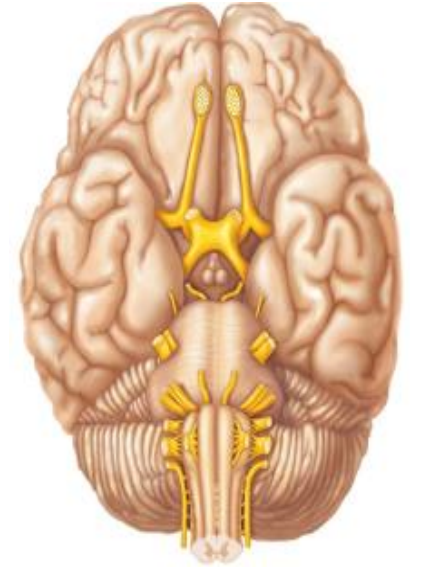


# Deep Origin Of Cranial Nerves



**Dr. Rasha Abdelaziz Abdellatif**

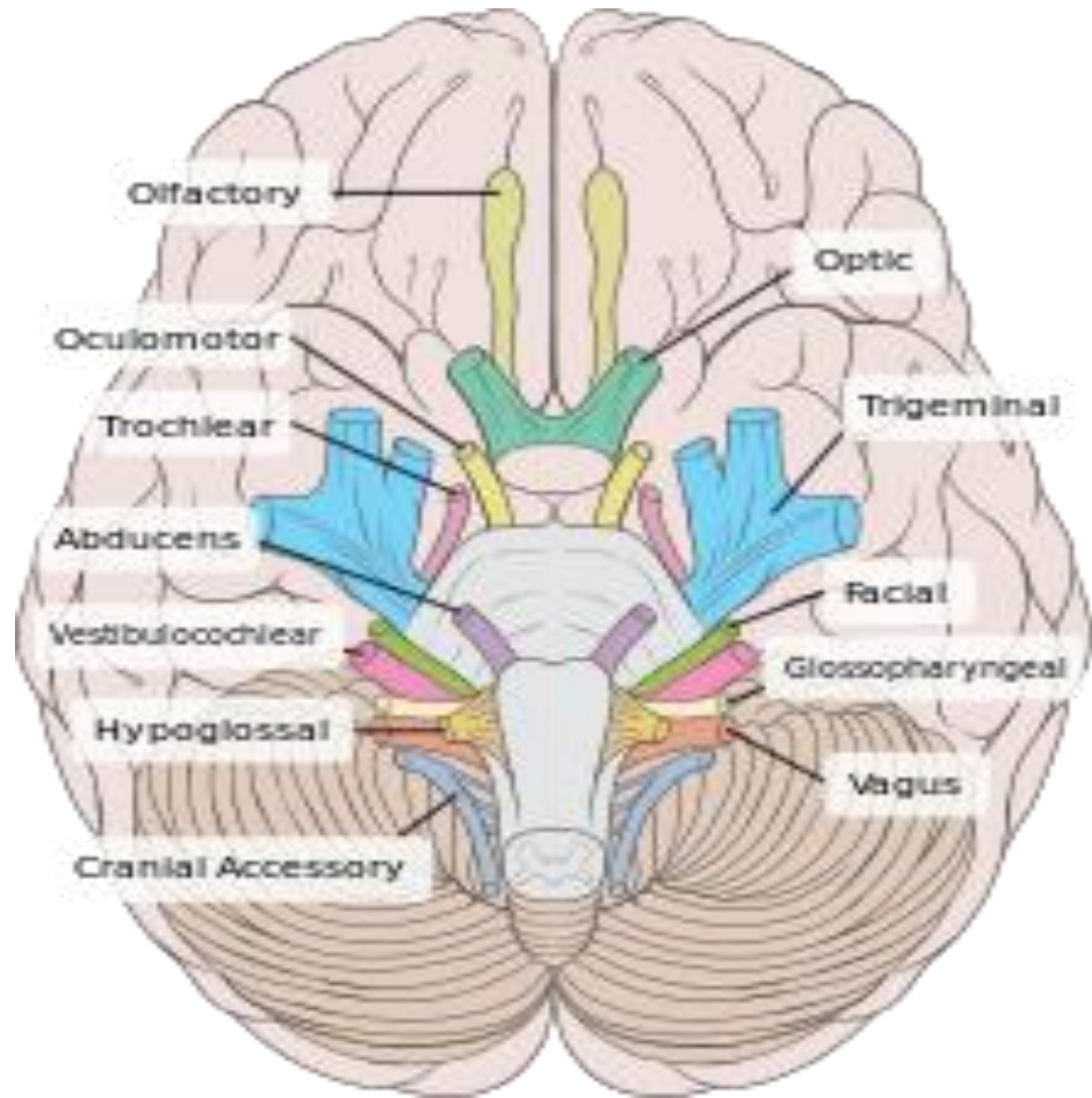
**Associate professor of human anatomy and  
Embryology – Mutah university**

# Session ILOs

**By the end of this lecture, the student should be able to:**

- 1. describe the origin of cranial nerves**
- 2. describe the functional components of cranial nerves**
- 3. describe the course of cranial nerves**
- 4. describe the supply of cranial nerves**

# cranial nerves



# Function of cranial nerves



REMEMBER ME...

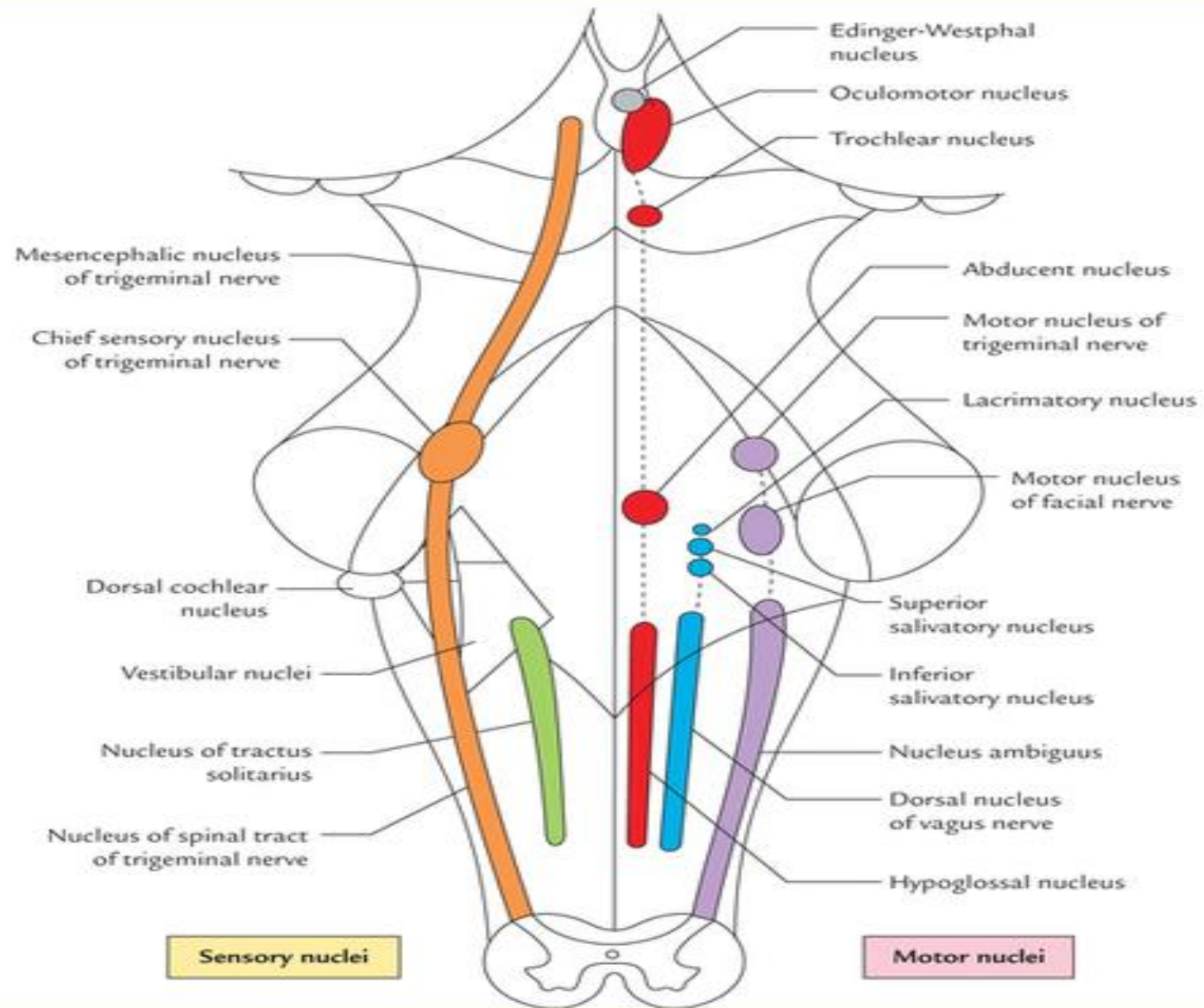
- I • SOME
- II • SAYS
- III • MONEY
- IV • MATTERS
- V • BUT
- VI • MY
- VII • BROTHER
- VIII • SAYS
- IX • BIG
- X • BRAIN
- XI • MATTERS
- XII • MOST



