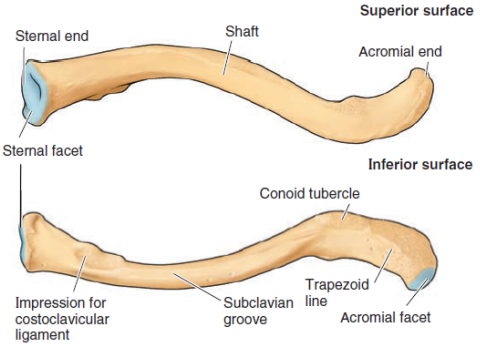
UPPER LIMB

❒ BONES

- SCJ is only jt connecting axial skeleton to limb = great mobility

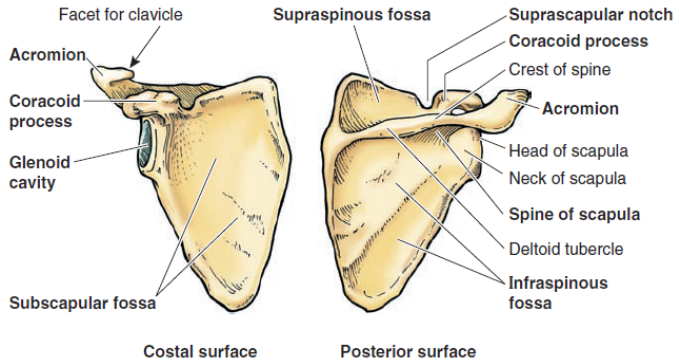
CLAVICLE

- SCJ & ACJ
- Trabeculae centre (ie not marrow) with compact shell
- Weakest part is medial & lateral 2/3
- Superior surface smooth
- Inferior surface
  - Medial: costoclavicular ligament
  - Shaft: Subclavian groove (*subclavius muscle*)
  - Lateral: conoid tubercle & trapezoid line (attaches medial and trapezoidal (lateral) *coracoclavicular ligament*)



SCAPULA

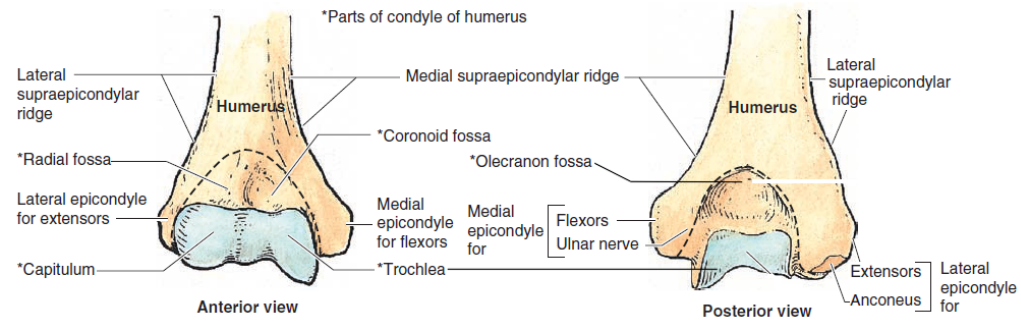
- Overlies ribs 2 to 7
- Fossa: supraspinous, infraspinous, subscapular
- Deltoid tubercle: medial attachment of deltoid
- Glenoid cavity: smaller than humeral head, directed anterosuperior
- Borders: Medial, lateral, superior
- Angles: Superior, Inferior, Lateral



HUMERUS

Proximal	Neck	*Anatomical:* Groove separating non/articulating surface
		Surgical: Just distal to head and greater/lesser tubercles
	Tubercles[1]	Greater: lateral projection
		Lesser: anterior projection
Shaft	Deltoid tuberosity	Posterior lateral
	Radial groove	Posterior middle
	Supraepicondylar ridges	
Distal	Epicondyles	lateral = extensors medial = flexors
	Condyles	*Olecranon, coronoid & radial fossa + trochlea & capitulum*

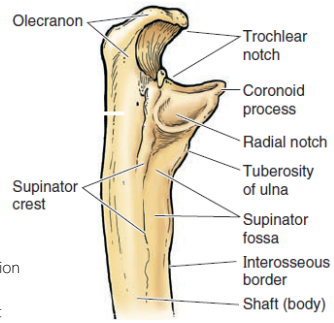
[1]Intertubercular groove separates and carries long head of biceps tendon



FOREARM: ULNA

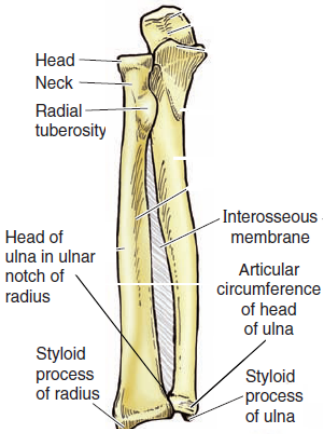
Proximal	Olecranon
	Coronoid process
	Radial notch
	Trochlear notch
	Tuberosity of the ulna
Shaft	Supinator crest & fossa
Distal	Head of the ulna
	Ulnar styloid process

- Small amount of abduction/adduction (during pronation/supination)
- Does not reach/articulate with wrist



FOREARM: RADIUS

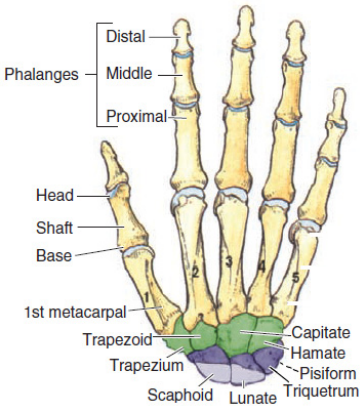
Proximal	Head
	Neck
	Radial Tuberosity
Shaft	-
Distal	Ulnar Notch
	Radial Styloid process
	Dorsal tubercle of radius



HAND

Bone	Articulation
Scaphoid	Radius
Lunate	
Triquetrium	Art disc of rad-ulnar jt
Pisiform	Palmar Triquetrium
Trapezium	1st, 2nd MC
Trapezoid	2nd MC
Capitate	3rd MC
Hamate	4th, 5th MC

NB 3rd MC has styloid process on lat base
Lunate & Trapezoid can't be palpated



❒ SURFACE ANATOMY

Scapula

- Superior angle @ T2
- Medial spine @ T3
- Inferior angle @ T7
- Medial border (abducted) @ 6th rib

❒ FASCIA & EFFERENT VESSELS

FASCIA

Region	Fascia	Orientation	Structures
Pectoral	Pectoral	Lat: Axillary Deep: clavipectoral	Pec Major
Pectoral	Clavipectoral[1]	Sup: clavicle Inf: Axillary	Subclavius Pec Minor
Shoulder	Deltoid	Inf: Pectoral Post: Infraspinous Lat: Brachial	
Arm	Brachial	Prox: all of above Distal: antebrachial	Attaches to epicondyles & olecranon
Forearm	Antebrachial		
Hand	Palmar fascia	Palmar Aponeurosis centrally Distal: *Tendon of palm long* & *sup transverse MC ligament*	
Fingers	Fibrous tendon sheaths		

[1]Costocoracoid membrane = btwn subclavius & pec minor, pierced by lat pec nerve, cephalic vein
Suspensory ligament of the axilla = inf to pec minor

Compartments

Region	Compartments	Contents	Borders
Shoulder	Subscapular	Ass muscles	Spinous process posteriorly
	Supraspinous		
	Infraspinous		
Arm	Anterior	Flexors	Medial & lateral intermuscular septa
	Posterior	Extensors	
Forearm	Anterior	Flexors	Interosseous membrane & extensor/flexor retinaculum (thickening of antebrachial fascia)
	Posterior	Extensors	

VENOUS DRAINAGE

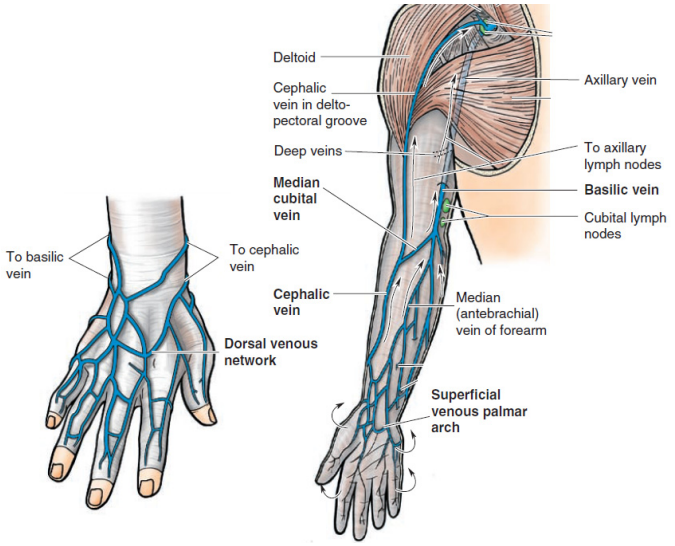
Superficial

+ Dorsal venous network

> Cephalic Vein
- Emerges from lateral aspect
- Ascends anterolaterally in forearm
- Communicates with *median cubital vein* in ACF
- Ascends anterolaterally btwn deltoid and pec major (in deltopectoral groove)
- Joins proximal end of axillary vein after going through costocoracoid fascia)

