

SOLE OF THE FOOT

The foot has two surfaces

Plantar Surface
sole of the foot



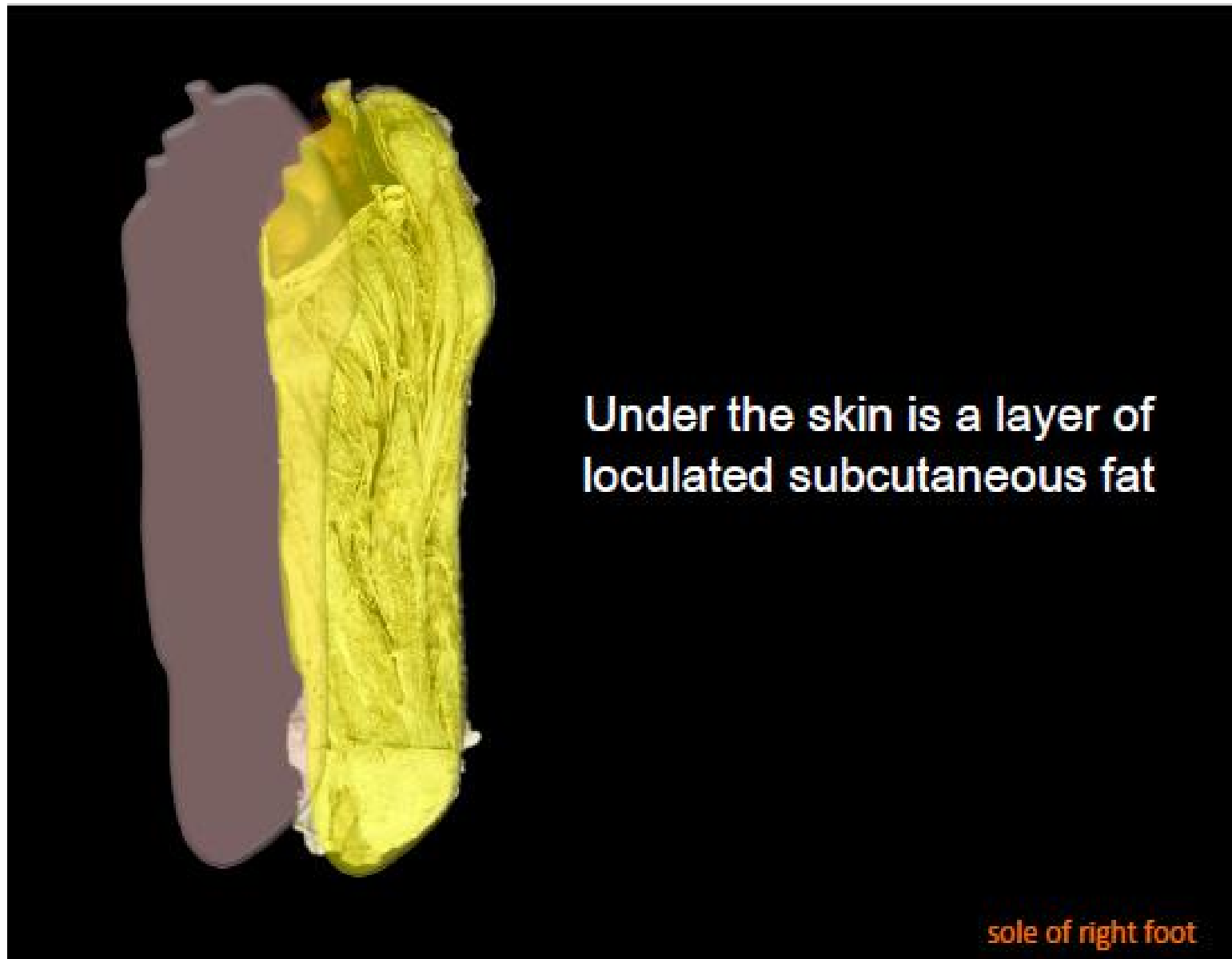
Dorsal Surface
upper part of the
foot

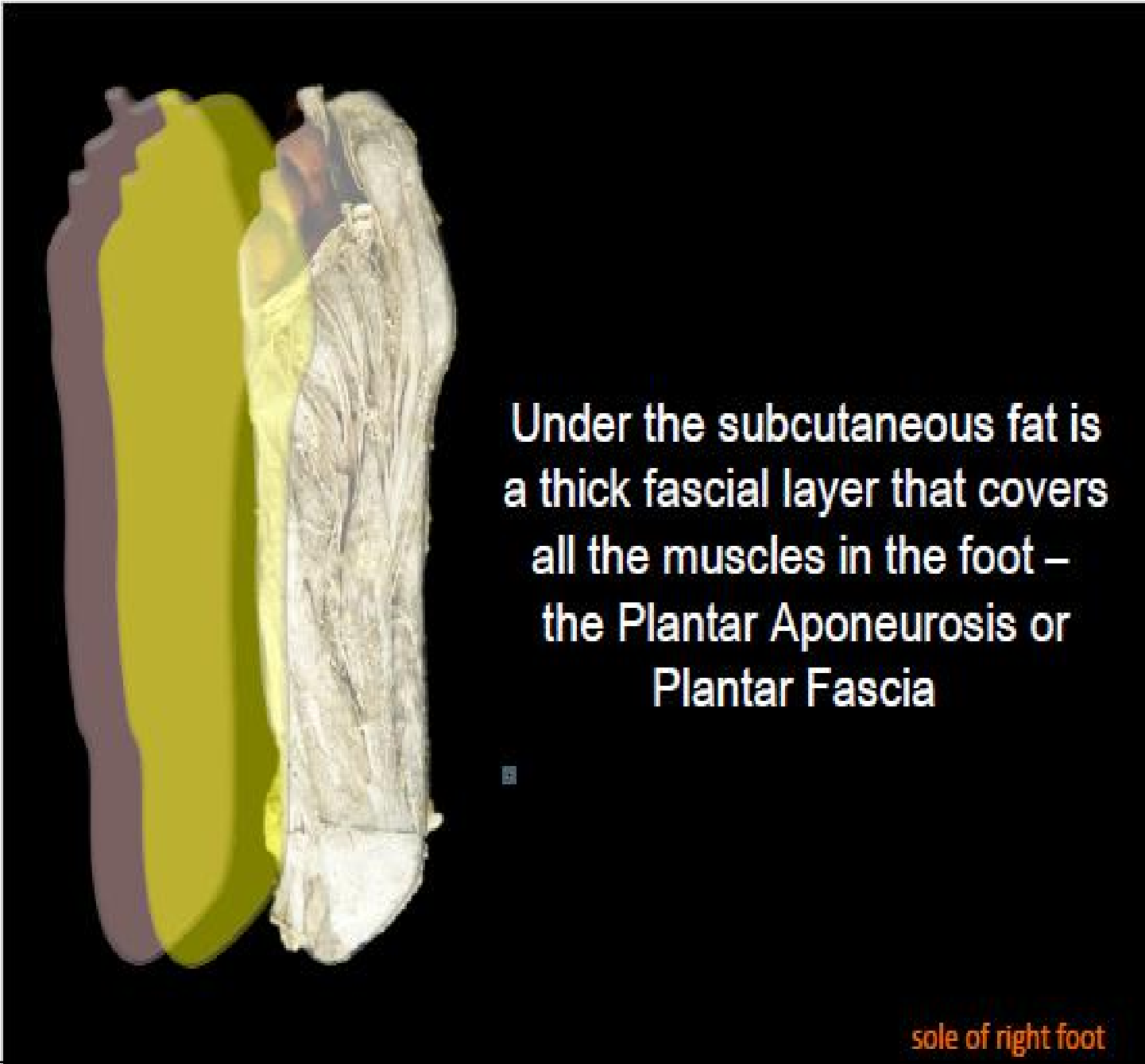


The Plantar Surface of the foot
is also known as the sole of
the foot

sole of right foot





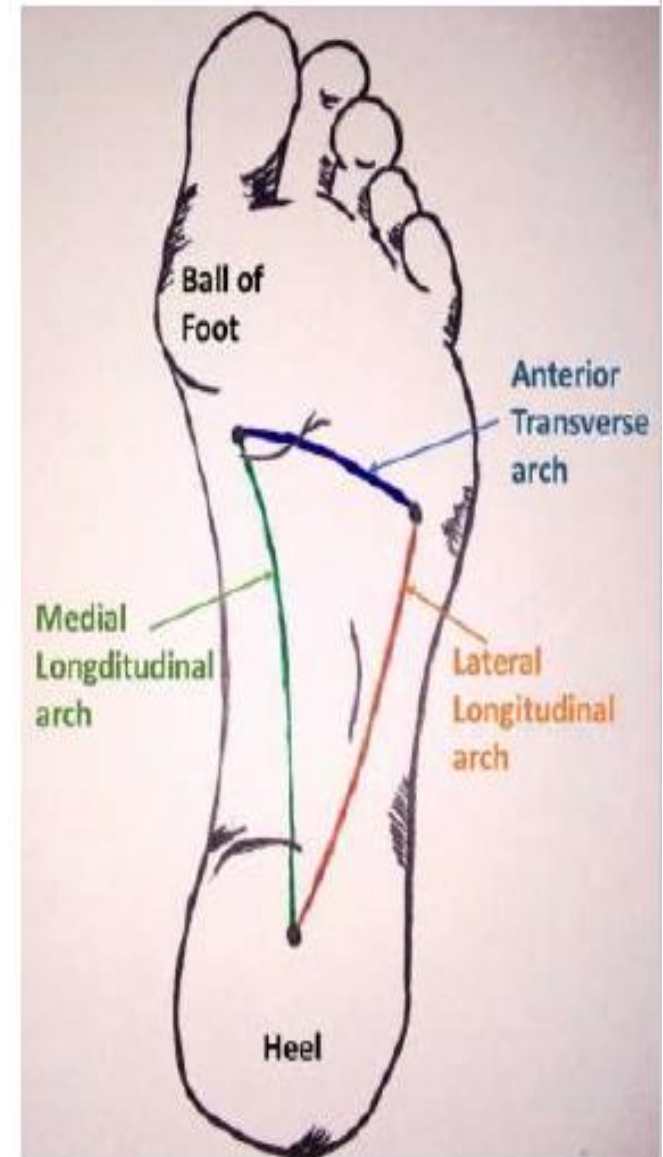


Sole is similar to palm.

The Skin, superficial fascia, deep fascia, muscle, vessels and nerves.

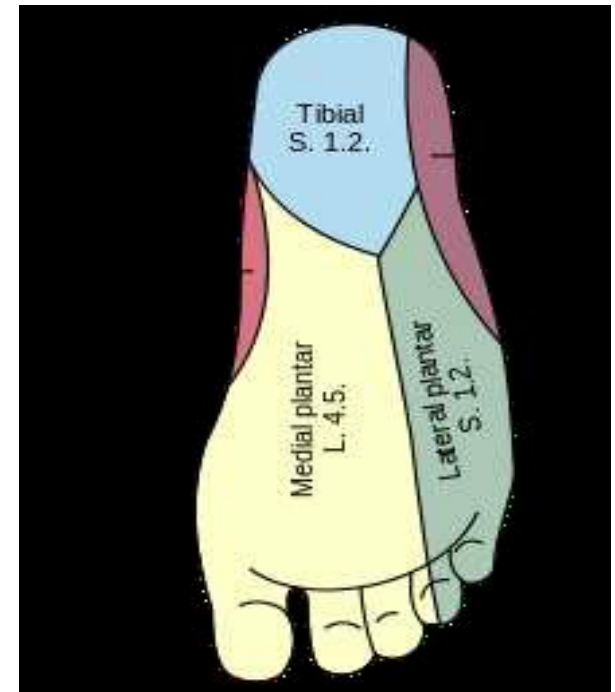
Foot is an organ for **Support** and locomotion.

The **arches** of foot help as elastic springs for efficient walking, running, jumping and support the body weight.



SKIN

1. Thick for protection.
2. **Glabrous skin**
3. **Sensory organ by which we perceive the ground.**
4. **Creases increase efficiency of grip on ground.**
5. The skin is mainly supplied by 3 cutaneous nerves

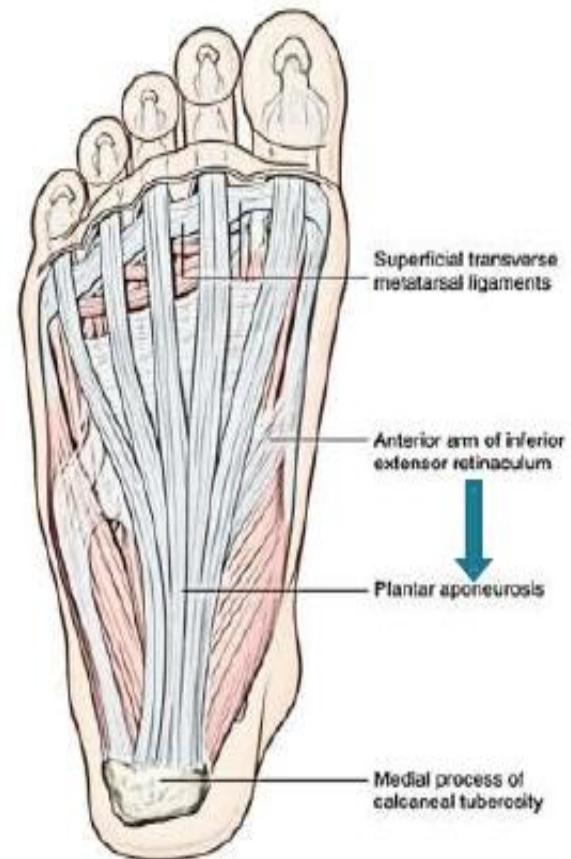


1. **Medial calcaneus** branches of **Tibial nerve** (posterior and Medial).
2. Branches from **Median planter nerve** (including three and half digits)
3. Branches from **lateral planter nerve**(anterolateral one and half.
4. Small areas on medial and lateral side are innervated by **Saphenous** and **Sural nerve**.

