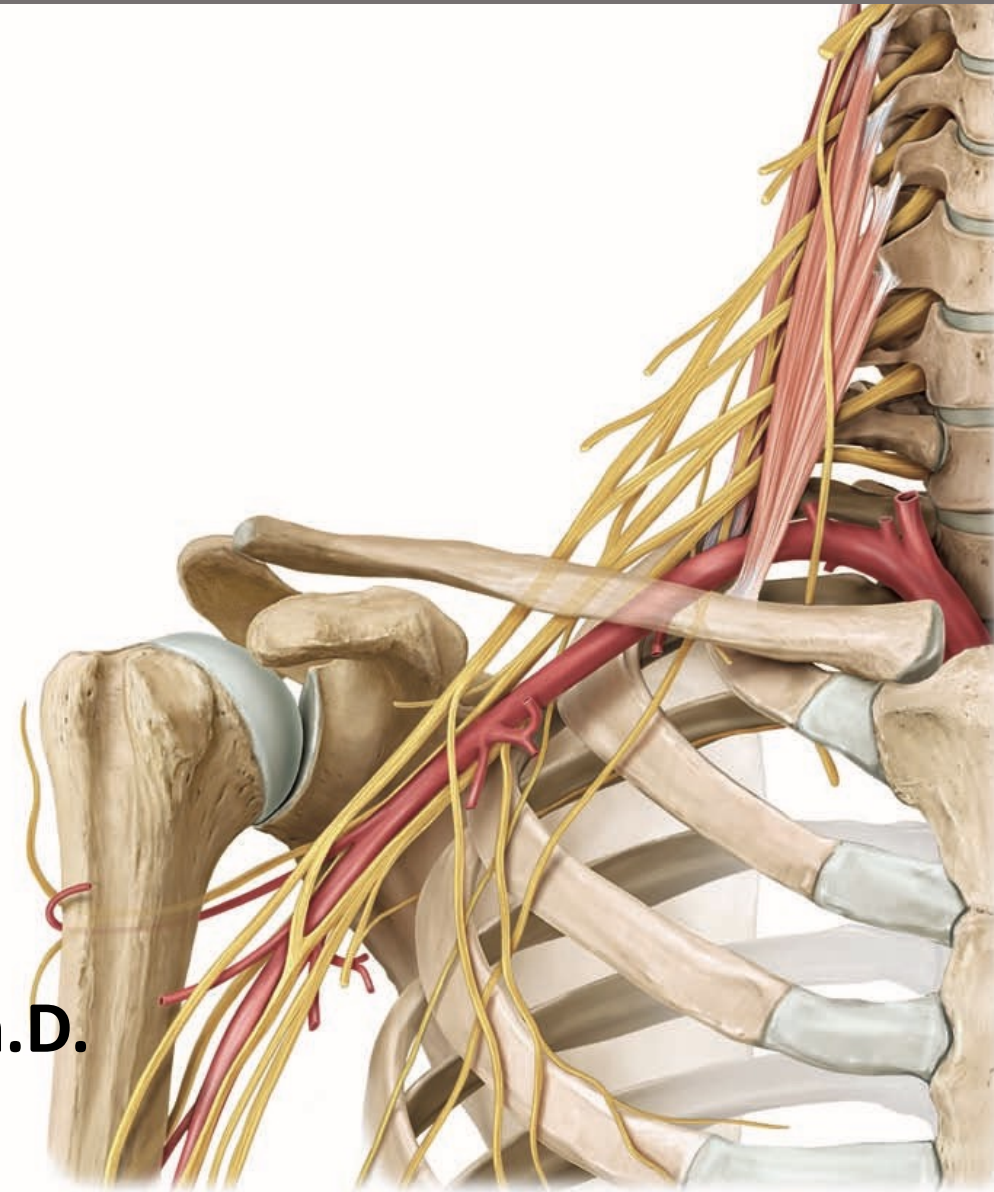


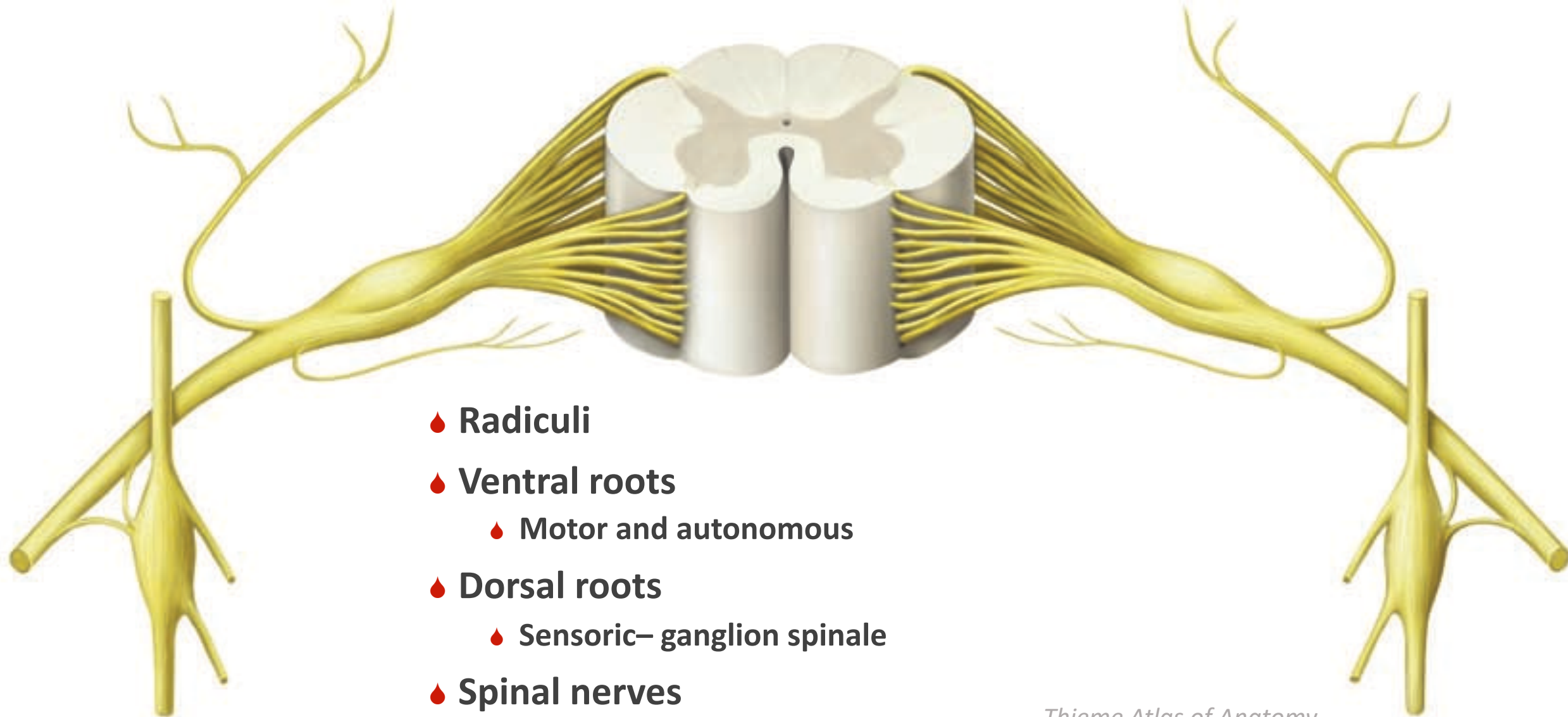
Peripheral nerves

Prof. MUDr. Jiří Ferda, Ph.D.

images Gray's Anatomy and Thieme Atlas of Anatomy

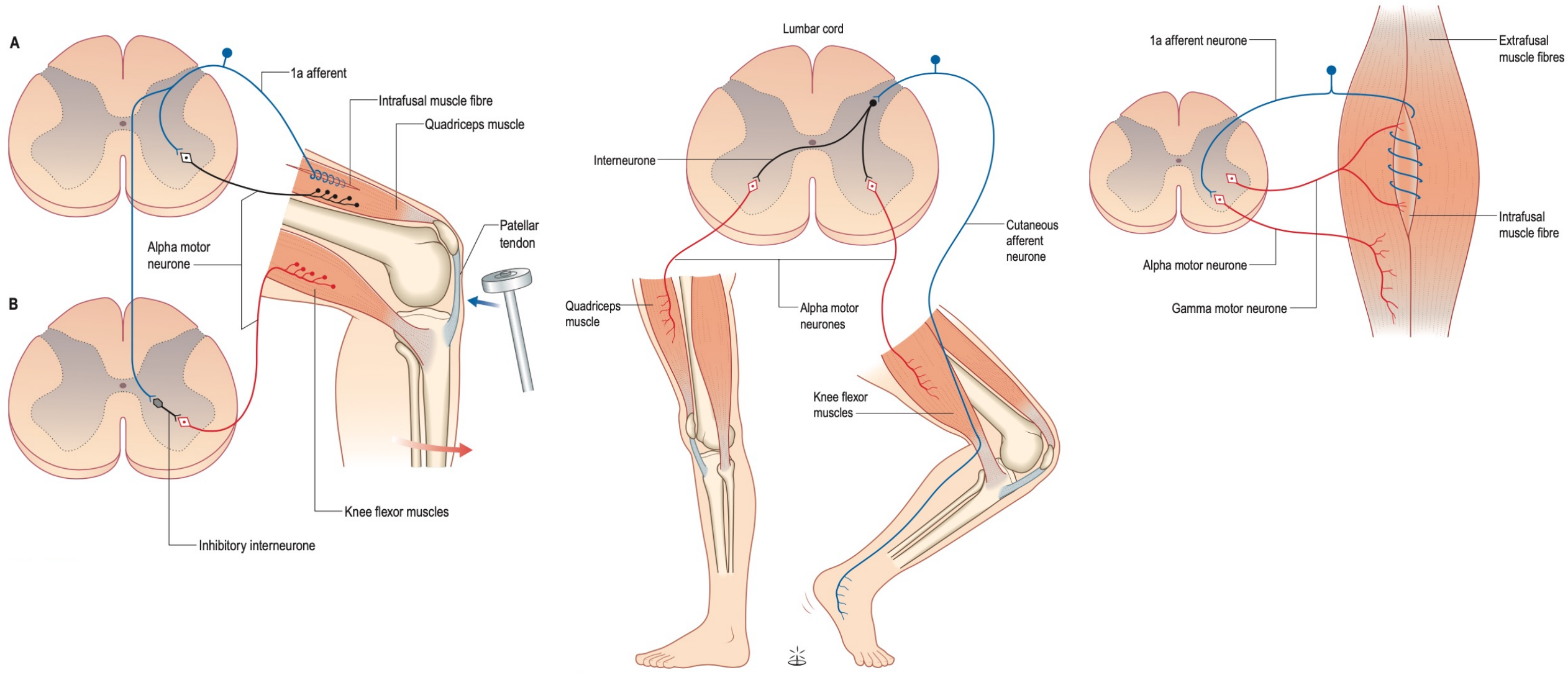


Nervi spinales



- ♦ **Radiculi**
- ♦ **Ventral roots**
 - ♦ Motor and autonomous
- ♦ **Dorsal roots**
 - ♦ Sensoric– ganglion spinale
- ♦ **Spinal nerves**

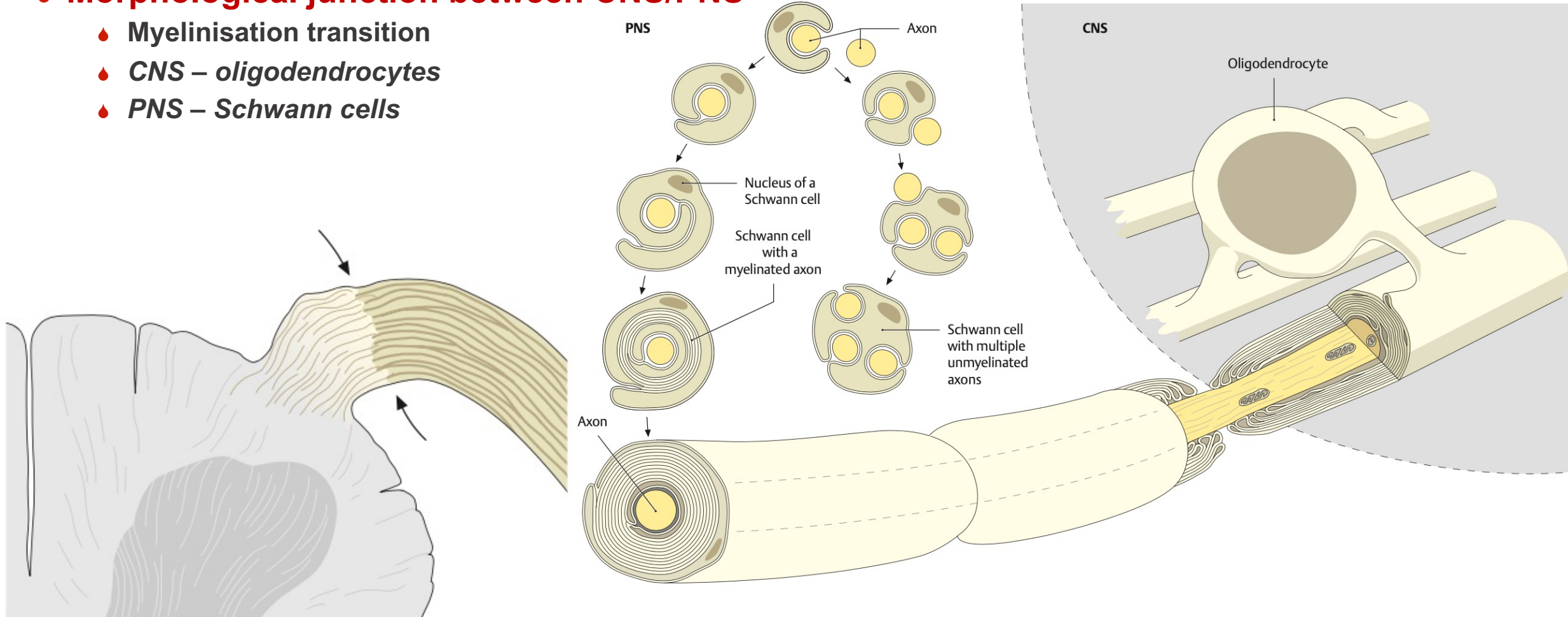
Anatomy of the reflex arch



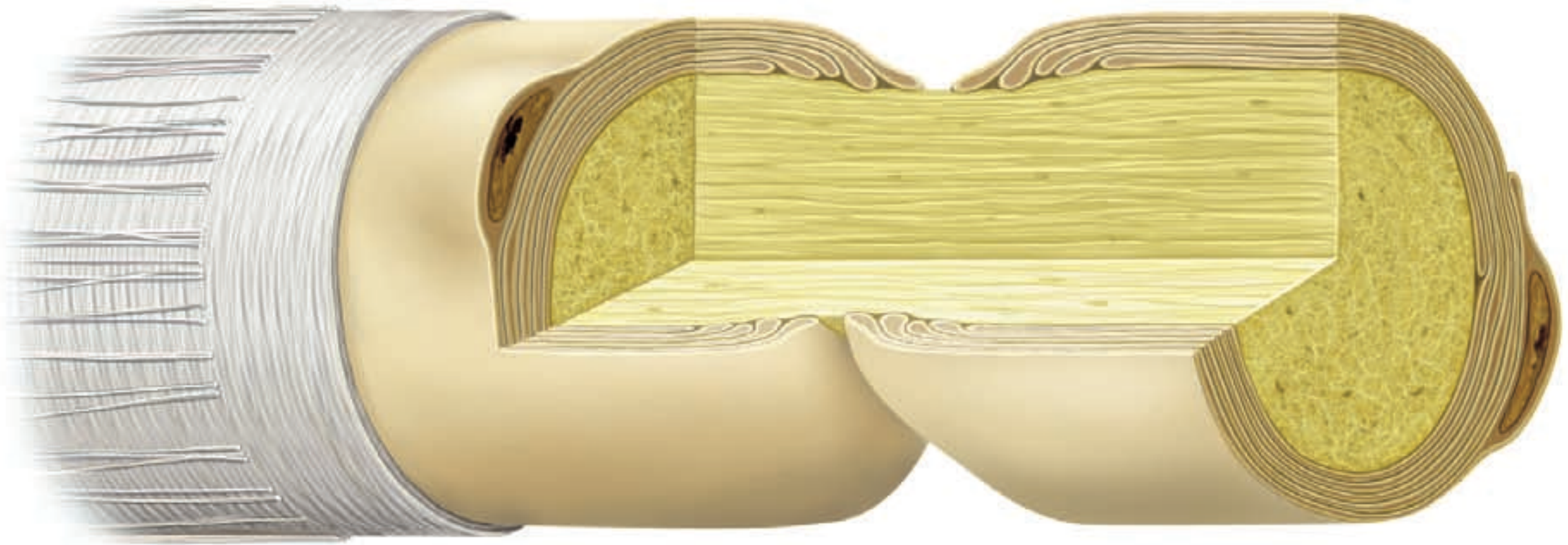
Obersteiner – Redlich zone

♦ Morphological junction between CNS/PNS

- ♦ Myelinisation transition
- ♦ *CNS – oligodendrocytes*
- ♦ *PNS – Schwann cells*

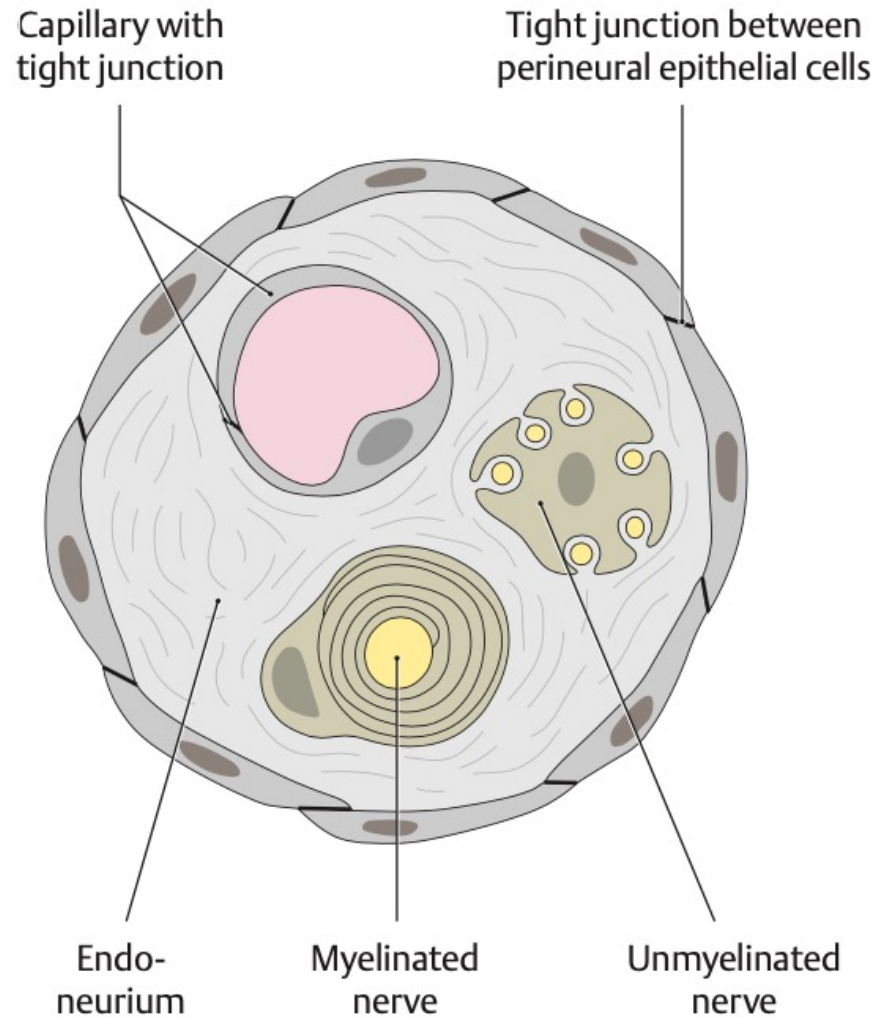


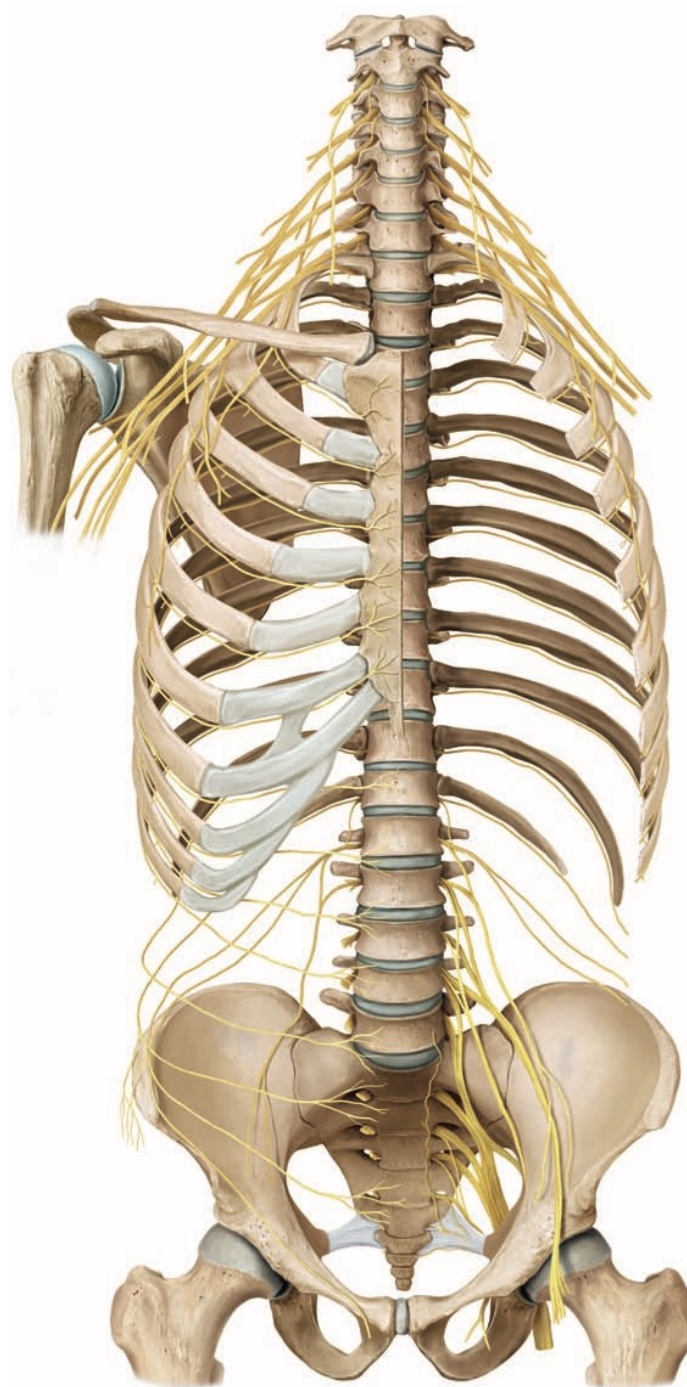
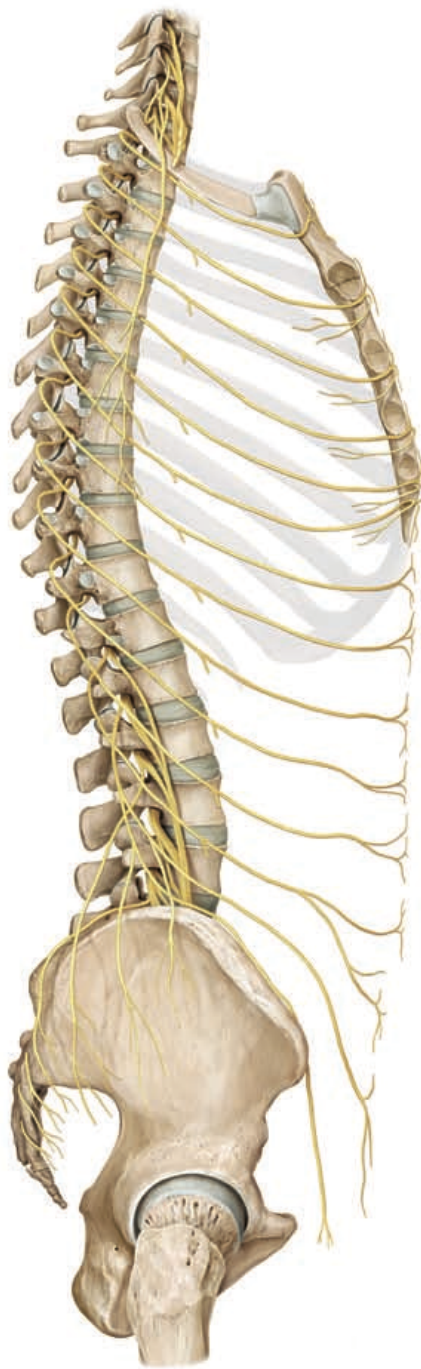
Myelin sheath



Nervous bundle

- ♦ **Perineurium**
- ♦ **Vasa capillaria**
- ♦ **Nervi**
 - ♦ myelinated
 - ♦ *unmyelinated*





Spinal cord segment	Anterior branches (ventral rami*)	Posterior branches (dorsal rami**)
C1	Cervical plexus	Suboccipital nerve
C2		Greater occipital nerve
C3		Third occipital nerve
C4		(see p. 172)
C5	Brachial plexus	Dorsal rami ***
C6		
C7		
C8		
T1	Intercostal nerves	
T2		
T3		
T4		
T5		
T6		
T7		
T8		
T9		
T10		
T11		
T12		
L1	Lumbar plexus	
L2		
L3		
L4		
L5	Sacral plexus	
S1		
S2		
S3		
S4		
S5		
Co1		
Co2		
	Coccygeal plexus (see p. 482)	

* Called also anterior rami

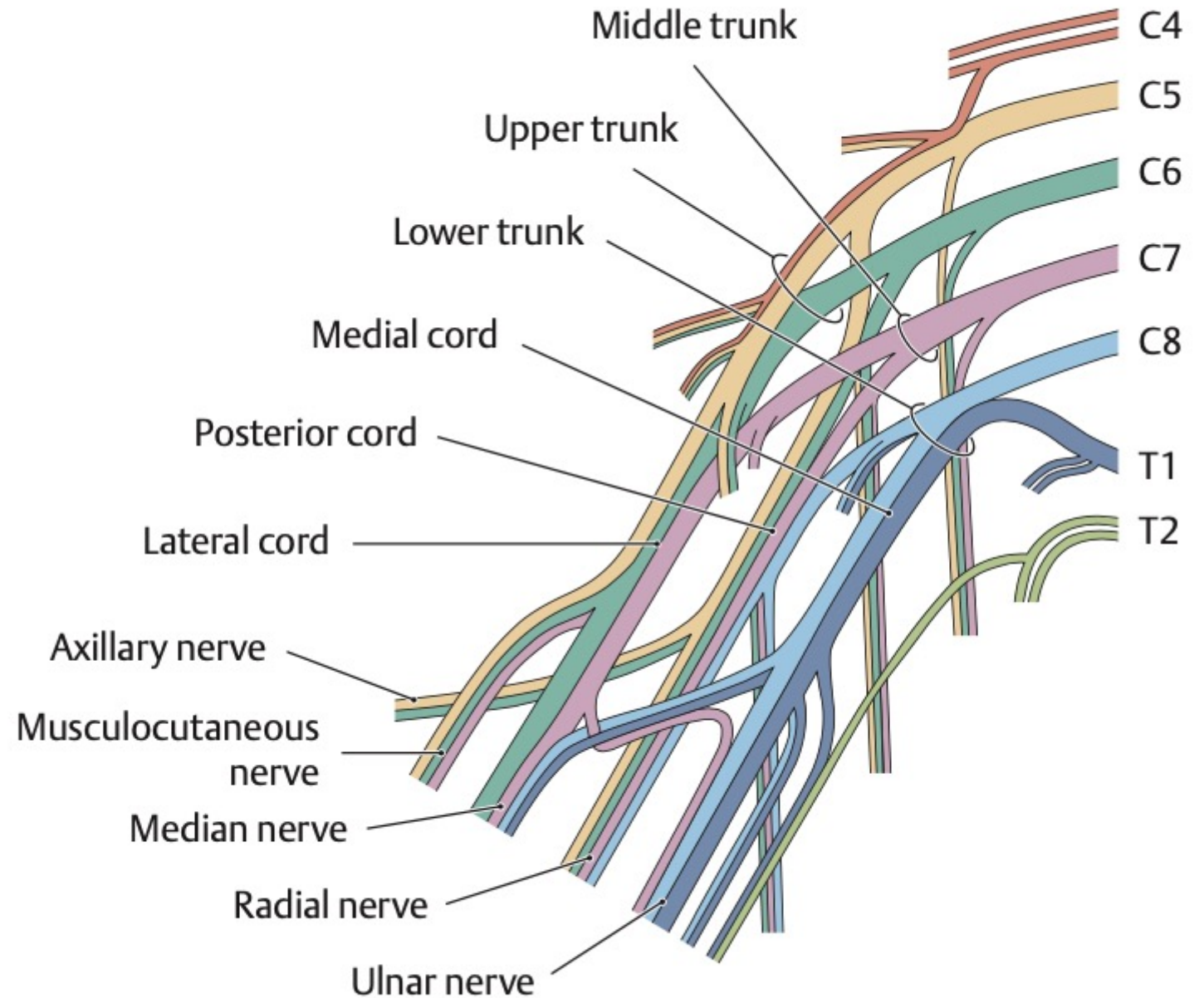
** Called also posterior rami

*** The dorsal rami of the L1–L3 spinal nerves are also known as the superior cluneal nerves, those from S1–S3 as the middle cluneal nerves (see C).

