MRI Interpretation: Foot and Ankle

Geoff Watson, MD

September 9, 2021 @ 8:30 am

PAOS in the Music City

Welcome!

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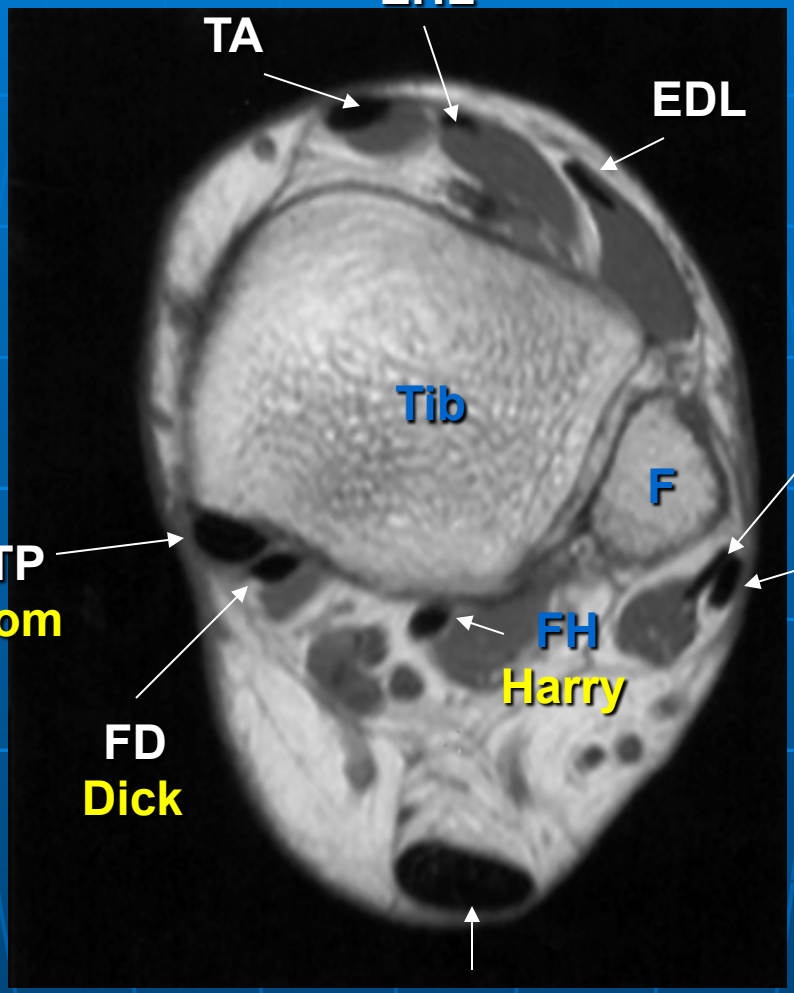
PAOS in the Music City

Outline

- Anatomy
- MRI – Anatomy
- MRI - Pathology

ANTERIOR



MEDIAL

LATERAL

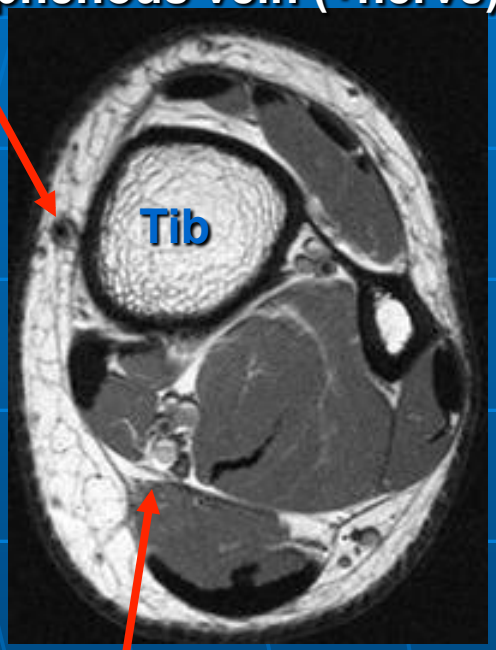
TP 2x size of FD and FH

PB=PL
PB Flat
PL ovoid

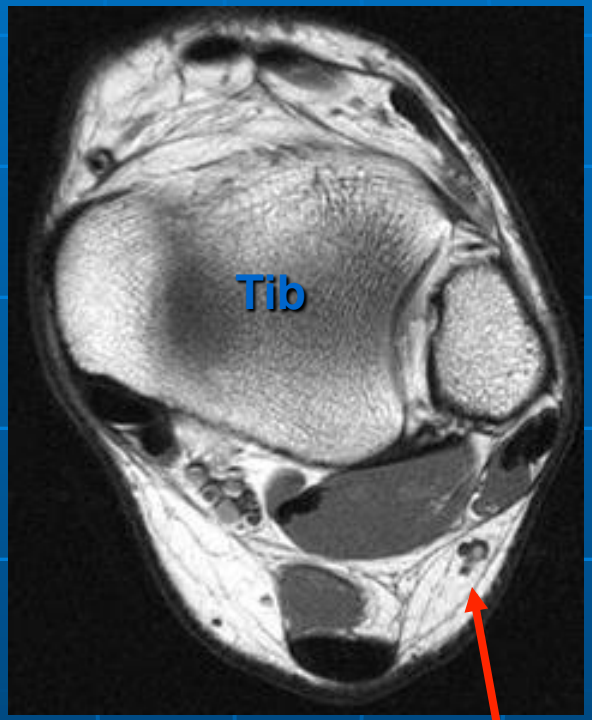
Transaxial, T1-weighted

Axial, T1-Weighted

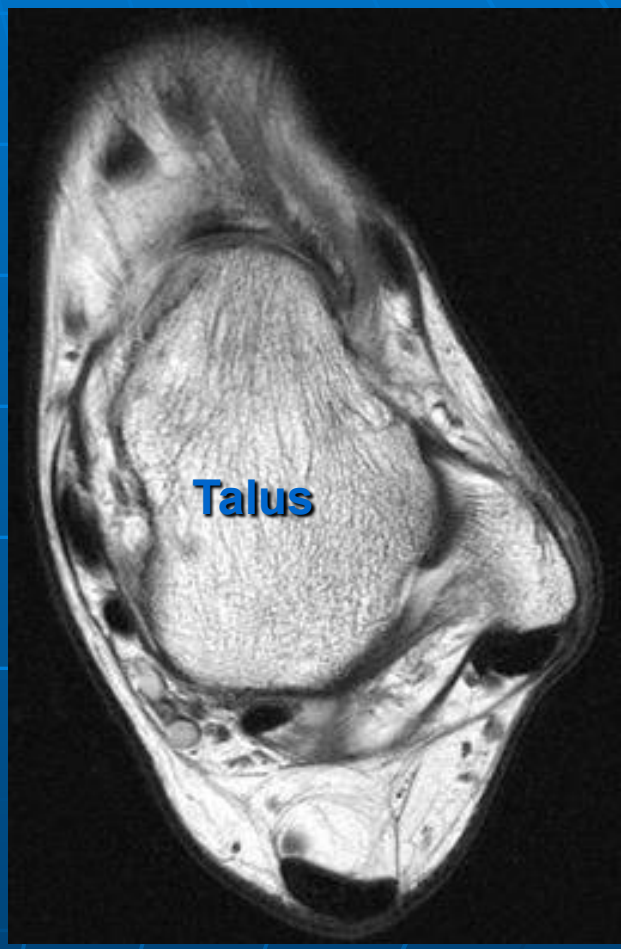
Saphenous vein (+nerve)



