Addition of dexmedetomidine to bupivacaine in Transversus Abdominis Plane Block in Inguinal Hernia Repair: A Perspective Double Blind Study

B. Royzada¹, S. Kujur², A. Royzada³, S. Pandey⁴

¹Associate Professor, Department of Anaesthesia, Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh. ²Assistant Professor, Department of Anaesthesia, Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh. ³Physician, Saibaba Hospital, Bilaspur, Chhattisgarh. ⁴Assistant Professor, Department of Biostatistics, Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh.

ABSTRACT

BACKGROUND
Dexmedetomidine an α 2 adrenergic agonist is well known for potentiating the effect of local anaesthetics in neuraxial blockade and peripheral nerve blocks. It prolongs the duration of analgesia produced by local anaesthetic, as well as reduces the dose of local anaesthetic required to produce the block. This helps in early mobilization and recovery of the patient. We conducted this study to access the effect of adding dexmedetomidine to bupivacaine in transversus abdominis plane (TAP) block in inguinal hernia repair.

METHODS
60 patients posted for inguinal hernia repair were divided into two groups of 30 each in randomized double-blind manner. Group B patients (n=30) received 20 ml of 0.25% of bupivacaine and 2ml normal saline for TAP block whereas Group D received 20 ml 0.25% bupivacaine and 0.5 µgm/Kg of dexmedetomidine (2 ml). NPRS scores for postoperative pain, time to request for first analgesic dose, total duration of analgesia, Inj. Diclofenac consumption, haemodynamic parameters and side effects were recorded.

RESULTS
Numerical pain rating scale scores were significantly lower in group D. Total analgesic requirement was significantly less in group D. Time to request for first analgesic dose was longer in group D as compared to group B. Patients were haemodynamically stable in both the groups.

CONCLUSIONS
The addition of dexmedetomidine to bupivacaine in TAP block provides prolonged and effective postoperative analgesia with haemodynamic stability.

KEYWORDS
Dexmedetomidine, Bupivacaine, TAP Block, Postoperative Analgesia

Corresponding Author:
Dr. Shweta Kujur,
#A-13, Phase II, Vaishnavi Vihar,
Bilaspur, Chhattisgarh.
E-mail: shwetakujur08@gmail.com
DOI: 10.18410/jebmh/2019/605

Financial or Other Competing Interests: None.

How to Cite This Article:

Submission 21-10-2019,
Peer Review 24-10-2019,
Acceptance 31-10-2019,
Published 07-11-2019.
BACKGROUND

Postoperative pain has been considered to be the leading cause of morbidity and prolonged hospitalization in operative patients. Deep vein thrombosis results from prolonged immobilization, pulmonary complications like basal lung atelectasis and collapse results from limited lung expansion after abdominal incision. Pain relief in postoperative care unit is always challenging for the treating doctor whose aim is awake, painless, haemodynamically stable patient. Systemic administration of analgesics like NSAIDS and opioids are associated with unwanted side effects. Regional techniques like local wound infiltration and epidural catheters are good options for analgesic administration for postoperative pain relief. They have limited use in patients with coagulopathy, cardiac disease, unable to give proper position for performance of block, infection at injection site, and higher cost. Local infiltration of local anaesthetic at incision site is also recommended by some authors but its duration is limited.

Transversus abdominis plane block is a novel block to relieve postoperative pain and discomfort after abdominal surgery. The lateral abdominal wall consists of three muscles, the External oblique, the Internal oblique and the Transversus abdominis and their fascial sheaths. Nerves supplying anterior abdominal wall derived from T6-T11, course through the neurofascial plane between the Internal oblique and the Transversus abdominis muscle. TAP block is applied by injecting local anaesthetic drug in a plane between internal oblique and transversus abdominis muscle, either blindly or with ultrasound guidance. The duration of block is limited to the duration of action of local anaesthetic, this can be prolonged by continuous infusion techniques and additives. Recently many adjuvant drugs have been used to prolong the effect of local anaesthetics. Dexamethasone, Clonidine, Fentanyl, Morphine are commonly used adjuvants, but they were less efficacious and had unwanted side effects. Dexametomidine is a highly selective α₂ adrenergic agonist with analgesic and sedative properties. It is safe and has less bradycardia and hypotension than Clonidine. Its addition to local anaesthetic prolongs the duration of block in neuraxial and peripheral blocks and provides haemodynamic stability as well. This double-blind randomized study was planned to study the efficacy and duration of postoperative pain relief after addition of dexametomidine to bupivacaine in TAP block in inguinal hernia repair patients.

