#### The Upper Extremity

#### Arm Muscles, Axilla, Brachial Plexus

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## Bones of Upper Extremity



- Appendicular Skeleton
  Pectoral Girdle = scapula,clavicle
- Upperlimb
  - Arm: humerus
  - Forearm: radius, ulna
    - Interosseus membrane
  - Hand: carpals, metacarpals, phalanges
- Review Bones + Landmarks studied in Lab!!

#### Joints of Upper Extremity





#### (a) Articulated pectoral girdle

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- Sternoclavicular
  - Synovial-saddle
  - Diarthrosis
- Acromioclavicular
  - Synovial-plane
  - Diarthrosis
  - Glenohumeral joint
    - Synovial-ball&socket
    - Diarthrosis
    - Many ligaments
    - Muscle reinforcement
    - Great Mobility

### Joints of the Upper Extremity



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**Elbow Joint** Synovial – hinge Diarthrosis Articulations Humerus & Ulna Humerus & Radius Many Ligaments 

## Joints of Upper Extremity



(a) Anterior view Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

Proximal Radioulnar joint Synovial - pivot Diarthrosis Distal Radioulnar joint • Synovial – pivot Diarthrosis Allows pronation and supination of forearm

## Joints of the Upper Extremity



<sup>(</sup>b) Posterior view Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

Radiocarpal joint Synovial-condyloid Distal radius with proximal row of carpals Intercarpal joints Synovial-plane Carpal-metacarpal (2-5) Synovial-plane **Trapezium-metacarpal** 1 Synovial-saddle Metacarpal-phalangeal Synovial-condyloid Interphalangeal Synovial-hinge ALL DIARTHROSES

## **Review of Naming**

What do the following names TELL you about the muscle?

- Naming
  - Flexor carpi ulnaris
  - Flexor digitorum superficialis
  - Flexor pollicis longus
  - Pronator quadratus
  - Extensor carpi radialis brevis

**Refer to tables in chapter 11 of text for muscle O + I** 

(Table 11.8-11.13)

Know at least 1 action of every muscle

## Muscles of Scapula



#### If ORIGIN on scapula = Move Arm

Rotator

Cuff

- Subscapularis
- Supraspinatus
- Infraspinatus
- Teres Minor
- Teres Major
- Latissimus Dorsi (partial O on scap)
- Coracobrachialis
- If INSERTION on scapula = Move scapula
  - Rhomboids
  - Trapezius
  - Pectoralis Minor
  - Serratus Ventralis
  - Levator Scapulae

**Use location of Insertion to determine movement!!** 

## Innervation of Scapula Muscles

- Origin on Scapula:
  - Latissimus dorsi = Thoracodorsal nerve
  - Subscapularis, Teres Major = Subscapular nerves
  - Supraspinatus, Infraspinatus = Suprascapular nerves
  - Teres Minor = Axillary nerve
- Insertion on Scapula
  - Levator Scapular, Rhomboids = Dorsal Scapular nerve
  - Pectoralis Minor = Pectoral n.
  - Serratus Ventralis = Long Thoracic n.
  - Trapezius = Accessory n.

Refer to tables in chapter 11 of text for muscle O + I Know at least 1 action of *every* muscle

#### Muscles of Arm: Cross elbow, Move forearm



#### 2 Compartments Anterior: Flexors of forearm Posterior: Extensors of forearm Anterior Compartment • Biceps brachii = MC nerve • Brachialis = MC nerve • Brachioradialis = Radial nerve Coracobrachialis = MC nerve • O = coracoid process of scapula • I = medial side humeral shaft • A = flex, adduct arm **Posterior Compartment** • Triceps brachii = Radial nerve • Anconeus = Radial nerve

MC = musculocutaneous nerve

#### Muscles of forearm: Cross wrist + finger joints, moves hand

- Cross Wrist = flex, extend, abduct, adduct hand
  - Cross Fingers = flex, extend fingers
- Most muscles fleshy proximally, long tendons distally

#### Flexor + Extensor Retinacula

- wristbands keep tendons from bowing
- thick, deep fascia

- Anterior Flexor Compartment (Superficial + Deep layers)
  - Most flexors have common tendon on medial epicondyle
  - Contains 2 pronators
  - Innervated by \*Median, Ulna nerves

Posterior Extensor Compartment (Superficial + Deep layers)

• Innervated by Radial nerve (or branches of)

## Innervation of Anterior Compartment-Forearm Muscles

Muscle Superficial Muscles

- Flexor digitorum superficialis
- Flexor carpi radialis
- Pronator teres
- Palmaris longus
- Flexor carpi ulnaris
- Deep Muscles
  - Pronator quadratus
  - Flexor pollicis longus
  - Flexor digitorum profundus

Median Median Median Median Ulnar

Nerve

Median Median Ulnar (med 1/2) Median (lat 1/2)



Innervation of Posterior Compartment-Forearm Muscles Muscle

#### Superficial

- Extensor carpi radialis longus
- Extensor digitorum
- Extensor carpi ulnaris

#### Deep

- Supinator
- Abductor pollicis longus
- Extensor pollicis longus + brevis
- Extensor indicus

