

## Tap the Potential of Tap Block: A Schematic Representation

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### Abstract

Transversus abdominis plane (TAP) block is an abdominal or truncal field block. Its popularity has increased in the recent times, mainly because its widespread applicability in several abdominal surgeries and less incidence of complications. The advent of ultrasound (USG) has revolutionised regional anaesthesia, in general and TAP blocks, in particular. There are various types of TAP block which can be utilised in various abdominal surgeries for effective analgesia, especially after caesarean sections. This article aims to elucidate in a pictorial format, the nerves traversing the TAP plane (Figure 1), the nerve supply of the abdominal wall (Figure 2), the various positions of TAP block (Figure 3) and the sono-anatomy of the USG-guided TAP block (Figure 4). The potential of this block is tremendous and can be useful in patients with coagulopathies, where epidural block is contraindicated. With improved accuracy of USG-guidance, the volume of local anaesthetic injected has also been reduced, bringing down the toxicity rates. Various adjuvants can also be added to local anesthetics for improving efficacy and duration of analgesia with TAP blocks. It is an analgesic boon in the era of minimally-invasive surgeries, especially laparoscopic and robotic surgeries.

**Keywords:** TAP Block; Abdominal Surgery; Analgesia; Sonoanatomy; USG-Guidance.

The TAP [1] (Transversus Abdominis Plane) lies between the internal oblique and the transversus abdominis muscle. The anterior border of TAP is formed by the *linea semilunaris* extending from the ninth rib cartilage to pubic tubercle. The superior border is formed by the subcostal margin, from the 9<sup>th</sup> to the 12<sup>th</sup> costal cartilage. The inferior border is formed by the inguinal ligament, iliac crest and posterior border of lumbar triangle of Petit. TAP block can be performed either blind, or by LOR (loss of resistance) technique and by ultrasound-guidance, for greater accuracy. USG-guided TAP block can be utilized for insertion of continuous catheter for continued postoperative analgesia with electronic patient controlled analgesia pumps (PCA).

In this article, the TAP plane, the nerves traversing it, the various forms of TAP block according to nerve supply of abdominal wall and

the relevant sono-anatomy of the TAP space is elucidated diagrammatically, rather than in words. This can serve as a starting point for resident anaesthesia training on truncal blocks. It is an extremely useful block, whose potential is yet to be fully tapped.

The Figure 1 represents the nerves traversing the plane between various muscles of the abdominal wall, from the vertebra posteriorly to the rib, anteriorly. The Figure 2 identifies the nerve supply of the anterior abdominal wall at various points, which can be useful in identifying the point of injection.

There are various sites where TAP block can be administered, depending upon the surgical requirements. The following are the broad types of TAP block, as represented pictorially in the Figure 3.

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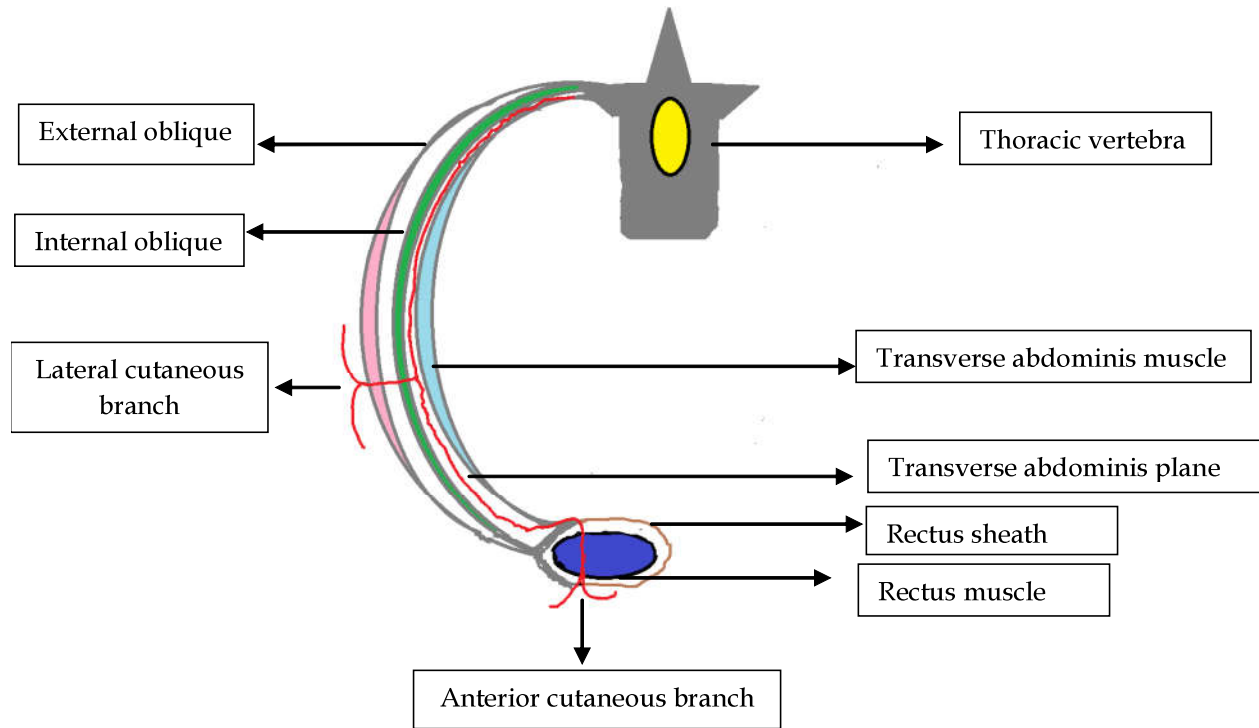


