Fractures of the Upper Limb

Comprehensive Orthopaedic

Review

Presented by: **Dr. PRUTHVI**

Learning Objectives

Anatomy

Review the surgical anatomy and vital neurovascular structures of the upper extremity.

Classification

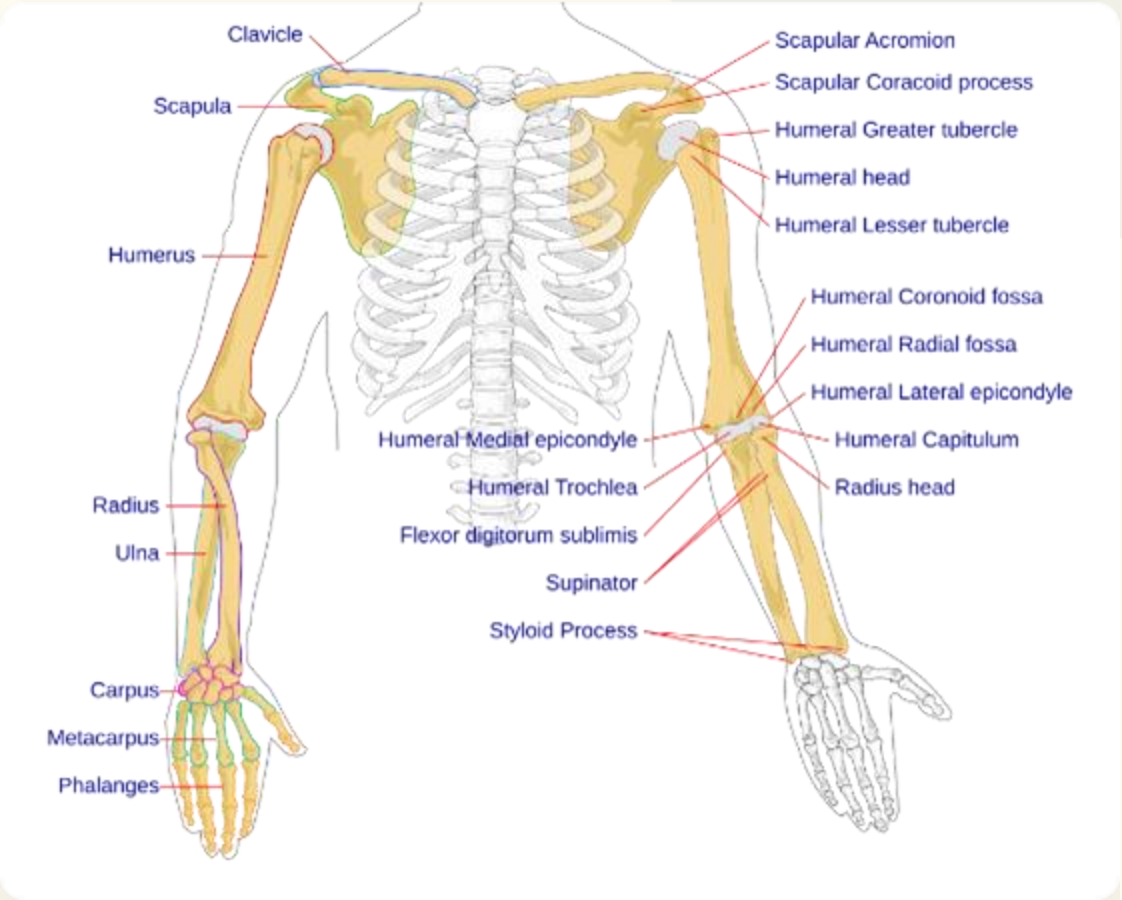
Understand key classifications (Neer, Gartland, Mason) to guide management.

Management

Differentiate between conservative and surgical indications for common fractures.

Anatomy of the Upper Limb

- **Shoulder Girdle:** Clavicle, Scapula.
- **Arm:** Humerus.
- **Forearm:** Radius (lateral) and Ulna (medial).
- **Hand & Wrist:** 8 Carpal bones, 5 Metacarpals, Phalanges.
- *Clinical Importance:* The upper limb prioritizes mobility and dexterity over stability.



