Abstract. – Background: Neuroaxial blockade for ambulatory transurethral resection of the prostate is a well established technique. Patients in this group are often at high risk for perioperative complications from concurrent diseases. The purpose of this study was to compare the elderly patients who received intrathecal fentanyl alone or intrathecal fentanyl plus bupivacaine or epidural anesthesia for transurethral resection of prostate surgery.

Material and Methods: Ninety-nine patients were prospectively randomized to receive fentanyl 25 μg (Group F), fentanyl 25 μg plus hyperbaric bupivacaine 2.5 mg (Group BF), or epidural anesthesia adding fentanyl 50 μg (Group E) by combined spinal epidural anesthesia technique.

Results: The amount of local anesthetics used until when the sensorial block reached the level of T10 was significantly lower in the Group BF than in the Group E and the Group F (p < 0.001). Maximum level of sensory block was significantly lower in the Group BF than in the Group E and the Group F (p = 0.01). The time elapsed until the sensory block reached T10, the regression of sensory block to L5 level were significantly lower in the Group BF than in the Group E and the Group F (p < 0.001, respectively). Compared to the basal values, mean arterial pressures were significantly lower in the Group BF than in the Group E and the Group F (p < 0.05). The occurrence of hypotension was significantly lower in the Group BF (9.4%) than in the Group E (18.2%) and the Group F (24.2%).

Conclusions: Intrathecal hyperbaric bupivacaine 2.5 mg plus fentanyl 25 μg administration provides shorter motor block onset time, less local anesthetic usage and adequate hemodynamic stability in elderly patients.

Key Words: Hemodynamic effects, Neuroaxial blockade, Spinal epidural, Anesthesia.

Introduction

Epidural, combined spinal epidural (CSE), or spinal anesthesia are the techniques preferred for transurethral resection of prostate (TURP) surgery because they provide convenient surgical conditions. The risk of hypotension development as a cardiovascular response to the spinal anesthesia is 40% among elderly patients. The occurrence of intra-operative hypotension in the patients with minimal or insufficient cardiac reserve may lead to undesired situations such as myocardial ischemia and acute cardiac failure.

It was thought that reducing the conventional dose of 7.5 mg of bupivacaine that is recommended to prevent hypotension in TURP surgery would be efficacious. With the addition of opioid, this dose has been reduced to 4 mg. It was found that CSE anesthesia with ultra low dose (2.5 mg) of local anesthetic and opioid was effective in obstetric patients and spinal anesthesia, in anorectal surgery. The need for time after epidural anesthesia generates a disadvantage, whereas the implications with ultra low dose have been successful without any requirement for waiting time.
An opioid may be added to local anesthetics in epidural or intrathecal applications; the opioids, in contrast to the local anesthetics, do not impair hemodynamics. Furthermore, it was reported that intrathecal administration of fentanyl provided more rapid and efficacious analgesia than epidural administration. However, the effect of epidural volume extension on hemodynamics after administration of intrathecal fentanyl alone has not been researched extensively.

Therefore, in our study, among elderly patients who underwent TURP surgery, we aimed to compare those who received CSE with intrathecal fentanyl 25 μg alone with those who received CSE or only epidural anesthesia with intrathecal fentanyl 25 μg plus hyperbaric bupivacaine 2.5 mg with regard to hemodynamics.

### Patients and Methods

After obtaining approval from local Ethics Committee of Inonu University Medical Faculty and informed consent of the patients, we enrolled 99 ASA I-II patients older than 65 years with prostate hypertrophy who were scheduled for TURP. The patients with deformities of the spinal column, hypersensitivity to bupivacaine or fentanyl, and severe renal, hepatic, respiratory, cardiac, neurological or psychiatric disorders were excluded from the study. The monitoring of the patients during surgery was done by an anesthesiologist, who was blinded to the study.

