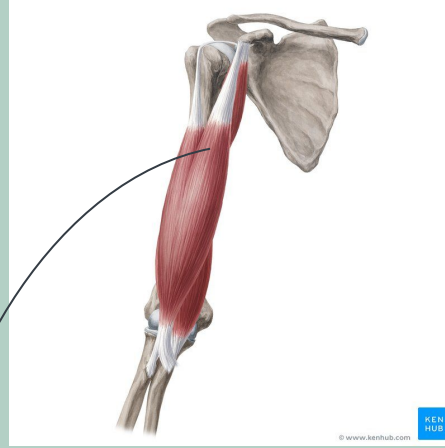


Upper Limb Anatomy



GKTeach 2023/24
Udomrat - Year 2
I'm a very humerus person :)

Learning Objectives

Today's session will mainly revolve around questions- you will attempt the questions then I will go through the relevant material!

THIS IS NOT A LECTURE- ASK QUESTIONS THROUGHOUT

SBA 1

A 70 y.o man suffers a fracture at the surgical neck of the humerus. A vessel posterior to the surgical neck is injured. Which one of the following is this vessel most likely to be?

1. Axillary artery
2. Brachial artery
3. Thoracoacromial artery
4. Posterior circumflex humeral artery
5. Anterior circumflex humeral artery

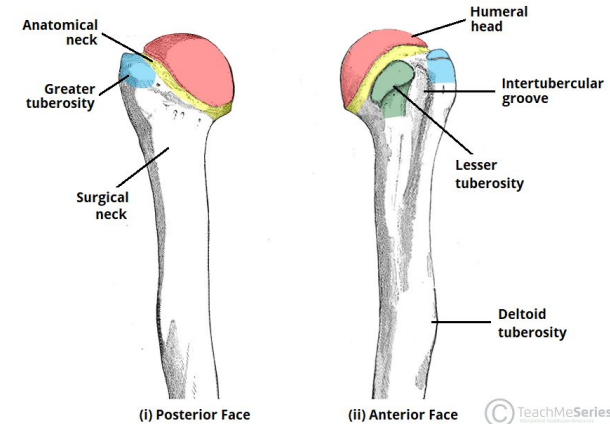
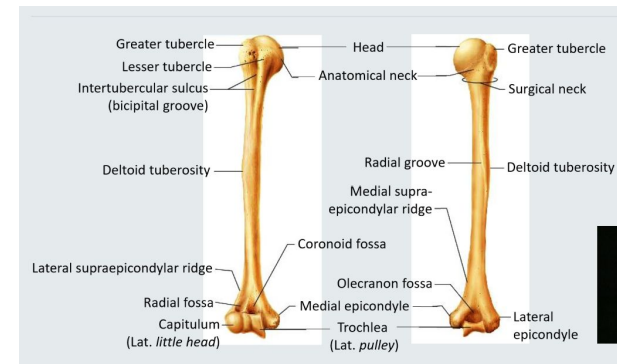
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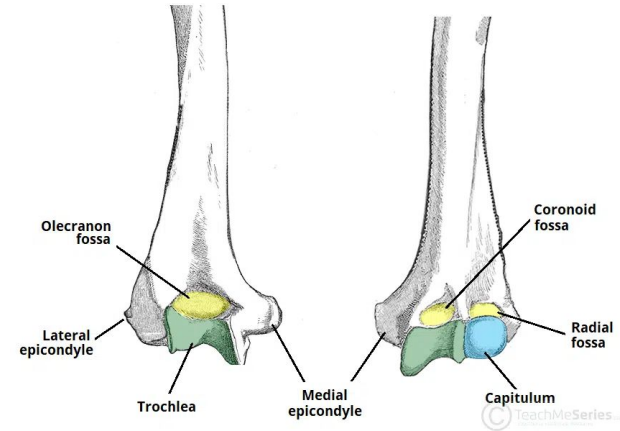
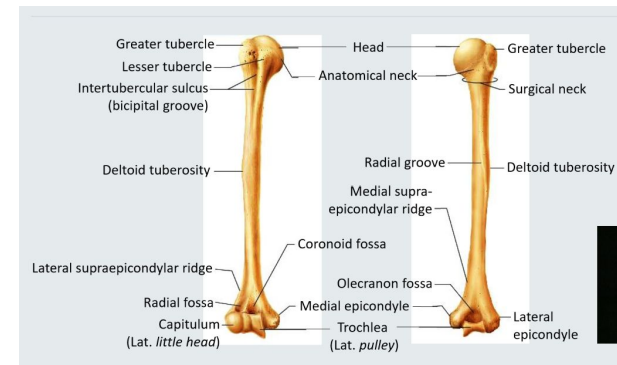
Proximal Humerus and Shaft

- Greater tuberosity: facets = attachment site for three rotator cuff muscles
 - Superior: supraspinatus
 - Middle: infraspinatus
 - Inferior: teres minor
- Lesser tuberosity: attachment for subscapularis
- Lips: edges of intertubercular groove/sulcus
 - Medial: Teres major
 - Latissimus dorsi
 - Lateral: pectoralis major
- Surgical neck
 - Just distal to tuberosities, to shaft
 - Circumflex humeral vessels
 - Axillary nerve
- Shaft: attachment for muscles, contains radial groove
 - Anterior: deltoid, brachioradialis, coracobrachialis, brachialis
 - Posterior: medial + lateral heads of triceps brachii
 - Deltoid tuberosity: roughened area on lateral side where deltoid attach
- Radial/spiral groove: shallow depression parallel to deltoid tuberosity
 - Radial nerve
 - Profunda brachii
- Articulation: proximal humerus x glenoid fossa of scapula → glenohumeral joint



Distal Humerus

- **Lateral supraepicondylar ridge**
 - Formed by lateral + medial borders
 - Origin of forearm extensors
- **Lateral + medial epicondyles: extrascapular projections of bone**
 - Ulnar nerve passes through posterior aspect of medial epicondyle
- **Trochlea: medial, extends onto posterior aspect of bone**
 - Articulates with trochlea notch of ulna
- **Capitulum: lateral to trochlea**
 - Articulates with radius
- **Fossae: accommodate forearm bones during elbow movement**
 - Coronoid
 - Radial
 - Olecranon



SBA 2

You are a 2nd year medical student on placement. A doctor finds that 'wrist drop' is present in a patient and x-ray confirms a midshaft fracture of the right humerus. He asks you what muscle is innervated by the affected nerve. How do you respond?

1. Brachioradialis
2. Radial nerve
3. Deltoid
4. Flexor carpi ulnaris
5. Casually walk away

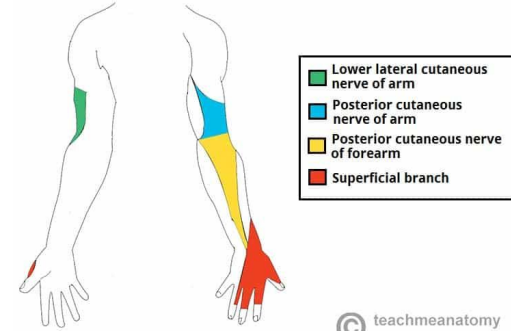
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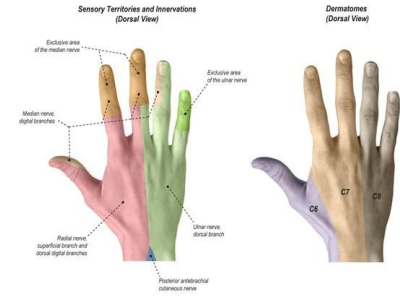
1. Brachioradialis
2. Radial nerve
3. Deltoid
4. Flexor carpi ulnaris
5. Casually walk away (I wouldn't blame you!)

