Managing the soft tissue injury in pilon fractures

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Pitfalls in fracture fixation—Distal tibial fracture as an example

- Consider the anatomy
- Consider the pathological response
- Consider the fixation options
Peri-articular fractures - the injury

- Metaphyseal-diaphyseal element
- Articular element
- Soft tissues
Junction of proximal \( \frac{3}{4} \) and distal \( \frac{1}{4} \) of tibia

- Narrowest, weakest zone
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- Narrowest, weakest zone
- No muscle attachments in distal $\frac{1}{4}$ of tibia
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- Narrowest, weakest zone
- No muscle attachments in distal $\frac{1}{4}$ of tibia
- “Watershed” between diaphyseal & metaphyseal blood supply
Soft tissue response

- Soft tissues vulnerable
- Swelling occurs early
- Fracture blisters are common
- Blood filled fracture blisters are colonised with bacteria
How do anatomy and pathological response influence fracture treatment?

- Care of soft tissue injury
- Choice of fixation
‘Traditional’ ORIF

- Plate fibula out to length
- Reconstruct articular surface
- Graft
- Buttress

Sands et al
Clin Orthop 1998
Traditional ORIF Problems

- Wound complications
- Non-union
- Malunion
- Poor function
- Difficult!

Sands et al
Clin Orthop 1998
Staged treatment of pilon fractures - soft tissue management

- ORIF fibula within 24 hours
- External fixator spanning joint
- Formal reconstruction after resolution of swelling
- 17% of closed fractures - partial wound necrosis
- 10% of open fractures - deep infection

Fracture healing and outcome not reported

Sirkin, Sanders at al, J Ortho Trauma 1999
Modified staged management of peri-articular fractures

- Span
  - Spanning external fixator/travelling traction

- Scan
  - Distraction CT to assess extent and pattern

- Plan
  - Assess pattern and decide on method of fixation, when soft tissues allow

Watson et al
Clin Orthop 2000
Spanning Ex-Fix

- Quick, easy, application
- Non-compromising
  - Careful pin placement
- Settle soft tissues
- Assess fracture
  - Imaging
Scanning of intra-articular fracture

- Needs very careful assessment of joint
- Aids planning of fixation
Evidence is Lacking!!

The pitfalls remain:

- Articular incongruity
- Problems with union
- Soft tissue problems
- Poor functional outcome
Typical Case

- 24 y.o. man
- Closed injury in fall down stairs
Span with Ex Fix

- Pins clear of potential incisions
CT Scan

- Assess congruity
- Assess major fragments
Plan limited exposure fixation

- Anatomically contoured plate
Plan limited exposure fixation
Principles of Treatment

- Careful assessment of joint
- Planning for “watershed” area of tibia
- Respect for soft tissues
The evidence

- Blauth et al, J Orthop Trauma 2001
  - Retrospective analysis: 51 cases (32 closed)
  - ORIF vs MIPO + ExFix vs 2 Stage ORIF
  - Staged group had better RoM and fewer arthrodeses. But no statistical differences
The evidence

- Hazarika et al, Injury 2007
  - 20 cases; Locking plate fixation. 13 cases “staged”.
  - FWB by about 18-19 wks. 50% unite in 6 months.
  - 2 of 8 open fractures went on to non-union.
  - 3 cases had metalwork removal for wound problems/infection
The evidence

- Krackhardt et al, Arch Orthop Trauma Surg 2005
  - Prospective analysis: 71 cases
  - Slide-insertion ORIF, mainly 2-Stage
  - Post-operative complications rare
  - 3 non-unions at 2 years, 1 malunion needing correction, 5 delayed unions needing graft, 2 revisions for technical problems
Modified staged management of peri-articular fractures

- **Span**
  - Spanning external fixator/travelling traction

- **Scan**
  - CT/MR to assess extent and pattern

- **Plan**
  - Assess pattern and decide on method of fixation, when soft tissues allow