring (software version 7.4.09 (first 5 cases) & 7.5.03 (next 10 cases) and sensor version C was applied to pediatric patients undergoing surgery. During the case, intermittent measurements of tHb were taken with both a POC device, i-STATTM (Abbott Laboratories, Abbott Park, IL) and a laboratory Cell-Dyn Sapphire Differential Cell Counter (Abbott Diagnostics, Santa Clara, CA), each maintained and calibrated according to the manufacturer's recommendations. At same time, data were collected from two SpHb sensors (Revision C: R1 20-L or R1 25-L) located on left & right ring finger, or on the toe if patient was too small. Absolute accuracy was determined by calculating bias, precision, and accuracy root mean square (ARMS) of the difference between SpHb and point-of-care tHb to Cell-Dyn Sapphire Differential Cell Counter tHb values. Trend accuracy was determined by retrospective panel review of each case for directional changes in tHb concentration and whether SpHb provided a similar directional indication.

RESULTS: A total of 17 patients from a variety of surgery cases (craniotomy, cardiac surgery, spinal fusion, liver transplant) were enrolled. Two patients were removed from analysis, one because blood gas samples were not acquired and one because SpHb was not applied per protocol. Thus, 4 males and 11 females were analyzed, with a mean age of 9.3+/- 5.9 years (Range 0.1 to 17 years).

An average of 2.7 +/- 0.9 arterial blood samples per patient were taken during the surgical procedure. 49 CO-Oximeter tHb measurements, 46 POC tHb, and 92 SpHb measurements were compared. Mean bias, standard deviation and ARMS are shown in Table 1.

Retrospective review indicated that all significant directional changes in tHb from the CO-Oximeter were indicated by changes in SpHb. In addition, SpHb provided earlier indications of directional changes than intermittent tHb values from the CO-Oximeter.

DISCUSSION: SpHb offers clinically acceptable absolute accuracy and very good trend accuracy compared to a laboratory CO-Oximeter. The impact of continuous SpHb on clinical decision making should be further investigated.

Table 1. Pediatric Surgery Hemoglobin Comparisons

	SpHb - Lab Hb N=92	POC - Lab Hb N=45
Bias (g/dL)	0.18	-0.26
Standard Deviation (g/dL)	1.10	0.46
ARMS (g/dL)	1.12	0.53

S-402.

EPIDURAL SUFENTANIL WITH ROPIVACAINE FOR POSTOPERATIVE PAIN RELIEF IN INFANTS: POSTINFUSION PHARMACOKINETICS. A PILOT STUDY

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INTRODUCTION: Epidural opioids are combined with diluted local anesthetics to improve analgesic effects and reduce side effects. Sufetanil has been reported to be effective in pediatric epidural analgesia [1], and plasma concentrations during continuous epidural postoperative infusion have been reported in children 5-12 y.o. [2], but no data are available with respect to infants. The purpose of this pilot study was to assess plasma sufentanil concentrations in infants receiving 0.2% ropivacaine with sufentanil for postoperative analgesia following major abdominal and urological procedures.

METHODS: With consent of local Ethics Committee and with informed parental consent, 10 infants (3-35 months old, 6.3 - 14.6 kg, ASA SP groups I and II) were involved in the study. Epidural catheter was placed after induction of general anesthesia in L3-L4, L4-L5 or L2-L3 interspace and threaded not farther than 4 cm into the epidural space. After initial bolus of 0.2% ropivacaine, 0.5 ml kg-1 and sufentanil 200 ng kg-1, continuous infusion of 0.2% ropivacaine, 0.3 mg kg-1 h-1 with sufentanil 112 ng kg-1 h-1 was given. For the postoperative period sufentanil dose was reduced to 37 ng kg-1 h-1. Epidural infusion was maintained for 48 h. Blood samples were drawn at the completion of surgery and 24 and 48 h later, as well as 3 and 6 hours after discontinuation of the infusion. "Late" samples, 24 h from discontinuation of infusion was obtained from two infants. Sufentanil was measured using LLE extraction procedure and HPLC-MS/MS method with LOQ = 5 pg/ml.

RESULTS AND DISCUSSION: In 8 out of 10 infants, sufentanil concentration in plasma did not decline immediately after discontinuation of epidural infusion: a distinct redistribution phase was observed (Fig.1.with sufentanil concentration of 35.82 (15,21) pg ml-1 immediately after discontinuation of the infusion and 47.59(23.14) pg ml-1six hours later (P<0.07). Our results differ from those reported in a similar study in adults [3].

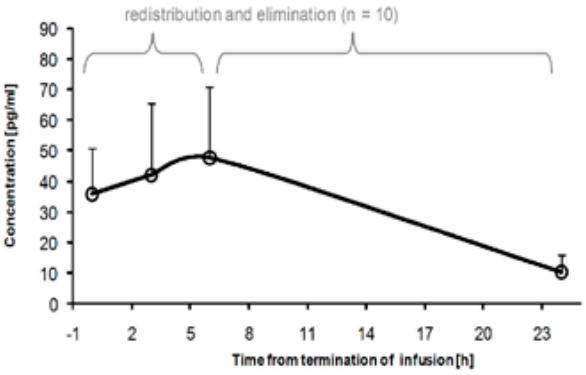

Fig.1. Postinfusion pharmacokinetics of sufentanil

Previously it was our practice to discharge children from the high dependency area immediately after discontinuation of the infusion; we believed that sufentanil concentration in plasma would start to decrease immediately, as in adults. Obtained data suggest a possibility of late respiratory depression due to the redistribution of previously bonded sufentanil; therefore, extended monitoring should be continued for at least for six hours after discontinuation of the epidural sufentanil infusion.

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S-403.

HYPERCARBIA DURING THORACOSCOPIC CDH REPAIR

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INTRODUCTION: Thoracoscopic CDH repair is being performed more frequently in our institution because of the advantages of minimally invasive surgery. Thoracoscopy in the neonate can be associated with varying degrees of hypercarbia. We report our experience with permissive intraoperative hypercarbia which was associated with minimal hemodynamic changes.

METHODS: IRB approval was obtained to perform a retrospective chart review of 22 patients with planned thoracoscopic CDH repair between September 2006 and September 2008. Nineteen records were available for review and eighteen patients who had their repair done in the neonatal period were included in this analysis. 2/18 had R sided CDH. 5/18 converted to open repair because of difficulty in reducing the hernia, extensive patch repair, lobar sequestration requiring lobectomy, and spleen laceration. 10/18 required a patch repair. 2/18 required reoperation because of recurrence. Patients had surgery between the ages of 1 to 10 days (mean 4.2 days). Surgery lasted a mean of 4.02 hours (2.42-5.38 hours). Patients remained intubated between 1 and 18 days (mean 2.9 days). Patients went home between 7 and 51 days postoperatively (mean 30 days). Intraoperatively, 14 patients developed hypercarbia ($pCO2 > 50$ mmHg), while 7 patients developed severe hypercarbia ($pCO2 \geq 70$ mmHg). One patient developed supraventricular thachycardia that resolved spontaneously. This followed an episode of bronchospasm requiring treatment with albuterol and terbutaline. Around this time, pCO2 was 118.7 and ph was 6.99. On PO day #6, this patient required 4 days of ECMO support because of respiratory failure and pulmonary hypertension in the setting of sepsis. He had multiple episodes of SVT right before decannulation, which responded to adenosine and digoxin. These were unrelated to hypercarbia or acidosis. One patient had significant bleeding requiring a transfusion because of splenic laceration. Postoperatively, 4 patients had SVT (including the one discussed earlier). One of those patients had associated cardiac disease (ASD, VSD), deletion of chromosome 8, and later went required a pacemaker placement. In the other two patients, these episodes were self limited and resolved spontaneously. Two patients had bacteremia/sepsis

DISCUSSION: There are conflicting opinions on whether hypercapnia can adversely affect neurologic outcomes in neonates.1.2 Yang et al published a case series in 2005 detailing 7 cases of thoracosopic CDH repair3. Three of these patients developed intraoperative respiratory acidosis without any untoward effects. Patients undergoing thoracoscopic repair of CDH will often present intraoperative hypercarbia and acidosis. In our experience, this does not seem to be associated with any lasting hemodynamic or neurologic consequences.

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S-404.

EPIDEMIOLOGY OF PULMONARY HYPERTENSION IN THE PEDIATRIC POPULATION

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INTRODUCTION: Primary pulmonary hypertension (PPH), once a largely fatal diagnosis in the pediatric population, is a growing area of interest as advances in diagnosis and treatment have improved survival rates (1, 2). Many pulmonary hypertensive patients require anesthesia and sedation for medical and surgical procedures. However, the epidemiology of this rare disease in children has not been examined and most studies have been limited to reports on small patient cohorts (2-5). Our goal was to determine the prevalence, demographic, and mortality rate of PPH on a large population basis for pediatric patients using the KID database.

METHODS: The KID is a national US inpatient care database for children up to age 20 years. Our cohort consisted of admissions in the KID database in the years 2003 and 2006 that contained the diagnosis "primary or idiopathic pulmonary hypertension" (ICD 9 code 416.0). Study variables included age, gender, race, hospital size by bed number (small, medium, large), and admission type (elective vs. non-elective). Statistical analysis included univariate analysis using the Statistical Analysis System 9.2 (SAS).

RESULTS: The KID database included at total of nearly 15 million admissions from 2003 and 2006. Of these, 2,564 admissions included the diagnosis of primary or idiopathic pulmonary hypertension. This reflects a prevalence rate of 17 per 100,000 admissions. The mean age of admission was 5.7 years old, and the average length of stay was 16 days.

Our demographic data is based on the un-weighted admission number of 1517 primary pulmonary hypertension patients and 6,113,416 total admissions.

		Primary Pulmonary Hypertension	Prevalence	General Population	Prevalence
Age					
	Less than 1 month	234	**0.175**	1723609	**0.313**
	1 month-<12 months	281	**0.210**	422980	**0.077**
	1 year to 4 years	225	**0.168**	675377	**0.123**
	5-9 years	140	**0.105**	423837	**0.077**
	10+ years	458	**0.342**	2253419	**0.410**
Sex					
	Male	721	**0.477**	2770296	**0.458**
	Female	790	**0.523**	3274394	**0.542**
Race					
	White	615	**0.494**	2222699	**0.503**
	Black	192	**0.154**	732038	**0.166**
	Hispanic	278	**0.223**	1071891	**0.243**
	Asian	64	**0.051**	127051	**0.029**
	Other	91	**0.073**	237067	**0.054**
Admission type					
	Non-elective	1133	**0.747**	5055583	**0.832**
	Elective	383	**0.253**	1022520	**0.168**
Bedsize of Hospital					
	Small	145	**0.096**	720799	**0.120**
	Medium	437	**0.291**	1603564	**0.267**
	Large	921	**0.613**	3680245	**0.613**
Mortality		114	**0.075**	35549	**0.006**

The demographic data shows little difference between the pediatric in-patient PPH population and the overall pediatric in-patient population . There was no propensity toward a certain sex or race. However, there were a higher number of pulmonary hypertension admissions in infants. The mortality rate in PPH patients was far higher than in the general in - patient population.

DISCUSSION: Primary pulmonary hypertension in children is a serious clinical condition which lacks population-based demographic data. Our analysis shows that the demographics for this population is similar to the general population in the KID database. But, pulmonary hypertension is a disease associated with a greater than 10 fold higher in-hospital mortality rate. Further studies are needed to risk-stratify these patients by identifying comorbid conditions that may impact survival.

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ANESTHESIA & ANALGESIA

Pediatric Anesthesia: Neonatal Safety and Anesthetics

ANESTH ANALG
2010; 110; S-1 – S-491

S-405.

BUMETANIDE ALLEVIATES NEUROTOXICITY AND SENSORIMOTOR GATING DEFICITS CAUSED BY SEVOFLURANE IN NEONATAL RATS

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INTRODUCTION: In previous experiments we showed that general anesthesia with sevoflurane caused electroencephalographic seizure activity in early postnatal rat pups. Pre-treatment of rat pups prior to exposure to sevoflurane with the Na+-K+-2Cl- co-transporter 1 (NKCC1) inhibitor and loop diuretic bumetanide, largely abolished the seizure activity. We wished to assess whether anesthesia of neonatal rats with sevoflurane causes neurotoxicity and affects elemental information processing in the form of sensorimotor gating and whether these side effects of sevoflurane are responsive to treatment with bumetanide.

METHODS: Sevoflurane anesthesia was induced in postnatal day 4 (P4) rats with 6 % sevoflurane for 3 min, and maintained with 2.1% sevoflurane for 6 hrs. Fifteen min prior to anesthesia rats received either bumetanide (5µmol/kg, I.P.) or saline. Unanesthetized rats of the same developmental age served as control. After being exposed to sevoflurane anesthesia all rats were divided in two groups for evaluation of sevoflurane-induced apoptosis and sensorimotor gating deficit. Apoptotic changes were assessed 18 hrs after termination of sevoflurane anesthesia by evaluating activated caspase 3 in brain tissue by using Western blotting. Sensorimotor gating was evaluated 16 and 28 days after sevoflurane anesthesia by measuring the acoustic startle response and prepulse inhibition (PPI) of startle. Metabolic effects of anesthesia were evaluated in a separate group of P4 rats by blood gas analysis at the conclusion of the anesthesia.

RESULTS: Six hours of anesthesia did not cause hypoglycemia, hypoxia or significant hypercarbia. Caspase-3 activity was significantly increased in brain tissue of the sevoflurane anesthetized rats that received saline before exposure to sevoflurane. In contrast, animals that received bumetanide before exposure to sevoflurane had activated caspase-3 activity comparable to control rats not exposed to anesthesia (figure 1).

Functionally, sevoflurane exposure caused a PPI deficit in P20 rats compared to unanesthetized age-matched controls. Bumetanide pretreatment nearly prevented this PPI deficit. Overall, the PPI deficit caused by sevoflurane anesthesia was transient, because it was no longer demonstrable at age P32.

DISCUSSION: Our data indicate that prolonged sevoflurane anesthesia in neonatal rats causes neurotoxicity and transient impairment of sensorimotor gating. Decreased neurotoxicity and normalized function after pretreatment with bumetanide suggests that sevoflurane enhanced GABA- and glycine-ergic neurotransmissions are important molecular mechanisms underlying these detrimental effects of sevoflurane.

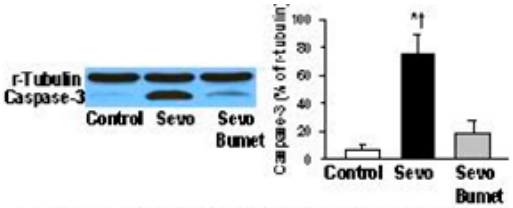

Figure 1: A: example of the 19kD fragment of caspase-3 compared to the 50 kD fragment of r-tubulin. B: Summary data from animals not exposed to sevoflurane (Control), and those exposed to sevoflurane either without (Sevo) or with bumetanide pretreatment (Sevo Bumet). *,† p<0.05 vs. control and Sevo/Bumet, n=5-7

S-406.

CARBON MONOXIDE IS REBREATHED DURING LOW-FLOW ANESTHESIA IN INFANTS AND CHILDREN

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INTRODUCTION: Carbon monoxide (CO) can impair the developing brain. CO has been detected within the breathing circuit during low-flow anesthesia (LFA). It is unknown if the source is degradation of anesthetics by conventional carbon dioxide absorbent (CDA), re-breathing of exhaled endogenous CO, or both. We hypothesize that exhaled CO is re-breathed during LFA. We aimed to quantify inspired CO during LFA in infants and children using CDA lacking strong metal alkali.

METHODS: Following IRB approval, 20 infants and children (2 months to 5 years) undergoing general anesthesia were evaluated. After placement of fresh CDA lacking strong metal alkali (Amsorb Plus) and mask induction, general endotracheal anesthesia was maintained with either sevoflurane or desflurane. Fresh gas flow (FGF) (0.21%) was set to ½ of minute ventilation (LFA) for 60 minutes and then increased to match minute ventilation for 60 minutes (relative high-flow (HFA)). CO was measured via electrochemical sensor continuously at the endotracheal tube, in the expiratory limb (just proximal to the machine), and in the inspiratory limb (just distal to the machine). Carboxyhemoglobin (COHb%) was measured via co-oximetry at baseline, 60 minutes (following LFA), and at 120 minutes (following HFA). Longitudinal ANOVA was used to assess differences in CO related to FGF and account for correlation between repeated measurements. Change in COHb% was assessed with T-test and significance set at P<.05.

RESULTS: During LFA, all CO levels increased from baseline over time. Mean inspired CO was 2.1 +/- 0.2 ppm with a peak of 14 ppm. During HFA, end-tidal and expiratory CO levels remained constant while inspiratory CO decreased markedly. When controlling for differences in baseline levels at the start of LFA, changes in inspiratory CO differed significantly based on FGF. When controlling for differences at the beginning of both LFA and HFA, changes in both inspiratory and expiratory CO levels correlated significantly with FGF. COHb% significantly increased in children < 2 years of age at 60 minutes following LFA compared to baseline and remained increased at 120 minutes. In children > 2 years of age, COHb% remained unchanged at all time points.

DISCUSSION: LFA was associated with a significant increase in inspired and exhaled CO and an increase in COHb% in children < 2 years of age. With the use of CDA lacking strong metal alkali, all of the CO detected must have originated from endogenous patient sources. Thus, LFA resulted in re-breathing of exhaled CO and exposure especially in the youngest and smallest children. HFA caused the rate of rise of exhaled CO to plateau and significantly decreased inspired CO. These findings suggest the need for a new paradigm in pediatric anesthesia. Thus, practitioners should match or exceed minute ventilation with FGF to avoid LFA and CO re-breathing.

S-407.

ISOFLURANE EXPOSURE LEADS TO A SIGNIFICANT REDUCTION IN GLUTAMIC ACID IMMUNOREACTIVITY IN NEONATAL MOUSE CEREBRAL CORTEX

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INTRODUCTION: Preclinical studies demonstrating widespread brain cell death in developing animals following isoflurane exposure have raised serious concerns about its safe use during pediatric anesthesia.1 Previously, 98% of these dying cells were immunohistochemically identified as post-mitotic neurons.2 It remained unknown whether this phenomenon also affects GABAergic interneurons, which play an important role in balancing inhibitory and excitatory brain function. Accordingly, the present study examined the effects of neonatal isoflurane exposure on GABAergic, inhibitory neuron structure and survival.

METHODS: Seven-day-old C57BL/6-CD1 hybrid mouse littermates (n=11) were randomly assigned to a 6-hour exposure to 1.5% isoflurane (≈0.7 MAC) in 30% oxygen (anesthesia) or fasting in room air (control). Animals were euthanized immediately following exposure and brain sections were stained with caspase 3 antibody, a marker for apoptotic cell death, combined with anti-GAD67, a marker for GABAergic interneurons. Using confocal microscopy and an unbiased counting method, the percentage of caspase 3-positive neurons expressing GAD67 was determined. To further assess the effects of isoflurane exposure on inhibitory interneurons, transgenic mice (n=6) expressing green fluorescent protein in somatostatin-positive GABAergic interneurons (GIN) were treated with isoflurane and analyzed as described above. Data are presented as means±SEM. Statistical significance was accepted at $P < 0.05$.

RESULTS: More than 2% of neurons expressing the apoptotic marker caspase 3 in the superficial cerebral cortex were identified as GABAergic interneurons, expressing GAD67, compared with only 0.5% in controls. ($P<0.05$) Unexpectedly, isoflurane exposure also significantly decreased the number of neurons with detectable GAD67 immunoreactivity in the soma (control, 0.24±0.042 cells/μm vs. anesthesia, 0.072±0.024; $P<0.05$), raising the possibility that either larger numbers of GABAergic neurons are dying, or that GAD67 protein levels are reduced in the soma. Studies of GIN mice support the latter conclusion, at least for the subpopulation of somatostatin-positive GABAergic interneurons, as the number of GFP-expressing cells was not significantly reduced following anesthesia treatment; 0.146±0.025 cells/μm vs. 0.154±0.034 cells/μm anesthesia vs. control ($P=1$), respectively. GFP colocalization occurred in 2.9%±0.77% and 0% of caspase 3 positive cells in anesthesia and control respectively ($P<0.05$).

DISCUSSION: Using immunohistochemical methods, we demonstrated that more than 98% of cortical brain cells eliminated following neonatal isoflurane exposure are post-mitotic neurons. The present study demonstrates that approximately 2% of these neurons are GABAergic interneurons. In addition, a 50% reduction in the number of GAD67 immunoreactive cell bodies was found in cortex. Preserved numbers of somatostatin-positive GABAergic interneurons in the GIN mice following anesthesia suggested that this reduction reflects reduced somatic GAD67 immunoreactivity rather than neuron loss, raising the possibility that the function of surviving GABAergic neurons may be impaired. Notably, previous studies with the GABAA-agonist propofol revealed changes in GAD enzymatic activity.3

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S-408.

DOES THE "MAGIC GLOVE" TECHNIQUE REDUCE VENIPUNCTURE PAIN IN ADULTS?

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INTRODUCTION: Anxiety associated with venipuncture is a common problem in the medical settings. In severe cases, it can interfere with the ability to receive medical treatment.1 Numerous techniques to reduce venipuncture pain have been developed to optimize patient comfort and satisfaction. Local anesthetics, ethyl chloride, ice, and distraction have all been utilized to decrease venipuncture pain. In the pediatric population, the "magic glove" has been used successfully to decrease venipuncture pain. This technique uses distraction and imaginary guide elements to reduce needle pain, also know as desensitization. A virtual "magical" glove is applied to the child's hand, using calming and suggestive wording along with gentle strokes over the hand. In most cases, reduced sensation and minimal discomfort with needle insertion is reported. We hypothesized that the same technique can be applied in adult patients to reduce venipuncture pain.

METHODS: After obtaining IRB approval, we studied 90 surgical patients randomized into 3 separate groups: control group, local anesthetic (lidocaine) group and the magic glove group. All venipunctures were done by the same operator (a third-year anesthesia resident). Each patient was asked to grade the venipuncture pain on a scale of 1-10. Patients were also asked if they would like to have the same technique in the future. Blood pressure and heart rate were recorded before and immediately after the procedure.

RESULTS: Average pain score for the control, lidocaine and the magic glove groups were 5±2, 2±2 and 3±2, respectfully. Using the Kruskal-Wallis One-Way Analysis of Variance, there was a statistically significant difference ($P<0.05$) between the control and lidocaine groups and between the lidocaine and the magic glove groups. There was no statistical difference between the control and the magic glove groups. In regards to patient satisfaction, 40% (control), 100% (lidocaine) and 85% (magic glove) of the patient said that they preferred to have the same technique in the future. Changes in heart rate and blood pressure were statistically insignificant.

DISCUSSION: Average pain score was highest in the control, followed by the magic glove and the lidocaine groups. However, statistically, the magic glove group did not demonstrate an advantage in reducing venipuncture pain. Contributing factors may include lower level of responsiveness and imaginary acceptance in adults compared to children. In addition, the operator did not have substantial experience and wide background in guided imagery techniques. Worth-mentioning is the high satisfaction level in the magic glove group compared to the control group. This may imply an additional value in re-exploring the magic glove technique with a more experienced operator.

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SUPPORT: Department of Anesthesia and Perioperative Care, UCI Medical Center, Orange, CA.

Pharmacology – Basic Science

S-409.

AMPHETAMINE ALTERS ACID-SENSING ION CHANNEL EXPRESSION IN THE RAT STRIATUM

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INTRODUCTION: The acid-sensing ion channel is activated by a drop in the extracellular pH level. These channels are widely expressed in mammalian brains and actively modulate synaptic transmission. In the striatum, two ASIC subtypes are densely expressed. Since the striatum is a central site for processing biological actions of drugs of abuse, expression of abundant ASICs in this structure implies a potential involvement of the channel in drug effects. In this study, we examined the expression of ASIC1 and ASIC2 in the rat striatum in response to chronic exposure to the psychostimulant amphetamine in vivo. We hypothesized that chronic amphetamine exposure would alter the expression of the ASIC channels in the striatum.

METHODS: Following IACUC approval, adult male Wistar rats (2 groups, n=12) received intraperitoneal injections of saline or amphetamine (qday for 7 days, 1.25mg/kg day1-7, 4mg/kg day2-6). 14 days after exposure, the rats were sacrificed using standard methodology. Brains were removed and sliced into coronal sections. The dorsal and ventral striatum were dissected in artificial cerebrospinal fluid . A membrane-impermeable croS-linking reagent bis(sulfosuccinimidyl)suberate was added. BS3 croS-links ASICs on live cell surfaces to form high-molecular weight aggregates which can be separated from intracellular ASIC proteins in Western blots. Densities of immunoblots were measured using optical scanning and analyzed using Student's t-test ($p < 0.05$).

RESULTS: BS3-treated striatal tissue showed high-molecular weight band of ASIC1/ASIC2 (surface channels) and monomeric molecular weight band of ASIC1/ASIC2 (intracellular channels). Quantification analysis revealed 70-80% of ASIC1 and ASIC2 are expressed in the surface membrane of normal striatal neurons. Chronic amphetamine administration induced parallel increases in ASIC1 protein levels in surface and intracellular pools in the CPu at 14-day withdrawal period. Similar results were observed in the NAc. In contrast, ASIC2 and α-actinin protein levels remained unchanged in the CPu and NAc of amphetamine-treated rats relative to saline-treated rats.

CONCLUSION: These data identify the central ASIC as a sensitive target to repeated stimulant exposure. ASICs may thus participate in the neural adaptations critical for addictive properties of drugs.

DISCUSSION: Plastic changes in the expression and function of all responsive proteins are thought to operate in concert to control drug effects. In this study, a new responsive protein is identified. After amphetamine administration, ASIC expression was upregulated in the CPu and NAc. This identifies the channel as an important element of molecular adaptations to drug exposure. Clinically, ASICs have been implicated in various mental disorders1. This study represents an initial effort toward elucidating the role of ASICs in the addictive action of amphetamines. In conclusion, chronic exposure of amphetamines in rats translated into an upregulation of ASIC1 protein levels in the surface and intracellular pool in the CPu and NAc.

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S-410.

WITHDRAWN.

ANESTH ANALG
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S-411.

THE EFFECT OF OCTREOTIDE ON LUNG INJURY AFTER HEPATIC ISCHEMIA-REPERFUSION IN THE RABBIT

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INTRODUCTION: Hepatic ischemic-reperfusion injury (HIRI) is of concern in the field of liver surgery and the concept of pharmacologic preconditioning to prevent it has recently been investigated(1). Octreotide has been reported to reduce HIRI in the rabbit(2). This study was designed to investigate the effects of Octreotide on lung injury after Hepatic Ischemia-reperfusion(HIR) in the Rabbit model.

METHODS: 24 adult New Zealand rabbits (weight 1.6-1.9 kg) were randomly divided equally into 3 groups: sham group(Gr.A), ischemic-reperfusion group(Gr.B) and an Octreotide preconditioning group(Gr.C). After anesthesia with pentobarbital and before laparotomy, In Gr. C, Octreotide 20 ug/kg intraperitoneal and 30 ug/kg subcutaneous was injected(3). The other two groups were given the same volume of 0.9% saline. Both in Gr. B and Gr. C, the hepatic hilum was clamped after excluding the common bile duct. Thirty minutes later, blood flow was restored by removing the clamps. We checked the tumor necrosis factor-alpha (TNF-α) and Interleukin-1beta (IL-1β) in the serum in every group at the time before ischemia (T1), 30 min (T2) after ischemia, and30 min (T3), 60min (T4), 120 min (T5), and 240 min (T6) after reperfusion. We observed the pneumonocyte ultrastructure under electromicroscope and detected the apoptosis of lung tissuess by TUNEL in every Gr. at T6.

