Foot and Ankle Injuries in Athletes

Robert C. Palumbo, M.D.
OAA Orthopaedic Specialists
Sports Medicine Institute Foundation

The Problem
- 300,000 lbs of stress per mile of running is centered on heel and then dissipated to the rest of the foot

Foot and Ankle Sports Injuries History
- Sport
- Surface
- Shoes
- Custom/Prefab Orthosis
- Onset
- Position at injury
- Noise
- Pain location
- Swelling
- Time out of Sports

Foot and Ankle Sports Injuries Physical Exam
- Gait
- Callus Distribution
- Shoe Wear
- Orthosis wear
- Palpation
- Auscultation
- Range of Motion
- Percussion
- Pulses
- Sensory Exam

Foot and Ankle Sports Injuries Imaging
- AP/Lat/Obliques
- Tangenital Views
- Weight Bearing Views
- CT/MRI
Foot and Ankle Sports Injuries Therapy

- R.I.C.E.
- Crushed ice best
- Ice Massage
- Compression-Jones Wrap
- Crutches

- Early Gentle Motion
- Whirlpool/Ultrasound
- Tilt Board
- Strengthening
- Stretching!!!

Metatarsalgia

- Common overuse injury described as pain in the forefoot that is associated with increased stress over the metatarsal head region.
- Often referred to as a symptom, rather than as a specific disease.

Metatarsalgia

- Common causes of Metatarsalgia
  - Sesamoiditis
  - Interdigital neurona (also known as Morton neurona)
  - Avascular necrosis (Frieberg's Infarction)
  - Metatarsophalangeal Synovitis
    - Inflammatory arthritis
    - Synovitis/Inflammation from Repetitive Trauma

Sesamoiditis

- Signs
  - Local Tenderness
  - Pain with Hyperextension
  - Rare Swelling

Sesamoid Fracture

- Mechanism
  - Acute Fall from height (Ballet)
  - Hyperextension of MTP (football)
  - Chronic-Stress Fracture (Runners)
  - Osteochondritis

Sesamoiditis

- Incidence
  - Stress Fracture
    - Any age
    - Tibial or Fibular Sesamoid
  - Osteochondritis
    - Female, 20’s
    - Lateral Sesamoid

Kilman, F+A, 3:220 1983
Sesamoid Fracture
X-RAY
- AP/Lat/Oblique
- Reverse Oblique
- Tangential Views
- Bone Scan

Sesamoid Fracture
Acute
- Presentation
  - May mimic Turf Toe
- Treatment
  - Depends on amount of Diastasis

Sesamoid Fracture
Acute
- Diastasis >2mm
  - Bony Fixation
  - Soft tissue repair
- Diastasis < 2mm
  - SLC 3-6 weeks
  - Steel shank insole
  - Prevent Hyperextension

Sesamoid Fracture
Chronic
- Treatment
  - U or J pad
  - Firm Soled Shoes
  - NWB 3 weeks if severe

Sesamoid Fracture
Surgical Treatment
- Displaced Fracture
- Non-Disp Fx Not Resp to cast Immob. or shoe inserts x 12 wks
- Unrelieved Sesamoiditis/Bursitis
- Osteomyelitis

Sesamoid Fracture
Excision of Fragment-Complications
- Migration of Hallux 10%
- Persistent Pain 41-50%
- Stiffness 33%
- Weakness 60%

Richardson, F + A 7:29, 1987
Mann AOFAS 1985
**Sesamoid Fracture Late Repair**

- Seventeen Patients
- Treated with Curetage and Bone Grafting
- Post-op SLC for Six Weeks
- Mean Follow-up 33 months
- 15/17 Asymptomatic return to all Pre Injury Activities
- 14/15 Healed by Tomography at 12 weeks

**Turf Toe Mechanism**

- Acute
  - Hyperextension of first MTP
  - Direct blow to heel with toe planted in dorsiflexion
    - Football Lineman
- Chronic
  - Repetitive valgus stress
  - Runner's (Especially Cross-country)

