

Summary of Lower Limb

❖ Attachment of Fascia lata :

Superiorly to the :

Iliac crest and inguinal ligament laterally.

Pubic crest and symphysis, inferior pubic ramus and the ramus of the ischium medially.

Inferiorly : it fuses with the patella at the knee, with the femoral and both tibial chondyles , the head of the fibula and continuous with the crural fascia of the leg.

Posteriorly : it fuses with the deep fascia of the popliteal fossa.

❖ Compartments of the thigh :

1. **Anteriorly and laterally** the extensor compartment , supplied by the femoral nerve.
2. **Medially** the adductor compartment, supplied by the obturator nerve.
3. **Posteriorly** the flexor compartment (hamstring muscles), supplied by the sciatic nerve.

❖ The saphenous opening transmits :

1. The great saphenous vein.
2. The superficial arteries from the femoral artery.
3. Efferent vessels from the superficial inguinal lymph nodes.

❖ The great saphenous vein receives tributaries from :

1. The dorsum of the foot, the heel, the leg and the calf.
2. The large accessory saphenous vein .
3. Before passing through the saphenous opening it receives : the superficial epigastric, superficial circumflex iliac and superficial external pudendal veins.

❖ Contents of femoral ring :

1. Fatty connective tissues
2. Efferent lymph vessels from the deep inguinal lymph nodes
3. One of the deep inguinal lymph node.

❖ Boundaries of the femoral ring :

Inguinal ligament , anteriorly

The sharp edge of the lacunar ligament , medially

The pectin pubis , posteriorly

The femoral vein , laterally

❖ Cutaneous nerves of the thigh :

From the lumbar plexus:

- 1- **Ilio-inguinal nerve (L1)** distributed to the skin of the upper medial part of the thigh.
- 2- **Femoral branch of the genitofemoral nerve (L1,L2)** , supply the skin over the femoral triangle

3- **Lateral cutaneous nerve of the thigh (L2,L3)** , divided in to 2 branches anterior one supply the anterolateral part of the thigh and posterior one supply the posterolateral part of the thigh and the skin of the lower lateral quadrant of the buttock.

From the femoral nerve :

Anterior cutaneous nerve of the thigh (L2,L3) , and divides into **medial cutaneous nerve** supply the distal 2/3 of the anteromedial surface of the thigh and upper part of the medial surface of the leg. **Intermediate cutaneous nerve of the thigh** divided into 2 nerves supply the distal 3/4 of the anterior aspect of the thigh.

From the obturator nerve :

Occasional branch to the medial side of the thigh.

❖ **Femoral triangle :**

Boundaries :

Superiorly (base): the inguinal ligament.

Medially : the medial border of the adductor longus muscle.

Laterally : medial border of the sartorius muscle.

Inferiorly (apex) : continuous with the adductor canal.

The anterior wall of the triangle : composed of the skin and the fascia. In the superficial fascia there are the following structures:

1. The upper part of the great saphenous vein
2. Superficial inguinal lymph nodes and vessels.
3. Femoral branch of the genitofemoral nerve.
4. Superficial branches of the femoral vessels.
5. Branches of the ilioinguinal nerve.

The posterior wall (the floor) : Muscles from medial to lateral : adductor longus, pectineus, psoas major and iliacus muscles (iliopsoas)

❖ **Contents :**

1. The Femoral vessels
2. Profunda femoris artery
3. The Lateral and medial circumflex arteries
4. Deep external pudendal artery
5. 3-4 deep inguinal lymph nodes
6. The Femoral branch of the genitofemoral nerve
7. Lateral cutaneous nerve of the thigh (L2,L3)
8. Femoral nerve (L2,3,4)

❖ **Adductor Canal :**

Boundaries :

Sartorius muscle anteromedially

Vastus medialis muscle anterolaterally

Adductor longus and magnus posteromedially

Contents :

1. The femoral vessels.
2. Saphenous nerve.
3. Nerve to vastus medialis.

Anterior compartment of the thigh :

Muscles (main extensor) : sartorius, the quadriceps femoris which include (rectus femoris, vastus lateralis, vastus medialis, vastus intermedius muscles). Supplied by the **femoral nerve**.

