

## DEXMETOMIDINE: A WONDER DRUG FOR TAP BLOCK IN PATIENTS UNDERGOING ELECTIVE CAESAREAN SECTION FOR POSTOPERATIVE PAIN RELIEF

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### ABSTRACT

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#### BACKGROUND

Transversus Abdominis Plane (TAP) Block is a field block which is widely used for post-operative pain relief in patients undergoing lower abdominal surgeries. The rate of lower segment caesarean sections seems to be increasing since the last decade all over the world. The objective of this study was to compare the efficacy of dexmedetomidine for transversus abdominis plane block for post-operative pain relief in elective caesarean section.

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#### MATERIALS AND METHODS

60 ASA grade I and II patients posted for elective caesarean section were included in the study. These patients were divided into two groups. Thirty patients were included in the study group and received dexmedetomidine 0.5 mcg/kg along with 20 ml of 0.25% of bupivacaine. The control group included 30 patients who were not given dexmedetomidine and received only 20 ml of 0.25% bupivacaine. Transversus Abdominal Plane (TAP) Block is a field block in which the drug is injected into the neurovascular plane between the internal oblique and transversus abdominis muscle of the anterior abdominal wall. Blockade of T6 to T11 nerves of anterior abdominal wall is caused with this technique.

#### RESULTS

The P value was found to be statistically significant.

#### CONCLUSION

The addition of dexmedetomidine to bupivacaine while giving the TAP block reduced the dose of opioid requirement and also increased the duration of rescue analgesia significantly.

#### KEYWORDS

Dexmedetomidine. TAP block. Bupivacaine.

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#### BACKGROUND

Previously, the rate of Caesarean section was 8.5 to 10 per cent. But in the last decade this number has increased nearly three times. Adequate pain relief is the need of the hour in these patients undergoing caesarean section. Optimal pain relief leads to early ambulation preventing thrombo-embolic phenomenon in addition to the improved maternal and neonatal wellbeing. Multimodal approach for pain relief is giving positive results and is thus gaining popularity. In our study, we assessed the efficacy of Transversus abdominis Plain block (TAP block) as a part of multimodal analgesia in

these patients. Chou R, Gordon DB et al.<sup>1</sup> highlighted on the guidelines of management of post-operative pain. Kaur M et al.<sup>2</sup> described the current role of dexmedetomidine in clinical anaesthesia and intensive care.

In TAP block, the drug is injected in the plane between the internal oblique and the transversus abdominis muscle. The neurovascular bundle lying between these two muscles gets anaesthetised. This results in blocking of nerves supplying the anterior abdominal wall (T6 to T11). It was first described by Rafi who performed the technique through the lumbar triangle of Petit in 2001. TAP block reduces the dose of opioids used in the post-operative period thus reducing opioid-related side effects e.g. sedation and post-operative nausea vomiting.

Dexmedetomidine is an imidazole compound. It has selective alpha-2 adrenoceptor agonistic action. It causes analgesia without delirium or respiratory depression. Activation of these alpha-2 receptors in the brain and spinal cord inhibits neuronal firing resulting in hypotension, bradycardia, sedation and analgesia.

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**Aims and Objectives**

The main aim of the study was to study the effect of dexmedetomidine as an adjuvant in TAP block for post-operative analgesia in patients undergoing elective Caesarean section. The time required for rescue analgesia was also studied. Adverse effects like pruritus, nausea and vomiting, hypotension, bradycardia and sedation were also recorded.

**MATERIALS AND MATERIALS**

A sample size of 60 patients undergoing elective Caesarean section were included. All these patients belonged to ASA grade I and II without any co-morbidities. These were divided into 2 groups. Group A included the Study group. This group received TAP block with 20 ml of 0.25% bupivacaine and dexmedetomidine 0.5 mcg/kg. Group B included the Control group who received only 20 ml of bupivacaine in the TAP block given post-operatively.

The exclusion criteria included local infection at the site of injection, coagulopathies, allergies to the specified drugs, any associated systemic disorders, pregnancy induced hypertension and gestational diabetes, psychological disorders and patient refusal.

