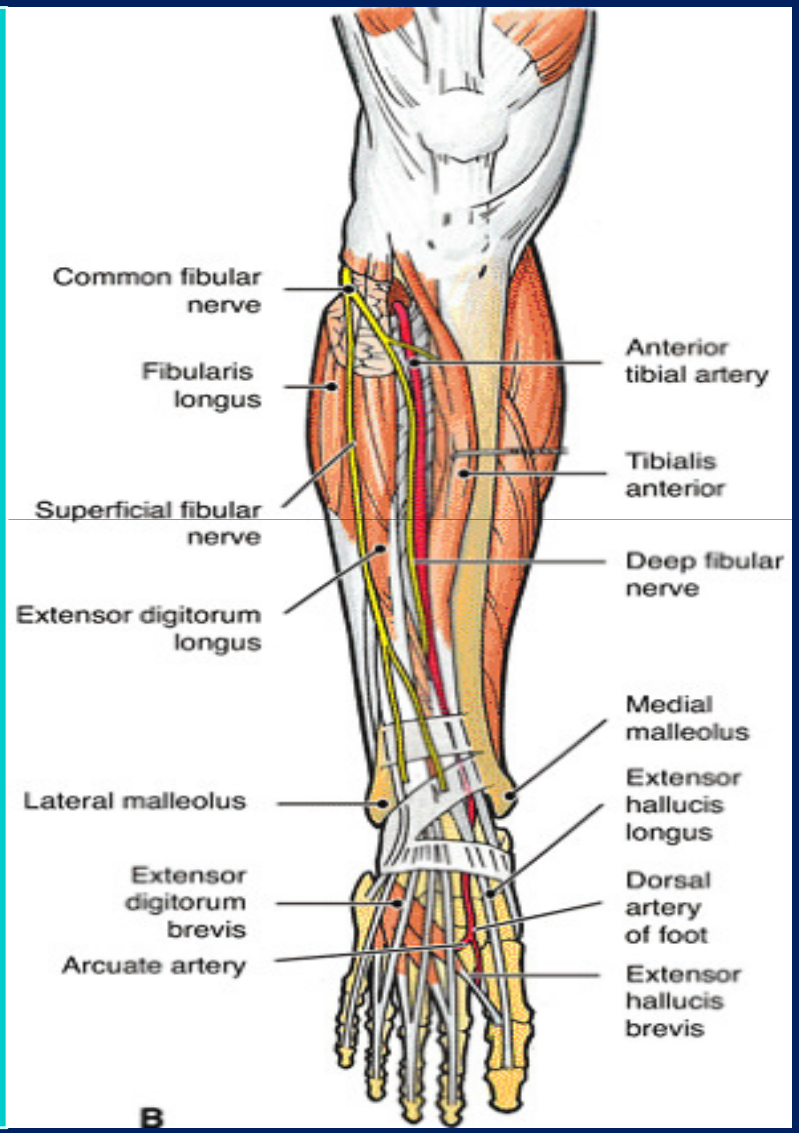
The Region of the Ankle

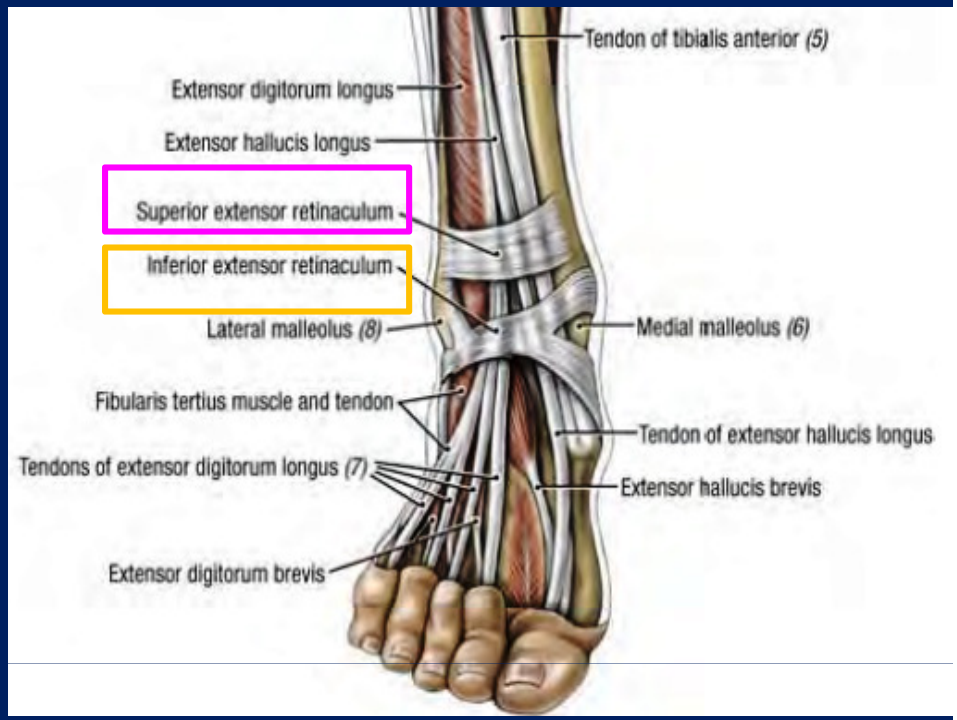
- The Region of the Ankle:
  - Retinacula
  - Tendons
  - Arteries
  - Nerves

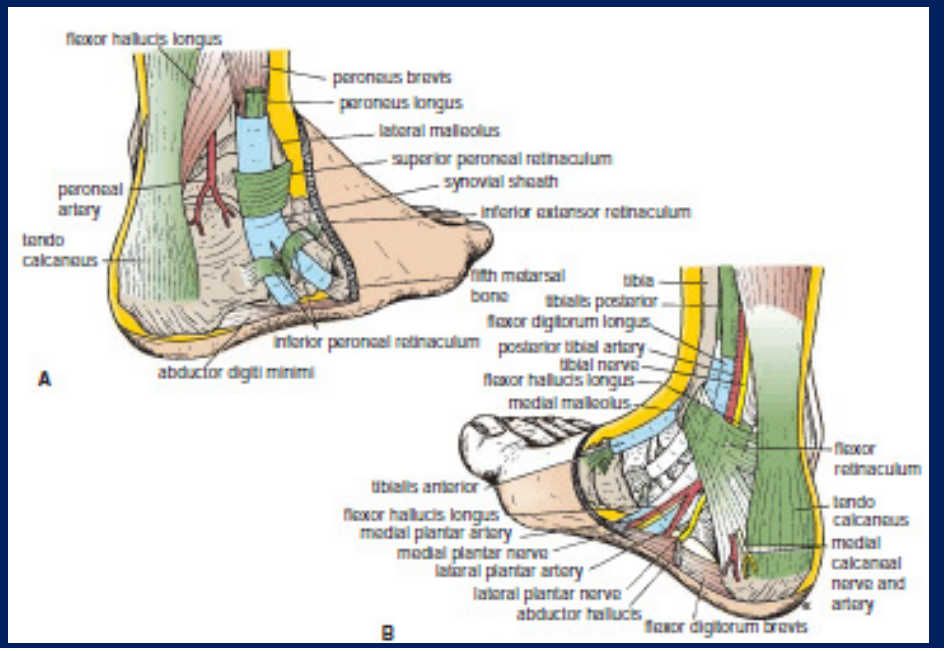


Retinacula of the Ankle:

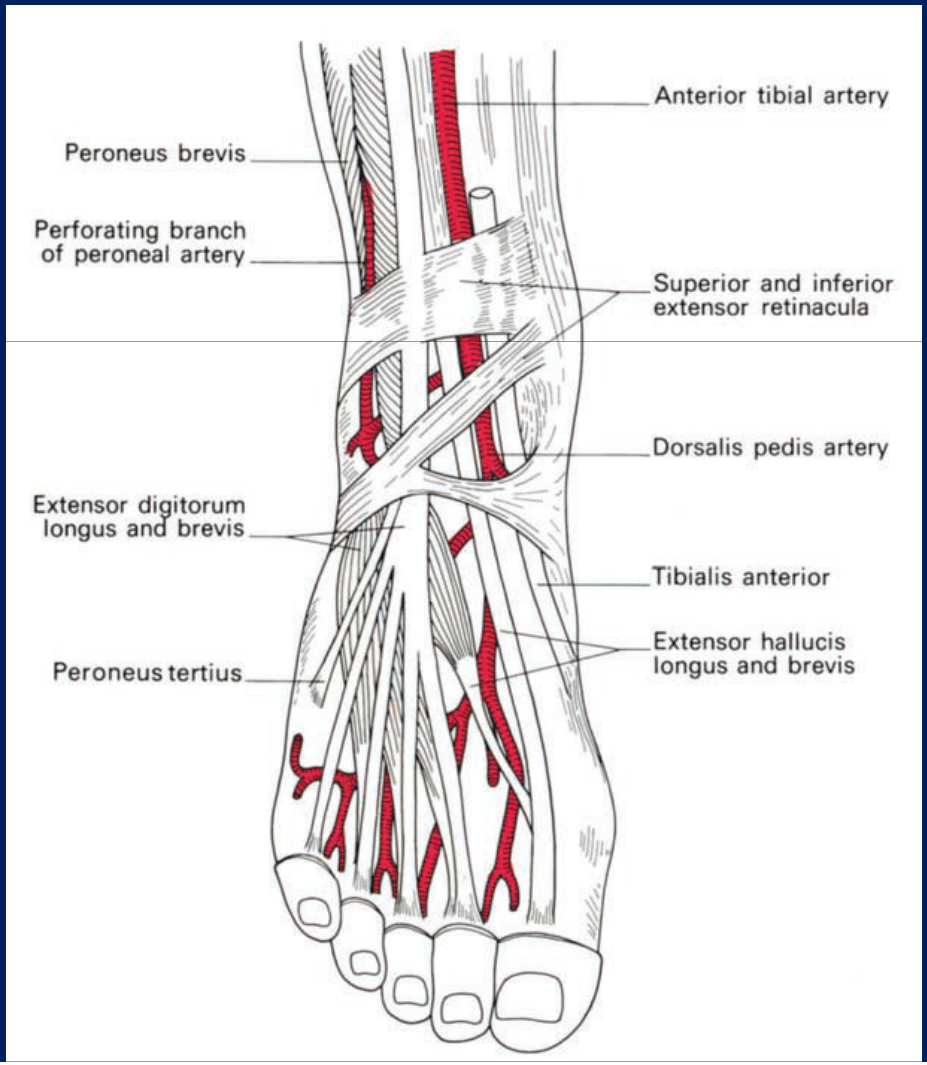
thickenings of the deep fascia that keep the long tendons around the ankle joint.

- Superior extensor retinaculum
- Inferior extensor retinaculum
- Flexor Retinaculum
- Superior Peroneal Retinaculum
- Inferior Peroneal Retinaculum



