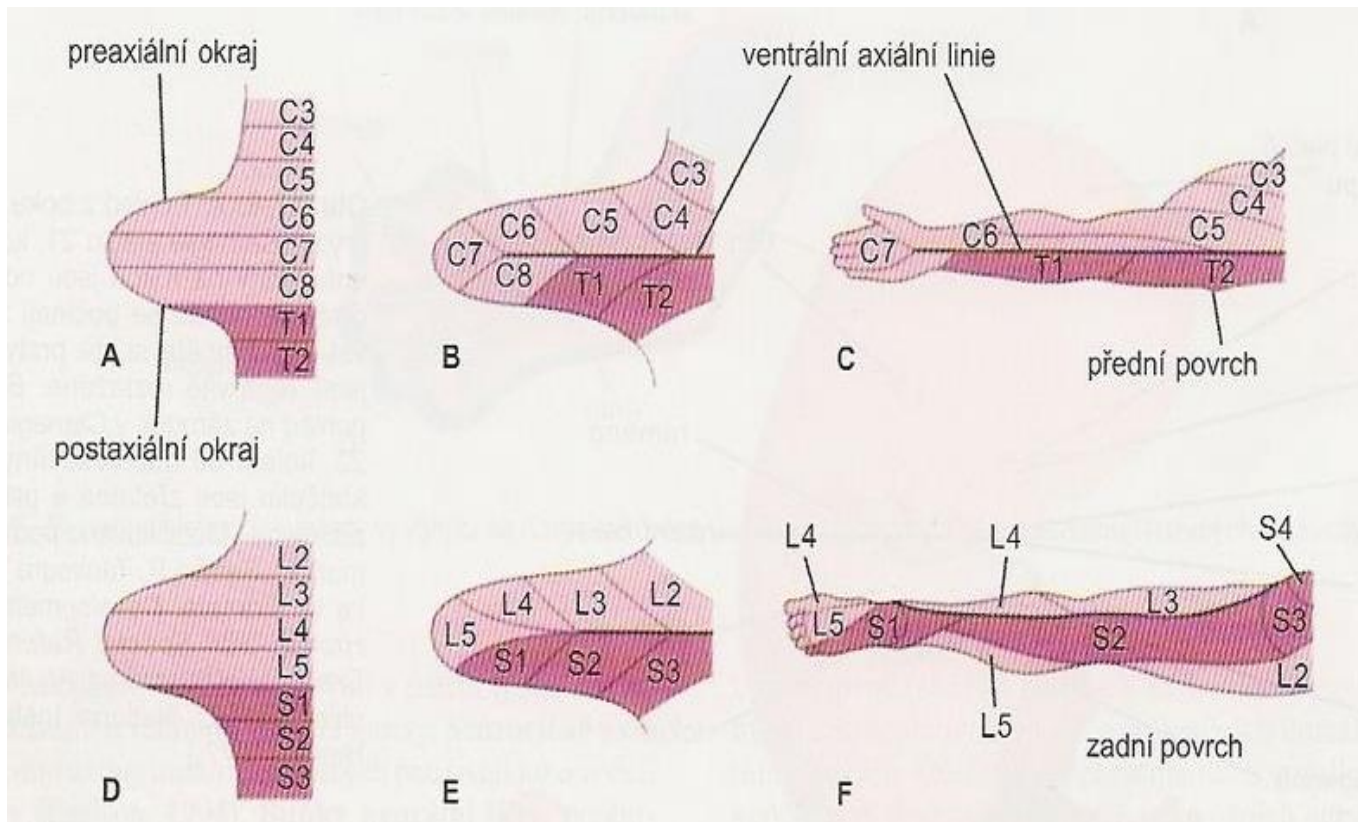


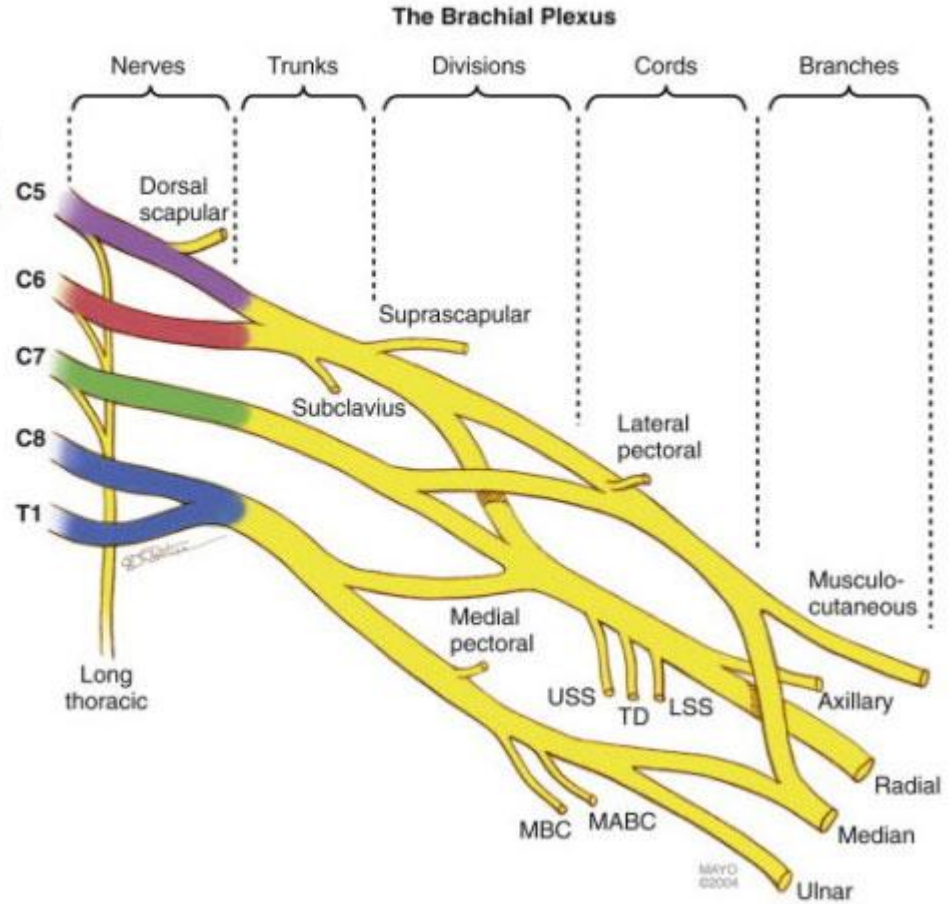
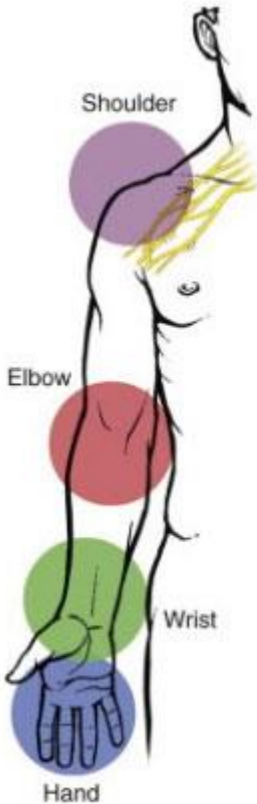
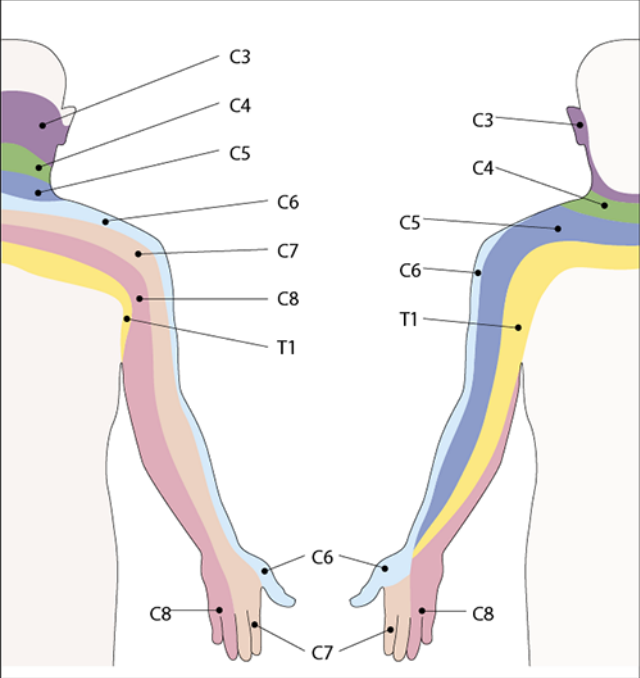
MUSCLES OF UPPER LIMB

David Kachlík

Dermatome's pattern of developpinmg limb



Brachial plexus



Brachial plexus

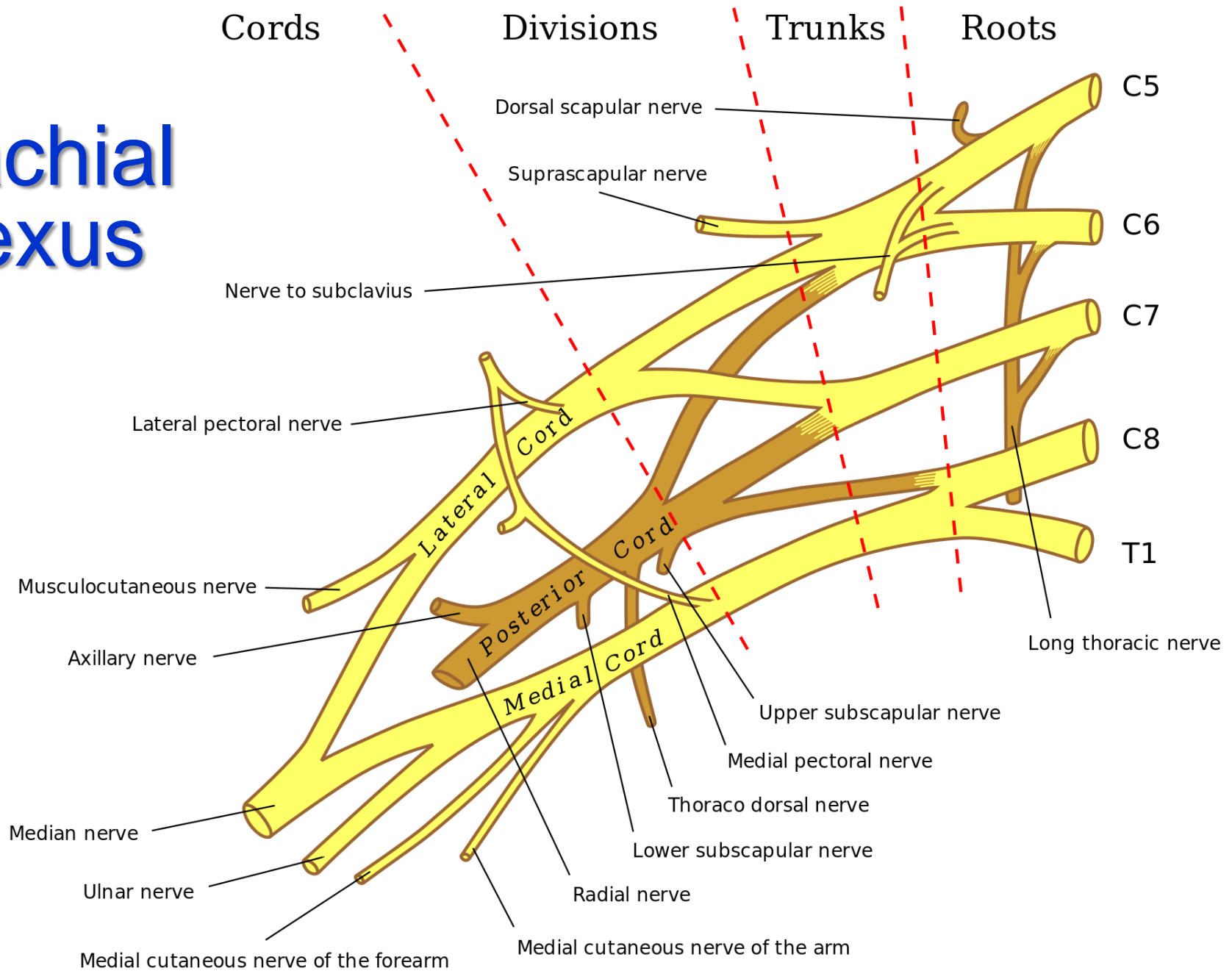


Figure 2-2. Upper extremity peripheral nerve innervation with arm supinated on arm board.

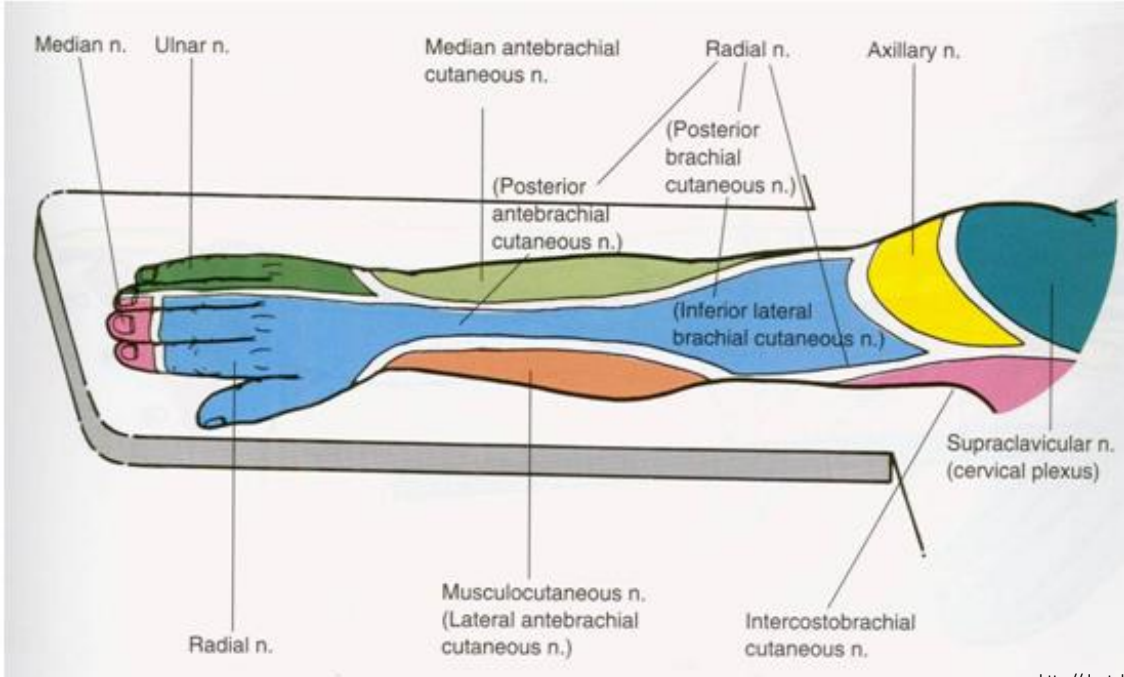
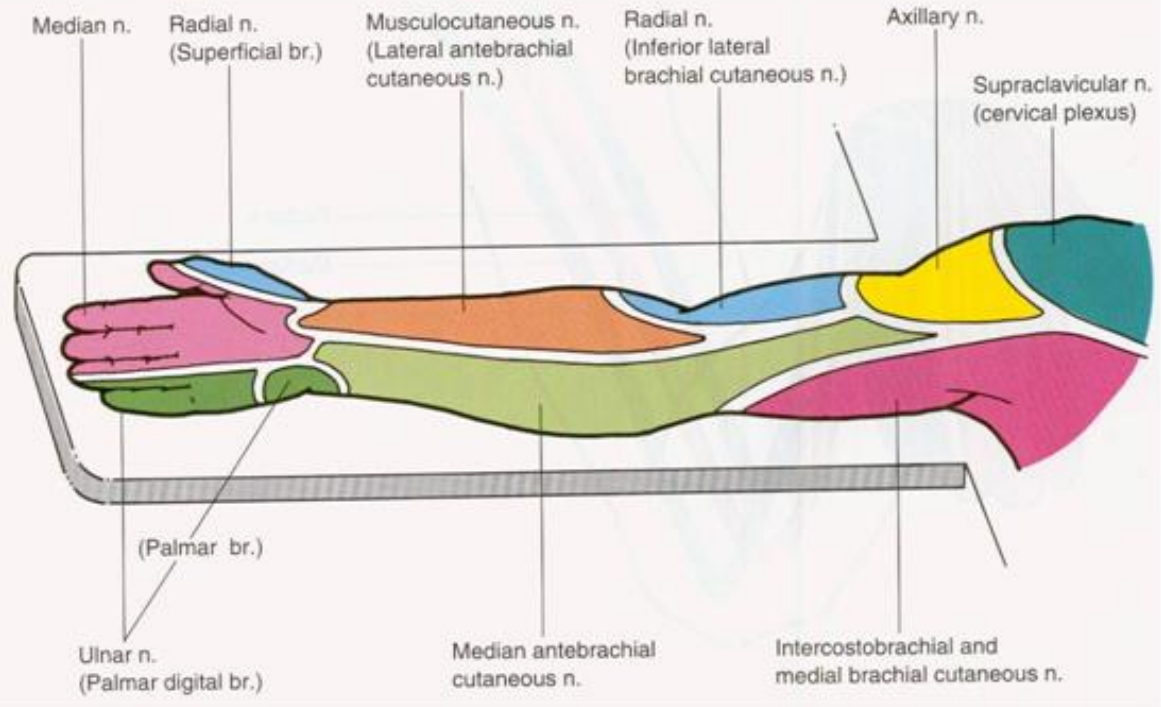
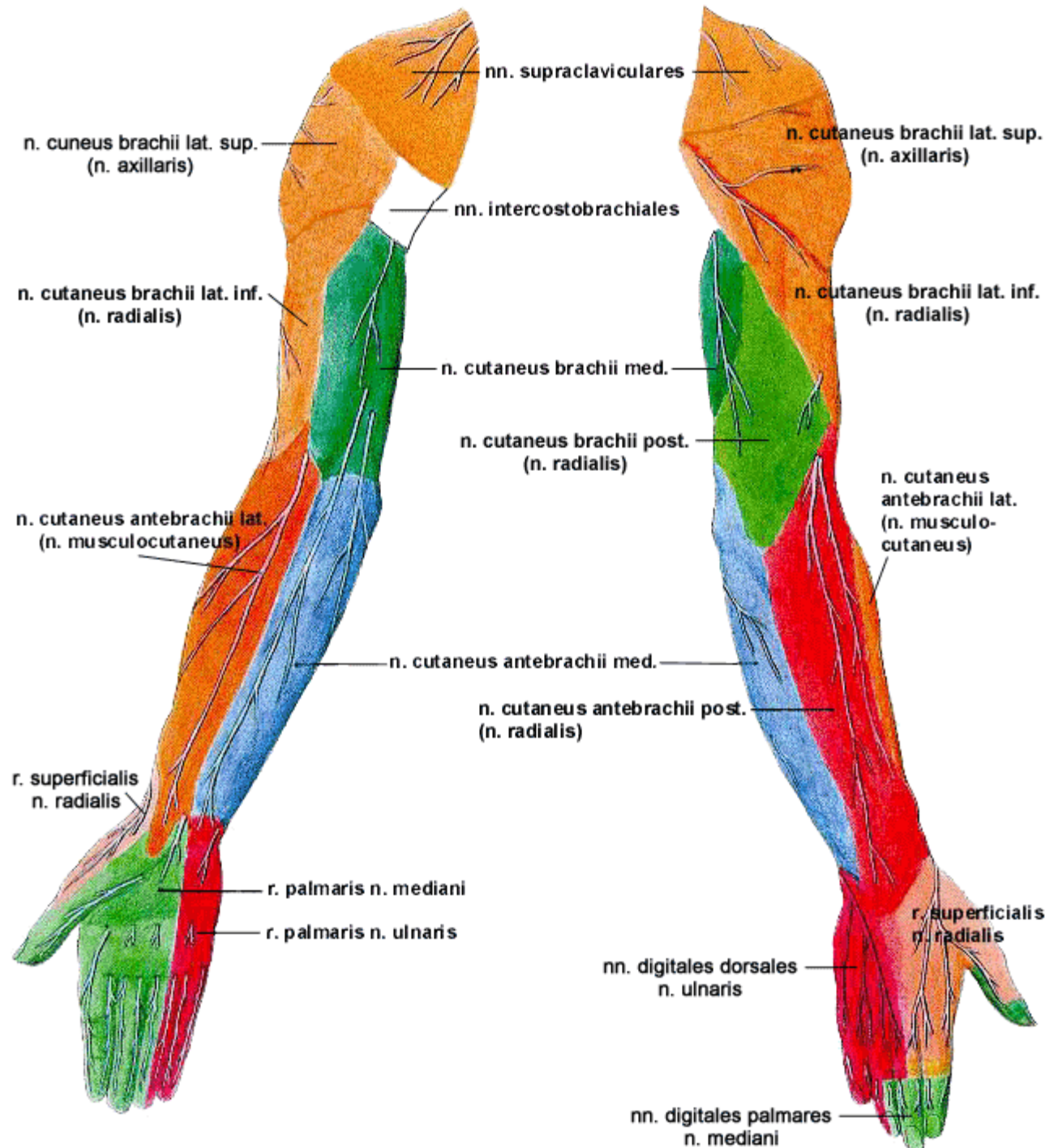


Figure 2-4. Upper extremity peripheral nerve innervation with arm pronated on arm board.

