MUSCULOSKELETAL SYSTEM
ANATOMY
MUSCLES OF LEG
DONE BY :- ALI HIARY
Muscles of Leg
Lecture Objectives

• List the muscles of the leg.
• Describe the attachments of the leg muscles and their nerve supply.
• Describe the popliteal fossa.
• List the content of the popliteal fossa.
• Understand the clinical importance of the popliteal fossa.
Popliteal fossa
(area just posterior to the knee, its importance: all the vital structures escape toward the safe areas of the joint same as axilla and cubital fossa.)

• **Shape** (almost diamond in shape)

• **Boundaries**
  (superiorly: muscles of the posterior compartment of the thigh. Sup.medially: Semimembranosus and Semitendinosus. Sup.laterally: Biceps femoris. Inferiorly: muscles of the posterior compartment of the leg, the most superficial muscle: Gastrocnemius has 2 heads, one laterally and one medially.
  Floor of popliteal fossa: the capsule of knee joint
  Roof: popliteal fascia which is a part of deep fascia.)
• Content (The neurovascular bundle)
  • Popliteal vessels (popliteal artery + vein that come from femoral artery + vein)
  • Small saphenous vein (superficial to popliteal fascia and must pierce it to enter into fossa and drains into popliteal vein)
  • Common peroneal & tibial nerves (these are the terminal branches of sciatic nerve which ends at the upper angle of popliteal fossa)
    *Relation:* the deepest one is artery, more superficial is vein, most superficial is tibial nerve: > cross in the middle of popliteal fossa while common peroneal runs along with tendon of biceps femoris.
  • Lymph nodes (popliteal group from 2 to 4 lymph nodes)

• Popliteal fascia
Leg Compartment

*Three compartments: Anterior, lateral and posterior compartments.
*Between anterior and lateral ones there is the anterior intermuscular septum.
*Between lateral and posterior ones there is the posterior intermuscular septum.
*Between anterior and posterior there is the interosseous membrane between tibia and fibula.
*The posterior compartment is divided into deep and superficial by Transverse intermuscular septum.
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
Muscles of Anterior Compartment of Leg

*Aneriormedial surface of the tibia is considered as superficial structure so there's no structure. All muscles of the anterior compartment of leg are located laterally to the palpable anterior border of tibia.

- **Dorsiflexors (same as extensor) of the ankle** (because they cross the ankle joint anteriorly)

- **Deep fibular nerve** (common personal nerve wraps on the neck of fibula and enters the anteriolateral compartment by piercing the fibularis longus and divides into 2 branches: superficial and deep) … so if there is a cut in the deep fibular nerves all the anterior muscles will be paralyzed.

*Tendons of these muscles are held in place by retinaculi (thickening of deep fascia anteriorly).

- **Superior extensor retinaculum**

- **Inferior extensor retinaculum (Y shape)**
Muscles of Anterior Compartment of Leg

*3 major muscles:-
Tibialis anterior and Extensor digitorum longus :- belly of these muscle located superiorly on leg so origin of them is superior half or 2/3 of tibia and fibula.

• **Tibialis anterior**(the most medial muscle)
  Origin:-(lateral side of tibia and interosseous membrane)
  Insertion:-(base of first metatarsal)

• **Extensor digitorum longus**(the most lateral muscle)
  Origin: (medial side of fibula and interosseous membrane )
  Insertion:-
  • Extensor expansion (proximal phalanx) gives :-
    • Central band (middle phalanx)
    • 2 Lateral bands (distal phalanx)

So different expansion for extension of metatarsal,phalangeal and interphalangeal joint and help in ankle extension.

**Extensor hallucis longus**(inferior deep continuation of Extensor digitorum longus goes to big toe)
  Origin:-(lower 1/3 of fibula and interosseous membrane)
Insertion:- (dital phalanx of big toe)

- **Fibularis tertius** (small muscle same as extensor hallucis longus and probably absent in some people)
  Attachmet on base of 5\(^{th}\) metatarsal bone or cuboid bone.

P.S:-
* Extensor from fibula and tibialis from tibia, when we get a cross section of ankle joint within retinacul we will see all the tendons are far away from each others and all superficial.
* When one muscle has tendons for more than one phalanx toe, the single movement of one toe is difficult so they all move together same as Extensor digitorum longus but the big toe has its muscle so move separately by extensor hallucis longus.
Muscles of Lateral Compartment of Leg

- Eversion of foot *(because of their location on lateral)*
- Superficial fibular nerve *(innervation)* *(Runs between fibularis longus and brevis)*
- Superior peroneal retinaculum
- Inferior peroneal retinaculum *(Both retinaculi help in fixation of tendons of fibularis longus and brevis)*
Muscles of Lateral Compartment of Leg

- Peroneus (fibularis) longus m. *(longer and superficial)*
  - Origin: superior part of fibula
  - Insertion: more deep toward medial side on base first metatarsal of sole.
  - So longer tract in insertion gives it more importance.

- Peroneus (fibularis) brevis m. *(deep)*
  - Origin: lower part of fibula
  - Insertion: base of 5th metatarsal
Anterolateral Compartment of Leg: Relations

• **Common Peroneal Nerve**
  - Superficial peroneal n.
    - Descends in the lateral compartment between peroneus longus & previs mm. *(leave them and head toward anterior leg and dorsum of foot to give sensory innervations)*
  - 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** *(branch from popliteal art.)*
  - Traverse the interosseous membrane to become anteriorly.
  - Companies the deep peroneal n.

