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Original Research Article

A prospective study of efficacy of ultrasound guided transversus abdominis plane block for postcesarean analgesia

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ABSTRACT

Background: The ultrasound guided transversus abdominis plane (TAP) block which provides effective analgesia after lower abdominal surgeries including caesarean section. It is a simple and reliable technique. In this prospective, randomized double-blind study, we determined the efficacy of TAP block using 0.25% Bupivacaine and 0.9N Saline with respect to VAS for pain, postoperative Tramadol consumption and post-operative ondansetron usage.
Methods: This study was conducted on 100 adult patients of ASA physical status I and II in the age group of 18 to 40 years undergoing elective lower segment cesarean section under spinal anaesthesia. Study group received TAP block with 0.25% Bupivacaine and control group received 10 ml of 0.9N saline on each side. Patients were analyzed for postoperative pain by pain score (at rest, on movement, on cough) using VAS was recorded at 0, ½, 1, 2, 4, 6, 12 and 24 hours postoperatively. Need for rescue analgesia was assessed by time to first dose of Tramadol requirement and total dose of Tramadol over 24 hours of postoperative period. Ondansetron (4 mg i.v.) was administered whenever nausea score was more than 2 or the patient vomited. All the data was noted using uniform performs.
Results: Patients received TAP block with 0.25% Bupivacaine had better pain scores at first hour of postoperative period during rest, cough and movement which was statistically significant ($p<0.0010$) in comparison to group B. There was a statistically significant difference ($p <0.001$) in the requirement of total dose of Tramadol as a rescue analgesia in patients who received transversus abdominis block with 0.25% Bupivacaine (138.77 mg) in comparison with other group(240 mg).The mean time to first request for Tramadol was significantly longer in group A (5.8 hrs) in comparison to group B (1.93 hrs) with p value <0.001. Patients received TAP block with 0.9N saline needed more dose of Ondansetron, however, the difference was not statistically significant ($p >0.001$).
Conclusions: TAP block using ultrasound provides substantial reduction in Tramadol consumption, time to first dose of rescue tramadol when compared with control group. This study reinforces the recommendation for TAP as a part of multimodal post-operative analgesic regimen.

Keywords: Bupivacaine, Postcesarean analgesia, Tap, Transversus abdominis plane block

INTRODUCTION

Major abdominal surgeries are associated with various metabolic and inflammatory responses leading to moderate to severe postoperative pain. An ineffective postoperative pain management increases the risk of deep vein thrombosis, pulmonary embolism, coronary ischemia, myocardial infarction, pneumonia, poor wound healing and extended lengths of stay and patient dissatisfaction.[1-4]

Direct blockade of the neural afferent supply of the abdominal wall, such as abdominal field blocks, ilioinguinal, and hypogastric nerve blocks have been used for post operative analgesia in patients undergoing abdominal procedures such as cesarean section and

inguinal herniorrhaphy. However, clinical utility of these approaches is limited as the degree of block is unpredictable.[5]

Rafi demonstrated a modified technique of abdominal field block known as transversus abdominis plane block (TAP) administered via triangle of Petit.[6] Triangle of Petit is a potential space in lumbar region bounded anteriorly by the external oblique muscle, posteriorly by latissmus dorsi muscle and inferiorly by iliac crest.[6] The local anesthetic agent injected in the area of lumbar triangle of Petit, blocks the lower intercostal nerves (T7 - T12), ilio-hypogastric nerve and ilio-inguinal nerve as they traverse in the neuro-vascular plane of abdominal musculature.[7]

Recent studies demonstrated that transversus abdominis block provides effective analgesia and reduces postoperative morphine consumption in patients undergoing major abdominal surgeries, cesarean section.[8,9] The incidence of postoperative nausea, vomiting and sedation was also reduced in patients receiving TAP though it was statistically not significant.[10]

Our study aims to evaluate the efficacy of ultrasound guided TAP block using 0.25% Bupivacaine in postoperative pain relief in a cohort of patients undergoing elective cesarean section by comparing it with patients who receive TAP block with Saline. The primary end point studied was total 24 hour Tramadol consumption.

METHODS

This is a prospective, randomized, controlled, and double blinded clinical study; enrollment began after receiving approval from ethical and scientific committee of KIMS Medical College and RF, Amalapuram, India. Total 100 adult patients were participated in this study, undergoing elective lower segment Cesarean section under spinal anaesthesia after taking informed consent at KIMS Medical College and RF, Amalapuram.

Inclusion criteria

- Patients scheduled for elective cesarean section
- ASA physical status I and II
- Age group of 18 to 40 years.

Exclusion criteria

- Patients with ASA III and IV[11]
- Patient refusal for the procedure
- History of relevant drug allergy
- Coagulopathy/anti-coagulation treatment (INR>1.5)
- Preoperative chronic opioid dependence
- Infection at the site of injection
- Patients with chronic pain syndrome
- Patients who received any NSAIDs or opiates 48 hours prior to surgery
- Body mass index (BMI) <18 or >35 kg/m^2
- History of substance abuse.

