Surgical Off-loading

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Reiber et al. 1999

- The most common causal pathway to a diabetic foot ulceration

NEUROPATHY + DEFORMITY + MINOR TRAUMA

= ULCERATION

Reiber et al. Diabetes Care 1999

Goals of Diabetic Foot Surgery

- Reduction of pressure
- Prevention of ulceration / amputation
- Increased function
- Relief of pain
- Allow for proper accommodation in shoes
Rigid Foot Deformities

- Any deformity that could not be reduced manually

Flexible vs. Rigid

- Rigid deformities CANNOT be offloaded

Metatarsal Head Resection for Diabetic Foot Ulcers

Griffiths et al, Arch Surg 1990; 125; 832-835

Retrospective review of diabetic patients who underwent metatarsal head resections for recalcitrant diabetic foot ulcerations

Indications

- Non healing ulcers (22)
- Infected ulcers (5)
- Transfer lesions (3)
- Ulcerations after amputations (2)
- Painful callus (2)

34 met head resections on 25 patients in 32 operations
Mean age 58
19 males / 6 female
Metatarsal Head Resection for Diabetic Foot Ulcers
Griffiths et al, Arch Surg 1990; 125; 832-835

- Mean time of ulceration pre-op = **9.0 months**
- Mean f/u 13.8 months
- Mean time for ulcer healing post-op = **2.4 months**
- No recurrence in same area
- 3 transfer lesions were re-operated

Is Prophylactic Diabetic Foot Surgery Dangerous?
Armstrong et al, J Foot Ankle Surg, 35(6) 585-589, 1996

- Retrospective study of single digital arthroplasties in 31 DM and 33 non-DM patients
- Purpose was to compare morbidity and outcomes of prophylactic surgery among diabetics and non-diabetics
- Avg. f/u of 3 yr with no significant difference
- 96.3 remain ulcer free

Outpatient Percutaneous Flexor Tenotomies for Management of Diabetic Claw Toe Deformities with Ulcers: A Preliminary Report

**Inclusion Criteria**
- Mild to moderate rigidity
- Distal ulceration

**Exclusion Criteria**
- Absence of pulses
- Cellulitis

Results
- 34 toes in 14 patients
- 8 male / 6 female
- 24 ulcers / 10 at risk
- 3 Osteomyelitis
- Average duration of ulceration 11 months
- Mean f/u 13 months
- Ulcers healed within 3 weeks
- No complications
- No recurrence
- No hyperextension deformities seen
Case control study to evaluate the complications and outcomes of 1st MPJ arthroplasty compared to standard, non-surgical management of hallux IPJ wounds

Clinical Efficacy of the First Metatarsal Phalangeal Joint Arthroplasty as a Curative Procedure for Hallux Interphalangeal Joint Wounds in Patients With Diabetes
Armstrong et al, Diabetes Care, Vol 26, No 12, Dec 2003

- 21 Surgical patients underwent Keller type arthroplasty
- 20 age, sex-matched patients receiving standard non-surgical care

Results
- Ulcer healing: 24 days vs. 67 days
- Ulcer recurrence: 5% vs. 35%
- Infection: 40% vs. 38%
- 6 month f/u

Efficacy of Fifth Metatarsal Head Resection for Treatment of Chronic Diabetic Foot Ulceration
Armstrong et al, JAPMA 2005

Retrospective cohort study to evaluate outcomes of operative versus non-operative treatment of ulcerations sub 5th metatarsal head in people with diabetes

- 22 patients underwent 5th met head excision
- 18 patients received standard non-operative care
- 6 month f/u

Re-ulceration rates
4.5% vs. 28%

Conservative Surgical Approach Versus Non-surgical Management for Diabetic Neuropathic Foot Ulcers: a Randomized Trial

Prospective, randomized trial addresses:
- Healing rate in 6 months
- Duration of healing time
- Prevalence of recurrence
- Prevalence of infection

Group A (n=20)
- Non-operative therapy
- Dressing changes
- Offloading

Group B (n=21)
- Operative therapy – removal of ulcer, removal of bone, closure with sutures
- 5 days IV abx
Conservative Surgical Approach Versus Non-surgical Management for Diabetic Neuropathic Foot Ulcers: a Randomized Trial
Piaggesi et al, Diab Med, 15: 412-17, 1998

<table>
<thead>
<tr>
<th></th>
<th>Group A (Non-operative)</th>
<th>Group B (Operative)</th>
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<tbody>
<tr>
<td>Healing Rate</td>
<td>19/24 (79%)</td>
<td>21/22 (95%)</td>
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<tr>
<td>Duration of Healing</td>
<td>129 days</td>
<td>47 days</td>
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<tr>
<td>Recurrence Rate</td>
<td>8/19 (41%)</td>
<td>3/21 (14%)</td>
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<tr>
<td><strong>transfer lesions</strong></td>
<td></td>
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<tr>
<td>Infection Rate</td>
<td>3/24 (12.5%)</td>
<td>1/22 (4.5%)</td>
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Pan Metatarsal Head Resection
Giurini et al JAPMA 83(2), 1993

- 34 panmetatarsal head resection
- Average follow-up of 20.9 months
- Overall success rate of 97%
- Most common complication was regrowth of bone resulting in development of new ulceration

Partial Calcanectomy in the Treatment of Recalcitrant Heel Ulcerations
Randall et al, JAPMA 95(4); 335-341, 2005

**Literature Review**
148 cases since 1931
89% healing rates
DM and PVD
Incisional approaches

Retrospective review 8 patients underwent partial calcanectomy for chronic non-healing ulcerations

8 patients / 9 feet
7/9 (78%) healed without recurrence
2 failures: PVD / Improper post-op offloading
Ambulatory status unchanged post-op

Surgical Management of the Charcot Foot

**Indications for Surgery**
- Unstable deformity not amenable to bracing
- Deformity with current non healing ulceration
- Deformity with potential for recurrent ulceration

**Surgical Procedures**
- Exostectomy
- Arthrodesis
Charcot Deformity
Brodsky and Rouse Clin Ortho 296 Nov, 1993

- 12 patients who underwent exostectomy
- Average follow-up was 25 months
- 11 of 12 patients had Type I midfoot involvement
- 11 of 12 patients remained healed

Achilles Tendon Lengthening
Armstrong et al JBJS 81A(4) April 1999

- 10 Subjects with DM
  - All UT DM Foot Risk Category 3
  - All with pre-operative AJ DF <10 degrees
  - TAL Performed
    - Peak plantar forefoot pressure assessments pre and 8-weeks postoperatively

Achilles Tendon Lengthening

- Reduction in postoperative peak plantar pressure
  - (86.1 ± 9.4 vs. 63.3 ± 13.2 N/cm², p < 0.001).
- Increase in ankle joint range of motion eight weeks, postoperatively
  - (0.4 ± 3.1 vs. 8.7 ± 2.3, p < 0.001).

Conclusions
Operative Management of Diabetic Foot Ulcers

- In order to treat wounds, we must understand the factors associated with the etiology of those wounds
- Healing success is related to the tenants of good wound care
- EBM exists to support surgical management of appropriate patients
Thank You