

## Foot Injuries

## Arches

Chapman University Athletic Training Education Program

- Three arches in the foot:
  - 1) Lateral longitudinal arch
  - 2) Medial longitudinal arch
  - 3) Transverse arch
- These arches are maintained and supported by the wedging of the interlocking tarsal and metatarsal bones, tightening of the ligaments of the plantar aspect of the foot, and the extrinsic muscles of the foot and their tendons.<sup>1</sup>

1. Magee. Orthopedic Physical Assessment. 2002.

## Medial Longitudinal Arch

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- Bones: Calcaneal tuberosity; Talus; Navicular; three Cuneiforms; first, second, and third Metatarsals<sup>1</sup>
- Supported by the tibialis anterior, tibialis posterior, flexor digitorum longus, flexor hallucis longus, abductor hallucis, and flexor digitorum brevis muscles, along with the plantar fascia and the plantar calcaneonavicular ligament.<sup>1</sup>

1. Magee. Orthopedic Physical Assessment. 2002.

## Lateral Longitudinal Arch

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- Bones: Calcaneus; Cuboid; fourth and fifth Metatarsals
- Supported by the peroneus longus, peroneus brevis, peroneus tertius, abductor digit minimi, and flexor digitorum muscles, along with the plantar fascia and the long and short plantar ligaments.<sup>1</sup>

1. Magee. Orthopedic Physical Assessment. 2002.

## Transverse Arch

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- Bones: Navicular, Cuneiforms, Cuboid, Metatarsal bones<sup>1</sup>
- Supported by the tibialis posterior, tibialis anterior, and peroneus longus muscles, along with the plantar fascia.<sup>1</sup>

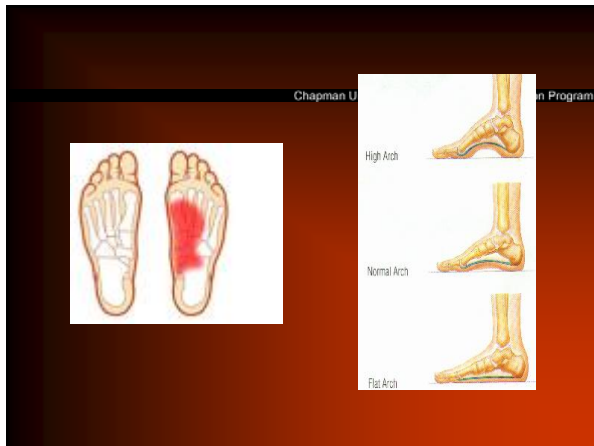
1. Magee. Orthopedic Physical Assessment. 2002.

## Arch Strains

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- An arch strain could be caused from an excessive jerk, twist, bend, plantarflexion, or dorsiflexion to any of the muscles or ligaments supporting the arches.<sup>1</sup>
- Treatment: Rest. Ice. Arch support system/brace or arch tape for extra support. Time off of sport related activity depends on the severity of the strain.<sup>1</sup>

1. Magee. Orthopedic Physical Assessment. 2002.

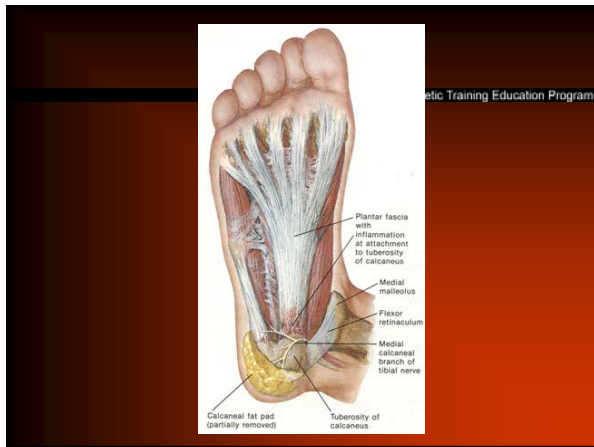


## Plantar Fascia

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- Thick white band of fibrous tissue originating from the medial tuberosity of the calcaneus and ending at the proximal heads of the metatarsals.<sup>2</sup>

