

Sole of the Foot

Objectives

- ✓ Sole : Skin and its innervation
- ✓ Superficial fascia
- ✓ Deep Fascia
- ✓ Plantar Aponeurosis
- ✓ Muscles of Sole : 18 intrinsic and 4 Extrinsic
- ✓ Medial and lateral plantar nerves
- ✓ Medial and lateral plantar arteries
- ✓ Applied anatomy

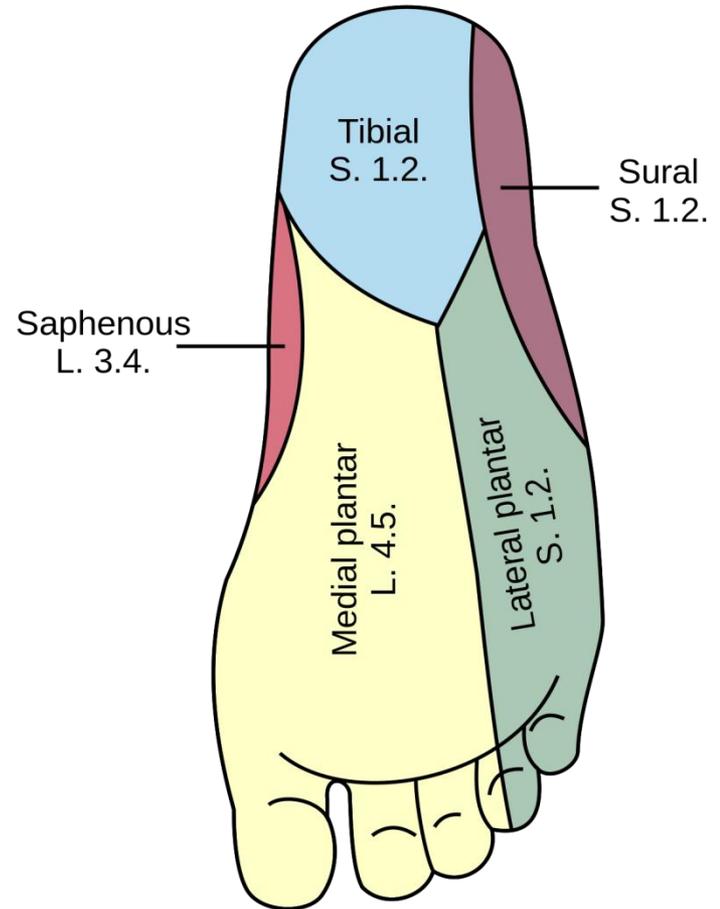
Skin of the Sole

- ✓ Thick and hairless
- ✓ Creased at the site of movement
- ✓ Sweat glands



Cutaneous Innervation of Sole

- ✓ Medial calcaneal nerve
- ✓ Cutaneous branches of medial plantar nerve
- ✓ Cutaneous branches of lateral plantar nerve



