External Fixation Surgery for Midfoot and Hindfoot Charcot Foot Disease

Armin Koller, Interdisciplinary Diabetic Foot Centre, Mathias-Hospital Rheine, Germany
The burden of diabetic polyneuropathy

Fig. 1  Upper sketch: Pain makes a healthy man fall when he begins to twist his foot. Lower sketch: The man who feels no pain walks on without realising the damage he is doing. Reprinted from (Brand 1977), courtesy of The Leprosy Mission, London. As an example, acute hyperflexion trauma to the foot is shown (Pechta et al., 2001).
Factors associated with nonunion, delayed union, and malunion in foot and ankle surgery in diabetic patients

• 165 diabetic patients who had undergone arthrodesis, osteotomy, or fracture reduction were enrolled

• Only peripheral neuropathy, surgery duration, and hemoglobin A1c levels >7% were significantly associated statistically with bone healing complications

• Peripheral neuropathy had the strongest association with bone healing complications
Diabetes & Surgery

- Diabetic patient (DP)
  > normal trauma surgery

- Diabetic neuropathic patient (DN)
  > trauma surgery with special follow-up treatment

- Diabetic neuroarthropathic patient (CN)
  > special surgery and follow-up treatment
Fracture Types

• Traumatic fracture < adequate trauma

• Neuroarthropathic fracture < inadequate trauma

• Please note:
  Inadequate treatment turns DN fracture into CN fracture
Potential hardware problems
Arthrodesis
Arthrodesis
Arthrodesis
Open reduction and fixation
Open reduction and fixation
Open reduction and fixation
Open reduction and fixation
Open reduction and fixation
3
Distraction Treatment
Distraction Treatment
Distraction Treatment
Distraction Treatment
Distraction Treatment

Follow-up treatment with custom made ankle foot orthoses for a period of 3-6 months
Distraction Treatment
Instable ankle fracture, brittle bone
Conservative treatment
Displaced ankle fracture, no closed reduction
Open reposition, tibial osteotomy, Steinman pins
Follow-up treatment with cast
Final outcome
Closed ankle fracture
Tri-malleolar fracture
Closed reduction by traction with frame
Follow-up treatment with orthosis
Final outcome after 6 months
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6-axis Platform / Flight Simulator
Tri-malleolar fracture
Pre-treatment serial casting
Hexapod frame 0810 / 0824 / 0907
Follow-up treatment with orthosis
MIS fracture gap debridement + ex fix
MIS fracture gap debridement + ex fix

Box typ external fixation (clamp to bar)
MIS fracture gap debridement + ex fix

2 and 16 months postoperative
Unstable ankle fractures in diabetic patients without neuropathy or vasculopathy are best treated with ORIF.

Careful soft-tissue management as well as stable, rigid internal fixation are crucial to obtaining a good outcome.

Prolonged non-weight-bearing and subsequently protected weight-bearing are recommended following both operative and nonoperative management of ankle fractures in patients with diabetes.
Superconstructs in the treatment of charcot foot deformity: plantar plating, locked plating, and axial screw fixation
Sammarco VJ, Foot Ankle Clin. 2009 Sep;14(3):393-407

- Progressive bony deformity and bone resorption increase the challenge of surgical treatment
- These challenges have led to "superconstruct" techniques
- Fusion is extended beyond the zone of injury to include joints that are not affected
- The strongest device is used that can be tolerated by the soft tissue envelope
## Pros and Cons of External Fixation

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<tr>
<th>Contra</th>
<th>Pro</th>
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<tbody>
<tr>
<td>Discomfort for the patient</td>
<td>Minimally invasive surgical approach</td>
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<td>(No) weightbearing allowed</td>
<td>Visual feedback mechanism</td>
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<td>Skin irritation &amp; pin tract infections</td>
<td>Optimal pressure protection</td>
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<td>Injury risk for contralateral limb</td>
<td>Dynamic deformity correction (distraction)</td>
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<td>Complete hardware removal</td>
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<td>Easier revision surgery</td>
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Take home messages

• Try simple solutions first
• Superconstructs are feasible, but not mandatory
• Ulcer is no contraindication for reconstructive surgery
• Start your reconstruction as soon as possible
Thanks for your attention

Interdisciplinary Diabetic Foot Centre
Technical Orthopaedics / Diabetology
Mathias-Hospital Rheine