Muscles of the Lower Limb
Lectures Objectives

• List the muscles of the gluteal region.
• Describe the attachments of the gluteal region muscles and their nerve supply.
• Describe the greater and lesser sciatic foramina and their contents.
• List the muscles of the thigh.
• Describe the femoral triangle.
• Describe the femoral sheath and its contents.
• List the muscles of the leg.
• Describe the attachments of the thigh and leg muscles and their nerve supply.
Lower Limb Fascia and Compartments

- Fascia lata (in thigh)
  - Iliotibial tract
  - Saphenous opening
- Crural fascia (in leg)
Lower limb arteries
Lower Limp Superficial Veins
Lower Limb Innervation
Anterior Thigh Muscles

- Mainly femoral nerve
- Flexors of the hip
  - Pectineus m.
  - Iliopsoas m.
    - Iliacus m.
    - Psoas major m.
      ➢ Major flexor
  - Sartorius m.
    - Longest
    - Flex hip & knee
Anterior Thigh Muscles

- **Extensors of the knee**
  - Quadriceps femoris m.
    - Rectus femoris m.
      - Can flex the hip
  - Vastus medialis m.
  - Vastus intermedius m.
    - Articularis genu
  - Vastus lateralis m.
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Main Action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectineus (Fig. 5.21A &amp; B)</td>
<td>Superior ramus of pubis</td>
<td>Pectineal line of femur, just inferior to lesser trochanter</td>
<td>Femoral nerve (L2, L3); may receive a branch from obturator nerve</td>
<td>Adducts and flexes thigh; assists with medial rotation of thigh</td>
</tr>
<tr>
<td>Iliopsoas (Fig. 5.21A &amp; C)</td>
<td>Sides of T12–L5 vertebrae and discs between them; transverse processes of all lumbar vertebrae</td>
<td>Lesser trochanter of femur</td>
<td>Anterior rami of lumbar nerves (L1, L2, L3)</td>
<td>Act conjointly in flexing thigh at hip joint and in stabilizing this joint&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Psoas minor</td>
<td>Sides of T12–L1 vertebrae and intervertebral discs</td>
<td>Pectineal line, iliopectineal eminence via iliopectineal arch</td>
<td>Anterior rami of lumbar nerves (L1, L2)</td>
<td></td>
</tr>
<tr>
<td>Iliacus</td>
<td>Iliac crest, iliac fossa, ala of sacrum, and anterior sacroiliac ligaments</td>
<td>Tendon of psoas major, lesser trochanter, and femur distal to it</td>
<td>Femoral nerve (L2, L3)</td>
<td></td>
</tr>
<tr>
<td>Sartorius (Fig. 5.21A &amp; D)</td>
<td>Anterior superior iliac spine and superior part of notch inferior to it</td>
<td>Superior part of medial surface of tibia</td>
<td>Femoral nerve (L2, L3)</td>
<td>Flexes, abducts, and laterally rotates thigh at hip joint; flexes leg at knee joint, (medially rotating leg when knee is flexed)&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> The Latin word *insertio* means *attachment*. The terms insertion and origin (*L. origo*) have not been used here (or elsewhere) since they change with function.

<sup>b</sup> The spinal cord segmental innervation is indicated (e.g., "L1, L2, L3") means that the nerves supplying the psoas major are derived from the first three lumbar segments of the spinal cord). Numbers in boldface (*L1, L2*) indicate the main segmental innervation. Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.

<sup>c</sup> The psoas major is also a postural muscle that helps control the deviation of the trunk and is active during standing.

