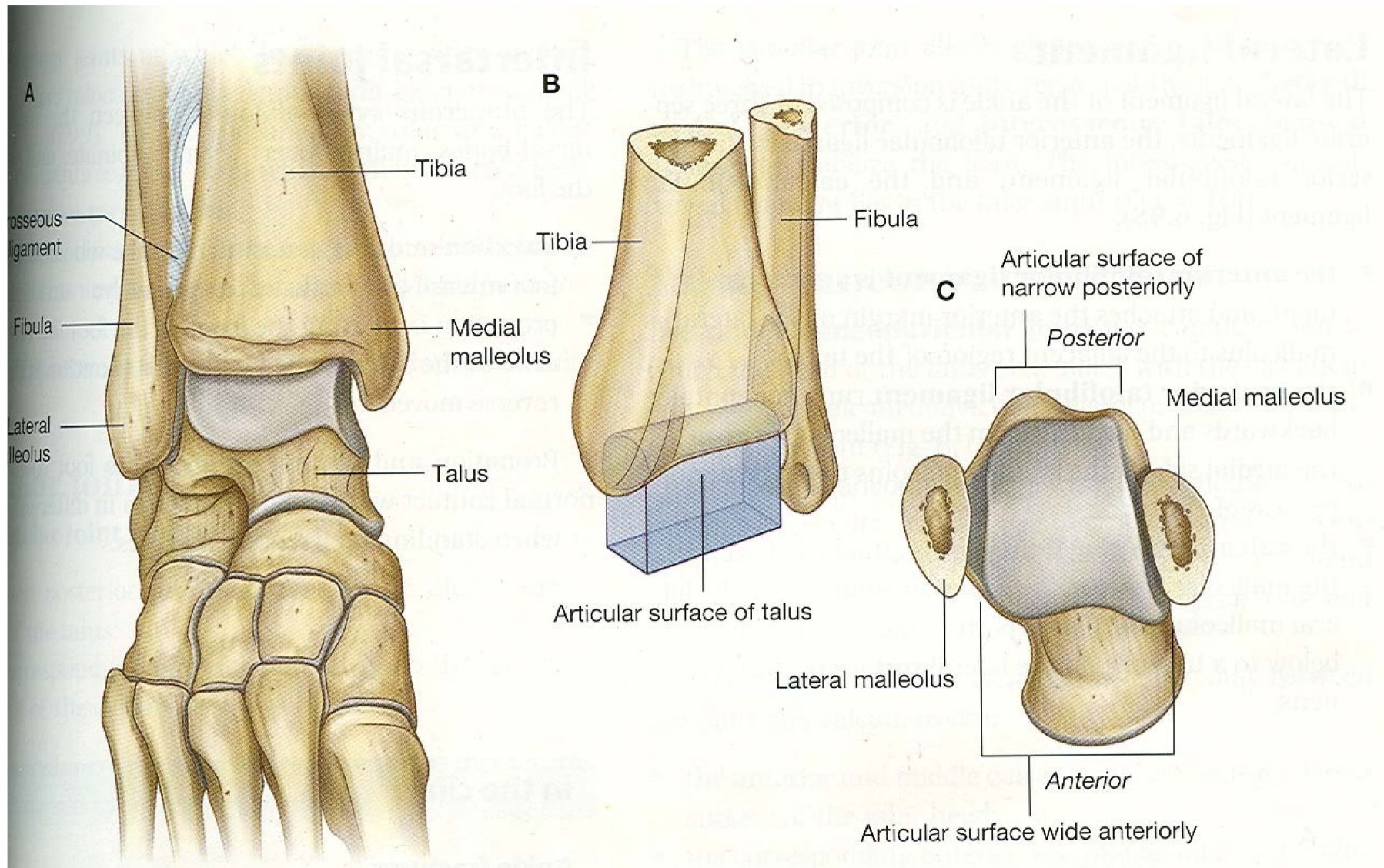




# Ankle Joint

Type: Uniaxial hinge joint. (Dorsiflexion –  $10^{\circ}$  with straight knee,  $30^{\circ}$  with flexed knee; Plantar flexion  $30^{\circ}$ ).

Articulating Surfaces: Lower end of tibia & medial malleolus.

- Lateral Malleolus & inferior transverse tibiofibular ligament.

- Body of talus, medial & lateral surfaces of talus.

- Covered by hyaline cartilage.

Close Pack position: Dorsiflexion – all thrusting movements e.g. walking, running, jumping start with this.

Synovial membrane: Lined by synovial membrane which projects into distal tibiofibular joint.

Fibrous capsule: Thin in front and behind. Proximally attached to borders of tibial and malleolar articular surfaces. Distally to talus in front reaches the dorsum of neck. Posteriorly mainly transverse fibres and blends with inferior transverse ligaments.

## **Ligaments**

Medial ligament: Strong triangular band. Very stable.

Apex: Attached above to medial malleolus.

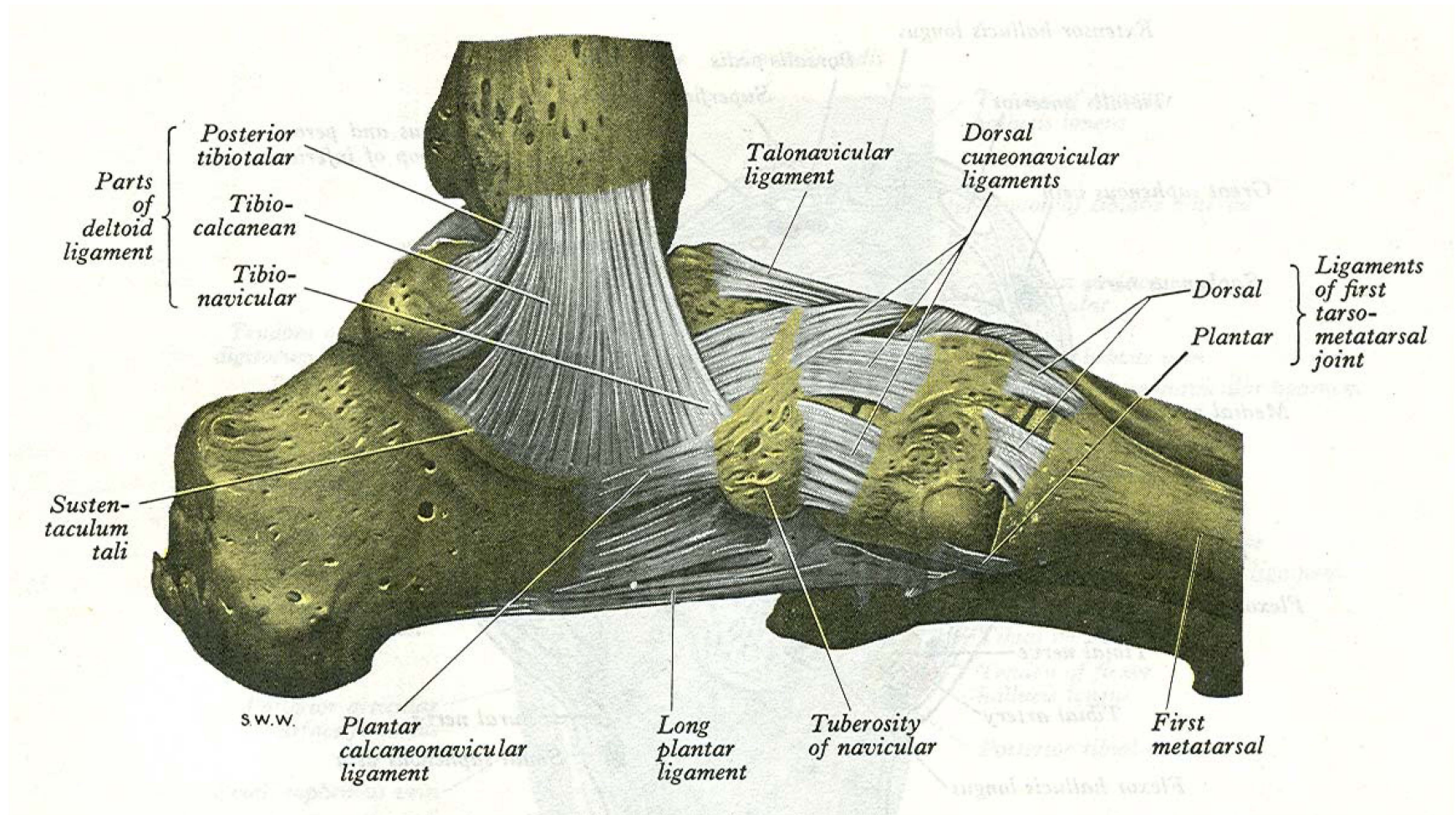
Base: across a line that extends from navicular tuberosity to medial tubercle of talus.

