Fractures of Proximal Humerus

- 1 shaft of humerus
- 2 greater tuberosity
- 3 lesser tuberosity
- 4 collar

Mechanism of injury:
- Fractures usually follow a fall on the outstretched arm
- Type of injury which, in younger people, might cause dislocation of the shoulder.
- Sometimes, a fracture-dislocation occurs.

Fractures of the proximal humerus usually occur after middle age & most of the patients are osteoporotic, postmenopausal women.

Treatment

- Immobilization: Arm in a sling for 2 to 3 weeks until the pain subsides.
- Medication: Analgesics, anti-inflammatory drugs.
- Radiography: X-rays to confirm diagnosis.
- Physical therapy: Once pain subsides and swelling decreases, gentle passive movements of the shoulder begin.
- Surgery: Open reduction and internal fixation (ORIF) for displaced fractures.
- Rehabilitation: Active range of motion exercises started when pain allows.

Fractures of the Humerus Head

Type I: Simple fracture
- A simple fracture of the humeral head.
- No dislocation of the fragments.
- Treatment: Immobilization in a collar. ORIF if there is displacement or unstable fracture.

Type II: Wedge fracture Type C: Complex fracture
- The fragment is dislocated.
- Treatment: Open reduction and internal fixation (ORIF).

Common Types

1. Surgery
2. Rehabilitation
3. X-ray

Fractures of the Distal Humerus in Children

- Supracondylar fractures
- Unicoronal fractures
- Bicondylar fractures

Mechanism of injury:
- The child falls with elbow stressed in varus, causing a spiral fracture.
- The distal fragment is dislocated.
- The distal fragment is displaced.

Classifications

- A: Simple
- B: Oblique fracture
- C: Transverse fracture

Treatment

- Immobilization: Cast for 6 weeks.
- Medication: Analgesics, anti-inflammatory drugs.
- Rehabilitation: Active range of motion exercises started 2 weeks after the injury.

Fractures of the Distal Humerus in Adults

- Unicoronal fractures
- Bicondylar fractures

Mechanism of injury:
- The distal fragment is dislocated.
- The distal fragment is displaced.

Classification

- Type I: Simple fracture
- Type II: Wedge fracture
- Type III: Complex fracture

Treatment

- Immobilization: Cast for 6 weeks.
- Medication: Analgesics, anti-inflammatory drugs.
- Rehabilitation: Active range of motion exercises started 2 weeks after the injury.

Fractures of the Elbow

- Fracture of the greater tuberosity is often associated with anterior dislocation.
- The fragment should be fixed with a screw.

Fixation options:
- In post. displaced fractures:
  - Posterior angulation or displacement
  - Mobilization of the elbow
  - Use of a posterior slab.
- In young patients:
  - Fixation should be as certain.

Conservative:
- Fractures of the humeral head readily.
- They require neither perfect reduction nor immobilization, the weight of the arm with an external cast is enough to pull the fragments into alignment.

In Oblique & Spiral fractures:
- A hanging cast. Applied from the elbow to the chest.

Surgical:
- If diagnosis uncertain, elbow is splinted in 0°.
- External fixator.

External fixation may be the best option for high energy segmental fractures and open fractures.

Fractures of the Proximal Humerus

- Small fractures of the proximal humerus:
  - Suggested by hyperextension injury, usually due to:
    - Fall on the outstretched arm.
    - X-ray:
    - Fracture of the humeral head.

Fractures of the Shaft of the Humerus

Type A: Simple fracture
- A: Spiral
- B: Oblique (>30°)

Type B: Wedge fracture Type C: Complex fracture
- B1: Spiral wedge
- B2: Banding wedge
- B3: Fragmented wedge

Fractures of the Elbow

- Type III:
  - The distal fragment is dislocated.
  - Fixation should be as certain.

Type I:
- The fragment is not clearly in the lateral view:
  - Diagnosis uncertain, elbow is splinted in 0°.

Type II:
- The distal fragment is palpable by triceps:
  - Diagnosis uncertain, elbow is splinted in 0°.

Type III:
- The distal fragment is palpable by biceps:
  - Diagnosis uncertain, elbow is splinted in 0°.

N.B:
- The fracture line runs obliquely downwards.
- The distal fragment is lifted backwards and/or shifted backwards.
- The elbow is flexed 90°. The radial nerve is sometimes at risk.

Clinical Features

- History: Following a fall:
  - Pain & elbow is swollen.
  - Weakness of the arm.