Note: The *inferior* cluneal nerves are anterior branches from the sacral plexus, see also p. 476.

radix, ramus, nervus, plexus

- Radices
- Rami
- Plexus
- Trunci
- Fasciculi
- Nervi



Areae radicales, areae nervinae

- ♦ **Area radicularis**

- ♦ Area innervated by one root only
- ♦ Innervation originated in one spinal segment

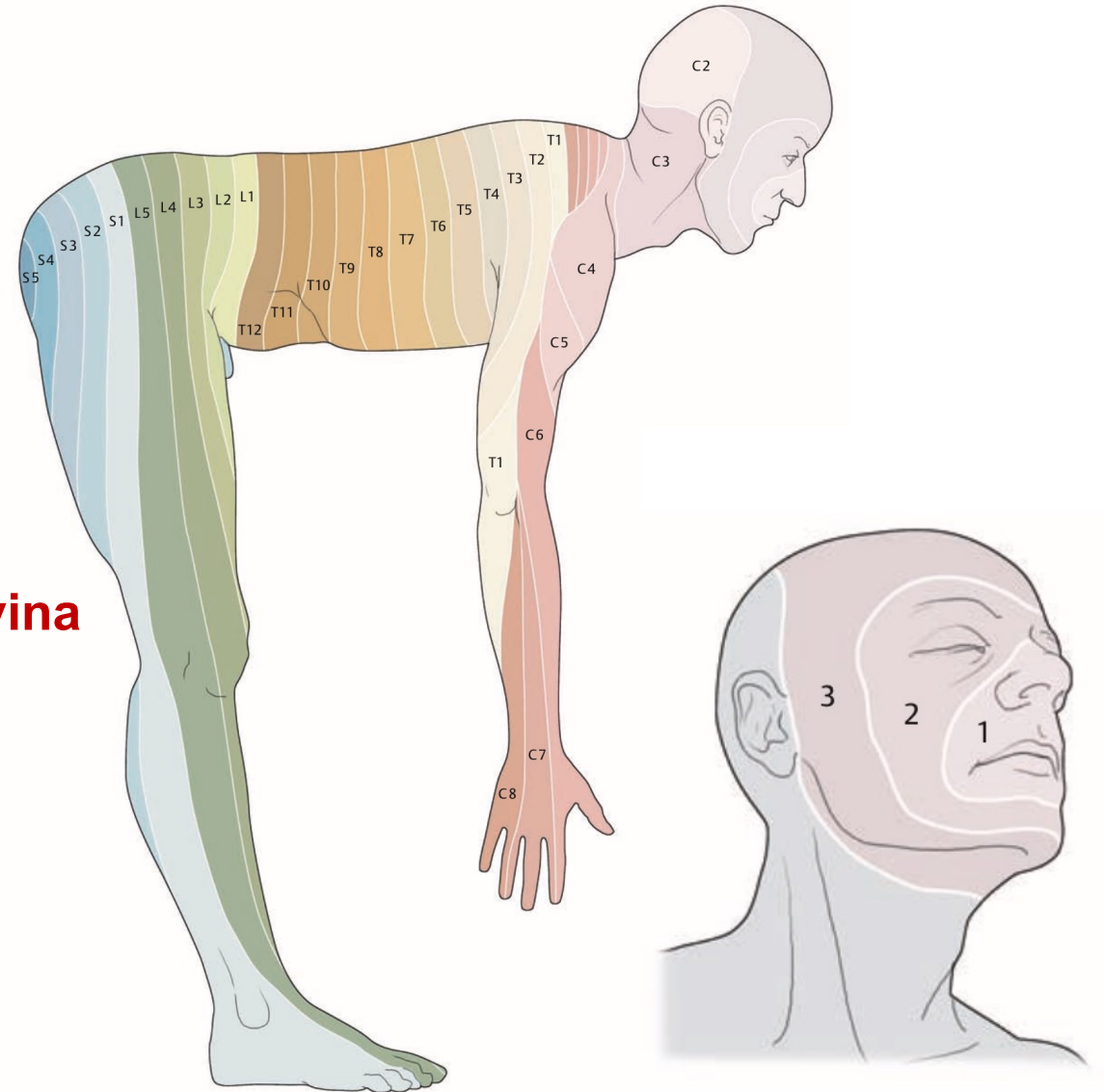
- ♦ **Area nervina**

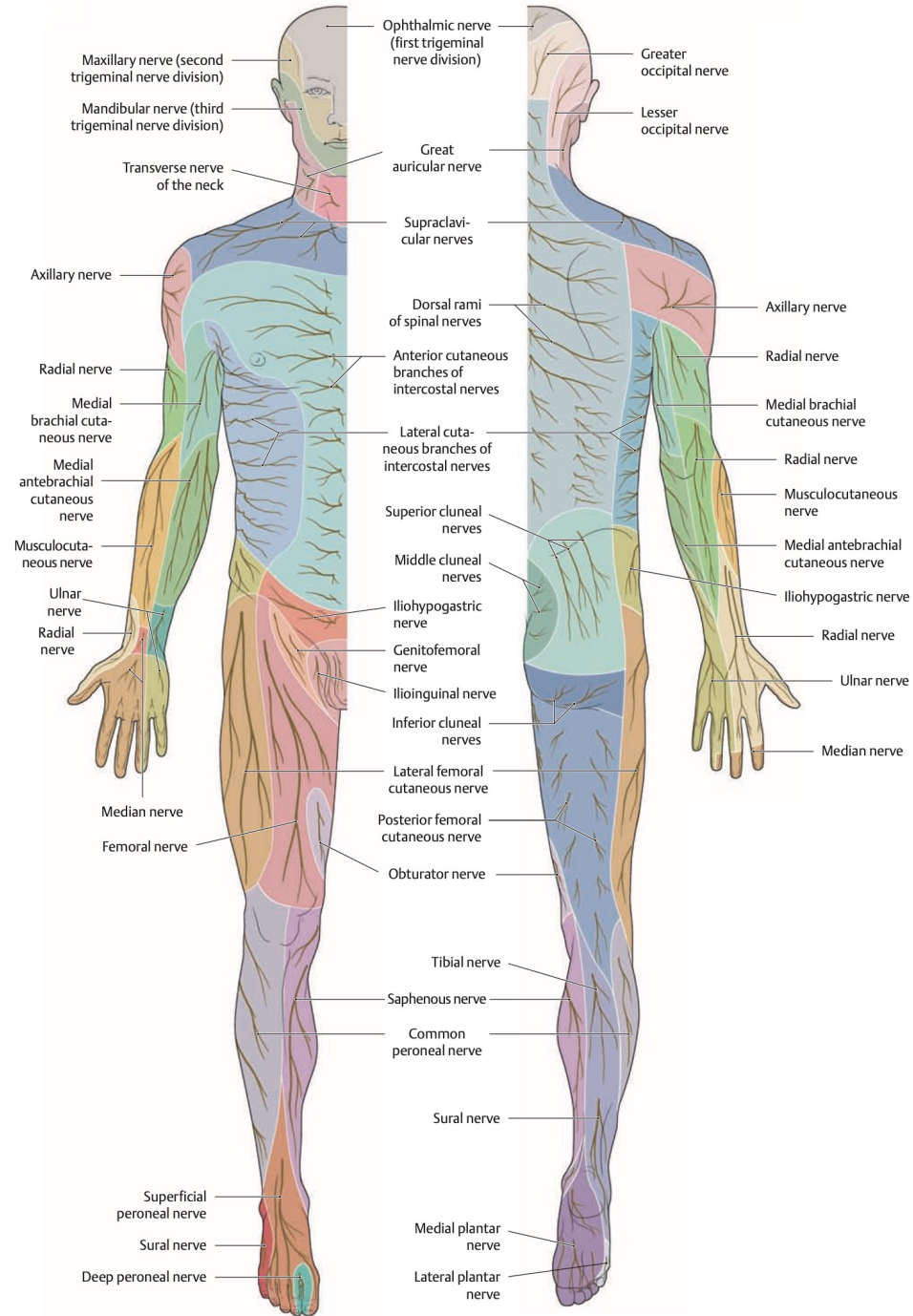
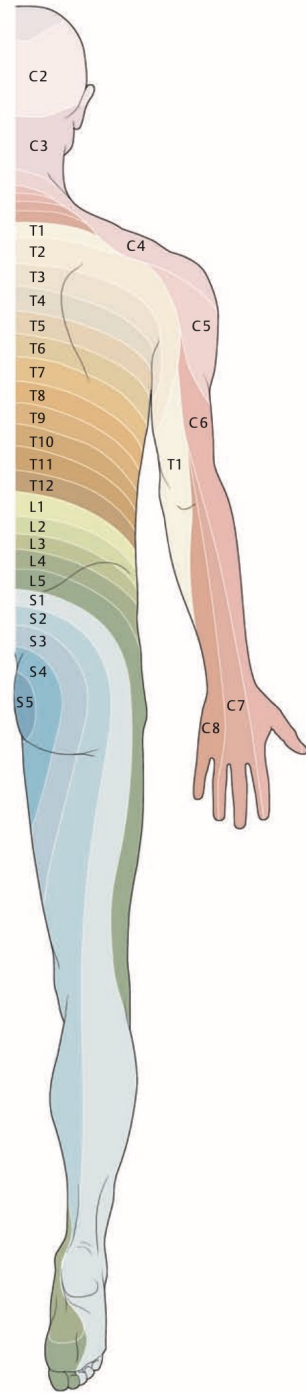
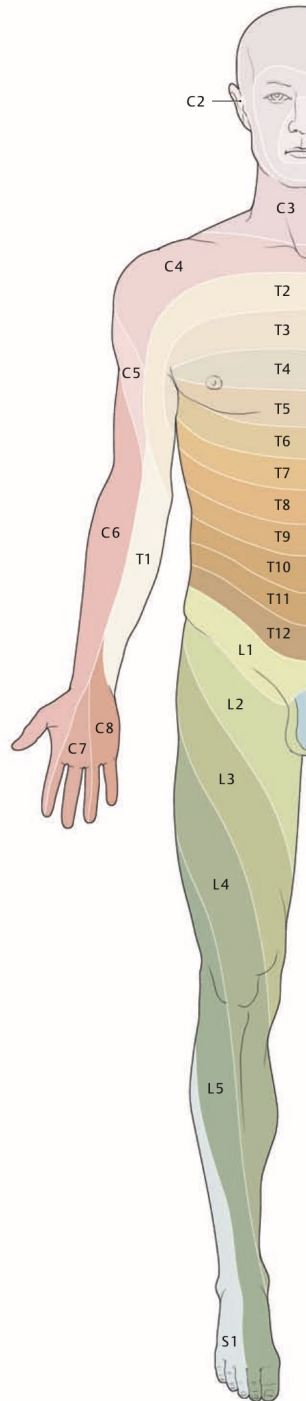
- ♦ Area innervated by one nerve only
- ♦ One or more segments
- ♦ *Nervus radialis* (C5 – Th1)
- ♦ *Nervus femoralis* (L2 – 4)

- ♦ **almost area radicularis smaller than area nervina**

- ♦ **Rami dorsales**

- ♦ *Area radicularis* = *area nervina*
- ♦ *Somit organization*



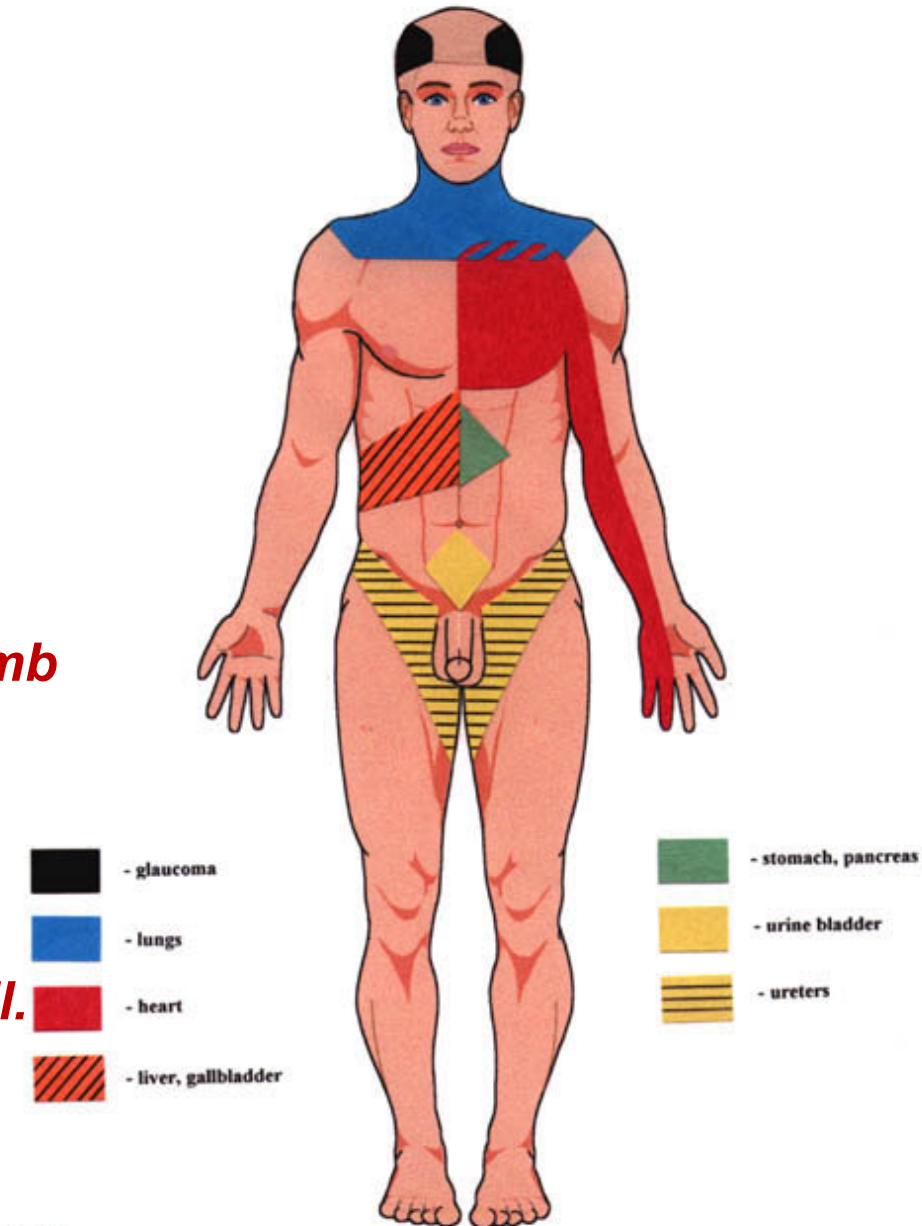


Head's zones

♦ Henry Head 1898

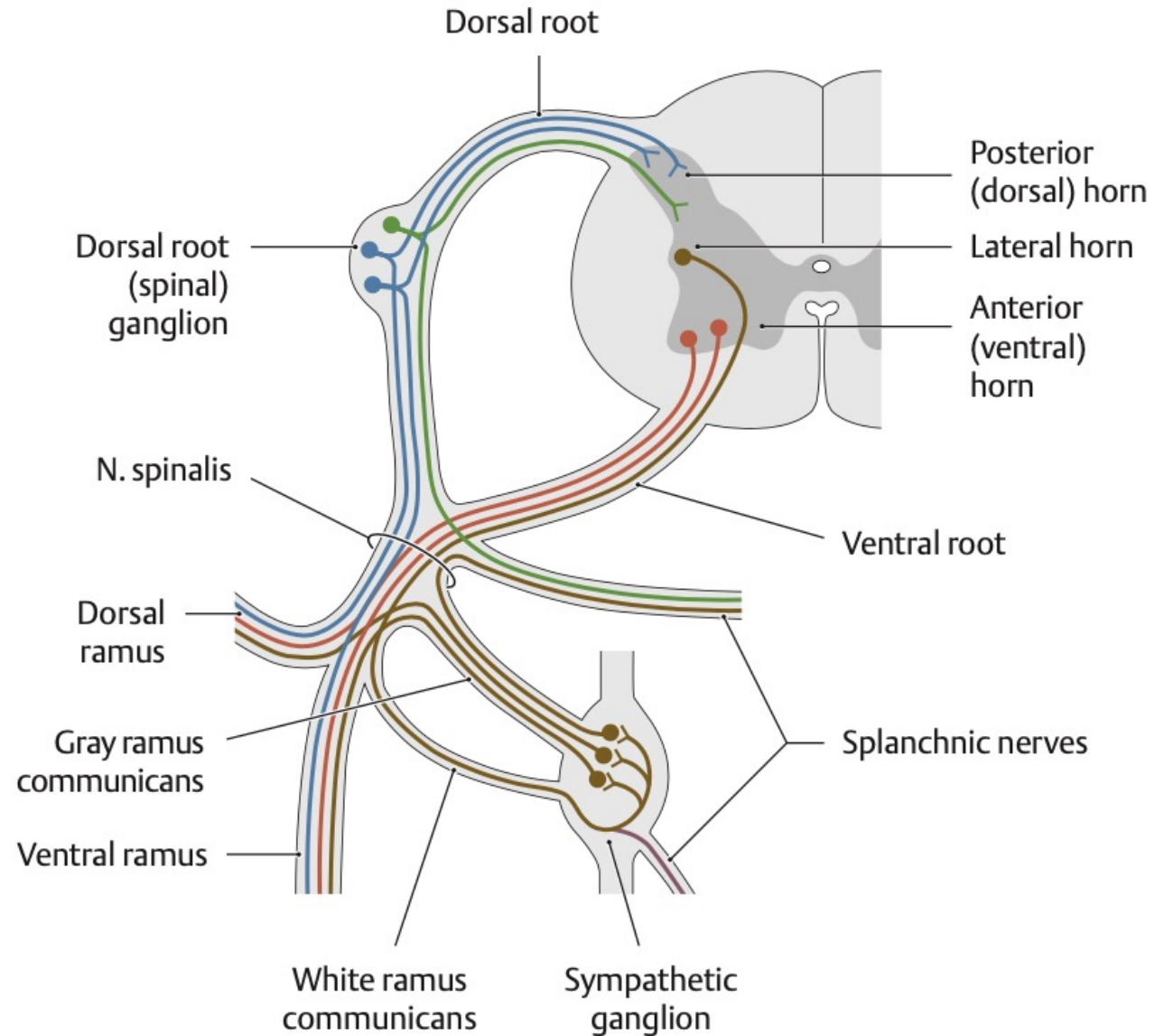
- ♦ Sensitive regions on skin surface
- ♦ Innervation from one spinal segment – skin and inner organ
- ♦ Reflex massage
- ♦ Influence on inner organ
- ♦ acupuncture

- ♦ *Diaphragma et pulmones C4 – shoulder*
- ♦ *Cor Th3-4 – left lateral chest and inner margin of upper limb*
- ♦ *Ventriculus Th8 – left hypochondrium*
- ♦ *Hepar et vesica fellea Th 8 -11 – right hypochondrium*
- ♦ *Intestinum tenue Th10 – umbilical region*
- ♦ *Intestinum crassum Th11 – between symphysis and umbil.*
- ♦ *Vesica urinaria Th11 – L1 – above symphysis*
- ♦ *Ren, testis, ureter – Th 10 – L1 – inguinal region*



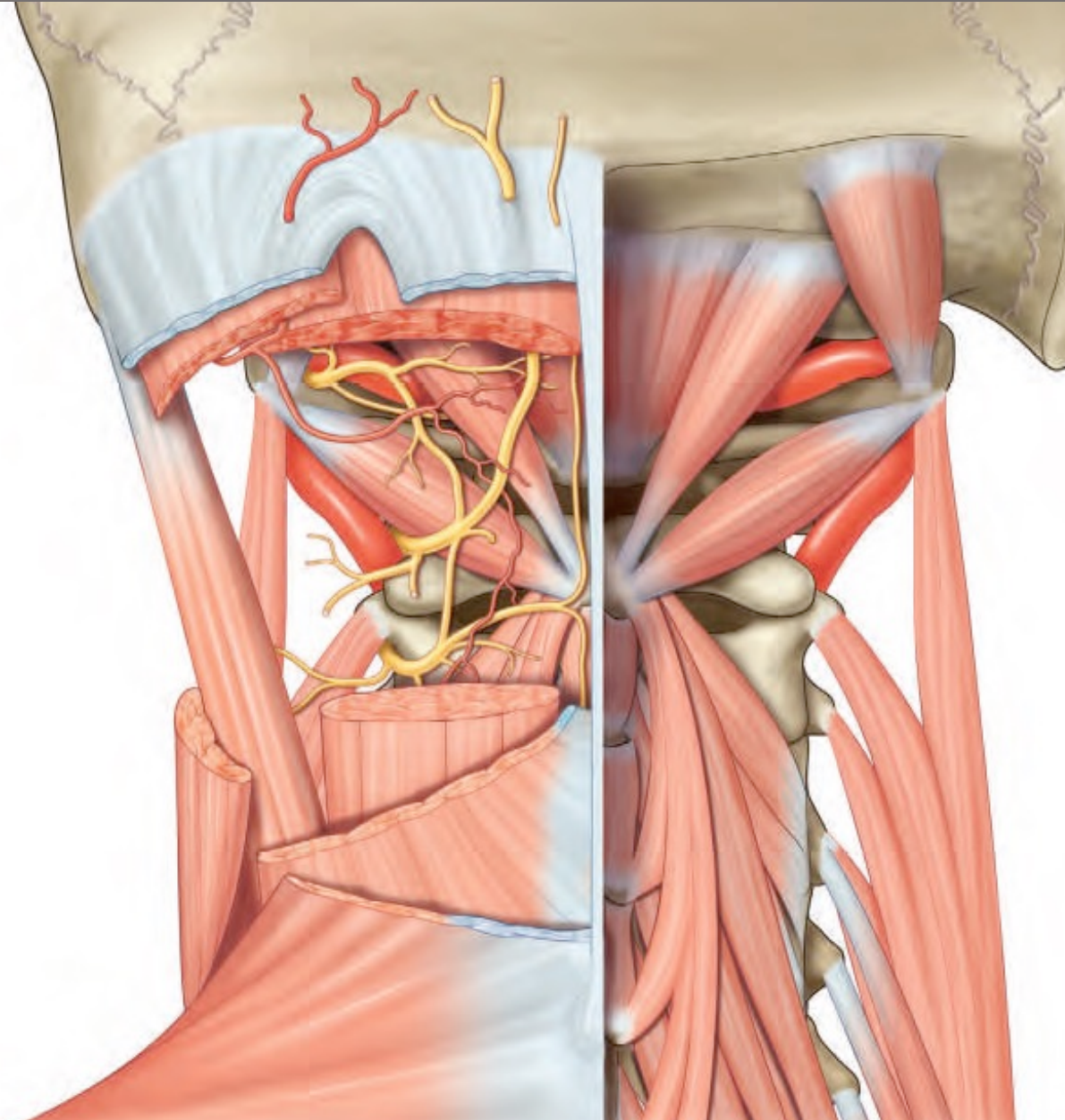
Nervi spinales - rami

- **Ramus dorsalis**
- **Ramus ventralis**
- *Ramus meningeus*
- **Ramus communicans griseus**
- **Ramus communicans albus**
- **Ganglion sympaticum**
- *Nervi splanchnici*



Nervi cervicales – rami dorsales

- ♦ Dorsal part of neck
- ♦ **The first three**
 - ♦ N. suboccipitalis - muscoli suboccipitales
 - ♦ N. occipitalis major – neck muscles
 - ♦ N. occipitalis tertius – skin in midline



Nervi cervicales - rami ventrales

♦ C1 – C4 – plexus cervicalis

♦ Sensaoric nervi

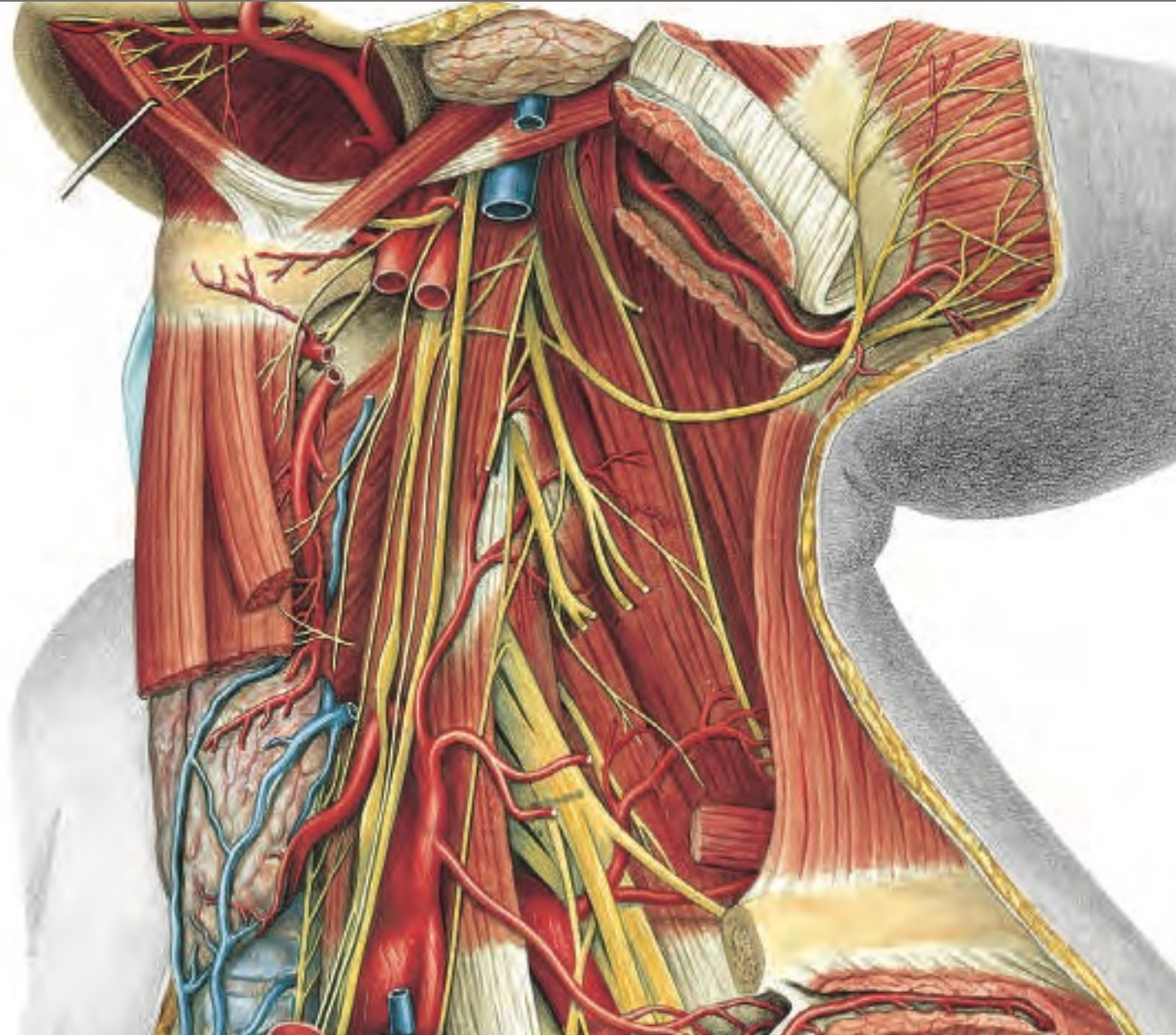
- ♦ N. occipitalis minor C2-3
- ♦ N. auricularis magnus C3
- ♦ N. transversus coli – C3
- ♦ Nn. supraclaviculares - C3-4

