

MRI OF THE ANKLE



William B. Morrison, M.D.

Thomas Jefferson University Hospital, Philadelphia, PA

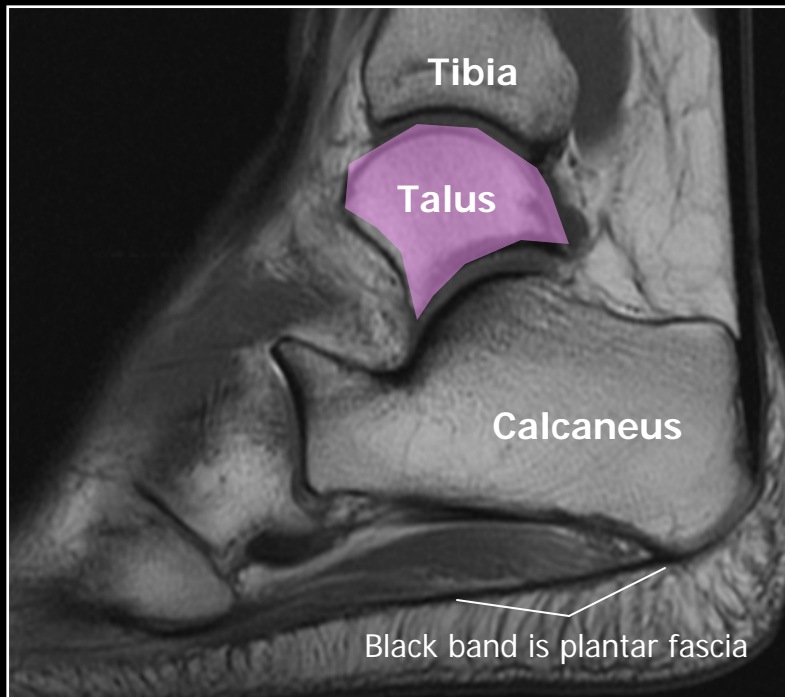


Ankle-Routine

Seq.	FOV	Matrix/ Nex	Slice	TR	TE	TI	Flip	ETL	BW
Sag T1 SE Non FatSat	16-18	256 x 192 1	3/1	400-800	Minimal				16
Sag STIR	16-18	256 x 192 3	3/1	>1500	40	150	90	8	16
Axial PD FSE Non FatSat	14-16	513 x 256 2	4/1	3000	40			8	16
Axial T2 FSE FatSat	14-16	256 x 256 2	4/1	>2000	70-80			8	16
Coronal T2 FSE FatSat	14	256 x 256 3	3/1	>2000	70-80			8	16

Ankle-Axial Imaging Plane

Relevant Anatomy



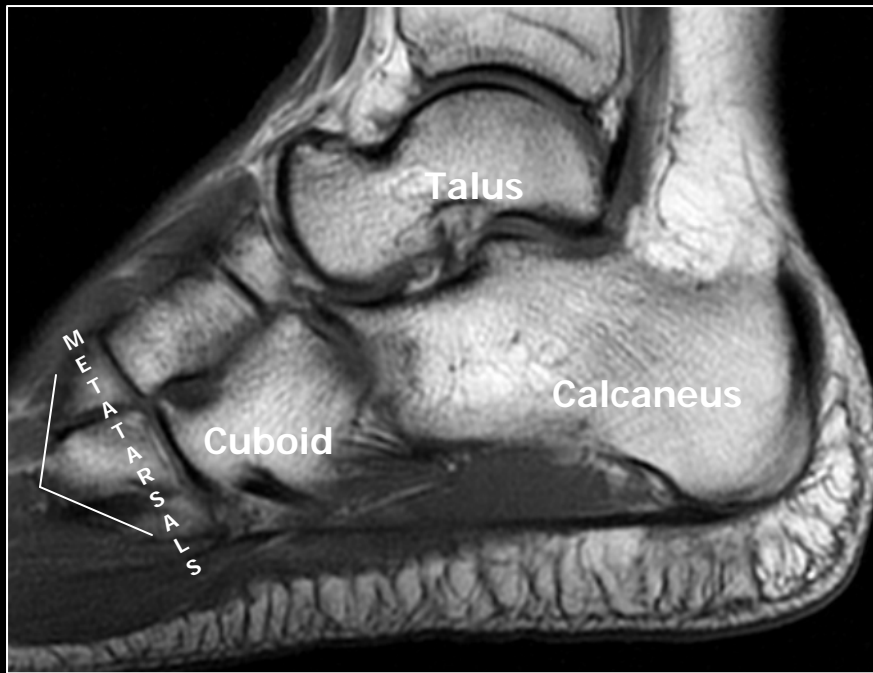
Axial Imaging Plane

Prescribe plane parallel to axis of calcaneus.
Scan ankle from distal tibia through subcutaneous soft tissues (include plantar fascia).



Ankle-Coronal Imaging Plane

Relevant Anatomy



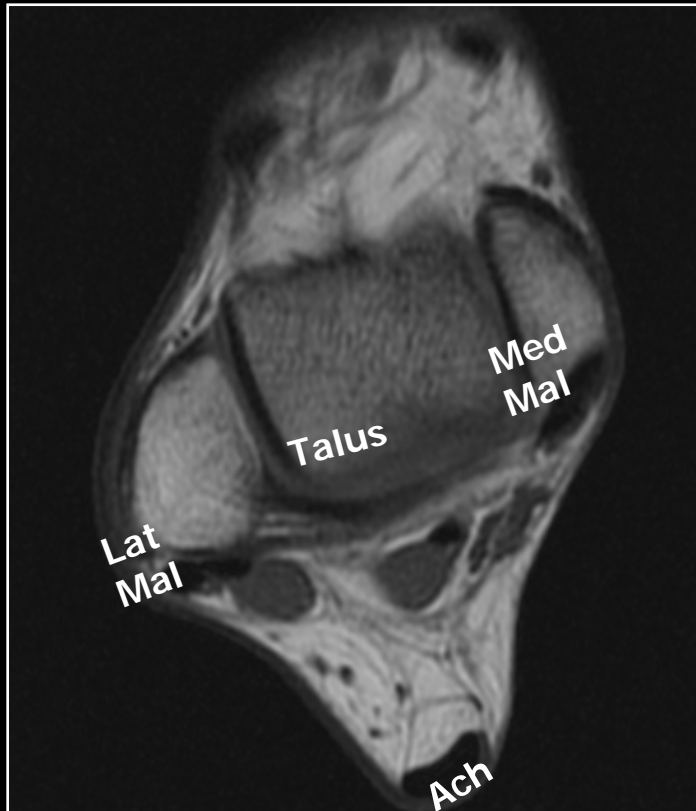
Coronal Imaging Plane

Prescribe plane perpendicular to axial imaging plane. Scan ankle from calcaneus through metatarsal bases.



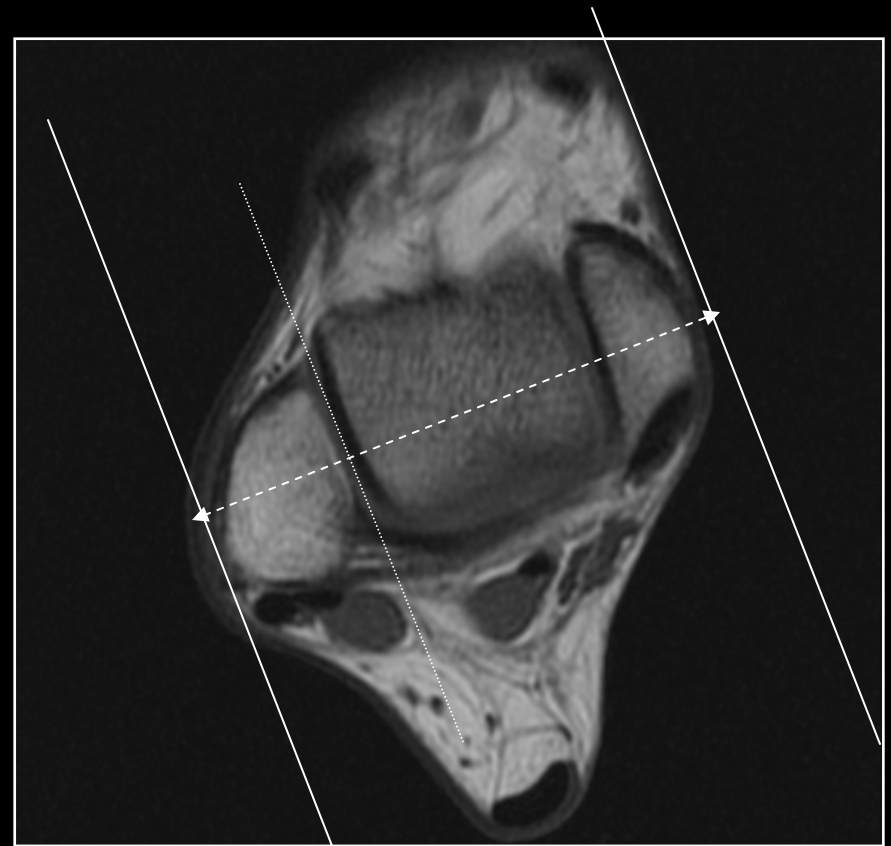
Ankle-Sagittal Imaging Plane

Relevant Anatomy



Sagittal Imaging Plane

Prescribe plane with line parallel to talus. Cover ankle from medial through lateral malleolus.



LIGAMENTS

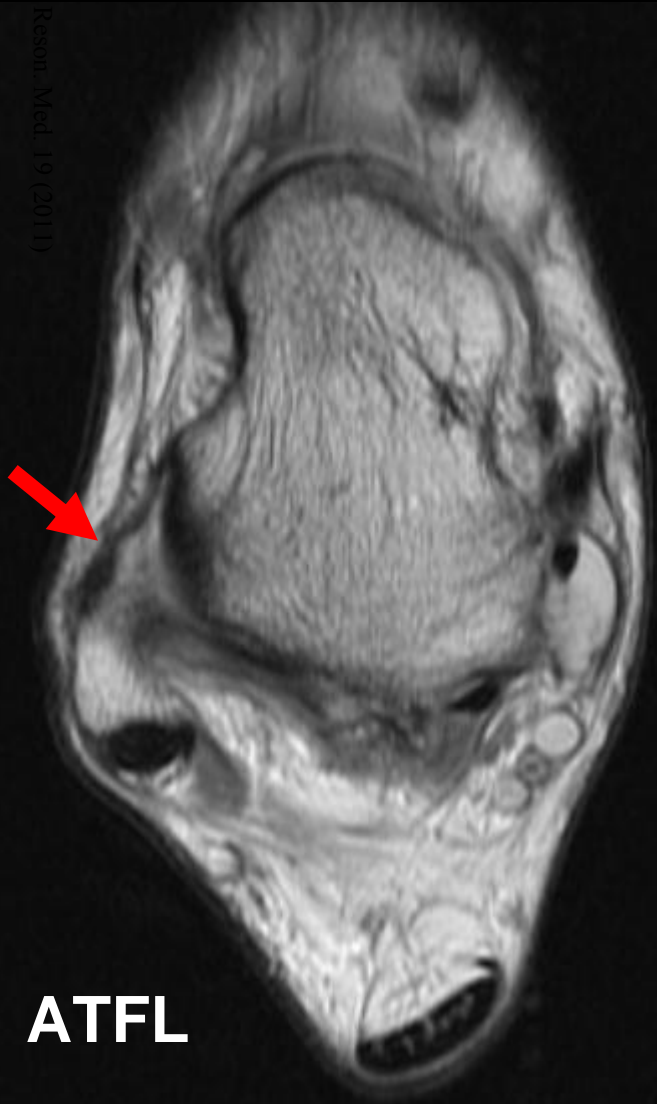
LIGAMENTS

Ankle sprain: most common injury

- Ligamentous injury usually self-limited
- Conservative tx
- MRI usu for chronic pain, can be from:
 - Tenosynovitis, esp peroneal*
 - Impingement, esp anterolateral*
 - Sinus tarsi syndrome*
 - OCD*
 - Synovial cyst*
 - Ankle / subtalar instability*

LATERAL LIGAMENTS

Reson. Med. 19 (2011)



