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INTERNATIONAL SURGICAL  
ANATOMY TEACHING  
SERIES



**ISATS**  
**HANDOUT**  
**2024/25**

Lower limb

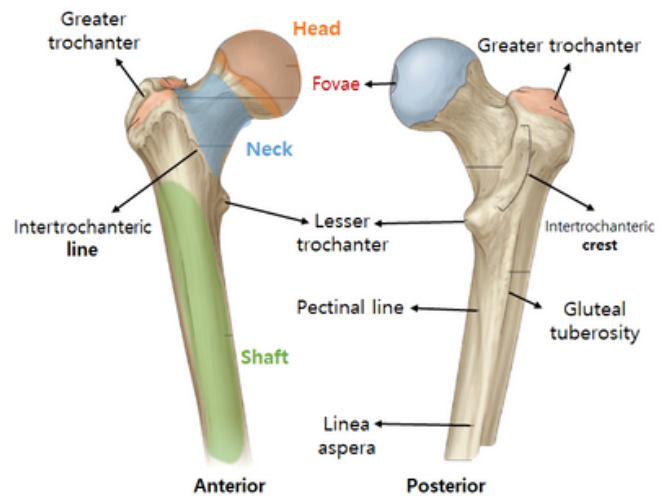
# LOWER LIMB ANATOMY

**Objectives:** To understand the bony anatomy, ligaments, muscle compartments and neurovascular supply of the lower limb, hip joint, knee joint and ankle joint. Further to apply this anatomical knowledge in performing a hip arthroplasty

## Bony Anatomy

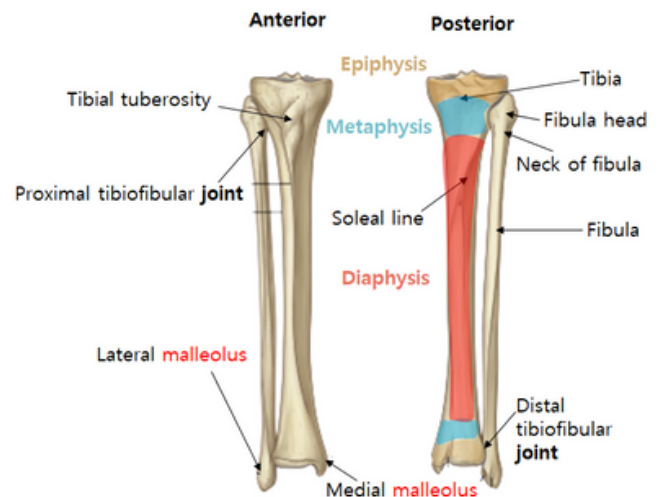
### Femur

- Commonest femur fractures are neck of femur fractures:
  - **Intracapsular fracture** – Occurs superomedial to intertrochanteric line
    - \*Surgical emergency as failure to treat can lead to **avascular necrosis** of femoral head
  - **Extracapsular fracture** – occurs inferolateral to intertrochanteric line



### Tibia & Fibula

- Tibia and fibula are both **long bones** located between the knee and ankle joint
- Tibial tuberosity – insertion point for muscles
- Proximal & Distal tibiofibular joints – synovial joint permitting limited gliding movement

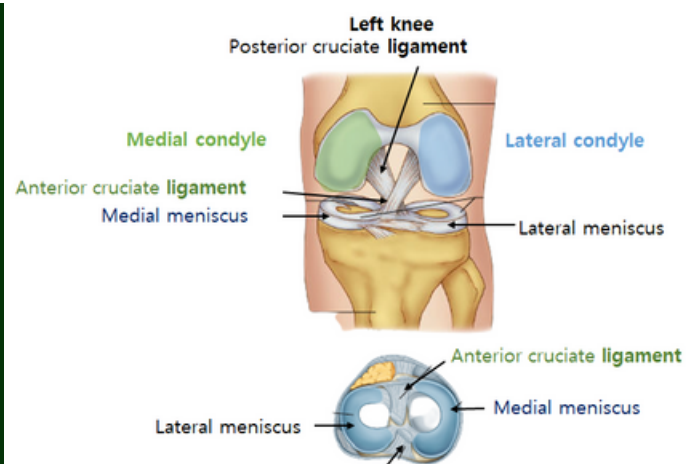


### Foot

- The foot is composed of 26 bones of various types, i.e. long bones (metatarsal), short bones (talus).
- The talus has retrograde blood supply, \* Surgical emergency if talus fracture occurs as can lead to **avascular necrosis**

