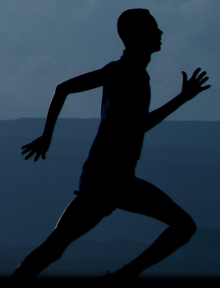
ANKLE EXAM

Richard Kim M.D., CAQSM



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THE ANKLE JOINT

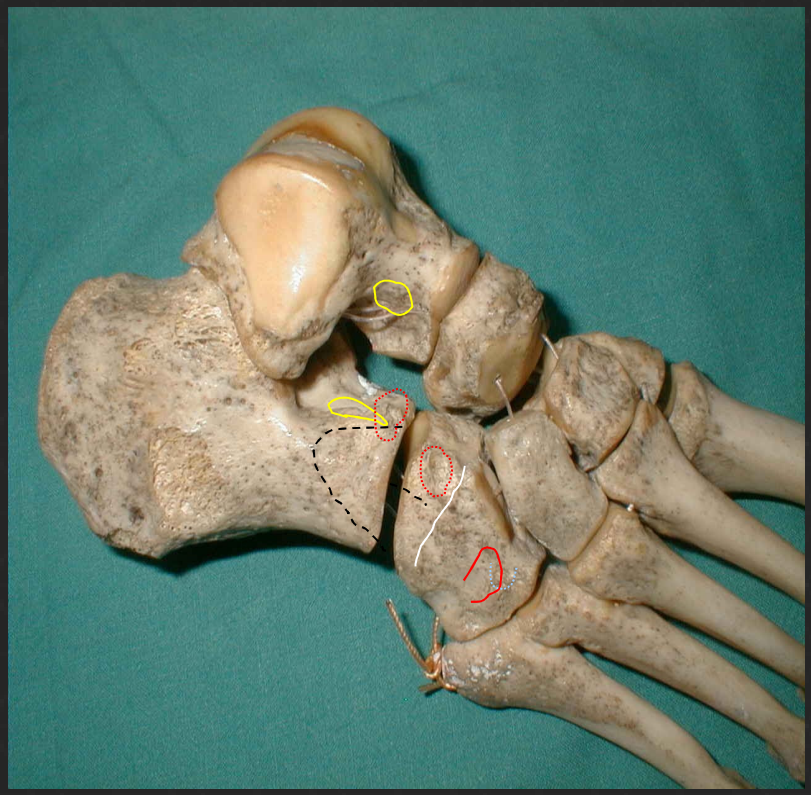
- The ankle joint is one of the most common joints to be injured.
- The foot is usually in the plantar flexed and inverted position when the ankle is most commonly injured.

Bröstrom, 1966

THE ANKLE JOINT

- Dorsiflexion and plantar flexion take place at the ankle joint
- In plantar flexion there is some side-to-side movement

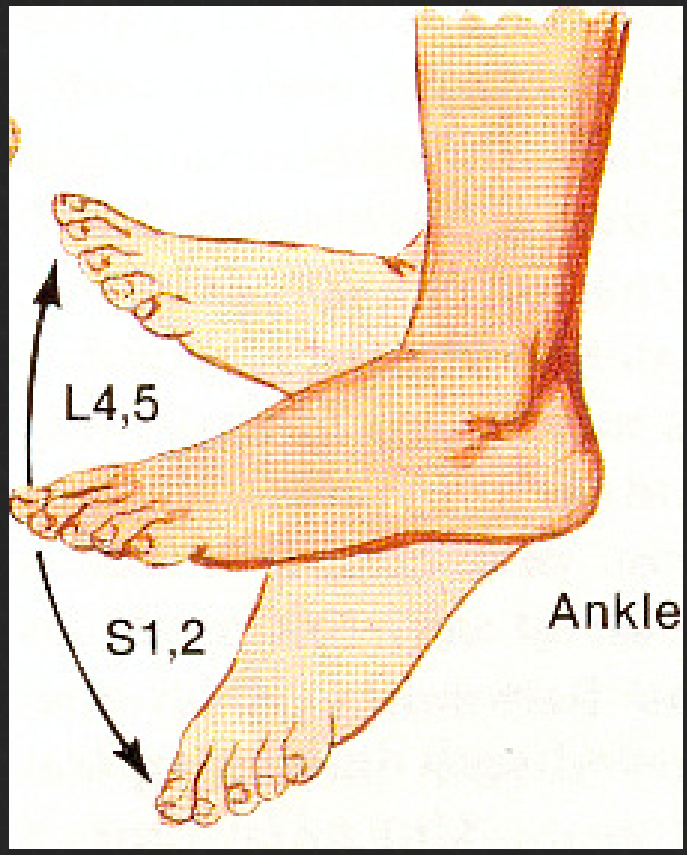
Last, 1963



THE ANKLE JOINT

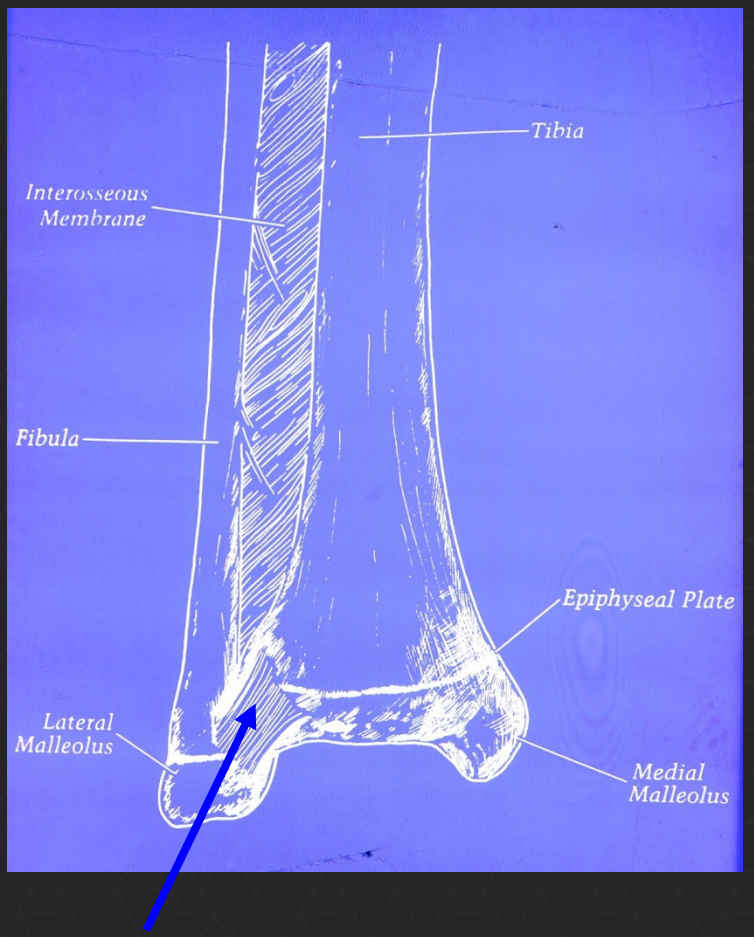
- In dorsiflexion the foot moves upwards and medially
- Downwards and laterally in plantar flexion

Plastanga et al., 1990



PROXIMAL ARTICULAR SURFACE

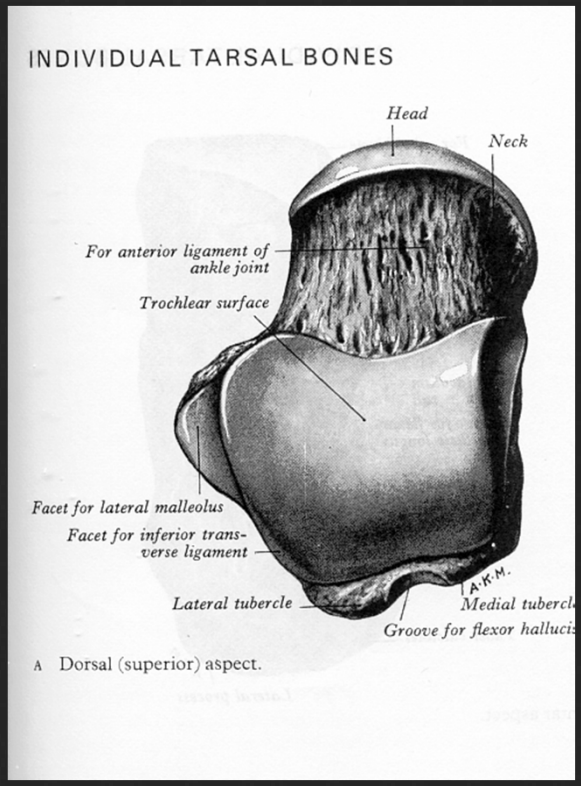
- Proximally the articulation depends on the integrity of the inferior tibiofibular joint
- Syndesmosis
- Lateral malleolus is larger, lies posteriorly
- Extends more inferiorly



DISTAL ARTICULAR SURFACE

- The talus has no muscles attached to it
- Has a very extensive articular surface
- As a result fractures of the talus may result in avascular necrosis of either the body or the head

