The foot

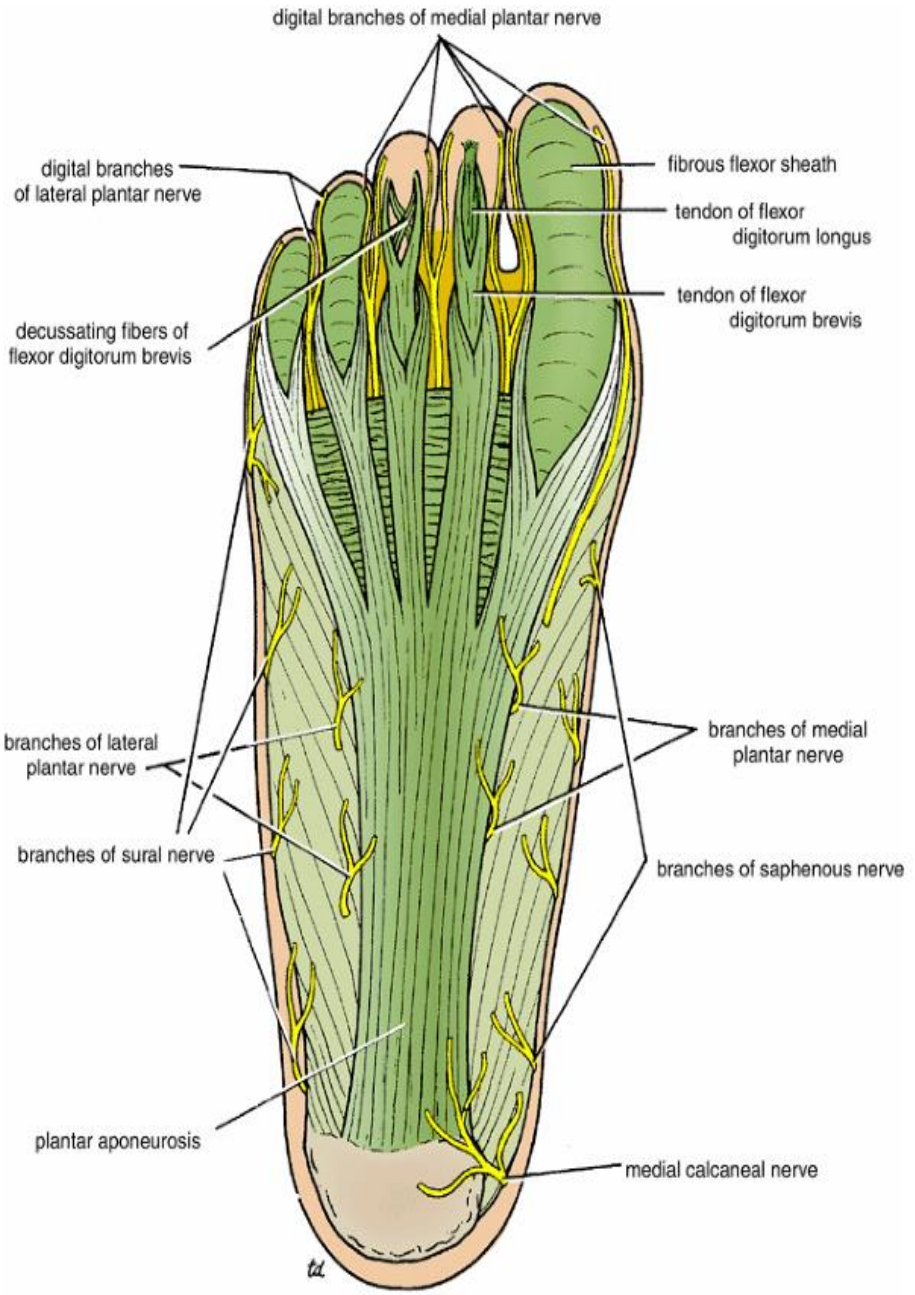
The Foot

- The foot supports the body weight and provides leverage for walking and running.
- It is unique in that it is constructed in the form of arches, which enable it to adapt its shape to uneven surfaces.
- It also serves as a resilient spring to absorb shocks, such as in jumping.

Deep Fascia:

The plantar aponeurosis:

- It 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.



