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Original Research Article

Comparison of analgesic efficacy of 0.25% bupivacaine vs 0.25% bupivacaine with dexmedetomidine in transversus abdominis plane block for postoperative caesarean section

[1]Dr. Prashanthi S, [2]Dr. SK Srinivasan, [3]Dr. Subbulakshmi S

[1]Post Graduate, Department of Anaesthesiology, Government Medical College and Hospital, Cuddalore, Erstwhile Rajah Muthiah Medical College and Hospital, Chidambaram, Tamil Nadu, India

[2]Professor and Head, Department of Anaesthesiology, Government Medical College and Hospital, Cuddalore, Erstwhile Rajah Muthiah Medical College and Hospital, Chidambaram, Tamil Nadu, India

[3]Associate Professor, Department of Anaesthesiology, Government Medical College and Hospital, Cuddalore, Erstwhile Rajah Muthiah Medical College and Hospital, Chidambaram, Tamil Nadu, India

Corresponding Author:

Dr. Prashanthi S (pressysomu@gmail.com)

Abstract

Aim: The aim of the study is to compare post-operative analgesic efficacy of 0.25% bupivacaine vs 0.25% bupivacaine with dexmedetomidine in transversus abdominis plane block for postoperative caesarean section.

Methodology: Prospective randomized double blinded experimental study was conducted among 60 patients posted for elective caesarean section surgery and were divided into two equal groups. Group B patients received 20ml of 0.25% Bupivacaine and Group BD patients received 20ml of 0.25% Bupivacaine with 50 mcg Dexmedetomidine. Visual Analogue Score was used to determine the pain at rest during postoperative period. The time of requirement of rescue analgesia during postoperative period was also assessed.

Results: The demographic variables such as age and sex were comparable between the two groups. VAS at rest was significantly reduced in group BD (p<0.05). Duration of analgesia was significantly prolonged in group BD when compared to group B with significant P value <0.05. Rescue analgesic consumption in 24 hours during postoperative period was significantly decreased in group BD (p<0.05). Intraoperatively the heart rate, systolic and diastolic bp was comparable between both the groups. Postoperatively there was a significant fall in heart rate systolic and diastolic bp in the group BD when compared to group B with a P value <0.05.

Conclusion: In this study we observed that Dexmedetomidine, in combination with bupivacaine when given for TAP block provided excellent postoperative analgesia, extending upto more than 12 hours. Dexmedetomidine seems to decrease postoperative analgesic consumption and improve pain scores.

Keywords: TAP block, bupivacaine, dexmedetomidine, caesarean section

Introduction

Adequate post-operative analgesia after caesarean section (CS) is vital as it impacts the distinct surgical recovery requirements of the parturient. Newer analgesic modalities and drugs for post-caesarean analgesia have been introduced over the recent years which includes opioids, transversus abdominis plane (TAP) block, wound infiltration/infusion, ketamine, gabapentin and ilioinguinal-iliohypogastric nerve block (II-IH NB) for post-caesarean analgesia. Administration of opioids still remains the gold standard for post-operative

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analgesia, but the associated troublesome side effects have led to the mandatory incorporation of non-opioid analgesics in post-CS analgesia regime. Among the non-opioid techniques, TAP block is the most investigated modality of the last decade. TAP block is the technique involving the injection of local anaesthetic in the plane between the internal oblique and the transversus abdominis plane muscle blocking the neural afferents from T6 to L1 [1]. It is usually a preferred method as postoperative analgesia for the surgeries involving the anterolateral abdominal wall Bupivacaine is the most common local anaesthetic used for regional block. Although it has a considerable duration of action, it is not long enough to provide postoperative analgesia for more than 4-6 hours, when given alone. Dexmedetomidine, an alpha2 agonist is frequently used as an adjuvant with local anesthetic in central or peripheral neural blockade. It produce intensification and foremost prolongation of sensory blockade by hyperpolarization of unmyelinated C fibers (sensory) and to a lesser extent the A fibbers (motor).

Methodology

A Prospective randomized double blinded experimental study was conducted from 60 patients undergoing elective and emergency caesarean section in Department of Anesthesiology, Rajah Muthiah Medical College, Chidambaram from October 2019 to October 2022.

Inclusion criteria

1. **Age:** 21-40 years.
2. BMI between 18.5-34.9 kg/m2.
3. All ASA I & II patients posted for elective caesarean section.

Exclusion criteria

1. ASA >III.
2. BMI >35.
3. Coagulation abnormalities.
4. Local infection.
5. Patient refusal.
6. Patients allergic to any of study medications.

After approval from institutional human ethical committee, the study was conducted after obtaining informed written consent from all patients. Patients will be randomly assigned into two groups of 30 each using sealed envelope method B group and BD group.