PT artery + veins
Tibial Nerve

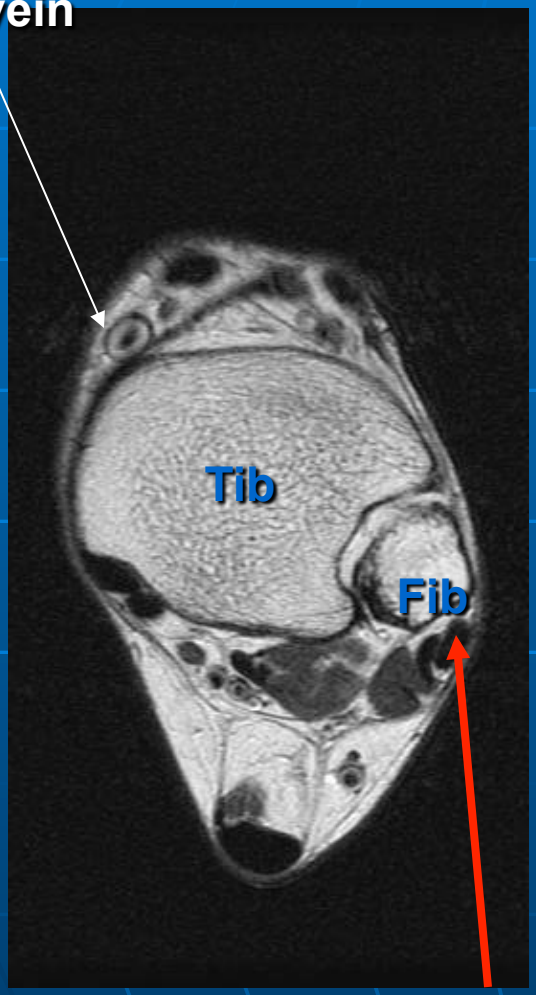


Sural nerve
Small saph v



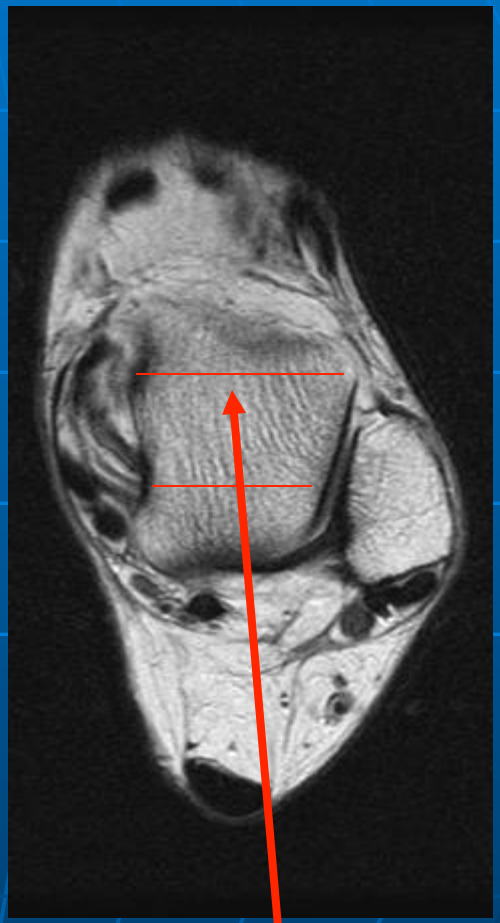
Axial, T1-Weigthed

Saphenous vein



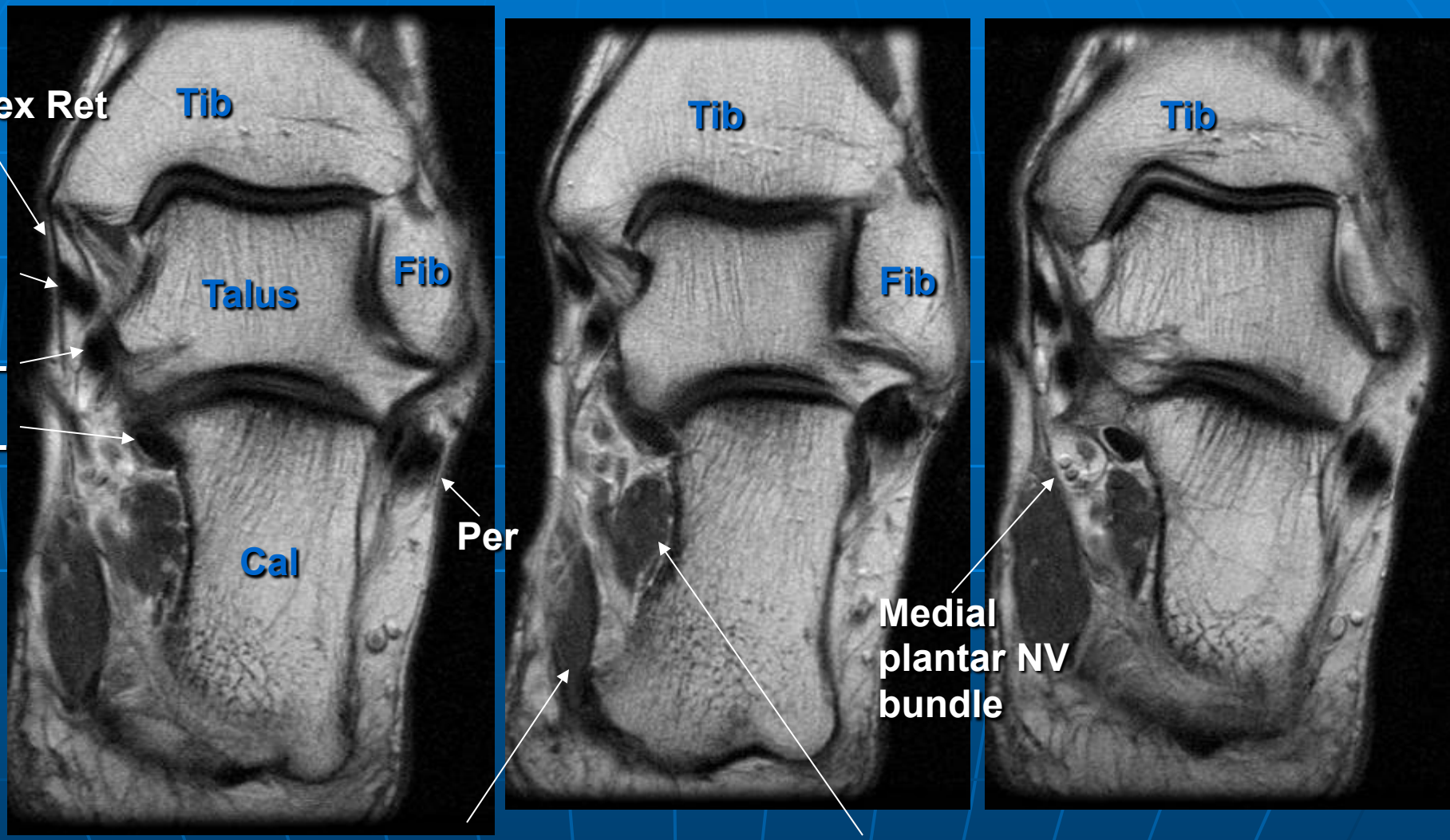
Fibular posterior-lateral to tibia

TA EHL EDL

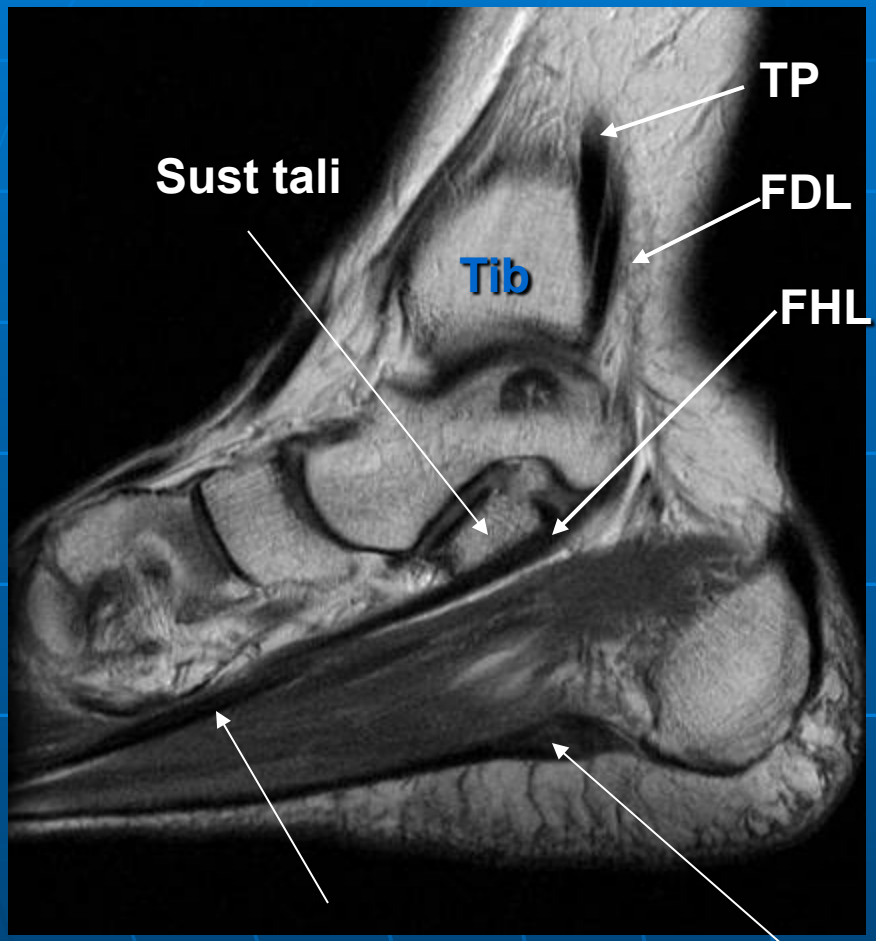


