ANATOMY & ASSESSMENT OF ELBOW COMPLEX
Joints of the Elbow

- Humeroulnar
- Radiohumeral
- Proximal Radioulnar

• Type of diarthrodial joints?
Major Ligaments

- Ulnar Collateral
- Radial Collateral
- Annular

- Evaluation of Overuse Elbow Injuries - February 1, 2000 - American Family Physician

- Function of each?
## Elbow Ligaments

<table>
<thead>
<tr>
<th></th>
<th>Valgus 0°</th>
<th>Valgus 90°</th>
<th>Varus 0°</th>
<th>Varus 90°</th>
<th>Distraction 0°</th>
<th>Distraction 90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulnar Collateral</td>
<td>31%</td>
<td>54%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>78%</td>
</tr>
<tr>
<td>Radial Collateral</td>
<td>0%</td>
<td>0%</td>
<td>14%</td>
<td>9%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Joint Capsule</td>
<td>38%</td>
<td>10%</td>
<td>31%</td>
<td>13%</td>
<td>85%</td>
<td>8%</td>
</tr>
<tr>
<td>Osseous</td>
<td>31%</td>
<td>33%</td>
<td>55%</td>
<td>75%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Diagrams

- **A** Medial aspect
- **B** Lateral aspect
Muscles of the Elbow

- List Elbow Flexors
- List Elbow Extensors
- Forearm Supinators
- Forearm Pronators
Osteokinematics of Elbow

- Humeroulnar: 0-150°

- Forearm Supination: 80-90°

- Forearm Pronation: 80-90°
Arthrokinematics

- Close-packed?
- **Open-packed** = 70° flex + 10° supination

- Open-chain flexion (example?)
- Closed-chain flexion (example?)

**Application:** If patient had limited elbow extension, what direction would you want to mobilize the joint in order to regain full extension?
- To improve pronation?
Carrying Angle

- Men  5°
- Women  10-15°
- Cubitus Varum
- Cubitus Valgum
Motor Distribution

- **Elbow Flexors**: Nerve? Spinal level = C5-6

- **Supinators**: Nerves? Spinal level = C5-6

- **Pronators**: Nerve? Spinal level = C6-7, C8-T1
  (Do you recognize a pattern? - embryonic development)

- **Elbow Extensors**: Nerve? Spinal level = C6-7, C7-8
Sensory Distribution

- Draw and label sensory distribution of the UE.
- Where appropriate, include what nerve it branches off of.
Common Elbow Injuries

- Hypomobility (Arthritis)
- Medial Epicondylitis
- UCL injury
- Ulnar Nerve Entrapment
- Lateral Epicondylitis vs. Radial Nerve Entrapment
Hypomobility

- **Acute**: Pain, effusion & muscle guarding. Is pronation/supination limited? Trauma (r/o Fracture)?

- **Subacute**: Capsular pattern = flexion > extension?

- **Chronic**: Pronation & supination become restricted with chronic arthritis
Medial Epicondylitis

- **MOI:** Wrist flexor strain
- Known as “Little Leaguer’s” or “Golfer’s elbow”

**Special Testing:**
- Palpation
- Strength testing
- What nerve might be irritated?
Medial Epicondylitis Rehab

• **Acute Epicondylitis:**
  - Avoid cox inhibitor NSAIDS for ≈ 1 week ([http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2266668/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2266668/))
  - Loading increases strength of tendon while disuse decreases strength of tendon (Kannus 1997)
  - Overloading can lead to degeneration &/or failure
  - What’s enough and what’s too much?
  - Depends on stage! **Acute:** “Inflammatory” (3-5 days)? **Subacute:** “Repair” (3-21 days)? **Chronic:** “Remodel” (up to 1 year)?

• **Chronic Epicondylitis:**
  - Eccentric exercise (Alfredson et al 1998). **Pain**?
  - Tissue mobilization (Davidson et al 1997).
  - Cyclic stretching - 8% at 0.5 Hz (Wang 2004, Garvin et al 2003).
Tendons

• Like tensile forces

• Don’t like compressive and shear forces
  • https://vimeo.com/118162021
  • https://www.youtube.com/watch?v=EAW87NsiGuI
Tendinopathy

3 Stages:

- Reactive: younger (15-25 yrs), rapid onset due to load, swelling of tendon, painful but uncommon
- Reactive on degenerative: older (40-60 yrs), PMH, onset after overload, variable edema, less irritable, painful & very common
- Degenerative: 30-60yrs, long history of minimal symptoms, variable edema, unloading strategies, atrophy, NOT painful & common

Normal Tendon

Healthy

Reactive Tendinopathy

Degenerative Tendinopathy

Degenerative Tendinopathy

Tendinopathy

**Treatment**

- **Reactive/Reactive on Degenerative Tendon**
  - Leave them alone (kind-of) – Avoid frictions, eccentrics, injections, needles
  - Remove abusive loads
  - Use tolerable loads (start with isometrics)

- **Degenerative Tendon**
  - Strengthen healthy tendon
  - Strengthen kinetic chain
  - Muscle, tendon & **brain**

Frequency & Injury

- Williams 1993

- Increased training effort
  - Increased tissue stress
    - Microscopic Tissue Damage
      - Tissue Remodelling
        - Remodelling Rate > Rate of damage
          - Stronger Tissue
        - Remodelling rate < rate of damage
          - Overuse Injury
UCL Injury

- **MOI**: Excessive valgus stress (acute or chronic). Lyman et al 2002: # of pitches > predictor than style. Slider more than curve.

- **Special Testing**: 1. ? 2. ?

- **Rehab**: 3-6 months of conservative Tx  
  ↓ pain and edema  
  Restore normal ROM  
  Progressive return to activity  
  16 wks start throwing  
  1yr for pitchers & 6 mos for position players  

**Surgery**: UCL Reconstruction (Tommy John) of the Elbow –YouTube
Ulnar Nerve Entrapment

• **MOI:** Hit “funny bone” or long-term compression

• **Special Testing:**
   1. Tinel’s at elbow - [Tinel Test for Ulnar and Median Nerve - YouTube](#)
   2. Elvey’s Brachial Plexus (ulnar specific) - [Ulnar Nerve Mobilization – YouTube](#)

Rehab:
1. Identify site of entrapment (Tx pain and edema)
2. Neural “flossing”
3. Ulnar nerve transposition - [ulnar nerve transposition - YouTube](#)
Lateral Epicondylitis vs. Radial Nerve Entrapment

- MOI: Just like medial but with wrist extensors

- Known as “Tennis Elbow”

- Special Testing:
  1. ?
  2. ?

- Differential Dx: ?

- Rehab:
  - see medial epicondylitis
  - neural “flossing”
  - surgical release

Arcade of Frohse