Fig. 1: Transverse Section of abdominal wall showing the path of nerves T7-T12 from spine to anterior abdomen

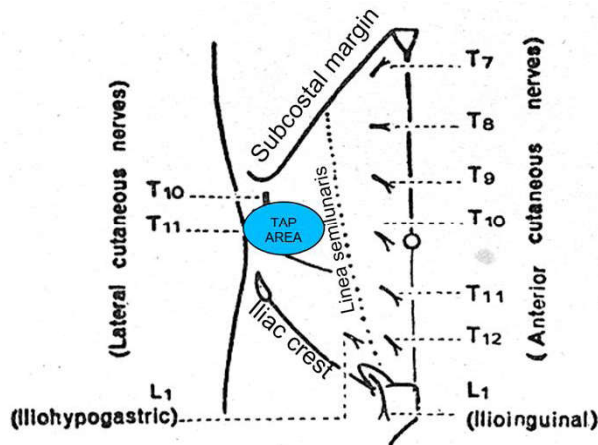


Fig. 2: The cutaneous nerve distribution of anterior abdominal wall with TAP area highlighted

1. Upper subcostal TAP (deep to rectus, mainly covering T7 and T8)
2. Lower subcostal TAP (lateral to rectus, mainly T9)
3. Lateral TAP (midway between costal margin and iliac crest, in mid-clavicular line covering T11- T12)
4. Posterior TAP (in area of triangle of petit)
5. Ilio -inguinal and ilio-hypogastric TAP.

The Figure 4 is a photographic, labelled representation of the various muscles and facial planes of the abdominal wall as seen in an ultrasound image, including the location of the TAP plane injection.

There have been several recent researches, studying the efficacy of TAP blocks in various abdominal surgeries [2], with excellent results and minimal complications, as compared to epidural blocks. The main advantages of TAP block include its lack of haemodynamic disturbances avoidance, dural puncture, motor blockade or urinary retention. This is especially true following Caesarean sections [3], where TAP block is given bilaterally. Many of the clinical research in parturients undergoing Cesarean deliveries showed that TAP block is an effective analgesic option when intrathecal opioids are contraindicated and are not

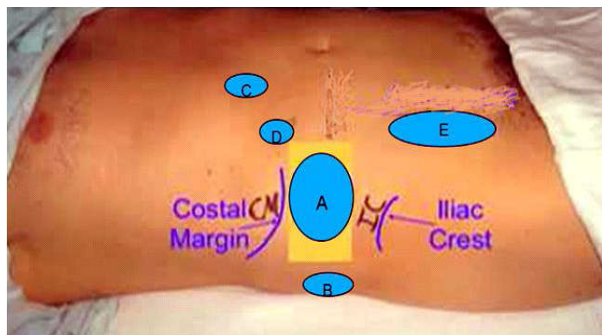


Fig. 3: Diagram of proposed TAP zones A) Lateral TAP, B) Posterior TAP, C) Upper subcostal, D) Lower subcostal, E) Ilioinguinal/hypogastric TAP