After getting approval from the ethical committee, written informed consent was obtained from all the patients. These patients were posted for surgery after appropriate 'nil by mouth' period and antacid prophylaxis. In the operation theatre, an intravenous line was established for every patient. The basic vital parameters such as blood pressure, heart rate and oxygen saturation were recorded by attaching multiparameter to the patient. Adequate preloading was done with 1 litre of crystalloid before giving spinal anaesthesia to each patient. Spinal anaesthesia was given in sitting position under strict aseptic precautions with heavy bupivacaine 0.5%. The level of anaesthesia achieved was up to T6 dermatome. The vital parameters were monitored throughout the intraoperative period. The duration of surgery was 1 to 1.5 hours and none of the patients had any intraoperative complications.

At the end of surgery, the incision was covered with a sterile pad and TAP block was given under strict aseptic conditions. The block was performed with 21-gauge spinal needle to which a 100 cm extension tube was attached. The drug was injected through this tube. The group A (Study group) received a combination of bupivacaine 0.25% and dexmedetomidine 0.5 mcg/kg. A total of 40 ml was used for the TAP block viz 20 ml on each side. In group B (Control group), 20 ml of 0.25% bupivacaine was injected on each side (Total 40 ml). After the TAP block was given, a sterile dressing was applied on the surgical wound and patient was shifted to the recovery room.

In the recovery room, a trained gynaecological resident was given charge of the patients in co-ordination with an anaesthesiology resident. They were unaware of the group to which the patient belonged. They monitored the vital parameters viz the blood pressure, heart rate, SPO<sub>2</sub>, the VAS score, sedation score and the post-operative nausea vomiting score. The residents were instructed to give inj.

Ephedrine 6 mg intravenously if the blood pressure went below 90 mm Hg(systolic) and inj. Atropine 0.6 mg in case of bradycardia (heart rate <50/min). If the patient had a sedation score of 3 or more than they were given supplemental oxygen via facemask at 10 lit/min. In any of the above instances, the concerned anaesthesiologist had to be informed immediately. Postoperatively, all the patients received 1 gm inj. Paracetamol intravenously which was repeated after every 8 hours. Rescue analgesia was provided with inj. Tramadol intravenously. Side effects such as nausea, vomiting, respiratory depression and deep sedation were checked for and taken care of.

**Statistical Analysis**

30 patients received TAP block with 0.25% bupivacaine & 0.5 mcg/kg dexmedetomidine (Group A) & 30 patients received 0.25% bupivacaine only (Group B). The results were analysed using the SPSS software. The time required for rescue analgesia was calculated. P value < 0.05 was considered as statistically significant. The T test and the Z test were used to analyse the statistical data.

**RESULTS**

The period following the TAP block up to the requirement of rescue analgesia was observed & studied for 24 hours postoperatively. The hemodynamic parameters viz. the blood pressure and heart rate were monitored up to 24 hours postoperatively at four hourly intervals. Rescue analgesia was given when the patient complained of pain and demanded for pain relief. The total dose of inj. Tramadol required was also monitored up to 24 hours post-operatively.

Level of Activity	Modified Ramsay Score
Anxious, agitated, restless	1
Cooperative, oriented, tranquil	2
Responsive to commands only	3
Brisk response to light, glabellar tap or loud auditory stimulus	4
Sluggish response to light, glabellar tap or loud auditory stimulus	5
No response to light, glabellar tap or loud auditory stimulus	6

**Table 1. Sedation Score**

The sedation score was recorded on the Modified Ramsay Score from 1 to 6 according to the level of activity of the patient. Nausea & vomiting was recorded on a 4-point scale (0- none, 1- nausea, 2- retching & 3- vomiting). Any patient with a score of more than 1 was treated with Inj. Ondansetron 4mg intravenously.

