

## Efficacy of the Transversus Abdominis Plane ( TAP ) Block for Lower Abdominal Surgeries in high risk patients: A prospective study.

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**Abstract :** The study included 40 patients category ASA II-III, scheduled for lower abdominal surgery, over a period of one year from May 2010 to April 2011. The triangle of Petit was located just anterior to the Latissimus Dorsi muscle. Local anaesthesia 2.0ml of 2% lignocaine was given at the site of injection for tap block. Using a 20 G Tuohy's needle, the skin was pierced just cephalad to the iliac crest over the triangle of Petit . The needle was then advanced at right angles to the skin gently, in a coronal plane, into the Transversus Abdominis fascial plane. After careful aspiration to exclude vascular puncture, 20 mL of 0.5% bupivacaine solution was injected into the plane. Pain severity was measured using a categorical pain scoring system (none = 0; mild = 1; moderate = 2; severe = 3). We studied 40 male patients, in the age group 70 +/- 4.5 years, selected randomly to undergo inguinal hernia repair under TAP block. The mean duration of surgery was 60 +/- 8.5 minutes. Eighteen (45%) patients had no pain and remained comfortable throughout the procedure. Eight (20%) patients required additional analgesia in the form of Injection Tramadol (50 mg). Fourteen (35%) patients required supplemental anesthesia peri-operatively and were considered as failures. There were no procedure related complications or mortality.

**Conclusion:** TAP block is a safe and effective adjunct to multimodal anesthesia and post-operative analgesia for abdominal surgery. TAP block administration using the landmark method as used in our study requires more skill and experience and has a slightly higher failure rate as compared to ultrasound guided TAP block.

### INTRODUCTION

The Transversus Abdominis plane (TAP) block is a regional anesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall<sup>1</sup>. A substantial component of the pain experienced by patients after abdominal surgery is derived from the abdominal wall incision. The abdominal wall consists of three muscle layers, the external oblique, the internal oblique, and the transversus abdominis and their associated fascial sheaths. The central abdominal wall also includes the rectus abdominis muscle and its associated fascial sheath. This muscular wall is innervated by nerve afferents that course through the transversus abdominis neuro-fascial plane. On the basis of anatomic studies, we identified the lumbar triangle of Petit as a potential access point to this neuro-fascial plane. This triangle is bounded posteriorly by the latissimus dorsi muscle and anteriorly by the external oblique, with the Iliac crest forming the base of the triangle, and is a fixed and easily palpable landmark. By introducing local anesthetics into the transversus abdominis plane via the triangle of Petit, it is possible to block the sensory nerves of the anterior abdominal wall before they pierce the musculature to innervate the abdomen<sup>1</sup>.

### MATERIALS AND METHOD

The aim of the study was to see the efficacy of TAP block for lower abdominal surgery in high risk patients who can be difficult to wean off the ventilator in case they are given general anaesthesia and in patients who have contraindication for spinal anaesthesia.

The study included 40 patients ASA II-III, scheduled for lower abdominal surgery, over a period of one year from May 2010 to April 2011. A written informed consent was taken from each patient.

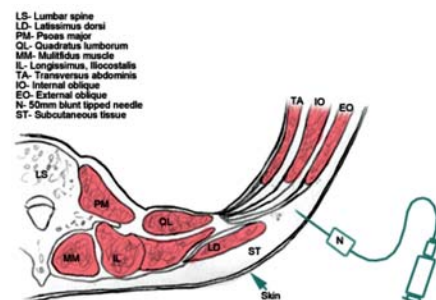
**Exclusion criteria :** Patients with history of allergy to local

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anaesthetics, infection at the site of injection, patient refusal or inability to co-operate.

All the patients were pre-medicated with tab lorazepam 2 mg for anxiolysis and tab tramadol 50 mg for intraoperative and postoperative pain relief. The TAP block was given with the patient in supine position.

