



Arthrokinematics, Injuries & Manual Therapy for the Elbow

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Learning Objectives

To understand the way the elbow moves.

To review common injuries to the elbow.

To prepare for practice of manual therapy for the elbow.

Overview

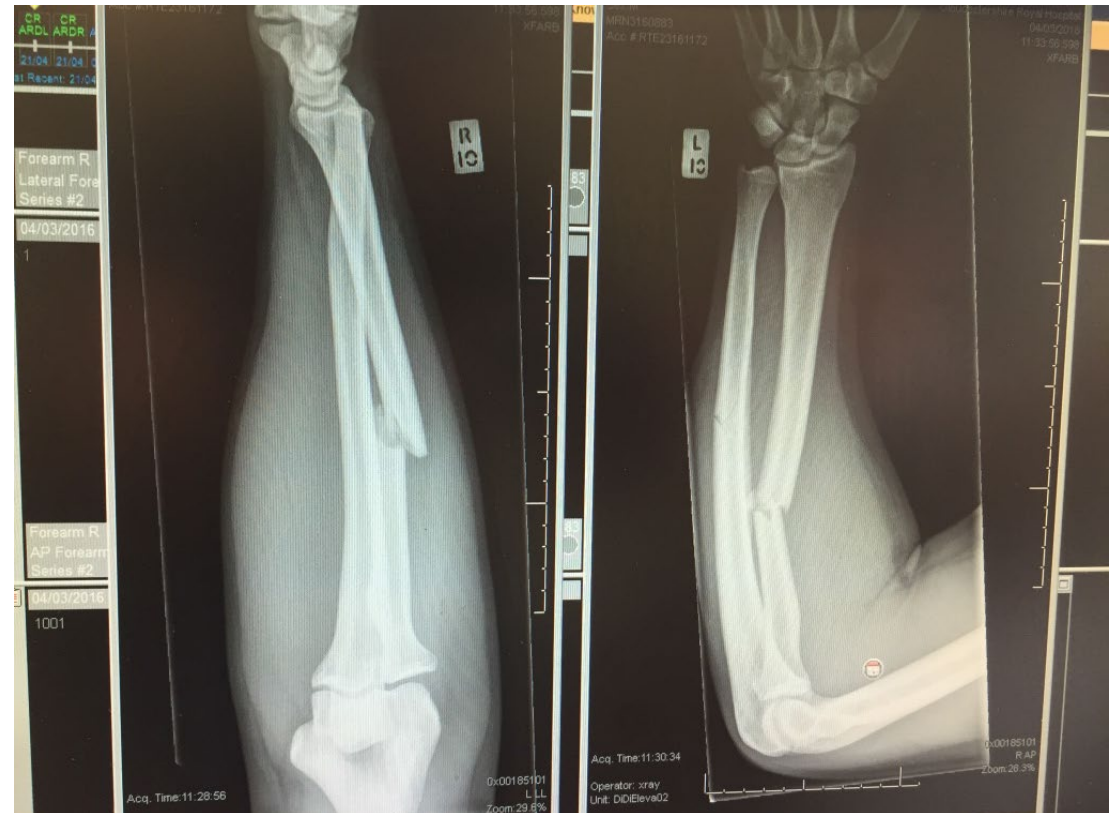
A story

Arthrokinematics

Injuries

Manual Therapy

Start with a story



Arthrokinematics

The image shows a metal hinge assembly, likely a knee joint prosthesis. The hinge consists of two metal plates connected by a central cylindrical rod. The top plate has three circular holes and a rectangular label with the text "CE 1121", "GRADE 1", and "EN1935". The bottom plate has four circular holes and a circular label with the text "WARRANTY", "10 YEARS", and "1997". The word "Arthrokinematics" is overlaid in white text across the center of the image.

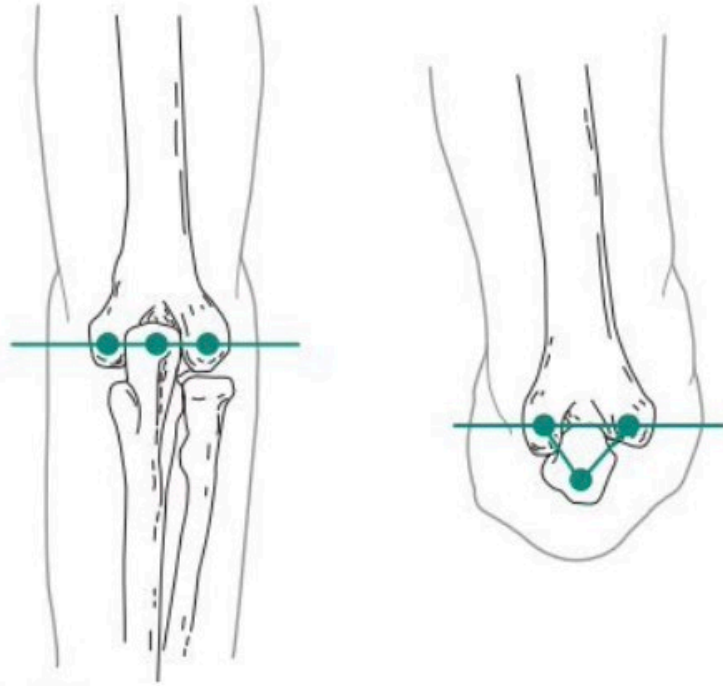
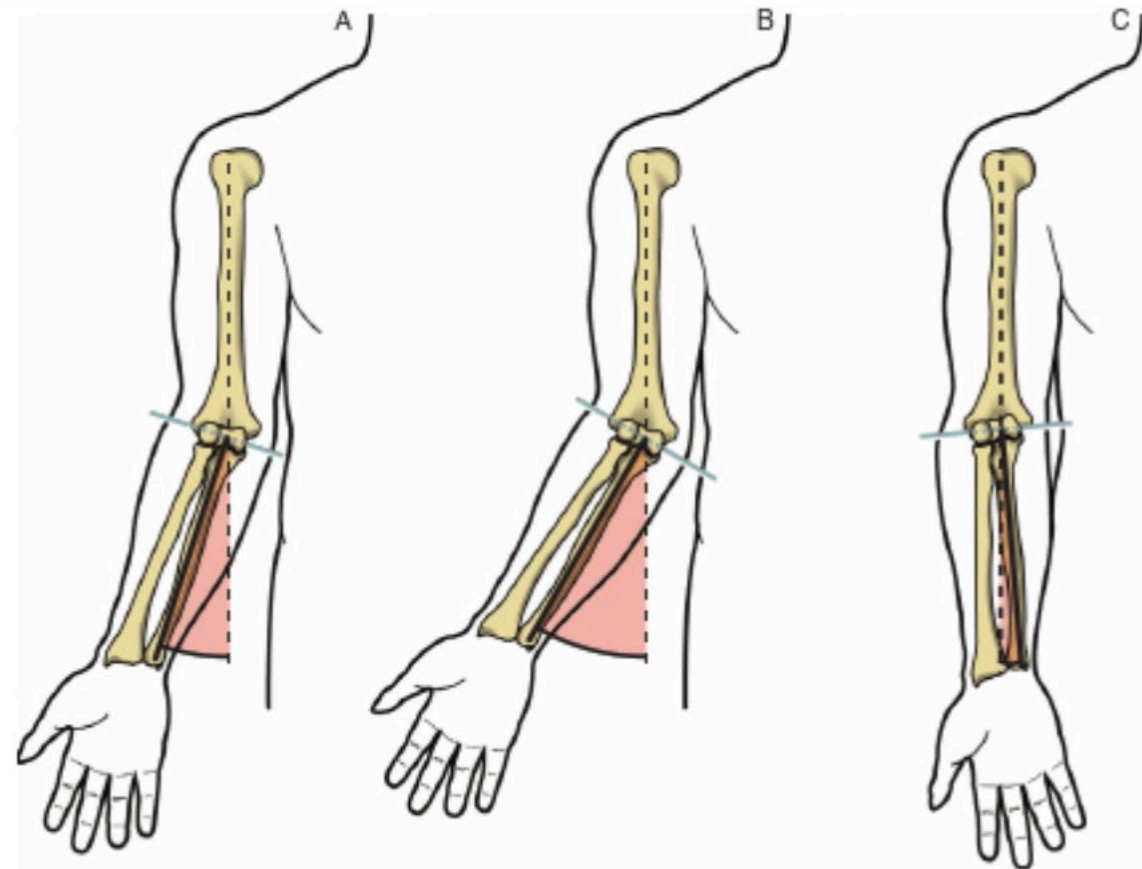


FIG. 10.1 The position of the olecranon and medial and lateral epicondyles should form a straight line with the elbow in extension and an isosceles triangle with the elbow flexed to 90°. (From Magee 2014, with permission.)



Normal cubitus valgus

Excessive cubitus valgus

Cubitus varus

FIGURE 6-9. **A,** The elbow's axis of rotation (green line) extends slightly obliquely in a medial-lateral direction through the capitulum and the trochlea. Normal cubitus valgus of the elbow is shown with an angle of about 15 degrees from the longitudinal axis of the humerus. **B,** Excessive cubitus valgus deformity is shown with the forearm deviated laterally 30 degrees. **C,** Cubitus varus deformity is depicted with the forearm deviated medially 5 degrees.