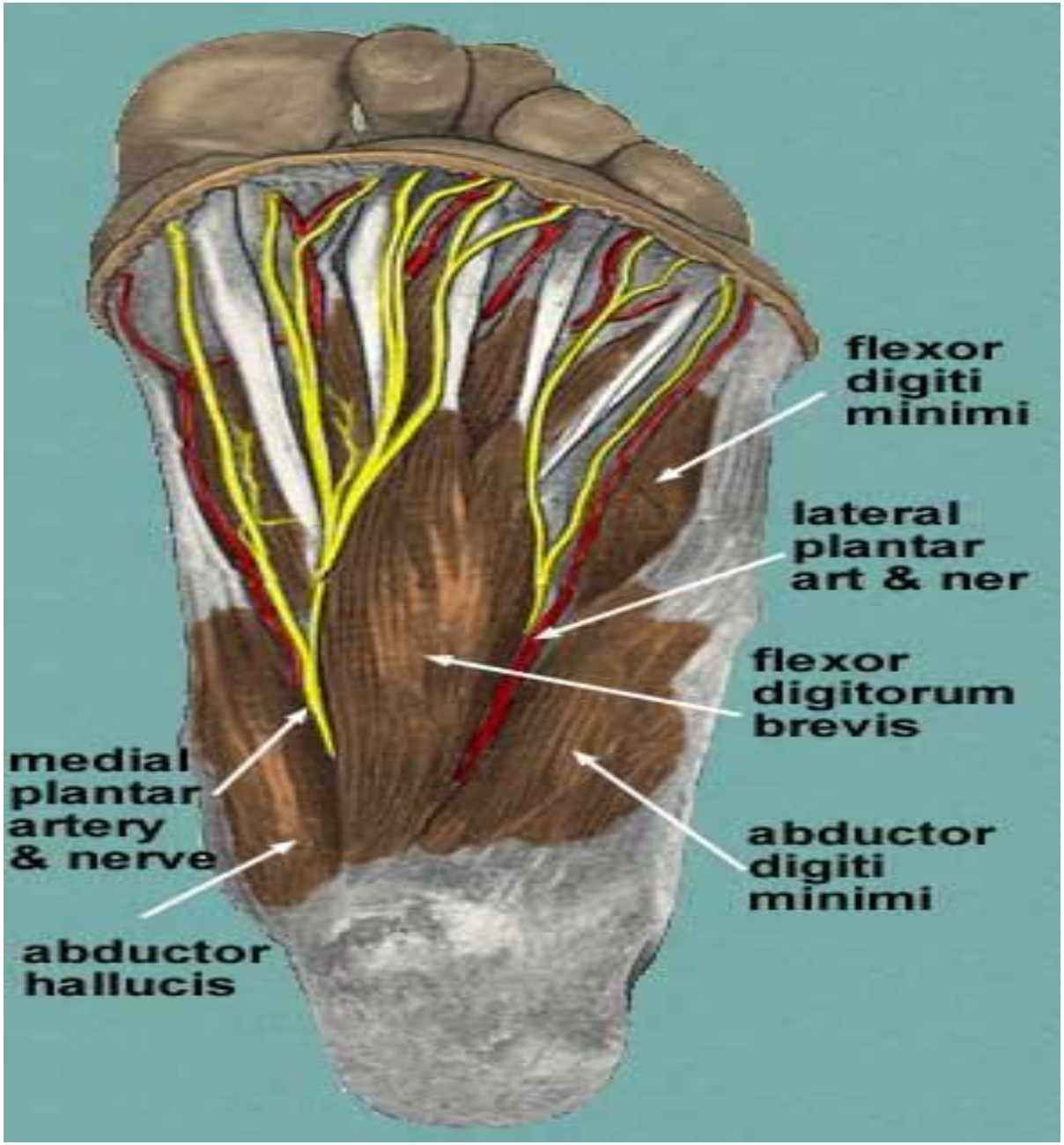
Muscles of the Sole of the Foot

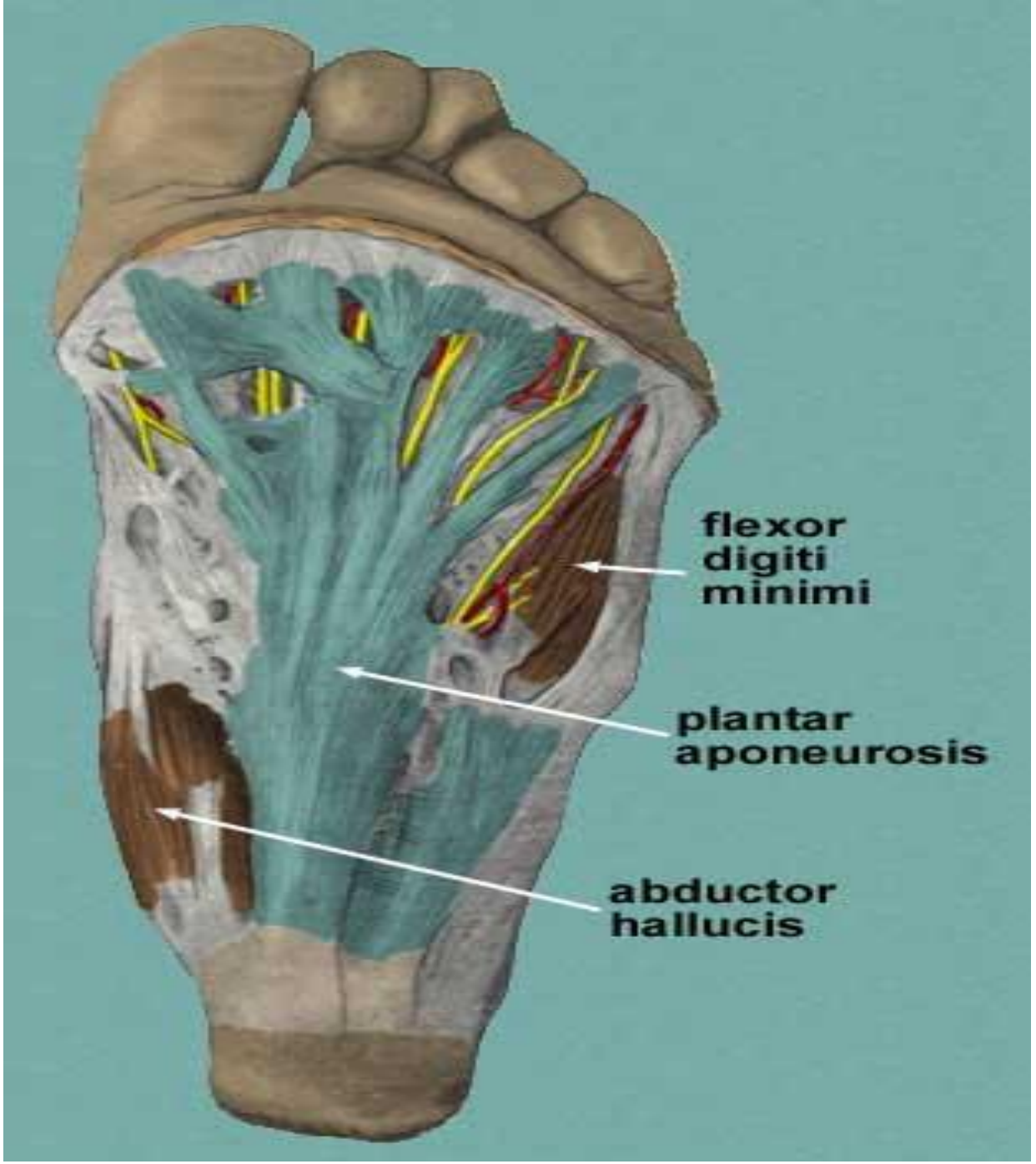
- The muscles of the sole are conveniently described in four layers from the inferior layer superiorly.
- **First layer:** Abductor hallucis, flexor digitorum brevis, abductor digiti minimi
- **Second layer:** Quadratus plantae, lumbricals, flexor digitorum longus tendon, flexor hallucis longus tendon
- **Third layer:** Flexor hallucis brevis, adductor hallucis, flexor digiti minimi brevis
- **Fourth layer:** Interossei, peroneus longus tendon, tibialis posterior tendon

- 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.
- Although their names would suggest control of individual toes, this function is rarely used in most people.

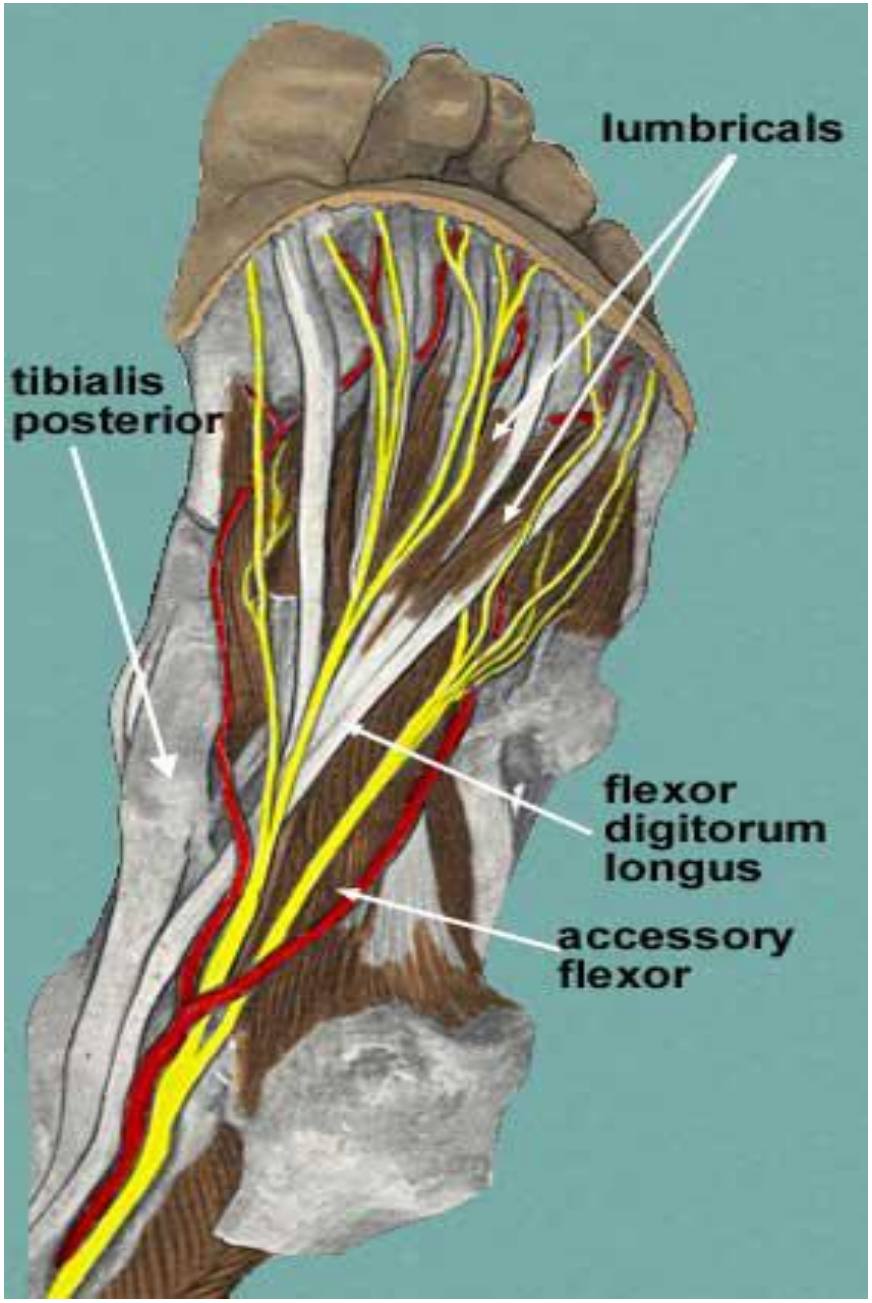
Muscles of the Sole of the Foot

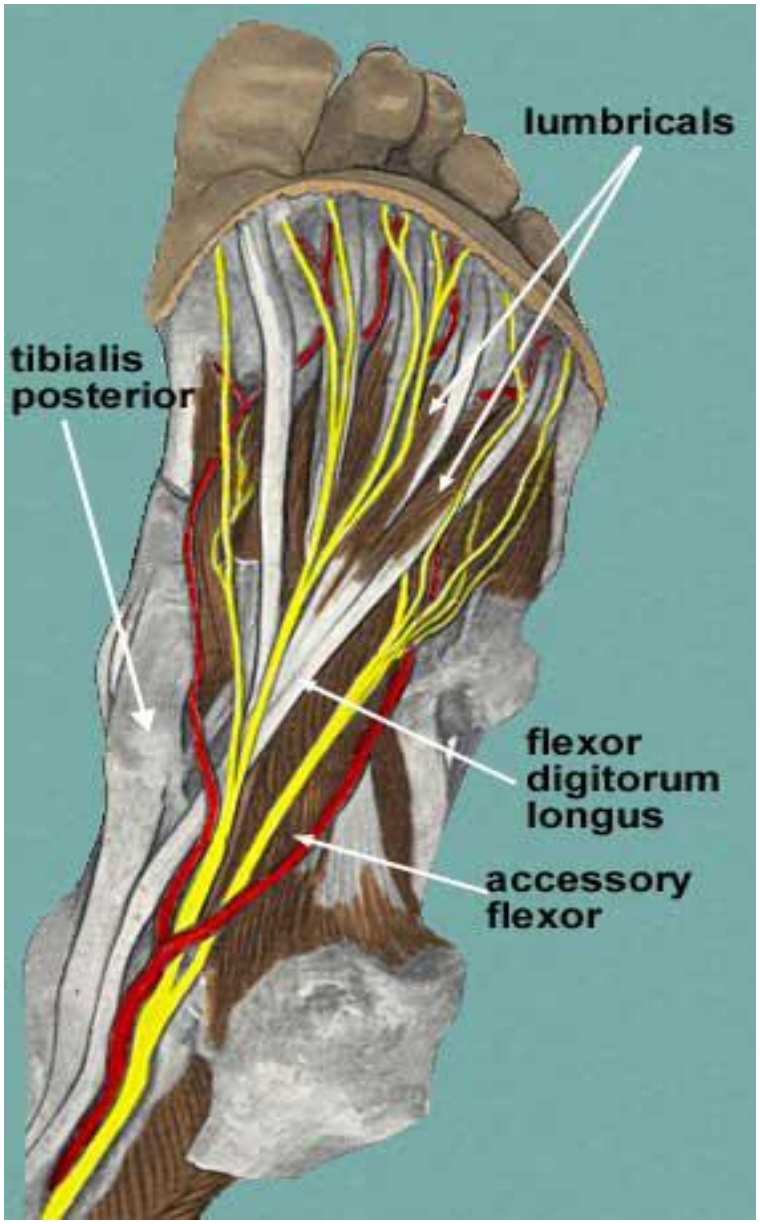
Muscle	Origin	Insertion	Nerve Supply	Nerve Rootsa	Action
First Layer					
Abductor hallucis	Medial tuberosity of calcaneum and flexor retinaculum	Base of proximal phalanx of big toe	Medial plantar nerve	S2, **3**	Flexes and abducts big toe; braces medial longitudinal arch
Flexor digitorum brevis	Medial tubercle of calcaneum	Four tendons to four lateral toesâ€" inserted into borders of middle phalanx; tendons perforated by those of flexor digitorum longus	Medial plantar nerve	S2, **3**	Flexes lateral four toes; braces medial and lateral longitudinal arches
Abductor digiti minimi	Medial and lateral tubercles of calcaneum	Base of proximal phalanx of fifth toe	Lateral plantar nerve	S2, **3**	Flexes and abducts fifth toe; braces lateral longitudinal arch


flexor digiti minimi
lateral plantar art & ner
flexor digitorum brevis
medial plantar artery & nerve
abductor digiti minimi
abductor hallucis

