

Original Article

ANALGESIC EFFECT OF TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK FOR ABDOMINAL SURGERY: COMPARISON WITH STANDARD POST OPERATIVE CARE

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Objective: To compare post operative pain in patients undergoing TAP block with that of standard post operative care in patients undergoing abdominal surgery.

Material & Methods: Fifty patients (21 males, 29 females) with ASA class I and II undergoing abdominal surgery were included in the study. Half of the patients selected through randomization received TAP block using landmark technique at the end of surgery under anaesthesia. The remaining half received standard post operative analgesia with nalbuphine and diclofenac sodium injections. All patients were questioned regarding the degree of analgesia on a Pakistan Coin Pain Scale till 12 hours post operatively. Use of analgesics was compared in the two groups postoperatively.

Results: The degree of pain was significantly lower in patients receiving TAP block compared with standard postoperative care (mean score 06 vs 16 $p < 0.05$). The quantity of nalbuphine (0.32 vs 4.08 $p < 0.01$) and diclofenac sodium (9.0 vs 63 $p < 0.01$) were significantly reduced in patients receiving TAP block compared with standard post operative care.

Conclusion: Transversus abdominis plane block provides effective post operative analgesia and is associated with markedly reduced analgesic consumption.

Key Words: TAP Block; Postoperative Analgesia; landmark technique.

Introduction

Worldwide, the very thought of postoperative surgical pain is a nightmare for any patient scheduled for surgery, leave alone the actual postoperative pain. Despite all the steps, pain relief is not up to the mark with frequent side-effects due to increased use of analgesics in order to calm the patient. Adequate pain relief involves multi-modal, multi-disciplinary approach and use of narcotics & anti-inflammatory drugs.

Transversus Abdominis Plane (TAP) block, a new rapidly expanding regional analgesia technique, is being used worldwide. It was introduced in Ireland by a physician of Pakistani origin, Dr. Rafi, for post operative analgesia in patients undergoing abdominal surgery in 2001.¹ The technique was originally described as 'single pop technique' but later on modified by McDonnell as 'double pop technique'.¹ The technique is gaining popularity due to its relative simplicity and efficacy. Postoperative significant analgesia is provided regardless of whether used after general or spinal anaesthesia.

Pakistan is a developing country with tremendous economic and trained human resource constraints, with heavy turnout in government run hospitals. Need for utilizing techniques that can comfort patients postoperatively with our restrictions led us to the use of TAP block in abdominal surgeries.

Presently, ultrasound guided TAP block studies are being carried out in the west. However, we used anatomical land mark technique owing to limited resources.

Anatomy:

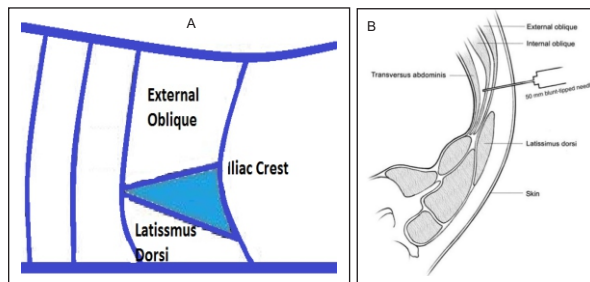
Anterior abdominal wall is formed by three muscular layers: external oblique, internal oblique and transversus abdominis. Innervation of anterolateral abdominal wall arises from the anterior rami of T7 to L1 spinal nerves. The anterior divisions enter abdominal wall between the internal oblique and transversus abdominis muscles & reach rectus abdominis, which they perforate and end as anterior cutaneous branches supplying skin of the front of abdomen. The space between rectus abdominis and internal oblique muscle is the Transversus Abdominis Plane, known popularly as TAP. There is extensive branching & communication between nerves within this transversus abdominis plane.

TAP Block:

Two techniques are currently used to perform TAP block, i.e., Landmark technique and Ultrasound-guided technique. The aim of TAP block is to place a large volume of local anaesthetic agent in the fascial plane between the internal oblique and transversus

abdominis which contains the nerves from T7 to L1 (**Figure 1**). The landmark technique is a blind technique based on anatomical landmarks. In this technique, the point of entry is lumbar triangle of Petit (LTOP) situated between the lower costal margin & iliac crest, bound anteriorly by the external oblique and posteriorly by latissimus dorsi in mid axillary line (**figure 1**). This method relies on feeling double pops as the needle traverses external oblique & internal oblique muscles perpendicularly. A blunt needle makes loss of resistance more appreciable. A single bolus injection is given in LTOP (**figure 2**). Anterior border of TAP is linea semilunaris which is aponeurosis of internal oblique, external oblique & transversus abdominis; that extends from cartilage of rib 9 to pubic tubercle. Superior border is subcostal margin, cartilages of 9 to 12 ribs and continued into border of latissimus dorsi muscle & LTOP. Inferior border is inguinal ligament, iliac crest & posterior border of LTOP. TAP thus provides a space into which local anesthetics can be deposited to achieve myocutaneous sensory blockade.

