

Fascia Iliaca



Fascia iliaca – fractured neck of femur, femoral shaft, hip surgery

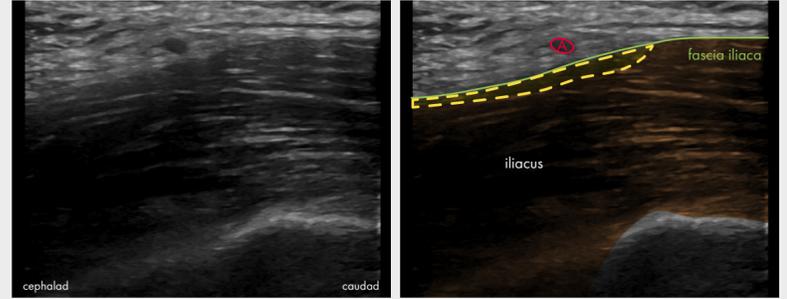
Identify: Start with the probe in a sagittal plane just medial to the anterior superior iliac spine and slide medially; note the deep circumflex iliac artery (a branch of external iliac) which lies superficial to the fascia 1-2cm above the inguinal ligament and is a useful landmark.

Target: Use an in-plane approach from the caudal end of the probe. The target is to deposit local anaesthetic on the belly of the iliacus muscle, beneath the fascia proximal to the inguinal ligament. Observe the spread of local anaesthetic proximally

above the muscle and beneath the fascia (and clearly beneath the circumflex artery).

Tips: Lateral tilt of the probe may improve the view and an assistant may be required to retract the abdomen in an obese patient. This suprainguinal parasagittal view demonstrates the muscle & fascia passing deep into the pelvis - gravity aids the spread of LA towards the lumbar plexus (this approach is also suitable to catheter placement).

Avoid: Injection distal to the inguinal ligament.



Femoral



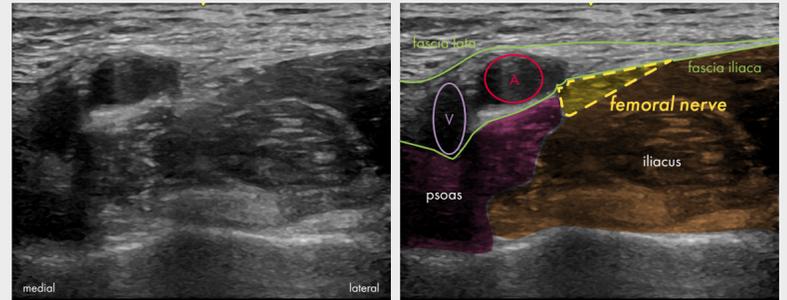
Femoral – femoral shaft, quadriceps mechanism, knee surgery

Identify: The femoral artery, iliacus and psoas muscles and fascia iliaca. Identify the indentation between the two components of iliopectas. The nerve lies lateral to the artery, usually flattened between the fascia and muscle and it can take on a variety of shapes.

Target: Using an in-plane approach from the lateral end of the probe, local anaesthetic injection must be beneath the fascia iliaca; ensure the spread of LA surrounds the nerve.

Tips: Choose a proximal site before the nerve branches immediately below the inguinal ligament (if the femoral artery has divided then you are too distal). The nerve is usually more visible following injection of LA. Quadriceps weakness will affect active rehabilitation and mobility.

Avoid: Superficial injection, distal injection, intravascular injection.



Adductor Canal



Adductor Canal – knee surgery, cruciate ligament repair, supplement to sciatic nerve block for distal lower limb surgery

Identify: The femoral artery beneath the sartorius muscle. The saphenous nerve lies in the same fascial plane, anterolateral to the artery, accompanied by the nerve to vastus medialis.

Target: Using an in-plane approach from the lateral end of the probe inject in the fascial plane alongside the femoral artery if the nerve itself is not clearly identified (it will be easier to see after injection).

