J Anesth (2002) 16:119–122

Journal of
Anesthesia

Clinical assessment of spinal and epidural anesthesia in inguinal hernia repair

Ömer Günal[1], Yüksel Arikan[1], and Nurhan Çelikel[2]

[1] Department of General Surgery, Düzce School of Medicine, Abant İzzet Baysal University, Konuralp, 14400, Düzce, Turkey
[2] Department of Anaesthesiology, Düzce School of Medicine, Abant İzzet Baysal University, Düzce, Turkey

Abstract

Purpose. The current study was done to compare the effect of spinal and epidural anesthesia on surgical outcome measures of inguinal herniorrhaphy.

Methods. Ninety-eight male patients undergoing inguinal hernia repair were randomized to either spinal (SA; $n = 39$) or epidural (EA; $n = 59$) anesthesia groups anesthetized with either glycosylated bupivacaine (20 mg) or 0.5 % bupivacaine (100 mg). Anesthesia onset time (AOT), postoperative stand-up time (SUT), first pain sensation time (FPT), operation time (OT), analgesic requirement (AR), hospital stay (HS), visual analogue scores of pain (VAS), per- and postoperative complications, and postanesthesia complications were recorded and compared with each other.

Results. FPT was 6.6 ± 0.6 h and 3.1 ± 0.4 h and OT was 40 ± 2 min and 33.1 ± 1 min in the EA and SA groups, respectively ($p < 0.05$). SUT was also longer in EA group. VAS scores at 12 and 24 h were significantly higher in the EA group (28 ± 4 mm and 24 ± 5 mm in EA and 16 ± 4 and 5 ± 1 mm in SA; $P < 0.05$). No statistically significant difference was found between the SA and EA groups with respect to the other outcome measures that were considered.

Conclusion. Spinal and epidural anesthesia show some differences from each other with respect to outcome measures such as OT, SUT, FPT, and 12- and 24-h VAS scores.

Key words Epidural · Spinal · Inguinal hernia · Pain

Introduction

Inguinal hernia repair can be performed by using a variety of anesthetic techniques. Today, conventional hernia repair is an ambulatory or day surgical procedure performed with patient under local anesthesia, resulting in low morbidity and mortality [1]. General, spinal, epidural, and regional field blocks have all been used [2]. Different types of anesthesia have been reported to cause hemodynamic changes during induction and maintenance of anesthesia [3–6]. Preference for any one for the anesthetic techniques is a subject of investigation. Good exposure of the operative site depends on muscle relaxation. In addition, hemodynamic stability of the patient and uneventful surveillance of the operation provides a great deal of comfort to the surgeon and may affect the patient's safety and the outcome of the surgery. The current study was planned to investigate the effect of spinal or epidural anesthesia on surgical outcome measures in patients who underwent inguinal hernia repair.

Address correspondence to: Ö. Günal, Hukukçular Sitesi, B-1 Blok, Daire:5, Yenilevend, 80690, Beşiktaş-İstanbul, Turkey
Received: October 10, 2000 / Accepted: November 30, 2001

Materials and methods

In this prospective clinical study, 98 patients with unilateral inguinal hernia underwent spinal (SA; $n = 39$) or epidural (EA; $n = 59$) anesthesia. Informed consent was obtained from each patient. The patients were randomized in the operating theatre by choosing a number card. Patients with odd numbers were allocated to the SA group and those with even numbers were allocated to the EA group. Bupivacaine 100 mg 0.5% in 20 ml of saline (Marcain, Eczacıbaşı, İstanbul) and glycosylated bupivacaine 20 mg (Heavy Marcain, Eczacıbaşı, İstanbul) were used as anesthetic agents in the EA and SA groups recpectively. We did not use concomitant opioid analgesia for standardization and exclusion of the relevant factors that affect the outcome. Patients who required opioid analgesia during anesthesia were excluded from the study.

Spinal and epidural anesthesia was performed by using 22 gauge and 18 gauge needles, respectively, through the L3–4 intervertebral space. All patients underwent posterior approach inguinal hernia repair. A senior consultant performed all the operations.

