MEDICAL EDUCATION RESOURCE

Radioulnar Joints, Interosseous Membrane,Middle Radioulnar Joint, Supination and Pronation

?? Radioulnar Joints

Overview

- The **radius and ulna** articulate with each other at **three levels**:
    1. **Superior (proximal) radioulnar joint**
    2. **Middle radioulnar joint** (via interosseous membrane)
    3. **Inferior (distal) radioulnar joint**

? Together, they allow the **rotatory movements of forearm — supination and pronation**.

? Superior (Proximal) Radioulnar Joint

Type

- **Pivot-type synovial joint**.

Articular Surfaces

- **Head of radius:** Cylindrical, articulates medially.
- **Radial notch of ulna:** Concave surface on lateral side of coronoid process.
- **Annular ligament:** Encircles radial head and holds it in place.

Ligaments

1. **Annular ligament:**
    - Strong band attached to anterior and posterior margins of radial notch of ulna.
    - Forms 4/5 of a ring for head of radius.
    - Inner surface lined by synovial membrane.
2. **Quadrate ligament:**
    - Between radial notch of ulna and neck of radius.
    - Limits rotation of head of radius.

Nerve Supply

- **Musculocutaneous**, **Median**, and **Radial nerves** (Hilton’s law).

Movements

- Rotation of **radius around ulna** (in supination–pronation).

? Middle Radioulnar Joint

Formed by

- **Interosseous membrane** and **oblique cord** joining radius and ulna.

Interosseous Membrane

Attachments

- Connects **interosseous borders** of radius and ulna.
- Fibres run **downward and medially** from radius to ulna.

Functions

1. Provides **firm union** between radius and ulna.
2. Serves as **muscle attachment** (for FDP, FPL, APL, etc.).
3. Transmits **forces** from radius ? ulna ? humerus.
4. Maintains relative position during rotation.

Openings

- **Upper aperture:** For passage of **posterior interosseous vessels**.
- **Lower aperture:** For **anterior interosseous vessels**.

Oblique Cord

- Fibrous band running **opposite to main fibres**, from ulna (below tuberosity) ? radius (below radial tuberosity).
- Function: Prevents downward displacement of radius.

? Inferior (Distal) Radioulnar Joint

Type

- **Pivot-type synovial joint**.

Articular Surfaces

- **Head of ulna** ? Convex.
- **Ulnar notch of radius** ? Concave.
- **Articular disc (triangular fibrocartilage complex, TFCC)** ? between ulna and carpus; strengthens joint inferiorly.

Ligaments

- **Anterior and posterior radioulnar ligaments** ? reinforce capsule.

Synovial Membrane

- Continuous with cavity of **inferior radioulnar joint** but **separate** from wrist joint cavity.

Movements

- Radius rotates around fixed ulna ? **supination & pronation**.

? Supination and Pronation

Axis of Movement

- Passes through **head of radius** (above) and **head of ulna** (below).
- The **radius rotates** over ulna.

Position

- **Supination:** Palm faces upward (anatomical position).

- **Pronation:** Palm faces downward.

Muscles Producing Movements

MOVEMENT	MUSCLES	NERVE SUPPLY
Supination	Supinator (in extension), Biceps brachii (in flexion)	Radial nerve (supinator), Musculocutaneous nerve (biceps)
Pronation	Pronator teres (rapid movement), Pronator quadratus (slow, steady)	Median nerve

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Functional Importance

- Allows rotation of hand without movement at shoulder.
- Essential for **writing, typing, eating, and screwing actions**.

Range

- Each: ~80–90°.
- Complete rotation (supination to pronation): **~180°**.

Clinical Testing

- **Ask patient to pronate and supinate** forearm with elbow flexed 90°.
- Observe restriction (may indicate nerve/muscle lesion or joint pathology).

? Dissection of Radioulnar Joints

Steps

1. Supinate forearm and make a longitudinal incision along midline.
2. Expose **biceps tendon**, **brachialis**, and **supinator** around proximal joint.
3. Identify **annular ligament** around radial head.
4. Reflect **flexor and extensor groups** partially to expose **interosseous membrane**.
    - Note its direction of fibres and the **oblique cord**.
    - Identify apertures for **interosseous arteries**.
5. Trace **posterior interosseous nerve** between supinator and APL.
6. Distally, clean the **inferior radioulnar joint**, identify **articular disc**, and open capsule to view surfaces.
7. Demonstrate pronation and supination movements by rotating radius around ulna.

? Clinical Anatomy

1. Pulled Elbow (Nursemaid’s Elbow)

- **Common in children.**
- Sudden jerk on pronated forearm ? head of radius slips out of **annular ligament**.
- **Symptoms:** Pain, forearm held semiflexed and pronated.
- **Treatment:** Supination and flexion to relocate.

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2. Fracture of Head or Neck of Radius

- Restricts pronation/supination due to disruption of radioulnar mechanics.

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3. Monteggia Fracture

- **Fracture of ulna** + **dislocation of head of radius** at superior radioulnar joint.

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4. Galeazzi Fracture

- **Fracture of radius** + **dislocation of distal radioulnar joint.**

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5. Injury to Interosseous Membrane

- May cause **longitudinal instability** and abnormal load transmission from radius to ulna.

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6. Supinator Syndrome

- Entrapment of **posterior interosseous nerve** in the supinator ? weakness of finger extension.

7. Pronation Deformity

- Seen in **median nerve injury** ? loss of pronators ? hand remains supinated.

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8. Limited Supination

- Due to **biceps tendon rupture**, **posterior interosseous nerve palsy**, or post-fracture stiffness.