Proximal humerus fractures, ORIF or Arthroplasty

M.N. Naderi, MD
Deforming forces in proximal humeral fractures

From Copeland: Operative Shoulder Surgery
Neer classification
(based on displacement of fragment)

Criteria: displacement > 1 cm
or angulation > 45°

The greater the number of displaced fragments, the higher the risk of AVN.

- Valgus-impacted four-part fracture
- Impression fracture
- Head splitting
The length of dorsomedial metaphyseal extension & integrity of medial soft tissue are more important than number of "parts" and degree of displacement in development of osteonecrosis.

Indications for operative therapy:

- angulation of the humeral head $>45^\circ$,
- displacement of the greater tuberosity $>0.5$ cm
- displacement of the shaft $>1$ cm

Treatment options in displaced fx

- Nonoperative
- Fixation
  - ORIF
  - CRIF
- Arthroplasty

- Suture
- Tension band
- Pins
- Plate
- Nail
- EF
The goal of fixation proximal humerus fx is:

- anatomic reduction
- mechanical stability
- early ROM
- preserving the humeral head’s blood supply
AO Principles of Fracture Management. Chap 1.4; Thieme, New York 2000
Fixations methods - Transosseous Suture

Alternate
(Enders medially)

6.5 years postop
Fixations methods - pins
percutaneous methods, although theoretically advantageous because of preservation of the blood supply, are inferior in stability compared with intramedullary devices and conventional plating.

Fixations methods - Tension band
Fixations methods - Nail

www.shoulderdoc.co.uk
Fixations methods - plate

In cantilever bending and torsional stiffness testing, the plate/screws construct and the IM nail construct were superior to the TBW/Enders nail construct.
Proximal humerus locking plate
In vitro analysis of implant anchoring in osteoporotic bone demonstrated significant lower loosening of angular plates at the bone-implant interface compared to the humerus T-plate and proximal humerus nail.
Fixations methods - Locking plate

- Rigid Fixation
- Early Mobilisation
Secondary loss of reduction into varus-malalignment is seen especially in fractures with medial comminution.

Micro-CT study of humeral head:

- marked porosity in greater tuberosity region
- densest bone just underneath humeral head

To overcome loss of reduction in medial comminution:
Anatomical reduction & careful placement of buttressing
inferomedial screws or impaction of the shaft into humeral head


How many displaced 3 & 4 part fx?
### Treatment of 3 & 4 part fx

<table>
<thead>
<tr>
<th>blood supply head</th>
<th>yes</th>
<th>yes</th>
<th>no</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomical stability by osteosynthesis</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>osteos.</td>
<td>prosth</td>
<td>osteos.</td>
<td>prosth</td>
<td></td>
</tr>
</tbody>
</table>

In 4-part fx and some 3-part fx and fx-dx in old patients: ORIF usually leads to a poor outcome as a result of osteonecrosis, failure of fixation, posttraumatic arthritis, and stiffness.
Cai M, Tao K, Yang C, Li S. Internal fixation versus shoulder hemiarthroplasty for displaced 4-part proximal humeral fractures in elderly patients. Orthopedics. 2012 Sep;35(9):

- advantage in functional outcomes favoring shoulder hemiarthroplasty compared with ORIF with a locking plate
Three- or four-part proximal humerus fracture identified preoperatively or intraoperatively

- Patient medically unfit for surgery
  - Nonoperative treatment
- Patient medically cleared for surgery
  - Valgus-impacted four-part fracture
  - Physiologically young patient with good bone stock
    - Open reduction and internal fixation
  - Physiologically old patient with poor bone stock
    - Hemiarthroplasty
Indications for primary hemiarthroplasty

- displaced four-part fractures in old patients
- Fx/dx with impaired vascular supply of the head fragment
- head-splitting fx involving >40% of the articular surface

hemiarthroplasty offers high subjective patient satisfaction despite moderate function
Three part fx-dx
Shoulder 4 part fx-dx
4 part fx-dx, prosthesis
• Parameters influencing the clinical outcome:
  • Preoperative delay
  • Problems of tuberosity fixation
  • Position of the tuberosities
  • Humeral offset and head height
Failed previous fixation of proximal humerus fx
Conclusion

- Difficult Fractures
- Require skilled decisions
- Tuberosities position
- ORIF ?!
- Consider primary prosthesis?