2. Prentice, Arnheim's Principles of Athletic Training: A Competency-Based Approach. 2003.

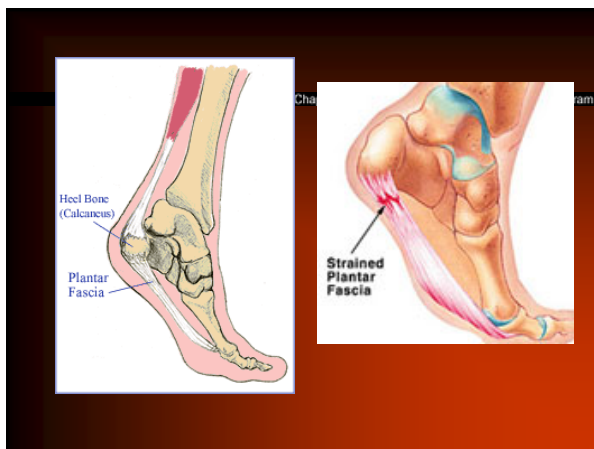


## Plantar Fasciitis

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- Inflammation of the Plantar Fascia. Usually caused by overuse and irritation.<sup>1</sup>
- Normal movements and ROM with pain (localized or radiating) in the anterior medial heel. Sometimes paresthesia in the sole of the foot will appear. Pain worsens after long periods of standing, walking, or running, or if foot is forced into dorsiflexion.<sup>1</sup>

1. Magee. Orthopedic Physical Assessment. 2002.



## Plantar Fasciitis

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- Treatment: the best treatment is orthotic therapy. A night splint may also be used to help maintain a static stretch. Athlete should maintain a stretching routine to add additional stretching. Anti-inflammatory medications are recommended.<sup>2</sup>

2. Prentice, Arnheim's Principles of Athletic Training: A Competency-Based Approach. 2003.

## Heel Bruise (Contusion)

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- Thick fat pad covering calcaneus bruises from sport activities that demand a lot of stop-and-go or sudden change from horizontal to vertical (e.g. basketball, volleyball, track and field, etc...)<sup>2</sup>
- Symptoms: unable to apply pressure to, or weight-bear on, the heel. Sometimes you may notice redness or the heel may feel warm.<sup>2</sup>

2. Prentice. *Arnheim's Principles of Athletic Training: A Competency-Based Approach*. 2003.

## Heel Bruise (Contusion)

Chapman University Athletic Training Education Program

- Treatment: athlete should not bear weight for 24 hours. RICE should be taken into affect. Anti-inflammatory medication are administered to help bring down the swelling. A heel cup or protective doughnut should be applied.<sup>2</sup>
- 2. Prentice. *Arnheim's Principles of Athletic Training: A Competency-Based Approach*. 2003.

## Sprained Digit

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- Pathology
  - Tearing of the ligaments in the toes
- Mechanism
  - Excessive flexion, extension, or twisting of the toes
  - Kicking an unyielding surface<sup>1</sup>

1 Prentice, William E. *Arnheim's Principles of Athletic Training*, 2003

## Sprained Digit

Chapman University Athletic Training Education Program

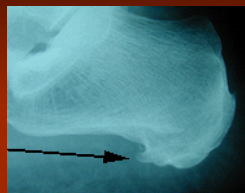
- Treatment
  - RICE
  - casting/splinting
  - Buddy taping
  - Weight bearing and activity as tolerated<sup>1</sup>

1 Prentice, William E. *Arnheim's Principles of Athletic Training*, 2003

## Exostosis

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- Pathology
  - a.k.a bone spur
  - An abnormal bony outgrowth extending from the surface of the bone
  - An increase in the bone mass at the site of an irritative lesion in response to overuse, trauma, or excessive pressure<sup>1</sup>



1 Magee, David J. *Orthopedic Physical Assessment*. 2002  
[www.podiatryinfo.com/volhtml/heel.html](http://www.podiatryinfo.com/volhtml/heel.html)

## Exostosis

Chapman University Athletic Training Education Program

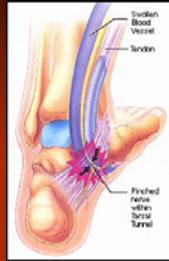
- Mechanism
  - Repeated strain placed on a bone or the bony insertion of a tendon<sup>1</sup>
- Treatment
  - RICE
  - Donut padding
  - Surgical intervention<sup>2</sup>

1 Magee, David J. *Orthopedic Physical Assessment*. 2002  
2 Prentice, William E. *Arnheim's Principles of Athletic Training*, 2003

## Tarsal Tunnel Syndrome

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- Pathology
  - Entrapment of the posterior tibial nerve or one of its medial or lateral branches as it passes through the tarsal tunnel<sup>1</sup>



Starkey, Chad, Ryan, Jeff. *Evaluation of Orthopedic and Athletic Injuries*, 2002.  
[www.footcaresdirect.com/tarsal\\_tunnel.html](http://www.footcaresdirect.com/tarsal_tunnel.html)

## Tarsal Tunnel Syndrome

Chapman University Athletic Training Education Program

- Mechanism
  - Compression
  - Fracture, dislocation, or inflammation of the tarsals or local ganglion
- Treatment
  - Orthotic
  - Surgical intervention<sup>1</sup>

Starkey, Chad, Ryan, Jeff. *Evaluation of Orthopedic and Athletic Injuries*, 2002.