Superficial part:

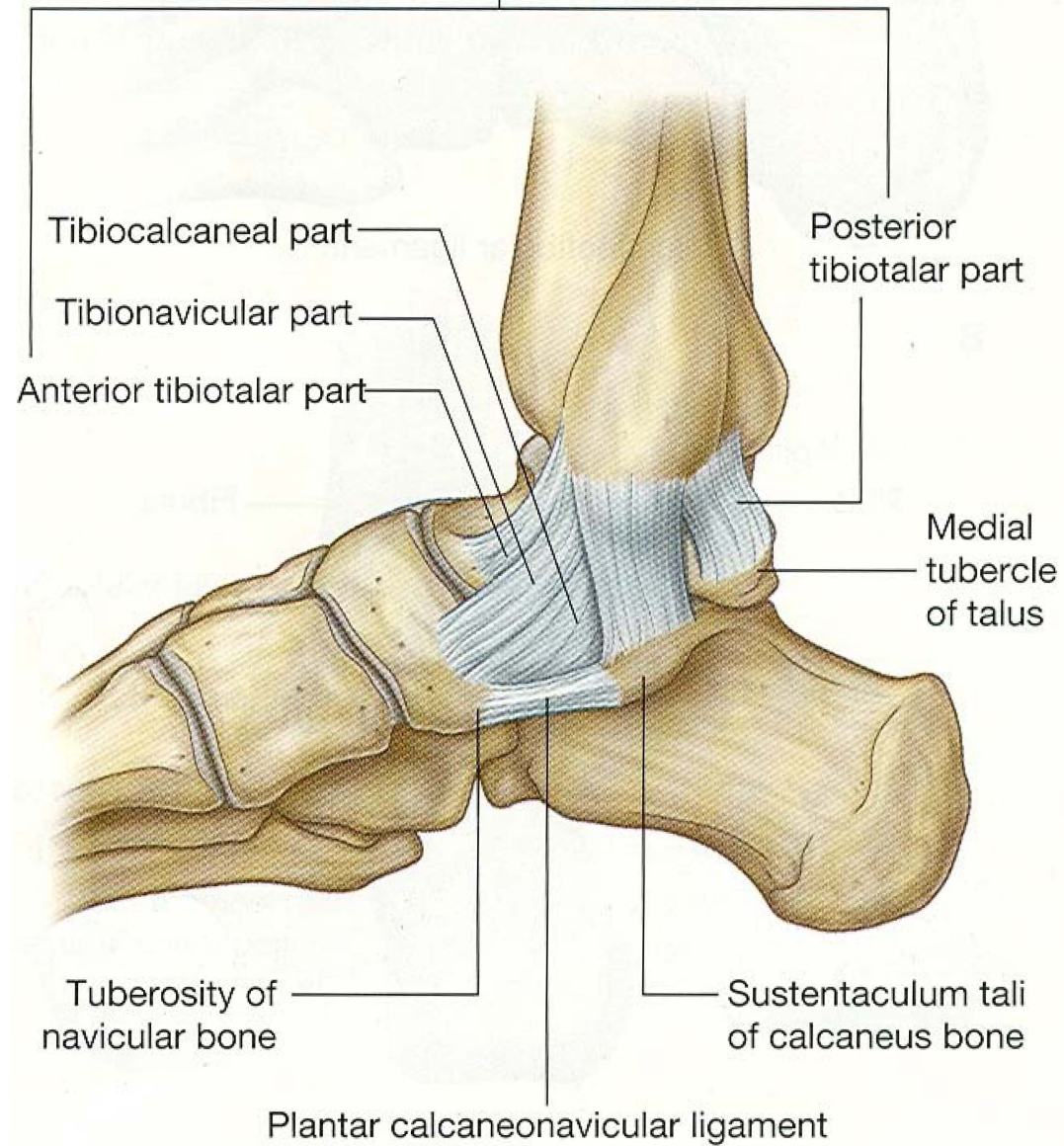
1. Tibionavicular- from medial malleolus to navicular tuberosity and to plantar calcaneo navicular ligament.
2. Tibiocalcaneal: central, from medial malleolus to sustentaculum tali of calcaneum.
3. Posterior Tibiotalar: To medial side & medial tubercle of talus.

Deep part: Anterior tibiotalar- which pass from medial malleolus to non articular part of medial talar surface.

Ligament is crossed by tendons of tibialis posterior & flexor digitorum longus.



## Medial Ligament of the ankle joint



**Lateral ligament:** Composed of three separate ligaments.

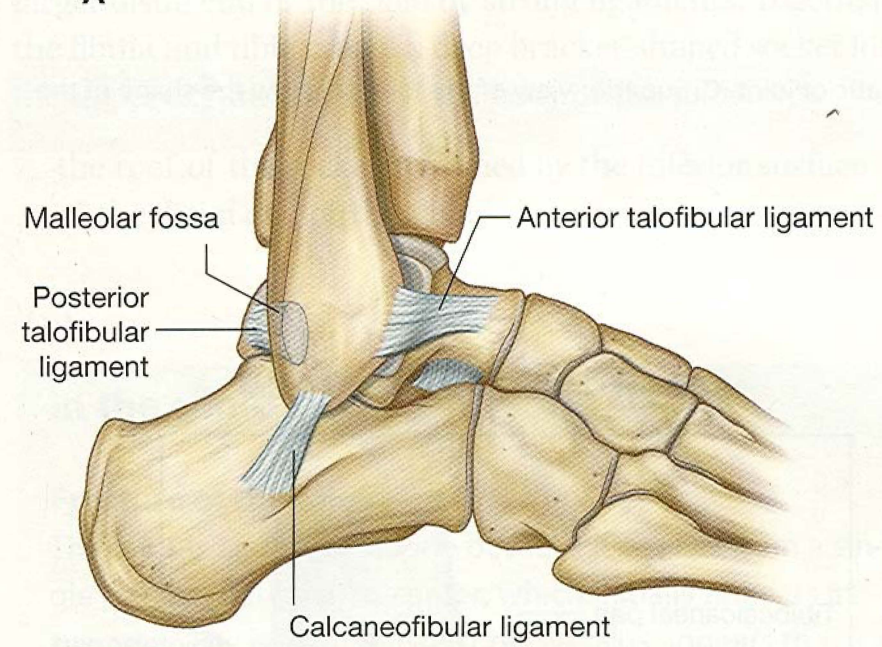
Anterior talofibular: from anterior margin of lateral malleolus to adjacent lateral aspect of body and neck of talus.

Posterior talofibular: horizontally, backwards and medially from lateral margin to posterior process of talus.

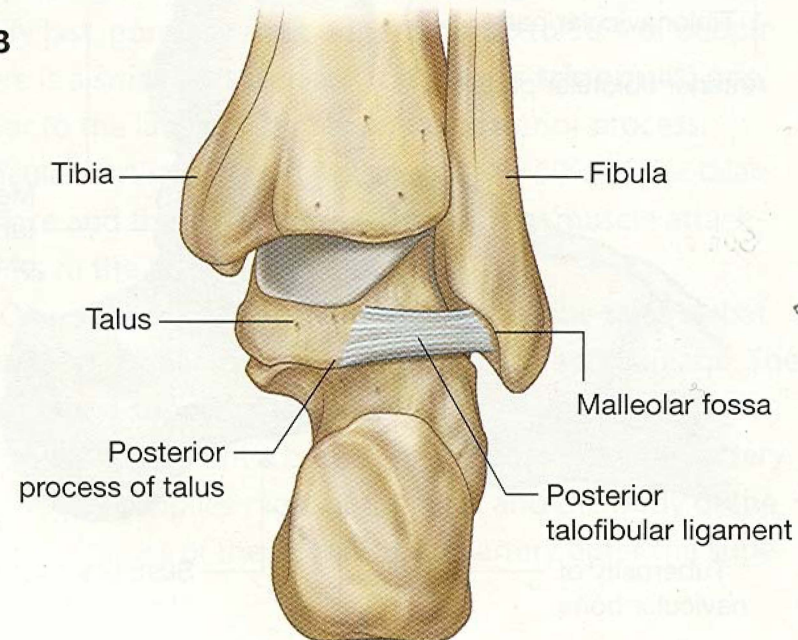
Calcaneofibular: From malleolar fossa of lateral malleolus posteroinferior to tubercle of lateral calcaneal surface.