Fascia

1. Superficial fascia

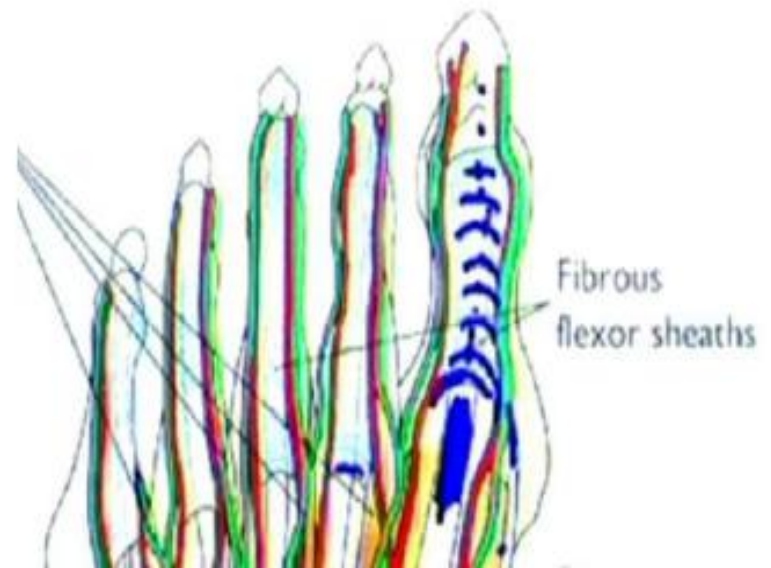
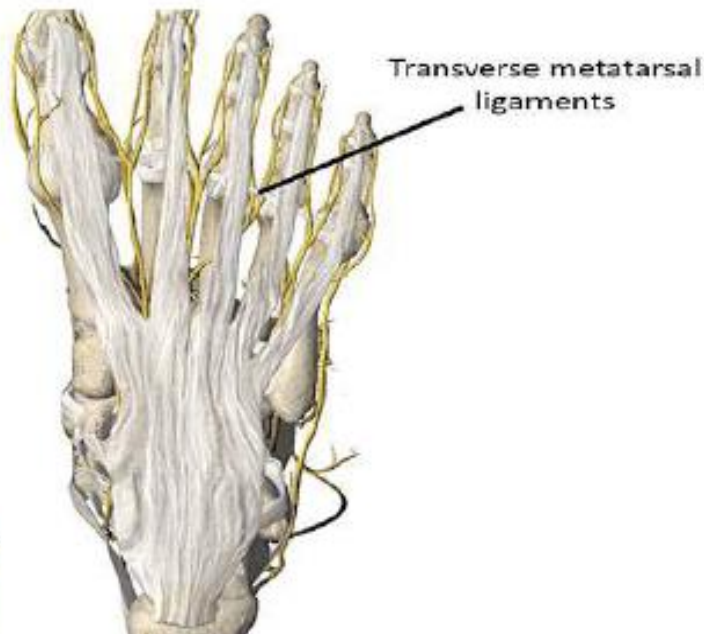
Once the skin of the sole of the foot is removed, there is a **very dense organized layer of deep fascia** that runs down the middle of the sole; This is **planter Aponeurosis**.



Fascia

2. Deep fascia

1. Plantar Aponeurosis
2. Deep transverse metatarsal ligament between Metatarsophalangeal joints.
3. The fibrous flexor sheaths in the toe.



Plantar Aponeurosis

Thickened band of the **deep fascia** in the sole of the foot.

Attachment

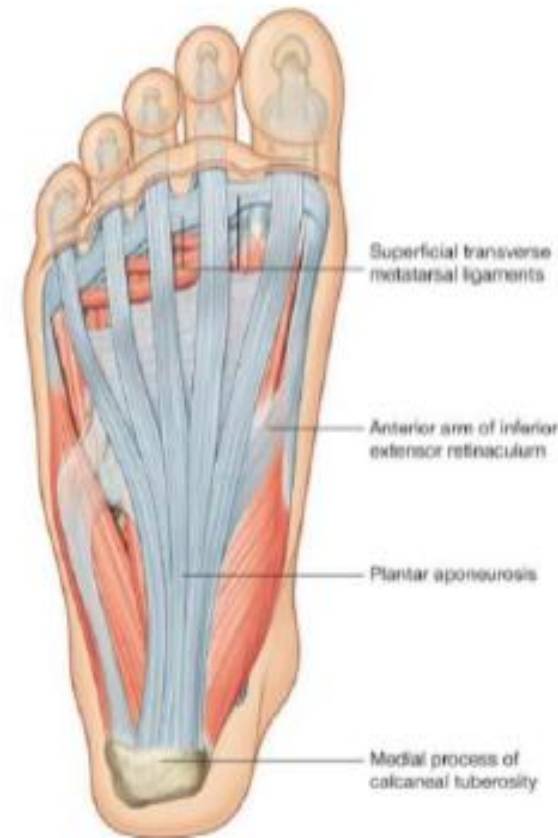
Posteriorly → Medial tubercle of Calcaneus.

Anteriorly → Divides into 5 slips which pass to the 5 toes.

On each side → Attached to the metatarsal and lateral intermuscular septa.

Function

1. It fixes the skin of sole.
2. It protects deeper structure.
3. It help to maintaining longitudinal arches of foot.
4. It gives origin to muscles of the first layer of sole.





There are four layers of
Intrinsic Muscles
that are present in the foot

1st Layer

Consists of 3 muscles





1st Layer

Consists of 3 muscles

Abductor Digiti Minimi



1st Layer

Consists of 3 muscles

Abductor Digiti Minimi

Flexor Digitorum Brevis



1st Layer

Consists of 3 muscles

Abductor Digiti Minimi

Flexor Digitorum Brevis

Abductor Hallucis



1st Layer

Abductor Hallucis

Originates from

- Medial process of the Calcaneum
- Flexor retinaculum
- Plantar aponeurosis

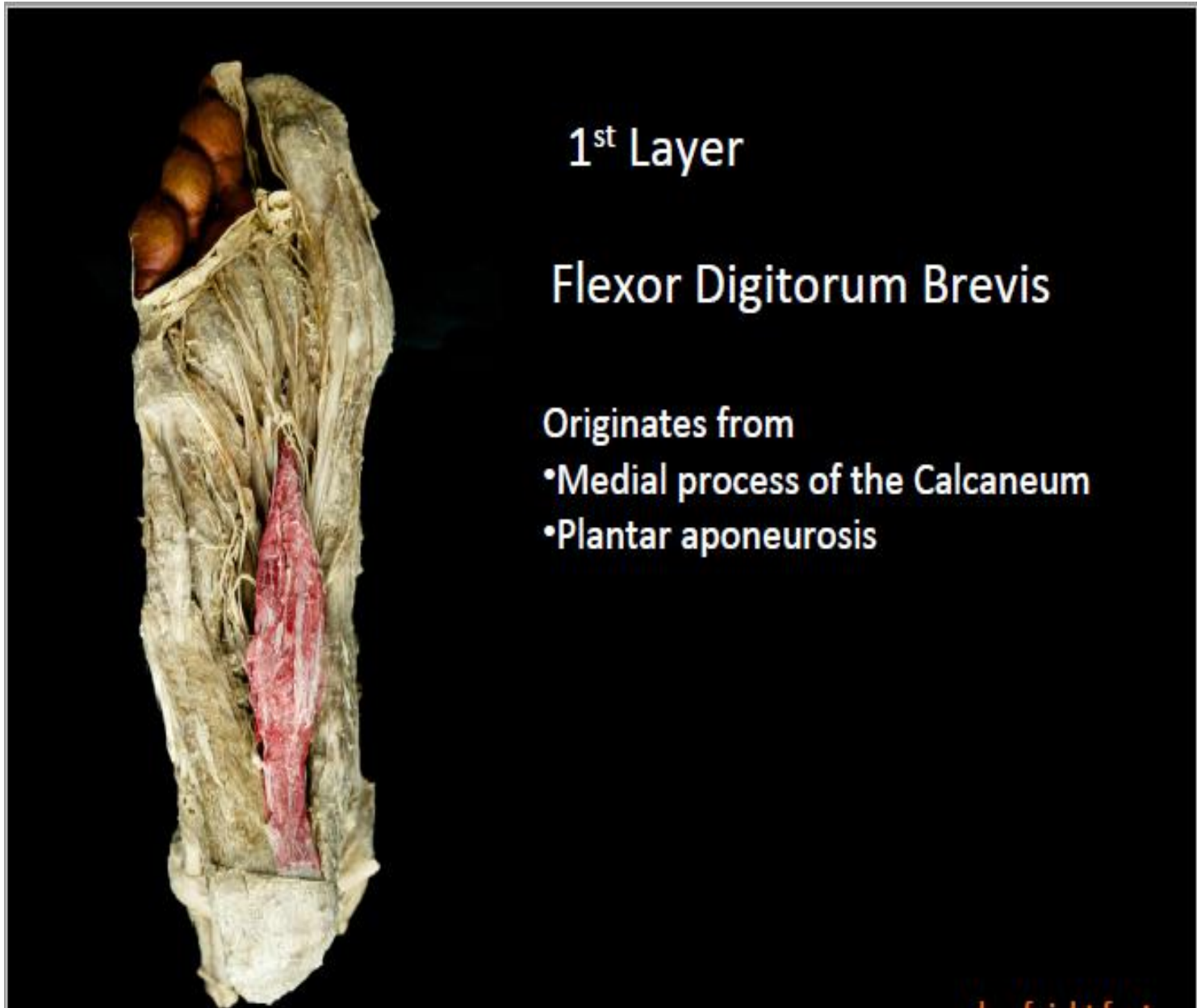
Inserts onto medial side of base of
Proximal Phalanx of Great Toe

1st Layer

Flexor Digitorum Brevis

This muscle is similar to
Flexor Digitorum Superficialis
in the hand







1st Layer

Flexor Digitorum Brevis

Splits into 4 tendons that enter the tendon sheaths of toes 2-5

Each tendon splits into two slips at the base of the proximal phalanx to allow the tendon of Flexor Digitorum Longus to pass through

The slips then reunite and insert onto the sides of the shaft of the middle phalanx of toes 2-5

sole of right foot



1st Layer

Abductor Digiti Minimi

Originates from

- Calcaneal tuberosity
- Plantar aponeurosis

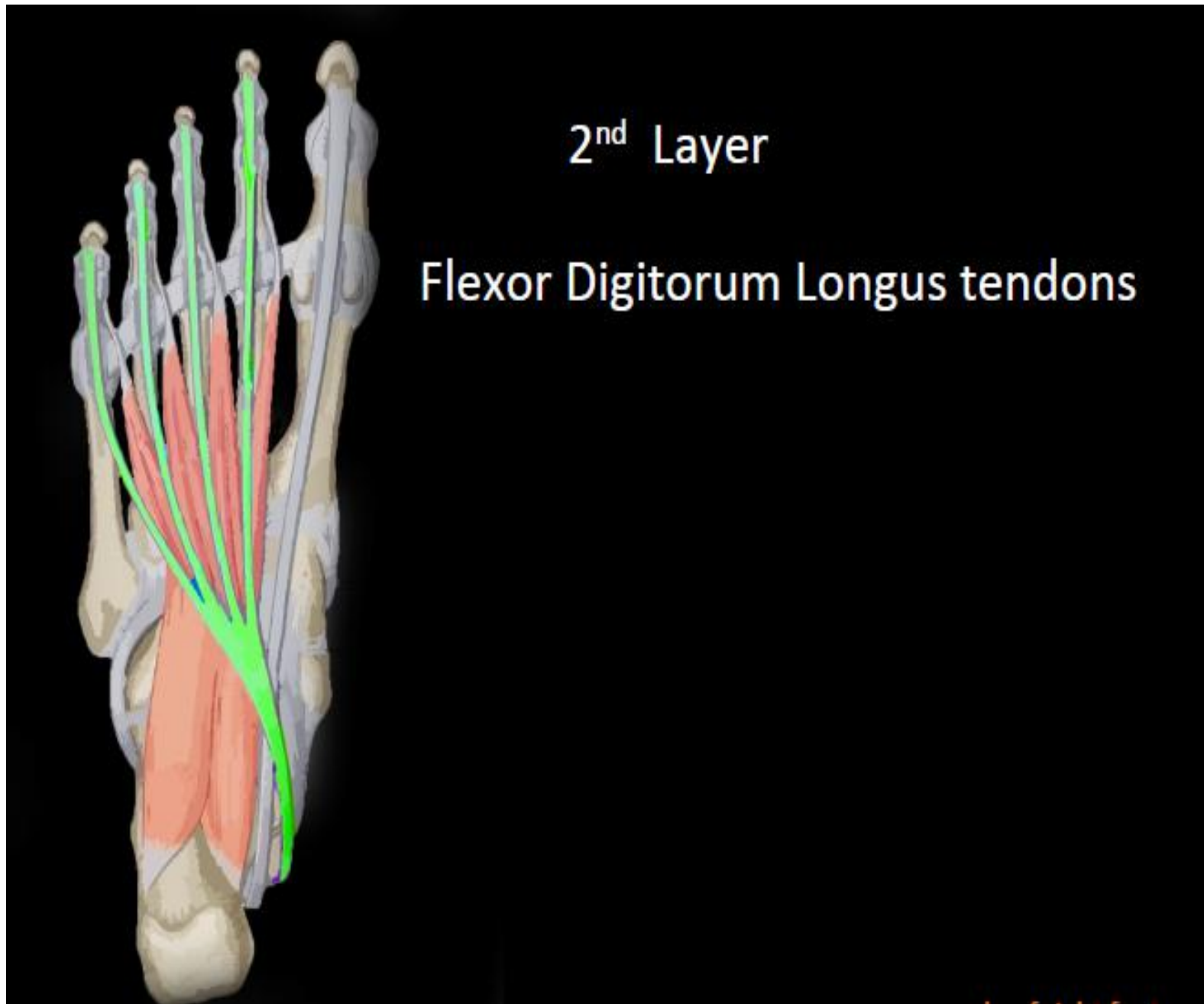
Inserts onto the lateral aspect of the base of the proximal phalanx of the little toe

