Unit 35: Leg and Dorsum of Foot

Dissection Instructions:

Remove the skin from the complete lower leg. Make incisions approximately two inches apart starting at the medial aspect of the knee. Go completely around the leg from anterior, lateral and posterior. Continue these incisions onto the dorsum of the foot. DO NOT remove the skin from the plantar aspect of the foot at this time. Carefully remove each one of the stripes.

On the dorsum of the foot locate the dorsal venous plexus and follow it medially and superiorly (Plates 526; 5.5, 5.6, 5.7A). It becomes the greater saphenous vein and passes anterior to the medial malleolus. It ascends the leg to reach a position a hand's breadth from the medial border of the patella. From there it goes to the saphenous opening in the fascia lata below the medial end of the inguinal ligament (Plates 526: 5.5, 5.7). During its course, it frequently divides and rejoins, and receives many tributaries. Now follow the dorsal venous arch laterally. It becomes the lesser saphenous vein and passes posterior to the lateral malleolus, where it ascends to the mid-line of the calf of the leg. Below the popliteal fossa, it pierces the deep fascia (527; 5.5B, 5.7C).

The saphenous nerve accompanies the greater saphenous vein in the leg (Plates 526; 5.3A). Locate it and clean it from the knee to the foot. Find its infrapatellar branch. Most of the dorsum of the foot and toes is supplied by the superficial peroneal nerve. Its branches should have been seen when the dorsal venous arch was cleaned. Follow its branches superiorly to find the common trunk which exits the deep fascia on the lateral side of the leg just below the mid-point of the leg. In the interval between the first and second toe, locate the common digital branch of the deep peroneal/fibular nerve.

The sural nerve can be found with the lesser saphenous vein behind and above the lateral malleolus (Plates 498, 527; 5.3B, 5.37). It is formed from branches from both the tibial and common peroneal/fibular nerves in the region of the popliteal fossa. It continues on the lateral side of the foot to the little toe.

Clean the gastrocnemius muscle and the calcaneal tendon (Plates 498, 503; 5.61B, 5.62A). This muscle takes origin from the femur immediately above the femoral condyles and inserts on the posterior surface of the calcaneus. It is a flexor of the leg at the knee and a plantar flexor of the foot at the ankle joint. Look carefully at the collagen bundles in the calcaneal tendon and note that they have a spiral arrangement. Bundles which begin superior and medial insert posterior. Note that the gastrocnemius is joined by a deeper muscle, the soleus. Divide the medial head of the gastrocnemius one-half inch from its origin and turn the muscle laterally to study the soleus. The soleus arises by two heads, one from high on the fibula and the other from the tibia below the popliteus muscle (Plates 499; 500 5.38, 6.61A, 5.62 A&B). The two heads are joined together by a fibrous arch which allows the tibial nerve and posterior tibial vessels to descend under the soleus without pressure from the muscle. The soleus inserts through the calcaneal tendon with the gastrocnemius muscle. The soleus assists in plantar flexion, but has no action at the knee since it doesn't cross that joint. The gastrocnemius and soleus muscles together are referred to as the triceps surae muscle.

Between the soleus and gastrocnemius muscles is a long tendon belonging to the plantaris muscle (Plates 499; 5.23, 5.37, Table 5.10 and figures-p. 414). This small muscle arises above the lateral condyle of the femur next to the lateral head of the gastrocnemius and inserts on the medial posterior aspect of the calcaneus. It crosses both the knee and ankle joints, but is a weak muscle compared to the gastrocnemius.
Clean the popliteus muscle external to the knee joint (Plates 493, 499, 500; 5.47, 5.48). This muscle arises from within the capsule of the knee joint on the lateral side of the lateral condyle of the femur deep to the lateral collateral ligament (fibular collateral ligament) (Plates 491: 5.47). It pierces the capsule of the knee joint under the arcuate ligament (Plate 493) and inserts on the popliteal surface of the tibia. The action of this muscle depends upon whether or not the foot is fixed. It can medially rotate the leg if the foot is not fixed or laterally rotate the femur if the foot is fixed, as in standing on the floor. When the knee is locked, the femur is medially rotated in respect to the leg. The popliteus unlocks the knee.

