

The Functional Treatment of Industrial Foot Injuries

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Industrial Accidents

20 percent of all injuries

- 60 percent – Orthopedic
- 10 percent – Foot / ankle



Industrial Accidents

Orthopedic foot / ankle Injuries

50% caused by being

- Struck by object
- Run over by vehicle
- Caught in machinery



Industrial Accidents

Injured workers are not universally welcomed in medical offices.

- Reimbursement issues
- Paperwork
- Less favorable results
- Litigation issues

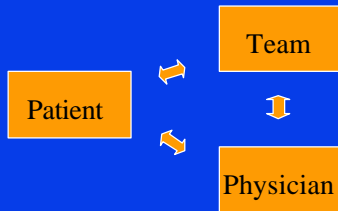
Industrial Foot Injury: Difficulty

- Patient relationship
- Data base failure
- System failure

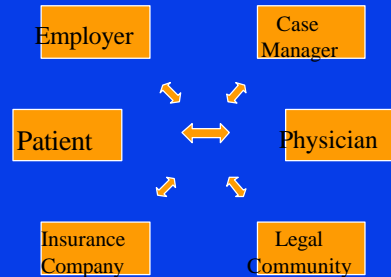
Normal Medical Relationship



Athletic Medical Relationship



Industrial Medical Relationship



Foot Data Base Issues

8 yrs grammar school	Ties shoes
4 yrs high school	0
4 years college	0
4 yrs medical school	0
Internship	0
Medical residency	0
Orthopedic residency	Fractures
	Bunions
Fellowship	0

Assessment of the Uninjured Worker

- Normal foot type does not exist.
 - 40% pes valgus
 - 20% pes cavus
- 20-40% foot symptoms in population.
- 20% heel spur incidence.
- 15 million diabetics

The Injured Worker

- Sprain or strain
- Fracture
- Heel pain
- Contusions
- Crush Injury
- Diverse neural pathology



System Failure

The conventional approach to medical problems that most of us were taught, is not particularly successful in the management of foot complaints.


History 36 y.o. waitress
6 months R foot pain
Worse with activity
No trauma

Physical
Generally tender midfoot
Good pulses

X-ray
Not helpful

Diagnosis
"Tendonitis"

RX
NSAIDs




Do you really think that this treatment will help the patient get better ?



The physician's task is to amuse his patient until nature heals him.


