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Research Article

Comparison of dexamethasone and clonidine as an adjunct to bupivacaine in transversus abdominis plane block in patients undergoing lower segment caesarean section

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ABSTRACT

Background: A lower segment caesarean section (LSCS) commonly induces moderate to severe postoperative pain for 48 hours. Aim of the study was to compare 0.25% bupivacaine with dexamethasone and 0.25% bupivacaine with clonidine for transversus abdominis plane (TAP) block as post-operative analgesia in patients undergoing lower segment caesarean section (LSCS).
Methods: A randomized prospective controlled clinical study was conducted in 104 patients undergoing LSCS. Participants were divided into two groups in which group TAP-D (n=54) received 0.25% Bupivacaine with Dexamethasone 4mg and those in group TAP-C (n=50) received 0.25% Bupivacaine with Clonidine 75mcg as TAP block at the end of surgery. The postoperative pain was evaluated by visual analog scale (VAS) for pain scoring at every 2 hours for 12 hours postoperatively. Subjective assessment of duration of analgesia was done.
Results: The average duration of analgesia with TAP bock for the overall study population was 316.15 minutes. The average VAS score in patients who received TAP with dexamethasone was 1.50 which is significantly lower than those who received clonidine (1.95) (P value-0.0001). Further the duration of analgesia was 151 minutes longer in the first group who received dexamethasone TAP. In majority of the patients (84%) who received clonidine TAP, the analgesia persisted for 2-4 hours. While in patients who received dexamethasone addition, the analgesia persisted for 6-8 hours in 37%.
Conclusions: TAP block is a safe and effective way of relieving postoperative pain in LSCS patients. Addition of dexamethasone to bupivacaine significantly enhances its effect in terms of block quality and analgesia duration as compared to clonidine addition.

Keywords: TAP block, Postoperative pain, Postoperative analgesia, VAS score

INTRODUCTION

A lower segment caesarean section (LSCS) commonly induces moderate to severe postoperative pain for 48 hours.[1] Care for the newborn, breastfeeding and mobilisation require the mother to be pain-free in the postoperative period. It has been noted that acute pain during childbirth is responsible for postpartum depression and post-traumatic stress disorder in mothers.[2] This calls for a need to develop adequate pain relief methods in post LSCS patients, keeping in mind lactating mothers and the health of their newborns.

The major trend in the provision of anaesthesia services to pregnant women over the past 25 years has been the increasing use of regional anaesthetic techniques for labour and operative delivery.[3] A report on confidential enquiries into maternal deaths in the United Kingdom states that, at least 80% of caesarean deliveries are now performed under regional block.[4]

Opioids are widely used for control of post-LSCS pain. These can be used either orally or by neuraxial route. Pain, pruritus, nausea, vomiting, sedation and respiratory depression are associated with postoperative opioid usage and thus require frequent monitoring.

Transversus abdominis plane (TAP) block was first described in 2001 by Dr Rafi, who advocated a blind technique performed through the triangle of Petit.[5] TAP block works by blocking the thoraco-lumbar nerves (T6–L1) which supply sensory fibres to the anterior abdominal wall and is a well established method to provide analgesia for various lower abdominal surgical procedures.[6,7]

METHODS

The present clinical study was conducted after obtaining a due permission from the institutional ethical committee. A randomized prospective controlled clinical study was done to evaluate the efficacy and safety of TAP block using 0.25% bupivacaine with either dexamethasone 4mg (Group TAP-D) or clonidine 75mcg (Group TAP-C) as an adjunct. A total of 104 American Society of Anaesthesiologists (ASA) physical status I-II patients were included in the study after a written informed consent.

Exclusion criteria were: Known allergy to local anaesthetic agents, patients who received any non-steroidal anti-inflammatory drugs or opioids 48 hours prior to surgery, failed block or patients with any contraindication for spinal anaesthesia. Out of 118 patients, 14 patients had a failed block and were thus excluded, resulting in a sample size of 104 patients.