These groups will receive

Group B patients: Ultrasound guided bilateral TAP block with 20ml of 0.25% bupivacaine.

Group BD patients: Ultrasound guided bilateral TAP block with 20ml of 0.25% bupivacaine with 50microgram of dexmedetomidine.

Data collection: Information on Age, Gender, History, Comorbidities, duration of analgesia and VAS score were extracted from proforma collected by anaesthetist who is not involved in the study.

After establishing intravenous access and placing standard monitoring (ECG, NIBP and pulse oximeter), baseline vitals (heart rate, respiratory rate, spo2, BP) were recorded prior to anaesthesia. Under sterile precautions spinal anaesthesia is given to both the groups with 10 mg of 0.5% hyperbaric bupivacaine at the beginning of surgery. At the end of the Caesarean section, the operative wound was covered with a sterile pad. TAP block was performed under strict aseptic precautions after cleaning the site of injection with antiseptic solution. Bilateral TAP block was performed under ultrasound guidance with Sonosite S II machine using high-frequency probe (6-13Hz) and in-plane technique of needle insertion. The probe was placed

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in midline between subcostal margin and iliac crest in the midaxillary line and its position adjusted until the three layers of the muscles (external oblique, internal oblique and the transversus abdominis) were clearly visible. 21G spinal needle with 100-cm extension tube was used to inject the drug. Saline was injected under ultrasound guidance to confirm the correct placement of the needle in the neurovascular plane between the internal oblique and the transversus abdominis plane muscle. After confirmation of the needle, drug was given to the patients as mentioned above.

Duration of analgesia is monitored from '0' hour with time of performing TAP block for both the groups. Patients with failed spinal and failed blocks are excluded from study. The anesthesiologist who performed the block was different from the person who assessed the post-operative pain and both were blinded to the study group. Patients are also blinded. Patients were monitored for vitals both intraoperatively till end of surgery and at regular intervals post operatively for 24 hours.

Parameters monitored

Duration of postoperative analgesia.

Duration of analgesia was measured from time of performing TAP block till visual analog scale score>4.

Postoperative pain was assessed using Visual Analog scale (VAS).

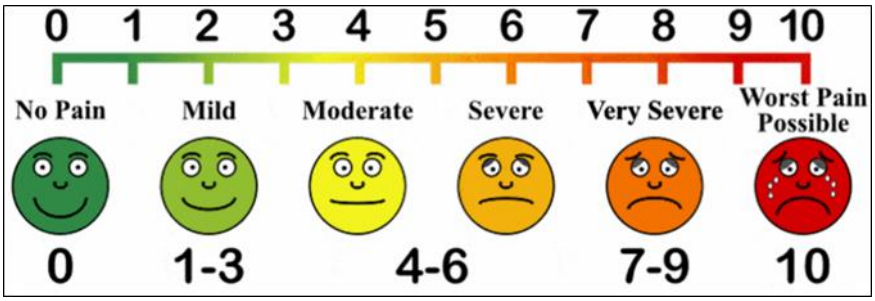

Fig 1: Vas Scale-0-No Pain, 10-Very Severe Pain

Total amount of analgesic requirements for 24 hours.

Heart rate and SPO_2.

Blood pressure.

Respiratory rate.

Side effects

a) Sedation level was assessed using Modified Wilson Sedation Scale:
   1-oriented 2-drowsy 3-arousable 4-not arousable.
b) Respiratory depression noted if respiratory rate<10/min.
c) Postoperative nausea and vomiting, pruritus was recorded if present and treated.

Statistical analysis: The data collected were entered into Microsoft excel 360 in order to create a master chart. The master chart was then loaded into statistical package for social sciences (SPSS) version 26 for further statistical analysis. Both quantitative and qualitative variables were present in the master chart. Both descriptive and inferential statistics were used for analysis. For describing the qualitative variables, frequency and percentages were used. For describing the quantitative data, mean and standard deviation were used. In order to find out difference in distribution of qualitative variable between the experimental arms, chi-square test was applied. To find out the difference in mean between two groups, independent samples T test was applied. To find out the difference in change of mean between the groups for a repeatedly measured variables, Repeated measures analysis of variance (RM-ANOVA) was used. A P value of less than 0.05 was considered to be statistically significant.

