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Regional anaesthesia Workshop

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Contents

SHORT-BEVEL NEEDLE INGUINAL INFILTRATION BLOCK

This block is described for adults for inguinal hernia repair. Lignocaine 50 ml (1% with 1:200,000 adrenaline) is used as the local anaesthetic agent for fast onset of action however for long acting analgesia, a long acting local anaesthetic such a ropivacaine or bupivacaine is preferable.

The key method of this blockade is using a short bevel needle so that the tissue planes can easily be identified with the appropriate nerves to be blocked lying within these planes.

Patient positioning

The patient lies supine and the surgeon marks the surgical incision line prior to block insertion

Anatomy

To successfully provide anaesthesia for an inguinal herniorrhaphy 3 nerves are to be blocked. These are ilioinguinal (T12 L1), iliohypogastric (T12, L1), and genitofemoral nerves (L1, L2). See Figure 1

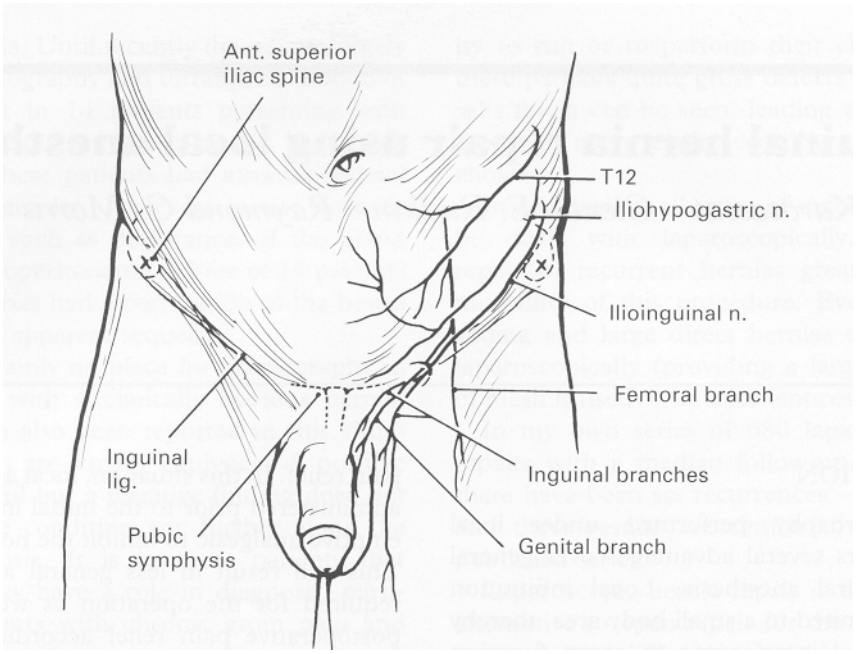

Figure 1.

Description [1]

A mark is made at a point 2cm along a line from the anterior superior iliac spine to the umbilicus with a skin wheal of lignocaine raised; see Figure 2, point A. A hole is made in the skin with a 19 gauge sharp needle. The 22 gauge short-bevel needle is inserted through the skin at an angle of 90 degrees. Care is taken to ensure that there is no resistance from the skin, which could impair recognition of tissue planes. The needle is advanced slowly and after approximately 1cm, a distinct pop is felt. This is the point of penetration of the external oblique aponeurosis. After negative aspiration, 7ml of local anaesthetic are injected. The needle is advanced with pressure on the syringe. At this point the needle is located within the internal oblique muscle where there is difficulty injecting solution through a short-bevel needle into muscle. The needle is further advanced 0.5 cm when a less distinct pop is felt with a loss of resistance to injection. A further 8 ml of local anaesthetic solution is injected after negative aspiration. No attempt is made to fan the needle.

The internal inguinal ring is located 1 cm superior to the mid-inguinal point At this point the external iliac artery can be palpated. The genitofemoral nerve and the indirect hernia sac lie deep to the internal oblique muscle at this point. The second injection site is a point over the internal inguinal ring, see Figure 2, point B. At this point, a skin wheal is raised with local anaesthetic and a hole is made with a 19 gauge sharp needle. The short-bevel needle is advanced until a very distinct pop is felt as the needle passes through the external oblique aponeurosis. No injection is made at this point in the tissue plane but further pressure applied to the syringe. The needle is advanced until a second less distinct pop of the internal oblique muscle is felt and a loss of resistance to injection detected. This is approximately 4 cm from the skin or more in the obese patient. Any pulsation of the needle means it is in close proximity to the artery. Twenty-five ml of local anaesthetic solution is injected slowly, aspirating at 5 ml intervals. This injection bathes the genitofemoral nerve, and the peritoneal sac in local anaesthetic. No attempt is made to fan the needle.

Finally, the skin is infiltrated along the marked incision line, with the remaining 10 ml of lignocaine or lignocaine diluted to 0.5% solution with normal saline to make a 20 ml volume, see Figure 2, Line C-D. The full length of the marked incision line is infiltrated with a 9 cm 22 gauge spinal needle with the bevel facing down. At the lateral end of the incision 3 ml of local anaesthetic is injected subcutaneously in the direction of the umbilicus.

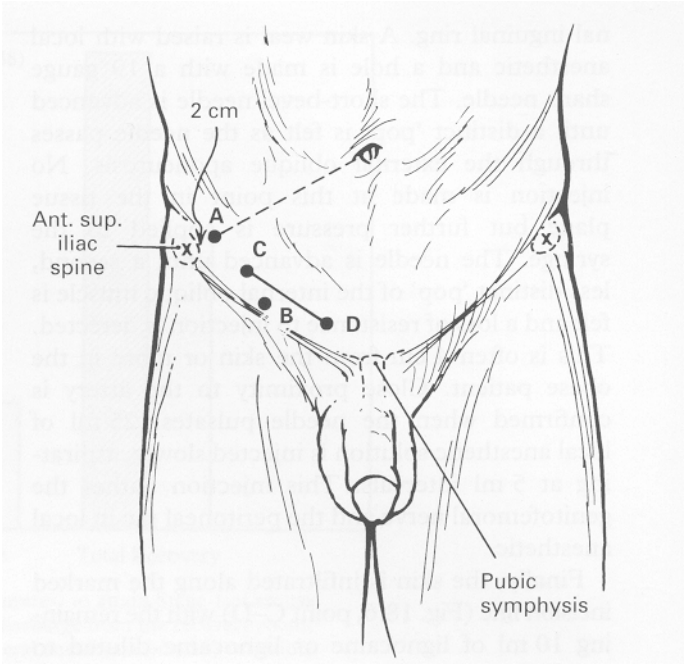

Figure 2

Complications and Side Effects

You can inject into a blood vessel resulting in local anaesthetic toxicity or haematoma. With the large volume of local anaesthetic used, surgical dissection may be difficult. The femoral nerve is often blocked resulting in leg weakness, as the patient is unable to extend the knee. Additional sedation may be required when surgical dissection is made around the spermatic cord.