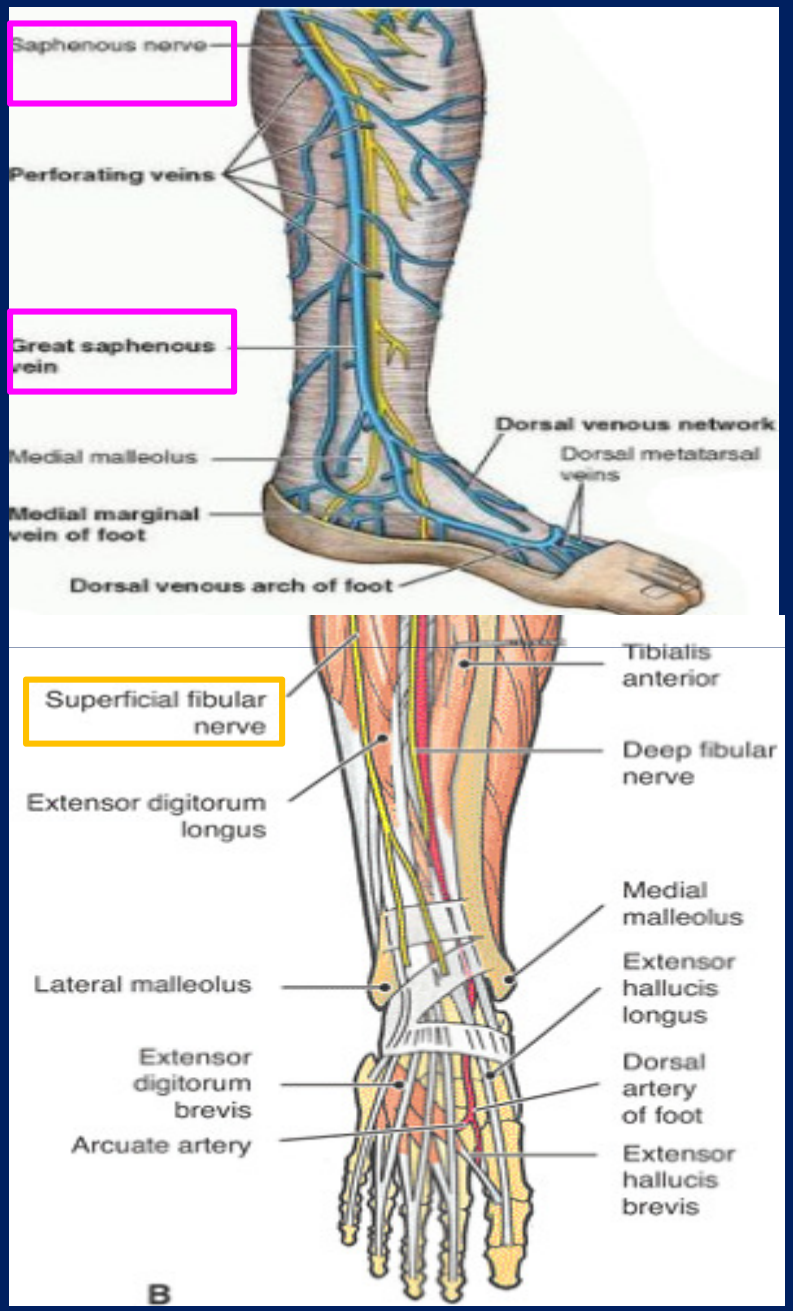


Anterior Aspect of the Ankle



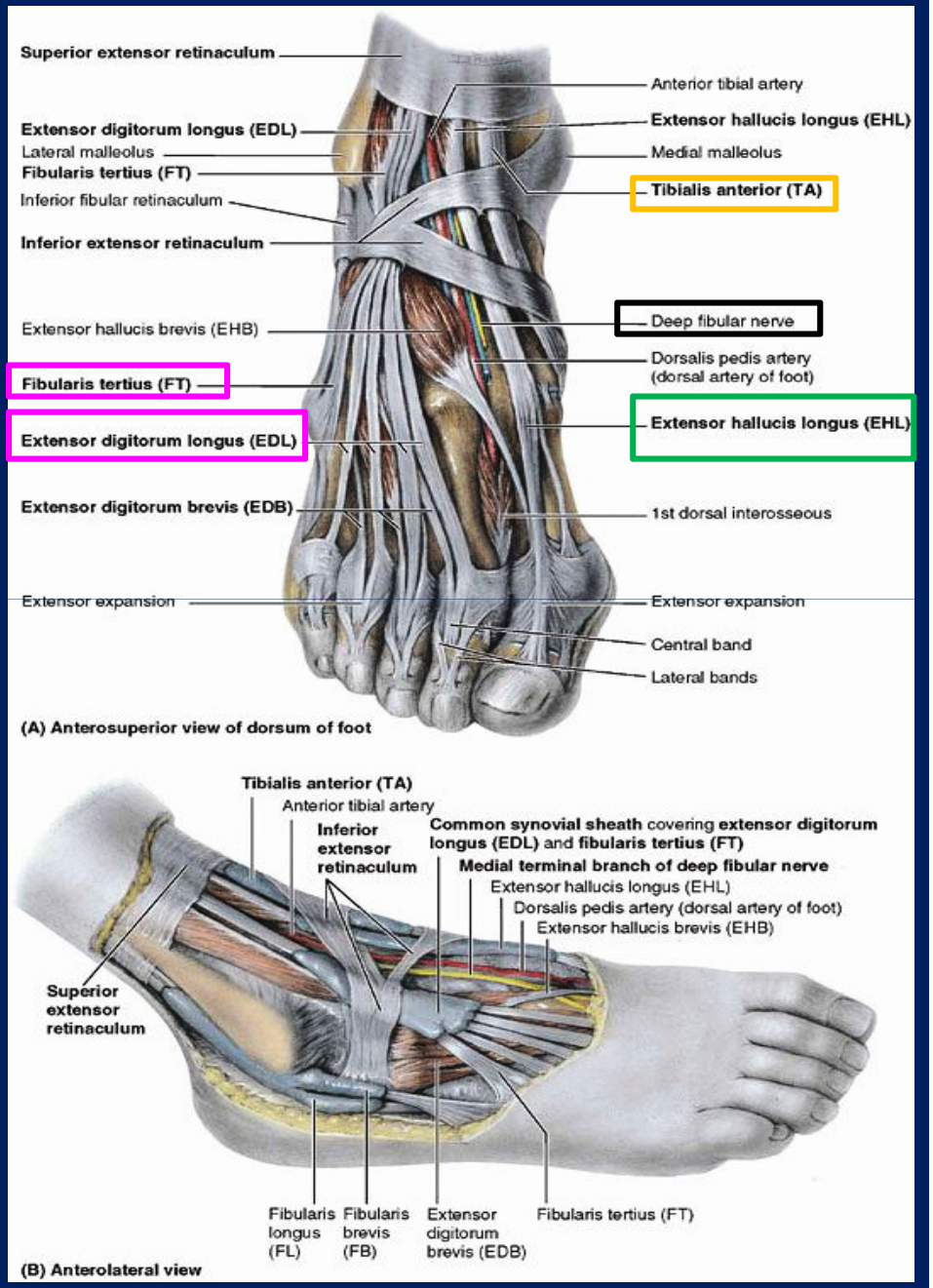
Structures That Pass **Anterior to the Extensor Retinacula** From Medial to Lateral

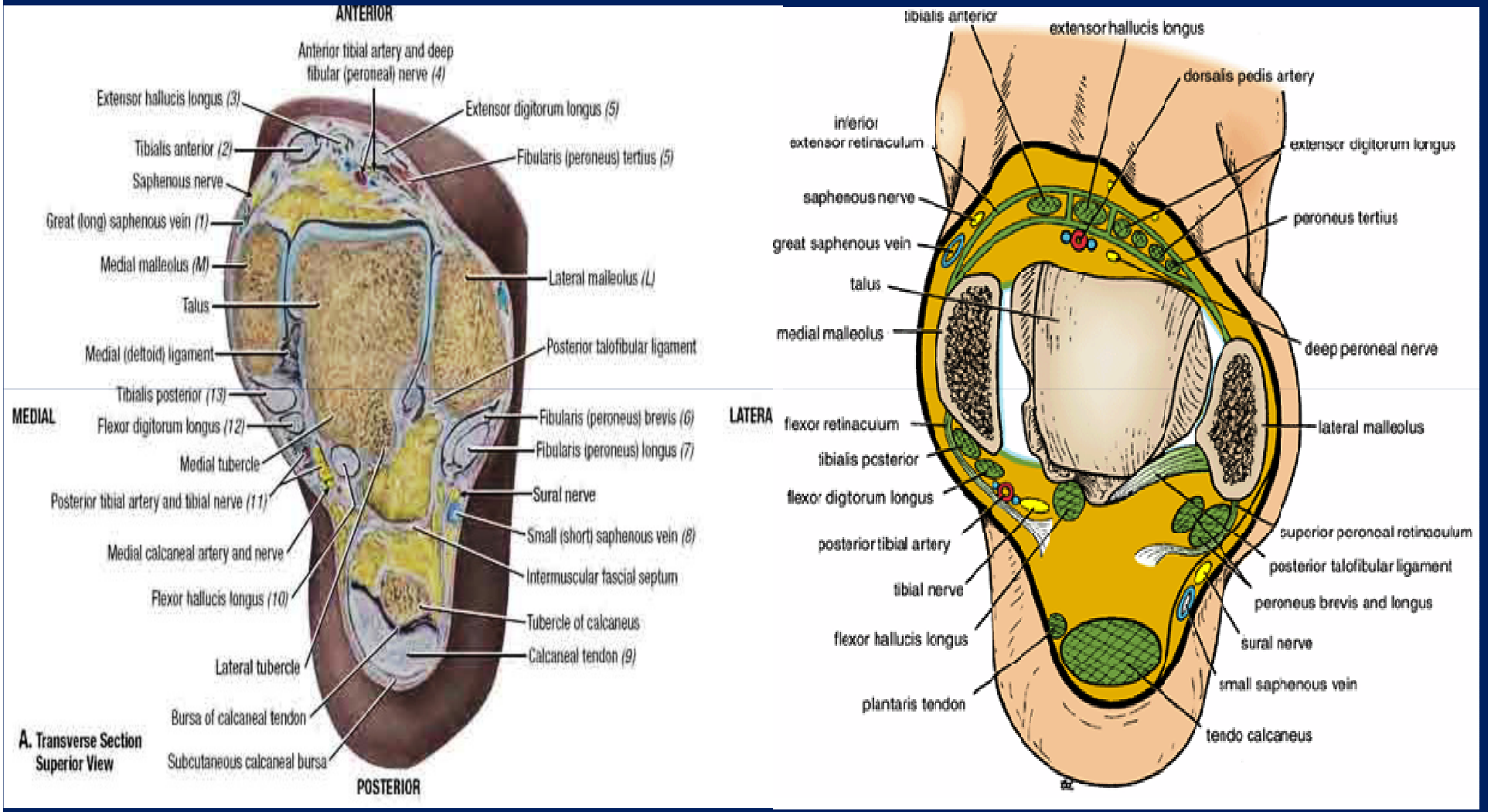
- Saphenous nerve and great saphenous vein (in front of the medial malleolus)
- Superficial peroneal nerve (medial and lateral branches)



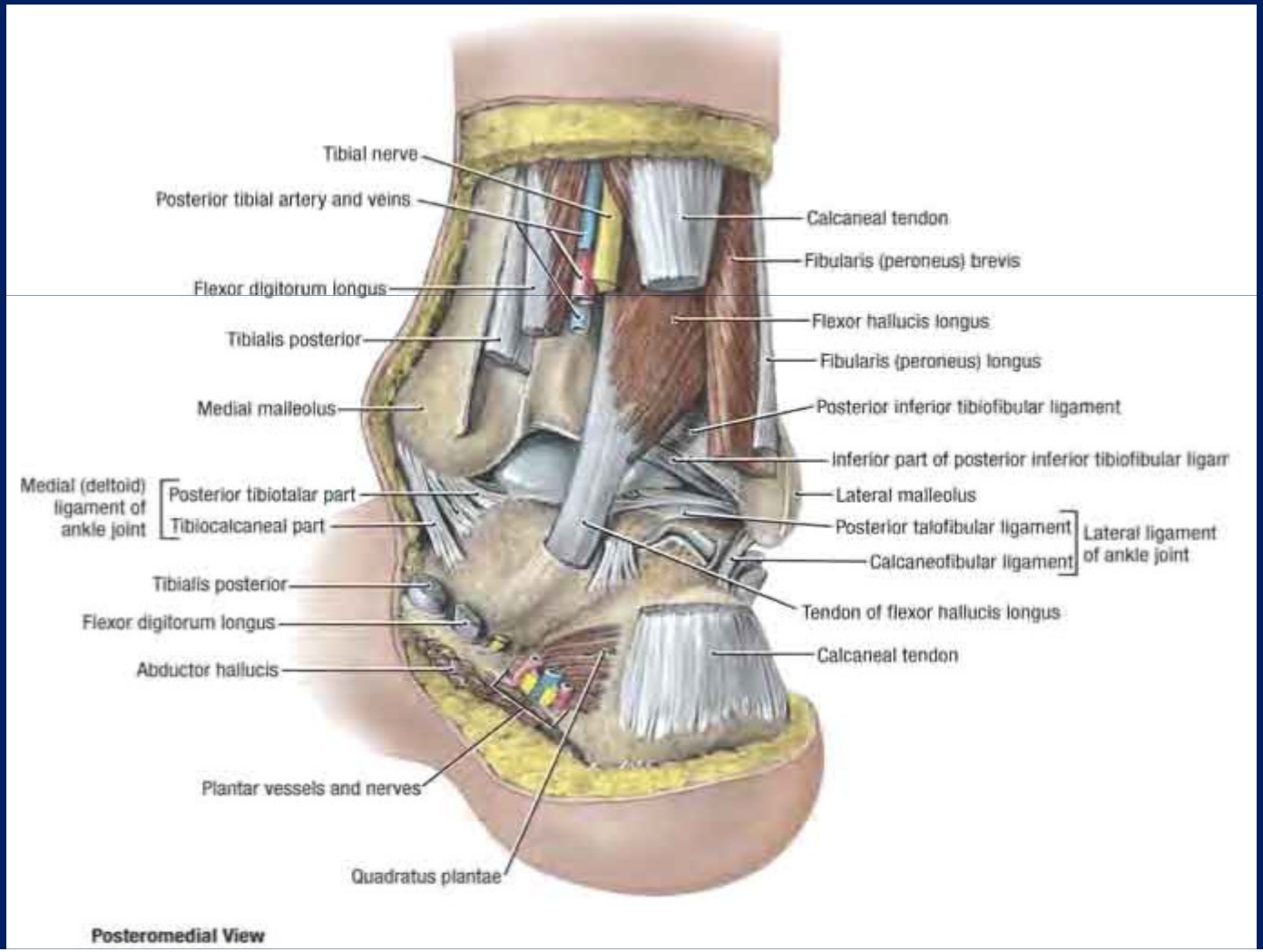
Structures That Pass **Beneath or Through the Extensor Retinacula** From Medial to Lateral

- Tibialis anterior tendon
- Extensor hallucis longus tendon
- Anterior tibial artery & venae comitantes
- Deep peroneal nerve
- Extensor digitorum longus tendons
- Peroneus tertius




ANTERIOR
Anterior tibial artery and deep fibular (peroneal) nerve (4)
Extensor hallucis longus (3)
Extensor digitorum longus (5)
Tibialis anterior (2)
Fibularis (peroneus) tertius (5)
Saphenous nerve
Great (long) saphenous vein (1)
Medial malleolus (M)
Lateral malleolus (L)
Talus
Medial (deltoid) ligament
Posterior talofibular ligament
Tibialis posterior (13)
MEDIAL
Flexor digitorum longus (12)
Fibularis (peroneus) brevis (6)
Fibularis (peroneus) longus (7)
Medial tubercle
Posterior tibial artery and tibial nerve (11)
Sural nerve
Small (short) saphenous vein (8)
Medial calcaneal artery and nerve
Intermuscular fascial septum
Flexor hallucis longus (10)
Tubercle of calcaneus
Calcaneal tendon (9)
Lateral tubercle
Bursa of calcaneal tendon
A. Transverse Section Superior View
Subcutaneous calcaneal bursa
POSTERIOR
tibialis anterior
extensor hallucis longus
dorsalis pedis artery
inferior extensor retinaculum
extensor digitorum longus
saphenous nerve
peroneus tertius
great saphenous vein
talus
medial malleolus
deep peroneal nerve
LATERA
flexor retinacuum
lateral malleolus
tibialis posterior
flexor digitorum longus
superior peroneal retinaculum
posterior tibial artery
posterior talofibular ligament
tibial nerve
peroneus brevis and longus
flexor hallucis longus
sural nerve
small saphenous vein
plantaris tendon
tendo calcaneus

