Foot and Ankle Injuries in Athletics

Thomas W. Kaminski, PhD, ATC, FNATA, FACSM, RFSA
Professor
Director of Athletic Training Education
University of Delaware

Learning

“All of life should be a learning experience, not just for the trivial reasons but because by continuing the learning process, we are challenging our brain and therefore building brain circuitry.”

Arnold Scheibel

A First State Fact!

Delaware is 96 miles long and varies from 9 to 35 miles in width.

Capital of DE is?

Athletic Training & Sports Health Care: The Journal for the Practicing Clinician

http://www.healio.com/journals/atshc


A New Way of Assessing Ankle Proprioception
**Anatomical Review**

Diagnosis is only a matter of applying one's anatomy.

---

**Lower Extremity ~ Foot**

Radiographically Viewed

Ankle Joint (Medial View)

1. Fibula
2. Tibia
3. Ankle joint
4. Promontory of tibia
5. Trochlear surface of talus
6. Talus
7. Posterior tuber of talus
8. Calcaneus
9. Sustentaculum talus
10. Talar tunnel
11. Navicular
12. Cuneiforms
13. Cuboid
Articulations

The Ankle Mortise

Major Lateral Ligaments

The Medial “Deltoid” Complex

Ankle Syndesmosis

The Subtalar Joint

IOM = Intergyseous membrane
IOL = Intergyseous ligament
AITFL = Anterior inferior Tibiofibular Ligament
PITFL = Posterior inferior Tibiofibular Ligament
The Ligaments of the Subtalar Joint

WOW!

Muscular Anatomy

Compartments of the Leg

- **Anterior**
  - Medial (Tibial Bone)
  - Lateral (Peroneal/Fibularis Region)
  - Middle

- **Posterior**
  - Superficial
  - Deep

Lower Leg Musculature

Anterior

- Peroneus Longus Muscle
- Tibialis Anterior Muscle
- Extensor Digitorum Longus Muscle
- Sartorius Muscle
- Gastrocnemius Muscle
- Soleus Muscle
- Long Plantar Flexor (Tibialis Posterior)

Posterior

- Plantar Muscle
- Extensor Muscle
- Achilles (Calcaneus) Tendon
Can you tell which one?

At what bony landmark do they bifurcate?

Posterior Compartment (S)

Peroneals

Tibialis Anterior

Extensor Digitorum Longus

Posterior Compartment (D)

Posterior Compartment (S)

Soleus

Plantaris

Peroneals

At what bony landmark do they bifurcate?

Can you tell which one?
Posterior Compartment (D)

HAS ANYONE SEEN FERRIS???

Selected Injuries involving the Ankle Region

Achilles Tendon Injuries
- common tendon of the triceps surae (2 heads of gastrocnemius & soleus) inserting into the calcaneus
- receives its greatest stress during knee extension/ankle dorsiflexion
- Tendinitis (aka tendonitis)
  - most common form of tendinitis seen in athletics
  - Et:
    - overuse
  - Sx:
    - crepitus
    - inflammatory run

Triceps Surae

Talocrural and Subtalar Joint Motion

Talocrural Joint
- Ankle Motion
  - Dorsiflexion
  - Eversion
- Inversion

Subtalar Joint
- Subtalar Function

Selected Injuries involving the Ankle Region

Achilles Tendon Injuries
- common tendon of the triceps surae (2 heads of gastrocnemius & soleus) inserting into the calcaneus
- receives its greatest stress during knee extension/ankle dorsiflexion
- Tendinitis (aka tendonitis)
  - most common form of tendinitis seen in athletics
  - Et:
    - overuse
  - Sx:
    - crepitus
    - inflammatory run

Triceps Surae

Talocrural and Subtalar Joint Motion

Talocrural Joint
- Ankle Motion
  - Dorsiflexion
  - Eversion
- Inversion

Subtalar Joint
- Subtalar Function
Achilles Tendon Injuries

- **Tendinitis** (con’t)
  - Tx:
    - cryotherapy
    - NSAID’s
    - heel lifts
    - stretching/strengthening of gastroc/soleus
    - orthotics
    - gradual return to activity

