Proximal Humerus Fractures
ORIF or IM Nail – Which is better?

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Up to 5% of all fractures, most often elderly from GLF

Physiologic status of patient
- Bone quality, medical comorbidities
- Associated injuries (vascular, neuro, or polytrauma)

- ***Psychological*** status of patient
  - Motivation, can they participate in rehab?
  - Compliance

- ***Functional*** status at baseline
  - Occupation
  - Lifestyle
  - Hand dominance

Mechanism

    Low Energy

        Ground level fall (elderly), sports

    High Energy

        Motor vehicle or motorcycle crash, fall from height

Physical Exam
- ***Visualize*** and ***palpate***
- Dislocation or deformity can be masked by:

    Deltoid muscle, soft tissue swelling, obesity
- Assess neurovascular status (axillary nerve especially assoc. with dx)
- Obtain AP and lateral xrays, axillary view depending on institution
- Consider CT – helpful in determining size and position of greater tuberosity which often displaces posteriorly

Neer Classification, OTA, Anatomic Description

(Neer based on Codman's observation that fractures occur along former physes)

- Neer Criteria:
    - > 45 degrees angulation
    - > 1 cm displacement (0.5 mm for greater tuberosity)
- Anatomical neck- rare
- Surgical neck – common
- Greater tuberosity – displacement greater than 5 mm associated with shoulder impingement (supraspinatus tendon)
- Lesser tuberosity – medial periosteal vessels provide blood supply to head (infraspinatus tendon)
- 4 categories:
    - 1-part: No displacement
    - 2-part: *One* displaced fragment
    - 3-part: *Three* displaced fragments; humeral head remains in contact with glenoid
    - 4-part: *Three or more* displaced fragments; *dislocation of articular surface* from glenoid; high risk of AVN.

OTA:

3 main groups and 3 subtypes based on fracture location, presence of impaction, translation, angulation or comminution or the surgical neck and +/- dislocation

Should fracture be treated non operatively?

Minimally displaced patterns are often stable. Pt should be able to initiate passive ROM exercises within a few days.
- Surgeon experience
- Vascularity to head - Displacement of lesser tuberosity in elderly patients, 3 or 4 part fxs, often lead to high rate of AVN, screw cut out and

hemiarthroplasty is often preferred treatment. Valgus impacted 4-part fractures have better prognosis.

Goals of surgical repair
- Restore anatomic reduction of the segments involved in glenohumeral and subacromial motion
- Provide fixation that is stable enough to permit immediate shoulder rehab
- Technique that encourages rapid bony healing
- Minimizes increase of AVN risk
- Minimizes fracture settling that leads to:
    - Screw cut out
    - Malunion
- Restore normal shoulder function, uninjured shoulders often have compromised function due to arthritis or cuff arthropathy

Surgical Approach
- **IM Nailing**
- Deltoid splitting approach, entry point determined by specific device but near supraspinatus insertion
- Fixed angle/length stable screws vs spiral blade
- Repair tuberosities to humeral shaft

- **Plating**
- Deltopectoral approach
- Some surgeons use mid-axillary skin incision (more cosmetic)
- Fixed angle and length screws
- Repair tuberosities to bone or plate

Intramedullary nails and fixed angle plates both have the potential to improve axial stability to minimize varus collapse and malunion

Considerations

Surgeon experience and the need to adapt to what is available

Advantage IM nailing techniques:
1) Decrease dissection at fracture site that can preserve vascularity to head
2) Good option with fractures that have significant comminution at the surgical neck and proximal shaft that would require an extensive exposure for plating
3) Pathologic fractures of the proximal humerus
4) Osteoporotic bone?

Advantage plating:
1) Best screw fixation can be achieved in the central aspect of the humeral head. Multiple options for achieving better fixation into head.
2) Easier fixation of tuberosity sutures to the plate.
3) Deltopectoral exposure allows easier mobilization of tuberosities
4) Reduction of varus shortening