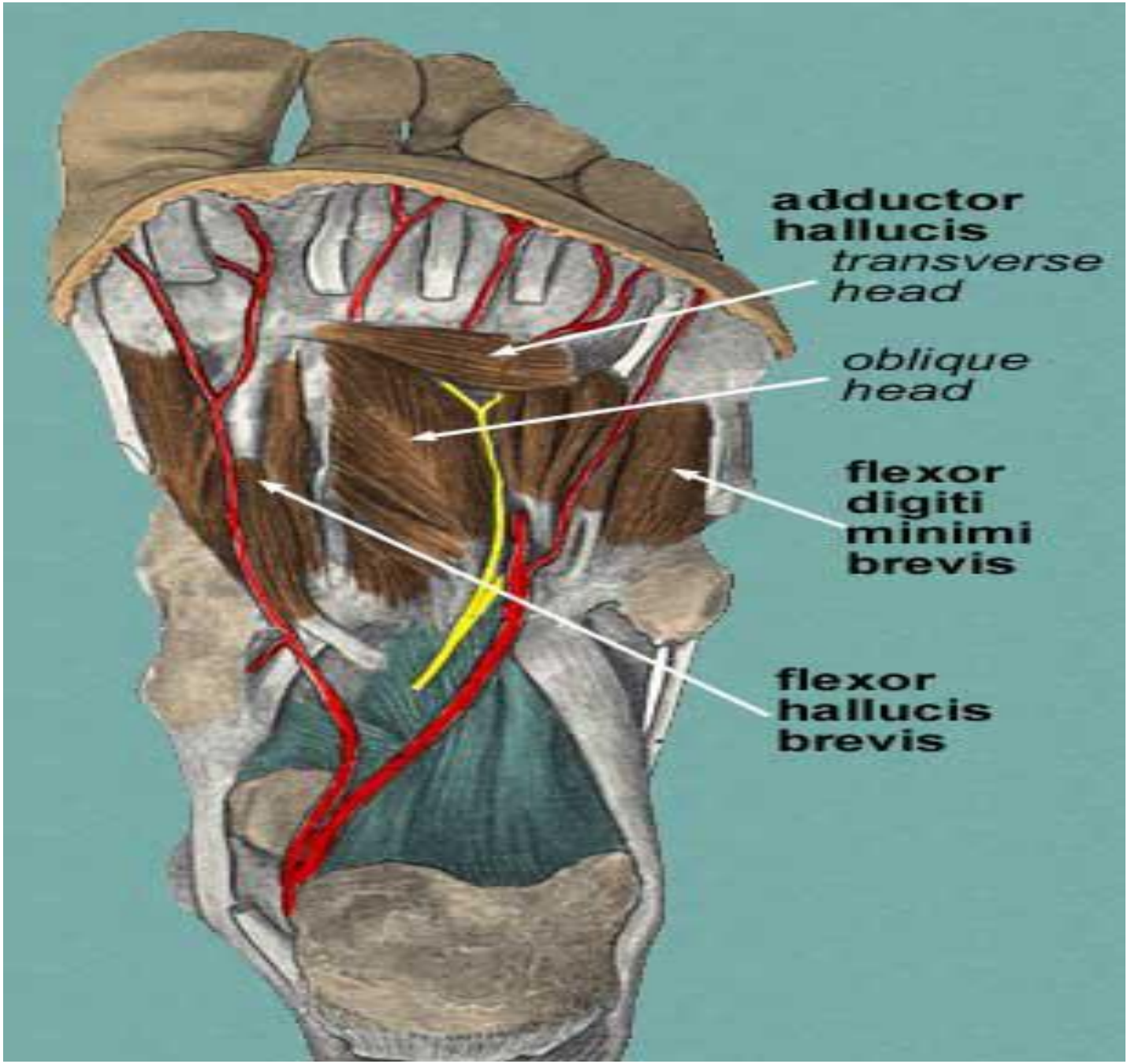

flexor
digiti
minimi
plantar
aponeurosis
abductor
hallucis

Second Layer					
Quadratus plantae	Medial and lateral sides of calcaneum	Tendon of flexor digitorum longus	Lateral plantar nerve	S2, **3**	Assists flexor digitorum longus in flexing lateral four toes
Lumbricals (4)	Tendons of flexor digitorum longus	Dorsal extensor expansion; bases of proximal phalanges of lateral four toes	First lumbrical: medial plantar nerve; remainder: lateral plantar nerve	S2, **3**	Extends toes at interphalangeal joints
Flexor digitorum longus tendon					
Flexor hallucis longus tendon					

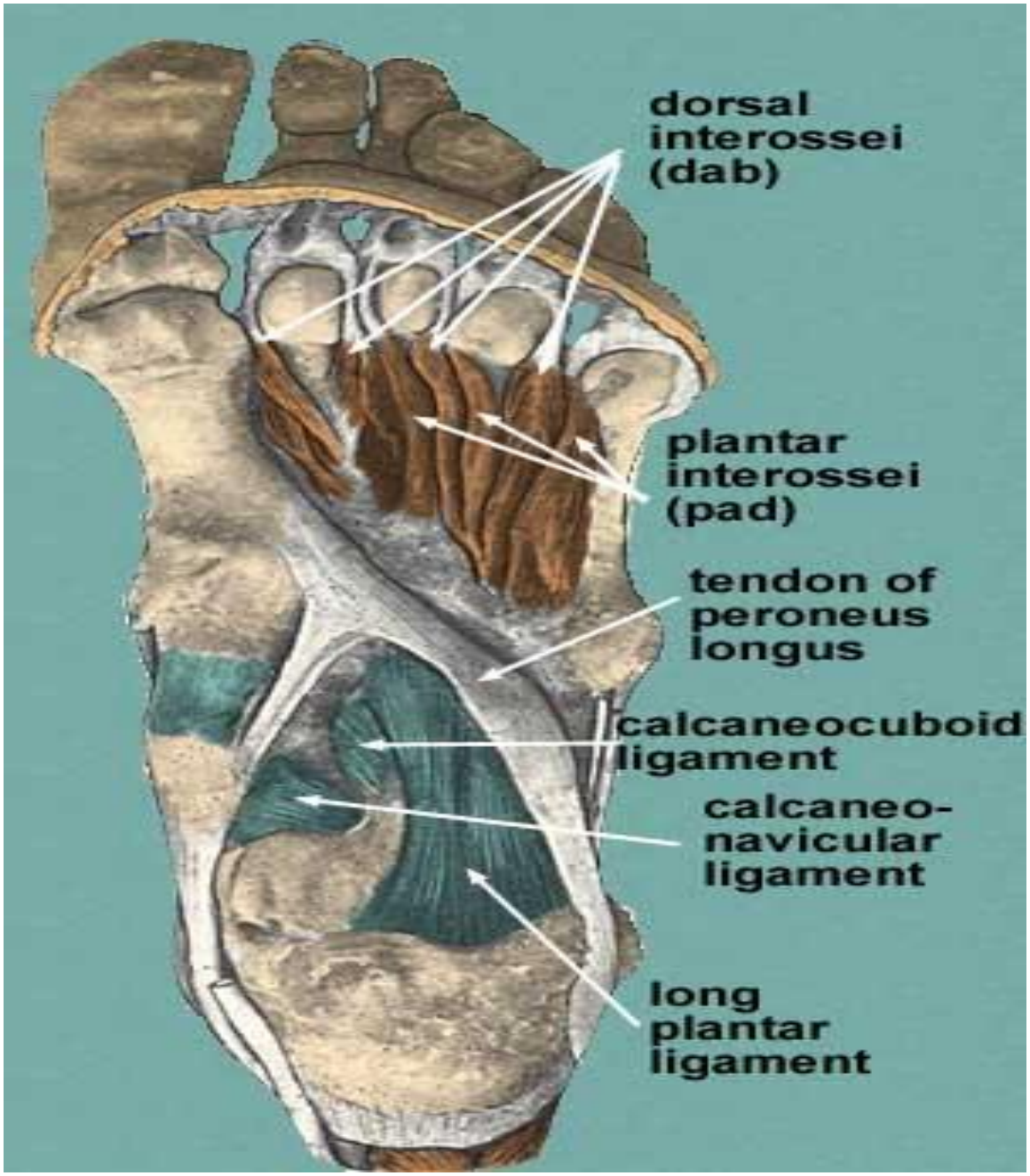

lumbricals
tibialis posterior
flexor digitorum longus
accessory flexor


lumbricals
tibialis posterior
flexor digitorum longus
accessory flexor

Third Layer					
Flexor hallucis brevis	Cuboid, lateral cuneiform, tibialis posterior insertion	Medial tendon into medial side of base of proximal phalanx of big toe; lateral tendon into lateral side of base of proximal phalanx of big toe	Medial plantar nerve	S2, **3**	Flexes metatarsophalangeal joint of big toe; supports medial longitudinal arch
Adductor hallucis	Oblique head bases of second, third, and fourth metatarsal bones; transverse head from plantar ligaments	Lateral side of base of proximal phalanx of big toe	Deep branch lateral plantar nerve	S2, **3**	Flexes metatarsophalangeal joint of big toe; holds together metatarsal bones
Flexor digiti minimi brevis	Base of fifth metatarsal bone	Lateral side of base of proximal phalanx of little toe	Lateral plantar nerve	S2, **3**	Flexes metatarsophalangeal joint of little toe


adductor hallucis
transverse head
oblique head
flexor digiti minimi brevis
flexor hallucis brevis