<sup>d</sup> The four actions of the sartorius (*L. sartor*, tailor) produce the once common cross-legged sitting position used by tailors, hence the name.
### TABLE 5.3.II. MUSCLES OF ANTERIOR THIGH: EXTensors OF KNEE

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation(^a)</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadriceps femoris (Fig. 5.21E-H)</td>
<td></td>
<td></td>
<td></td>
<td>Extend leg at knee joint; rectus femoris also steadies hip joint and helps iliopsoas flex thigh</td>
</tr>
<tr>
<td>Rectus femoris</td>
<td><strong>Anterior inferior iliac spine and ilium superior to acetabulum</strong></td>
<td>Via common tendinous (quadriceps tendon) and independent attachments to base of patella; indirectly via patellar ligament to tibial tuberosity; medial and lateral vasti also attach to tibia and patella via aponeuroses (medial and lateral patellar retinacula)</td>
<td>Femoral nerve (L2, L3, L4)</td>
<td></td>
</tr>
<tr>
<td>Vastus lateralis</td>
<td>Greater trochanter and lateral lip of linea aspera of femur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vastus medialis</td>
<td>Intertrochanteric line and medial lip of linea aspera of femur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vastus intermedius</td>
<td>Anterior and lateral surfaces of shaft of femur</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) The spinal cord segmental innervation is indicated (e.g., “L1, L2, L3” means that the nerves supplying the quadriceps femoris are derived from the first three lumbar segments of the spinal cord). Numbers in boldface (L3, L4) indicate the main segmental innervation. Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.
Medial Thigh Muscles

- Mainly obturator nerve
- Adductor group
  - Adductor longus m.
    - Most anterior
  - Adductor brevis m.
    - Deep to pectinus & adductor longus
Medial Thigh Muscles

- Adductor magnus m.
  - Most posterior
  - Adductor hiatus
    - Adductor part
    - Hamstring part
      - Sciatic nerve
Medial Thigh Muscles

- **Gracilis m.**
  - Most medial and superficial
  - Crosses hip & knee joints

- **Obturator externus m.**
### TABLE 5.4. MUSCLES OF MEDIAL THIGH: ADDUCTORS OF THIGH

<table>
<thead>
<tr>
<th>Muscle(^a) (Fig. 5.23E &amp; G)</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation(^b)</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adductor longus</td>
<td>Body of pubis inferior to pubic crest</td>
<td>Middle third of linea aspera of femur</td>
<td>Obturator nerve, branch of, anterior division (L2, L3, L4)</td>
<td>Adducts thigh</td>
</tr>
<tr>
<td>Adductor brevis (Fig. 5.23F &amp; G)</td>
<td>Body and inferior ramus of pubis</td>
<td>Pectineal line and proximal part of linea aspera of femur</td>
<td></td>
<td>Adducts thigh; to some extent flexes it</td>
</tr>
<tr>
<td>Adductor magnus (Fig. 5.23C, D, &amp; G)</td>
<td>Adductor part: inferior ramus of pubis, ramus of ischium</td>
<td>Adductor part: gluteal tuberosity, linea aspera, medial supracondylar line</td>
<td>Adductor part: obturator nerve (L2, L3, L4), branches of posterior division</td>
<td>Adducts thigh</td>
</tr>
<tr>
<td></td>
<td>Hamstrings part: ischial tuberosity</td>
<td>Hamstring part: adductor tubercle of femur</td>
<td>Hamstring part: tibial part of sciatic nerve (L4)</td>
<td>Adductor part: flexes thigh</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hamstrings part: extends thigh</td>
</tr>
<tr>
<td>Gracilis (Fig. 5.23H)</td>
<td>Body and inferior ramus of pubis</td>
<td>Superior part of medial surface of tibia.</td>
<td>Obturator nerve (L2, L3)</td>
<td>Adducts thigh; flexes leg; helps rotate leg medially</td>
</tr>
<tr>
<td>Obturator externus</td>
<td>Margins of obturator foramen and obturator membrane</td>
<td>Trochanteric fossa of femur</td>
<td>Obturator nerve (L3, L4)</td>
<td>Laterally rotates thigh; steadies head of femur in acetabulum</td>
</tr>
</tbody>
</table>

\(^a\) Collectively, the five muscles listed are the adductors of the thigh, but their actions are more complex (e.g., they act as flexors of the hip joint during flexion of the knee joint and are active during walking).

