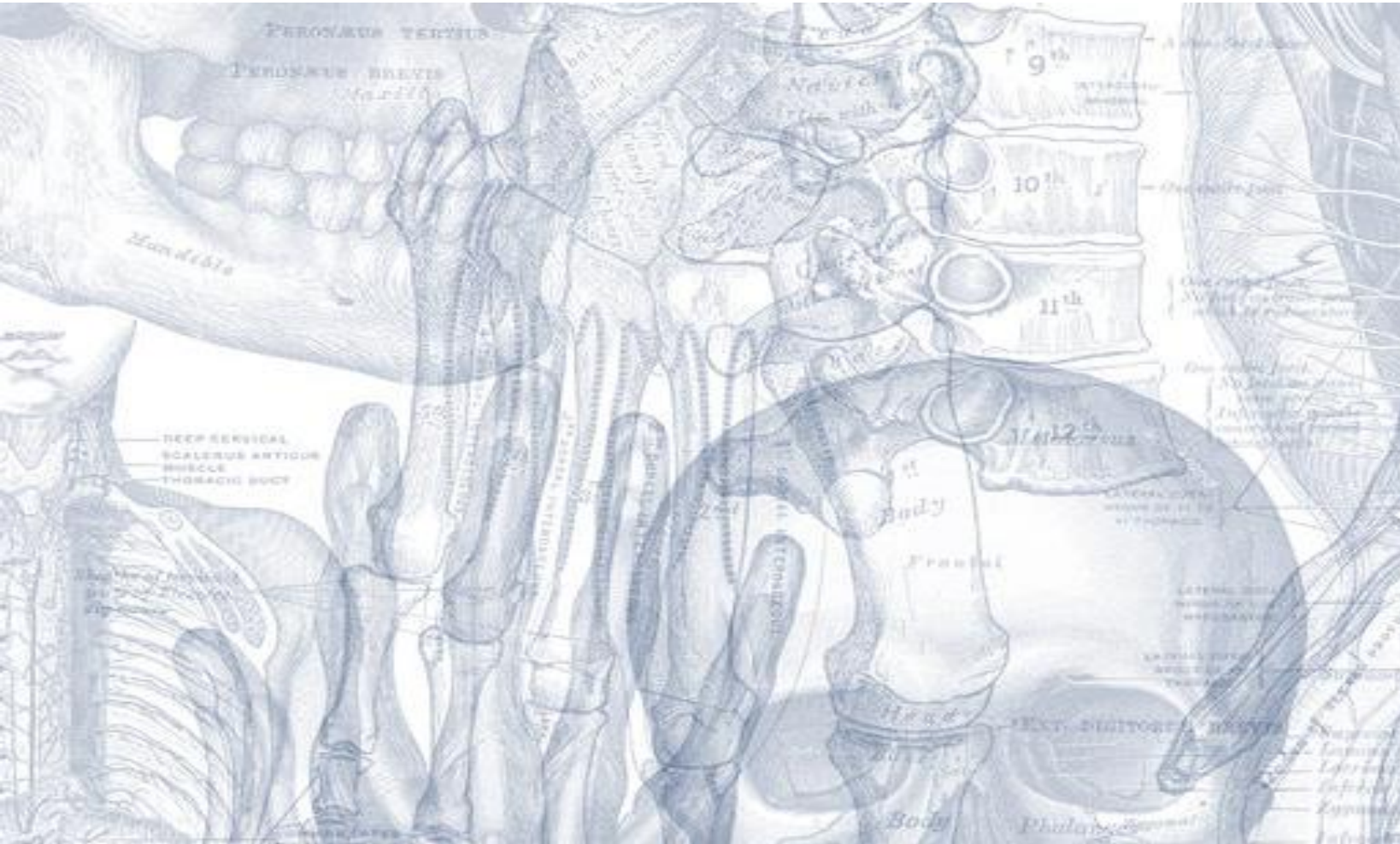


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Brachial Plexus and Lumbosacral Plexus

Please view our [Editing File](#) before studying this lecture to check for any changes.

Color Code

- Important
- Doctors Notes
- Notes/Extra explanation

Objectives

At the end of this lecture, the students should be able to :

- ✓ Describe the formation of brachial plexus (site, roots)
- ✓ List the main branches of brachial plexus
- ✓ Describe the formation of lumbosacral plexus (site, roots)
- ✓ List the main branches of lumbosacral plexus
- ✓ Describe the important Applied Anatomy related to the brachial & lumbosacral plexuses.

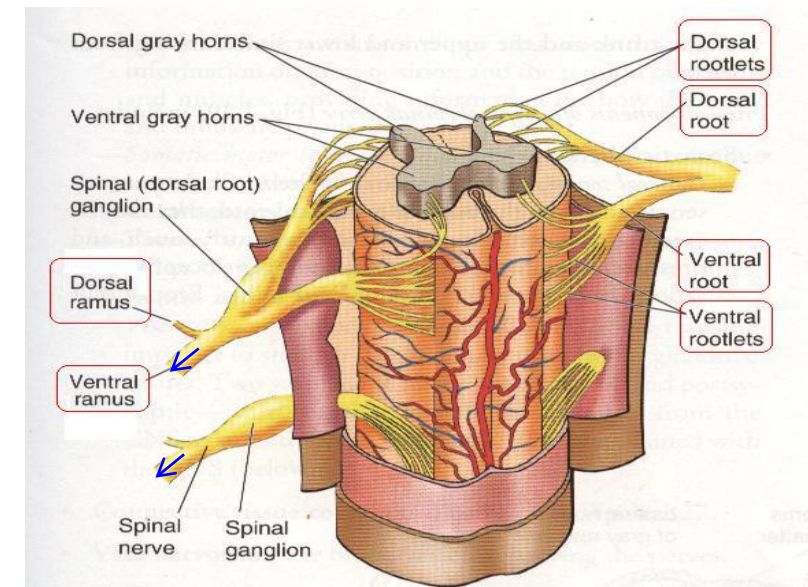
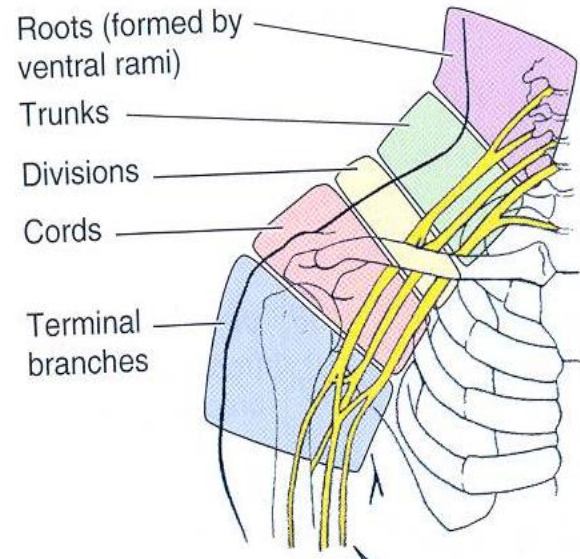
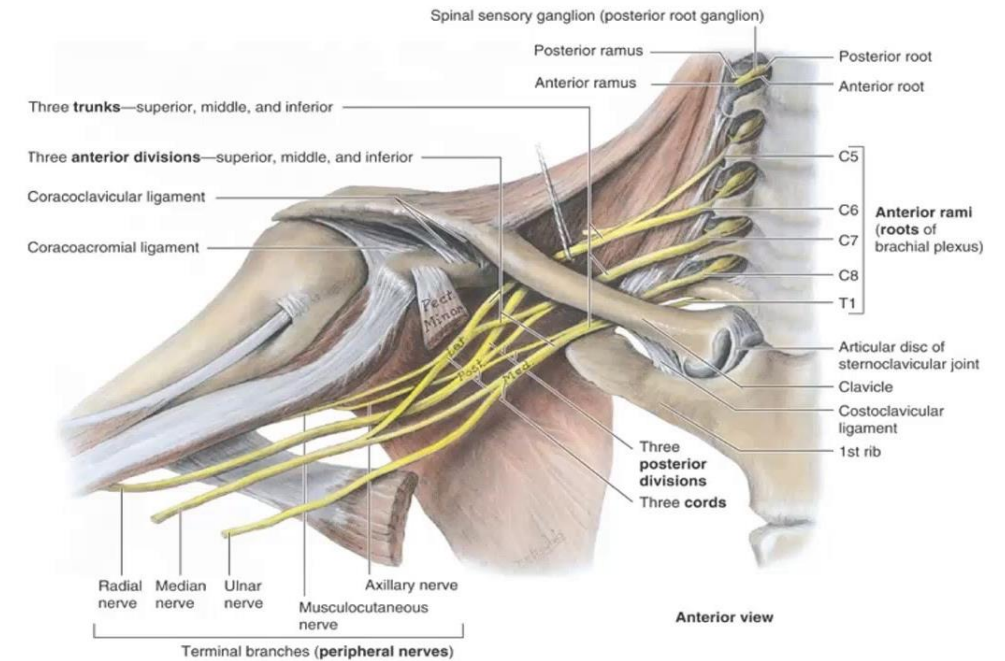
Brachial Plexus Formation