Parameter	Group A (n=30)		Group B (n=30)		Z Value	P Value
	Mean	SD	Mean	SD		
Age (Years)	23.00	2.626	23.20	2.618	0.29	0.77

**Table 2. Comparison of Age in Group A and Group B**

Parameter	Group A (n=30)		Group B (n=30)		Z Value	P Value
	Mean	SD	Mean	SD		
Weight (Kgs)	53.27	3.581	53.30	3.334	0.04	0.97

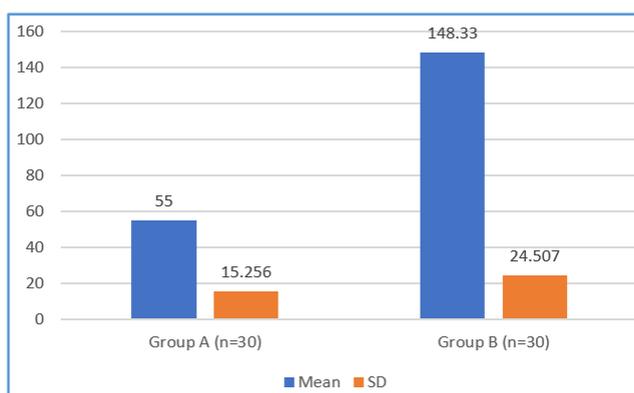
**Table 3. Comparison of Weight in Group A and Group B**

HR/min	Group A (n=30)		Group B (n=30)		Z Value	P Value
	Mean	SD	Mean	SD		
At 1 hr	75.07	4.571	74.73	4.441	0.29	0.78
At 4 hrs	76.77	4.408	77.07	4.806	0.25	0.80
At 8 hrs	75.20	4.567	74.73	4.441	0.40	0.69
At 12 hrs	79.30	5.466	77.07	4.806	1.68	0.098
At 16 hrs	75.07	4.571	74.87	4.539	0.17	0.87
At 20 hrs	75.07	4.571	76.07	3.841	0.92	0.36
At 24 hrs	75.20	4.567	75.80	4.246	0.53	0.60

**Table 4. Comparison of Heart Rate in Group A and Group B**

SBP (mmHg)	Group A (n=30)		Group B (n=30)		Z Value	P Value
	Mean	SD	Mean	SD		
At 1 hr	100.87	6.141	100.00	5.330	0.58	0.56
At 4 hrs	108.93	3.433	108.93	2.273	0	1
At 8 hrs	109.33	3.122	118.80	2.605	12.75	<0.0001
At 12 hrs	109.60	3.212	109.53	2.813	0.09	0.93
At 16 hrs	118.80	2.605	109.73	2.273	14.36	<0.0001
At 20 hrs	109.33	3.122	109.47	2.874	0.17	0.86
At 24 hrs	118.80	2.605	110.47	3.391	10.67	<0.0001

**Table 5. Comparison of Systolic Blood Pressure in Group A and Group B**



**Figure 1. Bar Diagram Showing Comparison of Dose of Tramadol (in mg) in Group A and Group B**

Z value= 17.71 P Value is <0.0001

Parameter (min)	Group A (n=30)		Group B (n=30)		Z Value	P Value
	Mean	SD	Mean	SD		
Rescue analgesia	874.50	21.828	376.50	18.715	94.87	<0.0001

**Table 6. Comparison of Rescue Analgesia in Group A and Group B**

Gr A: 14 hrs and 35 min.

Gr B: 6 hrs and 17 min.

The sample size was calculated from data based on previous similar studies. A total of 60 patients were studied. The groups were comparable based on demographic data. The patients were observed in order to calculate the time at which the rescue analgesia was required in each patient.

In group A, two patients required inj. Atropine 0.6 mg for bradycardia and one patient received Inj. Ephedrine 6mg intravenously in view of hypotension (BP <84 mmHg). No hypotension or bradycardia was seen in any of the patients in Group B.

Only 6 patients from Group A (study) & 13 patients from the Group B (control) required opioids. The average time at which the first dose of opioid required was 14 hours and 35 mins in the study group & 6 hours and 17 mins in the control group. The p- value of this difference was found to be <0.0001. The heart rate and systolic blood pressure were monitored at 4 hourly intervals up to 24 hours.