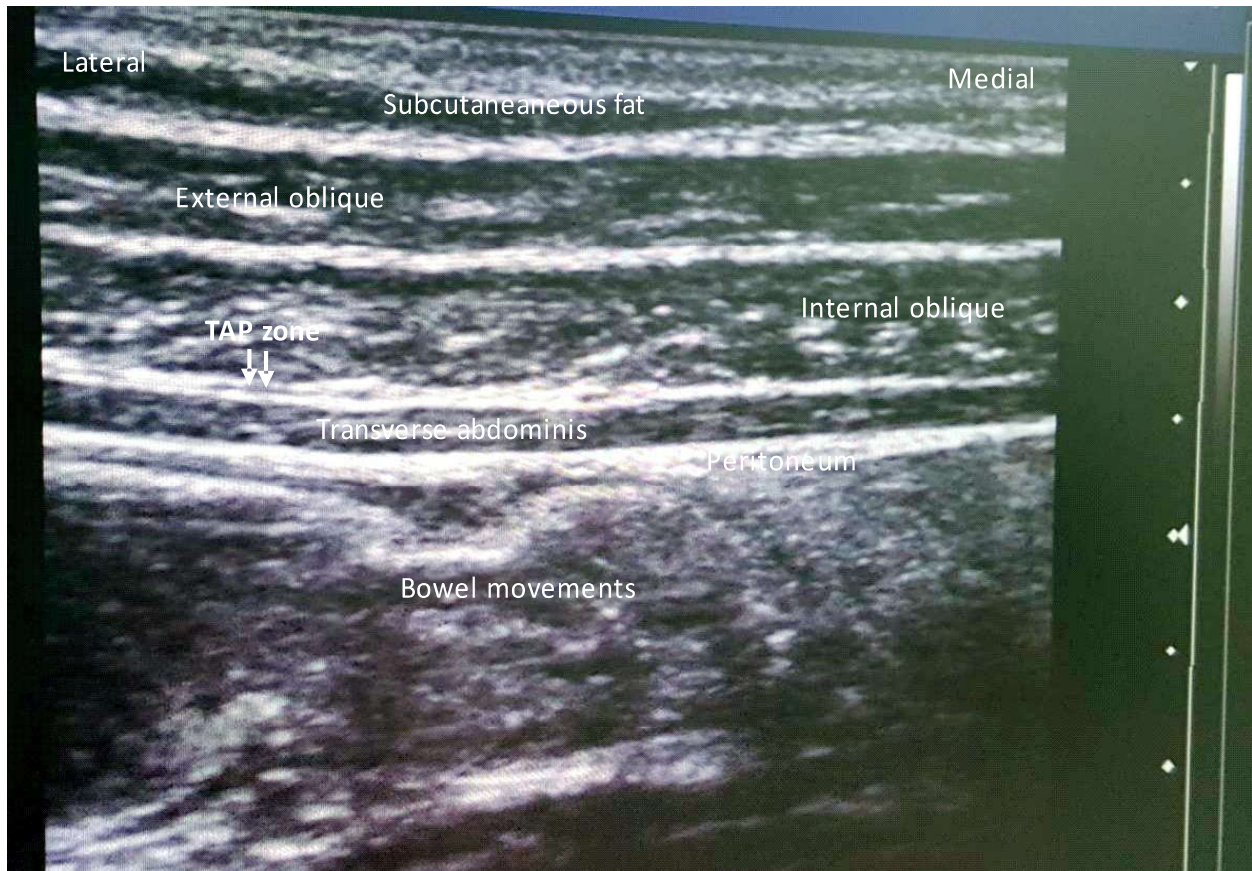


Fig. 4: Ultrasonography picture of TAP area showing different layers of anterior abdominal wall muscles

used. Sharkey A et al, in his meta-analysis, found that TAP block in cesarean section is a viable alternative to reducing opioid consumption and opioid related side effects [3]. R Champneria et al also suggested that TAP block is a very effective pain relief method whenever cesarean section was carried out in general anesthesia [4]. Adjuvants like fentanyl, clonidine and dexmedetomidine can be successfully added in TAP block to prolong the duration of analgesia. In an Indian study, Prashant et al studied the effects of addition of dexmedetomidine (alpha-2 agonist) with ropivacaine (local anesthetic) in TAP block for postoperative pain relief in cesarean deliveries and concluded that Dexmedetomidine prolongs the duration of analgesia due to its slower systemic absorption [5].

Incidence of inadvertent intravascular injections of local anesthetics are much lesser as TAP is relatively an avascular zone. But, care should be given not to cause the underlying organ or bowel injury or hematomas. Ultrasound-guided TAP [6] block is particularly useful in such situations, helping us to visualize the path of needle thorough-

out the procedure. Ultrasound guided and Lap-assisted TAP block are gaining popular in surgeries for hernia repairs (both open and laparoscopic), laparoscopic cholecystectomies, laparoscopic nephrectomies and laparoscopic sleeve gastrectomy (bariatric surgery).

It has recently found use as an analgesic in the state of the art, robotic surgeries [7] as well, which also employ pneumoperitoneum. When given preoperatively, it can reduce intra-operative anaesthetic requirements. Excellent postoperative analgesia can be accomplished with continuous catheter techniques, inserted under USG-guidance. The various types of TAP [8] can be utilised in different settings for maximal efficacy, in both laparotomies and laparoscopic surgeries.

The future of TAP blocks is bright, as more and more research is surfacing, highlighting its immense utilities and enhanced accuracy with ultrasound guidance [9]. Further randomised controlled trials are required to cement its efficacy in robotic surgeries, especially in minimally-invasive radical cancer surgeries.

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