

Ossification of Humerus, Radius and Ulna

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Humerus

- **Primary center:** shaft (8th week intrauterine life).
- **Secondary centers:**
 - Head ? 1 year.
 - Greater tubercle ? 3 years.
 - Lesser tubercle ? 5 years.
 - Capitulum ? 1 year.
 - Trochlea ? 9–10 years.
 - Lateral epicondyle ? 12 years.
 - Medial epicondyle ? 5 years.
- **Fusion:**
 - Upper end ? ~20 years.
 - Lower end ? ~16–17 years.
- Total = **1 primary + 7 secondary centers.**

Radius

- **Primary center:** shaft (8th week IUL).
 - **Secondary centers:**
 - Lower end ? 2 years, fuses at 20 years.
 - Upper end (head) ? 5 years, fuses at 17 years.
 - Total = **1 primary + 2 secondary centers = 3 centers.**
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Ulna

- **Primary center:** shaft (8th week IUL).
 - **Secondary centers:**
 - Lower end ? 5 years, fuses at 18 years.
 - Olecranon ? 10 years, fuses at 15–16 years.
 - Total = **1 primary + 2 secondary centers = 3 centers.**
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Importance of Capsular Attachments and Epiphyseal Lines

General Principle

- The **capsule of a joint** is usually attached close to the articular margins of bones.
 - The **epiphyseal line (growth plate)** is placed either **within** or **outside** the capsule ? this has important clinical implications.
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Upper Limb Examples

1. Shoulder Joint (Humerus)

- Capsule attached **beyond the anatomical neck** of humerus.
- Epiphyseal line of head lies **inside the capsule**.
- Clinical importance ? **septic arthritis in children** may spread to epiphyseal cartilage, leading to growth disturbances.

2. Elbow Joint (Humerus, Radius, Ulna)

- Capsule attached **away from epiphyseal lines**.
- Epiphyseal lines lie **outside the capsule**.
- Clinical importance ? infection of joint is less likely to damage growth plates.

3. Wrist Joint (Radius, Ulna, Carpals)

- Capsule attached to articular margins.
- Lower epiphyseal line of radius lies **within capsule**.
- Clinical importance ? **osteomyelitis or septic arthritis** can spread to epiphysis in children.

Clinical Relevance

- **Intra-capsular epiphyseal lines** ? prone to growth disturbances in septic arthritis (e.g., shoulder, hip).
- **Extra-capsular epiphyseal lines** ? relatively protected (e.g., elbow).
- Knowledge important in **pediatric orthopedics** and **forensic medicine (age estimation)**.