Posterior Aspect of the Ankle

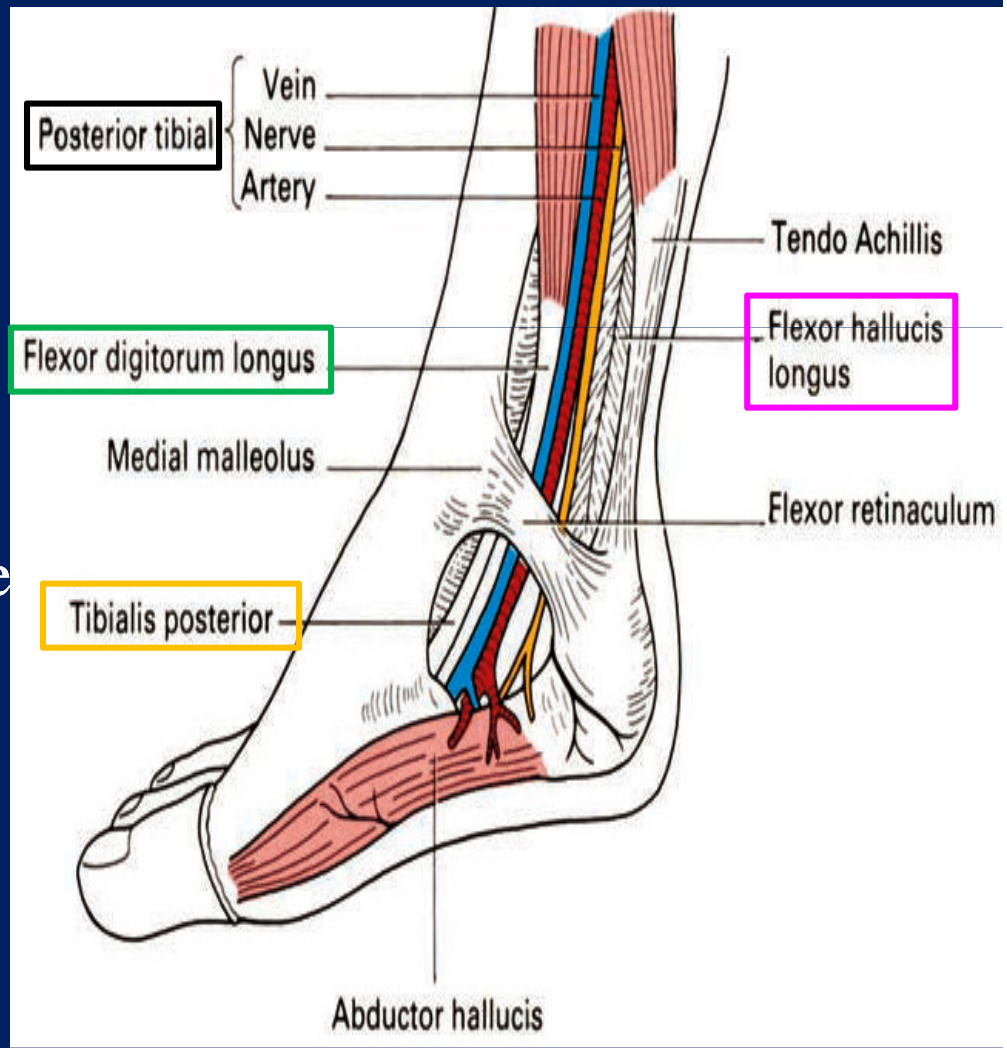


Structures That Pass

Beneath the Medial Malleolus Beneath the Flexor Retinaculum

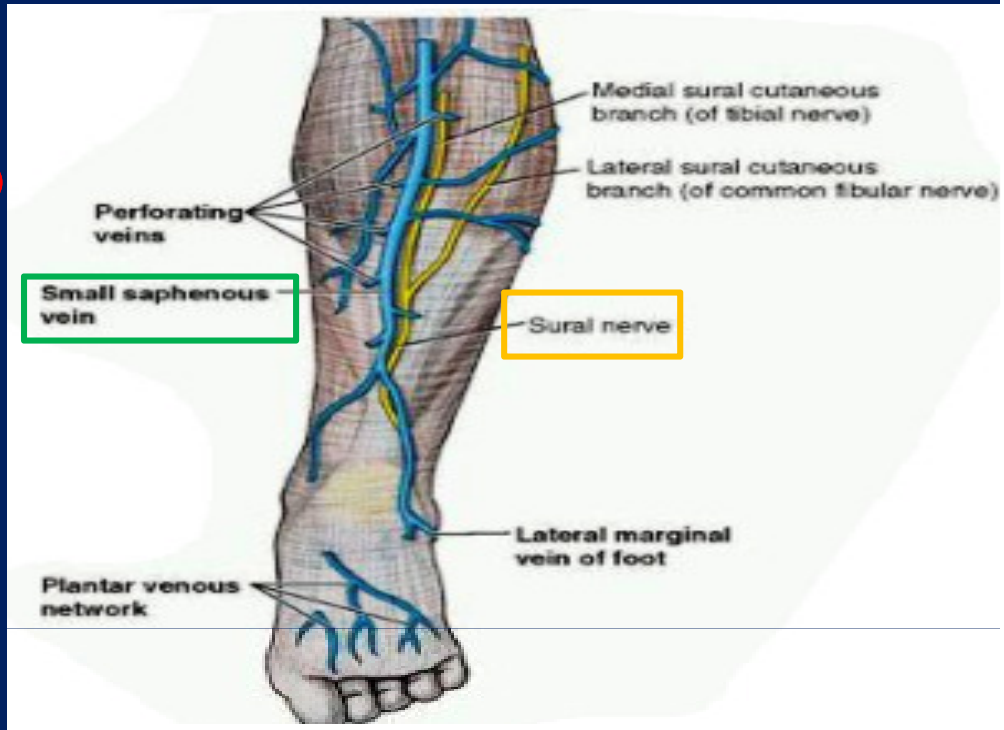
From Medial to Lateral

- Tibialis posterior tendon
- Flexor digitorum longus
- Posterior tibial artery with venae comitantes
- Tibial nerve
- Flexor hallucis longus



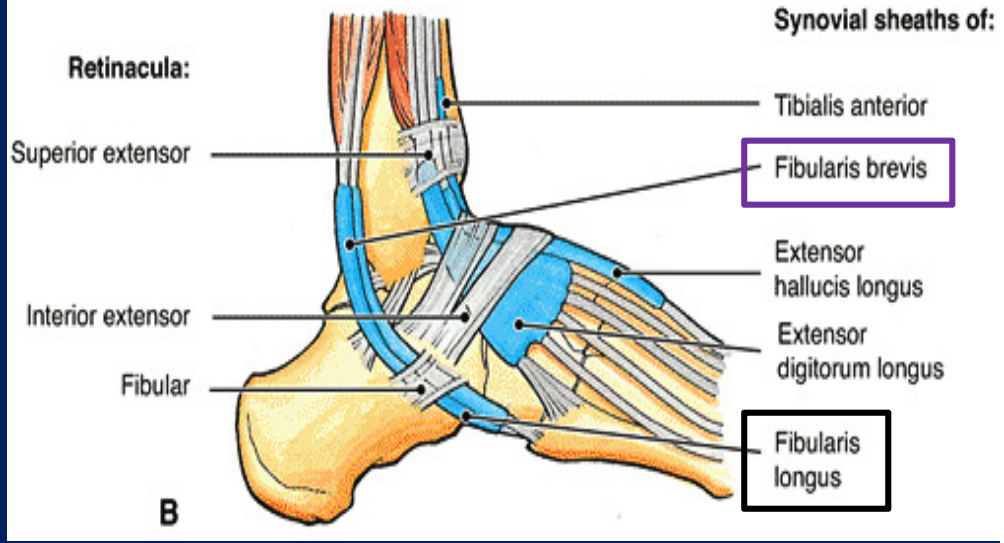
Structures That Pass Beneath the Lateral Malleolus Superficial to the Superior Peroneal Retinaculum

- The sural nerve
- Small saphenous vein



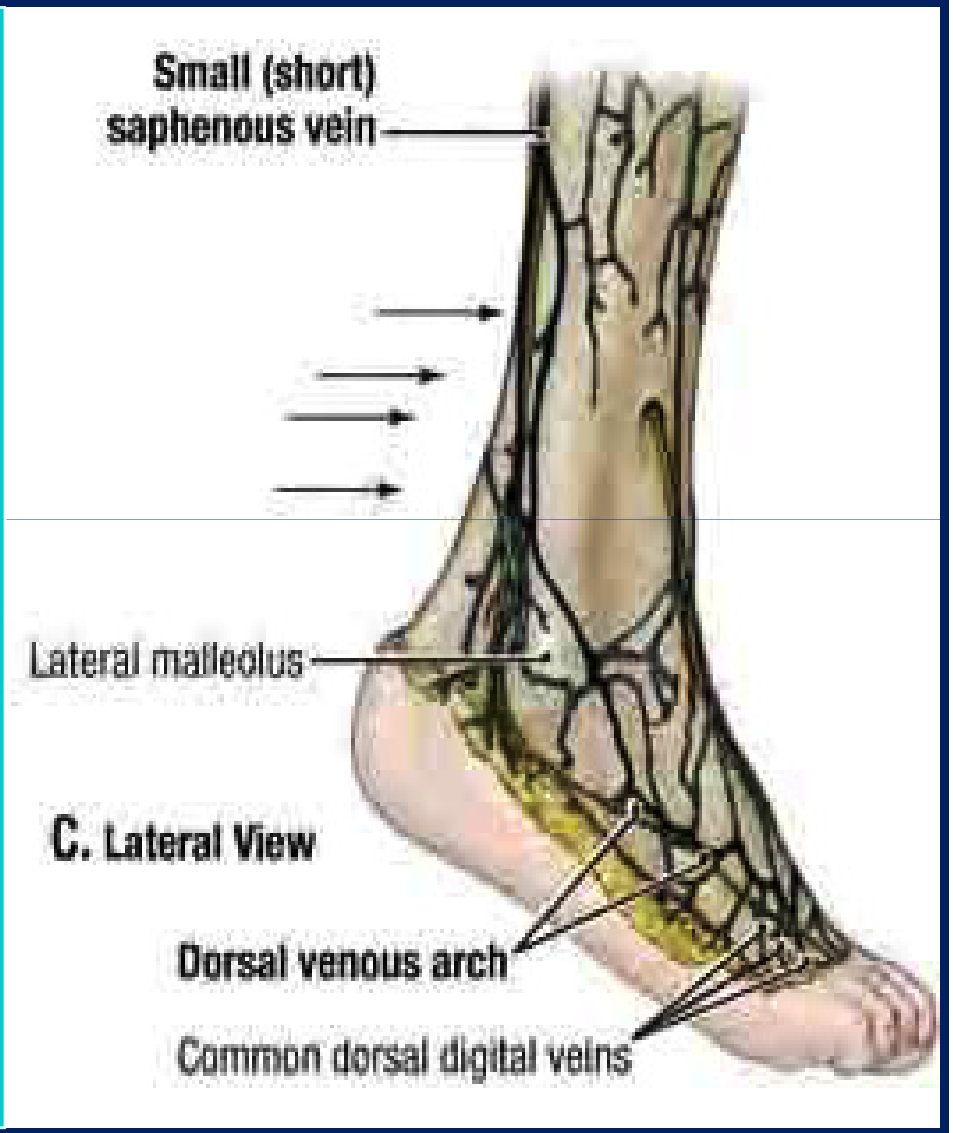
Structures That Pass Behind the Lateral Malleolus Beneath the Superior Peroneal Retinaculum

