Elbow/Forearm/Wrist

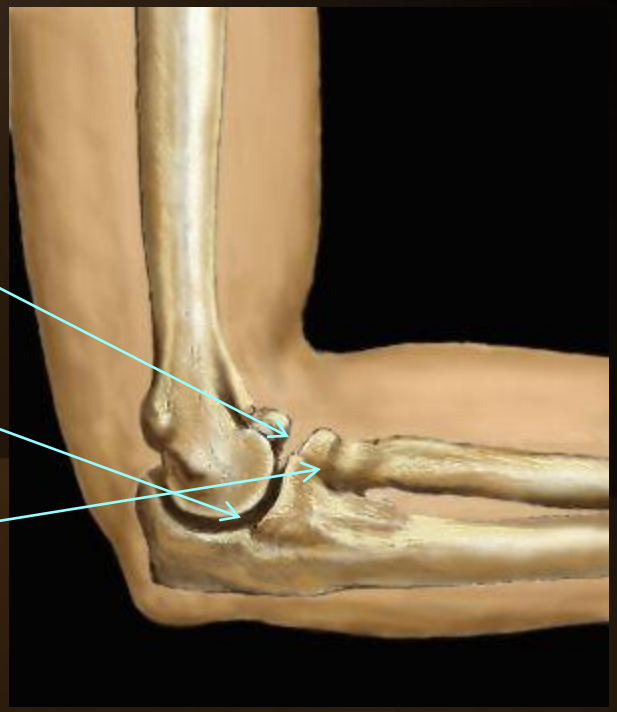
STACY CAMOU ATC

Elbow - Anatomy

- Bones
  - Humerus
    - The distal end of the humerus forms the medial and lateral epicondyles of the elbow
  - Radius
  - Ulna

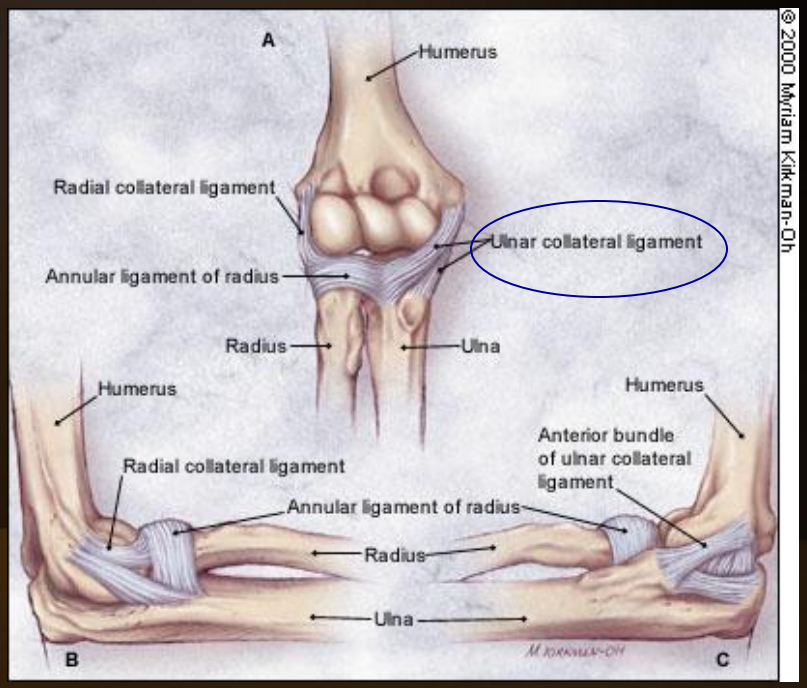
Elbow - Anatomy

- 3 separate joints form the elbow complex
  - Humeroulnar joint (A)
  - Humeroradial joint (B)
  - Radioulnar joint (C)



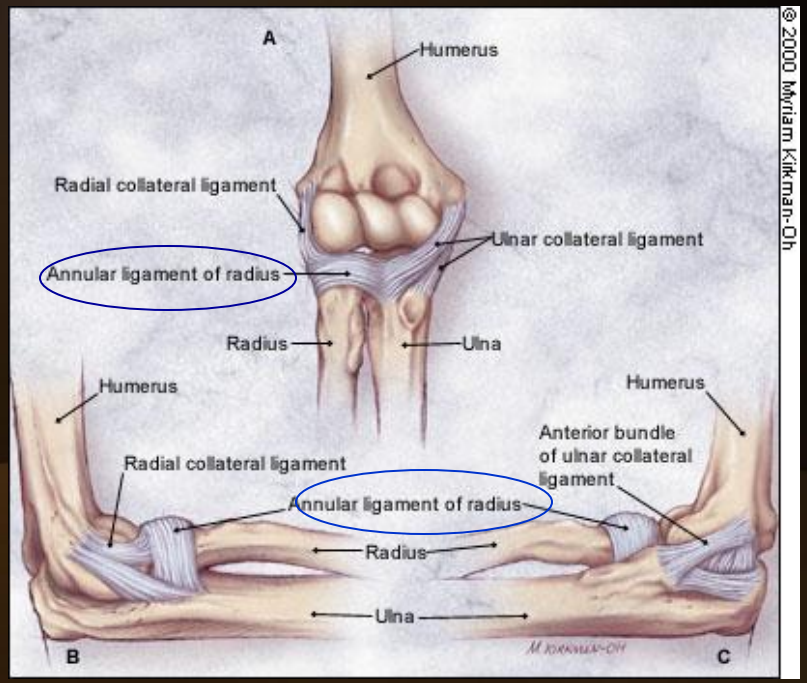
Elbow - Anatomy

- Major Ligaments
  - Ulnar Collateral
    - Also called the medial collateral ligament
    - Most important for stability of the elbow



