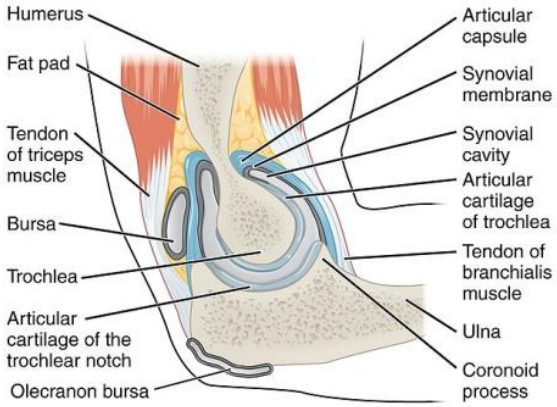
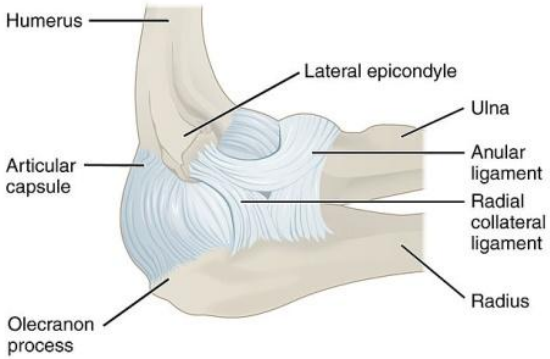
Elbow Assessment

Page 431

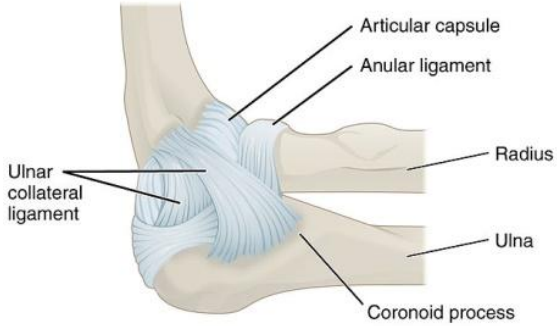
Anatomy Review



(a) Medial sagittal section through right elbow (lateral view)



(b) Lateral view of right elbow joint



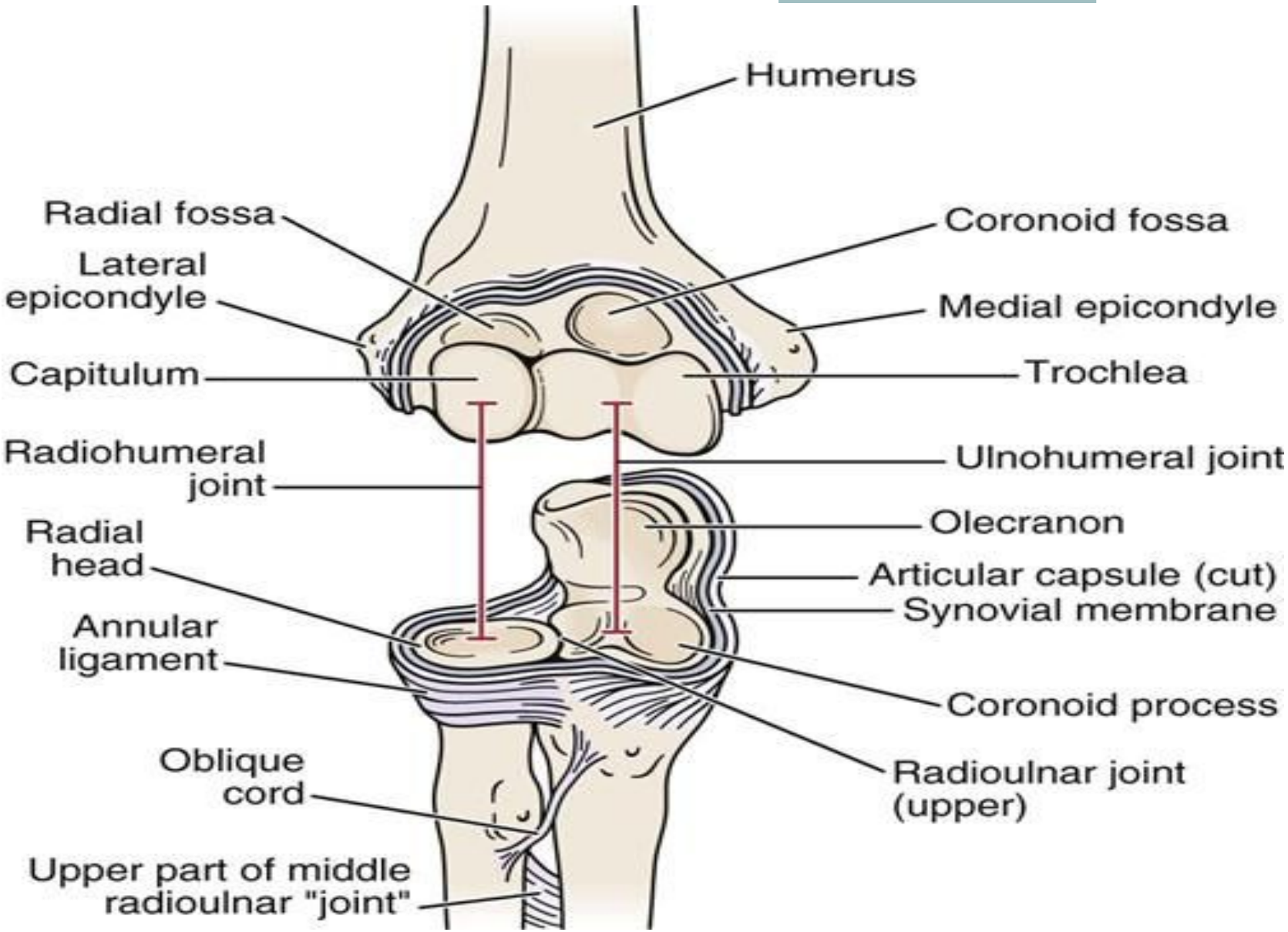
(c) Medial view of right elbow joint

Joints

- Within the Joint capsule
  - Ulnohumeral Joint (Trochlear Joint)
  - Radiohumeral Joint
  - Superior Radioulnar Joint

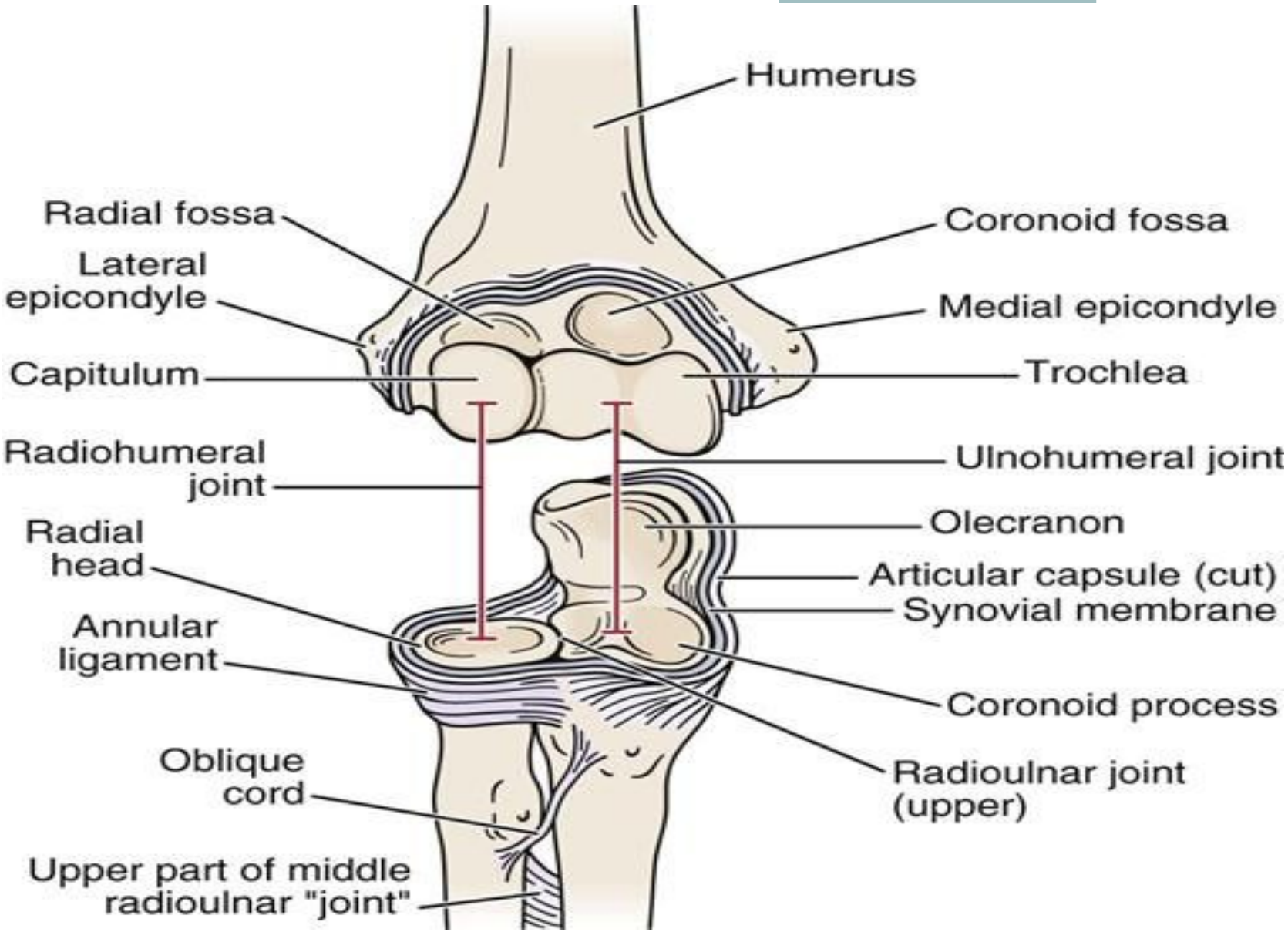
Ulnohumeral Joint

- Between trochlea of humerus and trochlear notch of ulna
- Uniaxial hinge joint
- Resting Position
  - 70 degrees elbow flexion, 10 degrees supination
- Close Packed Position-
  - extension with supination
- Capsular Pattern
  - flexion=extension