\(^b\) The spinal cord segmental innervation is indicated (e.g., “L2, L3, L4” means that the nerves supplying the adductor longus are derived from the second to fourth lumbar segments of the spinal cord). Numbers in boldface (L3) indicate the main segmental innervation. Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.
Femoral Triangle: Boundaries

- **Superior**
- **Lateral**
- **Medial**
- **Floor**
  - Iliopsoas
  - Pectineus
Femoral Triangle: Content

- Lateral → Medial
  - Nerve – artery – vein – lymphatics
- Femoral sheath
  - Continuation of
    - Transversalis fascia – anteriorly
    - Iliacus fascia - posteriorly
  - Content
    - artery – vein – lymphatics
- Femoral canal
  - Femoral ring
Adductor (Subsartorial) Canal

- **Location**
- **Boundaries**
  - Anteromedial – Sartorius
  - Posterior – longus & magnus
  - Lateral – Vastus medialis
- **Content**
Femoral Artery

- Its entrance to the thigh
  - Position
    - Midway between ASIS and pubic symphysis
  - Femoral sheath

- Relations
  - Sartorius
  - Iliopsoas & adductor muscles
  - Femoral vein and nerve

- Exit to popliteal region
  - Adductor hiatus

- Profunda femoris a. (deep a. of thigh) (thigh region)
  - Deep to the adductor longus
Femoral Nerve

• Largest branch of the lumbar plexus

• Relations
  – Psoas m.
  – Iliacus m.
  – Inguinal ligament
  – Femoral sheath
Saphenous Nerve

- **Cutaneous branch** of the femoral nerve
- **Relations**
  - In Femoral triangle
  - Within Adductor canal
  - Cross Femoral a.
  - Between Sartorius & gracilis tendons
  - Companies great saphenous v.
  - Anterior to Medial malleolus
Muscles of Gluteal Region

- Superficial layer
  - Extensors, abductors

- Deep layer
  - Lateral rotators
Muscles of Gluteal Region

- **Superficial layer**
  - Extensors, abductors
    - Gluteus maximus m.
      - Most superficial
      - Largest
    - Gluteus medius m.
    - Gluteus minimus m.
    - Tenser fascialata m.
Muscles of Gluteal Region

- **Deep layer**
  - **Lateral rotators**
    - Piriformis m.
    - Greater sciatic foramen
    - Obturator internus m.
    - Lesser sciatic foramen
    - Superior gemellus m.
    - Inferior gemellus m.
    - Quadratus femoris m.
Sciatic Foramina

- Greater sciatic foramen
- Lesser sciatic foramen
  - Associated notches
    - Greater sciatic notch
    - Lesser sciatic notch
  - Associated ligaments
    - Sacrotuberous ligament ➔ greater sciatic foramen
    - Sacrospinous ligament ➔ lesser sciatic foramen
Sciatic Foramina: Connections

- **Greater sciatic foramen**
  - Pelvis & gluteal region

- **Lesser sciatic foramen**
  - Perineum & gluteal region
Sciatic Foramina: Contents

• Greater sciatic foramen
  – Piriformis m.
  – Branches of sacral plexus
  – BVs