**Turf Toe Anatomy**

- MTP Capsule
- Articular Cartilage
- Great Toe Flexors
- Sesamoids
- Abductor Hallicus
- Plantar Nerves
- Bones

**Turf Toe Treatment**

- No role for injections
- RICE, Shoe Mod. And Taping
- If can’t jog w/in 3 wks. Consider
  - open treatment
  - Late repair works

**Morton’s Neuroma**

- Symptoms
  - Classically described as a burning pain in the forefoot
  - can also be felt as an aching or shooting pain in the forefoot
  - Pain may occur in the middle of a run or at the end of a long run
  - If your shoes are quite tight or the neuroma is very large, the pain may be present even when walking
  - Occasionally a sensation of numbness is felt in addition to the pain or even before the pain appears.

**Morton’s Neuroma**

- “Click” which is known as Mulder’s sign
- There may be tenderness in the interspace
- Rule out similar or concurrent problems
  - Tenderness at one of the metatarsal bones can suggest an overstress reaction (pre-stress fracture or stress fracture) in the bone.
  - An ultrasound scan can confirm the diagnosis and is a less expensive and at this time, at least as sensitive a test as an MRI
  - An x-ray does not show neuromas, but can be useful to “rule out” other causes of the pain.
**Morton’s Neuroma**

- **Cause**
  - An enlargement of the sheath of an intermetatarsal nerve in the foot
  - Most Common – The third intermetatarsal space
  - The second interspace being the next most common location.

- **Contributing Factors**
  - Pronation of the foot can cause the metatarsal heads to rotate slightly and pinch the nerve running between the metatarsal heads
  - Chronic pinching can make the nerve sheath enlarge. As it enlarges it than becomes more squeezed and increasingly troublesome.
  - Tight shoes, shoes with little room for the forefoot, pointy toeboxes can all make this problem more painful.
  - Walking barefoot may also be painful, since the foot may be functioning in an over-pronated position.

- **Self-Treatment**
  - Wear wide toe box shoes
  - Don’t lace the forefoot part of your shoe too tight
  - Make sure your feet are in supportive shoes that do not squeeze your forefoot

- **Orthotics** – esp. for the Pronator
- Injection of Steroid and Local Anesthetic
- Occasionally injection of other substances to "ablate" the neuroma.
- **Surgical Removal of Neuroma**

- **Tips**
  - Wear shoes designed with a roomy toebox.
  - Wear shoes that have good forefoot cushioning.
  - Use sport specific shoes.
  - Fit your shoes with the socks that you plan to wear during aerobics activity.

---

**Freiberg’s Infraction**

- AKA Avascular Necrosis, Osteonecrosis, Osteochondrosis

- **General considerations**
  - Named "infraction" because it was originally thought secondary to trauma
  - Exact cause remains uncertain but thought to be one of the osteochondroses in adolescents
  - Osteochondroses are diseases that usually affect the epiphyses of growing bones resulting in necrosis most likely on a vascular basis, although the exact mechanism is not known
  - In others, Freiberg’s may be due to a combination of trauma, and vascular insults

- **Relatively uncommon**
  - Painful collapse of the head of the 2nd metatarsal
  - May affect 3rd metatarsal head as well
  - Women to men by 5:1
  - Possibly because of shoes, i.e. stresses placed on toe by high-heeled shoes
  - Length of second metatarsal thought to be a factor by some
  - Usually adolescents
  - Almost always unilateral
Freiberg’s Infarction

- Clinical findings
  - Local pain, activity-related
  - Tenderness
  - Stiffness and limp

- Imaging findings
  - Early signs are sclerosis of 2nd MT head and widening of joint space
  - Later there is fragmentation and collapse
  - End result is flattening of head
  - May produce “loose body”

Freiberg’s Infarction

- Treatment
  - Medical
    - Immobilization and avoidance of weight-bearing to rest the joint
  - Surgical
    - Various osteotomies, bone grafts, excision of the head, joint replacement have each been used alone or in combinations

- Surgical Complications
  - Premature closure of growth plate
  - Loose bodies
  - Secondary osteoarthritis

Midfoot Injuries

- Midfoot Dislocation
- Tarso-metatarsal Sprains
- Metatarsal Fractures
- Metatarsal and Tarsal Stress Fractures