- Radiography:
  - X-ray:
    - Fracture of the humeral head.
  - CT scan:
    - Fracture of the humeral head.

Treatment

- Immobilization: Cast for 6 weeks.
- Medication: Analgesics, anti-inflammatory drugs.
- Rehabilitation: Active range of motion exercises started 2 weeks after the injury.

Fractures around the elbow in adults

- Fractures are commonest fractures:
  - Proximal humerus
  - Distal humerus

The AO-ASIF Group have defined three types of distal humeral fracture:

- Type A – Supracondylar fracture
- Type B – Unicoronal fracture
- Type C – Bicondylar fractures with varying degrees of comminution.

Type A – Supracondylar fracture
- The elbow is held 90°. The dislocation of the arm is immobilized.

Type B – Unicoronal fracture
- The wrist and fingers are exercised from start.
- The elbow is held 90°. The dislocation of the arm is immobilized.

Type C – Bicondylar fractures
- The wrist and fingers are exercised from start.
- The elbow is held 90°. The dislocation of the arm is immobilized.

The child falls with elbow stressed in varus, causing a spiral fracture.

B) Fracture - separation of lateral condyle
- The child falls with elbow stressed in varus, causing a spiral fracture.
  - A large fragment including the lateral condyle can be avulsed by the attached wrist extensor.

C) Separation of medial epicondyloid apophysis
- If the fracture is forced into extension, the medial epicondyloid apophysis is avulsed by the attached wrist flexor.

D) Fracture-separation of the entire distal humeral epiphysis
- Occurs with severe injury, such as a birth injury or child abuse.

E) ‘The treatment is like a supracondylar fracture

F) ‘The fracture is separated into two parts, one part is the humerus, the other is the elbow.

The elbow is flexed 90°. The radial nerve is sometimes at risk.

- The diagnosis is confirmed by manipulation.
- If displaced, the elbow is splinted in 90° for 3 weeks.
**Fractures around elbow – Fractures of forearm**