General Classification

Mechanism

FOOSH (Fall On Out-Stretched Hand), Direct Blow, High Energy Trauma.

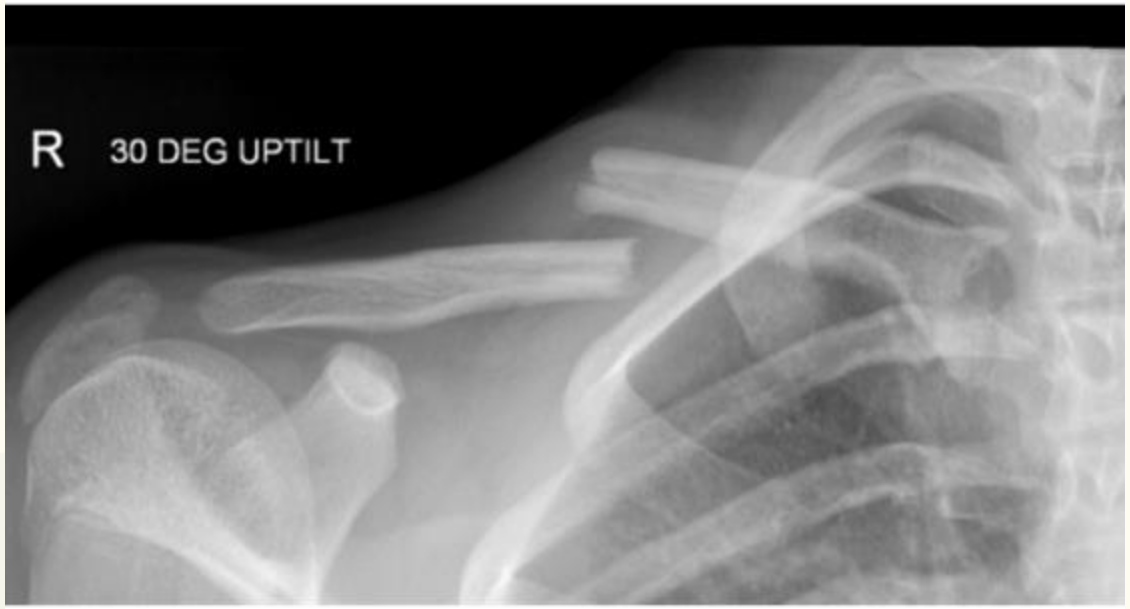
Displacement

Angulated, Rotated, Shortened, or Transformed.

Skin Integrity

Open (Gustilo-Anderson Classification) vs. Closed Fractures.

Clavicle Fractures



Epidemiology & Classification

- **Mid-shaft (80%):** Most common due to FOOSH.
- **Distal (15%):** Associated with AC joint injury.
- **Medial (5%):** Rare, high-energy trauma.

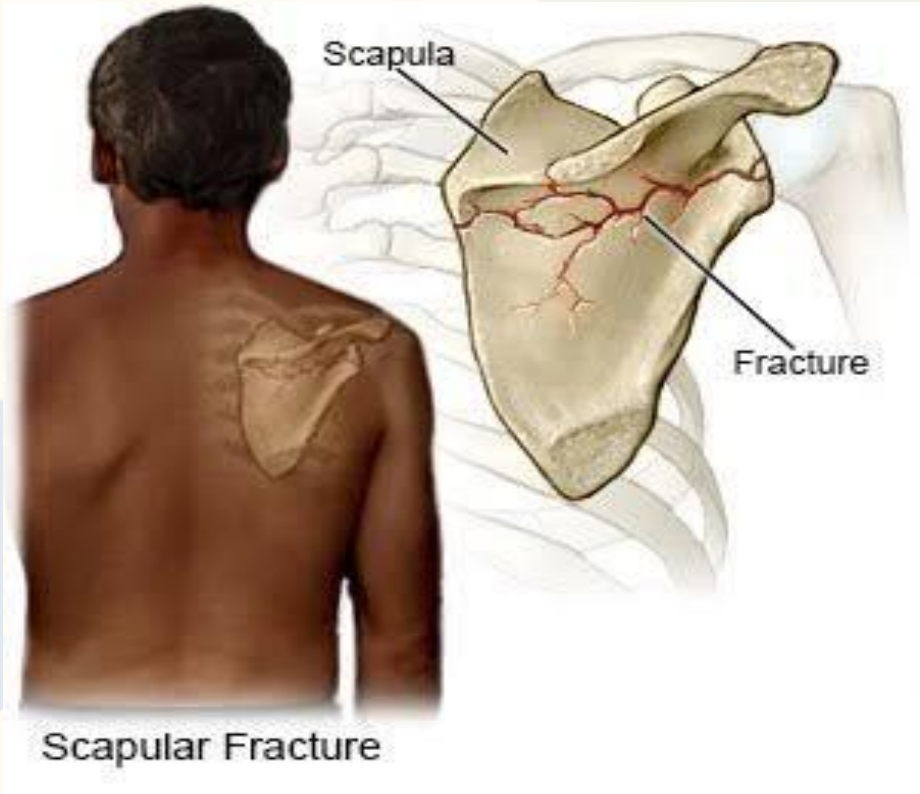
Management: Majority managed conservatively with a broad arm sling.

