A Comparison of Intrathecal Isobaric Ropivacaine 0.5% and 0.75% for Orthopaedic Lower Limb Surgeries and Lower Abdominal Surgeries.

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ABSTRACT

Background: Aim: This study was done to evaluate the onset, extent and duration of sensory and motor block and side effects of ropivacaine when used in spinal anaesthesia in lower limb orthopedic and lower abdominal surgery. Methods: A prospective randomized double blind study was conducted on 60 patients of ASA status I and II, posted for lower limb orthopedic and lower abdominal surgery. All patients were randomly allocated into two groups of 30 each; group I received 3ml of isobaric ropivacaine 0.5%(15mg) and group II received 3ml of 0.75% (22.5mg)isobaric ropivacaine in subarachnoid block. The onset, extent, duration of sensory and motor block and side effects were recorded. Results: Onset of sensory block and highest level of sensory block achieved was comparable in both the groups. The duration of sensory block at T10 and total duration of sensory blockade was prolonged in group II in comparison to group I, which was statistically significant. The onset time of motor block was comparable in both groups. Time to maximum degree of motor block was longer in group I (17.45±6.63min) compared to group II(11.04±4.26min) which was statistically significant. Total duration of motor block was longer in group II(152.60±23.02min) compared to group I (112.62±13.72min) which was statistically significant. Conclusion: 0.75% ropivacaine when used in spinal subarachnoid block prolonged the sensory and motor block in comparison to 0.5% ropivacaine.

Keywords: abdominal, intrathecal, ropivacaine, orthopaedic.

INTRODUCTION

Spinal anaesthesia is a very popular regional anaesthetic technique, with a high success rate and a good safety profile.[1] A review of the current literature suggests that ropivacaine have improved safety profile over bupivacaine, with a reduced neurotoxic and cardiotoxic potential, together with a wide clinical utility at different doses.[2] It has been shown to provide effective and prolonged surgical anaesthesia in different regional anaesthetic techniques like epidural and brachial plexus blocks.

MATERIALS AND METHODS

Sixty patients posted for elective orthopaedic lower limb surgeries & lower abdominal surgeries under spinal anaesthesia were included in this study. Patients of either sex, patients with ASA Grade-I &II and patients aged between 20-60 years were included in this study. Patients with severe systemic
In the present study the onset of sensory blockade in group-I was 2.30±0.21min compared to 1.58±0.20...
min in group-II which was statistically not significant. Similarly, the onset of motor blockade in group-I was 2.34±0.67 min compared to 1.64±0.22 min in group-II which was also statistically not significant. The median time to reach the highest level of analgesia was comparable in both groups. Duration of analgesia at T10 and total duration of analgesia was longer in group II in comparison to group I which was statistically significant [Table 2, Figure 1].

**Table 2: Intrathecal block characteristics**

<table>
<thead>
<tr>
<th>Sensory Block (min)</th>
<th>Group-I</th>
<th>Group-II</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset time of sensory block</td>
<td>2.30±0.21</td>
<td>1.58±0.20</td>
<td>0.054</td>
</tr>
<tr>
<td>Time to reach highest level of sensory block</td>
<td>17.48±5.94</td>
<td>18.32±6.20</td>
<td>0.06</td>
</tr>
<tr>
<td>Duration at T10</td>
<td>45.52±17.02</td>
<td>90.34±35.48</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total duration</td>
<td>146.80±27.64</td>
<td>184.20±18.06</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Motor Block (min)

<table>
<thead>
<tr>
<th>Side effects</th>
<th>Group-I</th>
<th>Group-II</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shivering</td>
<td>5</td>
<td>4</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Hypotension</td>
<td>2</td>
<td>3</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Nausea</td>
<td>3</td>
<td>3</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Vomiting</td>
<td>1</td>
<td>1</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>4</td>
<td>5</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Post spinal headache</td>
<td>1</td>
<td>1</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

Heart rate, systolic and diastolic blood pressure in both the groups did not vary significantly. Cardiovascular changes were unremarkable throughout and similar in the two groups, as were the volumes of fluid administered.[Figure 2,3]