Figure-1: A: Lumbar triangle of Petit between external oblique muscle and latissimus dorsi. B: Placement of a TAP block.



In ultrasound guided technique, the probe is placed in a transverse plane to the lateral abdominal wall in mid axillary line, between the lower costal margin and iliac crest. The use of ultrasound allows for accurate deposition of the local anesthetic in the correct neurovascular plane. However, dependency on ultrasound machine would be a limiting factor for this technique.

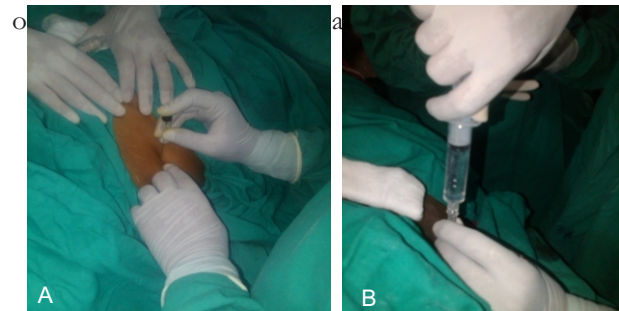
TAP block has been used in various types of abdominal surgeries, e.g., appendectomy, hernia repair, caesarean section, abdominal hysterectomy, prostatectomy and laparoscopic surgeries. Bilateral blocks can be given for midline incisions.

Objective

To compare analgesic effect of Landmark

Technique TAP block with that of standard post operative analgesia in patients undergoing abdominal surgery.

Figure-2: A: Perpendicular needle insertion at angle



Material and Methods

This study was conducted in Anaesthesia Department of Services Hospital / Services Institute of Medical Sciences Lahore, in August & September 2011. Approval for the study was obtained from hospital ethical committee. It was a randomized control trial (RCT). Fifty patients undergoing abdominal surgeries were selected for the study. Sample size of 50 cases (25 in each group) was calculated with 95% confidence level, 80% power of test and taking expected mean \pm S.D of mean pain score in both groups i.e. 1.7 in TAP block group versus 3.1 ± 1.5 in standard care groups at 24 hrs in patients undergoing elective surgical procedures. A study done by G. McDonnell J et al on 32 adults undergoing large bowel resection concluded that patients undergoing TAP block had reduced VAS pain score as compared to standard postoperative care at 24 hours i.e. (1.7 ± 1.7 vs 3.1 ± 1.5) and similarly mean analgesia requirement in first 24 postoperative hours were also reduced i.e. 21.9 ± 8.9 mg vs 80.4 ± 19.2 mg in both groups respectively. The patients were divided into two equal groups (A & B) by randomization. Group A patients received TAP block following abdominal surgery. Group B received standard post operative care.

Inclusion Criteria:

- ASA I & II patients
- 18 to 80 yrs of age.
- Both male and female undergoing elective abdominal surgeries.

Exclusion Criteria:

- allergy, local infection.
- Weight above 90 kg.
- Previous abdominal wall surgeries

Technique:

All patients underwent same general anesthetic management regimen for surgery. Injection nalbuphine (0.05 mg/kg) and injection midazolam (0.025 mg/kg) were given at induction. Injection propofol (1-2 mg/kg) was used for induction. Muscle relaxant injection atracurium was used both for airway control as well as muscle relaxation. Oxygen, nitrous oxide and isoflurane were given for maintenance. Both groups were given post operative analgesia as well as rescue analgesia as and when required with 75 mg intramuscular diclofenac sodium intramuscular injection or 2 mg intravenous nalbuphine injection according to severity of pain. TAP block was given using landmark technique at end of surgery after skin suturing while patient was still under light plane of anesthesia. Abdomen was repainted and strict asepsis was observed. Angle of Petit was located and a 22G blunt spinal needle (Whitacare) was advanced perpendicularly in the mid axillary line. 'Two pop' technique was used: first pop when needle penetrated external oblique muscle and the second as it penetrated the internal oblique fascial layer and entered the TAP. On reaching TAP plane, free flow without resistance on the syringe piston was felt. In case resistance was felt, the needle was withdrawn and reinserted. A cocktail comprising 10ml of lignocaine 2% with adrenaline, 10ml of bupivacaine 0.5% and 10ml of distilled water was injected. The total injection volume for unilateral injection was 30 ml. Bi-lateral blocks were given for patients with midline incisions.