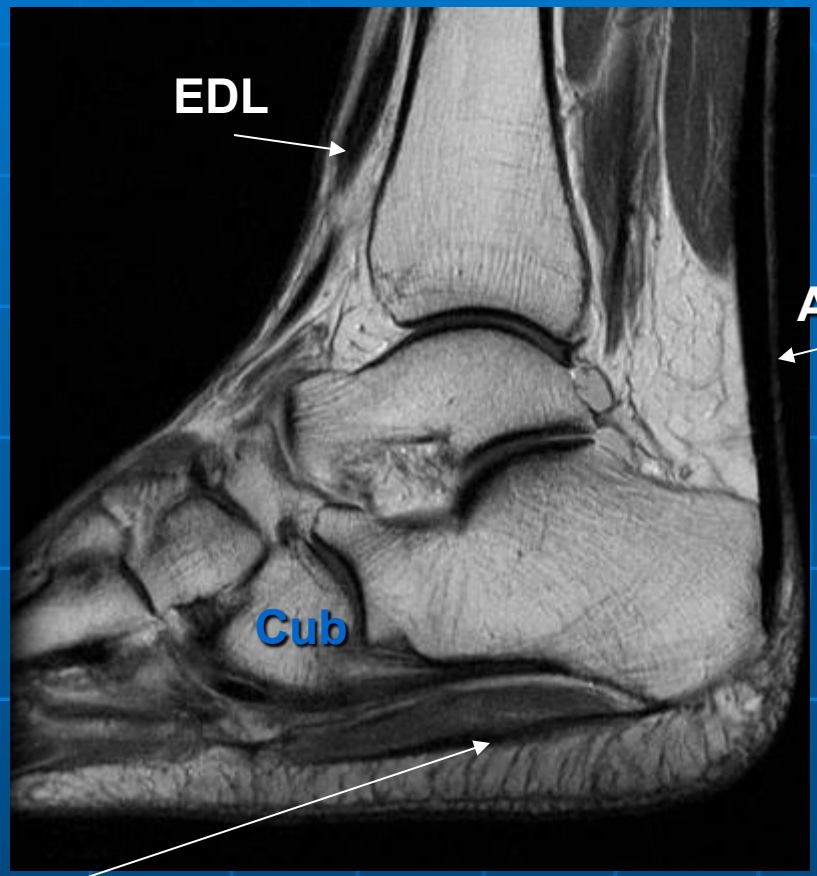
Talus wider anterior

Coronal, T1-Weigthed



Sagittal, T1-Weigthed





Plantar aponeurosis

MRI Pathology

Tenosynovitis

- Tendon: homogenous low signal

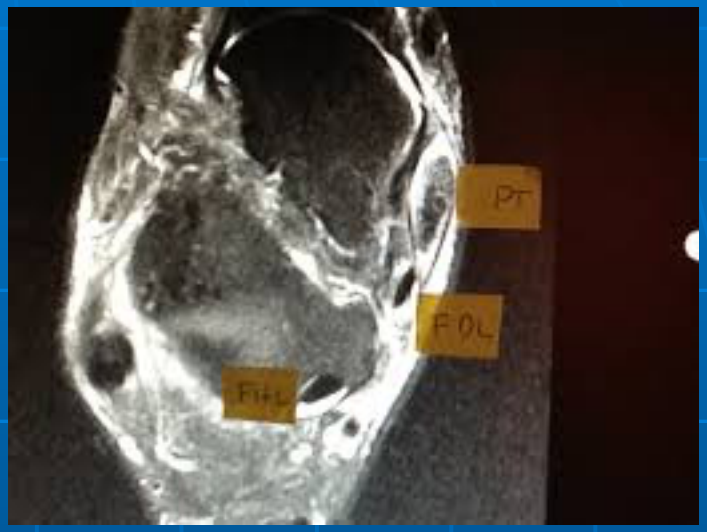
- Tenosynovitis: high-signal fluid around normal appearing tendon

vs.