❖ **Femoral artery**

Branches :

1. Profunda femoris artery (A- Medial B- Lateral circumflex femoral arteries)
2. Deep external pudendal artery
3. Superficial arteries (superficial external pudendal artery, superficial epigastric artery and the superficial circumflex iliac artery)
4. Muscular arteries
5. Descending genicular artery

❖ **The cruciate anastomosis :**

Situated at the level of the lesser trochanter of the femur formed from :

1. Transverse branch of the medial circumflex artery.
2. Transverse branch of the lateral circumflex artery.
3. Inferior gluteal artery.
4. 1st perforating branch of the profunda artery.

❖ **Medial compartment of the thigh :**

Muscles (Adductors) : pectineus, adductor longus, adductor brevis, adductor magnus, gracilis and obturator externus. Supplied by the **obturator nerve (L2, 3, 4)**

❖ **Cutaneous nerves of the gluteal region :**

- 1- The upper lateral quadrant of the buttock supplied by the lateral cutaneous branches from subcostal (T12) and iliohypogastric nerve(L1)
- 2- The lower lateral quadrant is supplied by the lateral cutaneous nerve of the thigh(L2,L3).
- 3- The lower medial quadrant supplied by the posterior cutaneous nerve of the thigh
- 4- The upper medial quadrant supplied by the lateral cutaneous branches from dorsal rami L1-L3 and the lateral cutaneous branches of the dorsal rami of S1-S3 and the perforating cutaneous nerve (S2,3) of the sacral plexus.

❖ **Structures which enter the gluteal region from the pelvis**

- 1- Remain in the gluteal region these include; the gluteal vessels and nerves and the piriformis muscle.
- 2- Descend from the gluteal region into the back of the thigh include; the sciatic nerve, the posterior cutaneous of the thigh and branches of the inferior gluteal vessels.
- 3- Turn forwards through the lesser sciatic foramen into the perineum include; the internal pudendal vessels, pudendal nerve and nerve to obturator internus muscle.

❖ **Muscles of the gluteal region :**

The large muscles include: Gluteus maximus, medius and minimus.

The small muscles include: Piriformis, obturator internus, superior and inferior gemelli and quadratus femoris.

❖ **Anastomosis between branches from the internal and external iliac arteries :**

1- **Between medial circumflex femoral artery and**

- a- Obturator artery.
- b- Both gluteal arteries.
- c- Lateral circumflex artery.
- d- Perforating branches of the profunda artery.

2- **Between the superior gluteal artery and**

- a- Lateral circumflex artery.
- b- Superficial circumflex iliac artery.

3- **Between internal pudendal artery and deep and superficial external pudendal arteries of the femoral artery.**

❖ **Posterior compartment of the thigh :**

Muscles (Hamstring) : biceps femoris, semitendinosus and semimembranosus. supplied by the sciatic nerve.

❖ **The popliteal fossa :**

Boundaries:

Upper lateral : biceps femoris m.

Upper medial : semimembranosus and semitendinosus ms.

Lower lateral and medial :the 2 heads of the gastrocnemius m.

The anterior wall is the popliteal surface of the femur, the posterior capsule of the knee joint and the fascia of the popliteus m.

The posterior wall is the skin and deep fascia of the fossa.

Contents :

- 1- The popliteal vessels.
- 2- Branches of the sciatic nerve (the tibial and common peroneal nerves).
- 3- Popliteal lymph nodes.
- 4- Posterior cutaneous nerve of the thigh.

❖ **Tibial nerve (L4 L5 S1 S2 S3) :**

Branches in the popliteal fossa :

1- Sural nerve : supplies :

A- The skin of the lower posterior part of the leg.

B- The skin of the lateral side of the dorsum of the foot.

2- Muscular branches : to the gastrocnemius, plantaris, soleus and popliteus ms.

3- Articular branches : it gives superomedial, inferomedial and middle genicular branches to the knee joint.

