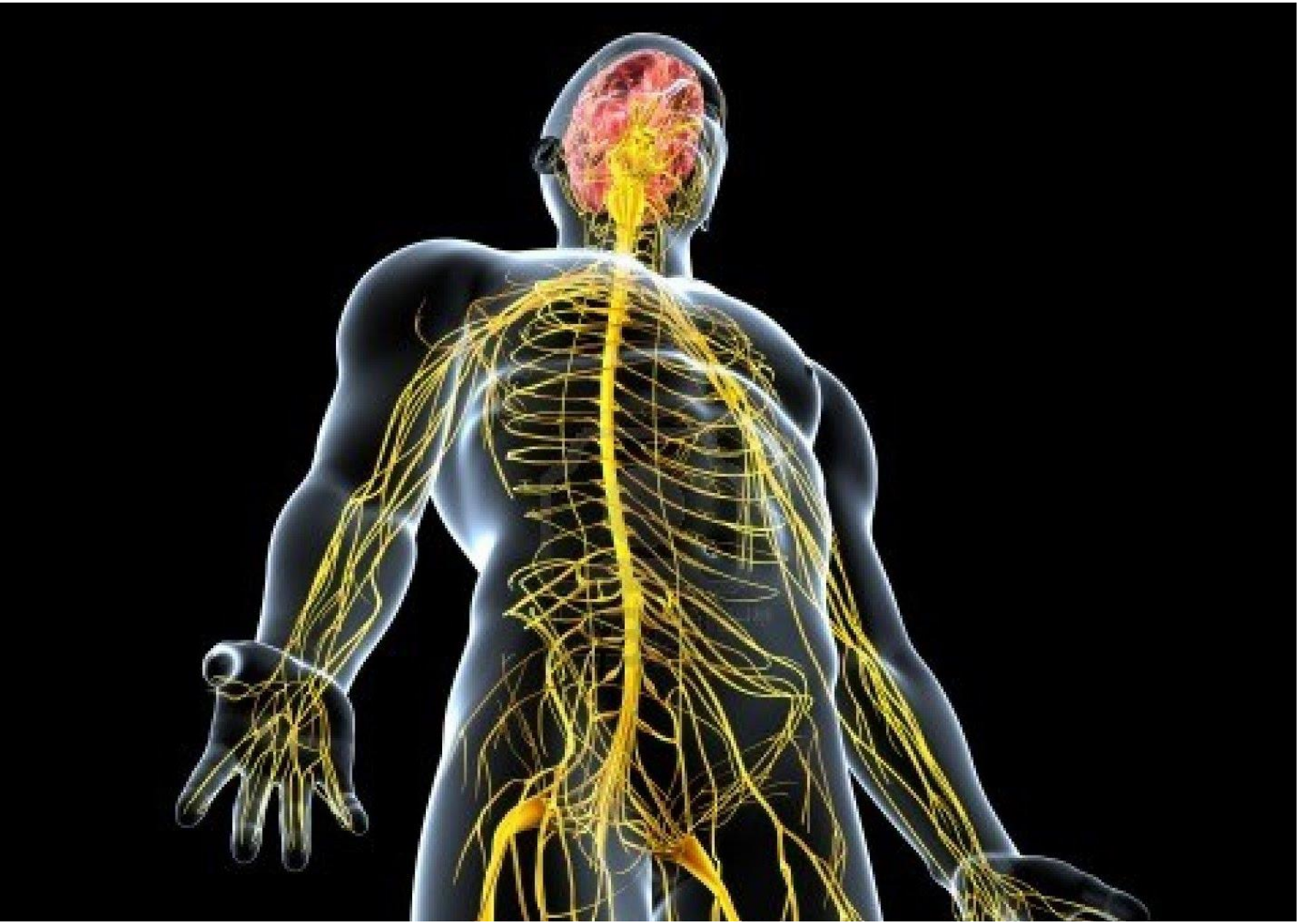
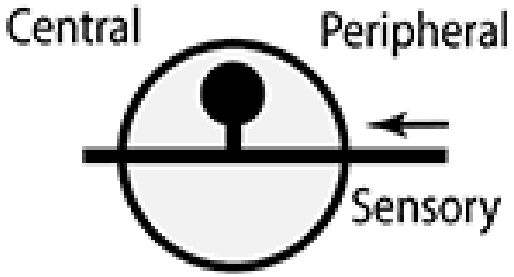
PNS- Spinal Nerves



MUDr. Azzat Al-Redouan

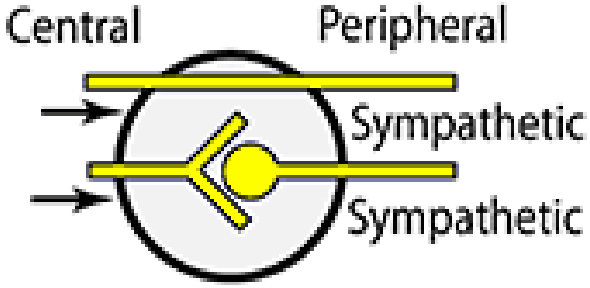
GANGLIA

3 TYPES OF GANGLIA



SENSORY GANGLION has cell bodies only and NO synapses Examples:

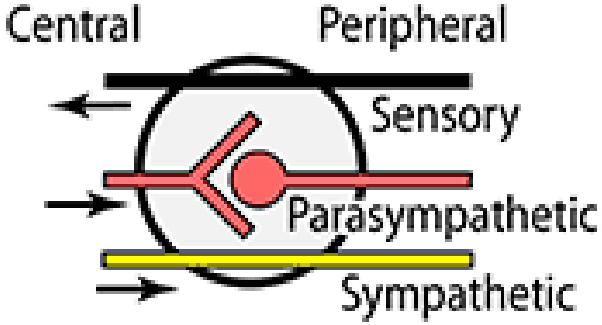
- Posterior (dorsal) root
- Trigeminal
- Geniculate
- Glossopharyngeal
- Vagal



SYMPATHETIC GANGLION has either a synapse or a fibre passing through it to synapse later.

Examples:

- Sympathetic chain
- Sympathetic peripheral ganglia (coeliac, renal, superior mesenteric)

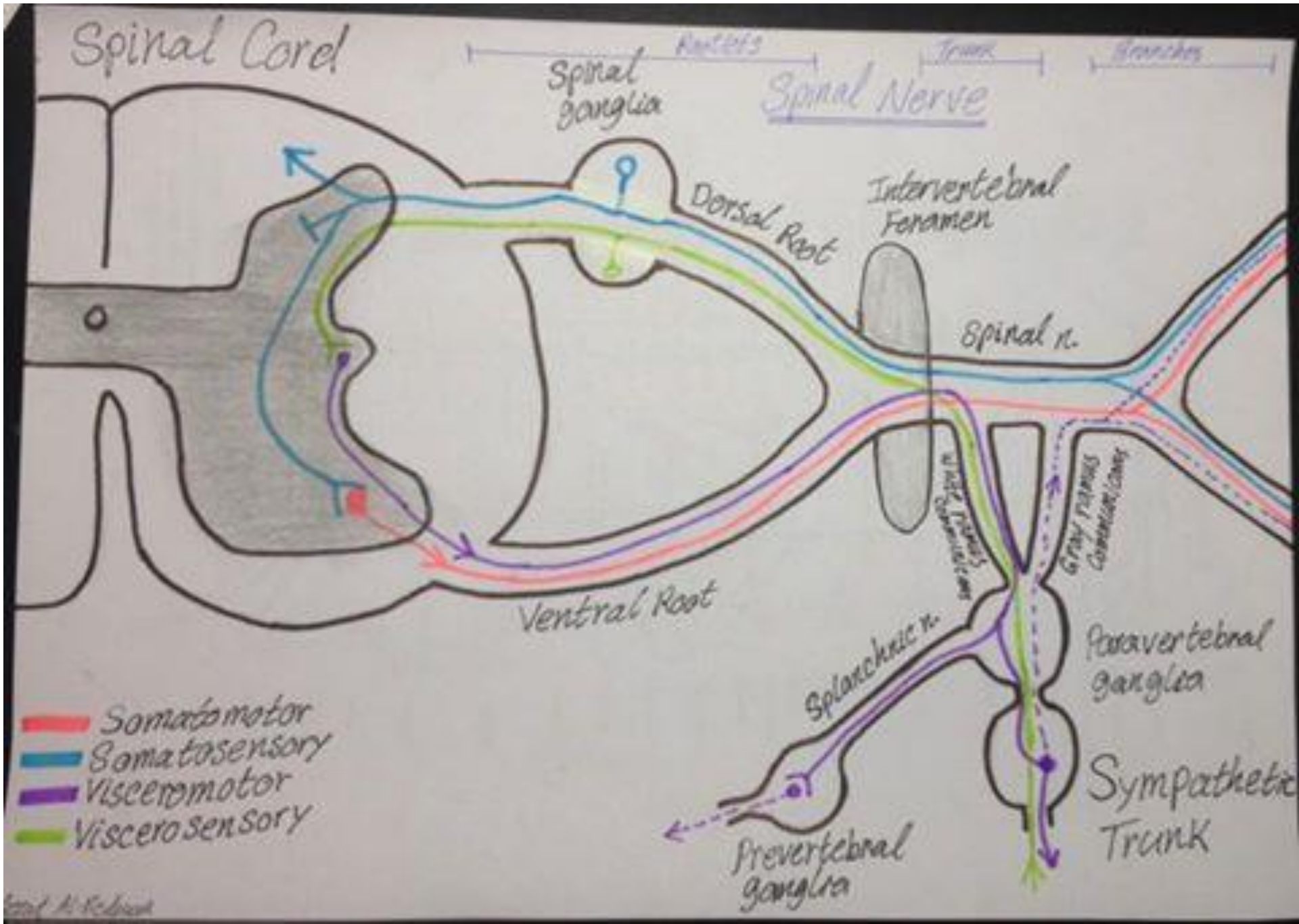


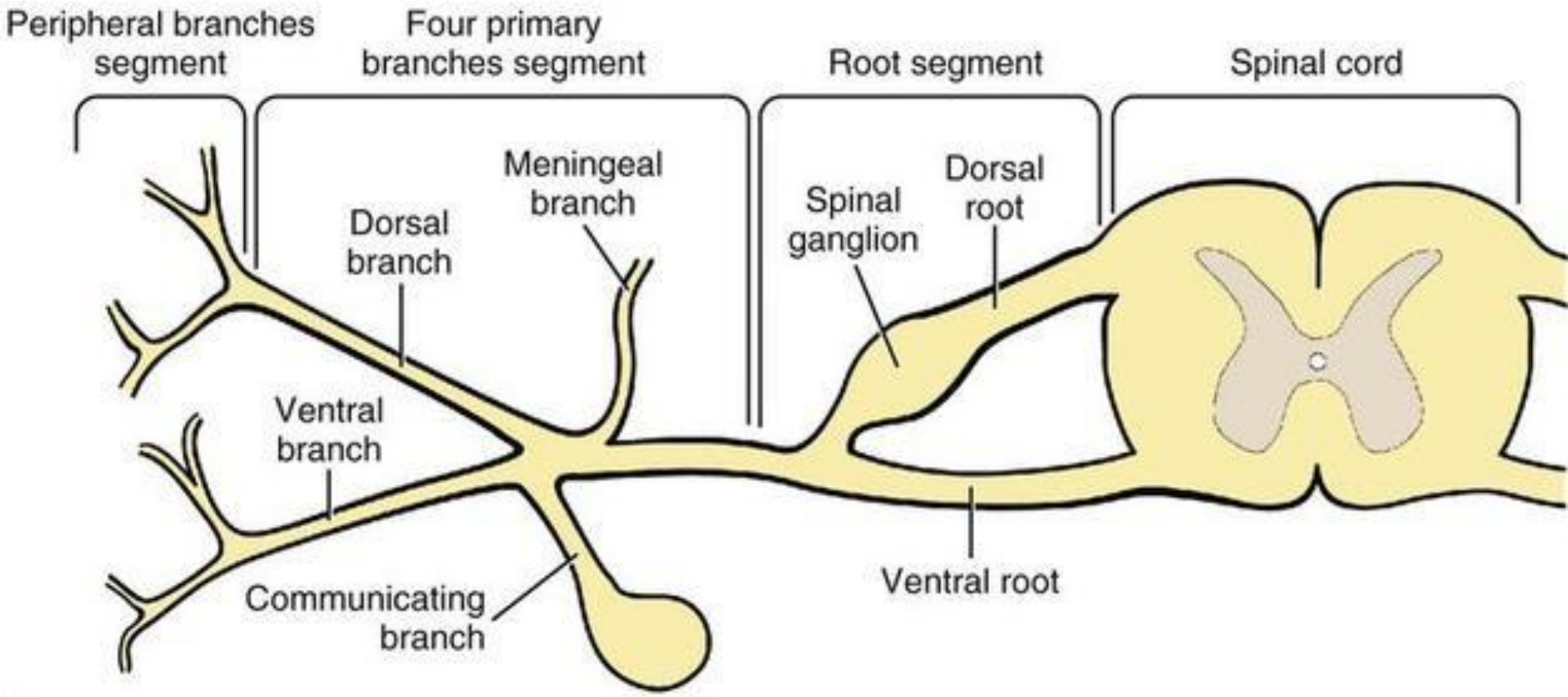
PARASYMPATHETIC GANGLION has parasympathetic nerves synapsing and both a somatic sensory and a sympathetic nerve passing through it. Examples:

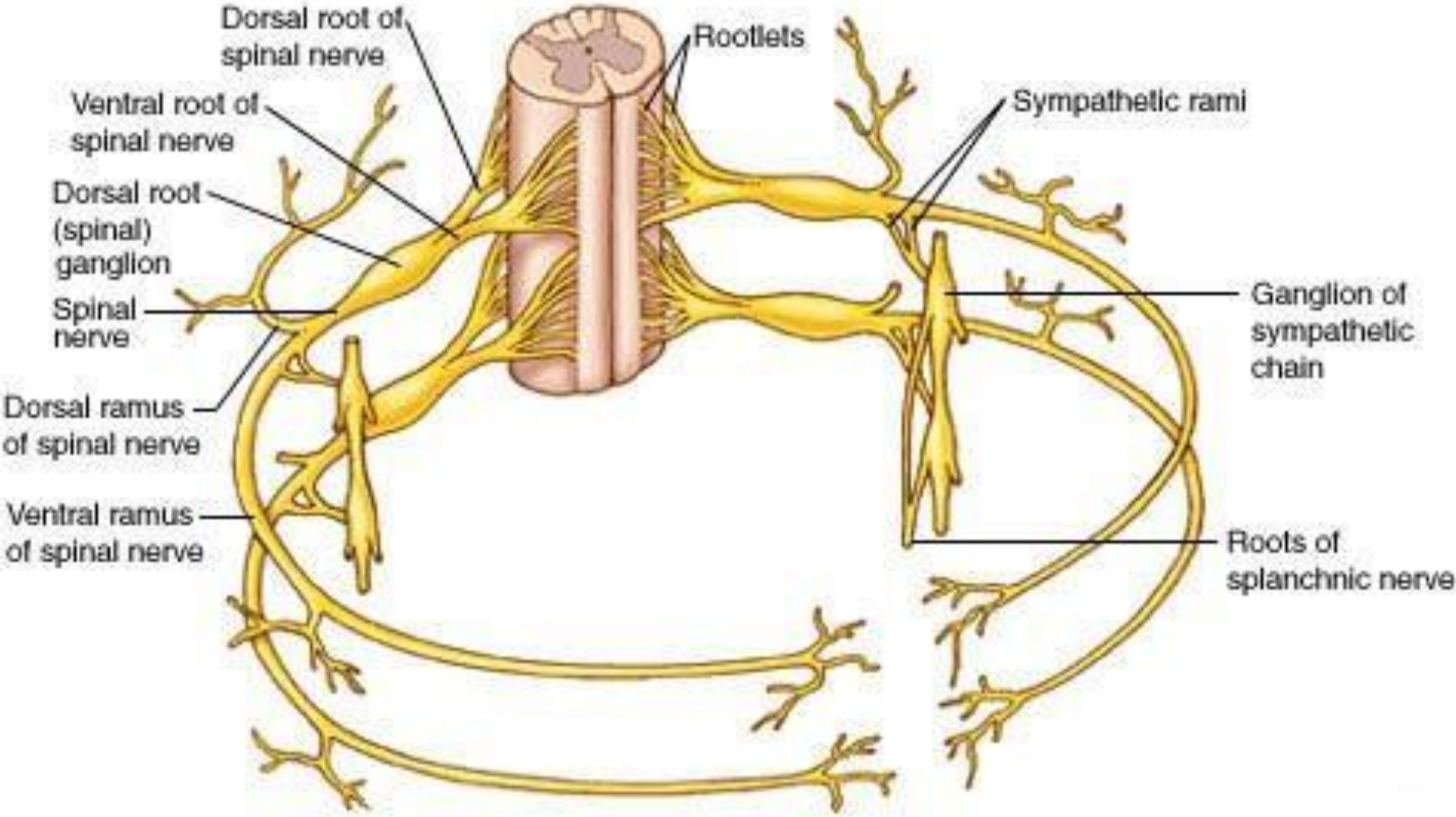
- Ciliary
- Ptergopalatine
- Submandibular
- Otic

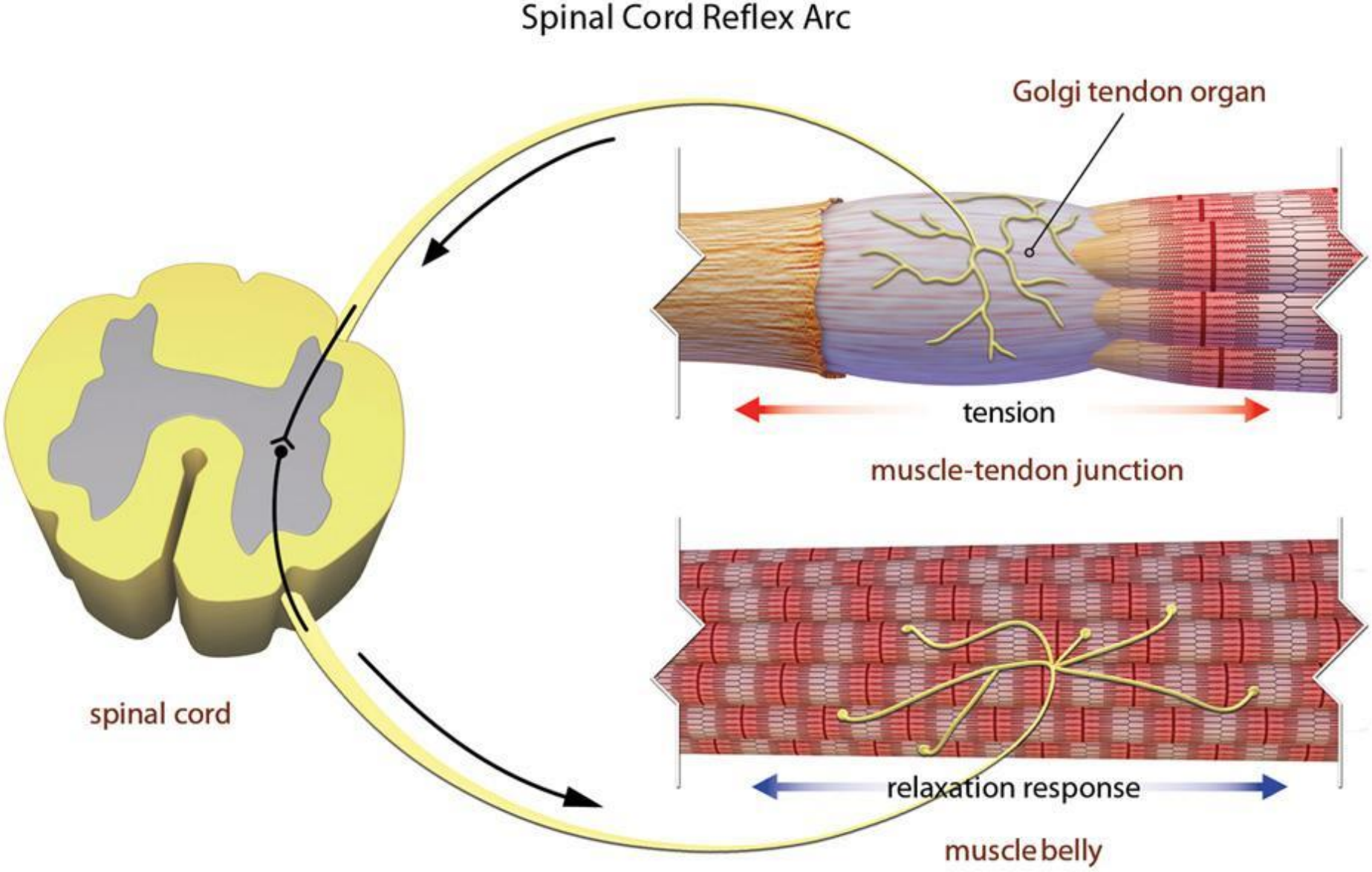
Ganglion

Draw a ganglion


Spinal Cord
Roots
Trunk
Branches
Spinal ganglia
Spinal Nerve
Dorsal Root
Intervertebral Foramen
Spinal n.
Ventral Root
White Rami Communicantes
Gray Rami Communicantes
Splanchnic n.
Paravertebral ganglia
Sympathetic Trunk
Prevertebral ganglia
Somatomotor
Somatosensory
Visceromotor
Viscerosensory


Peripheral branches segment
Four primary branches segment
Root segment
Spinal cord
Meningeal branch
Dorsal branch
Spinal ganglion
Dorsal root
Ventral branch
Communicating branch
Ventral root


Dorsal root of spinal nerve
Rootlets
Ventral root of spinal nerve
Sympathetic rami
Dorsal root (spinal) ganglion
Spinal nerve
Ganglion of sympathetic chain
Dorsal ramus of spinal nerve
Ventral ramus of spinal nerve
Roots of splanchnic nerve


Spinal Cord Reflex Arc
Golgi tendon organ
tension
muscle-tendon junction
spinal cord
relaxation response
muscle belly