- **Ruptures**
  - 75% seen in males 30 - 40 yr. old who participate in intermittent activities

Chauncey Billups NBA ----
https://www.youtube.com/watch?v=qGwnFAbDOZ8

- **Ruptures** (con’t)

  - Sites:
    - calcaneal insertion
    - 2-6 cm above insertion pt
      (poor vascularity)
      - most common site of injury
    - M-T junction

  - MOI:
    - forced pf during knee extension
      - common move during propulsion activities
    - sudden, forced df of an already pf foot
      - return from a jumping movement
      - most common mechanism

  - Imaged:
    - Side View of Ruptured Achilles’ Tendon. Notice depression at site of rupture (red circle).

Inversion/Lateral Sprains

- **85-95%** of all ankle sprains
  - lateral malleolus extends further
  - medial acts as a fulcrum
  - weaker lateral ligs

- **MOI**:
  - inversion (CF lig)
  - arc + pf (ATF/CF/Tib/Fib ligs)
  - most common mechanism

- **Rx**:
  - ICERS
  - NSAID’s
  - x-rays to R/O fx and mechanical instabilities

Achilles Tendon Rupture (Repaired!)
OTTAWA ANKLE RULES

- Developed to reduce the use of unnecessary radiographs in the diagnosis of acute foot and ankle injuries in emergency departments
- Estimated only 15% of foot/ankle injuries presenting to emergency departments are fractures
- Use of these diagnostic rules have significantly reduced unnecessary x-rays

METADATA

- Meta-analysis of 32 studies of the efficacy of the Ottawa Ankle Rules
- Sensitivity = .99 - 1.0 (EXCELLENT)
  - Sensitivity is the proportion of individuals with a given disease or condition in which a test intended to identify that disease or condition yields positive results. Sensitivity (%) = number of diseased individuals with a positive test / 100 total number of diseased individuals tested.
- Specificity = .26 - .48 (MODEST)
  - Specificity is the proportion of individuals who do not have a disease or condition and in whom a test intended to identify that disease or condition yields negative results. Specificity (%) = number of non-diseased individuals with a negative test / 100 total number of non-diseased individuals tested.
- (+) LR = 1.57
  - Likelihood Ratio = The Likelihood Ratio (LR) is the likelihood that a given test result would be expected in a patient with the target disorder compared to the likelihood that same result would be expected in a patient without the target disorder.
  - LR+ = sens / (1 - spec)
  - LR- = (1 - sens) / spec
- (-) LR = .03
- BOTTOM LINE = Less than 2% of patients who were (-) for fracture according to Ottawa Ankle Rules actually had a fracture!

MODIFIED OTTAWA ANKLE RULES

- Change in palpation zone on tibia and fibula

- Sensitivity remained >.99
- Specificity increased to .42-.59
- (+) LR = 1.94
- (-) LR = .02
MODIFIED OTTAWA ANKLE RULES

Explained

• 99/100 patients with a fx are identified for x-ray
• 49/100 patients without a fx are identified as needing an x-ray

• A positive test is 1.94 times more likely in a person with a fracture than someone without a fx
• A negative exam is found in only 2 of 100 patients having a fx

Overview – Ankle Instability

• Inversion ankle sprains are a frequent orthopedic injury
• The majority of appropriately rehabilitated ankle sprains will do well . . . , but saying “they all do well” is a misnomer!