Humerus
Radial fossa
Coronoid fossa
Lateral epicondyle
Medial epicondyle
Capitulum
Trochlea
Radiohumeral joint
Ulnohumeral joint
Olecranon
Radial head
Articular capsule (cut)
Synovial membrane
Annular ligament
Coronoid process
Radioulnar joint (upper)
Oblique cord
Upper part of middle radioulnar "joint"

Radiohumeral Joint

- Between capitulum of humerus and radial head
- Uniaxial hinge joint
- Resting Position
  - full extension with supination
- Close Packed Position
  - 90 degrees elbow flexion and 5 degrees supination
- Capsular Pattern
  - flexion, extension, supination, pronation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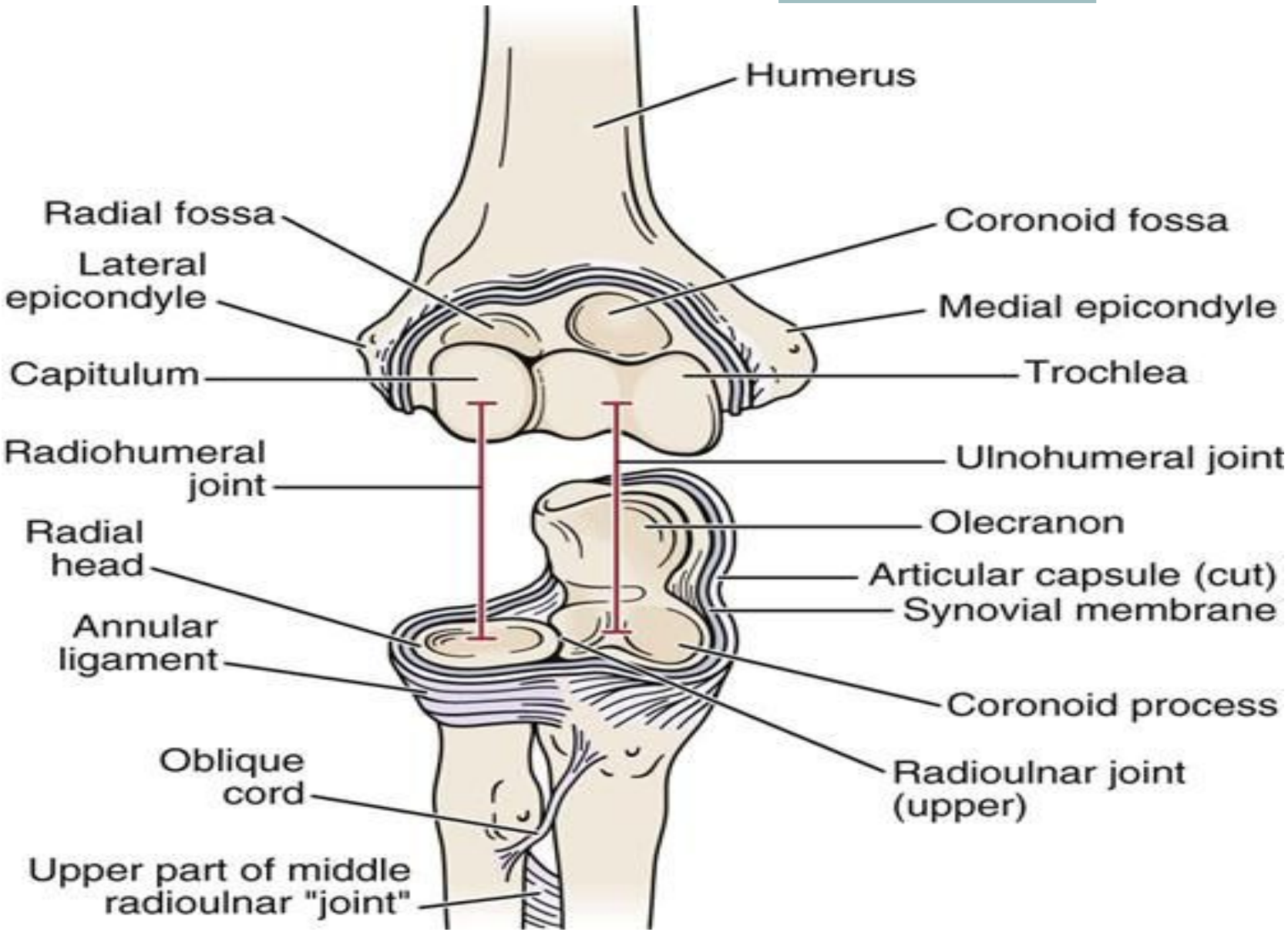
Radioulnar joint (upper)
Oblique cord
Upper part of middle radioulnar "joint"

Superior Radioulnar Joint

- Radial head held to ulna and humerus by annular ligament
- Uniaxial pivot joint
- Resting Position
  - 35 degrees supination, 70 degrees flexion
- Close Packed Position
  - 5 degrees supination
- Capsular Pattern
  - supination=pronation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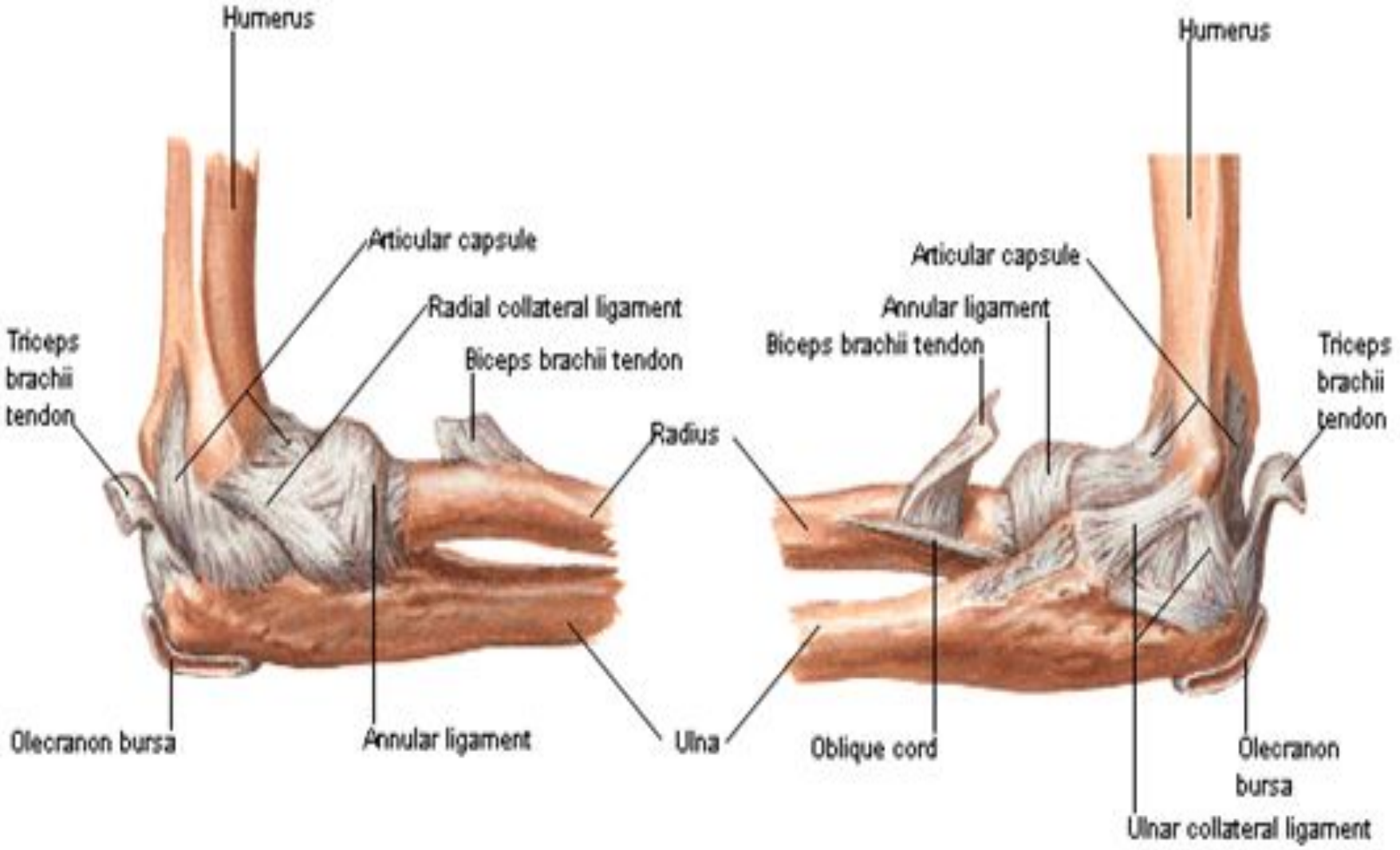
Oblique cord
Upper part of middle radioulnar "joint"