> Basilic Vein
- Emerges from medial aspect
- Ascends medially
- Comm with median cubital vein in ACF
- Ascends medially and passes deeply to brachial fascia 1/3 the way up arm
- Runs sup to brachial artery and medial cutaneous nerve
- Forms axillary vein with deep branches

> Median Antebrachial vein
- Variable
- Ascends from base of thumb btwn cephalic and brachia
- Terminates in ACF

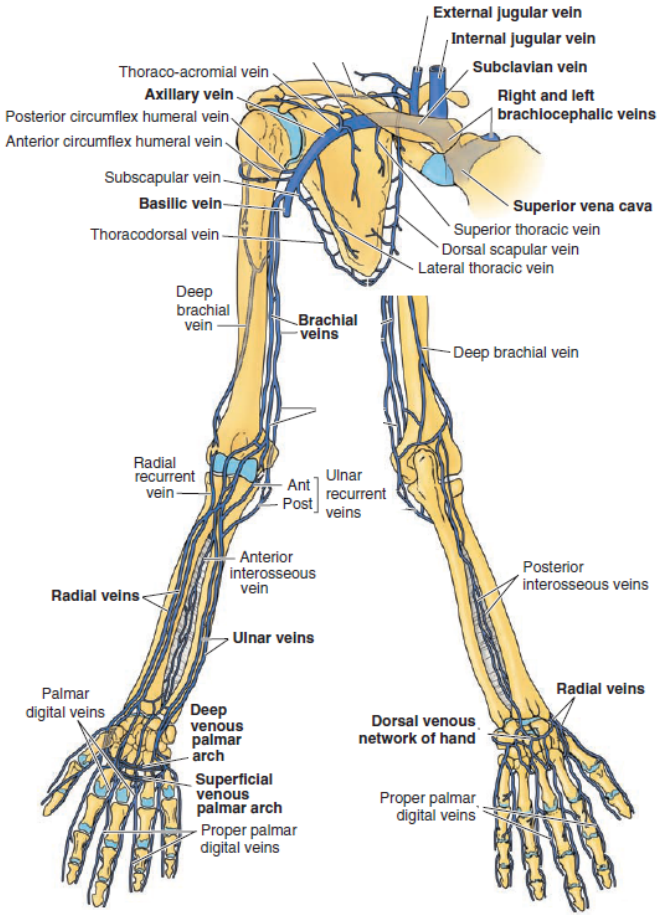


VENOUS DRAINAGE

Deep

- Run with arteries – same name

+ Proper palmer digital veins
> Superficial & Deep venous palmar arches
> Radial & Ulnar (branches of ant/post Interosseous & radial/ulnar recurrent near ACF)
> Brachial
> Axillary vein



Clinical Concept
- Axillary vein overlaps artery when arm fully abducted – therefore more at risk of injury
- Subclavian venous puncture: through proximal axillary vein 1st (lies in front of axillary artery and plexus)

LYMPHATIC DRAINAGE

Superficial
- Run with cephalic or Basilic veins
- Basilic: Some enter cubital nodes | Terminate in humeral axillary nodes
- Cephalic: Course over prox ant shoulder to apical nodes (some to deltopectoral nodes)

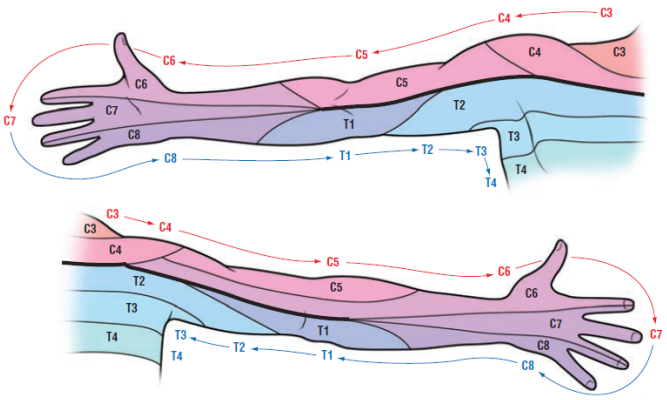
Deep
- Run with veins to humeral axillary nodes
- Cont as Subclavian trunk

❒ CUTANEOUS INNERVATION, MYOTOMES

DERMATOMES

- Shoulder: from cervical plexus (C1-4)
- Arm: from brachial plexus (C5-T1)

Spine	Dermatome
C3, 4	Base of neck, lateral shoulder
C5	Lateral arm
C6	Lateral forearm, thumb and ½ of 2nd digit
C7	3rd digit and medial ½ of 2nd and 4th digits
C8	Medial forearm and 5th digit and lateral ½ of 4th digit
T1	Medial elbow
T2	Medial arm & axilla



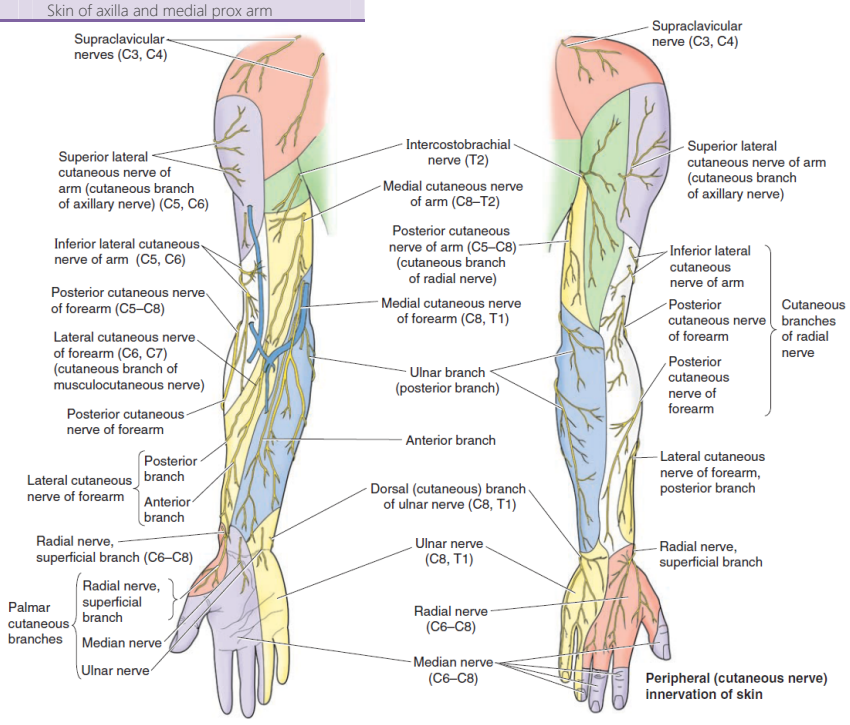
Innervation of Movements

Jt	Mvt	Spinal Nerve
Shoulder	Lat Rotation	C5
	Abduction	
	Flexion	
	Med Rotation	C6-8
	Adduction	
	Extension	
Elbow	Flexion	C5-6
	Extension	C6-7
	Supination	C6
	Pronation	C7-8
Wrist	Flexion	C7
	Extension	C6
Hand	Flexion	C7-8
	Extension	
	3rd Med Abduction	T1
	3rd Lat Adduction	
	Abduction	
	Adduction	

CUTANEOUS NERVES

Nerve		Source	Course/Distribution
Supraclavicular	C3,4	Cervical Plexus	Ant to clavicle Deep to platysmas Skin over clav @ sup/lat pec major
Sup lat cut[1]	C5,6	Axillary (terminal)	Post margin of deltoid Supplies lat deltoid and lat arm
Inf lat cut[1]	C5,6	Radial or Post cut1	Lat to head of triceps Skin around lat elbow
Post cut[1]	C5-8	Radial (in axilla)	Skin on post arm (to olecranon)
Post cut[2]	C5-8	Radial (with inf lat cut1)	Lat head of triceps Post forearm (to wrist)
Lat cut[2]	C6-7	Musculocutaneous (term)	Lat biceps tendon Skin anterolateral forearm/wrist
Medial cut[2]	C8,T1	Medial cord[3]	Medial to brach a Pierces deep fascia with brachial vein Divides into ant/post Skin to ant/med wrist
Medial cut[1]	C8-T2	Same	Skin medial arm
Intercostobrachial	T2	2nd IC nerve	Skin of axilla and medial prox arm