None of the patients was premedicated. All the patients were fasted before the onset of operation starting from the midnight before. The patients were admitted into the operating theatre, their non-invasive blood pressures (NIBP), ECG, heart rates (HR), and peripheral oxygen saturations (SPO₂) were monitored. All the parameters were measured three times at 2-minute intervals, and the arithmetic means of basal values were calculated and recorded. The same parameters were recorded at every 2 minutes for 20 min and then every 10 min until the end of the procedure. All the patients were given pre-hydration with 0.9% NaCl solution for 20 minutes before the procedure. For the maintenance, 4 ml.kg⁻¹ of 0.9% NaCl solution was infused.

Then, the patients were divided into 3 groups using the sealed envelope randomization method. Regional anesthesia was performed with the patients in the sitting position at L4-L5 or L4-L3 intervertebral space. After the epidural space was identified using loss of resistance technique with Tuohy 18-G epidural needle in all the patients. The patients in Group F (n = 33) were given intrathecal fentanyl 25 μg plus saline 0.5 mL using the needle-through-needle technique with 25-G Quincke spinal needle. The patients in Group BF (n = 33) were given intrathecal fentanyl 25 μg plus hyperbaric bupivacaine 2.5 mg using the same technique. In Group E (n = 33), only epidural anesthesia was performed by giving 2% of lidocaine 5 mL plus fentanyl 50 μg through a 20-G catheter inserted. The patients were laid in the supine position after the procedure and motor and sensory block levels were checked at 2-minute intervals. Modified Bromage scale (Bromage scale: 0 = no paralysis, able to flex hips, knees/ankles, 1 = able to move knees, unable to raise extended legs, 2 = able to flex ankles unable to flex knees, 3 = unable to flex ankles, knees, or hips) was used to assess motor block, and pinprick test was used for sensory block. Motor and sensory blocks were evaluated at 1 min intervals until sensory block reached the level of T10. If block level did not reach the T10, additional 2% lidocaine 5 mL injections were given at 5-minute intervals. The maximum sensory block levels of the patients, the time elapsed until T10 blockage level, and total amounts of local anesthetics given into epidural space were recorded.

A drop in the mean blood pressure by 20% of basal blood pressure was considered hypotension, and if necessary, it was treated with intravenous ephedrine 10 mg. An additional 250 mL of fluid was given rapidly. Regardless of the level of the systolic blood pressure, in case the heart rate was < 45 beats per minute or decreased blood pressure did not respond to ephedrine and heart rate was < 50 beats per minute, the patients were treated with atropine 0.5 mg.

Side effects such as nausea, vomiting, pruritus, hypotension, and/or bradycardia were recorded. Surgeon satisfaction was evaluated using the following scoring scale: 1 = poor, 2 = moderate, and 3 = good or excellent and recorded at the end of the surgery.

The patients admitted in post-operative care unit at the end of the surgery were transferred into the urology ward after their sensory block level (L5) and vital signs stabilized.

### Statistical Analysis

Values are expressed as mean ± SD, or with numbers and percentages as appropriate. To eval-
uate for normality, Shapiro Wilk test was performed. The comparisons of the three groups were carried out using one-way analysis of variance (ANOVA) with post-hoc Tukey HSD test for homogeneous variances or Tamhane’s T2 for non-homogeneous variances in multiple comparisons. Pairwise comparisons of repeated measurements in each group were analyzed with paired samples t test and Wilcoxon signed rank test. Categorical data and postoperative side effects were analyzed with the Pearson’s Chi-Square test. p-value < 0.05 was considered statistically significant.

Results

Demographic data including age, body weight, height, the duration of anesthesia, duration of surgical procedures of the patients in three groups were not different (Table I).

Time to two-segment regression of the sensory block was similar in all the groups (p = 0.06). The additional amount of local anesthetics used until the sensory block reached T10 and total amount of local anesthetic for surgery, maximum level of sensory block, the time elapsed until the sensory block reached T10, the regression of sensory block to L5 level were significantly lower in Group BF than in Group E and Group F (p < 0.001, p < 0.001, p = 0.01, p = 0.005, p < 0.001, respectively) (Table II).

