

Comparison of Ultrasonography Guided Bilateral Transverse Abdominis Plane (TAP) Block and Local Site Infiltration with 0.2% Ropivacaine for Post Operative Analgesia Following Caesarean Section

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Abstract

Background: Postoperative pain management plays a key role in perioperative anaesthesia care. Postoperative analgesia can be achieved by the use of oral or parenteral analgesics like NSAIDs and opioids. However, opioids are associated with dose dependent side effects including nausea, vomiting, pruritis, sedation and respiratory depression. Techniques that reduce opioid requirements such as peripheral nerve blocks, neuraxial blocks with local anaesthetics, intrathecal opioids and adjunctive techniques may be beneficial to the patient. Transversus abdominis plane block has recently been described as an addition or alternative to the other analgesic regimes. TAP block has been shown to reduce postoperative opioid use in elective abdominal surgery, including open appendectomy, laparotomy, Caesarean section and laparoscopic cholecystectomy.¹

Aim: The purpose of this study was to compare the efficacy of Ultrasound guided Transversus abdominis plane (TAP) blocks with local site infiltration using 0.2% Ropivacaine in providing postoperative analgesia in patients undergoing elective caesarean section surgeries.

Objectives: To study the time taken for first dose administration of rescue analgesic. To study the total amount of analgesic consumed and the assessment of patient satisfaction.

Material: After obtaining approval from the ethical committee and obtaining informed consent, 60 pregnant women aged 20-40 years posted for elective caesarean section surgeries were randomly divided into Group T and Group L. Bilateral TAP block was performed in Group T after the completion of surgery, under ultrasonography guidance with a Sonosite M Turbo portable ultrasound unit with a linear 5-10 MHz probe. A 100mm long, 22G short bevel needle (Stimuplex, B. Braun Melsungen AG, Germany) was used to administer a total of 40ml (20ml for each side) of 0.2 % Ropivacaine for the TAP block. In group L, post-operatively a total of 40ml of 0.2% Ropivacaine was used for subcutaneous wound site infiltration. The

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parameters recorded were intraoperative haemodynamics, postoperative pain scores and the need for rescue analgesia in the first 24 hours postoperatively.

Results: A total of 60 patients were analyzed. Duration of analgesia was significantly longer 5.5 ± 2.8 hours in group T compared to group L 2.5 ± 1.36 hours ($p < 0.001$), mean consumption of diclofenac was 107.5 ± 37.8 mg and 162.5 ± 34.585 mg in group T and L respectively ($p < 0.001$).

Conclusion: Post-operative analgesia and patient satisfaction is better with ultrasound guided TAP block than with local site infiltration.

Keywords: Anaesthesia; Pregnant women; Caesarean Section; Postoperative pain; Ultrasonography; Transversus abdominis plane block.

INTRODUCTION

Postoperative pain is the most common complaint following any surgery. In spite of advances in methods of providing analgesia, many patients continue to experience considerable discomfort during the post-operative period due to pain.² Post-operative pain relief is associated with advantages like cardiovascular stability, decreased sympathetic activity, prevent chronic pain syndromes, and also better patient satisfaction in terms of faster recovery and early mobilization, and shorter duration of hospitalization.

TAP block technique has been shown to be a safe and effective method of providing postoperative analgesia in a variety of general, gynecological, urological, plastic, obstetric surgeries.³ TAP block is used as part of a multimodal analgesic approach to control the acute pain arising from the parietal peritoneum, skin and muscles of the anterior abdominal wall. It is a safe, effective method of providing post-operative analgesia for Caesarean section and also to enhance early recovery.⁴ TAP block can be done with a blind landmark technique via the Lumbar Triangle of Petit, but in obese patients identifying this triangle may be difficult. To overcome the difficulty of a blind technique ultrasound guidance is being increasingly used to locate the Transversus Abdominis Plane and to administer local anaesthetic in this plane.⁵

Aim: The purpose of this study was to compare the efficacy of Ultrasound guided Transversus abdominis plane (TAP) blocks with local site infiltration using 0.2% Ropivacaine in providing postoperative analgesia in patients undergoing elective caesarean section surgeries.

Objectives: To study the time taken for first dose administration of rescue analgesic. To study the total amount of analgesic consumed and the assessment of patient satisfaction.

Hypothesis: The ultrasound guided transversus abdominis plane (TAP) block involves infiltration of local anaesthetic into the plane between the

transversus abdominis and the internal oblique muscles to block the thoracolumbar intercostal nerves which are derived from anterior divisions of spinal segmental nerves T6 to L1.⁶ This blockage will decrease the acute pain arising from the parietal peritoneum, skin and muscles of the anterior abdominal wall in the post operative period after the regression of spinal anaesthesia effect.

