RESOURCES

Human Anatomy & Physiology

Clinical Anatomy

Gray’s Anatomy
Introduction

- The posterior leg is the largest of the three compartments.

- The posterior compartment of the leg contains seven muscles, organized into two layers: superficial and deep.

- The two layers are separated by a band of fascia.

- Collectively, the muscles in this area plantarflex and invert the foot.

- They are innervated by the tibial nerve, a terminal branch of the sciatic nerve.
The transverse intermuscular septum of the leg is a septum divides the muscles of the posterior compartment into superficial and deep groups.

The contents of the posterior compartment of the leg includes:

- Superficial group of muscles
- Deep group of muscles
- Posterior tibial artery
- Tibial nerve
Superficial Group of Muscles

- The superficial muscles form the characteristic calf shape of the posterior leg.

- They all insert into the calcaneus of the foot (the heel bone), via the calcaneal tendon.

- The calcaneal reflex tests spinal roots S1-S2.

- To minimize friction during movement, there are two bursae (fluid filled sacs) associated with the calcaneal tendon:
  - Subcutaneous calcaneal bursa lies between the skin and the calcaneal tendon.
  - Deep bursa of the calcaneal tendon lies between the tendon and the calcaneus.

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Gastrocnemius

- The gastrocnemius is the most superficial of all the muscles in the posterior leg.

- It has two heads: medial and lateral, which converge to form a single muscle belly.

- **Attachments:** The lateral head originates from the lateral femoral condyle, and medial head from the medial femoral condyle. The fibres converge and form a single muscle belly. In the lower part of the leg, the muscle belly combines with the soleus to form the calcaneal tendon, with inserts onto the calcaneus (the heel bone).

- **Actions:** It plantarflexes at the ankle joint, and because it crosses the knee, it is a flexor there.

- **Innervation:** Tibial nerve.
Plantaris

- The plantaris is a small muscle with a long tendon, which can be mistaken for a nerve as it descends the leg. It is absent in 10% of people.

- **Attachments:** Originates from the lateral supracondylar line of the femur. The muscle descends medially, condensing into a tendon that runs down the leg, between the gastrocnemius and soleus. The tendon blends with the calcaneal tendon.

- **Actions:** It plantarflexes at the ankle joint, and because it crosses the knee, it is a flexor there. It is not a vital muscle for these movements.

- **Innervation:** Tibial nerve.
Soleus

- The soleus is located deep to the gastrocnemius. It is large and flat.

- **Attachments:** Originates from the soleal line of the tibia and proximal fibular area. The muscle narrows in the lower part of the leg and joins the calcaneal tendon.

- **Actions:** Plantarflexes the foot at the ankle joint.

- **Innervation:** Tibial Nerve.
Deep Group of Muscles

- There are four deep muscles at the posterior compartment of the leg.
- They are all innervated by the tibial nerve and supplied by the posterior tibial artery with little contribution of the fibular artery.
**Popliteus**

- The popliteus is located superiorly in the leg. It lies behind the knee joint, forming the base of the popliteal fossa.

- There is a bursa (fluid filled sac) that lies between the popliteal tendon and the posterior surface of the knee joint. It is called the popliteus bursa.

- **Attachments**: Originates from the lateral condyle of the femur and the posterior horn of the lateral meniscus. From there, it runs inferomedially towards the tibia and inserts above the origin of the soleus muscle.

- **Actions**: Laterally rotates the femur on the tibia – ‘unlocking’ the knee joint so that flexion can occur.

- **Innervation**: Tibial nerve.
Tibialis Posterior

- The tibialis posterior is the deepest out of the four muscles. It lies between the flexor digitorum longus and the flexor hallucis longus.

- **Attachments**: Originates from the interosseous membrane between the tibia and fibula, and posterior surfaces of the two bones. The tendon enters the foot posterior to the medial malleolus and attaches to the plantar surfaces of the medial tarsal bones.

- **Actions**: Inverts and plantarflexes the foot.

- **Innervation**: Tibial nerve.
Flexor Digitorum Longus

- The FDL is (surprisingly) a smaller muscle than the flexor hallucis longus. It is located medially in the posterior leg.

- **Attachments**: Originates from the medial surface of the tibia, attaches to the plantar surfaces of the lateral four digits.

- **Actions**: Flexes the lateral four toes.

- **Innervation**: Tibial nerve.
Flexor Hallucis Longus

- The flexor hallucis longus muscle is found on the lateral side of leg. This is slightly counter-intuitive, as it is opposite the great toe, which it acts on.

- **Attachments**: Originates from the posterior surface of the fibula, attaches to the plantar surface of the phalanx of the great toe.

- **Actions**: Flexes the great toe.

- **Innervation**: Tibial nerve.
Posterior Tibial Artery

- The posterior tibial artery is a branch of the popliteal artery that supplies the posterior compartment of the leg and the sole of the foot.

