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FASCIA ILIACA COMPARTMENT BLOCK: LANDMARK APPROACH

GUIDELINES FOR USE IN THE EMERGENCY DEPARTMENT

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Based on the document: 'Fascia Iliaca Block: Landmark and Ultrasound Approach.' Anaesthesia Tutorial of the Week 193. 23rd August 2010. Written by, and with kind permission from Dr. Christine Range and Dr. Christian Egeler, Consultants in Anaesthesia, Morriston Hospital.[1]

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FASCIA ILIACA COMPARTMENT BLOCK: LANDMARK APPROACH

INTRODUCTION

Neck of femur fracture affect an estimated 65,000 patients per annum in England in Wales, a figure that is set to rise to >100,000 by 2020 at a cost of around £2 billion a year to the NHS.[2, 3] These injuries affect an ever increasing elderly population, many of whom have significant co-morbidities and are subject to polypharmacy.

Research has shown that pain left untreated may have significant physical and psychological effects on the patient, may delay operative management and complicate hospital stay.[4] Furthermore, studies report that the pain management for limb fractures in the elderly is hugely sub-optimal with some suggesting that only 2% receive adequate analgesia.[5-7]

Hip fractures can be extremely painful, and the provision of adequate, early analgesia should be a priority in the Emergency Department. Conventional pain relief can often cause undesirable side-effects in this cohort of patients. In particular bolus opioids can lead to respiratory depression, hypotension and confusion, and non-steroidal anti-inflammatories may cause renal impairment. Fascia iliaca blocks provide a safe, cheap and effective form of pain relief for patients with neck of femur fractures, and indeed for those with femoral shaft fractures.[8-9]

This document aims to cover the relevant anatomy of the fascia iliaca compartment, the indications, contra-indications and guidance on performing the block, potential complications and a brief section on trouble-shooting tips.

ANATOMY

The nerve supply of the lower extremity is provided through four major nerves: the sciatic nerve, the femoral nerve, the obturator nerve and the lateral cutaneous nerve of the thigh. The femoral, obturator and lateral cutaneous nerves of the thigh all arise from the lumbar plexus (nerve roots L2-4). The sciatic nerve arises from the lumbar and sacral plexuses (nerve roots L4-S3).

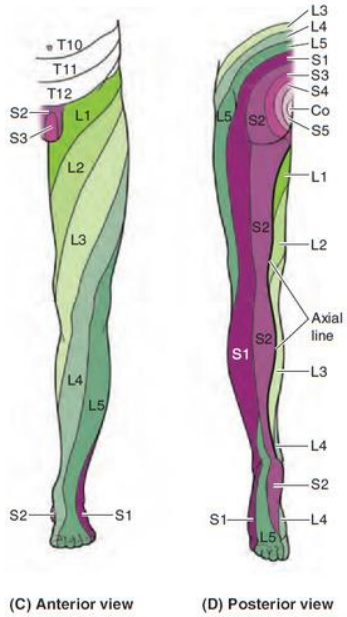

Figure 1 Dermatomes of the lower limb.[10]

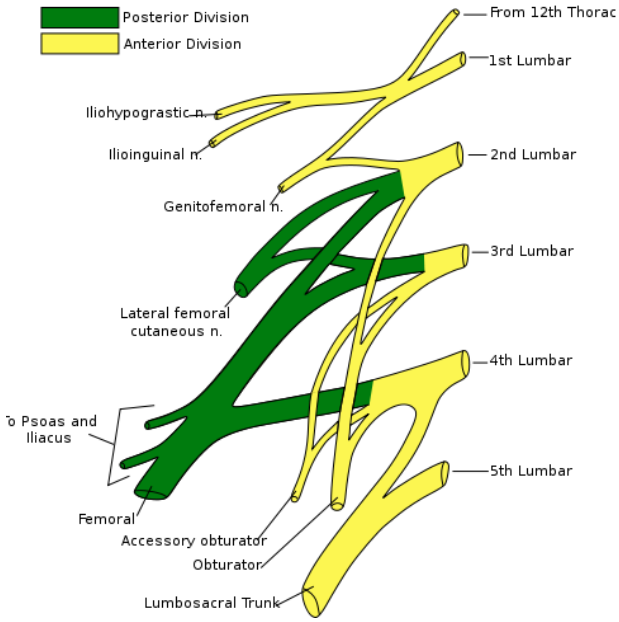

Figure 1 Right lumbar plexus.[11]