The women undergoing elective cesarean section were randomized to undergo either TAP block with 10 ml of 0.25% Bupivacaine (n-50) on each side, which was classified as Group A versus 10 ml of 0.9N saline (n-50) on each side which was taken as Group B. Randomization was done using a computer-generated table of random numbers. Patients received TAP block with either 10 ml 0.25% Bupivacaine or 10ml of normal saline.

Transversus abdominis plane block (TAP) technique

The ultrasound guided method was done with the ultrasound machine, using a 6-12 MHz linear probe. The transducer was covered with ultrasonic gel and wrapped in a sterile sheath.

Skin preparation with 2% chlorrhexidine was done. TAP block was performed under dynamic ultrasound guidance. Broadband linear ultrasound probe was placed in the axial plane across the mid axillary line midway between the costal margin and iliac crest. Following identification of the three layers of the abdominal wall; 21G blunt tipped short bevel sonoplex needle was inserted in plane until its tip is located between internal oblique and transversus abdominis muscle. The patients received TAP block with either 10 ml 0.25% Bupivacaine or 10 ml of normal saline.

Patients were analyzed for postoperative pain by pain score (at rest, on movement, on cough) using VAS was recorded at 0, ½, 1, 2, 4, 6, 12 and 24 hours postoperatively.[12] Need for rescue analgesia was assessed by time to first dose of Tramadol requirement and total dose of Tramadol over 24 hours of postoperative period. All patients received injection Tramadol 100 mg i.m. as rescue analgesia whenever pain scores were recorded >3. Ondansetron (4mg i.v.) was administered whenever nausea score was more than 2 or the patient vomited. All the data was noted using uniform performs.

Statistical analysis

Discrete categorical data were presented as n Data were analysed using SPSS 22.

RESULTS

A total of 100 patients underwent elective lower segment cesarean section under spinal anaesthesia.

Group A (n-50) received TAP block with 0.25% Bupivacaine and Group B (n-50) received TAP block with 0.9N saline.

Post operative parameters

Pain scores

Pain was assessed by visual analogue score (no pain=0; worst imaginable pain=5) at rest, on movement and on cough at time interval of 0, ½, 1, 2, 4, 6, 12 and 24 hrs postoperatively. The mean pain scores at various time intervals are presented in Tables1-3 below. Group A patients had better pain scores at first hour of postoperative period during rest, cough and movement which was statistically significant (p <0.0010) in comparison to group B. Though pain scores were higher in Group B, at all other time intervals in the first 24 hours they were not statistically significant (p <0.001).

Table 1: Postoperative pain scores at rest (visual analogue score).

Time (Hours)	Group A (mean±SD)	Group B (mean±SD)	p-value
0	0.20±0.40	0.04±0.19	0.014
0.5	1.04±0.75	1.24±0.79	0.201
1	1.48±0.58	2.42±1.14	<0.001
2	2.12±0.82	2.82±1.11	<0.001
4	2.68±0.95	3.16±1.16	0.027
6	2.78±1.01	2.74±1.00	0.844
12	2.84±0.95	3.44±1.01	0.003
24	2.56±0.70	2.28±0.45	0.020

Table 2: Postoperative pain scores on movement (visual analogue score).

Time (Hours)	Group A (mean±SD)	Group B (mean±SD)	p-value
0	0.80±0.80	0.22±0.50	<0.001
0.5	1.36±0.77	1.58±0.90	0.195
1	1.92±0.66	3.08±1.15	<0.001
2	2.78±0.95	3.32±1.13	0.011
4	3.46±1.01	3.86±1.14	0.067
6	3.58±0.99	3.32±1.13	0.225
12	3.66±0.96	4.22±0.93	0.004
24	3.20±0.70	3.00±0.35	0.074

Table 3: Postoperative pain scores on cough (visual analogue score).

Time (Hours)	Group A (mean±SD)	Group B (mean±SD)	p-value
0	1.12±0.98	0.44±0.67	<0.001
0.5	1.54±0.67	2.06±0.97	0.003
1	2.16±0.54	3.42±1.14	<0.001
2	3.00±0.85	3.52±1.18	0.013
4	3.62±0.96	4.00±1.06	0.065
6	3.72±1.03	3.52±1.12	0.357
12	3.70±0.99	4.32±0.95	0.002
24	3.20±0.70	3.00±0.35	0.740

Postoperative tramadol consumption

All patients received injection Tramadol 100 mg i.m. as rescue analgesia, whenever pain scores were recorded >3. The mean scores of rescue analgesia in terms of total postoperative Tramadol (I.M.) consumption, mean time (hours) to first request for Tramadol, and total number of patients receiving different doses of Tramadol in first 24 hrs were tabulated in Tables 4-6 below. 40% (n-20) patients who received TAP with 0.9N saline needed higher dose of Tramadol whereas none of the patients who received TAP with 0.25% Bupivacaine. There was a statistically significant difference (p:<0.001) in the requirement of total dose of Tramadol as a rescue analgesia in patients who received transversus abdominis block with 0.25% Bupivacaine (138.77 mg) in comparison with other group (240 mg). The mean time to first request for Tramadol was significantly longer in group A (5.8 hours) in comparison to group B (1.93 hrs) with p value <0.001.

