The Upper Limb VI

Elbow Joint
Muscles of the arm

Anatomy

RHS 241

Lecture 15

Dr. Einas Al-Eisa

Radius

- The **lateral** bone of the forearm

- The **shorter** of the long bones of the forearm

  - Spherical proximal end (head)
  - Shaft
  - A greatly expanded distal end

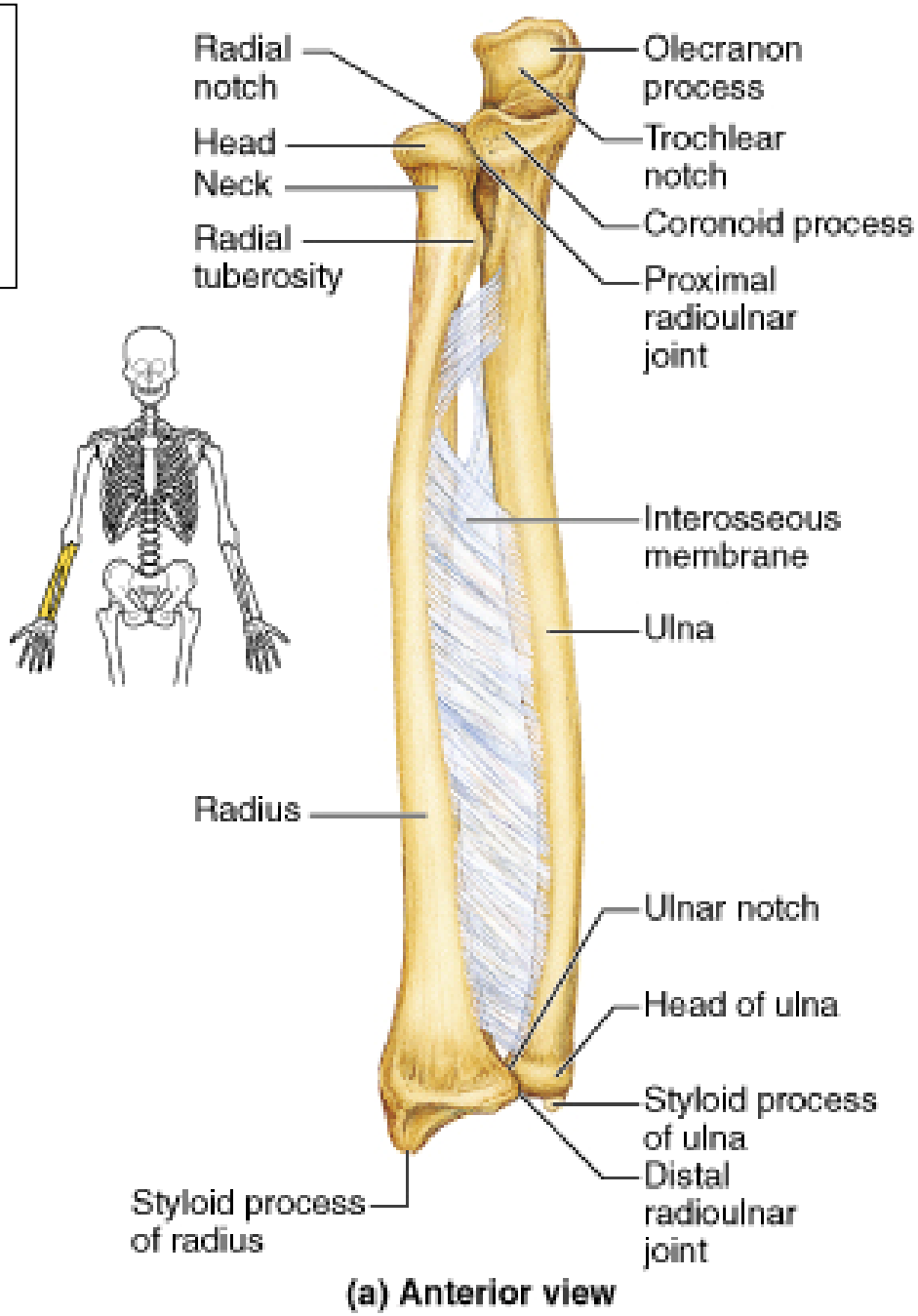
Radius

- **Proximal end:** articulate with the humerus & ulna
- **Distal end:** articulates with the ulna and proximal row of carpals

Radius

- Tuberosity
- Dorsal (lister’s) tubercle
- Styloid process

Radius & Ulna (anterior view)



(a) Anterior view

Ulna

- The **medial** bone of the forearm
  - Large proximal end
  - Shaft
  - Distal end

Ulna

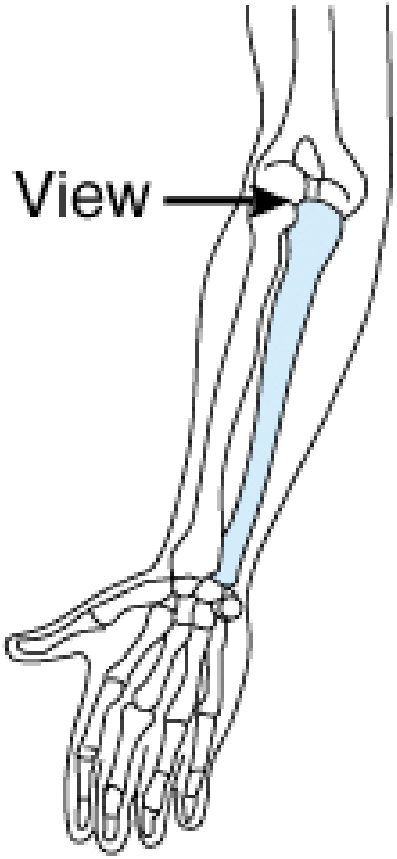
- **Proximal end:** articulate with the humerus & radius

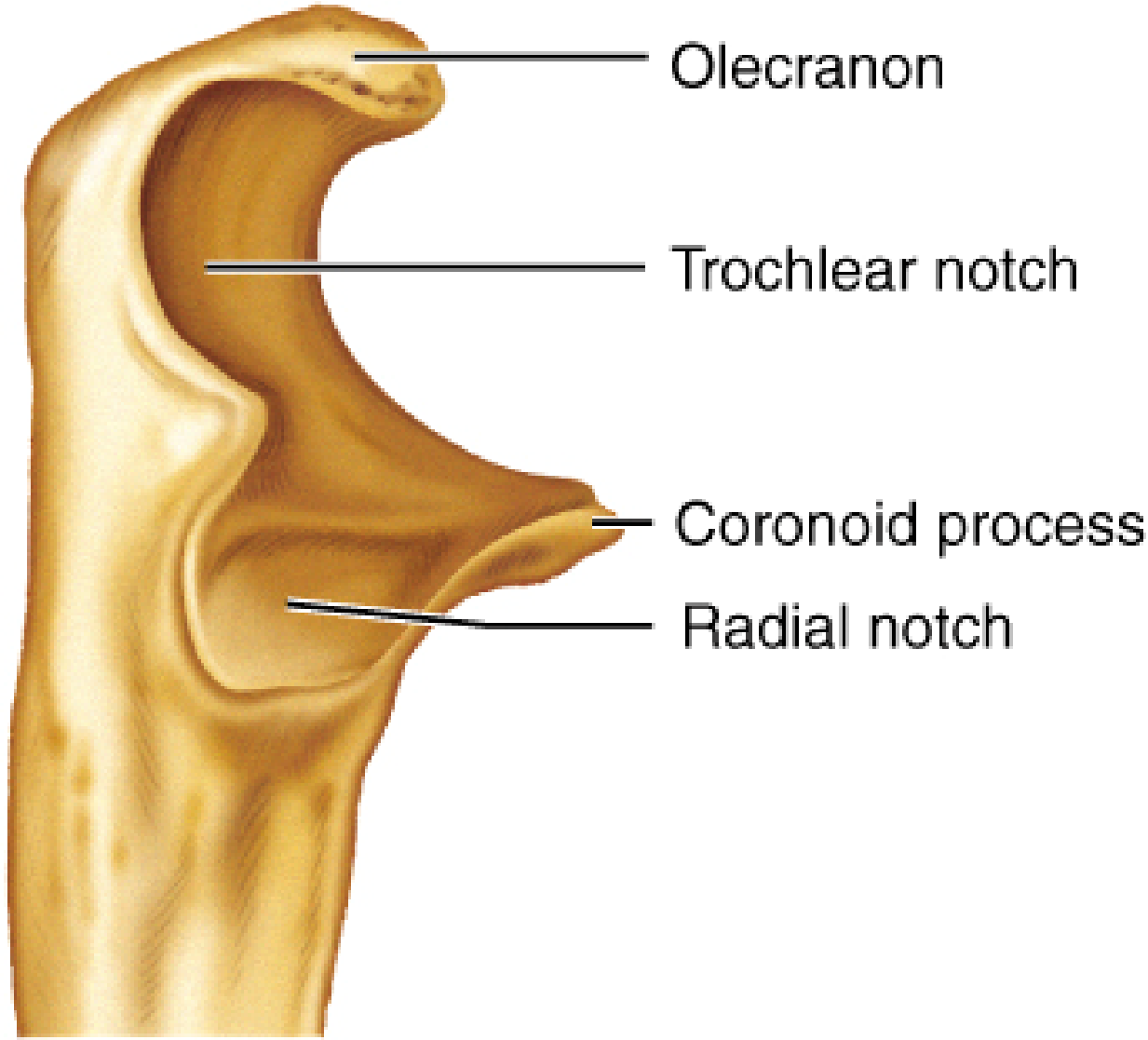
- **Distal end:** articulates with the radius only

Ulna

- Olecranon
- Trochlear notch
- Coronoid process
- Head (distal)
- Styloid process

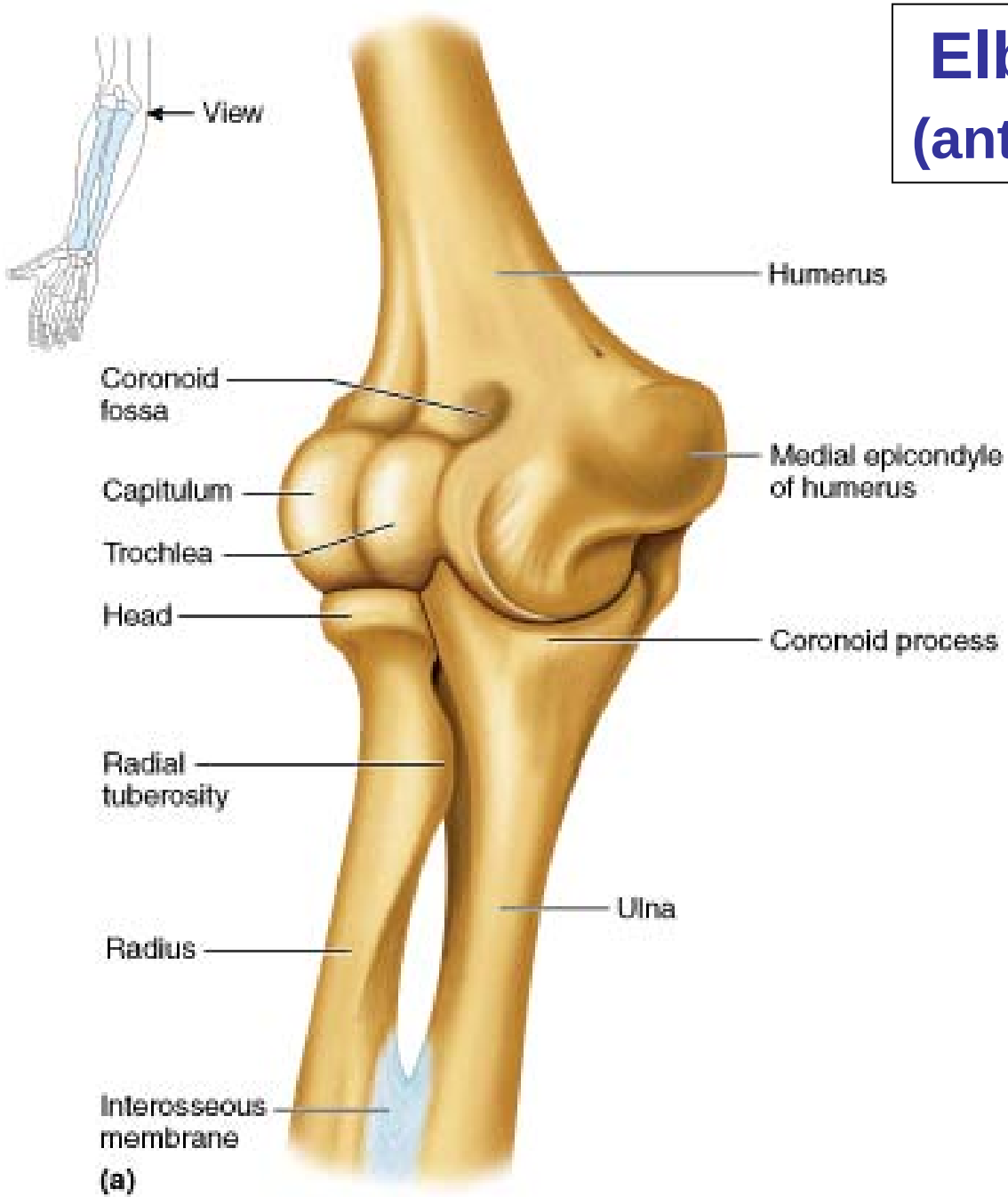
Ulna
(proximal end)