It must be recognised that achieving good pain control is important for inguinal hernia repair as this group of patients experiences a high incidence of postoperative pain. Sleep disturbance is also common with 30 % of patients waking up with pain.[2]

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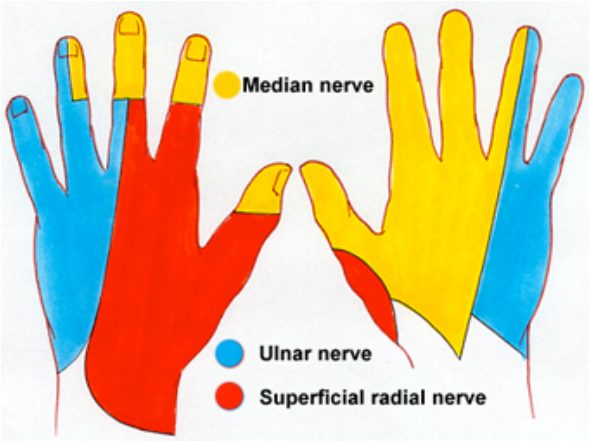
1. CJ Sparks, GE Rudkin, K Agiomea, JR Fa'arondo. Inguinal field block for adult hernia repair using a short-bevel needle. Description and clinical experience in Solomon Islands and an Australian teaching hospital. *Anaesthesia and Intensive Care* 1995; 23:143-8

2. Rawal et al *Acta Anaesthesiol Scand* 1997;41:10122

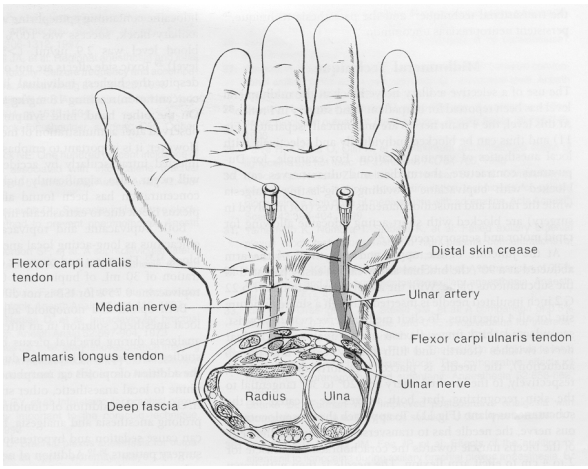
WRIST BLOCK

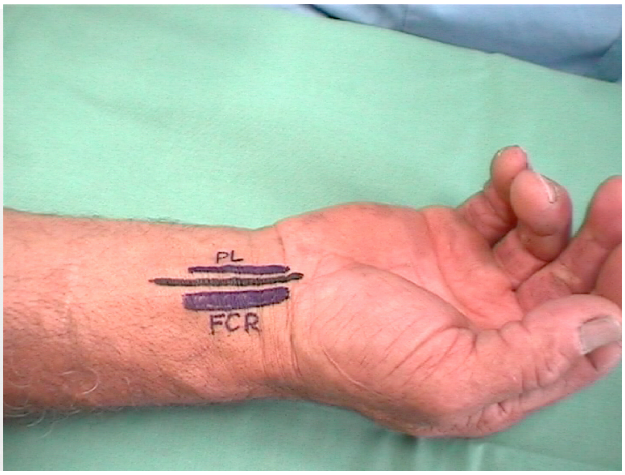
This can be easily performed in an awake patient. Don't use adrenaline with the local anaesthetic. Stop injecting if there is resistance to injection or paraesthesia particularly with median nerve injection at the wrist.

Anatomy



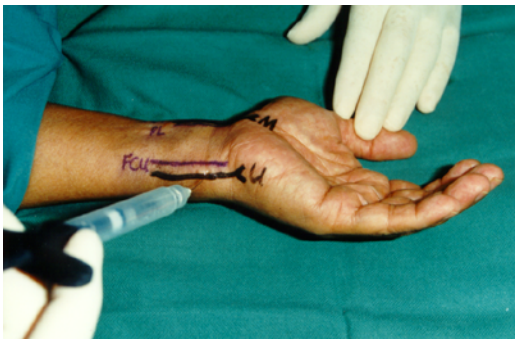
Three nerves supply sensation to the hand. These nerves may be conveniently blocked at the wrist. The ulnar nerve runs down in the flexor compartment of the forearm, first covered by the flexor carpi ulnaris (FCU) then passing radial to this muscle. The ulnar artery accompanies the nerve radially. The nerve divides 5 cm from the wrist into a dorsal and a palmar branch, both of which run next to or deep to the FCU tendon. The median nerve runs between the deep and superficial flexor tendons. At the proximal crease it lies between the palmaris longus and the flexor carpi radialis, deep to the flexor retinaculum. If the Palmaris Longus is absent the nerve runs between the flexor tendons and Flexor carpi radialis. The radial nerve lies on the radial side of the forearm at first accompanying the radial artery but then branching about 7 cm above the wrist so at the wrist it has divided into several branches.



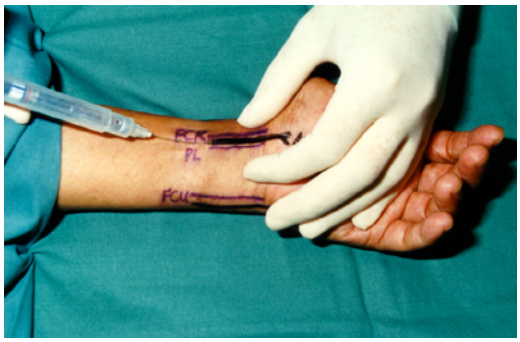


Ulnar Nerve Block

Palpate the Flexor Carpi Ulnaris tendon and insert a 27 gauge needle posterolaterally in a horizontal approach and place 5 ml LA into the space.



Median Nerve Block



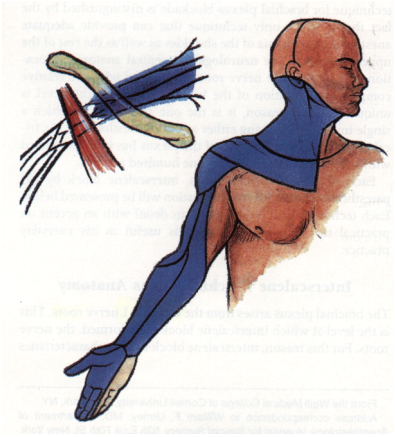
Identify Palmaris Longus and Flexor Carpi Radialis by flexing the wrist. Inject 5 ml LA beneath the deep fascia. Piercing the deep fascia can result in a 'click', however it is more reliable to insert the needle until it contacts bone. The needle is then withdrawn 2-3 mm and the LA injected. Direct injection into the nerve is strictly avoided.

Radial Nerve Block

Place 10 ml LA in a subcutaneous plane from Flexor Carpi Radialis to mid dorsum of the wrist.