The patients were randomly divided into two groups (Group TAP-D, n=54 and Group TAP-C, n=50) by a computer generated random sequence to receive either dexamethasone or clonidine as an adjunct to bupivacaine for post-LSCS TAP block. All patients underwent LSCS under spinal anaesthesia with 0.5% bupivacaine (heavy). Intraoperatively all the vitals were maintained. A bilateral TAP block was given by a single experienced investigator at the end of elective/emergency LSCS surgery for post-operative pain relief.

An 18 Gauge, 90 mm Tuohy needle was used to pierce the skin at the mid-axillary line, two inches cephalic to the iliac crest over the triangle of Petit. The needle was advanced perpendicular to the skin in the coronal plane until the first resistance of external oblique muscle was felt. Further advancement of the needle resulted in a pop sensation as the needle entered the plane between the external and internal oblique fascial layers.

A second resistance was felt as the needle passed through the internal oblique muscle layer. A loss of resistance was felt when the needle reached the transversus abdominis plane between the internal oblique and transversus abdominis muscle. After negative aspiration to exclude vascular puncture, a volume of 0.6 ml/kg of 0.25% bupivacaine in two divided doses i.e. 0.3 ml/kg on either side was administered. Clonidine (75 mcg) or dexamethasone (4 mg) was added as an adjunct to bupivacaine depending on the randomly allocated group.

Post-operative pain was evaluated by visual analog scale (VAS) of 0-100mm (0 = no pain, 100 = worst pain imaginable) for pain scoring at every 2 hours for 12 hours. Duration of analgesia was calculated from the time of giving block at the end of surgery to the time when VAS was more than or equal to 6 (moderate pain). At this point of time rescue analgesia was given with intramuscular injection diclofenac 75mg.

After data tabulation in Microsoft Excel (Version 2007), descriptive and analytical statistics were performed for the two study groups using the SPSS software (Statistical Package for Social Sciences, Version 21.0, IBM Corporation). A p-value of less than 0.05 was considered significant. Independent Student's 't-test' was carried out to compare the VAS score and postoperative duration of analgesia in the two study groups.

RESULTS

The total sample size for the study was 118. Out of these 14 patients had a failed block and they were thus excluded from the data analysis. This resulted in an 83.5% success rate by 'landmark technique'. Thus a total of 104 patients with successful TAP blocks were included in the study.

Majority of the study population was between 21 to 30 years of age (66.3%). Table below shows the age distribution of study population (Table 1).

Table 1: Age distribution of patients.

Age (years)	Frequency N	Percent %	Cumulative percent %
16-20	16	15.4	15.4
21-25	49	47.1	62.5
26-30	20	19.2	81.7
31-35	18	17.3	99.0
36-40	1	1.0	100.0
Total	104	100.0	

47% (n=49) of the total study population was between 21-25 years while 19% belonged to the 26-30 years group. Majority of the patients undergoing LSCS had full term pregnancy. The table below shows weeks of gestation for the study population (Table 2).

As seen in the below Table (Table 2), 96% of the patients had completed 37 weeks of gestation. Only three patients had a pre-term delivery, of which one was delivered at 33 weeks and two were delivered at 36 weeks of gestation.

Out of 104 patients 57 (54.8%) underwent an elective LSCS procedure while the remaining underwent an emergency operation.

The average duration of analgesia with TAP bock for the overall study population was 316.15 minutes. Majority of the patients had the effect of block between 3 – 4 hours after which they were administered rescue analgesia depending on the reading on VAS scale. Table 3 compares the means of the two study groups. The mean duration of analgesia in TAP-D group is 388.9 minutes while that of the TAP-C group is 237.6 minutes with a standard deviation of 145.5 and 101.4 minutes respectively.

Table 2: Weeks of gestation prior to LSCS.

Weeks of gestation	Frequency N	Percent %	Cumulative Percent %
33	1	1.0	1.0
36	2	1.9	2.9
37	8	7.7	10.6
38	17	16.3	26.9
39	41	39.4	66.3
40	31	29.8	96.2
41	4	3.8	100.0
Total	104	100.0	

Table 3: Comparison of means of both groups.

