Impingement Syndromes of the Ankle

Ankle Impingement Overview

- **Clinical DX**
- **Increasingly recognized cause of chronic ankle pain**
- **Etiology can be soft tissue or osseous**
- **Professional and amateur athletes**
- **Painful limitation of the full range of ankle movement**

- **ANTEROLATERAL**
- **ANTERIOR**
- **ANTEROMEDIAL**
- **POSTERIOR**

Imaging of Ankle Impingement

Conventional Radiography

Osseous abnormalities. Alignment.

CT and Scintigraphy

Osseous abnormalities, soft tissue evaluation superseded by MRI.

Scintigraphy has very limited role.

MRI

Most useful modality. Excellent soft tissue resolution. MR Arthrography can provide improved detection of soft tissue impingement.

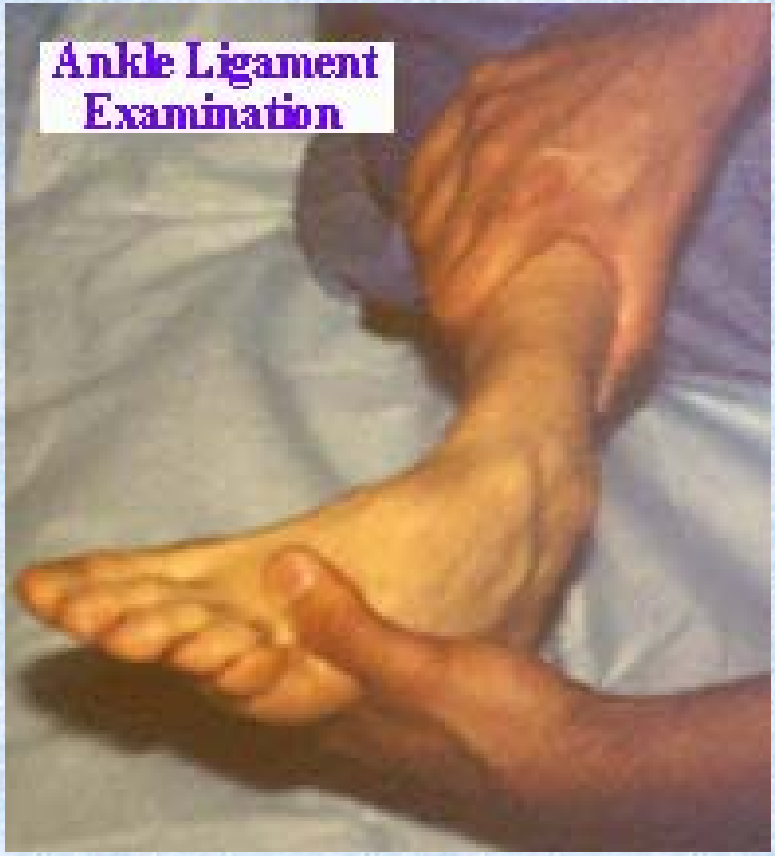
Mechanism of Anterolateral Impingement

- **Forced plantar flexion and supination**
- **Tear Ant-Lat capsular tissues**
- **Mechanical instability**
- **Repeated microtrauma**
- **Soft tissue hemorrhage**
- **Synovial hypertrophy and scarring**
- **= SOFT TISSUE IMPINGEMENT**

*Hypertrophy of Inf portion of ant. tib-fib lig and spurs are rarely predominant features.

Symptoms of Anterolateral Impingement

- **Focal anterolateral pain aggravated by supinating or pronating**
- **Diagnosis of exclusion confirmed by arthroscopy**



Anterolateral Anatomy

Osseous Boundaries:

Tibia – Posteromedial

Fibula – Lateral

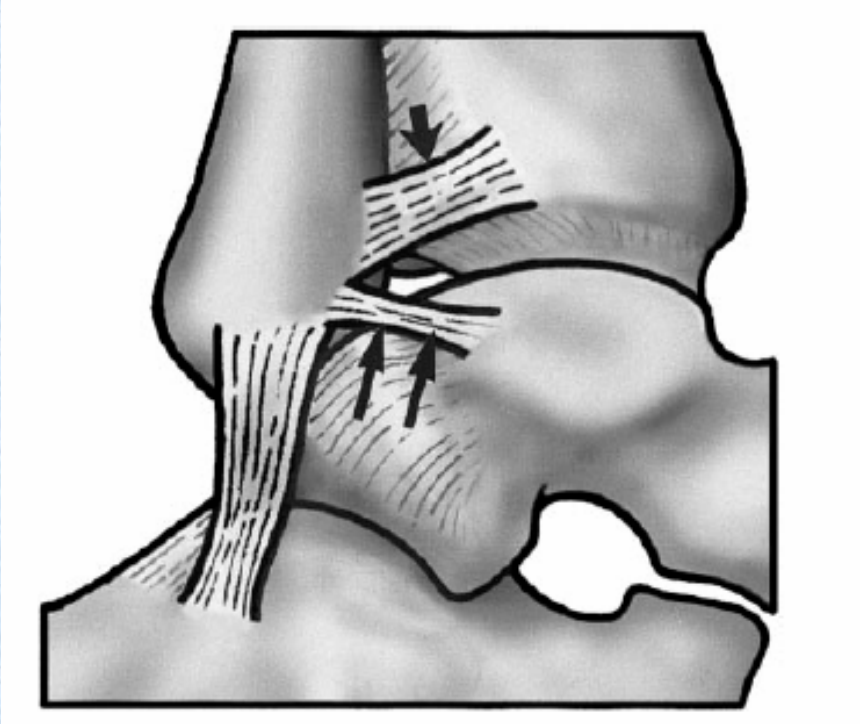
Soft Tissue Boundaries:

Tib-Fib Jt. Capsule

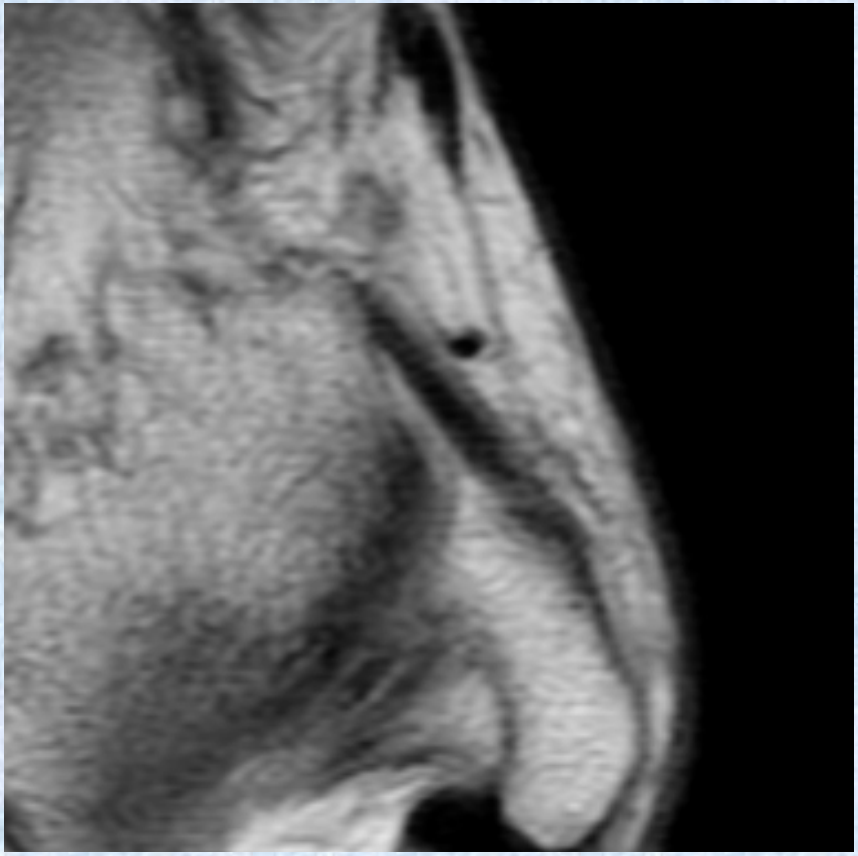
Ant. Tib-Fib Ligament

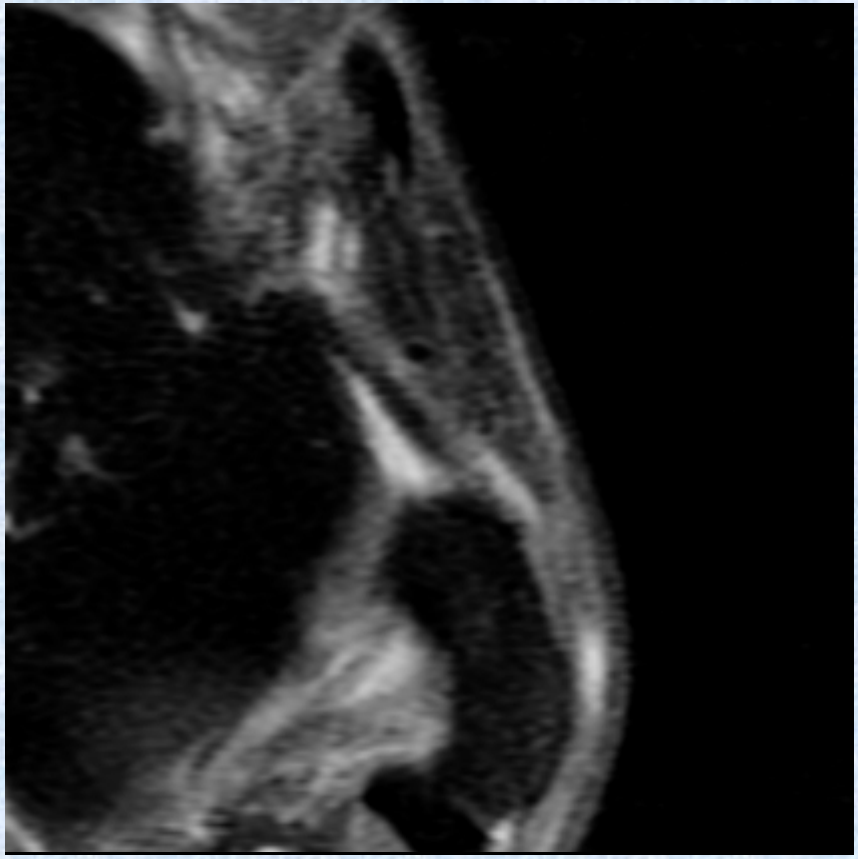
Ant Talo-Fib Ligament

Calcaneo-Fib Ligament



Anterolateral MR Anatomy





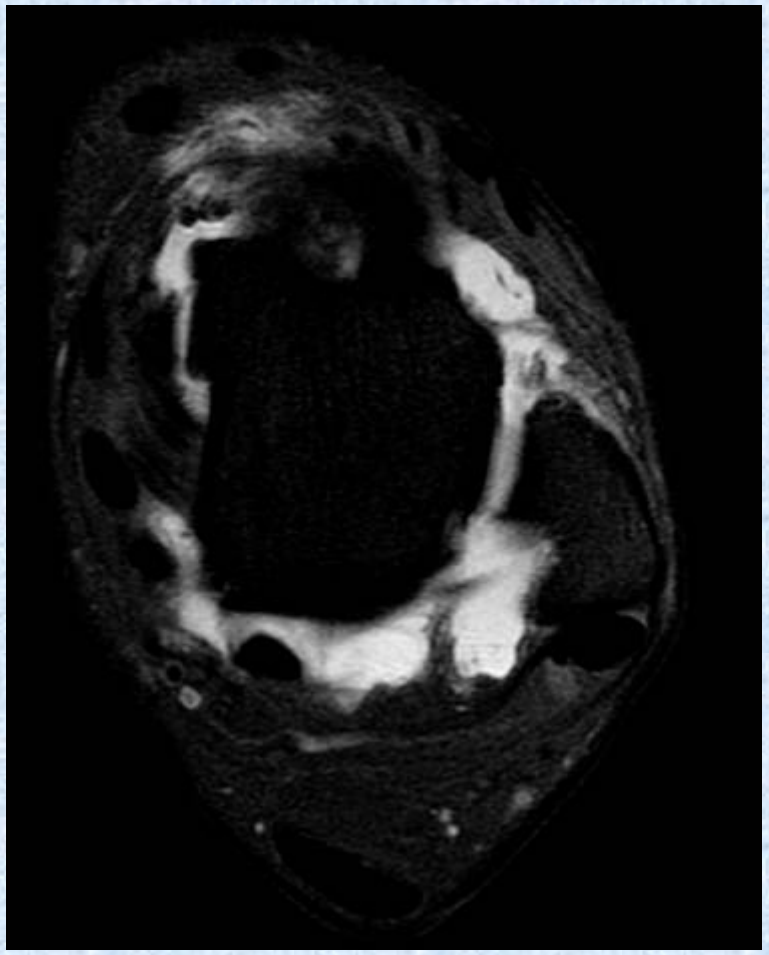
Anterolateral MR Anatomy

Anterolateral Impingement: MR Findings

- **Nodular contour of the anterolateral capsule**
- **Synechiae**

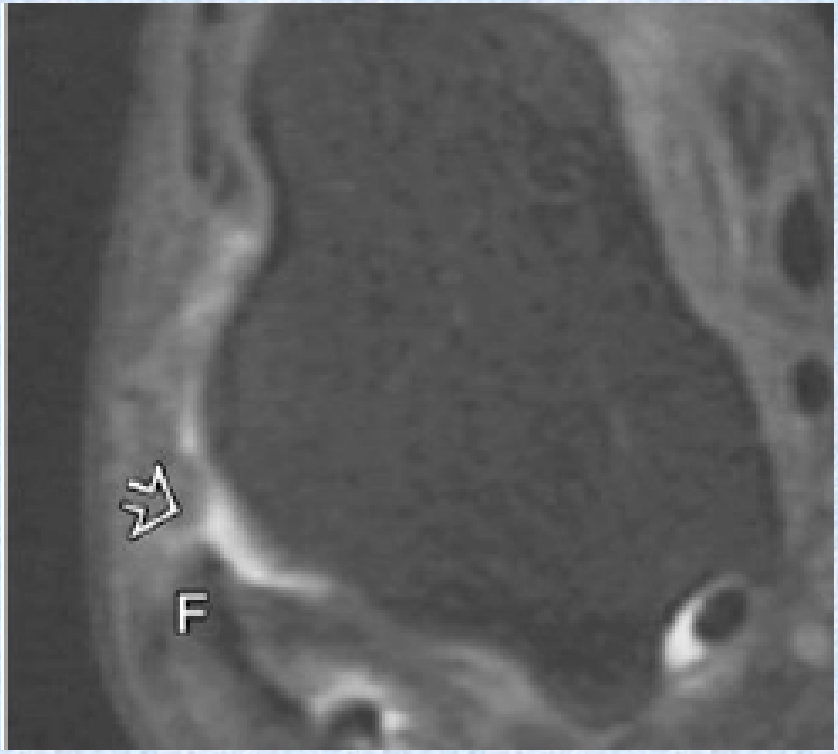
Anterolateral Impingement: MR Findings

- **Disrupted anterior talofibular ligament**
- **Synovial thickening within the anterolateral recess**
- **Nodularity of the capsular tissues**
- **Synechiae**

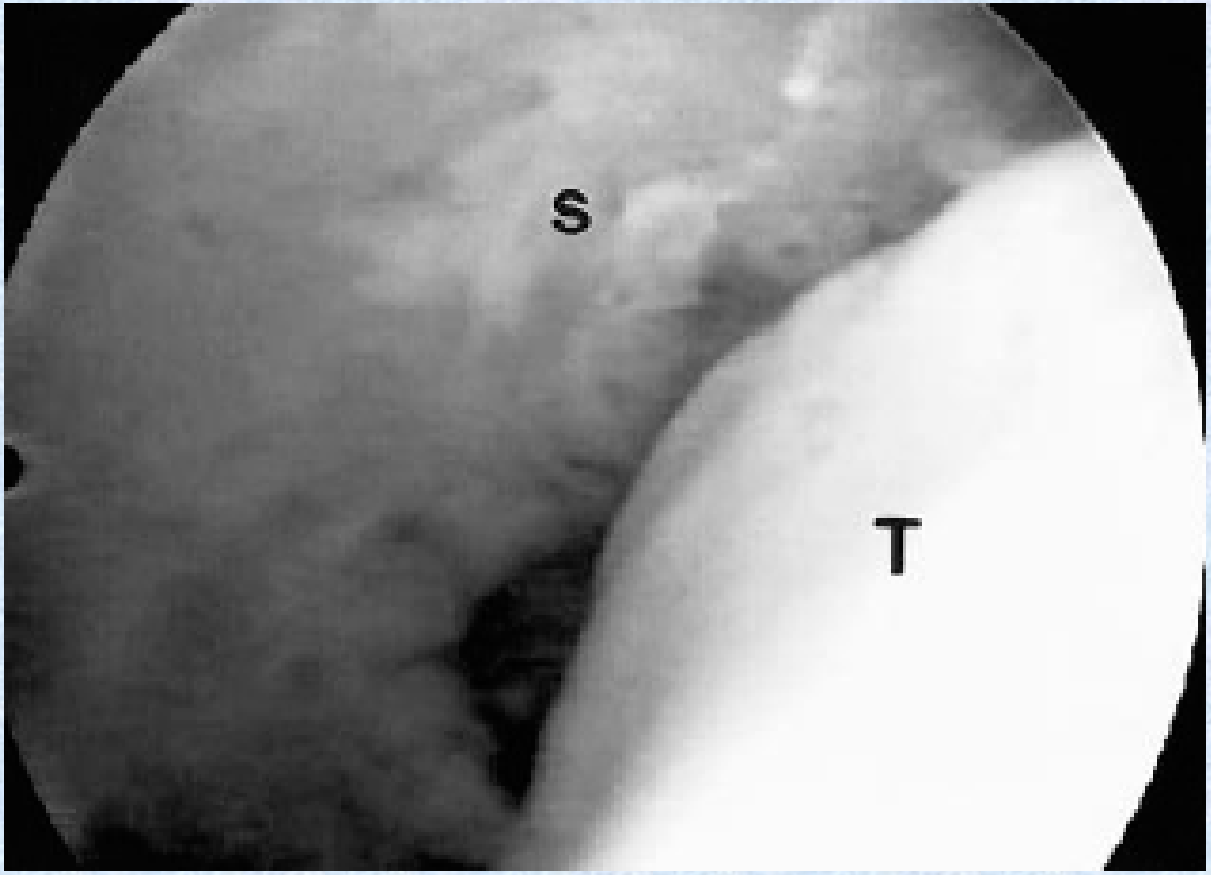


Anterolateral Impingement: MR Findings

- **No fluid between the fibula and talus**
- **Irregular capsule despite arthrographic distention**



Anterolateral Impingement: Arthroscopic Findings



Anterolateral Impingment: Conclusion

- **Conflicting Studies - MR Sens: 39-100% Spec: 50-100%**
- **Rubin et. al: MR only accurate with jt. Effusion**
- **Robinson et. al: Arthrography 100% sens and spec. for synovitis at arthroscopy.**
- **One study found synovitis and scarring in 11/19 pts at arthroscopy who did NOT have sx of anterolateral impingement.**
- **Look for concomitant findings: chondral defects, osseous spurs, ATAF rupture.**

