EVALUATION OF POSTOPERATIVE ANALGESIC EFFECTS OF INTRATHECAL TRAMADOL WITH BUPIVACAINE AND BUPIVACAINE ALONE IN PATIENTS UNDERGOING LOWER ABDOMINAL SURGERY: A COMPARATIVE STUDY

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ABSTRACT

BACKGROUND
Effective pain control is essential for optimum care of patients in the postoperative period. Epidural and intrathecal administration of drugs have been used increasingly for relief of postoperative pain. Tramadol is a centrally acting analgesic that has minimal respiratory depressant effects compared to other opioids like morphine. This study was conducted to evaluate safety and efficacy of the intrathecal tramadol and to determine the postoperative analgesia.

MATERIALS AND METHODS
Sixty ASA 1 and 2 patients were randomly assigned to two groups. Group B (n=30) received 3 ml of 0.5% hyperbaric bupivacaine with 0.5 ml of normal saline and group BT (n=30) received 3 ml of hyperbaric bupivacaine with 0.5 ml (25 mg) of preservative free tramadol by intrathecal route at L3-L4 intervertebral space. Patient`s vital parameters, level of sensory block and sedation scores were recorded every two minutes for the first 20 minutes and then every ten minutes for the rest of surgical procedure. Assessment of pain was done using visual analogue scale (VAS=0-100 mm). Duration of analgesia was estimated from the time of completion of spinal injection to administration of rescue analgesic.

RESULTS
In group BT patients the VAS score was significantly lower as compared to group B patients. The mean duration of analgesia was 393.33±123.21 minutes in group BT, whereas in group B it was 167.47±12.46 minutes, which was found to be statistically significant.

CONCLUSION
25 mg tramadol with hyperbaric bupivacaine intrathecally provides a better postoperative analgesia in lower abdominal surgeries.

KEYWORDS
Intrathecal Opioids, Tramadol, Bupivacaine, Postoperative Analgesia, Lower Abdominal Surgeries.


BACKGROUND
Anaesthesiologist plays a major role in post-operative pain management. Spinal anaesthesia with 0.5% hyperbaric bupivacaine is routinely administered for lower abdominal and major gynaecological surgeries. To increase the duration of analgesia produced by local anaesthetics a number of adjuvants have been added through the central neuraxial route. Intrathecal opioid administration has been demonstrated to provide effective post-operative analgesia after variety of surgical procedures, at the cost of increased risk of respiratory depression.1

Spinal anaesthesia with Bupivacaine hydrochloride is popular for longer procedures due to its prolonged duration of action, but there is a need to intensify and increase duration of sensory blockade without increasing the intensity and duration of motor blockade, and thus prolong the duration of postoperative analgesia.

Tramadol is a centrally acting analgesic agent that is structurally related to morphine and codeine. Tramadol acts by modulating opioid and monoamine descending pathways mediated by raphe nucleus, periaqueductal grey and locus coeruleus. It also inhibits reuptake of nor adrenaline and 5HT. Tramadol causes no clinically relevant respiratory depression in adults or children undergoing surgery. There were no clinically significant changes in oxygen saturation, end-tidal CO2, minute volume and respiratory rate in adults or children.
Tramadol has 6000-fold less affinity for μ receptors compared to morphine.²,³ It also has no reported neurotoxicity.⁴ Thus tramadol provides effective post-operative analgesia with no risk of respiratory depression after central neuraxial administration. Tramadol causes adverse effects like pruritus, nausea, vomiting, urinary retention, unpredictable respiratory depression,⁵,⁶ hence has directed the clinicians to use a lower dose of tramadol. So we have undertaken this study to know whether addition of intrathecal tramadol to bupivacaine influences the later regarding, duration of analgesia, quality of analgesia and adverse effects like respiratory depression, nausea and vomiting in patients undergoing lower abdominal surgeries.

**MATERIALS AND METHODS**

This prospective randomized control study was done after obtaining institutional ethical committee approval and written informed consent. Sixty patients of physical status ASA 1 and 2 aged between 18 and 50 years of both the sexes posted for elective lower abdominal surgical procedures from various specialties under subarachnoid block were included in this study. Patients with spinal deformity, history of allergy to the drugs used and having contraindications to regional anaesthesia were excluded from the study.

Patients were randomly divided into two groups (B and BT) of 30 each. Group B received 3 ml of 0.5% bupivacaine heavy with 0.5 ml of 0.9% normal saline intrathecally and Group BT received 3 ml of 0.5% bupivacaine heavy with preservative free tramadol 0.5 ml that is 25 mg intrathecally. Visual analogue scale (VAS), consisting of 100 mm line with '0' = no pain and 100= worst possible pain, was explained to all the patients preoperatively. The VAS provides a simple, efficient and minimally intrusive measure of pain intensity that has been used widely in clinical and research settings, where a quick index of pain is required and to which a numerical value can be assigned. The VAS is sensitive to pharmacologic and non-pharmacologic procedures that alter the experience of pain and correlated highly with pain measured on verbal and numerical rating scales.

