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Research Article

COMPARE THE ANALGESIC EFFICACY OF 0.25% BUPIVACAINE AND 0.25% BUPIVACAINE WITH 0.9 μG/KG DEXMEDETOMIDINE IN TAP BLOCK

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ABSTRACT

Objectives: The transversus abdominis plane (TAP) block is a relatively new regional anesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall. Despite a relatively low risk of complications and a high success rate using modern techniques, TAP blocks remain overwhelmingly underutilized. The objective is to compare the analgesic efficacy of 0.25% bupivacaine and 0.25% bupivacaine with 0.9 μg/kg dexmedetomidine in TAP block as a part of a multimodal analgesia regimen for post-cesarean delivery pain management.

Methods: Patients more than 18 years old posted for elective/emergency caesarean section in ABVGMC, Vidisha, Madhya Pradesh. After approval from the institutional ethical committee and written informed patients consent, 20 each pregnant women were included in the both study group. Group A: TAP block with 0.25% bupivacaine 20 mL each side Group B: TAP block with 0.25% bupivacaine with 0.9 μg/kg dexmedetomidine 20 mL each side. We studied TAP block in patients posted for elective caesarean section.

Results: The women received 0.25% bupivacaine or 0.25% bupivacaine with 0.9 μg/kg dexmedetomidine. The median visual analogue scale (VAS) for pain was significantly higher in the bupivacaine Group A at 12 h with compare to Group B. Overall, there was no difference in VAS score at 0.5, 2, 4, 6, and 24 h demands between the two groups. The mean time to first rescue analgesia in Group A was 14.6±5.5 h and in Group B was 16.8±4.2 h.

Conclusion: We conclude that the using dexmedetomidine as an additive to bupivacaine in ultrasound-guided TAP block for elective/emergency caesarean section provides prolonged duration of post-operative analgesia, and lowered VAS pain scores. The addition of dexmedetomidine to bupivacaine also reduced the total dose of opioid requirement in the first 24 h after caesarean section.

Keywords: Bupivacaine, Dexmedetomidine, Transversus abdominis plane block, Visual analogue scale.

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INTRODUCTION

The transversus abdominis plane (TAP) block is a regional anesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall [1]. First described just a decade ago, it has undergone several modifications, which have highlighted its potential utility for an increasing array of surgical procedures [2]. Despite a relatively low risk of complications and a high success rate using modern techniques, TAP blocks remain overwhelmingly underutilized [3]. TAP block has been described as an effective technique to reduce post-operative pain after cesarean section. Cesarean section is the most common obstetric surgical procedure performed and it is associated with moderate to severe pain which may last up till 48 h, so adequate post-operative pain control is important to reduce morbidity in these patients [4]. Inadequate pain relief after caesarean delivery can negatively impact ambulation, breast feeding, and even maternal bonding [5]. TAP block has been studied in last decade but some researchers have mentioned that there may be an inadequate pain relief specifically of the skin incision extends beyond the dermatome supplied by the peripheral nerve. Hence, we would like to conduct this study to compare the analgesic efficacy of 0.25% bupivacaine and 0.25% bupivacaine with 0.9 μg/kg dexmedetomidine in TAP block as a part of a multimodal analgesia regimen for post-cesarean delivery pain management.

Objectives

To compare the analgesic efficacy of 0.25% bupivacaine and 0.25% bupivacaine with 0.9 μg/kg dexmedetomidine in TAP block as a part of a multimodal analgesia regimen for post-cesarean delivery pain management.

METHODS

A comparative study was done after getting approval from the Institutional Ethics Committee among parturient more than 18 years old posted for elective cesarean section in Atal Bihari Vajpayee Government Medical College, Vidisha. Written informed consent was obtained from all 40 study participants presenting for elective cesarean section.

Inclusion criteria

1. Pregnant women undergoing elective caesarean section under spinal anesthesia more than 18 years old
2. American Society of Anesthesiologists Grade I and II.

Exclusion criteria

1. Patient's refusal
2. Allergy to opioids, amide group of local anesthetic, α2-adrenergic receptor agonist, and non-steroidal anti-inflammatory drugs
3. Coagulation derangement or bleeding disorders
4. Infection at the site of block
5. Patients with cardiovascular, pulmonary, or neurological diseases
6. Patients converted to general anesthesia after giving sub-arachnoid block
7. Surgical duration extended more than 2 h or any complication during surgery.

