Charcot Neuroarthropathy: Conservative Management

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Charcot Neuroarthropathy
Charcot

- Deforming and destructive process
  - increased patient morbidity
  - gross instability
  - recurrent ulceration
  - high risk for amputation
- Diagnosed cases associated with diabetic patients ranges from 0.08% to 7.5%
- Associated with DM, Leprosy, Polio, RA and etc.
Etiology

- "Neurotrophic theory" Charcot and Féré (1883):
  - neurogenic deficit in bone nutrition
- "Neurovascular theory" Johnson (1966):
  - hypervascular reflex
  - overactive bone resorption
  - mechanical weakening
- "Neurotraumatic theory" Virchow, Rotter and Volkman (1886)
  - Repetitive trauma to neuropathic joint
  - Reduced BMD in Charcot
  - reduced bone strength
- Sanders & Frykberg (2007) with Monckeberg’s arteriosclerosis
Acute Charcot

- Early recognition & treatment
  - Improve symptoms, reduce sequelae, and improve quality-of-life
    - Optimize glucose control with team approach
    - Educate
    - Identify at risk patients
    - Immobilization
    - Custom orthosis or shoes
Staging

- Eichenholtz (1966): Charcot based on radiographic appearance and physiologic course
- Shibata (1990): stage 0

<table>
<thead>
<tr>
<th>Stage</th>
<th>Phase</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>Inflammatory</td>
<td>Localized warmth, swelling, and redness; minimal to no radiographic abnormalities; MRI may show nondisplaced pathologic fracture(s) and increased marrow edema to the foot and/or ankle</td>
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<tr>
<td>1</td>
<td>Development</td>
<td>Localized warmth, marked swelling, and redness; radiographic presence of bony debris, fragmentation of subchondral bone, perarticular fracture, subluxation, and/or dislocation</td>
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<td>2</td>
<td>Coalescence</td>
<td>Continued but decreased warmth, swelling, and redness; radiographic presence of absorption of fine debris, new bone formation, coalescence of fragments, fusion of joints (ankylosis), and/or sclerosis of bone ends</td>
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<td>3</td>
<td>Remodeling</td>
<td>Marked decrease or absence of warmth, swelling, and redness; physically enlarged fixed (&quot;healing&quot;) deformity; radiographic appearance of remodeled and new bone formation, decreased sclerosis, and/or possible gross residual deformity</td>
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Classifications

- Sanders and Frykberg (1991)
Classifications

- Brodsky (1993)
Classifications

- Schon (1998)
CN Treatment Considerations

- Diagnosis & Stage
- Joint of involvement
- +/- ulceration
- +/- infection
- Health, A1c, vascular status, BMI, family support
- Compliance
Conservative Treatment

- Goals:
  - Maintain or achieve structural stability
  - Prevent ulceration
  - Preserve plantigrade foot
The gold standard of acute CN is immobilization in a total contact cast.
Total Contact Casting

- Pressure relief
  - Offloads forefoot and midfoot by 80%
- Non-removable
- Avg time DFU healing of 43 days in 88% of patients (Shaw, Jensen)
- Offloaded in CN 1 until reduction of erythema, edema and signs of osseous consolidation; 5 weeks up to 12 months
CROW

- Initially developed for Stage 1 CN
- Pressure reduction at the site of ulceration ranging from 64-92%
- Reduces patient’s activity level
Patellar Tendon Bearing Brace

- Foot in suspension without use of crutches
- Extra-depth shoe with a steel shank is recommended
- Addition of padding with PTBB (alone entire foot reduced by 15%)
  - Decreased the mean peak force to the entire foot by 19%, to the hindfoot by 37%, and to the midfoot by 20%.
  (Saltzman)
Stage 0, I & II Charcot

0 & I
- Recognition of acute stages
- Immobilization
- TCC, AFO, Splinting

II
- Limited to partial WB
- TCC
- CROW
9 patients

Acute stage

- Biweekly WB TCC

Successful treatment of Stage I CN using the weight bearing TCC with an average return to depth inlay shoes and custom orthoses in 9.2 weeks
Stage III Charcot

III

- CROW
- Double Upright AFO
- DM shoes with CMO
Eleven (91.7%) patients had initiation of treatment with a WB-TCC

Acute stage

One patient was not diagnosed and thus treatment was not initiated until 22 weeks following symptom onset.

Average duration of casting for all patients was 17.8 weeks (range: 8–52)

All 11 patients who were diagnosed and immobilized early did not progress to fracture formation during the follow-up time (range: 12–26 months).

1 patient who was diagnosed late progressed to Charcot fracture of the foot during their 3-month follow-up time.
Surgical versus accommodative treatment for Charcot arthropathy of the midfoot.
Pinzur M1.

- 6-year period, 198 patients (201 feet) were treated DM CN
- Location: midfoot in 147 feet, in the ankle in 50, and in the forefoot in 4
- Results: At a minimum 1-year follow-up, 87 of the 147 feet with midfoot disease (59.2%) achieved the desired endpoint without surgical intervention. Sixty (40.8%) required surgery. Corrective osteotomy with or without arthrodesis was attempted in 42, while debridement or simple exostectomy was attempted in 18 feet.
- Using a simple treatment protocol with the desired endpoint being long-term management with commercially available, therapeutic footwear and custom foot orthoses, more than half (59.2%) of patients with Charcot arthropathy at the midfoot level can be successfully managed without surgery.
Exostectomy

- No accepted protocol to quantify how much bone to resect
- Increased risk of complications related to plantar lateral midfoot ulcerations following an exostectomy
  - Lateral healing rate: 38% vs. medial 92%
Realignment Arthrodesis

- High rate of incomplete bony union
  - Fusion rates of 71-84% for diabetics and ranging from 33-84% for Charcot patients
  - Grant, 2009
Post Op Complications

- Pin tract infections
  - 0.9-100%

- Stress Fractures
  - 6.5% with DM experienced a tibia fracture

- Osteomyelitis

- Psychosocial issues

- Major Amputation
  - CN related wound -> major amp increased likelihood by factor of 6; Wukich 2017
My Concerns

- DM Statistics
- Timeline
- Multiple trips to OR & hospital
- Costs & Socioeconomic factors
- Post op Complications
- Quality of life
References

- American Diabetes Association Standards of Medical Care in Diabetes. Diabetes Care 2016.


References

Thank You