Tips: If necessary trace the femoral artery down from the inguinal region to the medial thigh, especially in larger patients. The true adductor canal starts where the medial border of sartorius crosses the medial border of adductor longus. Above that level it is technically a femoral triangle block but the outcome is similar.

Avoid: Intravascular injection, trauma to the nerve supplying vastus medialis.



Subgluteal



Subgluteal – a proximal approach to the sciatic nerve for surgery below the knee, an alternative to the popliteal approach when access is limited; the posterior cutaneous nerve of the thigh will not be blocked

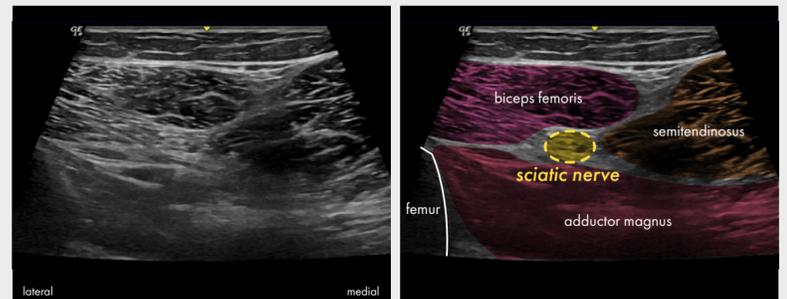
Identify: At this level the sciatic nerve lies between biceps femoris laterally and semitendinosus medially. Deep to the nerve is the adductor magnus muscle and there is usually a clear fascial plane between this and the superficial muscles. The nerve is rarely round, more usually flattened or triangular in cross section.

Target: Using an in-plane approach from the lateral end of the probe with a longer needle, aim for circumferential spread of LA around

the sciatic nerve.

Tips: Trace the nerve up from the popliteal fossa if necessary; tilt the probe to optimize visibility (anisotropy). Track the spread of local anaesthetic distally to ensure complete coverage of the nerve. Block onset can be delayed due to the size of the target.

Avoid: Check for arteries crossing obliquely deep to the sciatic nerve.



Popliteal



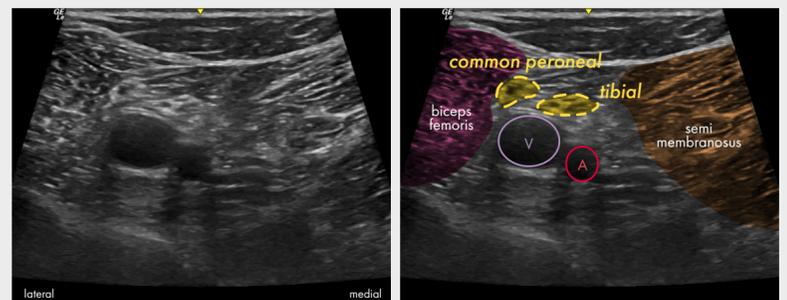
Popliteal – procedures of the leg, ankle and foot

Identify: At the level of the popliteal crease, identify the popliteal artery and vein. The larger tibial component lies just superficial to the vessels, the smaller common peroneal nerve will be lateral and more superficial. Scan up and down to find the point at which they join to form the sciatic nerve.

Target: Inject between the two components at the point where they separate or target the two nerves individually more distally.

Tips: Probe tilt is useful here to identify the nerves (anisotropy); ankle flexion & extension demonstrates the "see-saw" sign where the 2 components move around each other. Track the spread of local anaesthetic distally after injection to assess coverage of both nerves. The lateral decubitus position is shown here and is very stable but alternative positions are the prone or supine with leg elevation, depending on patient factors.

Avoid: Inadequate needle length, direct nerve trauma, intravascular injection.