Detach the tibial head of the soleus and turn the muscle laterally to expose the three deep muscles in the posterior compartment of the leg (Plates 500; 5.62A & C, Table 5.10 and figures-p. 414). Define the borders of the deep leg muscles. The flexor digitorum longus takes origin from the posterior surface of the tibia, the flexor hallucis longus takes origin from the fibula and posterior intermuscular septum and the tibialis posterior takes origin from the interosseous membrane and adjacent areas of the tibia and fibula. Clean the flexor retinaculum at the ankle joint (Plates 499, 500; 5.62A & C). Dissect and follow the structures deep to the flexor retinaculum (Plates 498-500, 511; 5.62A&C, 5.63A&B, 5.64A&B). It begins from the medial malleolus, extends posteriorly and inferiorly to attach to the medial tubercle of the calcaneus. The tibialis posterior forms a tendon which passes deep to the tendon of the flexor digitorum longus and enters the medial side of the foot by passing immediately posterior to the medial malleolus under the flexor retinaculum. The tendon of the flexor digitorum longus passes superficial to the tendon of the tibialis posterior and passes under the flexor retinaculum posterior to the tibialis posterior. The flexor hallucis longus remains lateral to the other tendons and is the most posterior structure passing under the flexor retinaculum. The tibial nerve and posterior tibial vessels pass under the flexor retinaculum between the two flexor muscles. At this time, do not follow the tendons beyond the flexor retinaculum.

All of the muscles of the posterior osteofascial compartment of the leg are innervated by the tibial nerve (Plates 500, 523; 5.62A&C). The branches to the gastrocnemius, soleus and plantaris usually come off in the popliteal fossa. The other branches come off deep to the soleus. The branch to the popliteus comes off at or above its upper border, descends to its lower border, then hooks under it to innervate the muscle from its anterior surface. The popliteal artery ends at the lower border of the popliteus muscle by dividing into anterior and posterior tibial arteries. The anterior tibial gives off the posterior tibial recurrent artery before passing between the tibia and fibula to enter the anterior compartment of the leg. The posterior tibial artery descends a short distance, then gives off the peroneal artery. The peroneal artery descends laterally in the posterior compartment to the ankle region. It gives off muscular branches, some of which enter the lateral compartment, and above the ankle sends a perforating artery between the tibia and fibula to serve the dorsum of the foot. The tibial nerve descends between the superficial and deep muscles, supplying them, and ends under the flexor retinaculum by dividing into medial and lateral plantar nerves.

The lateral osteofascial compartment of the leg contains only two muscles, the peroneus/fibular longus and brevis (Plates 502, 503; 5.58B, Table 5.9 and figure-p. 411). The compartment is formed by the fibula, anterior and posterior intermuscular septa and the crural fascia. The peroneus/fibular longus arises higher from the fibula than the peroneus/fibular brevis and also from the crural fascia, and both muscles arise from the intermuscular septa. For the most part, the peroneus/fibular longus is superficial to the peroneus/fibular brevis, but as they pass behind the lateral malleolus, the peroneus/fibular longus is posterior to the peroneus/fibular brevis. At the lateral malleolus, both tendons pass under the superior peroneal/fibular retinaculum. Near the anterior end of the calcaneus an inferior peroneal/fibular retinaculum holds the two tendons to the calcaneus (Plates 503, 511; 5.59B&C). The peroneus/fibular brevis inserts on the tubercle of the fifth metatarsal. The peroneus/fibular longus passes under the cuboid bone to cross the plantar surface of the foot. It should
not be followed into the foot at this time.

The common peroneal/fibular nerve divides into superficial and deep peroneal/fibular nerves as it crosses the neck of the fibula and enters the lateral compartment of the leg (Plates 502, 524; 5.55). The deep peroneal/fibular is superior to the superficial peroneal/fibular, which descends in the lateral compartment, supplies both muscles and pierces the deep fascia to become the primary sensory supply to the dorsum of the foot. The deep peroneal/fibular nerve continues into the anterior compartment.