THE FEMORAL NERVE

This is the largest branch of the lumbar plexus, originating from the posterior divisions of the anterior rami of the lumbar nerves 2, 3 and 4 (Fig 2). It descends through the posterior third of the psoas major muscle, emerges from its lateral border and continues caudally between the bulk the psoas major and iliacus muscle. It enters the thigh behind the inguinal ligament, lying lateral to the femoral artery and on top of the iliacus muscle. It is separated from the artery by the fascia iliaca. It gives its motor supply to the knee extensors (quadriceps femoris and sartorius muscles), and its sensory supply to the anteromedial surface of the thigh and medial aspect of the lower leg, ankle and foot via its terminal branch, the saphenous nerve (Fig 1).

THE LATERAL FEMORAL CUTANEOUS NERVE (LFCN)

The LFCN arises from L2 and L3 (Fig 2). It emerges from the lateral border of the psoas major muscle, heading towards the anterior superior iliac spine (ASIS). It is covered on its course by the fascia iliaca. Passing behind the inguinal ligament close to its lateral insertion at the ASIS the LFCN perforates the fascia iliaca. Once in the thigh it splits into its terminal cutaneous branches, which usually cross over the sartorius muscle and are covered by the fascia lata. As the name suggests it gives its sensory supply to the lateral aspect of the thigh, and as distal as the knee (Fig 3).

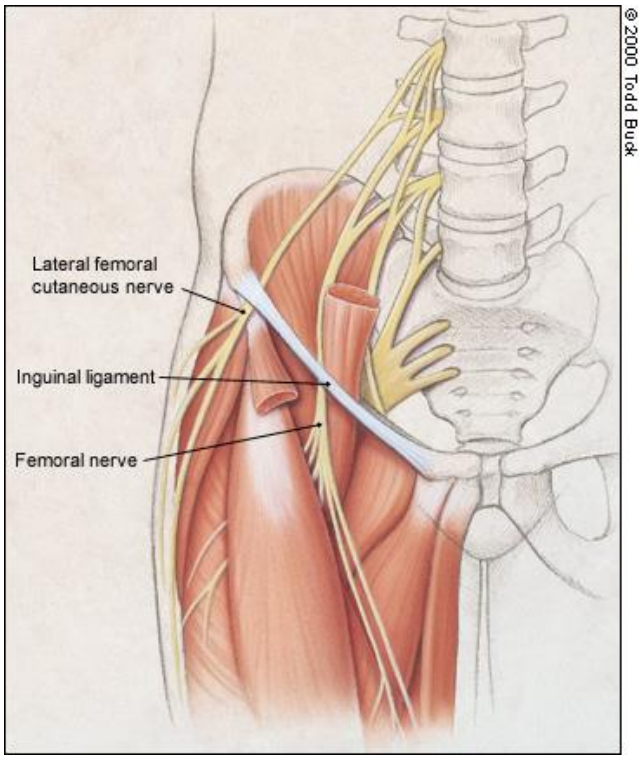

Figure 3 [12]

THE FASCIA ILIACA

Location

- Spans from the lower thoracic vertebrae to the anterior thigh.
- Lines the posterior abdomen and pelvis, covering psoas major and iliacus muscles.
- Forms the posterior wall of the femoral sheath, containing the femoral vessels.
- In the femoral triangle is covered by fascia lata, merging with it distally.

Attachments

- Lateral: thoracolumbar fascia.
- Medial: vertebral column, pelvic brim, pectineal fascia.
- Anterior: posterior part of inguinal ligament, fascia lata.

Neurovascular relations

Above the inguinal ligament the femoral vessels lie superficial to the fascia iliaca while the femoral, obturator and LFCN are covered by it in their respective locations. The area behind the inguinal ligament can be divided into medial and lateral parts:

- Medially, the fascia iliaca forms the posterior wall of the femoral sheath (lacuna vasorum), which contains the femoral artery and vein, and the femoral branch of the genitofemoral nerve.
- Laterally, it forms the roof of the lacuna musculorum, which contains the psoas major and iliacus muscles, and the femoral nerve. The fascia iliaca separates the lacuna musculorum from the lacuna vasorum with fibers that link to the capsule of the hip joint, thereby forming a functional septum between the two lacunae.

THE FASCIA ILIACA COMPARTMENT

The fascia iliaca compartment is a potential space with the following limits:

- Anteriorly: the posterior surface of the fascia iliaca, which covers the iliacus muscle, and with a medial reflection, every surface of the psoas major muscle.
- Posteriorly: the anterior surface of the iliacus muscle and the psoas major muscle.
- Medially: the vertebral column, and cranially laterally the inner lip of the iliac crest.
- Cranio-medially: it is continuous with the space between the quadratus lumborum muscle and its fascia.

