CHAPTER

12

Bones of Lower Limb

OLA-1 Attachments to intertrochanteric line

The intertrochanteric line provides

1. **Attachment to the following ligaments**
   - A. Capsular ligament of the hip joint,
   - B. Upper band of the iliofemoral ligament in its upper part, and
   - C. Lower band of iliofemoral ligament in its lower part.
2. **Origin to the highest fibres of the following muscles.**
   - A. Vastus lateralis from the upper end of the line, and
   - B. Vastus medialis from the lower end of the line.

OLA-2 Enumerate the structures attached to pubic tubercle

1. Ligament
   - A. Apex of lacunar ligament
   - B. Medial end of inguinal ligament
   - C. Reflected part of inguinal ligament
2. Fascia
   - A. Superficial layer of fascia lata,
   - B. Fascia transversalis.
3. Muscle: Ascending loops of cremaster muscle in male, and
4. Superior crus of saphenous opening.

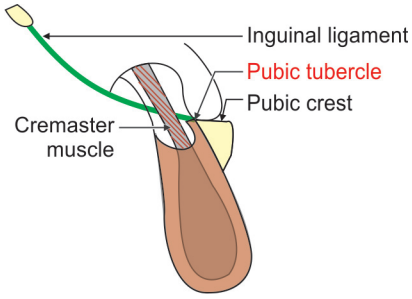

Fig. 12.1: Attachments of pubic tubercle

SN-1 Greater sciatic notch

1. **The posterior border of ilium of hip bone** is divided by ischial spine into two notches
   - A. Greater sciatic notch—above the spine, and
   - B. Lesser sciatic notch—below the spine.

2. **The structures passing through greater sciatic notch** are divided by the piriformis into (Fig. 12.2)

A. **Structures above piriformis,**

a. Superior gluteal vessels—branch/tributary of posterior division of internal iliac artery, and

b. Superior gluteal nerve L4, L5, S1.

B. **Structures below piriformis** (from medial to lateral): They are divided into three groups

a. Structures going to *gluteal region*

I. Laterally

i. Sciatic nerve (L4, L5, S1, S2, S3). It lies at the inferior margin of greater sciatic notch,

ii. Nerve to quadratus femoris (L4, L5, S1).

