Dr. Ali Mohsin

THE POSTERIOR COMPARTMENT OF THE LEG

Deep to fascia lata, the leg is divided into 3 compartments by the leg bones, the interosseous membrane & intermuscular fasciae.

Surface Anatomy:

The posterior compartment of the leg extends from the popliteal fossa superiorly, to the insertion of the calcaneal tendon inferiorly. Palpable bony prominences include the head of the fibula, the medial & lateral malleoli, & the calcaneus. The calcaneal tendon (Achilles tendon) is the most prominent palpable structure in the lower back of the leg. The leg is widest at the calf region due to the presence of the gastrocnemius muscle. The posterior tibial artery can be palpated posterior to the medial malleolus.

Cutaneous Innervation:

The skin of the upper calf region is supplied by the terminal branches of the posterior cutaneous nerve of thigh. Below this area, the posteromedial side of the leg is supplied by branches of the saphenous nerve, while the posterolateral side is supplied by 2 nerves: the medial sural cutaneous nerve (from the tibial nerve) inferiorly, & the lateral sural cutaneous nerve (from the common peroneal nerve) superiorly. This nerve has a communicating branch connecting it with the sural nerve.

Bones & Fasciae:

The posterior aspects of the tibia & fibula give attachment to the muscles of the posterior compartment of the leg & to the fascial layers surrounding the region. The upper part of the posterior surface of tibia has the oblique "soleal line" that gives origin to the soleus muscle. The interosseous membrane is a strong layer of connective tissue closing the gap between the 2 bones, & separating the posterior leg compartment from the anterior compartment. The membrane has 2 apertures near its upper & lower ends. The posterior compartment is separated from the lateral compartment of the leg by a narrow intermuscular fascia extending from the fascia lata to the fibula. Fascia lata covers the whole posterior compartment, it is perforated by the cutaneous nerves of the region (mentioned above), cutaneous lymphatics, & the small saphenous vein.

Muscles of the Posterior Compartment (Review the table in the figures appendix to know the origin, insertion, nerve supply & action of each muscle) **:**

Superficial group: gastrocnemius, soleus, & plantaris muscles.

Deep group: popliteus, flexor digitorum longus, tibialis posterior, & flexor hallucis longus.

The gastrocnemius muscle consists of medial & lateral heads, with the plantaris muscle running medial to the lateral head. They are attached to a common large tendon (the calcaneal tendon) at the middle of the leg, through which they are inserted to the calcaneus. The soleus muscle is a broad muscle that lies deep to gastrocnemius & the calcaneal tendon. The 3 muscles are inserted to the calcaneus via the calcaneal tendon. Between the tibial & fibular attachments of soleus muscle, there is a tendinous arch that bridges the origins & makes an aperture, through which the tibial nerve & popliteal vessels pass deep to the soleus, where the vessels become the posterior tibial vessels.

The triangular popliteus muscle is attached to the posterior surface of the tibia above the soleal line, while the other 3 muscles of the deep group are attached below the line. Note that the flexor hallucis longus is situated laterally while the flexor digitorum longus is situated medially, opposite to the position of the big toe & other toes. This means that the tendons of these 2 muscles should cross each other, & this cross occurs in the proximal foot. All of those muscles are supplied by the tibial nerve.

Blood Vessels & Nerves:

The popliteal artery is the main arterial supply of the leg & foot. It enters the posterior compartment of the leg between the gastrocnemius & the popliteus muscles, giving off the medial & lateral sural arteries supplying gastrocnemius. At the lower border of the popliteus muscle it divides into a small anterior tibial artery & a large posterior tibial artery. The 2 arteries pass deep to soleus muscle via the tendinous arch of the muscle. Just distal to the arch, the anterior tibial artery passes anteriorly through the upper aperture in the interosseous membrane to the anterior compartment of the leg, supplying it & the dorsum of the foot. The posterior tibial artery, running as the continuation of the popliteal artery, accompanied by its 2 veins & the tibial nerve, form the neurovascular bundle of the posterior compartment of the leg. The bundle passes vertically between the superficial & the deep groups of muscles, to enter the foot deep to the flexor retinaculum. The posterior tibial artery gives the following branches:

1. Circumflex fibular artery: It perforates the soleus muscle, encircles the lateral side of the neck of the fibula to pass anteriorly & participate in the arterial anastomosis around the knee joint.
2. Peroneal (fibular) artery: It is the largest branch of the posterior tibial artery. It arises 2.5 cm distal to the inferior border of popliteus. It passes inferolaterally to descend parallel to the posterior tibial artery, running between flexor hallucis longus & tibialis posterior muscles, close to the fibula. The peroneal artery supplies the surrounding muscles, fibula, & gives several branches that perforate the intermuscular septum separating the posterior & lateral leg compartments, to supply the lateral compartment of the leg. At the lower leg, the peroneal artery gives a perforating branch that passes through the lower aperture of the interosseous membrane & joins a similar branch from the anterior tibial artery. The peroneal artery ends by passing posterior to the lateral malleolus to participate in the anastomosis around the ankle joint.
3. Muscular branches: To the muscles of posterior compartment.
4. Nutrient artery to tibia: It is the largest nutrient artery in the body. It enters the nutrient foramen of tibia below the soleal line.
5. Communicating branch: It joins with the similar branch of peroneal artery about 5 cm above the ankle.
6. Medial malleolar branch: It passes toward the medial malleolus.
7. Calcaneal branch: It pierces the flexor retinaculum and supplies soft tissues of the heel.
8. Terminal branches: These are medial and lateral plantar arteries of the sole.