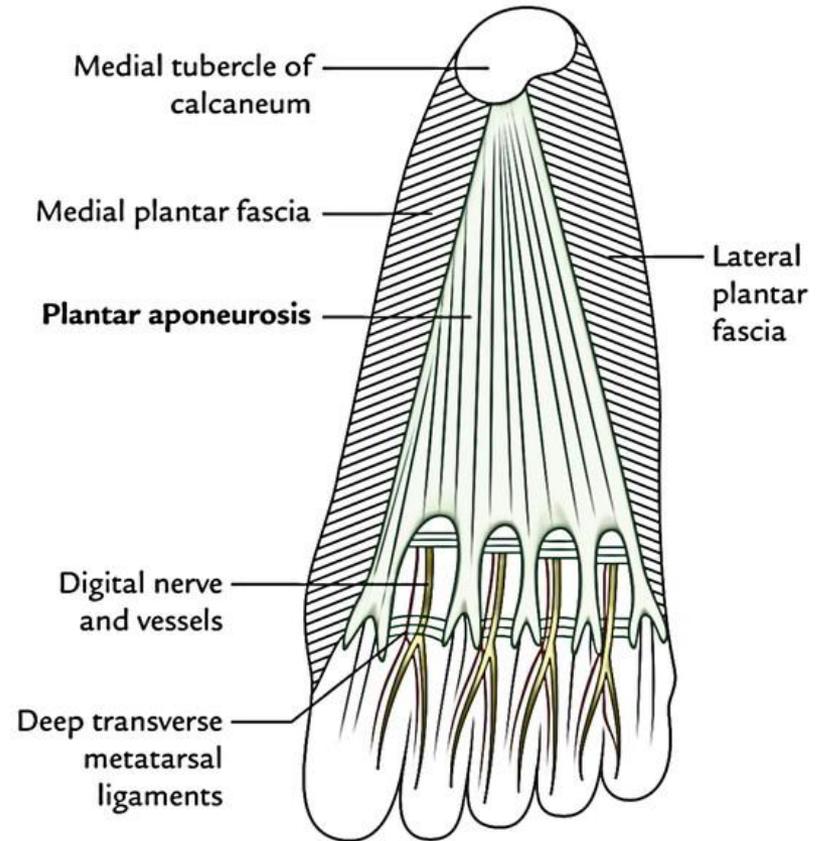
Superficial Fascia

- ✓ Subcutaneous fat with meshwork of fibrous septa
- ✓ Thick



Deep / Plantar fascia

- ✓ Plantar aponeurosis
- ✓ Medial plantar fascia
- ✓ Lateral plantar fascia



Deep / Plantar fascia

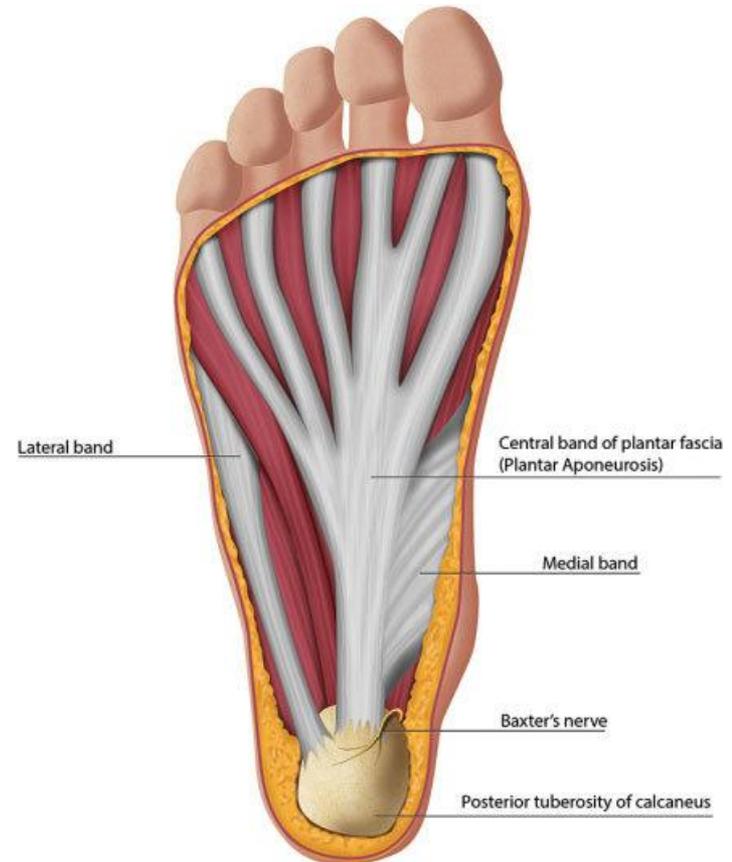
Modifications

1. Plantar aponeurosis

2. deep transverse

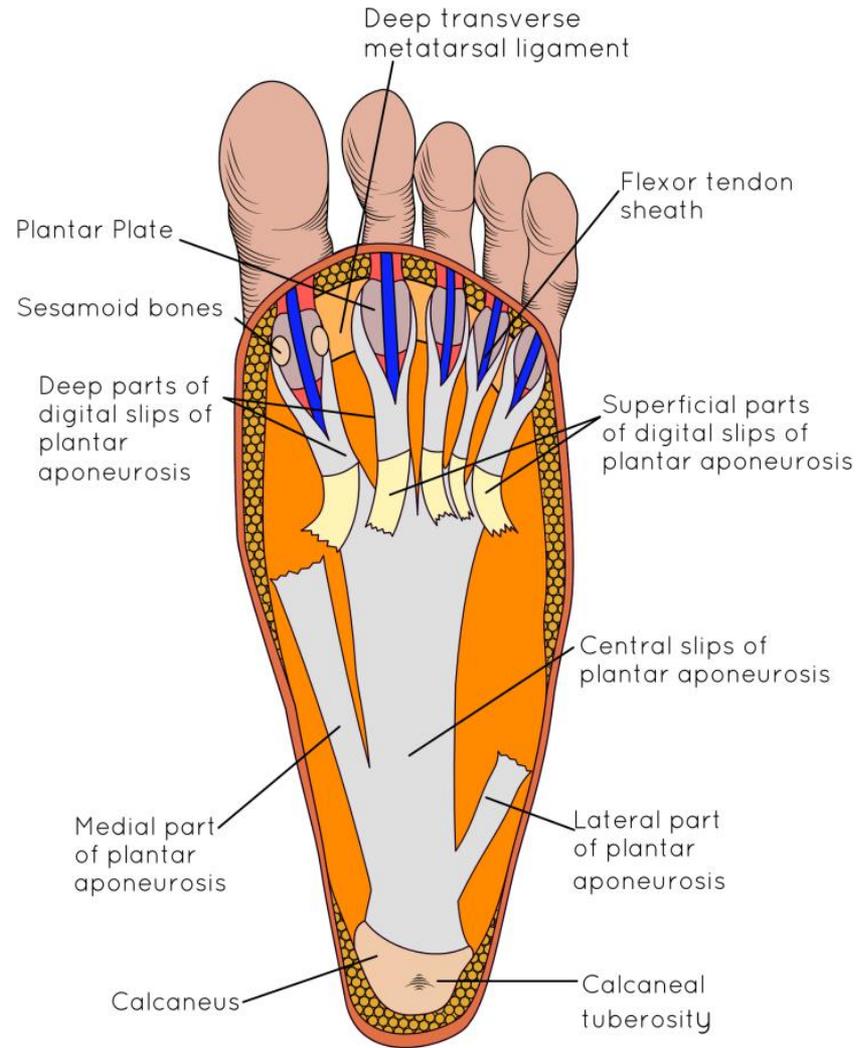
metatarsal ligament

3. Fibrous flexor sheath



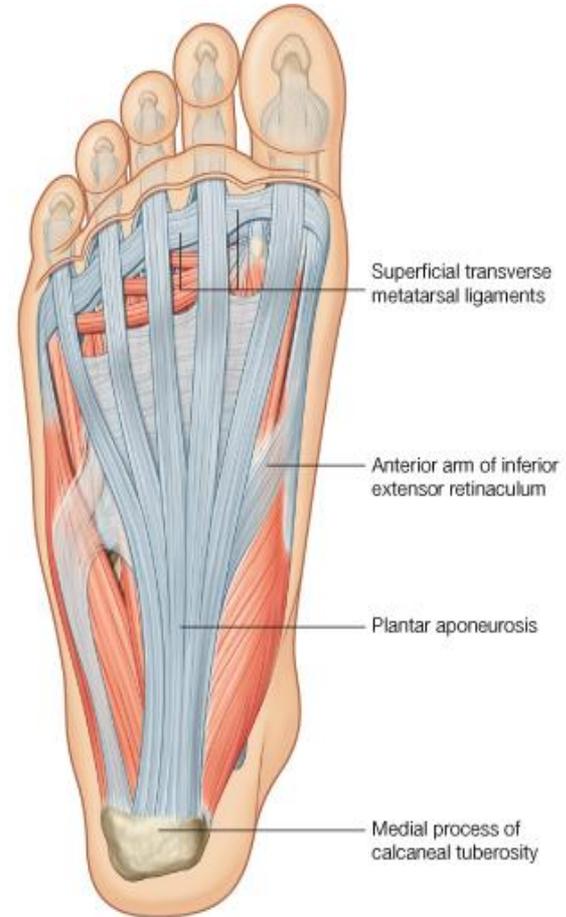
Plantar aponeurosis

- ✓ Triangular in shape
- ✓ Apex
- ✓ Base
- ✓ Superficial and deep slip
- ✓ Degenerated tendon of plantaris muscle



Plantar aponeurosis

- ✓ Triangular in shape
- ✓ Apex
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- ✓ Degenerated tendon of plantaris muscle



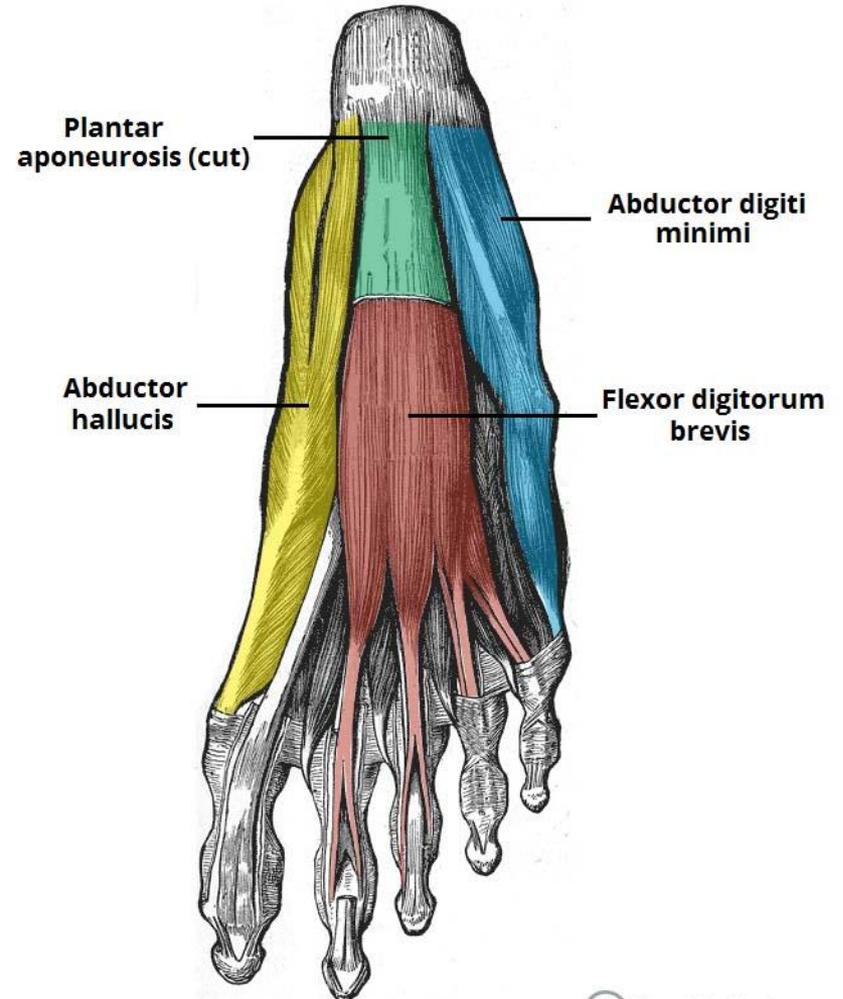
Muscles of the Sole

- ✓ Intrinsic muscles 18 and Extrinsic muscles 4
- ✓ Arranged in 4 layers
- ✓ Neurovascular plane
- ✓ Superficial plane between **first and second** layer - Medial and lateral plantar nerves and arteries
- ✓ Deep plane between **third and fourth layer** – Deep branches of lateral plantar nerves and arteries

First Layer of Sole

Muscles of the first layer

- ✓ Flexor digitorum brevis
- ✓ Abductor Hallucis
- ✓ Abductor digiti minimi



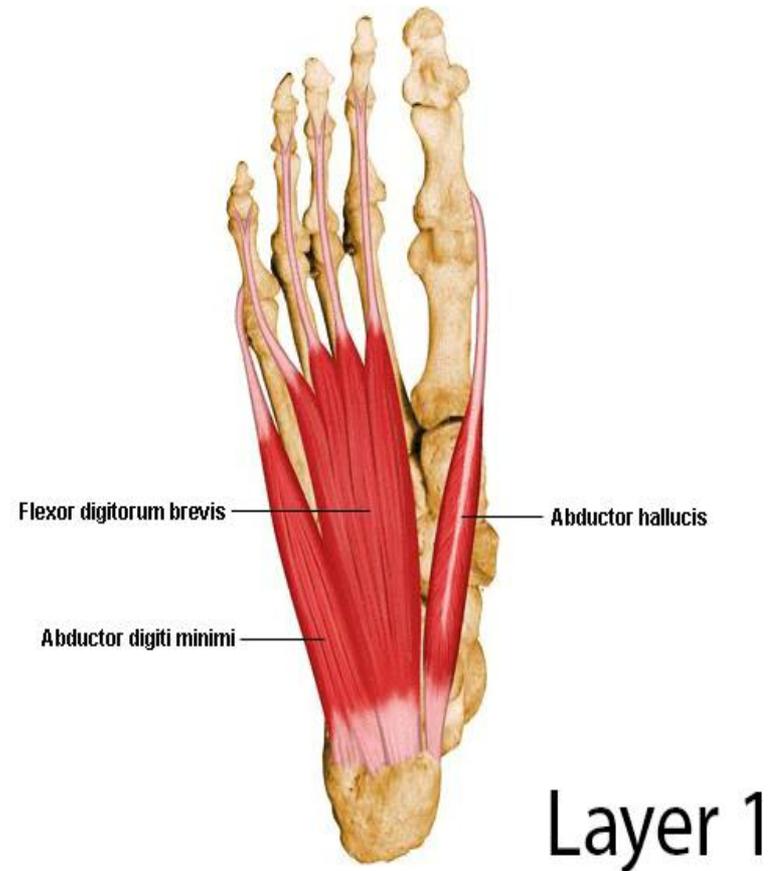
First layer : Flexor digitorum brevis

- ✓ O: Medial tubercle of Calcaneum
- ✓ I: middle phalanges of lateral 4 toes
- ✓ N: Medial plantar
- ✓ A: flexion of lateral 4 toes



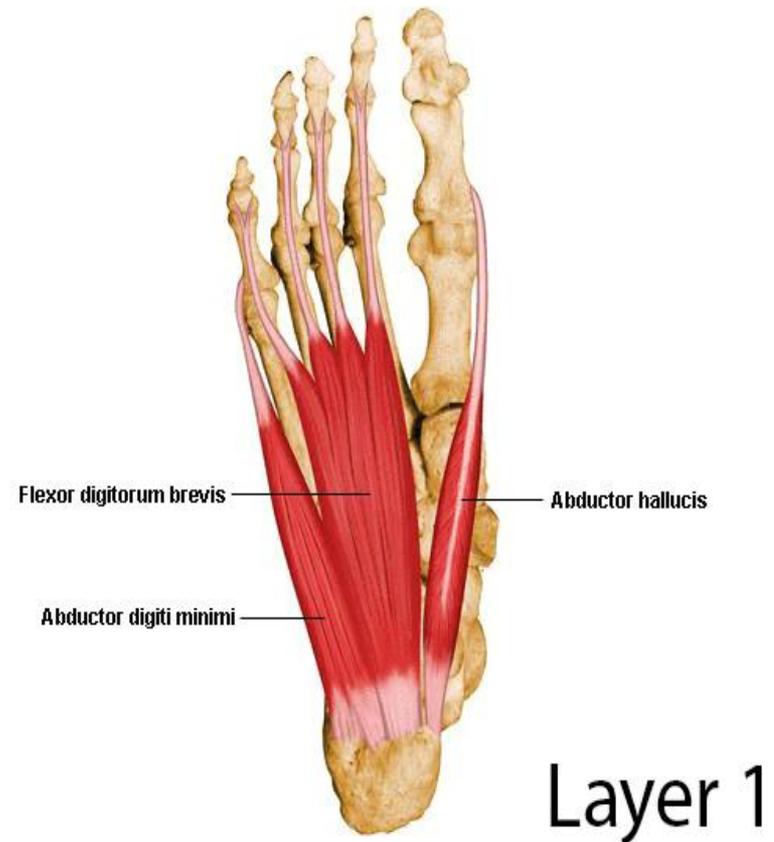
First layer : Abductor Hallucis

- ✓ O: Medial tubercle of Calcaneum and flexor retinaculum
- ✓ I: Medial side of base of proximal phalanx of big toe
- ✓ N: Medial plantar
- ✓ A: Flexion and abduction of great toe