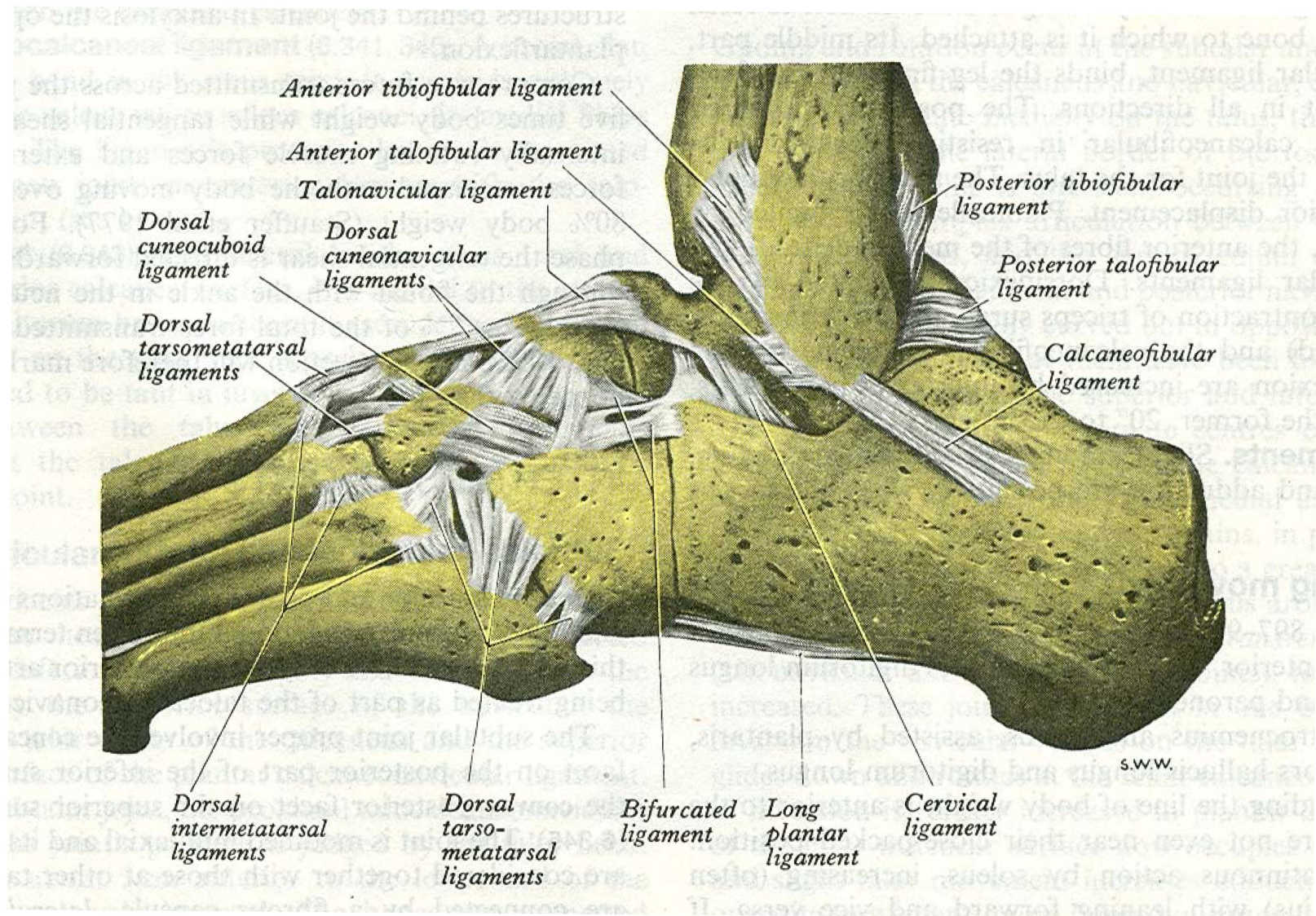
Commonly injured in inversion sprains (during sports).

**A**



**B**





**Relations:** Anteriorly – medial to lateral – tibialis anterior, extensor hallucis longus, anterior tibial artery, deep peroneal nerve, extensor digitorum longus and peroneus tertius.

Posteriorly – medial to lateral – tibialis posterior, flexor digitorum longus, posterior tibial artery, tibial nerve, flexor hallucis longus.

Laterally – peroneus longus and brevis ( anterior to longus).

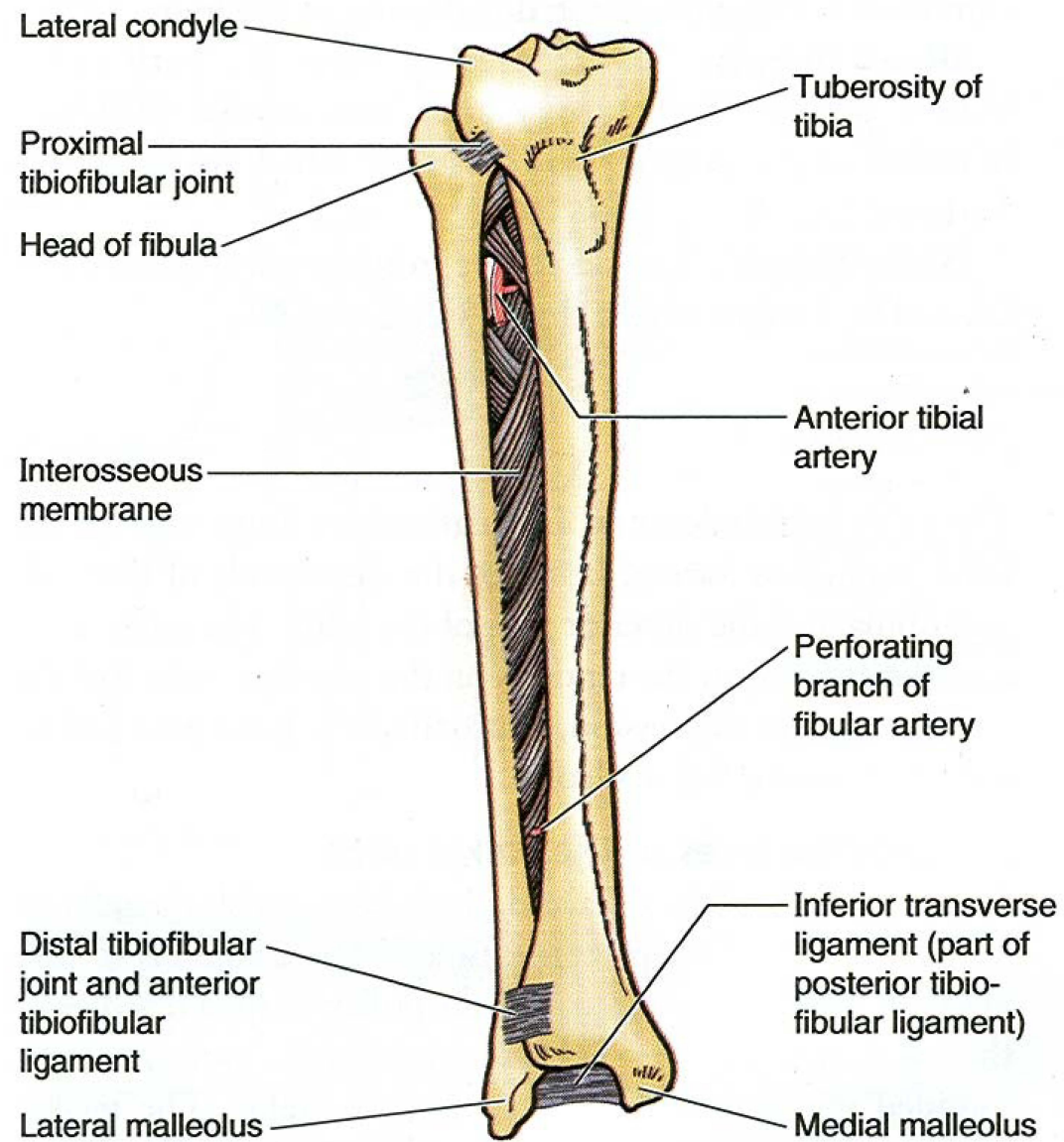
Medially – long saphenous vein and saphenous nerve.

**Arterial supply:** anterior and posterior tibial artery, peroneal artery.

**Nerve supply:** deep peroneal nerve, saphenous, sural and tibial nerves.

**Factors maintaining stability:**

1. Passive
  - Bony contours.
  - Capsule attachments.
  - Medial and lateral ligaments.
  - distal tibiofibular ligaments.
  - Crossed and Uncrossed tendons.
2. Dynamic
  - Gravity.
  - Muscle action.



**(A) Anterior view**

# Distal Tibiofibular joint

Syndesmosis

Articulating surfaces:

rough medial convex surface on distal end of fibula.