- Tendinopathy – Intrasubstance degeneration

Tenosynovitis FH
Transaxial T1

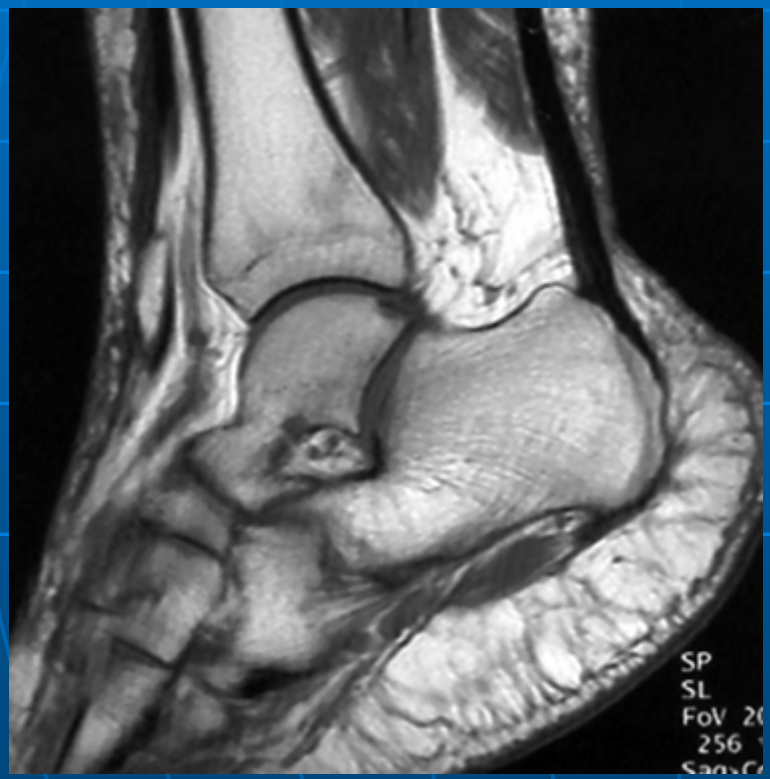
Posterior Tibial Tendon Dysnfunction



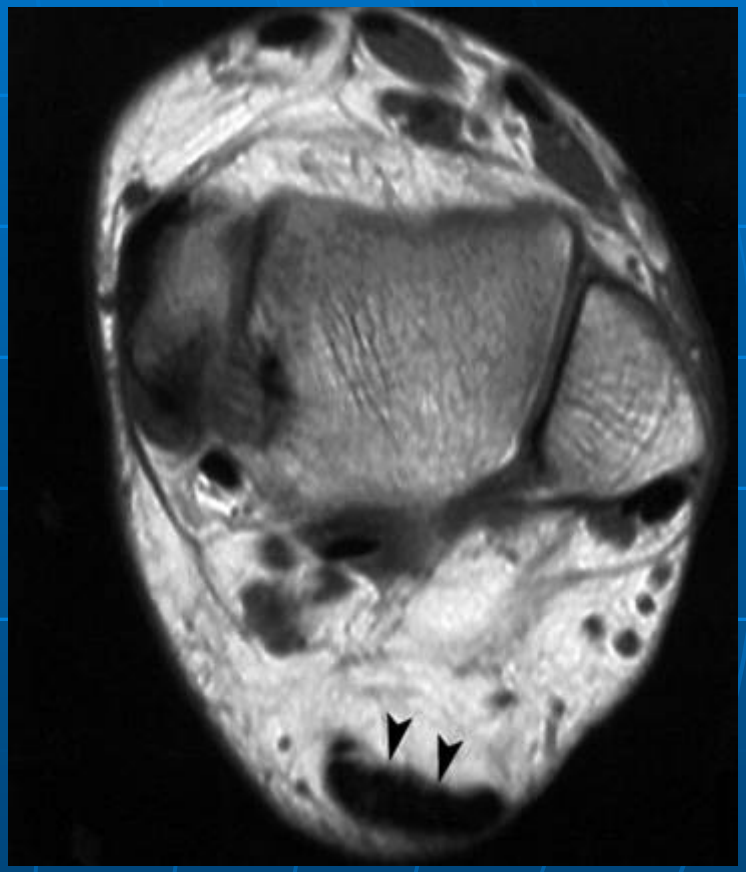
- Tenosynovitis: high-signal fluid around normal appearing tendon (halo)