Scapular Fractures

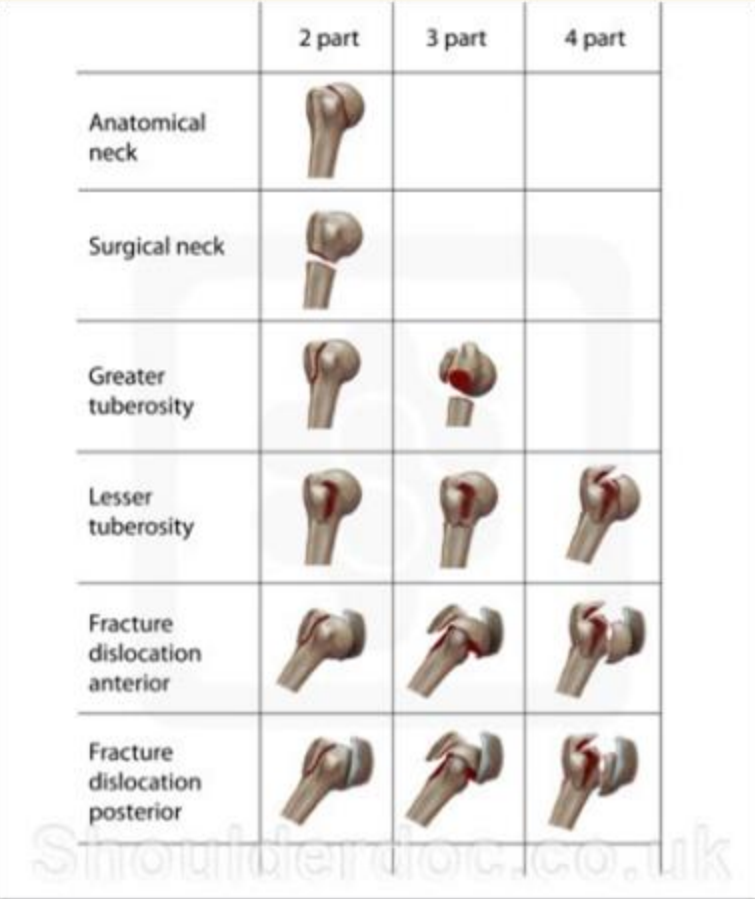
High Energy Indicator

Often associated with rib fractures, pneumothorax, or pulmonary contusion.

- **Body:** Most common (80%).
- **Neck/Glenoid:** May require ORIF if articular step-off >5mm.
- **Acromion/Coracoid:** Rare, often avulsion.



Proximal Humerus Fractures



The 4 Segments (Neer)

1. Humeral Head
2. Greater Tuberosity
3. Lesser Tuberosity
4. Humeral Shaft

Displacement is defined as >1cm or >45° angulation.