Tarsometatarsal Sprains

- Considerable Disability
- Diagnosis
  - Pain/Swelling over TMT Joint
  - Flattening of Longitudinal Arch
  - Standing X-ray
Tarsometatarsal Sprains
- Nondisplaced
  - Immobilize in *NWB SLC* for Eight weeks
  - Orthotic Arch Support
- Displaced
  - Reduction and internal fixation

Base of 5th MT Fracture
Location
- Tuberosity Avulsion Fracture
  - Mechanism - Inversion
  - Heals Clinically-3 wks
    Radiographically-6 wks
- Metaphyseal/Disphyseal (Jones Fracture)
  - Mechanism - Supination
  - Delayed union/non-union is common

Metatarsal Stress Fracture
**SIGNS AND SYMPTOMS**
- Recent Change in Distance
- No relation to ht, wt., age
- Tender on bone, not interspace
- X-rays pos. at 3-6 wks.
- Bone scan is diagnostic

Jones Fracture
**Natural History**
- Fracture of Proximal diaphysis interrupts intraosseous Blood Supply
- Creates Zone of Relative Avascularity
- Significant Delayed Union
- Significant Refracture

Jones Fracture
**Presentation**
- Type I
  - Acute Fracture, No IM Sclerosis
- Type II
  - Delayed Union, IM Sclerosis
- Type III
  - Non-union, Complete Obliteration of Medullary Canal by Sclerotic Bone

Jones Fracture
**Treatment**
- Type I
  - NWB Cast
- Type II
  - Non-Athlete treat Conservatively
  - Athlete treat w/ Curretage/Bone Grafting
- Type III
  - Curretage/Bone Grafting
**Jones Fracture**
- IM Fixation
- POD#10 WBAT Cast Boot
- Healed Clinically in 6 weeks
- Return to Athletics in 6 weeks
- Healed Radiographically by 13 weeks

**Typical Jones Stress Fracture**

**Ankle Sprains**
**Associated Injuries**
- Osteochondritis Dissicans
- Distal Tib/Fib Disruption
- Anterior Process of Talus Fx
- Lateral Process of Talus Fx
- Fibula, Tibia Fx

**Ankle Sprain**
**Prevention**
- Patients with Previous Ankle Injury 2.3 Times Greater Risk of Future Injury than uninjured Patient
- After 10 weeks of Proprioception Training, Risk Decreases to that of the Uninjured Patient

**Ankle Sprains**
**Treatment**
- At one year, no difference between Function Bracing and Cast immobilization in Ankle Stability or symptoms during activity.
- Functional Bracing allowed Significantly Earlier Return to Natural Walking and Resumption of Sports

**Ankle Sprains**
**Treatment**
- Much Debate –
  - Taping
  - Casting
  - Bracing
- Rehab
  - 90% do well with any conservative RX
  - Reasonable to wait and treat fractures

---

**Ekstrand F + A 11:41-44 1991**

**Kontadren F + A 12:69 1991**
Ankle sprains
Rehabilitation

- Walk > Jog > Run > Steps
  > Turns > Jumps

- Return to Dance when:
  - Proprioception and Strength normal
  - Able to perform Jumps and Turns

Ankle Sprains
Treatment

- 90% do well with any conservative treatment
- Reasonable to wait and treat failures later
- There is some tread to consider earlier surgical stabilization in the elite dancer

Ankle Sprains
Syndesmosis Injuries

- Diagnosis
  - Hx of External Rotation
  - Tenderness over Ant Tibiofib, Syndesmosis or Post Tibiofib
  - Usually Less Swelling than Lateral Sprains
  - + External Rotation Test
  - + Syndesmosis Squeeze Test

Boytim AJSM 19(3):294 1991

Ankle Sprains
Syndesmosis Injuries

- Compared to Lateral Ankle Injury
  - More Games Missed
  - Received More Treatments
  - Missed More Practices

