Foot and Ankle Injuries in the Pediatric Athlete

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Disclosures

John Faust, M.D., has no financial relationships to disclose

Overview

• Sever’s disease
• Ankle sprains and instability
• Peroneal tendon instability
• Osteochondral lesions of the talus (OLT)
• Ankle impingement
• Ossicles
Sever’s disease
Calcaneal apophysitis
- 8% of all overuse injuries in children and adolescents
- Typically 8-12 yo
- Males 2-3x more than girls
- 60% bilateral

Sever’s disease
Typical history
- Pain brought on by activity
- Improves with rest, ice, NSAIDs
- Returns with activity
- No pain at rest
- When pain resolves has no pain with weight bearing

Sever’s disease
Differential diagnosis of heel pain:
- Calcaneal tumor
  - Benign and malignant
- Calcaneal stress fracture

Radiographs
- Pain with weight bearing
- Parent’s request
- Findings: nothing
  - Sclerosis and fragmentation vs. normal development of the apophysis
Sever’s disease

Treatment
• Rest, ice, NSAIDs
• Activity modification
• Achilles tendon stretching
• Pad the shoe cleat
• Temporary use of heel cups if desperate
• Tuli’s heel cups
• Tuli’s cheetahs

Have to get serious to improve the pain
• Many wait to finish the season

Recurrence possible/common until skeletally mature

Ankle sprains

Incidence and frequency:
• Most common sports injury
• 27,000/day in the US
• Extreme need for ROM and loading in maximal plantar flexion
• Peak incidence 15-19 yo
• 70% of basketball players
• 1/3rd of all high school basketball players over 4 years will have a severe sprain
• 80% recurrence

Rehab is key to re-injury prevention

Ankle sprains / instability

Pertinent ligaments
Ankle sprains / instability

History:
• Ankle inversion

Physical exam:
• Anterior and distal to the tip fibula
• Swelling, bruising
• Tenderness

Ankle sprains / instability

Physical exam:
• Anterior and distal to the tip fibula
• Swelling, bruising
• Tenderness

Ankle sprains / instability

Physical exam:
• Anterior drawer test
• 10° plantarflexion: ATFL
• Neutral dorsiflexion: CFL
Ankle sprains / instability

Physical exam:
• Anterior drawer test
• Talar tilt test

Exam under x-ray or fluoro

Treatment options

Ankle sprains:
• Non-operative care
• RICE
  • Rest
  • Ice
  • Compression
  • Elevation
• Immobilization
  • Lace-up ankle brace
  • Stirrup brace
  • Fracture-boot
  • Possibly more recurrence than lace-up brace
• Cast
• Physical therapy – early

Recurrent ankle instability
**Treatment options**

**Ankle sprains:**
- Non-operative care
- RICE
  - Rest
  - Ice
  - Compression
  - Elevation
- Immobilization
  - Lace-up ankle brace
  - Stirrup brace
  - Fracture-boot
  - Possibly more recurrence than lace-up brace
- Cast
  - Physical therapy – early

**Recurrent ankle instability**
- Repeat non-operative care
- Bracing
- Physical therapy
- Surgery
- Repair and plication
- Reconstruction / augmentation
  - (Shrinkage)

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**Ankle sprains / instability**

**Physical therapy**
- Pediatric / adolescent programs
- Pain management
- Range of motion
- Strengthening
  - Peroneals – key to rehab
  - Critical for dynamic stabilization
  - Prone to over-use
- Proprioception
- Return to sport

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**Ankle sprains / instability**

**Physical therapy – pain management**
- RICE
- Modalities
  - Ice
  - Electrical stimulation
  - Taping / bracing
Ankle sprains / instability

Physical therapy – range of motion
• Active – write the alphabet
• Passive
• Active-assisted

Ankle sprains / instability

Physical therapy – strengthening
• Therabands
• Isometric
• Isotonic
• Concentric
• Eccentric
• Isokinetic

Ankle sprains / instability

Physical therapy – proprioception
• Affected by injury
• Start in early phases
• Advance throughout
Ankle sprains / instability

Physical therapy – return to sports
• More than exercises
• Sport specific skills
• Vary the challenges
• Protect
• Taping
• Bracing
Prevent re-injury

Repair and plication

Broström

Gould modification

Reconstruction / augmentation

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Ankle sprains / instability

Summary:
• Very common injury
• Most non-operative
• PT does make a difference
  • More severe
  • More athletic
• Primary repair rarely indicated
• Secondary repair if recurrent instability

Surgery in growing athletes:
• Broström is ideal for most
  • Good tissue
  • Avoids physes
  • Augmentation for tissue deficit

Peroneal tendon instability

Superior peroneal retinaculum

Peroneal Tendon Subluxation

Mechanism
• Ankle dorsiflexed
• Hindfoot everted

Acute presentation:
• Very similar to lateral ankle sprain

Chronic presentation
• Visible
• Audible Snap
• Palpable snap
**Peroneal tendon instability**

**Non-operative Care**
- Recognize the acute injury
- Immobilize
- Therapy
- 50% successful?

**Surgery**
- Repair
- Reconstruction

*Ferran et al. Sport Med 2006*

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**Peroneal tendon instability**