RESULTS: 1. Both TNF-α and IL-1β in Gr.B and Gr.C increased from T2, with the peak value at T5($p<0.05$). These levels were, however, significantly lower in Gr.C than in Gr. B for these time points ($p<0.05$). 2. Under electromicroscope we could see the injury of the pneumonocyte ultrastructure in Gr. C was slighter than in Gr. B.We detected the apoptosis of the lung tissuess by TUNEL and discovered that the apoptosis counts of Gr. B and Gr. C were more than that of Gr.A, and Gr. C were less than that of Gr. B ($P<0.01$).

DISCUSSION: The current study demonstrated that Octreotide down-regulated inflammatory cytokines such as TNFα, IL-1β, alleviated the changes of pneumonocyte ultrastructure after hepatic ischemia-reperfusion, decreased the pneumonocyte apoptosis. Octreotide appears to protect lung injury after hepatic ischemic-reperfusion in rabbits.

Table 1

	T1	T2	T3	T4	T5	T6
TNF-α A	0.56±0.13	0.62±0.12	0.58±0.12	0.63±0.14	0.62±0.16	0.63±0.17
B	0.61±0.12	1.13±0.14*	1.33±0.11*	1.41±0.14*	2.06±0.15*	1.69±0.13*
C	0.60±0.07	0.86±0.08*+	0.89±0.08*+	1.17±0.16*+	1.32±0.11*+	1.08±0.12*+
IL-1β A	0.16±0.05	0.18±0.03	0.18±0.06	0.19±0.04	0.16±0.03	0.17±0.02
B	0.17±0.05	0.32±0.06*	0.36±0.04*	0.41±0.03*	0.38±0.02*	0.30±0.02*
C	0.16±0.04	0.22±0.03*+	0.27±0.05*+	0.30±0.02*+	0.26±0.04*+	0.21±0.05*+

S-412.

CARBON MONOXIDE RELEASING MOLECULE-2 INHIBITS RAT PANCREATIC STELLATE CELL PROLIFERATION BY UP-REGULATION OF HEME OXYGENASE-1

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INTRODUCTION: Proliferation of pancreatic stellate cells (PSCs) plays a pivotal role in the pathogenesis of pancreatic fibrosis (1). Therefore, suppression of PSC growth represents a therapeutic option. Recently we have reported that the cytoprotective enzyme heme oxygenase-1 (HO-1) exerts anti-fibrotic effects in the pancreas (2). The role of carbon monoxide (CO), a catalytic by-product of the HO metabolism, in this context has not been investigated so far. Thus, the aim of the present study was to examine the effect of CO-releasing molecule-2 (CORM-2) liberated CO on PSC proliferation and to elucidate the mechanisms involved.

METHODS: PSCs were isolated from rat pancreatic tissue and used in their culture-activated, myofibroblast-like phenotype. Cell proliferation was assessed by BrdU proliferation assays, cell counts and native microscopy. Cell cycle analysis was performed by flow cytometry of propidium iodide stained cells. Activation of mitogen-activated protein kinases (MAPKs) and expression of HO-1 protein were determined by western blotting. To determine the role of HO-1 in CORM-2 mediated effects, PSCs were transfected with HO-1 small interfering RNA (siRNA).

RESULTS: CORM-2 inhibited PSC proliferation at non-toxic concentrations, arresting cells at the G0/G1 phase of the cell cycle. These effects were associated with activation of the p38 MAPK signaling pathway and subsequent induction of HO-1 gene expression. The selective p38 MAPK inhibitor SB203580 abolished the inhibitory effect of CORM-2 on PSC proliferation and prevented CORM-2 induced HO-1 up-regulation. Treatment with tin protoporphyrin IX, an HO inhibitor, or transfection of HO-1 siRNA reversed the suppressive effect of CORM-2 on PSC growth.

DISCUSSION: CORM-2 inhibits PSC proliferation via activation of the p38/HO-1 pathway. These findings suggest that CO carriers may offer therapeutic potential for the treatment of pancreatic fibrosis.

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S-413.

WITHDRAWN.

S-414.

ISOFLURANE ANESTHESIA ATTENUATES HIGH-FREQUENCY BUT NOT LOW-FREQUENCY GAMMA OSCILLATIONS IN THE CEREBRAL CORTEX AND HIPPOCAMPUS OF FREELY MOVING RATS

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INTRODUCTION: Gamma oscillations in the EEG and local field potentials play an important role in conscious cognition(1-4). Loss of consciousness during general anesthesia was proposed to be linked to a suppression of 40 Hz gamma oscillations(5-8). However, other investigators noted that in certain brain regions, gamma oscillations may actually be increased during anesthesia(9-12). To resolve this controversy, we examined the concentration-dependent effect of isoflurane on spontaneous cortical gamma oscillations in three distinct brain regions of the rat.

METHODS: Seven adult male Sprague-Dawley rats were chronically implanted with epidural and coaxial depth electrodes to record cortical field potentials in the frontal cortex, occipital cortex and hippocampus. Seven days after surgery, the rats were anesthetized with increasing concentrations of isoflurane at 0.4%, 0.8% and 1.2%. Field potentials were recorded at a sampling rate of 500 Hz for 10 minutes at steady state in the awake and each anesthetized condition. Gamma power was calculated using Welch's method for the frequency bands of 30-50 Hz and 70-140 Hz. The hypothesized effect of isoflurane was examined by linear regression of the logarithm of gamma power on the isoflurane concentration followed by ANOVA. Loss of consciousness was identified by the loss of righting reflex(13).

RESULTS: There was no significant dependence of low-frequency (30-50 Hz) gamma power on isoflurane in any of the three brain regions ($R = 0.415, 0.498, 0.222$ for frontal cortex, occipital cortex and hippocampus, respectively, NS for all). In contrast, high-frequency (70-140 Hz) gamma power was significantly reduced by isoflurane ($R = 0.867, 0.929, 0.772$ for the same regions, respectively, $p<0.001$ for all). Rats lost their righting reflex between 0.5 and 0.7 MAC (average inhaled concentration: 0.8+0.1%) that was within the range of the examined isoflurane concentrations.

DISCUSSION: Studies into the role of gamma oscillations were traditionally focused on the 40 Hz component or a relatively narrow frequency band surrounding it (6-8). Although high-frequency gamma oscillations are prevalent in both the cortex (14) and the hippocampus (15), they have received sparse attention in anesthesia studies. Our result suggests that a distinction between various gamma-frequency bands is important when evaluating the effect of general anesthetics on brain activity. Only the loss of high-frequency gamma oscillations may indicate or be linked to the loss of consciousness.

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ANESTH ANALG
2010; 110; S-1 – S-491

S-415.

ESTIMATION OF THE CD_{50} AND LD_{50} OF N-LINKED SYMETRICAL LIDOCAINE DIMER IN MICE

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INTRODUCTION: N-linked symmetrical dimers of lidocaine have increased affinity and slow dissociation from voltage-gated Na+ channels in vitro.[1] Bivalent ligands may increase potency by increasing the occupancy of adjacent domains within the channel and could offer greater receptor selectivity than monovalent ligands. In addition, dimeric molecules may have different pharmacokinetic and pharmacodynamic properties than the corresponding monomeric moieties. The purpose of this study was to evaluate the convulsive and lethal dose of an N-linked symmetrical dimer of lidocaine in mice.

METHODS: The protocol was approved by the Institutional Animal care and Use Committee of Northwestern University. 120 (CD-1 stain) mice were randomly allocated receive lidocaine dimer at a dose of 25, 50, 90, 130, 140, 160, 180, 200, 210, 220, 240, or 280 mg/kg. The drug (0.5 mL) was administered in a 0.1 M Sorenson's phosphate buffer (pH = 5.68). Intraperitoneal injections (IP) were performed with the mouse briefly restrained. Following IP injection the mouse was placed in a clear plastic caged and observed (15 min) for changes in behavior, gait and grooming. The time from intraperitoneal injection to the first clonic seizure and the duration of the seizure (when the mouse recovered the righting reflex or expired) was recorded. CD50 and LD50 and 95% confidence intervals of the estimates were determined using a probit regression model.

RESULTS: The estimated CD50 and LD50 of lidocine dimer were 172 mg/kg (95% CI 156 to 187) and 198 mg/kg (95% CI 184 to 216), respectively. The mean time from IP injection to seizure was 382±122 sec and 491±110 sec to death. Mean seizure duration was 103±84 seconds. The Pearson goodness of fit test for the probit model for seizures was 0.73 and for 0.96 for death.

DISCUSSION: The CD50 for lidocaine in mice has been reported as 77 mg/kg to 110 ± 8 mg/kg and the LD50 is estimated at 133 mg/kg. De- Oliveira et al showed that the latency to seizure onset with lidocaine was approximately 160 sec and was not affected substantially by the dose.[2,3] However the duration of the seizures (mean 260 sec) was dose dependent and significantly altered by drugs that altered seizure threshold. The important finding of this study was substantial increase in seizure threshold and lethal dose as well as prolonged onset to seizures of shorter duration with lidocaine dimer compared with lidocaine in mice.

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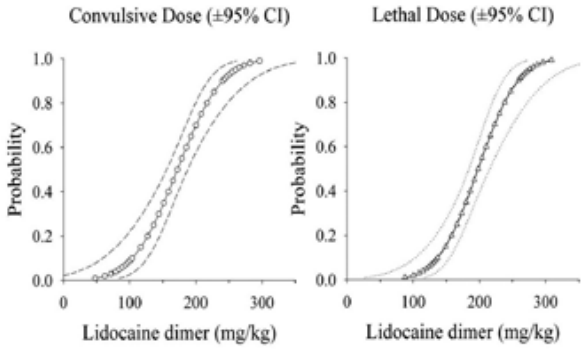

S-416.

PROPOFOL PROTECTS AGAINST H_2O_2-INDUCED SHSY5Y CELL DEATH BY PROMOTING GLOBAL SUMOYLATION

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BACKGROUND: SUMO modification has been reported to be activated by H_2O_2 [1], but this role on cell death and/or cell survival during this process are still unclear. Based on these results, the author first identified the role of SUMO modification during H_2O_2 induced apoptosis, then hypothesized that propofol, as its particular chemical structure, mitigates the effects of H_2O_2-mediated oxidative stress and apoptosis by the activation of SUMO modification in SHSY5Y cells.

Methods: First, human neuroblastoma SHSY5Y cell lines stably-expressing Flag-SUMO1, Flag-SUMO2, or Flag-SUMO3 respectively, were incubated for 6 h with H_2O_2 (200 mM). The role of SUMO modification during H_2O_2 treatment was detected by Annexin-V assay. Second, SHSY5Y cells were incubated for 6 h with H_2O_2 (200 mM) in the presence or absence of propofol (50 μM, 100 μM, 200 μM and 500 μM). The protective effects of propofol were evaluated by cell proliferation assay and cytotoxicity assay (using Cell counting kit-8), and the levels of SUMO conjugations were detected by Western blot analysis.

Results: SHSY5Y cell lines stably-expressing Flag-SUMO1 and Flag-SUMO2 respectively, were significantly more resistant to H_2O_2-mediated apoptosis compared with control cells ($p < 0.05$). Appropriate propofol concentrations (ranging from 100 μM to 500 μM) significantly increased SUMO1 and SUMO2/3 modification and attenuated H_2O_2-mediated apoptosis, suggesting a possible role of SUMO1 and SUMO2 modification in propofol protects against H_2O_2-induced SHSY5Y cell apoptosis.

DISCUSSION: Post-translational modification of proteins by the small ubiquitin-like modifiers (SUMOs) has emerged as an important regulatory mechanism for alteration of protein activity, stability, and cellular localization [2]. It has been reported that SUMOylation plays an important role in some activities of neuronal cells [3]. SUMO1 and SUMO2 modification (appearing as unusually strong high molecular weight immunopositive smears on western blots) showed increased survival after severe oxygen/glucose deprivation (OGD)[4]. Here we found SHSY5Y cells in which stably transfected SUMO1 or SUMO2 showed increased survival rates respectively after exposed to H_2O_2. The antioxidant properties of propofol can be partially attributed to its scavenging effect on ROS as well as to its ability to increase SUMO conjugation at higher concentrations, a property that might be relevant to neuroprotection during anesthesia.

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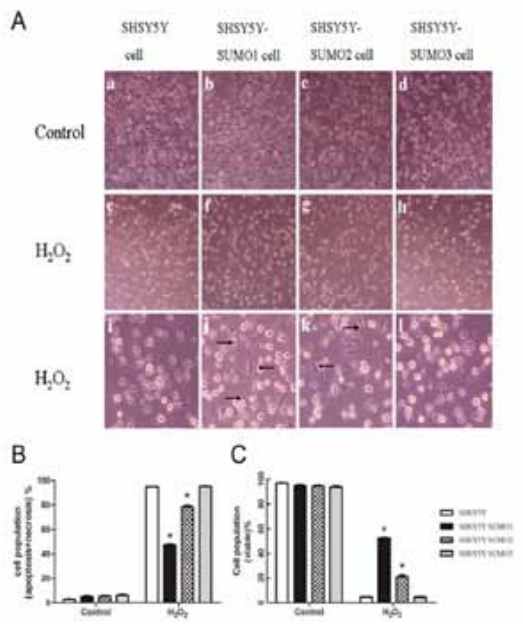

Figure 1: SUMO1 and SUMO2 stable-transfected SHSY5Y cell line are more resistant to H_2O_2. (A) Neuronal injury was estimated by examination of cell morphology using a phase-contrast microscope. The arrows showed the normal morphology. (B-C) Cells were stained with annexin V (for apoptosis) and propidium iodide (for necrosis) for flow cytometry analysis. Different cell populations with or without H_2O_2 (200 mM) treatment for 6h.

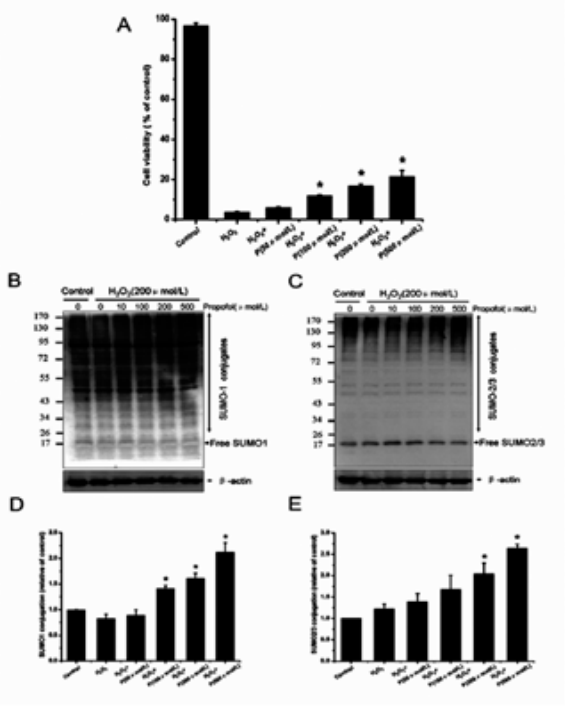

Figure 2: Propofol protects against H_2O_2-induced SHSY5Y cell death through up-regulation of SUMO modification. Propofol at the indicated concentrations was added to the incubation medium 30min prior to H_2O_2 stimulation. (A) Cell viability was measured using the CCK-8 assay. (B) The levels of SUMO conjugations were detected by Western blot analysis. *: $p<0.05$ vs. H_2O_2 group.

S-417.

WITHDRAWN.

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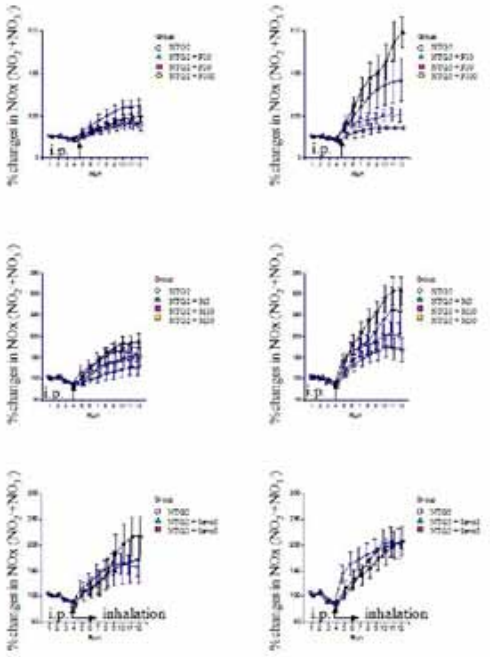

Figure. The effect of propofol (upper), midazolam (middle) and sevoflurane anesthesia (lower) on the nitroglycerine-induced change in the extracellular concentration of NO products. NTG2 and NTG5: nitroglycerine 2 and 5 mg/kg i.p., respectively. P10, P30 and P100: propofol 10, 30 and 100 mg/kg i.p. M3, M10 and M100: midazolam 3, 10 and 30 mg/kg I.p. Sevo1 and Sevo3: 1 and 3% sevoflurane inhalation during 45 min. Data are expressed as mean ± SE.

S-418.

AMBIENT GABA CONCETRATIONS AFFECT HYPNOTIC AND IMMOBILIZING ACTIONS OF GENERAL ANESTHETICS IN MICE.

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INTRODUCTION: Two types of GABAergic inhibition are known; a phasic form (phasic inhibition) regulating neural excitability via the activation of postsynaptic GABAA receptors by intermittent GABA release from presynaptic terminals, and a persistent tonic form (tonic inhibition) generated by continuous activation of extrasynaptic GABAA receptors by low concentrations of ambient GABA. Recent studies have suggested that extrasynaptic (tonic) GABAA receptors could be important targets for general anesthetics. If so, manipulations designed to alter ambient GABA concentrations may affect hypnotic (as indicated by loss of righting reflex, LORR) and immobilizing (as indicated by loss of tail-pinch withdrawal reflex, LTWR) actions of an inhaled anesthetic sevoflurane, intravenous anesthetics propofol, and midazolam. We tested the hypothesis that manipulations of ambient GABA concentrations would affect cellular and behavioral responses to general anesthetics.

METHODS: Two manipulations studied were 1) the genetic absence of glutamate decarboxylase (GAD) 65 gene (GAD65-/-), which purportedly reduced ambient GABA concentrations, and 2) the pharmacological manipulation of GABA uptake using GABA transporter inhibitor (NO-711). GAD65-/- mice are viable and fertile, and appear to show altered sensitivity to propofol 1) and thermal hyperalgesia 2). We measured the influence of these manipulations on in vivo anesthetic actions and in vitro membrane properties of frontal cortical layer V neurons using patch-clamp methods.

RESULTS: HPLC assays revealed that GABA levels in GA65-/- mice were reduced in the brain (76.7% of WT) and spinal cord (68.5% of WT). NO-711 (3 mg/kg, i.p.) enhanced the duration of LORR and LTWR by propofol and midazolam, but not sevoflurane. Patch-clamp recordings revealed that sevoflurane (0.23 mM) had relatively small but significant effects on the amplitude of tonic GABA current. However, these effects were not strong enough to alter discharge properties of cortical neurons.

DISCUSSION: Although the molecular and cellular factors underlying differences in anesthetic sensitivity are currently unknown, the present data lead us to believe that relatively small changes in ambient GABA concentrations are insufficient to alter behavioral responses to sevoflurane. We think that imbalance in excitatory and inhibitory neurotransmitter contents in the brain significantly affect the hypnotic and immobilizing actions of propofol and midazolam. Together, we conclude that ambient GABA concentration is an important determinant of hypnotic and immobilizing actions of propofol and midazolam, whereas manipulations of ambient GABA concentrations minimally alter cellular and behavioral responses to sevoflurane.

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S-419.

WITHDRAWN.

S-420.

WITHDRAWN.

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S-421.

WITHDRAWN.

S-422.

COCAINE IS PHARMACOLOGICALLY ACTIVE IN THE FETAL NON-HUMAN PRIMATE BRAIN

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INTRODUCTION: Brain function and potentially cognitive experiences of the fetus in utero are not well-understood and are likely (if at all) to occur only in the most mature third trimester fetal brain. Recently, discussion around the increase in fetal surgical procedures has raised the question of whether the fetus feels pain and the need for adequate analgesia at least in fetuses with maturing thalamocortical pain fibers (1). There is also serious lack of information in regards to whether drugs taken by the mother during pregnancy are pharmacologically active in the fetal brain and linked with behavioral or cognitive changes in the child later in life. For exmple, it is well known that cocaine use during pregnancy is deleterious to the newborn child in part via its disruption of placental blood flow. However the extent to which cocaine can affect the function of the fetal primate brain is still an unresolved question. Here we investigate the effect of maternal intake of cocaine on the non-human primate fetal brain function using positron emission tomography (PET) and 2-deoxy-2-[18F]fluoro-D-glucose for tracking of fetal brain glucose metabolism in utero.

METHODS: Twelve healthy pregnant macaca radiata and five healthy non-pregnant baboons were used in the study which was approved by the institutional animal use and care committee. All animals were anesthetized with propofol/remifentanil. Group 1 (n=8), pregnant control group; Group 2 (n=4), pregnant group, were exposed to cocaine 1mg/kg IV; Group 3, non-pregnant group (n=5) were tested with and without exposure to 1mg/kg IV cocaine.

RESULTS: In the pregnant non-human primates, cocaine 1mg/kg IV (dose typically used by drug abusers) significantly increased brain glucose metabolism to the same extent in the mother as in the fetus (~50%). We also show for the first time that cocaine's effects in brain glucose metabolism differed in pregnant and nonpregnant animals, which suggests that the psychoactive effects of cocaine are influenced by the state of pregnancy.

CONCLUSIONS: Inasmuch as brain glucose metabolism is a sensitive marker of brain function the current findings provide evidence that cocaine use by a pregnant mother will also affect the function of the fetal brain. Our findings have clinical implications for they suggest that the adverse effects of prenatal cocaine exposure to the newborn child include not only cocaine's deleterious effects to the placental circulation but also cocaine's direct pharmacological effect to the developing fetal brain.

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S-423.

PRAVASTATIN AT THE TIME OF REOXYGENATION INDUCED CARDIOPROTECTION MEDIATED BY NO SYNTHASE AND MITOCHONDRIAL PERMEABILITY TRANSITION PORE IN HUMAN MYOCARDIUM, IN VITRO

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INTRODUCTION: Reperfusion is a double-edged sword and can itself induce severe and also irreversible damage to the myocardium: the reperfusion injury. New therapeutic approach will need to be focused on limiting reperfusion-induced injury following an acute myocardial infarction resulting in increased salvage of ischemic myocardium, and subsequently improved mortality and morbidity (1). Statins have been reported to have pleiotropic effects on the cardiovascular system, beyond their ability to lower cholesterol (2). This present work investigated: a) the effect of pravastatin and simvastatin when administered at the point of reoxygenation following severe hypoxia using human atrial muscle taken from patients undergoing coronary artery bypass surgery and aortic valve replacement; b) the involvement of NO synthase and mitochondrial Permeability Transition Pore (mPTP) in pravastatin induced cardioprotection, in human myocardium, in vitro.

METHODS: After the approval of local medical ethics committee, human right atrial appendages were obtained during cannulation for cardiopulmonary bypass. The force of contraction (34°C, stimulation frequency 1 Hz) of right atrial trabeculae was recorded during 30-min hypoxia followed by 60-min reoxygenation (control group, n=10). In statins groups (n=6 in each group), after a 30-min hypoxic period, pravastatin (5µM, 10µM, 50µM, 75µM) and Simvastatin (1µM, 10µM, 100µM) were administered during the time of reoxygenation. In 2 additional groups, Pravastatin 50µM was administered in presence of 200µM L-NAME, a Nitric Oxyde Synthase inhibitor, and 50µM atractyloside, the mPTP opener. The endpoint of the study was the recovery of FoC at 60 min of reoxygenation (FoC60, expressed as percent of baseline) was compared (mean + Standard Deviation) between the groups by a variance analysis.

RESULTS: Pravastatin 5µM didn't modify the FoC60 as compared to control group (49+10 % of baseline; P>0.05 vs. Control). Pravastatin 10µM (FoC60: 77+5 % of baseline), 50µM (FoC60: 86+6 % of baseline) and 75µM (FoC60: 88+13 % of baseline) induced a significant increase of FoC60 as compared to control group (P<0.0001). In presence of L-NAME and Atractyloside the enhanced recovery of FoC60 induced by pravastation 50µM was abolished (51+6 % and 54+4 % of baseline; P<0.0001 vs. Pravastatin). L-NAME and Atractyloside alone (FoC60: 50+2 % and 54+8 % of baseline) did not modify the FoC60 as compared to control group (P>0.05 vs. Control). As compared to control group, simvastatin 1µM, 10µM and 100µM didn't modify the recovery of FoC60 (respectively FoC60: 58+9%, 54+10%, 56+9% of baseline; P>0.05 vs. Control).

DISCUSSION: However, simvastatin, unlike pravastatin, was not cardioprotective when administered at reperfusion. Our data demonstrate that pravastatin effect is dose-dependent, and it seems that optimal concentration range between 50 and 75µM. Moreover, pravastatin administered at reperfusion was cardioprotective through NOS activation, and inhibition of mPTP opening.

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S-424.

PROPOFOL INCREASES TAU PHOSPHORYLATION IN THE MOUSE HIPPOCAMPUS UNDER NORMOTHERMIC CONDITIONS

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INTRODUCTION: In Alzheimer's disease, tau protein, a microtubule (MT)-associated protein, can undergo aberrant hyperphosphorylation leading to the development of neurofibrillary pathology. Recent work has demonstrated that certain anesthetics can accelerate tau hyperphosphorylation in vivo,[1] and that these changes are dependent on the inhibition of protein phosphatase 2A (PP2A) activity by anesthesia-induced hypothermia. Nevertheless, more recent in vitro studies have demonstrated that propofol can hyperphosphorylate tau under normothermic conditions in vitro.[2] The purpose of this study was to examine tau phosphorylation following in vivo propofol administration under normothermic and hypothermic conditions.

METHODS: Following institutional animal care approval, male C57/BL6J mice (7-8 weeks old) received either propofol 250 mg/kg or intralipid 10 ml/kg i.p. (control, n = 8). The propofol-anesthetized mice were then placed either in a warmed incubator set to maintain normothermia (Prop-Norm, n = 10) or kept in their home cage to induce hypothermia (Prop-Hypo, n = 10). Thirty minutes after propofol or intralipid administration, hippocampal brain tissue was immediately harvested. Levels of total tau and tau phosphorylated at the AT8, CP13, and PHF-1 epitopes were determined using immunoblotting. Protein bands were visualized by enhanced chemoluminescence, and densitometric analysis was performed on scanned immunoblots using MultiGauge® image analysis software. Band immunoreactivity levels for all phosphoepitopes were normalized to total tau. Statistical comparisons were made using ANOVA with Newman-Keuls post-hoc test when appropriate or by using an unpaired t-test with Welch's correction. Data are expressed as mean ± SD and $P < 0.05$ was considered statistically significant.

RESULTS: Significant hypothermia occurred in Prop-Hypo following propofol anesthesia as the mouse rectal temperature decreased to 30.9 ± 1.0 °C versus 37.5 ± 0.4 and 37.5 ± 0.6 °C in the control and Prop-Norm groups, respectively. As expected, propofol-induced hypothermia produced a significant increase in tau phosphorylation at the AT8, CP13, and PHF-1 epitopes (Figs. 1A,C,E). However, significant tau hyperphosphorylation at the AT8, CP13, and PHF-1 was also observed in the Prop-Norm group: 282.9 ± 134.7, 199.6 ± 50.8, and 195.5 ± 43.7% of control, respectively (Figs. 1B,D,F). There were no significant changes in total tau in the propofol-treated groups versus control (Figs. 1G,H).

DISCUSSION: These data suggest that propofol produces tau hyperphosphorylation in vivo via a mechanism that does not involve the inhibition of PP2A activity by anesthetic-induced hypothermia. Further studies examining the mechanism(s) underlying tau hyperphosphorylation under normothermic conditions as well as the neuropathological consequences of this direct propofol effect are warranted.