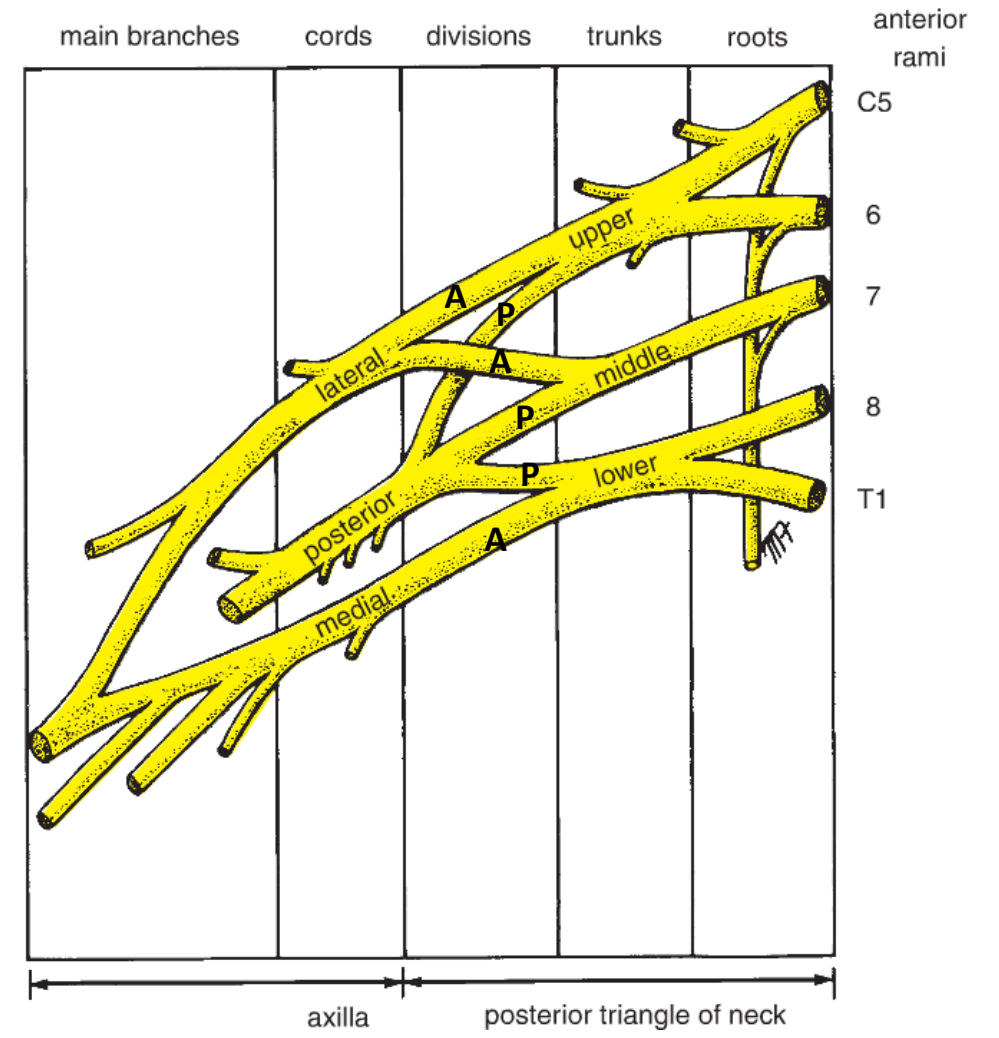
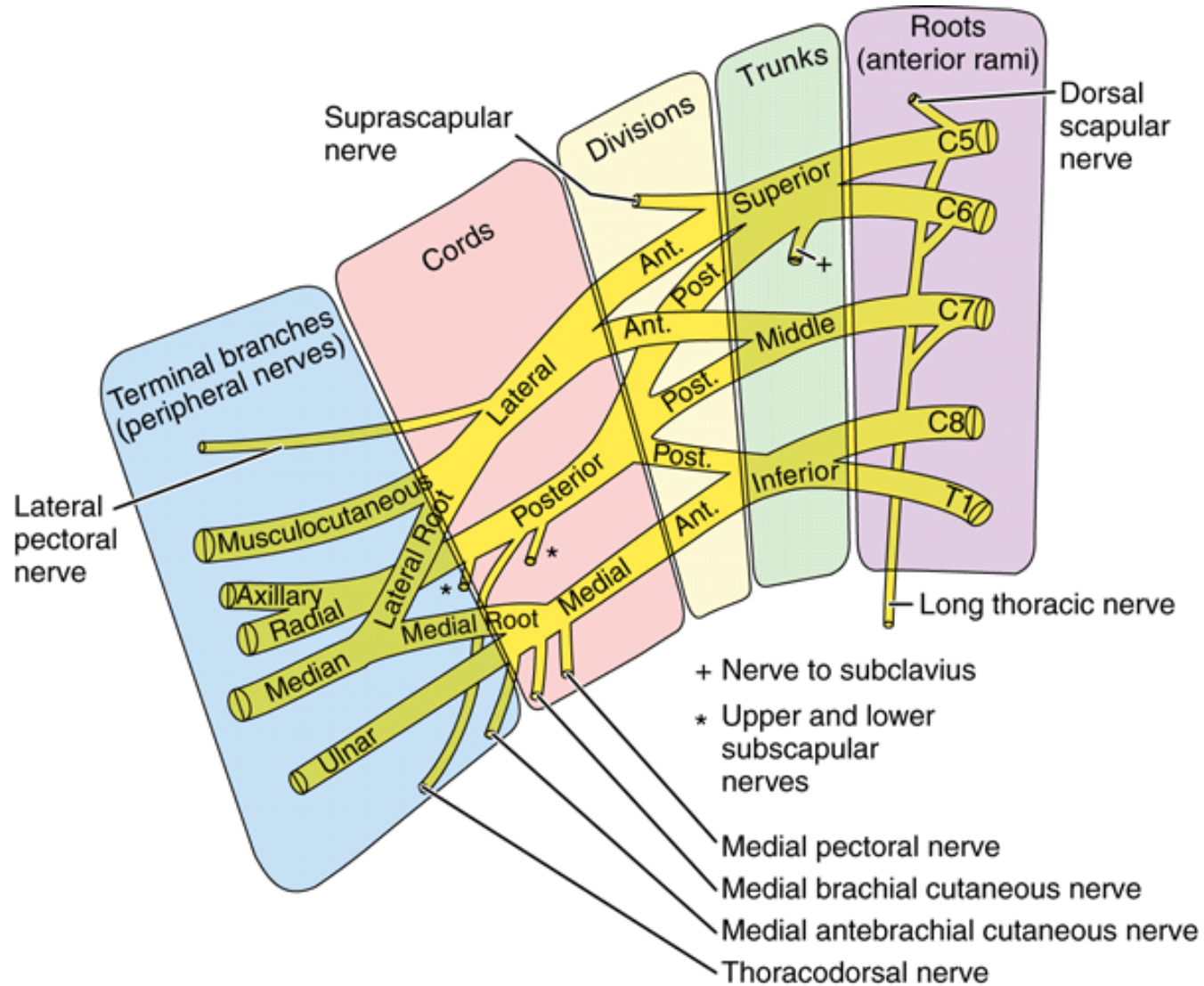
- It is formed in the **posterior triangle** of the neck.
- It is the union of the **anterior rami** (or ventral) of the **5th, 6th, 7th, 8th cervical** and the **1st thoracic** spinal nerves.
- The plexus is divided into 5 stages:

- Roots
- Trunks
- Divisions
- Cords
- Terminal branches

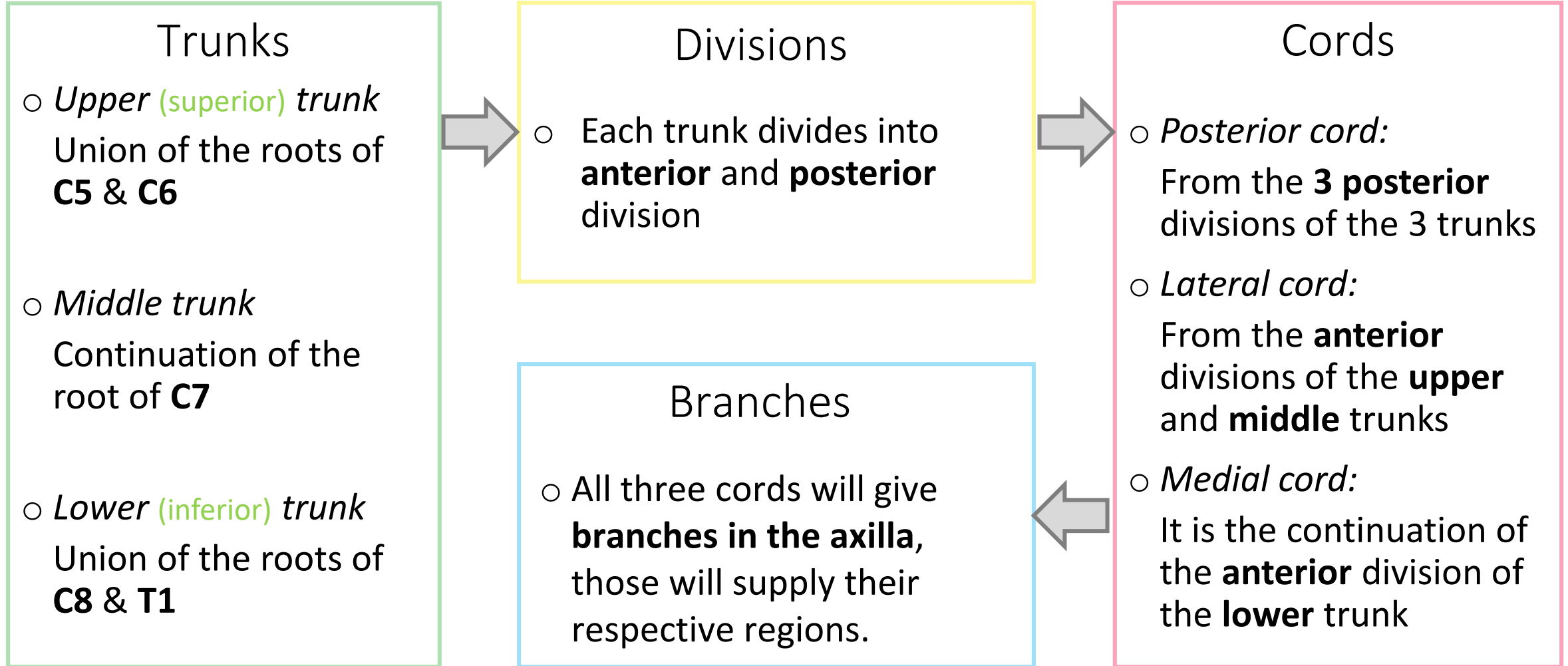
Really Tired? Drink Coffee!



