

## Transversus Abdominis Plane (TAP) Block as a Sole Anesthetic for Inguinal Hernia Repair and for Postoperative Pain Management in Patients Undergoing Lower Abdominal Surgeries

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Received March 22, 2019; Accepted March 28, 2019; Published April 09, 2019

### ABSTRACT

Postoperative pain management in patients with cardiac and other multiple co-morbidities undergoing lower abdominal surgeries like abdominal hysterectomy, inguinal hernia repair, prostatectomy, caesarean delivery poses a challenge to anesthetists. Many techniques have been tried, like Transversus Abdominis Plane block (TAP), paravertebral block, quadratus lumborum plane block, inguinal field block, continuous epidural anesthesia are a few.

In this review article, the effectiveness of TAP block as a sole anesthetic for inguinal hernia repair and postoperative pain management in patients undergoing lower abdominal surgeries have been highlighted.

**Keywords:** TAP block, Inguinal hernia, Lower abdominal surgeries

### INTRODUCTION

TAP (Transversus Abdominis Plane) block is a newly introduced regional anesthetic technique where the local anesthetic is deposited in the potential space between the internal oblique and transversus abdominis muscle in the abdominal wall. It has been used in patients undergoing Caesarean delivery, total abdominal hysterectomy, appendectomy, inguinal hernia repair, and also radical prostatectomy and found to provide excellent analgesia postoperatively [1,2].

Transversus Abdominis Plane is formed by the subcostal margin, from 9<sup>th</sup> to 12<sup>th</sup> costal cartilage, continued into the border of the latissimus dorsi superiorly, inguinal ligament, iliac crest below and linea semilunaris anteriorly. Anterior rami of T7-T11 nerves continue from intercostal space to enter the abdominal wall in this TAP to reach the rectus abdominis muscle which they pierce to supply the skin in front of the abdomen. The intercostal, subcostal, iliohypogastric and ilioinguinal nerves course through the lateral abdominal wall within the TAP before piercing the muscle to innervate the abdominal wall, upper anterior part of the gluteal region and upper and medial part of the thigh and part of the skin covering the genitalia [3-6].

TAP block, as described by Mukhtar [6], provides anesthesia to parietal peritoneum as well as skin and muscles of anterior abdominal wall by blocking these nerves.

In 1993, Kuppuvelumani et al. [7] injected local anesthetic (0.5% Bupivacaine 20 ml on each side) into a point just above the iliac crest, bilaterally and found it to be useful as a technique for postoperative pain management in patients undergoing caesarean section. Rafi [8] formally described and portrayed it as a new abdominal field blocks with a targeted single shot local anesthetic delivery into the TAP. Since then it has undergone several modifications. McDonnell et al. [9] adopted the term TAP block in 2007 and demonstrated its utility for postoperative pain management in patients undergoing lower abdominal surgeries.

The drug injected into the TAP spreads from the superior margin of the iliac crest to the level of the costal margin and posteriorly up to the quadratus lumborum muscle [10-16].

TAP block is given using either conventional landmark technique or using Ultra Sound Guidance.

In the landmark technique, TAP is accessed as described by

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**Citation:** Venkatesh Murthy KT. (2019) Transversus Abdominis Plane (TAP) Block as a Sole Anesthetic for Inguinal Hernia Repair and for Postoperative Pain Management in Patients Undergoing Lower Abdominal Surgeries. *Int J Anaesth Res*, 2(1): 35-38.

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McDonnell et al. [9] via the lumbar triangle of Petit (LTOP), whose base is formed by the iliac crest, anterior border by the lateral border of external oblique muscle and posterior border by the latissimus dorsi muscle, using 18 G Tuohy's needle. The needle is inserted perpendicular to the skin just above the highest point of iliac crest, in the posterior axillary line. Needle is gently advanced until a "pop" was felt - indicating the needle piercing the external oblique fascia. The needle is further advanced until a second "pop" was felt; indicating piercing of the internal oblique fascia and entering the transversus abdominis plane [2]. After aspiration to exclude any vascular injury and malposition of the needle tip, the intended drug is injected not exceeding the toxic dose. (2.5 mg/kg)

In the USG technique, USG is used to insert the needle in plane and inject the drug into TAP [17,18].

