Osteology of the Elbow and Forearm Complex

The ability to perform many activities of daily living (ADL) depends upon the elbow.
Can you think of anything that you do to take care of yourself that would not require you to flex your elbow?
Osteology of the Structures

Right Humerus
Anterior Distal Aspect

- radial fossa
- lateral epicondyle
- capitulum
- trochlea
- medial epicondyle
- coronoid fossa
- ulnar nerve sulcus
Right Humerus
Posterior Distal Aspect

- medial epicondyle
- lateral epicondyle oelecranon fossa
- ulnar nerve sulcus
- trochlea
- trochlea
Osteology of the Proximal Structures of the Elbow & Forearm

- Ulna
- Radius
Ulna
Proximal Anterior Aspect

- coronoid process
- trochlear (semilunar) notch
- olecranon
- radial notch
Osteology of the Distal Structures of the Forearm

- Ulna
- Radius

head

styloid process
Osteology Note:

- The **proximal** radius rotates around the ulna which is stationary
- The **distal** radius is larger and broader than the distal ulna
The Elbow Joint

- 2 articulations
  - The **humeroulnar joint**
    - Structural stability for the joint: trochlear notch
  - The **humeroradial joint**
    - The capitulum and the head of the radius
    - Not involved in elbow flexion,
      - Only involved in supination and pronation
Carrying Angle? (normal cubitus valgus)

- With the forearm supinated and elbow fully extended, the forearm projects laterally about 15-20° relative to the humerus. This is normal, but tends to be greater in females.
Supporting Structures of the Elbow

- **Articular Capsule:**
  - Thin connective tissue encasing 3 articulations

- **Medial Collateral Ligament:**
  - Fibers from the medial epicondyle to the coronoid and olecranon processes, help provide stability in resisting cubital valgus producing forces

- **Lateral Collateral Ligament:**
  - From the lateral epicondyle to the proximal forearm, resist cubital varus
Help I’m falling... an outstretched elbow often suffers.
So how much elbow ROM do you need?

- Usually about 100° for most ADLs, but it occurs between 30 and 130 degrees of flexion.
Arthrology of the Forearm

- Composed of proximal and distal radioulnar joints
- Supination and Pronation occur at both joints and in the FOREARM
Supination & Pronation

- Shoulder rotation can often be functionally substituted for each motion
- But not if the humerus is held tight against the thorax and the elbow is in 90° of flexion
Colle’s Fracture

- Fracture of the distal radius
  - The weight of the body is transmitted through the hand and wrist, exceeding the strength of the radius
  - The interosseous membrane dissipates some of the force
Interosseous Membrane
Redundancy is a fact of life function

**Innervation**

- The musculocutaneous n.
  - Supplies the elbow flexors EXCEPT the brachioradialis
- The radial n.
  - Supplies the elbow extensors
- The median n.
  - Supplies all the pronators of the forearm
Redundancy is a fact of life function.

The elbow flexors are innervated by 3 different nerves*

- Preservation of “hand to mouth” activities
- The likelihood of all 3 nerves being injured is “slim”

* mucusoskeletal n.
  radial n.
  median n.
# Myology of the Elbow

## Biceps Brachii

| Origin       | Long Head: Supraglenoid tubercle of the scapula  
| Short Head: Coracoid process of the scapula |
| Insertion    | Bicipital tuberosity of the radius |
| Innervation  | Musculocutaneous n. |
| Action       | Elbow flexion, sh flexion and forearm supination |
| “tidbit”     | “corkscrew” muscle |
## Myology of the Elbow

<table>
<thead>
<tr>
<th>Brachialis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>Anterior aspect of the distal humerus</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td>Coronoid process of the ulna</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Musculocutaneous n.</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Elbow flexion</td>
</tr>
<tr>
<td><strong>“tidbit”</strong></td>
<td>“workhorse” for elbow flexion</td>
</tr>
</tbody>
</table>

![Diagram of the Brachialis muscle](image)
# Myology of the Elbow

**Brachioradialis**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Lateral supracondylar ridge of the humerus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Near the styloid process of the distal radius</td>
</tr>
<tr>
<td>Innervation</td>
<td>Radial n.</td>
</tr>
<tr>
<td>Action</td>
<td>Elbow flexion, Pronation or supination of the forearm to the neutral position</td>
</tr>
</tbody>
</table>
# Myology of the Elbow

## Triceps Brachii

| Origin       | Long Head: infraglenoid tubercle of the scapula  
|              | Lateral Head: posterior aspect of the superior humerus, lateral to the radial groove  
|              | Medial Head: posterior aspect of the superior humerus, medial to the radial groove  
| Insertion    | Olecranon process of the ulna  
| Innervation  | Radial n.  
| Action       | Elbow extension  
|              | Sh extension: *Long head only*  

![Diagram of Triceps Brachii with labels](image)
Myology of the Elbow

<table>
<thead>
<tr>
<th>Anconeus</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>Posterior aspect of the laterals epicondyle of the humerus</td>
</tr>
<tr>
<td>Insertion</td>
<td>Olecranon process of the ulna</td>
</tr>
<tr>
<td>Innervation</td>
<td>Radial n.</td>
</tr>
<tr>
<td>Action</td>
<td>Elbow extension?</td>
</tr>
<tr>
<td>“tidbit”</td>
<td>Believed to “clear” the joint space of soft tissue to permit full elbow extension. Too small to create torque for elbow extension.</td>
</tr>
</tbody>
</table>
## Supinator

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Lateral epicondyle of the humerus and supinator crest of the ulna</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Lateral surface of the proximal radius</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Radial n.</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Forearm supination,</td>
</tr>
</tbody>
</table>
# Myology of the Forearm

## Pronator Teres

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th><strong>Humeral head; medial epicondyle of the humerus</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td><strong>Lateral surface of the midshaft of the radius</strong></td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td><strong>Median n.</strong></td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td><strong>Forearm pronation, secondary elbow flexion</strong></td>
</tr>
</tbody>
</table>
Myology of the Forearm

<table>
<thead>
<tr>
<th>Pronator Quadratus</th>
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</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
</tr>
<tr>
<td><strong>Action</strong></td>
</tr>
</tbody>
</table>

![Muscle Diagram](image)
Identify!

- Biceps brachii
- Brachialis
- Coracobrachialis
- Pronator Teres
Identify!

- Triceps brachii
- Anconeus
- Teres Major
- Teres Minor
- Infraspinatus
Identify!

- Biceps Brachii
- Brachialis
- Brachioradialis
- Pronator Teres
- Pronator Quadratus