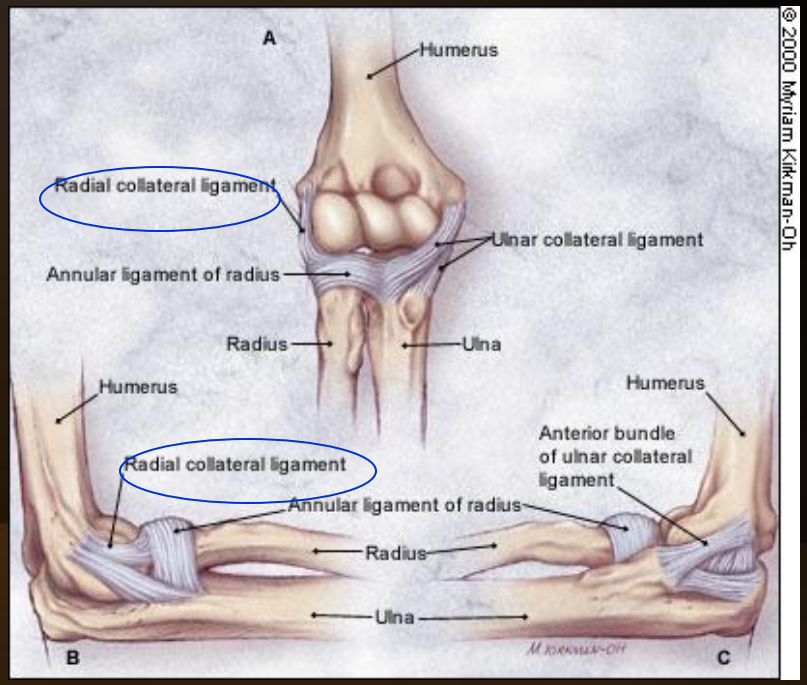
Elbow/Forearm/Wrist – Anatomy

- Major Ligaments
  - Annular ligament
    - Extends from the ulna and forms a sling around the radial head allowing for free rotation of the radius



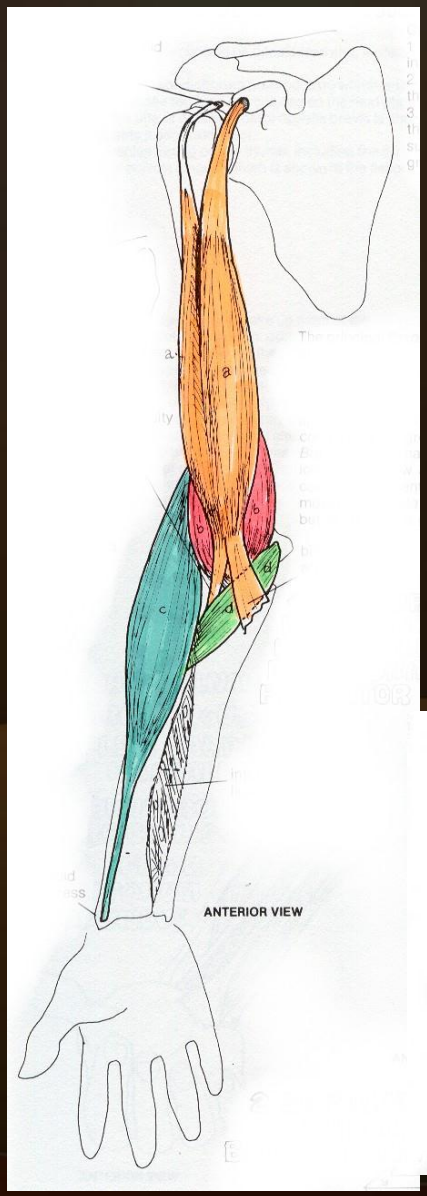
Elbow - Anatomy

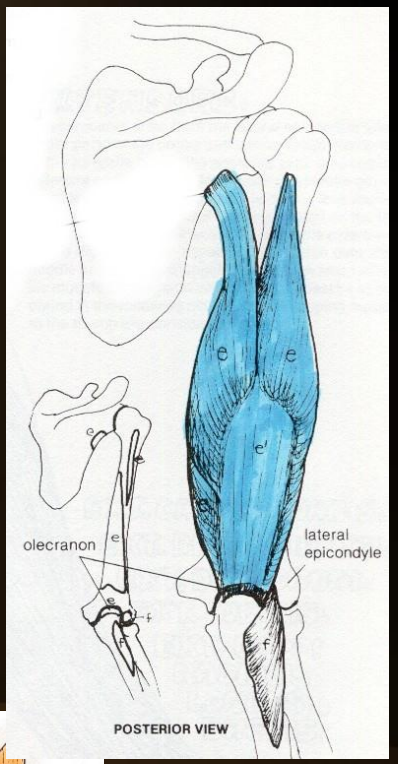
- Major Ligaments
  - Radial Collateral
    - Also referred to as the lateral collateral ligament
    - Extends from the lateral epicondyle and attaches to the annular ligament