METHODS

This study was planned after taking approval from institutional ethics committee and proper written informed consent from the patients. Patients aging 18 to 50 years, ASA status I & II undergoing inguinal hernia repair surgery were selected for the study. Demographic profile was comparable in both the groups. Patients with history of cardiac disease, respiratory compromise, hepatic and renal disease, coagulation disorders, allergy to study drug, psychological disorders and uncooperative patients were excluded from the study. Thorough preanaesthetic checkup was done and Numerical rating scale for pain assessment was explained, which requires the patient to rate their pain on a defined scale. It is a 11 point scale ranging from 0-10 where 0 is no pain at all and 10 is worst pain imaginable.

Non-invasive blood pressure, electrocardiogram, heart rate, oxygen saturation, was monitored. Spinal anaesthesia was given under aseptic precautions in L3-L4 space with 25 G Quinke needle, 3 ml of bupivacaine Heavy was injected intrathecally. Sensory and motor blockade was assessed by pinprick method and modified Bromage scale. TAP block was given after completion of surgery. Randomization to study groups was done by coded, sealed and opaque envelopes with computer generated allocation number. Resident who was not involved in the study made the drug mixtures according to allocated envelopes. The single injection ultrasound guided TAP block was performed after completion of surgery with 18 G epidural Touhy needle using high frequency linear probe of 5-13 MHz. With patient in supine position, ultrasound probe was placed in mid axillary line in a transverse plane between costal margin and iliac crest. 18 G epidural needle was inserted in plane and advanced till it reached plane between internal oblique and transversus abdominis muscles, on reaching this plane 2ml of previously prepared drug solution was injected in TAP space after negative aspiration, whole amount of drug was injected after seeing the elliptical expansion of the space. Group B patients were given TAP block using 22 ml drug mixture, consisting of 0.25% bupivacaine 20 ml + 0.9% Normal saline 2ml whereas Group D patients were given TAP block using 22 ml drug mixture, consisting of 0.25% bupivacaine 20 ml + dexmedetomidine 0.5 µgm/Kg 2ml. Patients were transferred to Post anaesthesia care unit, inj. Ondansetron 4 mg was given on complaint of nausea vomiting. Both the anaesthesiologist and resident, in postoperative unit were unaware of composition of the drug given in TAP block. Patient were evaluated for NPRS score at 1, 2, 4, 8, 12, 24 and 48 hours postoperatively. Time to request for first analgesic (Diclofenac 75mg) dose, total analgesic consumption, occurrence of side effects like shivering, nausea & vomiting were recorded along with haemodynamic monitoring.

Statistical Analysis

The minimum sample size for this study was obtained by the formula

\[ n = \frac{Z^2 \times p \times (1-p)}{\varepsilon^2} \]

Where \( P = \) prevalence rate =assumed 50%,
\( L = \) Allowable error=20%, Power of test =80%),
\( Z = \) standard normal variate=1.96 at 95% confidence interval.
We get 30 samples in each Group. The data was entered in Microsoft Excel 2000. The data was analysed by SPSS (statistical package for social science) 21.0 version. Then we calculated Mean, Standard Deviation, SE standard error of mean for each Group. The difference between groups were found by using independent sample 't' test for all respective variables. The graphs were made of all mean values of respective variables in both the groups. The frequency table is also made for each group w.r.t. All characteristics.

**RESULTS**

Demographic data and operative characteristics were comparable in both the groups (Table 1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group B</th>
<th>Group D</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>34.6 ± 8.47</td>
<td>37.5 ± 6.42</td>
<td></td>
</tr>
<tr>
<td>Weight(Kgs)</td>
<td>68.4 ± 9.90</td>
<td>65.33 ± 6.82</td>
<td></td>
</tr>
<tr>
<td>Height (cms)</td>
<td>166.8 ± 18.24</td>
<td>163.43 ± 4.21</td>
<td></td>
</tr>
<tr>
<td>Duration of Surgery (mins)</td>
<td>77.3 ± 7.73</td>
<td>77.1 ± 9.4</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1**

Patients were asked to rate their pain on 11-point scale (NRS) ranging from No pain to worst possible pain in post-anaesthesia care unit. It was found that NRS scores were significantly lower in patients who received TAP block with dexmedetomidine i. e. Group D as compared to Group B (Table 2).