Sampling procedure

The patients were allocated to one of the two groups according to patients consent and then, they were grouped into A or B

In Group A: TAP block with 0.25% bupivacaine 20 mL each side

In Group B: TAP block with 0.25% bupivacaine with 0.9 μg/kg dexmedetomidine 20 mL each side.

Operational definitions
Pain is defined in the study if visual analogue scale (VAS) score of patients is ≥4.

VAS
VAS is a most common method for measuring pain and pain relief in clinical practice.

- 1–2=No pain
- 3–4=Mild pain,
- 5–6=Moderate pain,
- 7–8=Severe pain
- 9–10=Intolerable pain.

Sample size
40 patients.

Study participants above 18 years of age, who were admitted for safe confinements were included for the study. Department of anesthesiology, intensive care, and pain management in similar setup taken the sample size of 20 in each group of similar study so we are also taking 20 sample size in each group of our study [6].

Laboratory specimen collection, transport and analysis
The patients were allocated to one of the two groups according to a patients will. The study technique used to be given to the anesthesiologist at the starting of surgery. Another anesthesiologist was involved in patient's data collection.

Intraoperative
All patients received subarachnoid block by 25 G Quincke's needle at L 3–4/L 4–5 inter vertebral space with a volume of 2 mL in the same syringe using a standard midline approach. Both groups received 10 mg of 0.5% of hyperbaric bupivacaine (2 mL). Supplemental oxygen was delivered by face mask at 6 L/min throughout surgery and during their stay in the post-anesthetic care unit. Monitoring was done of all patients using the following:

- Electrocardiogram
- Pulse oximetry
- Non-invasive blood pressure monitoring.

Surgery was allowed to proceed after T6 to T4 sensory blockade to pin prick sensation was been established. Intravenous crystalloids and ephedrine were administered as needed to treat hypotension. All patients received an intravenous infusion of oxytocin 10 IU after delivery.

At end of surgery, under all aseptic precautions, ultrasonography (USG)-guided TAP block was given with 22 G hypodermic needle attached to a 20 mL syringe containing the drug as per the group allocation. Then, the drug was deposited in the fascial plane after aspiration, check aspiration was done every 5 mL to rule out intravascular injection. The patient was observed for 15 min and then shifted to post-anesthesia care unit.

In Group A 20 mL of 0.25% of bupivacaine injected on either side (total 40 mL) and in Group B 20 mL of 0.25% bupivacaine with 0.5 μg/kg dexmedetomidine injected on either side (total 40 mL) for the TAP block.

Routine nil per oral guidelines were followed. Any sedative or analgesic medications other than that used in the study were avoided in the 24 h before and after the cesarean section. Patients who satisfied the inclusion criteria were allotted to either group by the sealed envelope technique. Preoperatively, the patient's blood pressure, heart rate, and oxygen saturation were recorded. All patients were preloaded with 10 mL/kg of crystalloids.

Table 1: Sociodemographic characteristics of both groups mean (SD)

Characteristics	Group A (n=20) mean±SD	Group B (n=20) mean±SD
Age (year)	25±3.6	27±4.5
Height (cm)	158±5.6	156±5.2
Weight (kg)	58.2±5.6	59.95±4.8
Time of 1st rescue analgesia (hours)	14.6±5.5	16.8±4.2

SD: Standard deviation, n: Number of patients, cm: Centimeter, kg: Kilograms

Table 2: Visual analogue scale score of both groups

Time in hours	Mean VAS in Group A	Mean VAS in Group B	Significance (p)
0.5	0.602	0.259	0.894, NS
2	2.375	2.352	0.613, NS
4	2.954	2.512	0.705, NS
6	3.525	2.252	0.815, NS
12	5.142	1.820	0.0041, (p<0.05)
24	5.285	4.987	0.712, NS