Obturator



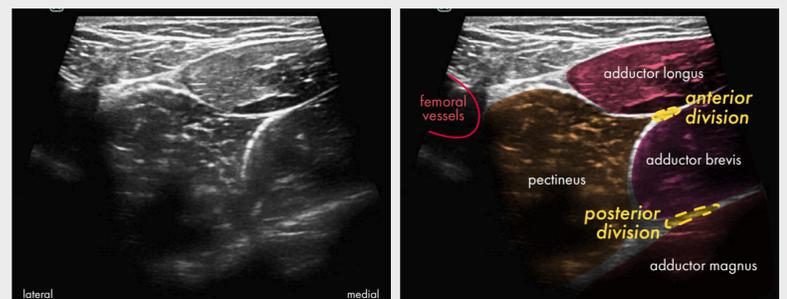
Obturator - supplement for hip, knee or bladder surgery

Identify: the femoral artery, then slide the probe medially to locate the pectineus muscle and the 3 layers of adductor muscles (longus, brevis and magnus from superficial to deep). The anterior and posterior divisions of the nerve appear as hyperechoic structures in the intermuscular fascial planes as shown.

Target: Using in-plane approach from the lateral end of the probe with a minimum 80mm echogenic needle, make an injection in the fascial plane for each division. The nerves will be more obvious following injection.

Tips: Abduct and externally rotate the limb if possible. Probe tilt is useful to highlight the nerves. A linear ultrasound probe is sufficient but a curvilinear can be required for a large leg. A more proximal target can be achieved by tracking and tilting the probe in a cephalad direction - the divisions will unite deep to pectineus muscle and a single injection here will result in a complete block including the branches to the hip joint. The knee is supplied by the posterior division.

Avoid: The needle entry point may overlie the femoral vessels, avoid puncturing them.



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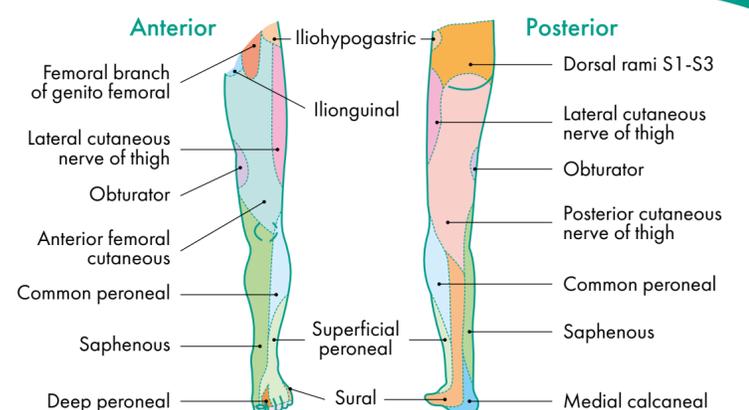
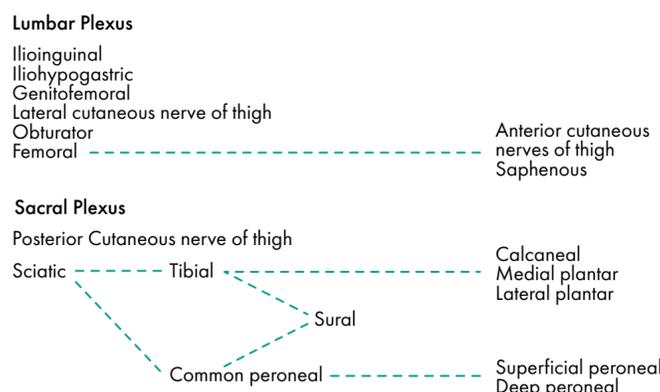
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Tibial

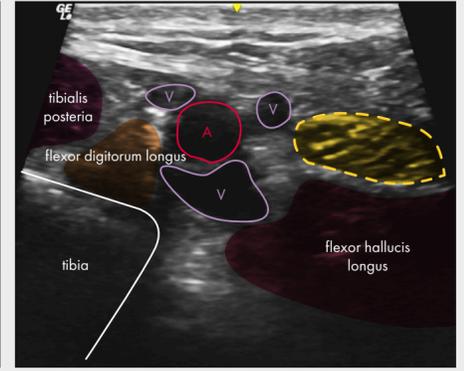


Identify: From anterior to posterior: medial malleolus, tibialis posterior, flexor digitorum longus, artery, nerve, flexor hallucis longus.