Assessment of post operative analgesia:

An observer blinded of the block administered to the patient, assessed the degree of pain experienced by each patient using Pakistan Coin Pain Scale (PCPS)ⁱⁱ. Each patient was asked to describe the pain in terms of Pakistani Paisa out of one Rupee. 75 paisa and above was taken as severe pain, 50 paisa as moderate, 25 paisa or below as minor pain. Those who reported 75 paisa or more pain were given diclofenac sodium plus nalbuphine injections. Those reporting 50 to 75 paisa pain were given only nalbuphine and those with 25 paisa or less pain were given only diclofenac injection. Patients between the two ends were monitored to whatever quantity of analgesics they settled to. Observation was carried out till 12 hours post operatively, at three hour

intervals. Total quantity of nalbuphine and diclofenac sodium injections given to each patient was also noted.

Statistical Analysis:

Quantitative variables in two groups were compared using student's t test. Qualitative variables were compared using chi square test. Statistical package for social sciences (SPSS) for Microsoft Windows was used for statistical analysis.

Results

Group A comprised 11 males and 14 females while group B comprised 10 males and 15 females. The degree of pain on Pakistani coin scale was significantly lower in group A (TAP Block) compared with group B (standard postoperative care). The mean score in group A was 6 ± 11.18 compared with 16 ± 16.07 in group B ($p < 0.05$) (**figure-3**). The quantity of nalbuphine was significantly lower in group A compared with group B (0.32 ± 0.945 vs 4.08 ± 1.935 $p < 0.01$) (**figure 4**). Similarly, consumption of diclofenac injection was significantly lower in group A compared with group B (9.0 ± 24.875 vs 63 ± 55.958 $p < 0.01$) (**figure 5**). Qualitatively, the number of patients who received post operative analgesia with diclofenac sodium or nalbuphine injections was much lower in group A compared with group B (**table 1**).

Discussion

The use of TAP block for control of post operative pain has been described for various types of abdominal surgeries.^{3,4} TAP block has been shown to be effective for post operative analgesia following abdominal surgeries.³ However, most of the studies with TAP block have been done using ultrasound guided technique.^{3,7} Unavailability of ultrasound machine and lack of expertise in its usage is a limiting factor for this technique in most of centers with limited resources. Our study was performed using landmark technique due to non-availability of ultrasound machine in the anesthesia department of our hospital. Our study clearly demonstrates the effectiveness of landmark technique.

Most of studies on effectiveness of TAP block have used analog visual pain score for assessment of severity of pain. Lack of literacy in our setup makes it difficult to use this pain score. Therefore, we used a Pakistani coin pain scale. This pain scale was introduced by Dr. Salim and is analogous to

commonly used methods for description of proportions in our society.³

Figure-3: Comparison of pain in TAP and control groups using Pakistan Coin Pain Scale (PCPS).

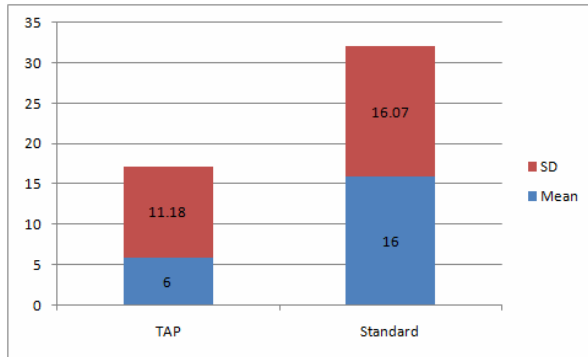
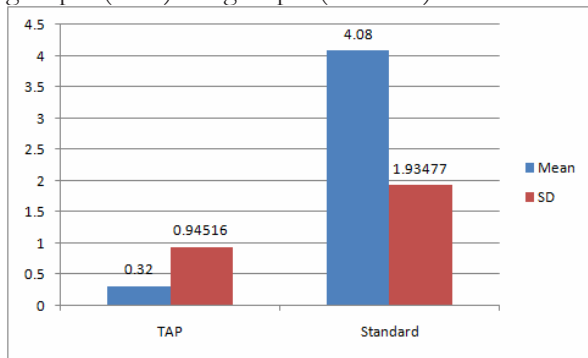


Figure-4: Consumption of nalbuphine injection in group A (TAP) and group B (standard).