[1]Of the arm
[2]Of forearm
[3]Of Brachial Plexus



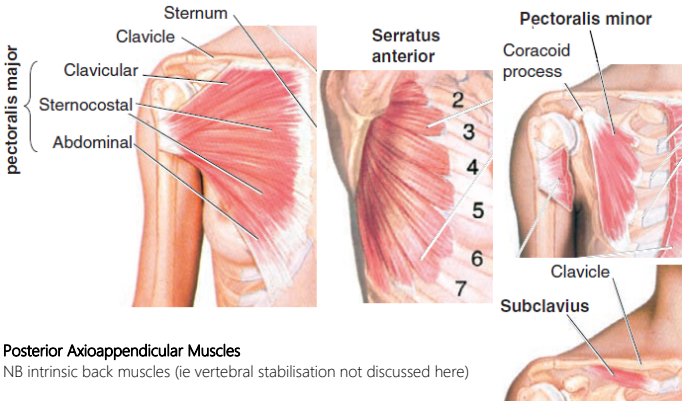
❒ PECTORAL AND SCAPULA REGION

Anterior Axioappendicular Muscles

- Pectoralis Major
- Pectoralis Minor
- Subclavius
- Serratus Anterior

Muscle	P	D	I	A
P Major				
Clavicular Head	Ant medial ½ clavicle	Lateral lip of intertubercular sulcus of ***Humerus***	Lat/Medial pec nerves Clavicular head (C5,6) Sternocostal head (C7,8,T1)	Together[1] Humerus: add, medial rot Scapula: ant/inf
Sternocostal Head	Ant sternum, 1-6 cartilage, Aponeurosis of ext obliques			
P minor	Rib 3-5 near cartilage	***Coracoid*** process	Medial pec nerve (C8, T1)	Stabilise scapula (draw ant/inf)
Subclavius	Rib 1 at jcn with cartilage	Inf surf of middle 1/3 ***clavicle***	Nerve to subclavius (C5, 6)	Anchor/depress clavicle
Serr Ant	Ant surface of lateral Ribs 1-8	Ant surface of medial ***scapula***	Long thoracic (C5, 6,7)	Protract scapula, holding it against thoracic wall Rotates scapula

[1]Independantly clavicular head flexes and sternocostal head extends the Humerus



Posterior Axioappendicular Muscles

NB intrinsic back muscles (ie vertebral stabilisation not discussed here)

Superficial posterior axioappendicular

Muscle	P	D	I	A
Trapezius	Medial 1/3 sup nuchal line Nuchal ligament Ext occipital protuberance Spin process C7-T12	Lat 1/3 clavicle Acromion Spine of Scap	Motor: Spinal acc (CN XI) Sensory: C3,4 spinal nerve	Descending: elevates Ascending: depresses Middle: retracts Rotate Glenoid cavity superiorly
Lat Dorsi	Spin process T6-12 Thoracolumbar fascia Iliac Crest Ribs 9-12	Floor of intertubercular sulcus of humerus	Thoracodorsal nerve (C6-8)	Ext, Add[1], Med rot humerus

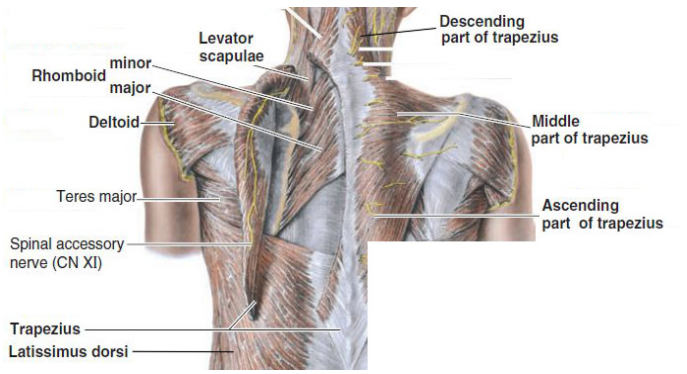
[1]Especially above 90 deg

Deep posterior axioappendicular

- Levator Scapulae
- Rhomboids

Muscle	P	D	I	A
Levator Scapulae	Post Tubercle of TP C1-4	Medial scapula (sup to spine)	Dorsal scap (C5) Cervical (C3,4)	Elevates scapula Tilts Glenoid cavity inf
Rhomboids Major	Spin process T2-5	Medial scapula (inf to spine)	Dorsal scap (C4,5)	Retract/rotate scapula Depress Glenoid cavity Fix scapula to wall[1]
Rhomboids Minor	Nuchal ligament Spin process C7-T1	Medial scapula		

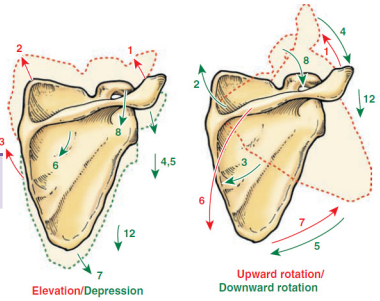
[1]With serr ant

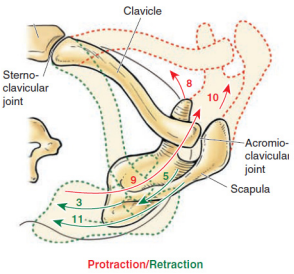


Movements of Scapula

Movement	Muscles
Elevation	**Trapezius (desc part)** Lev Scap Rhomboids
Depression	**Gravity** Pec Maj (inf sternocostal head) Lat Dorsi Trapezius (asc part) Serr ant (inf part) Pec minor
Protraction	**Serr ant** Pec major & minor
Retraction	**Trapezius (middle)** Rhomboids Lat dorsi
Upward rotation	**Trap (desc part)** Trap (asc) **Serr ant (inf part)**
Downward rotation	**Lat Dorsi** Gravity Lev scap Rhomboids Pec major & minor

Bold = prime mover





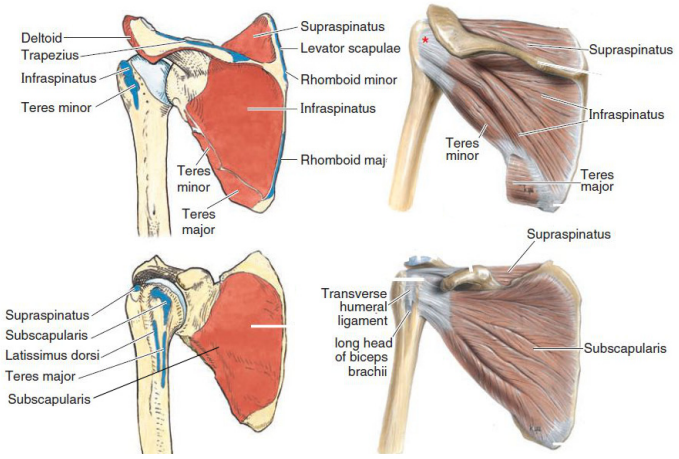
Scapulohumeral

- Deltoid
- Teres Major
- Supraspinatus
- Infraspinatus
- Subscapularis
- Teres Minor

} Rotator Cuff Muscles

Muscle	P	D	I	A
Deltoid	Lateral 1/3 clavicle Acromion Lateral 1/3 spine scap	Deltoid tuberosity (humerus)	Axillary (C5,6)	Clavicular: flex/med rotate Acromial: abduct[1] Spinal: ext/lat rotate
Teres Maj	Inf angle scapula (post)	Medial lip of intertubercular sulcus of humerus	Lower subscapular (C5,6)	Adduct Medial rotate
Supraspinatus	Supraspinous fossa	Superior facet[2]	Suprascapular (C4-6)	Initiates/aids abduction
Infraspinatus	Infraspinous fossa	Middle facet[2]	Suprascapular (C5,6)	Lat rotation
Teres Min	Mid lat scapula border	Inferior facet[2]	Axillary (C5-6)	Lat rotation
Subscapularis	Subscapular fossa	Lesser tubercle	Upper & lower subscap (C5-7)	Med rotation

[1]Supraspinatus assists in 1st 15deg
[2] of greater tubercle



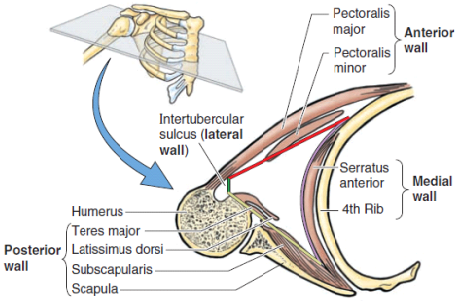
UPPER LIMB

❒ AXILLA

Passage of neurovascular structures

- Superior: cervico-axillary canal = root of neck
- Ant: clavipectoral triangle to pectoral region
- Inf/Lat: limb
- Post: quadrangular space to scapular
- Inf/Med: Axioappendicular muscles (lat dorsi & serr ant)