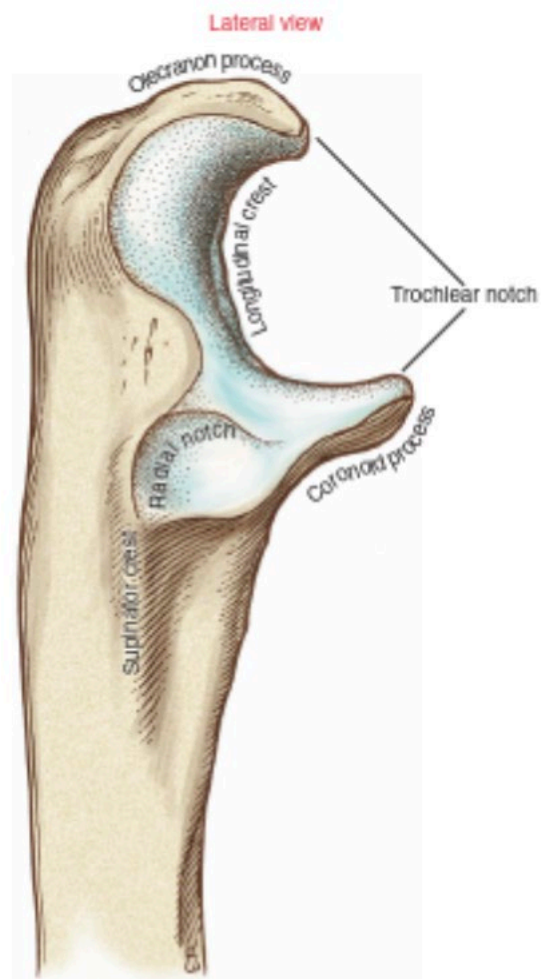


FIGURE 6-7. A lateral (radial) view of the right proximal ulna, with the radius removed. Note the jawlike shape of the trochlear notch.

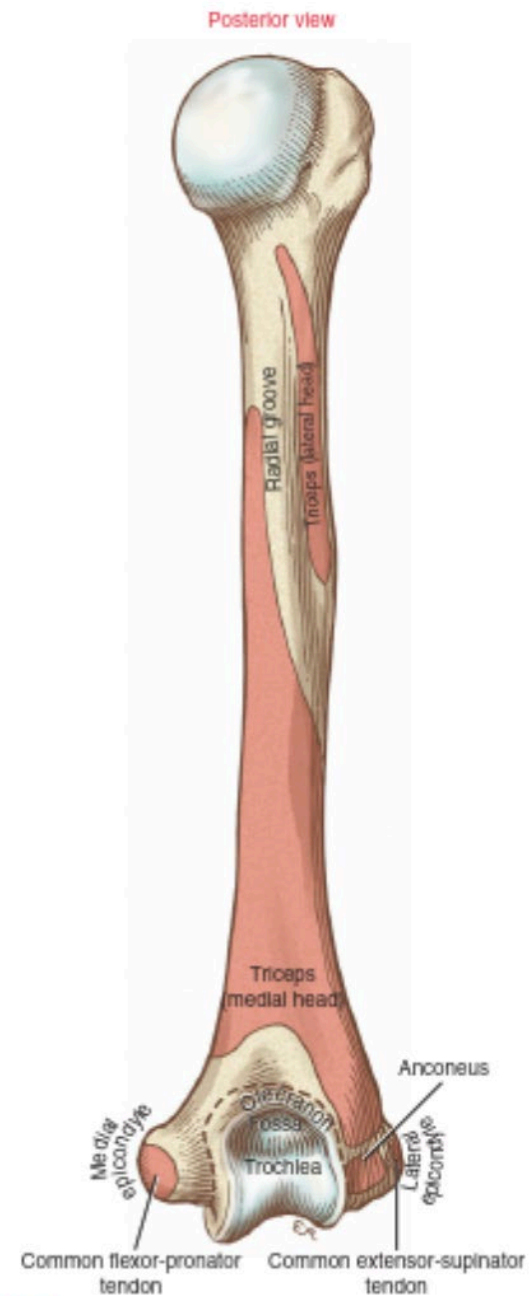
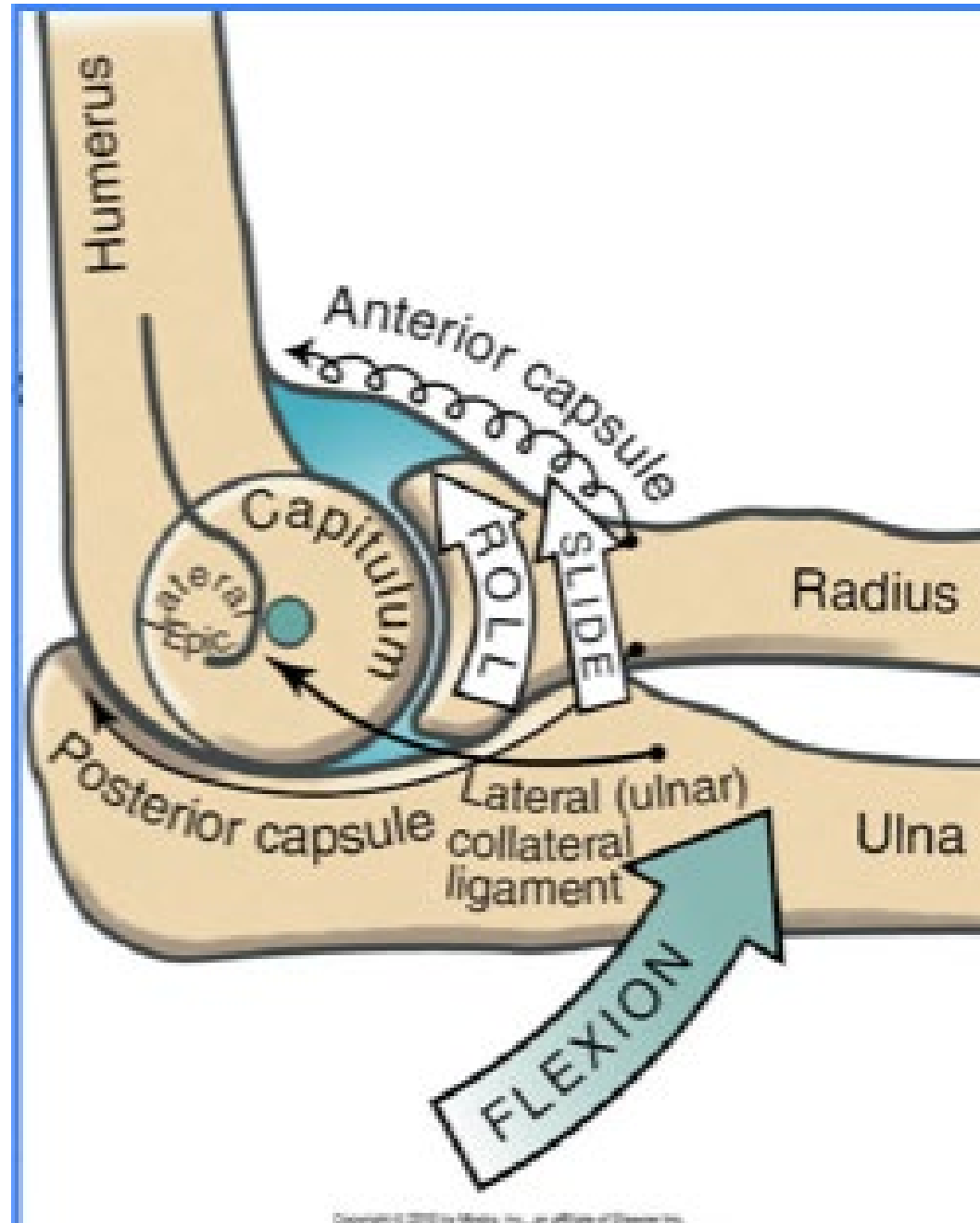
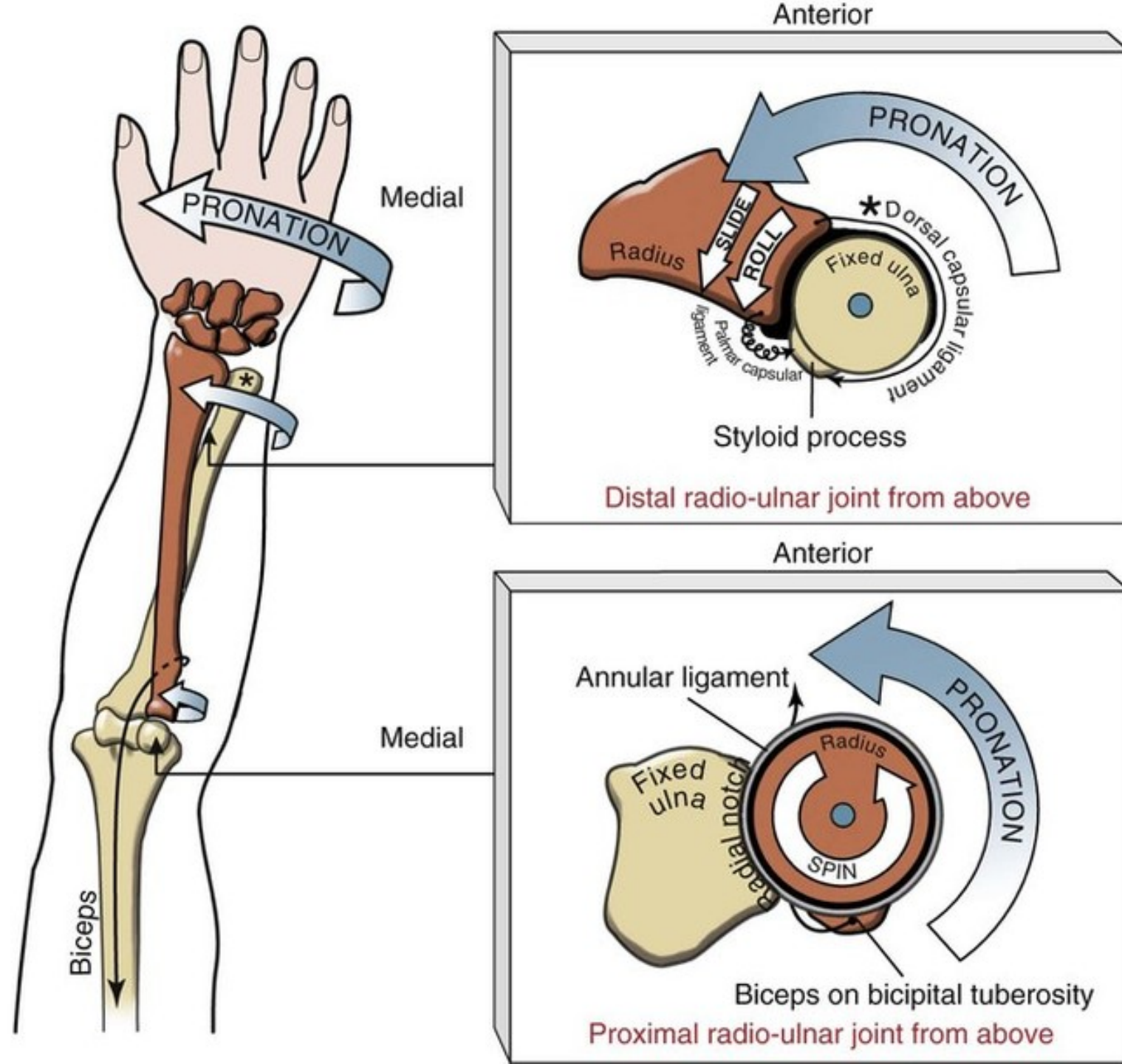