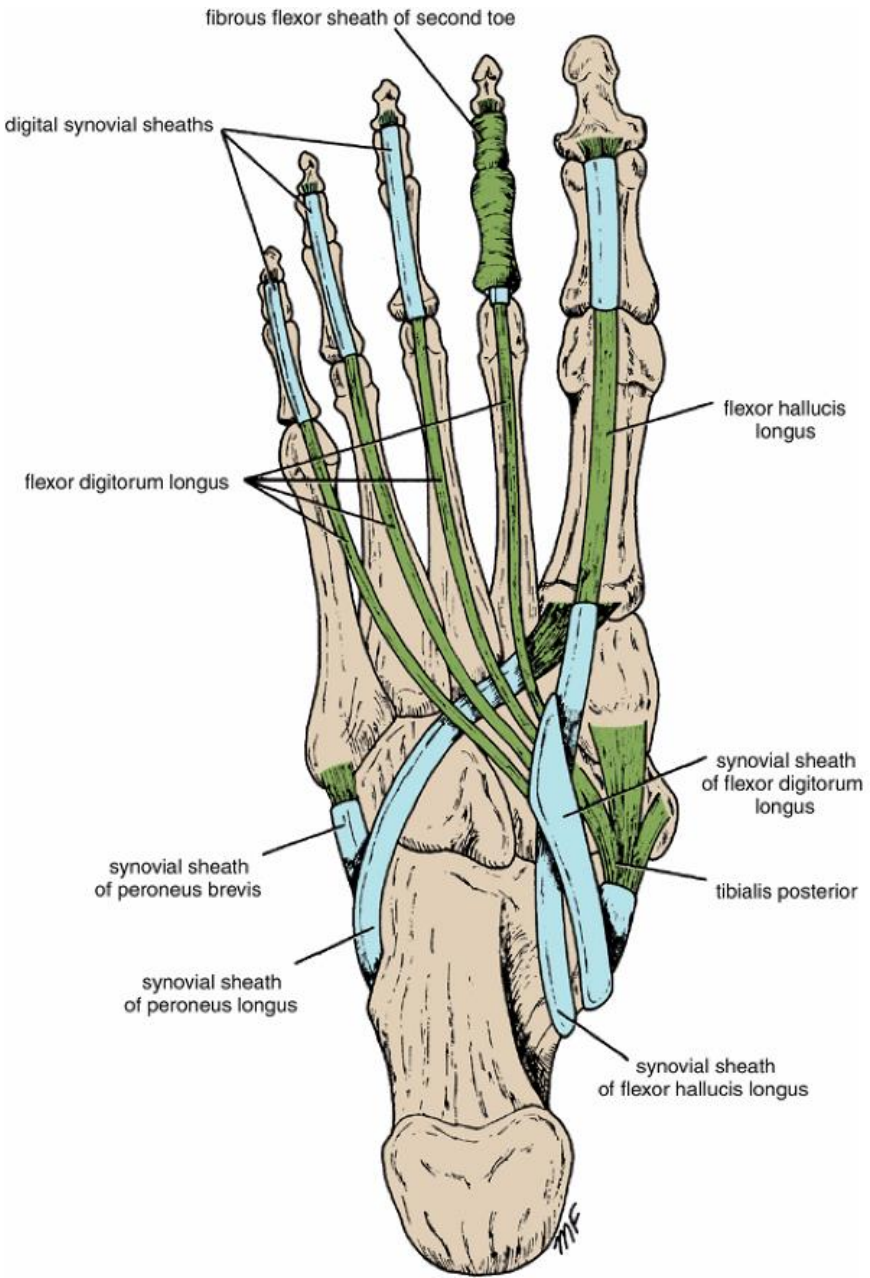
Fourth Layer				
Interossei				
Dorsal (4)	Adjacent sides of metatarsal bones	Bases of proximal phalangesâ€”first: medial side of second toe; remainder: lateral sides of second, third, and fourth toesâ€”also dorsal extensor expansion	Lateral plantar nerve	Abduction of toes; flexes metatarsophalangeal joints and extends interphalangeal joints
Plantar (3)	Inferior surfaces of third, fourth, and fifth metatarsal bones	Medial side of bases of proximal phalanges of lateral three toes	Lateral plantar nerve	Adduction of toes; flexes metatarsophalangeal joints and extends interphalangeal joints
Peroneus longus tendon				
Tibialis posterior tendon				


dorsal interossei (dab)
plantar interossei (pad)
tendon of peroneus longus
calcaneocuboid ligament
calcaneo-navicular ligament
long plantar ligament

Long Tendons of the Sole of the Foot

Flexor Digitorum Longus Tendon

- The flexor digitorum longus tendon enters the sole by passing behind the medial malleolus beneath the flexor retinaculum



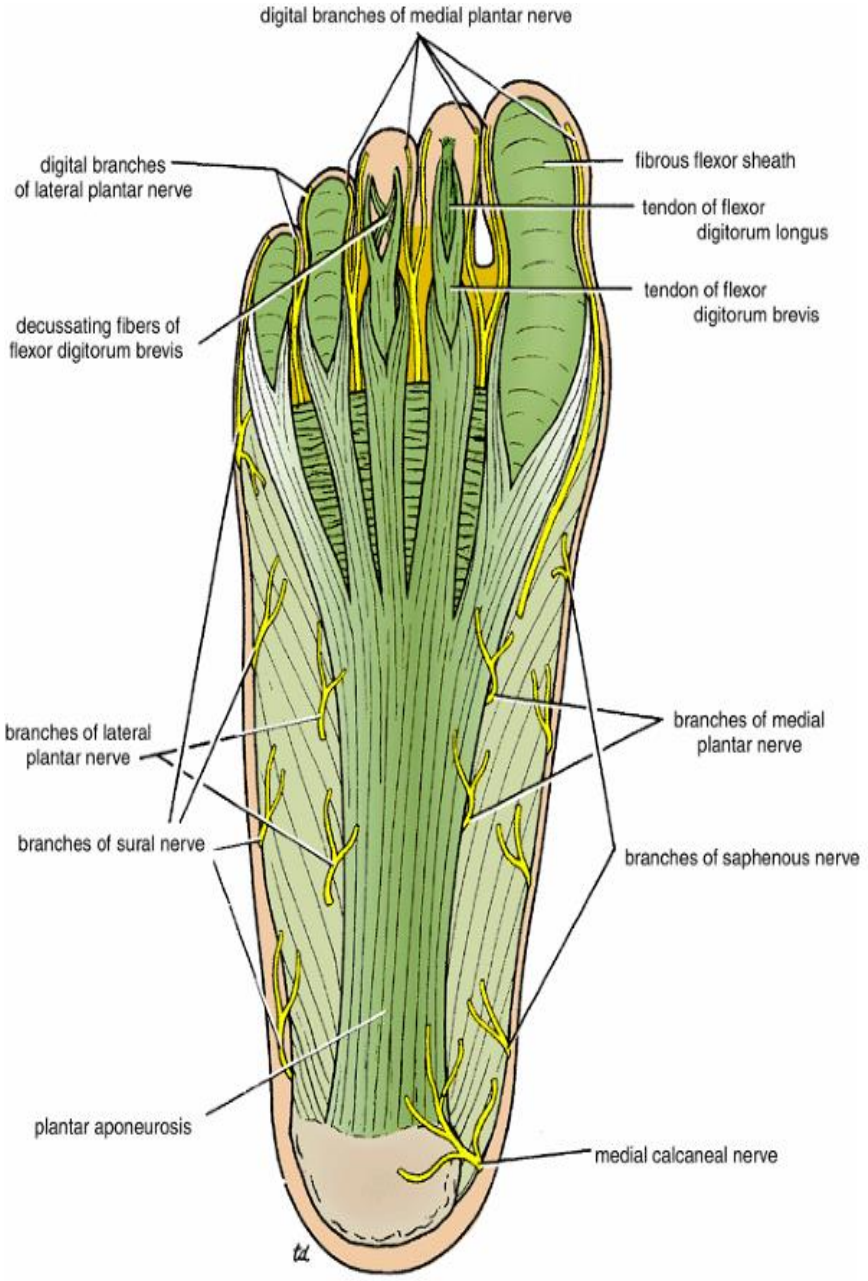
- It passes forward across the medial surface of the sustentaculum tali and then crosses the tendon of flexor hallucis longus, from which it receives a strong slip.

- It is here that it receives on its lateral border the insertion of the quadratus plantae muscle.

- The tendon now divides into its four tendons of insertion, which pass forward, giving origin to the lumbrical muscles.

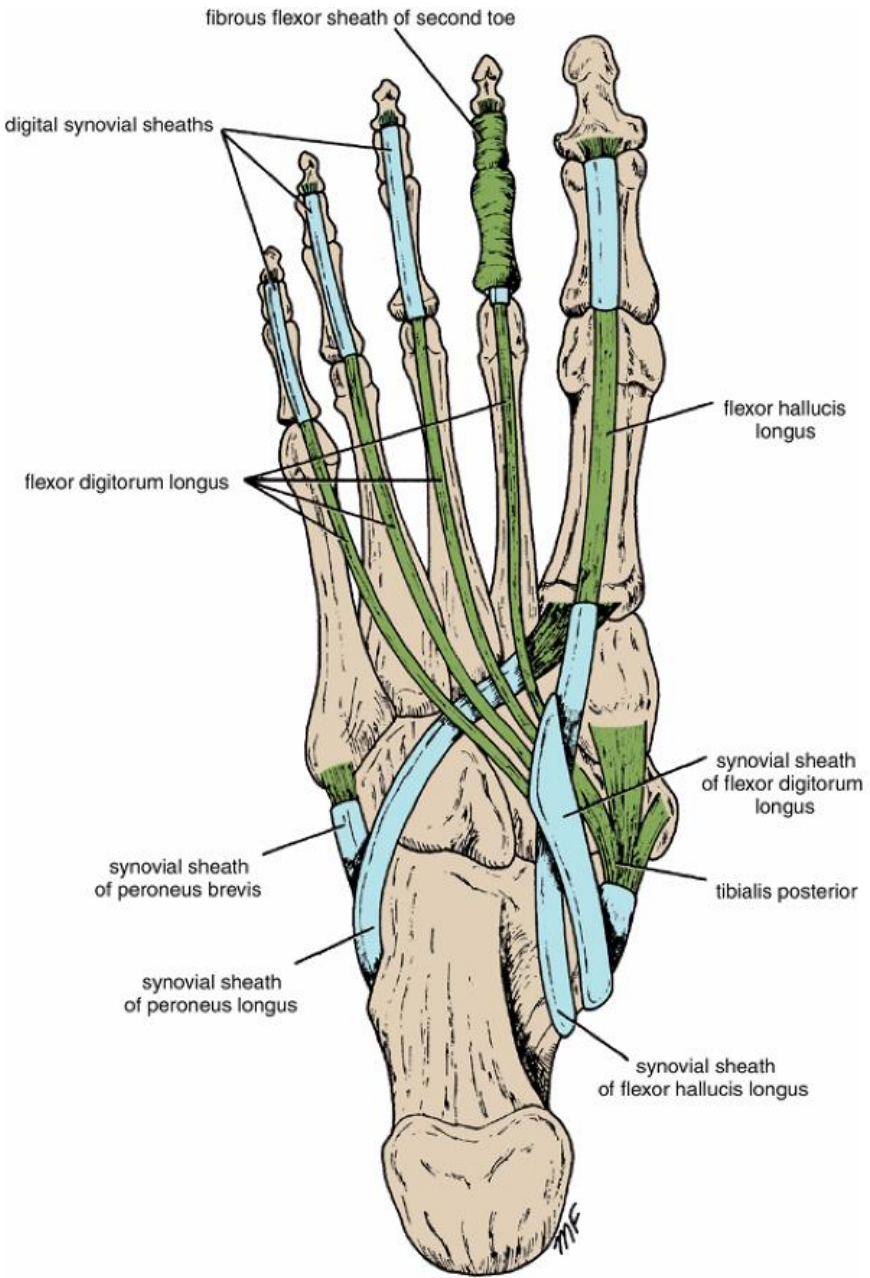
- The tendons then enter the fibrous sheaths of the lateral four toes

