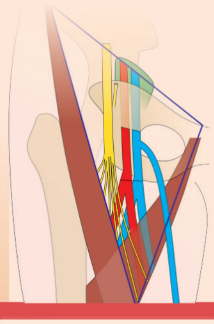

Section 1

Anatomy

1. SUPRASPINATUS

The supraspinatus is the smallest of the four muscles that make up the rotator cuff in the shoulder joint, located specifically in the supraspinatus fossa of the scapula (Fig. 1.1). It runs underneath the acromion.

Origin: Supraspinatus fossa of the scapula, a shallow depression above its spine

Insertion: Greater tuberosity of the humerus, on the superior facet

Nerve supply: Suprascapular nerve, C5 and C6 from the superior trunk of the brachial plexus

Blood supply: Suprascapular artery

Action: It abducts the arm from 0 to 15°, acting as the primary agonist. Beyond this range, up to 90° of abduction, it assists the deltoid muscle in abduction.

Function: Shoulder stability, as part of the rotator cuff, the supraspinatus resists gravitational forces pulling the shoulder joint downward due to the weight of the upper limb. It also stabilizes the shoulder joint by keeping the head of the humerus firmly pressed medially against the glenoid fossa of the scapula.

Active movement: The supraspinatus is crucial in initiating shoulder abduction.

Test for supraspinatus: The 'empty can test', along with the 'full can test', is commonly used to assess supraspinatus impingement or the integrity of the muscle and tendon. The patient is asked to abduct his/her arm to 90° in the plane of the scapula (approximately 30° of forward flexion) with full internal rotation and the thumb pointing down as if emptying a beverage can. The examiner applies downward pressure on the superior aspect of the forearm, and the patient resists. A positive empty can test indicates significant pain and/or weakness.

2. ILIOTIBIAL BAND

The iliotibial tract, also known as the iliotibial band (ITB), is a fibrous reinforcement of the fascia lata that runs along the lateral thigh (Fig. 2.1). It plays a significant role in lower extremity motion. The ITB tightens around the knee area due to the tensor fasciae latae (TFL) muscle, providing knee bracing during opposite foot lifting.

Origin: It originates at the anterolateral iliac tubercle portion of the external lip of the iliac crest.

Insertion: It inserts at the lateral condyle of the tibia, specifically at Gerdy's tubercle.

Nerve: The ITB shares innervation with the TFL and gluteus maximus through the superior gluteal nerve (SGN) and inferior gluteal nerve (IGN).

Artery: The ITB receives arterial supply from the ascending branch of the lateral femoral circumflex artery (LFCA) and superior gluteal artery (SGA).

Function: The muscles associated with the ITB, including TFL and some fibres of the gluteus maximus, perform hip flexion, extension, abduction, and lateral and medial rotation. The ITB also contributes to lateral knee stabilization during knee movement.

Clinical relevance: External snapping hip syndrome, or externa coxa saltans, can cause chronic pain in the lateral hip area over the greater trochanter of the femur. This is due to the thickening of the posterior aspect of

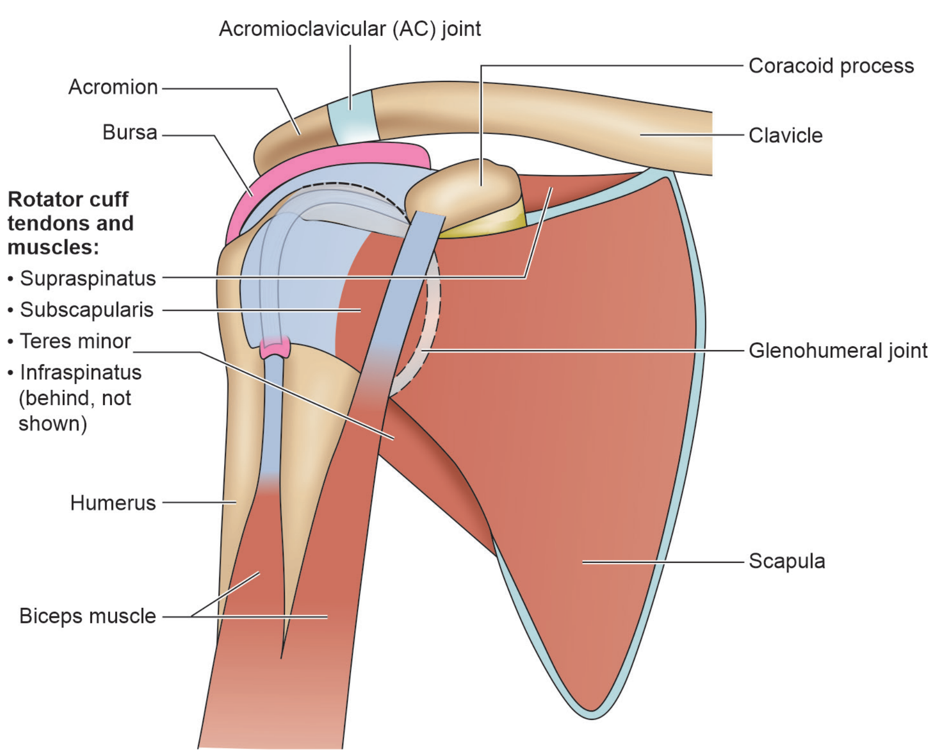

Fig. 1.1: Supraspinatus muscle

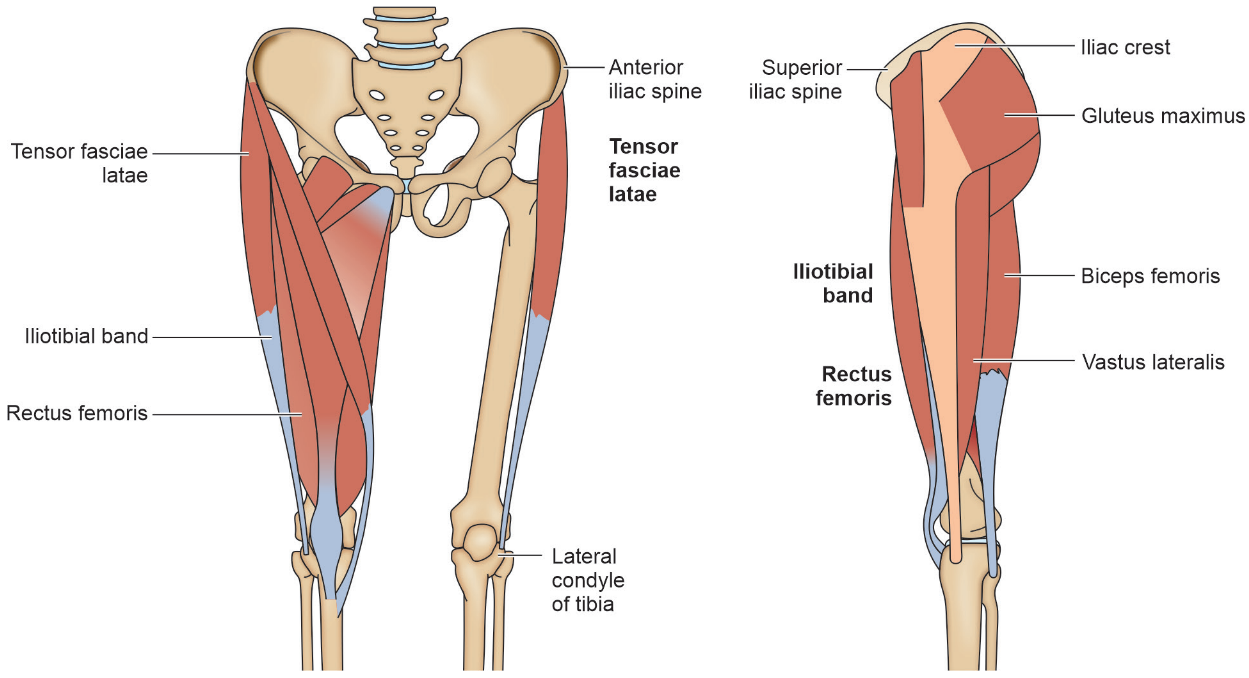

Fig. 2.1: Iliotibial band

the ITB or anterior tendon fibres of the gluteus maximus muscle near its insertion. The ITB snaps over the greater trochanter during specific hip motions.

Assessment: The Ober test is commonly used to assess ITB dysfunction. During this test, the patient lies on the uninvolved side with the symptomatic side facing upward. The examiner passively flexes the knee to about 90° and then brings the hip passively into a flexed and abducted position. The examiner checks for pain, tightness, or clicking over the ITB during passive hip extension and adduction.

Treatment: Treatment for ITB-related issues usually involves stretching, therapeutic exercises, and physical therapy. NSAIDs may be used to reduce inflammation. Surgery is considered a last resort for refractory cases.

3. BRACHIAL PLEXUS

The brachial plexus is a network of nerves that originates from the ventral primary rami of the lower four cervical (C5–C8) and the first thoracic (T1) nerves (Fig. 3.1). It is responsible for providing motor and sensory innervation to the upper limb.

Formation: The brachial plexus is formed by the ventral primary rami of C5–C8, and T1 spinal nerves, with contributions from C4 and T2. The plexus has roots, trunks, divisions, cords, and branches.

Roots: The roots are formed by the anterior primary rami of the spinal nerves mentioned above.

They join to form trunks, and the plexus can be prefixed or post-fixed based on the shifting origin of its roots.

Trunks: The roots C5 and C6 combine to form the upper trunk. Root C7 forms the middle trunk. Roots C8 and T1 combine to form the lower trunk.

Divisions of the trunks: Each trunk divides into ventral and dorsal divisions, which supply the anterior and posterior aspects of the limb, respectively. These divisions join to form cords.

Cords: The lateral cord is formed by the union of ventral divisions of the upper and middle trunks. The medial cord is formed by the ventral division of the lower trunk. The posterior cord is formed by the union of the dorsal divisions of all three trunks.

Sympathetic innervation: Sympathetic nerves for the upper limb arise from spinal segments T2 to T6. Preganglionic fibres from lateral horn cells emerge through ventral nerve roots and reach the sympathetic chain through white rami communicans. Postganglionic fibres from sympathetic ganglia pass through grey rami communicans to reach specific nerve roots (C5, C7, C8, and T1) and innervate the arteries, skin, sweat glands, and arrector pili muscles.

Branches: The brachial plexus gives rise to various branches that innervate different muscles and areas of the upper limb. Some of the branches include:

- Nerve to serratus anterior (long thoracic nerve) at C5, C6, C7
- Nerve to rhomboids (dorsal scapular nerve) at C5
- Suprascapular nerve (C5, C6)
- Musculocutaneous nerve (C5, C6, C7)
- Lateral pectoral nerve (C5–C7)
- Lateral root of median nerve (C5–C7)
- Medial pectoral nerve (C8, T1)
- Ulnar nerve (C7, C8, T1)
- Radial nerve (C5–C8, T1) and several others.