Anterior Impingement

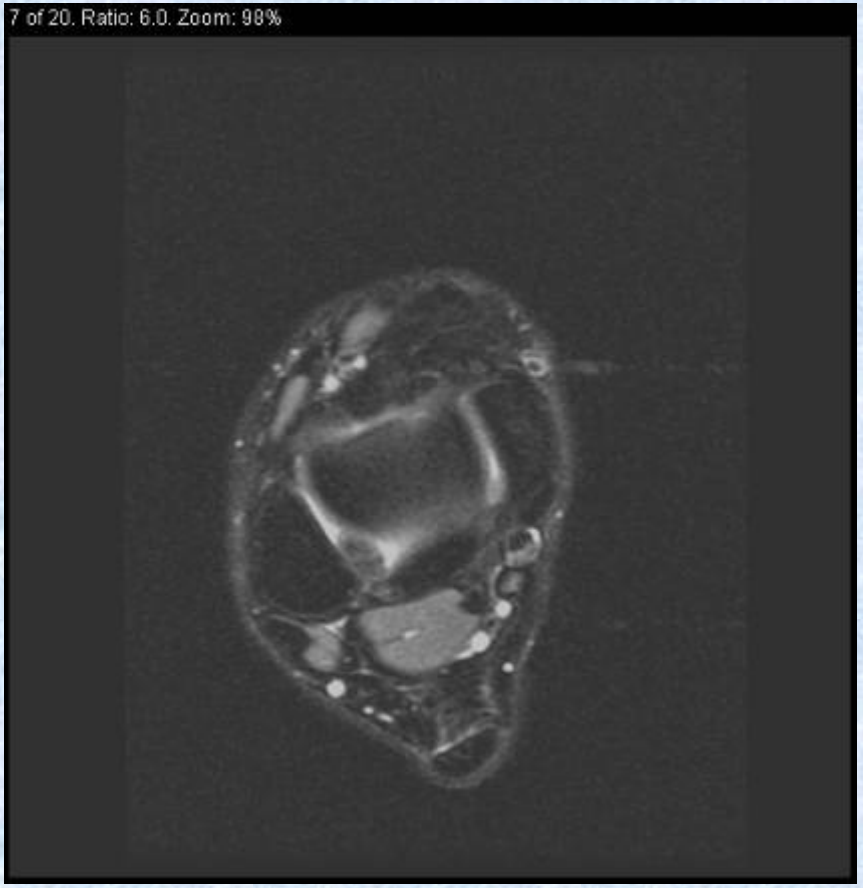
- **Supination and forced dorsiflexion injuries with repeated microtrauma**
- **Very common in ballet and soccer**
- **Anterior tibiotalar osteophytes form within the joint capsule at the margin of the articular cartilage rim**
- **Cartilage damage repairs with scarring and fibrosis**

Normal Anterior Ankle Joint

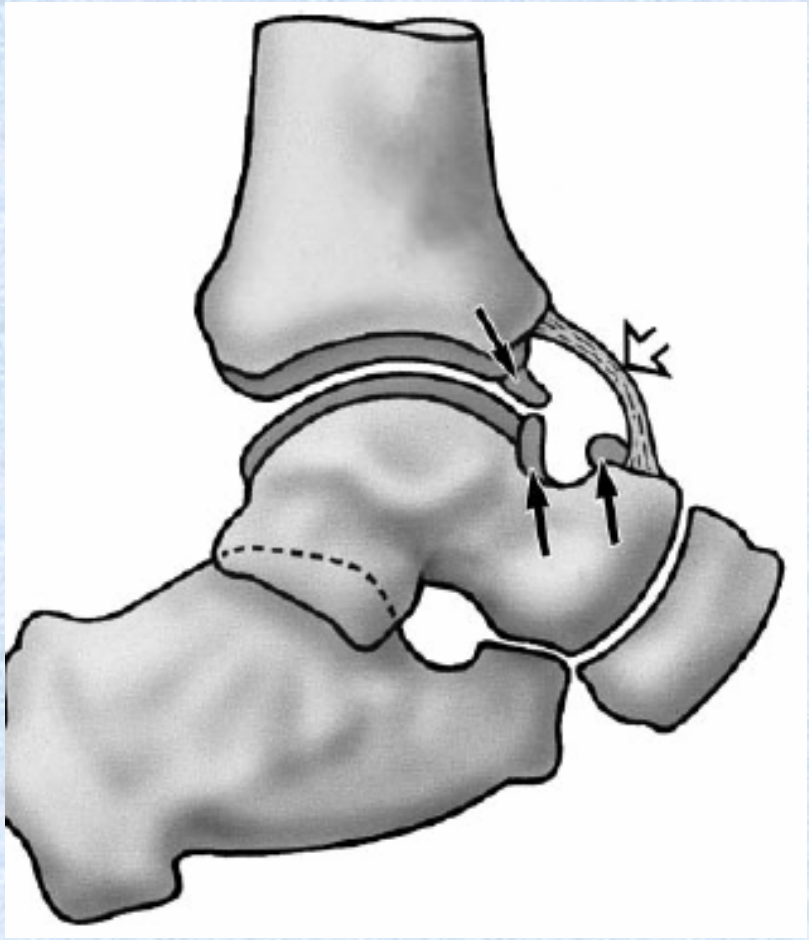
- **Anterior Tibiotalar articulation**
- **Anterior joint capsule**

Normal Anterior Ankle Joint

Normal Anterior Ankle Joint

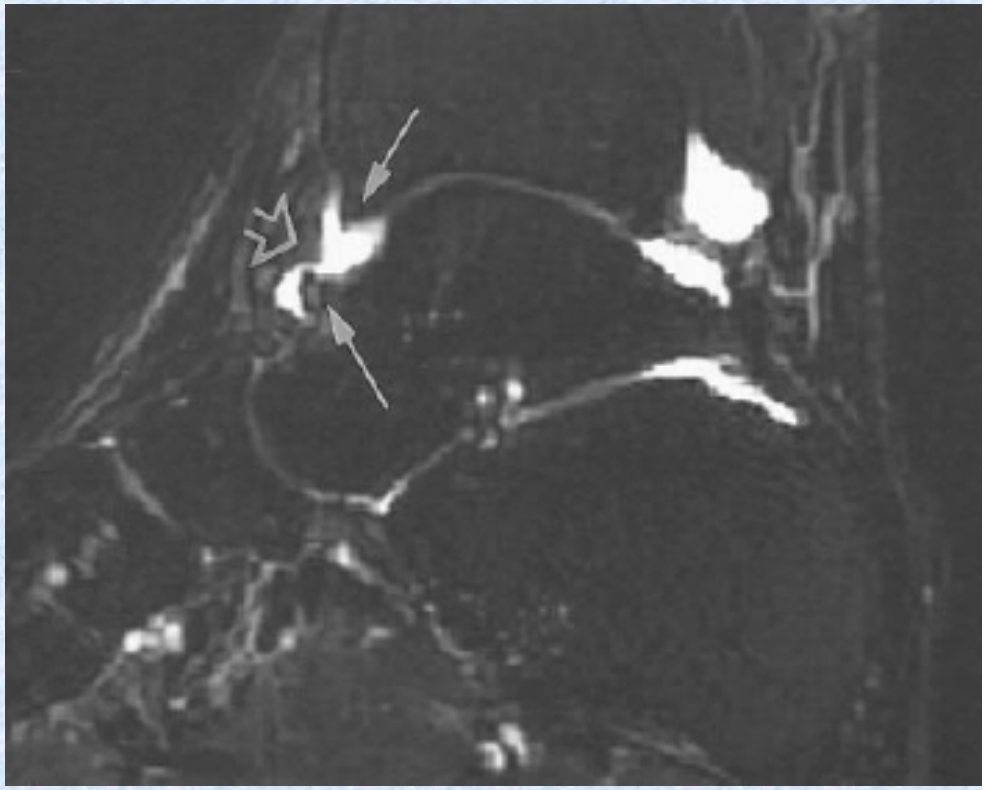


Anterior Impingement: Radiographic Findings



Anterior Impingement: MR Appearance

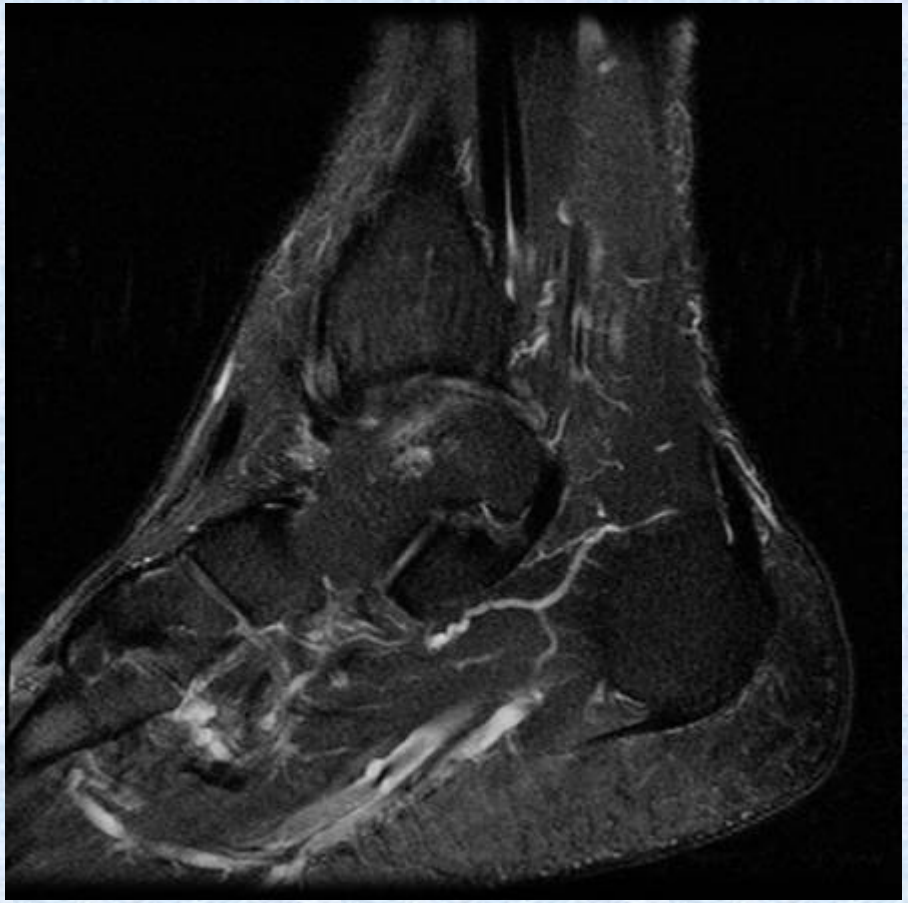
- **Anterior tibiotalar osteophytes**
- **Synovial thickening at the anterior joint capsule. Low T1/Low-Intermediate T2.**



