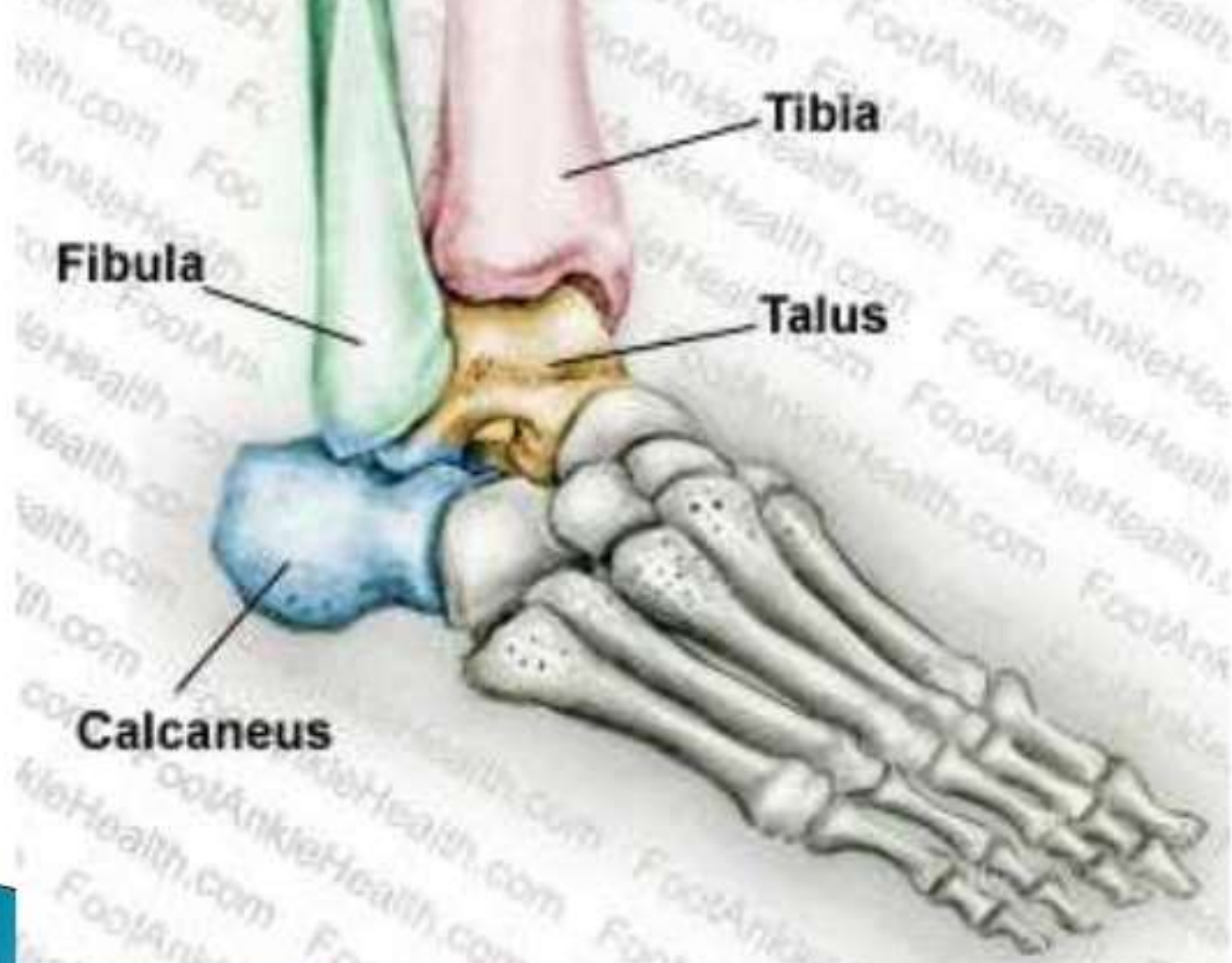


# ANKLE JOINT ANATOMY

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## **TYPE**

**It is a synovial joint of hinge variety.** The shape of articulating bones, strength of the ligaments and the surrounding tendons make this joint strong and stable.