## Knee joint

- Knee joint is a **synovial hinge joint**
- Knee joint is stabilised by 4 ligaments, 2 menisci
- **Knee locking** occurs when femur rotates medially with respect to tibia – permits knee extension with minimal muscular effort
- **O'Donoghue's unhappy triad**
  - Lateral to medial traumatic force on the knee joint
  - Classically damages ACL, MCL, Medial meniscus
  - Treatment involves ACL ligament reconstruction and meniscectomy



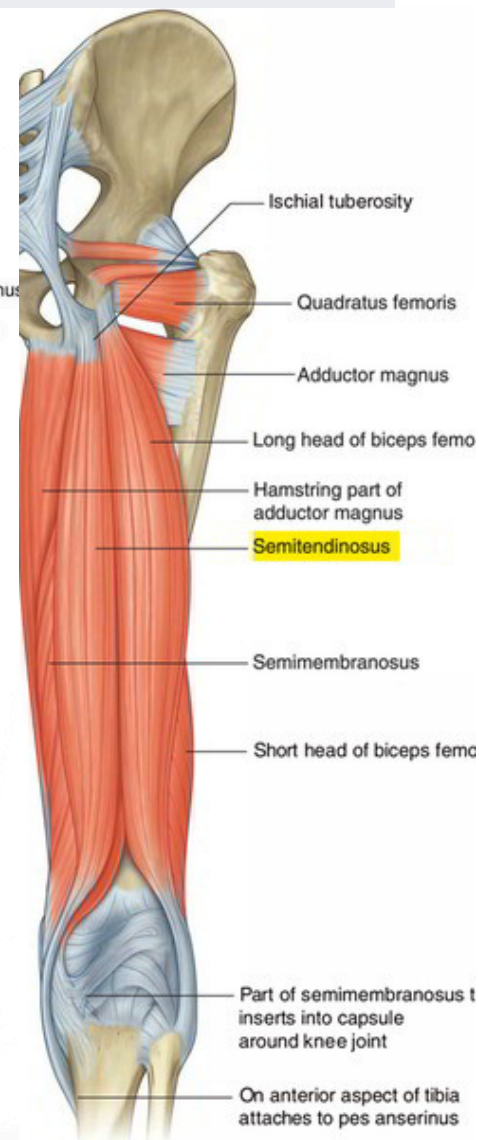
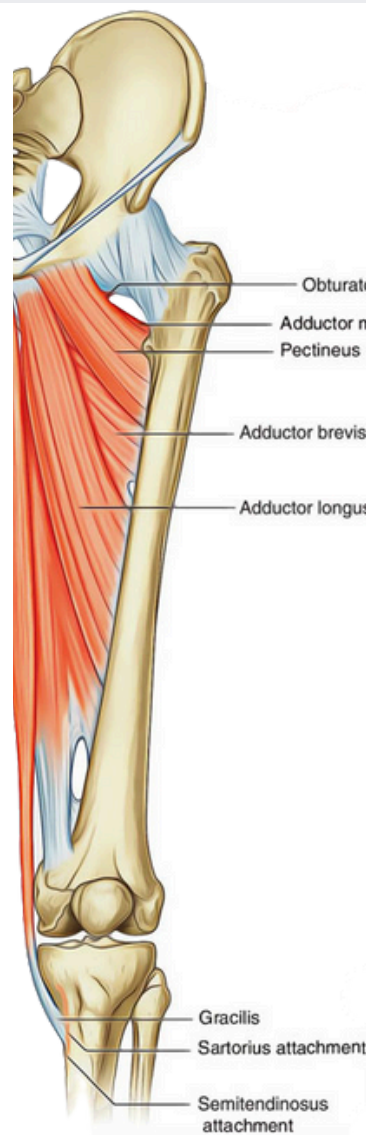
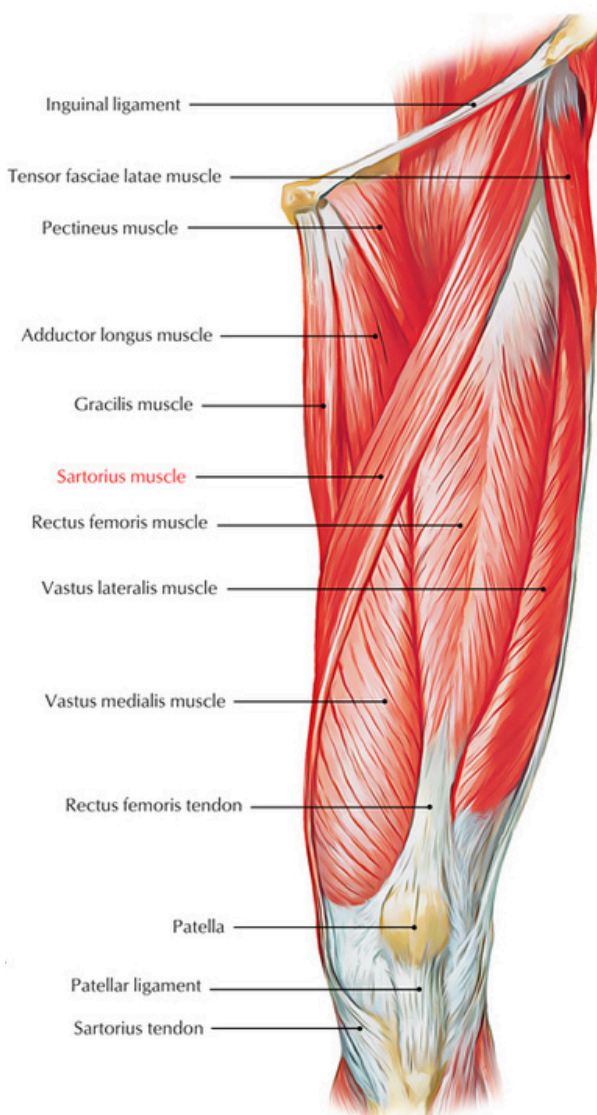
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## Muscular Anatomy