First layer : Abductor digiti minimi

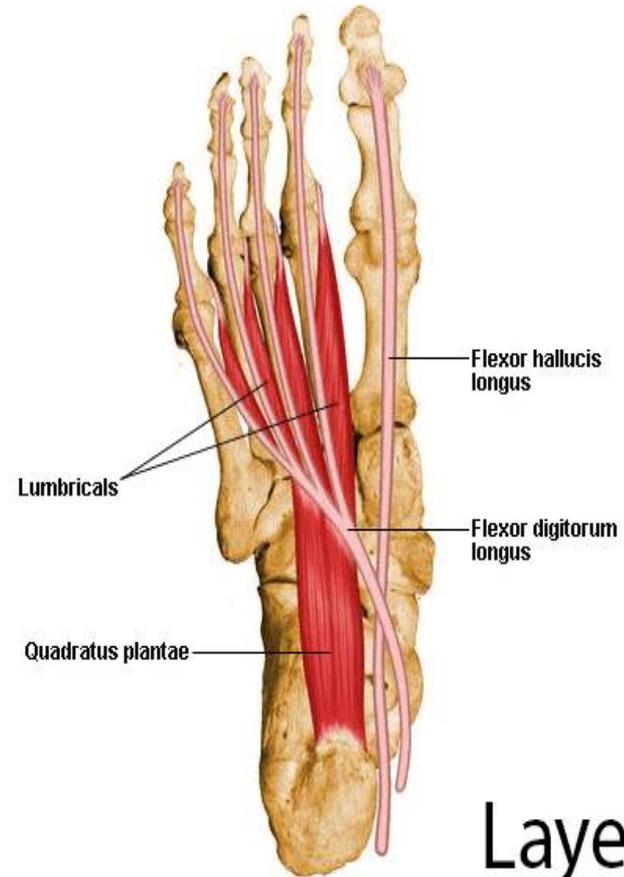
- ✓ O: Medial and lateral tubercle of Calcaneum
- ✓ I: Lateral side of base of proximal phalanx of little toe
- ✓ N: Lateral plantar
- ✓ A: Flexion and abduction of little toe



Second Layer of Sole

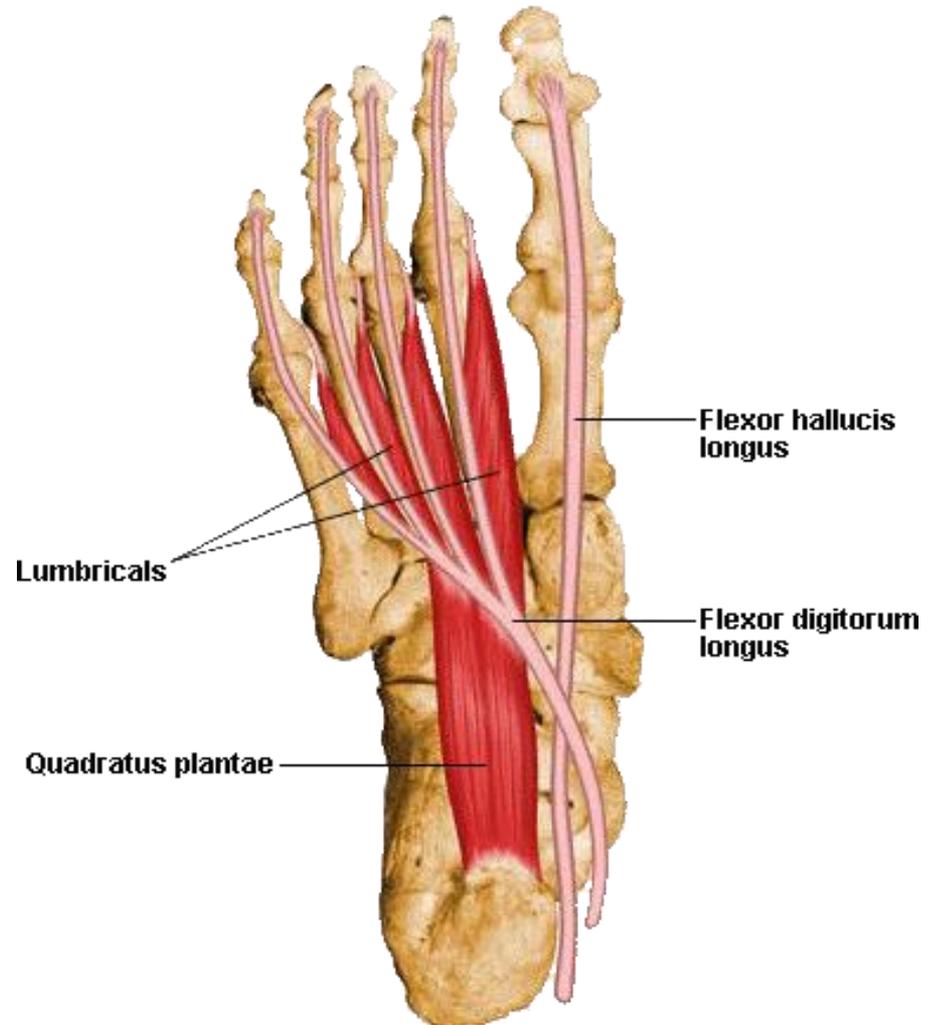
Second Layer of Sole

- ✓ Flexor digitorum
 Accessorius
- ✓ Four lumbricals
- ✓ Two tendons (Flexor
 digitorum longus and
 flexor hallucis longus)



Second Layer : Flexor digitorum Accessorius

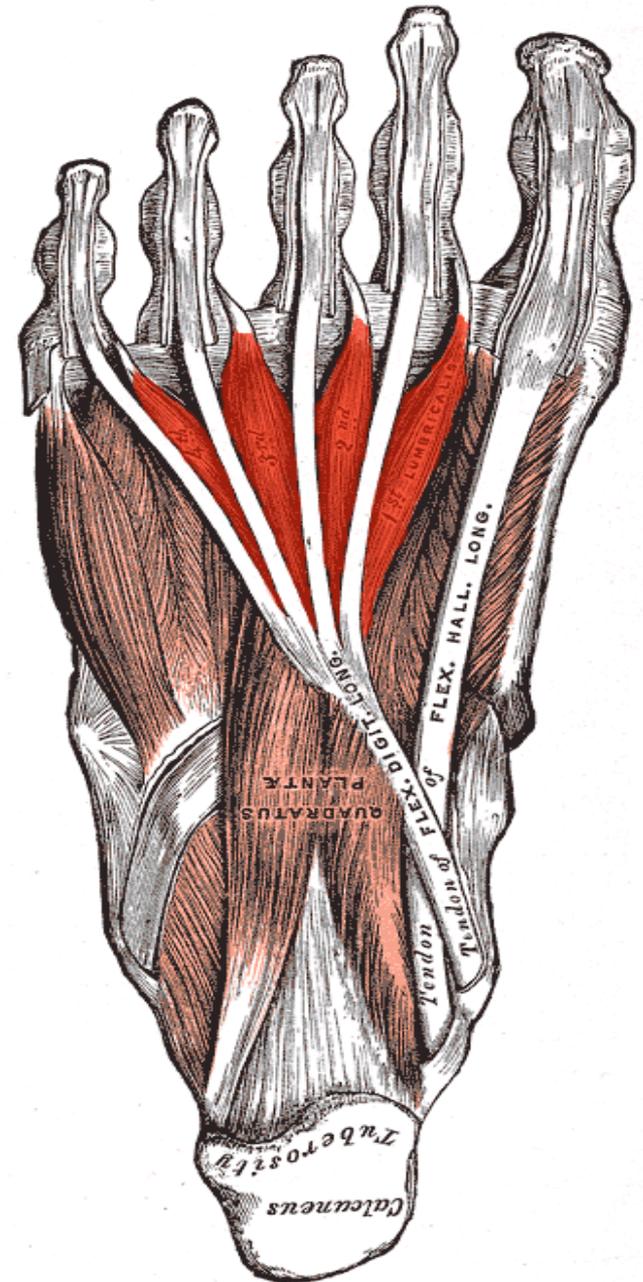
- ✓ O: Medial head- medial surface of Calcaneum
Lateral head – lateral surface of Calcaneum
- ✓ I: Tendon of flexor digitorum longus
- ✓ N: Lateral plantar
- ✓ A: Strengthen the pull of long tendons