Midshaft Fracture ➔ Wrist Drop

- Radial nerve innervates extensors
- Unresisted flexion of wrist
- Sensory loss over dorsal hand and proximal ends of lateral 3 ½ fingers

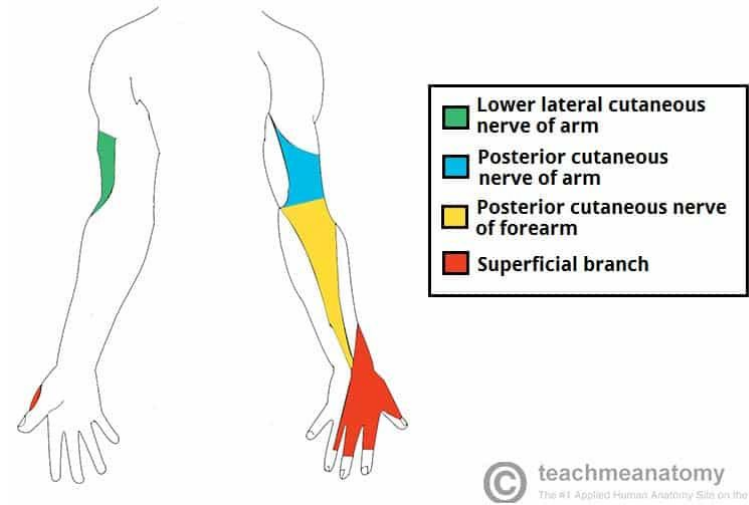


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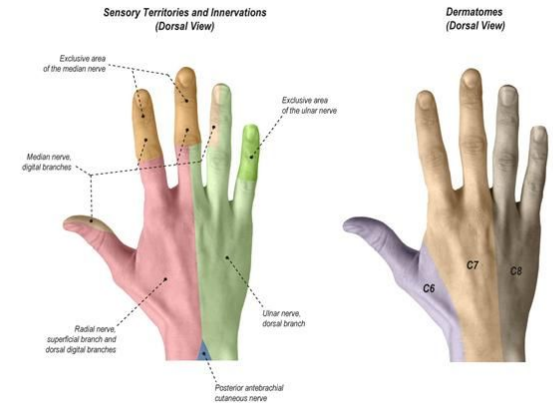


Radial Nerve: C5-T1

- Sensory Innervation
 - Most of posterior forearm
 - Lateral dorsal hand
 - Dorsal surface of lateral 3 ½ digits
- Motor Innervation
 - Triceps brachii
 - Forearm extensors

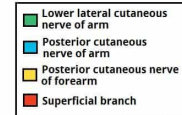
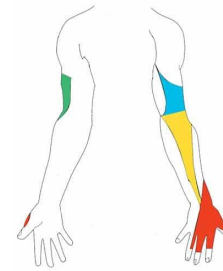


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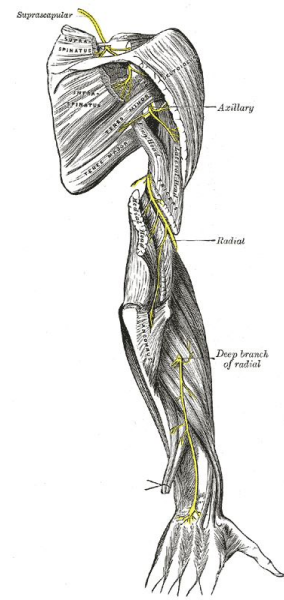


Path

1. Arises in axilla, posterior to axillary artery
2. Exits axilla inferiorly → branches to long + lateral heads of triceps
3. Descends through radial groove
4. Wraps around humerus laterally → branch to medial head of triceps
5. Travels through cubital fossa, anterior to lateral epicondyle of humerus
6. Terminates into two branches
 - a. Deep, motor → posterior compartment of forearm: extend at wrist + finger, supinate
 - b. Superficial, sensory → dorsal hand + fingers
7. Sensory branches in upper arm:
 - a. Lower lateral cutaneous nerve → lateral aspect of arm inferior to insertion of deltoid
 - b. Posterior cutaneous of arm → posterior surface of arm
 - c. Posterior cutaneous of forearm → skin down middle of posterior forearm



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SBA 3

A 18-year-old medical student presents to Tommy's following a fall. He reports tripping over a sleeping Lenny and falling onto his left hand. There is palpable tenderness over the anatomical snuffbox with telescoping of the left thumb.

Given the likely diagnosis, what additional structure is at risk of damage?

1. Median nerve
2. Radial artery
3. Pisiform bone
4. Ulnar artery
5. Flexor pollicis longus tendon

SBA 3

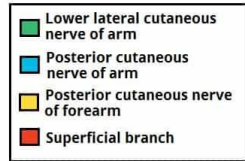
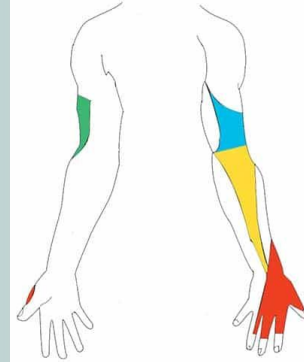
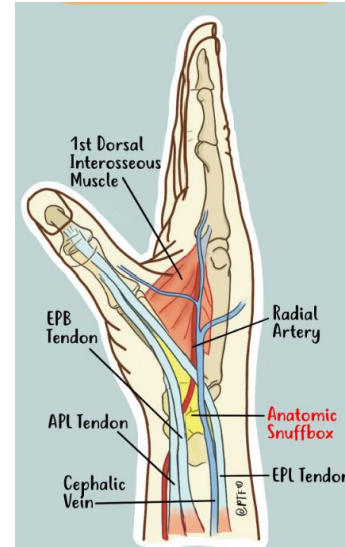
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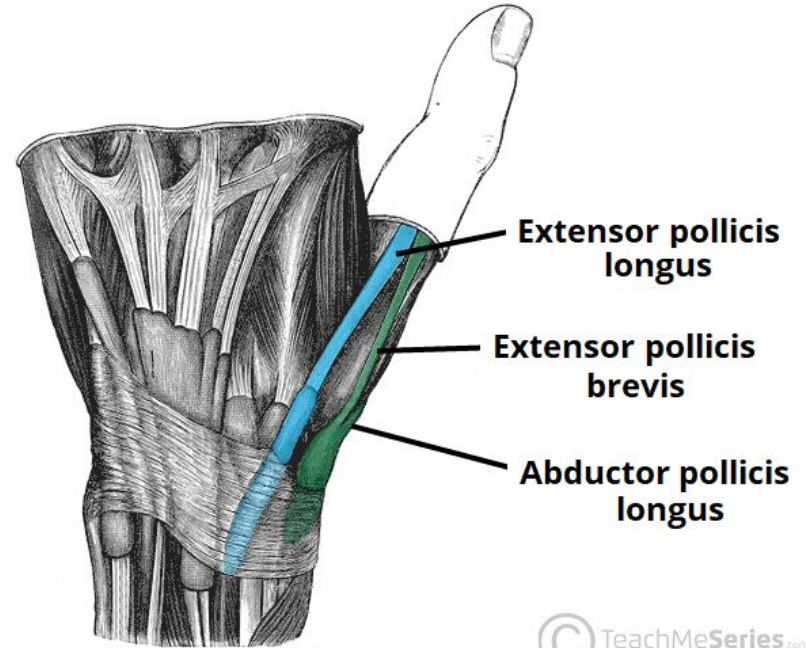
Contents of Anatomical Snuff Box