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Results

Both the groups were found to be comparable with respect to the distribution of participants based on age, BMI and duration of surgery with P value of more than 0.05 and there was no statistical significant difference (Table1). At the baseline both the groups were found to have statistically similar pulse rate. Over the period of observation at 30mins, 45mins, 1 hour, 4 hours, 8 hours and 12 hours, the mean pulse rate was found to be significantly less in the 0.25% bupivacaine and dexmedetomidine group than the group that had received both 0.25% bupivacaine with a significant P value <0.05 (fig2). Similarly, the mean systolic and diastolic blood pressure (Table 2 and Table 3) was found to be significantly less in the 0.25% bupivacaine and dexmedetomidine group than the group that had received 0.25% bupivacaine with a significant P value <0.05

Table 1: Distribution of subjects according to Age, BMI and Duration of surgery

Variables	Group BD (mean)	Group B (mean)	P Value
BMI (kg/m2)	28.26	26.69	0.054
Age (yrs)	28.03	27.53	0.724
Duration of surgery (minutes)	99	98	0.771

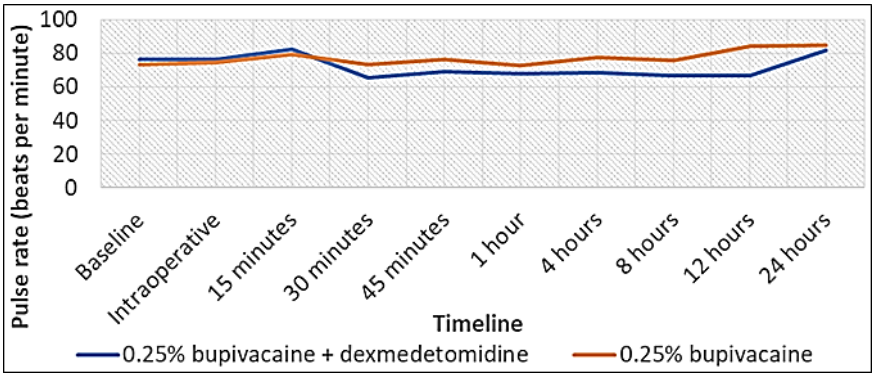

Fig 2: Line diagram showing change in mean pulse rate between the groups

Table 2: Change in mean systolic blood pressure between the experimental groups

Timeline	0.25% bupivacaine + dexmedetomidine		0.25% bupivacaine		P value	
	Mean	SD	Mean	SD	Within	Between
Baseline	131.47	12.87	132.50	14.46	0.001	0.001
Intraoperative	125.13	10.96	124.40	11.58		
15 minutes	113.73	8.69	125.57	12.47		
30 minutes	95.47	9.75	124.17	14.09		
45 minutes	101.73	8.20	125.13	12.77		
1 hour	98	6.12	127.27	11.45		
4 hours	101.87	7.49	126.73	10.64		
8 hours	115.47	8.69	129.33	9.84		
12 hours	126.47	10.78	125.87	7.01		
24 hours	124.93	10.93	129.47	6.86		

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Table 3: Change in mean diastolic blood pressure between the experimental groups

Timeline	0.25% bupivacaine + dexmedetomidine		0.25% bupivacaine		P value	
	Mean	SD	Mean	SD	Within	Between
Baseline	80.80	7.81	70.73	8.61	0.001	0.001
Intraoperative	77.13	5.32	76.80	6.04		
15 minutes	71.80	7.72	74.93	7.46		
30 minutes	62.47	5.91	75.07	6.47		
45 minutes	65.53	8.79	73.40	7.08		
1 hour	61.50	5.64	77.93	6.48		
4 hours	66.10	7.70	78.47	6.81		
8 hours	75	6.92	78.40	7.34		
12 hours	82.40	8.14	83.73	5.51		
24 hours	79.13	7.38	82.73	6.44		

The VAS score was analysed in both the groups postoperatively from 45 minutes till 24 hours following surgery it was found that subjects in the Group B had a higher VAS score than the subjects in the Group BD (Table 4) with P value of less than 0.05.

Table 4: Distribution of subjects according to VAS score

Timeline	0.25% bupivacaine + dexmedetomidine		0.25% bupivacaine		P value
	Mean	SD	Mean	SD	
45 minutes	0	0	0	0	-
4 hours	0	0	0.23	0.63	0.001
8 hours	0.17	0.53	0.63	0.32	0.001
12 hours	0.73	0.24	2.90	1.02	0.001
24 hours	3.27	1.11	3.93	1.41	0.001