Iliopubic tractus and/or prolene mesh repair was performed on all patients. All patients were in ASA class I.

The operation was started when pain sensation at the incision site was lost. The duration from injection of the anesthetic agent until the moment that pain sensation was lost was taken as the anesthesia onset time (AOT). Pain sensation was evaluated by the pinprick test. Motor blocks were evaluated by the Bromage test [7]. If the patient had no motor block and had full ability to flex the knees and feet, the block was considered Bromage I. Patients with Bromage II block had partial block, in that they had the ability to flex the knees and resist gravity with full movement of the feet. Patients with Bromage III block had almost complete block, in that they were unable to flex the knees but retained the ability to flex the feet. Bromage IV score was considered a complete block, in that the patient was unable to move the legs or feet.

The time when the patient was first able to walk was taken as the stand-up time (SUT). The first pain sensation time (FPT) was the time when the patient first felt pain in the incisional wound postoperatively. Operating time (OT) was the time between skin incision and skin closure. Analgesic requirement (AR) was expressed by the amount of analgesic (milligrams of metamizole) that was administered intramuscularly (IM) to the patient upon his request during the first postoperative 24 h. Pain was measured by the visual analogue scale (VAS) at 1, 12, and 24 hours postoperatively and at FPT. Hospital stay (HS) was the time from operation until discharge from the hospital. Bleeding in the operation site and inadvertent severing of the ilioinguinal nerve or the ductus deferens were considered intraoperative complications. Postoperative urinary retention, scrotal edema, infection (testicular or incisional), scrotal or incisional hematoma, and ischemic orchitis were considered postoperative complications. Patients were also followed up for postanesthesia complications, such as headache, post-lumbar-puncture back pain, nausea and vomiting, and dizziness.

Statistical analysis

For statistical analysis, Fisher's exact test and the student *t*-test were used; a *P* value less than 0.05 was considered to indicate a significant difference. All values are expressed as mean ± SEM.

Results

All patients were male. Patient characteristics were similar in both groups (Table 1). AOT was similar in both groups (Table 2). SUT was significantly longer in the EA than in the SA group (Table 2). Patients in the SA group tended to require injection of more metamizole than those in the EA group (Table 2). HS was similar in both groups (Table 2). The percentage of patients discharged on the day of operation was greater in the EA than in the SA group (Table 3). VAS scores at different periods and at the FPT are shown at Table 4. Postoperative scores at hours 12 and 24 were significantly higher in the EA than in the SA group. FPT was 6.6 ± 0.6 and 3.1 ± 0.4 h in the EA and SA groups,

Table 1. Patient characteristics

Characteristic	Epidural anesthesia	Spinal anesthesia
Sex (male/female)	59/0	39/0
Age(yr)	24.3 ± 1.2	23.2 ± 1.7
Weight(kg)	68.2 ± 1	69 ± 1.4
Height(cm)	172.1 ± 0.9	170.3 ± 1

Table 2. Comparison of epidural (EA) and spinal (SA) anesthesia groups with respect to some outcome measures that are relevant to anesthesia and surgery

Outcome	EA	SA	*P*
Anesthesia onset time (min)	11.7 ± 0.6	11.3 ± 1	0.36
Stand-up time (h)	9.4 ± 1	5.7 ± 1	0.03
Analgesic requirement (mg)	88.3 ± 12 (100)[a]	100 ± 15 (100)[a]	0.29
Hospital stay (days)	1.2 ± 0.1	1.8 ± 0.2	0.10

[a] Values in parantheses are medians of groups

Table 3. Numbers of patients in epidural (EA) and spinal (SA) anesthesia groups according to length of hospital stay

Hospital stay (days)	EA(%)	SA (%)
0	17 (29)	4 (10.2)
1	21 (35)	13 (33.3)
2	13 (22)	11 (28.2)
3	4 (7)	9 (23.2)
4	4 (7)	2 (5.1)

Table 4. Visual analogue scores (VAS) of pain at different times and first pain sensation time (FPT) in epidural (EA) and spinal(SA) anesthesia groups