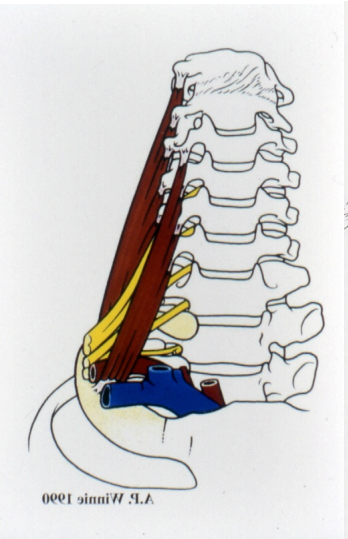
INTERSCALENE BRACHIAL PLEXUS BLOCK

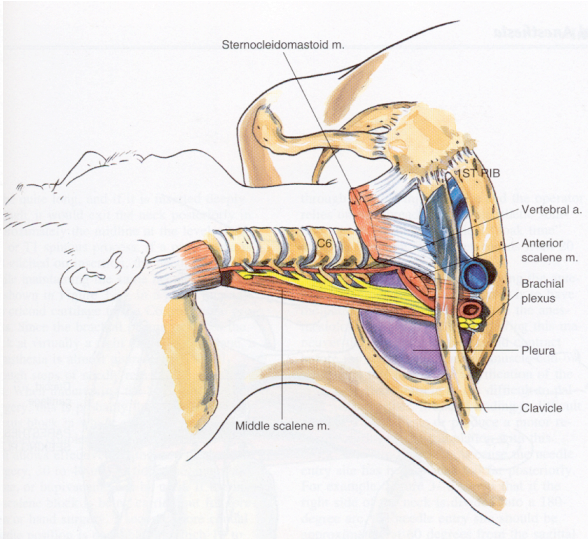
The interscalene approach is recommended for shoulder, upper arm and elbow surgery.



Anatomy

This approach focuses on the ventral roots (C4-T1) as they pass through the scalenus groove. A fascial sheath surrounds the nerves and there are no vessels within the sheath.





Patient Positioning

The patient should lie supine, with the head turned away from the side to be blocked, without a pillow.

Landmarks

C6 vertebra, which is found by extending a line laterally from the cricoid cartilage. The external jugular vein crosses the interscalene groove at the level of C6 virtually all the time.

Technique – Winnie's approach

Ask the patient to lift his head to identify the clavicular head of sternocleidomastoid muscle. Place your index and middle fingers behind the lateral edge of sternocleidomastoid and ask the patient to relax, then your fingers will be lying on the belly of anterior scalene muscle. Roll your fingers laterally across the belly of this muscle until the interscalene groove is palpated.

With both index and middle fingers in the interscalene groove, a 22 gauge needle with extension tubing and syringe attached, is inserted at the level of C6. The direction of the needle should be 45° at all angles, down (caudad), back (posterior) and in (medial). The needle is advanced slowly until a paraesthesia is elicited. Only a paraesthesia below the level of the shoulder is acceptable, since a paraesthesia to the shoulder could result from stimulation of the suprascapular nerve. The needle should never be advanced beyond 2.5 cm to avoid the risk of complications. The needle is aspirated and a few ml of local anaesthetic (LA) is injected. Aspirate every 5 ml. Never inject when resistance (high pressure) to injection of LA is encountered.

Local Anaesthetic

2% lignocaine can be used, with an onset time of 10-20 minutes and duration of analgesia 2-5 hours. Alternatively, 0.5% bupivacaine will have an onset of 20-30 minutes and duration of analgesia 16-18 hours. Volumes such as 15-20 ml can be used successfully for analgesia

Side effects and Complications

Side effects such as Horner's, hoarseness, cough, and phrenic nerve paresis are common. Block failure can occur and more serious complications such as haematoma, pneumothorax, and neuropathy can occur.

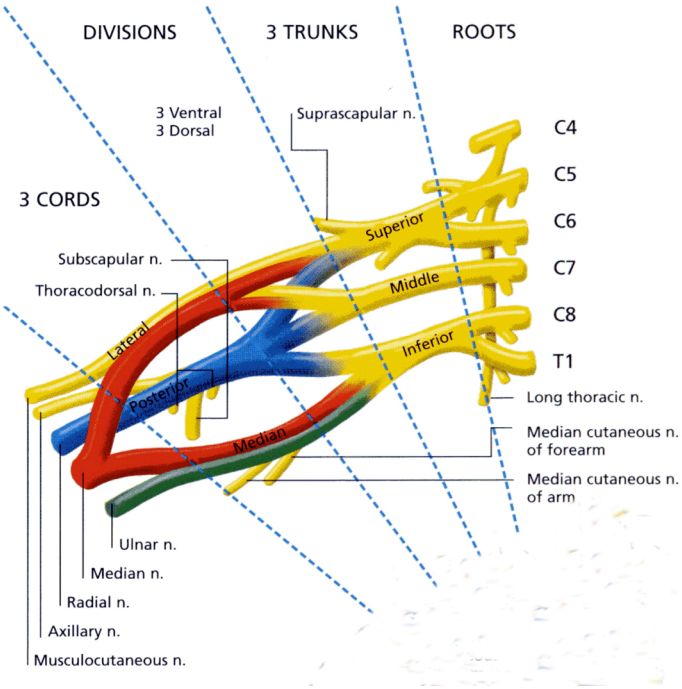
References:

Plexus Anesthesia. Volume 1. Perivascular techniques of Brachial Plexus Block. Alon P Winnie

AXILLARY BRACHIAL PLEXUS BLOCK (TRANSARTERIAL)

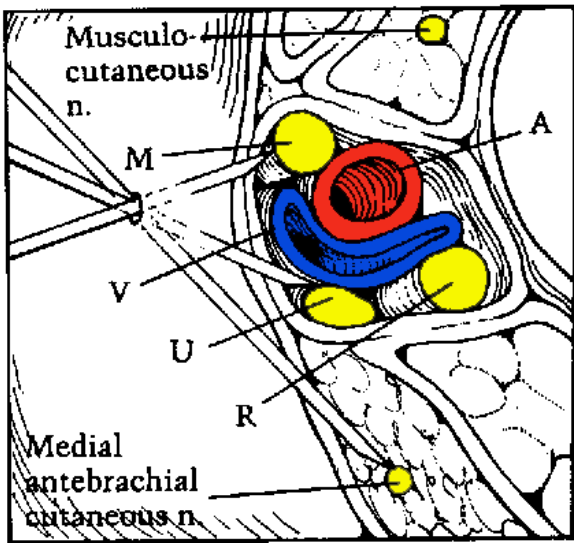
This block is useful for forearm and hand surgery

Anatomy



After passing from the neck between the clavicle and first rib, the brachial plexus enters the upper limb via the axilla. At this point the trunks of the plexus have each divided into an anterior and posterior division, which combine to form 3 cords: lateral, medial and posterior.

All the nerves are in close relationship to the artery and lie within the perivascular sheath. In the lower axilla the trunks divide into the 4 main terminal branches: the median, radial, ulnar and musculocutaneous nerves. The musculocutaneous nerve quickly leaves the perivascular sheath through the coracobrachialis muscle.



Patient Position

The patient lies supine and the upper limb on the side to be injected should be abducted at the shoulder and flexed at right angles at the elbow so that the wrist is at the same level as the patient's head. This is like a "stop sign".

Needle insertion

A 23-gauge needle attached to a plastic extension tube is used with a syringe on the end for aspiration. The axillary artery is palpated and the needle inserted directly over the artery at right angles to it. When arterial blood is seen, the needle is advanced further so as to exit the artery opposite its entry point and where it will be within the perivascular sheath. Using an assistant to aspirate for blood when aspiration is negative 10 ml local anaesthetic injected. This will effectively block the radial nerve. Withdraw the needle almost to skin and angle the needle slightly cephalad, a paraesthesia may be felt and 5-7 ml of local anaesthetic is injected after negative aspiration to blood. This will block the median nerve. The needle is then angled caudad, aspiration check and another 5-7 ml injected. This will block the ulnar nerve.