Somato sensory inner- vation



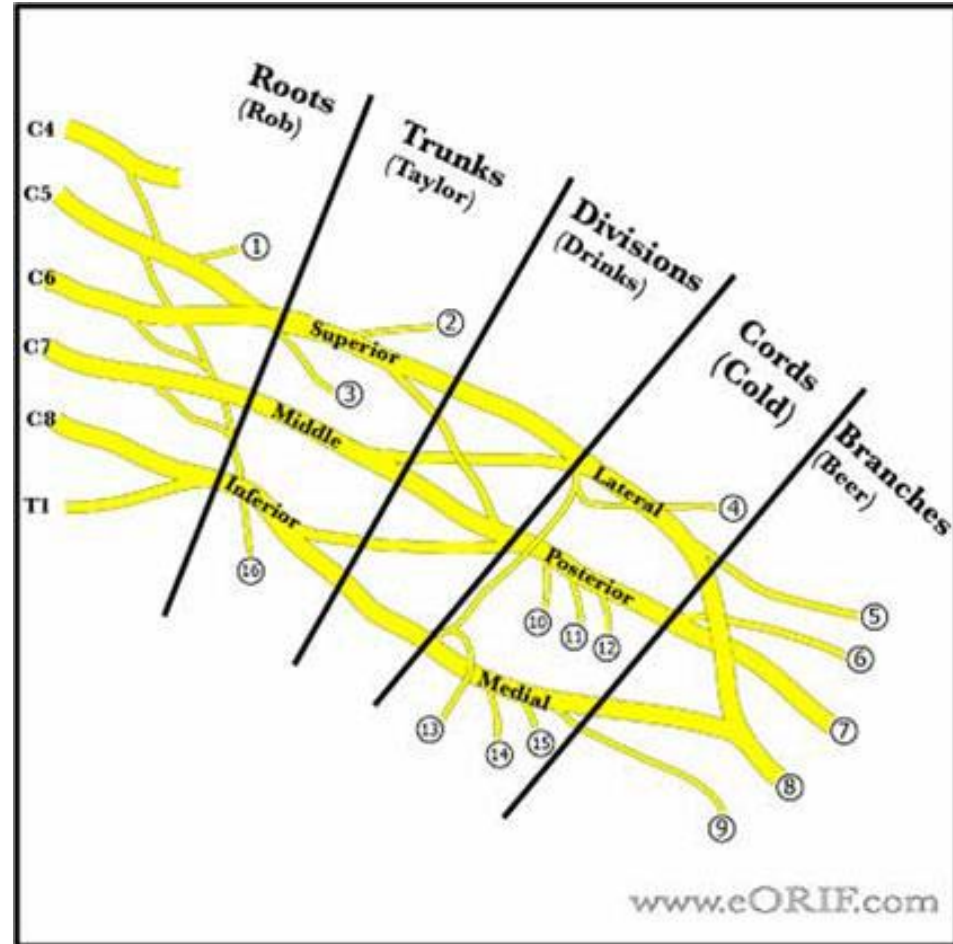
Plexus brachialis (C4-T1)

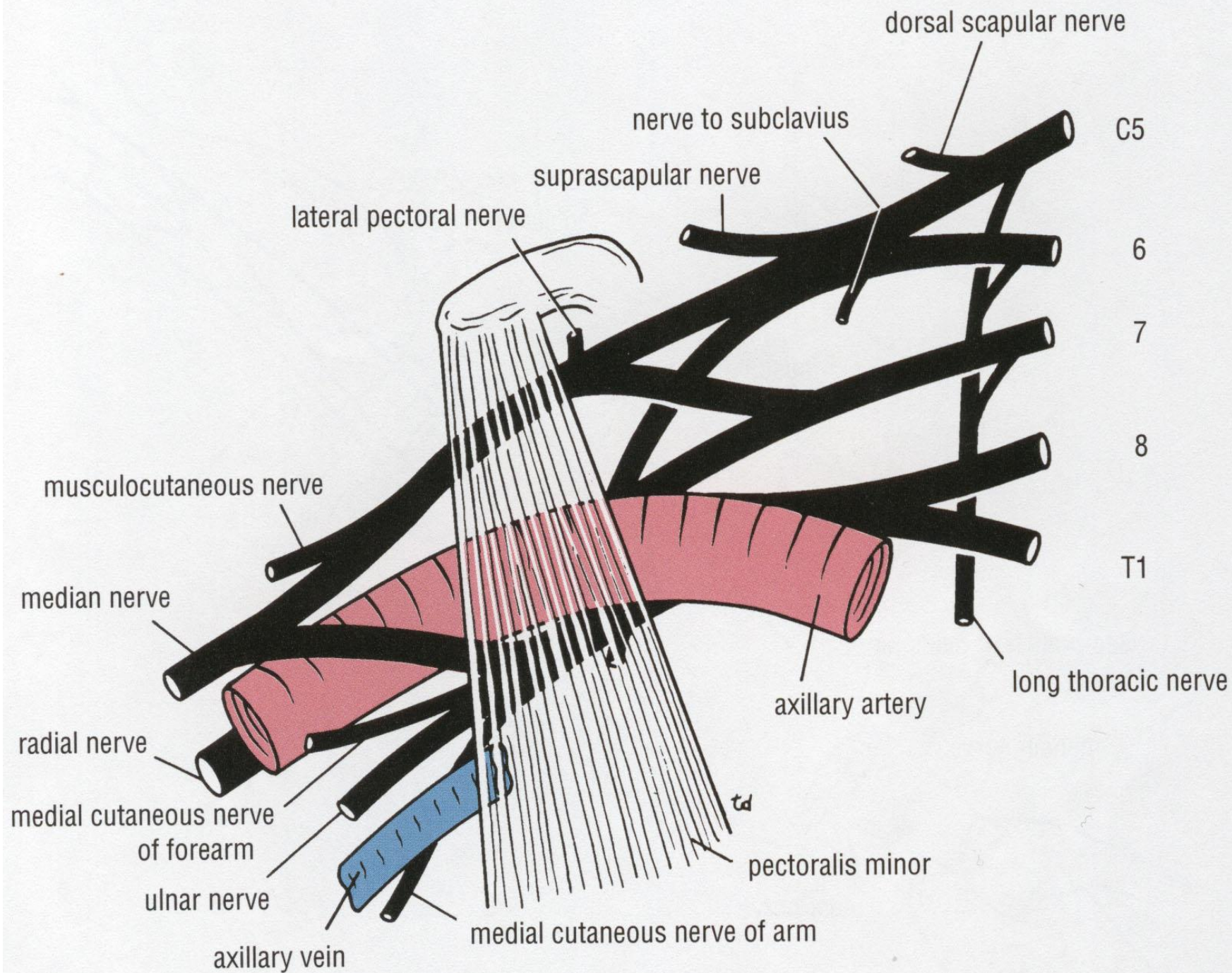
- **truncus** (trunk)
 - superior (C4+C5+C6)
 - medius (C7)
 - inferior (C8+T1)*fissura scalenorum*

- **fasciculus** (cord)
 - lateralis
 - medialis
 - posterior*axilla*

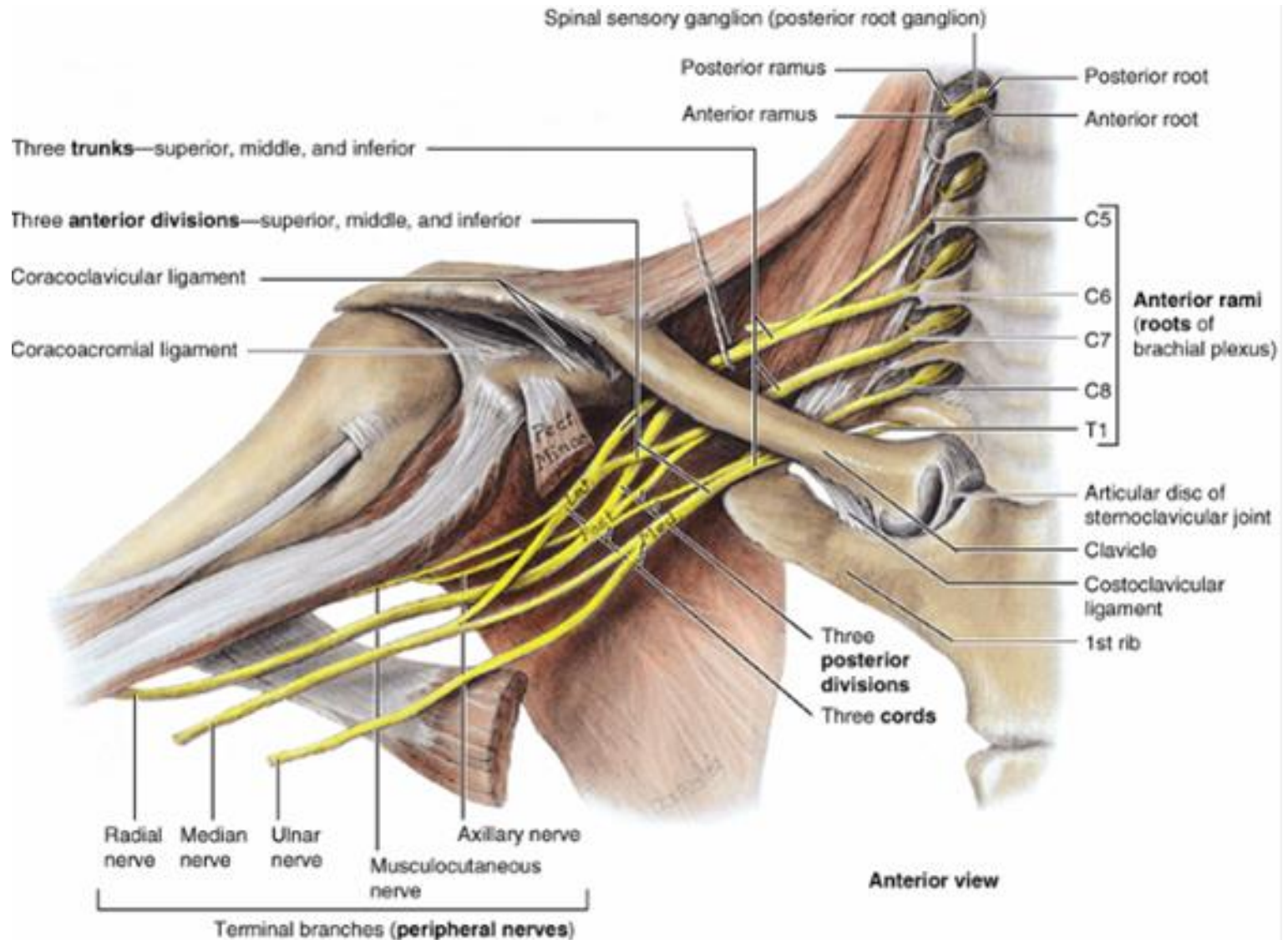
relation to clavícula:

- pars supraclavicularis
- pars infraclavicularis

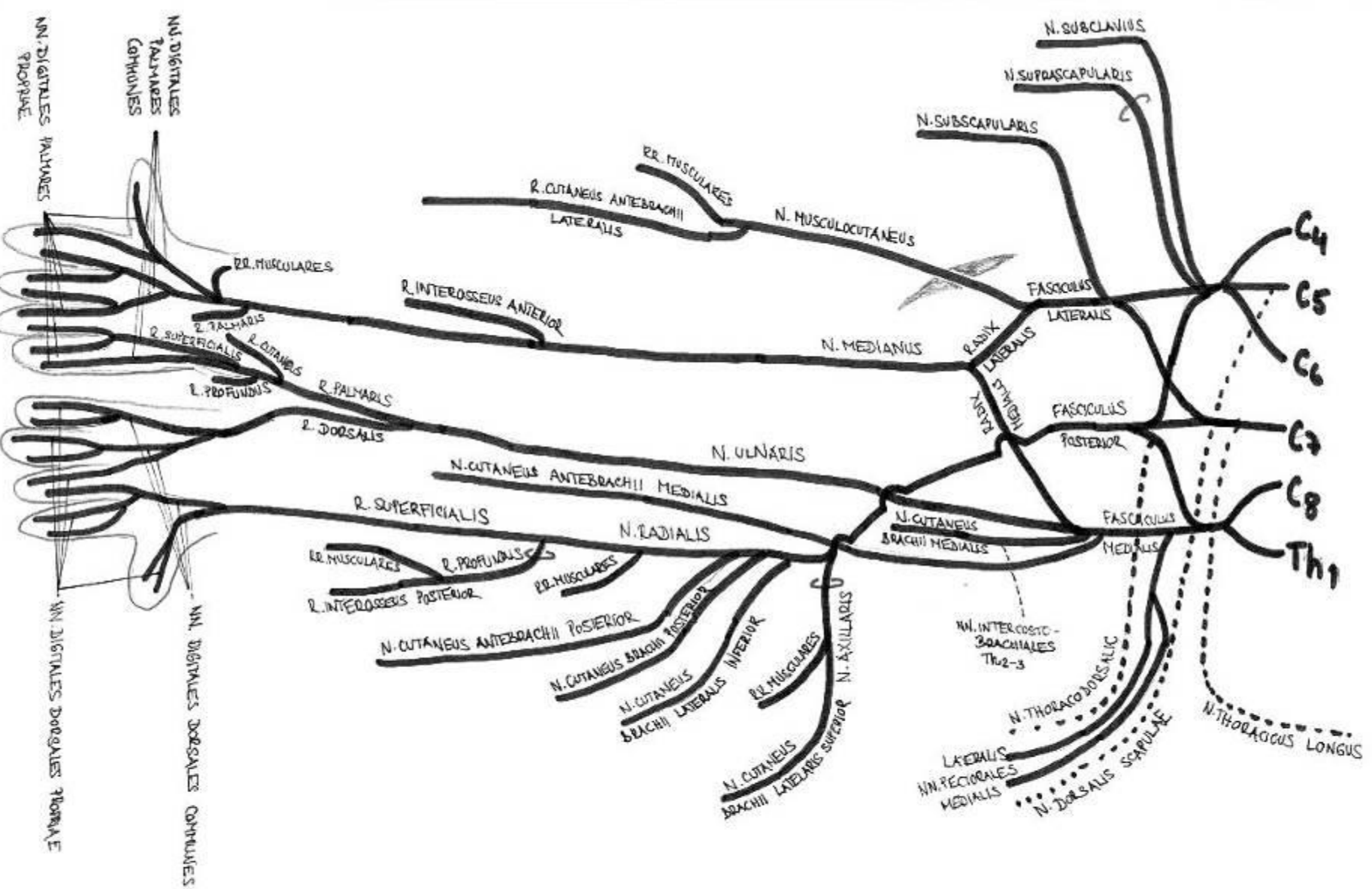




Plexus brachialis in axilla



PALMA
DORSUM



PLEXUS BRACHIALIS
ID

Plexus brachialis

Nerves and their roots

<i>Pars infraclavicularis</i>	
n. musculocutaneus	C5-7
n. medianus	C5-T1
n. ulnaris	C8-T1
n. cutaneus antebrachii medialis	
n. cutaneus brachii medialis	
n. axillaris	C5-6
n. radialis	C5-C8 (T1)

Pars supraclavicularis plexus brachialis

= motor nerves for spinohumeral,
thoracohumeral and shoulder girdle muscle

- n. dorsalis scapulae

- mm. rhomboidei
- m. levator scapulae

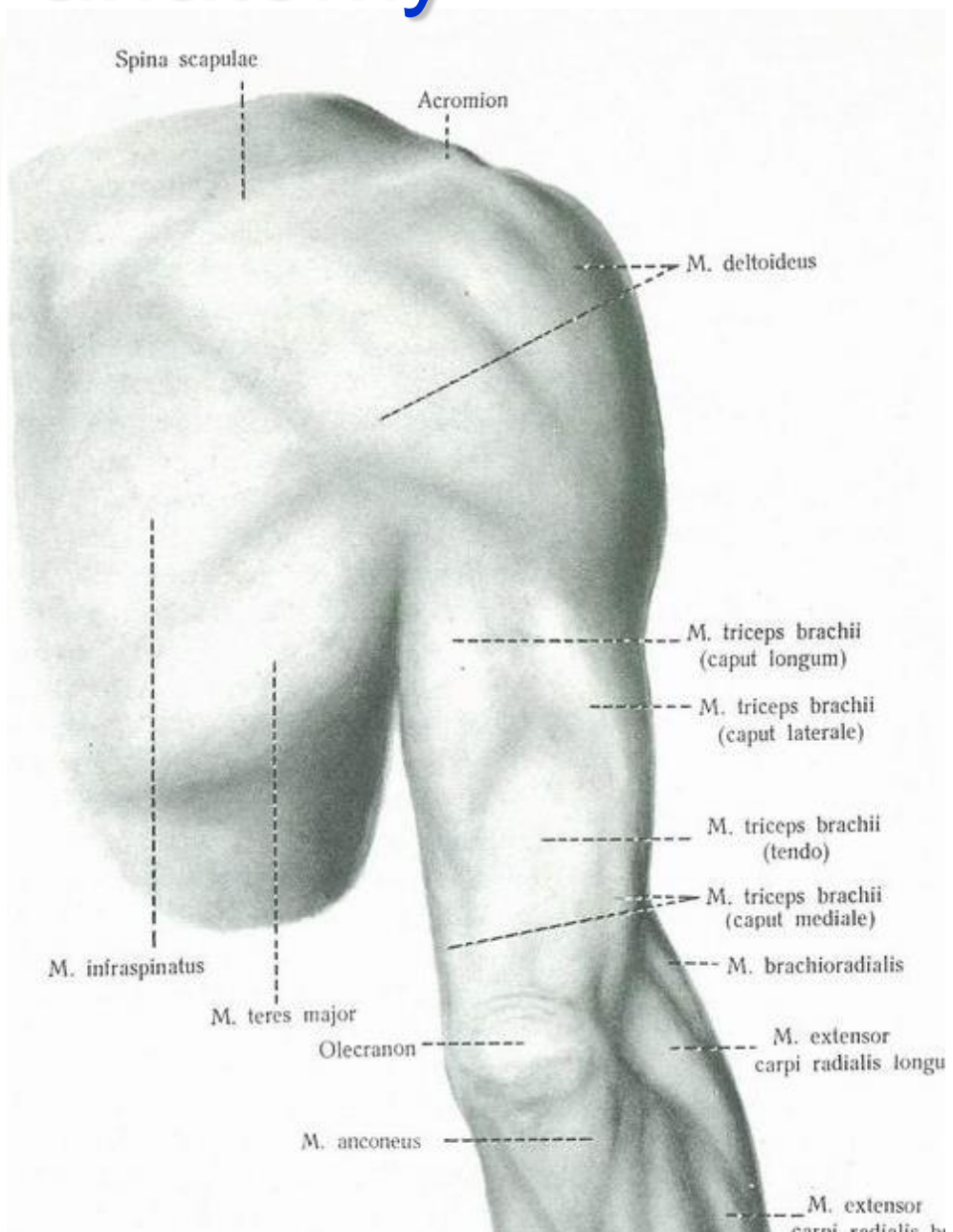
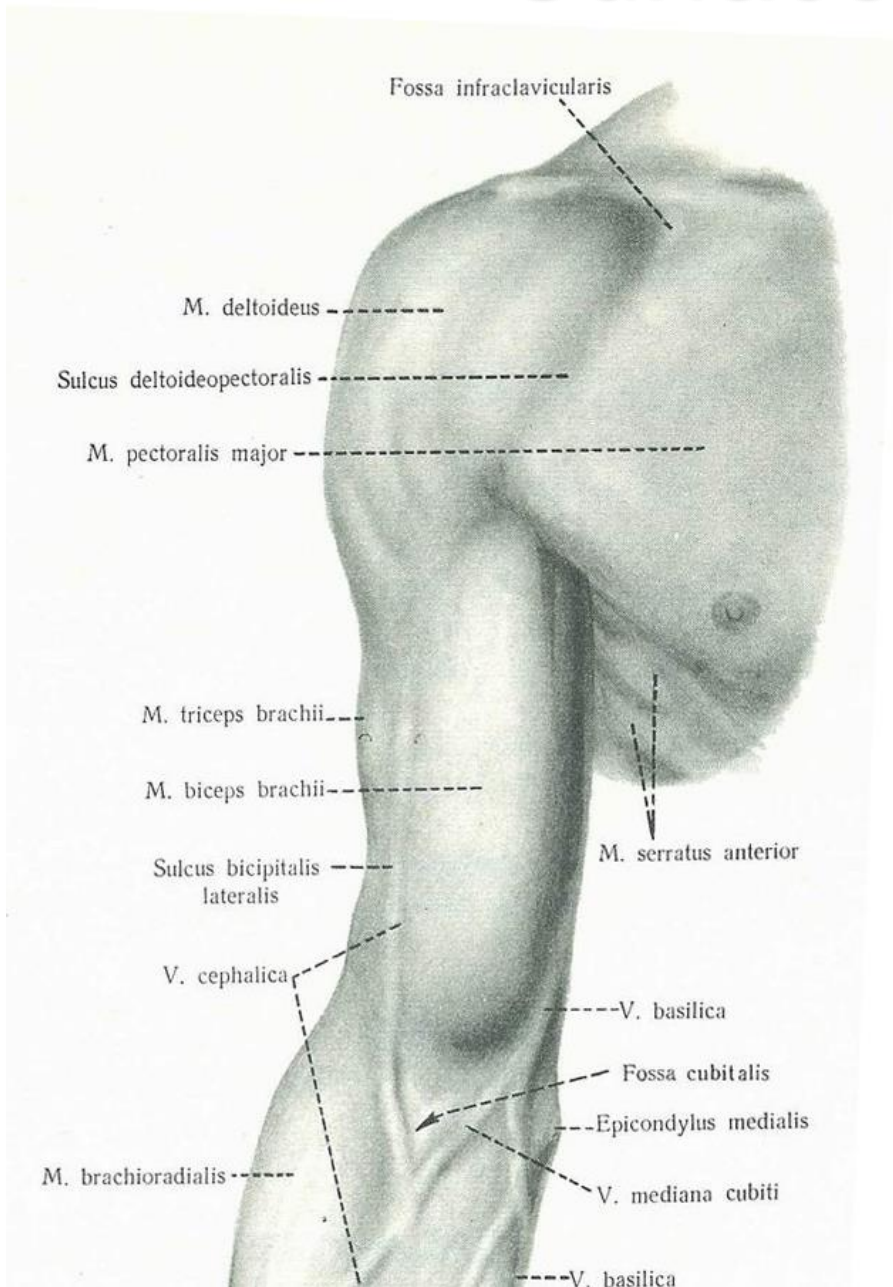
- n. suprascapularis

- m. supraspinatus + m. infraspinatus (+ m. teres minor)
- *articular capsule*
- topographic sites: incisura scapulae
incisura spinoglenoidalis

Pars supraclavicularis plexus brachialis

- n. thoracicus longus
 - m. serratus anterior
- n. thoracodorsalis
 - m. latissimus dorsi
- nn. subscapulares
 - m. subscapularis
 - m. teres major
- n. subclavius
 - m. subclavius
- n. pectoralis medialis et lateralis
 - m. pectoralis major et minor