Management by Neer Part

Classification	Clinical Management
1-Part	Sling & Early Rehab (Pendulum exercises)
2-Part	Closed Reduction +/- Percutaneous Pinning or ORIF
3-Part	ORIF (Plating/IM Nailing)
4-Part	ORIF in young; Hemi/Total Arthroplasty in elderly

Humeral Shaft Fractures

Radial Nerve Injury: Incidence of 12% in mid-distal shaft fractures.

- **Holstein-Lewis Fracture:** Distal 1/3 spiral fracture with radial nerve palsy.
- Check for "Wrist Drop" during examination.
- 90% of radial nerve palsies recover spontaneously.

Supracondylar Humerus Fractures

Figure 1: Wilkins modification of the Gartland classification. a: Type I fracture: Undisplaced fracture in which the anterior humeral line passes through the centre of the capitellum (fracture line- blue arrow). b: Type IIa fracture: Minimally displaced fracture without rotation. c: Type IIb fracture: Minimally displaced fracture with rotation. d: Type III fracture: Grossly displaced fracture

A Pediatric Emergency

Risk of **Volkmann's Ischemic Contracture** due to brachial artery impingement.

- Gartland Type I: Non-displaced.
- Gartland Type II: Displaced with intact posterior cortex.
- Gartland Type III: Completely displaced.

Gartland Classification Summary

Type I

Non-displaced.
Rx: Long arm cast (3-4 weeks).

Type II

Angulated.
Rx: Closed reduction & K-wire pinning.

Type III

Multidirectional instability.
Rx: Urgent ORIF/CRPP.

Adult Distal Humerus Fractures

Complex Articular Injury

Commonly "T" or "Y" patterns (Intercondylar).

- Goal: Anatomical reduction of articular surface.
- Treatment: Dual-plate fixation (Parallel or Orthogonal).
- Early elbow ROM is critical to prevent stiffness.

Early mobilization is the "key" to elbow function.

Olecranon Fractures

Clinical Presentation

Inability to extend the elbow against gravity due to triceps avulsion.

Mechanism

Direct fall on the elbow or forceful triceps contraction.

Surgery

Tension Band Wiring (TBW) converts tensile forces to compression.

Plating

Indicated for comminuted or Monteggia-type fractures.

Radial Head and Neck

Mason Classification

- **Type I:** Non-displaced (<2mm). Rx: Early ROM.
- **Type II:** Displaced (>2mm). Rx: ORIF if block to rotation.
- **Type III:** Comminuted. Rx: Excision vs. Replacement.
- **Type IV:** Mason III + Elbow Dislocation.

> Radial head is a secondary stabilizer for valgus stress.

Monteggia Fracture-Dislocation

Definition

Fracture of the proximal third of the **Ulna** with dislocation of the **Radial Head**.

> Mnemonic: MU (Monteggia - Ulna)

Always examine the elbow in any forearm fracture!

Galeazzi Fracture-Dislocation

Definition

Fracture of the distal third of the **Radius** with dislocation of the **Distal Radioulnar Joint (DRUJ)**.

> Mnemonic: GR (Galeazzi - Radius)

Often referred to as the "Fracture of Necessity" (Necessity of Surgery).

Colles' Fracture

Dinner Fork Deformity

- **Dorsal** displacement and tilt.
- Extra-articular fracture within 1 inch of wrist joint.
- Common in osteoporotic post-menopausal women.
- Rx: Closed reduction + Below elbow cast (Colles Cast).