Second Layer : Four Lumbricals

From medial to lateral side

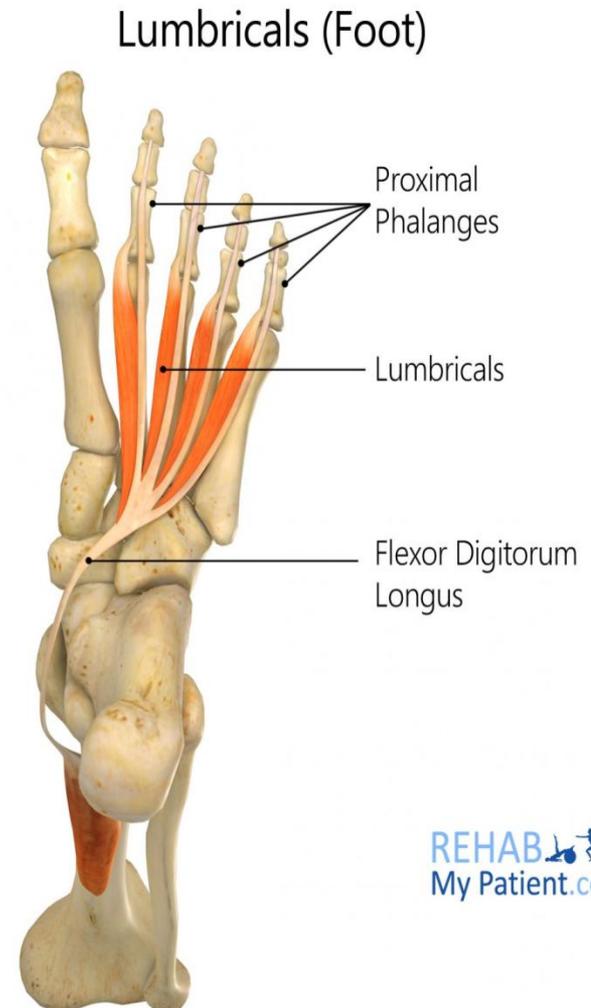
- ✓ O: from tendon of the flexor digitorum longus
- ✓ I: Extensor expansion and base of proximal phalanges of lateral 4 toes
- ✓ N: 1st and 2nd by medial and 3rd and 4th by Lateral plantar
- ✓ A: Plantar flexion of toes at metatarsophalangeal and extension at interphalangeal joints



Second Layer : Four lumbricals

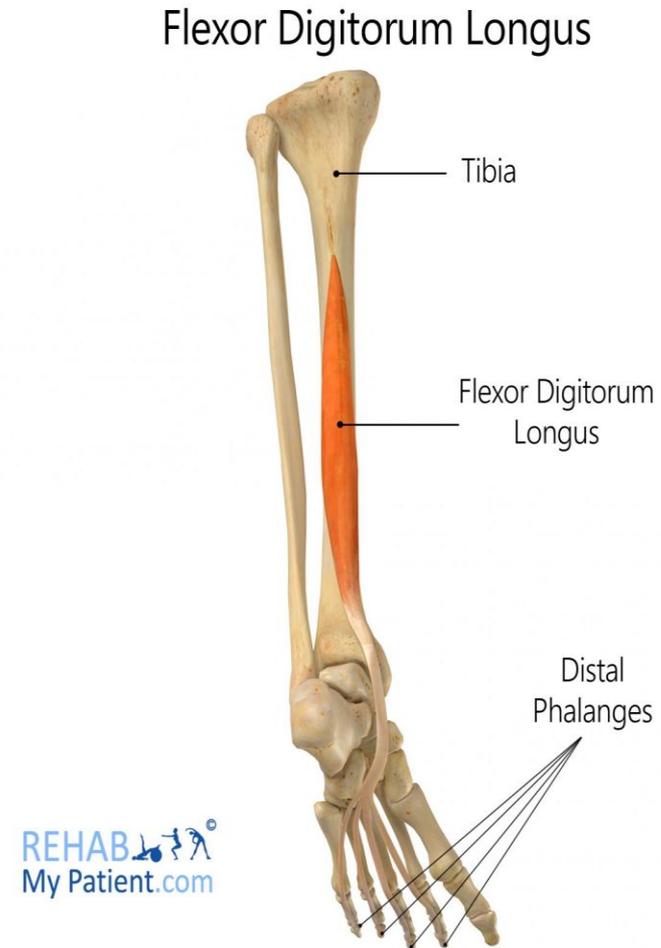
From medial to lateral side

- ✓ O: from tendon of the flexor digitorum longus
- ✓ I: Extensor expansion and base of proximal phalanges of lateral 4 toes
- ✓ N: 1st and 2nd by medial and 3rd and 4th by Lateral plantar
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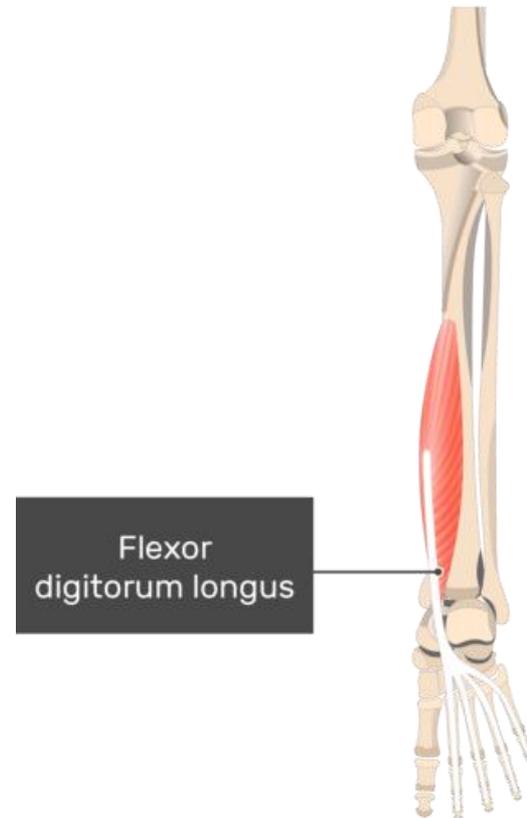
Second Layer : Flexor digitorum longus

- ✓ O: Posterior surface of tibia below soleal line
- ✓ I: Plantar surface of distal phalanges of lateral four toes
- ✓ N: Tibial nerve
- ✓ A: Plantar flexion of lateral four toes



Second Layer : Flexor digitorum longus

- ✓ O: Posterior surface of tibia below soleal line
- ✓ I: Plantar surface of distal phalanges of lateral four toes
- ✓ N: Tibial nerve
- ✓ A: Plantar flexion of lateral four toes



Second Layer : Flexor hallucis longus

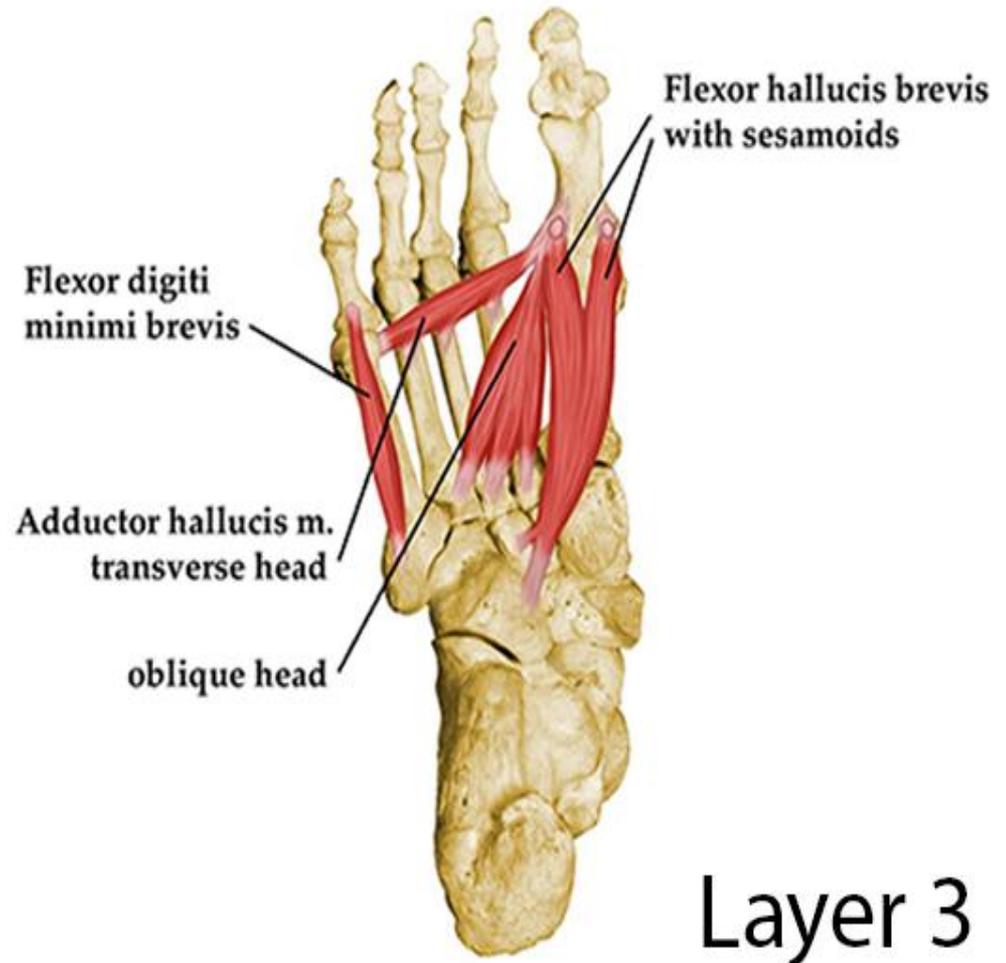
- ✓ O: Posterior surface of shaft of fibula
- ✓ I: Plantar surface of base of distal surface of great toe
- ✓ N: Tibial nerve
- ✓ A: Plantar flexion of great toe