The patients who received dexmedetomidine in group A had a sedation score of 3 in comparison to those in group B who had a score of 2. None of the patients had nausea or vomiting.

## DISCUSSION

TAP block was introduced by Rafi in 2001. Since then it is widely used for pain relief following lower abdominal surgeries. Lee et al.<sup>3</sup> and Onishi et al.<sup>4</sup> have shown that TAP block is superior to neuraxial opioids, thus reducing the dose of opioids and their side effects in the post-operative period. Meta-analysis done by Mishriky et al.<sup>5</sup> concluded that TAP block produces more pain relief compared to intrathecal morphine. Jankovic Z<sup>6</sup> called TAP block as "The Holy Grail of anaesthesia for lower abdominal surgery". H. Loane et al.<sup>7</sup> suggested that TAP block may be a reasonable alternative when intrathecal morphine is contraindicated or is not appropriate. Meta-analysis done by Yu N et al.<sup>8</sup> proved that TAP block is superior to local wound infiltration for pain relief following lower abdominal surgeries. Esmoglu et al.<sup>9</sup> evaluated the effect of adding dexmedetomidine to levobupivacaine and concluded that dexmedetomidine shortens the onset time and prolongs the duration of the block and thus the post-operative analgesia.

D. Marhofer et al.<sup>10</sup> studied the effect of dexmedetomidine as an adjuvant to ropivacaine. He concluded that dexmedetomidine prolongs the peripheral nerve block by 10% in comparison to ropivacaine used alone. Naaz S et al.<sup>11</sup> reviewed the use of dexmedetomidine in current anaesthesia practice. He confirmed that dexmedetomidine is an alpha 2 adrenergic receptor agonist which is 10 times more selective than clonidine. It is an intense analgesic, has anaesthetic sparing effect, sympatholytic property and cardiovascular stabilising property. It reduces delirium and preserves respiratory function which adds benefits to its uses. Thus, dexmedetomidine is a very versatile drug in anaesthesia practice finding a place in increasing number of clinical scenarios. Almarakhi et al.<sup>12</sup> added dexmedetomidine to bupivacaine in TAP block and concluded that the combination provided better pain relief in patients undergoing abdominal hysterectomy. Singh R. et al.<sup>13</sup> proved that clonidine prolongs post-operative analgesia when added to bupivacaine in TAP blocks.

Siddiqui MR et al.<sup>14</sup> did a meta-analysis on the clinical effectiveness of transversus abdominis plain block. McDonnell et al.<sup>15</sup> studied the analgesic efficacy of transversus abdominis plain block after caesarean delivery. Loane et al.<sup>7</sup> did a randomised controlled trial comparing the effectiveness of intrathecal morphine with transversus abdominis plain block for post caesarean delivery analgesia

and concluded that the latter is more superior and efficacious than the former.

In this era we are moving away from injecting any adjuvant in the intrathecal space. Hence TAP block stands apart and scores higher for post-operative pain relief following lower abdominal surgeries. Also we can decrease the dosage of local anaesthetics used in peripheral nerve blocks by using ultrasound guidance. With the help of ultrasound, the drug can be injected in close proximity to the nerves with maximum precision. In our study TAP block had a significant analgesic effect in patients following caesarean sections. Addition of dexmedetomidine in the study group reduced the need for rescue analgesia significantly compared to the control group. It also prolonged the time of rescue analgesia with opioids significantly. New-born babies were monitored by the resident paediatrician up to 24 hours after delivery. None of the babies had respiratory depression or bradycardia and did not require NICU admission.

## CONCLUSION

The addition of dexmedetomidine as an adjuvant in the TAP block prolonged the duration of requirement of rescue analgesia & thus it also reduced the total opioid requirement in the first 24 hours in patients undergoing caesarean sections. It also improves the patients' outcome along with the mother & child wellbeing.

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