ORIGINAL RESEARCH

THE COMPARISON OF THE RECOVERY CHARACTERISTICS OF EITHER SPINAL OR EPIDURAL ANESTHESIA WITH PRILOCAINE FOR KNEE ARTHROSCOPY

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ABSTRACT

Objective: The aim of our study was to compare the recovery characteristics of single-dose spinal and epidural anesthesia with 2 % prilocaine for outpatient knee arthroscopy.

Methods: Forty patients were randomly assigned to receive either spinal or epidural anesthesia with prilocaine. Maximum sensory level, recovery of the motor and sensorial functions, time to ambulate, time to voiding, side effects, and medications used for the treatment were recorded. After 48 hours, the patients were questioned for pain and need for analgesia, their opinion about the quality of anesthesia, side effects such as nausea, vomiting, pruritus, backache, post-dural puncture headache (PDPH), urinary difficulties and transient neurological symptoms (TNS).

Results: Maximum sensory level was similar in the groups. The time from injection to recovery of motor and sensory functions and ambulation time were significantly shorter in the epidural group than the spinal group ($p < 0.05$). The percentage of patients who required additional analgesic was 9 versus 6% in spinal versus epidural groups. One of the patients in the spinal group had PDPH postoperatively. None of the patients had postoperative nausea, vomiting, pruritus, backache, urinary difficulties or TNS.

Conclusion: Relatively fast recovery time make epidural anesthesia with prilocaine a good alternative for outpatient knee arthroscopy.

Keywords: Spinal, Epidural, Prilocaine

DİZ ARTROSKOPİSİ CERRAHİSİNDE PRİLOKAİN İLE YAPILAN SPİNAL VE EPİDURAL ANESTEZİNİN DERLENME ÖZELLİKLERİNİN KARŞILAŞTIRILMASI

ÖZET

Amaç: Bu çalışma spinal ve epidural anestezide kullanılan tek doz prilokainin hastanın derlenme özellikleri üzerine etkisinin karşılaştırılması amacıyla planlanmıştır.

Yöntem: Diz artroskopisi geçirecek 40 hasta, 2 mL %2 prilokain ile spinal ya da 15-20 mL %2 prilokain ile epidural anestezi yapılacak şekilde randomize olarak 2 gruba ayrıldı. Hastaların maksimum duyu bloğu seviyeleri, motor ve duyu bloğunun geri dönüş süreleri, ayağa kalkma zamanları, ilk idrar yapma zamanları, yan etkiler ve tedavisinde kullanılan ilaçlar kaydedildiler. Hastalar taburcu olduktan 48 saat sonra, telefonla aranarak, operasyon sonrası ağrıları, analjezik ihtiyaçları, anestezi yönteminden memnuniyetleri, bulantı, kusma, kaşıntı, belağrısı, dura delinmesine bağlı baş ağrısı, idrar yaparken zorlanma ve geçici nörolojik semptomlar açısından sorgulandılar.

Bulgular: Maksimum duyu bloğu seviyesi her iki grupta benzerdi. İlacın verilişinden duyu ve motor bloğun sonlanmasına dek geçen süre ve ayağa kalkma süresi epidural anestezi sonrası belirgin kısa bulundu ($p < 0.05$). Ek analjezik kullanan hasta sayısı, spinal anestezi sonrası %9 iken, epidural anestezi sonrası %6 idi. Spinal gruptan bir hastada dura delinmesine bağlı başağrısı görüldü. Hastaların hiçbirinde postoperatif bulantı, kusma, kaşıntı, bel ağrısı, idrar zorluğu ya da gecici norolojik semptomlar görülmedi. Hasta memnuniyeti açısından gruplar arasında fark bulunmadı.

Sonuç: Hızlı derlenme süresi nedeniyle prilokain ile epidural anestezi diz artroskopilerinde iyi bir alternatiftir.

Anahtar Kelimeler: Spinal, Epidural, Prilokain

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INTRODUCTION

Knee arthroscopy is a common procedure of orthopaedic surgery. Recent advances in this surgical practice combined with "fast-tracking" anesthetic techniques have increased the number of patients discharged on an outpatient basis after knee arthroscopic surgery[1]. Complete recovery from sensory and motor blocks is a critical discharge criterion for outpatient surgery. Any deficiencies in these areas limit the patient's ability to be self-caring after discharge[2,3]. The discharge time, that is, the length of time from the end of surgery until the patient is discharged, is greatly affected by the anesthetic technique used[4]. The ideal anesthetic technique for outpatient surgery should be easily administered, should have a quick onset of action and should provide good surgical conditions with a rapid recovery and minimal side effects[5]. There are several published studies citing advantages of different anesthetic techniques[2,3,5-13]. Spinal or epidural anesthesia may provide many of these advantages; however, comparison of the single dose spinal and epidural techniques each with a short acting local anesthetic, prilocaine, is not well documented.