O'Brien et al., 2002

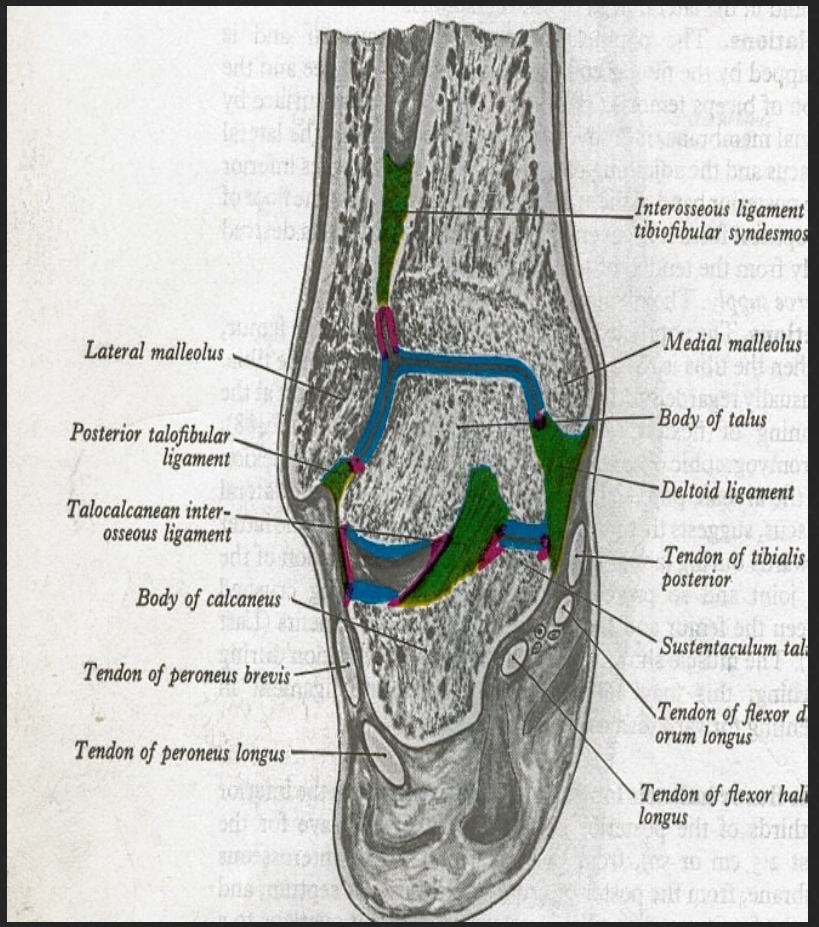


CONGENITAL ABNORMALITIES

- Congenital abnormalities include os trigonum and tarsal coalition
- Os trigonum in 7% of normal population but in 32% of soccer players
- It is a problem in soccer players, ballet dancers and javelin
- Forced hyperplantar flexion compresses the posterior portion of the ankle and may fracture the lateral tubercle or an os trigonum

ARTICULAR SURFACES

- Articular surfaces are covered with hyaline or articular cartilage
- Synovial fold which may contain fat
- Fills the interval between tibia, fibula and inferior transverse tibiofibular ligament



CAPSULE

- Is attached just beyond the articular margin
- Except anterior-inferiorly
- Attached to the neck of the talus

Williams & Warwick, 1980

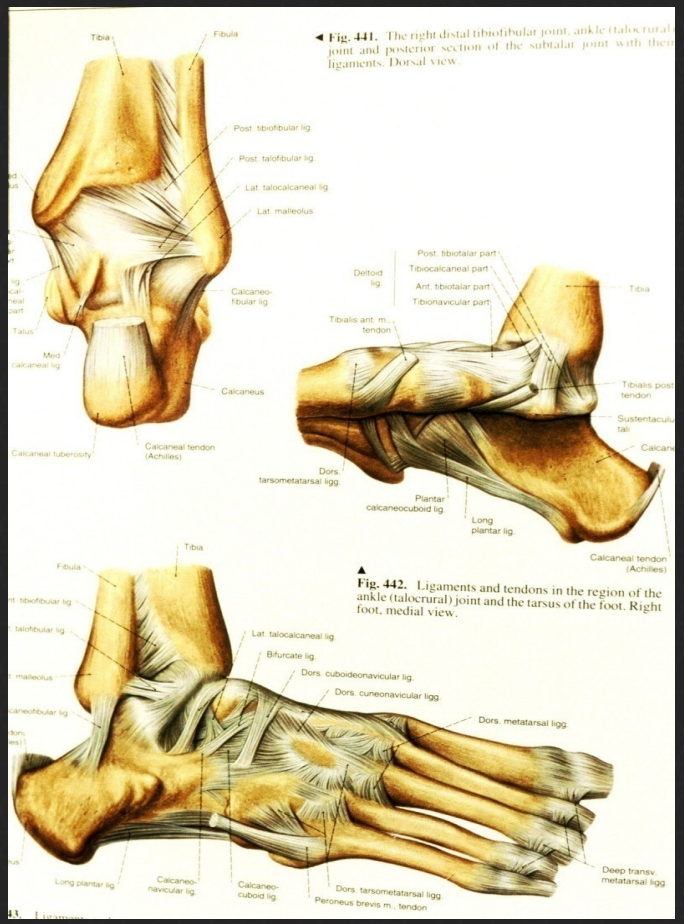


Fig. 441. The right distal tibiofibular joint, ankle (talocrural) joint and posterior section of the subtalar joint with their ligaments. Dorsal view.

Fig. 442. Ligaments and tendons in the region of the ankle (talocrural) joint and the tarsus of the foot. Right foot, medial view.

THE ANKLE JOINT

- The capsule is thin and weak in front and behind
- The anterior and posterior ligaments are thickenings of the joint capsule
- The anterior runs obliquely from the tibia to the neck of the talus

Williams & Warwick,1980

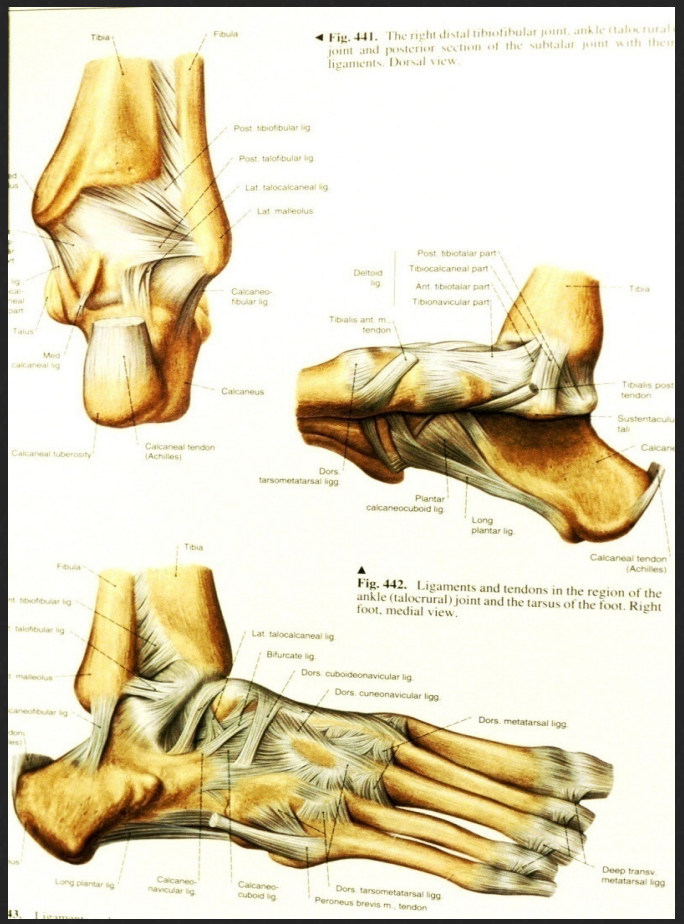


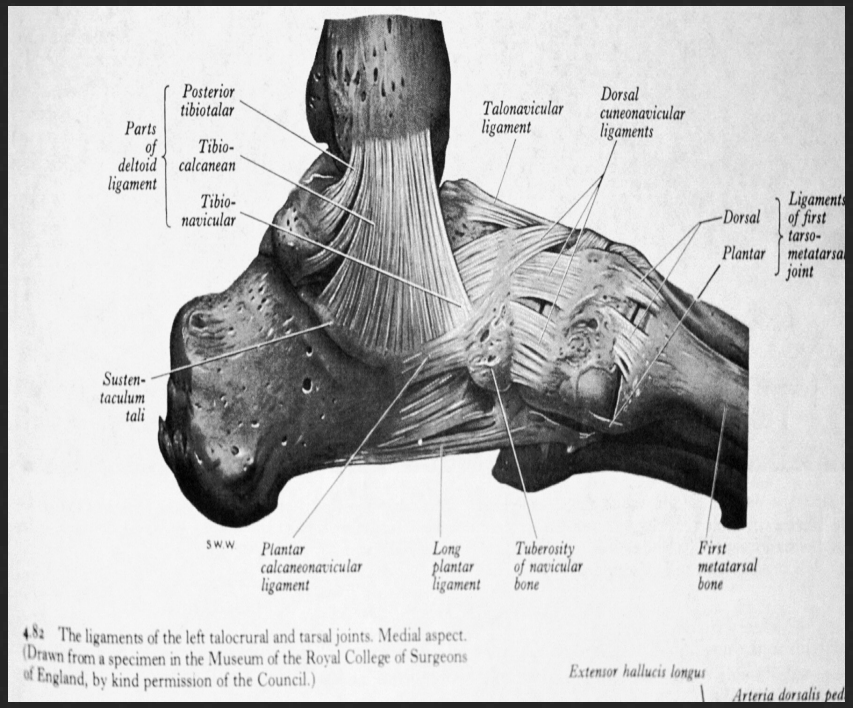
Fig. 441. The right distal tibiofibular joint, ankle (talocrural) joint and posterior section of the subtalar joint with their ligaments. Dorsal view.

Fig. 442. Ligaments and tendons in the region of the ankle (talocrural) joint and the tarsus of the foot. Right foot, medial view.