## Ingrown Toe Nail

Chapman University Athletic Training Education Program

- Pathology:
  - The toe nail grows into skin, cutting the flesh.
- MOI:
  - Trimming nail too short
  - Small shoes
- Treatment:
  - Remove excess nail
  - Place sterile object, i.e. cotton to push nail away from skin,



[http://www.cgh.com.sg/health\\_public/pamphlet/general/nail/nail\\_content2.html](http://www.cgh.com.sg/health_public/pamphlet/general/nail/nail_content2.html)



<http://www.podiatryclinician.com/prod01.htm>

[http://www.cgh.com.sg/health\\_public/pamphlet/general/nail/nail\\_content2.html](http://www.cgh.com.sg/health_public/pamphlet/general/nail/nail_content2.html)

## Bunions

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- Pathology:
  - Inflammation of the bursa over the 1<sup>st</sup> metatarsophalangeal joint causes the hallux to become deformed
- MOI:
  - Narrow shoes
  - Pronated foot
  - Depressed or flattened trans arch
- Treatment:
  - Wear wide box shoes
  - Orthotics
  - Pad or splint w/ wedge
  - Surgery<sup>1</sup>



[http://www.americanfootdoctor.com/yourfeet\\_bunions.shtml](http://www.americanfootdoctor.com/yourfeet_bunions.shtml)



[www.footandheel.com/topics/bunions.htm](http://www.footandheel.com/topics/bunions.htm)

Prevent. *Arkham's Principles of Athletic Training*.

## Callous and Corns

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- Pathology:
  - Thickening of skin as a result of friction
    - Callous = bottom of foot
    - Corns = Top of foot
- MOI:
  - Rubbing against shoes
- Treatment
  - Wear different shoes
  - Cover with moleskin e.g.
  - Pads,



[http://www.family-foot.com/foot\\_ailments/corns\\_calluses](http://www.family-foot.com/foot_ailments/corns_calluses)

[http://www.family-foot.com/foot\\_ailments/corns\\_calluses](http://www.family-foot.com/foot_ailments/corns_calluses)

## Blisters

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- Pathology:
  - Fluid filled sacs covered with a thin layer of almost transparent skin
- MOI:
  - Improper footwear
  - Foot structure or gait patterns
  - Tape
- Treatment:
  - Clean blister and try not to pop it
  - If popped...keep area clean
    - Cover blisters and apply disinfectants



<http://images.search.yahoo.com>





"Caring for Your Feet." Our Health Network. Retrieved August 31, 2005, from [http://www.ourfootdoctor.com/yourfeet\\_injuries\\_feet\\_b.shtml](http://www.ourfootdoctor.com/yourfeet_injuries_feet_b.shtml)

## Neuroma

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- **Pathology:**
  - Swelling of a nerve
  - The most common nerve affected connects the 3rd and 4th toes
- **MOI:**
  - Over Pronation
  - The pulling of the ligaments under the foot irritates the nerve
  - High heels
- **Treatment:**
  - Orthotics
  - Inflammatory injections
  - In severe cases, surgery may be necessary





Neuroma - Dr. Foot. Retrieved August 31, 2005, from <http://www.drfoot.co.uk/neuroma.htm>.

## Plantar Flexed First Ray

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- **Pathology:**
  - Structural deformity occurs when the big toe lies lower than the other four metatarsal bones
- **MOI:**
  - Poor biomechanics
    - Pes cavus
  - Genetics
- **Treatment:**
  - Orthotics
  - Dorsal Osteotomy
    - Surgical repositioning of the bone



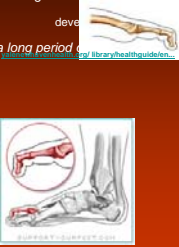
http://images.search.yahoo.com

Magee (2002). Orthopedic Physical Assessment. Saunders, Inc. Pg. 787.