Surface anatomy



Thoracohumeral muscles

- **m. pectoralis major**

- pars claviculans

- pars sternocostalis

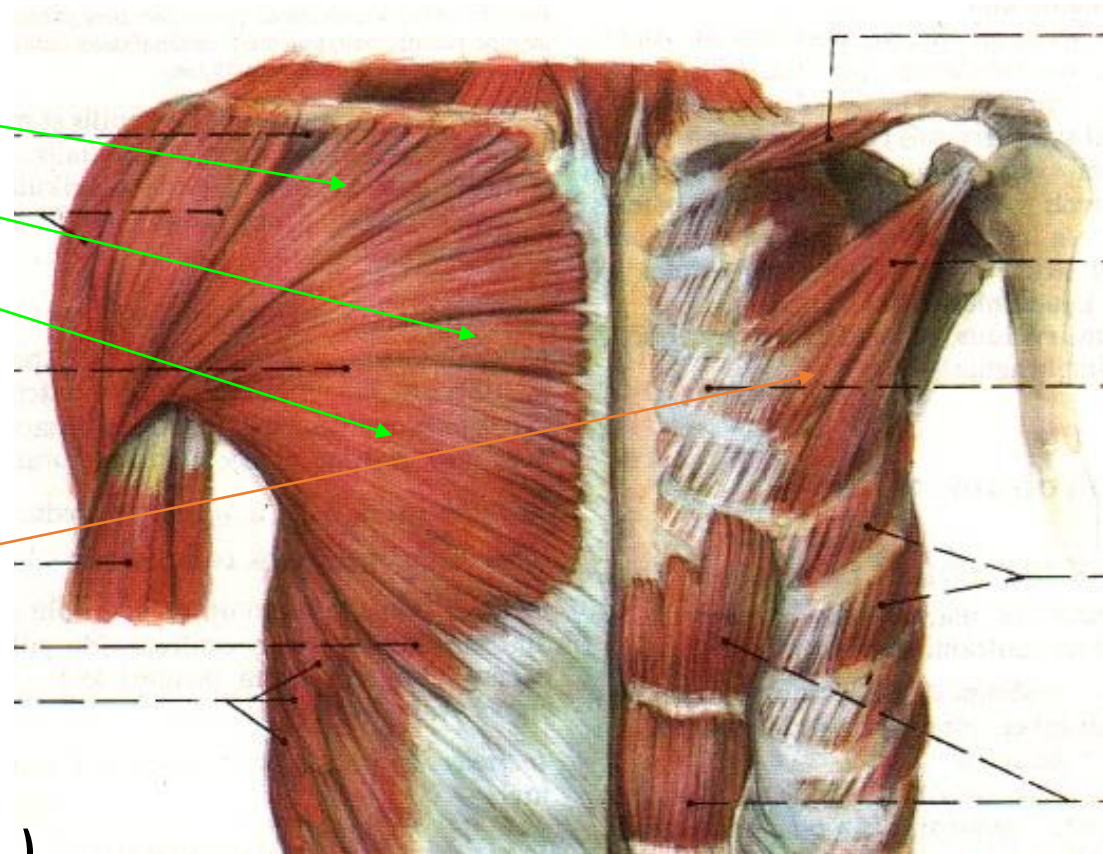
- pars abdominalis

rotation of insertion tendon
180°

- **m. pectoralis minor**

fascia clavipectoralis

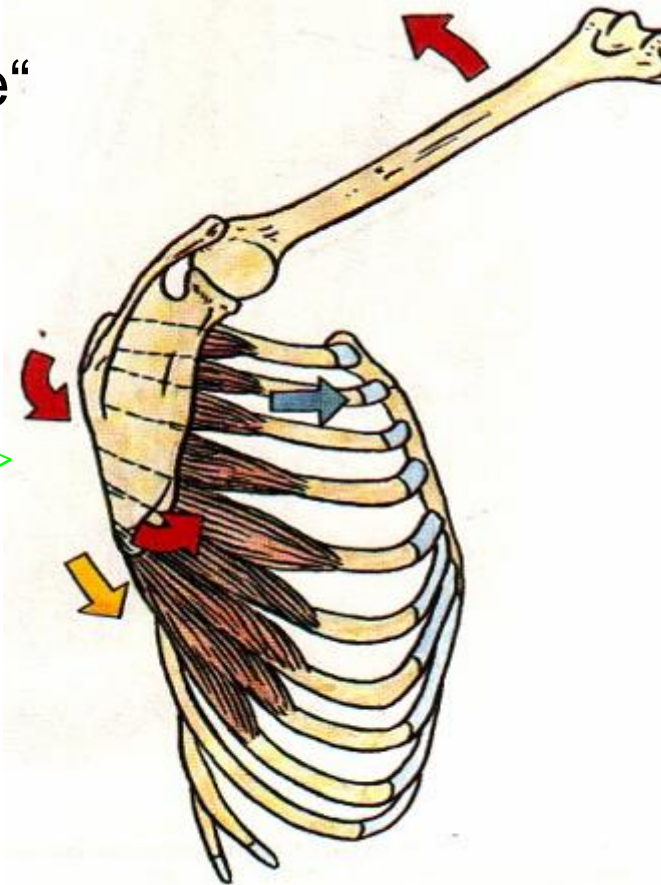
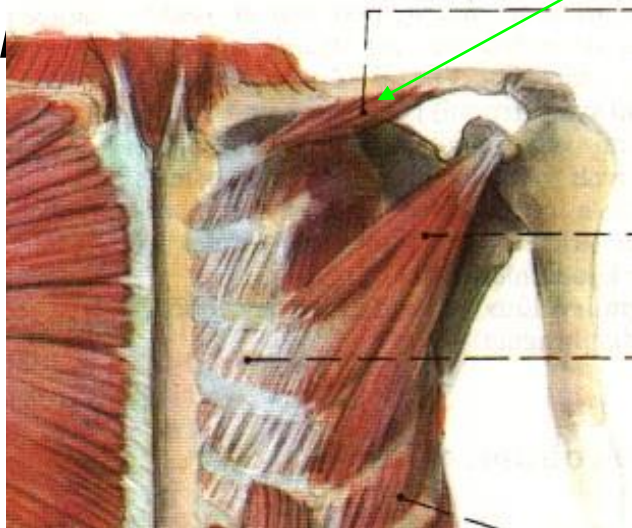
nn. pectorales (med.+lat.)



Thoracohumeral muscles

- **m. serratus anterior**
„thoracoscapular muscle“
n. thoracicus longus

- **m. subclavius**
fascia clavipectoralis



351. MUSCULUS SERRATUS ANTERIOR – schéma funkci svalu



Superficial (first) layer of back muscles

spinodorsal muscle

- **m. trapezius**

- pars descendens
- pars transversa
- pars ascendens
- speculum rhomboideum C7

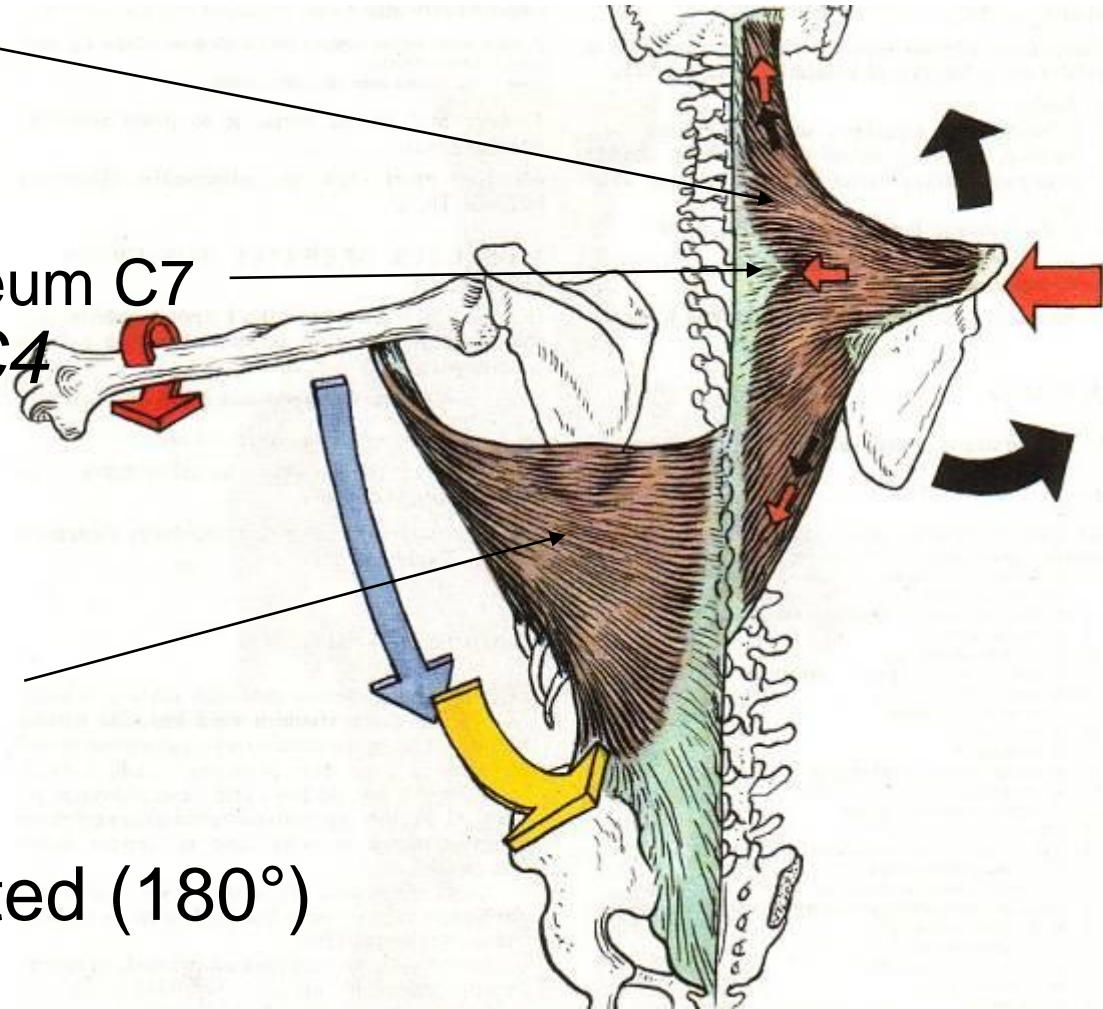
n. accessorius + C3-C4

spinohumeral muscle

- **m. latissimus dorsi**

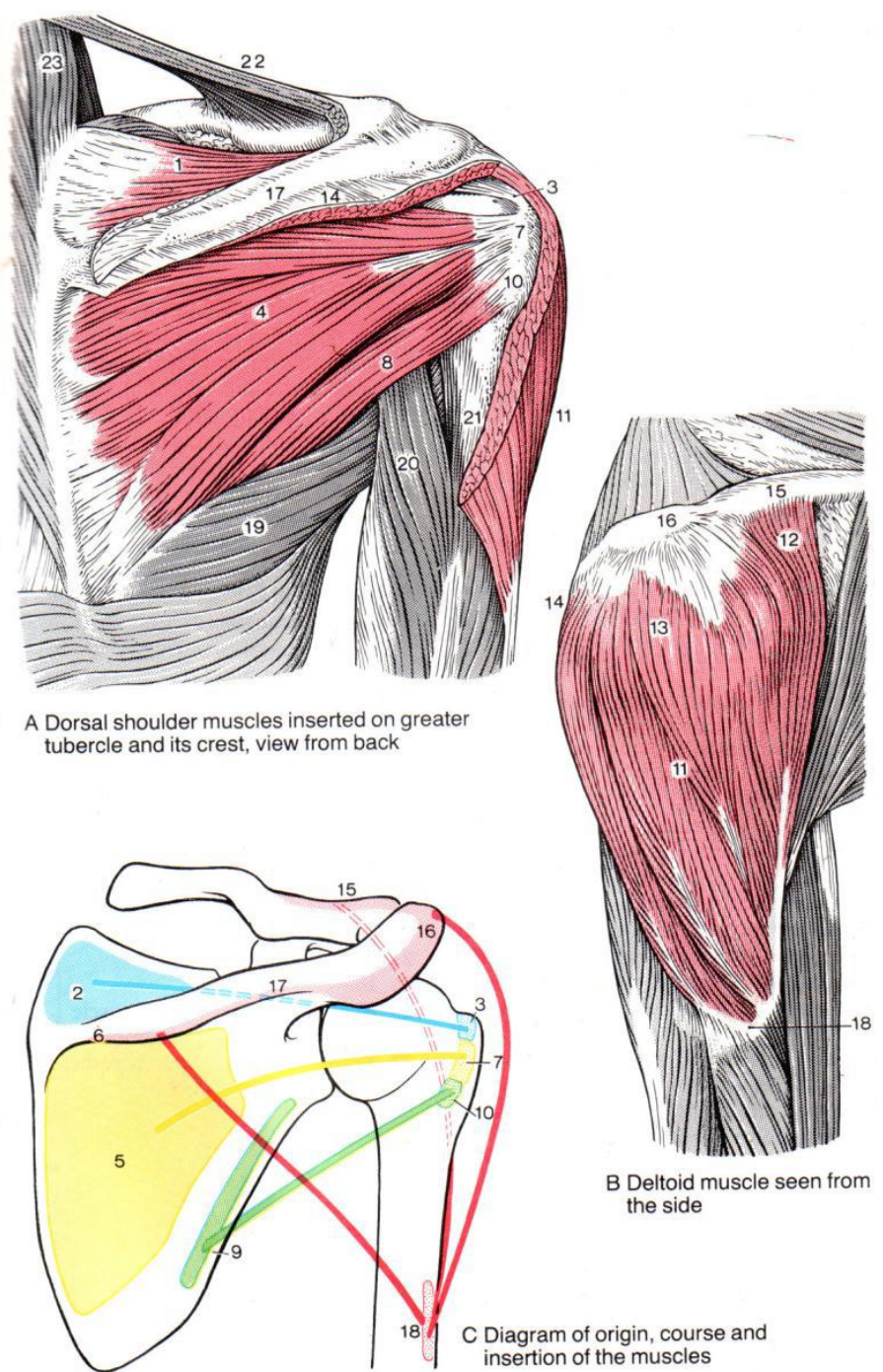
n. thoracodorsalis

insertion tendon inverted (180°)



Shoulder girdle muscles

- origin: scapula
- insertion: humerus
- m. deltoideus
- m. supraspinatus
- m. infraspinatus
- m. subscapularis
- m. teres major
- m. teres minor



M. deltoideus

O: pars clavicularis – lateral 1/3 of clavícula
pars acromialis – acromion
pars spinalis – lateral 2/3 of spina scapulae

I: tuberositas deltoidea humeri

F: p.c. – ventral flexion, abduction, internal rotation)

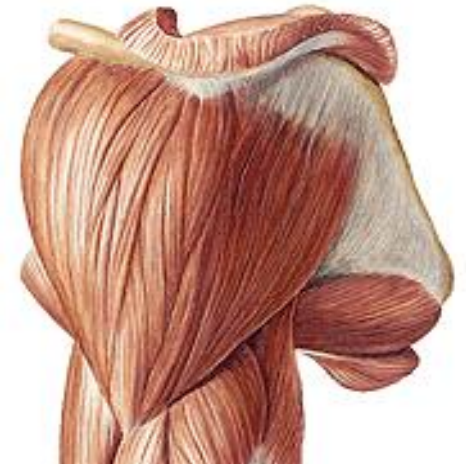
p.a. – abduction above horizontal plane

p.s. – extension, external rotation

keeps head in fossa

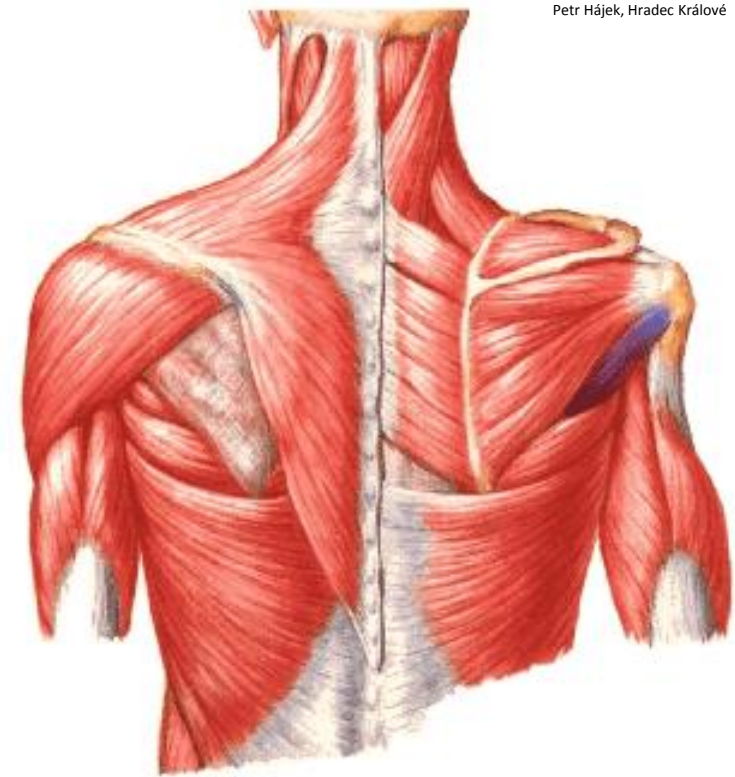
In: n. axillaris

in paralysis spontaneous subluxation due to weight of the upper limb



M. supraspinatus

O: fossa supraspinata
 I: tuberculum majus humeri
 F: abduction and external rotation of arm
 In: n. suprascapularis

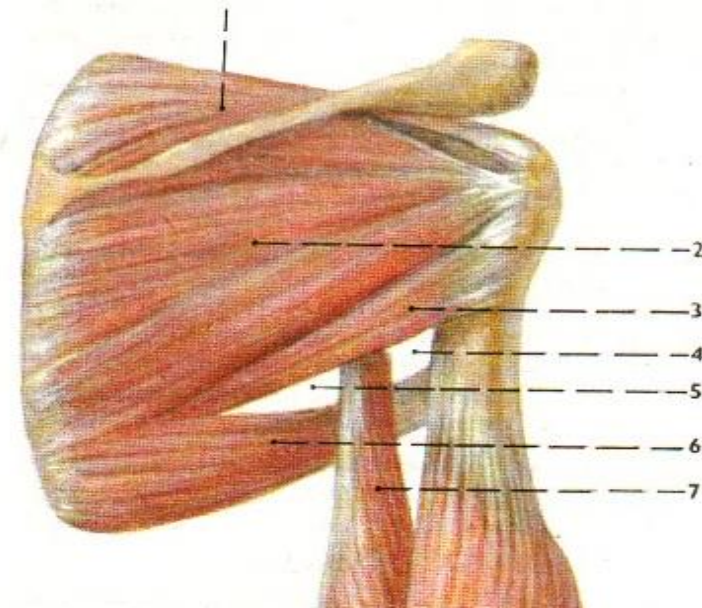


M. infraspinatus

O: fossa infraspinata
 I: tuberculum majus humeri
 F: adduction and external rotation of arm
 In: n. suprascapularis

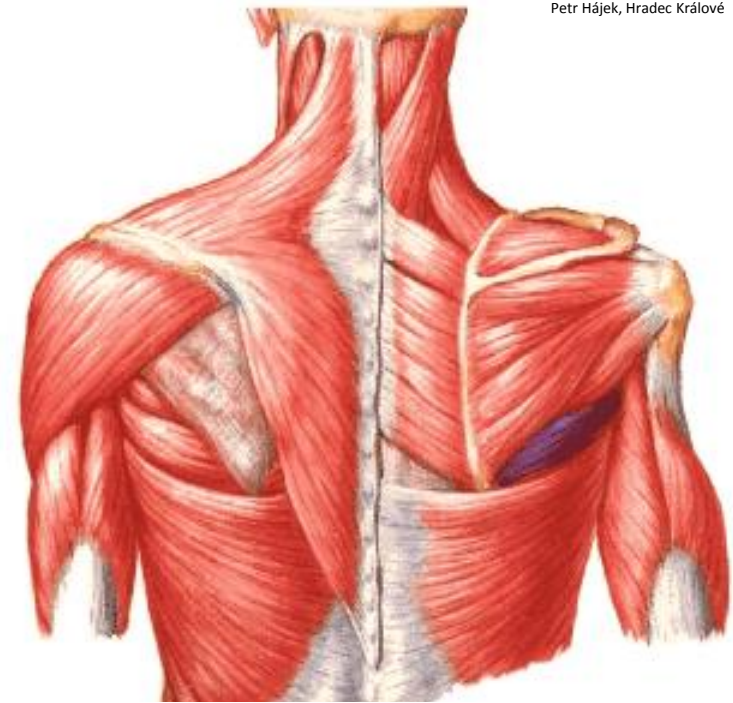
M. teres minor

O: cranial 2/3 of margo lateralis scapulae
 I: tuberculum majus humeri
 F: external rotation of arm
 In: n. axillaris



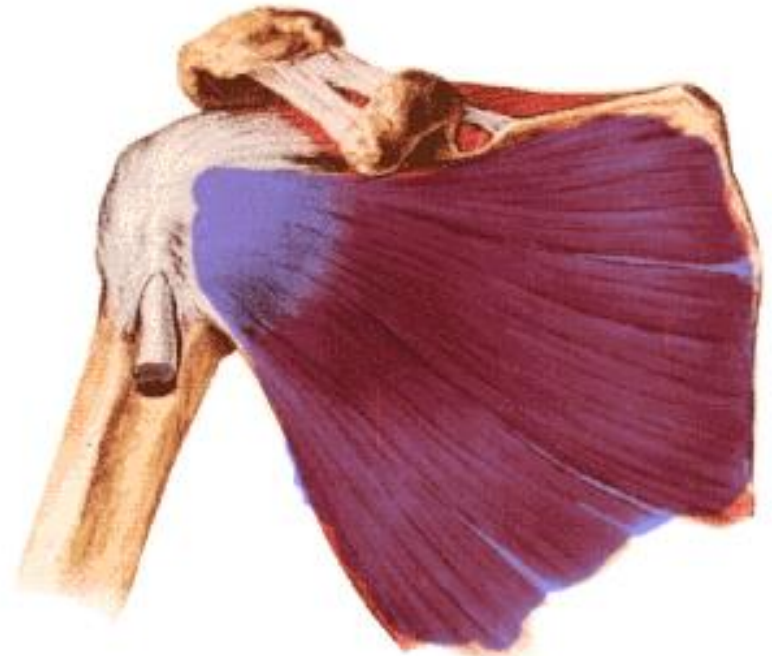
M. teres major

- O: posterior surface of angulus inferior scapulae
 In: crista tuberculi minoris
 F: adduction, dorsal flexion and internal rotation of arm
 In: n. subscapularis