- **S**-SENSORY
- **M**- MOTOR
- **B**- BOTH

All in  
sequence

# Nuclei of deep origin of cranial nerves

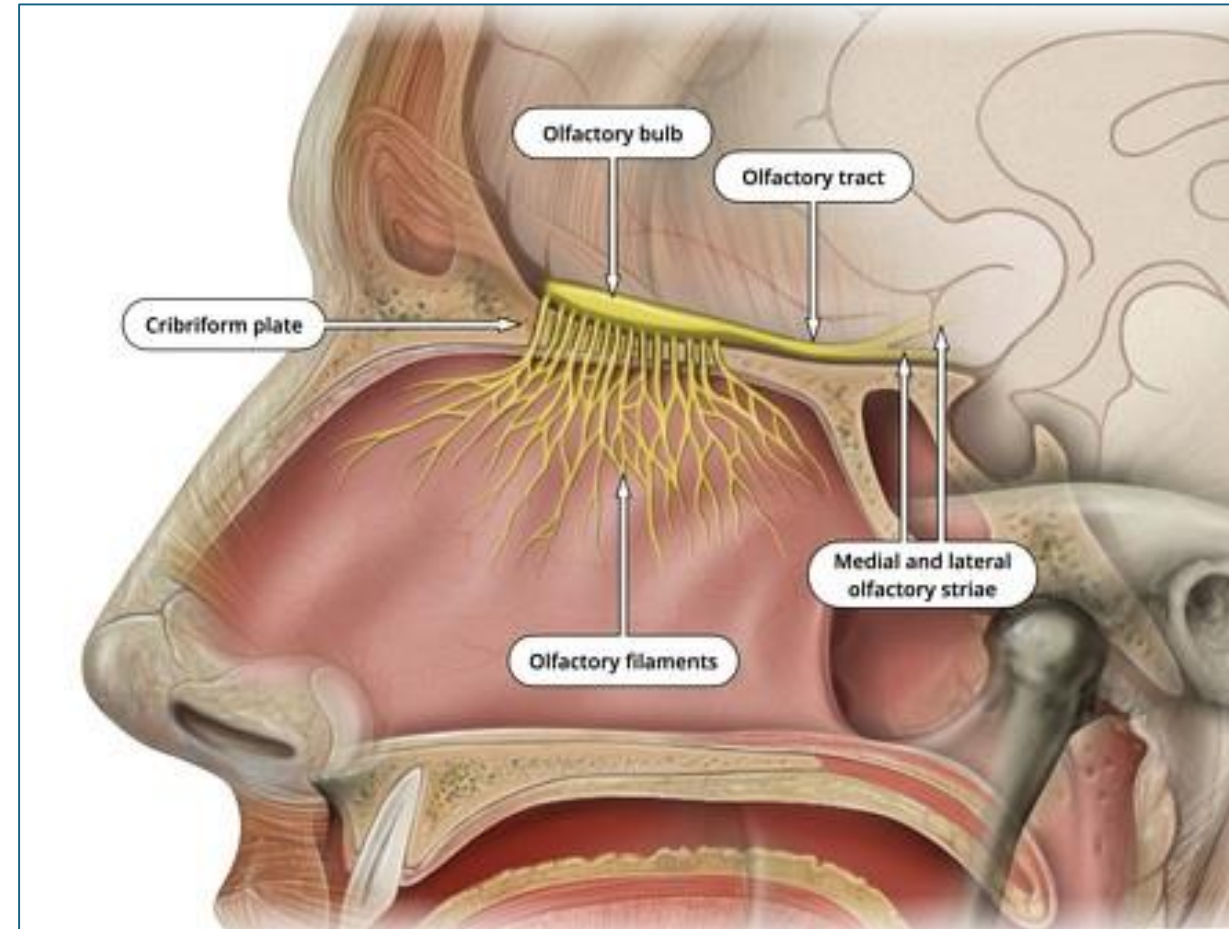


Functional component	Position	Nucleus
General somatic efferent (GSE) supply skeletal muscles developed from myotomes (extraocular and tongue muscles)	Medulla	Hypoglossal nerve (XII) nucleus
	Pons	Abducent nerve (VI) nucleus
	Midbrain	- Trochlear nerve (IV) nucleus - Oculomotor nerve (III) nucleus
Special visceral efferent (SVE) supply muscles developed from pharyngeal arches	Medulla	Nucleus ambiguus (IX, X& XI)
	Pons	- Facial nerve (VII) motor nucleus - Trigeminal nerve (V) motor nucleus
General visceral efferent (GVE) supply visceral muscles and glands	Medulla	-Dorsal nucleus of vagus (X) -Inferior salivatory nucleus (IX)
	Pons	- Superior salivatory nucleus (VII)
	Midbrain	Edinger- Westphal nucleus (III)
General& Special visceral afferent (GVA& SVA) Carry general sensation from viscera and special senses of smell, taste	Medulla& Pons	Solitary nucleus & tract: - medial part (GVA)receives general sensation carried by IX& X - Lateral part (SVA) receives taste sensation carried by VII, IX& X
General Somatic afferents (GSA) carry general sensation from muscles, joints	Spinal cord (C1-C3), Medulla& Pons	
	Pons	Main sensory nucleus (V)
	Upper part of Pons & Midbrain	Mesencephalic nucleus (V)
Special Somatic afferents (SSA) carry special sense of vision ,	Ventral and dorsal to inferior cerebellar peducle	
	Dorsal and ventral cochlear nuclei of (VIII)	
Special Somatic afferents (SSA) carry special sense of vision ,	Ventral and dorsal to inferior cerebellar peducle	
Special Somatic afferents (SSA) carry special sense of vision ,	Dorsal and ventral cochlear nuclei of (VIII)	

# Cranial nerve (I) Olfactory nerve

## Functional component SVA Nerve

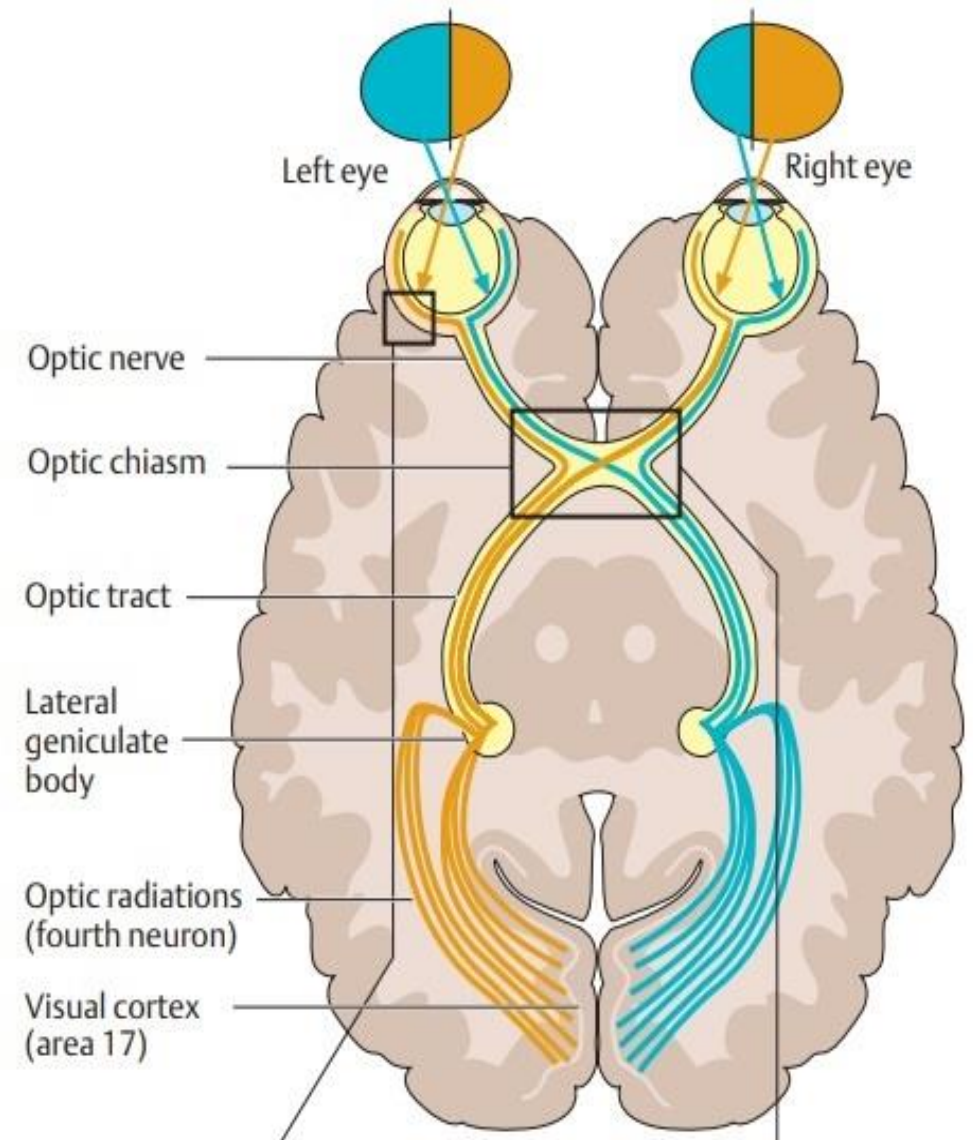
- arise from the olfactory receptor nerve cells in the olfactory mucous membrane located in the upper part of the nasal cavity .Travels through the cribriform plate of the ethmoid bone.
- Bundles of these nerve fibers enter the olfactory bulb and synapse there
- from the bulbs (one on each side) the olfactory information is transmitted into the brain via the olfactory tract.



# Cranial nerve (II) Optic nerve

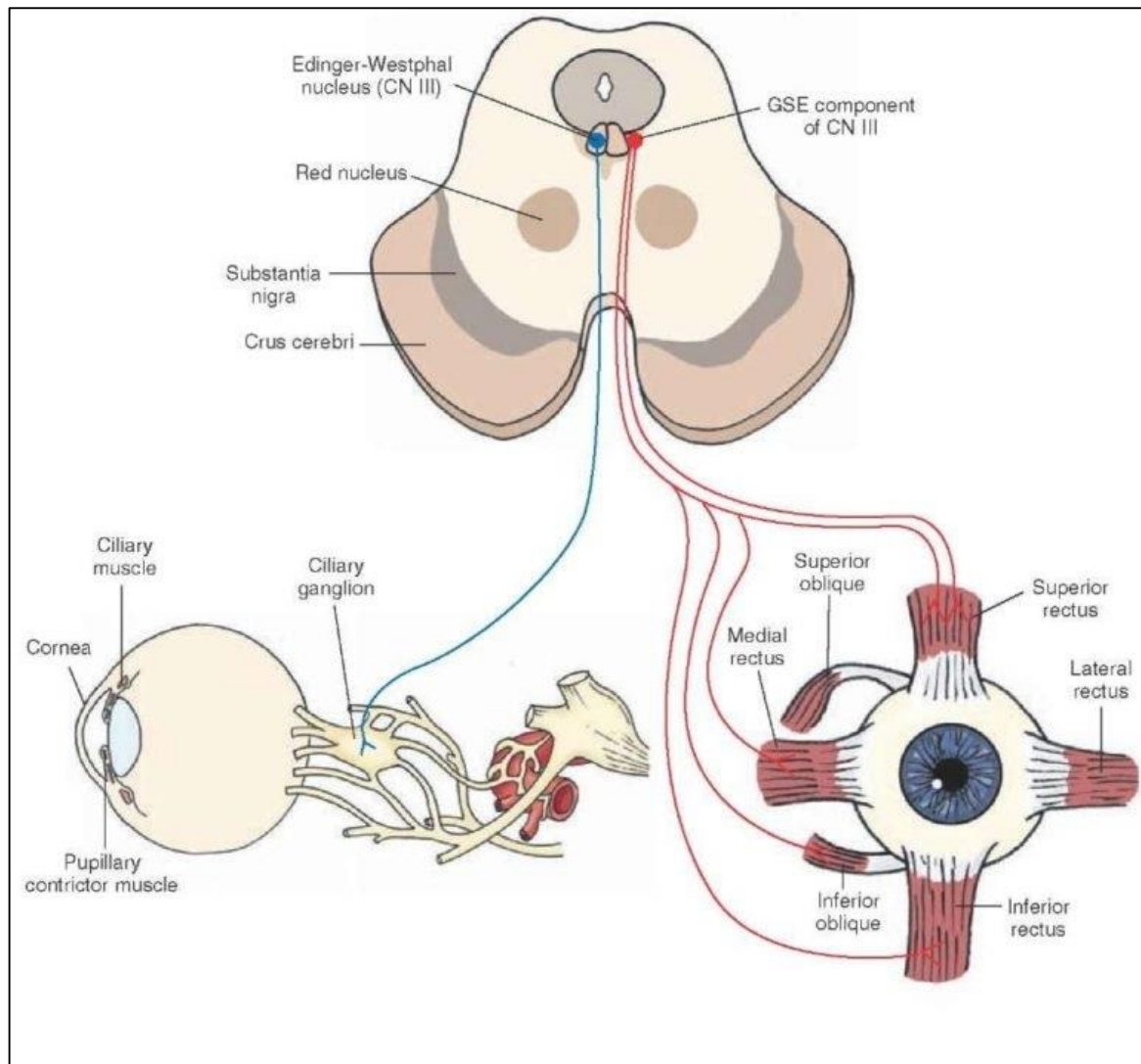
## Functional component SSA Nerve

- The fibers of the optic nerve are the axons of the cells in the ganglionic layer of the retina.
- They converge on the optic disc and exit from the eye, about 3 or 4 mm to the nasal side of its center
- The optic nerve leaves the orbital cavity through the optic canal
- Then unites with the optic nerve of the opposite side to form the optic chiasma.