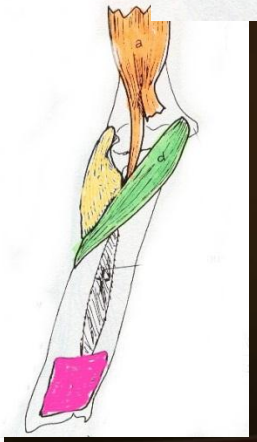


Elbow/Forearm - Anatomy

- Major Muscles
  - Biceps
    - Flexes elbow
    - Assists with supination
  - Brachialis
    - Flexes elbow
  - Brachioradialis
    - Flexes elbow
  - Triceps
    - Extends elbow
  - Pronator Teres
    - Pronates elbow
  - Pronator Quadtratus
    - Pronates elbow
  - Supinator
    - Supinates elbow

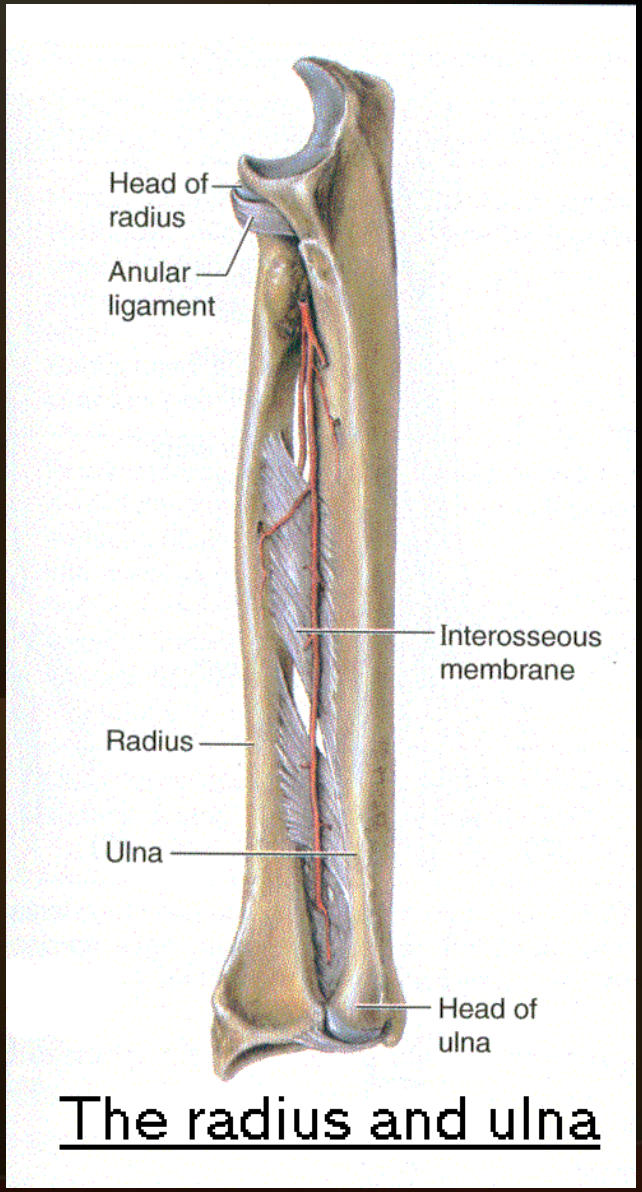






Forearm - Anatomy

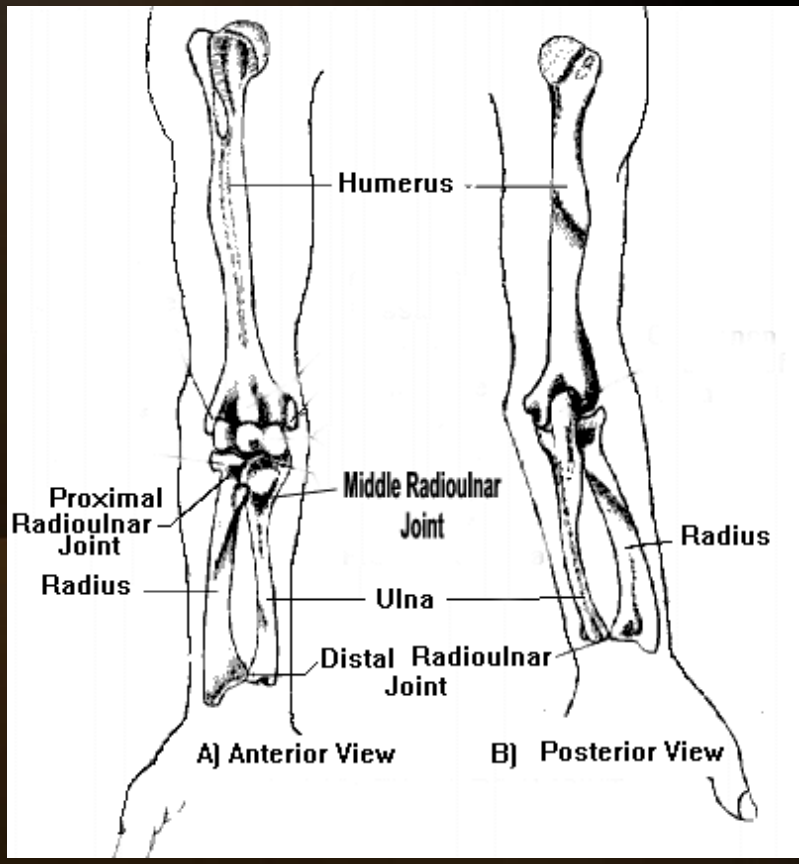
- Bones
  - Ulna
    - Considered a direct extension of the humerus
    - Long, straight, and larger on its superior end than inferior end
  - Radius
    - Considered an extension of the hand
    - Thicker at its inferior end than at its superior end