❖ **Common peroneal nerve (L4 L5 S1 S2) :**

Branches in the popliteal fossa :

- 1- Cutaneous branches (Peroneal communicating branch, Lateral cutaneous nerve of the calf).
- 2- Articular branches (The superior and the inferior lateral genicular branches , Recurrent genicular branch.
- 3- Muscular branch to the short head of biceps m.

❖ **Cutaneous nerves of the front of the leg and dorsum of the foot :**

- 1- The upper 2/3 of the front of the leg is supplied by the saphenous nerve (L3 L4) medially and the lateral cutaneous nerve of the calf laterally.
- 2- The lower 1/3 is supplied by the superficial peroneal nerve laterally and the saphenous nerve medially.
- 3- The dorsum of the foot supplied mainly by the medial and intermediate cutaneous branches of the superficial peroneal nerve.
- 4- The lateral margin of the foot supplied by the sural nerve.
- 5- The medial margin by the saphenous nerve.
- 6- The 1st interdigital cleft is supplied by the deep peroneal nerve.
- 7- The dorsum of the toes supplied by the digital branches of the superficial peroneal nerve.
- 8- The terminal phalanges supplied by the planter nerves.

❖ **The Retinacula :**

- 1- **Superior extensor retinacula** : between the triangular subcutaneous area of the fibula and the medial surface of the tibia
- 2- **Inferior extensor retinacula** : Y shaped, the stem of Y attached to the upper part of the calcaneum. Medially the limbs of Y are separated , upper one to the medial malleolus , lower one passes to the medial side of the foot and fuses with fascia of the sole.
- 3- **Superior peroneal retinaculum** : from the lateral malleolus downwards and backwards to the lateral surface of the calcaneum.
- 4- **Inferior peroneal retinaculum** attached to the lateral surface of the calcaneum above and below the peroneal tendons.
- 5- **Flexor Retinacula** : from the medial malleolus downwards and backwards to the medial tubercle of calcaneum

❖ **Intermuscular septa of the leg :**

- 1- **The interosseous membrane** between the tibia and fibula separates the anterior and posterior compartments.
- 2- **Anterior intermuscular septa** attached to the anterior border of the fibula separates the anterior and lateral compartments.
- 3- **The posterior septa** attached to the posterior border of the fibula separates the posterior and lateral compartments.

- From the posterior septa a broad transverse intermuscular septa extends medially separating the superficial and deep groups of calf muscles.

❖ **Anterior compartment of the leg :**

Muscles : Tibialis anterior , Extensor hallucis longus, Extensor digitorum longus, Peroneus tertius. Supplied by anterior tibial vessels and the **deep peroneal nerve**.

❖ **Anterior tibial artery : Branches :**

- 1- **Muscular branches** to the muscles of the anterior compartment.
- 2- **Anterior tibial recurrent artery** passes upwards to the knee joint.
- 3- **Medial and lateral malleolar arteries** to the lateral and medial malleoli, the lateral one anastomosed with the perforating branch of the peroneal artery.

❖ **Deep peroneal nerve : Branches :**

- 1- Muscular branches to all the muscles of the anterior compartment.
- 2- Medial branch to the 1st interdigital space supply the joint and the 1st dorsal interosseous m. ends by dividing into dorsal digital nerves to the adjacent sides of the 1st and 2nd toes.
- 3- Lateral branch pass deep to the extensor digitorum brevis m. supply the muscle and surrounding joints.

❖ **Dorsalis pedis artery : Branches :**

- 1- Lateral tarsal branch
- 2- Medial tarsal branch
- 3- Arcuate artery : gives three dorsal metatarsal arteries
- 4- the first dorsal metatarsal artery : gives deep plantar artery

❖ **Lateral compartment of the leg :**

Muscles : peroneus longus and brevis ms. Supplied by the **superficial peroneal nerve**.

❖ **Posterior compartment of the leg : Muscles :**

- 1- Superficial posterior compartment (flexors of ankle joint) : gastrocnemius, soleus and plantaris muscles.
- 2- Deep posterior compartment (long flexors of toes) : flexor hallucis longus, flexor digitorum longus and tibialis posterior muscles. Supplied by the **tibial nerve**.

