



The Lower Limb VII:



The Ankle & Foot

Anatomy

RHS 241

Lecture 7

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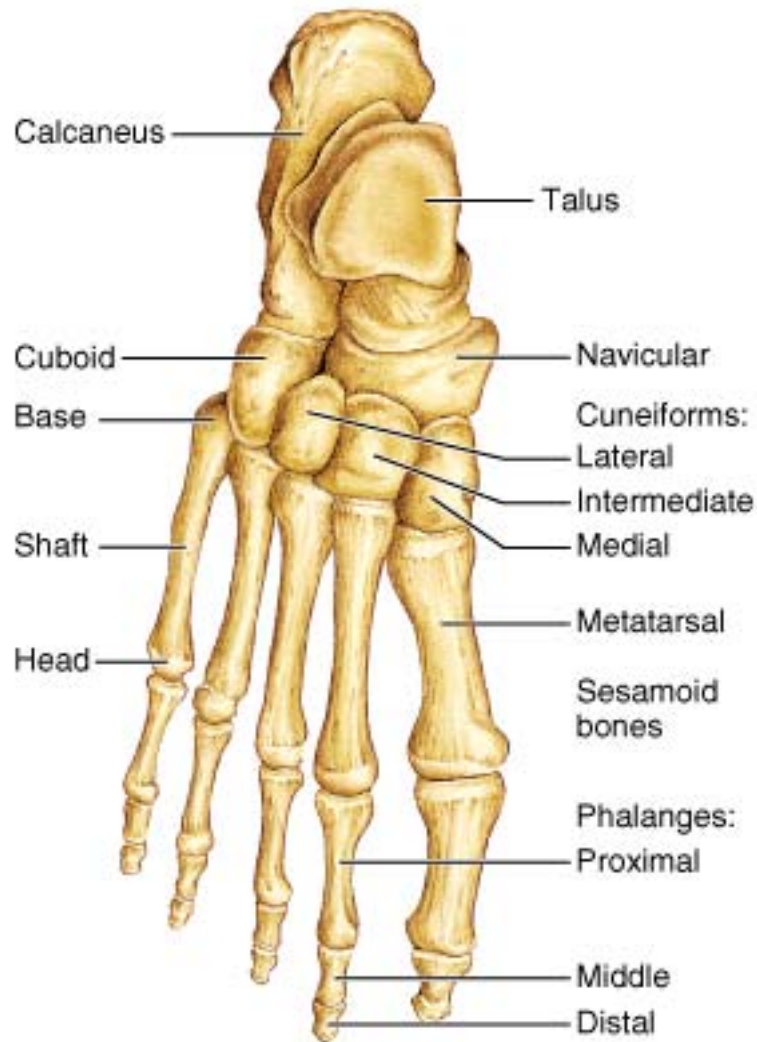
Ankle joint

- Synovial, hinge joint
- Allow movement of the foot in the sagittal plane only (1 degree of freedom):
 - **dorsiflexion:** as in standing on heels
 - **plantarflexion:** as in standing on toes

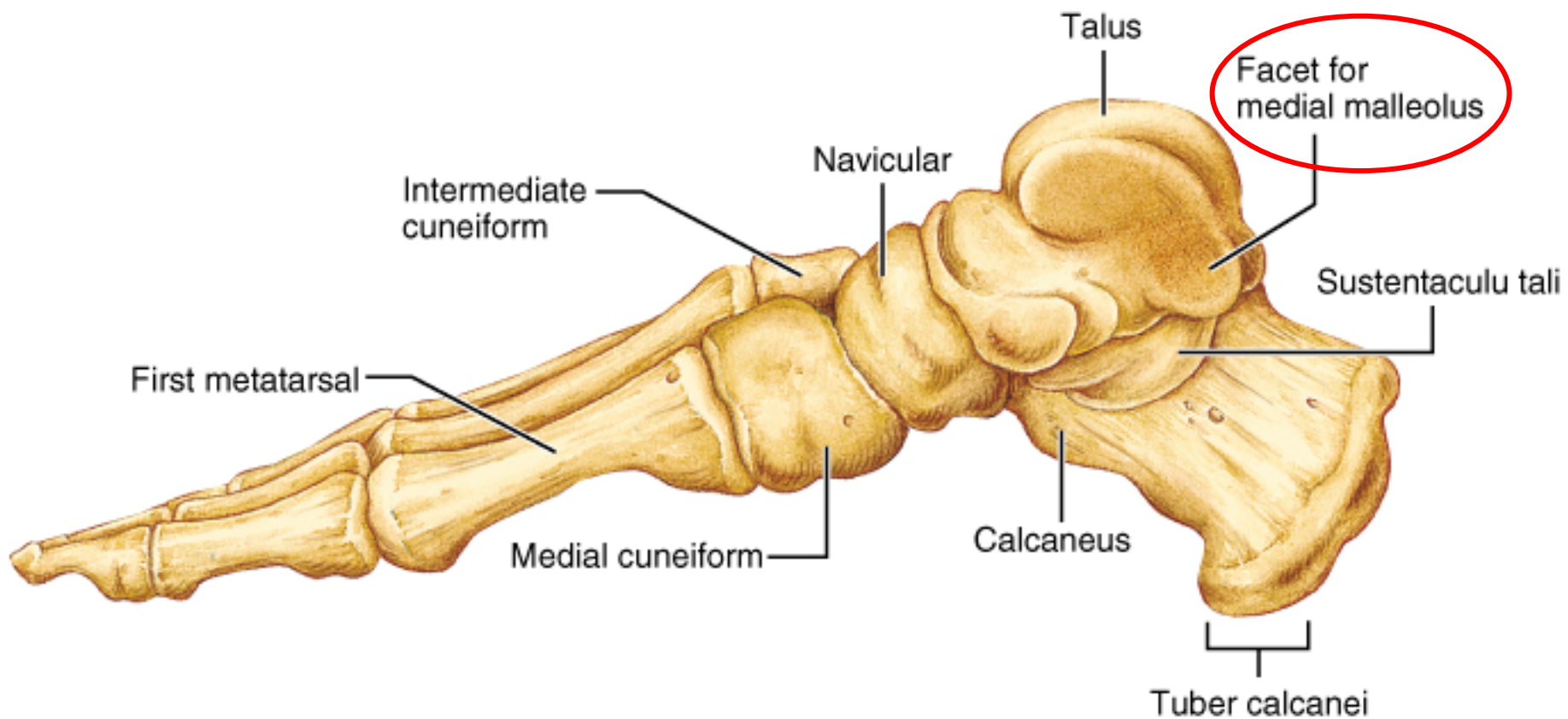
Ankle joint

Articular surfaces:

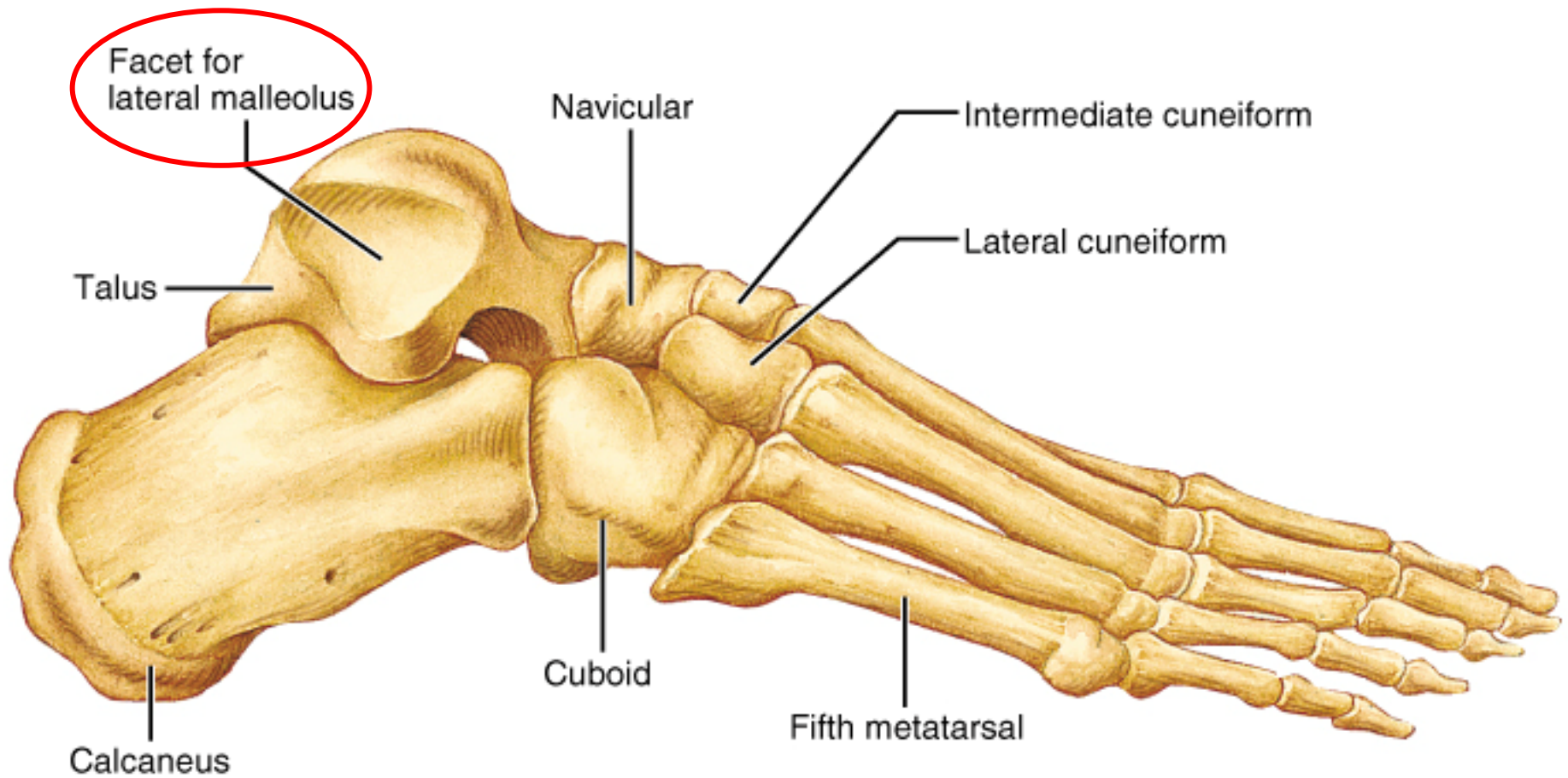
- The **ankle mortise**: formed by the articular surface of the tibia, & articular surfaces of the medial and lateral malleoli
- The **trochlea** of the talus