• Symptoms:
  - pain
  - feeling of giving way
  - swelling
  - recurrent injury

EPIDEMIOLOGY

• Ankle sprains are extremely common in:
  - Sport and exercise
  - Military training
  - Occupational injuries
  - General population

• 1.6 million physician visits annually for ankle sprains in the US (AAOS, 1999)
• Annual aggregate medical costs of 2 billion dollars in US (Soboroff, Clin Orthop, 1984)

• Recurrence rates >70% in basketball (Yeung et al, BJSM, 1994)
• 55-72% report residual symptoms 6 months post-injury (Braun, Arch Fam Med, 1999)
• 74% reported at least one residual symptoms at 2 years post-injury
  - 47% reported perceived instability and more than one symptom
  - Also rated lower general health quality of life (SF-36) compared to those with upper extremity injuries (Anandacoomarasamy & Barnsley, BJSM, 2005)

EPIDEMIOLOGY

• Most common predisposition to an ankle sprain is the history of a previous sprain (Beynnon et al, J Athletic Training, 2002)
• 55% of ankle sprains are not treated by a health care professional (McKay et al, BJSM, 2001)
• Relationship between ankle sprain history and development of osteoarthritis (Valderrabano et al, AJSM, 2006)
Chronic Ankle Instability

Ankle Instability (Mechanical)

- **Definition:**
  - lateral ligament laxity (Freeman et al. - 1965)
  - joint motion that exceeds physiologic motion (Tropp - 1985)

- **Assessment Tools:**
  - anterior drawer test
  - talar tilt
  - roentgenographic studies (Telos Stress)

A fancy name for x-ray!

Ankle Instability (Functional)

- **Definition:**
  - disability to which patients refer when they say the foot tends to “give way” (Freeman et al. - 1965)
  - joint motion beyond voluntary control, but not necessarily exceeding physiologic ROM (Tropp - 1985)
Ankle Instability (Functional)

**Assessment Tools:**
- muscular strength
- isometric
- isokinetic
- stabilometry
- peroneal reaction times

**Cumberland Ankle Instability Tool (CAIT)**

- Designed to measure functional ankle instability
- 9 questions related to subjects’ perception of ankle stability during various activities
- Shown to be valid and reliable

**How do you score?**
- Maximum score = 30
- Scores < 25 = ankle instability

**APPENDIX 1: THE CAIT QUESTIONNAIRE**

Please tick the ONE statement in EACH question that BEST describes your ankle.

<table>
<thead>
<tr>
<th></th>
<th>LEFT</th>
<th>RIGHT</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>I have pain in my ankle</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Q2</td>
<td>Never</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Q3</td>
<td>Sometimes during sport</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>Occasionally</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>When I make sharp turns, my ankle feels unstable</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>I have never rolled over on my ankle</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>1-2 days</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Q8</td>
<td>More than 2 days</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Common Questions**

- When administering CAIT, ensure participants understand all questions. Explanations are often required for the following:
  - Q1 Make sure the pain is related to the ankle injury, whether the most recent or a previous incident.
  - Q2 For dancers, substitute ‘dance’ for ‘sport’
  - Q3 Sharp turns is a change of direction, not a spin on the spot.
  - Q6 Hop from side to side is on the SAME foot, not changing from one foot to the other.
  - Q8 and 9 Relate to rolling over on something ex. – stones, NOT JUST an injuring incident.
- If participants tick more than one box per question score the lowest mark only.

**International Ankle Consortium**

Selection criteria for patients with chronic ankle instability: A position statement of the IAC

BJSM
JOSPT
JAT

**Wake Up!**
Eversion/Medial Ankle Sprains

- less common (5 - 15% prevalence)
  - strong deltoid complex
  - bony structure of ankle mortise
- **MOI:**
  - eversion + df (ruptures deltoid + tibfib ligs.)
  - R/O associated fx’s
  - rotation + eversion (fx fibular shaft + sprain of deltoid complex)

Syndesmotic Ankle Sprains

- uncommon injury, the “high ankle sprain”
- more disabling with prolonged recovery time
- **MOI:**
  - forced df
    - talus located between malleoli forces bones apart
    - damage to syndesmosis (fibrous sheath)
  - forced rotation with a fixed foot
    - shape of the talus acts as a fulcrum forcing the tibia and fibula apart

Syndesmotic Ankle Sprains

- **Sx:**
  - point tenderness and swelling localized over the anterior + posterior tibiofibular ligaments
  - bilateral compression increases pain
  - walk on toes
  - inability to push off
- **Tx:**
  - ICERS
  - immobilization usually for a period of 2-3 weeks
  - depends on the severity of mortise separation
  - NSAID’s

Radiological View

Radiograph showing widening of the tibiofibular “clear space” (arrows) as a result of disruption of the syndesmosis. The clear space is normally less than 5 mm wide.