Wall	Structures
Apex	• 1st rib, clavicle, sup edge of scapula • Cervico-axillary canal
Base	• Axillary fossa: skin, subcut tissue and deep fascia • Approx. level of 4th rib
Ant	• *Pec major, minor* and pectoral & clavicopectoral fascia • Ant axillary fold = pec major only
Post	• Medial: *Scapula & subscapularis* • Lateral: *Teres major and lat dorsi* • Post axillary fold = lat dorsi & teres major
Medial	• 1st – 4th ribs & serr Ant
Lateral	• Intertubercular groove of humerus



ARTERIES OF THE PROXIMAL UPPER LIMB

Artery	Origin		Course
Int Thoracic	Inf surf 1st part	Subclavian	Descends post to medial clavicle/parasternal *> Ant IC | Musculophrenic | Sup epigastric*
Thyrocervical trunk	Ant surf 1st part		*> Suprascapular | Asc Cervical | Inf thyroid | Cervicodorsal trunk*
Suprascapular		Thyrocervical	Ant to scalenes, phrenic nerve, Subclavian a., brachial plexus Posterolateral to clavicle Supraspinous fossa → spine → infraspinous fossa
Superior Thoracic	1st part	Axillary	Anteromedial along sup pec minor Btwn pec minor/major to thoracic wall > Supplies 1-2 intercostal, sup serrates ant
Thoracoacromial	2nd part		Curls around sup/med pec minor Pierces costocoracoid membrane *> pectoral | deltoid | acromial | clavicular*
Lateral Thoracic	2nd part		Descends along axillary border of pec minor > Supplies lateral aspect of breast/pec/serr ant/IC
Circumflex humeral	3rd part		Post larger
Subscapular	3rd part		Descends along lateral border of scapula inf to subscapularis *> Thoracodorsal | Circumflex scapula*
Circumflex Scap		Subscapular	Infraspinous fossa after lateral course
Thoracodorsal			Desc with Thoracodorsal nerve to lat dorsi
Deep brachial	Near origin	Brachial	Descends in radial groove with radial artery > Posterior compartment
Sup Ulnar collateral	Near middle		Descends with ulnar nerve
Inf Ulnar collateral	Epicondyle		Anterior to medial epicondyle

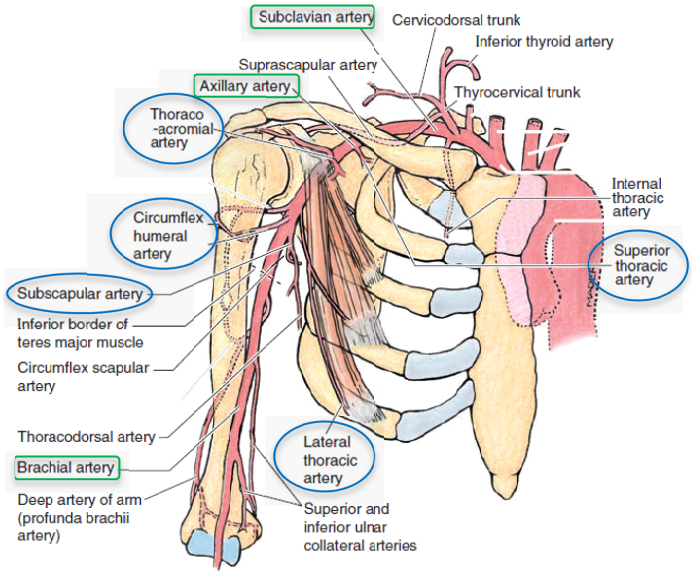
Course/Artery	Landmarks
Subclavian	-
Axillary	Lateral border 1st rib (post to pec minor)
Brachial	Inf border teres major

Axillary Artery

Parts	Landmarks	Branches
1st	Lateral border 1st rib to medial border pec minor	Superior thoracic artery
2nd	Post to pec minor	Thoracoacromial Lateral thoracic
3rd	Lateral border pec minor to inf border teres major	Subscapular Ant/Post circumflex humeral

Anastomoses

- *Suprascapular* & *dorsal scapula* anastomose with *subscapular* to allow bypassing of axillary artery between 1st rib and subscapular branch



AXILLARY VEIN

- Anteromedial then anteroinferior to axillary artery
- Formed by brachial & basilic veins @ inf border of teres major

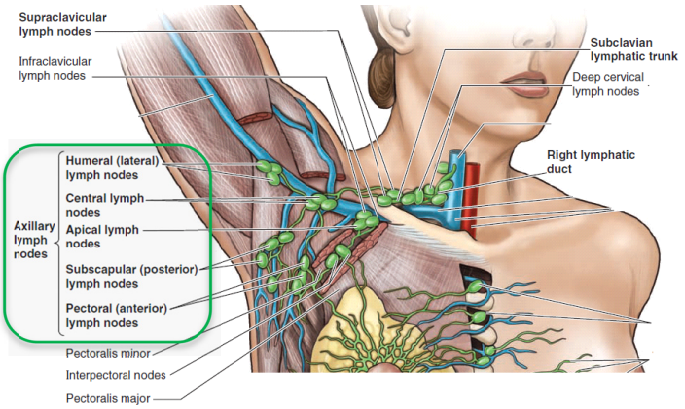
Exceptions to general rule (of following arteries)

1. Thoracoacromial drainage is to cephalic as well as axillary
2. Receives thoracoepigastric veins (collateral for IVS obstruction)

AXILLARY NODES

Nodes	Location	Drainage
Pectoral 3-6	*Anterior* Medial wall axilla & Around lat thoracic vein & inf border pec minor	Ant thoracic wall
Subscapular 6-7	*Posterior* Post axillary fold & subscapular vessels	Post thoracic wall & scapula
Humeral 4-6	*Lateral* Medial/Post to axillary vein	Upper limb[1]
Central 3-4	Deep to pec minor Around 2nd art of axillary artery	Pectoral/Subscapular/Humeral
Apical[2]	Medial to axillary vein and 1st part of artery	Central
Subclavian trunk	Superior to Subclavian vessels	

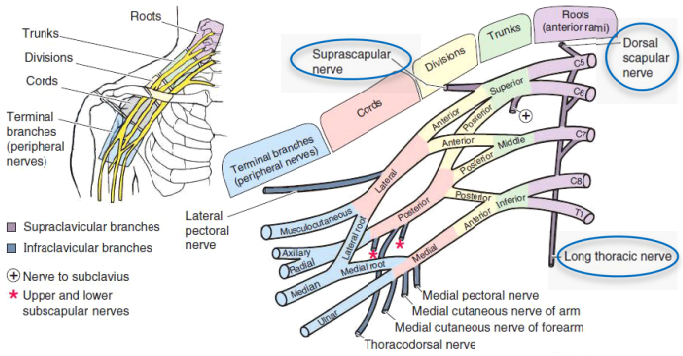
[1]Except for drainage of proximal cephalic (→ apical & infraclavicular)
[2]enalrgment of apical nodes can compress cephalic vein (superior to pec minor)



UPPER LIMB

❒ AXILLA

BRACHIAL PLEXUS



Generation	Subdivision	Landmarks
Roots	Ant Rami f C5-8, T1	Pass through ant/middle scalenes (with Subclavian artery medially)
Trunks	Sup, Middle, Inf	
Divisions	Ant/Post	@ cervico-axillary canal[1]
Cords	Lat, Post, Medial	Subdivisions named by orientation to middle part of axillary artery
Terminal Branches	Misc	Make up infraclavicular part of plexus