(a) Superior view



(b) Medial view

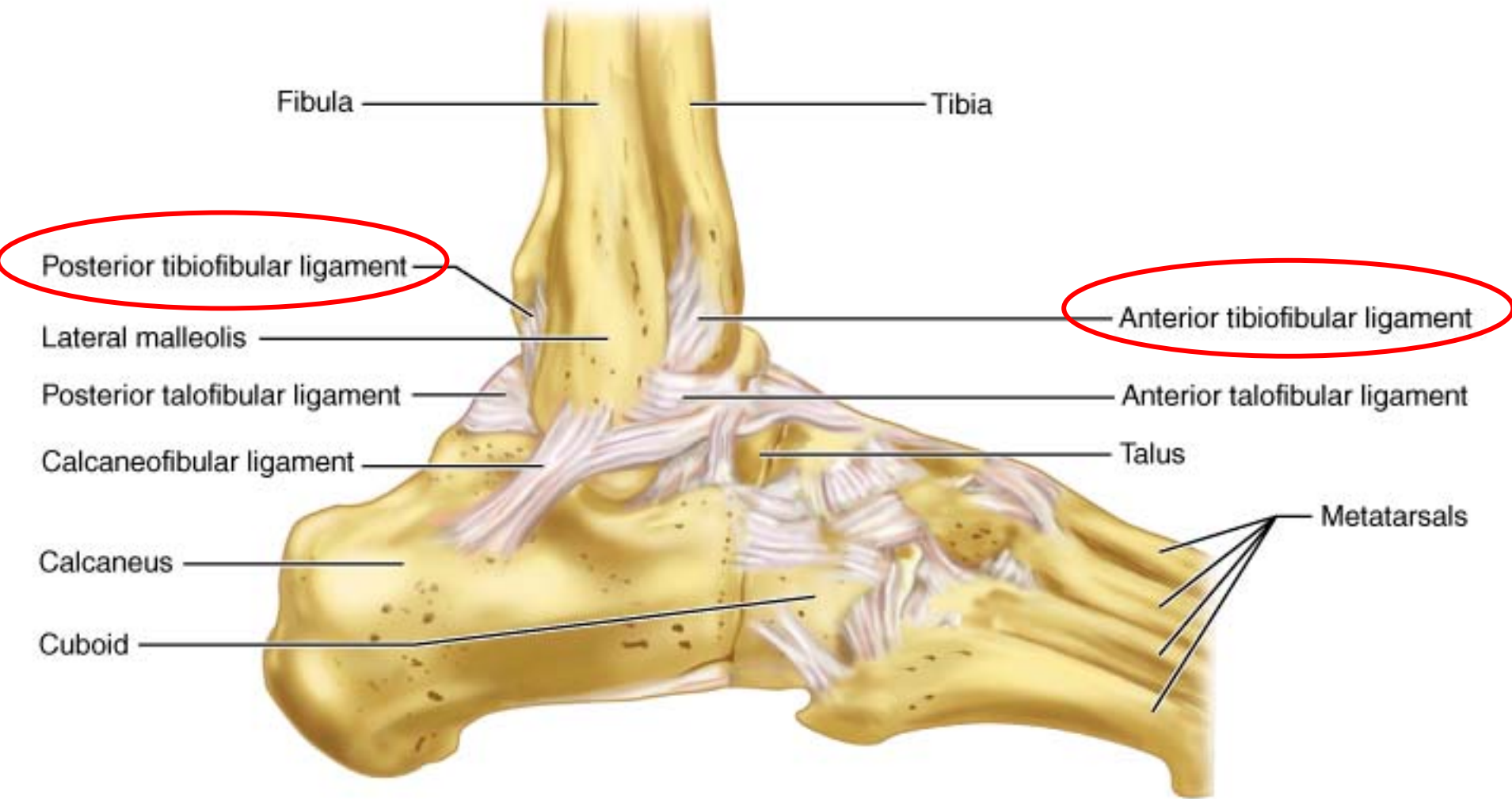


(c) Lateral view

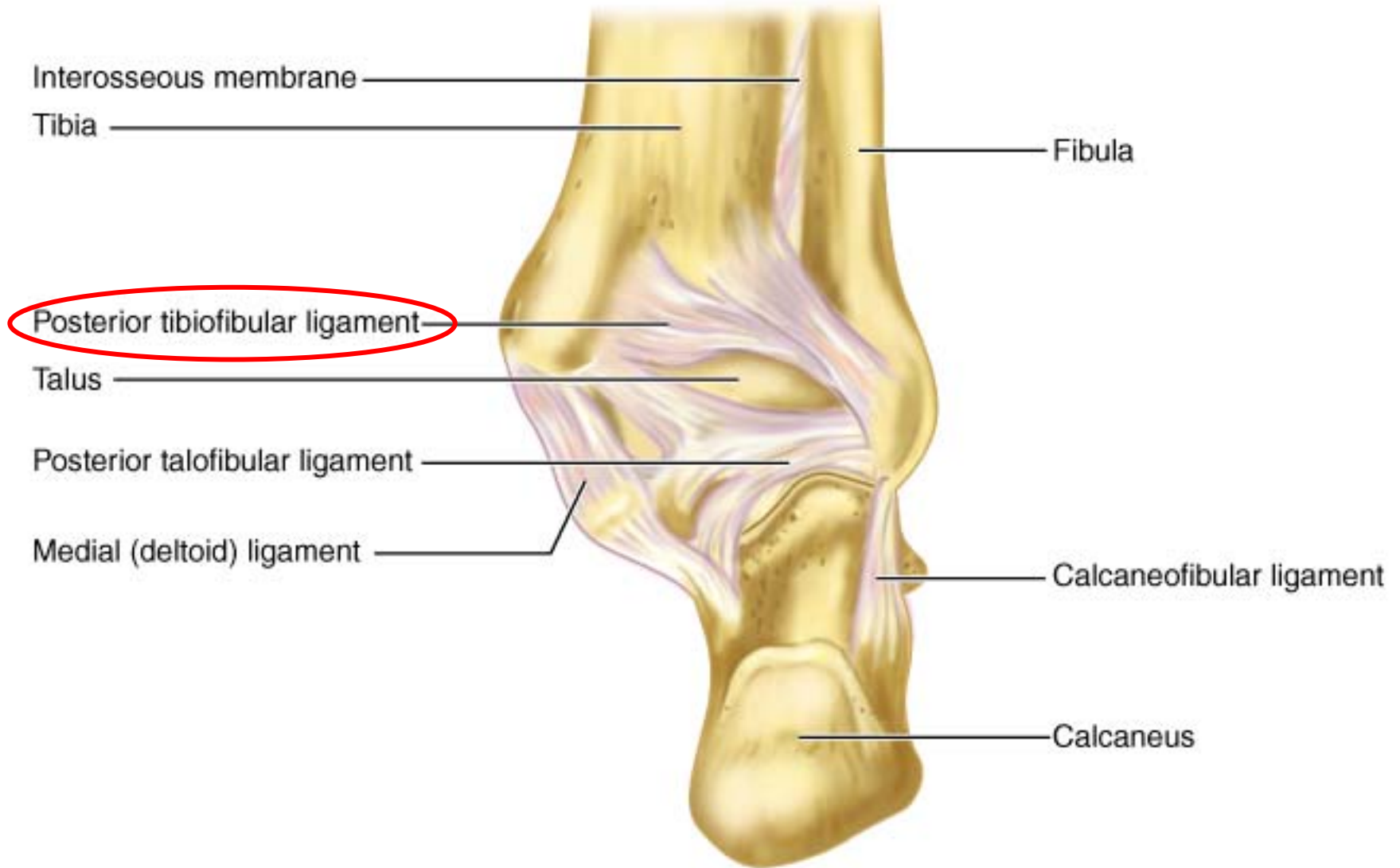
Ligaments

- Ligaments for the stability of the ankle mortise (tie the distal ends of the tibia and fibula together):
 - Anterior inferior **tibiofibular** ligament
 - Posterior inferior **tibiofibular** ligament