Ankle Fractures

Alexia Bell UD
WBB Player 11-2014
Did this really happen?

Ankle Fractures

- Ankle fractures are usually defined as single malleolar, bimalleolar, or trimalleolar.
- Trimalleolar involves med/lat and posterior tibial malleolus.

Isolated fibular fractures are the most common type of fracture and, without displacement, usually requires 4-6 weeks to heal.

Dorsal Plafond: the articular surface of the distal end of the tibia.

Posterior Malleolar Fracture

Ankle Dislocation

- Ankle dislocation results from complete disruption of articular elements in the ankle.
- An isolated ankle dislocation without associated fracture is quite rare.

Acute Ankle Dislocation
England’s Physiotherapist Dislocates Ankle during 2014 World Cup --- Ughhhh!

https://www.youtube.com/watch?v=ZBTayAua2Y0

Os Trigonum Syndrome (Posterior Ankle Impingement)

- **Os Trigonum** - Δ bone, posterior stylus of the talus
  - 7% of population has a free os trigonum (non-union)
- **Path:**
  - traction apophysitis during early childhood caused the separation
    - FHL irritates the bone as it passes by
    - PF motions impinge the posterior process

Os Trigonum Syndrome

- **Sx:**
  - painful & limited pf
  - pain on great toe flexion
- **Dx Tests:**
  - bilateral x-rays (feet pf)
  - bone scans or MRI
- **Tx:**
  - symptomatic therapy (conservative)
  - surgical intervention in some cases

Differential Diagnosis

A Shepherd's fracture (avulsion fracture of the posterolateral process of talus), which is often difficult to differentiate radiographically from an os trigonum.

Foot Injuries

- neck of talus (forced DF)
- calcaneus (crush injury/compression)
- avulsion of base of 5th metatarsal (strong contraction of peroneus brevis)
- metatarsal fractures (direct trauma)
- Jones fracture (just distal to the base of the 5th metatarsal)
Calcaneal Fracture

Lateral radiograph of the ankle. There is a hatchet injury to the calcaneus.

Arch Injuries

- **Longitudinal Arch**
  - know anatomy
  - sprain - intertarsal ligaments
  - pes planus - flat foot
- **Transverse Arch**
  - know anatomy
  - sprain - intertarsal ligaments
  - look for callosities under 2nd metatarsal head

Morton’s Neuroma

- **Definition** - a type of metatarsalgia (pain in the metatarsals) associated with a localized thickening (neuroma) at the point where the medial & lateral branches of the plantar nerve join between the 3rd & 4th metatarsal heads
  - **Sx**
    - pinpoint tenderness between 3rd & 4th meta heads
    - decreased sensation in 3rd and 4th toes
- **Hs**
  - complain of sprained transverse arch, sharp shocklike pain during activity that is relieved when the shoe is removed, numbness in the 3rd & 4th toes
- **Tx**
  - transverse arch pad
  - proper shoes
  - NSAID’s
  - RICE
Plantar Fascitis

- **Definition**: inflammation of the fascia covering the plantar aspect of the foot, most common site is from the attachment off the medial tubercle of the calcaneus.

Lisfranc Injury

- The injury is named after Jacques Lisfranc de St. Martin, a French surgeon and gynecologist who described the injury in 1815.
- **Lisfranc Ligament**: ligament between the 2nd metatarsal and the medial cuneiform (oblique fashion)
- **MOI**: axial load of pf foot
  - usually traumatic
- **Sx**:
  - swelling & tenderness midfoot
  - ecchymosis late
  - pain on stress of 1st/2nd met bases

Lisfranc Fracture

- AP radiograph of the forefoot. There is homolateral Lisfranc fracture-dislocation.