- Tendinopathy – Intrasubstance degeneration – white within the tendon

Normal Achilles

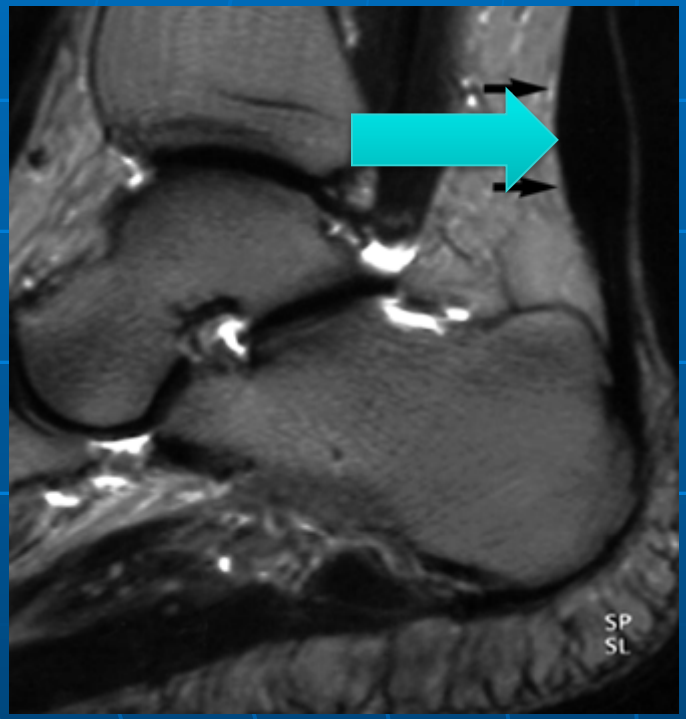


Sagittal T1

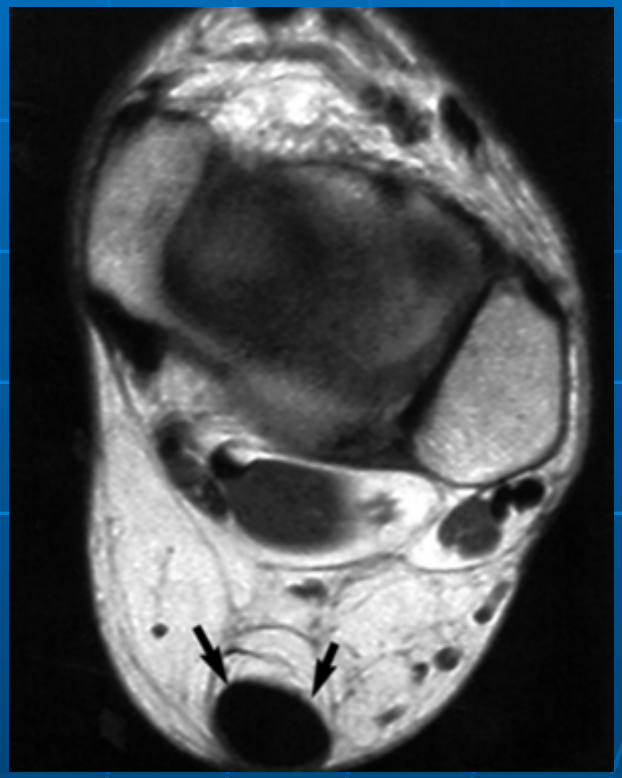


Transaxial T1

Chronic tendinopathy Achilles

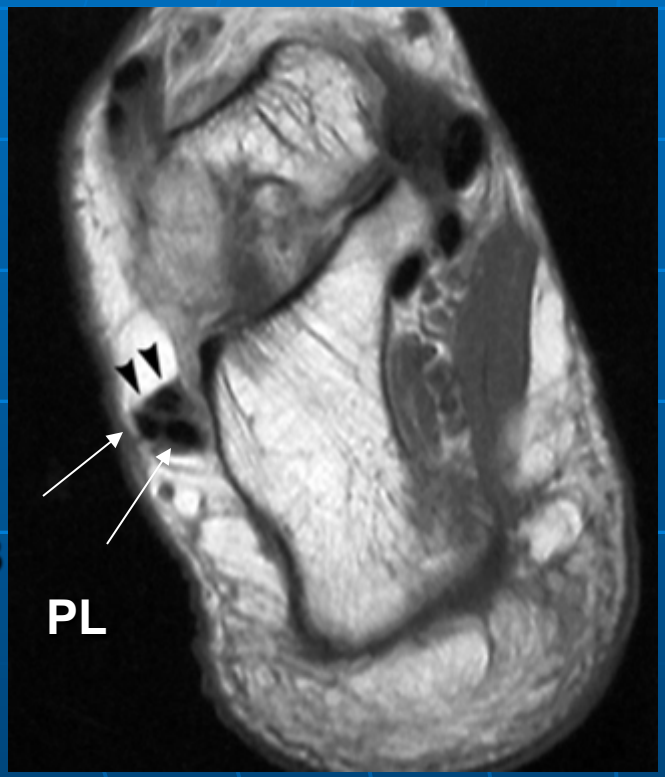


Sagittal T2



Transaxial T1

Peroneal Tendon Bisection



Transaxial T1

- Peroneal tendons share common synovial sheath up to level of calcenocuboid joint
- At lateral malleolus, PB anterior to PL
- Longitudinal splits of PB:
  Repeat subluxation and compression against fibular groove
- Look for osseous ridge at lateral fibular groove, flat fibular groove, low-lying muscle belly peroneus brevis.

Peroneal Subluxation

Transaxial T1

Coronal T1

Plantar Fascia

Normal Plantar Fascia

Plantar Fasciitis
Thickened Plantar Fascia
Bone Marrow Edema of Calc

Ankle Ligaments

- **Lateral complex**
  - -Anterior talofibular
  - -Posterior talofibular
  - -Calcaneofibular (crosses 2 joints)
- **Deltoid complex (medial)**
- **Syndesmotic complex**
  - -IO membrane
  - -Anterior tibiofibular
  - -Posterior tibiofibular
  - -Transverse tibiofibular

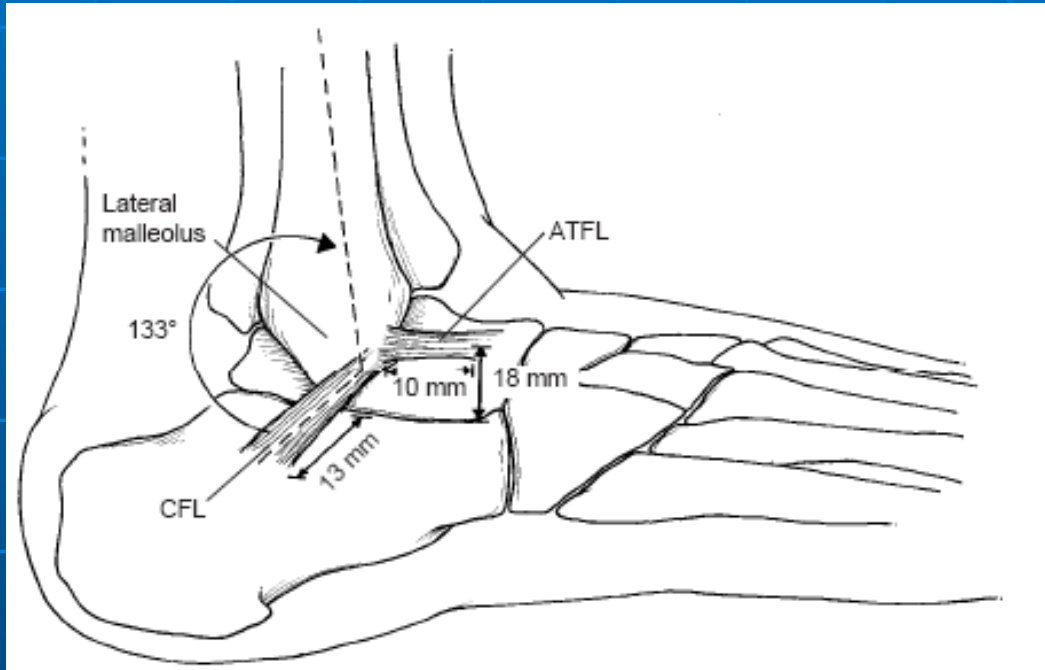


Fig. 1 The critical anatomy of the lateral ankle ligaments.

