SO VERILY, WITH THE HARDSHIP, THERE IS RELIEF.
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Objectives:

By the end of the lecture, you should be able to:

- List the different bones of the UL.
- Describe the characteristic features of each bone.
- Differentiate between the bones of the right and left sides.
- Name the articulations between the different bones.
- Correlate the anatomy of the bones clinically.
Introduction: Types of Bones

- Flat bone: Sternum
- Irregular bone: Vertebra
- Long bone: Femur
- Short bones: Lateral cuneiform, Intermediate cuneiform, Medial cuneiform
- Sesamoid bone: Patella
5 types according to the shape of the bone:

I. **Long bones**: humerus, ulana, radius, femur

II. **Short bones**: carpal, tarsal

III. **Flat**: skull bones

IV. **Irregular**: vertebrae

V. **Sessamoid**: pisiform
The Bones of UL are:

Pectoral Girdle: clavicle & scapula

Arm: Humerus.

Forearm: Radius & Ulna.

Wrist: Carpal bones

Hand: Metacarpals & Phalanges
Pectoral Girdle

- **Formed of Two Bones:**
  - **Clavicle (anteriorly).**
  - **Scapula (posteriorly).**

- **It is very light and allows the upper limb to have exceptionally free movement.**
Clavicle

- It is a doubly curved long bone lying horizontally across the root of the neck.
- It is subcutaneous throughout its length.

**Functions:**

1. It serves as a rigid support from which the scapula and free upper limb are suspended & keeping them away from the trunk so that the arm has maximum freedom of movement.
2. Transmits forces from the upper limb to the axial skeleton.
3. Provides attachment for muscles.
4. It forms a boundary of the Cervicoaxillary canal for protection of the neurovascular bundle of the UL.
It is a long bone with **no medullary cavity**. It has the appearance of an elongated letter Capital (S) lying on one side.

It has **Two Ends**:
- **Medial (Sternal)**: enlarged & quadrangular.
- **Lateral (Acromial)**: flattened.

**Body (shaft):**
- Its medial 2/3 is convex forward.
- Its lateral 1/3 is concave forward.
**Surfaces:**

- **Superior**: smooth as it lies just deep to the skin.
- **Inferior**: rough because strong ligaments bind it to the 1<sup>st</sup> rib, subclavius groove and conoid tubercle and trapezoid ridge.

Is the **first** bone to begin ossification during fetal development, but it is the **last** one to complete ossification, at approximately 21 years of age.
(b) Right clavicle
- **Medially** with the manubrium at the **Sternoclavicular joint**.
- **Laterally** with the Scapula at the **Acromioclavicular joint**.
Fractures of the Clavicle

- The clavicle is commonly fractured especially in children as forces are impacted to the outstretched hand during falling.

- The weakest part of the clavicle is the junction of the middle and lateral thirds.

- After fracture, the medial fragment is elevated (by the sternomastoid muscle), the lateral fragment drops because of the weight of the UL.

- It may be pulled medially by the adductors of the arm.

- The sagging limb is supported by the other.
**It is a triangular **Flat** bone.**

**Extends between the 2nd - 7th ribs.**

**It has:**

**Two Surfaces:**

1. **Concave Anterior (Costal):** it forms the large **Subscapular Fossa.**

2. **Convex Posterior:** divided by the spine of the scapula into the:
   - **Smaller Supraspinous Fossa** (above the spine)
   - **larger Infraspinous Fossa** (below the spine).
Three Angles:

- **Superior**
- **Lateral** (forms the Glenoid cavity): a shallow concave oval fossa that receives the head of the humerus.
- **Inferior**

Three Processes:

1. **Spine**: a thick projecting ridge of bone that continues laterally.
2. **Acromion**: forms the subcutaneous point of the shoulder.
3. **Coracoid**: a beaklike process.

It resembles in size, shape and direction a bent finger pointing to the shoulder.

