CLINICAL RESEARCH / KLİNİK ÇALIŞMA

COMPARISON OF EPIDURAL VERSUS SPINAL ANESTHESIA METHODS FOR INGUINAL HERNIA SURGERIES

İNGUİNAL HERNİ OPERASYONLARINDA SPİNAL VE EPİDURAL ANESTEZİ YÖNTEMLERİNİN KARŞILAŞTIRILMASI

[1]Elif ÇOPUROĞLU, [2]Beliz BİLGİLİ, [1]Gönül SAĞIROĞLU, [3]Tamer SAĞIROĞLU, [1]Sevtap HEKİMOĞLU ŞAHİN

[1]Trakya University Faculty of Medicine, Department of Anesthesiology and Reanimation, Edirne, Turkey
[2]Marmara University Faculty of Medicine, Department of Anesthesiology and Reanimation, Istanbul, Turkey
[3]Trakya University Faculty of Medicine, Department of General Surgery, Edirne, Turkey

[1]Trakya Üniversitesi Tıp Fakültesi Anesteziyoloji ve Reanimasyon Anabilim Dalı, Edirne, Türkiye
[2]Marmara Üniversitesi Tıp Fakültesi Anesteziyoloji ve Reanimasyon Anabilim Dalı, İstanbul, Türkiye
[3]Trakya Üniversitesi Tıp Fakültesi Genel Cerrahi Anabilim Dalı, Edirne, Türkiye

ABSTRACT

Objective: *This randomized prospective study aimed to compare the quality of two anesthetic techniques, patient comfort, and perioperative complications of spinal versus epidural anesthesia for inguinal hernia repair.*

Method: *Seventy-five consented patients undergoing elective inguinal hernia repair were randomized into: spinal anesthesia group (SA group, n=37) and epidural anesthesia group (EA group, n=38). Patients in each group were compared for intraoperative hypotension, time of onset of anesthesia, duration of surgery, intravenous fluid consumption, postoperative pain, first pain sensation time (FPT), perioperative complications and hospital length of stay.*

Results: *The SA group had significantly shorter mean time of onset for anesthesia (5.08 vs 11.47 min) than the EA group (p<0.0001). Visual analogue scale (VAS) scores at the postoperative 12th (2.7±1.9 vs 3.6±1.4) and 24th (0.6±0.9 vs 2.2±1.9) hours of the SA group were significantly lower than EA group (p=0.028, p=0.0001, respectively). FPT, the hospital length of stay, duration of surgery and intravenous fluid consumption were comparable between the two groups.*

Conclusion: *Spinal block application was found to be superior to epidural block due to its advantages of early onset of anesthesia and a better postoperative pain control.*

KEYWORDS: *Spinal anesthesia, Epidural anesthesia, Inguinal hernia*

ÖZ

Amaç: *Randomize ve prospektif çalışmada, inguinal herni operasyonlarında, hasta konforu, kalitesi ve perioperatif komplikasyonlar açısından spinal ve epidural anestezi yöntemlerinin karşılaştırılması amaçlandı.*

Yöntem: *Elektif inguinal herni onarımı yapılan 75 hasta, spinal anestezi grubu (SA grub, n = 37), epidural anestezi grubu (EA grubu, n = 38) olarak randomize edildi. Her bir gruptaki hastalar intraoperatif hipotansiyon, anestezi başlama zamanı, ameliyat süresi, intravenöz sıvı tüketimi, postoperatif ağrı, ağrı başlangıç zamanı (FPT), perioperatif komplikasyonlar ve hastanede kalış süreleri açısından karşılaştırıldı.*

Bulgular: *SA grubunda ortalama anestezi başlama zamanı (5.08 vs 11.47 dakika) EA grubuna göre anlamlı olarak daha düşüktü (p <0.0001). SA grubunun ameliyat sonrası 12. (2.7 ± 1.9'a karşı 3.6 ± 1.4) ve 24. (0.6 ± 0.9 vs 2.2 ± 1.9) saatlik visual analog skalası (VAS) skorları EA grubundan anlamlı derecede düşüktü (p = 0.028, p = 0.0001 , sırasıyla). FPT, hastanede kalış süreleri, ameliyat süresi ve intravenöz sıvı tüketimi iki grup arasında benzerdi.*