THE MEDIAL (DELTOID) LIGAMENT

- A strong triangular ligament
- Superiorly attached
- The medial malleolus of the tibia

Williams & Warwick, 1980

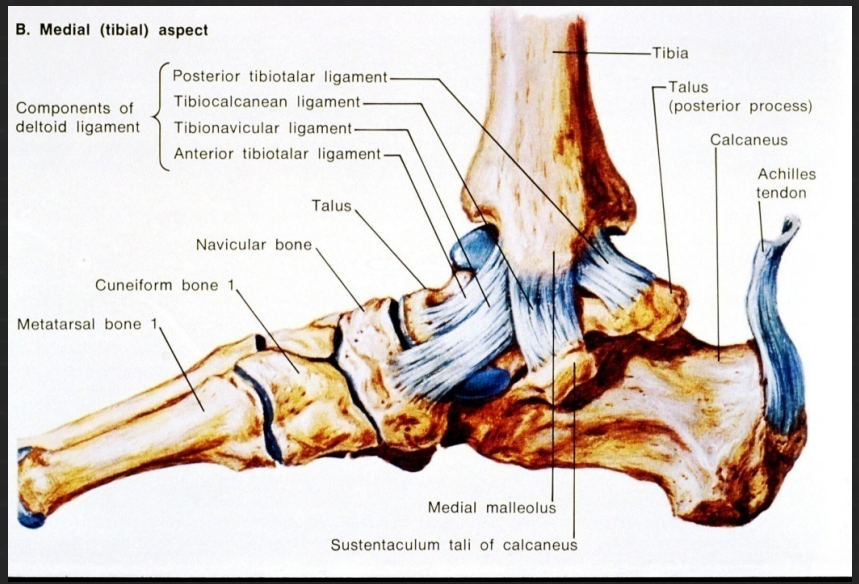


4.82 The ligaments of the left talocrural and tarsal joints. Medial aspect. (Drawn from a specimen in the Museum of the Royal College of Surgeons of England, by kind permission of the Council.)

MEDIAL LIGAMENT

- Inferiorly, ant-post
- The tuberosity of the navicular
- Neck of talus
- The free edge of the spring ligament
- The sustentaculum tali
- The body of the talus

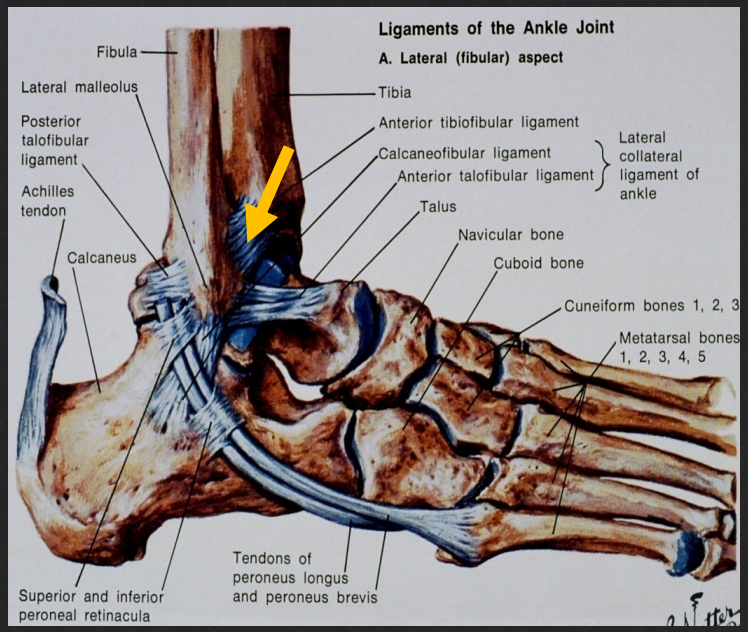
Last, 1963



LATERAL LIGAMENTS OF ANKLE

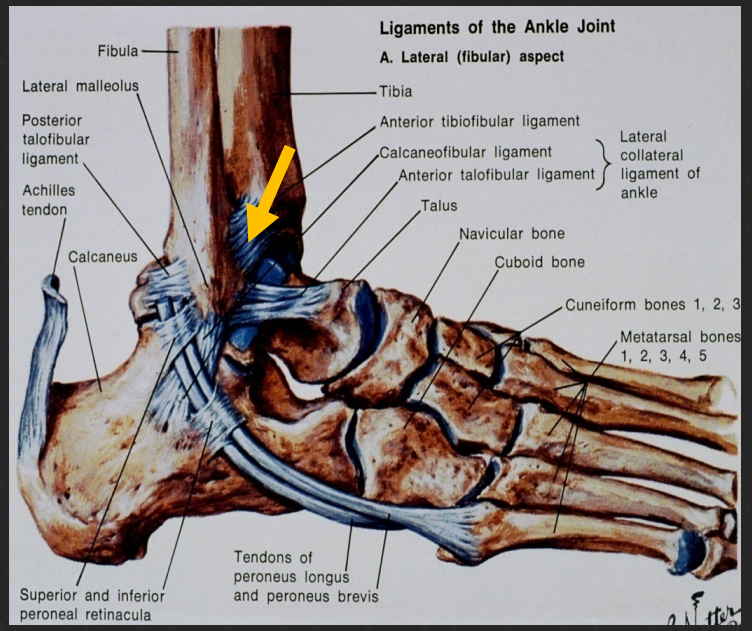
- The anterior talofibular ligament (ATFL)
- The calcaneofibular (CFL)
- The posterior talofibular (PTF)
- They radiate like the spokes of a wheel

Liu & Jason, 1994



THE ATFL

- Is part of the capsule
- An upper and lower bands
- It is cylindrical, 6-10 mm long and 2 mm thick
- The anterior inferior border of the fibula runs parallel to the long axis of the talus when the ankle is neutral or dorsiflexion
- More perpendicular to the talus when the foot is equinus

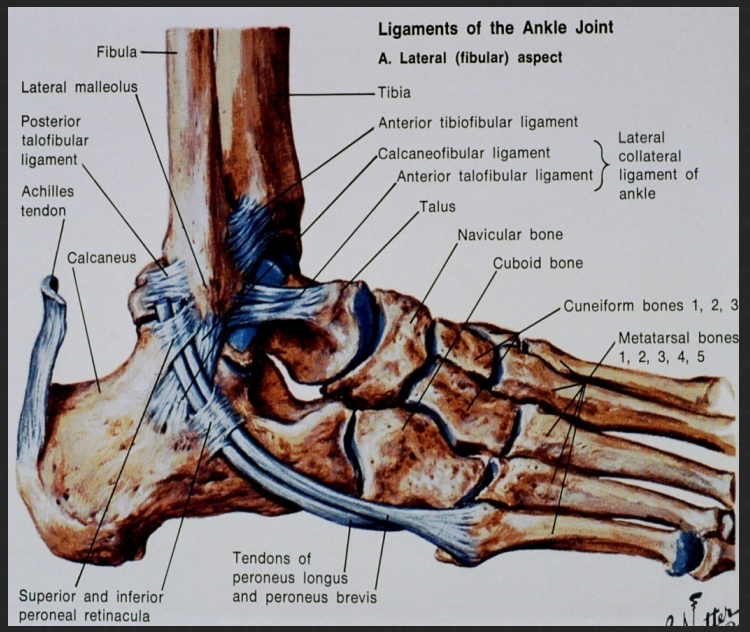


Liu & Jason, 1994

THE ATFL

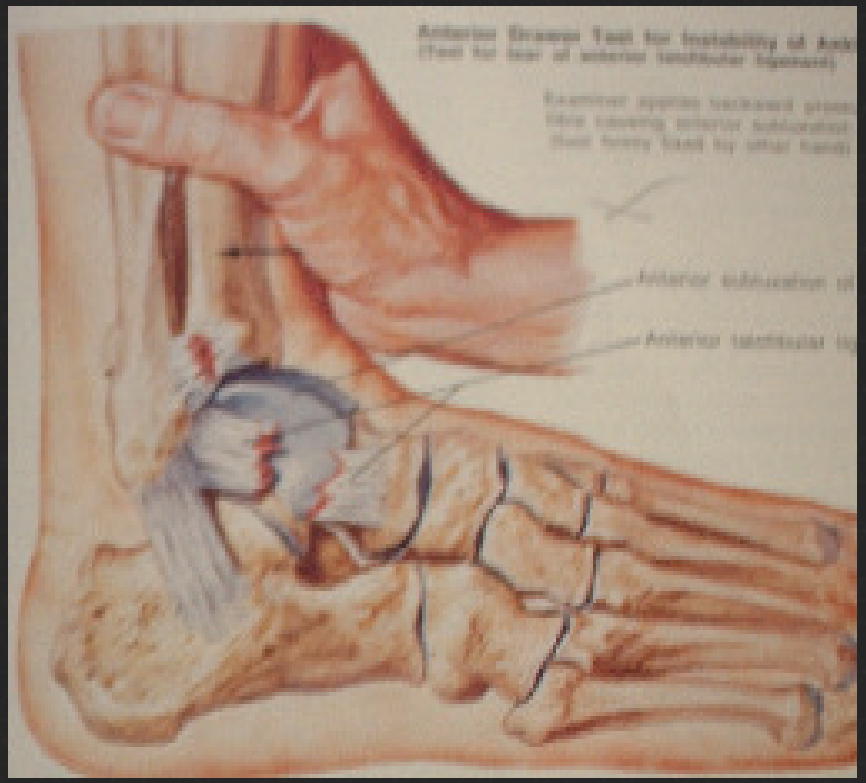
- It is the weakest ligament
- Strain increases with increasing plantar flexion and inversion
- The AFTL is a primary stabiliser against inversion and internal rotation for all angles of plantar flexion