- peroneus longus tendon
- peroneus brevis tendon



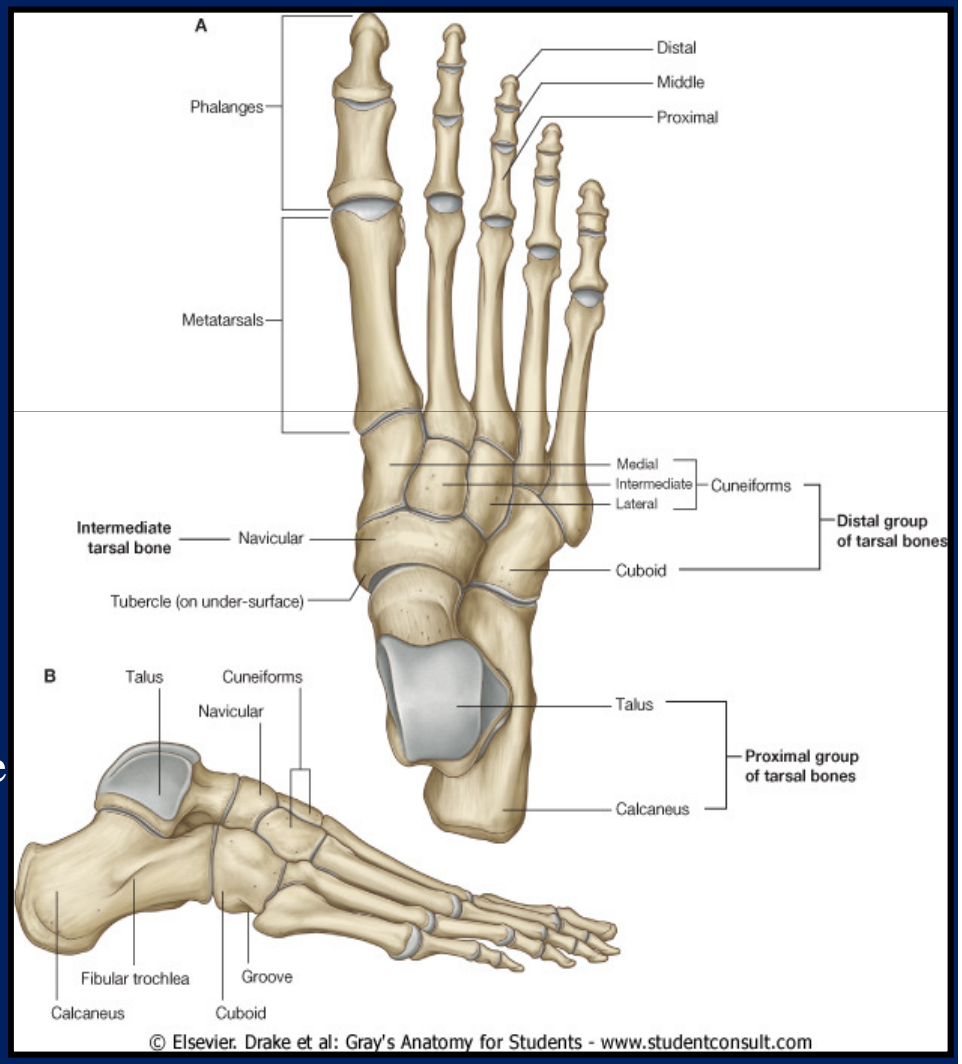
The Foot

- Contents of the Foot :
  - Bones
  - Muscles
  - Vessels
  - Nerves



Bones of the Foot

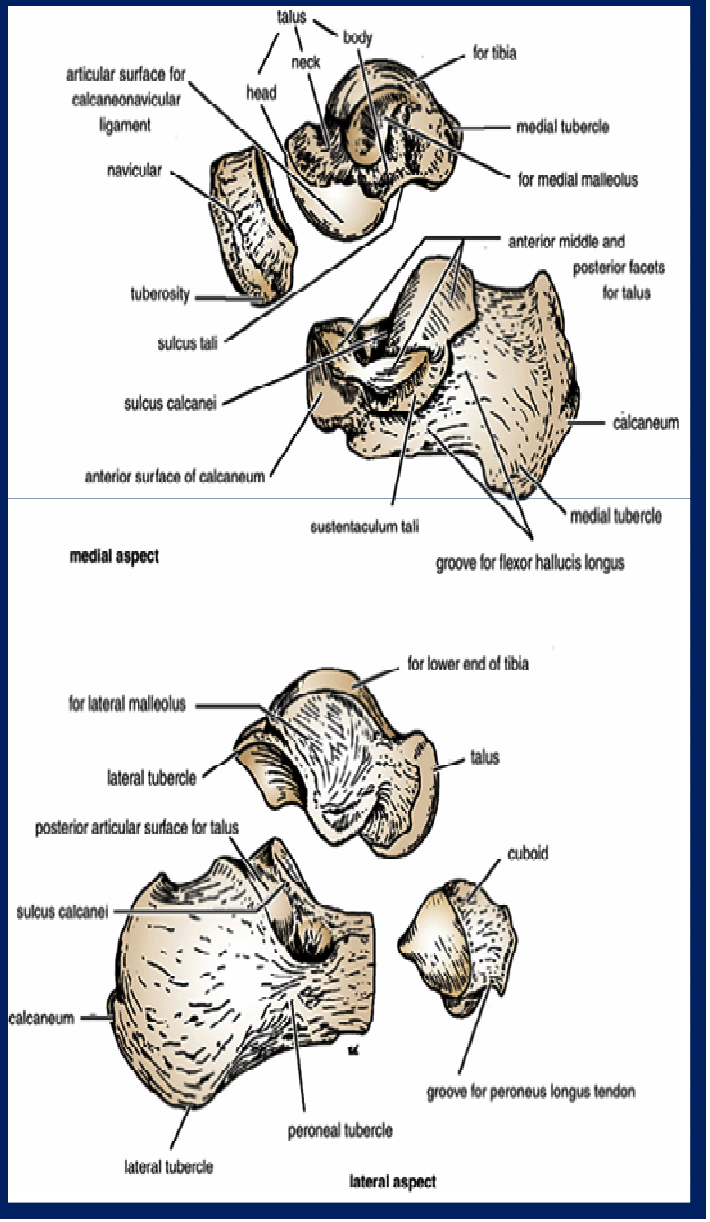
- tarsal bones (7)
  - Tarsals
    - Talus = ankle
      - Between tibia and fibula
      - Articulates with both
    - Calcaneus = heel
      - Attachment for Calcaneal tendon
      - Carries talus
    - Navicular
    - Cuboid
    - Medial, lateral and intermediate cuneiforms
- metatarsals bones (5)
- Phalanges (14)



Calcaneum

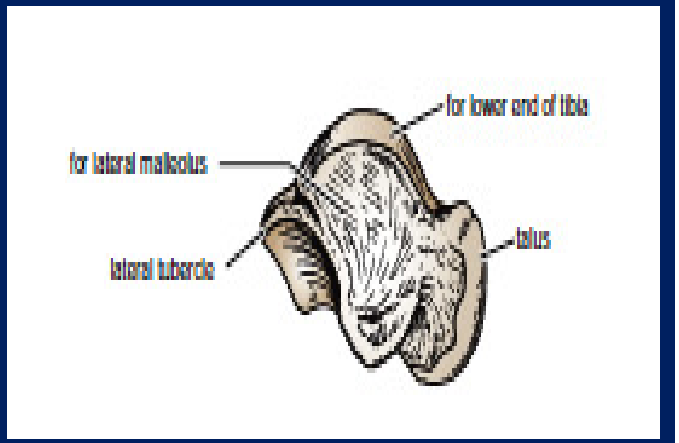
the largest bone of the foot and forms the prominence of the heel .It articulates above with the talus and in front with the cuboid. It has six surfaces.

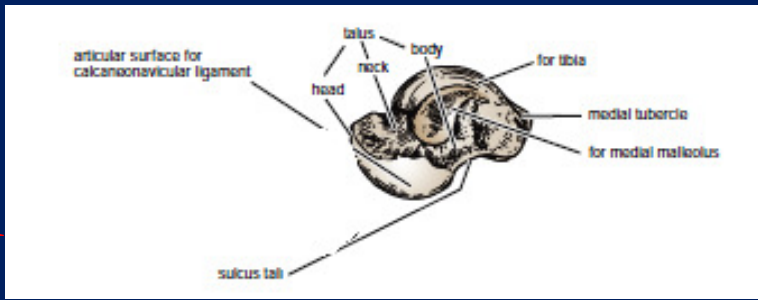
- anterior surface articulates with cuboid .
- posterior surface forms the heel.
- superior surface articulates with the talus, a roughened groove, the sulcus calcanei.
- The inferior surface has an anterior tubercle in the midline .
- The medial surface possesses a large, sustentaculum tali .
- The lateral surface is almost flat.



Talus

- The talus articulates above at the ankle joint with the tibia and fibula, below with the calcaneum, and in front with the navicular bone. It possesses a head, a neck, and a body .
- head : distally and articulation with the navicular bone.
- neck :posterior to the head and is slightly narrowed. (the sulcus tali groove).
- body : Its cuboidal.





Navicular Bone

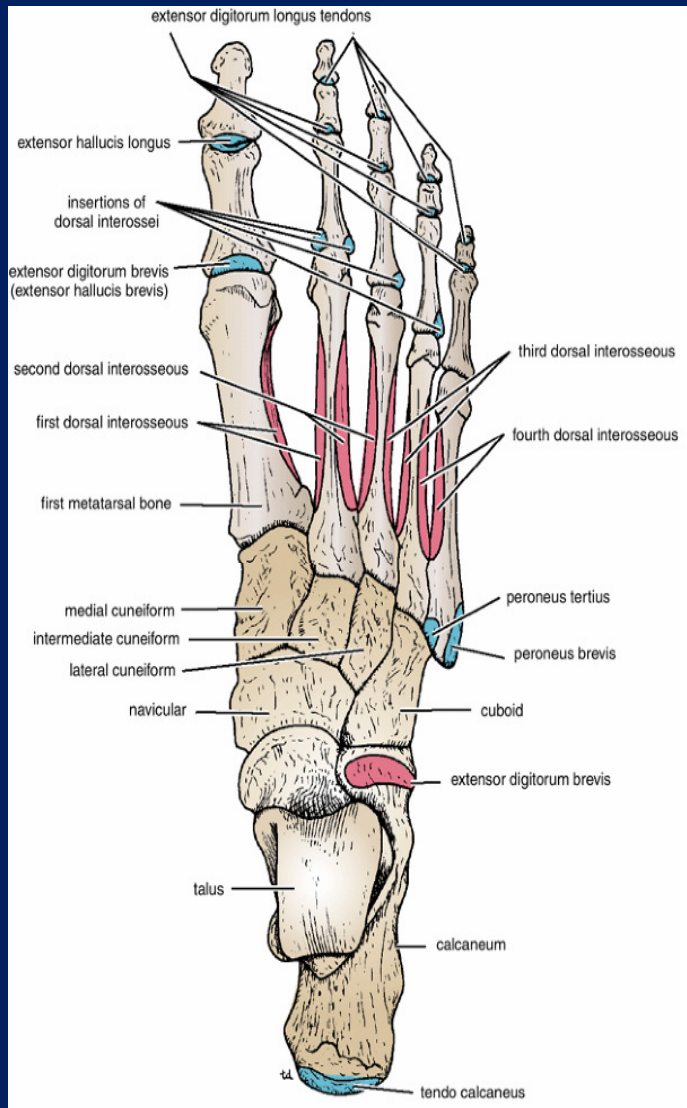
- The tuberosity of the navicular bone on the medial border below the medial malleolus.

Cuboid Bone

- A deep groove on the inferior lodges the tendon of the peroneus longus muscle.

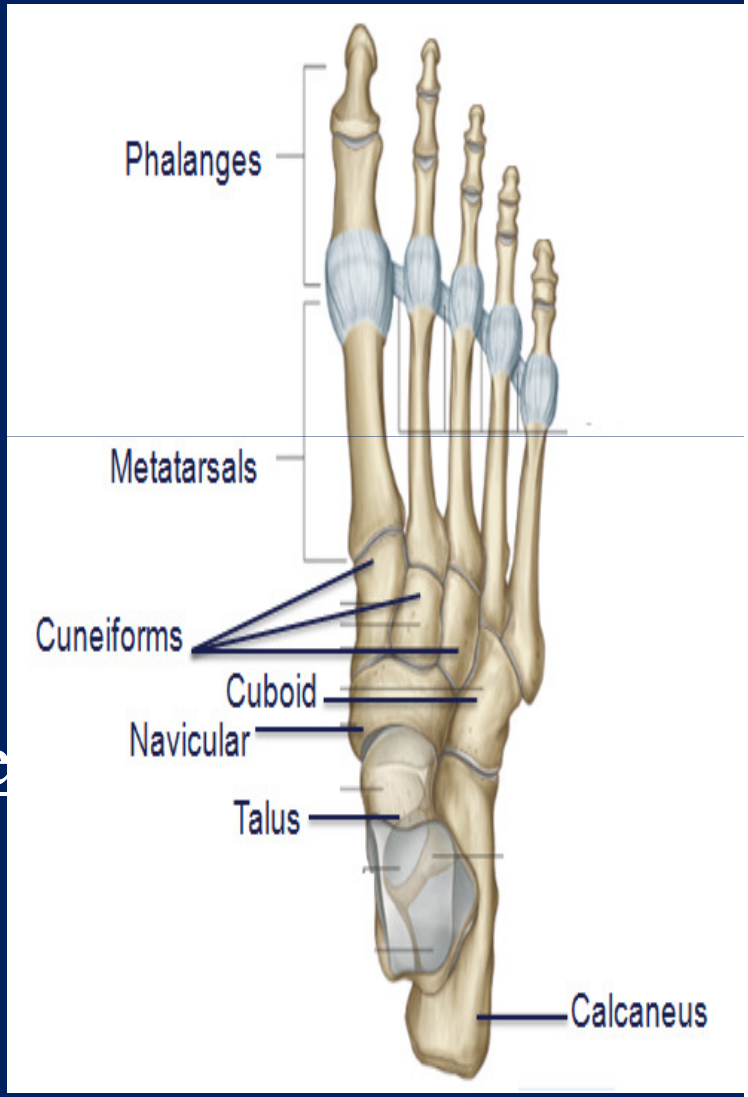
Cuneiform Bones

- The three small, wedge-shaped articulate with navicular and distally with the first three metatarsal bones.



Metatarsal Bones and Phalanges

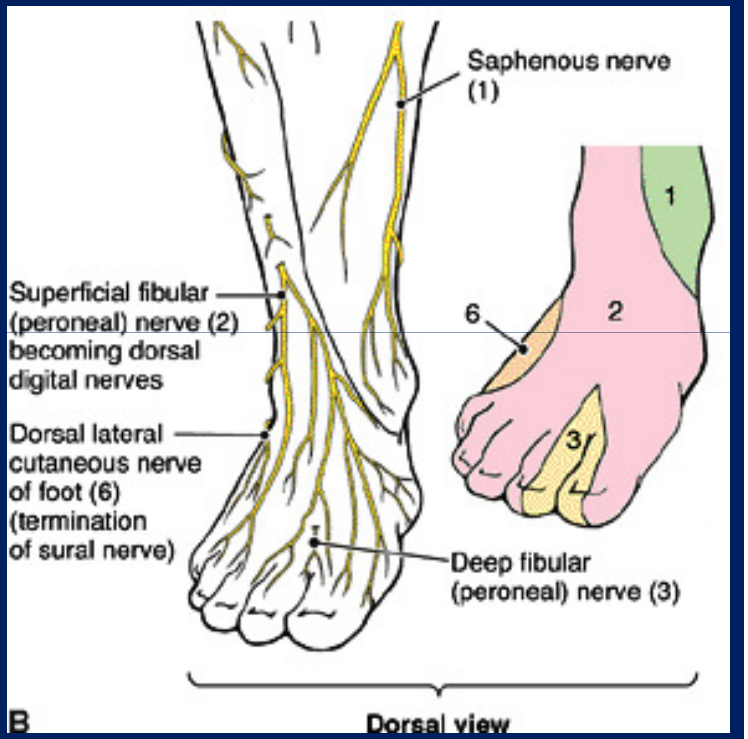
- The metatarsal bones and phalanges head distally, a shaft, and a base proximally. The five metatarsals are numbered from the medial to the lateral side.
- The first metatarsal bone is large. its inferior aspect by the medial and lateral sesamoid bones in the tendons of flexor hallucis brevis.
- The fifth metatarsal has a tubercle attachment to peroneus brevis .
- Each toe has 3 phalanges except the big toe 2 phalanges.