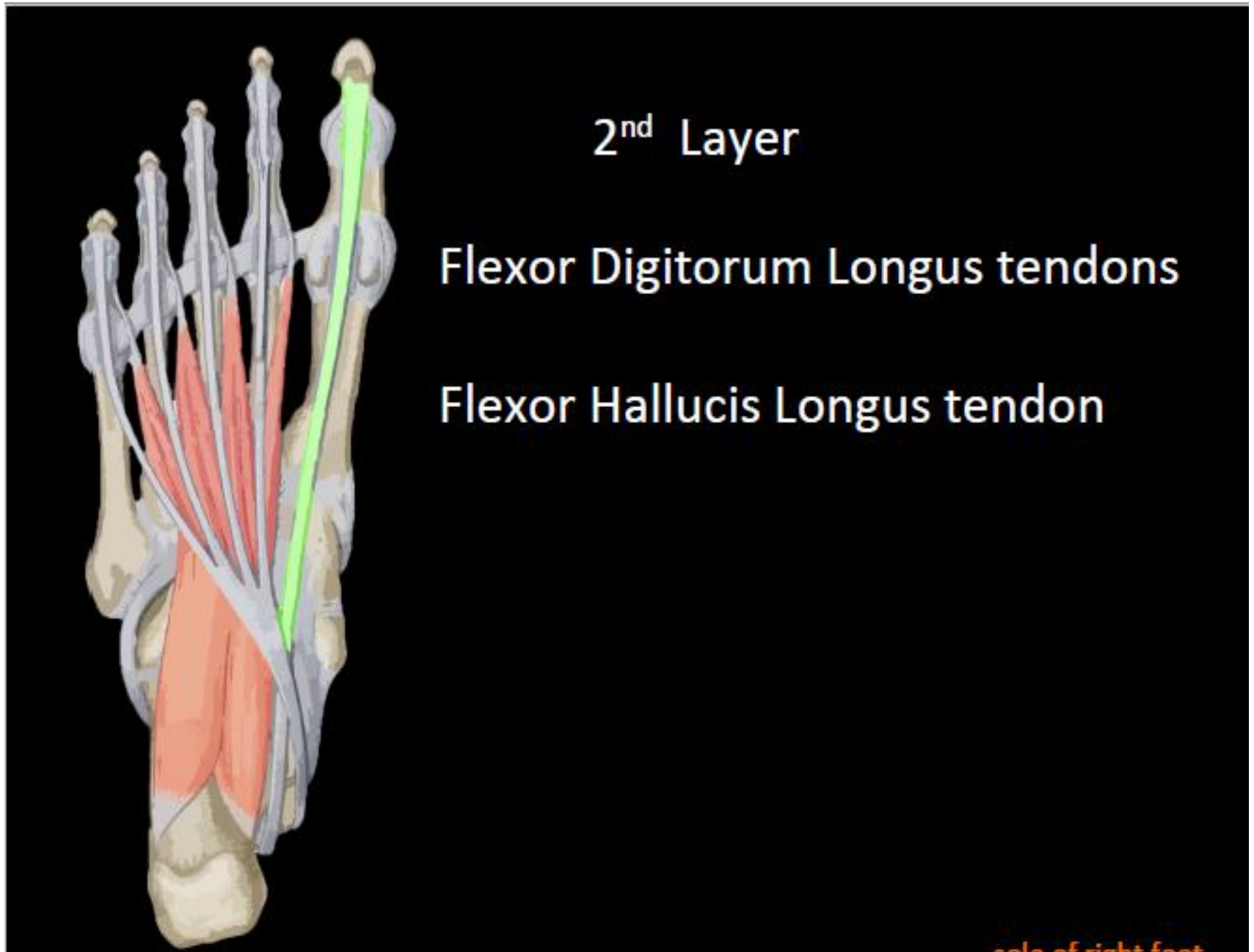
Abducts the little toe

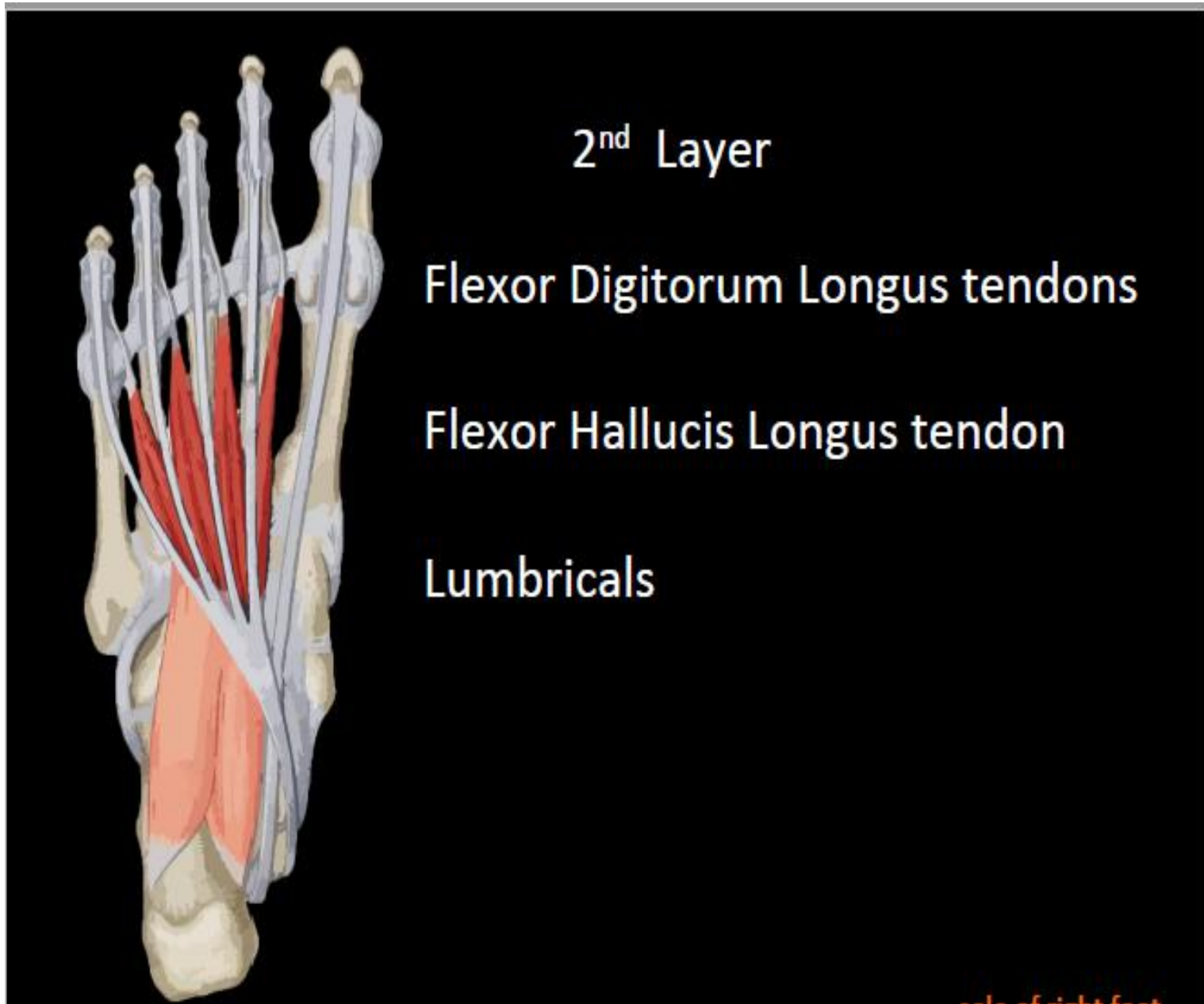


2nd Layer

Consists of the Long Flexor Tendons
and
intrinsic muscles (lumbricals and flexor
accessorius)









2nd Layer

Flexor Digitorum Longus tendons

Flexor Hallucis Longus tendon

Lumbricals

Flexor Accessorius



2nd Layer

Flexor Tendon Sheaths

Contains tendons of
Flexor Digitorum Longus



2nd Layer

Flexor Tendon Sheaths

Contains tendon of

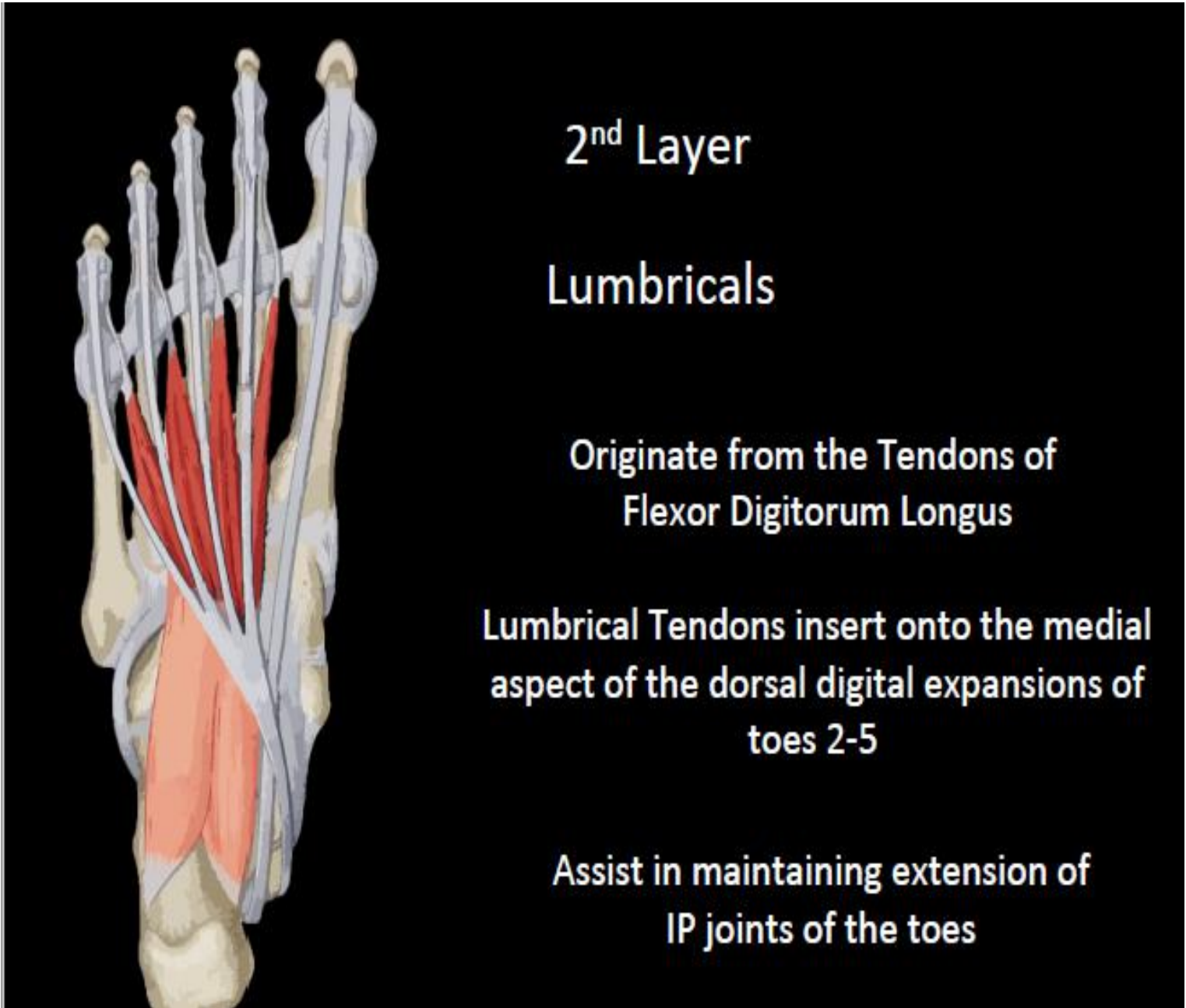
- Flexor Digitorum Longus
- Flexor Hallucis Longus



