

Combined spinal–epidural–general anesthesia (CSEGA)

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The concept of combined spinal–epidural–general anesthesia (CSEGA) was recently described in a case report [1]. This method might also be useful for upper abdominal operations. It would be beneficial if we could reduce the amount of muscle relaxants necessary for an operation, especially for patients with cirrhosis or renal failure. We designed this study in order to evaluate whether this technique can also be extended for upper abdominal operations without the use of muscle relaxants or intravenous anesthetics, except for the endotracheal intubation. No comparisons were made with other types of anesthesia in terms of the effectiveness of CSEGA. Patients with lower abdominal operations were also included in order to evaluate the possibility of ventilating them throughout the operation with the use of only 0.5% isoflurane, with no muscle relaxants or i.v. anesthesia.

Fifteen patients aged 35–73 years (mean 61.4 years), seven males and eight females, were included in the study after an informed consent was obtained (Table 1). One liter of Lactated Ringer's solution was given before starting anesthesia. While the patient was lying on one side an 18G epidural needle (Portex Minipack, Kent, UK) was inserted at the L2–3 interspace. An epidural catheter was introduced through it with its tip directed cephalad, without injecting anything through it. At the L3–4 interspace a spinal needle (22G Quincke for patients aged more than 60 years, and 24G Sprotte for patients less than 60 years) was inserted until CSF was obtained. Three milliliters of 0.5% heavy bupivacaine (Astra, Sweden) was injected through the spinal needle. The patient was then laid on his/her back. Five minutes later, after monitoring the regional anesthetic level, an endotracheal tube was inserted and $0.01\text{ mg}\cdot\text{kg}^{-1}$

pancuronium, $1.5\text{ }\mu\text{g}\cdot\text{kg}^{-1}$ fentanyl, $5\text{ mg}\cdot\text{kg}^{-1}$ thiopental $1.5\text{ mg}\cdot\text{kg}^{-1}$ succinylcholine were administered. After tracheal intubation the patient was ventilated with an FiO_2 of 0.3 with air or N_2O with 0.5% isoflurane. Top-up injections through the epidural catheter were given every 2.5 h using 5 ml 1.5% lidocaine. After the operation, the patient received 4 mg epidural methadone every 8 h.

The double-space combined spinal–epidural anesthesia was especially chosen instead of the controversial needle-through-needle technique to avoid mixing the CSEGA concept with the technical issue of performing combined spinal–epidural anesthesia. Excellent anesthesia was obtained in all patients. The abdominal relaxation obtained by the spinal anesthetic injection with the epidural top-up injections provided the surgeons with a working field which was no different from the one they had with i.v. muscle relaxants. No opiates or other i.v. anesthetics were needed. One patient was operated on for 480 min (Whipple operation). The patients were awakened within 5 min after closing the isoflurane. Post-operatively, the patients were kept pain-free by the use of epidural methadone injections. There were no intraoperative events which necessitated giving muscle relaxants or i.v. anesthetics. Since there were no control groups to either of the separate techniques (spinal, epidural, or general), which are well-known separate techniques, there is no claim about CSEGA's benefits based on clinical grounds, but only on theoretical ones.

The CSEGA technique combines excellent muscle relaxation of the subarachnoid block with the ability to supplement analgesia through the epidural catheter and the endotracheal tube ventilation using a low concentration of an inhalational anesthetic. By using these three anesthetic approaches, the patients were able to be operated on as effectively as with the usual general anesthesia. Operations like right hemicolectomy, Whipple operation, sub-total colectomy and umbilical hernias were done with the full satisfaction of the surgeons and the patients. There was no need to use i.v.

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Table 1. Details of the 15 patients included in the study

Subject	Age (years), sex	ASA	Operation	Duration (min)
1	69, M	2	Retropubic prostatectomy	65
2	67, F	2	Sub-total colectomy	240
3	43, F	1	Umbilical hernia	65
4	68, M	2	Retropubic prostatectomy	60
5	35, F	2	Umbilical hernia	50
6	61, M	2	Whipple operation	480
7	54, F	2	Umbilical hernia	240
8	72, M	3	Retropubic prostatectomy	70
9	66, F	2	Right hemicolectomy	120
10	50, F	2	Umbilical hernia	90
11	71, M	2	Retropubic prostatectomy	60
12	55, F	2	Umbilical hernia	100
13	72, M	2	Hemicolectomy	120
14	65, F	1	Abdomino-perineal resection	270
15	73, M	2	Retropubic prostatectomy	70

muscle relaxants or other i.v. anesthetics, except for the endotracheal intubation. The excellent regional anesthetic element of CSEGA obviates the need to use high anesthetic inhalational concentrations because there is no painful stimuli coming from the surgical field through the spinal cord into the brain.

The logic of the method relies on minimal doses for maximal benefits. It means the use of a minimal dose in the spinal anesthetic, a minimal augmentation dose in the epidural anesthetic, and a minimal inhalational dose to keep the endotracheal tube in place and aid ventilation. The doses that were used in this study (spinal, 3 ml

heavy 0.5% bupivacaine; epidural, 5 ml 1.5% lidocaine every 2.5h; general, isoflurane 0.5%) are only one example of the various doses that can be used in CSEGA. The CSEGA technique is a new kind of anesthesia and is not only a simple combination of three approaches: spinal, epidural, general. The whole is more than the sum of its parts.

Reference

1. Eldor J (1994) Combined spinal-epidural-general anesthesia. *Reg Anesth* 19:365-366