• Lesser sciatic foramen
  – Obturator internus m.
  – Nerves and BVs to perineum
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervationa</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gluteus maximus (Fig. 5.34A &amp; C)</td>
<td>Ilium posterior to posterior gluteal line; dorsal surface of sacrum and coccyx; sacro-tuberosous ligament</td>
<td>Most fibers and in iliotibial tract, which inserts into lateral condyle of tibia; some fibers insert on gluteal tuberosity</td>
<td>Inferior gluteal nerve (L5, S1, S2)</td>
<td>Extends thigh (especially from flexed position) and assists in its lateral rotation; steadies thigh and assists in rising from sitting position</td>
</tr>
<tr>
<td>Gluteus medius (Fig. 5.34A, C, &amp; E)</td>
<td>External surface of ilium between anterior and posterior gluteal lines</td>
<td>Lateral surface of greater trochanter of femur</td>
<td></td>
<td>Abduct and medially rotate thigh; keep pelvis level when ipsilateral limb is weight-bearing and advance opposite (unsupported) side during its swing phase</td>
</tr>
<tr>
<td>Gluteus minimus (Fig. 5.34A–D)</td>
<td>External surface of ilium between anterior and inferior gluteal lines</td>
<td>Anterior surface of greater trochanter of femur</td>
<td>Superior gluteal nerve (L5, S1)</td>
<td></td>
</tr>
<tr>
<td>Tensor fasciae latae (Fig. 5.34J)</td>
<td>Anterior superior iliac spine; anterior part of iliac crest</td>
<td>Iliotibial tract, which attaches to lateral condyle of tibia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piriformis (Fig. 5.34F &amp; G)</td>
<td>Anterior surface of sacrum; sacrotuberous ligament</td>
<td>Superior border of greater trochanter of femur</td>
<td>Branches of anterior rami of S1, S2</td>
<td></td>
</tr>
<tr>
<td>Obturator internus (Fig. 5.34H)</td>
<td>Pelvic surface of obturator membrane and surrounding bones</td>
<td>Medial surface of greater trochanter (trochanteric fossa) of femur</td>
<td>Nerve to obturator internus (L5, S1)</td>
<td>Laterally rotate extended thigh and abduct flexed thigh; steady femoral head in acetabulum</td>
</tr>
<tr>
<td>Superior and inferior gemelli (Fig. 5.34H)</td>
<td>Superior: ischial spine; inferior: ischial tuberosity</td>
<td>Medial surface of greater trochanter (trochanteric fossa) of femur</td>
<td>Superior gemellus: same nerve supply as obturator internus; inferior gemellus: same nerve supply as quadratus femoris</td>
<td></td>
</tr>
<tr>
<td>Quadratus femoris (Fig. 5.34I)</td>
<td>Lateral border of ischial tuberosity</td>
<td>Quadrate tubercle on intertrochanteric crest of femur and area inferior to it</td>
<td>Nerve to quadratus femoris (L5, S1)</td>
<td>Laterally rotates thigh; steadies femoral head in acetabulum</td>
</tr>
</tbody>
</table>

aThe spinal cord segmental innervation is indicated (e.g., “S1, S2” means that the nerves supplying the piriformis are derived from the first two sacral segments of the spinal cord). Numbers in boldface (S1) indicate the main segmental innervation. Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.

bThe gemelli muscles blend with the tendon of the obturator internus as it attaches to the greater trochanter of the femur.

cThere are six lateral rotators of the thigh: piriformis, obturator internus, superior and inferior gemelli, quadratus femoris, and obturator externus. These muscles also stabilize the hip joint.
Posterior Thigh Muscles

- **Hamstring muscles**
  - Extend hip & flex knee
  - *Tibial division of sciatic nerve*
- Semitendinosus m.
- Semimembranosus m.
- Biceps femoris m.
  - Long head
  - Short head
    - *Fibular division of the sciatic nerve*
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semitendinosus</td>
<td>Ischial tuberosity</td>
<td>Medial surface of superior part of tibia</td>
<td>Tibial division of sciatic nerve part of tibia (L5, S1, S2)</td>
<td>Extend thigh; flex leg and rotate it medially when knee is flexed; when thigh and leg are flexed, these muscles can extend trunk</td>
</tr>
<tr>
<td>Semimembranosus</td>
<td></td>
<td>Posterior part of medial condyle of tibia; reflected attachment forms oblique popliteal ligament (to lateral femoral condyle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biceps femoris</td>
<td>Long head: ischial tuberosity; Short head: linea aspera and lateral supracondylar line of femur</td>
<td>Lateral side of head of fibula; tendon is split at this site by fibular collateral ligament of knee</td>
<td>Long head: tibial division of sciatic nerve (L5, S1, S2) Short head: common fibular division of sciatic nerve (L5, S1, S2)</td>
<td>Flexes leg and rotates it laterally when knee is flexed; extends thigh (e.g., accelerating mass during first step of gait).</td>
</tr>
</tbody>
</table>

*a Collectively these three muscles are known as hamstrings.