FIGURE 6-3. The posterior aspect of the right humerus. The muscles' proximal attachments are shown in red. The dashed lines show the capsular attachments around the elbow joint.





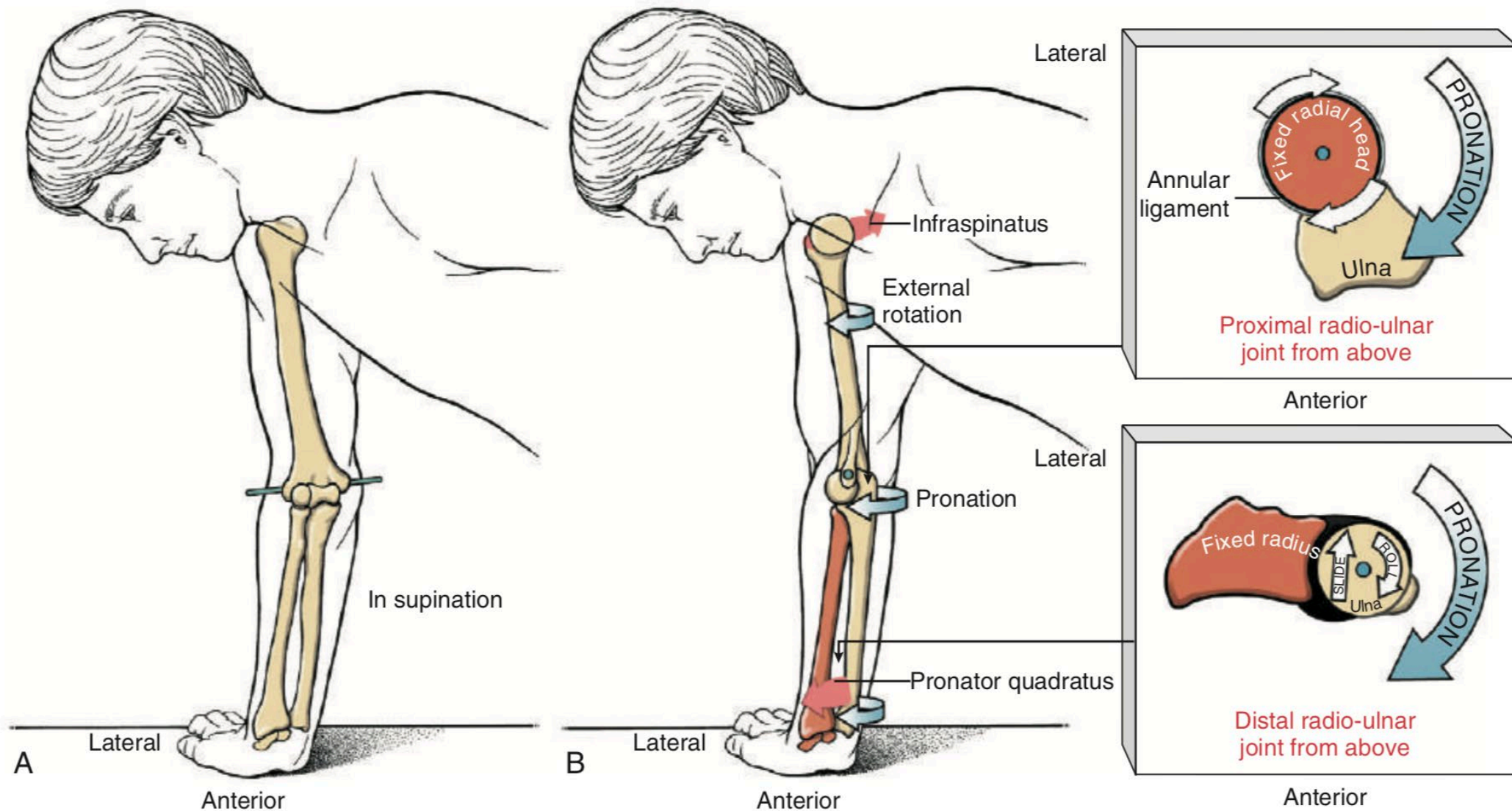
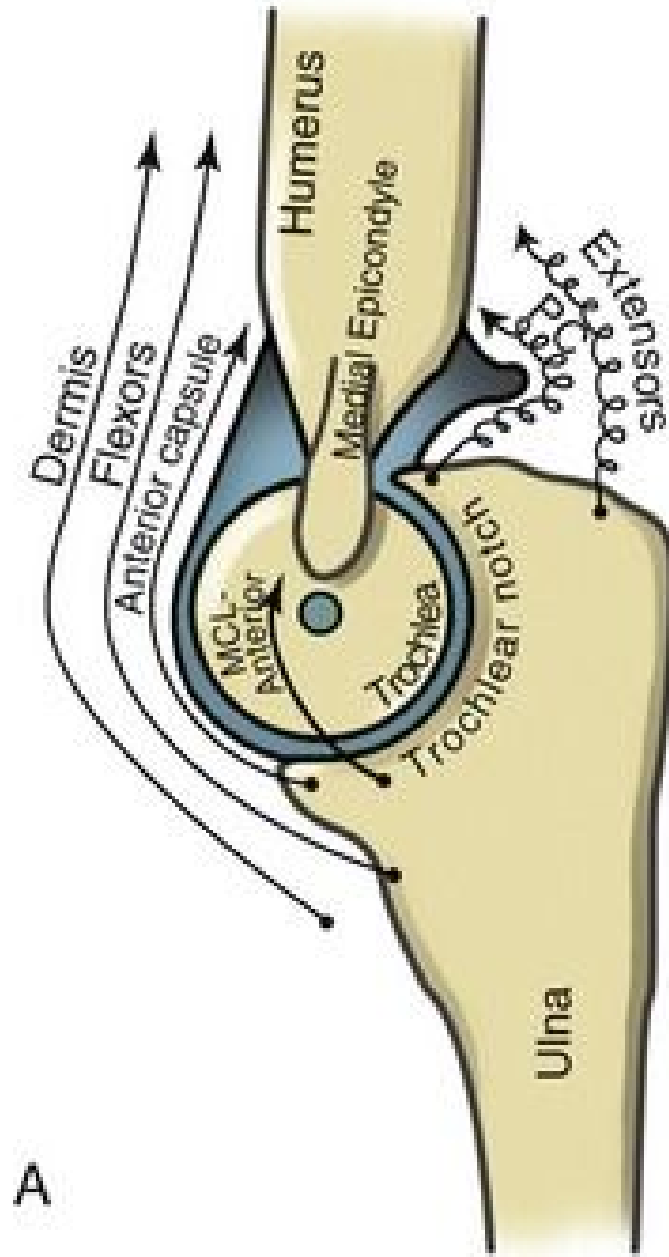
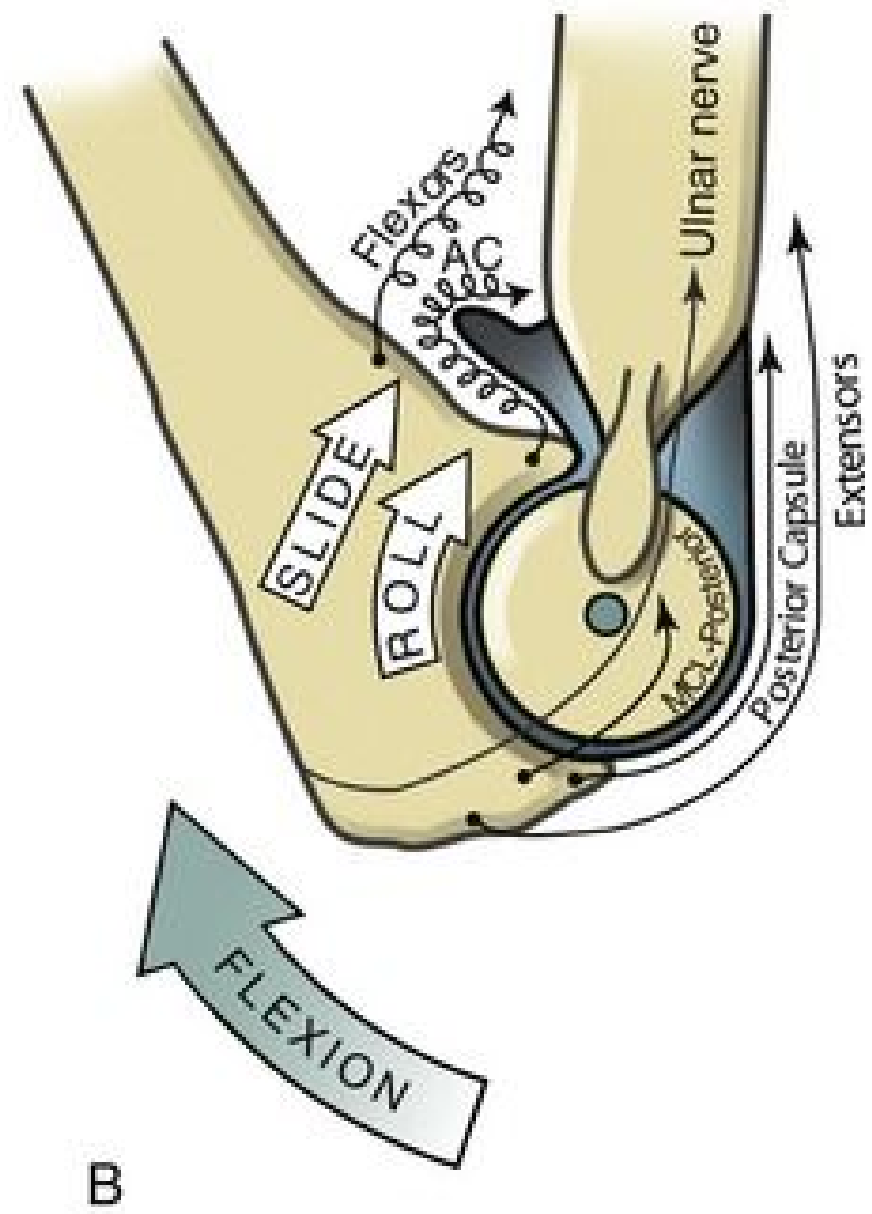