- Radial artery
 - Crosses floor
 - Turns medially
 - Travels between heads of APL
- Superficial branch of radial nerve
 - In skin + SC tissue
 - Innervates dorsal surface of lateral 3 ½ digits and associated area on back of hand
- Cephalic vein
 - Arises from dorsal venous network of hand
 - Crosses anatomical snuff box
 - Travel up anterolateral aspect of forearm



Borders of Anatomical Snuff Box

- Medial: tendon of extensor pollicis longus
- Lateral: tendon of extensor pollicis brevis + abductor pollicis longus
- Proximal: styloid process of radius
- Floor: scaphoid + trapezium
- Roof: skin



SBA 4

Which muscle is responsible for causing flexion of the distal interphalangeal joint of the ring finger?

1. Flexor digitorum profundus
2. Flexor digitorum superficialis
3. Flexor digitorum minimus
4. Palmar interossei
5. Flexor digiti minimi brevis

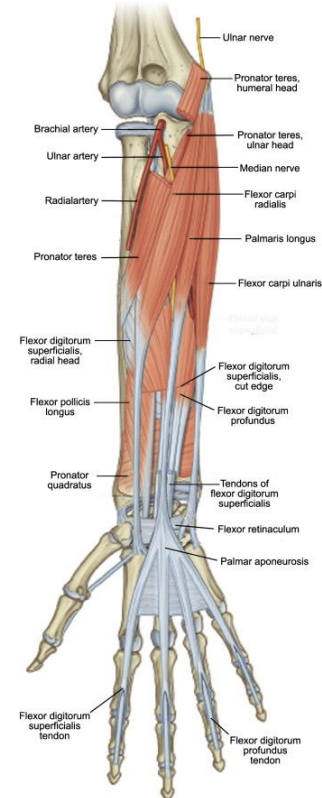
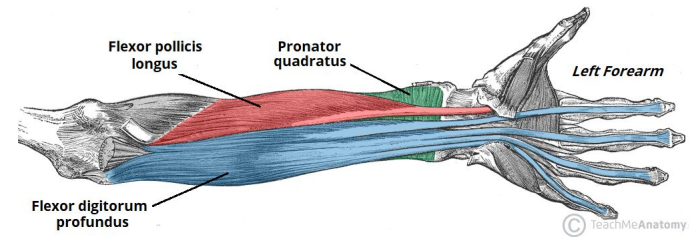
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2. Flexor digitorum superficialis
3. Flexor digitorum minimus
4. Palmar interossei
5. Flexor digiti minimi brevis

Flexor Digitorum Profundus

- Fusiform muscle in anterior compartment
- Part of deep flexor compartment
 - Flexor pollicis longus
 - Pronator quadratus (i?) muscles
- Flexes MCPJs and ITPJs 2-5
- Origin: proximal ½ of ulna anterior surface
- Insertion: palmar surfaces of DPs of d2-5
- Innervation
 - Median (anterior interosseous); d2-3
 - Ulnar (C8, T1): d4-5



SBA 5

A 52 year old woman presents to her GP with tingling and sensory loss in her hand. She is diagnosed with carpal tunnel syndrome.

Which part of the hand will the sensory loss affect?

1. Back of the hand
2. Palm and fingers
3. Thumb, index and middle fingers
4. Entire hand
5. Pinky finger and ring finger

SBA 5

A 52 year old woman presents to her GP with tingling and sensory loss in her hand. She is diagnosed with carpal tunnel syndrome.

Which part of the hand will the sensory loss affect?

1. Back of the hand
2. Palm and fingers
3. **Thumb, index and middle fingers**
4. Entire hand
5. Pinky finger and ring finger

Median Nerve: C6-T1

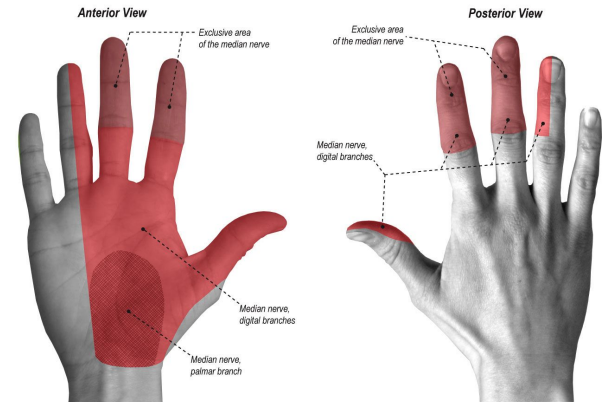
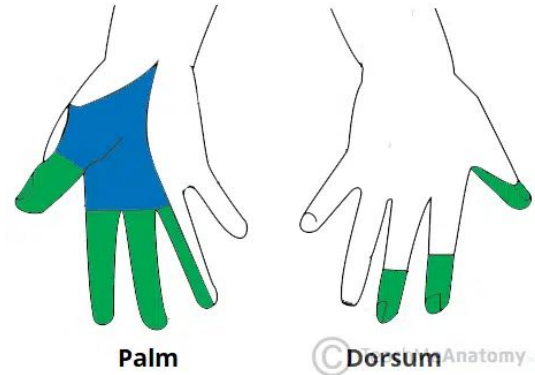
- Sensory Innervation

- Palmar cutaneous branch → lateral aspect of palm
- Digital cutaneous branch → lateral 3 ½ fingers on palmar surface of hand

- Motor Innervation

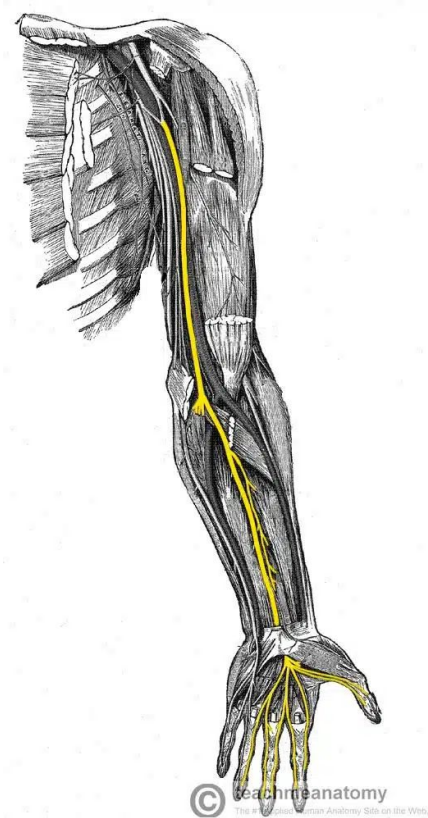
- Flexor and pronator muscles in anterior compartment except FCU and part of FDP
- Thenar muscles + lateral two lumbricals