The radius and ulna

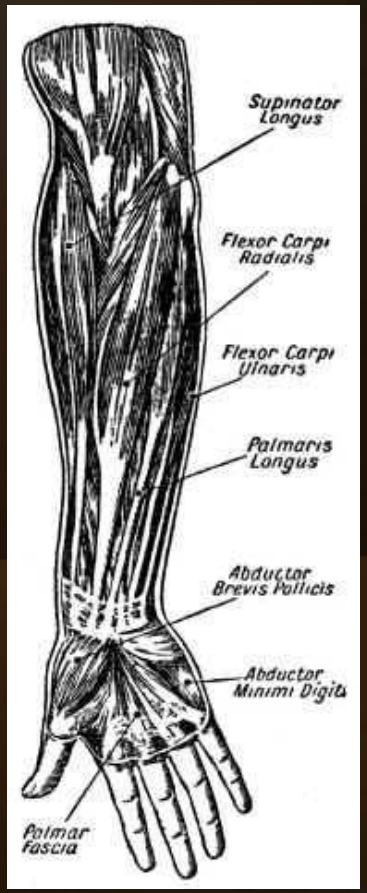
Forearm - Anatomy

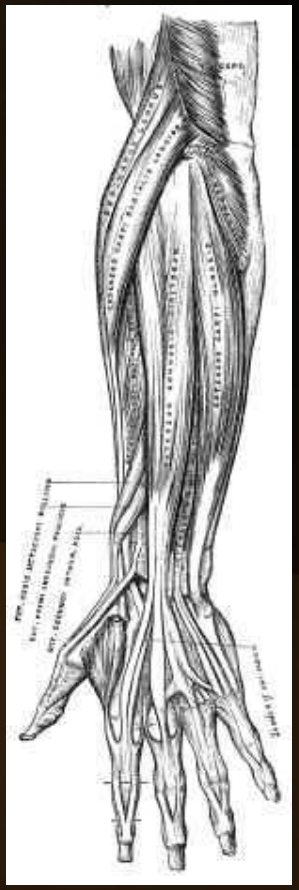
- Joints
  - The forearm has 3 major articulations, or joints
    - Superior, middle, and distal radioulnar joints



Forearm - Anatomy

- Muscles
  - Forearm muscles consist of…
    - Flexors and pronators, which are positioned on the anterior aspect of the forearm
    - Extensors and supinators, which lie posteriorly
    - The flexors of the wrist and fingers are separated into both superficial and deep muscles