This compartment allows deposition of local anaesthetic of sufficient volumes spread to at least two of the three major nerves that supply the medial, anterior and lateral thigh with one simple injection, namely the femoral and lateral femoral cutaneous nerves (Fig 4).

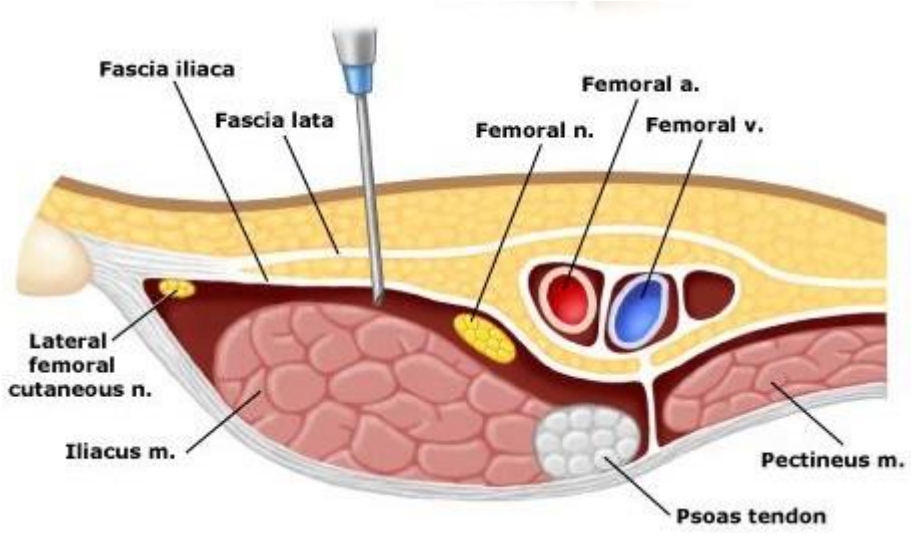

Figure 4 [13]

Key points:

- Innervation of medial, anterior and lateral aspects for the thigh come from L2-4.
- The fascia iliaca compartments contains three of four major nerves supplying the leg.
- Local anaesthetic injected here reliably reaches the femoral and LFCN only.

INDICATIONS

The aim is to reduce the requirement for systemic analgesics such as opioids and non-steroidal anti-inflammatories, along with their side-effects. This is particularly important in elderly patients, who form by far the largest group admitted with neck of femur fractures.

- Pre-operative analgesia for patients with neck of femur or femoral shaft fractures.
- Analgesia for the application of plaster in children with femoral fractures (following discussion with a senior clinician).

CONTRA-INDICATIONS

- Patient refusal
- Known true allergy or previous anaphylactic reaction to local anaesthetic.
- Inflammation or infection over the site.
- Previous femoral-bypass surgery, or near a graft site.
- Anticoagulation – INR >1.5
    - Consider recent clopidogrel/high dose aspirin/low molecular weight heparin.
    - Use clinical judgement and discuss with a senior clinician.

GENERAL PREPARATION

Confirm the indication and correct patient, rule out contra-indications, obtain informed (verbal) consent, and ensure that you have the right assistance, monitoring and equipment.

Specific equipment required:

- Fascia iliaca block pack (kept in 'theatre' in the Emergency Department). (Block packs supplied by PAJUNK® UK Medical Products Ltd. See appendix 1).
- Skin antiseptic solution (0.5% chlorhexidine spray or ChloraPrep® sponges).
- 30-40mls of long acting local anaesthetic. We advise 0.25% (2.5mg/ml) chirocaine/levobupivacaine, 30mls if patient weighs <50kg or 40mls if >50kg.
- 1-2mls of 1% lignocaine for skin infiltration if necessary.

LANDMARK PROCEDURE

The landmarks for the procedure are the anterior superior iliac spine (ASIS) and the ipsilateral pubic tubercle. Place one finger on each of these bony landmarks and draw an imaginary line between them. Using your index fingers divide this line into thirds. At the junction of the lateral 1/3 and medial 2/3 make a mark. Your insertion point will be 1cm distal/caudal to this mark.

Figure 5[1] The injection site for a right-sided fascia iliaca block. Divide a line between the ASIS and pubic tubercle (PT) into thirds. The left index finger (in this case) marks the junction of the lateral third and medial two thirds of the line.

