Primary Cast Episode 1 - Upper Limb Anatomy

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1. **Shoulder Stability**

What are the articulating surfaces in the shoulder joint?

- Ball and socket synovial joint
- Rounded head of humerus and glenoid cavity of the scapula, deepened by the labrum.

What anatomical features contribute to the stability of the shoulder joint?

- Joint capsule with fusion of tendons of rotator cuff muscles
- Deepening of glenoid cavity by the glenoid labrum
- Coracoacromial arch superiorly created by the coracoacromial ligament
- Ligaments - anterior glenohumeral ligaments, coracohumeral nd transverse humeral.
- Rotator cuff muscles - supraspinatus, infraspinatus, teres minor and subscapularis.
- Tendons of biceps and triceps

What muscles are responsible for abduction and adduction of the shoulder.

- Abduction - supraspinatus for the first 15 degrees, deltoid the rest
- Adduction - pec major and lat dorsi acting together, also terms major and long head of triceps as synergists.

2. **Scapula**

Identify the main features of the scapula

- Glenoid cavity
- Spine
- Supraspinous fossa
- Infraspinous fossa
- Costal surface - Subscapular fossa
- Acromion
- Coracoid process
- Suprascapular notch
- Medial and lateral borders

Where do the scapulohumeral muscles attach?

- Deltoid - acromion and spine of scapula
- Supraspinatus - supraspinous fossa
- Infraspinatus - infraspinous fossa
- Teres minor- middle part of the lateral border
- Teres major - posterior surface of the inferior angle
- Subscapularis - in the subscapular fossa

3. **Humerus**

Describe the bony features of the proximal half of the humerus

- Head, anatomical neck, surgical neck, greater and lesser tubercles, intertubercular groove, deltoid tuberosity, radial groove

What are the common sites of fracture of the proximal humerus and what nerves are at risk with these fractures?

- Neck - axillary nerve and brachial plexus
- Midshaft - radial nerve

4. **Rotator Cuff**

What are the rotator cuff muscles and describe their actions

- Subscapularis - medial rotation of the humerus
- Supraspinatus initiates abduction - for the first 15 degrees
- Infraspinatus and teres minor do lateral rotation of the humerus
- All 4 muscles together help stabilise the shoulder joint

What is the nerve supply to the rotator cuff muscles?

- Supraspinatus- suprascapular nerve
- Infraspinatus - suprascapular nerve
- Subscapularis - Upper and lower subscapular nerves supply
- Teres minor - posterior branch of the axillary nerve

1 for 2 and 2 for 1 . i.e Suprascapular nerve does both supra and infraspinatus. Then 2 nerves supply the subscapularis

5. **Axilla**

Please describe the boundaries of the axilla

- Base: axillary skin and fascia
- Apex: Cervicoaxillary canal
- Anterior wall: Pec major and minor, clavipectoral fascia
- Posterior wall: Scapula and subscapularis on its surface, inferiorly latissimus dorsi and teres major
- Medial wall: thoracic wall, serratus anterior
- Lateral wall: intertubercular groove of the humerus

What are the contents of the axilla?

- Axillary artery in three parts as divided by the pec minor
- Axillary vein formed by the brachial and basilic veins, becomes the subclavian vein at the lateral border of the 1st rib,
- Brachial plexus
- Axillary lymph nodes - pectoral, subscapular, humeral, central, apical.
- Fat

6. **Cubital fossa**

Please describe the boundaries of the cubital fossa.

- Superiorly - a line between humeral epicondyles
- Medially - the lateral border of pronator teres
- Laterally - medial border of brachioradialis
- Floor - brachialis (& supinator)
- Roof - deep fascia reinforced by the bicipital aponeurosis, subcutaneous tissues and skin

What are the contents of the cubital fossa?

- Radial nerve
- biceps tendon
- brachial artery dividing into radial and ulnar arteries
- median nerve
- brachialis

7. **Elbow**

Please describe the main features of the proximal ulna

- Olecranon process
- Coronoid process
- Trochlear notch
- Radial notch
- Supinator crest
- ulna tuberosity and the interosseous border

How does the ulna articulate with other bones of the elbow?