MEDIAL LIGAMENTS



DEEP

PTT

SUPERFICIAL

FDL

FHL

LATERAL LIGAMENT INJURY

Inversion mechanism

Anterior talofibular – first injured

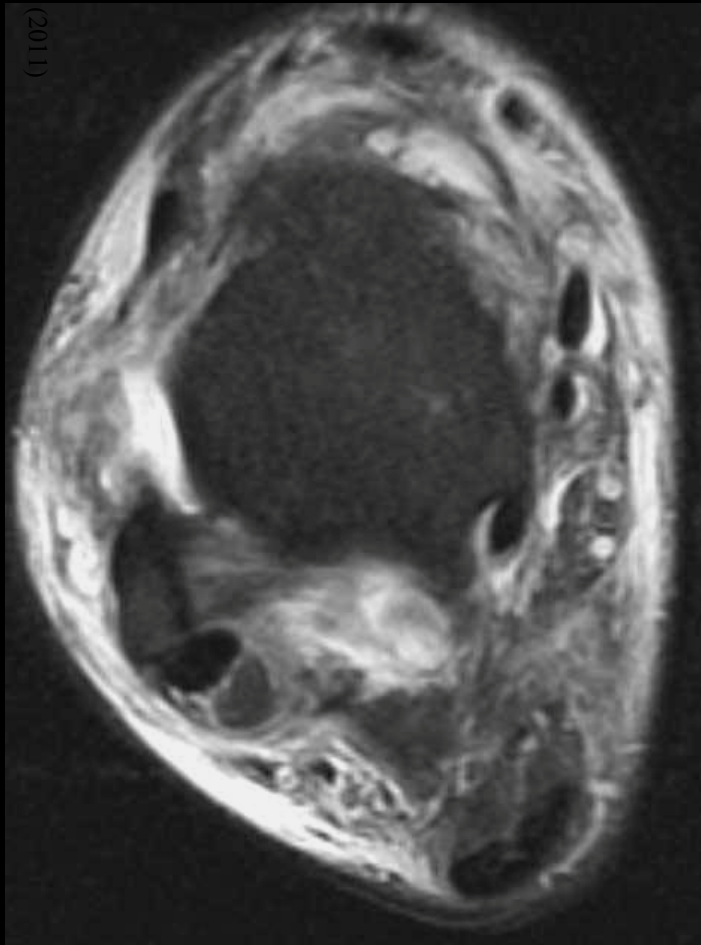
Calcaneofibular – second injured

Posterior talofibular - almost never injured

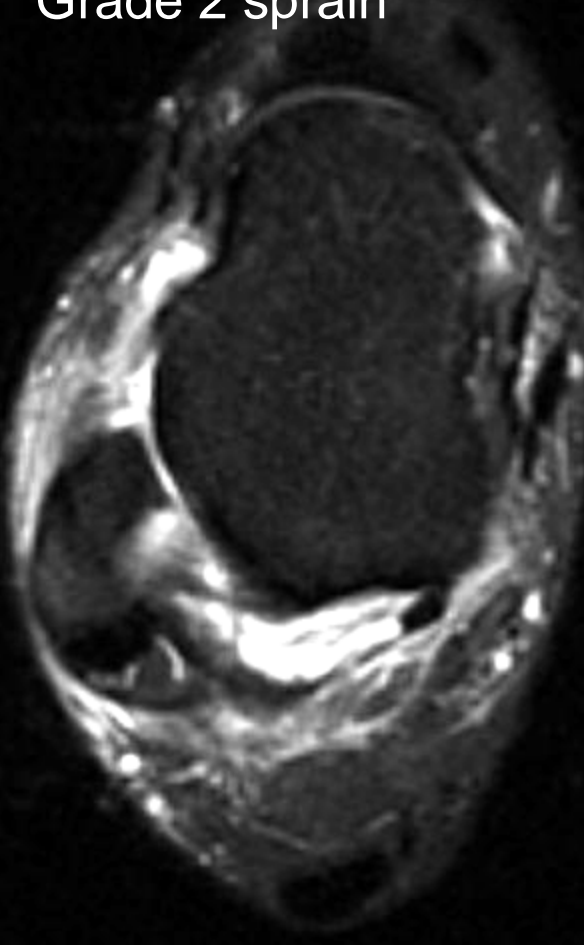
Syndesmosis – more severe injuries

ACUTE SPRAIN GRADING: ATFL

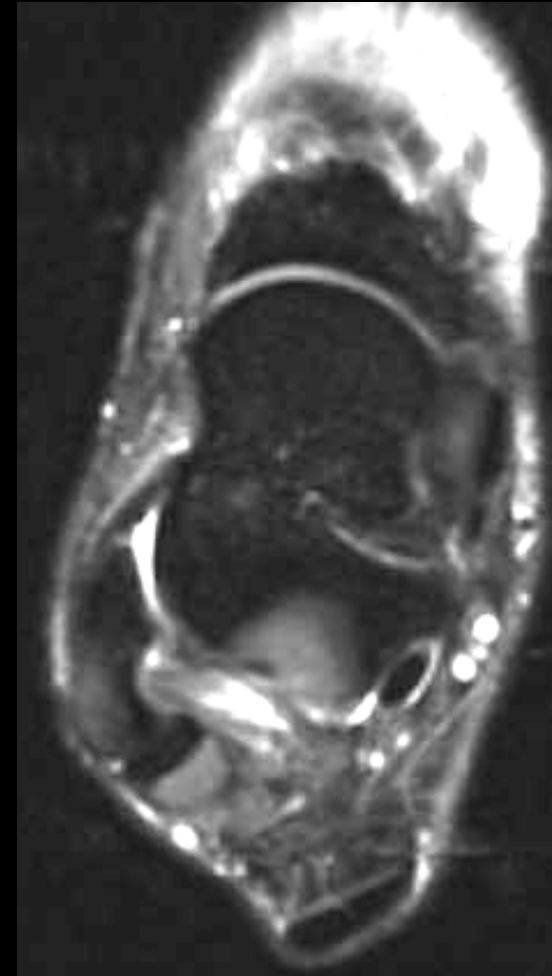
Complete tear – Grade 3

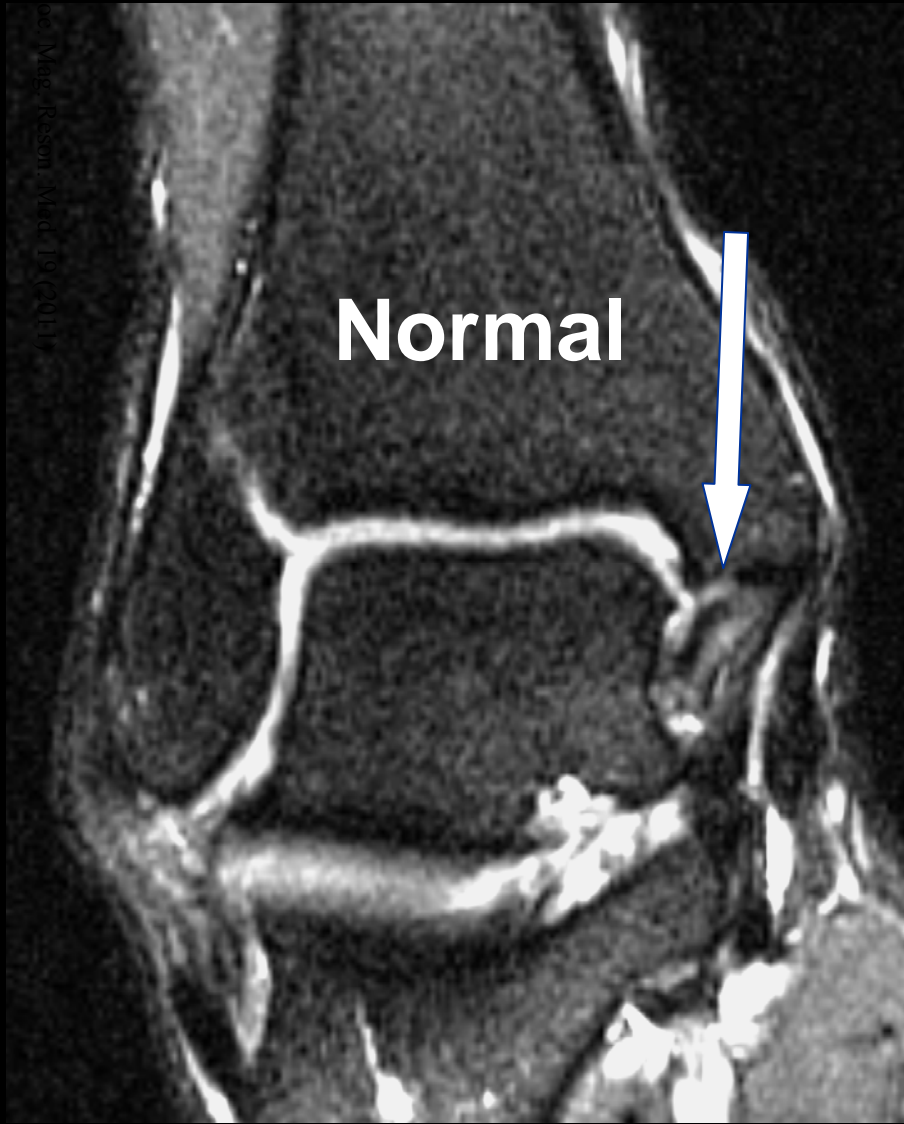


Partial tear -
Grade 2 sprain

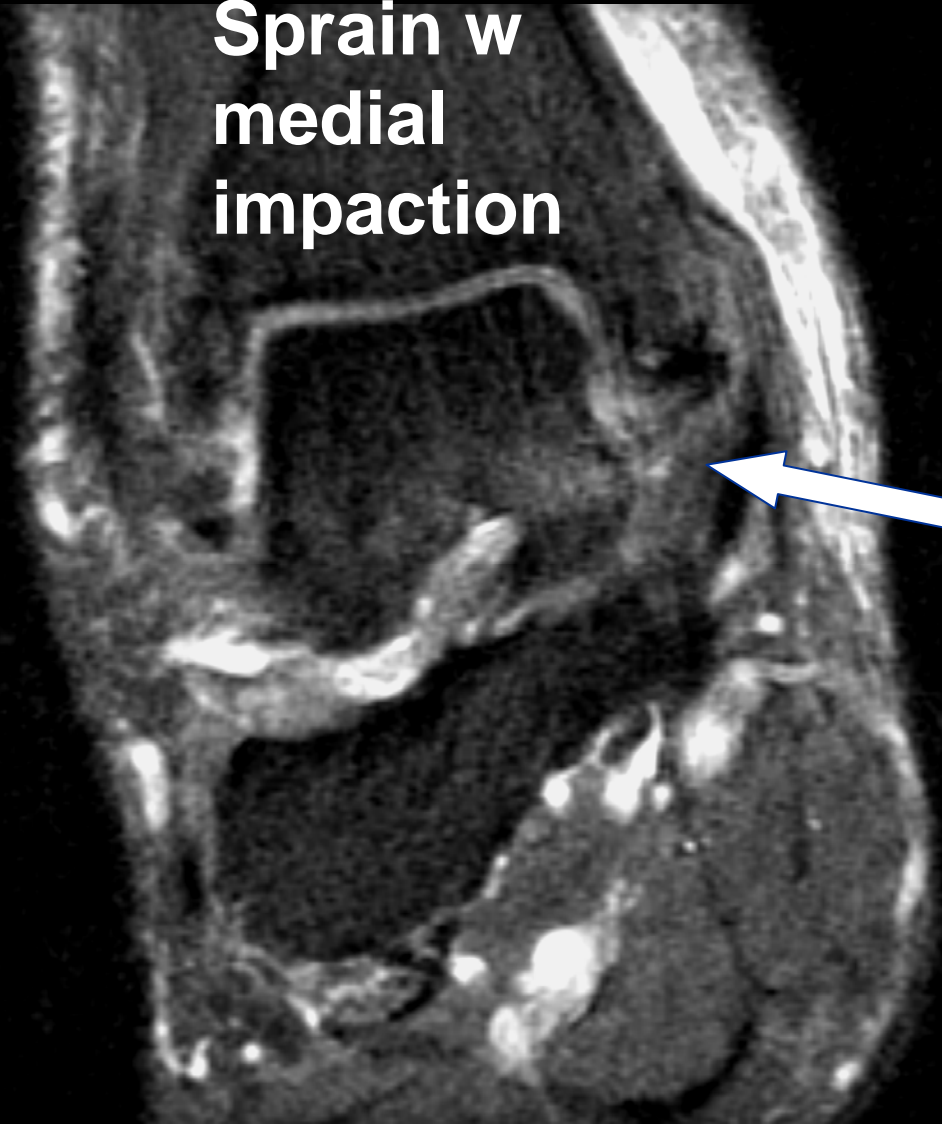


Edema -
Grade 1 sprain





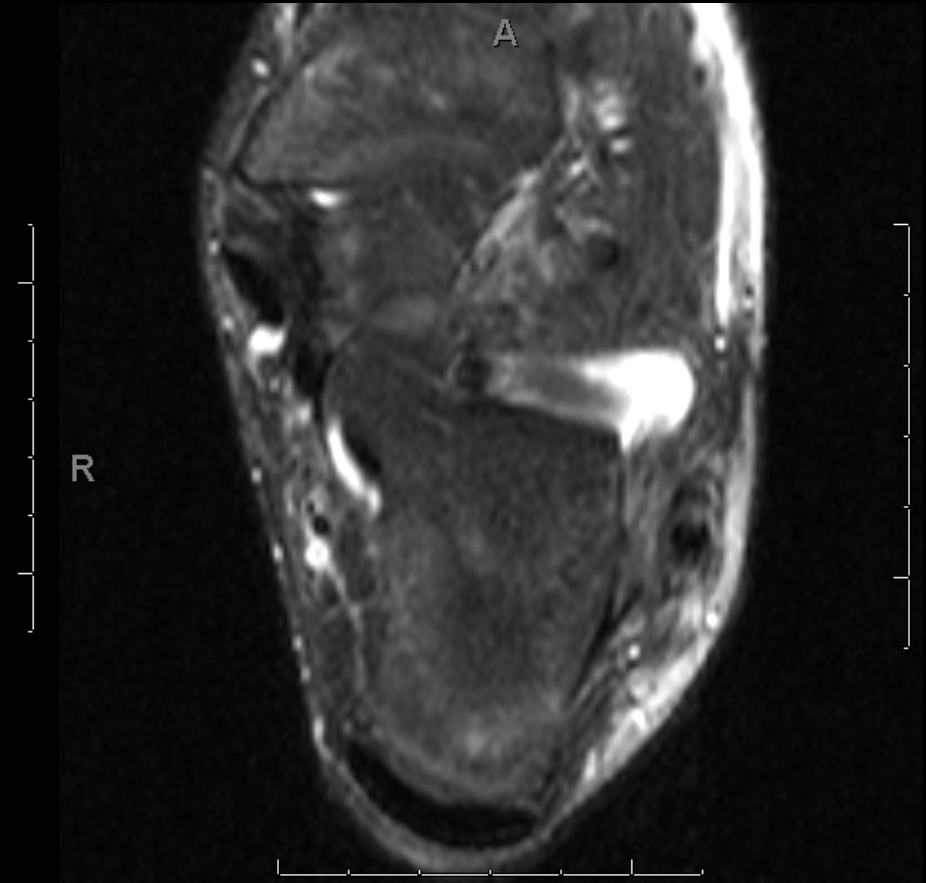
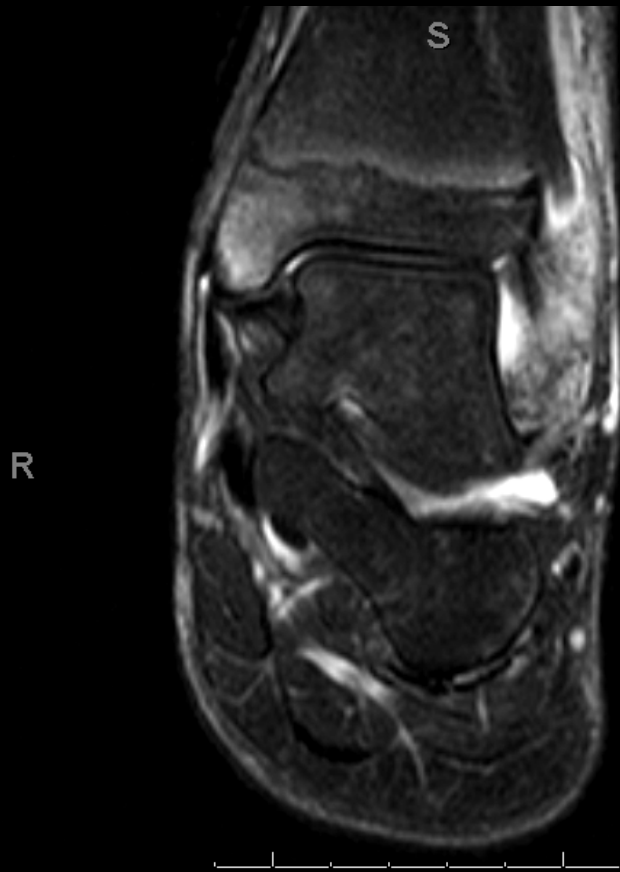
Normal



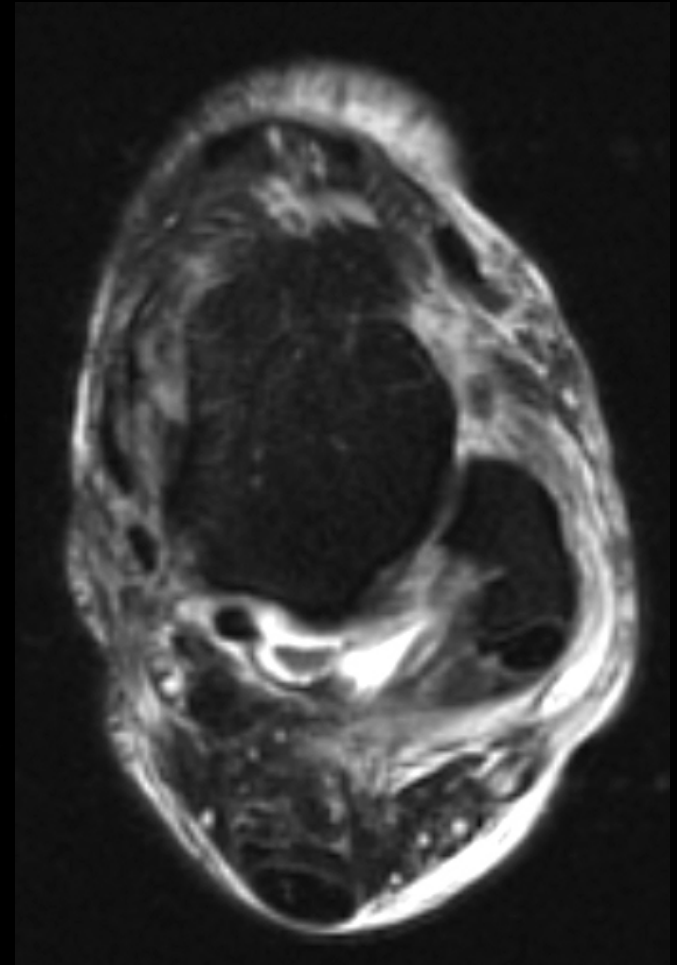
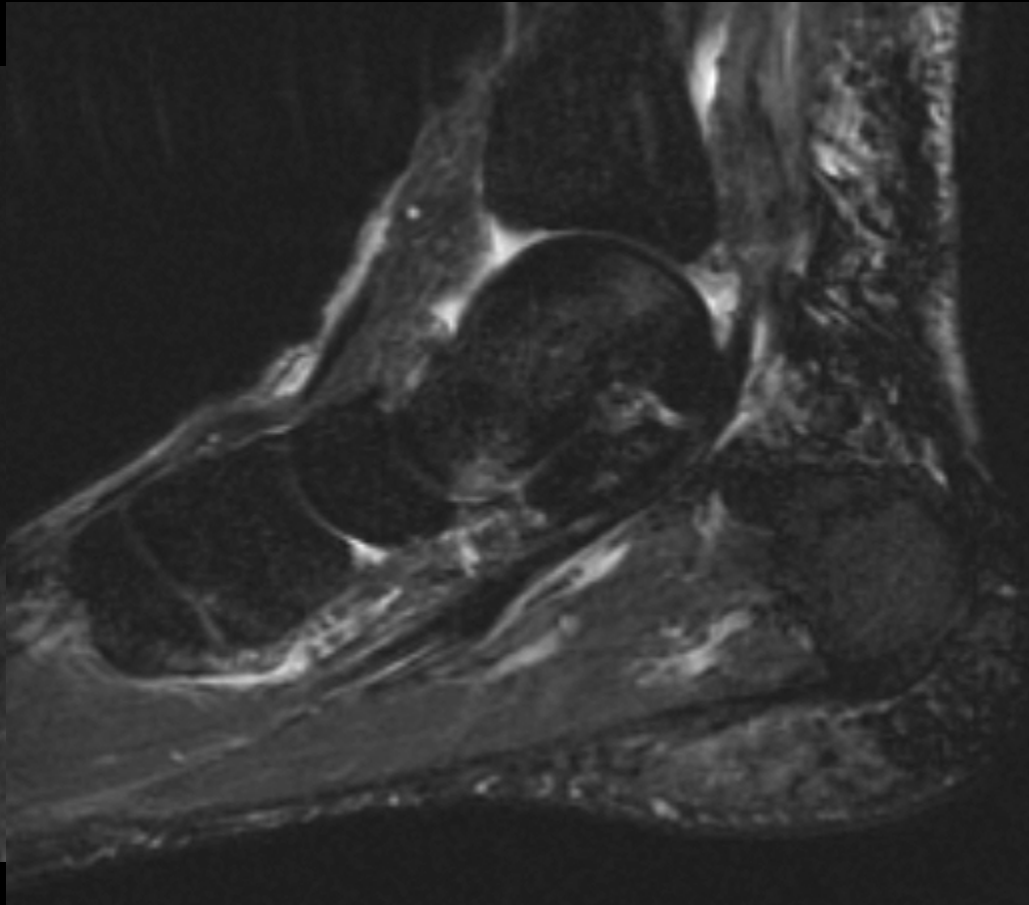
**Sprain w
medial
impaction**



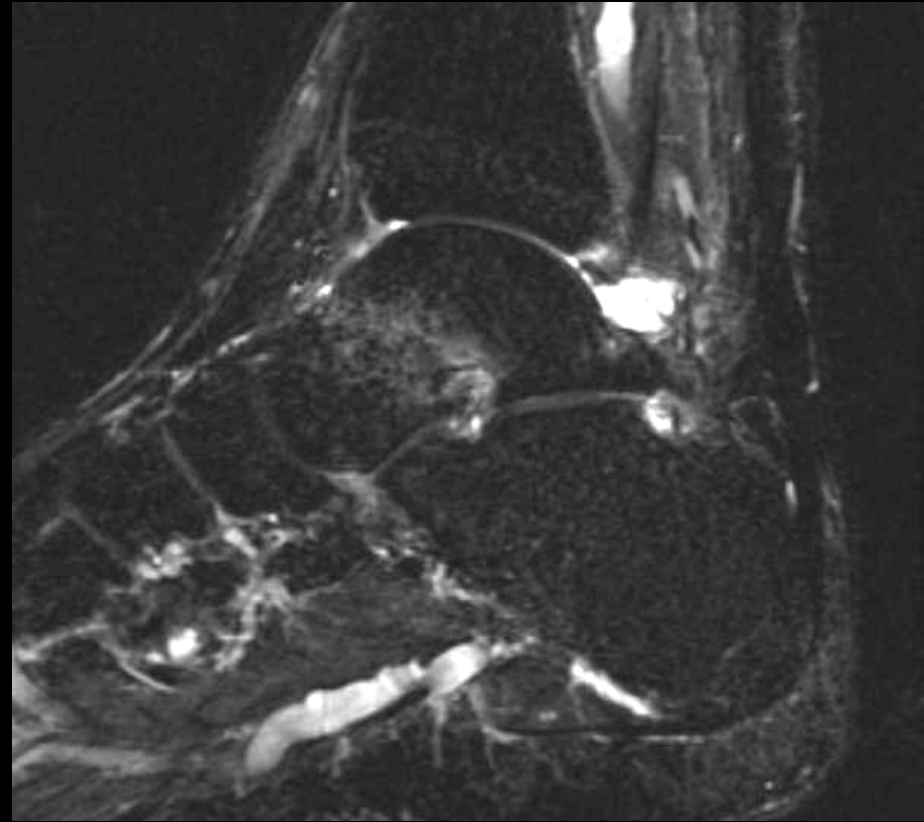
ATFL INJURY: BONE BRUISES

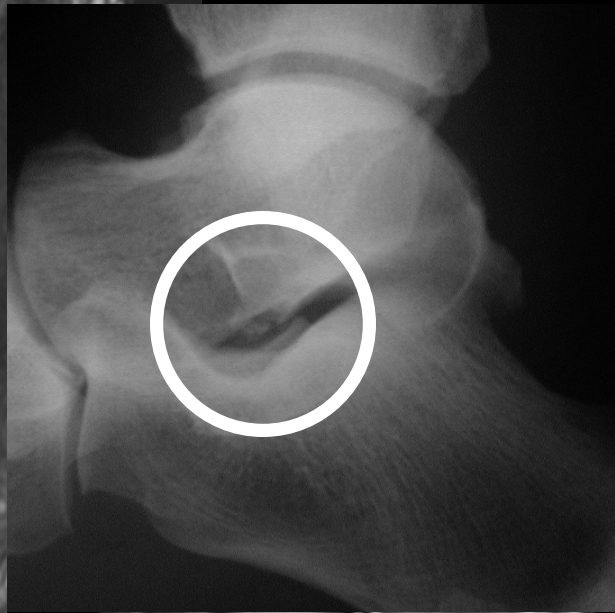
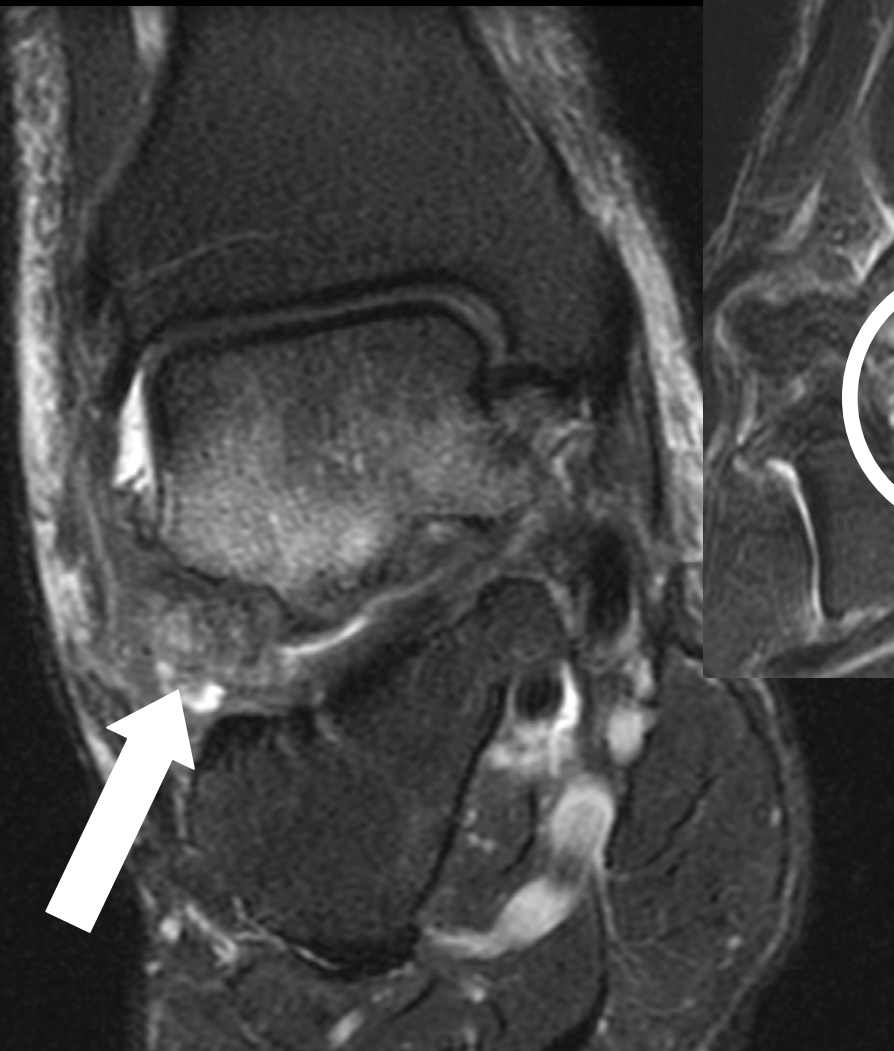