- Each tendon perforates the corresponding tendon of flexor digitorum brevis and passes on to be inserted into the base of the distal phalanx. It should be noted that the method of insertion is similar to that found for the flexor digitorum profundus in the hand



Flexor Hallucis Longus Tendon

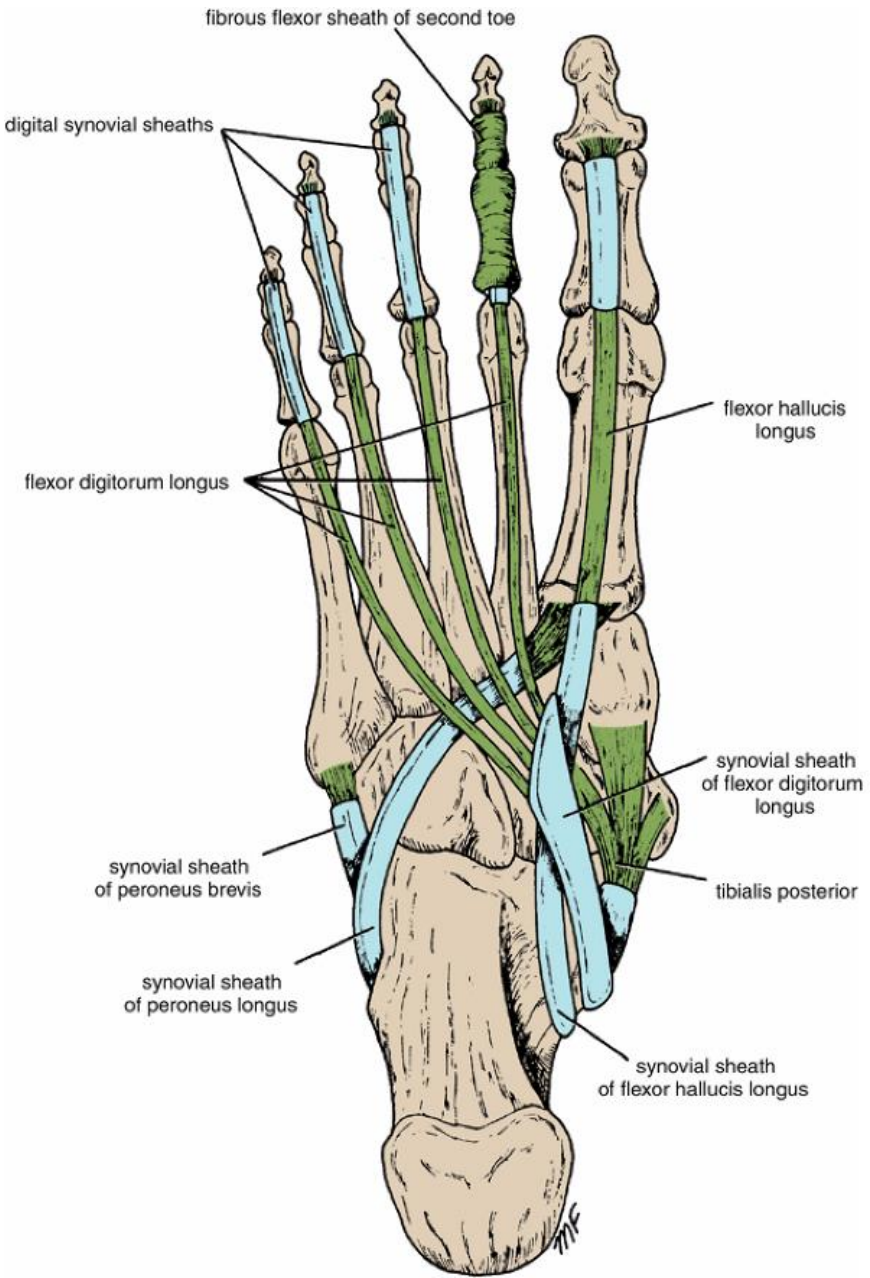
- The flexor hallucis longus tendon enters the sole by passing behind the medial malleolus beneath the flexor retinaculum.
- It runs forward below the sustentaculum tali and crosses deep to the flexor digitorum longus tendon, to which it gives a strong slip.
- It then enters the fibrous sheath of the big toe and is inserted into the base of the distal phalanx.



Fibrous Flexor Sheaths:

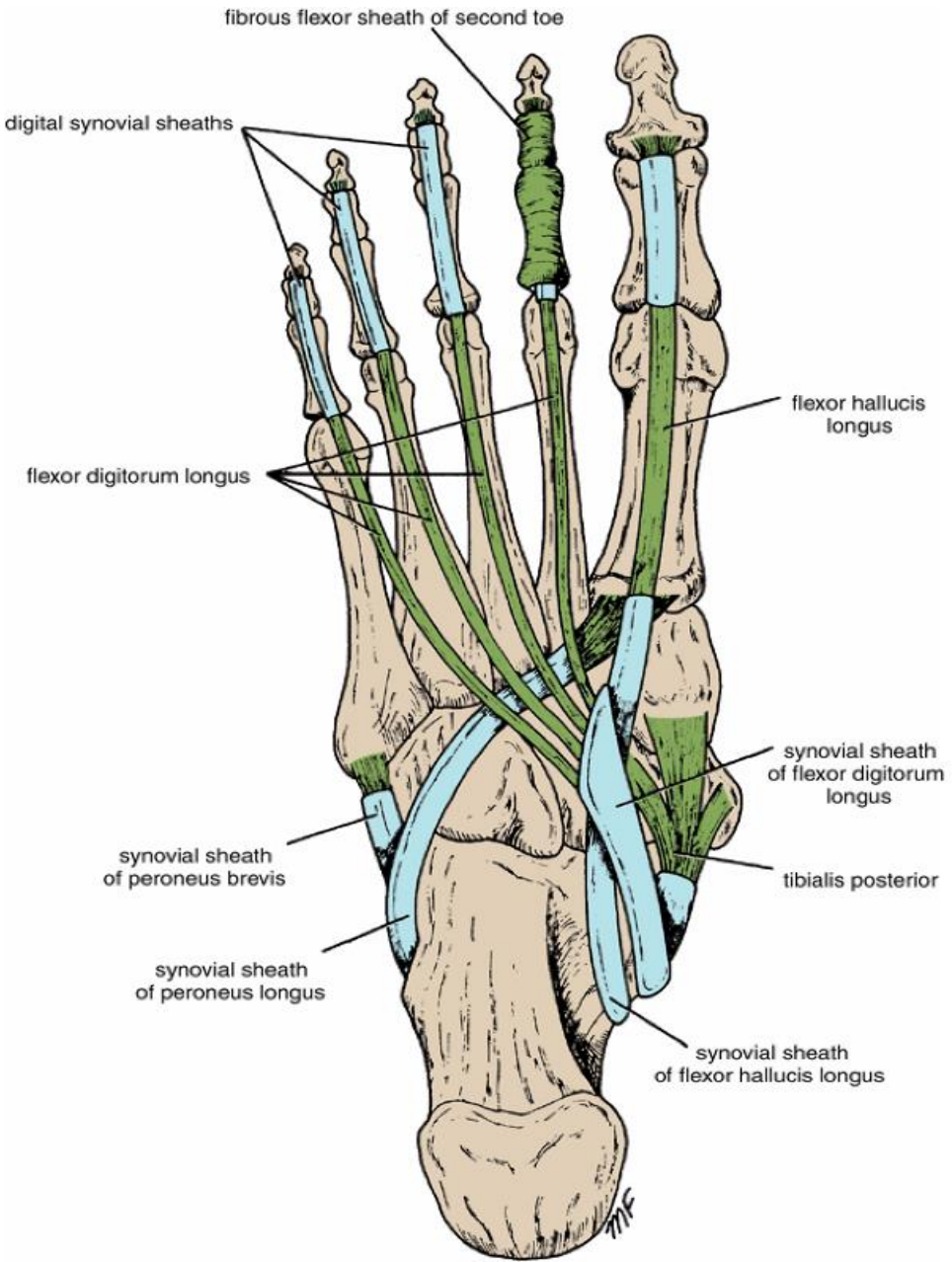
- The inferior surface of each toe, from the head of the metatarsal bone to the base of the distal phalanx, is provided with a strong fibrous sheath, which is attached to the sides of the phalanges

