

Nerve Blocks of the Anterior Abdominal Wall

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Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

Nerve blocks of the anterior abdominal wall provides analgesia for the skin over the anterior abdominal wall and the parietal peritoneum, but not for the visceral contents. They are used as part of a multimodal approach to analgesia. Good post-operative analgesia and a decrease in morphine requirements for up to 48 hours after operation have been demonstrated.¹ Used bilaterally, it is used as a simple alternative in patients for whom an epidural is not possible.

TYPES OF BLOCKS

1. Transversus abdominis plane (TAP) block
 - Posterior TAP block
 - Subcostal TAP block.
2. Rectus sheath block
3. Iliohypogastric ilioinguinal nerve block.

The posterior TAP block is used to provide anaesthesia for any somatic procedure involving the lower abdominal wall and post-operative analgesia after surgical procedures using a pfannenstiell incision (caesarean section,² abdominal hysterectomy³). A subcostal TAP block extends the analgesia to the T7 level, and is useful for surgeries with an upper abdominal incision like gastrointestinal surgeries, splenectomy, hand-assisted laparoscopic nephrectomy and open cholecystectomy.⁴ The rectus sheath block is indicated for analgesia after midline surgical incisions as in umbilical or incisional hernia repairs.⁵ The iliohypogastric-ilioinguinal

nerve block is indicated for any somatic procedure involving the inguinal region such as inguinal herniorrhaphy.⁶ When used as the sole anaesthetic for inguinal herniorrhaphy, the sac (containing peritoneum) must be infiltrated with LA by surgeon.

ANATOMY⁷

There are 4 paired muscles of the anterior and lateral abdominal wall: the anterior rectus abdominis muscles, and from deep to superficial, the 3 lateral muscles: transversus abdominis (TA), internal oblique (IO), and external oblique (EO) muscles. In the lateral abdomen, the 3 fleshy muscle bellies overlies one another. Medially, they become aponeurotic. The aponeuroses form the linea semilunaris lateral to the rectus abdominis muscle. The aponeurosis of the internal oblique splits to form the anterior and posterior rectus sheath to enclose the rectus abdominis muscle. Medial to the rectus abdominis, the aponeurosis is inserted into the thick fibrotic linea alba.

The somatic supply of the skin, muscles and parietal peritoneum of anterior abdominal wall are from anterior the divisions of T7–L1. T7 to T11 are intercostal nerves, T12 is the subcostal nerve and L1 forms the iliohypogastric and ilioinguinal nerves. There are extensive anastomoses between these segmental nerves emerging from the costal margin.

Terminal branches course through the lateral abdominal wall within a plane between the IO and TA muscles. In posterior TAP block, both the anterior and lateral cutaneous branches of the 9th, 10th and 11th intercostal

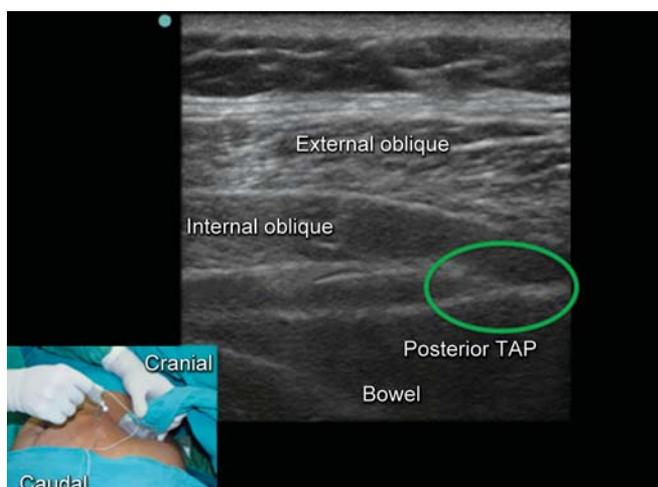


Fig. 1: Circle showing most posterior point of the TAP plane: site of LA injection in posterior TAP block