Target: Surround the nerve with local anaesthetic, using an in-plane or out-of-plane approach depending on patient morphology.

Tips: The nerve usually lies posterior to the artery and 2 veins. A small ultrasound probe is useful.

Avoid: Confusion with tendons which also exhibit anisotropy on ultrasound (flex the ankle or scan proximally to distinguish between them). Excessive probe pressure, intravascular injection.



Saphenous

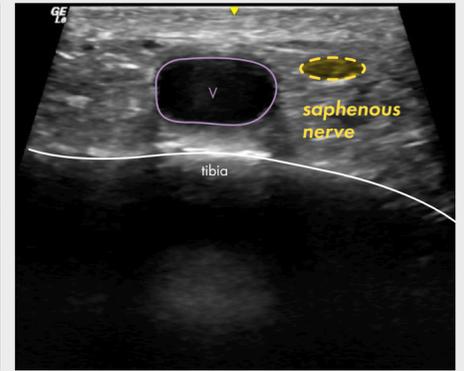
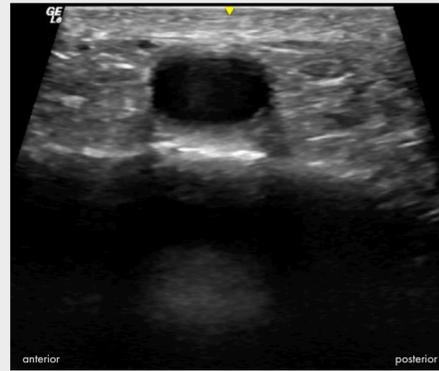


Identify: The long saphenous vein which lies very superficially, anterior to the medial malleolus; the nerve accompanies the vein.

Target: In the fascial plane around the vein if the nerve is not directly visible.

Tips: A venous tourniquet can be used to help identify the vein; use minimal probe pressure and minimal depth setting to avoid compressing the vessel.

Avoid: Excessive probe pressure, intravascular injection.



Deep Peroneal

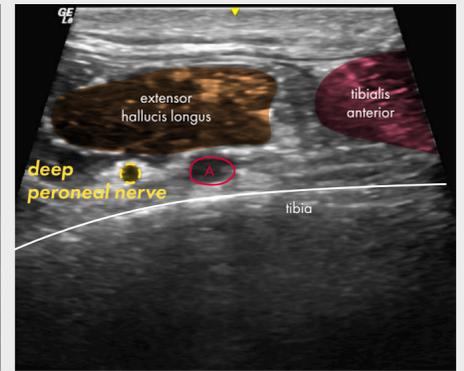


Identify: The small dorsalis pedis artery lies directly on the subcutaneous surface of the tibia. The nerve crosses over the artery from medial to lateral and this is a reliable sign.

Target: The nerve as it lies alongside the artery either on its lateral or medial side.

Tips: Use minimal probe pressure, minimal depth setting and scan up and down above the ankle to see the nerve crossing the artery.

Avoid: Excessive probe pressure, intravascular injection.



Superficial Peroneal

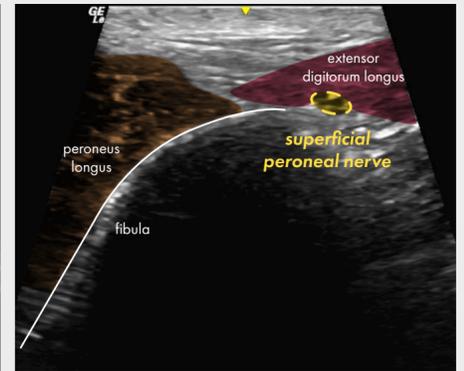


Identify: The anterior border of the fibula in the lower third of the leg has a characteristic sickle shape on ultrasound. The superficial peroneal nerve lies superficially and the sharp anterior border of the bone points to the intermuscular septum and the nerve.