Table 4: Mean time (hours) to first request for tramadol (Rescue analgesia).

Time (Hours)	Group A (mean±SD	Group B (mean±SD)	p-value
Time (Hours)	5.8±2.97	1.93±1.17	0.001

Table 5: Number of patients receiving different doses of tramadol in first 24 hours.

Total Tramadol in 24 hours	Group A	Group B
100 Mg	31	0
200 Mg	19	30
300 Mg	0	20

Table 6: Total postoperative tramadol (i.m) consumption (mg).

Time (Hours)	Group A (mean±SD)	Group B (mean±SD)	p-value
0-24	138.77±49.22	240±49.48	0.001

Table 7: Postoperative antiemetic medicine (ondansetron).

Ondansetron	Group A	Group B	p value
4 mg	21	29	0.09
>4 mg	5	12	1.00

Post-operative antiemetic (Ondansetron)

Ondansetron (4 mg i.v.) was administered whenever nausea score was more than 2 or the patient vomited. Data was tabulated in Table 7. Patients in the Group B received more dose of Ondansetron, however, the difference was not statistically significant (p>0.001). The time to first dose of antiemetic was less in the Group B but insignificant (p>0.001).

DISCUSSION

Adequate postcesarean analgesia has specific concerns because the mother can care for her baby only after adequate analgesia. Effective analgesia improves the amount of breastfeeding and infant weight gain.[13] It increases the mother baby bonding and in turn reflects a positive note on the infant's health. These compelling advantages of post cesarean analgesia has resulted in the search of anaesthetic techniques that results in prolonged and adequate postoperative analgesia keeping in mind the health of mother and baby. The ultrasound guided TAP blocks which provides good postoperative pain relief is a simple and reliable technique.[6]

While a lower thoracic or lumbar epidural technique constitute the gold standard for postoperative analgesia, it is not always possible to provide neuraxial analgesia, due to logistic issues and/or the presence of medical contraindications like coagulopathy. Opioids, such as Morphine, can result insignificant adverse effects, including sedation, nausea, vomiting in addition to its secretion in breast milk.[14] Alternative approaches, which reduce the requirement for strong opioids postoperatively, are required.

Our study demonstrated that TAP block was effective in reducing severity of pain on rest, movement as well as during cough. Our study also concluded that significant delay in the need of first postoperative analgesic and significant reduction in the total dose of Tramadol during first 24 hours after surgery in patients undergoing cesarean section under spinal anesthesia. The patients receiving TAP block also had lower post operative nausea and vomiting compared to those who did not receive TAP block.

McDonnell et al, compared TAP block with either ropivacaine or placebo at the end of caesarean section under spinal anesthesia and demonstrated significant reduction in 48 hours postoperative morphine consumption, pain scores, and side effects was observed in TAP group.[8] Other placebo- controlled studies also clearely demonstrated the analgesic benefit of TAP block in patients of cesarean delivery under spina anesthesia.[15,16] Our study showed similar results with previous studies.

Our study had reduced the incidence of side effects like nausea, or vomiting and lesser number of requirement of antiemetic medication in TAP group. High incidence of side effects could be due to higher consumption of Tramadol in the control group. Although our results showed need of more doses of Ondansetron, in control group which was not statistically significant (p>0.001),it differs with previous studies.[8,15,16]

In conclusion we found that ultrasound guided transversus abdominis block provided substantial reduction in Tramadol consumption when compared with control group. TAP with 0.25% Bupivacaine also reduced significantly the time to first dose of rescue Tramadol. The technique is found to be safe and effective. This study reinforces the recommendation for TAP as a part of multimodal post-operative analgesic regimen.

Limitations of the study were effect of successful TAP block was not tested physically due to fear of blinding. Saline was used as a placebo but effect of saline injection on pain pathway was ignored which rises the ethical issue.

CONCLUSION

Patients who received transversus abdominis block with Bupivacaine had significantly reduced 24 hours Tramadol requirements in milligrams (Group A: 138.77±49.22, Group B: 240±49.48, p value<0.001). The mean time (in hours) to first request for Tramadol was significantly longer in patients belonging to Group A (Group A: 5.8±2.97, Group B: 1.93±1.17, p<0.001). There was significant difference in the pain scores at the end of first postoperative hour, with patients in Group B complaining of significant pain at rest, cough and movement. At all other time intervals in the first 24 hours the pain scores were higher in Group B but not significantly different. But pain requiring rescue analgesic (>3) was significantly higher in Group B. There was no difference in sedation score postoperatively except at 2 hrs after arrival, where the sedation score was significantly lower in Group A. Patients in Group B received more dose of Ondansetron. However, the difference was not statistically significant (p>0.001). The time to first dose of antiemetic was less in Group B but insignificant (p>0.001). No complication of TAP block was reported in any of the patients.

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