Background

- **Idaho State University**: B.S. in Zoology in 2007
- **Des Moines University College of Podiatric Medicine and Surgery**: Doctor of Podiatric Medicine (DPM) 2011
- **St. Luke’s University Hospital and Health Network**: surgical training leading to Reconstructive Forefoot, Rearfoot and Ankle Certification
- Board Qualified by the American Board of Foot and Ankle Surgery (ABFAS)
- Associate Member of the American College of Foot and Ankle Surgeons (ACFAS)
Disclosures

• None
What many people think I do all day...
Lecture Objectives

• Etiology, prevalence, and risk factors for Charcot Foot
• Recognize characteristics of wounds associated with the Charcot Foot
• Explain comprehensive evaluation of Charcot Foot
• Categorize which Charcot Foot patients can benefit from surgery and who can be managed conservatively
What is Charcot

- Named after Professor Jean-Martin Charcot (1825-1893)
- Also termed **Neuro-osteoarthropathy**
- Prior to the mid 1900’s majority of cases were linked to spinal lesions from Syphilis
- Wasn’t until 1936 that the disease was linked with Diabetes Mellitus
Charcot

• Progressive, non-infectious neuro-osteoarthropathy of the bones and joints in patients with sensorial neuropathy leading to destruction of the foot architecture

• 2 theories existed to describe the phenomenon:
  • Neurotraumatic
  • Neurovascular

• Research is now focused on the RANKL/OPG signal pathway
  • Bone damage (fracture) leads to RANKL expression and upregulation/activation of osteoclasts → bone degradation
  • Profound neuropathy allows patient to continue ambulating and further enhances the inflammatory response
  • Loss of bony architecture and joint stability
Prevalence

• Most commonly today Charcot foot is seen in Diabetic patients with peripheral neuropathy
  • Estimated incidence of CN in the diabetic population was recently found to be between 0.08-0.13%
  • This prevalence is less than the actual number of cases due to misdiagnosis or delay in diagnosis

• Other causes of Charcot Neuropathy:
  • Infection (Leprosy, HIV)
  • Toxins (Ethanol, drug related)
  • Rheumatoid arthritis
  • Multiple sclerosis
  • Tabes dorsalis
#1 Risk Factor for Charcot Foot

Peripheral Neuropathy
Identifying and Evaluating the Charcot Foot

• Charcot foot presents very similarly to acute gout attack, cellulitis, deep vein thrombosis, infection and other inflammatory conditions

• Most commonly acute Charcot Neuroarthropathy is misdiagnosed as cellulitis of unknown origin and the patient is discharged home with an antibiotic and fully weightbearing on the affected foot

• **WE CANNOT MISS THE ACUTE CHARCOT FOOT**
Clinical Examples
Clinical Examples
Clinical Examples
Clinical Examples
Stages of Charcot

- Stage 0:
  - Acutely red, swollen, increased skin temp, sometimes painful foot
  - No radiographic changes
    - If 3 phase bone scan performed will be positive
  - Bounding pedal pulses, even in patients with Peripheral vascular disease
    - It is critical to obtain LE Arterial dopplers to assess true vascular status
- Stage 1:
  - Destructive phase, severe edema, pedal dislocations (rocker bottom), fractures
- Stage 2:
  - Coalescence phase, decreased edema, decreased skin temp, stabilization of deformity
- Stage 3:
  - Remodeling phase, arthrosis
Neuropathic Ulcerations

• Leading cause of lower extremity amputations in the diabetic and neuropathic population
• Majority occur on the plantar weight bearing surface of the foot due to underlying bony prominences and loss of protective sensation
• Quickly lead to infection and osteomyelitis of the underlying bone due to the immunocompromised host, and proximity of the bone to the outside environment
• It is important that we learn to identify patients early on in the developmental stages of Charcot so proper offloading techniques can be initiated to prevent these devastating ulcerations
Charcot Foot Wounds

• I have treated or am currently treating around 10-12 patients with chronic Charcot Neuroarthropathy which has resulted in plantar foot ulcerations or pre-ulcerations
• I am currently one of the panel physicians in the Advanced Wound Care center where I am able to manage these complex wounds
• A few of these patients have gone on to needing Charcot Foot and Ankle reconstructive surgery (will be discussed shortly)
• The following slides are examples of a few of the ulcerations we deal with as a result of Charcot collapse
93 Year Old Female
Midfoot Charcot collapse of the medial column
56 Year Old Male

Hindfoot Charcot collapse with subluxed Cuboid
47 Year Old Female
Severe hindfoot Charcot with complete cuboid subluxation
76 Year Old Female
Chemo induced neuropathy with chronic Charcot of hindfoot
Treatment

• Stages 0-1:
  • **GOLD STANDARD**: complete offloading of the limb in *Total Contact Cast*
  • Surgical reconstruction/stabilization is questionable and up for debate

• Stages 2-3:
  • If plantigrade foot then can use custom shoes and braces for support
  • If rocker bottom deformity is present and areas of increased pressure are noted → candidate for reconstructive surgery

• Pharmacologic Therapy for CN:
  • Bisphosphonates (Pamidronate, Alendronate, Zolendronic acid)
  • Calcitonin (fewer complications compared with bisphosphonates)
Total Contact Cast
Cases
Case #1

- 56 year old male with failed medial column fusion for pes valgus deformity
  - Midfoot and rearfoot collapse
  - Hindfoot charcot deformity
Preop
Preop
Post-op Recon
Post-op Recon
Case #3

• 52 year old female with Type II DM and peripheral neuropathy
• Recent swelling, redness and pain in a usually neuropathic foot
• Slight rocker bottom deformity with plantar arch prominence
• Complains of a crunching/cracking sound with weightbearing on the right foot
Complete destruction of the TMTJ

Creates difficult bone voids to fill during reconstruction
Post-op Medial and Lateral Column Fusion

Gold standard surgical technique to reconstruct the Charcot Midfoot by using medial and lateral Intramedullary Beaming
Lateral view of the Beaming technique
Questions?
Thank you for your time!