Sonuç: *Spinal blok uygulaması, erken anestezi başlangıcı ve postoperatif ağrı kontrolü açısından daha iyi olduğu için epidural bloktan daha üstün bulundu.*

ANAHTAR KELİMELER: *Spinal anestezi, Epidural anestezi, İnguinal herni*

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Yazışma Adresi (Correspondence):
Dr. Elif ÇOPUROĞLU, Trakya Üniversitesi Tıp Fakültesi Anesteziyoloji ve Reanimasyon Anabilim Dalı, Edirne, Türkiye
E-posta (E-mail): elifcopuroglu@hotmail.com

INTRODUCTION

Inguinal hernia operation is a frequently applied day case procedure during which different anesthetic techniques are implemented (1). Due to less mortality and morbidity rates, regional anesthesia techniques are preferred in daily operations (2). The most commonly implemented techniques are epidural and spinal anesthesia. These are generally preferred since they are easier to apply in comparison to general anesthesia, drug costs are low and postoperative complications occur less (3,4). Preference for any one for the anesthetic techniques is a subject of research.

In such operations, muscle relaxation is important for a good surgery to be conducted. In addition, the 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. There are few potential disadvantages of regional anesthesia which includes time taken for block insertion and onset, needs of active cooperation with patient and surgeon, risk of nerve damage, variable failure rates and urinary retention (5).

The number of studies in the literature that contain comparisons of regional anesthesia methods in inguinal hernia operations is very limited (6). This was a randomized, prospective study comparing two groups of patients on whom inguinal hernia surgery was carried out with respect to quality of different anesthetic techniques, patient comfort, and perioperative complications.

MATERIAL AND METHOD

Study Design and Participants

Seventy-five male patients aging between 22 to 56 with ASA (American Society of Anesthesiologists) scores of I- III undergoing elective inguinal hernia operation were included in the controlled double-blind study. After obtaining the approval of the hospital ethics committee, patients were randomized into two groups as follows: patients who received spinal anesthesia (SA group) (n=37); and those who received epidural anesthesia (EA group) (n=38). The informed consent was taken from all the patients. Patients with severe hepatic or renal failure, known drug allergies, bleeding profile disorders, systemic local infection or local infection at the spot of application, use anticoagulants, thrombocytes below $50x10^9$ L^{-1}, declined the regional anesthesia method, or did not cooperate adequately, were excluded in the study.

Anesthetic Procedures and Interventions

After 10 mL kg^{-1} of Ringer's lactated solution intravenously (i.v.) was applied on the unpremeditated patients for 20 minutes, infusion was continued at a rate of 5 mL kg^{-1} $hour^{-1}$ In the operating room, noninvasive systolic, diastolic and mean arterial blood pressures (SBP, DBP, MAP), heart rate and cardiac rhythm, and peripheral oxygen saturations (SpO_2) were monitored. Patients received each anesthesia technique through an incision made at the disc space between L4-5 while in sitting position. 0.5% hyperbaric bupivacaine 10 mg and 7.5 µg sufentanyl were applied in the subarachnoid space to the patients in the spinal anesthesia group via a 25G spinal needle. On the other hand, 0.5% isobaric bupivacaine 50 mg and 7.5 µg sufentanyl were applied in the epidural space of patients in the epidural group with an 18G epidural needle via the loss of resistance to physiological saline technique. Motor blockade was assessed using a modified Bromage scale while sensory block was assessed with pinprick test (7). The time of settlement for the sensory block, duration of surgery and whether motor block performance occurred was recorded.

During the operation, 3 L min^{-1} of O_2 was applied via a face mask to the patients who were in Fowler's position at approximately 20 degrees. 1 mg kg^{-1} of propofol infusion was started on patients with Visual Analogue Scale (VAS) score of 4 and higher and propofol infusion rate was increased up to 4 mg kg^{-1} maximum when necessary. Intraoperative propofol and iv fluid consumptions were also recorded.