The Dorsum of the Foot

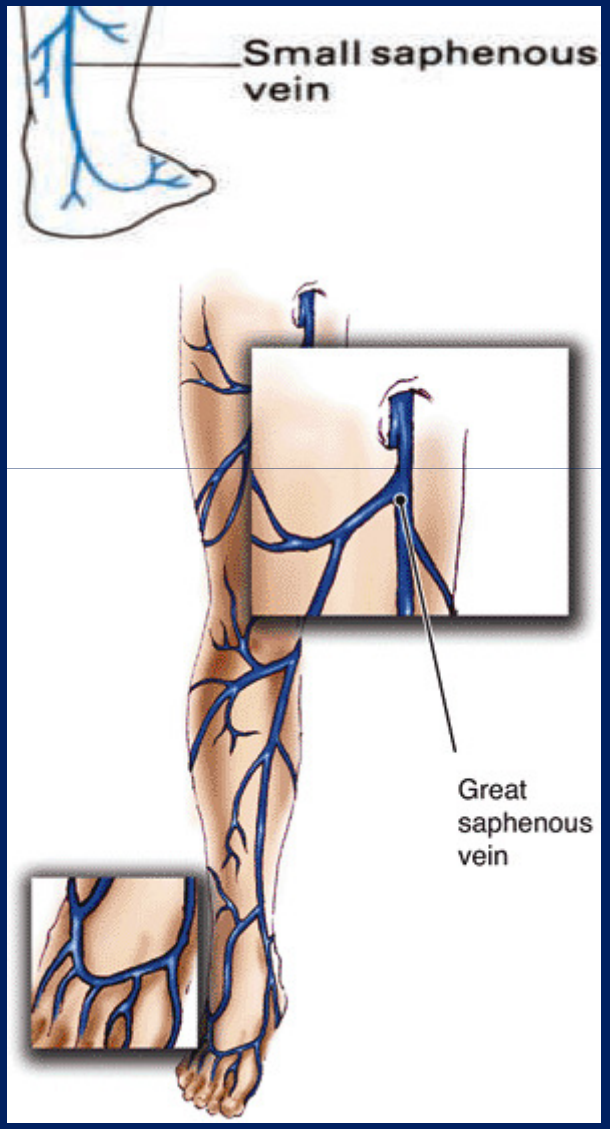
Cutaneous Nerves

- **The saphenous N** passes onto front of the medial malleolus .It supplies **medial** side to the first metatarsal bone.
- **The superficial peroneal N** divides into medial and lateral cutaneous branches that supply the skin on the **dorsum** of the foot.
- **The deep peroneal N** supplies skin of adjacent sides of **big** and **second** toes .
- **The sural N** enters the foot behind the lateral malleolus and supplies the skin along the **lateral** margin of the foot and the **lateral** side of the **little** toe.
- **medial and lateral plantar N** supplied **nail beds** and the skin covering the dorsal surfaces of **terminal phalanges** .



Dorsal Venous Arch (or Network)

- The dorsal venous arch lies in the subcutaneous tissue over the heads of the metatarsal bones and drains on the medial side into the great saphenous vein and on the lateral side into the small saphenous vein .
- The great saphenous vein leaves the dorsum of the foot by ascending into the leg in front of the **medial malleolus**.
- The small saphenous vein ascends into the leg behind the **lateral malleolus**.

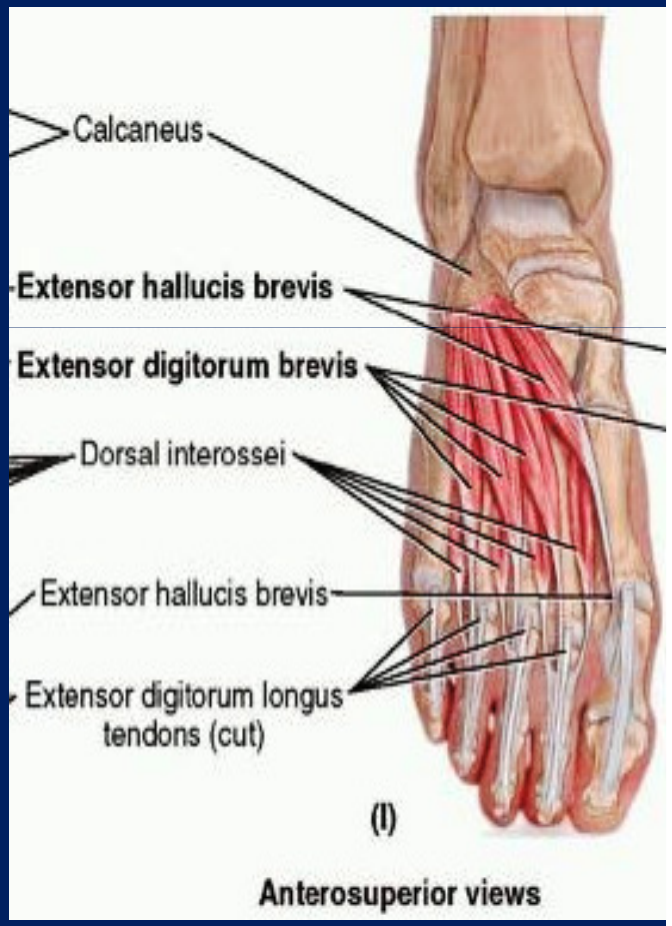


•Muscle of the Dorsum of the Foot:

Extensor digitorum brevis

- **Origin:**
  - Anterior part of upper surface of the calcaneum and from the inferior extensor retinaculum.
  - **Insertion:** By four tendons into the proximal phalanx of big toe and long extensor tendons to second, third, and fourth toes.
- **Nerve supply:** Deep peroneal nerve S1, S2
- **Action:**

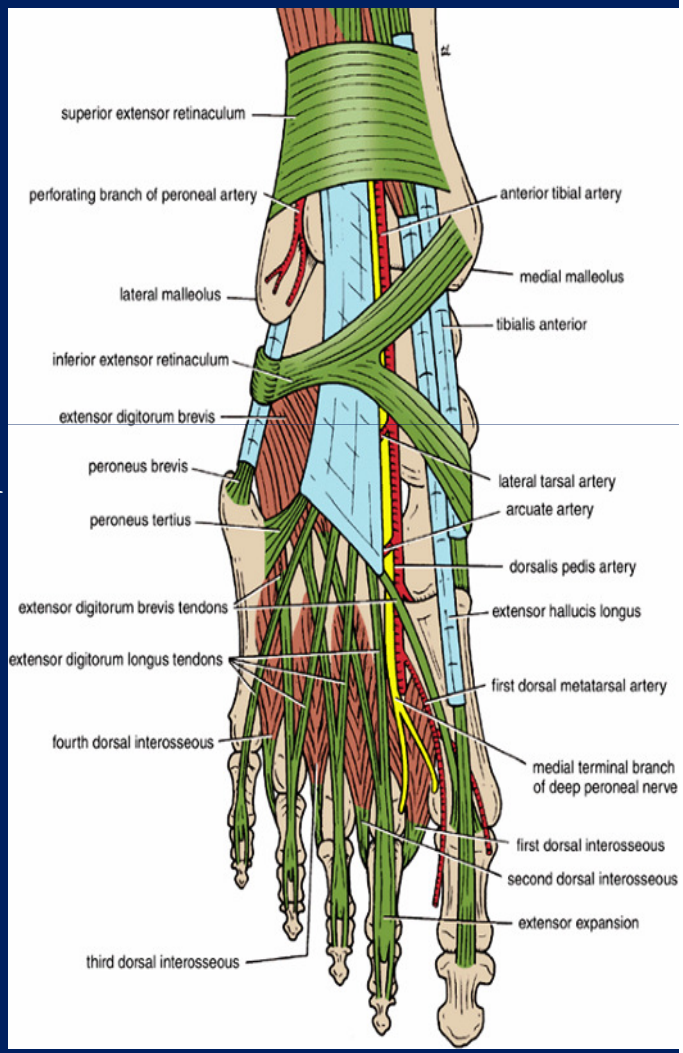
  Extends toes



Artery of the Dorsum of the Foot

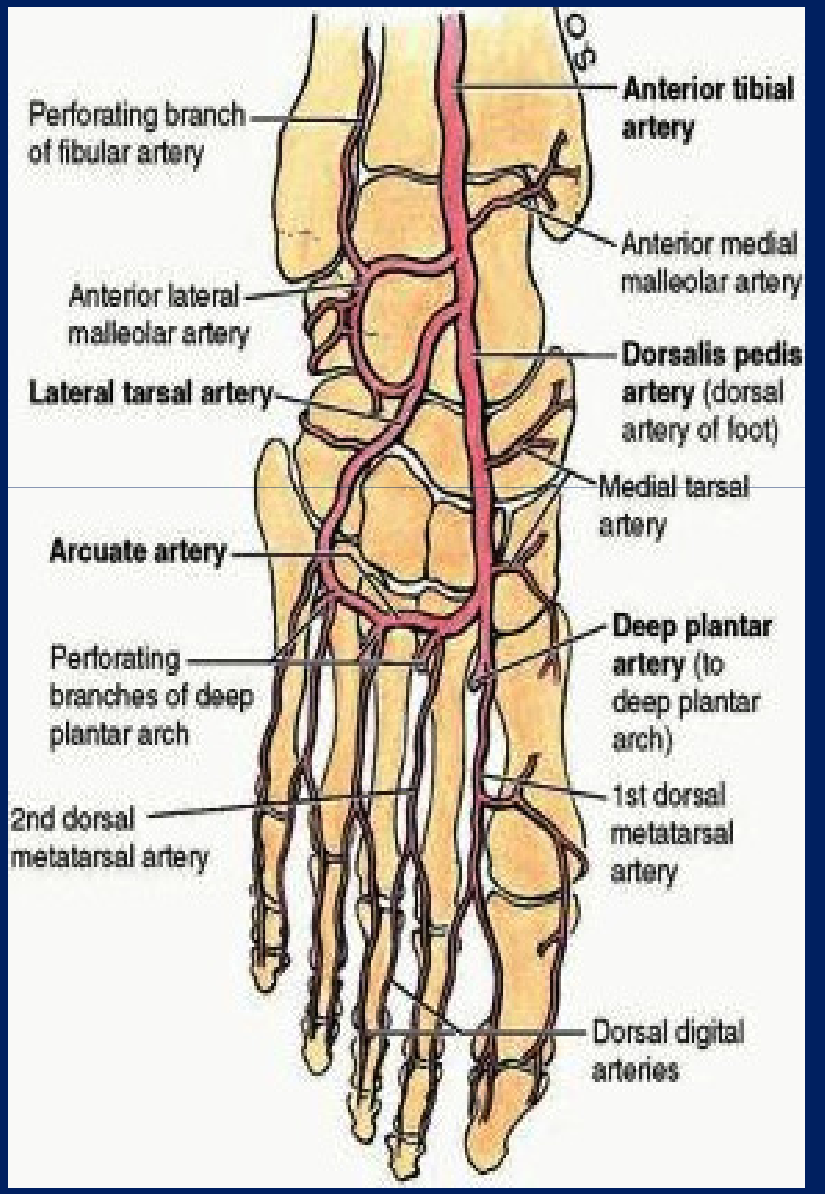
Dorsalis Pedis Artery (the Dorsal Artery of the Foot)

- The dorsalis pedis artery begins in **front** of the ankle joint as a continuation of the anterior tibial artery .It terminates by passing **downward** into the sole between the two heads of the first dorsal interosseous muscle, where it joins the lateral plantar artery and completes the plantar arch .It is superficial in position and is crossed by the inferior extensor retinaculum and the first tendon of extensor digitorum brevis. On its lateral side lie the terminal part of the deep peroneal nerve and the extensor digitorum longus tendons. On the medial side lies the tendon of extensor hallucis longus. (Its pulsations can easily be felt).