Lisfranc Injury

- **Tx**:
  - no flattening of long. arch
    - NWB cast 6 wks
    - walking cast 2 wks
  - flattening of long. arch
    - ORIF
    - poor prognosis
  - 14.5 wks return to sports on average!

5th Metatarsal Tuberosity Fracture

- most common
- “tennis fracture”
- **MOI**: inversion force with pull by lateral plantar fascia
- **Tx**:
  - undisplaced
    - wooden sole shoe
    - symptomatic care
    - union in 8 wks
  - > 2 mm displacement = ORIF

Open Reduction and Internal Fixation
5th Metacarpal Fracture

• 1902 Sir Robert Jones described 4 cases
• **Definition** -
  - transverse fx @ the junction of the diaphysis and metaphysis
  - intraarticular fx (between 4th & 5th)
  - distal to base of 5th
    - @ a pt. between insertions of peroneus brevis & tertius
• **MOI:**
  - pf ankle with a large adduction force to forefoot
• **Tx:**
  - SLC for 6-8 wks.
  - ORIF in competitive athletes

Classification Scheme

Lateral radiograph of the foot. A patient stepped off a curb and sustained a fracture of the proximal aspect of the fifth metatarsal.

Jones Fracture

• **Definition** -
  - sprain of plantar capsuloligamentous complex of the great toe
• **MOI:**
  - hyperextension
  - hyperflexion + valgus stress (uncommon!)
• **Predisposing Factors:**
  - artificial turf
  - flexible footwear
  - pes planus
  - decreased ankle or MP joint motion

Turf Toe

• graded according to sx’s (I, II, III)
• **Sx:**
  - inflammatory signs
  - ecchymosis
  - tenderness
• **Tx:**
  - ICERS
  - rigid foot insole
  - taping
  - restricted activity
  - crutches NWB in severe cases
Neuropathies and Compartment Syndromes

Definitions

- **Neuropathy** - any disorder affecting the nervous system.
- **Radiculopathy** - disorder of the spinal nerve roots
- **Compartment Syndrome** - condition in which increased intramuscular pressure in a confined anatomical space brought on by overactivity or trauma impedes blood flow and function of tissues within that space.

Background Info - Neuropathies

- Effect both UE and LE
- Neuropathies are often associated with other bony or soft-tissue conditions
- Must consider the pt’s sport and training regime in the diagnosis
- Radiographic/neuroimaging, EMG, and NCV studies are helpful in the dx.

Generalized Causes - Neuropathies

- Acute Compression
  - Blunt trauma
  - Fracture
  - Compartment syndrome (acute or exertional)
  - Internal compression sources (ganglia, anomalies)
- Chronic Overuse/Overload
  - Muscular hypertrophy
  - Chronic inflammation
  - Poor flexibility

Pathophysiology - Neuropathies

- For compressive nerve injuries = ischemia (direct hypoxic effects)
  - Capillary hypoperfusion
  - Venous stasis (Greek for “standing still”)
  - Indirect disruption of the axonal membrane integrity
- Seddon (1943) Classification Scheme
  - Neurapraxia, axonomasias, neurotmesis

LE Neuropathies – Foot

- **Tarsal Tunnel Syndrome**
  - Tunnel formed by the lower retinaculum (laciniate ligament), medial wall of the calcaneus, posterior tuber, distal tibia, and medial malleolus
  - Structures include:
    - Posterior tibial nerve
    - PT tendon
    - FDL tendon
    - FH tendon
    - Posterior tibial artery & vein
LE Neuropathies – Foot

- **Tarsal Tunnel Syndrome:**
  - Uncommon in athletes
  - **Etiology:**
    - Vascular compromise of the nerve (sensory)
    - Direct compression neuropathy (sensory + motor)
    - Abnormalities of the tunnel
    - Extrinsic factors that compress

LE Neuropathies – Lower Leg

- **Entrapment of the SPN:**
  - **Etiology:**
    - Facial impingement as it exits the deep fascia approx. 6 cm above the lateral malleolus
    - Chronic ankle sprains subject the nerve to recurrent stretching