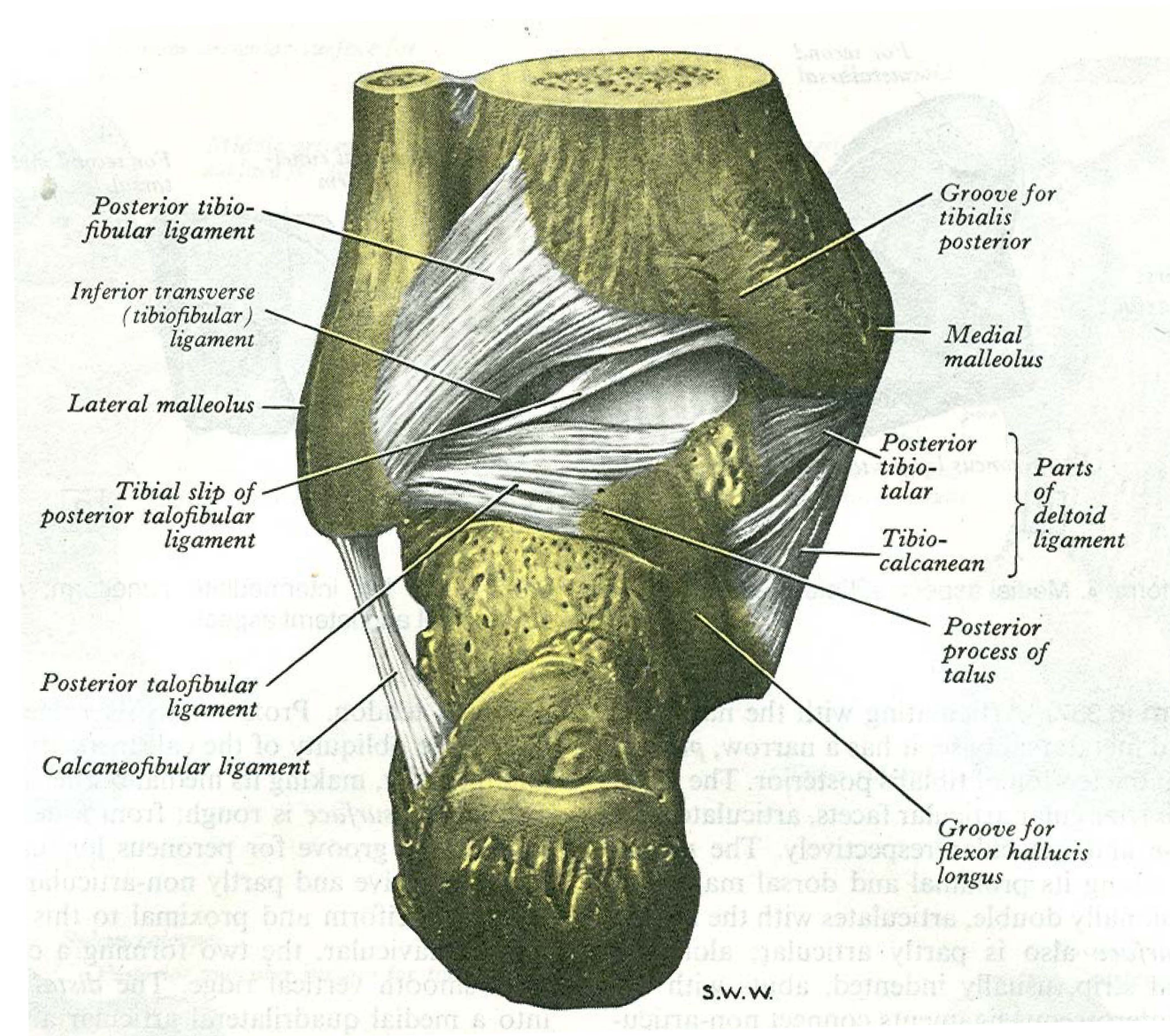
concave surface on fibular notch of tibia.

No capsule:

Synovial membrane – Projection of ankle joint in the lowest 4 mm.

Ligaments:

1. Anterior tibiofibular ligament – flat band between adjacent margins of tibia and fibula.
2. Posterior tibiofibular ligament – stronger in a similar position, posterior deep part is inferior transverse ligament.
3. Interosseous ligament – Continuous with interosseous membrane, strongest bond between the bones.



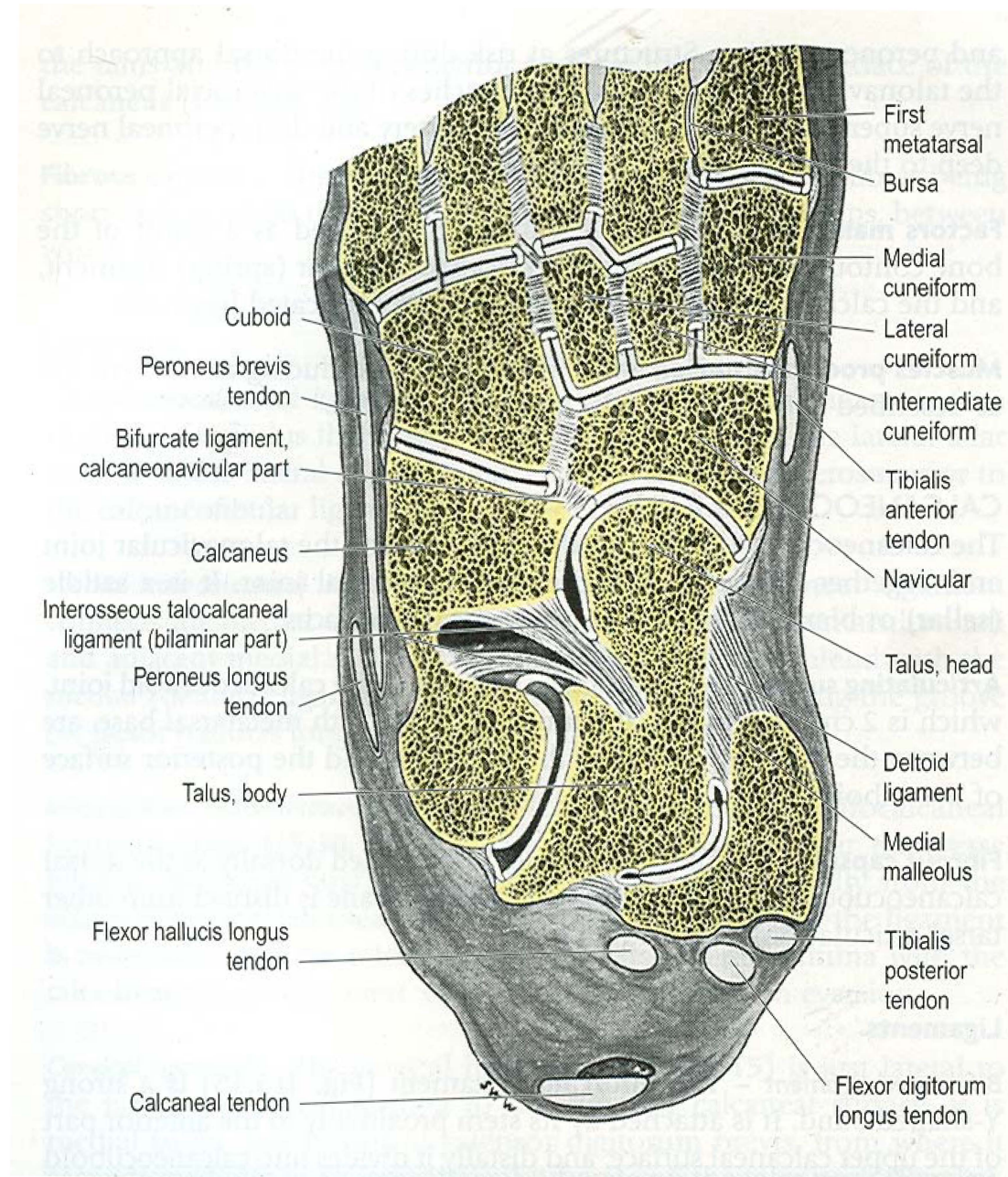
# Distal Tibiofibular Joint (Contd.)

Blood supply – Peroneal perforating branch.

Medial malleolar rami of anterior & posterior tibial arteries.

Nerve supply – deep peroneal nerve, sural nerve.

Movements – Slight lateral rotation of fibula during dorsiflexion. No muscles at but the slope of lateral malleolus varies.