Liu & Jason, 1994



TEST FOR THE ATFL

- The anterior draw tests the ATFL
- Test should be done with the ankle in 10^{o}-20^{o} plantar flexion
- Low loads



THE CFL

- A long rounded 20-25 mm long, 6-8 mm in diameter
- It contains the most elastic tissue
- It is attached in front of the apex of the fibular malleolus
- Passes downwards and backwards
- To a tubercle on the lateral aspect of the calcaneus

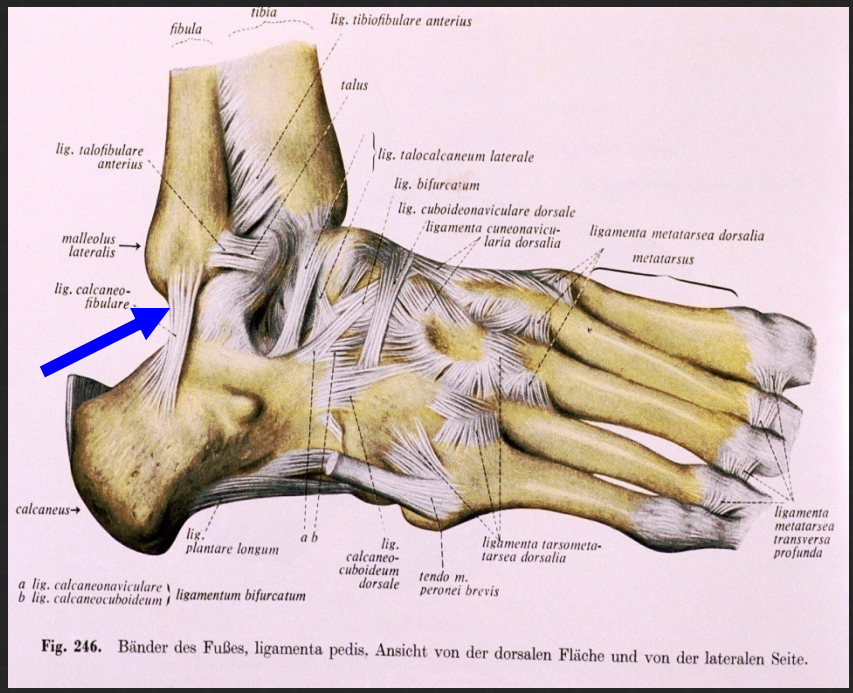


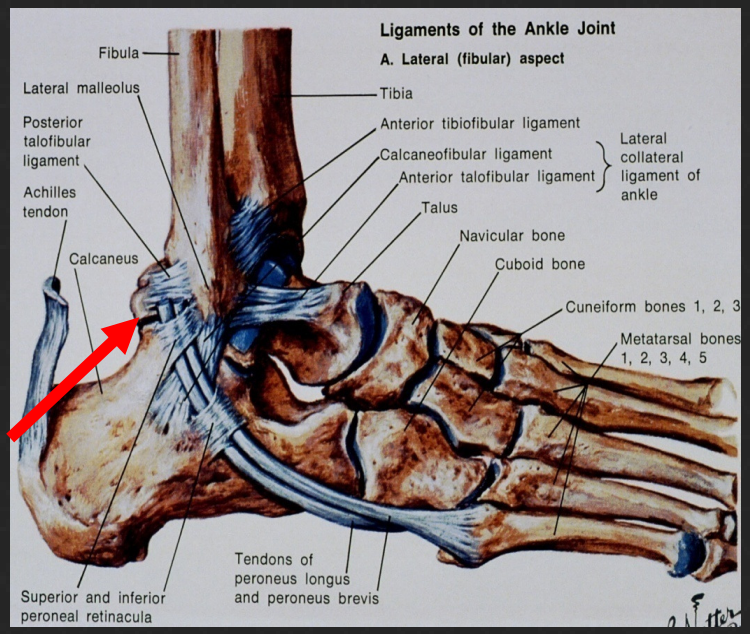
Fig. 246. Bänder des Fußes, ligamenta pedis. Ansicht von der dorsalen Fläche und von der lateralen Seite.

Williams & Warwick, 1980

THE CFL

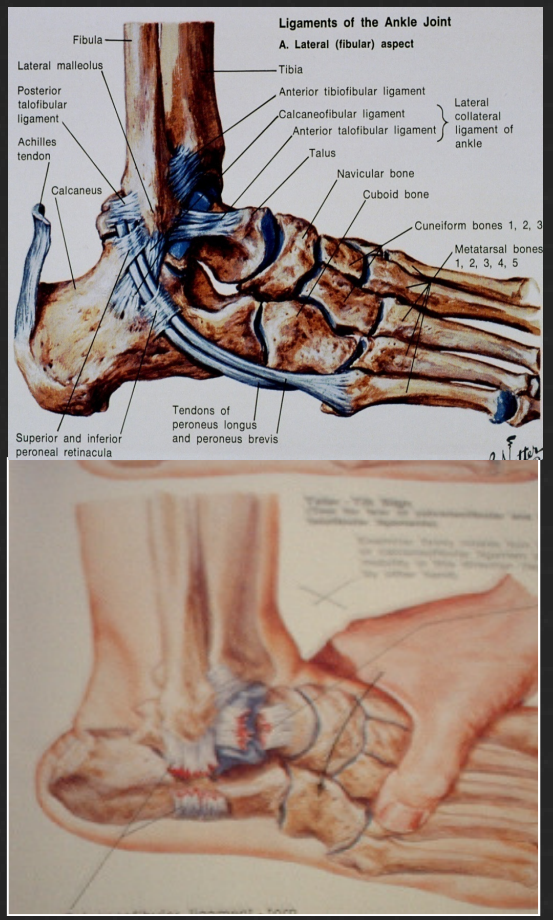
- It is separated from the capsule by fibro-fatty tissue
- Part of the medial wall of the peroneal tendon sheath
- Crosses both the ankle and subtalar joints
- The CFL has the highest linear elastic modulus of the three ligaments

Siegler et al., 1988



THE CFL

- When the ankle is in the neutral or dorsiflexion, the CFL is perpendicular to the long axis of the talus
- Dorsiflexion and inversion result in an increased strain
- Talar tilt tests the CFL



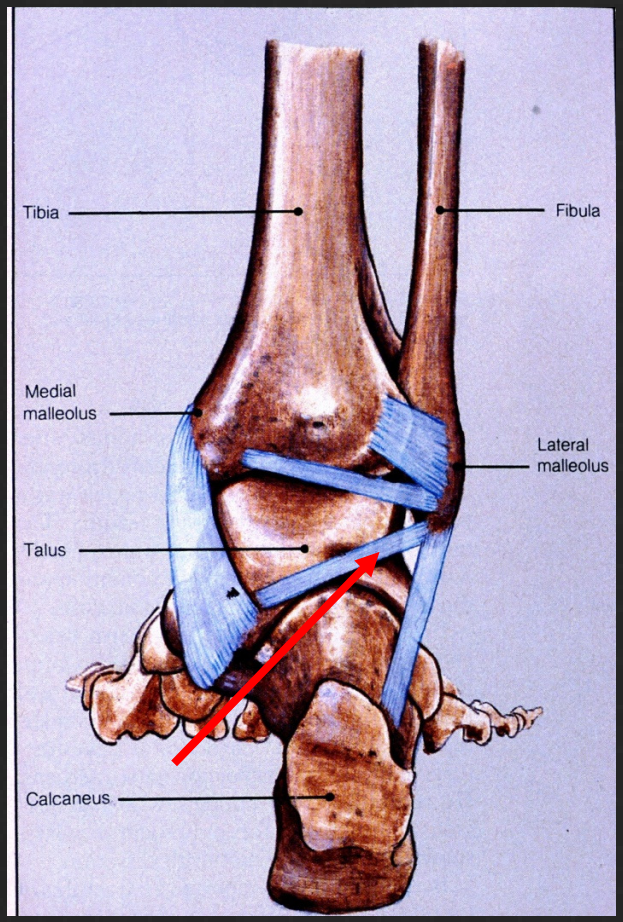
ATFL AND CFL

- A difference of 10^{o} between the two ankles is significant.
- A talar tilt of more than 10^{o} is a lateral ligament injury in 99% of cases
- The AFTL is injured in 65% and combined injuries of the AFTL and CFL occur in 20%
- The CFL is a major stabiliser of the subtalar joint

Liu & Jason, 1994

THE POSTERIOR TALAR FIBULAR (PTL)

- The PTL is the strongest part of the lateral ligament
- It runs almost horizontally from malleolar fossa to lateral tubercle of talus

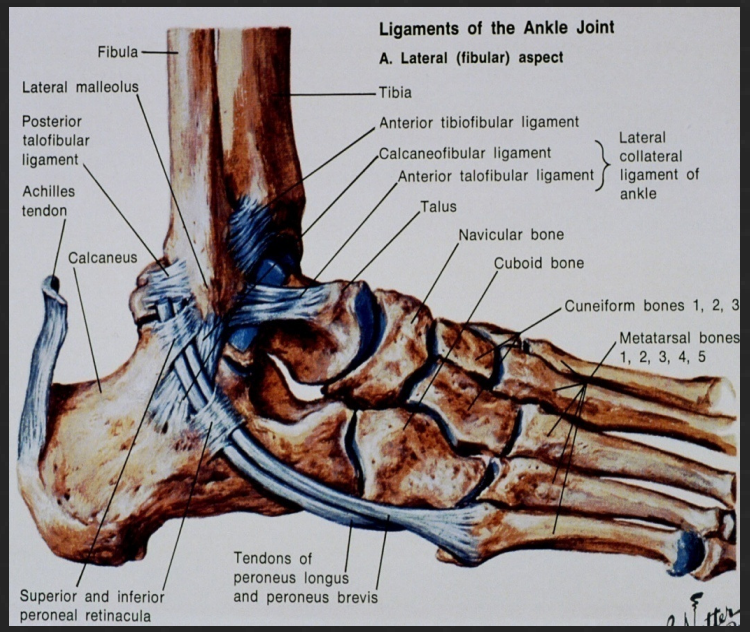


THE ANKLE JOINT

- In 7% of normal population the lateral tubercle has a separate ossification and is called an os trigonum
- It occurs in 32% of soccer players
- Tarsal coalition is another congenital abnormality