ATFL INJURY: BONE BRUISES



Occult Talar Neck Fracture





**Lateral talar process fracture
-subacute**

ATFL - SUBACUTE TO CHRONIC INJURY

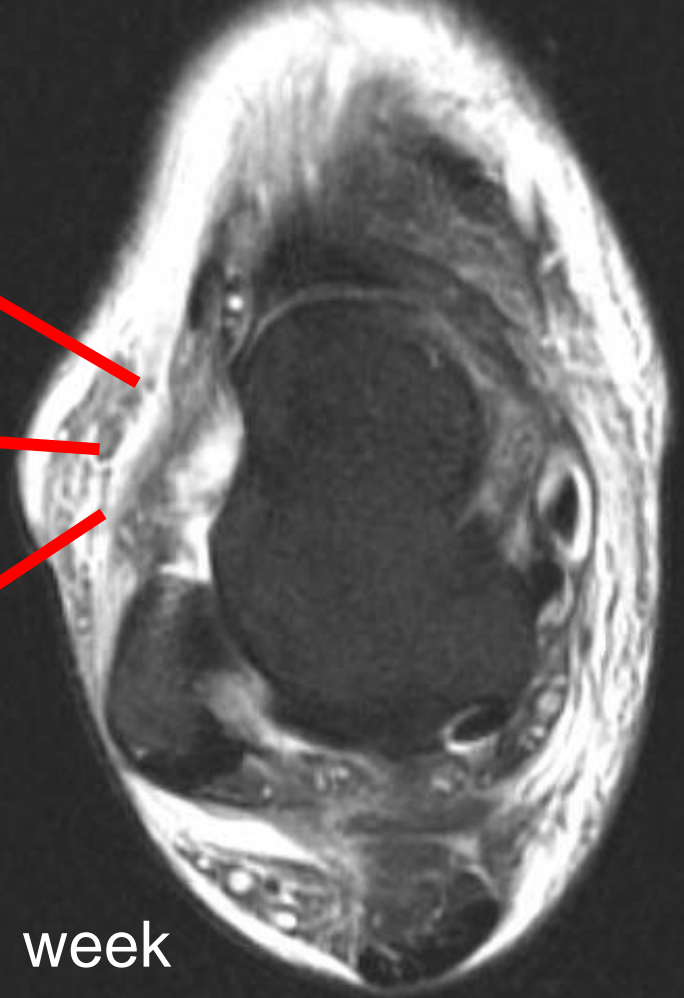
POSSIBILITIES

Absent

Normal

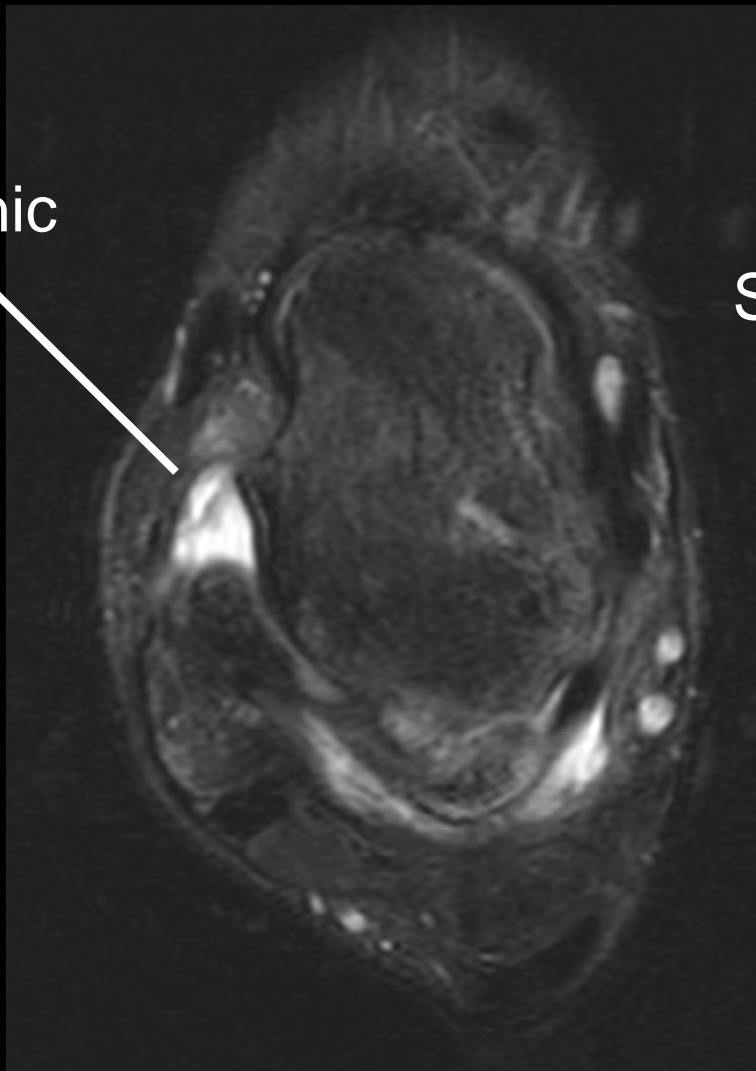
Thickened

1 week

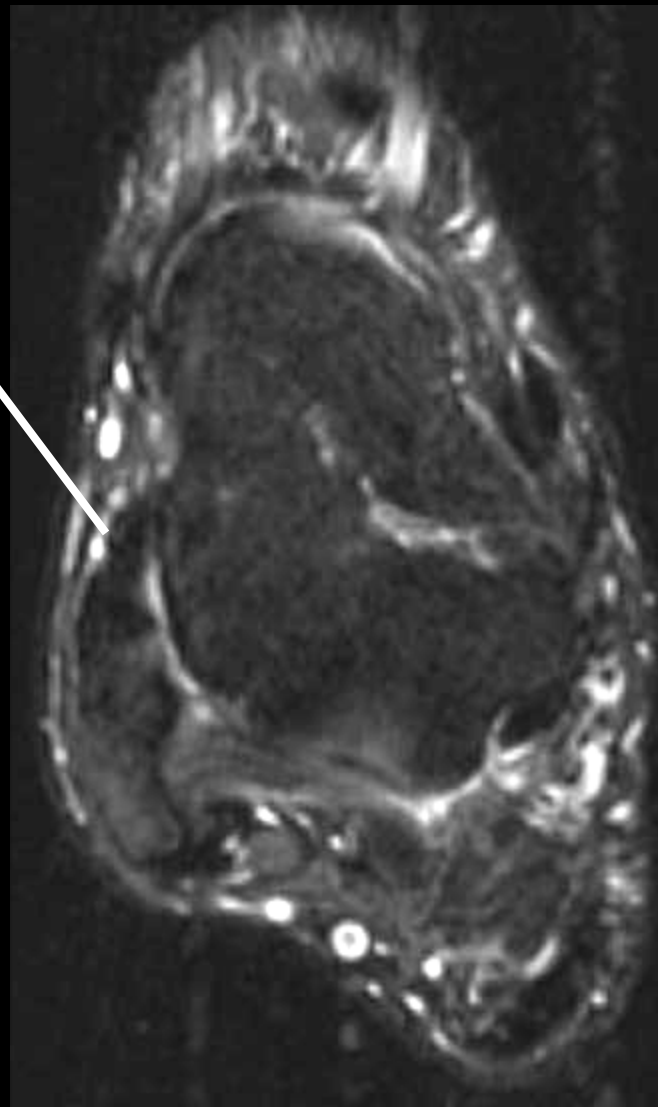


CHRONIC ATFL INJURY

Chronic
tear

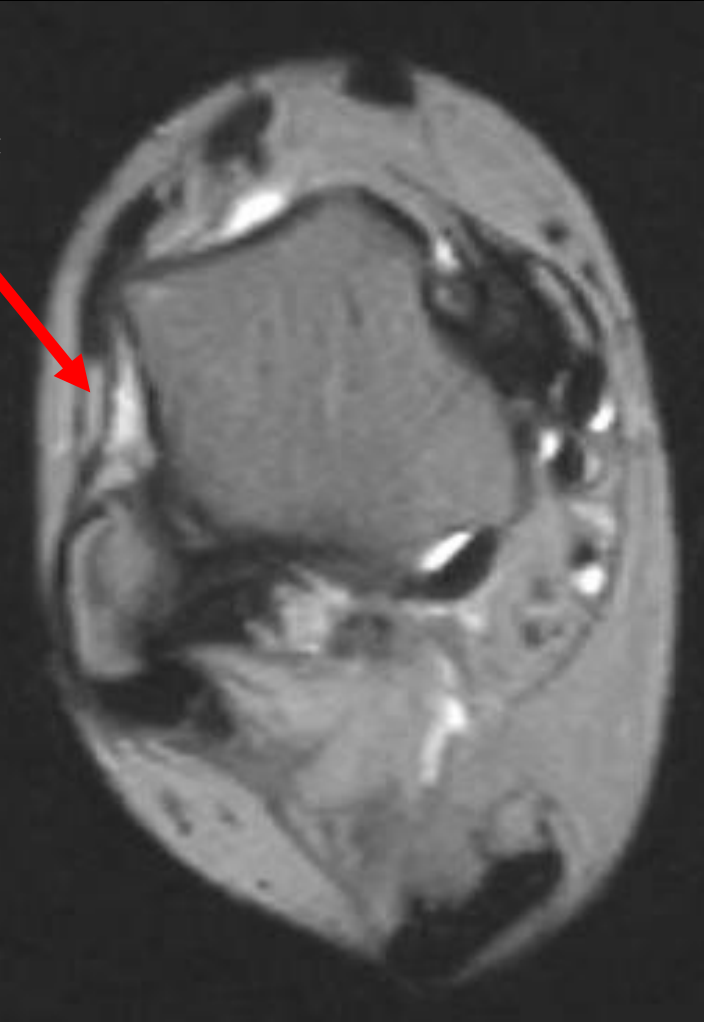


Scarring



ANKLE INSTABILITY

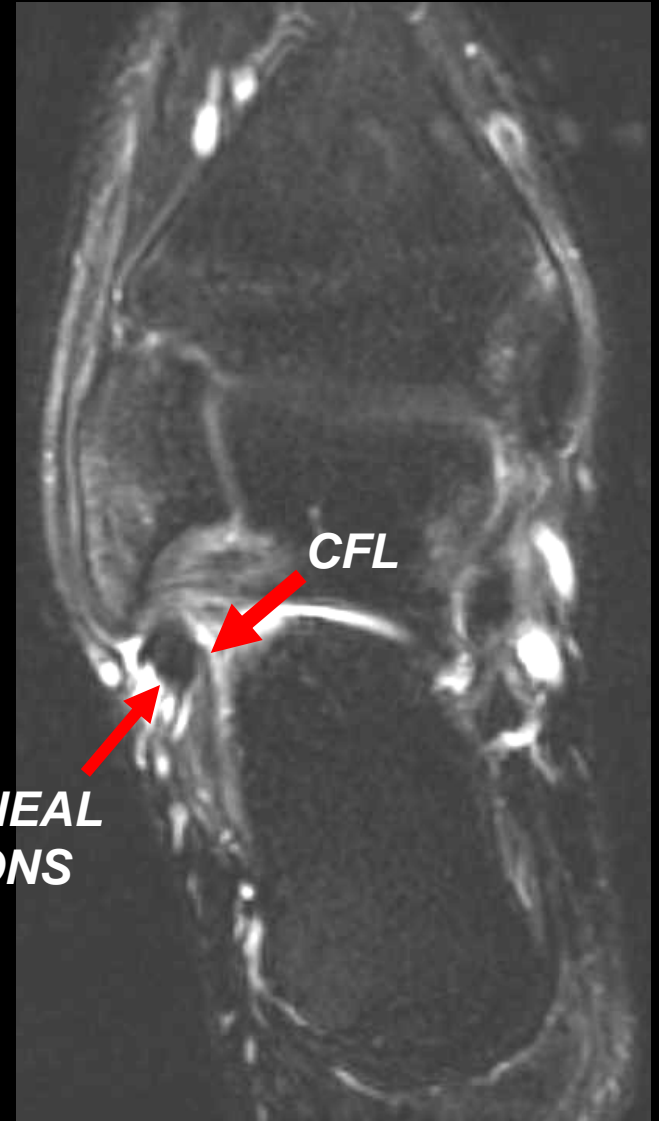
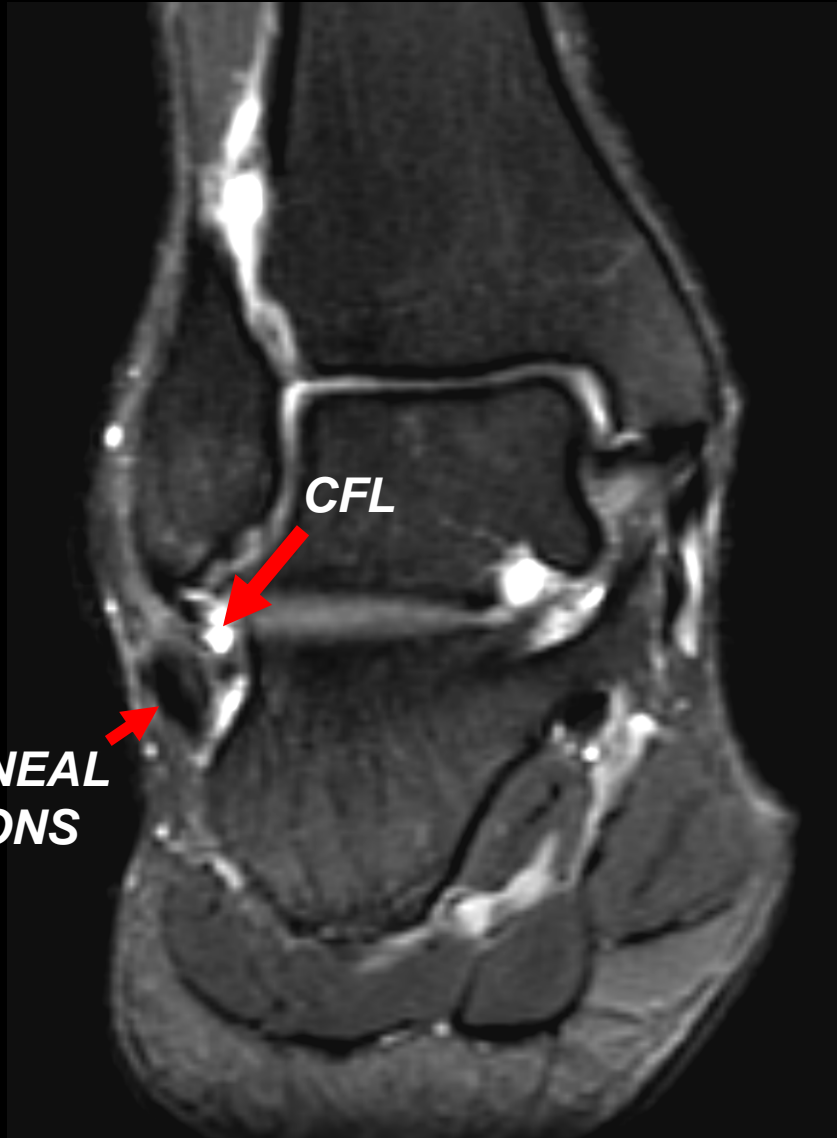
Chronic
tear



*Anterior
drawer*

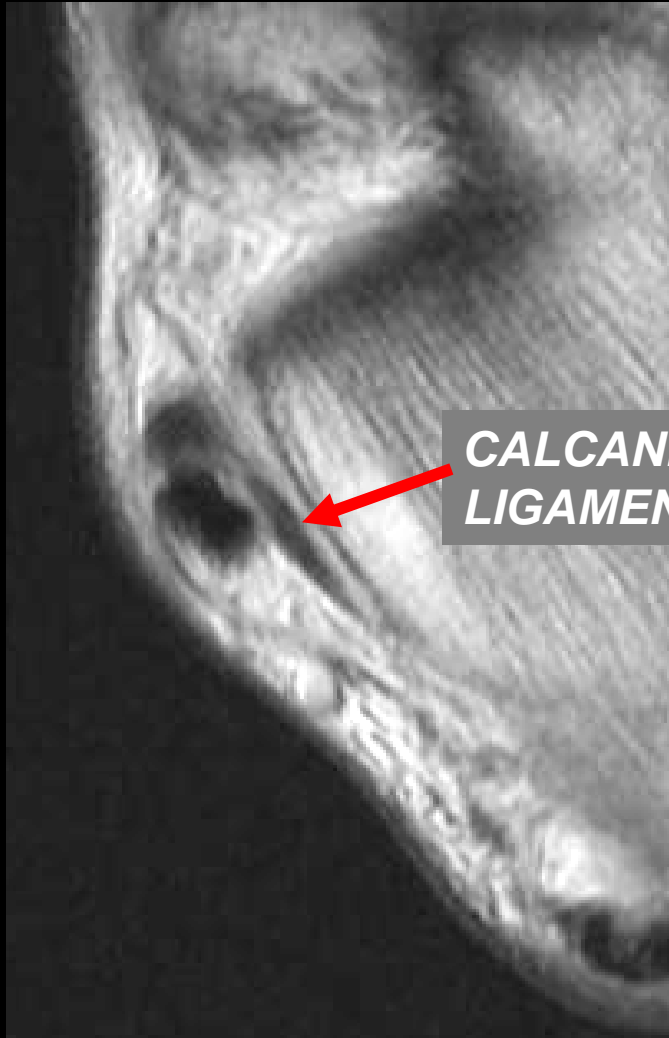


CF LIGAMENT TEAR



CF LIGAMENT

USE OF AXIAL IMAGES

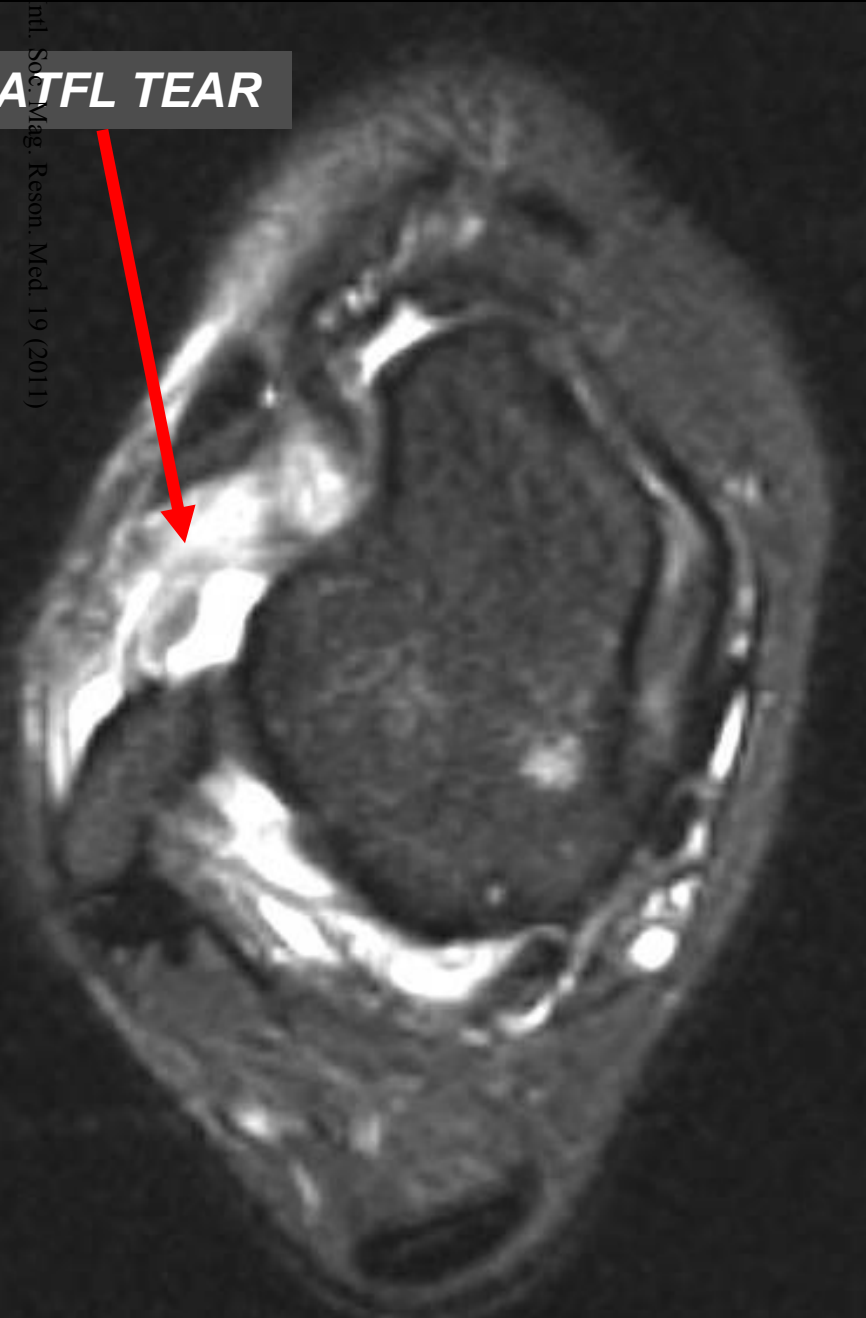


***CALCANEOFIBULAR
LIGAMENT***

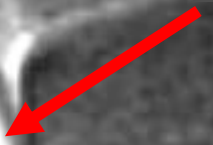


***PERONEAL
TENDONS***

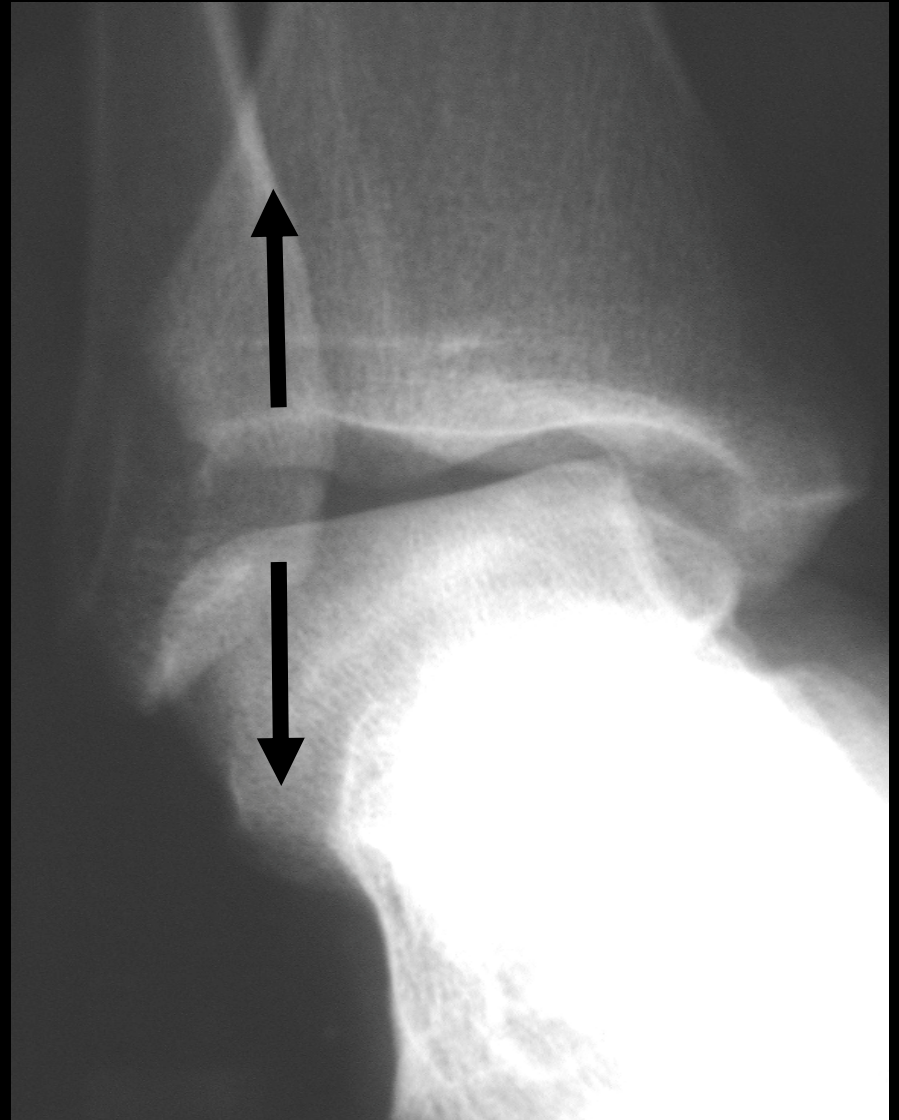
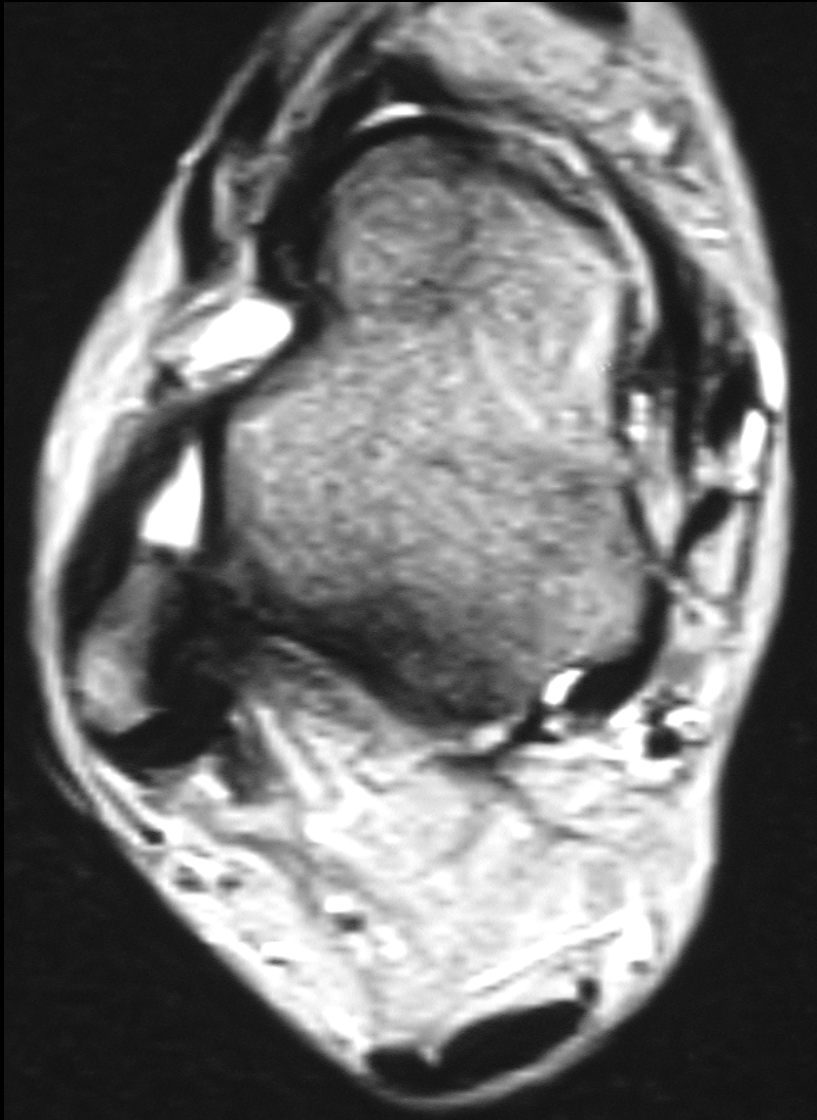
ATFL TEAR