Target: The nerve in the superficial tissues at any point in the leg.

Tips: Scan up and down at a reasonable speed to identify the nerve above the bone and intermuscular septum.

Avoid: Deep injection.



Sural

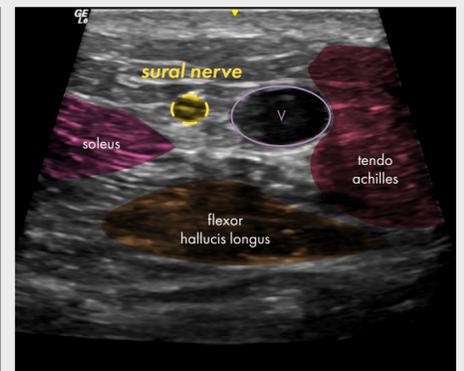


Identify: The short saphenous vein runs vertically down the back of the calf; the sural nerve accompanies the vein.

Target: The nerve directly if it is visible, otherwise the fascial plane surrounding the vein(s).

Tips: Use a venous tourniquet to help identify the short saphenous vein; flex the knee to leave room for access with the ultrasound probe.

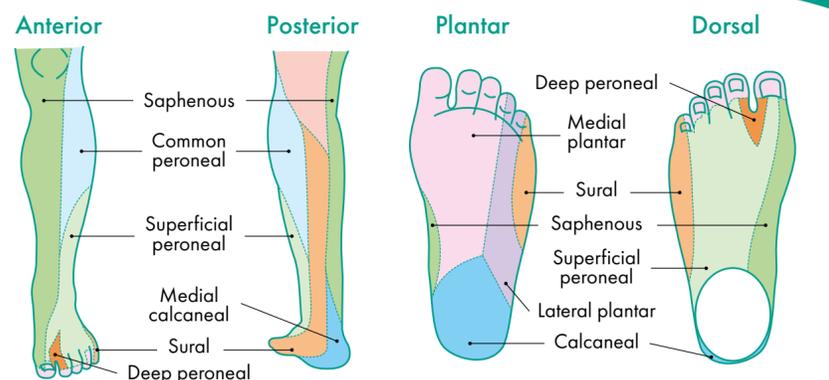
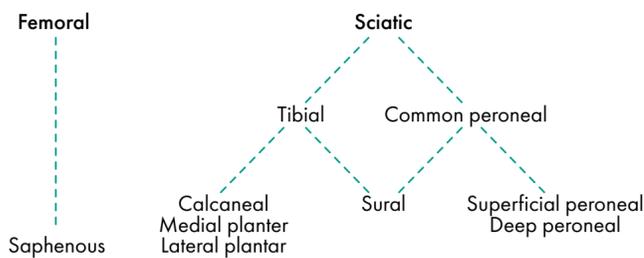
Avoid: Excessive probe pressure, intravascular injection.



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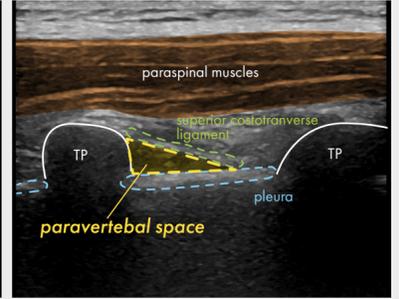
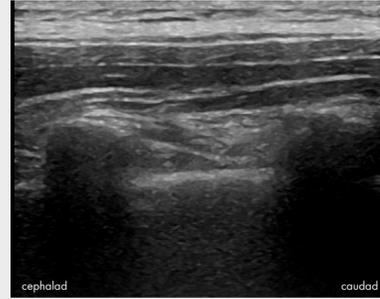
Thoracic Paravertebral – surgery involving the breast, ribs and chest wall

Identify: In a parasagittal plane identify the ribs at the level you wish to block, then trace medially until the bony shadow changes to the more superficial and squarer outline of the transverse processes (described as tombstones). Tilt the probe laterally to demonstrate the pleura and superior costo-transverse ligament in the same image.