Clean the deep fascia covering the anterior compartment of the leg and dorsum of the foot. Skin the dorsum of the toes. Look carefully at the deep fascia immediately above the malleoli to see where it is thickened to form the superior extensor retinaculum (Plates 501; 5.53B, 5.55A). On the dorsum of the foot, the inferior extensor retinaculum is also formed by thickening of the deep fascia. The inferior extensor retinaculum begins on the dorsal surface of the calcaneus and soon becomes "Y" shaped. The upper limb of the "Y" goes up to fuse with the superior extensor retinaculum and the lower limb of the "Y" passes to the medial side of the foot, becoming continuous with the plantar aponeurosis. Retain the retinacula and remove the rest of the deep fascia. In the upper part of the anterior compartment of the leg the muscles take origin from the deep surface of the crural fascia, so it can be left on the muscles where it is fused to them.

Dissect the muscles of the anterior compartment: the tibialis anterior muscle, extensor hallucis longus, extensor digitorum longus and peroneal/fibularis tertius muscles (Plates 502; 5.53B, 5.54A, Table 5.8 and figures-p. 405). The largest and most medial muscle of the anterior compartment is the tibialis anterior muscle. It arises from the lateral surface of the tibia and descends to the medial surface of the first tarso-metatarsal joint where it inserts. It is a strong dorsi flexor. Arising from the interosseous membrane deep in the compartment adjacent to the tibialis anterior is the extensor hallucis longus. It inserts on the dorsal surface of the base of the distal phalanx of the first toe. The extensor digitorum longus arises from the lateral tibial condyle, fibula and adjacent fascias to end as four tendons to the four lesser toes. The tendons to each toe form a dorsal expansion (hood) as was seen on the dorsal surface of the fingers. The peroneus tertius muscle appears as an extra slip of the extensor digitorum longus, but its tendon inserts on the fifth metatarsal bone.

After the deep peroneal/fibular nerve enters the anterior compartment, it joins the anterior tibial vessels which entered the compartment through the interosseous membrane (Plates 502; 5.24, 5.55). The anterior compartment is served by this neurovascular bundle. The deep peroneal/fibular nerve continues onto the foot to supply the extensor digitorum brevis and the adjacent sides of the first two toes. The anterior tibial vessels change their name at the ankle joint to dorsalis pedis artery. The dorsalis pedis artery begins mid-way between the malleoli and ends between the bases of the first two metatarsal bones by dividing into dorsal metatarsal and deep plantar arteries. On the dorsum of the foot, the artery gives off medial and lateral tarsal branches and an arcuate branch which supplies the rest of the dorsal metatarsal arteries.

The extensor digitorum brevis muscle arises from the dorsal surface of the calcaneus and inserts on the dorsum of the four medial toes (Plates 501, 503, 511, 512; 5.56, 5.59B&C). The first and largest slip of the muscle is often called the extensor hallucis brevis. It has no tendon to the fifth toe. The tendons join the tendons of the extensor digitorum longus to help form the dorsal tendon hood, although the first tendon may insert directly on the base of the first phalanx of the first toe.
Be sure to identify all of the following in this unit:

dorsal venous plexus/arch  popliteal artery
greater saphenous vein  anterior tibial artery
lesser saphenous vein  posterior tibial artery
saphenous nerve  peroneal artery
infrapatellar nerve  medial plantar nerve
common digital branch of lateral plantar nerve
depth peroneal/fibular nerve  lateral osteofascial compartment
sural nerve  peroneus/fibular longus muscle
gastrocnemius muscle  peroneus/fibular brevis muscle
calcaneal tendon  anterior intermuscular septum
soleus muscle  superior peroneal/fibular reticulum
popliteus muscle  inferior peroneal/fibular reticulum
tibial nerve  common peroneal/fibular nerve
posterior tibial vessels  superficial peroneal/fibular nerve
triceps surae muscle  deep peroneal/fibular nerve
plantaris muscle  anterior compartment
arcuate ligament  tibialis anterior muscle
flexor digitorum longus muscle  extensor hallucis longus muscle
flexor hallucis longus muscle  extensor digitorum longus muscle
posterior intermuscular septum  peroneus tertius muscle
tibialis posterior muscle  dorsalis pedis artery
flexor retinaculum  extensor digitorum brevis muscle
medial malleolus  extensor hallucis brevis muscle
posterior osteofascial compartment