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| Elkbow dislocation              | 1. Post. or postero-laterally (90%): Fall on outstretched hand while elbow in mild flexion  
2. Ant. Dislocation: 
   - Direct trauma to elbow. 
   - Ulna migrates forward with associated fracture of olecranon. (fracture dislocation) | Uncomplicated dislocation: 
   - Patient fully relaxed under anaesthesia. 
   - Pulls on the forearm while the elbow is slightly flexed 
   - With one hand, sideways displacement is corrected ⇒ then the elbow is further flexed while the olecranon process is pushed forward. 
   - X-ray confirms the reduction | Fracture dislocation: 
   - Associated fractures of humeral condyles or epicondyles or the olecranon process, need: Internal fixation |
| Pulled elbow                     | In young children: 
   The elbow is some times injured by a sharp tug on the wrist | What has happened is that the radius has been pulled distally and the orbicular ligament has slipped up over the head of radius. 
   - TTT: Forcefully supinating and then flexing the elbow; the ligament slips back with a snap. | A single large fragment (Type II): 
   - If displaced ⇒ ORIF with small headless screws. |
| Head of the radius               | 1. A fall on the outstretched hand with the elbow extended and the forearm pronated causes impaction of the radial head against the capitulum. 
2. Sometimes fractured during elbow dislocation. | An undisplaced split (Type II): 
   - Pain relief by applying the haemotagma and injecting local anaesthetic. 
   - The arm is held in a collor and cuff for 3 weeks. 
   - active flexion, extension and rotation are encouraged | Displaced transverse fractures: 
   - Reduction & fixation by: 
     1. Tension band wiring. 
     2. If fails ⇒ rigid internal fixation & bone grafting. 
   - Displaced comminuted fractures: 
     - Rigid internal fixation & bone grafting |
| Olecranon process                | 3 types: 
   Type I: comminuted 
   Type II: undisplaced transverse 
   Type III: Displaced transverse | A comminuted fracture, with intact triceps: 
   - The arm is rested in a sling for a week 
   - x-ray is to ensure that there is no displacement 
   - then exercises are begun. | Displaced transverse fractures: 
   - Reduction & fixation by: 
     1. Tension band wiring. 
     2. If fails ⇒ rigid internal fixation & bone grafting. |
| Fracture radius & Ulna           | A twisting force (usually a fall on the hand) produces ⇒ a spiral fracture with the bones broken at different levels. 
   An angulating force causes a transverse fracture of both bones at the same level. 
   Rotation deformity & displacement may be produced by the pull of muscles attached to the radius: 
   - the biceps & supinator muscles to the upper third, the pronator teres to the middle third, and the pronator quadratus to the lower third. | Two broad types of injury are seen: 
   1. a comminuted fracture: 
      due to a direct blow or a fall on elbow. 
   2. a transverse fracture: 
      due to traction when the patient falls onto the hand while the triceps muscle is contracted. | A single large fragment (Type II): 
   - If displaced ⇒ ORIF with small headless screws. |
| Fractures of single forearm bone | Fracture of the radius alone is very rare and Fracture of the ulna alone is uncommon. 
   They are important for: 
   - An associated dislocation may be undisguised, if only one forearm bone is broken along its shaft and there is displacement and deformity or shortening of one bone, here either: 
   - Proximal radio-ulnar joint dislocation or 
   - Distal radio-ulnar joint must be dislocated. | Isolated fracture of the ulna: 
   The fracture is rarely displaced. 
   1. Forearm brace: may be sufficient. 
   However, it takes about 8 weeks before full activity can be resumed. 
   2. Rigid internal fixation will allow: 
      - earlier activity and 
      - avoids the risk of displacement or non-union. | Isolated fracture of the radius: 
   Radius fractures are prone to rotary displacement; so, internal fixation with: 
   - Compression plate & screws ⇒ in adults 
   - Intramedullary nails ⇒ in children |
| Monteggia fracture-dislocation of Ulna | Previous definition: 
   It was defined as fracture of the shaft of the ulna associated with dislocation of the proximal radio-ulnar joint. 
   Nowadays definition: 
   recently, it is defined as fracture of the ulna associated with dislocation of the radio-capitellar joint, including trans-olecranon fractures and radial head dislocation in which the proximal radioulnar joint remains intact. | CHILDREN 
   A) Conservative: Closed reduction ⇒ Full-length cast 
   1. Reduction: 
      - in children, closed reduction because tough periostium 
   2. Immobilization: 
      - Full-length cast, from axilla to metacarpal shafts (to control rotation). 
      - The cast is applied with the elbow at 90 degrees. 
      - if the fracture is proximal to pronator teres, forearm is supinated. 
      - if it is done to pronator teres, the forearm is held in neutral. 
      - The position is checked by x-ray after a week, if it is satisfactory ⇒ splintage is retained until both fractures are united (usually 6–8 weeks). 
   3. Rehabilitation: 
      - shoulder exercises are encouraged. 
   B) Operation: Indicated if: 
   - the fracture cannot be reduced or unstable. 
   Fixation with: 
   1. intramedullary nails is preferred, 
   2. plate & screws or 
   3. K-wire fixation can be used. | ADULTS ⇒ ORIF 
   Unless the fragments are in close apposition, reduction is difficult and re-displacement in the cast almost invariable. So preferred line is ⇒ open reduction and internal fixation. 
   1. Reduction: Open reduction 
   2. Fixation: Internal fixation with plates and screws. 
   3. Healing: 
      - Bone grafting ⇒ if there is comminution. 
      - Deep fascia is left open to prevent a build-up of pressure in the muscle compartments, and only the skin is sutured. 
   4. Rehabilitation: 
      - If after Operation the arm is kept elevated until the swelling subsides. 
      - During this period active exercises of the hand encouraged. 
      - It takes 8–12 weeks for the bones to unite. |
| Galeazzi fracture-dislocation of radius | Definition: 
   Injury is a fracture of the distal third of the radius ANO dislocation or subluxation of the distal radio-ulnar joint. 
   Deformity: Instability of radio-ulnar joint by "balloting" the distal end of ulna (gleno-key sign) | The usual cause is a fall on the hand; probably with a superimposed rotation force. 
   The radius fractures in its lower third & inferior radio-ulnar joint subluxates or dislocates. | The key to successful treatment is to restore the length of the fractured ulna, only then can the dislocated joint be fully reduced and remain stable. 
   In adults: ⇒ ORIF 
   1. Reduction: 
      - The ulnar fracture must be accurately reduced. 
   2. Fixation: 
      - then fixed with a plate and screws. 
   The radial head usually reduces once the ulna has been fixed. 
   3. Rehabilitation: 
      - If the elbow is completely stable, then flexion– extension & rotation can be started after very soon after surgery. 
      - If there is doubt, then the arm should be immobilized in plaster with the elbow flexed for 6 weeks. |

Source: Apley’s System of Orthopedics