**Tibia**

**Fibula**

**Talus**

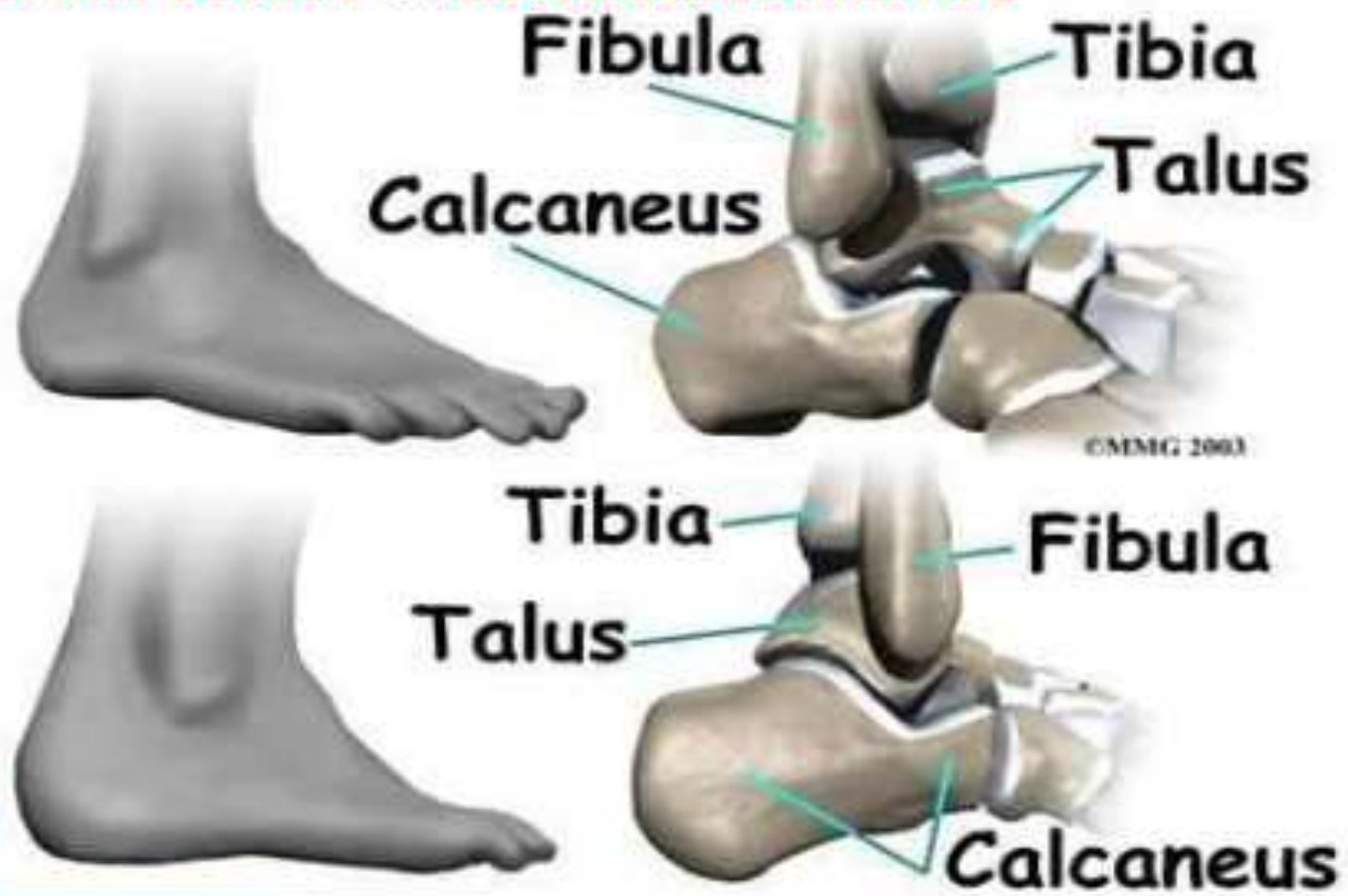
**Calcaneus**

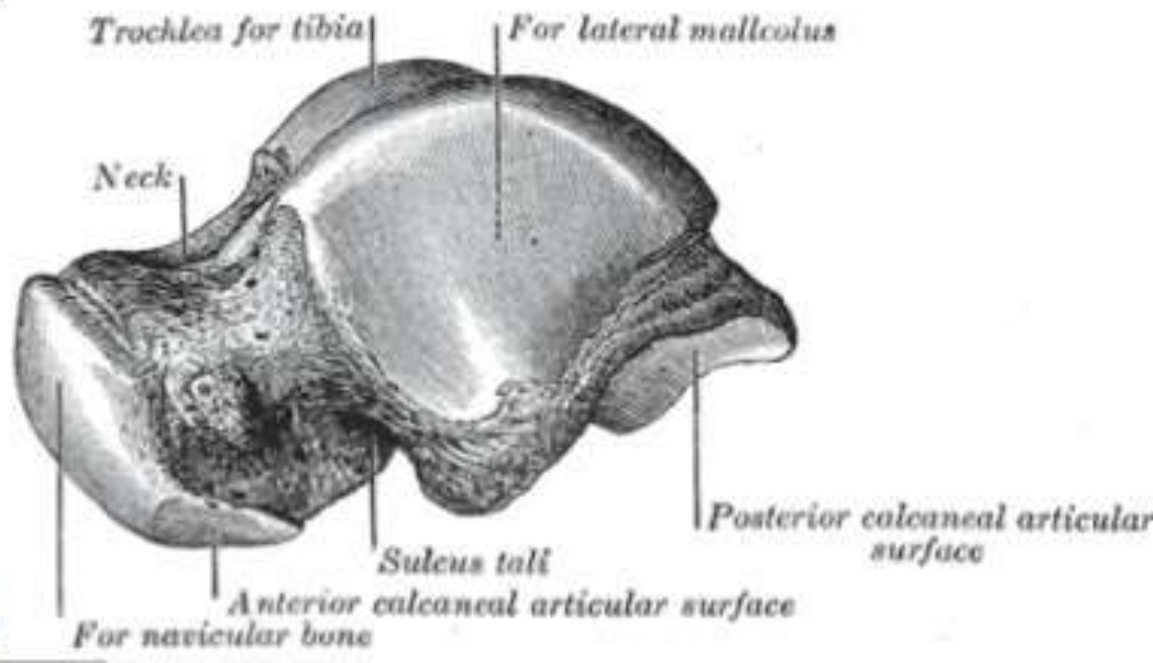
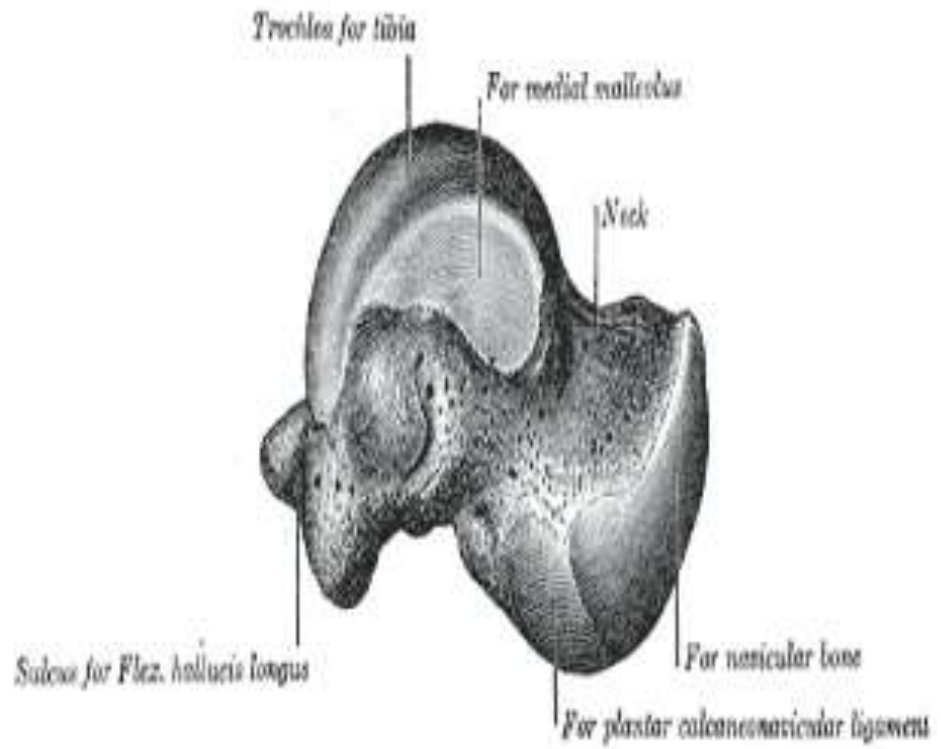
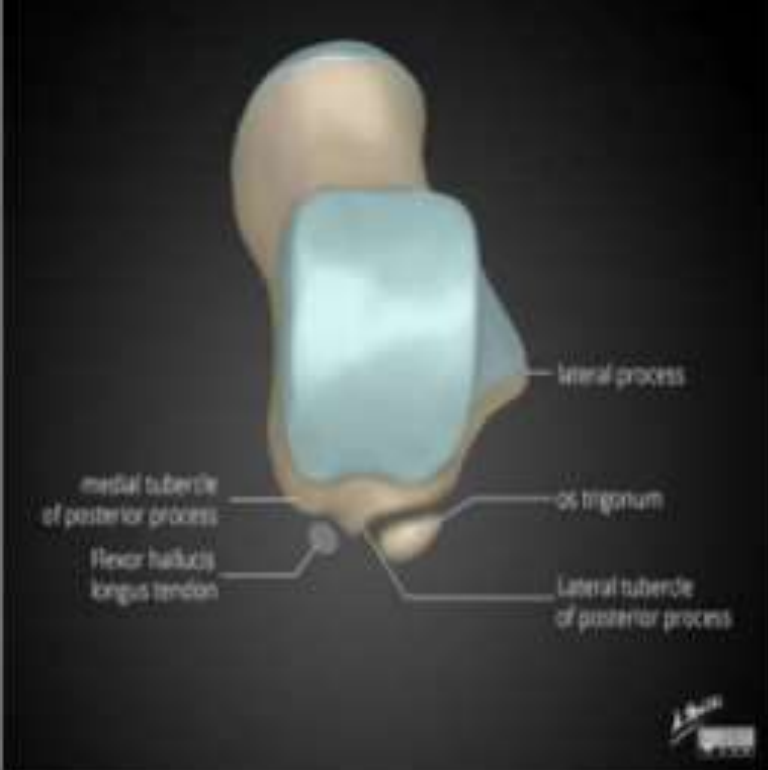
**PROXIMAL ARTICULAR SURFACE** 1.the lower end of tibia, including medial malleolus 2.lateral malleolus 3. inferior transverse tibiofibular ligament.

