

3<sup>rd</sup> Nordic Diabetic Foot Symposium

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# External Fixation Surgery for Midfoot and Hindfoot Charcot Foot Disease

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#### The burden of diabetic polyneuropathy



Fig. 1 Upper sketch: Pain makes a healthy man fall when he begins to twist his foot. Lowersketch: 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 (Peicha et al., 2001).



# Factors associated with nonunion, delayed union, and malunion in foot and ankle surgery in diabetic patients

Shibuya N, Humphers JM, Fluhman BL, Jupiter DC. J Foot Ankle Surg. 2013 Mar-Apr;52(2):207-11

- 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</li>
- Please note: Inadequate treatment turns DN fracture into CN fracture

#### Potential hardware problems





# Arthrodesis



# Arthrodesis



#### Arthrodesis

































Follow-up treatment with custom made ankle foot orthoses for a period of 3-6 months







#### Instable ankle fracture, brittle bone



#### Conservative treatment







#### Displaced ankle frakture, no closed reduction



#### Open reposition, tibial osteotomy, Steinman pins





#### Follow-up treatment with cast





#### Final outcome





#### Closed ankle frakture





#### Tri-malleolar fracture



#### Closed reduction by traction with frame



#### Follow-up treatment with orthosis



#### Final outcome after 6 months





#### 6-axis Platform / Flight Simulator





#### Tri-malleolar fracture



#### Pre-treatment serial casting



## Hexapod frame 0810 / 0824 / 0907



#### Follow-up treatment with orthosis





#### MIS frature gap debridement + ex fix





#### MIS frature gap debridement + ex fix



Box typ external fixation (clamp to bar)

#### MIS frature gap debridement + ex fix



2 and 16 months postoperative

#### **Current Concepts Review**

#### The Management of Ankle Fractures in Patients with Diabetes

Dane K.Wukich, MD, and Alex J. Kline, MD. J Bone Joint Surg Am. 2008;90:1570-8

- 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

#### Contra

- Discomfort for the patient
- (No) weightbearing allowed
- Skin irritation & pin tract infections
- Injury risk for contralateral limb

#### Pro

- Minimally invasive surgical approach
- Visual feedback mechanism
- Optimal pressure protection
- Dynamic deformity correction (distraction)
- Complete hardware removal
- Easier revision surgery

### 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**