FIGURE 6-31. **A**, A person is shown supporting his upper body weight through his right forearm, which is in full supination (i.e., the bones of the forearm are parallel). The radius is held fixed to the ground through the wrist; however, the humerus and ulna are free to rotate. **B**, The humerus and ulna have rotated about 80 to 90 degrees externally from the initial position shown in **A**. This rotation produces pronation at the forearm as the ulna rotates around the fixed radius. Note the activity depicted in the infraspinatus and pronator quadratus muscles. The two insets show a superior view of the arthrokinematics at the proximal and distal radio-ulnar joints.



Resting in extension



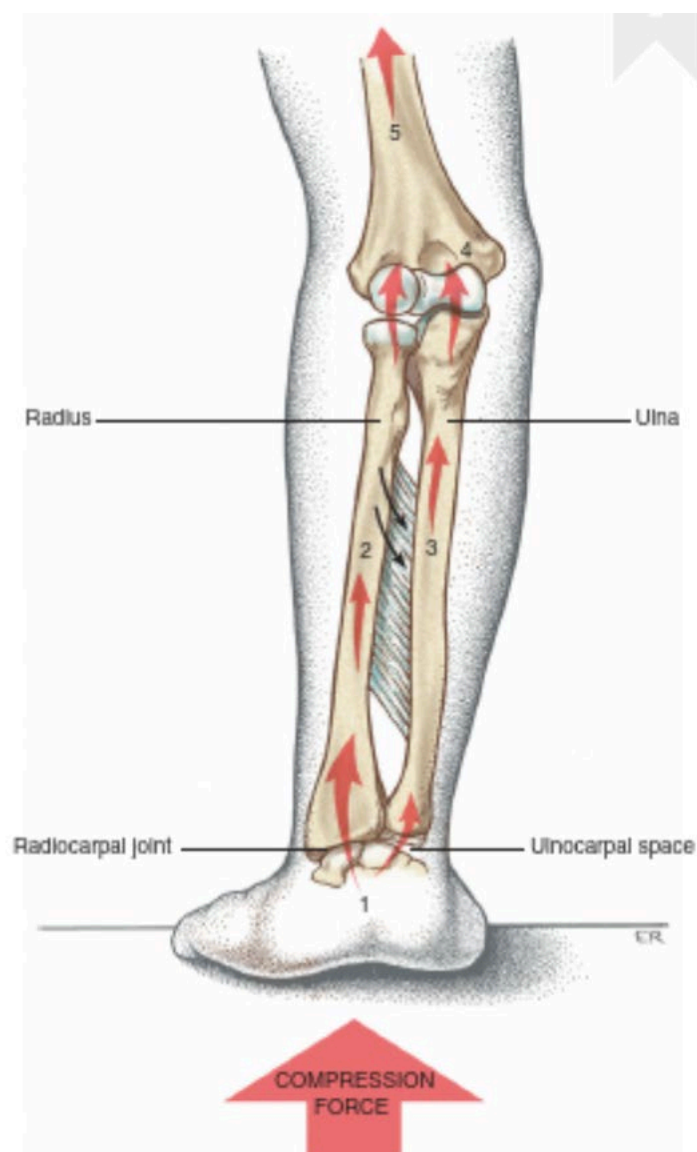


FIGURE 6-21. A compression force through the hand is transmitted primarily through the wrist (1) at the radiocarpal joint and to the radius (2). This force pulls the interosseous membrane taut (shown by two black arrows), thereby transferring a significant part of the compression force to the ulna (3) and across the elbow at the humero-ulnar joint (4). The compression forces that cross the elbow are finally directed toward the shoulder (5). The stretched (taut) structures are shown as thin elongated arrows.

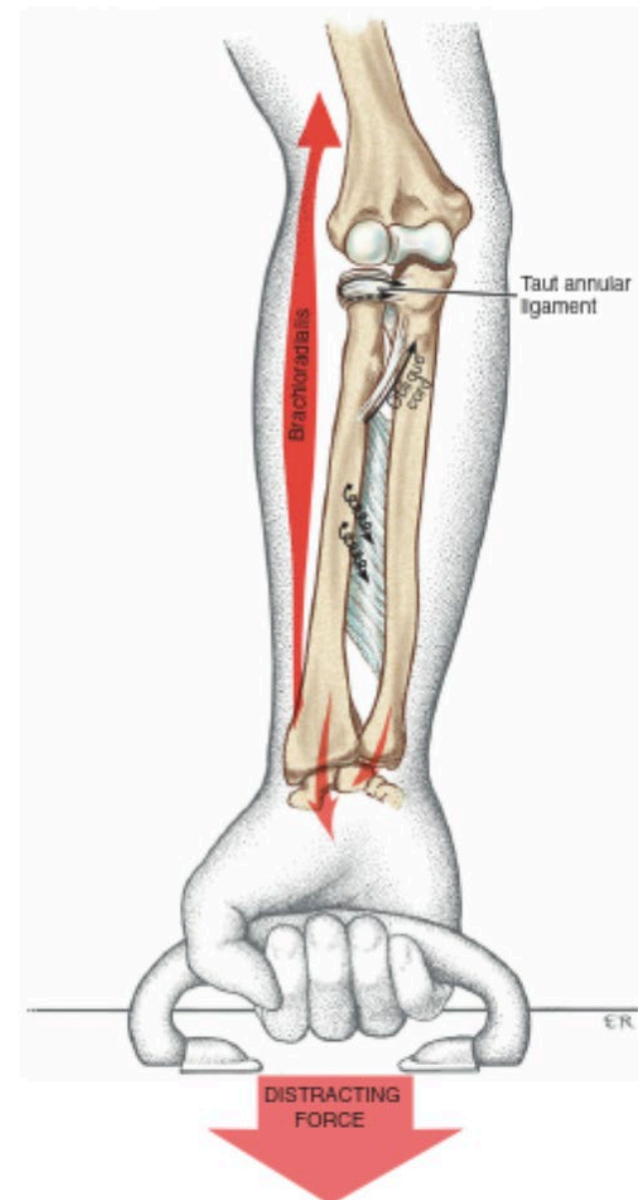


FIGURE 6-22. Holding a load, such as a suitcase, places a distal-directed distracting force predominantly through the radius. This distraction slackens most of the interosseous membrane (shown by wavy arrows over the membrane). Other structures, such as the oblique cord, the annular ligament, and the brachioradialis, must assist with the support of the load. The stretched (taut) structures are shown as thin elongated arrows, and the slackened structures are shown as wavy arrows.