Boytim AJSM 19(3):294 1991

Ankle Sprains
Chronic Pain

- Meniscoid Lesion (Anteriolateral Hypertrophic Synovitis)
  - 31 Patients
  - >2 months of rehab
  - Anteriolateral Pain and tenderness
  - MRI most useful screening test (But only 25% accurate)

Ferkel AJSM 19(5):440 1991

Meniscoid Lesion

- Treatment
  - All Treated with Arthroscopic debridement
  - Path showed Chronic Synovitis
  - 15 Exc., 11 Good, 4 Fair, 1 Poor
Osteochondral Injuries of the Talar Dome

- PosterioMedial
  - Less often has a history of trauma

- Anteriolateral
  - More often associated with trauma
  - Often with an inversion injury

PosterioMedial
- Larger, Deeper
- Can be Developmental

Anteriolateral
- Smaller, Flakelike
- Mostly Trauma Related

Treatment
- I–II: Non-Op
- III Med: Trial of Non-Op
- III Lateral, All IV: Surgery
  - Fixation for acute with bone attached
  - Debridement, Curatage and Microfracture for Chronic lesions or those without attached bone

Canale JBJS 62A p.97, 1980

Osteochondral Injuries of the Talar Dome

- Usually graded Stage I - IV

Stage I Stage II Stage III Stage IV

Osteochondral Injuries of the Talar Dome

- Few Lesions unite long term without surgical treatment

- Degenerative changes (+/- Symptoms) present in 50%

Canale JBJS 62A p.97, 1980

Osteochondral Injuries of the Talar Dome

- All lesions excised followed by drilling or abrasion

- Average followup – 18 months
- 86% excellent or good

Van Buecken AJSM 17(3) 350 1989
Osteochondral Injuries of the Talar Dome

- <12 yo, prior to physeal closure
  - Non-displaced – Immobilize
  - Displaced – Consider fixation or excision

Tendon Disorders

- Very Common
  - Achilles Tendon disorders most common
    - Peroneal and Posterior Tendon disorder also common

- Tendonitis/Tendonosis/Paratendonitis/Tenosynovitis/Partial Tears/Complete tears
  - All can happen independently, or concurrently

- Direct Trauma/Overuse/ Collagen disorders/Inflammatory conditions

Common Disorders

- Gastrocnemius Musculo-tendonous Junction Tears
- Achilles Tendonitis
  - Non insertiona
  - Insertional
- Achilles tendon Tears
  - Partial
  - Complete

Anatomy

- Triceps Surae
  - Soleus muscle
  - Gastrocnemius
    - Crosses 2 joints
- Largest and strongest tendon in the body
- “Watershed” blood supply proximal to insertion
- This area most susceptible

Biomechanics

- Up to 8X Body weight while running
- Medial gastrocnemius by far the largest component as per EMG studies

- Because soleus doesn’t cross knee, subject to early disuse atrophy w/ under training and immobilization

Gastrocnemius Muculotendonous Junction Tear

- Presentation
  - Sudden “Pop” in calf
  - History of sudden movement or Stop
  - +/- Prodromal “tightness” or tenderness
  - Difficulty bearing weight / push-off
Gastrocnemius Musculotendinous Junction Tear

- **Diagnosis**
  - Point Tenderness
  - +/- Palatable Defect
  - Negative Thompson’s Test
  - Normal Galiazzi Pasteur

Medial Gastrocnemius Musculotendinous Junction Tear

- **Treatment**
  - Always conservative
  - Immobilize 1-2 weeks if severe
  - Protected weight-bearing in Cam Walker
  - Heel Lift
  - **Return to Full Activity 2-4 months**
    - Must have full painfree range of motion and full strength

Achilles Tendonitis

- Common in Ballet Dancers
  - Pain on grand plie'
  - Swelling, tenderness, occasional nodule
  - Ribbons, elastic or back of dance shoe may rub against inflamed tissue
  - Repetitively explosive activities
  - Repetitive toe-off activities

Achilles Tendonitis

- Pain on grand plie'
- Swelling, tenderness, occasional nodule
- Ribbons, elastic or back of dance shoe may rub against inflamed tissue