(b)

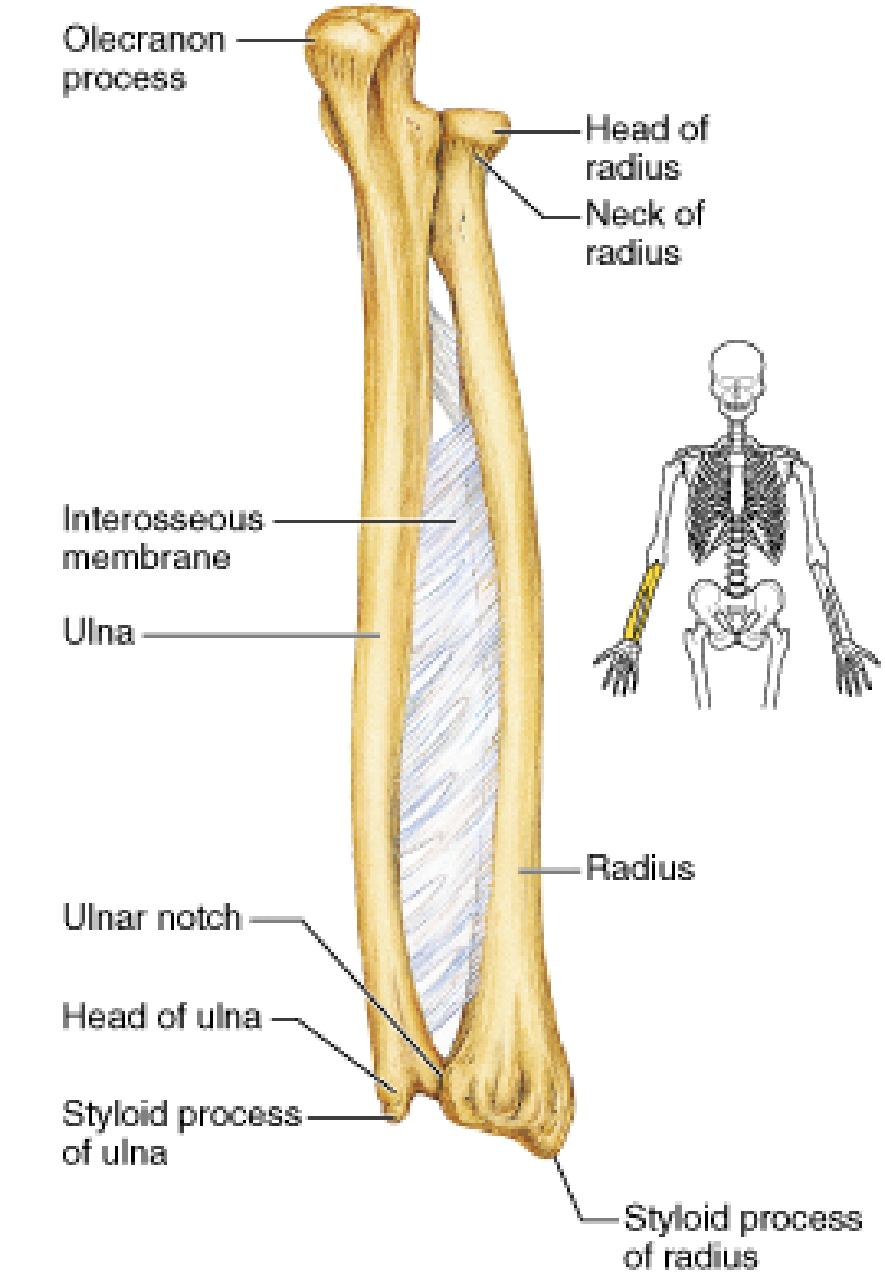
Elbow joint (anterior view)



Landmarks of the elbow

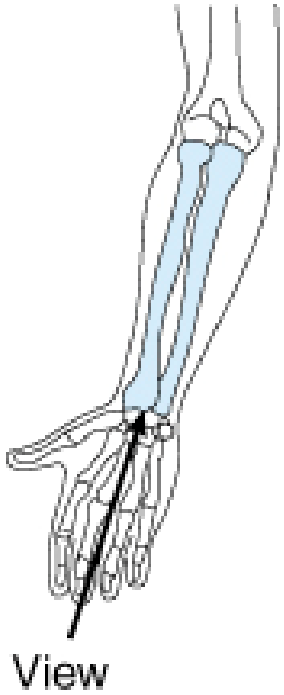
- Medial & lateral **epicondyles of the humerus**
- Tip of the **olecranon process** of the ulna

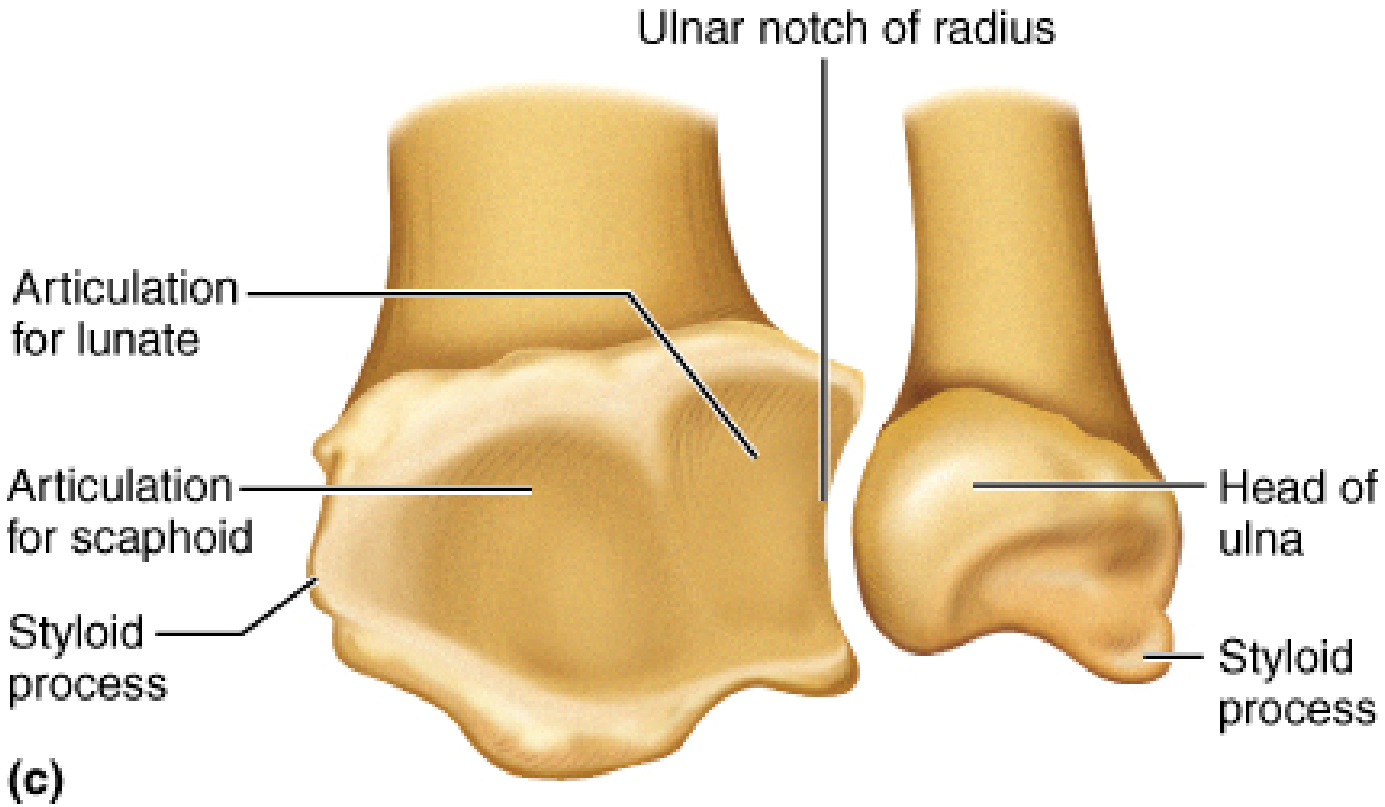
Radius & Ulna (posterior view)



(b) Posterior view

Radius & Ulna (distal end)



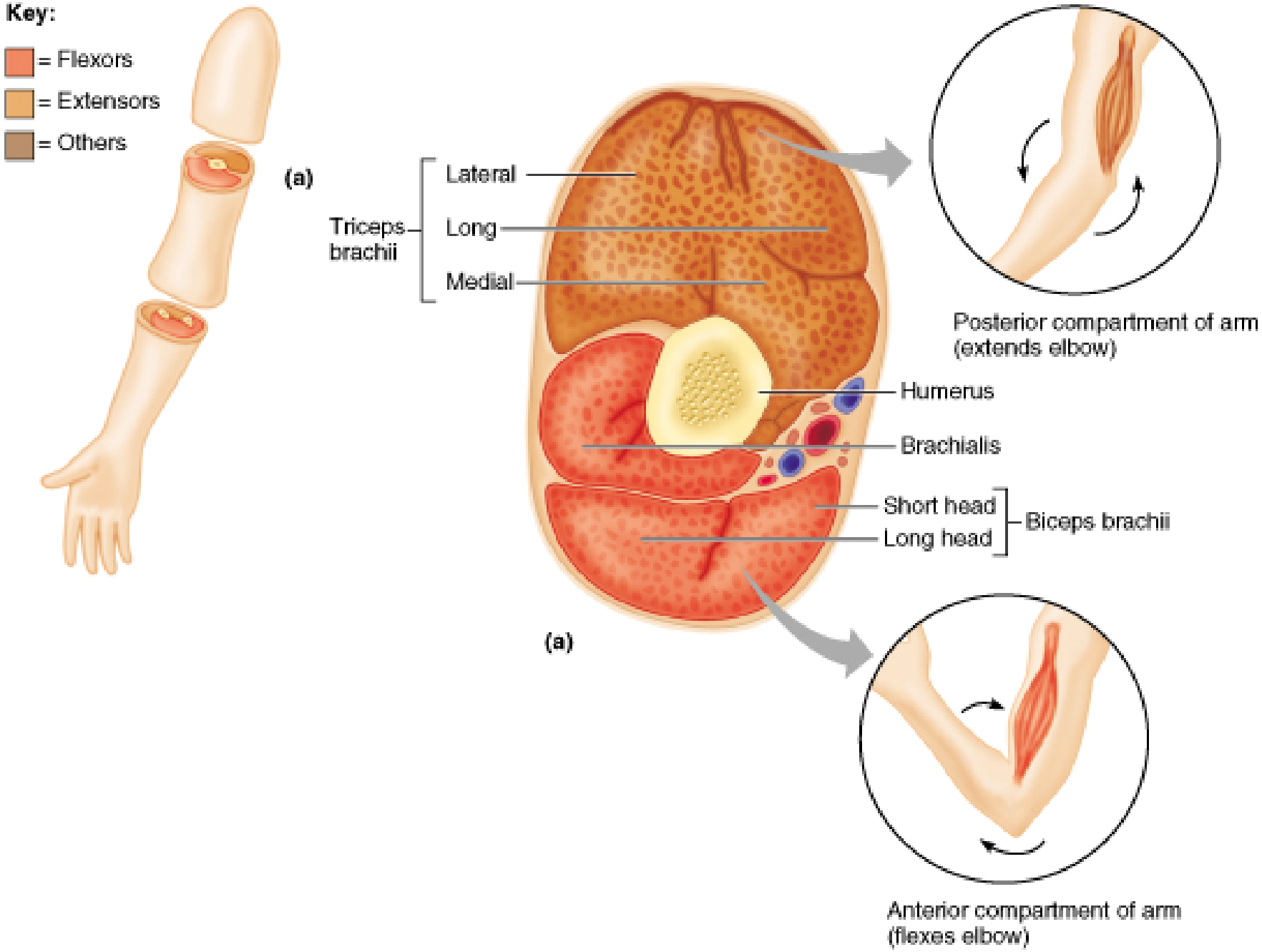


Elbow joint

- **Uniaxial** joint:
  - **single axis** of function (mediolateral)
  - permits movements in a **single plane**
  - permits the movement of **flexion & extension**