MATERIAL METHOD

After obtaining approval from the ethical committee, informed consent for participation in the study was taken from all the patients. The pregnant women aged between 20-40 years posted for elective cesarean section were enrolled in the study. Exclusion criteria were patients known allergic to drugs used in the study, patients with known cardiovascular, respiratory, hepatic, renal disease.

Randomisation was done using the website www.randomisation.com to divide the patients into two groups of 30 each, to receive either TAP block (Group T n=30) or local infiltration (Group L n=30) randomly. The patients and the investigator enrolling the patients were blinded to the intervention. Allocation concealment was done using sequentially numbered opaque sealed envelopes (SNOSE technique). The study was carried out in operation theatre of Bhaskar General Hospital and the post-operative data were collected in the post operative ward.

Patient was infused with lactated Ringer's solution (20ml/kg) over 15-20min for pre loading just before shifting to operation theater. After taking full aseptic precautions, lumbar puncture was performed at L3-L4 interspace through midline approach using a disposable 26G Quincke's spinal needle, 2ml of hyperbaric bupivacaine was then injected in the subarachnoid space. Surgical incision was allowed once sensory dermatomal level of T6 was achieved. At the end of surgery before administering the TAP block or local site

infiltration, two segment regression of sensory block was assessed. Regression time for motor block to Bromage 0 was recorded. All durations were calculated considering the time of spinal injection as time 0.

After the surgery, group T patients were administered bilateral TAP block was performed using Sonosite M Turbo ultrasound machine with 5-10MHz probe, 40ml (20ml + 20ml each side) of 0.2% of Ropivacaine Hydrochloride was administered in the transverses abdominis plane using 100mm 22-G (Stimuplex, B. Braun Melsungen AG, Germany) needles after a two segment recession in the spinal block level was noted. A 3mm linear array US probe was positioned in the mid axillary line in the axial plane, halfway between the iliac crest and the costal margin views were considered satisfactory, if subcutaneous fat, external oblique muscle, internal oblique muscle, transverses abdominis muscle, peritoneum and intra-peritoneal structures were identified.

A 100 mm long, 22G short bevel needle (Stimuplex, B. Braun Melsungen AG, Germany) was introduced anteriorly and inserted in plane under real time US guidance to lie between the internal oblique and transverses abdominis muscle with the tip in the mid axillary line. A total of 20ml of study solution was injected on each side after aspiration to avoid intravascular placement. Successful injection produced an echo-lucent lens shaped space between the two muscles. In group L,

post-operatively a total of 40ml of 0.2% Ropivacaine Hydrochloride was used for subcutaneous wound site infiltration.

In postoperative period, haemodynamic variables, the presence and severity of pain was assessed systematically using numerical pain scale (NPS) at 4th, 6th, 12th and 24 hours from the time of block. Any patient with a NPS score of more than 3 was administered intramuscular diclofenac sodium 1mg/kg as rescue analgesic.

Maximum allowable dose of diclofenac was 225mg per day. Time for first analgesic administration and the total need for analgesic was recorded in each case. Patient satisfaction was determined by asking verbally to provide a number between 0-10 (0-not satisfied, 10-fully satisfied) and the number was recorded. Patient satisfaction evaluation was performed 24 hours after the block.

Data were represented as mean \pm SD. Categorical data were represented as number of patients. Physical characteristics, heart rate, mean arterial pressure, onset and duration of sensory block, onset and duration of motor block, first analgesic demand was compared using the unpaired t-test. Categorical data was compared using chi-square test. Adverse effects profile was compared using Fischer's exact test. P value <0.05 was considered to be significant. All the statistical calculation was done by using software SPSS version 16.

RESULTS

Data from 60 patients was analyzed in this study.

Table 1: Distribution Based on Various Parameters

Parameters	Group T	Group L	P value
Age in years	26.22 \pm 14.86	24.28 \pm 13.81	0.174
Height in cms	157.72 \pm 5.73	158.34 \pm 5.80	0.380
Weight in Kgs	56.22 \pm 6.59	57.88 \pm 7.64	0.810
Duration of Surgery	35.85 \pm 2.476	35.53 \pm 2.837	0.785

There was no significant difference in the demographic profile of the two groups with respect

to age, height, weight and the average duration of surgeries.