Achilles Tendonitis Non-Insertional

- **4 Pathologic Stages**
  - Paratendonitis
  - Paratendonitis with Tendonosis
  - Tendonosis
  - Tendonitis

Achilles Paratendonitis

- **Saline/Lidocaine Injections** may be helpful in cases of Para tendonitis
  - Used to separate Paratendon from tendon
- **Severe Acute Case of Tendonitis**
  - Immobilization 10 – 14 days
  - **No!!!?? Steroid Injection**
    - Reports of several complete ruptures following intratendonious cortisone injections
    - Studies show no positive effect on degenerative changes or tendinopathy
Achilles Paratendonitis

- Release Sheath from musculotendinous junction to Achilles insertion
- Adhesions should be released posteriorly, medially and laterally but NOT Anteriorly, to avoid injury to blood supply
- +/- Venting of the tendon to encourage ingrowth of new blood vessels

Achilles Paratendonitis/Tendonitis

- Post-Op Management
  - Paratendonitis
    - Immobilize only for would healing
  - Tendonitis
    - Depends on extent of debridement
    - Simple debridement – Immobilize 2 weeks
    - Turndown/Augmentation – Immobilize 5 to 7 weeks

Achilles Paratendonitis

- Release Sheath from musculotendinous junction to Achilles insertion
- Adhesions should be released posteriorly, medially and laterally but NOT Anteriorly, to avoid injury to blood supply
- +/- Venting of the tendon to encourage ingrowth of new blood vessels

Achilles Tendonitis

- Non-Insertional

  - Etiology
    - Watershed of Blood Supply
    - Repeated Micro-Trauma
    - Training Disorders
      - I.e. Sudden increase of training intensity
    - Hindfoot Malalignment
      - Overpronation 56%
    - Poor Triceps Surae flexibility

Achilles Tendonitis

- Non-operative Treatment in Majority of Cases
  - Rest
  - Heel Lift
  - NSAIDs
  - Orthotic treatment
  - Modalities (U/S, Phono, Ionto, Deep Massage)
  - Stretching

  - Return to dance when pain-free for 10 days
Achilles Tendonitis

Surgical Results

- Paratendon Release
  - 89% Good/Excellent

- Tendon Debridement and side to side
  - 67 to 75% Good/Excellent

- 16% Reoperation in 5 years

Nelen AJSM 1989
Schepsis and Leach AJSM 1994

Achilles Tendonitis

Surgical Treatment

- Diseased area should be completely excised
  - Remaining tendon repaired side to side

- Palpate remainder of tendon to assure no non-adjacent involvement

- If more than 50% of the cross-sectional area is excised, consider augmentation with:
  - Plantaris graft
  - Gastroc Turndown
  - Flexor Tendon Transfer

Achilles Tendonitis

Post-Op Management

- Stretching and Strengthening after immobilization

- After tendon Reconstruction
  - Jog 8 – 12 Weeks
  - Full recovery 5 – 6 months

Investigational Treatments for Tendonopathies and Fasciopathies

- Prolotherapy ("Proliferative Injection Therapy")
  - Injection of an irritant solution into the area where connective tissue has been weakened or damaged through injury or strain
  - Many solutions are used, including Dextrose, Lidocaine (a commonly used local anesthetic), Phenol (an alcohol), Glycerine, or Cod Liver Oil extract
  - The injected solution causes the body to heal itself through the process of inflammation and repair. In the case of weakened or torn connective tissue, induced inflammation and release of growth factor at the site of injury may result in a 30-40% strengthening of the attachment points

- Extracorporeal Shock Wave Therapy (ESWT)
  - Application of high-intensity acoustic radiation
  - Microtrauma of the repeated shock wave to the affected area creates revascularization into the area which promotes tissue healing

- Platelet Rich Plasma Therapy (PRP)
Platelet Rich Plasma Therapy

Achilles Tendonitis

- Post-Op Management
  - Stretching and Strengthening after immobilization
  - After tendon Reconstruction
    - Jog 5 – 12 Weeks
    - Full recovery 5 – 6 months