VAS: Visual analogue scale, NS: Non significant

Table 3: p-value of median VAS scores

VAS scores	Group A	Group B	p-value
>Median	18	13	0.05833 significant
≤Median	2	7	

VAS: Visual analogue scale

At the completion of the TAP block, sterile dressing was applied to the needle prick site and patient blood pressure, heart rate and VAS were recorded. Average duration of the surgery was between 1 and 1.5 h. None of the patients in either group had any complications intraoperatively. Patient was then transferred to the recovery room, and baseline vital parameters were recorded. A trained doctor who was unaware of the drug injected was monitoring the vital parameters and recorded VAS score and related side effects in all patients. Doctor was instructed to monitor the blood pressure, heart rate, SpO_2, VAS score at rest, and any side-effect. Doctor was advised to give injection ephedrine 6 mg intravenous stat if the systolic blood pressure <90 mmHg, injection atropine 0.6 mg intravenous when the heart rate was <45/min stat and then inform the concerned anesthetist immediately. When the patient had a sedation score of C3, supplement oxygen through face mask at 6 L/min and alert the anesthesiologist.

Rescue analgesia was provided with 50 mg of intravenous tramadol if VAS ≥4 and additional doses of 50 mg every 6 h thereafter to maintain VAS <3 or was precluded by adverse effects such as nausea and vomiting, respiratory depression, or occurrence of deep sedation. In the first 24 h postoperatively, mean arterial pressure, heart rate, sedation score (RS), any side-effect was monitored and VAS score recorded on 0.5, 2, 4, 6, 12, and 24-h postoperatively by a trained doctor who was unaware of the group to which the patient belonged. The time following the TAP block when rescue analgesia was first given, as dose of tramadol required in the first 24-h postoperatively, and its adverse effects such as pruritus, nausea, and vomiting were recorded. VAS (where 0=No pain and 10=Worst imaginable pain) was used to assess post-operative pain during rest.

Post-operative
The presence and severity of pain, nausea, vomiting, and any other side effects were assessed for all patients in both groups. These assessments

were performed in the post-operative ward for 30 min and at 2-, 4-, 6-, 12-, 24-h postoperatively. Rescue analgesia was given for VAS ≥4 with intravascular tramadol 2 mg/kg.

Statistical analysis

The data were entered in MS excel spreadsheet 2007 and analysis was done using Statistical Package for the Social Sciences version 24.0. The quantitative data were expressed in terms of mean±SD, median, inter-quartile range. The qualitative variables were summarized through frequencies and percentages. Quantitative variables (time to first rescue analgesia, nps, total numbers of first rescue analgesic, number of patients requiring second rescue analgesia) between two groups was compared using independent "t" test. Qualitative data (complications) tested with help of Chi-square and Fisher's exact. The primary outcome was to calculate the time at which the first dose of rescue analgesia was required. Total dose of rescue analgesia used was calculated as the secondary outcome. $p<0.05$ was considered as statistically significant.

RESULTS

Above Table 1 shows the mean time to first rescue analgesia in Group A was 14.6±5.5 h and in Group B was 16.8±4.2 h. Mean age in Group A was 25±3.6 years and in Group B was 27±4.5 years. Mean height in Group A was 158±5.6 cm and in Group B was 156±5.2 and Mean weight of Group A was 58.2±5.6 kg and in Group B was 59.95±4.8 kg.

Above Table 2 shows that the difference between the pain scores of the two groups was found to be statistically significant at 12 h whereas the pain score of both the groups where insignificant at 0.5, 2, 4, 6, and 24 h. The difference between the pain scores of the two groups was found to be statistically significant at 12 h whereas the pain score of both the groups where insignificant at 0.5, 2, 4, 6, and 24 h.

Above Table 3 shows that VAS scores of Group A significant with Group B. Both the groups were comparable in reference to age, height, and weight. Median VAS score is calculated and found that 18 out of 20 in Group A is above median whereas 13 out of 20 in Group B where above median. The Chi-square statistic of median VAS score revels p=0.05833 which is significant.

DISCUSSION

With the growing focus on labor analgesia in modern anesthesia practice, post-operative pain associated with caesarean section is underestimated. Various techniques have been compared for postoperative analgesia in cesarean section in the past. The benefit of adequate post-operative analgesia is to reduce post-operative stress response, which in turn reduces post-operative morbidity and improve surgical outcome. Effective pain control also facilitates rehabilitation and fastens recovery from surgery. TAP blocks have been described as an effective component of multimodal post-operative analgesia for a wide variety of abdominal procedures:

- Large bowel resection
- Cesarean section
- Laparoscopic appendectomy/cholecystectomy
- Total abdominal hysterectomy
- Open prostatectomy [7]
- Abdominoplasty with/without flank liposuction.