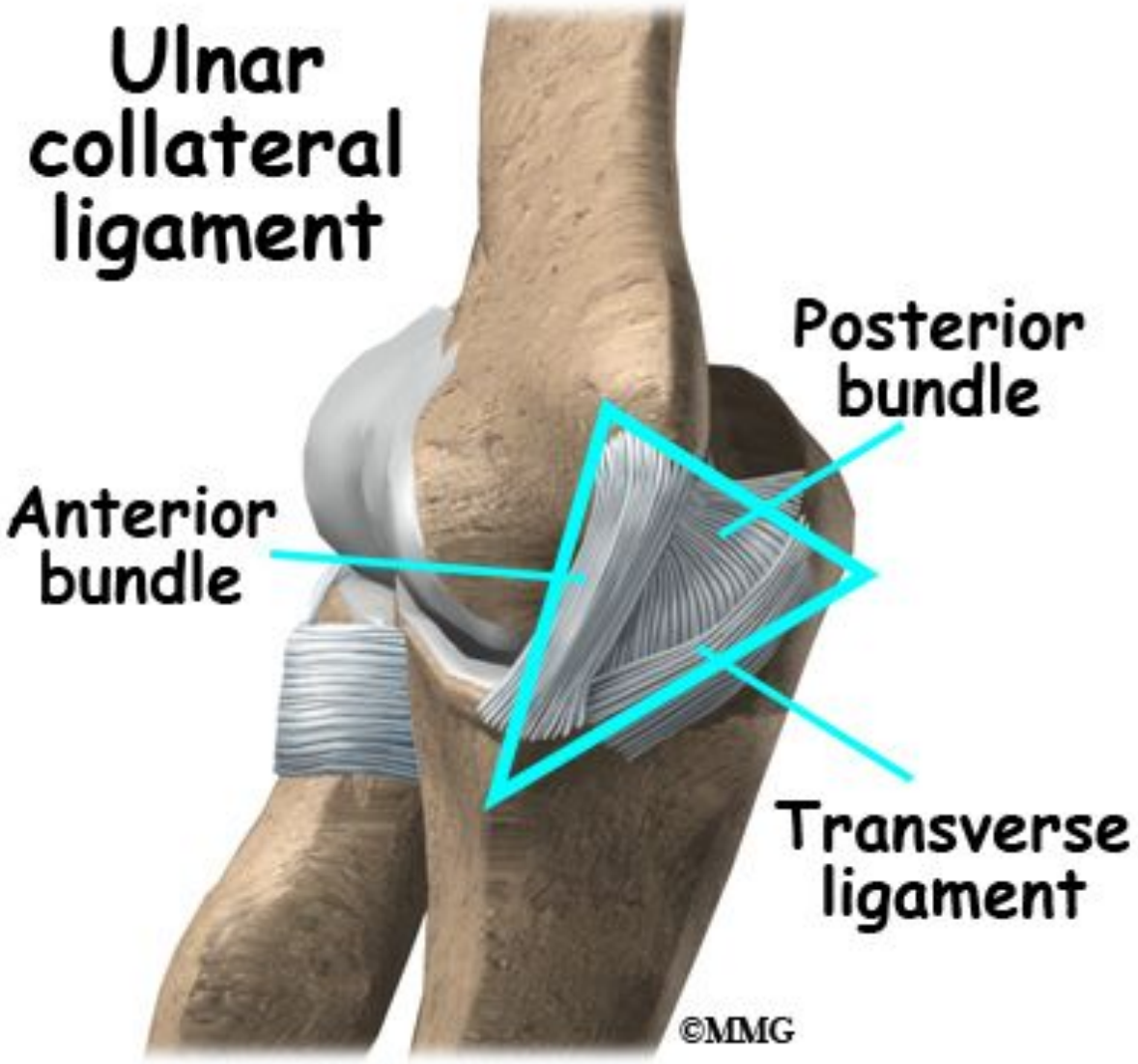
Ligaments

- Annular
- Ulnar collateral ligaments
- Radial collateral ligaments


Humerus
Articular capsule
Radial collateral ligament
Biceps brachii tendon
Triceps brachii tendon
Radius
Olecranon bursa
Annular ligament
Ulna
Humerus
Articular capsule
Annular ligament
Biceps brachii tendon
Triceps brachii tendon
Oblique cord
Olecranon bursa
Ulnar collateral ligament

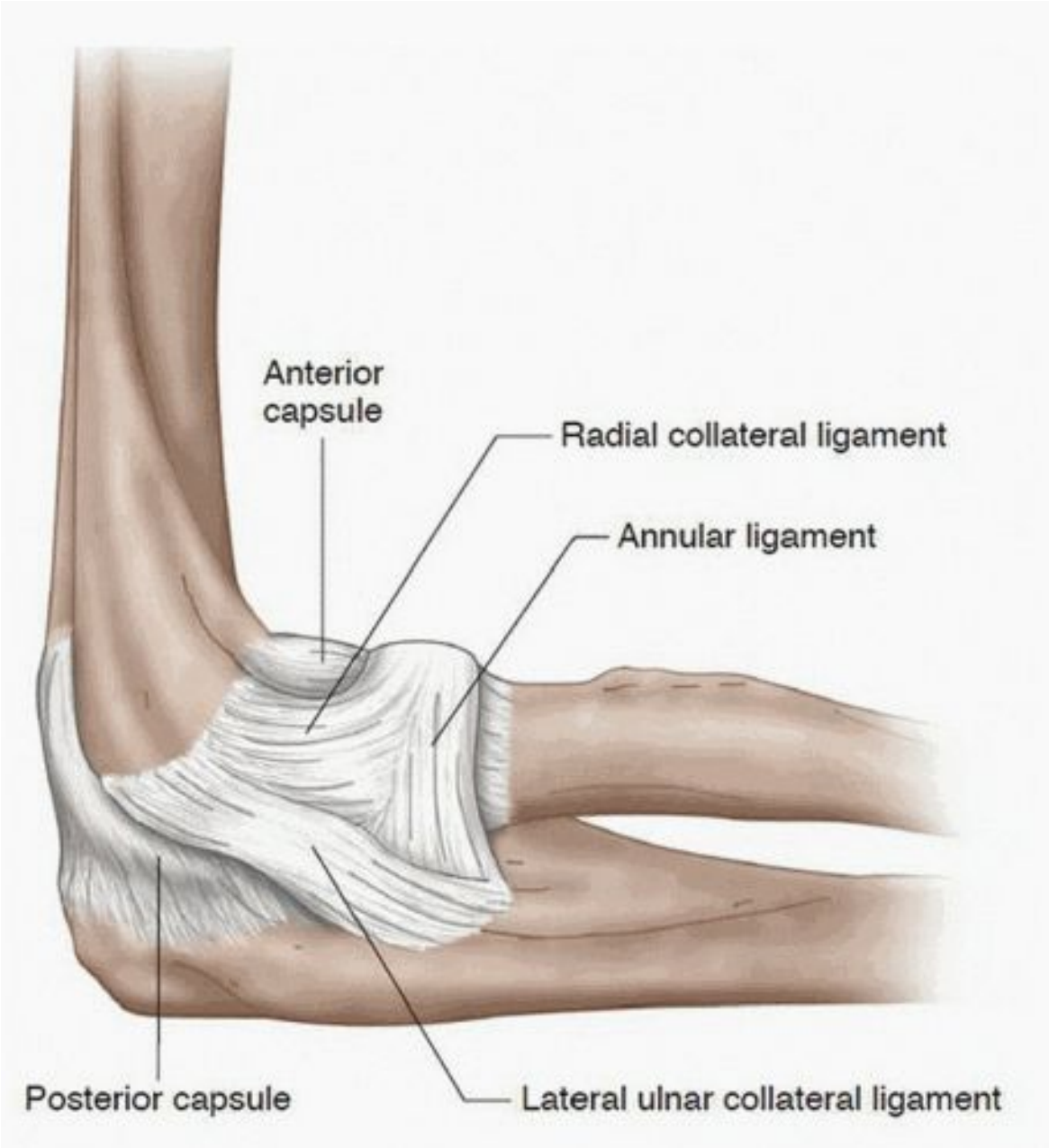
Ulnar Collateral Ligament

- Originates from central 2/3 of anteroinferior medial epicondyle
- 3 bands:
- Anterior band inserts into anterior coronoid and trochlear notch
- Posterior band- inserts into posterior trochlear notch
- Oblique band- variable attachments
- Most taught during flexion
- Primary restraint to Valgus instability


Ulnar collateral ligament
Posterior bundle
Anterior bundle
Transverse ligament
©MMG

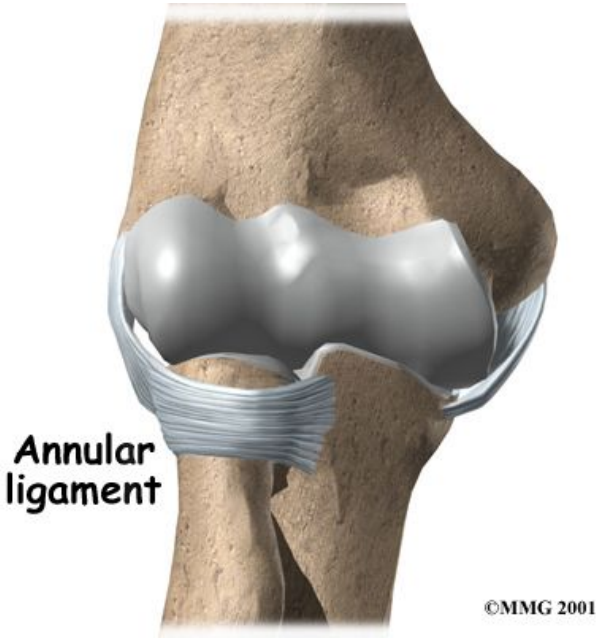
Radial Collateral Ligament

- Originates from the anteroinferior lateral epicondyle
- Inserts into annular ligament
- 3 bands (anterior, posterior and middle)
- Anterior band taught in extension
- Middle band taught in 90 degrees flexion
- Posterior band taught in full flexion
- Primary restraint to posterolateral instability


Anterior capsule
Radial collateral ligament
Annular ligament
Posterior capsule
Lateral ulnar collateral ligament