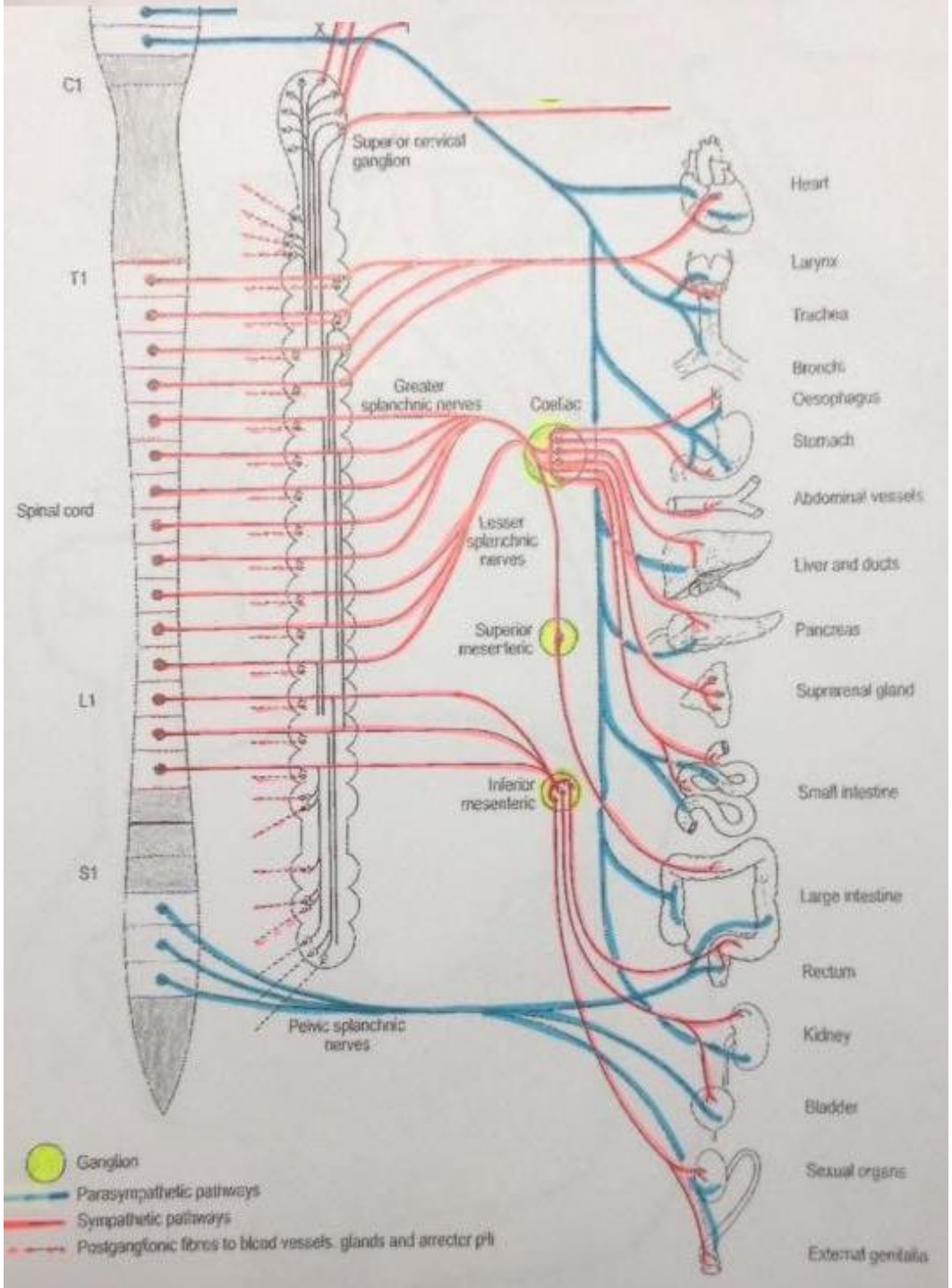
Spinal Nerve

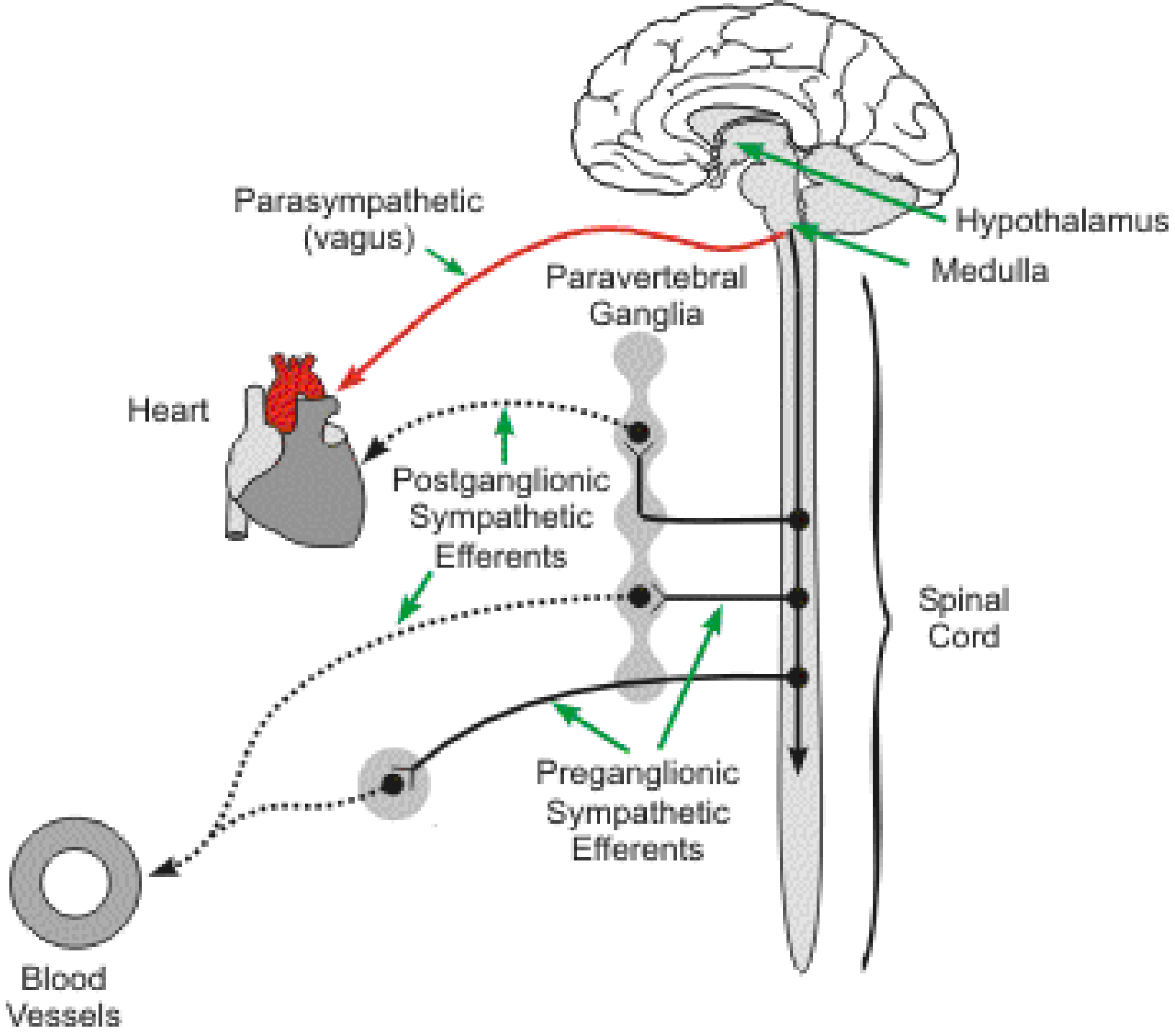
Draw a spinal nerve

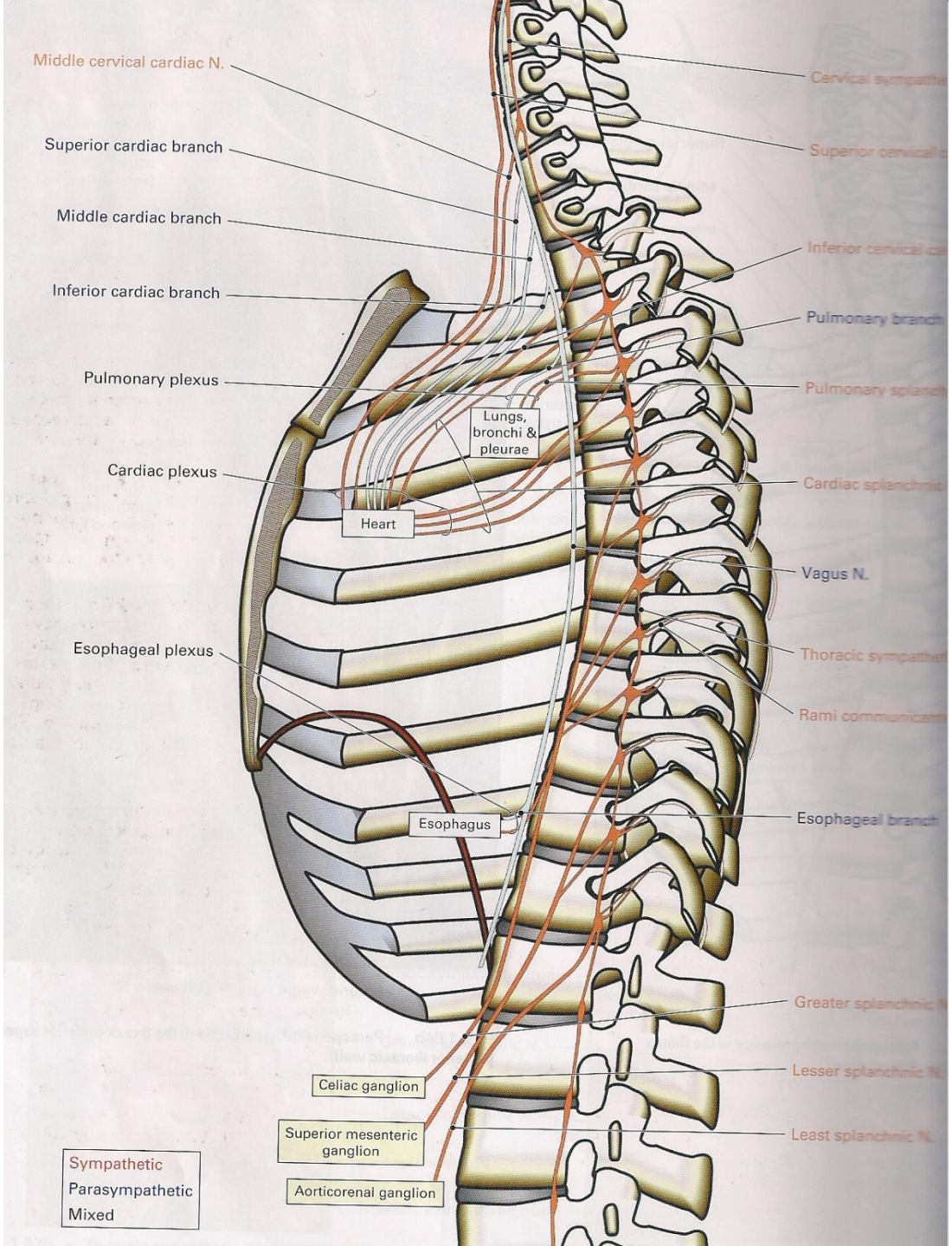
Spinal Autonomic Nervous System

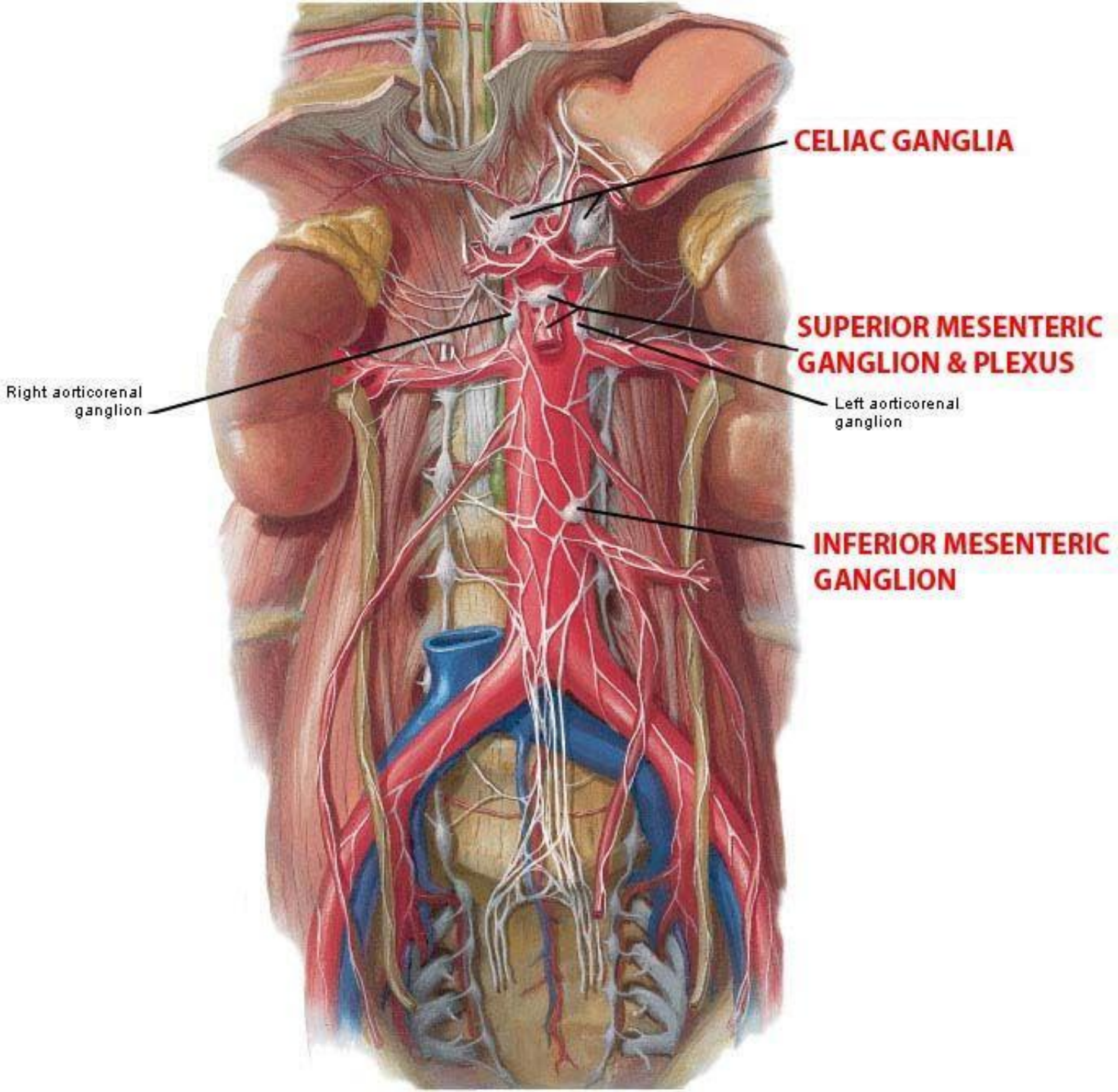
A) Sympathetic

B) Parasympathetic

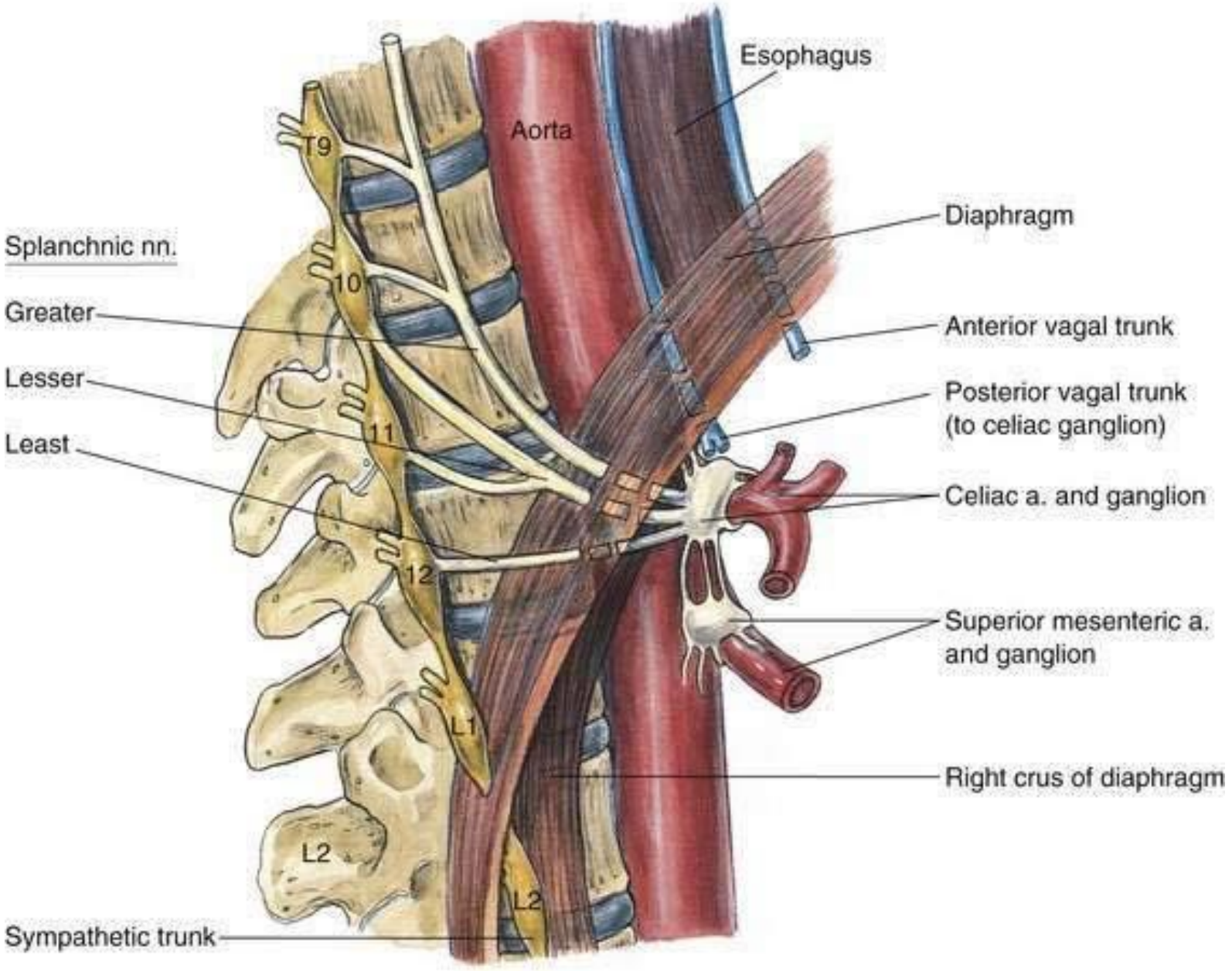

C1
T1
L1
S1
Spinal cord
Superior cervical ganglion
Greater splanchnic nerves
Coeliac
Lesser splanchnic nerves
Superior mesenteric
Inferior mesenteric
Pelvic splanchnic nerves
Heart
Larynx
Trachea
Bronchi
Oesophagus
Stomach
Abdominal vessels
Liver and ducts
Pancreas
Suprarenal gland
Small intestine
Large intestine
Rectum
Kidney
Bladder
Sexual organs
External genitalia
Ganglion
Parasympathetic pathways
Sympathetic pathways
Postganglionic fibres to blood vessels, glands and arrector pili


Parasympathetic
(vagus)
Hypothalamus
Medulla
Paravertebral
Ganglia
Heart
Postganglionic
Sympathetic
Efferents
Spinal
Cord
Preganglionic
Sympathetic
Efferents
Blood
Vessels

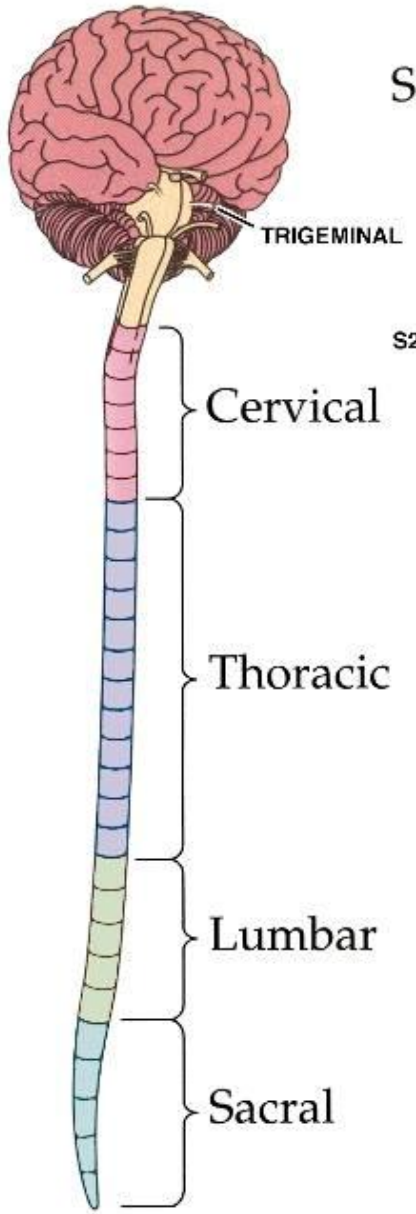

Middle cervical cardiac N.
Superior cardiac branch
Middle cardiac branch
Inferior cardiac branch
Pulmonary plexus
Cardiac plexus
Esophageal plexus
Lungs, bronchi & pleurae
Heart
Esophagus
Celiac ganglion
Superior mesenteric ganglion
Aorticorenal ganglion
Cervical sympathe
Superior cervical
Inferior cervical
Pulmonary branch
Pulmonary splanch
Cardiac splanchnic
Vagus N.
Thoracic sympathet
Rami communicant
Esophageal branch
Greater splanchnic N
Lesser splanchnic N
Least splanchnic N
Sympathetic
Parasympathetic
Mixed

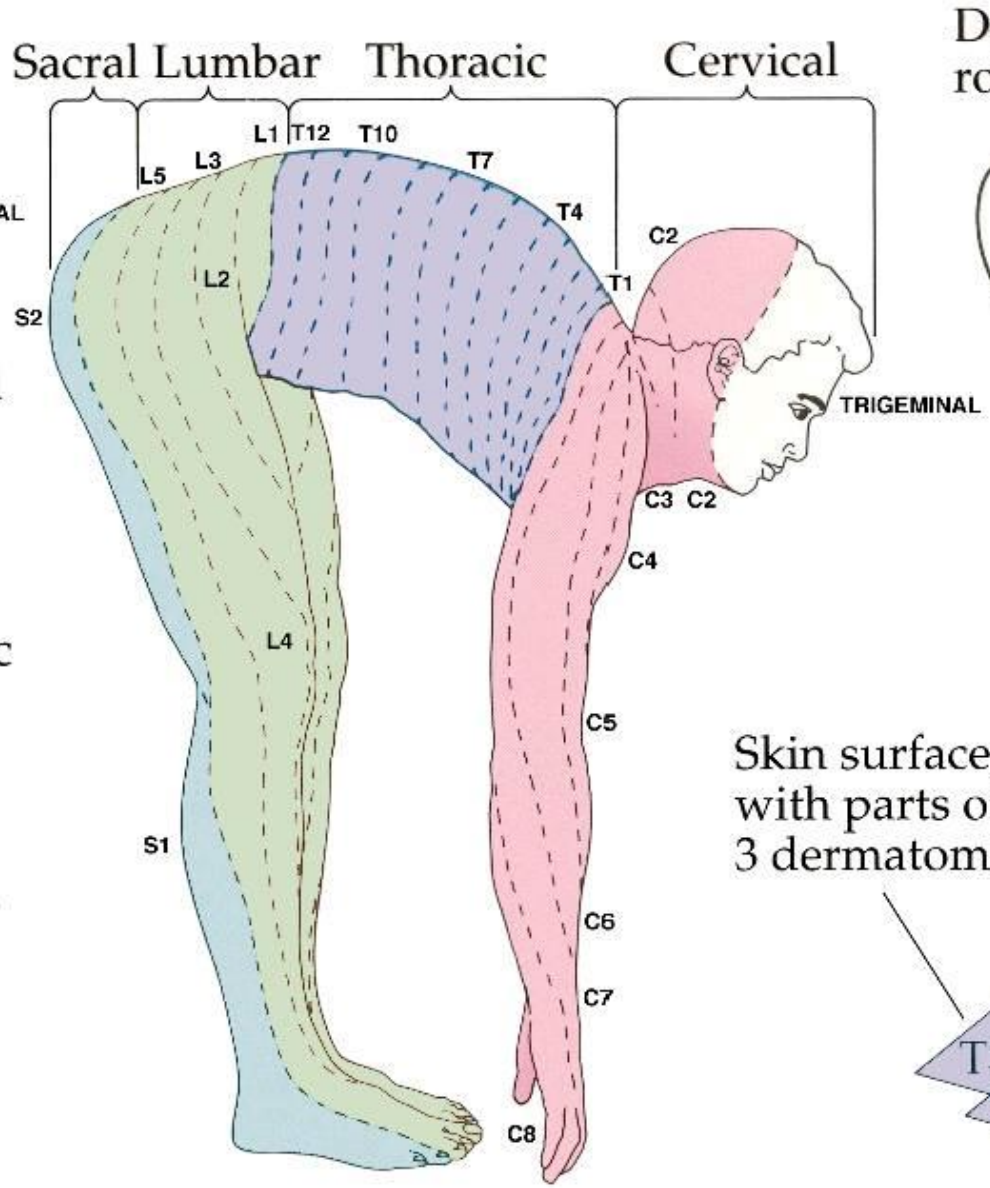

CELIAC GANGLIA
SUPERIOR MESENTERIC GANGLION & PLEXUS
Right aorticorenal ganglion
Left aorticorenal ganglion
INFERIOR MESENTERIC GANGLION