2nd Layer

Lumbricals

4 small muscles similar to the
Lumbricals in the Hand





2nd Layer

Flexor Accessorius

Deeply placed muscle also known as

Quadratus Plantae



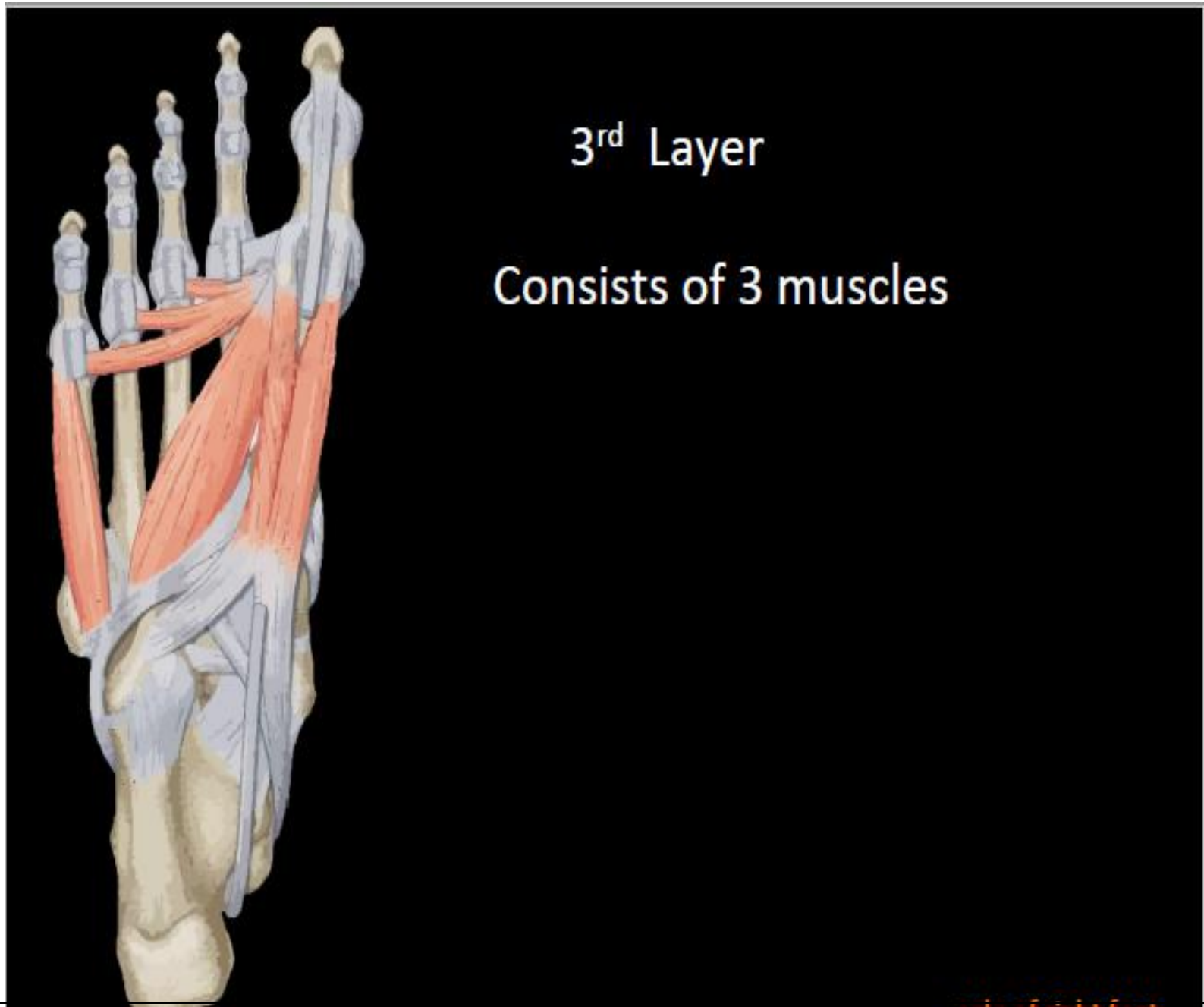
2nd Layer

Flexor Digitorum Accessorius

Originates from the
Calcaneum by 2 heads

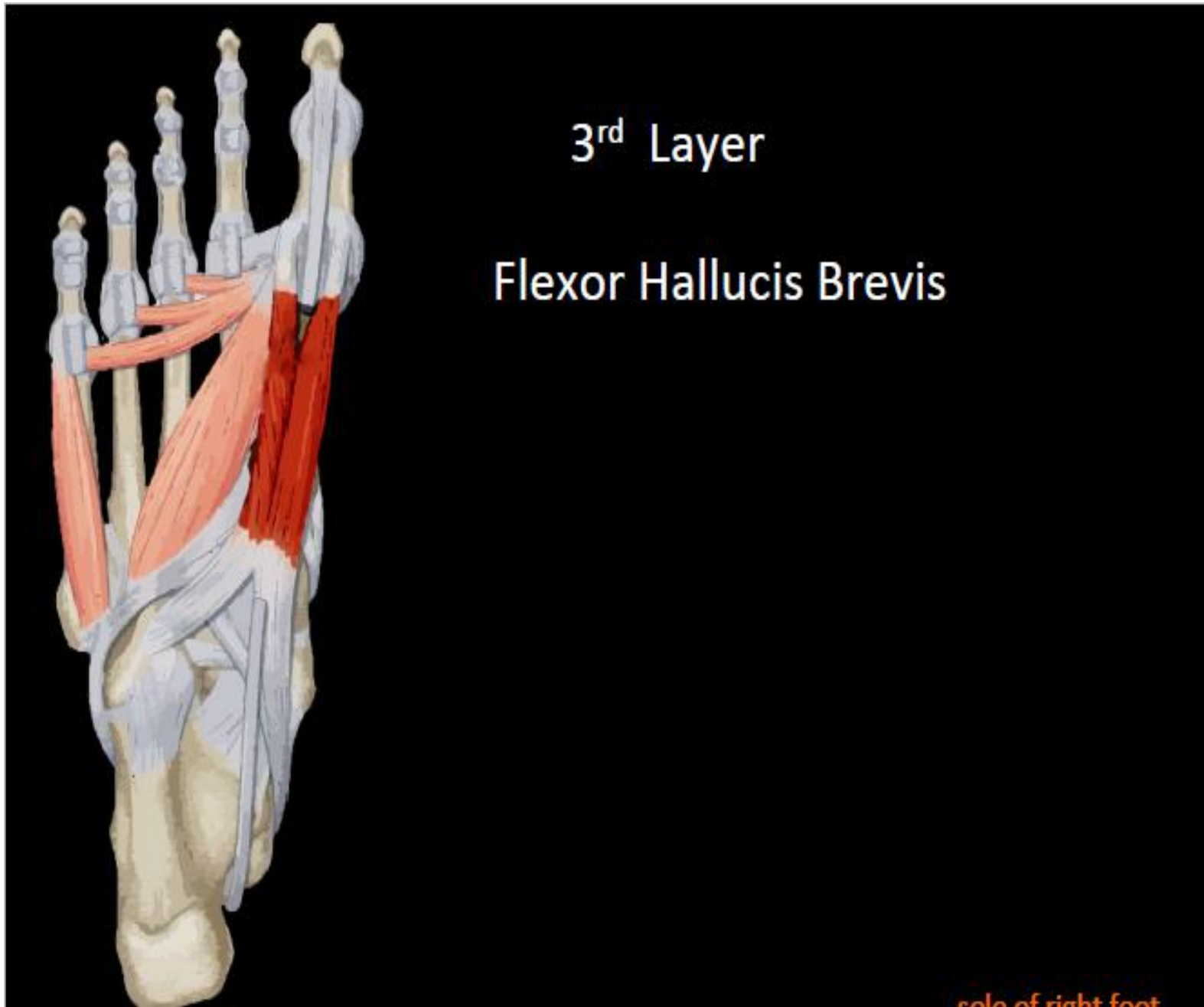
Inserts onto the tendon of
Flexor Digitorum Longus

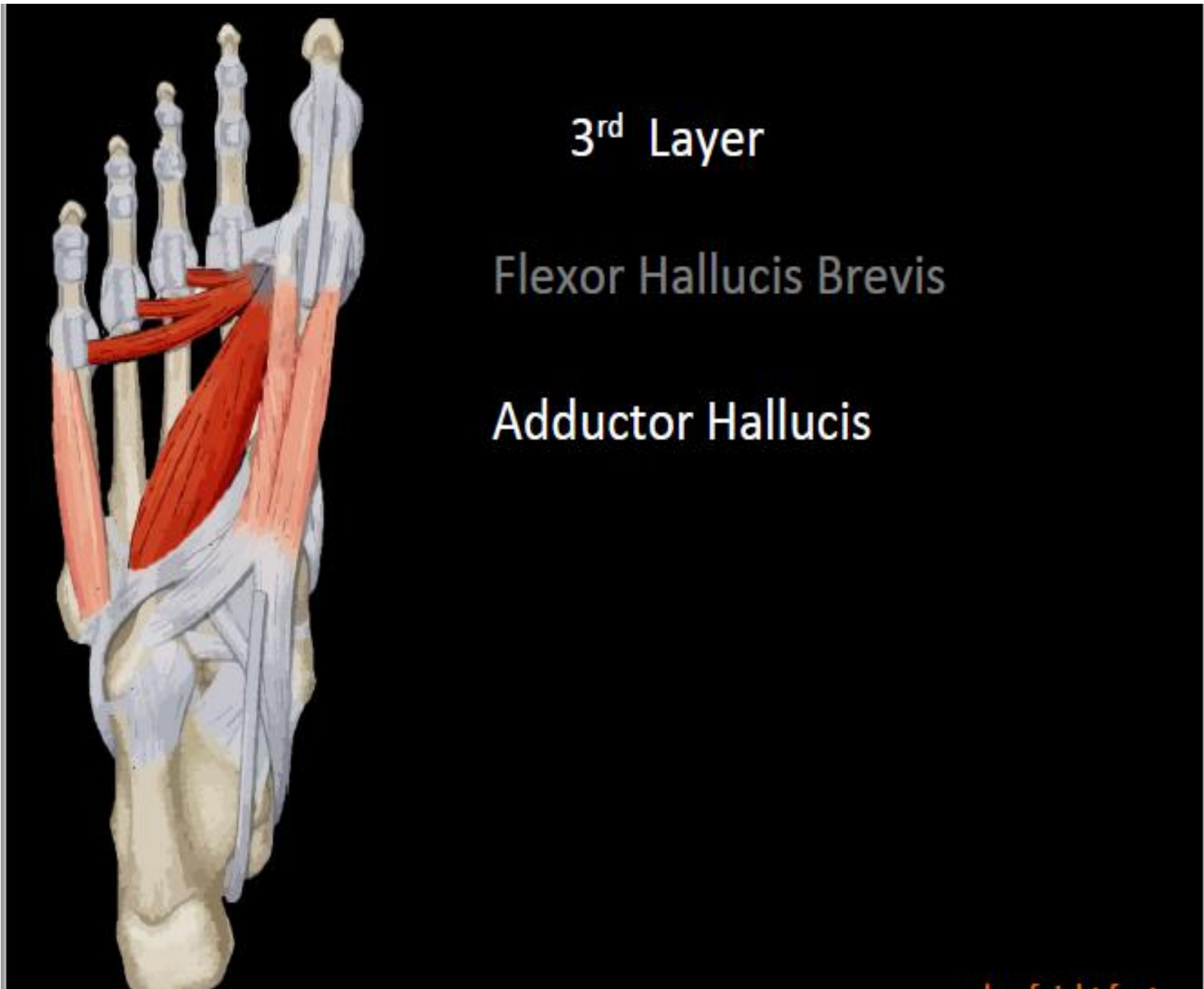
Assists Flexor Digitorum Longus
in flexing the toes 2-5