### Thigh

Muscle Compartment	Function	Innervation
Anterior	Hip flexion, Knee extension	Femoral nerve
Medial	Adduction	Obturator nerve
Posterior	Hip extension, Knee flexion	Sciatic nerve



Anterior Thigh

Medial Thigh

Posterior Thigh

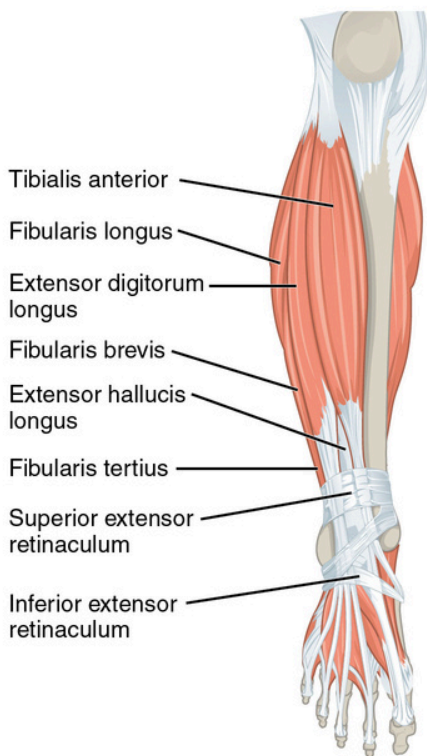
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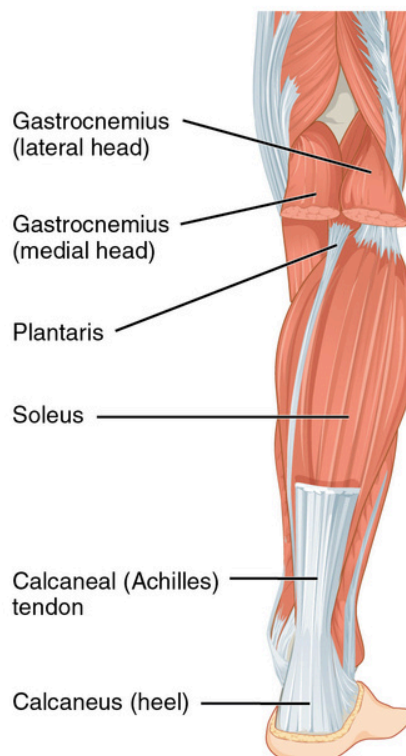
## Muscular Anatomy