Angle btw ATFL & CFL ~130 degrees

Ankle Ligaments

- **Ligaments on MR:**
  - **Thin**
  - **Low signal intensity**
  - **Some with striated appearance (deltoid, posterior talofibular, tibiofibular ligaments)**

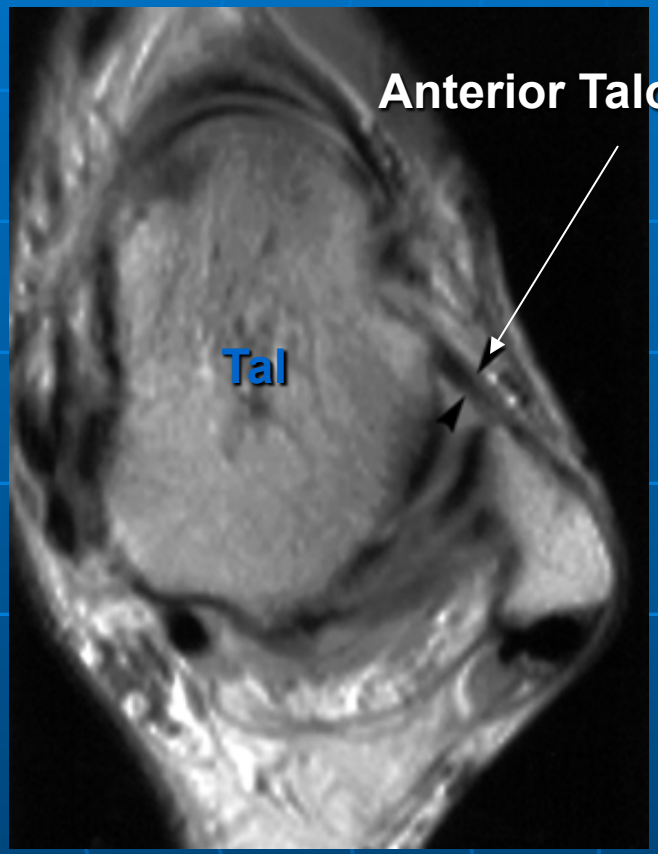
- ***Transaxial***
  - ***talofibular, anterior transverse, posterior tibiofibular***

- ***Coronal***
  - ***Most components deltoid***

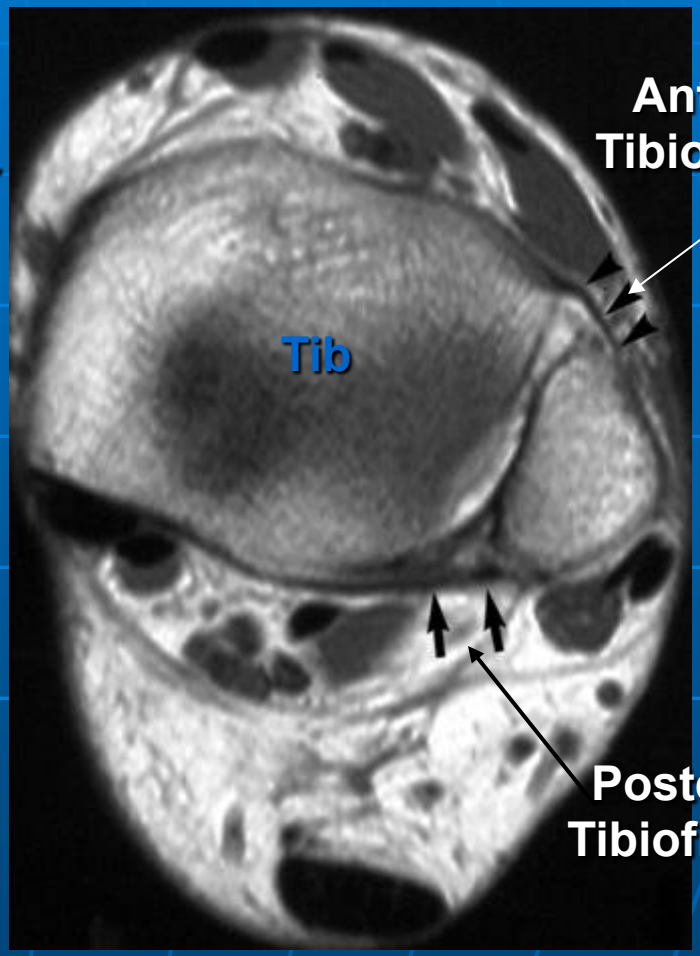
Differentiation Between Syndesmotic and Talofibular Ligaments

1. Identify insertion of ligaments
2. Identify shape of talus and fibula in transaxial plane
    - Tibiofibular ligaments: tibia rectangular, flat medial border of fibula
    - Talofibular ligaments: talus elliptical, deep indentation along medial border of fibula