# Subtalar Joints

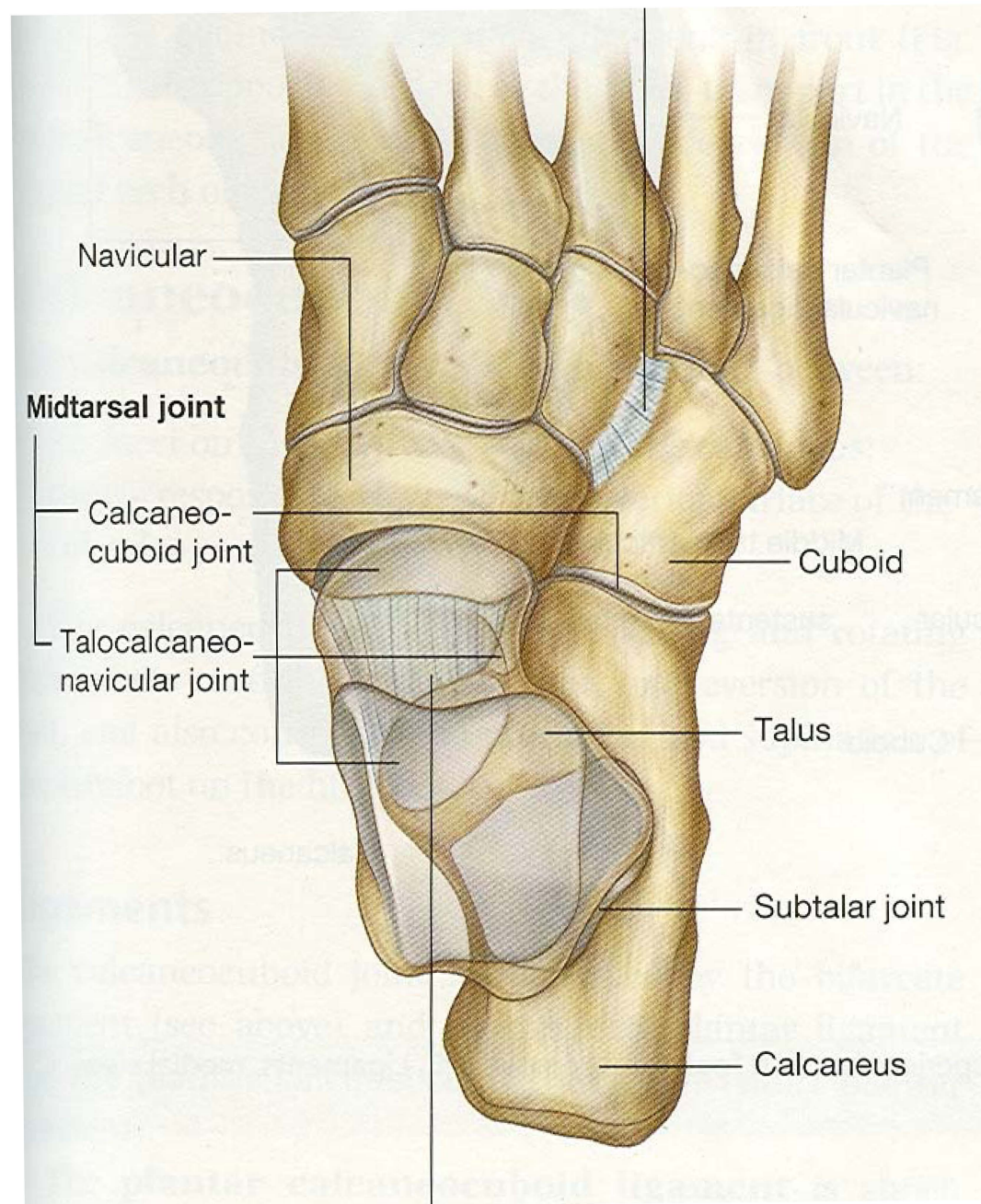
Posterior – Talocalcaneal joint.

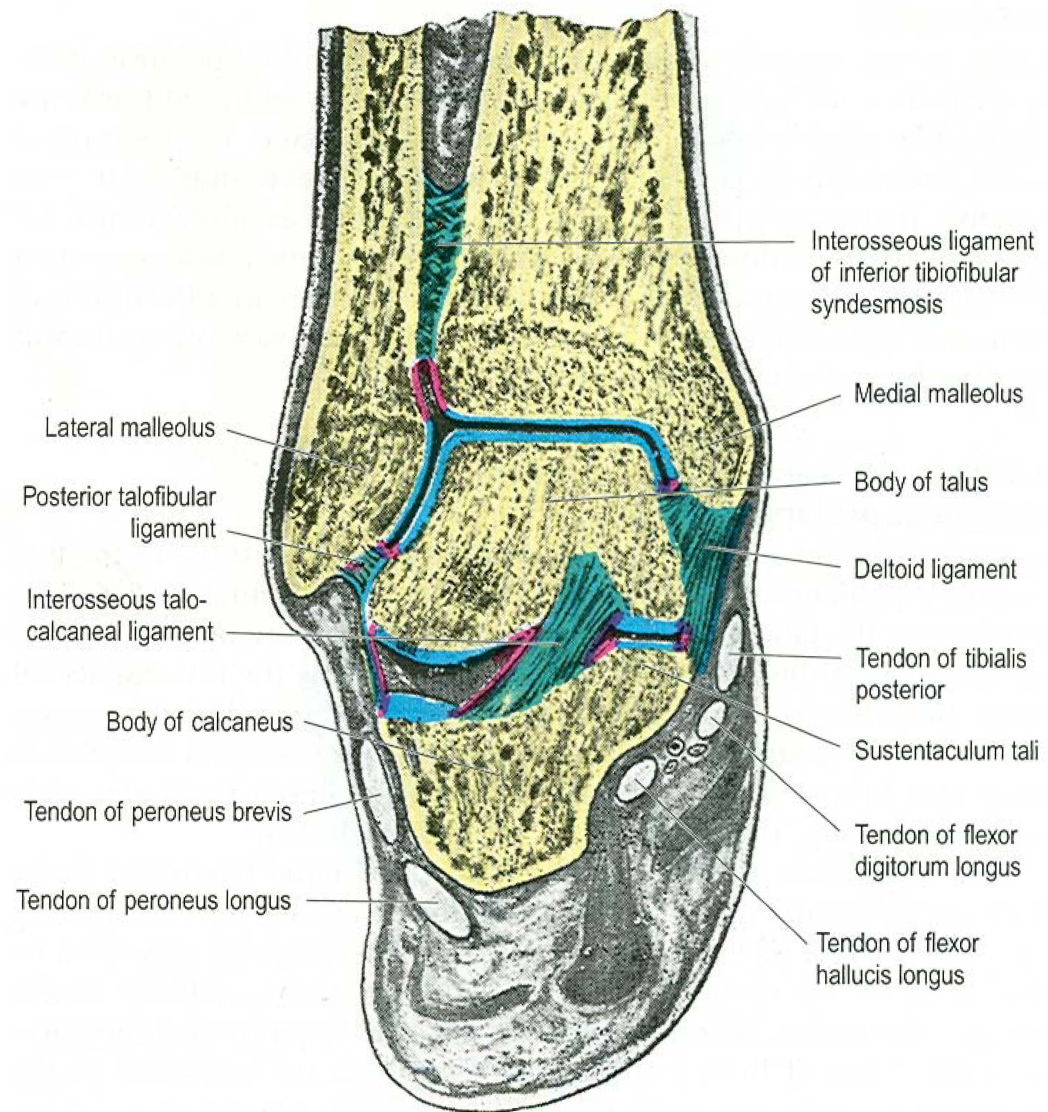
Modified multiaxial synovial joint.

Articulating surfaces – Concave posterior facet on the inferior surface of talus.

posterior facet on the superior surface of calcaneus.

cavity enclosed by synovial membrane which is enveloped by fibrous capsule attached to articular margins.





**Fig. 115.30** Coronal section through the left ankle and talocalcaneal joints.

# Subtalar joints-Ligaments

Lateral talocalcaneal – attached to calcaneo fibular ligament.

Medial talocalcaneal – blends with deltoid ligament.

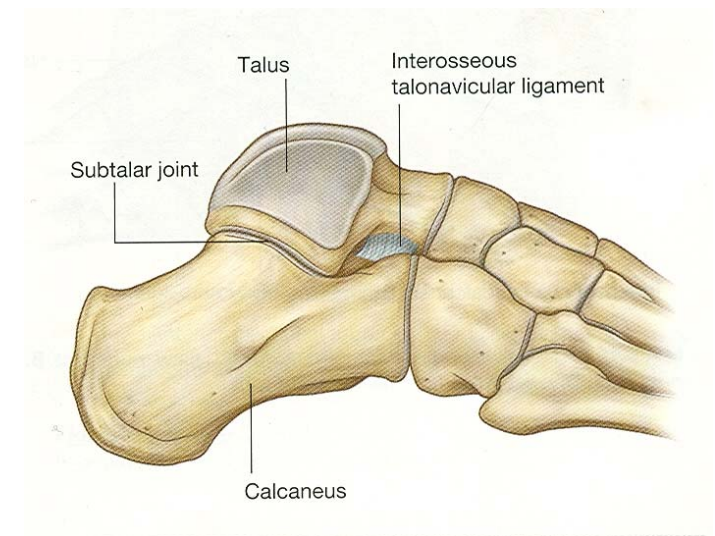
Introsseous ligament – Broad, flat, bilaminar.