Voltaire



Western Medicine

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    graph TD
      A[History Physical] --> B[Data]
      B --> C[Diagnosis]
      C --> D[Treatment]
      C --> E[Reference]
      E --> D
  
```




Treatment ?




Perestroika
A new way of looking at things




Acute Structural Issues



Chronic foot Issues

Many foot complaints are not failures of structure but rather primarily failures of function. This dysfunction may be related to either foot type or injury.



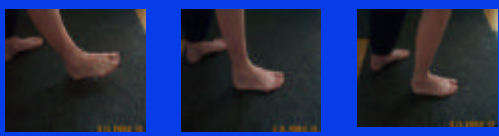
Foot function




- Shock absorption
- Support – Stance
- Propulsion

Foot function: Gait

- Stance phase
 - Heel strike
 - Foot flat
 - Heel off
- Swing phase



Sub talar Joint



Gait



- Ankle joint
- Dorsi/plantar flexion
- Subtalar joint
- Inverting/everting

Shock absorption

Walking Body weight
Running Twice body weight
Jumping Seven times body wt.



10K 2 million pounds

Shock Absorption

Heel strike



Shock Absorption

Shortly after heel strike the arch flattens and the heel everts. This motion occurs in the subtalar complex and is called pronation. This results in a supple yielding foot.

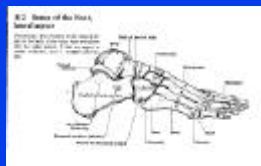


Foot flat



Foot flat. Support

There is very little muscular activity at stance. Stability is provided by the integrity of joints and ligaments.



Propulsion

Heel off



Propulsion: Heel off

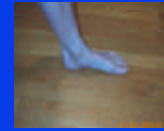
As the heel leaves the ground the reverse of what happens at heel strike occurs. The foot supinates and the arch reforms. This results in a rigid lever for push off.



Foot Classification



Flat Foot
Hyperpronator
Loose foot
Pes valgus



Normal foot



Cavus foot
Rigid foot
Tight foot

Loose or Hyperpronated foot

Anatomy

- Flexible foot
- Low arch in stance
- Flexible at heel off
- Valgus hindfoot



Foot Symptoms: Flat foot

Flat foot

- Anterior tibial pain
- Anterior knee pain
- Post tib tendonitis
- "tired feet"



Loose or Hyperpronated foot

Needs support

- Athletic shoes
- Work boot
- Orthotics



Normal Foot

Anatomy

- Pronates at heel strike
- Arch present at stance
- Supinates at heel off

Needs

- Nothing special



Cavus foot: High arched foot

Anatomy

- Foot never pronates
- High arch at stance
- Often plantar-flexed first metatarsal
- Varus heel



Foot Symptoms: Cavus foot

Cavus foot

- Ankle sprains
- Heel pain
- Metatarsalgia
- Lateral leg pain



Cavus foot

Needs cushioning

- Padding
- Soft cushioned shoes
- Lateral heel wedge



Shoe Modifications

Shoes are items of apparel

Imagery

- Status
- Sexuality



Shoe Modifications

Only make suggestions your patient will actually wear.



Athletic Shoes

- Widely available
- Proper Imagery
- Foot type specific



Athletic Shoes

SHOE REFERRAL	
Foot Type <input type="checkbox"/> Normal <input type="checkbox"/> Flat <input type="checkbox"/> High <input type="checkbox"/> Overpronator <input type="checkbox"/> Supinator <input type="checkbox"/> Normal <input type="checkbox"/> Flat <input type="checkbox"/> High <input type="checkbox"/> Overpronator <input type="checkbox"/> Supinator	Common Problems <input type="checkbox"/> Pain <input type="checkbox"/> Blisters <input type="checkbox"/> Calluses <input type="checkbox"/> Corns <input type="checkbox"/> Bruises <input type="checkbox"/> Blisters <input type="checkbox"/> Calluses <input type="checkbox"/> Corns <input type="checkbox"/> Bruises <input type="checkbox"/> Blisters <input type="checkbox"/> Calluses <input type="checkbox"/> Corns <input type="checkbox"/> Bruises
SHOES <input type="checkbox"/> Sneaker <input type="checkbox"/> Running Shoe <input type="checkbox"/> Tennis Shoe <input type="checkbox"/> Basketball Shoe <input type="checkbox"/> Soccer Shoe <input type="checkbox"/> Football Shoe <input type="checkbox"/> Hockey Shoe <input type="checkbox"/> Baseball Shoe <input type="checkbox"/> Softball Shoe <input type="checkbox"/> Golf Shoe <input type="checkbox"/> Dress Shoe <input type="checkbox"/> Sandal <input type="checkbox"/> Flip Flop <input type="checkbox"/> Boot <input type="checkbox"/> Slipper <input type="checkbox"/> Barefoot	
PHYSICIAN INFORMATION NAME: _____ TITLE: _____ ADDRESS: _____ CITY: _____ STATE: _____ ZIP: _____ PHYSICIAN SIGNATURE _____ DATE _____	

Orthotics

An orthotic is a device placed in the shoe to alter the biomechanical forces between the foot and the ground.

OTC

Soft

Semi rigid

Rigid



Orthotics

- Modifies, but does not decrease, total force.
- Acts from heel strike to stance phase.
- Works best for the symptomatic flat foot.