**Figure 1. Visual Analogue Scale**

In the operating room, pulse rate, blood pressure, SpO₂ and respiratory rate were recorded before spinal anaesthesia. A suitable intravenous line was secured. Patient was then put in sitting position with head, neck, spine, hip and knees flexed and back arched. Under aseptic precautions, back painted, draped and lumbar puncture was performed at L₃-L₄ interspace with 26G Quincke needle after local infiltration with 2 cc of 0.5% lignocaine.

After free flow of CSF, 3.0 ml of hyperbaric bupivacaine 0.5% with 0.5 ml of 0.9% normal saline was deposited slowly in patients of group B. In patients of group BT 3.0 ml of 0.5% hyperbaric bupivacaine with 0.5 ml (25 mg) of preservative free tramadol was deposited. After the drug was deposited, the patients were made to lie down in supine position immediately. Pulse rate, blood pressure were recorded immediately and at 5, 10, 15, 30, 60, 120, 180 minutes. Level of sensory blockade was assessed by using the 23G hypodermic needle immediately after spinal anaesthesia. Using the "Bromage scale" level of motor blockade is assessed. (Bromage scale: 0 - full flexion of knee and feet, 1- just use to flex knees, full flexion of feet, 2 - unable to flex knees, but some flexion of feet possible, 3 - unable to move legs or feet).

Time for two-segment regression of sensory level in minutes was also noted down.

The degree of sedation was assessed by "Ramsay sedation scale".

**Ramsay Sedation Scale**

1. Patient is anxious and agitated or restless, or both.
2. Patient is cooperative, oriented, and tranquil
3. Patient responds to commands only
4. Patient exhibits brisk response to light glabellar tap or loud auditory stimulus
5. Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus
6. Patient exhibits no response.

Side effects of intrathecal administration of tramadol like nausea, vomiting, hypoxemia, hypotension and sedation were noted down during the intra-operative and postoperative period.

The patients were followed up for 24 hours after surgery. Hypotension (defined as decrease in systolic blood pressure more than 20% of the baseline value) after spinal anaesthesia was treated by increasing the rate of intravenous fluid administration and/or 5-10 mg of intravenous administration of bolus dose of ephedrine hydrochloride as and when required. Bradycardia (Pulse rate <60 beats per minute) was treated with intravenous atropine 0.2 mg as and when needed.

**Statistical Methods**

Chi-square and Fisher exact test have been used to test the significance of study parameters between groups. Student t test (independent samples) has been used to find the significance of investigations between the two groups. p value <0.05 is considered statistically significant. The statistical software namely SPSS 11.0 and Systat 8.0 were used for the analysis of the data.

**RESULTS**

In our study both the groups, group B and group BT were comparable with respect to age, sex, height and weight distribution, ASA physical status and duration of the surgery (Table 1). The duration of analgesia or pain free period in
group B was 167.47 minutes (with standard deviation of 12.46) and in group BT it was 393.33 minutes (with standard deviation of 123.21) as shown in Table 2.

In our study the total analgesic dose in group B was 202.50 mg with standard deviation of 34.95 and in group BT it was 105 mg with standard deviation of 37.37, p value is < 0.001, which is highly significant. Intraoperatively and postoperatively no significant differences in blood pressure, pulse rate and respiratory rate were noted.

VAS score (≥40 mm) was observed in group B, group BT patients showed VAS score (≤40 mm) more than 6 hours after the intrathecal injection. None of the patients in our study experienced postoperative complications like pruritus, vomiting, respiratory depression and lower limb weakness.

<table>
<thead>
<tr>
<th>Basic Characteristics</th>
<th>Group B (n=30)</th>
<th>Group BT (n=30)</th>
<th>p - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years, Mean±SD)</td>
<td>36.53±8.83</td>
<td>36.63±7.89</td>
<td>0.963</td>
</tr>
<tr>
<td>Height (in cm, Mean±SD)</td>
<td>158.60±9.98</td>
<td>157.73±8.17</td>
<td>0.714</td>
</tr>
<tr>
<td>Weight (in kg, Mean±SD)</td>
<td>57.47±8.66</td>
<td>55.73±5.54</td>
<td>0.360</td>
</tr>
<tr>
<td>Sex Male</td>
<td>15 (50.0%)</td>
<td>16 (53.3%)</td>
<td>0.796</td>
</tr>
<tr>
<td>Female</td>
<td>15 (50.0%)</td>
<td>14 (46.7%)</td>
<td></td>
</tr>
<tr>
<td>ASA grade</td>
<td>I-26 (86.7%) II-4 (13.3%)</td>
<td>I-25 (83.3%) II-5 (16.7%)</td>
<td>0.718</td>
</tr>
<tr>
<td>Duration of surgery (in minutes, Mean±SD)</td>
<td>93.50±39.53</td>
<td>96.00±43.52</td>
<td>0.817</td>
</tr>
</tbody>
</table>