**DISTAL ARTICULAR SURFACE** body of talus.

The socket is formed by proximal articular surface into which the body of talus fits, is deepened by the inferior transverse tibiofibular ligament

/a **deep tibiofibular socket** or **tibiofibular mortise**





# Articulating Surfaces

- The **body of the talus** fits snugly into the mortise formed by the bones of the leg.
- The body of talus presents 3 articular surfaces:
  - Superior pulley-shaped articular surface (trochlear surface).
    - Articulate the inferior aspect of the lower end of [tibia](#)
  - Medial comma-shaped articular surface.
    - Articulates the lateral aspect of medial malleolus
  - Lateral triangular articular surface.
    - Articulates the medial aspect of lateral malleolus
- The wedge shaped body of the talus fits into the socket above



**Distal tibiofibular joint**

**Bracket shaped socket:**



**Talus**

# LIGAMENTS

• The essential ligaments of ankle joint are:

1. Capsular ligament.
2. Medial and lateral collateral ligaments.



# Capsular Ligament

- ▶ Fibrous capsule is attached all around articular margins with two exceptions.
- ▶ **Posterosuperiorly** it is attached to inferior transverse tibiofibular ligament.
- ▶ **Anteroinferiorly** it is attached to the dorsum of neck of talus.

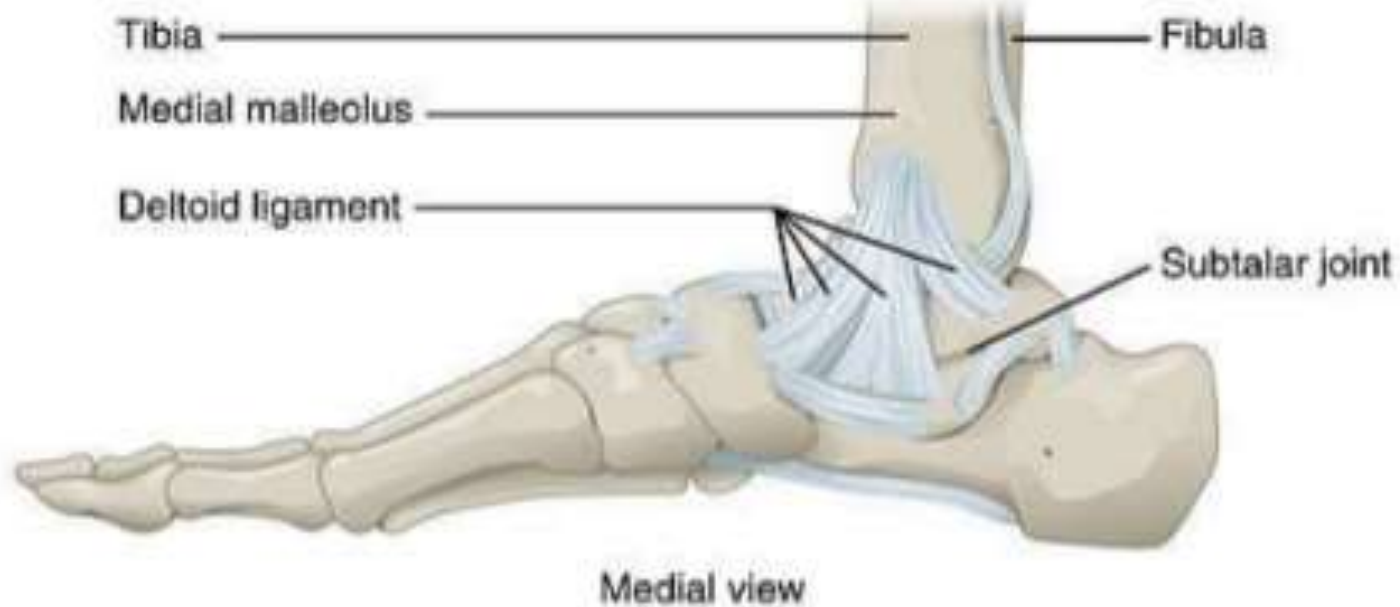


• **Medial Ligament:** Also known as deltoid ligament  
This is located on the medial aspect of the foot. It is the largest ligament but is actually comprised of several sections all fused together. This ligament prevents (eversion) of the ankle. The deltoid ligament is triangular in shape