Drugs and dose

30-40 ml 1.5% lignocaine or 0.375% bupivacaine with adrenaline 1:200,000

Complications

Acute generalised toxicity. Inadvertent intravenous injection is unlikely if frequent aspirations are made. If it does occur, toxicity will be seen within a few minutes. Neuropathy can also occur.

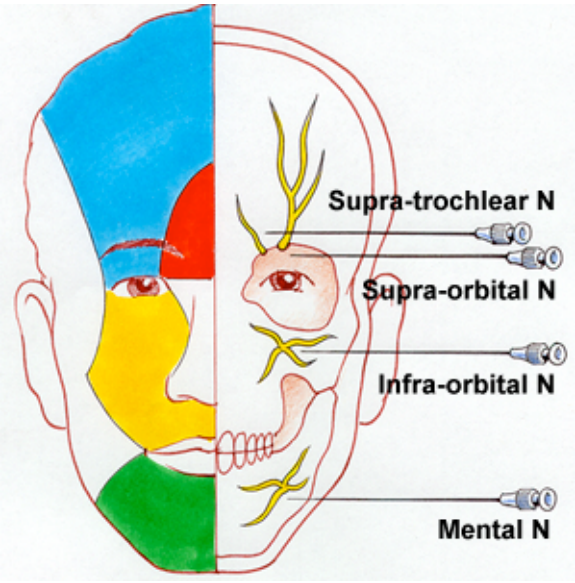
References:

Plexus Anesthesia. Volume 1. Perivascular techniques of Brachial Plexus Block. Alon P Winnie

SOME USEFUL FACIAL NERVE BLOCKS (TRIGEMINAL)

Anatomy

Knowledge of the distribution of the nerves and the sensory dermatomes is the key to success. The bony landmarks of the skull and the foramina are guides.



Division one –Ophthalmic nerve

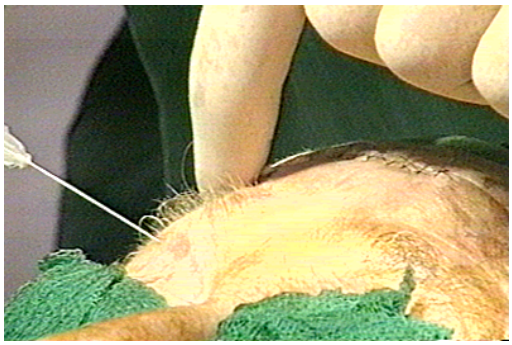
This is sensory to the upper eyelid, forehead, scalp, skin, septum and lateral nasal wall via the following branches: -

Supraorbital/Supratrochlear

The supraorbital nerve ascends through a notch/foramen on the supraorbital rim 2 cm from the midline and supplies the forehead and scalp to the vertex. The supratrochlear is always blocked with it and supplies the skin over the medial part of the forehead, above the nose.

Technique

Raise a central bleb of local anaesthetic (LA) just above the root of the nose and advance it laterally depositing about 5 ml of LA across each supraorbital rim. This can be done unilaterally however there is quite a bit of "crossover". Ensure that the needle travels in a horizontal plane and does not deviate inferiorly towards the globe.



Anterior ethmoidal

This is a terminal branch of the nasociliary nerve and it passes through the anterior ethmoidal foramen on the medial wall of the orbit into the anterior cranial fossa, along the cribriform plate and into the nasal cavity. Here it divides into a septal branch, (supplying the nasal septum) and a lateral branch, (supplying the wall of the nose inside and outside), via the external nasal nerve.

Technique

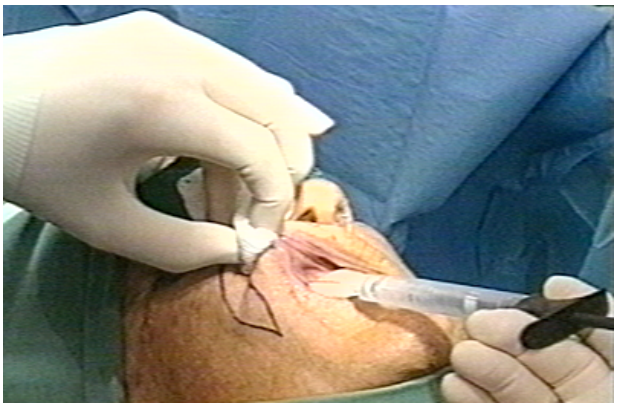
This nerve is blocked as it enters the ethmoidal foramen. A 25 Gauge needle is passed vertically backwards about 1cm above the inner canthus and to a depth of 2cm, depositing about 2mls at 2cm and 1ml on withdrawal. If you're using this block for nasal lesions you practically always need to block the infraorbital nerve as well.

Division two –Maxillary Nerve

The Maxillary nerve exits the skull via the foramen rotundum and gives off branches as it crosses the pterygo-palatine fossa and the floor of the orbit. It emerges through the infraorbital groove as the infraorbital nerve, which supplies the skin of the cheek and some of the side of the nose.

Technique

The trunk of the Maxillary nerve can be anaesthetised by a number of methods as it crosses the pterygo-palatine fossa. The one I use is the antero-lateral approach. Draw a vertical line from the lateral orbital margin to intersect with a horizontal line through the upper lip- this is the point of injection. Pass a needle at 30 degrees to the horizontal on a path directed towards the pupil and to a depth of 4-5 cm, this will get the tip of your needle into the pterygo-maxillary fissure. Always aspirate and then inject 5mls at 5cm and another 5mls after withdrawing the needle about 1cm. I often use a 25 gauge spinal needle and mark it at 5cm.



The infraorbital nerve can be blocked by an intra or extra oral approach. I think the intra oral is easiest and least painful for the patient. Elevate the upper lip and rub a small amount of LA gel over the gum above the incisor. The needle is inserted into the mucous membrane at its reflection from the gum and directed until it is about 1cm from the midpoint of the orbital rim where 2mls of LA are slowly injected.

Division Three – Mandibular nerve.

The mandibular nerve emerges from the skull through the foramen ovale and divides into branches supplying the ear, temporal region, mandible, lower lip, chin and floor of the mouth. The mandibular nerve can be blocked through the mandibular notch but much easier is the mental nerve, which is a terminal branch and supplies the lower lip and the chin.

Technique

As with the infraorbital nerve it can be blocked intra or extra orally. Use topical Lignocaine on the gum and then pass a 25g needle between the apices of the 1st and 2nd premolars: inject 5ml. If the patient is edentulous this is about in line with the angle of the mouth and in line with the supra and infra orbital foramina. The needle is inserted at the junction of the gingiva and labial mucosa. Quite extensive surgery can be performed with this block, including vermillionectomy.