Achilles Insertional Tendonitis

- “Different Animal”
- Usually Older population
- Pathology at the Achilles insertion
  - Associated often with a Haglund’s Deformity
- Treatment
  - 90% Conservative
    - Prolonged attempts
  - 10% Surgical
    - Debride fibrotic / Calcific Debris
    - Remove Boney Impingement and resect inflamed, scarred bursa

Insertional Achilles Tendonitis

- McGarvey WC, Palumbo RC, et al
  - Foot Ankle Int. 2002 Jan;23(1):19-25
- 22 heels in 21 patients
- Treated with central splint
- Debride tendon bursa and Haglunds process
- Post-op
  - 20/22 returned to work or normal activities
  - Only 13 of 22 were pain free
  - 3 patients required reop
Achilles Tendon Rupture

- Most Common 2 to 6 in proximal to insertion
- 22% missed originally by Primary Care physicians
- Presentation
  - "Pop"
  - Acute but not dramatic pain
  - Edema and ecchymosis often follow late
  - Complaints of instability

Exam
- Positive Thompson’s Test
- Loss of normal Galazzi posture
- Palpable Defect – if seen early

Presentation
- "Pop"
- Acute but not dramatic pain
- Edema and ecchymosis often follow late
- Complaints of instability

Exam
- Positive Thompson’s Test
- Loss of normal Galazzi posture
- Palpable Defect – if seen early

Achilles Tendon Rupture

Partial Rupture

- 10 – 50% of Tendon – Conservative Treatment
- >50% = Likely complete Rupture
- Treat as complete
- Palpative Defect
- Neg Thomsongs
- Treatment
  - Surgery Effective if no response to 6 months of conservative treatment
  - Most Patients return to Pre-Injury Status

Achilles Tendon Rupture

Partial Rupture

- 10 – 50% of Tendon – Conservative Treatment
- >50% = Likely complete Rupture
- Treat as complete
- Palpative Defect
- Neg Thomsongs
- Treatment
  - Surgery Effective if no response to 6 months of conservative treatment
  - Most Patients return to Pre-Injury Status

Achilles Tendon Rupture

Treatment
- In the Athlete/Dancer, surgery is the only option other than retirement
- Principles of Surgical repair
  - Avoid Excessive Tension
  - Should come to Full Dorsiflexion in OR
  - Use Flaps, Grafts, etc. To make up Gap

Achilles Tendon Rupture

Treatment
- In the Athlete/Dancer, surgery is the only option other than retirement
- Principles of Surgical repair
  - Avoid Excessive Tension
  - Should come to Full Dorsiflexion in OR
  - Use Flaps, Grafts, etc. To make up Gap

Achilles Tendon Rupture

Functional Non-op Treatment

- Ultrasound proved <10mm btw tendon ends at 20 deg plantar flexion
- Cam walker brace w/ 3cm heel lift
- PT started at 3 weeks
- Results
  - 6.4% re-rupture
  - 73.5% good/excellent complete return to activities
  - 9% satisfactory
  - 17.5% poor – pain, tendon lengthening, decreased strength, decreased calf size

Achilles Tendon Rupture

Functional Non-op Treatment

- Ultrasound proved <10mm btw tendon ends at 20 deg plantar flexion
- Cam walker brace w/ 3cm heel lift
- PT started at 3 weeks
- Results
  - 6.4% re-rupture
  - 73.5% good/excellent complete return to activities
  - 9% satisfactory
  - 17.5% poor – pain, tendon lengthening, decreased strength, decreased calf size

Authors now recommend
1) Repeat U/S 2 to 5 days after original
2) 3 cm heel lift 6 to 8 weeks
3) 1 cm lift in shoe for 3 months

Hufner et al: Foot Ankle Int. 2006
Mar;27(3):167-71

Hufner et al: Foot Ankle Int. 2006
Mar;27(3):167-71
Achilles Tendon Rupture

- New Trend in Post-op Care
  - Functional Treatment
  - Early Weight-Bearing
  - Dorsiflexion Block Orthosis


Chronic Achilles Tendon Tear

Chronic Achilles Tendon Tear
Tendon Disorders in Runners

- Peroneal Tendon disorders
  - Often Traumatic, Inversion injury
- Posterior Tibialis Disorders
  - Often attritional
  - Orthotic Devices can be very helpful