## Mallet Toe

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- **Pathology:** caused by a flexion contracture at the DIP joint involving the flexor digitorum longus tendon.
  - Mallet toe usually becomes a fixed deformity, causing the callus dorsally over the DIP joint or on the tip of the toe.
- **Mechanism of injury:** wearing shoes that are too small over a long period of time.
- **Treatment:**
  - Conservative treatment
    - Focusing on relieving pressure by wearing loose footwear
    - Paddling can help with irritation
    - Shave the callus
  - Surgery
    - Necessary when deformity becomes fixed
    - Involves straightening the toe using a K-wire, inserted through phalanges in



Anatomy Principles of Athletic Training, Prentice, 2003

## Claw Toe

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- **Pathology:** caused by flexion contracture at the DIP joint but also involves hyperextension at the PIP joint.
  - Callus develops over PIP joint and under the metatarsal head.<sup>1</sup>
- **Mechanism of injury:** wearing shoes that are too small over a long period of time.
  - Can be associated with Pes Cavus
- **Treatment:**
  - Same as Mallet Toe



Anatomy Principles of Athletic Training, Prentice, 2003  
Physical Examination of Spine and Extremities, Hoppenfeld, 1976

## Sprained Hallux (Great Toe)

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- **Pathology:** stretching or tearing of the ligaments or joint capsule in the first phalange
- **Mechanism of injury:** force applied to extend joint beyond normal range, jamming it or twisting it
  - Example: kicking a stable object
- **Treatment:**
  - RICE- reduce swelling
  - Buddy tape to adjacent toes to immobilize
    - Toes are too small to splint or cast!!
- **Most common example is turf toe.**

Anatomy Principles of Athletic Training, Prentice, 2003

## Turf Toe

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- **Pathology:** hyperextension of the MP joint of the great toe resulting in a sprain.
- **Mechanism of injury:** occur on synthetic turf because shoes designed for this field are more flexible and allow dorsiflexion of first toe.
- **Treatment:**
  - Ice
  - Ultrasound
  - Rest, until able to walk without pain
  - Shoe companies have added steel to forefoot of shoes to prevent this injury or you can add Orthoplast under the shoe





Anatomy Principles of Athletic Training, Prentice, 2003

## EQUINUS DEFORMITY

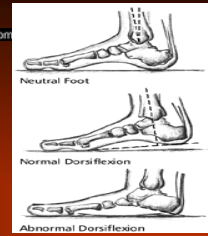
- Pathology – occurs when there is less than 10° of dorsiflexion in the ankle<sup>1</sup>
- MOI – results from contracture of the Achilles tendon or gastrocnemius or soleus muscles. Can also result from structural bone deformity<sup>1</sup>



© R.L. Huckstep, 1997.

1. Magee, David. Orthopedic Physical Assessment 4th ed. Pg. 781  
<http://www.worldortho.com/inventions/cnipple/c111.html> (picture)

- Treatments – heel lifts, foot orthotics, shoe modification, physical therapy or surgery<sup>2</sup>
- All treatments are based on severity of deformity.

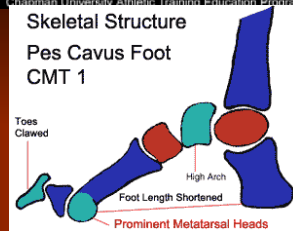


2. Prescription Custom Foot Orthoses Practice Guidelines, The American College of Foot and Ankle Orthopedics and Medicine. December 2004, pg 17

<http://www.footmaxx.com/clinicians/live.html#equinus> (picture)

## Pes Cavus

- Pathology – the longitudinal arches of the foot are accentuated all the way to the toes<sup>3</sup>
  - Can cause claw foot<sup>3</sup>
  - Results from excessive supination<sup>3</sup>
- MOI – cause of deformity is caused by abnormal orthopedic or neurological condition<sup>3</sup>



3. Prentice, William, Principles of Athletic Training 11th ed. Pg 510  
[www.ordesignstv.com/cmt.html](http://www.ordesignstv.com/cmt.html) (picture)

- Treatments – orthotics, lateral wedge, stretching of the Achilles tendon and plantar fascia<sup>3</sup>



3. Prentice, William, Principles of Athletic Training 11th ed. 2003  
<http://www.global-technologies.net/ShopSite/Extremities.html> (picture)

## Pes Planus

- Pathology – the medial longitudinal arch is flat<sup>3</sup>
  - Excessive pronation of the feet<sup>3</sup>
  - "flat feet"
- MOI – overweight<sup>3</sup>
  - Wearing of tight shoes
  - Trauma that weakens supportive structures<sup>3</sup>