All become superficial at retinaculi and run together
<table>
<thead>
<tr>
<th>Muscle*</th>
<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervationb</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anterior compartment</strong></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 inferor surfaces of medial cuneiform and base of 1st metatarsal</td>
<td>Dorsiflexes ankle and inverts foot</td>
<td></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>Deep fibular nerve (L4, L5)</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><strong>Lateral compartment</strong></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.*

bThe 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** *(Because they cross the ankle joint posteriorly)*
- **Tibial nerve** *(all the posterior compartment +dorum of foot by terminal branches)*

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

*Three muscles:-

- **Calcaneal tendon** (the 3 muscles meet together and make one tendon)
- **Gastrocnemius** (The most superficial)
  - Origin: (2 heads => medial and lateral aspects around condyles of femur)
  - Insertion: (calcaneal tendon)
    - Large, superficial
    - Two heads
    - Flex knee and ankle
- **Soleus** (also large muscle, wider than gastrocnemius)
  - Origin: (upper 1/3 of tibia and fibula)
  - Insertion: (calcaneal tendon)
• **Plantaris (small muscle)**
  Origin: - (lateral aspect from inferior part of lateral epicondyle of femur just above origin of gastrocnemius)
  Insertion: - (calcaneal tendon)

  *Functions of calf muscles:*
  • Flex knee and ankle (plantar flexion)
  • Traverse the knee articular capsule

P.S: - No vital structures between calf muscles but only small saphenous vein which is superficial to gastocnemius.
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<thead>
<tr>
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<th>Proximal Attachment</th>
<th>Distal Attachment</th>
<th>Innervation⁶</th>
<th>Main Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrocnemius</td>
<td>Lateral head: lateral aspect of lateral condyle of femur; 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>Plantarflexes ankle when knee is extended; raises heel during walking; flexes leg at knee joint</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>Posterior-surface of calcaneus via: calcaneal tendon</td>
<td>Tibial-nerve (S1, S2)</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>Posterior-surface of calcaneus via: calcaneal tendon</td>
<td>Tibial-nerve (S1, S2)</td>
<td>Weakly assists gastrocnemius in plantarflexing ankle</td>
</tr>
</tbody>
</table>

⁶Numbers refer to Figure 5.60A.

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

*Deeper to Transverse intermuscular septum and calf muscles + they gonna traverse ankle joint medially just posterior to medial malleolus

➢ Transverse intermuscular septum
➢ Flexor retinaculum (*keep the tendons against the ankle joint*)
Posterior Compartment of Leg:
Deep layer

- **Popliteus** (small short muscle, traverse the knee capsule posteriorly and has an attachment on lateral meniscus)
  *Origin:* lateral condyle of femur
  *Insertion:* posterior superior medial part of tibia
  *Function:* steadying of knee joint while movement of knee joint mainly during the extension.

- **Flexor hallucis longus**
  *Origin:* middle part of fibula
  *Insertion:* base of distal phalanx of big toe
  *Function:* flexion of phalanges

- **Flexor digitorum longus**
  *Origin:* medial part of tibia
  *Insertion:* distal phalanx of rest of toes
  *Function:* flexion of phalanges

- **Tibialis posterior** (same as fibularis longus going deep)
  *Origin:* lateral upper posterior part of tibia and interosseous membrane
  *Insertion:* tarsus and bases of metatarsals, crosses the subtalus and transverse tarsal joints.
  *Function:* Inversion of foot

*Order from medial to lateral:*
- Flexor digitorum longus - Tibialis posterior - Flexor hallucis longus.
**Muscular Relations:**

- **Flexor hallucis longus** is the most lateral one but it inserts most medially in the sole so it crosses over superficially to tibialis posterior and deeply to flexor digitorum longus.
- **Tibialis posterior** crosses over deeply to flexor digitorum longus which goes up to the 5th toe but tibialis posterior ends earlier at tarsus.
- **Flexor digitorum longus** is the most medial one, its tendon crosses both muscles in order to insertion which is the most lateral one.
- **Calcaneal tendon** is the most lateral and posterior to the tendons of 3 muscles so the tendons are surrounded by medial malleolus anteriorly and calcaneal tendon posteriorly and you can palpate it.
Deep Layer: Muscular Relation

At Ankle

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

At Leg

- Popliteus
- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
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<th>Innervation(^b)</th>
<th>Main Action</th>
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</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^\text{th}) 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>
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\(^a\) Numbers refer to Figure 5.60A.

\(^b\) 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 to the medial malleolus there are 2 structures crossing over toward the sole of foot (plantar side) along with tendons of deep posterior muscles:*

- **Posterior Tibial Artery** *(terminal branches are media and lateral plantar arteries)*
- **Tibial Nerve** *(terminal branches are medial and lateral nerves)*

*At the posterior compartment itself they are superficial to the all deep muscles because they run within the transverse intermuscular septum so they are between superficial layer and deep layer but when they reach ankle ::> the superficial layer gives he calceneal tendon which is the most posterior and tendon of deep layer are separated from each other so they are superficial structure and you can feel the impulsiation of posterior tibial artery and you can locate the tibial nerve location .

*At the beginning of crossing over he flexor retinaculum (before the flexor retinaculum from posterior to anterior order) ::> tendon of flexor hallucis longus – tibial nerve - posterior tibial artery-flexor digitorum longus ::>because they are superficial so when you palpate the posterior tibial artery you will know that posterior to it is the tibial nerve*

- Accompany each other
- Deep to gastrocnemius and soleus mm.
- Deep to flexor retinaculum
  - Superficial