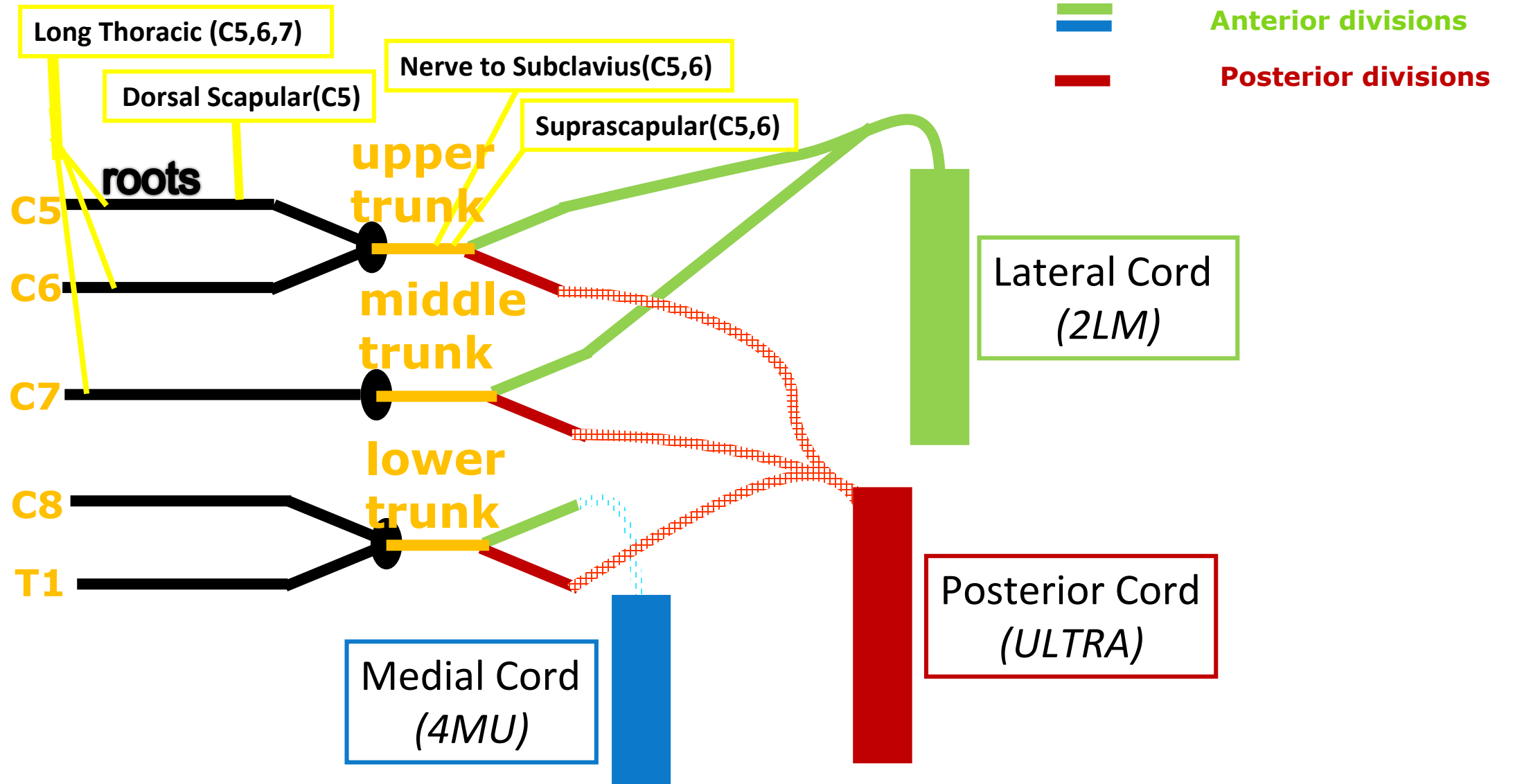
Brachial Plexus



Brachial Plexus



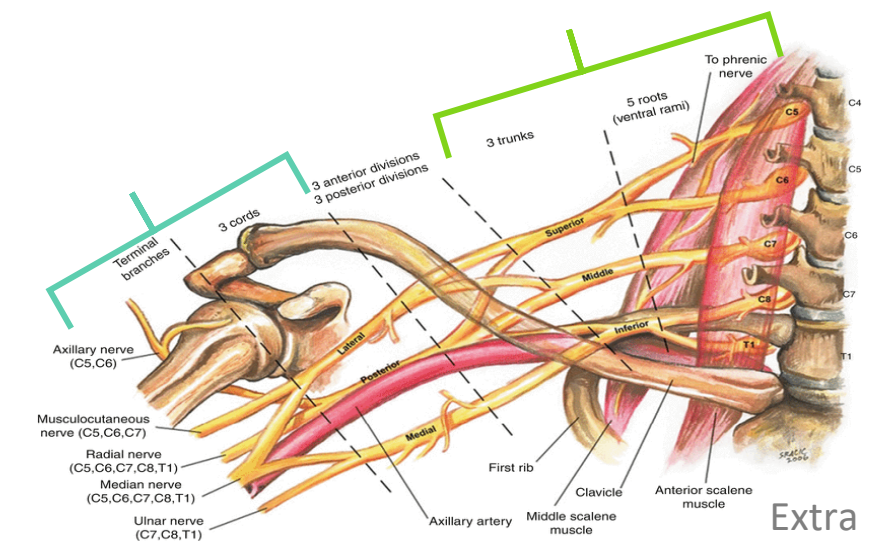
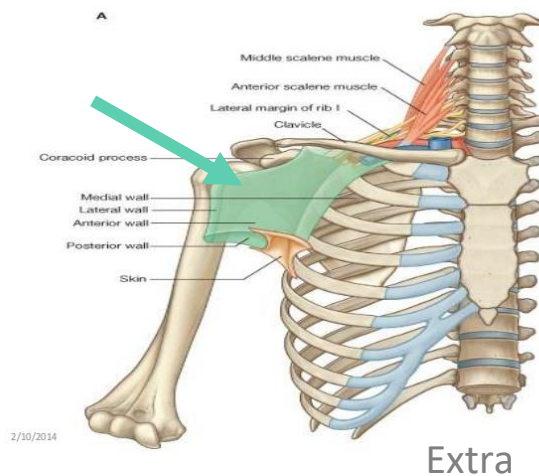
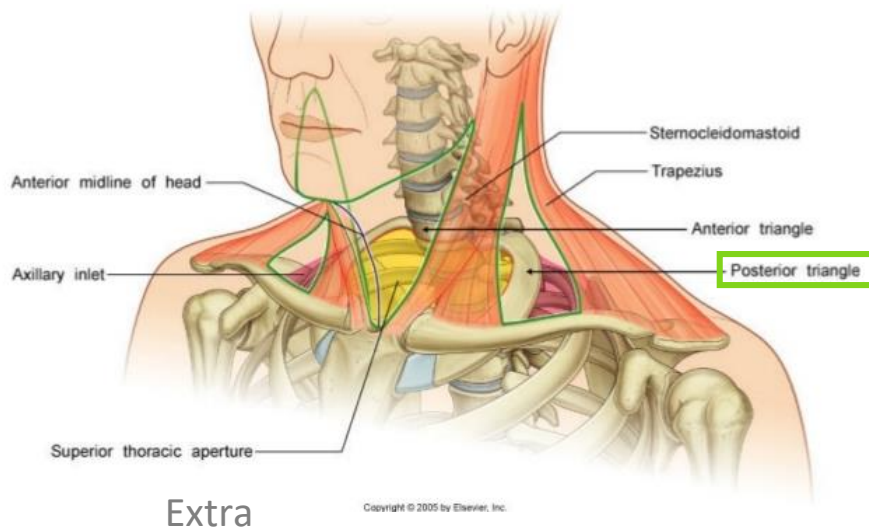
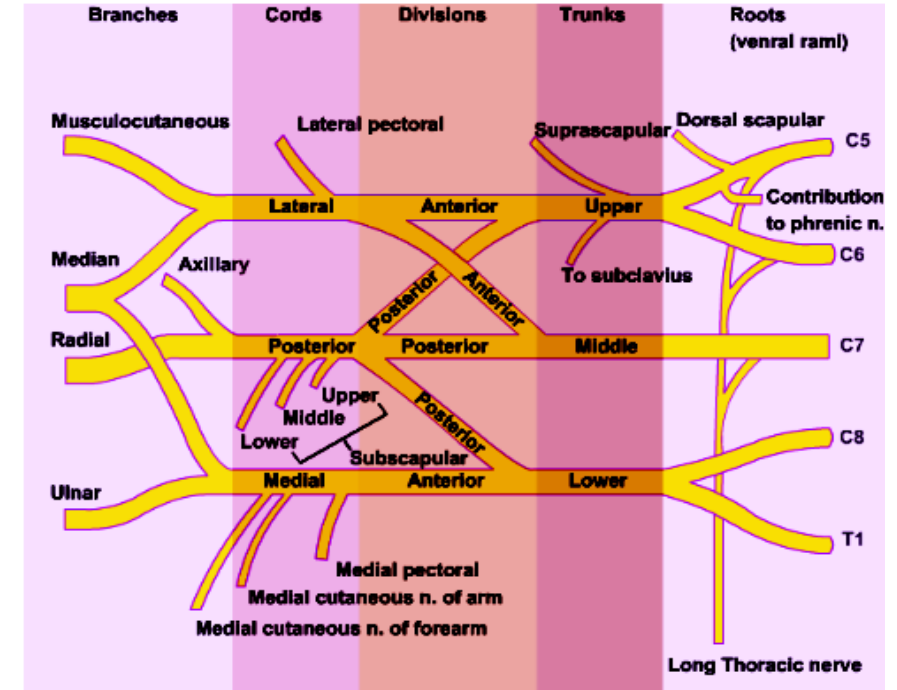
The Brachial Plexus