• **Divided into two parts: superficial and deep**

**Above :** both parts are attached to the apex and margins of the medial malleolus.

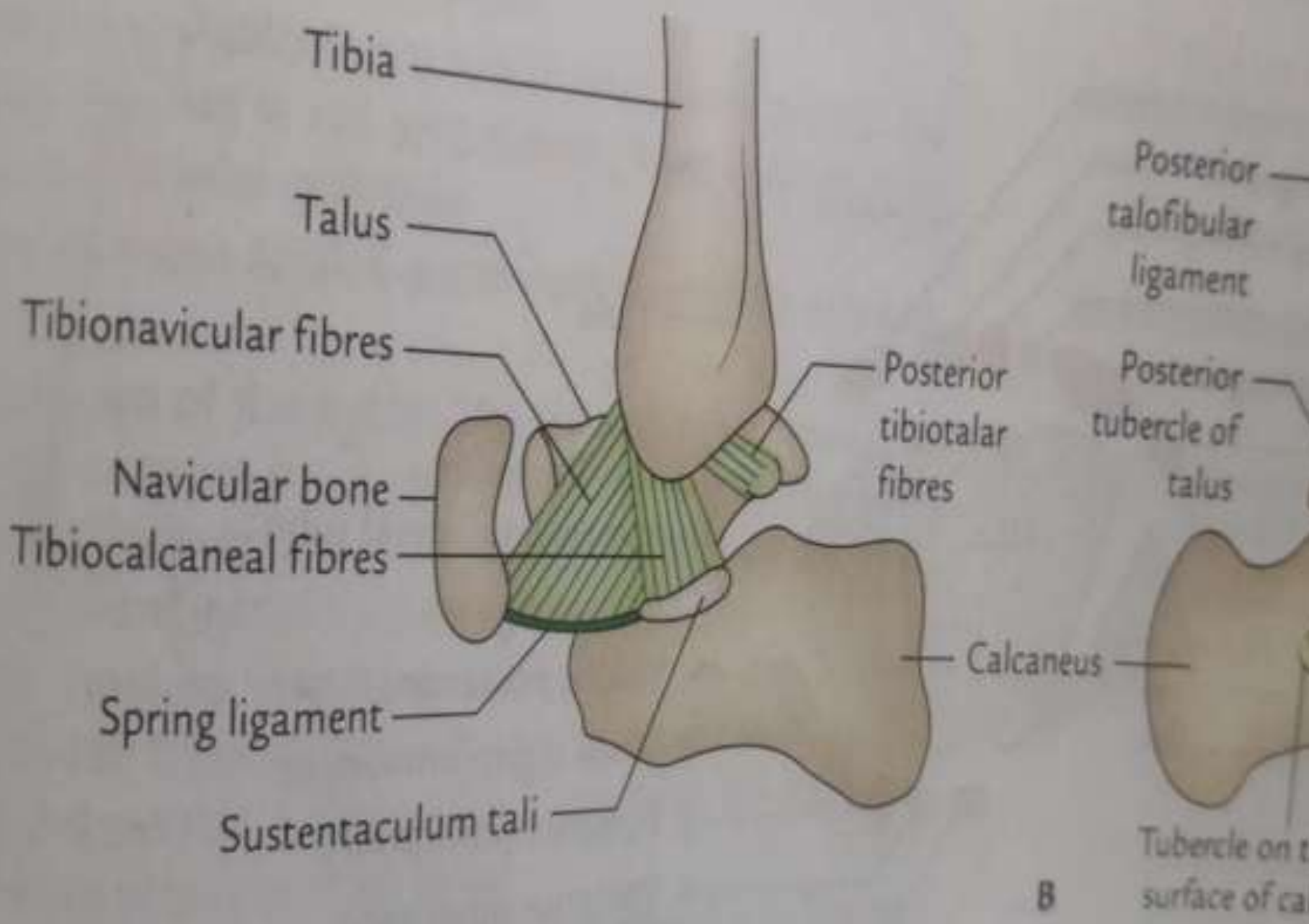
**Below** it has two places of attachment.



**Superficial part** : it's fibers are divided into three parts:

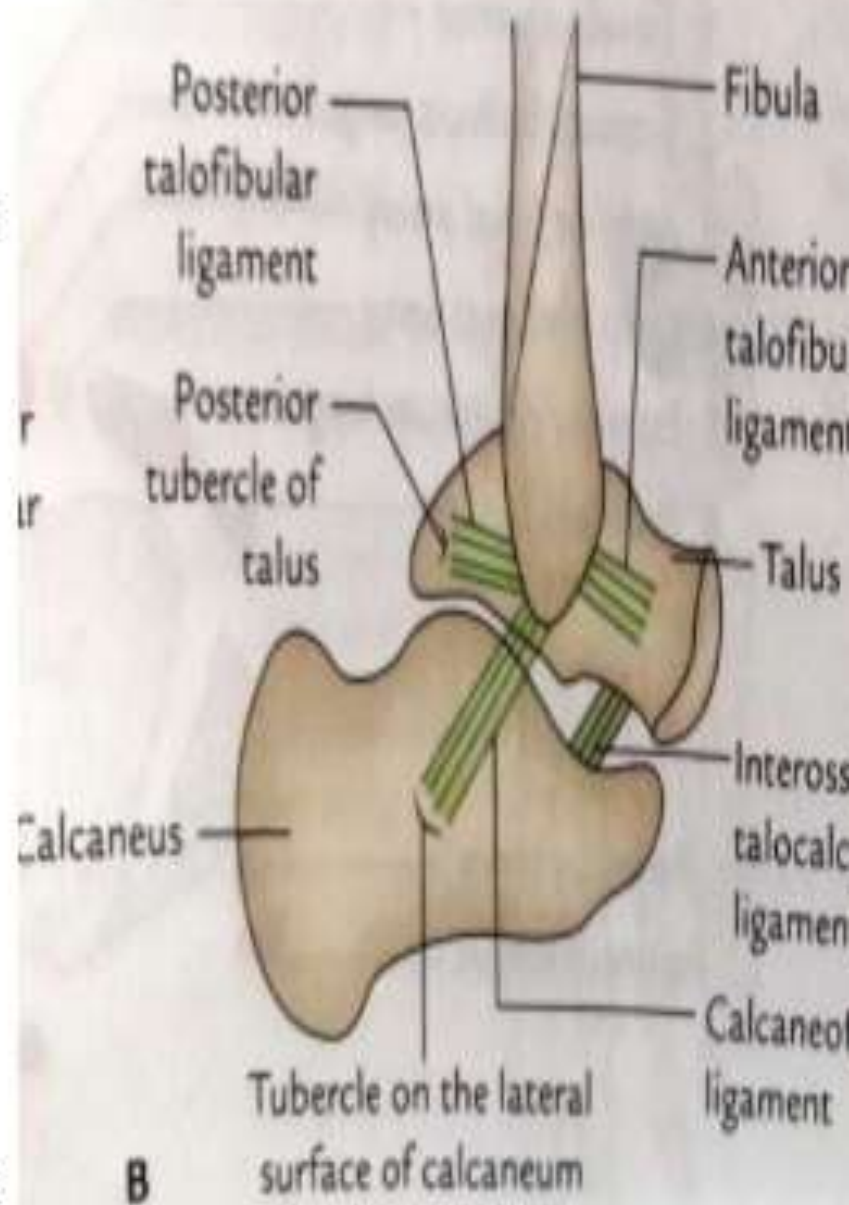
- ▶ **ANTERIOR FIBERS (Tibionavicular )**
- ▶ **MIDDLE FIBERS (Tibiocalcaneal )**
- ▶ **POSTERIOR FIBERS(Posterior tibiotalar )**