### Leg

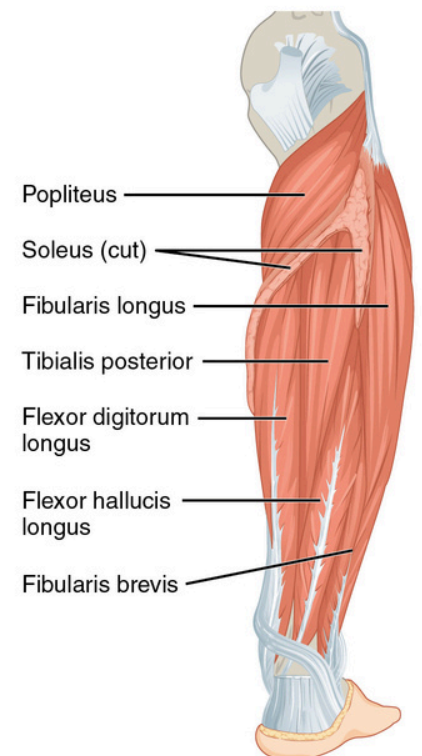
Muscle Compartment	Function	Innervation
Anterior	Dorsiflexion, Toe extension	Deep peroneal nerve
Lateral	Eversion	Superficial peroneal nerve
Posterior	Plantarflexion, Toe flexion	Tibial nerve



Superficial muscles of the right lower leg (anterior view)



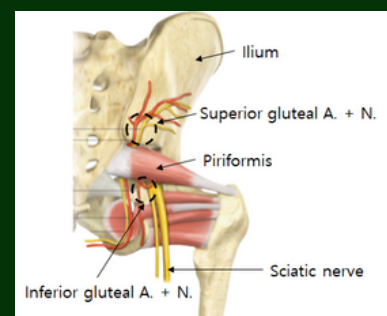
Superficial muscles of the right lower leg (posterior view)



Deep muscles of the right lower leg (posterior view)

## Gluteal Region

- Superficial and Deep group
- Gluteus maximus receives inferior gluteal neurovascular supply
- All the rest superior gluteal supply
- Sciatic nerve sits inferior to piriformis