ANKLE BLOCK

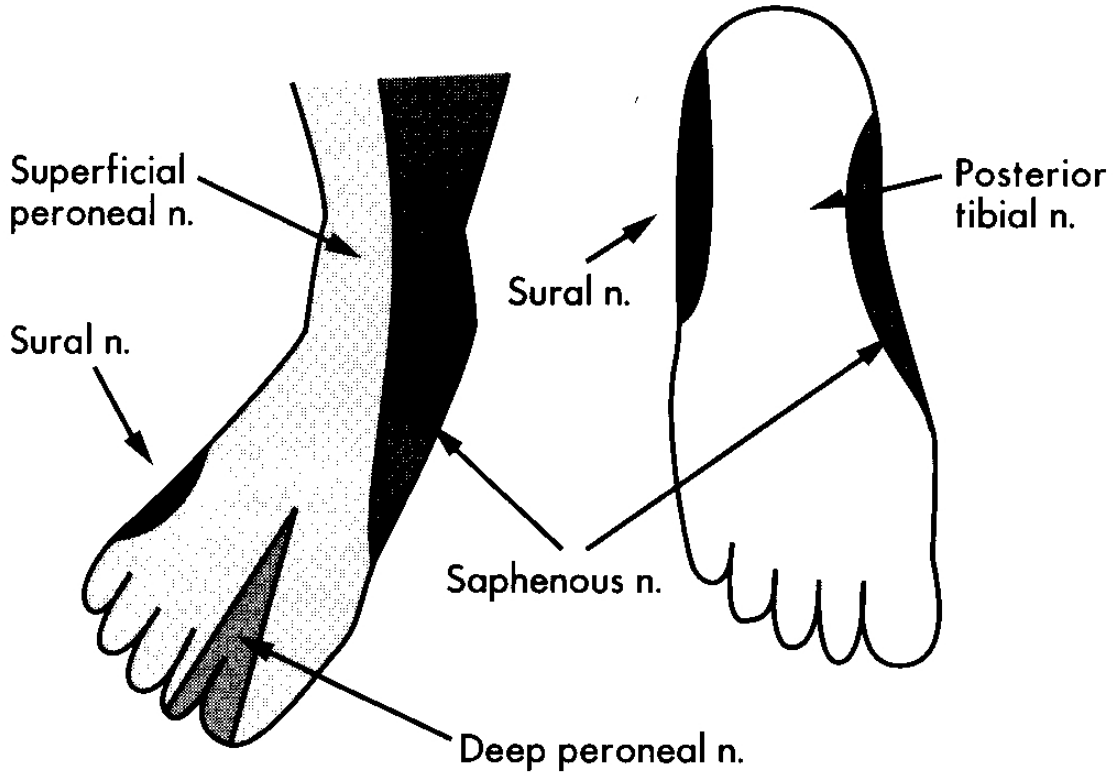
Introduction

Ankle block is a simple, safe, reliable technique with high patient satisfaction, providing excellent anaesthesia for bony or soft tissue surgery of the foot. It is usually used for mid-foot or forefoot surgery. Using long acting local anaesthetic (LA) agents, prolonged postoperative analgesia without motor block can be achieved allowing early ambulation.

Anatomy

Five nerves supply the foot: 4 are branches of the sciatic (tibial, superior and deep peroneal, sural) the fifth (saphenous) is a terminal branch of the femoral nerve. Innervation to the foot is highly variable; therefore, aim to block all 5 nerves, except for great toe surgery where a sural nerve block can be excluded. The tibial and deep peroneal nerves, which are blocked beneath the deep fascia supply bones, joints and muscles of the foot. The sensory distribution of the 5 nerves is shown in Figure 1.

Figure 1



Block the tibial nerve first as it takes longest to take full effect. Allow at least 30 minutes for block onset when using long acting LA agents. To assist patient comfort during insertion of the block, titrate a sedative agent such as intravenous midazolam. Use a technique such that after the initial LA infiltration, further LA is injected through previously anaesthetised areas.

Choice of Local Anaesthetic.

Onset and duration of the ankle block depends mainly on the choice and concentration of LA. There is little advantage in adding adrenaline to the LA and best avoided in patients with peripheral vascular disease or compromised circulation. Short acting local anaesthetics such as lignocaine can be used for surgery however for bony surgery a long acting local anaesthetic is the preferred choice which will provide long acting pain relief. Ropivacaine is a most suitable agent for ankle block with its significant advantages in reduced cardiovascular toxicity and long duration of action, similar to bupivacaine. Using ropivacaine, onset time for ankle block is between 15 to 25 minutes with a mean duration of 9 hours.[1] Bilateral blocks can be performed taking care not to exceed the maximum recommended dose of 200 mg ropivacaine.[2] More recently, a number of studies have demonstrated prolonged postoperative analgesia with the addition of clonidine (1 mcg/kg) to LA solutions.[3]

Equipment and patient positioning

Place the patient in the supine position. Use a 35 mm 25 gauge needle to minimize the number of injection sites. It is not necessary to use a nerve stimulator or paraesthesia technique. When a tourniquet is required, use a conical low pressure ankle cuff, placed immediately above the malleoli. This will be tolerated comfortably by the patient for up to 90 minutes. Patients 70 years of age or older are at greater risk of experiencing tourniquet pain.[4] Set the pressure between 200-250 mmHg or100 mmHg above systolic blood pressure.

