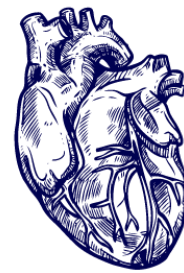


Primary Cast Episode 7 - Lower Limb Anatomy

Host - Dr. Charlotte Durand

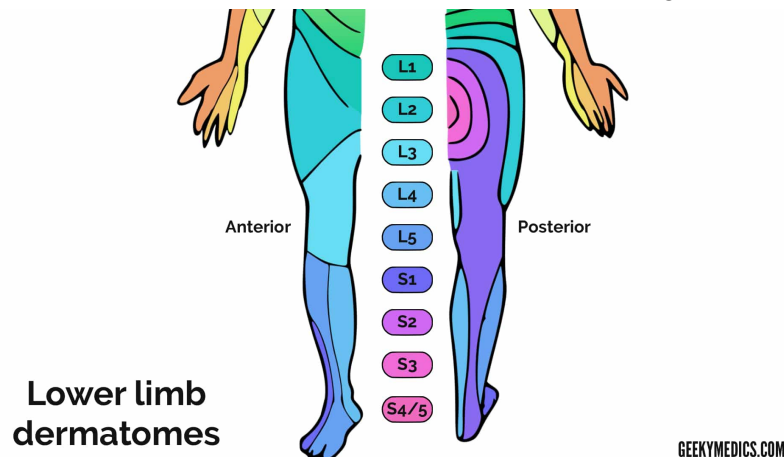
Guest - Dr. Anna Morgan



Primary Cast

1. Dermatomes

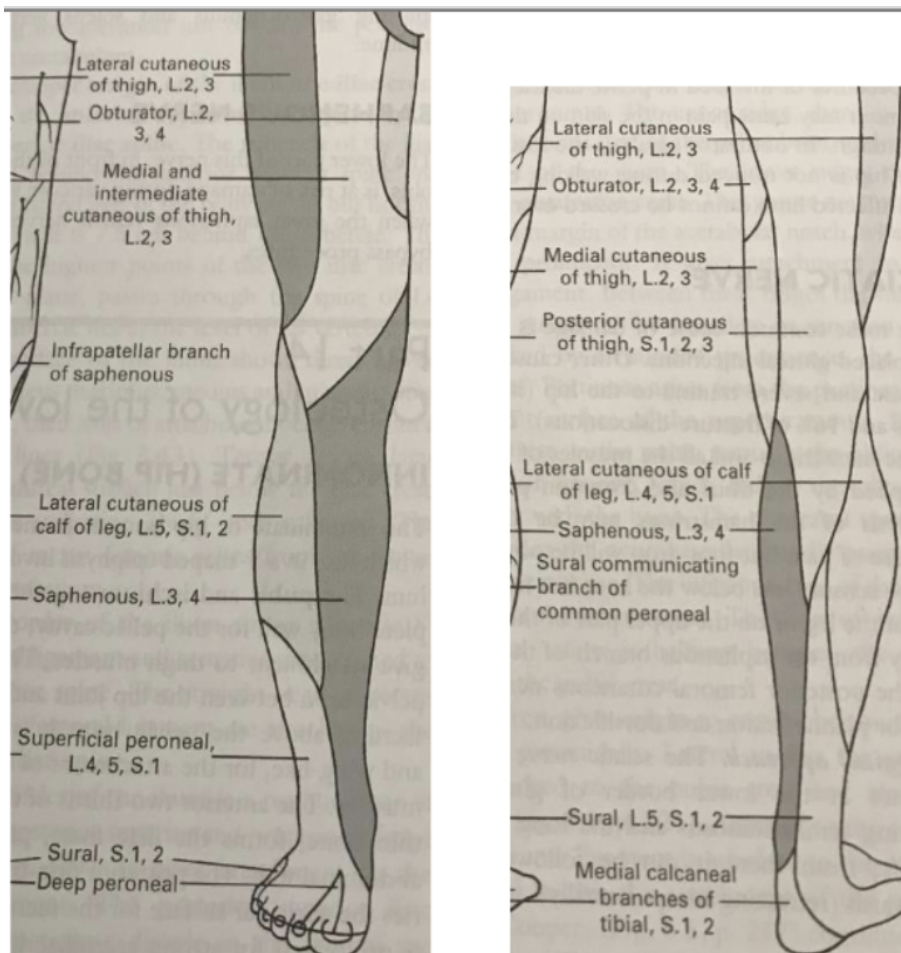
- Describe the dermatomes of the lower limb
- L1 L2 L3 L4 and L5 wind around leg in an inferomedial direction
- L1 is over the inguinal region
- L2 is over the middle and lateral aspect of the anterior thigh
- L3 is over the knee
- L4 is over the medial malleolus
- L5 supplies the medial foot and the great toe
- S1 S2 supply the back of the leg, which becomes the lateral foot
- There is an axial line down posteromedial aspect of leg