3. Prentice, William, Principles of Athletic Training 11th ed. 2003  
<http://www.global-technologies.net/ShopSite/Extremities.html> (picture)

- Treatments – if there is no pain with the athlete, then nothing should be done to correct the problem<sup>3</sup>
  - If athlete experiences pain, a properly constructed orthotics should be used<sup>3</sup>
  - A medial wedge should be used to correct excessive pronation<sup>3</sup>



3. Prentice, William, Principles of Athletic Training 11th ed. 2003  
[www.supportyourfeet.com/over\\_pronation.htm](http://www.supportyourfeet.com/over_pronation.htm) (picture)

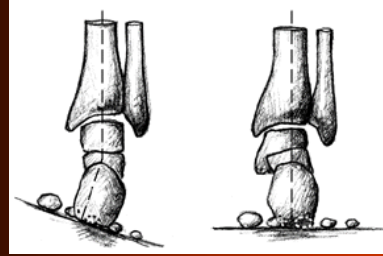
## REARFOOT VARUS

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- Pathology – inverted calcaneus relative to the long axis of the tibia<sup>4</sup>
  - Subtalar joint is in neutral position
- MOI - heel spur syndrome, Taylor's union, leg fatigue<sup>4</sup>

4. <http://www.footmaxx.com/clinicians/five.html>

- Treatments – depending on severity of the problem, orthotics would be used to treat the deformity<sup>4</sup>



4. <http://www.footmaxx.com/clinicians/five.html>

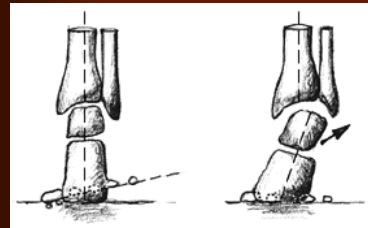
## REARFOOT VALGUS

Chapman University Athletic Training Education Program

- Pathology – the calcaneus is inverted relative to the long axis<sup>5</sup>
  - Rarely observed
  - Valgus tibial alignment
- MOI – the rear foot becomes hyper mobile<sup>5</sup>
  - Increased pronation
  - Hammer toes
  - Lateral ankle pain

5. Starkey, Chad. Evaluation of Orthopedic and Athletic Injuries 2<sup>nd</sup> ed. 2002.

- Treatments – orthotics with a control in the rear foot<sup>5</sup>



## Plantar Fasciitis

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- Pathology<sup>1</sup>
  - Inflammation of the plantar fascia
  - Inflammation of the interface between the fascia and the first layer of intrinsic muscles



[http://www.orthopedicjournal.com/images/heelbone\\_fascia.jpg](http://www.orthopedicjournal.com/images/heelbone_fascia.jpg)

1: Starkey, Evaluation of Orthopedic and Athletic Injuries, 2002.

## Plantar Fasciitis

Chapman University Athletic Training Education Program

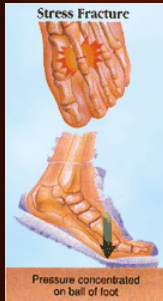
- Mechanism of Injury<sup>1</sup>
  - Acute
    - Forced dorsiflexion of ankle with toe extension
  - Insidious
    - Additional distance running
    - increased activity levels
    - Changing surfaces
    - New or different shoes
- Treatment<sup>2</sup>
  - Soft orthotics w/ deep heel cup built in
  - Heel cord stretching
  - Plantar fascia stretching
  - NSAIDs

1: Starkey, Evaluation of Orthopedic and Athletic Injuries, 2002, 2<sup>nd</sup> edition.

2: Arnhem, Athletic Training: A Competency-Based Approach, 2003, 11<sup>th</sup> edition.