- 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 toe**



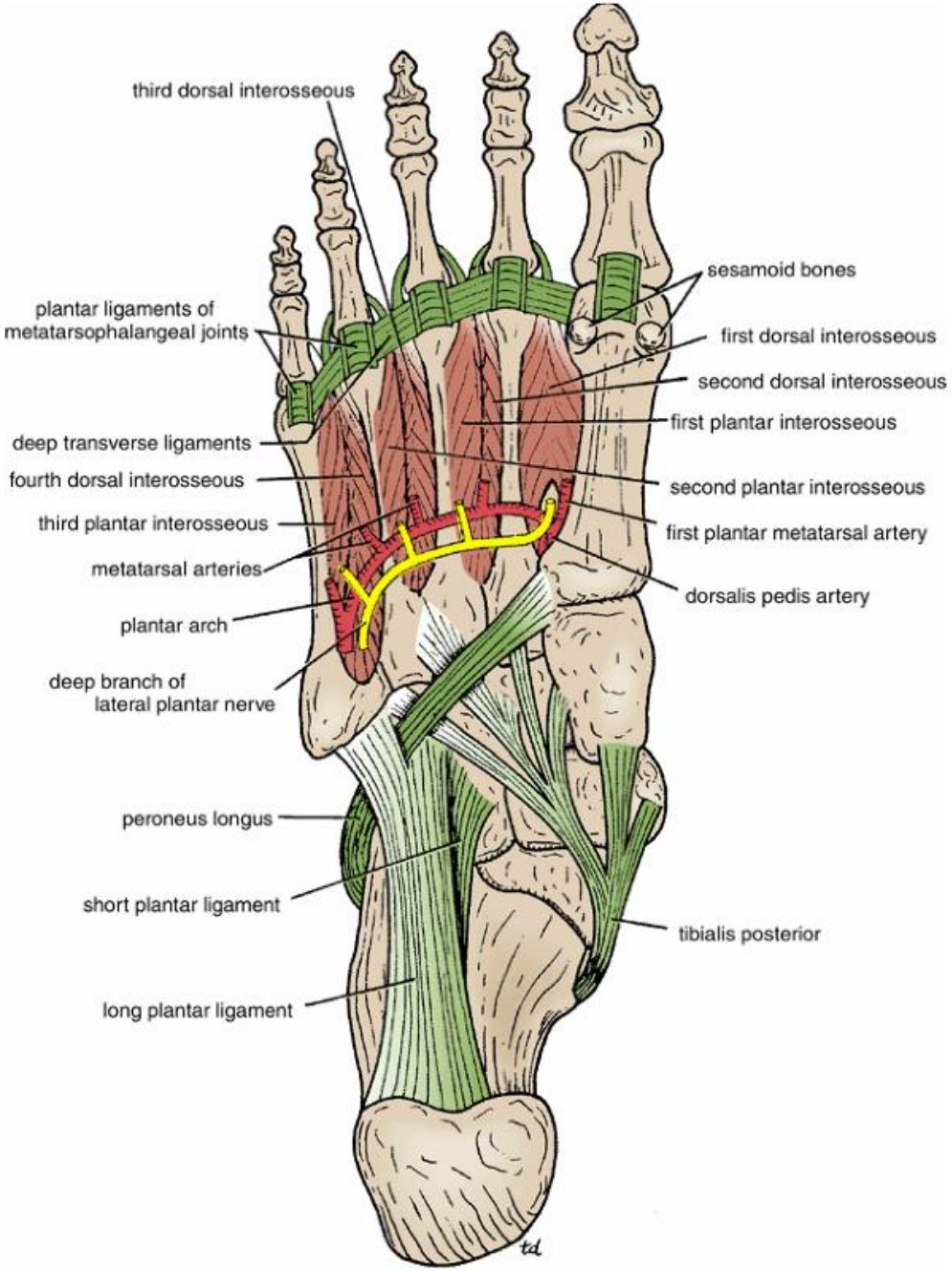
Synovial Flexor Sheaths:

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

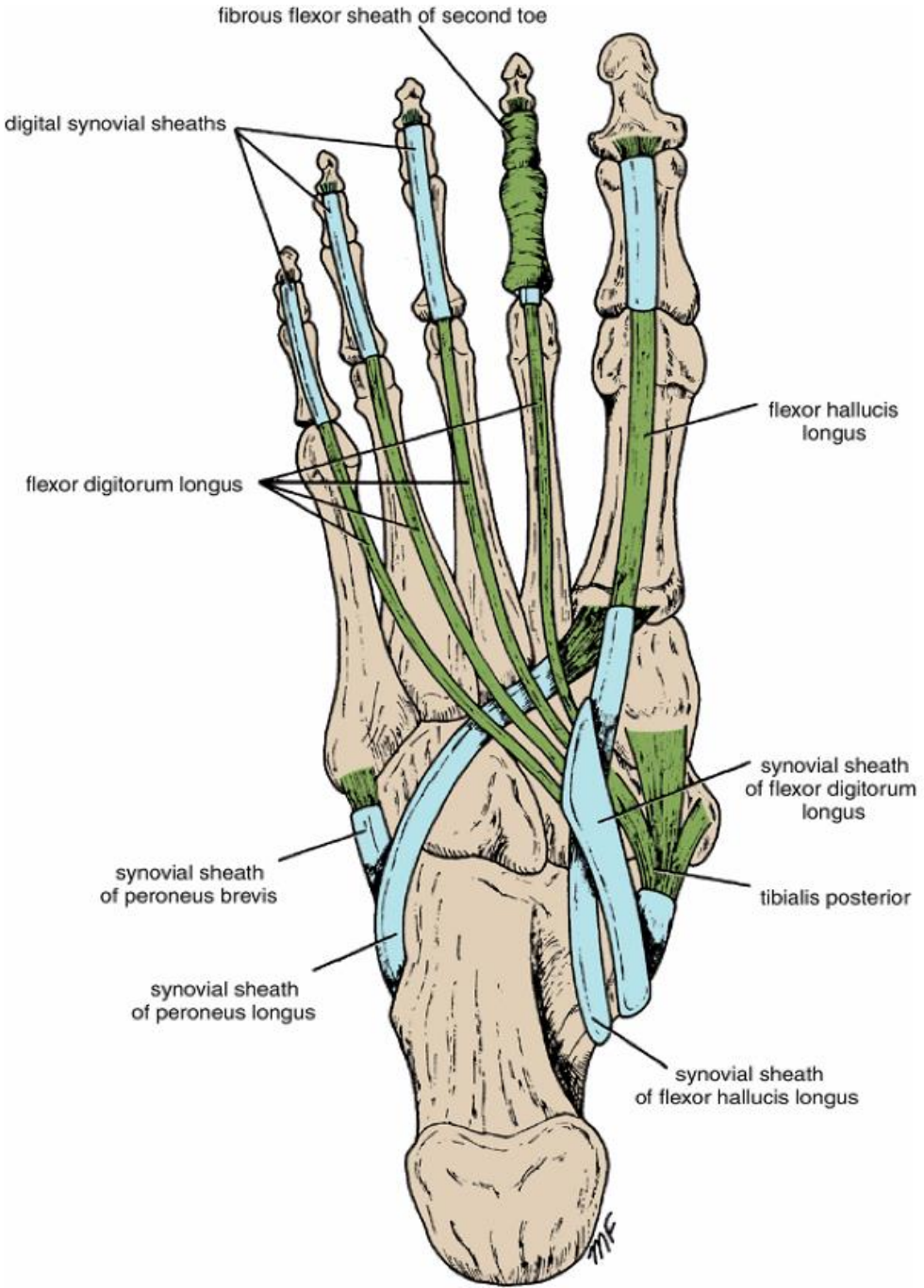


Peroneus Longus Tendon

- The peroneus longus tendon enters the foot from behind the lateral malleolus and runs obliquely across the sole to be inserted into the base of the first metatarsal bone and the adjacent part of the medial cuneiform

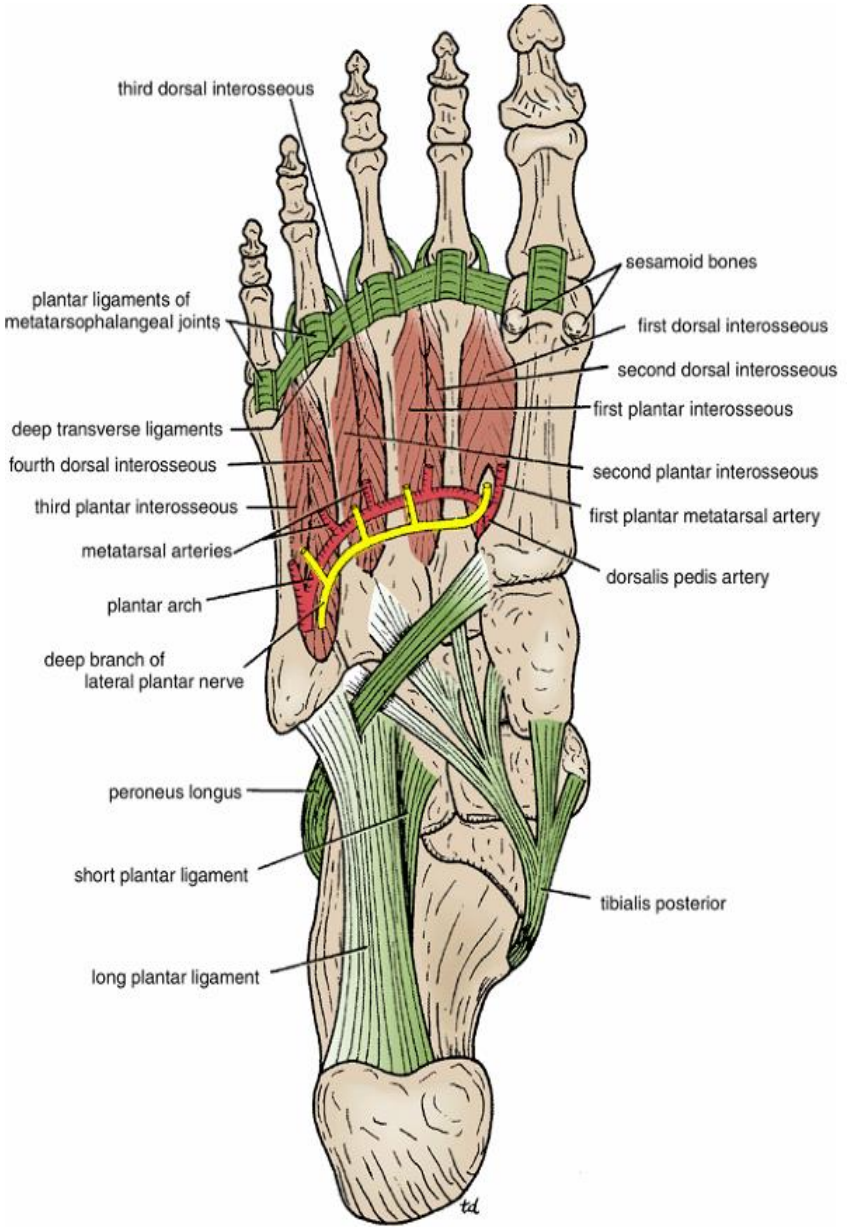


- The tendon grooves the inferior surface of the cuboid where it is held in position by the long plantar ligament and is surrounded by a synovial sheath



