



Transversus abdominis plane block offers prolonged postoperative analgesia than surgical incision infiltration by bupivacaine in cesarean section patients

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ABSTRACT

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Background and objective: Postoperative pain requires a well-planned analgesia regimen to ensure adequate patient comfort, satisfaction, early mobilization and also to decrease the hospital stay after anesthesia. We conducted this study to compare the transversus abdominis plane block with direct infiltration of bupivacaine into surgical incision in cesarean section to prolong the mean duration of postoperative analgesia.

Methodology: This Randomized control trial was conducted in department of anesthesia, Nishtar Hospital, Multan from July 2016 to December 2016. A total of sixty patients were included in the study and randomly divided into two equal groups of 30 each; Group-T and Group-I. Group-T received TAP block with 0.3 ml/kg of 0.25% bupivacaine on each side under double pop technique, and Group-I received 0.6 ml/kg of 0.25% bupivacaine infiltration in surgical incision. Postoperatively all the patients were monitored in PACU. VAS was noted at 1/2, 1, 2, 4 and 6 h intervals. Inj tramadol 1.5 ml/kg was given as rescue analgesia when VAS score ≥ 4 . Time to requirement of first rescue analgesia was noted. Sample size was calculated with 80% power of test, 95 % confidence interval taking mean and standard deviation of rescue analgesia in Group-T 148 ± 46.7 and in Group-I 85.38 ± 38.07 . Data were analyzed with computer software SPSS version 23. Mean \pm SD was calculated for quantitative variables and frequency (percentage) was calculated for qualitative variables. Student t-test and chi square test were applied. P value 0.05 was considered as significant.

Results: Mean VAS score at half hour in Group-T was 3.8 ± 2.9 and in Group-I was 5.0 ± 3.0 ; and mean VAS score at one hour was 4.4 ± 3.01 in T Group and in Group-I was 5.3 ± 3.09 respectively; at two hours 4.7 ± 2.9 and 6.3 ± 4.2 , and at four hours was 5.2 ± 2.9 and 5.7 ± 2.8 in Group-T and Group-I respectively. Mean VAS score during six hours was 5.5 ± 2.8 and 6.1 ± 2.5 in Group-T and Group-I respectively. Mean time for 1st analgesia in Group-T was 296.3 ± 37.1 min and in Group-I was 202.0 ± 34.9 min, by applying t-test $P = 0.000$ a significant value.

Conclusion: TAP block is a promising technique in alleviating postoperative pain in patients' cesarean section. The procedural simplicity of this block, along with reliable level of analgesia (T10-L1), and longer duration makes the TAP block a good option.

Key words: Transverse Abdominis Plane Block; Bupivacaine; Cesarean section; Analgesia; Local anesthesia

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INTRODUCTION

Postoperative analgesia is indeed of great value to every surgical patient. Pain is a vexatious sensory and emotional experience resulting from actual or potential tissue damage. Adequate patient comfort, early mobilization and reduced hospital/post-anesthesia care unit (PACU) stay can be achieved through well managed analgesic regime after gynecological surgeries. Intravenous use of NSAIDs, parenteral paracetamol, opioids, epidural analgesia, transversus abdominis plane (TAP) block, local anesthetic wound infiltration are various methods that can be used to achieve postoperative analgesia. Abdominal field block of thoracolumbar nerves (T6-L1) innervating anterior abdominal wall was mentioned by Rafi in 2001.¹ Abdominal hysterectomy, Cesarean section,² large bowel resection, open retroperitoneal prostatectomy, laparoscopic cholecystectomy^{2,3,4} and appendectomy⁵ are included in a group of various diverse surgical procedures that have enjoyed a great degree of benefits from TAP block. In postoperative analgesia, efficacy of TAP block is equivalent to morphine with the additional benefits of increasing time duration of analgesia, reducing postoperative opioid usage, with satisfactory pain relief and few side effects.⁶ Local anesthetic infiltration into the surgical site as a part of multi-modal postoperative analgesic regimens is common procedure. However, VAS score was found to be remarkably low with TAP block in a clinical trial, as compared to direct infiltration of surgical incision with local anesthetic in lower abdominal gynecological surgeries. In this study time to first rescue analgesia was 148 ± 46.7 min with TAP block compared to 85.38 ± 38.07 min with local infiltration.

Purpose of our study was to compare the analgesic efficacy of TAP block with direct infiltration of local analgesic into surgical incision in terms of a better analgesia with lower rate of complications in patients undergoing lower segment cesarean sections.