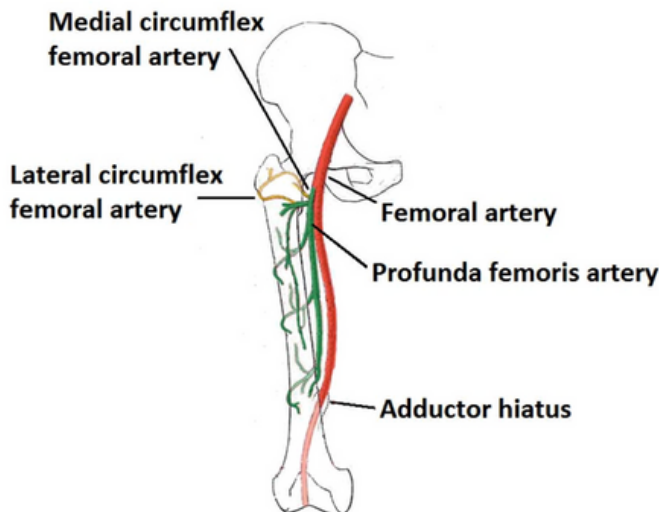


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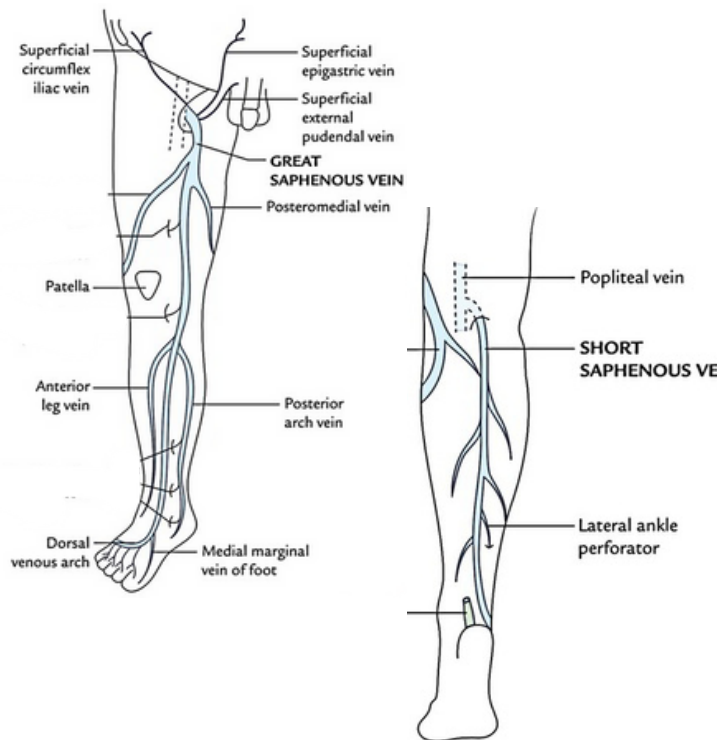
## Arterial supply

- **Supply to thigh & femur:**
  - External iliac artery → femoral artery (under inguinal ligament) → Profunda femoris → Medial + Lateral circumflex arteries
- **Supply to leg**
  - Femoral artery → passes through adductor hiatus → Popliteal artery → Anterior tibial artery + Tibioperoneal trunk → Peroneal artery + Posterior tibial artery → Medial + Lateral plantar artery



## Venous drainage

- Greater saphenous vein drains into femoral vein at **saphenofemoral junction**.
- **Lesser saphenous vein** drains into anterior and posterior tibial veins at popliteal fossa → popliteal vein at **saphenopopliteal junction** → femoral vein



## NERVE SUPPLY TO THE LOWER LIMB – SUMMARY

### THIGH

Nerve	Spinal Nerve	Supply
Femoral	L2 to L4	Anterior Compartment
Obturator	L2 to L4	Medial Compartment
Sciatic	L4 to S3	Posterior Compartment