Tibialis Posterior Tendon

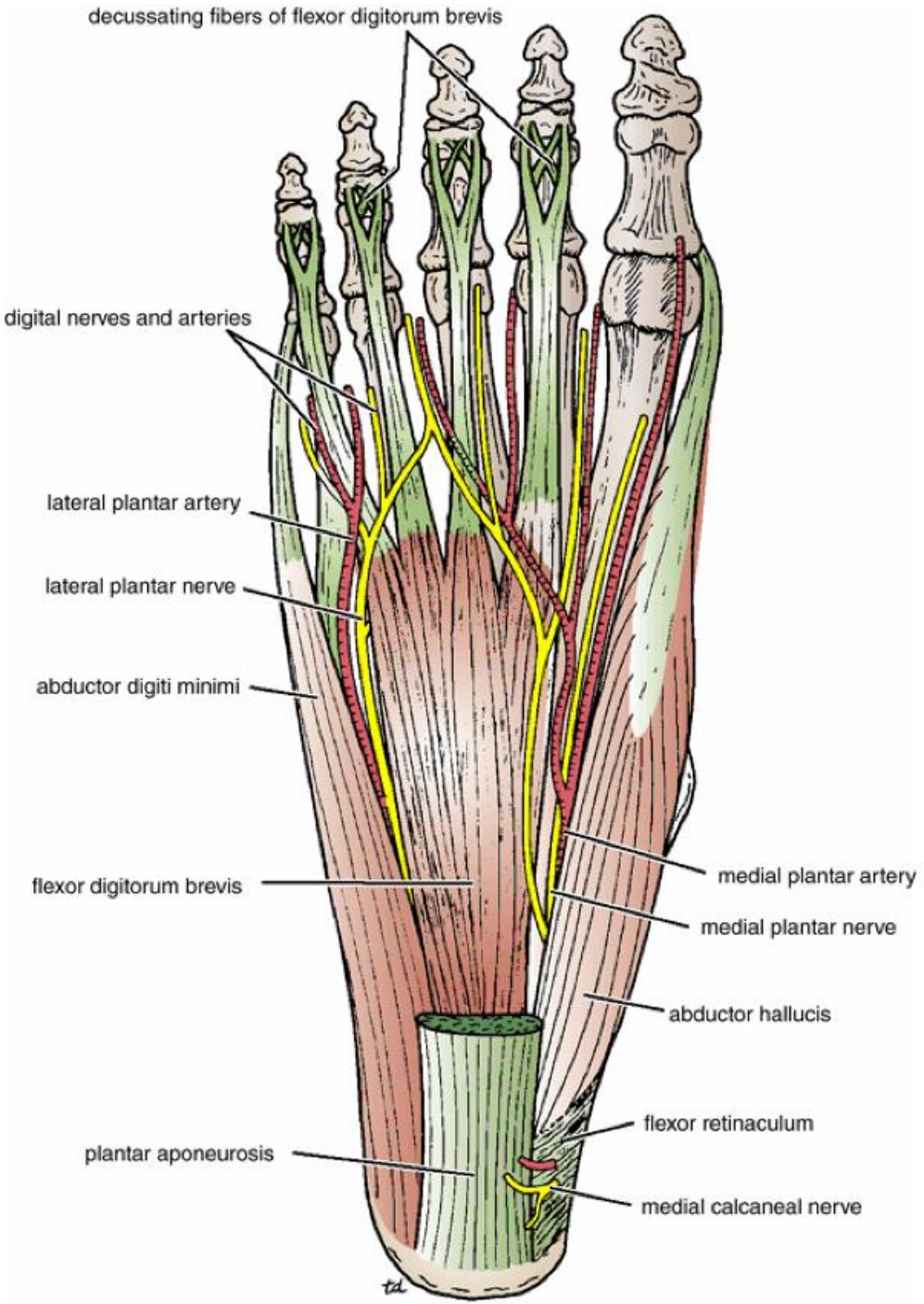
- The tibialis posterior tendon enters the foot from behind the medial malleolus.
- It passes beneath the flexor retinaculum and runs downward and forward above the sustentaculum tali to be inserted mainly into the tuberosity of the navicular.
- Small tendinous slips pass to the cuboid and the cuneiforms and to the bases of the second, third, and fourth metatarsals.
- The tendon is surrounded by a synovial sheath.



Arteries of the Sole of the Foot

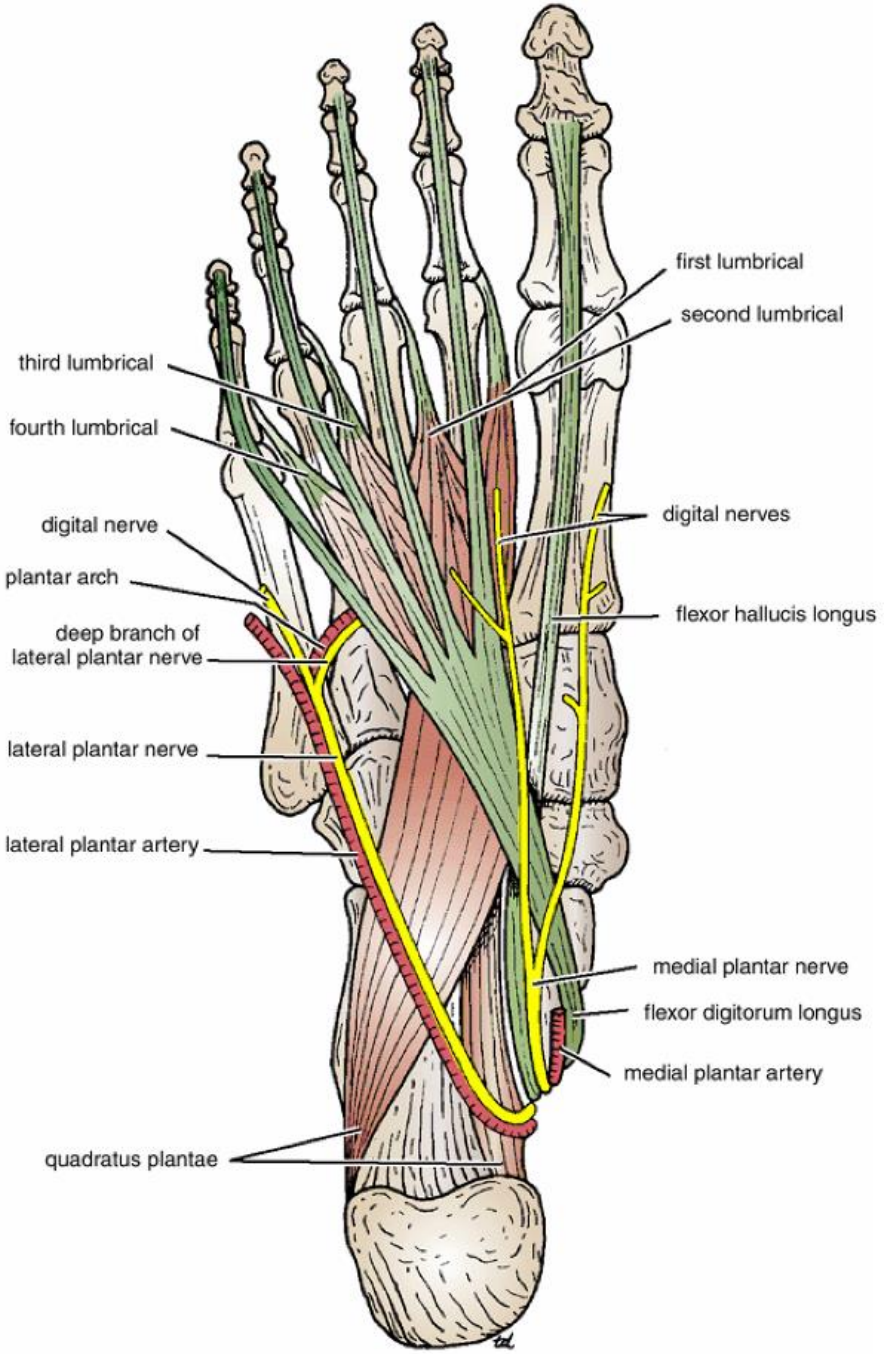
Medial Plantar Artery

- The 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 the abductor hallucis muscle
- It ends by supplying the medial side of the big toe
- During its course it gives off **numerous muscular, cutaneous, and articular branches.**