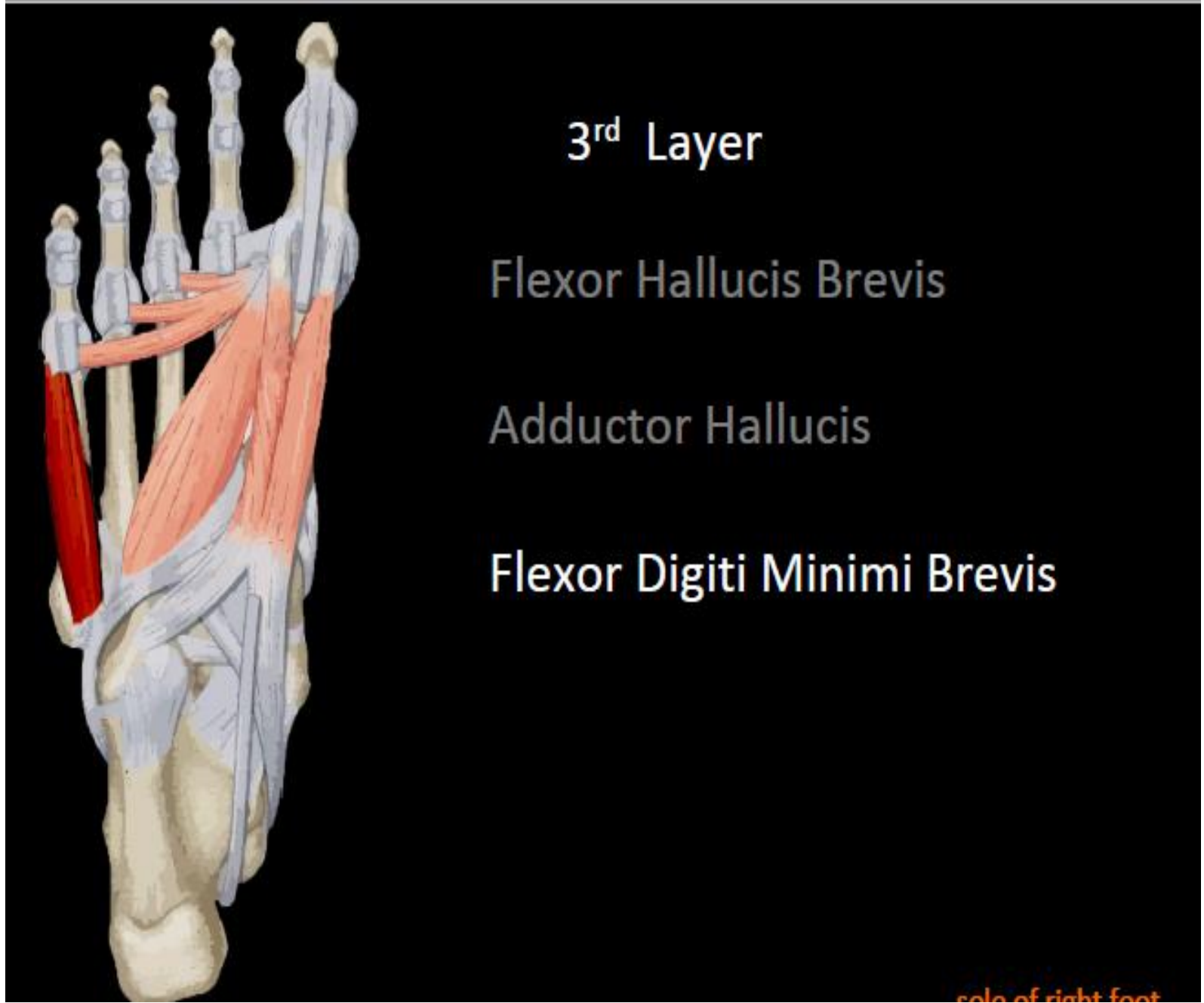


3rd Layer

Consists of 3 muscles









3rd Layer

Flexor Hallucis Brevis



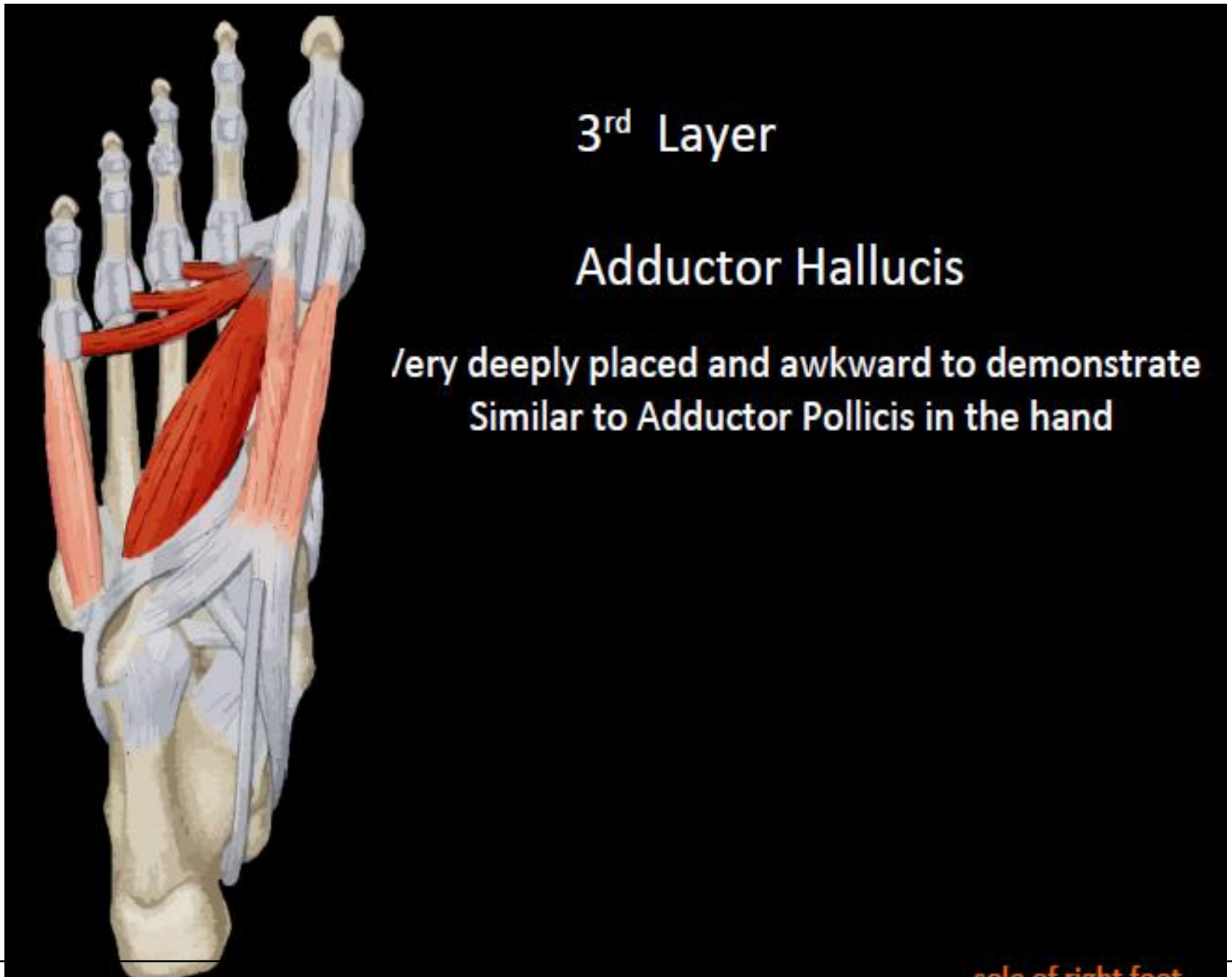
3rd Layer

Flexor Hallucis Brevis

Originates in 2 parts:

- Medial limb from the medial and intermediate cuneiforms and from the tendon of Tibialis Posterior
- Lateral limb from the Cuboid and Lateral Cuneiform

Inserts onto either side of the base of the Proximal Phalanx of Big Toe which it flexes





3rd Layer

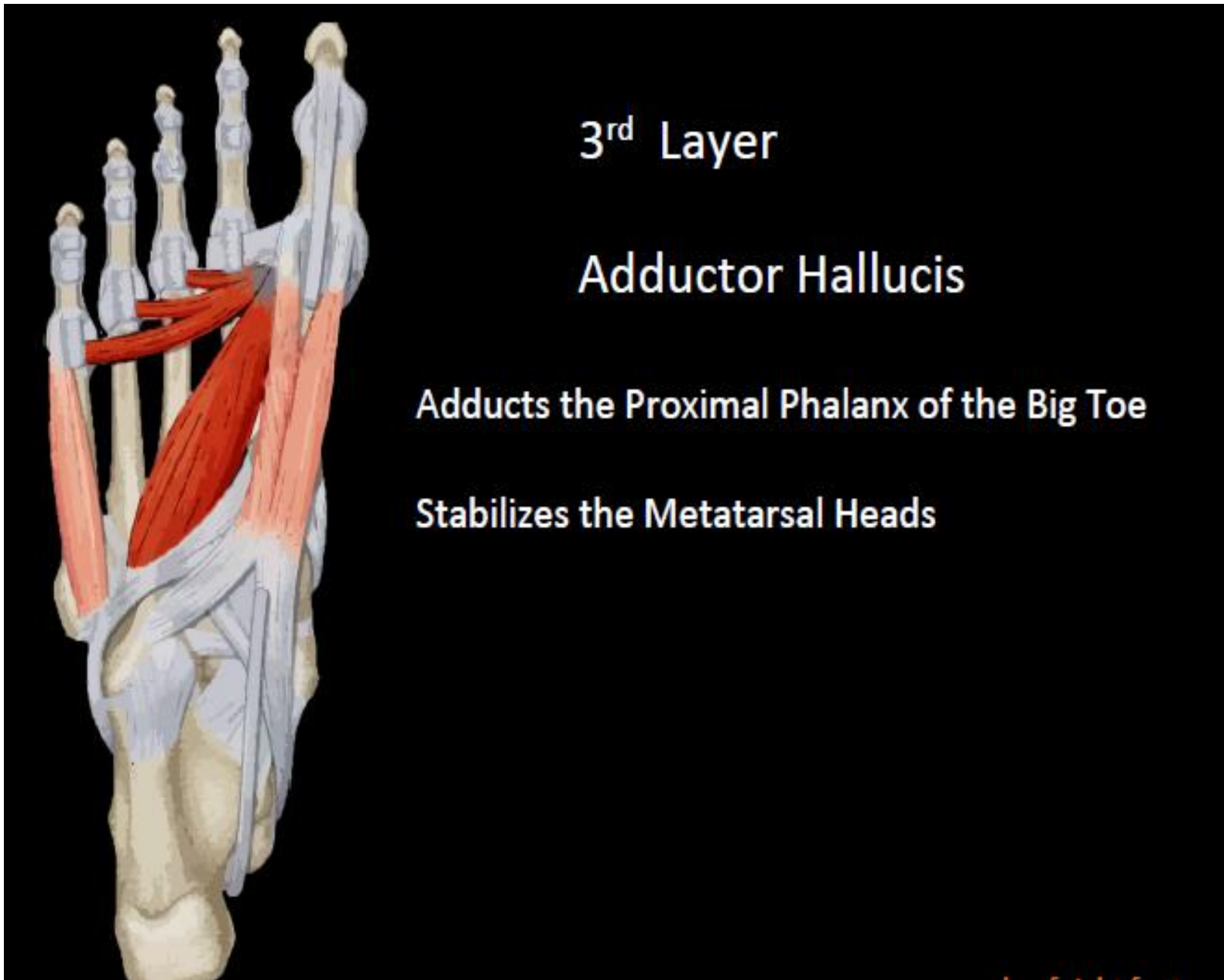
Adductor Hallucis

Originates by 2 heads:

- Oblique Head - bases of 2,3,4 metatarsals
- Transverse head – from plantar metatarsophalangeal ligaments of 3,4,5 toes

Inserts onto:

- Lateral Sesamoid
- Base of the Proximal Phalanx





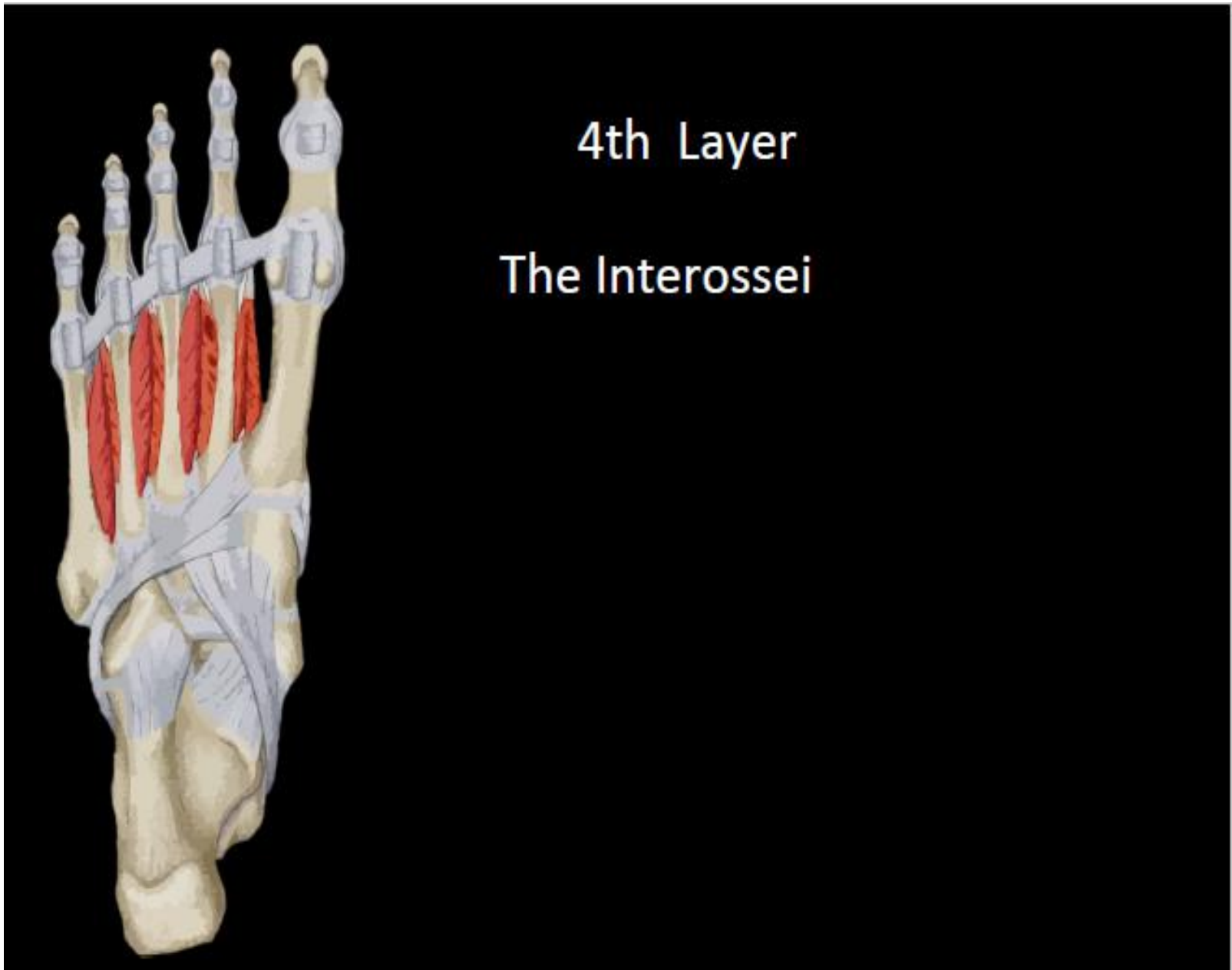
3rd Layer

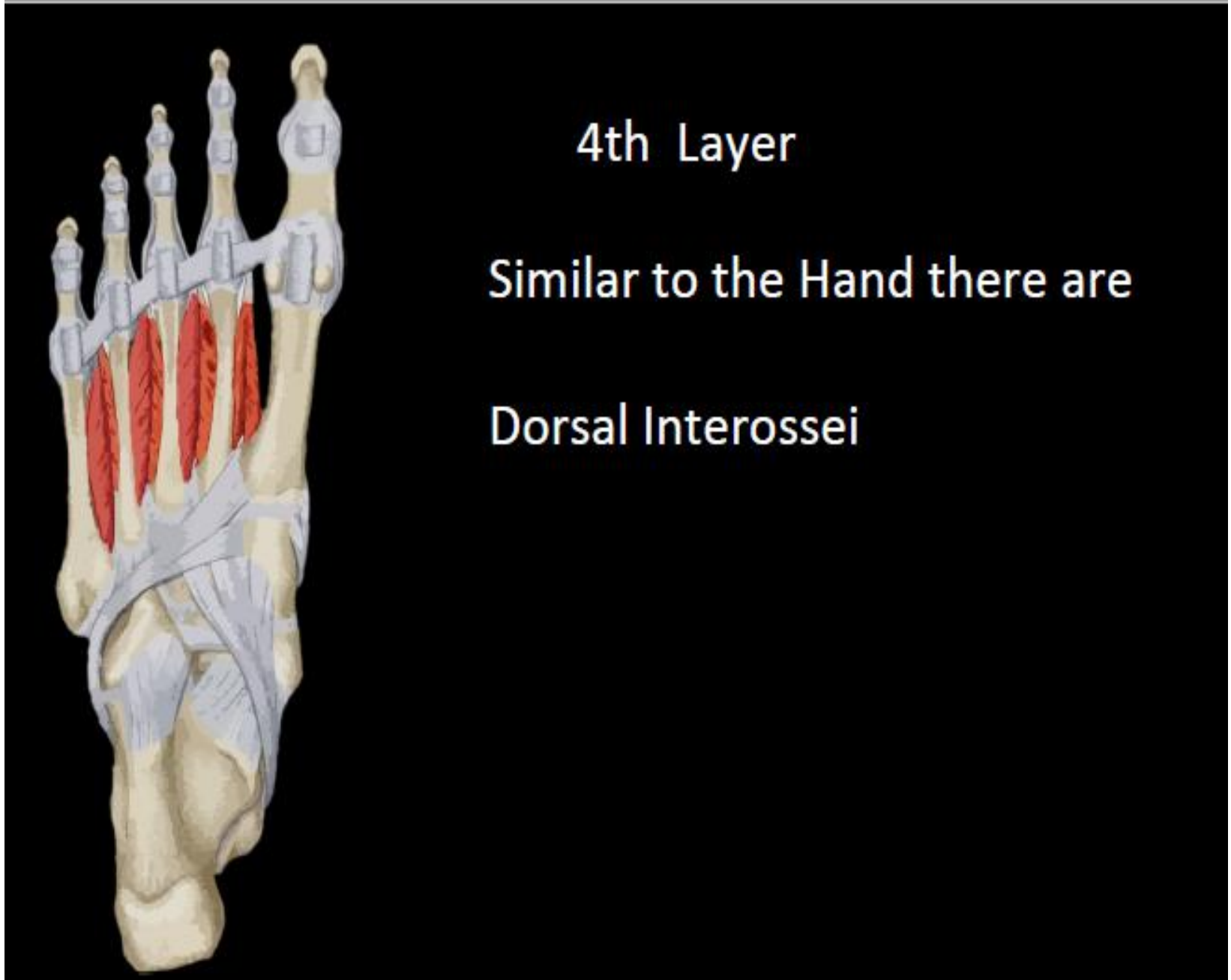
Flexor Digiti Minimi Brevis

Originates from medial part of plantar surface of base of the 5th Metatarsal

Inserts onto lateral side of base of Proximal Phalanx of Little Toe



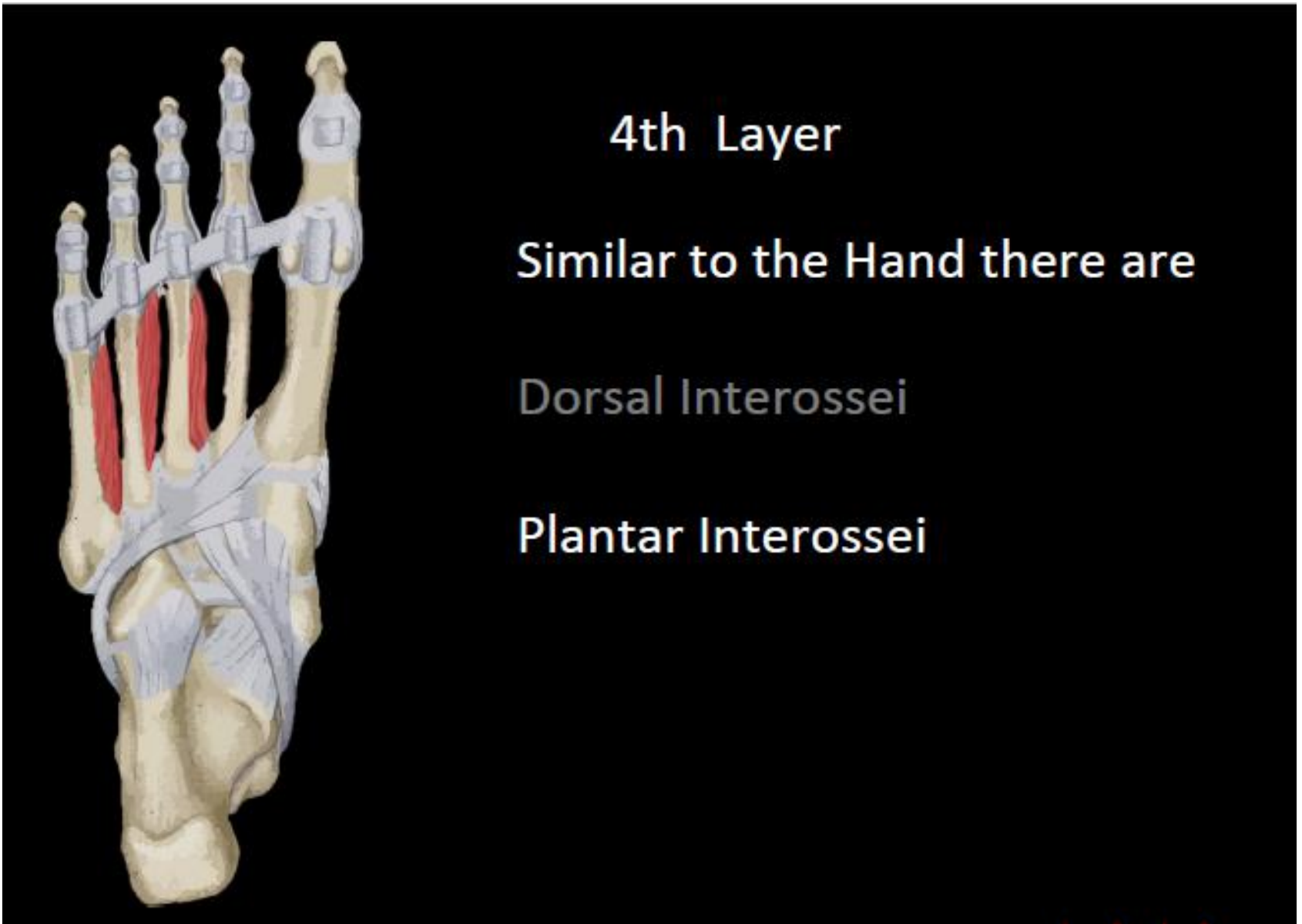


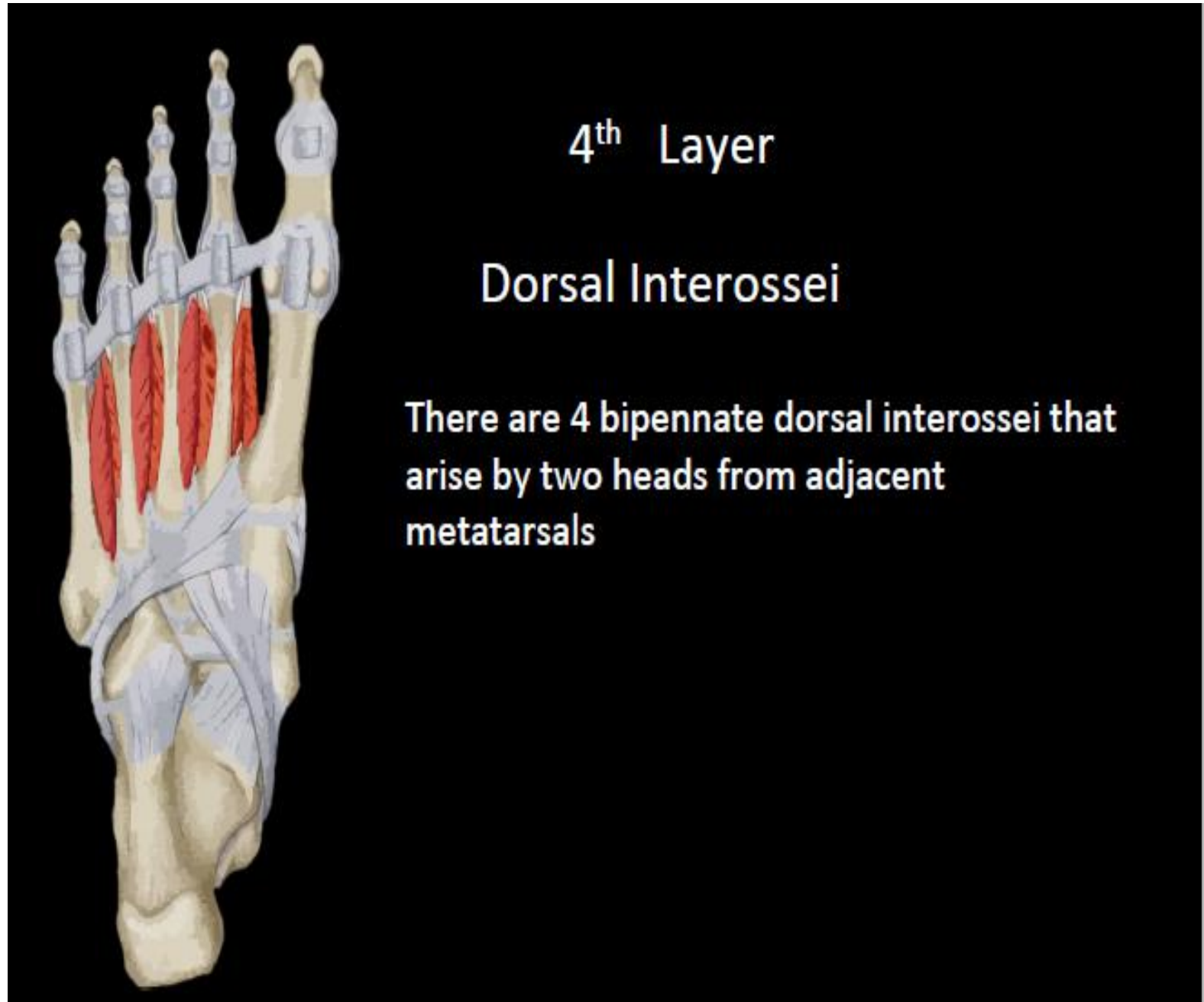


4th Layer

Similar to the Hand there are

Dorsal Interossei





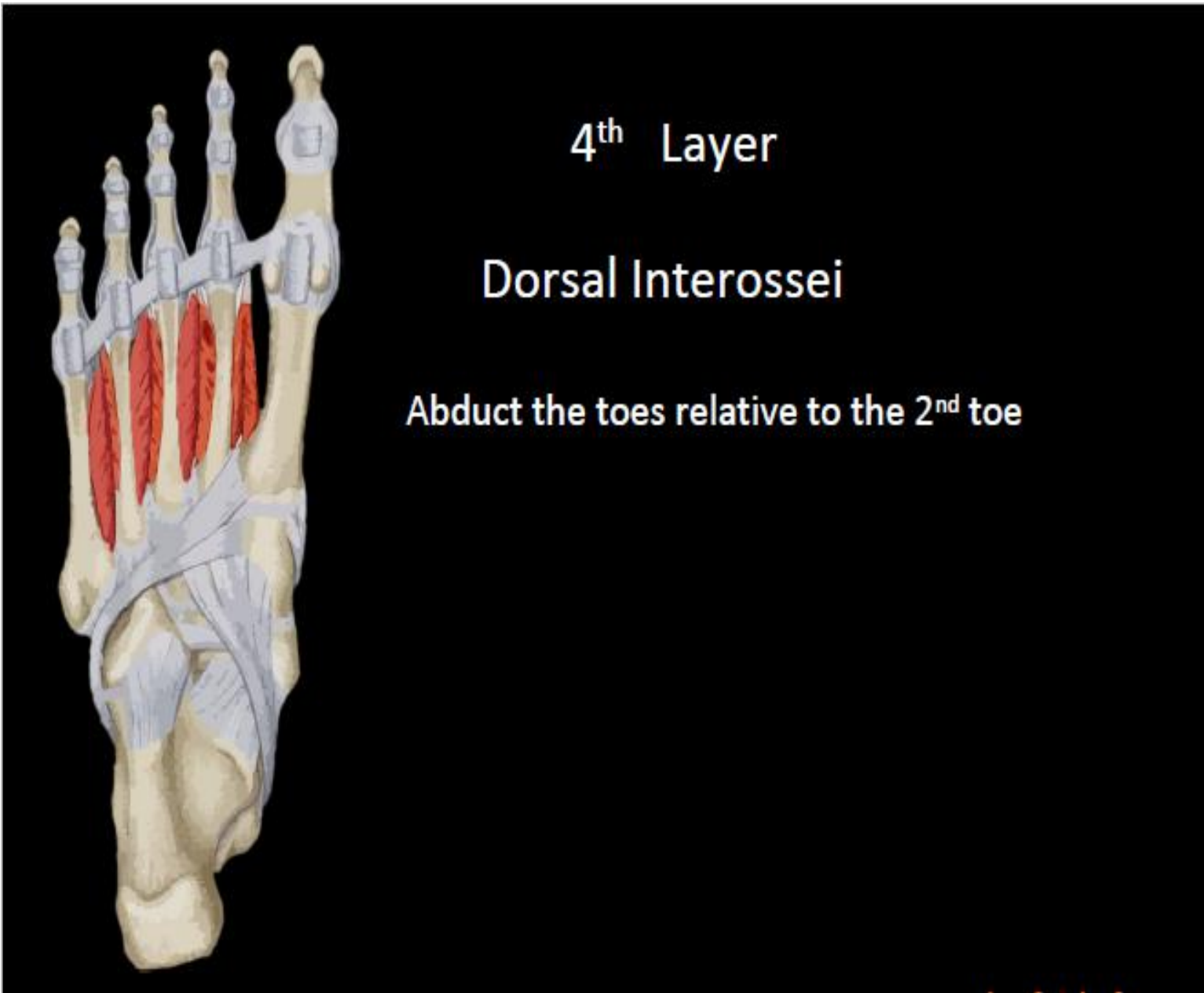


4th Layer

Dorsal Interossei

Insertion

1st dorsal interossei inserts onto the medial aspect of proximal phalanx of the second toe
The other three insert onto the lateral aspect of proximal phalanges of toes 2,3,4 respectively





4th Layer

Plantar Interossei

There are 3 Plantar Interossei

They are unipennate muscles.

