

Fractures of the proximal humerus:

Usually occur in middle age & most common in osteoporotic & post-menopausal woman, in young age group occur after sever trauma.

Mechanism of injury: fall on outstretched hand; it's either displaced or undisplaced



Clinical feature:

pain , bruises of the arm & deformity.

Neer classification:

The two main components of the classification are:

1. number of fracture parts
2. displacement

Parts:

The Neer system divides the proximal humerus into 4 parts and considers not the fracture line, but the displacement as being significant in terms of classification.

The four parts are:

1. humeral head
2. greater tuberosity
3. lesser tuberosity
4. humeral shaft

Displacement

A fracture part is considered displaced if angulation exceeds 45 degrees, or if the fracture is displaced by more than 1cm.

As such the simplest displaced fracture which is possible is a two-part fracture, however a minimally displaced fracture, even if this includes multiple fracture lines, merely constitutes an type I, one-part fracture. This classification important in functional outcome & guide to treatment.

Classification

One-part fracture

- fracture lines involve 1 - 4 parts
- none of the parts are displaced (i.e. <1cm **and** <45 degrees)

These undisplaced / minimally displaced fractures account for ~ 70 - 80% of all proximal humeral fractures and are almost always treated conservatively.

Two-part fracture

- fracture lines involve 2 - 4 parts
- one part is displaced (i.e. >1cm **or**>45 degrees)

Four possible types of two-part fractures exist (one for each part):

1. surgical neck: most common
2. greater tuberosity
 - frequently seen in the setting of anterior shoulder dislocation
 - a lower threshold of displacement (> 5mm) has been proposed
3. anatomical neck
4. lesser tuberosity: uncommon

These fractures account for approximately 20% of proximal humeral fractures.

Three-part fracture

- fracture lines involve 3 - 4 parts
- two part are displaced (i.e. >1cm **or**>45 degrees)

Two three-part fracture patterns are encountered:

1. greater tuberosity and shaft are displaced with respect to the lesser tuberosity and articular surface which remain together
2. lesser tuberosity and shaft are displaced with respect to the greater tuberosity and articular surface which remain together

These fractures account for approximately 5% of proximal humeral fractures.

Four-part fracture

- fracture lines involve parts
- three parts are displaced (i.e.>1cm **or**>45 degrees) with respect to the 4th

These fractures are uncommon (<1% of proximal humeral fractures)

The fracture pattern can be complex and difficult to assess adequately with plain x-rays, so a CT scan may be required to better understand the severity of the fracture.

Treatment:

- Type I-----> rest the arm in a sling for 6 weeks & active exercise later.
- Type II-----> MUA & sling arm for 6weeks , if failure open reduction & internal fixation by percutaneous pinning, plate & screws or intramedullary nailing.
- Type III----->open reduction & internal fixation.
- Type IV----->young age patient by open reduction & internal fixation & reconstruction by interosseous sutures, in elderly patient treated by prosthetic replacement.

Complications:

1-vascular injury.

2-stiffness of shoulder joint.

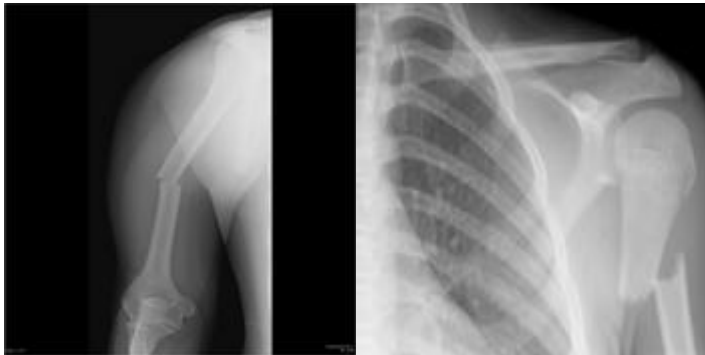
3-malunion

.4- avascular necrosis.



Fracture shaft of humerus:

- Traumatic & pathological
- 3-5% of all fractures
- Bimodal age distribution
 - young patients with high-energy trauma
 - Elderly, osteopenic patients with low-energy injuries or due to 2ndary metastasis.
- Fracture location: proximal, middle or distal third.
- Fracture pattern: spiral, transverse, comminuted or oblique.



Clinical features:

Pain, bruises at site of fracture, radial nerve examination before & after treatment by extension of metacarpo-phalangeal joints.

X-ray: to show types & site of fracture.



Treatment of humeral shaft fractures:

-Nonoperative

Splint for 7-10 days until pain & odema subside followed by functional brace (3-6) weeks, or using hanging cast from shoulder to wrist joint to pull the fragment in alignment with elbow 90^0 with sling to neck for 2-3 weeks replaced by functional cast for 6 weeks.



indications

Gold standard and indicated in vast majority of humeral shaft fractures &90% union rate

criteria for acceptable alignment include:

- 1) $< 20^{\circ}$ anterior angulation
- 2) $< 30^{\circ}$ varus/valgus angulation
- 3) < 3 cm shortening

absolute contraindications :

- 1) severe soft tissue injury or bone loss
- 2) vascular injury requiring repair
- 3) brachial plexus injury

Operative treatment

Indications:

- 1- Severe multiple injuries
- 2- Open fracture
- 3- Segmental fracture
- 4- Displaced intraarticular extension of the fracture
- 5- Pathological fracture
- 6- Floating elbow
- 7- Radial nerve palsy after manipulation (Holstein-Lewis fracture)
- 8- Non-union

Type of fixation either by plate and screws or intramedullary nail (in closed fracture) while in open fracture using external fixation with antibiotic cover, ATS and wound debridement and later on either secondary suture of the wound or skin graft in case of skin and soft tissue loss.



Complications:

Early:

- 1- Vascular injury (brachial artery injury)
- 2- Nerve injury

Radial nerve palsy (wrist drop + paralysis of metacarpophalangeal joint extension)

Late:

1-Delayed union and malunion

2-Joint stiffness

Holstein-Lewis fracture :

a spiral fracture of the distal one-third of the humeral shaft commonly associated with neuropraxia of the radial nerve (22% incidence due to entrapment of the radial nerve between fracture site), & need urgent open reduction & internal fixation with freeing of the nerve.