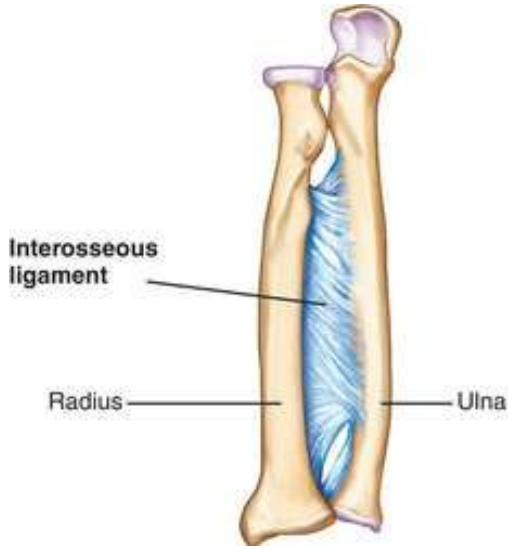
Annular Ligament

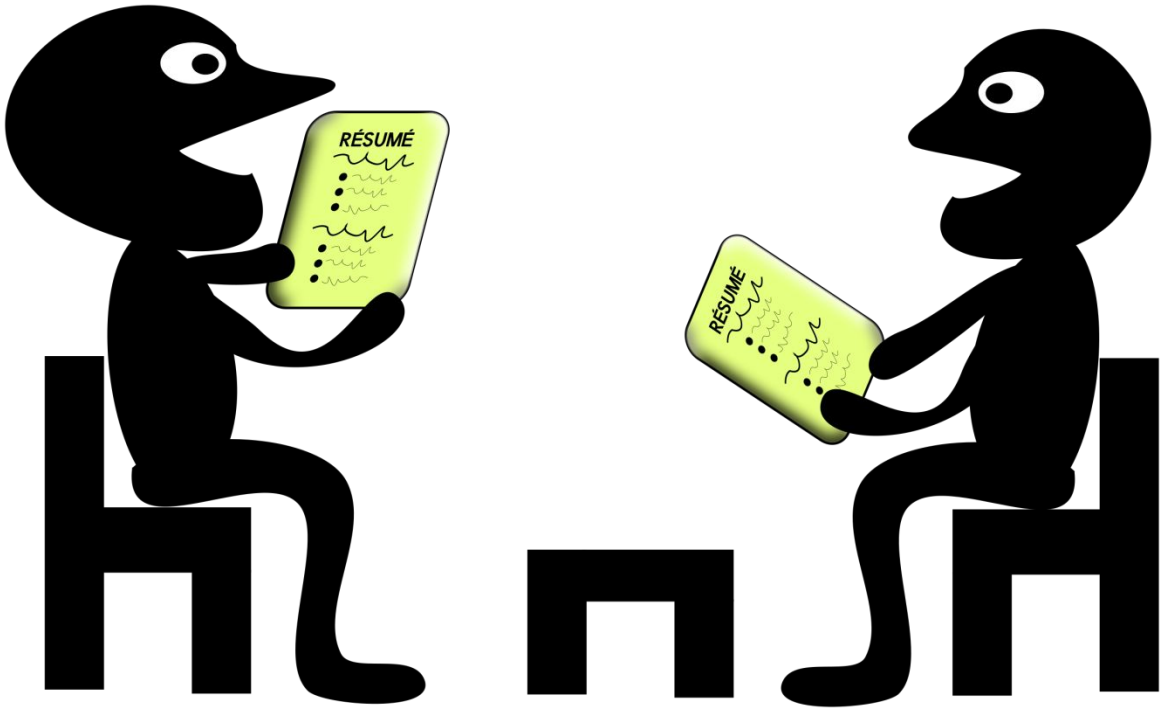
- Main stabilizer of SRUJ
- Encircles radial head and holds SRUJ together
- Bound to humerus via RCL
- Supinator blends with RCL and ligament



Interosseous Membrane

- 2 layers of fibers between ulna and radius
- Essential for maintaining the length relationship between the radius and ulna and stabilizes the forearm and DRUJ during pronation and supination




RÉSUMÉ
RÉSUMÉ

Q & A

- Age and occupation
  - Lateral epicondylitis
    - Commonly over 35, great deal of wrist flexion and extension
  - Dislocation of radius
    - Occurs in young children, complaints of elbow pain, often seen when child recieves a tug on the arm or trips while holding hands
  - Osteochondritis dissecans
    - Commonly between the ages of 15 -20

Mechanism of injury

- FOOSH, or fall on the tip of the elbow, catching ones self from falling or repetitive overuse in throwing sports
  - Severe Valgus force – sprain of ulnar collateral ligament, lateral side compression injury,
- Centralized pop and weakness of elbow flexion
  - Bicep tendon rupture

Other Questions

- How long have they had the problem?
- Does the condition come and go?
- What are the details of the present pain and other symptoms?
- Are there activities that make the pain worse?
- Positions that relieve pain?
- Any movements impaired?
- What is the patient unable to do functionally?
- Have current activities been altered?
- Any abnormal nerve distribution symptoms?
- Previous History?

Observation

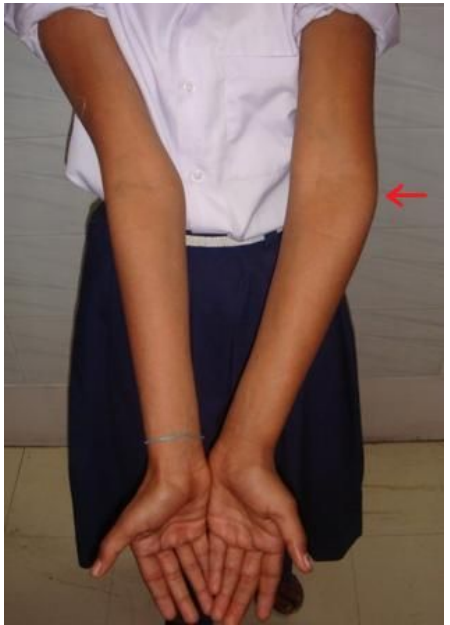
- Arms should be exposed. Shoulders and cervical regions should observed for possible referral of symptoms especially if a gradual start
- Items to note
  - Carrying angle
  - Color
  - Muscle mass
  - bruising
  - Normal functional position
  - Triangle swelling
  - Goose egg swelling over olecranon

Carrying Angle

- Anatomical position results in a carrying angle in the arm. It is the angle formed by the long axis of the humerus and the long axis of the ulna. Most evident in extension and supination
- In adults normal range
  - Men ~ 5 – 10 degrees
  - Women ~ 10 – 15 degrees
- Carrying angle greater than 15 results in Cubitius Valgus
- Carrying angle less than 5 results in cubitus varus – see page 393 magee