❖ **Tibial nerve (L4,L5,S1,S2,S3) : Branches in the leg :**

- 1- Muscular branches : tibialis posterior, flexor digitorum longus, flexor hallucis longus and deep part of soleus m.
- 2- Cutaneous branches: medial calcaneal nerve arises in the ankle pierces the flexor retinaculum to supply the skin on the posterior and lower part of the heel.
- 3- Small articular branch to the capsule of the ankle joint.

❖ **Posterior tibial artery : Branches in the leg :**

- 1- **Peroneal artery** it is the largest branch. it gives:
 - a- Muscular branches to the muscles of the lateral compartment of the leg.
 - b- Nutrient branch to the fibula.
 - c- Perforating artery.
 - d- Posterior lateral malleolar and lateral calcaneal branches.

- 2- **Nutrient artery** to the tibia
- 3- **Muscular branches** to the deep muscles of the back of the leg.
- 4- **Communicating branch** with the peroneal artery behind the ankle joint.
- 5- **Medial calcaneal artery**
- 6- **Posterior medial malleolar** to the posterior part of the medial malleolus.
- 7- **Circumflex fibular artery** (NOT MENTIONED IN THE LECTURE)

❖ **Cutaneous nerves of the sole :**

- 1- **Medial calcaneal branches** from the tibial nerve distributed to the heel and the posterior part of the of the sole.
- 2- **Lateral calcaneal branches** from the sural nerve.
- 3- **Planter cutaneous branches** from the lateral and medial planter nerves.
- 4- **Planter digital nerves** supply the plantar surface of the toes.

❖ **Compartments of the sole :** Contents :

The great toe compartment : abductor hallucis and flexor hallucis brevis muscles, the medial planter nerve and vessels, and the first metatarsal bone.

The little toe compartment : abductor and flexor digiti minimi muscles and the fifth metatarsal bone.

The central compartment of the sole:

- 1- The flexor digitorum brevis muscle
- 2- The tendons of the flexor digitorum longus and its associated muscles (quadratus plantae and four lumbrical muscles)
- 3- The tendon of the flexor hallucis longus muscle
- 4- The lateral planter nerve and vessels.

The interosseous- adductor compartment :

- 1- The planter arch.
- 2- The deep branch of the lateral planter nerve.
- 3- The dorsal and plantar interosseous muscles
- 4- The adductor hallucis muscle.
- 5- The dorsal metatarsal branches of the dorsalis pedis artery.

❖ **The medial planter nerve :**

- 1- Muscular branches to the abductor hallucis and flexor digitorum brevis muscles.
- 2- Articular branches supply the joint and tarsal and metatarsal bones.
- 3- Planter cutaneous branches supply the skin of the medial part of the sole.
- 4- The medial planter nerve become cutaneous at the middle of the sole divided into proper digital branch to the medial side of the great toe which supply the flexor hallucis brevis muscle. Three common digital branches supply the medial three and half toes. The first common digital branch supply the first lumbrical muscle.

❖ The lateral plantar nerve :

- 1- Muscular branches to the abductor digiti minimi and quadratus plantae muscles.
- 2- Articular branches.

Divides into :

Superficial branch : flexor digiti mini , and cutaneous branches.

Deep branch :

- 1- **Muscular branches** to the lateral 3 lumbrical muscles, the adductor hallucis m. and the interosseous muscles except the first dorsal interosseous
- 2- **Articular branches** to the intertarsal and tarsometatarsal joints.

❖ Hip joint :

The strength and stability of the joint depend on :

- 1- Depth of the acetabulum which increased by the labrum acetabulae.
- 2- The strong ligaments and muscles surrounding the joint.