Target: The small triangular paravertebral space lies between the superior costo-transverse ligament and the pleura.

Tips: While maintaining the same probe orientation, angle the caudad end of the probe away from the mid line to improve the needle access past the rib and transverse process below.

Avoid: Keep the needle tip in view at all times to avoid pneumothorax, never advance the needle if you cannot see the tip.



Erector Spinae



Erector Spinae Plane – thoracic and upper abdominal surgery, posterior rib fractures

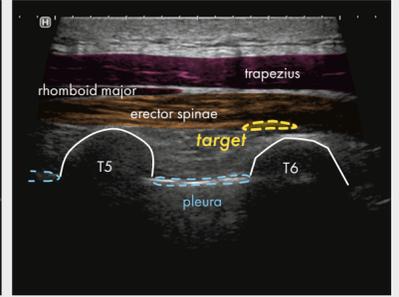
Identify: Count the spinous processes to identify the correct spinal level. In the paramedian plane identify the corresponding transverse process, overlying muscle layers and underlying pleura.

Target: Using an in-plane approach from the cephalic end of the probe, the target is the fascial plane deep to the erector spinae muscle.

Tips: Choose a site where the needle track would hit the transverse process if it was

inserted too far - this acts as a safety net. Look for free spread of local anaesthetic in the fascial plane and use ultrasound to assess the segmental spread up and down the spine. This is a suitable site for catheter techniques for chest wall injuries.

Avoid: Lateral injection - be sure to identify transverse processes not ribs. Calculate the maximum local anaesthetic dose and dilute as necessary to achieve a suitable volume, especially with bilateral injections.



PECS



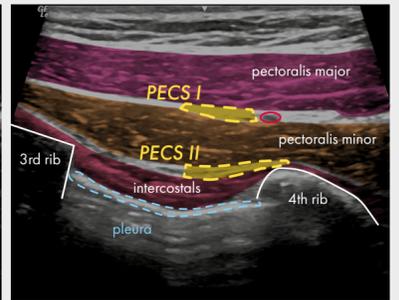
PECS – breast surgery

Identify: Starting in the infraclavicular brachial plexus position in the deltopectoral groove, count the ribs down from the clavicle to identify the 3rd and 4th ribs, then rotate the probe towards the axilla. There are 3 muscle layers: pectoralis major lies superficially, the pectoralis minor is beneath that and the intercostals are deepest, running between the ribs. Serratus anterior arises beneath the lateral border of pec minor.

Target: The PECS I injection is between pec major and pec minor; the PECS II includes a second injection between pec minor and the intercostal muscles.

Tips: A single needle path in plane from the medial end of the probe allows both targets to be reached through one insertion point. This block relies on adequate volumes of local anaesthetic for spread.

Avoid: Keep the 4th rib deep to the needle path to act as a safety measure against pneumothorax, ensure the safe dose of local anaesthetic is not exceeded especially when performing bilateral blocks. Avoid the artery that runs in the PECS I plane (a pectoral branch of the thoracoacromial artery).



Serratus Anterior



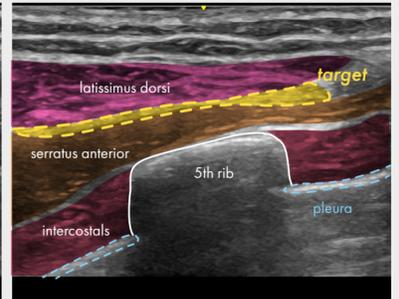
Serratus Anterior Plane – rib fractures, breast surgery, axillary surgery

Identify: Starting with the probe in a transverse plane in the mid-axillary line, scan posteriorly until the latissimus dorsi muscle appears. There is usually an artery in the serratus anterior plane (a branch of the thoracodorsal artery).