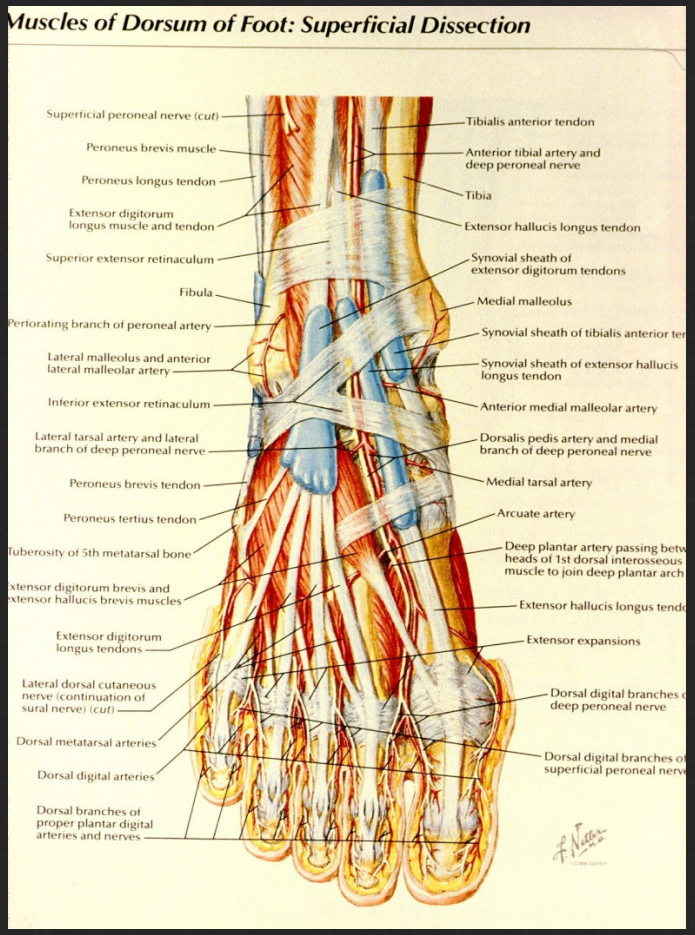
ANKLE STABILITY

- The ankle is most stable in dorsiflexion, with increasing plantar flexion there is more anterior talar translation (drawer) and talar inversion (tilt)
- The ATFL is the main talar stabiliser and the CFL acts as a secondary restraint



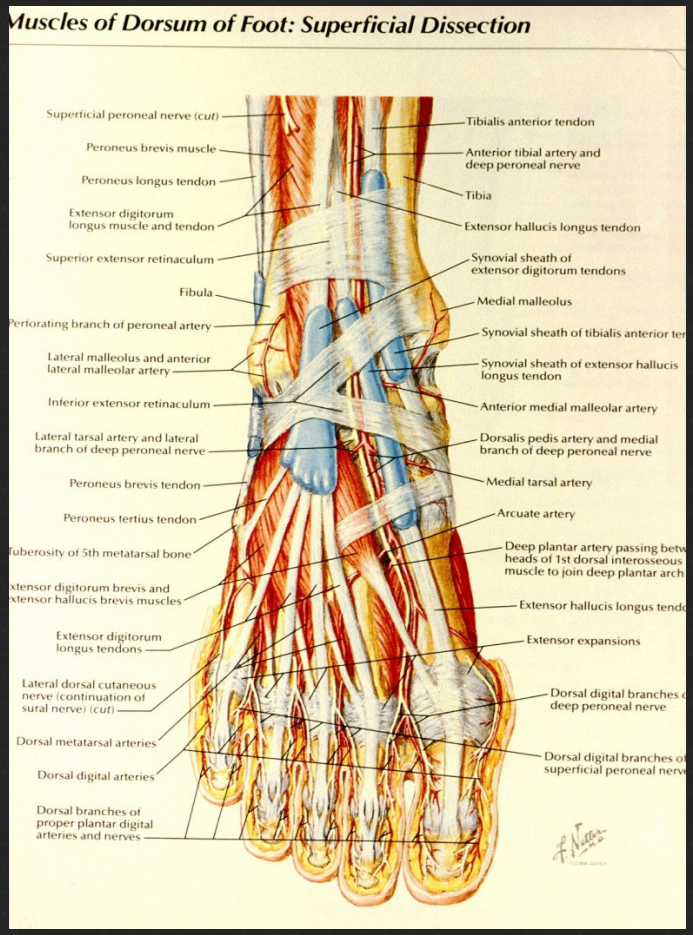
BLOOD SUPPLY OF THE ANKLE

- Malleolar branches of the anterior tibial
- Perforating peroneal and posterior tibial arteries



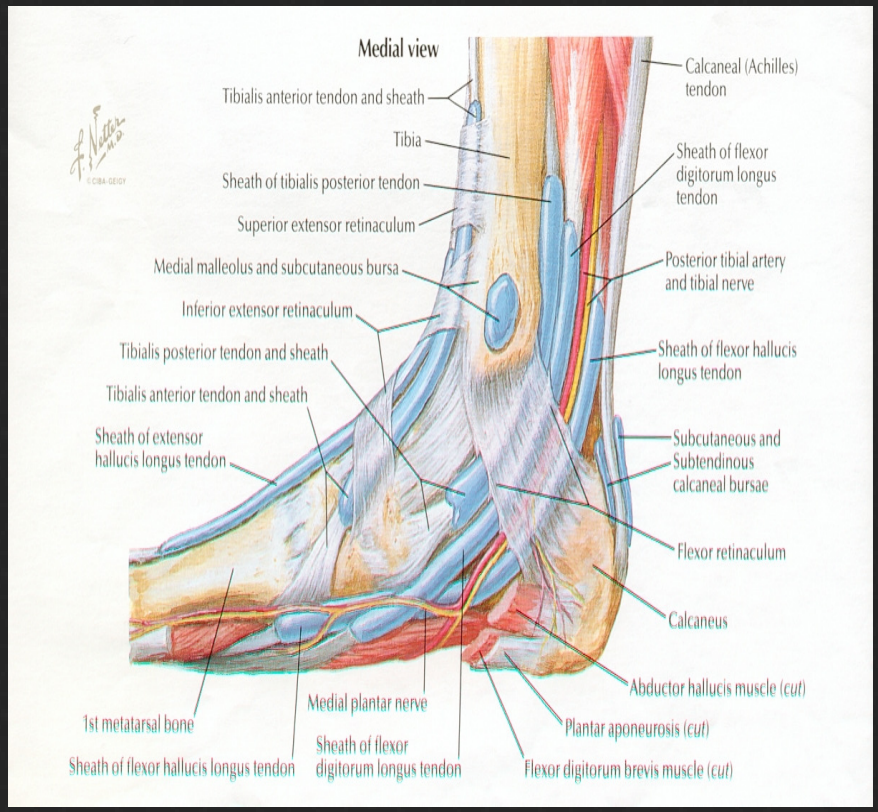
NERVE SUPPLY OF THE ANKLE

- Nerve supply is via articular branches of the deep peroneal
- Tibial nerve from L4 - S2



POSTERO-MEDIAL ASPECT OF THE ANKLE

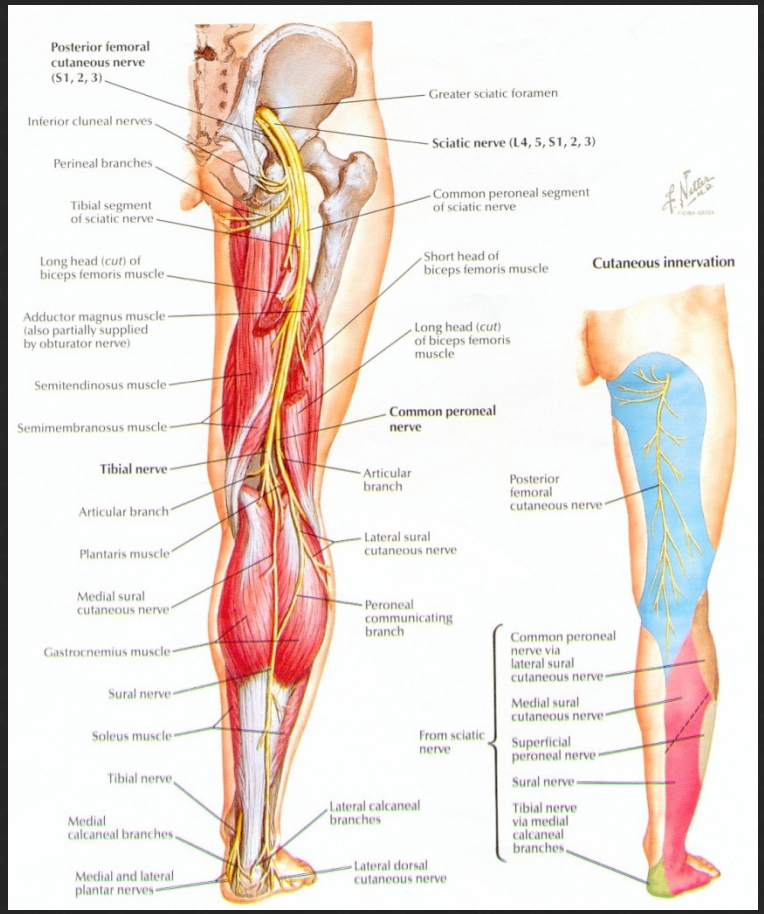
- Tibialis posterior
- Flexor digitorum longus
- Posterior tibial vessels
- Posterior tibial nerve
- Flexor hallucis longus



