Distal Femur Fractures: Tips and Tricks for Plating and Nailing?

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Conflict of Interest

- Consultant: Smith & Nephew, Biomet, Stryker
- Royalty: Smith & Nephew, Biomet
  Advanced Orthopedic Systems, Synthes
- Editorial Board: J Ortho Trauma, JBJS
- BOD: Foundation for Orthopedic Trauma

From my lecture files: 2004

- 75 yo woman fell off step ladder

Principles of Early Plating Methods
- Anatomical restoration of bone
- Rigid stability
Traditional Open Plating: Case Example

Early Plating Methods Required:

• Soft-tissue stripping
• Evacuation of fracture hematoma

Often ..... nonunion & fixation failure

Early Plating Methods: Distal Femur

• 10-40% nonunions
• 5-25% infections
• 5-20% malunion
• 10-95% bone graft

Sarris et al., Acta Orthop Scand, 1971
Neer et al., Injury, 1975
Delpit, J Bone Joint Surg Am, 1972
Schatzker and Lambert, Clin Orthop, 1979
Siliski et al., J Bone Joint Surg-Br, 1989
Evolution of Plating Techniques

“Indirect reduction”: fracture realignment is obtained *without direct visualization*

- Rationale: Maintain fracture environment (vascul arity and hematoma) to achieve…
  - Early healing
  - Fewer bone grafts
  - Lessen infection risk

Mast et al. Planning and Reduction Techniques in Fracture Surgery, 1989

“Locked Plating”

- Condylar fixation

“Locked Plating”

- Great case, man!
Results of MIPO: Distal Femur

<table>
<thead>
<tr>
<th>Standard ORIF</th>
<th>MIPO¹,²,³,⁴</th>
</tr>
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<tbody>
<tr>
<td>• 10-40% nonunions</td>
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“...mostly attributable to a learning curve”

1. Schutz et al., Injury, 2001
4. Others
So…..what’s the deal?
• 33 A1-3, C1 fractures at 12 trauma centers
• 126 pts: 76 locked plates vs 80 nails
• No difference in pts or injuries


### Surgical times (min) vs.
- Nails: 125 +/- 61
- Locked plates: 124 +/- 51
- P: 0.9

<table>
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<th>Malalignment &gt;5°</th>
<th>Nails</th>
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<th>P</th>
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<tr>
<td>22%</td>
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<td>32%</td>
<td>0.4</td>
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- Nonunion surgery: 5% vs. 8%

- All patients have disability at 1 year

SMFA
Evolution of Nails

Similar to Plating
• MIPO or open
• New technology

Evolution of Nails

Advances in IM nails
• More locking screws
• Fixed angled screws
• Open Rx of articular component

How is a Plate Designed?

• Anatomical geometry
  – CT “averaging” of population
How is a Plate Designed?

Modern Plate Design

• “Anatomical” plates do not fit everybody!

Plate Misapplication & Malalignment

Anything else?
• Technical screw-ups
• “Rule of too’s”

Collinge et al. J Ortho Trauma, 2012
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“... mostly attributable to a learning curve”

1. Schutz et al., Injury, 2001
2. Schandelmaier et al., Injury, 2001
3. Kregor et al., Injury, 2001
4. Others

Modern Open Plating: Case Example

• 37 yo woman shot by boyfriend
• Type 33A

Set-up

Reduction aids
C-arm opposite
Pre-op planning
Indirect Reduction
• Femoral Distractor

Indirect Reduction
• Knee roll

Ready to Plate
• Fracture reduced
Lateral Skin Incision
Incise IT band

Plate insertion

Plate design & anatomy
Position Plate

Confirm Quality Radiographs: Proximal & Distal

Rectangularize Plate-Targetter Construct

Fine Tune Reduction

Lag Screw

King Tong Clamp
Fine Tune Reduction

Add Necessary Screws

Lag Screw @ Shaft
Case Example: Osteoporotic Distal Femur

Approaches

• Anterolateral approach is extensile
So what are we to do?

Do a nice plating:
- Pre-op plan
- Plate carefully - radiography
- High threshold for alignment
So what can we do?

Nailing
• Minimally invasive
• Open (biologically friendly)

Modern Nailing

Critical elements
• Starting point
• Reduction
• Nail geometry

Thank You