Originate from medial sides of
3, 4, 5 metatarsals



4th Layer

Plantar Interossei

There are 3 Plantar Interossei

They are unipennate muscles.

Originate from medial sides of
3, 4, 5 metatarsals

Adduct toes 3, 4, 5 (towards the 2nd toe)

Flex MTP joints

Extend IP joints

In Summary

1st Layer

- Abductor Hallucis
- Flexor Digitorum Brevis
- Abductor Digiti Minimi

3rd Layer

- Flexor Hallucis Brevis
- Adductor Hallucis
- Flexor Digiti Minimi Brevis

2nd Layer

- Flexor Hallucis Longus
- Flexor Digitorum Longus
- Flexor Accessorius
- Lumbricals

4th Layer

- Plantar Interossei
 - Dorsal Interossei
- (also included in the fourth layer are the tendons of Tibialis Posterior and Peroneus Longus)

To try and remember the layers think of

1st layer – 1 Flexor between 2 Abductors

Abductor Hallucis - Flexor Digitorum Brevis - Abductor Digiti Minimi

2nd Layer – All the long flexors and their accessories

Flexor Hallucis Longus - Flexor Digitorum Longus – Flexor Accessorius -
Lumbricals

3rd layer – 1 Adductor between 2 Flexors

Flexor Hallucis Brevis - Adductor Hallucis - Flexor Digiti Minimi Brevis

4th Layer – the Interossei

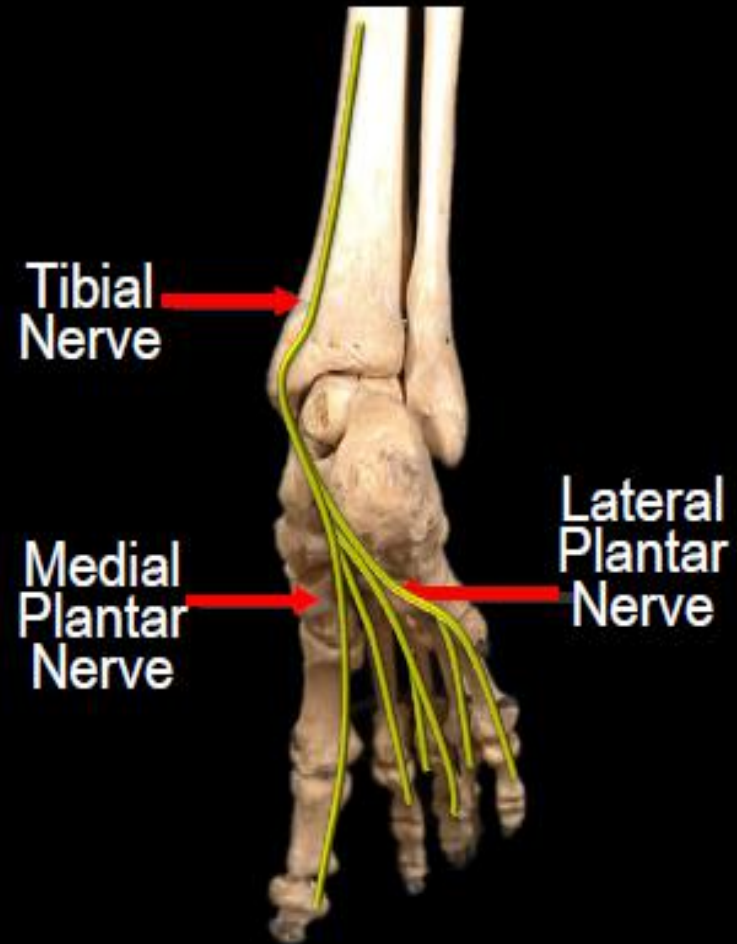
Plantar Interossei - Dorsal Interossei

Neurovascular Supply

The Tibial Nerve innervates all the muscles in the foot

It passes behind the Medial Malleolus, crosses the Tarsal Tunnel and divides into

- Medial Plantar Nerve
- Lateral Plantar Nerve



1. Medial plantar Nerve

❖ origin and course :

Largest terminal branch of Tibial nerve. It passes forwards between Abductor hallucis and flexor digitorum brevis and divides into its branches.

Its Root ventral primary rami of L4, L5 and S1

❖ Branches:

The Muscular branches supply the Four muscle.

1. Abductor hallucis
2. Flexor digitorum brevis
3. Flexor hallucis brevis
4. First lumbrical muscle

1. Medial Plantar Nerve

❖ Branches

Cutaneous branches supply the skin of the Medial part of the sole and of the medial Three and a half Toes through Four Digital branches.



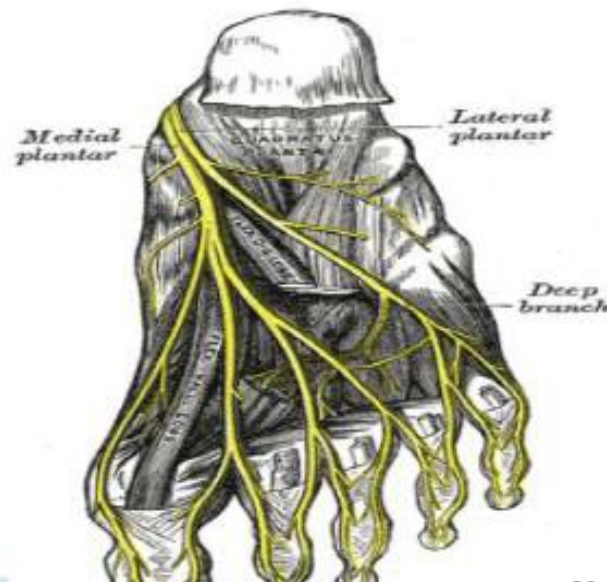
2. Lateral Plantar Nerve

❖ Origin:

Small terminal branch of **Tibial nerve**.

passes laterally and forwards till base of **fifth Metatarsal**, where it divides **Superficial and Deep branches**.

its **Root value** is **Ventral Primary Rami of S2,S3**, its supply 14 muscles of the sole.



2. Lateral Plantar Nerve

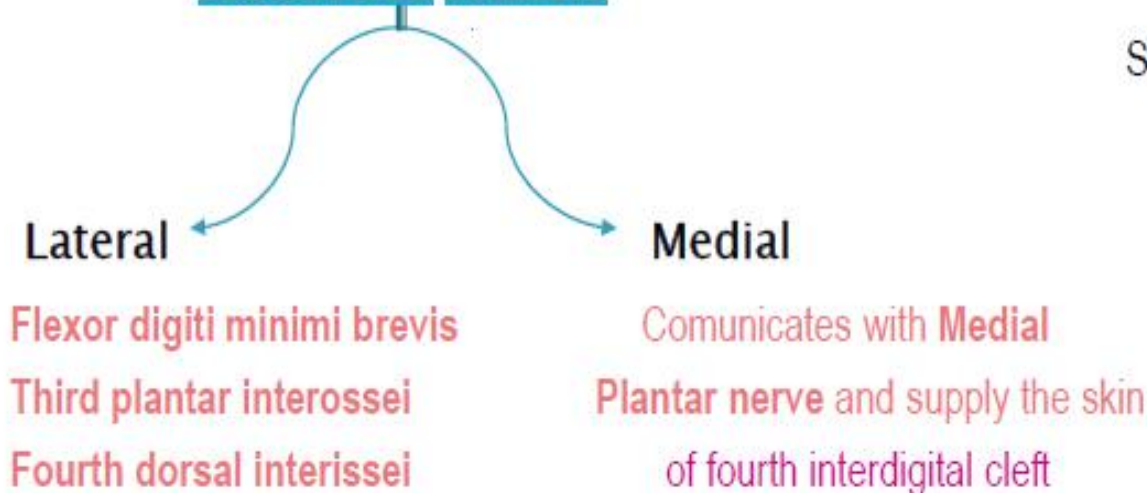
❖ Branches:

The main Trunk supply Two muscle

Flexor digitorum accessories.

Abductor digiti minimi.

Superficial branch



Deep branch

Supply Nine muscles,

2,3,4 Lumbricals

1,2,3 Dorsal interossei

1,2 Plantar interossei

Adductor Hallucis



Lateral Plantar Nerve Branches

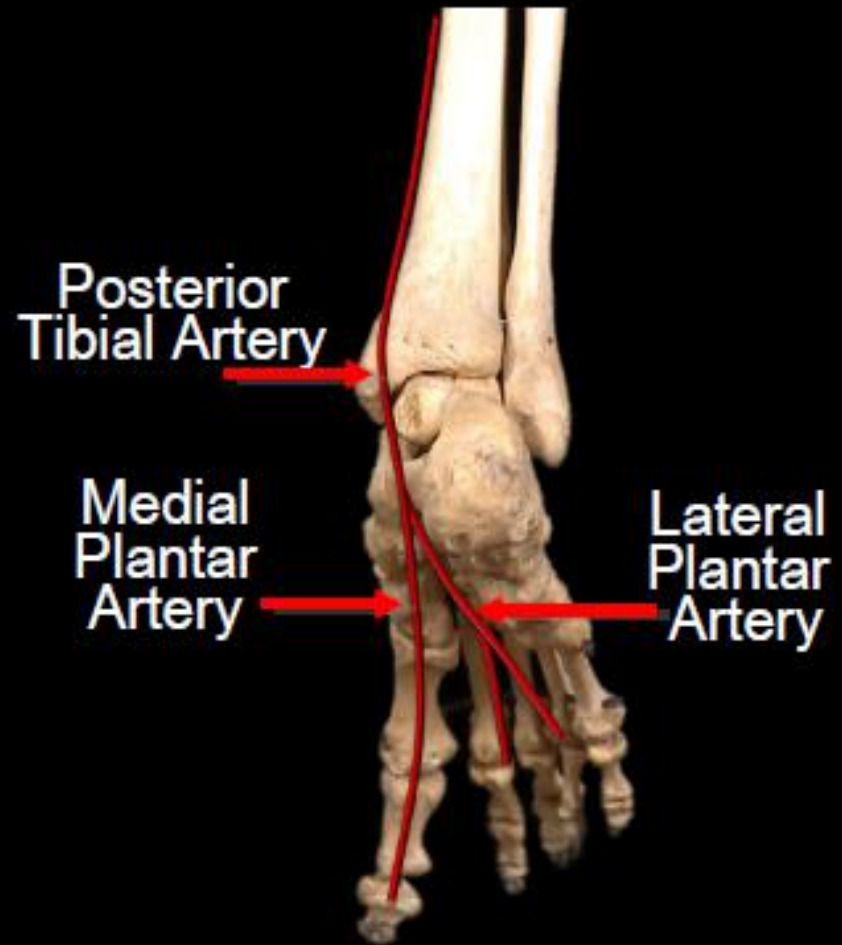


Medial Plantar Nerve Branches

The Posterior Tibial Artery accompanies the Tibial Nerve and passes behind the Medial Malleolus through the Tarsal Tunnel

It divides into two branches

- Medial Plantar Artery
- Lateral Plantar Artery



Medial Plantar Artery

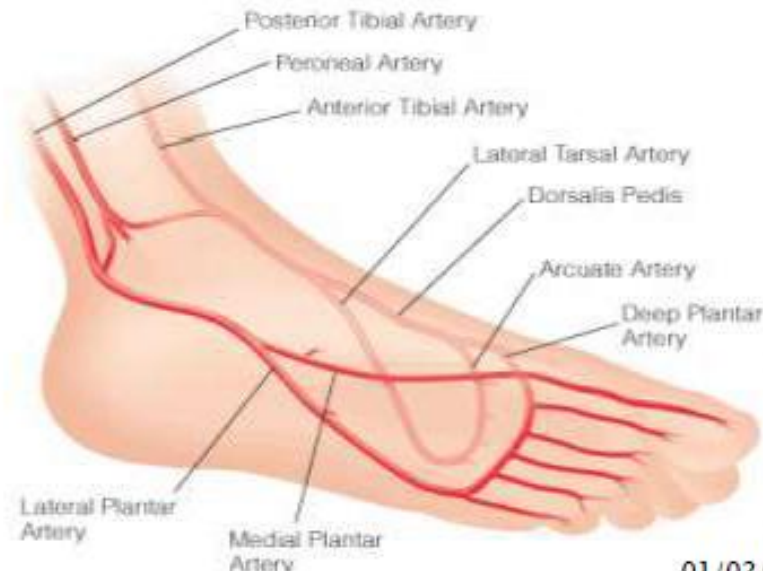
❖ Beginning, Course and Termination

Smaller terminal branch of posterior tibial artery.

