Evaluation and Treatment of Ankle Sprains

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Ankle Sprains in Children

DeLee & Drez, 1994
Evaluation

• Tenderness: Location, especially the interosseous ligament
• Eccymosis
• Instability
• Other structures

Differential Diagnosis

• Salter Harris Fracture of distal fibula
• Peroneal Tendon Injury or subluxation
• Talus Fracture
• Recurrent ankle sprains
  – Think of Tarsal Coalitions
Instability

• Static restraints
  – Bony mortise
    • Increased stability in DF
  – Lateral ligamentous structures
    • ATFL—weakest, taut w/ PF
    • CFL—taut in neutral & DF, spans tibiotalar & subtalar joints
    • PTFL—strongest
• Dynamic restraints
  – PB, PL

Instability

• Ankle is least stable in Plantar flexion & inversion
  – Position of most ankle sprains
• Arc of injury progresses laterally
  – Failure begins in anterolateral joint capsule → rupture of the ATFL → CFL rupture
• ATFL is injured in 85% of lateral ankle sprains
• CFL is injured in 20% to 40%
• PTFL injury is rare
Stress Radiographs

DeLee & Drez, 1994

Magnetic Resonance Imaging

- Soft tissue injuries
- Bone contusions
- Osteochondral or chondral fractures
Instability

- **Grading**
  - I → stretching of ATFL
  - II → complete tear of ATFL
    - Frequently partial tear of CFL
  - III → complete ruptures of both ATFL & CFL
    - Difficulty with WB
  - “IV” Anterior Syndesmosis injury

- **Treatment (Acute Injury)**
  - Surgical
    - No recent literature proving surgery superior to conservative tx, even for G-III
      - *OKU Sports Medicine IV*
    - RCT comparing surgery vs non-op found significant differences in pain, giving way and recurrent sprains w/ surgery having better outcomes
      - Still recommended surgery for only the most elite athletes due to cost, risks, and similar results with delayed repair
      - *Pijnenburg JBJS Br 2003*
Instability

- **Treatment (Acute injury)**
  - Non-op → *functional treatment*
    - Preferred initial management of all lateral ankle sprains
    - Provide external support while instituting early controlled motion
      - Elastic bandage, short-term casting, CAM boot, Air-stirrup brace
        » Air-stirrup brace w/ an elastic bandage shown to return patients with GI & II faster to preinjury function
        - ROM, strengthening & proprioception are key components to rehab
    - G/E outcomes in regards to motion, return to work and physical activity

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**Treatment of Sprains in Children**

**Grades 1 & 2**
- early motion
- splint immobilization
- Strengthen and Proprioception

**Grade 3 and syndesmosis injuries**
- cast for 2-3 weeks
- splint immobilization
- Strengthen and Proprioception
- ? Ankle Brace
Physical Therapy – Ankle Instability

• Evaluation
  – Screening Tools

• Treatment
  – Top Down Approach
  – Bottom Up Approach

Evaluation – Screening Tools

• 1-Leg Postural Sway
  – Eyes open (balance)
  – Eyes closed (proprioception)

• Star Excursion Balance Test

• Single-Leg (SL) Heel Raise
1-Leg Postural Sway

**Procedure:**
- Eyes open/eyes closed
  - SL balance for 15 seconds
  - Two practice trials prior to testing

**Assessment:**
- Positive test results
  - Increased ankle excursion medial/lateral and/or forward/backward
  - Increased upper extremity (UE) sway
  - Medial displacement of the knee

**Evidence to support positive test:**
- Basketball players who demonstrated poor balance experienced 7x more ankle sprains than those with good balance
- 1-leg postural sway test can be used as a screening tool to indicate the need for balance training prior to basketball season

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**Star Excursion Balance Test**

![Star Excursion Balance Test Image](image)

**Procedure:**
- Measure furthest distance reached in all 3 directions
  - 6 practice trials per leg
  - 3 test trials per leg

**Assessment:**
- Positive test results
  - Anterior reach variance > 4cm
  - Composite reach distance < 94% of limb length

**Evidence to support positive test:**
- Athletes with an anterior reach difference > 4cm were 2.5x more likely to sustain a lower extremity injury
- Female athletes with a composite reach distance less than 94% of limb length were 6.5x more likely to have a lower extremity injury
  - Plisky et al. JOSPT Dec 2006
Single-Leg Heel Raise

Procedure:
- SL heel raise for 10 repetitions each leg

Assessment:
- Distance of heel from surface (right versus left)
- Degree of postural sway
- Excessive ankle inversion

Treatment – Top Down Approach

Stephen Curry

What you already know!!!