- Palmar cutaneous branch
- Digital cutaneous branch



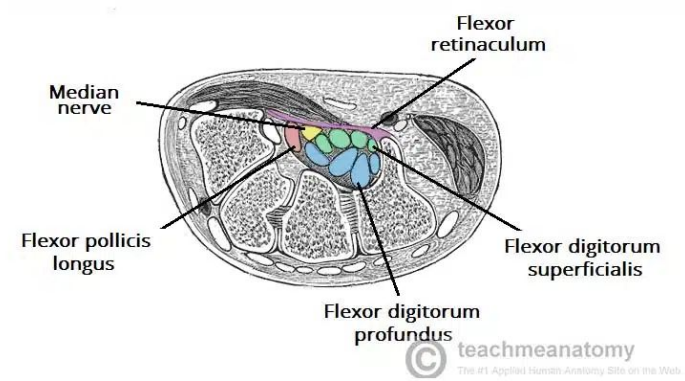
Path

1. Arises from brachial plexus in axilla
2. Descends down arm, lateral to brachial artery
3. Crosses over brachial artery halfway down arm
4. Enters anterior compartment of forearm via cubital fossa
5. Travels between two heads of pronator teres, descends in plane between FDP and FDS
6. Branches in forearm:
 - a. Anterior interosseous → deep muscles in anterior forearm
 - b. Palmar cutaneous → skin of lateral palm
7. Enters hand via carpal tunnel → two branches
 - a. Recurrent → thenar muscles
 - b. Palmar digital branch → palmar surface + fingertips of lateral 3 ½ digits + lateral 2 lumbricals

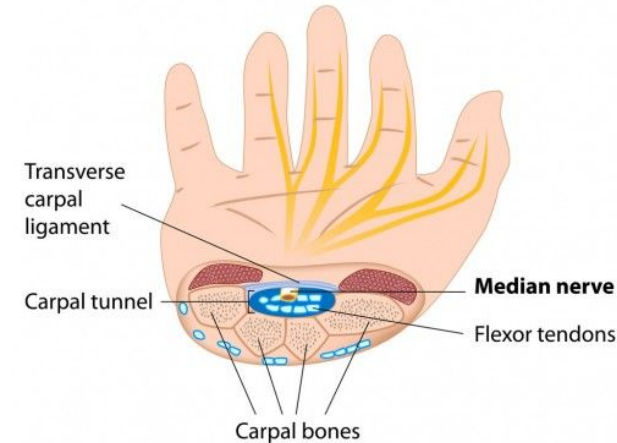


Borders of Carpal Tunnel

- Deep carpal arch
 - Concave on palmar side → base + sides
 - Lateral: scaphoid + trapezium
 - Medial: hook of hamate + pisiform
- Flexor Retinaculum
 - Thick connective tissue → roof
 - Bridges space between medial + lateral arch → tunnel
 - Medial: hook of hamate + pisiform
 - Lateral: scaphoid + trapezium

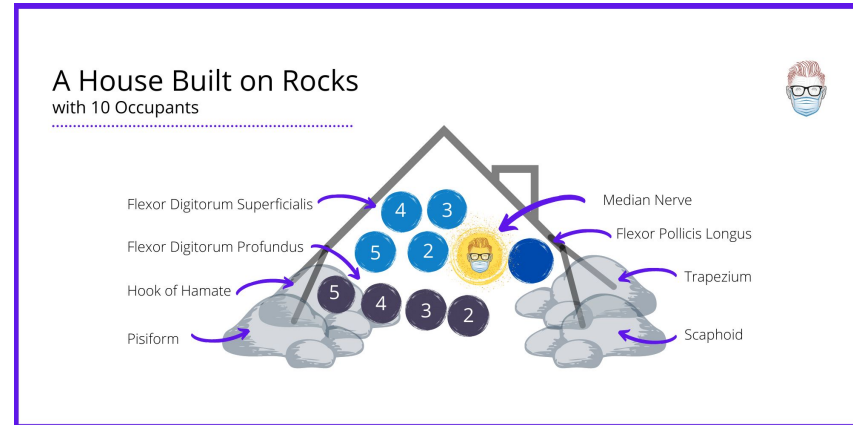


The Carpal Tunnel



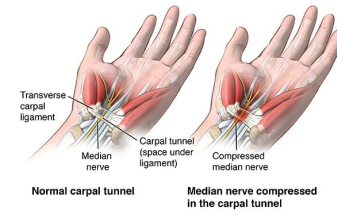
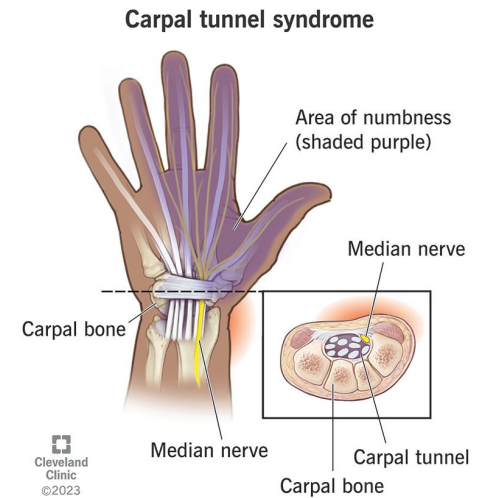
Contents of Carpal Tunnel

- 9 Tendons
 - Flexor pollicis longus: own synovial sheath
 - 4x FDP
 - 4x FDS
- Median nerve
 - Palmar digitals → palmar skin + dorsal nail beds of lateral 3 ½ digits, lateral 2 lumbricals
 - Recurrent → thenar muscle group



Carpal Tunnel Syndrome (CTS)

- Cause: compression of median nerve
- Clinical features
 - Numbness, tingling, pain in median nerve distribution
 - Pain radiates to forearm
 - Wakes pt from sleep, worse in mornings
- Tinel's sign: tap CT → pain in median nerve distribution
- Phalen's manoeuvre: flex wrist for 60s → numbness/pain in median nerve distribution
- Treatment options
 - Conservative: splint
 - Pharmacological: corticosteroid injections
 - Surgical decompression



SBA 6

From which of the following structures does the long head of the triceps arise?