- Olecranon and the coronoid process form walls of the trochlear notch which articulates with the trochlear of the humerus, allowing for flexion and extension.
- On lateral side of the coronoid process is the radial notch which articulates with the radial head

8. **Forearm muscles - flexors**

What are the muscles of the flexor compartment of the forearm?

- Superficial: Pronator teres, flexor carpi radialis, palmaris longus, flexor digitorum superficialis, flexor carpi ulnaris
- Deep: Flexor digitorum profundus, flexor policis longus, pronator quadratus

9. **Forearm muscles - extensors**

What is the nerve supply to the extensor compartment of the forearm?

The radial nerve and it's deep branch which becomes the posterior interosseous nerve.

How do these muscles produce movement of the thumb?

- Abductor pollicis Longus - abduction and extension at carpometacarpal joint
- Extensor pollicis Longus - extension at interphalangeal joint
- Extensor pollicis Brevis - extension at the metacarpophalangeal joint

Which muscles produce supination and pronation of the forearm?

- Supination - supinator and the biceps
- Pronation - pronator teres and pronator quadratus

Which nerves are required for pronation and supination?

- Median for pronation
- Musculocutaneous and radial for supination

10. Radial Nerve

Describe the course of the radial nerve in the upper limb

- Branch of the posterior cord, behind the axillary artery
- Leaves the axila
- Between long and medial heads of triceps
- Travels obliquely in the spiral groove of the humerus
- Pierces the lateral intermuscular septum
- Lies between brachialis and brachioradialis
- Supplies

Describe the sensory supply of the hand

1. **Median nerve** supplies the palmar surface and the distal dorsal; tips of the radial 3.5 fingers and the radial side of the palm.
2. **Ulnar nerve** supplies the palmar and dorsal surface of the ulnar 1.5 digits plus the corresponding palmar surface
3. **Radial nerve-** supplies the dorsal aspect of the lateral 3.5 digits excluding the tips, as well as the corresponding dorsal segment of the hand.

11. Median Nerve

Describe the course of the median nerve in the upper limb

- Derived from the medial and lateral cords of the brachial plexus
- Descends lateral to the brachial artery and then crosses to become medial
- Travels through the cubital fossa
- Passes between the heads of pronator teres
- Descends deep to flexor digitorum superficialis
- Continues distally between FDS and FDP
- Gives off the palmar cutaneous nerve before...
- ...passing through the carpal tunnel, deep to the flexor retinaculum
- Divides into the recurrent branch and the palmar digital branch

Describe the median nerve supply in the hand

- Sensory - palmar surface of the radial 3½ fingers and the dorsal surface of the tips of those fingers
- Motor - LOAF muscles, lateral 2 lumbricals, opponens pollicis, Abductor pollicis Brevis, Flexor Pollicis Brevis.

12. Ulnar Nerve

Describe the course of the ulnar nerve around the elbow

Passes through the elbow posterior to the medial epicondyle of the humerus

What clinical findings would you expect with an ulnar nerve injury at the elbow?

Sensory Loss

- Medial half of the palm
- Medial 1½ fingers on palmar and dorsal surface

Motor Loss - unable to

- Flex and adduct the hand at the wrist (FCU)
- Flex the distal interphalangeal joints of 4th and 5th digits (FDP)
- Flex and abduct @ the 5th MCPJ - loss of hypothenar muscles
- Adduct the thumb - adductor pollicis
- Abduct and adduct the 4th and 5th finger from loss of 3rd and 4th lumbricals

How would an ulnar nerve injury at the elbow differ from one at the wrist?

More pronounced ulnar claw hand if the lesion is more distal due to innervation to FCU and FDP being preserved.

13. Brachial Plexus

What are the terminal branches of the medial cord?

Ulnar, medial cutaneous nerves of the arm and forearm, medial pectoral nerve, medial root of the median nerve.