Third Layer of Sole

Third Layer: Muscles of Sole

- ✓ Flexor hallucis Brevis
- ✓ Flexor digiti minimi brevis
- ✓ Adductor Hallucis

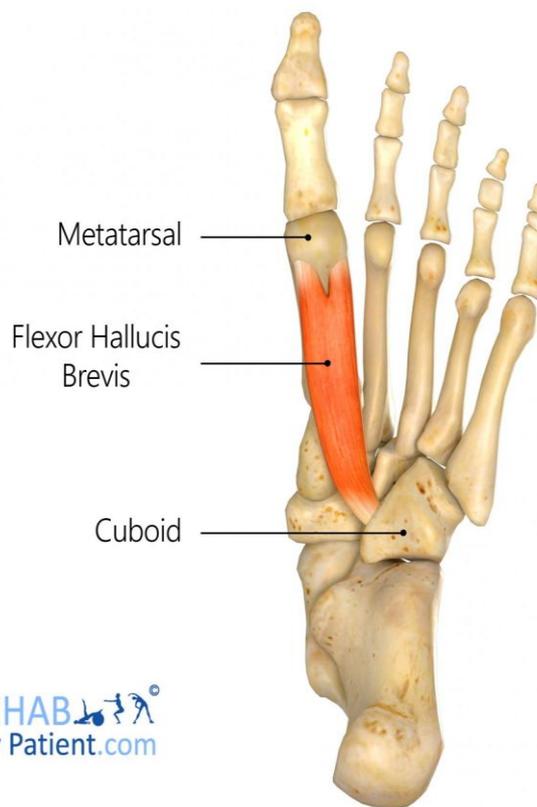


Third Layer: Flexor hallucis Brevis

Y shaped tendon

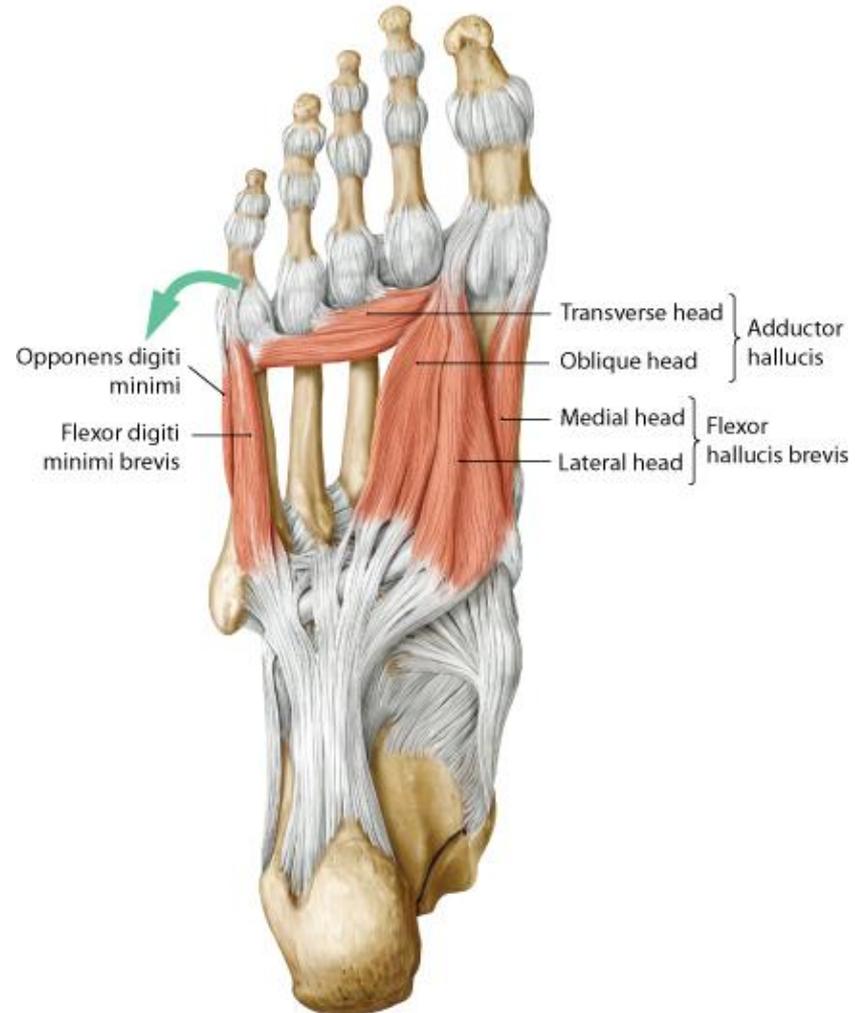
- ✓ O: medial limb from medial surface of cuboid bone
Lateral limb from lateral cuneiform bone
- ✓ I: base of proximal phalanx of great toe
- ✓ N: Medial plantar nerve
- ✓ A: Flexion of proximal phalanx of great toe

Flexor Hallucis Brevis



Third Layer: Flexor digiti minimi brevis

- ✓ O: Base of fifth metatarsal bone
- ✓ I: lateral side of base of proximal phalanx of little toe
- ✓ N: Lateral plantar nerve
- ✓ A: Flexion of proximal phalanx of little toe



Third Layer: Adductor Hallucis

Two Heads

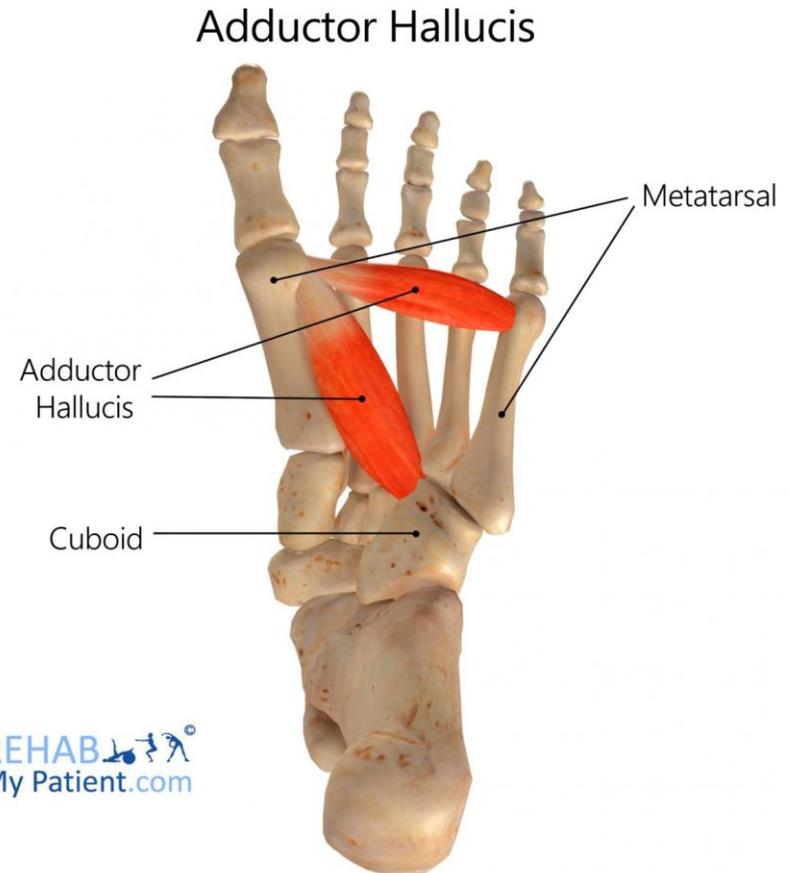
- ✓ O: oblique head: base of 2nd, 3rd and 4th metatarsal
- ✓ I: base of proximal phalanx of great toe
- ✓ N: Lateral plantar nerve
- ✓ A: Adduction of great toe



Third Layer: Adductor Hallucis

Two Heads

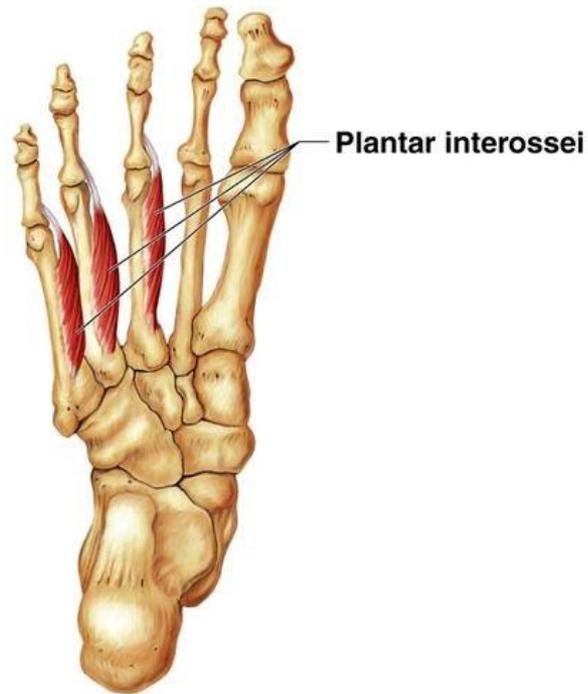
- ✓ O: oblique head: base of 2nd, 3rd and 4th metatarsal
- ✓ I: base of proximal phalanx of great toe
- ✓ N: Lateral plantar nerve
- ✓ A: Adduction of great toe



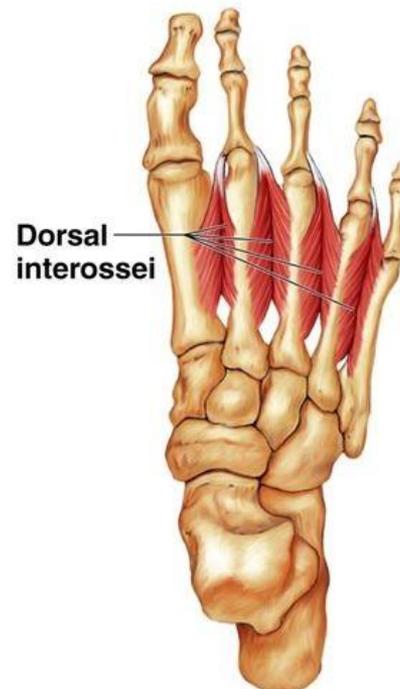
Fourth Layer of Sole

Fourth Layer: Muscles of Sole

Intrinsic Muscles of the Foot



(d) Fourth layer: plantar interossei



(e) Fourth layer: dorsal interossei

Fourth Layer: Dorsal Interossei

Four in number , Bipennate

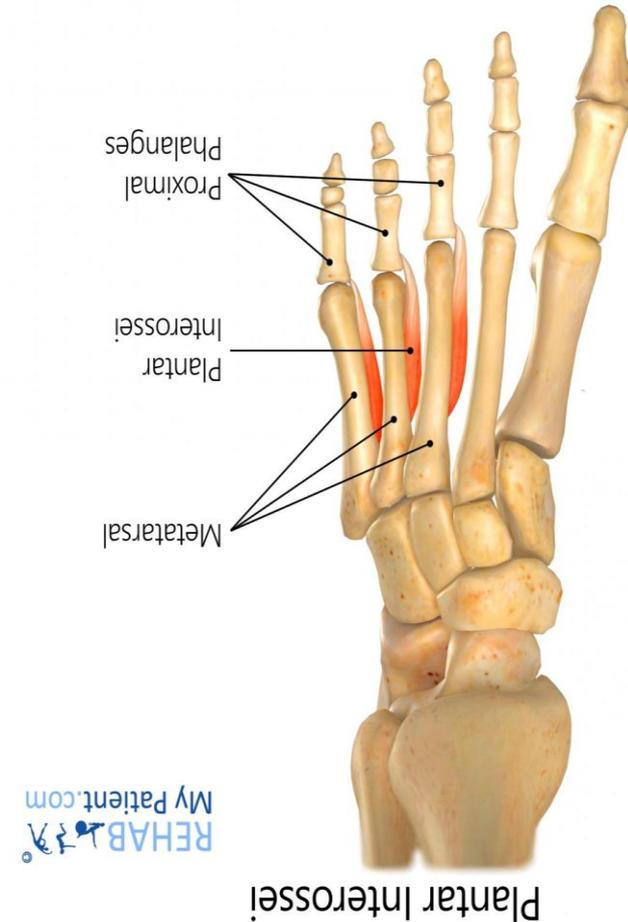
- ✓ O: Adjacent sides of metatarsal bones
- ✓ I: First on the medial side of 2nd digit
2nd to 4th on lateral sides of 2nd -4th digits
- ✓ N: Lateral plantar nerve
- ✓ A: Abduction of digits and flexion of metatarsophalangeal joint