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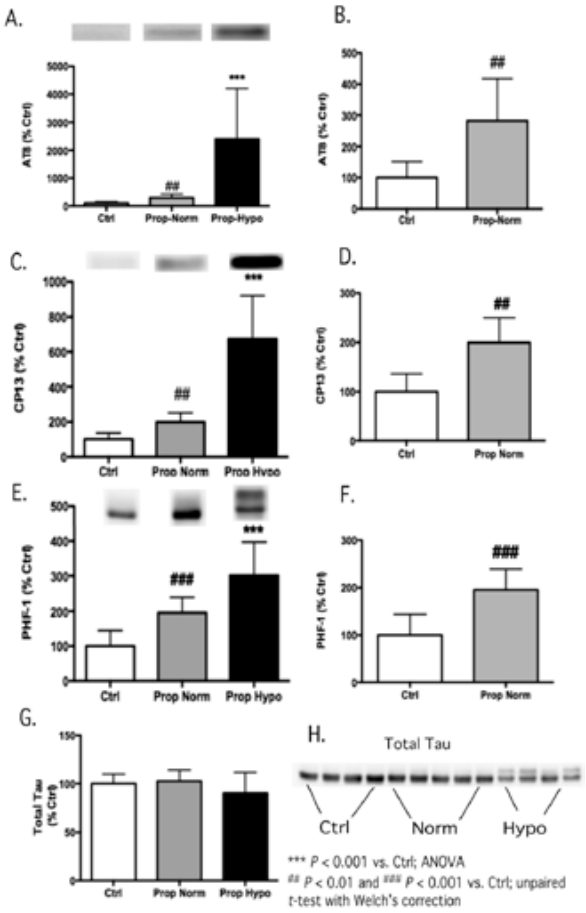

S-425.

LOCALIZED IMMUNE SUPPRESSION PROVIDES NEUROPROTECTION IN A MOUSE MODEL OF SURGICAL BRAIN INJURY

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INTRODUCTION: Surgical resection of intra-axial lesions causes brain damage from cortical incisions, intraoperative hemorrhage, retraction, and electrocautery.[1] These injuries, collectively referred to as surgical brain injury (SBI), are attributable to operation (Figure 1).[2] Inflammation following SBI contributes to blood brain barrier (BBB) disruption, increased brain edema, and neuronal damage.[3] T-cells can be developed that are immunologically tolerant to brain antigen via the exposure of myelin basic protein (MBP) to airway mucosa.[4] These T-cells travel to the surgical site following BBB disruption and secrete immunosuppressive cytokines, such as TGFβ15. Hypothesis: this treatment alters immune responses to brain antigens following SBI, reduces brain edema, and improves neurological outcomes. This treatment modality could reduce inflammation at the site of injury with potentially fewer side effects compared to systemic immunosuppression.

METHODS: A standard model for SBI and sham SBI was used1. C57 mice were divided into 6 groups: SHAM+Vehicle (Phospate buffer solution)(12), SHAM+OVA(Ovalbumin)(12), SHAM+MBP(12), SBI+Vehicle (11), SBI+OVA (14), and SBI+MBP (14). Treatments were nasally administered over 10 days prior to SBI. Neurological scores, brain water and TGFβ1 levels were measured 48h post-operatively. Antigen sensitivity testing was performed on 18 mice (6 Vehicle, 6 OVA, 6 SBI) by measuring footpad thickness after local MBP injection following pretreatment regimes.

RESULTS: All SBI mice demonstrated a reduction in neurological score versus SHAM groups at 24h and 48h ($p<0.05$). MBP-tolerized animals had a trend for increased neurological scores at 24h versus PBS and OVA groups, which reached statistical significance at 48h ($p<0.05$). SBI increased brain water content in the right frontal lobe surrounding the resection site at 48h in all SBI groups versus SHAM groups ($p<0.05$). MBP-tolerized groups had less post-operative edema compared to vehicle or OVA groups ($p<0.05$). Western blot analysis showed SBI decreased expression of TGFβ1 in PBS and OVA treated groups ($p<0.05$), while MBP-tolerized animals preserved pre-operative levels. Right foot thickness 48h following immune challenge with MBP demonstrated attenuated inflammatory reactions to MBP in MBP-tolerized compared to Vehicle and OVA treated ($p<0.05$) mice.

DISCUSSION: Exposure of MBP to mucosal surfaces preserved endogenous TGFβ1 levels in brain following SBI, presumably through the presence of TGFβ1 secreting T-cells recruited to the injury site through the inherent inflammatory response.[5] Local inflammation inhibition by TGFβ1 is non-specific, inhibiting all effectors of cell mediated immunity within the vicinity of the secreting cell. While systemic anti-inflammatory agents are limited by side effects, CNS inflammation was limited in a site-specific manner through the induction of tolerance to MBP. This induction leads to significant improvement in neurological outcome and reduced postoperative brain edema versus controls.

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Figure 1: Right Frontal Lobe Resection for SBI Model

S-426.

INHIBITION OF THE NEUROTRANSMITTER RELEASE MACHINERY IN RAT CHROMAFFIN/PC12 CELLS AND HIPPOCAMPAL NEURONS BY PROPOFOL VIA A POSSIBLE INTERACTION WITH SYNTAXIN 1A

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INTRODUCTION: The mechanism of action of general anesthetics is only partially understood. Facilitation of inhibitory $GABA_A$ receptors plays an important role in the action of most anesthetics, but this mechanism is thought to be especially relevant in the case of intravenous anesthetics. In addition to its effect on $GABA_A$ receptors, propofol, an intravenous anesthetic, is known to affect other receptors and ion channels in a dose-dependent manner. More recent evidence suggests that propofol may inhibit excitatory synaptic transmission via a presynaptic mechanism(s), but it has been difficult to determine whether propofol acts on the neurotransmitter release machinery itself. We previously found that the commonly used inhalational anesthetic, isoflurane, dose-dependently inhibited the neurotransmitter release machinery in neurosecretory cells and in cultured hippocampal neurons. We also found that the overexpression of a C-terminal truncated form of syntaxin 1A, named md130A, completely blocked the effects of isoflurane on the neurotransmitter release machinery; this result suggested that syntaxin 1A was a key mediator of the response to isoflurane. In the present study we sought to determine whether propofol also inhibits the neurotransmitter release machinery.

METHODS: Two experimental protocols were used to stimulate neurotransmitter release while bypassing confounding anesthetics effects on channels and receptors. In protocol 1, chromaffin/PC12 cells were permeabilized by digitonin and then exposed to a known concentration of Ca^{2+}. Amperometry was used to measure transmitter release from these cells in the presence and absence of propofol (0.5 to 10 μM). In protocol 2, optical measurement of evoked RH414 release by ionomycin in hippocampal neurons were performed in the presence and absence of propofol. Finally, similar experiments in protocol 1 were performed in PC-12 cells which were transfected with the syntaxin 1A mutant, md130A.

RESULTS: Clinically relevant concentrations of propofol inhibit the neurotransmitter release from digitonin permeablized cells in a dose-dependent manner. Propofol also significantly inhibited neurotransmitter release in hippocampal neurons. Together these results suggest that a SNARE and/or SNARE-associated protein represent important target(s) for propofol. Furthermore, overexpression of a mutant syntaxin 1A completely eliminated the reduction in neurotransmitter release produced by propofol, without affecting release, thereby raising the possibility that syntaxin 1A is a key intermediary in both isoflurane's and propofol's ability to inhibit the neurotransmitter release machinery.

CONCLUSIONS: Propofol-induced inhibition of the neurotransmitter release machinery likely contributes to reduced neurotransmitter release within the CNS and which may be relevant to the anesthetized state.

This study was supported by NIH, FAER and BRF grants.

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S-427.

PROPOFOL AND MELATONIN: IN VIVO AND IN VITRO APPROACHES ON THE EFFECTS OF PROPOFOL ON ENDOGENOUS MELATONIN IN RODENTS

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INTRODUCTION: It was previously demonstrated that general propofol anesthesia disturbs the circadian time structure in rodents by altering the circadian rhythms of body core temperature, rest-activity and corticosterone rhythms (1,2,3). Melatonin is one of the most important hormones involved in the circadian organization of the body. Yet, it is unclear if anesthesia itself disturbs melatonin secretion (independently of surgery) (1). We examined the effects of propofol both in vivo on peripheral melatonin release and in vitro on activity of N-acetyltransferase (NAT), a key enzyme in melatonin synthesis, and melatonin release in cultured pinealocytes.

METHODS: In vivo experiments: rats were exposed to 12h light/12h dark alteration conditions and anesthetized with propofol (120 mg/kg intraperitoneally) around their peak of melatonin secretion (Zeitgeber time 16). Trunk blood samples were collected at 7 subsequent Zeitgeber times to assess the effects of propofol on circadian melatonin secretion. In vitro experiments: dissociated rat pinealocytes were incubated with propofol (0, 10-6, 10-7 M) and the beta-adrenergic agonist isoproterenol (3 10-6 M). After 5 hour of incubation NAT activity in the pinealocytes and melatonin released in the culture medium were determined.

RESULTS: In vivo, propofol modifies the peripheral melatonin by significantly decreasing its concentration (about 22-28%) during the immediate three hours following the wake up from anesthesia and then significantly increasing melatonin secretion 20 h after anesthesia (about 38%). Cosinor analysis suggests that propofol could induce a phase advance of the circadian secretion of peripheral melatonin. In vitro, propofol has no effect per se, but induces a significant decrease in isoproterenol-induced NAT activation, however with no effect on melatonin release.

CONCLUSIONS: Propofol anesthesia per se disturbs the circadian rhythm of peripheral melatonin. These results parallel the desynchronization of other circadian markers previously observed after anesthesia. In vitro results suggest that propofol might disturb some of the biochemical mechanisms involved in the synthesis of melatonin by pinealocytes.

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S-428.

THE SYNERGISTIC ANTINOCICEPTIVE INTERACTION BETWEEN ADRENALINE AND DEXMEDETOMIDINE AFFECTING THE LOCAL ANESTHETIC ACTION OF LIDOCAINE IN GUINEA PIGS

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INTRODUCTION: Adrenaline (AD) is administered in combination with local anesthetics as a commonly used adjunct in dentistry to prolong the duration of peripheral nerve block and decrease blood loss during dental surgery. However, AD elicits side effects in some patients with heart diseases and has adverse interactions with some drugs, leading to the risk of AD being debated for a decade in dentistry, but its safety has been not fully established. Recently, we reported that dexmedetomidine (DEX), highly specific to alpha-2 adrenoceptors, enhances the local anesthetic action of lidocaine (1). We hypothesized that the combination of AD and DEX might reduce the required dosage of AD and, therefore, lower the risk. Thus, the purpose of the present study was to evaluate the interaction regarding the local anesthetic action between AD and DEX in guinea pigs using isobolographic analysis.

METHODS: We studied eight male Hartley guinea pigs. AD and DEX, combined with 0.5% lidocaine, were intracutaneously injected into 5 respective areas of the back of the same guinea pig at intervals of one minute, randomly and blindly. The six pin prick test was applied every 5 minutes until 60 minutes after injection. The number of times that a pin prick failed to elicit a response during the 60 minute period was summed, and the total (maximum value: 72) served as an anesthetic score, indicating the degree of local anesthesia. Differences from the control value within the group were analyzed using analysis of variance followed by a post-hoc Dunnnet's test. The effects of the combination were tested by isobolographic analysis using a 50% effective dose (ED50). Fractional value (γ) was calculated as [ED50 dose of AD in combination] / [ED50 dose of AD alone] + [ED50 dose of DEX in combination] / [ED50 dose of DEX alone].

RESULTS: Both AD and DEX, combined with 0.5% lidocaine, independently increased the duration and degree of the local anesthetic action of lidocaine in a dose-dependent manner. The ED50 values of AD and DEX were 5.91×10-6M and 7.83×10-8M, respectively. Theoretical and experimental ED50 values for the combination of AD and DEX are shown in Table 1. The ED50 value of the combination was significantly lower than the calculated additive value. The isobologram of the combination of AD and DEX showed a total fractional dose value (γ) of less than 1, identifying a synergistic interaction between them.

CONCLUSION: We demonstrated that the combination of AD and DEX exhibits a synergistic antinociceptive effect in guinea pigs. This finding suggests that this combination can lower the dose requirement of AD and DEX, reducing the incidence of side effects caused by not only AD but also DEX.

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Table 1

	ED50 theoretical	ED50 experimental	γ
DEX in combination	3.92×10-8M	1.13×10-8M	0.266
AD in combination	2.96×10-6M	7.88×10-7M	

S-429.

ISOFLURANE POTENTIATES THE CYTOTOXICITY OF HUMAN BETA-AMYLOID AND POLYGLUTAMINE IN C. ELEGANS

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INTRODUCTION: A number of rodent studies have shown that clinical concentrations of volatile anesthetics (VAs) have the capacity to produce cytotoxicity [1]. Most studies have observed evidence of apoptosis after anesthetic exposure [2, 3]. VAs have also been shown to enhance oligomerization of β-amyoid, and this effect has been proposed as a primary mechanism for toxicity of neurons in older animals [4]. The mechanisms whereby VAs induce apoptosis and enhance β-amyloid oligomerization are unclear. Utilizing existing C. elegans strains, we present here a new model to study VA-induced cytotoxicity.

METHODS: CL2006 contains chromosomally integrated plasmid DNA encoding the human β-amyloid1-42 peptide expressed with a muscle specific promoter[5]. AM141 contains chromosomally integrated plasmid DNA that expresses a 40 residue polyglutamine peptide fused to YFP (PolyQ40::YFP). AM134 contains a chromosomally integrated plasmid DNA that expresses a linker peptide with no polyglutamines fused to YFP (PolyQ0::YFP)[6]. Locomotion rates were measured by assays previously described with an observer blinded to the experimental group. Polyglutamine aggregates were counted using a dissecting fluorescent microscope by an blinded observer. Group comparisons were by two-tailed t-test. A p-value of < 0.01 was considered significant.

RESULTS: CL2006, the β-amyloid1-42 containing strain, exhibited an age-progressive paralysis as previously reported. Exposure to 16 hours of 0.39 mM isoflurane and higher concentrations significantly enhanced the age-dependent paralysis with delayed onset after an initially full recovery. No paralysis was seen in wild type animals. 16 hours of 0.5 mM isoflurane produced a transient (one day later only) but significant increase in PolyQ40 aggregate number. An 8 or 16 hour exposure to 0.2 mM and higher isoflurane concentrations produced significant and persistent reductions in speed of movement of PolyQ40 animals with a delayed onset. There was no effect on PolyQ0 control animals.

DISCUSSION: Isoflurane at clinical concentrations can increase cytotoxicity as measured by delayed behavioral deficits of both human-β-amyloid1-42 and polyglutamine peptides. Isoflurane also enhances polyQ aggregation at high clinical concentrations. We speculate that isoflurane may enhance toxicity of aggregation prone proteins by increasing protein misfolding.

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S-430.

LITHIUM IMPROVES THE SPATIAL MEMORY IN AGED RATS POSTOPERATIVELY BY PHOSPHORYLATING GSK-3β AND DECREASING IL-1ß IN THE HIPPOCAMPUS

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INTRODUCTION: Surgery and anesthesia can cause postoperative cognitive dysfunction (POCD); however mechanisms underlying POCD are still unclear. Increasing evidence supports that neuroinflammation in the brain impairs cognitive function, and pro-inflammatory IL-1β plays a role in this process[1]. Recently, glycogen synthase kinase -3β (GSK-3β) has been shown to mediate the neuroinflammatory response, and GSK-3 inhibitors including lithium, have anti-inflammatory properties[2-3] . The present study aimed to investigate the effects of treatment with lithium chloride on the expression of IL-1β and the activity of GSK-3β in the hippocampus, as well as the cognitive function in aged rats after exploratory laparotomy.

METHODS: Forty-eight male SD rats, aged 18 month, were divided into three groups randomly (n=16 each): control group (C), operation group (O) and lithium chloride pretreatment group (L). The rats in group L were injected with 2mmol/kg lithium chloride peritoneally once a day for seven days, while the rats in the other two groups were injected with same volume of normal saline. All rats were established exploratory laparotomy model on the eighth day, except for group C, in which no surgery was performed. 24h after surgery, the rats' spatial memory was evaluated by Morris Water Maze, and the contents of IL-1β or GSK-3β in rats' hippocampuses were measured by ELISA and western blotting.

RESULT: The latency and swimming distance were both significantly prolonged postoperatively in group O (69.35±9.13 s. and 6560.94±877.00 mm) compared with group C (35.10±8.99 s, and 3845.07±563.13 mm, $p<0.05$); these changes were markedly reduced in group L (52.06±8.63 s. and 4153.83±414.60 mm, $P<0.05$, respectively). In addition, IL-1β expression increased while phospho-GSK-3β (ser9) decreased in hippocampus in group O vs. group C ($P<0.05$) but lithium treatment reversed these changes as showed in group L ($p<0.05$, respectively). The differences of GSK-3β expression were not significant among three groups postoperatively ($P>0.05$)

CONCLUSION: In aged rats, the cognitive function was impaired significantly after exploratory laparotomy, which was associated with the increase of IL-1β and the decrease of phospho-GSK-3β (ser9) in hippocampus. However, lithium pretreatment could reverse these changes markedly, indicating that lithium has potential protection against POCD in aged animals through reducing central inflammation reaction and phosphorylating GSK-3β in the brain.

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S-431.

REGULATION OF MITOCHONDRIAL KATP CHANNELS BY FLUOXETINE IN RATS: IMPLICATIONS FOR CARDIAC ISCHEMIC PRECONDITIONING.

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INTRODUCTION: The mitochondrial ATP sensitive potassium channel (mKATP) is implicated in cardioprotection by ischemic preconditioning (IPC)1,2, but its molecular identity is controversial. We applied pharmacological manipulations and novel assays to isolated mitochondria and perfused hearts, to interrogate the identity of the K+ channel-forming component of mKATP. In addition, the antidepressant fluoxetine (FLX, Prozac™) is known to regulate K+ channels, and so its effects on mKATP activity and IPC were investigated.

METHODS: Cardiac mitochondria were rapidly isolated from male Sprague-Dawley rat hearts by differential centrifugation. Using a thallium (Tl+) sensitive fluorophore, we developed a novel Tl+ flux based assay for mKATP channel activity. Rat hearts were also perfused in Langendorff mode. Following 20 min. equilibration, hearts were divided into 5 groups: (i) Vehicle + ischemia-reperfusion (IR), comprising 20 min. vehicle infusion, 25 min. global ischemia, 120 min. reperfusion; (ii) FLX + IR, comprising 20 min. FLX infusion (5 µM), 30 s. wash-out, then IR; (iii) IPC + IR, comprising 3 x 5 min. ischemia interspersed with 5 min. reperfusion, then IR; (iv) FLX + IPC + IR, comprising 5 min. FLX infusion (5 µM), plus FLX infused during the 3 reperfusion phases of IPC, 30 s. wash-out, then IR; (v) Zimelidine (ZM) + IPC + IR. As above, replacing FLX with ZM (5 µM). Following reperfusion hearts were TTC stained, imaged, and infarcts quantified.

RESULTS: Four key observations were: (i) The IC50 for ATP-dependent mKATP channel inhibition was 4.5 µmol/L. (ii) The EC50 for UDP-dependent mKATP channel opening was 20 µmol/L. (iii) mKATP activity rapidly degraded with time, and this channel "run-down" was reversed by phosphatidylinositol-4,5-bisphosphate (PIP2). (iv) FLX both inhibited mKATP and blocked IPC-mediated cardioprotection. The related antidepressant ZM was without effect on either mKATP or IPC.

DISCUSSION: The Tl+ flux mKATP assay was validated by correlation with a classical mKATP channel osmotic swelling assay (R2 0.855). The pharmacologic profile of mKATP (response to ATP, UDP, PIP2, and FLX) is consistent with that of a bona fide inward rectifying K+ channel, likely Kir6.2. The discovery that FLX blocks IPC mediated cardioprotection is consistent with both its effect on mKATP, and a critical role for mKATP in IPC.1,3,4. The results have important clinical implications, i.e. an antidepressant widely prescribed to patients suffering from acute coronary syndrome5 blocks cardioprotection by IPC.

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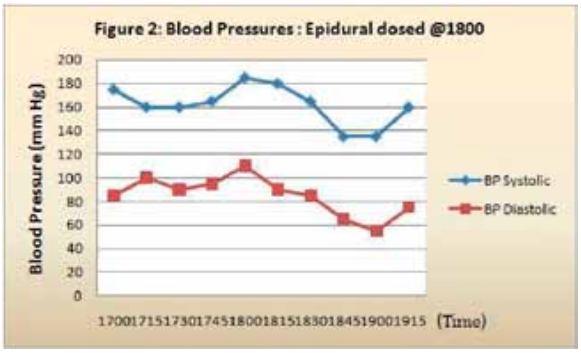

DISCUSSION: PPCM is a condition of unknown cause that occurs in previously healthy women during the last trimester of pregnancy and up to five months after delivery (1). Diagnosis of PPCM should be considered when a parturient presents with symptoms of heart failure including dyspnea, fatigue and pedal edema (3). PPCM with gestational hypertension should raise the level of suspicion in patients with these conditions (2). The goal in PPCM management is to reduce preload and afterload (4). A regional anesthetic was chosen as the platelet count was normal. We chose epidural rather than subarachnoid anesthesia to allow gradual administration of local anesthetic. Sudden sympathectomy may cause life threatening hypotension and compromise fetal oxygen supply. Gradually unloading the heart reduced preload and improved cardiac output, allowing symptom resolution.

Invasive monitoring was used to guide and assess improvement in the patient's condition and determine if volume overload developed after delivery when uterine autotransfusion occurs. It is notable that when the anesthesiologist is confronted with a patient having severe comorbidities, we must keep in mind a well controlled anesthetic can be performed safely.

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S-432.

EFFECT OF DEXMEDETOMIDINE ON CHRONIC INTRATHECAL MORPHINE-INDUCED TOLERANCE AND SPINAL GRANULOMA FORMATION IN RATS

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INTRODUCTION: Spinal opioid exert marked inhibitory effect on spinal neurotransmission. Recently patients with chronic pain have benefited from intrathecal (IT) morphine therapy. However, it has been shown that chronic IT administration of morphine results in tolerance and intradural granulation tissue. IT administration of alpha 2 agonists can produce a potent analgesia though the activation of the spinal receptor. Some reports have shown that alpha 2 agonists suppress the development of tolerance to morphine analgesia and dexmedetomidine (DEX) has neuroprotective effects. We have shown that chronic IT morphine induces development of tolerance and in granuloma formation followed by motor impairment in rats. In the present study, we aimed to investigate whether IT DEX suppresses the development of tolerance and the granuloma formation induced by the chronic IT morphine.

METHODS: Male SD rats (300-350 g) were implanted with IT catheters connected to osmotic mini-pumps to receive IT DEX (2.5, 5, 10 nmol/hr), IT morphine (40 nmol/hr), IT saline or IT DEX + IT morphine (40 nmol/hr) for 13 days. To determine the development of tolerance and the motor impairment, thermal escape and behavior were evaluated on days 0-13.

On day 13, animals were perfusion-fixed and the spinal cords were harvested for pathology.

RESULTS: IT morphine and IT DEX infusion for 1 day produced analgesic effect. After 3-5 days of morphine and DEX infusion, thermal escape latencies were the same as in pre-infusion animals or saline-infused controls. Analgesic doses of IT morphine and IT DEX infusion (5, 10 nmol/hr) produce tolerance. Co-administration of analgesic doses of IT morphine (40 nmol/hr) and low doses of IT DEX (2.5 nmol/hr) had significant analgesia without tolerance for 13days. Though motor impairment was appeared gradually after IT morphine infusion, there were no changes in DEX infusion animals. Severe impression of the spinal cord along the course of the catheter indicating granuloma formation with inflammatory cells could be seen in morphine infusion animals but not in saline and DEX infusion animals. Motor impairment in IT morphine infusion may result from compression of spinal cord due to granuloma.

The granuloma formation followed by motor impairment was not shown by co-administration of analgesic doses of IT morphine and low dose of IT DEX.

DISCUSSION: These results suggest that low dose of IT DEX prevent chronic IT morphine infusion-induced tolerance and granuloma formation followed by motor impairment. DEX may have not only neuroprotective but also anti-inflammatory effects. Co-administration of IT morphine and IT DEX may be effective treatment for patients with chronic pain. In conclusion, development of tolerance and granuloma formation followed by motor impairment induced by chronic IT morphine were inhibited by addition of DEX.

S-433.

WITHDRAWN.

Pharmacology – Clinical

S-434.

THE EFFECT OF LANDIOLOL, ULTRA-SHORT ACTING BETA-BLOCKER, ON ONSET TIME OF ROCURONIUM

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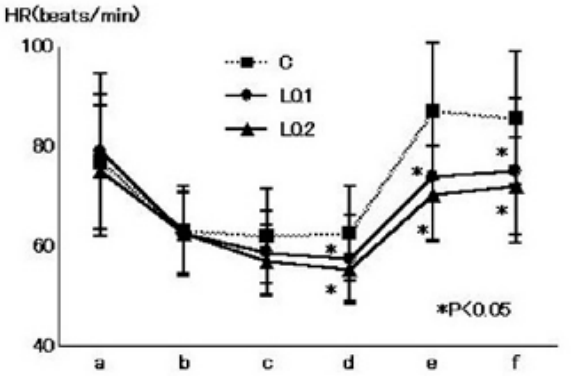
Introduction: The speed of onset of neuromuscular blockade depends in part on physiological factors such as cardiac output, circulation time and muscle perfusion. It has been reported that the onset time of rocuronium was longer after administration of esmolol. The purpose of this study was to evaluate effect of landiolol on onset time of rocuronium.

METHODS: We studied 90 ASA physical status 1and 2 patients, aged 20-70 yr. Patients were randomly assigned to receive either 0.1mg/kg of landiolol (L0.1; n=30), 0.2mg/kg of landiolol (L0.2; n=30), or a saline placebo (C; n=30). Anesthesia was induced with propofol (1-2mg/kg) and fentanyl (1-3μg/kg), and maintained with propofol (4-10mg/kg/hr). One minute after the study drug were given, rocuronium (0.6mg/kg) was administered to all patients. The neuromuscular blockade monitoring was started before the administration of the study drug by using TOF Watch SXTM of the adductor pollicis muscle in response to train-of-four (TOF) stimulation. Onset time of rocuronium was defined as the time from the end of injection of rocuronium to maximum depression of TOF stimulation. When maximum depression of TOF was observed, the tracheal intubation was performed. ANOVA followed by Dunnett's procedure was used for statistical analysis. *P<0.05 was considered statistically significant for control.

RESULTS: Heart rate was significantly decreased in group L0.1 and L0.2 (57.3±8.6*, 55.2±7.1* beats/min, respectively) compared with group C (62.5±9.5 beats/min) before tracheal intubation and also 1min after tracheal intubation (Figure). However, blood pressures were no differences in three groups. The onset time was 83.1±28.7sec , 94.6±49.0 and 99.2±44.8 for C, L0.1 and L0.2, respectively.

DISCUSSION: In this study, sufficient doses of landiolol were administrated to attenuate tachycardia in response to tracheal intubation. Landiolol has a less potent negative inotropic effect than esmolol at equipotent chronotropic doses, therefore reduction in cardiac output was minimal and onset time tended to be longer but not significant.



a: before induction, b: before injection of landiolol, c: before injection of rocuronium, d: before intubation, e: 1min after intubation, f: 2min after intubation

S-435.