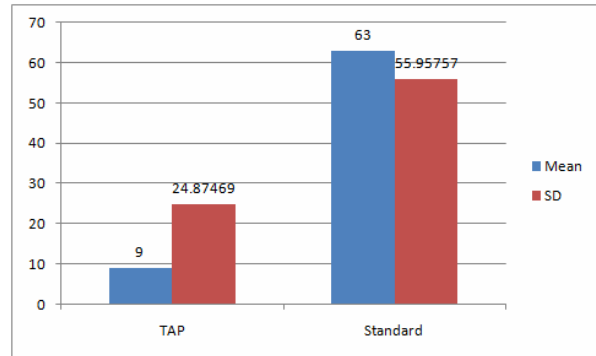
In our study, the mean pain score was markedly reduced in group A compared with group B. Our results are in agreement with those of earlier researchers. El Bayoumy has demonstrated reduced pain score after TAP block in patients undergoing laparoscopic cholecystectomy.³ Similarly, Bharti N et al have also demonstrated lower pain scores in patients receiving TAP block following colorectal surgery.⁷

Use of TAP block has been shown to be associated with markedly reduced consumption of narcotic and analgesic injections in the post operative period in our study. This is also in agreement with the results of other researchers who have shown reduced

Table-1: Number of patients who needed analgesic injection in groups A and B.

	Group A (TAP)	Group B (Standard)	Significance
Diclofenac	3	16	p<0.05
Nalbuphine	3	24	p<0.05

Figure-5: Consumption of Diclofenac sodium injection in group A (TAP) and group B (standard).



consumption of narcotics for post operative analgesia and their associated side effects.⁷ This technique needs to be studied for longer post operative period. Our limitations primarily of human resources did not allow us to do so. However, couple of patients were followed up for more than 24 hours and found to be up and about much early and cheerful as compared to other group, with no pain. This technique needs to be explored in developing countries as tremendous results may be seen in patients' well being with early mobilization, along with expected short hospital stay.

Conclusions

Transversus abdominis plane block with landmark technique provides effective post operative analgesia and is associated with markedly reduced analgesic consumption. TAP Block using landmark technique is useful and highly effective mode of quality postoperative analgesia at minimal cost, with no reported major side effects so far.

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References

1. McDonnell JG, O'Donnell B, Curley G, Heffernan A, Power C, Laffey JG. The analgesic efficacy of transversus abdominis plane block after abdominal surgery: a prospective randomized controlled trial. *Anesth Analg*. 2007 Jan;104(1):193-7.
2. Salim M. Pakistan Coin Pain Scale. *J Coll Phys Surg Pak* 1992; 2(4).
3. Petersen P. The transversus abdominis plane block: a valuable option for postoperative analgesia? *Acta Anaes Scand* 2010;54:529-35.
4. Young MJ, Gorlin AW, Modest VE, Quraishi SA. Clinical Implications of the Transversus Abdominis Plane Block in Adults. *Anesthesiology Research and Practice*. 2012;2012:1-11.
5. Bharti N, Kumar P, Bala I, Gupta V. The efficacy of a novel approach to transverses abdominis plane block for post operative analgesia after colorectal surgery. *Anesth Analg*. 2011 Jun;112(6):1504-8.
6. El-Dawlatly AA, Turkistani A, Kettner SC, Machata AM, Delvi MB, Thallaj A et al. Ultrasound-guided transversus abdominis plane block: description of a new technique and comparison with conventional systemic analgesia during laparoscopic cholecystectomy. *Br J Anaesth*. 2009 Jun;102(6):763-7.
7. Singh M, Chin KJ, Chan V. Ultrasound-guided transversus abdominis plane (TAP) block: a useful adjunct in the management of postoperative respiratory failure. *J Clin Anesth*. 2011 Jun;23(4):303-6.
8. Hebbard P, Fujiwara Y, Shibata Y, Royse C. Ultrasound-guided transversus abdominis plane (TAP) block. *Anaesth Intensive Care* 2007;35: 616-7.
9. Baaj JM, Alsatli RA, Majaj HA, Babay ZA, Thallaj AK. Efficacy of ultrasound-guided transversus abdominis plane (TAP) block for post cesarean section delivery analgesia--a double-blind, placebo-controlled, randomized study. *Middle East J Anesthesiol*. 2010 Oct;20(6):821-6.
10. Ra YS, Kim CH, Lee GY, Han JI. The analgesic effect of the ultrasound-guided transverse abdominis plane block after laparoscopic cholecystectomy. *Korean J Anesthesiol*. 2010 Apr;58(4):362-8.
11. Salim BM. Pakistan coin pain scale. *Pain*. 1993 Mar;52(3):373-4.
12. El Bayoumy R, Khan O, King E, Wainwright D, Sadek S. Trans-abdominal plane (TAP) block analgesia in day case laparoscopic cholecystectomy - A prospective study: *Eur J Anaesthesiol* 2010 June; 27(47):222.
13. McDonnell JG, Curley G, Carney J, Benton A, Costello J, Maharaj CH et al. The analgesic efficacy of transversus abdominis plane block after cesarean delivery: a randomized controlled trial.