A man with short grey hair, wearing a blue martial arts gi, is captured in a moment of intense physical effort. He is crouching and using his right fist to smash through a stack of red bricks. His facial expression is one of strain and determination, with his mouth open in a shout or yell. His left hand is held out flat to the side. The background is dark and out of focus, suggesting an indoor training space. The word "Injuries" is superimposed in white text over the center of the image.

Injuries

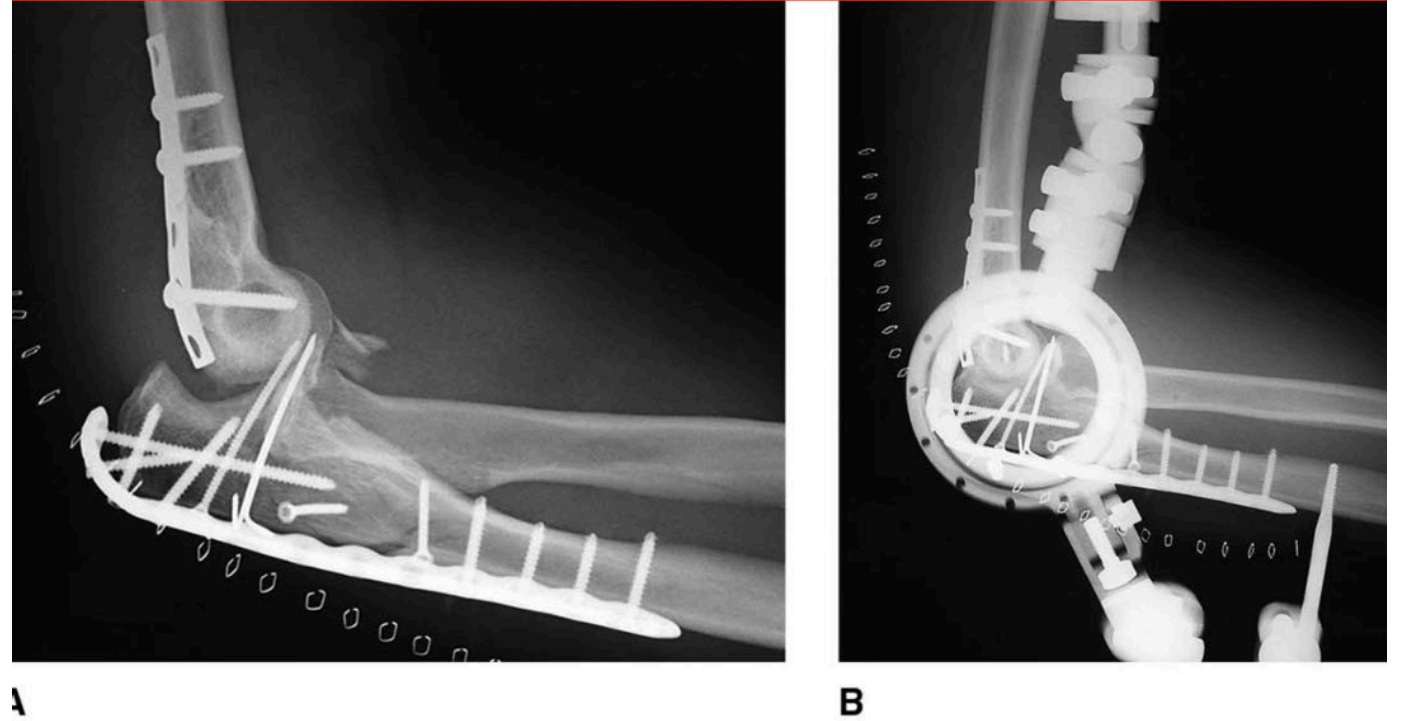
Elbow Dislocation



Elbow Dislocation

- Second most common dislocation
- Fall with elbow in [hyper]extension
- Simple or complicated
- Complete ligamentous tears were more common on the medial versus the lateral side in simple dislocations.

Figure 6



Lateral radiographs of the elbow demonstrate a complex elbow dislocation following open reduction and internal fixation (A) and application of an external fixator for residual elbow instability (B).

Tennis Elbow

- Lateral compartment overload
- Rotational activation of forearm and upper arm in tennis
- Insidious:
 - Loaded and repeated gripping occupations.
 - Overhitting, hitting late, into wind, wet balls.
 - Microscopic insult
- Acute
 - Macroscopic failure
- Insertional or midsubstance
- Grip or serve agg? Serve is like throwing.
- Ax Cx and shoulder TrP

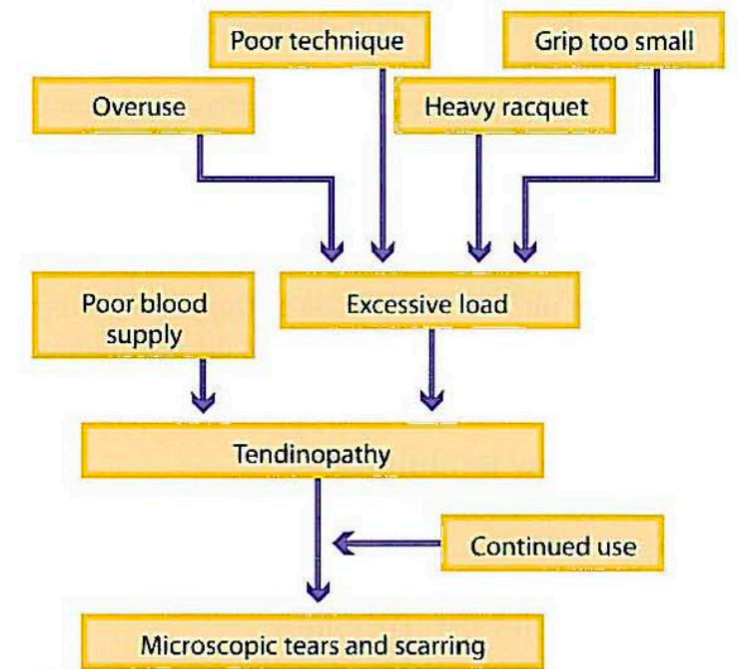
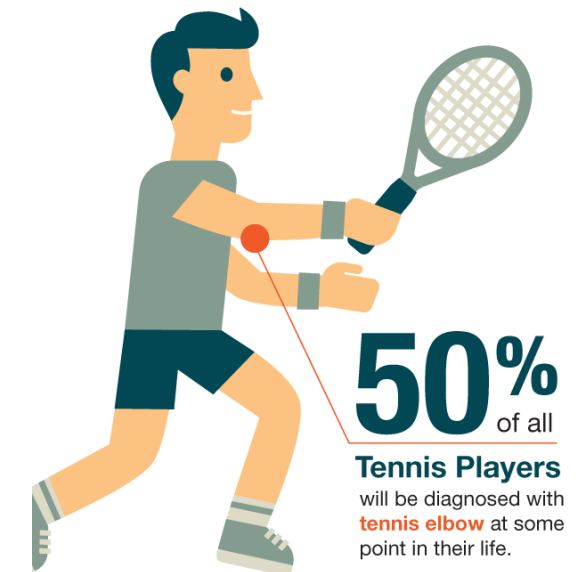


Figure 22.3 Processes leading to the development of extensor carpi radialis brevis tendinopathy