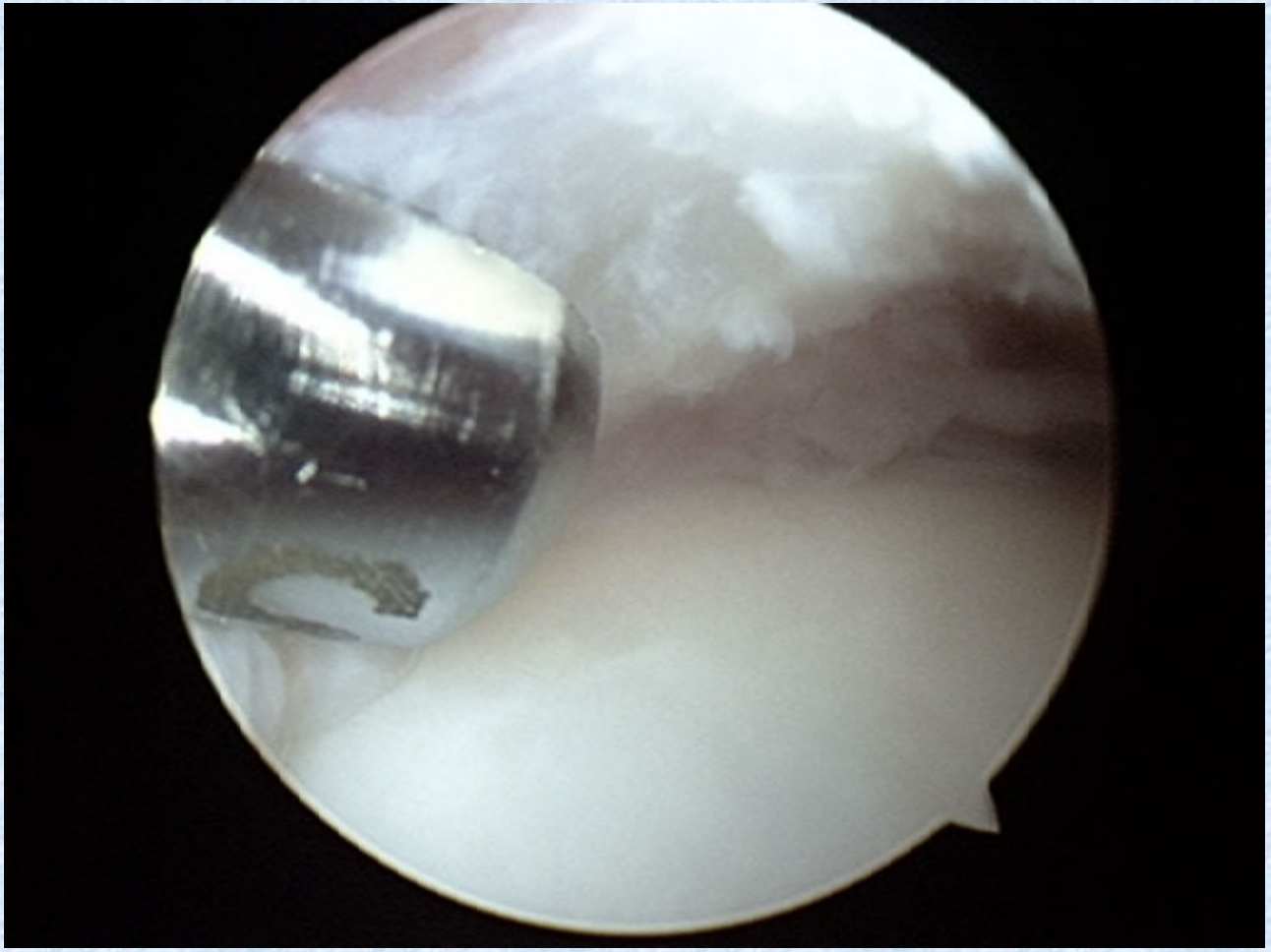
Anterior Impingement: MR Appearance

34 y/o soccer player

- **Anterior tibiotalar osteophytes**
- **High signal tissue within the anterior joint capsule**
- **Talar edema (uncommon finding)**



Anterior Arthroscopy

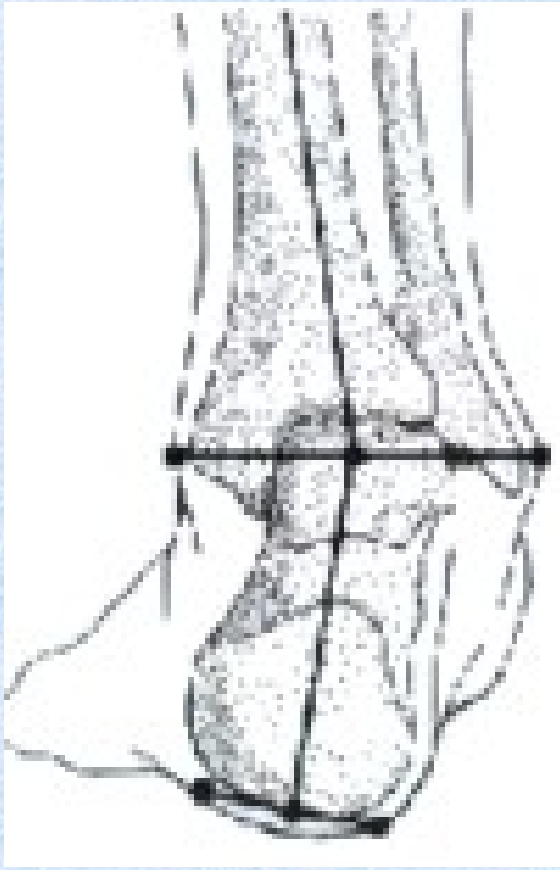


Anterior Impingement: Conclusions

- **45-59% asymptomatic professional athletes have anterior tibiotalar spurs**
- **Anterior synovial thickening and scarring critical for producing symptoms.**
- **Most respond to rehab**
- **Arthroscopic resection of spurs and soft tissue with joint washout has shown excellent results**
- **Prognosis depends heavily on amount of OA present**

Anteromedial Impingement

- **Most patients experienced a remote supination injury**
- **Possible rotational component**
- **Tear anteromedial capsule**
- **Microtrauma**
- **Synovitis and capsular thickening**
- **+/- Spurs**

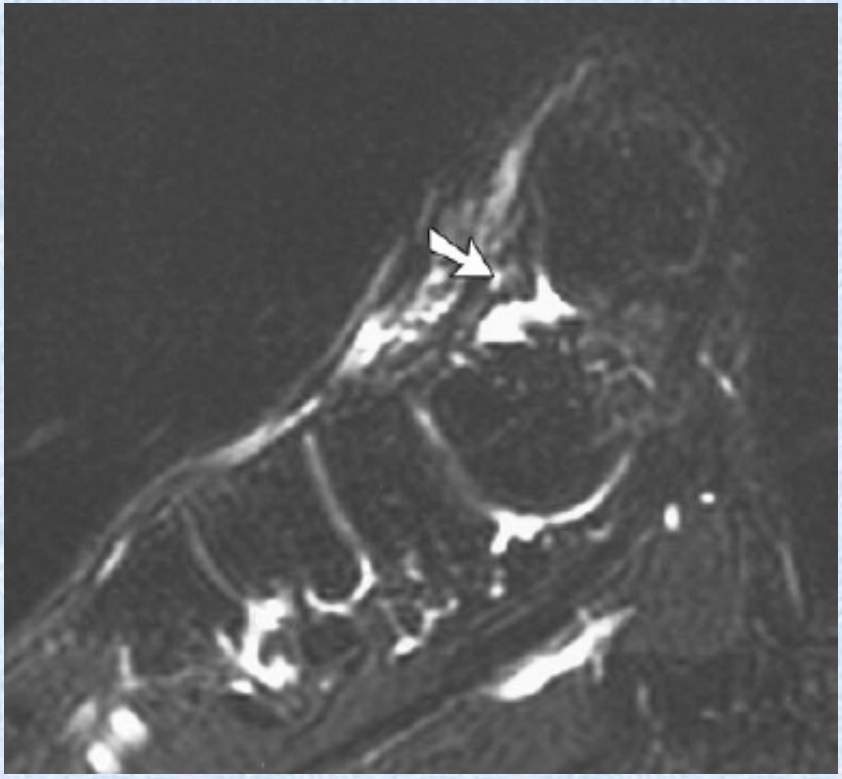


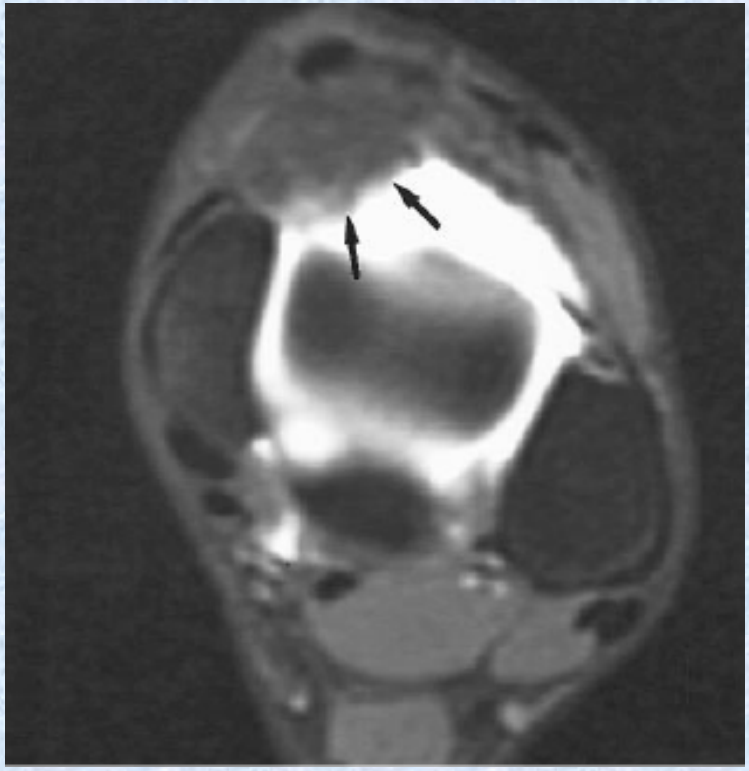
Anteromedial Anatomy

- **Anteromedial tibiotalar articulation**
- **Anteromedial joint capsule**
- **Deltoid Ligament:**
  - **Anterior tibiotalar and Tibionavicular components**