METHODOLOGY

After approval from institutional ethical committee parturients meeting the inclusion criteria and undergoing elective lower segment cesarean section were enrolled in the study. Patients with placenta previa, emergency cesarean section or any co-morbid condition like hypertension, diabetes mellitus, or a known hypersensitivity to the local anesthetic used, were excluded from the study. Informed consent was taken. Patients were randomly divided into two groups by blind balloting technique, into Group-T and Group-I. Patients were properly explained

about VAS scoring technique pre operatively. All patients were given standard general anesthesia with propofol, suxamethonium, atracurium, endotracheal intubation, intermittent positive pressure ventilation and reversal with neostigmine and glycopyrrolate. Standard monitoring like NIBP, SpO₂ and ECG were applied. Group-T received TAP block with 0.3 ml/kg of 0.25% bupivacaine on each side under double pop technique, and Group-I received 0.6 ml/kg of 0.25% Bupivacaine infiltration in surgical incision. Postoperatively all the patients were monitored in PACU. Blinding was ensured to pack bupivacaine with same color of packing and syringes and person entering the data was also kept blind about the type of analgesic technique whether direct infiltration of surgical incision and TAP block. VAS was noted by a blinded observer at 1/2, 1, 2, 4 and 6 h intervals. Inj tramadol 1.5 ml/kg was given as rescue analgesia when VAS score ≥ 4 . Time to requirement of first rescue analgesia was noted. The collected information was entered and analyzed through SPSS version 10. Mean and standard deviation was calculated for quantitative variables like age, weight, height, VAS score, BMI and time for first rescue analgesia. Post stratification chi square test applied. P value of < 0.05 was considered as significant.

RESULTS

This study was conducted on 60 patients, all patients divided into two equal groups. The differences in mean age, mean height and weight, as well as mean BMI were statistically insignificant in both groups (Table-1). Mean VAS score at half hour was 3.8 ± 2.9 and 5.0 ± 3.0 in Group-T and Group-I respectively; at one hour it was 4.4 ± 3.01 and 5.3 ± 3.09 , at two hours 4.7 ± 2.9 vs. 6.3 ± 4.2 , at four hours 5.2 ± 2.9 vs. 5.7 ± 2.8 in Group-T and Group-I respectively. At six hours mean VAS was 5.5 ± 2.8 in Group-T and was 6.1 ± 2.5 in Group-I (Table-2). The mean time for 1st rescue analgesic in patients of Group-T was 296.3 ± 37.1 min compared to patients in Group-I which had had mean time of 202.0 ± 34.9 min. By applying t-test $p = 0.000$; a significant value (Table 3).

DISCUSSION

TAP block provided longer and better quality analgesia in contrast to local anesthetic infiltration of surgical incision with minimum sedation and reduced chances of occurrence of postoperative nausea and vomiting. The convenience and benefit of TAP block in patients going through various surgical procedures, e.g. abdominal hysterectomy,⁷ large bowel resection,⁸ open retroperitoneal prostatectomy,⁹ Cesarean section,^{10,11} laparoscopic

TAP block vs. surgical incision infiltration

Table 1: Demographic variable in both groups (Mean ± SD)

Characteristics	Group-T	Group-I	p value
Age	27.03 ± 4.45	27.1 ± 4.6	0.000
Height	144.4 ± 7.1	105.3 ± 57.3	
Weight	46.6 ± 3.9	89.9 ± 49.3	
BMI	21.8 ± 1.7	30.3 ± 13.0	

Table 2: Comparison of VAS Score in both groups (Mean ± SD)

Vas score at	Group-T	Group-I	p-value
half hour	3.8 ± 2.9	5.0 ± 3.0	0.000
one hour	4.4 ± 3.01	5.3 ± 3.09	
two hour	4.7 ± 2.9	6.3 ± 4.2	
Four hour	5.2 ± 2.9	5.7 ± 2.8	
six hour	5.5 ± 2.8	6.1 ± 2.5	

Table 3: Mean time for first analgesia [mean ± SD]

