

Radius and Ulna

Q.1. A 30-year-old man had a fall from bike on his left forearm. He was taken immediately to the emergency medicine department. On examination, no bony deformities or skin lacerations were present. Radial pulse was palpable normally on injured hand. No sensory deficits were present. Radiograph showed Monteggia fracture Type II (Fracture of upper one-third of ulna with dislocation of head of radius posteriorly) on left side.

1. Explain the anatomical basis for dislocation of radial head along with fracture of shaft of ulna.
2. Name the nerve that is prone to injure in this patient. Justify your answer.

Explanation

1. Most common cause for a **Monteggia fracture** is a direct blow to an extended and pronated forearm (Fig. 4.1). As the radius and ulna are connected by an interosseous membrane, any force on shaft of ulna will be transmitted via membrane to the radius. The transmitted high energy can lead to rupture of quadrate and annular ligament of radius that further leads to dislocation of head of radius.

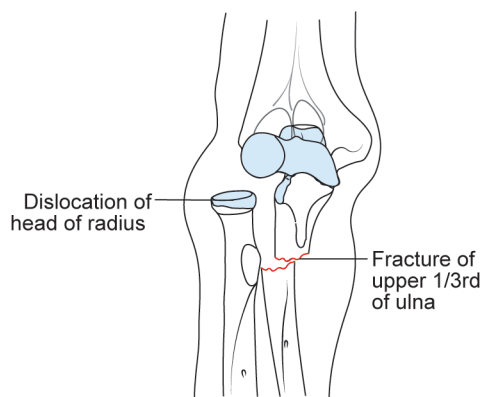


Fig. 4.1: Monteggia fracture of ulna

2. As the head of radius displaces posteriorly, it may compress against the supinator muscle. The posterior interosseous nerve pierces the supinator muscle to enter the posterior compartment of forearm and supply the muscles. Hence, any compression of supinator further compresses the nerve.

Q.2. A 28-year-old security guard was struck on the forearm with a metal baton while defending himself during an altercation. He immediately experienced sharp pain and swelling in the mid-forearm. At the emergency department, physical examination revealed localized tenderness and bruising along the ulnar border of the forearm without any deformity. X-rays confirmed a nightstick fracture.

1. What is nightstick fracture?
2. How is it different from the Monteggia fracture?
3. What is Hume fracture?
4. What is Madelung's deformity?

Explanation

1. **Nightstick fracture** is the fractured shaft of ulna without any other fracture (Fig. 4.2). It occurs due to a direct hit on the shaft of the ulna and may happen when a watchman raises his arm to protect himself from trauma.
2. In the nightstick fracture, there is an isolated fracture of the ulna, whereas in the Monteggia fracture, there is the fracture of upper one-third of ulna with dislocation of the head of radius.
3. **Hume fracture** is a fracture of olecranon with anterior dislocation of head of radius (described in 1957 by AC Hume, orthopedic surgeon from St. Bartholomew's Hospital, Rochester, UK).

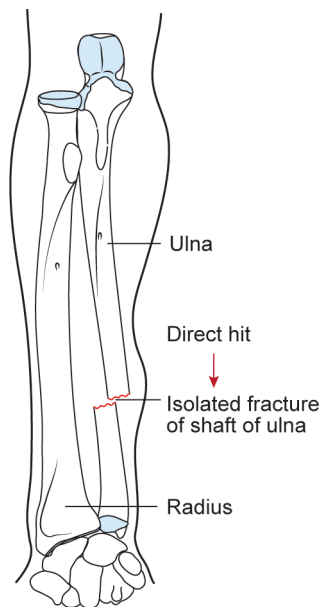


Fig. 4.2: Nightstick fracture of ulna

4. **Madelung's deformity** is dorsal subluxation (displacement) of the lower end of the ulna, due to retarded growth of the lower end of the radius (Fig. 4.3).