**Anatomic repair**
- Deepen peroneal groove
  - If growth plate closed

*Oliva, F Bull Hosp Joint Dis 2006*

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**Peroneal tendon instability**

**Pediatric reconstruction:**
- Modified Chrisman-Snook
  - Split peroneus brevis
  - Through the epiphysis
  - Into the calcaneus

*Forman & Micheli. Foot & Ankle 2000*
Osteochondral Lesion of the Talus (OLT)

Osteochondritis dissecans (OCD) of the talus
- Injury to the surface of the talus
- Cartilage and subchondral bone
- Conservative treatment not very successful
  - Prolonged
  - Risks cartilage

Medial (70%)
- 64% trauma
- Deeper
- Posterior
- Plantarflexion, inversion, ER

Lateral (20%)
- 100% trauma
- Shallow/wafer
- Anterior
- Dorsiflexion, inversion, IR

Berndt & Hardy. JBJS, 1959
Canale. JBJS, 1980.

Berndt and Hardy Classification

Berndt & Hardy. JBJS, 1959
Osteochondral Lesion of the Talus (OLT)

Cartilage surface intact  Cartilage NOT intact

Retroarticular drilling
Osteochondral Lesion of the Talus (OLT)
Cartilage surface intact
• Retroarticular drilling

Barnes & Ferkel. Foot Ankle Clin N Am, 2003

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Osteochondral Lesion of the Talus (OLT)

Cartilage NOT intact
- Debridement
- Marrow stimulation (microfracture)

18 months post-op
Ankle impingement

Bone or soft tissue pinched inside the ankle

3 locations
- Anterolateral
- Anterior
- Posterior

Anterolateral ankle impingement

Etiology:
- Ankle sprains
- Fractures
- Repetitive activities
- Mechanical issues
- Just about anything...

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Anterolateral ankle impingement

Treatment:
- PT
- Brace
- Ice
- NSAIDs
- Cast
- Inject
- Arthroscopy
- Debridement

Anterolateral ankle impingement

Culprits:
- Synovitis
  - Felkel lesion
  - Meniscoid lesion
- Bassett’s ligament
  - Accessory fascicle of the anterior inferior tibiofibular ligament (AITFL)
Anterolateral ankle impingement

- Talus

Anterior ankle impingement

- Primarily tumblers
- "Landing short" → forced dorsiflexion

Soft tissue impingement initially
- Look for bony lesion like a cam or pincer of the hip
- Underlying anatomy?
- Repetitive injury?

Anterior ankle impingement

- Talar dome
- Cam-like lesion
- Talar neck
Anterior ankle impingement

Pincer-like lesion, early bone spur

Talus

Anterior ankle impingement

Arthroscopic resection

• Before

• After

Anterior ankle impingement

Dome

Neck

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Posterior ankle impingement

Differential diagnosis:
- Chronic synovitis
- Adhesions
- Extension of lateral impingement
- Hypertrophied transverse ligament
- “Meniscus of the ankle”
- “Labrum” of the posterior ankle
- Os trigonum

Gould JF, Ankle Arthroscopy - Pathology and Surgical Techniques
Os trigonum

Separate bony ossicle at the lateral tubercle of the talus
• Present in ~7% of adults
• Ossicle forms between 7-13 years of age
• Fuses with the talus in most people, otherwise persists as an os trigonum

Different from Steida process
• Enlongated lateral tubercle of the talus
• Usually an incidental finding
• Pain
• Snapping/popping

Occasionally symptomatic after trauma or repetitive use

Steida process

Os trigonum

Sports
• Dance
• Gymnastics
• Competitive cheering
• Marshal arts

Sports
• Dance
• Gymnastics
• Competitive cheering
• Marshal arts
Os trigonum

Treatment
- Conservative:
  - Rest and immobilization
  - Activity modification
  - Cast
  - NSAIDs
  - Physical therapy
  - Steroid injection
- Excise for refractory cases
  - open vs. arthroscopic


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Os trigonum

Arthroscopic resection
- Set up like a knee
- Exsanguinate before prep
- Foot in lap
- 2.9 mm scope

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Ankle arthroscopy

“Coaxial” posterior ankle portals

Ankle arthroscopy
Posterior coaxial portals

Os trigonum
Arthroscopic resection

Talus
Calcaneus
Subtalar joint

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**Os trigonum**

Arthroscopic resection
- Pre-op
- Post-op

**Accessory ossicles**

Many ossicles in the foot
- Often incidental
- Correlate with symptoms
- Conservative treatment for most

**Os navicular**
Os subfibulare
Tip of fibula
Usually an incidental finding
- Ankle sprain
- Snapping/popping
Occasionally becomes symptomatic

Os subtibiale
Usually unites
Traumatic vs. developmental
- Can become symptomatic after trauma or repetitive use
Treatment:
- Rest, time
- Rarely more

Os subtibiale
Arthroscopic resection
- Accessory portal
Os subtibiale
Arthroscopic resection
• Pre-op
• Post-op

Youth sports
• Injury prevention
• Parental oversight
• Proper Instruction
• Medical Care and Expertise
• Screening
• Tips

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