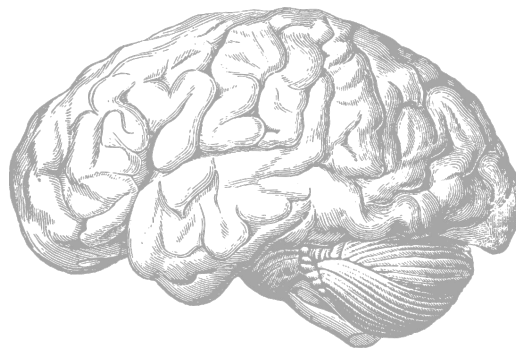




Cranial Nerves IX & X

CNS Block








Color Index

- ◆ Main Text
- ◆ Female Slides
- ◆ Male Slides
- ◆ Drs' Notes
- ◆ Important
- ◆ Extra info

[The Editing File](#)



Objectives

-  Define the deep origin (**nuclei**) of both Glossopharyngeal and Vagus Nerves.
-  Locate the exit of each nerve from the brain stem.
-  Describe the course and distribution of each nerve.
-  List the branches of both nerves.
-  **Applied anatomy of above nerve.**

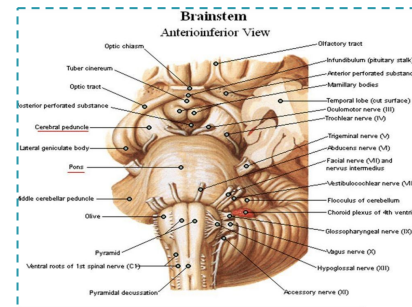
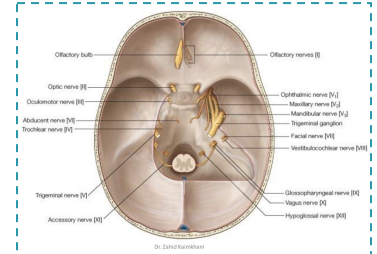


You can find Atlas by [Clicking HERE!](#)

Introduction

Functional Components of Cranial Nerve

Afferent Fibers	Functions
General somatic afferent (GSA)	General sensations
Special somatic afferent (SSA)	Hearing, balance, vision
General visceral afferent (GVA)	Viscera
Special visceral afferent (SVA)	Smell, taste



The Cranial Nerves (IX)

Name		COMPONENTS	FUNCTION	EXIT FROM SKULL
Glossopharyngeal	IX	Motor (SVE)	Stylopharyngeus muscle Assists swallowing	Jugular foramen
		Secretomotor (GVE) parasympathetic	Parotid gland	
		Sensory (GVA, SVA, GSA)	General sensation and taste from posterior one-third of tongue and pharynx; Carotid sinus (baroreceptor); Carotid body (chemoreceptor)	

Glossopharyngeal (IX) Cranial Nerve

Definition

Female Slides

- It is principally a sensory nerve with **preganglionic parasympathetic** and few motor fibers.
- It has no real nucleus to itself, Instead it shares nuclei with **VII (facial)** and **X (vagus)**
- it is considered as a mixed nerve, but primarily with a sensory function

Superficial Attachment (Brain Stem Surface)

- It **arises** from the **ventral aspect** of the medulla by a linear series of small rootlets, in groove between **olive** and **inferior cerebellar peduncle**.
- It **leaves** the cranial cavity by passing through the **jugular foramen** in company with the **Vagus**, and the **Accessory nerves** and the **Internal jugular vein**.