VAS score (cm)	EA	SA	*P*
Postoperative hour 1	0.5 ± 0.2	1.1 ± 0.3	0.16
At FPT	4.3 ± 0.3	3.7 ± 0.4	0.16
Postoperative hour 12	2.8 ± 0.4	1.6 ± 0.4	0.02
Postoperative hour 24	2.4 ± 0.5	0.5 ± 0.1	0.0001

Table 5. Per- and postoperative surgical complications in epidural (EA) and spinal (SA) anesthesia groups

Complication	EA	SA	*P*
Peroperative			
Bleeding	6	8	0.23
Ilioinguinal nerve injury	0	1	0.39
Spermatic duct injury	1	0	1
Total (%)	7 (12)	9 (23)	0.08
Postoperative			
Urinary retention	2	0	0.51
Scrotal edema	5	2	0.69
Infection(scrotal/incisional)	0	0	—
Hematoma(scrotal/incisional)	1	1	1
Ischemic orchitis	0	0	—
Total (%)	8 (13)	3 (7)	0.52

Table 6. Anesthesia-related complications in epidural (EA) and spinal (SA) anaesthesia

Complication	EA	SA	*P*
Headache	2	3	0.38
PLBP[a]	7	11	0.06
Nasea and vomiting	1	2	0.56
Dizziness	1	1	1

[a] Post-lumbar-puncture back pain

respectively ($P < 0.05$). OT was 40 ± 2 and 33.1 ± 1 min in the EA and SA groups, respectively ($P < 0.05$). No statistically significant difference was found between SA and EA groups with respect to per- and postoperative surgical complications (Table 5). The most frequently seen anesthesia-related complication was post-lumbar-puncture back pain (PLBP) with both anesthesia techniques (7 of 59 patients in the EA group *vs* 11 of 39 in the SA group; $P > 0.05$). No significant difference was found between the two anesthetic techniques with respect to any postanesthesia complication (Table 6). We obtained a T10 level analgesia in both groups. All patients in the SA group had complete motor block in the lower extremities up to the T10 level (Bromage IV). Only seven patients in the EA group developed motor block (five patients Bromage II, two patients Bromage III). We observed no intraoperative anesthetic complication that caused hemodynamic instability in either group.

Discussion

Our data show that SA and EA for inguinal hernia repair have different effects on some outcome measures. Choosing a type of anesthesia is as important as choosing the appropriate surgical technique. Diverse types of criteria have been used for comparison of the different types of anesthesia techniques in different surgical operations [8–11].

In our study, we tried to use the most determining outcome measures for the surgeon in inguinal hernia repair. All patients were male. Both groups were comparable regarding patient characteristics. OT was significantly longer in the EA group (40 ± 2 *vs* 33.1 ± 1 min). This may result from the easier exposure of the operative site due to the greater muscle relaxation in the SA group. In our study group, SA provided complete motor and pain block to the T10 dermatome level in all patients Despite the longer operation time, FPT was significantly longer in the EA group, suggesting that EA provides a more painless postoperative period than SA [10]. However, VAS scores were significantly higher in the EA group than in the SA group at postoperative hours 12 and 24.

Both types of aneshesia technique provided analgesia at approximately the same time (11.7 ± 0.6 min for EA and 11.3 ± 1 min for SA; $p > 0.05$). We thought that rapid EA onset time was due to the relatively large dose of bupivacaine (100 mg in 20 ml of normal saline). This aspect of regional anesthesia needs to be further studied. SUT was longer in the EA group (9.4 ± 1 *vs* 5.7 ± 1 h; $P < 0.05$). This may be the result of early clearance of the drug through the spinal route [10]. The type of anesthesia did not affect HS. However, the percentage of patients who were treated as outpatients was higher in the EA than in the SA group. Epidural anesthesia seems advantageous in the ambulatory setting. AR tended to be less in the EA group (88.3 ± 12 *vs* and 100 ± 15 mg; $P > 0.05$). We thought that this was due to the long postoperative painless period in the EA group.