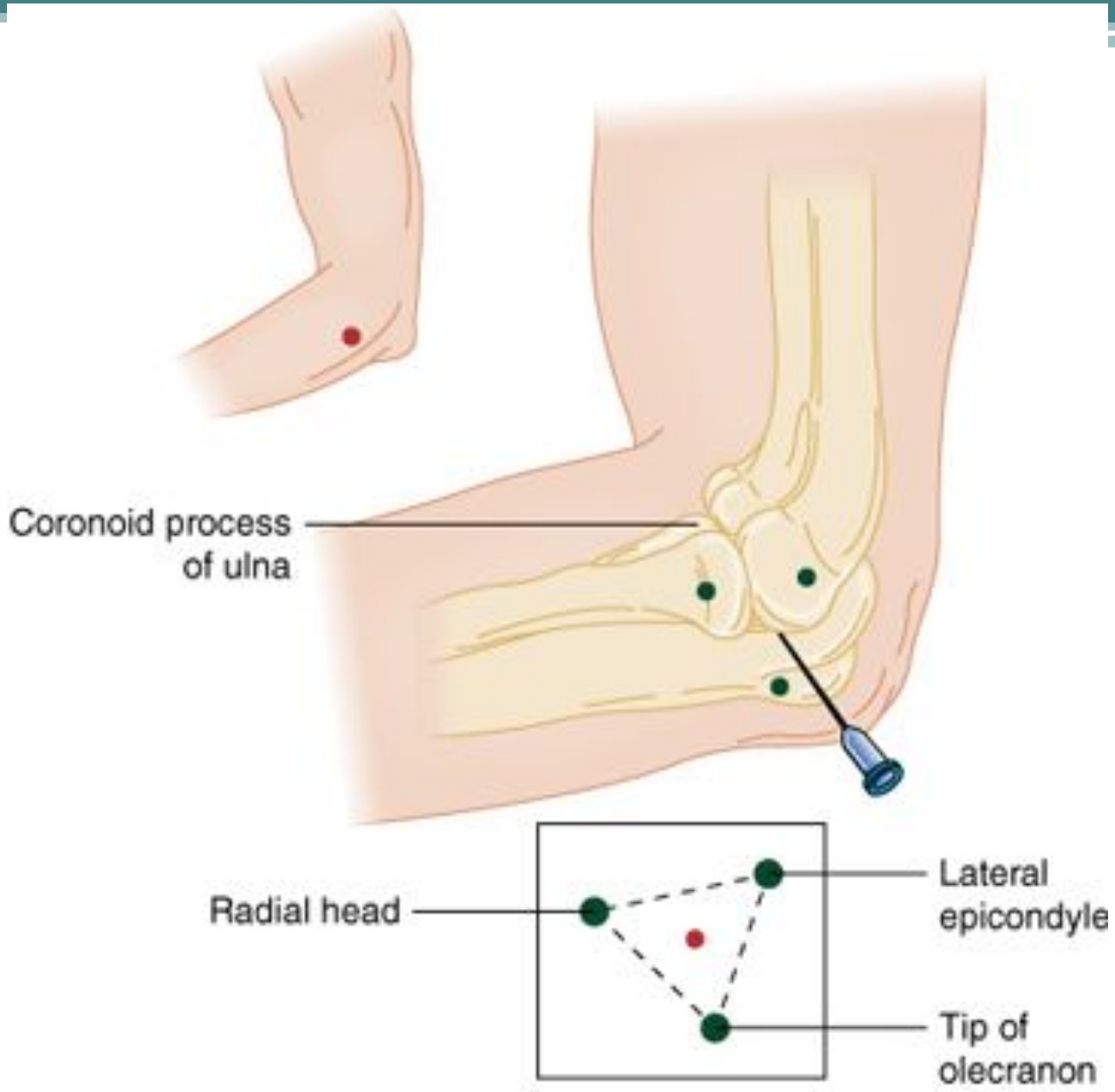
Gun stock deformity

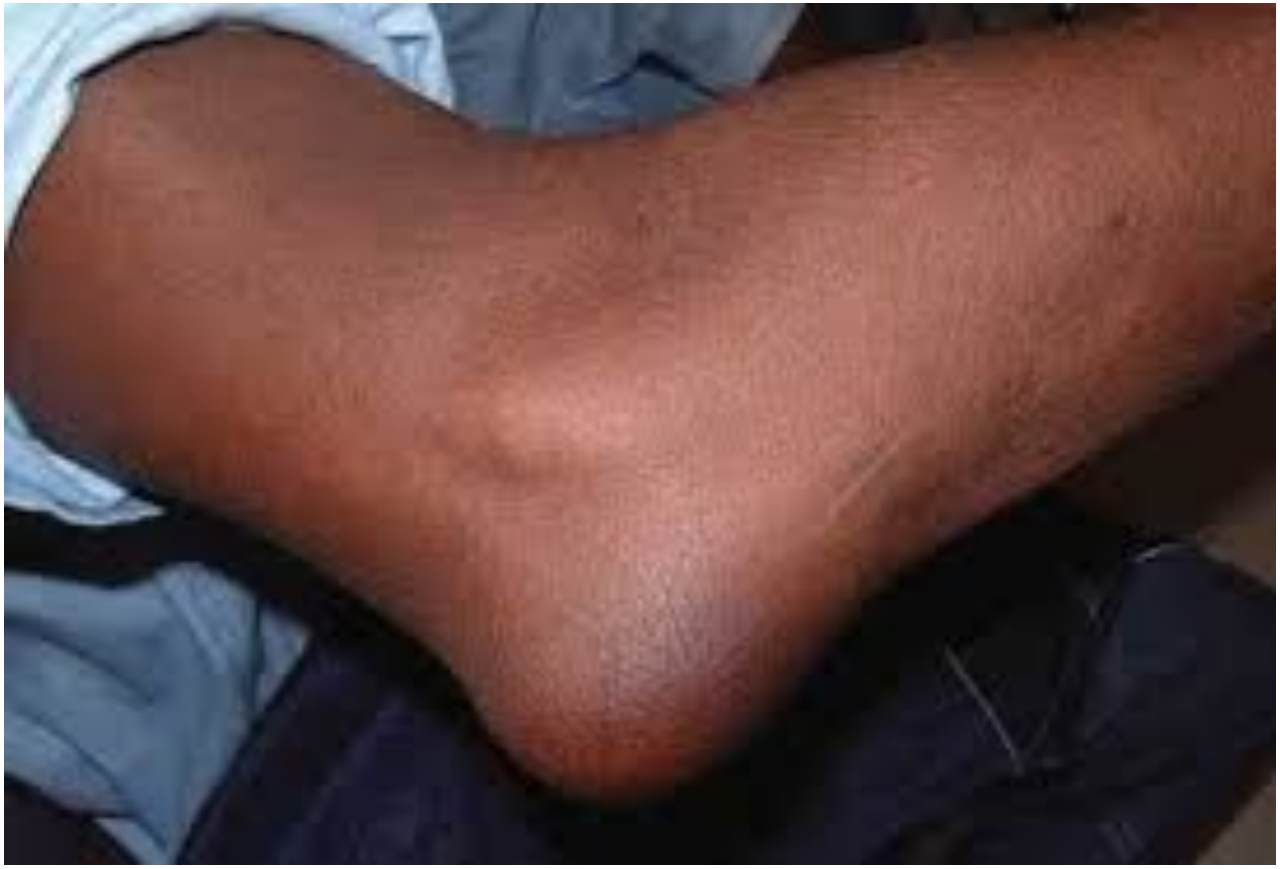
- Fracture or epiphyseal injury to the distal humerus and cubitus varus results a gun stock deformity may occur in full extension.



Swelling

- If swelling exists all three joints will be affected as they are located in the same joint capsule
- Intra articular swelling is most evident in the triangle created by the radial head, tip of the olecranon and the lateral condyle of the humerus
- Swelling from olecranon bursitis (Students elbow) appears more like a goose egg over the olecranon. With swelling like this the joint would be held in resting position


Coronoid process
of ulna
Radial head
Lateral
epicondyle
Tip of
olecranon



Normal Functional Position

- Can the client assume normal functional position of 90 degrees flexion and forearm midway between supination and pronation, or when slightly pronated as in when writing notes for ever and ever and ever. Adding shoulder flexion to this motion and increasing elbow flexion to 120 mimics eating. Supination decreases shoulders ability to flex

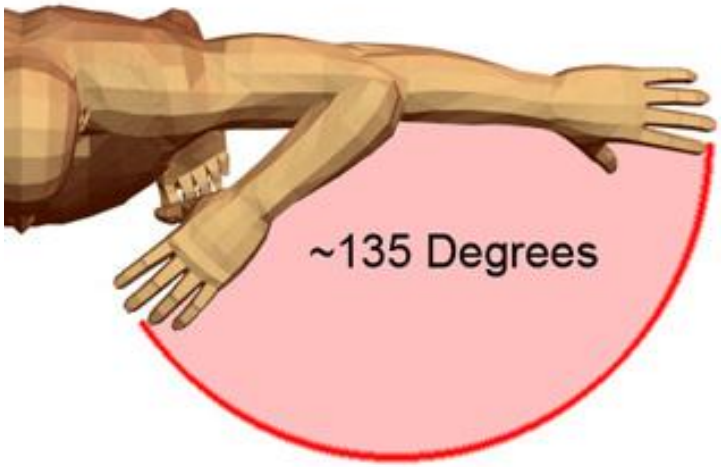
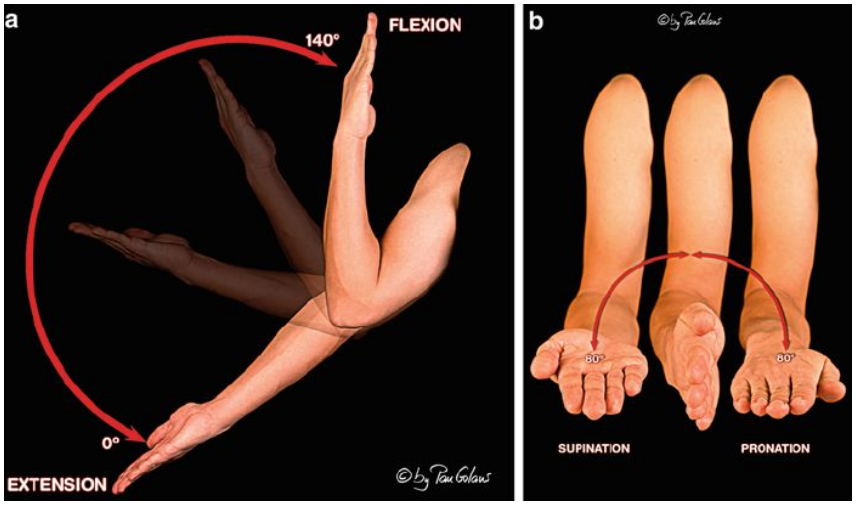


Fig. 3a

Degrees of Motion

- Flexion- 140-150
- Extension- 0-10
- Supination 90
- Pronation 80-90



Active Range of Motion

- Done seated
- Painful movements last
- Compare bilateral/unaffected side first
- Hyperextension of elbow is more common in women, normal if equal on both sides
- Loss of elbow extension is an indicator or intr-articular patholgy
- Shoulder adduction can be a trick movement for supination
- Shoulder abduction can be a trick movement for pronation

End Feels

- Flexion
  - tissue approximation
- Extension
  - Bony (hard)
- Supination/pronation
  - tissue stretch
- The capsular pattern – more Flexion then extension

Passive Range of Motion

- In thin individuals elbow flexion may have a bony end feel
- Evolve video

Resisted Isometric Movements

- Flexion strongest between 90 and 110
- Include Wrist Flexion/Extension because a large number of muscles act over the wrist as well as the elbow
- Evolve video

Special Tests & Conditions

Ligament Instability

- What is it?
  - Stretching or Tearing of the ligaments around the elbow, most commonly the Ulnar Collateral Ligament in throwers and golfers
    - Grade 1 – Slight Stretch of Ligament
    - Grade 2 – Partial tear of Ligament
    - Grade 3 – Full Rupture of Ligament
- How it happens?
- Injury occurs either secondary to a repetitive Stress or a Single Traumatic Event involving a Valgus or Varus Force

Special Test

- Ligamentous Valgus Instability Test
  - Client standing, therapist stabilizes just above the elbow and wrist. An abduction force is applied to the wrist while ligament is palpated
- Positive sign – excessive movement, altered pain when compared to other side

Ligamentous Varus Instability

- How its done?
  - Client standing, elbow flexed 20 – 30 degrees. Stabilized above wrist and LCL palpated. Adduction force applied to forearm
- Positive Sign
  - Increased laxity or soft end feel – Injury to ligament
  - May indicate posterolateral elbow instability-
    - which is the most common in the elbow (displacement of the ulna on the humerus accompanied by the radius) ulna laterally rotates away or off the trochlea)

Moving Valgus Test

- Patient supine or standing, arm abducted and fully flexed, while maintaining a valgus force examiner quickly extends the clients elbow
- Positive sign – Reproduction of pain between 70 and 120 degrees indicates partial tear of MCL

Lateral Epicondylitis

- Also known as – Tennis Elbow
- What is it?
  - Lateral Elbow pain secondary to tendinosus (Chronic Tendon Injury) or periostitis (inflammation of the periosteum)
- How Does it happen?
  - Most common occurs with over use that damages the common extensor tendon and Extensor Carpi Radialis Longus. Inflammation leads to micro tears and fibrosus