The veins of the posterior leg generally follow the arteries, usually as 2 veins accompanying each artery.

The Tibial Nerve:

It is the main nerve present in the posterior compartment of the leg. The nerve lies superficial to the popliteal artery & vein in the popliteal fossa. When the neurovascular bundle enters deep to soleus muscle, the tibial nerve becomes lateral to the artery, then posterolateral to it at the flexor retinaculum. Branches of the tibial nerve are:

1. Motor branches to the superficial group of posterior compartment muscles (& soleus): these arise in the popliteal fossa & descend to enter the supplied muscles.
2. Motor branches to the deep group of posterior compartment muscles: these arise deep to soleus muscle & descend to enter the supplied muscles.
3. The sural nerve: cutaneous branch that arises in the popliteal fossa, runs in the midline over the gastrocnemius muscle, then penetrates the fascia lata at the middle of the leg to supply the skin over its lower posterolateral side, lateral side of the ankle, foot, & little toe.

4. Medial calcaneal nerve: originates from the tibial nerve low in the leg and descends onto the medial side of the heel. The medial calcaneal nerve innervates skin on the medial surface and sole of the heel

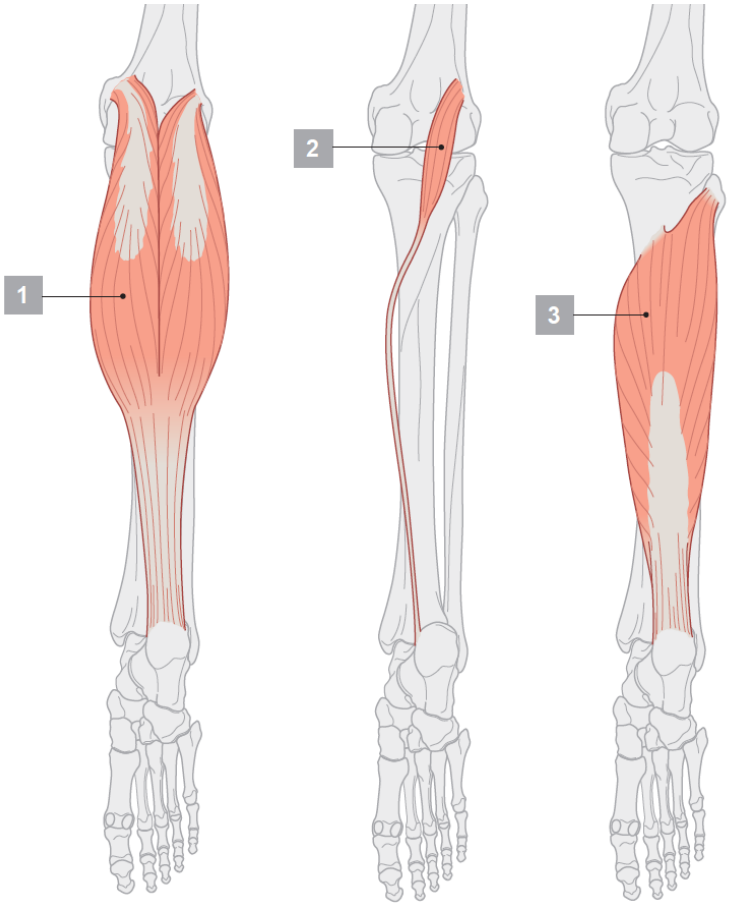
Flexor Retinaculum & Structures Deep to It:

The flexor retinaculum is a strong band of connective tissue lying medial to the ankle joint. It extends posteroinferiorly from the tip & posterior border of the medial malleolus to the medial side of the calcaneal tuberosity. Its upper border defines the boundary between the posterior compartment of the leg & the sole of the foot. The retinaculum functions to hold in position the structures passing deep to it. These structures are (from anterior to posterior): tibialis posterior tendon, flexor digitorum longus tendon, posterior tibial artery (where its pulsation can be felt), tibial nerve, & flexor hallucis longus tendon.