The iliac crest was palpated from anterior to posterior until the latissimus dorsi muscle could be felt. The triangle of Petit was then located just anterior to the latissimus dorsi muscle. Local anaesthesia 2.0 ml of 2% lignocaine was given at the site of injection for tap block. Using a 20 G Tuohy's needle, the skin was pierced just cephalad to the Iliac crest over the triangle of Petit as shown in fig 1. The needle was then advanced at right angles to the skin, in a coronal plane, until resistance was encountered. This resistance indicated that the needle tip was at the external oblique muscle. Gentle advancement of the needle resulted in a "pop" sensation as the needle entered the plane between the external and internal oblique fascial layers. Further gentle advancement of the needle resulted in a second pop, which indicated entry into the Transversus Abdominis fascial plane. After careful aspiration to exclude vascular puncture, 20 mL of 0.5% Bupivacaine solution was injected into the plane. Surface anatomical landmark for the TAP block is shown in fig 2.



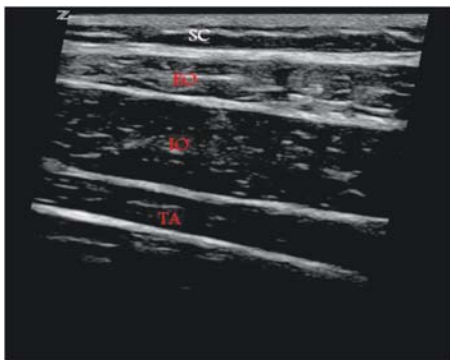
**Figure 1:** Line drawing of a transverse section through the abdominal wall at the level of the lumbar triangle of Petit.<sup>2</sup>



**Figure 2:** Surface anatomy labelled for landmark insertion of TAP block in an adult male in the supine position.<sup>3</sup>

The transversus abdominis plane can also be located by ultrasound guidance and the needle advanced under real time ultrasound monitoring as shown in fig 3. The floor of the triangle is composed, from superficial to deep, of the fascial extensions of external oblique, internal oblique and transversus abdominis, respectively, and the peritoneum. The needle is inserted through the triangle, using the loss-of-resistance technique. The needle is shown in the transversus abdominis plane, and the fascial layers have separated as a result of the injection of local anaesthetic. Pain severity was measured using a categorical pain scoring system (none = 0; mild = 1; moderate = 2; severe = 3).

The block was considered to be successful if no additional drug was required to provide analgesia. Patients who had severe pain during the surgery and required additional analgesics throughout the surgery were considered to have a failed TAP block.



**Figure 3:** Image of the abdominal wall as seen with the help of an ultrasound. SC: subcutaneous tissue, EO: External Oblique muscle, IO : Internal Oblique muscle, TA : Transversus Abdominis muscle .

## RESULTS

**Baseline patient characteristics :** Age(yrs) : 70 +/- 4.5; Sex : all male patients; Weight : 72 +/- 3.8; Duration of surgery (min) : 60+/-8.5. Forty (40) male patients were randomly selected to undergo inguinal hernia repair under TAP block. The block was given by the same anaesthetist to all the patients. Pain severity was measured using a categorical pain scoring system (none = 0; mild = 1; moderate = 2; severe = 3).

Eighteen(45%)out of the 40 patients had no pain and remained comfortable throughout the procedure. Eight(20%) had mild pain during the perioperative period and they were given additional dose of injection tramadol 50mg. After the additional dose of analgesic

they remained comfortable throughout the surgery.

Fourteen (35%) patients had severe pain during the procedure and they had to be given supplemental anaesthesia throughout the perioperative period. Failed TAP block was considered in these patients. In our study no complications were noticed as a result of the block except for inadequate effect and failed block. The outcome characteristics of the study are shown in the following Table.

**Table-:** Outcome during procedure

	No of cases- n	Percentage-%
No pain during procedure	18	45
Mild pain	8	20
Severe pain requiring supplemental anaesthesia	14	35
<b>Total</b>	<b>40</b>	<b>100</b>

One of the important complications of the landmark technique is the peritoneal placement of the block needle which was not noticed in our study.

