Comparative study of low dose bupivacaine-fentanyl Vs. conventional dose of bupivacaine in spinal anaesthesia for orthopedic procedures in elderly patients

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ABSTRACT

Background: The purpose of the study was to compare low dose bupivacaine - fentanyl and conventional dose of bupivacaine in spinal anaesthesia for orthopaedic procedures in elderly patients. Materials and methods: 60 elderly patients of either sex belonging to ASA I, II & III undergoing elective orthopedic lower limb surgeries under spinal anaesthesia were studied in this prospective, randomized double blinded study. First group A (n=30) was given inj. Bupivacaine 3 ml (15mg) &group B (n=30) was given inj. Bupivacaine (2 cc) + 25 mcg fentanyl.

Parameters like time for adequate level of analgesia (T10), peak sensory level reached, time for motor block to recced to L3-L4 level (modified bromage scale), duration of sensory block and incidence of complications are noted in both groups. Result: The time of onset of adequate level of sensory block (T10) was longer for group B than group A. Duration of sensory block was slightly more for group A. Duration of motor block was longer in group A than group B. Conclusion: It is concluded that subarachnoid block with 2cc bupivacaine 0.5%H and 25mcg fentanyl is a more safer and better option for elderly patients undergoing lower limb surgeries.

INTRODUCTION

It is universally agreed that anaesthesia of choice for lower limb surgery is subarachnoid block producing less post-op confusion and delirium than General Anesthesia. However spinal anaesthesia has got its own inherent complications, especially related to cardiovascular stability. Perioperative hypotension may affect postoperative recovery and also the high incidence of coronary disease, increases risk of ischemia secondary to hypotension. Vasopressor and IV fluids are used to treat or prevent hypotension. Another technique is by using very small titrated dose of local anaesthetic but it may not provide acceptable anaesthesia for sufficient duration.

Studies have established that opioids and local anaesthetics administered together intrathecally have potent synergistic analgesic effect, enhancing the sensory blockade without altering the degree of sympathetic blockade ensuring better hemodynamic stability. The goal of this study was to compare hemodynamic and sensory effects of low dose bupivacaine-fentanyl in spinal anaesthesia versus conventional dose of bupivacaine in elderly patients undergoing surgical repair of lower limb fractures.

MATERIALS AND METHODS

After approval of institutional ethical committee and informed consent, 60 patients of ASA I,II,& III with age > 50 years of both sexes undergoing elective lower limb orthopedic surgeries were included in this double blind randomized trial. Patients with history of allergy to local anesthetics, severe cardiac or respiratory diseases and uncontrolled hypertension were excluded. After routine and special investigations (if required) are done, patients were randomly allocated to group A (Bupivacaine-15mg, 3ml) & group B (Bupivacaine-10mg, 2ml + 25 mcg [1ml] fentanyl). Demographic data were comparable in age, height and duration of surgery(Table-1). Patients were fasted 8-10 hours and in operation theatre preloading with 8ml/ kg Ringer lactate done and standard monitors applied.

From previous studies, low dose of bupivacaine and fentanyl was identified. Those studies are as below.

1. Diana Fernander, Monterrat Rue et al (1996) 12.5 mg plus saline or 25 mcg fentanyl.

Under all aseptic and antiseptic precautions lumbar puncture was performed in sitting position in L3-L4 space
by 23 Gauge Quincke point needle. Both the groups were given respected drugs and sensory level of T6-T8 was achieved. Patients were given oxygen by ventimask at 4L/minute.

Pulse rate, blood pressure and SpO2 were measured intraoperatively every 2 minutes for first 10 minutes and every 5 minutes for next 30 minutes and every 15 minutes there after till 1 hour postoperatively.

Hypotension was defined as SBP of < 90 mm of Hg or a decrease of more than 30% from baseline mean arterial pressure which was treated with an incremental IV bolus of mephentermine 6 mg. Bradycardia (heart rate< 60bpm) was treated with IV atropine(Graph-2,3).

Other parameters like time for adequate level of analgesia, peak sensory level reached, time for motor block to recede to L3-L4 level, duration of sensory block(Table-2) and incidence of complications like Nausea, vomiting, pruritus, sedation, shivering were assessed and compared(Table-3).

Motor block was assessed using modified Bromage scale.

0 – No paresis – full movements of lower limbs
1 – Partial paresis – flex knees and ankles
2 – Partial paresis – flex ankles
3 – Partial paresis – flex toes only
4 – Full paresis – no movement

Sedation status was assessed using

0 – Awake and alert
1 – Respond to voice
2 – Respond to painful stimuli
3 – No response

The study was done in a double blinded, prospective randomized manner in 60 patients scheduled to undergo elective orthopedic lower limb surgeries under spinal anaesthesia. The demographic data (age, weight, sex & ASA grading) were comparable and statistically non significant (Table-1). Average duration of surgery was 120 to 150 minutes. Equal distribution of males and females in both groups was done and majority of them were ASA II. Student's t-test was used for statistical analysis.

