ORIGINAL ARTICLE

Effects of intrathecal bupivacaine and bupivacaine plus sufentanil in elderly patients undergoing transurethral resection

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Abstract

Introduction: The present study compared the effect of bupivacaine and bupivacaine + sufentanil on hemodynamic parameters and characteristics of spinal anesthesia in elderly patients undergoing transurethral resection of the prostate (TURP) under spinal anesthesia.

Technical Considerations: The study included 40 American Society of Anesthesiologists (ASA) I-III patients scheduled to undergo TURP. Patients were blindly and randomly divided into two groups. Group B (n = 20) received 10 mg of intrathecal bupivacaine and group BS (n = 20) received 7.5 mg of bupivacaine + 5 μg of sufentanil. Sensory and motor block characteristics, hemodynamic changes, side effects, and time to first analgesic requirement were recorded. No differences in mean arterial pressure or heart rate, time for sensory blockade to reach the T10 level, and maximum sensory level were observed between the two groups. The time to first analgesic request was longer in group BS ($P < 0.05$). Motor block was significantly higher in group B ($P < 0.05$). In terms of side effects, no statistically significant differences occurred between the groups.

Conclusions: Similar hemodynamic stability and sufficient level of sensory blockade were provided by bupivacaine and bupivacaine + sufentanil used for spinal anesthesia in patients undergoing TUR. Due to the fact that less motor block was observed and the time to first analgesic request was longer, the combination of bupivacaine + sufentanil might be appropriate for patients undergoing TUR.

Key words: Bupivacaine, intrathecal, opioid, spinal, sufentanil

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Introduction

Transurethral resection of the prostate (TURP) interventions is primarily transient, and due to the fact that a large number of elderly patients undergo these interventions; reducing complications, early hospital discharge, and reducing the cost of treatment are desirable.[1,2] Sufficient spinal anesthesia with fewer side effects, less intense motor block of shorter duration, and rapid recovery can be obtained by combining opioids and lower doses of local anesthetics.[3-6] Sufentanil has a μ-receptor ligand and is able to produce spinal-type analgesia preserving motor function of lower extremities and is a lipophilic opioid, improve intraoperative, and postoperative analgesia with no adverse effects.[3] As such, safe anesthesia can be accomplished in elderly and high-risk patients. Many studies[7-10] have included obstetric patients to determine the effects, safety, and most effective dose of combining intrathecalsufentaniland lower doses of local anesthetics. However, the number of studies that examined the effects of intrathecalsufentanil in elderly patients undergoing urological surgery is limited.

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We hypothesized that intrathecal bupivacaine + sufentanil would provide a more adequate spinal block without hemodynamic side effects for TURP operation than subarachnoid bupivacaine in elderly patients undergoing TURP.

Materials and Methods

This study was approved by the hospital ethics committee of Ankara Oncology Hospital. We obtained written informed consent from 40 American Society of Anesthesiologists (ASA) I-III patients undergoing elective TURP for benign prostatic hypertrophy. Patients with a history of back surgery, mental retardation, infection at injection sites, coagulopathy, a history of opioid and chronic analgesic use, hypersensitivity to local anesthetics or opioids, diabetes, peripheral neuropathy, coronary artery disease, advanced cardiac valve disease, or an ejection fraction <50% were excluded from the study.

This study was conducted in a randomized, double blind, single center fashion, and performed between May 2006 and October 2006. One of the investigators prepared the drug solution before anesthesia. The anesthetic administrator and the patients were blinded to the type of drug solution and the patient groups. Patients were allocated into two groups using a random number sequence. Group B (bupivacaine group) received bupivacaine 0.5% (2 ml) (10 mg) (Marcaine Spinal Heavy; Astra, Sodertalje, Sweden) + dextrose %10 (0.8 ml) (80 mg) + distilled water (0.2 ml) in total 3 ml drug mixture, and group BS (bupivacaine plus sufentanil) received bupivacaine 0.5% (7.5 mg) +5 μg of sufentanil (Sufenta, Janssen-Cilag) + dextrose% 30 (0.4 ml) (120 mg) + distilled water (0.1 ml) in total 3 ml drug mixture.