Ganglia & Communications

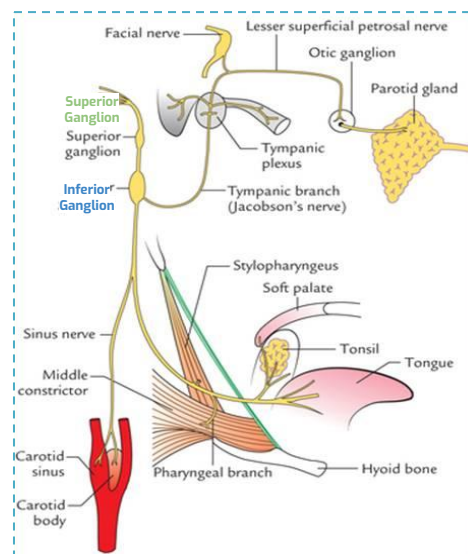
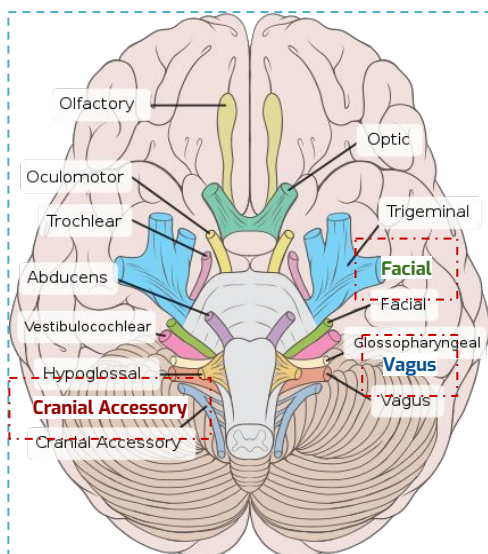
It has **two** ganglia:

1. Superior Ganglion:

- Small, with **no branches**.
- It is **connected** to the Superior Cervical sympathetic ganglion.

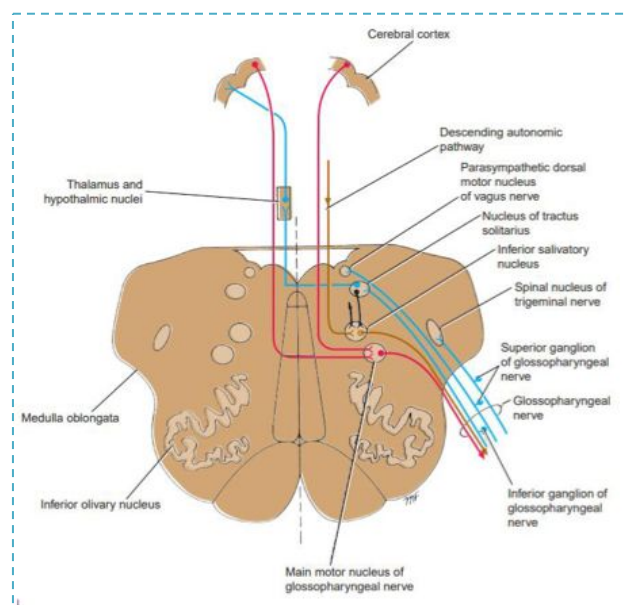
2. Inferior Ganglion:

- Large and carries general sensations from pharynx, soft palate and tonsil.
- It is **connected** to Auricular Branch of Vagus.
- The Trunk of the nerve is connected to **the Facial** nerve at the stylomastoid foramen.



Glossopharyngeal Nerve Nuclei:

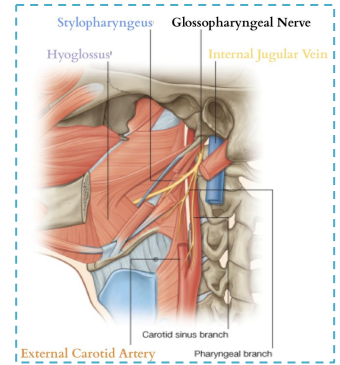
Main Motor Nucleus	Parasympathetic Nucleus (Inferior salivatory nucleus)	Sensory Nucleus
<ul style="list-style-type: none"> Lies deep in RF of the medulla oblongata Is formed by the superior end of the nucleus ambiguus. Receives corticonuclear fibers from both cerebral hemispheres. Supply the stylopharyngeus muscle. 	<p>Receives AFFERENT fibers from:</p> <ul style="list-style-type: none"> The hypothalamus The olfactory system Information concerning taste from the nucleus of the solitary tract. <p>EFFERENT preganglionic parasympathetic fibers:</p> <ul style="list-style-type: none"> the Otic ganglion (through the tympanic branch of the glossopharyngeal nerve, the tympanic plexus, and the lesser petrosal nerve. <p>The postganglionic fibers pass to the parotid gland.</p>	<ol style="list-style-type: none"> Part of the nucleus of the tractus solitarius. Efferent fibers cross the median plane – ventral group of nuclei of the opposite thalamus and a number of hypothalamic nuclei – lower part of the postcentral gyrus. Common sensation enters the brainstem through the superior ganglion of the glossopharyngeal nerve but ends in the spinal nucleus of the trigeminal nerve. <p>Afferent impulses from the carotid sinus terminate in the nucleus of the tractus.</p>