♦ Motor nervi

- ♦ *Rami musculares*
- ♦ *Mm. rraevertebrales*
- ♦ *M. sternocleidomastoideus, m. trapezius*
- ♦ **N. phrenicus C4 (C3-5)**
- ♦ *diaphragma*

♦ Anastomotoc nervi

- ♦ **Ansa cervicalis superficialis**
- ♦ *with nervus facialis (N VII)*
- ♦ **Ansa cervicalis profunda**
- ♦ *With nervus hypoglossus (N. XII)*

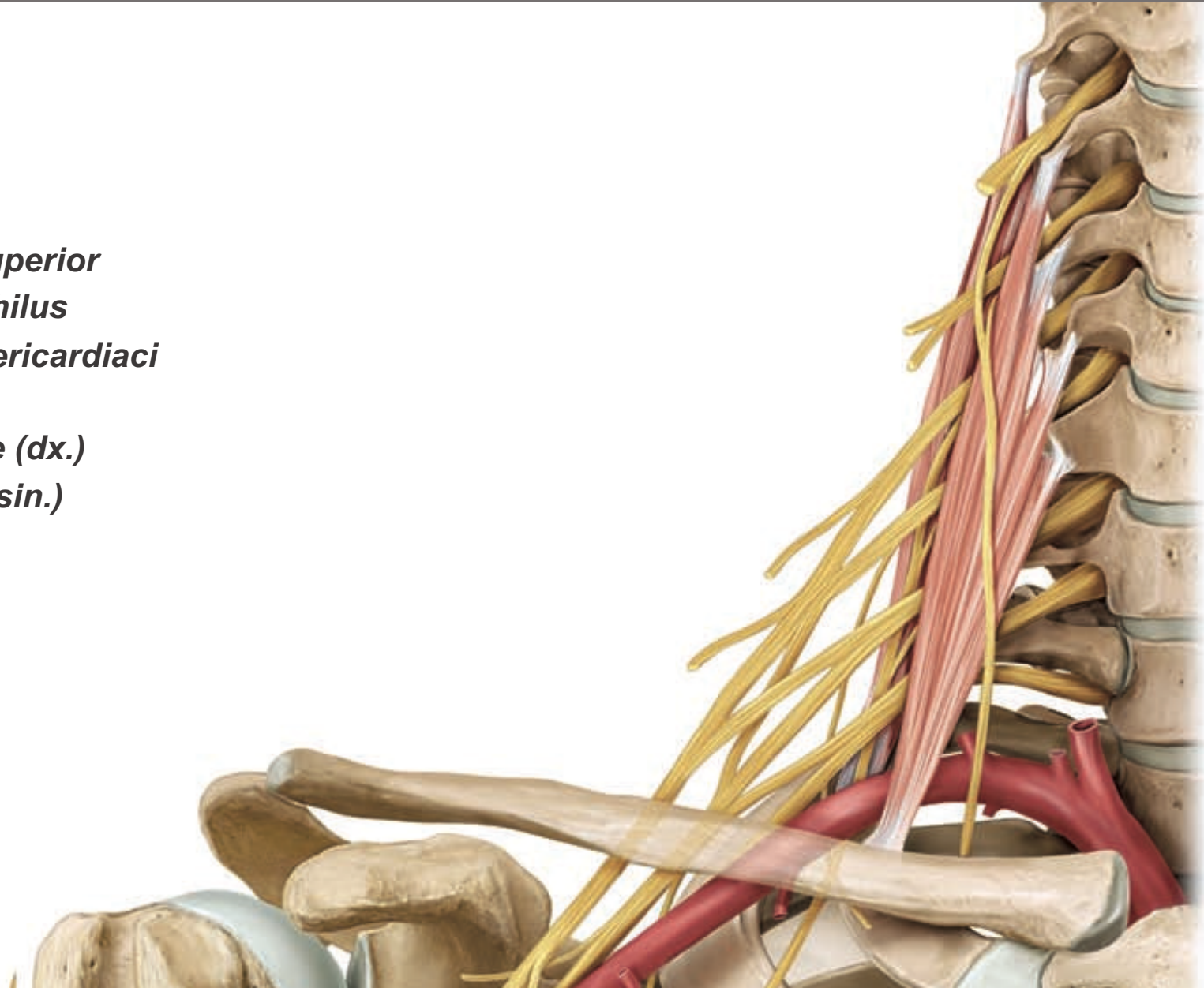


Nervus phrenicus

♦ C4 (C3-5)

♦ course

- ♦ M. scalenus anterior
- ♦ *Apertura thoracica superior*
- ♦ *Anteriorly form lung hilus*
- ♦ *Pericardium – rami pericardiaci*
- ♦ *Diaphragma*
- ♦ *Foramen venae cavae (dx.)*
- ♦ *Centrum tendineum (sin.)*



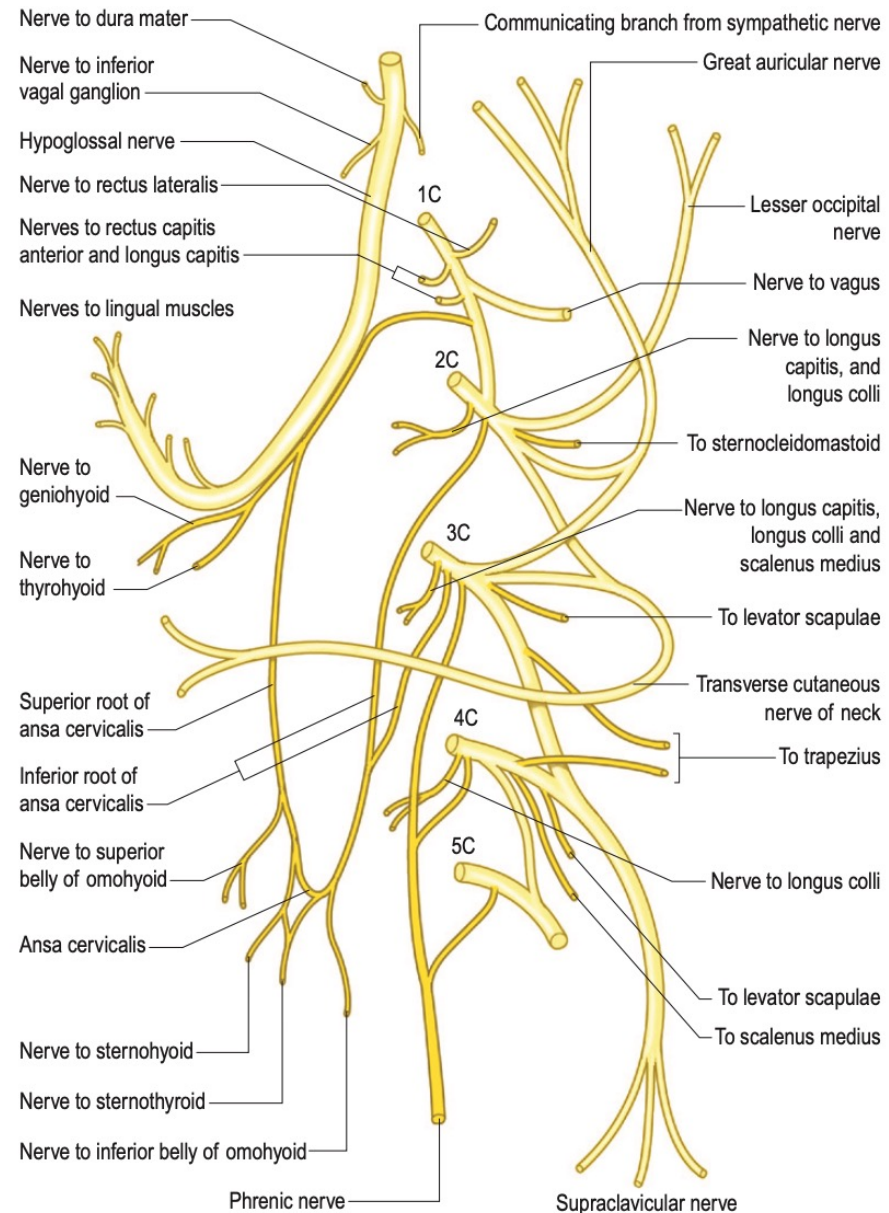
Ansa cervicalis profunda

♦ Anastomotic structure

♦ Associated N. XII

♦ course

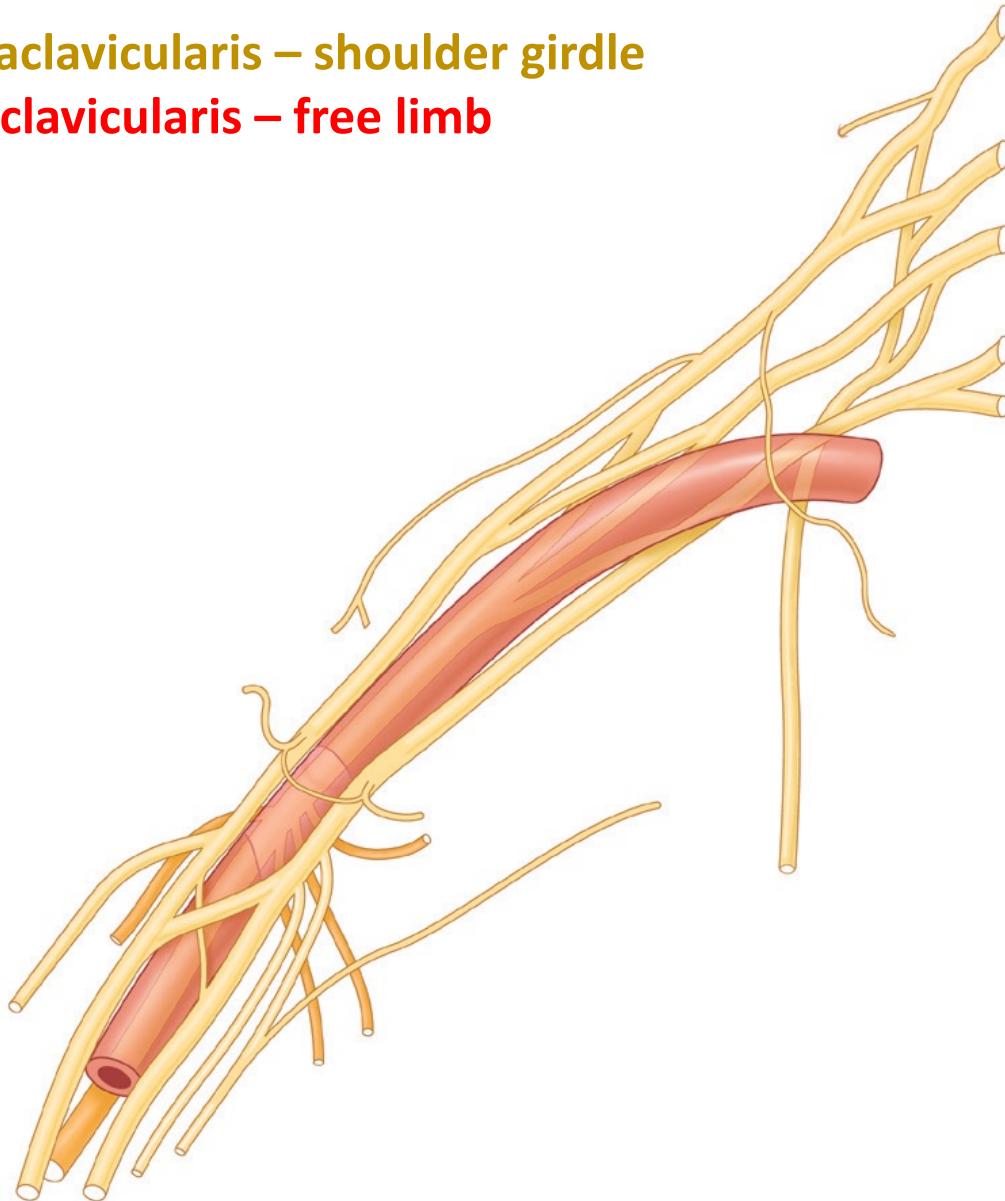
- ♦ junction C1-C3 – radix inferior
- ♦ *Junction in the anterior arch - radix superior*
- ♦ *M. genioglossus*
- ♦ *M. thyrohyoideus*
- ♦ *M. sternohyoideus*
- ♦ *M. sternothyroideus*
- ♦ *M. omohyoideus*



Plexus brachialis

Pars supraclavicularis – shoulder girdle

Pars infraclavicularis – free limb



♦ Trunci

- ♦ I. superior C5,6
- ♦ II. medius C7
- ♦ III. Inferior C8, TH1

♦ Divisiones

- ♦ Anterior C5 - C7 + Posterior C5-Th1

♦ Fasciculi (cords)

- ♦ Lateralis C5 - 7 (n. musculocutaneus, ulnaris, cutaneus brachii)
- ♦ Medialis C8, Th1 (n. ulnaris, n. cutaneus brachii medialis, n. cutaneus antebrachii medialis)
- ♦ Posterior C5 - Th1 (n. axillaris, n. radialis)

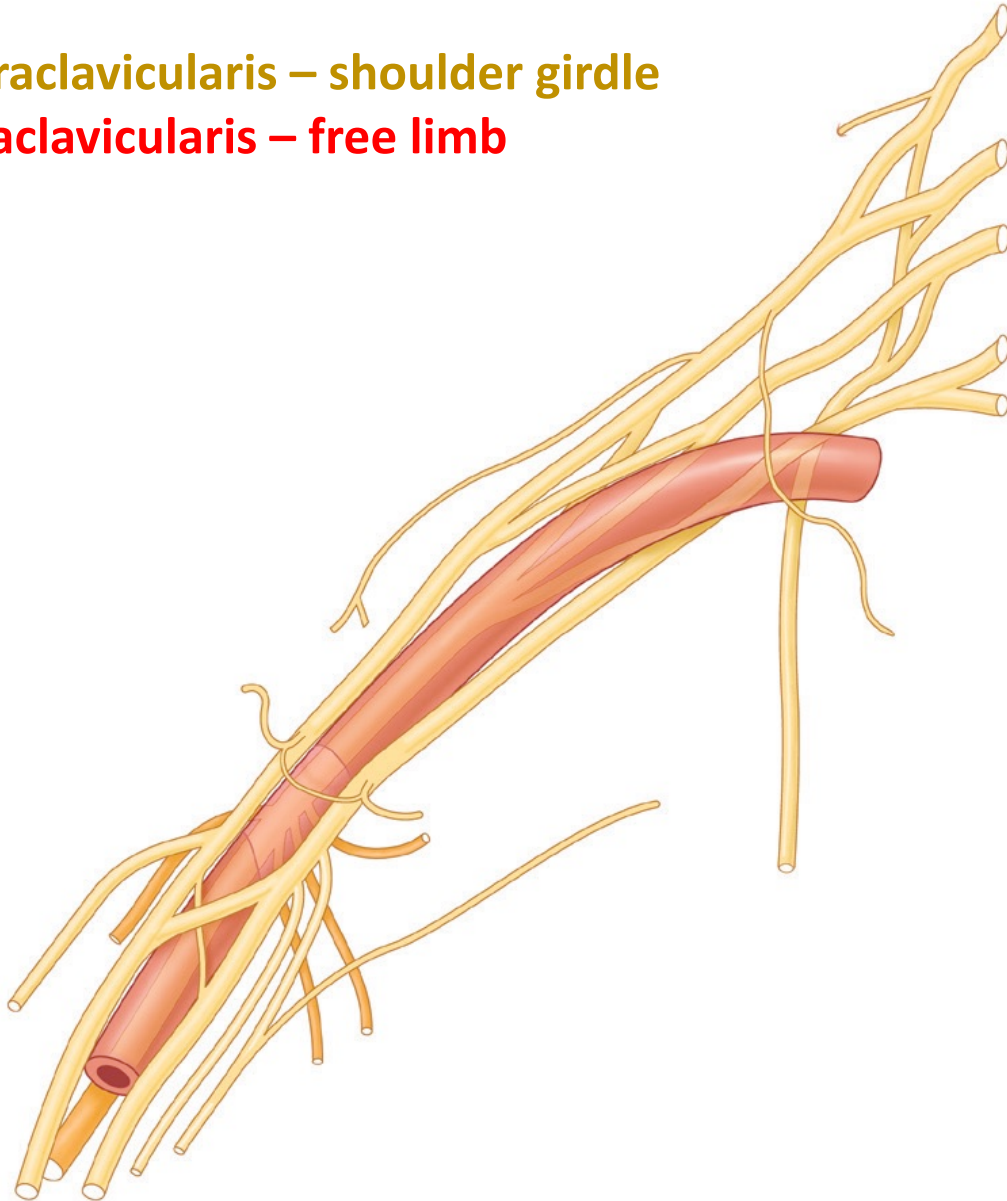
♦ Nervi - infraclaviculares

- ♦ N. musculocutaneus (C5-C7)
- ♦ N. medianus (C5 - Th1)
- ♦ N. ulnaris (C(7)8 - Th1)
- ♦ N. cutaneus brachii medialis (C7 - Th1)
- ♦ N. cutaneus antebrachii medialis (C7 - Th1)
- ♦ N. radialis (C5-TH1)
- ♦ N. axillaris (C5-TH1)

Plexus brachialis

Pars supraclavicularis – shoulder girdle

Pars infraclavicularis – free limb



♦ **Spinohumeral muscles**

♦ **Thoracohumeral muscles**

♦ **Scapular muscles**

♦ ***Nervi – dorsal group***

♦ *N. dorsalis scapulae (C5,6)*

♦ *N. suprascapularis (C4-6)*

♦ *N. thoracicus longus (C5,6)*

♦ *N. thoracodorsalis (C6-8)*

♦ *N. subscapularis (C5-7)*

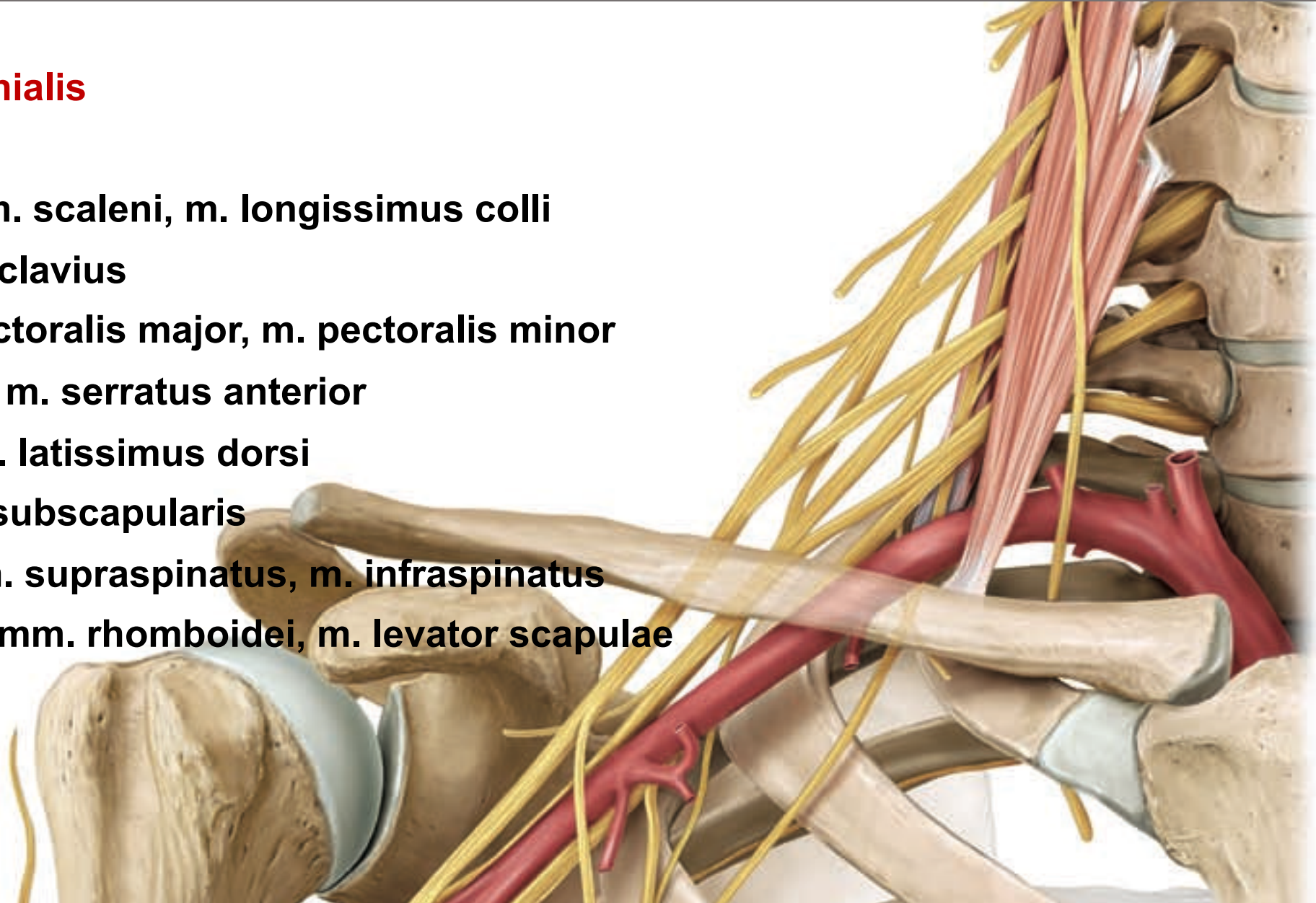
♦ ***Nervi – ventral group***

♦ *N. subclavius (C5,6)*

♦ *N. pectoralis medialis et lateralis (C5-Th1)*

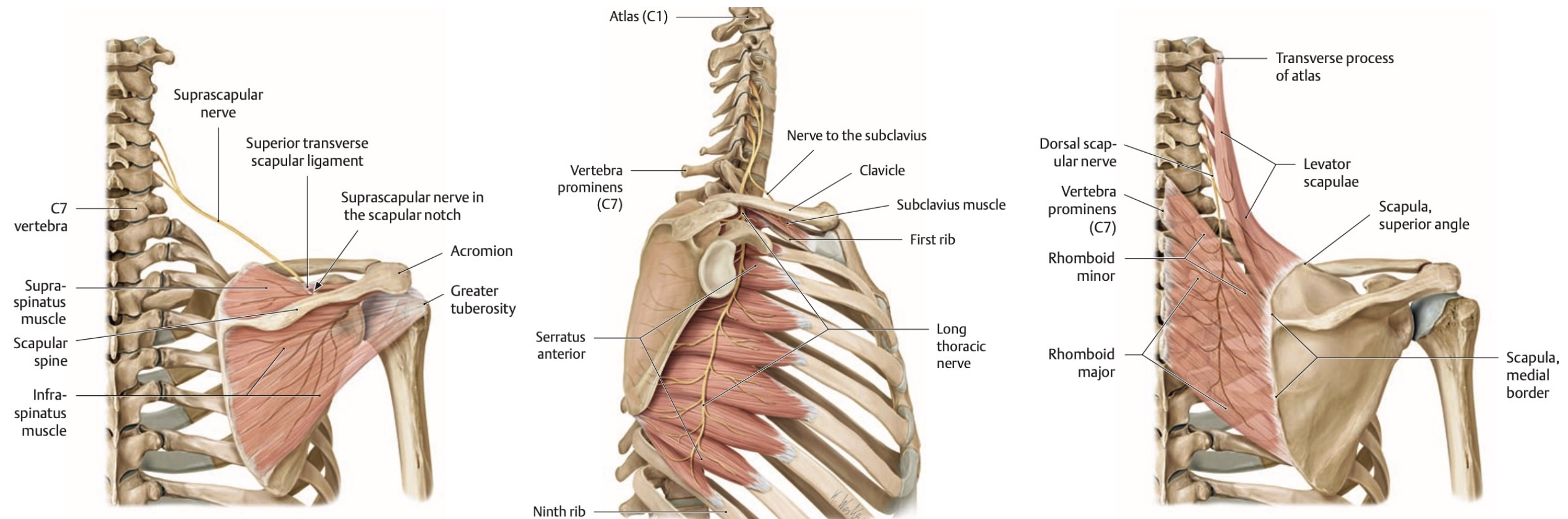
Plexus brachialis

- ♦ **C5 – Th1– plexus brachialis**
- ♦ **Pars supraclavicularis**
- ♦ Rami musculares – mm. scaleni, m. longissimus colli
- ♦ N. subclavius – m. subclavius
- ♦ Nn. pectorales – m. pectoralis major, m. pectoralis minor
- ♦ N. thoracicus longus – m. serratus anterior
- ♦ N. thoracodorsalis – m. latissimus dorsi
- ♦ N. subscapularis – m. subscapularis
- ♦ N. suprascapularis – m. supraspinatus, m. infraspinatus
- ♦ N. dorsalis scapulae – mm. rhomboidei, m. levator scapulae
- ♦ **Pars infraclavicularis**