### LEG

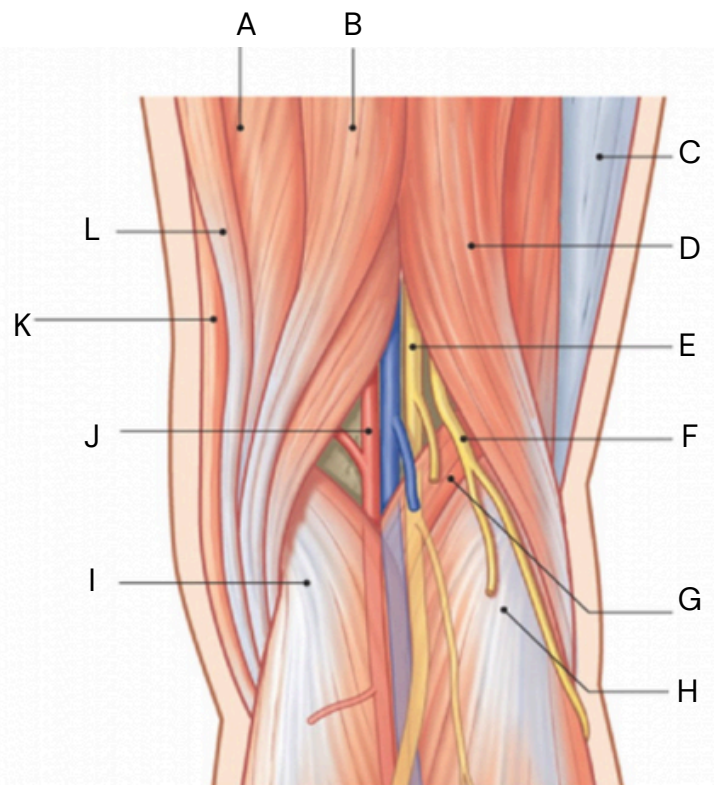
Nerve	Spinal Nerve	Supply
Tibial	L4 to S1	Posterior Compartment
Superficial Peroneal	Branches of Sciatic (L4 – S3)	Lateral Compartment
Deep Peroneal	Branches of Sciatic (L4 – S1)	Anterior Compartment

# LOWER LIMB ANATOMY

*Test yourself...*

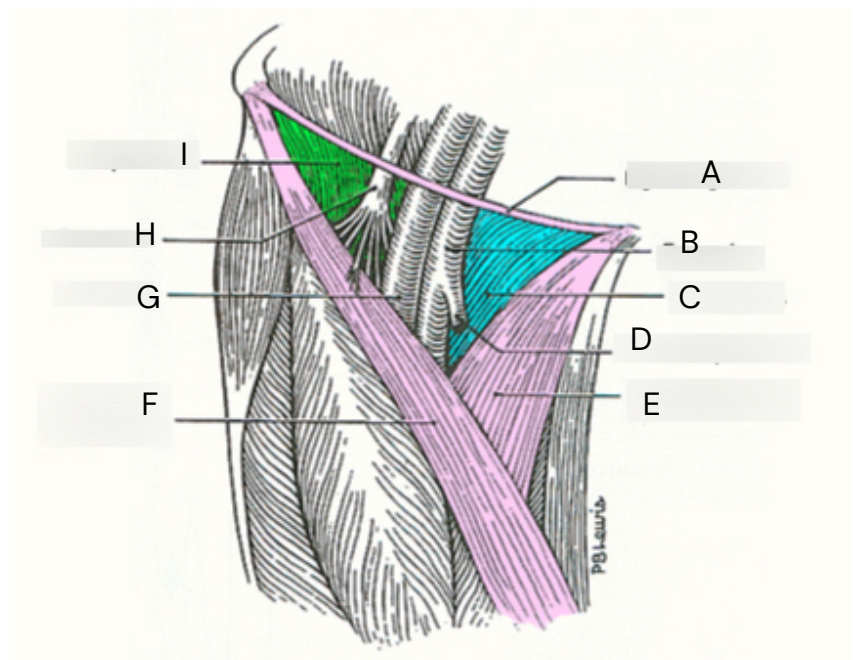
## 1) Label the structures...

- A .....
- B .....
- C .....
- D .....
- E .....
- F .....
- G .....
- H .....
- I .....
- J .....
- K .....
- L .....



## 2) Label:

- A .....
- B .....
- C .....
- D .....
- E .....
- F .....
- G .....
- H .....
- I .....
- J .....
- K .....