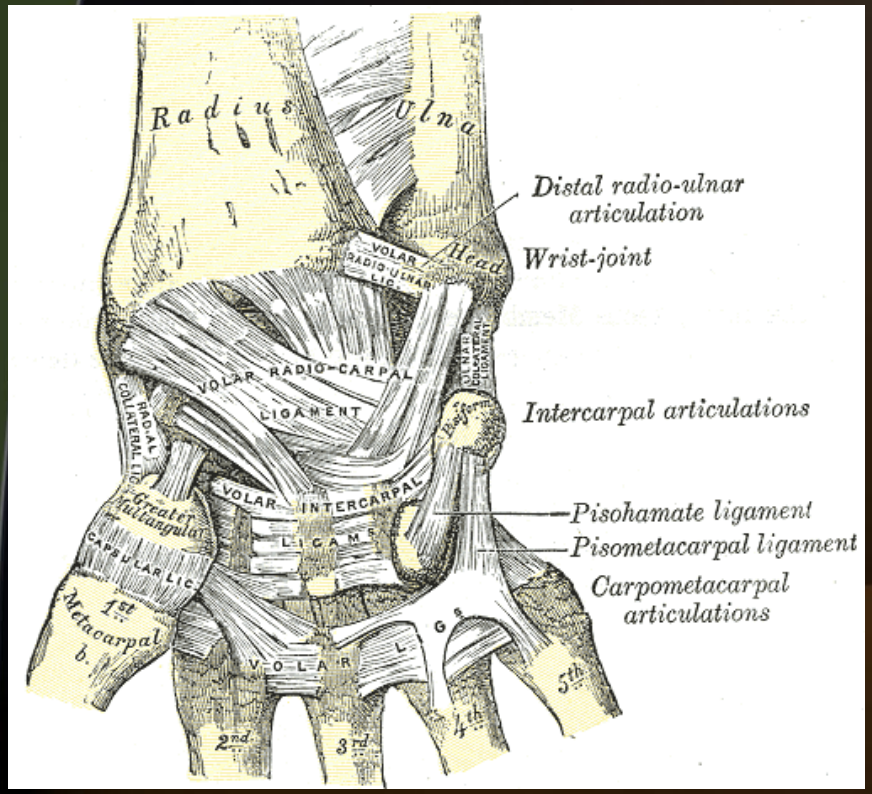
Wrist - Anatomy

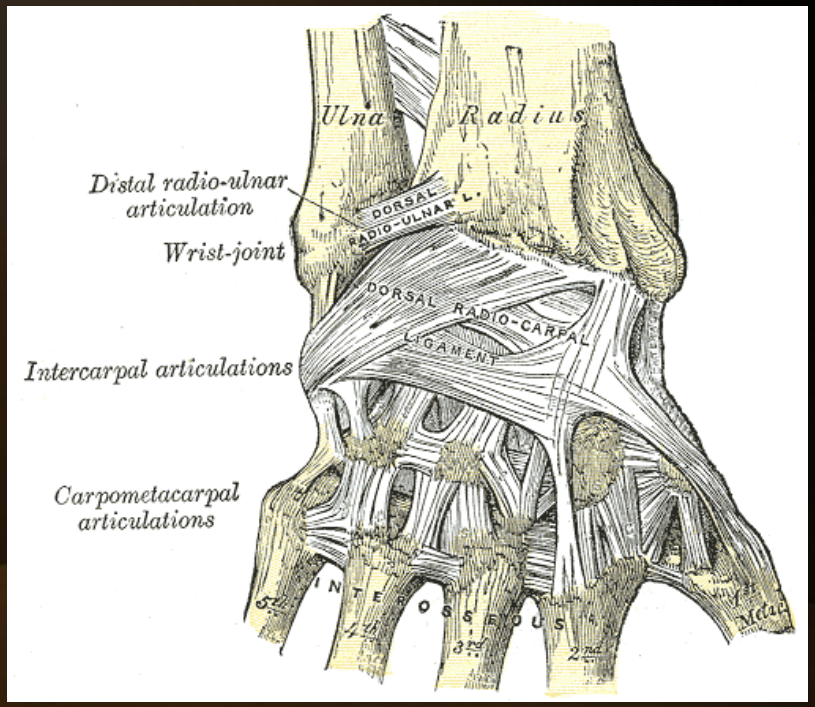
- Bones
  - The wrist is formed by the distal aspect of the radius and the ulna with a proximal row of four and a distal row of four *carpal* bones.
  - The carpal bones articulate with five *metacarpals*
  - The metacarpals join the carpal bones above and the *phalanges* below, forming the *metacarpophalangeal (MCP) joint* for each finger and metacarpal
  - Each of the four fingers have a proximal, middle, and distal *phalanx*
    - The thumb only has a distal and proximal phalanx

Wrist Anatomy

- Ligaments
  - The wrist has numerous ligaments that connect the carpal bones to one another, the ulna, the radius, and the metacarpal bones
  - In wrist injuries, the *collateral ulnar ligament* and/or the *collateral radial ligament* are usually involved
  - Crossing the volar aspect of the carpal bones is the *transverse carpal ligament*
    - This ligament is significant because it forms the roof of the carpal tunnel, in which the median nerve is often compressed
  - In the phalanges, the bones are connected by medial and lateral collateral ligaments and a thickened joint capsule known as the *volar plate*

Wrist Hand Anatomy





Wrist Hand Anatomy

- Muscles
  - The muscles of the wrist and hand originate both outside (*extrinsic*) and inside (*intrinsic*) of the wrist and hand
  - In general, both the intrinsic and extrinsic muscles located on the medial aspect and front of the wrist and hand flex the wrist and fingers
  - The muscles on the posterior and lateral aspect of the wrist and hand extend the wrist and fingers
  - Intrinsic muscles of the hand also abduct, adduct, and in the thumb create *opposition* of the metacarpals