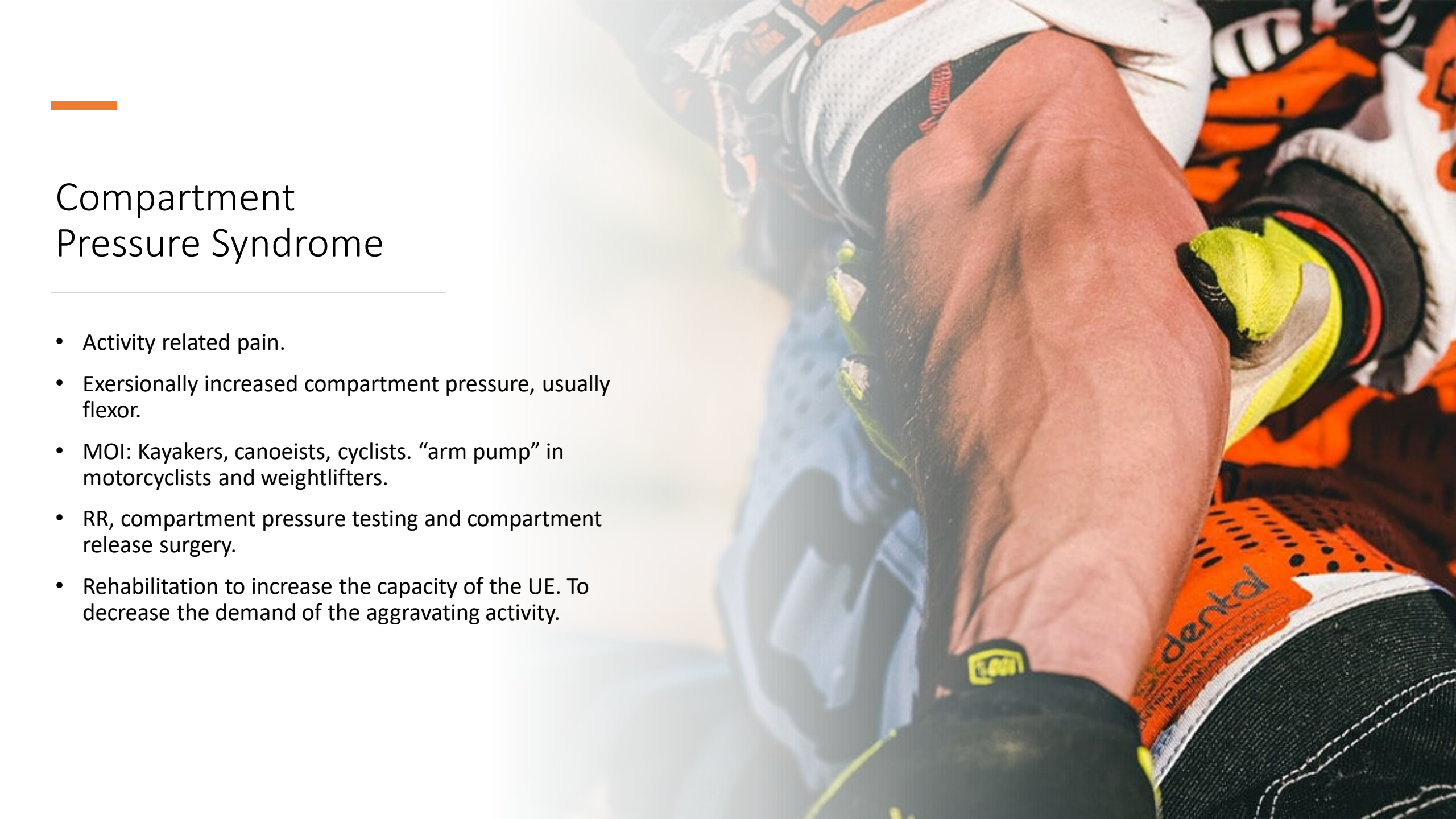


Golfers Elbow

- Medial compartment overload
- Cocontraction of flexors and extensors during golf and other activities.
- Flexor / pronator tendinopathy.
- Assessment of Cx and shoulder TrP.

Posterior Interosseus Nerve Entrapment

- Repetative pronation and supination of the forearm, and less so the wrist which is more common in tendinopathy.
- S&S: Parasthesia in hand and lateral forearm, pain in forearm extensors, wrist aching,
- Ax: Reproduction of symptoms on palpation, pain on resisted extension of the middle finger in elbow extension (which may also be true with tendonopathy), UL neurodynamic tests,
- Mx: Manual therapy, STT



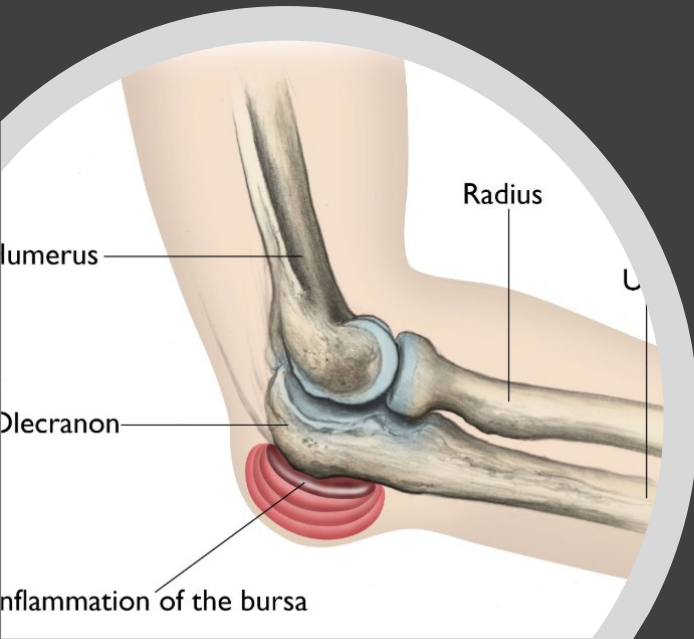
Compartment Pressure Syndrome

- Activity related pain.
- Exersionally increased compartment pressure, usually flexor.
- MOI: Kayakers, canoeists, cyclists. “arm pump” in motorcyclists and weightlifters.
- RR, compartment pressure testing and compartment release surgery.
- Rehabilitation to increase the capacity of the UE. To decrease the demand of the aggravating activity.



Students Elbow

- Compression overload
 - Acute or prolonged
- Olecranon bursitis
 - Not impingement
- Taking a charge (bball)



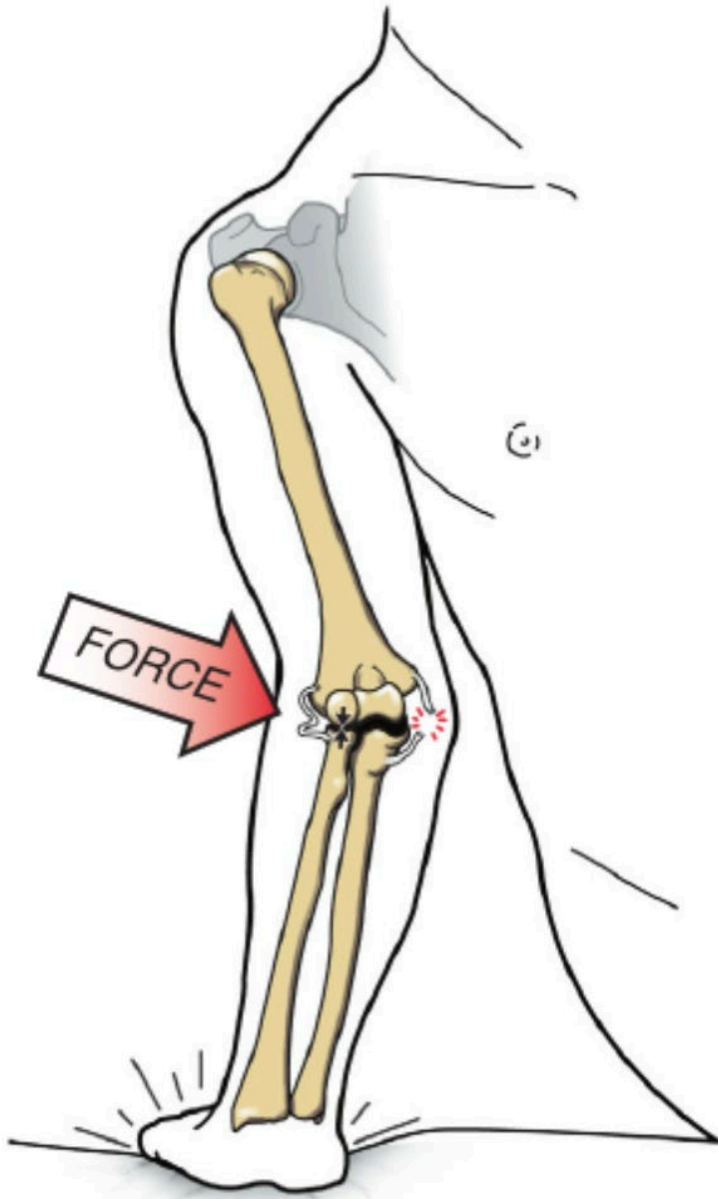
Posterior Impingement

- Most common cause of posterior elbow pain
- Hyperextension & valgus overload syndrome
- Impingement of the posteromedial corner
- If allowed to continue consider osteophyte formation and fixed flexion deformity.
- Mx: Minimise extension forces with strengthening, taping, bracing, manual therapy.



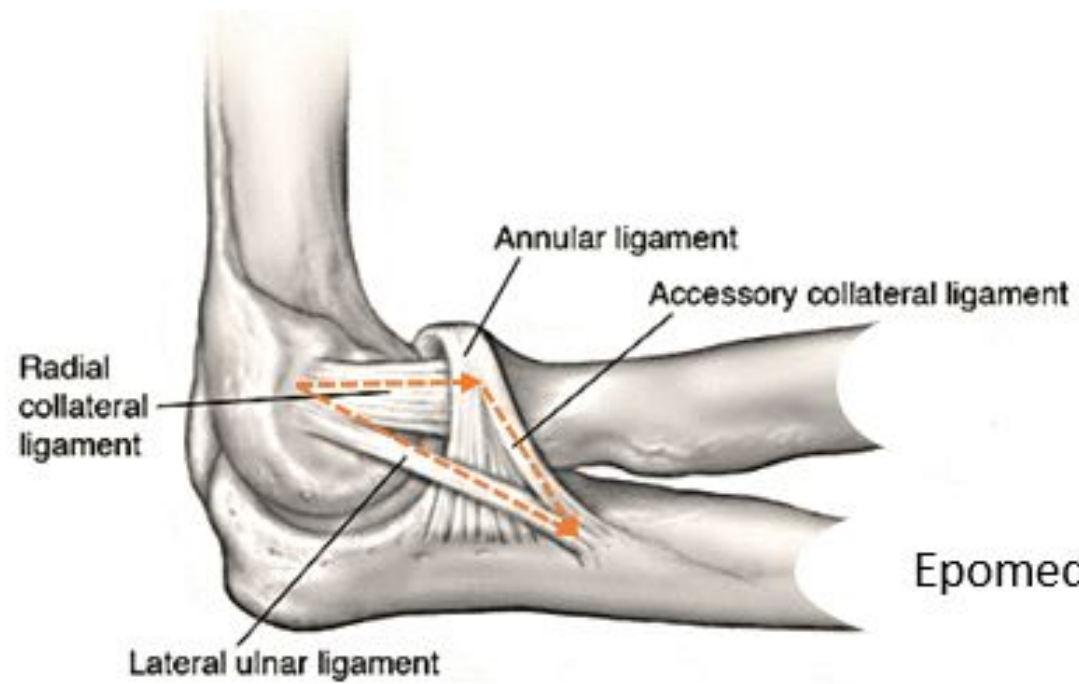
Medial Collateral Ligament Sprain

- MOI: FOOA / Microtrauma
- Throwing
- Ax: Valgus stress test at 30d flx. Complete disruption require surgery. Incomplete sprain require protection through taping and bracing with strengthening