Elbow joint

- **Articular surfaces:**
  - Capitulum of the humerus
  - Trochlea of the humerus
  - Head of the radius
  - Trochlear notch of the ulna
- **Ligaments:** radial & ulnar collateral ligaments



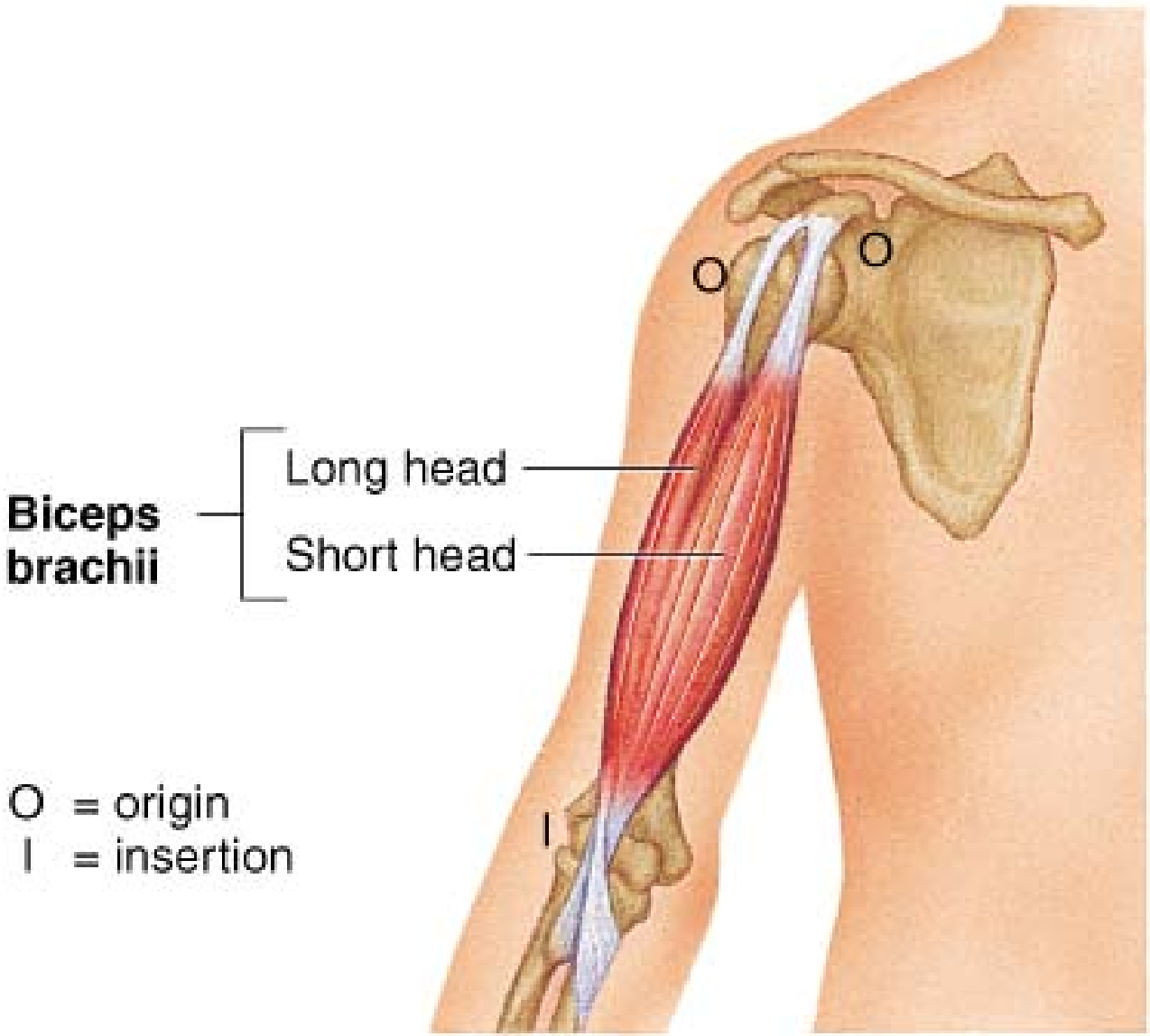
Flexors of the elbow

- Lie within the **anterior** muscle compartment of the **arm**
- Cross the elbow joint anterior to its axis of function
- Take their distal attachment from the radius or ulna

Biceps brachii

- **Origin:**
  - short head: tip of the coracoid process (in common with the coracobrachialis)
  - long head: supraglenoid tubercle of scapula

- **Insertion:**
  - tendon: radial tuberosity
  - bicipital aponeurosis: into the fascia of the forearm



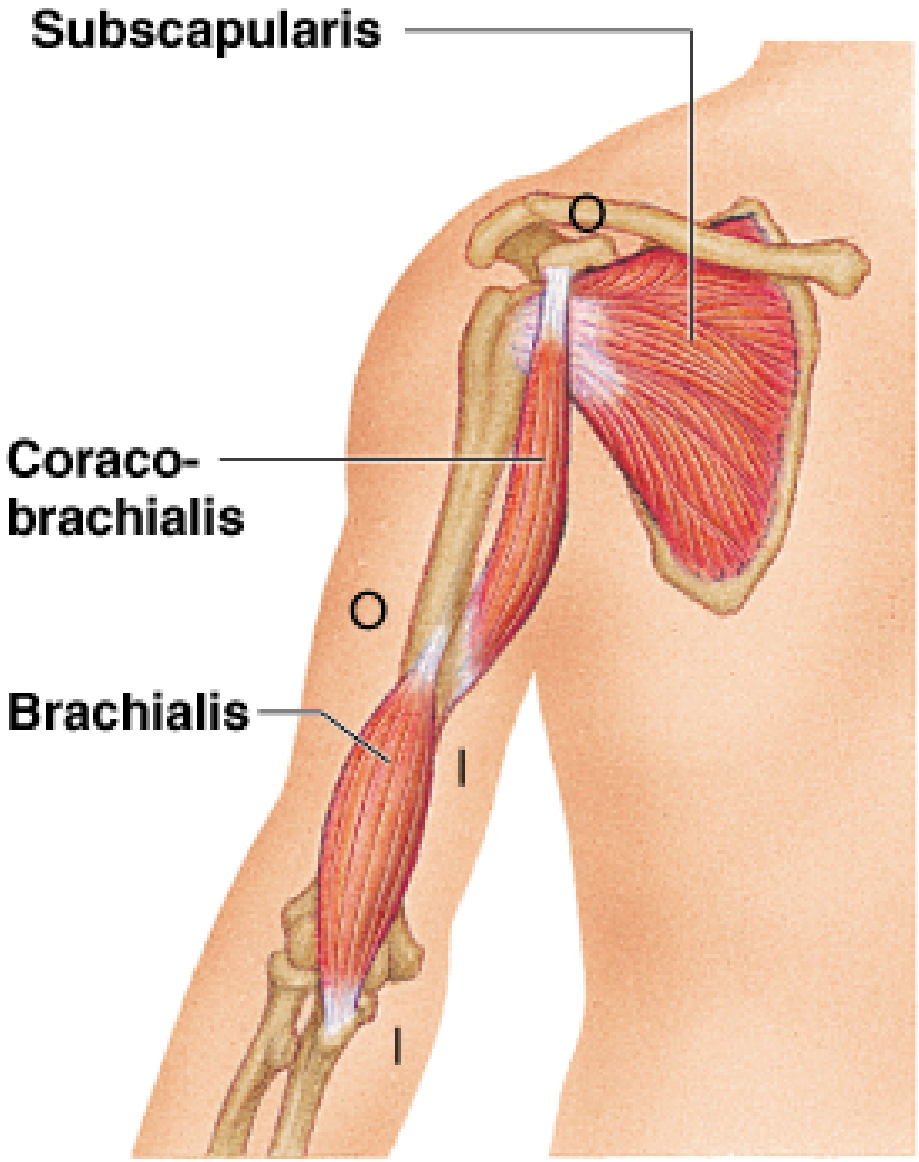
(c) Anterior view

Biceps brachii

- **Action:**
  - ➢flexion & supination of the forearm
  - ➢flexion of the arm
- **Innervation:** musculocutaneous nerve

Coracobrachialis

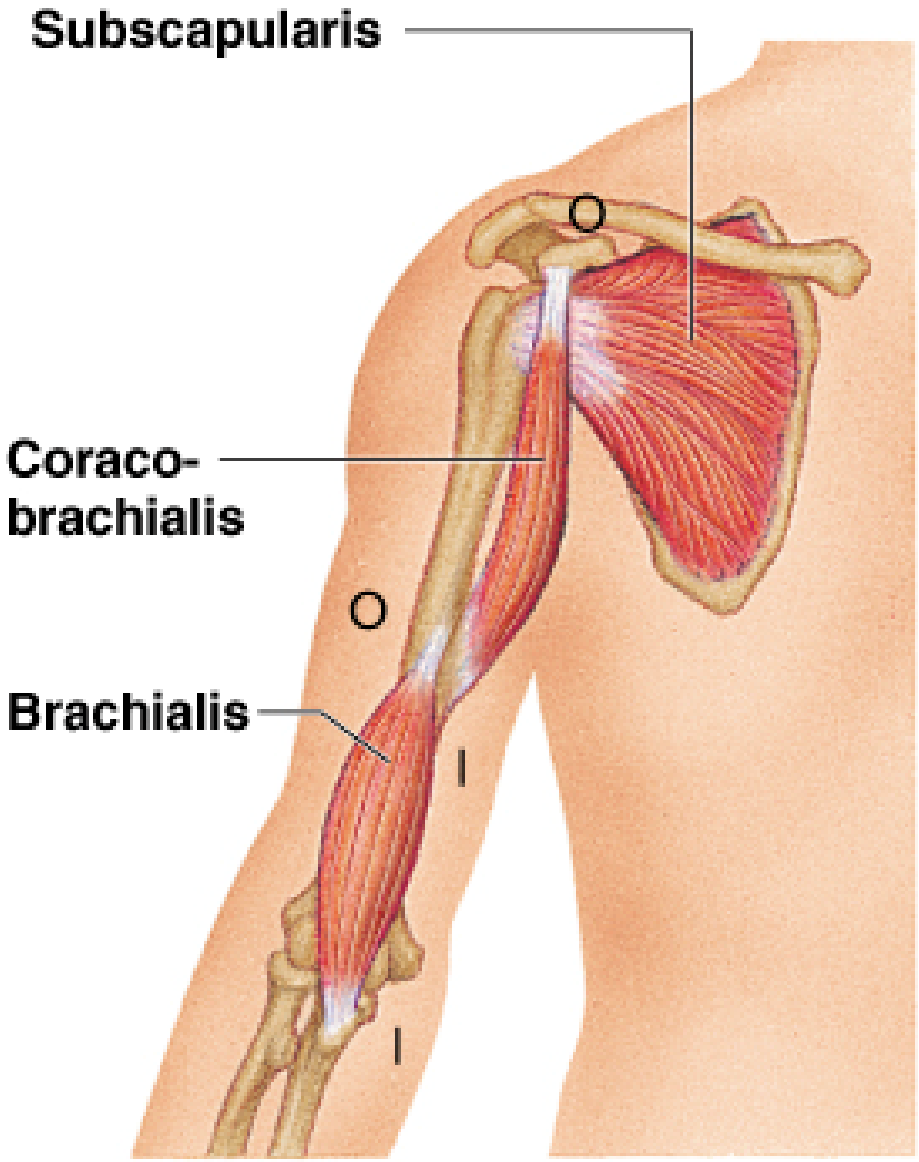
- **Origin:** coracoid process of scapula
- **Insertion:** anteromedial surface of midshaft of humerus
- **Action:** flexion & adduction of arm
- **Innervation:** musculocutaneous nerve (pierces the muscle as it enters the arm)



(d) Anterior view

Brachialis

- **Origin:**
  - lower half of anterior humerus
  - intermuscular septa
- **Insertion:** ulnar tuberosity



(d) Anterior view

Brachialis

- **Action:** flexion of forearm
- **Innervation:**
  - musculocutaneous nerve
  - lateral side may receive twig from radial nerve