1. Coracoid process
2. Infraglenoid tubercle
3. Acromion
4. Coracoacromial ligament
5. Coracohumeral ligament

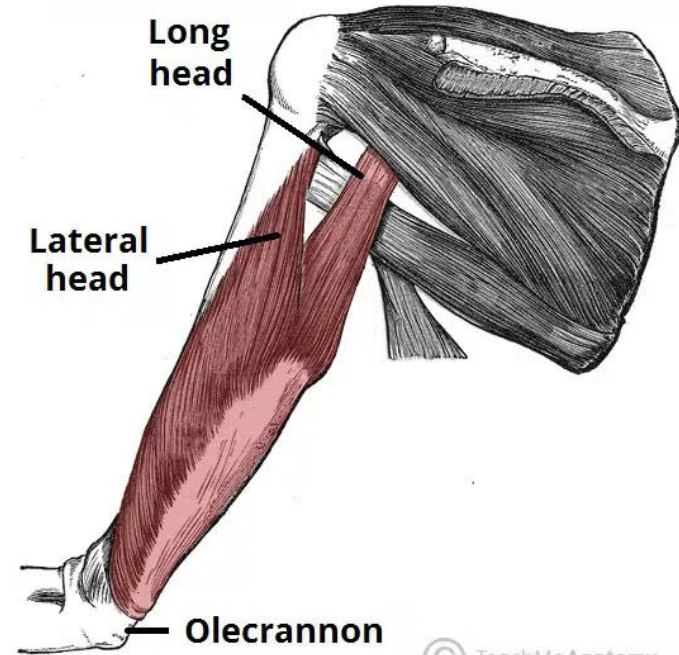
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5. Coracohumeral ligament

Triceps Brachii (Posterior Compartment)

- Attachments
 - Long head: infraglenoid tubercle of scapula
 - Lateral head: superior to radial sulcus
 - Medial head: inferior to radial groove
 - Heads converge into one tendon → olecranon
- Extends arm at elbow
- Innervation: radial nerve (C7-C8)
 - Sometimes long head innervated by axillary



SBA 7

A 28-year-old man complains of pain in his left upper arm. He also complains that he can't turn his left hand over so that the palm of his hand faces the ceiling. He describes the pain as being worse when his arm is bent.

What muscle is most likely affected?

1. Coracobrachialis
2. Biceps brachii
3. Flexor carpi ulnaris
4. Pronator quadratus
5. Triceps brachii

SBA 7

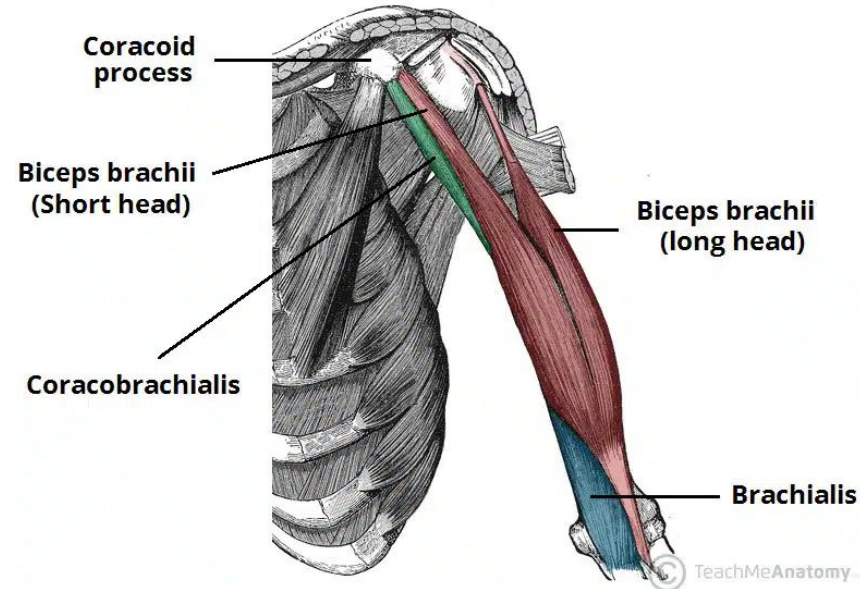
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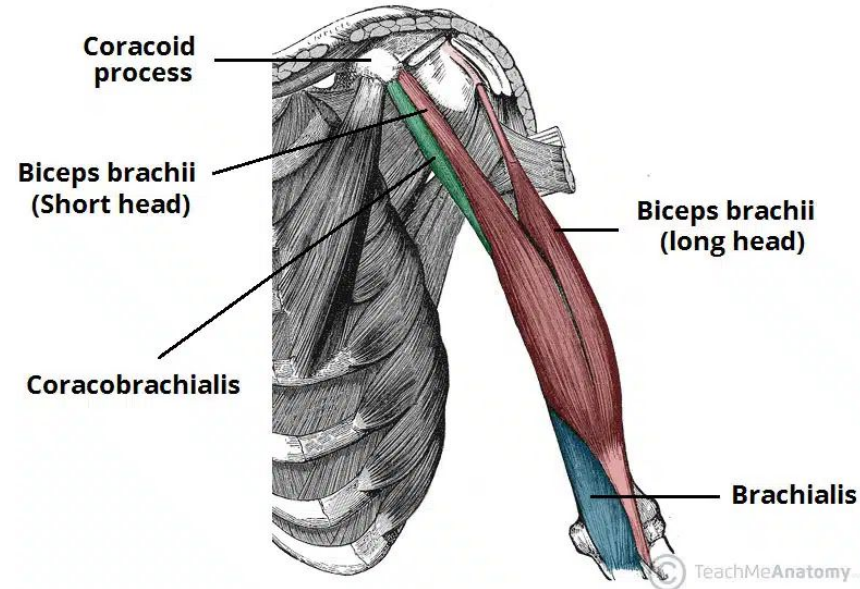
Biceps Brachii (Anterior Compartment)

- Attachments
 - Long head: supraglenoid tubercle of scapula
 - Short head: coracoid process of scapula
 - Both insert distally into radial tuberosity + fascia of forearm via bicipital aponeurosis
- Functions
 - Supination of forearm
 - Flexes arm at elbow + shoulder
- Innervation: musculocutaneous nerve (C5-C6 or 7)



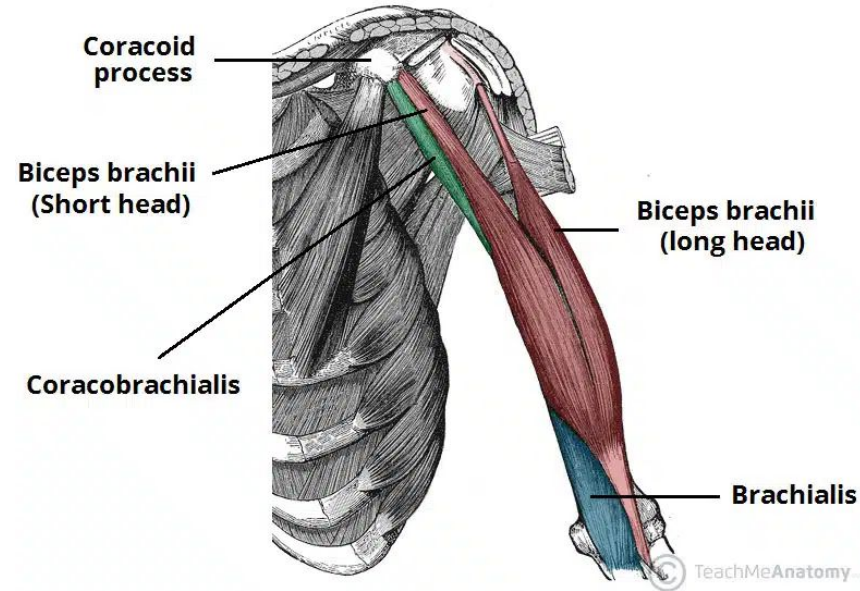
Coracobrachialis (Anterior Compartment)