POSTERIOR ASPECT

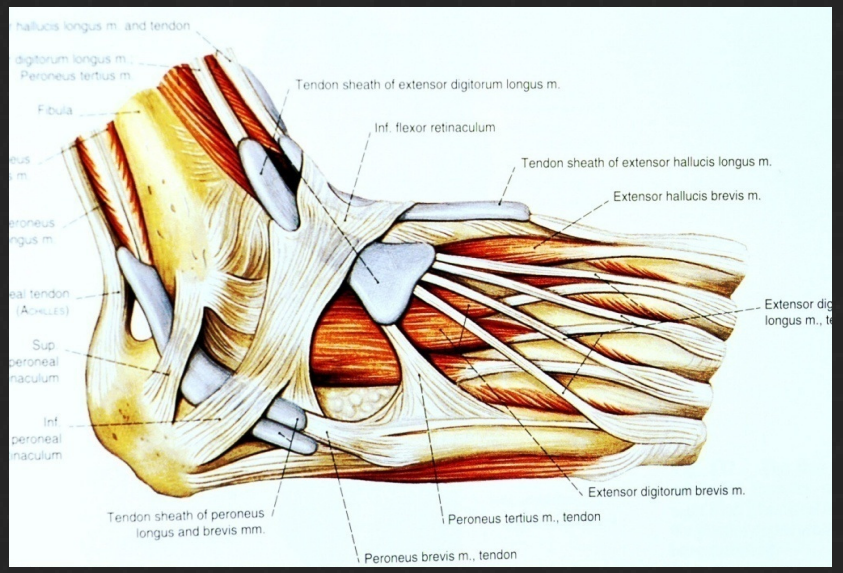
- Achilles tendon separated by a bursa and pad of fat

Jaivin & Ferkel, 1994



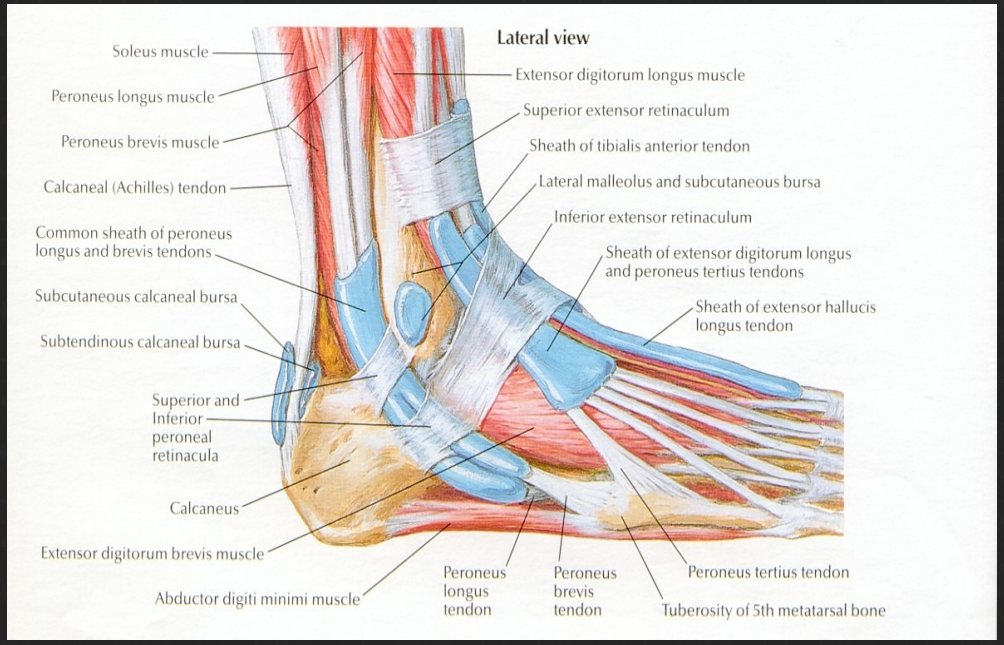
LATERAL ASPECT OF THE ANKLE

- The inferior extensor retinaculum
- Extensor digitorum brevis
- Peroneus longus and brevis
- Peroneal retinaculum
- Ligament of the neck of talus
- Bifurcate ligament
- Sural nerve
- Short saphenous vein

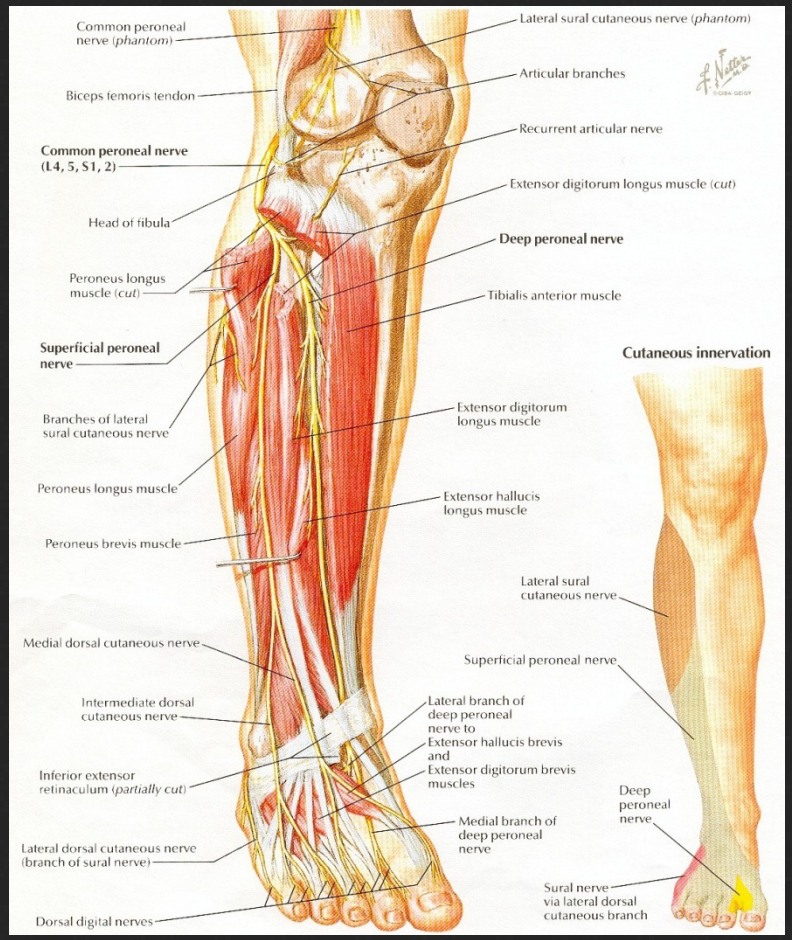


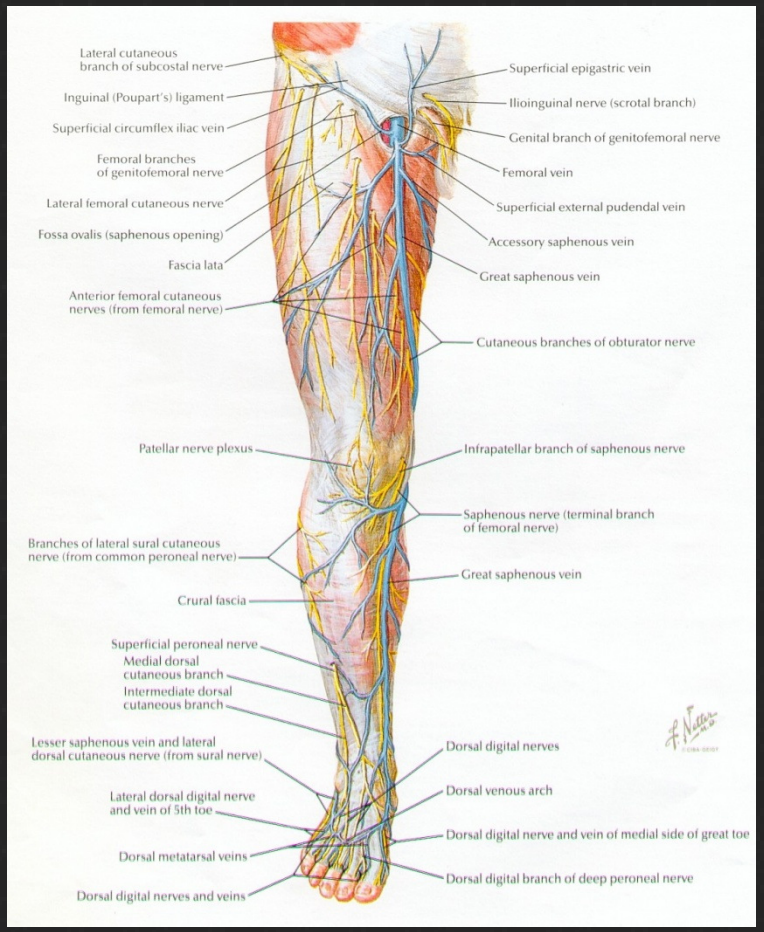
LATERAL ASPECT OF THE ANKLE

- Plantar flexion and eversion
  - Peroneus longus
  - Peroneus brevis
- Dorsi-flexion and eversion
  - Peroneus tertius