Smith's and Barton's

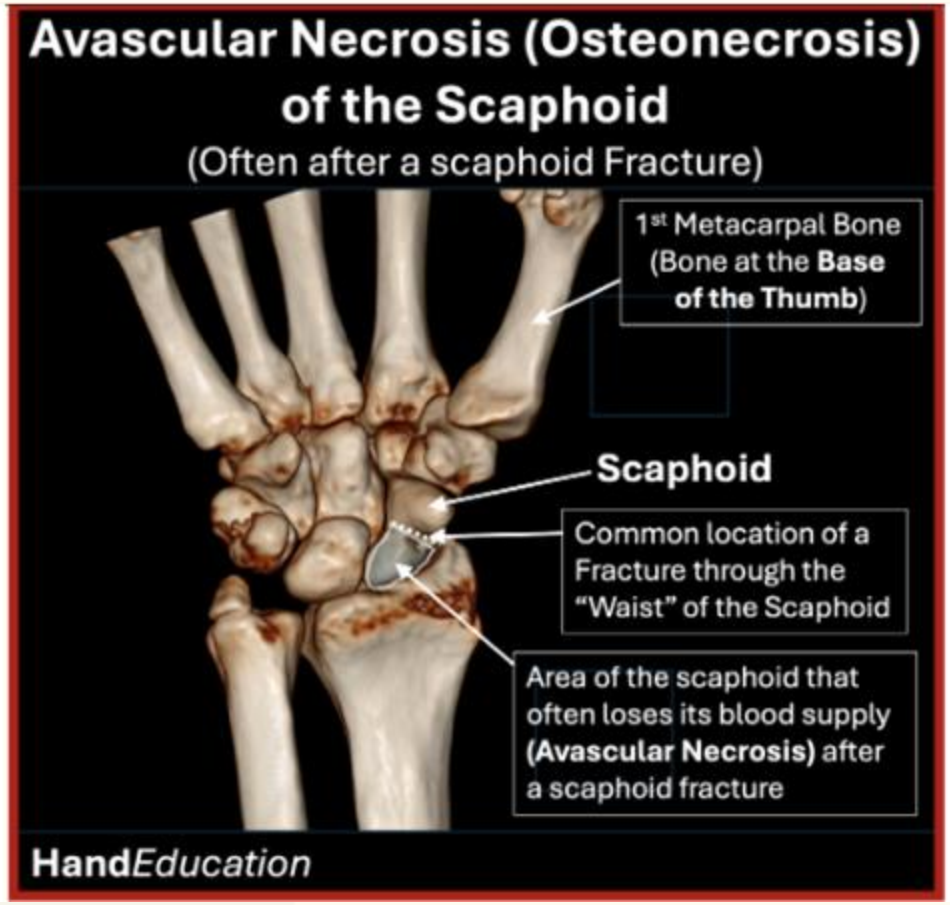
Smith’s Fracture

Reverse Colles'. **Volar** displacement (Garden Spade deformity). Unstable fracture.

Barton’s Fracture

Intra-articular fracture-dislocation of the radiocarpal joint (Volar or Dorsal).

Scaphoid Fractures



The Retrograde Blood Supply

Clinical Sign: Tenderness in the **Anatomical Snuffbox**.

> High Risk: Avascular Necrosis (AVN) of the proximal pole.

If X-ray is negative but pain persists, cast for 2 weeks and re-image or perform MRI.

Carpal Dislocations

Lunate Dislocation

Lunate dislocated volarly; spilled teacup sign on lateral X-ray.

Perilunate

Carpus dislocated around the lunate, which stays in position.

Triquetrum

Common flake fracture on dorsal aspect of wrist.

Metacarpal - Boxer's Fracture

5th Metacarpal Neck

Common in young men after a punch with a clenched fist.

- Angulation up to 40° is acceptable.
- Rx: Ulnar gutter splint or ORIF if rotational deformity exists.

Bennett vs. Rolando

- **Bennett:** Intra-articular fracture-subluxation of the base of the 1st metacarpal.
- **Rolando:** Comminuted "T" or "Y" shaped fracture of the base of the 1st metacarpal.
- Both require stable fixation to preserve thumb opposition.

Upper Limb Complications

Early

Compartment Syndrome, Vascular compromise, Nerve palsy, Infection.

Delayed

Non-union, Malunion, Avascular Necrosis (AVN), Myositis ossificans.

Late

Stiffness, Post-traumatic Arthritis, CRPS Type I.

Summary & Principles

- **Reduce:** Restore anatomical alignment, especially for articular surfaces.
- **Retain:** Cast, Splint, or Internal Fixation (Screws, Plates, Nails).
- **Rehabilitate:** Early ROM for elbow and hand is vital to functional recovery.
- **Monitor:** Watch for neurovascular changes and skin tenting.

Thank you for your attention.

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