The Elbow & Radioulnar Joints

• Most upper extremity movements involve the elbow & radioulnar joints
• Usually grouped together due to close anatomical relationship
• Elbow joint movements may be clearly distinguished from those of the radioulnar joints
• Radioulnar joint movements may be distinguished from those of the wrist
Bones

- Ulna is much larger proximally than radius
- Radius is much larger distally than ulna
- Scapula & humerus serve as proximal attachments for muscles that flex & extend the elbow
- Ulna & radius serve as distal attachments for these same muscles
Bones

- Scapula, humerus, & ulna serve as proximal attachments for muscles that pronate & supinate the radioulnar joints
- Distal attachments of radioulnar joint muscles are located on radius
- Bony landmarks
  - medial condyloid ridge
  - olecranon process
  - coranoid process
  - radial tuberosity
Bones

• Key bony landmarks for wrist & hand muscles
  – medial epicondyle
  – lateral epicondyle
  – lateral supracondylar ridge
Joints

- Ginglymus or hinge-type joint
- Allows only flexion & extension
- 2 interrelated joints
  - humeroulnar joint
  - radiohumeral joints
Joints

• Elbow motions
  – primarily involve movement between articular surfaces of humerus & ulna
  – specifically humeral trochlear fitting into ulna trochlear notch
  – radial head has a relatively small amount of contact with capitulum of humerus
  – As elbow reaches full extension, olecranon process is received by olecranon fossa
    • increased joint stability when fully extended
Joints

- As elbow flexes 20 degrees or more, its bony stability is unlocked, allowing for more side-to-side laxity.
- Stability in flexion is more dependent on the lateral (radial collateral ligament) & the medial or (ulnar collateral ligament).
Joints

- Ulnar collateral ligament is critical in providing medial support to prevent elbow from abducting when stressed in physical activity
  - Many contact sports & throwing activities place stress on medial aspect of joint, resulting in injury
Joints

- Radial collateral ligament provides lateral stability & is rarely injured
- Annular ligament provides a sling effect around radial head for stability
Joints

- Elbow moves from 0 degrees of extension to 145 to 150 degrees of flexion
Joints

• Radioulnar joint
  – Trochoid or pivot-type joint
  – Radial head rotates around at proximal ulna
  – Distal radius rotates around distal ulna
  – Annular ligament maintains radial head in its joint
Joints

- **Radioulnar joint**
  - Supinate 80 to 90 degrees from neutral
  - Pronate 70 to 90 degrees from neutral
Joints

• Radioulnar joint
  – Joint between shafts of radius & ulna held tightly together between proximal & distal articulations by an interosseus membrane (syndesmosis)
  • substantial rotary motion between the bones
Movements

• Flexion
  – movement of forearm to shoulder by bending the elbow to decrease its angle

• Extension
  – movement of forearm away from shoulder by straightening the elbow to increase its angle
Movements

• Pronation
  – internal rotary movement of radius on ulna that results in hand moving from palm-up to palm-down position

• Supination
  – external rotary movement of radius on ulna that results in hand moving from palm-down to palm-up position
Muscles

• Elbow flexors
  – Biceps brachii
  – Brachialis
  – Brachioradialis
  – Weak assistance from Pronator teres

• Elbow extensor
  – Triceps brachii
  – Anconeus provides assistance
Muscles

• Radioulnar pronators
  – Pronator teres
  – Pronator quadratus
  – Brachioradialis
• Radioulnar supinators
  – Biceps brachii
  – Supinator muscle
  – Brachioradialis
Muscles

• “Tennis elbow" - common problem usually involving extensor digitorum muscle near its origin on lateral epicondyle
  – known lateral epicondylitis
  – associated with gripping & lifting activities

• Medial epicondylitis
  – somewhat less common
  – known as golfer's elbow
  – associated with medial wrist flexor & pronator group near their origin on medial epicondyle
  – Both conditions involve muscles which cross elbow but act primarily on wrist & hand
Muscles