The first pain sensation time (FPT) was the time when the patient first felt pain in the incisional wound postoperatively. The operating time (OT) was the time between skin incision and skin closure. The 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; 0 represented no pain and 10 represented intractable pain) at the 1^{st}, 12^{th} and 24^{th} hours postoperatively and at FPT. The hospital length of stay (HS) was the time from the start of the operation until discharge from the hospital. Bleeding in the operation site and inadvertent severing of the ilioinguinal nerve or the ductus deferens were considered as intraoperative surgical complications. Postoperative urinary retention, scrotal edema, infection (testicular or incisional), scrotal or incisional hematoma, and ischemic orchitis were considered as postoperative complications. Intraoperative hypotension (MAP<65 mmHg) occurrunce was recorded. Patients were also followed up for post-anesthesia complications, such post-lumbar-puncture-headache (PLPH), nausea and vomiting, and dizziness.

Statistical Analysis

All the results were recorded and analyzed statistically using unpaired students-t test and chi square test, p values <0.05 were considered as significant.

RESULTS

The two study groups were similar regarding the baseline demographic characteristics (age, gender, weight, height, and ASA scores) The difference between two groups in regard to the length of hospital stay, the duration of operation, and perioperative iv fluid and propofol consumptions were found to be insignificant (Table I). The SA group had significantly shorter mean time of onset for anesthesia (5.08 vs 11.47 min) than the EA group (p<0.0001)

Values of VAS for the SA group at the postoperative 12th (2.7±1.9 vs 3.6±1.4) and 24th (0.6±0.9 vs 2.2±1.9) hours were significantly lower in comparison to the EA group (p=0.028, p=0.0001, respectively). No significant difference was observed in the comparison of FPT between the SA (3.8±1.6) and EA groups (4.4±1.7) (p=0.154, Table II). The additional analgesic requirement was greater in EA group (119±81 mg) than SA group (88±78 mg) (p=0.003). Occurrence of complications during and after the operation between the two groups did not differ significantly (Table III).

DISCUSSION

We investigated the quality of anesthesia, patient comfort, and perioperative complications related to spinal and epidural anesthesia techniques applied during inguinal hernia repair. We determined that spinal anesthesia enabled early onset of anesthesia and a better postoperative pain control compared to epidural anesthesia.

In our study, both groups were comparable regarding patient characteristics. The two techniques were similar with regard to surgical outcome measures such as operating time, length of hospital stay, ilioinguinal nerve injury, scrotal edema and hematoma. We found that the anesthetic effect of spinal anesthesia started earlier in comparison to epidural anesthesia. Similarly, Devis et al. (8) found that the maximal effect duration to be prominently shorter in the spinal anesthesia group (13±7 min) than the epidural anesthesia group (21±4 min). However, the anesthesia technique provided analgesia at

Table I. Demographics characteristics and comparison of epidural (EA) and spinal (SA) anesthesia with regards to outcome measures that are relevant to anesthesia and surgery

	Group SA (n=37)	Group EA (n=38)	p value
Age (years)	56.7±14.63	57.18±16.49	0.894
Sex (M/F)	19/18	22/16	0.422
Height (cm)	172.46±6.61	171.63±8.35	0.636
Weight (kg)	74.71±12.92	78.24±14.59	0.271
BMI (kg m^{-2})	25.12±4.29	26.7±5.33	0.164
ASA (I/II/III)	16/13/8	13/21/4	0.173
Mean anesthesia onset time (min)	5.08±2.2	11.47±4.61	<0.0001*
Operation time (min)	66.76±19.37	68.42±20.93	0.722
Intraoperative fluid consumption (mL)	1547.3±427.19	1393.42±356.82	0.094
Intraoperative propofol consumption (mg)	7.03±21.59	20±49.1	0.145
Hospital stay (h)	35.35±16.23	30.63±12.06	0.157

*p < 0.05: Statistically significant, SA: Spinal anesthesia, EA: Epidural anesthesia,
BMI: Body mass index, ASA: American Society of Anesthesiologists