Please describe the cutaneous nerves of the lower limb

NB: Thigh = above the knee, leg = below the knee.

- Lateral thigh = Lateral cutaneous nerve of thigh L2 L3
- Anterior and medial thigh = Anterior cutaneous branch of femoral nerve, intermediate and medial femoral cutaneous nerves, obturator nerve
- Posterior thigh = Posterior cutaneous nerve of the thigh (S1- S3)
- Lateral leg from knee to mid calf = lateral cutaneous nerve of calf and leg
- Anterolateral leg from mid calf = superficial fibular nerve
- Posterolateral leg from mid calf = sural nerve
- Medial leg = saphenous nerve
- Dorsum of the foot (except 1st webspace) = superficial fibular nerve
- 1st webspace = deep fibular nerve
- Heel = Medial calcaneal branch of tibial nerve
- Sole of the foot except heel = medial and lateral branches of tibial nerve



2. Myotomes

What are the myotomes of the lower limb?

• Hip flexion L2/L3	• Hip Extension L4/L5
• Knee Extension L3/L4	• Knee Flexion L5/S1
• Ankle Dorsi Flexion L4/L5	• Ankle Plantar Flexion S1/S2
• Ankle Inversion L4	• Eversion L5/S1
• Big Toe Extension L5/S1	• Big Toe Flexion S1/S2

3. Pelvis - you must be able to look at a pelvic xray and name all the key landmarks

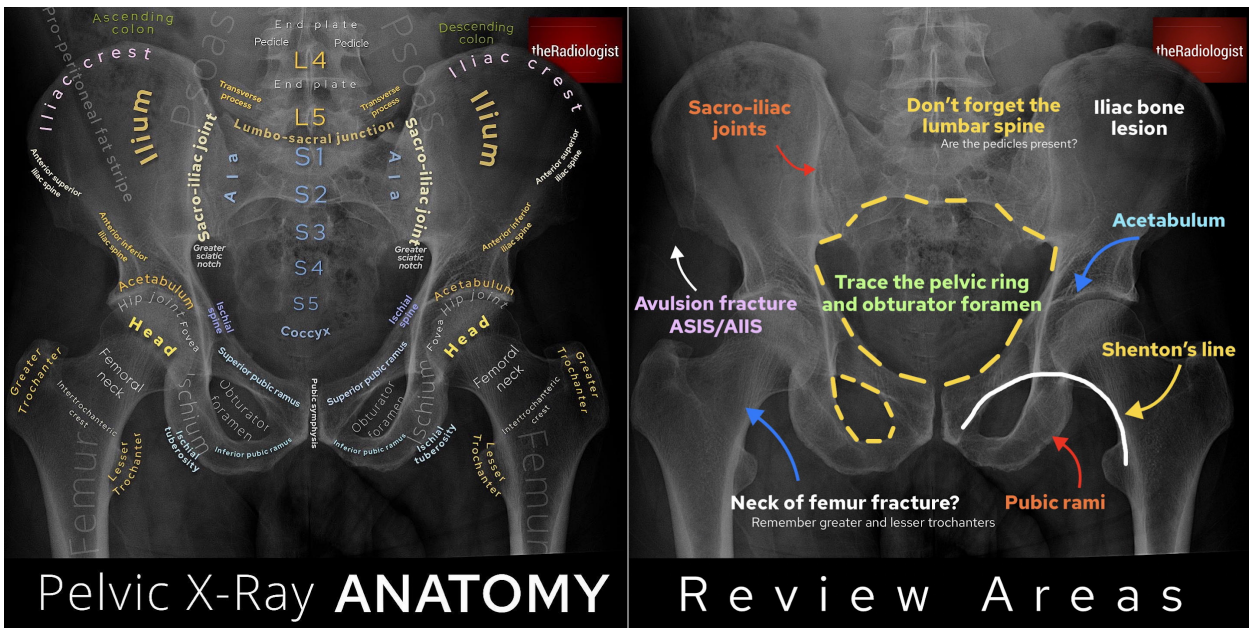
What are the bony landmarks of the pelvis?