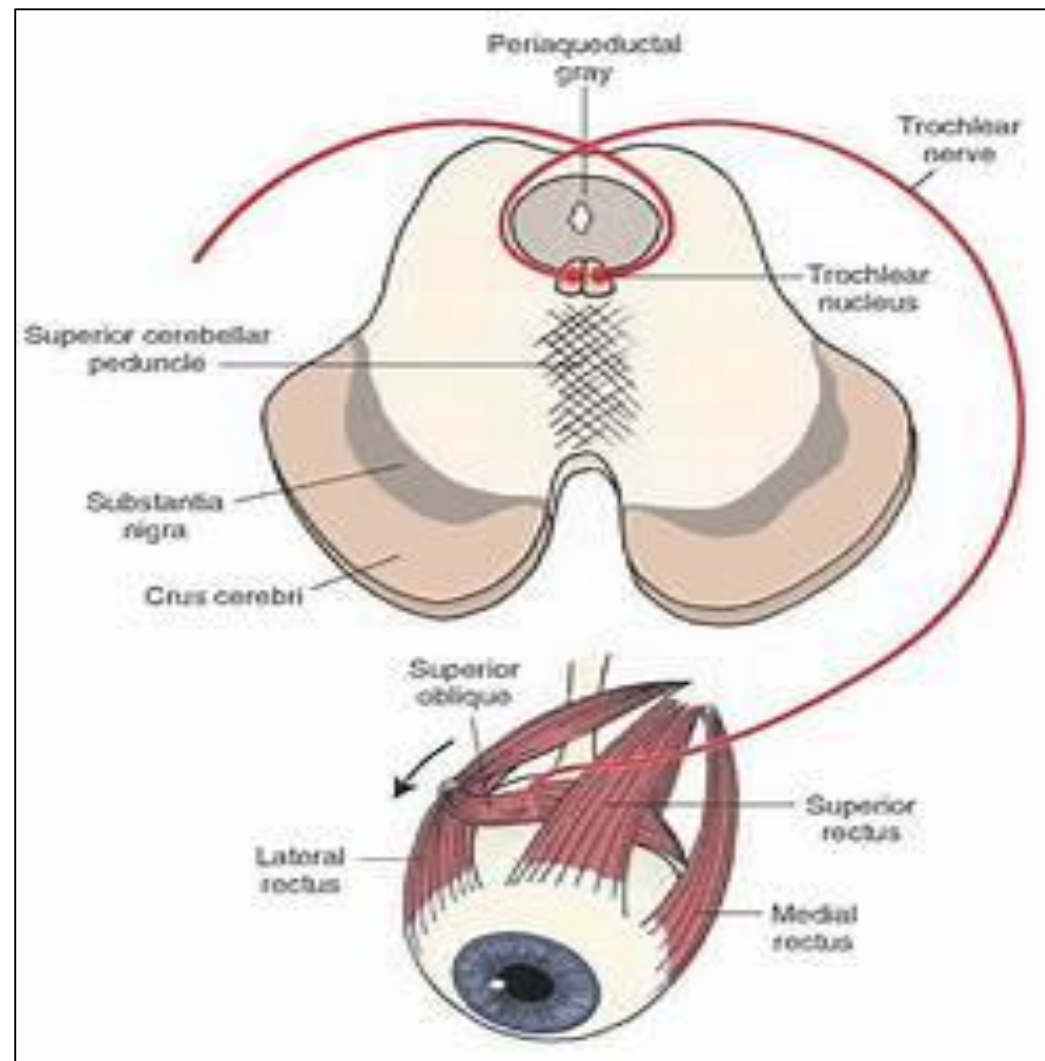


# Cranial nerves originating from Mid brain

## Oculomotor Nerve (III)



## Trochlear Nerve (IV)



# Cranial nerves originating from Mid brain

## Oculomotor Nerve (III)

### Oculomotor nucleus

Situated in the anterior part of grey matter that surround cerebral aqueduct at level of superior colliculus

### Supply

levator palpebral superioris muscle

superior rectus muscle

Medial rectus muscle

Inferior rectus muscle

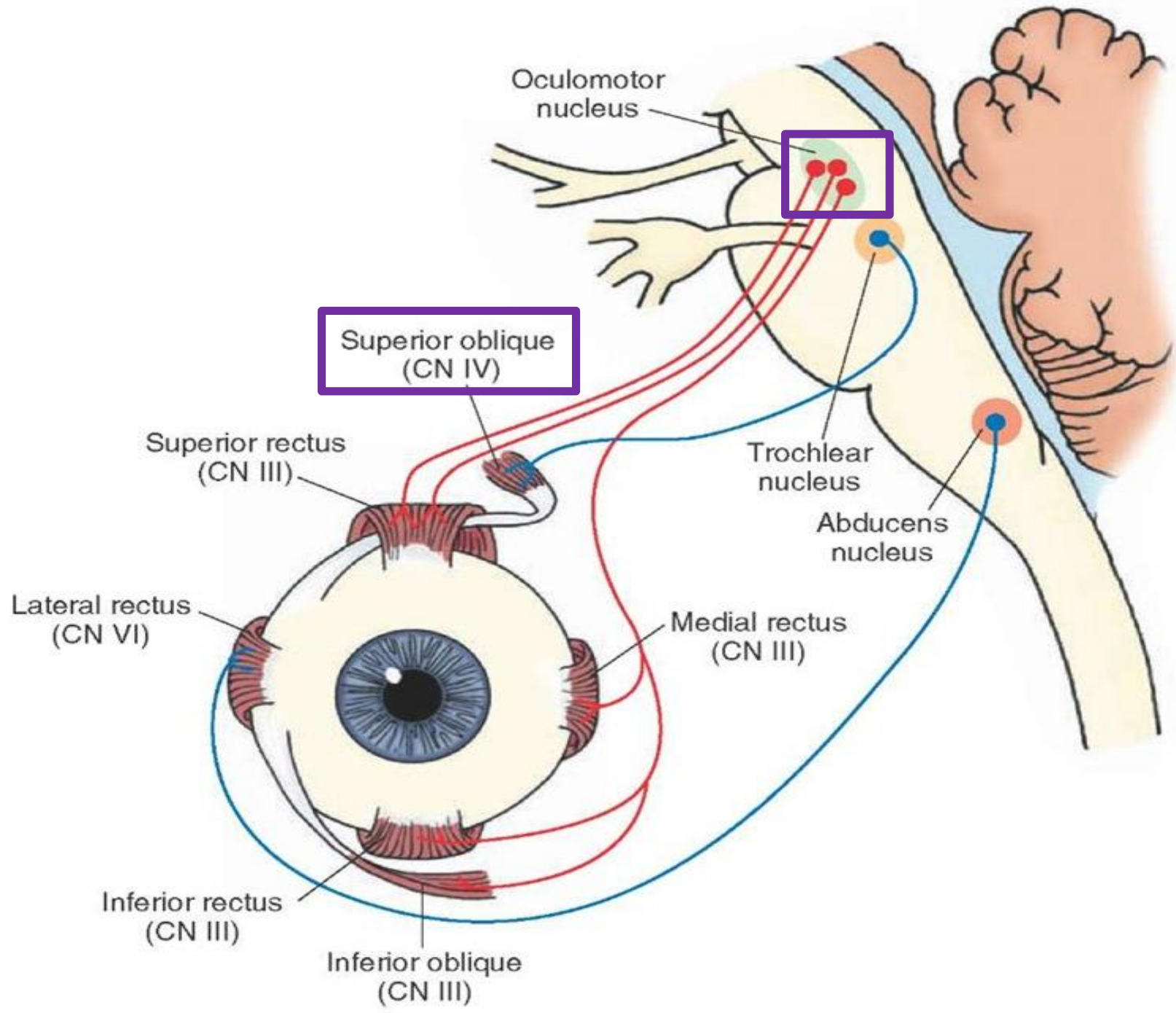
Inferior oblique muscle

### Edinger westphal nucleus

- Situated posterior to oculomotor nucleus
- Supply Constrictor pupillae and ciliary muscles

## Trochlear Nerve (IV)

- Trochlear nucleus  
situated at the level of inferior colliculus
- Supply Superior oblique muscle



# Cranial nerves originating from Pons

**Sensory root arises from**

**a- Main sensory nucleus:**

Lies in the middle between the other two sensory nuclei lateral to the motor nucleus.

Receives GSA fibres that convey discriminative tactile impulses from the face

**b- spinal trigeminal nucleus:**

Lies caudally and extends from the spinal cord C1-C3 through medulla to the pons.

Receives pain, temperature and light touch input from the oral cavity, face and scalp anterior to a coronal plane passing through the ears.

**c- Mesencephalic nucleus**

Appears as an upward continuation of the main sensory nucleus.

Receives input from muscle spindles and pressure & joint receptors in the head that convey proprioception from the extraocular muscles, muscles of mastication, teeth, hard palate and temporomandibular joint.

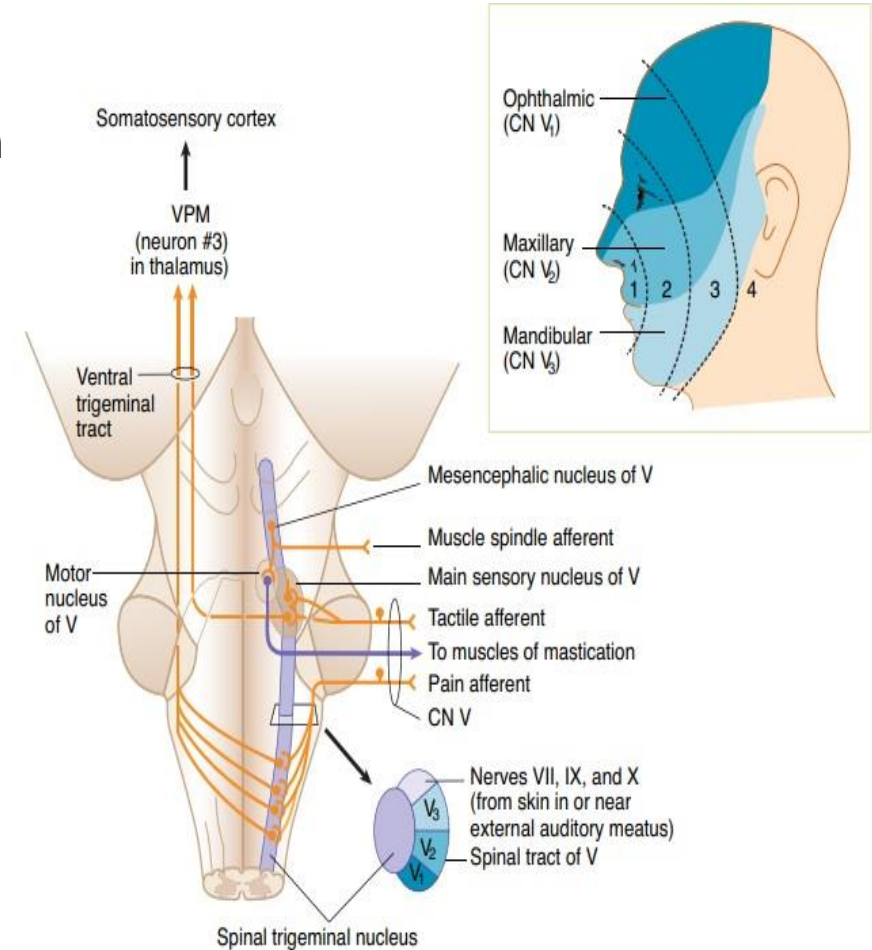
**Motor root arises from**

**Trigeminal motor nucleus : (SVE)**

Located at the middle of the pons in the SVE column.