[1]Clavicle, superior border of scapula, 1st rib

Branches of Brachial Plexus

Branch	Origin	Course	Innervation
Supraclavicular			
Dorsal scapular	C5 ± C4	Middle of scalene Descends deep to levator scapulae & rhomboids	Rhomboids ± levator scapulae
Long thoracic	C5-7	Through cervico-axillary canal Post to C8/T1 Descends on superficial surface of serr ant	Serr Ant
Suprascapular	Sup Trunk	Sup to plexus in post triangle Through scap notch inf to sup transverse scap ligament	Supraspinatus Infraspinatus Glenohumeral Jt
Subclavian		Descends post to clavicle & ant to plexus/*Subclavian artery* Sometime contributes to phrenic nerve	Subclavius Sternoclavicular Jt
Infraclavicular			
Lat Pec	Lat Cord	Pierces costocoracoid membrane to reach deep surface of pec muscles	Pec Major ± Minor
Musculocutaneous		Pierces coracobrachialis Descends btwn biceps brachii & brachialis Emerges lateral to biceps Cont as *lat cut nerve to forearm*	Ant comp arm[1] Skin on lateral forearm
Median	Lat/Medial	Starts lateral to axillary artery Crosses anterior Medial to *brachial artery* @ ACF	Ant comp forearm[3] 5 lat intrinsic muscles Associated skin
Med[2] Pec	Medial	Btwn *axillary a* & v Pierces pec minor → major *Lateral to lateral pectoral nerve*	Pec minor SC part of major
Med[2] cut to arm		Medial to *a* & v	Skin to medial arm
Med[2] cut to forearm		Runs with ulnar Deep with basilic vein with ant/post branches	Skin to medial forearm
Ulnar		Medial arm Post to medial epicondyle (medial to olecranon) Cont medially down forearm	Median n exceptions + Intrinsic muscles Skin medial to ½ 4th dig
Upper subscapular	Post	Post to subscapularis	Superior subscapularis
Lower subscapular		Inf/Lat deep to *subscapular a* & v	Inf subscapularis Teres Major
Thoracodorsal		Btwn upper/lower subscapular Inf/lat along post axillary wall to apex of lat dorsi	Lat dorsi
Axillary (C5-6)		Exits axilla post Travels through quadrangular space with post circumflex humerus Branch of sup lateral brachial cutaneous nerve Runs deep to deltoid	Glenohumeral Jt Teres Minor Deltoid Skin sup/lat arm
Radial (C5-T1)		Exits axilla post Post to humerus in radial groove with *deep brachial artery* (btwn med lat heads of triceps) Divides at ACF into superficial (Cut) & deep (motor)	*Post compartment of arm/forearm* Skin post/inf/lat arm Skin post forearm Ulnar exceptions in hand

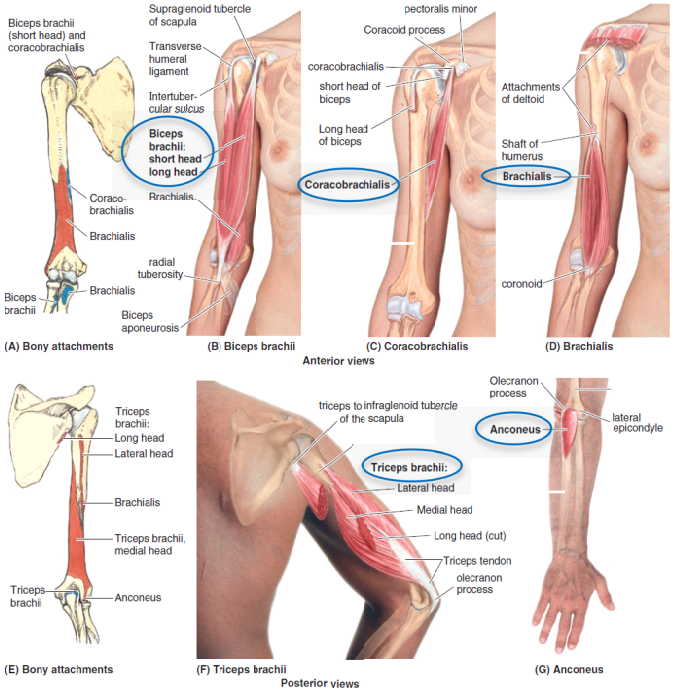
[1]Coracobrachialis, biceps brachii, brachialis
[2]Medial
[3]Except flexor carpi ulnaris & ulnar ½ of flex dig profundus

❒ ARM

Muscle	P	D	I	A
Flexors (ant compartment, supplied by Musculocutaneous nerve)				
Biceps Brachii				
Short head	Coracoid process	Tuberosity of radius	Musculocutaneous	Supinate, flex, resist shoulder dislocation
Long head	Supraglenoid tubercle			
Brachialis	Distal ½ ant humerus	Coronoid process & ulna tuberosity		Flex forearm in all positions (main flexor)
Coracobrachialis	Coracoid process	Middle 3rd medial humerus		Flex, adduct, resist shoulder dislocation
Extensors (post compartment supplied by radial nerve)				
Triceps brachii				
Long head	Infraglenoid tubercle	Prox olecranon	Radial nerve	Forearm extensor Long head resists humeral head dislocation
Lateral head	Post humerus (sup to rad groove)			
Medial head	Post humerus (inf to rad groove)			
Anconeus	Lat epicondyle	Lat olecranon & sup/post ulna		Extend forearm Stabilise elbow

Biceps Brachii

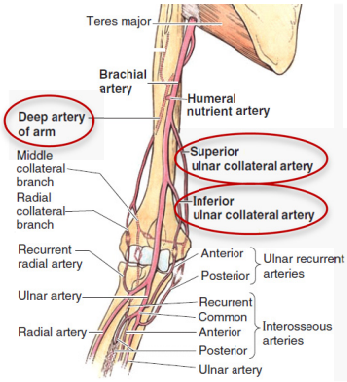
- Proximal long head travels in intertubercular sulcus
- Fixed to head of humerus by transverse humeral ligament



❒ ARM

BRACHIAL ARTERY

- Cont of axillary @ inf border of teres major
- Down humerus med along *medial bicipital groove* (ulnar nerve lateral, median nerve medial)
- Ant to medial Supraepicondylar ridge & trochlea
- Passes laterally with median nerve crossing laterally above
- Terminates under brachialis fascia *ant to radial head* → radial & ulna arteries



Branches

Deep arteries

- Superior most branch
- Follows radial nerve post/lat to humerus in [illegible]*e*
- Branches into [illegible]*dle* and [illegible]*tial*

Ulnar collateral arteries

(anastomoses @ elbow)

Superior ulnar collateral

- Branch @ medial middle brach a
- Follows ulnar nerve to medial epi

Inferior ulnar collateral

- 5cm prox to elbow

Humeral nutrient arteries

VEINS

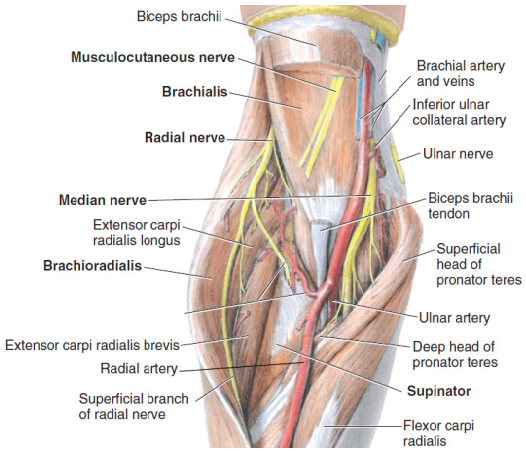
- Superficial: cephalic & basilic
- Deep: brachial

CUBITAL FOSSA

Boundaries	
Superior	Medial to lateral epicondyles
Medial	Common flexor attachment
Lateral	Common extensor attachments
Floor	Brachialis & supinator muscles
Roof	Brachial/antebrachial fascia

Content

- Terminal brachial artery
- Deep veins
- Biceps brachii tendon
- Median & Radial nerve



❒ FOREARM

COMPARTMENTS

Action	Proximal Location	Distal Location	Nerve
Flexor/Pronation[2]	Medial Epicondyle	Anterior forearm	Median[1]
Extensor/Supination	Lateral Epicondyle	Posterior forearm	Radial

[1]Ulnar to exceptions
[2]Brachioradialis is a flexor located in the posterior compartment
NB ant compartment communicates with palm through carpal tunnel

Muscles: Flexor/Pronators

- Tendons located on *ant surface of wrist* and held by palmar carpal ligament and flexor retinaculum (thickening of antebrachial fascia)

General rule: more distal proximal attachment = more distal distal attachment (not pro quad)

Superficial					
Pronator Teres					
Ulnar head	Coronoid process	Mid lat radius	Median	Flex +	Pronate forearm
Humeral head	Medial epicondyle				
Flexor Carpi Radialis[1]		Base 2nd MC		Flex hand	Abduct hand
Palmaris Longus[2]		Distal ½ flex ret & apex of palmar aponeurosis			Tense palmar apo
Flexor carpi ulnaris[3]					
Humeral head		Pisiform, hook of hamate, 5th MC	Ulnar		Adduct hand
Ulnar head	Olecranon				