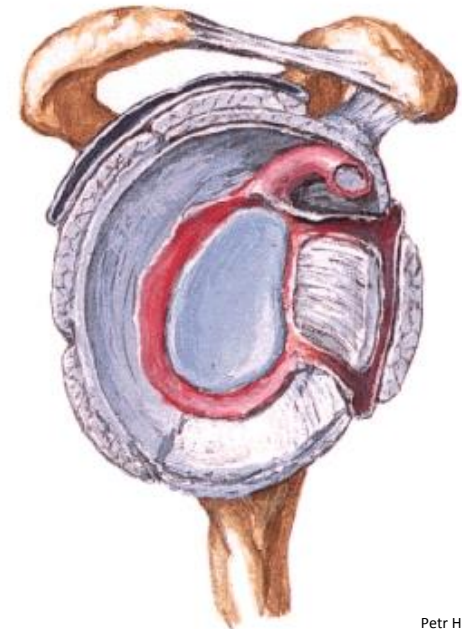
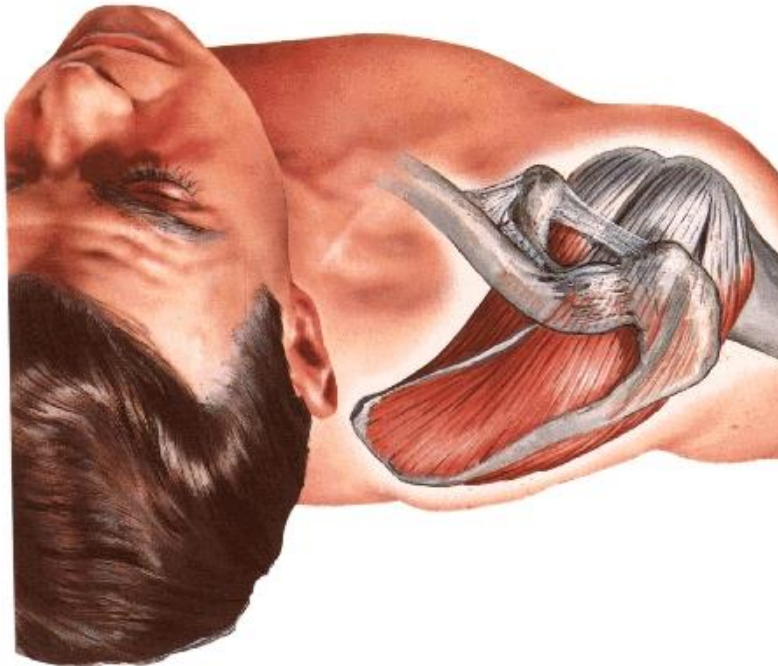
M. subscapularis

- O: fossa subscapularis
 I: tuberculum minus
 F: adduction and internal rotation of arm
 In: n. subscapularis



Rotator cuff

- fixation apparatus of caput humeri
- 4 muscles of shoulder girdle
 - m. supraspinatus, m. infraspinatus, m. teres minor, m. subscapularis
- rupture of rotator cuff
 - rupture of m. supraspinatus
 - fracture with abruption of tip of tuberculum majus



Incisura scapulae

Suprascapular notch

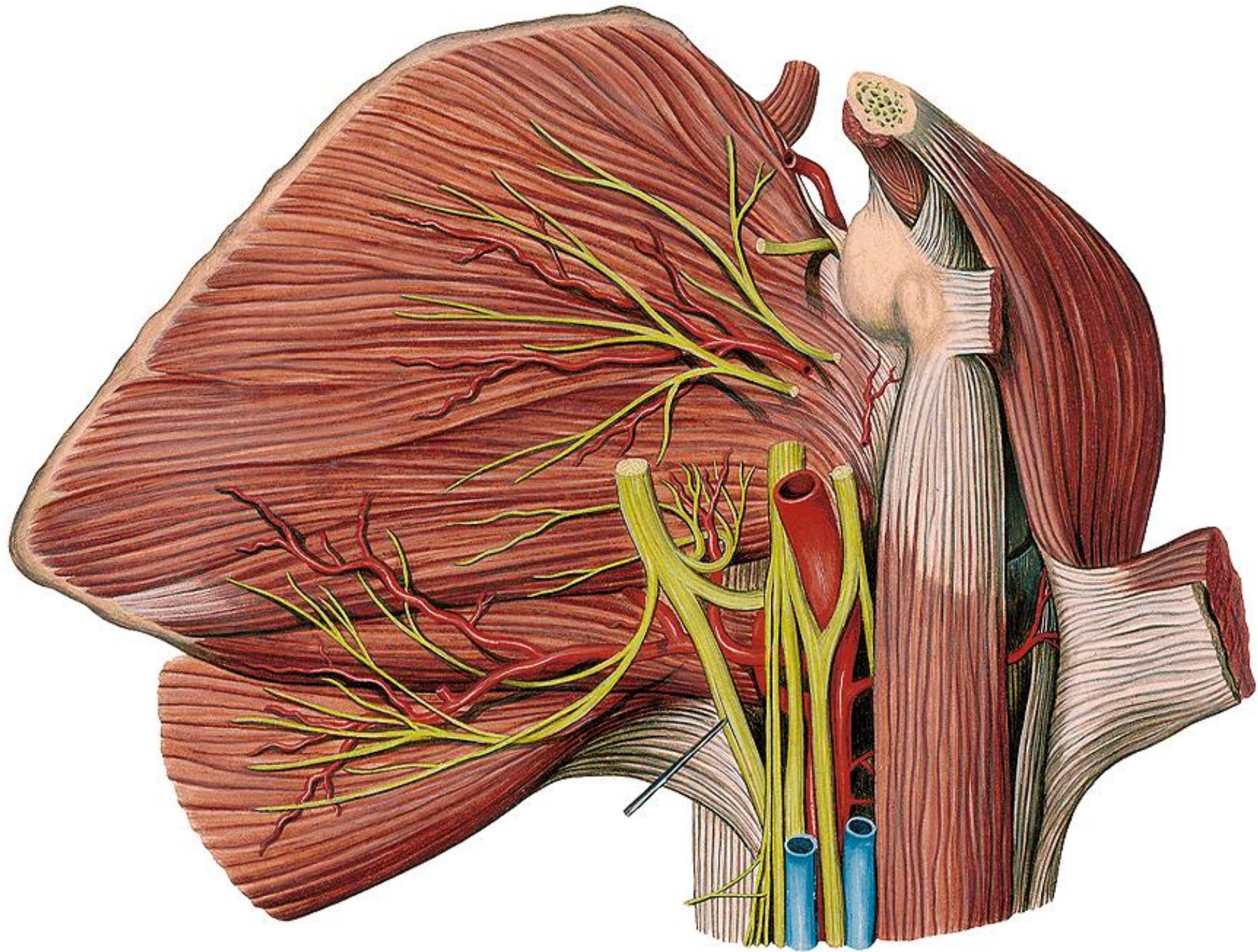
border:

- incisura scapulae
- lig. transversum scapulae superius (cranially)

contents:

- n. suprascapularis
- vasa suprascapularia (above the ligament)

clinical problem: supraclavicular syndrome



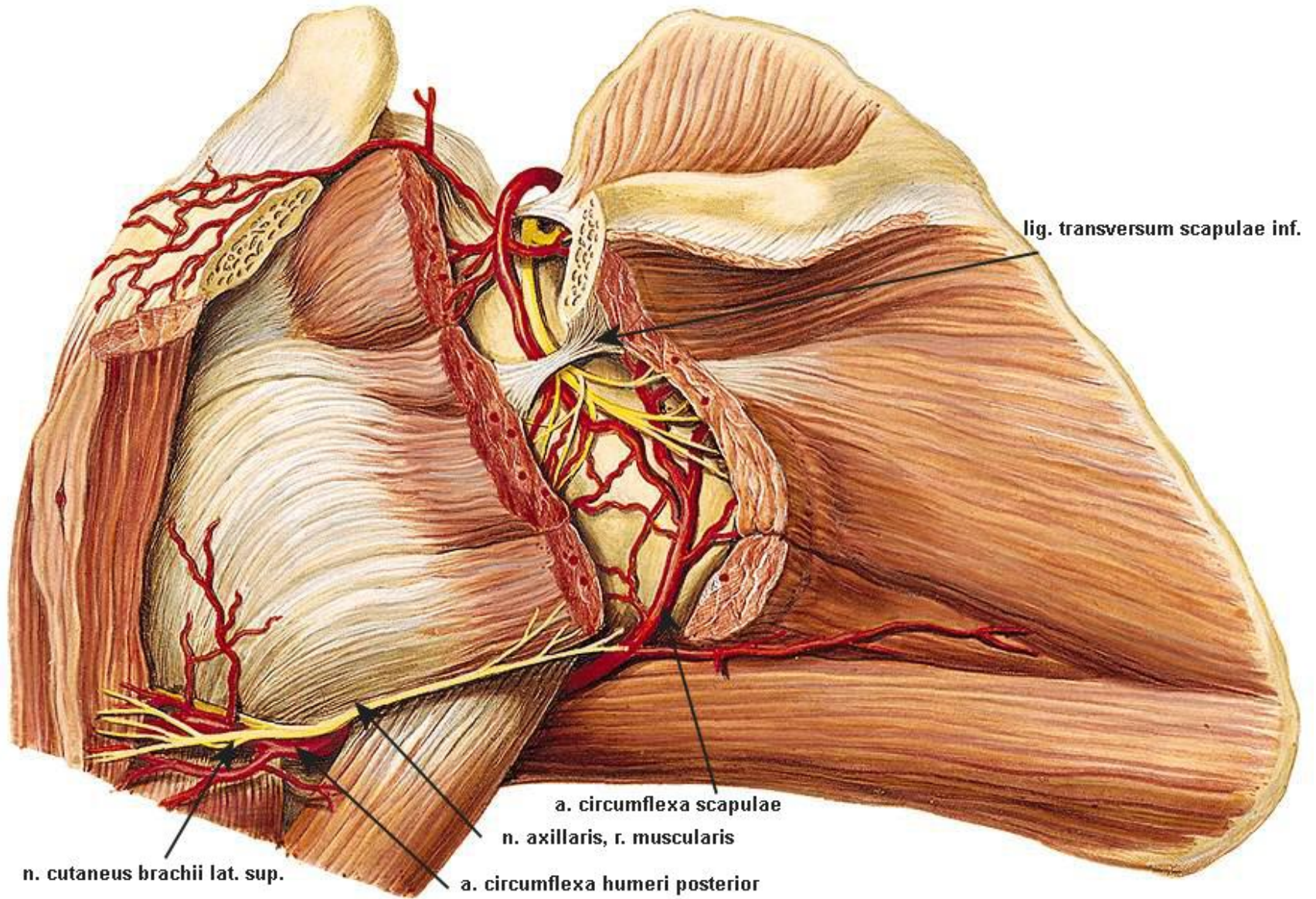
Incisura spinoglenoidalis

border:

- cavitas glenoidalis – laterally
- base of spina scapulae – medially
- lig. transversum scapulae inferius

contents:

- nervus suprascapularis
- vasa suprascapularia



Trigonum clavipectorale / deltopectorale

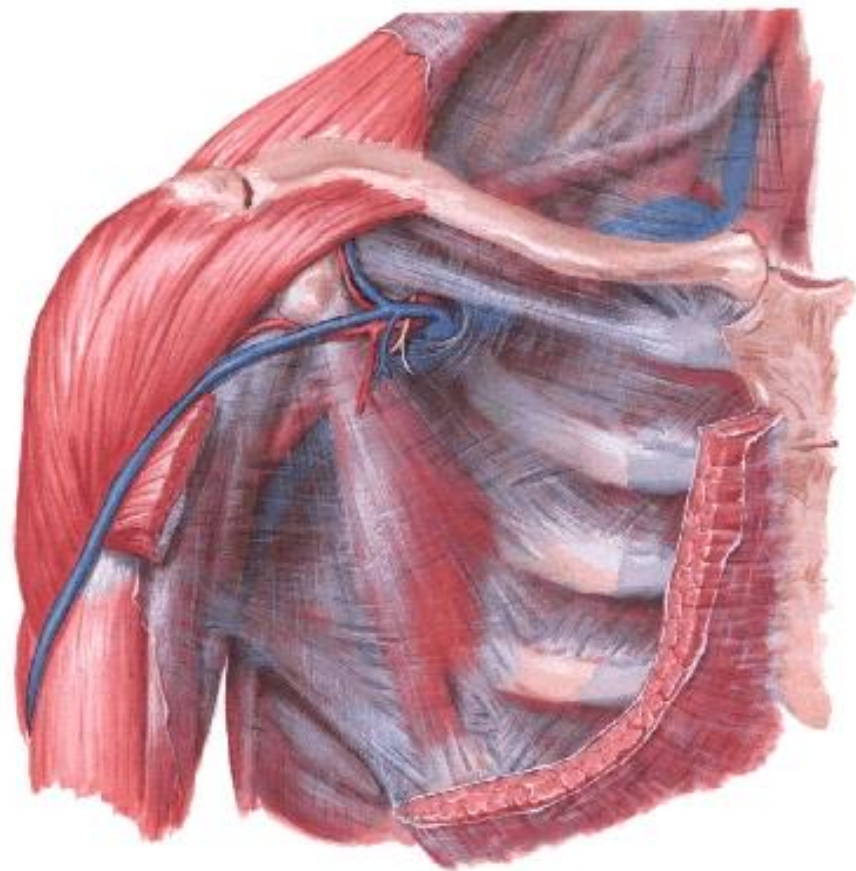
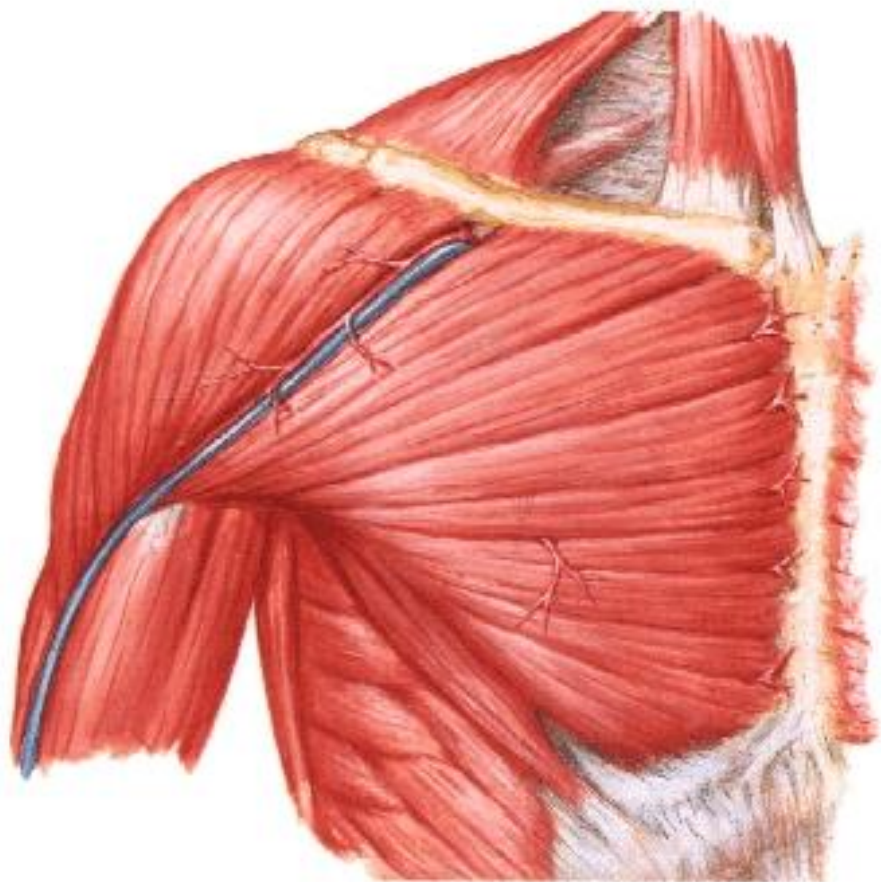
deep: fossa ovalis infraclavicularis von Mohrenheimi
in fascia clavipectoralis

border:

- m. deltoideus – laterally
- m. pectoralis medialis – medially
- clavicula – cranially

contents:

- v. cephalica
- a. thoracoacromialis
- nn. pectorales (lat. et med.)
- branches of nn. supraclaviculares



Movements of shoulder joint

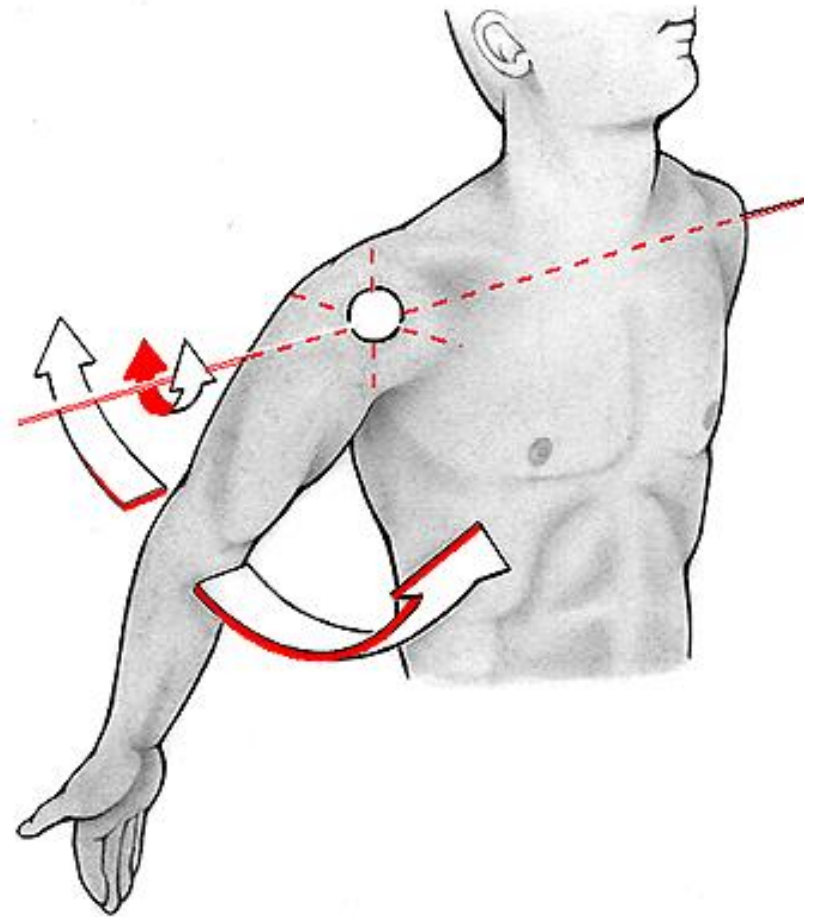
Ventral and dorsal flexion

Ventral flexion:

- m. deltoideus – pars clavicularis
- m. coracobrachialis
- m. biceps brachii – caput breve

Dorsal flexion:

- m. deltoideus – pars spinalis



Movements of shoulder joint

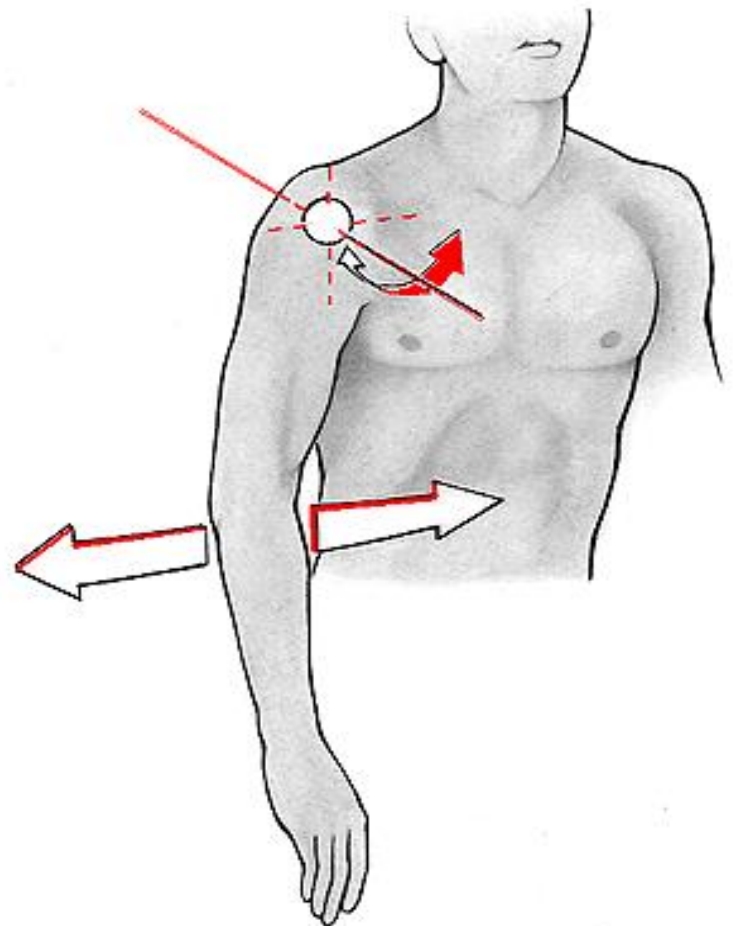
Abduction and adduction

Abduction:

- m. deltoideus – pars acromialis + clavicularis
- m. supraspinatus
- m. biceps brachii – caput longum

Adduction:

- m. infraspinatus
- m. teres minor
- m. teres major
- m. subscapularis
- m. biceps brachii – caput breve
- m. coracobrachialis
- m. triceps brachii – caput longum



Movements of shoulder joint

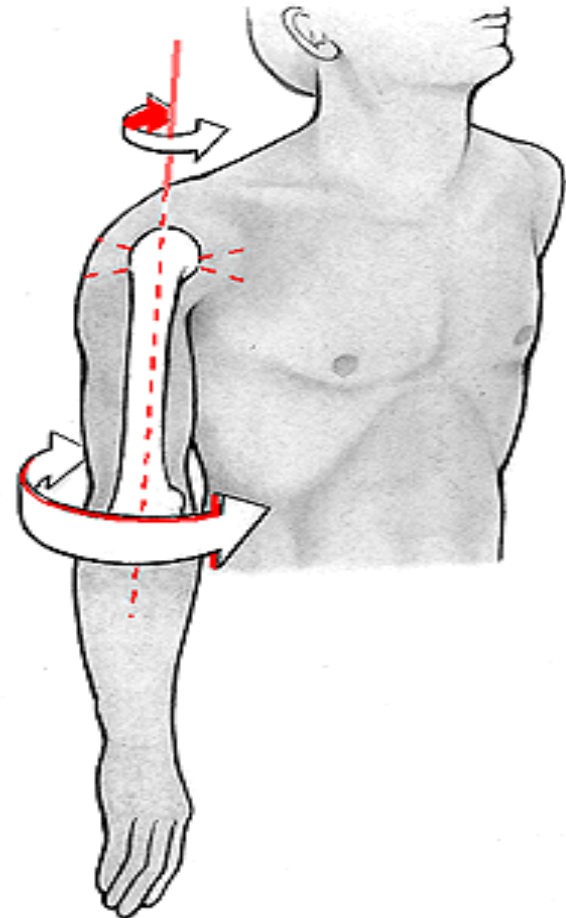
External and internal rotation

External rotation

- m. supraspinatus
- m. infraspinatus
- m. teres minor
- m. deltoideus – pars clavicularis