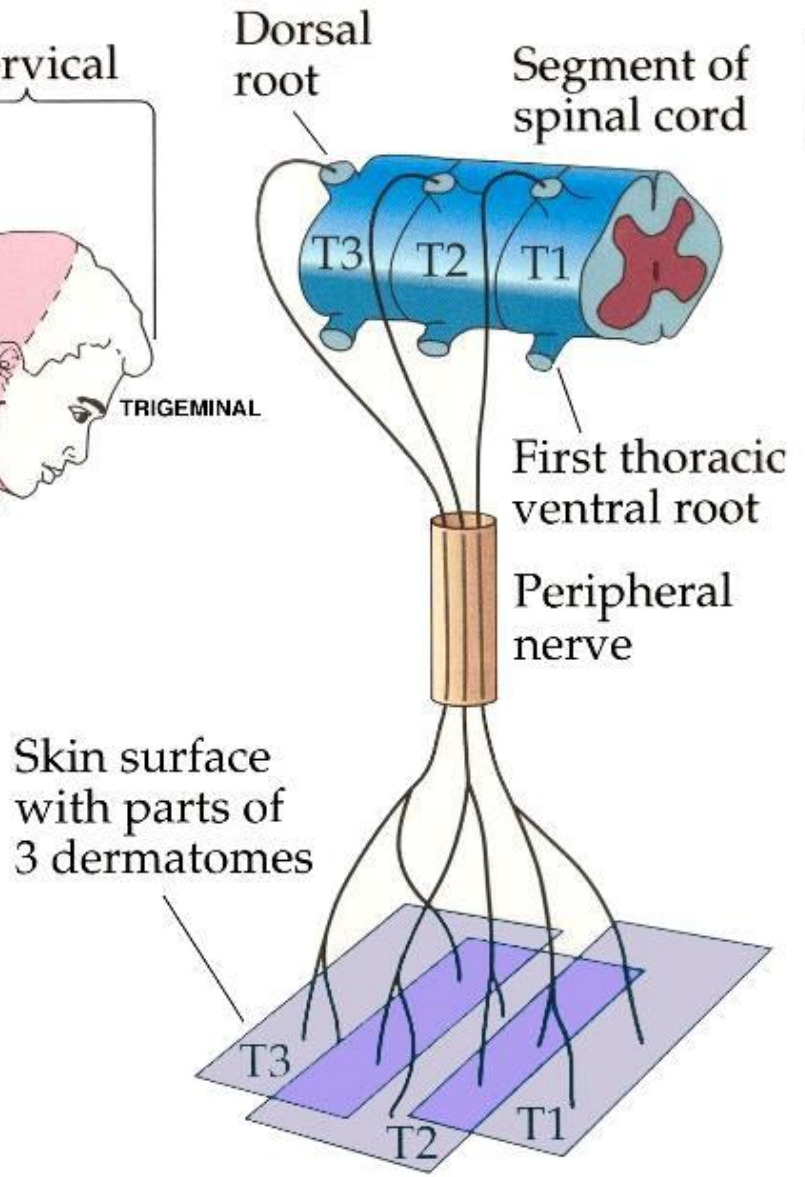
Celiac Ganglia

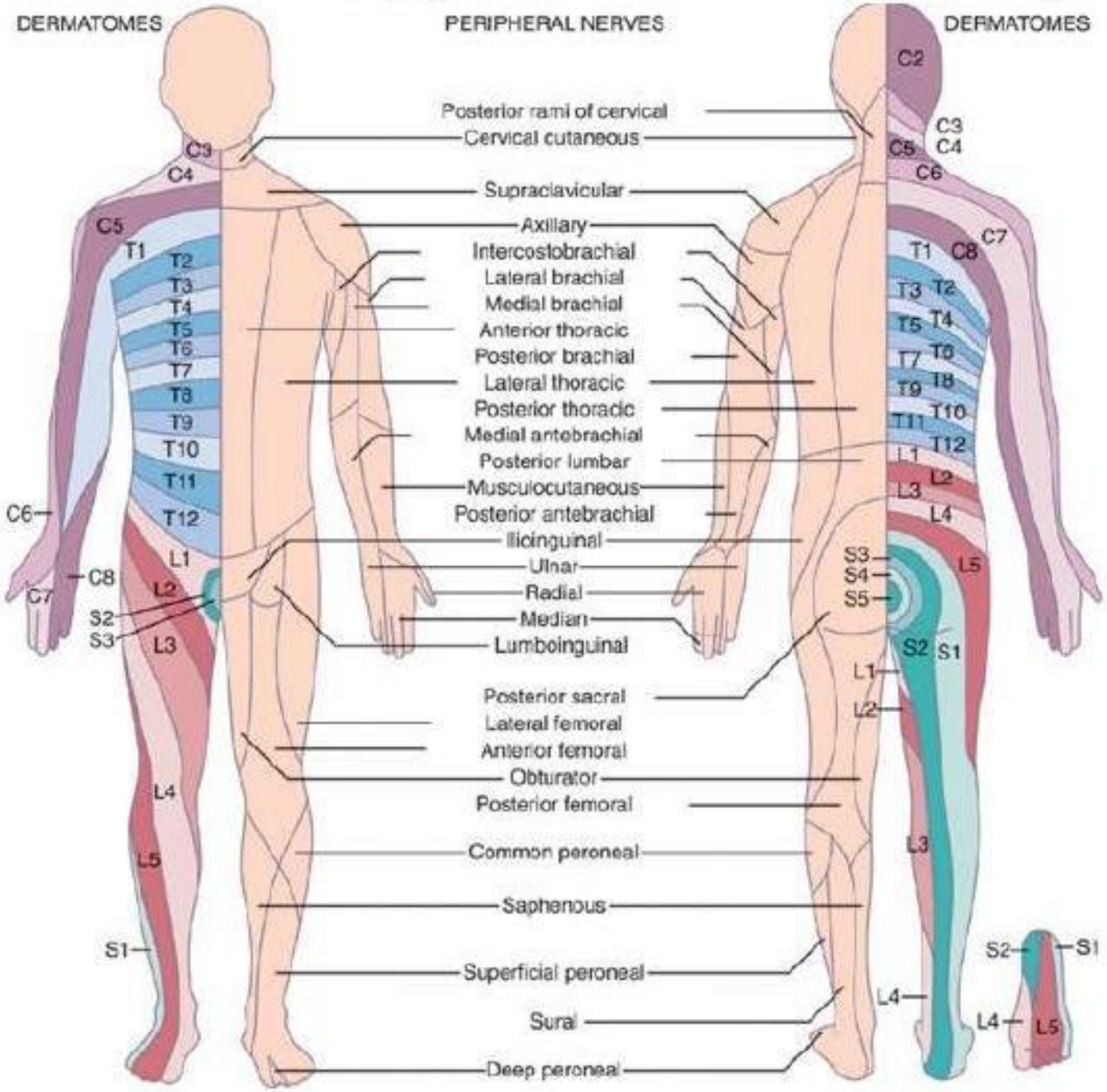


Dermatomes

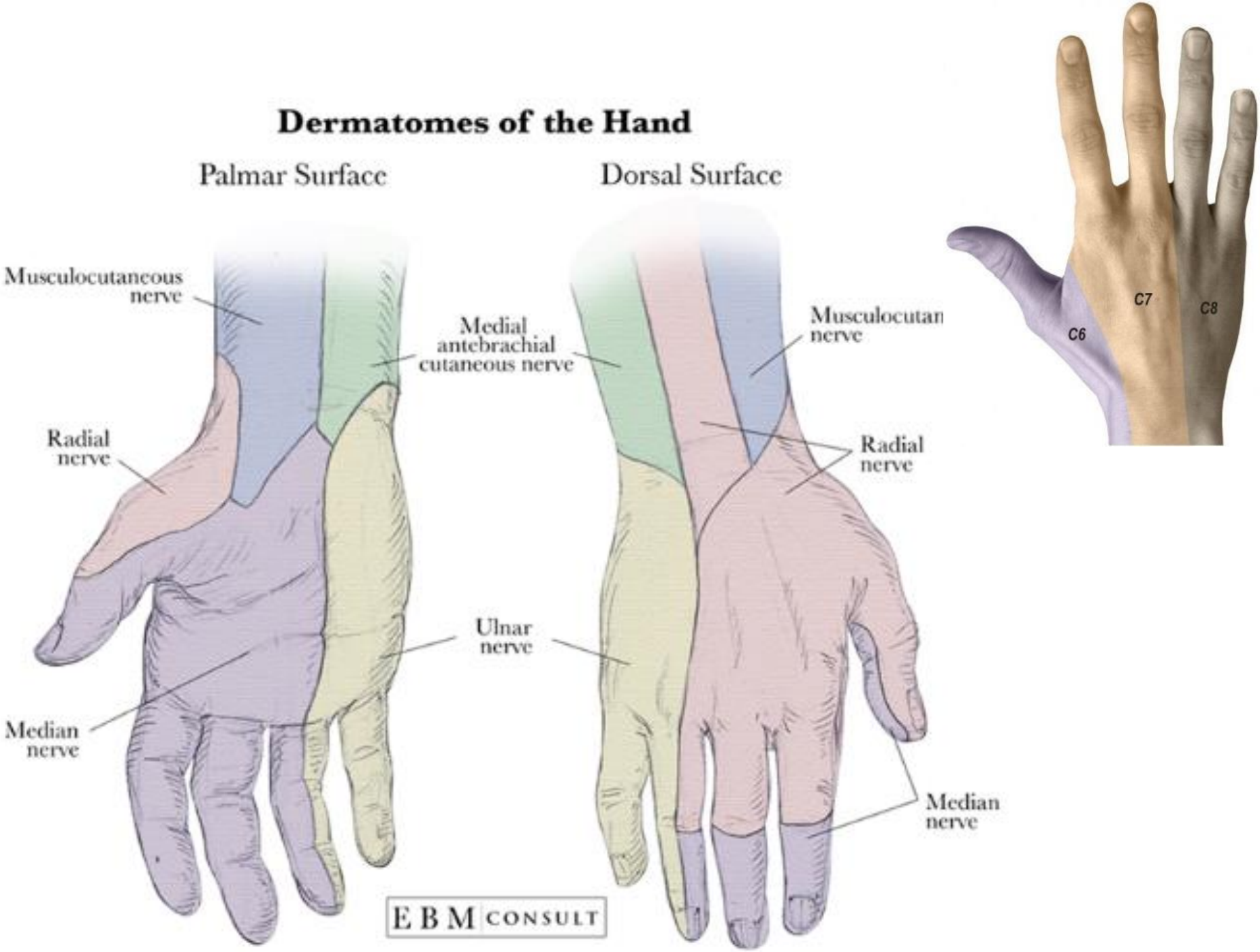

TRIGEMINAL
Cervical
Thoracic
Lumbar
Sacral

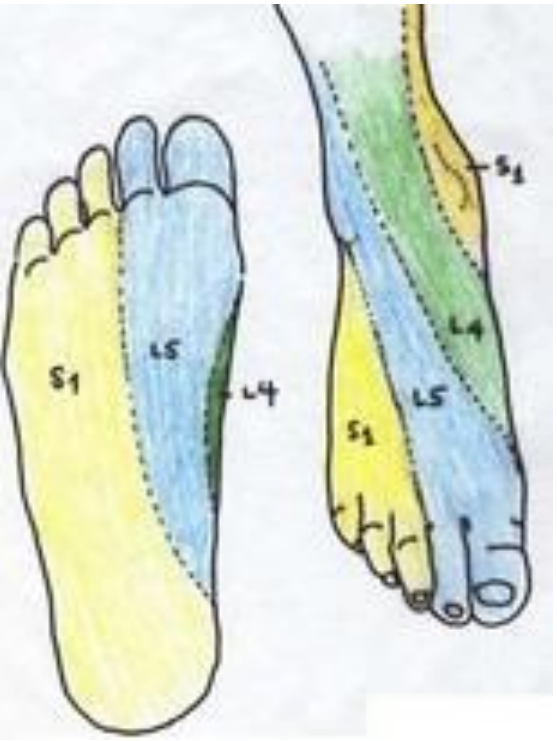

Sacral
Lumbar
Thoracic
Cervical
L1
T12
T10
L5
L3
T7
T4
C2
L2
T1
S2
TRIGEMINAL
C3
C2
C4
L4
C5
S1
C6
C7
C8


Dorsal root
Segment of spinal cord
T3
T2
T1
First thoracic ventral root
Peripheral nerve
Skin surface with parts of 3 dermatomes
T3
T2
T1

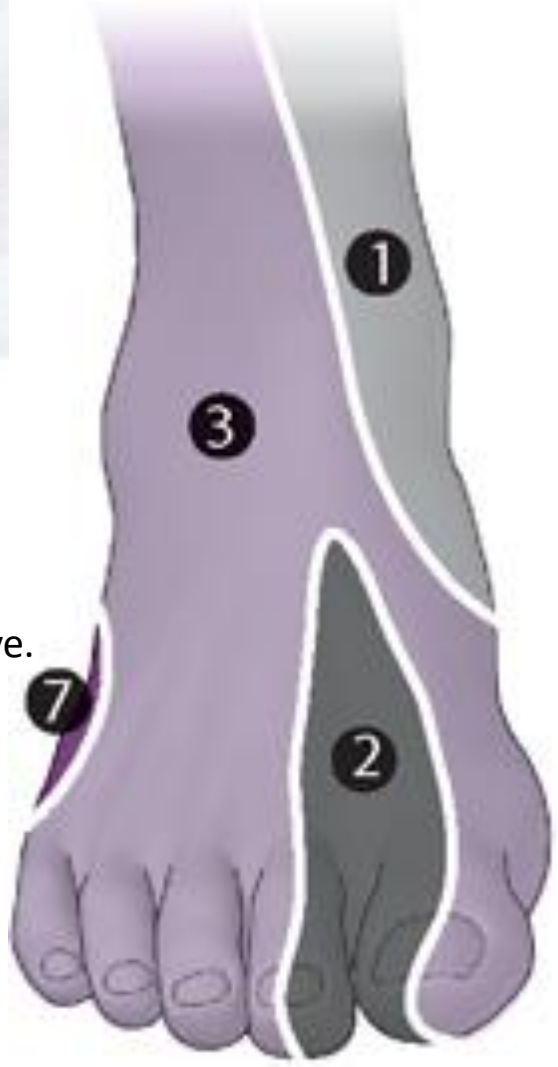

DERMATOMES
PERIPHERAL NERVES
DERMATOMES
Posterior rami of cervical
Cervical cutaneous
Supraclavicular
Axillary
Intercostobrachial
Lateral brachial
Medial brachial
Anterior thoracic
Posterior brachial
Lateral thoracic
Posterior thoracic
Medial antebrachial
Posterior lumbar
Musculocutaneous
Posterior antebrachial
Ilicinguinal
Ulnar
Radial
Median
Lumboinguinal
Posterior sacral
Lateral femoral
Anterior femoral
Obturator
Posterior femoral
Common peroneal
Saphenous
Superficial peroneal
Sural
Deep peroneal
C2
C3
C4
C5
C6
C7
C8
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5

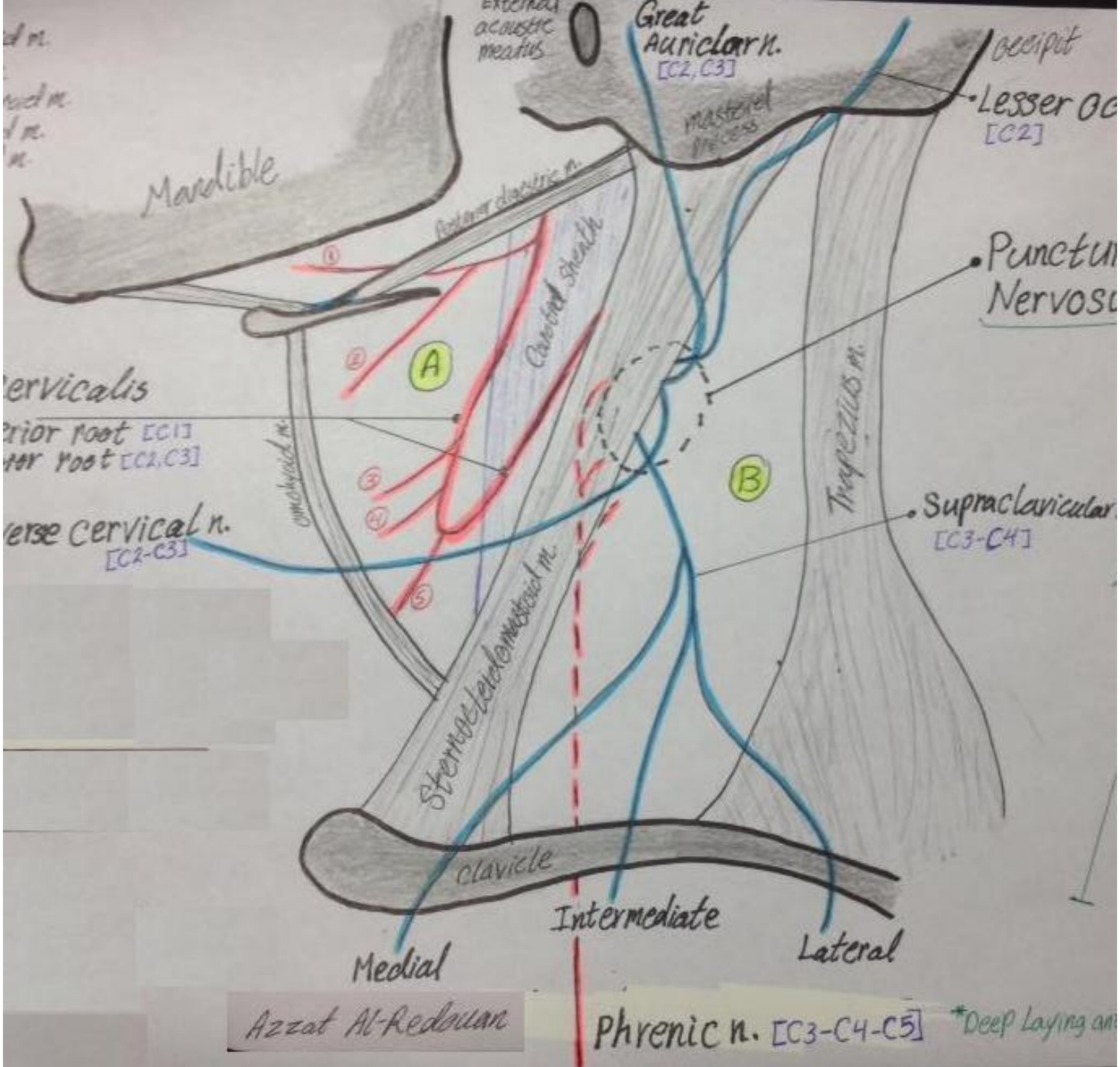
Dermatomes of the Hand





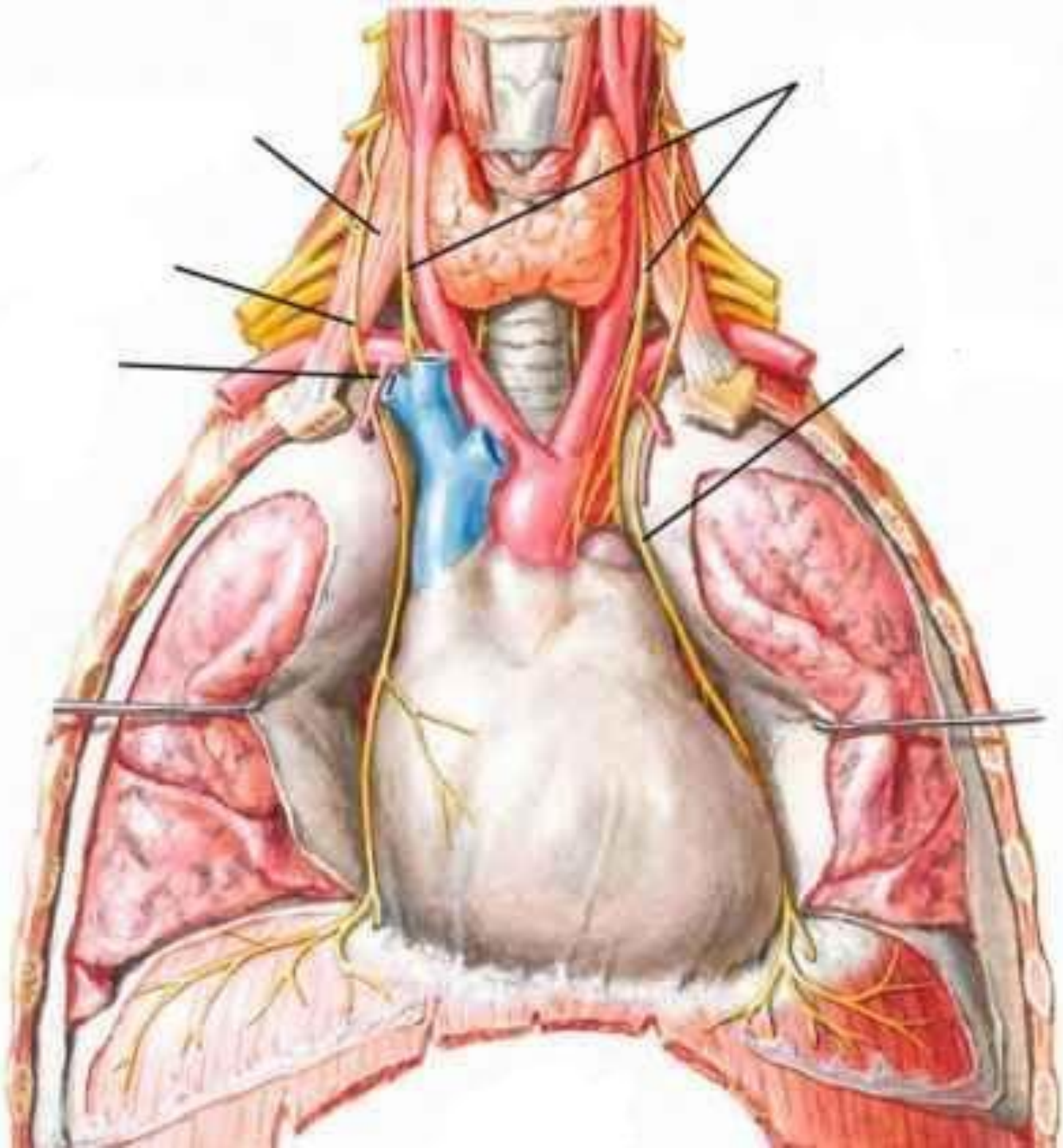
(1) Saphenous nerve.
(2) Deep peroneal nerve.
(3) Superficial peroneal nerve.
(4) Medial plantar nerve.
(5) Lateral plantar nerve.
(6) Tibial nerve.
(7) Sural nerve.

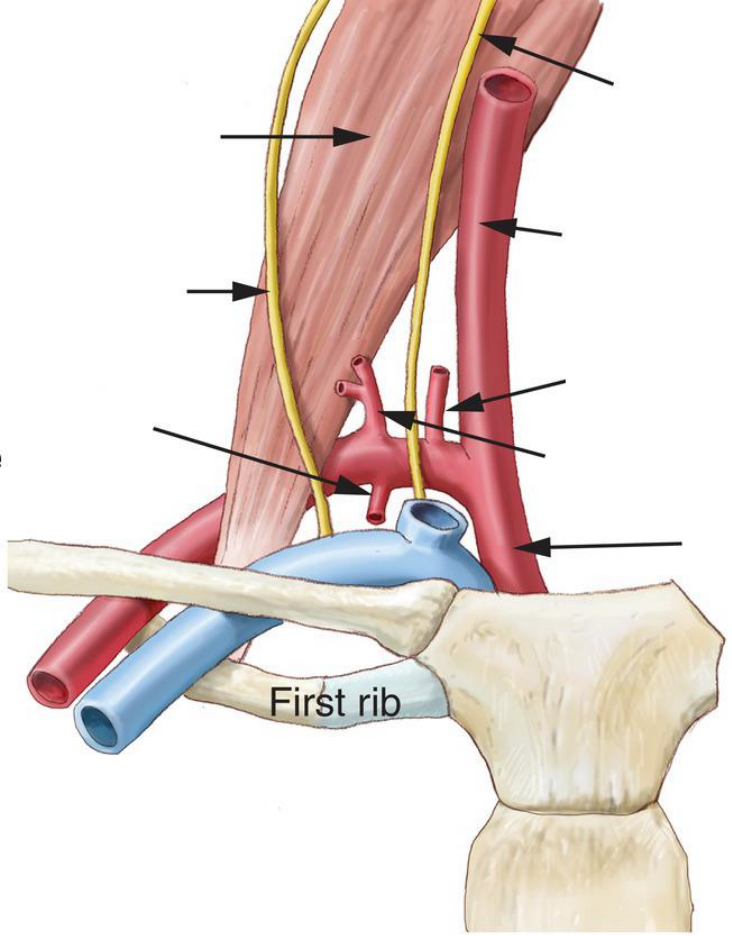


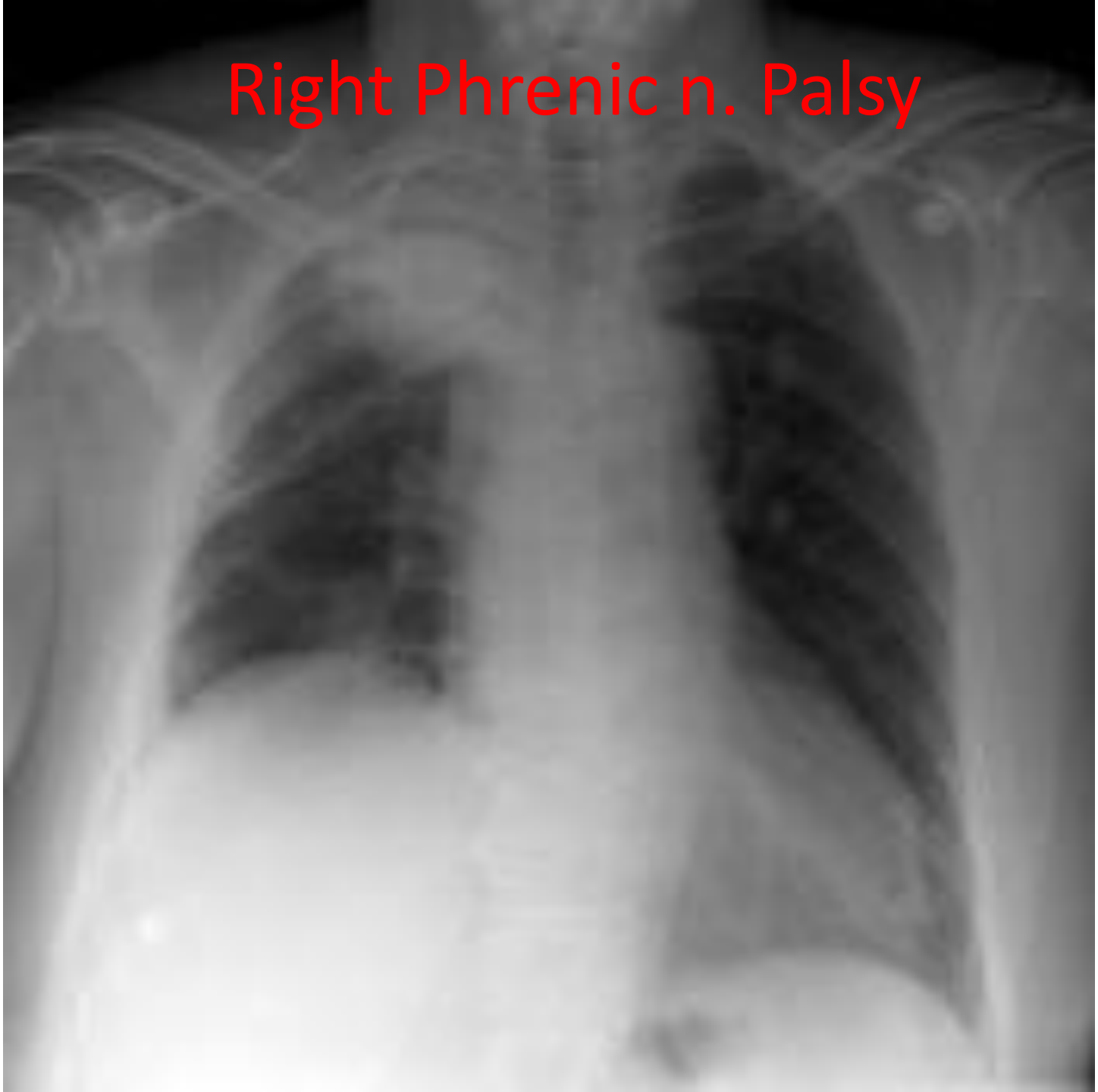

External acoustic meatus
Great Auricular n.
[C2, C3]
occipit
Lesser oc
[C2]
mastoid process
Mandible
Posterior auricular a.
Punctum Nervosum
Carotid sheath
A
B
ervicalis
erior root [C1]
ter root [C2, C3]
Omohyoid m.
Trapezius m.
verse cervical n.
[C2-C3]
Supraclavicular
[C3-C4]
Sternocleidomastoid m.
Clavicle
Intermediate
Medial
Lateral
Azzat Al-Redouan
Phrenic n. [C3-C4-C5]
*Deep Laying an