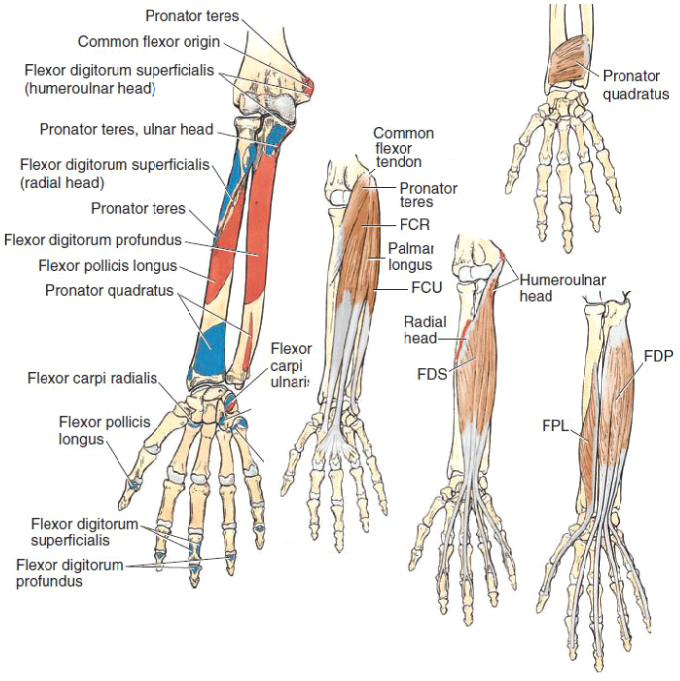
[1]through own vertical groove on trapezium, lat to radial artery
[2]Deep and medial to median nerve
[3]ulnar nerve enters btwn humeral and ulnar heads, ulnar nerve and artery lie lateral to it distally

Intermediate				
Flexor Digitorum superficialis[1]				
Humeroulnar Radial	Medial epi Ant/Sup ½	Shaft of middle phalanx of digits 2-5	Median	Flex MP @ PIJ Flex PP @ MCPJ

[1]Ulnar nerve & artery pass between heads | tendons pass through carpal tunnel into common flexor sheath

Deep [1]				
Flexor digitorum profundus				
Medial part	Prox ¾ med/ant ulnar	DP base of 4th, 5th digits	Ulnar	Flex DP @ DIPJ of respective digits
Lateral part		DP base of 2nd, 3rd digits	Median2	
Flexor pollucis longus	Ant radius	DP base of 1st		Flex PP & DP of 1st digit
Pronator quadratus	Dist ¼ ant uln	Distal ¼ ant rad		Pronate forearm

[1]Deep group doesn't cross elbow joint
[2]Ant Interosseous branch



❒ FOREARM

Muscles: Extensors/Supinators

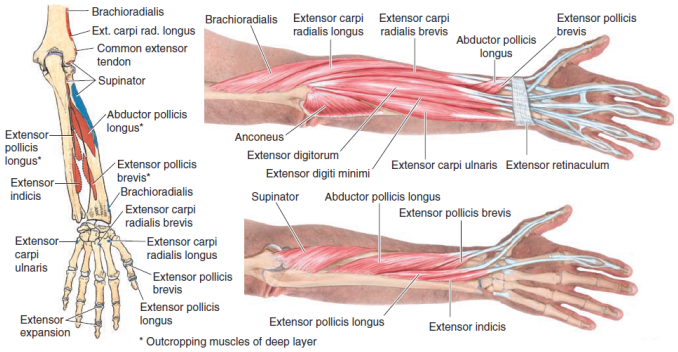
Functional groups
1. Hand: extend, abduct, adduct
2. Fingers: extend digits 2-5
3. Thumb: extend digit 1

Superficial				
Brachioradialis	Distal Supraepicondylar ridge	Lateral distal radius (prox to styloid)	Radial	Weak flexion (best in mid pronation)
Extensor Carpi Radialis Longus		Base of 2nd lat MC	Deep branch Radial nerve	Extend & Abduct Hand
Extensor Carpi Radialis Brevis	Lateral epicondyle	Base of 2nd med MC		
Extensor Digitorum[2]		Ext expansion of digits 2-5		Extend @ 2-4 MCPJ[1]
Extensor Digitiminimi		Ext expansion digit 5		As above for digit 5
Extensor Carpi Ulnaris	Lat epi + post border ulna	Base of 5th med MC		Extent & Adduct Hand

[1]IPJ to a lesser extent
[2]form extensor expansions and hood, divide into median band (→ base of MP) and 2 lateral bands (→ base of DP)

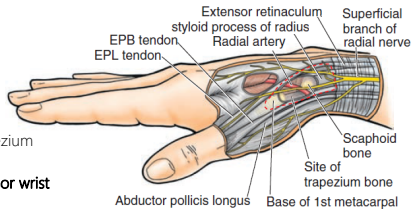
Deep				
Supinator[2]	Lat epicondyle + radial collateral lig + ulnar crest	Ant/Post/Lat prox 1/3 radius	Deep branch radial	Supinate
Extensor Indicis	Distal 1/3 ulna/Interosseous	Ext expansion digit 2	Post Interosseous nerve[1]	Extend digit 2 (ie indep ext)
Abductor Pollucis Longus	Prox/median ½ of ulna/radius	Base 1st MC		Abduct & Extend thumb @ CMJ
Extensor Pollucis Longus	Middle 1/3 lat ulna	Base of 1st DP		Extent DIPJ thumb
Extensor Pollucis Brevis	Distal 1/3 radius	Base of 1st PP		Extend MCJ thub

[1]Cont of deep branch of radial
[2]radial nerves pierces (into sup and deep muscle)

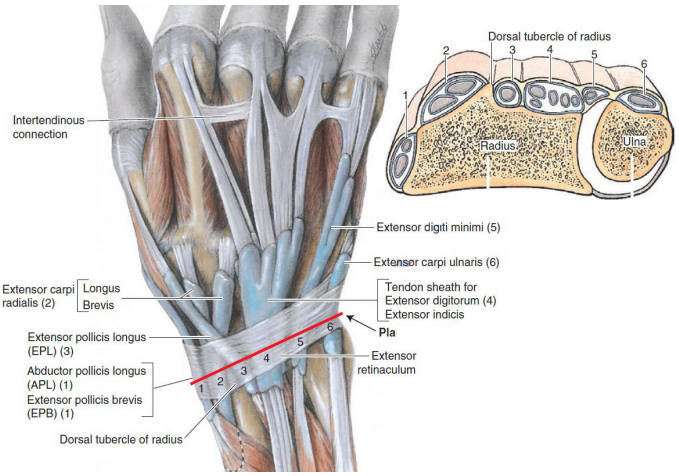


Anatomical Snuff Box

- Post: EPL Ant: EPB
- Porximal: radial styloid
- Distal: Base of 1st MC
- Within: radial artery
- Base: scaphoid & trapezium



Synovial sheaths @ the extensor wrist

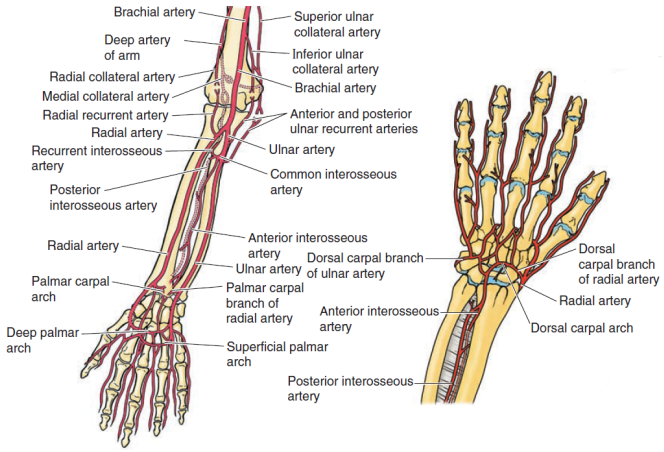


ARTERIES

Artery	Origin	Course
ULNAR	Brachial in ACF	Runs inferomedial to superficial/intermediate flexors Superficial to flexor retinaculum
Ulnar recurrent		
Ant	Ulnar distal to elbow	Ascends[1] btwn brachialis and pronator teres Ant to medial epicondyle | Anastomoses with inf ulnar
Post	Ulnar ant to ulnar	Post to medial epicondyle | anastomose with sup ulnar
Interosseous		
Common	Prox ulnar	Passes deep and branches quickly
Anterior	Common Interosseous	Descends ant to Interosseous (with nerve) Pierces Interosseous @ prox border of quadratus Joins dorsal carpal arch
Posterior		Descends[1] post to Interosseous btwn sup & deep extensors (with nerve)
Recurrent	Common or Post Inter	Anastomoses with middle collateral
Palmar carpal	Ulnar	Across ant wrist deep to tendons of FDP Anastomose with palmar carpal branch of radial
Dorsal Carpal		Travels dorsal prox to pisiform anastomosing with radial branches