CFL TEAR

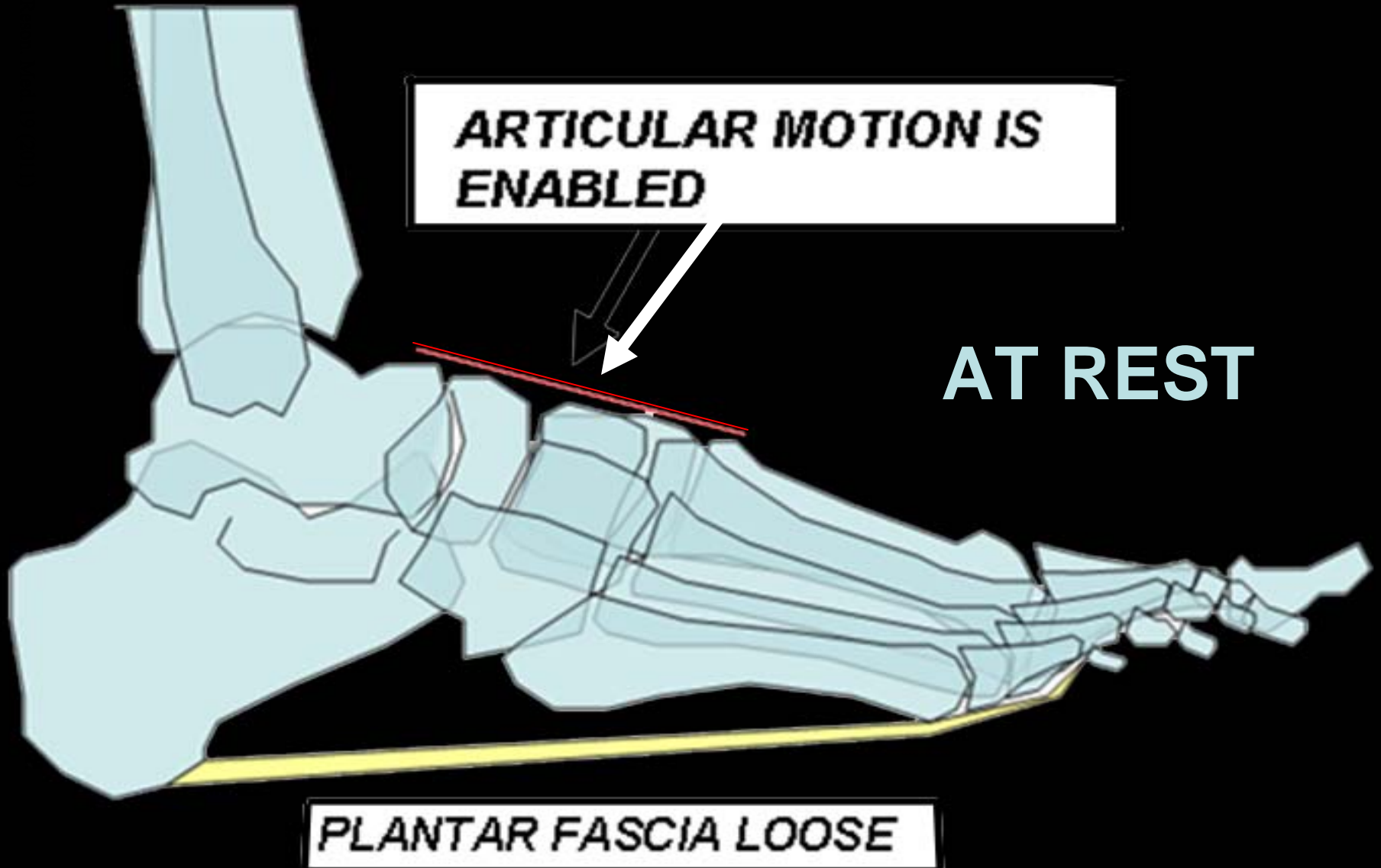


CF ligament insufficiency



FASCIA

WHAT DOES THE PLANTAR FASCIA DO?

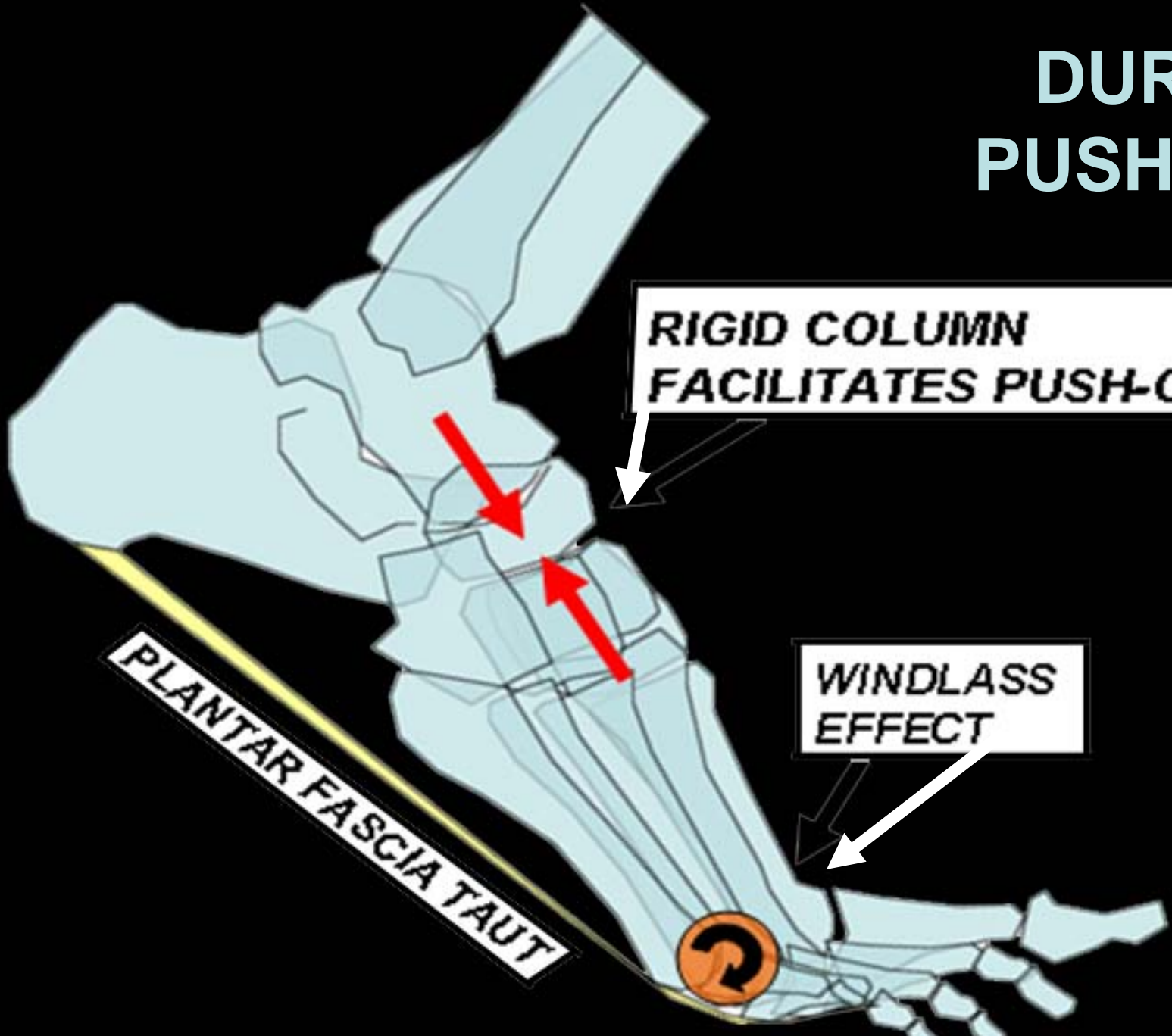


DURING PUSHOFF

**RIGID COLUMN
FACILITATES PUSH-OFF**

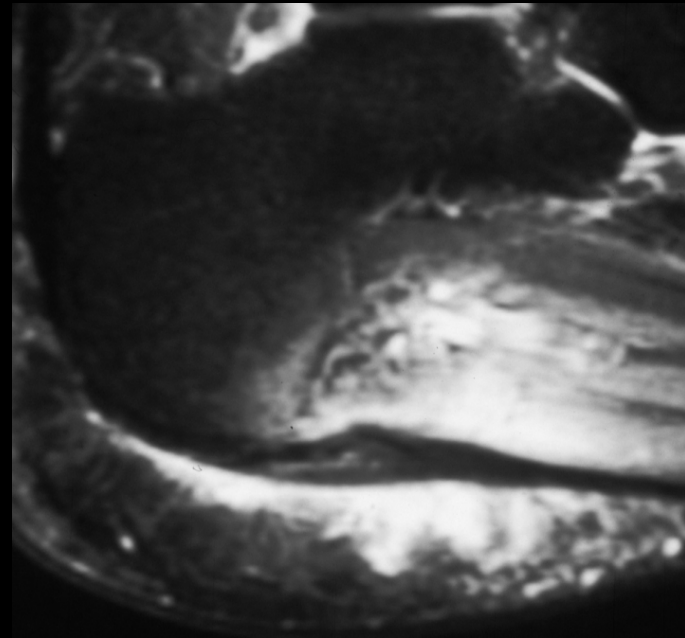
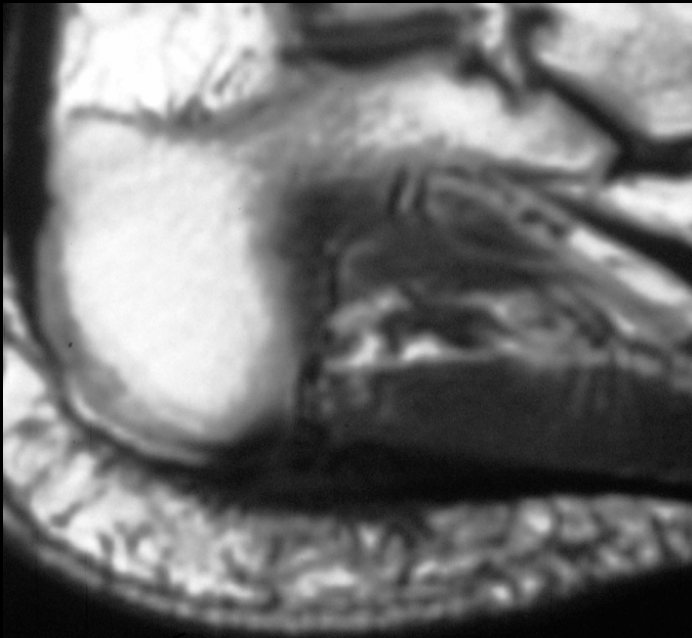
**WINDLASS
EFFECT**

PLANTAR FASCIA TAUT



PLANTAR FASCIITIS

- Plantar heel pain (esp medial) upon walking, esp AM; *'spur' is meaningless*
- Chronic repetitive trauma with microtears of aponeurotic complex at origin on the medial inferior calcaneus
- Acute: edema around proximal plantar aponeurosis
- Chronic: Dark; diffuse thickening
- If severe / longstanding: stress fracture-like appearance



JOINTS

Osteochondral Defect (OCD)

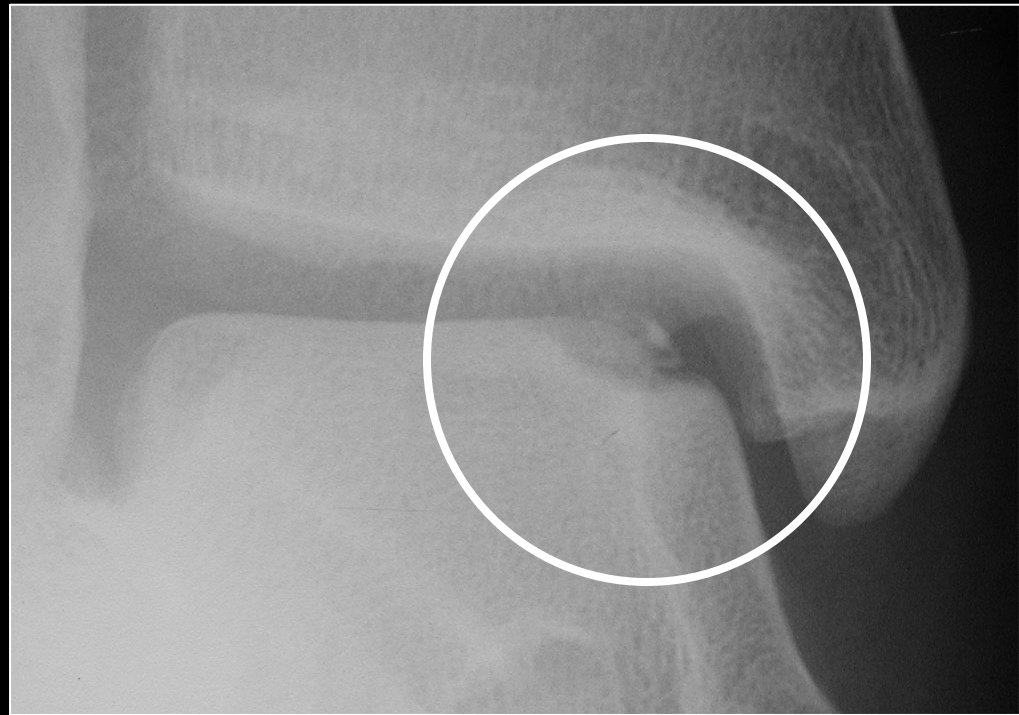
AKA

Osteochondral Lesion of the Talus (OLT)

AKA

“Osteochondritis Dissecans”