- 3 bones - ilium, ischium, pubis
- Anterior surface - ASIS, AIIS, pubic symphysis, superior and inferior pubic rami

- Laterally - iliac crest
- Posterior surface- PSIS and PIIS, greater and lesser sciatic notches, ischial spine
- Inferiorly - ischial tuberosities

What are the main articulations within the pelvic girdle?

- Sacroiliac joints
- Pubic symphysis
- Acetabulum articulating with the femur



What attaches to the anterior inferior iliac spine?

Rectus femoris

What attaches to the anterior superior iliac spine?

Sartorius

Describe the course of the iliac arteries

- Common iliac arteries originate from the aorta around L3 -L5
- Follows the medial border of psoas to the pelvic brim
- Divides at the level of L5- S1
- Internal iliac artery enters the pelvis
- External iliac artery follows iliopsoas and ends at the inguinal ligament where it becomes the femoral artery at the mid inguinal point

4. Hip

What are the factors maintaining stability of the hip joint?

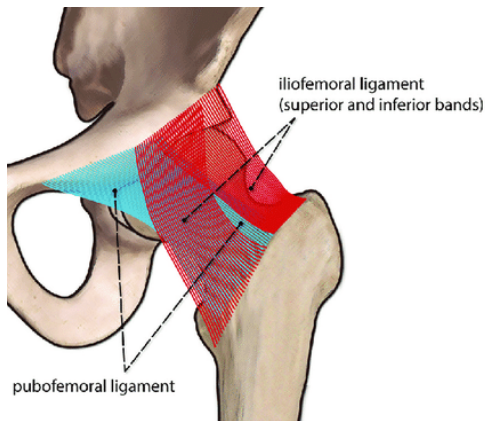
- Bony Articulations
 - Acetabular socket, formed by the ilium, ischium and pubis
 - Articulates with the femoral head for transfer of weight
 - Reinforced by labrum
- Ligaments
 - Capsule
 - Iliofemoral
 - Ischiofemoral
 - Pubofemoral
 - Transverse acetabular ligament
- Muscles
 - Short muscles are important, especially gluteus medius and minimus

What is the least stable position of the hip?

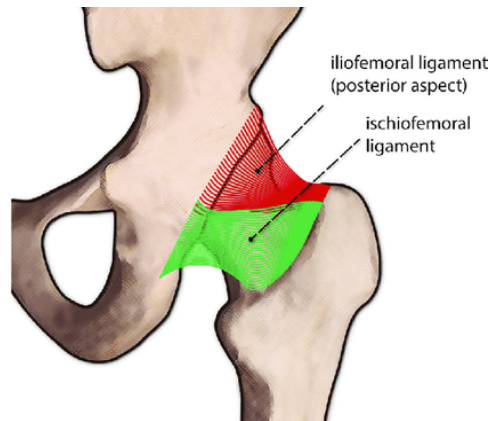
Flexed and adducted (*i.e. seated position* → *bad for car accidents*)

Describe the attachments of the ligaments of the hip

- iliofemoral ligament
 - From the anterior inferior iliac spine and acetabular rim to the intertrochanteric line
- Pubofemoral ligament
 - From obturator crest of pubis, blends with medial aspect of iliofemoral ligament
- Ischiofemoral ligament (weakest)
 - Posterior acetabular rim, spirals superolaterally to the base of the greater trochanter
- Transverse acetabular ligament - bridges the acetabular notch
- Ligament of the head of the femur, to the fovea of the head



a.