Lateral view



Posterior view



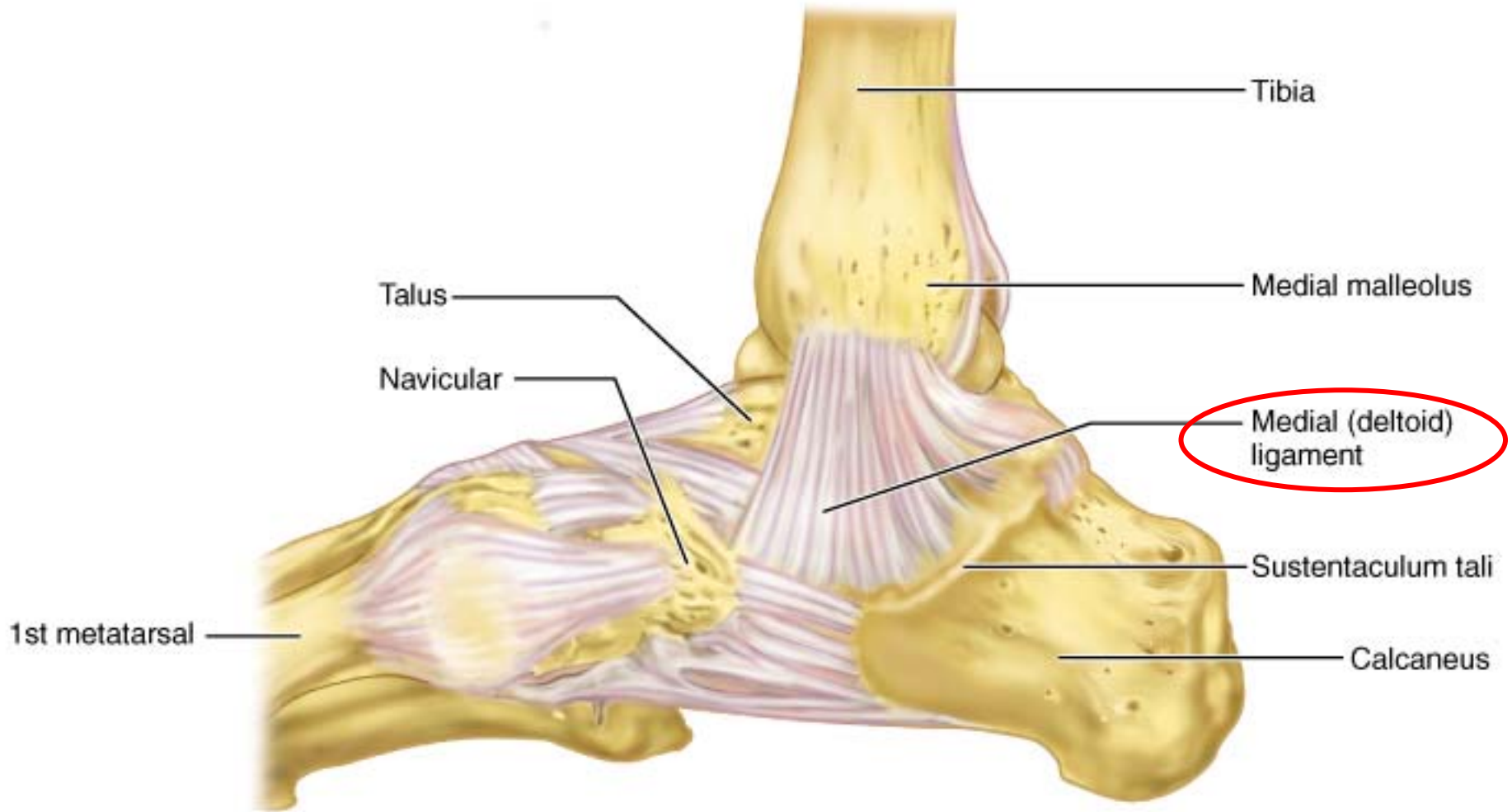
Ligaments

- Ligaments that prevent side-to-side movement of the foot (stabilize the talus within the ankle mortise):
 - Deltoid ligament (medial collateral)
 - Anterior talofibular ligament
 - posterior talofibular ligament
 - Calcaneofibular ligament

Deltoid ligament

- On the medial side
- Fans out from the medial malleolus
- Composed of four parts:
 - Anterior & posterior **tibiotalar**
 - **Tibiocalcaneal**
 - **Tibionavicular**