# LOWER LIMB ANATOMY

*Test yourself...*

## **MCQ 1**

**In the case of a femoral neck fracture, which artery is most at risk of damage, potentially leading to avascular necrosis of the femoral head?**

- A) Inferior gluteal artery
- B) Obturator artery
- C) Lateral circumflex femoral artery
- D) Medial circumflex femoral artery

## **MCQ 2**

**The tibial nerve divides into which two terminal branches as it passes through the tarsal tunnel?**

- A) Sural nerve and deep peroneal nerve
- B) Superficial peroneal nerve and deep peroneal nerve
- C) Medial plantar nerve and lateral plantar nerve
- D) Calcaneal nerve and superficial peroneal nerve

## **MCQ 3**

**Which structure passes through the adductor hiatus to transition from the anterior thigh to the posterior knee?**

- A) Femoral nerve
- B) Popliteal artery
- C) Saphenous nerve
- D) Tibial artery

## **MCQ 4**

**The femoral triangle is bordered by which of the following structures?**

- A) Inguinal ligament, sartorius, and adductor longus
- B) Inguinal ligament, rectus femoris, and gracilis
- C) Sartorius, gracilis, and biceps femoris
- D) Adductor magnus, vastus medialis, and sartorius

## **MCQ 5**

**Which of the following muscles is responsible for unlocking the knee from full extension during the initiation of knee flexion?**

- A) Sartorius
- B) Popliteus
- C) Rectus femoris
- D) Tensor fasciae latae

## **MCQ 6**

**Which ligament in the hip joint is responsible for limiting hyperextension and plays a crucial role in stabilizing the joint during standing?**

- A) Ischiofemoral ligament
- B) Iliofemoral ligament
- C) Pubofemoral ligament
- D) Ligamentum teres

# LOWER LIMB ANATOMY

*Test yourself...*

## OSCE Station – Case Based Discussion

A 45-year-old cyclist presents to the emergency department after falling off his bike during a race. He reports immediate sharp pain in his right hip and inability to bear weight on that leg. The right leg appears externally rotated and shortened. On palpation, there is tenderness over the hip joint. He is afebrile, HR 85 bpm, BP 125/75, RR 18.



- Q1. What initial imaging investigations would you request?**
- Q2. What is the most likely diagnosis based on the clinical findings?**
- Q3. How would you classify this injury?**
- Q4. What are the key components of the immediate management?**
- Q5. What factors influence the long-term treatment plan for this patient?**
- Q6. What are the potential long-term complications associated with this injury?**

OSCE  
 1. Request an X-ray of the pelvis and hip (AP and lateral views). If inconclusive or further details are needed, consider a CT scan or MRI to assess for fractures and soft tissue injuries.  
 2. The most likely diagnosis is a hip fracture or dislocation (posterior). The externally rotated and shortened leg are classic signs of a displaced femoral neck or intertrochanteric fracture.  
 3. If a hip fracture, it can be classified using the Garden classification (for femoral neck fractures) or Evans classification (for intertrochanteric fractures). Dislocations are classified as anterior or posterior.  
 4. Immobilize the leg, provide pain relief, and ensure neurovascular stability. Early surgical intervention (within 24-48 hours) is often required, especially for displaced fractures. Preoperative stabilization and traction may be needed.  
 5. Factors include the patient's age, bone quality (e.g., osteoporosis), type and classification of the fracture, pre-injury mobility, comorbidities, and whether internal fixation or arthroplasty is more appropriate.  
 6. Potential complications include avascular necrosis of the femoral head, non-union, post-traumatic arthritis, deep vein thrombosis (DVT), and reduced mobility. Recurrent dislocations or infections may also occur.

MCQs  
 D, C, B, A, B, B

A – Semimebranosus, B – Semitendinosus, C – Iliotibial tract, D – Biceps Femoris, E – Tibial Nerve, F – Common Peroneal nerve, G – Plantaris, H – Lateral head of gastrocnemius, I – Medial head of gastrocnemius, J – Popliteal artery, K – Sartorius, L – Gracilis artery, H – Femoral nerve, I – Iliopsoas  
 A – Inguinal ligament, B – Femoral vein, C – Pectineus, D – Great saphenous vein, E – Adductor longus, F – Sartorius, G – Femoral artery, H – Femoral nerve, I – Iliopsoas