Table II. Visual analogue scores (VAS) of pain at different times and first pain sensation time (FPT) in both groups

VAS score (cm)	Group SA (n=37)	Group EA (n=38)	p value
Postoperative hour 1	1.0 ± 1.4	0.7 ± 1.6	0.312
At FPT	3.8 ± 1.6	4.4 ± 1.7	0.154
Postoperative hour 12	2.7 ± 1.9	3.6 ± 1.4	0.028*
Postoperative hour 24	0.6 ± 0.9	2.2 ± 1.9	0.0001*

*p < 0.05: Statistically significant, VAS: Visual Analog Scale Group
SA: Spinal anesthesia group, Group EA: Epidural anesthesia group.
Values are expressed as mean±SD.

Table III. Perioperative complications in the study groups

Complications	SA (n=37)	EA (n=38)	p value
Perioperative bleeding	0	1	0.314
Ilioinguinal nerve injury	1	0	0.314
Spermatic duct injury	0	0	-
Post-operative urinary retention	2	0	0.15
Scrotal edema	2	1	0.546
Infection (scrotal/incisional)	0	0	-
Hematoma (scrotal/incisional)	0	1	0.314
Post lumbar puncture-headache	2	0	0.15
Nausea and vomiting	5	6	0.713
Dizziness	0	0	-
Hypotension	2	0	0.15

*p < 0.05: Statistically significant, SA: Spinal anesthesia EA: Epidural anesthesia

approximately the same time (11.7±0.6 min for epidural anesthesia and 11.3±1min for spinal anesthesia) in another study (9). The authors of the study concluded that the rapid onset of epidural anesthesia time was due to the relatively large dose of bupivacaine (100 mg in 20 mL normal saline), which is a double dose compared to bupivacaine used for epidural anesthesia in our study. Dose and volume are important for epidural anesthesia. In addition to the anesthesia and analgesia effects with dose increase, side effects also increase in epidural anesthesia (10).

VAS scores were significantly higher in the EA group than in the SA group at postoperative hours of 12 and 24. The analgesic requirement was greater in EA group than SA group. Spinal anesthesia enabled better postoperative pain control and decreased the additional analgesic requirement in the postoperative period, which can make this technique the preferred choice for inguinal hernia surgery, especially in the ambulatory setting. Spinal anesthesia is accompanied with less postoperative pain, use of additional analgesics and side effects than epidural anesthesia in patients undergoing caesarean section (11). Enhanced recovery after surgery optimizes perioperative care to reduce morbidity and shorten length of hospital stay especially in major surgery. Epidural analgesia is considered fundamental in this setting for postoperative pain control (12). Even though epidural analgesia performed better postoperative pain control than spinal anesthesia in laparoscopic colorectal surgery, the return of bowel function and length of hospital stay were longer in patients received epidural analgesia compared to spinal anesthesia (13).

Urinary retention was observed in two patients in the SA group. A one-time catheter application was sufficient for these patients and there was no need for repetitive applications. Neither of the patients experienced urinary retention in EA group. One of the important side effects of inguinal hernia repair is post-operative urinary retention (14). The type of anesthesia has an impact on urinary retention especially the regional techniques (15). The association between spinal anesthesia with long-acting local anesthetics and postoperative urinary retention is demonstrated (16). Using low-dose, short-acting local anesthetic drug in spinal anesthesia provides early recovery of the bladder function (17). The similarity in urinary retention between our study groups is attributed to using low dose local anesthetic in spinal anesthesia. The limitation of our study is to be mentioned. Although a homogeneous group of patients is a favorable condition in a prospective study, this becomes a limitation when the variety of patient population in an ambulatory setting taken into the account.

CONCLUSION

In conclusion, spinal anesthesia is superior to epidural anesthesia due to its advantages of early onset of anesthesia and better postoperative pain management. Neither technique showed any superiority over the other in regard to length of hospital stay and postoperative complications. Nevertheless, both methods are anesthesia techniques that can be confidently chosen for ambulatory surgeries.

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