## DISCUSSION

The skin, muscles, and parietal peritoneum of the anterior abdominal wall are innervated by the lower six thoracic nerves and the first lumbar nerve. The anterior primary rami of these nerves leave their respective intervertebral foramina and course over the vertebral transverse process. They then pierce the musculature of the lateral abdominal wall to course through a neuro-fascial plane between the internal oblique and transversus abdominis muscles. The sensory nerves branch first in the mid-axillary line sending out a lateral cutaneous branch, and continue within the plane to perforate anteriorly supplying the skin as far as the midline. The transversus abdominis plane thus provides a space into which local anaesthetic can be deposited to achieve myocutaneous sensory blockade. Deposition of the local anaesthetic dorsal to the mid-axillary line also blocks the lateral cutaneous afferents, thus facilitating blockade of the entire anterior abdominal wall. The lumbar triangle of Petit offers an easily identifiable, fixed and palpable landmark, and is located dorsal to the mid-axillary line. The transversus abdominis neuro-fascial plane can easily be accessed via this triangle, and local anaesthetic deposited into this plane, using the loss of resistance technique as we have described.

TAP block can be used for any surgery involving the lower abdominal wall. This includes bowel surgery, caesarean section, appendectomy, hernia repair, umbilical surgery and gynaecological surgery. A single injection can achieve sensory block over a wide area of the abdominal wall. The block has been shown to be useful in upper abdominal surgery, but the upper extent of the block and its use in upper abdominal surgery are controversial.<sup>4,5</sup>

TAP block is particularly useful for cases when an epidural is contraindicated or refused. The block can be performed unilaterally eg. for appendectomy<sup>4</sup> or bilaterally when the incision crosses the midline eg. in Pfannenstiel incision. A single injection can be used, or a catheter inserted for several days for analgesic benefit. TAP block also has a role as rescue analgesia on awake postoperative patients who did not receive blocks prior to abdominal surgery<sup>5</sup>.

Regional anaesthesia in general has a very low rate of serious complications<sup>6</sup>. The risk in regional anaesthesia varies with the type and location of the block. General risks of regional blockade include: needle trauma, intraneural injection, neural ischaemia, inadvertent intravascular injection, local anaesthetic toxicity, infection and poor/failed block. The general risks for regional blockade are applicable

to the TAP block, however the site of injection for the TAP block is relatively low risk. The landmark technique relies on the 'pop' sensation which some clinicians believe is an imprecise sign. The identification of the landmarks is more challenging in the obese hence the risk of peritoneal perforation is probably higher. If anatomy is abnormal, such as hepatomegaly, there is risk of damage from the needle puncture<sup>7</sup>. Ultrasound techniques are likely to improve the safety of this block as the needle passage and injection can be followed in real time<sup>8</sup>. Some authors argue that peritoneal perforation with a small gauge sterile needle is not likely to be significant<sup>9</sup>.

Ultrasound guidance for performance of this block has become the method of choice<sup>10</sup> and it was not done in our study because of its non-availability. We can look forward to conduct more research on this topic with the help of an ultrasound to go for wider range of possible techniques, particularly for targeting the upper abdominal wall. The ease with which this block can be performed, an excellent safety profile to date and outstanding clinical utility, will no doubt lead to increase in popularity and use of the transversus abdominis plane block.

## CONCLUSION

The TAP block is an effective and safe adjunct to multimodal anaesthesia and post-operative analgesia for abdominal surgery. Multiple studies have demonstrated its superiority over standard medical therapy for postoperative pain control. It should be considered as part of a multimodal approach to anaesthesia and enhanced recovery in patients undergoing abdominal surgery. Most of the literature focus on the use of ultrasound guided tap block as the failure rate is very low with it. The main highlight of our study is that tap block using

the landmark technique though is very safe and effective, as we have experienced 65% success rate in our study; it requires more skill and experience and has a slightly higher failure rate as compared to the ultrasound guided TAP block which is a very important drawback in patients who are at high risk for general anaesthesia and have absolute contraindication for spinal or epidural anaesthesia.

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