COMPARING THE RELATIVE EFFICACY OF SEDATION REGIMENS WITH AND WITHOUT DEXMEDETOMIDINE FOR AWAKE FIBEROPTIC INTUBATIONS: A RANDOMIZED, DOUBLE-BLINDED, PROSPECTIVE STUDY

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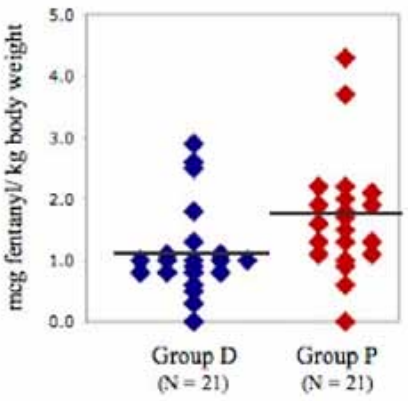
BACKGROUND: The challenge of awake fibertopic intubation is achieving patient comfort and sedation while maintaining spontaneous ventilation and airway patency. Current methods to balance these objectives are incomplete, as the combination of midazolam and fentany[1] depresses respiratory drive and increases the risks of hypoxemia and apnea.1 The highly selective alpha-2 adrenergic agonist dexmedetomidine has been used clinically for its sedative and analgesic properties and has been demonstrated to be a safe agent for use in awake fiberoptic intubations[2] The purpose of this study was to evaluate the effects of adjunct dexmedetomidine infusion on fentanyl dose requirements and hemodynamic stability during awake fiberoptic intubation.

METHODS: Forty-two ASA II - IV, narcotic-naive patients who were scheduled for general anesthesia and required awake fiberoptic intubation were randomized into two groups: Group D (dexmedetomidine, N = 21) and Group P (placebo, N = 21). Patients were premedicated with anti-emetics, 0.2 mg glycopyrrolate, and 1-2 mg midazolam and infused with 4 mcg · mL-1 dexmedetomidine or 0.9% saline at 0.7 mcg · kg-1 · hr-1 at least 10 minutes prior to intubation. Patients' airways were topically anesthetized with lidocaine, and fentanyl was titrated in 50 mcg aliquots to reach the desired level of sedation. Oxygen was delivered at 3 L · min-1 via nasal cannulae. Hemodynamic parameters were recorded at one-minute intervals.

RESULTS: There were no inter-group differences in patients' age, gender, BMI, Mallampati class, or baseline hemodynamic values. The average infusion time was 25 ± 8 minutes, and the difference between Group D and Group P infusion times was not significant ($p < 0.67$). Patients in Group D required 32% less fentanyl per kilogram of body weight (1.21 ± 0.77 mcg · kg-1) than patients in Group P (1.78 ± 0.99 mcg · kg-1) [Fig. 1, $p < 0.5$]. Patients infused with dexmedetomidine for 23 minutes or more required less fentanyl per kilogram of body weight than patients infused with dexmedetomidine for fewer than 23 minutes, but this difference did not quite reach statistical significance ($p < 0.06$). In both study groups systolic blood pressure, mean arterial pressure, and heart rate increased during preparation for intubation; dexmedetomidine attenuated these increases, and the difference was significant for heart rate ($p < 0.05$).



S-435.

COMPARING THE RELATIVE EFFICACY OF SEDATION REGIMENS WITH AND WITHOUT DEXMEDETOMIDINE FOR AWAKE FIBEROPTIC INTUBATIONS: A RANDOMIZED, DOUBLE-BLINDED, PROSPECTIVE STUDY

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BACKGROUND: The challenge of awake fibertopic intubation is achieving patient comfort and sedation while maintaining spontaneous ventilation and airway patency. Current methods to balance these objectives are incomplete, as the combination of midazolam and fentany[l] depresses respiratory drive and increases the risks of hypoxemia and apnea.1 The highly selective alpha-2 adrenergic agonist dexmedetomidine has been used clinically for its sedative and analgesic properties and has been demonstrated to be a safe agent for use in awake fiberoptic intubations[2] The purpose of this study was to evaluate the effects of adjunct dexmedetomidine infusion on fentanyl dose requirements and hemodynamic stability during awake fiberoptic intubation.

METHODS: Forty-two ASA II - IV, narcotic-naive patients who were scheduled for general anesthesia and required awake fiberoptic intubation were randomized into two groups: Group D (dexmedetomidine, N = 21) and Group P (placebo, N = 21). Patients were premedicated with anti-emetics, 0.2 mg glycopyrrolate, and 1-2 mg midazolam and infused with 4 mcg · mL-1 dexmedetomidine or 0.9% saline at 0.7 mcg · kg-1 · hr-1 at least 10 minutes prior to intubation. Patients' airways were topically anesthetized with lidocaine, and fentanyl was titrated in 50 mcg aliquots to reach the desired level of sedation. Oxygen was delivered at 3 L · min-1 via nasal cannulae. Hemodynamic parameters were recorded at one-minute intervals.

RESULTS: There were no inter-group differences in patients' age, gender, BMI, Mallampati class, or baseline hemodynamic values. The average infusion time was 25 ± 8 minutes, and the difference between Group D and Group P infusion times was not significant ($p < 0.67$). Patients in Group D required 32% less fentanyl per kilogram of body weight (1.21 ± 0.77 mcg · kg-1) than patients in Group P (1.78 ± 0.99 mcg · kg-1) [Fig. 1, $p < 0.5$]. Patients infused with dexmedetomidine for 23 minutes or more required less fentanyl per kilogram of body weight than patients infused with dexmedetomidine for fewer than 23 minutes, but this difference did not quite reach statistical significance ($p < 0.06$). In both study groups systolic blood pressure, mean arterial pressure, and heart rate increased during preparation for intubation; dexmedetomidine attenuated these increases, and the difference was significant for heart rate ($p < 0.05$).

DISCUSSION: Preoperative infusion of dexmedetomidine at 0.7 mcg · kg-1 · hr-1 for awake fiberoptic intubation reduced fentanyl dose requirements, limiting the risks of hypoxemia and apnea that may result from combining fentanyl and midazolam. Dexmedetomidine also demonstrated a protective hemodynamic effect on heart rate.

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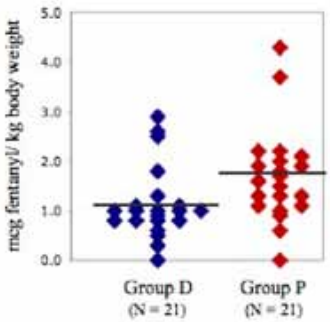

S-436.

A COMPARISON OF THE COMBINATION OF APREPITANT AND DEXAMETHASONE VERSUS THE COMBINATION OF ONDANSETRON AND DEXAMETHASONE FOR THE PREVENTION OF POSTOPERATIVE NAUSEA AND VOMITING IN PATIENTS UNDERGOING CRANIOTOMY

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INTRODUCTION: Postoperative nausea and vomiting (PONV) occur commonly after craniotomy. In patients receiving prophylaxis with ondansetron and dexamethasone, vomiting occurred in 45 % of patients at 48 h (1). Aprepitant is a NK-1 receptor antagonist with a long duration of action and no sedative side effect that was previously reported to be significantly more effective than ondansetron in preventing vomiting at both 24 and 48 hours after abdominal surgery (2). We hypothesized that the combination of aprepitant with dexamethasone will lower the incidence of PONV when compared with the combination of ondansetron and dexamethasone in patients undergoing craniotomy under general anesthesia.

METHODS: After IRB approval and written informed consent, patients scheduled to undergo craniotomy under general anesthesia were enrolled in this prospective, double blind, randomized study. Patients were randomized to receive oral aprepitant 40 mg (or matching placebo) 1-3 hours before induction of anesthesia or ondansetron 4 mg IV (or placebo) within 30 minutes of end of surgery. All patients received dexamethasone 10 mg after induction of anesthesia. Randomization was stratified by type of craniotomy (supratentorial versus infratentorial). The anesthetic technique was standardized. Data were collected at regular intervals for 48 h after surgery. Analysis was performed using wilcoxon rank sum test and pearson chi square test. $P < 0.05$ was accepted as statistically significant.

RESULTS: 104 patients completed the study. There was no difference in patient demographics, or duration of surgery between the two groups (Table). Cumulative incidence of vomiting at 48 h was 42 % in the ondansetron group and 33 % in the aprepitant group (p=0.42). Complete response at 48 h (no vomiting, no more than mild nausea, and no need for rescue antiemetics) was 34 % in the ondansetron group and 24 % in the aprepitant group (p=0.28). Nausea occurred in 62 % of patients in the ondansetron group and 71 % of patients in the aprepitant group (p=0.41). Rescue antiemetics were given to 66 % and 65 % of patients in the ondansetron and aprepitant groups respectively (p=1).

DISCUSSION: The incidence of PONV is high in patients undergoing craniotomy under general anesthesia despite double combination antiemetic therapy. While there was no statistically significant difference in antiemetic efficacy between the two combinations, the incidence of no vomiting was numerically higher with aprepitant and that of no nausea was numerically higher with ondansetron. Combination of the two agents might therefore offer enhanced antiemetic prophylaxis against both nausea and vomiting. Future studies should explore more aggressive antiemetic prophylaxis including triple agents or a multimodal approach in this high-risk population.

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Table: Patient demographics and risk factors for PONV

	Aprepitant (n=51)	Ondansetron (n=53)
Age, yrs	51 ± 13	48 ±13
Body Mass Index	28 ± 6	29 ± 6
Female	27 (53)	34 (64)
History of PONV	10 (20)	15 (28)
History of Motion Sickness	14 (28)	12 (23)
Non-smoker	47 (92)	50 (94)
Supratentorial craniotomy	28 (55)	31 (59)
Duration of Surgery, min	189 ± 85	189 ± 83

Data are mean +/- SD or n (%)

S-437.

COMPARISON OF PREVENTION EFFECT OF LIDOCAINE PRETREATMENT ON PAIN AND WITHDRAWL ASSOCIATED WITH INJECTION OF MICROEMULSION PROPOFOL

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INTRODUCTION: A newly developed microemulsion propofol consisted of 10% purified poloxamer 188 and 0.7% polyethylene glycol 660 hydroxystearate.1) I.V. microemulsion propofol produces intense discomfort at the site of injection2), so some trials have been conducted on prevention of pain induced by I.V. microemulsion propofol. This study evaluate whether venous retention induced by squeezing forearm with a tourniquet, affects lidocaine efficacy.

METHODS: Eighty patients, ASA physical status 1-2 undergoing general anesthesia for elective surgery were randomly enrolled. One group received lidocaine (0.5 mg/kg) and the other forearm was squeezed with tourniquet keeping the lidocaine (0.5 mg/kg) within the vein. After 30, 60 seconds microemulsion propofol (2 mg/kg) was injected.

RESULTS: There was statistical difference in reduction pain and withdrawal among groups. Squeezing group showed less pain and withdrawal than no squeezing group.

Table 1. Pain after injection of microemulsion propofol

Group	None	Mild	Moderat	Severe	Overall incidence
1 (n=20)	6(30%)	8(40%)	5 (25%)	1 (5%)	14 (70%)
2 (n=20)	14 (70%)	4 (20%)	2 (10%)	0 (0%)	6 (30%)*
3 (n=20)	1 (5%)	11 (55%)	5 (25%)	3 (15%)	19 (95%)
4 (n=20)	16 (80%)	4 (20%)	0 (0%)	0 (0%)	4 (20%)*

Values are number of patients. *: $P < 0.05$ compared with group 3. Group 1: patients received lidocaine 0.5 mg/kg 30 seconds before and microemulsion propofol 2 mg/kg injected, Group 2: forearm was squeezed with a torniquet up to 70 mmHg, patients received lidocaine 0.5 mg/kg 30 seconds before and microemulsion propofol 2 mg/kg injected, Group 3: patients received lidocaine 0.5 mg/kg 60 seconds before and microemulsion propofol 2 mg/kg injected, Group 4: forearm was squeezed with a tourniquet up to 70 mmHg, patients received lidocaine 0.5 mg/kg 60 seconds before and microemulsion propofol 2 mg/kg injected.

DISCUSSION: Venous retention induced by squeezing forearm and keeping lidocaine with a tourniquet could reduce pain and withdrawal movement more effectively.

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S-438.

INFUSION REQUIREMENTS AND REVERSIBILITY OF ROCURONIUM IN YOUNGER ADULT AND ELDERLY PATIENTS

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INTRODUCTION: The aim of this study is to compare the infusion requirements of rocuronium to maintain a constant neuromuscular block at the corrugator supercilii muscle (CSM) and the reversibility with neostigmine between younger adult and elderly patients.

METHODS: Fifteen female younger adult (20-50 yr) and 15 female elderly (≥70 yr) patients were enrolled in this study. After induction of anesthesia and laryngeal mask insertion without an aid of neuromuscular blocking agent, contraction of the CSM to the facial nerve stimulation was acceleromyographically quantified during 1.0-1.5% end-tidal sevoflurane and remifentanil anesthesia. All the patients received a bolus of 1mg kg-1 rocuronium. When the first twitch (T1) of the train-of-four (TOF) responses recovered to 10% of the control at the CSM, rocuronium infusion was commenced and maintained at T1 of 10% of the control for 120 min. Immediately after rocuronium infusion was discontinued, the time required for 0.04 mg kg-1 neostigmine-facilitated recovery to a TOF ratio of 0.9 was recorded.

RESULTS: Onset of rocuronium-induced neuromuscular block (mean [SD]; 113.6 [37.5] s vs. 64.6 [11.3] s, P=0.001) and spontaneous recovery to T1 of 10% of control (75.1 [24.8] min vs. 55.8 [11.0] min, P=0.032) was significantly slower in the elderly than in the younger adult. Requirement of rocuronium after a lapse of 120 min was significantly smaller in the elderly than in the younger adult (4.6 [1.6] μg kg-1 min-1 vs. 7.1 [2.3] μg kg-1 min-1, P=0.003). The time for facilitated recovery to a TOF ratio of 0.9 was longer in the elderly, when compared with the younger adult (16.5 [7.1] min vs. 11.7 [4.1] min, P=0.037).

DISCUSSION: Basically, both sensitivity of the endplate to rocuronium-induced neuromuscular block 1 and the effective antagonizing dose of neostigmine 2 are not different between elderly and younger adult patients. Based on the results of this study, it is therefore likely that a smaller infusion requirement of rocuronium and longer reversal time observed in the elderly may be resulted from a smaller volume of distribution.

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S-439.

STRATEGY TO PREVENT CARDIOVASCULAR DEPRESSION DURING ANESTHETIC INDUCTION USING REMIFENTANIL. ~ THE EFFECT OF BOLUS ADMINISTRATION OF REMIFENTANIL ~

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INTRODUCTION: During anesthetic induction using remifentanil, cardiovascular instability such as bradycardia and hypotension occurs occasionally. We hypothesized these events were caused by relative high effect-site concentrations of remifentanil during mask ventilation. The objective of the present study was to determine the effect of the bolus administration of remifentanil before laryngoscopy to prevent cardiovascular depression before intubation.

METHODS: Fifty adult patients (ASA 1-2) undergoing elective surgery were enrolled. All patients were randomly assigned to 2 groups. Group B received remifentanil infusion at 0.1 mcg/kg/min followed by 1 mcg/kg of bolus remifentanil administration 1 minute before intubation. Group C received 0.5 mcg/kg/min of remifentanil. Remifentanil infusion was started at each rate and continued until the completion of the tracheal intubation. Thirty seconds after starting remifentanil, anesthesia was induced with 1.5 mg/kg of propofol followed by inhalation of sevoflurane (2%). After the patient fell asleep, 1 mg/kg of vecuronium was administered. The systolic blood pressure (sBP) and heart rate (HR) were recorded at T0 (pre-induction), T1 (just before the intubation), and T2 (1 minute after intubation). When severe hypotension (sBP < 80mmHg) or bradycardia (HR < 45 bpm) occurred during induction, appropriate intervention was performed. The accumulated number of the cases that needed interventions to treat hypotension or bradycardia was compared between the groups. Repeated measured ANOVA followed by Dunnett's test or chi-square test was performed. $P < 0.05$ was considered significant. All data are expressed as mean ± SD, unless otherwise described.

RESULTS: sBP decreased significantly in both groups at T1 and T2. HR decreased significantly in group C at T1 and T2, although it had not changed significantly in group B at T1 ($P = 0.1$). No patient in group B showed severe bradycardia. However, five patients in group C exhibited severe bradycardia and needed interventions such as a cessation of remifentanil infusion or atropine administration, and this incidence was significantly higher than that in group B. [table 1]

DISCUSSION: This study shows that high doses of remifentanil administration before laryngoscopy cause cardiovascular depression, indicating that low dose remifentanil administration during mask ventilation would be better. However, the increase in the remifentanil effect site concentration is necessary during laryngoscopy and intubation process. This study clearly demonstrates that 1 mcg/kg of remifentanil, which is known as rapid onset and offset narcotics, is effective to prevent cardiovascular instability. In conclusion, the bolus administration of remifentanil before laryngoscopy is useful in prevention of bradycardia during the induction of anesthesia using remifentanil and sevoflurane.

Table 1. Hemodynamic changes

	Systolic Blood Pressure (mmHg)			Heart Rate (bpm)			No. of severe bradycardia'total patients (%)
	T0	T1	T2	T0	T1	T2	
group B	132±19	104±18*	102±20*	70±12	66±9	64±10*	0/25 (0%)
group C	140±21	95±22*	95±19*	73±14	57±22*	60±13*	5/25 (20%) #

group B: 0.1 mcg/kg/min of remifentanil + 0.1 mcg/kg of bolus remifentanil
group C: 0.5 mcg/kg/min of remifentanil
T0: pre-induction; T1: just before intubation; T2: 1 minute after intubation; Vs T0: *<0.05. Vs group B: #<0.05

S-440.

CALCULATED EFFECT-SITE SEVOFLURANE LEVELS ON AWAKENING AFTER LAPAROSCOPIC SURGERY ARE CLOSE TO "MAC-AWAKE"

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INTRODUCTION: We have developed a system that provides a continuous display of current and future effect site sevoflurane (Ceff-sevo) levels. We are exploring Ceff-sevo requirements at different stages of anesthesia in the context of surgical insults. In a previous, observational, study we found patients undergoing minor or intermediate surgery woke at calculated effect site sevoflurane levels (Ceff) close to published levels of MAC-awake. However that study raised a number of questions in part due to the variety of adjunctive drugs used. The aim of this study was to determine Ceff at awakening after sevoflurane /fentanyl anesthesia.

METHODS: Ethical Committee approval and written informed consent. 24 ASA-PS 1, 2 or 3 subjects undergoing simple laparoscopic procedures were recruited. Propofol induction, maintenance with sevoflurane and fentanyl, no other analgesic or sedative drugs used. Point of first response noted. Ceff determined using end-tidal values predicted forward from time of disconnection from the anesthesia breathing circuit using a previously validated model with an end-tidal to effect site t1/2 of 3.2min, and corrected for age. Effect site fentanyl levels calculated by entering fentanyl doses and times into an Excel spreadsheet utilizing Scott's parameters.

RESULTS: Data available for 23 subjects, ages 19-57yr, mean 37yr (SD 19), weights 44-115kg mean 79 (19) kg, Mean Ceff sevo at first response was 0.53vol% (95%CI 0.44 - 0.62). Mean Ceff fentanyl level was 0.83ng/ml (95%CI 0.67-1.0, max 1.58). There was no significant correlation between Ceff sevo and Ceff-fent (R2 0.098).

DISCUSSION: These patients responded at calculated sevoflurane effect site levels close to "MAC-awake" . We did not see any effect of fentanyl on Ceff sevo; fentanyl levels were all below the threshold previously described for an effect on awakening. These results are consistent with previous data and provide further validation of our techniques for determining effect site levels as a basis for ongoing studies.

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S-441.

REFRACTORY HYPOTENSION DURING GENERAL ANESTHESIA DESPITE PREOPERATIVE DISCONTINUATION OF AN ANGIOTENSIN RECEPTOR-BLOCKER

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INTRODUCTION: Angiotensin receptor blockers (ARBs) have been shown to reduce morbidity and mortality associated with hypertension. However, it is recommended to discontinue ARBs at least 24 hrs prior to induction of anesthesia.[1,2] Here, we describe a patient who developed refractory hypotension under general anesthesia despite preoperative discontinuation of Diovan-HCT (Valsartan/HCTZ 160/12.5 mg) for 24 hrs.

CASE REPORT: A 51 yo female (60 kg) whose hypertension was well controlled with Diovan-HCT was scheduled for a T2-10 posterior thoracic fusion. She had last taken her medication 24 hrs prior to surgery. Her preoperative exam was unremarkable. Non-invasive BP, 5-lead ECG with ST segment analysis, HR, and pulseoximetry were continuously monitored. Her baseline vital signs were stable with BP 136/94 mmHg, HR 86 and SpO_2 99% on RA. After induction of anesthesia with 150 mg propofol, 100 mcg fentanyl, and 60 mg rocuronium and an uneventful intubation, her BP decreased and remained 65-75/35-45 mmHg for 45 min with 75-85 HR despite rapid administration of 1500 cc LR, a phenylephrine infusion and repeated boluses of vasopressin (cumulative dose of 20 units within 25 min). Sevoflurane for anesthesia maintenance was kept at 0.8 Vol%. Due to the refractory hypotension, the decision was made to postpone the surgery and awaken the patient. Upon emergence her BP recovered to 115/65 mmHg with a HR of 90 and she was extubated successfully after NMB reversal. The patient did not suffer any neurologic sequelae. Diovan-HCT was withheld postoperatively and she was successfully anesthetized and operated five days later without significant hypotension.

DISCUSSION: This case suggests that Valsartan's relatively short biological half life of 6 hrs is outlived by its physiological effect in the human body. Valsartan selectively blocks AT1 receptors leading to vasodilatation and an anesthetic-induced reduction in pre- and afterload. This may be afforded in part by up-regulated angiotensin II activating AT2-receptors and causing vascular relaxation.[3] Chronic AT1 blockade also reduces the vasoconstrictor response to norepinephrine which may explain why ARB-induced hypotension can be so resistant to sympathetic drugs such as phenylephrine, ephedrine and norepinephrine. ACE-inhibition can also lead to hypotension which responds to methylene-blue, an antivasodilator, but not a vasoconstrictor.[4] Due to insufficient literature on safety and efficacy of this approach in elective surgery, we decided against administering methylene-blue for correction. However, vasopressin or its synthetic analogues can restore the sympathetic response and may be useful pressors in cases of refractory hypotension. We conclude that chronic ARB-therapy can result in severe hypotension after induction of anesthesia even when the medication is withheld for 24 hrs; thus, discontinuing ARBs for more than 24 hrs may be indicated.

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S-442.

LANDIOLOL, AN UTRA-SHORT ACTING BETA1 ADRENORECETOR ANTAGONIST, FOR TREATMENT OF TACHYCARDIA IN PATIENTS UNDERGOING TOTOL KNEE ARTHROPLASTY UNDER GENERAL ANESTHESIA

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INTRODUCTION: Tachycardia and hypertension due to surgical and tourniquet pain often occur during general anesthesia for total knee arthroplasty (1). We evaluated the effects of landiolol on tachycardic response in this clinical setting, since this agent is able to suppress the cardiovascular responses associated with sympathetic stimulation (2).

METHODS: After obtaining IRB approval and informed consent, 114 patients, aged 51-89 yr (a mean of 74.7 yr), undergoing total knee arthroplasty under general anesthesia were enrolled in this study. Following general anesthesia induction with fentanyl 1-2 μg/kg, propofol 1.5-2 mg/kg and 5% sevoflurane, a laryngeal mask airway was inserted, and anesthesia was maintained with 1% sevoflurane and 50% N2O in oxygen. Thereafter, supplemental fentanyl 0.5-1 μg/kg was injected repeatedly to keep the end-tidal CO2 tension of 30-45 mmHg, and spontaneous respiratory rate of 10-25 breaths/min. When a tachycardic response (defined as heart rate of more than 90 beats/min for more than 3 minutes) was observed, landiolol or normal saline (as a time control group) was infused continuously at a rate of 40 or 80 μg/kg/min, or of 0.24 ml/kg/h, respectively, until the end of surgery. Hemodynamic and respiratory variables were recorded at 1-5 minute intervals. Data were analyzed by analysis of variance or Scheffe's F test for comparisons among groups or within each group, with $P<0.05$ being significant.

RESULTS: Tachycardic responses developed in 47 of 114 patients (41%) studied. There were no significant differences in demographic data among patients who received landiolol 40 μg/kg/min (n=21), landiolol 80 μg/kg/min (n=20), and saline (n=6). Heart rate decreased below pre-administration values ($P<0.05$) 3 and 1 minutes after the start of landiolol infusion in patients receiving landiolol 40 and 80 μg/kg/min, respectively, while heart rate unchanged in control patients. Mean blood pressure remained unchanged as compared with pre-infusion values in all groups. When compared with the control group, heart rate was lower 5 and 4 minutes after the start of landiolol infusion ($P<0.05$) in patients given landiolol of 40 and 80 μg/kg/min, respectively.

DISCUSSION: These data show that landiolol infusion at a rate of 80 μg/kg/min provided more rapid suppression of tachycardia in patients undergoing total knee arthroplasty under general anesthesia. Since the prompt treatment of tachycardia seems essential for the older patients who are likely to have occult ischemic heart disease, the use of landiolol should be suitable for the treatment of tachycardia, particularly in the elderly.

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S-443.

EFFECTS OF LONG TERM EXPOSURE TO INHALATIONAL ANESTHETICS ON EMOTION AND EMOTIONAL MEMORY OF OPERATING ROOM STAFF

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INTRODUCTION: Inhalational anesthetics have been reported to affect the emotion and memory of human beings[1,2]. However, the condition of emotion and emotional memory of the staff who work under trace concentration of inhaled anesthetics is not yet on the focus. To investigate the hypothesis that long term exposure to inhalational anesthetics does affect emotion and emotional memory of operating room staff, we conducted the following study using the International Affective Picture System (IAPS)[3], a normative system and widely used tool in the emotion and memory investigation.

METHODS: At first, we collected the air samples from the operating rooms for concentration measurement. Secondly, Thirty-one anesthetists were asked to perform the test with a series slides chosen from IAPS and gave the emotional rates. Recall and recognition tests performed one week later. Another thirty-two physicians from the same hospital were allocated as control.

Results: The concentrations of all three volatile anesthetics (isoflurane, sevoflurane, desflurane) used daily at the workplace of a Chinese University Hospital were under the American threshold value. In emotion rating experiment, female anesthetists rated more neutral slides than female physicians. Anesthetists whose service time below five years rated more neutral slides than those of physicians. One week later, as in the recognition experiment, the hit rate was higher in female physicians than in female anesthetists. A mnemonic boost for emotionally arousing stimuli was evident in all groups.

DISCUSSION: Occupational exposure to trace volatile anesthetics blocks the emotion and emotional memory of anesthetists working in OR especially to women and the new staff. Nevertheless, the exposure does not block the mnemonic boost for emotionally stimuli.