Internal rotation

- m. teres major
- m. subscapularis
- m. deltoideus – pars spinalis



Axilla – fossa axillaris

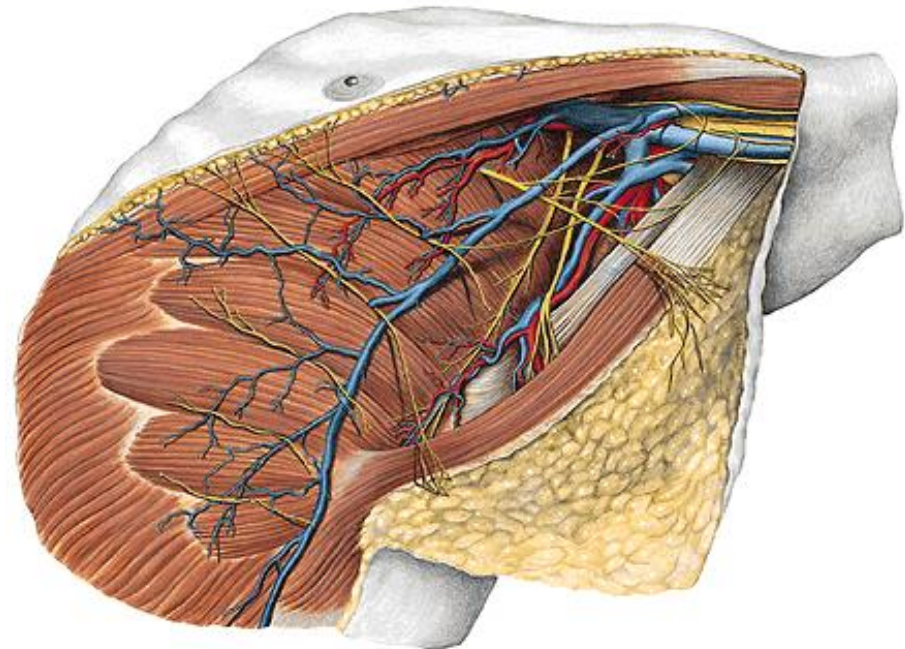
four-wall pyramid-shaped fossa

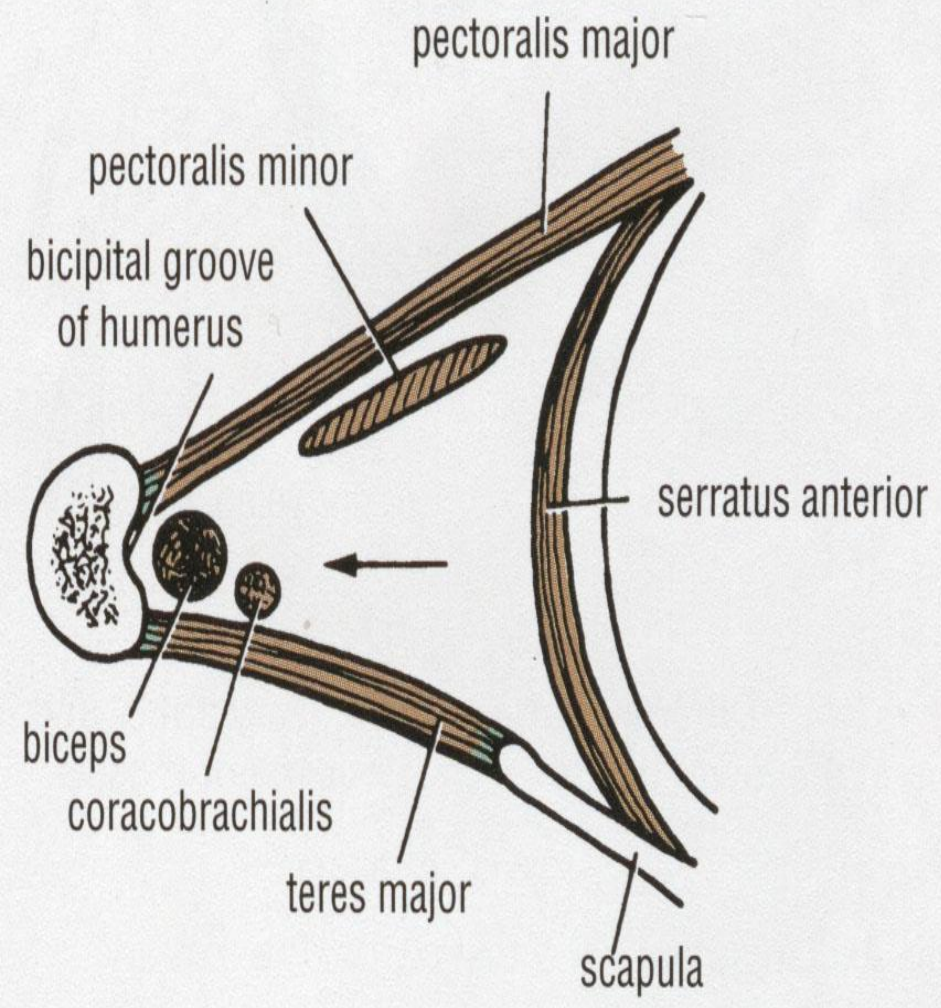
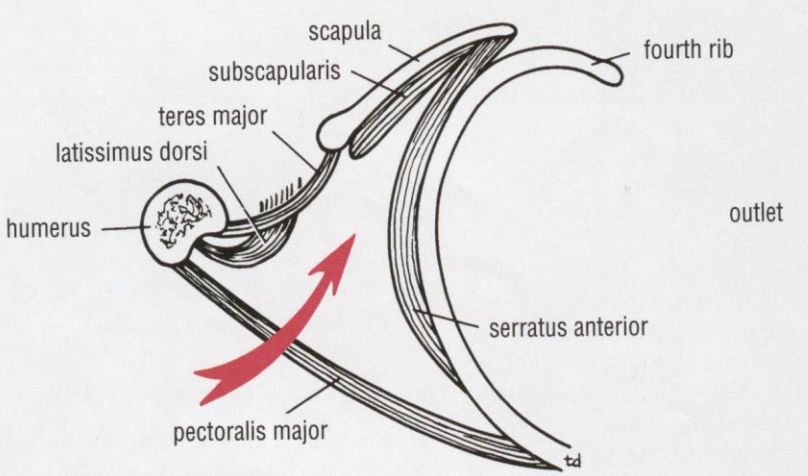
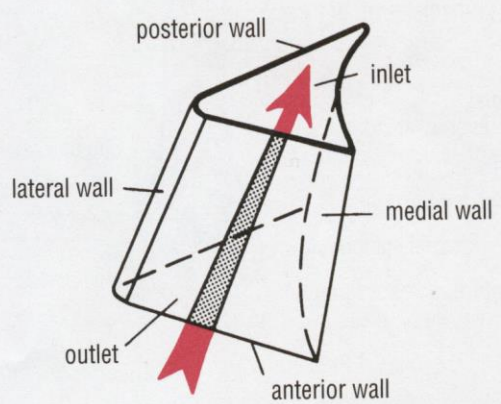
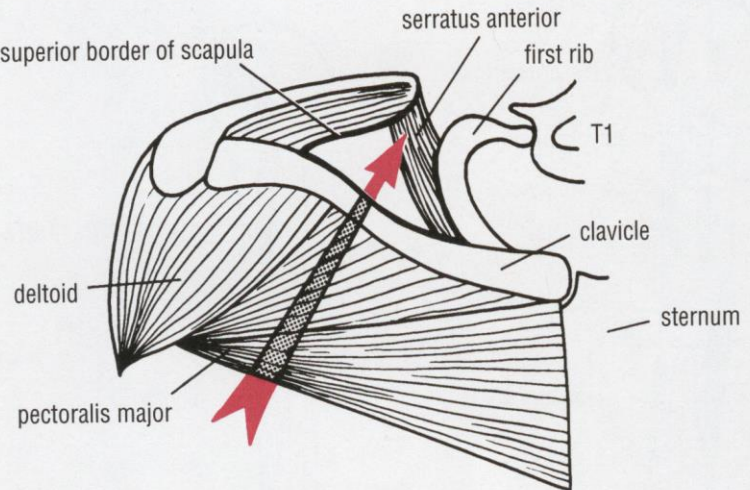
border:

- Inferior surface of shoulder joint (top)
- mm. pectorales (ventrally)
- m. latissimus dorsi, m. teres major (dorsally)
- m. serratus anterior, thoracic wall and its muscles (medially)
- humerus and its muscles (laterally)
- fascia axillaris (bottom)

• contents:

- a. axillaris and its branches
- v. axillaris and its tributaries
- plexus brachialis (pars infraclavicularis)
- n. thoracodorsalis
- n. thoracicus longus
- nodi lymphoidei axillares



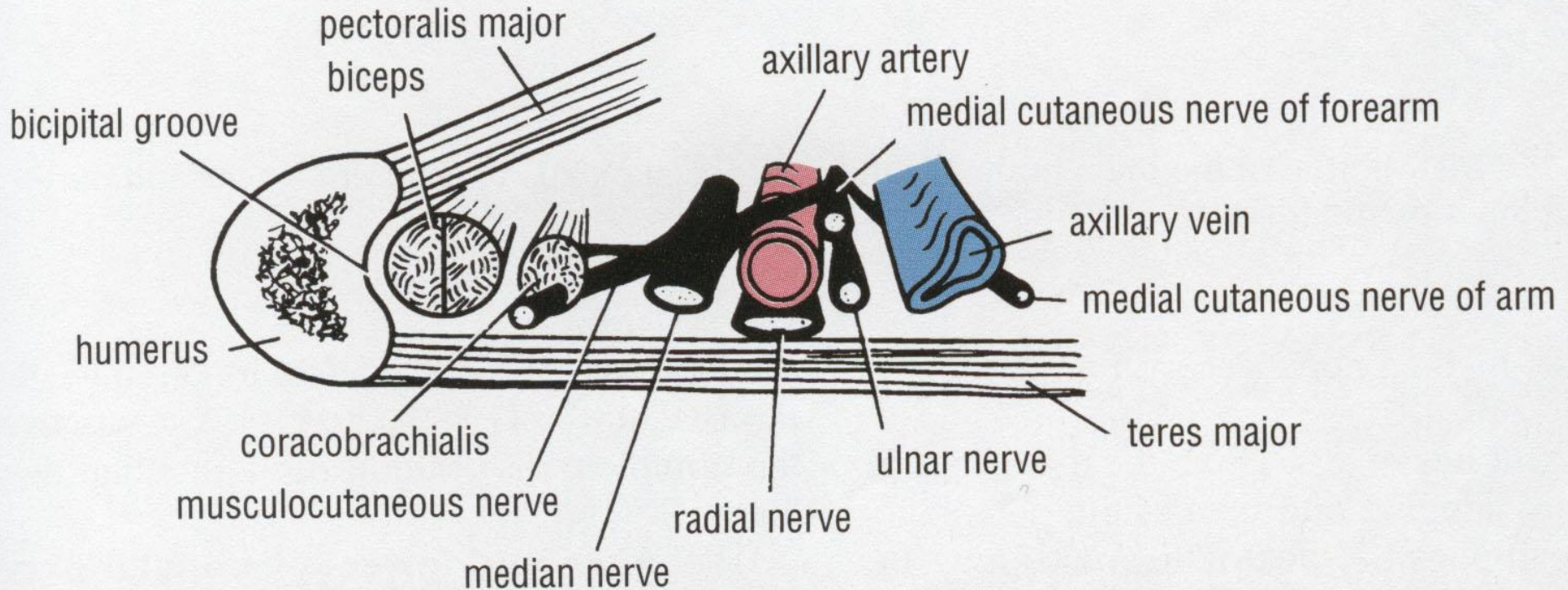


inlet from above

outlet

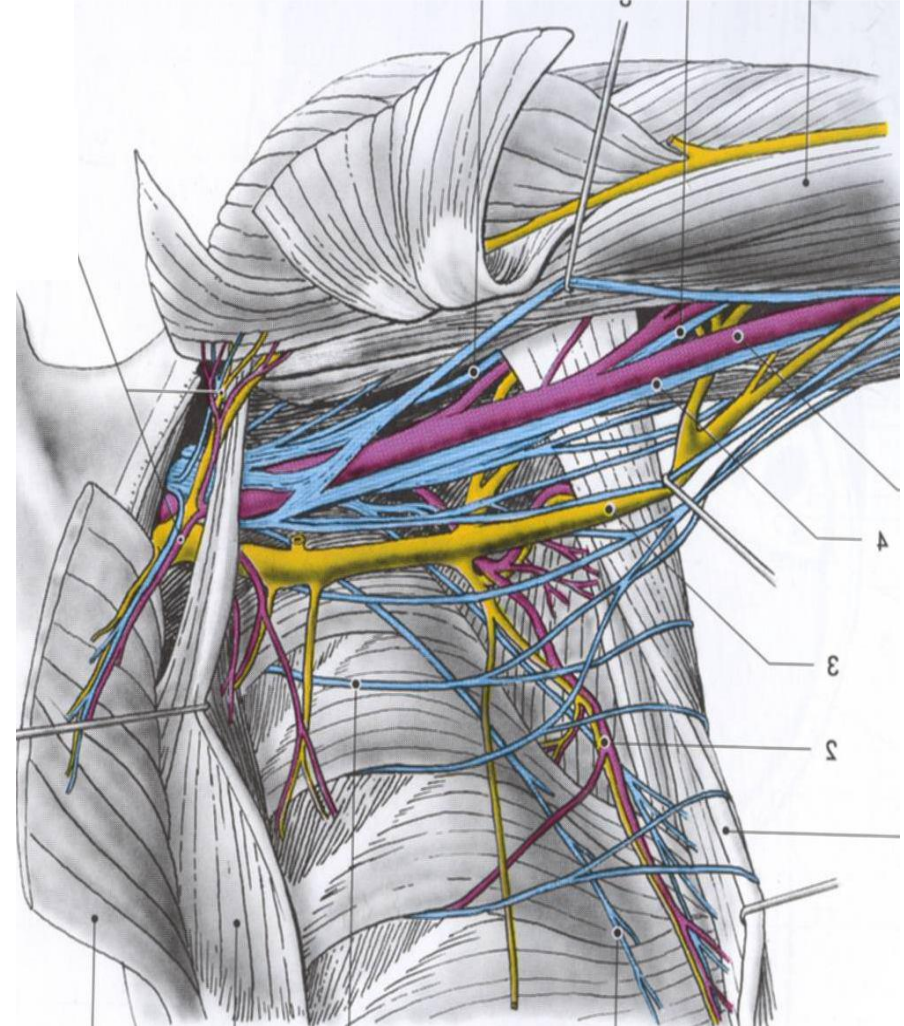
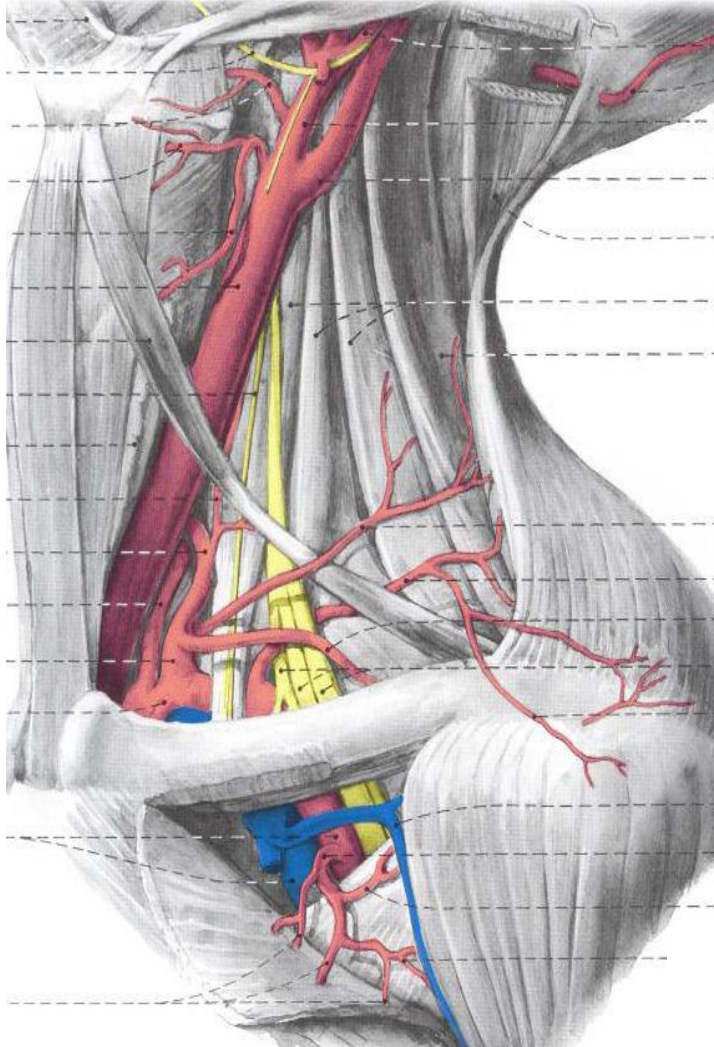
lateral wall