Ankle Ligaments

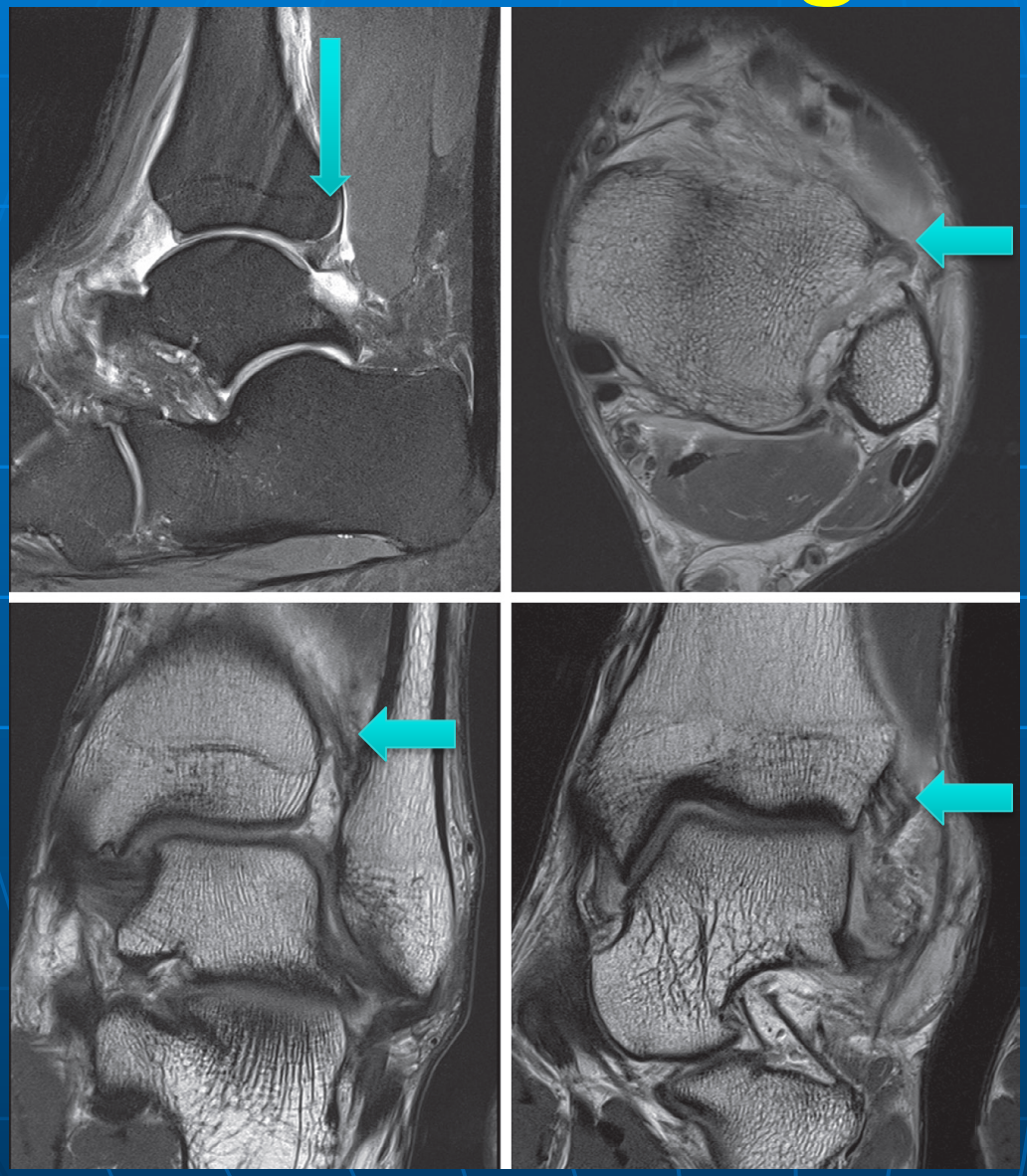


Transaxial T1



Transaxial T1

Ankle Ligaments



Syndesmosis:
Made up of:
AITFL
IO membrane
PITFL

Top Left:
PITFL peeled off posterior tibia

Top Right:
AITFL torn off fibula

Bottom Left:
IO tear

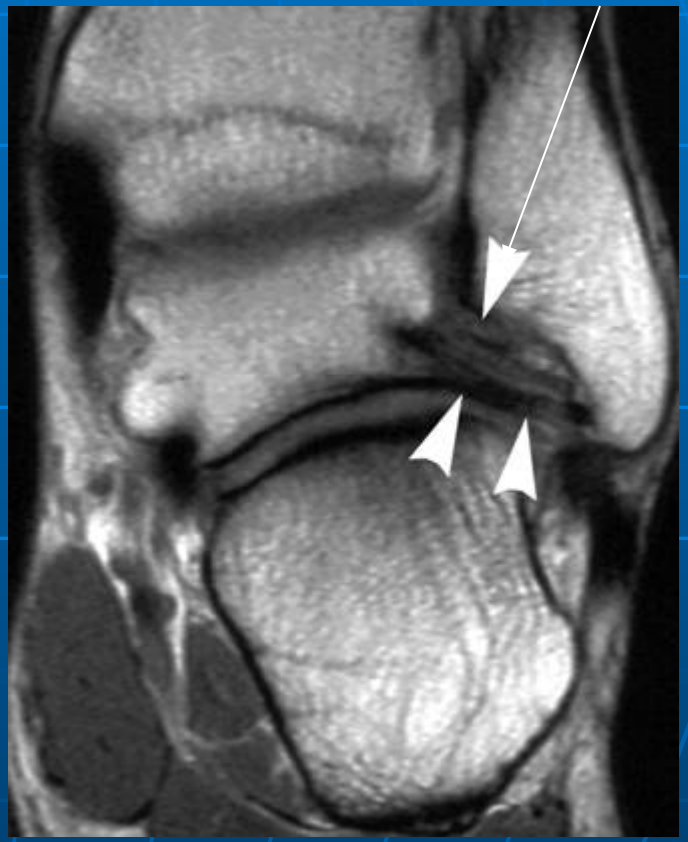
Bottom Right:
High great partial tear

Ankle Ligaments

Deltoid
Tibiotalar component

Coronal T1

Posterior talofibular



Coronal T1

Deep Deltoid

Anterior + posterior colliculi with groove
Non-articular medial talus
Stabilizes talus

Superficial Deltoid

Anterior/inferior medial mal
Navicular, calcaneonavicular (spring), sustentaculum, medial tubercle
Resists Hindfoot Eversion

Coronal T1

Deep

Superficial

Coronal T1

Spring Ligaments

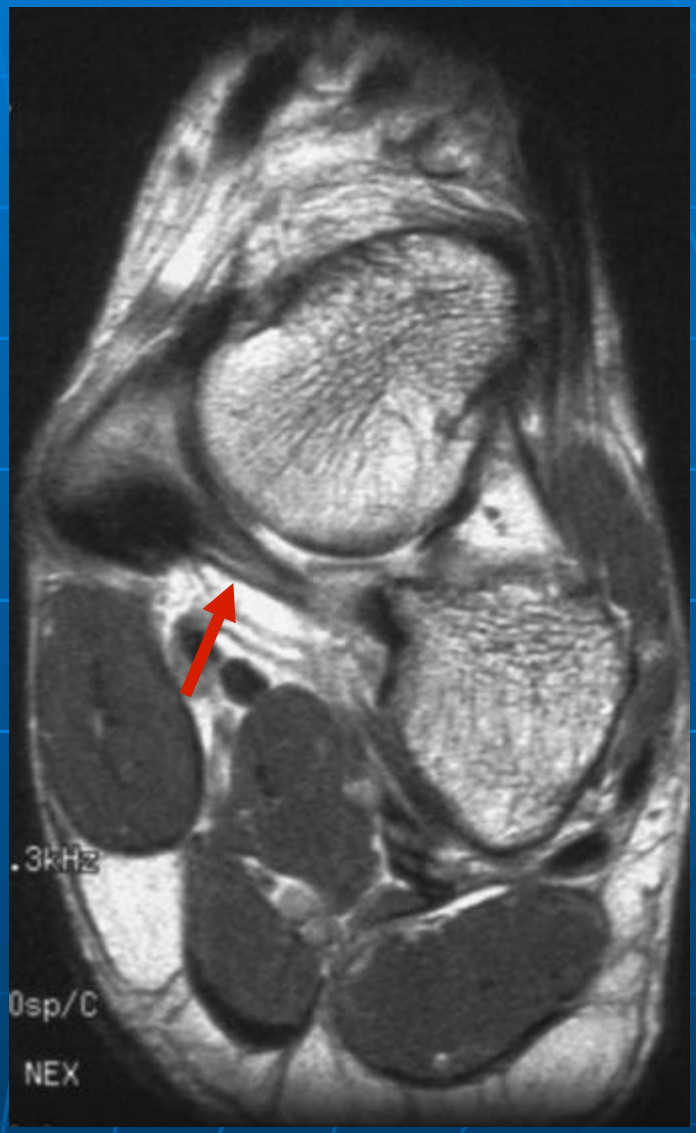
Plantar calcaneonavicular ligament

Inferomedial (axial)

Superomedial components (oblique coronal)