*b The spinal cord segmental innervation is indicated (e.g., “L5, S1, S2” means that the nerves supplying the semitendinosus are derived from the fifth lumbar segment and first two sacral segments of the spinal cord). Numbers in boldface (L5, S1) indicate the main segmental innervation. Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.
Sciatic Nerve: Relations

- Exit from greater sciatic notch
- Inferior to piriformis m.
- Descend in the posterior thigh deep to gluteus maximus m. and biceps femoris m.
  - Supply the hamstring mm.
- At the superior part of the popliteal fossa divides into its terminal branches
  - Tibial n.
  - Common peroneal n.
Popliteal fossa

- Shape
- Boundaries
  - will be discussed in future lecture ....
- Content
  - Popliteal vessels
  - Small saphenous vein
  - Common peroneal & tibial nerves
  - Lymph nodes
- Popliteal fascia
Leg compartments

- Tibialis anterior (TA)
- Deep fibular nerve and anterior tibial vessels
- Extensor hallucis longus (EHL)
- Extensor digitorum longus and fibularis tertius (EDL)
- Anterior intermuscular septum of leg (AC)
- Superficial fibular nerve
- Fibularis brevis (FB)
- Fibularis longus (FL)
- Fibula (F)
- Posterior intermuscular septum of leg (PC)
- Flexor hallucis longus (FHL)
- Fibular vessels
- Soleus (SOL)
- Tibia (T)
- Interosseous membrane (IN)
- Flexor digitorum longus (FDL)
- Tibialis posterior (TP)
- Posterior tibial vessels and tibial nerve (TV)
- Transverse intermuscular septum (TIS)
- Plantaris (P)
- Gastrocnemius aponeurosis (GA)

A. Transverse section
Leg compartments

Anterior compartment (brown): deep fibular nerve territory; dorsiflexors of foot and toes

Lateral compartment (light brown): superficial fibular nerve territory; evertors of foot

Posterior compartment (green): tibial nerve; plantar flexors of foot and toes

B. Transverse section

C. Transverse section
Muscles of Anterior Compartment of Leg

- Dorsiflexors of the ankle
- Deep fibular nerve
- Superior extensor retinaculum
- Inferior extensor retinaculum
Muscles of Anterior Compartment of Leg

- Tibialis anterior
- Extensor digitorum longus
  - Extensor expansion (proximal phalanx)
    - Central band (middle phalanx)
    - Lateral bands (distal phalanx)
- Extensor hallucis longus
- Fibularis tertius
Muscles of Lateral Compartment of Leg

- Eversion of foot
- Superficial fibular nerve
  - Superior peroneal retinaculum
  - Inferior peroneal retinaculum
Muscles of Lateral Compartment of Leg

- Peroneus (fibularis) longus m.
  - Longer & superficial
- Peroneus (fibularis) brevis m.
Anterolateral Compartment of Leg Relations

- **Common Peroneal Nerve**
  - **Superficial** peroneal n.
    - Descends in the lateral compartment between peroneus longus & previs mm.
  - **Deep** peroneal n.
    - Descends in the anterior compartment deep to the extensor digitorum longus m.
    - Anterior to the interosseous membrane
    - Accompanies the anterior tibial vessels

- **Anterior Tibial Artery**
  - Traverse the interosseous membrane
  - Companies the deep peroneal n.
<table>
<thead>
<tr>
<th>Muscle*</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation*</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior compartment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibialis anterior (1)</td>
<td>Lateral condyle and superior half of lateral surface of tibia and interosseous membrane</td>
<td>Medial and inferior surfaces of medial cuneiform and base of 1st metatarsal</td>
<td>Deep fibular nerve (L4, L5)</td>
<td>Dorsiflexes ankle and inverts foot</td>
</tr>
<tr>
<td>Extensor digitorum longus (2)</td>
<td>Lateral condyle of tibia and superior three quarters of medial surface of fibula and interosseous membrane</td>
<td>Middle and distal phalanges of lateral four digits</td>
<td></td>
<td>Extends lateral four digits and dorsiflexes ankle</td>
</tr>
<tr>
<td>Extensor hallucis longus (3)</td>
<td>Middle part of anterior surface of fibula and interosseous membrane</td>
<td>Dorsal aspect of base of distal phalanx of great toe (hallux)</td>
<td></td>
<td>Extends great toe and dorsiflexes ankle</td>
</tr>
<tr>
<td>Fibularis tertius (4)</td>
<td>Inferior third of anterior surface of fibula and interosseous membrane</td>
<td>Dorsum of base of 5th metatarsal</td>
<td></td>
<td>Dorsiflexes ankle and aids in eversion of foot</td>
</tr>
<tr>
<td>Lateral compartment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibularis longus (5)</td>
<td>Head and superior two thirds of lateral surface of fibula</td>
<td>Base of 1st metatarsal and medial cuneiform</td>
<td>Superficial fibular nerve (L5, S1, S2)</td>
<td>Everts foot and weakly plantarflexes ankle</td>
</tr>
<tr>
<td>Fibularis brevis (6)</td>
<td>Inferior two thirds of lateral surface of fibula</td>
<td>Dorsal surface of tuberosity on lateral side of base of 5th metatarsal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Numbers refer to Figure 5.55A & B.