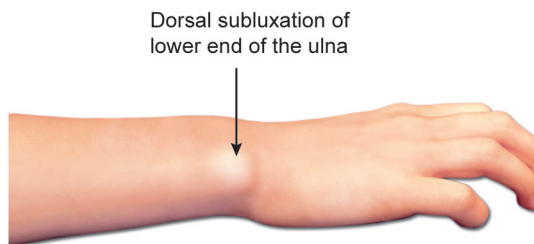


Fig. 4.3: Madelung's deformity (Source: BD Chaurasia's Human Anatomy, 10th Edition)

Q.3. A 65-year-old woman slipped on the floor and fell onto her outstretched hand. She immediately experienced pain and swelling in her wrist. On examination, there was a visible deformity, with the wrist appearing dorsally displaced. Radiographs showed a distal radius fracture with dorsal angulation, consistent with a Colles' fracture, which was confirmed on the radiological investigation. The patient was unable to grip objects or perform wrist extension without severe pain.

1. What is Colles' fracture?
2. Name the deformity shown in the below (Fig. 4.4).



Fig. 4.4: Deformity (Source: BD Chaurasia's Human Anatomy, 10th Edition)

3. What is the anatomical basis of this deformity?
4. Name the nerves that can be injured in this clinical condition.
5. Name the other fractures of the radius.

Explanation

1. **Colles' fracture** is a fracture of the distal end of radius 2 cm above the lower end, and the distal fragment is displaced upward and backward [Abraham Colles, Irish surgeon 1773–1843] (Fig. 4.5).

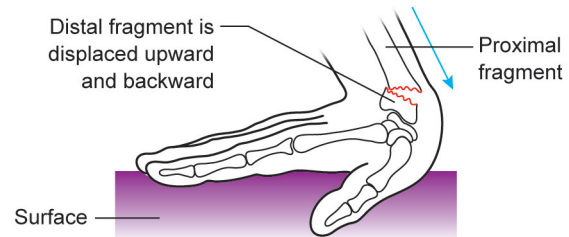


Fig. 4.5: Colles' fracture

2. The deformity given in the above image is dinner fork deformity (Fig. 4.4).
3. The **dinner fork (bayonet-like) deformity** is produced by the posterior displacement of the distal fragment of the radius, with upward tilt. This displacement leads to the characteristic upward curve of the wrist, resembling the shape of a dinner fork when viewed from the side.
4. Superficial branch of ulnar nerve and the median nerve may be injured in Colles' fracture.
5. The other fractures of the lower end of radius are as follows:
 - a. **Essex-Lopresti fracture:** It is a fracture of radial head with dislocation of distal radioulnar joint and disruption of interosseous membrane [Prefer Essex-Lopresti, British orthopedic surgeon, 1916–1951] (Fig. 4.6).
 - b. **Smith's fracture:** It is the fracture of the distal end of radius with the anterior displacement of the distal fragment. It is also called reverse of Colles' fracture [Robert William Smith, Irish surgeon, 1807–1873] (Fig. 4.7).
 - c. **Barton's fracture:** It is an intra-articular fracture of distal end of radius with dislocation of radiocarpal joint [John Rhea Barton, American orthopedic surgeon, 1794–1871] (Fig. 4.8).
 - d. **Chauffeur's fracture or Hutchinson fracture:** It is a fracture of styloid process of radius caused by compression of scaphoid bone against the styloid process [Chauffeur's were appointed as drivers] (Fig. 4.9).