These branches provide motor function to various muscles and sensory innervation to specific areas of the

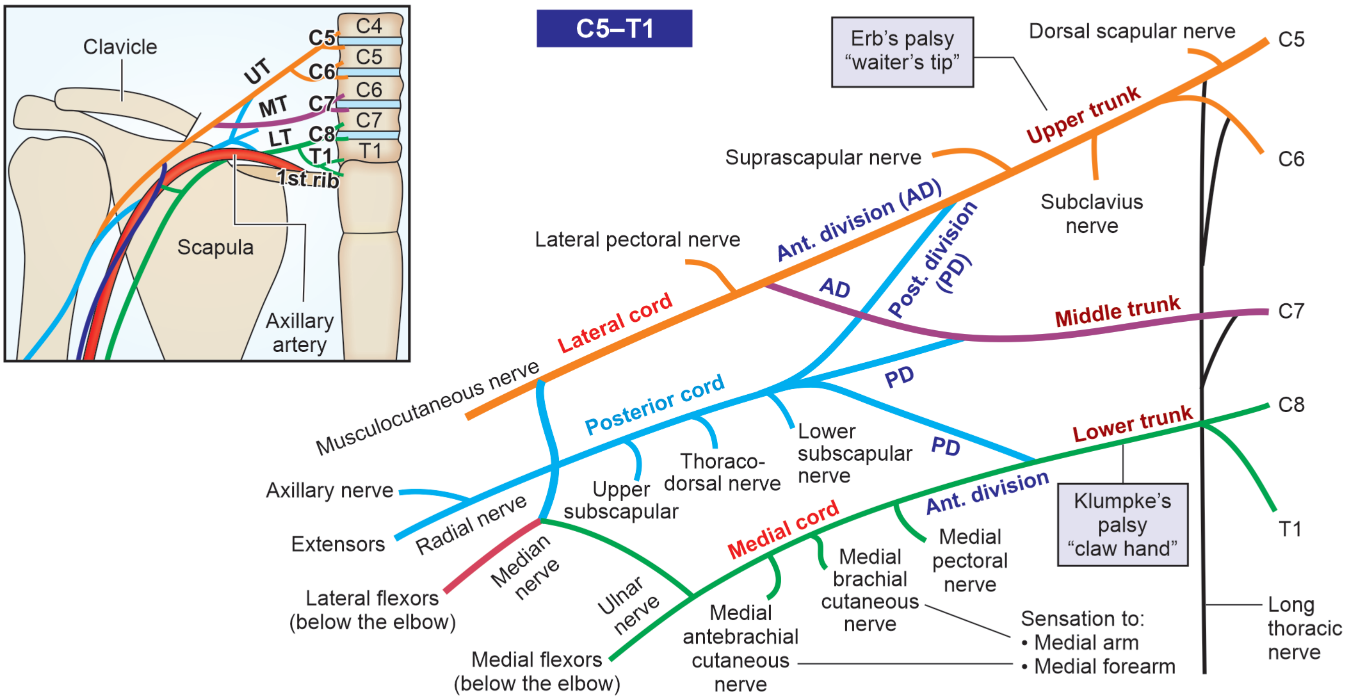

Fig. 3.1: Brachial plexus

arm and hand. The brachial plexus and its branches are essential for the functioning of the upper limb and are vital for movements and sensation in the arm.

4. TENSOR FASCIAE LATA

- The tensor fasciae lata is a gluteal muscle that acts as an abductor, flexor and internal rotator of the hip (Fig. 4.1).
- When stimulated, the tensor fasciae lata tightens the iliotibial band and braces the knee, especially when the opposite foot is lifted.
- This property gives an elastic stocking up the thigh. When the fasciae lata is pulled taut, it forces muscle groups closer together within their intermuscular towards the femur. This action centralises muscle weight and limits outward expansion.

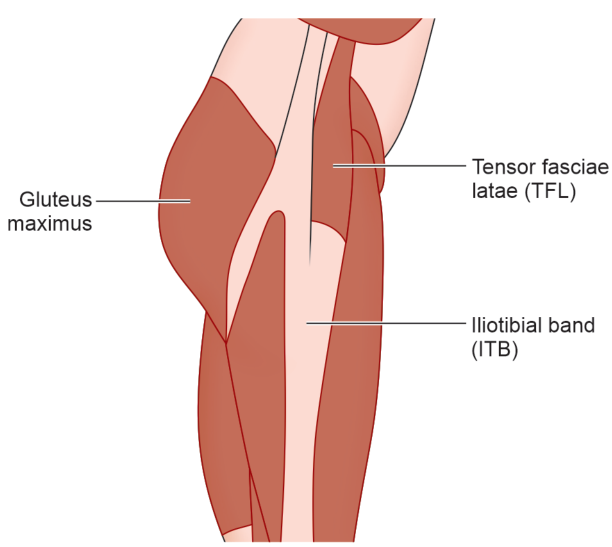

Fig. 4.1: Tensor fasciae lata

- It makes muscle contraction more efficient in compressing deep veins. This ensures adequatte venous return to the heart from the lower limbs.
- It originates from the anterior iliac spine.
- It is inserted in the iliotibial band.
- Action abducts and helps stabilise and steady the hip and knee joints by putting tension on the iliotibial fascia.
- Innervation is by superior gluteal nerve (L4, L5, S1).

5. LIGAMENTS OF THE KNEE JOINT

The knee joint is supported by the following ligaments.

1. Fibrous (articular) capsule
2. Ligamentum patellae
3. Tibial collateral or medial ligament
4. Fibular collateral or lateral ligament
5. Oblique popliteal ligament
6. Arcuate popliteal ligament
7. Cruciate ligament
8. Anterior cruciate ligament (ACL)
9. Posterior cruciate ligament (PCL)
10. Menisci or semilunar cartilage
11. Median meniscus
12. Lateral meniscus
13. Transverse ligament

1. Fibrous (Articular) Capsule

The fibrous capsule is very thin, and is deficient anteriorly, where it is replaced by the quadriceps femoris, the patella and the ligamentum patellae.

Femoral attachment: It is attached about 0.5–1.0 cm beyond the articular margins. The attachment has three special features:

a. Anteriorly, it is deficient;

b. Posteriorly, it is attached to the intercondylar line; and
c. Laterally, it encloses the origin of the popliteus.

Tibial attachment: It is attached about 0.5–1.0 cm beyond the articular margins. The attachment has three special features:
a. Anteriorly, it descends along the margins of the condyles to the tibial tuberosity, where it is deficient;
b. Posteriorly, it is attached to the intercondylar ridge which limits the attachment of the posterior cruciate ligament; and
c. Posterolaterally, there is a gap behind the lateral condyle for the passage of the popliteus tendon. Some terms applied to parts of the capsule, are as follows:

Coronary ligament: The fibrous capsule is attached to the periphery of the menisci. The part of the capsule between the menisci and the tibia is sometimes called the coronary ligament.

Short lateral ligament: This is a cord-like thickening of the capsule deep to the fibular collateral ligament. It extends from the lateral epicondyle of the femur, where it blends with the tendon of the popliteus, to the medial border of the apex of the fibula.

The capsular ligament is weak. It is strengthened anteriorly by the medial and lateral patellar retinacula, which are extensions from the vastus medialis and lateralis; laterally by the iliotibial tract medially by expansions from the tendons of the sartorius and semimembranosus; and posteriorly by the oblique popliteal ligament.

Openings: The capsule has two constant gaps:
a. One leading into the suprapatellar bursa, and
b. Another for the exit of the tendon of the popliteus. Sometimes, there are gaps that communicate with the bursae deep to the medial head of the gastrocnemius, and deep to the semimembranosus.

2. Ligamentum Patellae

This is the central portion of the common tendon of insertion of the quadriceps femoris; the remaining portions of the tendon form the medial and lateral patellar retinacula. The ligamentum patellae is about 7.5 cm long and 2.5 cm broad. It is attached above to the margins and rough posterior surface of the apex of the patella, and below to the smooth, upper part of the tibial tuberosity. The superficial fibres pass in front of the patella. The ligamentum patellae is related to the superficial and deep infrapatellar bursae and the infrapatellar pad of fat.

3. Tibial Collateral or Medial Ligament

This is a long band of great strength. Superiorly, it is attached to the medial epicondyle of the femur just below the adductor tubercle. Interiorly, it divides into anterior and posterior parts.

The anterior or superficial part is about 10 cm long and 1.25 cm broad and is separated from the capsule by one or two bursae. It is attached below to the medial border and posterior part of the medial surface of the shaft of the tibia. It covers the inferior medial genicular

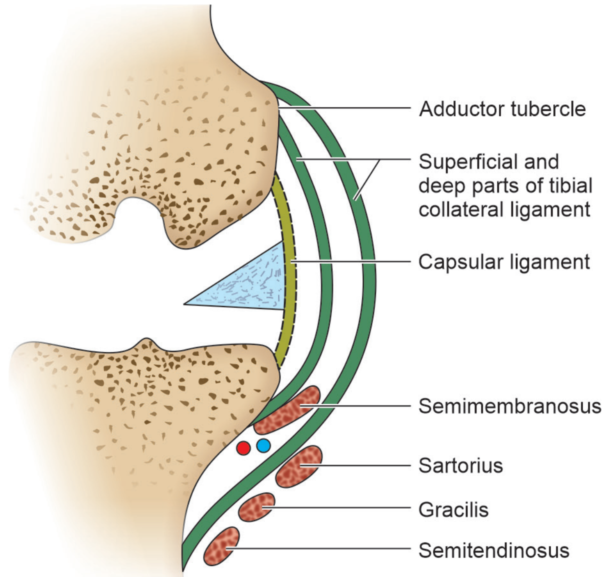

Fig. 5.1: Tibial collateral ligament

vessels and nerve, and the anterior part of the tendon of the semimembranosus, and is crossed below by the tendons of the sartorius, gracilis and the semitendinosus. The posterior (deep) part of the ligament is short and blends with the capsule and with the medial meniscus. It is attached to the medial condyle of the tibia above the groove for the semimembranosus. Morphologically, the tibial collateral ligament represents the degenerated tendon of the adductor magnus muscle (Fig. 5.1).

4. Fibular Collateral or Lateral Ligament

- This ligament is strong and cord-like. It is about 5 cm long (Fig. 5.2).
- Superiorly, it is attached to the lateral epicondyle of the femur just above the popliteal groove.

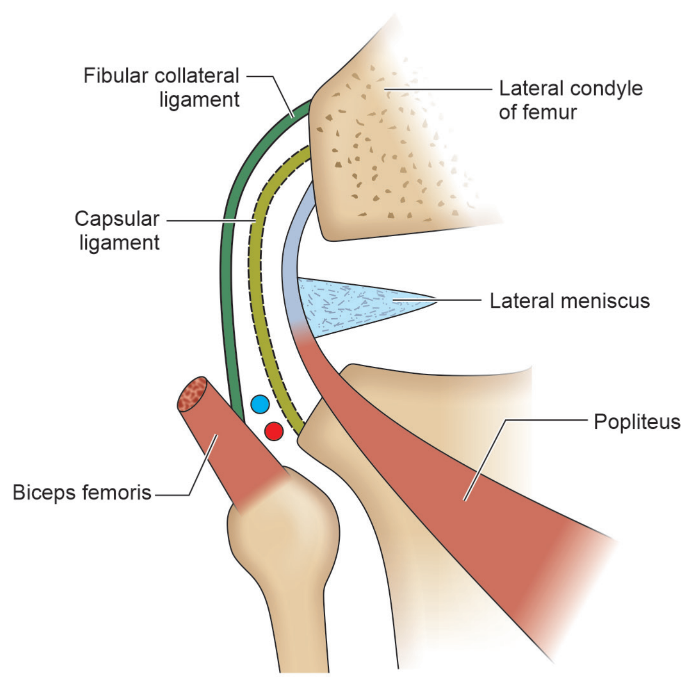

Fig. 5.2: Fibular collateral ligament

- Inferiorly, it is embraced by the tendon of the biceps femoris, and is attached to the head of the fibula in front of its apex.
- It is separated from the lateral meniscus by the tendon of the popliteus and by the capsule, the inferior lateral genicular vessels and nerve separate it from the capsule. Morphologically, it represents the femoral attachment of the peroneus longus.