*The spinal cord segmental innervation is indicated (e.g., “L4, L5” means that the nerves supplying the tibialis anterior are derived from the fourth and fifth lumbar segments of the spinal cord). Numbers in boldface (L4) indicate the main segmental innervation. Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.
Muscles of the Posterior Compartment of Leg

- Planter flexion
- Tibial nerve

- Superficial layer (calf muscles)
  - Transverse intermuscular septum
- Deep layer
Posterior Compartment of Leg
Superficial layer (calf muscles)

• Gastrocnemius
  – Large, superficial
  – Two heads
  – Flex knee and ankle
  – Calcaneal tendon

• Soleus
  – Calcaneal tendon

• Plantaris
  – Flex knee and ankle
  – Traverse the knee articular capsule
<table>
<thead>
<tr>
<th>Muscle&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrocnemius (1)</td>
<td>Lateral head: lateral aspect of lateral condyle of femur</td>
<td></td>
<td></td>
<td>Plantarflexes ankle when knee is extended; raises heel during walking; flexes leg at knee joint</td>
</tr>
<tr>
<td></td>
<td>Medial head: popliteal surface of femur; superior to medial condyle</td>
<td>Posterior surface of calcaneus via calcaneal tendon</td>
<td>Tibial nerve (S1, S2)</td>
<td></td>
</tr>
<tr>
<td>Soleus (2)</td>
<td>Posterior aspect of head and superior quarter of posterior surface of fibula; soleal line and middle third of medial border of tibia; and tendinous arch extending between the bony attachments</td>
<td></td>
<td></td>
<td>Plantarflexes ankle independent of position of knee; steadies leg on foot</td>
</tr>
<tr>
<td>Plantaris (3)</td>
<td>Inferior end of lateral supracondylar line of femur; oblique popliteal ligament</td>
<td></td>
<td></td>
<td>Weakly assists gastrocnemius in plantarflexing ankle</td>
</tr>
</tbody>
</table>

<sup>a</sup>Numbers refer to Figure 5.60A.

<sup>b</sup>The spinal cord segmental innervation is indicated (e.g., “S1, S2” means that the nerves supplying these muscles are derived from the first and second sacral segments of the spinal cord). Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.
Posterior Compartment of Leg

Deep layer

- Transverse intermuscular septum
- Flexor retinaculum
- Popliteus
- Flexor hallucis longus
- Flexor digitorum longus
- Tibialis posterior
  - inversion
Deep Layer
Muscular Relation

At Ankle

At Leg

- Tibialis Posterior
- Flexor digitorum longus
- Flexor hallucis longus
- Calcaneal tendon