Fourth Layer: Plantar Interossei

Three in number, Unipennate

- ✓ O: Medial sides of metatarsal bones
- ✓ I: Medial sides of base of phalanx of 3rd -5th digit
- ✓ N: Lateral plantar nerve
- ✓ A: Adduction of digits and flexion of metatarsophalangeal joint



Medial Plantar nerve

✓ Muscular

Abductor hallucis

Flexor digitorum brevis

Flexor Hallucis brevis

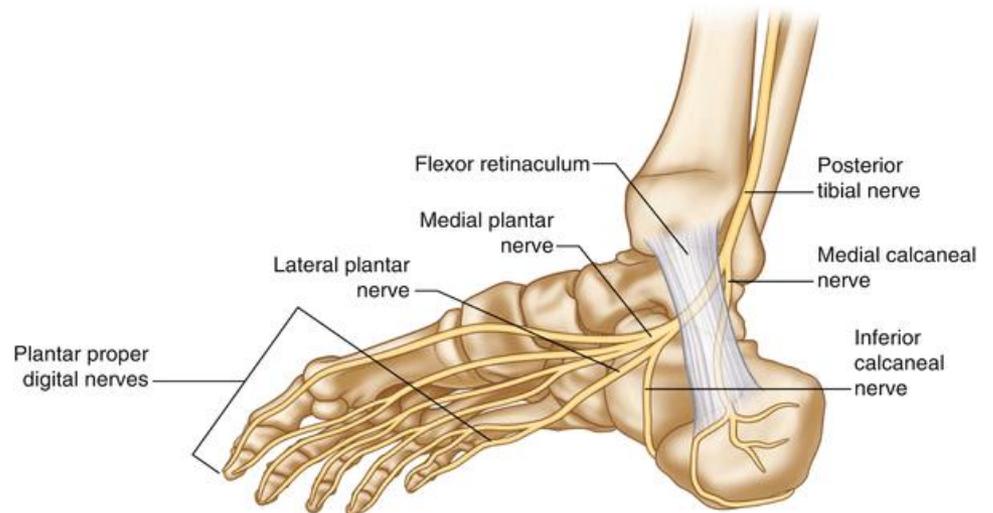
1st Lumbrical

✓ Cutaneous

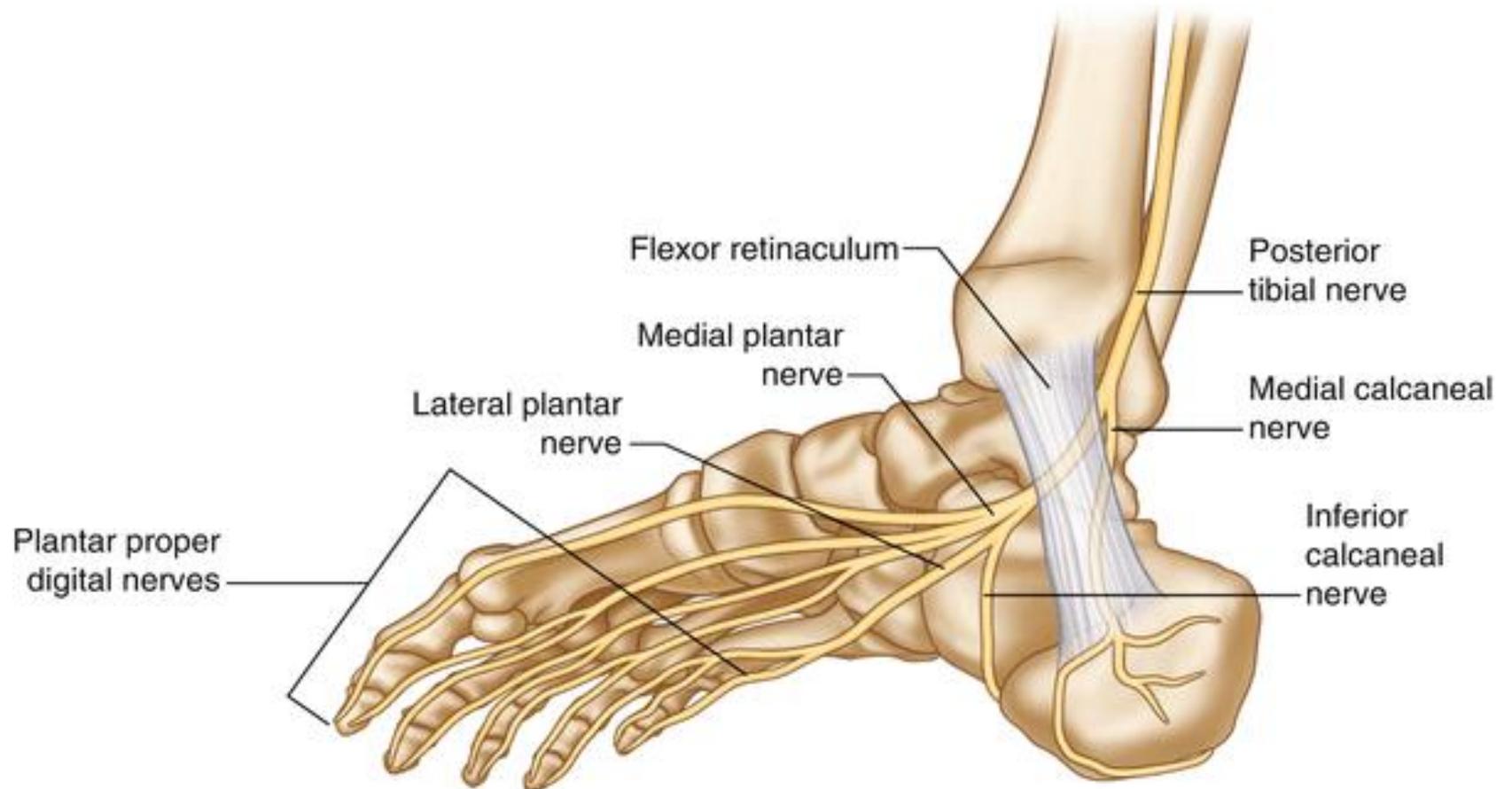
medial 3 ½ toes and
medial part of sole

✓ Articular

Joints of tarsus and
metatarsal bones

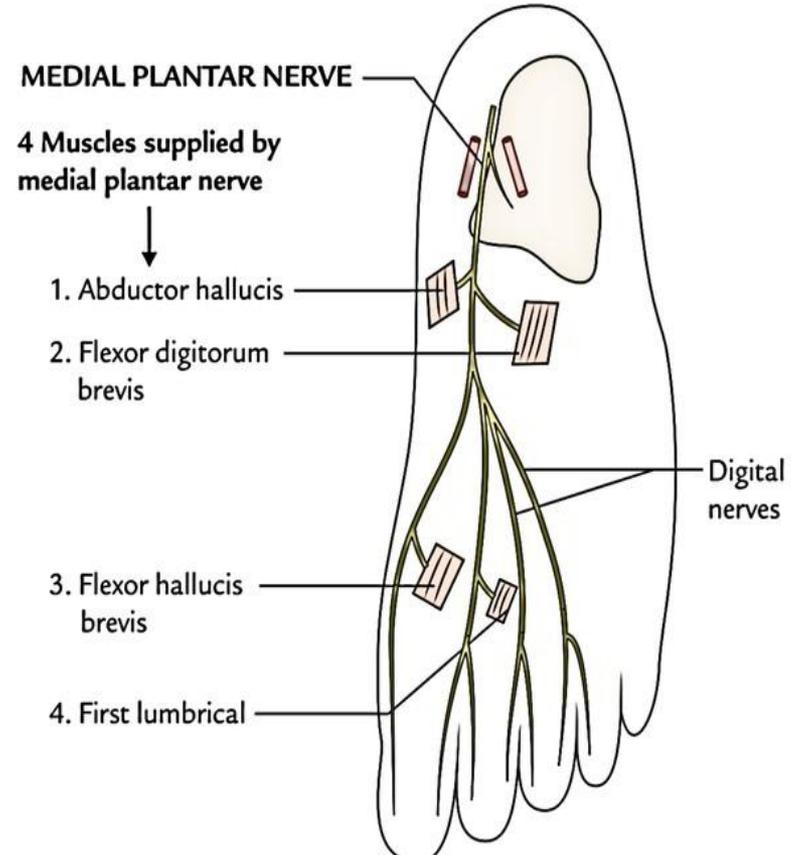


Medial and lateral plantar nerve

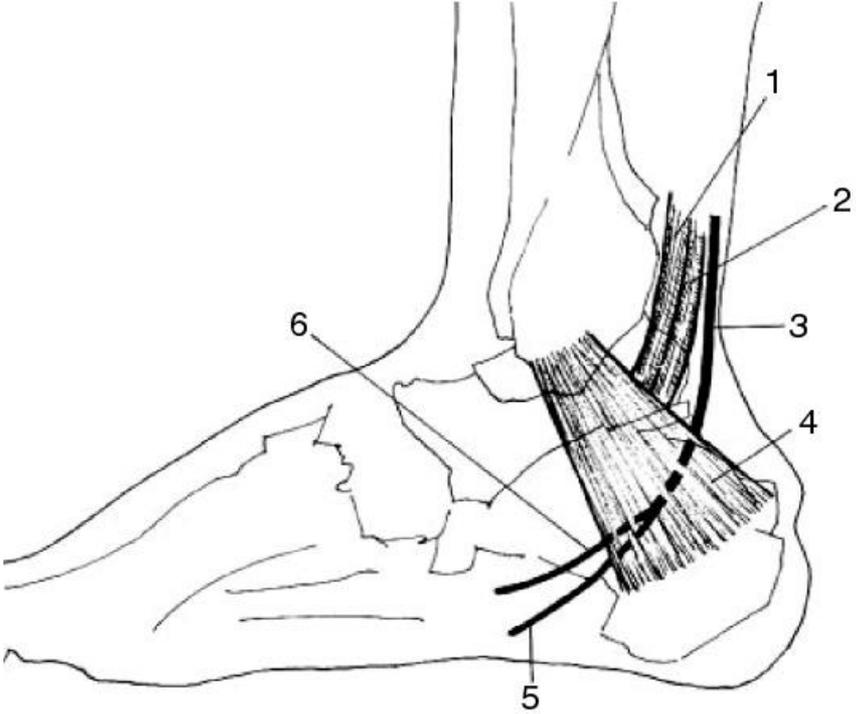


Medial Plantar nerve

- ✓ Larger terminal branch of tibial nerve