Elbow

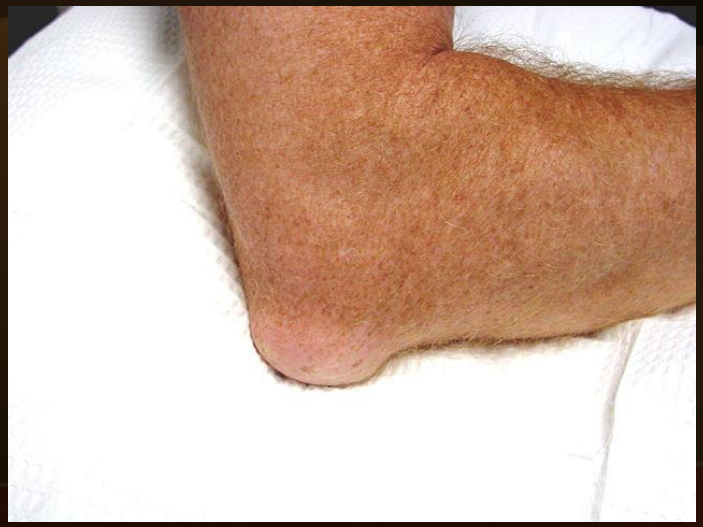
- General considerations…
  - The elbow is susceptible to injury in athletics because of its wide range of motion, its weak boney arrangement, and its relative exposure to soft tissue damage in and around the joint
  - The locking of the elbow joint in sports like gymnastics and or using sports implements such as racquets and golf clubs can lead to injury
  - The throwing motion, particularly during acceleration and follow-through can also lead to elbow injury

Elbow Injuries

- Olecranon Bursitis
  - The olecranon bursa, lying between the olecranon process and the skin, is the most frequently injured bursa in the elbow area
  - Its location near the surface of the body makes it susceptible to acute and chronic injury, usually as the result of direct blows to the area

Elbow Injuries

- Olecranon Bursitis
  - Signs and symptoms…
    - Inflammation
    - Pain
    - Swelling
    - Point tenderness
  - *Note…*
    - Sometimes swelling appears without the usual pain and inflammation



Elbow Injuries

- Olecranon Bursitis
  - Care and treatment…
    - In acute cases, immediate application of ice
    - In chronic cases, a program of superficial therapy that may involve the use of ice, heat, e-stim, ultrasound, etc.
    - In rare cases, a physician may choose to aspirate the bursa
  - The condition is seldom serious, but can be annoying to the athlete so the ATC should always work to protect the area with special padding while the athlete is competing or practicing

Elbow Injuries

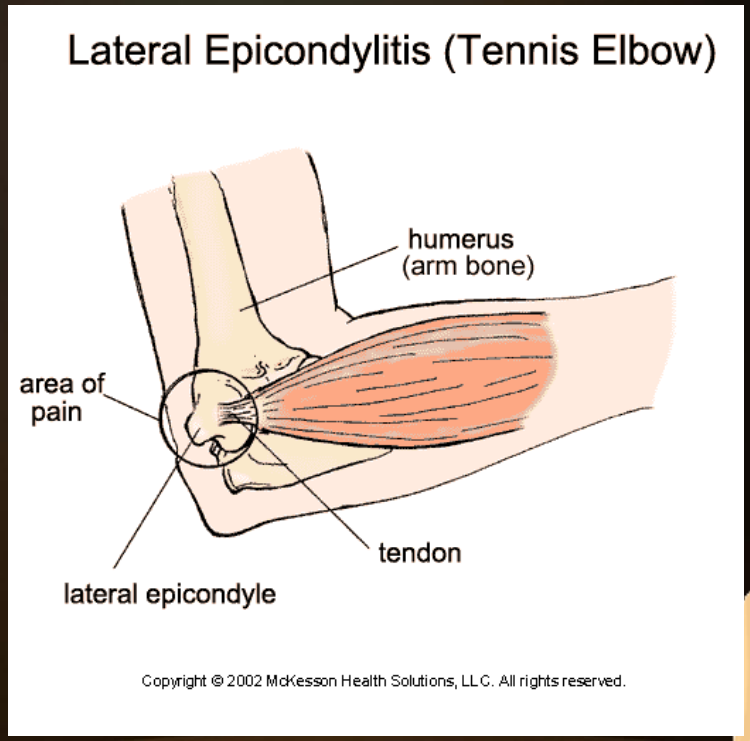
- Elbow Sprains
  - Usually caused by a hyperextension of the elbow joint or a force that bends or twists the lower arm causing injury to the collateral ligaments
  - Signs and symptoms of elbow sprains include…
    - Pain
    - Inability to throw or grasp an object
    - Point tenderness over the medial or lateral collateral ligaments

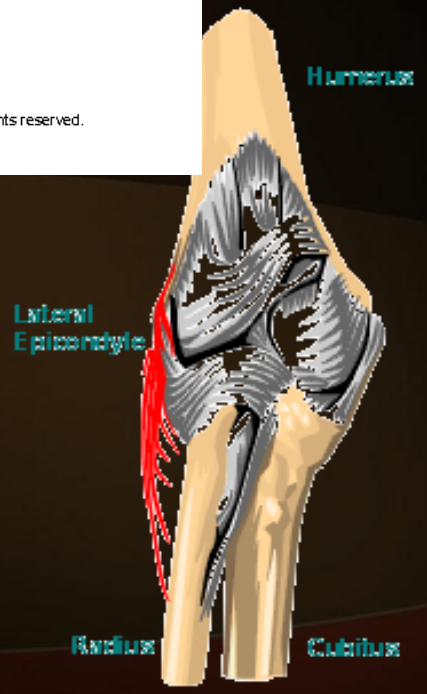
Elbow Injuries

- Elbow Sprains
  - Care and treatment includes…
    - Application of ice and pressure bandage
    - Use of a sling to support the elbow at 90° flexion
    - A program of therapy and exercise to return the elbow to full range of motion, strength, and flexibility which may include…
      - » Ice, heat, e-stim, ultrasound
      - » Range of motion exercises
      - » Flexibility exercises
      - » Isometric and isotonic strengthening exercises