CERVICAL PLEXUS

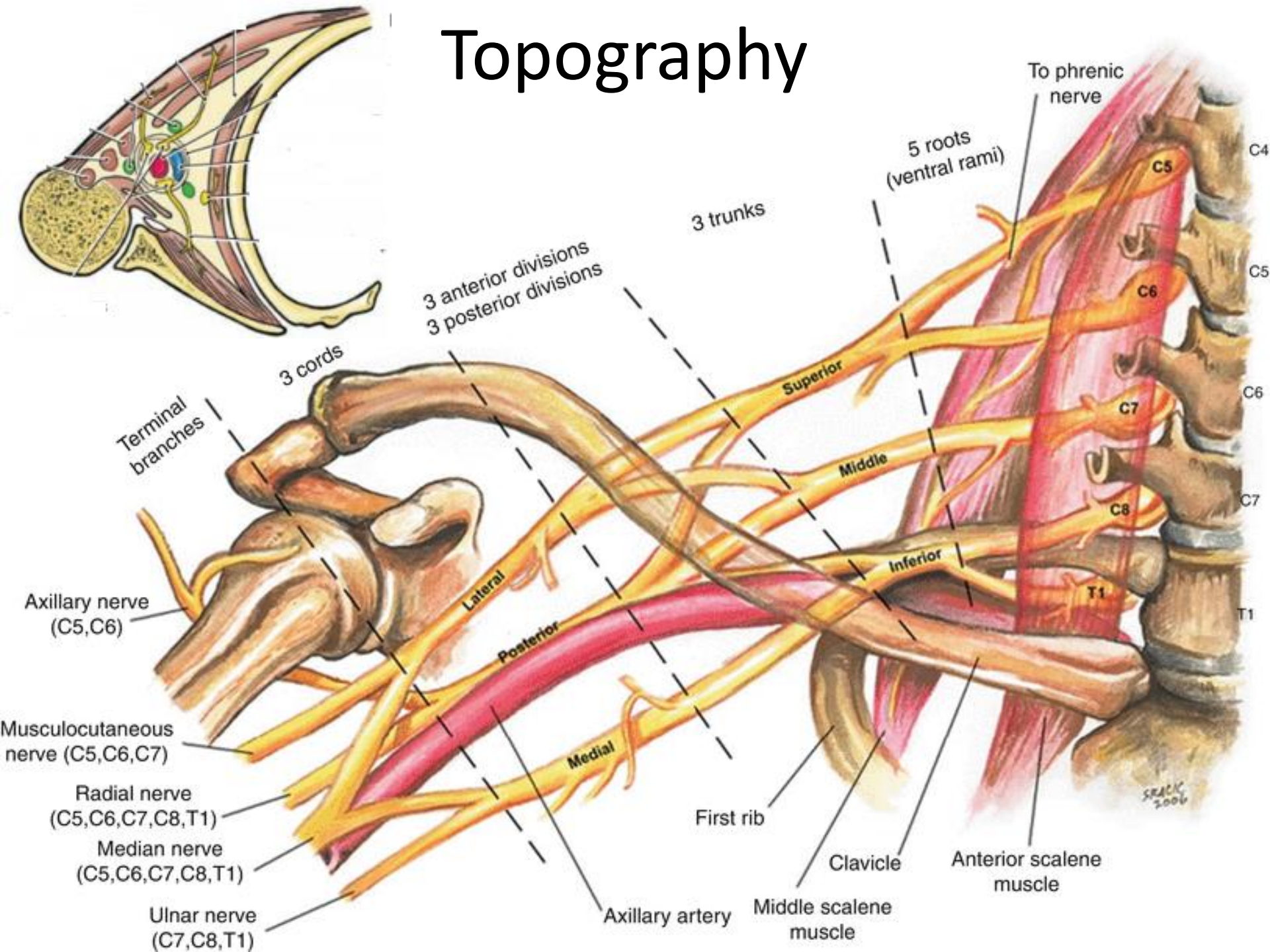
Draw the cervical plexus



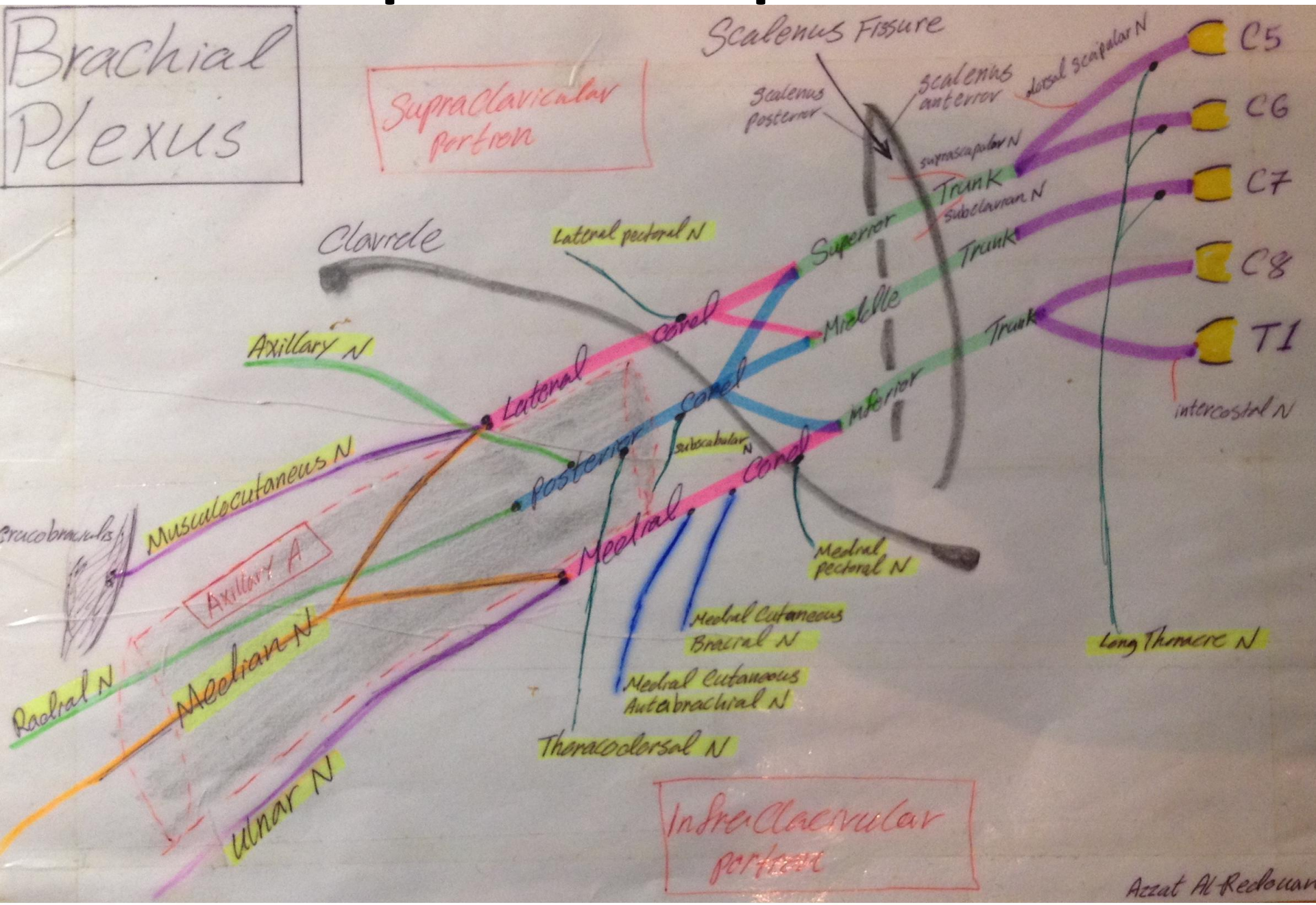

First rib


Right Phrenic n. Palsy

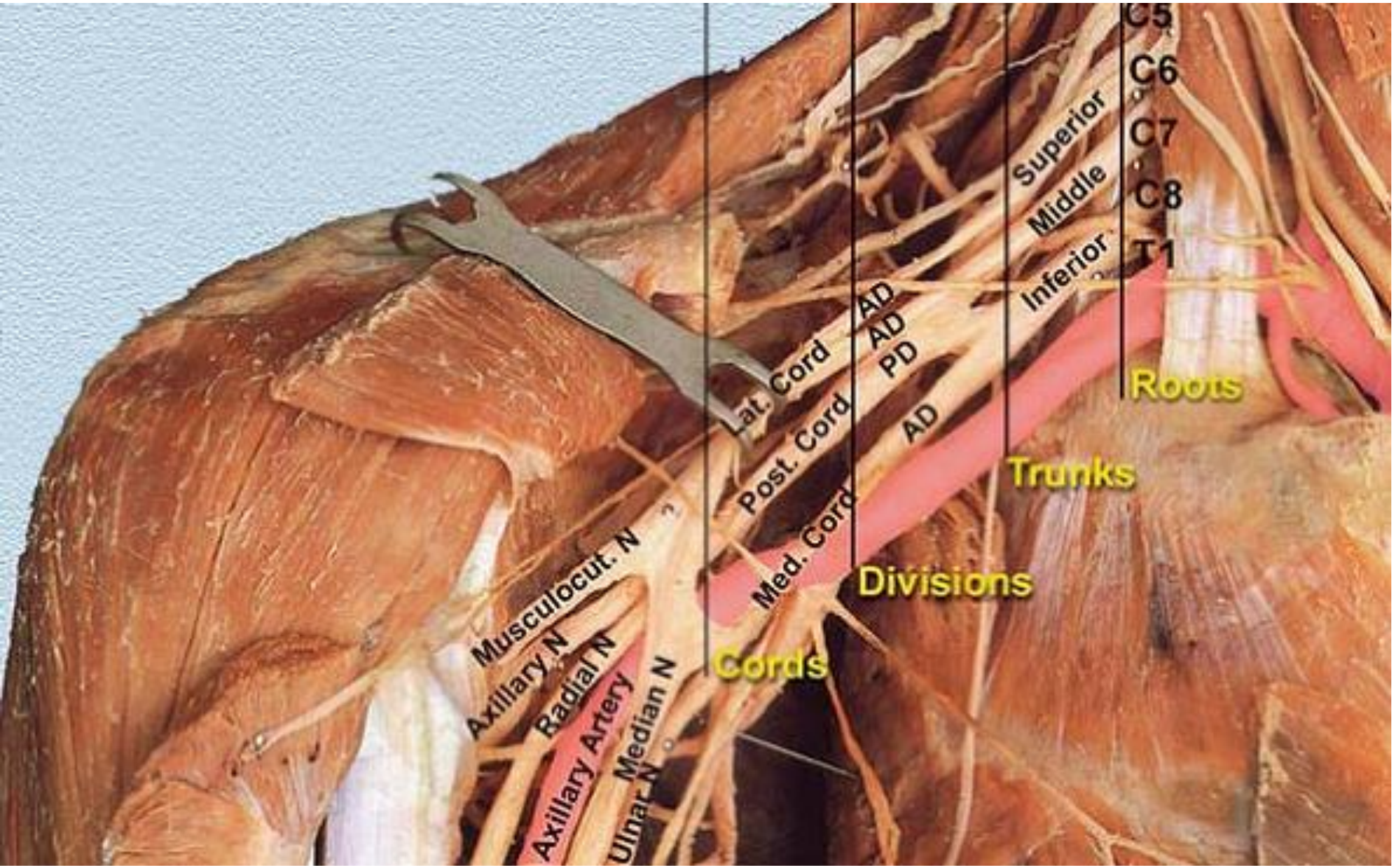
Topography


To phrenic nerve
5 roots (ventral rami)
3 trunks
3 anterior divisions
3 posterior divisions
3 cords
Terminal branches
Superior
Middle
Inferior
Lateral
Posterior
Medial
C4
C5
C6
C7
C8
T1
Axillary nerve (C5,C6)
Musculocutaneous nerve (C5,C6,C7)
Radial nerve (C5,C6,C7,C8,T1)
Median nerve (C5,C6,C7,C8,T1)
Ulnar nerve (C7,C8,T1)
Axillary artery
First rib
Middle scalene muscle
Clavicle
Anterior scalene muscle

brachial plexus – simplified scheme



Dissection Appearance

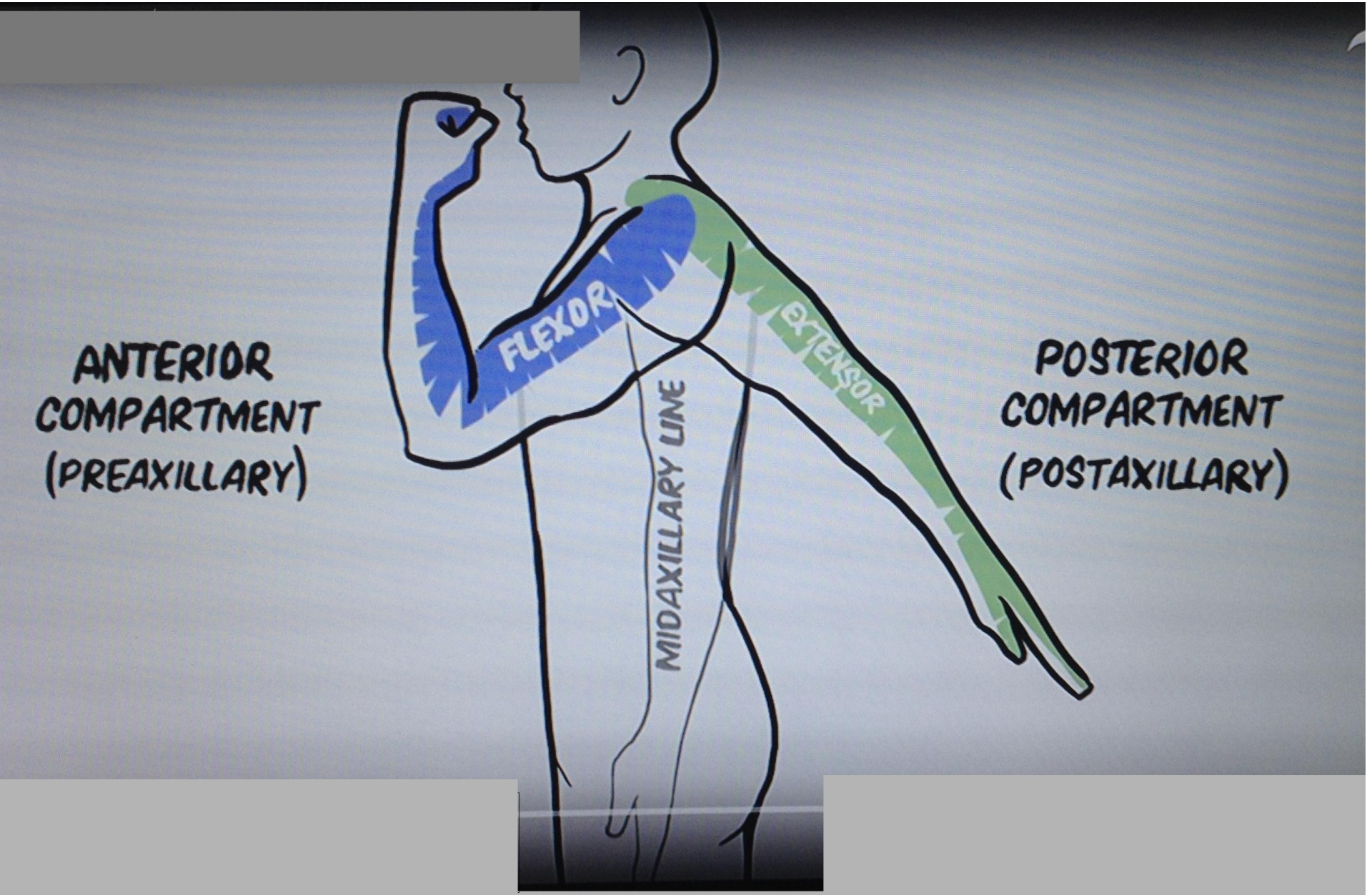


Dissection Appearance

BRACHIAL PLEXUS

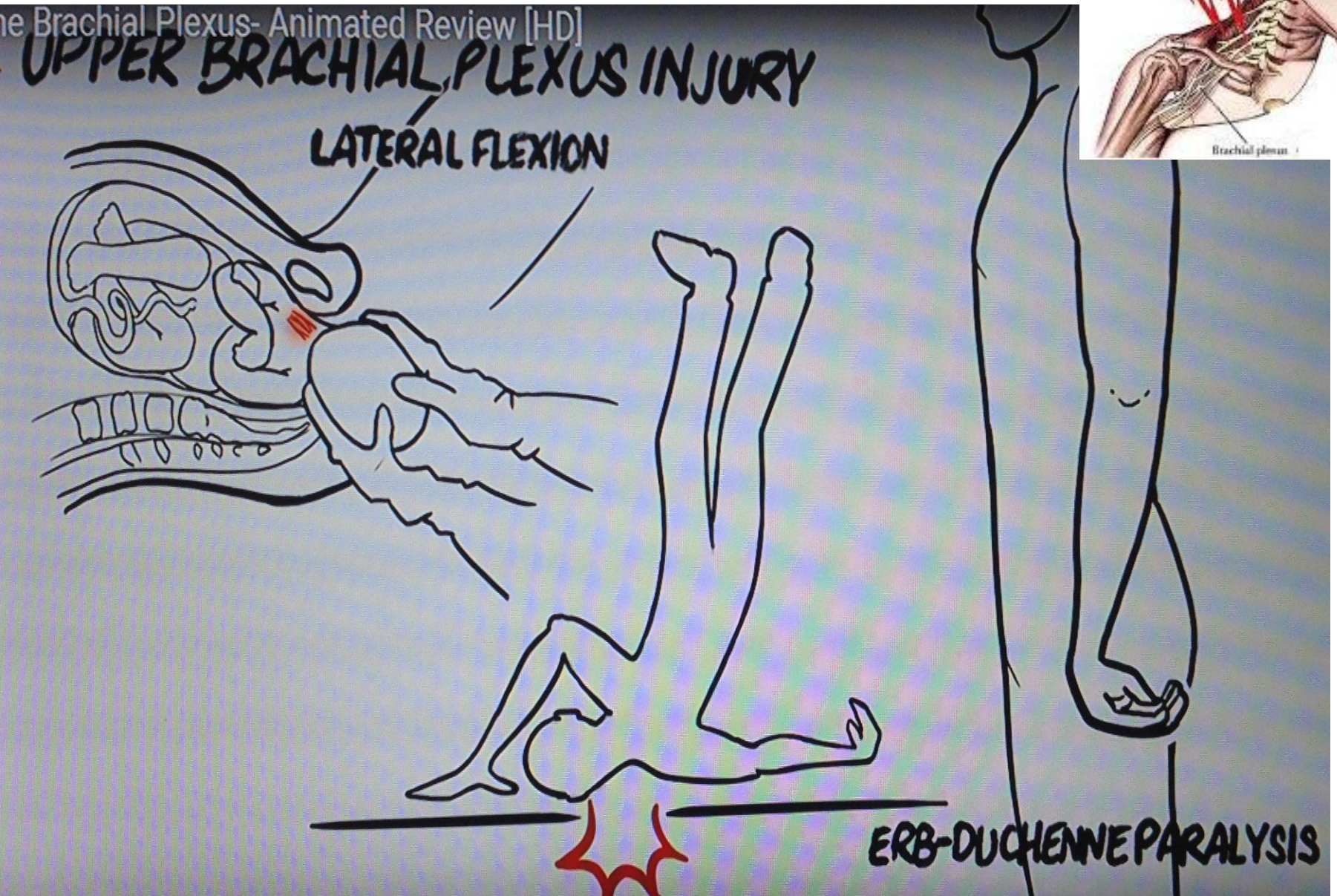
Draw the brachial plexus

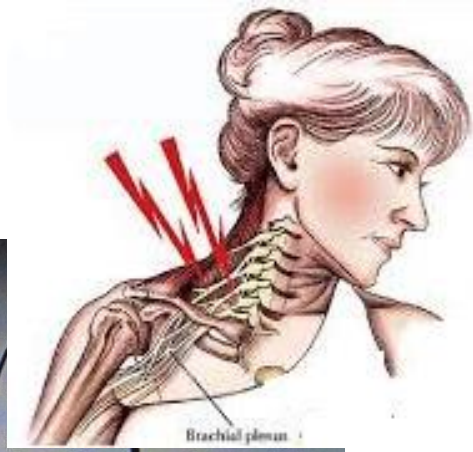
General Overview of Function



Clinical Application – Injuries

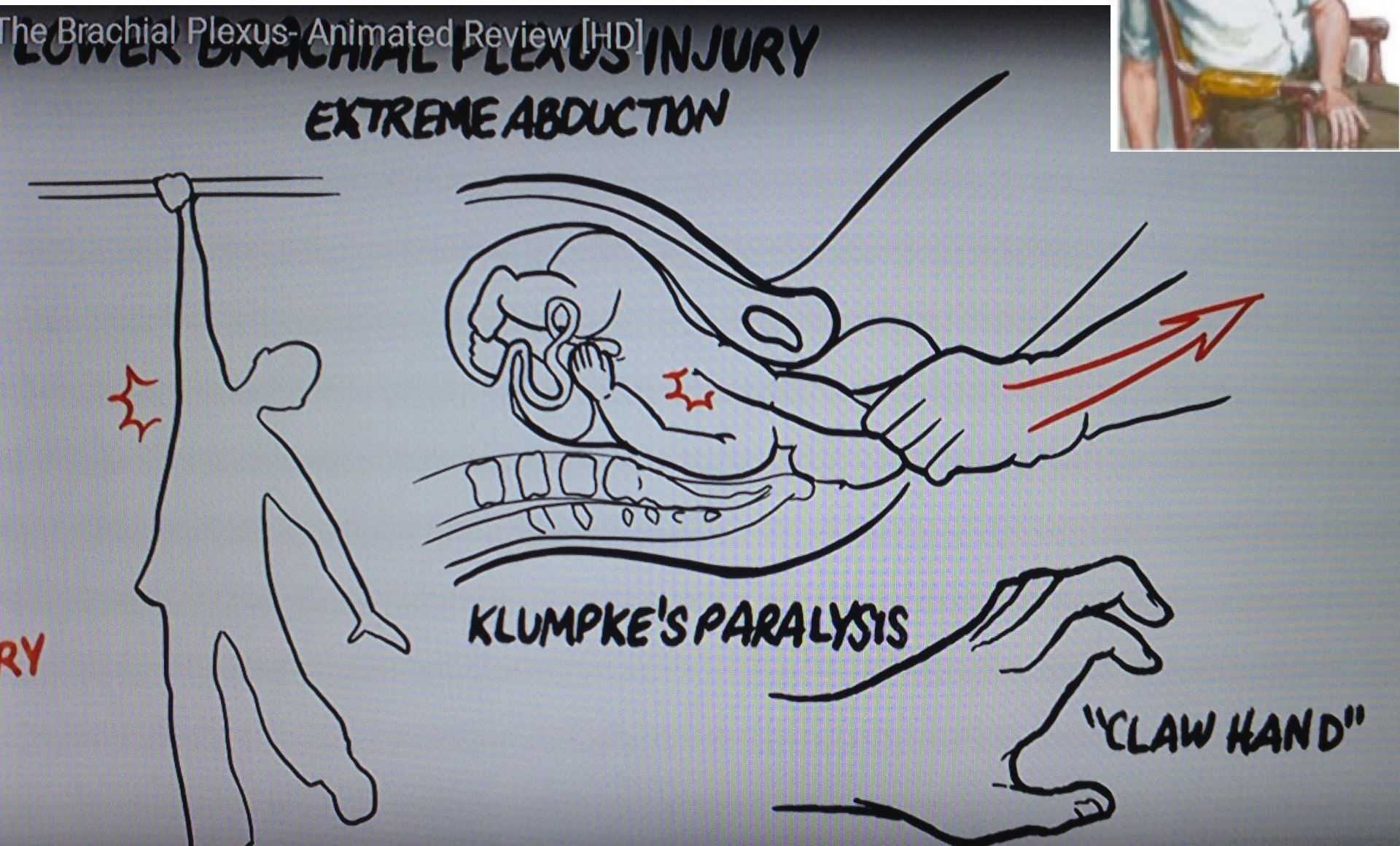
(Upper Roots) *Injury at supraclavicular portion.





Clinical Application – Injuries

(Lower Roots) *Injury Infraclavicular portion, axillary fossa.

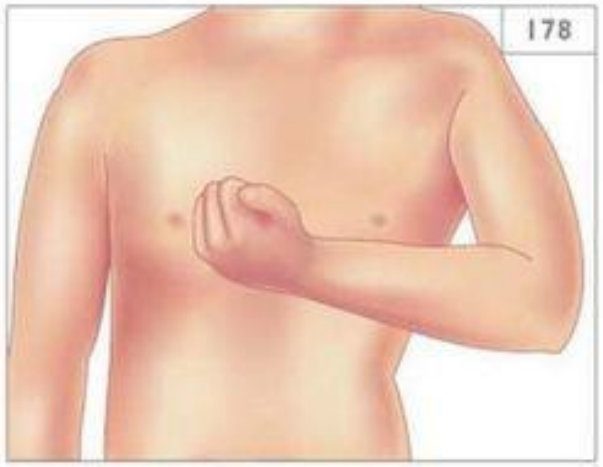


Clinical Application – Injuries

(Upper Roots Injury)

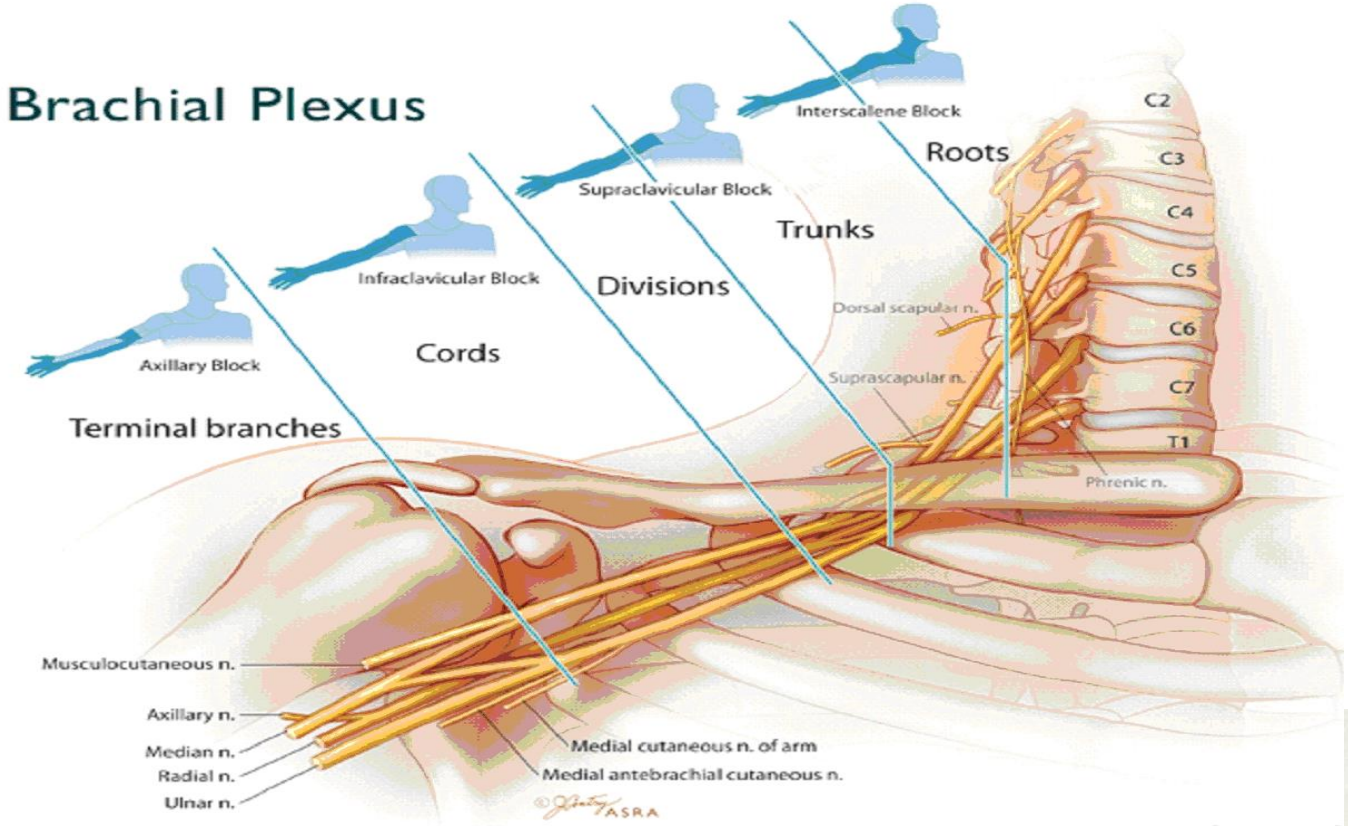
(Lower Roots Injury)

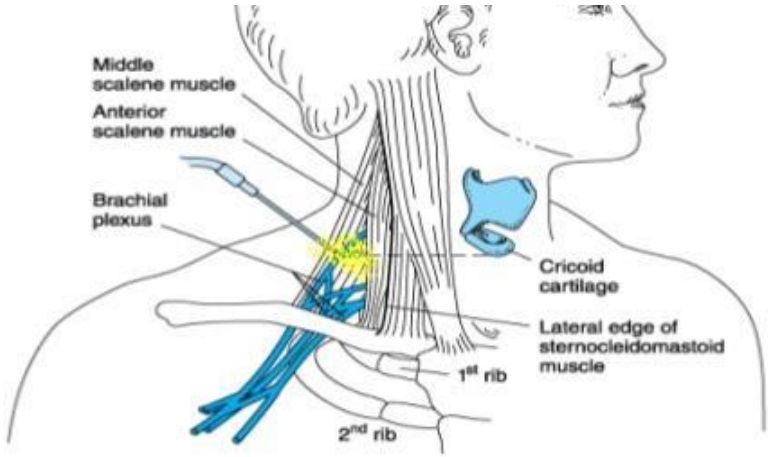
177 Erb's palsy.