II. Medially: Nerve to obturator internus (L5, S1, S2). It crosses the base of the ischial spine.

III. Intermediate position: Inferior gluteal vessels and nerve (L5, S1, S2).

b. Structures which re-enter into *lesser sciatic notch*

I. Internal pudendal vessels of smaller terminal branch/tributary of posterior division of internal iliac vessels, and

II. Pudendal nerve (S2, S3, S4). It lies close to the tip of ischial spine.

C. Structures going to *thigh region*: Posterior femoral cutaneous nerve of thigh.

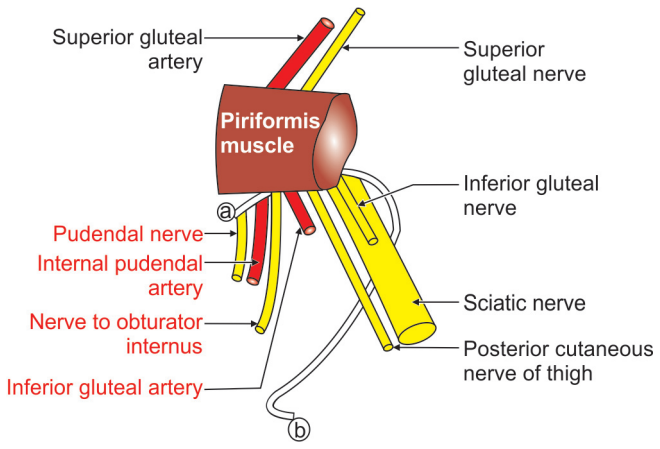

Fig. 12.2A: Structures passing through the right greater sciatic notch

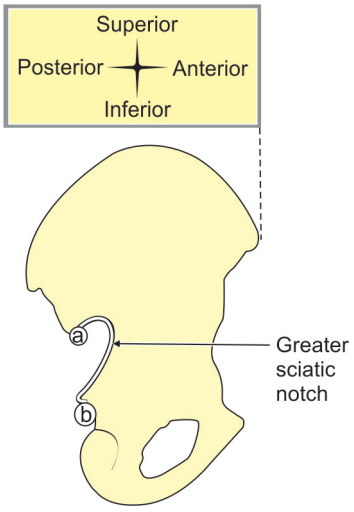

Fig. 12.2B: Right hip bone seen from behind showing greater sciatic foramen

3. Applied anatomy

- About *greater sciatic* notch:
  - At the upper border of greater sciatic notch, the internal iliac artery divides into anterior and posterior divisions.
  - Internal iliac vein begins above greater notch.
  - There is a preauricular sulcus above it. It is deep in female hip bone and more pronounced in the hip bones of multiparous female.
  - It is converted into greater sciatic foramen by sacrospinous ligament.
  - Anterior gluteal line starts from middle of upper margin of greater sciatic notch.
- About *lesser sciatic* notch:
  - Pudendal canal extends from lesser sciatic notch to deep perineal pouch.
  - It is converted into lesser sciatic foramen by sacrotuberous ligament.
  - The inferior gemellus muscle arises from inferior margin of lesser sciatic notch near ischial tuberosity.

SAQ-1 Organs related to hip bone

Table 12.1: Organs related to the hip bone

Bone	Organs	
	Male ♂	Female ♀
• **Pelvic part of pubic bone**	• Urinary bladder • Prostate gland	• Urinary bladder
• **Anterior margin of greater sciatic notch**	• Ureter	• Ovary and ureter
• **Transtubercular plane**	• Appendix and caecum on right side of pelvis.	
• **Pubic tubercle**	• Spermatic cord	• Round ligament of uterus

SN-2 Linea aspera

(*Linea*—line, *aspera*—thick, broad, thickened ridge)

1. **Definition:** It is irregular thick line present on the posterior border of femur.
2. **Features**

A. In middle 1/3rd of thigh, it forms the apex of adductor canal.

B. It gives attachment to intermuscular septa. These septa divide muscles of thigh into extensor, adductor and flexor compartments. Following are the muscles attached to linea aspera (from lateral to medial) (Fig. 12.3).

I Love B. Mr. B Loves Me

Vastus **I**ntermedius,

Vastus **L**ateralis,

Short head of **B**iceps femoris
Adductor **M**agnus,
Adductor **B**revis,
Adductor **L**ongus, and
Vastus **M**edialis.

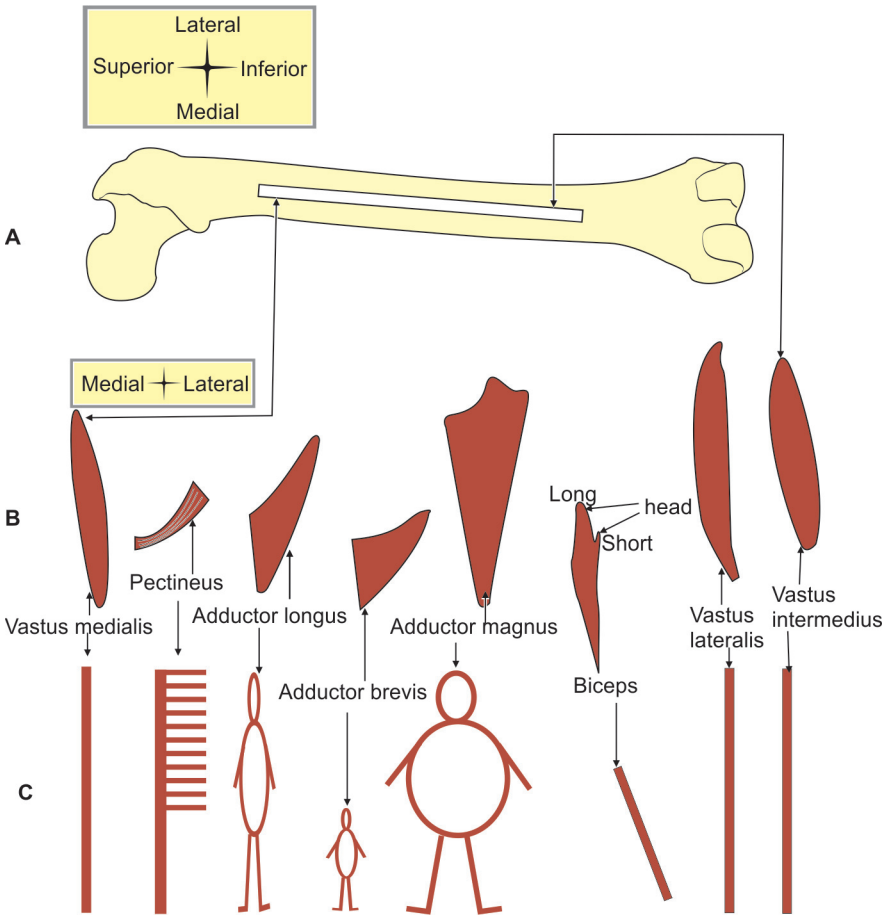

Fig. 12.3A to C: Muscles attached to linea aspera of right femur (from medial to lateral)

