Distal Femoral Fracture

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Summary

• Classification

• Management
  – What is known...
  – What is not known...
  – What should we do?

• Anything else in the literature?
Background

• Incidence: 37/100 000 person years (i.e. Low)
  – 10 x less than #NOF

• High energy trauma in younger men
  vs

• Low energy trauma in older women

• Different fracture patterns

• Different treatment options
Classification

- AO (Muller) - 33

A1 Simple
B1 Lateral Sagittal
C1 Simple

A2 Wedge
B2 Medial Sagittal
C2 Metaphyseal Comminution

A3 Multifragment
B3 Coronal
C3 Multifragment

Ref: www.aofoundation.org
Management Basics

• Operative treatment superior to non-operative
  – ↑ROM, ↓malunion, ↓DVT

• Aims of fixation:
  – Alignment
  – Rotation
  – Length
  – +/- anatomical reduction at articular surface if 33B/C
  – Preserve biology and fragment integrity
Traditional Fixation

- DCS (*fixed angle*)
- Blade Plate
- Buttress/Condylar Plate

Newer Techniques

- Retrograde IM Nail
- Locking Plates
- MIPO (i.e. LISS etc = internal external fixator)
• Newer techniques have evolved to help with:
  – Preserving bone biology/soft tissues
  – Osteoporotic bone
  – Distal fractures
  – Comminution, fixed angle device prevents varus collapse
  – Articular involvement
• Locking plates are more expensive
  – 3-4 times
• Paucity of literature in support of newer devices
  – Mainly level II,III evidence i.e case series etc
  – Support that they work, just not that they are better
How Low Can You Go?

• LISS plate:
  – Subchondral bone

• Condylar Plate:
  – Subchondral bone

• Blade Plate:
  – 1.5-2cm

• DCS:
  – 2cm

• Retrograde Nail:
  – 6cm for 2 screws
  – ?lower for 1 screw
<table>
<thead>
<tr>
<th></th>
<th>Plate ORIF</th>
<th>DCS/Blade Plate</th>
<th>Nail</th>
<th>Locking Plate (MIPO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Union</td>
<td>~80%</td>
<td>~90%</td>
<td>~90%</td>
<td>~100%</td>
</tr>
<tr>
<td>ROM</td>
<td>80°</td>
<td>-</td>
<td>120°</td>
<td>110°</td>
</tr>
<tr>
<td>Infection</td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
<td>↓</td>
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<tr>
<td>Blood Loss</td>
<td>↑</td>
<td>↑↑</td>
<td>↓</td>
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<tr>
<td>Alignment</td>
<td>↓</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Soft Tissue Preservation</td>
<td>↓</td>
<td>↓</td>
<td>↑</td>
<td>↑</td>
</tr>
</tbody>
</table>

References:
- AO Surgery Reference [www.aofoundation.org](http://www.aofoundation.org)
- J Orhtop Trauma 2006 Złowodzki et al.
Q. What should you do then?
A. What you are most used to...

A1-3
(DCS or Blade Plate)
IM Nail
(Doctor's Locking Plate for A3)
MIPO vs ORIF

B1-2
Interfragmentary screws
+- buttress plate

C1
Interfragmentary screws
+- IM Nail or Locking Plate
[Or DCS/Blade Plate]

B3
Interfragmentary screws

C2
Interfragmentary screws
+- IM Nail or Locking Plate
[Or DCS/Blade Plate]

C3
Locking Plate
Special Considerations

• Hip stem:
  – Overlap plate to avoid stress riser
  – Locking plate allows unicortical screws

• TKR:
  – Need to know exact prosthesis
  – Nail if space between condyles
  – Otherwise careful plating

• OA:
  – Primary TKR, stanmore, rotating hinge

• Osteoporosis:
  – Locking plate (theoretical, little evidence over nail)
Literature

• **Polyaxial** Locking Plates “offer more fixation versatility without an apparent increase in mechanical complications or loss of reduction”
  – JBJS 2008 Haidukewych et al

• Recent review: “no significant difference between locking and nonlocking plates for outcome, complications or adverse events”

• **ORIF vs Submuscular Plates**: theoretical advantage but in femoral shaft no clear clinical advantage and more technically challenging and suboptimal reduction
  – J Trauma 2007 Zlowodzki et al.
Conclusion

• Newer techniques preserve bone biology and soft tissue
• However there is little evidence to choose between locking plates or IM nails
• Different fracture patterns demand different fixation methods