What nerves make up the posterior cord of the brachial plexus?

C5, C6. C7, C8, T1.

What are the terminal branches of the posterior cord and what do they supply?

- Axillary nerve
    - Glenohumeral joint
    - Muscles - deltoid and teres minor
    - Skin over the inferior aspect of deltoid
- Radial nerve
    - All muscles of the posterior compartment of arm and forearm
    - Skin over the posterior-inferolateral arm, posterior forearm, dorsum of hand to the radial 3 and a half fingers.
- Other branches
    - Upper subscapular nerve
    - Lower subscapular nerve
    - Thoracodorsal nerve

14. Venous Drainage

Describe the venous drainage of the hand and forearm

Superficial → Dorsal venous network and superficial palmar arch drain to the basilic and cephalic veins. Basilic vein becomes the axillary vein, cephalic vein pierces the clavipectoral fascia.

Deep → Deep venous palmar arch trains to radial and ulnar veins which accompany the arteries. All terminate in the brachial vein as they leave the forearm.

15. Lymphatic Drainage

Describe the superficial lymphatics of the upper limb

- They originate from lymphatic plexuses in the hand and ascend mostly with the superficial cephalic and basilic veins
- Some accompanying the basilic veins enter the cubital lymph nodes
- Efferent vessels from here drain to the axillary nodes
- Lymphatics accompanying the cephalic veins enter the axillary lymph nodes

16. Arterial supply

Please describe the arterial supply of the hand

- The blood supply to the hand is via the radial and ulnar arteries.
- **Radial artery** becomes the deep palmar arch, which gives off the princeps pollicis, radialis indicis and 3 palmar metacarpal arteries
- **Ulnar artery** has a deep palmar branch which anastomoses with the radial artery via the deep palmar arch. There is also the superficial palmar arch, which is the main terminal branch. This gives off 3 common palmar digital arteries.

Describe the course of the brachial artery as it passes through the arm

- Continuation of the axillary artery below the lower border of teres major.
- Gives rise to the profunda brachii artery which travels in the radial groove with the radial nerve.
- The brachial artery proper travels medial to the humerus and is crossed by the median nerve anteriorly as it descends.
- Lies on brachialis as it descends into the cubital fossa, where it travels underneath the bicipital aponeurosis.
- It terminates by bifurcating into the radial and ulnar arteries.

17. Anatomical snuffbox

What are the boundaries of the anatomical snuffbox?

- Ulnar side: Extensor pollicis longus
- Radial side: Extensor pollicis brevis and Abductor Pollicis Longus
- Floor: Radial styloid, scaphoid, trapezium, base of thumb MC

What are the contents of the snuffbox?

Radial artery, cutaneous branches of the radial nerve, origin of cephalic vein

18. Carpal bones

Name the carpal bones in the hand.

- Scaphoid, Lunate, Triquetrum, Pisiform, Trapezium, Trapezoid, Capitate, Hamate.

What movements occur at the wrist joint?

- Flexion, extension, abduction, adduction and circumduction.

19. Thenar muscles

Describe the origins and insertions of the muscles in the thenar eminence

The muscles are:

- Abductor pollicis brevis
- Flexor pollicis brevis
- Opponens pollicis

All originate from the flexor retinaculum and the tubercles of the scaphoid & trapezium.
Abductor pollicis brevis & Flexor pollicis brevis insert onto the base of the proximal phalanx
OP inserts on the 1st MC

20. Flexor retinaculum

Outline the attachments of the flexor retinaculum.
Scaphoid tubercle, trapezium ---> hook of hamate and pisiform.

What structures pass through the carpal tunnel?

- FCR
- FPL
- FDS
- FDP
- Median nerve

Extensor retinaculum

Which tendons pass under the extensor retinaculum of the wrist?

From radial to ulnar side

- Abductor Pollicis Longus
- Extensor pollicis brevis
- ECRB
- ECRL

- Extensor Pollicis Longus
- ED
- Extensor indicis
- EDM
- ECU