**The deep part:** (**Anterior tibiotalar**) are attached to the anterior part of medial surface of talus

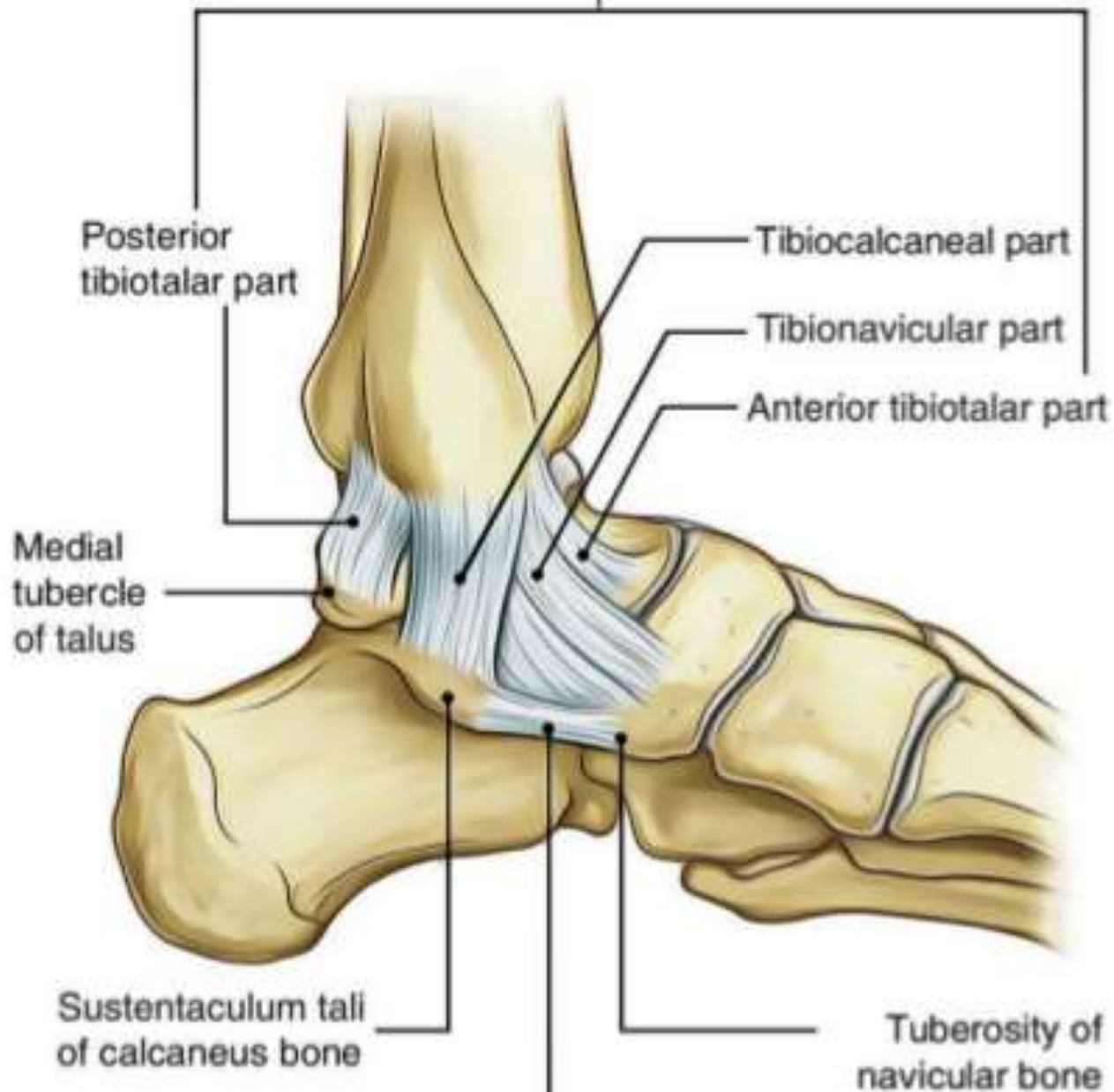


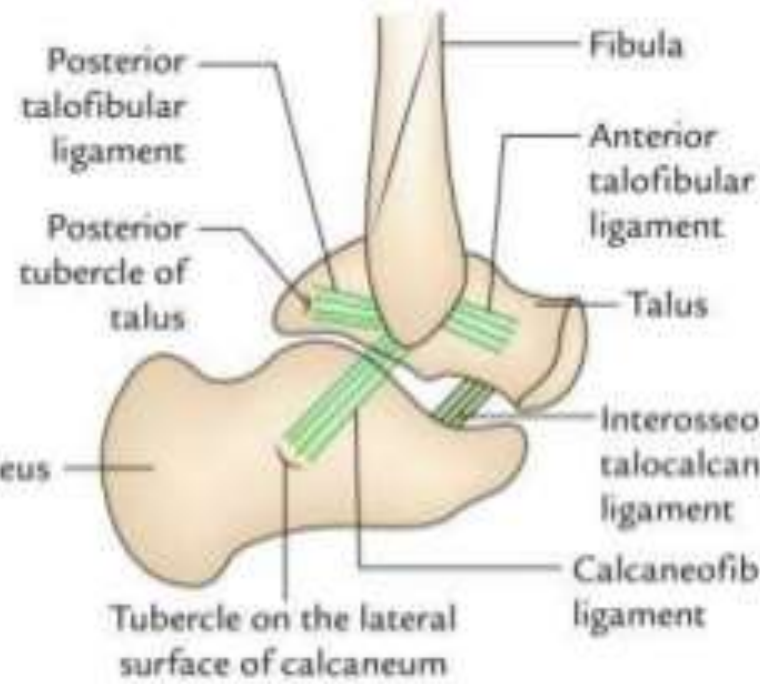
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- **Lateral ligament:** It consists of three bands
- **Anterior talofibular ligament:** It runs from the ant. margin of lateral malleolus to the neck of talus.
- **Calcaneofibular ligament:** It runs from the tip of lateral malleolus to lateral surface of calcaneum.
- **Posterior talofibular ligament:** It runs from the lateral malleolus to the posterior tubercle of the