LE Neuropathies – Lower Leg

- **Sural Nerve Entrapment:**
  - Secondary to 5th met fx’s
  - Recurrent sprains (PF/inv)
  - Ganglions
  - Extrinsic compression (tight ski boot)

Common Compartment Syndromes - LE

<table>
<thead>
<tr>
<th>Lower-Leg Compartment</th>
<th>Muscle</th>
<th>Nerve</th>
<th>Vascular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior</td>
<td>Extensor hallucis longus, extensor digitorum communs, tibialis anterior, peroneus tertius</td>
<td>Deep peroneal nerve</td>
<td>Anterior tibial artery</td>
</tr>
<tr>
<td>Lateral</td>
<td>Peroneus brevis and longus</td>
<td>Superficial peroneal nerve, peroneal branch of deep peroneal nerve</td>
<td>Peroneal artery</td>
</tr>
<tr>
<td>Posterolateral</td>
<td>Gastrocnemius, soleus, plantaris</td>
<td>Tibial nerve branches</td>
<td>Peroneal artery, popliteal artery, peroneal artery, sural artery</td>
</tr>
<tr>
<td>Posterior deep</td>
<td>Popliteus, flexor hallucis longus, flexor digitorum longus, peroneus</td>
<td>Tibial nerve</td>
<td>Peroneal artery, popliteal artery, sural artery</td>
</tr>
</tbody>
</table>

**DID YOU SEE THAT????**
Today’s lecture can be viewed at the following URL address:

http://sites.udel.edu/chs-atep/lectures/

Now this takes some coordination!

Recommendations

The purpose of this position statement is to present recommendations for certified athletic trainers and other allied health professionals in the conservative management and prevention of ankle sprains in athletes. Our recommendations will be reinforced by relevant scholarly evidence currently available in peer-reviewed publications and graded according to the Evidence Category Taxonomy (SORT) Evidence Based Scale.

Recommendations from Five (5) Different Categories

- Diagnosis
- Treatment and Rehabilitation
- Return-to-Play Considerations
- Prevention
- Special Considerations

What is Evidence-Based Practice
**Current State of AT Practice**

- **Best Research**
- **Clinical Experience**
- **Patient Values**

**Evidence Categories SORT Taxonomy**

Strength of Recommendation Taxonomy (SORT)

<table>
<thead>
<tr>
<th>Strength of Recommendation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Recommendation based on consistent and good quality patient-oriented evidence. *</td>
</tr>
<tr>
<td>B</td>
<td>Recommendation based on inconsistent or limited-quality patient-oriented evidence. *</td>
</tr>
<tr>
<td>C</td>
<td>Recommendation based on consensus, local practice, opinion, disease-oriented evidence.* or case series for studies of diagnosis, treatment, prevention, or screening.</td>
</tr>
</tbody>
</table>

**Evidence Categories Made Simple**

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>SORT Grade</th>
<th>Clinical Practice Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Based on consistent and good evidence</td>
<td>No brainer! You should be doing this in clinical practice</td>
</tr>
<tr>
<td>B</td>
<td>Based on inconsistent or limited-quality evidence</td>
<td>Should probably include in our clinical practice!</td>
</tr>
<tr>
<td>C</td>
<td>Based on consensus or usual practice</td>
<td>Flip a coin --- it is up to you to decide!</td>
</tr>
</tbody>
</table>

**Implementing the Position Statement Recommendations**

- Easier said than done

**Diagnosis**

- **1. Patient history including mechanism of injury and past injuries, clinician observation, and palpation can provide important insights into the anatomical structures that may be injured, but not the severity of injury, in a patient suspected of having an ankle sprain.**
  - **Evidence Category: C**

- **2. Assessment of active, passive, and resistive range of motion about the ankle can provide insight into injury to ligaments, muscles, tendons, and nerves.**
  - **Evidence Category: C**
Diagnosis

3. Special tests to assess for injury to the lateral ankle ligaments such as the anterior drawer and inversion talar tilt tests performed soon after injury and before joint effusion has accumulated may have better diagnostic accuracy than tests performed after effusion has occurred.