Medial view



Deltoid ligament

- Resist eversion of the foot
- Weakness of the deltoid ligament



allowing greater weight on the medial side of
the arch

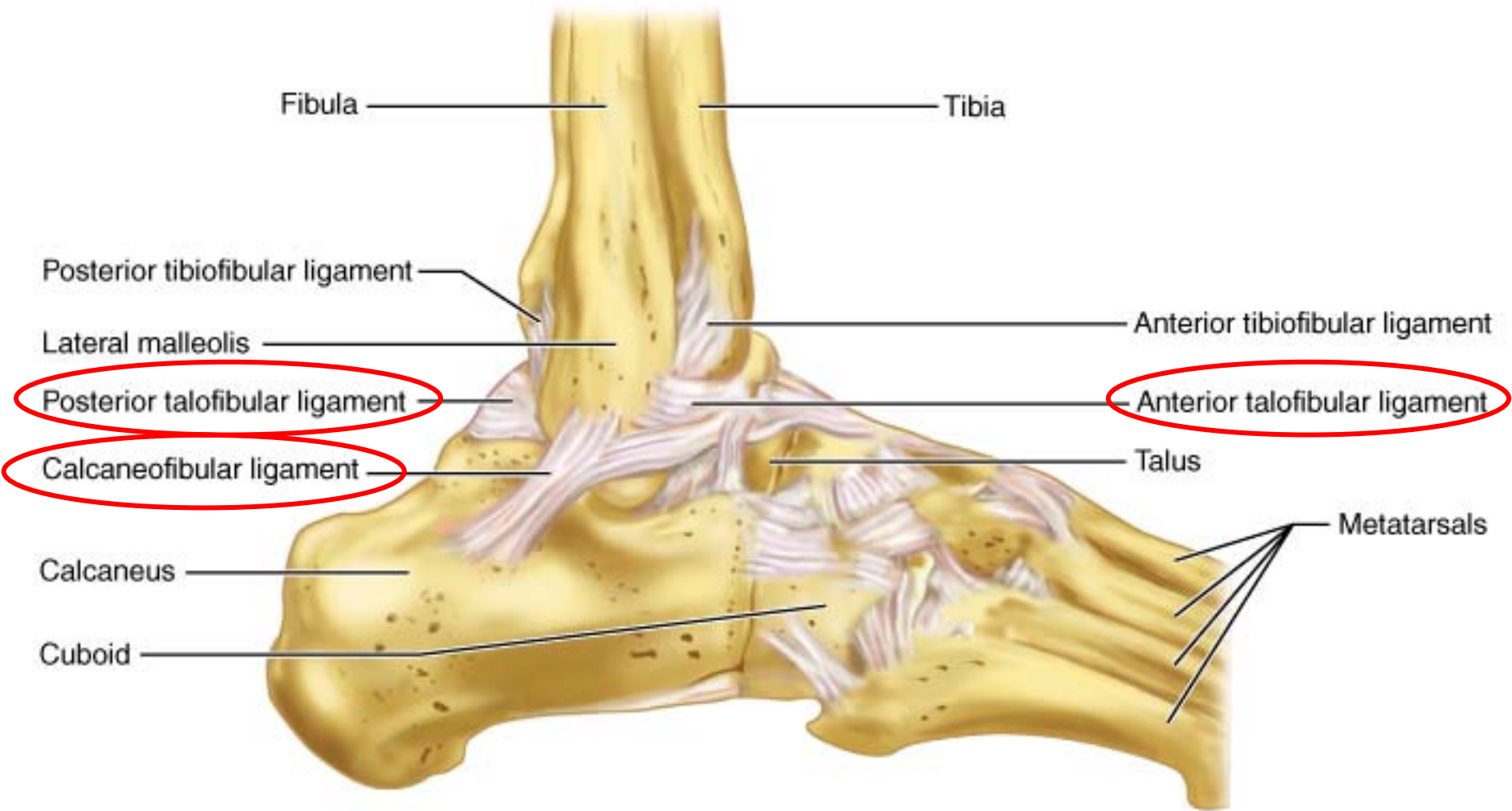


predisposing cause of flat foot

Lateral ligaments

- Three lateral ligaments fan out from the lateral malleolus
 - Anterior **talofibular** ligament
 - Posterior **talofibular** ligament
 - **Calcaneofibular** ligament
- Check inversion of the foot
- Also check anteroposterior movement at the talocrural joint



Lateral view



Ligament injuries

- Turning an ankle = forced eversion or inversion may produce:
 - Strain: ligaments are stretched but **not** torn
 - Sprain: where some of the ligaments are torn

Ligament injuries

- **Forced inversion** (most common) 
anterior **talofibular** is usually affected
- **Forced eversion** 
affect some part of the **deltoid** ligament

Arches of the foot

- The bones of the foot are held together by ligaments so that in a normal foot, none of the parts **between the posterior end of the calcaneus and the heads of the metatarsals** transmits weight to the ground

Arches of the foot

- All the weight transmitted to the **talus** by the leg is transmitted posteriorly and inferiorly to the posterior **end of the calcaneus**, or anteriorly and inferiorly to the **heads of the metatarsals** (ball of the foot)
- Arches of the foot = the curvature of the plantar surface between these points

Arches of the foot

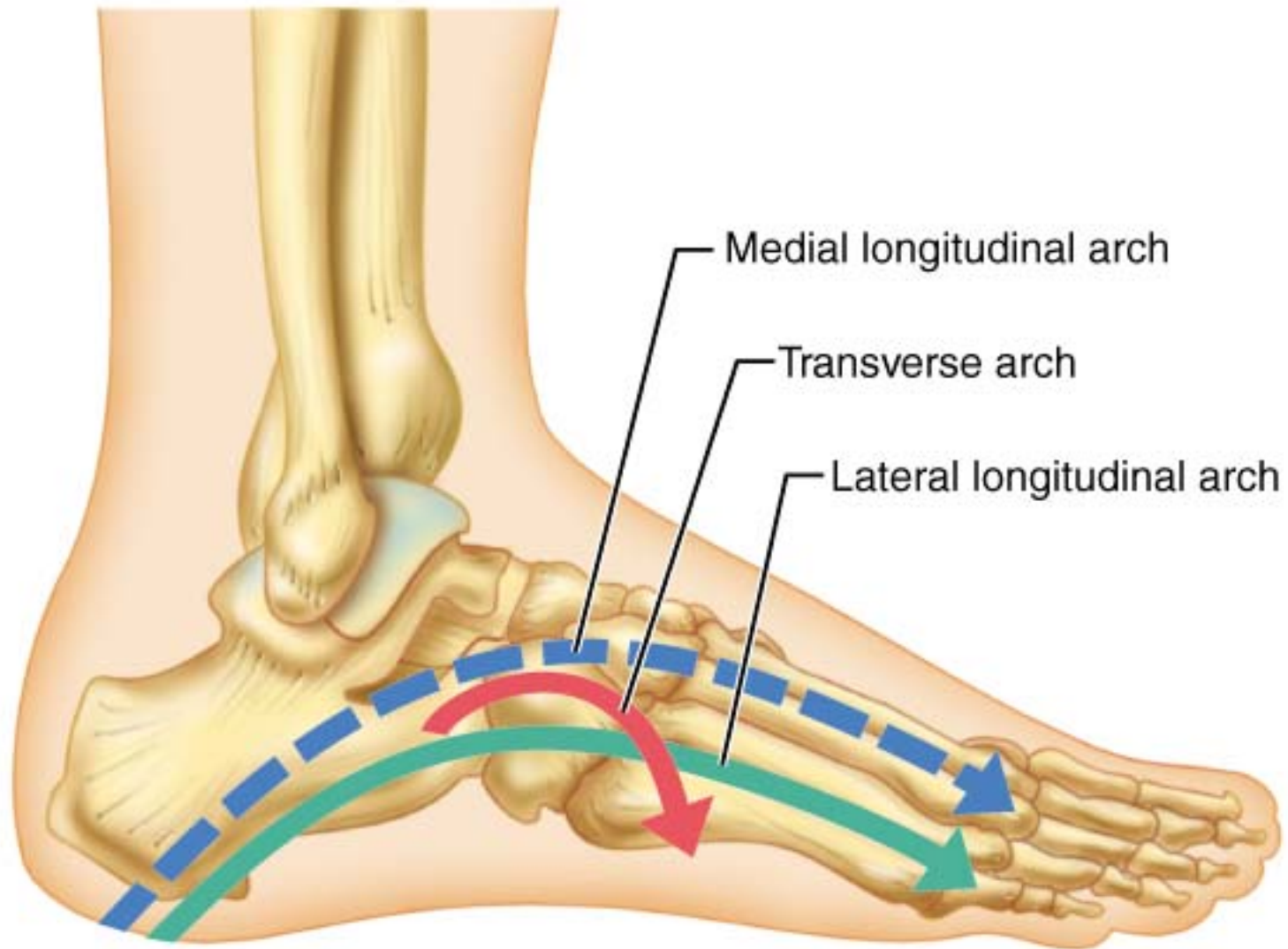
- Act as shock absorbers for supporting the weight of the body and propelling it during movement

Longitudinal arch

- Higher on its medial than on its lateral side
- Described as consisting of 2 parts:
 - **Medial part:** starts posteriorly with the calcaneus, proceeds through the talus, navicular, and the 3 cuneiforms to the heads of the 3 medial metatarsals
 - **Lateral part:** starts with the calcaneus, proceeds through the cuboid to the heads of the 2 lateral metatarsals