[1]Ant supplies

RADIAL	Brachial in ACF	Descends under Brachioradialis Then lateral to FCR tendon Crosses floor of anatomical snuff box Pierces 1st dorsal Interosseous muscle
Radial Recurrent	Lat rad	Ascends1 btwn Brachioradialis and brachialis anastomoses with deep branch of radial collateral
Palmar carpal	Rad	Deep to flexor tendons anastomosing with palmar arches
Dorsal carpal		Runs medially across wrist Dee to pollicis and extensor Radialis tendons



NERVES

Nerve	Origin	Course
Median	Lat/Me cords	ACF: medial to brachial artery Exit: btwn heads of pronator teres Descends btwn FDS/P, Deep to PL *in carpal tunnel*
Ant Interosseous	Distal ACF	Btwn FDP/FDL, deep to PQ
Palmar Cut	Cont Median	Superficial to flexor retinaculum

Ulnar	Medial cord	Enters post to medial epicondyle btwn heads of FCU Descends btwn FCU & FDP
Palm Cut	Mid	Ant to ulnar artery Supplies to medial axis of 4th digit
Dorsal Cut	Distal	Supplies same as palmar

Radial	Post cord	Enters btwn Brachioradialis and brachialis Ant to lateral epicondyle
Post Cut	In rad groove	Perforates lateral heads of triceps
Superficial	ACF	Supplies snuff and skin to lateral axis of 4th digit
Deep	ACF	Winds around neck of radius, penetras1 supinator Cont in post compartment of forearm
Lat Cut	Cont of Musculocutaneous	Lat to biceps brachii Runs with cephalic vein initially Descends lateral border of forearm
Med Cut	Medial cord	Travels with basilic vein Descends medial to wrist

❒ HAND

FASCIA AND COMPARTMENTS OF PALM

Fascia

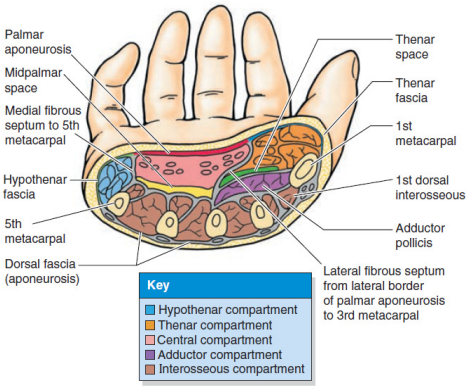
- Fascia of palm cont with antebrachial fascia
- Palmar aponeurosis cont with *flexor retinaculum & Palmaris longus tendon*
- Continue distally as fibrous digital sheaths
  - Enclose synovial sheath
  - Superficial and deep flexor tendons,
  - Tendon of FPL

Compartment	Borders	Contents
Hypothenar	Medial to medial fibrous septum (Medial aponeurosis to lat 5th MC base)	Hypothenar muscles • abductor digiti minimi • flexor digiti minimi Brevis • Opponens digiti minimi
Thenar	Lateral to lateral fibrous septum (Lateral aponeurosis to lat base 3rd MC)	Thenar muscles • abductor pollucis brevis • flexor pollucis brevis • Opponens pollucis
Central	Between hypo and thenar compartments	Lumbricals, superficial palmar arterial arch, digital vessels & nerves
Adductor	Deep	Adductor Pollucis
Interosseous	Between metacarpals	Interossei

Spaces

Midpalmer: Cont with ant compartment of forearm via carpal tunnel

Thenar



MUSCLES

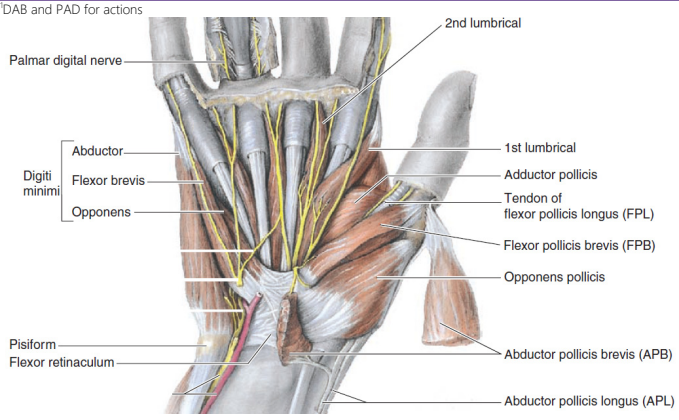
Thenar Muscles				
Opponens pollicis	Flexor Retinaculum & tubercles of scaphoid & trapezium	Lat shaft of 1st MC	Recurrent Branch Median	Oppose thumb
Abductor pollicis brevis		Lateral base of 1st PP		Abduct, help oppose
Flexor pollicis brevis[1]				
Superficial head				Flex thumb
Deep head			Deep branch ulnar	Adduct thumb
Adductor Pollicis[2]				
Oblique head	Bas 2nd, 3rd MC, capitate, adj carpals	Medial base of 1st PP		
Transverse head	Ant shaft 3rd MC			

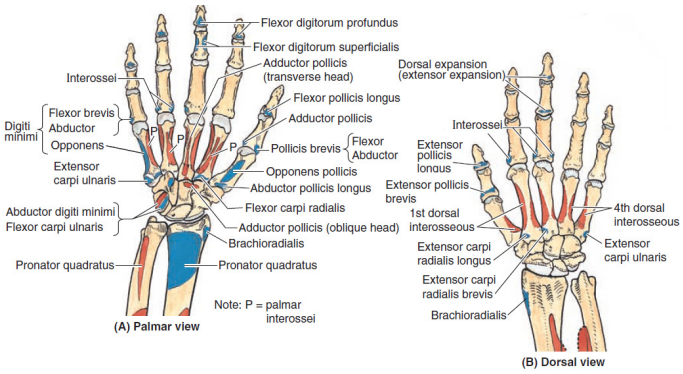
[1]Divided by FPL tendon
[2]Divded by radial artery

Hypothenar Muscles				
Abductor digiti minimi	Pisiform	Medial base 5th PP	Deep branch ulnar	Abducts 5th digit
Flexor digiti minimi brevis	Hook of hamate & flexor retinaculum			Flex 5th MCPJ
Opponens digiti		Medial 5th MC		Opp 5th digit

Short Muscles				
Lumbricals				
1st, 2nd	Lat 2 tendons of FDP	Lat ext expansions of 2-5 digits	Median	Flex MCPJ Ext IPJ 2-5
3rd, 4th	Med 3 tendons of FDP		Deep branch ulnar	
Dorsal Interossei[1]	Adj sides of 2 metacarpals	Base 2-4th PP		Abduct 2-4 digits
Palmar Interossei[1]	2,4,5 MC palmar surface	Base 2,4,5 PP		Adduct 2,4,5 digits

[1]DAB and PAD for actions





Thumb Movements

Movement	Hand Muscles	Forearm Muscles
Extension		EPL, EPB, AbPL
Flexion	FPB	FPL
Abduction	APB	APL
Adduction	1st dorsal Interossei	Adductor Pollicis
Opposition		Opponens Pollicis

ARTERIES

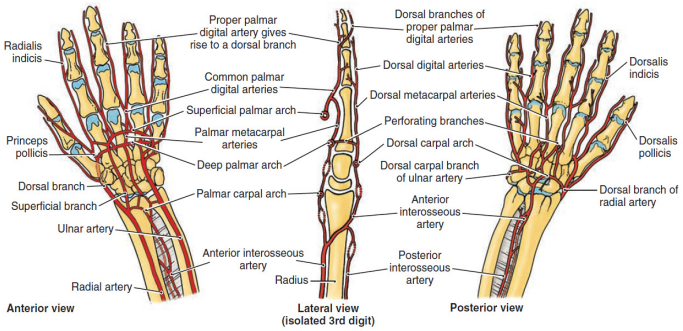
Ulnar artery

- Enters btwn pisiform & hook ant to flex retinaculum
- Lat to ulnar artery

Radial artery

- Enters palm btwn 1st dorsal Interosseous muscle

Artery	Origin	Course
Superficial palmar arch	Continuation of ulnar anastomosing with branch of radial	*Superficial to long flexors* Deep to palmar aponeurosis,
Common palmar digitals	Superficial arch	On lumbricals to webbing digits
Proper palmar digitals	Common palmar	Med & lat 2nd – 5th phalanges
Deep palmar arch	Continuation of radial anastomosing with branch of ulnar	*Deep to long flexors* In contact with base of MC
Princeps pollicis	Radial as it becomes deep arch	Divides at base of 1st MC that course med and lat along phalanx
Radialis indicis	Radial or princeps	Lat border of 2nd phalanx
Dorsal carpal arch	Rad & ulnar arteries	In fascia