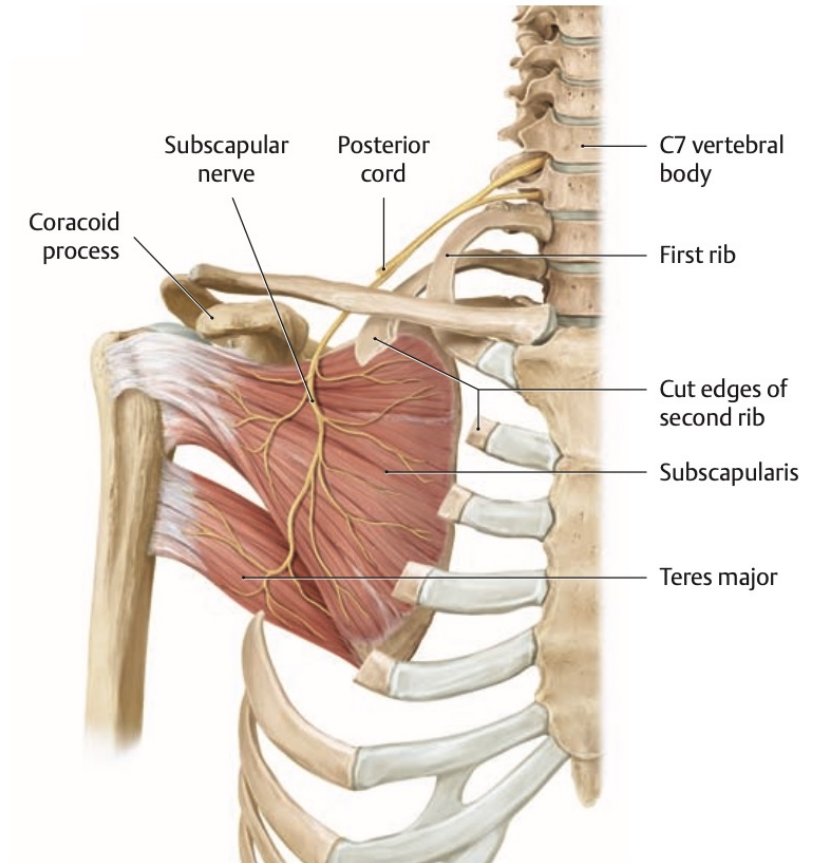
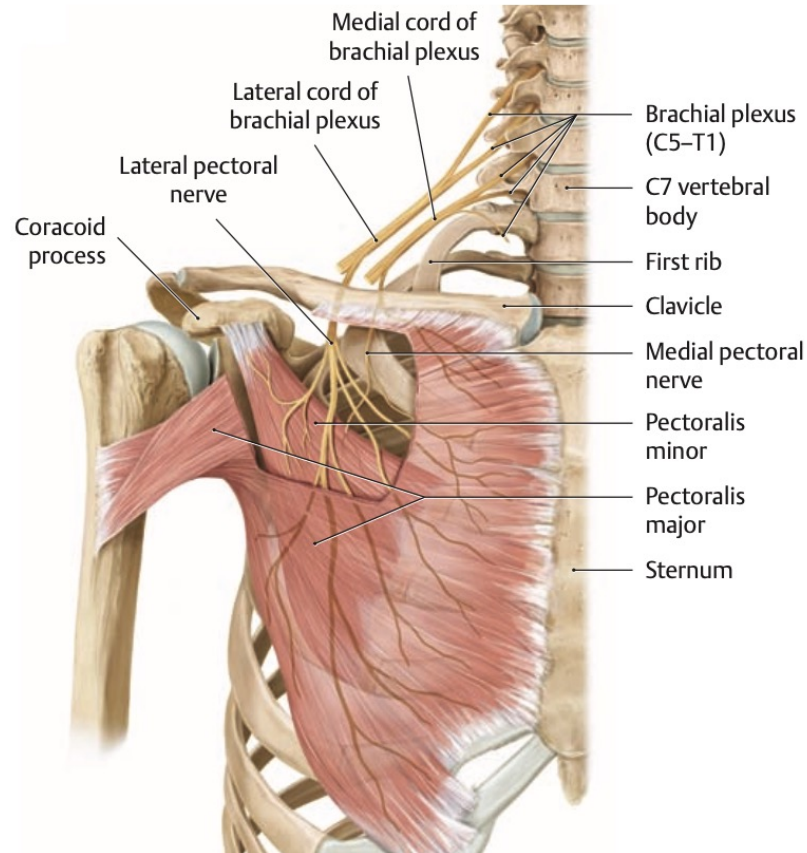
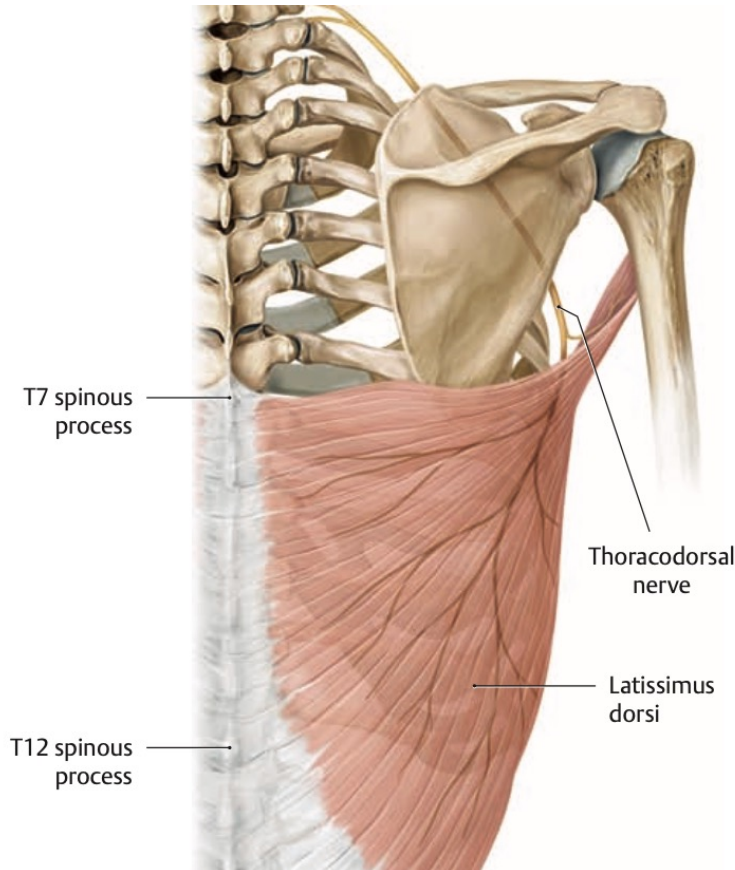
Plexus brachialis – pars supraclavicularis

- ♦ **N. suprascapularis – m. supraspinatus, m. infraspinatus**
- ♦ **N. thoracicus longus – m. serratus anterior**
- ♦ **N. dorsalis scapulae – mm. rhomboidei, m. levator scapulae**



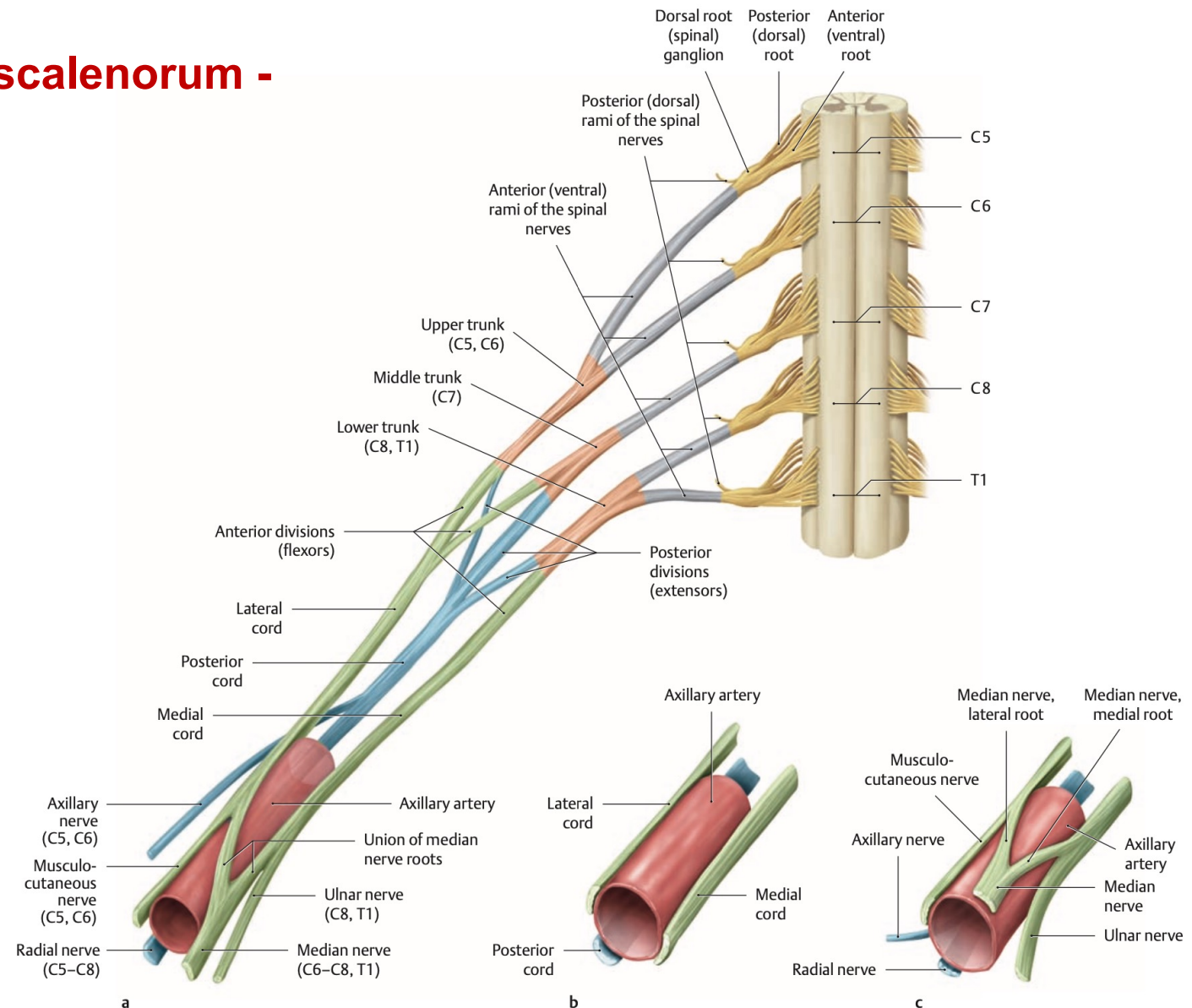
Plexus brachialis – pars supraclavicularis

- **N. thoracodorsalis – m. latissimus dorsi**
- **Nn. pectorales – m. pectoralis major, m. pectoralis minor**
- **N. subscapularis – m. subscapularis**

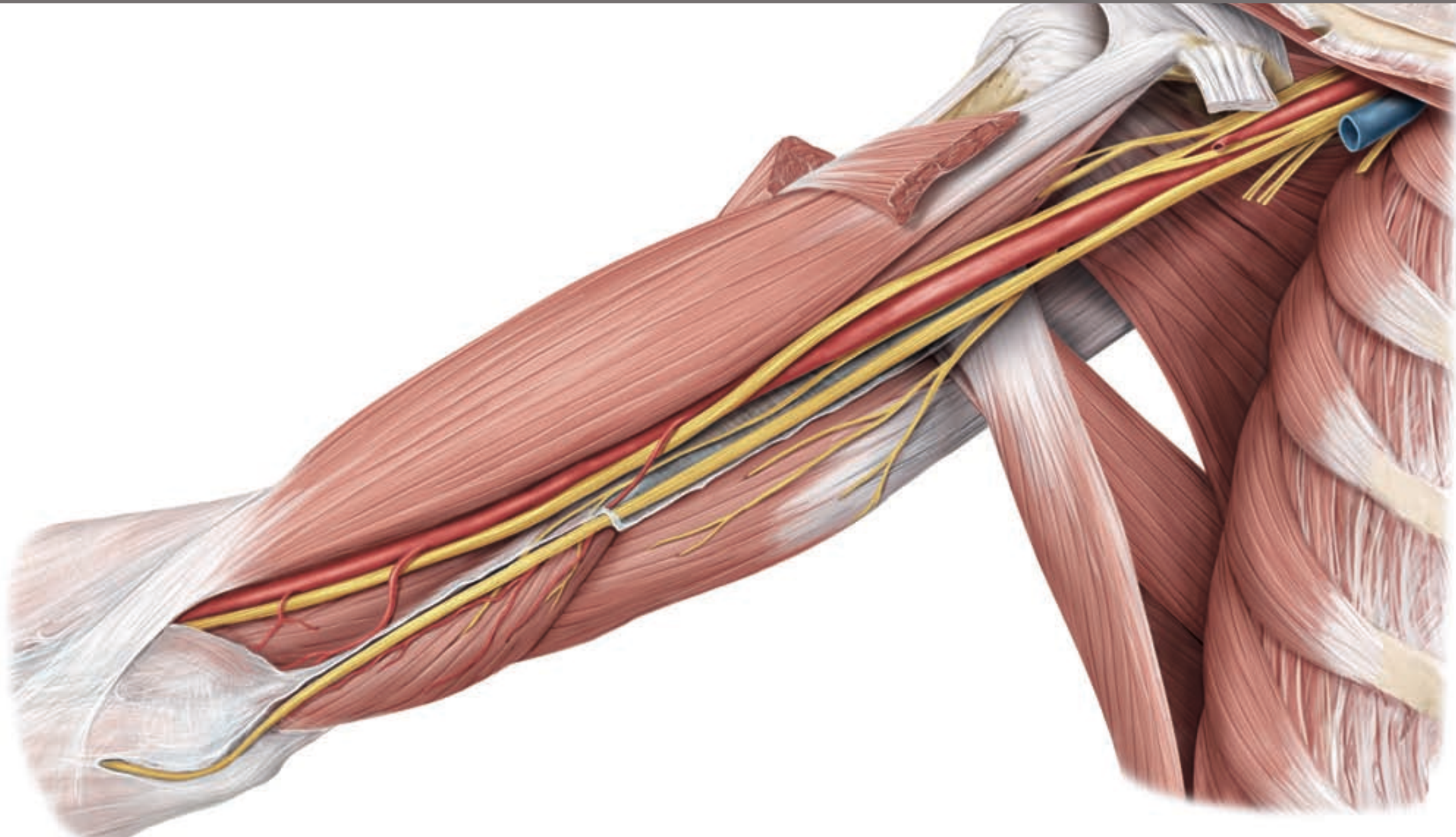


Plexus brachialis

- ♦ C5 – Th1– plexus brachialis - *fissura scalenorum* -
- ♦ *Pars infraclavicularis*
- ♦ *Fasciculus lateralis C5-7*
- ♦ N. musculocutaneus
- ♦ N. medianus
- ♦ *Fasciculus medialis C8 – Th1*
- ♦ N. ulnaris
- ♦ N. cutaneus brachii medialis
- ♦ N. cutaneus antebrachii medialis
- ♦ *Fasciculus posterior C5 – Th1*
- ♦ N. axillaris
- ♦ N. radialis

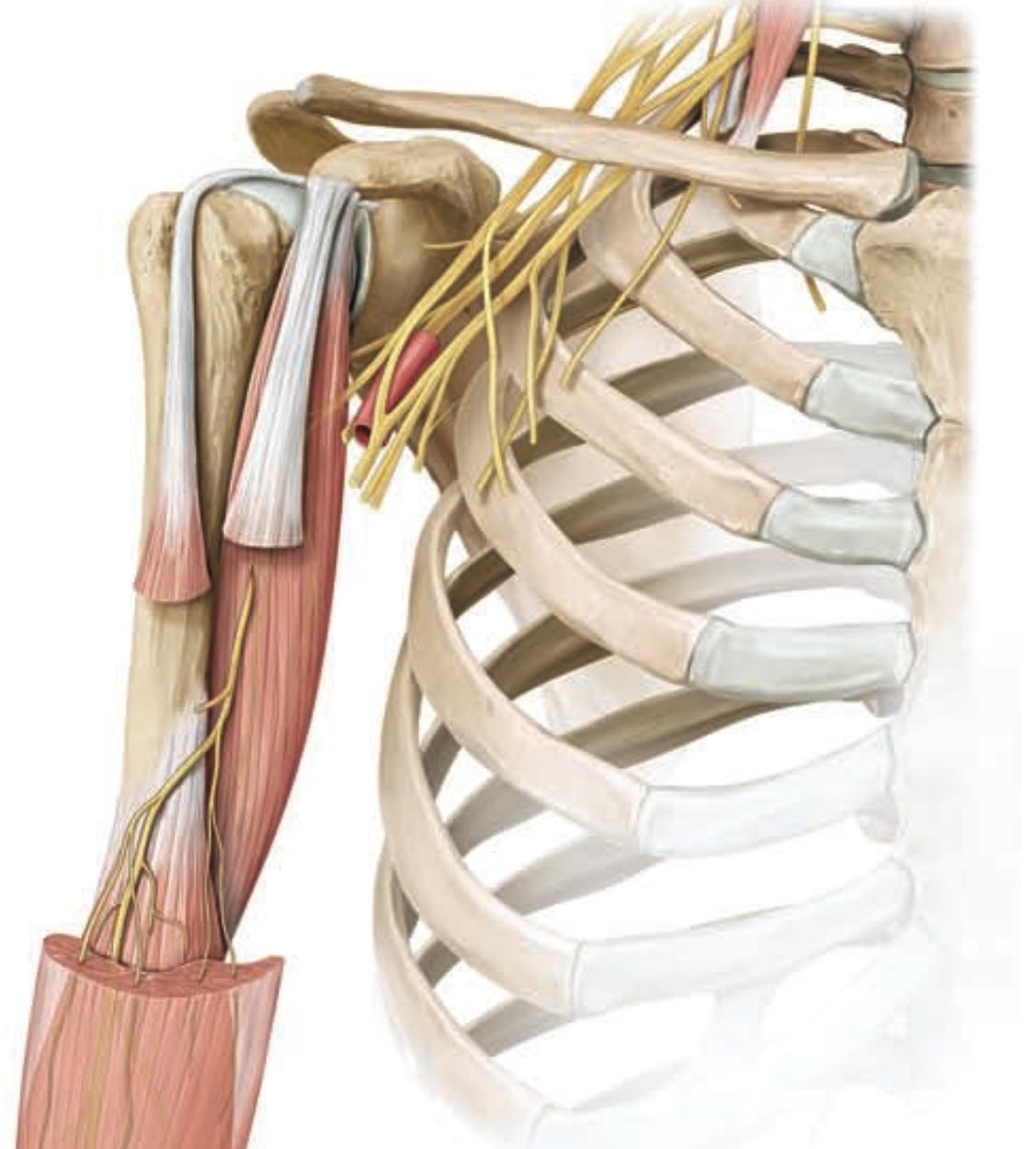


Plexus brachialis



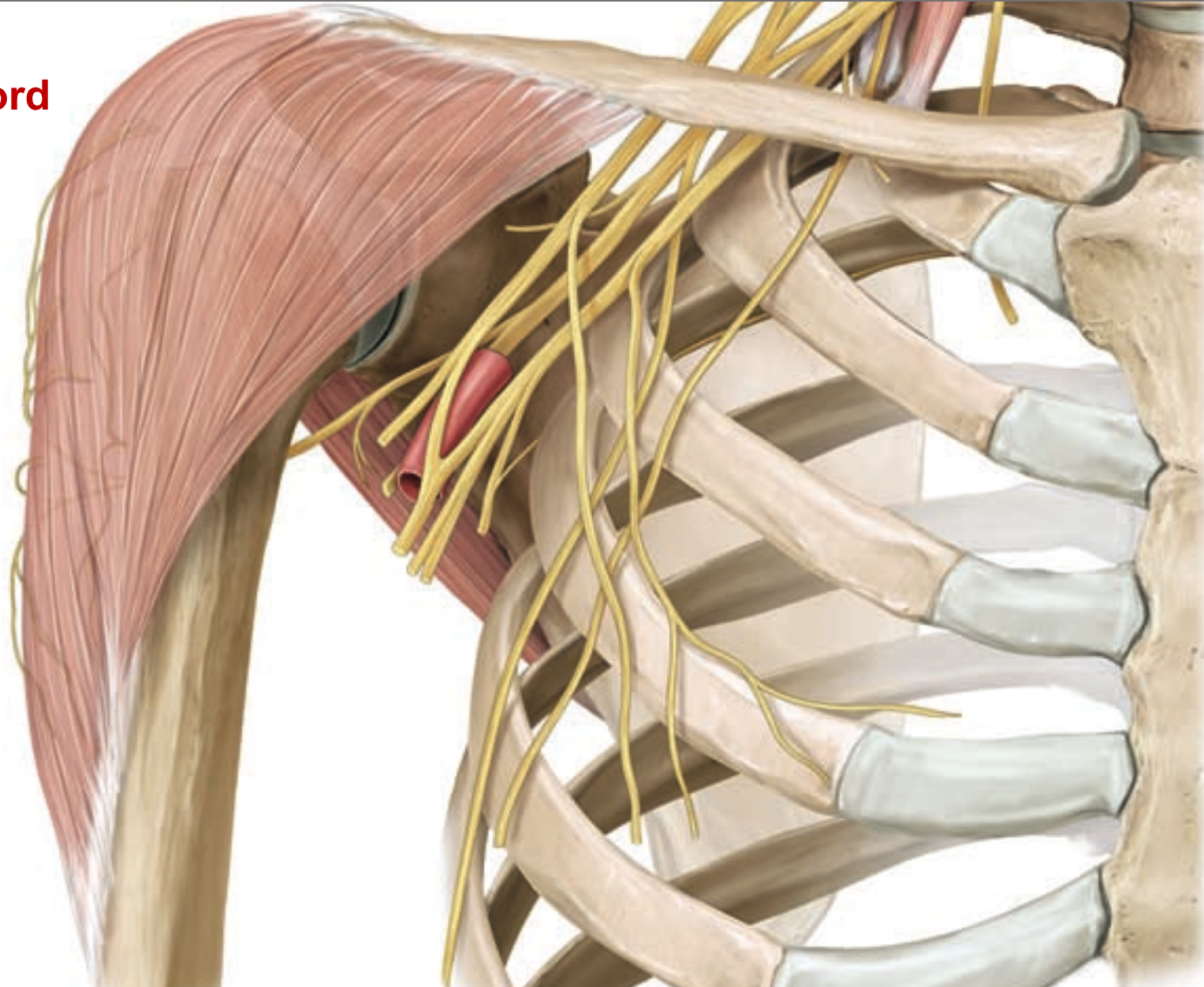
Nervus musculocutaneus (C5-C7)

- ♦ **M. biceps brachii**
- ♦ **M. brachialis**
- ♦ **M. coracobrachialis**

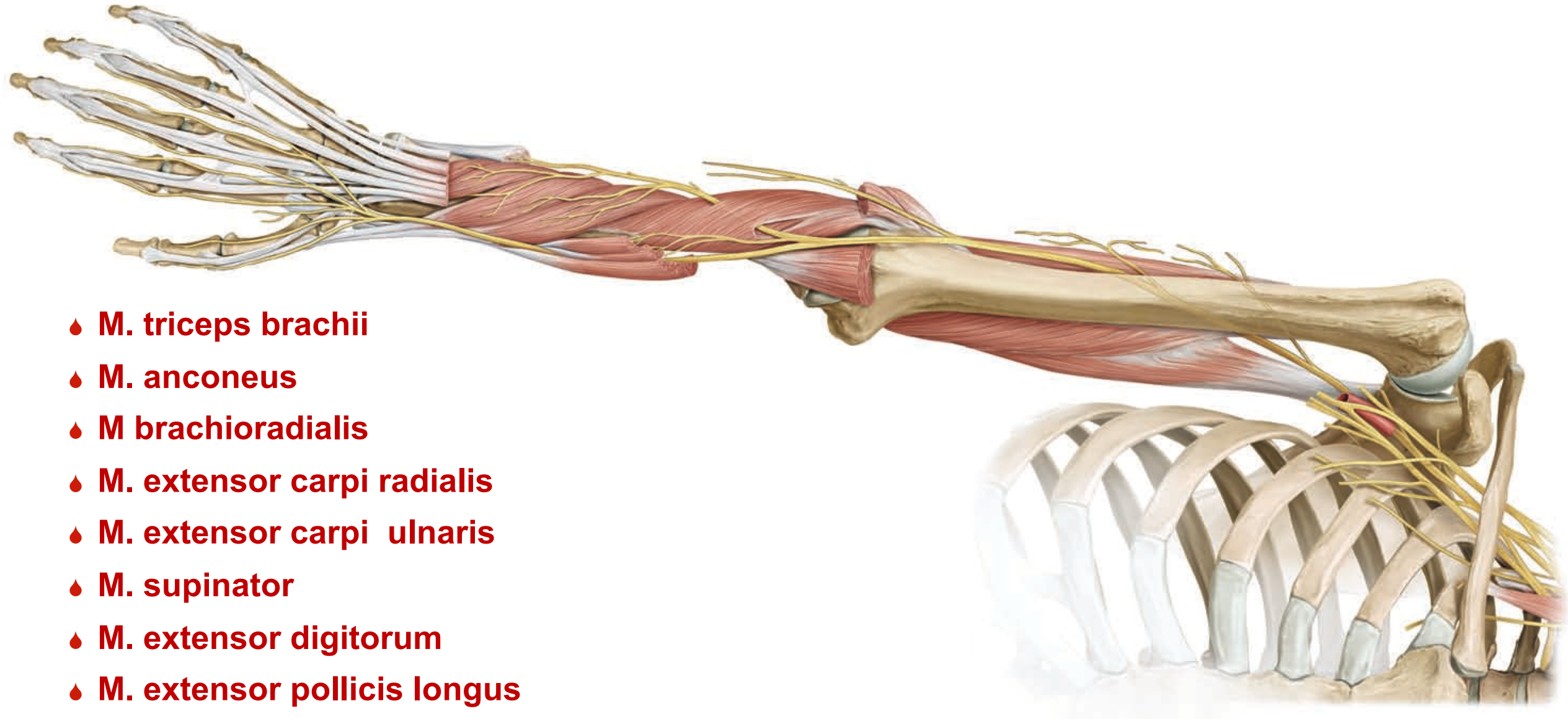


Nervus axillaris (C5, C6)

- ♦ Fasciculus posterior – posterior cord
- ♦ M. deltoideus
- ♦ M. teres minor



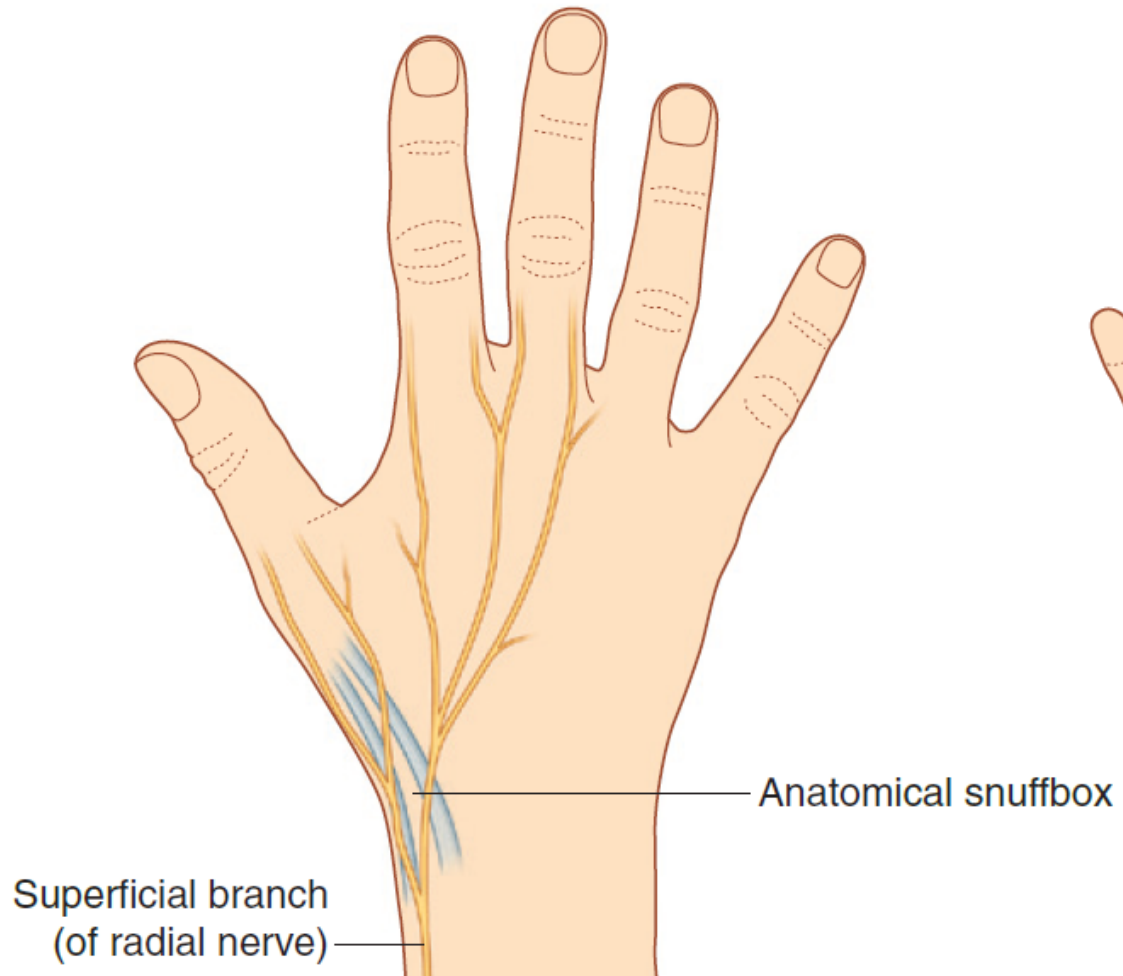
Nervus radialis (C5 – Th1)