Three Borders:

- **Superior**, **Medial (Vertebral)** & **Lateral (Axillary)** (the thickest) part of the bone, it terminates at the lateral angle.
1. Gives attachment to muscles.
2. Has a considerable degree of movement on the thoracic wall to enable the arm to move freely.
3. The glenoid cavity forms the socket of the shoulder joint.

Because most of the scapula is well protected by muscles and by its association with the thoracic wall, most of its fractures involve the protruding subcutaneous Acromion.
WINGED SCAPULA

- It will protrude posteriorly.
- The patient has difficulty in raising the arm above the head (difficult in rotation of the scapula).
- It is due to injury of the long thoracic nerve (as in radical mastectomy) which causes paralysis of serratus anterior muscle.
- The medial border and inferior angle of the scapula will no longer be kept closely applied to the chest wall.
Fracture of the Scapula

**Definition:** Is a fracture of shoulder blade, represent an uncommon injury.

**Types:**
- Body (A).
- Neck (D).
  - Type I - nonangulated, nondisplaced
  - Type IIa - shortened / displaced > 1 cm.
  - Type IIb - Angulated > 40 degree.
- Glenoid (B C).
- Acromian (E).
- Coracoid (G).
A typical **Long bone**.

It is the largest bone in the UL

**Proximal End:**

Head, Neck, Greater & Lesser Tubercles.

**Head:** Smooth

- it forms 1/3 of a sphere, it articulates with the glenoid cavity of the scapula.

**Greater tubercle:** at the lateral margin of the humerus.

**Lesser tubercle:** projects anteriorly.

- The two tubercles are separated by **Intertubercular Groove**.

**Anatomical neck:** formed by a groove separating the head from the tubercles

**Surgical Neck:** a narrow part distal to the tubercles.
Shaft (Body):
- Has two prominent features:
  1. **Deltoid tuberosity:**
     - A rough elevation laterally for the attachment of deltoid muscle.
  2. **Spiral (Radial) groove:**
     - Runs obliquely down the posterior aspect of the shaft.
     - It lodges the important radial nerve & profunda brachii vessels.

Distal End:
- Widens as the sharp medial and lateral Supracondylar Ridges and end in the **Medial** (can be felt) and **Lateral Epicondyles**.
- They provide muscular attachment.
- **Structures at Distal end:**
  - **Anteriorly:**
    - **Trochlea:** (medial) for articulation with the ulna
    - **Capitulum:** (lateral) for articulation with the radius.
  - **Coronoid fossa:** above the trochlea.
  - **Radial fossa:** above the capitulum.
  - **Posteriorly:**
    - **Olecranon fossa:** above the trochlea.
Fractures of Humerus

- Most common fractures are of the **Surgical Neck** especially in **elder people with osteoporosis**.

- The fracture results from falling on the hand (transition of force through the bones of forearm of the extended limb).

- In **younger people**, fractures of the **greater tubercle** results from falling on the hand when the arm is abducted.

- The **shaft of the humerus** can be fractured by a direct blow to the arm or by indirect injury as falling on the outstretched hand.
- Imaging Studies:
Supracondylar Fractures

**Definition:**
- Occurs just above the two condyles of the lower humerus, commonly seen in children between the age of 5-10 years.

**Types:**
- Posterior angulation or displacement (*Extension Type*) 95%.
- Anterior angulation or displacement (*Flexion Type*) 5%
Complications:

- Early:
  - Neurovascular injuries:
    - Median nerve 32%.
    - Ulnar nerve 23%.
    - Brachial artery <1%.

- Late:
  - Malunion.
  - Varus & Valgus

Diagram:
- Median nerve
- Radial nerve
- Ulnar nerve
- Brachial artery
- Supracondylar fracture
- Bone impinging artery & nerve
- Radius
- Ulna
Nerves Affected in Fractures of Humerus