❒ HAND

NERVES

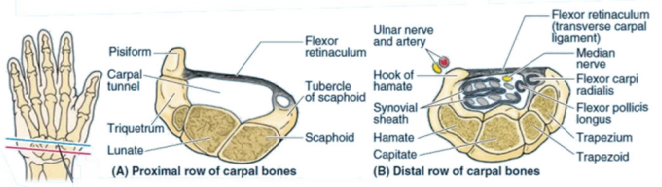
Nerve	Origin	Course
Median	Lateral & medial cord	Through carpal tunnel Motor: Thenar[1], lumbricals 2,3 Sensation: lateral 3 ½ digits and palm on palmer aspect, tips on dorsal aspect
Recurrent branch	Loops around flexor ret into thenar muscles Abductor pollicis brevis Opponens pollicis Superficial head of flex pollicis brevis	
Lateral branch	Runs to palmar 1st digit and lateral border 2nd digit Motor: 1st lumbricals Sensation: palmar and dorsal tip 1st digit, radial side of 2nd digit	
Medial branch	Cont of median adj to 2nd – 4th digit borders Motor: 2nd lumbricals Sensation: palmar and dorsal tip of 2nd – 4th digits	
Palmar cutaneous branch	Branch before flexor retinaculum btwn PL and FCR Sensation to central palm	

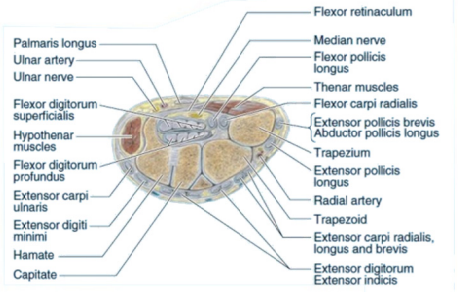
[1]Not adductor pollucis or deep head of flex pollicis brevis

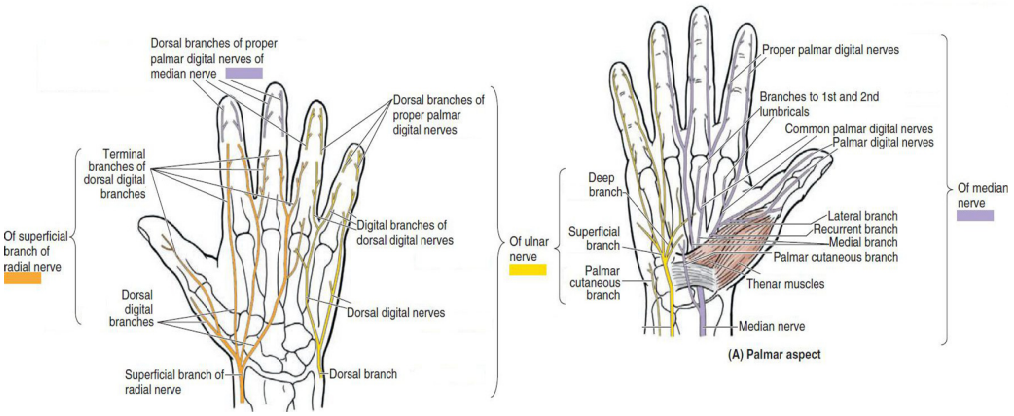
Ulnar	Medial cord	Above carpal tunnel Motor: most intrinsic muscles Sensation: medial 1 ½ digits and associated palm
Palmar cutaneous branch	Branches mid forearm Descends on ulnar artery Sensory: skin over medial carpals	
Dorsal branch	Branches 5cm before flexor retinaculum Passesd deep to FCU Sensory: remaining skin	
Superficial branch	Passes palmaris brevis Motor: Palmaris brevis Sensory: same as dorsal	
Deep branch	Crosses palm with deep palmar arch Motor: Hypothenar muscles (abductor, flexor, opponens digiti minimi), lumbricals 4,5, Interossei, adductor pollicis, deep head of flexor pollicis brevis	

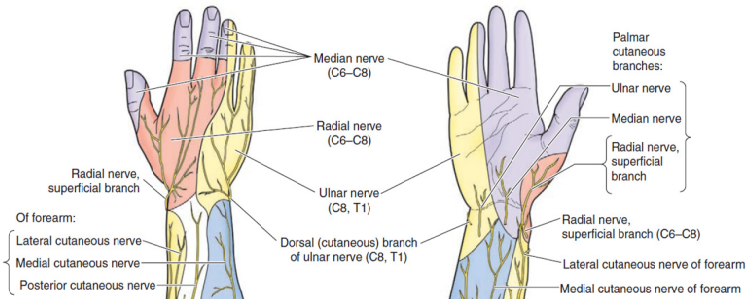
Radial	Posterior cord	Dceep to Brachioradialis Sensory: skin dorsal 3 ½ hand and thumb Motor: none

Carpal Tunnel









UPPER LIMB

❒ JOINTS

SCJ

Type	Bones	Ligaments	Blood	Nerve
Saddle	clavicle manubrium 1st costal cartilage	Ant/Post: ant/post Sternoclavicular Sup: Interclavicular lig Inf: costoclavicular lig	int thoracic Suprascapular	supraclavicular subclavius

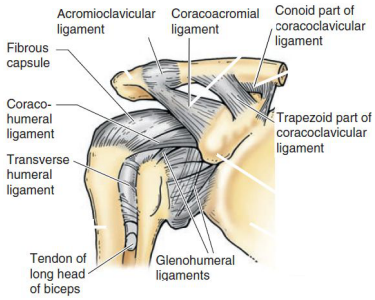
ACJ

Type	Bones	Ligaments	Blood	Nerve
Plane	scapula, clavicle	coracoclavicular, conoid, trapezoid	Suprascapular, Thoracoacromial	lat pec and axillary

Glenohumeral Joint

- Jt capsule: 2 apertures – intertubercular and subscapular
- Bursae: subscapular and subacromial – comm with jt

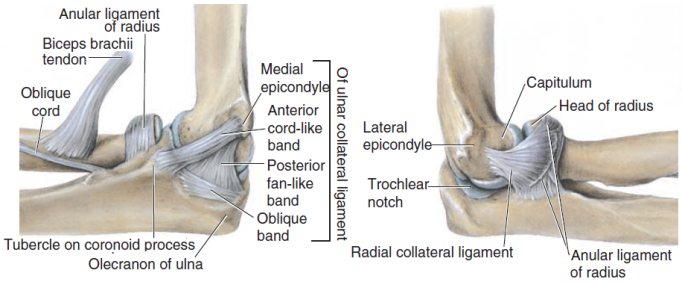
Type	Bones	Ligaments	Blood	Nerve
Ball and socket	humerus, scapula	**Glenohumeral:** reinforce ant capsule, (part of capsule) **Coracohumeral:** coracoid → greater tubercle **Transverse humeral:** greater → lesser tubercle **Coracoacromial arch:** acromion + coracoid + Coracoacromial ligament	ant/post circumflex humeral, Suprascapular	Suprascapular, axillary, lat pec



Elbow

- Bursae: 3 olecranon bursae: intratendinous, subtendinous, subcutenaous
- Bicipitoradial bursae (separated biceps tendon from radial tuberosity)

Type	Bones	Ligaments	Blood	Nerve
Hinge	distal humerus with ulnar and radius	**radial collateral:** lat epicondyle → annular ligament **Ulnar collateral:** medial epicondyle → coronoid & olecranon in ***3 bands***	Radial, Ulnar Collaterals	Musculocutaneous, radial, ulnar



Prox Rad-Ulna

Type	Bones	Ligaments	Blood	Nerve
Pivot	Radius & Ulna	radial annular	radial branches	median (pronation) msc & radial (supination)

Distal Rad-Ulna

Type	Bones	Ligaments	Blood	Nerve
Pivot	radius, ulna	Articular disc of distal radio ulnar Jt binds ends of bones together	ant/post Interosseous	

Wrist

Type	Bones	Ligaments	Blood	Nerve
Condyloid synovial Jt	Radius, Ulnar Proximal Carpal Bones	palmar radiocarpal Dorsal radiocarpal Ulnar and radial collateral	dorsal & palmar arch	median, ulnar, radial

Intercarpal Jt

Type	Bones	Ligaments	Blood	Nerve
Plane synovial	Carpals	ant, post, Interosseous	same as wrist	median and deep ulnar

CMCJ & IMJ

Type	Bones	Ligaments	Blood	Nerve
Plane synovial[1]	Carpals Metacarpals	palmar, dorsal CMC and IM ligaments, Interosseous IM ligaments, transverse metacarpal ligament	peri articular anastomoses	median, radial , ulnar

[1]1st CMCJ is saddle joint

MCPJ, IPJ

- MCPJ Condyloid synovial
- IPJ Hinge