Transverse arch

- Runs from side to side
- Formed by the **cuboid, cuneiforms, and base of the metatarsals**
- The tendon of the **peroneus longus** (crossing the sole of the foot obliquely) helps maintain the curvature of the transverse arch



Joints of the foot

- Together these joints (along with the intertarsal joints) permit inversion & eversion
- **Subtalar (talocalcaneal) joint:**
 - between the **talus & calcaneus**
- **Transverse tarsal joint:**
 - between the head of **talus & navicular**
 - between the **calcaneus & cuboid**

Ligaments of the plantar foot

- Important for supporting the arches of the foot when weight bearing
- **Spring ligament** (plantar calcaneonavicular ligament):
 - from the sustentaculum tali to navicular
 - supports the head of talus
 - maintain the medial longitudinal arch of the foot

Ligaments of the plantar foot

- Long plantar ligament:

- from calcaneus to groove on cuboid
- some fibers extend to the metatarsals (forming a tunnel for the tendon of the fibularis longus)
- important in maintaining the arches of the foot

Ligaments of the plantar foot

- **Short plantar (calcaneocuboid) ligament:**
 - deep to the long plantar ligament
 - from anterior calcaneus to inferior cuboid
 - supports the lateral longitudinal arch of the foot

Clinical application

- Which extreme movements of the foot relative to the ankle are most likely to result in tearing of the deltoid ligament?
- In simple terms, describe the mechanism of injury that occurs during the tearing of the: 1) anterior talofibular ligament, and 2) calcaneofibular ligament?

Clinical application

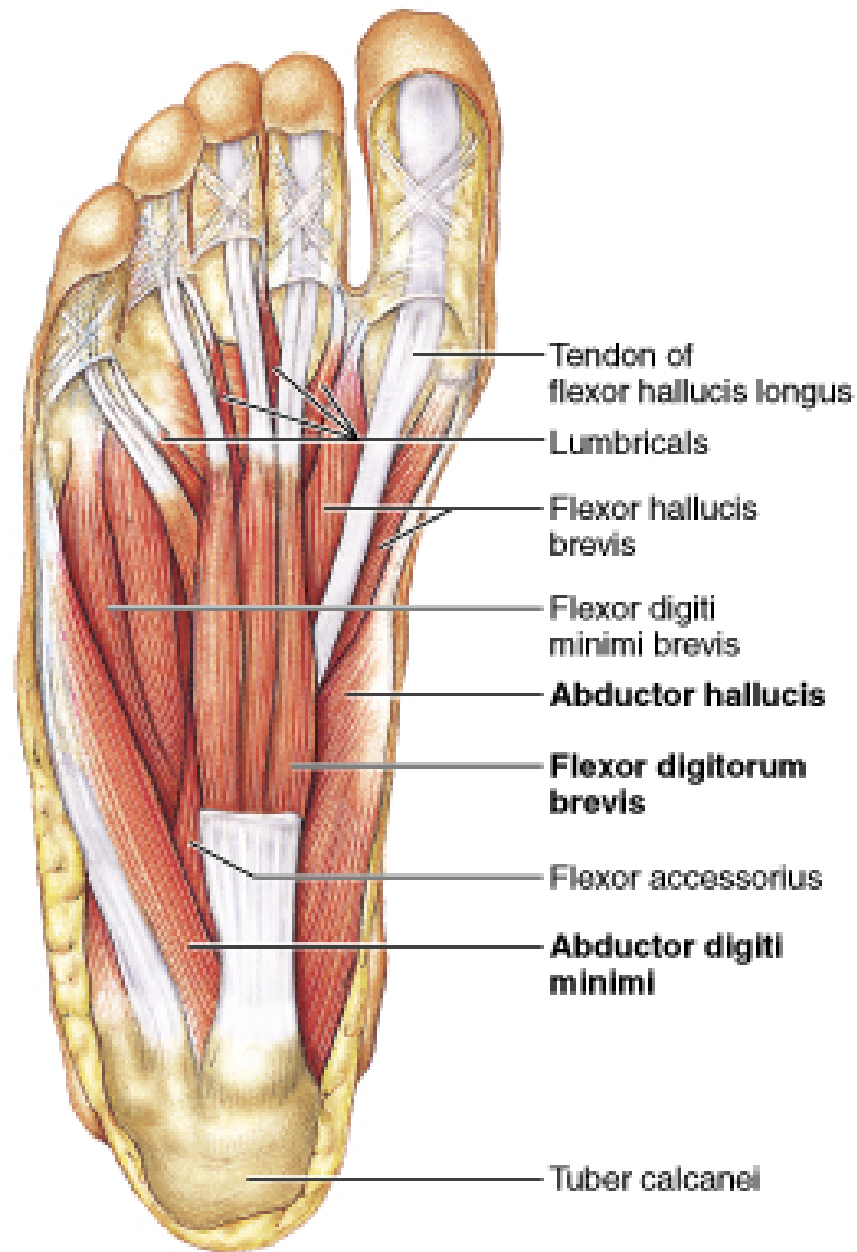
- Can you explain why the ankle joint is most stable when in dorsiflexion?

Intrinsic muscles of the foot

- The most important are associated with the big toe
- The big toe plays an important role in walking
- Arranged in layers

1st layer

- Abductor hallucis
- Abductor digiti minimi
- All rise from the calcaneus and insert into the proximal phalanges of.....