5. Oblique Popliteal Ligament

The oblique popliteal ligament is an expansion of the tendon of the semimembranosus muscle. It runs upwards and laterally, blending with the posterior surface of the knee joint capsule. The ligament is attached to the intercondylar line and the lateral condyle of the femur. It is closely associated with the popliteal artery and is pierced by the middle genicular vessels and nerve, as well as the terminal portion of the posterior division of the obturator nerve.

6. Arcuate Popliteal Ligament

This is a posterior expansion from the short lateral ligament. It extends backwards from the head of the fibula, arches over the tendon of the popliteus, and is attached to the posterior border of the intercondylar area of the tibia.

7. Cruciate Ligaments

These are very thick and strong fibrous bands, which act as direct bonds of union between the tibia and femur, to maintain anteroposterior stability of the knee joint (Fig. 5.3). They are named according to the attachment on tibia.

8. Anterior Cruciate Ligament (ACL)

This begins from the anterior part of the intercondylar area of the tibia, runs upwards, backwards and laterally and is attached to the posterior part of the medial surface of the lateral condyle of the femur. It is taut during the extension of the knee.

9. Posterior Cruciate Ligament (PCL)

This begins from the posterior part of the intercondylar area of the tibia, runs upwards, forwards and medially and is attached to the anterior part of the lateral surface of the medial condyle of the femur. It is taut during flexion of the knee. It is supplied by middle genicular vessels and nerves.

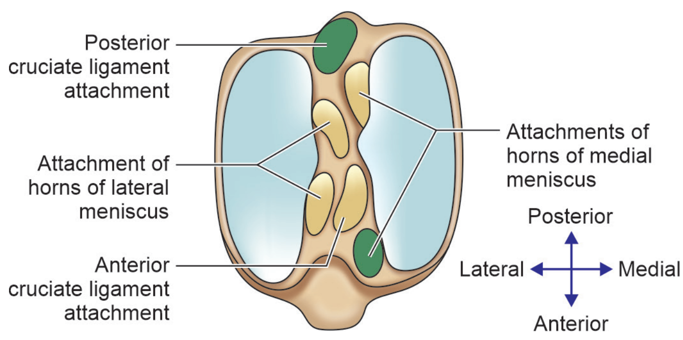

Fig. 5.3: Cruciate ligaments and meniscus attachments

10. Menisci or Semilunar Cartilages

The menisci are two fibrocartilaginous discs. They are crescent-shaped. They deepen the articular surfaces of the condyles of the tibia and partially divide the joint cavity into upper and lower compartments. Flexion and extension of the knee take place in the upper compartment, whereas rotation takes place in the lower compartment. Each meniscus has the following:

1. *Two ends:* Both of which are attached to the tibia.
2. *Two borders:* The 'outer' border is thick, convex and fixed to the fibrous capsule; while the 'inner' border is thin, concave and free.
3. *Two surfaces:* The upper surface is concave for articulation with the femur. The lower surface is flat and rests on the peripheral two-thirds of the tibial condyle. The peripheral thick part is vascular. The inner part is avascular and is nourished by synovial fluid.

11. Median Meniscus

The medial meniscusis nearly semicircular, being wider behind than in front. The posterior fibres of the anterior end are continuous with the transverse ligament. Its peripheral margin is adherent to the deep part of the tibial collateral ligament.

12. Lateral Meniscus

The lateral meniscus is nearly circular. The posterior end of the meniscus is attached to the femur through two meniscofemoral ligaments. The tendon of the popliteus and the capsule separate this meniscus from the fibular collateral ligament. The more medial part of the tendon of the popliteus is attached to the lateral meniscus. The mobility of the posterior end of this meniscus is controlled by the popliteus and by the two meniscofemoral ligaments.

Functions of Menisci

1. They help in making the articular surfaces more congruent because of their flexibility. They can adapt their contour to the varying curvature of the different parts of the femoral condyles, as the latter glide over the tibia.
2. The menisci serve as shock absorbers.
3. They help in lubricating the joint cavity.
4. Because of their nerve supply, they also have a sensory function. They give rise to proprioceptive impulses.

13. Transverse Ligament

It connects the anterior ends of the medial and lateral menisci.

6. TALUS

The heel bone of the horse was used as dice and was called taxillus. This word evolved into talus. It is one of the 7 tarsal bones of the foot. It acts as a connecting link between the foot and the leg. It is unique as 60% of its surface is articular which articulates with tibial

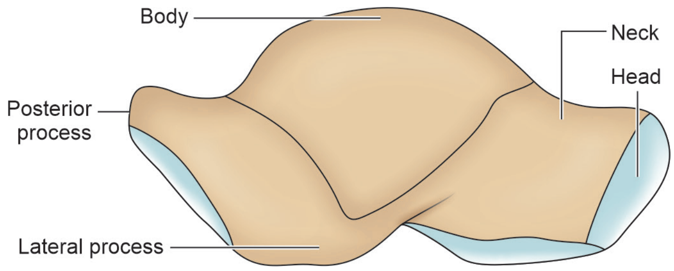

Fig. 6.1: Talus

plafond, medial malleolus, lateral malleolus, calcaneum and navicular bones. It has ligamentous and capsular attachments but no muscular attachment (Fig. 6.1).

Parts: Talus has
- Head
- Neck
- Body
- Lateral process
- Posterior process

Head

Head is intra-articular and it articulates anteriorly with navicular bone and inferiorly with sustentaculum tali of calcaneum. Head is supported inferiorly by plantar calcaneonavicular ligament which is also known as the spring ligament. All the three together form the talocalcaneonavicular joint.

Neck

It is non-articular. Directed forward, medially and downwards.

Body

It has following surfaces:
- Superior surface
- Inferior surface
- Lateral surface
- Medial surface
- Posterior surface

Lateral Process

It is wedge-shaped. Superolaterally, lateral malleolus and inferomedially calcaneum are seen.

Posterior Process

It has medial and lateral tubercle and flexor hallucis longus passes in between them.

Lateral: Talofibular ligament is seen

Medial: Deltoid ligament

Blood Supply of Talus

The blood supply of talus is crucial for maintaining the health of this bone, especially given its limited vascularity and susceptibility to avascular necrosis following injury (Fig. 6.2). The blood supply comes from multiple arteries:
- Anterior tibial artery

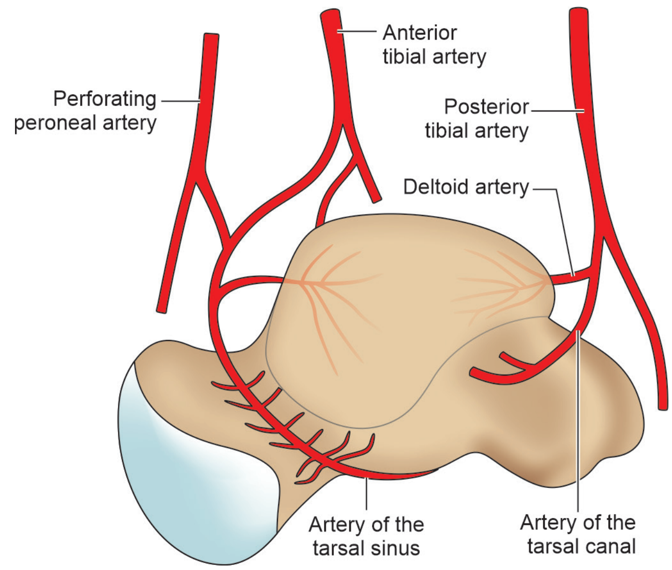

Fig. 6.2: Talus blood supply

- Posterior tibial artery
- Peroneal artery
- Major supply is from posterior tibial artery.

Clinical Importance of Talus in Orthopaedics

The second most common tarsal bone to fracture after calcaneal fracture. On clinical examination, the patient presents with complains of pain in the hind foot and restriction of movement of the ankle.

Radiological Examination of Talus

- Anteroposterior (AP) view
- Lateral view
- Special view known as 'canale view' in which visualisation of the neck of the talus is good.

7. FEMORAL TRIANGLE

Femoral triangle is a triangular wedge-shaped area located on the upper one-third of the thigh immediately below the inguinal ligament (Fig. 7.1).

Boundaries of Femoral Triangle

The femoral triangle is bounded
- Laterally by the medial border of sartorius
- Medially by the medial border of the adductor longus
- Base is formed by the inguinal ligament
- Roof of the femoral triangle is formed by the skin
- The superficial fascia containing the superficial inguinal lymph nodes, the femoral branch of the genitofemoral nerve, branches of the ilioinguinal nerve, superficial branches of the femoral artery with accompanying veins, and the upper part of the great saphenous vein, the deep fascia, with the saphenous opening and the cribriform fascia.
- Floor of the triangle is formed medially by the adductor longus and pectineus, and laterally by the iliacus and psoas major.

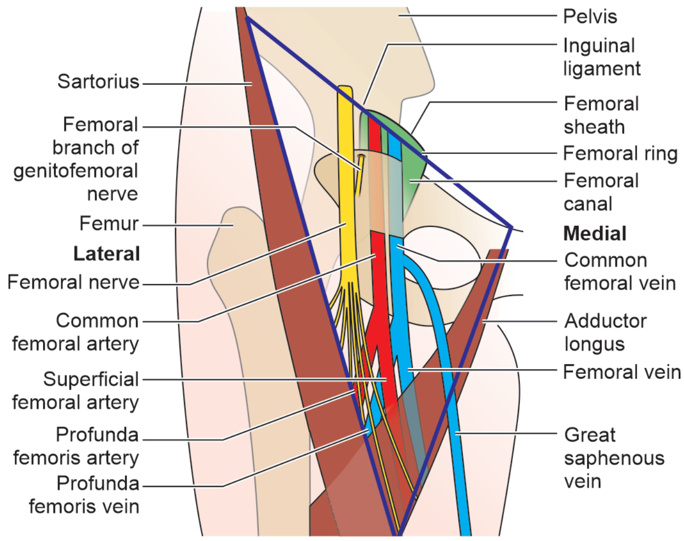

Fig. 7.1: Femoral triangle

Contents of Femoral Triangle

The contents of the femoral triangle are:

Femoral Artery and its Branches

- The femoral artery traverses the triangle from its base at the midinguinal point to the apex.
- In the triangle, it gives off six branches, three superficial and three deep.
- The superficial branches are the superficial external pudendal, the superficial epigastric and the superficial circumflex iliac artery.
- The deep branches are the profunda femoris, the deep external pudendal and muscular branches.