We performed a prospective, randomized clinical study to compare the recovery characteristics of single dose spinal and epidural anesthesia each with 2% prilocaine for outpatient knee arthroscopy.

MATERIAL AND METHOD

Following the Institutional Ethics Committee approval and written informed patient consent, forty patients scheduled for knee arthroscopy (no prior medication, American Society of Anesthesiologists (ASA) score I-II, age between 20-60 years) were randomly assigned to receive either epidural or spinal anesthesia. This study was performed according to the recommendation for conduct of clinical research of the Declaration of Helsinki. Patients with respiratory or cardiac disease, diabetes, those receiving chronic analgesic therapy, those with contraindications to regional anesthesia (allergy, coagulopathy, infection, or neurologic disease) and pregnant patients were excluded from the study. Each patient's age, sex, weight, and height were recorded prospectively by the anesthesiologist on a preprinted form. All patients in both groups received 500 mL of intravenous isotonic saline before anesthesia was induced. Monitors for routine measurements were as follows: pulse oximeter, electrocardiogram, and noninvasive systolic/diastolic and mean arterial blood pressure.

Spinal anesthesia (Group S) (n=20) was administered at the L4-5 intervertebral space using a 25-gauge pencil point spinal needle through the midline approach with the patient placed in the lateral decubitus position. After the free flow of cerebrospinal fluid was observed, 2 mL of prilocaine 2% (Citanest, AstraZenaca Ltd, Istanbul, TR) was injected. Patients were then immediately turned to the supine position. Epidural anesthesia (Group E) (n=20) was performed after cutaneous anesthesia with 1.5 mL of 2% lidocaine. An 18-gauge Tuohy epidural needle was introduced midline at the L4-5 intervertebral space, using a loss-of-resistance to saline technique with the patient placed in the lateral decubitus position and the operative knee dependent. If no blood or cerebrospinal fluid was aspirated, 15-20 mL of 2% prilocaine was given in 5-mL increments. Patients were immediately turned to supine position.

Sensory block level was assessed with bilateral pinprick testing in the midclavicular line in all the patients. Motor block was assessed with modified Bromage score (0= full flexion of knee and ankles; 1= partial flexion of knees, full flexion of ankles; 2= inability to flex knees, partial flexion of ankles; 3= inability to flex knees and ankles). The maximum level of the sensory block and duration of surgery were recorded. All the patients were transferred to the postanesthesia care unit (PACU) after the operation and clinical observations were made by same investigators who were blinded to the groups. Side effects such as bradicardia (>30% decreases from baseline); hypotension (>30%

decrease from baseline), drowsiness, nausea, vomiting, pruritus, shivering, pain, and medications used for the treatment were noted. Sensory and motor block levels were measured at 10-min intervals during the PACU period. Sensory block resolution occurred when the dermatomal level receded to S1. Motor recovery was defined as a Bromage score 0 and the ability to do a deep knee bend. When the patients' vital signs were stable and sensory and motor blocks were resolved, they were transferred to their beds.

Time to sensorial (< S1) and motor block resolution, time to first urination, time to ambulation were recorded. All times were defined as the time from injection of the drugs to the time to the sensorial or motor block resolution.

Patients were asked to score the degree of pain themselves and to write down the respective times and severity on a follow-up form they were given after the surgery (Appendix). Patients were discharged with a prescription for paracetamol as required, up to six tablets a day. Forty-eight hours after discharge, the patients were contacted by telephone and questioned for the side effects, medication requirement, and their opinion about the quality of anesthesia (good, satisfactory or poor). The data collected, such as pain, nausea, vomiting, backache, post dural puncture headache (PDPH), urinary difficulties, transient neurological signs (TNS), need for analgesia, and patient satisfaction about the quality of anesthesia were recorded. TNS was defined as pain or dysesthesia in the buttocks, thighs or calves occurring within 24 hrs and resolving within 72 hrs.

A power analysis indicated that a sample size of 18 patients per group was required to show a 30 min difference in discharge time among groups at a p value <0.05 with 80% power. A statistical analysis of the data recorded from the two groups was carried out with the Chi-square test, unpaired t-test and Mann Whitney-U test where appropriate.