Normal Anteromedial MR Anatomy

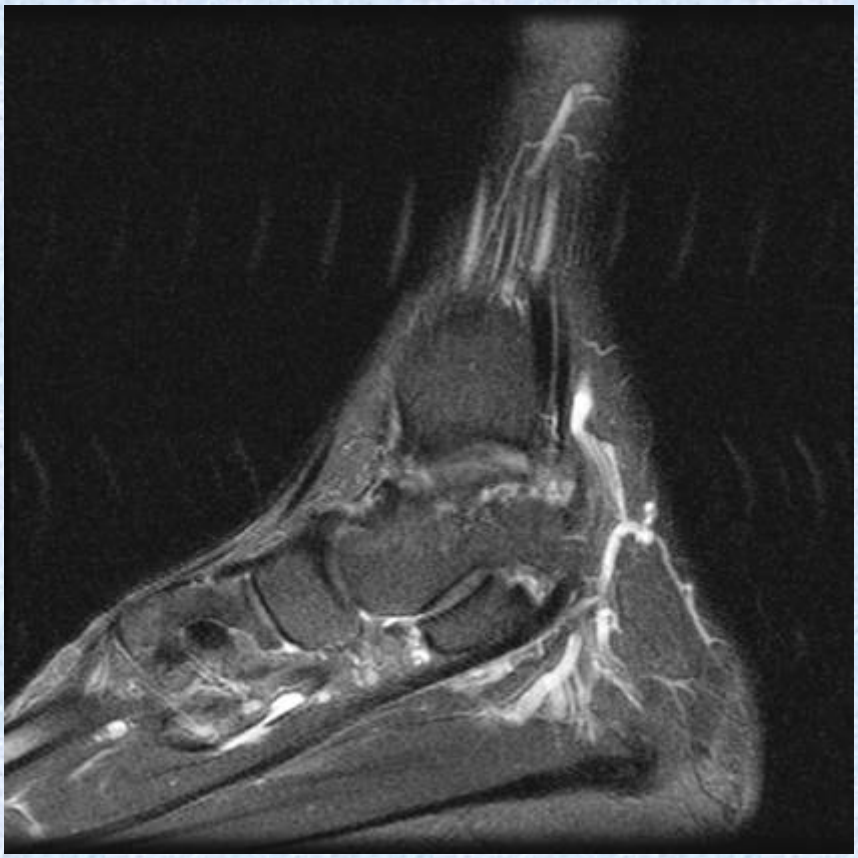
Anteromedial Impingement: MR Findings

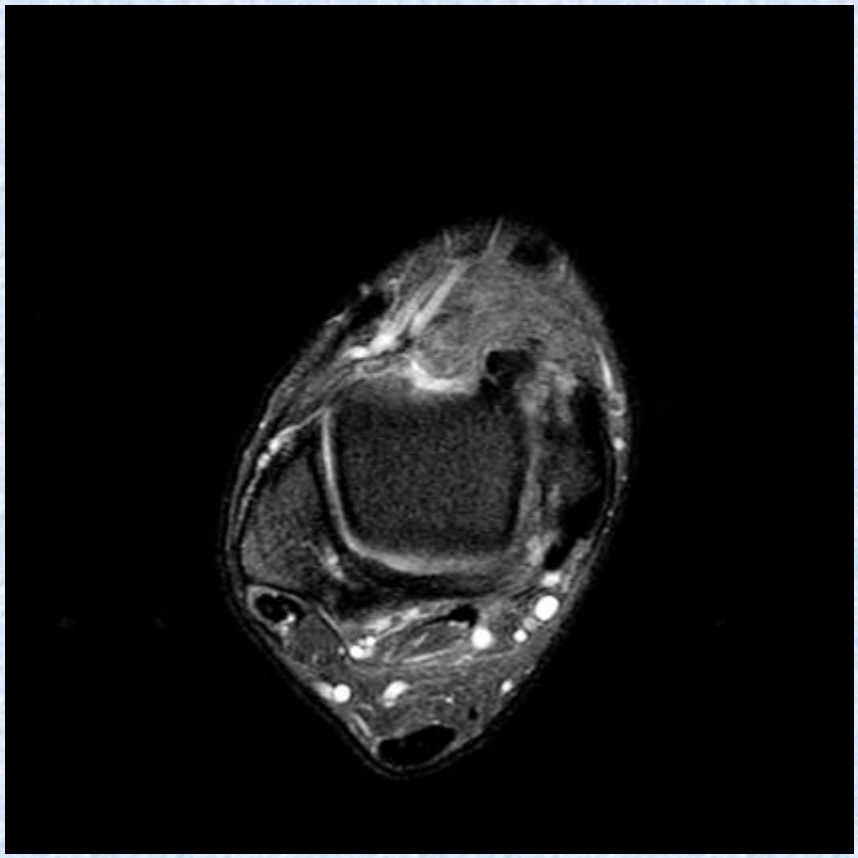




Male kickboxer with focal thickening of anteromedial capsule.

Anteromedial Impingement: MR Findings





41 y/o with anteromedial osteophytes and extensive capsular and synovial hypertrophy.

Anteromedial Impingement: MR Findings

- **Female hockey player with anteromedial tibiotalar osteophytes**
- **Fluid within the anteromedial recess**

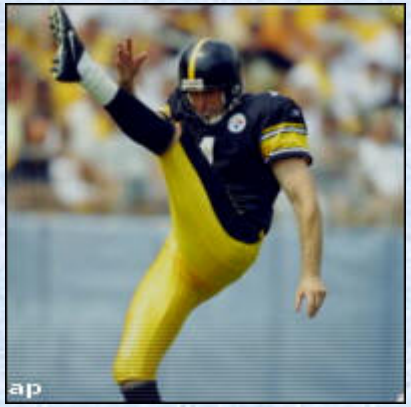
Anteromedial Arthroscopy

Anteromedial Impingement: Conclusions

- **Largest series: 11 pts with clinical sx:**
  - **11/11 – Capsular thickening**
  - **2/11 – Spurs**
  - **6/11 – Thick anterior deltoid fibers**
  - **6/11 – Medial OCD**
  - **5/11 – Lateral ligament tears and capsular synovitis**
- **Main Sx: Chronic focal anteromedial pain exacerbated with dorsiflexion**
- **Good results with arthroscopic resection**
- **MR arthrography**

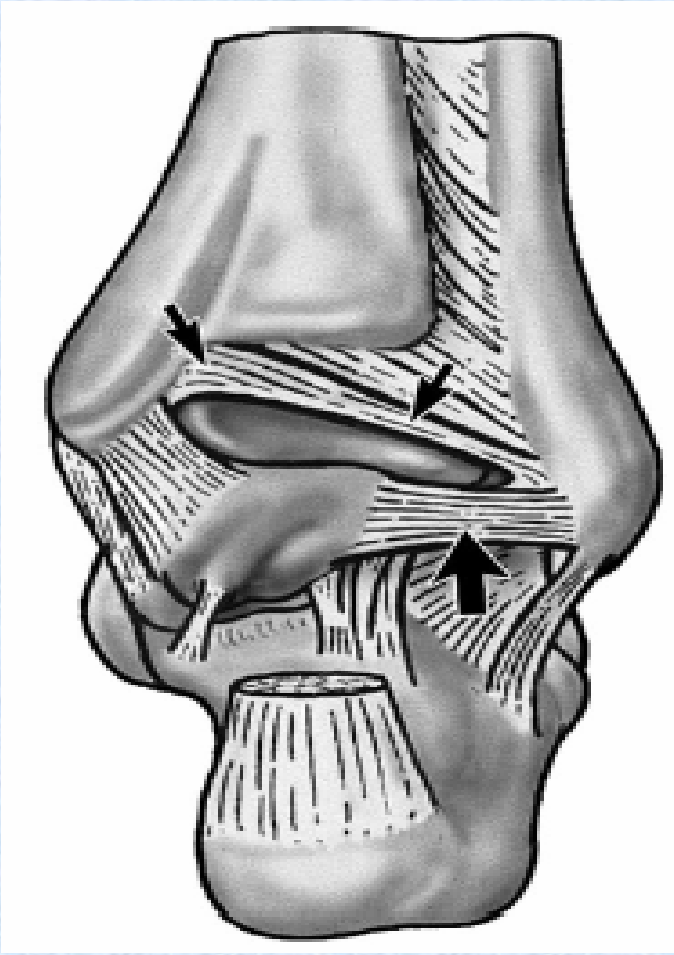
Posterior Impingement

- **a.k.a. os trigonum syndrome, posterior tibiotalar compression syndrome**
- **Soft tissue compression between posterior tibia and the posterior process of calcaneous**
- **Bony impingement between tibia and posterolateral process of the talus or os trigonum**