Its fibres are collected in the motor root of CN V and run with its mandibular division to muscles of mastication.

## Trigeminal nerve (V)



**-Is the largest cranial nerve .**

**-Leaves the pons about half way between the lower and upper borders of the pons on its ventro-lateral aspect .**

**-It is formed of two bundles, a small motor root and a larger sensory root.**

**-About 1 cm from the pons , the sensory root swells and forms the trigeminal (Gasserian or semilunar ganglion).**

### **The trigeminal (semilunar) ganglion**

**– It lies on the trigeminal impression at the apex of the petrous bone.**

**– Its convex anterior border gives its 3 branches :**

#### **1- Ophthalmic nerve:**

**– Runs forwards in the lateral wall of the cavernous sinus below the trochlear nerve and enters the superior orbital fissure.**

#### **2- Maxillary nerve**

**– Runs forwards in the lateral wall of the cavernous sinus below the ophthalmic nerve**

**– It enters the pterygopalatine fossa through the foramen rotundum.**

#### **3- Mandibular nerve**

**– Descends downwards through the foramen ovale to enter the infratemporal fossa.**

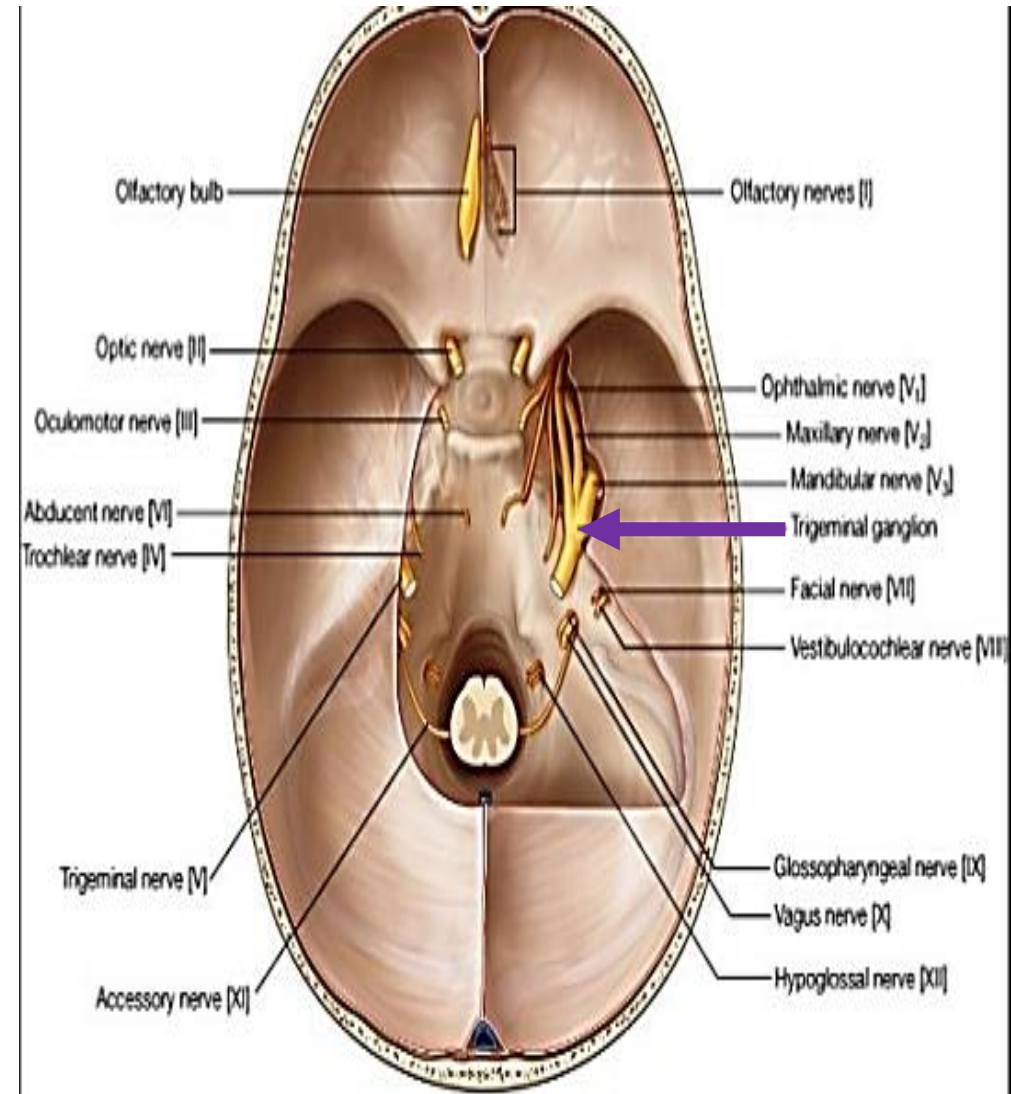
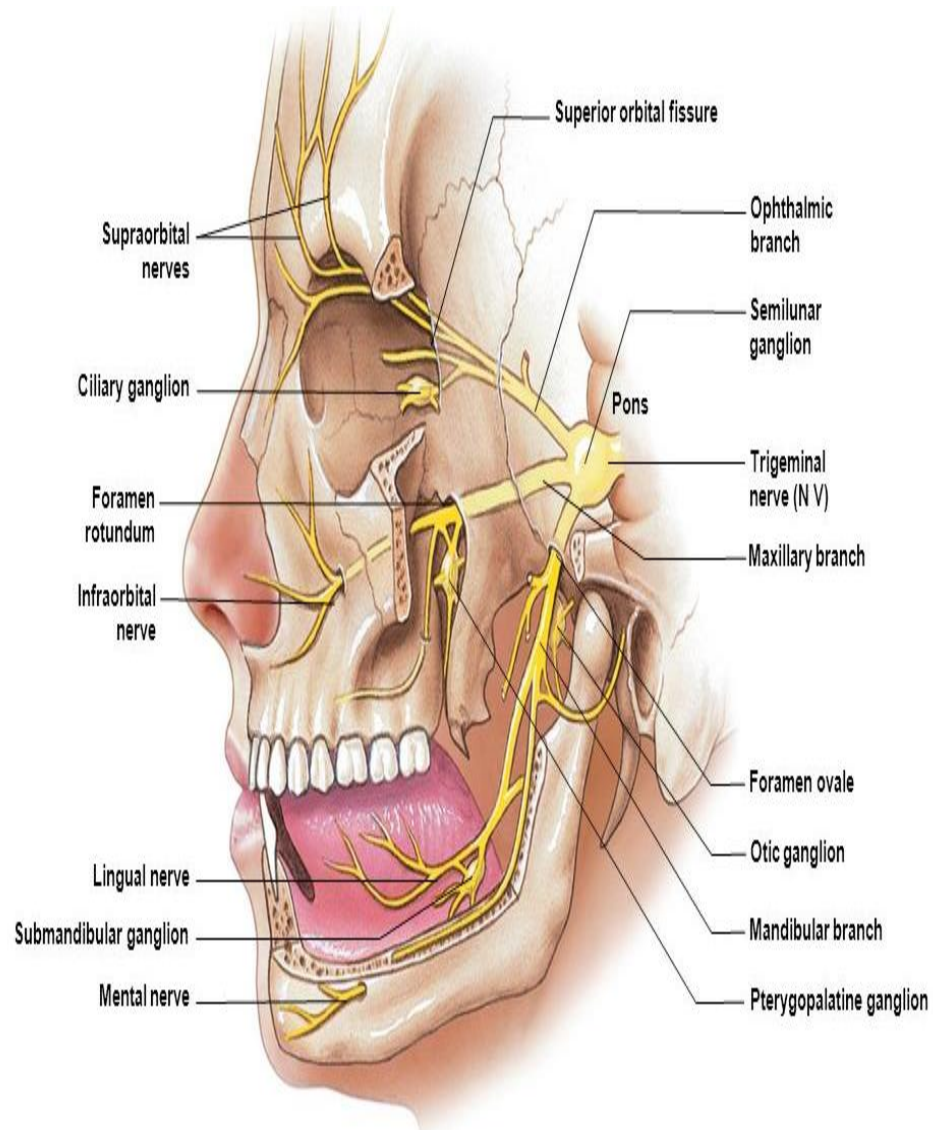
**– The motor fibres are distributed through the mandibular to:**