First, 0.05-0.07 mg/kg of midazolam and 0.5 mg of atropine with intramuscular premedication were administered to the patients 30 min before TURP surgery; electrocardiograph (ECG), non-invasive arterial pressure, and peripheral oxygen saturation were monitored (PetasKMA® 800). Before spinal anesthesia, the patients received 7-8 mL/kg i.v. lactated ringer over 20 min. Spinal puncture was performed at L 4-5 with a 25 G Quincke needle with the patient in sitting position. After the free flow of clear cerebrospinal fluid (CSF) was observed, the drug mixture was given within 2 min and the patients were placed in a sitting position for 5 min and then in supine position until the sensory block peaked. The level of sensory block, defined as the dermatomal segment with loss of pain sensation to cold alcohol swap and pin-prick test with a 22G hypodermic needle and on each side of the mid-thoracic line, was measured every 2 min, until it reached the peak level with four consecutive tests and then every 10 min during the surgery. We recorded time for sensory blockade to reach the T10 level, the duration of motor blockade, the first analgesic request after operation. The duration of motor blockade was defined as the time that had elapsed between injection and total recovery of motility by the feet. Motor blockade in the lower limbs was recorded bilaterally using a modified Bromage scale, as follows: 0 = no block; 1 = minimal block (difficulty moving feet); 2 = medium block (difficulty raising legs); 3 = high block (complete paralysis). Motor and sensory blockades were evaluated.

The quality of anesthesia was assessed as excellent (no discomfort or pain), good (mild pain or discomfort, no need for additional analgesics), fair (pain that required analgesics), or poor (severe pain that required analgesics) during the operation. During the preoperative period, all patients were instructed to assess the severity of their pain using a 10-point verbal analog pain scale (VAPS; scores range from 0, which indicates no pain, to 10, which indicates the worst pain imaginable). If the patient experienced mild discomfort (VAPS between 3 and 6), additional anesthesia was provided using i.v. propofol bolus.

Adverse effects such as hypotension, bradycardia, nausea or vomiting, pruritus, shivering, and respiratory depression were recorded during the operation and recovery. Data mean arterial pressure (MAP), and heart rate (HR), SpO_2 were recorded 5, 10, 15, 20, 25,30,40, 50, 60,75,90, 105,120 minutes.

Hypotension was defined by a decrease in SAP to, 90 mm Hg or, 75% from the baseline value, and bradycardia was defined as HR of less than 45 beats min. whereas hypotension was treated with 5-10mg ephedrine i.v. bolus doses, bradycardia was treated with 0.5 mg of i.v. atropine. Hypoxemia was defined as oxygen saturation under 95%, which was treated with ventilatory support via facemask with higher oxygen flow.

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) v. 11.0 for Windows (Chicago, IL, USA). The unpaired *t* test, Mann Whitney-U test, and chi square test were used for statistical analysis, as applicable. Friedman's test was used to compare arterial pressure, and heart rate values. Differences between arterial pressure and heart rate parameters were evaluated using the Wilcoxon marked serial test with Bonferroni correction.

Results

Spinal anesthesia was successfully accomplished in all patients. No technical difficulties were encountered during surgery, which in all cases was uneventful. Patient characteristics were similar between the groups [Table 1]. The overall quality of spinal anesthesia was also similar in both groups ($P > 0.05$). No significant differences were found in MAP and HR between the groups. Intra group

analysis ofhemodynamic parameters in both groups showed a significant decrease in mean arterial pressure and heart rate at 5 minutes later than spinal block, as compare to basal values ($P < 0.05$) [Figures 1 and 2]. In group B, the decrease in MAP was more than that in group BS but this difference was not statistically significant. Bradycardia, which developed in four patients in group B (20%) and in one patient in group BS (5%), was treated with 0.5 mg of i.v. atropine. The difference between the groups, in terms of treatment requirements, was not statistically significant.

There were no significant differences in time for sensory blockade to reach the T10 level and maximum sensorial level between the groups. In group B, motor block was observed significantly more frequently and longer than in group BS ($P < 0.05$). The time to the first analgesic request was longer in group BS ($P < 0.05$) [Table 2].