RESULTS

Demographic data were similar between the groups (Table I). Anesthesia was found to be satisfactory for surgical incision in all the patients. After the injection of prilocaine, maximum sensory level was similar and T_9 (T_7- T_{10}) in group S, T_{10} (T_6- T_{11}) in group E (Table II). No differences were observed between the groups regarding the incidence of hypotension or the number of the patients requiring ephedrine.

The maximum level of the sensory block was above the T_{12} dermatome in all the patients. The time from local anesthetic injection to recovery of motor function was significantly longer [119± 42 min] in group S compared to [85±10 min] in group E ($p< 0.05$). Prolonged recovery of the sensory block time (< S1) was also observed in group S [143±39 min] compared to group E (110±2 min, $p< 0.05$). Time to first urination was reported as 272±97 min in group S and 203±63 min in group E ($p< 0.05$). During the follow-up report, none of the patients noted voiding difficulty. Early postoperative side effects during the PACU period are shown in Table III. None of the patients noted hypotension, bradycardia, nausea, vomiting, pruritis, shivering, pain or respiratory depression and there were no major surgical or anesthetic complications (Table III). All the surgeons described their opinion about the anesthetic quality as good.

The number of patients who needed an additional analgesic during the first 48 hrs after surgery was lower in group E than in group S ($p< 0.05$). Postoperative pain relief was adequate with acetaminophen in these patients (Table II). The quality of anesthesia as determined by the patients was either satisfactory or good (Table II). None of the patients had symptoms of postoperative nausea, vomiting, pruritus, urinary difficulties, or TNS following discharge from the hospital. Only one patient in group S had postoperative mild PDPH which resolved within 2 days without treatment.

Table I. Demographic data (mean ± SD).

	Spinal (n=20)	**Epidural (n=20)**
Age (yrs)	47 ± 14	47 ± 14
Weight (kg)	76 ± 10	76 ± 9
Height (cm)	168 ± 7	171 ± 11
Sex (male/female)	8/12	11/9

No significant difference was observed between the groups ($p > 0.05$).

Table II. Duration of surgery and anesthetic characteristics (mean± SD) (min).

	Spinal(n=20)	**Epidural (n=20)**
Duration of surgery	38 ± 14	44 ± 12
Maximum sensory level	T_9 [T_7- T_{10}]	T_{10} [T_6- T_{11}]
Recovery of motor function (Bromage 0)	119 ± 42	85 ± 10*
Recovery of sensation (<S_1)	143 ± 39	110 ± 2*
Time to ambulate	167± 14	123± 10*
Time to void	272± 97	203± 63*
Postoperative analgesic use (%)	9 (45%)	6 (10%)*

*There were significant differences between the groups ($p < 0.05$).

Appendix. Patient Questionnaire

Please note down time

1. You feel pain when you get back home……
2. How much pain are you in

   (0: no pain, 1: mild pain, 2: moderate pain, 3: severe pain)
3. Please also note down if you have to take painkillers, how many and approximately at what time.
4. Please note down when you were able to void the first time after the surgery…… .
5. Do you have any of following side effects after your surgery:

	None	Mild	Moderate	Severe	Treatment /Time
Nausea, Vomiting					
Pruritus					
Backache					
Headache					
Inable to void					
Transient neurological symptoms*					

   * Transient neurological symptoms may be defined as pain or dysesthesia in your buttocks, thighs or calves occuring within 24 hrs.
6. Your satisfaction with the whole procedure ranging from 1 (poor), 2 (satisfactory) or 3 (good)…….

You will be phoned forty-eight hours after discharge from hospital and you will be asked these questions.

Any further comments you wish to make. We thank you for your time!

DISCUSSION

The main finding in this study is that, both single dose spinal and epidural anesthesia with 2% prilocaine provided satisfactory surgical and anesthetic conditions; However, epidural anesthesia provided faster recovery compared to spinal anesthesia following outpatient arthroscopic surgery.

