ANKLE INSTABILITY

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St George’s Hospital
Ankle Instability

- Anatomy
- Pathomechanics
- Acute injury to ankle ligaments
- Clinical assessment
- Treatment
- Chronic instability
- Treatment options
- Results
anatomy slide
Functional Anatomy

Anterior Talofibular Ligament (ATFL)

- Thickening of capsule
- Strain minimum in Dflx + neutral
- Increases with Plflx
- Resists INVERSION & INT ROTATION

Functional Anatomy

Calcaneofibular Ligament (CFL)

- Discrete extra-articular band
- Connected with peroneal tendon sheath
- Greatest strain resisting INVERSION FORCE in Dflx
- Also stabilises subtalar joint

Functional Anatomy

Deltoid Ligament

- Deep
  - Medial malleolus to talus
  - Resists EXT ROTATION

- Superficial
  - Broad fan shaped
  - Resists ABDUCTION
Functional Anatomy

*Distal Tibiofibular Syndesmosis*

Anterior & Posterior Tib-Fib Ligaments
Tight in Dorsiflexion

Inferior transverse & Interosseus ligaments resist
EXTERNAL ROTATION of the talus
Pathomechanics of Injury

- Injuries occur when loading or unloading ankle
- Usually progressive inversion of plantarflexed ankle
- Sequential failure of structures
- Severity dependant on magnitude & duration of applied force
Pathomechanics of Injury

Anterolateral capsule

ATFL

CFL

PTFL

Dislocation of Talus

RARE
Pathomechanics of Injury

Brostrom 1964 Acta Chir Scand

- Injury to ATFL 100%
  CFL 27 (- 67%)

- Rarely PTFL or dislocation of talus as malleolar fractures tend to occur first

- Isolated rupture of CFL does \textit{not} occur clinically
<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Clinical Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Stretch</td>
<td>Stable with no functional deficit</td>
</tr>
<tr>
<td>II</td>
<td>Partial tear</td>
<td>Mild to moderate instability</td>
</tr>
<tr>
<td>III</td>
<td>Complete</td>
<td>Positive stress test(s)</td>
</tr>
</tbody>
</table>
Deltoid ligament rupture

- Isolated rupture uncommon <10% (Brostrom)

- Eversion or external rotation

- More commonly results in syndesmotic rupture + fibular fracture

- Non surgical treatment if isolated
Clinical Assessment - History

- Previous ankle injury
- Past level of performance
- Mechanism - distinguish eversion / ER (syndesmotic + deltoid ligament)
- Severity tearing, popping, played on?
## Examination

### Inspection

<table>
<thead>
<tr>
<th>Swelling</th>
<th>100% Grade III ruptures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>Inferior to malleolus</td>
</tr>
<tr>
<td></td>
<td>Sinus tarsi</td>
</tr>
<tr>
<td></td>
<td>Supramalleolar</td>
</tr>
<tr>
<td></td>
<td>Posterior</td>
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</table>

Specificity is time dependent
Examination

**Palpation**
- Whole area below knee
- Ligamentous & bony structures

**Active ROM**
- Peroneal & Achilles tendons

**Squeeze test**
- Hopkinson 1991
## Special Tests - Manual Stress Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
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</table>
| **Anterior Drawer** (10° plantarflexion) | Tests ATFL  
  “suction” sign  
  quality of end point |
| **Talar tilt test**       | Tests CFL & ATFL  
  lateral dimpling  
  quality of end point |
| **Anaesthetic?**          | X-ray Glasgow, Jackson & Jamieson 1980 JBJS 62B |
Syndesmosis injuries

- 1-11% of ‘sprained’ ankles
- Squeeze test
- External rotation of ankle causes pain
- External rotation stress test (clear space >6mm)
- Normal stress views - functional rehab
- Latent diastasis - AK POP NWB
- Frank diastasis reduction & syndesmosis screw
Radiographic evaluation

AP, lat & mortice views

Osteochondral fractures of talus
Lateral process of talus
Anterior process of calcaneus
Malleolar fractures

Recurrent injuries
ossicles, HO,
degenerative change
### Stress radiographs

<table>
<thead>
<tr>
<th>Test</th>
<th>Measure</th>
<th>Anatomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior Drawer</td>
<td>&gt;3mm</td>
<td>ATFL</td>
</tr>
<tr>
<td>10° plantarflexion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talar tilt test</td>
<td>&gt;5-10°</td>
<td>ATFL &amp; CFL</td>
</tr>
<tr>
<td>Reproducibility - Telos machine</td>
<td></td>
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</tbody>
</table>