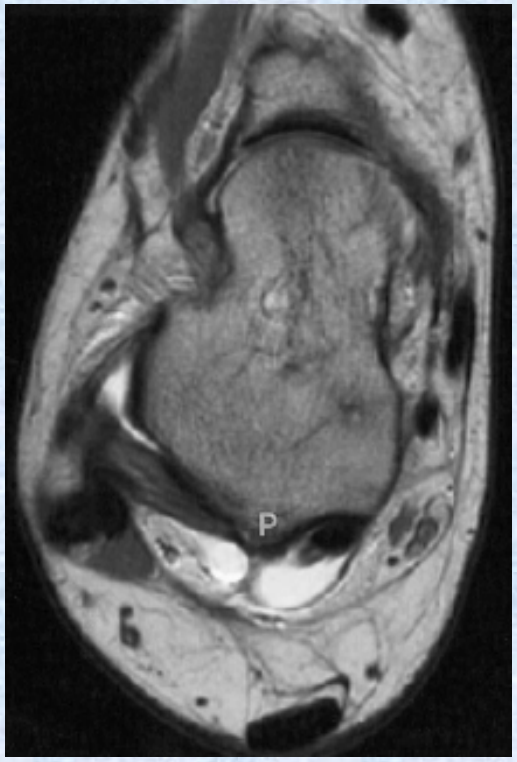


Posterior Anatomy

- **Posterior intermalleolar ligament**
- **Posterior Talofibular ligament**
- **Posterior Talar Process**



Posterior MR Anantomy

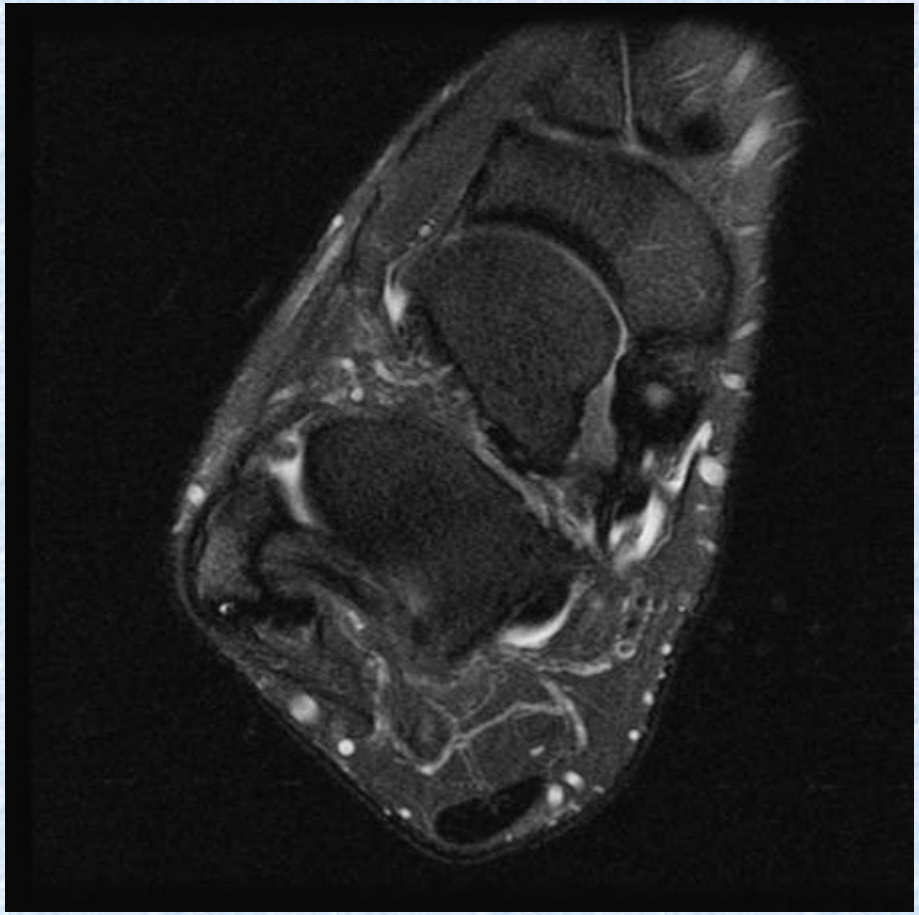


Posterior Impingement: Anatomic Contributors

Anatomical variants at the posterior ankle	
Os trigonum	28% ($n = 7$)
Stieda process	16% ($n = 4$)
Posterior intermalleolar ligament	48% ($n = 12$)
Down-sloping posterior tibia	25% ($n = 6$)
Calcaneal tuberosity	64% ($n = 16$)

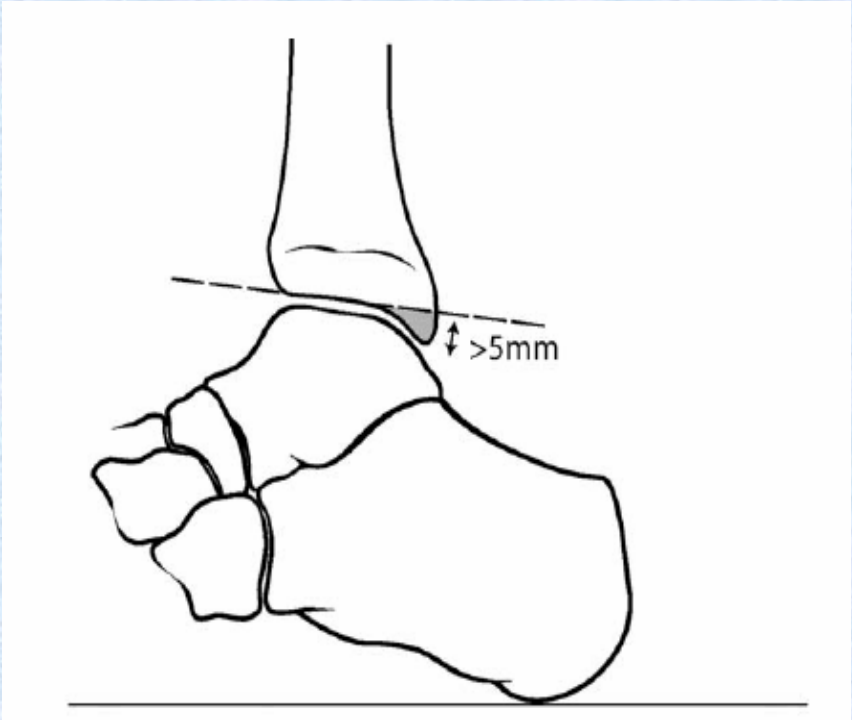
Posterior Talar Process

- **2 Tubercles: Medial and Lateral**
- **Lateral: PTAF attachment site, articular surface**
- **Medial: Post 1/3 Deltoid attachment**



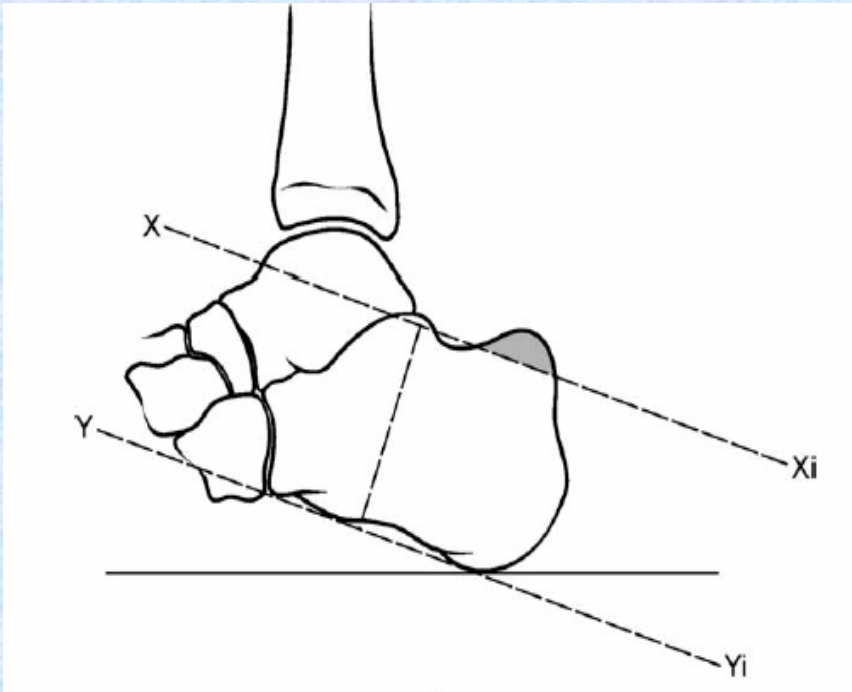
Downsloping Posterior Tibia

- **> 5mm protuberance of posterior malleolus below line tangential to anterior tibial articular surface**



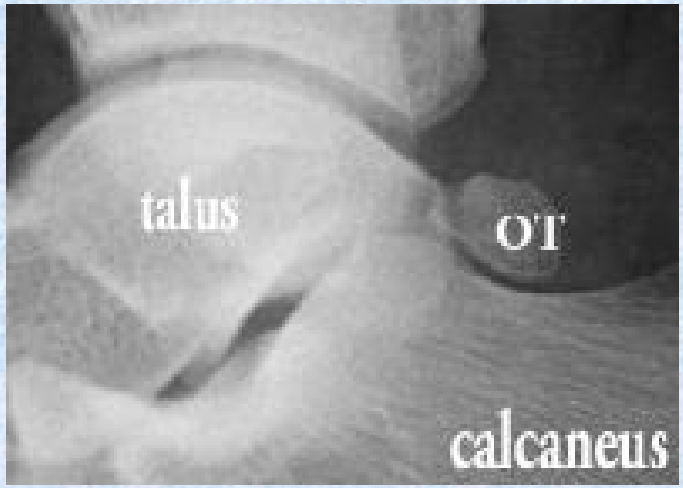
Posterior Superior Calcaneal Tuberosity

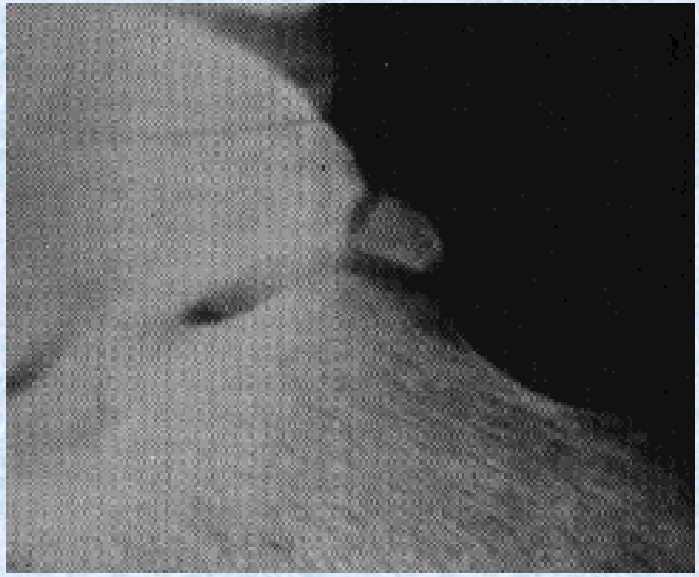
- **Prominent if any portion of the posterior superior tuberosity is above superior pitch line.**