- ♦ **M. triceps brachii**
- ♦ **M. anconeus**
- ♦ **M. brachioradialis**
- ♦ **M. extensor carpi radialis**
- ♦ **M. extensor carpi ulnaris**
- ♦ **M. supinator**
- ♦ **M. extensor digitorum**
- ♦ **M. extensor pollicis longus**
- ♦ **M. extensor indicis**

Nervus radialis

♦ Ramus superficialis n. radialis

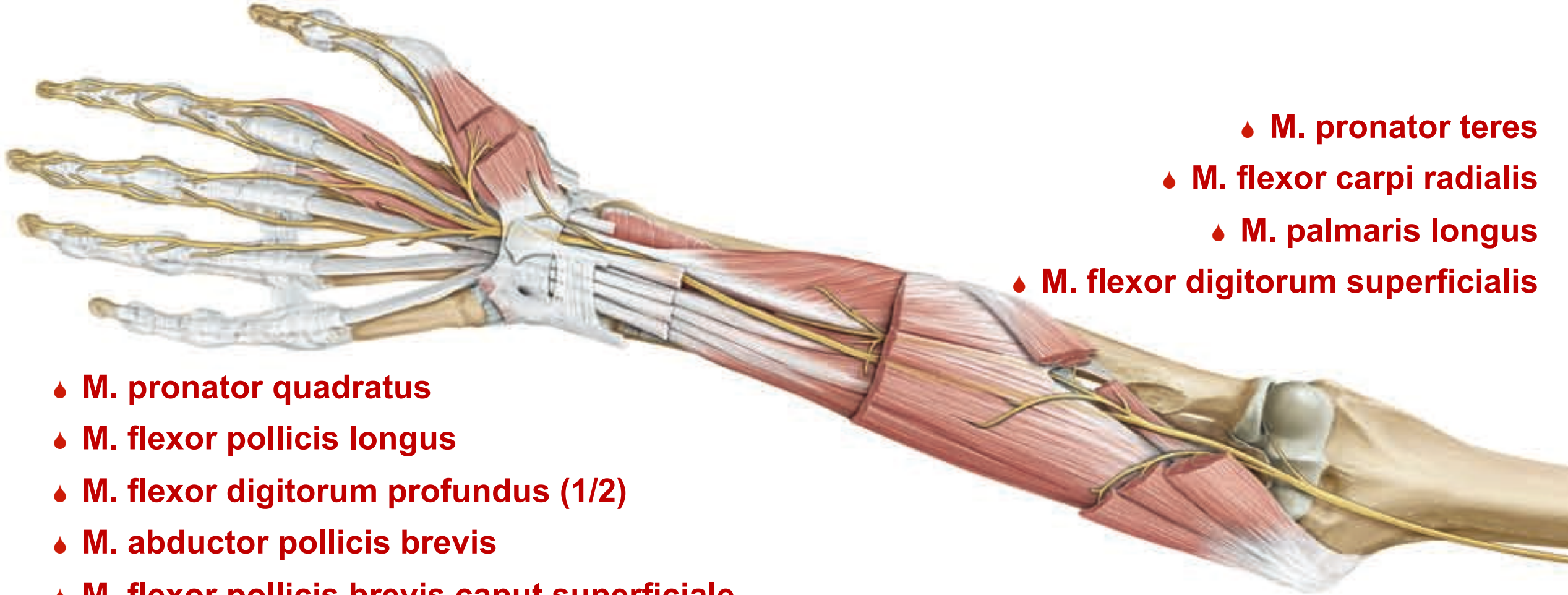


Palmar view



Dorsal view

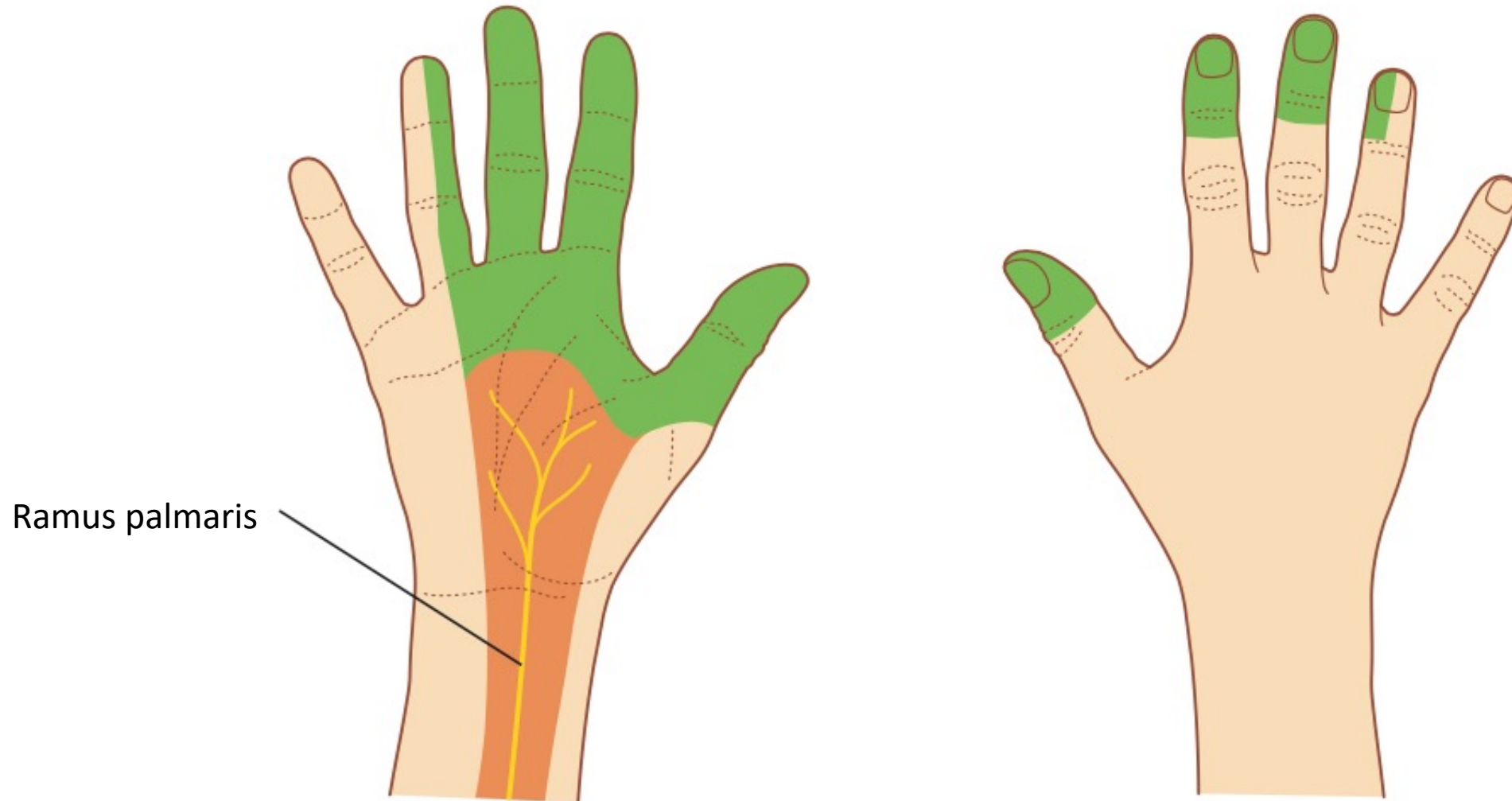
Nervus medianus (C6-Th1)



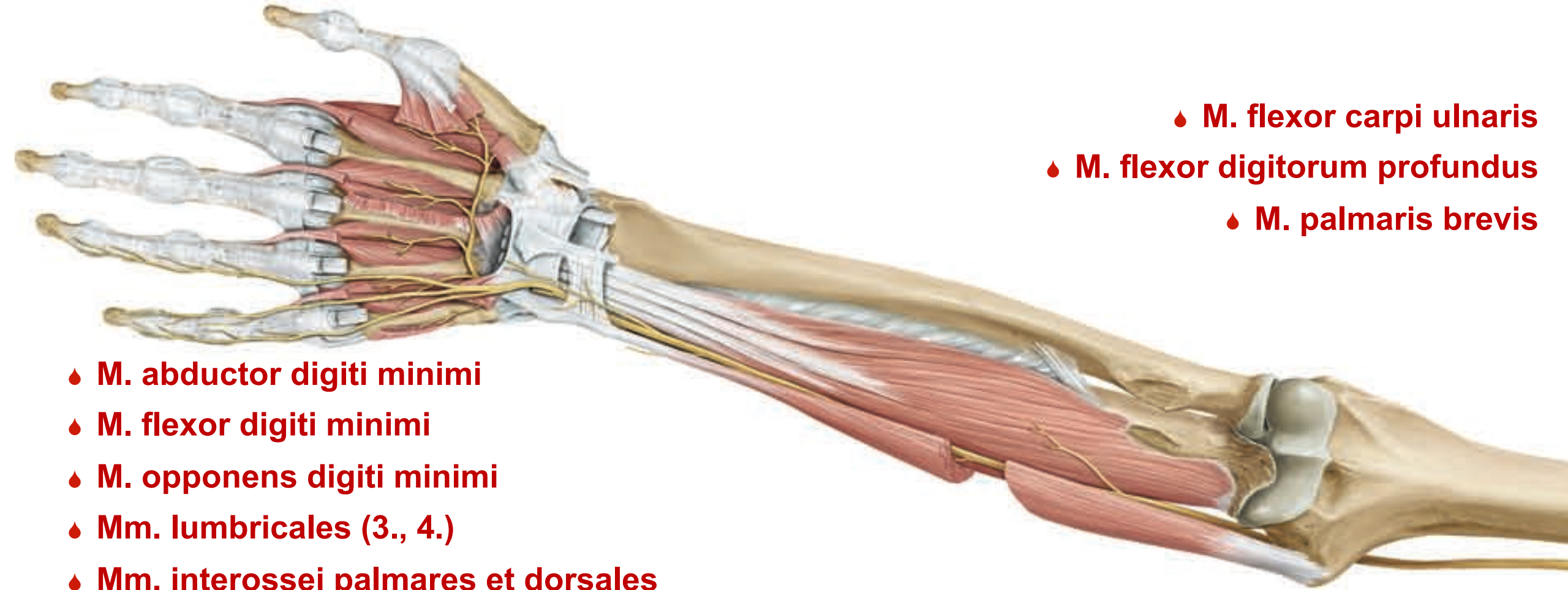
- ♦ M. pronator quadratus
- ♦ M. flexor pollicis longus
- ♦ M. flexor digitorum profundus (1/2)
- ♦ M. abductor pollicis brevis
- ♦ M. flexor pollicis brevis caput superficiale
- ♦ M. opponens pollicis
- ♦ Mm. lumbricales (1., 2.)

- ♦ M. pronator teres
- ♦ M. flexor carpi radialis
- ♦ M. palmaris longus
- ♦ M. flexor digitorum superficialis

Nervus medianus (C6-Th1)



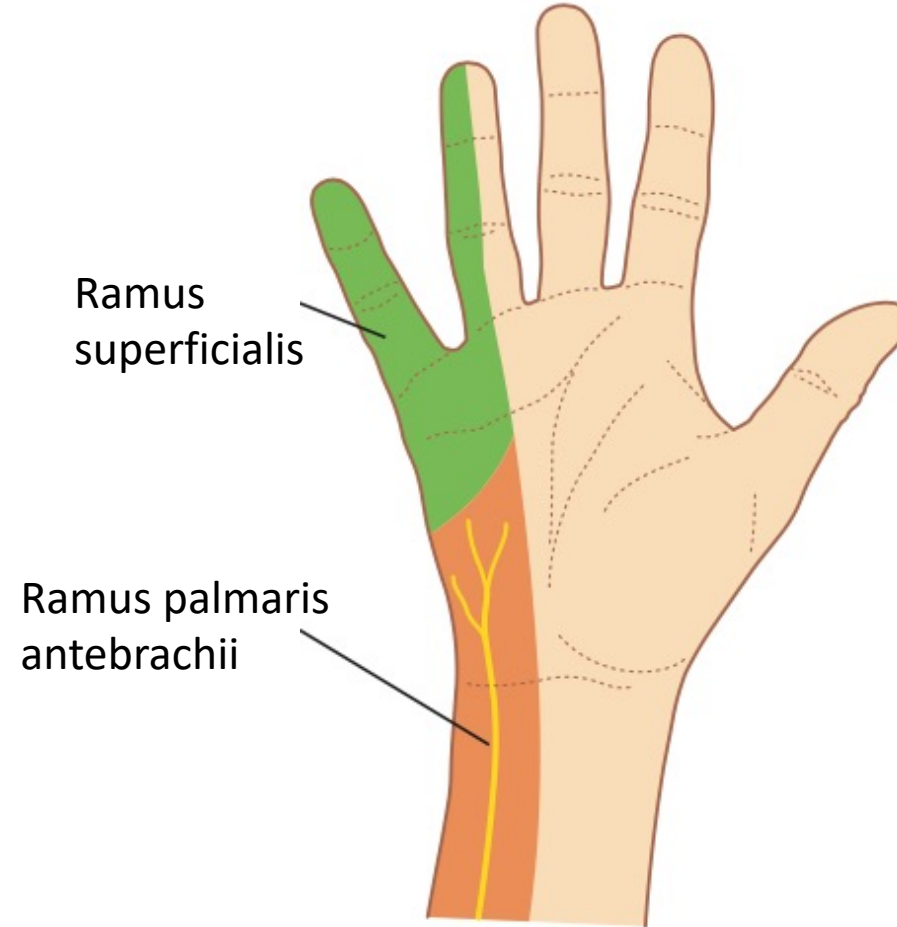
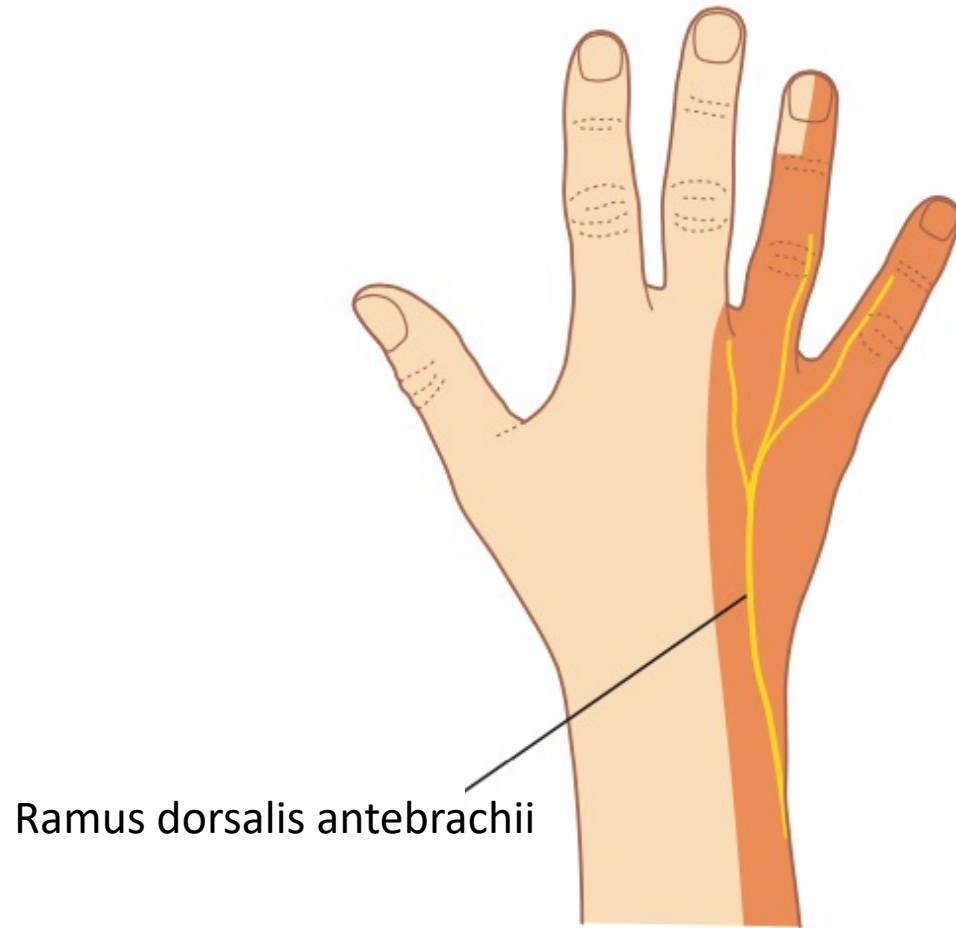
Nervus ulnaris (C8, Th1)



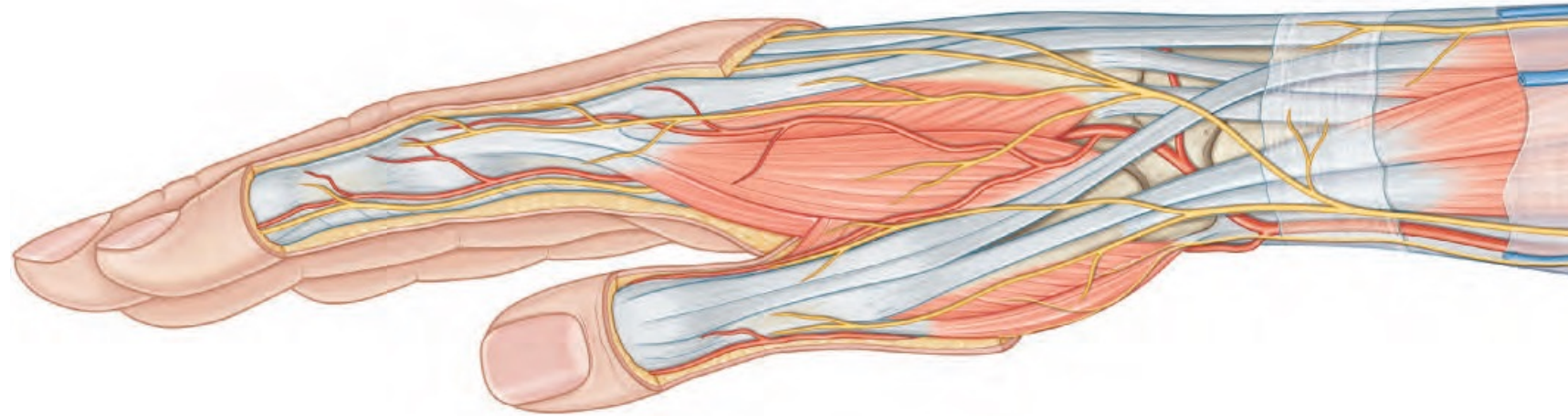
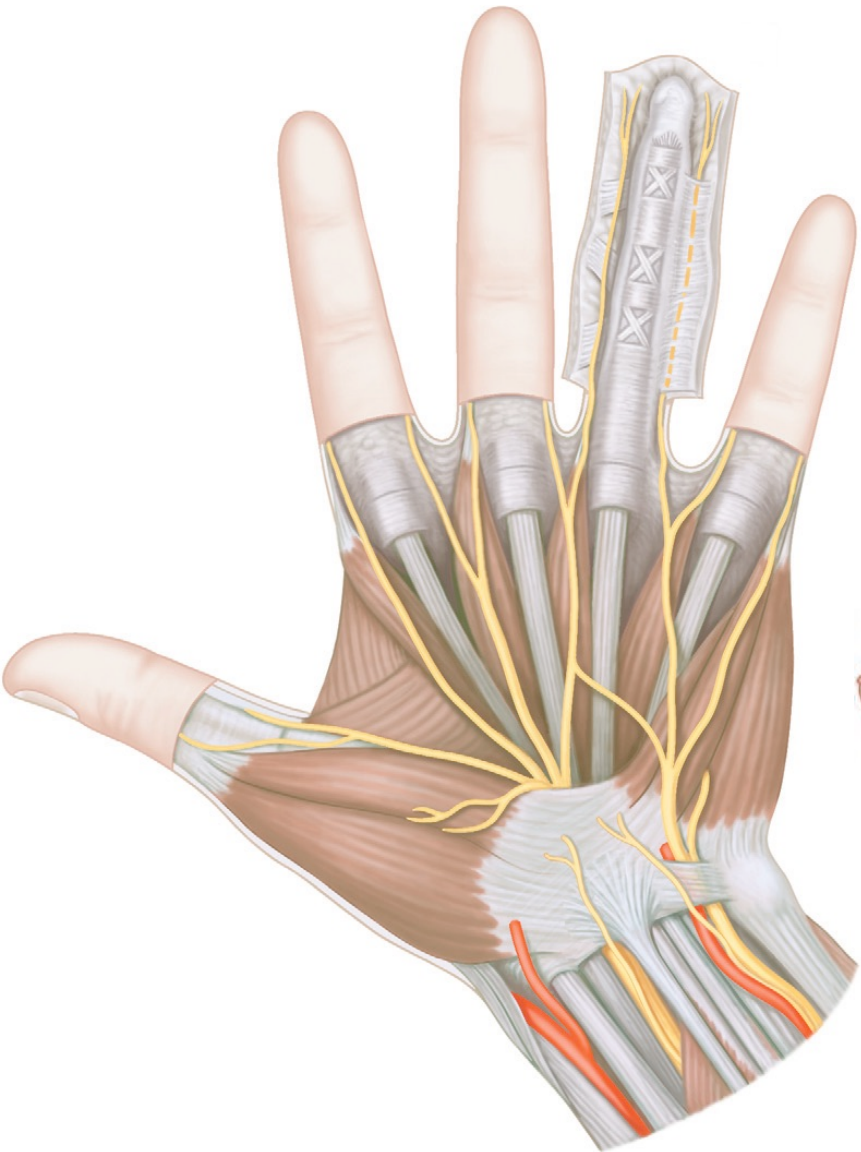
- ♦ M. flexor carpi ulnaris
- ♦ M. flexor digitorum profundus
- ♦ M. palmaris brevis

- ♦ M. abductor digiti minimi
- ♦ M. flexor digiti minimi
- ♦ M. opponens digiti minimi
- ♦ Mm. lumbricales (3., 4.)
- ♦ Mm. interossei palmares et dorsales
- ♦ M. adductor pollicis
- ♦ M. flexor pollicis brevis caput profundum

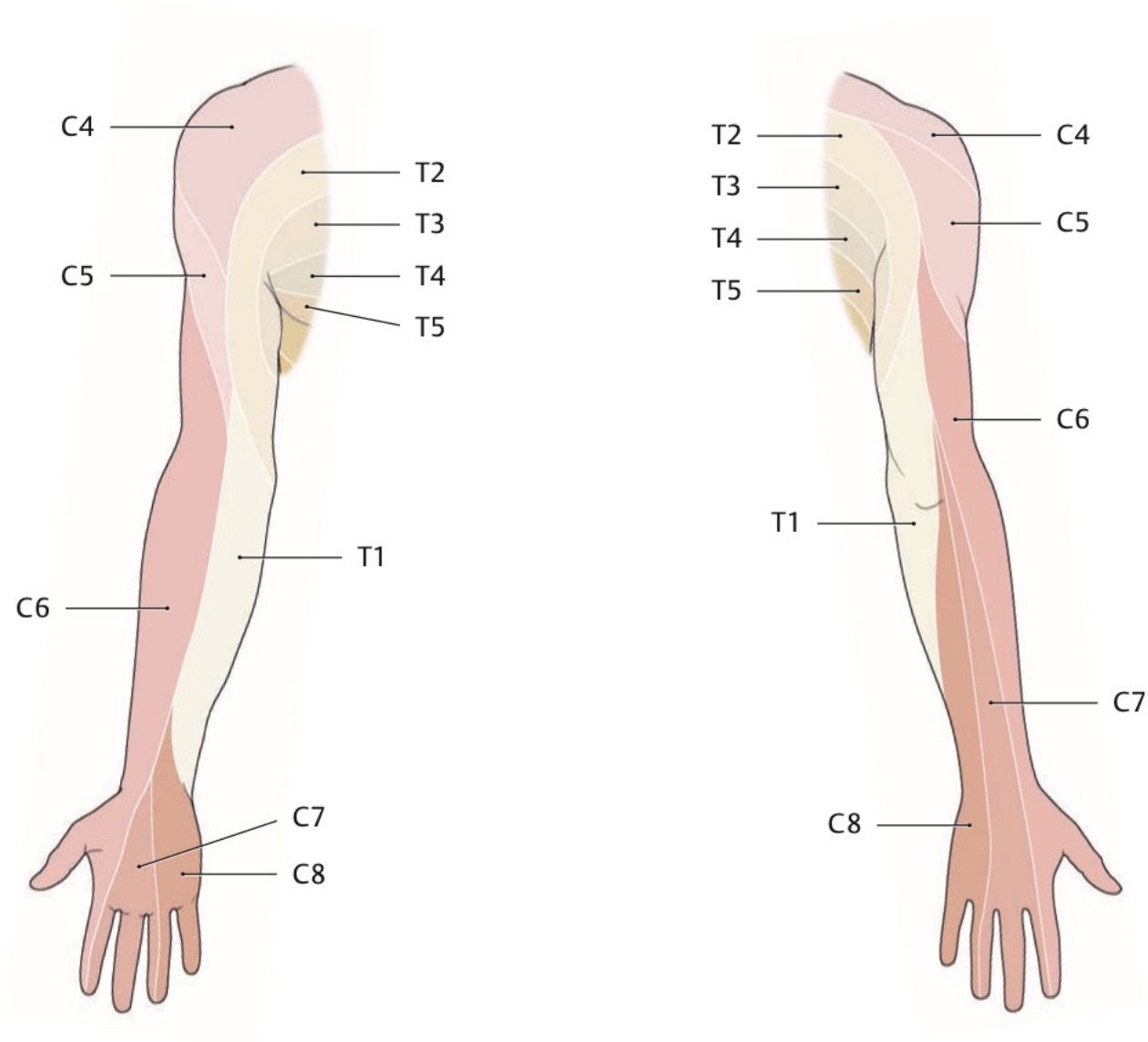
Nervus ulnaris (C8, Th1)