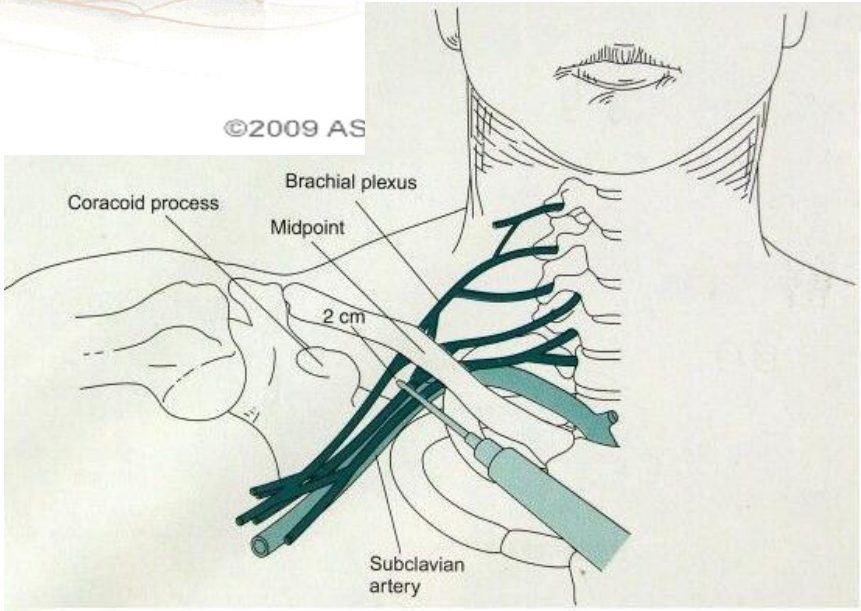


178 Klumpke palsy.

Clinical Application – Anaesthesia





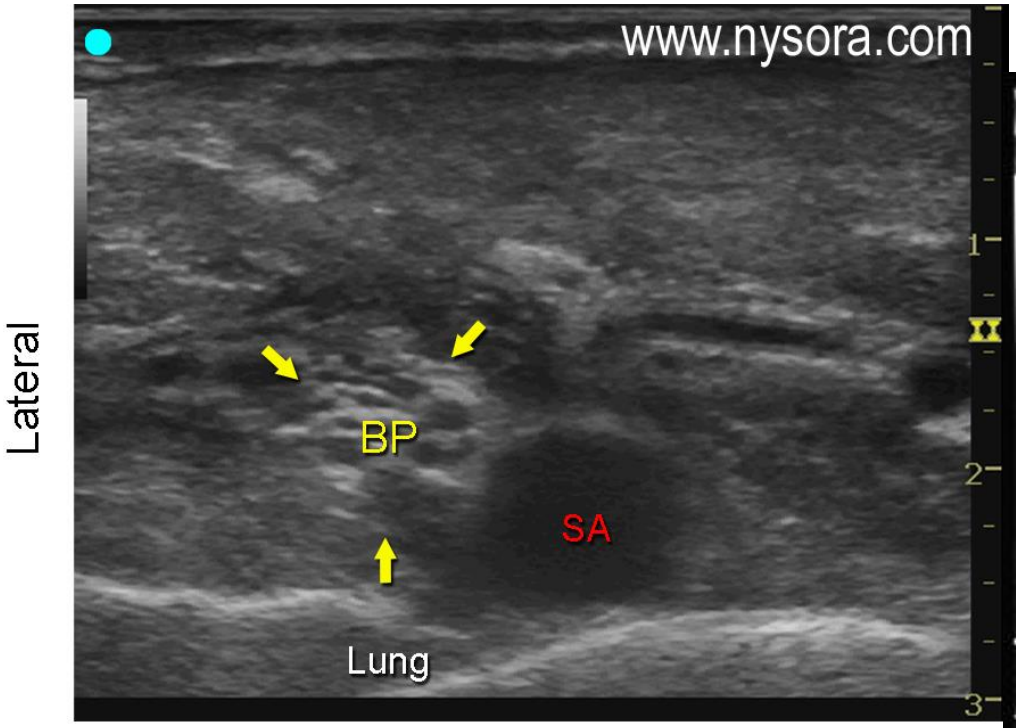


Clinical Application – Imaging (Sonography)

*Can detect compression e.g.tumors

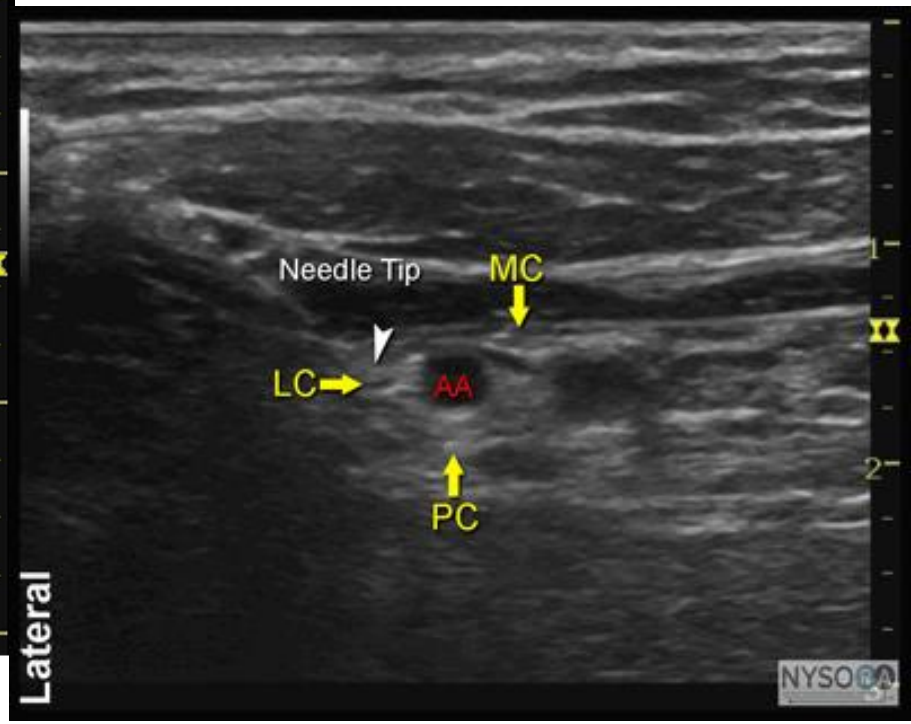
*Anaesthesia guidance

Supraclavicular

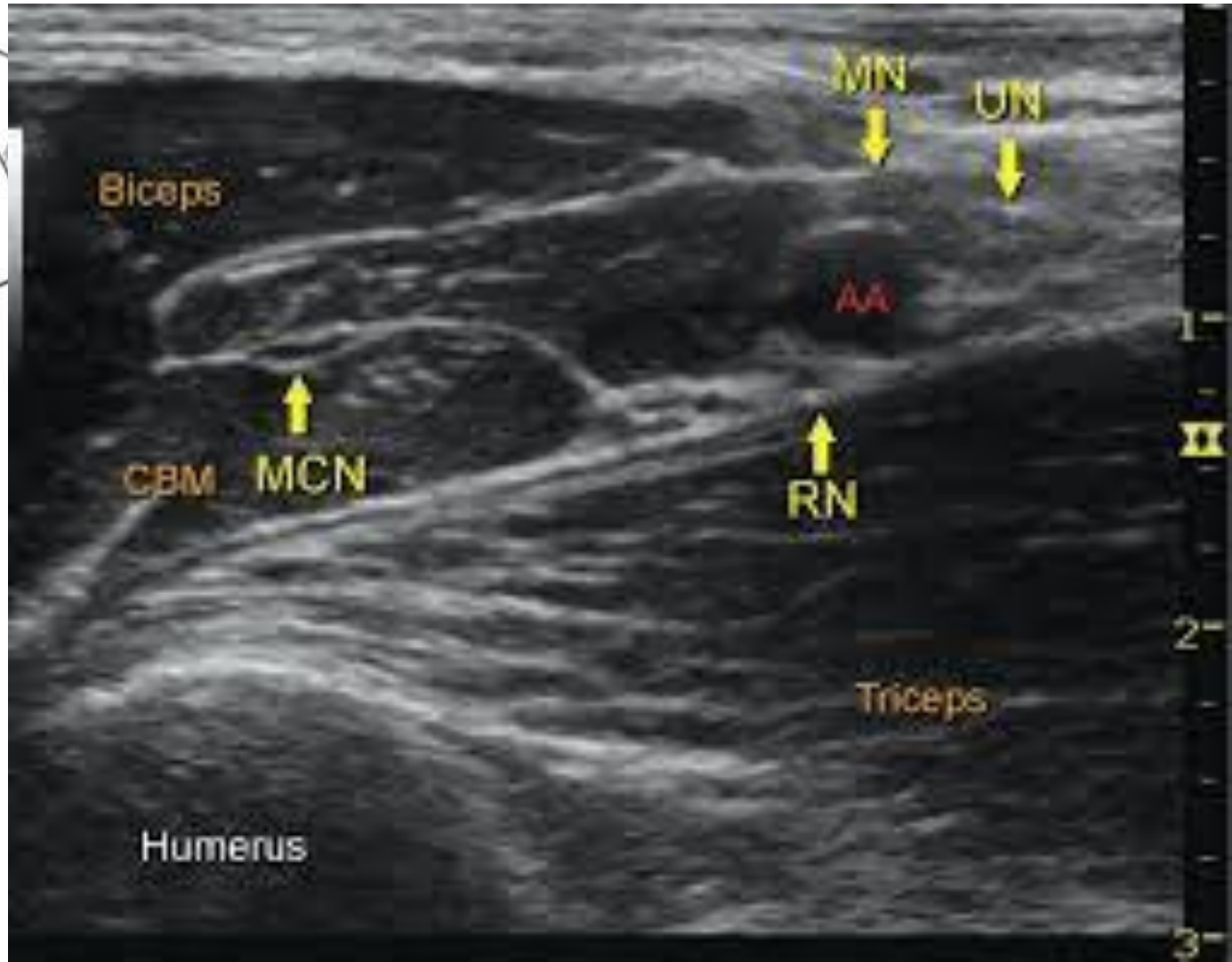


Supraclavicular Brachial Plexus

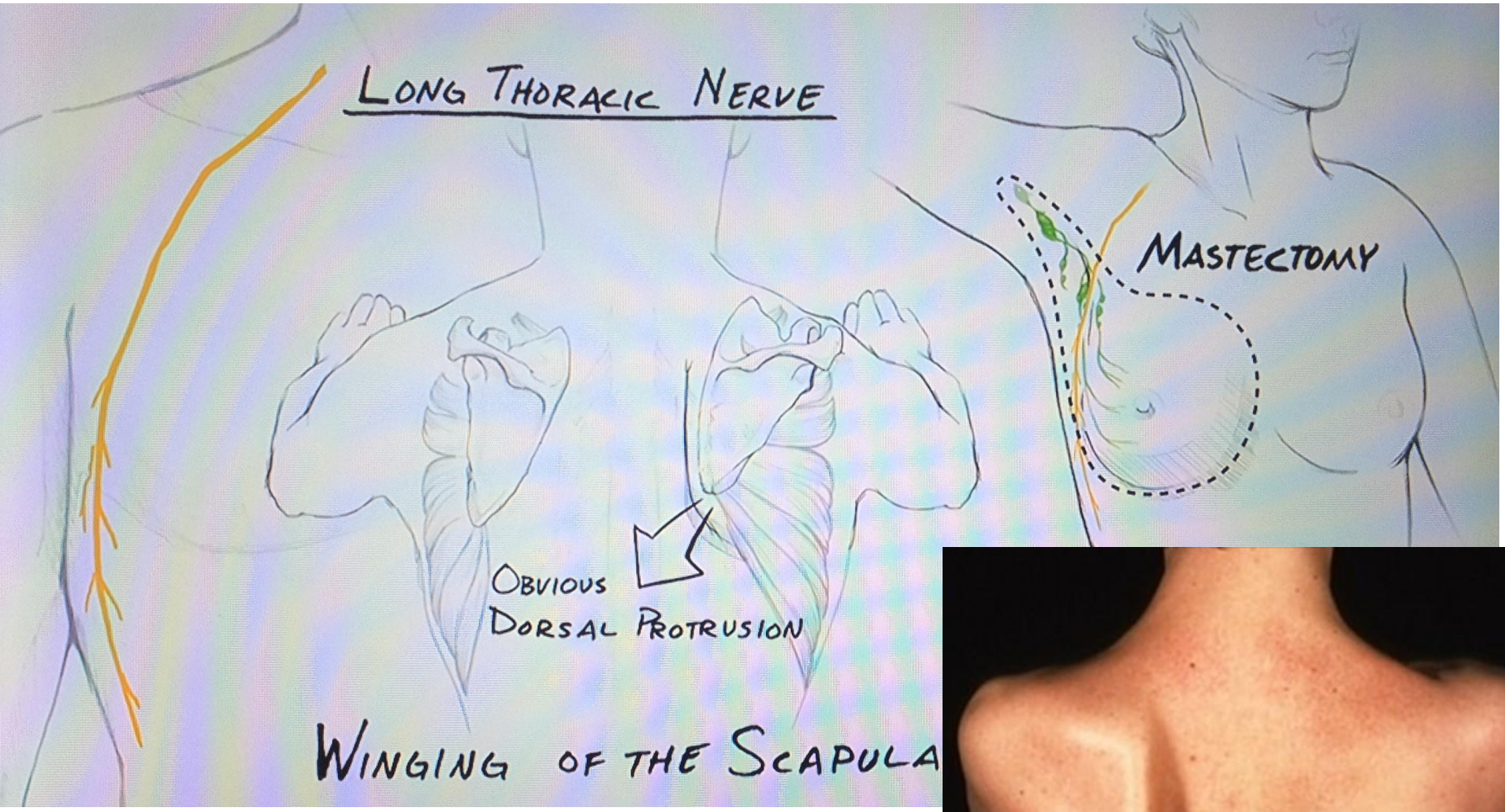
Infraclavicular



Axillary view

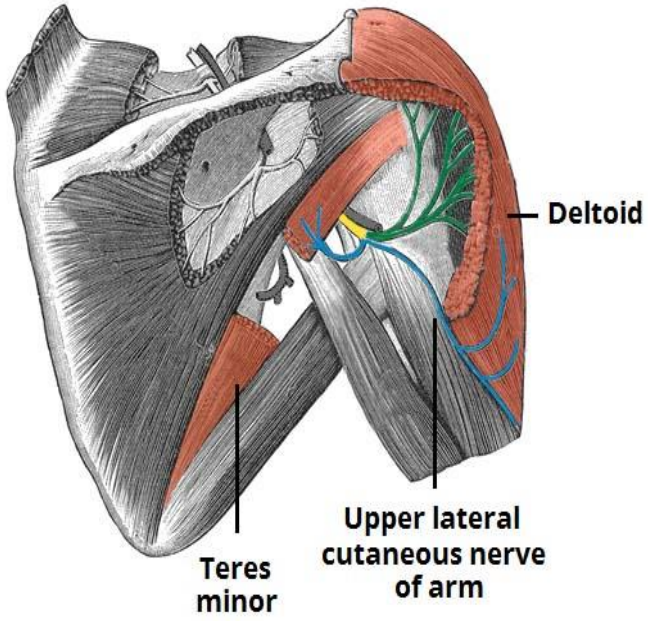


Long Thoracic n. & Common Injuries



C5-C7

Axillary n. & Common Injuries

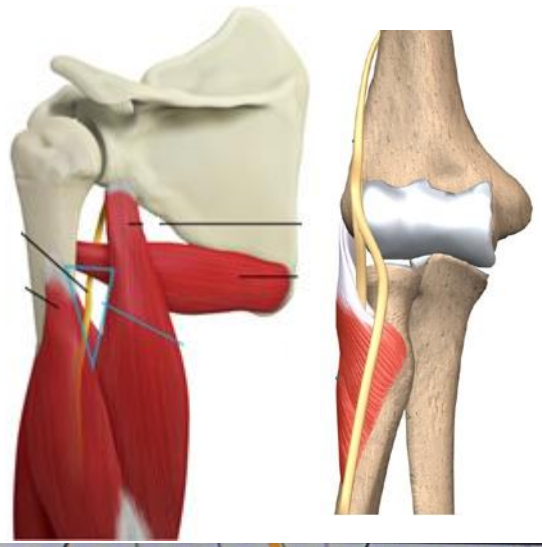


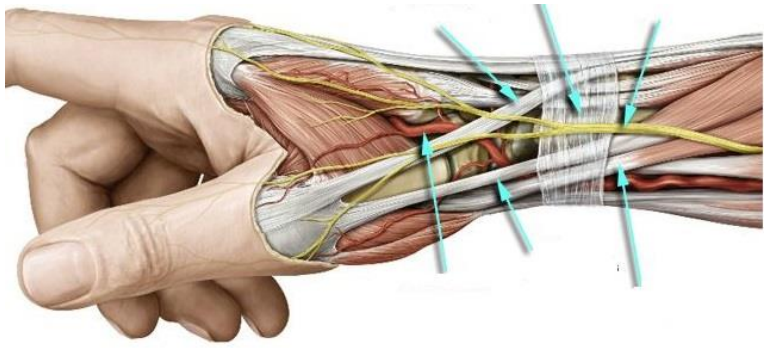
C5-C6

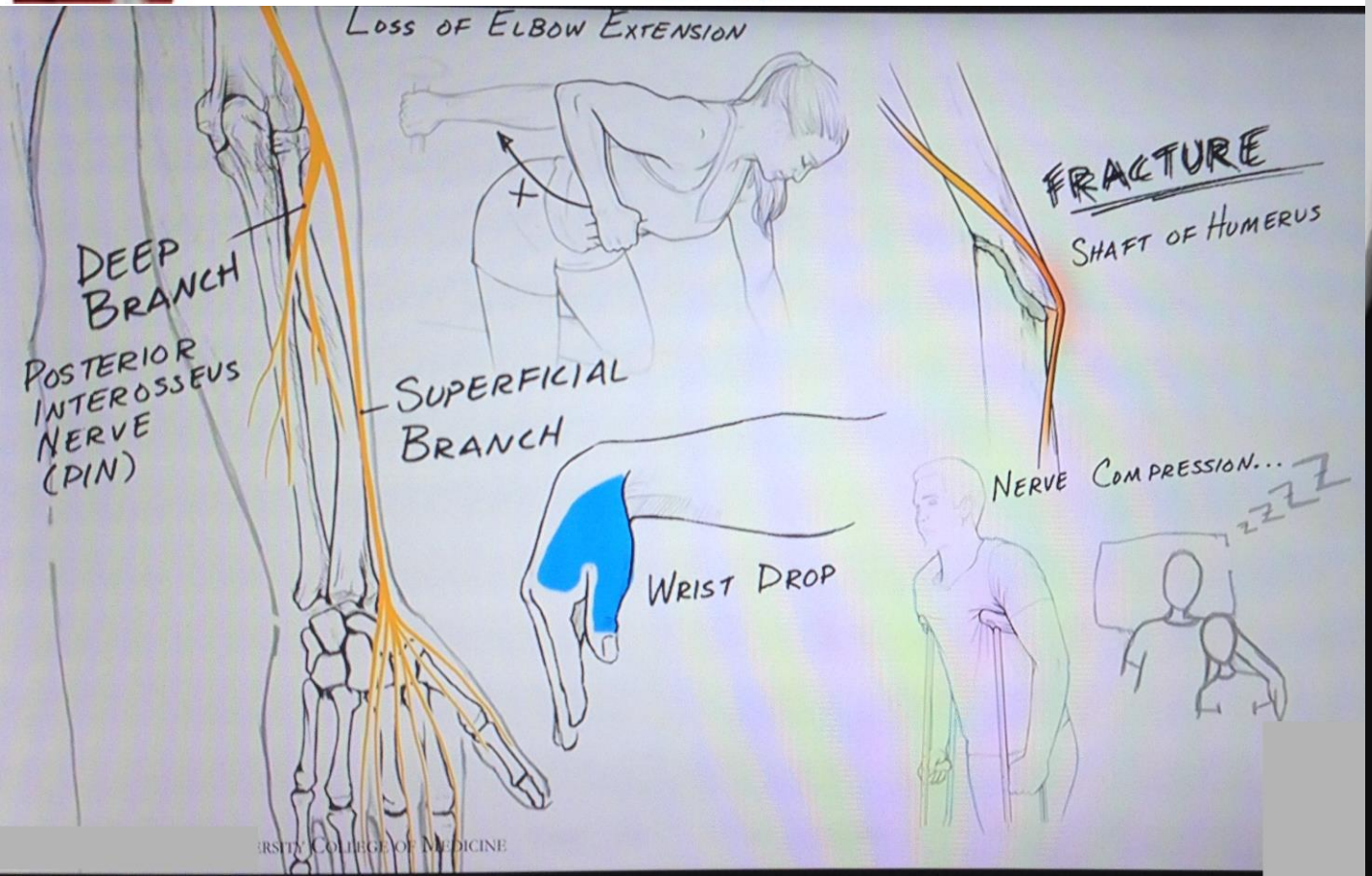
Anterior terminal division
Posterior terminal division