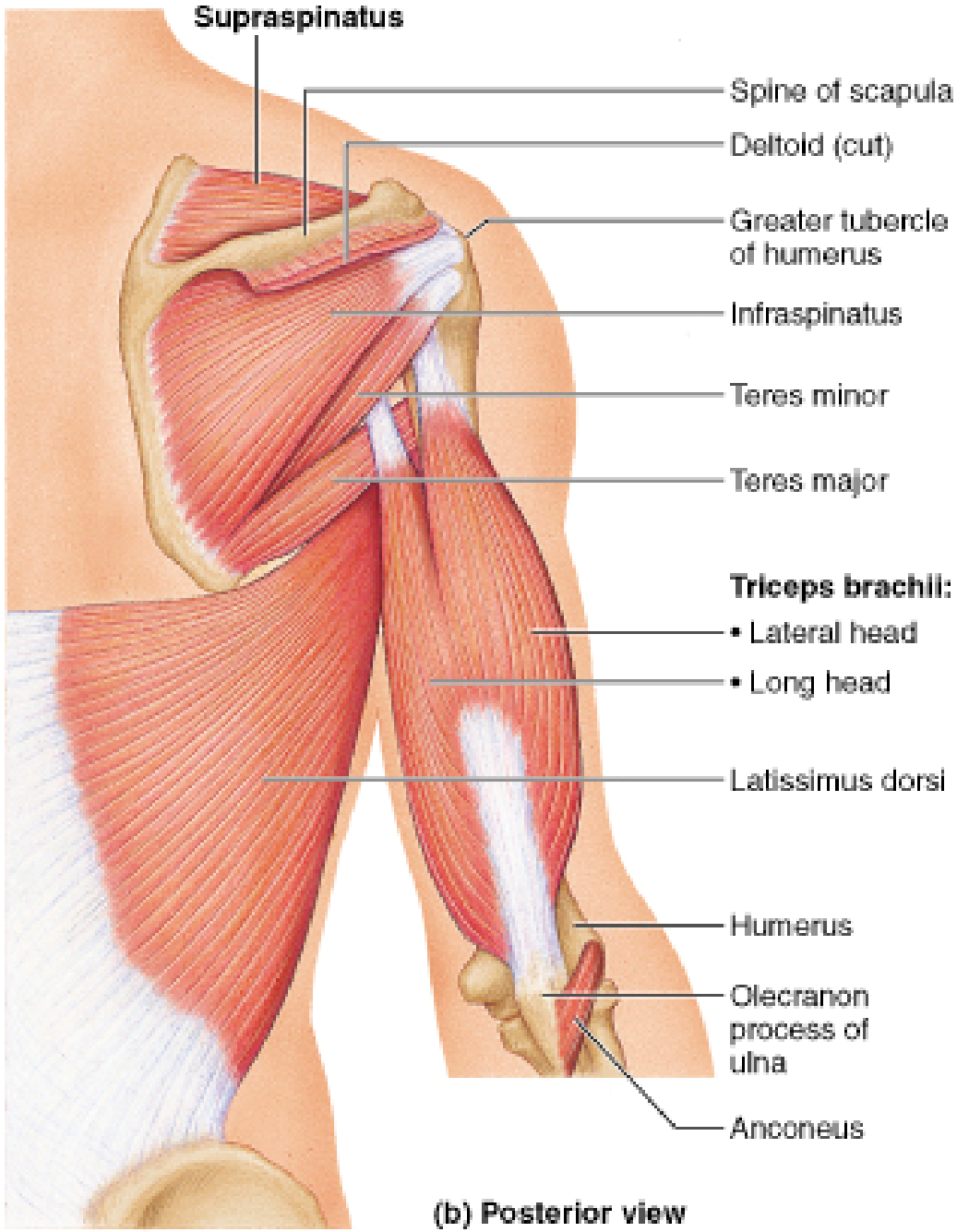
Extensors of the elbow

- Lie within the **posterior** muscle compartment of the **arm**
- Cross the elbow joint **posterior** to its axis of function
- Take their distal attachment from the ulna

Triceps brachii

- **Origin:**
  - long head: infraglenoid tubercle of scapula
  - lateral head: posterior surface of humerus above & lateral to groove of radial nerve
  - medial head: posterior surface of humerus below & medial to groove of radial nerve

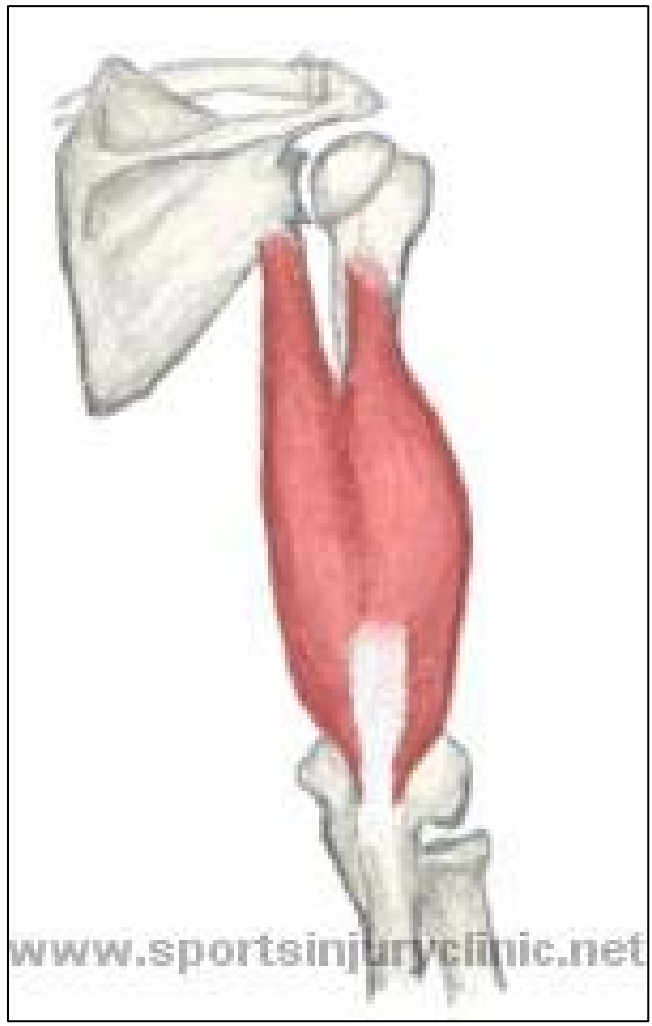
- **Insertion:** olecranon of ulna



(b) Posterior view

Triceps brachii

- **Action:**
  - ➢extension of the forearm
  - ➢extension of the arm (long head)
- **Innervation:** radial nerve



Anconeus

- **Origin:** lateral epicondyle of humerus
- **Insertion:** lateral side of olecranon
- **Action:** extension of forearm
- **Innervation:** radial nerve

Radial nerve

- Vulnerable in the medial side of the upper arm (e.g., axillary crutches: crutch palsy)

- Enters the posterior compartment of the arm by passing between the long and deep heads of triceps

Radial nerve lesions

- Fracture of the midshaft of humerus
- Saturday night palsy
- Wrist drop (few sensory symptoms)

Fractures of the mid shaft of the humerus

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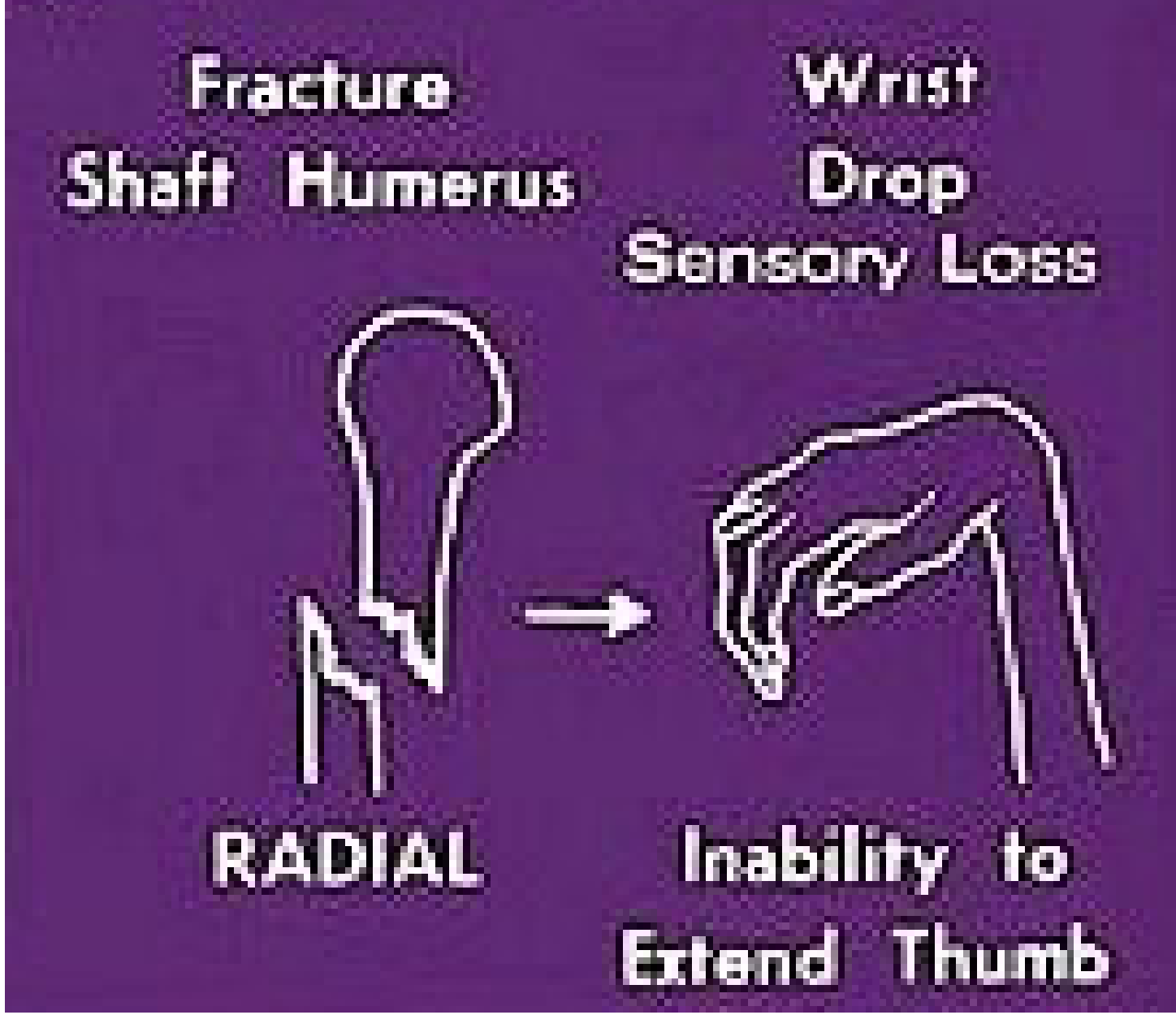
radial nerve palsy