Peroneal Tendon Disorders
Tendonitis, Subluxation and Tears

- Pain Presents laterally and the dancer may also complain of weakness and Instability
- Pain at Demi- and Grand Plie'
- Sense of snapping consistent with subluxing tendon

Peroneal Tendon Disorders
Tendonitis, Subluxation and Tears

Treatment
- Avoidance of Releve'
- NSAIDs
- Stirrup Brace
- Physical Therapy Modalities

If pain persists
- MRI or Exploration
- Debridement and/or Repair

Peroneal Tendon Subluxation

- Treatment – Acute Injury
  - Immobilize 6 weeks in well molded Short leg Cast
    - Good results in 50%
    - Poor results in 50%
    - Reason some recommend immediate surgery

Peroneal Tendon Subluxation
Treatment

- “Bankart Lesion”
  - Detachment of Periosteum
  - Tendons Dislocate into False Pouch
- Anatomic Repair
  - Reattach Periosteum thru Drillholes

Das De JBJS 67(B):585 1985
Peroneal Tendon Subluxation

- Treatment
  - Deepens groove, maintains gliding surface
  - 9 Patients, 10 Ankles
  - All Patients reported excellent results

“False” Peroneal Tendon Subluxation

- Peroneus Quadratus
  - Congenital abnormality
  - Extra Tendon “Fills” Retinaculum
  - Can mimic subluxation and tendonitis

- Treatment
  - Surgical debridement

Peroneus Brevis Abnormality

Extensor Tendonitis

- Pain or pointing of foot on Relevé
- Clinically-
  - Pain with passive plantar flexion
  - Crepitus if severe

- Rx-
  - Rest, occasional immobilization
Flexor Hallucis Longus Stenosing Tenosynovitis

“Dancer’s Tendonitis”

- Tendon under maximal tension in demi-pointe
- Triggering of the Big Toe with stenosing tenosynovitis at the fibrous sheath in the posterior ankle
- Stenosis can occur at the Knot of Henry and at the MTP joint (mimics Hallux Rigidus)

Flexor Hallucis Longus Stenosing Tenosynovitis

“Dancer’s Tendonitis”

- Treatment
  - Relative Rest
  - NSAIDs
  - Physical Therapy with modalities
  - NEVER INJECT
  - Surgery to release the tight sheath

Posterior Impingement of the Ankle

- Painful Os Trigonum
- Large Trigonal Process
  - Stress Fracture can occur
  - Lateral Instability
  - May notice asymmetry of pointe’ and releve’

Posterior Impingement of the Ankle

- Needs to be differentiated from FHL STS
- Test FHL in Dorsiflexion would not hurt if pain was due to Posterior impingement
- Passive Plantarflexion should hurt with Posterior impingement, not FHL STSD

Anterior Ankle Impingement

- Not as common in dancers
- Presents at Plie’
- Anterior osteophyte on Talar neck and/or Anterior Tibia
**Anterior Ankle Impingement**
- Treatment
  - NSAIDs
  - Heel Lift
  - Surgery - Arthroscopic Debridement

**Plantar Aponeurosis**
- Arises predominately from the medial calcaneal tubercle
- Inserts distally through multiple slips into plantar plates, flexor sheaths, proximal phalanges and skin

**Plantar Fasciitis**
- Plantar Heel Pain
  - 6 million cases / year
  - 2 billion dollar cost / year
  - 300,000 lbs of stress per square mile of running centered on heel

**Plantar Fascia Rupture**
- Trauma
- Cortisone injection
- Attrition

**Proximal Plantar Fasciitis**
- Microtrauma to the plantar fascia attachment with attempted repair and chronic inflammation
- Often associated with seronegative arthritides
- Diagnosis
  - Usually clinical
    - Heel pain at anteriomedial calcaneal tubercle
  - Bone scan positive 60% of cases
  - MRI fairly specific
**Proximal Plantar Fasciitis**

- Initial Conservative Care
  - Activity and Shoe modification
  - Stretching Program
  - Orthotic Device
  - NSAIDs
  - Night Splint