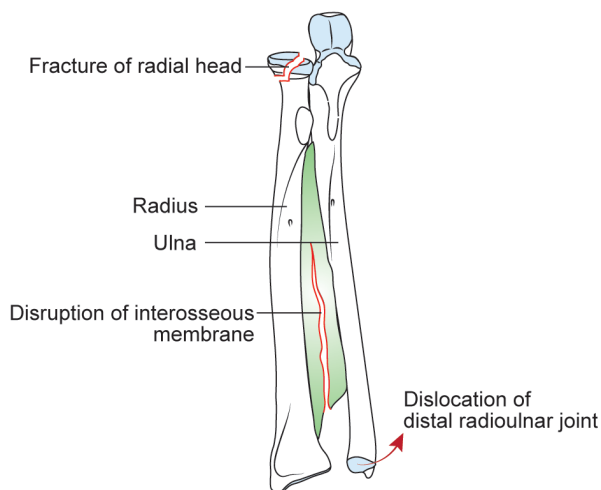


Fig. 4.6: Essex-Lopresti fracture

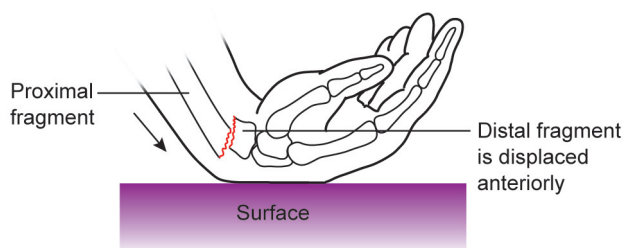


Fig. 4.7: Smith's fracture

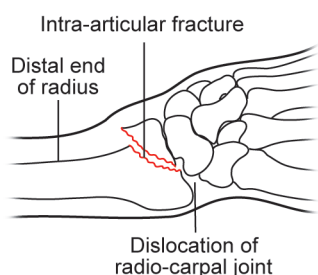


Fig. 4.8: Barton's fracture

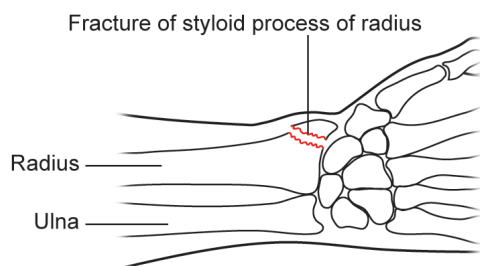


Fig. 4.9: Chauffeur's fracture

Q.4. A 42-year-old woman fell onto her outstretched hand with her wrist in a flexed position. She immediately felt severe pain and swelling in her right wrist. On examination in the emergency department, there was a visible deformity with the hand displaced toward the palm. X-rays confirmed a Smith's fracture.

1. What is Smith's fracture?
2. What is difference between Smith's and Colles' fracture?

Explanation

1. **Smith's fracture** is the fracture of the distal end of radius with the anterior displacement of the distal fragment.
2. The Smith's fracture is reverse of Colles' fracture. In Smith's fracture, the distal fragment of fractured radius is displaced anteriorly, whereas in Colles' fracture, the distal fragment is displaced posteriorly.

Q.5. A 35-year-old male fell onto his outstretched hand while cycling. He immediately experienced severe pain and swelling in his right forearm. On examination in the emergency department, there was a visible deformity at the distal forearm, with tenderness along the distal radius and a prominent ulnar head. Radiographs confirmed a Galeazzi fracture-dislocation, showing a displaced distal radial shaft fracture with associated dislocation of the distal radioulnar joint.

1. What is Galeazzi fracture-dislocation?
2. What are the joints between radius and ulna?
3. Name the factors maintaining the stability of radioulnar joints.

Explanation

1. A **Galeazzi fracture-dislocation** is a fracture of the distal third of the radius, accompanied by a dislocation of the distal radioulnar joint (Fig. 4.10).

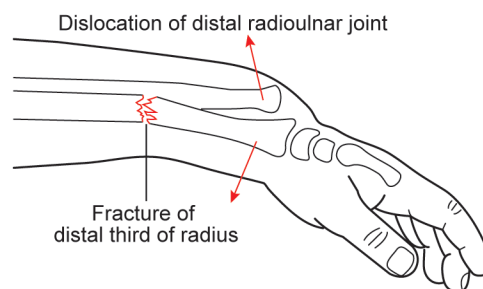


Fig. 4.10: Galeazzi fracture-dislocation

2. There are three main joints between the radius and ulna:
 - a. Proximal radioulnar joint
 - b. Middle radioulnar joint that consists of the interosseous membrane
 - c. Distal radioulnar joint.

3. The stability of the radioulnar joints is primarily maintained by the following factors:
 - a. Interosseous membrane is a fibrous sheet that connects the radius and ulna
 - b. Triangular fibrocartilage located at the distal radioulnar joint which stabilizes the joint and acts as a cushion between the end of the ulna and the carpal bones.
 - c. *Joint capsule and ligaments:* The palmar and dorsal radioulnar ligaments, annular ligament and pronator quadratus muscle maintain the position of the radius and ulna during forearm rotation.

Q.6. A 3-year-old child was suddenly lifted by the hand while playing with her mother. She immediately began crying and refused to use her right arm, holding it slightly bent at the elbow. At the emergency department, the child resisted any attempt to move the elbow. The clinical diagnosis of a pulled elbow was made on clinical examination.

1. What is pulled elbow?
2. What is another name for this condition?
3. Why the radiological findings are mostly normal in the case of pulled elbow?