- Deep to biceps
- Attachments
 - Origin: coracoid process of scapula
 - Passes through scapula → medial side of humeral shaft at level of deltoid tubercle
- Function
 - Flexion of arm at shoulder
 - Weak adduction
- Innervation: musculocutaneous nerve



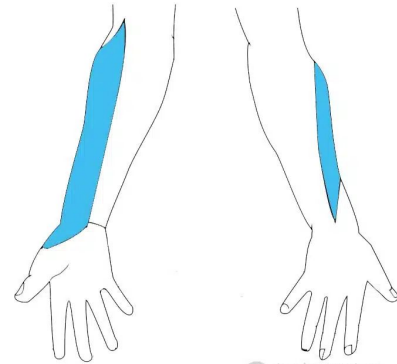
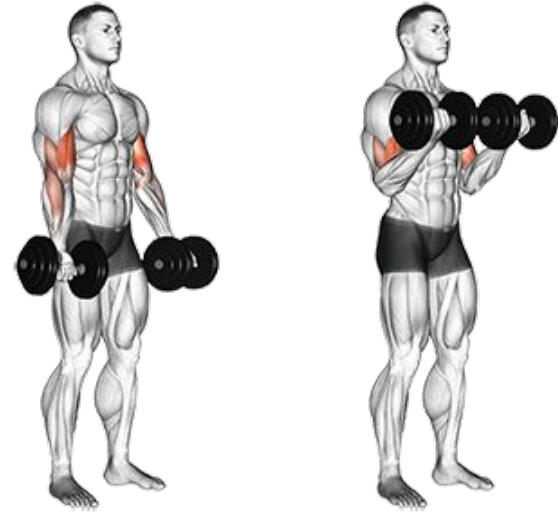
Brachialis (Anterior Compartment)

- Deep to biceps, more distal
- Forms floor of cubital fossa
- Attachments
 - Origin: medial + lateral surfaces of humeral shaft
 - Insertion: ulnar tuberosity, just distal to elbow joint
- Function: elbow flexion
- Innervation: musculocutaneous + radial nerve



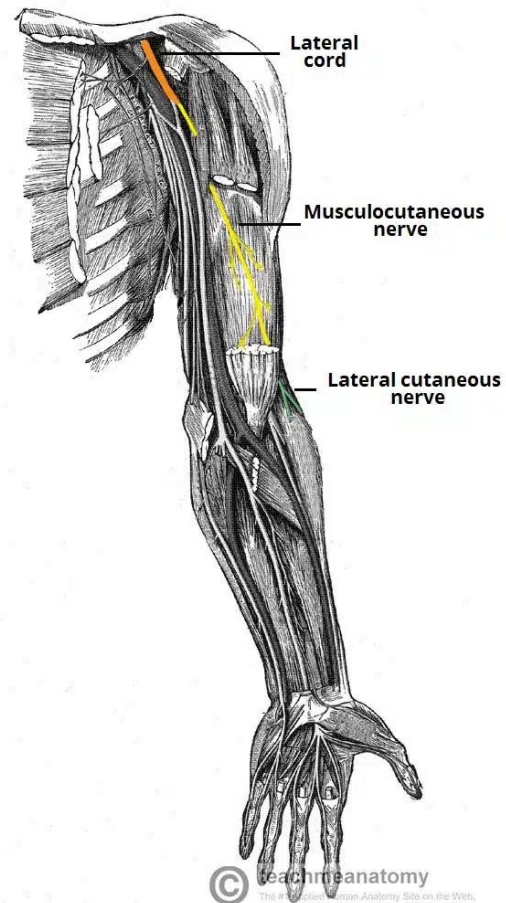
Musculocutaneous Nerve: C5-C7

- Sensory: lateral cutaneous nerve of forearm → anterolateral aspect of forearm
- Motor Innervation: BBC
- Terminal branch of lateral cord of brachial plexus



Musculocutaneous Nerve Path

1. Emerges at inferior border of pectoralis minor
2. Leaves axilla + pierces coracobrachialis near point of insertion on humerus
3. Down flexor compartment superficial to brachialis, deep to biceps
4. Articular branches to humerus + elbow
5. Pierce deep fascia lateral to biceps → emerge lateral to biceps tendon + brachioradialis
6. Continues into forearm as lateral cutaneous nerve



SBA 8

Which of the following is a branch of the third part of the axillary artery?