In the PowerPoint presentation this slide is animated.

Brachial Plexus

- The Plexus can be divided into 5 stages:
 - **Roots:** in the posterior Δ
 - **Trunks:** in the posterior Δ
 - **Divisions:** behind the clavicle
 - **Cords:** in the axilla
 - **Branches:** in the axilla
- The first 2 stages lie in the posterior triangle, while the last 2 stages lie in the axilla.



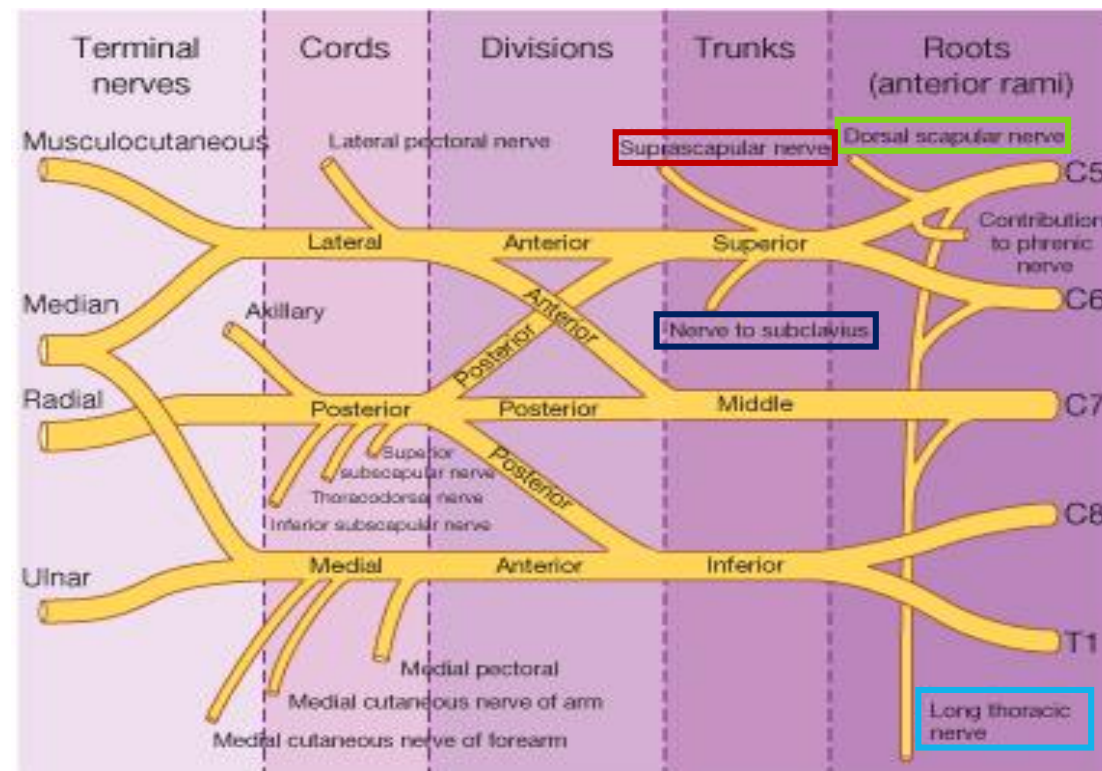
Brachial Plexus Branches

(A) *From Roots:*

1. C5: **Nerve to rhomboids** (dorsal scapular nerve).
2. C5,6 &7: **Long thoracic nerve** (supplies serratus anterior).

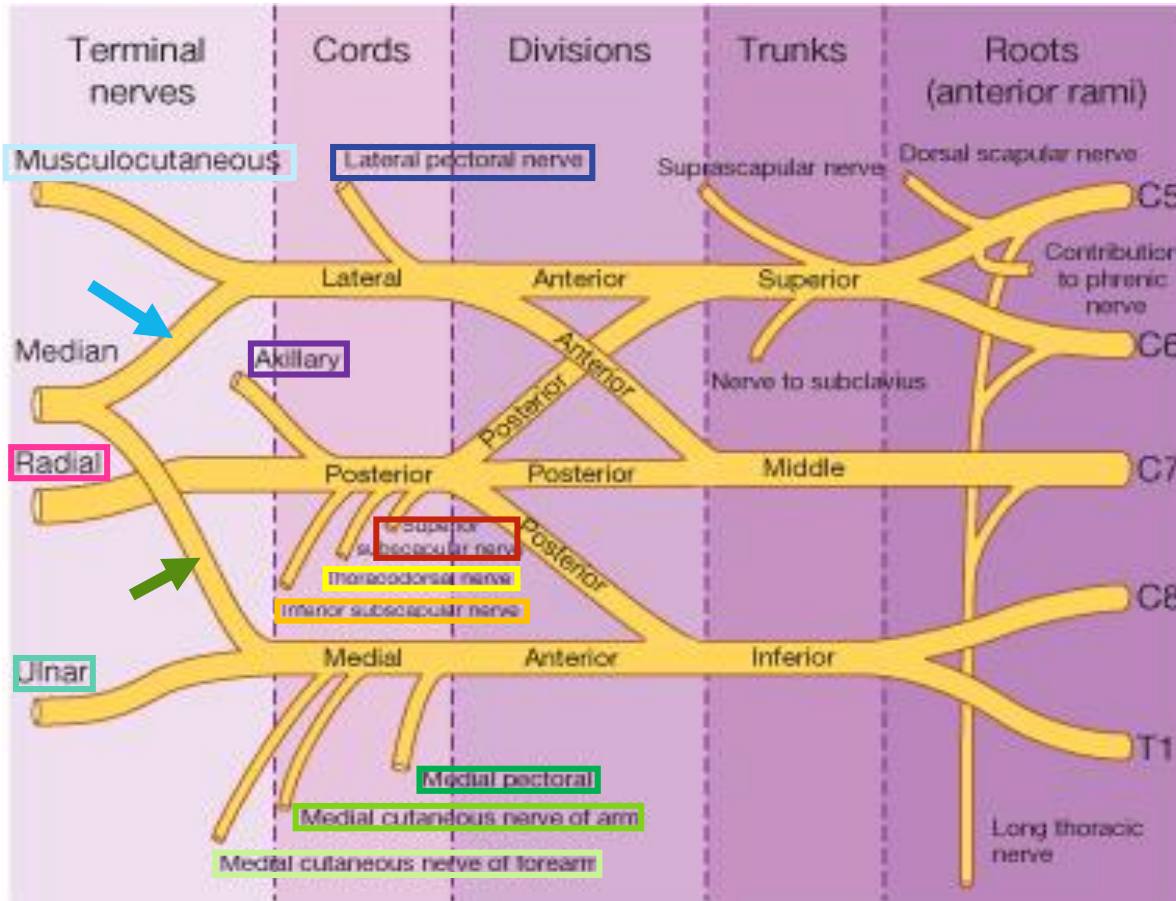
(B) *From Trunk* (upper or superior trunk):

1. C5 & 6: **Nerve to subclavius**
2. C5 & 6: **Suprascapular nerve** (supplies supraspinatus & infraspinatus).



Superior trunk → Suprascapular nerve + nerve to Subclavius

Brachial Plexus Branches



(C) From Cords:

- Lateral Cord: **(2LM)** Lucy Loves Money
 1. Lateral pectoral nerve.
 2. Lateral root of median nerve
 3. Musculocutaneous nerve.
- Posterior Cord: **(ULTRA)**
 1. Upper subscapular nerve.
 2. Lower subscapular nerve.
 3. Thoracodorsal nerve.
 4. Radial nerve.
 5. Axillary nerve.
- Medial Cord: **(4MU)** Money Makes Many
Men Unhappy
 1. Medial pectoral nerve.
 2. Medial root of median nerve.
 3. Medial cutaneous nerve of arm.
 4. Medial cutaneous nerve of forearm.
 5. Ulnar nerve.