**Table 1. Demographic Profile of the Study**

<table>
<thead>
<tr>
<th>Study parameters</th>
<th>Group B</th>
<th>Group BT</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of Analgesia (minutes)</td>
<td>167.47±12.46 (144-188)</td>
<td>393.33±123.21 (220-720)</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Analgesic Time (Inj. Diclofenac Sodium 75 mg IM) (in minutes)</td>
<td>180.50±13.64 (158-210)</td>
<td>404.57±121.48 (230-730)</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Total rescue analgesic dose (in mg)</td>
<td>202.50±34.95 (150-225)</td>
<td>105.00±37.37 (75-150)</td>
<td>&lt;0.001**</td>
</tr>
</tbody>
</table>

**Table 2. Comparison of Study Parameters (Analgesia Parameters) between Two Groups**

DISCUSSION

Effective pain control is essential for optimum care of patients in the postoperative period. If a method of analgesia is to be successful and available to large number of patients, it must be suitable for use in a general surgical ward and should require only simple routine nurse monitoring.

In recent year’s epidural and intrathecal narcotic therapies have been used increasingly for the postoperative pain relief. Various drugs added to local anaesthetics have been studied with regard to intrathecal administration for the treatment of postoperative pain viz., Morphine, Pethidine, Fentanyl, Tramadol, Pentazocine, and Neostigmine etc.

Tramadol is a centrally acting analgesic that has minimal respiratory depressant effects, by virtue of its 6000-fold decreased affinity for µ receptors compared to morphine.7

Although epidural tramadol has been demonstrated to provide adequate postoperative analgesia in patients undergoing major abdominal surgery and caesarean sections, its efficacy after Intrathecal administration has not been studied sufficiently. Hence, we thought it would be appropriate to study the effects of intrathecally-administered tramadol and compare it with intrathecally administered bupivacaine for the duration of postoperative analgesia and complications. The present clinical study is a randomized prospective study in 60 patients belonging to the age group of 18-50 years of both the sexes and of ASA grade 1 and 2.
who were scheduled to undergo selective lower abdominal surgical procedures from various specialties. The patients of group B received 3 ml of 0.5% bupivacaine heavy with 0.5 ml of 0.9% normal saline intrathecally and patients of group BT received 3 ml of 0.5% bupivacaine heavy with tramadol (preservative free) 0.5 ml, i.e., 25 mg intrathecally.

In the present study, there was no significant difference between groups in the pattern of decrease in systolic or diastolic blood pressure during this period. Wang C et al. in their experimental work found that the decrease in sympathetic efferent activity after spinal anaesthesia is related to bupivacaine and not to the intrathecal opioid which was added.

Alsheshmi et al. found that Intrathecal tramadol did not seem to influence the intraoperative hemodynamic profile. In our study, none of the patients experienced respiratory depression. Baraka A et al. found that mean PaO₂ values did not change in the epidurally administered tramadol group. Similar findings were also observed by Yaddenapudi CN et al. with epidurally administered tramadol.

The mean duration of analgesia in the group B was 167.47±12.46 minutes and in group BT it was 393.33±123.21 minutes. So, there is considerably a longer duration of analgesia in group BT compared to group B. Brijesh Jain et al. found that intrathecal tramadol 25 mg added to bupivacaine provided a mean duration of postoperative pain relief of about eight hours, which is similar to our finding. Prosser DP et al. Baraka A et al. Delikan AE et al. found that tramadol given epidurally provided good postoperative pain relief. Similarly, the analgesic time in group BT was 404.57±121.48 and also total analgesic dose was significantly lesser in group BT (105±37.37).

The effectiveness of postoperative pain relief based on VAS in group BT was higher than group B especially after 3 hours, which is statistically significant. The addition of tramadol has improved the effectiveness of postoperative pain relief. The patients in both the groups showed minimal side effects, but in group BT few patients experienced nausea and vomiting which was not statistically significant.

CONCLUSION
In conclusion, it can be inferred that Tramadol 25 mg (preservative free) in combination with Bupivacaine 0.5% heavy can be safely administered intrathecally for better postoperative analgesia in lower abdominal surgical procedures.

REFERENCES