1. Superior thoracic
2. Lateral thoracic
3. Posterior circumflex humeral
4. Dorsal scapular
5. Thoracoacromial

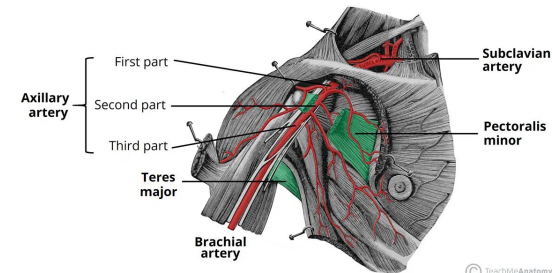
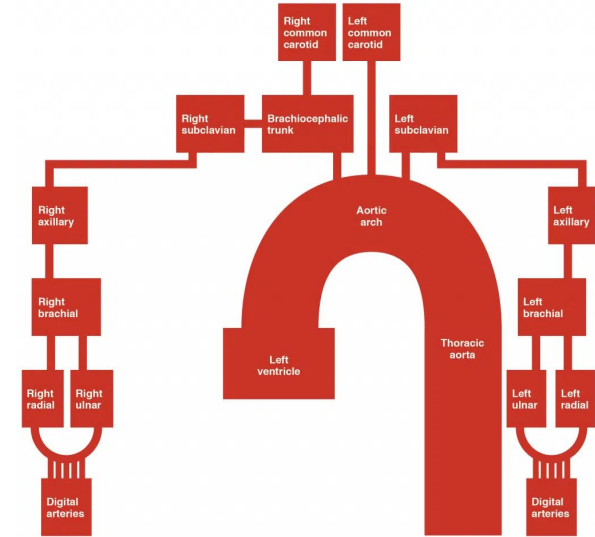
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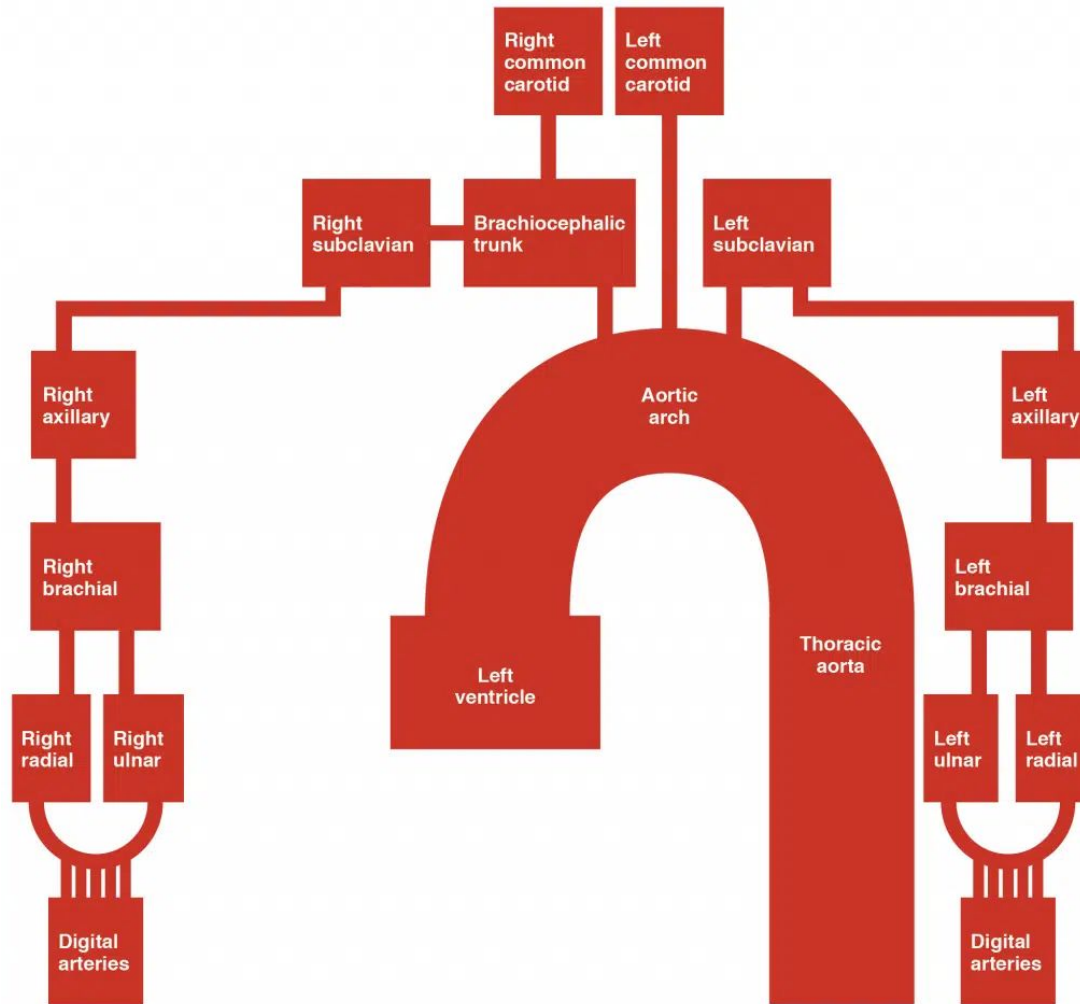
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3. **Posterior circumflex humeral**
4. Dorsal scapular
5. Thoracoacromial

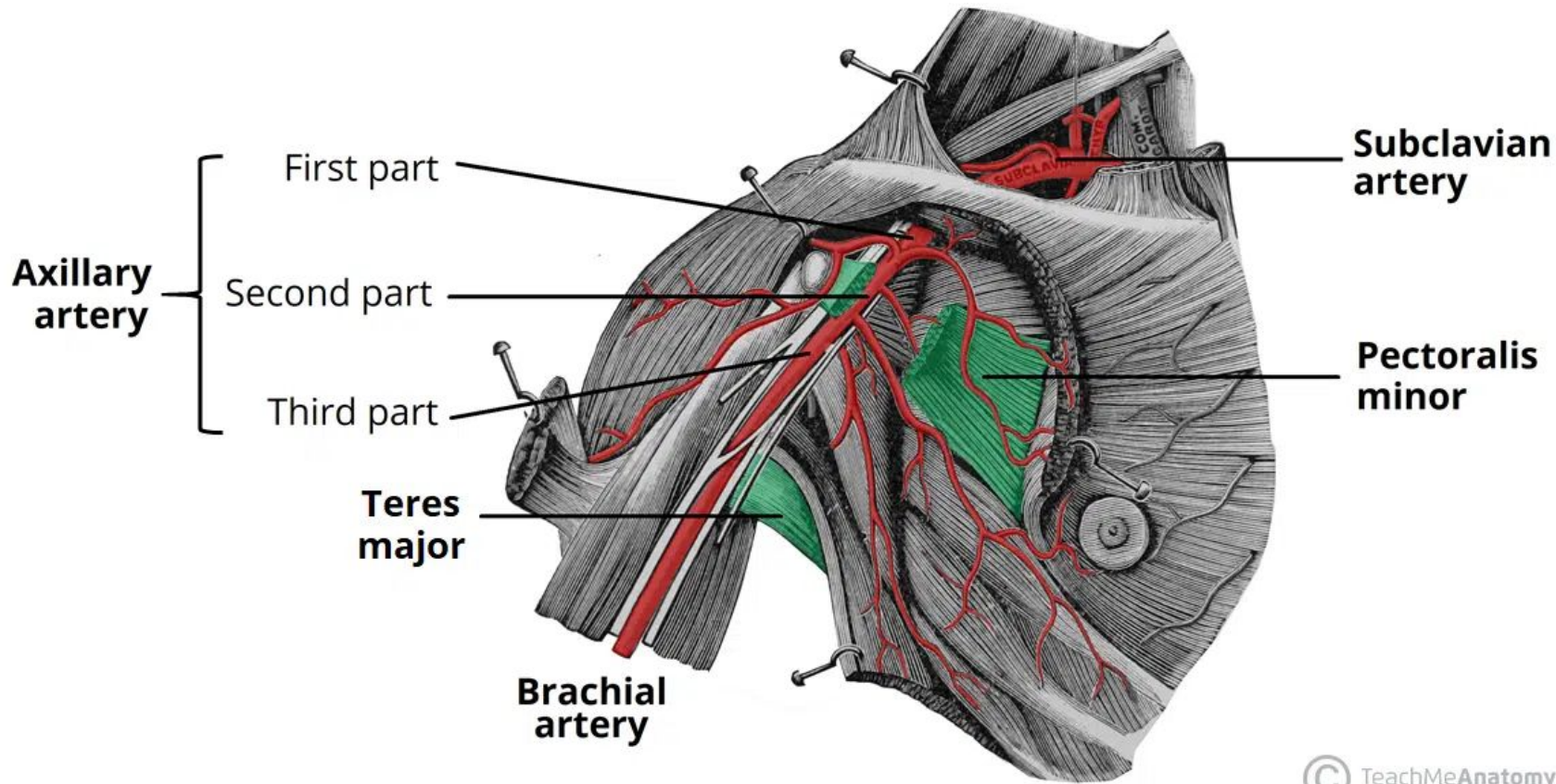
Axillary Artery

- Deep to pectoralis minor in axillary sheath (also covers 3 cord of brachial plexus)
- First part: proximal to pectoralis minor
 - Superior thoracic artery
- Second part: posterior to pectoralis minor
 - Thoracoacromial
 - Lateral thoracic
- Third part: distal to pectoralis minor
 - Subscapular
 - Anterior + posterior circumflex
- Called brachial artery from lower border of teres major



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SBA 9

Which of the following is not closely related to the capitate bone?