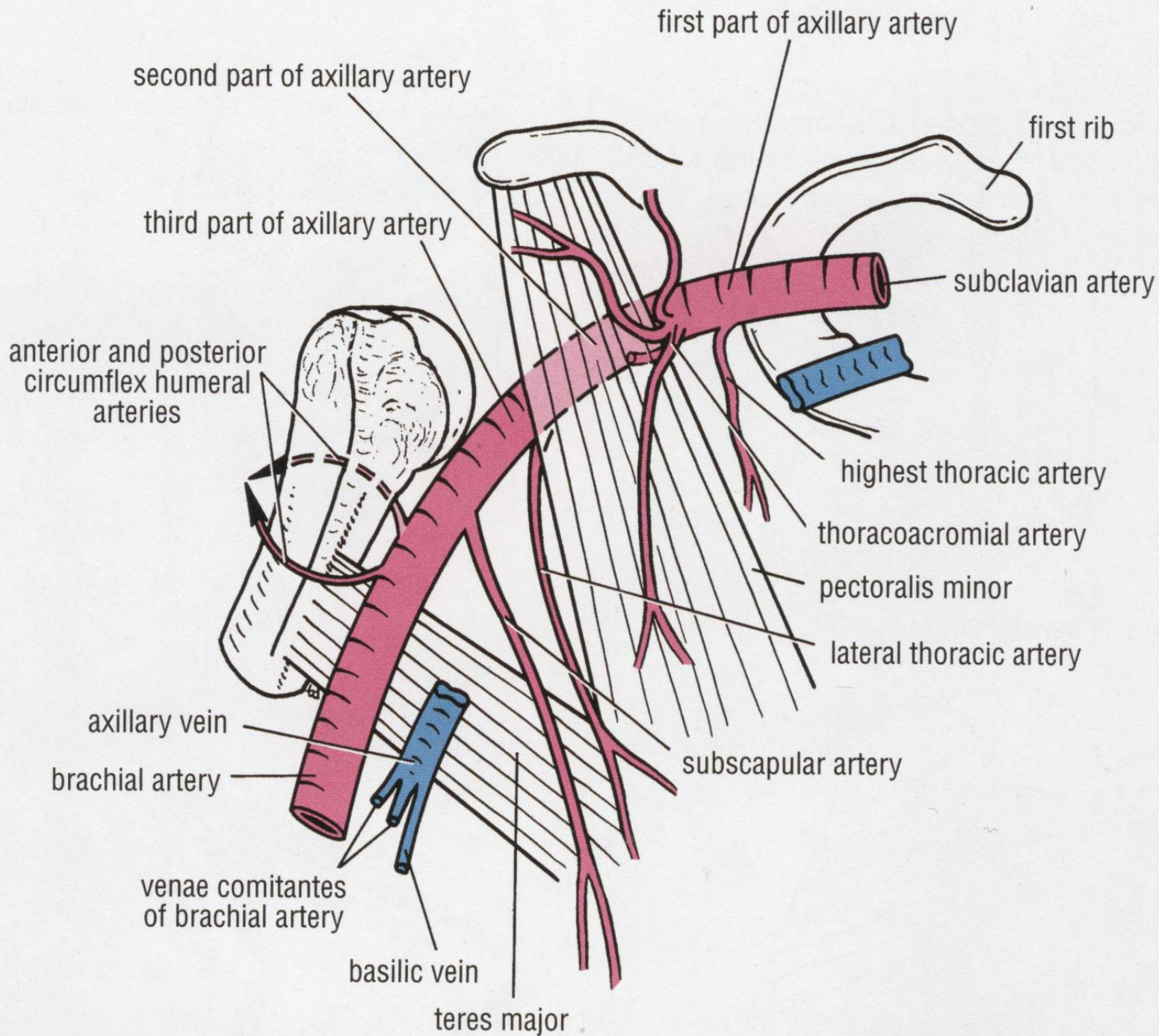
Relation of structures in axilla

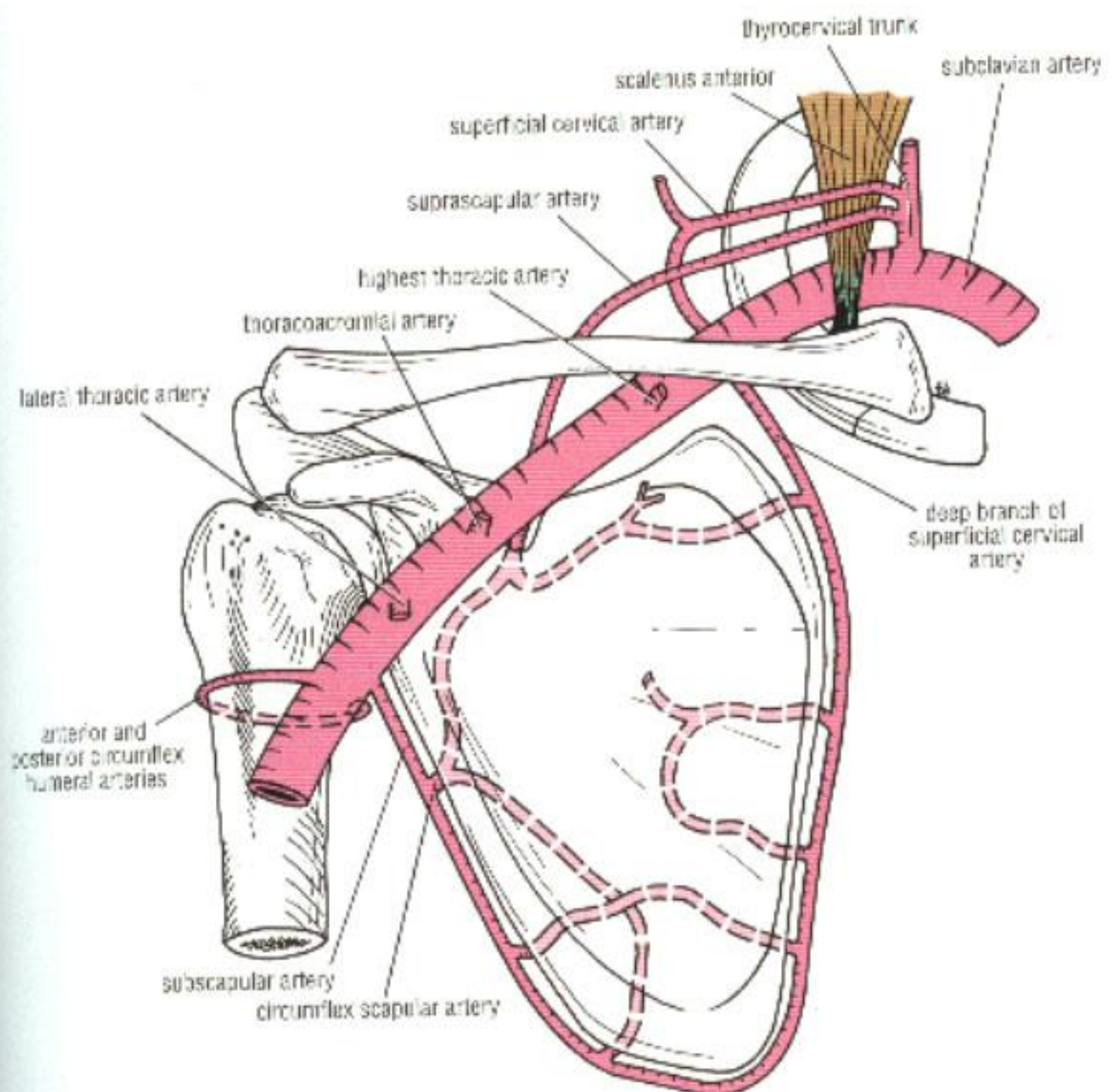


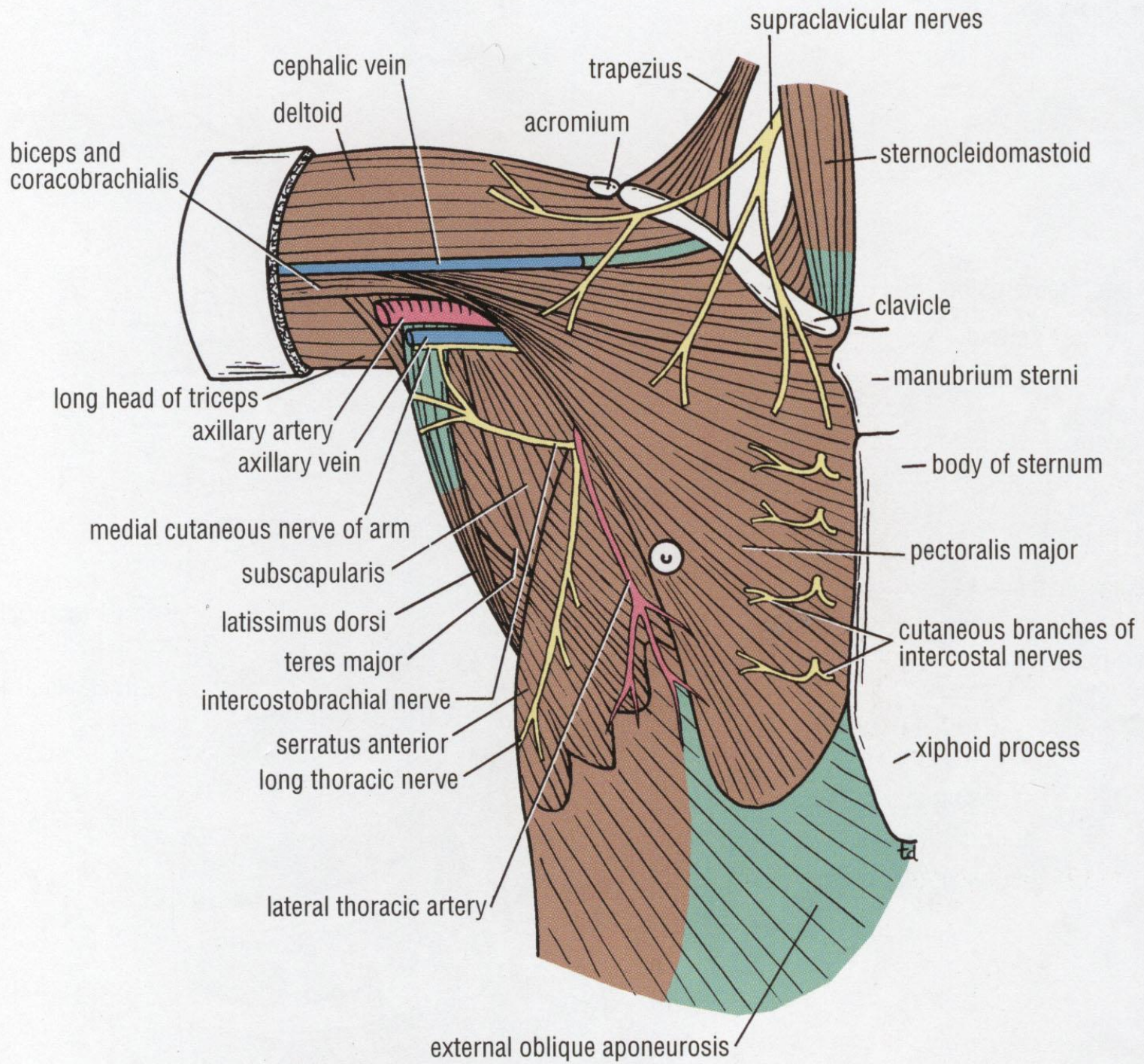
Pathway of main vessels and nerves of upper limb

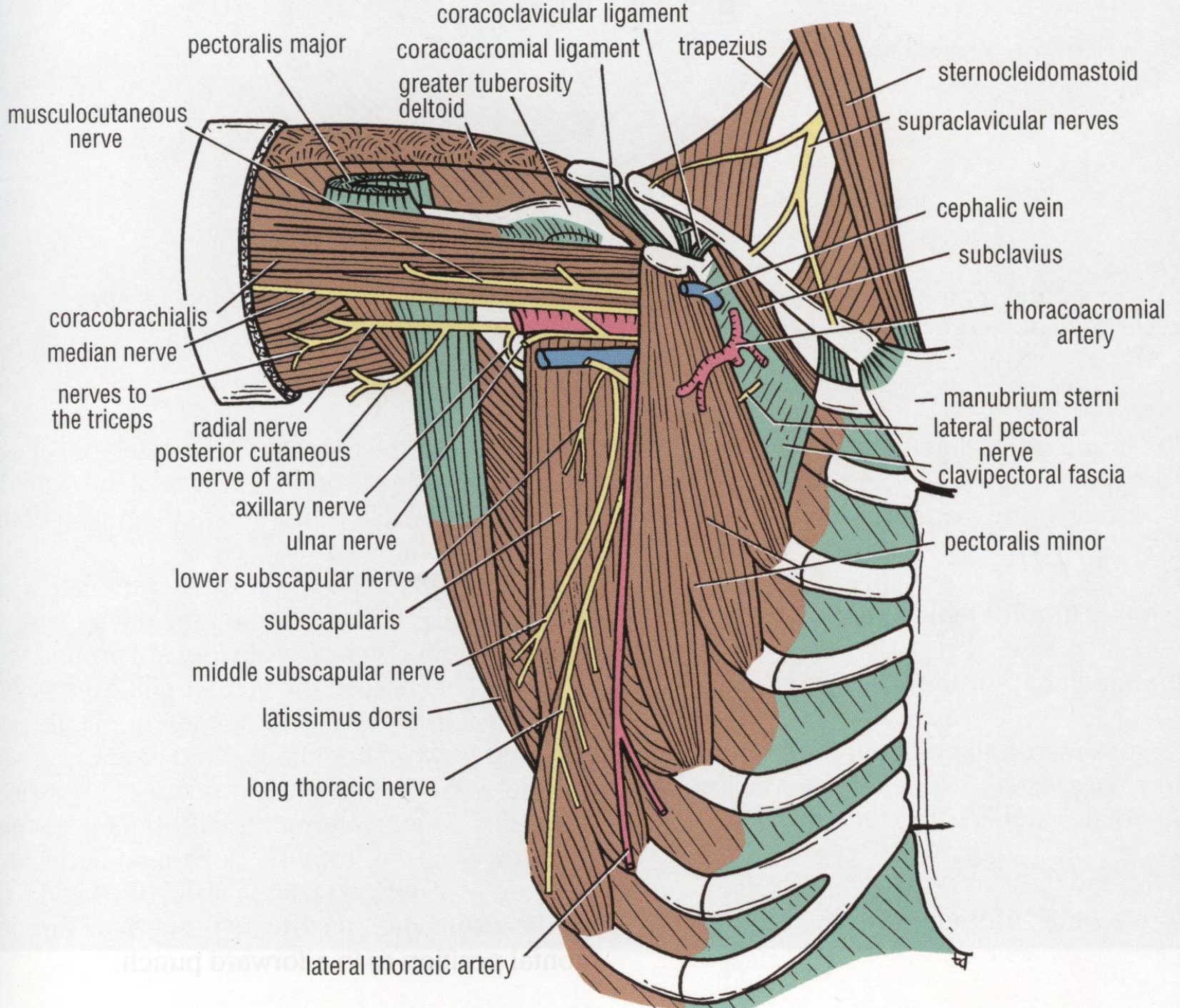
fissura scalenorum → axilla → septum intermusculare
brachii mediale → fossa cubitalis

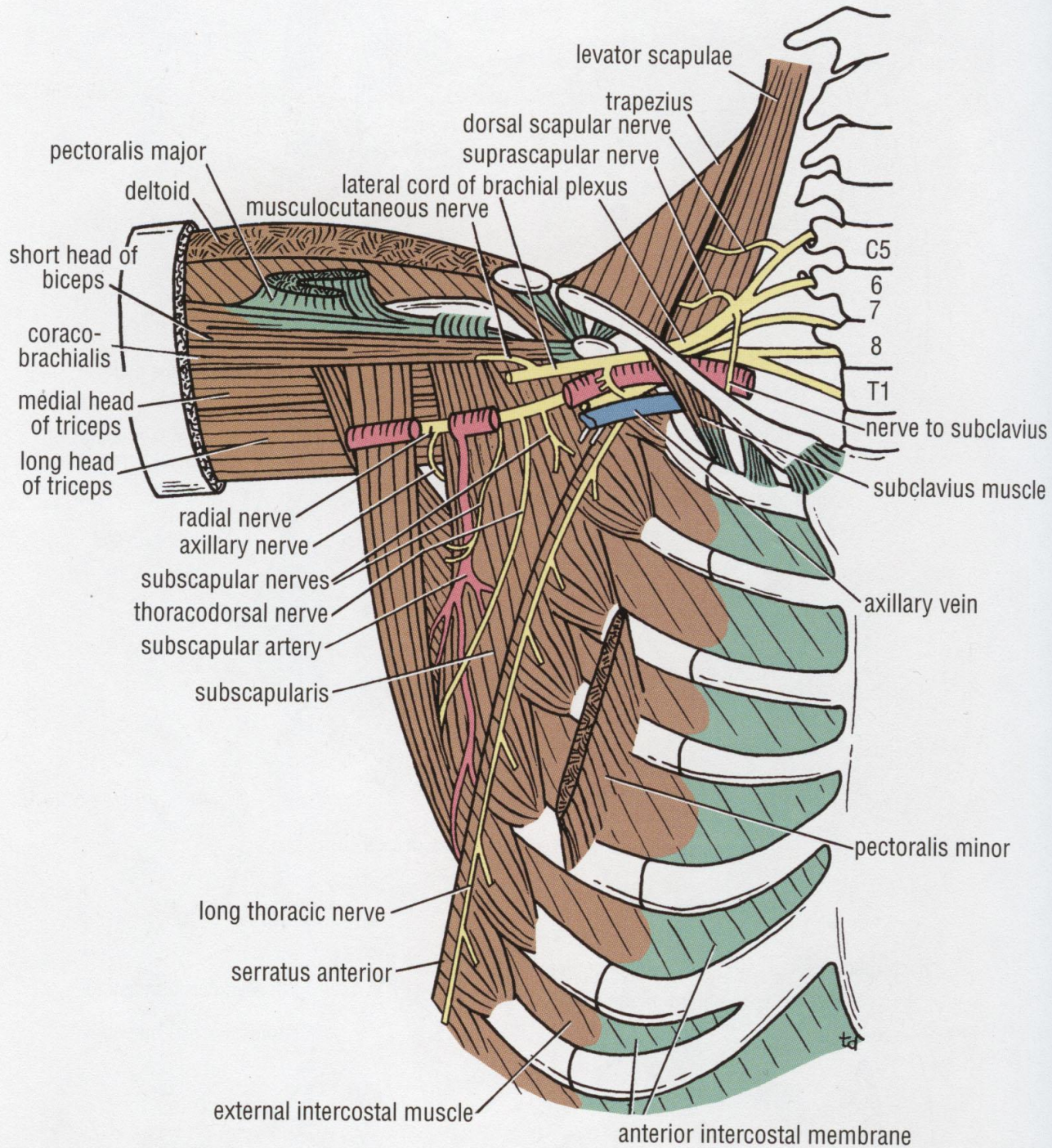


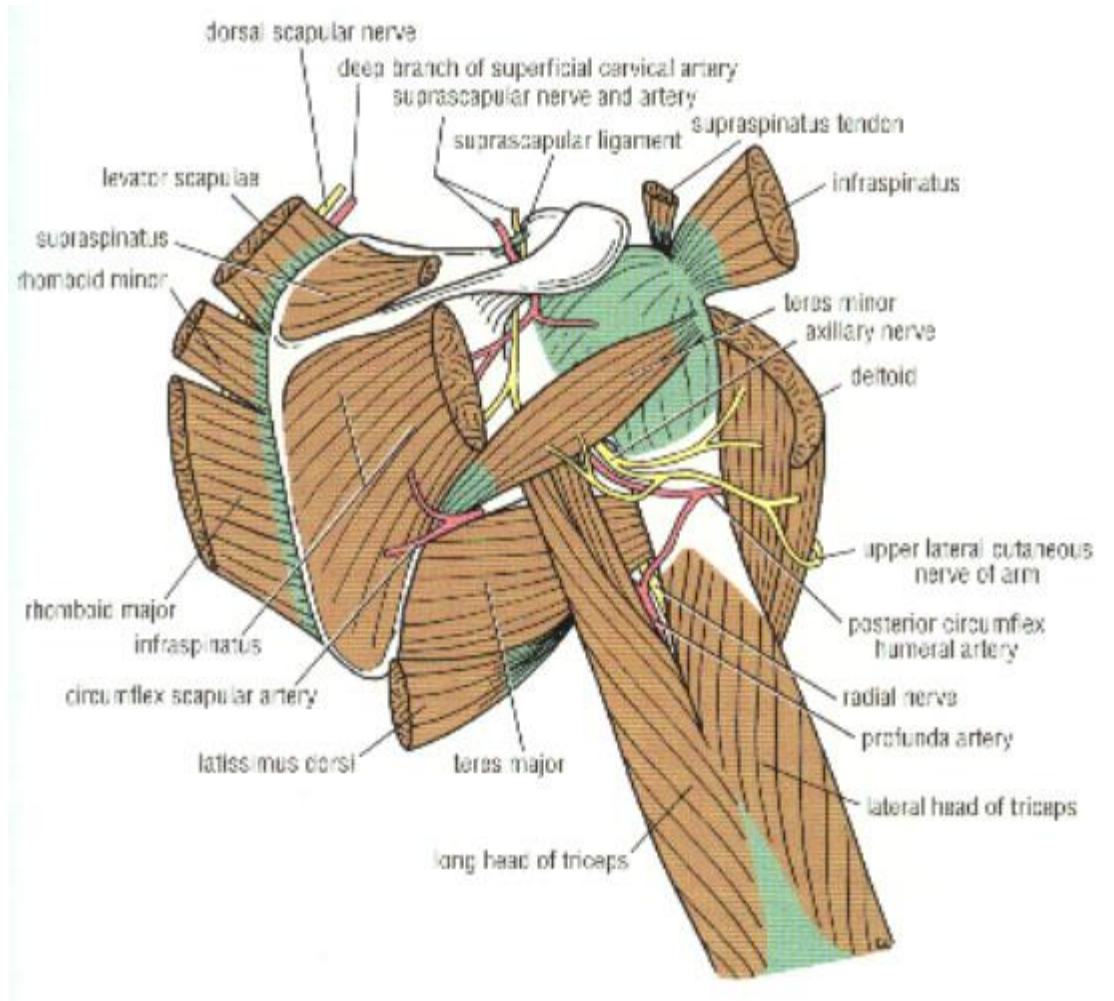
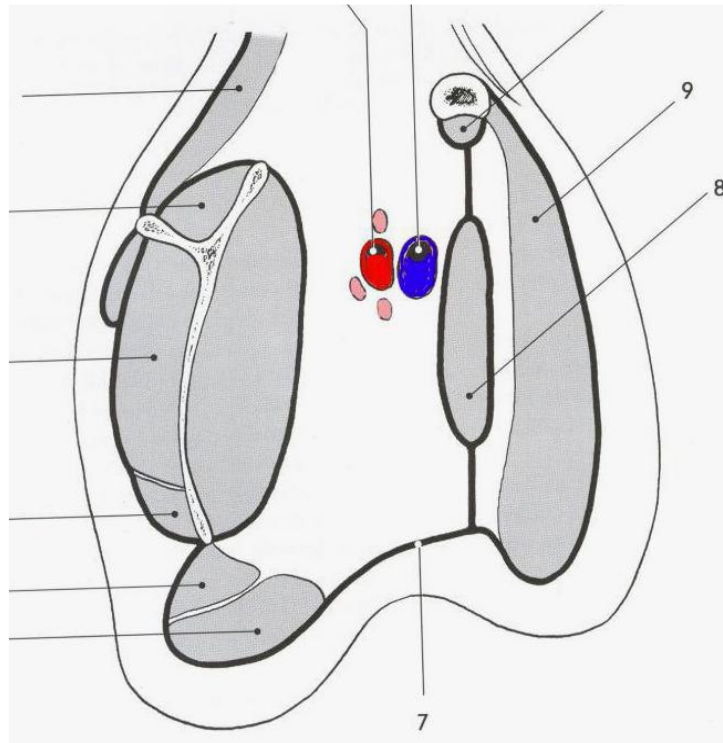