Femoral Vein and its Tributaries

The femoral vein accompanies the femoral artery. The vein is medial to the artery at the base of the triangle, but posteromedial to the artery at the apex. The femoral sheath encloses the upper 4 cm of the femoral vessels.

Nerves

- The femoral nerve lies lateral to the femoral artery, outside the femoral sheath, in the groove between the iliacus and the psoas major muscles. The nerve to the pectineus arises from the femoral nerve just above the inguinal ligament. It passes behind the femoral sheath to reach the anterior surface of the pectineus.
- The femoral branch of the genitofemoral nerve occupies the lateral compartment of the femoral sheath along with the femoral artery. It supplies most of the skin over the femoral triangle.
- The lateral cutaneous nerve of the thigh crosses the lateral angle of the triangle.

Lymph Node

The deep inguinal lymph nodes lie deep to the deep fascia.

Clinical Importance of Femoral Triangle

- Femoral artery and femoral vein are highly palpable in the femoral triangle.
- Femoral artery catheterisation done in this area.
- Femoral artery presents very superficially in femoral triangle so it is highly vulnerable to traumatic injury, especially laceration injury.
- Heavy bleeding in the lower limb can be stopped by applying pressure in the femoral triangle.
- It is an important landmark for coronary angioplasty and peripheral angioplasty procedures.

8. SURGICAL ANATOMY OF HIP JOINT

INTRODUCTION

- The hip joint is a type of synovial joint of ball and socket variety formed by head of femur and the acetabulum.
- It is the most stable ball and socket joint in the body and still has great range of motion.

OSTEOLOGY

Proximal End of Femur

- Proximal end of femur includes the head of femur, neck, greater trochanter, lesser trochanter, intertrochanteric line and intertrochanteric crest.
- The head forms two-thirds of a sphere and joins the neck at subcapital sulcus.
- Head is directed medially, upwards and slightly forwards.
- The roughened pit, situated just below and behind its centre, is called the fovea which gives attachment to ligamentum teres.
- The neck connects the head with the shaft and is about 1.5 inches long (Fig. 8.1). The normal neckshaft angle varies from 125° to 135°.
- The angle between the plane of the femoral condyles and the axis of femoral neck is the angle of torsion.
- Normally, there is 14° of anteversion.

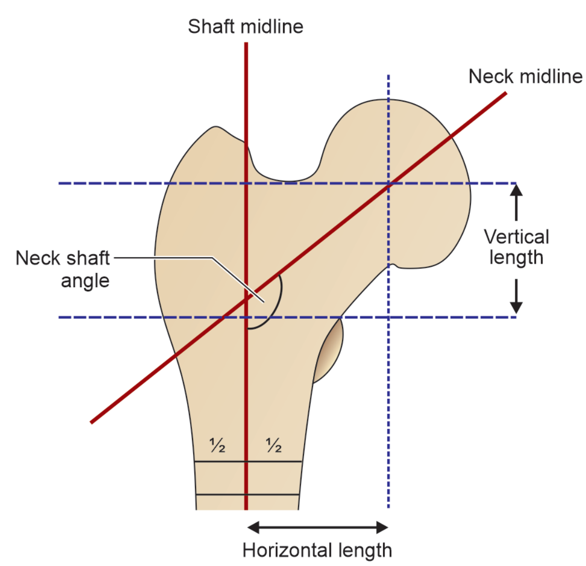

Fig. 8.1: Normal neck shaft angle

- The periosteum of neck contains no cambium layer due to which there is no callus formation in healing of fracture neck femur.
- The greater trochanter is a typical traction epiphysis for insertion of abductors.
- It overhangs the expanded junction of neck and shaft.
- The upper border of the greater trochanter lies at the level of centre of head of femur.
- The lesser trochanter projects from posteromedial aspect of proximal shaft and is joined posteriorly to the greater trochanter by intertrochanteric crest.
- The intertrochanteric line is prominent roughened ridge which marks the junction of anterior surface of neck and shaft of femur.
- It begins above at the anterosuperior angle of the greater trochanter and is continuous below with the spiral line in front of lesser trochanter.
- The intertrochanteric crest marks the junction of posterior surface of neck and shaft of femur.

Acetabulum

- The acetabulum is formed by iliac, ischial and pubic components of hip bone.
- It is directed laterally, distally and anteriorly.
- In the acetabulum, the weight-bearing cartilage—covered articular surface of horseshoe outline surrounds the non-articular acetabular fossa.

Ligaments

- The capsule is made up of dense fibrous tissue and is attached proximally about the rim of the acetabulum.
- Distally, it closely covers lateral margins of head of femur and most part of neck.
- Anteriorly, the capsule is attached to the intertrochanteric line.
- Posteriorly, it is attached to the neck about half inch proximal to the intertrochanteric crest leaving the lateral half of the neck extracapsular.
- The capsule is reinforced by three ligaments.
- The iliofemoral ligament of Bigelow is one of the strongest ligaments, located anteriorly (Fig. 8.2).
- It is shaped like an inverted 'Y'.
- It is a chief stabilizer of hip in erect standing position.
- When intact, it prevents excessive displacement and provides a fulcrum about which manipulative reduction of dislocation of the hip can be done.
- The pubofemoral ligament reinforces the capsule on the inferior aspect.
- The ischiofemoral ligament is a weak band within the posterior capsule.
- The capsule is constricted around the narrowest area of neck by the zona orbicularis which is a condensed group of deeply placed circular fibres.
- The transverse ligament of acetabulum is a strong band of fibres attached to the margins of acetabular notch.
- It completes the rim of acetabulum.

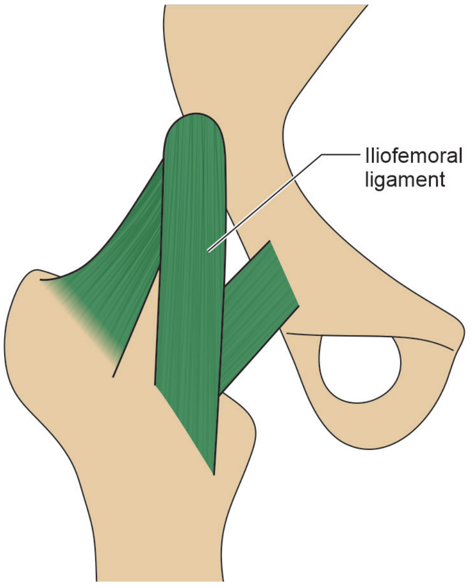

Fig. 8.2: Iliofemoral ligament

- The vessels and nerves enter the joint through the foramen beneath the ligament.
- The labrum acetabulae is a tough fibrocartilaginous ring attached to the rim of acetabulum.
- It increases the depth of acetabulum and enhances the stability of hip joint.
- The ligamentum teres also known as round ligament is a flat fibrous band covered with synovium extending from acetabular notch and transverse ligament to the fovea capitis.
- A small artery runs along the ligamentum teres to the head of femur.
- Before epiphyseal fusion, the artery of ligamentum teres contributes to the blood supply of the epiphysis.

Muscles

- The hip joint is surrounded by muscle groups which play an important role in stability of the joint and locomotion (Fig. 8.3).
- Psoas major and iliacus muscles cause flexion at hip.
- Gluteus maximus is the main extensor of the hip joint.
- Adduction is caused by adductor longus, adductor brevis and adductor magnus.
- Glutei medius and minimus cause abduction.
- Medial rotation is caused by tensor fasciae latae and the anterior fibres of glutei medius and minimus.
- Obturators—internus and externus, gemelli—superior and inferior, quadratus femoris causes lateral rotation.

Fascia

- The deep fascia of the thigh also known as fascia lata is a tough fibrous sheet that envelops the whole of the high like a sleeve.
- Superiorly, it is attached in continuity to the inguinal ligament, iliac crest, sacrotuberous ligament, ischial tuberosity and pubic arch.
- Fascia lata is the thickest laterally and forms a strong band called the iliotibial tract.

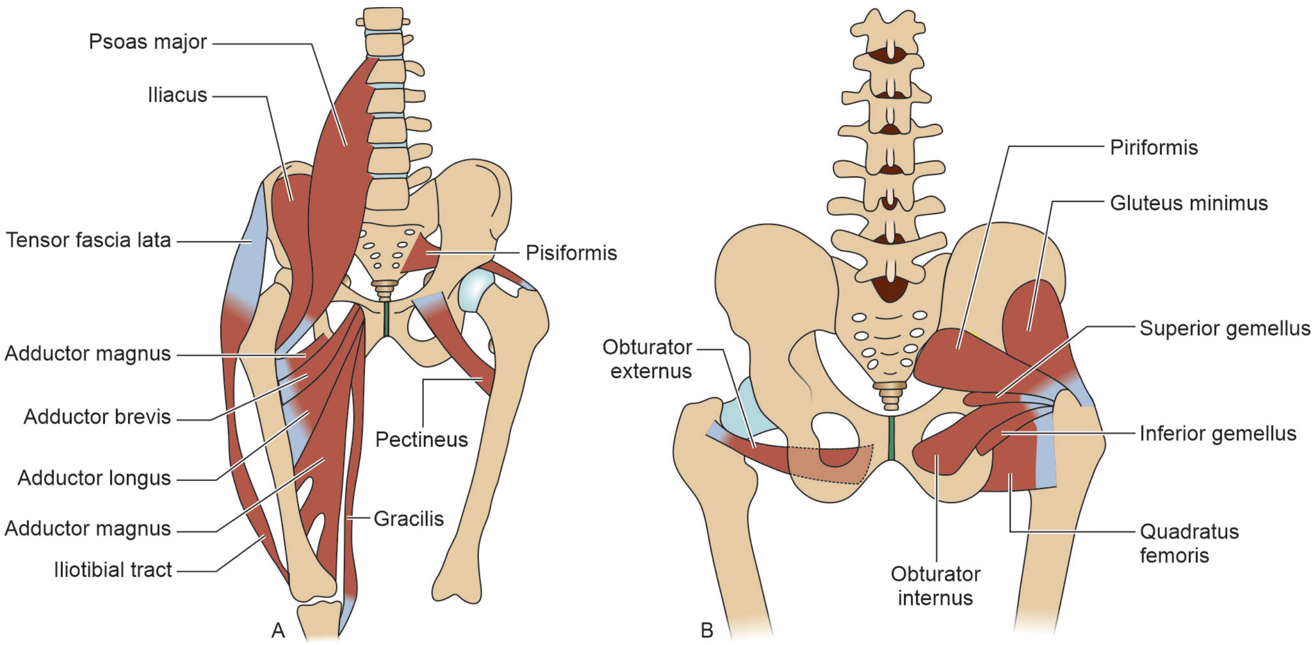

Fig. 8.3: (A) Flexor and adductor muscles of hip. (B) Short external rotator muscles of hip joint

- Superiorly, the tract splits at the level of the greater trochanter to receive insertion of three-fourths of the gluteus maximus and the tensor fasciae latae.
- Inferiorly, it is attached to the lateral condyle of tibia.

Vascular Supply

- The hip joint is supplied by the two circumflex femoral, two gluteal arteries and an obturator artery.
- Medial and lateral circumflex femoral arteries form an arterial circle around the capsular attachment on the neck of the femur.

