Proximal Tibial Metaphyseal and Diaphyseal Fractures

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What we aim to cover

• Adult
• Non operative
• Operative
  – IM nails
  – Plates
  – External fixators
• Conclusions
Proximal Tibial Fractures

- Fracture pattern and associated soft tissue injuries
- Aim of fixation is restoration of length, alignment and rotation
- and protection of the soft tissues
- Treatment problems are closely related to the anatomy of the tibia and the soft tissue
Non operative

• Relies on good reduction and plaster technique
• Frequent review
• Dependant on “fracture personality”
• Malunion, nonunion, knee stiffness
• Difficult to control of proximal fragment

• I have attempted to show ...that this mechanical approach (internal fixation) to fracture healing is out of touch with biological reality.”
Charnley, 1950
IM nails

• “It is possible that time will show that an intramedullary rod …will be enough to enhance alignment…

• the intramedullary rod will not be responsible for immobilisation; it will merely control alignment and prevent slipping of the reduced fracture” Charnley 1950
IM Nails – Advantages

- Less disruption of soft tissue and fracture
- Remote from fracture site
- Biology of fracture undisturbed
- Healing by callus
IM nails – Disadvantages

• Anterior knee pain
• Reaming affects blood supply
• Infection
  The rate of infection for open versus closed reduction was higher but not statistically different
• Non union
• Mal-alignment
  27/32 proximal third tibial fractures had valgus angulation of 5° or more, and 9/32 had apex anterior angulation of 10° after IM nailing.
IM nails – Surgical tips

• Reduce valgus angulation
  – blocking (poller) screw
  – lateral entry point
  Primary valgus deformation can be corrected by inserting nail into lateral third lateral tibial plateau.
  Weninger et al. Injury Oct 2009

• Reduce anterior translation
  – avoid flexion of proximal fragment
  – lateral, posterior and proximal entry
  25/30 fractures nailed using a partial medial parapatellar incision with the leg at 15° knee flexion…eliminated extension force of quadriceps…(to reduce anterior angulation).

• Nail configuration
Plates

• Used for both absolute and relative stability depending on fracture configuration

• Absolute stability required if articular component
  – Buttress plate, lag screw

• Relative stability satisfactory
  – Buttress plate
  – Bridging plate
  – Minimally invasive methods
  – Periarticular plates
Plates - Advantages

• If both metaphyseal and diaphyseal component to the fracture, a contoured plate can be used for bridging

• Minimally invasive methods allow less disruption of the fracture biology and more respect to the soft tissues
  Treatment of complex tibial periarticular fractures using percutaneous techniques

• Control of length, rotation and alignment
  – Anatomical reduction possible if open direct technique
Plates - Disadvantages

• Subcutaneous metalwork
  – disturbs soft tissue envelope and vascular supply – upsetting the fracture biology
  – periosteal stripping
  – wound breakdown and infection is the biggest problem
  – anterolateral approach favoured to maximise soft tissue coverage

• Single plating can result in angulation

• Fixed angle devices can be technically difficult
  Treatment of complex proximal tibial fractures with the LISS system
Plates - Disadvantages

- Less invasive methods require skill in indirect reduction of the fracture, plate contouring and percutaneous screw placement

- Removal of implants is common

External Fixators

Indications:
- Open
- Vascular injury
- Significant soft tissue injury
- Sick patient

Can be:
- Temporary in damage control
- Definitive (frames) alone or in combination
External Fixators

• Advantages
  – technically simpler to apply and construct
  – limited soft tissue damage
  – easy to remove

• Disadvantages
  – knee stiffness if spanning joint
  – pin site or track infections
  – osteomyelitis
  – delayed union, malunion
  – cosmesis and psychological effects
External Fixator vs...

- IM nail
  - 104 IM nails, 70 Ex-Fix, all open fractures
  - Satisfactory alignment: 92% vs 69% (p=<0.01)
  - Infection: 13% vs 21% not sig
  - Time to heal : not sig
  - No of procedures: 1.7 vs 2.7

External fixator vs…

• Plate
  – 59 cases, prospectively randomised
  – All Grade II or III open fractures
  – Severe osteomyelitis in 3% vs 19%
  – Both methods yielded “excellent” results
  – Rate and extent of complications were lower with external fixation

Conclusions

• Essentials
  – Understanding anatomy
  – Understanding reduction – proximal fragment
  – Understanding mal-alignment problems
  – Excellent surgical technique

• Operative management has a better outcome than non operative

• Less invasive techniques favoured in order to protect and preserve the soft tissues
Conclusions

• Treatment choice depends upon
  – fracture configuration
  – achievement of type of stability
  – associated soft tissue concerns

• Consider plate in periarticular, ex-fix or IM nail in open fractures

• Yet to find the ideal treatment option