The Elbow
Anatomy of the Elbow
Bones

- Humerus
- Radius
- Ulna
Coronoid fossa
Radial fossa
Lateral epicondyle
Capitulum
Humerus
Medial epicondyle
Trochlea
Olecranon
Radial notch of ulna
Head of radius
Neck of radius
Trochlear notch
Coronoid process
Tuberosity of ulna
Tuberosity of radius
Ulna
Radius
Interosseous membrane
What Motions Does the Elbow Perform?

- Flexion
- Extension
- Pronation
- Supination
Muscles in Motion

► FLEXION

- Biceps brachii (supinated)
- Brachialis (pronated)
- Brachioradialis (neutral)
- Prime movers depends on position of the forearm
EXTENSION

- Triceps brachii
  - Primary mover
- Anconeus
  - Secondary mover
SUPINATION

- Supinator
  - Primary mover
    - Biceps brachii
  - Secondary mover
    - Brachioradialis
    - Secondary mover
    - Also pronates forearm from a supinated position
PRONATION

- Pronator teres
- Pronator quadratus

Primary movers
Tendons

- Biceps
- Triceps
- Flexor tendon group
- Extensor tendon group
Joints

► Humeroulnar joint
  ▪ Humerus and ulna
  ▪ Allows for flexion and extension

► Humeroradial joint
  ▪ Humerus and radius
  ▪ Flexion and extension
  ▪ Pronation and supination
Ligaments

Medial – resists valgus stress

- ulnar collateral ligament (UCL)
  - three bands
  - anterior oblique band
    - medial epicondyle to coronoid process
    - resists against valgus stress
  - transverse band
    - medial epicondyle to coronoid process
- posterior oblique band
  - medial epicondyle to olecranon process
Lateral – resists varus stress

- **Lateral Collateral Ligament (LCL)**
  - Main lateral stabilizer
  - Middle of the lateral epicondyle to ulnar tuberacle

- **Radial collateral ligament**
  - Thickened capsule
  - Lateral epicondyle to annular ligament
  - Maintain close relationship between humeral head and radial head
- **Annular ligament**
  - Encircles the radial head
  - Permits internal/external rotation of radius on ulna
- **Interosseous membrane**
  - Dense band of fibrous connective tissue
  - Obliquely between radius to the ulna
  - Transmits forces
  - Attachment point for muscles
Assessment of the Elbow

► History

- Past history
- Mechanism of injury
- When and where does it hurt?
- Motions that increase or decrease pain
- Type of, quality of, duration of, pain?
- Sounds or feelings?
- How long were you disabled?
- Swelling?
- Previous treatments?
Observations

- Deformities and swelling?
- Carrying angle
  - Cubitus valgus versus cubitus varus
- Flexion and extension
  - Cubitus recurvatum
- Elbow hyperextension?

Palpation

- Be sure to check sites of pain and deformity
- Assess epicondyles, olecranon, distal aspect of humerus and proximal aspect of ulna
- Soft tissue – muscles, tendons, joint capsules and ligaments surrounding joint
**Figure 8** The physiological valgus ("carrying angle") of the elbow is increased when a load is being carried. Normally, the angle is between 9 and 14° when the elbow is extended and the forearm is supinated.

Methods to assess elbow and forearm injuries include:

- ROM test for elbow flexion
- ROM test for elbow extension
- ROM test for elbow supination
- ROM test for elbow pronation
Manual Muscle Tests for the Elbow

- Flexion strength test
- Extension strength test
- Supination strength test
- Pronation strength test
Prevention of Elbow, Forearm, and Wrist Injuries

► Vulnerable to a variety of acute and chronic injuries

► Protective gear is always recommended to reduce severity of injury

► Chronic injury reduction
  - Limit repetitions (baseball, tennis)
  - Utilize proper mechanics
  - Use equipment that is appropriate for skill level
  - Maintain appropriate levels of strength, flexibility, and endurance for activity
Injuries to the Elbow and Arm

- Fractures
- Dislocations and subluxations
- Contusions
- Sprains
  - Valgus stress test for the elbow
  - Varus stress test for the elbow
Injuries to the Elbow and Arm

- Impingement
  - Tinel’s sign
- Synovitis and bursitis
- Biceps brachii rupture
- Epicondylitis
- Volkmann’s contracture
Common Injuries

Olecranon Bursitis

- Cause of Injury
  - Superficial location makes it extremely susceptible to injury (acute or chronic)
    --direct blow

- Signs of Injury
  - Pain, swelling, and point tenderness
  - Swelling will appear and w/out usual pain and heat
Contusion