Radial Radial Radial

Radial Radial Radial Radial



Intrinsic Muscles of Hand Muscle Pinky (little finger) • All digiti minimi (Flexor, Abductor, Opponens) Thumb Abductor pollicis brevis Flexor pollicis brevis Opponens pollicis Adductor pollicis Other Intrinsic Muscles Palmar + Dorsal Interossei Lumbricals

Median Median Median Ulnar Ulnar

Median, Ulnar

Ulnar

Nerve



## **Blood Supply: Veins**

#### SUPERFICIAL

Cephalic (arm-forearm)
Basilic (arm-forearm)

Median Cubital (elbow) Median Vein \_\_\_\_\_

•SF. Palmar Venous Arch
•Digital

DEEP

•Subclavian (neck) •Axillary (axilla)

•Brachial (arm-elbow)

•Radial (forearm)
•Ulnar (forearm)
•Deep Palmous Venous arch



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## **Blood Supply: Arteries**



- Subclavian (neck)
- Axillary (armpit)
  - Subscapular
- Brachial (arm)
  - Deep brachial
- Radial (forearm)
- Ulnar (forearm)
  - Common Interosseous
- Superficial & Deep Palmar arches
  - Digital

## Axilla = Armpit

- Region between arm and chestBoundaries
  - Ventral pectoral muscles
  - Dorsal = latissimus dorsi, teres major subscapularis
  - Medial = serratus ventralis
  - Lateral = bicipital groove of humerus
- Contents
  - Axillary lymph nodes, Axillary vessels Brachial Plexus



## Surface Anatomy of Upper Limb

- Biceps + Triceps brachii
  - **Olecrenon Process**
  - Medial Epicondyle
  - Cubital Fossa

- Anterior surface elbow
- Contents
  - Median Cubital Vein
  - Brachial Artery
  - Median Nerve
- Boundaries
  - Medial= Pronator teres
  - Lateral= Brachioradialis
  - Superior= Line between epicondyles





# Surface Anatomy of Upper Limb





#### Carpal Tunnel

- Carpals concave anteriorly
- Carpal ligament covers it
- Contains: long tendons, Median nerve
- Inflammation of tendons = compression of Median nerve

#### Anatomical Snuffbox

- Lateral = E. pollicis brevis
- Medial = E. pollicis longus
- Floor = scaphoid, styloid of radius
- Contains Radial Artery (pulse)

#### **Brachial Plexus**

Network of nerves; part in neck, part in axilla Muscles of upper limb receive innervation from nerves of the brachial plexus Formed from Ventral Rami of Inferior 4 Cervical Nerves  $(C_{5-8})$  and  $T_1$ 







#### Parts of Brachial Plexus

Really Tired? Drink Coffee Buddy!

R = ROOTS (ventral rami)
T = TRUNKS
D = DIVISIONS
C = CORDS
B = BRANCHES









## PUT IT ALL TOGETHER.....



#### **Innervation by Posterior Cord**

#### Radial Nerve (largest branch)

- Course: Through arm, around humerus, around lateral epicondyle, then divides
- Innervates: all posterior muscles of arm and forearm
  - Triceps brachii, anconeus, supinator, brachioradialis
- Divides in forearm:
  - Superficial = skin of arm and dorsolateral surface of hand
  - Deep = extensor muscles of forearm (eg E. carpi radialis L + B)
- Damage to Radial Nerve = wristdrop
  - Inability to extend the hand, st inability to fully extend forearm

#### Innervation by Posterior Cord (continued)

- Axillary Nerve (runs w/ caudal humeral circumflex a.)
  - Innervates:
    - Deltoid and Teres minor (motor inn)
    - Capsule of shoulder, skin of shoulder (sensory inn)
- Subscapular Nerve {branches of C5 + C6 rami}
   Innervates: Subscapularis, Teres major

Thoracodorsal Nerve (runs w/thoracodorsal a+v)
 Innervates: Latissimus dorsi

#### Innervation by Lateral Cord

#### Musculocutaneous

- Course: branches to arm, distal to elbow becomes cutaneous for lateral forearm skin
- Innervates
  - Biceps brachii, brachialis, coracobrachialis (motor inn)
  - Skin distal to elbow (sensory)

• Suprascapular (runs w/suprascapular a+v) {C5, C6}

• Innervates: Supraspinatus, Infraspinatus

## Innervation by both Lateral and Medial Cords

#### Median

- **Course:** middle of brachial plexus, does not branch in arm, distal to elbow provides many branches to most forearm flexors, passes through carpal tunnel to hand to lateral palmar intrinsics
- Innervates: most muscles of anterior forearm (motor inn)
  - (eg) most flexors, some intrinsics (thumb)
- Innervates: skin of lateral 2/3 hand on palm side, dorsum of fingers 2+3 (sensory inn)
- Nerve Damage = "Ape" Hand
  - Inability to Oppose Thumb

#### Innervation by Medial Cord

#### Ulnar

- Course: runs along medial side of arm, behind medial epicondyle, superficial to carpal tunnel into hand, branches to supply intrinsics and skin
- Innervates:
  - FCU and part of FDP, most intrinsics (motor inn)
  - Skin of medial 2/3 of hand A+P (sensory inn)
- Nerve Damage: Clawhand
  - Inability to extend fingers at interphalangeal joints, results in permanent flexion = claw

#### Cutaneous Innervation to the Hand