What you do not know???

What led to his success???
Treatment – Top Down Approach

Primary Focus
- Core
- Glutes

Intervention
- Activation and strength exercises

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<tr>
<th>Top Down Exercise</th>
<th>Muscle Group(s)</th>
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<td>Glutes/Core</td>
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<td>Glute Max/ Med</td>
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<td>SL deadlift/airplane</td>
<td>Glutes/Core</td>
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Treatment – Bottom Up Approach

Primary Focus
- Evaluating how structure influences function
  - 26 Bones
  - 33 Joints
  - >100 Tendons, Ligaments, Muscles

Intervention
- Stabilization
- Motor control & timing
Stabilization

Understanding your assessment

- Taping vs Orthotics
  - Foot appearance weight-bearing and non-weight-bearing
- Subtalar joint:
  - End-feel: restricted, normal, loose
  - Motion: 2-to-1 inversion/eversion ratio
- Forefoot: varus versus valgus
- 1st ray position: plantarflexion (PF) vs dorsiflexion (DF)
- Hallux Dorsiflexion: rigid, semi-rigid, average
- Tibial torsion influence
- Gait, pain, endurance, diagnosis

Motor Control & Timing

Exercises
- Dip with towel roll under arch
- Single-leg push off with band
- Timing drill for push off
Instability

- **Prevention**
  - Taping and bracing have been shown to decrease incidence of ankle sprains
    - Taping loses 50% of its strength in the first 20m
  - Provide direct mechanical support for an unstable ankle
    - Also suggested that the beneficial effect is explained by enhancement of proprioception through skin pressure
    - Decreases peroneal reaction time to firing
  - Proprioceptive exercise programs have also shown to decrease rates of sprains
  - Should be a multidisciplinary approach
    - bracing, balance training, rehabilitation, and muscle recruitment evaluation for the entire lower extremity

Chronic Instability

- Residual instability after ankle sprains in 32-76%
- C/o residual swelling, pain, instability
- Dx’d with a combination of PE, stress radiographs, MRI, ankle arthroscopy
- DDx must include OLT, peroneal tendon pathology, base of the 5th MT fx, fx of the lateral or posterior process of the talus, anterior calcaneus fx, syndesmosis injury
Chronic Instability

- Treatment varies based on residual disability
- *Functional instability* → sensation of instability without ligamentous laxity
- *Mechanical instability* → laxity of medial or lateral ligamentous structures
  - 10mm of anterior translation of talus (or >3mm)
  - PF/inversion stress of >9°

Chronic Instability

- **Treatment**
  - Non-op
    - Brace, activity modification, PT
  - Operative
    - Anatomic reconstruction of CFL & ATFL
      - Gould modification of the Brostrom, autograft reconstruction
    - Non anatomic tenodesis
      - Watson-Jones, Evans, Chrisman-Snook
Lateral Impingement Syndrome

- Soft tissue impingement
- Anterior Tib Fib Ligament Hypertrophy
- Bony Impingement

A = talus
B = meniscoid lesion
C = fibula

Surgical Findings
Soft-tissue impingement

Before Debridement
After Debridement
Surgical Findings

Instability lesion with tear or hypertrophic ATibFibL

Before Debridement

After Debridement

Surgical Findings

Osteophyte

Before Debridement

After Debridement
Question:

When should a child with an ankle sprain be placed in a cast

A. Never
B. If they can’t get a cam walker
C. If PT will be delayed
D. If they have a Grade III or syndesmosis injury

Question:

When should an MRI be ordered:

A. Whenever the parent wants one
B. If there is a lot of swelling
C. For patients who don’t respond to conservative treatment
D. If there is significant instability
Question:

What percentage of injuries to NCAA athletes do ankle ligament sprains represent?

A. 10%
B. 15%
C. 20%
D. 25%

Thank You!

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