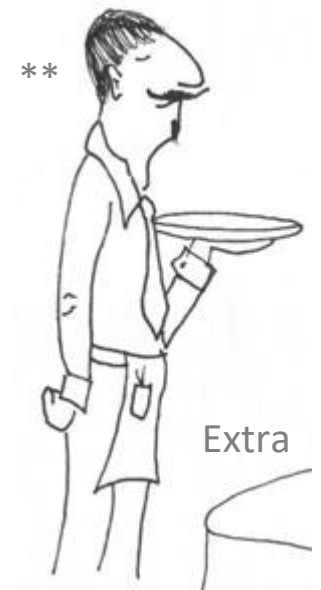
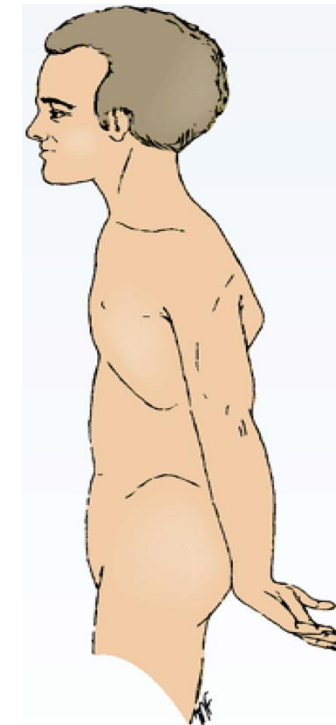
Brachial Plexus Injuries

How to remember the lesion and the trunk?
Erb – Duchenne
زي الدش او الصحن فلما نمسك الصحن باطن اليد راح
يكون متجه على فوق. **Upper Trunk**

Upper Lesions of the Brachial Plexus Upper Trunk C5,6 (Erb-Duchenne Palsy "waiter's tip position").

- Resulting from excessive displacement of the head to the opposite side and depression of the shoulder on the same side (a blow or fall on shoulder*).
- The position of the upper limb in this condition has been likened to that of a porter or waiter hinting for a tip** or policeman's tip hand.
- The arm hangs by the side and is **rotated medially**. The forearm is **extended** and **pronated**.

Extra: This type of injury may also result during child birth if the baby is tugged



Brachial Plexus Injuries

How to remember the lesion and the trunk?

Klumpke

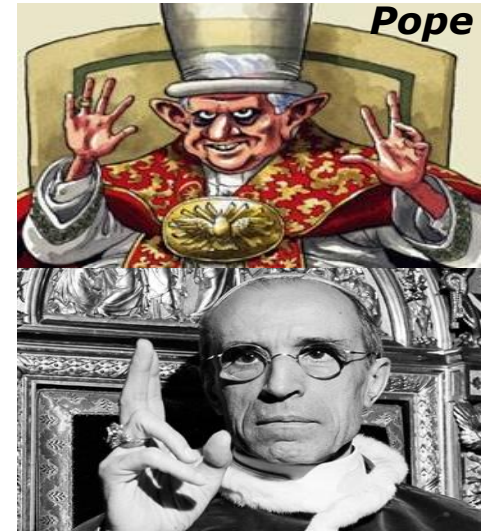
الكلمة تشبه 'كلب' ولما نلمس الكلب اتجاه باطن اليد راح

Lower Trunk. يكون على تحت

Lower Lesions of the Brachial Plexus (Klumpke Palsy) / Lower Trunk (C8,T1) Lesion

- Lower lesions of the brachial plexus are usually traction* injuries caused by a person falling from a height clutching at an object to save himself**. The **first thoracic nerve** is usually torn.
- The nerve fibers from this segment run in the ulnar and median nerves to supply all the small muscles of the hand. The hand has a **clawed appearance** due to **ulnar nerve injury**.
- Hand of Benediction or Pope's Blessings (**APE HAND**) will result from **median nerve injury**.

* traction: (جر) the action of drawing or pulling something over a surface



Ape Hand

DR. CUMAB

DR: Drop wrist – Radial nerve

CU: Claw hand – Ulnar nerve كلو إنا

MAB: Median nerve – Ape hand / hand of Benediction

عيب (ape) عليك تسوي هذا في نص (median) الشارع.

Lumbar Plexus

○ Formation:

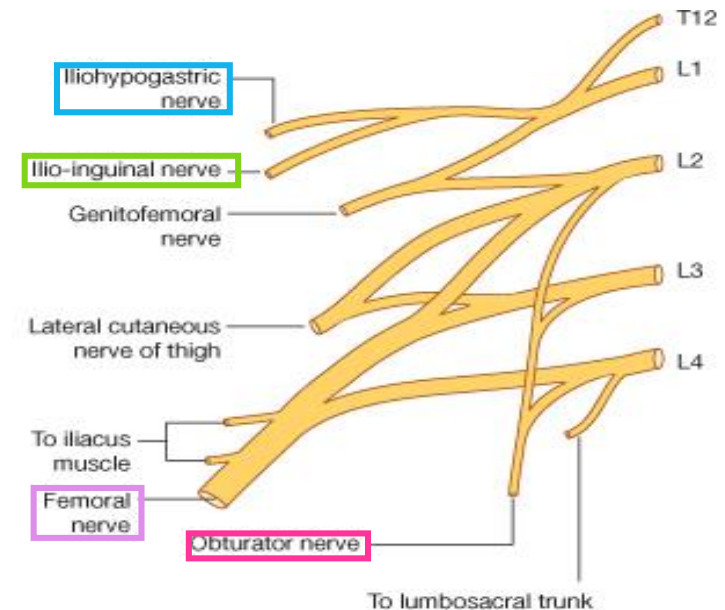
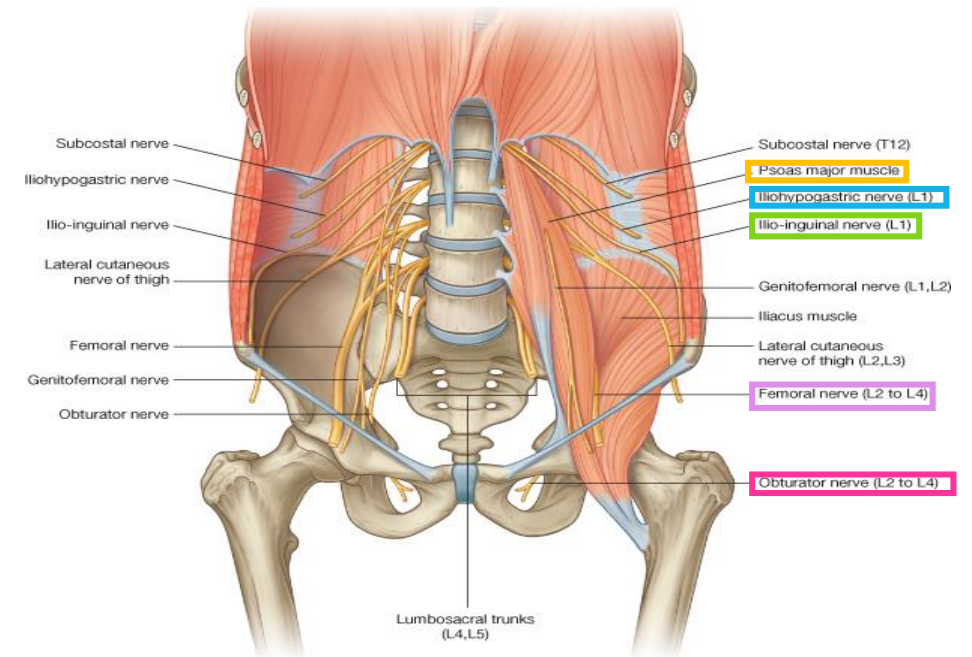
By ventral rami of **L1,2,3** and **most of L4**.

○ Site:

In the substance of **psoas major muscle**.

○ Main branches:

- **Iliohypogastric** & **ilioinguinal (L1)**: to anterior abdominal wall.
- **Obturator (L2 – L4)**: to medial compartment of thigh.
- **Femoral (L2 – L4)**: to anterior compartment of thigh.



Sacral Plexus

○ Formation:

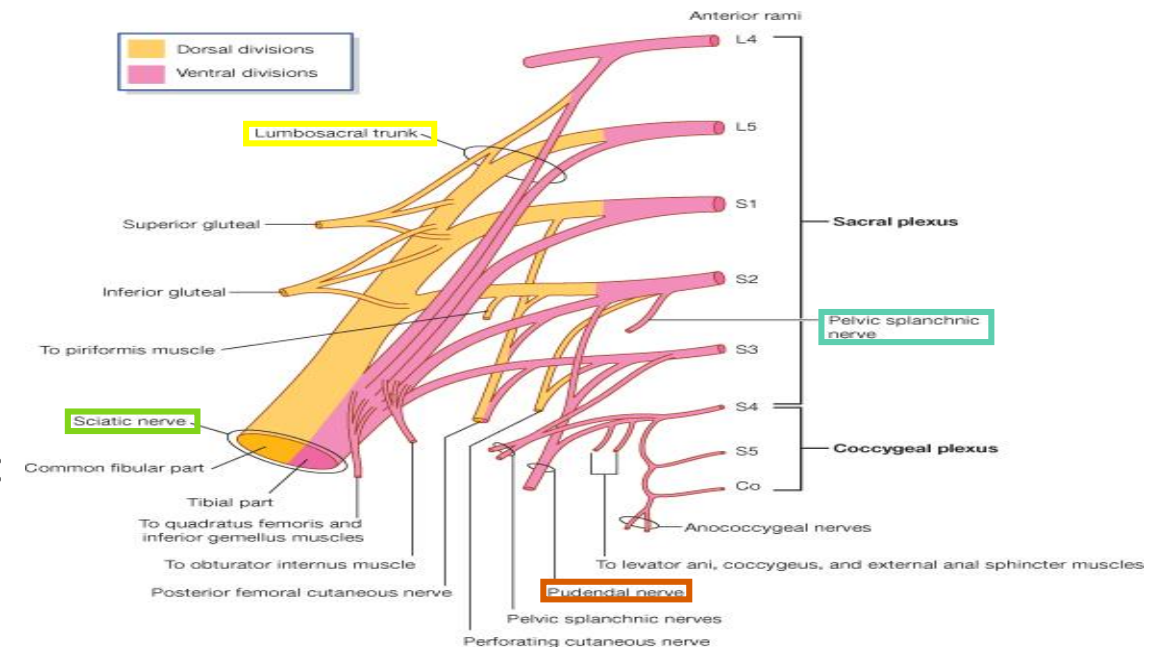
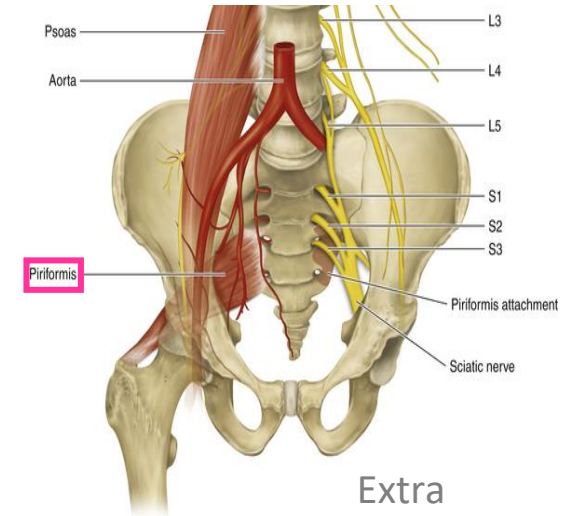
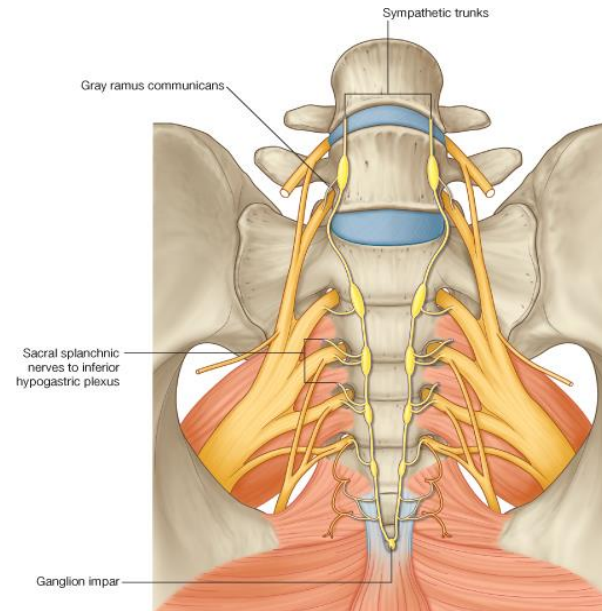
By ventral rami of a part of **L4** & whole **L5** (lumbosacral trunk) + **S1, 2, 3** and **most of the S4**.

○ Site:

In front of **piriformis** muscle

○ Main branches:

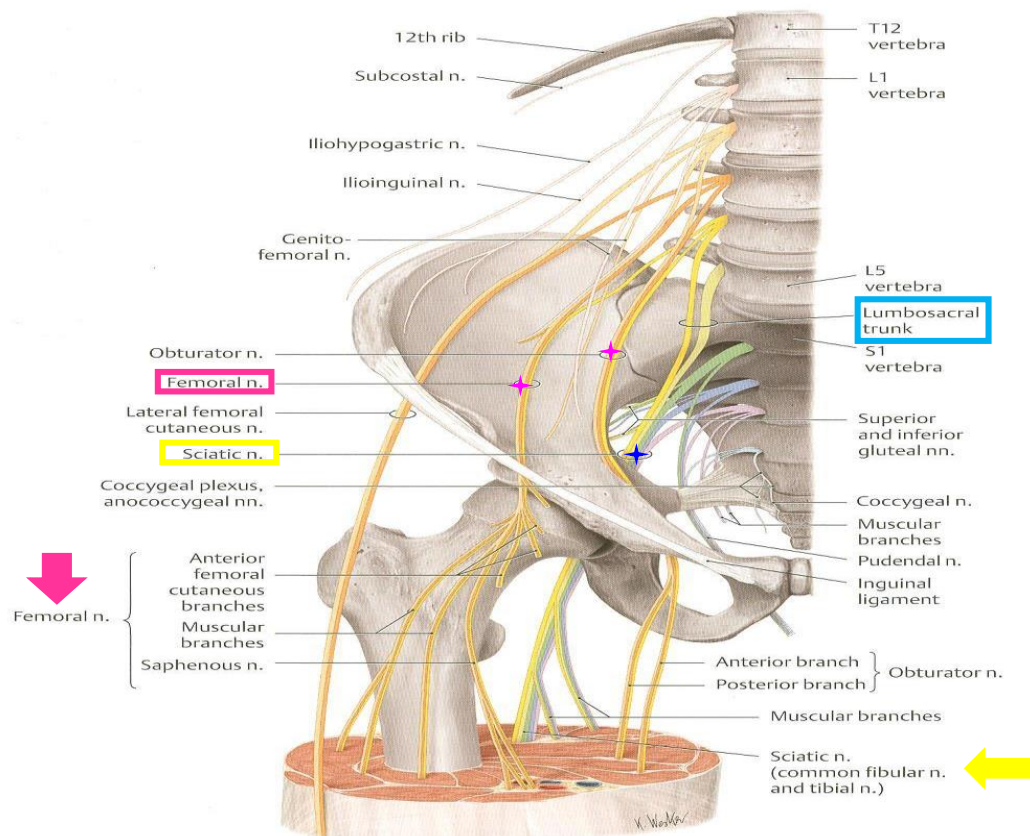
- **Pelvic splanchnic** nerve (from sacral plexus): preganglionic parasympathetic to pelvic viscera & hindgut
- **Pudendal** nerve (from sacral plexus): to perineum
- **Sciatic** nerve (from lumbosacral plexus L4,L5 + S1, S2,S3): to lower limb



Lumbosacral Plexus

Note: the sacral plexus is also called the lumbosacral plexus, but the lumbar plexus is only called lumbar because it is purely lumbar.

- The lumbosacral trunk connects the lumbar and sacral plexus.
- The 2 main branches of the lumbar/sacral plexus which we will discuss are:
 1. Femoral nerve (from lumbar)
 2. Sciatic nerve (from sacral) divides into: Tibial nerve and Common peroneal nerve



Compare: *Important!*

Brachial Plexus	Lumbar Plexus	Sacral Plexus
C5, C6, C7, C8, T1	L1, L2, L3, L4	L4*, L5*, S1, S2, S3, S4
Formed <u>in posterior triangle of neck</u>	Formed <u>in psoas major muscle</u>	Formed <u>in front of piriformis muscle</u>

*L4 & L5 make up the lumbosacral trunk

Lumbosacral Plexus

Femoral Nerve



○ *Origin:*

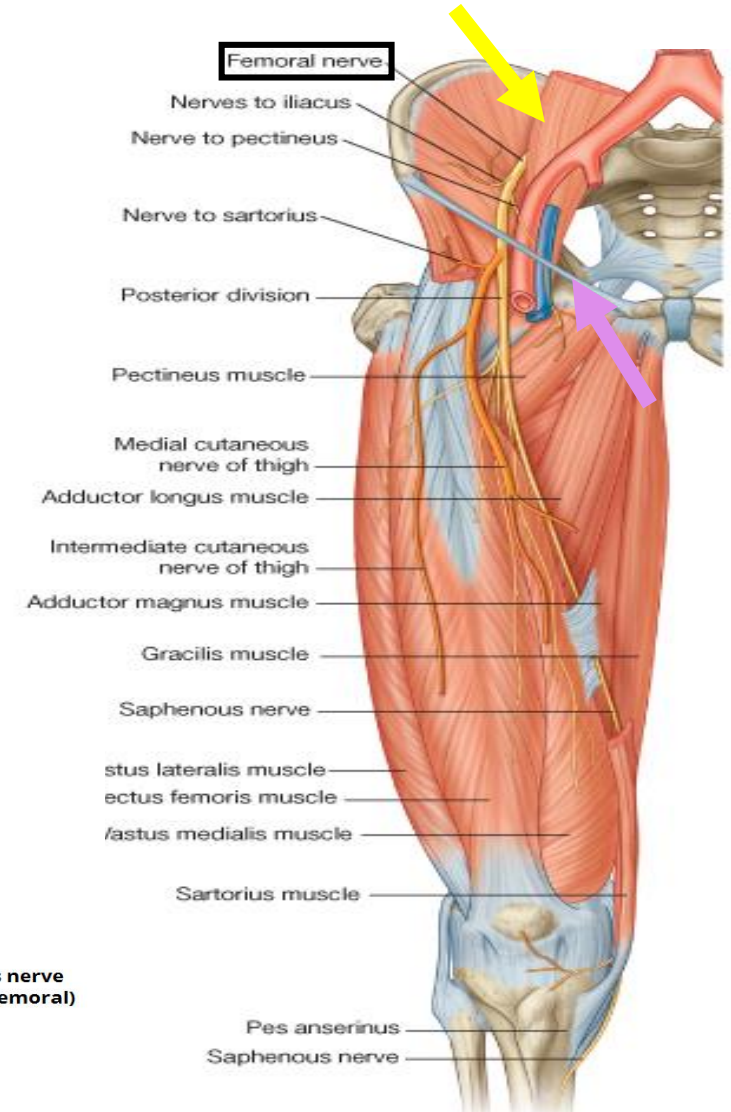
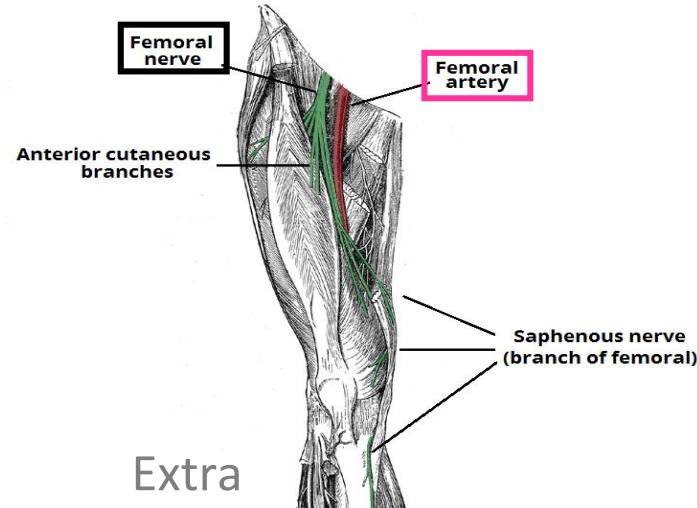
A branch from lumbar plexus (**L2,3,4**)