Innervation

The hip joint is innervated by the femoral nerve, the anterior division of the obturator nerve, the accessory obturator nerve, the nerve to quadratus femoris, and the superior gluteal nerve.

APPLIED ANATOMY

1. Posterior dislocation of the hip (a) more common than anterior dislocation, (b) this is due to the anterior dislocation being prevented by the iliofemoral ligament of Bigelow.
2. Avascular necrosis of the femoral head
3. Tuberculosis of the hip

9. LUNATE

The lunate is a bone located in the wrist (Fig. 9.1), and it has certain characteristic features:

Shape: The lunate bone is half-moon-shaped or crescentic.

Non-articular surfaces: The dorsal (back) non-articular surface of the lunate is larger than the palmar (palm-side) non-articular surface, except for the lunate bone itself, where the palmar surface is larger than the dorsal surface.

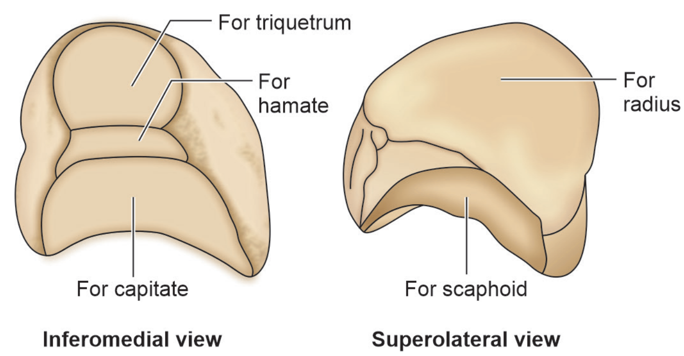

Fig. 9.1: Lunate bone articular surfaces

Articular surfaces: The lunate bone has two articular surfaces. On the lateral side, there is a small semilunar articular surface that articulates with the scaphoid bone. On the medial side, there is a quadrilateral articular surface that articulates with the triquetral bone.

Attachments: The lunate bone is connected to several other bones in the wrist and hand, including the radius, scaphoid, capitate, hamate, and triquetral bones.

Dislocation: Dislocation of the lunate bone can occur as a result of a fall on an acutely dorsiflexed hand with the elbow joint flexed. This displacement of the lunate bone is usually anteriorly, and it can also lead to the compression of the median nerve, causing carpal tunnel syndrome.

The lunate bone is an important component of the wrist joint, and its proper alignment and function are essential for normal wrist movement and stability. Dislocations or injuries to the lunate bone can lead to significant wrist problems and should be promptly evaluated and treated.

10. SCARPA'S TRIANGLE

It is a triangular depression on the front of the upper one-third of the thigh immediately below the inguinal ligament (Fig. 10.1).

Boundaries

- The femoral triangle is bounded laterally by the medial border of the sartorius; and medially by the medial border of the adductor longus.
- Its base is formed by the inguinal ligament. The apex which is directed downwards, is formed by the point where the medial and lateral borders meet.
- The apex is continuous, below, with the adductor canal.
- The roof of the femoral triangle is formed by:
  - The skin;
  - The superficial fascia containing the superficial inguinal lymph nodes, the femoral branch of the genitofemoral nerve, branches of the ilioinguinal nerve, superficial branches of the femoral artery with accompanying veins, and the upper part of the great saphenous vein; and
  - The deep fascia, with the saphenous opening and the cribriform fascia.
- The floor of the triangle is formed medially by the adductor longus and pectineus, and laterally by the iliacus and psoas major.

Contents

The contents of the femoral triangle are as follows.

1. Femoral Artery and its Branches

- The femoral artery traverses the triangle from its base at the mid-inguinal point to the apex.
- In the triangle, it gives off six branches, three superficial and three deep.

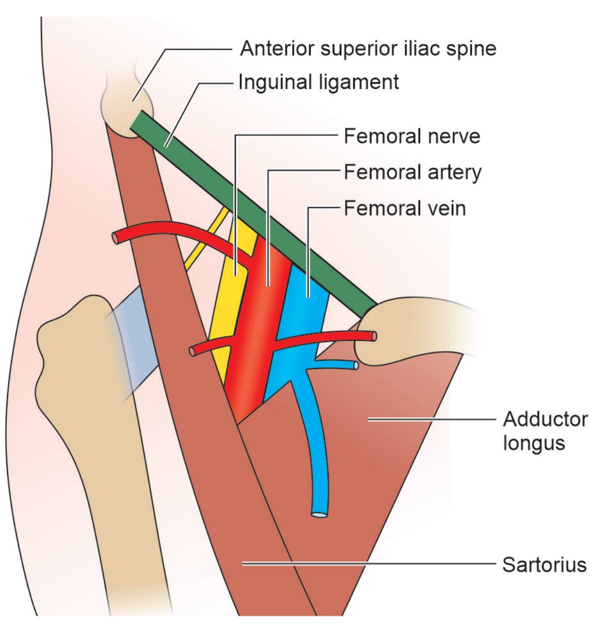

Fig. 10.1: Scarpa's triangle

- The superficial branches are the superficial external pudendal, the superficial epigastric and the superficial circumflex iliac.
- The deep branches are the profunda femoris, the deep external pudendal and muscular branches.
- The profunda femoris artery is the largest branch of the femoral artery, and this, in turn, gives rise to the medial and lateral circumflex femoral arteries.

2. Femoral Vein and its Tributaries

- The femoral vein accompanies the femoral artery. The vein is medial to the artery at the base of the triangle, but posteromedial to the artery at the apex.
- The femoral sheath encloses the upper 4 cm of the femoral vessels.

3. Nerves

- The femoral nerve lies lateral to the femoral artery, outside the femoral sheath, in the groove between the iliacus and the psoas major muscles.
- The nerve to the pectineus arises from the femoral nerve just above the inguinal ligament. It passes behind the femoral sheath to reach the anterior surface of the pectineus.
- The femoral branch of the genitofemoral nerve occupies the lateral compartment of the femoral sheath along with the femoral artery. It supplies most of the skin over the femoral triangle.
- The lateral cutaneous nerve of the thigh crosses the lateral angle of the triangle.
- The deep inguinal lymph nodes lie deep to the deep fascia.

11. BLOOD SUPPLY TO THE SPINAL CORD

The spinal cord receives its blood supply from 3 major longitudinal arteries that run along the length of the cord (Fig. 11.1). They are branches of:

1. Anterior spinal artery
2. Posterior spinal artery

Anterior Spinal Artery

Anterior spinal artery is present in relation to anterior median sulcus, they supply anterior two-thirds of the cord. They are formed by union of 2 small spinal branches of right and left vertebral arteries in upper cervical canal.

Posterior Spinal Artery

Two posterior spinal arteries one on each side run along the posterolateral sulcus along the line of attachment of the dorsal nerve root and supplies posterior one-third of cord. They are branched from either vertebral or posterior inferior cerebellar artery. In addition to above two arteries, the pia mater covering spinal cord has arterial plexus called arteria vasocorona which sends branches to substance of the cord.

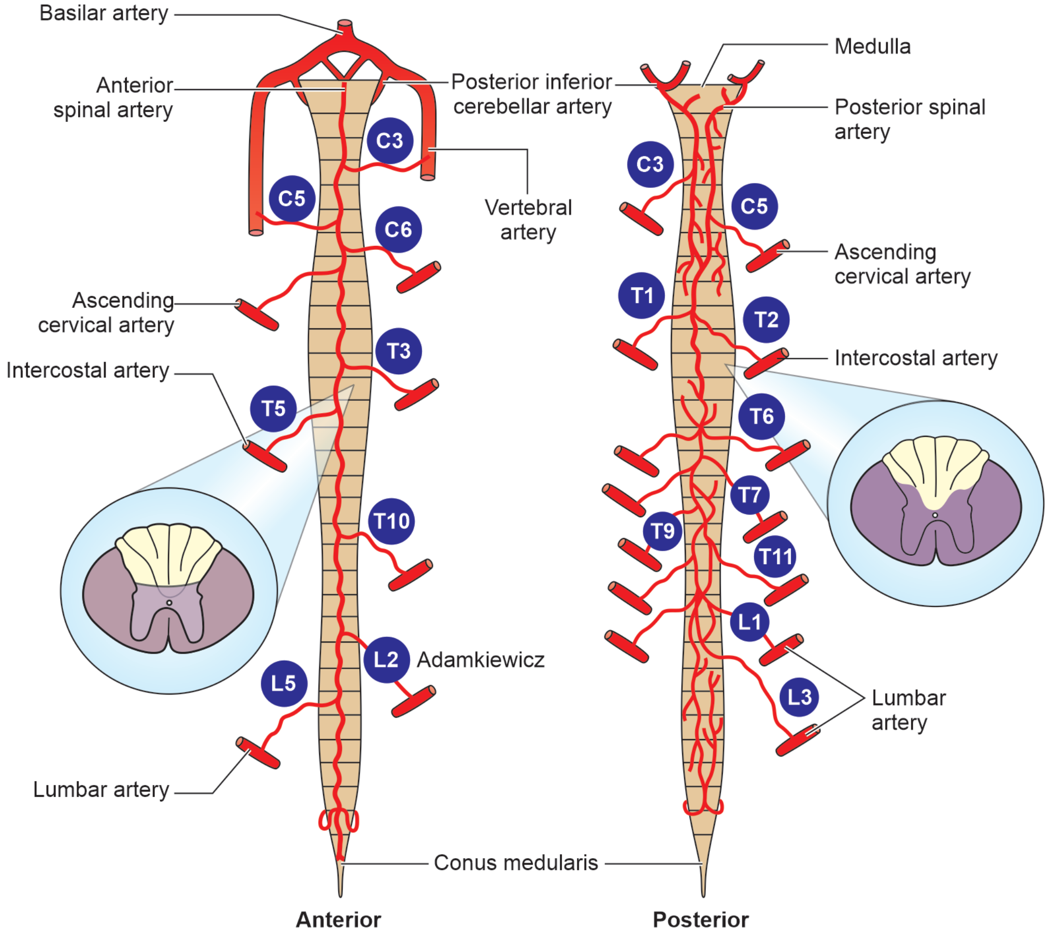

Fig. 11.1: Blood supply to spinal cord

Radicular Artery

The radicular arteries arise from spinal branches of vertebral, ascending cervical, deep cervical, intercoastal, lumbar, and sacral arteries and reach the cord along the root of spinal nerves. Many radicular branches are small and end by supplying nerve roots. A few are large and contribute blood supply to spinal artery one such artery is the arteria radicularis magna called the artery of Adamkiewicz, which may supply blood to the lower two-thirds of the spinal cord. The importance of radicular arteries is they are end arteries so any blockage results in ischaemia of area supplied by it.

Venous Drainage

Veins draining the spinal cord are arranged in the form of six longitudinal channels, they are:

1. Anteromedian and posteromedian channels that lie in midline.
2. Anterolateral and posterolateral channels are paired.

These venous channels interconnected by a plexus of veins that forms venous vaso corona. The blood from these veins drains into the radicular vein that in turn opens into a venous plexus lying between duramater and vertebral canal called epidural plexus or intervertebral venous plexus and through it into various segmental veins.

APPLIED ANATOMY

Anterior spinal artery syndrome: Occurs due to thrombosis or compression resulting in:

a. Loss of motor function due to involvement of corticospinal tract and anterior grey column.
b. Loss of bilateral pain and temperature sensation due to ischaemia of spinothalamic tracts.