– Evidence Category: C

4. Special tests such as the anterior drawer and inversion talar tilt test have more diagnostic accuracy 5 days after injury than they do at 2 days post injury.

– Evidence Category: B

5. Clinicians must be vigilant in assessing for associated lesions, both local and distant to the talocrural joint that may accompany ankle sprains.

– Evidence Category: C

6. Special tests for high ankle sprains, such as the Squeeze test, Cotton test, external rotation test, and fibular translation tests, should be performed to assess for injury to the anterior inferior tibiofibular ligament.

– Evidence Category: C

7. The Ottawa Ankle Rules are a valid clinical tool to determine the need for radiographs of the acutely injured ankle or midfoot.

– Evidence Category: A

Treatment and Rehabilitation

14. Cryotherapy should be applied to acute ankle sprains to reduce pain, diminish swelling formation and reduce secondary injury.

– Evidence Category: C

15. Compression should be applied to acute ankle sprains to minimize swelling formation.

– Evidence Category: C

16. Acute ankle sprains should be elevated to curb swelling formation.

– Evidence Category: C

17. Non-steroidal anti-inflammatory drugs, administered orally or topically reduce pain, swelling and improve short-term function following ankle sprains.

– Evidence Category: A
An Interesting Take on an Old Practice

POLICE = Protection, Optimal Loading, Ice, Compression, and Elevation

Did This 2012 JAT Article Make You Stop and Think About Current Ankle Sprain Management?

The Future of Acute Ankle Sprain Treatment Intervention?

Treatment and Rehabilitation

- 18. Early mobilization and functional rehabilitation is more effective over immobilization in the management of Grade I and II ankle sprains.
  – Evidence Category: A

- 19. Electrical stimulation can be used as an adjunct to diminish swelling formation during the acute phase of injury.
  – Evidence Category: C

Treatment and Rehabilitation

- 20. Clinicians should refrain from thermotherapy during the acute and sub-acute phase of injury due to lack of evidence and potential to exacerbate the injury.
  – Evidence Category: C

- 21. Cryokinetics can be used to reduce pain and thereby allow early rehabilitative exercises.
  – Evidence Category: C

Treatment and Rehabilitation

- 22. Rehabilitation should include comprehensive range-of-motion, flexibility, and strengthening of the surrounding musculature.
  – Evidence Category: B
Treatment and Rehabilitation

23. Balance training should be included throughout rehabilitation, and follow-up management of ankle sprains to reduce re-injury rates.
   – Evidence Category: A
   [http://www.youtube.com/watch?v=ESqPhgXaVl4]

24. Joint mobilizations should be utilized to increase ankle dorsiflexion and improve function.
   – Evidence Category: B

Return-to-Play Considerations

25. Patients’ perception of function should be included in any return-to-play decision making. This information can be obtained through an array of self-report questionnaires that have been developed for patients with lateral ankle sprains
   – Evidence Category: C

26. Functional performance testing should be a component of the return-to-play decision making. Specifically, during functional hopping tests, the injured limb should perform at the level of at least 80% of the uninjured limb to return to sport specific tasks.
   – Evidence Category: B
   [http://www.youtube.com/watch?v=iNzGCetoLlu]

Return-to-Play Considerations

27. Athletes with a history of previous ankle sprains should wear prophylactic ankle support in the form of ankle taping or bracing for all practices and games.
   – Evidence Category: B
   [http://www.youtube.com/watch?v=RvhPd7c6l0c]

Prevention

28. Both lace-up and semi-rigid ankle braces and traditional ankle taping have been shown to be effective in both preventing ankle injuries and reducing the rate of recurrence in athletic populations.
   – Evidence Category: A
   ** EBP Quiz ?
29. Clinicians working with athletes should perform a multi-intervention prevention program, lasting at least 3 months, focused on balance and neuromuscular control to reduce the risk of ankle injury. Athletes with a history of ankle injury may benefit more from this type of training.