# Medial ligament of the ankle joint



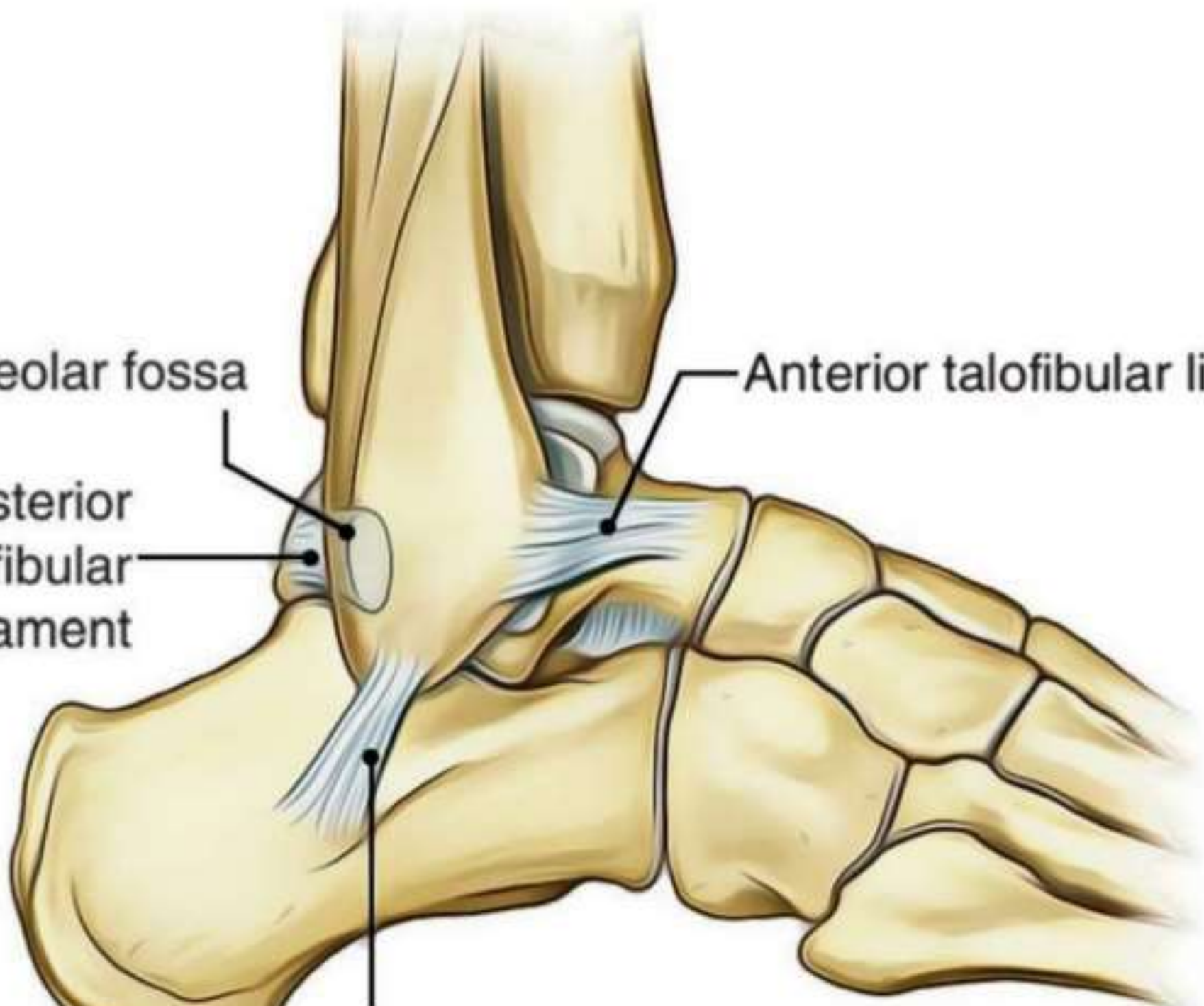




Malleolar fossa

Posterior  
talofibular  
ligament

Anterior talofibular liga



LIGAMENT	DESCRIPTION	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	ROLE
Anterior Talofibular Ligament (ATFL)	Flat Weak Band that extends Anteromedially. Most commonly damaged ligament of the ankle.	Lateral Malleolus	Neck of Talus	<ul style="list-style-type: none"> <li>•Restrain anterior displacement of the talus in respect to the fibula and tibia.</li> <li>•Resists Inversion in planterflexion.</li> </ul>
Posterior Talofibular Ligament (PTFL)	Thick, fairly strong band that runs horizontally medially. This ligament is under greater strain in full dorsiflexion of ankle. Rarely injured because bony stability protects ligaments when ankle in dorsiflexion.	Malleolar Fossa of Fibula	Lateral Tubercle of Talus	<p>Forms the back wall of the recipient socket of the talus' trochlea.</p> <p>Resists posterior displacement of the talus.</p>
Calcaneofibular Ligament (CFL)	Round cord that passes posteroinferiorly	Tip of Lateral Malleolus	Lateral Surface of Calcaneus	<ul style="list-style-type: none"> <li>•Aids Talofibular stability during Dorsiflexion.</li> <li>•Restrain inversion of the calcaneus with respect to the fibula. Prevent Talar tilt into inversion.</li> </ul>

LIGAMENTS	DESCRIPTION	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	ROLE
Anterior Tibiotalar Ligament		Medial Malleolus	Head of Talus	Reinforces Ankle Joint. Control Plantarflexion Eversion
Posterior Tibiotalar Ligament			Talus Posteriorly	Control Dorsiflexion
Tibionavicular Ligament	Forms most anterior part of the Deltoid Ligament		Dorsomedial Aspect of Navicular	Reinforces Ankle Joint
Tibiocalcaneal Ligament	Very thin ligament		Sustentaculum Tali	Reinforces Ankle Joint

# The synovial membrane

- The synovial membrane lines the inner surface of the joint capsule, but ends at the periphery of the articular cartilages.
  - A small synovial process goes upward into the inferior tibiofibular syndesmosis.