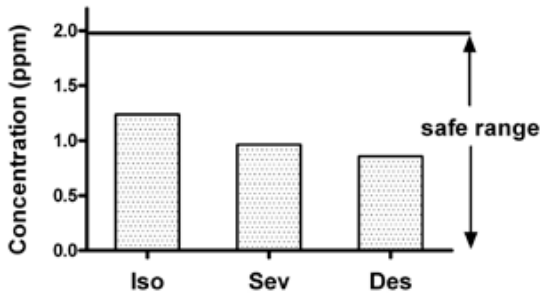

Figure 1: The concentration of inhalational anesthetics in operating rooms

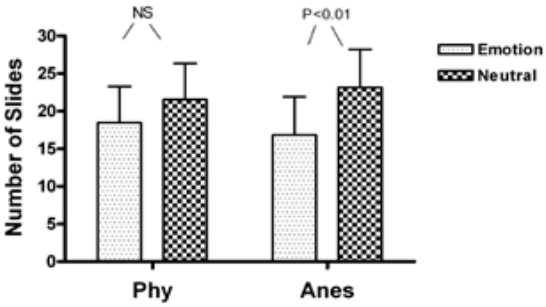

Figure 2: Female anesthetists rated significantly more slides as neutral than emotional ($p<0.01$) when compared with female physicians ($p=0.074$)

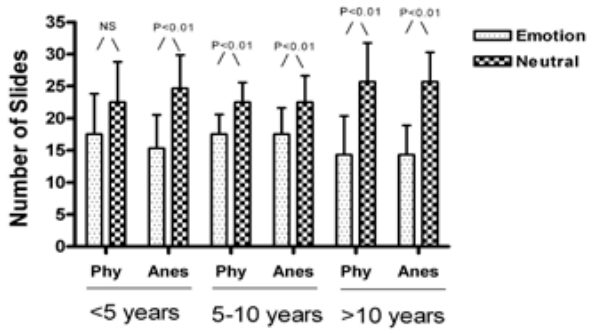

Figure 3: Anesthetists whose service time below five years rated more neutral slides than physicians with the same service time

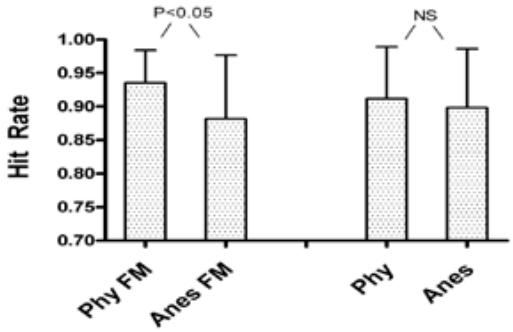

Figure 4: The total hit rate proportion (i.e., confident plus non-confident hit rate) is significantly higher in female physicians than female anesthetists

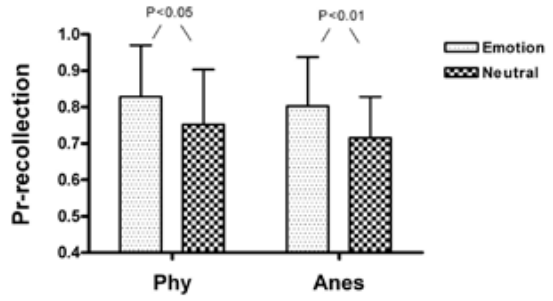

Figure 5: Participants work in both departments significantly recollected more emotional slides than neutral slides

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S-444.

CAN CHANGES IN RESPIRATORY RATE PREDICT VOLUNTEER RESPONSES TO A NOXIOUS STIMULUS. A PRELIMINARY LOOK USING A REMIFENTANIL CHALLENGE?

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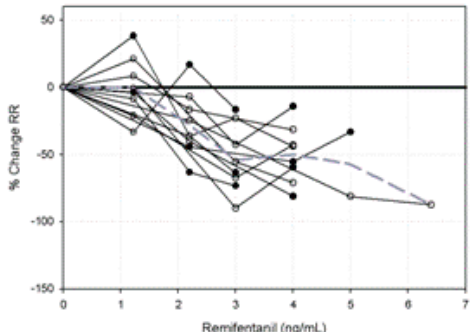
INTRODUCTION: In this preliminary study, we explored the feasibility of using changes in respiratory as a surrogate of opioid effect to estimate the loss of response to a noxious stimulus in healthy volunteers. The premise of our study was a continuous escalating target controlled infusion of remifentanil (a remifentanil challenge) could be used to predict volunteer sensitivity to remifentanil (defined as a loss of response to a noxious stimulus) based on changes in respiratory rate. We hypothesized that volunteers sensitive to remifentanil would develop a larger percentage change in respiratory rate and become unresponsive to a noxious stimulus at lower predicted remifentanil concentrations than volunteers less sensitive to remifentanil.

METHODS: Following IRB approval, 10 subjects received escalating target controlled remifentanil infusion. Predicted target concentrations were 0, 1.2, 2,2, 3, 4, 5, and 6.4 ng/mL. Each subject received up to 4 of the target concentrations. Respiratory rate was measured using a capnograph. The number of breaths over a 60 second period was used to calculate the respiratory rate. Percentage changes in respiratory rate were calculated at each target effect site concentration. The response to 30 PSI applied to the anterior aspect of the tibia using a pressure algometer was also recorded at each target effect site concentration. The algometer applied pressure using a 1.5 cm diameter piston with flat surface to the tibia. Response was defined as a 20% change in heart rate from baseline, withdrawal, or signal from the volunteer to stop the stimulus.



RESULTS: All subjects completed the study. Results are presented in Figure 1. Open and filled circles represent presence and absence of a response to 30 PSI of tibial pressure. As the predicted remifentanil concentration increased, the percent change in respiratory depression from baseline decreased. The grey line represents the mean percent change in respiratory rate across increasing remifentanil concentrations. Volunteers that developed a loss of response to 30 PSI of tibial pressure had a wide range of percentage changes in respiratory rate.

DISCUSSION: In this preliminary study, our results did not confirm our study hypothesis. Changes in respiratory rate in response to a remifentanil challenge did not identify volunteers that would loose responsiveness to a noxious stimulus. Limitations to this study include a small sample size, a potentially small range in sensitivity to remifentanil among the volunteers entered into the study, and the inadequacies of using respiratory rate alone as a surrogate of opioid effect. Future work is warranted to potential utility of a remifentanil challenge in predicting opioid effect.

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S-445.

EVAULATION OF A PHARMACODYNAMIC MODEL FOR SEDATION IN PATIENTS UNDERGOING FIXED-RATIO PROPOFOL REMIFENTANIL PATIENT CONTROLLED ANESTHESIA FOR ELECTIVE COLONOSCOPY

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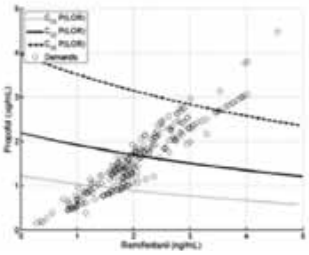
INTRODUCTION: Patient controlled anesthesia (PCA) can be employed in minimally invasive procedures to allow the personalized pain management often associated with post operative patient controlled analgesia. However, because drug dosing is controlled by the patient rather than by an anesthesiologist, there is an increased risk of over dosing, introducing complications such as over sedation and respiratory depression, which require intervention (1). Incorporating pharmacodynamic models into a PCA system may reduce these risks. The aim of this study was to evaluate a previously published pharmacodynamic model for loss of responsiveness(LOR) (2) in patients using PCA for elective endoscopy. We hypothesized that the model would adequately describe the patient data.

METHODS: Data were collected from 23 patients undergoing elective colonoscopy with fixed-ratio propofol-remifentanil PCA (10 mg/ml prop:10 mcg/ml remi). Time of insertion, time to reach the cecum, time to completion and time of all button pushes as well as dosing information for both drugs were recorded. Effect site concentrations were predicted from the dosing information using STANPUMP(3) and Schnider's (4) and Minto's (5) pharmacokinetic models for propofol and remifentanil, respectively. Button events at least one minute from insertion and reaching the cecum were used to determine patient consciousness. Probability of LOR was computed for all events. Percentages of data points in each probability quadrant were then calculated.

RESULTS: Comparison of the LOR probability when patients demanded an additional dose to the sedation isobols (Figure 1) showed the majority of demands were at doses that corresponded to medium to low probability of loss of responsiveness. Forty five percent of the data had less than 25% probability of LOR, with 34%



at a probability of 5% or less. Thirty percent of the data are at a greater than 75% probability of LOR, with 6% of the demands at 95% or greater. However, 12 of the 23 patients also had peak effect site concentrations above the 95% isobol.

DISCUSSION: The majority of the data points lie below the 50% LOR isobol, an indication that the LOR pharmacodynamic model may be useful in ensuring PCA does not reach excessive sedation. It is worrisome that 52% of patients reached LOR probabilities greater than 95%. However, all peak concentrations occurred before the cecum was reached (avg 6.5 mins) and may be a result of nervousness at the start of the procedure. The pump had a 13 second lockout, so it was possible to demand many doses before any drug effect set in.

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S-446.

INCIDENCE AND RISK FACTORS OF HYPOTENSION DURING ANESTHETIC INDUCTION: MULTICENTER PROSPECTIVE OBSERVATIONAL STUDY

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INTRODUCTION: Hypotension during anesthetic induction was a common complication, but usually do not result in serious consequences. However, in high-risk patients, even transient hypotension would be dangerous. So, it is important to know what is the incidence and risk factors of hypotension during anesthetic induction to avoid this dangerous complication.

In recent years, most of anesthetic inductions are conducted by so-called "balanced" anesthesia. Almost all patients received some hypnotics, some opioids and some inhaled anesthetics. In these circumstances, it is difficult to recognize what is a cause of hypotension, and how should we avoid/treat this.

We conducted a multicenter, prospective, observational study to address what is the incidence and risk factors of hypotension during anesthetic induction, and to clarify the effects of hypnotics and opioids on this hypotension.

METHODS: This prospective observational study conducted in 25 centers around Okayama area in Japan. Inclusion criteria were those who were age > 20 years old and undergoing general anesthesia with tracheal intubation. Prospectively implemented case sheet was used to collect demographics and anesthetic information. Severe hypotension was defined as systolic blood pressure < 80 mmHg. We compared demographic and anesthetic variables between the hypotension group and the non-hypotension group. We also conducted logistic regression analyses to clarify the independent risk factors associated with severe hypotension. Finally, we conducted subgroup analyses using hypnotics (propofol or thiopental) and opioids (fentanyl or remifentanil) as grouping variables.

RESULTS: During 3 months study period, 2455 patients were recruited in this study. 548 patients suffered from severe hypotension (22.3%). As hypnotics, propofol was administered to 54.9% patients, and thiopental to 28.4%. Remifentanil was administered to 72.0% patients, and fentanyl to 28.0%. The hypotension group was associated with higher age, severer ASA PS compared to the non-hypotension group. The hypotension group also had more preoperative complications, more epidural test dose, lower systolic blood pressure before anesthesia, and less atropine pretreatment. Choice of opioids was not different between the groups, but more propofol was used in the hypotension group. Multivariate analysis revealed that choice of hyponotics (propofol) was independent risk factors for hypotension, but opioids was not. Finally, in the subgroup analyses, dose of remifentanil was more important predictor of hypotension that the dose of propofol in patients used this combination.

DISCUSSION: Almost one-fourth of patients suffered from severe hypotension during anesthetic induction. Age and preoperative complications were significant predictors of this hypotension. Choice of hypnotics (propofol or thiopental) was related to this hypotension but choice of opioids (fentanyl or remifentanil) was not. However, in anesthetic induction using propofol and remifentanil, dose of remifentanil was more important predictor of hypotension than that of propofol.

S-447.

WITHDRAWN.

S-448.

A SURVEY OF THE USE OF ONDANSETRON AS A RESCUE DRUG FOR ONDANSETRON PROPHYLAXIS FAILURE

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INTRODUCTION: Ondansetron, an antiemetic drug commonly used to prevent and treat postoperative nausea and vomiting (PONV), often fails to relieve or prevent PONV. Data demonstrates that when ondansetron fails for prophylaxis, it will also fail as a rescue drug in the same patient (1-4). We hypothesize that despite this information, and due to a lack of attractive options, physicians often inappropriately re-order ondansetron as a rescue medication. To test our hypothesis, we conducted a retrospective survey of the records of 500 patients who received PONV prophylaxis therapy with ondansetron.

METHODS: A retrospective single center analysis was conducted on 500 case records from May to July 2009 at Jackson Memorial Hospital, Miami, FL. Records were reviewed sequentially and were selected for inclusion in the study if patients had been given ondansetron any time prior to the end of their surgery. Recovery room orders for the same patients were also reviewed for both primary and secondary PONV rescue medications, along with dosing, and any other follow up treatments.

RESULTS: Our results demonstrated that of the 500 patients who received ondansetron for PONV prophylaxis, 488 (88%) had ondansetron ordered as the primary rescue medication for PONV despite the known lack of efficacy. Additionally, of the 488 patients who had ondansetron ordered as the primary rescue medication, 91 (19%) also had it ordered as a secondary rescue medication. Only 12 of the 500 patients had a different medication, other than ondansetron, ordered for primary rescue. Other agents ordered for rescue included: phenergan, compazine and dexamethasone. Of the 500 patients 1 (0.2%) had dexamethasone ordered for first line rescue and 32 (6.4%) patients had it ordered as a secondary rescue medication.

DISCUSSION: Our survey indicated that 88% of subjects given ondansetron PONV prophylaxis also had it ordered as the primary rescue agent if prophylaxis failed; in spite of the fact that that rescuing an ondansetron prophylaxis failure with more ondansetron is no more effective than using placebo. (1-4) Additionally, 33 patients had dexamethasone ordered for primary or secondary rescue. Due to the slow onset of dexamethasone it is generally not considered appropriate as a solo rescue agent. The ordering of inappropriate PONV rescue agents is most likely due to a lack of awareness of their ineffectiveness and the lack of optimal rescue agents. The planned installation of an electronic ordering system and PONV treatment algorithms, combined with further education, should help reduce these costly and wasteful practices.

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S-449.

SHOULD PERI-OPERATIVE ARGININE CONTAINING NUTRITION THERAPY BECOME ROUTINE IN THE SURGICAL PATIENT? A SYSTEMATIC REVIEW OF THE EVIDENCE AND META-ANALYSIS

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INTRODUCTION: Despite modern advances in surgical and anesthesia technique, the incidence of major infection from all cause post-operative infections ranges from 3.1% to 45% depending on patient risk factors and type of surgery1. Surgical Site Infections (SSIs) alone occur in 500,000 U.S. patients per year1. Attributable costs of SSI range from $3,000 to $29,000 per infection. These infections lead to a total cost of $10 billion annually in potentially preventable healthcare expenditures1. Each SSI is associated with approximately 7-10 additional postoperative hospital days and patients with a SSI have a 2-11 times higher risk of death, compared with operative patients without an SSI.[1] The etiology of this increased risk of infection in the peri-operative setting appears to be related to an initial post-operative inflammatory response, followed by a subsequent marked depression of cell-mediated immunity.[2] This immunosuppression may be caused by the significant decrease in plasma arginine levels that occurs following surgery. Peri-operative arginine administration can prevent arginine deficiency and restore cellular immunity.[3] This meta-analysis was conducted to examine clinical trials evaluating the effect of arginine-containing PerI-operative Nutrition Therapy (PINT) on infectious complications and length of stay (LOS) in surgical patients.

Methods: All prospective randomized controlled trials of arginine-containing PINT versus standard enteral nutrition in surgical patients conducted from 1990 to 2008 were identified from multiple databases. Methodological quality of studies was scored and data was abstracted independently and in duplicate.

RESULTS: 30 studies evaluating 3055 patients compared the use of PINT with standard enteral nutrition in surgical patients. PINT significantly decreased overall infectious complications ((RR=0.60; 95% CI, 0.51-0.71; p <0.00001) and overall LOS ((weighted mean difference [WMD] = -1.78, 95% CI, -2.76, -0.79, p 0.0004). In sub-group analyses, infectious complications were decreased in both GI and non-GI surgery patients (RR=0.61, 0.52, p<0.0001, p=0.0005); and upper and lower GI surgical patients (RR=0.67, p=0.01; RR=0.52, p<0.00001). Finally, there was a trend towards a benefit on reducing infection (p=0.082) in patients who were fed the PINT therapy both pre-operatively and post-operatively (RR=0.52; 95% CI, 0.42-0.65, p <0.00001) versus those who received the therapy post-operatively only (RR=0.62; 95% CI, 0.48-0.81, p<0.0004). Conclusions: Arginine-containing Peri-Operative Nutrition Therapy (PINT) should be strongly considered as a future standard of care to prevent infection and shorten length of stay in surgical patients. This significant treatment effect demands definitive evaluation in a large multi-center trial versus standard nutrition care in the peri-operative patient.

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S-450.

PROPOFOL-REMIFENTANIL RESPONSE SURFACE FOR RESPIRATORY DEPRESSION USING RESPIRATORY RATE AND MINUTE VENTILATION

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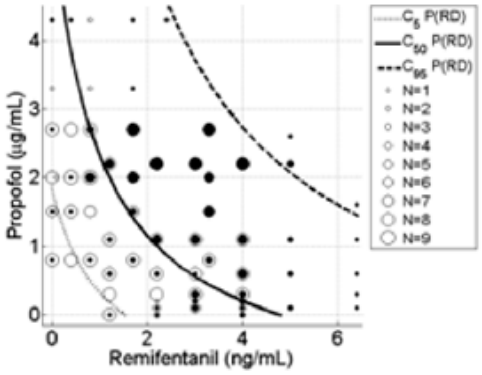
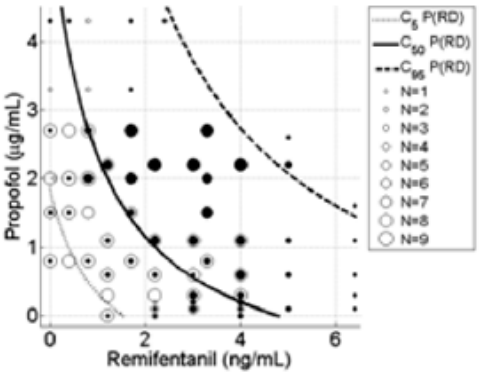
AFFILIATION: Anesthesiology and Bioengineering, University of Utah, Salt Lake City, UT.

INTRODUCTION: Propofol and, to a lesser extent, propofol in combination with remifentanil are commonly used to provide moderate sedation and analgesia in spontaneously breathing patients. The aim of this study was to explore the presence or absence of respiratory depression over a range of predicted remifentanil and propofol concentrations used to provide moderate to deep sedation. Using these observations, a secondary aim was to construct response surface models of respiratory depression based on respiratory rate and minute volume.

METHODS: Following IRB approval, 24 subjects received escalating target controlled remifentanil and propofol infusion over ranges of 0-6.4 ng/mL and 0-4.27 mcg/ml respectively following a crisscross design (16 targets per subject). Respiratory rate and minute ventilation were computed from volumetric flow and CO2 waveforms. Respiratory depression was defined as ≤ 4 breaths/min when using RR data and less than 3 L/min using MV values. Three L/min represented a 40% decrease in the average minute volume (5 L/min). Response surface models were fit using a Greco construct modified for categorical data.(1) Model predictions were presented as iso-effect lines (isobols) for 5, 50, and 95% probabilities of respiratory depression.

RESULTS: Observations of respiratory depression defined by respiratory rate and minute volume are presented in Figure 1 (panels A and B respectively). Open circles represent the number of volunteers assessed at each concentration pair. Filled circles





represent the number of volunteers that exhibited respiratory depression. In 240 out of 376 assessments, volunteers developed a respiratory rate less than 4 breaths per minute. In 213 out of 364 assessments, volunteers developed a minute volume less than 3 liters per minute. Using respiratory rate, respiratory depression was observed in 2 out of 50 assessments at low dose remifentanil (predicted effect site concentrations < 1.5 ng/mL) and moderate to high dose propofol (predicted effect site concentrations 2 - 4.2 mcg/mL). Using minute volume, respiratory depression was observed in 9 out of 50 assessments over the same range. Five, 50 and 95% model predictions of respiratory depression are presented as dotted, solid, and dashed lines.

Discussion: Respiratory depression was less likely to occur at predicted low remifentanil and moderate to high propofol concentrations. Based on prior work (2), these concentrations have a high probability of producing moderate sedation and analgesia. The model of respiratory depression based on respiratory rate ≤ 4 breaths per minute was shifted up and to the right when compared to the model based on minute volume < 3 L/min. The interaction between remifentanil and propofol on respiratory depression was synergistic. Additional work is warranted to evaluate and possibly validate these observations in patients receiving remifentanil and propofol for moderate sedation.

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S-451.

REMIFENTANIL INCREASES VOMITING DURING OTOLOGICAL SURGERY

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INTRODUCTION: Although postoperative vomiting is a painful symptom, intraoperative opioid is known to increase the frequency of its occurrence. Because remifentanil does not accumulate being an ultra short-acting opioid, a large amount of remifentanil is often used to suppress a nocioceptive stimulus. However, it is unclear whether the incidence of vomiting is associated with the dosage of remifentanil.We investigated the relationship between the amount of remifentanil administered and the occurrence of vomiting.

METHODS: We performed a retrospective chart analysis. A total of 109 patients who admittied to PACU from June to September 2009 after E.N.T. surgery under general anesthesia with remifentanil were reviewed. Sevoflurane or propofol was used as the hypnotic anesthetic. We examined their anesthesia records as well as PACU records to retrospectively investigate the relationship between the total dosage of remifentanil per unit of body weight and the incidence of vomiting. Age, gender, surgery, other opioids use, nitrous oxide, type of anesthetics, antiemetics use, and duration of surgery and anesthesia were also collected. Statistical analysis was performed using Mann-Whitney-U test or chi-square test as appropreate.

RESULT: There were 15 patients(13.8%) who vomited (vomiting group) and 94 patients(86.2%) who did not (non-vomiting group). The mean age of participants was 47.1 year (range 6-83). Male gender was 71 (65.1%). Intravenous fentanyl was administered in 70 of 109 patients (64.2%) during surgery. These indices were not significantly different between the groups. In addition Sevoflurane was used to all patients of vomiting group and 85.1% of non-vomiting group. The total dosage of remifentanil in the vomiting group was significantly larger than that in the non-vomiting group (49.5 μg/kg vs 38.5 μg/kg, P=0.028)

DISCUSSION: Remifentanil tends to be widely used because it is rapidly metabolized and is hemodynamically stable. However, postoperative vomiting may accompany high dosage.

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S-452.

EFFECTS OF SEVOFLURANE OR PROPOFOL MAINTAINED ANESTHESIA IN ELDERLY PATIENTS UNDERGOING ABDOMINAL SURGERY

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INTRODUCTION: Sevoflurane and propofol are well used and have myocardial protection effects by different mechanisms. Our research is to compare the effects of sevoflurane and propofol on intraoperative haemodynamic state, recovery profile and perioperative cTnT change in elderly patients undergoing abdominal surgery.

METHODS: Sixty elderly patients with history or at high risk of coronary heart disease, undergoing general anesthesia for elective intra- abdominal were assigned randomly to one of two groups (n=30 each): sevoflurane group (group S) and propofol group (group P). Anesthesia was induced with propofol and sufentanil. TCI of sufentanil was started at a target effect-site concentration of 0.25ng/ml, and TCI of propofol was started at a target plasma concentration of 1.5μg/ml followed by increments of target plasma concentration until the patient lost eye lash reflex. Rocuromiun 0.6mg/kg was administered and propofol was adjusted to keep BIS values 40-50. After endotracheal intubation, Group S received sevoflurane and Group P used TCI of propofol for maintenance of anesthesia Sevoflurane and propofol were titrated to keep BIS values 40-60. SBP, DBP, HR, BIS were recorded prior to induction of anesthesia (baseline), and then again at predetermined times; pre- and post-intubation, pre- and post-incision, pre- and post-extubation, leaving the operating room. Time intervals were recorded including eye opening, extubation, and orientation. cTnT concentrations were measured preoperatively and on the first 2 postoperative days using Elecsys 2010 analyzer. New ECG changes were noted, including ST-segment depression or elevation and arrhythmia.

RESULTS: There was no significant difference between the two groups with respect to HR, MAP, SBP, DBP at each point(P>0.05). Time intervals to eye opening, extubation and orientation with group S were significantly shorter than group P, but the incidence of PONV was higher than group P(P<0.05).The incidence of elevated troponin T concentrations was 50% and the values were mainly "marginal" elevations. The peak concentrations were often found at 6h or 48h after the surgeries. The incidence of positive cTnT levels was higher in group P than in group S.

DISCUSSION: Intraoperative haemodynamic stability is good and comparable in both groups. TIVA of propofol leads to lower incidence of PONV for its antiemetric properties. Less emergence time and lower incidence of abnormal cTnT are found in group S. Perioperative myocardiac damage is common in an elderly population and routine perioperative surveillance for cardiac troponins could be used in detecting patients with high cardiac risk.

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Patient Characteristics

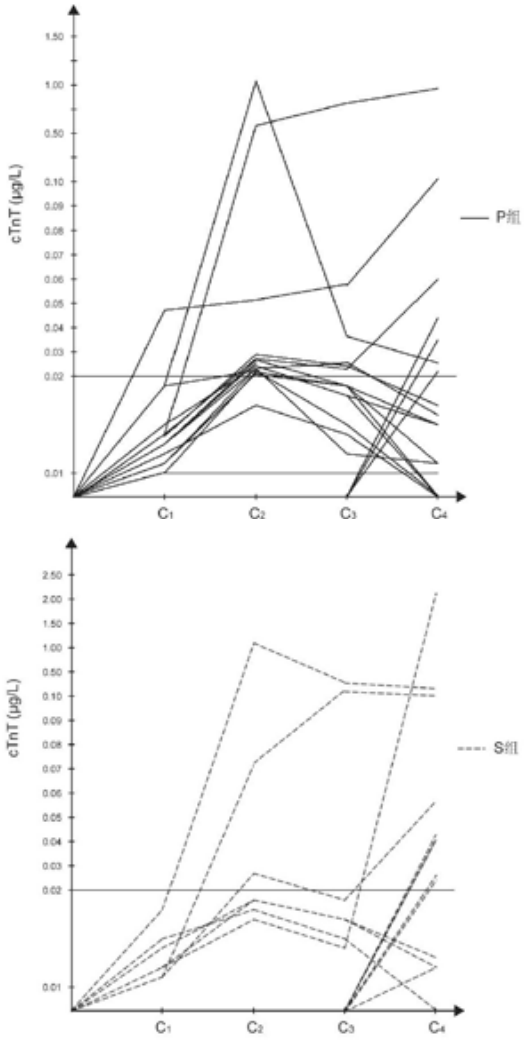
	Group P (n=30)	Group S (n=30)
male gender	18 (4)	23 (2)
mean age, yrs (SD)	73 (5)	73 (6)
weight, kg (SD)	63 (10)	68 (11)
operation time, min (SD)	183 (74)	188 (91)
anesthesia time, min (SD)	220 (78)	231 (88)
sufentanil dose, μg(SD)	49 (12)	48 (13)
rocuronium dose, mg (SD)	73 (20)	72 (22)

The Time Interval and Incidence of PONV

	Group P (n=30)	Group S (n=30)
eye opening, min (SD)	7 (3)	4 (2) *
extubation, min (SD)	8 (4)	5 (2) *
orientation, min (SD)	11 (4)	7 (2)*
incidence of PONV (%)	3.3	20 *

Comparison of Elevated Peak cTnT Cases

	Group P (n=30)	Group S (n=30)
elevated cTnT(>0.01μg/L)	18	12
marginal (0.01~0.09μg/L)	15	9
positive (>0.10μg)	3	3
Prognosis meaning		
<0.02 μg/L	14	22 *
>0.02 μg/L	16	8 *



S-453.

OUTCOMES AFTER SEVOFLURANE VERSUS ISOFLURANE OR DESFLURANE FOR RENAL TRANSPLANTATION

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INTRODUCTION: Despite evidence for mild nephrotoxicity, sevoflurane (Sevo) is a commonly used inhaled anesthetic with a record of safety (1). Its use in renal transplantation, however, has not been well studied. Teixera et al. reported on the use of sevoflurane vs. isoflurane during renal transplantation and found similar gross outcomes, albeit with a frequent incidence of post-transplant dialysis (8-13%) (2). We hypothesized that Sevo was as safe as alternative agents and performed a retrospective chart review of 160 cases to compare renal transplant outcomes with two anesthetic groups: sevoflurane (N=36) and isoflurane or desflurane (N=101).

METHODS: Following IRB approval we reviewed the medical records of 160 consecutive adult patients undergoing renal transplantation under general anesthesia at the same institution. Complete data were available for 137 patients. Data were divided into 2 groups based on the maintenance inhaled anesthetic used: Isoflurane (Iso) or Desflurane (Des) (n=101) vs Sevoflurane (n=36). Data collected included pre-transplant and post-transplant serum creatinine, urine creatinine, urine protein, and urine output at times through postoperative day 4. Primary outcomes included incidence of graft loss or patient death within 3 months of transplant. Statistical analysis was by ANOVA or Chi-square as appropriate using SPSS (v17.0- Windows, SPSS, inc.).