Supports head of talus: importance in acquired flatfoot

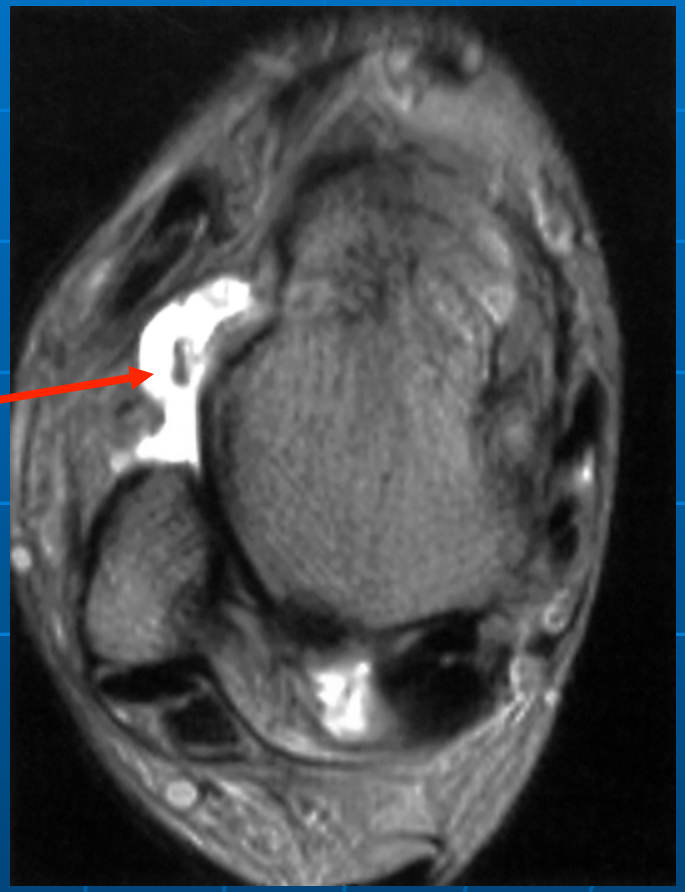
Failed Spring Ligament = Flat Foot



Axial T1

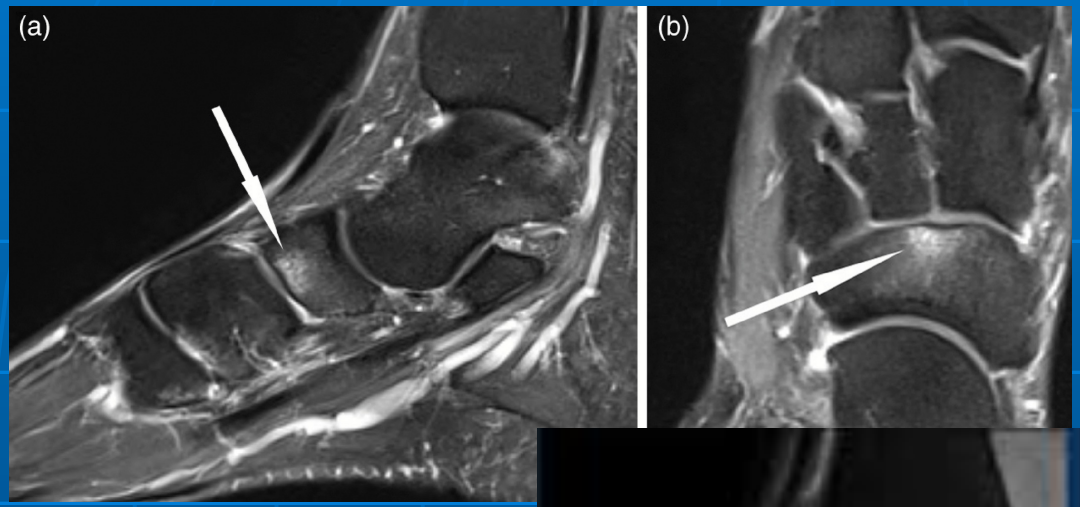
Chronic Ligament Tear: Ankle

Absent Talofibular Ligament
Surrounding fluid



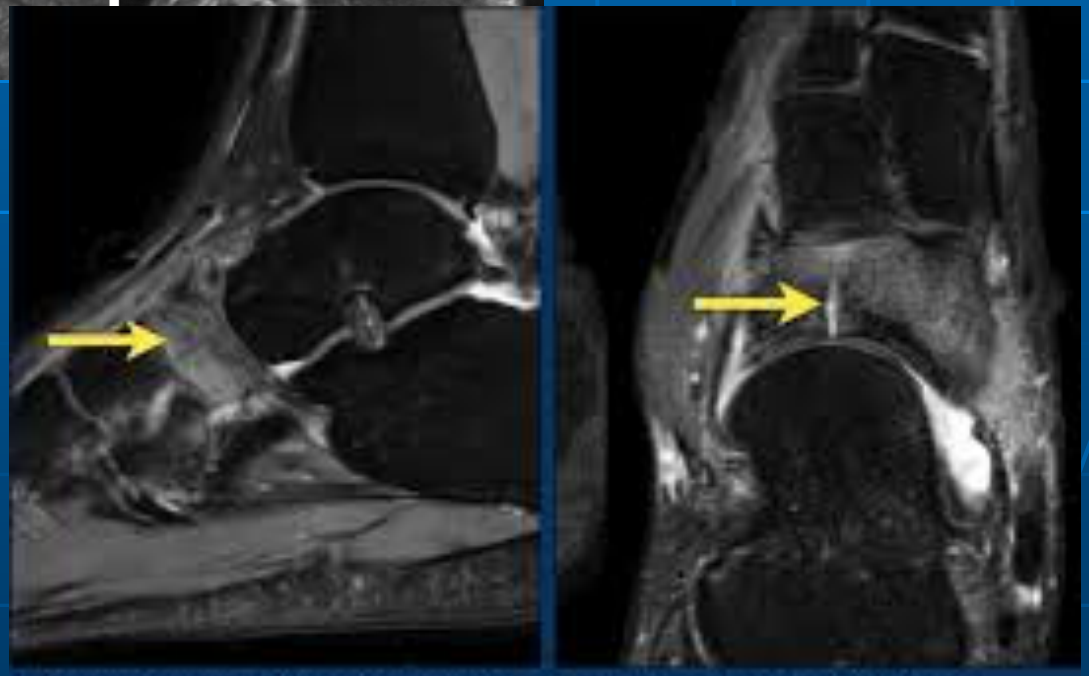
Transaxial T2

Stress Reaction vs Fracture



Stress Reaction:
Edema without fracture line

Stress Fracture:
Edema with fracture line



Bone marrow edema in navicular bone due to stress fracture.

Posterior Ankle Impingement

Posterior Process Fracture of the talus
-very similar to os trigonum

Bone marrow on both sides of new fracture line

Fluid Surronding the bone

Conclusions

- Pay attention to fluid around tendons (halo)
- Evaluate bone marrow edema (light color in the bone on T2)
- Look to see structures are in normal location

Thank you early risers!