Os Trigonum

- **Accessory ossicle posterior to posterolateral process talus**
- **Incidence 2.5-13%**
- **DDx: Fx of Posterolateral talar process i.e. Shepherd's FX.**





Findings in Posterior Impingement

Bone marrow oedema	
Os trigonum	86% ($n = 6$)[a]
Posterior talus	40% ($n = 10$)
Talar dome	20% ($n = 5$)
Posterior calcaneum	24% ($n = 6$)
Posterior tibia	8% ($n = 2$)
Generalized patchy	40% ($n = 10$)
Posterior synovitis	100% ($n = 25$)
Posterior capsular thickening	52% ($n = 13$)
Tenosynovitis of FHL	68% ($n = 17$)
High signal at muscle/tendon junction FHL	36% ($n = 9$)
Impingement during plantar flexion	100% ($n = 11$)[b]
Tibiotalar joint effusion	44% ($n = 11$)

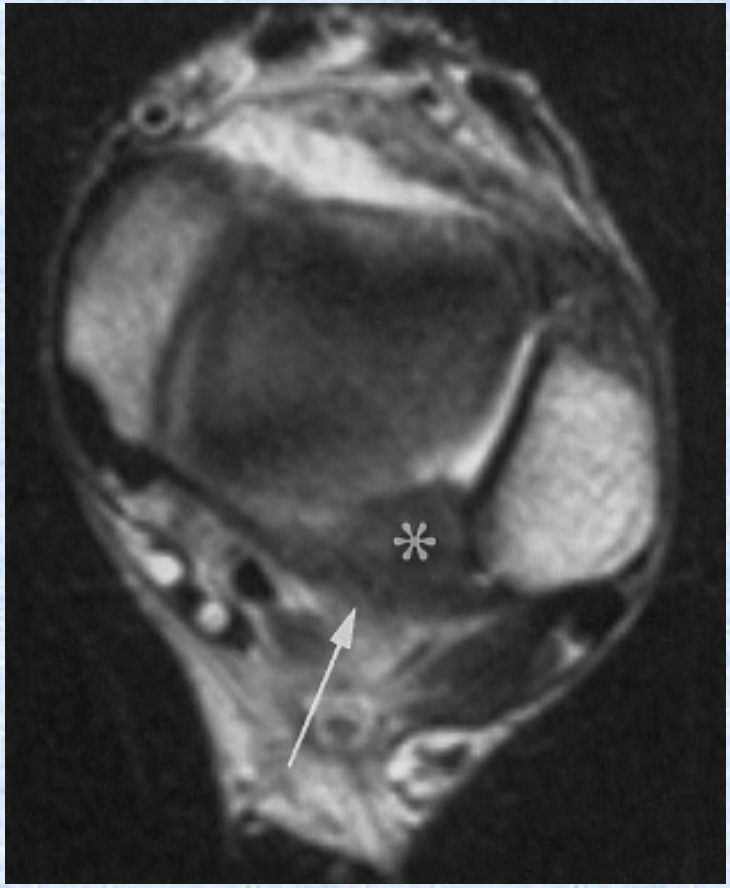
Posterior Impingement: MR Appearance

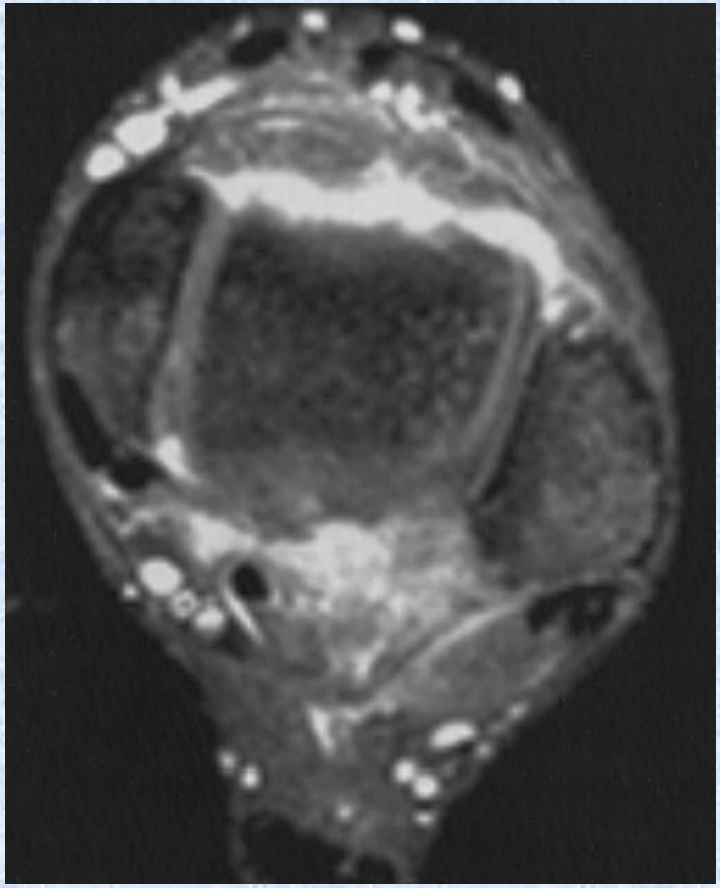
Ballet dancer with prominent posterolateral talar process and posterior capsular thickening.

Posterior Impingement: MR Appearance

Ballet dancer with prominent talar process and posterior soft tissue compression and inflammation. Scan performed during plantar flexion.

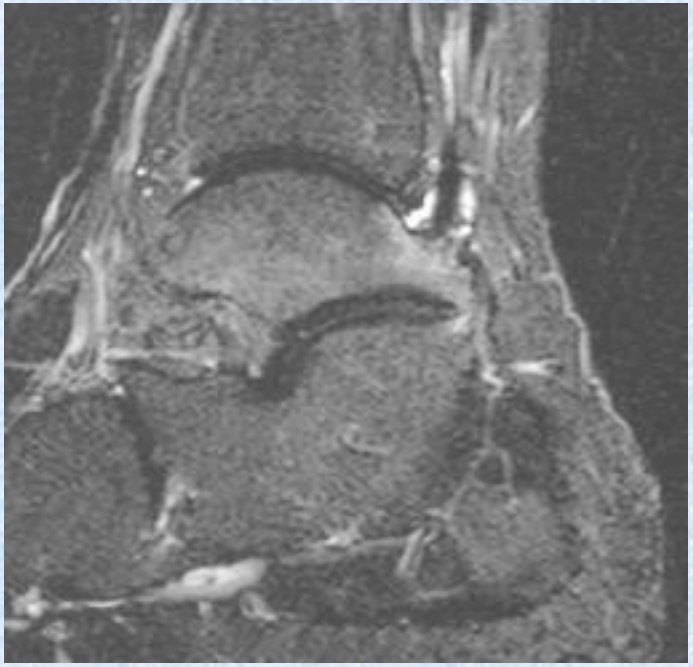
Posterior Impingement: MR Appearance

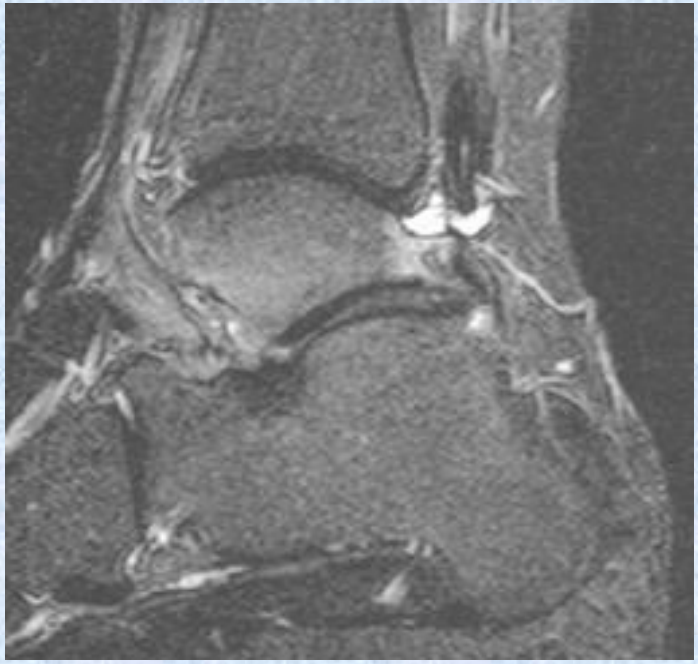




Soccer Player with focal capsular thickening that involves and displaces the intermalleolar ligament.