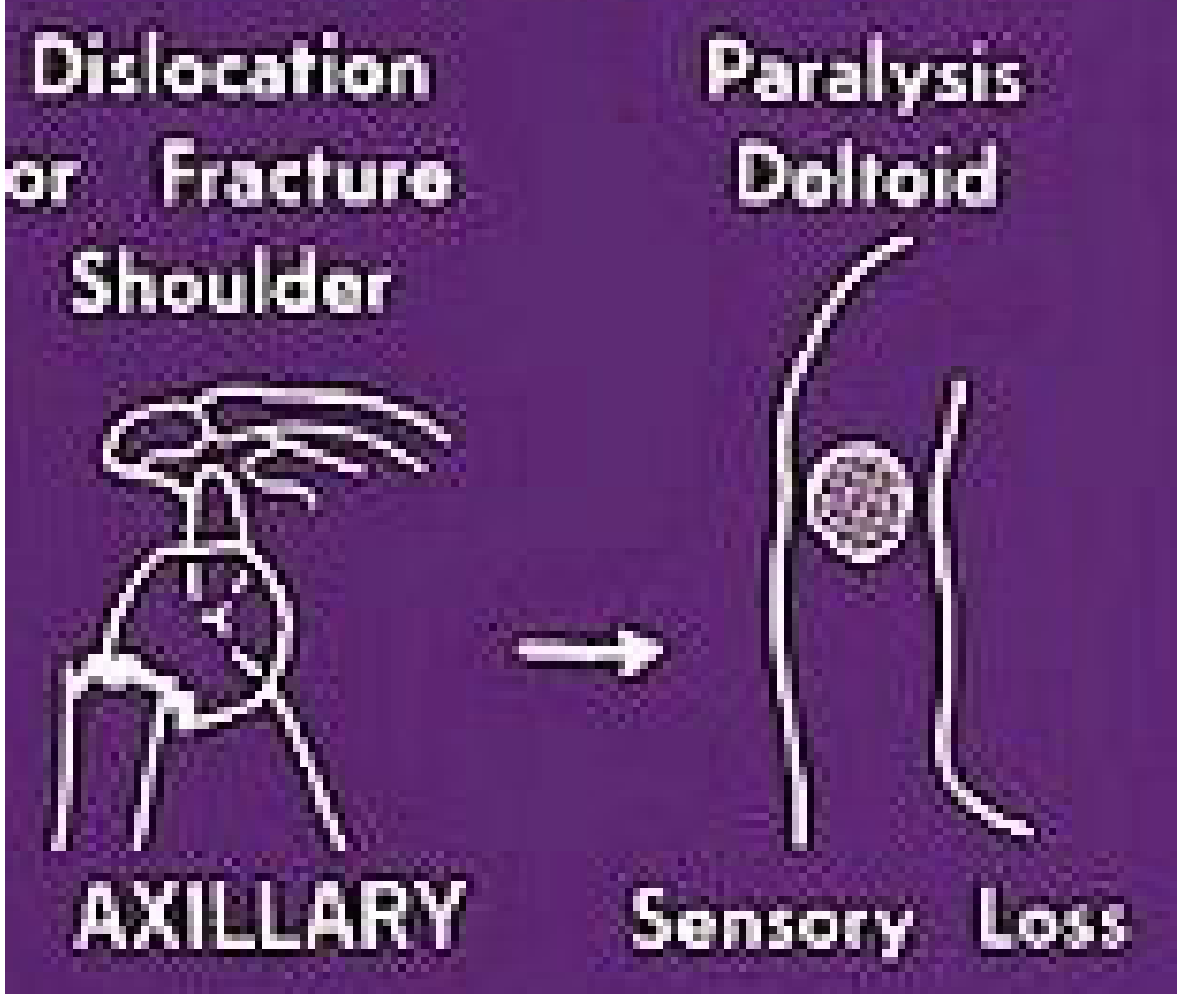


Wrist drop due to a **radial nerve palsy**

Radial nerve

- Injury to the nerve in the shaft of humerus (groove of the radial nerve) affects primarily extension of wrist & fingers (not triceps)…..why?

- Some of the branches to the triceps arise before the nerve leaves the axilla

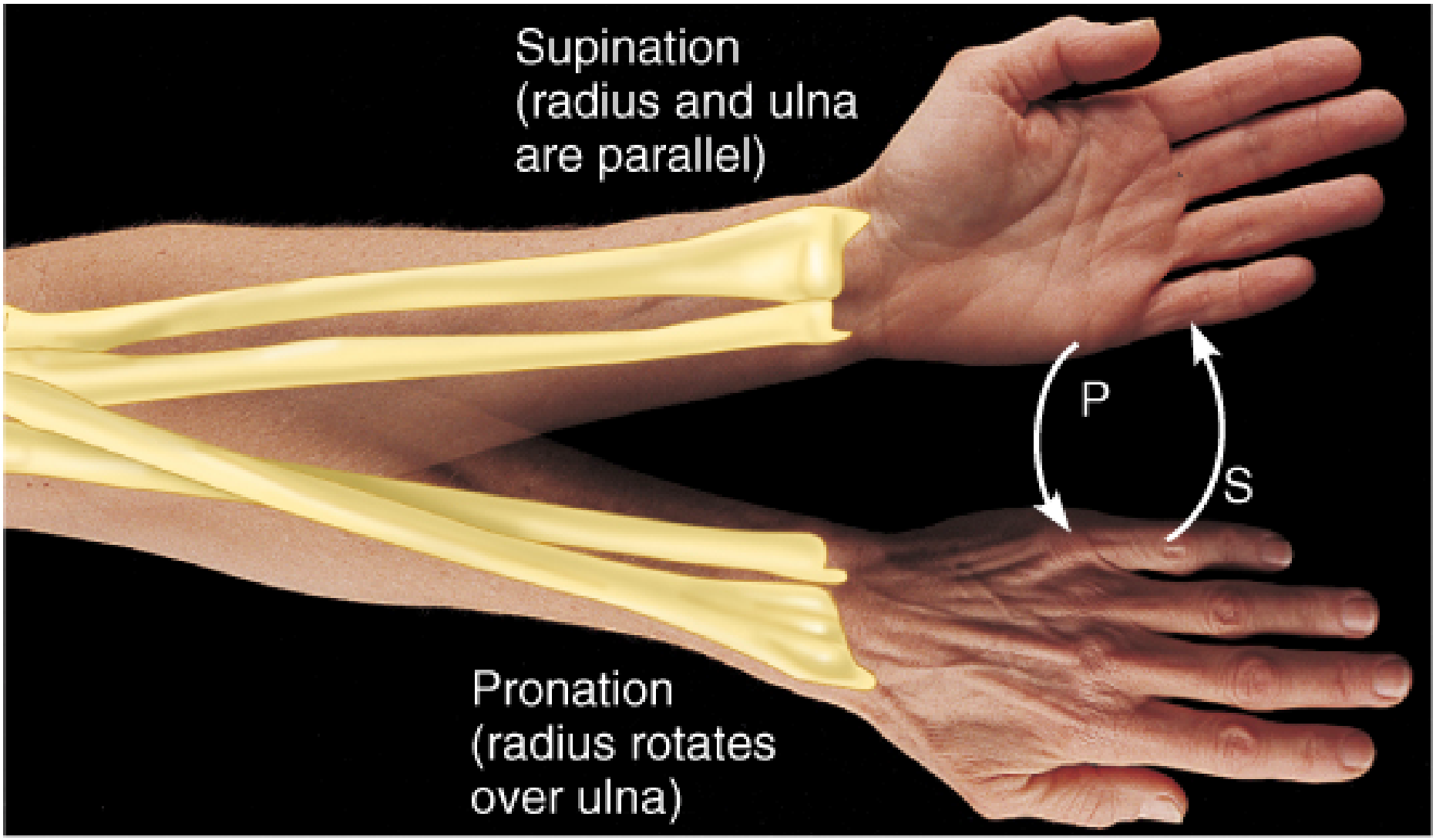


axillary nerve lesions:
fractures of the neck of the humerus
& dislocations of the shoulder

Radioulnar joints

- **Pronation & supination** (as in turning a key to lock or unlock a door)

- Demonstrate these movements with the arm at your side, elbow flexed to 90^{o}, palm facing medially, and thumb directed superiorly



(a) Supination (S) and pronation (P)

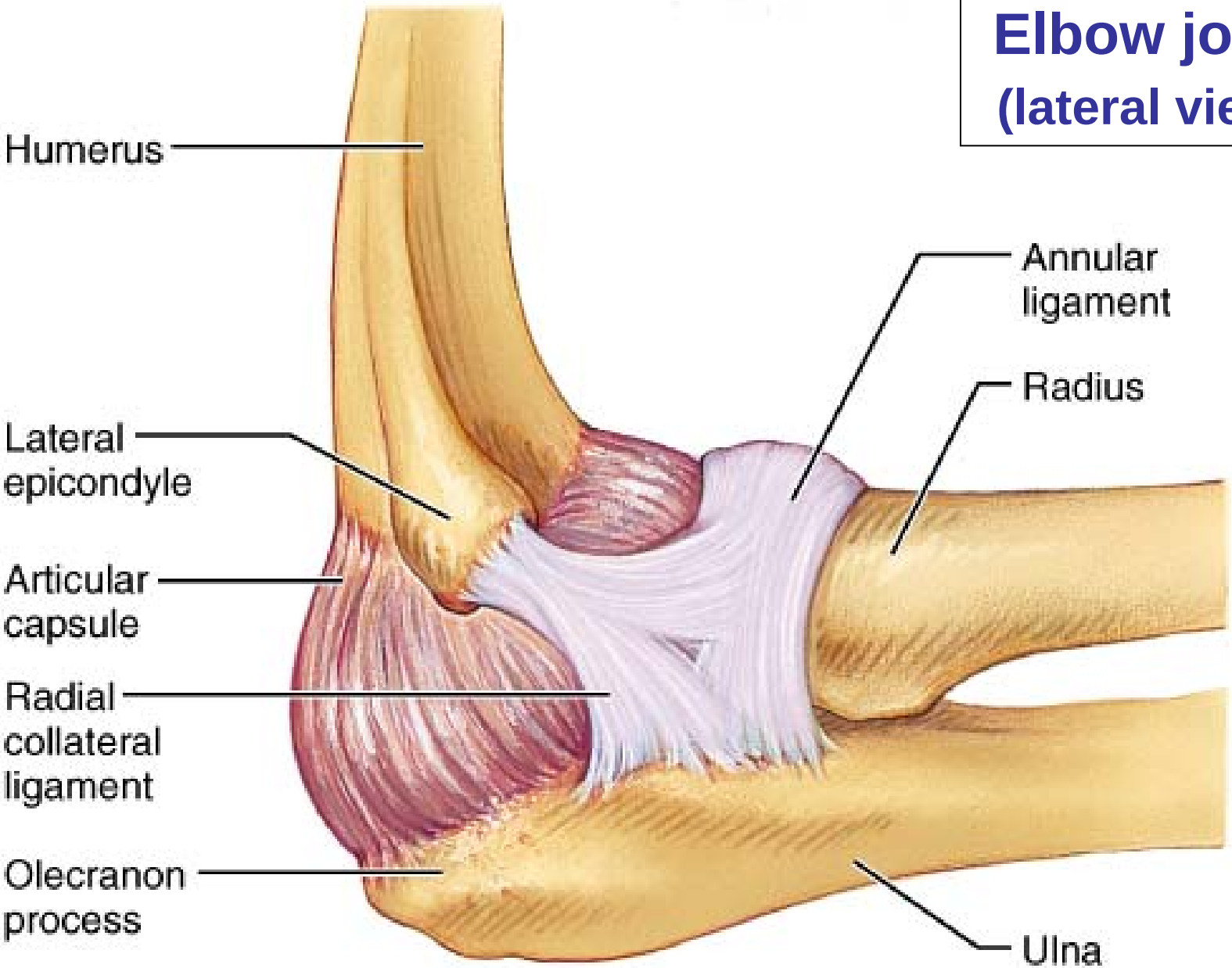
Radioulnar joints

- **Proximal radioulnar joint:** between the head of radius & radial notch of ulna; supported by the annular ligament

- **Middle radioulnar joint:** between the shaft of radius & ulns; tied together by the interosseous membrane