Parameter	Group-T	Group-I	p-value
Time to first rescue analgesic (min)	296.3 ± 37.1	202.0 ± 34.9	0.000

cholecystectomy^{12, 13} and appendectomy¹⁴ has been demonstrated. Almost all of the studies compared TAP block with placebo but none of these studies compared TAP block with local anesthesia infiltration, even though both are concerned with incisional pain (parietal component of surgical pain). In a study done by McMorro et al., no superior analgesic effects or benefits with TAP block (with bupivacaine 0.375%) were found compared to spinal morphine (100 µg morphine) in patients who underwent cesarean section which could be attributed to the analgesic effect of intradural morphine on both the parietal and visceral components of pain pathway in contrast to TAP block which acts only on the nerves innervating the anterior abdominal wall, and therefore mitigate the pain of parietal component only.³ Those patients who deliver their baby through cesarean section under spinal anesthesia with morphine gain no additional comfort in analgesic effect by ultrasound guided TAP block. However, another similar study illustrated opioid sparing effect of ultrasound guided TAP block after cesarean delivery, which led to lesser opioid consumption in first six hours resulting in reduced 24 h morphine consumption.^{4,7} In our study we found that the incidence of PONV in Group-T was significantly lower compared to the

results of Carney et al, who was not able to observe any reduction in the severity and incidence of PONV in the TAP block group in contrast to placebo group in patients undergoing total abdominal hysterectomy.⁷ Three approaches of TAP block comprising sub costal, mid-axillary and lumbar triangle of Petit approach were studied in comparison.² The sub costal approach seemed to be associated with a greater area of spread (T7-L1) of block while only T10-L1 block was achieved with other two methods. In our study, mid-axillary approach was used taking into consideration that the level T10-L1 would be adequate for controlling incisional pain in lower abdominal procedures reliably with its relatively explicit landmarks and paravertebral spread of drug on administration at that peculiar location.

Landmark technique was used in our study instead of ultrasonographic technique due to its widespread use and proven merit by many studies.

Even with its ill-defined sonoanatomy, mid-axillary approach has a para-vertebral spread leading to blocking of the lateral cutaneous afferent supply in contrast with the more anatomically clear anterior approach of the US-guided block. These two approaches might lead to varied local anesthetic distribution. The transversus abdominis plane can act as a depot for prolonged duration of action compared to a surgical incision in which duration of action is lesser probably because of its rich vessels leading to faster local anesthetic absorption followed by its metabolism. T-rescue in Group-T was significantly longer compared to Group-I.

Barrington MJ et al. illustrated the fact that the nerves located between the inguinal ligament and costal margin in the anterior axillary line have segmental origin from T9-L1 vertebrae (TAP plexus) and the location of a fascial layer within TAP requires the anesthetic solution introduction between this layer and the transversus abdominis muscle layer.¹⁵ "Double-pop" technique, with a large-bore (18G) needle, can also be used which introduces the drug beyond the external and internal oblique muscles into the TAP reliably.

A review of literature and various studies for

postoperative pain relief of abdominal operations shows that incisional local anesthesia was neither effective nor adequate method for postoperative analgesia (appendectomy, major abdominal surgeries, caesarean section, open cholecystectomy, abdominal hysterectomy) excluding only herniotomy. Meta-analysis on the efficacy of TAP block concludes that TAP block is comparable to morphine for postoperative analgesia and always reduces the requirement of postoperative opioid analgesia, it also increases time to first request for further analgesia with least side effects and better analgesia. Instead of placebo as in most studies and meta-analysis, we have compared two standard methods of analgesia to mitigate pain including TAP block and local infiltration.

Many studies are required to compare vast variety of individual local anesthetics, in diverse concentrations, different dosage, with or without ultrasound-guided technique, with use of additives, in other surgeries, and also comparing pain on movement. We did not use continuous block with a catheter, as we were concerned mainly with the evaluation of the duration of analgesia with a single injection on each side. In our study, we also kept an eye on the opioid requirement in the first 24 hours postoperatively, which would

have been prejudiced by a continuous block giving us another reason not to use continuous block.

LIMITATIONS

Our study has certain limitations as we did not assessed pain on movement, as our primary aim was to find the duration of action of the two techniques, and assess the pain on movement by which both visceral and parietal components of pain can be assessed.

CONCLUSION

TAP block is a promising technique in alleviating postoperative pain in patients' cesarean section especially when used as part of multi-modal analgesia regimen. The procedural simplicity of this block, along with reliable level of analgesia (T10-L1), longer duration, with lesser opioid requirement and their side-effects makes the TAP block a good option to be used for cesarean sections.

Conflict of interest: Nil declared by the authors

Author contribution:

MA - Conceived the idea, study design
 AF - Manuscript writing, data collection
 MA - Data analysis, statistical analysis
 SW - Proof reading, final approval

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