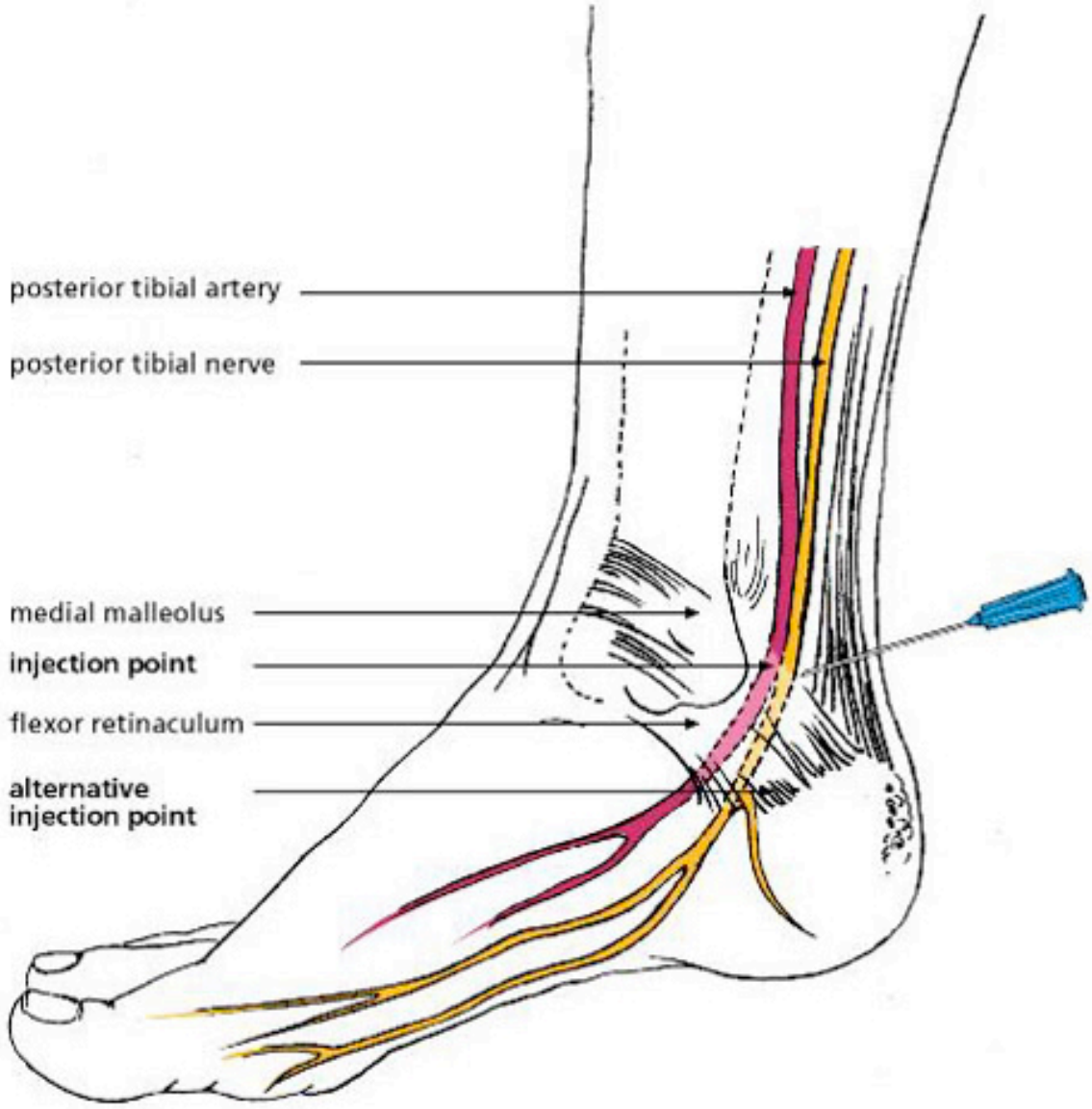
Complications

Ankle block has a low complication rate. Temporary paraesthesia can occur, usually resolving within a few weeks[5]. Systemic toxicity is rare (reported incidence <0.1%)[6], if it occurs it is usually after intravascular injection. Published work suggests a block failure rate between 0.1 and 3 %[6.] The main causes of block failure are lack of anatomical knowledge, inadequate time for block onset or failure to block a nerve required for the procedure.

Step by step infiltration technique

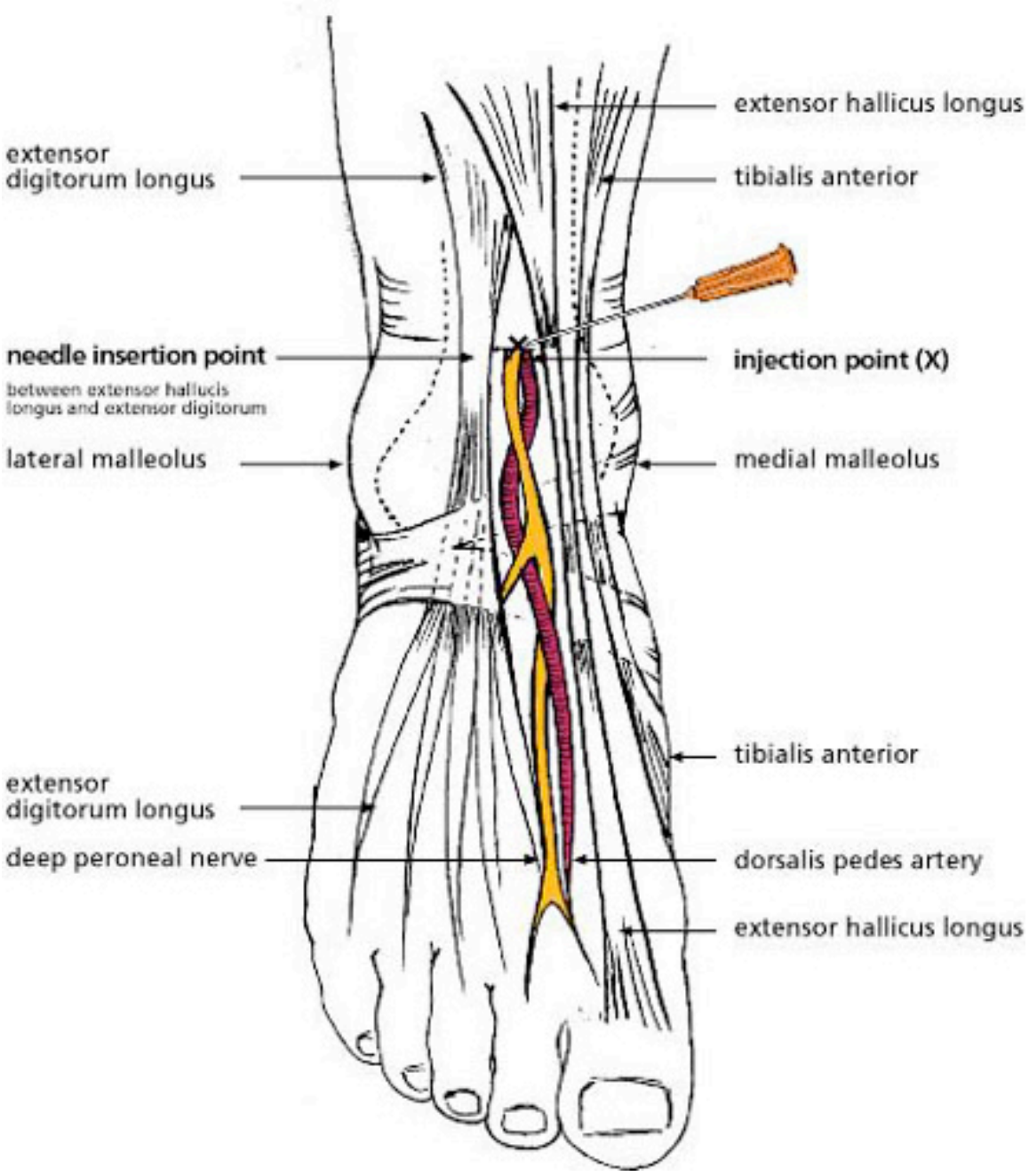
Tibial nerve (8 ml)

Palpate the posterior tibial artery and immediately behind the medial malleolus insert the needle perpendicular to skin and direct it dorsal to the artery, until bone is contacted, withdraw slightly and inject. Alternatively, if arterial pulsation is difficult, insert the needle at a point one-third of the way from the medial malleolus to the posterior apex of the heel.[7]



Deep peroneal nerve (5 ml)

Inject LA either side of the dorsalis pedis artery at the level of the malleoli between bone and skin. Alternatively, you may choose to block this nerve at the midtarsal level directly lateral to the extensor hallucis longus tendon and usually medial to the dorsalis pedis artery.