Radial n. & Common Injuries

C5-C8

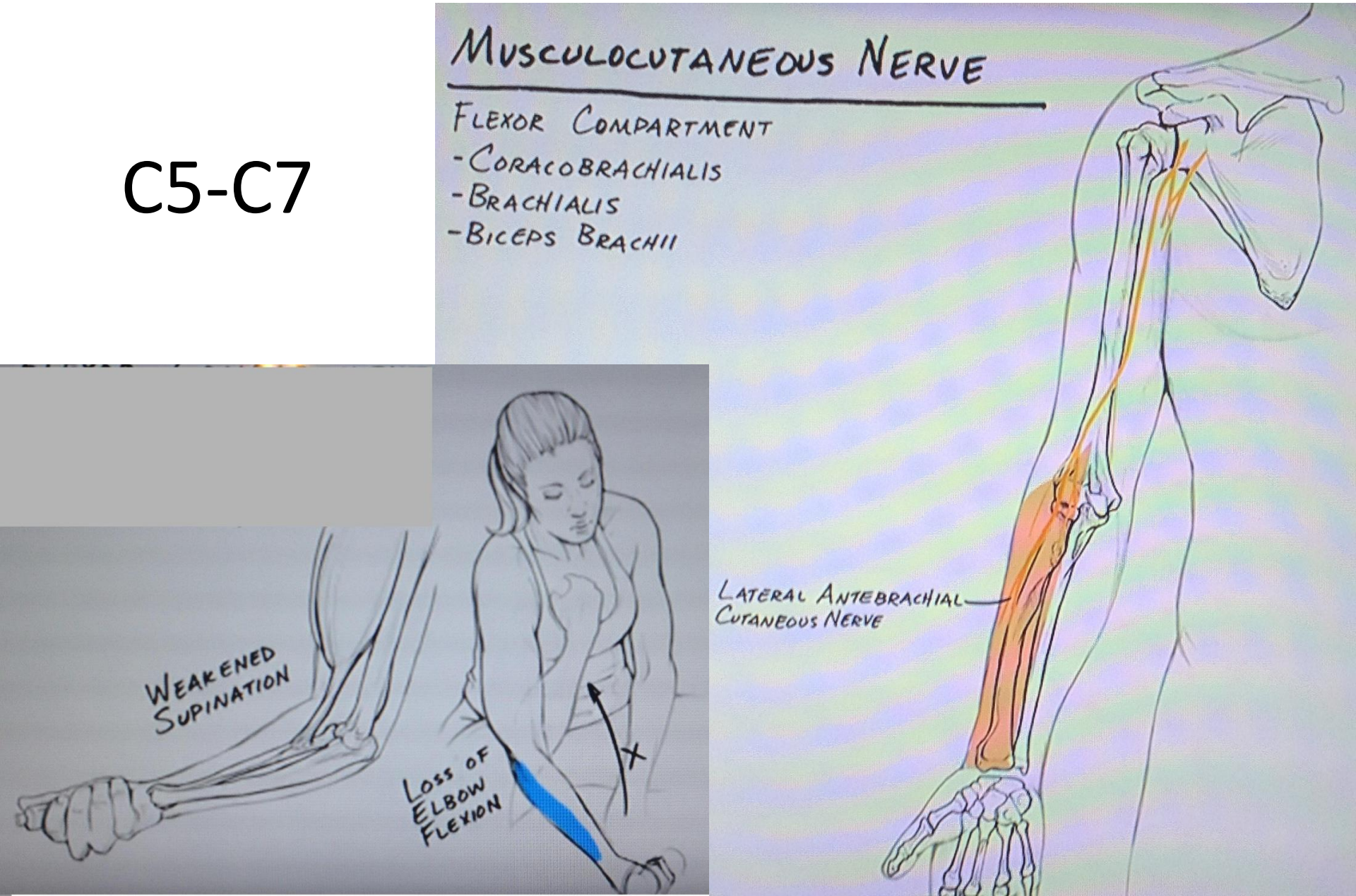






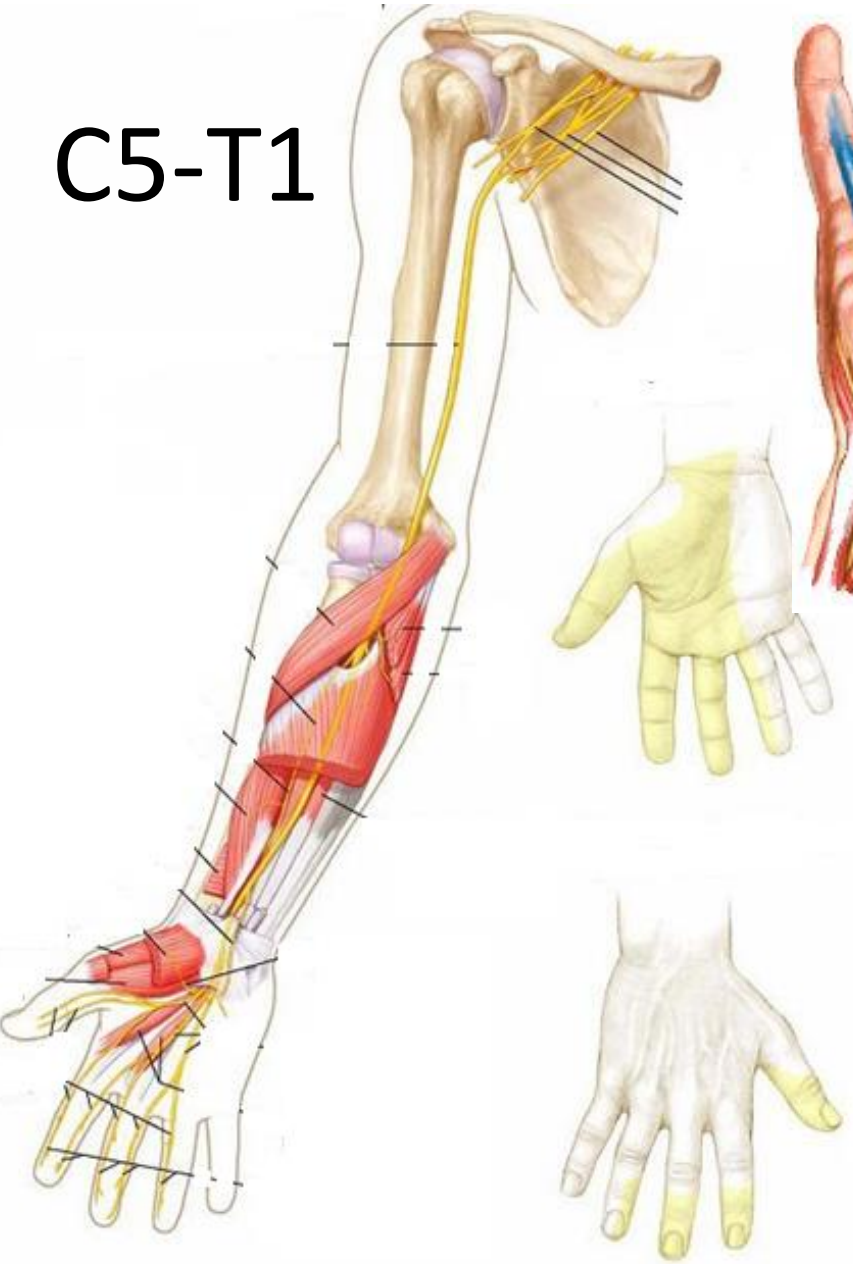
Musculocutaneus n. & Common Injuries

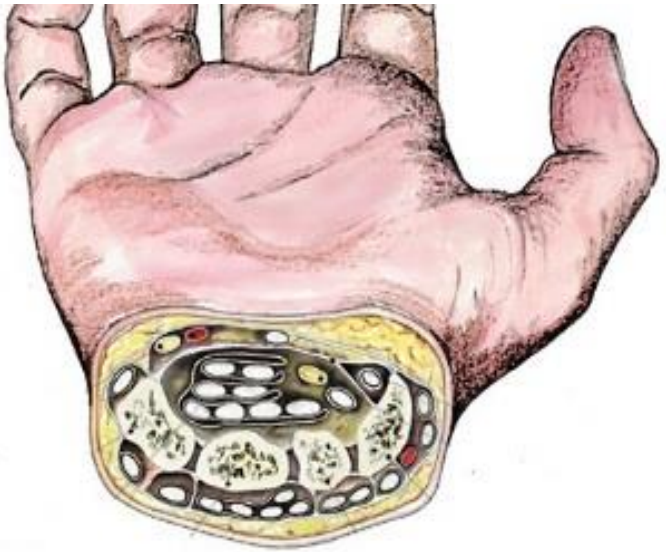
C5-C7

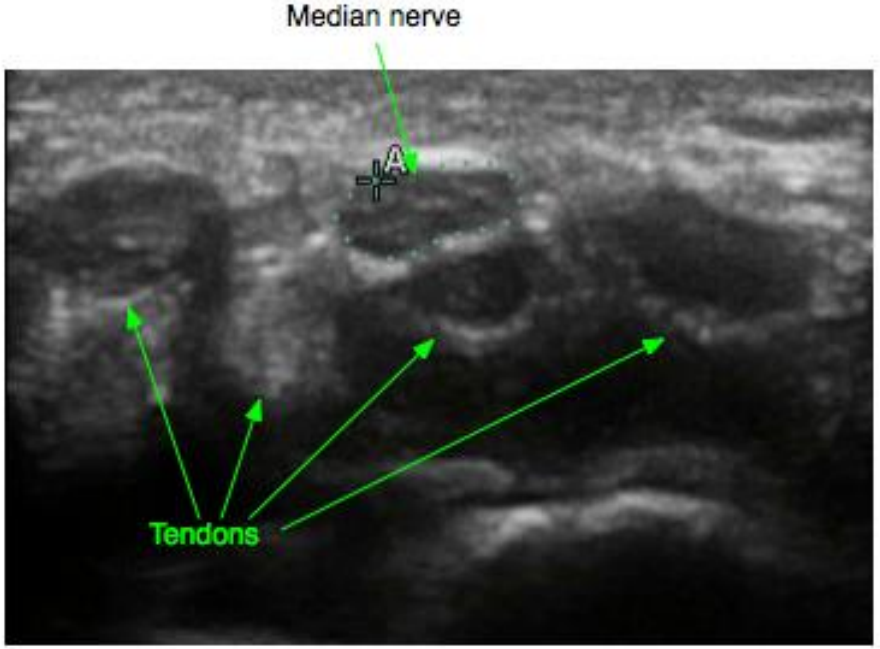


Median n. & Common Injuries

C5-T1

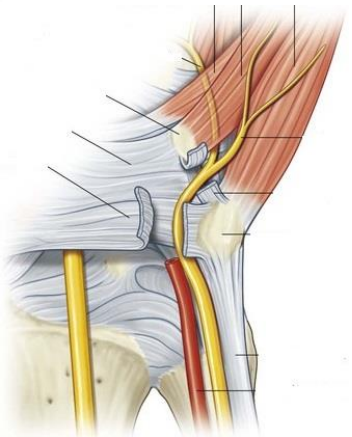


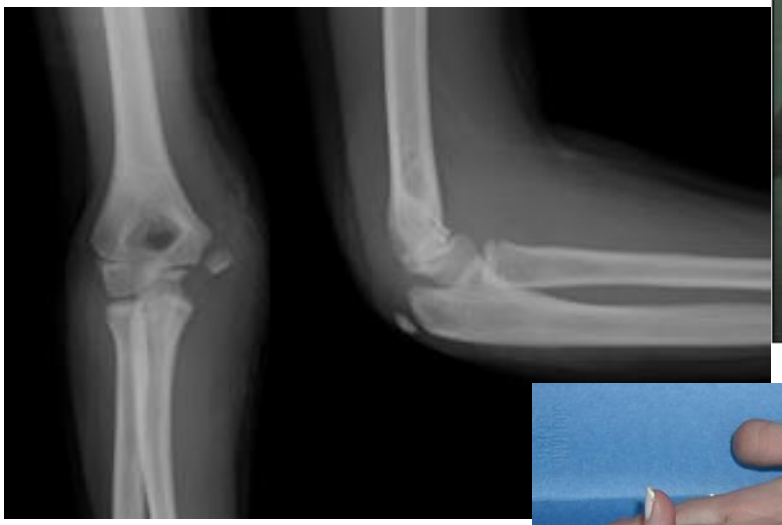


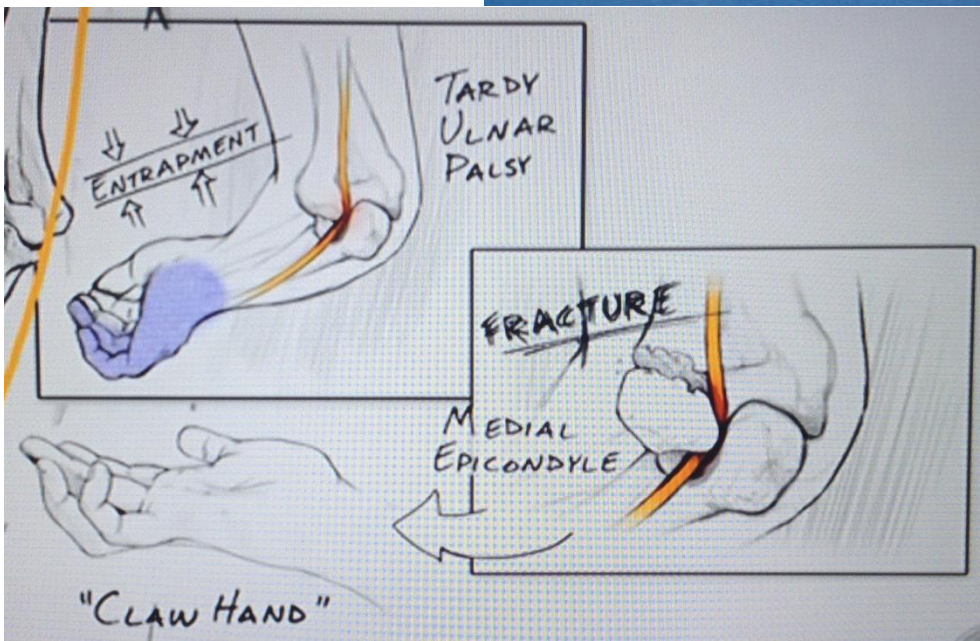


Ulnar n. & Common Injuries

C7-T1

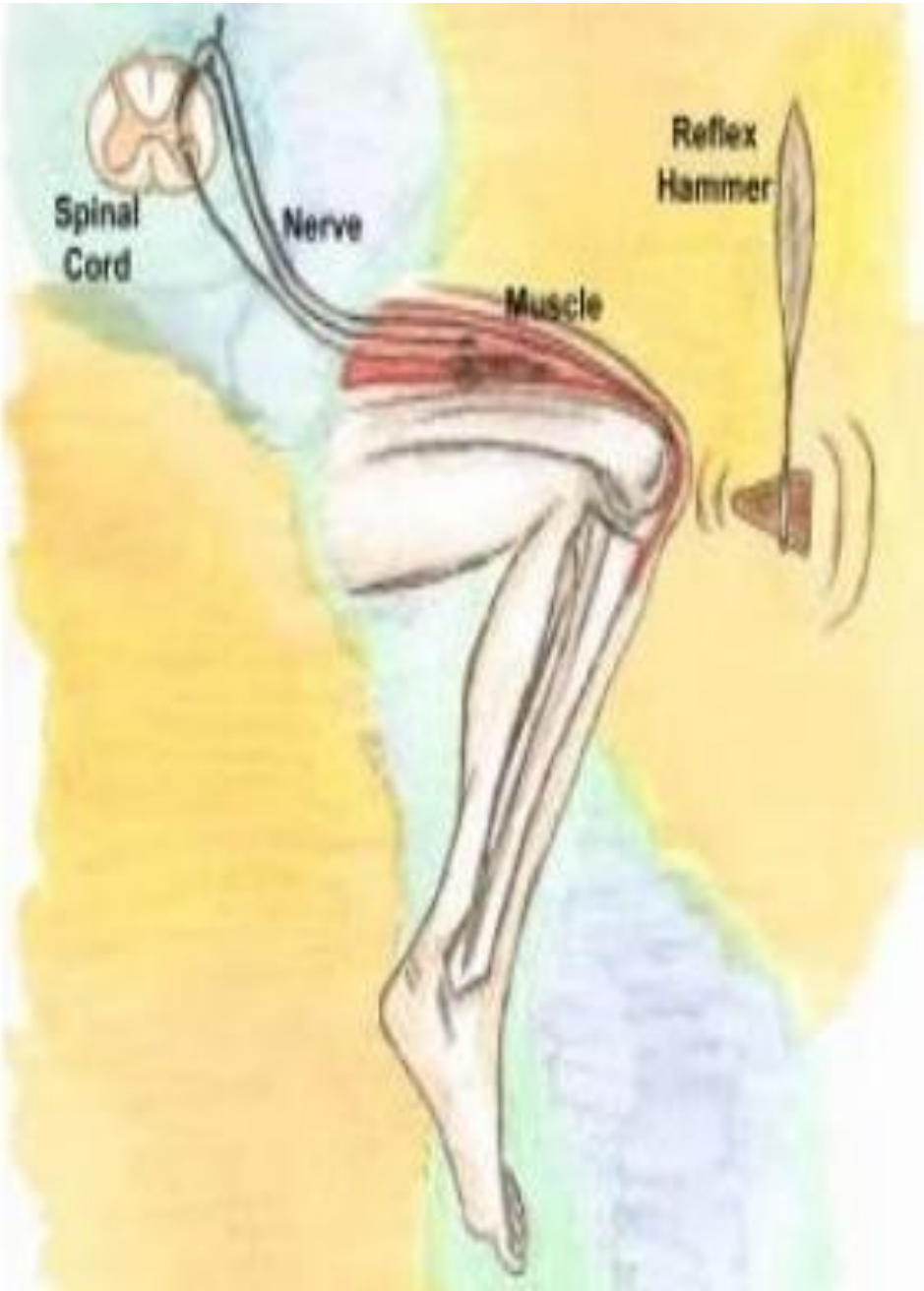






Reflexes

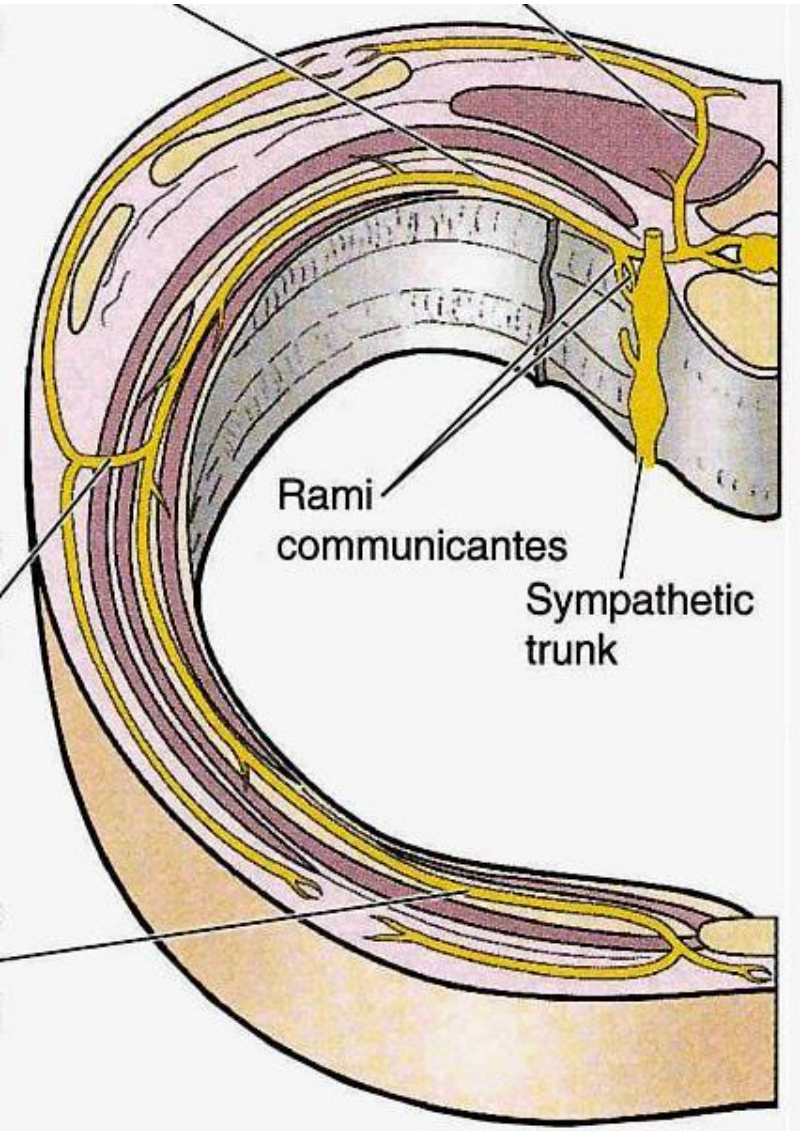
- Some, but not all, of the nerve roots have a reflex. C5, C6 and C7 have reflexes. L4 and S1 have reflexes.
- For example, when the C6 nerve is pinched, there is loss of the pronator reflex in the forearm. When the L5 nerve is pinched, there is no reflex loss. Not all nerves have a reflex which can be tested.
- List of Reflexes of Commonly Injured Nerve Roots
- C5 – Flexion at the elbow, biceps.
- C6 – Flexion at the elbow, brachioradialis.
- C7 – Extension at the elbow, triceps.
- C8 – Finger flexion.
-
- L4 – The knee reflex, quadriceps.
- L5 – No reflex.
- S1 – The ankle reflex, gastrocnemius.

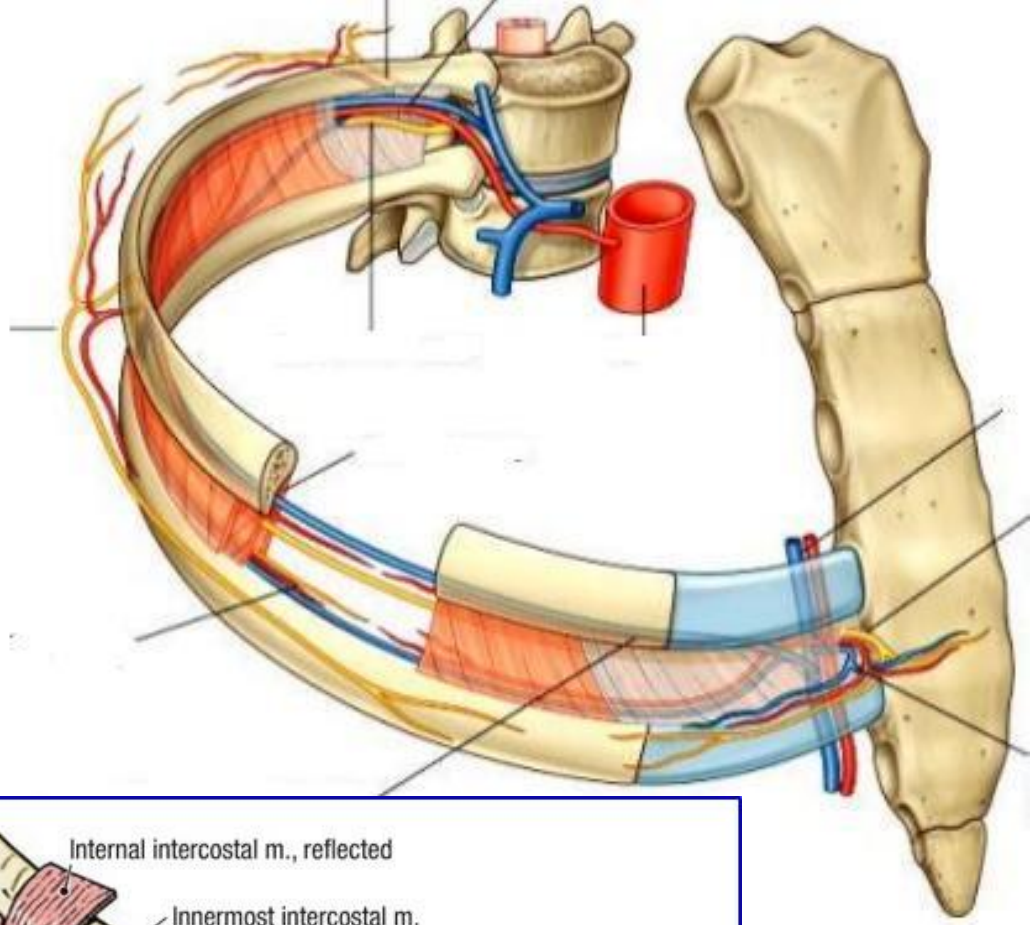


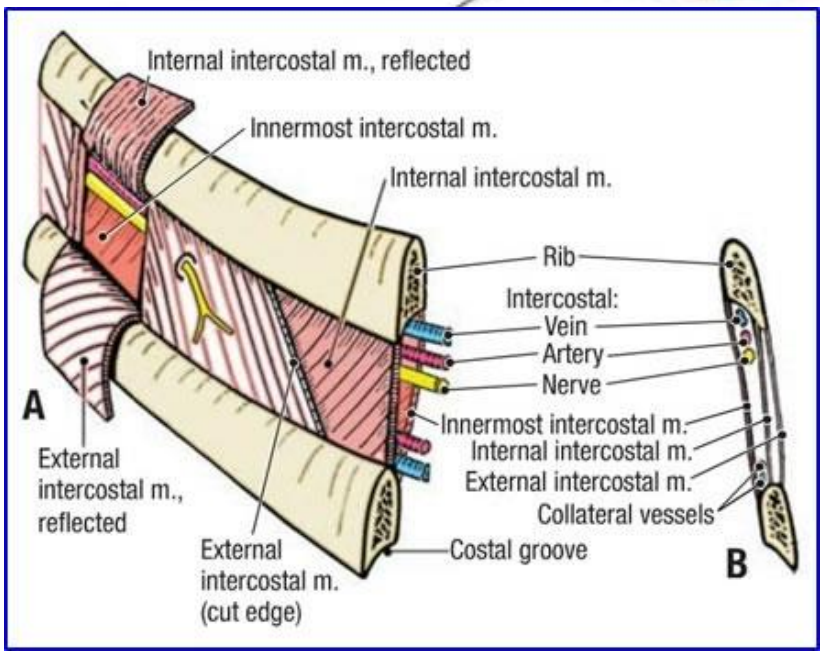
Examine the function of brachial plexus:

a) on your self
b) on a colleague

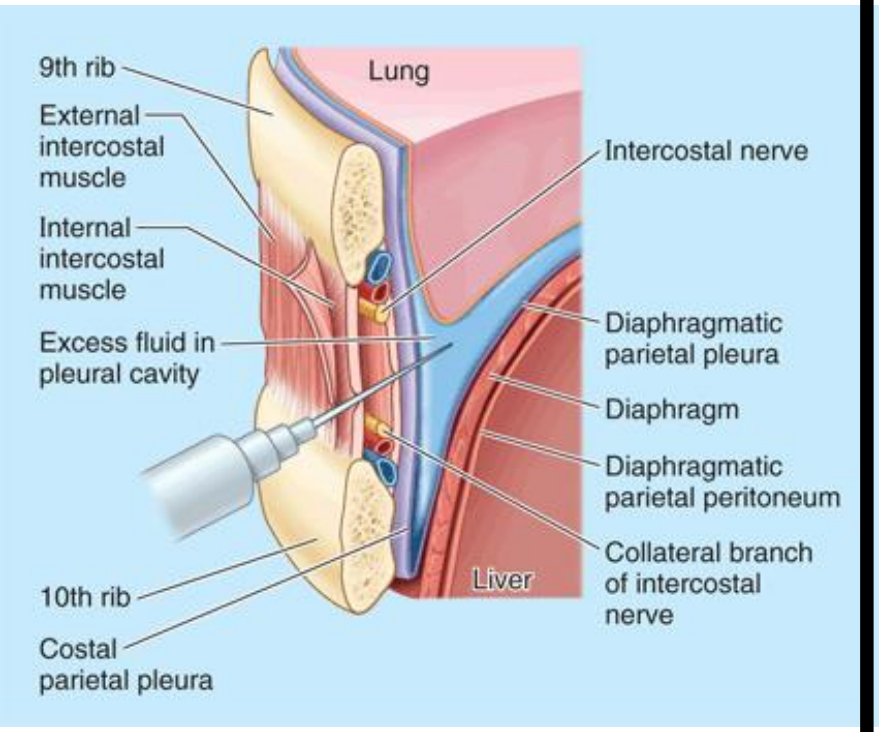
Intercostal nerves



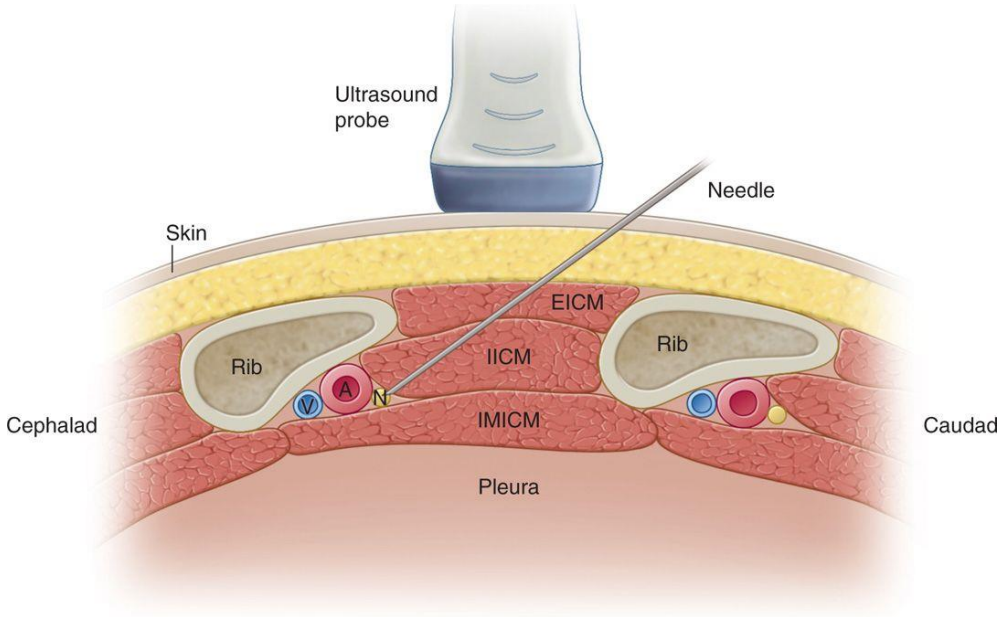


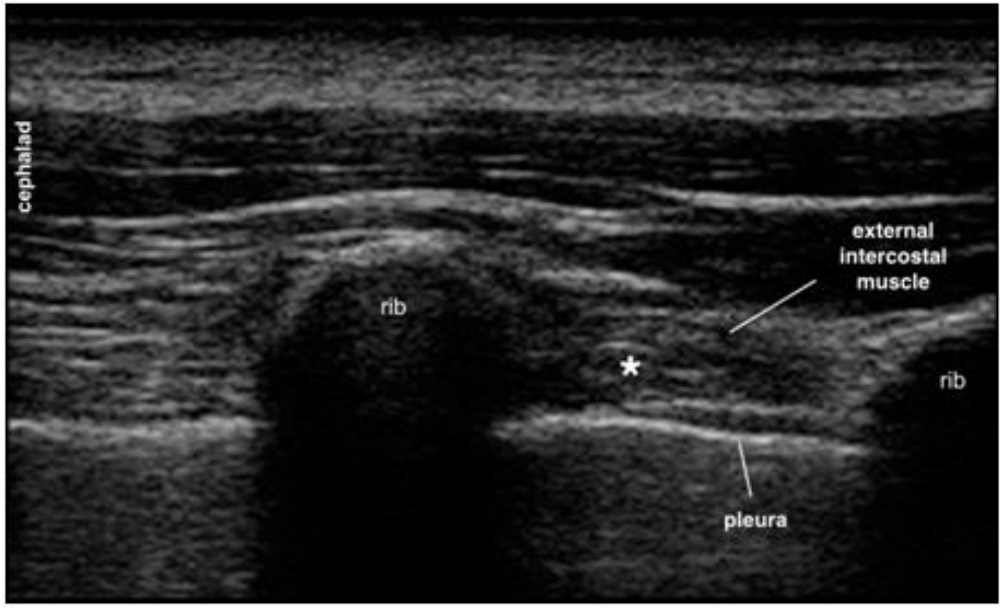


Pleural cavity needle

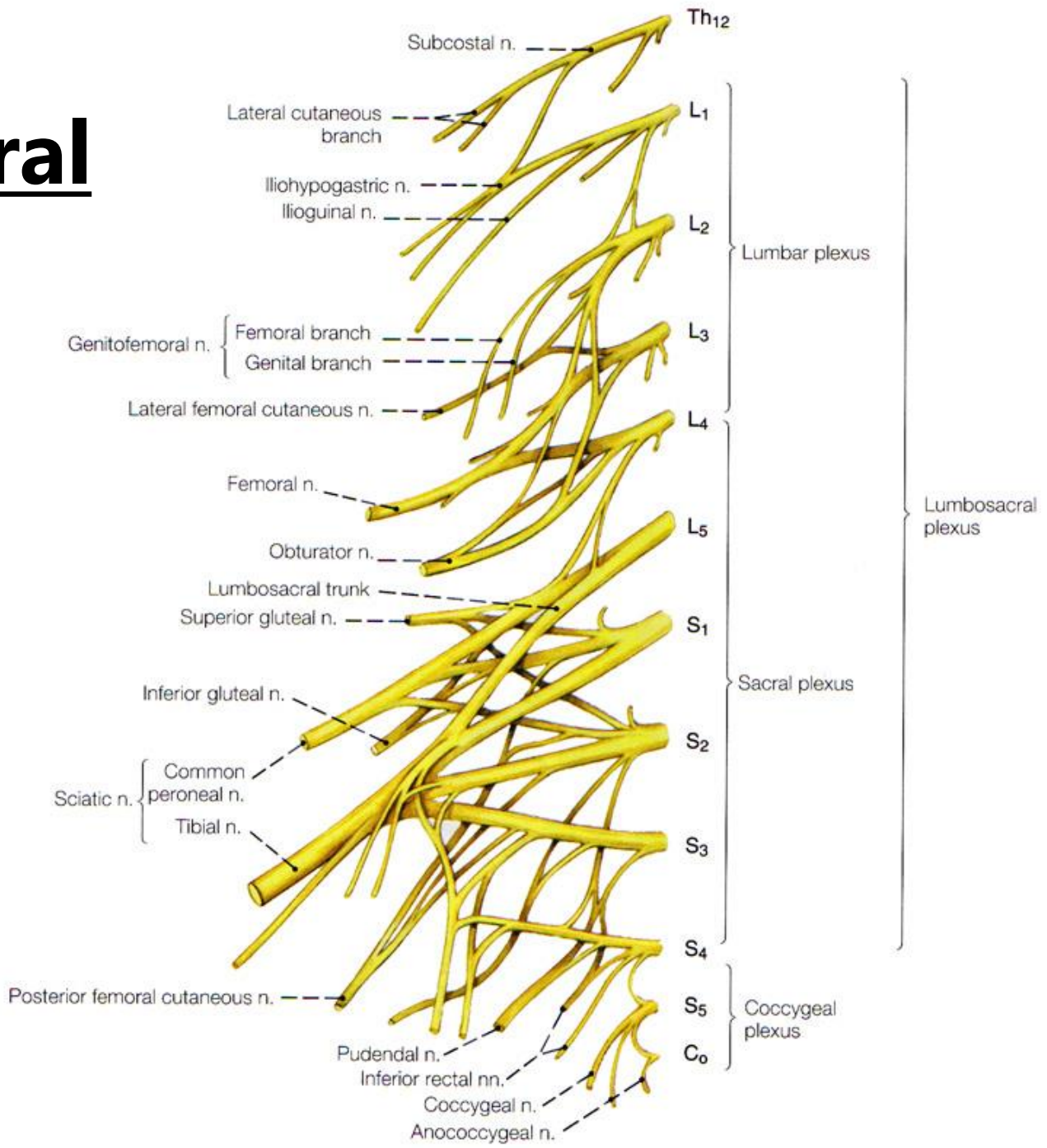


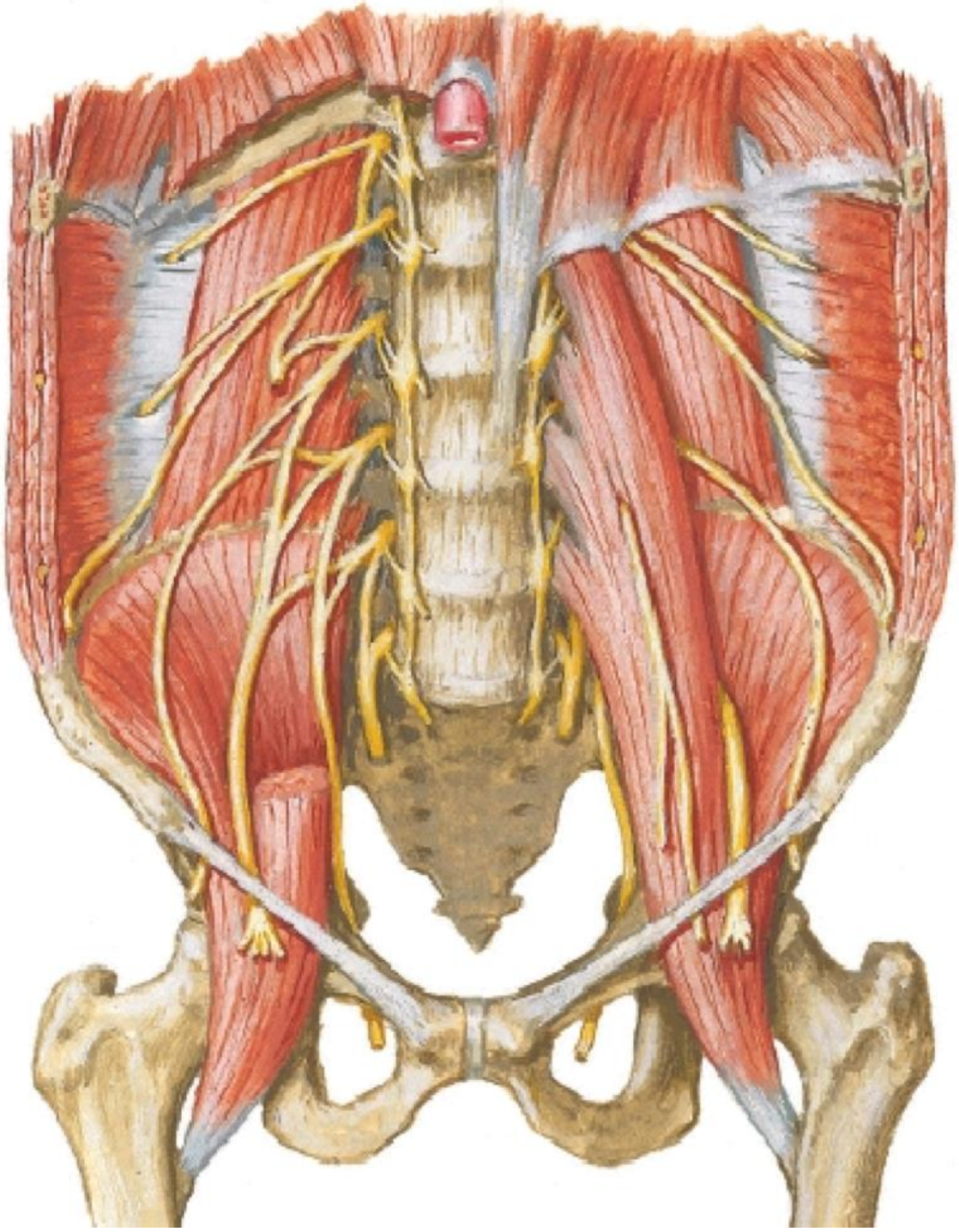
Intercostal n. block





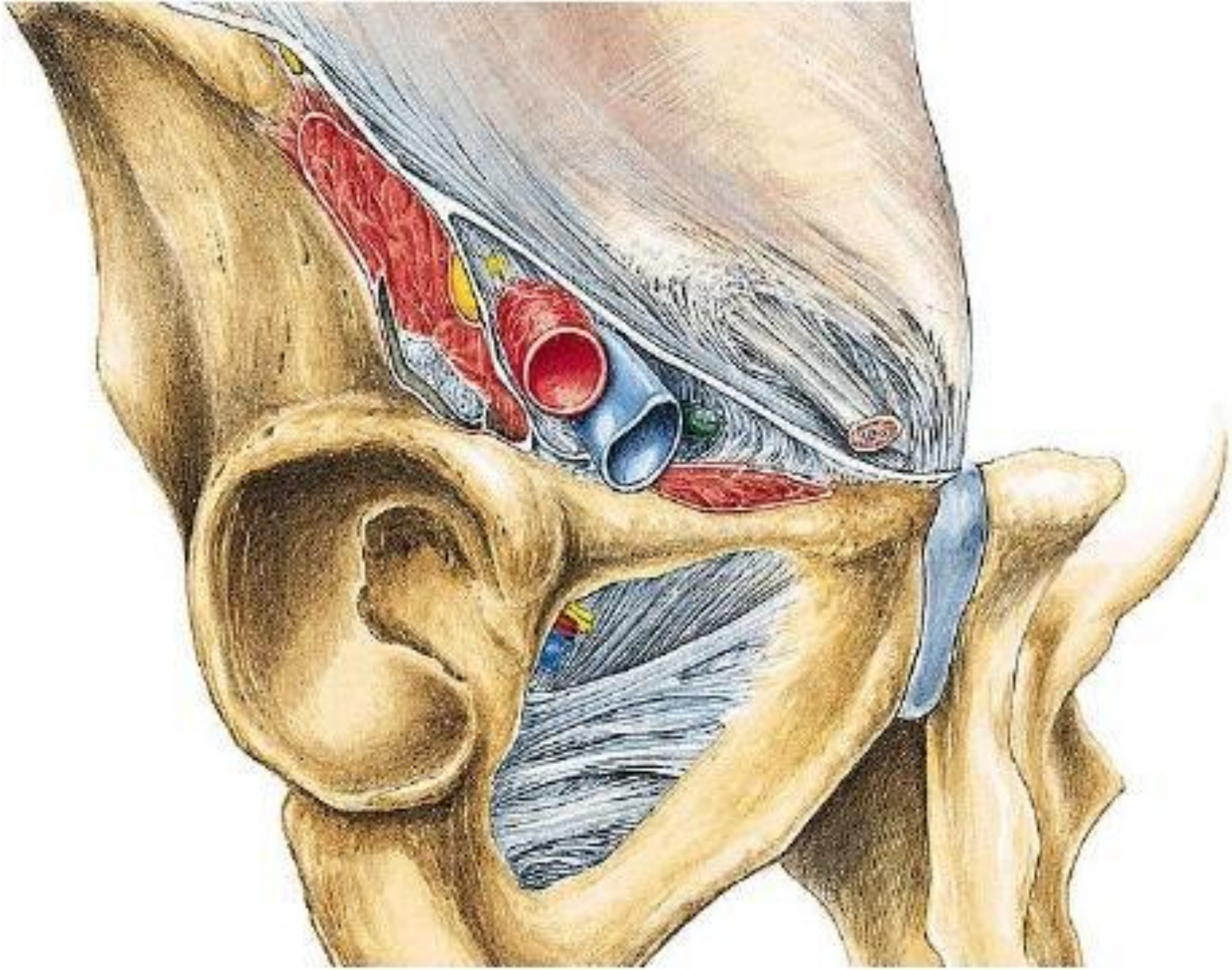
Lumbosacral Plexus



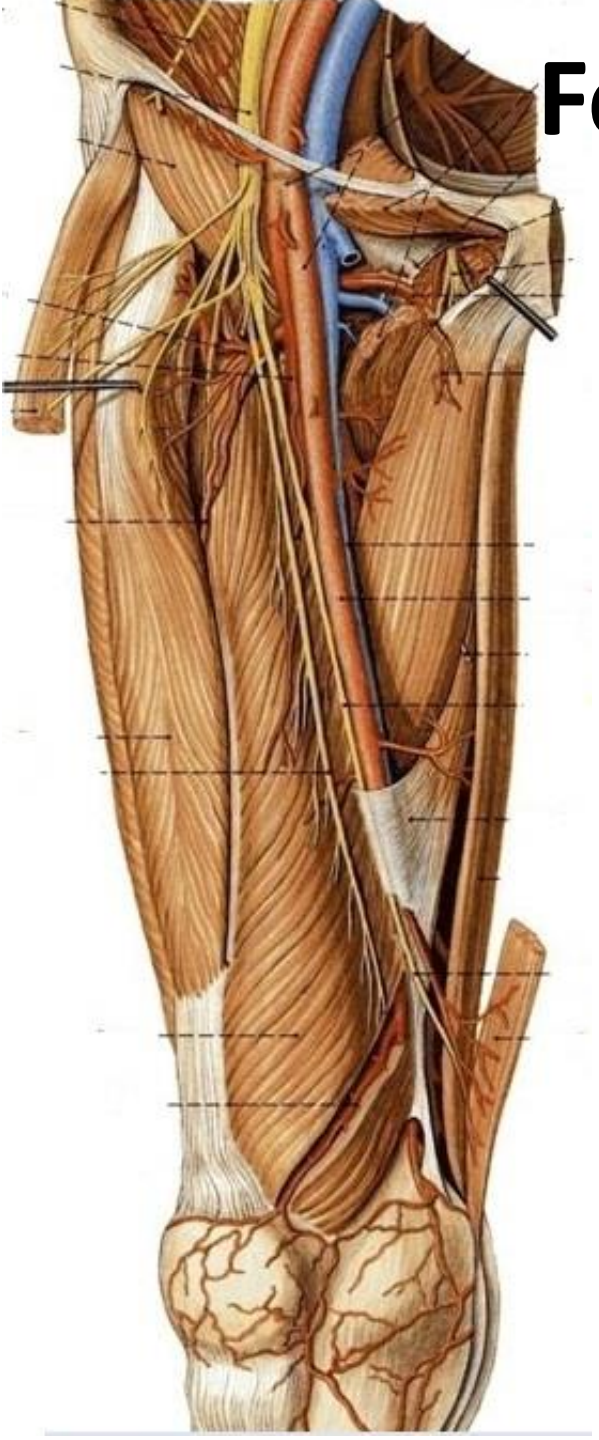


LUMBAR PLEXUS

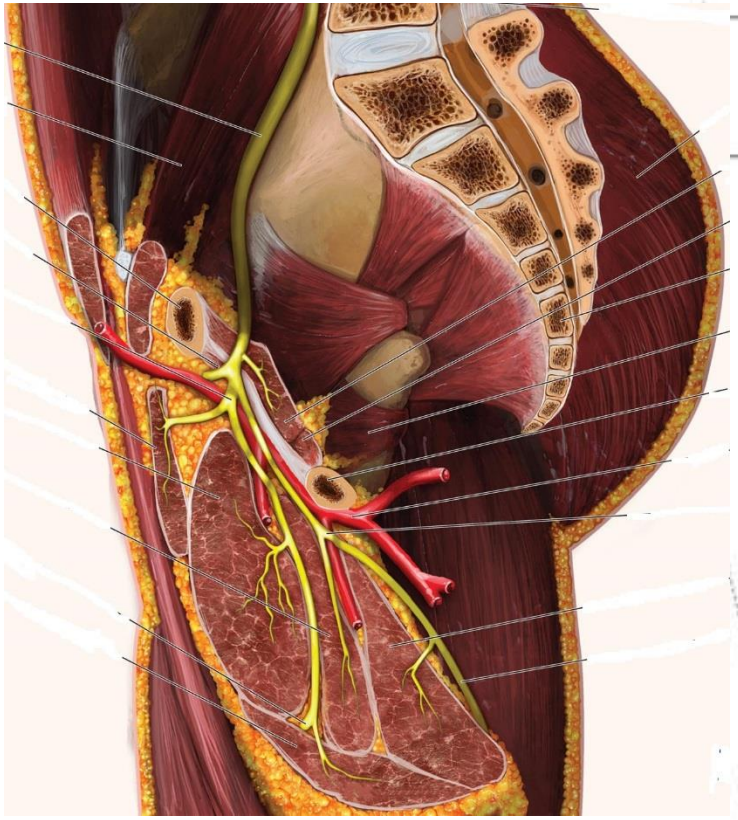
Draw the Lumbar plexus

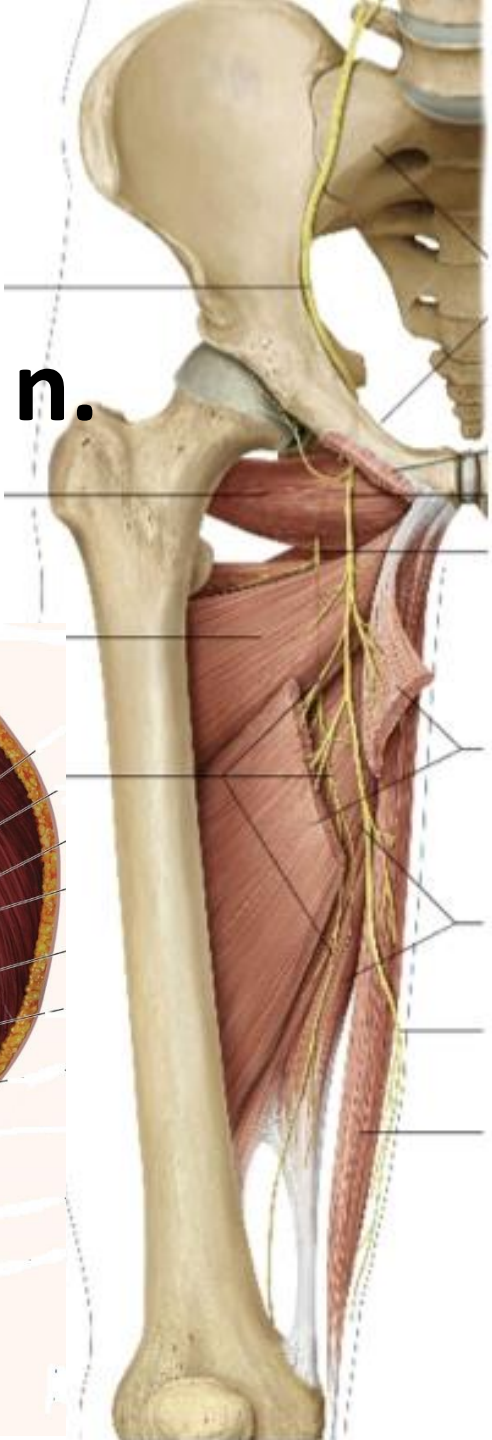


Femoral n.
L2-L4

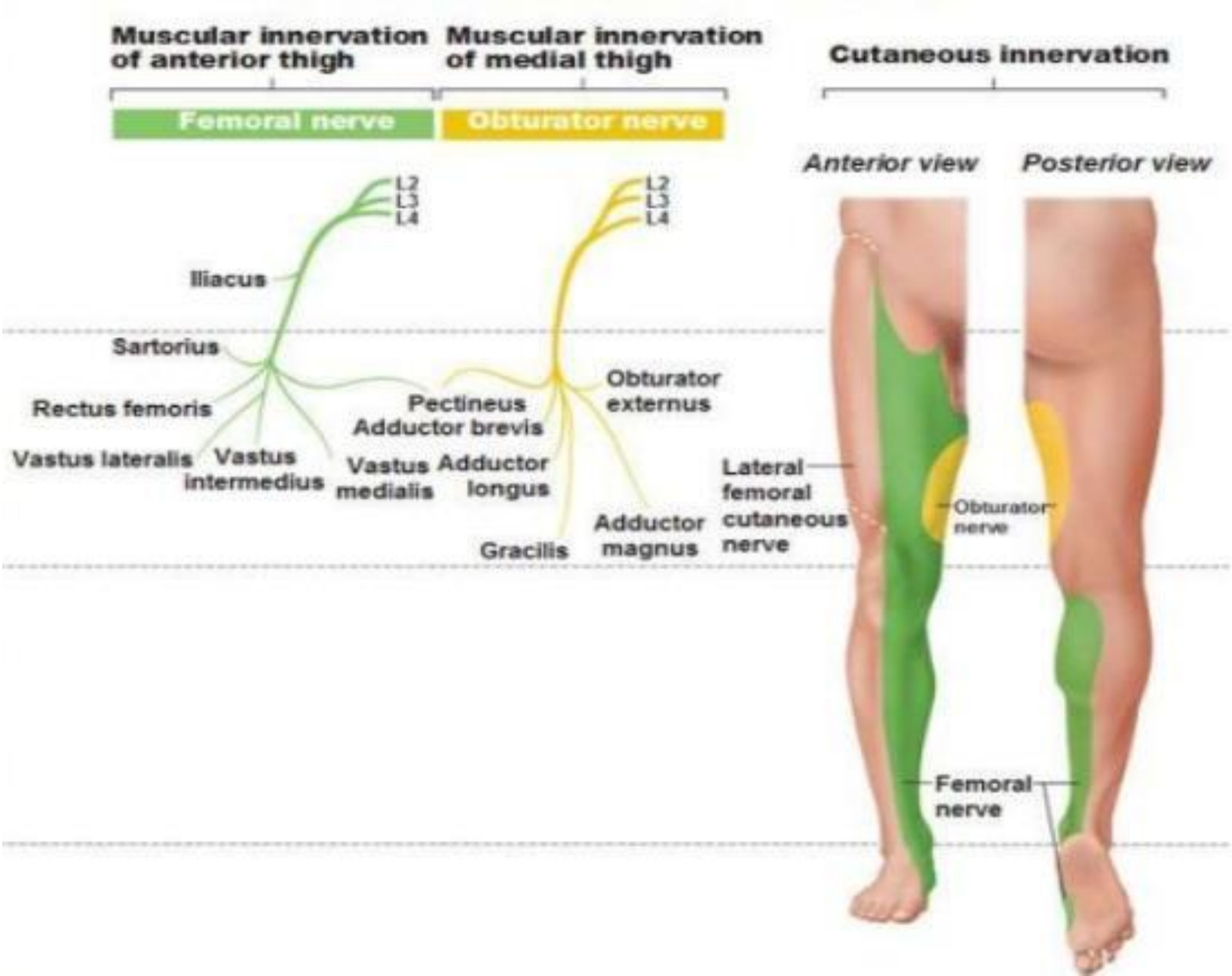


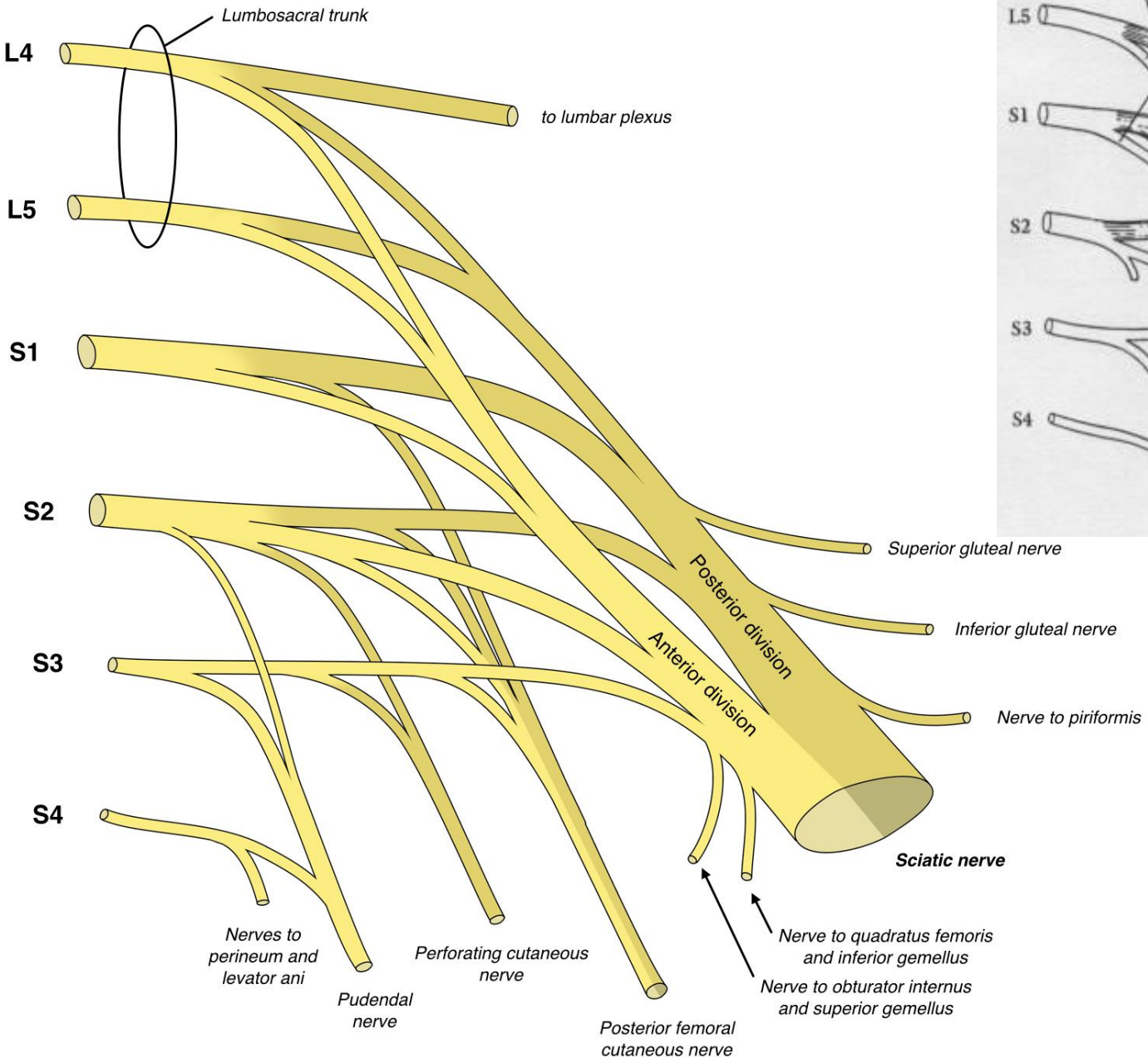
Obturator n.
L2-L4

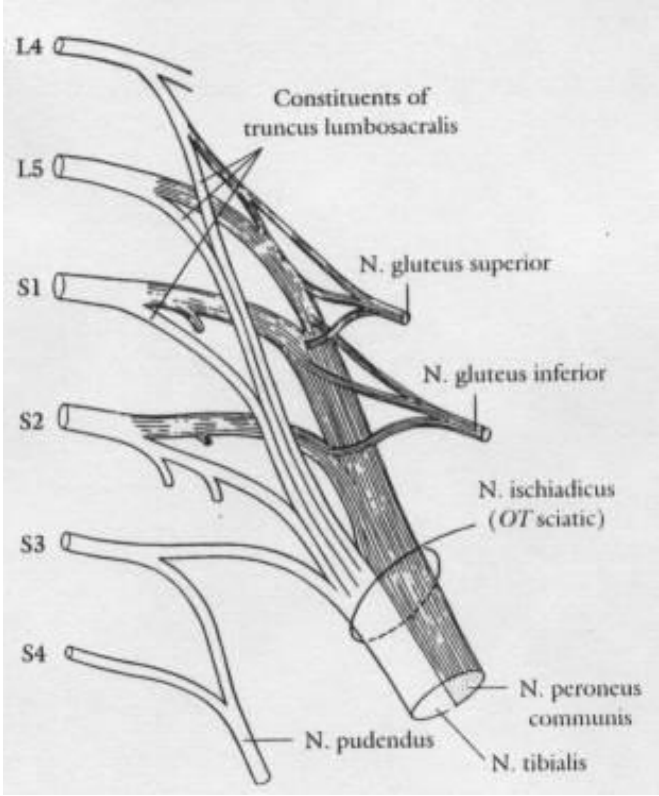




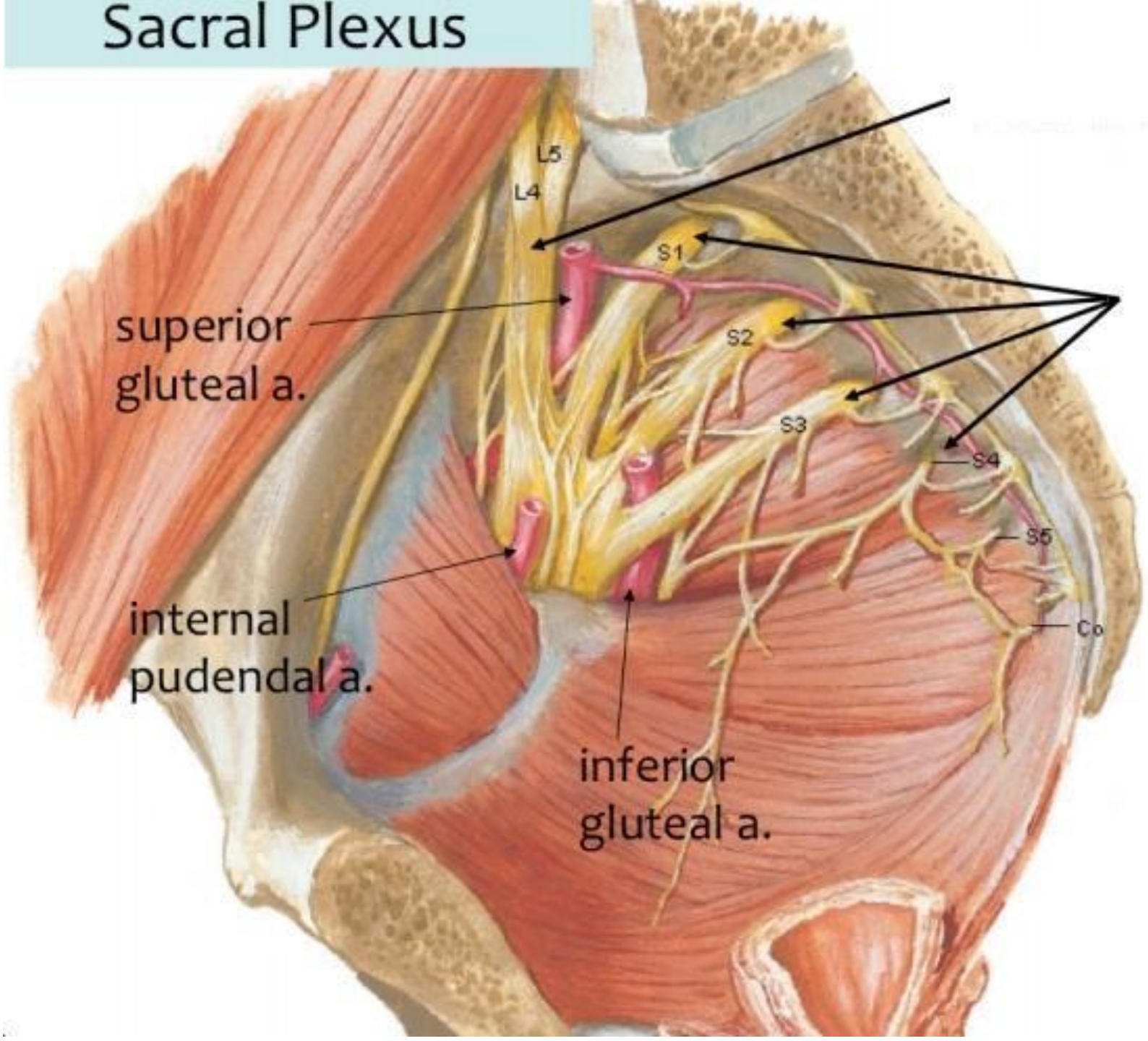
Lumbar plexus Syndrome




Lumbosacral trunk
L4
L5
S1
S2
S3
S4
to lumbar plexus
Superior gluteal nerve
Inferior gluteal nerve
Nerve to piriformis
Posterior division
Anterior division
Sciatic nerve
Nerves to perineum and levator ani
Pudendal nerve
Perforating cutaneous nerve
Posterior femoral cutaneous nerve
Nerve to quadratus femoris and inferior gemellus
Nerve to obturator internus and superior gemellus

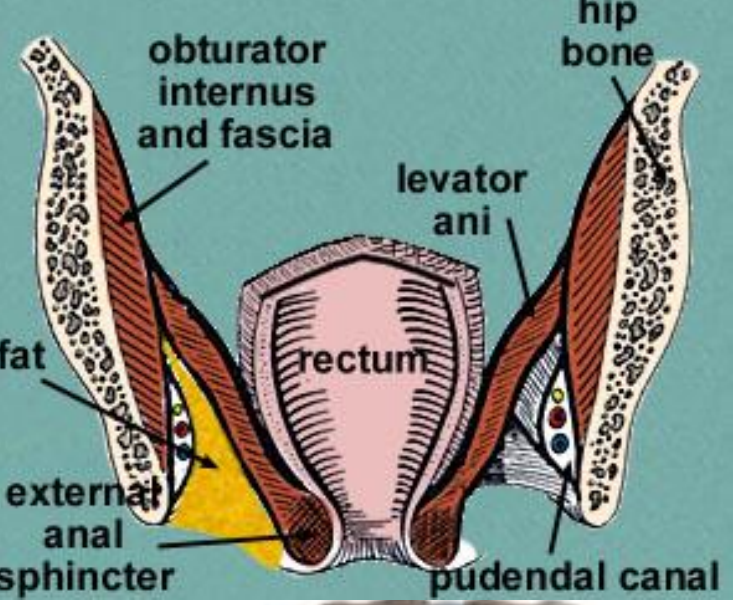

L4
L5
S1
S2
S3
S4
Constituents of truncus lumbosacralis
N. gluteus superior
N. gluteus inferior
N. ischiadicus (OT sciatic)
N. peroneus communis
N. pudendus
N. tibialis