## Stress Fracture (Metatarsals)

Chapman University Athletic Training Education Program



<http://www.footpain.org/Resources/stressfracture.pdf>

- Pathology
  - Fracture of metatarsal(s)
- Mechanism of Injury<sup>1</sup>
  - Insidious/complex
    - Fatigued/ weak toe extensors
    - Diabetes mellitus
    - Hypermobility increases stress on forefoot
    - Hypomobility increases stress on midfoot

1: Starkey, *Evaluation of Orthopedic and Athletic Injuries*, 2002, 2nd edition

## Stress Fracture (MT)

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- Treatment<sup>2</sup>
  - Use a bone scan to detect the fracture
  - 3-4 days limited weight bearing
  - 2 weeks rest
  - Return to running should be very gradual

2: Amheim, *Athletic Training: A Competency-Based Approach*, 2003, 11th edition

## Rear Foot Valgus/ Varus

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- Pathology<sup>1</sup>
  - Valgus
    - Pronation of subtalar joint (rarely observed)
  - Varus
    - Supination of subtalar joint



1: Starkey, *Evaluation of Orthopedic and Athletic Injuries*, 2002

<http://www.footdoc.com/images/ss1.jpg>

## Rear Foot Valgus/ Varus

Chapman University Athletic Training Education Program

- Mechanism of Injury<sup>1</sup>
  - Valgus
    - Eversion of the calcaneus
  - Varus
    - Inversion of calcaneus
    - Calcaneus does not completely derotate during fetal development
- Treatment<sup>1</sup>
  - Valgus
    - Orthotics that wedge below medial aspect of calcaneus
  - Varus
    - Orthotics that wedge below the lateral aspect of calcaneus

1: Starkey, *Evaluation of Orthopedic and Athletic Injuries*, 2002

## Sinus Tarsi Syndrome

Caused by hemorrhage or inflammation (synovitis) in the sinus tarsi

Frequently misdiagnosed as chronic ankle sprain and, if improperly treated, will result in chronic pain and disability.

Symptoms include pain and instability when walking on uneven surfaces, and pain when the affected foot is at rest.

Oloff, LM, *Subtalar joint arthroscopy for sinus tarsi syndrome*, 2001

## INGROWN TOENAIL

Chapman University Athletic Training Education Program

- caused by a toenail that grows or is pressed into the skin. Most often with the great toe.
- Treatments include trimming the nail or surgery or simply wider shoes

Mosby's medical dictionary, 2002



## Bunion

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- An enlargement of the joint at the base of the great toe (mtp joint) due to hallux valgus has three phases of formation
- 1. callus 2. thickened bursa 3. exostosis
- treatment can require surgery



Magee, orthopedic physical assessment, 2002

## Apophysitis (Sever's Disease)

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- Ryan Machuca
- ATPE 396
- 8/1/05



## Etiology

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- A traction injury at the apophysis of the calcaneus.
- A bony outgrowth on the posterior aspect of the calcaneus where the Achilles tendon inserts.
- Comparable to Osgood-Schlatter's disease at the tibial tubercle of the knee.
- Effects mostly young physically active populations.



## Signs and Symptoms

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- Pain on the posterior aspect of the calcaneus.
- Continued pain with activity.
- Bony growth

## Management

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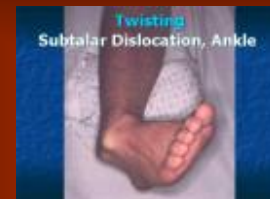
- RICE
- Stretching
  - Slant board
- Antiinflammatory medications (NSAIDS)
- Heel lift/donut
  - Helps relieve stress



## Dislocation and Subluxation

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- Ryan Machuca
- ATPE 396
- 8/1/05



## Etiology

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- Any displacement of the bones within the foot due sudden movement such as...
  - Hyper-flexion
  - Hyper-extension
  - Lateral rotation
  - Medial rotation
    - or a combination of more that one.

## Etiology

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- Stubbing toes
- Kicking an object
- Being stepped on
- Usually dislocations and subluxations are accompanied with fractures.

## Signs and Symptoms

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- Swelling
- Crepitus
  - Pop or grind
- Ecchymosis
- Deformity/Displacement
- Severe pain
- Loss of function

## Management

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- Immediate reduction by a physician for all dislocations.
- Buddy taping
  - phalanges
- Orthotics
  - Cuboid subluxation
- Depending on the severity of the injury it is not uncommon for the athlete to return to play almost immediately.

## Forefoot Varus and Valgus

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- Ryan Machuca
- ATPE 396
- 8/1/05



Figure 1. Pes planus (low arched) and pes cavus (high arched).

## Etiology/Signs and Symptoms

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- F.F. Varus- excessive pronation
- F.F. Valgus- excessive supination

Due to...

1. Poor footwear
2. Poor gait
3. Hereditary

## Management

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- Orthotics

- F.F. Varus

- Medial wedge applied under the head of the 1<sup>st</sup> metatarsal

- F.F. Valgus

- Later wedge applied under the head of the 5<sup>th</sup> metatarsal

