Diabetic Neuropathic Arthropathy (Charcot)

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Charcot

1. What is it? (definition) & Who gets it? (epidemiology & predisposing factors)

2. How do I recognize it? (diagnosis)

3. Natural history & Classification

4. How do I treat it? (treatment)
Neuropathic arthropathy

Definition

Noninfective, destructive, bone and joint fractures and dislocations associated with a peripheral neuropathy
History

Charcot (1868) : manifestation of tertiary syphilis

Jordan (1936) : neuropathic arthropathy of diabetes mellitus

Diabetes leading cause of Charcot arthropathy
Demographics

Occurs in 0.8 – 7.5% of diabetics

Average age: 57 y.o.

Average duration of diabetes: 15 years

Bilaterality: 6 – 40%

Equal sex distribution
Pathophysiology

- Theory I: repetitive microtrauma unrecognized by the sensory neuropathy
- Theory II: auto-sympathectomy loss of vascular regulation caused by autonomic neuropathy
- General lack of ischemia in Charcot feet
- Clinically hypervascular in early stage
Pathophysiology

Sensory neuropathy
Loss of protective sensation
Loss of proprioception
Autonomic: change of blood flow

Unrecognized injury (acute or overuse)

Continued repetitive stress (on injured structure)
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Evaluation

The diagnosis is primarily clinical

Early diagnosis and treatment is important

History

Exam

X-ray
<table>
<thead>
<tr>
<th>History</th>
<th>Physical Exam</th>
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<tbody>
<tr>
<td>DM neuropathy</td>
<td>Painless swelling</td>
</tr>
<tr>
<td>DM duration</td>
<td>No skin ulcer</td>
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<tr>
<td>Injury history</td>
<td></td>
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<tr>
<td>Charcot until proven otherwise</td>
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</table>
**Clinical Presentations**

- **Swelling**: most common, always present
- **Inflammation**: localized heat, erythema
- **Redness** will subside with elevation (10 min.)
- **Pain**: cc in 50% of cases, not commensurate with amount of osseous destruction
- **Often precede radiographic changes by 2-6 weeks**
Clinical Problems

- **Deformity:**
  shoewear difficult
  bony prominences : ulceration and infection
- **Instability:**
  loss of structural support of limb
- **Infection:**
  ulceration caused by deformity
- **Loss of plantigrade position:** esp. hindfoot
Infection vs Charcot

warm, red, swelling, WBC, sed rate, bone scan

**Infection** : wound, ulcer, poor glucose control, lymphangitis, hot indium scan

X-ray : osteolysis, periosteal rx, gas in soft tissue

**Charcot** : no ulcer, no glucose change, no lymphangitis, cold indium scan

X-ray : fragmentation, heterotopic bone, sclerosis
Indium and Technetium Scan

Indium WBC scan first
Day one: WBC labeled & inject
Day two: scan
If uptake: technetium scan

- **Indium** (infection, inflammation, not bony repair)
  
- **Technetium** not bony or soft tissue infection

Same lesion: osteomyelitis, neuropathic Fx
Other lesion: cellulitis, abscess
Key Points for Differentiation

• Intact skin with red, warm, swollen : Charcot
• Average glucose control
• Stage I or II : deep bone infection in Charcot is very rare
• MRI is not helpful unless an abscess if found
Charcot

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Natural Hx (Eichenholtz Stages)

Characteristic change from acute phase to healing phase

Stage I : Dissolution

Stage II : Coalescence

Stage III : Resolution
Stage I: Dissolution

- **Clinical**
  - Acute inflammation: swelling, erythema, warmth
  - Pain
  - Instability
- **X-ray**
  - Periarticular fragmentation
  - Joint subluxation of dislocation
Stage II: Coalescence

- Clinical
  less inflammation
  increased stability of fragments

- X-ray
  periosteal new bone
  early healing of fracture fragments
Stage III: Consolidation

- **Clinical**
  - fixed deformity
  - little swelling
  - no redness or warmth
- **X-ray**
  - consolidation of fragment: bony fibrous ankylosis
  - smoothing of borders of large fragments
  - sclerosis
**Anatomic(Radiographic) Classification**

- **Brodsky anatomic classification**
  - Type I  midfoot
  - Type II  hindfoot
  - Type IIIA  ankle
  - Type IIIB  calcaneus

*Forefoot charcot*
Forefoot

- Clinical forefoot ulcers infection
- Location MTP metatarsals
Midfoot (type I)

- Clinical
  - most common (70%)
  - collapse: rocker bottom foot deformity
  - plantar ulceration
- Location
  - TMT
  - Nav-Cun
Hindfoot (type II)

- **Clinical**
  - less common (20%) instability
- **Location**
  - calcaneus
  - subtalar
  - T-N, C-C
Ankle (type IIIA)

- Clinical
  uncommon (5-7%)
  severe instability
  varus valgus
  requires op
- Location
  tibiotalar
Calcaneus (type III B)

- **Clinical**
  
  least common (5%)
  
  stable pattern
  
  pes planus

- **Location**

  os calcis : pathologic Fx
Charcot

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Basic Concepts (I)

Early stop progressive deformity
Maintain until resolution stage
Stable, plantigrade, braceable foot
Basic Concepts (II)

Complex Fx & D/L : prolonged rest, immobilization and non weightbearing

Subuxation or dislocation : difficult to control

Ankle > hindfoot > midfoot > forefoot : complication and immobilization periods

Goal : plantigrade, braceable foot
Treatment of Acute Charcot (stage I)

Immobilization and non weight bearing

Total contact cast

1 week / 3 weeks / 6 weeks / 9 weeks / 12 weeks

P/E : swelling, heating, instability

X-ray : sclerotic
Treatment of Subacute (stage II)

Longterm casting: 4-6 months

Smaller fluctuation in swelling and increased stability: Brace

Patellar tendon bearing

AFO
Treatment of Consolidation (stage III)

Forefoot and midfoot deformity

- In-depth shoe
- Custom molded shoe

Hindfoot and ankle

- Long term bracing
Timing of Cast Off

Normal skin temperature

No erythema, swelling

X-ray: sclerosis, no progression

P/E: no instability
Surgical Tx of Charcot

Indications

Severe instability and deformity
  nonbraceable and impending ulcer

Acute(<4 weeks) dislocation

Goal of surgery

A plantigrade, braceable foot not normal foot
Surgical Tx of Charcot

Timing of Surgery

Usually stage III: after casting, footwear and bracing have failed.

Early stage I: acute dislocation, uncontrollable deformity: inflammation is not significant and bone stack is sufficient.
Contraindications of Surgery

Absolute

• Severe PVD
• Compliance

Relative

• Osteomyelitis
• Poor bone quality
Type of Surgery

Reconstruction surgery

• Ostectomy (bumppectomy)
• Realignment and arthrodesis

Acute fracture dislocation
Type of Surgery (Ostectomy)

Prominent bone at plantar apex of rocker bottom foot deformity

Incision through intact skin

Full thickness flap to bone

Suction drain and total contact cast

Avoid excessive resection : further collapse
Type of Surgery (Arthrodesis)

Alignment and stability: bracing and footwear

Rigid internal fixation

External fixation: pin site problems

Longterm immobilization

3 mo: non WB total contact cast

1-2 mo: WB total contact cast
Acute Fx in Patient with Neuropathy

Most important point

Recognize the potential for complication

Warn the patient about this risk

Test patient insensitivity

Extend length of immobilization: 2 times more

Serial check up
Summary

Charcot

Early Diagnosis &

Early Treatment

Minimal Deformity and Instability

Surgical Treatment

Plantigrade, stable, braceable foot
Thank you !!