Group	N	Mean duration of analgesia (Minutes)	SD	Std. Error Mean
Addition of dexamethasone (TAP-D)	54	388.89	145.455	19.794
Addition of clonidine (TAP-C)	50	237.60	101.390	14.339

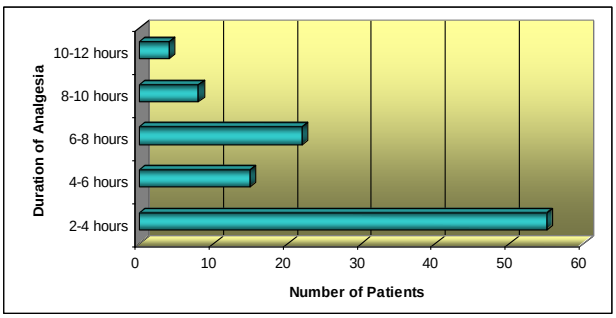


Figure 1: Duration of analgesia of overall study population.

As seen in Figure 1, the duration of postoperative analgesia with TAP block is seen for 2-4 hours in the majority of the study population (53%), followed by 6-8 hours duration seen in 21% of the patients.

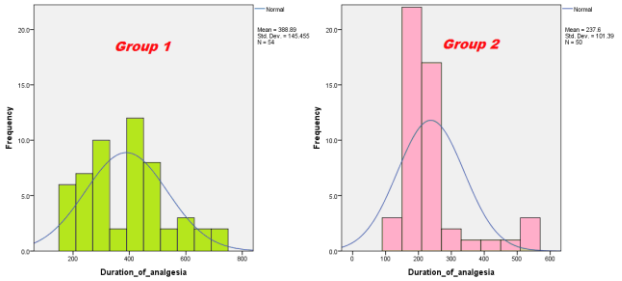
Pearson's Chi-Square test was performed to find a relationship between the two groups of study population and the duration of analgesia with TAP block. It was seen that the requirement of rescue analgesia was earlier in Group TAP-C, while those in Group TAP-D could sustain the TAP block for more hours. The correlation was statistically significant (p value = 0.0001).

Table 4: Duration of analgesia obtained in the two study groups.

Duration of analgesia	Groups (Frequency N)				Total N
	TAP-D Dexamethasone addition		TAP-C Clonidine addition		
	Frequency N	**%**	**Frequency N**	**%**	
2-4 hours	13	24.1	42	84.0	55
4-6 hours	12	22.2	3	6.0	15
6-8 hours	20	37.0	2	4.0	22
8-10 hours	5	9.3	3	6.0	8
10-12 hours	4	7.4	0	0.0	4
Total	54	100%	50	100%	104

Table 4 depicts that post-operative analgesia persisted only for 2-4 hours in 84% of the patients in Group TAP-C.

While the number of patients who had the effect of TAP block for 6-8 hours postoperatively was much higher in group TAP-D (n = 20).



Group 1 = TAP-D ; Group 2 = TAP-C

Figure 2: Comparison of histograms of duration of analgesia with tap block in the study groups.

Figure 2 represents the comparison of histograms for the study groups with their durations of analgesia. It is clearly seen that the values steeply decrease in Group 2 (Clonidine addition) after 2-4 hours of postoperative analgesia. Chi-Square test was performed for the same to see if there is any correlation between the duration of TAP block and weight of the patients.

It was found that there was no statistically significant correlation between the above discussed parameters (Table 5). Comparison of the study groups in terms of duration of analgesia (p=0.0001) and average VAS score (p=0.0001) was found to be statistically significant.

Table 5: Duration of analgesia in relation to weight of patients.

	Number of patients (N)				
Duration of analgesia	**31-40 kg**	**41-50 kg**	**51-60 kg**	**61-70 kg**	**101-110 kg**
2-4 hours	2	2	27	22	2
4-6 hours	1	0	8	6	0
6-8 hours	0	2	15	5	0
8-10 hours	0	0	3	5	0
10-12 hours	0	0	4	0	0
Total	3	4	57	38	2

DISCUSSION

TAP block has been shown to reduce postoperative pain scores and opioid consumption, allowing for early ambulation and faster discharge, after a multitude of lower abdominal operations (colectomy, appendectomy, hysterectomy, caesarean section, abdominoplasty, renal transplantation, prostatectomy, iliac crest bone harvest).[8]