Ligaments :

- 1- Iliofemoral ligament
- 2- Pubofemoral ligament
- 3- Ischiofemoral ligament
- 4- The transverse acetabular ligament
- 5- Ligaments of the head of the femur

Movement :

- 1- **Flexion**₅ : psoas major, iliacus, petineus, sartorius, and rectus femoris.
- 2- **Extension**₄ : gluteus maximus, semimembranosus, semitendinosus and long head of biceps.
- 3- **Abduction**₄ : gluteus medius, minimus, tensor fasciae latae and piriformis.
- 4- **Adduction**₆ : adductor magnus, longus, brevis, gracilis, pectineus and quadratus femoris.
- 5- **Medial rotation**₆ : gluteus medius, minimus, tensor fasciae latae, sartorius, iliopsoas and adductor magnus.
- 6- **Lateral rotation**₆ : gluteus maximus, piriformis, quadratus femoris, obturator externus, internus and the two gemelli.

Blood supply :

- 1- Ascending branches of lateral and medial circumflex femoral artery.
- 2- Acetabular branches of the obturator and medial circumflex arteries.
- 3- Branches of the superior and inferior gluteal artery.

Nerve supply :

- 1- Nerve to quadratus femoris.
- 2- The femoral nerve through nerve to rectus femoris.
- 3- Anterior division of the obturator nerve.

❖ Knee joint :

Unstable joint but this instability is overcome by certain mechanism :

- 1- Expansion of the upper end of the tibia and lower end of the femur.
- 2- Presence of the strong collateral ligament and tendons.
- 3- Strong capsule.
- 4- Presence of the intra-articular ligaments.

Ligaments :

- 1- Lateral and medial patellar retinacula.
- 2- Iliotibial tract.
- 3- The ligamentum patellae.
- 4- Oblique popliteal ligament.
- 5- Arcuate popliteal ligament.
- 6- Collateral ligament : tibial and fibular collateral ligaments.
- 7- Cruciate ligaments : Anterior and posterior cruciate ligaments.

Anastomosis around the knee joints :

Formed by 8 arteries these are:

- 1- 2 lateral and 2 medial genicular arteries from the popliteal artery.
- 2- Descending genicular artery from the femoral artery.
- 3- Anterior tibial recurrent arteries.
- 4- Descending branch from the lateral circumflex artery.
- 5- Circumflex fibular artery from the posterior tibial artery.

The middle genicular artery play a little part since it supply the structures within the capsule of the joint.

Nerve supply :

- 1- Femoral nerve through nerve of vasti muscles.
- 2- Common peroneal nerve through superior and inferior lateral genicular nerves.
- 3- Tibial nerve through superior, inferior medial and middle genicular nerves.
- 4- Obturator nerve through the posterior division.

Movements :

Flexion : biceps, semitendinosus and semimembranosus; assisted by the sartorius, gracilis and popliteus.

Extension : quadriceps femoris m.

Rotation: medial rotation by sartorius, gracilis and semitendinosus. Lateral rotation by biceps femoris m.

❖ Ankle joint :

It is strong and stable joint by:

- 1- The powerful ligaments and tendons.
- 2- The insertion of the trochlea into the deep socket between medial and lateral malleoli.

Ligaments :

- 1- Medial (Deltoid) ligament.
- 2- Lateral ligaments consists of 3 bands :
 - A. The anterior talofibular ligament
 - B. The posterior talofibular ligament
 - C. The calcaneofibular ligament

Anastomosis around the ankle joint :

- 1- **On the lateral side** , the anterior and posterior lateral malleolar arteries and the lateral tarsal branch of the dorsalis pedis artery anastomosed with the perforating branch and terminal branches of the peroneal artery.

2- **On the medial side**, the anterior and posterior medial malleolar arteries anastomosed with the medial calcaneal branch of the posterior tibial artery. The posterior tibial artery itself also anastomosed with the peroneal artery posterior to the ankle joint.

Nerve supply :

- 1- Tibial nerve
- 2- Lateral branch of the deep peroneal nerve

Movements :

Dorsiflexion : Muscles of the anterior compartment of the leg

Planteflexion : Superficial group of muscles of the back of the leg

- The maximum stability of the joint is achieved in dorkiflexion.

Cutaneous nerves of the lower limb