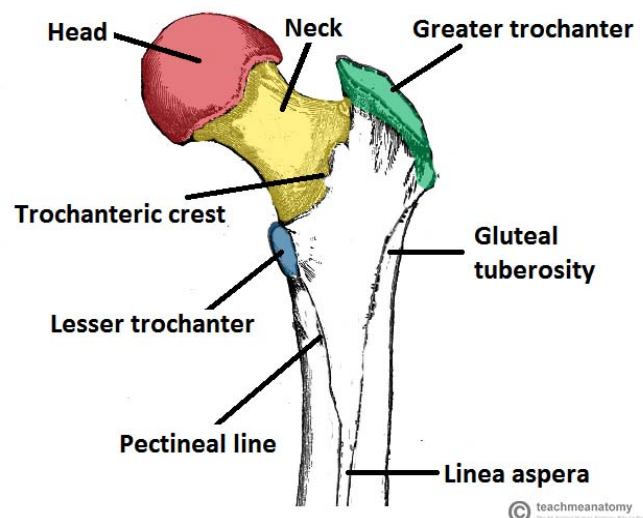
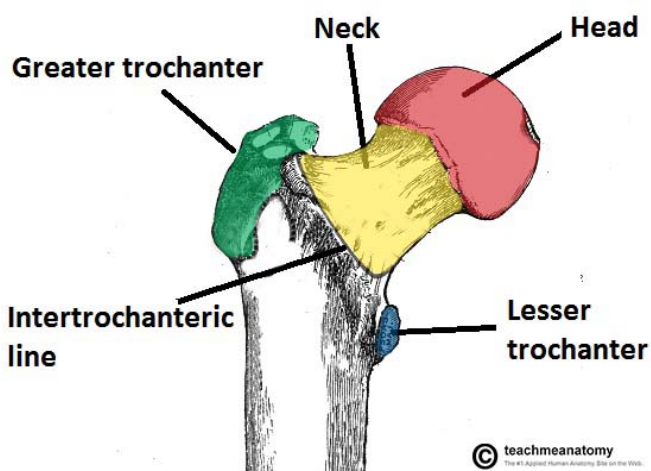
b.

Where might you find a pathological fracture around the hip joint?

Pubic rami, neck of femur or the proximal shaft

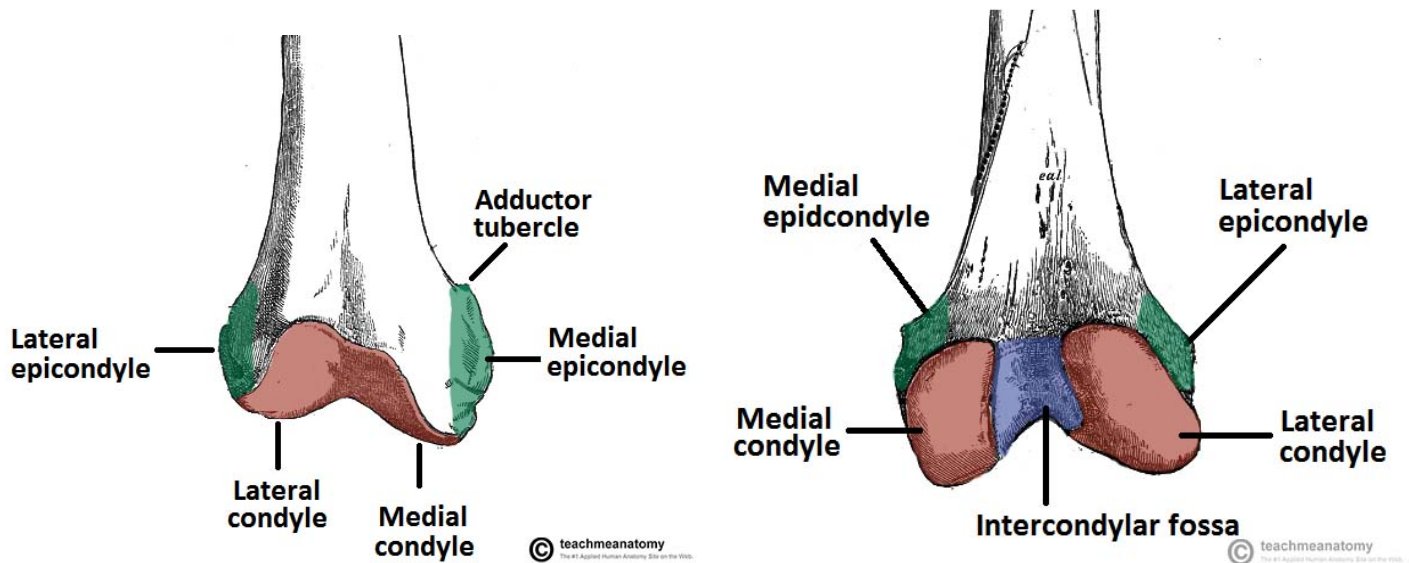
5. Femur**Please describe the main bony features of the proximal femur**