The change in the mean arterial pressures from the basal value was significantly smaller in Group BF in all the measurements throughout the surgery in comparison with the change in Group E and the Group F (p < 0.05) (Figure 1).

The occurrence of hypotension was significantly lower in Group BF (9.4%) than in Group E (18.2%) and Group F (24.2%) (p < 0.05). None of the patients in Group BF had a need for ephedrine, whereas 4 patients in Group E and Group F required ephedrine (Table III).

The groups were similar with regard to the adverse effects such as nausea, vomiting, pruritus, bradycardia. There were no significant differences between the groups for surgeon satisfaction scores.

Discussion

In our study, we found that among the patients who received spinal 2.5 mg of hyperbaric bupivacaine plus fentanyl 25 μg by CSE technique, the frequency of hypotension was lower; the regulation of blood pressure was better, and the need for local anesthetic was lower in comparison with the patients who received only spinal fentanyl or those who were performed only epidural anesthesia.

Mc Naugh et al.13 showed that saline or local anesthetic injected into epidural space after spinal anesthesia enhanced the spread of intrathecal block. They reported with regard to the mechanism that thecal compression rather than the transfer of local anesthetic from the dural hole might be effective.

In our study, the dose of bupivacaine was set at 2.5 mg, while that dose was used with fentanyl 25 μg by Gurbet et al.8 for anorectal surgery among obstetric patients who were not hemodynamic ally stable. The dose used by Gurbet et al.8 was found to be successful. Literature does not provide any data on the effect of fentanyl on the need for epidural drug. In obstetrical analgesia, analgesic effect was usually achieved in the patients that were given either fentanyl or sufentanil. However, in the present study, where the effect of fentanyl on hypotension because of

<table>
<thead>
<tr>
<th>Table I. Demographic data of the study.</th>
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<tr>
<td>Variable</td>
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<td>---------------------------</td>
</tr>
<tr>
<td>Age (yr)</td>
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<tr>
<td>Weight (kg)</td>
</tr>
<tr>
<td>Height (cm)</td>
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<tr>
<td>Duration of anesthesia (min)</td>
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<tr>
<td>Duration of surgical procedures (min)</td>
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</tbody>
</table>

Values are mean ± SD.
epidural dose requirement of intrathecal fentanyl was investigated, fentanyl ensured analgesia, but it did not change the need for local anesthetic. This may be due to the fact that fentanyl given along with intrathecal local anesthetic reduces the need for epidural anesthetic, but fentanyl alone does not reduce the need for epidural anesthetic, which may be associated with the baricity of fentanyl. When epidural volume extension was achieved, higher sensory block levels could be reached because the baricity of fentanyl plus bupivacaine combination was lower than the baricity of fentanyl. That fentanyl possesses only analgesic feature but no local anesthetic features may be another reason. The prevalence of hypotension in the patients who received only intrathecal fentanyl was similar to the prevalence rate of hypotension in the patients who received epidural anesthesia, which might have been due to the use of local anesthetics at similar rates in the fentanyl group and epidural anesthesia group because adequate sensory block could not be obtained in the fentanyl group.

It is known that fentanyl, an opioid drug, does not affect hemodynamics. Nevertheless, local anesthetics used for central blocks may lead to hypotension through autonomous nervous system blockage. In a study performed by Kararmaz et al. in which CSE technique was used as in our study, when the patients who received plain bupivacaine 7.5 mg were compared with those who received bupivacaine 4 mg plus fentanyl 25 μg, it was found that hypotension did not occur in the group of the patients who received additional fentanyl. The Authors defined hypotension as a 30% drop from the basal value. This might explain their findings. In our study, the incidence of hypotension as a 30% drop from the basal value. This might explain their findings. In our study, the incidence of hypotension was somewhat decreased (9.4%), but not zero, and in our study, a 20% drop from the baseline was considered hypotension.