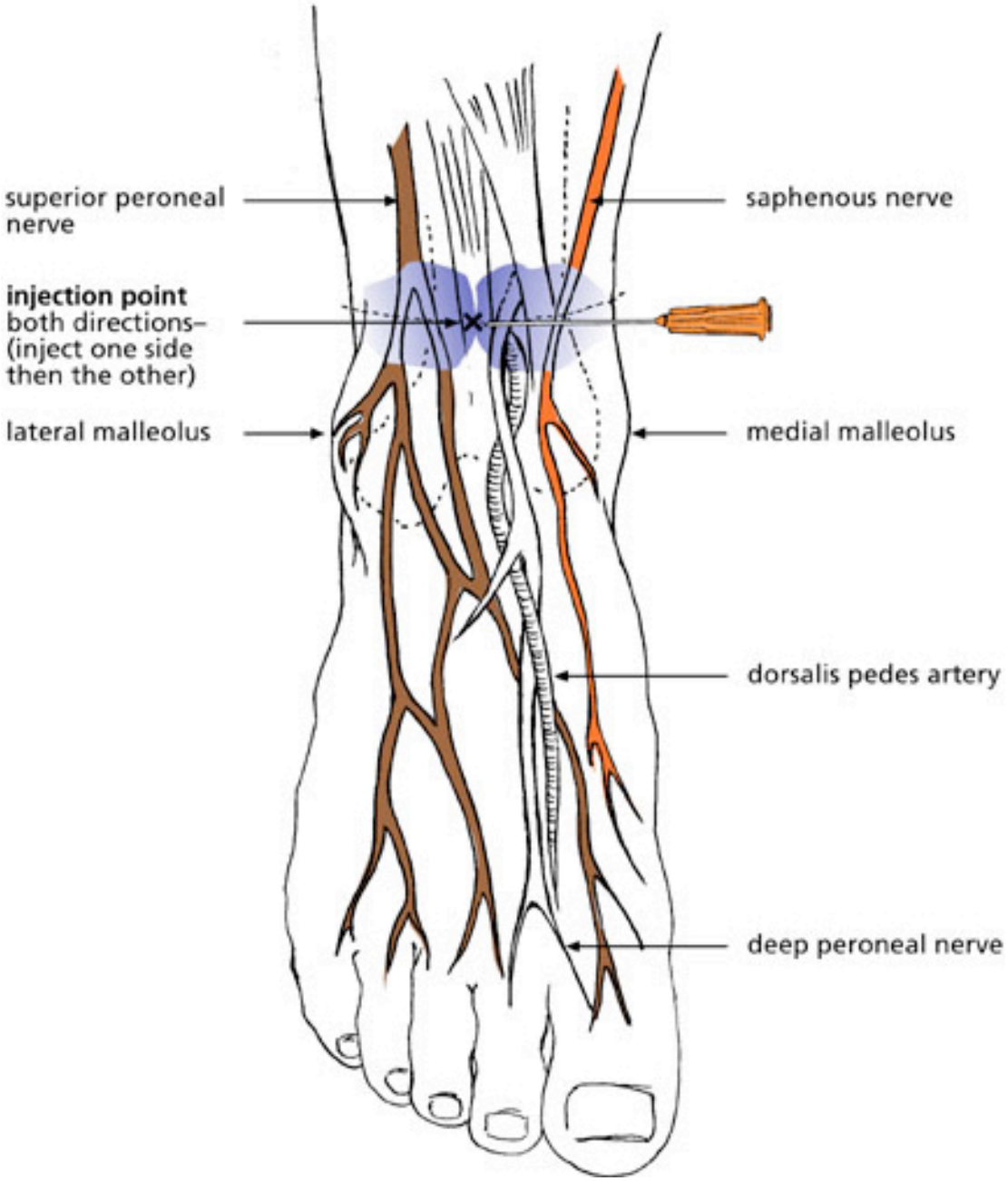


Superficial peroneal nerve (10 ml)

Inject subcutaneous LA along a line joining the malleoli.

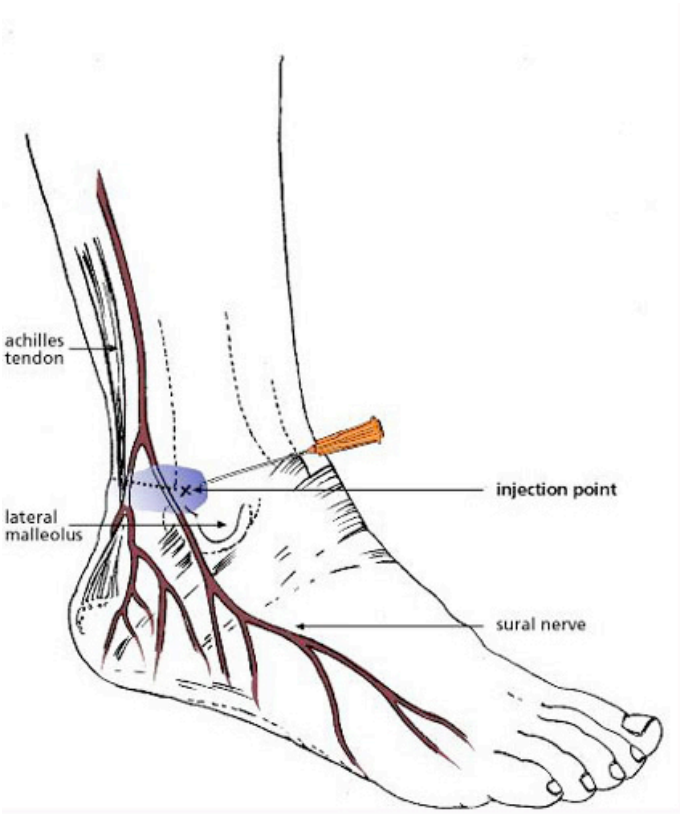
Saphenous nerve (5 ml)

Block with a perivenous infiltrate of LA 1-2 cm above the medial malleolus (the saphenous nerve runs very close to the saphenous vein) Alternatively, incorporate this block into the superficial peroneal nerve block, by continuing to inject anterior to the medial malleolus.



Sural nerve (5 ml)

Infiltrate LA subcutaneously between the lateral malleolus and the achilles tendon.



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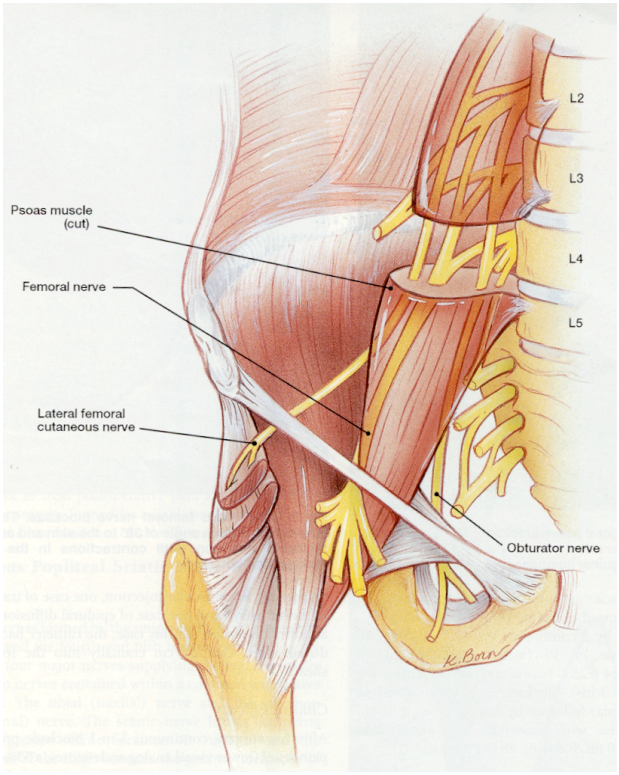
FEMORAL NERVE BLOCK (FASCIA ILIACA COMPARTMENT BLOCK FICB)

Introduction

First described by Dalens in 1989. FICB is fast to perform and does not require any special equipment other than a short bevel needle. It can be used a "single shot" or as a catheter technique. This block is most useful for analgesia for fractured shaft and neck of femur, anterior cruciate ligament repairs. It can be used for hip surgery; however supplemental analgesia will be necessary.