*IT'S NOT A COINCIDENCE
THAT OCD ALSO MEANS
OBSESSIVE-COMPULSIVE
DISORDER!!*



Osteochondral injury

Underlying bone necrosis,
collapse, fragmentation

Medial: chronic injury; rounded

Lateral: acute injury; wafer

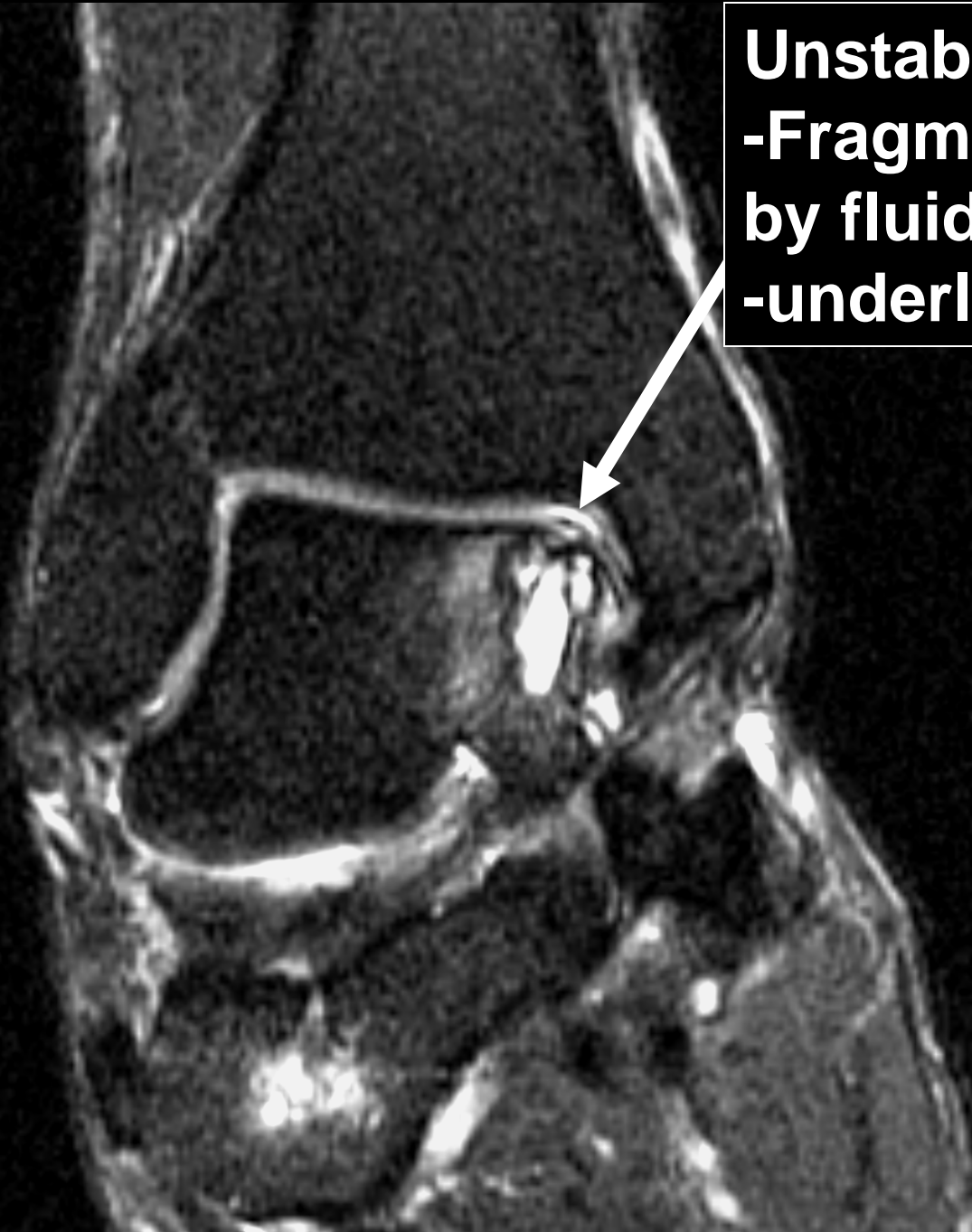


Unstable OCD
*-fluid surrounds
fragment*

Unstable OCD

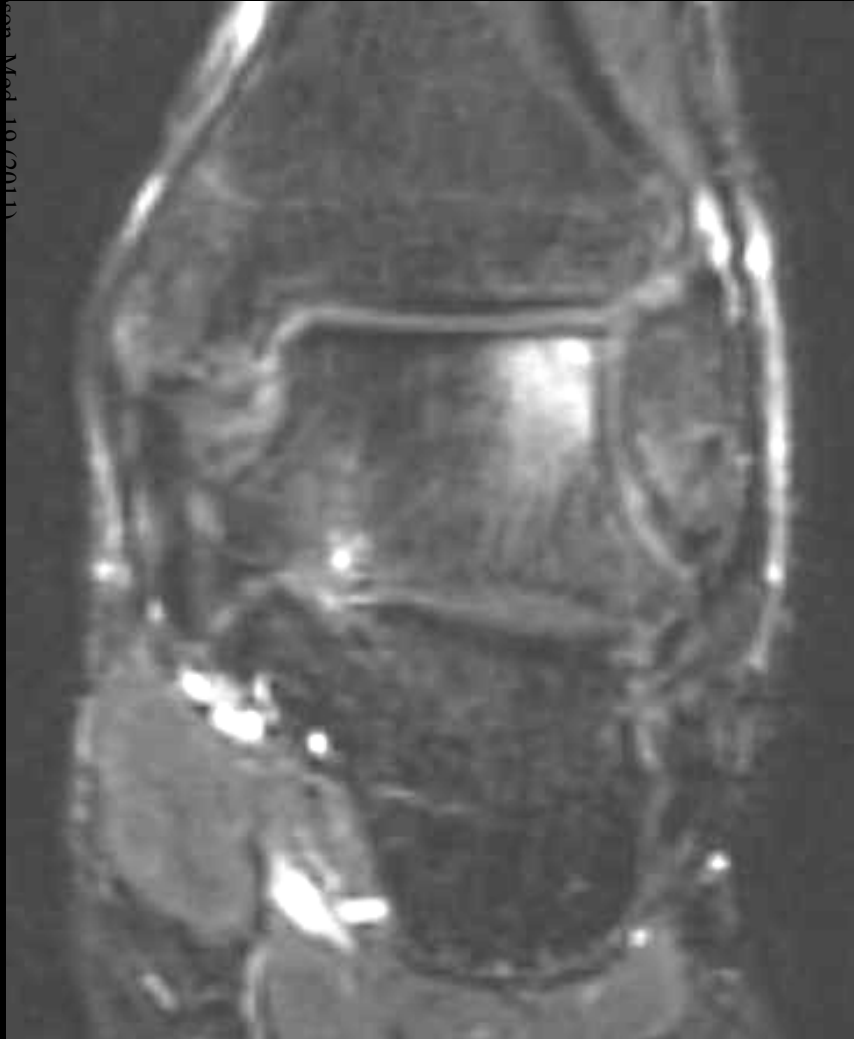
**-Fragment surrounded
by fluid**

-underlying cysts, edema

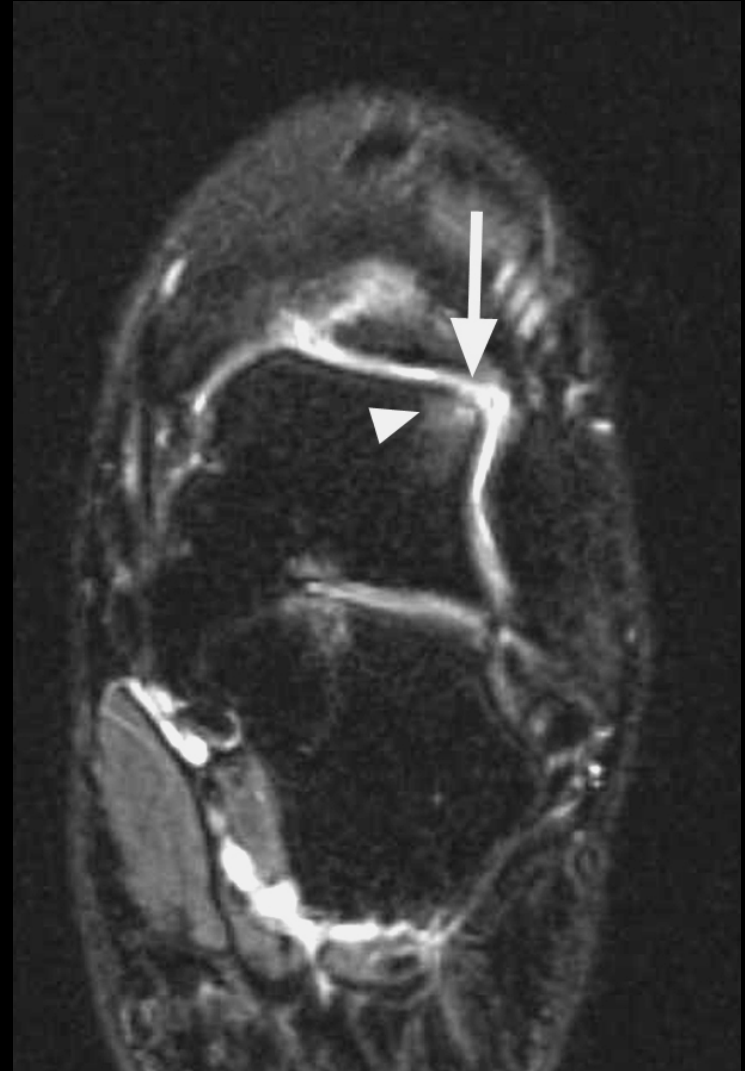
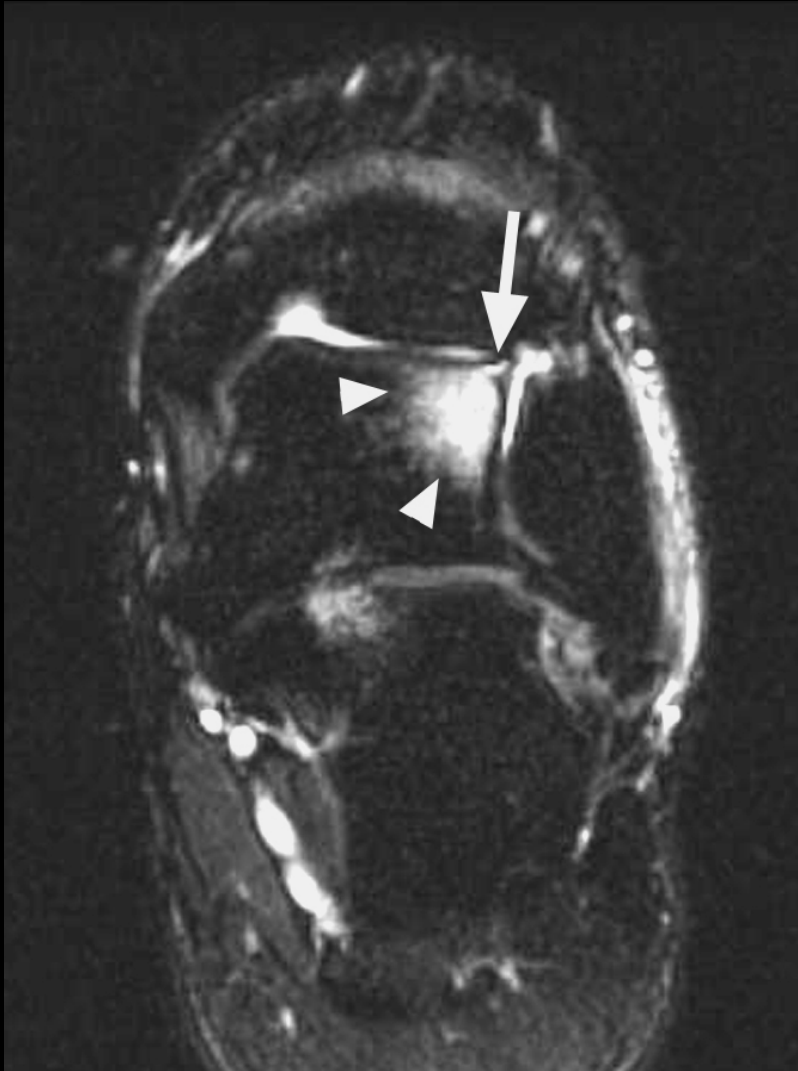


35 month follow up

interval detachment of fragment

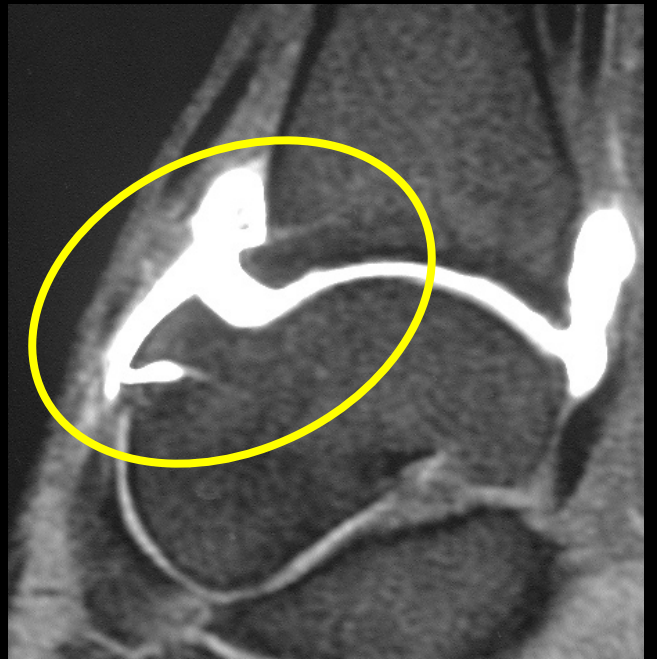
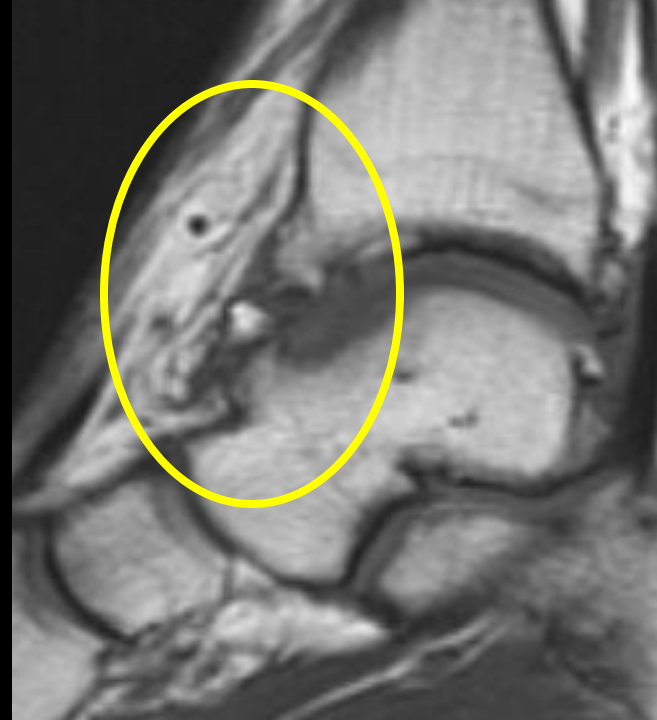


7 month follow up with decreased BME and interval displacement of fragment



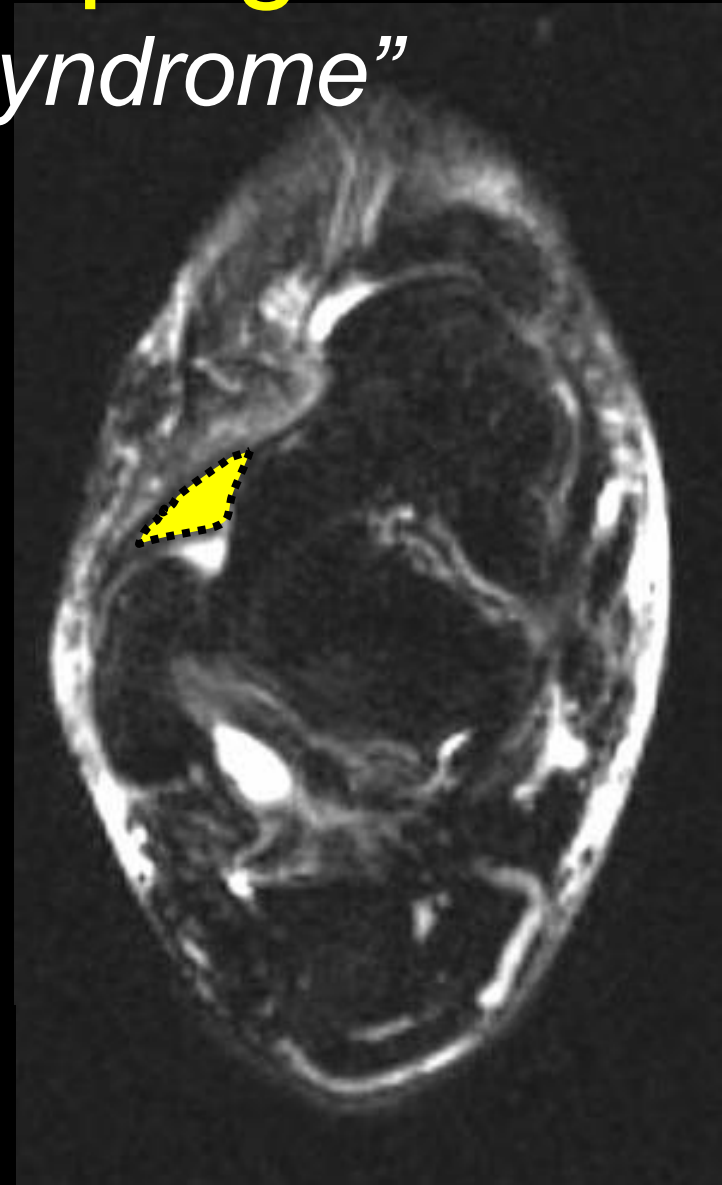
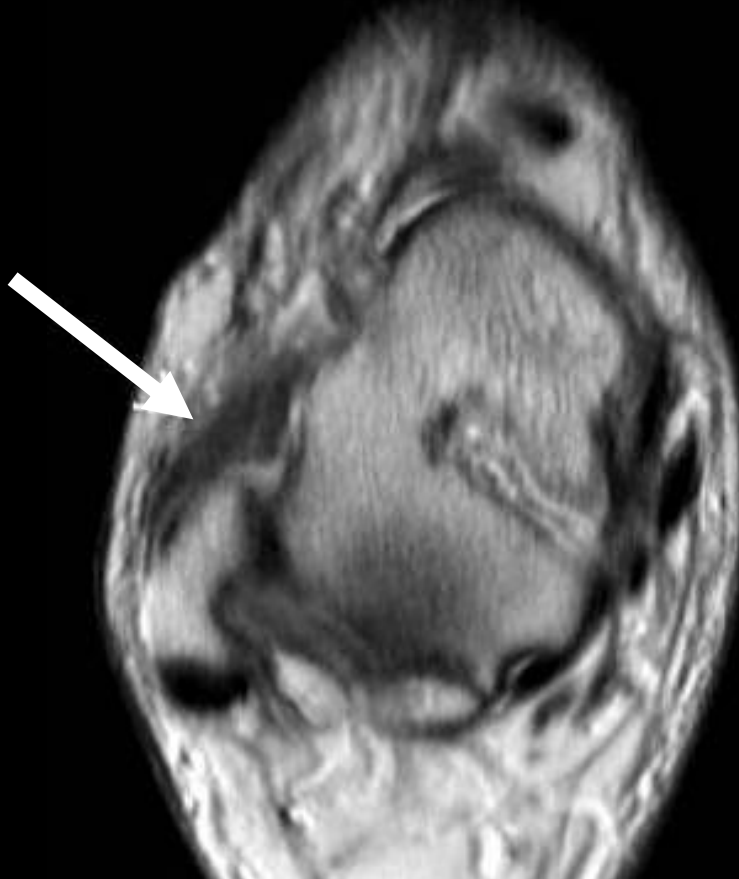
JOINT *Impingement*

Anterior impingement:
large spurs limiting
motion on dorsiflexion
-anteromedial especially



Anterolateral Impingement

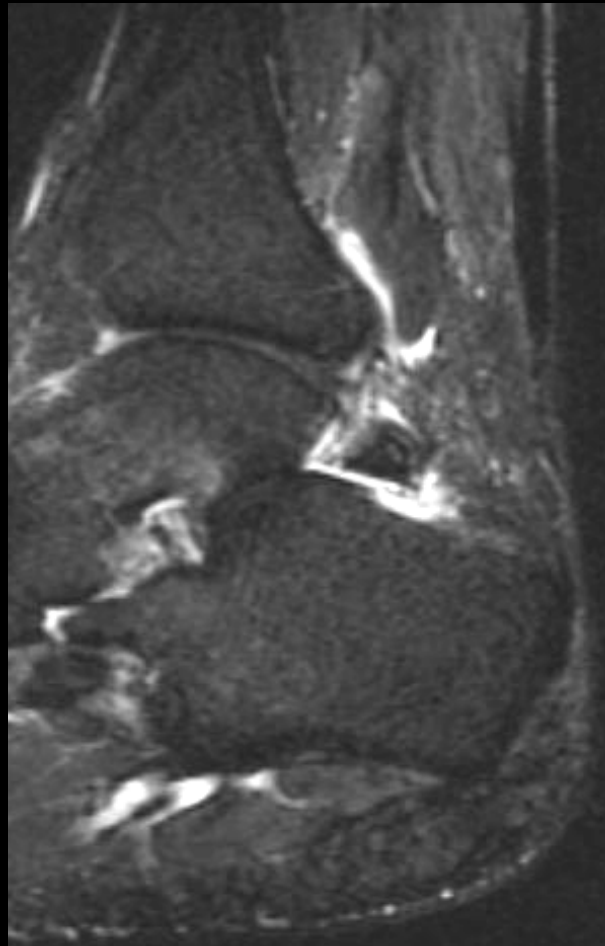
“meniscus syndrome”



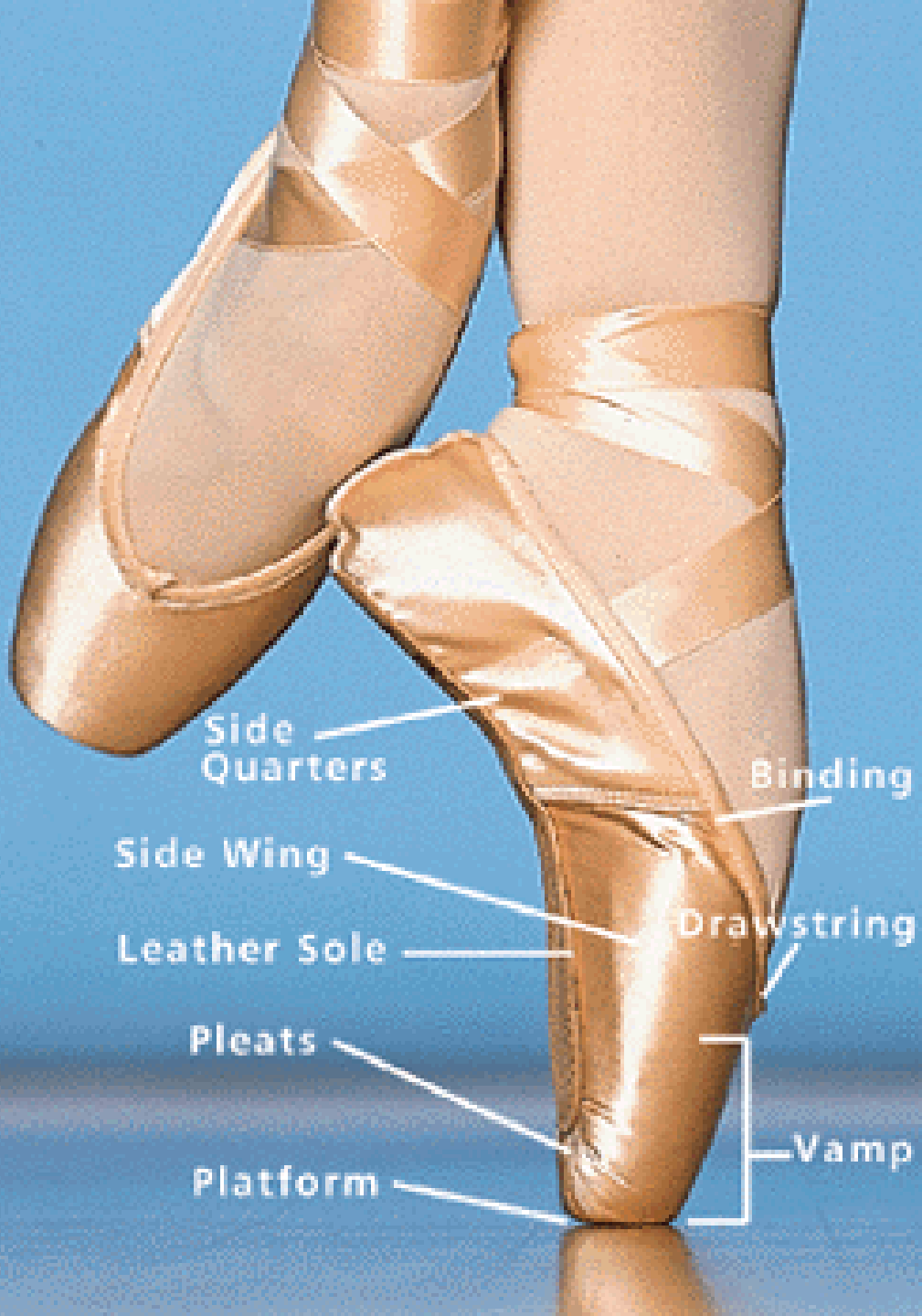
- Following tear of lateral ligaments
- Scar tissue forms in recess
- Leads to impingement, pain

Posterior Impingement

“Os Trigonum Syndrome”