Comparison of sides
Anterior Drawer

Shortest distance from posterior lip of tibia to constant point on talar dome

>3mm signifies rupture of ATFL
Other Investigations

**Arthrography**
Brostrom
rarely performed

**Peroneal tenography**

**MRI** useful in acute shows torn ligaments and chronic but is a static investigation
Major role of MRI - evaluation of osteochondral lesions of the talus
## Other investigations

<table>
<thead>
<tr>
<th>Bone scan</th>
<th>Occult syndesmotic injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Late persistent pain</td>
</tr>
<tr>
<td>Arthroscopy</td>
<td>Talar dome fractures</td>
</tr>
<tr>
<td></td>
<td>Loose bodies</td>
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</tbody>
</table>
Treatment of acute ankle instability

Functional Treatment

3 stages:
- Initial RICE treatment
- Period of immobilisation
- Exercises strengthening peroneal, dflx, Achilles tendon
  Proprioceptive re-training & endurance
Functional Treatment
Kannus et al  JBJS 73A 1991 305-311

- Treatment of choice for grades I, II & even III
- Functional treatment results in earlier return to pre-injury level with fewer complications
- Same results as surgery in terms of: giving way, long term pain stiffness, likelihood of re-injury, objective mechanical stability
Functional Treatment
Kannus et al  JBJS  73A, 1991 305-311

- Superior cost-benefit analysis
- Results of late reconstruction are as good as early
- ? Role for acute repair of Grade III ruptures in high-demand athletes - controversial but most say not
Functional Treatment

Contraindications

- Displaced osteochondral talar fracture
- Displaced fibular avulsion fracture
- Acute sprain on long history of chronic instability
- ? combined medial & lateral ligament injuries
Chronic Lateral Ankle instability

- Incidence 10 - 30%
- Functional instability (Freeman et al 1965)
- Mechanical instability
- No correlation between presence of these types. 50% of functionally unstable ankles are mechanically stable
Functional Ankle instability

- Motion beyond voluntary control but **NOT** exceeding physiological range
- ‘Giving way’ loss of control
- Ability to maintain postural equilibrium reduced
- Caused by proprioceptive disorders, pain muscle weakness
- Proprioceptive training effective
Mechanical Ankle instability

- Motion **beyond** physiological range of motion
- Demonstrated by anterior drawer or talar tilt tests
- Ability to maintain postural equilibrium may be unaffected
### Differential diagnosis - chronic instability

<table>
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<tr>
<th>Condition</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Peroneal tendon</td>
<td>tear, subluxation, dislocation</td>
</tr>
<tr>
<td>Loose bodies</td>
<td></td>
</tr>
<tr>
<td>Impingement</td>
<td>tibio-talar, talo-fibular</td>
</tr>
<tr>
<td>Nerve injuries</td>
<td>peroneal nerves</td>
</tr>
<tr>
<td>Bony pathology</td>
<td>osteochondral fracture, avulsions</td>
</tr>
</tbody>
</table>

May be isolated or in addition to lateral ligament instability
Differential diagnosis contd

- Isolated subtalar instability
- Sinus tarsi syndrome
Functional Treatment

- Muscle strengthening and proprioceptive exercises (> 10 weeks)
- Patients with functional instability will improve
- No published reports of combined instability - most are operated on
- If chronic instability occurs in day to day activities - surgery indicated
- Prophylaxis: taping and bracing effective
Surgical treatment of lateral instability

Indication: functional & mechanical instability with failure of conservative management

> 50 procedures described
Most have good / excellent short term results
Age no bearing on outcome

• Anatomical Repair
• Nonanatomical (augmented) Reconstruction
Anatomical Repair

- Direct repair of ligaments long after the injury
  Brostrom 1966
- Modifications made as ends difficult to find
- Shortening, imbrication, repair in bony troughs
  Karlsson et al JBJS 70A 1988
- No sacrifice of normal tissue & no loss of subtalar motion
Nonanatomical Reconstruction

• Split or complete peroneus brevis tendon
• Other grafts - plantaris or even prosthetics

• Advantages
  – increased strength of repair
  – enables stabilisation of longstanding laxity

• Disadvantages - morbidity from harvest of graft
  – larger incisions, neuroma formation
  – weakness of eversion
Karlsson modification of Brostrom
Karlsson repair