- Cost \$5 to \$500 – rarely covered by insurance.
- Abusively prescribed

Orthotics

Most efficacious for the symptomatic flat foot



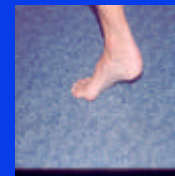
Orthotics

Avoid in cavus foot
KIMS look orthotic



Lateral heel wedge or soft shoe would work better.

Forefoot pain : Metatarsalgia



Metatarsalgia

Pain in forefoot usually 2nd-5th ray

Etiology

- Stress fracture
- Neuroma
- Synovitis/Instability



Metatarsalgia: Treatment

- Low heeled shoes
- Stiff soled shoes
- Extra depth shoes with padding
- Metatarsal pads



Metatarsalgia Treatment

Metatarsal Pads



Metatarsal Pad



Injured Worker: History

- Acute vs. chronic trauma
- Smoking - vascularity
- ETOH - neuropathy
- Beware of crush injury

Chronic pain
Compartments



Injured Worker: Physical

Inspection

- Standing
- Swelling
- Ecchymosis



Injured Worker: Physical

Palpation

- Pulses
- Sensation
- Motor
- Tenderness
- ROM



Injured Worker: Physical

Palpation - Tenderness

- Achilles tendon
- Malleoli
- ATF + Deltoid ligaments
- Anterior os calcis
- 5th Metatarsal tuberosity
- Dorsal midfoot

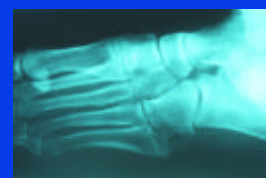
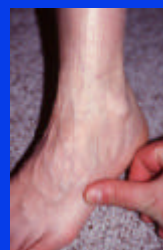
Injured Worker: Palpation



Injured Worker: Palpation



Injured Worker: Palpation



Injured Worker: Palpation



Injured Worker: Imaging

X-ray

Exam the patient first.
When are they needed ?



X-rays-The Ottawa Criteria OAR

X-rays required when pain in the malleolar region

And Bone tenderness at posterior aspect of malleoli

Or Inability to walk 4 steps

X-rays-The Ottawa Criteria OAR

Sensitivity 97 – 100%

Specificity 20 – 30%

Reduction in X-rays 20 – 40%

Cost savings



X-rays-The Ottawa Criteria OAR

Remember The OAR only suggests which patients will have a fracture of a malleolus on X-ray.

The patient still requires a diagnosis.

The patient still requires treatment.

X-ray

Positive X-ray

- Visible fracture
- Visible dislocation



Negative x-ray

- Strain
- Sprain
- Contusion
- Occult fracture
- OCD talus
- Tendonitis
- Etc. Etc.

Injured Worker: Imaging

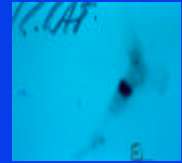
In the setting of the industrial accident I would err on the side of ordering x-rays.



Imaging

Bone Scan

- Very sensitive – non specific
- Yes/no information
- Better tests available



Imaging

MRI

+

Excellent soft tissue
Excellent bone marrow
Widely available

-

Expensive
Variable quality
Non specific findings
Poor bony detail

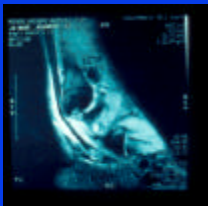
Imaging

MRI

- Rarely used acutely
- Useful as secondary tool when clinical course not progressing appropriately
- Better define pathology – pre-op

Imaging

MRI



Imaging

CT

+

Excellent bony detail
Excellent for alignment
Excellent formatting

-

Poor soft tissue detail

Imaging

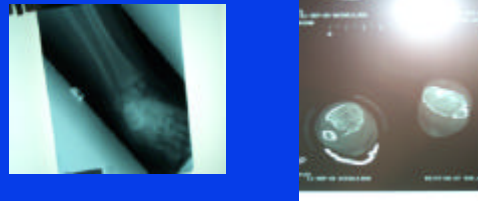
CT

Often used acutely to better define injury.

- Hindfoot fractures
- Midfoot injury
- Loose bodies

Imaging

CT



Treatment

In general you want to provide the most optimum environment for rapid healing.

Protection

Swelling ↓

Function ↑

Atrophy ↓

Treatment: Acute Injury

- Protection
- Rest
- Ice
- Compression
- Elevation



Protection and Rest

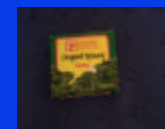
Protect injured foot or ankle
Limping – dispense crutches



Ice

What form?

How often?



Compression therapy

- Ace wraps
- Compression socks
- Pump systems



Post Injury Plan

Day 0-10	PRICE cast, brace, ice etc.
Day 10-21	early mobilization active/passive ROM
Day 21-42	strengthening closed chain rehab.
Day 42+	full rehab

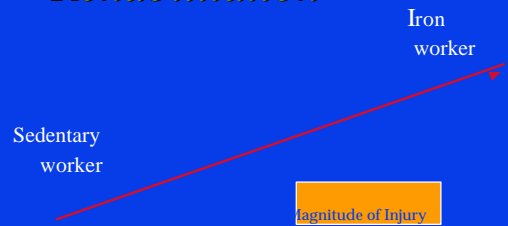
Rehabilitation

Most acute injuries require some rehab.

- Home
- Health club – gym
- Formal physical therapy

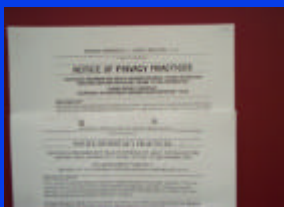


Rehabilitation



HIPAA

Health Insurance Portability and Accountability Act
Huge Increase in Paperwork and Aggravation



HPIAC

Hot pack in a corner



Rehabilitation

- Range of Motion
- Strength
- Proprioception



Range of Motion

Injured part must move through its full ROM.

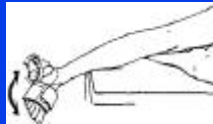
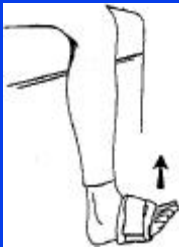


Active
Assisted
Passive



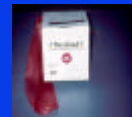
Strengthen

Progressive Resistance Exercises PREs



Strengthen

Theraband



Strengthen

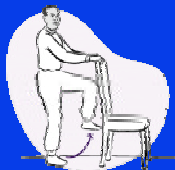


Proprioception

The body's own awareness of the position and loading of joints.



Proprioception



Proprioception



Conclusions



Industrial foot problems are common injuries.
Rarely inflammatory lesions
Think functionally
Act mechanically
Rehabilitate appropriately