Superficial group of muscles in the posterior compartment of leg

(spinal segments in bold are the major segments innervating the muscle)

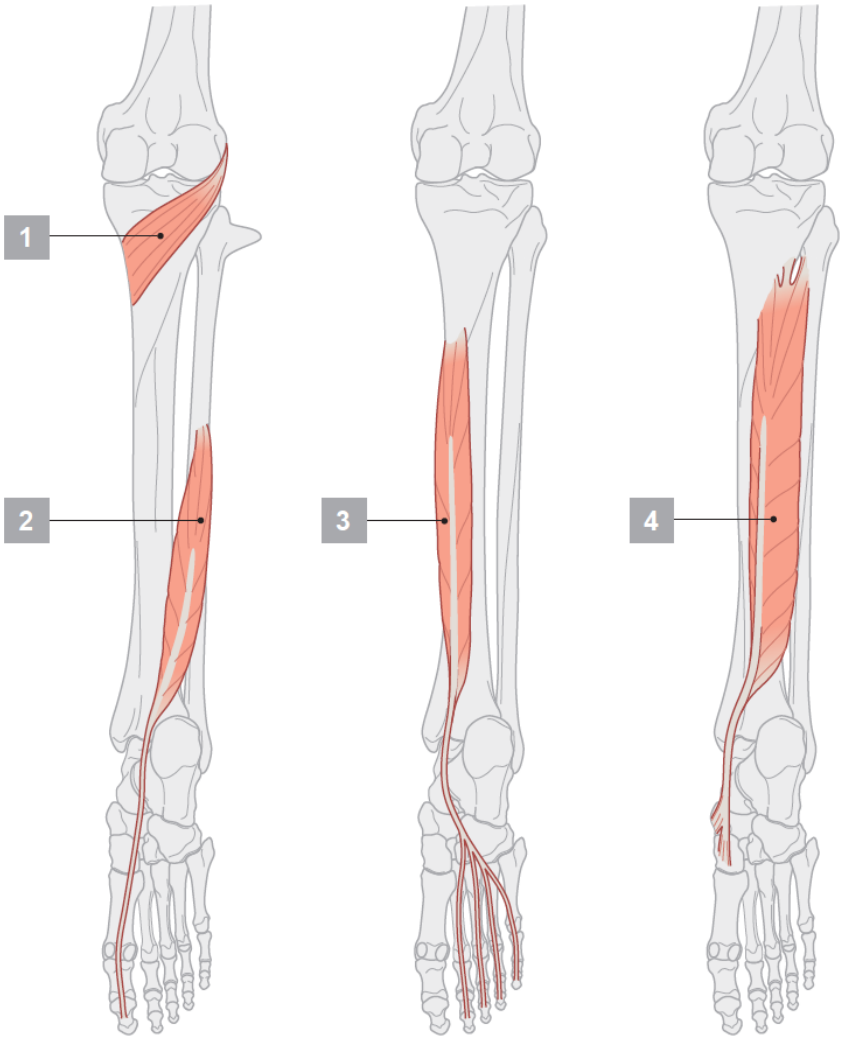
Muscle		Origin	Insertion	Innervation	Function
Gastrocnemius	1	Medial head—posterior surface of distal femur just superior to medial condyle; lateral head—upper posterolateral surface of lateral femoral condyle	Via calcaneal tendon, to posterior surface of calcaneus	Tibial nerve [**S1, S2**]	Plantarflexes foot and flexes knee
Plantaris	2	Inferior part of lateral supracondylar line of femur and oblique popliteal ligament of knee	Via calcaneal tendon, to posterior surface of calcaneus	Tibial nerve [**S1, S2**]	Plantarflexes foot and flexes knee
Soleus	3	Soleal line and medial border of tibia; posterior aspect of fibular head and adjacent surfaces of neck and proximal shaft; tendinous arch between tibial and fibular attachments	Via calcaneal tendon, to posterior surface of calcaneus	Tibial nerve [**S1, S2**]	Plantarflexes the foot



Deep group of muscles in the posterior compartment of leg

(spinal segments in bold are the major segments innervating the muscle)

Muscle		Origin	Insertion	Innervation	Function
Popliteus	1	Lateral femoral condyle	Posterior surface of proximal tibia	Tibial nerve [L4 to S1]	Stabilizes knee joint (resists lateral rotation of tibia on femur) Unlocks knee joint (laterally rotates femur on fixed tibia)
Flexor hallucis longus	2	Posterior surface of fibula and adjacent interosseous membrane	Plantar surface of distal phalanx of great toe	Tibial nerve [**S2**, S3]	Flexes great toe
Flexor digitorum longus	3	Medial side of posterior surface of the tibia	Plantar surfaces of bases of distal phalanges of the lateral four toes	Tibial nerve [**S2**, S3]	Flexes lateral four toes
Tibialis posterior	4	Posterior surfaces of interosseous membrane and adjacent regions of tibia and fibula	Mainly to tuberosity of navicular and adjacent region of medial cuneiform	Tibial nerve [L4, L5]	Inversion and plantarflexion of foot; support of medial arch of foot during walking



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