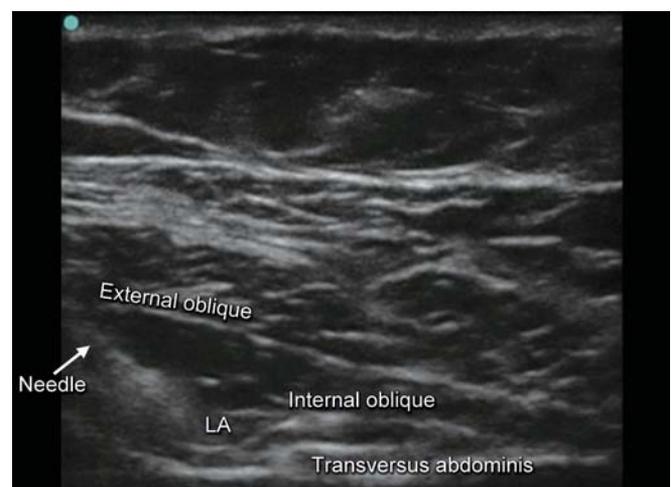


Fig. 2: Collected local anaesthetic pushing the transversus abdominis muscle down

nerve are blocked. Only the 9th, 10th and 11th intercostal nerves are consistently seen in the TAP plane; so for incisions extending above the umbilicus, a subcostal TAP block provides more reliable analgesia.³ In rectus sheath block, only the terminal branches (anterior cutaneous nerve) of the intercostal nerves are blocked.⁵

The inguinal nerves originate from L1. Superomedial to ASIS, they pierce the TA to lie between it and IO. After travelling a short distance inferomedially, their ventral rami pierce the IO to lie between IO and EO. Branches pierce the EO to supply skin over the inguinal region (Iliohypogastric) or the superomedial aspect of the thigh (Ilioinguinal).⁸

PATIENT POSITIONING, PROBE PLACEMENT AND SCANNING TECHNIQUE

Ultrasound guided TAP block is a basic skill level block. The patient is placed supine, abdomen exposed between costal margin and iliac crest. A linear, high frequency

(6-13 MHz) transducer is placed in a transverse plane, above the iliac crest, in the anterior axillary line. A 80 to 120 mm short bevelled (spinal/tuohy) needle is inserted in-plane with the transducer, in an antero-posterior direction. Facilitated by hydro-dissection, the local anaesthetic is placed deep to the fascial layer between the IO and TA⁹ (Fig. 1). 20 to 30 ml of local anaesthetic (bupivacaine 0.25% or ropivacaine 0.2%) is injected into this plane² (B/L) (Fig. 2). Over several hours, the LA spreads and anaesthetises multiple nerves.¹⁰

The subcostal block involves injection of local anaesthetic (10 ml)¹¹ into the TAP lateral to the linea semilunaris (Fig. 3) immediately inferior and parallel to the costal margin.¹²

In rectus sheath block, the probe placed in a transverse plane just lateral to the midline and positioned for optimal visualisation of the posterior rectus sheath⁴ (Fig. 4). 15 to 20 ml of the local anaesthetic is injected between the rectus abdominis muscle and the posterior rectus sheath (Fig. 5).

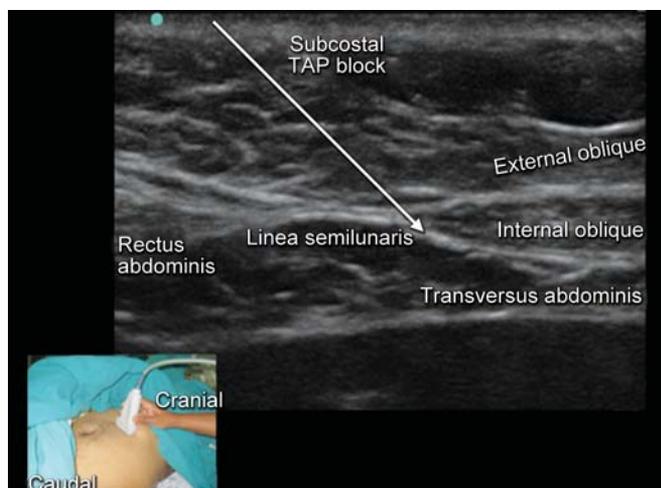


Fig. 3: Arrow shows most medial point of the TAP plane, immediately lateral to linea semilunaris: site of LA injection in subcostal TAP block

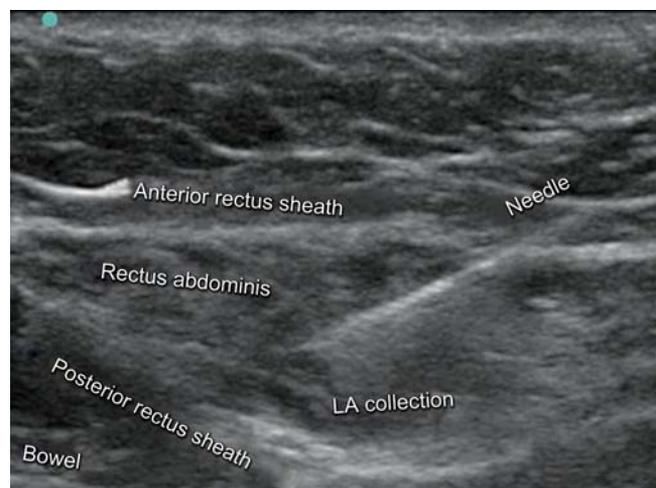


Fig. 5: Collected local anaesthetic lifting away the rectus abdominis away from its posterior rectus