In terms of side effects, no statistically significant differences occurred between the groups. Itching was observed in three patients (15%) in group BS. None of the patients experienced nausea, vomiting, shivering or respiratory depression.

Discussion

In this study, we found that the addition of sufentanil 5 μgto a small-dose bupivacaine for spinal anesthesia effectively decreasedthe motor block level, time to regression of motor block andincreasing postoperative analgesic request time without increasing the hemodynamic or another side effects in elderly patients.

Table 1: Patient demographic data and duration of surgery

	Group I (*n*=20)	Group II (*n*=20)	*P*
Age (years)*	61±11	64±9	0.203
Gender (M/F)	17/3	18/2	1.000
Weight (kg)*	72±7	73±7	0.478
ASA (I/II/III)	6/11/3	5/13/2	
Duration of surgery (min)**	30 (15-90)	40 (20-70)	0.192

*Values are mean ± SD (range), **Values are median (min-max).
SD=Standard deviation; ASA=American Society of Anesthesiologists

Table 2: Characteristics of spinal anesthesia in the study groups

	Group B (*n*=20)	Group BS (*n*=20)
Time to reach T10 level (min)*	15 (5-30)	12.5 (5-30)
Maximum sensory level *	T8 (T11-T6)	T8 (T10-T4)
Motor block ending time (min)**	159±42	134±31
Time to the first analgesic requirement**	250.1±33.8	288.6±32.7
Motor block (Bromage: 0/1/2/3)	0/5/5/10	13/5/0/2

* Values are median (min-max),**Values are mean ± SD (range).
SD=Standard deviation

In the present study, the maximum level of sensory block was T8 in both groups. Active anesthesia in sacral regions, and sufficient analgesia at the lumbar and thoracic levels were obtained. Motor block was longer in group B (159.1 ± 42.1 min) than in group BS (134.0 ± 31) and group B patients experienced intense motor blockade, whereas group BS patients showed a negligible motor impairment. Although, 10 mg of bupivacaine provided a satisfactory level of analgesia, it had the disadvantage of inducing a motor blockade whose intensity and duration greatly exceeded the requirements for a short-lasting procedure such as TURP. We think that less motor block had a positive effect on postoperative recovery in patients with early mobilization. This result, significantly less motor blockade in the BS group, may be one of features of the mixture of bupivacaine and sufentanil.

Development of hypotension during spinal anesthesia in geriatric patients is common.[11,12]

The opioids, which are added to local anesthetics, may provide lowering the dosages of both medications; in addition, this combination may decrease the hemodynamic side effects.[7,13] The addition of sufentanil to low dose bupivacaine (7.5 mg) has been reported to cause fewer hemodynamic effects.[11] Previous studies have also shown that the use of intrathecalsufentanil did not cause changes in sympathetic response, heart rate, or blood pressure.[14,15] We did not observe statistically significant intergroup differences in circulatory variables.

There was no benefit in increasing intrathecal dose beyond sufentanil 5 μg in regard to duration of analgesia in a previous study.[8] Two independent studies have revealed that the median effective dose (ED50) of intrathecalsufentanilwas 2.6 μg.[7,9] Therefore, intrathecal sufentanil 5 μgcould be considered as an equipotent dose and we used sufentanil 5 μg. The duration of postoperative analgesia for sufentanil was previously reported to be 4 h and 5 h, after intrathecal administration as an adjunct to surgical spinal anesthesia and analgesia.[16] Dahlgren[10] concluded that addition of small doses of fentanyl and sufentanil to bupivacaine intrathecally increased the duration of analgesia in the postoperative period. Although, it has been reported that the effects of postoperative analgesia are brief after intrathecal administration of sufentanil because of its rapid clearance from the cerebrospinalfluid (CSF),[17] in our study, the time to the first analgesic request was longer in the group BS (288.6 ± 32.7 min.) than group B (250.1 ± 33.8 min.) in elderly patients undergoing TURP. These results are consistent with the results of studies demonstrating that intrathecal opioids enhance analgesia when added to subtherapeutic doses of local anesthetics.[18]