Table 2: Pain scores

Pain Score (NPS)	Group T	Group L	P value
NPS at 0 Hrs	0.0 \pm 0.0	0.0 \pm 0.0	0.001
NPS at 2 Hrs	1.9 \pm 1.49	2.8 \pm 1.03	0.001

Pain Score (NPS)	Group T	Group L	P value
NPS at 6 Hrs	2.06±1.74	4.45±1.69	0.001
NPS at 12 Hrs	3.8±1.55	4.3±1.39	0.001
NPS at 24 Hrs	3.3±1.61	5.6±1.82	0.001

Numeric pain scores at different time intervals were compared using unpaired t test. NPS at the time of giving TAP block or surgical site infiltration

was 0. Analysis showed that there was highly significant difference in numeric pain scores at 2nd, 6th, 12th and 24th hours ($p < 0.0001$)

Table 3: Comparison of rescue analgesics requirement

	Group T	Group L	P value
First demand of rescue analgesic (in hours)	5.5±2.8	2.5±1.36	0.001
Total Diclofenac consumed in first 24 hrs (in mg)	107.5±37.800	162.5±34.585	0.001

In present study (27/30) patients in group L needed supplemental analgesia in the form of injection Diclofenac or Tramadol, whereas in the TAP group only (3/30) patients required rescue analgesia in the first 24 hours. Both the time for

first rescue analgesic was longer in group T and total amount of analgesic consumed was higher in group L. This difference was statistically significant ($p < 0.0001$).

Table 4: Comparison of patient satisfaction

	Group U	Group L	P value
Patient Satisfaction score	8.52 ± 1.37	7.64 ± 1.11	0.032

Level of satisfaction was more in TAP block group, but the difference was not significant. Adverse effects profile was not significant in both the study groups.

DISCUSSION

The pain experienced following a caesarean section is frequently significant. Effective analgesia has been demonstrated to minimize postoperative stress and speedy recovery, early ambulation and newborn care (including breast feeding and maternal-infant bonding). Multiple methods have been put into use to achieve pain free recovery such as local anaesthesia injections, epidural analgesia, peripheral nerve block, and intravenous patient controlled analgesia. TAP block, which can be easily performed under ultrasound guidance or using a landmark-based approach is becoming more commonly used in lower abdominal surgeries to decrease post-operative pain. TAP block is currently described as an effective technique for reducing postoperative pain and post operative analgesic consumption after the surgeries.

MT Ayodogmus *et al.* studied the analgesic efficacy between TAP block and Local infiltration

using levo-bupivacaine 0.25%. The authors demonstrated a significant lower NPS at 6th, 12th, 24th hour (NPS6: $p = 0.003$, NPS12 $P = 0.0001$, NPS 24: $p = 0.0001$). A single shot TAP block can produce effective analgesia for up to 2 days. This prolonged duration of analgesia is due to relatively poor vascularisation of transverses abdominis plane.⁷

Telenes A *et al.* in their study, compared TAP block with LIA (Local Infiltration Anaesthesia) in Caesarean section using bupivacaine 0.25% with adrenaline 5mcg/ml. Their study also demonstrated decreased cumulative analgesic consumption in terms of morphine consumption (TAP41±34mg vs LIA 38±27mg).⁸

Vijaylaxmi Sivapurapu *et al.* also demonstrated a statistically significant decreased consumption of analgesic in 24 hours in TAP group (TAP22.15±4.14 vs LIA 29.15±3.93 $p = 0.001$).¹² Their finding further supported TAP block as a more effective analgesic procedure than LIA.⁹

McDonnell *et al.* compared a placebo with TAP block and reported that TAP block provided superior analgesia until 48 hours. In addition, it has been reported that TAP block not only reduced postoperative opioid need but also extended first analgesia application time.¹⁰

Sirvasta *et al.* conducted a randomised double blind study on 62 pregnant women scheduled for caesarean delivery to evaluate the role of TAP block as a component of multimodal postoperative analgesia. They discovered that the TAP block significantly decreased pain score at all study times during rest and movement, as well as decreased parturients Tramadol consumption through patient controlled analgesia.¹¹

In the present study, time for first rescue analgesic was longer in group T (5.5 ± 2.8 hours) compared to Infiltration group (2.5 ± 1.36 hours). MT Ayodogmus *et al.* also demonstrated a statistically significant difference in first analgesic application time (LIA 2.63 ± 1.83 vs TAP 6.11 ± 6.2) ($p=0.003$). Vijaylaxmi Sivapurapu *et al.* compared bilateral TAP block with LIA using 0.25% bupivacaine and noted the time for first request of analgesia as well as visual analogue scale at that time (VAS T-rescue). They used morphine 0.1mg/kg IV as rescue analgesic, TAP proved its superiority in their study ($p=0.001$) as well.

CONCLUSION

From these observations and analysis, it can be inferred that TAP block provides better analgesia in comparison to local anesthetic infiltration, TAP block also prolongs the time interval for first rescue analgesic, TAP block decreases the total analgesic consumption. It can be concluded that the TAP block is a safe and effective procedure for providing postoperative analgesia after Caesarean sections.

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Ethical Declaration: Ethical Clearance was obtained from the institutional ethics committee of Bhaskar Medical College prior to the commencement of study.

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