- Femoral head - fovea for the ligament of the head of femur
- Neck
- Greater trochanter
- Lesser trochanter
- Intertrochanteric line (anterior) and intertrochanteric crest (posterior)
- Quadrate tubercle (which is on the intertrochanteric crest)
- Pectineal line and Gluteal tuberosity join to form the Linea aspera with medial and lateral lips

**Describe the bony features of the middle and lower end of the femur**

you should be able to point these out on an image of the bone

- Linea aspera
- Medial supracondylar ridge - which is an inferior continuation of the medial lip of the linea aspera, interrupted to allow passage of the femoral artery, ends as the adductor tubercle
- The lateral supracondylar ridge descends to the lateral epicondyle
- Lateral and medial condyles separated by the intercondylar fossa
- Adductor tubercle on medial epicondyle
- Attachment of the medial ligament



Which muscles attach to the linea aspera?

Vastus medialis, vastus lateralis, adductor brevis, adductor longus, adductor magnus and short head of biceps femoris

Which artery is most likely to be damaged by a fracture to the midshaft of the femur?

The profunda femoris

6. Muscles acting on the hip

Describe the anatomy of the iliopsoas muscle

Iliopsoas consists of the iliacus and psoas major muscles

Psoas Major

- Superior attachment
 - Transverse processes of the lumbar vertebrae
 - Sides of vertebral bodies T12 - L5
 - Intervertebral discs T12 - L5
- Inferior attachment
 - Single tendon to the lesser trochanter of the femur
- Innervation
 - Anterior rami of L1, L2 and L3

Iliacus

- Superior attachment
 - Superior $\frac{2}{3}$ of iliac fossa
 - Ala of sacrum
 - Anterior sacro-iliac ligaments

- Inferior attachments
 - Lesser trochanter of femur and shaft inferior to it
 - Psoas major tendon
- Innervation
 - Femoral nerve L2- L4

**What are the lateral rotators of the femur and where do they originate? & insert.
(group them together) - image of gluteal region from anatomy book**

- Piriformis - anterior sacrum and sacrotuberous ligament to the greater trochanter
- Obturator internus- pelvic surface of obturator membrane and surrounding bones, to the greater trochanter
- Superior gemellus - ischial spine to the greater trochanter
- Inferior gemellus - ischial tuberosity to the greater trochanter
- Quadratus femoris - lateral border of ischial tuberosity, attaches to the quadrate tubercle on the intertrochanteric crest
- Gluteus maximus - ilium, posterior to the posterior gluteal line, dorsal surface of the sacrum and coccyx, sacrotuberous ligament

Describe the actions of the gluteus maximus muscle

- Straightens the leg at the hip during walking, running, climbing.
- Assists in raising to stand from a seated position
- Tensor of the fascia lata and its connection with the iliotibial band
- Steadies the femur during standing

7. Femoral Triangle (asked every couple of years - must know this,)

What are the borders and contents of the femoral triangle

Boundaries:

- lateral border = Medial border of sartorius
- medial border = lateral border of adductor longus
- superior border = inguinal ligament
- floor = iliacus, psoas, pectineus and adductor brevis

Contents: (NAVEL, from lateral to medial) = Femoral Nerve, Femoral Artery, Femoral Vein, Empty Space, Lymphatics

What are the surface markings when trying to locate the femoral vein?

- Use the anatomical landmark for the femoral artery
- Femoral artery is found below the inguinal ligament, midway between the ASIS and the pubic tubercle
- Femoral vein is just medial to the artery

Describe the course of the femoral vein in the femoral triangle

- Starts as popliteal vein
- Travels medial to the femoral artery, lateral to the femoral canal
- Ends as the external iliac vein
- The great saphenous vein drains to the femoral vein through the cribriform
- The profunda femoris veins also drain into the femoral vein

8. Nerves

Describe the origin and course of the sciatic nerve and the muscles it supplies

The sciatic nerve originates from the sacral plexus and supplies the muscles in the posterior compartment of the thigh

Course

- It enters the gluteal region via the greater sciatic foramen, inferior to piriformis and deep to gluteus maximus
- Descends in the midline posterior thigh deep to the biceps femoris and lying on the adductor magnus
- Bifurcates into tibial and common fibular nerves before the apex of the popliteal fossa

Supply

- Common fibular part - supplies short head of the biceps femoris
- Tibial part - supplies the rest, including long head of biceps femoris, semitendinosus, semimembranosus and the hamstring portion of adductor magnus

What are the clinical features of a severed sciatic nerve in the upper thigh?