Target: The aim is to inject in the fascial plane between latissimus dorsi and serratus anterior.

Tips: This approach is also very suitable for insertion of a nerve catheter. This block relies on adequate volume for spread eg 30ml of local anaesthetic.

Avoid: Vascular puncture, intravascular injection, pneumothorax.



Quadratus Lumborum



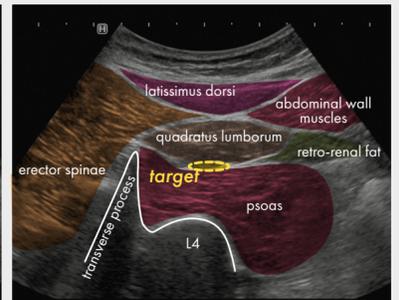
Quadratus Lumborum (transmuscular) – abdominal surgery

Identify: With the patient in the lateral position, use a curvilinear probe in the posterior axillary line between the costal margin and the iliac crest. Identify the L4 vertebral body then tilt the probe caudally to see the transverse process with the three muscle groups forming the "shamrock sign" as illustrated.

Target: Using a 100mm echogenic needle and an in-plane approach from the posterior end of the probe, the target is the fascial plane between quadratus lumborum and psoas major.

Tips: A curvilinear probe is required and the MSK preset may be best. Use an adequate depth initially to identify the vertebral outline. The QL muscle attaches to the tips of L1-L4 transverse processes.

Avoid: Intramuscular injection - look for fascial plane spread and adjust the needle position if necessary. Avoid the lateral peritoneal recess and retro-renal fat. Adequate spread depends on volume of injectate, typically 30ml each side. Avoid exceeding the maximum dose for the individual patient.



TAP



Transversus Abdominis Plane – abdominal surgery

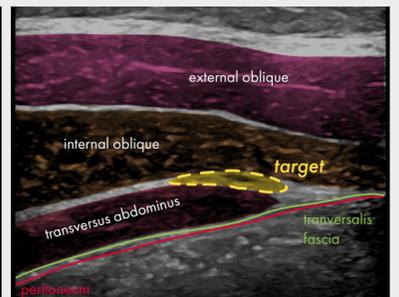
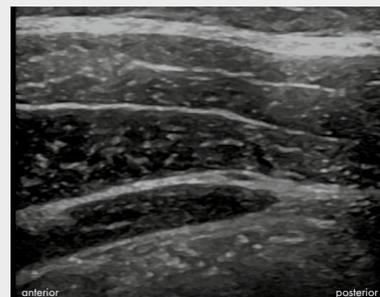
Identify: The 3 muscle layers of the abdominal wall (external oblique, internal oblique; transversus abdominis) and trace them back posteriorly to the termination of transversus abdominis.

Target: Beneath the fascial layer between the internal oblique and transversus abdominis muscles near the posterior limit of the transversus muscle.

Tips: The posterior target site is generally the most effective and because of the tangential approach through the abdominal wall a

100mm needle is appropriate. The block can be performed unilaterally or bilaterally, depending on surgical site, and adequate volume is required for spread eg 20-30ml each side. Visceral pain will not be blocked by a TAP block. For surgery above the umbilicus use the quadratus lumborum block.

Avoid: Intravascular injection - check for small vessels with doppler prior to injection; avoid intraperitoneal injection; be aware of total local anaesthetic dose.



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- Cervical plexus – Supraclavicular nerves
- T2 – 12 segmental nerves – Lateral cutaneous branches (lat cut branch of T2 = intercostobrachial) Anterior cutaneous branches
- Lumbar plexus – Iliohypogastric Ilioinguinal Genitofemoral Lateral cutaneous nerve of thigh

