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Osseous abnormalities, soft tissue evaluation superseded by MRI.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 Anatomy
Posterior Impingement: Anatomic Contributors

### Anatomical variants at the posterior ankle

<table>
<thead>
<tr>
<th>Variant</th>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Os trigonum</td>
<td>28% (n = 7)</td>
<td></td>
</tr>
<tr>
<td>Stieda process</td>
<td>16% (n = 4)</td>
<td></td>
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<tr>
<td>Posterior intermalleolar ligament</td>
<td>48% (n = 12)</td>
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<tr>
<td>Down-sloping posterior tibia</td>
<td>25% (n = 6)</td>
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<tr>
<td>Calcaneal tuberosity</td>
<td>64% (n = 16)</td>
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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

<table>
<thead>
<tr>
<th>Condition</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Bone marrow oedema</td>
<td>86% (n = 6)(^a)</td>
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<tr>
<td>Os trigonum</td>
<td>40% (n = 10)</td>
</tr>
<tr>
<td>Posterior talus</td>
<td>20% (n = 5)</td>
</tr>
<tr>
<td>Talar dome</td>
<td>24% (n = 6)</td>
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<tr>
<td>Posterior calcaneum</td>
<td>8% (n = 2)</td>
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<tr>
<td>Posterior tibia</td>
<td>40% (n = 10)</td>
</tr>
<tr>
<td>Generalized patchy</td>
<td>100% (n = 25)</td>
</tr>
<tr>
<td>Posterior synovitis</td>
<td>52% (n = 13)</td>
</tr>
<tr>
<td>Posterior capsular thickening</td>
<td>68% (n = 17)</td>
</tr>
<tr>
<td>Tenosynovitis of FHL</td>
<td>36% (n = 9)</td>
</tr>
<tr>
<td>High signal at muscle/tendon junction FHL</td>
<td>100% (n = 11)(^b)</td>
</tr>
<tr>
<td>Impingement during plantar flexion</td>
<td>44% (n = 11)</td>
</tr>
<tr>
<td>Tibiotalar joint effusion</td>
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</tbody>
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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.
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