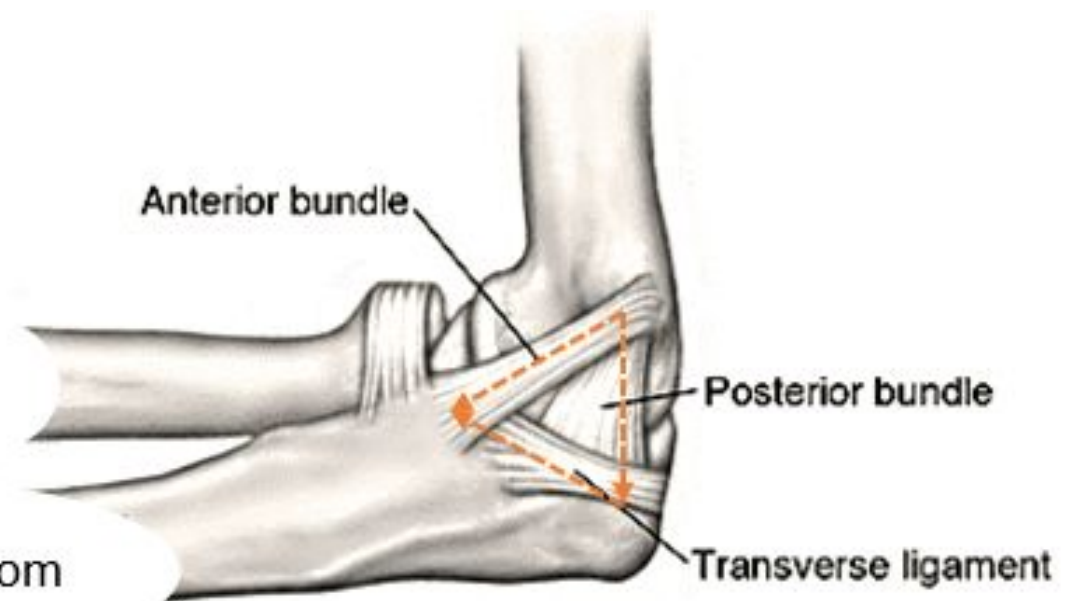


Anterior view

FIGURE 6-13. Attempts at catching oneself from a fall may create a severe valgus-producing force to the elbow, causing rupture of the medial collateral ligament and a potentially damaging compression force within the humeroradial joint.



Lateral collateral ligament complex



Medial collateral ligament complex

Tommy John's Elbow

- Medial collateral sprain > instability
- Throwing overload, post surgical?
- Repetitive valgus force



1

In a common technique, the surgeon drills tunnels in the ulna and the base of the humerus.



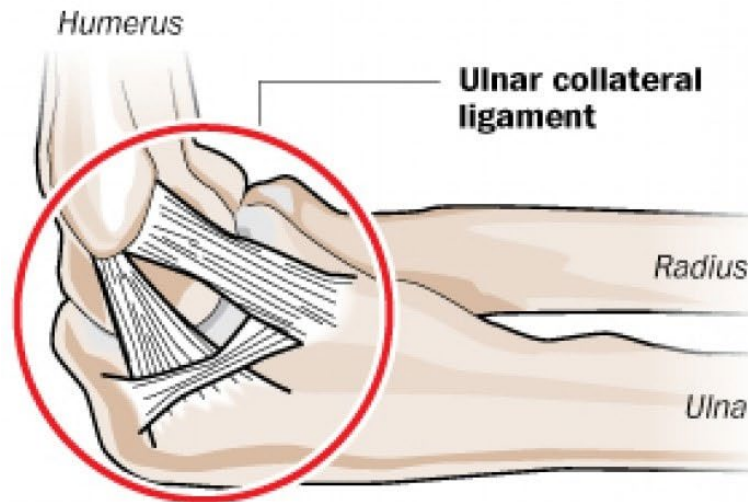
2

A tendon, usually taken from the forearm or leg, is threaded through the holes in a figure-eight pattern.



3

The tendon then functions as a ligament, stabilizing the joint by holding the bones in place.



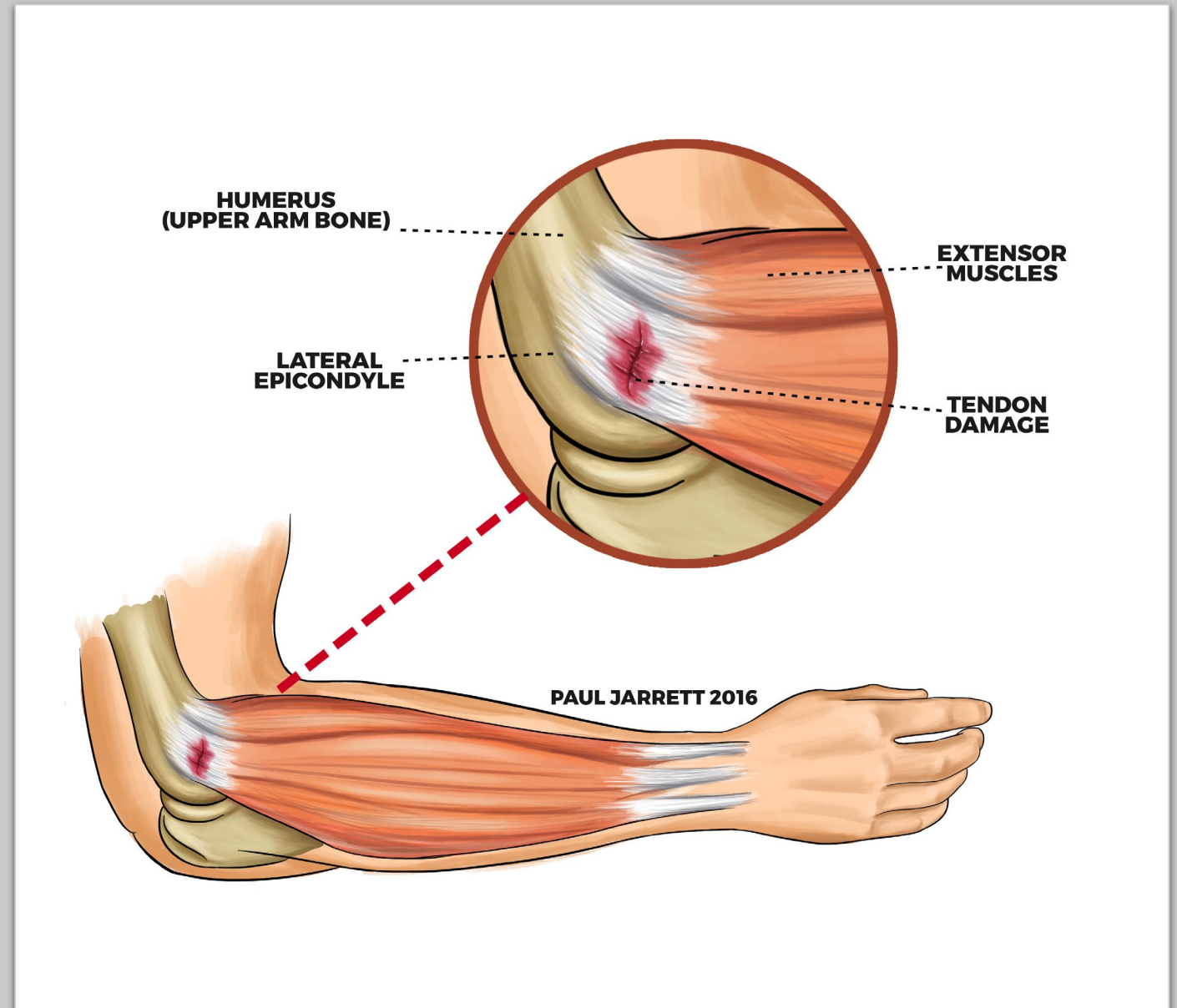
The result

A 2007 Penn study found that **56 of 68** major leaguers had **no significant change in ERA**, walks or hits per inning pitched after this type of surgery. The average recovery time was 18½ months.