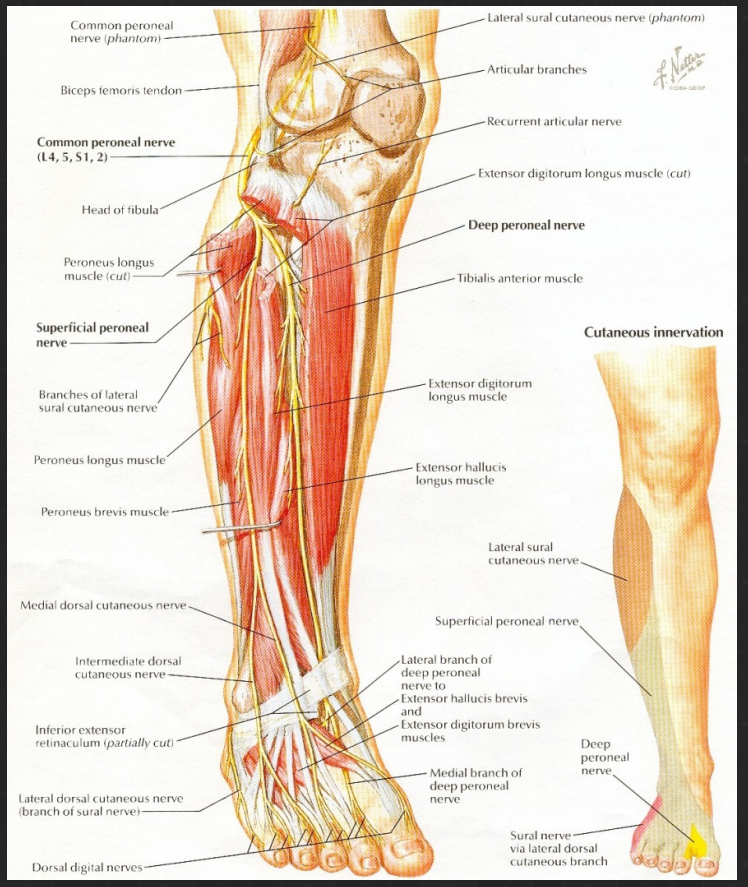


NERVES RELATED TO ANKLE JOINT



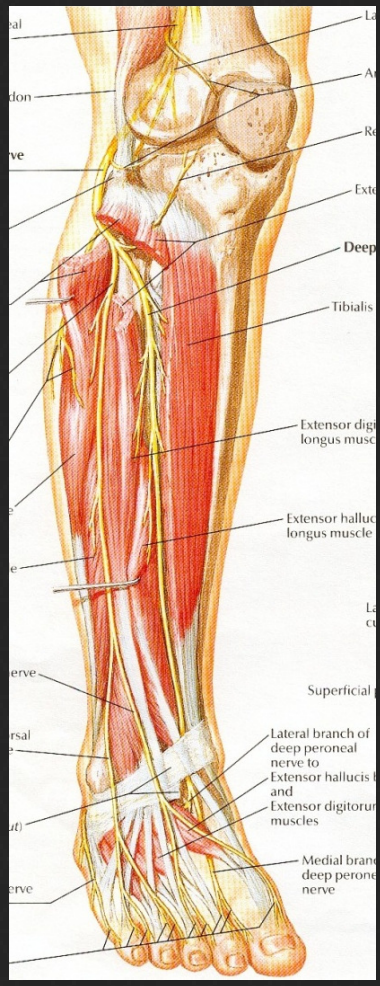


TIBIALIS POSTERIOR SUPERFICIAL PERONEAL NERVE



DORSIFLEXION

- Dorsiflexion is produced by the tibialis anterior
- Extensor hallucis longus
- Extensor digitorum longus
- The peroneus tertius
- Deep peroneal nerve

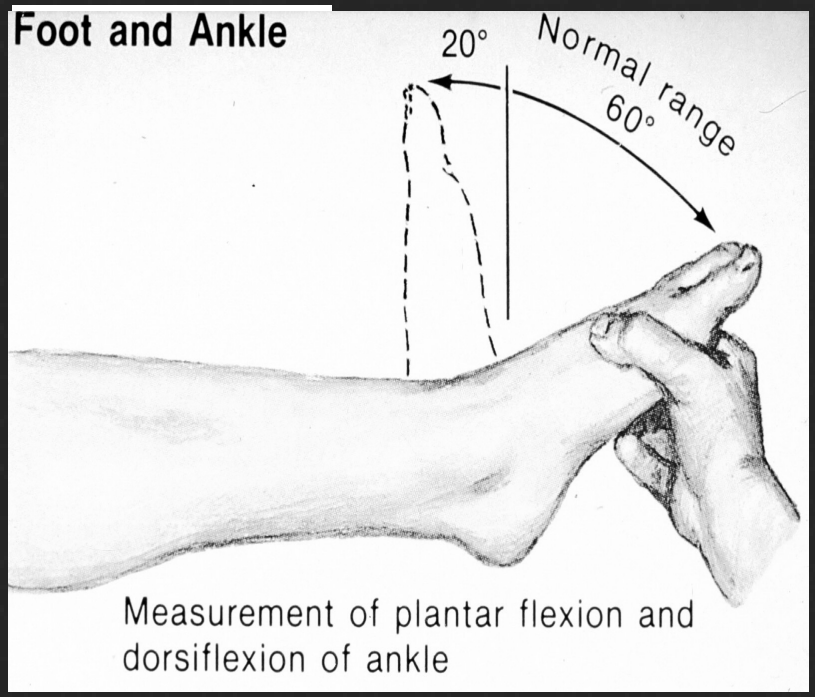


PLANTAR FLEXION

- During plantar flexion
- The dorsal capsule
- The anterior fibres of the deltoid
- The anterior talofibular ligaments are under maximum tension
- Plantar flexion is caused mainly by the action of the achilles tendon
- Assisted by the tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
- Peroneus longus and brevis

THE ANKLE JOINT

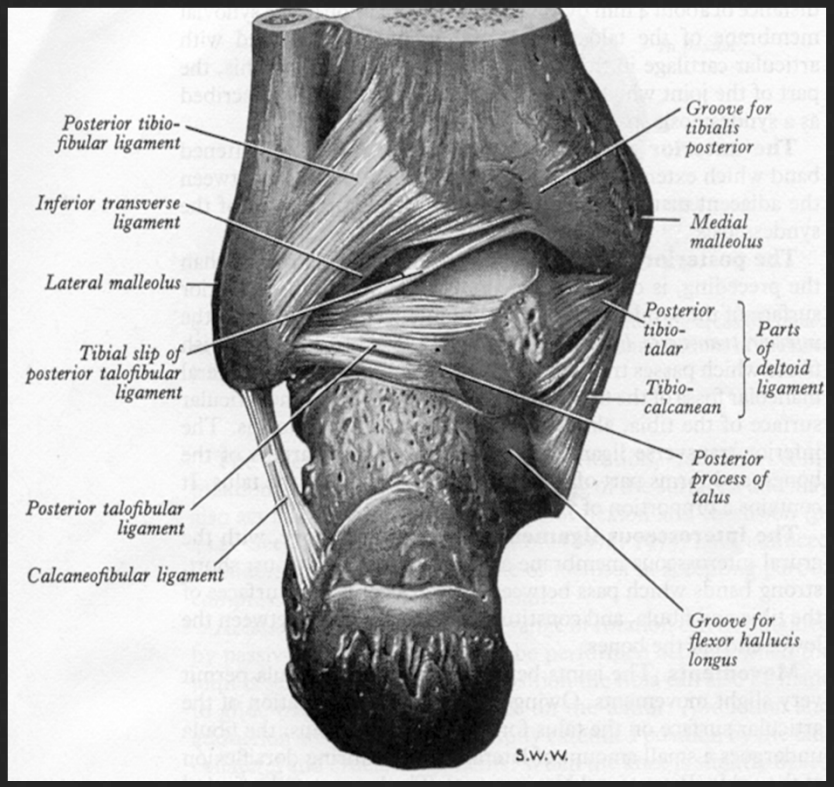
- The ankle is most stable in dorsiflexion, with increasing plantar flexion there is more anterior talar translation (drawer) and talar inversion (tilt)



Measurement of plantar flexion and dorsiflexion of ankle

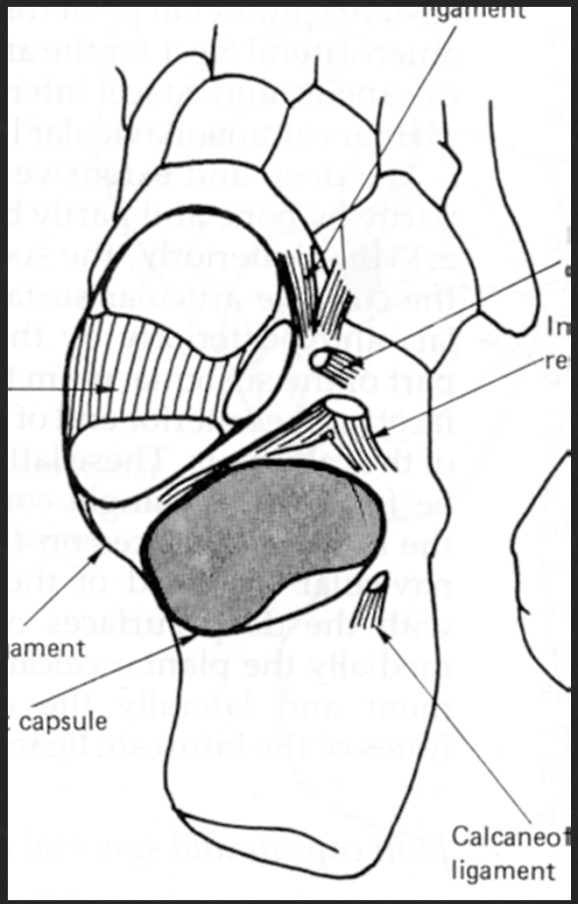
EXAMINATION OF ANKLE

- ATFL
- CFL
- Distal tibiofibular
- Syndesmosis
- Deltoid ligament
- Lateral malleolus
- Medial malleolus
- Base 5th metatarsal