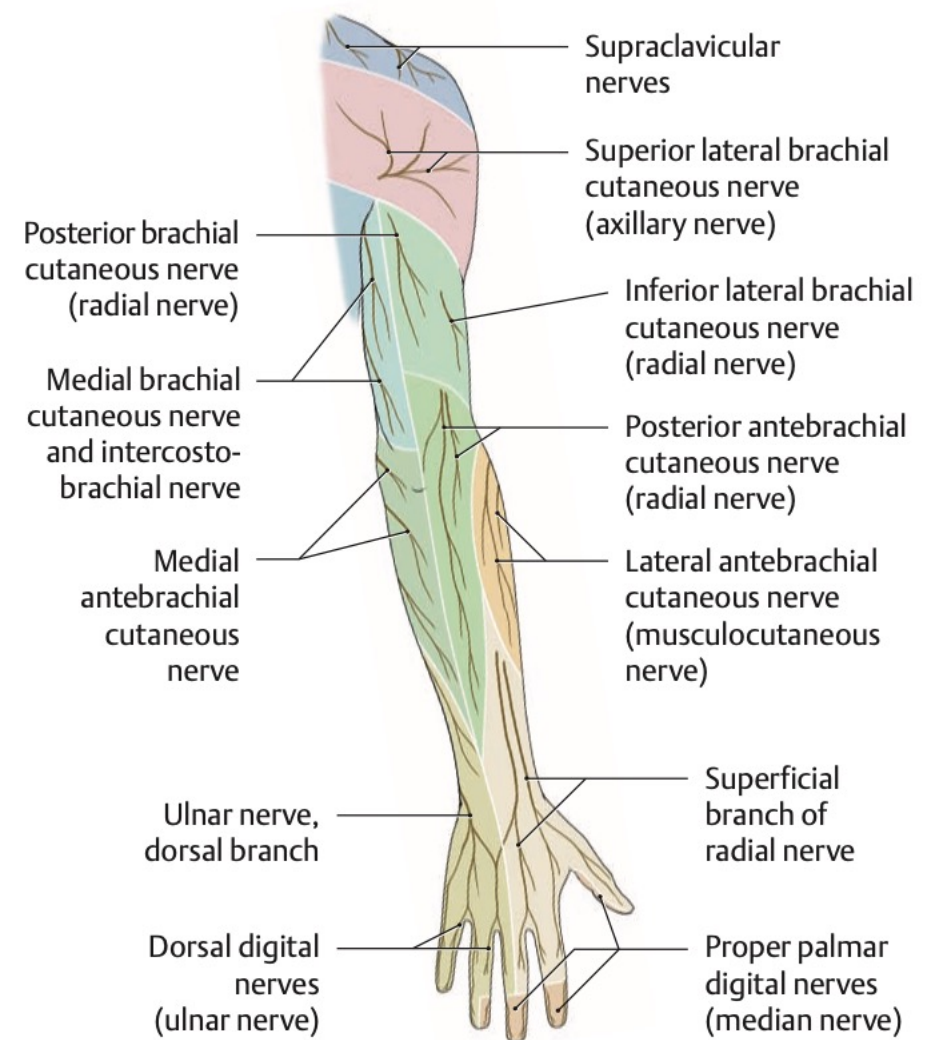
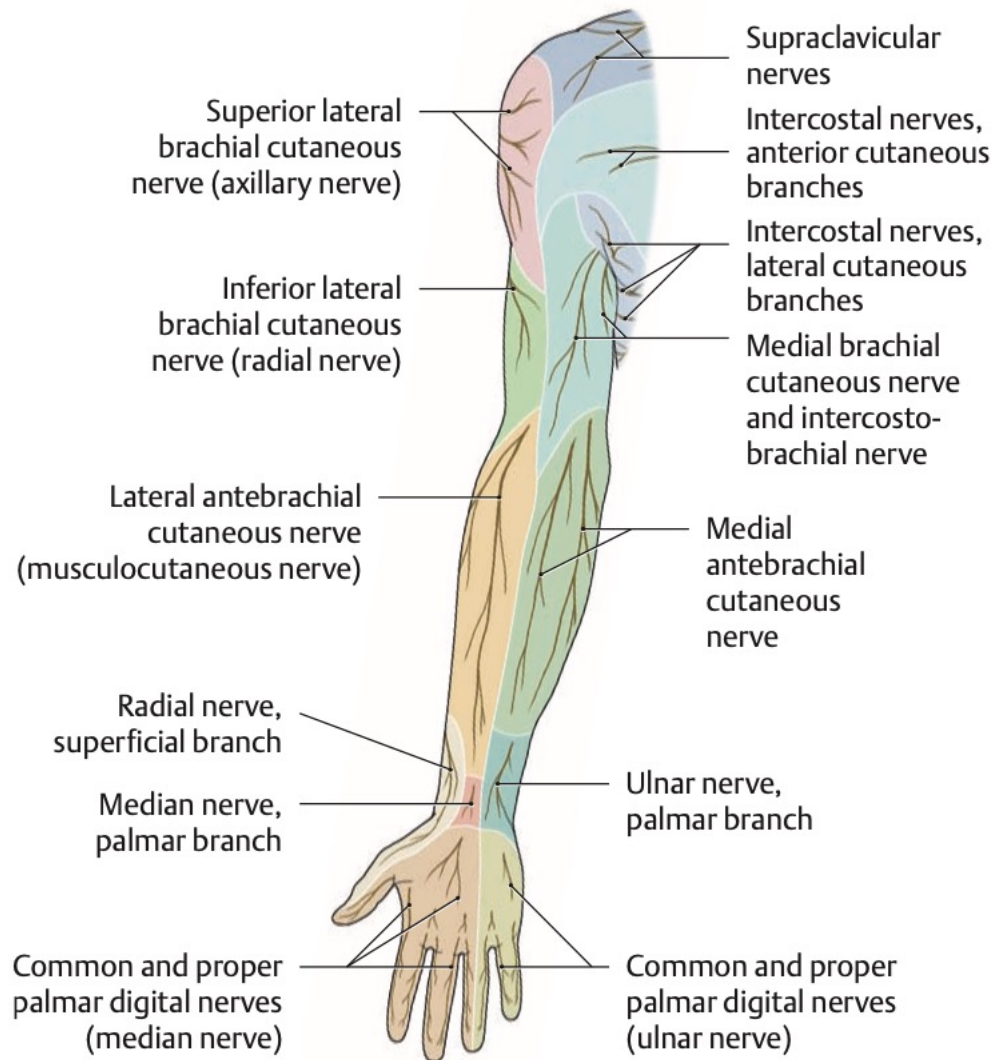
Nervi manus



Areae radicales



Areae nervinae



Nervi antebrachii

♦ N. ulnaris

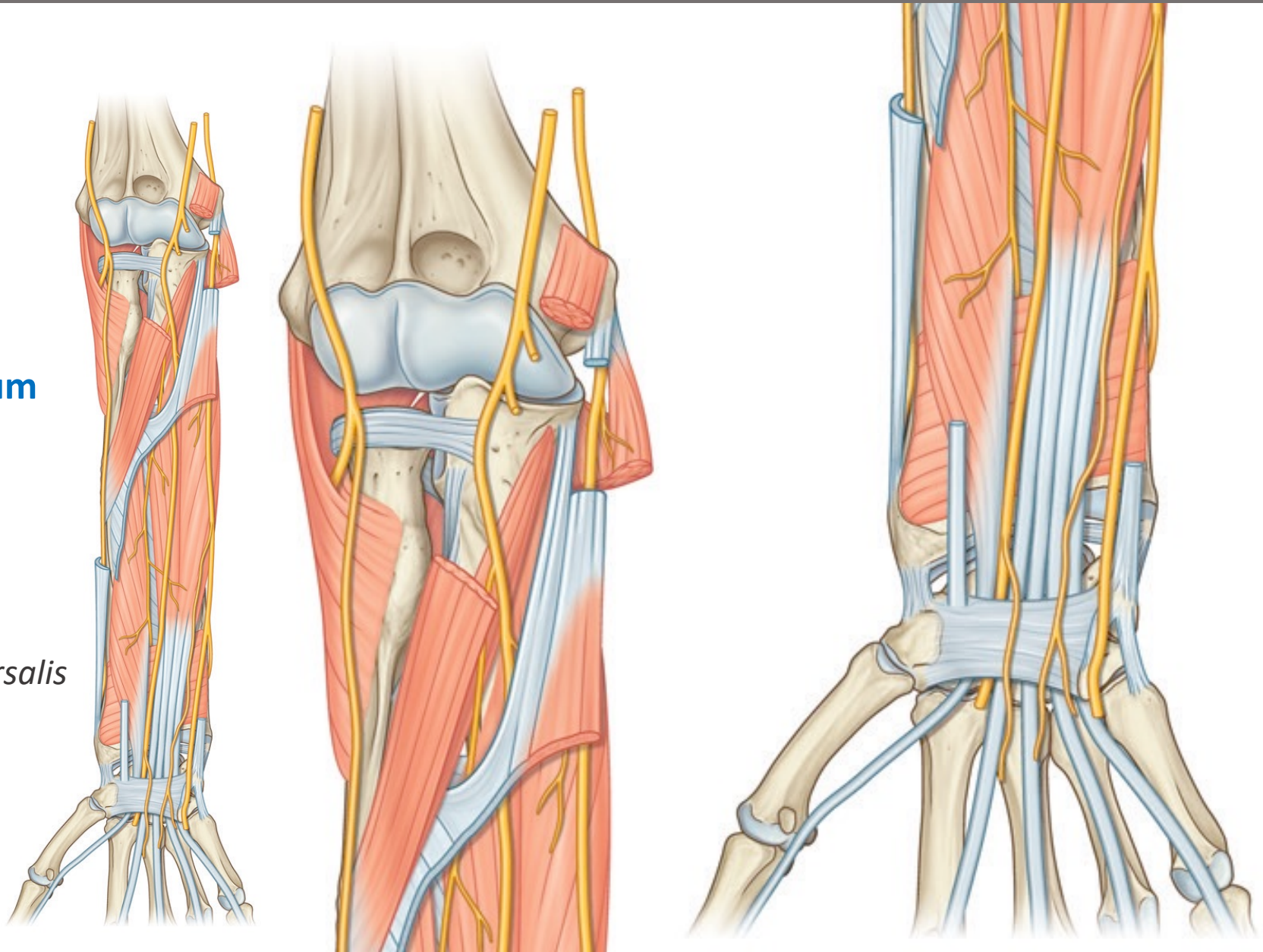
- ♦ *Ramus dorsalis*
- ♦ *Ramus palmaris*

♦ N. medianus

- ♦ *Retinaculum flexorum*
- ♦ *Ramus palmaris*

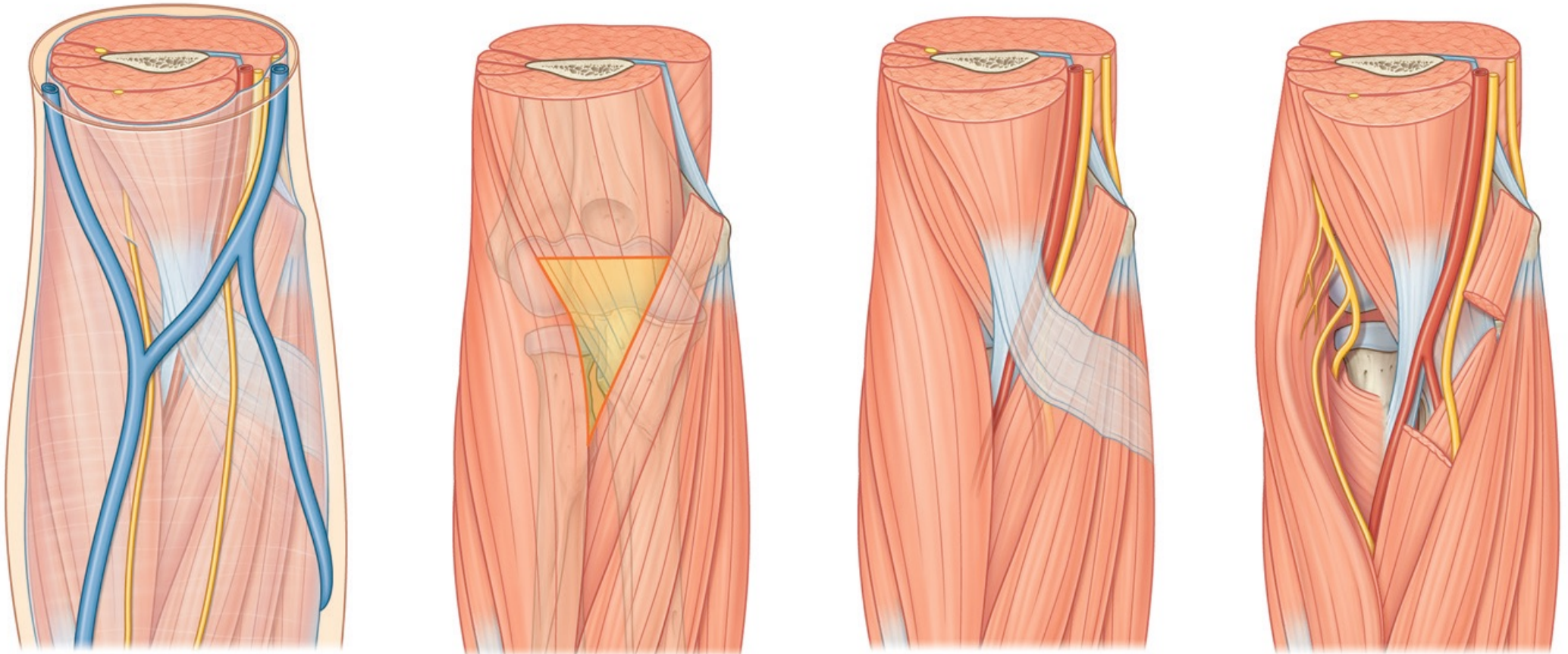
♦ N. radialis

- ♦ *Ramus superficialis*
- ♦ *Ramus profundus*
 - ♦ *N. interosseus dorsalis*

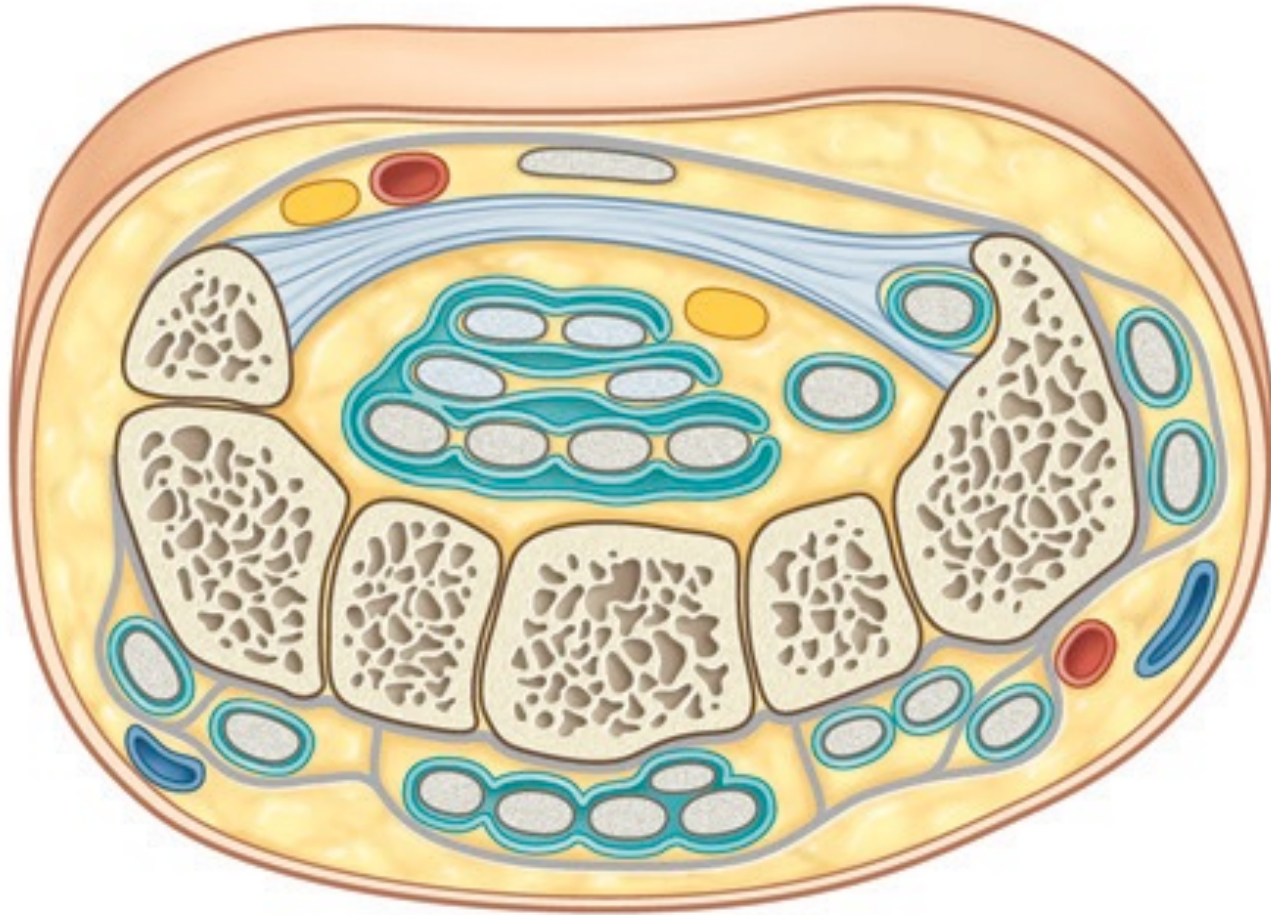


Nervi antebrachii

- ♦ v. cephalica, v. basilica, v. mediana cubiti
- ♦ *a. brachialis (a. radialis, a. ulnaris), n. medianus, n. cutaneus antebrachii med, lat., n. radialis*
- ♦ *CAVE: N. ulnaris - za mediálným epikondylem !*



Canalis carpalis



♦ U - space

- ♦ *Tuberculum ossis trapezii*
- ♦ *Os pisiforme*

♦ below retinaculum

- ♦ ***N. medianus***
- ♦ *Mm. flexores digitorum superf. et prof. (T)*
- ♦ *M. flexor pollicis longus (T)*

♦ In retinaculum

- ♦ *M. flexor carpi radialis (T)*

♦ Above retinaculum

- ♦ ***N. ulnaris***
- ♦ *A. ulnaris*
- ♦ *M. palmaris longus (T)*

Nervi membri inferioris

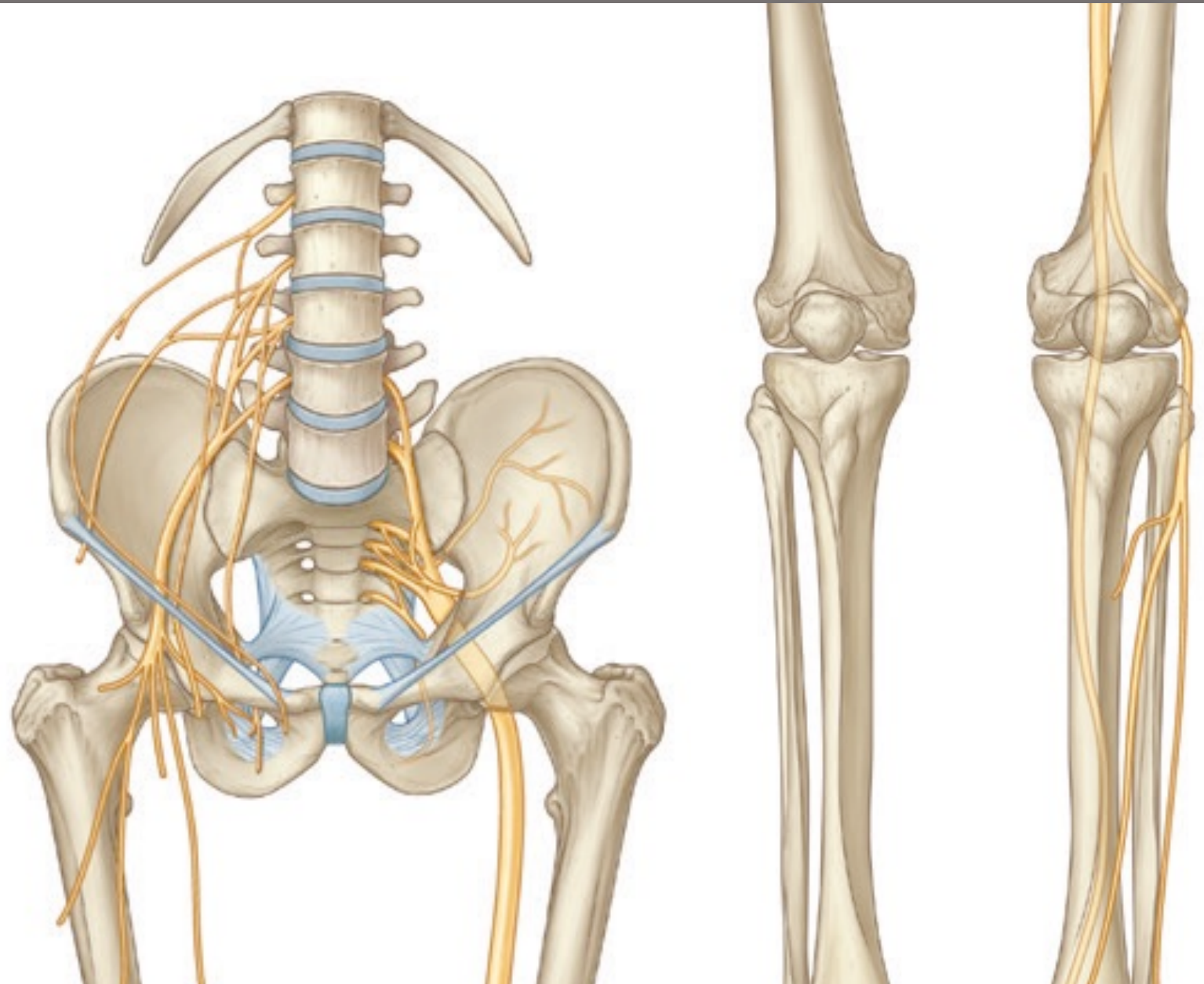
- ♦ **Nn. clunium – rami dorsales**

- ♦ **Plexus lumbalis**

- ♦ N. ilioinguinalis
- ♦ N. iliohypogastricus
- ♦ N. genitofemoralis
- ♦ N. femoralis
- ♦ N. obturatorius

- ♦ **Plexus sacralis**

- ♦ N. gluteus superior
- ♦ N. ischiadicus
 - ♦ N. tibialis
 - ♦ N. fibularis (peroneus)
- ♦ N. gluteus inferior
- ♦ N. pudendus



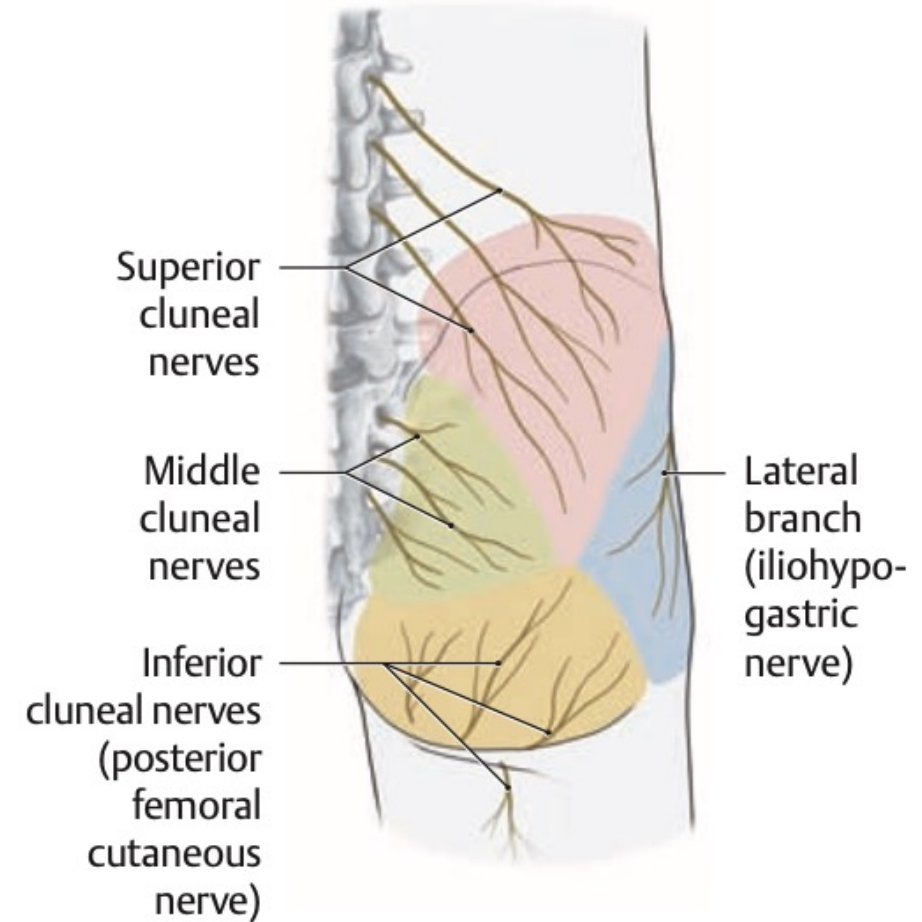
Nervi clunium



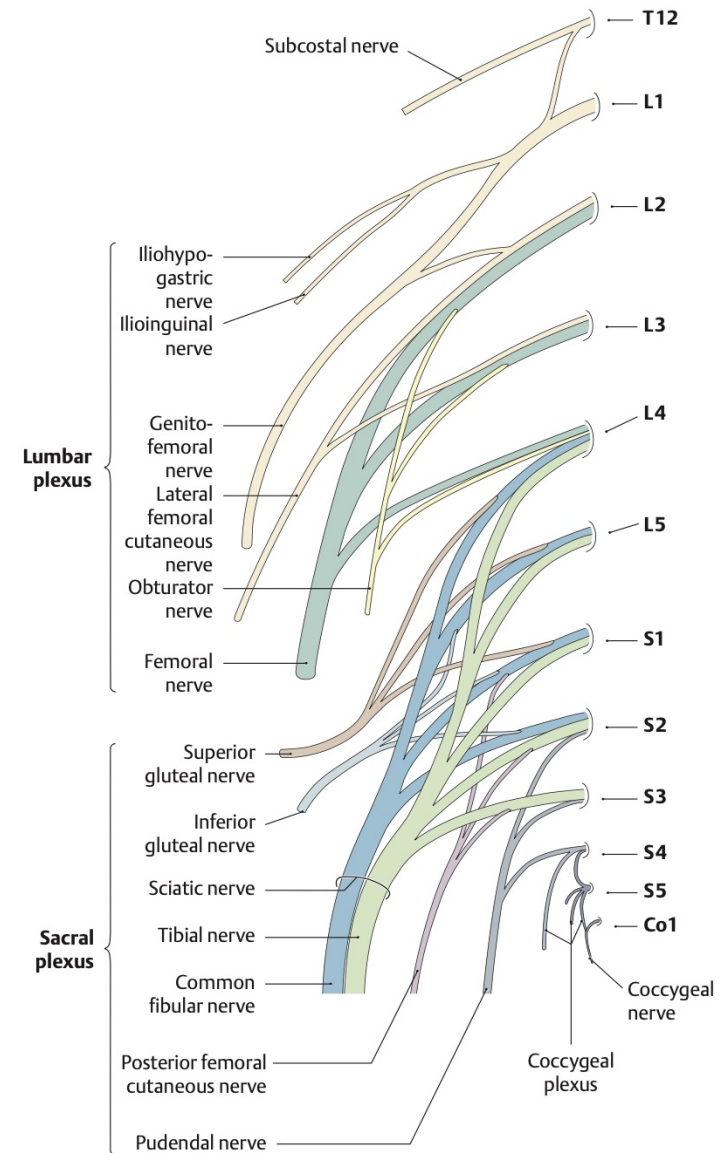
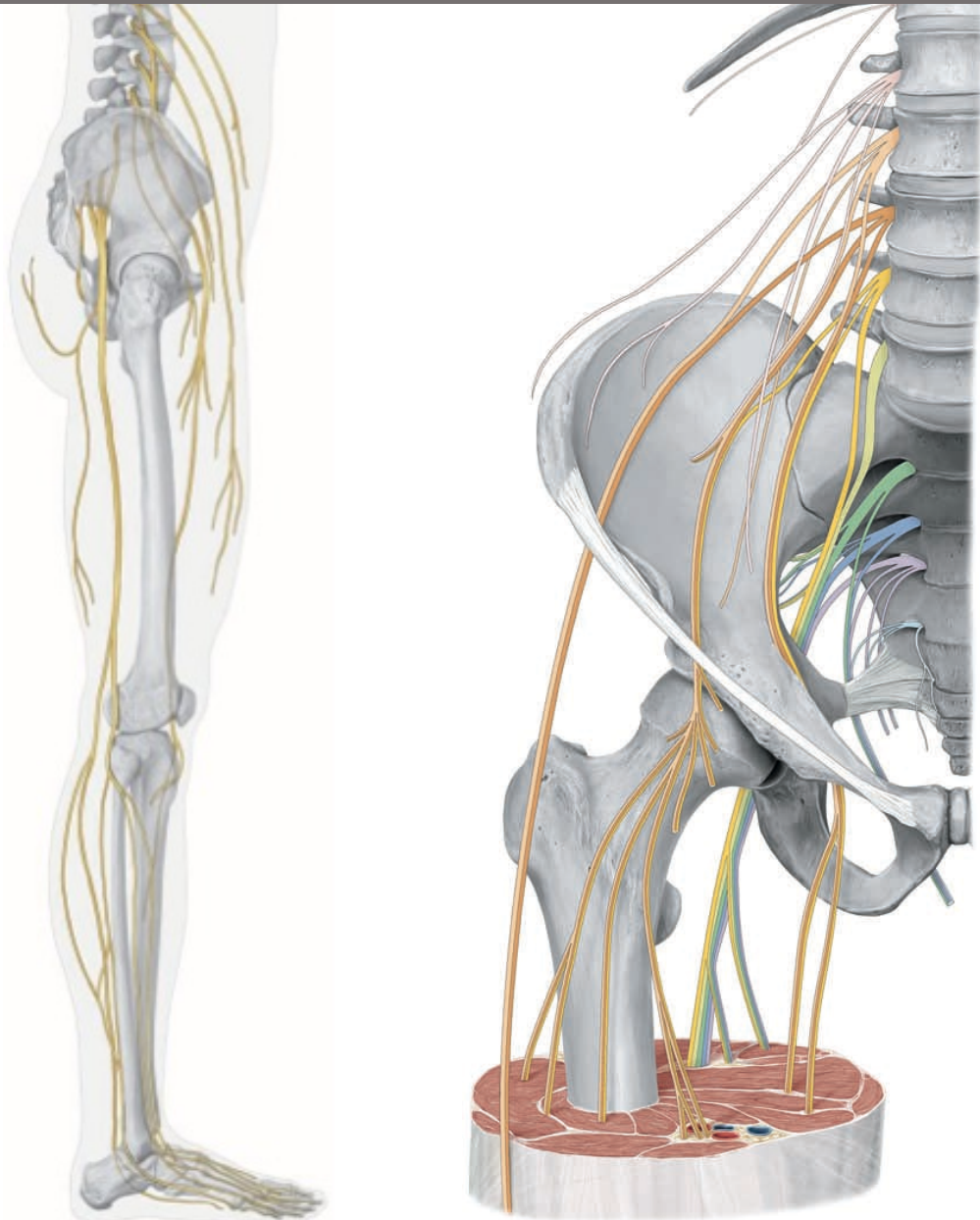
- **Nn. clunium**
- **Rami dorsales nn. lumbalium**
- **Nn. clunium superiores L1-4**
- **Nn. clunium medii S1-S3**