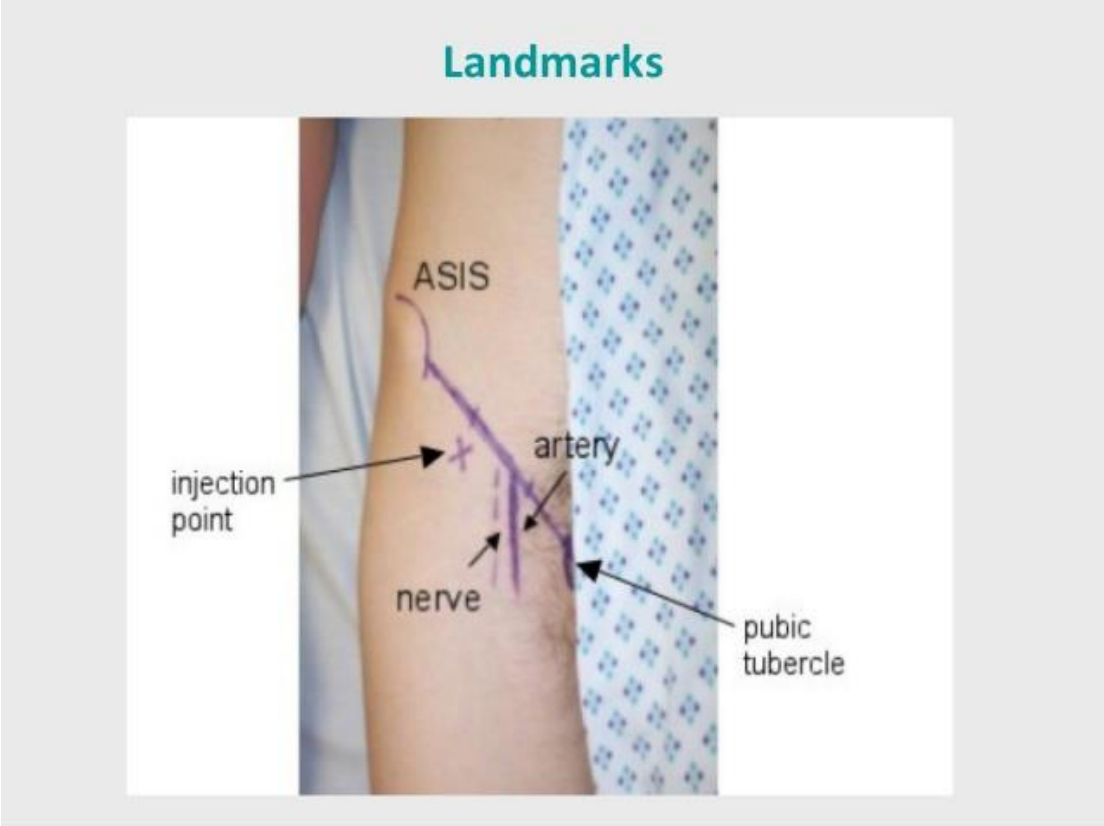

Figure 6[1] Landmarks projected onto the skin. Anterior superior iliac spine (ASIS), pubic tubercle, with the adjoining line divided into thirds. The femoral artery is marked with a solid line, with an estimation of the position of the femoral nerve marked with a dotted line. The injection point is marked with an 'X', and is 1cm caudad to the junction of the lateral 1/3 and medial 2/3 of the line.

PERFORMING THE BLOCK

- Confirm patient and indication for block.
- Gain informed (verbal) consent for the procedure.
- Ensure appropriate assistance available and monitoring attached (ECG, saturations probe and non-invasive BP).
- Position the patients correctly.
- Prepare your equipment and draw up the appropriate amount of local anaesthetic (as specified above).
- Attach the first syringe to the block needle and flush out any air.
- Perform your landmark procedure.
- Locate the position of the (ipsilateral) femoral pulse. This should be palpable approximately 1.5-2cm medial to the intended injection site in order to avoid inadvertent impalement of the femoral neve.
- Prepare and clean the skin. (Infiltrate the skin superficially with 1-2mls of 1% lignocaine at this point if chosen).
- Using the appropriate needle (provided in the FIB pack) pierce the skin at right angles to its surface (it may help to keep the skin taught at this point).