**– 4 muscles of mastication.**

**– 2 tensors (palati & tympani)**

**– 2 muscles below the mandible (mylohyoid & anterior belly of digastric)**

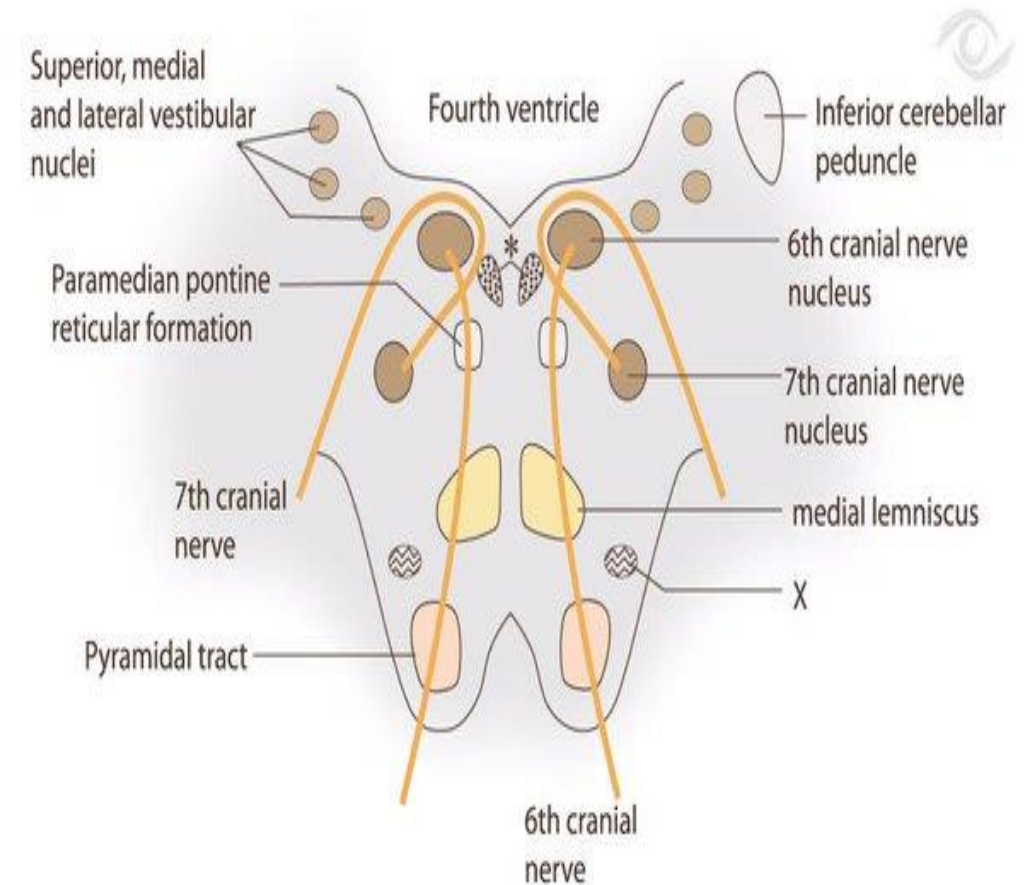
# Course of trigeminal nerve



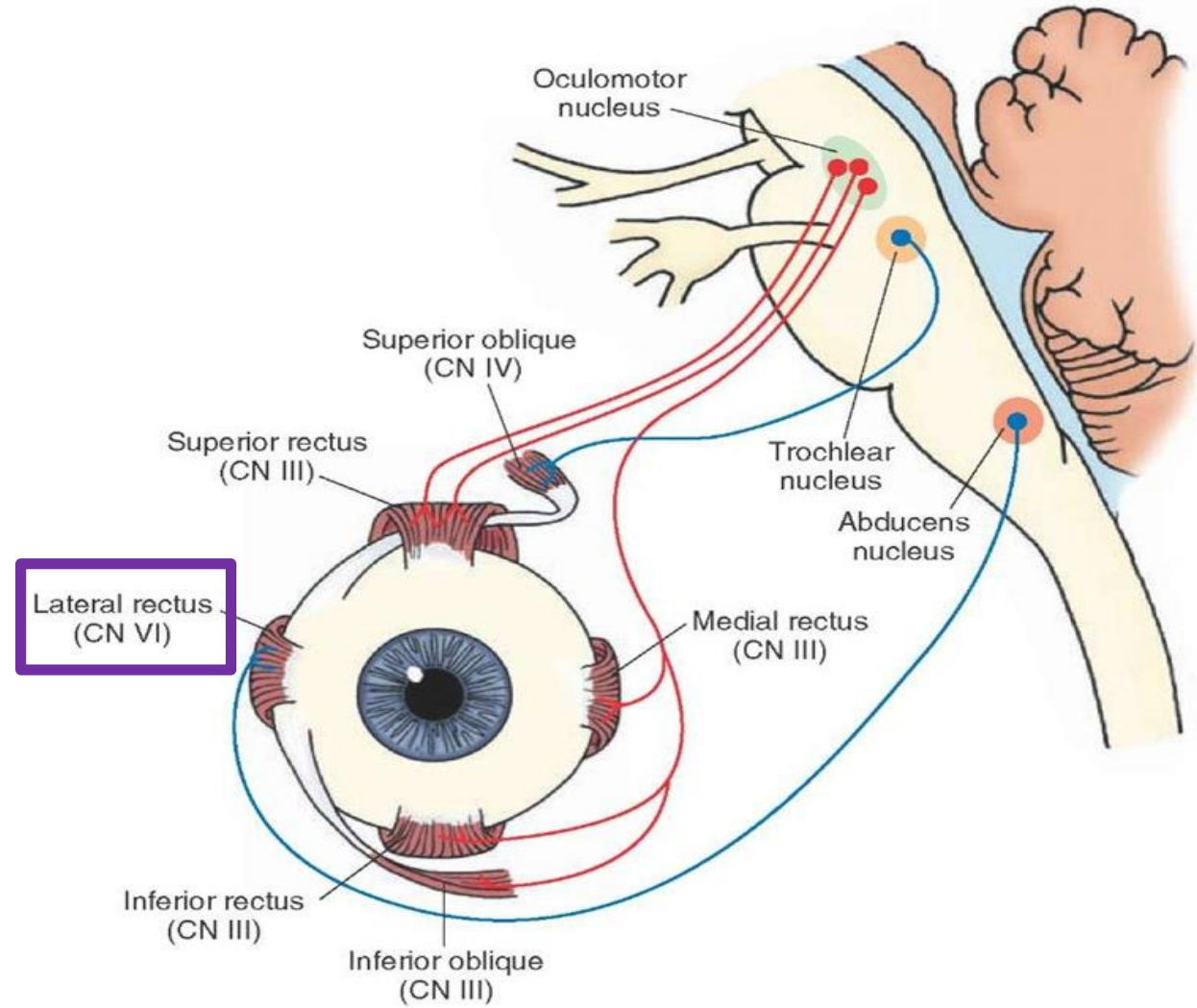
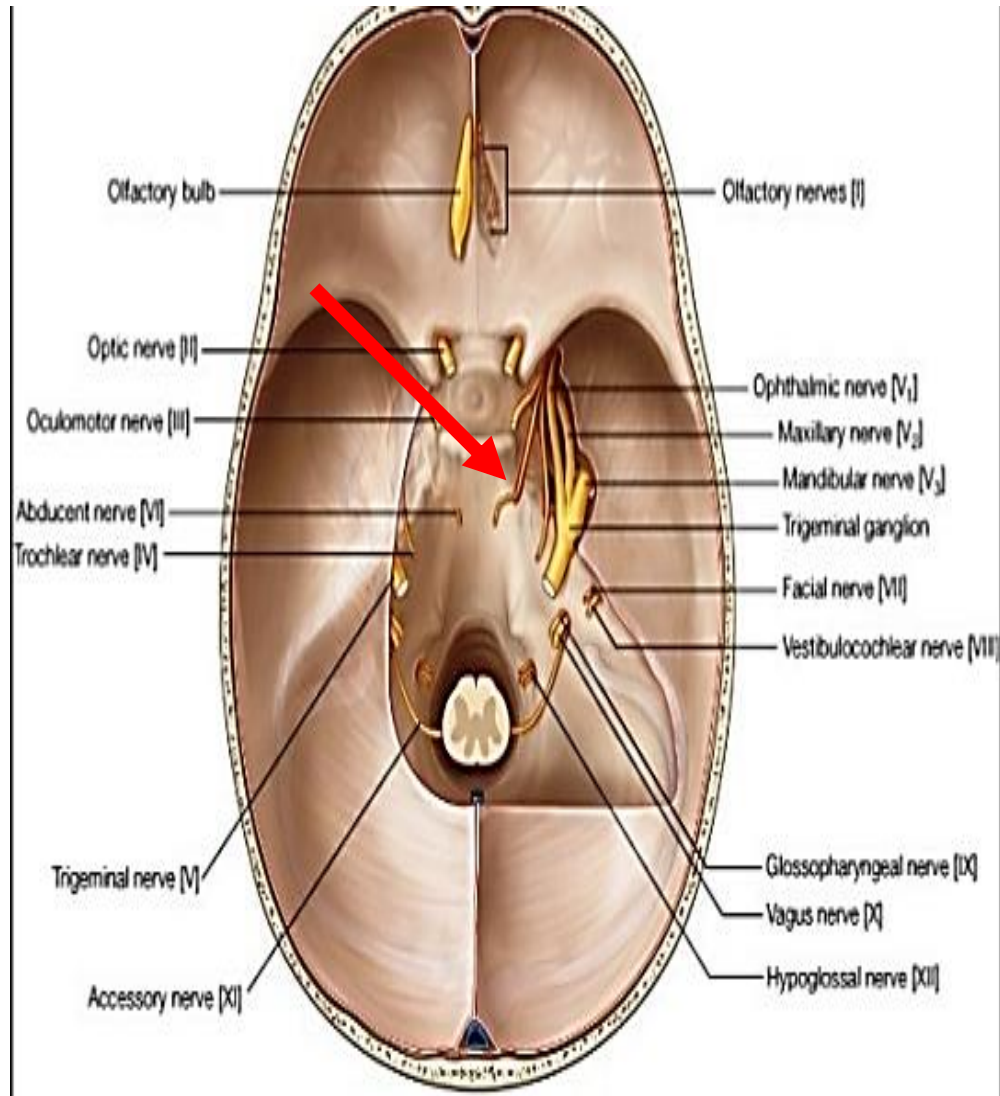
# Cranial nerves originating from Pons