- Popliteus
- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
<table>
<thead>
<tr>
<th>Muscle</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popliteus</td>
<td>Lateral surface of lateral condyle of femur and lateral meniscus</td>
<td>Posterior surface of tibia, superior to soleal line</td>
<td>Tibial nerve (L4, L5, S1)</td>
<td>Weakly flexes knee and unlocks it by rotating femur 5° on fixed tibia; medially rotates tibia of unplanted limb</td>
</tr>
<tr>
<td>Flexor hallucis longus (4)</td>
<td>Inferior two thirds of posterior surface of fibula; inferior part of interosseous membrane</td>
<td>Base of distal phalanx of great toe (hallux)</td>
<td>Tibial nerve (S2, S3)</td>
<td>Flexes great toe at all joints; weakly plantarflexes ankle; supports medial longitudinal arch of foot</td>
</tr>
<tr>
<td>Flexor digitorum longus (5)</td>
<td>Medial part of posterior surface of tibia inferior to soleal line; by a broad tendon to fibula</td>
<td>Bases of distal phalanges of lateral four digits</td>
<td></td>
<td>Flexes lateral four digits; plantarflexes ankle; supports longitudinal arches of foot</td>
</tr>
<tr>
<td>Tibialis posterior (6)</td>
<td>Interosseous membrane; posterior surface of tibia inferior to soleal line; posterior surface of fibula</td>
<td>Tuberosity of navicular, cuneiform, cuboid, and sustentaculum tali of calcaneus; bases of 2nd, 3rd, and 4th metatarsals</td>
<td>Tibial nerve (L4, L5)</td>
<td>Plantarflexes ankle; inverts foot</td>
</tr>
</tbody>
</table>

*Numbers refer to Figure 5.60A.

The spinal cord segmental innervation is indicated (e.g., “S2, S3” means that the nerves supplying the flexor hallucis longus are derived from the second and third sacral segments of the spinal cord). Damage to one or more of the listed spinal cord segments or to the motor nerve roots arising from them results in paralysis of the muscles concerned.
Posterior Compartment of Leg: Relations

- Posterior Tibial Artery
- Tibial Nerve
  - Accompany each other
  - Deep to gastrocnemius and soleus mm.
  - Deep to flexor retinaculum
    - Superficial
Surface Anatomy of Pelvic Girdle

- Iliac crest
- ASIS

(A) Right lateral view

(B) Anterior oblique view
Surface Anatomy of Pelvis & Femur

- Pubic symphysis
- Pubic tubercle
  - 2cm from pubic symphysis
- Ischial tuberosity
- Greater trochanter
- Femoral condyles
  - Epicondyles
- Adductor tubercle
- Patella
Surface Anatomy of Tibia & Fibula

- Tibial tuberosity
- Anteromedial surface of tibia
- Head of fibula
- Medial malleolus
- Lateral malleolus
Surface Anatomy of Femoral Triangle
Surface Anatomy of Anterior Thigh

- Femoral triangle
  - Femoral artery
  - Femoral vein
  - Femoral nerve

- Patellar ligament
Surface Anatomy of Buttock

- Highest points of iliac crests
  - L4-L5 (for lumbar puncture)
- Intergluteal cleft
  - Sacrum & coccyx
- Gluteal fold
- Gluteus maximus
  - Inferior edge – line between coccyx and ischial tuberosity
  - Superior edge – line between PSIS and greater trochanter
    - Gluteus medius
Surface Anatomy of Buttock

• Nelaton line
  – Between ASIS and ischial tuberosity
  – Pass by greater trochanter
    • Greater trochanter above the line in:
      – Hip dislocation
      – Femur neck fracture
Intragluteal Injection

- Vital structures
- Safe area
  - Quadrants
  - Line between PSIS & greater trochanter
Surface Anatomy Sciatic Nerve

- Location of sciatic nerve
  - Line between greater trochanter and ischial tuberosity
  - Down middle of posterior thigh
- Tibial nerve
  - Middle popliteal fossa
- Common fibular nerve
  - Tendon of biceps femoris muscle
Surface Anatomy of Posterior Thigh
Catheterization

- Femoral artery catheterization
  - Midway between the ASIS and the symphysis pubis
  - Just below the inguinal ligament
- Femoral vein catheterization
  - Just medial to the felt femoral artery
  - High incidence of thrombosis
Great Saphenous Vein Cutdown

- Great saphenous vein is used in coronary bypass surgery
- Ankle vein cutdown
  - Anterior and superior to the medial malleolus
  - Phlebitis could happen
- Groin vein cutdown
  - 4 cm inferior and lateral to the pubic tubercle
Cutaneous Innervation of the Lower Limb

- **Posterior rami**
- **12th thoracic**
- **Lumber plexus**
- **Femoral**
- **Sacral plexus**
- **Tibial**
- **Common peroneal**