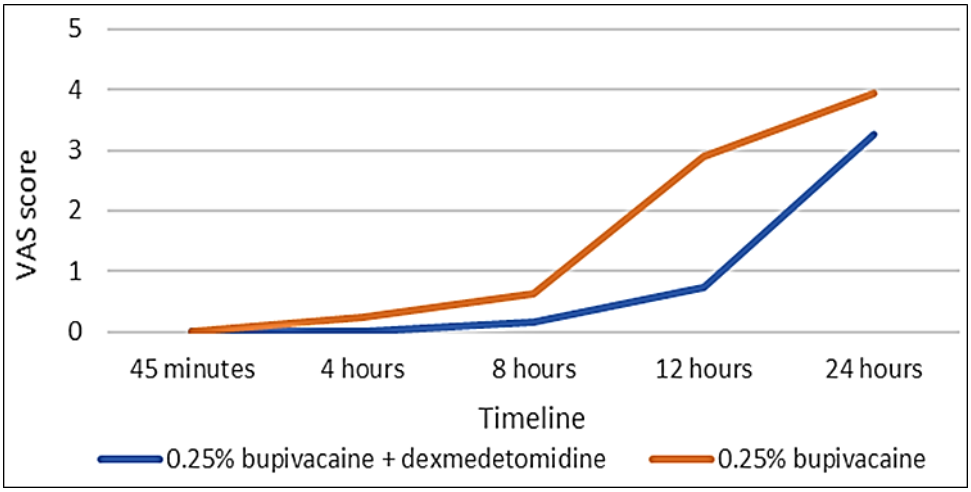

Fig 3: Line diagram showing change in mean VAS score between the groups

The mean duration of analgesia among the participants in the 0.25% bupivacaine and dexmedetomidine group was 12.67 ± 2.61 hours and that of the 0.25% bupivacaine group was 10.08 ± 1.23 hours (Table 5). The mean duration of analgesia was found to be more in the 0.25% bupivacaine and dexmedetomidine group than the 0.25% bupivacaine group and the P value was statistically significant.

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Table 5: Distribution of subjects based on duration of analgesia

Group	Duration of anaesthesia (In hours)		T value	P value
	Mean	SD		
0.25% bupivacaine + dexmedetomidine	12.67	2.61	4.88	0.001
0.25% bupivacaine	10.08	1.23		

The mean paracetamol dose among the participants in the 0.25% bupivacaine and dexmedetomidine group was 1.00 ± 0.64 and that of the 0.25% bupivacaine group was 1.53 ± 0.73 (Table 6). The paracetamol dose was significantly higher among those in the 0.25% bupivacaine group than the participants in 0.25% bupivacaine and dexmedetomidine group.

Table 6: Comparison of mean paracetamol dose between the two experimental groups

Group	Paracetamol dose		T value	P value
	Mean	SD		
0.25% bupivacaine + dexmedetomidine	1	0.64	3.01	0.004
0.25% bupivacaine	1.53	0.73		

Discussion

With the introduction of the TAP block in 2001 by Rafi [2], it has been widely used for pain relief following lower abdominal surgeries [1, 4]. With the advancement of ultrasound technology, TAP blocks become technically easier and safer to perform even in obese patients [3]. Thus, there was a surge of interest in TAP blocks as therapeutic adjuncts for analgesia after abdominal surgeries. In the past decade, there has been growing evidence supporting the effectiveness of TAP blocks for a variety of abdominal surgeries, such as hernia repair, cesarean section, hysterectomy, prostatectomy, cholecystectomy, renal transplant, colectomy [5, 6, 7, 8, 9, 10, 11, 12]. Although its analgesic effect covers only somatic pain with short duration [13], single-shot TAP block plays a valuable role in multimodal analgesia. With continuous infusion [14, 15, 16, 17] or prolonged-release liposomal local anesthetics [18, 19, 20, 21], TAP blocks could overcome the problem of short duration. However, TAP block duration is limited to the action time of administered local anesthesia. In several studies it has been stated that addition of dexmedetomidine to local anesthesia administered to central neuraxial and peripheral block prolonged the local anesthetic action time and reduced anesthetic request [22]. In the current study, we demonstrated that the addition of dexmedetomidine to bupivacaine in TAP block can extend the duration of analgesia, reduce the requirement of postoperative paracetamol and promote the satisfaction of analgesia of the patient. However, addition of dexmedetomidine caused significant fall in heart rate, systolic and diastolic blood pressure in the study group (BD) with a significant P Value of < 0.05. The decrease observed in hemodynamic data was long lasting and the patients did not require any treatment with vasoactive drugs. Almarakbi WA and his colleagues [23] also added dexmedetomidine to bupivacaine in TAP block and found it could prolong the duration of postoperative analgesia; the results were similar to our results. Moreover, Luan [24] compared using ropivacaine alone with using ropivacaine and dexmedetomidine in TAP block and concluded that ropivacaine, when combined with dexmedetomidine, can reduce postoperative sufentanil consumption and provide superior pain management, which is also consistent with our results. The limitation of this study is plasma levels of dexmedetomidine were not monitored. Also, the time at which the TAP block began to work and the time at which the sensory effect of the intrathecal block began to wear off could not be clearly differentiated.

Conclusion

To conclude, this study observed that TAP block when performed with dexmedetomidine as an adjuvant to local anaesthetics provided enhanced duration of analgesia, has decreased the

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VAS score and postoperative analgesic requirement significantly. In our opinion, the TAP block has potential to become an important tool in managing postoperative pain of cesarean delivery as it is easy to perform, is safe and has definite clinical utility.

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