3. **Fate of linea aspera**
   A. It divides into medial and lateral lips at both the ends.
   B. Fate of these lips
      a. At upper end.
         I. The medial lip continues with the spiral line, and
         II. The lateral lip continues to the gluteal tuberosity.
      b. At lower end
         I. Medial lip continues as medial supracondylar line, and
         II. Lateral lip continues as lateral supracondylar line.

4. **Applied anatomy**

- It acts as a *buttress* to resist the compressive forces. Hence, it *prevents* the anterior *bowing* of the shaft.
- The nutrient foramen of the femur lies on the linea aspera. It is directed upward.
- The perforating branches of profunda femoris are closely related to the linea aspera.

SAQ-2 Adductor tubercle

Introduction: It is the 1st bony prominence felt on the medial side of thigh as you slide your finger from above downwards.

1. **Gives attachment** to
   - A. Ischial fibres of adductor magnus muscle, and
   - B. Tibial collateral ligament.

2. **Applied anatomy**

- It forms a bony landmark for surface anatomy.
- The *epiphyseal line* in the femur runs transversely through the *adductor tubercle*.
- *Damage of adductor tubercle* during surgical intervention. leads *permanent shortening* of the lower limb. This is applicable to the bone before ossification.
- To palpate the tubercle, flex the knee partly and note the wide, shallow groove that appears posterior to the mass of vastus medialis. The tendon of adductor magnus can be felt in this groove. It can be traced down to the adductor tubercle.

SN-3 Iliac crest

Introduction: It is an 'S'-shaped curvature present on the upper border of ilium (Fig. 12.4).

1. **Curvatures**
   - A. **Vertical curvature:** It is convex upwards.
   - B. **Anteroposterior**
     - a. It is concave inwards in front, and
     - b. Concave outwards behind.
2. It shows two spines at both the ends.
   - A. **Spines**
     - **a. Anterior superior iliac spine** gives attachment to
       - I. Inguinal ligament, and
       - II. Sartorius.
     - **b. Posterior superior iliac spine** gives attachment to piriformis.
   - B. **Iliac crest** has
     - **a. Ventral segment** which is subdivided into
       - **I. Anterior 2/3rd:** It gives attachment to following muscles (from lateral to medial).

i. Fascia lata in whole extent,
ii. Tensor fasciae latae in front of tubercle,
iii. External oblique,
iv. Internal oblique,
v. Transversus abdominis, and
vi. Fascia transversalis.

II. **Posterior** 1/3rd**:** It gives attachment to following muscles (from lateral to medial)
i. Latissimus dorsi,
ii. Quadratus lumborum (**L for L—L**atissimus for **L**ateral), and
iii. Thoracolumbar fascia around quadratus lumborum.

b. Dorsal segment gives attachment to
I. Gluteus maximus in outer sloping area, and
II. Erector spinae in inner sloping area.