- Incision posterolateral fibula to sinus tarsi
- Anterolateral capsulotomy leaving cuff of ATFL & capsule on fibula
- Anterior capsule & ATFL repaired to bony trough in fibula through 3 drill holes (double breasted)
- CFL repaired to insertion on calcaneus in similar manner
Karlsson repair
Karlsson et al, JB JS :70A 1988

- **Postoperative care**
  - Splint in dorsiflexion for 1 week
  - Below knee cast for 5 weeks
  - 4 weeks in athletes

  Ankle brace to limit inversion

  Functional rehabilitation programme

  Prophylaxis: taping, ankle corset or stirrup
Results - anatomical repair
Karlsson et al, JB JS:70A 1988

• 152 ankles  6 year follow up  87% good / excellent

• Functional result correlates with degree of stability achieved

• 16 Fair / Poor results :
  – history of instability > 10 years
  – generalised joint hypermobility
  – repair of ATFL alone
Non - anatomic reconstruction

• Watson - Jones

Section peroneus brevis and route through fibula posterior to anterior then through neck of talus & finally back to fibula
Watson - Jones tenodesis

- Reconstructs ATFL but not effective for CFL
- Restriction of dorsiflexion & inversion in 10 - 30%
- Long term instability or insecurity in 66%
- Has reputation for being difficult to perform
Evans procedure

- Peroneus brevis through drill hole in distal fibula then sutured to itself
- Reconstructs neither CFL or ATFL
- Early results 80 - 95% good / excellent

- 4% neuroma
- 30% restricted inversion
- Long term 50% become fair / poor due to instability or pain
Chrisman - Snook Reconstruction

- Split peroneus brevis tendon graft brought through fibula from anterior to posterior (to reconstruct ATFL)

- Posteriorly & inferiorly to calcaneus (CFL)

- Through tunnel in calcaneus and sutured to itself with foot in “mild eversion”

Snook et al JBJS 67A 1-7 1985
Diagrams  Chrisman & Anatomy
Results - augmented reconstructions
Snook et al JBJS 67A 1-7 1985

- Chrisman Snook 10 year follow up 48 patients
  98% good / excellent

- 3 recurrences - all after significant trauma

- Loss of $\geq 20^\circ$ inversion inherent in procedure and not a complication
Horstman et al 1981

- High incidence of postoperative pain - may be related to overtightening the graft
- 63% had some degree of pain (only 5% severe)
- Chrisman-Snook lowest incidence of instability because anatomical
- Greatest loss of inversion
- Chrisman-Snook 90% satisfied overall
Conclusions - lateral ligament instability

- Adequate trial of conservative management prior to surgery

- Augmented reconstruction not necessary for most patients. Anatomical Karlsson type repair is preferable

- Generalised joint hypermobility, >10 yr from injury or previous failed repair then Chrisman-Snook.
Degenerative change after lateral instability

- Natural history of treated & untreated inversion instability is unclear
- Not known whether stabilisation will prevent progression to osteoarthrosis
Degenerative change

- Harrington JBJS 1979 reported OA in 36 patients with chronic instability and improvement of symptoms following stabilisation

- Retrospective studies only - limitations

- No comparative trials & not discussed in most reports
Subtalar instability

- Easily confused with tibiotalar instability
- 10-25% of patients with lat instability
- Initial tenderness over sinus tarsi
Diagram of Subtal
Subtalar instability contd

- Stress views or fluoroscopy
- Inversion & anterior drawer tests
- **Broden projection** - $45^\circ$ internal rotation with heel stressed into varus exposures taken at various inclinations
- Two sides compared - talo-calcaneal angle, loss of parallel alignment
- Two recent Japanese papers in JBJS claim this can be reliably diagnosed with standard lateral X-rays whilst stressing the subtalar joint (anterior translation)
Subtalar instability

- Functional rehabilitation & bracing are successful in most cases
- Treated with procedure to reconstruct CFL
- If isolated need to reconstruct cervical ligament of subtalar joint by passing anterior limb of peroneus brevis through a V-shaped tunnel in neck of talus
- Reconstruction of interosseus talo-calcaneal ligament (Kato 1987)
Subtalar instability contd

Kato  JBJS  77B(3) May 1995

3 groups:
  – trauma
  – joint laxity
  – young females

• Conservative treatment as effective as surgery
• Surgery for severe symptoms in those unwilling to wear a brace
THANK YOU