The optimum anesthetic technique for outpatient knee arthroscopy should provide rapid onset and recovery from anaesthesia. Complete recovery from sensory and motor block is of critical importance as discharge criteria in outpatient surgery, because it limits the ability of patients' self-caring after discharge[12]. Some authors have pointed out that regional anesthesia provides rapid discharge times comparable to that of general anesthesia[2,13]. However, recent data suggest that both spinal and epidural anesthesia require longer discharge times than new short-acting general anesthetic drugs and opioids, propofol and sevoflurane[4,12]. Epidural anesthesia is advocated for outpatient surgery because of the minimal side effects and excellent patient acceptance[14]. There are also studies comparing the spinal technique with the epidural during outpatient surgery showing similar discharge times[5,15]. Local anesthetics were not standardized in some of the studies comparing spinal and epidural techniques[5,10,16]. Mulroy and colleagues have compared epidural 2-chloroprocaine to procaine combined with fentanyl for spinal anesthesia[16]. Neal[17] and Pollock[5] have compared epidural 2-chloroprocaine to lidocaine with fentanyl for spinal anesthesia. We compared recovery and discharge characteristics of spinal and epidural anesthesia with 2% prilocaine for ambulatory arthroscopic knee surgery, therefore this study gives important results about the behavior of the same drug used with two different regional anesthesia techniques. However, prilocaine has previously been scantily documented[15,18]. Reisli et al[18] concluded that both continuous spinal and continuous epidural anesthesia were reliable for transurethral resection of the prostate in elderly patients and prilocaine appeared to be a safe local anesthetic for either method. Since patients undergoing knee arthroscopy are mostly younger patients than the patients scheduled for prostate resection, incremental dosing of local anesthetics to avoid their toxic and untoward effects is unlikely to be as important as in an elderly population. A younger population needs to be discharged and ready to work as soon as possible. Prilocaine, one of the short acting local anesthetics, is known as having lower incidence of transient neurological symptoms when applied intrathechally and is therefore recommended for use in surgical procedures of short duration[18]. Recovery of motor and sensorial functions was significantly prolonged after spinal anesthesia compared to epidural anesthesia as expected.

Prilocaine is not a popular local anesthetic today in anesthesia practice, due to a well-known side effect, methemoglobinemia. This side effect is usually of clinical importance with larger doses. The maximum prilocaine dose used in our study was 400 [20 mLx 20 mg/ml] mg, below the maximum recommended dose, and therefore this agent may be safely used for single dose epidural anesthesia in adult patients. However, care must be taken during repeated doses and continuous infusion for regional anesthesia.

In clinical practice there are many choices of local anaesthetics with intermediate duration of action for outpatient regional anaesthesia such as lidocaine, prilocaine and mepivacaine. Although prilocaine is preferred, with less risk of neurotoxicity, it was recently suggested that intrathecal mepivacaine and prilocaine are less neurotoxic than highly concentrated lidocaine in a rat intrathecal model[18]. Our study was designed to search for an optimal central block type (spinal or epidural) in outpatients, not to document the recovery charactheristics or side effects of prilocaine. However, in clinical settings other local anesthestics may be preferable to prilocaine for short surgical procedures.

A potential limitation of this finding is the sample size studied. In clinical settings, a recovery difference of 30 minutes is unlikely to be clinically significant, as institutional costs may not appear to be affected by such differences[19,20]. However, discharge from hospital is not the end of the recovery process, as far as the patient is concerned. The patients in whom the side effects extend to 24 hour postoperatively have less functional recovery. Probable complications following regional anesthesia include postoperative pain, backache, PDPH and TNS. None of the patients reported backache or TNS in this study. Only one patient in the spinal group had symptoms of mild PDPH in this study. The incidence of PDPH can be reduced to 1% or less in hospitalized patients through meticulous selection of patients, needles, and technique[21]. The use of a thinner spinal needle with a pencil-point tip design has the advantage of being associated with low incidence of PDPH[21].

TNS is another postoperative side effect of regional anaesthesia. Lidocaine, lithotomy position, knee arthroscopy and outpatient status have been implicated as risk factors for TNS[22]. In a recent study, the incidence of TNS using prilocaine for spinal anaesthesia has been reported as 4% and was not significantly different between the patients given prilocaine or lidocaine[23]. However, there were no reports of TNS in our study with prilocaine. Recent studies suggest that the frequency of TNS with a small dose of the agent is decreased; therefore we chose a relatively small dose of prilocaine to reduce the probability of TNS[2,24]. However, further studies are needed to determine the etiology and significance of TNS in such a practice with higher doses.

Pain is one of the most important problems following the regional anesthesia after outpatient surgery. Local anesthetics with long duration of action are useful in an outpatient setting because of their prolonged analgesic effects. On the other hand, a longer duration of action may lead to prolonged ambulation and recovery times. We found that the percentage of patients who needed additional analgesic was 9% in the spinal group, and 6% in the epidural group with prilocaine. Postoperative pain relief was satisfactory with acetaminophen in these patients. These results were probably related to the relatively painless type of surgery chosen in our study.

In conclusion, our study supports the hypothesis that epidural anesthesia with 2% prilocaine is suitable for outpatient knee arthroscopy due to its short-duration of action. Furthermore, both spinal and single dose epidural anesthesia provided satisfactory surgical, anesthetic conditions for surgeons and patients.

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