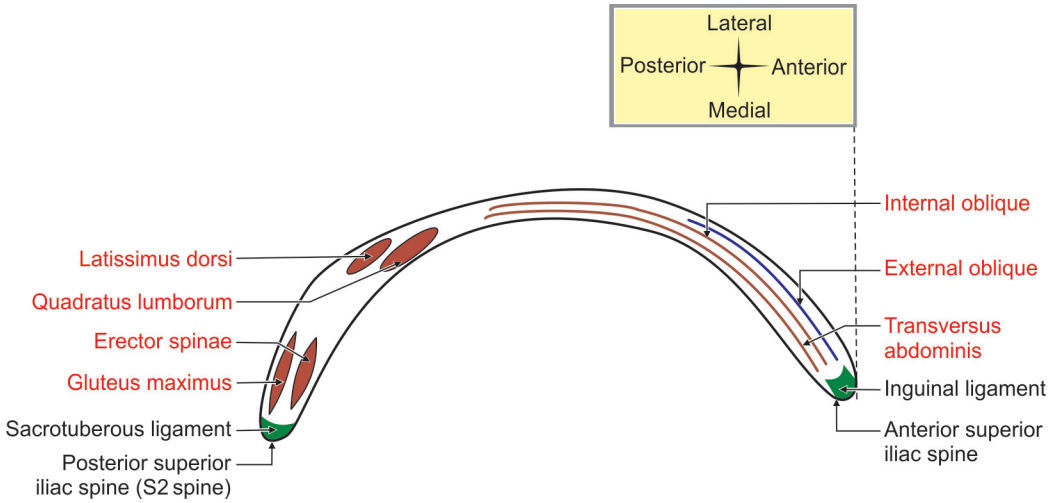

Fig. 12.4: Structures attached to right iliac crest

3. **Ends:** It has two ends.
A. Anterior end is called anterior superior iliac spine, and
B. Posterior end is called posterior superior iliac spine.

4. **Bony landmarks**
A. *The highest point of the iliac crest* is situated a little behind the midpoint of the crest.
B. It lies at the level of the interval between the spines of vertebrae L3 and L4.

5. **Surface anatomy**
A. Iliac crest can be felt in the living at the lower limit of the flank.
B. *Anterior superior iliac spine* (ASIS) is a prominent landmark. It is easily felt in the living individuals.

6. Applied anatomy

- Anterior superior iliac spine is important surface landmark especially used by tailors for taking measurements.
- Iliac crest is used for bone grafting.
- Iliac crest is used for bone marrow examination.
- Tuberosity of iliac crest is subcutaneous bone which can be palpated in fatty patient. It helps to find out highest point of iliac crest and anterior superior iliac spine.

SAQ-3 Structures attached to spines of hip bone

Table 12.2: Structures attached to spines of hip bone

Spines	Attachments	
	Muscles	Ligaments
• **Anterior superior iliac spine**	• Sartorius in lower part	• Lateral end of inguinal ligament in upper part
• **Anterior inferior iliac spine**	• Straight head of rectus femoris in upper part	• Iliofemoral ligament in lower part
• **Posterior superior iliac spine**	• Erector spinae	• Posterior sacroiliac ligament and sacrotuberous ligament
• **Posterior inferior iliac spine**	• Piriformis	• Sacrotuberous ligament
• **Ischial spine**	• Posterior fibres of levator ani	• Sacrospinous and coccygeal ligaments.

SAQ-4 Trochanteric anastomosis

Site: Trochanteric fossa

1. Arteries taking part

A. Ascending branch of medial } circumflex femoral artery branch of profunda femoris artery
B. Ascending branch of lateral }

C. **Branches of internal iliac artery**

a. Descending branch of superior gluteal artery.

b. Inferior gluteal artery,

c. Internal pudendal artery (Fig. 12.5)

2. Applied Anatomy

- It **provides chief source of blood supply to the**
  - Head of femur, and
  - Intracapsular part of neck of femur.

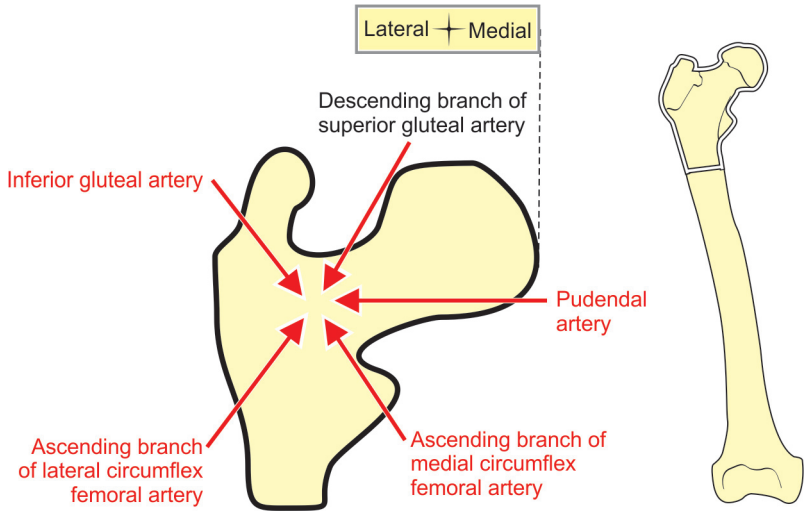

Fig. 12.5: Arteries forming right trochanteric anastomosis

- **Trochanteric anastomosis** is between branches of internal iliac and femoral arteries. In case of blockage of one of the arteries, the collateral circulation is developed to maintain the blood supply to this region.