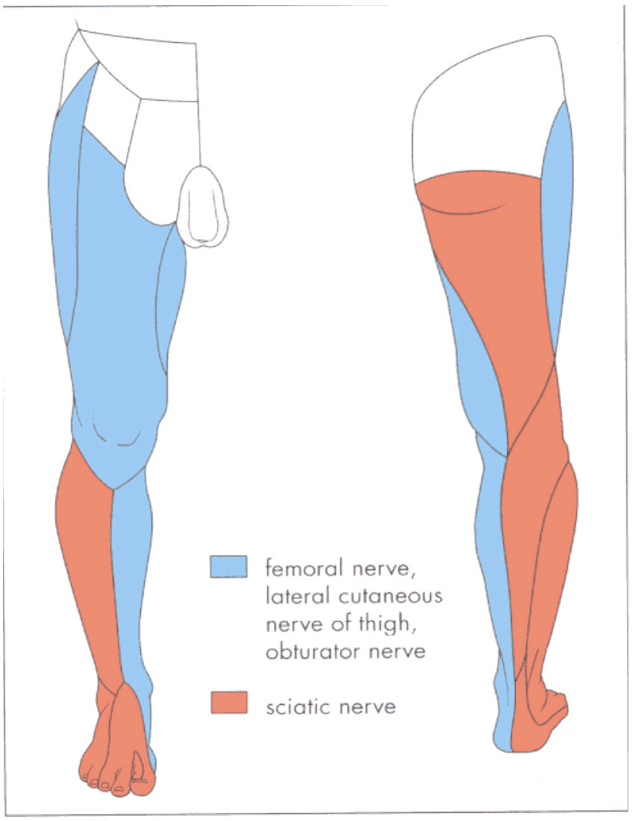
Anatomy



The lumbar plexus is formed from the anterior rami of L1-3 with part of L4.
Dalen's technique consists of depositing a volume of local anaesthetic immediately posterior to the fascia iliaca at a point 0.5 cm inferior to the junction of the midpoint of the lateral and middle thirds of the inguinal ligament. The 'Fascia Iliaca Compartment' represents a potential space defined anteriorly by the fascia iliaca, and posteriorly by the iliacus muscle. The femoral, lateral femoral cutaneous, obturator, and genitofemoral nerves all run a considerable part of their course close to the posterior aspect of the fascia iliaca. Both the obturator and genitofemoral nerves emerge at the medial border of the psoas muscle and require larger volumes of local anaesthetic to block, compared to the femoral and lateral femoral cutaneous nerves. Therefore the rate of successful block of the obturator and genitofemoral nerves is less.

Distribution of Anaesthesia

The femoral and lateral femoral cutaneous nerves are sensory to skin overlying the anterior and lateral aspects of the thigh respectively. The femoral nerve also supplies the hip and knee joints. In the case of the knee joint, the additional innervation from obturator and sciatic nerves is minor. With the hip these are more significant. The shaft of the femur is predominantly supplied from the femoral nerve.



Technique

Place the patient supine, secure IV access, and you can lightly sedate the patient. Mark the inguinal ligament and the femoral artery. In an adult the injection point is 3-4 cm lateral to the femoral artery and 1 cm inferior to the inguinal ligament or 1 cm below the junction of the middle and lateral thirds of the inguinal ligament (child). Using a short bevel needle, approach the skin at an angle of 45° (bevel up). Two 'pops' are felt, the first as the fascia lata is penetrated which is quite a definite pop. The second pop (which is felt as the fascia iliaca is penetrated) is less distinct and is often felt as a series of 2-3 pops. The depth of the needle tip at this stage is usually 4 cm in the adult but may be 5 cm in larger individuals.

Local Anaesthetic Drugs

I inject 2 mg/kg of bupivacaine 0.25% (plain) after aspiration in doses of 5-7 ml. The total dose is given over 1-2 minutes or 30-40 ml lignocaine 1% in divided doses.

Complications and Side effects

The main complication is the block not working adequately (10% chance) however this risk is lowered with experience. Femoral nerve neuropathy may occur. This usually resolves over weeks, but beware, the neuropathy may be due to the surgery itself. There is a low risk of infection at the injection site if aseptic techniques are applied. There are no reports of local anaesthetic toxicity however potentially it could occur. Motor blockade of the quadriceps occur and the knee extensor can be blocked which can be a problem for ambulation when the block is working.

References:

B Dalens, G Vanneuville, A Tanguy. Comparison of the fascia iliaca compartment block with the 3-in -1 block in children. *Anesth Analg*1989: 69:705-13

www.developinganaesthesia.org

Welcome to www.developinganaesthesia.org. This web site has been created to promote the advancement of anaesthetic practice and to empower anaesthetists in countries with limited resources. The site also hopes to foster the growth of an online community of anaesthetists throughout the world.

A web-based resource has significant advantages. The information provided can remain current and be tailored to the requirements of the community. Hard copy texts may be expensive, difficult to access and inappropriate to the delivering of anaesthesia outside of tertiary institutions. The majority of journals have similar limitations.

DevelopingAnaesthesia.org is a free, up to date resource, specifically designed to address these problems.

The authors envisage the web site will have five principle functions, though the dynamic nature of web publishing will allow the evolution of the site as directed by the anaesthesia community.

- **1. Continuing education**
  DevelopingAnaesthesia.org will provide an anaesthetic educational resource for anaesthetists. The site contains a textbook, articles, case studies and links. with time the site will contain power point and video presentations.

- **2. Anaesthetic training**
  DevelopingAnaesthesia.org will provide an anaesthetic educational resource for anaesthetic trainees. The site will contain lecture notes for physiology, pharmacology, equipment, monitoring and statistics.

- **3. Teach the teacher**
  DevelopingAnaesthesia.org will provide a resource to aid anaesthetists in educational methods.

- **4. Peer-reviewed publication**
  DevelopingAnaesthesia.org will provide a venue for peer-reviewed publication online at no cost to authors or readers. All submitted material (case studies, articles, audits etc) is welcomed and encouraged.

- **5. Discussion forums**
  DevelopingAnaesthesia.org has an open forum for discussion, exchange of ideas/experience and seeking advice. A panel of anaesthetists with experience in delivering anaesthesia and teaching in developing countries will moderate the forum but colleges in similar countries may provide the most relevant advice.

Success and the growth of www.developinganaesthesia.org will depend on feedback from the anaesthetic community it serves. Please have a look at the site and register as a user, there is no cost. Registration allows you to participate in forum discussions, submit your own articles and comments and in doing so help foster community growth.