○ *Course:*

- Descends *lateral* to **psoas major** & enters the thigh *behind* the **inguinal ligament**
- Passes *lateral* to **femoral artery** & divides into terminal branches (anterior and posterior divisions).

Extra:

The terminal branches are **anterior cutaneous** nerve and **saphenous** nerve



Lumbosacral Plexus

Femoral Nerve

○ Injury:

Motor effect:

- Wasting of **quadriceps femoris***
- **Loss of extension** of knee
- **Weak flexion** of hip (psoas major is intact because it takes supply from other fibers of the lumbar plexus)

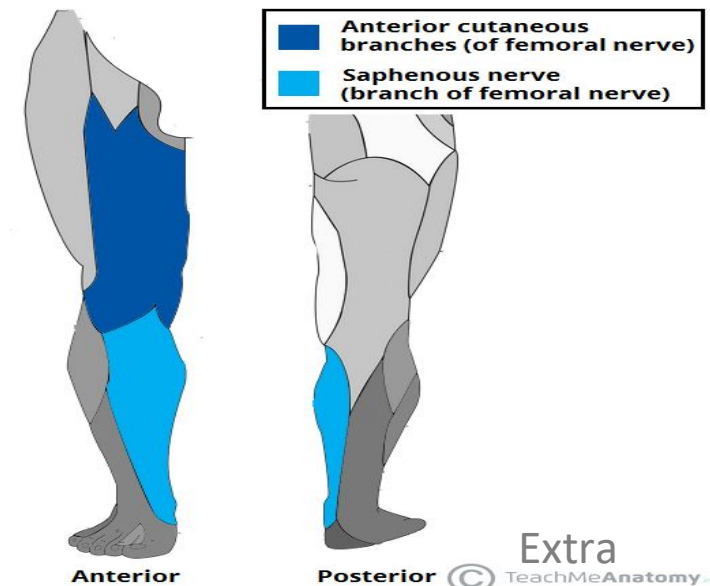
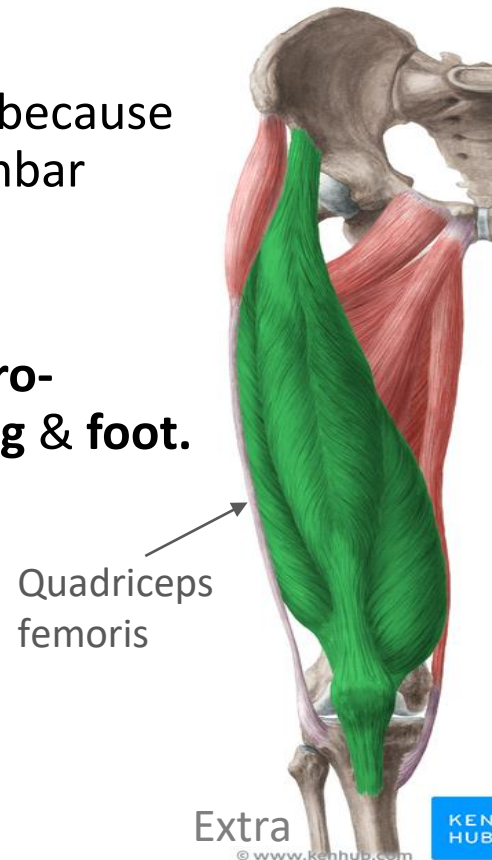
Sensory effect:

- loss of sensation over areas supplied **antero-medial aspect of thigh & medial side of leg & foot.** (injury of **saphenous** branch of femoral)

*Recall: action of quadriceps femoris:

- Extension of the knee (only muscle that does this)
- Flexion of hip (with other muscles)

So if the quadriceps aren't working we will completely lose the ability to extend the knee but weak flexion of the hip is still possible.



Lumbosacral Plexus

Sciatic Nerve (The largest nerve of the body)

○ Origin:

- from sacral plexus (**L4, L5, S1, S2, & S3**)
- It is one of the terminal branch of sacral plexus.

○ Course:

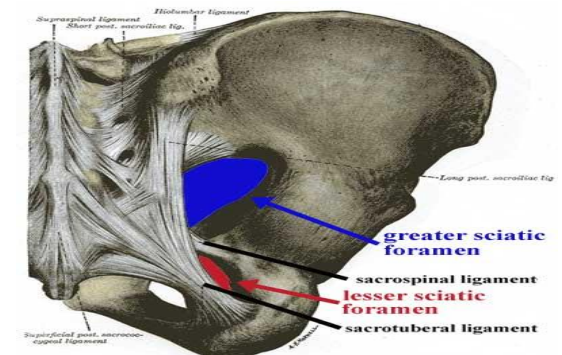
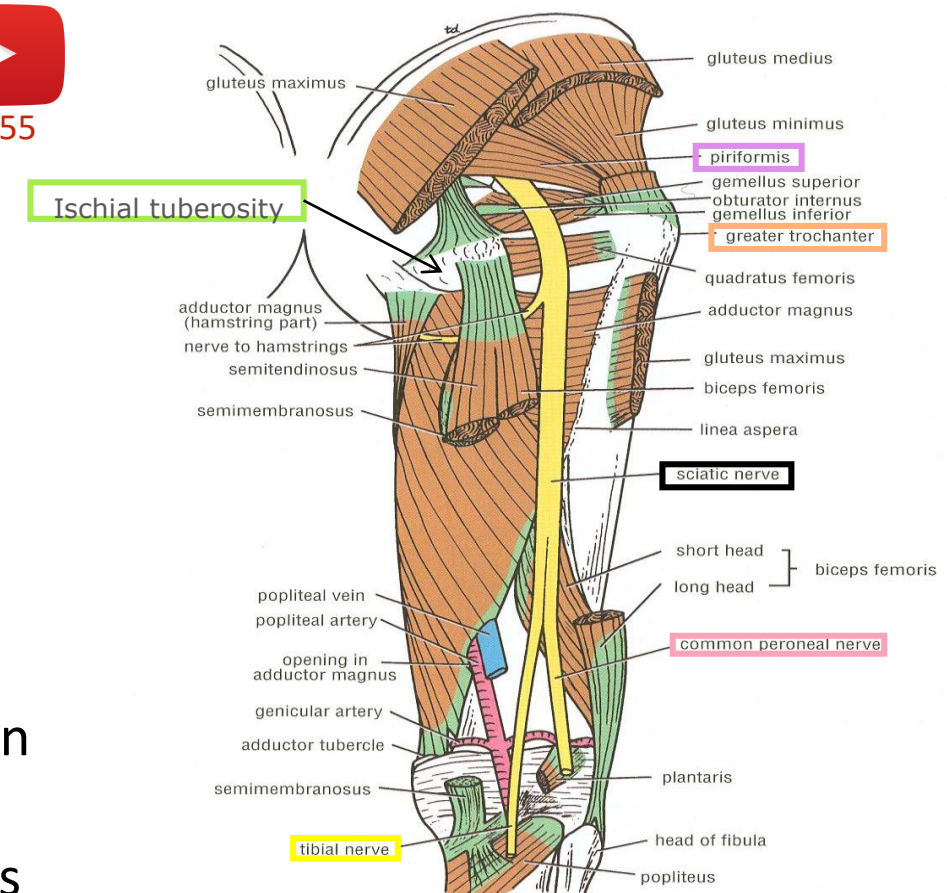
- Leaves the pelvis through **greater sciatic foramen**, below **piriformis** & passes in the gluteal region (between **ischial tuberosity** & **greater trochanter**) then to posterior compartment of thigh
- Divides into **tibial** & **common peroneal** (fibular) nerves

○ Injury:

- Injury will affect the *flexion of knee, extension of hip, all movements of leg & foot, as well as loss of sensation of skin of leg and foot* (except areas supplied by saphenous branch of femoral nerve).



