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
ATFL  CFL  PTFL
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
Edema – Grade 1

ATFL - SUBACUTE TO CHRONIC INJURY

POSSIBILITIES

Absent
Normal
Thickened

1 week
CHRONIC ATFL INJURY

ANKLE INSTABILITY

CF LIGAMENT TEAR
CF LIGAMENT
USE OF AXIAL IMAGES

CALCANEOFIBULAR LIGAMENT
PERONEAL TENDON

PLANTARFLEXION

INSERTS ON PERONEAL TUBERCLE
CF LIGAMENT SPLAYED OUT

PITFALLS

SPLIT PERONEUS BREVIS T.
Ankle

ATFL tear

- Fluid extends from joint into peroneal sheath

Calcaneofibular ligament tear

-CFL tear

CF ligament insufficiency

- Fluid extends from joint into peroneal sheath
LIGAMENTS

- Syndesmosis (tibiofibular ligaments)
  - More severe ankle sprain
  - Anterior > posterior
  - If unrecognized: chronic pain, instability
  - Late: ossification at tib/fib interval
Ankle

Anterior Syndesmosis Tear

Syndesmosis Injury ("high ankle sprain")

Chronic Syndesmosis Injury
LIGAMENTS

Medial (deltoid) ligament
- Strong, thick
- Superficial and deep portions
- Eversion injury
- Usually avulses bone instead of tearing

MEDIAL LIGAMENTS

Normal Sprain w/ medial impaction
Ankle

Professional football player - eversion mechanism

Deltoid ligament avulsion

The Sinus Tarsi

- Fat signal is normal
- Contains five ligaments, arterial anastomosis and nerve

Sinus Tarsi Syndrome

- Lateral pain, tenderness, hindfoot instability
- Association with ankle sprains / lateral ligament injury or ganglion cyst
PERONEAL TENDONS

Pathology usually associated with recurrent or severe ankle sprains

PERONEAL TENOSYNOVITIS

- More fluid than tendon = abnormal
- Synovial = abnormal

PERONEAL SPLIT

Peroneal subluxation
Peroneus longus migrates into brevis, first flattening it with 'boomerang' shape finally splitting it

Posterior fibular morphology may predispose
Ankle

Symptoms: chronic lateral retromalleolar pain / snapping, occasional sx of instability

Osteochondral Defect (OCD) *AKA*
Osteochondral Lesion of the Talus (OLT) *AKA*
"Osteochondritis Dissecans"

Osteochondral injury
Underlying bone necrosis, collapse, fragmentation
Medial: chronic injury; rounded
Lateral: acute injury; wafer

Joint Impingement

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

It's not a coincidence that OCD also means obsessive-compulsive disorder!!
Anterolateral Impingement syndrome

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

OCCULT FRACTURE

Following acute trauma - radiographically normal
Marrow edema on T2 / STIR – may obscure fx line (look on T1)
Subacute: fx line dark
- identical to stress fx

Occult Talar Neck Fracture
BIOMECHANICAL STRESS

Increased signal on T2 related to trabecular remodeling (probably not true edema)
- Subcortical, subarticular, subenthesial
Commonly seen on MRI after prolonged immobilization, altered weight-bearing
Painless at site(s)
Simulates true pathology
Anatomy – Lisfranc Ligament

Jacques Lisfranc de Saint-Martin (1790-1848)
Anatomic Concepts

Anatomic Concepts
Reminder…
Lisfranc Ligament

- 2nd MT in a Mortise between medial and lateral cuneiforms
- C1M2 interosseous ligament
- 22% 2 bands
- Dorsal and plantar (stronger) bands
- Plantar blends with peroneus longus tendon
- 1cm long, 0.5cm thick
Lisfranc injury

• Before 2009, studies described the appearance of injury to osseous structures and the Lisfranc ligament itself, without surgical correlation. 1,2

• We describe a spectrum of Lisfranc joint injuries on MRI and determine the accuracy of MRI compared to surgical evaluation.


Retrospectively, 1.5T MRIs were reviewed by two MSK radiologist in consensus (blinded to clinical data). Integrity of the following structures on long (axial) and short axis (coronal) were evaluated:

MATERIALS & METHOD II
Radiographs equivocal
• No malalignment at Lisfranc interval
• Standing radiographs nondiagnostic due to pain

Case 1:
Professional football player, dorsiflexion injury on turf
Case 1:
Professional football player, hyper-planter flexion injury
Surgery (exam under anesthesia): stable Lisfranc joint, intact Lisfranc (C1=M2M3)

Case 2:
Professional football player, plantar flexion, difficulty bearing weight
Surgery: Lisfranc ligament (C1=M2M3) intact

Case 3:
Professional football player, point tenderness, difficulty bearing weight
Surgery: (C1=M2M3) disrupted, reconstructed
Case 4: Competitive aerobics injury

Surgery:
Complete (C1=M2M3) disruption, screw fixation

Case 5: 38 yr old diabetic, dance injury

Surgery:
(C1=M2M3) disruption:

RESULTS I

MRI evaluation revealed:

- 18/21 pC2-M2 ruptures (2nd tarso-metatarsal)
- 17/21 pC1-M2M3 ruptures (plantar Lisfranc bundle)
- 13/21 dC1-M2 ruptures (dorsal Lisfranc bundle)
- 13/21 fluid along MT1
- 7/21 fractures (5 second MT, 1 med cun, 1 lat cun.)
- 3/21 pC1-M1 ruptures (1st tarso-metatarsal)
RESULTS III

Logistic Regression Model determined: the strongest MRI predictor for instability of the Lisfranc Joint complex was disruption or attenuation of the plantar Lisfranc ligament bundle (pC1-M2M3)

Sensitivity = 94%
Specificity = 75%
PPV = 94%

Classification Table

<table>
<thead>
<tr>
<th>Observed in OR</th>
<th>Predicted by use of pC1-M2M3</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Stable/Unstable</td>
<td></td>
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<td>Stable</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Unstable</td>
<td>1</td>
<td>16</td>
</tr>
</tbody>
</table>

Overall: 19/21 were correctly classified 90.5%

RESULTS III

All other predictors such as:

- dC1-M2 (dorsal Lisfranc ligament bundle)
- pC1-M1 (1st tarso-metatarsal ligament)
- pC2-M2 (2nd tarso-metatarsal ligament)
- Fluid along 1st MT
- Fractures

had low predictive values for instability of the Lisfranc Joint complex

Disruption of the 2nd tarso-metatarsal ligament is a MIMICKER of Lisfranc Ligament injury
CONCLUSION

Disruption of the 2nd tarso-metatarsal ligament was the most common finding in Lisfranc joint complex injuries, but is not a useful predictor of instability.

The appearance of a normal or low grade sprain of the plantar Lisfranc ligament bundle (pC1-M2M3) suggests a stable midfoot and may obviate the need for MSRE in pt with equivocal clinical and radiological findings.

Whereas, rupture or high grade sprain of the plantar Lisfranc ligament bundle (pC1-M2M3) is highly suggestive of an unstable midfoot which requires surgical reconstruction.

CONCLUSION

Clinical Significance

Conventional MRI is valid to diagnose instability to the Lisfranc Joint Complex when using the plantar bundle of the Lisfranc ligament (pC1-M2M3) as a predictor.

SPRAINS - COMPLICATIONS

- Ligaments
- Tendons
- Joints
- Marrow