EXAMINATION OF ANKLE

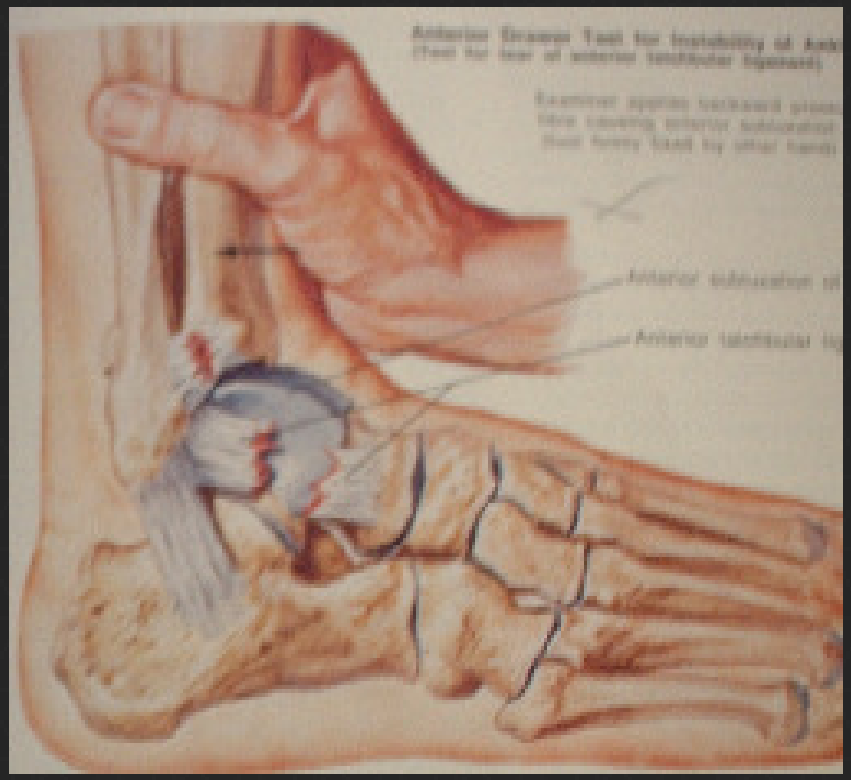
- Achilles tendon
- Peroneal tendons
- Posterior tibial tendon
- Anterior process of calcaneus
- Talar dome
- Sinus tarsi
- Bifurcate ligament

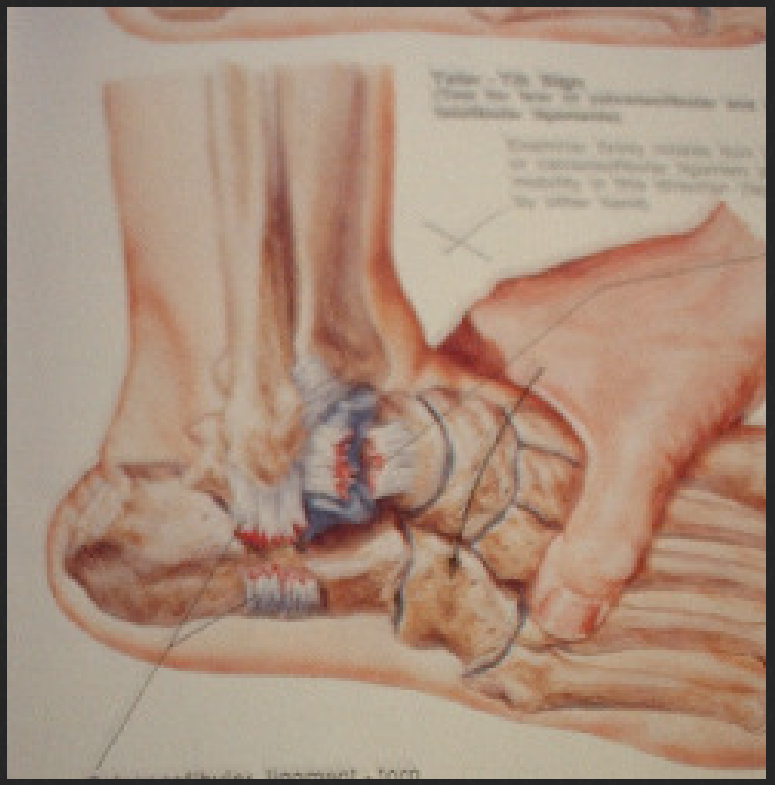


ANKLE EXAMINATION

- Anterior drawer
- Talar tilt
- External rotation test
- Thompson test
- Compression test

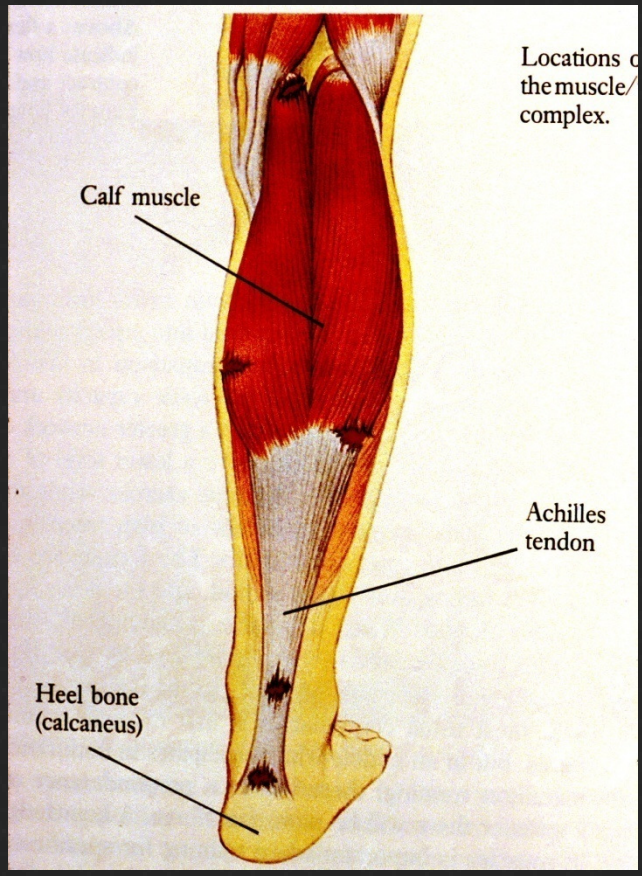
TESTS FOR ANKLE LIGAMENT INJURY





OTTAWA ANKLE RULES

- Anteroposterior
- Oblique
- Lateral views
  - Bone tenderness
  - Medial or lateral malleolus
- Unable to weight bear
- Four steps post injury



A FEW STATISTICS

- Basketball 5.5 ankle injuries/1000 player hours
- Netball 3.3 ankle injuries/1000 player hours
- Volleyball 2.6 ankle injuries/1000 player hours
- Soccer 2.0 ankle injuries/1000 player hours

Hopper et al., 1999

BASKETBALL STATISTICS

- 53% of basketball injuries are ankle injuries
- 30.4 ankle injuries/1000 games
- 10.0 ankle injuries/season for a squad of twelve

Garrick, 1977

RISK FACTORS

Extrinsic

- Training error
- Type of sport
- Playing time
- Level of competition
- Equipment
- Environmental

Intrinsic

- Malalignment
- Strength deficit
- Reduced ROM
- Joint instability
- Joint laxity
- Foot type
- Height/weight

RISK FACTORS

- Previous ankle injury — Ekstrand & Gillquist, 1983; Milgrom et al., 1991
- Competition — Ekstrand & Gillquist, 1983
- Muscle Imbalance — Baumhauer et al., 1995
- Mass moment of inertia — Milgrom et al., 1991

ANKLE INJURIES

- Lateral ligament sprain
- Medial ligament sprain
- Peroneal dislocation
- Fractures
- Dislocations

- Tendon rupture
- Tibialis posterior
- Peroneal tendons
- Ruptured syndesmosis
- Superficial peroneal nerve lesion
- Reflex sympathetic dystrophy

ANKLE SPRAINS

- **Grade one**
  Stretch of ATFL; mild swelling; no instability
- **Grade two**
  Partial macroscopic tear; pain; swelling; mild-moderate instability
- **Grade three**
  Complete tear; severe swelling; unable to weight bear; limited function; and instability

PROPRIOCEPTION THEORY

REDUCING INJURY

- Proprioceptive
- Agility and Flexibility training — Ekstrand & Gillquist, 1983
- Taping
  - Loosens in 10 minutes — Garrick, 1977
  - Nil effect in 30 minutes? — Tropp et al., 1985; Rovere et al., 1988; Sitler et al., 1994
- Bracing

Thank You!