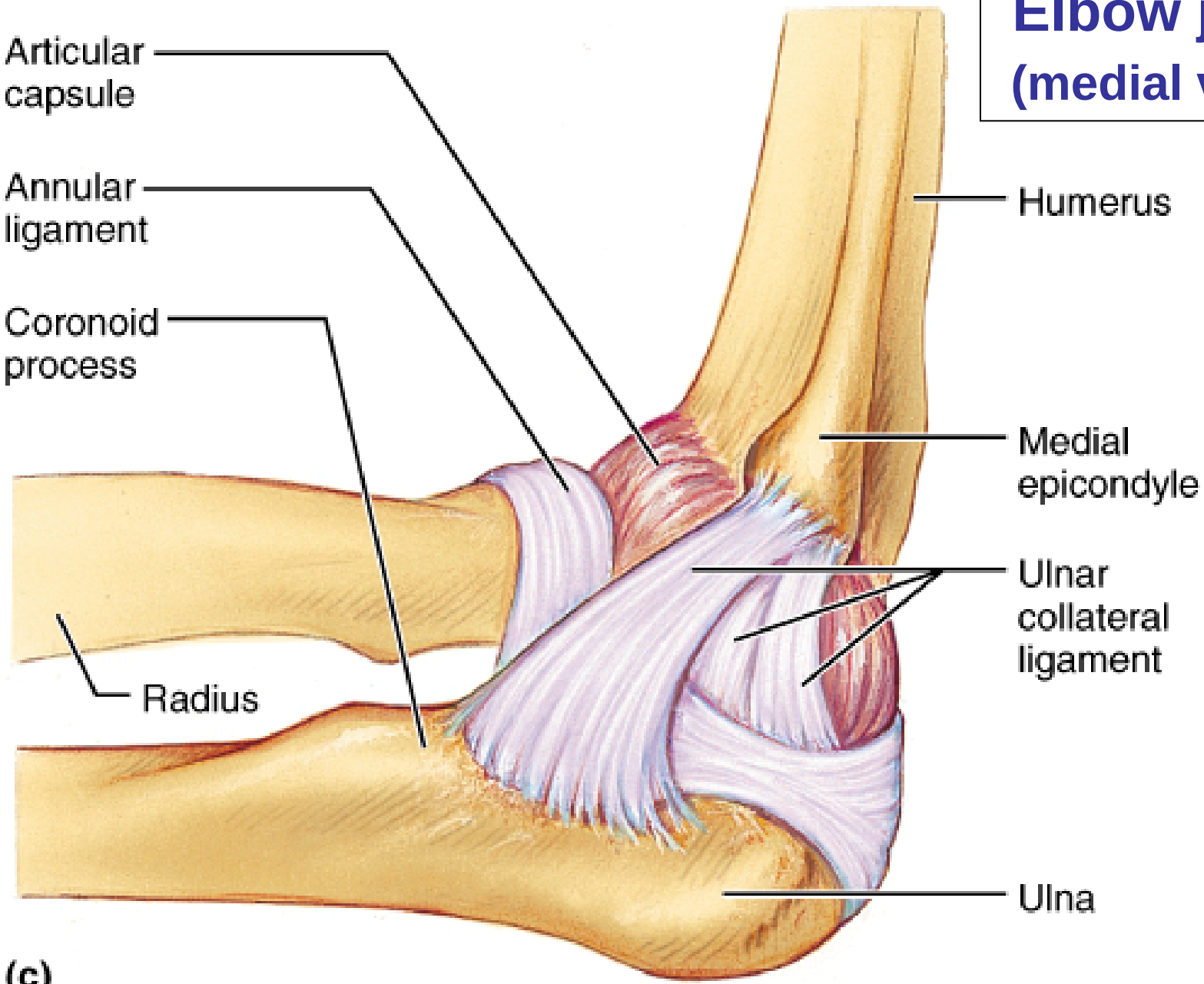
- **Distal radioulnar joint:** between the head of ulna & ulnar notch of radius

Elbow joint
(lateral view)



(b)

Elbow joint (medial view)



(c)

Pulled elbow

- Common in young children (less than 8 years old) who present with a painful inability to use the arm

- Peak incidence: between 2-3 years old

Pulled elbow

- Caused by sublaxation of the head of radius after traction injury (sudden traction applied to the child’s arm which is in extended and pronated position)

- Completely and rapidly cured by manipulation

Pulled elbow

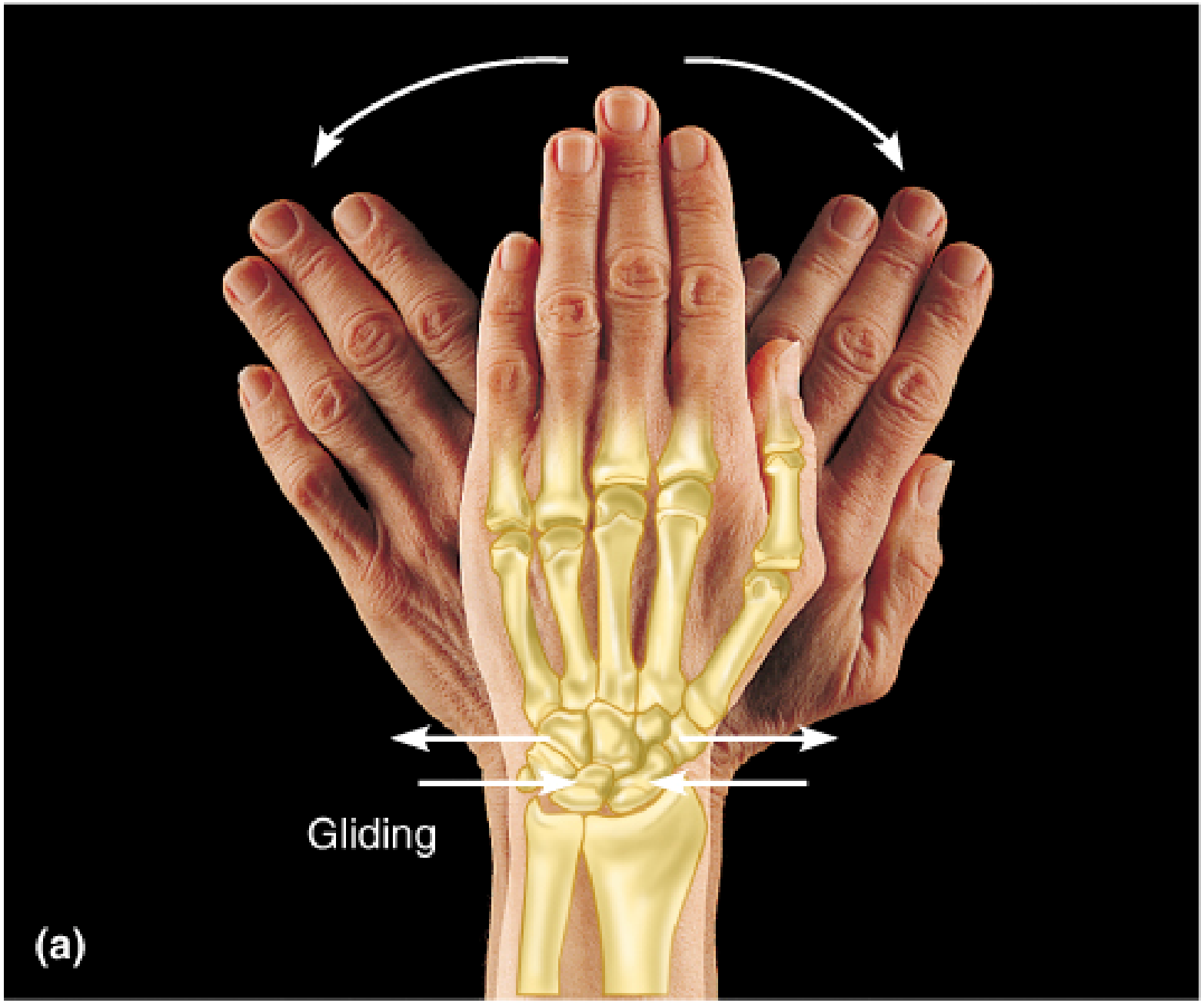
- When traction is applied → transverse tear in the annular ligament in the distal attachment to the neck of radius

  ↓

  the head of radius can then easily slip through the tear → the annular ligament becomes detached and interposed between the head of radius and capitulum

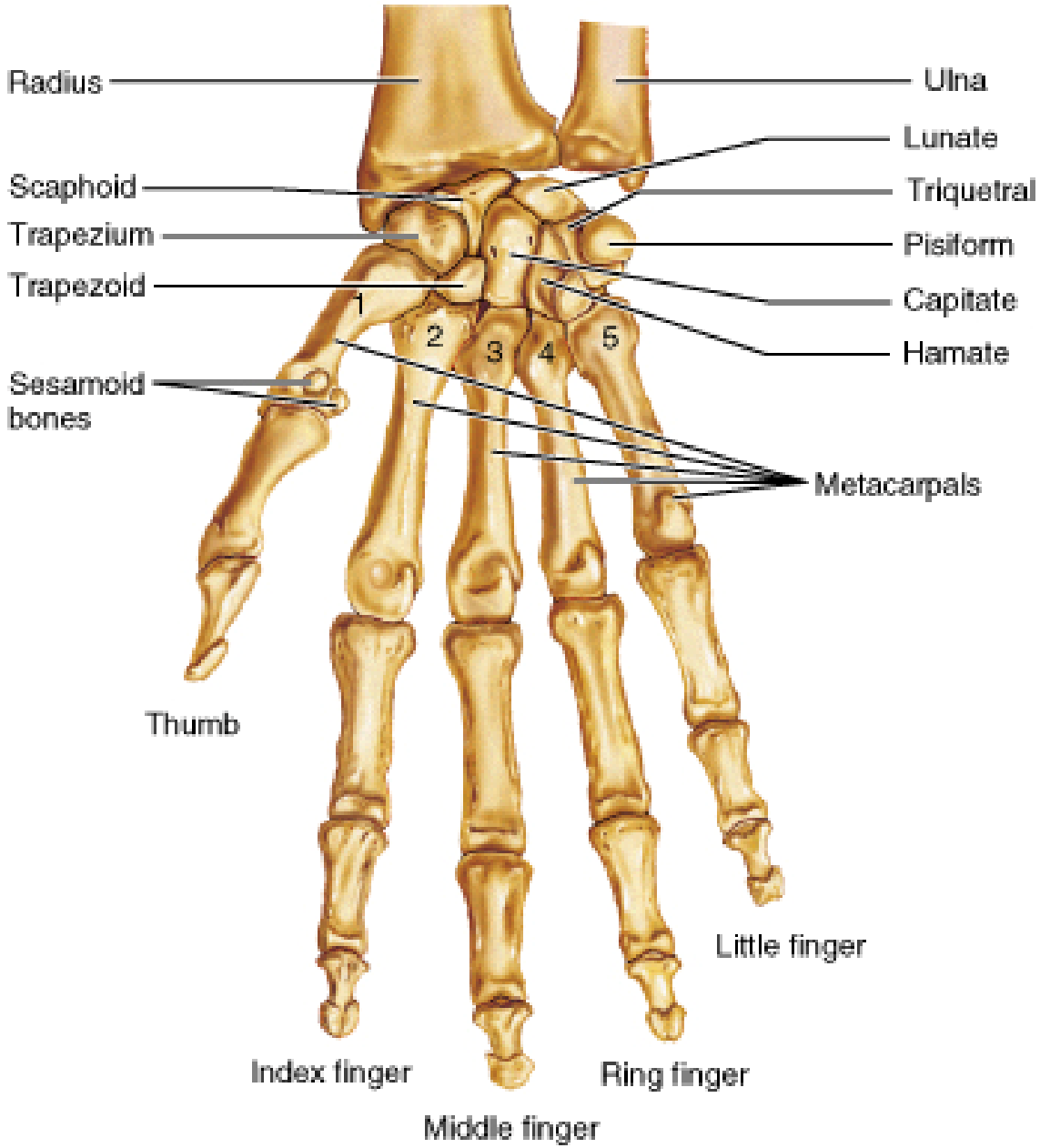
Wrist (radiocarpal) joint

- Biaxial joint:
  - **two axes** of function
  - permits movements in **two planes**
  - permits the movements of **flexion / extension** (sagittal plane), **abduction {radial deviation}/ adduction {ulnar deviation}** (frontal plane)