# Relations

- ▶ **Anterior relations:**

Tibialis anterior, Extensor Hallucis longus,  
Anterior tibial vessels, deep peroneal nerve,  
Extensor digitorum longus, Peroneus tertius

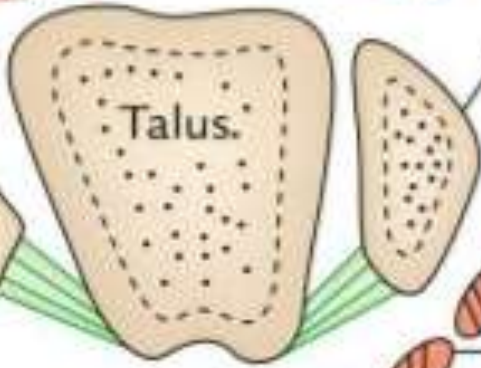
- ▶ **Pneumonic – Tall Himalayas Are Never Dry Places**

**Anterior**  
(From medial to lateral side)



- 1. Tibialis anterior
- 2. Extensor hallucis longus
- 3. Anterior tibial artery
- 4. Deep peroneal nerve
- 5. Extensor digitorum longus
- 6. Peroneus tertius

Fibula



Talus

Tibia

**Posterior**  
(From medial to lateral side)



- Peroneus brevis
- Peroneus longus

- 1. Tibialis posterior
- 2. Flexor digitorum longus
- 3. Posterior tibial artery
- 4. Posterior tibial nerve
- 5. Flexor hallucis longus

# Relations

- ▶ **Posterior relations:**

Tibialis posterior, Flexor digitorum longus, posterior tibial vessels, tibial nerve, flexor hallucis longus

- ▶ **Pneumonic – Tom Dick And Not Harry**

# The Ankle 'Ring'

The ankle joint and associated ligaments can be visualised as a **ring** in the coronal plane:

The **upper part** of the ring is formed by the articular surfaces of the tibia and fibula.

The **lower part** of the ring is formed by the subtalar joint (between the talus and the calcaneus).

The **sides** of the ring are formed by the medial and lateral ligaments.

A ring, when broken, usually breaks in two places (*the best way of illustrating with is with a polo mint – it is very difficult to break one side without breaking the other*).



### **Blood supply of ankle joint:**

The ankle joint receives its blood supply from malleolar branches of the anterior and posterior tibial and peroneal arteries.

### **Nerve supply to ankle joint:**

The ankle joint receives its nerve supply from deep peroneal and tibial nerves. Occasionally, the superficial peroneal nerve also supplies the ankle joint.

## *Movements of ankle joint*

As the ankle joint is a uniaxial hinge joint permitting only two types of movements: Dorsiflexion and Plantar flexion.

• **Dorsiflexion:** It is the movement in which the dorsal surface of foot is flexed. In this movement the toes point upward.

Muscles responsible for it include;

- Tibialis anterior
- Extensor hallucis longus
- Extensor digitorum longus
- Peroneus tertius

**Ankle joint is most stable in dorsiflexion**

**Plantar flexion:** It is the movement of foot in which its plantar surface is flexed. The toes point downward in this movement. Muscles responsible for plantar flexion include;

- Gastrocnemius
- Soleus
- Plantaris
- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus.

**The joint is unstable in plantar flexion**

# Movements

Movements	Principal muscles	Accessory muscles
Dorsiflexion	Tibialis anterior	<ul style="list-style-type: none"><li>•EDL</li><li>•EHL</li><li>•Peroneus tertius</li></ul>
Plantar Flexion	Gastrocnemius Soleus	<ul style="list-style-type: none"><li>•Plantaris</li><li>•Tibialis posterior</li><li>•FHL</li><li>•FDL</li></ul>

*Flexors*  
(*Plantar-flexion*)

- (1) **Soleus**
- (2) **Gastrocnemius**

helped by other less effective muscles



*Extensors*  
(*Dorsi-flexion*)

**Tibialis anterior**

helped by : extensor digitorum longus  
extensor hallucis longus peroneus tertius