**Surgical neck:**
- Axillary nerve

**Radial groove (shaft):**
- Radial nerve.

**Distal end of humerus:**
- Median nerve.

**Medial epicondyle:**
- Ulnar nerve.
Bones of The Forearm

Radius
Ulna

Pronation → Supination

Palm anterior
Palm posterior
Palm anterior
Ulna

- It is the stabilizing bone of the forearm.
- It is the medial & longer of the two bones of the forearm.
- **Proximal End**
  1. **Olecranon Process**: projects proximally from the posterior aspect (forms the prominence of the elbow).
- **Radial Notch**: a smooth rounded concavity lateral to coronoid process.
**Shaft:**
- Thick & cylindrical superiorly but diminishes in diameter inferiorly
- It has **Three Surfaces** (Anterior, Medial & Posterior).
- **Sharp Lateral Interosseous border.**

**Distal End:** Small rounded
1. **Head:** lies distally at the wrist.
2. **Styloid process:** Medial.
It is the shorter and lateral of the two forearm bones.

**Proximal End:**

1. **Head:** small & circular
   - Its upper surface is concave for articulation with the Capitulum.

2. **Neck.

3. **Radial (Bicipital) Tuberosity:** medially directed and separates the proximal end from the body.

**Shaft:**

- Has a lateral convexity.
- It gradually enlarges as it passes distally.
**Radius**

- **Distal (Lower) End:** It is rectangular
- **1. Ulnar Notch:** a medial concavity to accommodate the head of the ulna.
- **2. Radial Styloid process:** extends from the lateral aspect.
- **3. Dorsal tubercle:** projects dorsally.
Fractures of radius & ulna

Definition: The radius and ulna are commonly fractured together – termed fracture of ‘both bones of the forearm’

Mechanisms of Injury:
- Fall on an outstretched hand with forearm pronated.
- Direct blow onto the forearm.
Fractures of radius & ulna

Because the radius & ulna are firmly bound by the interosseous membrane, a fracture of one bone is commonly associated with dislocation of the nearest joint.

**Colle’s Fracture** (fracture of the distal end of radius) is the most common fracture of the forearm.

It is more common in women after middle age because of osteoporosis.

**Clinical Features:**
- Dinner-fork deformity is a classical deformity in a Colles' fracture.
Rest
Composed of Eight Carpal (short bones) arranged in two irregular rows, Four each.

These Small bones give flexibility to the wrist.

The carpus presents Concavity on their Anterior surface & Convex from side to side Posteriorly.

Proximal row (from lateral to medial):
- Scaphoid, Lunate, Triquetral & Pisiform bones.

Distal row (from lateral to medial):
- Trapezium, Trapezoid, Capitate & Hamate.
Carpal

Capitate

Trapezoid

Hamate

Trapezium

Pisiform

Scaphoid

Triquetrum

Lunate
Scaphoid: is the commonly fractured = avascular necrosis
Lunate: most commonly dislocated = anteriorly
Triquetral: pisiform lie anterior to it
Pisiform: sesamoid bone= flexor carpi ulnaris / Ossify last
Trapezium: groove for flexor carpi radialis ant./ radial artery post.
Capitate: largest ! Ossify first
Hamate: hook ^= deep branch of ulnar nerve

• All ossify in cartilage by age of 7 years
Scaphoid

It is the most commonly fractured carpal bone and it is the most common injury of the wrist.

It is the result of a fall onto the palm when the hand is abducted.

Pain occurs along the lateral side of the wrist especially during dorsiflexion and abduction of the hand.

Union of the bone may take several months because of poor blood supply to the proximal part of the scaphoid.
Metacarpus

- It is the skeleton of the hand between the carpus and phalanges.

- It is composed of **Five Metacarpal bones**, each has a Base, Shaft, and a Head.

- They are numbered 1-5 from the thumb.

- The distal ends (Heads) articulate with the proximal phalanges to form the **Knuckles** of the fist.

- The Bases of the metacarpals articulate with the carpal bones.

- The **1st metacarpal** is the shortest and most mobile.
Each digit has **Three Phalanges**

Except the Thumb which has only Two

Each phalanx has a Base Proximally, a Head distally and a Body between the base and the head.

The proximal phalanx is the largest.

The middle ones are intermediate in size.

The distal ones are the smallest, its distal ends are flattened and expanded distally to form the nail beds.
Fracture of phalanges
any questions
Thank you