Branches

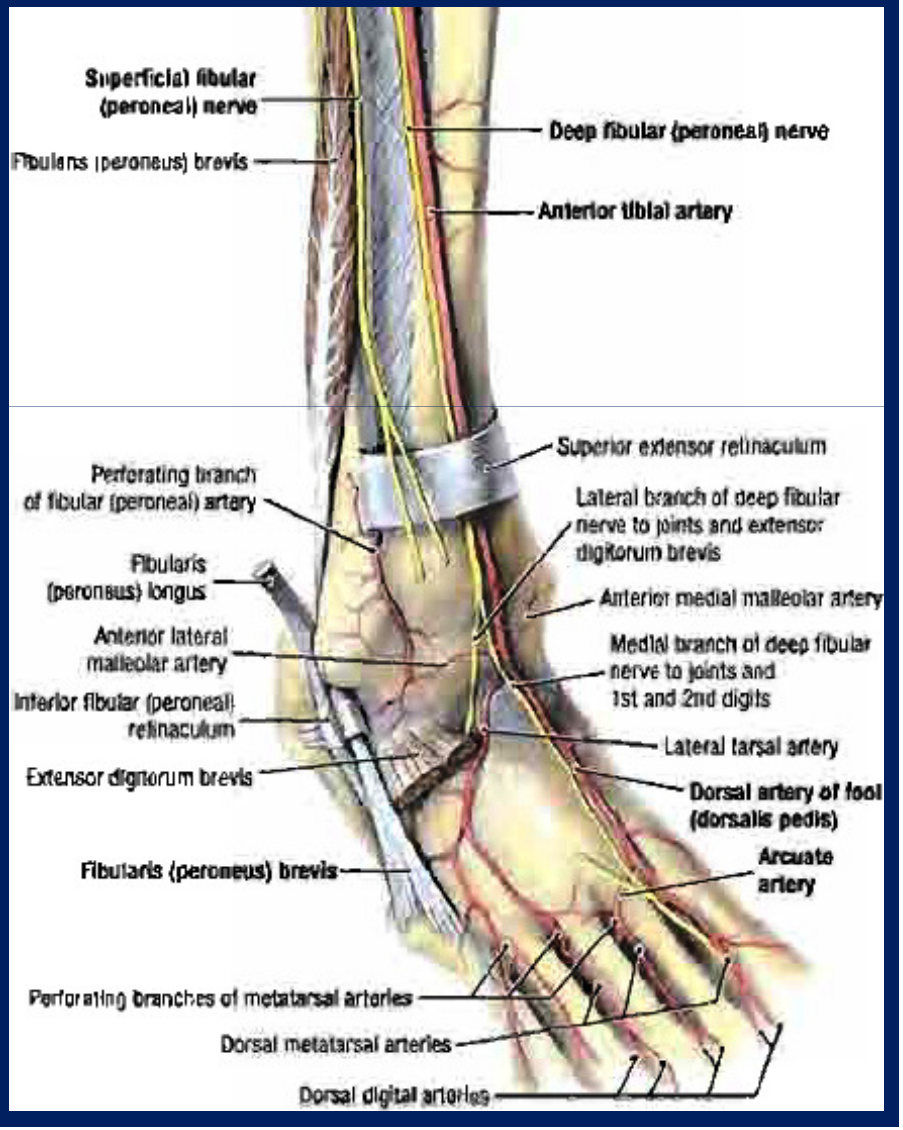
- Lateral tarsal artery, which crosses the dorsum of the foot just below the ankle joint.
- Arcuate artery, which runs laterally under the extensor tendons opposite the bases of the metatarsal bones .It gives off metatarsal branches to the toes.
- First dorsal metatarsal artery, which supplies both sides of the big toe.



Nerve Supply of the Dorsum of the Foot

Deep Peroneal Nerve

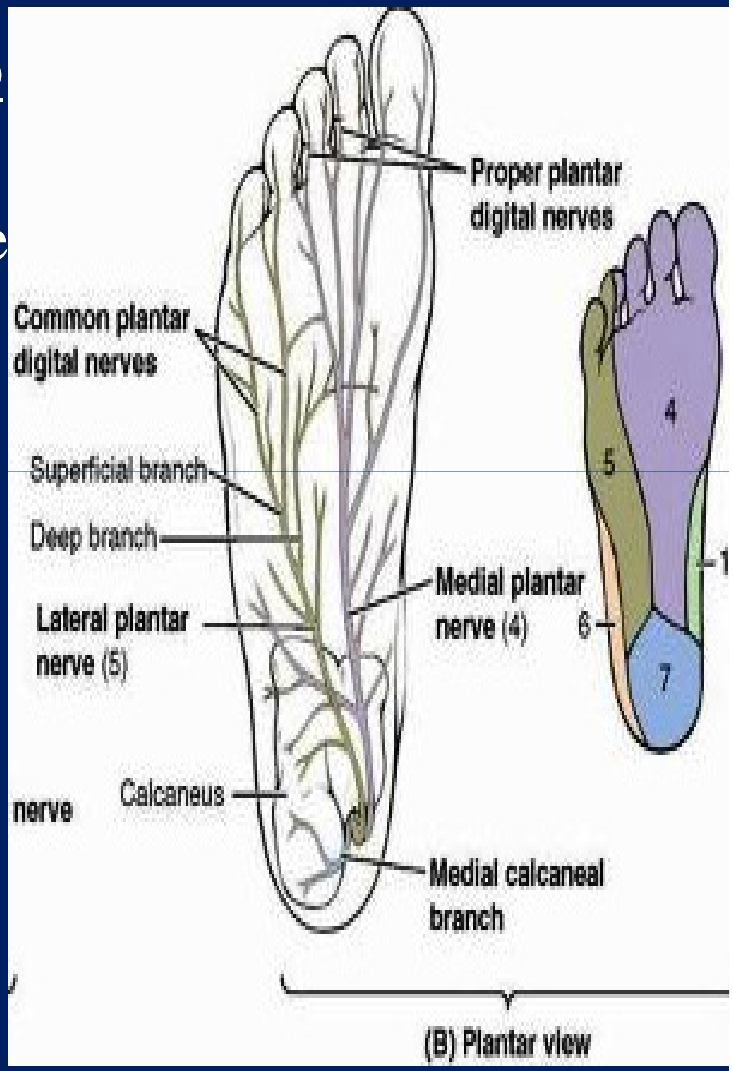
- The deep peroneal nerve enters the dorsum of foot by passing deep to the **extensor retinacula** on **lateral** side of the dorsalis pedis artery .
- It divides into terminal medial and lateral branches.
- The medial branch supplies the skin of the adjacent sides of the **big** and **second** toes .
- The lateral branch supplies the **extensor digitorum brevis muscle**.
- Both terminal branches give **articular** branches to the joints of the foot.



The Sole of the Foot

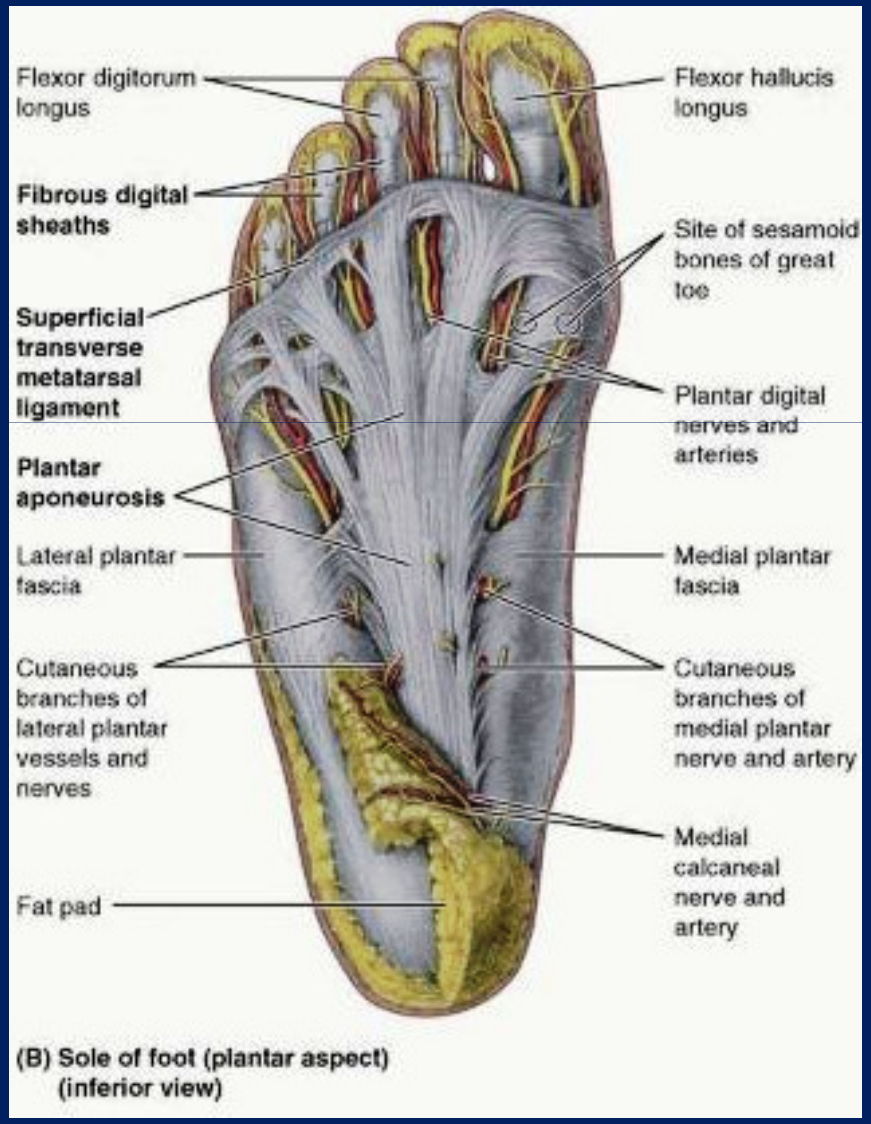
Cutaneous Nerves

- skin of sole of foot is thick and hairless.
- It is firmly bound down to underlying deep fascia by numerous fibrous bands.
- The skin shows a few flexure creases at the sites of skin movement.
- Sweat glands are present in large numbers.
- The sensory nerve supply to skin of the sole of foot is derived from **the medial calcaneal branch of the tibial nerve,** which innervates the **medial** side of the heel; branches from the **medial plantar nerve**, which innervate the **medial two thirds** of the sole; and branches from **the lateral plantar nerve**, which innervate the **lateral third** of the sole .



Deep Fascia

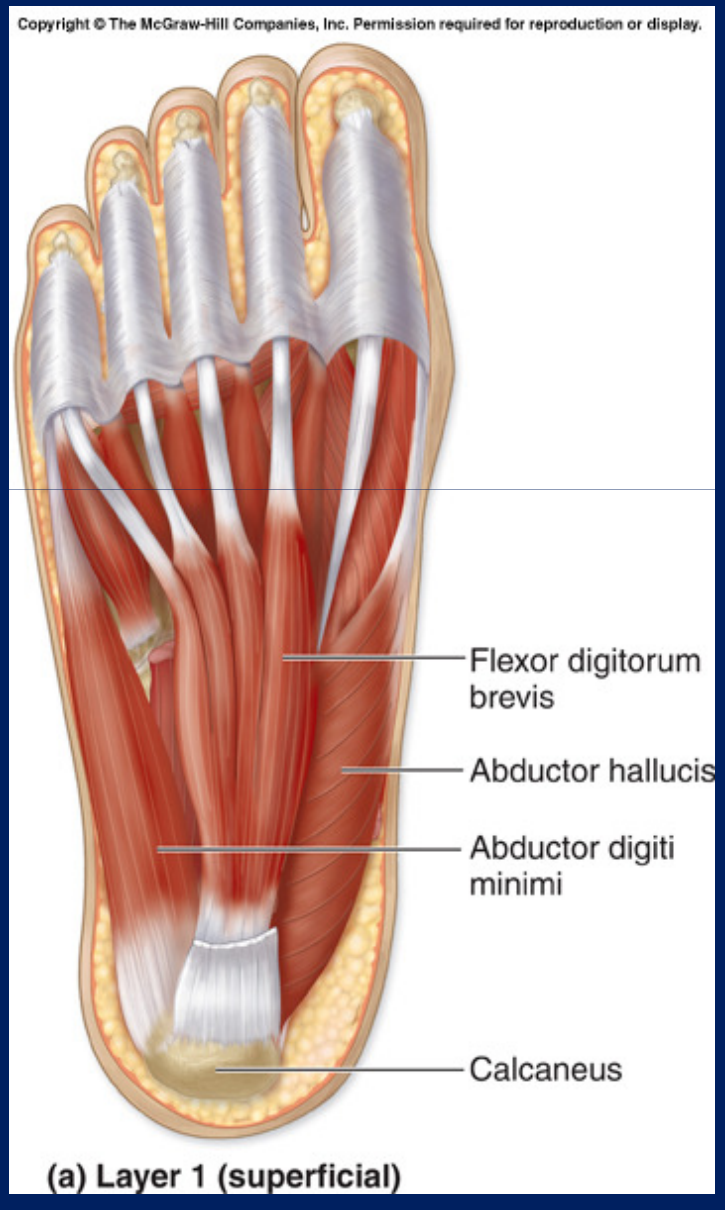
- The plantar aponeurosis is a triangular thickening of the deep fascia that protects the underlying nerves, blood vessels, and muscles .
- Its apex is attached to the **medial** and **lateral** tubercles of the **calcaneum**. The base of the aponeurosis divides into **five** slips that pass into the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



Muscles of the Sole of the Foot

First Layer

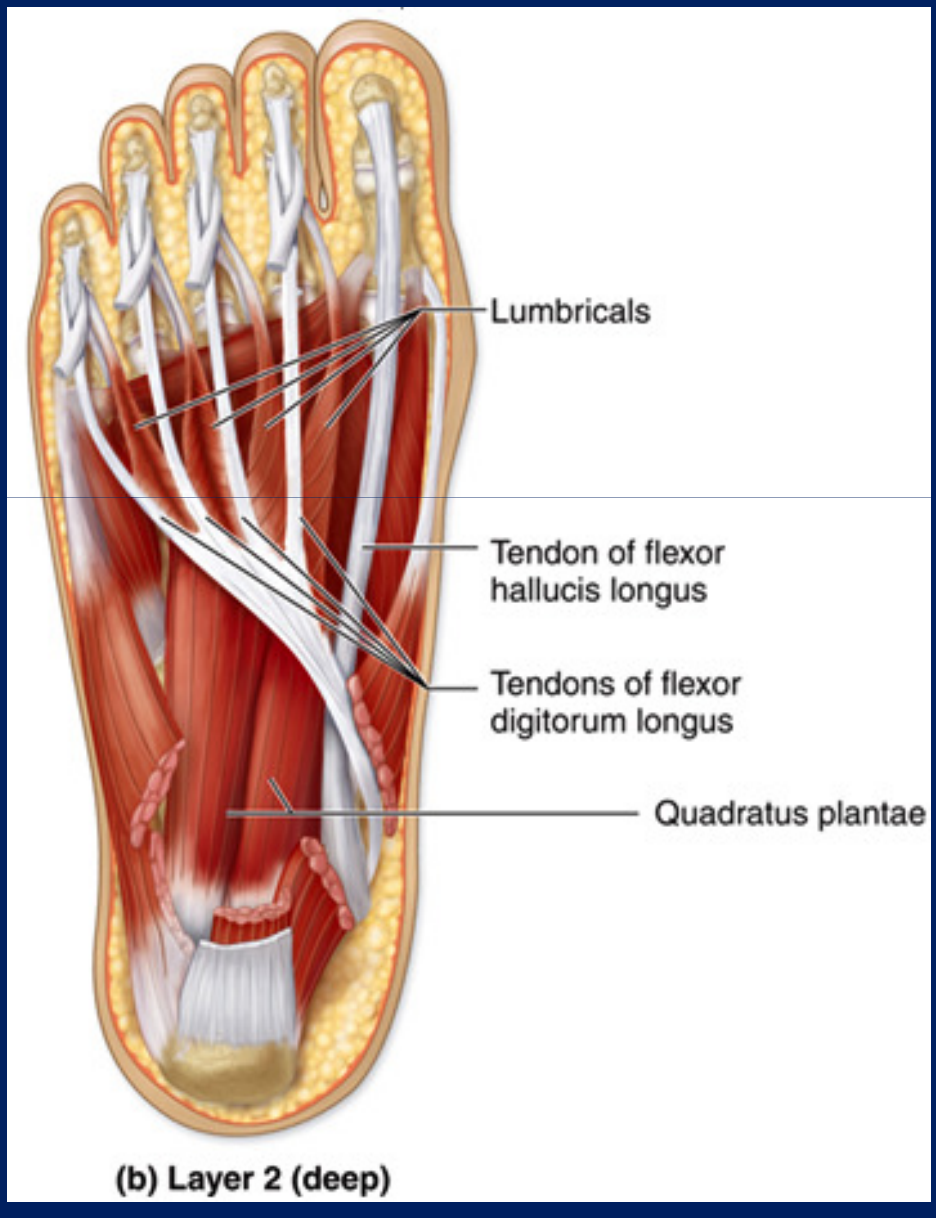
- Abductor hallucis
- Flexor digitorum brevis
- Abductor digiti minimi