The landmark technique is simple and easy to perform while USG technique can improve accuracy and reduce complications. The success rate has been claimed to be 85% in experienced hands. TAP block is increasingly becoming popular because of its simplicity in performing and also its effectiveness.

Duration of post-operative analgesia (time interval between TAP block given and the time to first dose of analgesic requested by the patient), Patient's acceptability and satisfaction, post-operative opioid/other analgesics (ketamine, NSAIDs, alpha 2 agonists and paracetamol) consumed in the first 24-48 h, complications such as block failure, bleeding, wound infection, respiratory depression, local anesthetic toxicity, nausea and vomiting requiring treatment are noted as monitored parameters. Pain scores (VAS) were assessed at 2, 4, 6, 12, 24, 36 h post-operatively.

Laffey and McDonnell [19] in their study found that the upward spread of local anesthetic in the TAP takes longer time and estimation of upper level of the block before the spread of the drug is inaccurate.

Aveline et al. [20] in their randomized control study, compared TAP block and ilioinguinal/iliohypogastric nerve block for inguinal hernia repair on 273 patients as a day care procedure and found that USG TAP block provided better post-operative analgesia and reduced opioid demand than blind IHN/IIN block. Patients who received a TAP block experienced less pain at rest on VAS scale at 4, 12 and 24 h post-operatively.

Their study included enough patients (134 in TAP block and 139 in IHN/IIN block) to obtain some definitive information about the complications and quality and duration of analgesia. The results of their study was in accordance with the study conducted by various scientists, who concluded that TAP block provided effective analgesia during first 24 h after lower abdominal surgeries.

Many other studies who have used landmark technique for TAP block have shown that TAP block provides effective post-operative analgesia in the first 24-48 h with reduced (>70%) dose of opioid and other analgesic requirement in the first 24 h with reduced incidences of post-operative complications [8-14].

Individual studies by Mishra et al. [21] and meta-analysis and reviews of clinical studies by many other authors revealed that TAP block is an excellent mode of post-operative pain management, especially in lower abdominal surgeries and in patients with multiple co-morbidities.

Some studies have reported using USG placement of an epidural catheter in the TAP for continuous TAP block. Resistance to catheter insertion can be reduced by injecting 5-10 ml of saline into the TAP beforehand [17].

Many of the anesthetists have used different drugs like, 0.5% bupivacaine, 0.5% L-bupivacaine, 1.5% mepivacaine, 0.75% ropivacaine in their separate studies and found that TAP block can be used as an alternative technique for post-operative pain management in patients undergoing lower abdominal surgeries, especially in patients with multiple co-morbidities, and found that USG TAP block gives better results than blind technique [19,22-24].

The onset and duration of analgesia varied with the concentration and volume of the drug used and also the pharmacodynamics of the drug used.

In our studies, conducted in Rajarajeswari Medical College, Bengaluru, India, we have followed blind landmark technique as described by McDonnell et al. [2,4] in 2007, in anesthetizing 60 patients undergoing unilateral inguinal hernia repair as sole anesthesia technique and also in another study, estimating the efficacy of bilateral TAP block for post-operative analgesia in 60 patients undergoing elective Caesarean deliveries using 0.5% bupivacaine in 30 patients and 0.75% ropivacaine in another 30 patients. We have found that TAP block can be used as a sole anesthetic technique for inguinal hernia repair. It also gives excellent post-operative analgesia in patients undergoing elective Caesarean delivery. The onset and duration of analgesia varied with the drug used and the concentration at which it is used.

## CONCLUSION

As with the conclusion of the previous authors studies and conclusion, along with the results of our study, it can be concluded that TAP block given either by landmark technique or USG technique, USG catheter for continuous TAP block or sub-costal USG TAP block, is an excellent alternative anesthetic technique in patients undergoing inguinal hernia repair and an excellent alternative postoperative analgesic technique in patients undergoing caesarean delivery, total abdominal hysterectomy, radical

prostatectomy, appendectomy with least postoperative complications.

Though many other techniques like paravertebral block, quadratus lumborum block, erector spinae block, rectus sheath block, inguinal field block have been introduced for postoperative analgesia in patients undergoing lower abdominal surgeries and claim that quadratus lumborum block and erector spinae block are excellent modes of providing postoperative analgesia in patients undergoing lower abdominal surgeries, TAP block performed using US guidance by an experienced anesthetist still has its role as a postoperative technique in such patients.

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