Elbow Injuries

- Lateral Epicondylitis
  - More commonly known as “tennis elbow”
  - One of the most common injuries to the elbow
  - Cause of the injury is repetitive extension of the wrist, which eventually causes irritation and inflammation to the insertion of the extensor muscle at the lateral epicondyle





Elbow Injuries

- Lateral Epicondylitis
  - **Signs and symptoms include…**
    - **Aching pain in the area of the lateral epicondyle during and after activity**
    - **Gradual worsening of the pain, followed by weakness in wrist and hand**
    - **Point tenderness over the lateral epicondyle**
    - **Pain when completing dorsiflexion of the wrist against manual resistance and full extension of the elbow**

Elbow Injuries

- Lateral Epicondylitis
  - Care and treatment includes…
    - Rest, ice, compression, and elevation (RICE)
    - Anti-inflammatory medications (with physician direction)
  - Rehabilitation for this injury involves the following…
    - Range of motion exercises
    - PREs
    - Deep friction massage
    - Hand grasping while in supination
    - Avoiding pronation movements

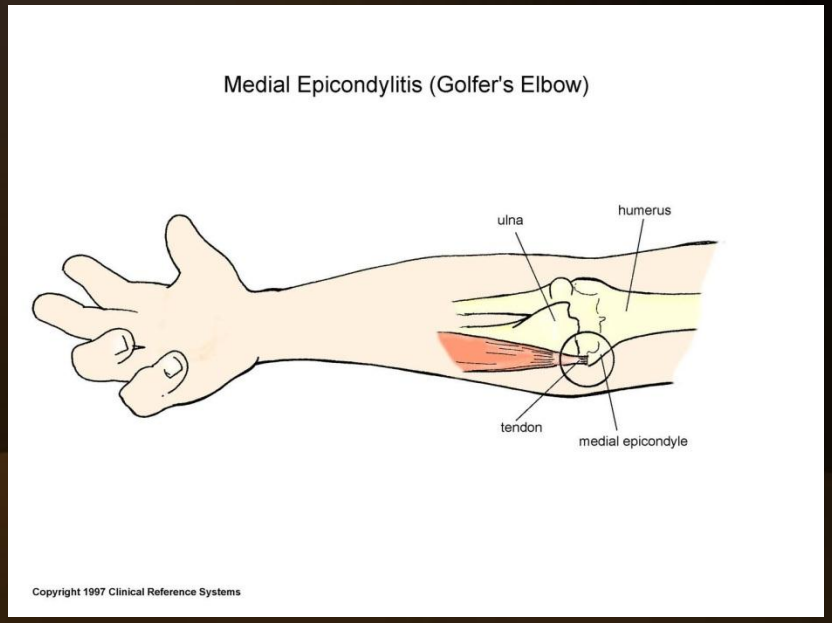
  - In addition, the athlete may find it helpful to wear a counterforce strap or neoprene elbow sleeve.
  - Also, the athlete must be taught proper techniques and use of sport equipment to avoid reinjury

Elbow Injuries

- Medial Epicondylitis
  - This condition may result from a number of different athletic activities that require repetitive forceful flexions of the elbow
  - The injury is often referred to as “little league elbow”, “pitchers elbow”, or “golfer’s elbow”

Elbow Injuries

- Medial Epicondylitis
  - Signs and symptoms…
    - Pain around the medial epicondyle of the wrist during forceful wrist extension, which may radiate down the arm
    - Point tenderness over the area
    - In some cases, mild swelling
    - Passive movement of the wrist usually does not cause pain, but active movement will



Elbow Injuries

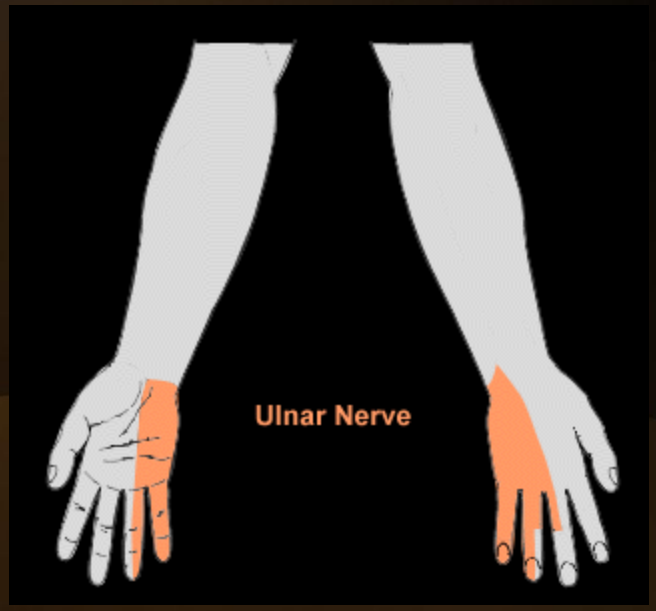
- Medial Epicondylitis
  - Care and treatment is generally conservative for this condition and includes the following…
    - Rest
    - Cold therapy
    - Heat therapy
    - Ultrasound
    - Physician prescribed analgesics and anti-inflammatories
    - The use of a counterforce brace applied just below the elbow can be helpful in reducing stress
    - In more severe cases, the elbow may be splinted to allow for complete rest for a week to 10 days