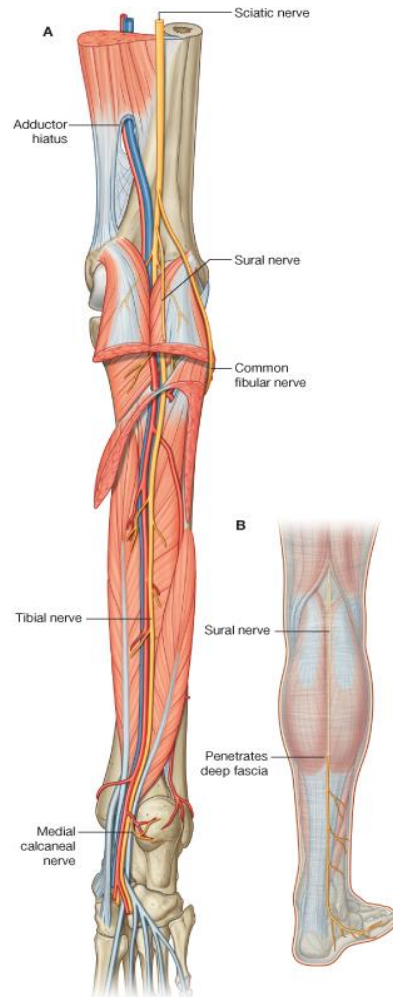
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Lumbosacral Plexus

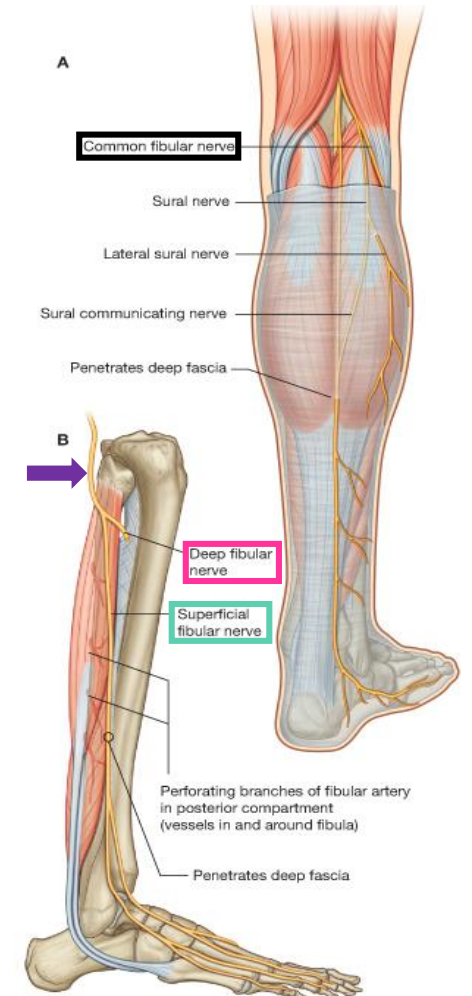
Tibial Nerve

- Course:
 - Descends *through popliteal fossa* to posterior compartment of leg, accompanied with posterior tibial vessels.
 - Passes deep to **flexor retinaculum** to reach the sole of foot where it divides into **2 terminal branches**.



Common Peroneal Nerve

- Course:
 - Leaves **popliteal fossa** & turns around the lateral aspect of neck of fibula. Then divides into:
 1. **Superficial peroneal**: descends into *lateral* compartment of leg.
 2. **Deep peroneal**: descends into *anterior* compartment of leg.



1.The Brachial plexuses is formed in :

- A. Behind sternum
- B. Posterior triangle of the neck
- C. Anteriorly to clavicle

Answer is: B

2.All nerve fibers forming the plexuses are union of:

- A. Anterior rami
- B. Dorsal rami
- C. Ganglion

Answer is: A

3.The lower trunk is a union of:

- A. Cord of C8 & T1
- B. Roots of C8 & T2
- C. Roots of C8 & T1

Answer is: C

4.The lateral cord is union of:

- A. Posterior division of upper and middle trunk.
- B. Anterior division of upper and middle trunk.
- C. Continuation of anterior division of upper trunk.

Answer is: B

5.All cords give branches in the:

- A. Clavicle
- B. Posterior triangle
- C. Axilla

Answer is: C

6.The divisions of brachial plexuses is anatomically found in:

- A. Axilla
- B. Posterior triangle
- C. Behind clavicle

Answer is: C

7.The long thoracic nerve is formed from the union of:

- A. Trunks of C5,C6,C7
- B. Roots of C5,C6,C7
- C. Roots of C4,C5,C6

Answer is: B

8.The musculocutaneous nerve is a branch of:

- A. Lateral cord
- B. Medial cord
- C. Posterior cord

Answer is: A

9.A patient came in with his arm hanging by his side, rotated medially and his forearm is extended and pronated. This lesion is called___ due to__:

- A. Klumpke palsy, lower trunk lesion
- B. Waiter's tip position, upper trunk lesion
- C. Erb-Duchenne palsy, middle trunk lesion

Answer is: B

10.A young boy fell from a high distanced and clutched on something.

What nerve is usually torn?

- A. First thoracic
- B. Ulnar nerve
- C. Median nerve

Answer is: A

11. Femoral nerve is a main branch of:

- A. Brachial plexuses
- B. Lumbar plexuses
- C. Sacral plexuses

Answer is: B

12. Site of sacral plexuses:

- A. Anteriorly to piriformis muscle
- B. Substance of psoas major
- C. Behind inguinal ring

Answer is: A

13. Femoral nerve injury will cause :

- A. Flexion of knee loss and weak hip extension.
- B. weak knee extension and loss hip flexion
- C. loss of knee extension and weakening of hip flexion

Answer is: C

1. A patient came to the ER with a upper lesion of brachial plexuses.

- a) name the two nerve roots affected?
- b) This injury results from?
- c) Describe the position of arm and forearm.
- d) Give three names to this lesion.

Answers:

- a. C5, C6
- b. Excessive displacement of the head to the opposite side and depression of shoulder on the same side.
- c. Arm hangs by side and is rotated medially, forearm is extended and pronated.
- d. Policeman's tip hand, Erb-Duchenne, Waiter's tip position.

2. A patient came in with a Klumpke palsy injury.

- a) What is the usual scenario to this injury?
- b) What nerve is usually torn in this lesion?
- c) This lesion will cause injury to two nerves name them and the result of their injury.

Answers:

- a. Falling from a height and clutching at an object.
- b. First thoracic.
- c. Ulnar nerve:
 - a. Clawed hand appearance.
- d. Median nerve:
 - a. Ape hand.

3. Femoral nerve injury will have two effects motor and sensory.

- a) Name the effects of this injury.

Answer:

- a. Motor:
 - a. Wasting of quadriceps femoris
 - b. Loss of knee extension
 - c. Weak flexion of hip
- b. Sensory:
 - a. Loss of sensation over antero-medial aspect of thigh
 - b. Loss of sensation over medial side of leg and foot.

BRACHIAL PLEXUS

Roots Ventral rami	Trunks	Brachial Plexus Injuries	Divisions	cords
C5	Upper trunk	Erb-Duchenne Palsy "waiter's tip position"	anterior	Lateral cord
C6			posterior	Posterior cord
C7	Middle trunk	-	anterior	Lateral cord
			posterior	Posterior cord
C8	Lower trunk	Klumpke Palsy *claw hand due to ulnar nerve injury. *APE hand due to median nerve injury.	anterior	Medial cord
T1			posterior	Posterior cord

BRANCHES

From Roots	From Trunks	From Cords		
C5:Nerve to rhomboids (dorsal scapular nerve).	(upper trunk): -Nerve to subclavius -Suprascapular nerve (supplies supraspinatus & infraspinatus)	Lateral cord *2LM	Posterior cord *ULTRA	Medial cord *4MU
C5,6 &7: Long thoracic nerve (supplies serratus anterior).		-Lateral pectoral n - Lateral root of median n - Musculocutaneous n	.Upper subscapular n .Lower subscapular n .Thoracodorsal n .Radial n .Axillary n	-Medial pectoral n. - Medial root of median n. -Medial cutaneous n of arm. -Medial cutaneous n of forearm. - Ulnar n.

	LUMBAR PLEXUS	SACRAL PLEXUS (LUMBOSACRAL TRUNK)
Formation	Ventral rami of L1,2,3 AND most of L4	By ventral rami of a part of L4 & whole L5 (lumbosacral trunk) + S1, 2, 3 and most of the S4
Site	In the substance of psoas major muscle.	In front of piriformis muscle
Main Branches	<ul style="list-style-type: none"> 1-Iliohypogastric & ilioinguinal. 2-Obturator. 3-Femoral. 	<ul style="list-style-type: none"> 1-Pelvic splanchnic nerve (from sacral). 2-Pudendal nerve (from sacral plexus). 3-Sciatic nerve (from Lumbosacral plexus: L4&5+S1,2,3).

	FEMORAL NERVE	SCIATIC NERVE
Origin	<u>lumbar plexus (L2,3,4)</u>	<u>sacral plexus (L4, 5, S1, 2, & 3)</u>
injury	Its injury will affect the flexion of hip & extension of knee as well as loss of sensation of skin of anteromedial aspects of the thigh, medial side of knee, leg and foot (Saphenous br.of femoral).	Its injury will affect the flexion of knee, extension of hip, all movements of leg & foot, as well as loss of sensation of skin of leg & foot (except areas supplied by saphenous branch of femoral nerve)



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Anatomy Team

References:

- 1- Girls' & Boys' Slides
- 2- Greys Anatomy for Students
- 3- TeachMeAnatomy.com