- **Cave:**

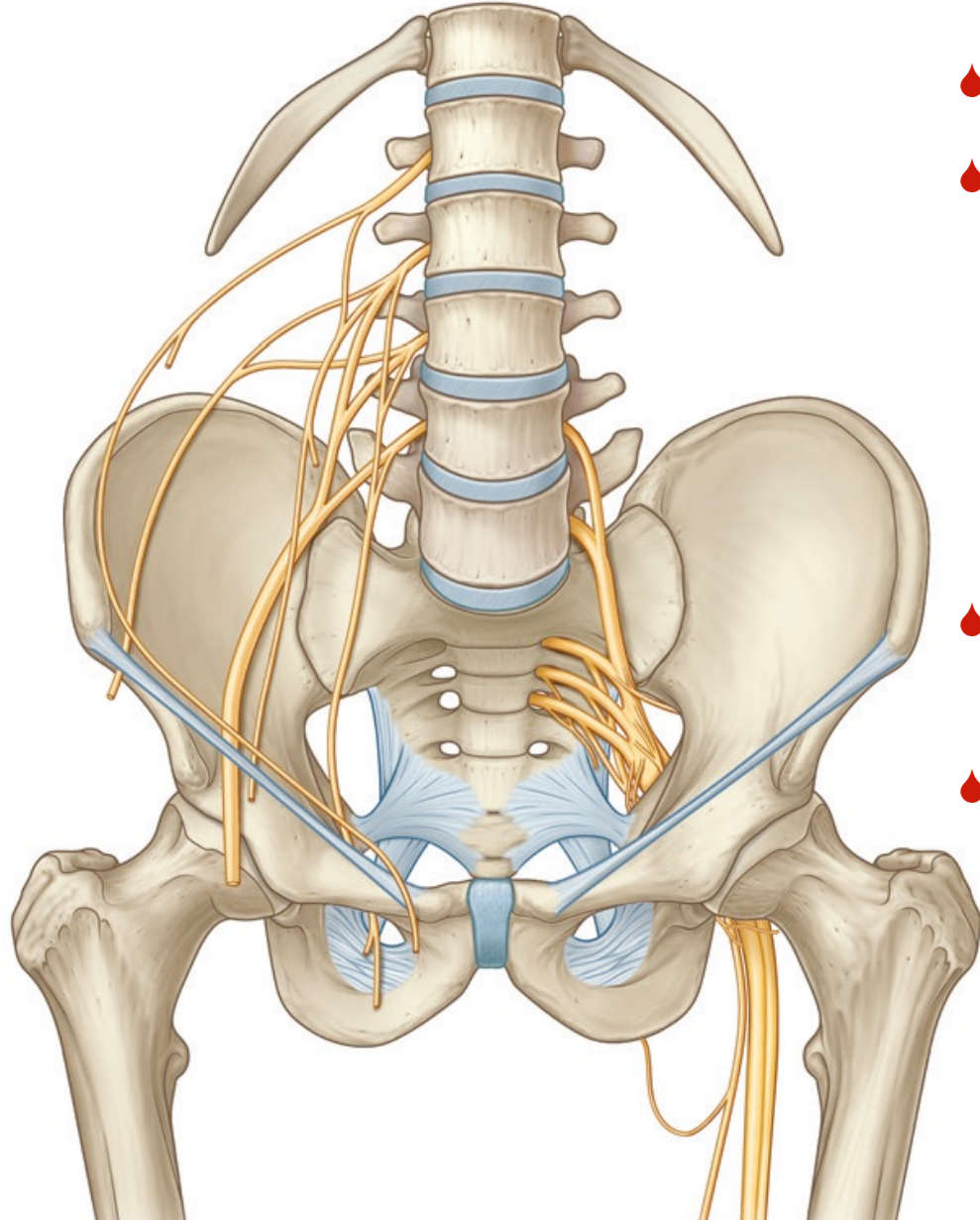
- **Nn. clunium inferiores S1-3**
- *From plexus sacralis branches of n. cutaneus femoris post.*



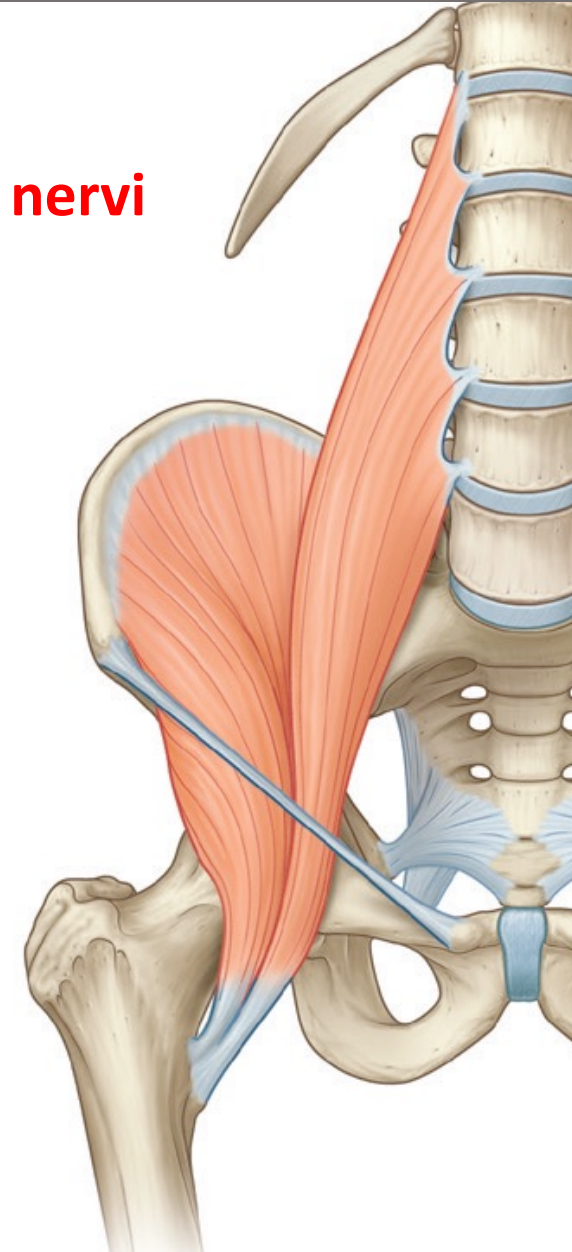
Nervi membri inferioris



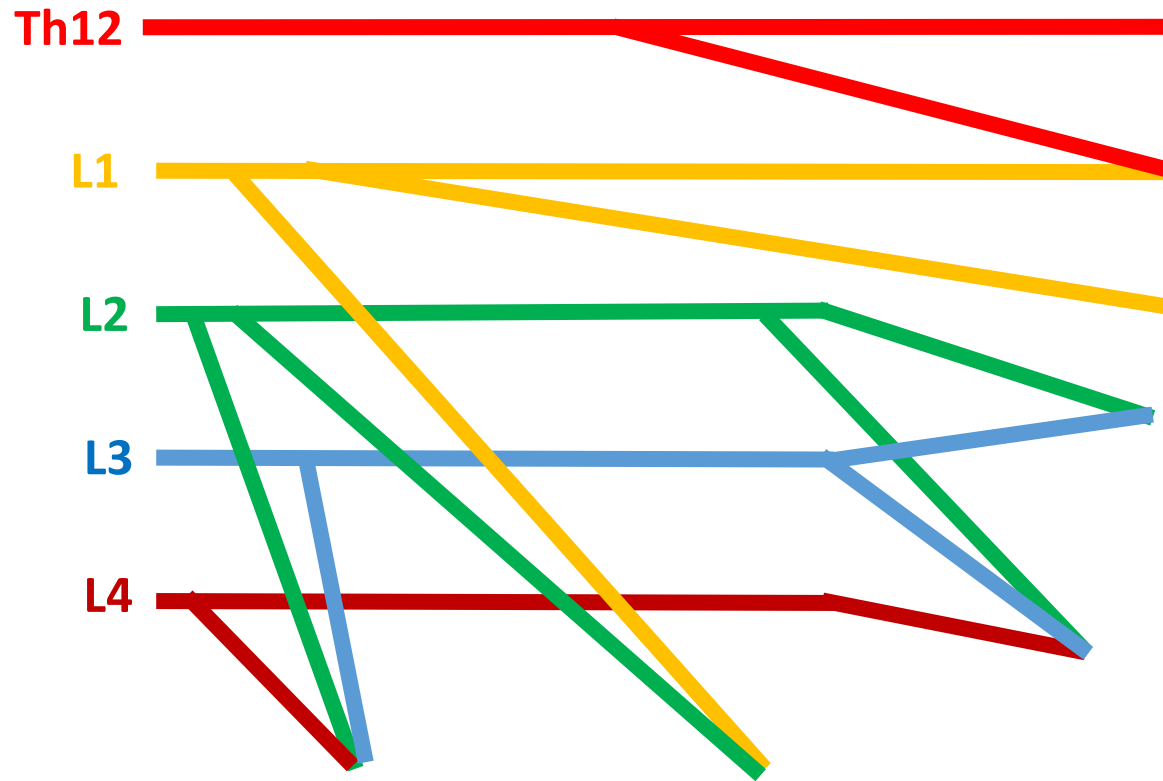
Plexus lumbalis



- ♦ **Plexus lumbalis** - *m. psoas major*
- ♦ **Lateral from m. psoas – majority of nervi**
 - ♦ N. subcostalis
 - ♦ N. iliohypogastricus
 - ♦ N. ilioinguinalis
 - ♦ N. cutaneus femoris
 - ♦ N. femoralis
- ♦ **Ventral from m. psoas**
 - ♦ N. genitofemoralis
- ♦ **Medial from m. psoas**
 - ♦ N. obturatorius

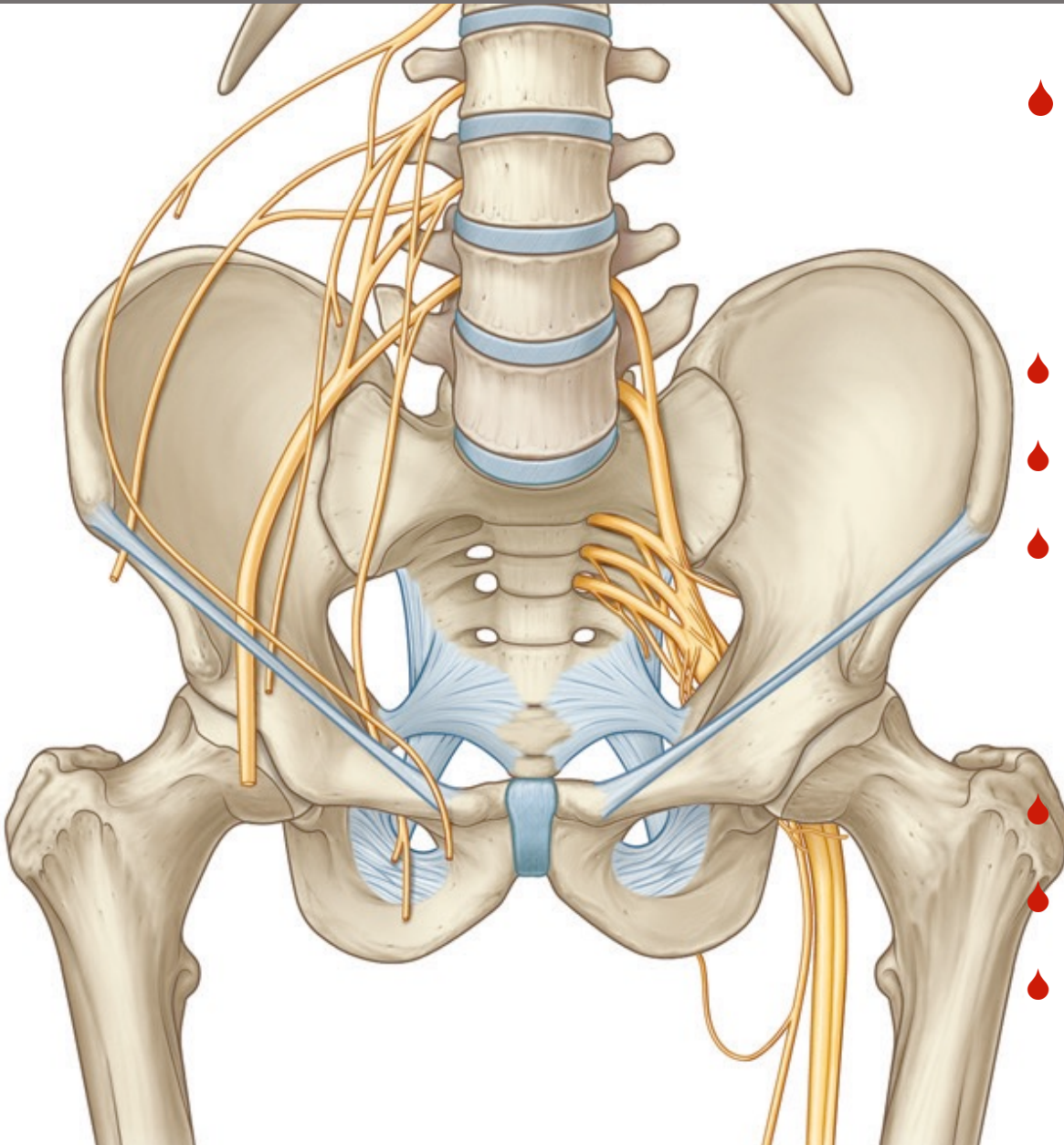


Plexus lumbalis



- **N. subcostalis Th12**
- **N. iliohypogastricus Th12-L1**
- **N. ilioinguinalis L1**
- **N. cutaneus femoris L2,3**
- **N. genitofemoralis L2-3**
- **N. femoralis L2-4**
- **N. obturatorius L2-4**

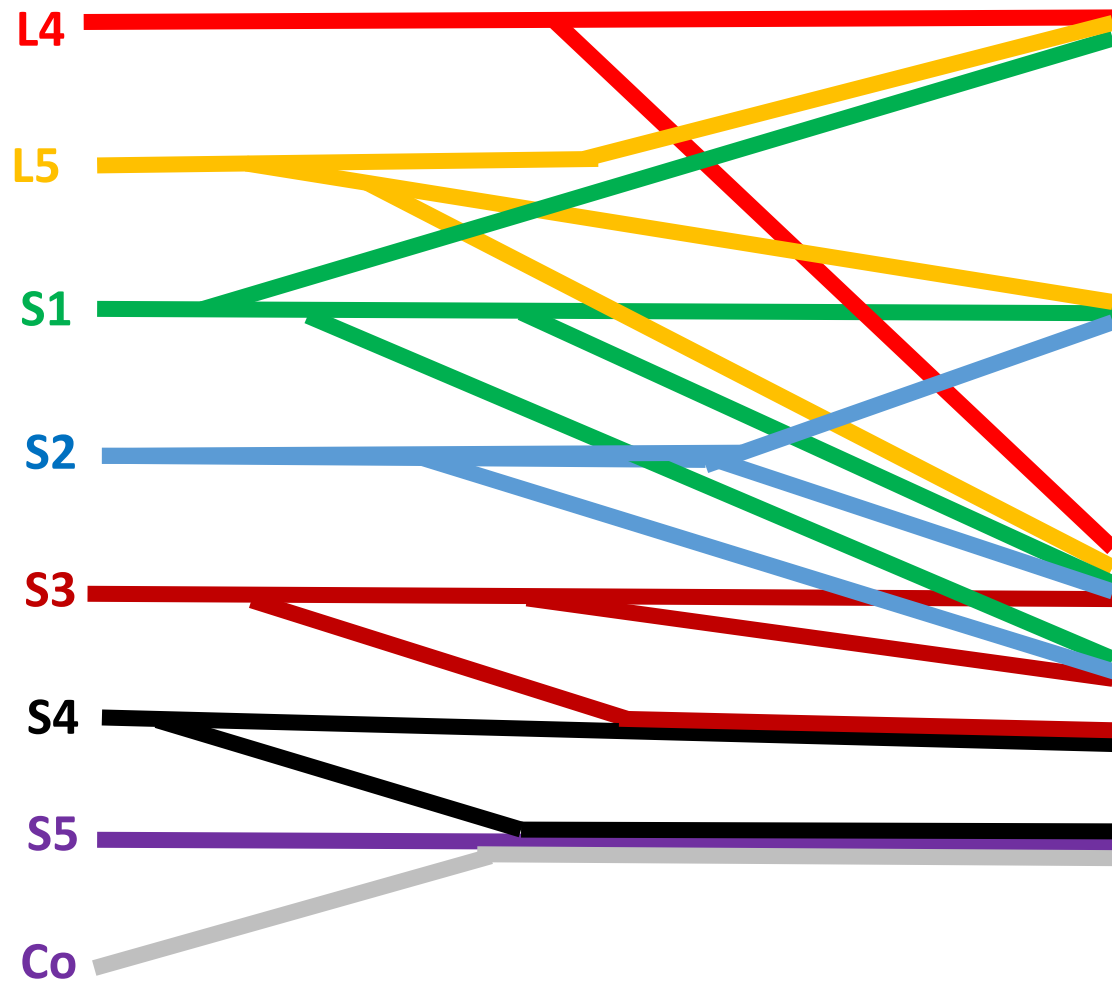
Plexus sacralis



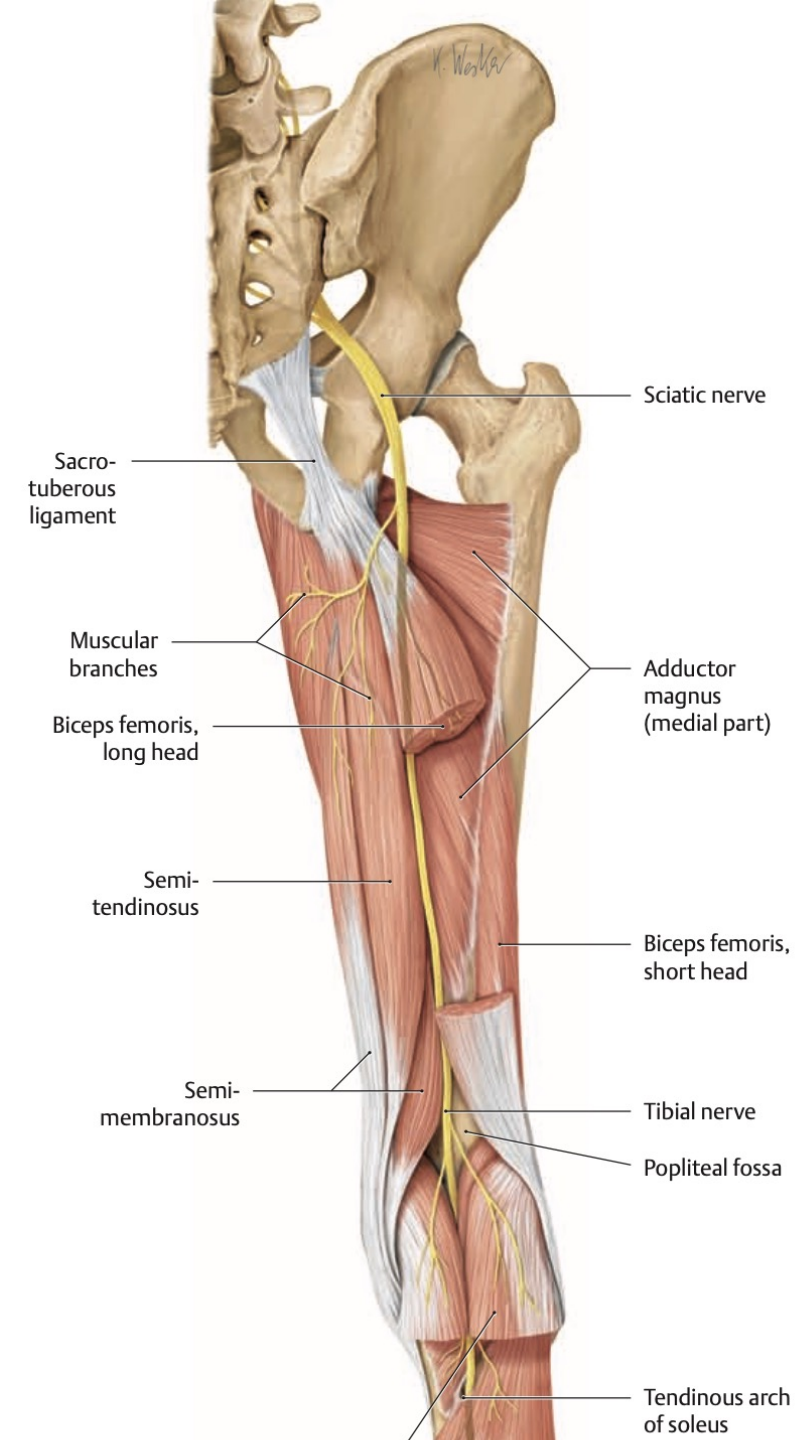
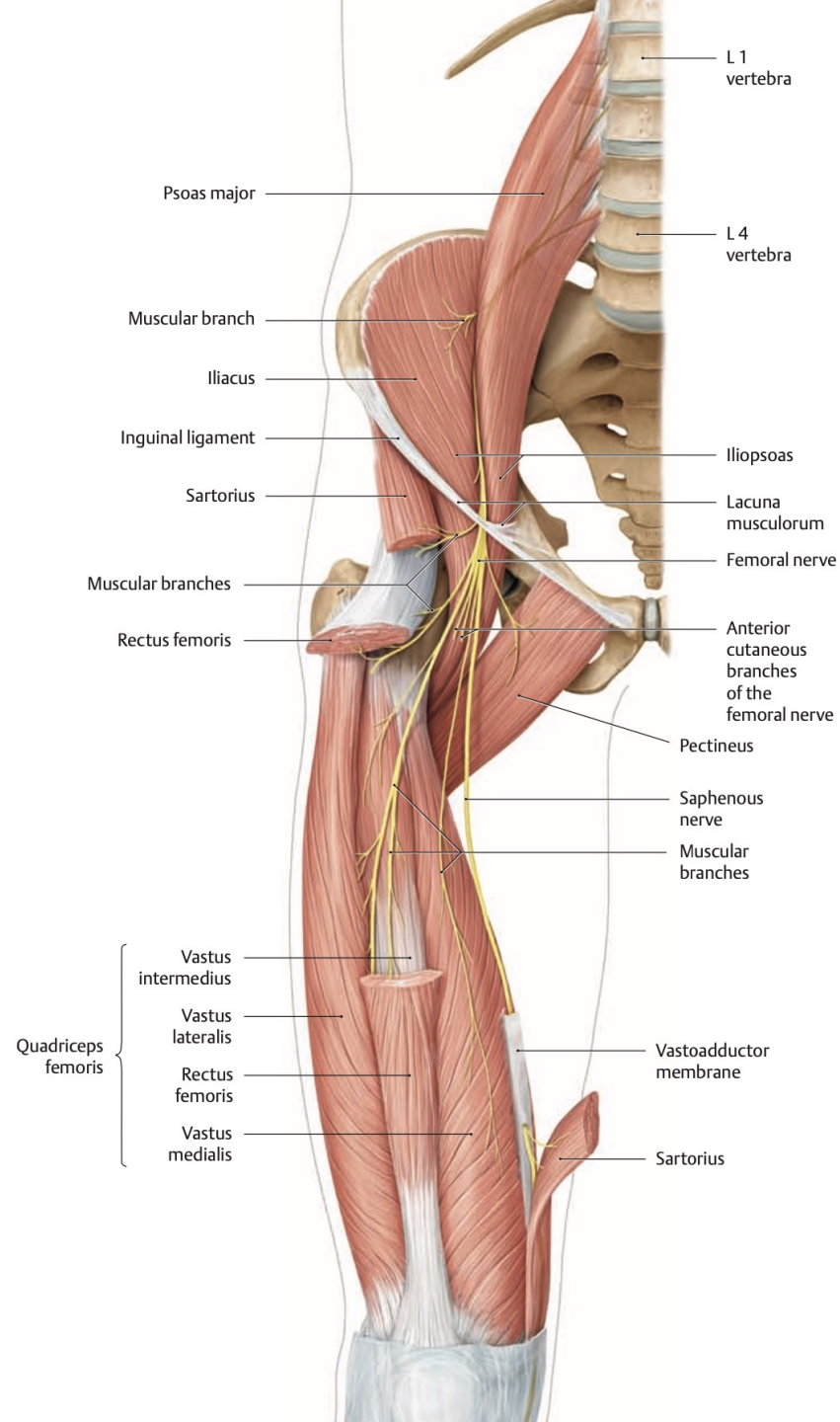
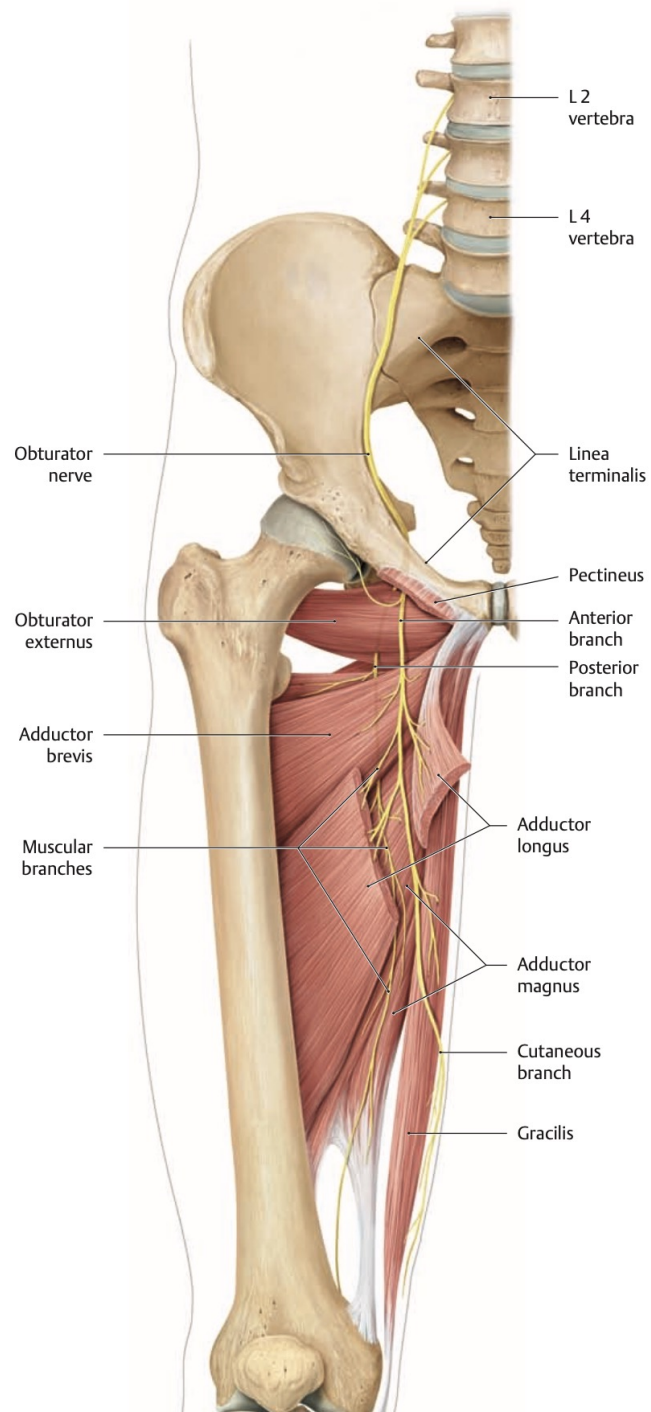
♦ Plexus sacralis