- **Anterior**
  - Primarily flexion & pronation
    - Biceps brachii
    - Brachialis
    - Brachioradialis
    - Pronator teres
    - Pronator quadratus
Muscles

• Posterior
  – Primarily extension & supination
    • Triceps brachii
    • Anconeus
    • Supinator
Nerves

- All elbow & radioulnar joints muscles are innervated from median, musculotaneous, & radial nerves of brachial plexus
**Nerves**

- Radial nerve - originates from C5, C6, C7, & C8
  - Triceps brachii
  - Brachioradialis
  - Supinator (posterior interosseous nerve)
  - Anconeus
  - Sensation to posterolateral arm, forearm, & hand
Nerves

- Median nerve - derived from C6 & C7
  - Pronator teres
  - Pronator quadratus (anterior interosseus nerve)
  - Sensation to palmar aspect of hand & first three phalanges, palmar aspect of radial side of fourth finger, dorsal aspect of index & long fingers
Nerves

- Musculotaneous nerve - branches from C5 & C6
  - Biceps brachii
  - Brachialis
Biceps Brachii Muscle

- Flexion of elbow
- Supination of forearm
- Weak flexion of shoulder joint
Brachialis Muscle

True flexion of elbow

Brachialis muscle

O, Distal half of anterior portion of humerus

I, Coronoid process of ulna

Flexion
Brachioradialis Muscle

Flexion of elbow

Pronation from supinated position to neutral

Supination from pronated position to neutral
Triceps Brachii Muscle

All heads:
- extension of elbow

Long head:
- extension of shoulder joint
- adduction of shoulder joint

O, Infraglenoid tubercle of scapula
O, Upper half of posterior surface of the humerus
O, Distal two-thirds of posterior surface of humerus
I, Olecranon process of ulna
Anconeus Muscle

Extension of elbow

- Anconeus m.
- O, Posterior surface of lateral condyle of the humerus
- I, Posterior surface of upper ulna and olecranon
Supinator Muscle

Supination of forearm

Supinator m.

Supination

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Pronator Teres Muscle

Pronation of forearm

Weak flexion of elbow
Pronator Quadratus Muscle

Pronation of forearm
Elbow Flexion

- Ex. Biceps curl
- Agonists
  - Biceps brachii
  - Brachialis
  - Brachioradialis
Elbow Extension

- EX. Push-up
- Agonists
  - Triceps brachii
  - Anconeus
Radioulnar Pronation

- Agonists
  - Pronator teres
  - Pronator quadratus
  - Brachioradialis
Radioulnar Supination

• Ex. Tightening a screw
• Agonists
  – Biceps brachii
  – Supinator muscle
  – Brachioradialis
Web Sites

Anatomy & Physiology Tutorials
www.gwc.maricopa.edu/class/bio201/index.htm

Radiologic Anatomy Browser
– This site has numerous radiological views of the musculoskeletal system.

University of Arkansas Medical School Gross Anatomy for Medical Students
http://anatomy.uams.edu/htmlpages/anatomyhtml/gross.html
– Dissections, anatomy tables, atlas images, links, etc.

Loyola University Medical Center: Structure of the Human Body
www.meddean.luc.edu/lumen/MedEd/GrossAnatomy/GA.html
– An excellent site with many slides, dissections, tutorials, etc. for study of human anatomy.
Web Sites

Wheeless' Textbook of Orthopaedics
www.ortho-u.net/
– This site has an extensive index of links to the fractures, joints, muscles, nerves, trauma, medications, medical topics, lab tests as well as links to orthopaedic journals, other orthopaedic, and medical news.

Arthroscopy.Com
www.arthroscopy.com/sports.htm
– Patient information on various musculoskeletal problems of the upper and lower extremity.

Premiere Medical Search Engine
www.medsite.com
– This site allows the reader to enter any medical condition and it will search the net to find relevant articles.
Web Sites

Virtual Hospital

www.vh.org

– Numerous slides, patient information, etc.