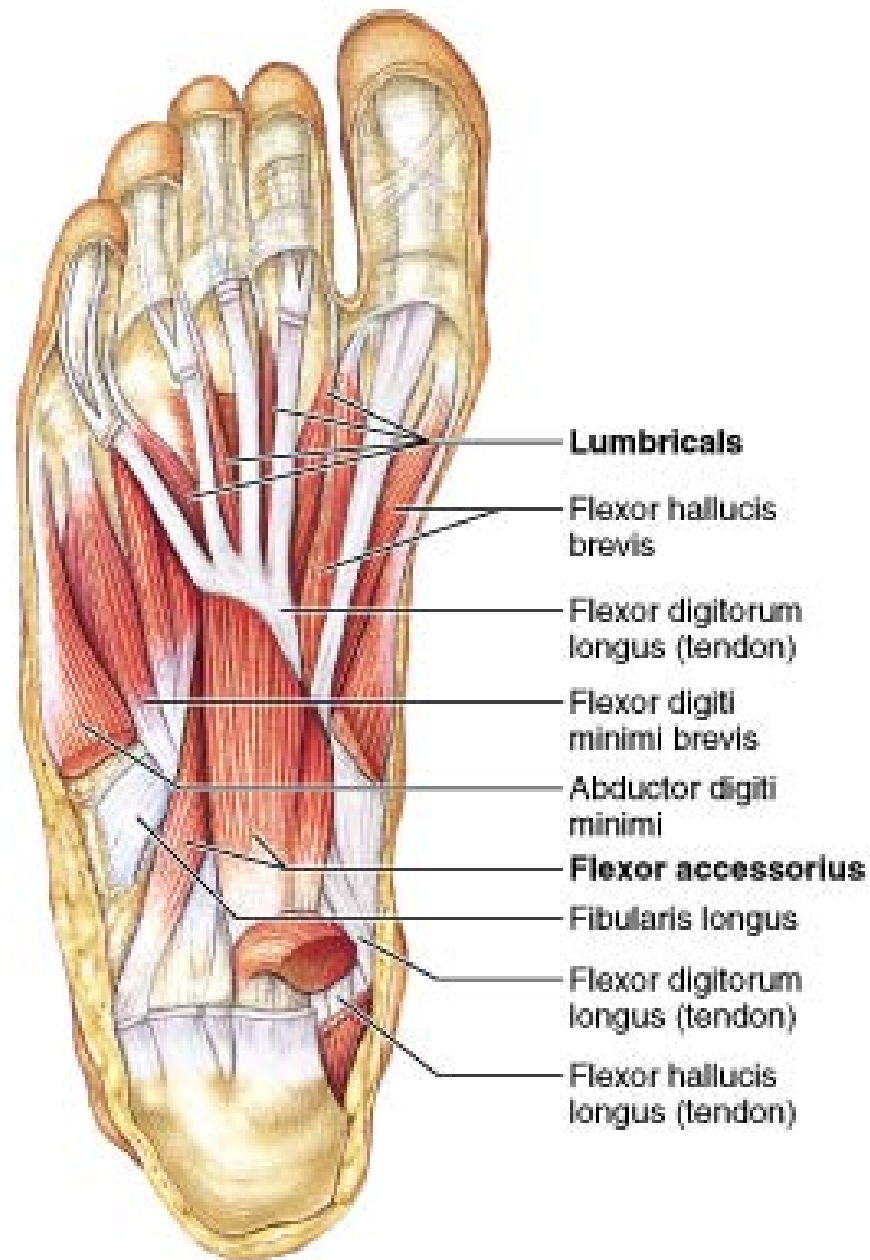


(a) First layer

2nd layer

Extrinsic muscles:

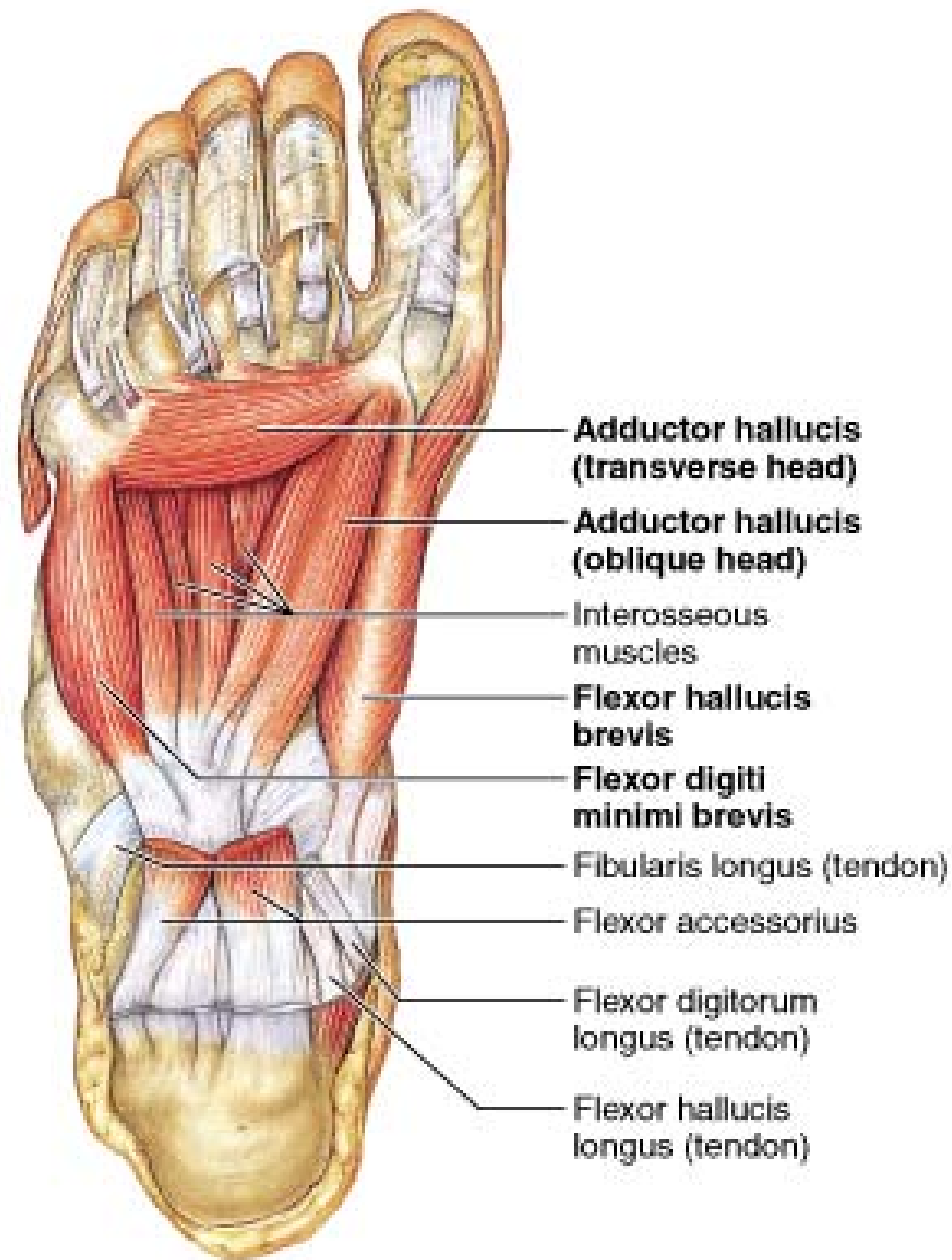
- Flexor digitorum longus
- Flexor hallucis longus