The benefits of adequate postoperative analgesia are many and include a reduction in the postoperative stress response, a reduction in postoperative morbidity and in certain types of surgeries postoperative analgesia does yield an improved surgical outcome.[9-11] Other benefits of effective regional analgesic techniques include reduced pain intensity, decrease in the incidence of side effects from analgesics and improved patient comfort.[12]

A review and meta-analysis by Mishriky et al.[13] suggested that TAP block significantly improved postoperative analgesia in women undergoing caesarean section who did not receive intrathecal morphine (ITM) but showed no improvement in those who received ITM.

ITM was associated with improved analgesia compared with TAP block alone at the expense of an increased incidence of side effects. Carney et al did a study of 50 females undergoing elective total abdominal hysterectomy who were randomized to undergo TAP block with ropivacaine (n = 24) versus placebo (n = 26).[14] They concluded that TAP block, as a component of a multimodal analgesic regimen, provided superior analgesia when compared to placebo block up to 48 postoperative hours after elective total abdominal hysterectomy.

Kanazi et al depicted the effect of low dose clonidine on the characteristics of bupivacaine spinal anaesthesia.[15] They concluded that clonidine (30 µg), when added to intrathecal bupivacaine, produced a prolongation in the duration of the motor and sensory block with preserved hemodynamic stability and lack of sedation.

Clonidine is a centrally acting α2 agonist and has attracted interest as an adjunct to anaesthesia. Previous studies have suggested that clonidine reduces the requirement for volatile anaesthetics when assessed by hemodynamic responses.[16] Fehr et al found that intravenous clonidine allows a lower propofol dose to be used at a similar level of anaesthesia without intraoperative awareness or prolonged recovery times.[17]

Ammar et al compared the efficacy of dexamethasome as an adjunct to bupivacaine in TAP block.[18] They concluded that addition of dexamethasone increases the duration of analgesia as compared to addition of saline (placebo). Prolongation of the block duration is due to the anti-inflammatory effect of dexamethasone. Another school of thought suggests a direct effect on nerve membrane rather than an anti-inflammatory action, as the

corticosteroids were able to inhibit ectopic neural discharge originating in experimental neuromas.[19] Steroids potentiate the action of local anaesthetics through modulation of the function of potassium channels in the excitable cells. Further, pain signal modulation in the spinal cord is a suggested mechanism as intrathecal betamethasone produced rapid analgesia for pelvic and perineal cancer pain that lasted for five days.[20]

In the present study, the addition of clonidine or dexamethasone to bupivacaine in TAP block was compared. The average VAS score in patients who received TAP with dexamethasone was 1.50 which is significantly lower than those who received clonidine (1.95) (P value-0.0001). Further, the duration of analgesia was 151 minutes longer in the first group who received dexamethasone TAP. In majority of the patients (84%) who received clonidine TAP, the analgesia persisted for 2-4 hours. While in patients who received dexamethasone addition, the analgesia persisted for 6-8 hours in 37%.

Inadequate postoperative analgesia is one of the most common causes for poor patient satisfaction following caesarean section.[21] Use of an effective TAP block can significantly minimise the use of opioids which are associated with high incidence of adverse effects, such as postoperative nausea, vomiting and pruritus.

CONCLUSION

TAP block is a safe and effective way of relieving postoperative pain in LSCS patients and addition of dexamethasone to bupivacaine significantly enhances its effect in terms of block quality and analgesia duration. TAP block has opioid-sparing effects, reduces antiemetic use and improves overall patient satisfaction with pain relief. In addition to the advantages of a TAP block, supplementation of dexamethasone to bupivacaine significantly increases the duration of analgesia. An early requirement of rescue analgesia arose in the clonidine addition group, while those in the other group could sustain the TAP block for more hours.

Women undergoing LSCS present a unique set of problems to the anaesthetist and require optimal pain management. Thus, TAP block becomes an important component of multimodal analgesia for post LSCS pain relief and dexamethasone is indeed a safe and effective adjunct that prolongs the duration of the block.

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