A "big os"
-Fluid at interval
-Cystic change



Side Quarters

Binding

Side Wing

Drawstring

Leather Sole

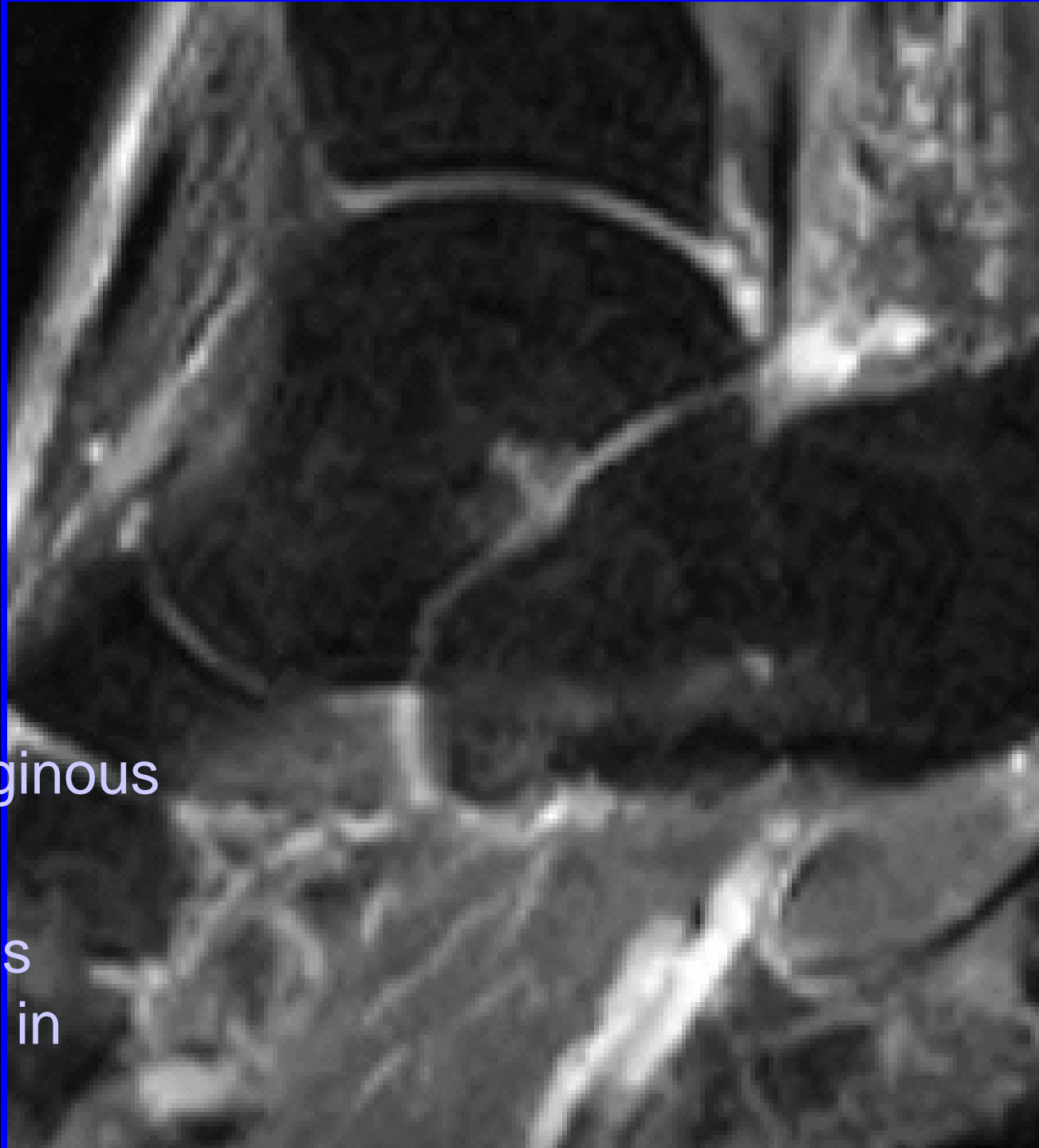
Pleats

Vamp

Platform

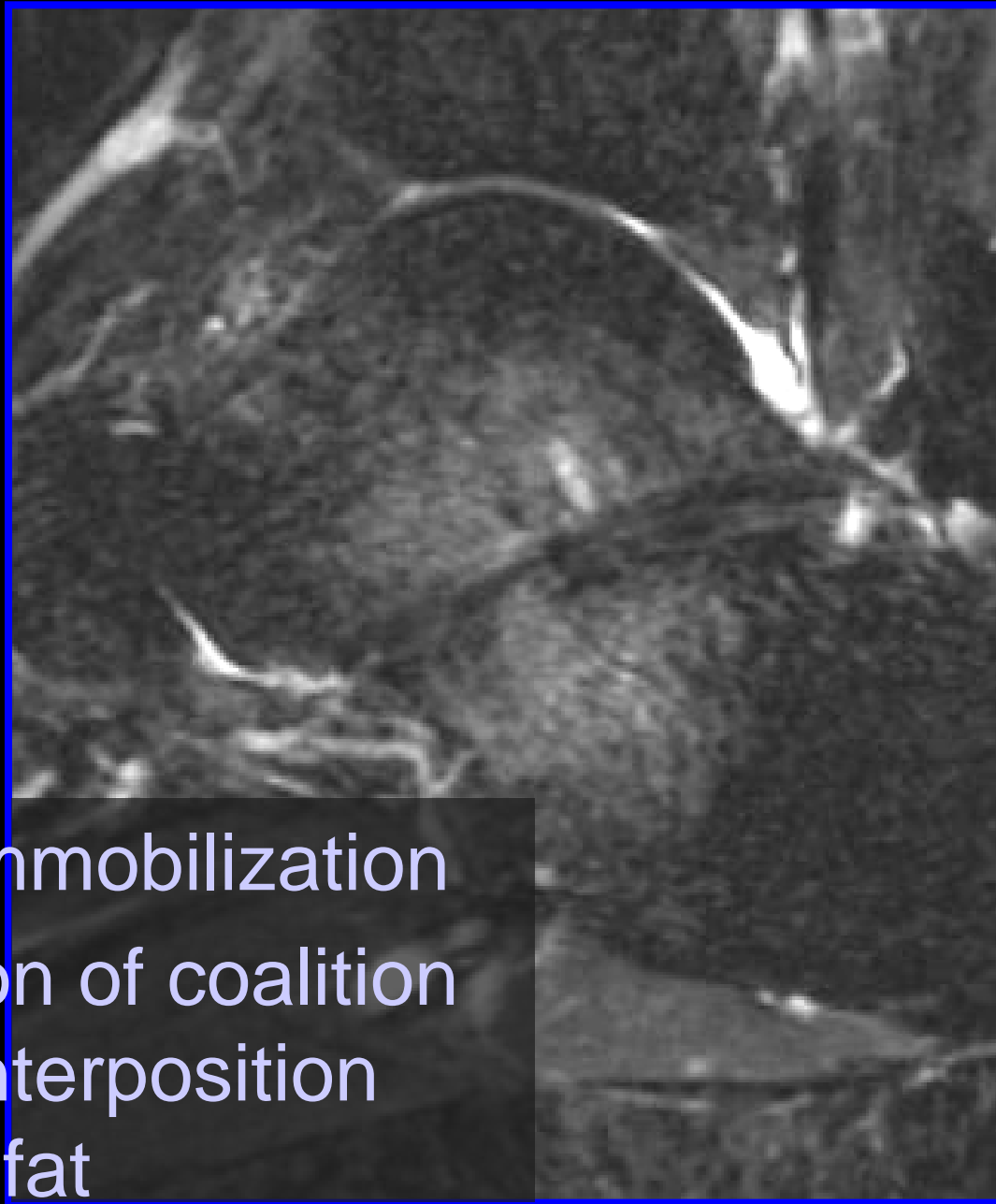
TARSAL COALITION

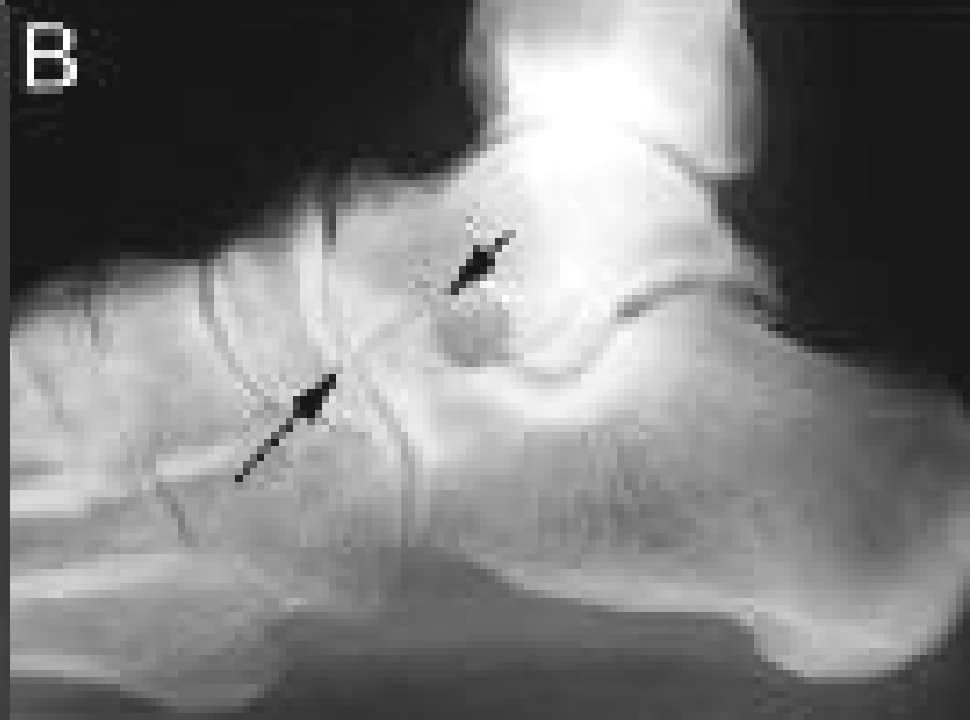
- Fibrous, cartilaginous or osseous
- HX = painful pes planus, stiffness in adolescent



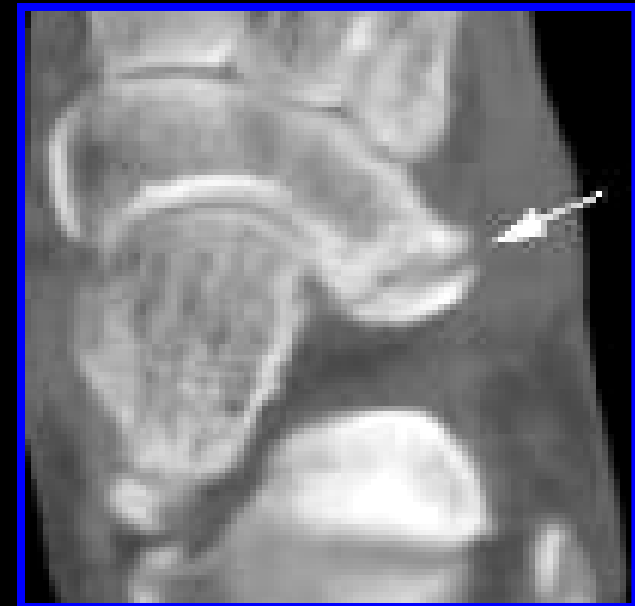
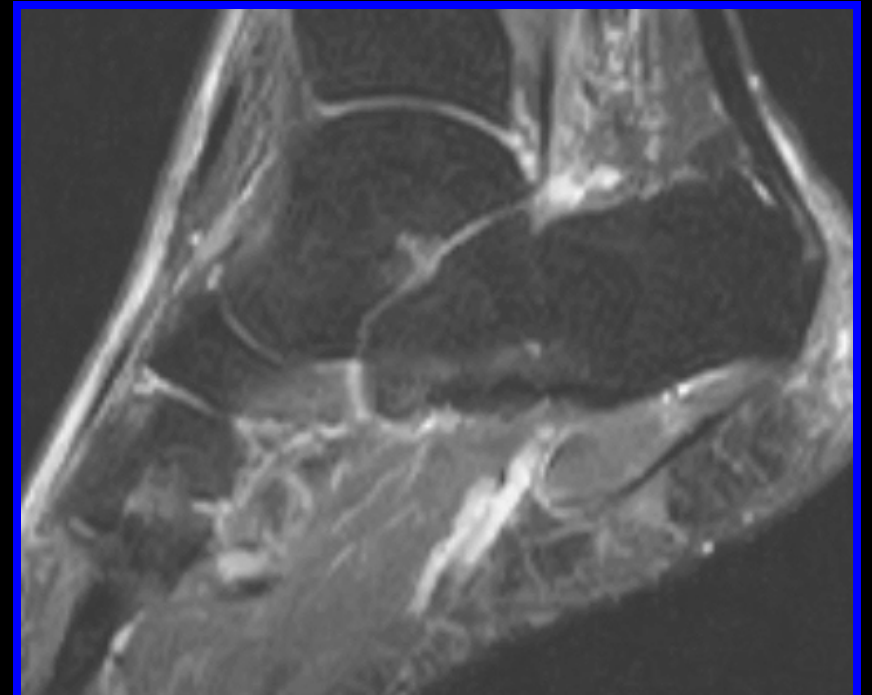
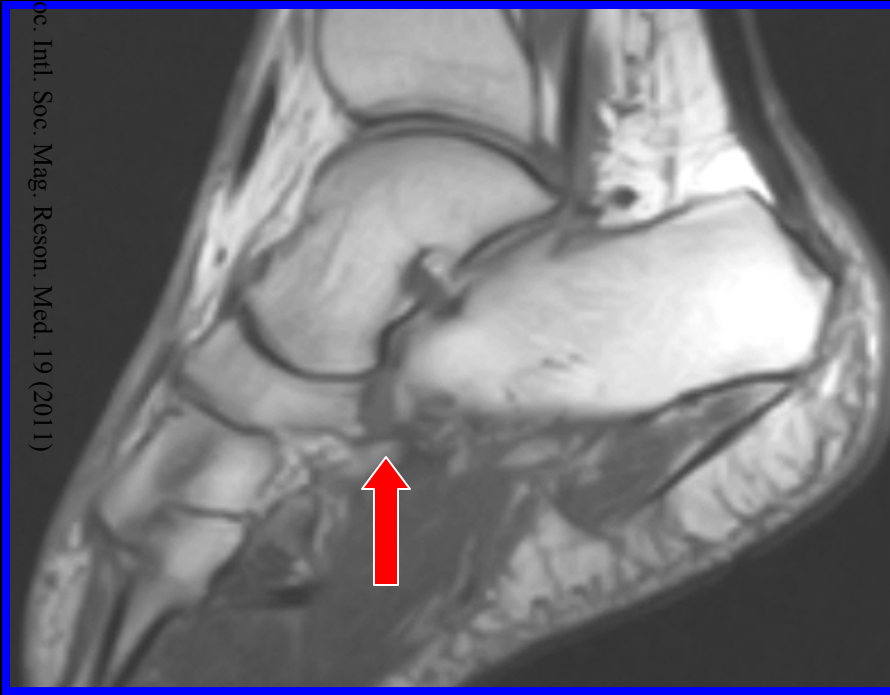
TARSAL COALITION

- Secondary signs
 - Talar beaking
 - Anteater sign (C-N)
 - “C” sign (Subtalar)
- Conservative tx – immobilization
- Surgical tx – excision of coalition with placement of interposition material, muscle or fat



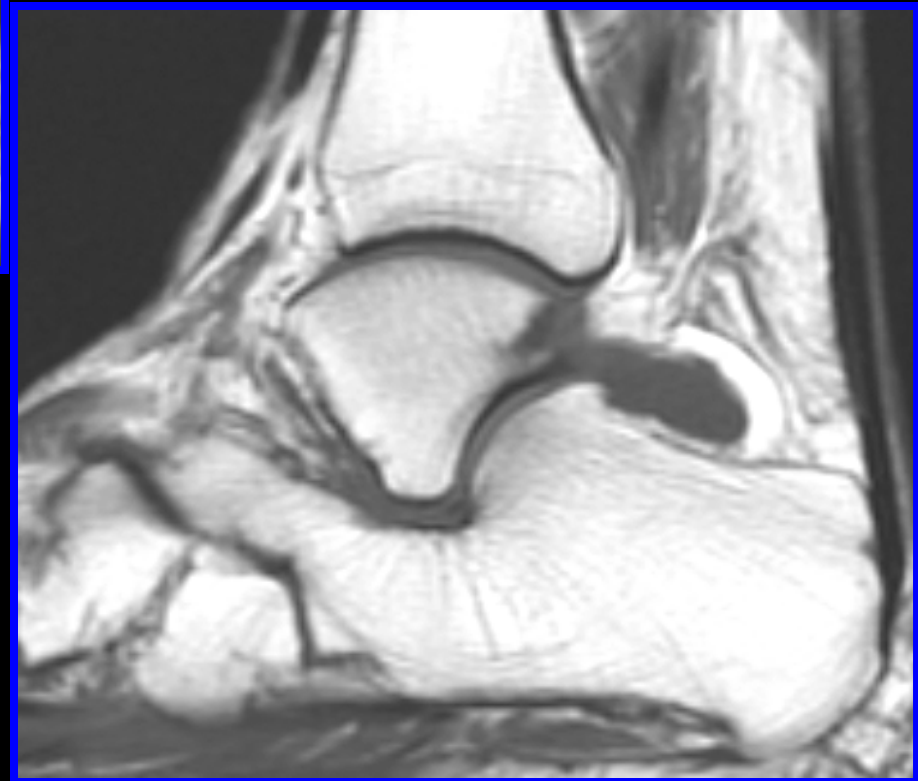
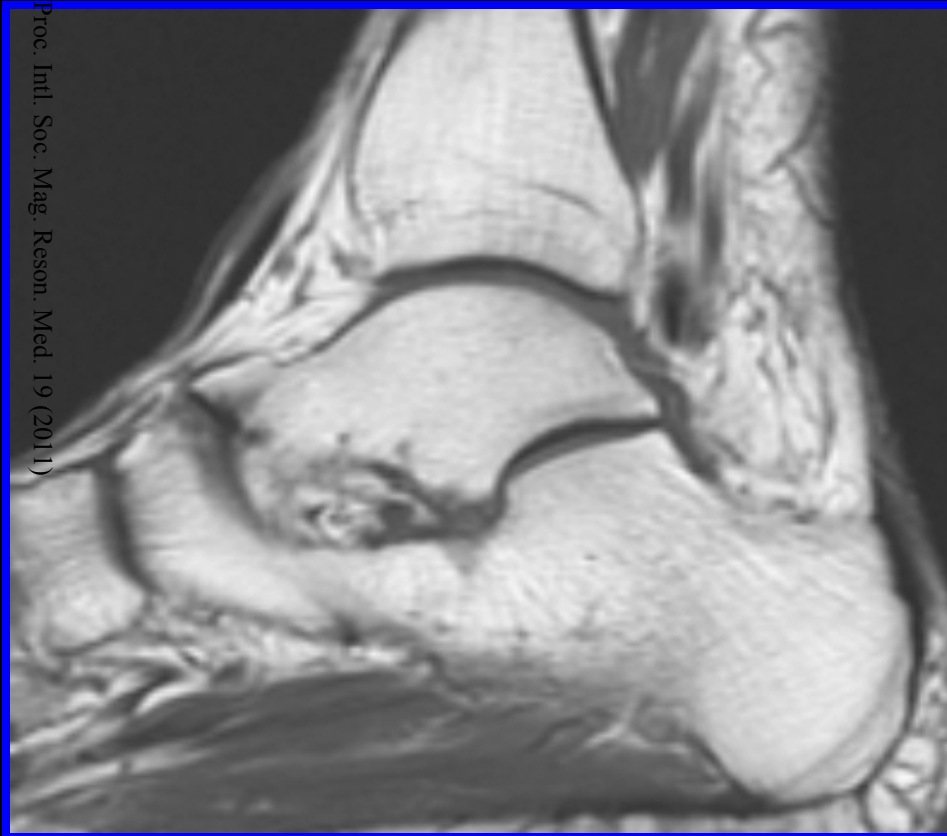