- Custom Orthotics?
  - Stretching plus a prefabricated insert is more effective than stretching plus a custom orthotic
    - Pfeffer, GB et al 1999

**Proximal Plantar Fasciitis**

- Efficacy of Cortisone Injection
  - 41% still improve at 5 months

- Focused Ultrasound Treatments (ESWT)
  - Effective, not often reimbursed

- Prolotherapy

**Proximal Plantar Fasciitis**

- Open Plantar Fasciotomy
  - 71% Good and excellent results at 8 year F/U

- Endoscopic Plantar Fascia Release
  - 89% with effective pain relief
  - 71% returned to unrestricted sports
    - Ogilvie-Harris, DJ 2000

**Endoscopic Plantar Fascia Release**

- Complications
  - Inadequate release
    - Nerve injury
    - Lateral column pain
    - Metatarsalgia

**Nerve Entrapments**

- Most Common
  - Superficial peroneal nerve as it exits fascia
- Must be aware of “Double Crush” concurrent HNP

- Rx
  - Injections, NSAID, Elevation
  - Surgical release with fasciectomy
**Entrapment of the First Branch of the Lateral Plantar Nerve**
- Often missed
- Not addressed with endoscopic release
- Release yields 83% complete resolution
  - Baxter, DE 1992

**Nerve Entrapments**
- Most Common-
  - Superficial peroneal nerve as it exits fascia
- Must be aware of “Double Crush” concurrent HNP
- Rx
  - Injections, NSAID, Elevation
  - Surgical release with fasciotomy

**Nerve Entrapments**

**Stress Fractures**
- Mechanism of injury
  - Repetitive loads
  - Wolfe’s law
    - Remodeling of bone results from stresses placed on it
  - Osteoclastic activity outstrips osteoblastic activity

**Stress Fractures**
- Presentation
  - Insidious onset, often after a change in training activities
  - Localized pain
  - Progressive worsening
    - 1st – Pain after activities
    - 2nd – Pain during activities
    - 3rd – Pain limiting activities

**Stress Fractures**
- Diagnostic Imaging
  - Xrays
    - 2/3 may initially be Negative
    - ½ may remain negative
  - Bone Scan
    - May take 2 to 3 weeks to become positive
    - Asymptomatic foci noted in up to ½ of those athletes with positive foci
Stress Fractures

Special Consideration - The Female Athlete
- Oligomenorrhea
- Low Body Fat
- Low Estrogen

May all contribute to higher risk of stress fractures
- Estrogen containing BCP's have been advocated by some

Treatment Principles
- Unload area from repetitive stress
- Maintain Conditioning

Metatarsal Stress Fracture Treatment
- Elastoplast strapping
- Stiff soled shoe
- MT pad X 6 weeks
- Occ. Cast treatment
- REST

Stress Fractures
- Tarsal Navicular Stress Fracture
  - Fracture usually in sagittal plane in middle 1/3 (Limited vascular supply)
  - CT Scan/MRI – usually diagnostic
  - Treatment
    - If no sclerotic margins
      - semi-NWB Cast 6-8 weeks
    - If Sclerosis seen – ORIF with bone graft

21 cases in 19 patients
- Sagital mid 1/3 fx
- Complete or proximal/distal cortex
- Most respond to immobilization
- occ. ORIF
Stress Fractures

- **Interosseous Talar Stress Fracture**
  - May mimic sinus tarsi syndrome
  - X-rays rarely helpful
  - MRI usually diagnostic
  - PROLONGED REST necessary

Stress Fractures

- **Os Calcis**
  - Important to differentiate from other sources of heel pain
  - Pain localized to tuberosity
  - Usually rapid healing due to cancellous bone

Stress Fractures

- **Medial Malleolus**
  - Pain directly over the Malleolus
  - Associated with effusion
  - RX
    - Immobilization/Unload
    - ORIF

Stress Fractures

- **Fibula**
  - Most common 4 to 7 cm above the tip of the lateral malleolus
  - Typical presentation
  - Usually return to full activities within 6 weeks

Thank You