- The time of onset of adequate level of sensory block (T10) was longer for group B (128 +/- 8.3sec) than group A (95 +/- 10.32sec) and was statistically significant (Table-2).
- Duration of motor block was longer in group A (162.5 +/- 7.5min) as compared to group B (129.4 +/- 9.9min) and was statistically significant. (P<0.05).
- Lower pulse rates and less fall in blood pressure was noted in group B than group A, thus there is better hemodynamic stability in group B(Graph-1).
- Incidence of hypotension and use of vasopressors was much higher in group A and was found to be statistically significant(Graph-2,3).
- Total duration of sensory block was slightly more for group A but was not found to be statistically significant.
- Incidence of bradycardia and pruritus was common in group B.
- None of the patients had nausea, vomiting and respiratory depression.
- Shivering was higher in group A

Sedation score was used to assess sedation intraoperative and postoperative.

DISCUSSION

Maintenance of body physiology as near normal as possible during anaesthesia is one of the primary goals of anesthesiologist. Marked hemodynamic derangements are often seen following subarachnoid block especially in trauma and elderly patients. Neuraxial opioids are not associated with sympathetic nervous system denervation, skeletal muscle weakness or loss of proprioception. They predominantly act at the mu receptors present in substantia gelatinosa of spinal cord to exert its synergistic analgesic effect more specifically for visceral pain.

The recommended level of regional anaesthesia for lower limb surgery is T10. Standard recommended dose of 0.5% Hyperbaric bupivacaine is 3cc (15mg).

In our present study, we have added 25 mcg fentanyl, a highly lipophilic opioid to lower doses of 0.5 % hyperbaric bupivacaine and compared hemodynamic parameters like blood pressure, heart rate changes, side effects of fentanyl and motor and sensory profiles of block.

In our study 12 patients of group A developed hypotension and needed vasopressors compared 3 patients of group B. these findings are in agreement with findings of Ben David et al (2000), Ben David, Frankel et al (2000) and Matyr et al (2001)(Graph-2,3).

There was significant increase in time for onset of adequate block in group B (128 +/- 8.3sec) as compared to group A (95 +/- 10.32sec). Addition of fentanyl reduces the pH of hyperbaric bupivacaine. This may be reason for delay in onset of adequate block(Table-2).

The total duration of sensory block for group A was 227.6 +/- 9.8min while group B was 211.5 +/- 14.2 min. The differences between two groups were statistically insignificant as per Boucher et al (2001)& Rajesh Mahayan, V K Grover et al (2005). Addition of fentanyl enhances duration of sensory block in which dose of bupivacaine-H was same. But in our study dose of bupivacaine in fentanyl group is much lower which can be the reason for slightly lower duration of sensory block(Table-2).
The duration of motor blockade was higher for group A than group B and none of the patients required any supplementary anaesthetic interventions during surgery (Table 2).

There was no incidence of sedation or respiratory depression in 2 groups. Fentanyl abolishes shivering by central mechanism in group B. Pruritus is most common side effect of intrathecal opioid. In our study 3 among 30 in group B had pruritus which was treated by ondansetron. Nausea and vomiting were not seen in any of these groups (Table 3). Addition of fentanyl reduces the pH of hyperbaric bupivacaine. It may be the reason for an observed delay in onset of adequate block.

### TABLE 1: DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>69.0 ± 8.4</td>
<td>69.7 ± 7.2</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>164.3 ± 5.8</td>
<td>163.4 ± 5.5</td>
</tr>
<tr>
<td>Duration of Surgery (min.)</td>
<td>135 ± 30.6</td>
<td>128.8 ± 32.4</td>
</tr>
<tr>
<td>Male : Female</td>
<td>19 : 11</td>
<td>19 : 11</td>
</tr>
<tr>
<td>ASA Grade II : III</td>
<td>19 : 11</td>
<td>18 : 12</td>
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</tbody>
</table>

### TABLE 2: CHARACTERISTICS OF SPINAL BLOCK

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of onset of adequate block-T 10 (sec)</td>
<td>95 ± 10.32</td>
<td>128 ± 8.3</td>
</tr>
<tr>
<td>Duration of motor block (min.)</td>
<td>162.5 ± 7.5</td>
<td>129.4 ± 9.9</td>
</tr>
<tr>
<td>Duration of sensory block (min.)</td>
<td>227.6 ± 9.8</td>
<td>211.5 ± 14.2</td>
</tr>
</tbody>
</table>

### TABLE 3: COMPLICATIONS

<table>
<thead>
<tr>
<th>Complication</th>
<th>Group A</th>
<th>Group B</th>
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<tbody>
<tr>
<td>Hypotension</td>
<td>12 (40%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>1 (3.3%)</td>
<td>2 (6.6%)</td>
</tr>
<tr>
<td>Pruritus</td>
<td>0</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>Sedation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nausea &amp; Vomiting</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shivering</td>
<td>3 (10%)</td>
<td>0</td>
</tr>
<tr>
<td>Respiratory depression</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

### CONCLUSION

From current study, it was concluded that subarachnoid block with 2 cc bupivacaine 0.5% H and 25 mcg fentanyl is more safer and better option, both in terms of maintaining hemodynamic stability and lower incidence of complications without compromising the surgical condition for elderly patients undergoing orthopedic lower limb surgeries. B+F can be a safer alternative for elderly patients, who may have more hypotension after conventional dose of bupivacaine, which can be reduce after adding fentanyl in low dose bupivacaine. After completing this study, we will study for other doses.
REFERENCES