- **Cause of Injury**
  - Vulnerable area due to lack of padding
  - Result of direct blow or repetitive blows

- **Signs of Injury**
  - Swelling (rapidly after irritation of bursa or synovial membrane)

- **Care**
  - Treat w/ RICE immediately for at least 24 hours
  - If severe, refer for X-ray to determine presence of fracture
Care

- In acute conditions, ice
- Chronic cases require protective therapy
- If swelling fails to resolve, aspiration may be necessary
- Can be padded in order to return to competition
Elbow Sprains

- **Cause of Injury**
  - Elbow hyperextension or a valgus force (often seen in the cocking phase of throwing)

- **Signs of Injury**
  - Pain along medial aspect of elbow
  - Inability to grasp objects
  - Point tenderness over the MCL

- **Care**
  - Conservative treatment begins w/ RICE elbow fixed at 90 degrees in a sling for at least 24 hours
  - Gradually regaining elbow full ROM
  - Athlete should modify activity
    - Gradual progression involving an increase in number of throws while range and strength return
Lateral Epicondylitis (Tennis Elbow)

- **Cause of Injury**
  - Repetitive microtrauma to insertion of extensor muscles of lateral epicondyle

- **Signs of Injury**
  - Aching pain lateral epicondyle after activity
  - Pain worsens; weakness in wrist and hand develop
  - Elbow has decreased ROM; pain w/ resistive wrist extension
Lateral Epicondylitis (continued)

- Care
  - RICE, NSAID’s and analgesics
  - ROM exercises and PRE, deep friction mass., avoidance of pronation motions
  - Mobilization and stretching in pain free ranges
  - Use of a counter force or neoprene sleeve
  - Proper mechanics and equipment instruction is critically important
Medial Epicondylitis

- **Cause of Injury**
  - Repeated forceful flexion of wrist and extreme valgus torque of elbow

- **Signs of Injury**
  - Pain produced with forceful flexion or extension
  - Point tenderness and mild swelling
  - Passive movement of wrist seldom elicits pain, but active movement does

- **Care**
  - Sling, rest, cryotherapy or heat through ultrasound
  - Analgesic and NSAID's
  - Curvilinear brace below elbow to reduce elbow stressing
  - Severe cases may require splinting and complete rest for 7-10 days
Medial Epicondylitis

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Healthy tendon

Tendon with inflammation and tiny tears
Elbow Osteochondritis Dissecans

- **Cause of Injury**
  - Impairment of blood supply to anterior surface resulting in degeneration of articular cartilage, and bone creating loose bodies within the joint

- **Signs of Injury**
  - Sudden pain, locking; range usually returns in a few days
  - Swelling, pain and crepitation may also occur

- **Care**
  - If repeated locking occurs, loose bodies may be removed surgically
  - Without removal, arthritis may develop
Ulnar Nerve Injuries

- **Cause of Injury**
  - Pronounced cubital valgus may cause deep friction problem
  - Ulnar nerve dislocation
  - Traction injury from valgus force, irregularities with tunnel, subluxation of ulnar nerve due to lax impingement, or progressive compression of ligament on the nerve

- **Signs of Injury**
  - Generally respond with paresthesia in 4\textsuperscript{th} and 5\textsuperscript{th} fingers

- **Care**
  - Conservative management – avoid aggravating condition
  - Surgery may be necessary if stress on nerve can not be avoided
Dislocation of the Elbow

- **Cause of Injury**
  - High incidence in sports caused by fall on outstretched hand with elbow extended or severe twist while flexed

- **Signs of Injury**
  - Swelling, severe pain, disability
  - May be displaced backwards, forward, or laterally
  - Complications with median and radial nerves and blood vessels
  - Rupture and tearing of stabilizing ligaments will usually accompany the injury

- **Care**
  - Immobilize and refer to physician for reduction
  - Following reduction, elbow should remain splinted in flexion for 3 weeks
Posterior elbow dislocation
Fractures of the Elbow

- **Cause of Injury**
  - Fall on flexed elbow or from a direct blow
  - Fracture can occur in any one or more of the bones
  - Fall on outstretched hand often fractures humerus above condyles or between condyles

- **Signs of Injury**
  - May or may not result in visual deformity
  - Hemorrhaging, swelling, muscle spasm

- **Care**
  - Ice and sling for support – refer to physician
Video

Hungarian wt lifter
Non displaced radial head fx
Displaced olecranon fx
T type condylar fx
Comminuted supracondylar fx
Spiral humerus fx