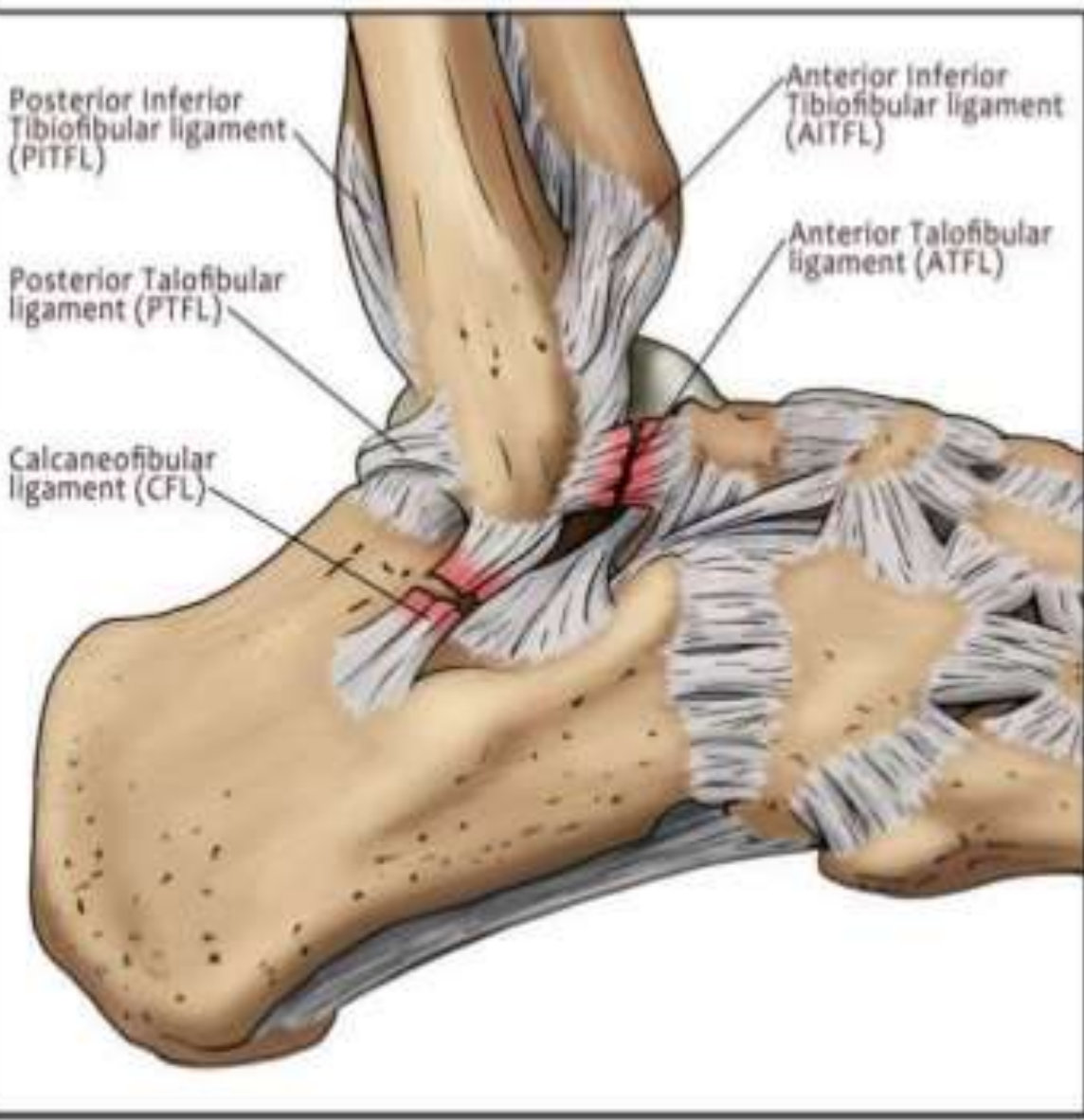




APPLIED

# Applied Anatomy

- ▶ Ankle sprain most common. Occurs due to stretching & tearing of the ligaments.
- ▶ When plantar flexed foot is excessively inverted. Lateral ligament is stretched & torn (anterior talofibular ligament most commonly torn).
- ▶ When plantar flexed foot is excessively everted – deltoid ligament is not torn, instead there is avulsion # of med malleolus.

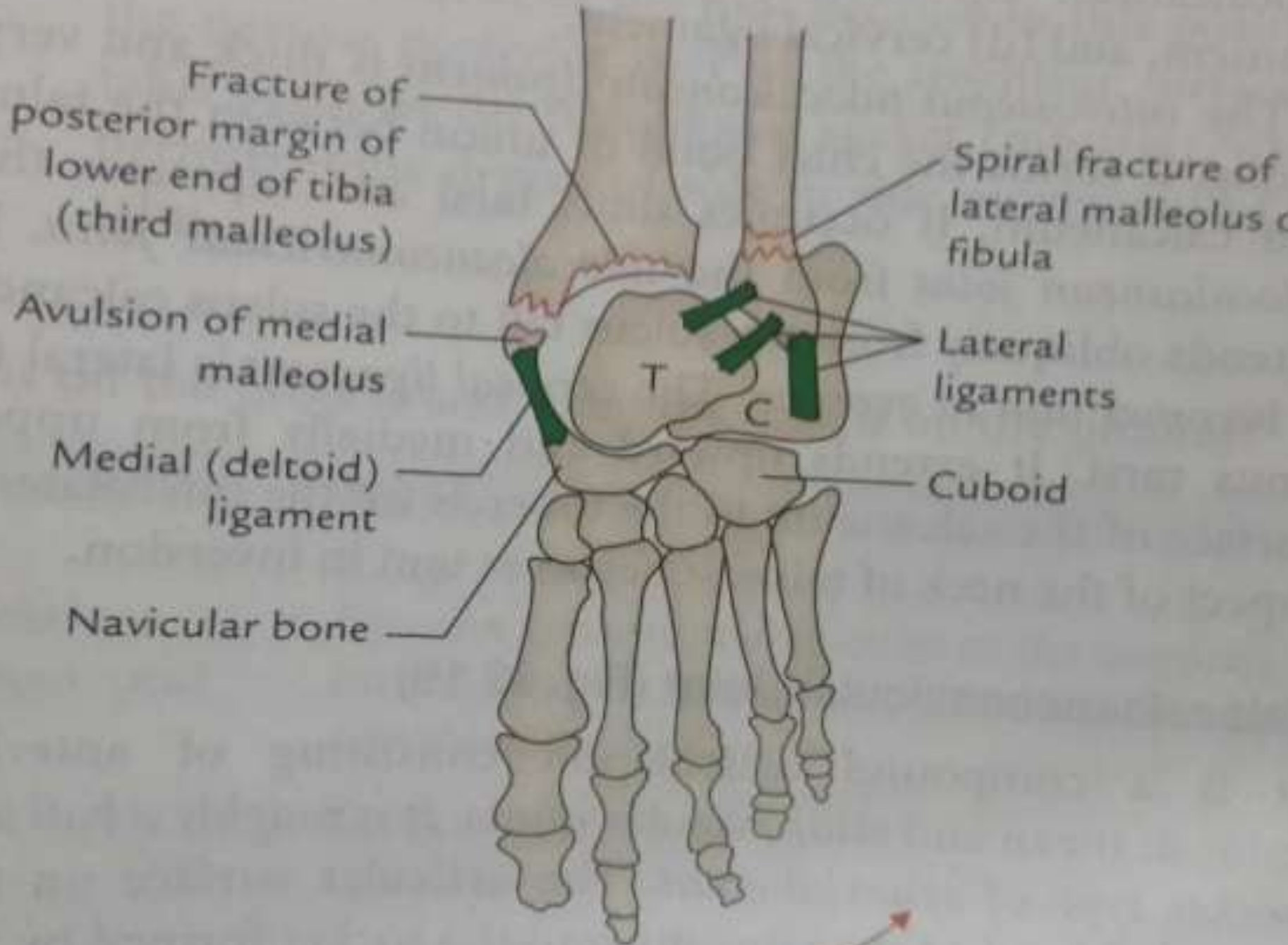




# Applied Anatomy

- ▶ # of Malleoli – Pott's fracture–
- ▶ Occurs when foot is everted forcefully.
- ▶ Oblique fracture of lateral malleolus due to internal rotation of tibia.
- ▶ Transverse fracture of medial malleolus due to pull by strong deltoid ligament
- ▶ Fracture of posterior margin of lower end of tibia(3<sup>rd</sup> malleolus)





Fracture of posterior margin of lower end of tibia (third malleolus)

Spiral fracture of lateral malleolus of fibula

Avulsion of medial malleolus

Lateral ligaments

Medial (deltoid) ligament

Cuboid

Navicular bone

Eversion of foot

# Applied Anatomy

- ▶ Dislocation of the ankle joint:-
- ▶ Very uncommon.
- ▶ If it occurs, it is accompanied by the # one malleoli.