Risk Factors

- Repetitive over use of extension with alternating supination and pronation
- Micro tears in the tendon
  - Handling tools heavier than 1 KG
  - Handling loads of over 20 KG more than 10 times per day
  - Repetive movements more than 2 hours per day
    - Tennis, typing, hedge trimming, musical instruments

Palpation and Observation

- Observation
  - Usually no visible swelling or bruising
- Palpation
  - Localized tenderness to palpation just distal and anterior to lateral epicondyle

Movement

- AROM and PROM – Pain with Wrist flexion (due to the stretch occuring at the Extensor Carpi Radialis Brevis)
- RROM – Increased pain with resisted extension

Special Tests – Cozen's Test

- How its done?
  - Patients elbow stabilized by examiners thumb, which rests on patients lateral epicondyle, patients asked to make a fist, pronate the forearm, radially deviate and extend the wrist while the examiner resists the motion
- Positive sign – A sudden severe sharp pain in the area of the lateral epicondyle
  - The lateral epicondyle can be palpated to indicate origin of pain

Mill's Test

- How it's done?
  - While palpating lateral epicondyle examiner pronates patients forearm flexes wrist fully and extends the elbow
- Positive Sign – pain over lateral epicondyle. Also stresses radial nerve which may cause symptoms similar to tennis elbow. Electrodiagnosis differentiates between the two

Medial Epicondylitis

- Also known as Golfer's elbow
- What is it?
  - Medial elbow pain secondary to tendinosis
- How it happens
  - Repetitive use of flexor and pronator forearm muscles can cause micro trauma and inflammation as well as possible micro tears to the common flexor tendon of the forearm

Risk Factors

- Repetitive work or sport activity
  - Over head throwing
  - Racquet sports
  - Factory workers
  - Manual labourers
  - Office employees
  - Working with vibrating tools
  - Handling loads of 5kg 2 x per minute for a minimum of 2 hours at a time
  - High hand grip forces

Health History

- Medial elbow pain after activity without direct trauma
- Pain increases with flexion or pronation
- Occasional tingling sensation that radiates into their fourth and fifth fingers (suggest ulnar nerve involvement)

Observation and Palpation

- Observation
  - Look for signs of swelling, redness and warmth
- Palpation
  - Tenderness over medial epicondyle or common flexor tendon

Movement

- AROM and PROM – usually normal, possible pain with tendon stretch on PROM
- RROM may show weakness or pain with resisted wrist flexion

Special Test – Medial Epicondylitis Test

- How it's done?
  - Examiner palpates patients medial epicondyle, patients forearm passively supinated and the examiner extends the elbow and wrist
- Positive Sign
  - Pain over medial epicondyle of humerus

Cubital Tunnel Syndrome

- What is it?
  - Increase of pressure on the Ulnar Nerve at the elbow (cubital tunnel). Leads to pain and tingling in the 4^{th} and 5^{th} digits
- How it Happens?
  - The cubital tunnel is located just distal to the Ulnar groove and is created by the tendinous arch joining the humeral and ulnar heads of the flexor carpi ulnaris. The Ulnar nerve runs through here and compression tension on this nerve causes the symptoms

Risk Factors

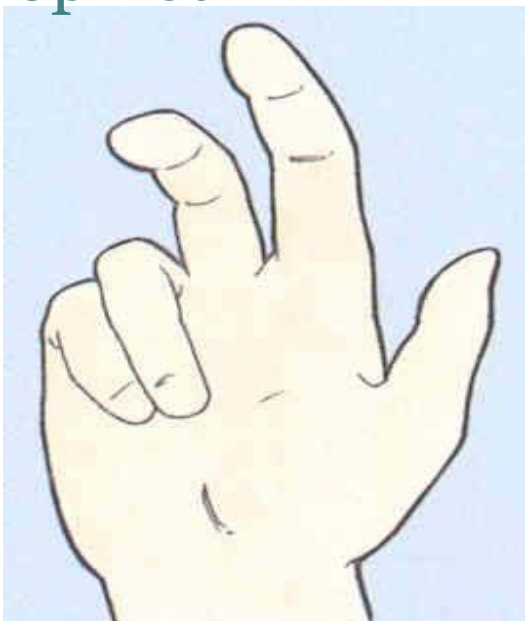
- Blunt trauma
- Consistent pressure on ulnar nerve at the elbow
- Prolonged hyperflexion – sleeping
- Repetitive elbow flexion and extension
- Inflammation of flexor carpri ulnaris

History

- Numbness and tingling at 4^{th} and 5^{th} digits and medial hand, may be burning
- May not be able to complete ADL due to weakness – dropping objects or weak grip
- Prior elbow trauma

Observation

- Observation
  - Cubitis Valgus
  - When condition has been occuring for a length of time intrinsic hand muscle may be atrophied
  - Possible claw hand or bishops hand



Palpation

- Direct pressure over the cubital tunnel will increase symptoms
- Inflammation of Flexor Carpi Ulnaris compared bilaterally

Special Tests – Elbow Flexion Test

- How its done?
  - Patient asked to fully flex elbow, extend wrist and depress shoulder, hold position for 3 – 5 minutes
- Positive sign
  - Tingling or paresthesia in ulnar nerve distribution

Tinnels Sign -Elbow

- How it's done?
  - Patient seated, examiner taps 4- 6 times over cubital tunnel (This is the groove that is located between the Olecranon process & medial epicondyle) with the fingers or reflex hammer
- Results – Positive sign – Shooting Electrical pain along the medial side of the forearm to the medial Hand **Indicates** – Ulnar compressive neuropathy
- Test indicates the point of regeneration of the sensory fibers of nerve. Most distal point of abnormal sensation indicates the limit of the nerve regeneration
- High rate of false positives as this is similar to hitting your funny bone

Pressure Provocation Test

- How its done?
  - Patient Seated, Standing or Supine elbow flexed to below 80, forearm supinated
  - Examiner places finger over ulnar nerve just proximal to the cubital tunnel and hold pressure for 60 seconds or less
- Results – Positive Sign – numbness or tingling in the Ulnar nerve distribution **Indicates** – Cubital Tunnel Syndrome

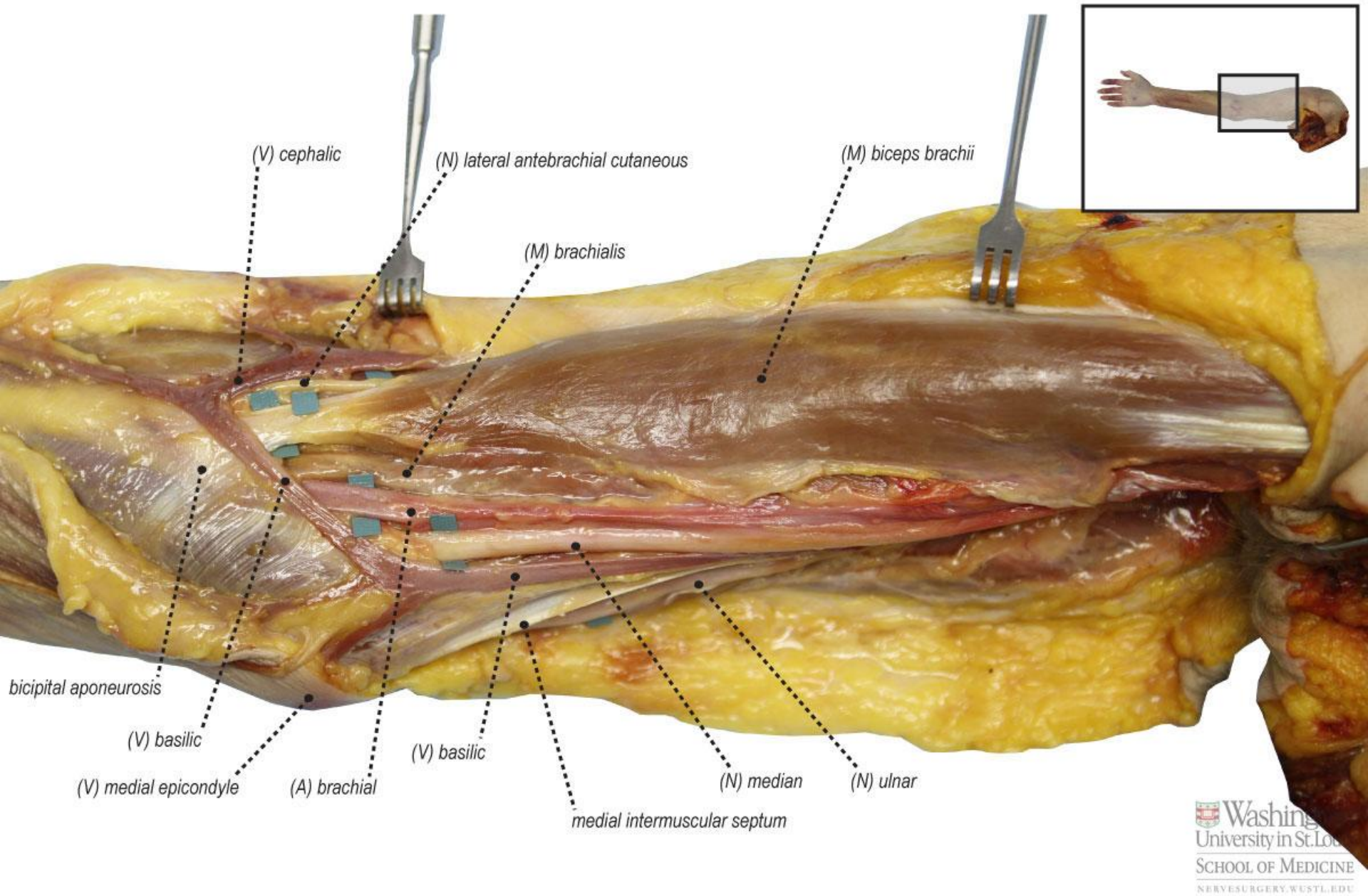
Peripheral Nerve Injuries

Median Nerve

- Can be injured by trauma, systemic disease and compression/traction
- Can be compressed or pinched above the elbow by the ligament of struthers (only found in 1% of the population) leading to motor and sensory loss
- Also can be compressed between the 2 heads of pronator teres which is called pronator syndrome leading to motor and sensory loss