## Abducent Nerve (VI)

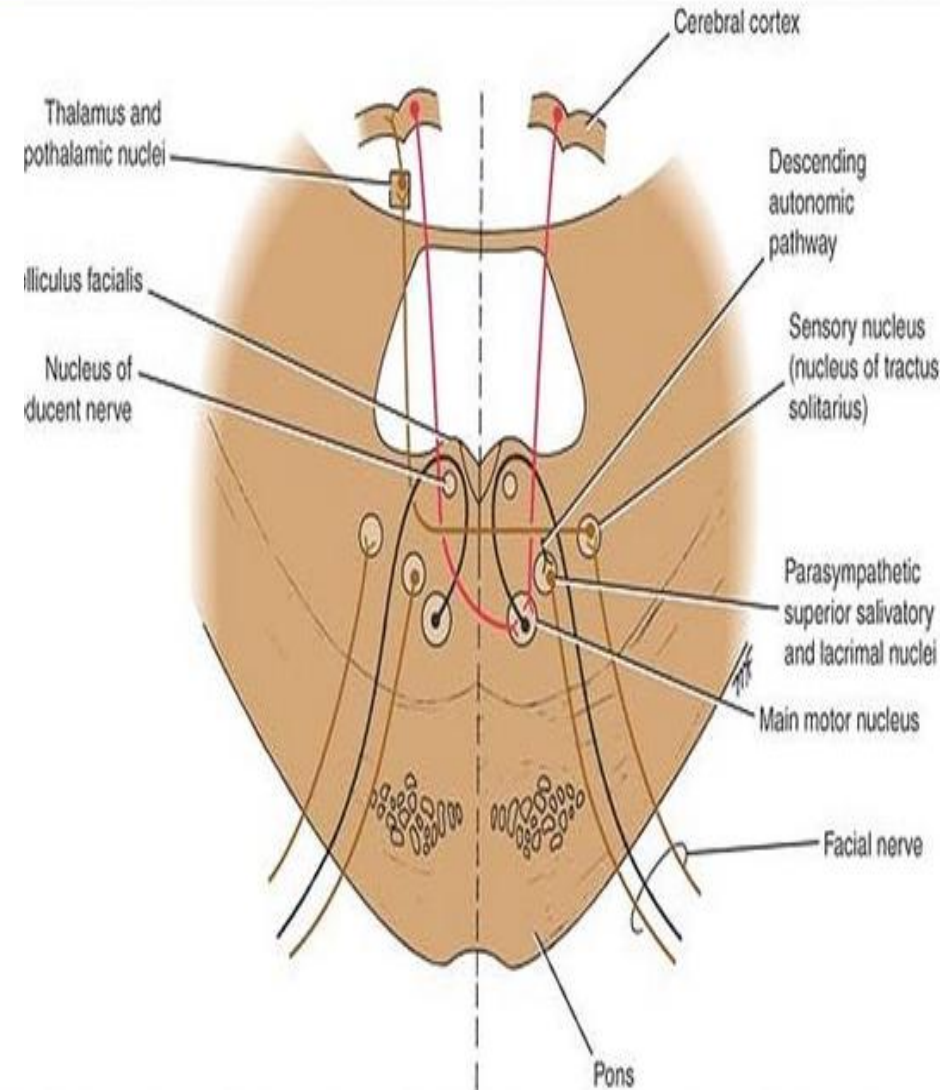
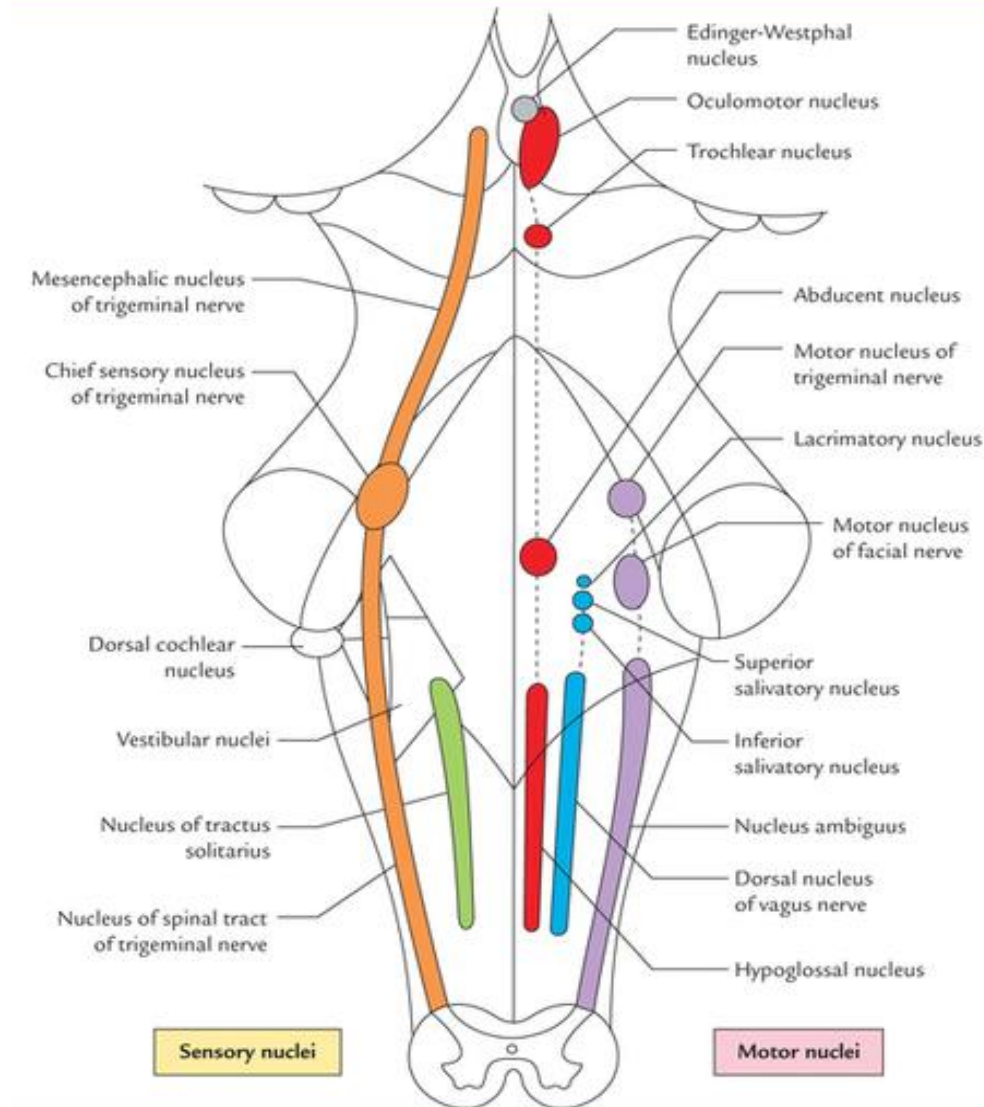
- It is a pure GSE nerve
- It arises from **abducent nucleus**
- Leaves the brain stem at the inferior border of pons.
- It pierces the dura at the clivus midway between the foramen magnum and posterior clinoid process
- It crosses the apex of the petrous bone.
- Then, it passes in the floor of the cavernous sinus below and lateral to the internal carotid artery
- Finally it enters the superior orbital fissure to reach the orbit to supply the lateral rectus muscle.



Source: Schiefer, Wilhelm, Hart (Eds.). Clinical Neuro-Ophthalmology - A Practical Guide. Springer, Berlin/Heidelberg/New York, 2007.



# Facial nerve (VII)



# Cranial nerves originating from Pons

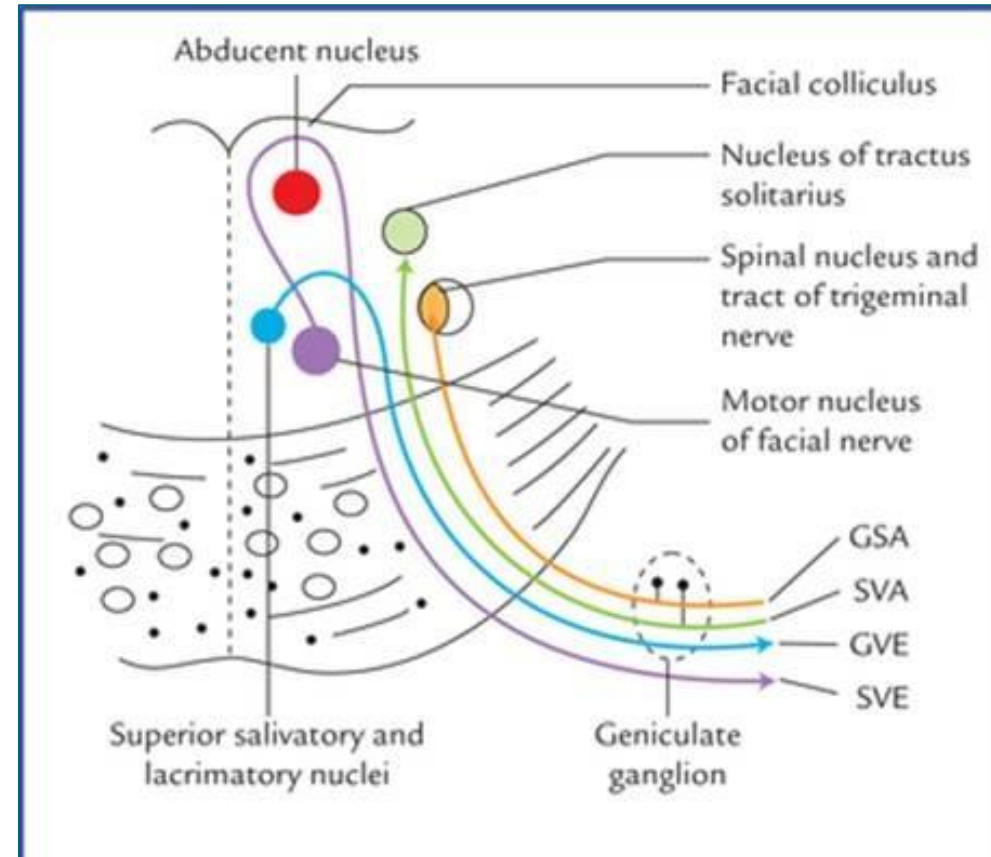
It arises from:

- Facial motor nucleus SVE
- Superior salivatory nucleus GVE
- Solitary tract and nucleus SVA
- Spinal trigeminal tract and nucleus GSA

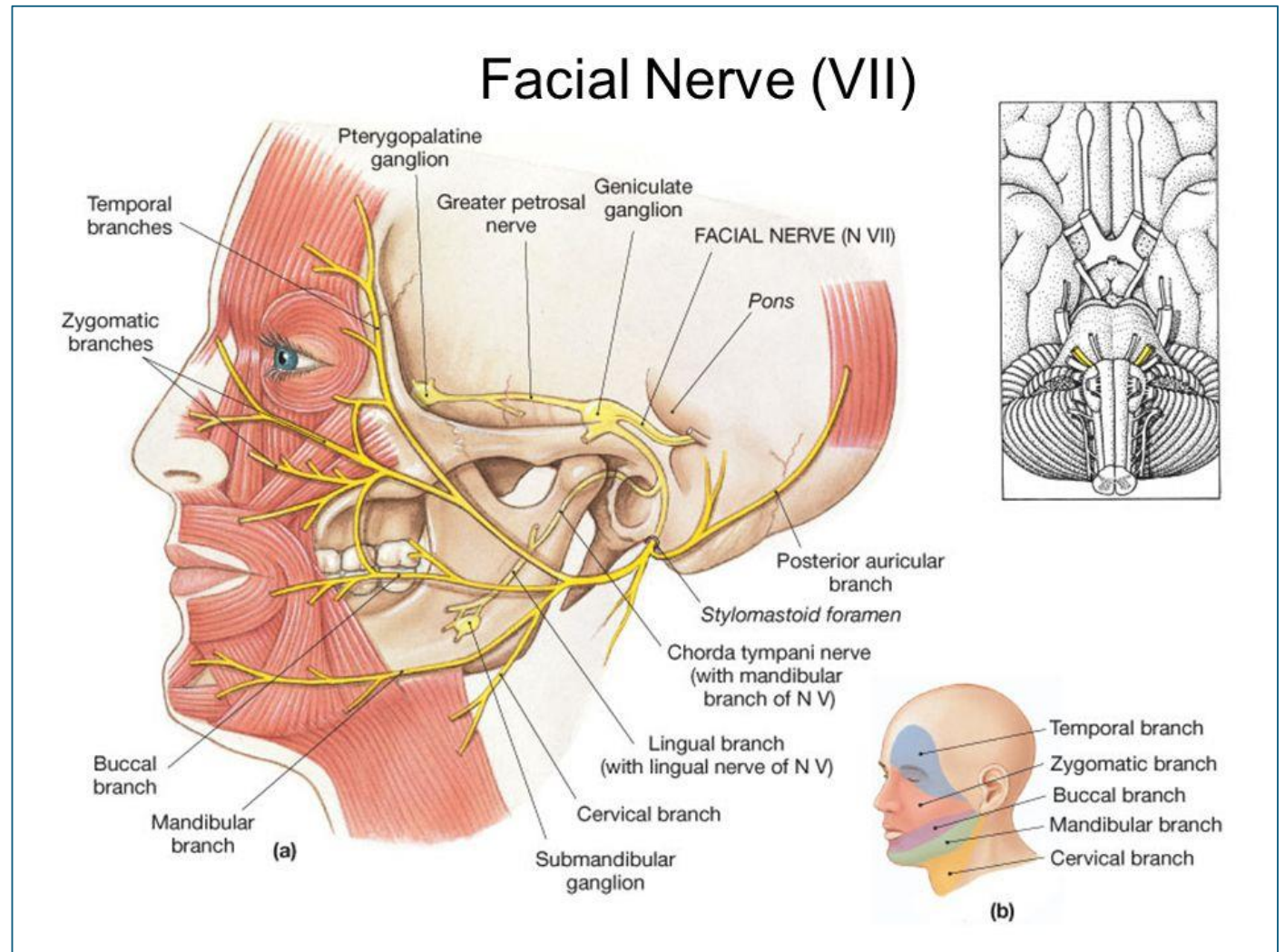
Consists of :

- Facial nerve proper (motor division ) which supply the facial muscles (SVE)
- Intermediate nerve (sensory division ) which contains GVE, SVA and GSA fibres. The 1<sup>st</sup> order neurons of these fibres are in the geniculate ganglion within the temporal bone. It mediates taste, salivation and lacrimation.