**DISCUSSION**

Ropivacaine is an amide local anaesthetic with a high pKa value and low lipid solubility. It is considered to block sensory nerves to a greater degree than motor nerves. Because of sensory motor dissociation, ropivacaine can be a favourable local anaesthetic for day-case surgery. This double blind randomized study was conducted to compare two different concentrations of intrathecal ropivacaine in orthopaedic lower limb surgeries & lower abdominal surgeries. Jack W van Kleef et al, found that the duration of analgesia at the level of T12 was significantly longer in the 0.75% group as compared to 0.5% group. This showed that ropivacine 0.75% had a longer duration of analgesia compared to 0.5% ropivacaine. They observed that, due to its greater propensity to produce longer duration of analgesia and complete...

**Figure 1: Sensory level block with time between the groups**

**Figure 2: Heart rate variation between the groups**

**Figure 3: Mean arterial pressure (MAP) variability between the groups**
motor block, 0.75% ropivacaine may be an ideal intrathecal anaesthetic, suitable for orthopaedic and vascular surgical procedures of intermediate duration, requiring an intense motor block. There was no significant difference regarding onset of either sensory or motor block. These findings were similar to ours. Kim S Khaw et al found that the incidence of hypotension were similar in a comparison of different doses of plain ropivacaine. Wong et al had observed the same, that there were no major cardiovascular changes in the two groups receiving two different doses (2.5ml and 3ml) of 0.75% ropivacaine in caesarean section. They opined that the onset of sensory and motor block were similar in two groups of ropivacaine 0.75%. Helena Kallio et al studied the effects of plain ropivacaine 20mg and 15 mg. They found that there was a significantly longer duration of motor block with 20mg than 15 mg of ropivacaine. They observed that both groups receiving plain ropivacaine did not have any differences in the hemodynamic parameters. Chari et al found that the onset of motor block in 0.75% isobaric ropivacaine to be at 2.54±1.01 min which was corroborating our study. They also concluded from their study that the time to maximum degree of motor block in 0.75% isobaric ropivacaine group to be 18.92±2.41min which was corroborating our study. Surekha C et al studied with intrathecal plain ropivacaine with bupivacaine and they did not found any hemodynamic instability in the both study group. Kelkar et al. in his study of 0.5% isobaric ropivacaine found that the sensory onset to be 8.40±2.94 min. which was not corroborating with our study. They found that the total duration of motor block in 0.5% of isobaric ropivacaine is 116.00±16.2 min and total duration of sensory block in 0.5% isobaric ropivacaine group is 138±17.4 min which was similar to our study. Above studies also concluded that use of 15 mg or 22.5mg of ropivacaine in spinal anaesthesia caused no gross hemodynamic disturbances. In the present study, the two segment regression of sensory level to T 10 dermatome in group-I was 45.52±17.02 min. compared to 90.34±53.48 minutes in group-II which was statistically highly significant (P<0.001). Also the time to maximum degree of motor block in group-I was 17.45±6.63 minutes compared to 11.04 ±4.26 minutes in group-II which was statistically significant (P<0.05). Five patients had shivering in group I as compared to 4 patients in group II. 5 patients in Group II and 4 patients in group I had bradycardia. There were one case of post spinal headache in both group. 3 patients have nausea and one patients have vomiting in both groups. There was no statistical significance regarding any of side effects. We summarized that 3ml of intrathecal isobaric ropivacaine 0.75% (22.5mg) brought better quality and longer duration of sensory block, reliable quality of motor block and better postoperative outcome with minimum side effects than 0.5% ropivacaine (15mg).

CONCLUSION

Intrathecal administration of 22.5 mg of 0.75% isobaric ropivacaine produced better quality of sensory and motor block with negligible hemodynamic disturbances as compared to 15 mg of isobaric 0.5% ropivacaine in orthopaedic lower limb surgeries & lower abdominal surgeries of intermediate duration. 0.5% ropivacaine may be suitable for short surgical procedures when motor block is not required.

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