- ♦ plexus ischiadicus
- ♦ Pl. Pudens
- ♦ Pl. Coccygeus
- ♦ N. gluteus sup. L4-S1 - foramen suprapiriforme
- ♦ N. gluteus inferior L5-S2 - for. infrapiriforme
- ♦ N. ischiadicus L4-S3 - for. infrapiriforme
 - ♦ Fossa poplitea
 - ♦ N. fibularis (peroneus) communis (superficialis et profundus)
 - ♦ N. tibialis
- ♦ N. cutaneus femoris post. S1-3 - for. infrapiriforme
- ♦ N. pudens S4-5
- ♦ N. coccygeus S4-Co

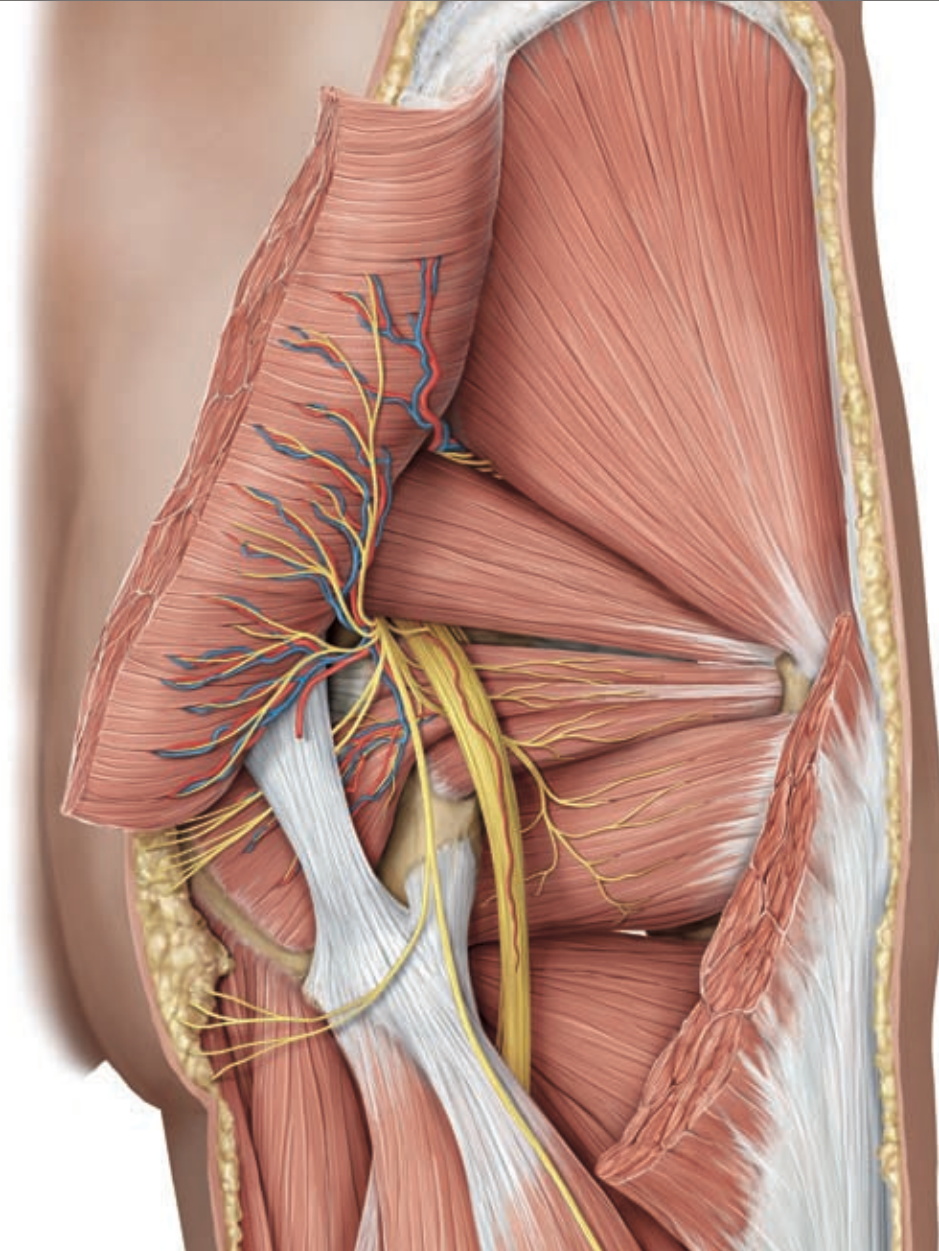
Plexus sacralis

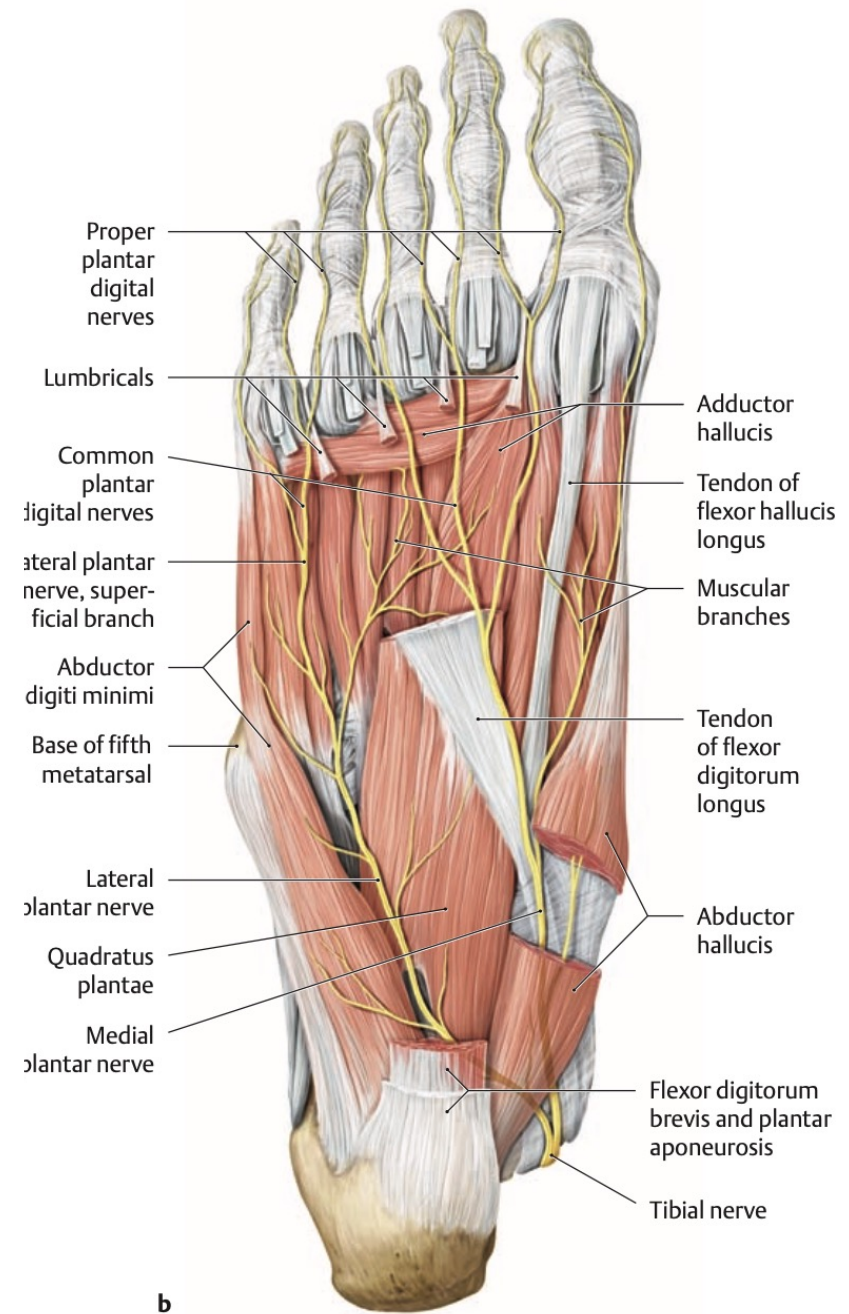
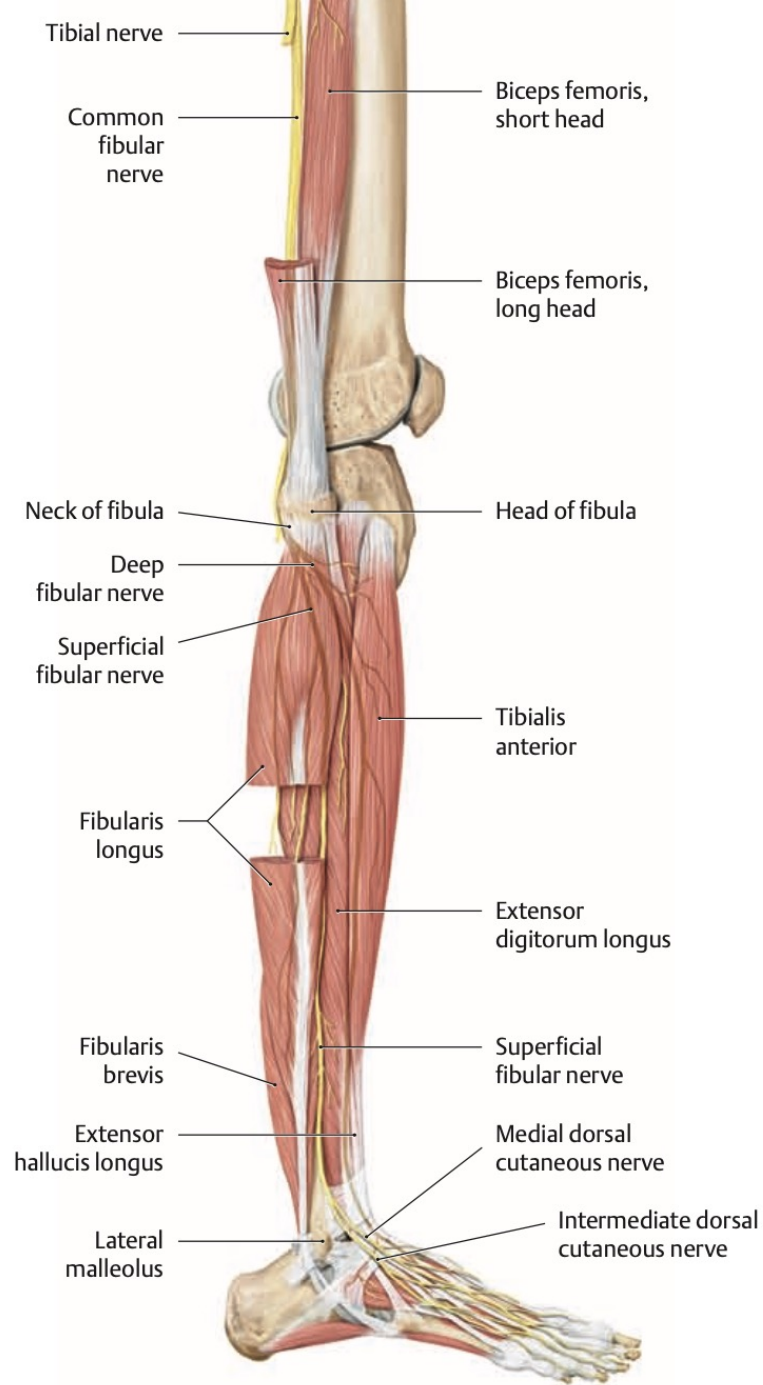
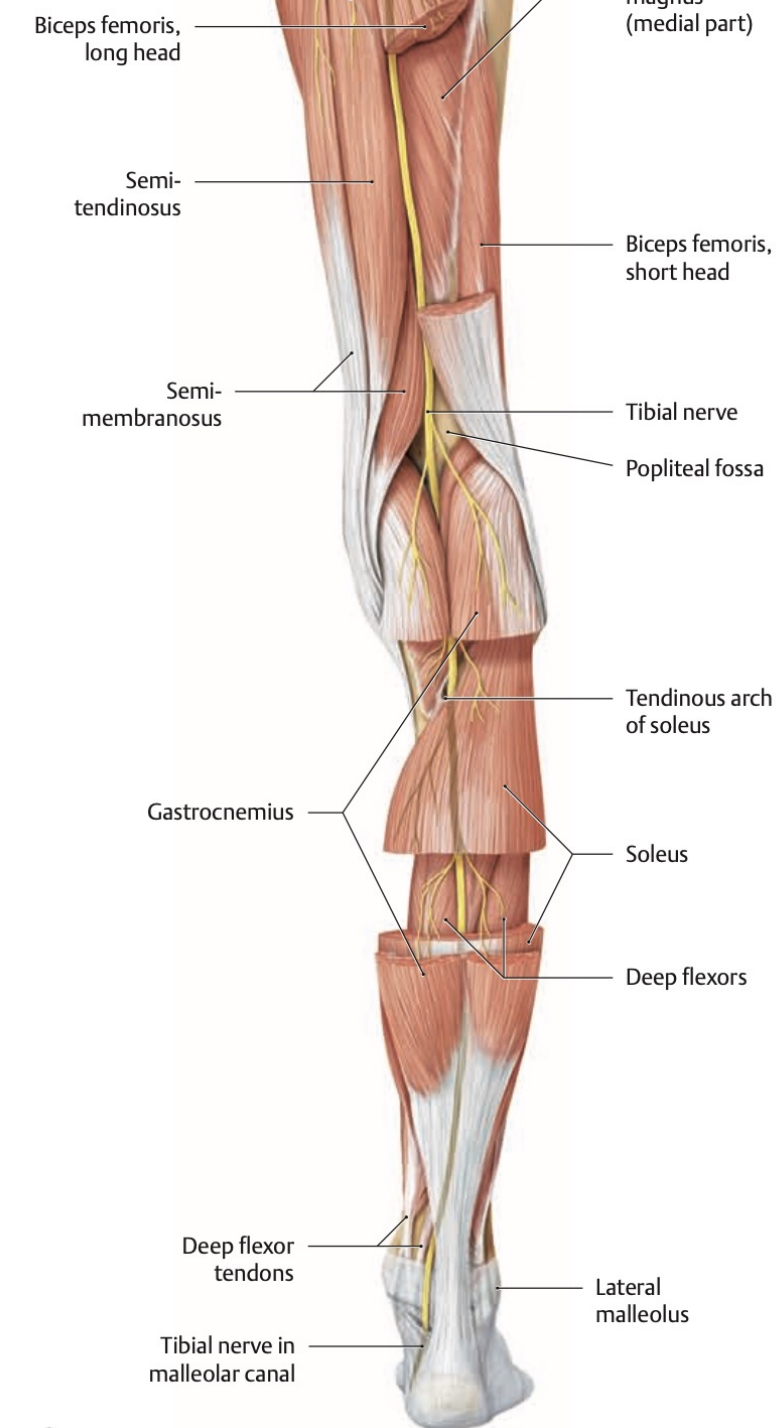


- 🔥 N. glutaesus sup L4-S1
- 🔥 N. glutaesus inferior L5-S2
- 🔥 N. ischiadicus L4-S3
- 🔥 N. cutaneus femoris posterior S1-3
- 🔥 N. pudendus S4-5
- 🔥 N. cocygeus S4-Co

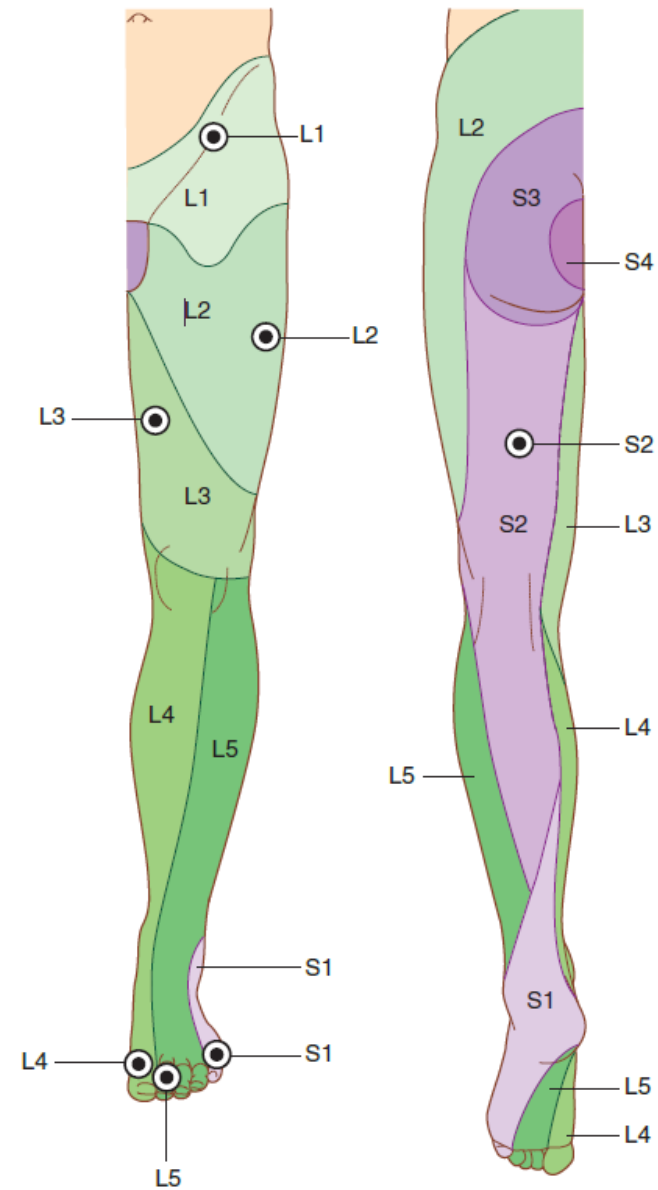
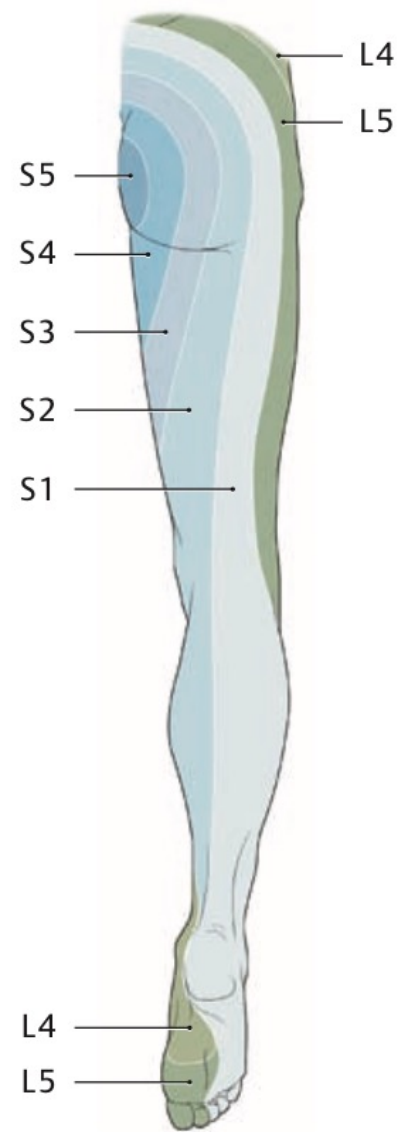


Nervus ischiadicus – sciatic nerve

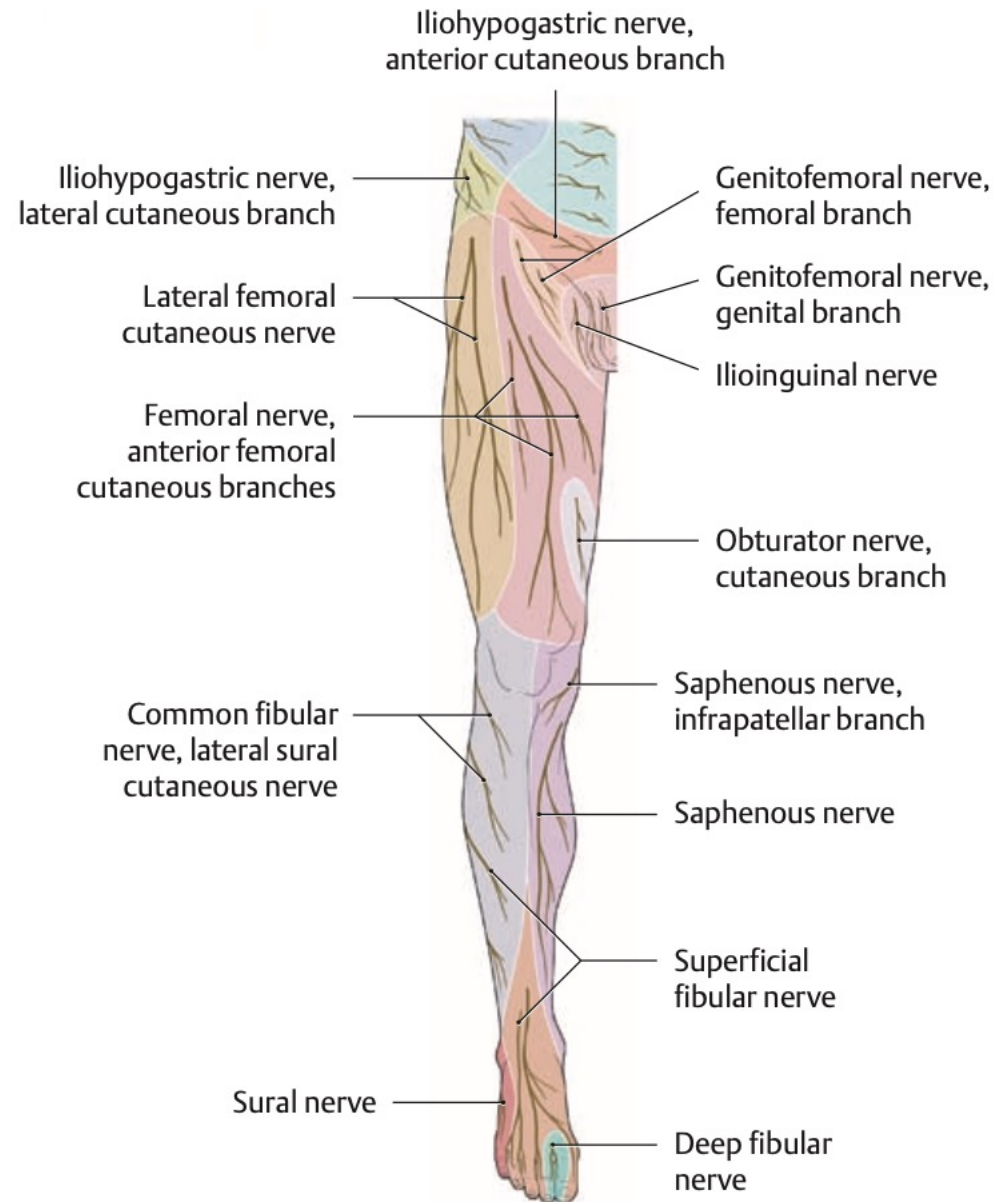
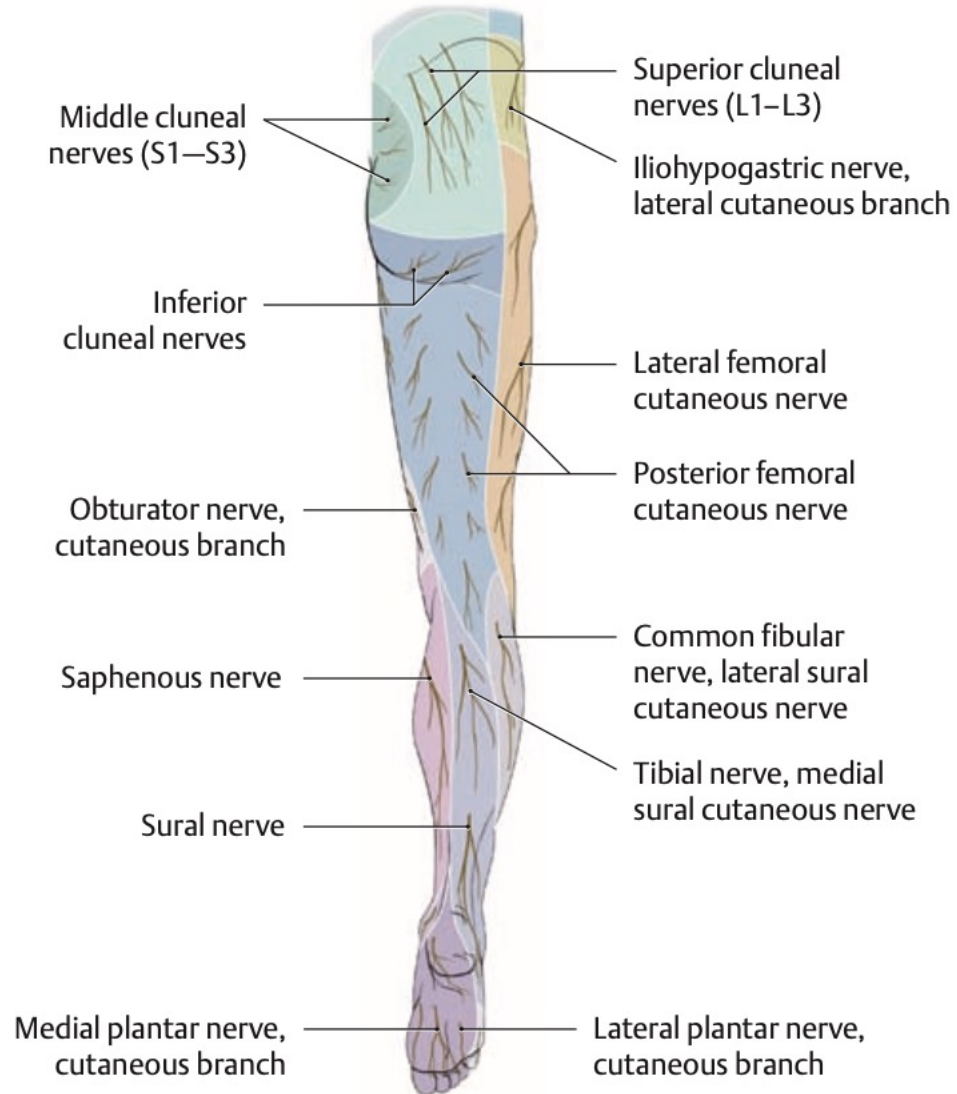




Areae radicales



Areae nervinae



Peripheral nerves

Prof. MUDr. Jiří Ferda, Ph.D.

Vyobrazení Gray's Anatomy a Thieme Atlas of Anatomy