- ✓ Root Value **L4, L5 & S1**
- ✓ Deep to flexor retinaculum
- ✓ Enters sole and travels between first and second layer of sole

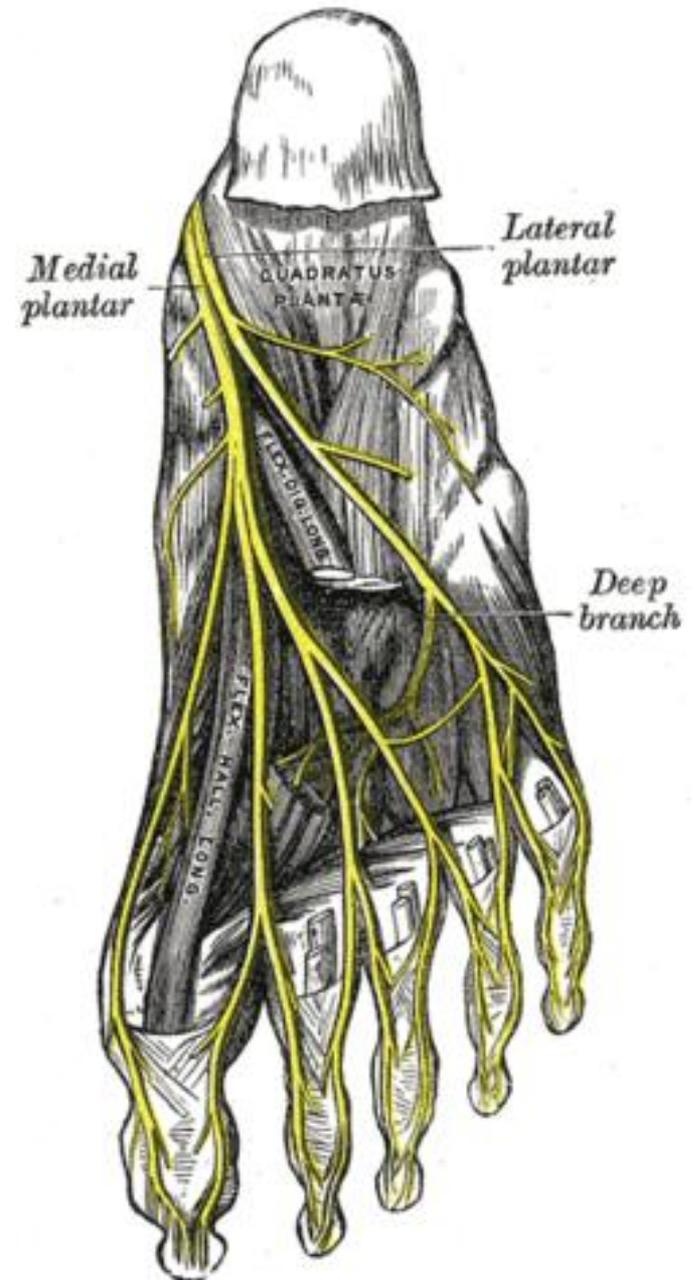


Medial plantar nerve entrapment (Jogger's foot)



Lateral Plantar nerve

- ✓ Smaller terminal branch of tibial nerve
- ✓ Root Value **L4, L5 & S1**
- ✓ Deep to flexor retinaculum
- ✓ Enters sole and travels between first and second layer of sole towards the base of 5th metatarsal bone



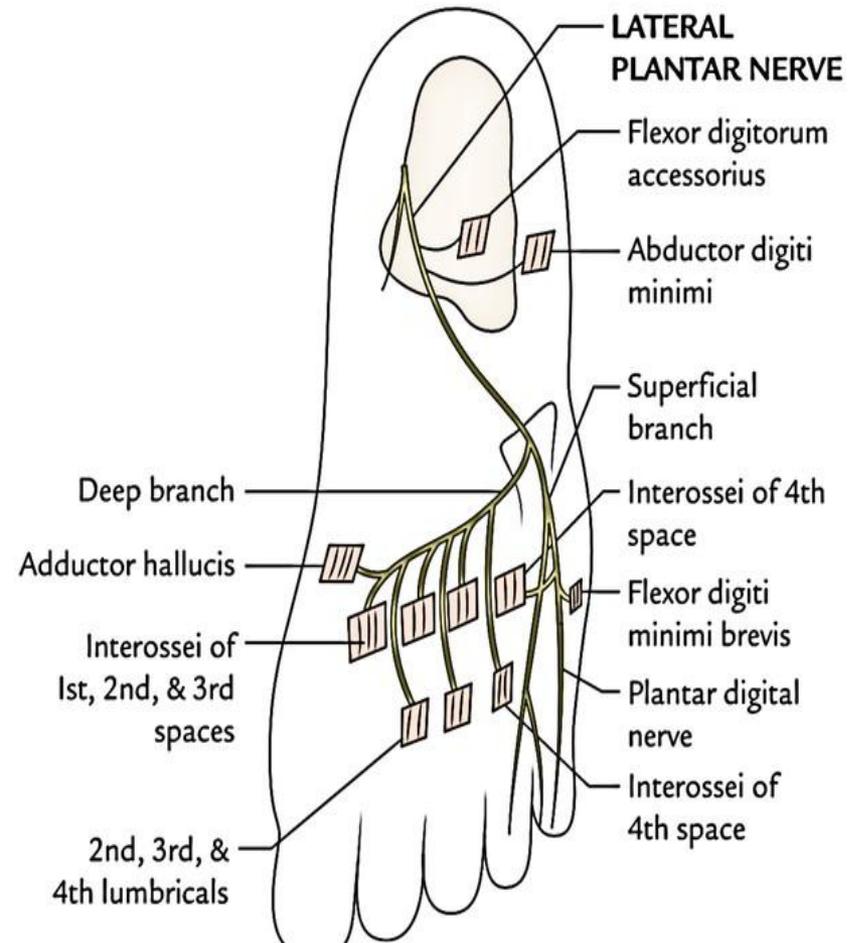
Lateral Plantar nerve

✓ Muscular

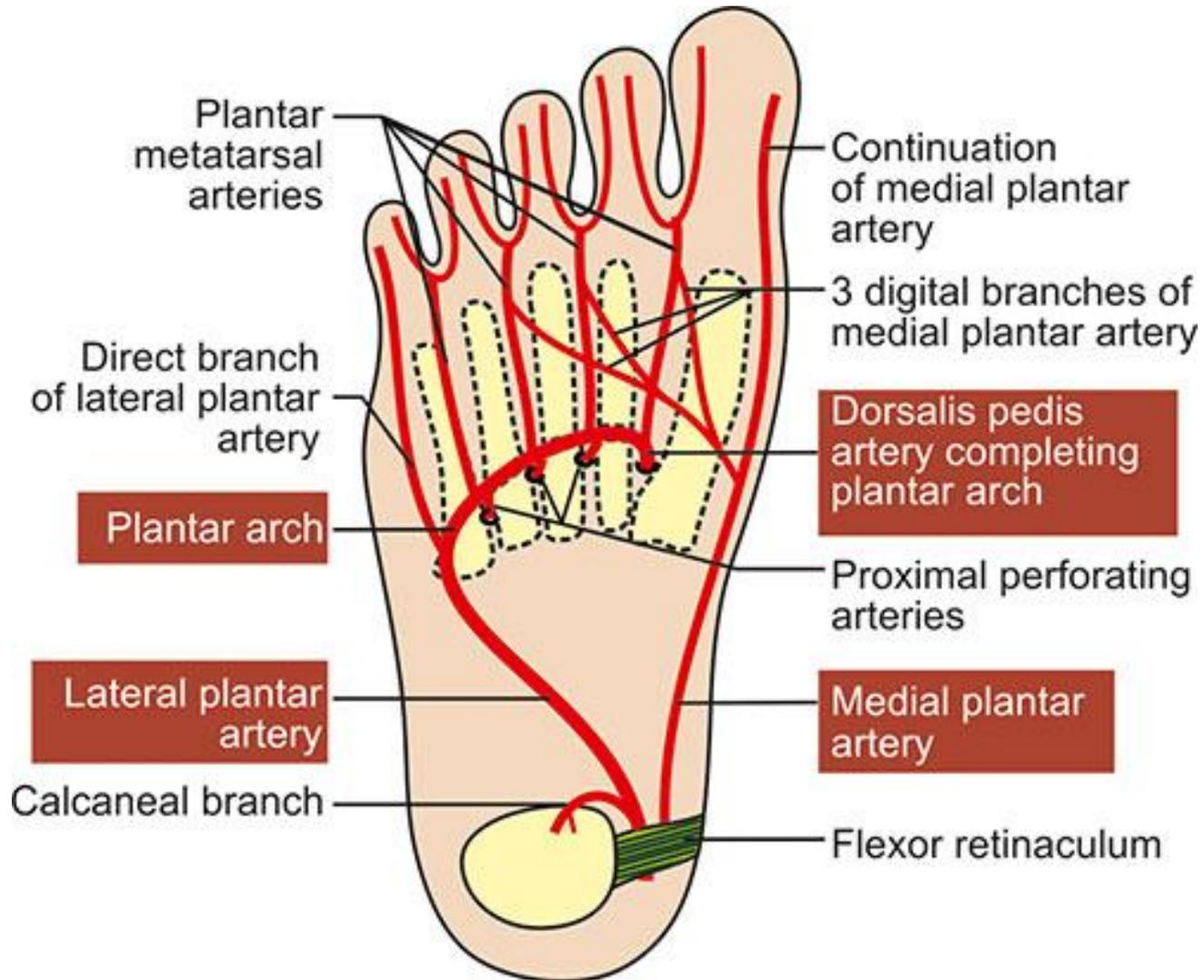
Abductor digiti minimi
Flexor digitorum
Accessorius
Flexor digiti minimi brevis
Adductor Hallucis
All Interossei
2nd, 3rd, 4th Lumbrical