12. SCIATIC NERVE

The sciatic nerve is the thickest nerve of the body. It is the terminal branch of the lumbosacral plexus (Fig. 12.1). It consists of two parts:

1. Tibial part
2. Common peroneal part

Root Value

Ventral rami of L4, L5, S1, S2 and S3 segments of the spinal cord. The tibial part receives its root value from the ventral division of the ventral rami of L4, L5, S1, S2 and S3. The common peroneal part root value is the dorsal division of ventral rami of L4, L5, S1 and S2 segments of the spinal cord.

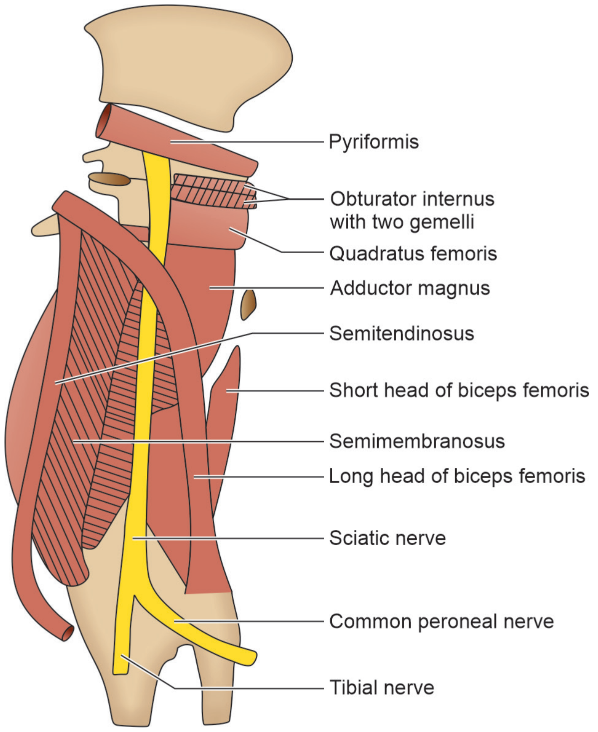

Fig. 12.1: Sciatic nerve

Course

It arises in the pelvis and leaves it by passing through the greater sciatic foramen below the pyriformis to reach the gluteal region. In the gluteal region, it lies deep to the gluteus maximus muscle and crosses superior gemellus, obturator internus, inferior gemellus, quadratus femoris to enter back of the thigh. During its short course, it lies between ischial tuberosity and greater trochanter with convexity to lateral side. It gives no branch in the gluteal region. In the gluteal region, it has the following relation with adjacent structures.

Posteriorly: Gluteus maximus and sometimes posterior cutaneous nerve of thigh.

Anteriorly:
1. Body of ischium and nerve to quatratus femoris
2. Tendon of obturator internus with gemelli
3. Quadratus femoris, obturator externus, and ascending branch of medial circumflex femoral artery
4. The capsule of the hip joint which lies deep into the forementioned muscles
5. Upper transverse fibres of adductor magnus.

Medially:
- Inferior gluteal nerve and vessels sometimes posterior cutaneous nerve of thigh
- In the back of the thigh, it lies deep to biceps femoris and superficial to adductor magnus. It gives branches to biceps femoris, semitendinosus, semimembranosus and ischial part of adductor magnus.
- It ends by dividing into two terminal branches: (1) Tibial nerve and (2) common peroneal nerve. In the thigh, it is related to the following structures:

  Posteriorly: It is crossed by the long head of biceps femoris.

  Anteriorly: Adductor magnus

  Medial: Posterior cutaneous nerve of thigh, semimembranous muscle, semitendinous muscle

  Lateral: Biceps femoris

The sciatic nerve is accompanied by a small companion artery which is a branch of the inferior gluteal artery. The artery runs along the sciatic nerve for some distance in thigh.

Branches:
1. Articular branches to the hip joint arise in the gluteal region.
2. Muscular branches to biceps femoris, semitendinosus, semimembranosus, ischial part of adductor magnus.

CLINICAL ANATOMY

1. Compression of the sciatic nerve against the femur after sitting for a long time, may give rise to a sleeping foot.
2. Pain along the cutaneous distribution of the sciatic nerve is known as sciatica. Pain usually begins in the gluteal region or even higher, and radiates along the back of the thigh, and the lateral side of the leg, to the dorsum of the foot. This is usually due to compression and irritation of one or more nerve roots forming the sciatic nerve. The cause may be osteoarthritis, lumbar disc prolapse spondylolisthesis, fibrositis, neuritis, etc.
3. The sciatic nerve may be injured by penetrating wounds, dislocation of the hip, or fracture of the pelvis. This results in loss of all movements below the knee with foot drop; sensory loss on the back of the thigh, the whole of the leg, and the foot except the area innervated by the saphenous nerve.
4. In above-knee amputations, the companion artery of the sciatic nerve should be carefully isolated and ligated separately to avoid bleeding.
5. Isolation of the artery from all the nerve fibres must be perfect because ligation of nerve fibres with the artery would be followed by severe pain in the stump.

13. SYNOVIAL PLICAE

Anatomy and Pathology

- Plicae are inward folds of the synovial lining and are present in most knees (Fig. 13.1).
- In their normal state, they are thin and pliable and appear almost transparent.
- Proximally, the mediopatellar, which is the most important clinically, is attached to the articularis genus muscle, while it runs distally to the intra-articular synovial lining and blends into the medial patellotibial ligament on the medial aspect of the retropatellar fat pad.
- Depending on its position, size, and elasticity, the plica may impinge between the quadriceps tendon and femoral trochlea at 70–100° of knee flexion, causing mechanical symptoms.

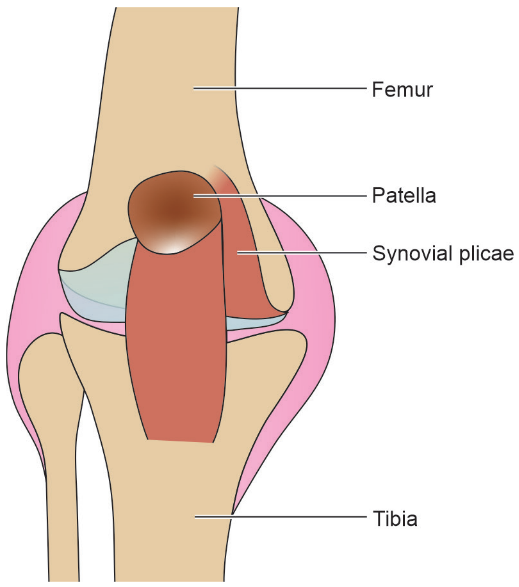

Fig. 13.1: Synovial plicae

- In some individuals, the size and elasticity of the synovial fold can be more developed compared with others.
- Plicae become pathological when its inherent qualities change due to an inflammatory process that alters the pliability of synovial tissue.
- A pathological synovial plica that has been through this inflammatory process can become inelastic, tight, thickened, fibrotic, and sometimes hyalinized.
- A synovial plica affected by such changes may bowstring across the femoral trochlea, causing impingement between the patella and femur in knee flexion.
- A pathological synovial plica can express a plethora of symptoms; the clinical history usually discloses nonspecific anterior or anteromedial knee pain, which has led to the conception of the term synovial plica syndrome.

Examination

- Patient lie supine on the examination table with both legs supported. The examiner can then palpate for the plica by rolling one finger over the plica fold, which is located around the joint lines in anterior knee compartment.
- A palpable plica will present as a ribbon-like fold of tissue, which can be rolled directly against the underlying medial femoral condyle.
- In more severe disease, examination may identify a cord-like structure in the anteromedial compartment of the knee with palpation often producing clicking on knee extension
  - The Hughston's plica test
  - Stutter test

  These are provocative tests for this purpose.

Diagnosis

- History
- Clinical examination
- Ultrasound
- Magnetic resonance imaging (MRI)
- Arthroscopic examination

Treatment

- Activity modification
- Analgesia
- Exercise therapy
- Taping
- Intra-articular steroid injection
- Arthroscopic excision

14. PSOAS MAJOR

It is a fusiform muscle placed on the side of the lumbar spine and along the brim of the pelvis (Fig. 14.1).

Origin

A. From the anterior surface and lower border of the transverse process of all lumbar vertebrae.
B. By 5 slips one each from the bodies of two adjacent vertebrae and their intervertebral discs from T12 to L5.
C. From 4 tendinous arches extending across the constricted parts of the bodies of the lumbar vertebra between the preceding slips, origin is continuous one from lower border of T12 to upper border of L5.

Insertion

The muscle passes behind the inguinal ligament and in front of hip joint to enter the thigh, it joins with tendon which receives fibres from iliacus on its lateral side, together it is inserted into the tip and medial part of anterior surface of lesser trochanter of the femur. The psoas and iliacus are together known as iliopsoas due to common insertion and its action.

Nerve Supply

Branches from roots of spinal nerve L2, L3 and sometimes L4.

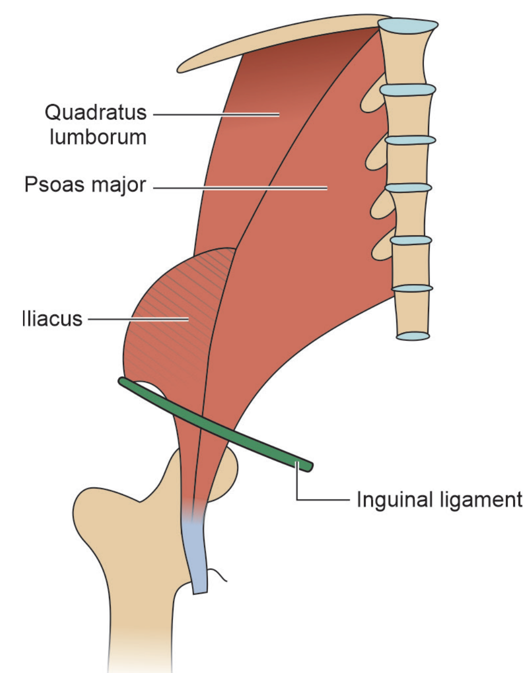

Fig. 14.1: Psoas major muscle

Actions of Muscle

a. With iliacus it acts as powerful flexor of hip joint as in raising the trunk from recumbent to sitting posture.
b. Helps in maintaining stability of hip joint, balances trunk while sitting.
c. It is weak medial rotator of hip, so in fracture of neck of femur, the limb rotates laterally.
d. When muscle of one side acts alone, it brings about lateral flexion of the trunk on that side.

APPLIED ANATOMY

Psoas abscess muscle is enclosed in psoas sheath, a part of the lumbar fascia. Pus from tubercular infection of thoracic and lumbar vertebrae may tract down through the sheath into the thigh producing a soft swelling in the femoral triangle.