Anterior Interosseus Nerve

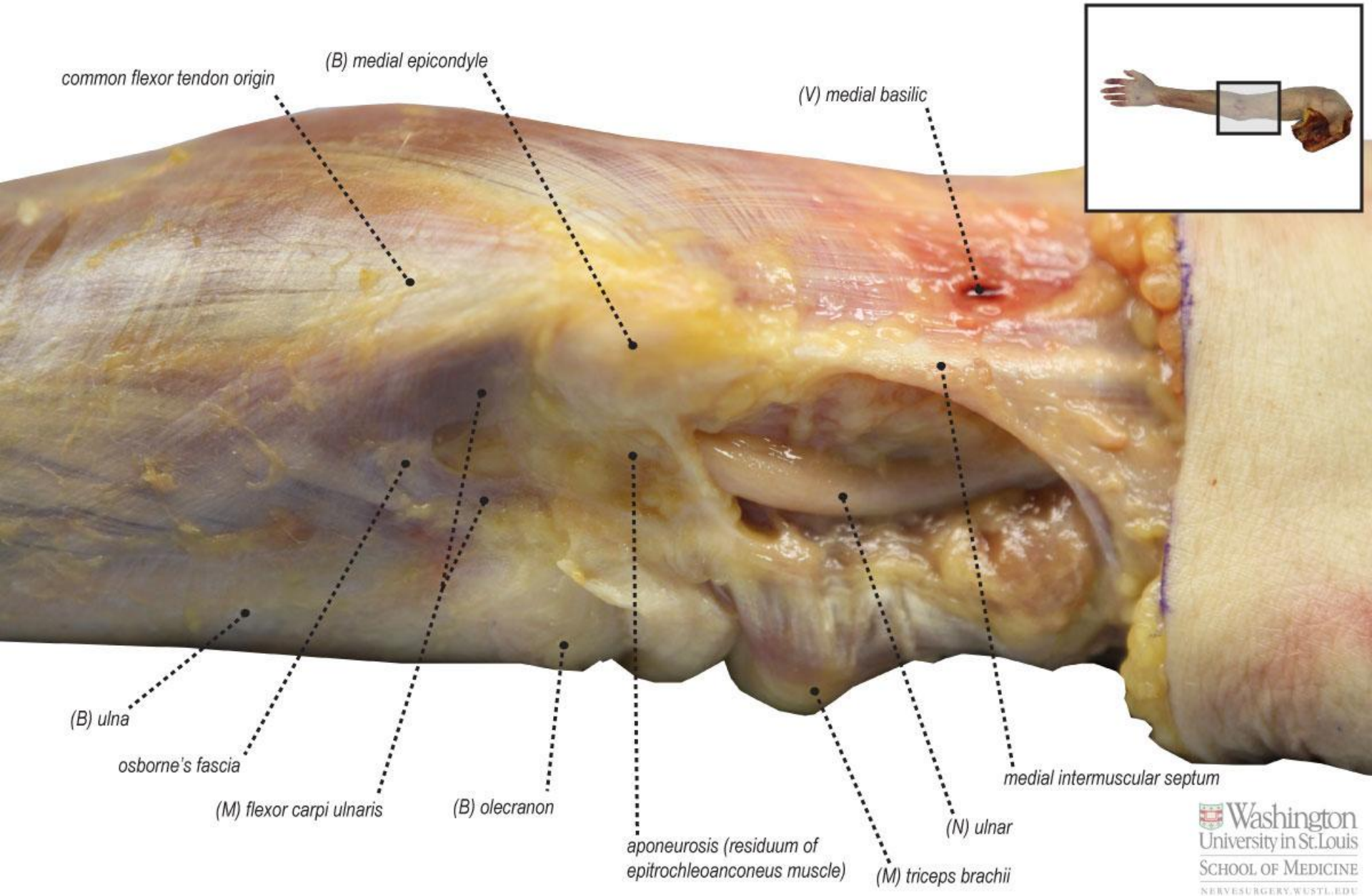
- Is a branch of the median nerve is sometime pinched as is passes between the heads of pronator teres, leading to pain and functional impairment which is called anterior interosseus nerve syndrome
- This nerve can also be injured with a forearm fracture
- No sensory loss; signs and symptoms are related to motor function



http://nervesurgery.wustl.edu/NerveImages/Anatomy%20and%20Physiology/AP-Median-Nerve---IMG

Ulnar Nerve

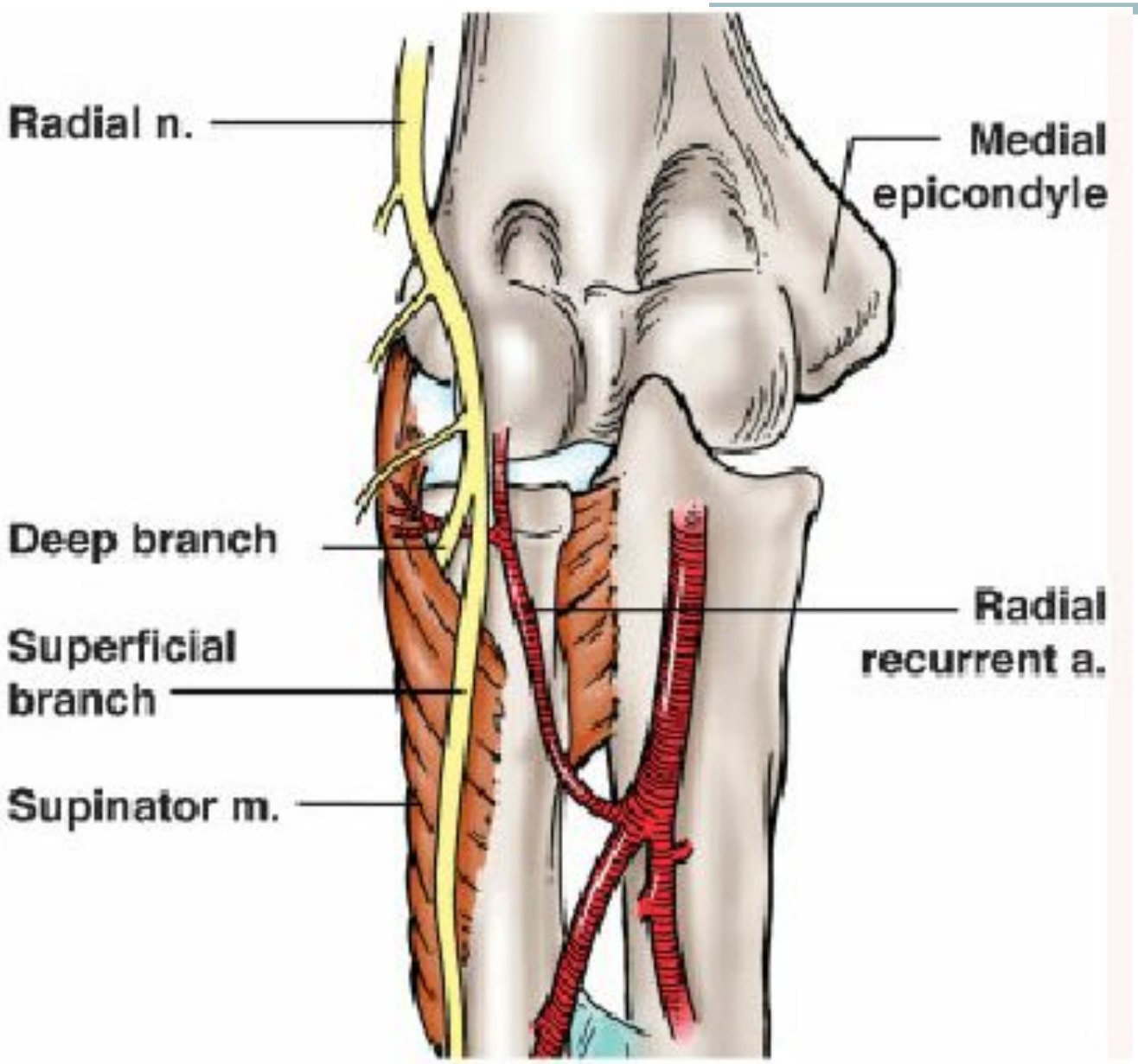
- Most likely to be injured in the elbow region
- Second only to carpal tunnel
- Can be injured or compressed due to swelling, osteophytes, arthritic diseases, trauma or repeated micro trauma
- Compression occurs between the 2 heads of flexor carpi ulnaris



http://nervesurgery.wustl.edu/NerveImages/Anatomy%20and%20Physiology/AP-Ulnar-Nerve---IMG_

Radial Nerve

- Can be injured if there is a fracture of the shaft of the humerus (either at time of fracture or during the healing process due to callus formation)
- Posterior interosseus nerve, a branch of the radial nerve can be compressed between the 2 heads of supinator
- Can also be compressed at the entrance of the tunnel anterior to the head of the radius
- Compression can also occur to the superficial branch of the radial nerve as it passes under the tendon on brachioradialis, only leading to sensory loss


Radial n.
Medial epicondyle
Deep branch
Radial recurrent a.
Superficial branch
Supinator m.