- It is located in the posterior compartment of the leg, coursing from the inferior margin of the popliteus muscle up to the medial malleolus.

- Along its course, the posterior tibial artery gives off eight branches that supply the structures of the posterior leg compartment.

- It terminates below the medial malleolus by giving off two terminal branches; medial plantar artery and lateral plantar artery.
Tibial Nerve

- It is a branch of the sciatic nerve, and it arises at the apex of the popliteal fossa.

- It travels through the popliteal fossa, giving off branches to muscles in the superficial posterior compartment of the leg.

- The tibial nerve also gives rise to branches that contribute towards the sural nerve, which innervates the posterolateral aspect of the leg.

- The tibial nerve continues its course down the leg, posterior to the tibia to supplies the deep muscles of the posterior leg.

- At the foot, the nerve passes posteriorly and inferiorly to the medial malleolus, through a structure known as the tarsal tunnel.
**Flexor Retinaculum**

- Extends from back of medial malleolus of tibia to medial side of calcaneum.

- The followings are the structures passing posterior to medial malleolus, deep to flexor retinaculum.
  - Tibialis posterior tendon
  - Flexor digitorum longus tendon
  - Posterior tibial artery with venae Comitantes
  - Tibial nerve
  - Flexor hallucis longus tendon

- All the tendons are surrounded by a synovial sheath.
Sole of the Foot

- The skin of the sole of the foot is thick and hairless.
- It shows a few flexure creases at the sites of skin movement.
- Sweat glands are present in large numbers.
Deep Fascia

- The plantar aponeurosis is a triangular thickening of the deep fascia that protects the underlying nerves, blood vessels, and muscles.
- Its apex is attached to the medial and lateral tubercles of the calcaneum.
- The base of the aponeurosis divides into five slips that pass into the toes.
Muscles of the Sole of the Foot

- The muscles of the sole are conveniently described in four layers from superficial to deep.

- **First Layer**
  - Abductor hallucis
  - Flexor digitorum brevis
  - Abductor digiti minimi

- **Second Layer**
  - Quadratus plantae
  - Lumbricals
  - Flexor digitorum longus tendon
  - Flexor hallucis longus tendon

- **Third Layer**
  - Flexor hallucis brevis
  - Adductor hallucis
  - Flexor digiti minimi brevis

- **Fourth Layer**
  - Interossei (3 plantar + 4 dorsal)
  - Peroneus longus tendon,
  - Tibialis posterior tendon

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Functions of the Muscles

- Unlike the small muscles of the hand, the sole muscles have few delicate functions and are chiefly concerned with supporting the arches of the foot.
- They control movements of individual toes; this function is rarely used in most people.
Arches of Foot

- **Medial longitudinal arch**
  - It is formed of calcaneum, talus, navicular, 3 cuneiform bones, and 3 medial metatarsal bones.

- **Lateral longitudinal arch**
  - It is formed of calcaneum, cuboid & lateral 4th & 5th metatarsal bones

- **Transverse arch**
  - It lies at the level of tarso-metatarsal joints, formed of bases of metatarsal bones, cuboid & 3 cuneiform bones.
Functions of the Arches

- Weight bearing
- Support walking & running
- Provide potential space for neurovascular bundle of the sole
- Act as shock absorber
- In young child, the foot appears to be flat because of presence of a large amount of subcutaneous fat on the sole of foot
Fibrous Flexor Sheath

- The inferior surface of each toe, from the head of the metatarsal bone to the base of the distal phalanx, is provided with a strong fibrous sheath, which is attached to the sides of the phalanges.

- The fibrous sheath, together with the inferior surfaces of the phalanges and the interphalangeal joints, forms a blind tunnel in which lie the flexor tendons of the toes.
Synovial Flexor Sheath

- The tendons of the flexor hallucis longus and the flexor digitorum longus are surrounded by synovial sheaths
Rupture of the Calcaneal Tendon

- It refers to a partial or complete tear of the tendon.
- It is more likely to occur in people with a history of calcaneal tendinitis (chronic inflammation of the tendon).
- The injury is usually sustained during forceful plantarflexion of the foot.
- The patient will be unable to plantarflex the foot against resistance, and the affected foot will be permanently dorsiflexed.
- The soleus and gastrocnemius can contract to form a lump in the calf region.
- Treatment of a ruptured calcaneal tendon is usually non-surgical, except in those with active lifestyles.
Medial Plantar Nerve Entrapment

- The medial plantar nerve can become compressed and irritated as it passes deep to the abductor hallucis muscle.
- This can cause aching, numbness and paraesthesia on the medial side of the sole of the foot.
- The muscle can become compressed during repetitive eversion of the foot, which may occur in some sports such as gymnastics.
QUESTIONS?

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