RESULTS: There were no statistically significant differences between groups in race, mean age, type of donated kidney, or history of hypertension, diabetes mellitus, previous blood transfusion, Hepatitis C, or previous transplant. There was a greater fraction of males than females in the Iso-Des group. There were no significant differences between the groups at any study data points in serum creatinine levels, urine protein, or urine volume. The incidence of post-transplant dialysis was 3% in both groups. No graft loss or patient death occurred within 3 months in either group.

DISCUSSION: There was no known selection bias in the greater proportion of males in the Isoflurane/Desflurane group, and outcomes did not differ by sex. Sevoflurane used as a maintenance anesthetic did not affect studied outcomes in adults undergoing renal transplantation and appears to be an acceptable anesthetic choice for these procedures.

Demographic Data & Results

	Sevo	Iso/Des	P Value
Mean age (yrs)	49.6	48.7	N.S.
Male sex (%)	44	63	<0.05
Prior Transfusion (%)	0	2	N.S.
Prior Transplant (%)	11	15	N.S.
Cadaveric Donor (%)	67	57	N.S.
Creatinine (mg/dL)			
Pre--op	7.9	7.8	N.S.
Post-op Day 2	7.2	6.9	N.S.
Post-op Day 4	3.0	2.8	N.S.
Urine Protein (mg/dL)			
Pre-op	7.5	6.9	N.S.
Post-op Day 2	5.8	5.6	N.S.
Post-op Day 4	5.6	5.6	N.S.
24hr Urine Vol (mL)			
Pre-op	469	478	N.S.
Immed Post-op	4808	5854	N.S.
Post-op Day 2	3624	4331	N.S.
Post-op Day 4	2994	3203	N.S.

S-454.

THE EFFECT OF KETAMINE ON HEMODYNAMICS FOR ANESTHESIA INDUCTION AND ONSET TIME OF ROCURONIUM IN SURGICAL PATIENTS

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INTRODUCTION: The cardiostimulant effects of ketamine tend to cancel the cardiodepressant effects of propofol, therefore, hemodynamic stability can be obtained by using this combination for anesthesia induction. The onset time of muscle relaxants is affected by hemodynamic conditions. The aim of this study was to compare ketamine-propofol combination and propofol alone on onset time of rocuronium.

METHODS: We studied 80 ASA physical status 1and 2 patients, aged 20-80 yr. Anesthesia was induced with fentanyl (1-3μg/kg) followed by ketamine 1mg/kg and propofol 1mg/kg (PK; n=40) or propofol 2mg/kg (P2; n=40), and maintained with inhalation of 2% sevoflurane. Both groups received rocuronium 0.6mg/kg. The neuromuscular blockade monitoring was started before the administration of rocuronium by using TOF Watch SXTM of the adductor pollicis muscle in response to train-of-four (TOF) stimulation. Onset time of rocuronium was defined as the time from the end of injection of rocuronium to maximum depression of TOF stimulation. When maximum depression of TOF was observed, the tracheal intubation was performed. Unpaired-t test was used for statistical analysis. $P<0.05$ was considered statistically significant.

RESULTS: Heart rate and systolic blood pressure were significantly decreased P2 (60±10 beats/min, 86±17 mmHg) compared with PK (65±13 beats/min, 105±18 mmHg) prior to tracheal intubation. The onset time of rocuronium was 82±30 sec and 92±31 sec for PK and P2, respectively.

DISCUSSION: The effects of cardiac output may be considerably greater for fast-acting muscle relaxants, such as rocuronium. However, a part of the cardiostimulant effects of ketamine result from increasing peripheral vascular resistance, not only cardiac output. For that reason, the onset time of rocuronium was not significantly different in PK and P2.

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S-455.

THE BENFIT OF USE OF GLUCOSE 5% SOLUTION AS IRRIGATING FLUID DURING TRANS-URETHREAL RESECTION OF THE PROSTATE IN PATIENTS WITH BENIGN PROSTATIC HYPERPLASIA. DOUBLE BLINDED STUDY.

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INTRODUCTION: Central nervous system changes, circulatory and electrolyte imbalances are the main complications of endoscopic transurethral resection of the prostate (TURP) which is known as transurethral resection (TUR) syndrome, which occurs as result of excessive absorption of irrigating fluid(1&2). We compare glycine 1.5% versus glucose 5% as irrigating solutions during TURP in patients with moderate to severe bladder outlet obstruction due to benign prostatic hyperplasia (BPH).

PATIENTS AND METHODS: One hundred twenty patients with symptomatic BPH were randomized into a prospective, controlled trial comparing the two irrigation modalities. Sixty-six patients used glycine 1.5% solution as irrigating fluid **(glycine group)** and 54 patients used glucose 5% solution **(glucose group).** Patient's demographics, operative time, hospital stay, postoperative amino acid glycine assay, postoperative serum cardiac troponin I and perioperative complications were noted.

RESULTS: No difference was found between both groups in the immediate postoperative levels of serum sodium, hemoglobin, hematocrite. A high glycine level was associated with the TUR syndrome. Five patients had TUR syndrome; all were in glycine group and they had the highest postoperative amino acid glycine levels. Transient Hyperglycemia and hypokalemia occurred in the immediate postoperative period in the glucose group. Glucose 5% irrigation was associated with better homeostasis, lower incidence of perioperative complications.

DISCUSSION: Endoscopic TURP performed using glucose 5% irrigating solution during and after surgery is associated with lower incidence of TURP syndrome, lower catheterization period, shorter hospital stay and no cardiac toxicity.

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Regional Anesthesia

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S-456.

WITHDRAWN.

S-457.

METHOD OF ANESTHESIA AND INCIDENCE OF PHANTOM LIMB PAIN AFTER LOWER EXTREMITY AMPUTATION: PRELIMINARY RESULTS

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INTRODUCTION: Data regarding the effect of regional anesthetic techniques (Epidural, Spinal, and Perineural Catheters) on the incidence of phantom limb pain(PLP) after amputation are inconclusive, however, there is minimal data on peripheral nerve blocks and their effect. The purpose of this study was to determine if the use of preoperative peripheral nerve blocks resulted in a lower incidence of PLP after amputation surgery. In addition, we examined the effect of preoperative pain and neuropathy in the surgical leg on PLP incidence.

METHODS: Medical records were reviewed for a two year period (2006-07) to include any patient who had a lower extremity amputation. Patients were excluded if they did not have at least one year of follow up or had an incapacitating condition. Data was collected regarding surgery, method of anesthesia, incidence of PLP for up to 1 year after surgery, medical diseases, reason for amputation, age, preoperative pain in amputated portion, and preoperative neuropathy in surgical leg. Patients were also contacted for a follow up portion in an effort to include patients not diagnosed with PLP in their medical record.

*Preliminary data for 16 months being presented, no follow up data included.

RESULTS: Preliminary data from sixty seven patients showed an incidence of PLP after Peripheral nerve blocks (38%) similar to General anesthesia only (35%) and Spinal Anesthesia (46%). The incidence of PLP in patients with preoperative pain was 61% and in patients with preoperative neuropathy was 20%. The overall incidence of PLP up to one year after surgery was 39%.

DISCUSSION: Preliminary data do not support the use of preoperative peripheral nerve blocks to reduce incidence of PLP after amputation surgery. This retrospective analysis has limitations and further study is needed on the use of regional anesthesia techniques and phantom limb pain. The presence of preoperative pain appears to result in a higher incidence of PLP, which is consistent with prior studies.

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S-458.

COMBINED SPINAL EPIDURAL ANESTHESIA VERSUS SPINAL ANESTHESIA IN HIGH RISK GERIATERIC PATIENTS UNDERGOING MAJOR ORTHOPEDIC SURGERY

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INTRODUCTION: Sequential combined spinal epidural anesthesia (Sequential CSEA) is one of the great advances in central neuraxial block in this decade for high risk geriatric patients because here the advantages of both spinal and epidural anesthesia are summated avoiding the side effects. This study is designed to compare the clinical effects of sequential combined spinal epidural anesthesia versus spinal anesthesia in high risk geriatric patients undergoing major orthopedic procedure.

METHOD: Eighty patients aged 65 and above, ASA III were randomly allocated into two equal groups. Group A (n=40) received sequential combined spinal epidural anesthesia with 1 ml (5 mg) of 0.5% hyperbaric bupivacaine with 25 mcg fentanyl through spinal route, and the expected incompleteness of spinal block was managed with small incremental dose of 0.5% isobaric bupivacaine through epidural catheter, 1.5 to 2 ml for every unblocked segment to achieve T10 sensory level. Group B (n=40) received spinal anesthesia with 2 ml (10 mg) of 0.5% hyperbaric bupivacaine and 25 mcg of fentanyl.

RESULT: Both the groups showed rapid onset, excellent analgesia and good quality motor block.

Group A showed a significantly less incidence of hypotension ($p< 0.01$) along with the provision of prolonging analgesia as compared to group B.

DISCUSSION/CONCLUSION: Sequential combined spinal epidural anesthesia (Sequential CSEA) is, thus, a safe, effective, reliable technique with stable hemodynamic along with provision of prolonging analgesia compared to spinal anesthesia for high risk geriatric patients undergoing major orthopedic surgery.

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S-459.

INTERSCALENE ANESTHESIA FOR ARTHROSCOPIC SHOULDER SURGERY: FAILURES AND COMPLICATIONS

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AFFILIATION: Anesthesiology, University of Tennessee Graduate School of Medicine, Knoxville, TN.

INTRODUCTION: Interscalene anesthesia combined with intravenous sedation is commonly utilized for arthroscopic shoulder surgery. The purpose of this study was to determine the failure and complication rates for this technique at our institution.

METHODS: 100 consecutive patients of a single surgeon scheduled for arthroscopic shoulder surgery under interscalene block were retrospectively reviewed. An interscalene block was considered a failure if the record specifically noted inadequate anesthesia or if the block was repeated preoperatively or immediately postoperatively. Conversion to general anesthesia (GA) as evidence by placement of an LMA or an endotracheal tube was also considered a block failure. Complication information was obtained from the anesthesia records and from the surgeon's postoperative records.

RESULTS: Demographic data: mean age 56; 54% female/ 46% male; BMI mean 29.0 (range 18.2-48.9). Nerve stimulation was used in 82 of 100 attempted blocks. In 18 blocks the specific block technique was not documented. All blocks, except one which was undocumented, utilized 0.5% ropivacaine. Epinephrine 1:200,000 was used in 93 blocks. 30 mL was the most frequently used volume (85 of 99 blocks); 25 mL (9/99); 20 mL (3/99), 40 mL (1/99), and undocumented 1/99. The mean operating room time was 98 minutes (range 59-245). Nine blocks were judged to be failures. One conversion to GA was judged not to be a block failure because the anesthetic was converted to GA at the surgeon's request due to a change in surgical plans. Of the nine failures, six were converted to GA after the block was placed, two had repeat blocks (one preoperatively; one immediately postoperatively), and a single block was aborted because satisfactory nerve stimulation was not obtained. 87% of the patients received no opioid analgesics in the postanesthesia recovery unit (PAR). One patient exhibited signs of local anesthetic toxicity and was treated with lipid emulsion. Interestingly the patient developed satisfactory anesthesia, underwent surgery successfully and required no opioids in PAR. Postoperative follow-up ranged from two weeks to six months (minimum three months follow-up was available for 90% of patients). During follow-up, three patients reported shooting or electrical upper extremity pain. Interestingly all of these reports were at the three months with no mention of this symptom at either two or six weeks and similarly no report at a 4.5 months. Two of these three patients also had follow-up visits at six months with no symptoms noted. One patient reported thumb numbness at six months. However this symptom was not noted at follow-up visits of two weeks, six weeks, three months or 4.5 months.

DISCUSSION: This retrospective review of 100 consecutive interscalene blocks, performed for arthroscopic shoulder surgery, revealed a 9% failure rate, a 4% rate of postoperative complications and one immediate complication, systemic local anesthetic toxicity.

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S-460.

WITHDRAWN.

S-461.

ADDITION OF SCHEDULED SCIATIC BOLUSES FOR POSTOPERATIVE ANALGESIA FOLLOWING TOTAL KNEE ARTHROPLASTY

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INTRODUCTION: Contemporary literature supports peripheral nerve catheters as a superior form of pain control for total knee arthroplasties (TKA) with fewer complications when compared to epidural or intravenous patient-controlled analgesia (PCA) regimens (1-3). Femoral nerve blocks, including continuous femoral nerve blocks, are considered the essential component of peripheral nerve analgesia while varying importance has been placed on the addition of sciatic and obturator nerve blocks. In fact, a single injection at the sciatic nerve may not improve analgesia over femoral nerve block alone (4). With the purpose of improving analgesia, nurse-delivered scheduled boluses were given in the sciatic peripheral nerve catheters of patients who underwent TKA with both femoral and sciatic nerve catheters. Visual analogue scores (VAS), opioid consumption, and degrees of flexion were recorded and compared to patients who received requested boluses only.

METHODS: Scheduled sciatic bolus doses were initiated in an effort to improve postoperative analgesia. All patients had a continuous femoral nerve infusion of 8 ml/hr of 0.2% ropivacaine with a PCA option of an additional 8 ml every hour. In half of the patients, sciatic boluses of 6 ml of 0.2% ropivacaine were available at the patient's request. In the other half, sciatic boluses of 6 ml of 0.2% ropivacaine were scheduled at 8 pm, 12 pm, and 4 am on postoperative day zero in addition to the 4 hours requested dose. VAS, adjunct analgesics, and degrees of flexion were recorded and compared for each patient during the first 48 hours postoperatively while the peripheral nerve catheters were in place.

RESULTS: Medical records were reviewed for the 25 patients who received scheduled sciatic boluses, as well as the 25 patients who received as-needed boluses only. Along with demographic information, primary endpoints were recorded including VAS, quantity of narcotics consumed, and degrees of flexion achieved in physical therapy. Patients in the scheduled-bolus group had lower pain scores than those in the as-needed group on both postpostoperative days, 1.0 average VAS versus 2.8 VAS and 1.1 versus 2.4 for anterior knee pain. For posterior knee pain the scores were 1.2 versus 4.3 for day one and 2.2 versus 2.8 for day 2. The scheduled-bolus group did not demonstrate a reduction in narcotic consumption nor an improvement in knee flexion. Total local anesthetic dose was similar for both groups despite the three scheduled sciatic nerve boluses in one group.

DISCUSSSION: When using continuous femoral and sciatic nerve blocks for total knee arthroplasty, scheduled sciatic nerve boluses are an effective addition to postoperative analgesia.

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S-462.

SMALL RISK OF LUMBAR EPIDURAL INSERTION IN ANESTHETIZED PATIENTS

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INTRODUCTION: The performance of regional blockade on anesthetized patients may increase the risk of postoperative neurologic complications, because these patients can not respond to painful stimuli. However, most children who undergo regional anesthetic techniques are either heavily sedated or under general anesthesia. This study evaluates the frequency of neurologic complications after lumbar epidural catheter placement in anesthetized adult patients.

METHODS: In this study I evaluated the frequency of neurologic complications in 577 orthopedic surgical patients undergoing lumbar epidural catheter placement while under general anesthesia. Catheters were placed immediately after the induction and tracheal intubation.. Patients were examined daily for evidence of neurologic complications resulting from infection, needle or catheter induced trauma, or spinal bleeding. These prospectively collected data were retrospectively reviewed to evaluate the frequency of neurologic complications among study patients.

RESULTS: In four patients opioids were administered intravenously because analgesia was graded as poor. The remaining 573 patients received local anesthetics epidurally with no use of opioids. There were no neurologic complications, including spinal hematoma, epidural abscess or catheter site infections, radicular symptoms, or persistent paresthesias.

DISCUSSION: None of the 577 patients in my study who underwent lumbar catheter placement while anesthetized developed a neurological complication related to lumbar epidural catheter placement or epidural infusion. In reviewing this subject, the following question should be asked. Is this study large enough? Since the risk of cord or nerve root damage is small, a large number of patients need to be examined before seeing such a complication. It is difficult to collect a large number of cases personally. But it seems possible to collect a large number of cases by collecting studies similar to this. I conclude that the risk of neurologic complications associated with lumbar epidural catheter placement in anesthetized patients seems small. However the relative risk of this practice, compared with epidural catheter placement in awake patients, is unkown.

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S-464.

PROPHYLACTIC MIRTAZAPINE PREVENTS SHIVERING DURING SPINAL ANESTHESIA IN ORTHOPEDIC SURGICAL PATIENTS

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INTRODUCTION: Serotonergic neurotransmission is one of the pathways, along with opioidergic, adrenergic, and anticholinergic systems, involved in the mechanisms of postanesthetic shivering (1,2). Mirtazapine is a noradrenergic and specific serotonergic antidepressant that selectively blocked postsynaptic 5-HT2 and 5-HT3 receptors (3,4). It also has kappa opioid activity (5,6). We therefore tested the hypothesis that preoperative mirtazapine could decrease shivering associated with spinal anesthesia.

METHODS: After institutional ethics committee approval and informed consent, thirty- eight ASA I or II patients undergoing orthopedic surgery were enrolled. The patients were randomly allocated to receive mirtazapine 30 mg or placebo 1 hr before anesthesia. Subarachnoid anesthesia with isobaric bupivacaine 15 mg was performed in all patients. The occurrence and intensity of shivering was evaluated and was scored with a five-point scale. Core and peripheral temperature were recorded at 10 min intervals during the perioperative period.

RESULTS: Shivering after 15 min of anesthesia was significantly less in mirtazapine group (2/19) compared with placebo (9/19) ($P = 0.03$). The number of patients with a shivering score of 3 was significantly higher in placebo group than that in mirtazapine group ($P < 0.001$).

DISCUSSION: Preoperative mirtazapine 30 mg is effective in reducing the incidence and intensity of shivering developed during spinal anesthesia.

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S-465.

ANESTHETIC DOSE NEURAXIAL BLOCKADE INCREASES THE SUCCESS RATE OF EXTERNAL FETAL VERSION: A META-ANALYSIS.

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INTRODUCTION: This study is a meta-analysis evaluating the efficacy of central neuraxial blockade (epidural or spinal) (CNB) to facilitate fetal version.

METHODS: A search in PUBMED on July 2nd 2009, EMBASE 1980 to 2009 Week 27, Ovid MEDLINE(R) 1950 to June Week 4 2009, EBM Reviews - Cochrane Central Register of Controlled Trials 2nd Quarter 2009 and CINAHL on July 4th 2009 with no language restriction for all randomized controlled trials (RCT) available was done. Reference lists of all studies were also checked. Data were extracted independently by the two investigators. The optimal information size (OIS) was calculated on a 50% failure rate of fetal version for an absolute reduction of 25% (α 0.05 two-tailed, β 0.2).

RESULTS: The OIS was 494. Seven RCTs 1-7 including 681 pregnant women with a Jadad score between 1 and 3 were found. CNBs increase the success rate of fetal version [Risk Ratio (RR)= 1.44 (95%CI= 1.16- 1.79); P=0.001](random effects model); I2= 30.25; P value for heterogeneity= 0.20. Three studies used a CNB at anesthetic dose of local anesthetic RR= 1.95 (95%CI= 1.46-2.60); P=0.000005; I2=0.00; P value for heterogeneity 0.86; number to treat (NNT) =4 (95%CI=3-6). Four studies used an analgesic dose RR= 1.18 (95%CI= 0.94- 1.49); P=0.15; I2=0.00; P value for heterogeneity 0.77; NNT=14 (95%CI=6-53). These two subgroups were significantly different one from the other with a P value of 0.007.

DISCUSSION: Anesthetic dose neuraxial blockade increases the success rate of external fetal version.

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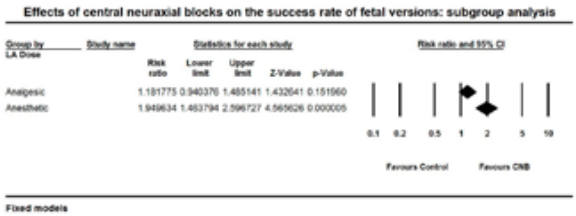

S-466.

ULTRASOUND VISUALIZATION V. ELECTRICAL NERVE STIMULATION FOR INTERSCALENE AND AXILLARY NERVE BLOCK IN UPPER EXTREMITY SURGERY: A PROSPECTIVE RANDOMIZED TRIAL

AUTHORS: J. W. Galassi, J. Buxbaum, J. J. Collins, D. Hartman, M. He, N. M. Schwann;

AFFILIATION: Anesthesiology, Lehigh Valley Health Network, Allentown, PA.

INTRODUCTION: Ultrasound can facilitate peripheral nerve blockade by providing visualization of nerves, surrounding structures, and the distribution of injected local anesthetic. Avoidance of electrical nerve stimulation and visualization of internal anatomy suggest that nerve blocks performed with ultrasound guidance (USNB) may require less time to perform and be associated with an improved patient experience. Provided that success rates are equivalent to those utilizing traditional nerve stimulation (NS), USNB may confer a distinct advantage for patient and provider. This randomized prospective trial compares USNB v. NS with respect to block success rate, time for block completion, and patient comfort.

METHODS: All patients over 18 years of age presenting for elective unilateral upper extremity surgery under isolated interscalene or axillary nerve block were screened. Patients with preexisting peripheral neuropathy, coagulopathy, local anesthetic allergy, or infection were excluded. After written informed consent was obtained, patients were randomized (1:1) to either USNB or NS techniques. A standardized pre-medication was used. NS was performed using a nerve stimulator attached to a 4 cm Stimuplex (B Braun) needle using twitches at a stimulus < 0.5 milliamps. USNB used a 13-6 MHz 25mm linear array probe and display monitor (L25e, S-Nerve, Sonosite). 40ccs of an equal mixture of 0.5% Bupivicaine/1.5% Mepivicaine with 1:200,000 of epinephrine were injected incrementally in both groups. Assessments of patient comfort (Table 1) were made immediately following the block, prior to surgery. Block failure was determined by the need for general anesthesia at any time during the procedure (intraoperative care team blinded to technique). Independent t tests were used to evaluate differences in mean scores between both groups.

RESULTS: 68 patients were enrolled. Overall, no statistically significant differences were seen between techniques in performance time, failure rates, or block related complications. However, there were statistically significant differences between groups with respect to comfort, pain, and anxiety experienced during the nerve block procedure (p=0.034, p=0.041, and p=0.023, respectively). Overall, patients in the NS group scored higher in pain and anxiety and lower in comfort than patients in the USNB group.

DISCUSSION: Practitioners are awaiting outcome data prior to investing in new techniques. Although effectiveness and safety are the primary endpoints of any nerve block, patient experience and provider time warrant evaluation. Procedure related discomfort creates a lasting impression and may affect patients' future acceptance of regional anesthesia. Our data suggests that in comparison to NS, USNB is associated with less pain, anxiety, and improved patient comfort.

Table 1

Scored Factor (1-least, 5-most)	Group	N	Mean	Std Deviation	p value
Total Block Time	NS Nerve Block	26	5.7	3.58	0.621
	USG Nerve Block	42	5.3	2.73	
Were you anxious during the block procedure?	NS Nerve Block	26	2.15	1.41	0.550
	USG Nerve Block	42	1.95	1.31	
Was the block procedure uncomfortable?	**NS Nerve Block**	**26**	**1.92**	**1.2**	**0.034**
	USG Nerve Block	**42**	**1.36**	**0.66**	
Did the block procedure cause pain?	**NS Nerve Block**	**26**	**1.73**	**1.19**	**0.041**
	USG Nerve Block	**42**	**1.21**	**0.42**	
Did you experience a funny bone sensation at any time during the block?	NS Nerve Block	26	1.35	0.89	0.865
	USG Nerve Block	42	1.38	0.76	
Did either US or nerve stimulation cause anxiety or pain?	**NS Nerve Block**	**26**	**1.58**	**1.1**	**0.023**
	USG Nerve Block	**42**	**1.05**	**0.22**	
Did the injection of medicine cause anxiety or pain?	NS Nerve Block	26	1.35	0.85	0.640
	USG Nerve Block	42	1.26	0.63	
Rate Nerve block experience	NS Nerve Block	25	4.68	0.56	0.442
	USG Nerve Block	41	4.8	0.68	
Overall anesthesia experience	NS Nerve Block	25	4.6	0.65	0.210
	USG Nerve Block	41	4.8	0.68	
Rate surgical experience	NS Nerve Block	25	4.72	0.46	0.230
	USG Nerve Block	41	4.9	0.63	

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S-467.

DOES WEIGHT AFFECT THE INR RESPONSE TO WARFARIN IN ORTHOPEDIC PATIENTS?

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INTRODUCTION: Post-operative anticoagulation for orthopedic patients is important for the prevention of thromboembolic events. A low dose oral warfarin regimen is used for prophylaxis in our institution. This specific study examines whether patient weight plays a role in the response to a standard warfarin protocol. Despite standard warfarin doses, the appropriate dose may vary from patient to patient and is often difficult to predict1. In this particular study, we examined the INR values after administration of warfarin.

METHODS: After IRB approval, a retrospective chart review of 2000 patients who had undergone lower extremity orthopedic surgeries between 2004-2008 was conducted. The patients concurrently received a standard low dose oral warfarin regimen and epidural catheters for pain control. For the duration of their inpatient stay, patients were routinely evaluated for motor and sensory functions. Patients were screened for elevated INR values >1.50 on post-operative day two when the epidural catheter was removed. Other information obtained from patient databases included: sex, age, weight, ethnicity, surgeon, and procedure type.

RESULTS: From the 2000 patients screened, there were 760 (482 F, 278M) with INRs >1.5 on post-operative day two. Of those with elevated INRs >1.50 (760/2000 patients), the average INR was 1.79. That group also had an average age of 66 and weight of 86.4kg. The majority of operations were knee surgeries (701), although there were 30 hips and 29 ankle/foot operations as well. The INR values were generally higher for patients in lower weight ranges (50-60kg) than patients in higher weights (>100kg).

DISCUSSION: Warfarin use for anticoagulation is not currently dosed by weight. This study demonstrates that weight seems to affect the patient's response to warfarin therapy. Thinner patients tend to have a higher average INR value compared to heavier patients. There may be an elevated risk of bleeding complications in patients within the lower weight range. In addition, standard warfarin dosing may put heavier patients at a higher risk of thrombembolic events after surgery due to a higher volume of distribution. Further studies are needed to evaluate the weight based dosing of warfarin for post-operative anticoagulation.

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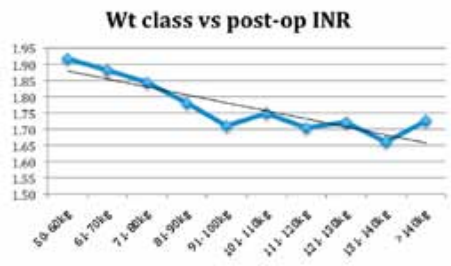
Wt range	INR AVG	# Patients
50-60kg	1.92	35
61-70kg	1.88	115
71-80kg	1.84	153
81-90kg	1.78	155
91-100kg	1.71	136
101-110kg	1.75	80
111-120kg	1.70	40
121-130kg	1.72	21
131-140kg	1.66	15
>140kg	1.73	2



S-468.

REDUCTION OF 48 MONTH MORTALITY DUE TO PERIOPERATIVE THORACIC EPIDURAL ANESTHESIA (96H) IN OPEN COLON SURGERY IN A UNIVERSITY-AFFILIATED SMALL TEACHING HOSPITAL.

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INTRODUCTION: Significant advantages of general anesthesia combined with thoracic epidural anesthesia in patients after open colon surgery have been shown in prospective randomized trials (1-3). We demonstrate that the clinical routine implementation of a 96 h perioperative thoracic epidural anesthesia and analgesia reduce perioperative blood transfusion requirements, reduction in length of hospital and ICU stay and overall mortality in a 48 month observational period in a small district hospital.

METHODS: After local ethical committee approval, we retrospectively investigated patients charts from 1999-2007 and compared patients with general anesthesia combined epidural anesthesia (EPI) and general anesthesia alone (GA). Additionally we integrated data from a follow up governmental based data base for all patients (survival). Statistical analysis was performed using Sigmaplot 7.101 (t-test, χ2-test).