Transverse band in sinus tarsi, descends obliquely and laterally from the sulcus tali to calcaneal sulcus.

It is associated with both subtalar joints.

Medial fibres are taut in inversion.

Separate synovial cavity.

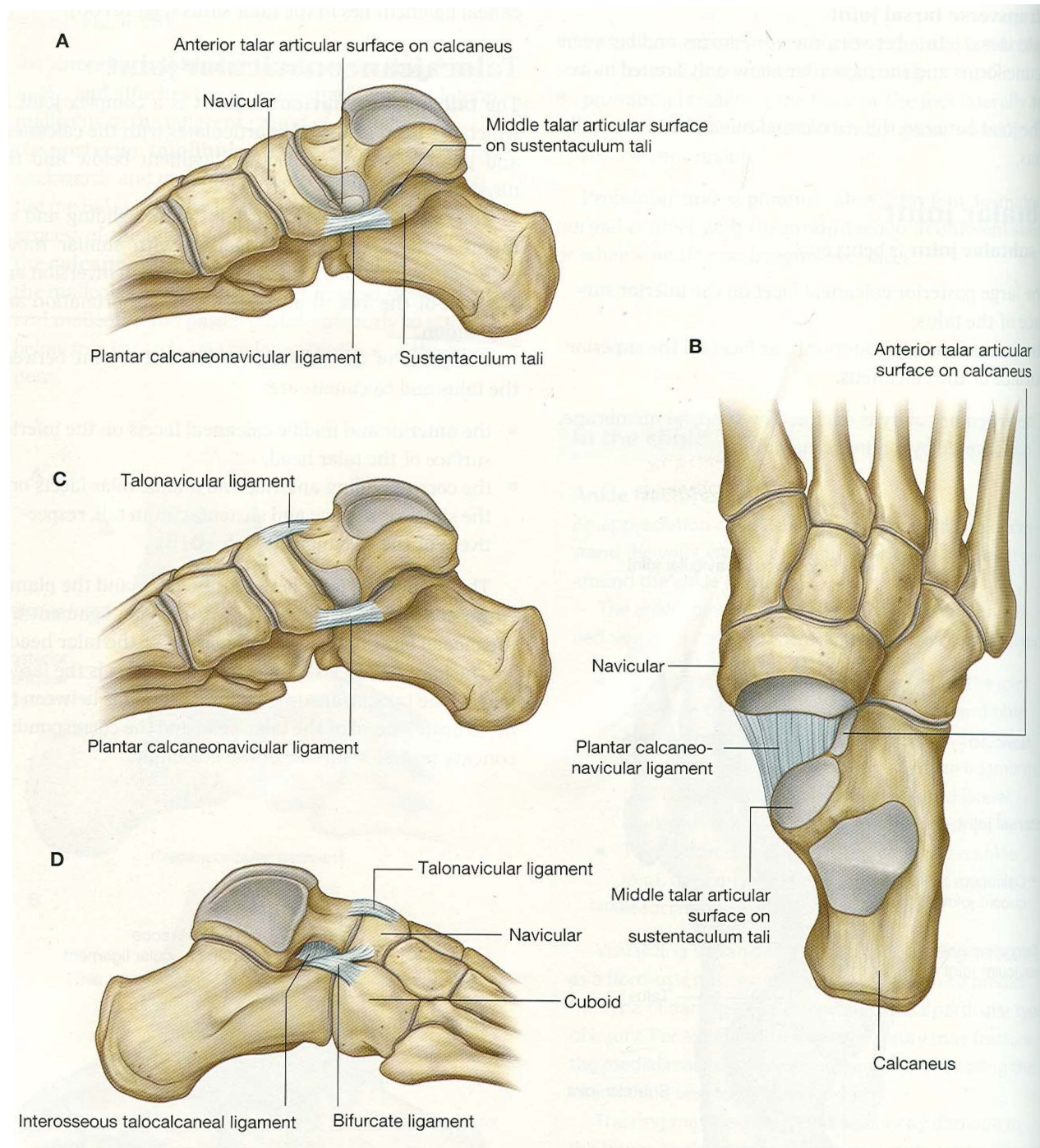


**Nerve supply** – posterior tibial, medial plantar, sural nerves.

**Movements** – Inversion – Tibialis anterior & posterior.

Gastrocnemius, soleus, flexors of long toe.

Eversion – Peroneus longus, brevis & tertius. Extensors of long toe.



# Talocalcaneo Navicular Joint

Anterior part of subtalar joint.

Compound multiaxial joint.

Articulating surfaces –

- ovoid talar head & triple faceted area on inferior surface of talus.
- Concavity formed by navicular, middle & anterior facets of calcaneus.
- Plantar calcaneonavicular ligament.

Synovial cavity – communicates with talo calcaneal & talonavicular joints.

Fibrous capsule – posteriorly thick.

# Talocalcaneo Navicular Joint

## **Ligaments-**

**Talonavicular** – neck of talus & navicular covered by extensor tendons.

**Plantar calcaneo – navicular (spring)** – broad, thick band.

Sustentaculum tali – plantar surface of navicular.

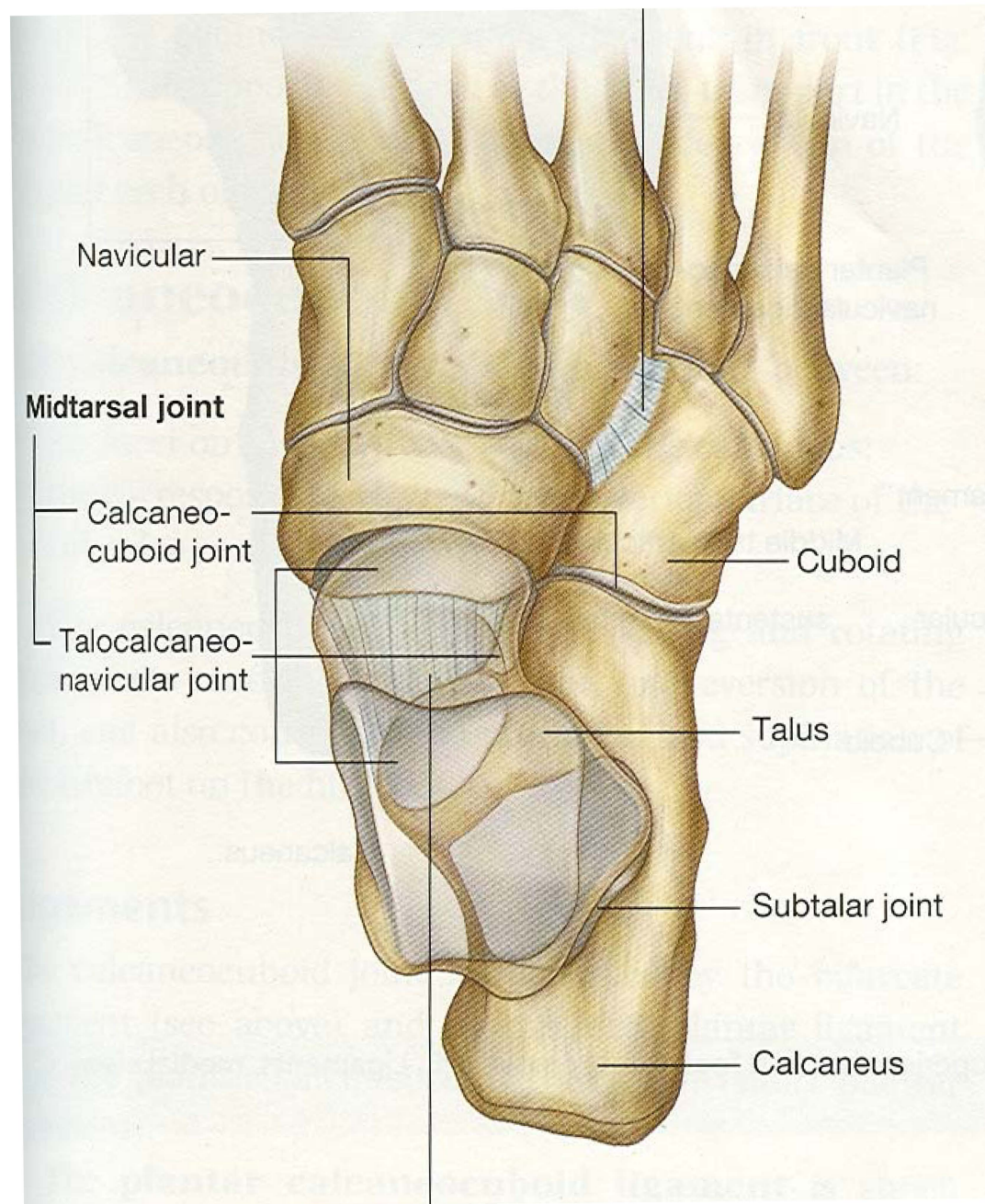
Ties Calcaneus to navicular below the head of talus.

