Foot Pain and Pedorthotics

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Outline

- Normal anatomy
- Biomechanics of the foot and ankle
- Pathology
- Treatment options
Critical Bony Structures

MEDIAL ASPECT

33° - 40° ANGLE OF INCIDENCE

TIBIA

TALUS

CALCANEUS

NAVICULAR

2ND CUNEIFORM

FUNCTIONAL RELATIONS OF THE CALCANEUS

2ND METATARSAL

PHALANGES

LONG PLANTAR LIGAMENT

STRUCTURE OF BONES OF ANKLE AND FOOT
Lateral Ligaments

Medial Ligaments
Supination and Pronation (mitered hinge joint)
Plantarflexors:  
Gastroc-soleus  
Posterior tib  
Peroneus longus

Dorsiflexors:  
Anterior tib  
Extensor hallucis  
Extensor digitorum
Inversion:
Posterior tib
Anterior tib

Eversion:
Peroneus longus and brevis
Met Pad

A

Met Bar

B
Shoe Lasts Adapted to Foot Types

- **Cardboard or fiberboard; shoe uppers glued to its underside**
- **Shoe uppers stitched together**
- **Stitching**
- **Board**

**Fully board-lasted shoe provides support for pronated foot (insole removed in this plate)**

**Slip-lasted shoe (most flexible) provides flexibility for cavus (rigid) foot**

**Combination last provides hindfoot stability, (board lasted); forefoot flexibility at toe-off (slip lasted)**

Heel-craddled insole of polyurethane maintains heel fat pad in proper alignment; removable and replaceable with orthotic device if indicated
Pronated (hyperflexible) foot

- Plantar view shows gait pressure pattern.
- Straight, board-lasted shoe provides medial support in midstance.

Medial view. Flattened longitudinal arch during weight bearing.

Posterior view. Hyperpronation during midstance.

Cavus (rigid) supinated foot

- Plantar view shows gait pressure pattern.
- Curved, slip-lasted shoe accommodates to supinated foot, preventing shoe deformation.

Medial view. Cavus foot during weight bearing.

Posterior view. Pronation limited during midstance.
Plantar Fasciitis

Pathology: Inflammation of plantar fascia
Associated with lack of DF ROM and lack of arch support
Calcaneal spurs develop long term

Treatment: Daytime semi-rigid foot orthotics with arch support (and heel lift?)
NSAID and physical therapy
Relative rest
Night time splinting in neutral
Steroid injection if necessary
Plantar Fasciitis
Heel spur syndrome

Calcaneal spur at attachment of plantar aponeurosis

Plantar aponeurosis with inflammation at attachment to calcaneal tuberosity

Medial malleolus

Flexor retinaculum

Medial calcaneal branch of tibial nerve

Positive bone scan of calcaneal stress fracture
Foot Orthotics
So Many Choices
Custom Foot Orthotics
Night-time positioning splint
Ankle Sprain

Pathology: Usually inversion injury
- Partial tear of anterior talo-fibular ligament
- Possibly tear of calcaneo-fibular ligament

Treatment: “RICE” initially
- Requires 3-4 weeks of protection
- May require long-term M-L support
  (McDavid, Swedo non-elastic ankle lacer)
- Exercises for M-L stability
  (BAPS board)
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Posterior Tibialis Tendonitis

Pathology: Overstretch of posterior tibialis tendon due to pronating foot or collapsing arch

Treatment: Control arch and calcaneo-valgus positioning with foot orthotic and strong counter shoes/sneakers
NSAID and physical therapy
Worst case needs UCBL orthotic
Corrective semi-rigid foot orthotics
UCBL
Foot
Orthotic
Sub-talar Joint Control
Heel Pain

Pathology: Chronic inflammation at the origin of the plantar fascia causes painful bone spurs
  Early sign of R.A.
  Recurrent branch of the Tibial Nerve

Treatment: Soft gel heel pad
  Soft heel on shoe
  Foot orthotic for arch support
Soft Heel Wedge
Metatarsalgia

Pathology: Tenderness at metatarsal heads due to lack of natural padding or poor footwear for sports

Treatment: Foot orthotics with met pad or bar
Rigid or board-lasted shoes to minimize toe-break
Add Met Bar or Build-up from Heel to Met Heads
Shoe Lasts Adapted to Foot Types

- Fully board-lasted shoe provides support for pronated foot (insole removed in this plate).
- Slip-lasted shoe (most flexible) provides flexibility for cavus (rigid) foot.
- Combination last provides hindfoot stability, (board lasted); forefoot flexibility at toe-off (slip lasted).
Neuroma

**Pathology:** Swelling and inflammation of distal nerves between 3rd-4th metatarsals
Sometimes due to tight footwear

**Treatment:**
- Proper footwear (wide toe-box)
- Injection of steroids
- Limited ambulation
- Surgical resection as last resort
Bunion/Hallux Valgus

Pathology:  Usually hereditary lateral deviation of big toe with hypertrophy of medial portion of 1\textsuperscript{st} MCP joint
Commonly associated with pronated feet

Treatment:  Extra-depth orthopedic shoes with wide-lasted (bunion-lasted) toe box
Foot orthotic for pronation control
Surgical correction as last resort
Sesamoiditis

Pathology: Inflammation of sesamoid bones under 1st MTP joint due to excessive impact from running and excessive extension of big toe

Treatment: Foot orthotic with build up at 1st metatarsal shaft and relief at sesamoid bones
Extra-depth shoe with rigid sole to minimize toe-break
Metatarsal Stress Fracture

Pathology: Overuse fracture of metatarsal shaft commonly seen in runners

Treatment: Rigid sole shoe or removable rigid boot (CAM walker)
Stress Fractures

Positive bone scan of tarsal stress fracture

Radiograph of stress fracture of distal fibula

Morton’s foot
May be factor in metatarsal fractures

Short 1st metatarsal
Hypermobile 1st ray

Greater impact on 2nd and 3rd metatarsals

Short 1st metatarsal and hypermobile 1st ray

Increased pronation of foot in midstance

Running in water with waterskiing vest is excellent conditioning exercise during fracture healing. Fiberglass cast may be worn in water.
Achilles Tendonitis

Pathology: Inflammation of Achilles tendon near insertion to calcaneous
Common in cutting and turning sports (tennis) and mountain hiking
Lack of adequate dorsiflexion for sport

Treatment: Removable rigid boot (CAM walker)
NSAID and physical therapy modalities
Need to improve ankle DF ROM
Achilles Tendonitis

Uphill running, especially in shoes with poorly flexible soles, puts strain on Achilles tendon at toe-off.

- Gastrocnemius m.
- Soleus m.
- Achilles (calcaneal) tendon
- Calcaneal tuberosity
- Fat pad

Cavus foot predisposes to Achilles tendonitis

Hyperpronation due to soft heel counter exerts torsion on tendon

Tenderness over tendon. Swelling may or may not be present

In downhill running, forceful impact transmitted to Achilles tendon.
Hammer Toes

Pathology:  Can be hereditary deformity
          Often associated with intrinsic muscle atrophy due to neuropathy

Treatment:  Extra-depth orthopedic shoes with high toe box
           Molded foot orthotic with met pad
           “Live with it”
Thank You