Muscles of the Sole of the Foot

Second Layer

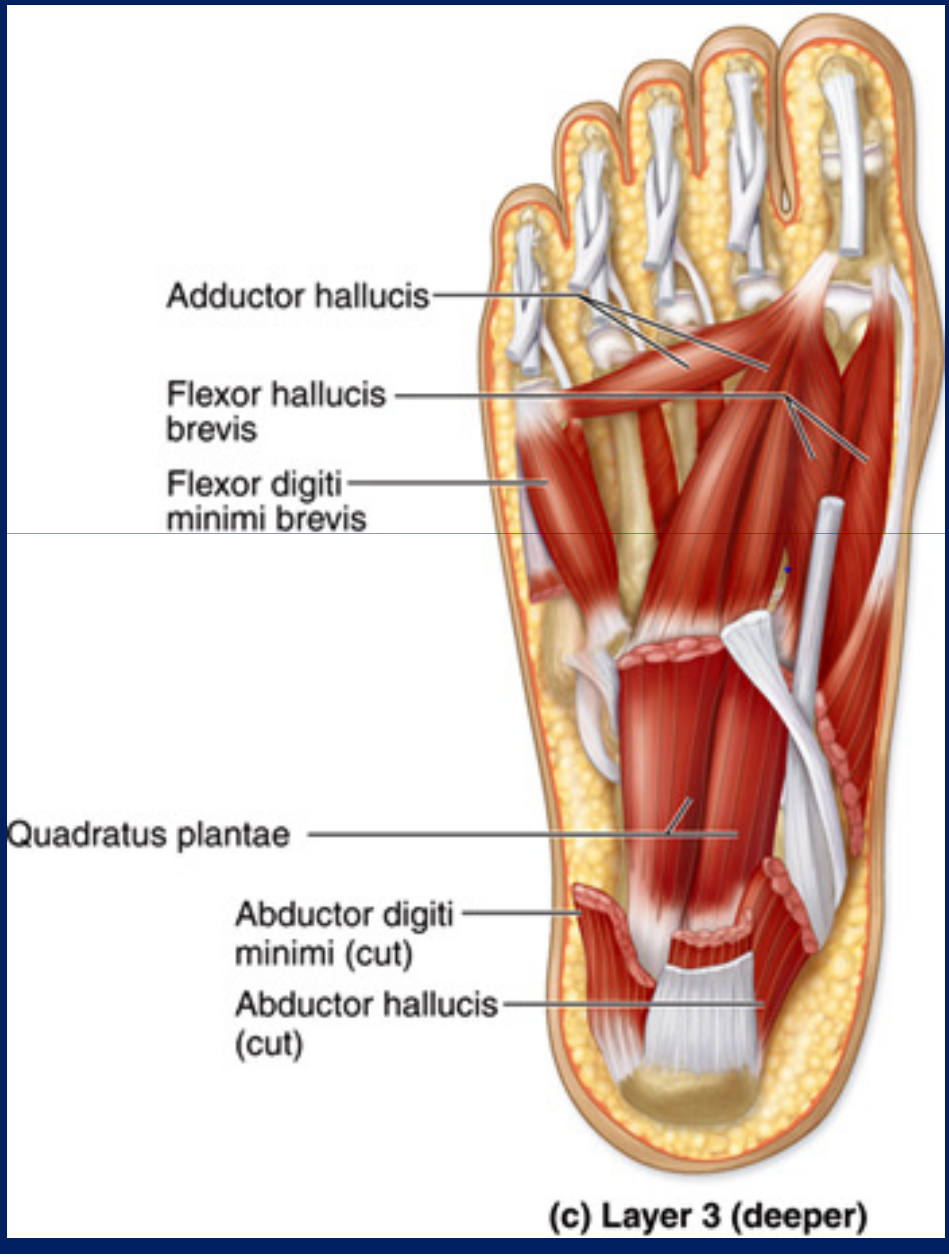
- Quadratus plantae
- Lumbricals (4)
- Flexor digitorum longus tendon
- Flexor hallucis longus tendon



Muscles of the Sole of the Foot

Third Layer

- Flexor hallucis brevis
- Adductor hallucis
- Flexor digiti minimi brevis

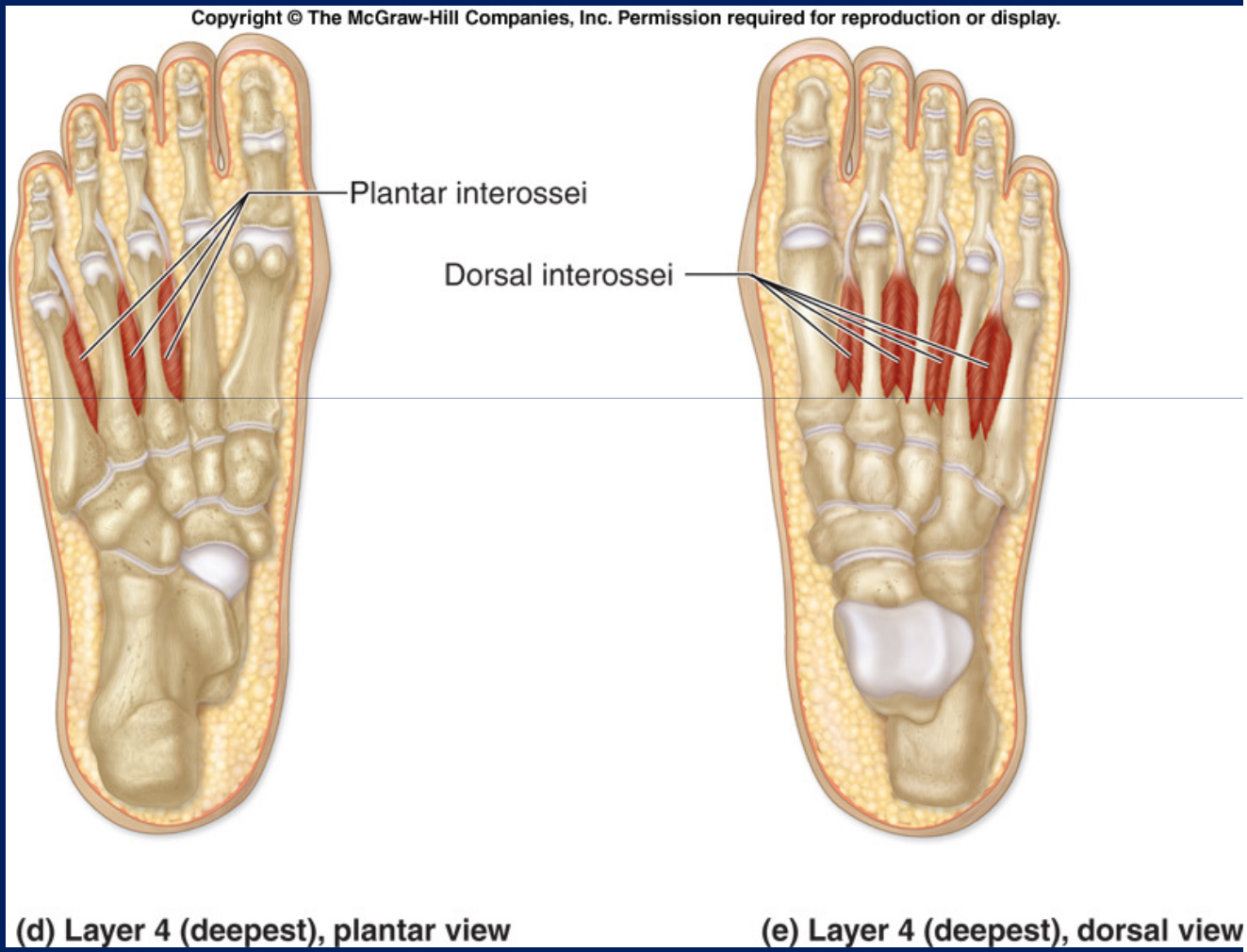


Muscles of the Sole of the Foot

Fourth Layer

Interossei

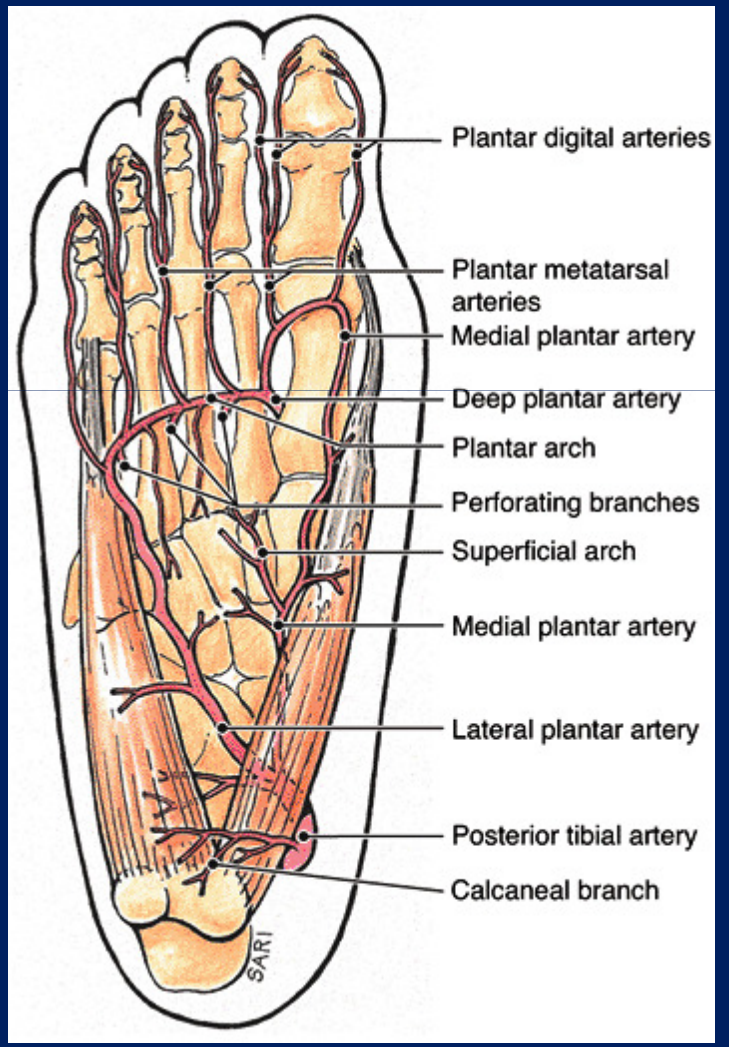
- Dorsal (4)
- Plantar (3)
- Peroneus longus tendon
- Tibialis posterior tendon



Arteries of the Sole of the Foot

1-Lateral Plantar Artery

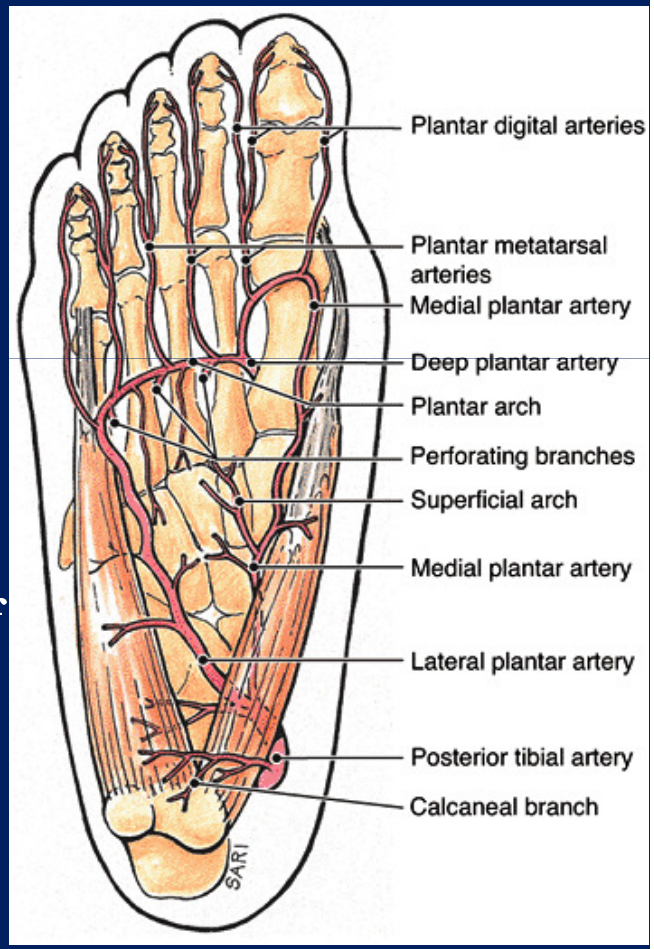
- Is the larger of the terminal branches of the posterior tibial artery. It arises beneath the **flexor retinaculum** and passes forward deep to the abductor hallucis and the flexor digitorum brevis.On reaching the base of the **fifth metatarsal** bone, the artery curves medially to form the plantar arch and at the proximal end of the first intermetatarsal space joins the dorsalis pedis artery). During its course, it gives off numerous muscular, cutaneous, and articular branches. The plantar arch gives off plantar digital arteries to **toes**.