Posterior Impingement: MR Appearance



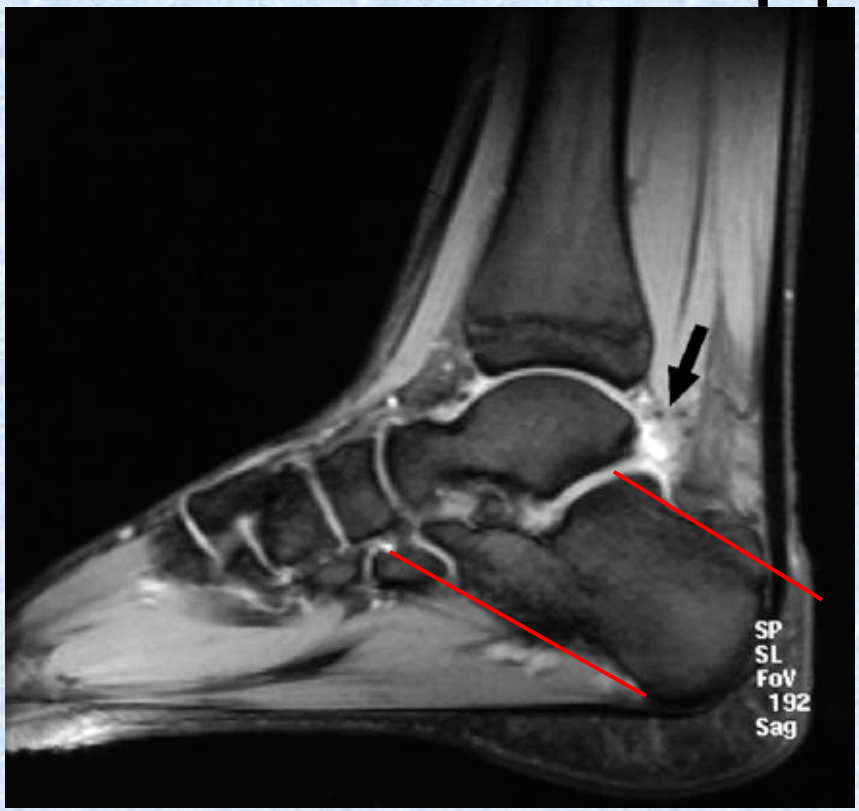


Posterior impingement in a soccer player with a prominent and edematous posterolateral talar process and focal FHL tenosynovitis.

Posterior Impingement: MR Appearance

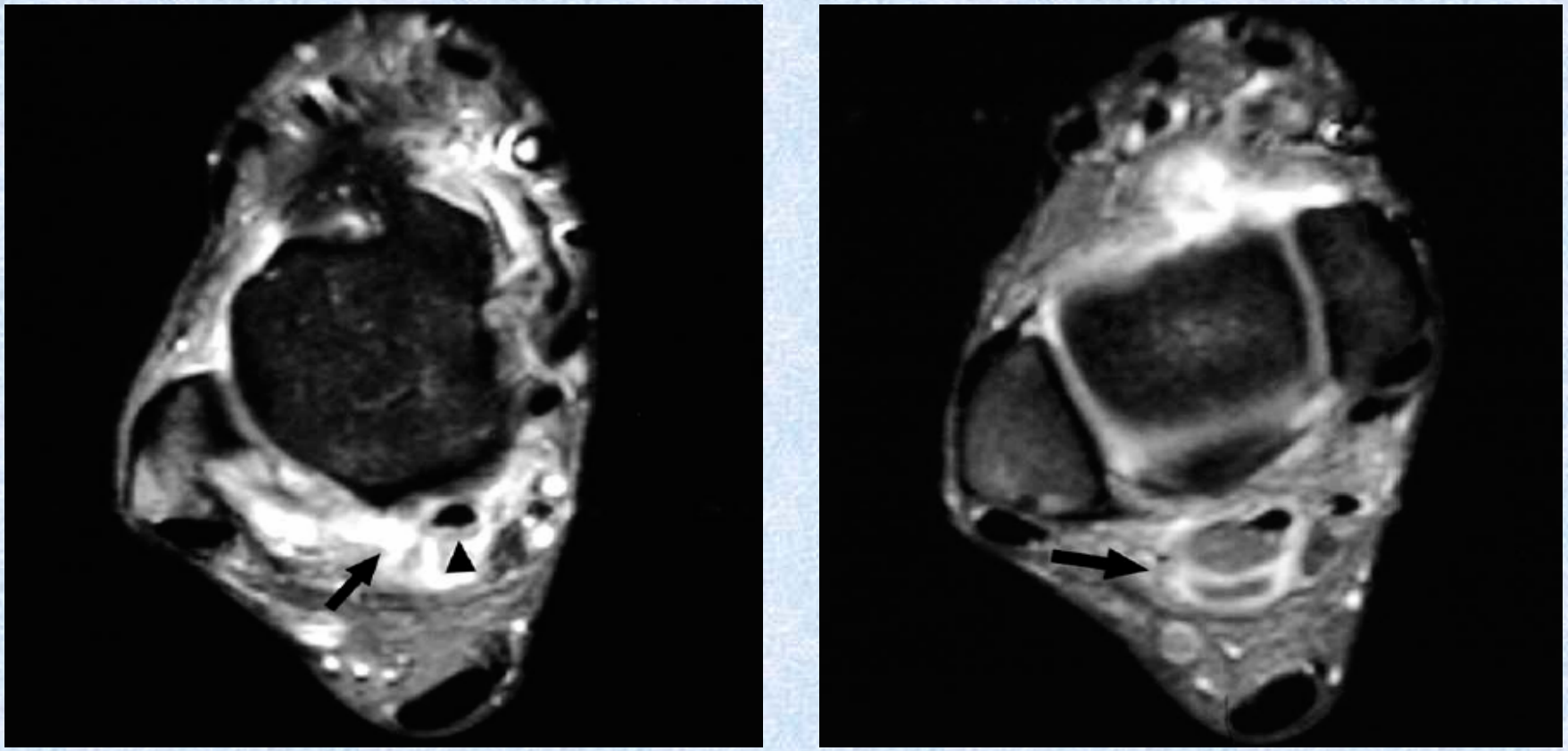
Ballet dancer with downsloping post. tibia, edematous os trigonum, posterior soft tissue synovitis. Scan done with plantar flexion.

Posterior Impingement: MR Appearance



Ballet dancer with fluid in synovial recess in neutral position. Repeat scan with plantar flexion shows compression due to prominent posterior superior calcaneal tuberosity.

Posterior Impingement: MR Appearance

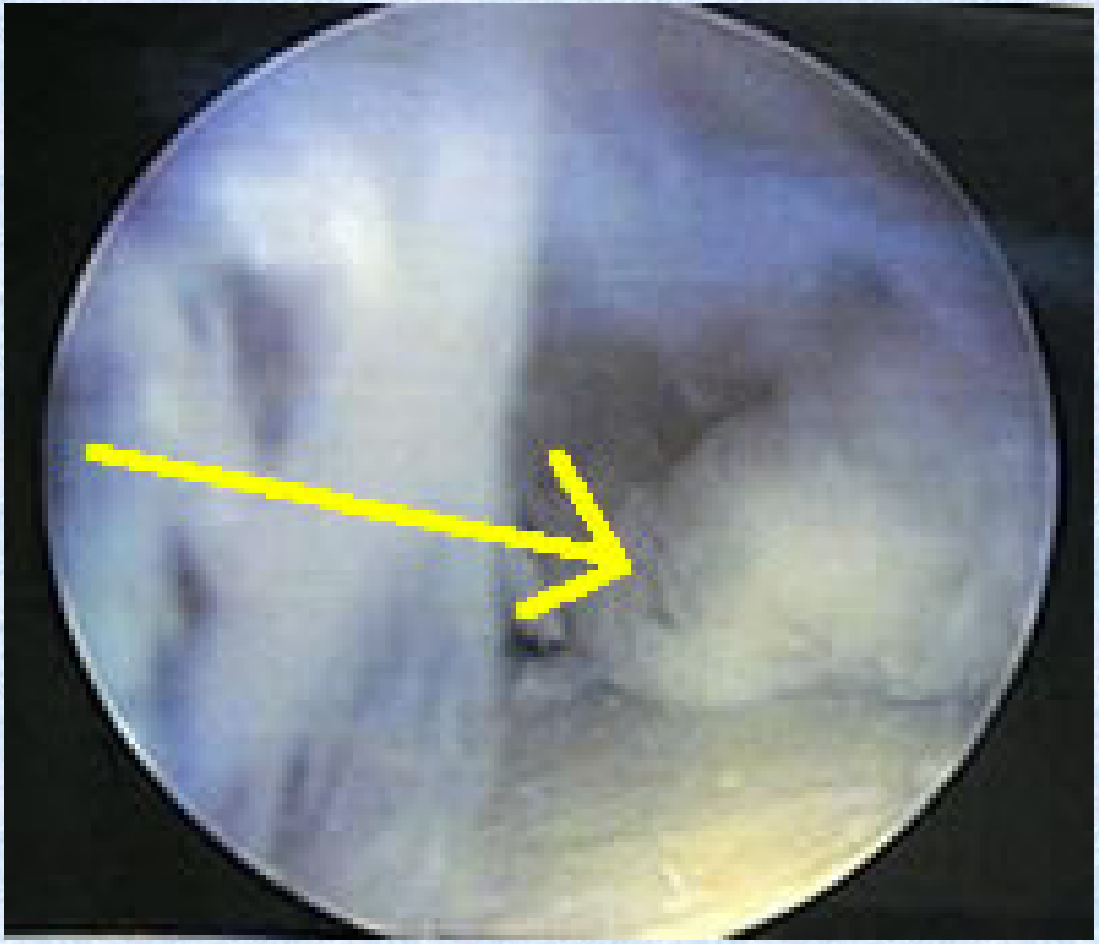


Ballet dancer with FHL tenosynovitis and enhancement in and around muscle belly.

Posterior Impingement: MR Appearance

Ballet dancer with thickened inflamed synovium, fluid collections, and talar edema. Scan done in plantar flexion.

Posterior Impingement Arthroscopic Findings



Posterior Impingement: Conclusion

- **Soft tissue thickening key feature almost universally seen, be mindful of intermalleolar ligament**
- **MR used to confirm dx. and guide therapy i.e. steroid injection, surgical resection.**
- **Plantar flexion imaging**
- **IV Gadolinium can highlight small areas of synovitis**
- **Physiotherapy primary tx.**
- **Image guided injections of steroid and lidocaine into inflamed tissues, os trigonum synchondrosis**
- **Surgical resection of bony abnormalities and synovial hypertrophy**

Final Thoughts

- **Clinical Dx.**
- **Role of Imaging Controversial**
- **+/- Osseous findings**
- **Synovial Hypertrophy is the key**
- **Arthrography**
- **Plantar flexion scanning**

References

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