RESULTS: We included 239 patients in this retrospective analysis. In the GA group 52 of 143 patients (37%) died within 48 month compared to 22 of 96 patients (22%, $p<0.05$, χ2-test) in the EPI group. There was no difference in age, BMI or sex within both groups. The average of transfused red blood cell packs (rbc) was 1,26 rbc's in GA group vs. 0,93 rbc's in the EPI group. Patients of the EPI group were discharged earlier from intermediate care / intensive care (65,6 h vs. 42,6 h, $p<0,05$, t-test) and left hospital 2 days earlier (21,36 vs. 19.02 days, $p<0.05$, t-test).

DISCUSSION: Our retrospective data strongly support the use of a combination of general and thoracic epidural anesthesia in patients undergoing open colon surgery. It reduces 48 month mortality, ICU and hospital length of stay as well as blood transfusion requirement.

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S-469.

WITHDRAWN.

S-470.

WITHDRAWN.

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S-471.

THE EFFECTS OF CONTINUOUS POPLITEAL SCIATIC AND SAPHENOUS NERVE BLOCKS ON ARTERIAL BLOOD FLOW FOR RECONSTRUCTIVE FREE FLAP GRAFT TO THE ANKLE: A DOPPLER ULTRASOUND STUDY

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INTRODUCTION: Free tissue transfer surgery is often used for tissue defects about the ankle that are caused by infection or trauma. One reason for free flap failure is poor arterial inflow; which may be caused by sympathetic mediated vasoconstriction of the proximal anastomosis of the arterial inflow or venous outflow obstruction resulting in decreased perfusion of the flap. The transplanted vessels are denuded of sympathetic innervations but are affected by circulating catecholamine released by the stress response.

CASE REPORT: A 49 year old male sustained bilateral ankle fractures following a motor cycle accident with the right ankle requiring a free flap to the medial malleolus. The patient presented with a 1 cm chronic draining wound over the lateral malleolus. After multiple staged debridements to treat chronic osteomyelitis, an ankle arthrodesis was performed followed by a free rectus abdominus flap to provide coverage to the lateral malleolus. Tran sartorial saphenous and popliteal sciatic catheters were placed preoperatively and doppler studies of the posterior tibial and dorsalis pedis were completed prior to administration of local anesthesia. Thirty minutes after local anesthesia was given in the saphenous catheter and confirmation of a block, the doppler study was repeated. Subsequently the procedure was replicated with the sciatic catheter followed with a repeat doppler study. The patient underwent uneventful free flap closure of the tissue defect and was discharged on POD 5. The sciatic block was maintained throughout the hospital stay and the patient was discharged home with an ambulatory infusion pump which was discontinued on POD 8. There was minimal increase in mean arterial time -averaged blood flow following the saphenous block but a significant increase of 227% following the sciatic block. Figure 1. The patient reported excellent pain control following the surgery.

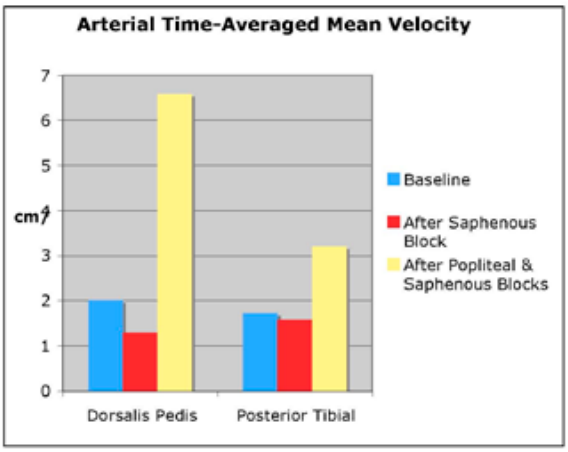

Figure 1

DISCUSSION: The sympathetic blockade prevents neural modulated vasospasm and adequate pain control decreasing circulating catecholamine and increasing the free flap blood inflow. Epidurals have been utilized for lower extremity sympathetic blo–ckade but have limited duration of infusion secondary to risks of infection and epidural hematoma following anticoagulation. Peripheral nerve catheters can be maintained safely for a week and have been used for up to a month for combat casualties at the Walter Reed Army Medical Center in Washington, DC.

CONCLUSION: The peripheral nerve blocks increased distal blood flow in the lower extremity and decreased arterial resistance which could have favorable implications in the success of lower limb free tissue transfer. Additional studies are needed to determine the significance of peripheral nerve block mediated prolonged sympathectomy on free flap success rate.

S-472.

COADMINISTRATION OF WARFARIN WITH EPIDURAL CATHETERS: WHAT IS THE RISK?

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INTRODUCTION: In major orthopedic surgeries, epidural catheters are a safe and reliable method of post-operative pain control. Post-orthopedic patients may receive thrombo-prophylaxis in the form of oral warfarin to prevent thromboembolic complications, such as pulmonary embolism. The purpose of this study is to examine the concurrent use of warfarin for post-operative thrombo-prophylaxis and epidural catheters. Although there are current guidelines (ASRA), there may be clinical questions not yet fully addressed.

METHODS: After IRB approval, a retrospective chart review of 2000 patients who had undergone lower extremity orthopedic surgeries between 2004-2008 was conducted. The patients concurrently received a standard low dose oral warfarin regimen and epidural catheters for pain control. For the duration of their inpatient stay, patients were routinely evaluated for motor and sensory functions. Patients were screened for elevated INR values >1.50 on post-operative day two (epidural catheter removal). Other information obtained from patient databases included: sex, age, weight, ethnicity, surgeon, and procedure type.

RESULTS: From the 2000 patients screened, there were 760 (482 F, 278M) with elevated INRs. There were no instances of neurological complications or clinically evident epidural hematomas from epidural catheter removals. Of those with elevated INRs >1.50 (760/2000 patients), the average INR was 1.79. That group also had an average age of 66 and weight of 86.4kg. The majority of operations were knee surgeries (701), although there were 30 hips and 29 ankle/foot operations as well. The majority of patients with elevated INR were between 1.5-1.99 (640/760), while 106/760 (14%) had INRs between 2.0-2.99. 13 patients had INR between 3-4, and 1 patient had an INR >4.0.

DISCUSSION: Few large studies examine the actual incidence of epidural hematomas for patients with elevated INR. Our study demonstrates a significant percentage of patients with elevated INR (at the time of epidural catheter removal) without clinically evident complications. Of those with INR >1.50, the majority falls between the 1.5-1.99 range. Larger multicenter trials with large populations may be needed to fully evaluate the concurrent use of epidural catheters and warfarin. The risk of moderately elevated INRs (1.5-1.99) may need to be further evaluated.

INR	# Patients	% of total pts
1.5-1.99	640	84.21
2.0-2.99	106	13.95
3.0-3.99	13	1.71
4.0-4.99	1	0.13
>5.0	0	0.00
Total	760	

S-473.

PRE-PROCEDURAL ULTRASOUND IMAGING IMPROVES EASE OF PERFORMANCE OF SPINAL ANESTHESIA IN PATIENTS WITH DIFFICULT SPINAL ANATOMY

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INTRODUCTION: Quality of surface anatomical landmarks is an important determinant of successful spinal anesthesia. Spinal anesthesia may be technically challenging in patients with difficult landmarks due to obesity, previous spinal surgery or spinal deformity. We hypothesized that pre-procedural imaging of the lumbar spine would accurately identify the lumbar intervertebral spaces and would increase the rate of successful dural puncture on the first needle insertion attempt compared to the traditional landmark-guided method.

METHODS: After research ethics board approval and informed consent, 57 patients with difficult surface anatomical landmarks were prospectively randomized to undergo spinal anesthesia using either the traditional landmark-guided approach (group LM) or an ultrasound-assisted approach (group US).

In group US, a low-frequency 2-5 MHz curved-array transducer and portable ultrasound unit (Sonosite M-Turbo) were used to identify the ligamentum flavum-dura mater complex (LFD), posterior vertebral body (PVB) and intrathecal space at the intervertebral levels using a longitudinal paramedian and transverse midline approach as described elsewhere(1). In both groups the number of redirections and attempts were counted and distance from skin to hub of spinal needle was measured. The time taken for surface landmark identification, ultrasound scanning and performance of the spinal anesthetic were recorded.

RESULTS: Patients in both groups were comparable in terms of age, sex, and body mass index (BMI). The mean BMI was 38.9 kg/m^2. 89% of patients had BMI >35, 14% had a spinal deformity and 2% had previous spinal surgery. Surface landmarks were difficult or impossible to palpate in 74% of patients. Dural puncture was achieved with one needle insertion attempt in significantly more patients in group US compared to patients in group LM (59% vs. 46%, p=0.05). Fewer needle redirections were required in group US compared to group LM (median 4 vs. 9). The time taken for performance of the spinal anesthetic was comparable in both groups.

DISCUSSION: Pre procedural ultrasound imaging may improve the ease of performance of spinal anesthesia in patients with difficult anatomical landmarks.

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S-474.

THE BISPECTRAL INDEX IS CLOSELY CORRELATED WITH THE SPREAD OF SPINAL BLOCKADE DURING DEEP SEDATION WITH PROPOFOL.

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AFFILIATION: [1]Anesthesiology, Nihon University School of Medicine, Tokyo, Japan, [2]Social Medicine, Nihon University School of Medicine, Tokyo, Japan.

INTRODUCTION: High spinal anesthesia reportedly causes sedation.[1-4] The degree of sedation, as evaluated by the Bispectral Index (BIS), is related to the extent of spinal block in patients with spontaneous respiration.[2-4] Knowledge of the relationship between BIS and the level of spinal block is important for adequate titration of sedatives during spinal anesthesia. However, there is insufficient data regarding this relationship in patients under deep sedation. The present study was designed to investigate the hypothesis that BIS values closely correlate with the spread of spinal analgesia with hyperbaric bupivacaine in young and middle-aged patients deeply sedated with propofol.

METHODS: One hundred, unpremedicated, American Society of Anesthesiologists physical status I patients, aged 20-64 years (mean age, 37.8±10.9 years) and scheduled for elective arthroscopic knee surgery, participated in this study. After the patients were given spinal block with 3 ml of 0.5% bupivacaine, the spread of analgesia was evaluated for 15 min and recorded at 15 min after the blockade. Subsequently, propofol was administered for 2.5 min as an intravenous target controlled infusion (Diprifusor, AstraZeneca UK Limited, UK), to achieve an estimated blood concentration of 6.0 μg/ml. A laryngeal mask airway (LMA) was inserted and the concentration of propofol was decreased to 3.0 μg/ml, which continued until at least 20 minutes after the estimated effect-site concentration reached and remained at 3.0 μg/ml unless any adverse effects were observed. In all patients, the lungs were mechanically ventilated through the LMA. BIS values were recorded every one minute for 20 min after the estimated effect-site concentration reached and remained at 3.0 μg/ml. The relationship between BIS values and the level of spinal analgesia was evaluated between 1-5 min, 6-10 min, 11-15 min and 16-20 min after the estimated effect-site concentration reached 3.0 μg/ml.

RESULTS: Ninety four patients were included for analysis. At constant estimated effect-site propofol concentrations, BIS values significantly and strongly correlated with the level of spinal analgesia recorded at 15 min after the spinal blockade at every time period ($P<0.0001$). The correlation coefficient values were 0.7979 from 1-5 min, 0.8439 from 6-10 min, 0.8010 from 11-15 min and 0.8036 from 16-20 min.

DISCUSSION: BIS values closely correlated with the level of spinal analgesia in patients during deep sedation with propofol. This implies that the dose of propofol should be titrated according to the spread of spinal analgesia in patients receiving spinal anesthesia and deep sedation with propofol.

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S-475.

COMPARING DUAL GUIDANCE WITH ULTRASOUND AND NERVE STIMULATOR IN COMBINATION VERSUS NERVE STIMULATOR ALONE FOR POSTERIOR LUMBAR PLEXUS BLOCK AND PARASACRAL NERVE BLOCK IN PATIENTS UNDERGOING TOTAL KNEE REPLACEMENT

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INTRODUCTION: Dual guidance with peripheral nerve stimulation (NS) and ultrasound (US) in combination may improve posterior lumbar plexus block (LPB) and parasacral nerve block (PSB) synergistically. A randomized, controlled study to evaluate this area remains to be performed and is required to demonstrate to anesthesiologists that dual guidance with ultrasound and nerve stimulation approach should supersede nerve stimulation alone as the technique of choice for LPB and PSB in patients undergoing total knee replacement.

METHOD: Twelve adults scheduled to undergo total knee replacement were randomized to LPB and PSB with either nerve stimulator alone (Group N) or ultrasound and nerve stimulator in combination (Group D). Both nerve blocks were performed with 20ml of 0.25% ropivacaine by one anesthesiologist. Anesthesia was maintained with general anesthesia and peripheral nerve block. Block performance duration, pain VAS score at rest and at movement until 24hrs after operation, sensory or motor block durations were recorded.

RESULTS: The results of both groups were similar. There were no difference in block performance duration, pain VAS score until 24hrs after operation, and sensory or motor block duration between Group N and Group D. In one patient of Group N, blood aspiration was observed during needle puncture. There was no complication in the other patients.

DISCUSSION: In this study, efficacy of the block, and block perfomance duration were similar between Group N and Group D. Dual guided nerve block is theoretically useful as compared to nerve stimulator guided nerve block, and may possibly decrease the rate of complications.

Block performance duration (sec)

	LPB	PSB
GroupN	61.5±26.4	61.3±18.3
GroupD	55.3±21.6	52.2±21.5

Pain VAS score at rest (100mm)

	0hr	6hr	12hr	18hr	24hr
GroupN	16.7±27.5	13.7±17.3	22.0±22.0	30.8±28.8	29.0±21.6
GroupD	15.0±24.1	20.8±24.2	44.3±9.0	47.8±11.6	50.8±14.6

Pain VAS score at movement (100mm)

	0hr	6hr	12hr	18hr	24hr
GroupN	20.3±34.2	17.5±20.7	40.3±30.0	58.5±27.5	55.2±32.9
GroupD	15.0±24.1	21.7±24.6	48.2±9.3	58.0±14.0	61.7±15.3

Sensory block duration (hr)

	Femoral	Sciatic
GroupN	13±4.5	16±6.2
GroupD	15±5.0	17±8.0

Mortor block duration (hr)

	Tibial	Peroneal
GroupN	11±5.9	14±6.2
GroupD	17±7.0	16±4.9

S-476.

RETAINED FEMORAL PERINEURAL CATHETER IN THE OUT-PATIENT SETTING

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INTRODUCTION: The relatively recent introduction of ultrasound guidance for placement of regional anesthesia techniques has increased the number of practices providing outpatient management of perineural catheters.[2,5,6] As more anesthesiology practices institute perineural catheter services, the utility of regional anesthetic catheters continue to gain attention.[3,4,7] The management of patients outside of the perioperative period presents new challenges to the anesthesiologist, however, and managing complications associated with perineural catheters is unique to such services.[9,10]

CASE REPORT: A 46-year-old male ASA I presented for outpatient repair of a left ACL injury. The patient underwent GA with a LMA. He received a femoral perineural catheter immediately following the surgery. The catheter was placed via a Tuohy needle under ultrasound guidance with an in-plane approach. Twenty mls LA was injected through the Tuohy to dilate the perineural space. The stimulating catheter was inserted 3 cm past the tip of the needle without observed looping. An additional volume of LA was injected through the catheter to verify placement with ultrasound. The catheter was secured using cyanoacrylate glue. An infusion pump was set to deliver 10ml/hr of LA. With his spouse present, the patient was discharged after compulsorily instructions. On POD #1, the patient began to feel pain in his knee and noticed a severed section of tubing and resulting spillage of the LA into the pump bag. The patient disconnected the pump and tubing from the catheter and discarded it. Upon contact by our service on POD#1, no mention of this event was made. The catheter was left in place, without the infusion of local anesthetic, until POD #3 at which time the patient attempted to remove the catheter. The patient was unable to freely remove the catheter but was able to pull with enough force to slide the insulating sheath off of the coiled metal catheter. The coiled metal component became uncoiled as he pulled leaving a thin metal wire protruding from the insertion site. It was only then that the patient contacted our service. Upon evaluation in the ER, an x-ray was done and an ultrasound performed by the anesthesiologist. The catheter tip appeared to be lodged in a deep fascial layer above the nerve without noted knotting. Elective surgery the following day was successful in removal of the remaining catheter material via a 2 cm incision. The patient recovered uneventfully.

DISCUSSION: The extension of practice beyond the perioperative period brings with it many new challenges. As evidenced by this case, having established patient education in place to ensure patient comfort and safety cannot always prevent adverse outcomes.[1,8] This case highlights the importance of effective 2-way communication as patients may not always seek help immediately with complications on their own.

S-477.

CONTINUOUS WOUND INFILTRATION - THE SUFFICIENT ANALGESIA AFTER OPEN ABDOMINAL SURGERY

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INTRODUCTION: Epidural anesthesia is recognized as the excellent modality in postoperative pain management for most major surgeries. However, the application is limited by the risk factors such as infection, hematoma, or the expansionary use of perioperative anti-coagrants. Continuous wound infiltration anesthesia using a multiholed catheter may have a potential as a novel pain management modality, although its benefit after open abdominal surgery seems still controversial. In this randomized controlled study, we evaluated the analgesic effect of continuous infusion of local anesthetic in the wound compared to epidural anesthesia and intravenous morphine analgesia after open lower abdominal surgery.

METHODS: The experiment was conducted in a prospective randomized approach with prior institutional review board (IRB) approval. After obtaining written informed consents, patients who were scheduled to undergo gynaecological open abdominal surgery were randomly allocated to following three groups; continuous wound infiltration (CWI+PCA) group, epidural anesthesia (EPI+PCA) group, or patient-controlled intravenous morphine analgesia (PCA) group as control. All patients including PCA group received intravenous morphine PCA as rescue. In CWI+PCA group, a multiholed catheter was placed by a surgeon in the prepritoneal space at the end of surgery. In EPI+PCA group, an epidural catheter was placed by an anesthesiologist prior to surgery. Patients received 0.2% ropivacaine (10 ml or 5 ml bolus followed by continuous infusion at 6 ml/h or 4 ml/h for 24 h; CWI+PCA group, EPI+PCA group, respectively) after surgery. Morphine consumption for 24hrs after surgery was evaluated as the primary endpoint.

RESULTS: The values of 15 patients were shown as preliminary results of whole study design. No severe adverse events were observed. CWI+PCA group and EPI+PCA group showed decreased morphine consumption [28.4 mg for 24hr (p=0.087 vs. PCA), 16.6 mg for 24h (p=0.014 vs. PCA), respectively] compared to PCA group (39 mg for 24h) (Fig.1). Numeric rating scores were similar between the groups (3.4, 3.1, 3.8; CWI+PCA, EPI+PCA, PCA, respectively) in spite of higher Prince-Henry scores in CWI+PCA group and PCA group compared to EPI+PCA group (2, 1, 2; CWI+PCA, EPI+PCA, PCA, respectively).

DISCUSSION: We have demonstrated that analgesia from continuous wound infiltration of 0.2% ropivacaine had the possibility of sufficient effect after open lower abdominal surgery, although this result does not mean two modalities (CWI and EPI) would have an equal power for the post operative pain management due to small sample size. Bolus injection of local anesthetics might contribute to reduce the initial dose of intravenous morphine. Another interesting result in this study was relatively worse Prince-Henry scores in CWI+PCA group and PCA group. This result may suggest the possible weakness of CWI against pain for mobilization in spite of the catheter placement in the preperitoneal space.

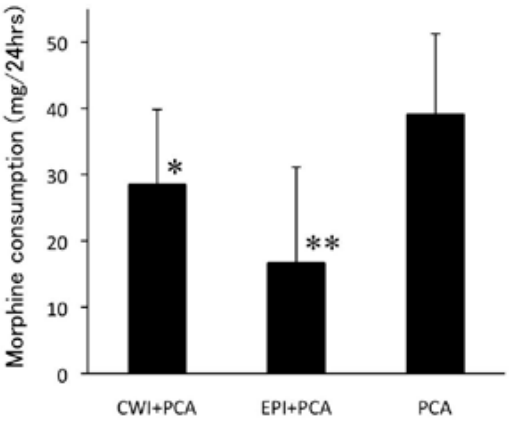

Fig 1 * p = 0.087 vs. PCA group, **p = 0.014 vs. PCA group

S-478.

WITHDRAWN.

S-479.

PERIPHERAL NERVE INJURY AFTER TOTAL KNEE ARTHROPLASTY: ODDS ARE, IT'S NOT THE NERVE BLOCK

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INTRODUCTION: Regional anesthesia (RA) techniques have been shown to improve outcomes after total knee arthroplasty (TKA).1 One of the most debilitating complications following TKA is postoperative nerve injury (PNI). Retrospective reviews have estimated the incidence of PNI following TKA to range from 0.3% to 10%.2-4 However, the overall incidence of neurological complications after RA has been estimated between 0.03% and 3%, depending on the type of RA (e.g. neuraxial vs. peripheral nerve blockade).5-8 The objective of this retrospective cohort study was to test the hypothesis that the use of RA during elective TKA does not increase the risk of PNI.

METHODS: All patients aged ≥ 18 years that underwent elective TKA surgery at Mayo Clinic from January 1, 1988 to July 1, 2007 were identified retrospectively from the Mayo Clinic Total Joint Registry. Data including patient demographics, procedure type, surgeon, anesthesia type, and use of peripheral nerve blockade were collected. The primary outcome variable was the presence of new PNI documented within 3 months of the procedural date. Cases of PNI were confirmed by manual chart review. The frequency of PNI was summarized using point estimates with 95% confidence intervals (CI) calculated using the Poisson approximation. Age, sex, procedure type, anesthesia type, and use of peripheral nerve blockade were evaluated as potential risk factors for PNI using multiple logistic regression.

RESULTS: A total of 12,329 patients underwent elective TKA during the study period and were included for review. After chart review, 97 cases met our criteria of PNI. The overall incidence of PNI was 0.8% (95% CI 0.6% to 1.0%). Use of lower extremity peripheral nerve blockade was not associated with PNI (OR=0.97; 95% CI 0.60 to 1.55). Also, PNI was not significantly associated with anesthesia type (OR=1.10; 95% CI 0.72 to 1.67 for neuraxial vs. general and OR=1.82; 95% CI 0.84 to 3.94 for combined vs. general). The risk for PNI was found to be decreased with older age (OR=0.68; 95% CI 0.58 to 0.80 per 10 year increase; $p < 0.001$) and increased with bilateral procedures (OR=2.51; 95% CI 1.58 to 3.99; $p < 0.001$).

DISCUSSION: The incidence of PNI (0.8%) is consistent with that reported previously for patients undergoing TKA or RA. The risk of PNI after TKA was unchanged by the use of any type of RA (neuraxial or peripheral nerve blockade). These results support the notion that RA provides substantial outcome benefits to patients undergoing TKA without increasing the risk of neurologic injury.

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S-480.

ANALGESIA AFTER TOTAL HIP ARTHROPLASTY: CONTINUOUS EPIDURAL VERSUS CONTINUOUS LUMBAR PLEXUS BLOCK

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Introduction: Continuous epidural block[1] (CEB) is commonly used to control postoperative pain .Recently, continuous lumbar plexus blocks[2,3] (CLPB) have been demonstrated to provide effective postoperative analgesia (POA) following total hip arthroplasty (THA). Our study aimed to investigate whether the CLPB with only local anesthetic can provides a good POA following THA.

METHODS: Thirty two patients undergoing elective THA under general anesthesia were randomized to CLPB or CEB. Both blocks were performed before surgery. In CLPB group, ultrasound was used for allocation of the plexus with the aid of nerve stimulator where the needle advanced under echo guide (in plane) technique. Catheter was inserted and 25 cc of ropivacaine 0.375% was injected through it. For the CEB group, 6ml ropivacaine 0.5% plus 100 µg fentanyl was injected through the catheter .Continuous infusion at a rate of 4-6 ml/h (only ropivacaine 0.2% for CLPB and ropivacaine 0.2% plus 4µg/ml fentanyl for CEB). All patients received flurbiprufen (NSAID) 50 mg/12h iv. Visual analog pain scores were recorded at 4h, 8h, 16h, 24h, 48h and 72h postoperatively at rest and during physiotherapy, pentazocine consumption, opioid-related side effects, complications and patient satisfaction were collected in first 72hrs.Repeated measure ANOVA ,Student t-test and Chi square test were used for analysis with significance at $P \leq 0.05$.

RESULTS: Demographic data were similar in both groups. Average weight was 53.5 kg and 51.5 kg for CLPB and CEB groups respectively. CEB significantly reduced pain scores at 4h, 8h, 16h, and 24h and 72h hours at rest and at 16 hours during physiotherapy compared with CLPB .There were no significant differences for pentazocine consumption, opioid-related side effects, complications or patient satisfaction between the two analgesic techniques.

DISCUSSION: CLPB with only local anesthetic doesn't provide good postoperative analgesia after THA for several factors:

1. Hip joint is supplied by branches of lumbar plexus and sciatic nerve[4] and block only lumbar plexus is not sufficient for POA.

2. Continuous epidural fentanyl and local anesthetic is the most effective analgesic route. However, no continuous fentanyl infusion in CLPB.

3. A large volume of local anesthetic is required to block the entire lumbar plexus which necessitates the dilution of the local anesthetic to stay below the toxic dose. Consequently, the quality of the block may decrease. In epidural block, ropivacaine volume is usually within safe limits.

4. Lumbar plexus anatomical variations were found in more than 40% of cadavers which explain inadequate block in hip surgery.[5]

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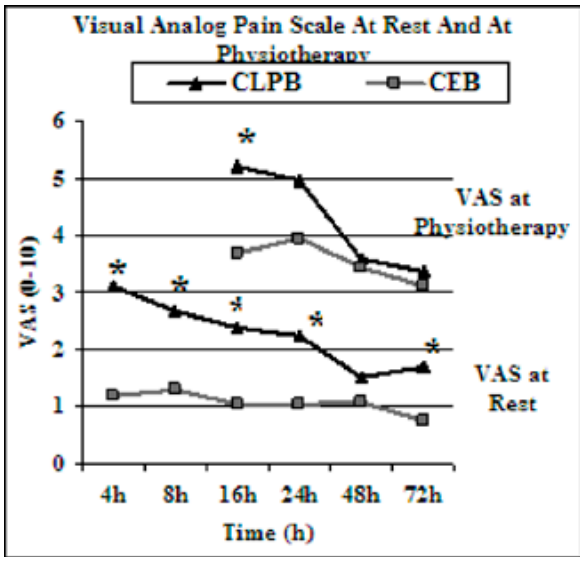

S-481.

TRANSVERSUS ABDOMINUS PLANE CATHETER ANALGESIA IN POSTOPERATIVE RENAL TRANSPLANT PAIN CONTROL

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INTRODUCTION: Postoperative pain after kidney transplant is a common complaint for patients. Typically, large doses of opioids are used to provide analgesia (1). The transversus abdominis plane (TAP) block provides anterior abdominal wall analgesia, and is currently performed with a single injection of local anesthetics (2) or surgical placement of a catheter (3). We describe the analgesic efficacy of a percutaneously-placed continuous TAP block in recipient renal transplant patients.

METHODS: In a retrospective, we collected perioperative information from 26 patients undergoing renal transplant, 12 with and 14 without continuous TAP catheter analgesia, respectively. Before surgery, the TAP catheter was inserted with ultrasound guidance. Placed at the level of the anterior axillary line between the iliac crest and the inferior border of the ribs. The catheter was advanced approximately 10 cm between the internal oblique and transversus abdominus muscles. All patients in the TAP catheter group received a postoperative patient controlled infusion of ropivacaine 0.2% at a basal rate of 8 mL/hour, 12 mL bolus every 60 minutes. Patients who did not have a TAP block receive intravenous opioid, patient controlled analgesia (IVPCA). Pain scores, nausea and vomiting scores and the amount of morphine-equivalent daily dose (MEED) in 48 hours were recorded. Data are expressed as median and percentiles (25th-75th). Comparisons between cases (TAP) and controls for demographic data were done using the Mann-Whitney U test for numeric variables and Fisher's exact test for categorical variables. The analysis for the pain intensity, MEDD, nausea and vomiting was done using Mann-Whitney U test. The threshold for statistical significance was set at $P < 0.05$.