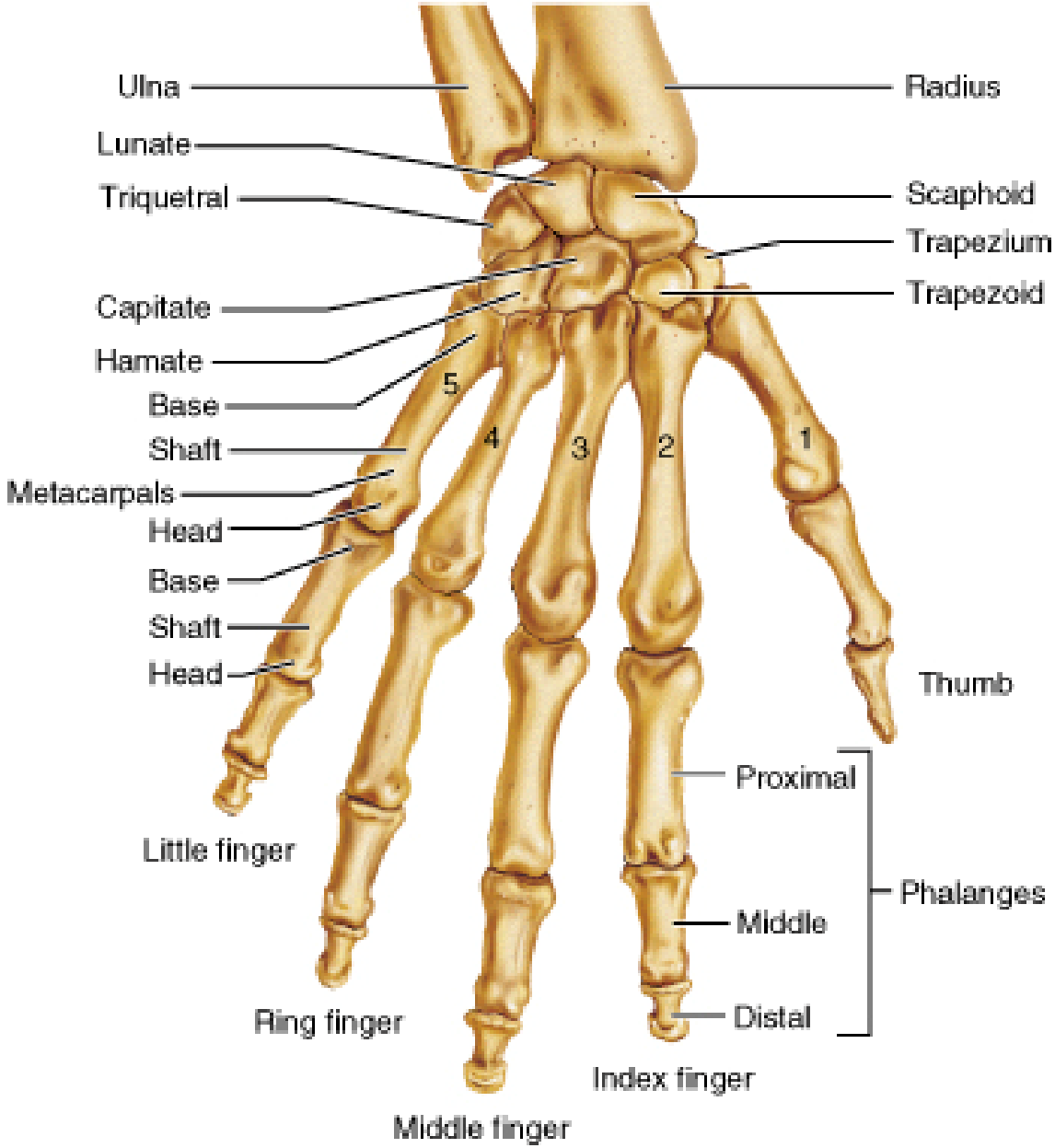


Wrist joint

- **Articular surfaces:**
  - Distal end of the radius
  - Scaphoid & lunate bones (proximal carpals)
- The distal end of the ulna is separated from the proximal row of carpals by an articular disc (therefore, does not articulate with the carpals)



(a) Anterior view



(b) Posterior view

Clinical note

- The scaphoid is the most frequently fractured bone of the wrist…why?

- Falling on an outstretched hand produces ulnar deviation, causing the scaphoid to slide under the radial styloid process;
  i.e., the **hyperextended hand** exposes the bone which is weaker in its central region

Falls on the outstretched hand

- Fractures of the **scaphoid** and anterior dislocation of the **lunate**
- **Colles' fracture** (fracture of distal end of radius)

Clinical note

- Avascular necrosis is a concern when treating fractures of the scaphoid…why?

- Vessels supplying the scaphoid enter the distal portion (therefore fracture at the waist will deprive the proximal portion of its blood supply)

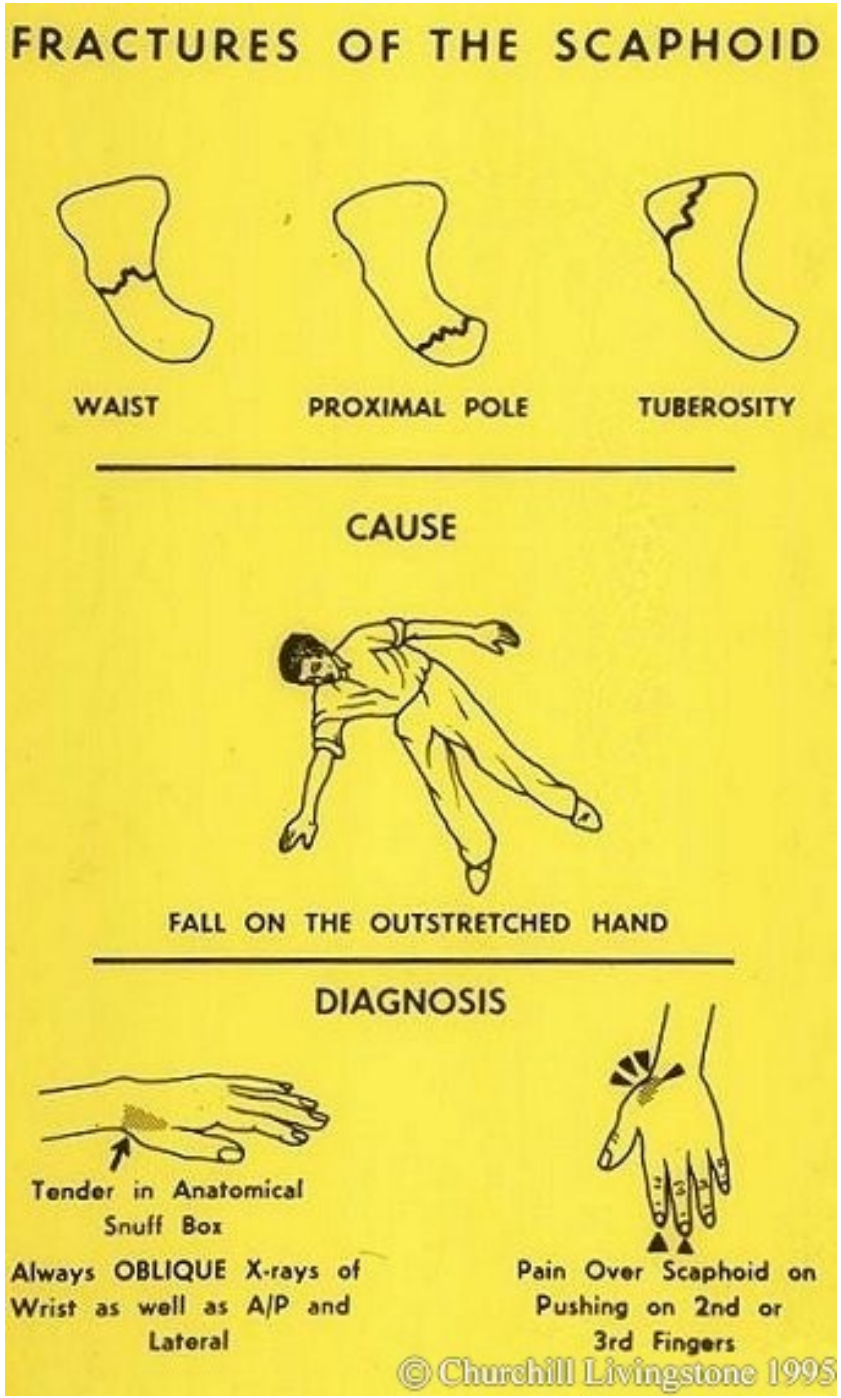
Fracture of the scaphiod

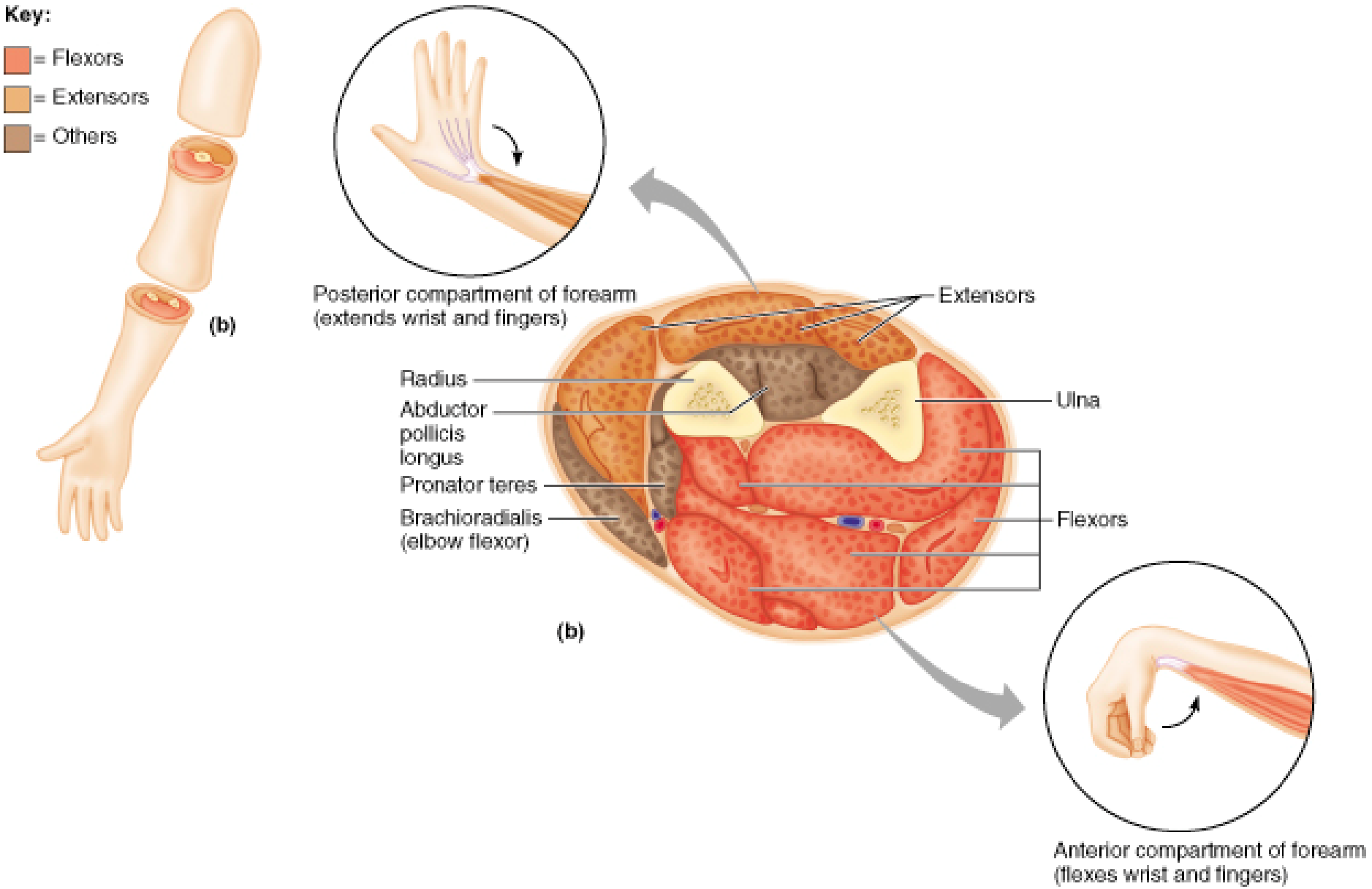
- Common in young adults
- As the result of falls on the outstretched hand
- May be overlooked because:
  - The person considers it to be a strain
  - Or the fracture may not be visible in the initial X-ray
- Healing is slow and there may be non-union (can be prevented by early diagnosis and immobilization)

• Fractures of the <u>waist</u> and <u>proximal pole</u> of the scaphoid are liable to progress to non-union or <u>*avascular necrosis*</u>