Special Tests for peripheral nerve Injury

- Pinch Grip Test
- Tests for pathology of the anterior interosseous nerve (branch of median nerve, mainly motor)
  - Client is asked to pinch the tips of the index finger and thumb together
  - Normally there should be a tip-to-tip pinch
  - If the client is unable to pinch tip to tip it is an indication of a pathology of the median nerve specifically the anterior interosseous portion as it passes between the 2 heads of pronator teres

Reflexes

- Biceps (C5 C6)
  - Therapist places their thumb over the client biceps tendon and then tapping nail with the reflex hammer to elicit the reflex
- Brachioradialis (C5 C6)
  - Therapist located the brachioradialis tendon and directly taps the tendon to elicit the reflex
- Triceps (C7 C8)
  - Therapist located the triceps tendon and directly taps the tendon to elicit the reflex

ULTT's

- Review
- Name the position of 1 – 4?
- What movement is performed last?
- What movement of the arm is performed last?

ULTT's

ULTT 1 (Median Nerve) "Set bird free"

- Shoulder ABD 110 degrees with elbow flexed to 90 degrees
- Extend wrist and fingers
- ER shoulder
- Supinate forearm
- Elbow extension

ULTT 2 (Median Nerve) "Throw it away"

- Shoulder depression
- Elbow extension
- ER shoulder with caudal hand
- Wrist and finger extension
- ABD shoulder 10 degrees

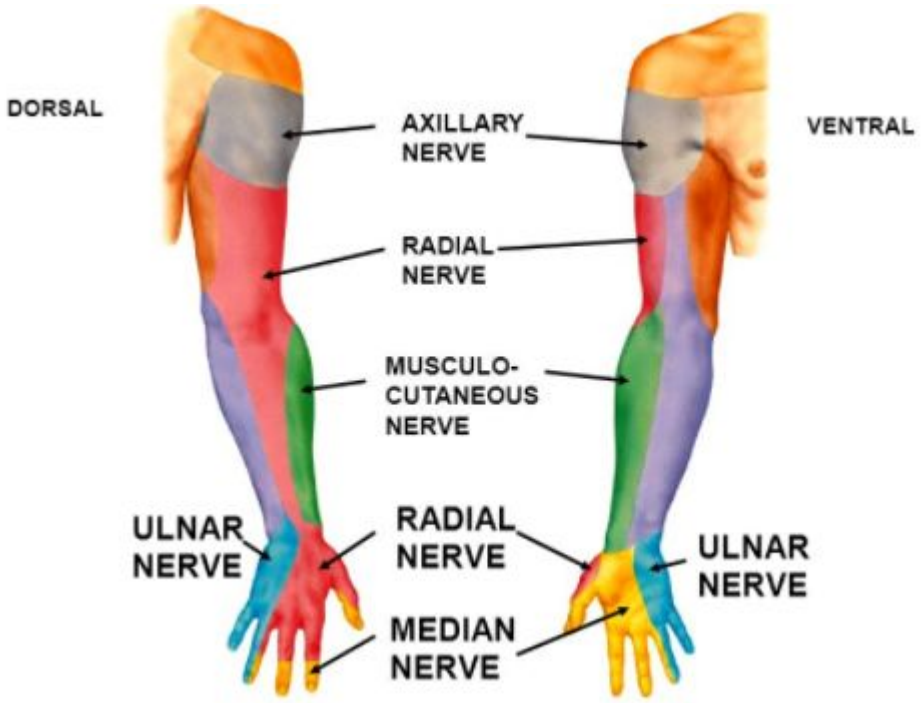
ULTT 3 (Radial Nerve) "Passing the baton"

- Shoulder depression
- Shoulder IR
- Wrist and finger flexion
- Elbow extension

ULTT4 (Ulnar Nerve) "Carrying a tray"

- Wrist and finger extension
- Supinate forearm
- Elbow flexion
- Shoulder ER/ABD

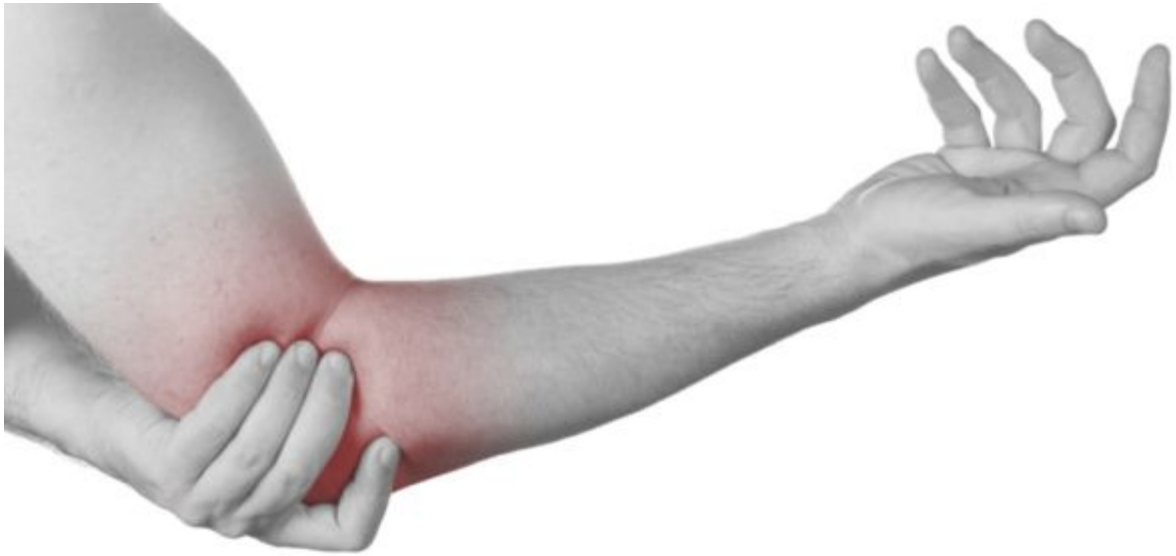
Dermatomes


DORSAL
AXILLARY NERVE
VENTRAL
RADIAL NERVE
MUSCULO-CUTANEOUS NERVE
ULNAR NERVE
RADIAL NERVE
ULNAR NERVE
MEDIAN NERVE

Cervical Dermatomes

- C1- Top of head
- C2- Face and upper neck
- C3- Anterolateral neck
- C4- UFT, ACJ, SCJ, clavicle
- C5- Lateral shoulder, brachium, forearm, outcroppers
- C6- Biceps, antecupital fossa, digits 1-2
- C7- Triceps, wrist extensors, into digits 2-4
- C8- Hypothenar eminance, into digits 4-5
- T1- Medial aspect of forearm and wrist

Elbow muscles referral of pain

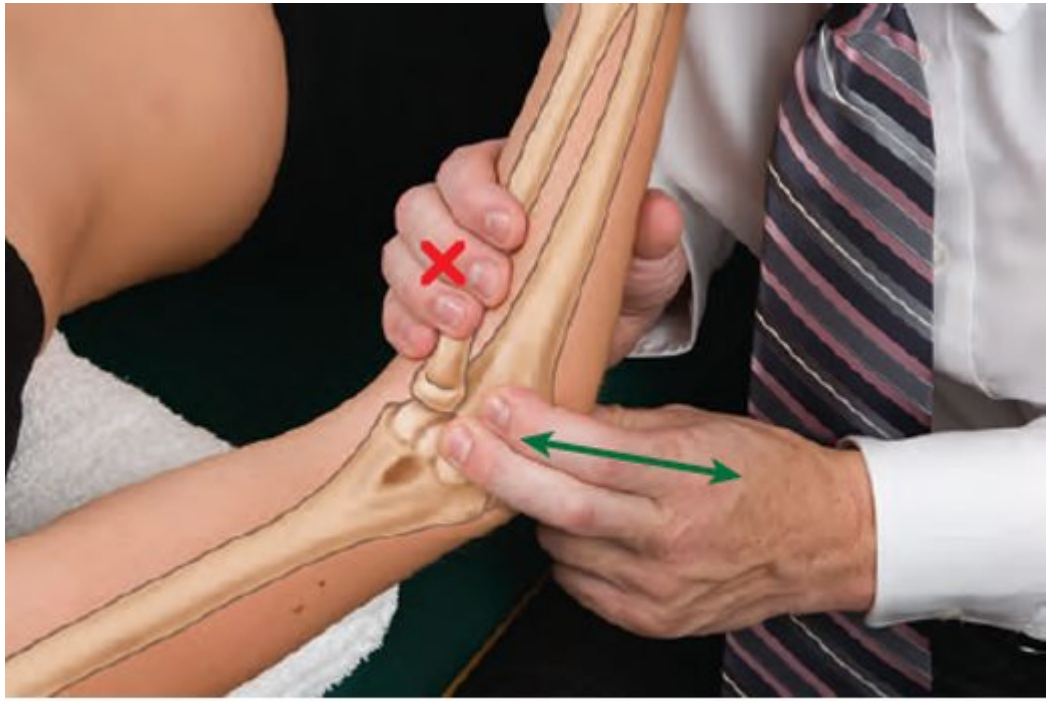


- Biceps – upper shoulder, bicep groove to anterior elbow
- Brachialis – anterior arm , elbow the lateral thenar eminence
- Triceps – posterior shoulder, arm, elbow, and forearm to medial two finger, medial epicondyle
- Brachioradialis – lateral epicondyle and lateral forearm to posterior web space b/w thumb and index finger
- Anconeus – Lateral epicondyle area

Continued

- Supinator – Lateral epicondyle and posterior web space
- Pronator teres – anterior forearm to wrist and part of ant. Thumb
- ECU – Medial wrist
- ECRB – Posterior forearm to posterior wirst
- ECRL – Lateral epicondyle to posterolateral wrist
- EI – posterior forearm to Index finger
- PL- anterior forearm to palm
- FDS – Palm to appropriate digit
- FCU & FCR - anteromedial wrist
- Remember that pain from the cervical area and upper extremity as well as the wrist can refer to the elbow region

Joint Play



Available Joint play movements of the Elbow complex

- Radial deviation of the ulna and radius on the humerus
- Ulnar deviation of the ulna and radius on the humerus
- Distraction of the Olecranon from the humerus in 90 degree flexion
- Anteroposterior glide of the radius on the humerus

https://youtu.be/GxyxvcIEE-E