	TAP (n=12) Median (25th-75th percentiles)	Controls (n=14) Median (25th-75th percentiles)	P value
Age	57.5 (40-63)	53 (40-57.25)	0.3
Weight	83.24 (63.39-111.9)	82.6 (60-107.84)	0.65
Height	175.3 (163.2-179.08)	167.6 (160-177.8)	0.56
BMI	30.5 (24.6-33.88)	29.41 (26.14-32.27)	0.56

RESULTS: There was no significant difference between both groups in any of the tested demographic variables (Table 1). Pain scores were similar in both groups of patients (TAP: 2.16 (0.71-3.05) versus IVPCA: 1.61 (0.65-3.54)) ($p>0.05$) (Figure 1). The median MEDD in the in the first 48 postoperative hours was significantly reduced in patients with continuous TAP block 15.19 (0-33.7) versus 287.1 (106.09-332.5) compared to IVPCA ($p<0.001$) (Figure 2). The nausea score was also significantly lower in the TAP group than in the control group (TAP: 1 (0.25-1) versus IVPCA: 1.06 (1-1.15) ($p<0.05$), however the number of vomiting episodes was same in both groups (Table 2). Conclusions: The continuous TAP block technique provides comparable analgesia when compared to IVPCA. This regional technique has opioid sparring effects which are likely responsible for decrease in side effects.

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	TAP (n=12) Median (25th-75th percentiles)	Controls (n=14) Median (25th-75th percentiles)	P value
Nausea	1 (0.25-1)	1.06 (1-1.15)	0.03
Vomiting	0 (0.-0)	0 (0-0)	0.6

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Table 1: Demographics

Table 2; Postoperative Nausea and Vomiting

S-482.

CONTINUOUS PERIPHERAL NERVE BLOCKS: IS LOCAL ANESTHETIC DOSE THE ONLY FACTOR, OR DO CONCENTRATION AND VOLUME INFLUENCE INFUSION EFFECTS AS WELL?

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BACKGROUND: Continuous peripheral nerve blocks (CPNB) are often provided for analgesia following hip (1) and knee (2) surgical procedures. However, one well recognized side effect is muscle weakness (3) and there is growing evidence that lower extremity CPNB increase the risk of falls (4). Many different local anesthetic concentration and basal-rate combinations have been proposed: for ropivacaine alone, concentrations vary between 0.1% and 0.4% (5, 6). Optimizing infusion characteristics is difficult because it is currently unknown if the primary determinant of continuous peripheral nerve block effects is simply total drug dose (mass), or whether local anesthetic concentration and/or volume exert an additional influence. We therefore tested the hypothesis that providing ropivacaine at different concentrations and rates but at an equivalent total basal and patient-controlled bolus doses produces comparable effects when used in continuous posterior lumbar plexus blocks following hip arthroplasty.

METHODS: Preoperatively, a psoas compartment perineural catheter was inserted via a posterior approach. Postoperatively, patients were randomly assigned to receive a perineural ropivacaine infusion of either 0.1% (basal 12 mL/h, bolus 4 mL) or 0.4% (basal 3 mL/h, bolus 1 mL) for at least 48 hours. Therefore, both groups received 12 mg of ropivacaine each hour with a possible addition of 4 mg every 30 min via a patient-controlled bolus dose. The primary end point was the difference in maximum voluntary isometric contraction (MVIC) of the ipsilateral quadriceps the morning following surgery compared with the preoperative MVIC, expressed as a percentage of the preoperative MVIC. A single investigator blinded to treatment group assignment performed preoperative baseline end points and postoperative measurements.

RESULTS: Quadriceps MVIC for patients receiving 0.1% ropivacaine (n=26) declined by a mean (SD) of 64.1% (6.4) vs. 68.0% (5.4) for patients receiving 0.4% ropivacaine (n=24) between the preoperative period and the day following surgery (95% CI for the group difference: -8.0 to 14.4%; P=0.70). Similarly, the groups were found to be equivalent with respect to the secondary end points (Table).

CONCLUSIONS: For continuous posterior lumbar plexus blocks, local anesthetic concentration and volume do not influence nerve block characteristics. This finding suggests that local anesthetic dose (mass) is the primary determinant of perineural infusion effects. Therefore, decreasing local anesthetic concentration to minimize muscle weakness while increasing the basal rate to retain potent analgesia will not likely have the desired effect.

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Table
(Secondary end points (all values postoperative day 1, unless otherwise noted)

	Ropivacaine 0.1%	Ropivacaine 0.4%	P-value
Ambulation 30 m, morning (min)	4.6 (0.3)	5.3 (0.2)	0.41
Ambulation 30 m, afternoon (min)	4.0 (0.3)	3.6 (0.3)	0.56
6-minute walking test, morning (m)	107 (17)	90 (11)	0.82
6-minute walking test, afternoon (m)	182 (35)	155 (23)	0.91
Total ambulation, morning (m)	136 (23)	119 (16)	0.95
Total ambulation, afternoon (m)	223 (43)	214 (36)	0.81
Total ambulatory duration, morning (min)	6.1 (0.7)	6.2 (0.6)	0.83
Total ambulatory duration, afternoon (min)	6.9 (0.6)	7.4 (0.8)	0.93
Hip flexion, preoperative (degrees)	88 (3)	90 (3)	0.60
Hip flexion, morning (degrees)	69 (4)	67 (3)	0.41
Hip flexion, afternoon (degrees)	75 (3)	78 (3)	0.51
Mean resting pain (NRS)	3.2 (0.4)	3.2 (0.4)	0.73
Average dynamic pain, preoperative (NRS)	4.8 (0.4)	5.2 (0.4)	0.35
Average dynamic pain, morning (NRS)	3.8 (0.4)	3.8 (0.4)	0.97
Average dynamic pain, afternoon (NRS)	3.2 (0.4)	2.9 (0.3)	0.49
Worst dynamic pain, preoperative (NRS)	7.6 (0.4)	8.0 (0.4)	0.60
Worst dynamic pain, morning (NRS)	6.2 (0.5)	6.5 (0.5)	0.76
Worst dynamic pain, afternoon (NRS)	4.3 (0.4)	5.0 (0.6)	0.43

Values are reported as mean (SD). Min = minutes. M = meters. NRS = Numeric rating scale.

S-483.

CIRCUMFERENTIAL LOCAL ANESTHETIC SPREAD SPEEDS THE ONSET OF ULTRASOUND GUIDED SCIATIC NERVE BLOCK AT THE POPLITEAL FOSSA

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INTRODUCTION: Ultrasound guidance can increase success rates of peripheral nerve block, and potentially reduce onset and procedure time when compared with the use of peripheral nerve stimulator techniques.[1]

One proposed mechanism of increased success and rapid onset is the ability to acccurately place local anesthetic circumferentially around the target nerve.

Slow onset times can limit the application of sciatic nerve blockade for patients undergoing outpatient foot and ankle surgery. Ultrasound guided techniques can increase success rates of sciatic nerve block at the popliteal fossa as well as potentially reduce onset time.[2]

Our hypothesis was that using ultrasound to ensure that the popliteal nerve is completely surrounded by local anesthetic will reduce local anesthetic perineural diffusion time and speed the onset of anesthesia compared to a single location injection under ultrasound guidance.

METHODS: Following institutional ethics approval and informed consent, 16 adult patients undergoing elective foot and ankle surgery were randomly assigned to one of two groups;Ultrasound guidance with circumferential spread (USC) and Ultrasound guidance with single injection (USS). Using a standardised technique the sciatic nerve was identified just above its bifurcation and 15 mL of 2% lidocaine containing 1:200,000 epinephrine and 15 mL of 0.5% bupivacaine (total volume = 30 mL) was injected using an out of plane approach with needle repositioning to achieve circumferential spread in group USC . The primary outcome measure was onset time of sensory and motor blockade.Secondary outcomes included block procedure time, number of needle redirection attempts and complications during the procedure. Tests of significance included t-tests for independent samples for parametric variables, the Mann Whitney ANOVA of ranks for non-parametric data.

RESULTS: Data was analyzed on an intention-to-treat basis, using SPSS 10.0 for Windows. Patient characteristics were similar between groups.The mean onset time was significantly shorter in group USC than group USS 23 +/-13 min vs 38. +/- 8min respectively(p=< 0.05), pain and block procedure time did not differ significantly between the groups. (Table 1) Complications were minor and transient and did not differ between the groups at two weeks post operatively.

DISCUSSION: Ensuring circumferential spread of local anesthetic around the popliteal nerve speeds the onset of surgical anesthesia and may be of clinical benefit potentially reducing operating room time when a predictable rapid onset block is desirable.

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Popliteal block procedural data

	USC Circumferential injection	USS Single injection	p value
Onset time (min) (+/- SD)	23.89 (+/- 13)	38.75 (+/- 8.5)	.039
Procedure time (min) +/- SD	7.33	6.0	.66
Pain score for procedure VAS (0-10)	3.5	3.5	.52

S-484.

ANALGESIC EFFICACY OF CONTINUOUS FEMORAL NERVE BLOCK PRIOR TO OPERATIVE FIXATION OF FRACTURED NECK OF FEMUR

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AFFILIATION: Anaesthesia, Intensive Care and Pain Medicine, Cork University Hospital, Cork, Ireland.

INTRODUCTION: Peripheral nerve blockade is effective in alleviating pain while avoiding side effects of opioids (1,2). We investigated the analgesic efficacy of femoral catheters versus conventional systemic analgesics in the clinical setting of fractured neck of femur.

METHODS: Consecutive patients awaiting operative fixation of fractured neck of femur were randomized to two groups. Patients with a Mini-mental score <25 were excluded.

Group I: standard analgesic regimen (morphine i.m. 0.1 mg/kg as required).

Group II: femoral catheter, with a bolus of local anaesthetic mixture followed by a continuous infusion of 0.25% bupivacaine 4 ml/h up to 72 hours. Rescue analgesia consisted of morphine i.m. 0.1 mg/kg. All patients received paracetamol 1 g 6 hourly around the clock. Patients were assessed at 30 min following first analgesia and six hourly thereafter for three days. Visual analogue scale (VAS) scores were analyzed using one way ANOVA and $p < 0.05$ was considered significant.

RESULTS: Twelve patients have been recruited to Group I and ten to Group II. Time to surgery was similar in the two groups (27.1 +/- 13.6 vs 32.0 +/- 18.7 h, p = NS). In Group II, resting VAS pain scores were less at 6 h (mm, 10.3 +/-9.6 vs 31.0 +/- 28.1, p = 0.05) and 48 h (8.4 +/- 11.1 vs 24.5 +/- 18.5, p = 0.05) following recruitment. Dynamic pain scores were less at each time point from 30 min up to 54 hours ($p < 0.05$). At positioning for spinal anaesthesia, patients in Group II reported less pain on the verbal rating scale (2.9 +/- 2.7 vs 5.4 +/- 2.7 p = 0.005). Cumulative morphine consumption was less in Group II compared to Group I at each time point. Patient satisfaction with analgesia was higher in group II (10 point verbal rating scale, 9.44 +/- 0.88 vs 7.45 +/-2.16, p =0.008). No side effects or complications of femoral catheters were noted.

DISCUSSION: Low dose continuous femoral nerve block (bupivacaine 0.25% 4 ml/h) is a simple an effective method of pain relief prior to operative fixation of fractured neck of femur resulting in improved patient satisfaction.

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S-485.

MIGRATED INTERSCALENE CATHETER RESULTING IN SEVERE IPSILATERAL VASOSPASM OF FACE

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INTRODUCTION: intersclane catheters have known to migrate leading to failure or even more dangerous complications like intravascular injection leading to toxicity1.

CASE REPORT: A 45 year old healthy male had right shoulder diagnostic arthroscopy, labral debridement and repair. Patient had an right interscalene block performed with ropivacaine, 0.5%, using ultrasound guidance and a Flextip catheter was placed in his brachial plexus. He had sensori-motor block prior to receiving general endotracheal anesthesia. The surgery was uneventful and patient was brought to PACU. An On-Q pump with ropivacaine, 0.2% , at 8 ml/hr with a 5 ml bolus every 30 min was connected to interscalene catheter after testing negative aspiration. Patient delivered a bolus of 5 ml and experienced nausea which was treated with decadron and compazine injection and suddenly he was found to have remarkable color difference in two sides of face . (fig 1.) The catheter had negative aspiration again. Ropivacaine 0.2% infusion was discontinued leaving catheter in situ. An IVPCA was started . The right half of face regained color after 15 minutes. There were no signs of phrenic nerve block, miosis, or anhidrosis, contralateral arm weakness, suggesting neuraxial blockade. His right eye showed minimal ptosis. Next morning an ultrasound exam revealed catheter tip found to be out of brachial plexus lying adjacent to an artery as confirmrd by color doppler. Few ml of saline was injected through catheter and was seen to track posteriorly between deep fascia of neck and scalenus medius muscle . The catheter was removed.

DISCUSSION: The change in color was initially thought to be caused by flushing of left side of face. possibility of left stellate ganglion block causing vasodilation on left side of face was considered . The color of left face appeared similar to rest of the body. The right half of face was markedly pale from vasospasm. This patient had successful initial block with ropivacaine injected through needle. It is plausible that catheter moved from plexus intraoperatively and lodged its tip in an artery. This may have resulted in bolus entering the external carotid artery system in a retrograde manner leading to arterial irritation and vasospasm. Had ropivacaine reached internal carotid or vertebral artery convulsion could have resulted. If the catheter had been in epidural or intrathecal spaces it would have resulted in bilateral arm block. Intra-artial injection appears to be a possible mechanism of vasospasm.

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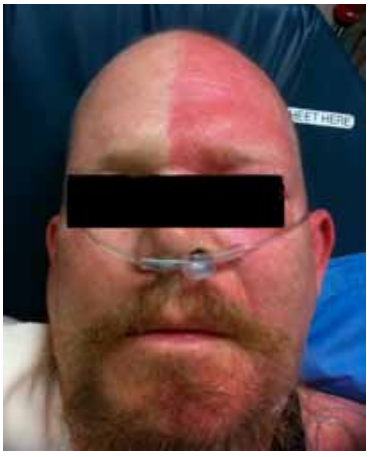

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S-486.

CONTINUOUS POPLITEAL-SCIATIC NERVE BLOCKS FOR POSTOPERATIVE ANALGESIA: COMPARATIVE EFFICACY OF TWO PERINEURAL CATHETER INSERTION TECHNIQUES

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AFFILIATION: Anesthesiology, University of California, San Diego Medical Center, San Diego, CA.

BACKGROUND: Using electrical current with a stimulating catheter is now a well-described and established technique to place a popliteal-sciatic perineural catheter (1). In contrast, using ultrasound guidance alone for perineural catheter insertion is a relatively new modality, and one recent study suggests catheters placed with this technique take less time to insert without a decrease in placement success rate (2). However, it remains unknown if this specific new ultrasound technique results in equivalent postoperative analgesia compared with the previously-described electrical technique employing a stimulating catheter. We therefore tested the hypothesis that a relatively new and exclusively ultrasound-guided technique for placing popliteal-sciatic perineural catheters results in equivalent postoperative analgesia compared to stimulating catheters inserted using electrical stimulation alone.

METHODS: Preoperatively, subjects receiving a popliteal-sciatic perineural catheter for foot or ankle surgery were randomly assigned to perineural catheter insertion using either the new ultrasound-guided non-stimulating catheter technique (2) or more-traditional stimulating catheter technique (1). Mepivacaine 1.5% (40 mL) was used for the primary surgical regional block. Postoperatively, ropivacaine 0.2% (basal 8 mL/h, bolus 4 mL, 30 min lockout) was infused for all subjects for at least 48 hours. The primary outcome was average surgical pain as measured with a numeric rating scale (NRS) the day following surgery.

RESULTS: Of 80 subjects enrolled, 40 were randomized to each treatment group. Thirty-nine of forty patients (97.5%) in the ultrasound group had their catheter placed per protocol and experienced surgical block onset compared with only 31 of 40 (77.5%) of the stimulating catheter group (p=0.014). The ultrasound group had catheters placed in less time (ultrasound median [10th-90th percentiles] of 7.0 [4.0-14.1] min vs. stimulation 11.0 [5.0-30.0] min; p<0.001). However, subjects with successful stimulating catheter placements experienced superior analgesia the day following surgery compared to those who received an ultrasound-guided non-stimulating catheter (3.0 [0.0-6.5] vs. 5.0 [1.0-7.8], respectively; p=0.032). There were five vascular punctures using stimulation compared to none in the ultrasound group (p=0.021). There were no statistically-significant differences in other secondary outcomes (Table).

CONCLUSIONS: For popliteal-sciatic perineural catheters using the specific catheter-insertion techniques described in this comparative-effectiveness study, ultrasound guided non-stimulating catheters take less time and result in higher placement success compared to a stimulating catheter. However, catheters placed successfully using the stimulating catheter technique provide superior analgesia compared to catheters placed by this new ultrasound-guided technique.

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Table

	Ultrasound (n=40)	**Electrical Stimulation** (n=40)	***P*-Value**
Procedure-related pain scores	1.0 [0.0-4.1]	2.0 [0.0-5.4]	0.083
Fluid leakage at site (#)	13	10	0.459
Catheter dislodged (#)	1	3	0.615

S-487.

GESTATION-RELATED REDUCTION IN CEREBROSPINAL FLUID VOLUME AND DURAL SURFACE AREA

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INTRODUCTION: Facilitation of the spread of neuraxial anesthesia in pregnant women may be due in part to compression of the dural sac by the engorged epidural venous plexus. In the present study, we used magnetic resonance imaging to examine pregnancy-induced changes in the lumbosacral cerebrospinal fluid volume (CSF) and dural sac surface area.

METHODS: Magnetic resonance images of 18 healthy women (mean age 29 years; mean height 158 cm; mean weight 58 kg) were obtained to measure lumbosacral CSF volume and dural sac surface area in the nonpregnant and pregnant state (median 36 [31-39] weeks' gestation) and the paired images were compared.

RESULTS: The mean lumbosacral CSF volume and dural sac surface area in the nonpregnant state were 39.6 ± 5.8 ml and 11.0 ± 0.8 cm2, respectively. Pregnancy was associated with compression of the dural sac, resulting in a significantly reduced mean CSF volume (33.2 ± 6.2 ml) and dural sac surface area (9.9 ± 1.0 cm2) in all subjects (p's<0.001). The mean percent change in CSF volume and dural sac surface area was 16.7 ± 0.8% and 10.0 ± 0.5%, respectively. Gestational week (between 31 and 39 weeks) correlated significantly with the reduction in CSF volume (ρ= 0.74, P<0.001) and dural sac surface area (ρ= 0.66, P<0.01).

CONCLUSIONS: These findings indicate an association between gestational week (weeks'31 through 39) and a reduction in both CSF volume and dural sac surface area. These reductions may, at least in part, explain the facilitation of the spread of intrathecal anesthesia in pregnant women.

S-488.

QUANTIFICATION OF VENODILATION FOLLOWING SUPRACLAVICULAR BRACHIAL PLEXUS BLOCKADE TO AID IN SURGICAL MANAGEMENT FOR ARTERIOVENOUS FISTULA CREATION

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INTRODUCTION: Autogenous arteriovenous fistula (AVF) is the preferred method for hemodialysis access in patients with end stage renal disease (ESRD), but it carries a significant failure rate (25%). A recent meta-analysis postulated shorter AVF maturation time after regional blockade1. While success rate largely depends on venous capacitance to accommodate high arterial flow, the degree of venodilation serves as an important surrogate measure. Peripheral nerve blockade may improve AVF surgical outcome, yet the degree of vasodilation has not been clearly established in anesthesia literature. Thus, we quantified the degree of vasodilation of several veins, namely, cephalic, basilic, and brachial veins, following supraclavicular brachial plexus block (SBB) and observed changes in surgical management.

METHODS: From March 2009 to August 2009, we prospectively studied 25 patients with ESRD undergoing AVF creation. All subjects received SBB without general anesthesia. SBB were performed under ultrasound guidance using 30 mL 0.5% bupivacaine. All SBB were successful based on complete sensory and motor blockade of the upper extremity. One observer marked and measured the vessel diameter in the anetcubital fossa pre and 30 minutes post SBB using ultrasound [MicroMaxx, Sonosite Inc].

RESULTS: All subjects showed venodilation following SBB. The average vein diameter increased from 0.39 ± 0.08 cm to 0.52 ± 0.08 cm, with a net change of 0.13 ± 0.04 cm (p-value <0.0001).

Vessels	Number of Subjects	Number of Vessels	Pre	Post	Post - Pre Change	p-value
All	25	58	0.39 (0.31 - 0.47)	0.52 (0.44 - 0.60)	0.13 (0.10 - 0.17)	<0.0001
Antecubital Basilic	23	23	0.32 (0.26 - 0.38)	0.50 (0.44 - 0.56)	0.18 (0.12 - 0.25)	<0.0001
Antecubital Cephalic	19	21	0.43 (0.27 - 0.58)	0.55 (0.38 - 0.72)	0.12 (0.08 - 0.17)	<0.0001

Vein selection was altered post SBB in four out of 25 patients based on the degree of vein diameter change.

DISCUSSION: A larger vessel diameter results in high AVF flow rate which leads to lower AVF failure rate. The antecubital basilic vein changed 56% in diameter, being the largest percent change. The reason for high predilection of basilic vein diameter change is inconclusive. However, based on the results of vessel dilatation post SBB, surgical management is facilitated by aiding in selection of optimal vein to create AVF2.

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S-489.

EFFICACY OF POSTOPERATIVE EPIDURAL ANALGESIA VERSUS SYSTEMIC OPIOIDS IN CHILDREN: A SYSTEMATIC META-ANALYSIS.

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INTRODUCTION: A systematic meta-analysis was performed using data from randomized controlled trials (RCTs) to assess whether epidural analgesia provides superior postoperative pain control in comparison to systemic opioids in infants, children and adolescents.

METHODS: A search of Pub Med was performed to identify RCTs comparing epidural analgesia with systemic opioids for postoperative pain control in pediatric patients (<18 years) from January 1970 to October 2009. A combined search of "epidural", "analgesia", "postoperative", and "children" yielded 450 results. The abstracts were filtered through inclusion and exclusion criteria, yielding 11 articles for analysis. Study endpoints included postoperative pain scores, rescue analgesia, and adverse events, including postoperative nausea and vomiting (PONV), pruritis, respiratory depression and urinary retention. Relevant data were extracted from accepted studies. All articles were analyzed for the above data by 3 anesthesiologists independently. Data were analyzed using Revman 4.2.

RESULTS: The data from 11 studies demonstrated that epidural analgesia was more effective in pain control based on postoperative pain scores when compared to intravenous opioids at 4, 12, and 18 hours after surgery. The pooled estimate VAS pain scores at 18 hours postoperatively comparing epidural analgesia to systematic opioids are depicted in [Fig 1]. The incidence of PONV was decreased in the epidural analgesia group compared to the intravenous analgesia group.[Fig 2] There was no difference in the incidence of pruritis in the groups at any time interval.

DISCUSSION: These data demonstrate that epidural analgesia provides superior analgesia in the first several hours postoperatively compared to systemic opioids in the pediatric population and provide a decreased incidence of PONV.

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Figure 1: This figure shows the pooled estimate VAS pain scores at 18 h postoperatively comparing epidural to systemic opioids. The pooled estimate and 95% confidence interval (WMD = -1.16, 95% confidence interval [CI]: -1.16, -0.35, p = 0.005) lies entirely to the left of "1", suggesting that the use of epidural is associated with significantly lower VAS pain scores compared to systemic opioids.

Figure 2: This figure shows the pooled estimate PONV comparing epidural compared to systemic opioids. The pooled estimate and 95% confidence interval (OR = 0.42, 95% confidence interval [CI]: 0.21, 0.82, p = 0.01) lies entirely to the left of "1", suggesting that the use of epidural is associated with a significantly lower odds of PONV compared to systemic opioids.

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S-490.

EFFECT OF FEMORAL CATHETER INSERTION DISTANCE ON QUALITY OF SENSORY BLOCK FOR TOTAL KNEE ARTHROPLASTY

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INTRODUCTION: Total knee arthroplasty may result in severe post-operative pain. To control pain, continuous femoral nerve blocks using catheters are now routinely employed as part of a multimodal pain management regimen. The optimal insertion distance of these catheters is unknown, and may affect the effectiveness of analgesia. Catheters inserted a greater distance may move away from the target nerve, diminishing initial effectiveness, while catheters inserted a lesser distance may not remain correctly positioned during the post-operative period. The present prospective, randomized, double-blind, bicentric study hypothesized that after insertion and immediate injection through the catheter of local anesthetic, the quality of the initial sensory and motor block produced using catheters inserted 7 cm past the needle tip would not be diminished compared to a second group in which catheters were inserted 3 cm past the needle tip. Secondary outcomes included pain scores, morphine consumption, and the quality of block 24 hours after surgery.

METHODS: 72 patients undergoing total knee arthroplasty were randomly assigned to either group 7CM or group 3CM. All patients received 0.4 ml/kg (maximum: 30 ml) of 2% lidocaine with epinephrine 1:200 000. Thirty minutes after injection, sensory (cold sensation at 3 points on the lateral, anterior, and medial thigh) and motor (knee extension) blockade were evaluated. Bupivacaine 0.125% was then perfused at 10-15 ml/h through the catheter for 24 hours. Pain scores (0-10 on a numerical rating scale) were recorded 3h, 6h and 24h after the surgery. Patient controlled intravenous morphine consumption over the first 24h was recorded. Sensory block was re-evaluated 24h after inserting the catheters. Proportions were compared using Fisher's Exact Test while means were compared using t-tests.

RESULTS: Thirty minutes after catheter injection, the presence of motor block (7CM 100% vs. 3CM 97%, p=0.5) as well as the incidence of total sensory analgesia in all 3 evaluation territories (7CM 33% vs. 3CM 17%, p=0.08) was not significantly different. Pain scores for groups 7CM and 3CM respectively at 3h (3.5 ± 3.1 vs. 3.1 ± 3.0, p=0.59), 6h (4.6 ± 2.7 vs. 4.2 ± 2.9, p=0.50) and 24h (3.3 ± 2.4 vs. 3.1 ± 2.5, p=0.78) as well as 24 hour morphine consumption (7CM 54 +/- 33 mg versus 3CM 46 +/- 34 mg, p=0.11) were not significantly different. At the 24h evaluation, significantly more patients showed complete sensory anesthesia of the 3 territories in group 7CM: 39%, vs. 3CM: 6%, p=0.0006.

DISCUSSION: Inserting femoral catheters 7 cm beyond the needle tip does not seem to diminish the initial quality of sensory anesthesia. Instead, it appears to result in significantly greater sensory block 24 hours after surgery.

REFERENCE: A procedure-specific systematic review and consensus recommandations for postoperative analgesia following total knee arthroplasty. Anaesthesia 2008; 63: 1105-1123

S-491.

CAUDAL EPIDURAL BLOCK VERSUS LUMBOSACRAL PLEXUS BLOCK IN LOWER LIMB OPERATIONS IN PEDIATRICS.

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The present study included 80 patients randomly allocated into two groups according to the technique of regional anesthesia to assess the quality and the haemodynamic effects of psoas compartment block (Group II) for anesthesia and postoperative analgesia compared with caudal technique (Group I) in lower extremity surgery. There were no significant changes between the two groups of patients as regards age, weight, gender, and ASA class. In the present study there were no significant changes between the two groups of patients as regards duration of surgery. Psoas compartment block (PCB) provides excellent anesthesia and analgesia to the regions supplied by the lumbar plexus.

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