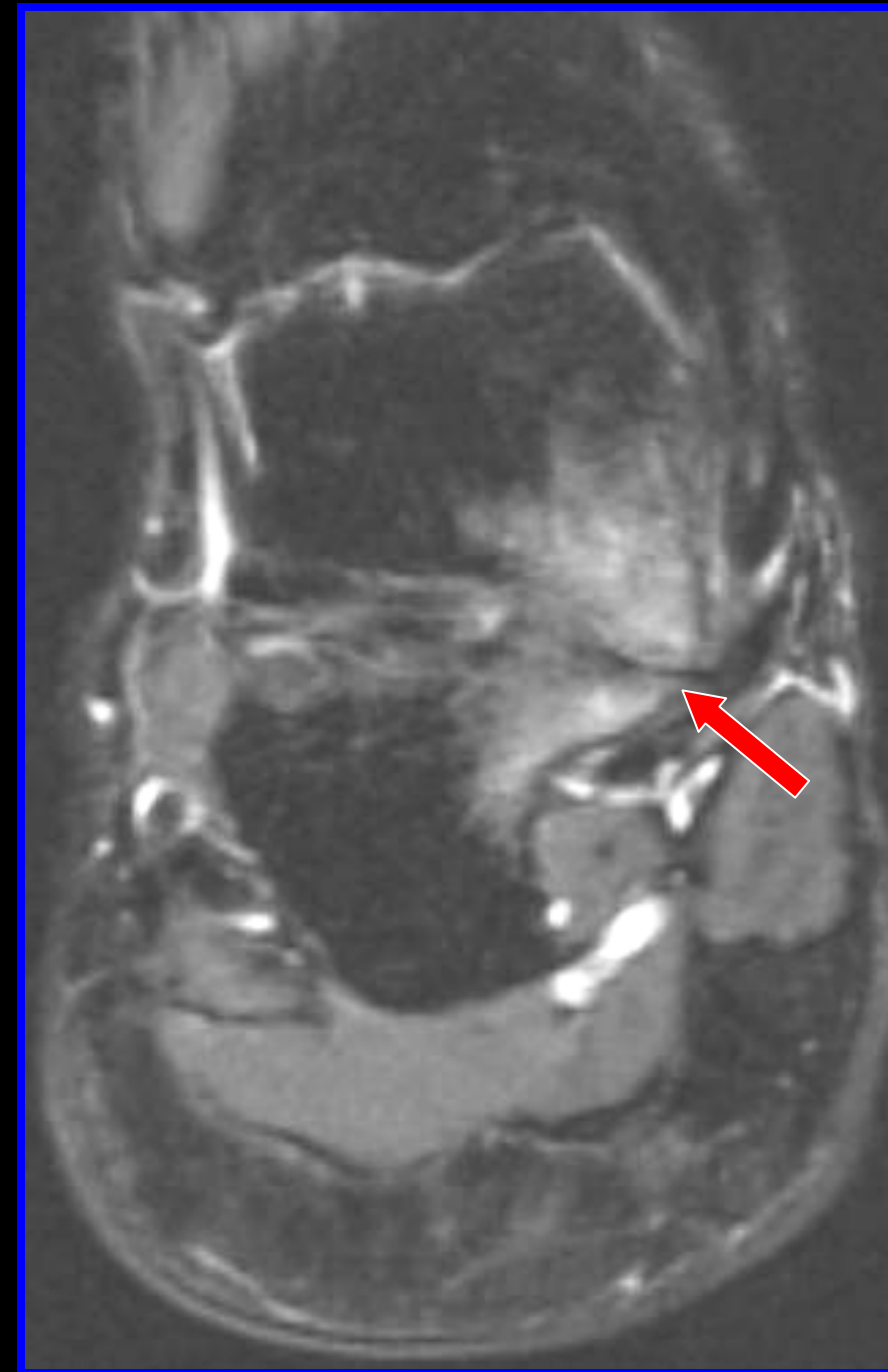
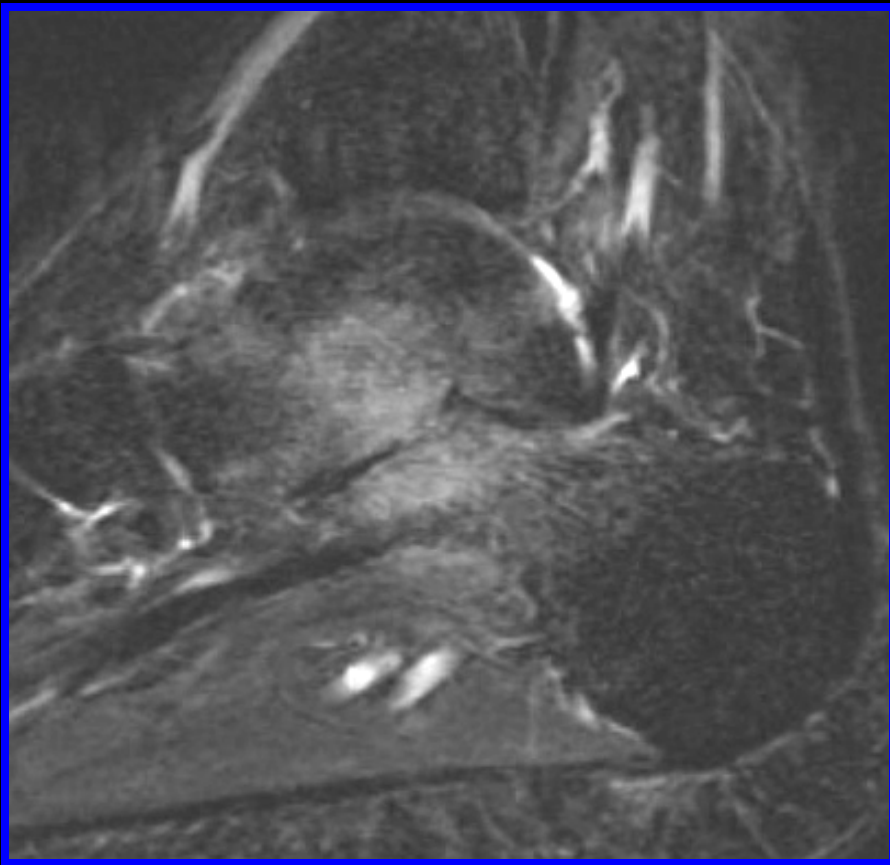
B B



**“Reverse Anteater”
sign**

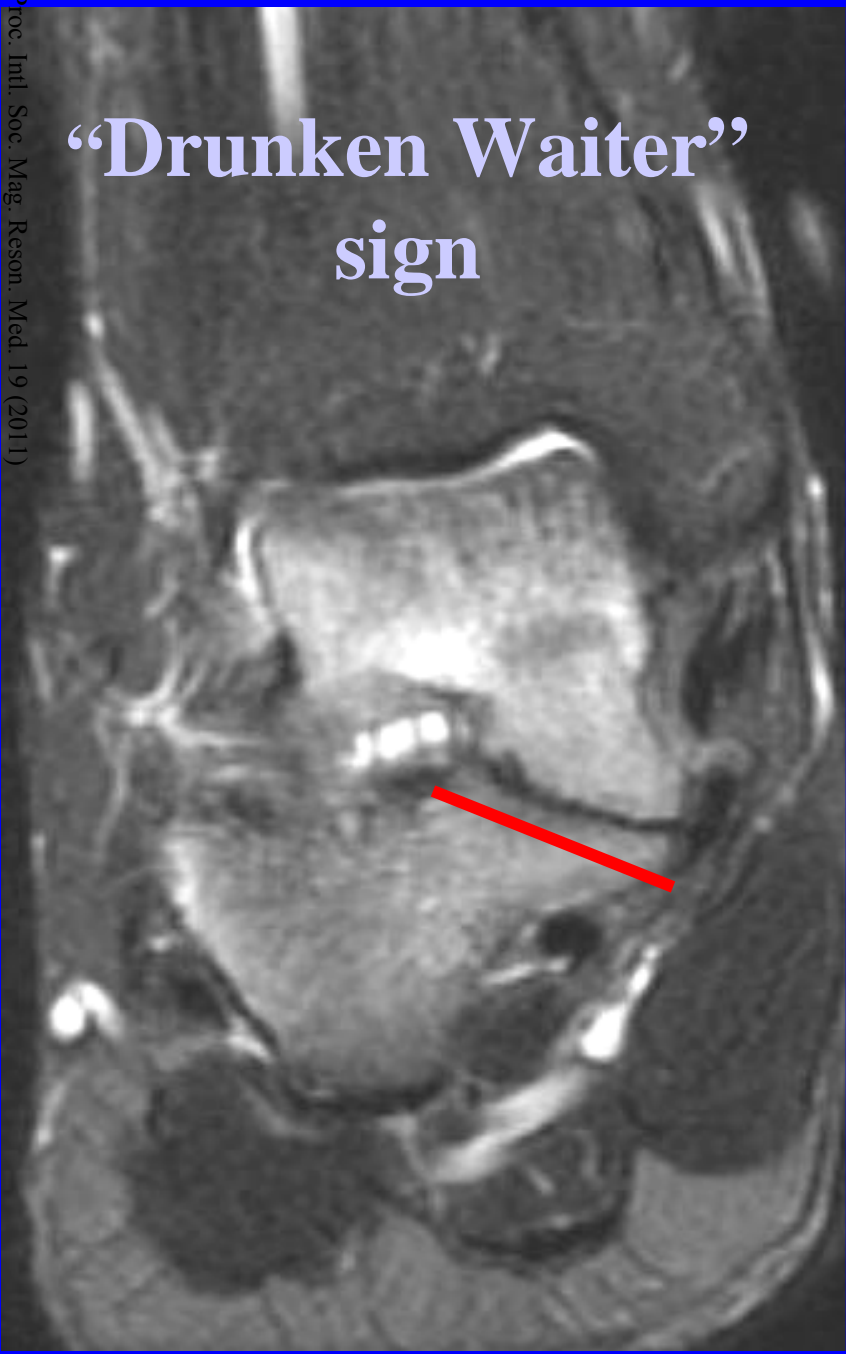
Osseous Calcaneonavicular Coalition

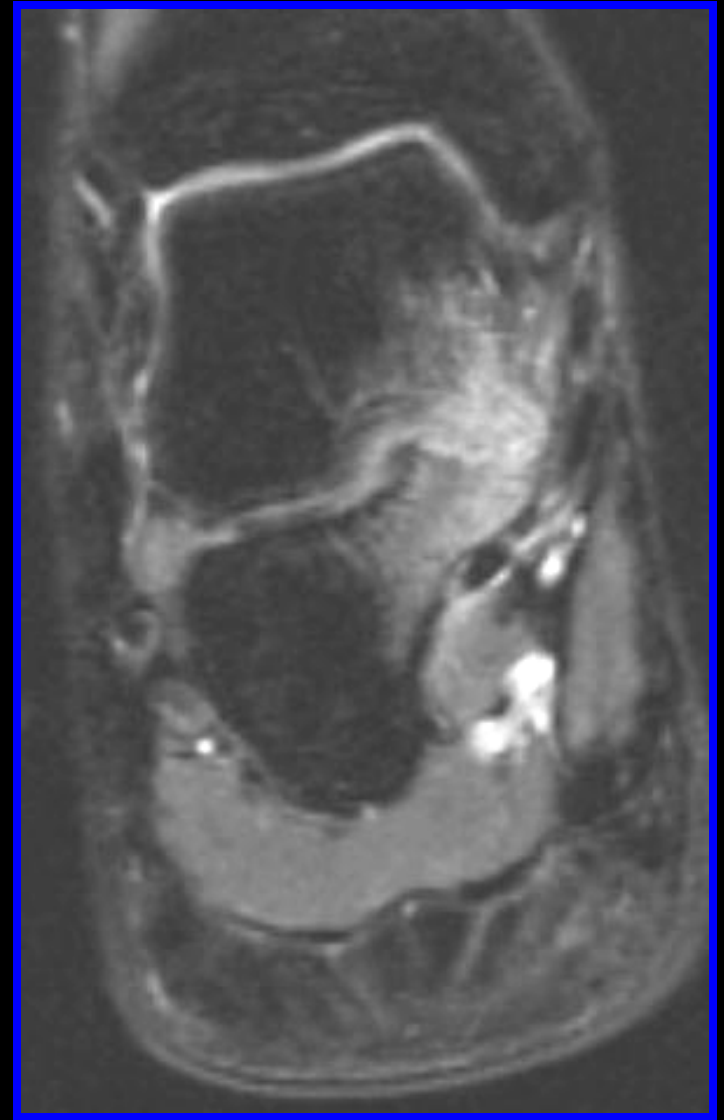




Middle
Talocalcaneal
(subtalar) Coalition

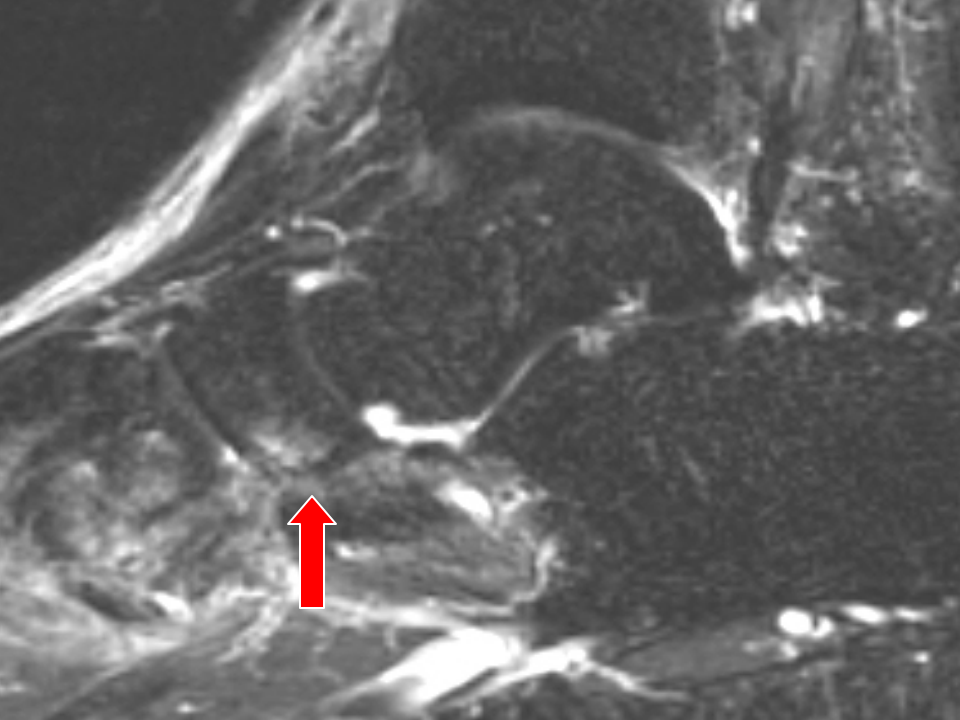
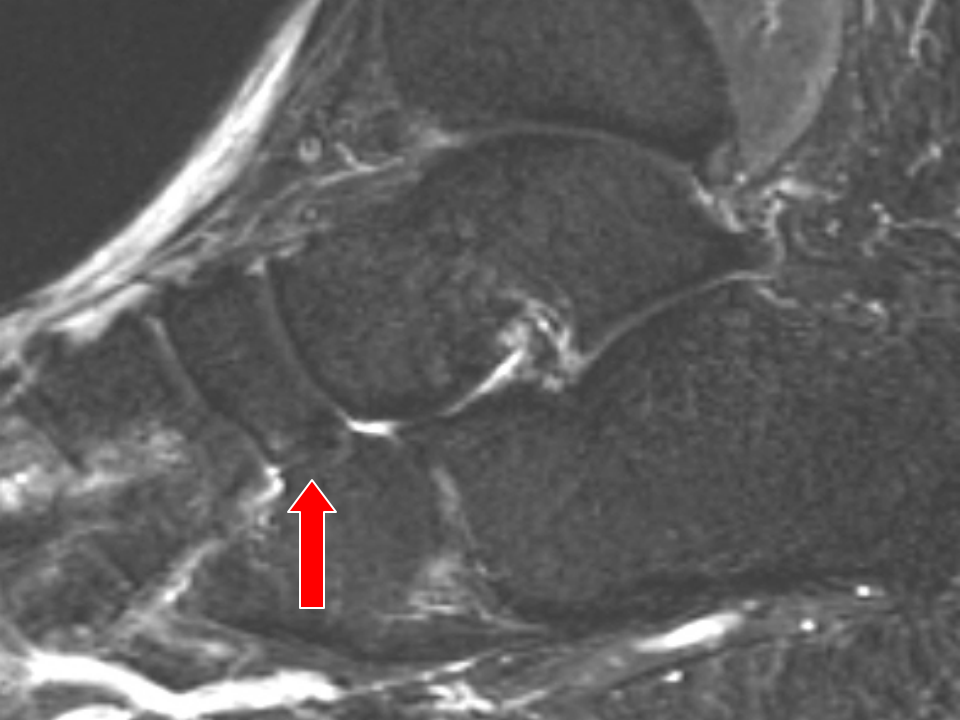
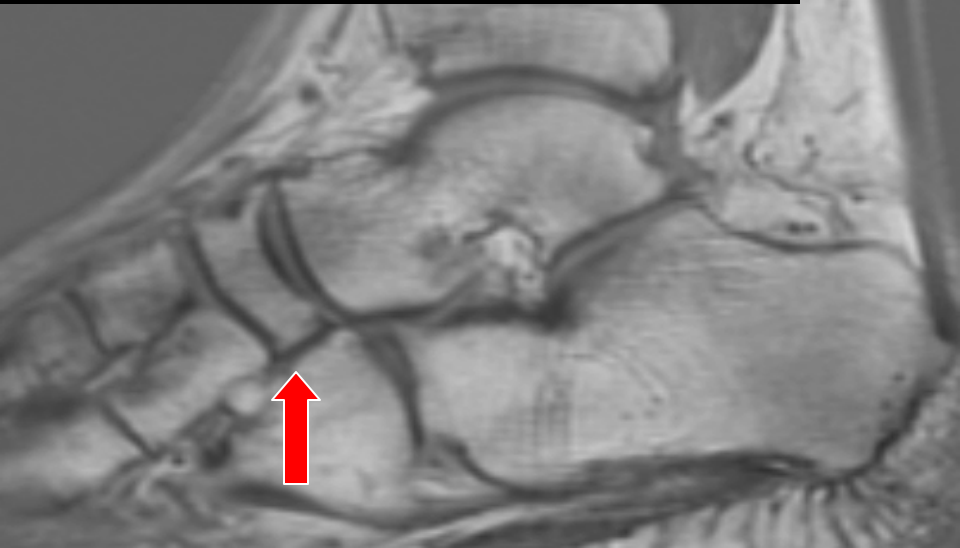
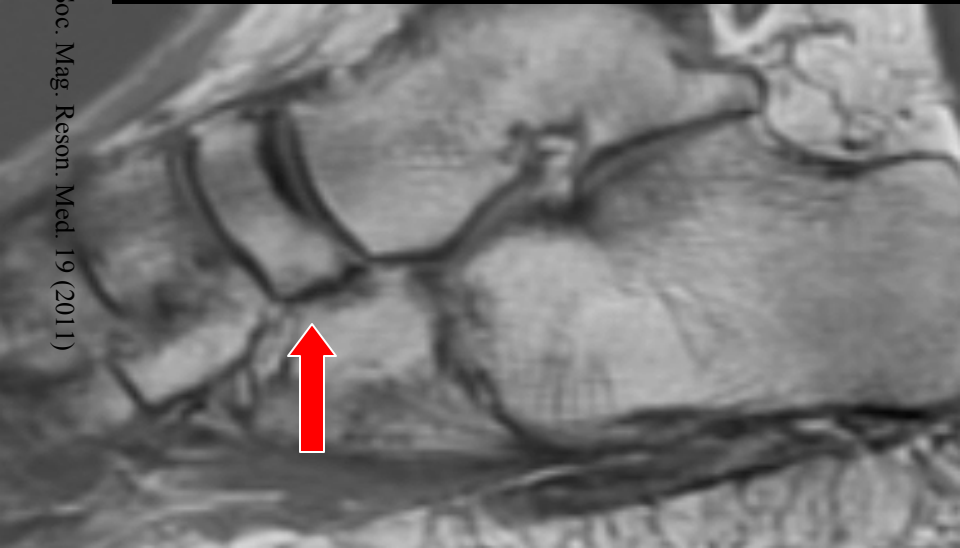
“Drunken Waiter” sign