1. Lunate
2. Trapezoid
3. Scaphoid
4. Ulnar nerve
5. Trapezium

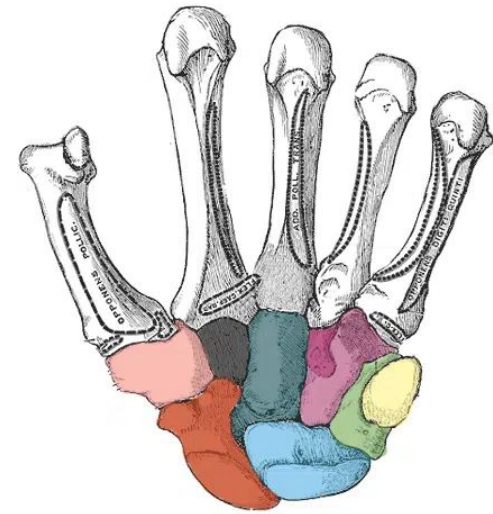
SBA 9

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2. Trapezoid
3. Scaphoid
4. **Ulnar nerve**
5. Trapezium

Carpal Bones

- Scaphoid + lunate articulate with radius to form wrist/radiocarpal joint
- Distal row articulates with MCs at CMCJs
- Hamate has projection on palmar surface: hook of hamate
- Pisiform: sesamoid bone formed within tendon of FCU
- Ulnar nerve + artery adjacent to pisiform



Orange	Scaphoid
Blue	Lunate
Green	Triquetrum
Yellow	Pisiform
Pink	Trapezium
Grey	Trapezoid
Teal	Capitate
Purple	Hamate

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SBA 10

What is the structure of a typical cervical vertebrae?

1. Heart-shaped vertebral body with bifid spinous process
2. Trifid spinous process with triangular vertebral canal
3. Bifid spinous process with quadrangular vertebral canal
4. Bifid spinous process with triangular vertebral canal
5. Kidney-shaped vertebral body with triangular vertebral canal

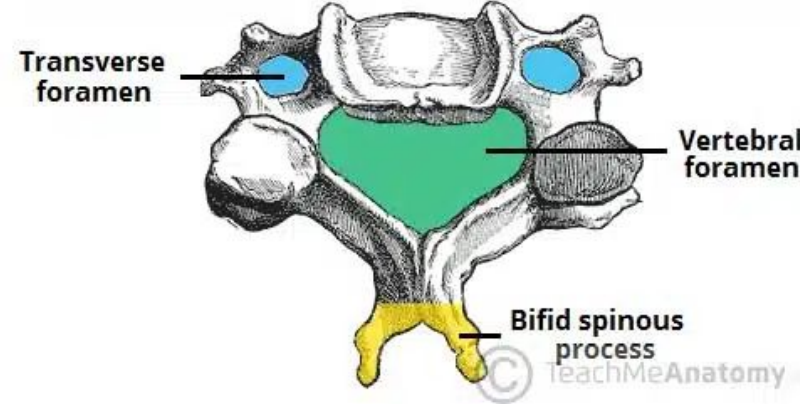
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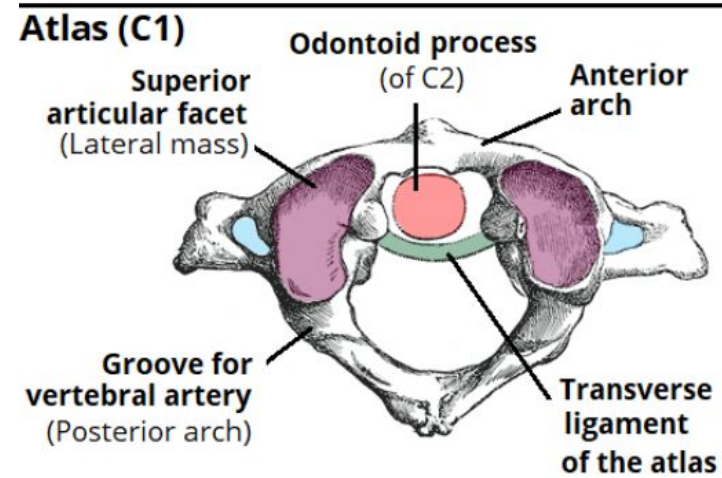
Cervical Vertebrae

- Triangular vertebral foramen
- Bifid spinous process: where spinous process splits into two distally
- Transverse foramina: holes in spinous process → passage to vertebral artery, vein, sympathetic nerves
- Unique: C1, C2



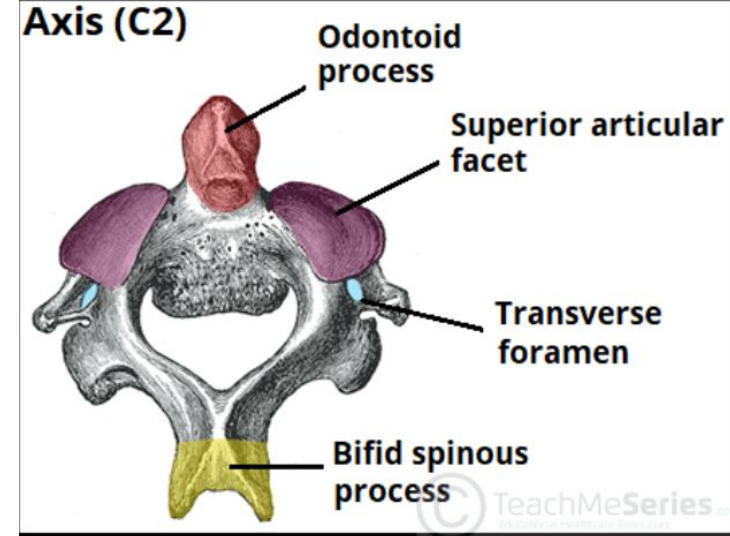
C₁: Atlas

- No vertebral body
- No spinous process
- Has lateral masses connected by anterior + posterior arch
 - Superior articular facet → occipital condyles
 - Inferior articular facet → C2
 - Posterior arch has groove for vertebral artery + C1 nerve
 - Anterior arch has facet for articulation with dens of axis, secured by transverse ligament of atlas
- Articulates with occiput of head and C2



C2: Axis

- Dens/odontoid process: extends superiorly from anterior portion of vertebra
 - Articulates with anterior arch of C1 → medial atlanto-axial joint
 - Allows rotation of head independently of torso
- Superior articular facets: articulate with inferior articular facets of atlas → two lateral atlanto-axial joints



BONUS SBA

What is the best hospital placement site in Year 2?

1. GSTT
2. KCH
3. PRUH
4. Lewisham
5. QEH

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SITE DOESN'T MATTER- ITS WHAT U MAKE OF IT!

Questions?



Thank you for attending the session -

Please fill in the feedback form:

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