### Table II. Characteristics of blocks.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group F (n = 33)</th>
<th>Group BF (n = 33)</th>
<th>Group E (n = 33)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to T10 (min)</td>
<td>8.8 ± 4.2</td>
<td>6.7 ± 4.8</td>
<td>10.2 ± 3.6</td>
<td>0.005</td>
</tr>
<tr>
<td>Total additional local anaesthetic amount for T10 (mL)</td>
<td>10.3 ± 3.5</td>
<td>3.1 ± 5.0</td>
<td>9.5 ± 2.8</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Total amount of local anaesthetic for surgery (mL)</td>
<td>16.3 ± 7.9</td>
<td>5.9 ± 7.2</td>
<td>22.7 ± 7.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Maximum sensory block level (segment)</td>
<td>8 ± 1.3</td>
<td>7 ± 1.1</td>
<td>7 ± 1.0</td>
<td>0.01</td>
</tr>
<tr>
<td>Time to two-segment regression (min)</td>
<td>34.0 ± 11.0</td>
<td>28.7 ± 10.1</td>
<td>26.3 ± 15.9</td>
<td>0.06</td>
</tr>
<tr>
<td>Time to L5 (min)</td>
<td>119.4 ± 15.4</td>
<td>112.6 ± 17.7</td>
<td>134.0 ± 21.7</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Values are presented as mean ± SD.

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**Figure 1.** Mean arterial pressure of the patients.
In contrast to our findings, there are investigations supporting that the use of fentanyl in addition to intrathecal bupivacaine does not change hemodynamics. Turhanoglu et al.\textsuperscript{15} reported in the patients performed CSE that the prevalence of hypotension in the patients given plain bupivacaine 4 mg plus fentanyl 25 μg and those given plain bupivacaine 10 mg did not differ between, but the severity of hypotension, the amount of ephedrine, and frequency of ephedrine injections were affected. Lower frequency of hypotension in our study may be accounted for by the diversity of the patient populations and the use of hyperbaric bupivacaine because the efficacy of bupivacaine differs depending on whether it is hyperbaric or plain when fentanyl is added\textsuperscript{7,16}.

Among the patients who had undergone TURP surgery under spinal anesthesia, Walsh et al.\textsuperscript{17} reported that fentanyl did not alter the hemodynamic response in the patients given intrathecal bupivacaine 15 mg or hyperbaric bupivacaine 10 mg plus fentanyl 25 μg, but affected only the spread of the block. Unlike in their study, we used CSE technique in our patients, and thus, we might have found that fentanyl plus local anesthetic was efficacious. Lin et al.\textsuperscript{18} reported that the use of 1.25 mg bupivacaine in addition to fentanyl did not change the efficacy and the occurrence of hypotension in comparison with the use of fentanyl alone. In our study, we used bupivacaine at a higher dose of 2.5 mg.

In a study with only spinal anesthesia on patients scheduled for TURP, Erdil et al.\textsuperscript{19} compared intrathecal levobupivacaine and bupivacaine, and they found the prevalence of hypotension to be 10% in the levobupivacaine group and 30% in the bupivacaine group\textsuperscript{19}. The latter prevalence rate is similar to the rate in our patients who received intrathecal fentanyl with bupivacaine. However, Erdil et al. used plain bupivacaine unlike in our study. Togal et al.\textsuperscript{20} however, used bupivacaine 7.5 mg with S (+) ketamine 0.1 mg.kg\textsuperscript{-1} and none of their patients required any treatment for hypotension. S (+) ketamine or levobupivacaine may not be easily available in every clinic. In such circumstances, in which hemodynamic impairment is undesired in a given patient, CSE with bupivacaine plus fentanyl combination may be a favourable option.

In conclusion, we suggest that when intrathecal fentanyl is used individually without addition of any local anesthetics in CSE, the hemodynamic response does not differ from that with epidural anesthesia itself. Thus, it can be said that in elderly patients undergoing TURP surgery, CSE with intrathecal hyperbaric bupivacaine 2.5 mg plus fentanyl 25 μg ensures adequate hemodynamic stability.

### References