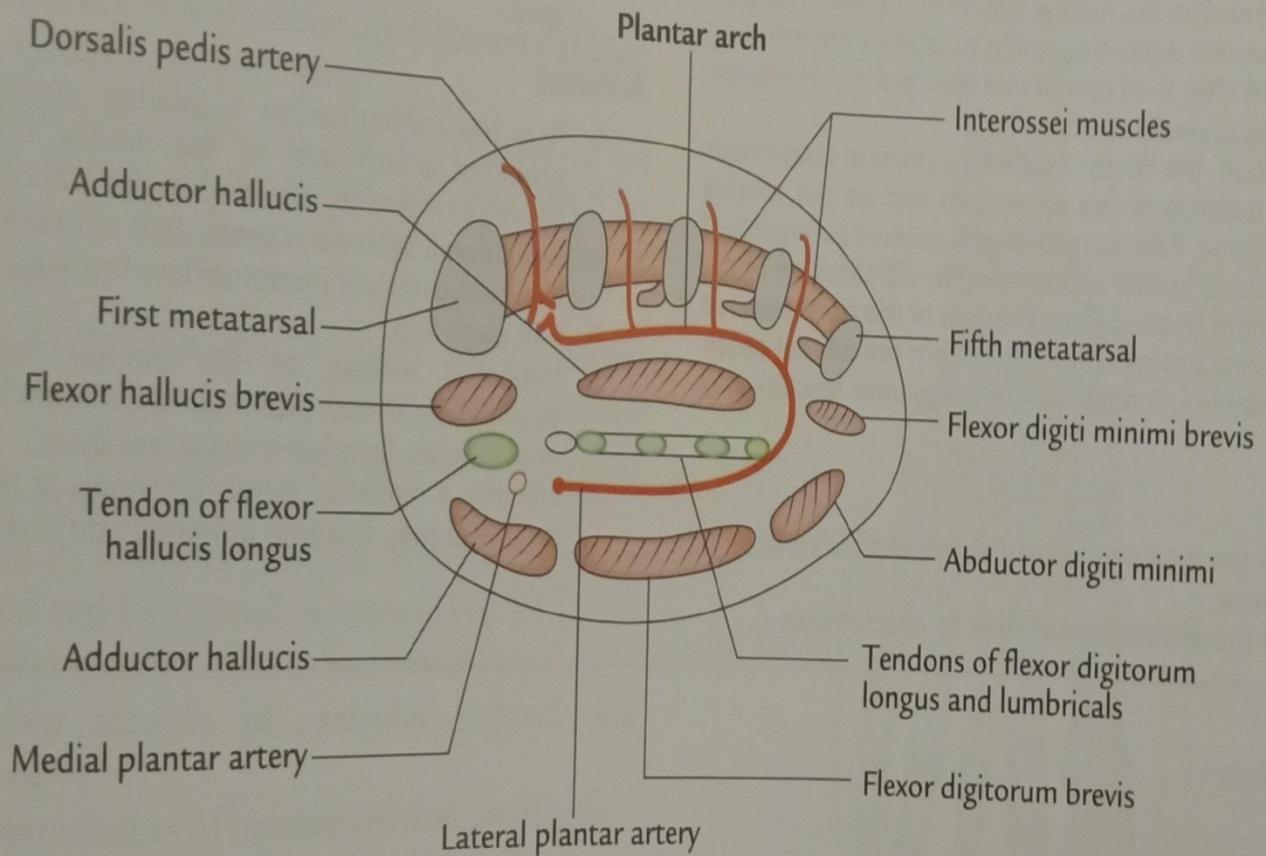
✓ Cutaneous

lateral 1 ½ toes and
skin of lateral part of sole

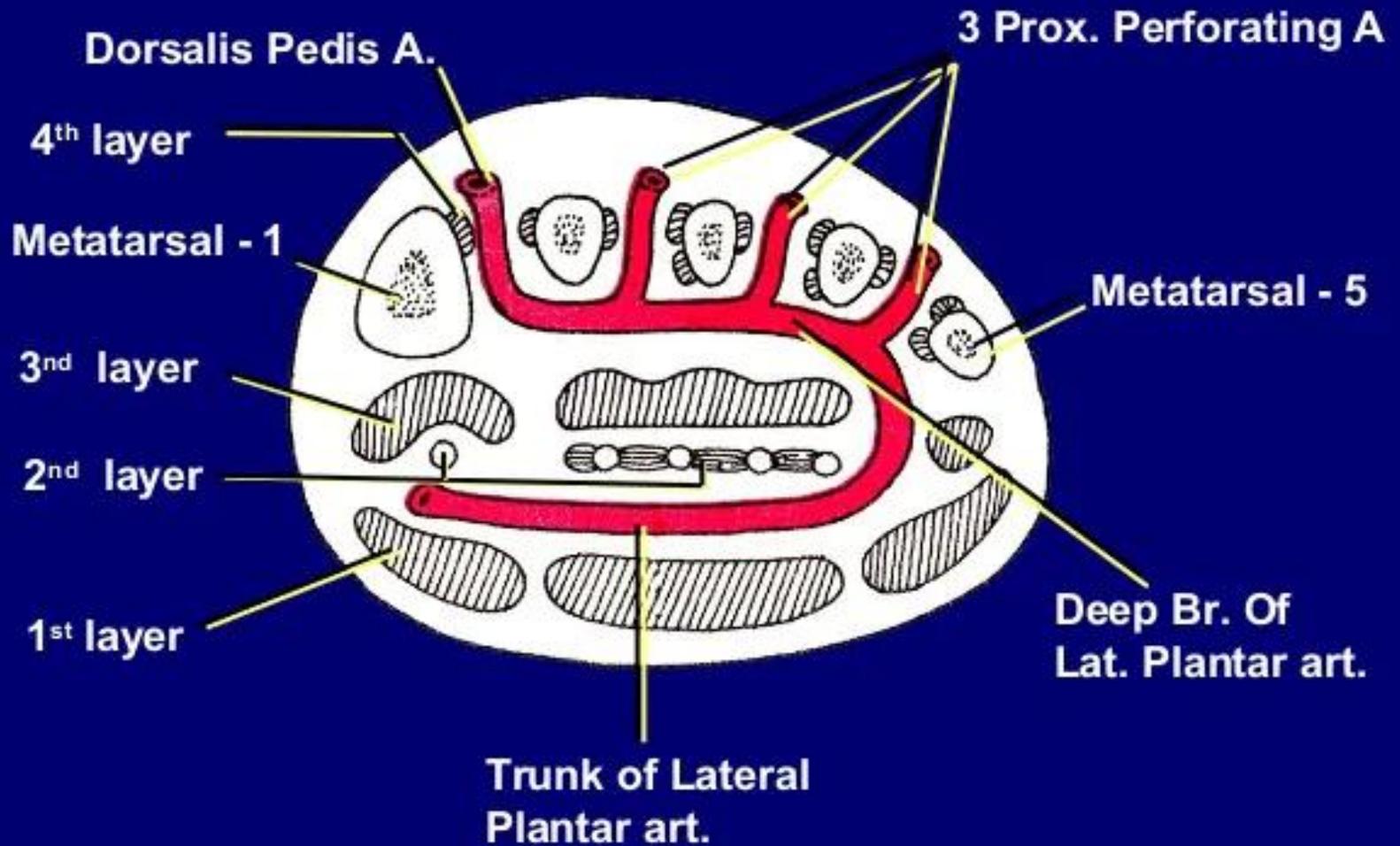


Medial and Lateral Plantar Artery





Transverse section through sole of right foot



Palm Vs Sole

Serial No	Palm	Sole
	Median Nerve	Medial Plantar nerve
1.	Abductor Pollicis	Abductor Hallucis
2.	Flexor Pollicis Brevis	Flexor Hallucis Brevis
3.	Opponens Pollicis	No Opponent
4.	Flexor Digitorum Superficialis	Flexor Digitorum Brevis
5.	Lumbricals 1 & 2	Lumbrical 1
6.	3½ digits	3½ digits

Palm Vs Sole

Serial No	Palm	Sole
	Ulnar Nerve	Lateral Plantar nerve
1.	Abductor Digiti Minimi	Abductor Digiti Minimi
2.	Flexor Digiti minimi	Flexor Digiti Minimi Brevis
3.	Opponens Digiti Minimi	No Opponent
4.	Adductor Pollicis	Adductor Hallucis
5.	All Interossei	All Interossei <u>Flexor Digitorum Accessorius</u>
6.	Lumbricals 3 & 4	Lumbrical 2,3 & 4
7.	1½ digits	1½ digits

Thank You