## Facial nerve (VII)



- Leaves the pons at the cerebello-pontine angle.
- Enters the skull through **the internal auditory meatus**, runs in the bony facial canal and leaves the skull again via **the stylomastoid foramen** where it enters the parotid gland and breaks into its terminal branches
- It is the nerve of the second branchial arch.



# Cranial nerves originating from Pons

(SSA) special somatic afferent nerve.

-Consists of two components:

**1- Cochlear nerve:** Its nuclei are the ventral and dorsal cochlear nuclei.

**2- Vestibular nerve:** Its nuclei are 4 vestibular nuclei.

-Both nerves enter the brain stem just beneath the caudal border of the pons, on its lateral surface, together with the facial nerve and nervus intermedius at the cerebello-pontine angle.

-Both nerves, together with the facial and intermediate nerves, pass through the internal auditory meatus.

-share in auditory and vestibular pathways

## Vestibulocochlear nerve

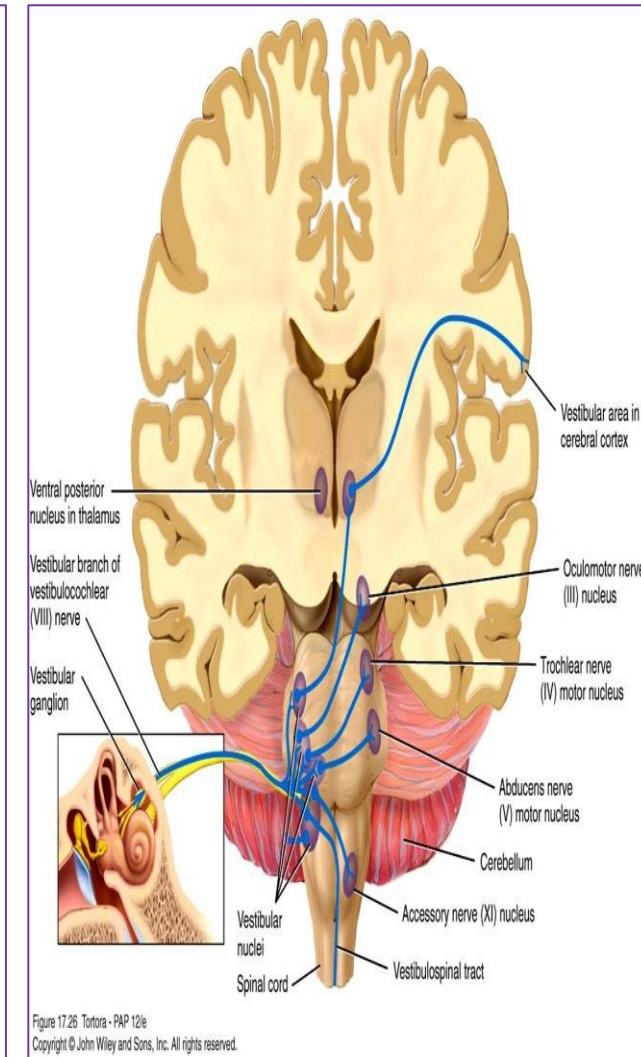
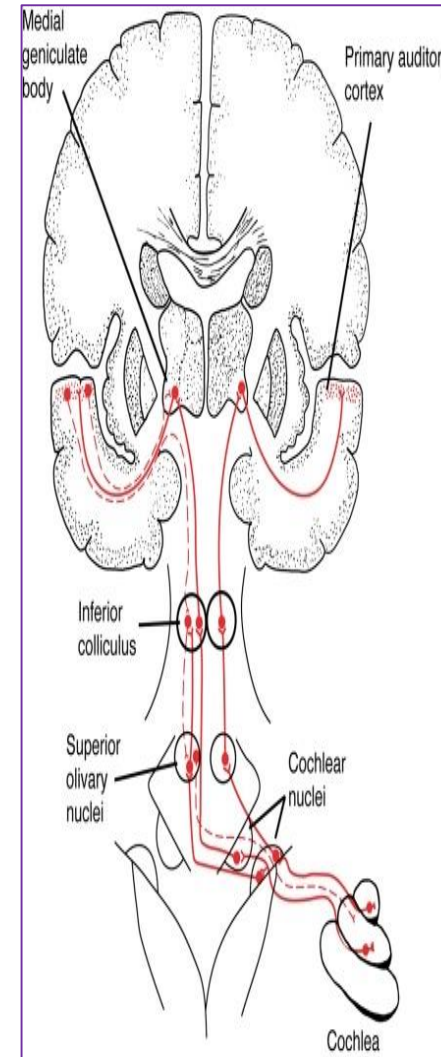


Figure 17.26 Tortora - PAP 12/e  
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# Cranial nerves originating from Medulla oblongata

## Glossopharyngeal Nerve (IX)

-It is predominantly a sensory nerve and arises from:

➤ Nucleus ambiguus (SVE)

➤ Inferior salivatory nucleus (GVE)

➤ Solitary tract and nucleus (GVA & SVA)

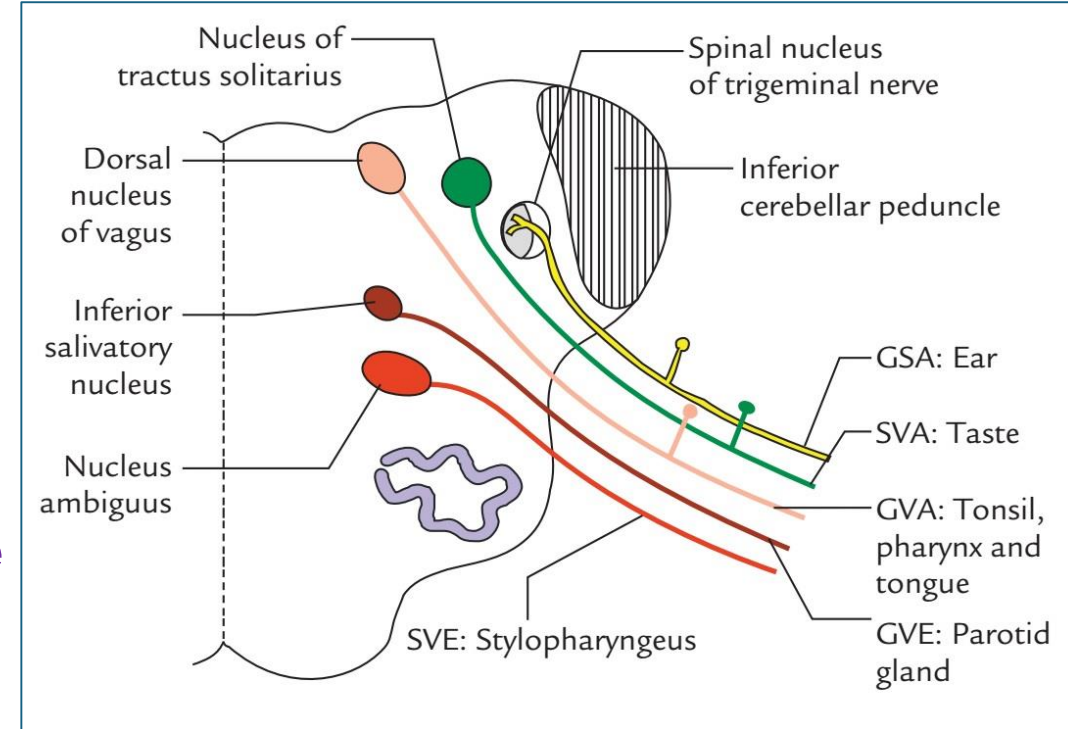
➤ Spinal tract and nucleus of trigeminal nerve

(GSA)

-Leaves the medulla from the postero-lateral sulcus

-It is the nerve of the third branchial arch

-Mediates: Taste, salivation & swallowing.



# Cranial nerves originating from Medulla oblongata

## Vagus Nerve(X)

It is a mixed nerve and it arises from the following cranial nuclei :

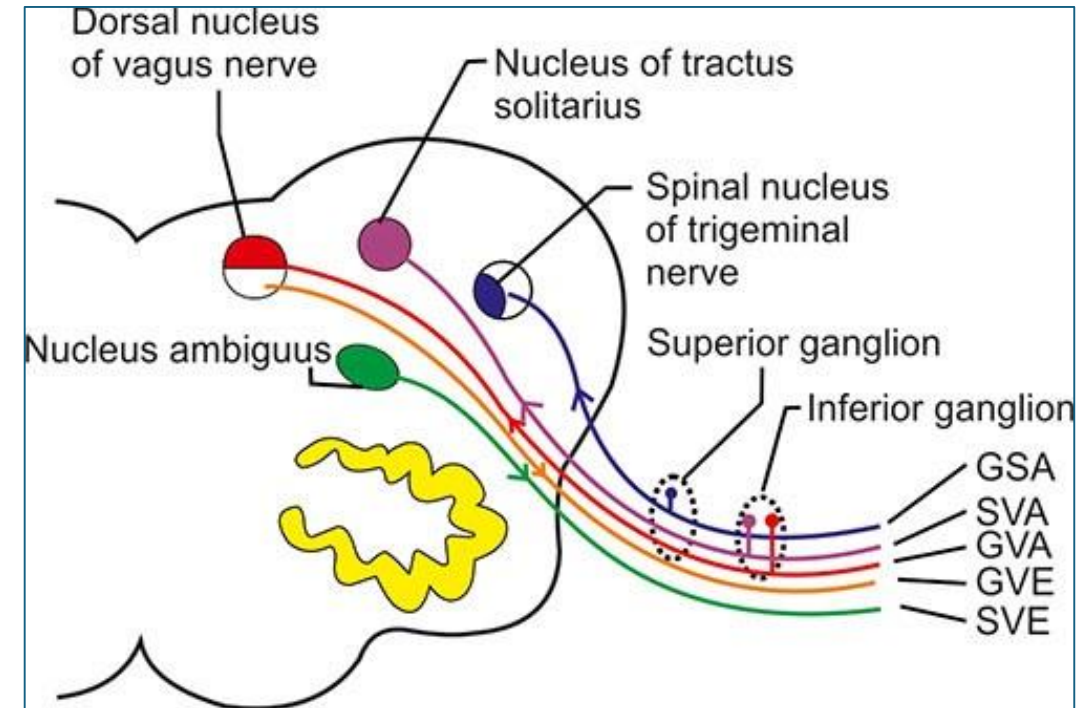
- Nucleus ambiguus(SVE)
- Dorsal nucleus of vagus (GVE)
- Solitary tract and nucleus (GVA & SVA)
- Spinal tract and nucleus of trigeminal nerve (GSA)

-Leaves the medulla from the postero-lateral sulcus .