Sustains medial longitudinal arch of foot.

Part of head of talus articulates with it.

Supported by tendons of tibialis posterior, flexor hallucis longus & flexor digitorum longus.

**Nerve Supply** – Deep peroneal, medial plantar nerves.



# Calcaneo – Cuboid Joint

Synovial, Saddle, Biaxial joint.

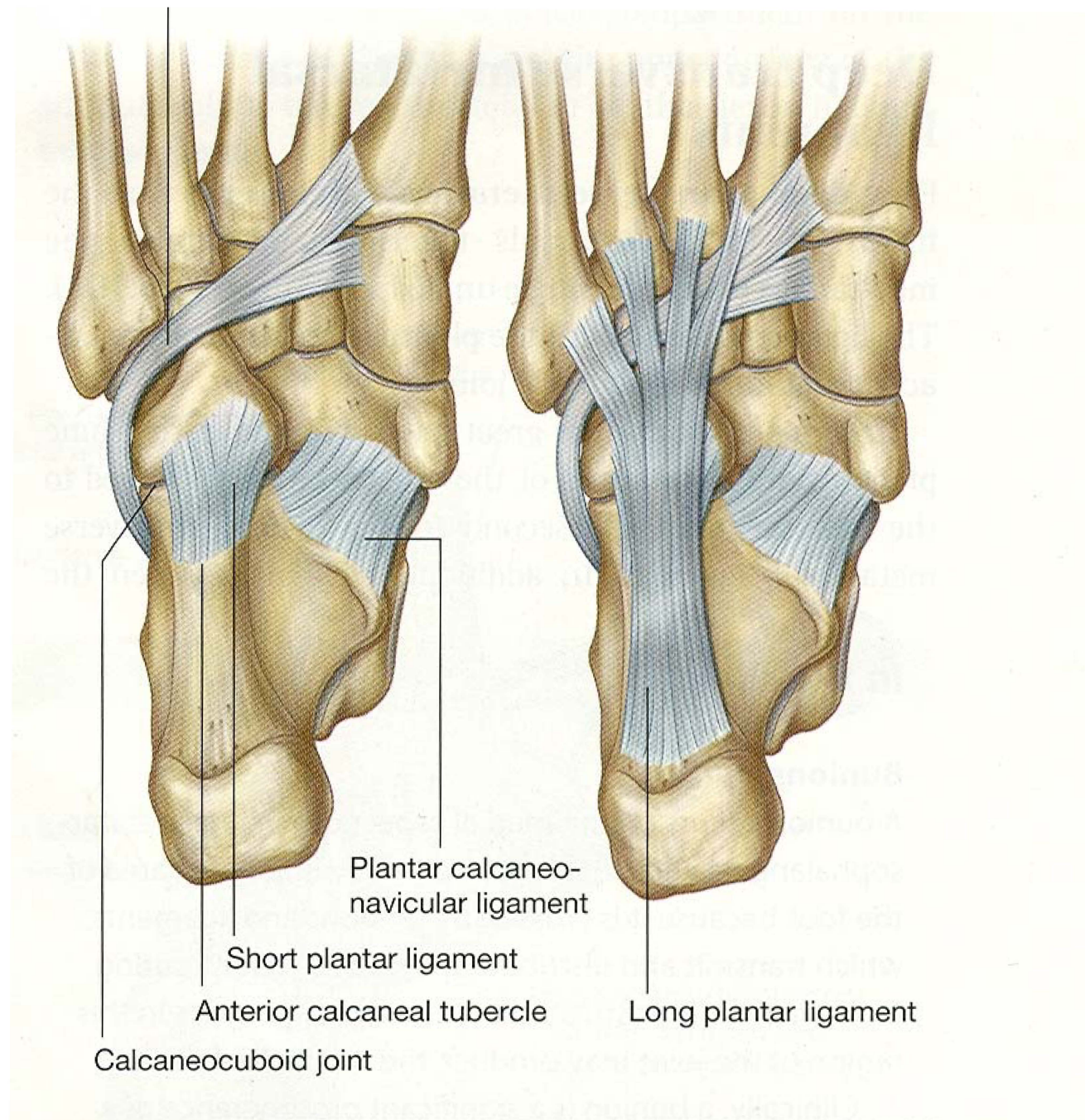
Corresponding facets on anterior surface of calcaneus & posterior surface of cuboid.

Allow sliding & rotating movement during inversion & eversion of foot.

Muscles acting are same.

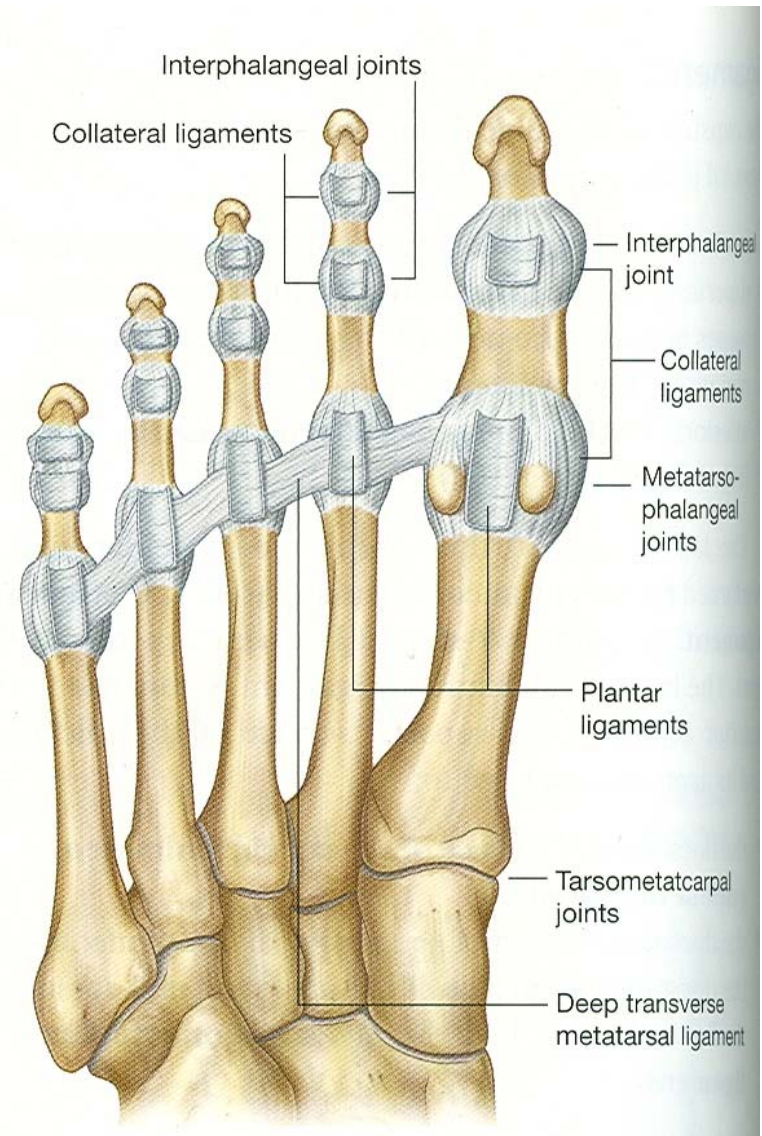
## **Ligaments –**

1. **Bifurcate** – Y shaped ligament.  
Base – To superior surface of calcaneous.  
One arm – dorsomedial surface of cuboid.  
Second arm – dorsolateral part of navicular.
2. **Plantar calcaneo cuboid ligament (short plantar)**– short. connects anterior calcaneal tubercle to be inferior surface of cuboid.
3. **Long plantar ligament** – longest & strongest ligament in the sole of foot, posteriorly attached to inferior surface of calcaneus between the tuberosity and anterior tubercle, anteriorly to a broad ridge and a tubercle on the inferior surface of cuboid bone. Resist depression of lateral arch of foot.