Motor and sensory deficits.

Motor

Sciatic nerve supplies posterior thigh muscles and depending on the level of injury these may all be affected, causing loss of hip extension and knee flexion. There will be loss of motor supply to all lower leg and foot muscles, causing loss of ankle flexion, extension, inversion and eversion. Toes movements will also be lost.

Sensory

Loss of sensation to the skin of most of the leg and foot. In particular, the posterior and lateral lower leg, sole of foot, lateral portion and the dorsum of the foot.

What is the origin and course of the femoral nerve?

Originates from spinal roots L2, L3, L4

What are the branches of the femoral nerve?

Motor Nerves

- Nerve to sartorius
- Nerves to quadriceps i.e. nerve to rectus femoris, nerve to vastus medialis, nerve to vastus lateralis, nerve to vastus intermedius

Sensory nerves

- Medial femoral cutaneous nerve
- Intermediate femoral cutaneous nerve
- Saphenous nerve
- Articular branches to the hip and knee joints

9. Arteries

Describe the course and relationships of the femoral artery

- A continuation of the external iliac artery
- Enters the femoral triangle deep to the midpoint of the inguinal ligament (midpoint between the ASIS and the pubic tubercle)
- Lies lateral to the femoral vein, deep to the fascia, anterior to the iliopsoas and pectineus, and medial to the femoral nerve
- Continues down the thigh, deep to sartorius
- Passes through the adductor canal, where it lies anterior to the femoral vein
- Becomes the popliteal artery at the adductor hiatus

Describe the branches of the femoral artery

- Profunda femoris branches off in the femoral triangle
- Medial and lateral circumflex femoral arteries. Medial supplies the neck of femur
- 4 Superficial cutaneous branches given off anteriorly in the femoral triangle - superficial circumflex iliac, superficial epigastric, superficial and deep external pudendal

Describe the anastomoses associated with the femoral artery

- Trochanteric (head of femur) via the medial and lateral circumflex femoral arteries
- Cruciate (lesser trochanter) via the medial/lateral circumflex femoral arteries and the inferior gluteal artery
- Geniculate (knee) via the popliteal, femoral and tibial arteries.

Describe the blood supply to the head of the femur

- Medial and lateral circumflex arteries from the profunda femoris
- Branch to form reticular arteries, which feed under the posterior unattached capsule or through the iliofemoral ligament
- The supply is from distal to proximal, which has implications for fractures in the region

- There is also a small artery to the head of the femur, which is a branch of the obturator artery, but this is less important

Why is this important if the patient has a subcapital (intracapsular) fractured neck of femur?

- Risk of avascular necrosis of the femoral head
- Because the major supply of the hip joint comes from branches of the circumflex femoral arteries
- These arteries pass under the border of the hip capsule and can be torn or disrupted in an intracapsular fracture

10. Muscles of the anterior thigh

Must be able to identify muscles of the thigh on an image.

What are the quadriceps muscles? Where do they originate and insert?

- Rectus femoris
 - Origin: from the AIIS and ilium superior to the acetabulum,
 - Insertion: via quadriceps tendon to the tibial tuberosity
- Vastus medialis
 - Origin: intertrochanteric line and medial lip of linea aspera
 - Insertion: Quadriceps tendon and medial patella
- Vastus lateralis
 - Origin: Greater trochanter and lateral lip of linea aspera
 - Insertion: Quadriceps tendon and patella retinacula
- Vastus intermedius
 - Origin: anterior and lateral shaft of femur
 - Insertion: Quadriceps tendon

What are the actions of the quadriceps muscles?

They extend the knee

Rectus femoris also assists in hip flexion

What is the nerve supply to the quadriceps?

Femoral nerve L2, L3, L4