Arteries of the Sole of the Foot

2-Medial Plantar Artery

- Is the smaller of the terminal branches of the posterior tibial artery. It arises beneath the **flexor retinaculum** and passes forward **deep** to abductor hallucis M . It ends by supplying **medial** side of **big toe** . During its course it gives off numerous muscular, cutaneous, and articular branches.

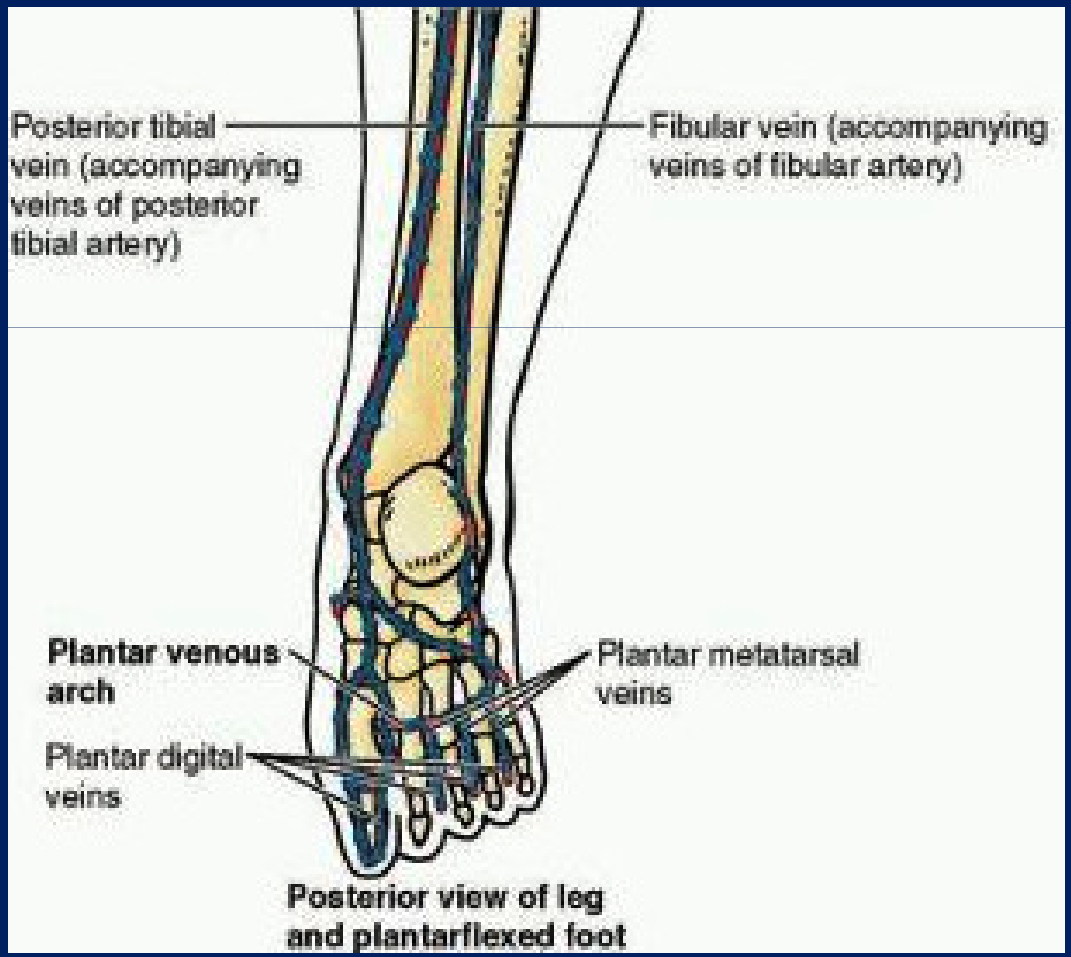


3-Dorsalis Pedis Artery

- On entering the sole between the two heads of the first dorsal interosseous muscle, the artery immediately joins the lateral plantar artery
- **Branches**:The first plantar metatarsal artery, which supplies the cleft between the big and second toes.

Veins of the Sole of the Foot

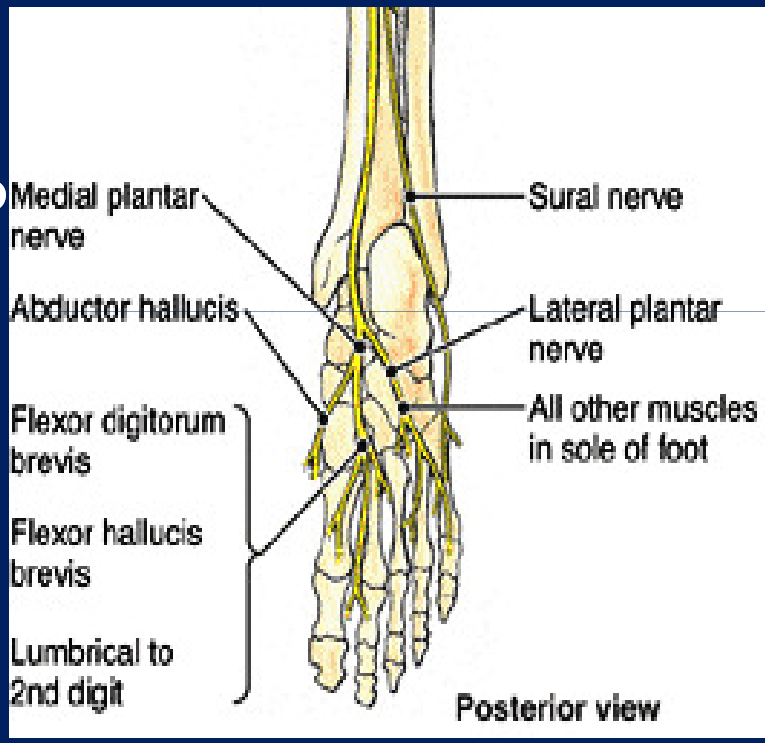
- Medial and lateral plantar veins accompany the **corresponding arteries**, and they unite behind the **medial malleolus** to form the posterior tibial venae comitantes.



Nerves of the Sole of the Foot

Medial Plantar Nerve

- The medial plantar nerve is a terminal branch of the tibial nerve .It arises beneath the flexor retinaculum and runs forward deep to the abductor hallucis, with the medial plantar artery .It comes to lie in the interval between the abductor hallucis and the flexor digitorum brevis.

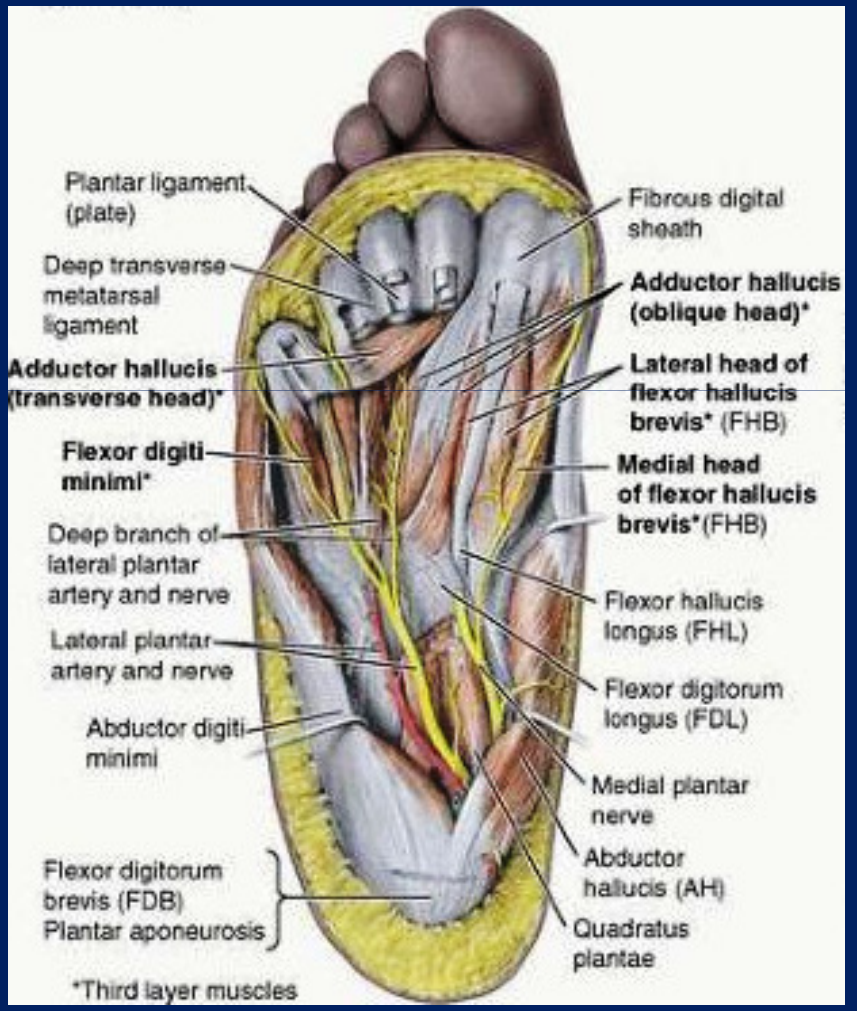


Branches

- Muscular branches to the abductor hallucis, the flexor digitorum brevis, the flexor hallucis brevis, and the first lumbrical muscle.
- Cutaneous branches: Plantar digital nerves run to the sides of the medial three and a half toes . The nerves extend onto the dorsum and supply the nail beds and the tips of the toes.

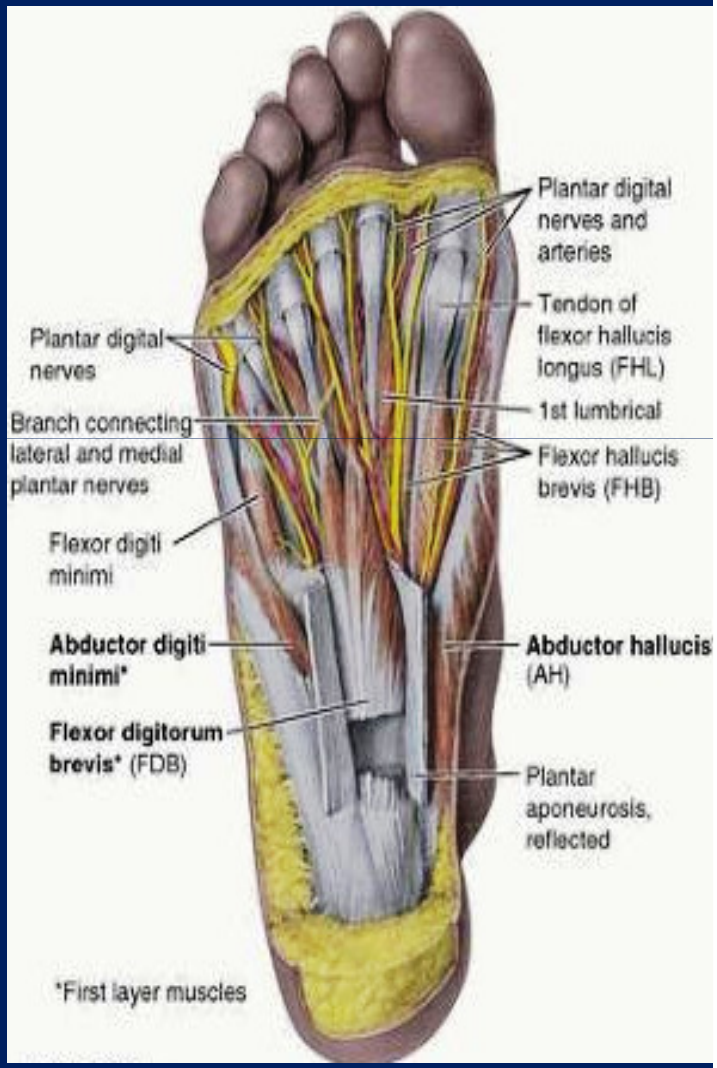
Nerves of the Sole of the Foot
Lateral Plantar Nerve

- The lateral plantar nerve is a terminal branch of the tibial nerve. It arises beneath the flexor retinaculum and runs forward deep to the abductor hallucis and the flexor digitorum brevis, in company with the lateral plantar artery .On reaching the base of the fifth metatarsal bone, it divides into superficial and deep branches.



Branches

- From the main trunk to quadratus plantae and abductor digiti minimi; cutaneous branches to skin of the lateral part of sole
- From the superficial terminal branch to the flexor digiti minimi and the interosseous muscles of the **fourth** intermetatarsal space. Plantar digital branches pass to the sides of the lateral one and a **half toes**. The nerves extend onto the dorsum and supply the **nail beds** and **tips** of the toes.
- From the deep terminal branch .This branch curves medially with the lateral plantar artery and supplies the adductor hallucis; second, third and fourth lumbricals; and all interossei, except those in the fourth intermetatarsal space.



Thank You & Good Luck