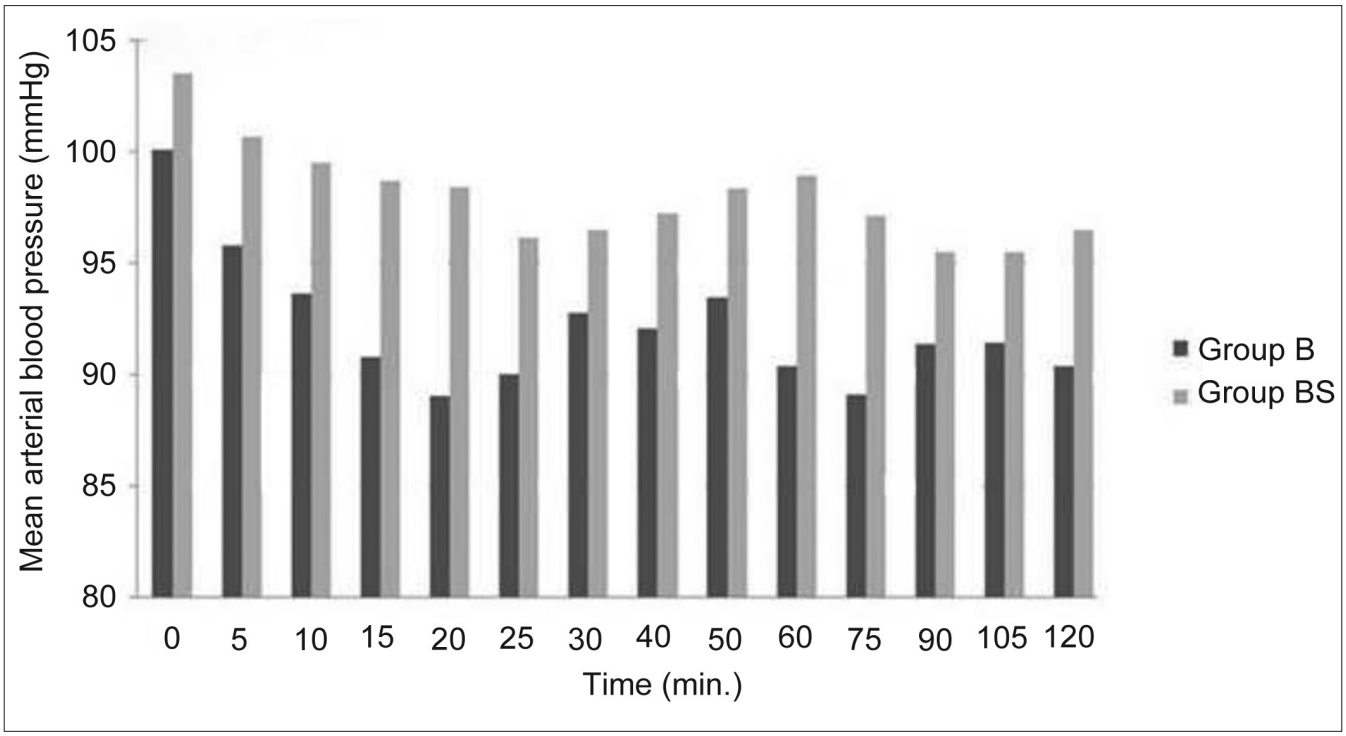

Figure 1: Differences in mean arterial blood pressure between groups ($P > 0.05$)