15. EXTENSOR MECHANISM OF THE KNEE

The knee extensor mechanism refers to the anatomical structures involved in extending (straightening) the knee joint (Fig. 15.1). This system primarily includes:
- Quadriceps muscle groups
- Patella
- Patellar tendon
- Tibial tuberosity
- Extensor retinaculum

Quadriceps Muscle Group

It has four distinct muscle bellies.
One is rectus femoris which is a biarticular muscle.
Rectus femoris innervation: Roots L2, L3, L4.
These are monoarticlular muscles:
1. Vastusmedialis innervation: Roots L2, L3, L4
2. Vastuslateralis innervation: Roots L3>, L2, L4
3. Vastusintermedius innervation: Roots L3>, L2, L4
4. Vascularization: Profunda femoris artery

Three Layers are Present

1. **Anterior layer:** Direct attachment by rectus femoris to patella.
2. **Intermediate layer:** Attachment of vastus medialis and vastus lateralis, vastus lateralis blended with the lateral patellar retinaculum and direct tibial insertion vastus medialis is more distally attached to patella.
3. **Deep layer:** Formed by tendon of vastus intermedius.

Patella and Patellar Tendon

- Patella is a sesamoid bone that lies in the tendon of quadriceps femoris.
- The patellar tendon arises from the apex of the patella as well as its anterior and posterior surfaces.
- The patellar tendon inserts onto the tibial tuberosity.
- Primary function of the patella is to increase the lever arm of the extensor mechanism around the knee, improving the efficiency of quadriceps contraction.

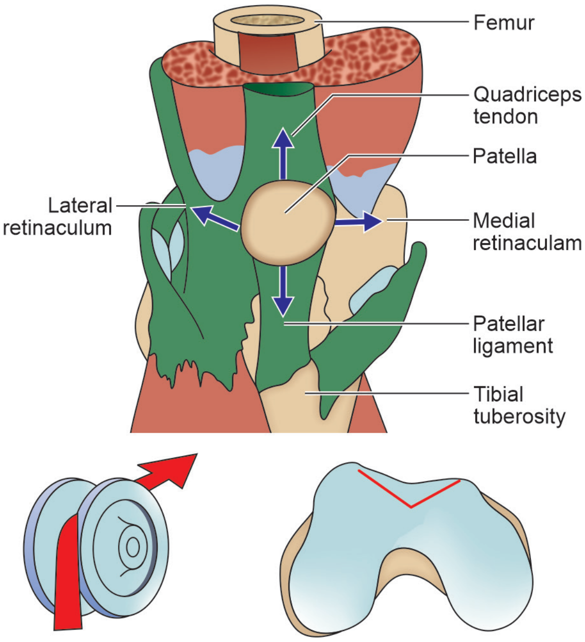

Fig. 15.1: Knee extensor mechanism

Open Kinetic Chain/Swing Phase

- During knee extension, tibia glides anteriorly on the femur, from 20° knee flexion to full extension, tibia rotates externally.
- During knee flexion, the tibia glides posteriorly and internally rotates from full extension to 20° flexion.

Closed Kinetic Chain/Stance Phase

- During knee extension, femur glides posteriorly and internally rotates on the stable tibia from 20° knee flexion to full extension.
- During knee flexion, the femur glides anteriorly and rotates externally on a stable tibia.

APPLIED ANATOMY

Extensor mechanism of knee injuries:

Extensor lag: Lack of knee full extension, with full quadriceps tendon contraction. The extensor lag is commonly seen after total knee replacement, ACL reconstruction or patella tendon rupture.

The weakness in the quadricep extensor mechanism causes the:
- Extensor lag
- Quadriceps muscle tears
- Quadriceps tendon tear
- Patella tendon rupture
- Patella fracture
- Patella dislocation often with medial retinaculum tears
- Patella sleeve fractures

Chronic injuries:
- Osgood-Schlatter disease
- Sinding-Larsen and Johansson syndrome
- Jumpers knee

16. ARCHES OF THE FOOT

Classification of Arches (Fig. 16.1)

A. Longitudinal

- Medial
- Lateral

B. Transverse

- Anterior
- Posterior

Medial Longitudinal Arch

- This arch is considerably higher, more mobile and resilient than the lateral.
- The anterior end is formed by the heads of the first, second and third metatarsals. The phalanges do not take part in forming the arches. The posterior end of this arch is formed by the medial tubercle of the calcaneum.
- *Summit*: The summit of the arch is formed by the superior articular surface of the body of the talus.
- *Pillars*: The anterior pillar is long and weak. It is formed by the talus, the navicular, the three cuneiform bones, and the first three metatarsal bones. The posterior pillar is short and strong. It is formed by the medial part of the calcaneum.
- The main joint of the arch is the talocalcaneonavicular joint.

Lateral Longitudinal Arch

- This arch is characteristically low, has limited mobility and is built to transmit weight and thrust to the ground. This is in contrast to the medial longitudinal arch which acts as a shock absorber.
- *Ends*: The anterior end of the arch is formed by the heads of the 4th and 5th metatarsal bones. The posterior end is formed by the lateral tubercle of the calcaneum.

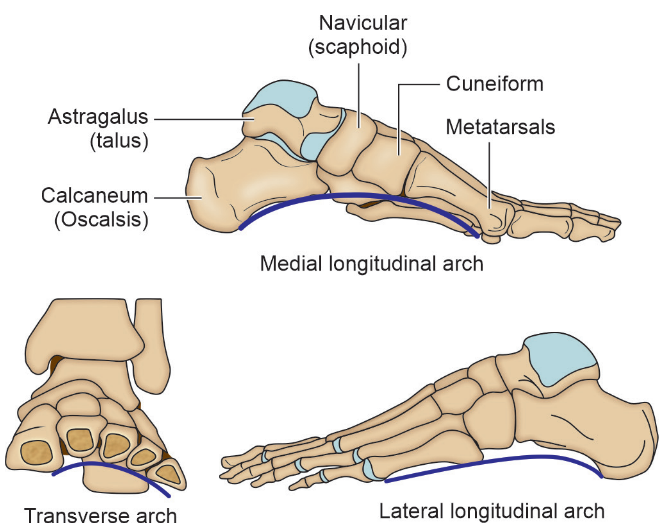

Fig. 16.1: Transverse, medial and lateral longitudinal arches of foot

- *Summit*: The summit lies at the level of the articular facets on the superior surface of the calcaneum at the level of the subtalar joint.
- *Pillars*: The anterior pillar is long and weak. It is formed by the cuboid bone and the 4th and 5th metatarsals. The posterior pillar is short and strong. It is formed by the lateral half of the calcaneum.
- *Main joint*: The main joint of the arch is the calcaneo-cuboid joint.

Anterior Transverse Arch

- The anterior transverse arch is formed by the heads of the five metatarsal bones.
- It is complete because the heads of the first and fifth metatarsals both come in contact with the ground and form the two ends of the arch.

Posterior Transverse Arch

- The posterior transverse arch is formed by the greater parts of the tarsus and metatarsus.
- It is incomplete because only the lateral end comes in contact with the ground, the arch forming a 'half dome' which is completed by a similar half dome of the opposite foot.

Factors Responsible for Maintenance of Arches

- Shape of the bones concerned.
- Intersegmental ties or ligaments (and muscles) that hold the different segments of the arch together.
  - i. The spring ligament for the medial longitudinal arch.
  - ii. The long and short plantar ligaments for the lateral longitudinal arch.
  - iii. In the case of the transverse arch, the metatarsal bones are held together by the interosseous muscles.
- Tie beams or bowstrings that connect the two ends of the arch.
  The longitudinal arches are prevented from flattening by the plantar aponeurosis, and by the muscles of the first layer of the sole. In the case of the transverse arch, the adductor hallucis acts as a tie beam.
- Slings that keep the summit of the arch pulled up
  1. The summit of the medial longitudinal arch is pulled upwards by tendons of tibialis posterior, flexor hallucis longus, flexor digitorum longus
  2. The summit of the lateral longitudinal arch is pulled upwards by the peroneus longus and peroneus brevis
  3. The tendons of the tibialis anterior and the peroneus longus together form a sling (or stirrup) which keeps the middle of the foot pulled upwards, thus supporting the longitudinal arches.
  4. As the tendon of the peroneus longus runs transversely across the sole, it pulls the medial and lateral margins of the sole closer together, thus maintaining the transverse arches. The transverse arch is also supported by the tibialis posterior which grips many of the bones of the sole through its slips.

Functions of the Arches

1. The arches of the foot distribute body weight to the weight-bearing areas of the sole, mainly the heel and the toes. weight is borne mainly on the first and fifth toes. The lateral border of the foot bears some weight, but this is reduced due to the presence of the lateral longitudinal arch.
2. The arches act as springs (chiefly the medial longitudinal arch) which are of great help in walking and running.
3. They also act as shock absorbers in stepping and particularly in jumping.
4. The concavity of the arches protects the soft tissues of the sole against pressure.

CLINICAL ANATOMY

1. Absence or collapse of the arches leads to flatfoot (pes planus), which may be congenital or acquired.
   a. Loss of spring in the foot leads to a clumsy, shuffling gait,
   b. Loss of the shock absorbing function makes the foot more liable to trauma and osteoarthritis.
   c. Loss of the concavity of the sole leads to compression of the nerves and vessels of the sole. Compression of the communication between the lateral and medial plantar nerves causes neuralgic pain in the forefoot (metatarsalgia).
2. Exaggeration of the longitudinal arches of the foot is known as pes cavus. Usually, a result of contracture (plantar flexion) at the transverse tarsal joint. When dosiflexion of the metatarsophalangeal joints, and plantar flexion of the interphalangeal joints (due to atrophy of lumbricals and interossei) are superadded, the condition is known as claw-foot. The common causes of pes cavus and claw-foot are spina bifida and poliomyelitis.

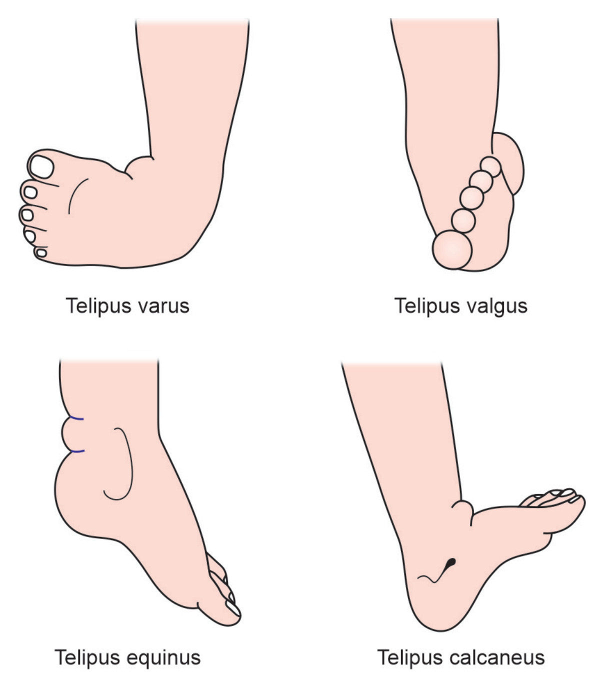

Fig. 16.2: Pathological arches of foot

3. Other deformities of the foot are as follows (Fig. 16.2).
   a. Talipes equinus in which the patient walks on toes, with the heel raised;
   b. Talipes calcaneus in which the patient walks on heel, with the forefoot raised;
   c. Talipes varus in which the patient walks on the outer border of foot (foot is inverted and adducted)
   d. Talipes valgus in which the patient walks on the inner border of foot (foot is everted and abducted).