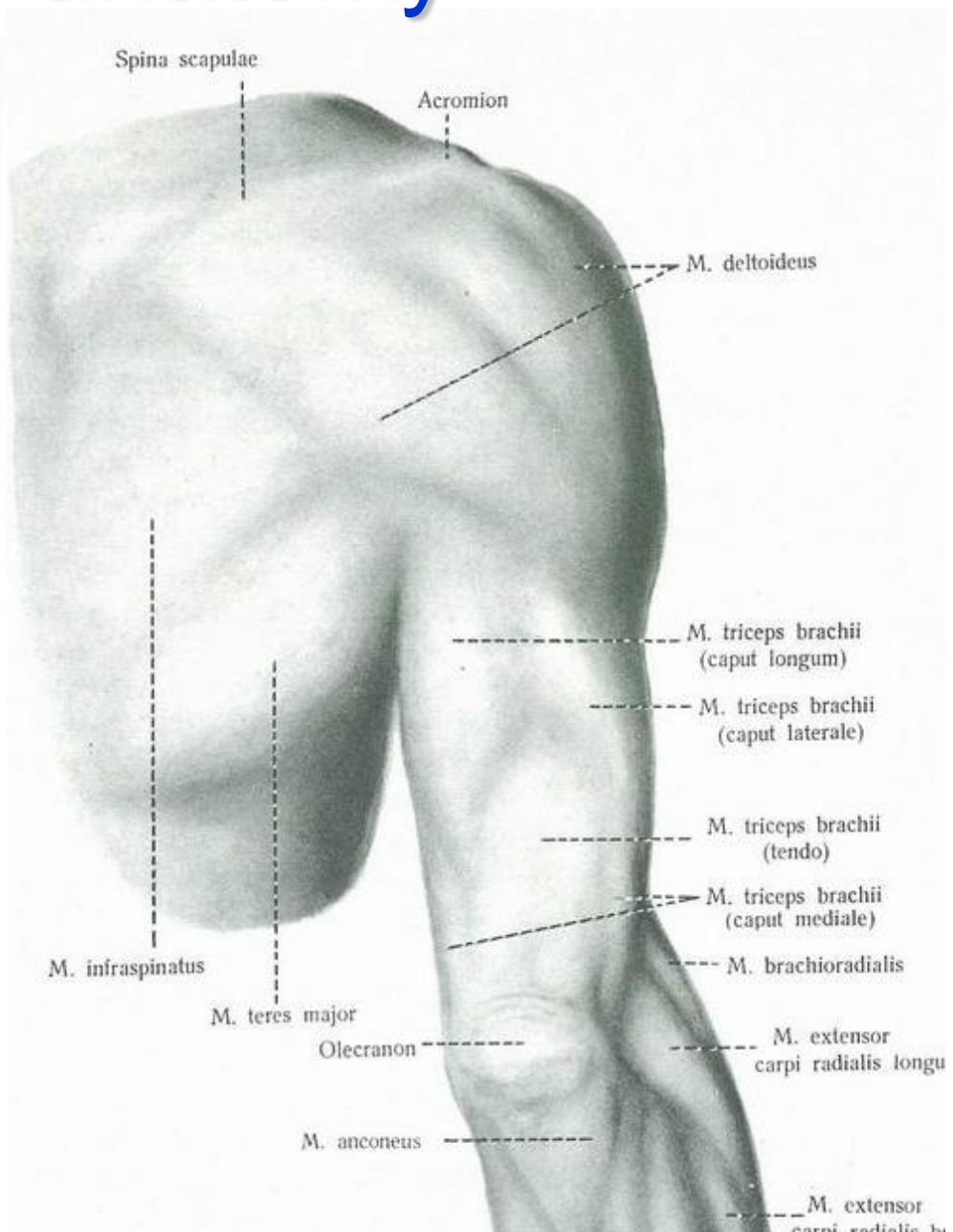
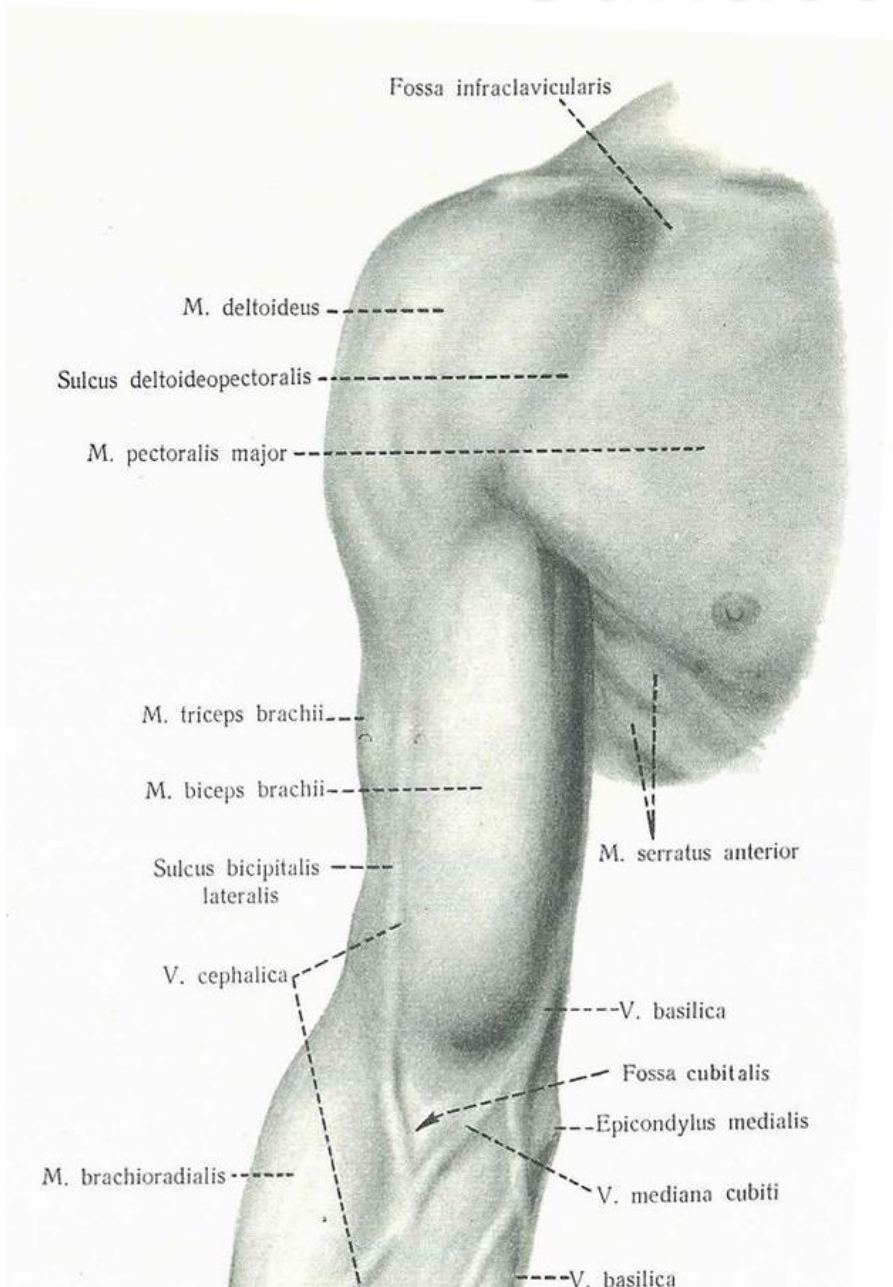








Surface anatomy



M. biceps brachii

O: caput longum – tuberculum
supraglenoidale

caput breve – processus coracoideus

I: tuberositas radii

aponeurosis bicipitalis (*former* lacertus
fibrosus)

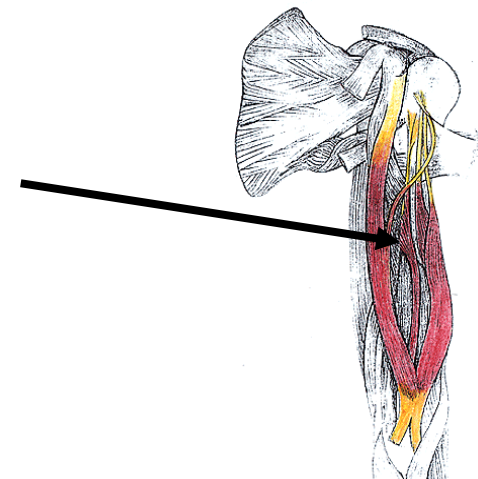
F: flexion and supination of forearm

c. longum – abduction of arm

c. breve – flexion and adduction of arm

In: n. musculocutaneus

*Variation: caput tertium – muscle bundle
origitating from m. brachialis and merging
with m. biceps brachii*



M. coracobrachialis

O: processus coracoideus

I: distal to crista tuberculi minoris down to the middle of corpus humeri

F: ventral flexion and adduction of arm,
(support of internal rotation)

In: n. musculocutaneus (piercing the muscle)

M. brachialis

O: facies anterior humeri

I: tuberositas ulnae

F: flexion of forearm

In: n. musculocutaneus

Note: m. articularis cubiti



M. triceps brachii

- O: caput longum – tuberculum infraglenoidale scapulae
caput laterale – dorsal aspect of corpus humeri, distal from insertion of m. teres minor, proximal to sulcus nervi radialis
caput mediale – dorsal aspect of corpus humeri, distal to sulcus nervi radialis
- I: olecranon ulnae
- F: extension of arm
c. longum – adduction of extended arm
- In. n. radialis

M. anconeus

- O: epicondylus lateralis humeri
- I: olecranon ulnae
- F: auxilliary extension of arm, extension of capsula articularis, stabilization of elbow joint in pronation-supination
- In: n. radialis



Foramen humerotricipitale

Quadrangular space

border:

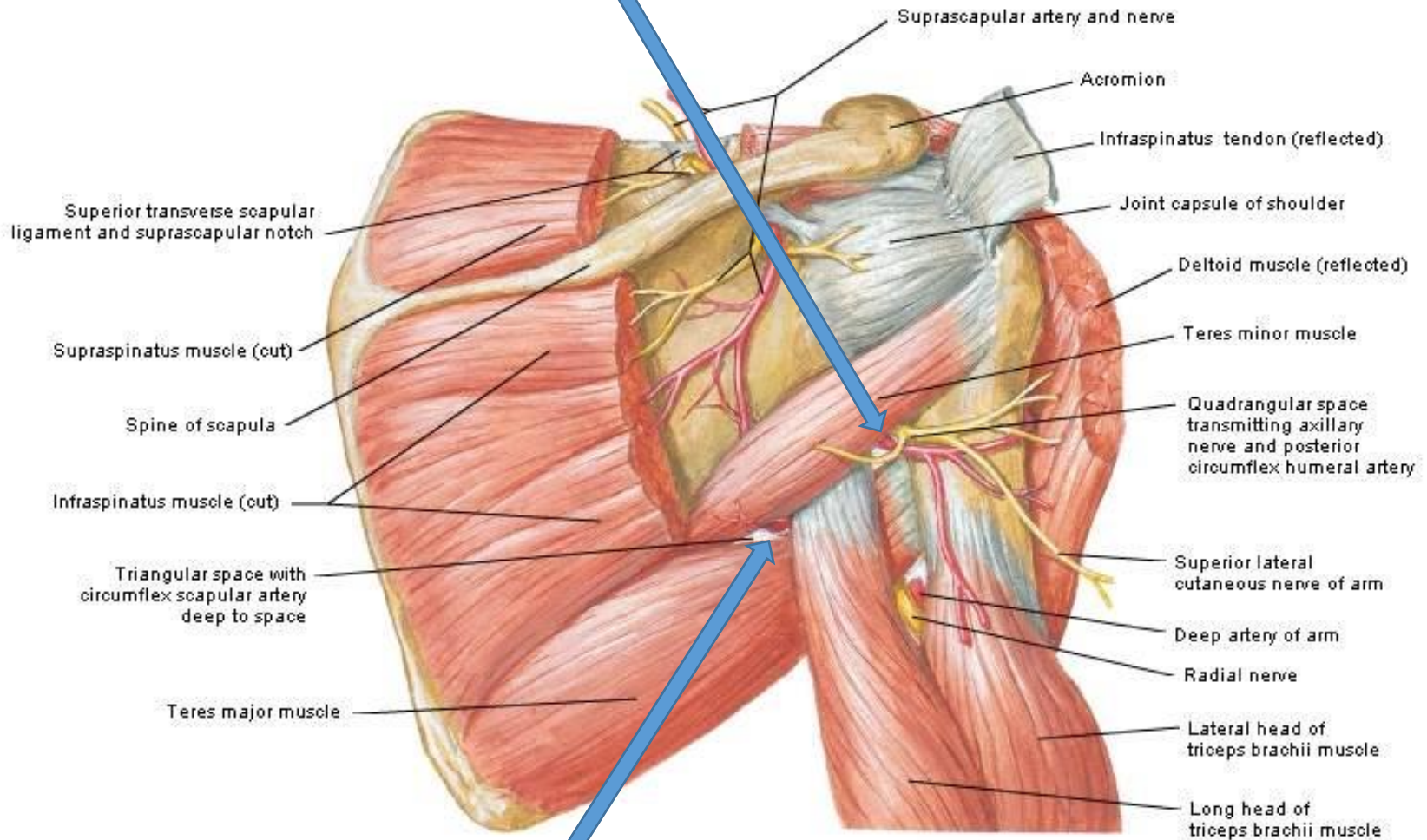
- m. teres minor – proximally
- m. teres major – distally
- caput longum m. tricipitis brachii – medially
- humerus – laterally

contents:

- n. axillaris
- vasa circumflexa humeri posteriora

clinical problem: entrapment syndrome of axillary nerve

Foramen humerotricipitale Quadrangular space



Foramen omotricipitale Triangular space

Foramen omotricipitale

Triangular space

border:

- m. teres minor – proximally
- m. teres major – distally
- caput longum m. tricipitis brachii – laterally

contents:

- vasa circumflexa scapulae

Movements of elbow joint

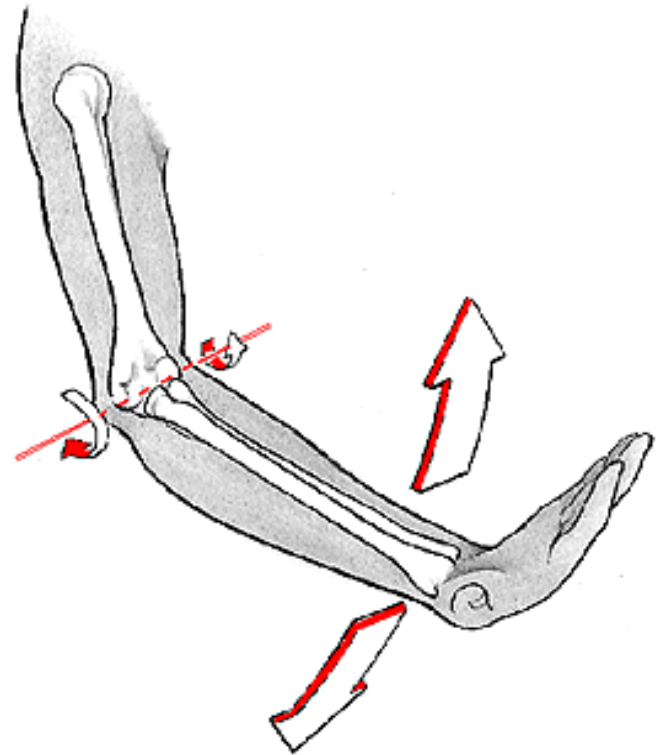
Flexion and extension

Flexion

- m. biceps brachii
- m. brachialis
- + forearm muscles

Extension

- m. triceps brachii
- m. anconeus



Movements of forearm

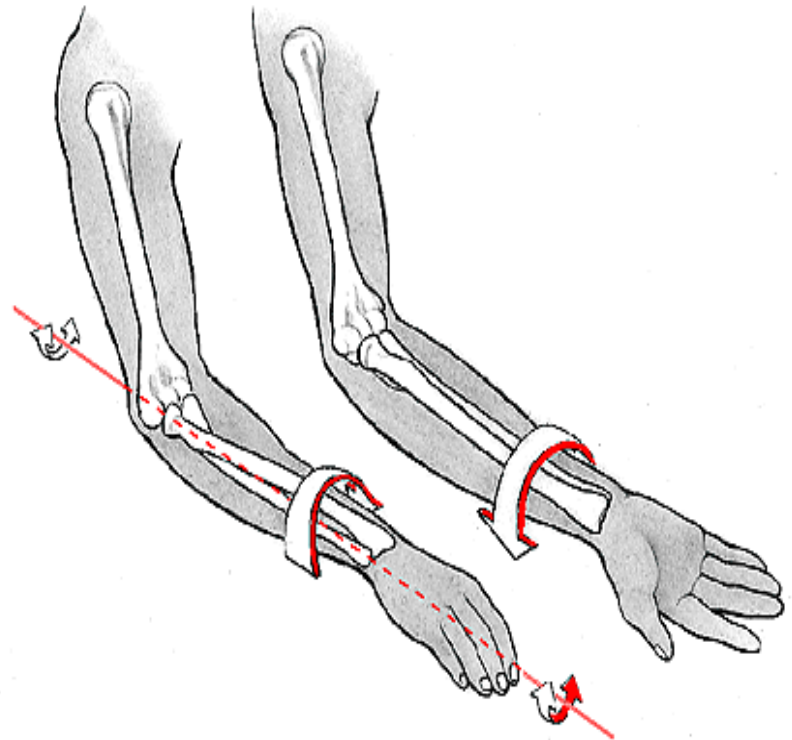
Pronation and supination

Supination

- m. biceps brachii
- m. brachioradialis (supination of extended forearm)
- m. supinator

Pronation

- m. pronator teres
- m. pronator quadratus
- m. brachioradialis (supination of flexed forearm)



Overview of innervation

- m. biceps brachii - n. musculocutaneus
- m. coracobrachialis - n. musculocutaneus
- m. brachialis - n. musculocutaneus

- m. triceps brachii - n. radialis
- m. anconeus - n. radialis

Section of arm

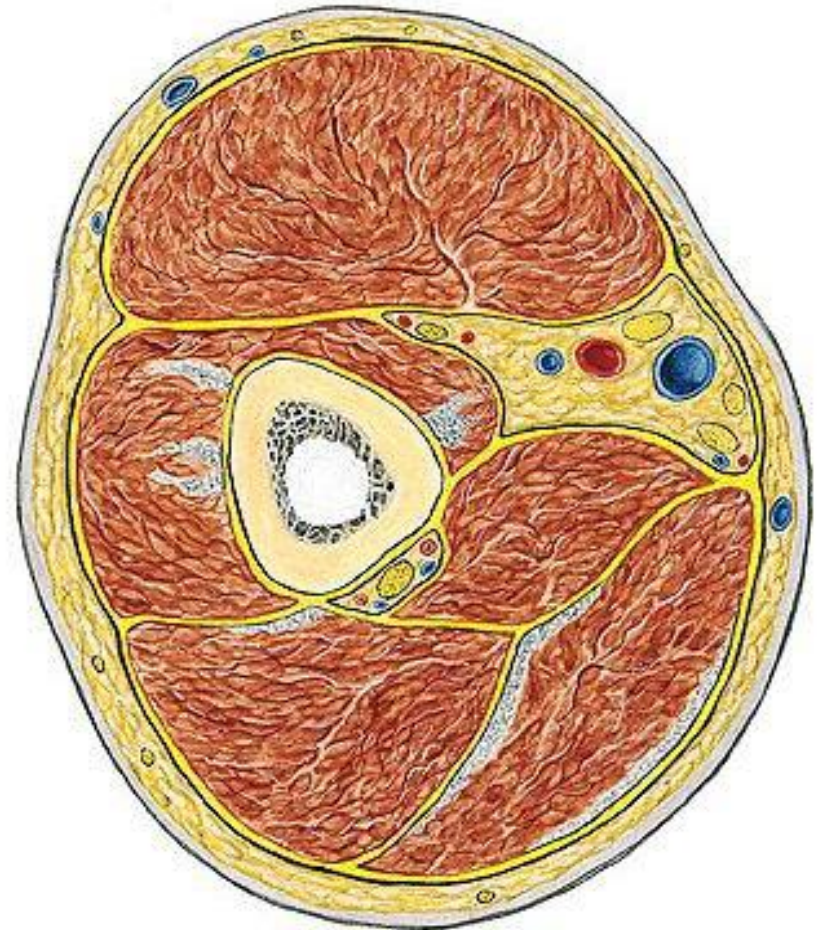
1 bone: humerus

2 compartments:

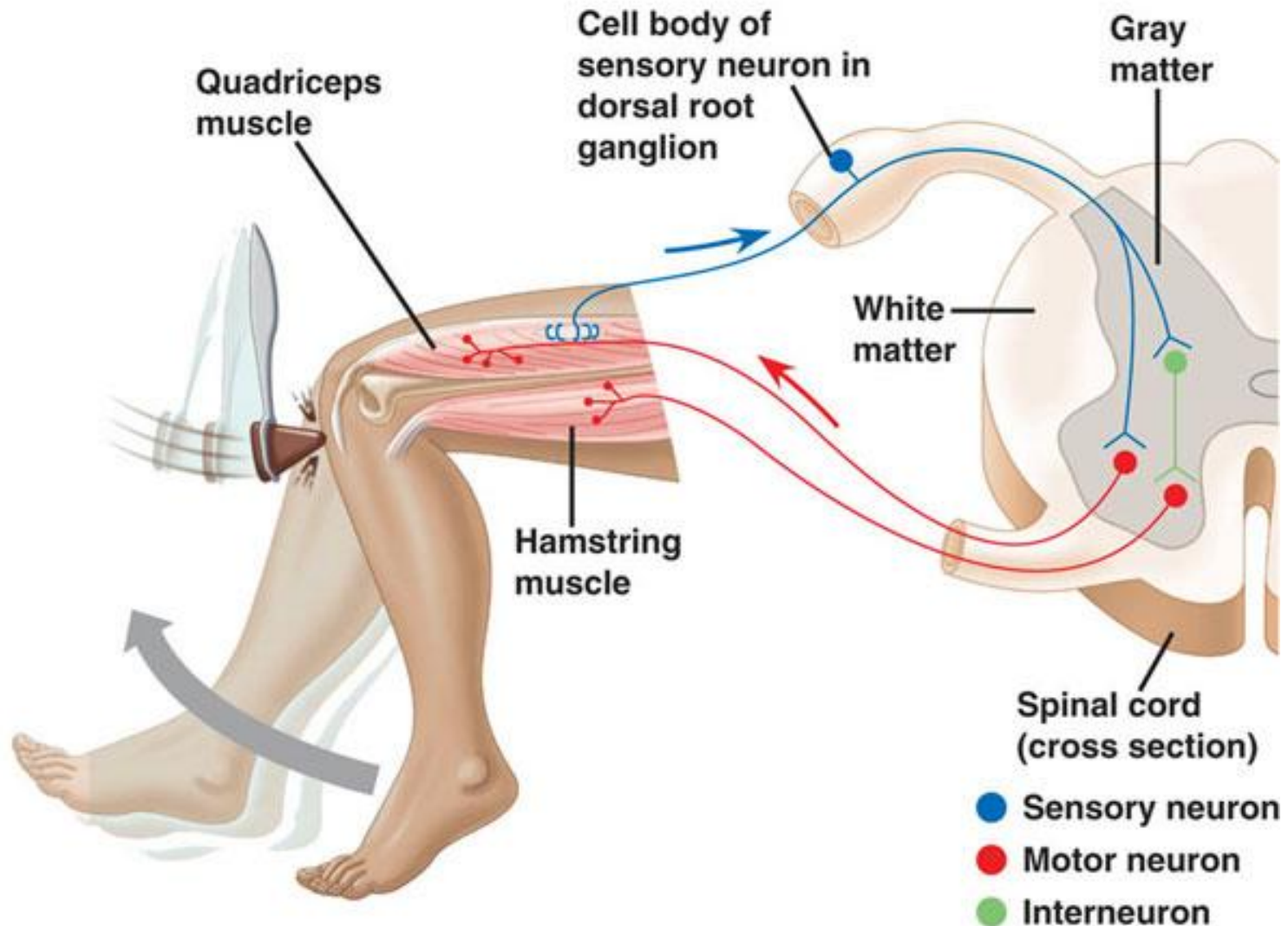
- compartimentum brachii anterior
- compartimentum brachii posterior

2 septa:

- septum intermusculare brachii mediale
- septum intermusculare brachii laterale



Monosynaptic reflex

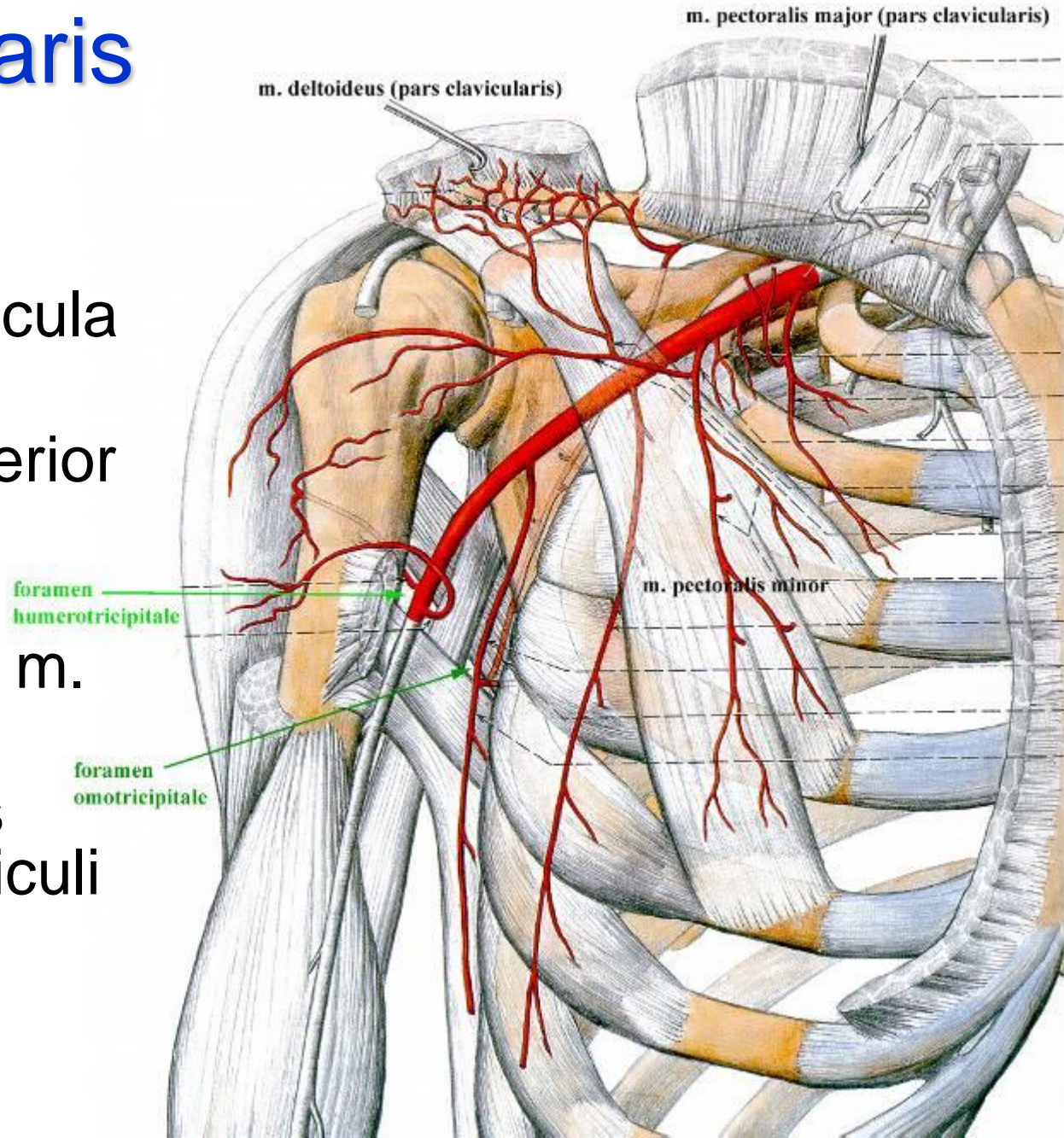


Reflexes in upper limb

Bicipital	C5
Styloradial	C6
Tricipital	C7
Reflex of digital flexors	C8

Arteria axillaris

- origin: from a. subclavia to clavícula
- end: collum chirurgicum = inferior margin of m. pectoralis major
- 3 parts related to m. pectoralis minor
- division of plexus brachialis in fasciculi
- bifurcation of n. medianus



Arteria axillaris - branches

pars suprapectoralis:

- a. thoracica superior – *variable caliber*
 - *for upper intercostal spaces*
- a. thoracoacromialis
 - rr. pectorales
 - r. acromialis
 - r. deltoideus
 - r. clavicularis
- rr. subscapulares (*for m. subscapularis*)

Arteria axillaris - branches

pars retropectoralis:

- a. subscapularis – *short and thick*
 - a. circumflexa scapulae
 - *foramen omotricipitale*
 - a. thoracodorsalis
 - *runs with n. thoracodorsalis*
 - *muscular and musculo-cutaneous flap of m. latissimus dorsi*
- a. thoracica lateralis
 - *runs with n. thoracicus longus in periphery*
 - for m. serratus anterior

Arteria axillaris - branches

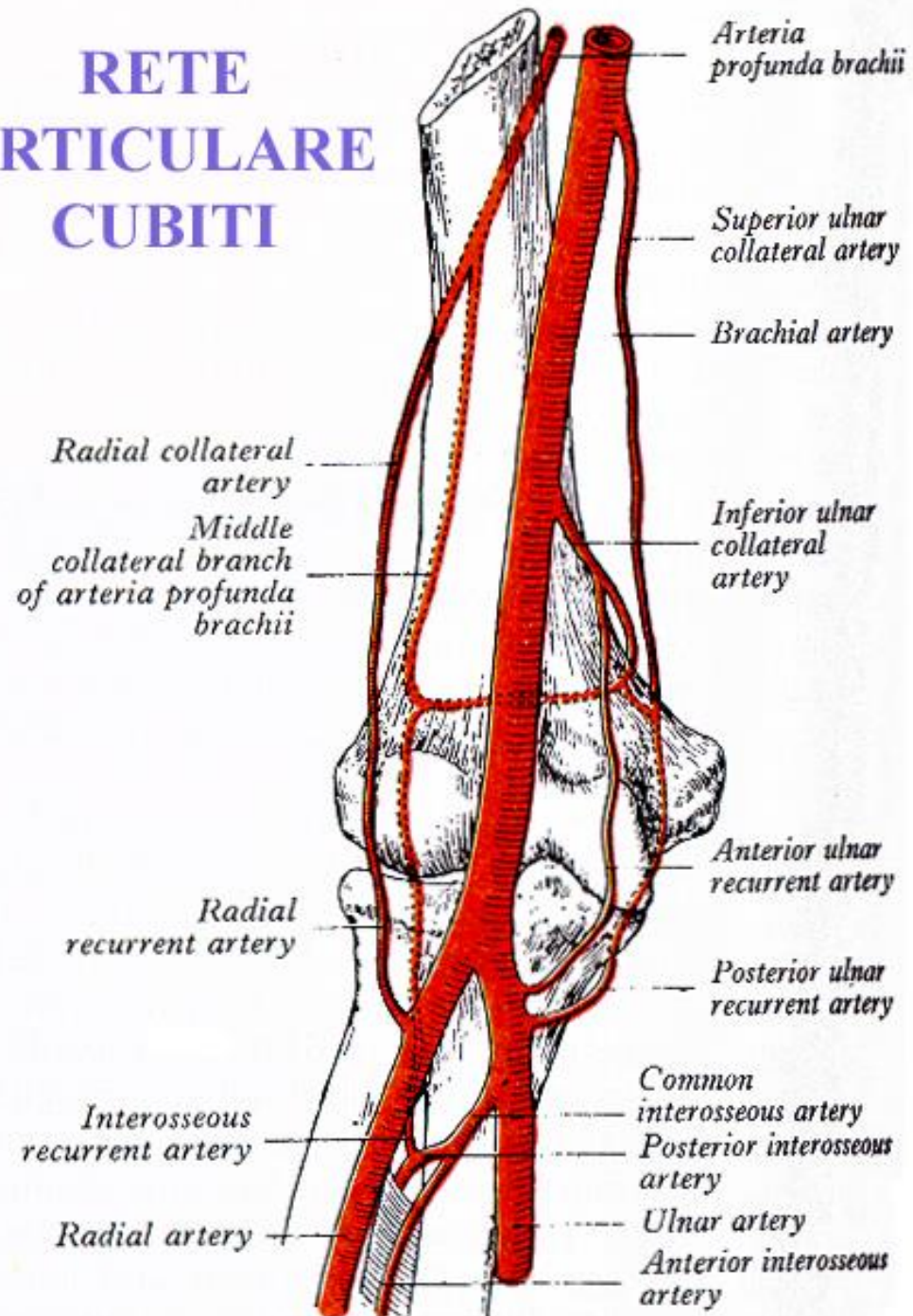
pars infrapectoralis:

- a. circumflexa humeri ant. – *thin*
- a. circumflexa humeri post.
 - *around collum chirurgicum humeri*
 - *foramen humerotricipitale*
 - *danger of injury in fractures of collum chirurgicum humeri*
 - *in 10% common trunk with a. profunda brachii*

Arteria brachialis

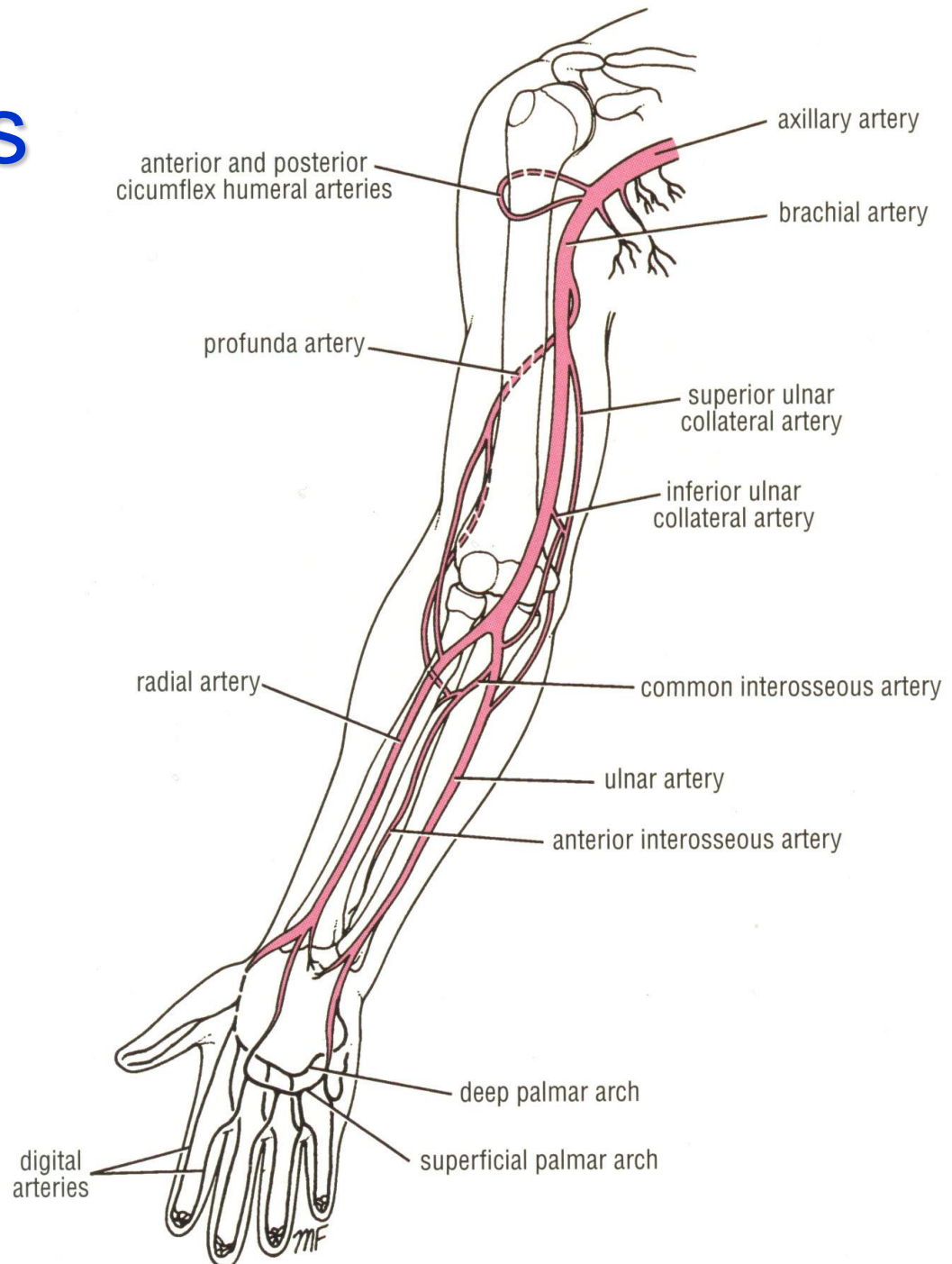
- bifurcate in fossa cubitalis into a. radialis et a. ulnaris
- collateral circulation
- rete articulare cubiti
- septum intermusculare mediale brachii
- blood pressure measurement (proximal to fossa cubitalis)
- catheterization site (proximal to fossa cubitalis)
- variation: a. brachioradialis (14%)

RETE ARTICULARE CUBITI



Arteria brachialis branches

- a. profunda brachii
 - a. collateralis media
 - a. collateralis radialis
- a. collateralis ulnaris superior
- a. collateralis ulnaris superior
- canalis radialis
 - sulcus nervi radialis humeri
 - n. radialis
 - vasa profunda brachii



Veins of upper limb

- superficial system
- deep system
 - accompany arteries
 - doubled up to axilla
 - frequent connections around artery
 - frequent valves
- v. subclavia
 - small tributaries only



Superficial veins of UL

- v. axillaris
 - v. cephalica
- v. brachialis (doubled)
 - v. basilica

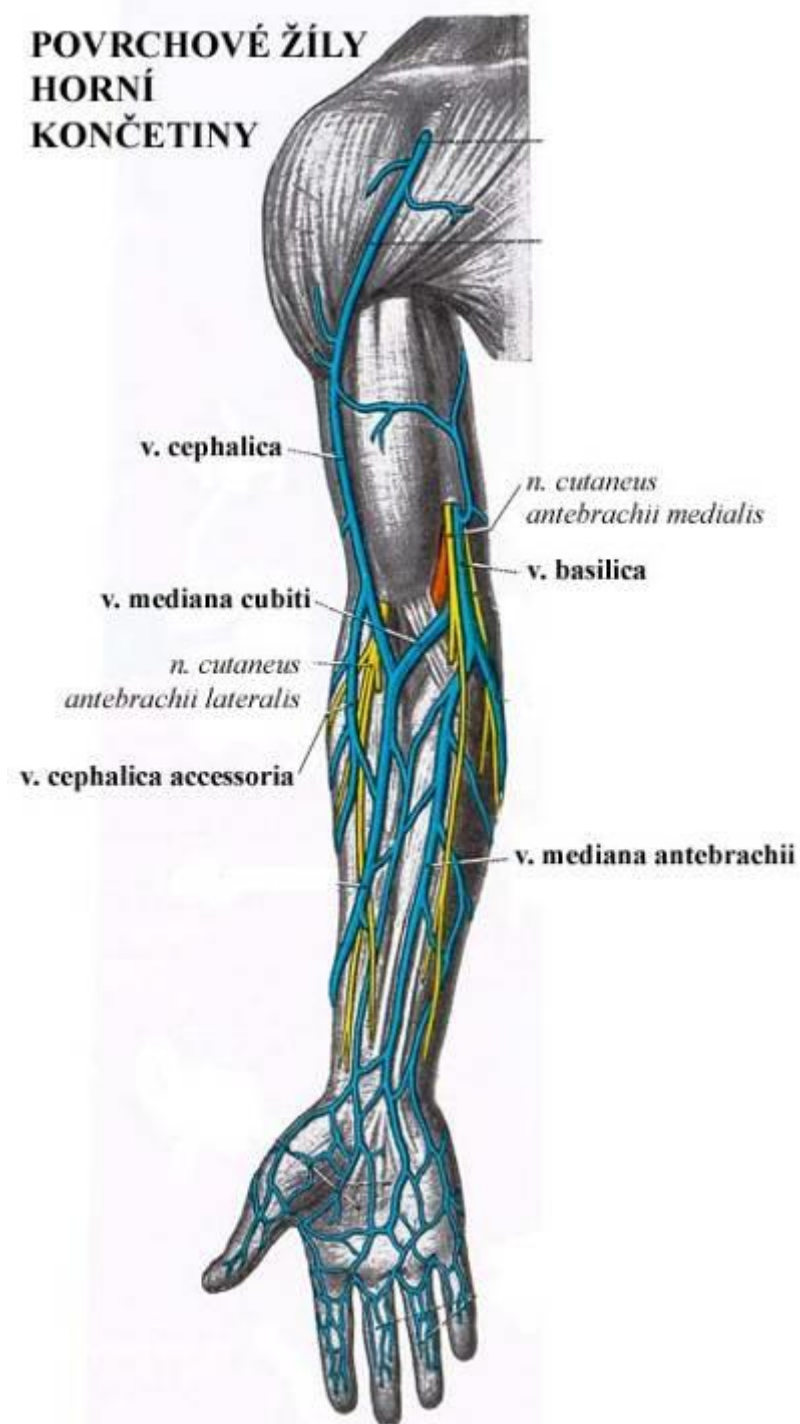
v. mediana cubiti + antebrachii

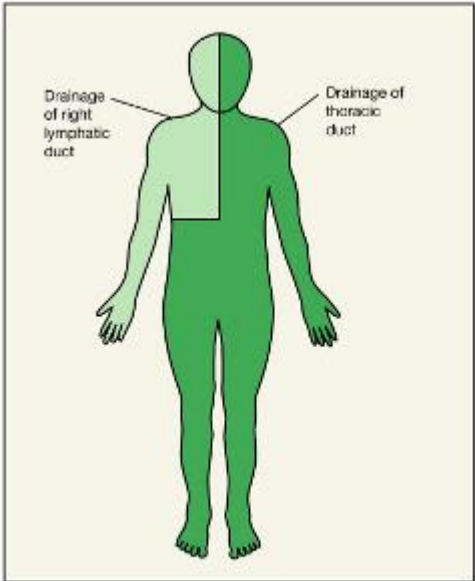
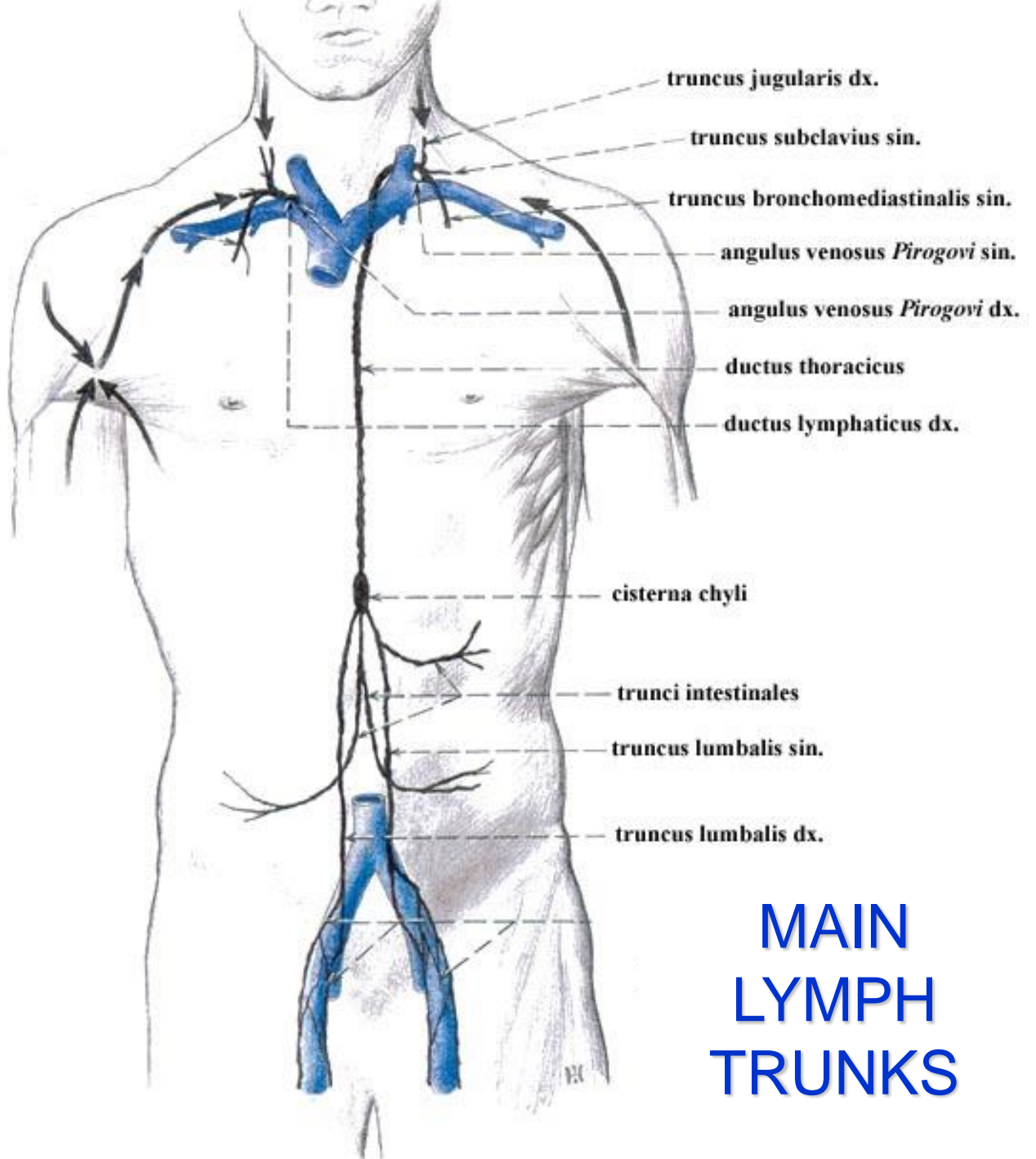
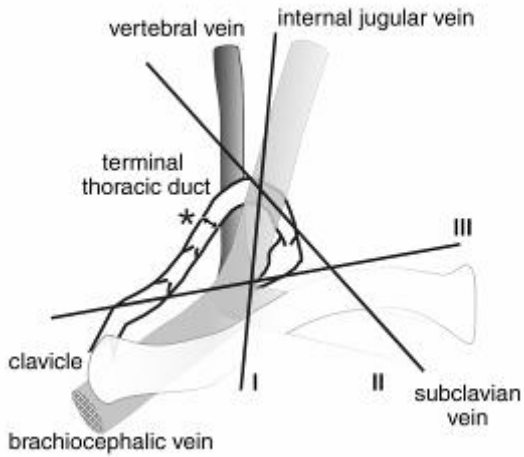
rete venosum dorsale manus

rete carpi dorsale

vv. intercapitulares

POVRCHOVÉ ŽÍLY
HORNÍ
KONČETINY



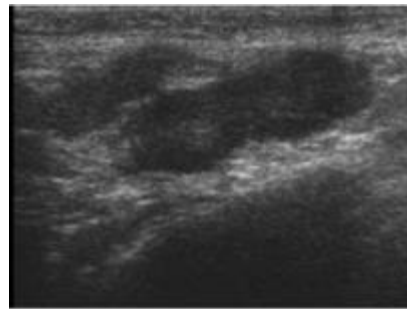


MAIN LYMPH TRUNKS

Axilla

up to 40
5 groups

- apicales
- centrales
- humerales
- subscapulares
- pectorales



Lymph nodes of the axilla