-It is the nerve of the 4<sup>th</sup> & 6<sup>th</sup> branchial arches.

-Mediates phonation , swallowing , elevation of palate and taste.

-Innervates viscera of the neck, thorax and abdomen.



# Cranial nerves originating from Medulla oblongata

## Accessory Nerve (XI)

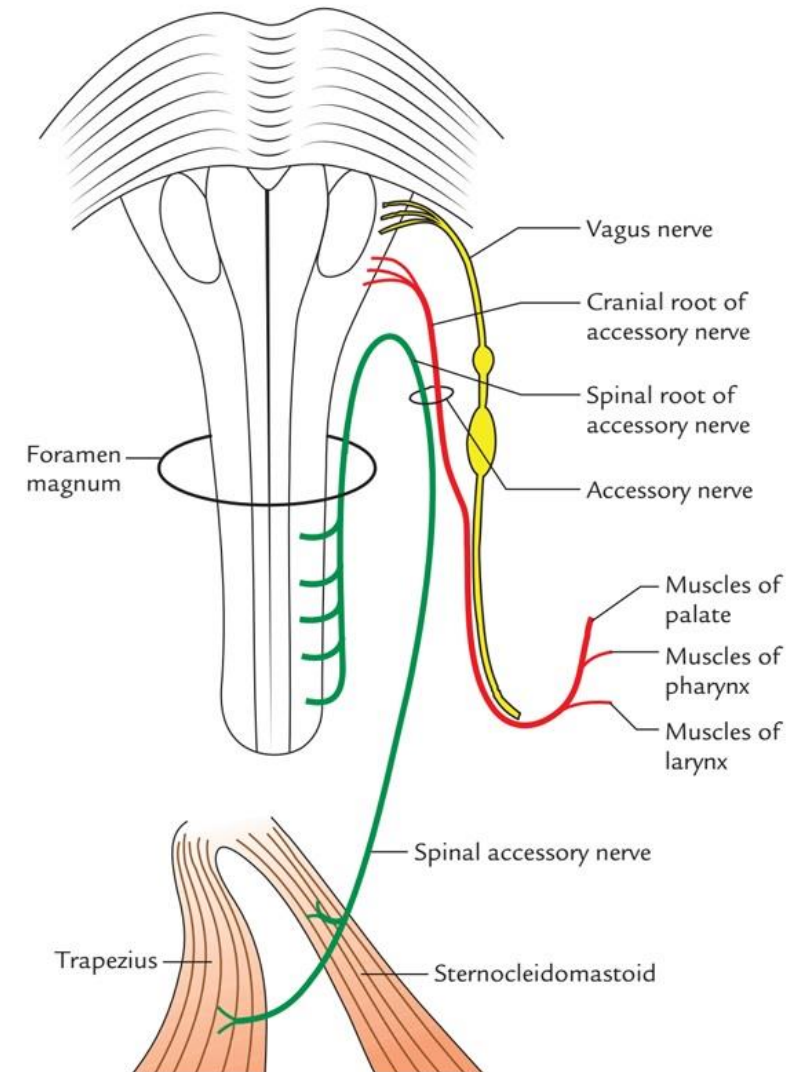
Has a double origin:

### 1- Cranial division:

- Arises from the lower part of the nucleus ambiguus (SVE).
- Leaves the medulla from the postero-lateral sulcus.
- It joins the vagus and so it is named accessory (i.e. it helps the vagus).
- Innervates the intrinsic muscles of the larynx (via the recurrent laryngeal nerve), with the exception of the cricothyroid muscle.

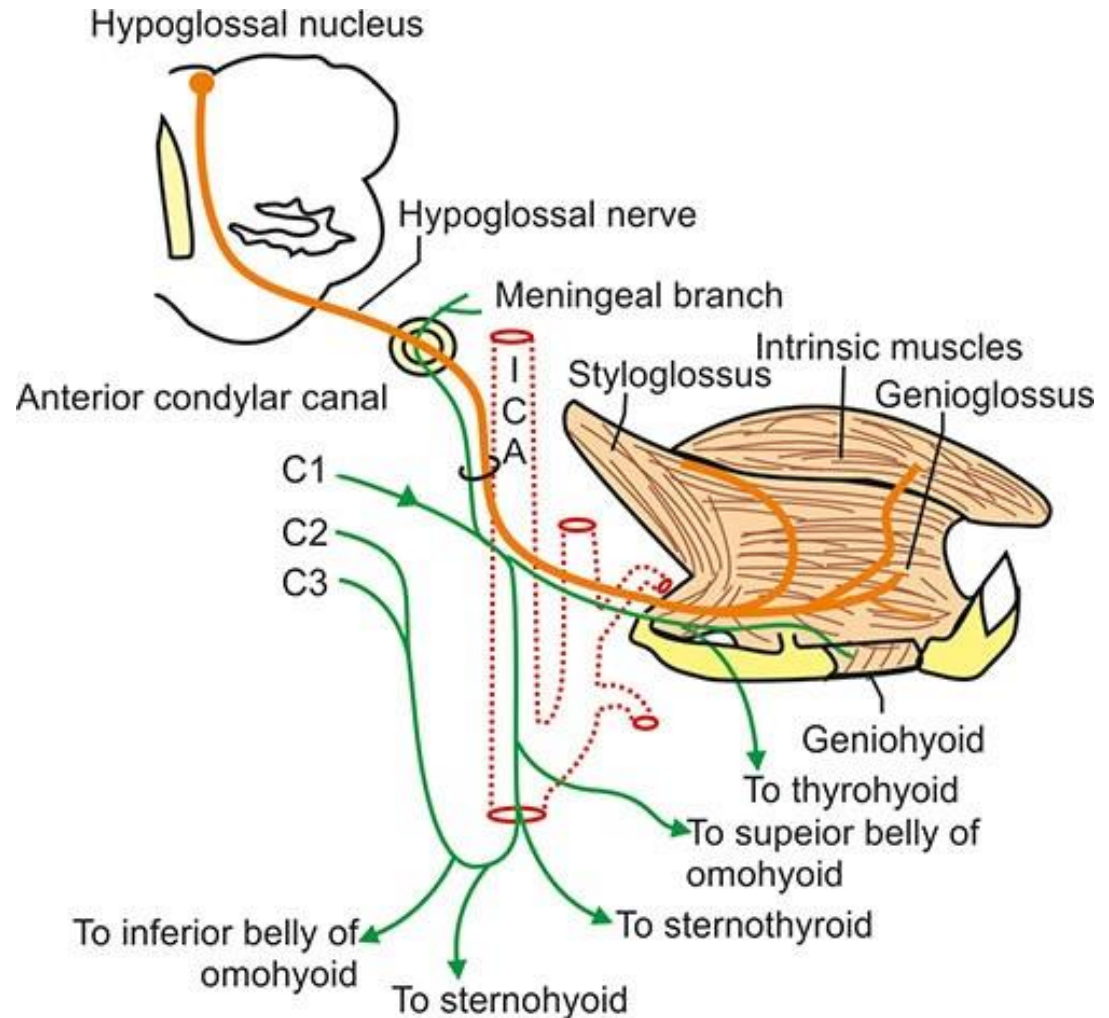
### 2- Spinal division:( GSE)

- Arises by a series of rootlets from the ventral horn of cervical segments C1 – C6.



# Cranial nerves originating from Medulla oblongata Hypoglossal Nerve(XII)

- Is a pure **GSE (General somatic efferent)**
- Arises from the **hypoglossal nucleus** in the open medulla.
- Leaves the medulla from the **antero-lateral sulcus**.
- Leaves the cranial cavity through the **hypoglossal foramen**
- Supply all muscles of the tongue except **palatoglossus muscle** supplied by **pharyngeal plexus**

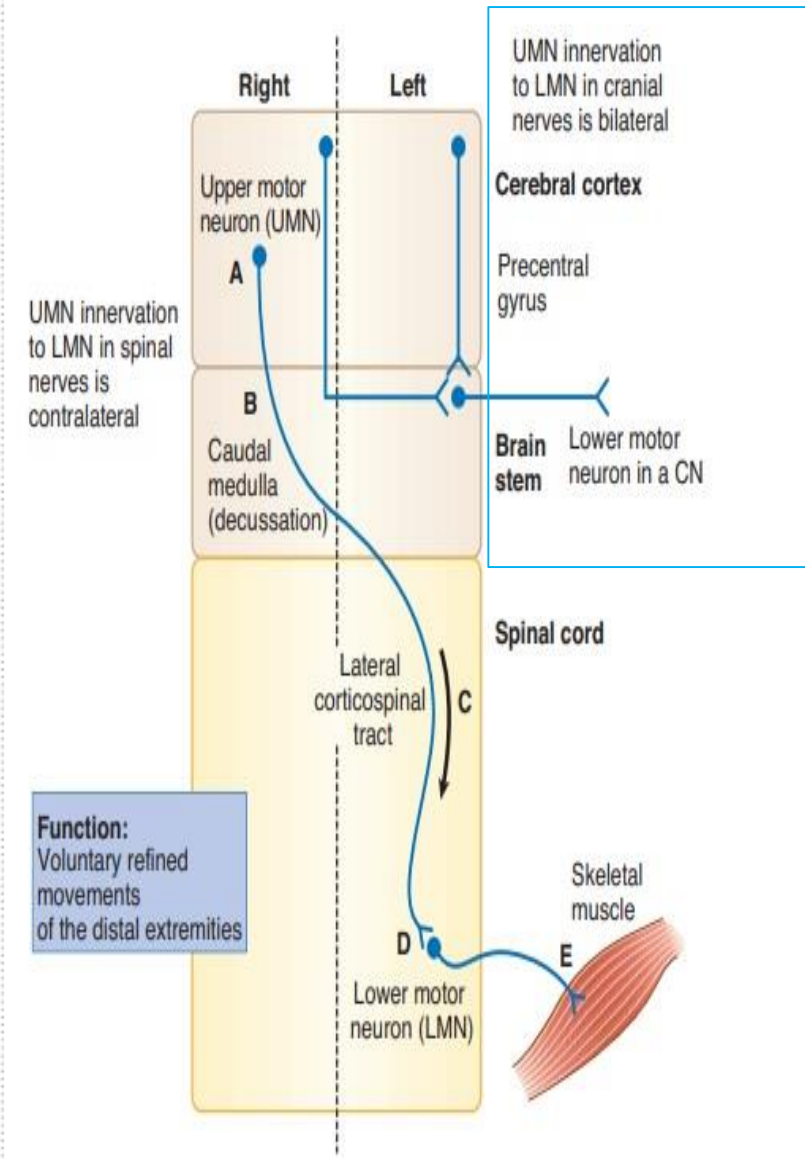


# Corticobulbar (Corticonuclear) Innervation of Cranial Nerve Nuclei

**Corticobulbar fibers arise in the motor cortex and influence all brain stem nuclei that innervate skeletal muscles.**

**includes:**

- Muscles of mastication (CN V)
- Muscles of facial expression (CN VII)
- Palate, pharynx, and larynx (CN X)
- Tongue (CN XII)
- Sternocleidomastoid and trapezius muscles (CN XI)



Thank  
you