- Keep the needle in the sagittal plane so as to avoid the neurovascular bundle which lies medially.
- Advance the needle through two distinct "pops" as it perforates first the fascia lata and then the fascia iliaca.
- Advance the needle a further 1-2mm.
- Aspirate, and if negative inject slowly. There should be no resistance to injection. If there is, the needle is likely to be in the iliacus muscle. In this case, withdraw the needle slightly until injection is easy. There should be no pain or paraesthesia on injection.
- Inject the first 20mls slowly, aspirating every 5mls. Then change the syringe, aspirate and inject the remaining volume.
- Withdraw the needle at the end of the procedure and apply a little pressure to the area for up to two minutes.
- Ensure that the patient is comfortable and that observations are checked:
    - Every 5 minutes for 15 minutes
    - At 30 minutes
    - 4 hourly thereafter
- Ensure that the block is clearly documented in the patient's notes – there are documentation labels included in the FIB packs.

Key points:

- Draw a line between the ASIS and pubic tubercle, and divide it into thirds.
- Needle insertion is 1cm caudad to the junction of the lateral 1/3 and medial 2/3.
- With the block needle feel two "pops".
- After negative aspiration inject local anaesthetic slowly, aspirating every 5mls.

COMPLICATIONS

- Intravascular injection
- Local anaesthetic toxicity
- Temporary or permanent nerve damage
- Infection
- Block failure
- Injury secondary to numbness/weakness of limb
- Allergy to any of the preparations used

Overall a FICB has a very low risk profile. The location of the landmarks should minimize the risk of intravascular injection and mechanical nerve injury, and the use of amide local anaesthetics (e.g. levobupivacaine/chirocaine) significantly reduces the risk of allergic reaction. Good aseptic technique should reduce the risk of infection, and the injection of high volumes of anaesthetic ensures good spread and improves the chances of success. The risk of local anaesthetic toxicity is highest in the first 15-30 minutes which makes close monitoring mandatory at this stage.

TROUBLE SHOOTING

Problem	*Suggested action*
No distinct "pops" felt during needle advancement.	Withdraw needle, check landmarks, change angle to be more perpendicular or cranial.
Hitting bone on needle advancement.	Too deep. Withdraw +/- change angle directing more cranially.
Blood on aspiration.	Remove needle, apply pressure for 2 minutes. Re-attempt directing more laterally.
Resistance to injection.	Withdraw needle slightly, and try again. The needle may be positioned within the muscle.
Pain on injection.	Localised slight burning sensation around the injection site is normal, slow your injection rate to ease it. Severe pain is not normal. Stop injecting if this occurs.
Signs of local anaesthetic toxicity (perioral numbness, tinnitus, dizziness, arrhythmia, seizures).	Stop injecting, call for help, give high flow oxygen, provide life support as required.
No pain relief within 30 minutes.	Inject a further 20mls of 0.25% chirocaine, consider alternative pain relief.

SAFETY POINT – If performing a fascia iliaca block after administration of opiate analgesia, be alert to the possibility of exacerbating some undesirable side-effects, such as respiratory depression once the painful stimulus has been removed.

SUMMARY

The fascia iliaca compartment block performed by landmark technique is inexpensive, safe and easy to perform. It delivers effective pain relief whilst avoiding the undesirable side-effects of certain other forms of analgesia. Delivering large volumes of low concentration local anaesthetic helps to maximize the benefits of the block, whilst following the well-established techniques set out above help to minimize complications.

It is important to remember to always work under safe conditions. Ensure that you have been trained and are competent in performing these blocks. Training should be regularly provided and we would encourage you to attend these sessions in order to acquire/refresh the necessary skills. For doctors, we advise that you conduct at least two (if within a short amount of time) to five blocks under supervision before attempting one alone.

Attached to this guide will be:

- A quick reference guide to performing a fascia iliaca block with simple flow chart;
- A copy of the AAGBI safety guidance on local anaesthetic toxicity;[14]
- A copy of the Resuscitation Council (UK) guidelines on the management of a patient with anaphylaxis.[15]

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APPENDIX 1

Fascia Iliaca Block Packs by PAJUNK® UK Medical Products Ltd.

Pack contents

1 One Compartment Tray 208x145x35 mm
1 FIB Needle
1 Injection needle 25G x 16 mm
1 Drawing Up needle 18G x 40 mm blunt
1 Syringe 3 ml, Luer Slip
2 Syringes 20 ml, Luer Slip
5 Gauze swabs 10x10 cm, 12 ply, white plain 1 Outer wrap 70x75 cm double layered
1 Sticker Label
1 FIB Compartment Block Proforma