Explanation

1. **Pulled elbow** is the subluxation of head of radius. It occurs due to sudden powerful jerk on the hand of a child (Fig. 4.11).

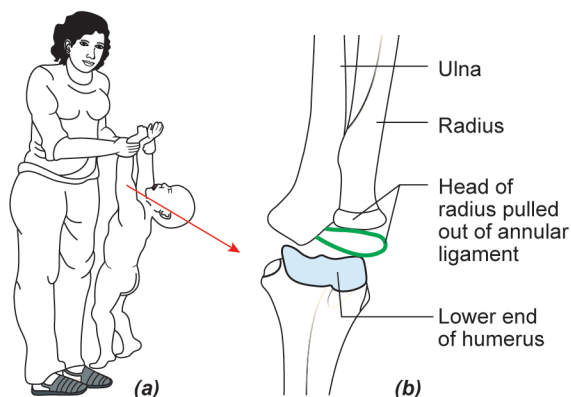


Fig. 4.11a and b: (a) Pulled elbow, (b) Positions of bones

2. This condition is also called Nursemaid's elbow.
3. In case of pulled elbow, the radiological finding may be normal because the radial head usually returns to its normal position on its own.

Q.7. What is Lister's tubercle of radius? What is its clinical significance?

Explanation

The **Lister's tubercle** is also called the dorsal tubercle of the radius. It is a small bony prominence located on the posterior surface of the distal radius (Fig. 4.12).

Clinical significance

- a. The Lister's tubercle acts as a pulley for the tendon of the extensor pollicis longus (EPL) muscle, redirecting the tendon toward the thumb. Thus, it plays a crucial role in the biomechanics of thumb extension by changing the direction of the EPL tendon, allowing it to extend the thumb more efficiently.
- b. Clinically, Lister's tubercle is an important palpable landmark and can be used as a reference point during physical examination or surgical procedures.
- c. Inflammation of the EPL tendon as it passes over Lister's tubercle can lead to a condition called tenosynovitis, which may result in pain and difficulty in thumb extension.

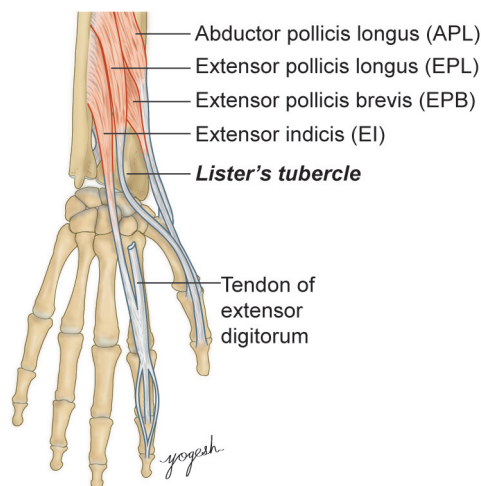


Fig. 4.12: Lister's tubercle

Q.8. Answer the following questions:

1. What is the range of adduction and abduction at the wrist joint?
2. Give anatomical basis: The range of adduction at the wrist joint is more than the abduction.

Explanation

1. The range of adduction at the wrist is about 0–50° and that of abduction at the wrist joint is about 0–15° (Fig. 4.13).

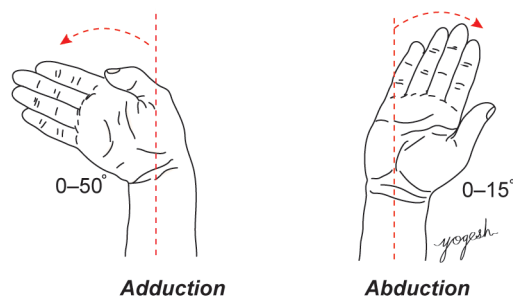


Fig. 4.13: Movements of wrist joint

2. The difference in the range of motion between adduction (ulnar deviation) and abduction (radial

deviation) at the wrist joint is mainly due to bony architecture. The ulnar styloid process is shorter and less prominent than the radial styloid process. This allows the carpal bones to move further toward the ulnar side (adduction) without encountering significant bony obstruction.

Note: *Functions of ulna:*

- a. *Stabilization:* It stabilizes the forearm by gripping the lower end of humerus in its trochlear notch.
- b. *Weight transmission:* It transmits the weight from forearm to the humerus.



Notes