– Evidence Category: A

30. Leg muscle (evertor, invertor, dorsiflexor, and plantar flexor) and hip extensor and abductor strength may be considered as an ankle injury prevention strategy.

– Evidence Category: C

31. Clinicians should consider assessing dorsiflexion range of motion in at-risk athletes. If dorsiflexion range of motion is limited, clinicians should incorporate techniques to enhance arthrokinematic and osteokinematic motion for possible prevention of ankle injury.

– Evidence Category: C

Helpful Resources

- Section I Risk and Risk Reduction of Ankle Sprains
- Section II Diagnosis
- Section III Treatment and Rehabilitation
- Section IV Surgical Considerations

Thank You
Range of Motion Testing

- AROM
- PROM
- RROM
  - MMT
  - “Break Test”

AROM

- Plantar Flexion
  
  Note that PF is two words!!

AROM

- Dorsiflexion

AROM

- Inversion

AROM

- Eversion

Weight Bearing AROM

Plantar and Dorsiflexion
Weight Bearing AROM

Inversion and Eversion

RROM

• Plantar Flexion

Any UNF students in the audience? Who is this?

RROM

• Dorsiflexion

RROM

• Inversion

RROM

• Eversion

Show Me the Evidence!

• Sensitivity – those people correctly identified by the test as having the condition of interest (Positive (+) Predictive Value)
• Specificity – those people correctly identified as NOT having the condition of interest (Negative (-) Predictive Value)
Special Tests for Ligamentous and Capsular Laxity

Anterior Drawer Test
Sensitivity 32% - 80%

Anterior Drawer Schematic
Anterior Drawer Schematic
Anterior translation is > when the ankle is in 15° of plantar flexion

Anterior Drawer Test (variation)

Talar Tilt (Inversion Stress)
Sensitivity 52%
What Does the Evidence Suggest?

- None of the syndesmotic stress tests could distinguish which ligaments were sectioned. Furthermore, the small displacements measured during the stress tests (with the exception of the external rotation test) suggest it is unlikely that the displacement induced in injured syndesmoses can be clinically differentiated from normal syndesmoses. Therefore, pain, rather than increased displacement, should be considered the outcome measure of these tests.

Cotton Test

Used to evaluate lateral translation of the talus in the ankle mortise - syndesmosis sprains.

Fibular-Translation Test

Performed by translating the distal fibula anteriorly and posteriorly on the tibia. (+) test results when pain is produced at the syndesmosis or when fibular displacement is > the uninvolved limb.

Medial Subtalar-Glide Test

Used to assess laxity of the subtalar joint resulting from lateral ligament injury. Test is performed by translating the calcaneus medially on the talus in the transverse plane — excessive laxity is a (+) test.

Special Tests - Fracture Identification

Squeeze Test (Potts Compression Test)

Pott’s Fx = fx distal fibula and medial malleolus. Sir Percival Potts identified this compound fx in 1756.

Bump Test (Heel Tap or Percussion Test)
Special Tests - Thompson Test
(Achilles Tendon Rupture)

(-) (+)

Dr. Homan (of "Homan's sign" fame) discredited his own test as being useless in the evaluation of DVT and admitted he was sorry he ever published its description.

On-Field Assessment Review

• **History**
  – MOI, location, pain
  – Unusual sounds/sensations
  – Information from others

• **Observation/Inspection**
  – Deformity, swelling, ecchymosis
  – Positioning
  – Skin color

• **Palpation**
  – Tenderness, crepititation, deformity:
    • distal tibia
    • distal fibula
    • ligamentous structures
    • syndesmosis
    • Achilles tendon
    • foot region

• **Neurovascular**
  – Dorsalis pedis pulse
  – Sensation over foot (dorsum and lateral border), calcaneus

• **Special Tests**
  – Pott’s Compression Test
  – Anterior Drawer Test

• **AROM Tests**
A Cool Web Site

http://ahn.mnsu.edu/athletictraining/spata/