Using local anesthetic agents in TAP block is a simple and effective analgesic technique, appropriate for surgical procedures where parietal pain is significant component of postoperative pain. In the our study, we found that the VAS scores at rest were significantly lower in Group B compared to Groups A at 12 h. TAP block with dexmedetomidine had lower VAS pain scores at rest at 12 h postoperatively, compared with group B.

No patient in either group required supplemental analgesia during surgery and this is reflected in the lower VAS scores for intraoperative pain due to spinal anesthesia. With the use of the right lateral position for induction of spinal anesthesia [8,9], and the dose of bupivacaine used (10 mg), anesthesia to touch to at least the T4 dermatome is generally achieved thus ensuring a pain free cesarean section during surgery [10]. In study conducted by Rafi in 2001 on TAP block, it has been used for pain relief following lower abdominal surgeries. USG guidance has increased the success rate of TAP block. Several studies done by Lee *et al*. [11] and Onishi *et al*. [12] have concluded that TAP block is superior or comparable to neuraxial opioids for the management of post-operative pain following caesarean sections. This reduces the need for opioids and hence their side effects in the post-operative period. Mishriky *et al*. [13] have done a meta-analysis of randomized controlled trials on TAP block for pain relief after cesarean section and concluded that TAP block produces pain relief comparable to intrathecal morphine without the side effects of morphine. Meta-analysis done by Yu *et al*. [14] has proved the superiority of TAP block over local wound infiltration for pain relief following lower abdominal surgeries. This supports Jankovic's [15] idea of calling TAP block, the holy grail of anesthesia for lower abdomen. As we find similar results in over study, there is decrease need of tramadol as rescue analgesia.

Almarakbi and Kaki [16] study has concluded that the addition of dexmedetomidine to local anesthetics in TAP block provided prolong pain relief than local anesthetics alone following abdominal hysterectomies. Tan *et al*. [17] performed USG-guided TAP block in patient undergoing cesarean section and concluded that TAP block not only reduced the opioid consumption but also improved patient satisfaction. A meta-analysis by Abdallah *et al*. [18] compared two different approaches (posterior versus the lateral) for performing the TAP block and concluded that the posterior approach is superior to the lateral approach. Under USG guidance, we can directly visualize the spread of the drug in the neurovascular plane. Similar to our finding, many investigators reported that the addition of dexmedetomidine to different types of local anesthetic agents in various peripheral nerve blocks resulted in prolongation and improved analgesic effect [19-23]. Furthermore, USG-guided blocks reduce the dose of local anesthetic used in various peripheral nerve blocks due to the injection of the drug in close proximity to the nerves [24].

TAP block had a significant effect in the control of post-operative pain following cesarean section. It reduced the opioid requirement in both the study and control groups. It shows that the addition of dexmedetomidine in Group B to local anesthetics further reduced the need of opioids as rescue analgesia. It also significantly prolonged the duration of time at which the first dose of opioid was given, in our study, the mean time to first rescue analgesia in Group A was 14.6±5.5 h and in Group B was 16.8±4.2 h. Our study further emphasizes that the addition of dexmedetomidine to local anesthetics in TAP block decreases the tramadol requirement and prolongs the duration of time for the first dose of rescue analgesia with opioids. Three patients in the dexmedetomidine group had bradycardia in the recovery ward following TAP block administration and were given injection atropine 0.6 mg for treatment. No other side effects were noted.

The limitation of this study is plasma levels of dexmedetomidine that was not monitored. Furthermore, the time of onset of TAP block and the duration of sensory effect of the subarachnoid block could not be clearly differentiated. The sample size of our study is too small to generalize the results.

CONCLUSION

Our study concludes that using dexmedetomidine as an additive to bupivacaine in ultrasound-guided TAP block after elective or emergency cesarean section: Prolonged duration of post-operative analgesia, lowered VAS pain scores, and reduces opioid requirements. The analgesic efficacy by using of dexmedetomidine as an adjunct mixed with local anesthetics for TAP block as multimodal post-operative analgesia might be an option to facilitate post-operative early ambulation.

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CONFLICTS OF INTEREST

None of the authors have any conflicts of interest to declare.

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