Extensor Tendinopathy

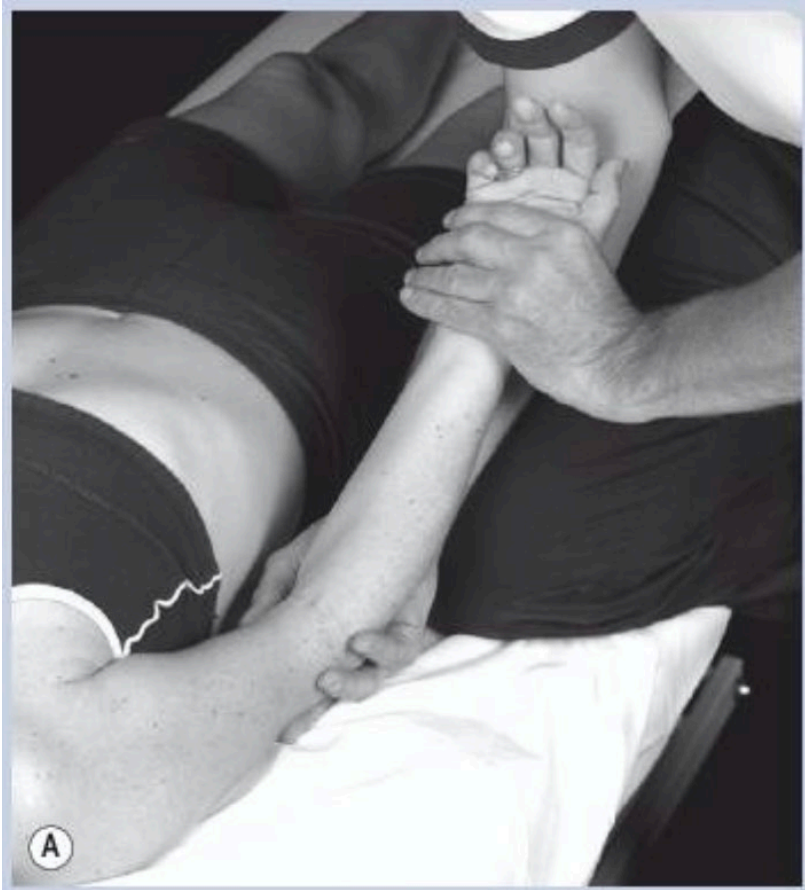
- Acute lateral epicondylitis
- Persistent extensor tendinopathy
- Mx: strengthening (iso>isot>ecc), stretching, MWM, STM if trialled as beneficial, UL neurodynamics, taping, bracing,





Manual Therapy

Improving Elbow Extension



Grade 2



Grade 3

Improving Extension 2



Grade 4



W palp in olecranon fossa

Improving Flexion

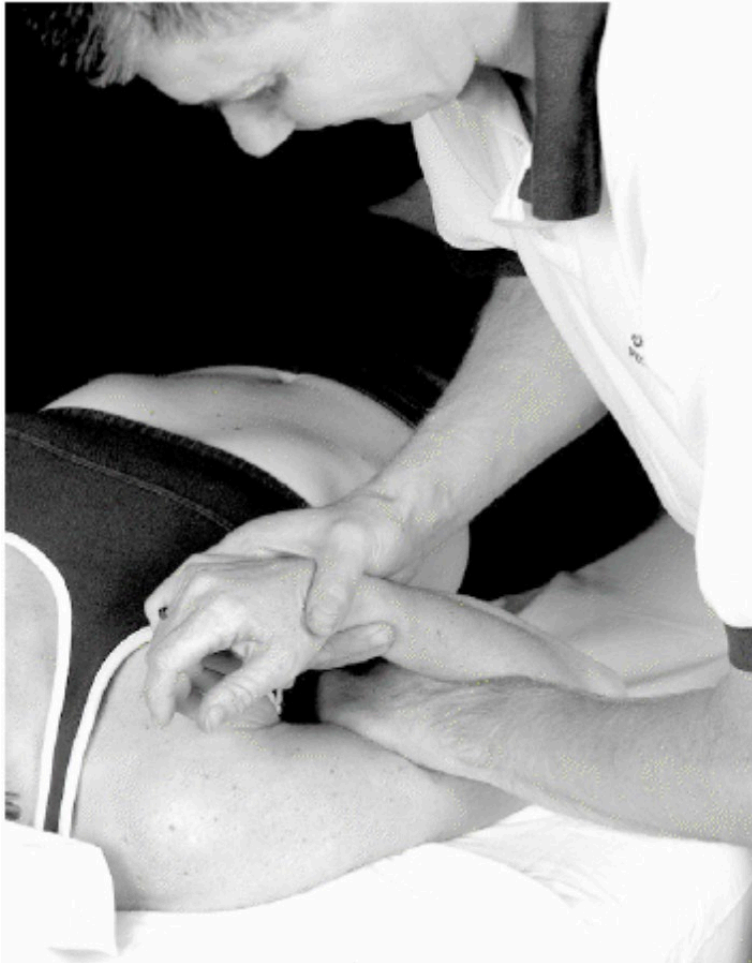


Grade 2



Grade 3-4

Improving Flexion 2



Flexion w caudad movement



Flexion w caudad movement in 90d flexion

Improving Flexion 3



Longitudinal caudad radio ulnar movement

Superior Radio Ulnar Movement



A-P movement in supination



A-P movement in pronation

Superior Radio Ulnar Movement 2



P-A movement in supination



Longitudinal movement in caudad

Mobilisation w Movement for Extension



Extension w lateral glide

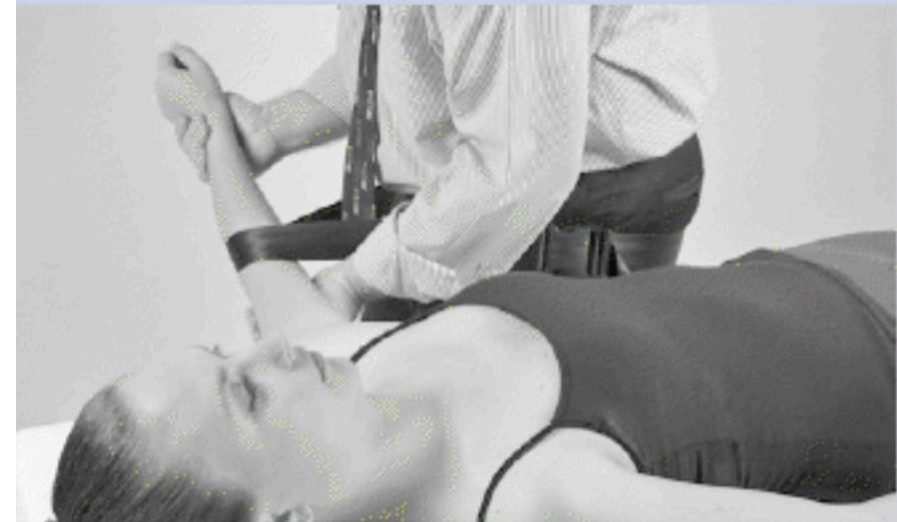


Extension w lateral glide

Mobilisation w Movement for Extension 2



Extension w medial glide



Extension w medial glide

Mobilisation w Movement for Flexion



Flexion w lateral glide



Flexion w lateral glide

Mobilisation w Movement for Flexion



Flexion w medial glide



Flexion w medial glide

Extension w gripping



Lateral Epicondylalgia

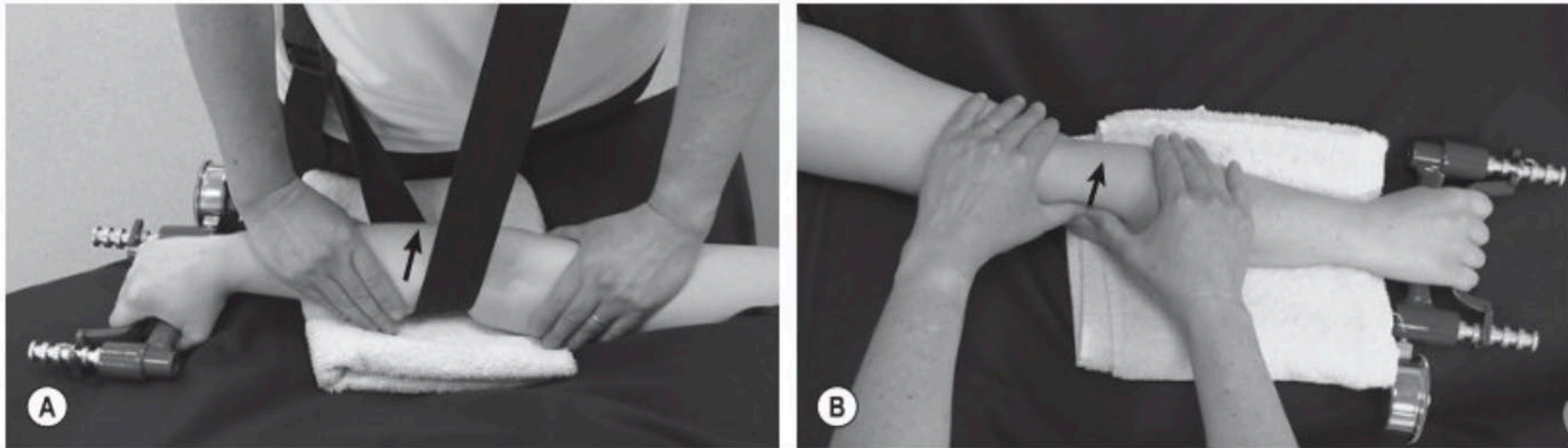


FIG. 10.8 (A) Lateral elbow mobilization with movement. The clinician applies a sustained lateral humeroulnar accessory glide while the patient grips and relaxes the dynamometer or performs the painful action. If there is significant improvement in the painfree grip then the clinician repeats the technique for 6–10 repetitions. A belt as in the example may be used to assist the accessory glide. (B) Radial head posteroanterior mobilization with movement. The clinician applies a sustained posterior–anterior accessory glide over the radial head whilst the patient grips and relaxes the dynamometer or performs the painful action. If there is significant improvement in the painfree grip then the clinician repeats the technique for 6–10 repetitions. The arrows represent the direction of the clinician's force.

Summary

- We have reviewed the arthrokinematics of the elbow complex which should underpin our manual therapy approaches.
- We have reviewed a variety of injuries affecting the elbow.
- We have reviewed the manual therapy techniques for improving movement at the elbow complex.

Thank you

I Found This

Humorous