Elbow Injuries

- Ulnar Nerve Injuries
  - Because of its location very close to the body's surface, the ulnar nerve is subject to injury and irritation in athletics
  - Individuals with an excessive outward angle at their elbow may develop a nerve friction condition
  - The nerve can also become dislocated or impinged when doing flexion type activities if there is structural deformity in the elbow

Elbow Injuries

- Ulnar Nerve Injuries
  - Signs and symptoms include…
    - Usually little or no pain
    - Parathesia of the 4th and/or 5th fingers
    - Burning or tingling in the 4th and/or 5th fingers



Elbow Injuries

- Ulnar Nerve Injuries
  - Care and treatment includes…
    - Management is generally conservative
    - It is important to not further aggravate the nerve by putting direct pressure on it
    - The area should be protected during activity with an elbow pad or a custom pad
    - In cases where continued stress on the nerve cannot be avoided, surgical intervention may be necessary to correct the problem

Elbow Injuries

- Elbow Dislocations
  - Have a high incidence in sport activity and is most often the result of a fall on an outstretched hand with the elbow in a position of hyperextension (as you just saw on the videos) or by severe twisting of the arm while the elbow is flexed

Elbow Injuries

- Elbow Dislocations
  - Signs and symptoms…
    - Displacement of the radius and/or ulna anteriorly, posteriorly, or laterally
    - Deformity of the olecranon process
    - Swelling
    - Severe pain
    - Inability to move the elbow

Elbow Injuries

- Elbow Dislocations
  - Care and treatment…
    - The primary responsibility of the ATC with this type of injury is to stablize the injury in the position it is found with a splint, sling, and swath and immediately refer the athlete to a physician for further medical care and reduction of the dislocation
    - After reduction, the elbow is typically immobilized in a flexed position with a sling and swath.
    - The sling is used for approximately 3 weeks, after which time a gradual program of rehabilitation for range or motion, strength, and flexibility may begin

Elbow Injuries

- Elbow Fractures
  - Fractures of the elbow can occur in any sport
  - Usually a fracture occurs when an athlete falls on their outstretched arm or flexed elbow. They also occur when the elbow is struck by a direct blow
  - Younger athletes seem to suffer this type of injury more frequently than adults
  - Fractures can occur in any and/or all of the bones that comprise the elbow
    - For example, a fall on an outstretched arm will often fracture the humerus

Elbow Injuries

Elbow Injuries

- Elbow Fractures
  - Signs and symptoms include…
    - Visible deformity of the elbow
      - *Note*…in some cases there is no deformity
    - Hemorrhage
    - Swelling
    - Muscle spasm

Elbow Injuries

- Elbow Fractures
  - Care and treatment….
    - Because of the seriousness of this injury, immediate emergency care is necessary
    - The elbow joint, and the bones above and below the joint should be immobilized using a splint and a sling and swathe.
    - After application of the splint, ice may be applied to the area of the suspected fracture
    - The athlete should the referred immediately to a physician for further medical evaluation and care

Elbow/Forearm Injuries

- Volkmann's Contracture
  - After an athlete suffers a serious elbow injury such as a dislocation or a fracture it is extremely important that circulation in, around, and through the elbow is monitored very closely
  - Swelling, muscle spasm, or a bone displacement can put pressure on the brachial artery and inhibit blood flow to the forearm, wrist, and hand
  - This circulatory interference can lead to muscle contracture and/or permanent muscle paralysis

Elbow/Forearm Injuries

- Volkmann's Contracture
  - **Signs and symptoms include…**
    - **Pain in the forearm that becomes progressively worse when the fingers are passively extended is usually the first indication of this condition**
    - **Weakness and paralysis in the hand and forearm**
    - **Atrophy of the forearm muscles**
    - **A claw hand**

Elbow/Forearm Injuries

- Volkmann's Contracture
  - **Care and treatment…**
    - **This condition is a major medical problem requiring immediate referral to a physician for emergency treatment to restore appropriate blood flow to the forearm, wrist, and hand**

Forearm - Injuries

- Contusions
  - The forearm is susceptible to bruising in contact and collision sports such as football
  - Typically the ulnar side of the forearm receives the majority of the injuries
  - Contusions of the forearm can be either acute or chronic in nature
    - Acute contusions can sometimes also result in fractures
    - Chronic contusions result from repeated blows to the forearm

Forearm - Injuries

- Contusions
  - Signs and symptoms include…
    - Pain
    - Swelling
    - Hematoma development (bruising)
    - Build up of scar tissue, in place of the hemtoma
    - In rare cases, the development of a bony callus in place of the scar tissue

- END