Sacral Plexus

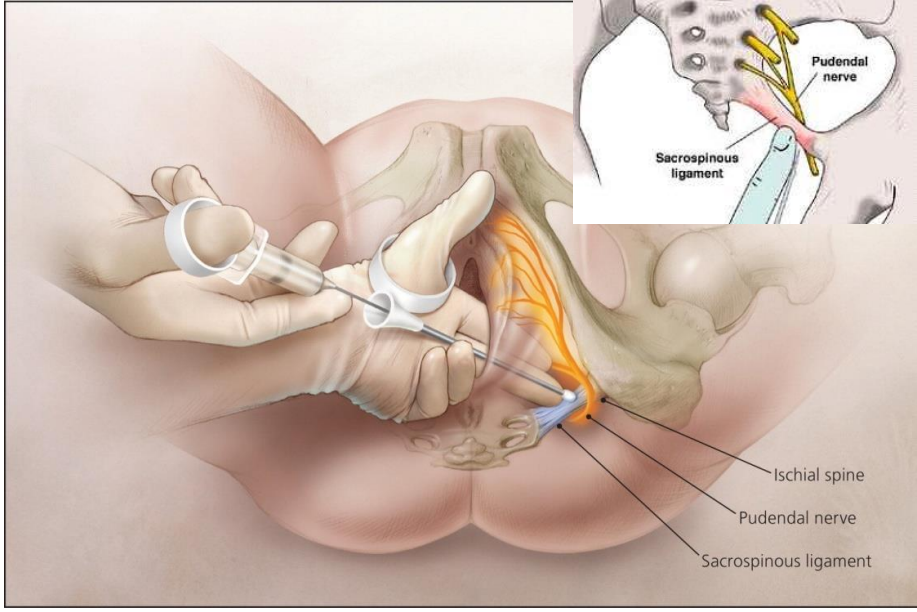


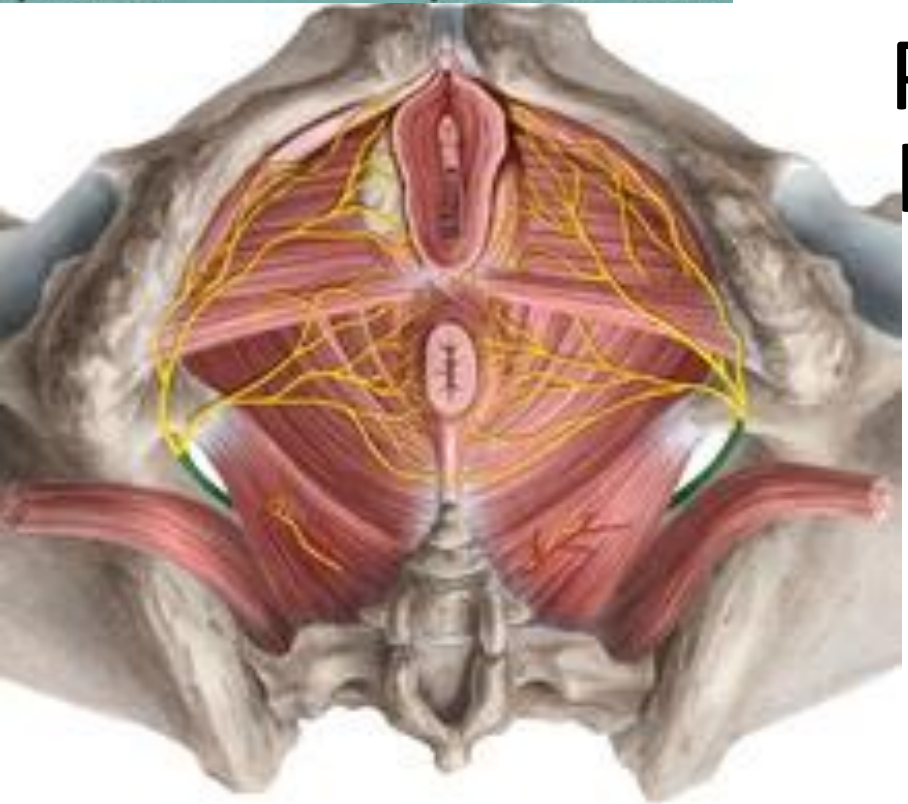
SACRAL PLEXUS

Draw the Sacral plexus



S2-S4

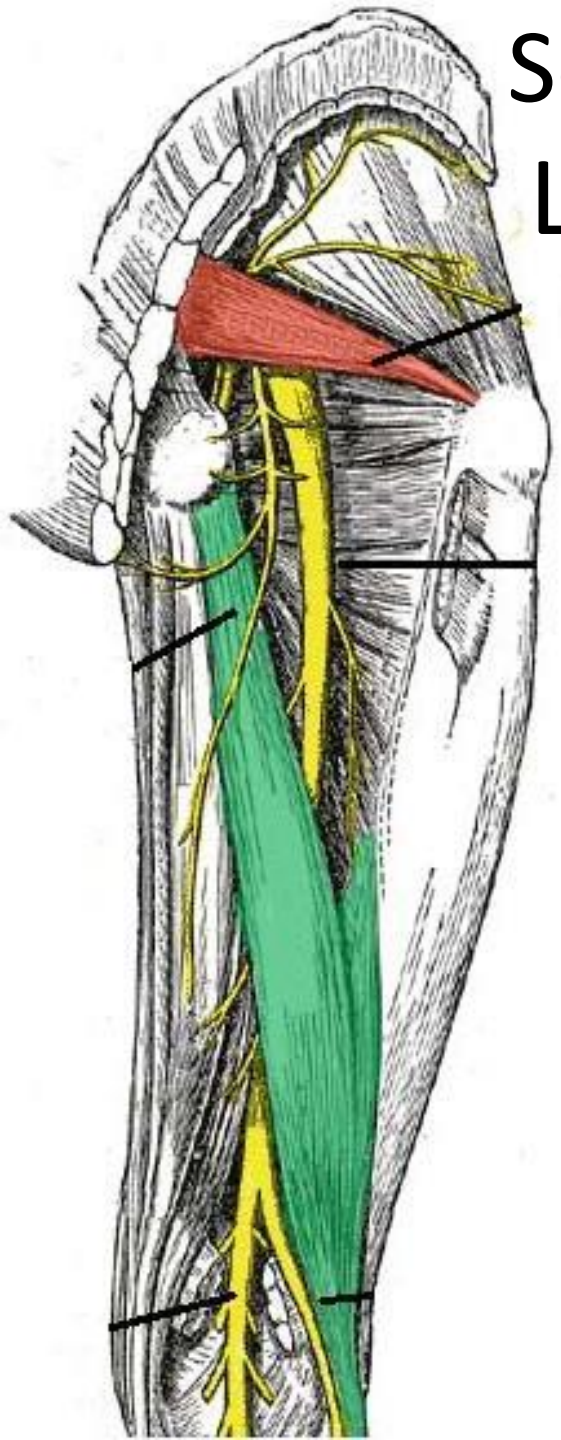


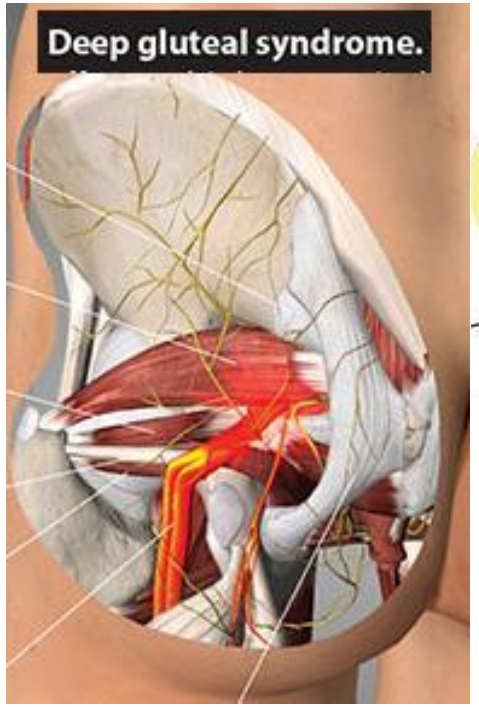


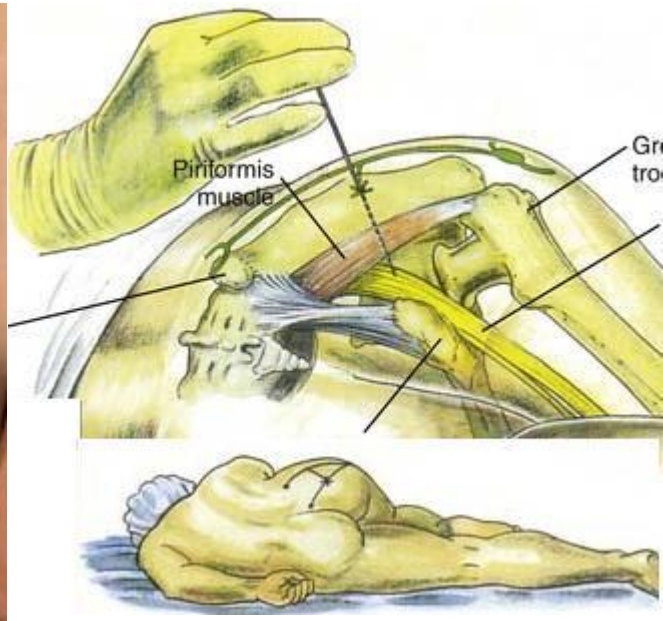
Pudendal n. In Obstetric

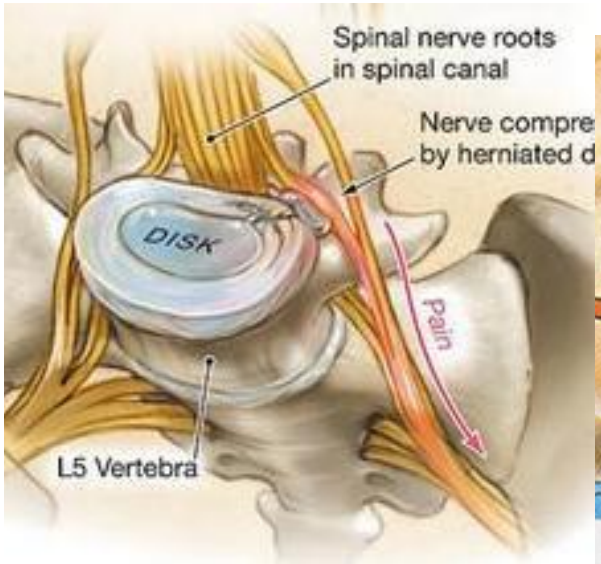
Sciatic n. & Sciatica

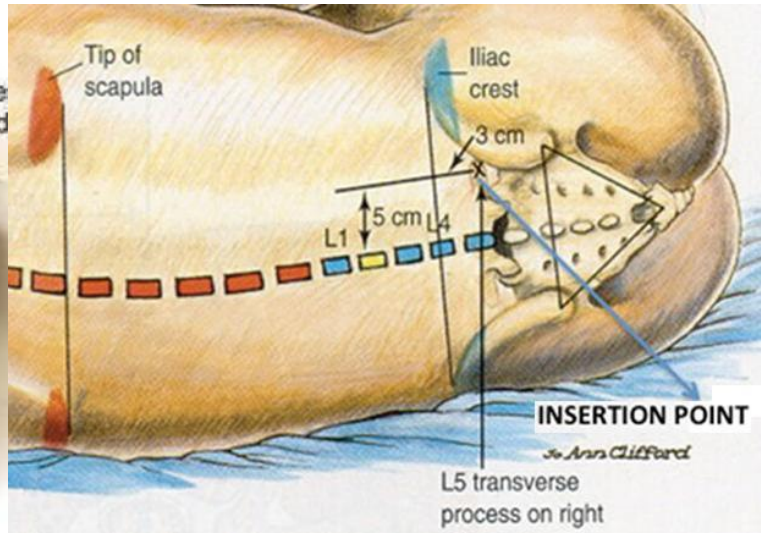
L5-S3

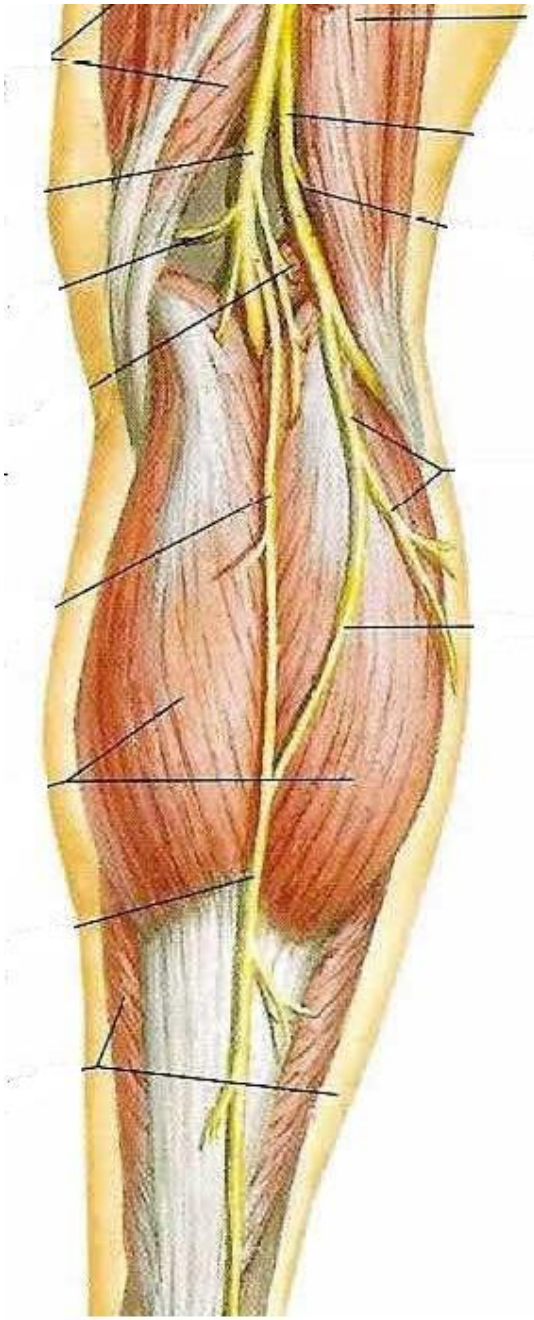


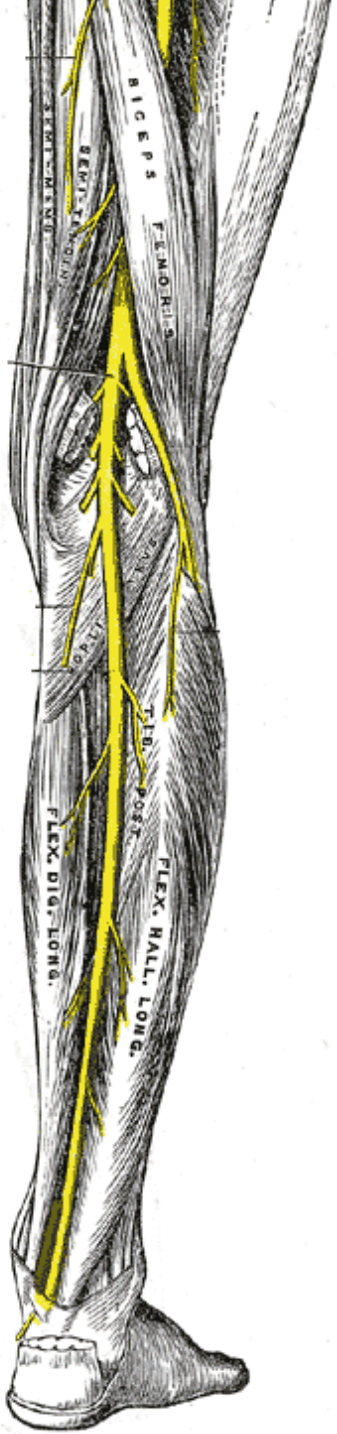


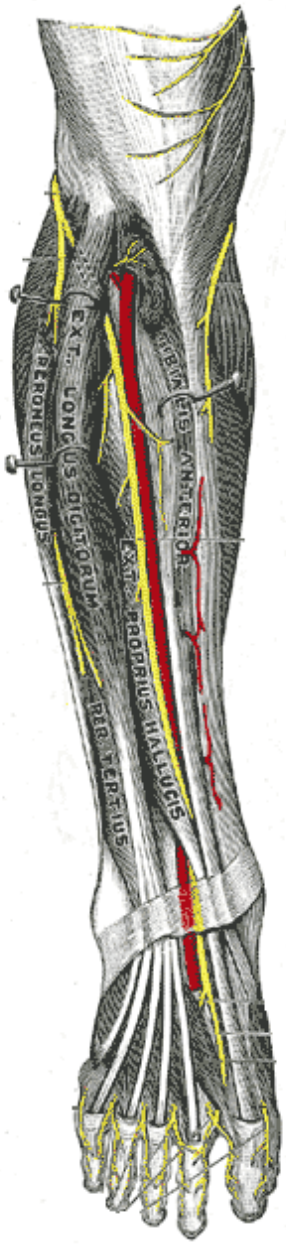









BICEPS FEMORIS
SEMITENDINOSUS
SEMIMEMBRANOSUS
POPLIT.
TIB. POST.
FLEX. HALL. LONG.
FLEX. DIG. LONG.


TIB. ANTERIOR
EXT. LONGUS DIGITORUM
PERONEUS LONGUS
EXT. PROPRIUS HALLUCIS
PER. TERTIUS

Sensation		Motor Function	
Peroneal Nerve Palpate dorsal surface of the foot		**Peroneal Nerve** The ability to dorsiflex ankle and toes	
Tibial Nerve Palpate plantar surface of foot		**Tibial Nerve** The ability to plantar flex ankle and toes	

Common Fibular nerve injuries

L4-S2

Tibial n. - Proximal injury

L4-S3

Sensory:

Sensory Loss over:
Lateral side of the leg and foot (sural nerve).

Trophic **ulcers** in the sole.

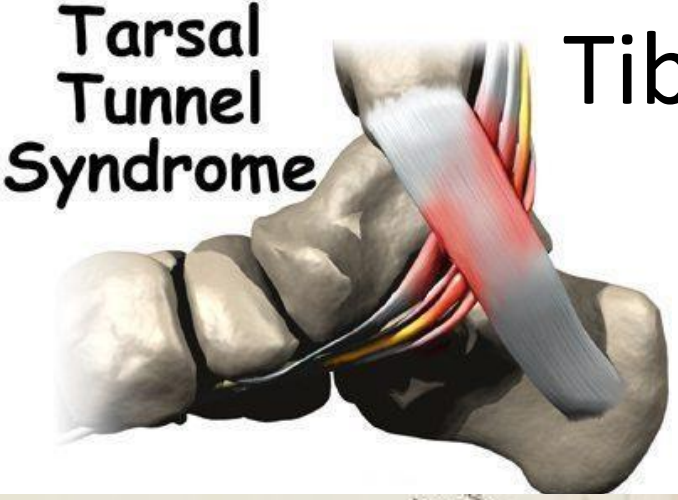
Complete division results in the following clinical features:

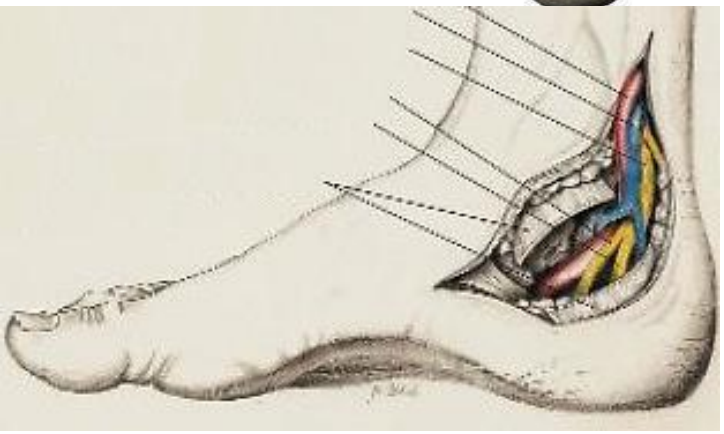
Motor:

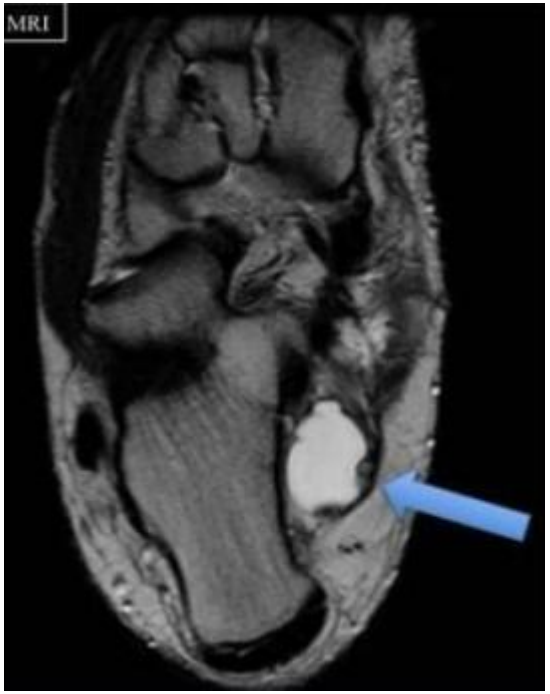
All the muscles in the back of the leg and the sole of the foot are paralyzed.

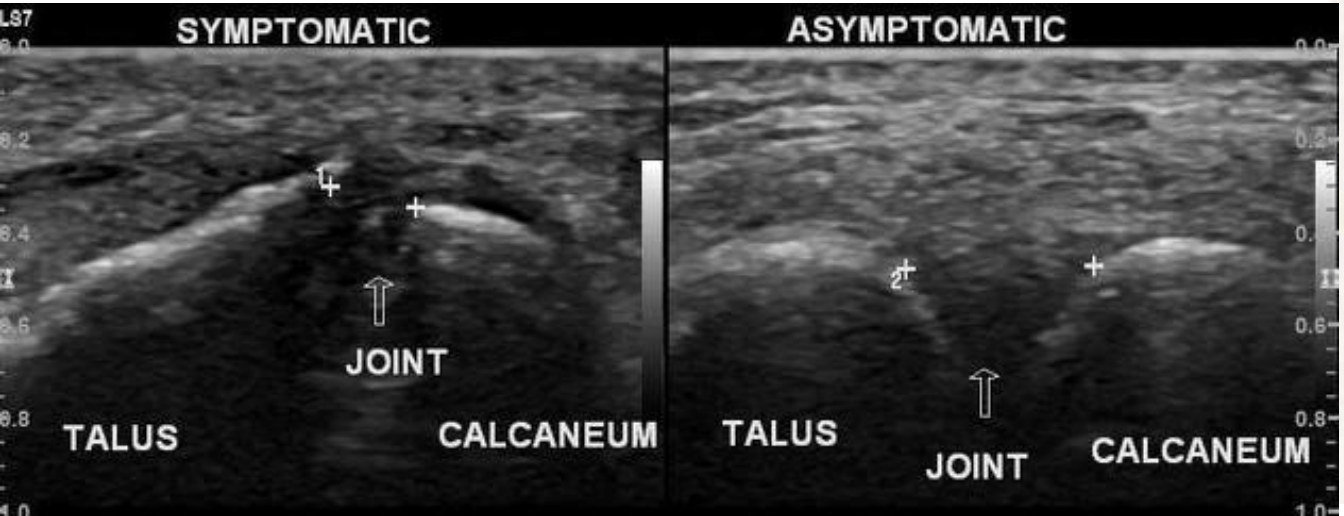
The opposing muscles ***Dorsiflex*** the foot at the ankle joint ***and Evert the foot*** at the subtalar joint, an attitude referred to as Talipes **Calcaneovalgus.**

Tibial n. - distal injury L4-S2









Reflexes

- Some, but not all, of the nerve roots have a reflex. C5, C6 and C7 have reflexes. L4 and S1 have reflexes.
- For example, when the C6 nerve is pinched, there is loss of the pronator reflex in the forearm. When the L5 nerve is pinched, there is no reflex loss. Not all nerves have a reflex which can be tested.
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- C5 – Flexion at the elbow, biceps.
- C6 – Flexion at the elbow, brachioradialis.
- C7 – Extension at the elbow, triceps.
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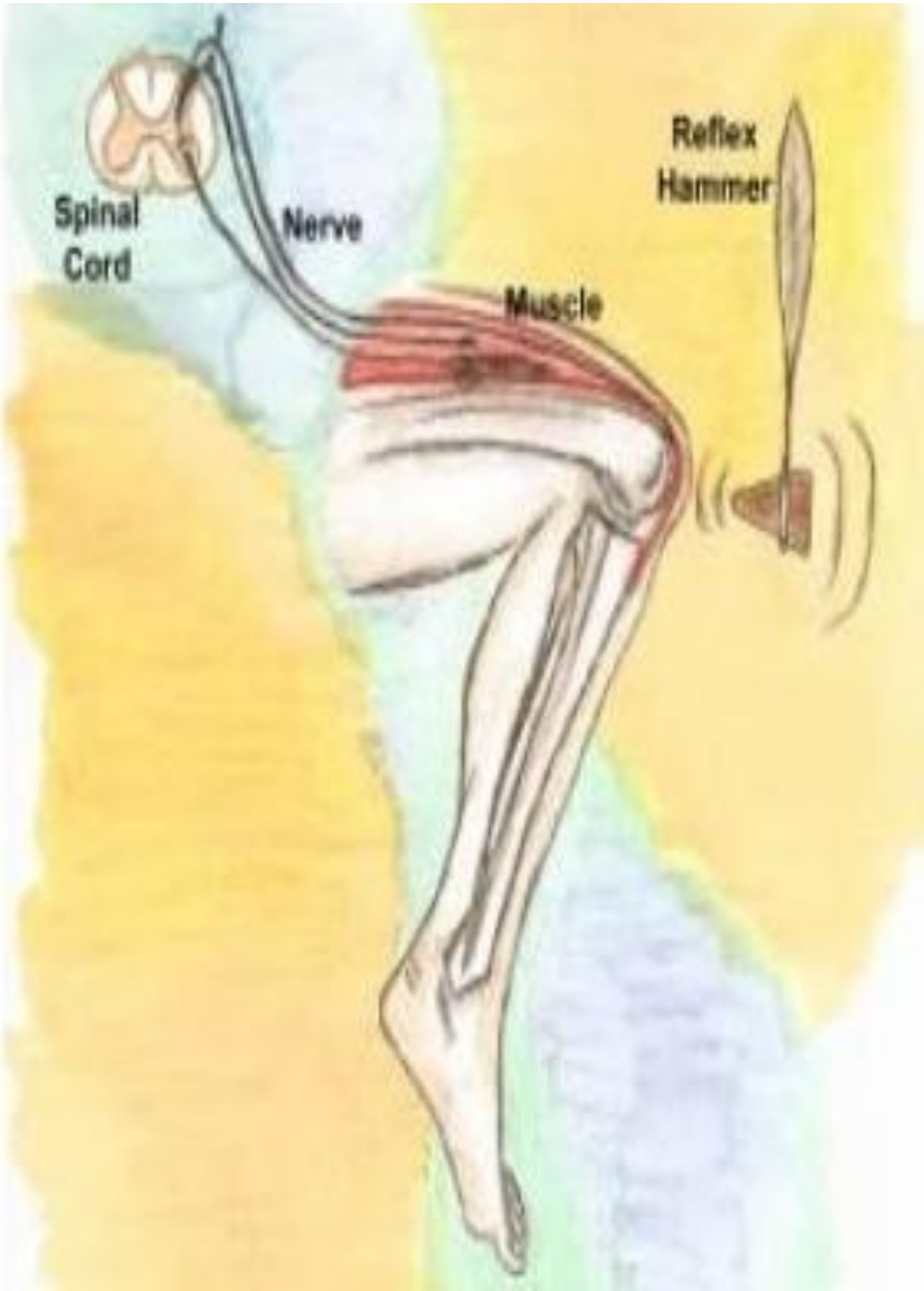
-
- L4 – The knee reflex, quadriceps.
- L5 – No reflex.
- S1 – The ankle reflex, gastrocnemius.



Examine the function of sciatic nerve:

a) on your self
b) on a colleague

Ask before being Asked !