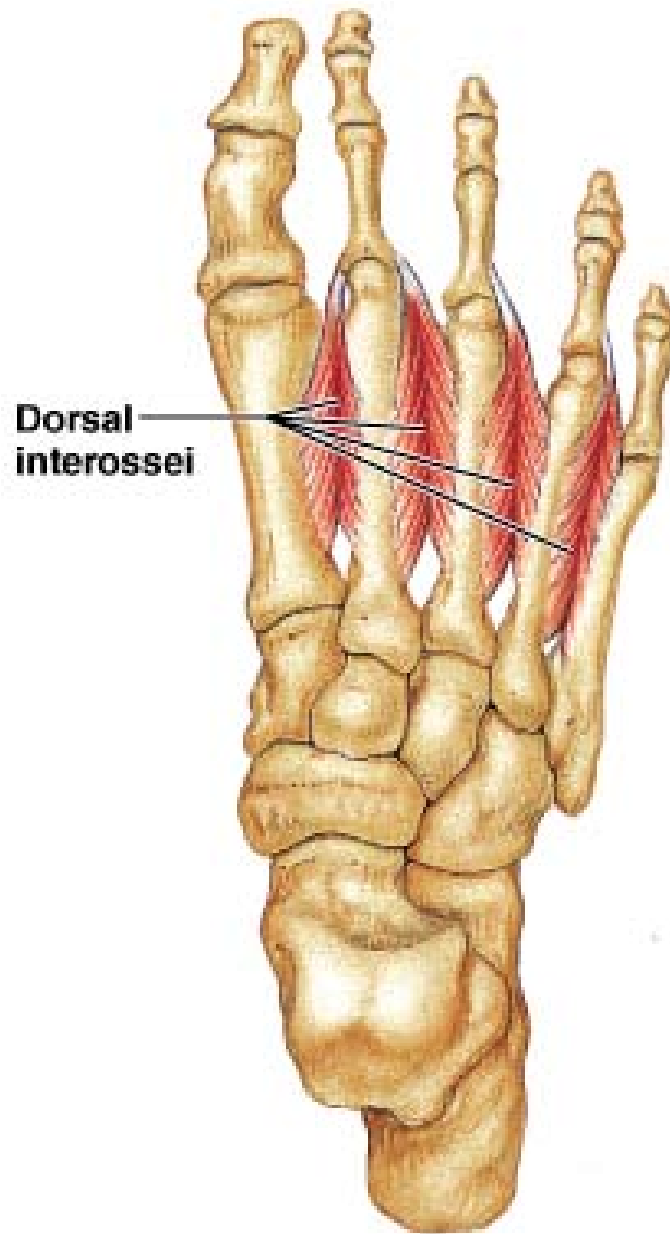
(b) Second layer

3rd layer

- Flexors of the big & small toes
- Adductor of the big toe

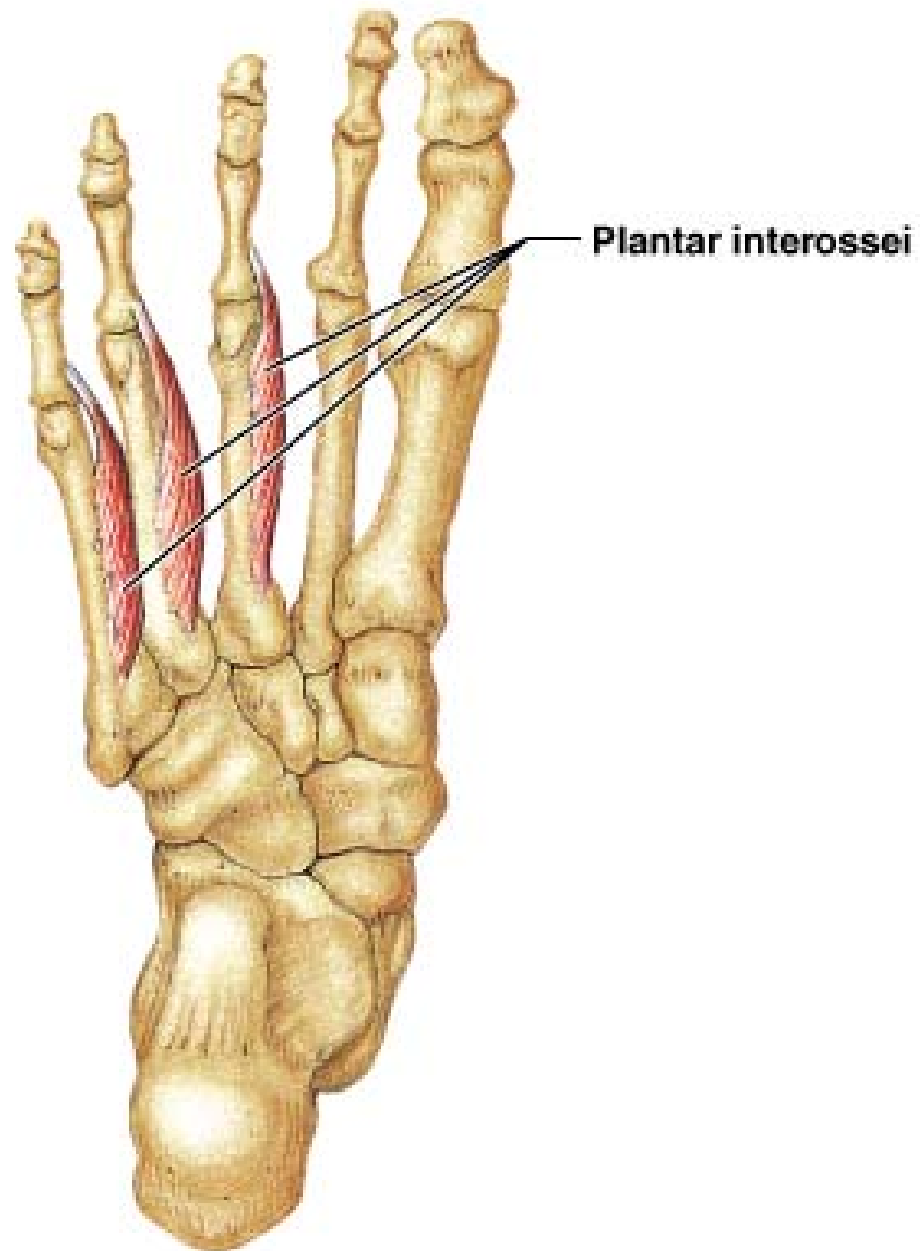


(c) Third layer



**Dorsal
interossei**

(e) Fourth layer: dorsal interossei



(d) Fourth layer: plantar interossei