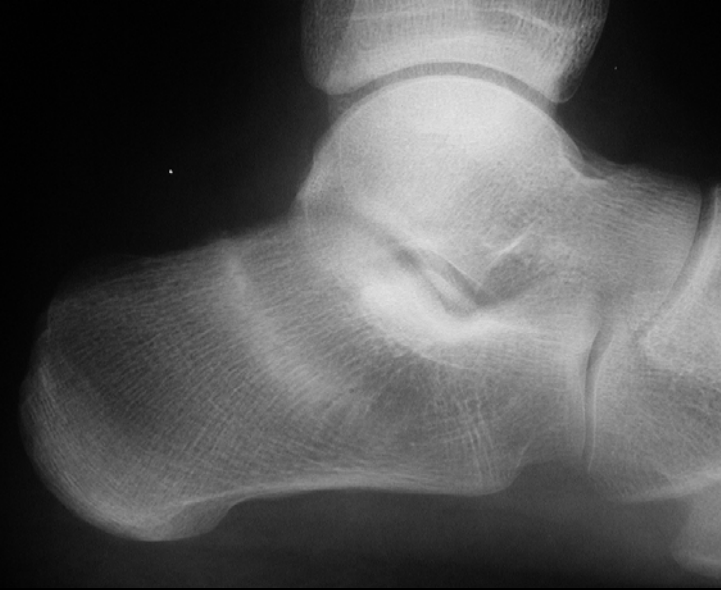


Osseous middle
subtalar coalition

Fibrous Navicular-cuboid Coalition



STRESS FRACTURE



Usually dx by radiography

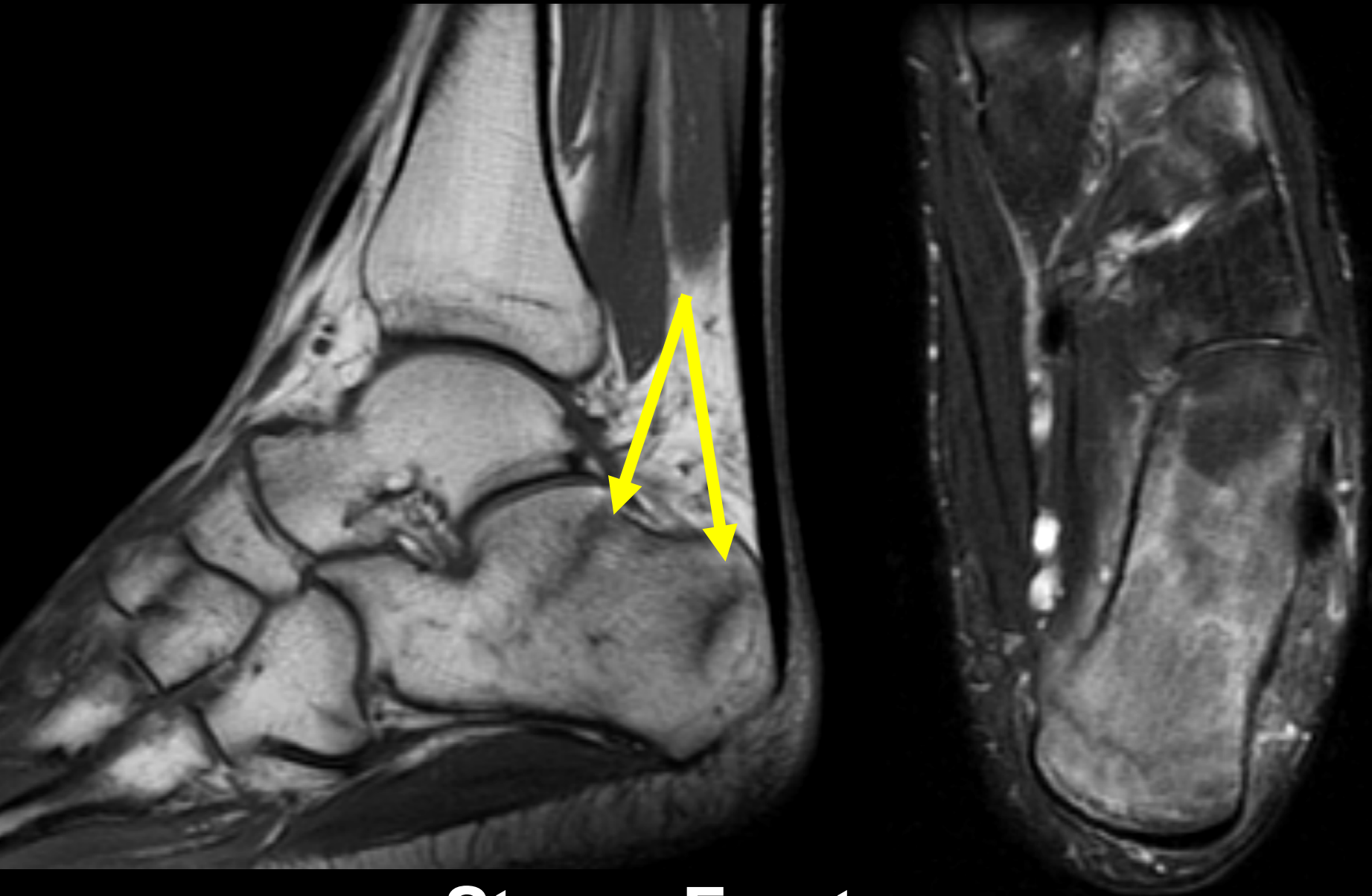
Chronic repetitive injury not

severe enough to cause acute fracture

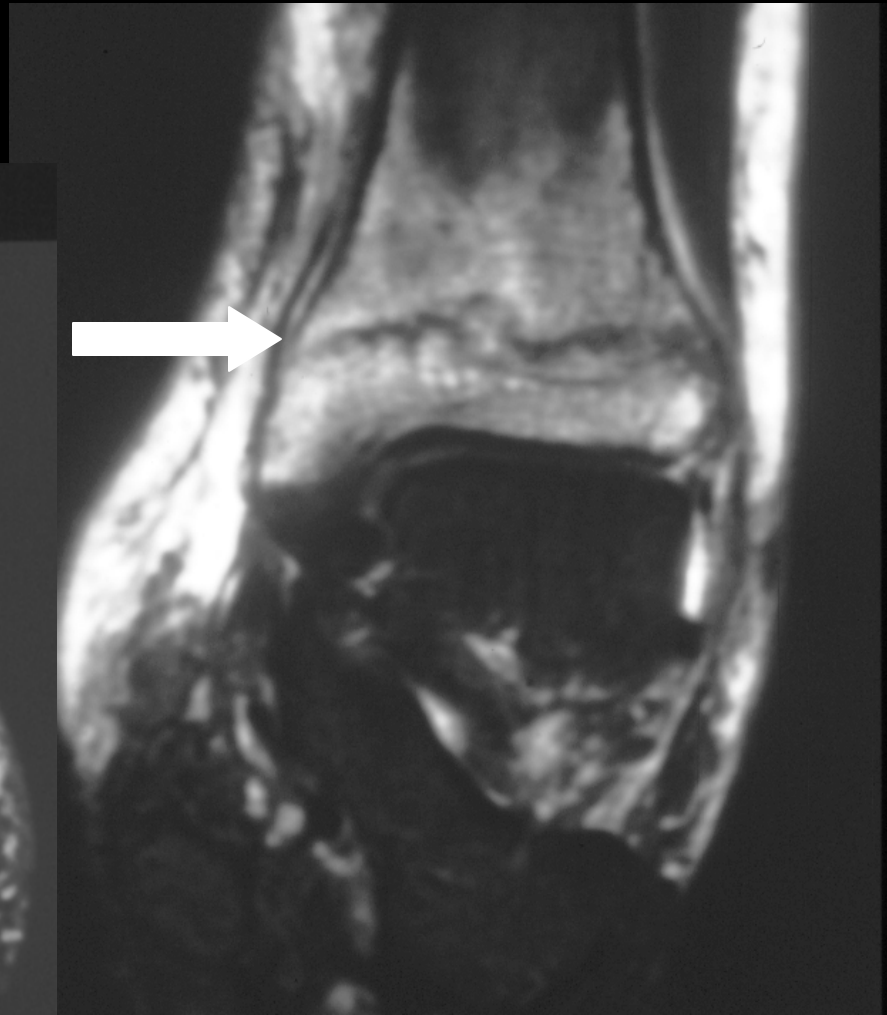
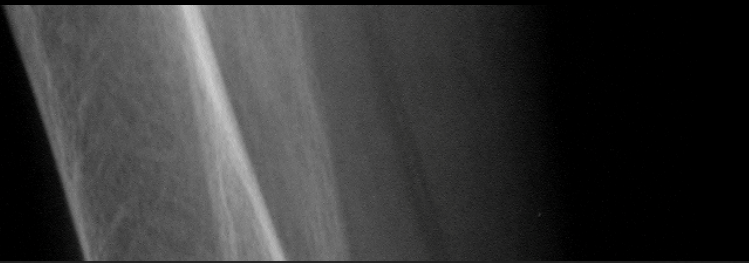
Common sites: distal MT shafts, calcaneus,
distal tibia

MR images - low signal line with surrounding
edema; just edema = 'stress response'

-pain at site, *no acute trauma by history*

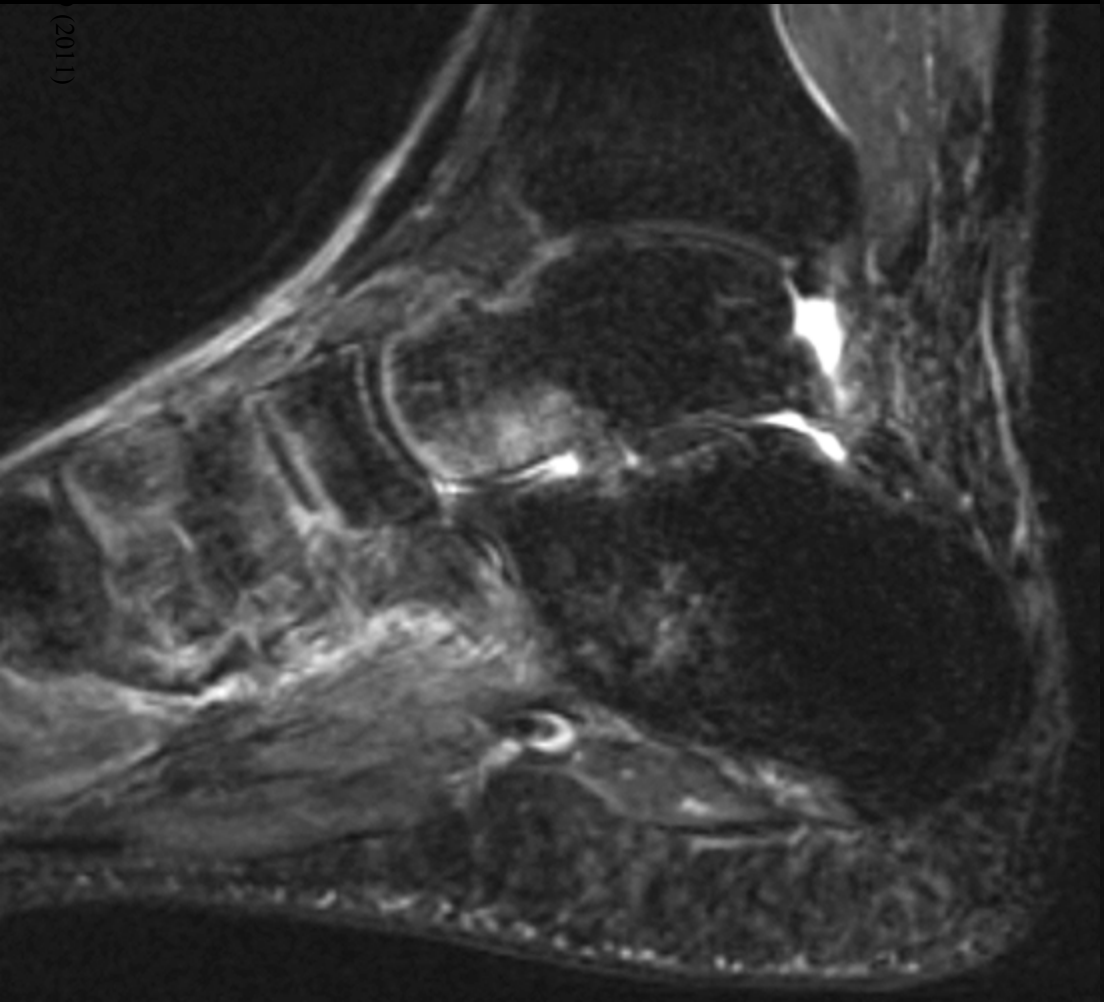


Stress Fracture

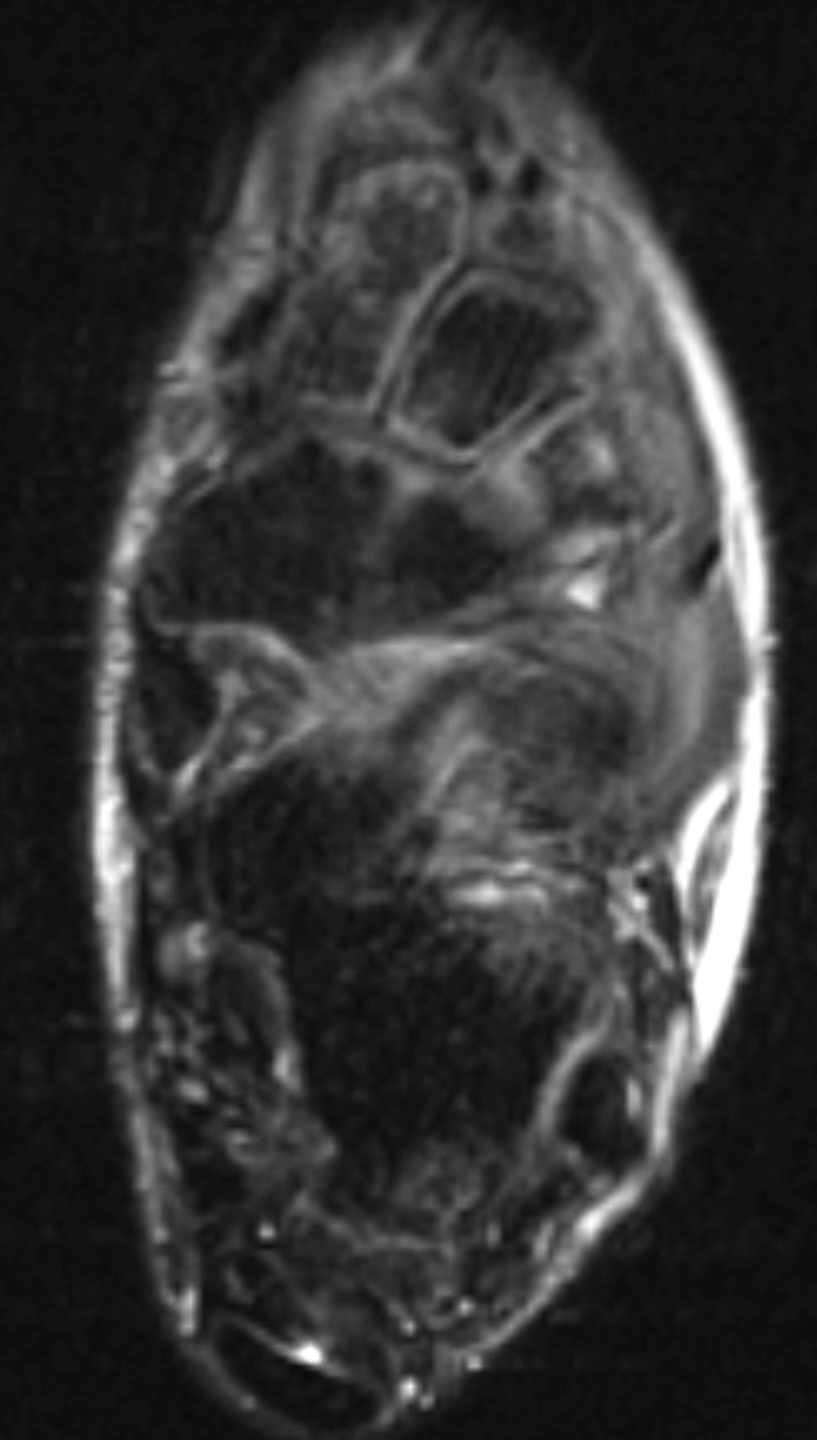


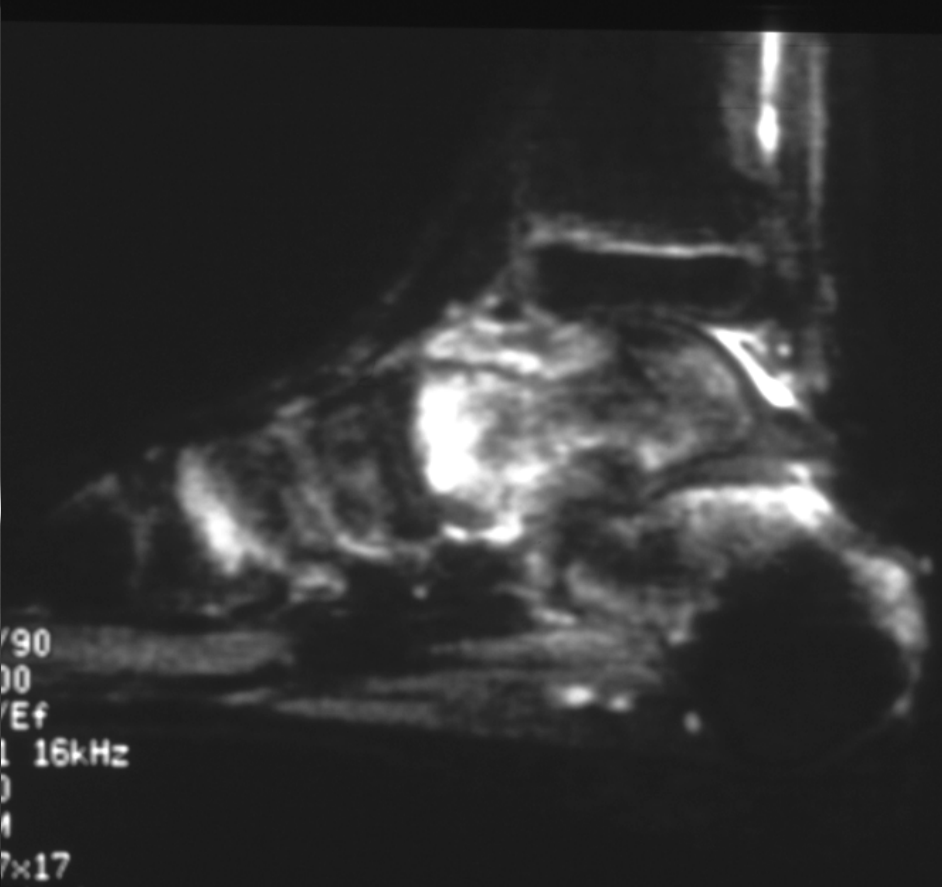
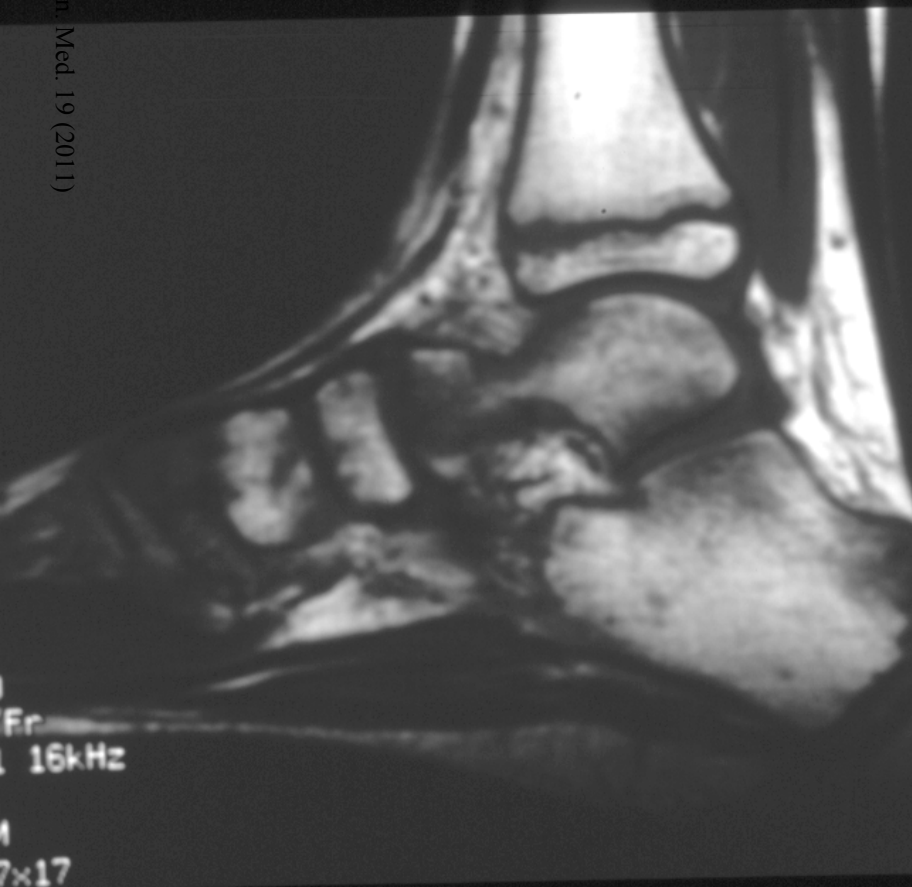
IMMOBILIZATION

- Increased signal on T2 related to trabecular remodeling (probably not true edema)
 - Subcortical, subarticular, subenthesisial
- Painless at site(s)
- Simulates true pathology

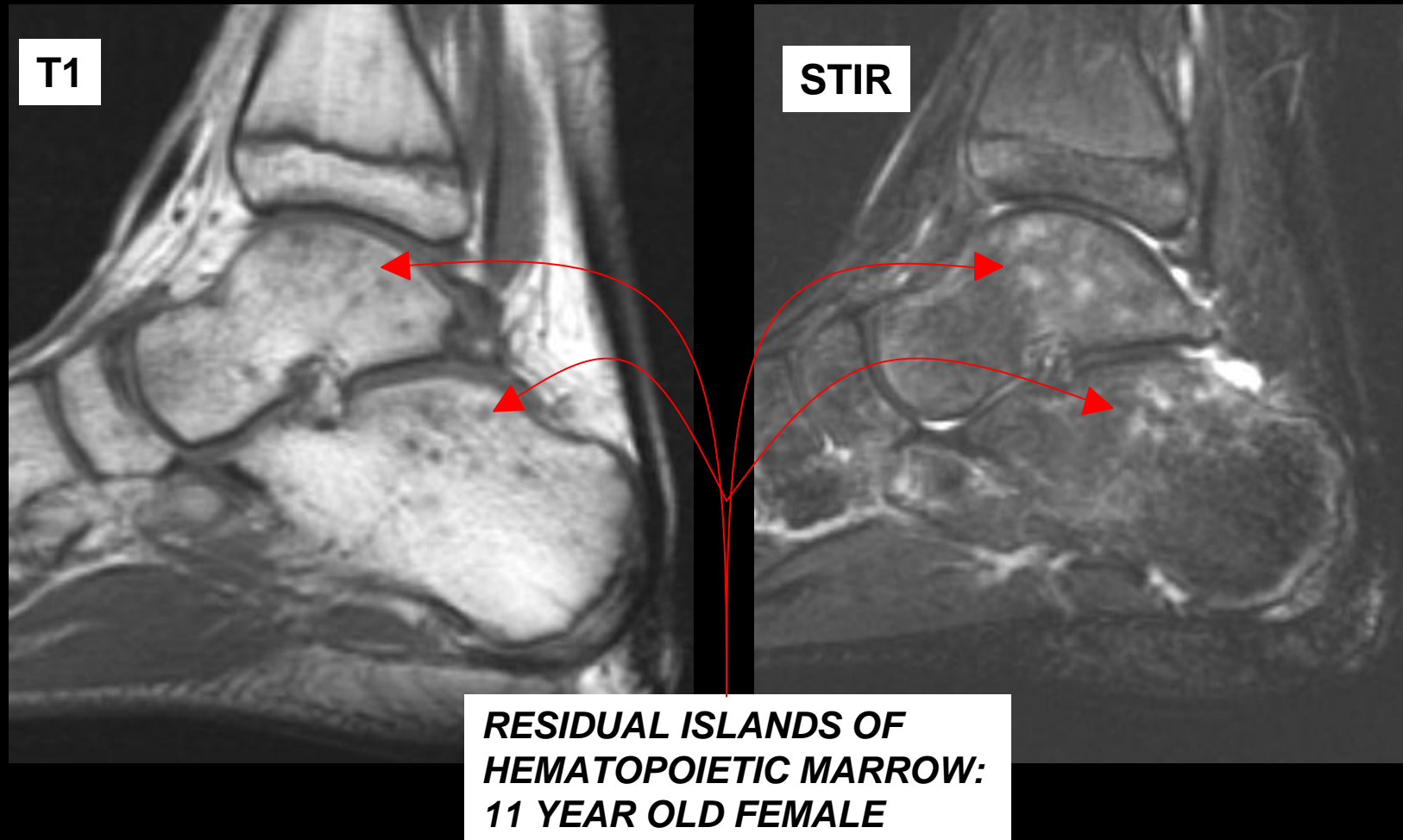


(2011)





PITFALL: HEMATOPOIETIC MARROW



Thank You!