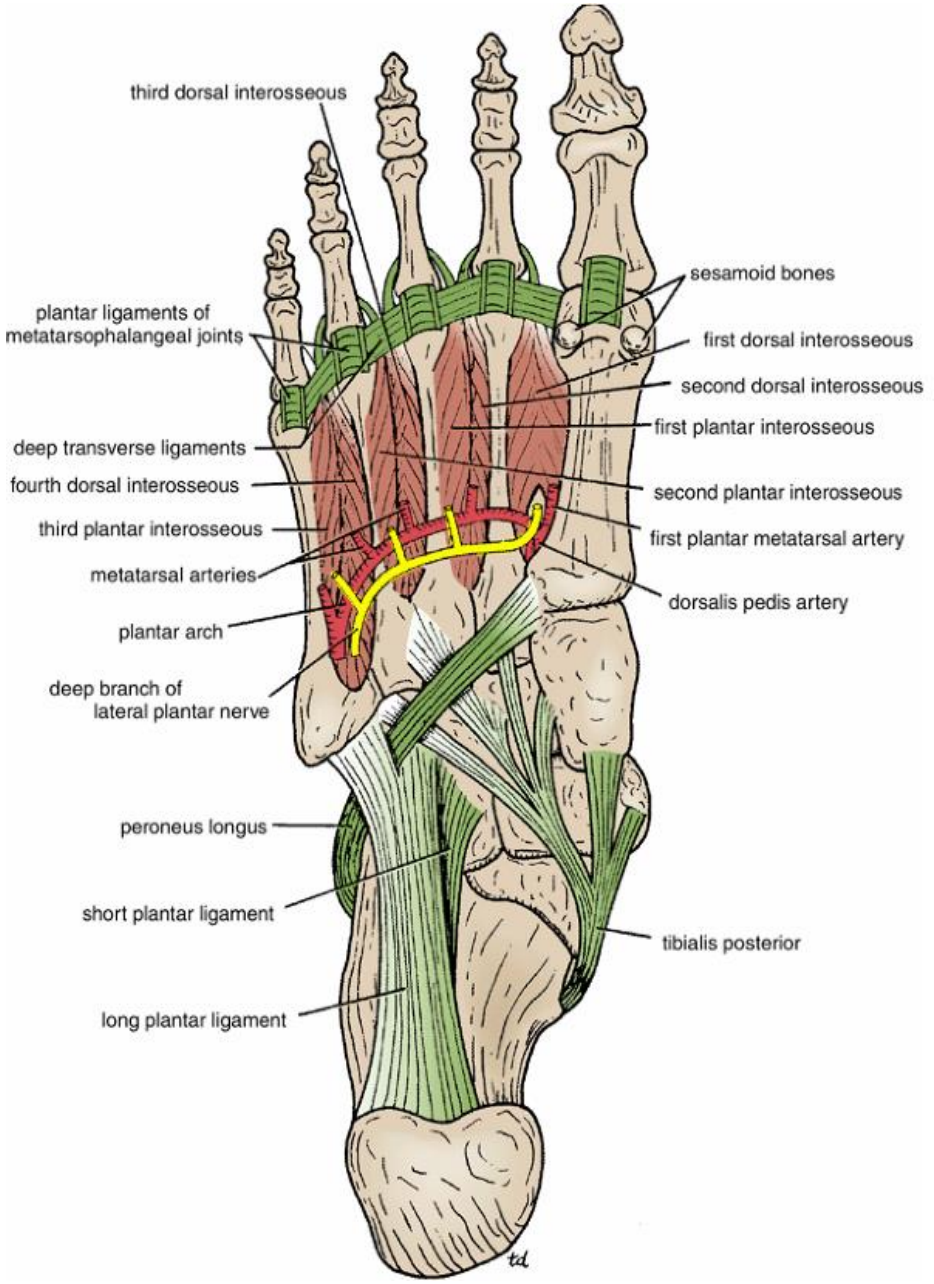
Lateral Plantar Artery

- The 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 the toes.**



Dorsalis Pedis Artery (the Dorsal Artery of the Foot)

- On entering the sole between the two heads of the first dorsal interosseous muscle, **the dorsalis pedis artery immediately joins the lateral plantar artery**



Branches

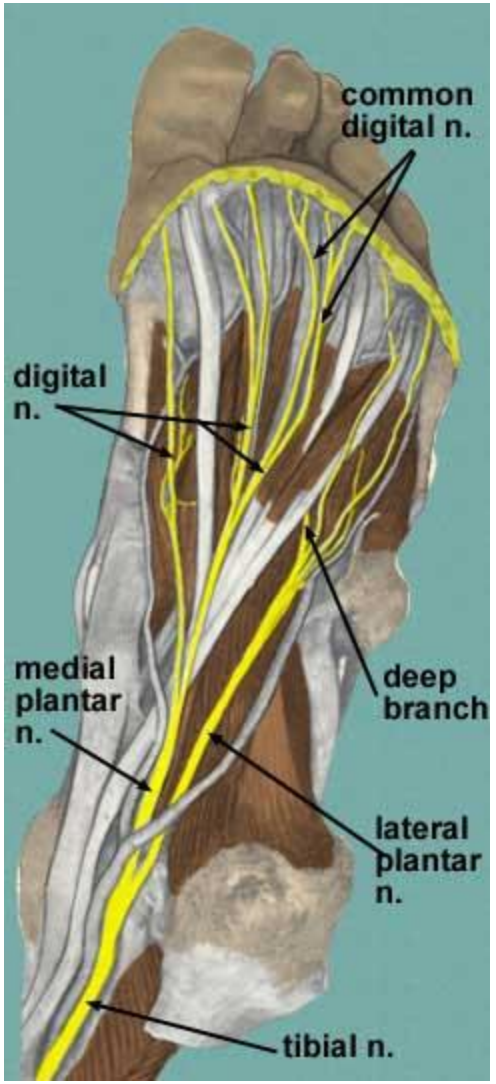
- The first plantar metatarsal artery, which supplies the cleft between the big and second toes

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 of lateral planter nerve**

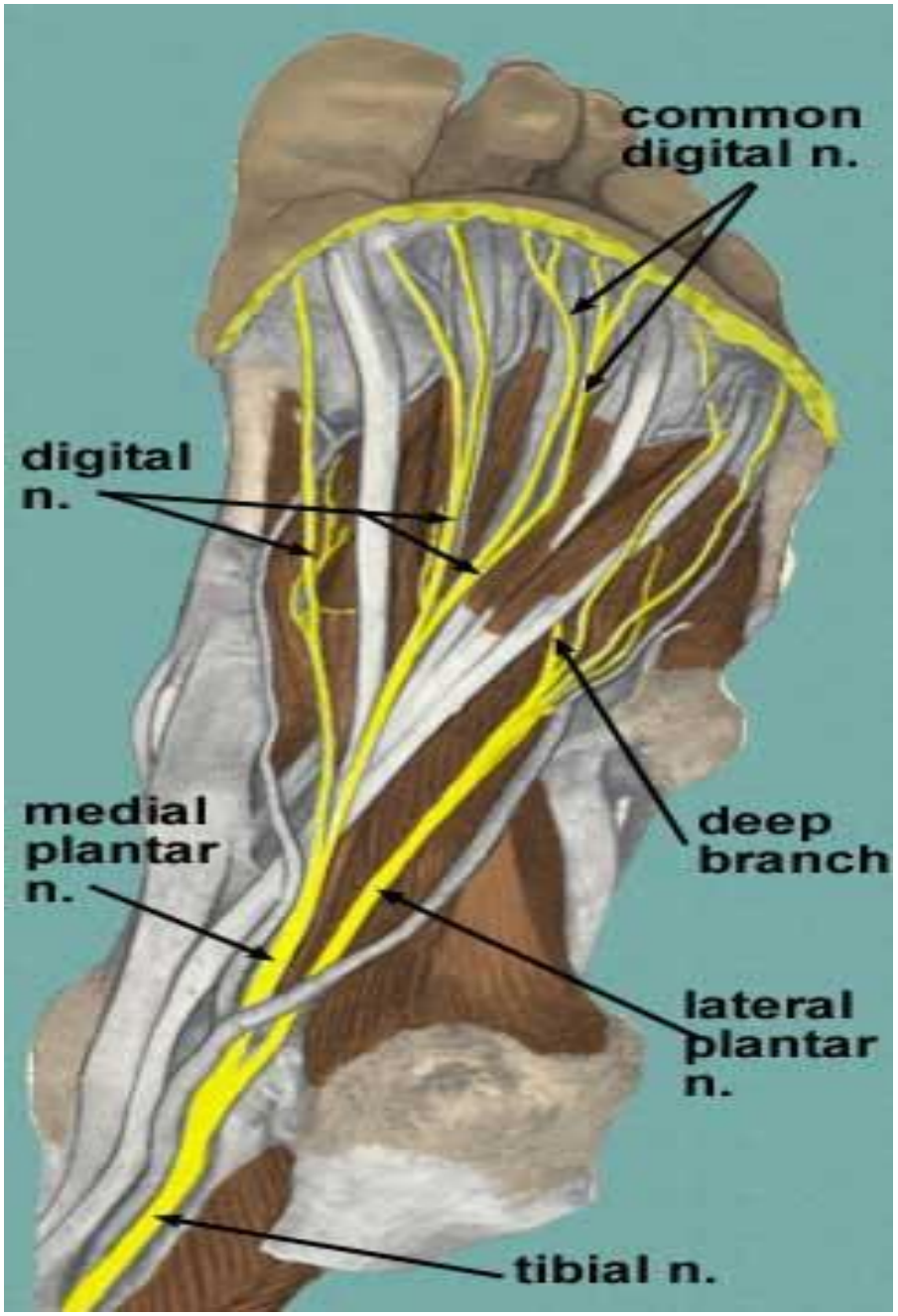
- **From the main trunk :**

1- to the quadratus plantae and abductor digiti minimi

2- cutaneous branches to the skin of the lateral part of the 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.



Branches of lateral planter nerve……cont

- ;the medial side of the big toe; and the adjacent sides of the second, third, fourth, and fifth toes.
- The nerves extend onto the dorsum and supply the nail beds and tips of the toes.
- **This branch curves medially** with the lateral plantar artery and supplies **the adductor hallucis**; **the second, third, and fourth lumbricals; and all the interossei, except those in the fourth intermetatarsal space**

Medial planter nerve

- Lateral to the medial planter artery
- Between abd.hallucis & flex.digi.brevis

- **Branches of medial planter nerve:**
- Muscular branches to:

1- Abd.hallucis
2- Flex.digi.brevis
3- 1st .lumbrical
4- Flex.hall.brevis

- Articular branch