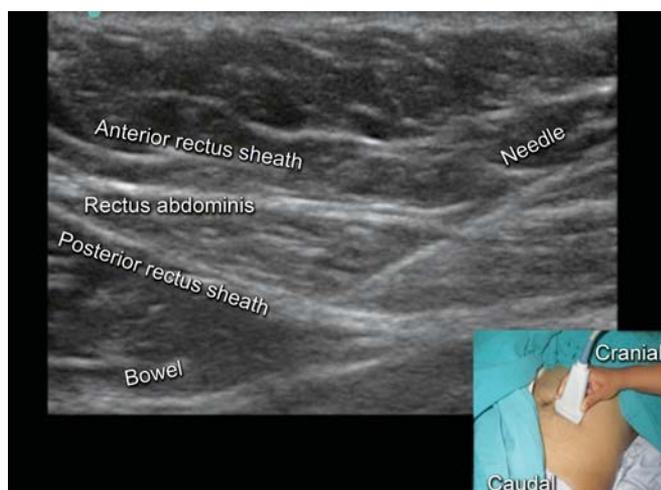


Fig. 4: Needle placed on the posterior rectus sheath: site of LA injection in rectus sheath block

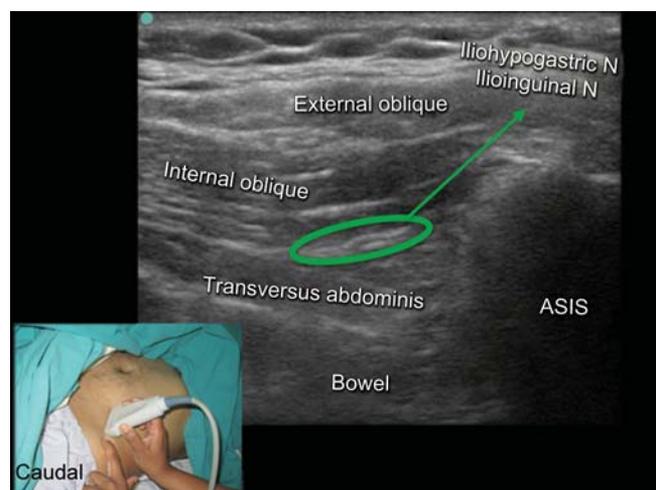


Fig. 6: Circle showing iliohypogastric and ilioinguinal nerves in the TAP plane

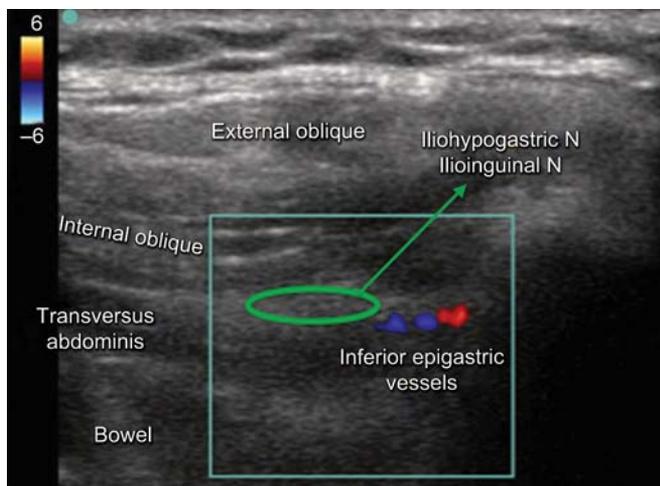


Fig. 7: Inferior epigastric vessels seen adjacent to the nerves

In iliohypogastric-ilioinguinal nerve block, the ultrasound probe is placed obliquely on a line joining the ASIS and the umbilicus. The nerves appear dark with a white horizon and white spots inside in fascia between the IO and TA⁸ (Fig. 6). 10 to 15 ml of local anaesthetic is injected in this plane. Small vessels can be visualised by colour Doppler adjacent to the two nerves (Fig. 7).

COMPLICATIONS

Complications include transient femoral anaesthesia due to tracking of local anaesthetic along fascia iliaca,¹³ perforation of bowel,¹⁴ intra-peritoneal injection and local anaesthetic toxicity.¹⁵

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