❖ Branches

it gives Cutaneous and Muscular branches

Three Small superficial digital branches and last it joining 1,2 and 3 plantar metatarsal arteries



Lateral Plantar Artery

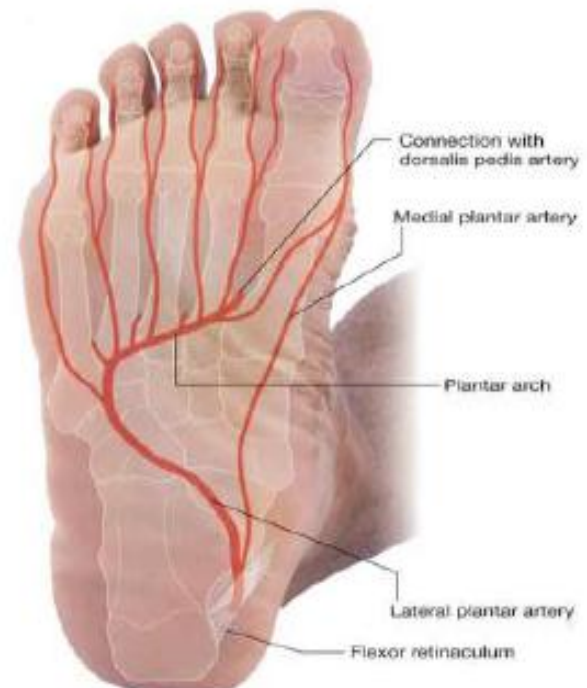
❖ Beginning, Course and Termination

Larger terminal branch of posterior Tibial Artery.

❖ Branches

Muscular branch supply adjoining muscles

Cutaneous branches supply **skin** and
fasciae of lateral part



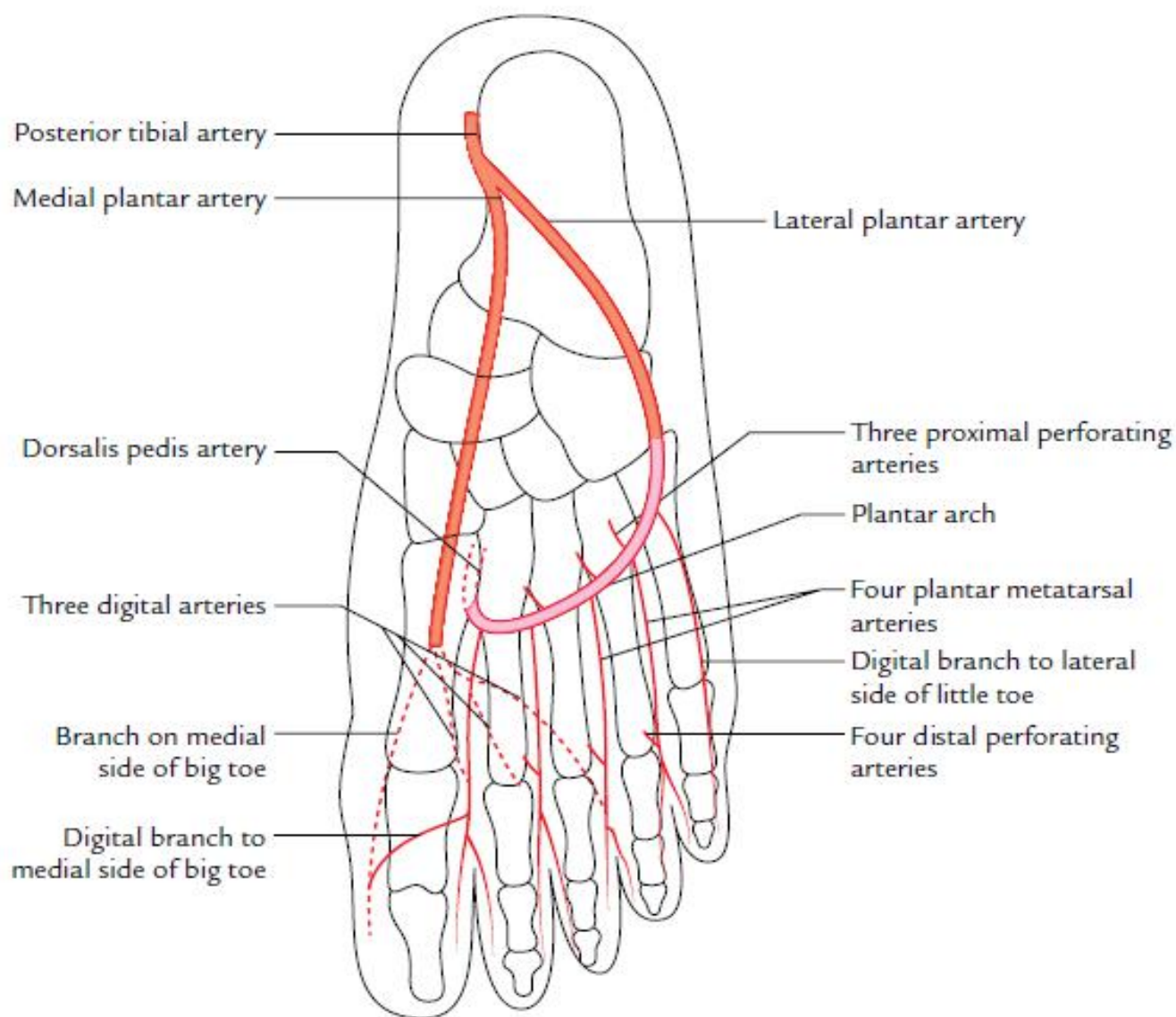
Plantar Arch

❖ Beginning, Course, and Termination

Direct continuation of the **lateral plantar artery** and completed medially by **Dorsal pedis artery**.

❖ Branches

- **Four plantar metatarsal arteries**. Each artery dividing into **Two plantar digital branches** for adjacent side of **Two digits**.
- Plantar arch give **Three proximal perforating arteries** pass through 2,3 and 4 metatarsal arteries which are branches of **arcuate artery**.
- the Distal end of **plantar metatarsal artery** gives off a **Distal perforating artery**.



Course and branches of the medial and lateral plantar arteries.

Plantar Fasciitis

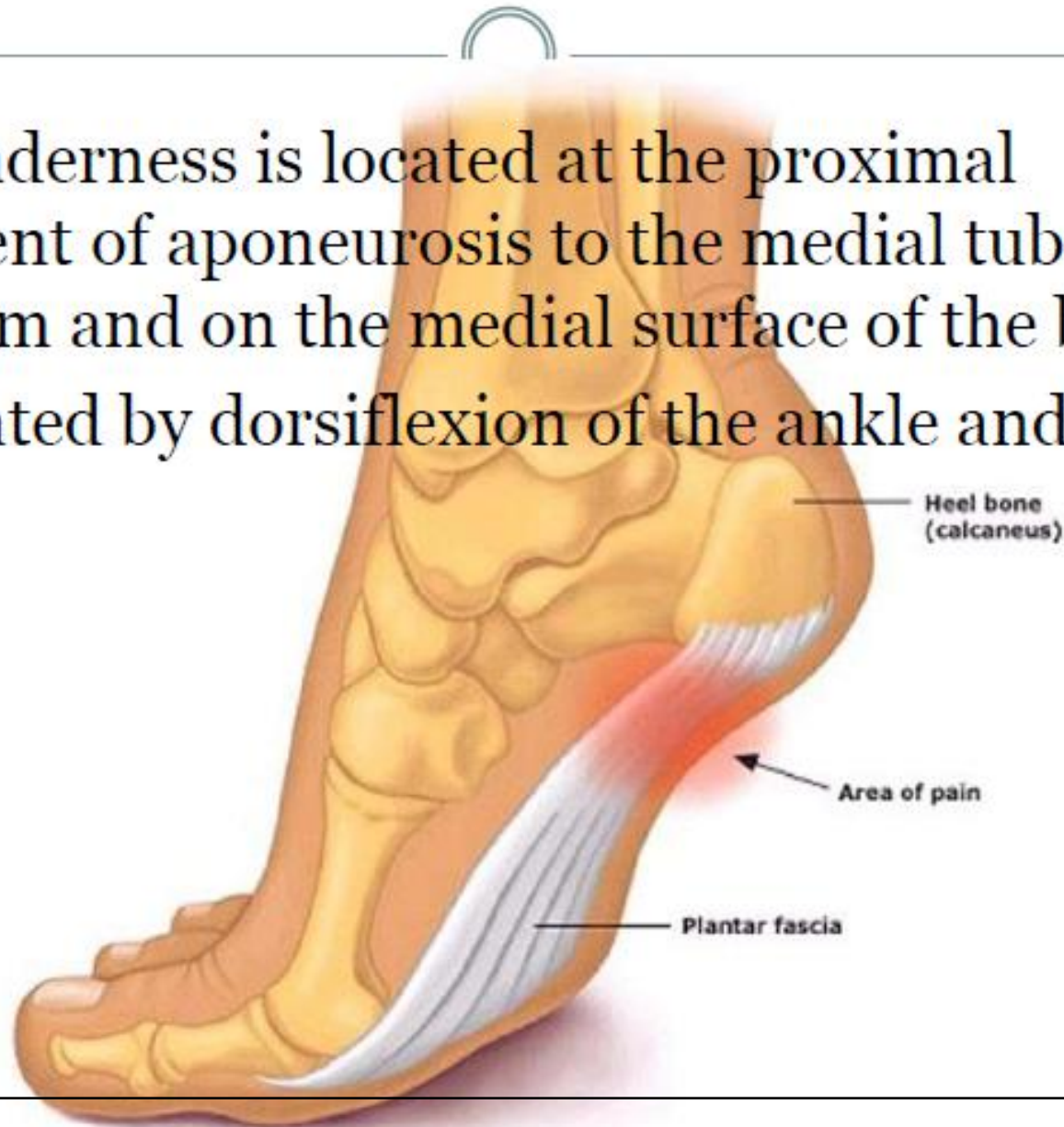


Plantar Fasciitis



- Plantar Fasciitis is the inflammation of the Plantar Fascia
- It is often caused by an overuse mechanism
- Plantar Fasciitis is the most common hind foot problem in runners
- It causes pain on the plantar surface of the foot and heel
- The pain is often more severe when after sitting and when beginning to walk in the morning
- The pain dissipates after 5-10 mins of activity and recurs after inactivity

- Point tenderness is located at the proximal attachment of aponeurosis to the medial tubercle of calcaneum and on the medial surface of the bone
- Exacerbated by dorsiflexion of the ankle and weight bearing.

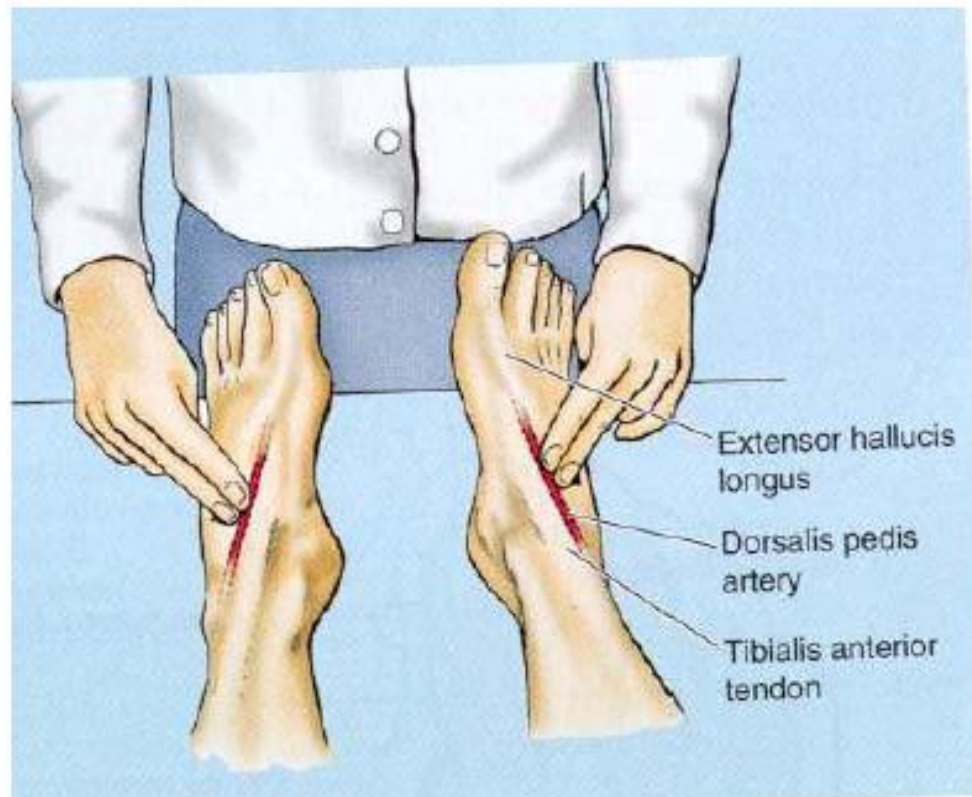


Calcaneal Spur

- An abnormal bony process that protrudes from the medial tubercle, if present along with pain on the medial side of the foot when walking may indicate plantar fasciitis.



Palpating the Dorsalis Pedis Artery



GENICULAR ANASTOMOSIS