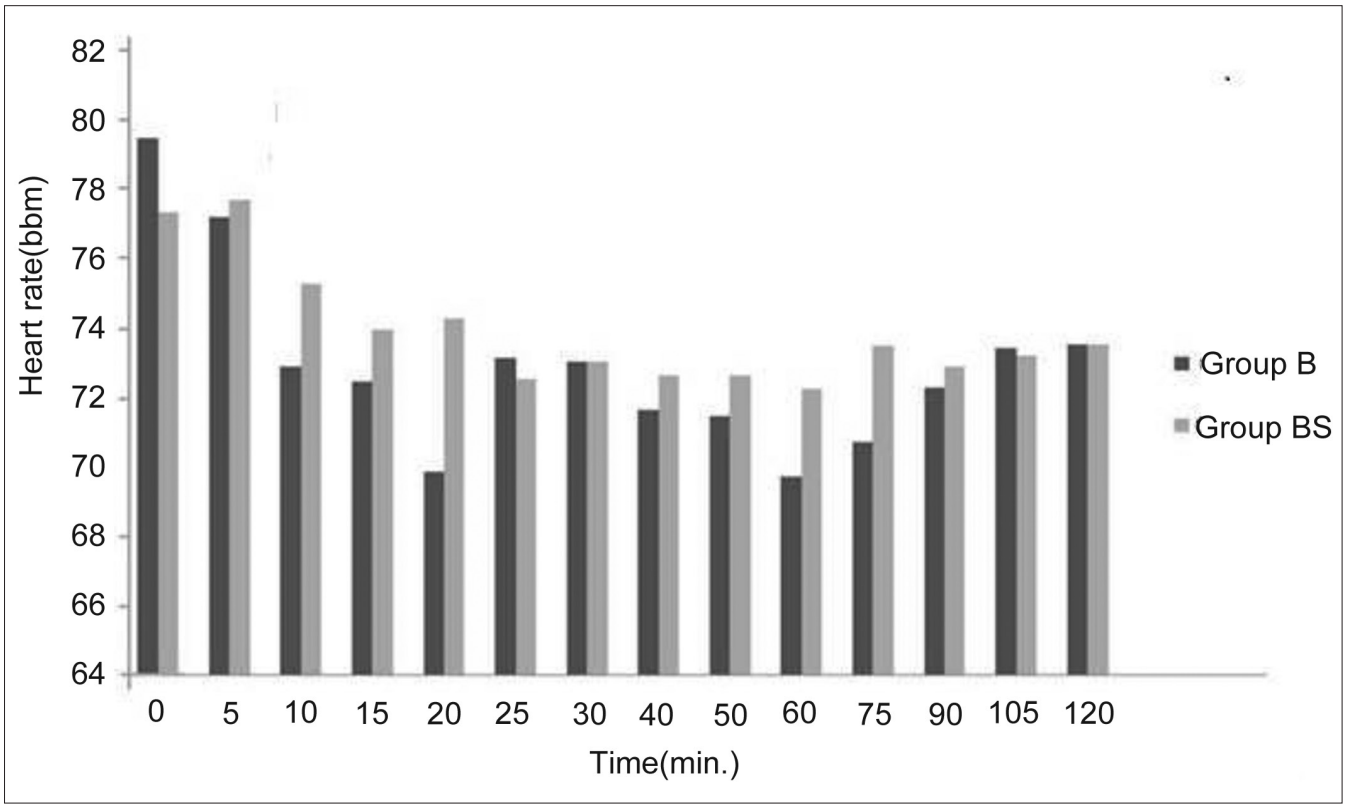

Figure 2: Differences in heart rate between groups ($P > 0.05$)

Further, research investigating differences in the inherent physiochemical properties of intrathecal opioids in elderly patients is warranted.

Intrathecal administration of opioids can cause such side effects as itching, nausea, vomiting, and respiratory depression. The frequency and severity of side effects depend

on the dose and they are observed in a fairly low incidence. Opioids cause itching by stimulating μreceptors in the posterior horn. Agonist-stimulating κ(kappa) receptors, on the other hand, prevent itching.[19] Intrathecal use of the same dose sufentanil and itching incidence is reported differently in various studies.[20-22] In the present study, the incidence of itching may have been low because opioids were administered in low doses.

Conclusion

7.5 mg of bupivacaine and 5 μg of sufentanil; provides adequate anesthesia without hemodynamic instability, fewer side effect, and less motor block for TURP in elderly patients. Sufentanil facilitates the spread of the block and offers greater postoperative analgesic efficacy. Due to the fact that less motor block was observed and the first analgesic request was longer, the combination of bupivacaine + sufentanil might be appropriate for elderly patients undergoing TURP.

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