# Small joints of foot

- Tarsometatarsal Joints: plane (synovial)  
Between 1st three metatarsals with cuneiforms; 4<sup>th</sup> & 5<sup>th</sup> with cuboid.  
Gliding and sliding movements
- Intermetatarsal joints: bases with each other.
- Metatarsophalangeal joints – Condylloid  
Flexion/extension; abduction/adduction circumduction. Presence of sesamoid bones.
- Interphalangeal joints: Hinge (synovial)  
flexion/extension

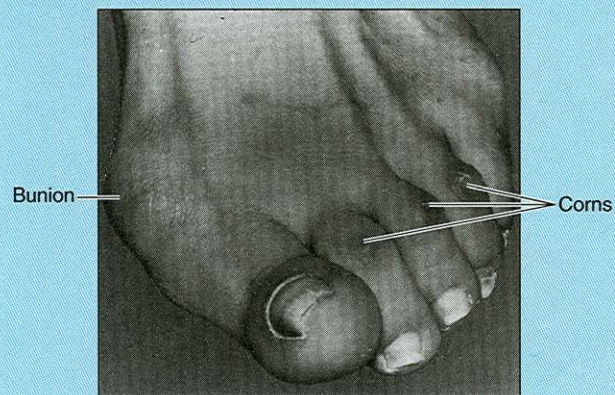


# Movements of joints

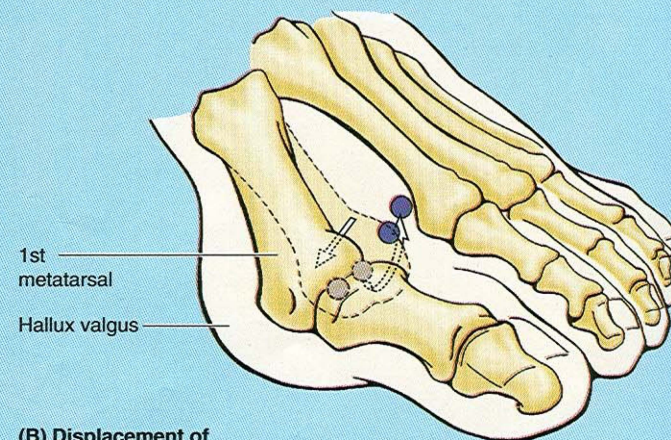
- Distal tibiofibular: gliding (lateral rot. of fibula)
- Ankle: dorsiflexion/plantarflexion
- Subtalar: inversion/eversion
- Intertarsal: gliding & rotation
- Tarsometatarsal: gliding
- Intermetatarsal: gliding
- Metatarsophalangeal: flexion/extension; adduction/abduction; circumduction.
- Interphalangeal: flexion/extension

# Applied Anatomy

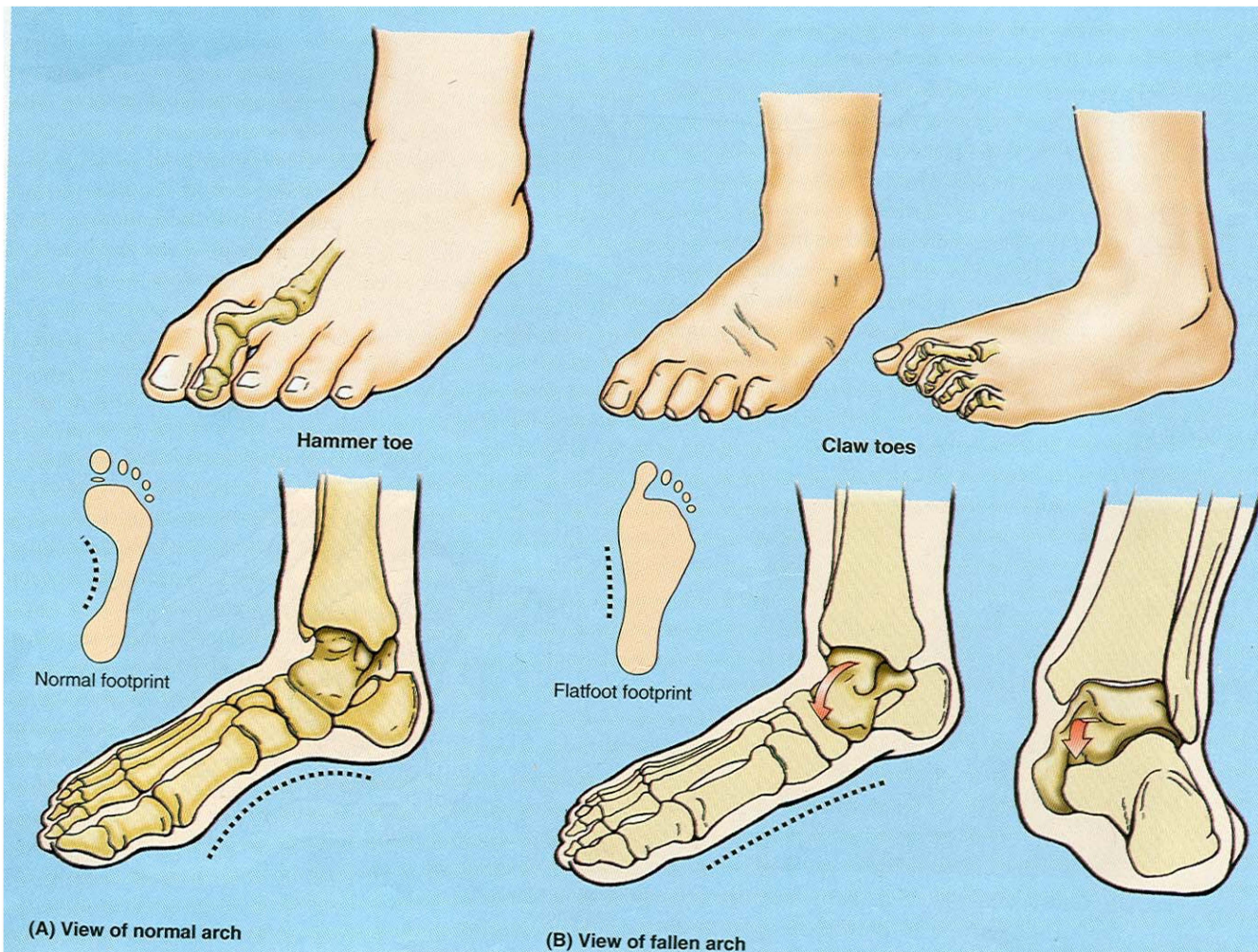
- Ankle injuries: sprains- lateral ligament sprains  
shearing injuries  
avulsion fractures
- Hallux Valgus: enlargement of 1st MP joint. Lateral displacement of big toe. More in females.  
Bunions, corns
- Hammer toe: Permanent dorsiflexion of 2<sup>nd</sup> toe at MP joint  
Callosity
- Claw toes
- Club foot (Talipes equinovarus)

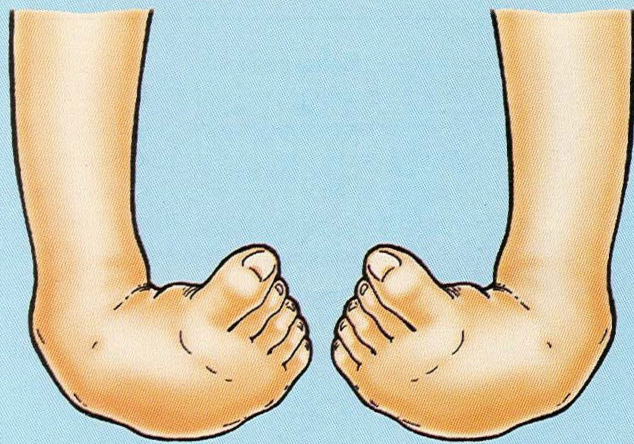


**(A) Hallux valgus and corns**

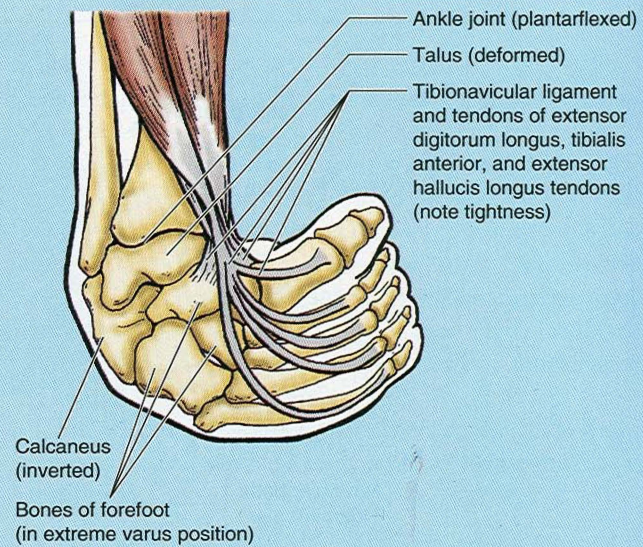


**(B) Displacement of  
sesamoid bones**





(A) Clubfeet or talipes equinovarus



(B)