•Tenderness in the <u>anatomical snuffbox</u>

•Tenderness on proximal pressure on the 2nd and 3rd metacarpals





Flexors of the forearm

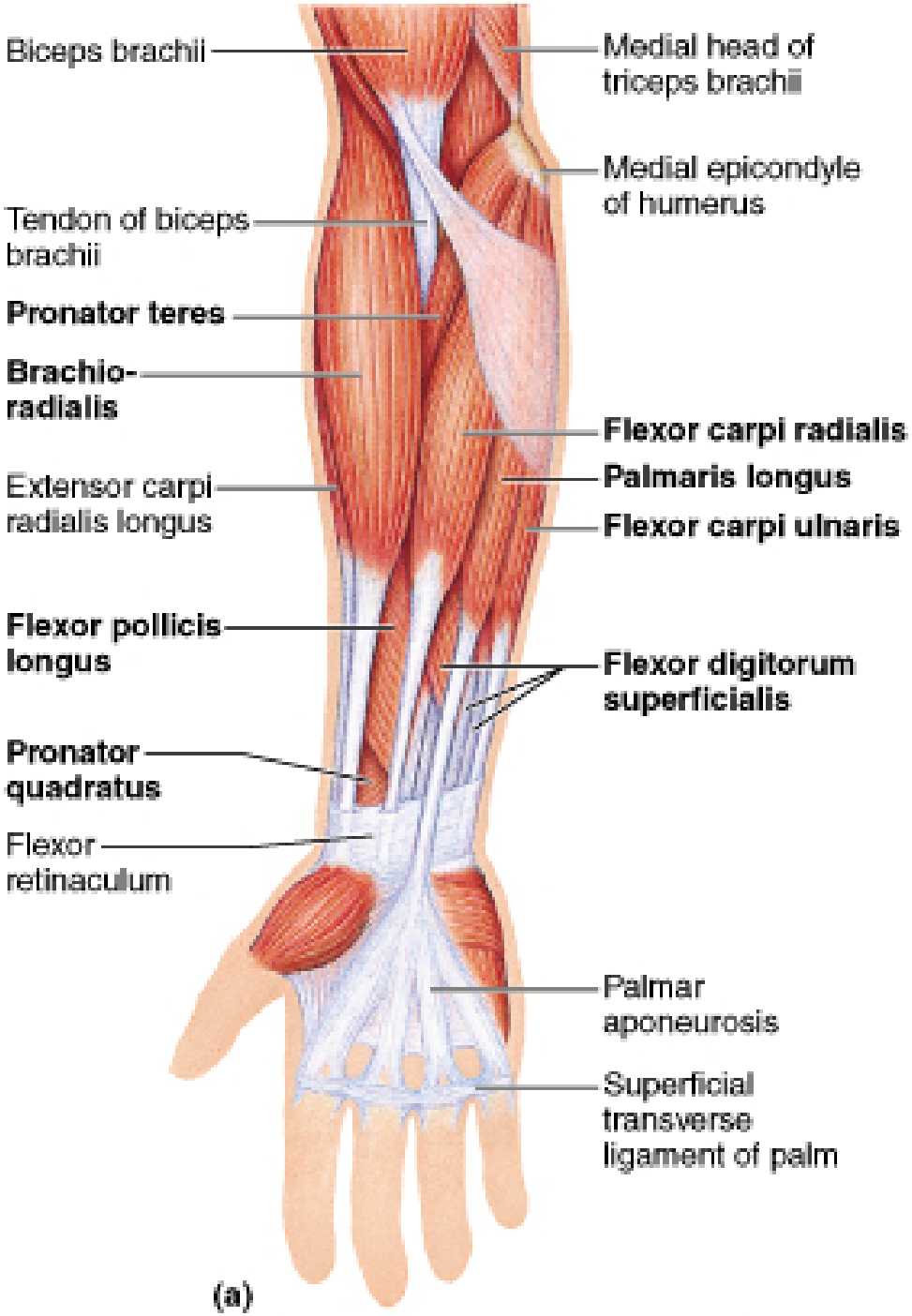
- Lie within the **anterior** muscle compartment of the **forearm**
- Cross the wrist joint anterior to its axis of function
- Take their common origin from the **medial epicondyle** (site of golfer's elbow = medial epicondylitis)

Flexors of the forearm

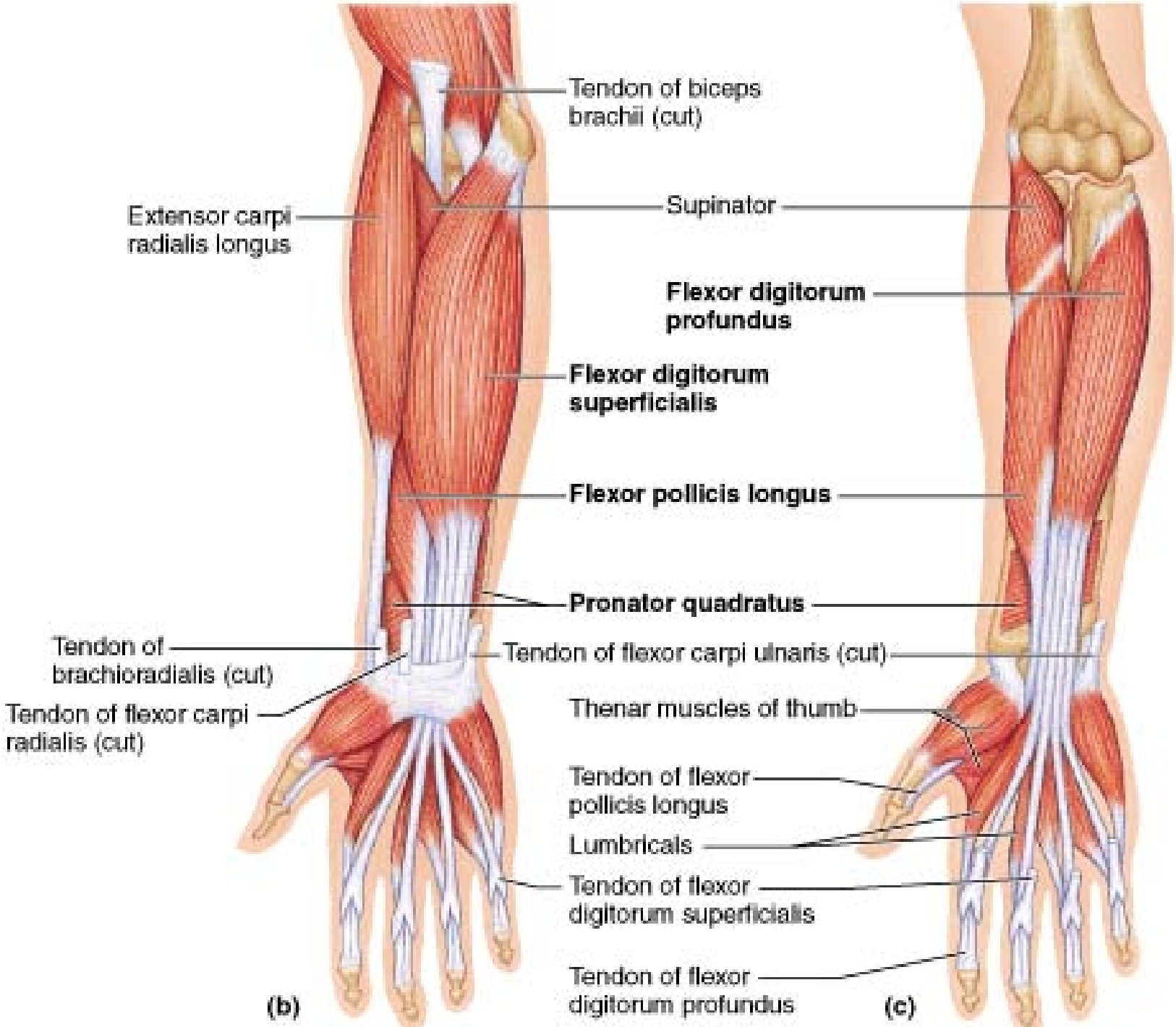
- **Superficial muscles:**
  - Pronator teres
  - Palmaris longus
  - Flexor carpi radialis
  - Flexor carpi ulnaris

Flexors of the forearm

- **Intermediate muscles:**
  - Flexor digitorum superficialis
- **Deep muscles:**
  - Flexor digitorum profundus
  - Flexor pollicis longus
  - Pronator quadratus


Biceps brachii
Medial head of triceps brachii
Medial epicondyle of humerus
Tendon of biceps brachii
Pronator teres
Brachio-radialis
Flexor carpi radialis
Palmaris longus
Extensor carpi radialis longus
Flexor carpi ulnaris
Flexor pollicis longus
Flexor digitorum superficialis
Pronator quadratus
Flexor retinaculum
Palmar aponeurosis
Superficial transverse ligament of palm

(a)


Tendon of biceps brachii (cut)
Extensor carpi radialis longus
Supinator
Flexor digitorum profundus
Flexor digitorum superficialis
Flexor pollicis longus
Pronator quadratus
Tendon of brachioradialis (cut)
Tendon of flexor carpi radialis (cut)
Tendon of flexor carpi ulnaris (cut)
Thenar muscles of thumb
Tendon of flexor pollicis longus
Lumbricals
Tendon of flexor digitorum superficialis
Tendon of flexor digitorum profundus
(b)
(c)

Extensors of the forearm

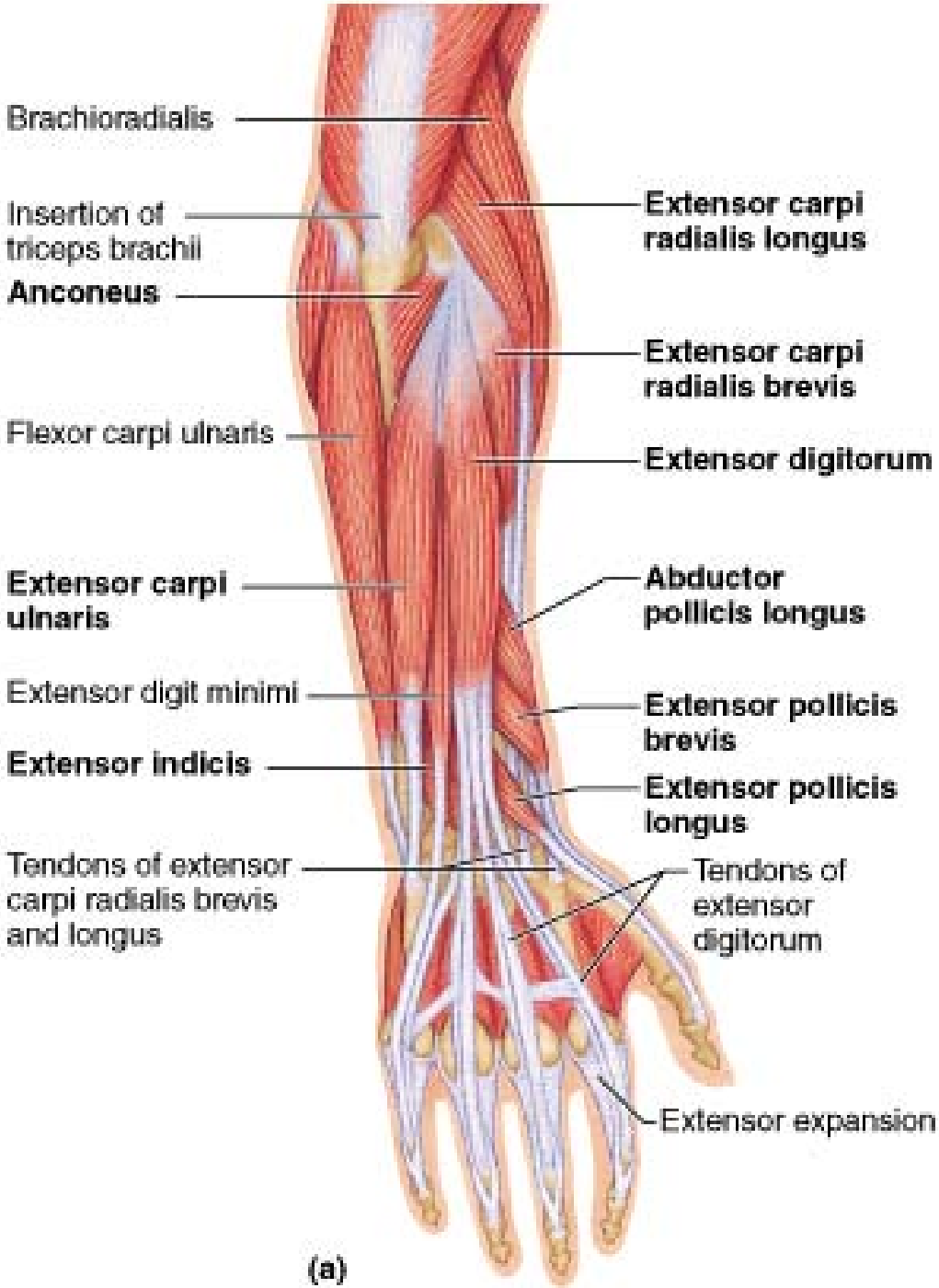
- **Superficial muscles:**
  - Brachioradialis
  - Extensor carpi radialis longus
  - Extensor carpi radialis brevis

  - Extensor digitorum
  - Extensor digiti minimi

  - Extensor carpi ulnaris

Extensors of the forearm

- **Deep muscles:**
  - Supinator
  - Abductor pollicis longus
  - Extensor pollicis brevis
  - Extensor pollicis longus
  - Extensor indicis


Brachioradialis
Insertion of triceps brachii
Anconeus
Flexor carpi ulnaris
Extensor carpi ulnaris
Extensor digit minimi
Extensor indicis
Tendons of extensor carpi radialis brevis and longus
Extensor carpi radialis longus
Extensor carpi radialis brevis
Extensor digitorum
Abductor pollicis longus
Extensor pollicis brevis
Extensor pollicis longus
Tendons of extensor digitorum
Extensor expansion

(a)


Olecranon process of ulna
Anconeus
Supinator
Abductor pollicis longus
Extensor pollicis longus
Extensor pollicis brevis
Extensor indicis
Interossei

(b)