The commonest deformity of the foot is talipes equino varus (or club foot). In this condition the foot is inverted, adducted and plantar flexed. The condition may be associated with spina bifida.

17. BLOOD SUPPLY TO FEMORAL HEAD IN ADULT

The blood supply to the femoral head is variable (Fig. 17.1). Three main arteries supply the femoral head are:

- The lateral epiphyseal branch of the medial femoral circumflex
- The ascending branch of the lateral femoral circumflex
- The ligamentum teres artery.

Retinacular Branches

- Arise from extracapsular arterial ring
- Pass up beneath the synovial and capsular reflections
- In their passage, they give branches to the metaphysis of the femoral neck
- There is a free intramedullary anastomosis between branches of the superior nutrient artery system, branches of the extracapsular ring, branches of the ascending cervical branches and the subsynovial ring
- Form 4 groups: Superior, inferior, medial and lateral
- The lateral group supplies most of the blood to femoral head
- At the margin of the articular cartilage, these vessels form a second ring, the subsynovial intracapsular ring.

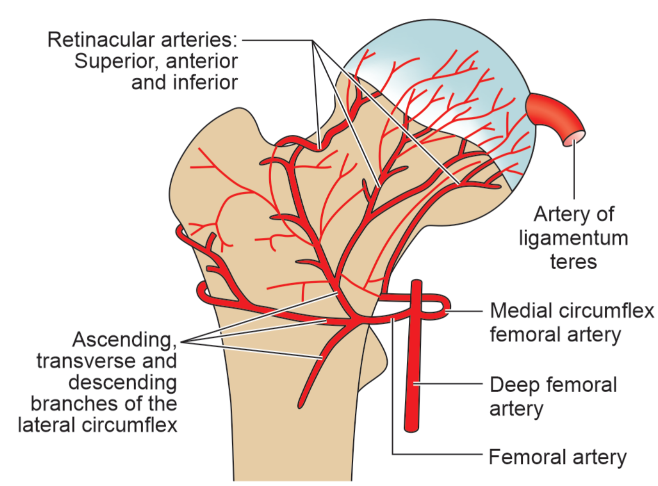

Fig. 17.1: Blood supply of head and neck of femur by branches of deep femoral artery and artery of ligamentum teres

Subsynovial Intracapsular Ring (Chung)

- Circulus articuli vasculosis
- This ring may be complete or incomplete
- From this ring, epiphyseal branches arise that enter the femoral head.

Extracapsular Arterial Ring

- Major contributions posteriorly from the horizontal branch of the medial femoral circumflex artery and anteriorly from ascending branch of the lateral femoral circumflex artery.
- Minor contribution from: Superior gluteal artery and inferior gluteal artery.
- They supply the large areas of femoral head.

Artery of the Ligamentum Teres

- From the lateral branch of the obturator artery.
- Supplies small area around the fovea.

Clinical Significance

Legg-Calve-Perthes disease: This is idiopathic osteonecrosis of the proximal femoral epiphysis in children. The blood supply to the femoral head is disrupted. Due to the lack of blood flow, the bone dies and stops growing.

18. PETIT'S TRIANGLE AND ITS IMPORTANCE

The Petit's triangle, also known as inferior lumbar triangle, is an anatomical space through which inferior lumbar hernias can occur (Fig. 18.1).

Boundaries: Petit's triangle is bounded by

- *Inferiorly:* Iliac crest
- *Anteriorly:* External oblique muscle
- *Posteriorly:* Latissimus dorsi muscle
- *Floor:* Internal oblique muscle

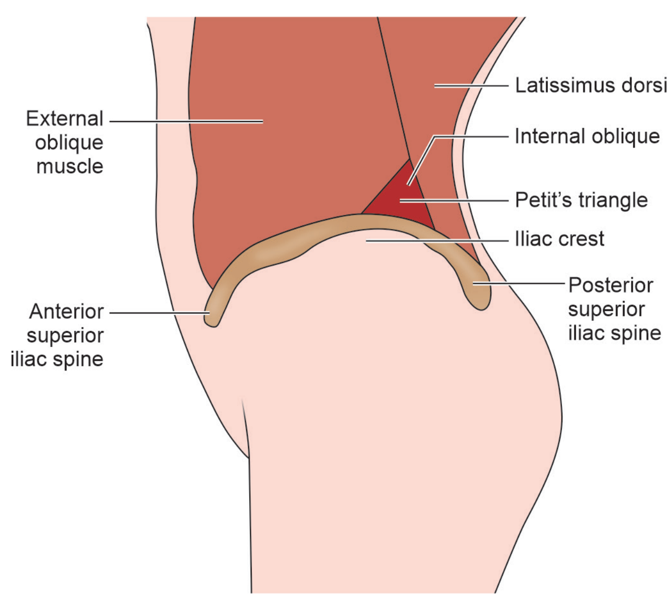

Fig. 18.1: Petit's triangle

Clinical Significance

Lumbar hernias occur through defects in the lumbar muscles or the posterior fascia, below the 12th rib and above the iliac crest. Petit's hernia occur through inferior lumbar triangle.

Etiology of Lumbar Hernia

There are three broad etiologies for lumbar hernias:

Congenital hernias (20%)

- Discovered in infancy and are due to defects in the musculoskeletal system
- May be associated with other malformations

Primary Acquired Lumbar Hernias (55%)

- Spontaneous, without a causal factor such as surgery, infection, or trauma.
- Risk factors include age, extremes of body habitus, quick weight loss, chronic disease, muscular atrophy, chronic bronchitis, wound infection, postoperative sepsis, and strenuous physical activity.

Secondary Acquired Lumbar Hernias (25%)

May be caused by blunt, penetrating, or crushing trauma; fractures of the iliac crest; surgical lesions; hepatic abscesses; infections in plumbodorsal fascia or infected retroperitoneal hematomas.

Contents of Lumbar Hernia

Lumbar hernias may contain a number of intra- or retroperitoneal structures including:

- Stomach
- Small or large bowel
- Mesentery and omentum
- Ovary
- Spleen and kidney

The imaging modality of choice for a suspected inferior lumbar hernia is a CT scan of the abdomen and pelvis. Surgical repair is recommended to avoid further complications such as incarceration, bowel obstruction, or strangulation.

19. TYPICAL LUMBAR VERTEBRAE AND ITS SIGNIFICANCE

There are five lumbar vertebrae. The first four lumbar vertebrae are typical, and the fifth is atypical (Fig. 19.1).

Body

- The body is large and wider from side-to-side than from before backwards.
- The size of the body increases progressively from first to fifth lumbar vertebra.
- The length of the body is somewhat greater anteriorly. This leads to the forward convexity of the lumbar vertebral column.
- The body has no costal facets on its sides.

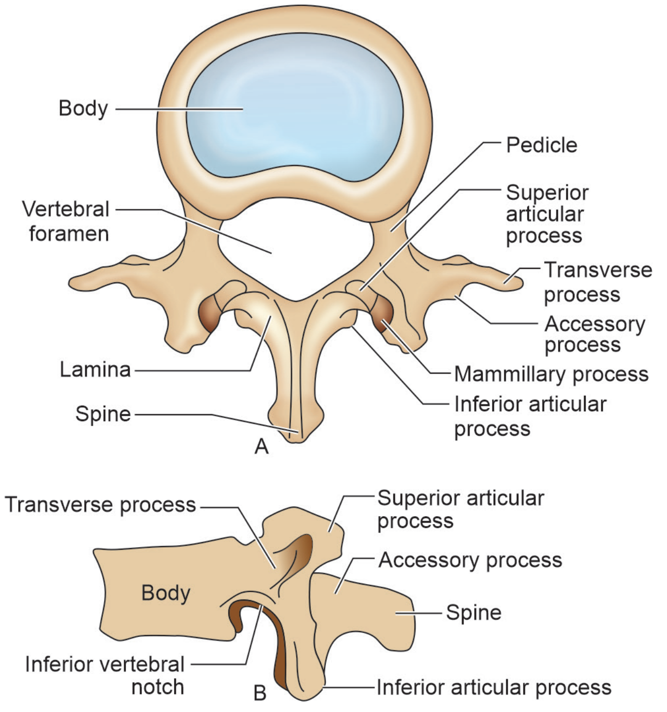

Fig. 19.1: Lumbar vertebra: (A) Seen from above, axial section, (B) seen from lateral side, sagittal section

Vertebral Foramen

- It is triangular in shape.
- It is bigger than in the thoracic vertebrae but smaller than in the cervical vertebrae.

Pedicles

- The pedicles are short and strong.
- They project backwards from the upper part of the body.
- So the inferior vertebral notches are considerably deeper in relation to the superior ones.

Laminae

- The laminae are short, thick, and broad plates.
- They are directed posteromedially.
- The overlapping between the laminae of the adjoining vertebrae is minimal.

Spine

- The spine is quadrilateral in shape.
- It projects nearly backward and slightly downwards
- It is thickened along its posterior and inferior borders.

Transverse Processes

- The transverse processes are thin and tapering.
- They are directed laterally and slightly backwards.
- The posteroinferior aspect of every transverse process presents a small rough elevation named accessory process. This represents the true transverse process of the vertebra.
- The length of the transverse processes increases from vertebra L1 to L3 and, thereafter it decreases.

Superior Articular Processes

- The facets on the superior articular processes are concave, which project backwards and medially.
- The superior articular processes lie further apart than the inferior articular processes.
- Their posterior edges are marked by a rough elevation called the mammillary process.

Inferior Articular Processes

- The inferior articular processes are located nearer to each other compared to the superior articular processes.
- They bear convex articular facets, which face forward and laterally.

Significance

- Anterior longitudinal ligament is connected on the upper and lower edges of lumbar vertebral bodies anteriorly.
- Posterior longitudinal ligament is connected on the upper and lower edges of lumbar vertebral bodies posteriorly.
- Right crus of the diaphragm is connected to the front of the upper 3 lumbar vertebral bodies.
- The left crus of the diaphragm is connected to the front of the upper 2 lumbar vertebral bodies.
- Psoas major originates by fleshy cases from the upper and lower edges of all lumbar vertebrae.
- Ligamenta flava are connected to the laminae of adjacent vertebrae.
- Anterior layer of thoracolumbar fascia is connected to the vague ridge on the front of transverse processes.
- Middle layer of the thoracolumbar fascia is connected to the tips of transverse processes of the all lumbar vertebrae.
- Posterior layer of the thoracolumbar fascia is connected to the spinous processes of lumbar vertebrae.
- Supraspinous and interspinous ligaments are connected to the spinous processes of lumbar vertebrae.
- Erector spinae and multifidus muscles are connected to the spinous processes of lumbar vertebrae.
- Medial and lateral arcuate ligaments of the diaphragm are connected to the tips of transverse processes of L1 vertebra.
- Multifidus and intertransverse muscles are connected to the mammillary processes.
- Iliolumbar ligaments are connected to the tips of the transverse processes of the fifth lumbar vertebra.

20. LIGAMENT OF BIGELOW AND ITS IMPORTANCE

The ligament of Bigelow is also called the Y-ligament, the ligament of Bertinthe is the strongest ligament in the human body (Fig. 20.1).

Attachment

- Above, it is attached to the lower part of the anterior inferior iliac spine and acetabular rim.