Surgical fixation now best achieved with proximal humeral locking plates
- Position plate below apex of greater tuberosity to prevent impingement
- Place locking screws low in the head along the calcar
- Avoid screw penetration into the head
- Other surgical options:
  - Minimally invasive techniques – steep learning curve, and K-wires less stable
  - Intra-medullary nailing offers more stable fixation in elderly osteoporotic fractures or pathological fractures, but the entry point can violate the rotator cuff
  - Hemiarthroplasty
  - Reverse shoulder replacement if the cuff is unreconstructable, as the joint is lateralized and therefore less dependent on the tension maintained by the rotator cuff – but risks include early loosening, notching of scapular neck and acromial stress fracture.

Complications:
- AVN – may be improved by early core decompression, but if reciprocal changes present treated by total shoulder replacement
- Malunion – usually caused by patient related factors such as alcohol, smoking, osteoporosis, medical comorbidities ... etc.
  - Patients complain of pain, stiffness, loss of function or pseudoparalysis from surrounding muscle dysfunction
  - Exclude infection, and consider ORIF with bone grafting or replacement.
- Malunion – can result in impingement and cuff tears
- Stiffness – MUA more effective than arthroscopic distension.

N. Südkamp et al, 2009; J Bone Joint Surg Am. 91:1320-1328
Case series of ORIF using locking proximal humerus plates (LPHP)
187 closed displaced/unstable surgical neck of humerus fractures treated acutely by ORIF using Synthes LPHP. At 1 year, achieving 85% of ROM and Constant & DASH scores, compared with uninjured side. Complication rate 34%, with half being related in technical error (e.g. screw perforation into joint). 20% required re-intervention within 1 year.
Proximal Humerus Fractures
Taken from Murray IR et al, Proximal Humeral Fractures, JBJS 2010; 93-B:1-11

- Surgery only considered in 20%, and rarely needed in elderly over 85.
- Predictors of poor outcome:
  - Severe osteoporosis
  - Smoking
  - Drug and alcohol abuse
  - Diabetes
  - Rheumatoid arthritis
  - Immunocompromised state (steroids, malignancy)

- Beware vascular injury in patients with fracture dislocation.
  - Rich collaterals may result in distal ischaemia not being present
  - Look for expanding haematoma, unexplained hypotension, delayed anaemia.
  - Be suspicious is co-existing nerve injury, which can be direct injuries to the brachial plexus or traction injuries to the axillary nerve.

- Indications for non-operative treatment:
  - Stable 1 or 2-part fractures with minimal angulation of humeral head
  - 3 or 4 part fractures with head-shaft angulation < 30 degrees in valgus or varus (away from the normal 130° inclination)
  - Frail, elderly and those unfit for surgery
  - Surgical inexperience

- Indications for surgery:
  - Younger and more active patients
  - Open fracture or those with neurovascular compromise
  - True head splitting fracture
  - Fracture configurations with >1 cm displacement of greater tuberosity
  - Fixation primarily allows reconstruction of the rotator cuff, which makes later arthroplasty easier, but if the head is devoid of soft tissue attachment consider primary hemiarthroplasty to avoid AVN.

- Non-operative management:
  - Functionally as good as surgery
  - Polysling initially for pain relief, and then change to collar & cuff within a week
  - Patients may find it easier sleeping in a chair
  - Hanging casts of no value, and distract fracture promoting AVN
  - Start physiotherapy at around three weeks.