<table>
<thead>
<tr>
<th>NRS (Post-Operatively)</th>
<th>Group B</th>
<th>Group D</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hour</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2 Hours</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4 Hours</td>
<td>4.6 ± 0.89</td>
<td>1.3 ± 0.46</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>8 Hours</td>
<td>5.33 ± 0.71</td>
<td>2.66 ± 0.50</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>12 Hours</td>
<td>4.93 ± 0.64</td>
<td>3.2 ± 0.50</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>24 Hours</td>
<td>2.9 ± 0.66</td>
<td>2.66 ± 0.46</td>
<td>0.12</td>
</tr>
<tr>
<td>48 hours</td>
<td>2.2 ± 0.66</td>
<td>1.96 ± 0.61</td>
<td>0.16</td>
</tr>
</tbody>
</table>

**Table 2**

Inj. Diclofenac 75 mg was given when patient complained of pain and NRS score was 3 or more. Time to request for first analgesic dose was recorded and compared along with total analgesic consumption. Patients in Group D had longer pain free interval as compared to Group B. Inj. Diclofenac Requirement was also significantly less in Group D patients (Table 3).

**DISCUSSION**

Postoperative pain secondary to abdominal surgeries is the cause of agony, apprehension and discomfort for the patient. Severe postoperative abdominal pain leads to pulmonary complications such as basal pneumonitis, collapse due to poor respiratory efforts. Stress related hypertension and tachycardia are also very common. Various systemic analgesics are available, but they are associated with certain side effects too. The common side effects are pruritis, constipation, nausea vomiting, and retention of urine. Regional analgesic techniques like continuous spinal catheter and epidural catheters are effective analgesic techniques. These are free from systemic side effects. With training and expertise these techniques are very helpful in relieving pain. In certain patients having coagulopathy, poor cardiac or respiratory reserve, these techniques are of limited use. Great difficulty is encountered in obese patients while giving Epidural. In view of above mentioned limitations Transversus abdominis plane block is emerged as safe and effective Technique. In this technique local anaesthetic drug is injected in the plane between Internal oblique and Transversus abdominis muscle. As compared to blind technique Ultrasound guided TAP block is better in success rate and safety. Ultrasound guided TAP block produces good pain relief and reduces intraoperative and postoperative opioid requirement. TAP block duration is limited to the effect of administered local anesthetics, so to prolong the duration of block adjuvants are added, and dexmedetomidine is a good choice. Dexmedetomidine is a highly selective alpha 2 adrenergic receptor agonist, ten times more selective than clonidine. It produces dose dependent anxiolysis, sedation and analgesia without respiratory depression. These all makes it versatile in ICU as well as anaesthesia practices in Operation Theatre. Dexmedetomidine enhances anaesthesia produced by local anaesthetic drugs, causes perioperative sympathetic and decreases blood pressure by simulating central alpha 2 and imidazoline receptors, It is the s-enantiomer of medetomidine. It causes vasoconstriction which helps in prolonging the effect of local anaesthetic. Its highly lipophilic nature allows rapid absorption in cerebrospinal fluid and binding to alpha 2 receptor of spinal cord. It

![Figure 1. Mean of All Characteristics in Both the Groups B & D](image-url)
prolongs duration of both sensory and motor blockade induced by local anaesthetics irrespective of route of administration. It has widespread applications in vitreoretinal surgeries as well as in dentistry.\textsuperscript{12} Addition of dexmedetomidine to bupivacaine for peripheral blocks shortens onset of block and prolongs the duration and reduces postoperative analgesic requirements.\textsuperscript{13,14} In one study, by VennRM et al. the postoperative analgesic requirements were reduced by 50% and need for rescue midazolam sedation was diminished by 80% in cardiac patients.\textsuperscript{15} In present study, 30 patients were given TAP block with bupivacaine 0.25% 20 ml (Group B) and 30 patients were given TAP block with bupivacaine 0.25% 20 ml + inj. dexmedetomidine 0.5-1 µg/Kg (Group D). Postoperative analgesia was compared by Numeric rating scale for pain. Pain was recorded on 1, 2, 4, 8, 12, 24, 48 hours interval from application of block. NRS scores were less, indicating better postoperative pain relief in group D as compared to group B. NRS scores at 4, 8, & 12 hours were significantly low in group D. Time elapsed between application of TAP block and request for first analgesic dose were compared along with total duration of analgesia and total analgesic consumption. Group D patients had significantly prolonged analgesia with significantly less Inj. Diclofenac consumption. Patients in both the groups were haemodynamically stable with minimal side effects.

CONCLUSIONS

Addition of dexmedetomidine to bupivacaine in TAP block results in prolonged and effective postoperative analgesia. It reduces postoperative analgesic requirements and prevents its related complications. It can be safely used in patients with poor pulmonary and cardiac reserve.\textsuperscript{16} TAP block with dexmedetomidine has emerged as safe and effective technique for postoperative pain management in patients of inguinal hernia repair.

REFERENCES