The role of spinal anesthesia in outpatient surgery is still controversial, despite the fact that it is one of the most useful methods of anesthesia. It is easy to perform, has a rapid onset of action, and provides good pain relief and muscle relaxation [10]. Pain scores were considerably higher in the EA group at postoperative hours 12 and 24. No statistically significant difference was found between the two groups with respect to the FPT VAS scores (Table 4). Although it seems that EA patients suffer more pain at postoperative hours 12 and 24 than SA patients, EA provides a longer painless postoperative period in the early postoperative period.

Spinal and epidural anesthesia are used on an outpatient basis [8,10,12]. However, the widespread use of SA in the ambulatory setting is controversial because of concern over postdural puncture headache (PDPH) and delayed micturition[9,10]. In our study group, two patients in the SA group and three patients in the EA group suffered from headache. Two patients in the EA group developed urinary retention. Any anesthetic technique suitable for day surgery should provide certain essential features of rapid outpatient recovery: alertness, ambulation, analgesia, and early return to alimentation [10]. All our patients in both groups started oral intake 6 h postoperatively. Only one patient in each group had dizziness during the first postoperative 24 h. Regional anesthesia offers many advantages in the ambulatory setting. It limits postanesthesia nursing care, reduces anesthesia-related unplanned hospital admissions, decreases patient recovery time, and reduces the amount of analgesic administration in the early postoperative period [8,9,13].

In conclusion, epidural and spinal anesthesia show differences with respect to some surgical outcome measures, such as OT, SUT, FPT, and 12- and 24-h VAS scores. To take into account the effects of spinal and epidural anesthesia techniques on these outcome measures in inguinal hernia repair may be helpful to both the anesthetist and the surgeon for decision-making.

References

1. Chung RS, Rowland DY (1999) Meta-analyses of randomised controlled trials of laparoscopic versus conventional inguinal hernia repairs. Surg Endosc13:689–694
2. Behnia R, Hashemi F, Stryker SJ, Ujiki GT, Poticha SM (1992) A comparison of general versus local anesthesia during inguinal herniorrhaphy. Surg Gyn Obstet 174:277–280
3. Philbin JH, Bland JH (1979) The cardiovascular effects of anesthetics: an introduction. Int Anesthesiol Clin 17:1–11
4. Albright GA (1979) Cardiac arrest following regional anesthesia with etidocaine or bupivacaine. Anesthesiology 51:285–287
5. Hirota Y, Sugiyama K, John S, Kiyomitsu Y (1986) An echocardiographic study of patients with cardiovascular disease during dental treatment using local anesthesia. Oral Maxillofac Surg 44:116–121
6. Barber WB, Smith LE, Zaloga GP (1985) Hemodynamic and plasma cathecolamine response to epinephrine-containing lidocaine anesthesia. Anesth Analg 64:924–928
7. Meyer J, Enk D, Penner M (1996) Unilateral spinal anesthesia using low flow injection through a 29-gauge Quincke needle. Anesth Analg 82:1188–1191
8. Quaynor H, Corbey M, Berg P (1990) Spinal anaesthesia in day-care surgery with a 26-gauge needle. Br J Anaesth 65:766–769
9. Chung F (1991) Which is the best anesthetic technique? Symposium report on outpatient anaesthesia. Can J Anaesth 38:882–887
10. Pittoni G, Toffoletto F, Calcarella G, Zanette G, Giron GP (1995) Spinal anesthesia in outpatient knee surgery: 22-gauge versus 25-gauge Sprotte needle. Anesth Analg 81:73–79
11. Sarma BJ, Bostrom U (1990) Intrathecal anesthesia for day-case surgery. A retrospective study of 160 cases using 25- and 26-gauge spinal needles. Anaesthesia 45:769–771
12. Flaaten H, Raeder J (1985) Spinal anesthesia for outpatient surgery. Anaesthesia 40:1108–1111
13. Pflug AE, Aasheim GM, Foster C (1978) Sequence of return of neurological function and criteria for safe ambulation following subarachnoid block (spinal anesthetic). Can J Anaesth 25:133–139