Glossopharyngeal (IX) Cranial Nerve

Course

Female
Slides



It Passes forwards between **Internal jugular vein** and **internal carotid artery**.
Lies Deep to Styloid process.

Passes between external and internal carotid arteries at the posterior border of **Stylopharyngeus** then lateral to it.

It reaches the pharynx by passing between middle and inferior constrictors deep to **Hyoglossus** where it breaks into terminal branches.

Course

Male
Slides

leaves the AL surface of the medulla as a series of rootlets in a groove between the olive and the ICP

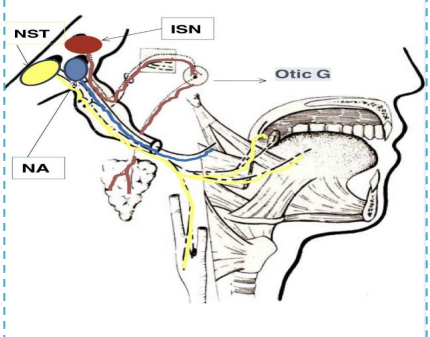
Leaves the skull through the jugular foramen. The superior and inferior sensory ganglia are situated on the nerve here.

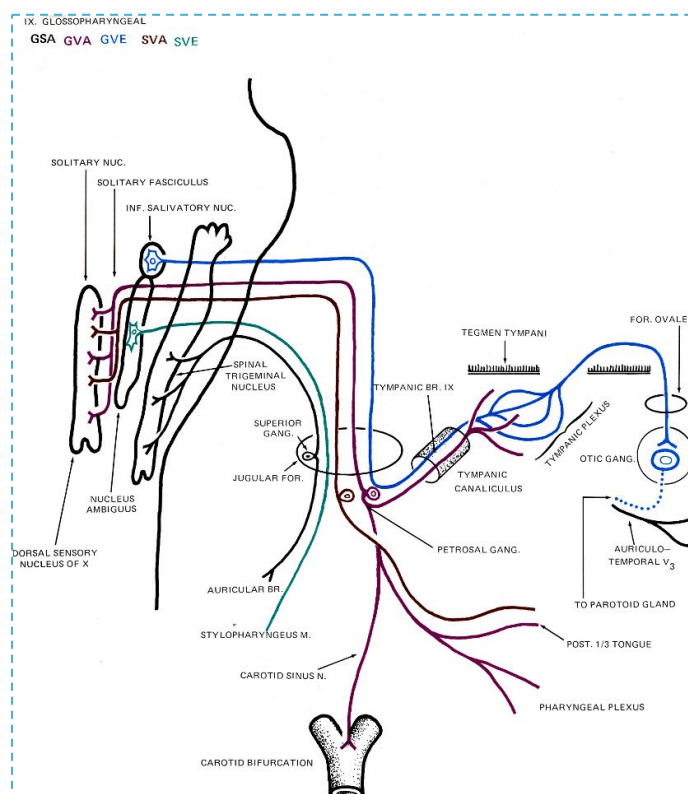
The nerve then descends through the upper part of the neck in company with the IJV and the ICA to reach the posterior border of the stylopharyngeus muscle, which it supplies.

The nerve then passes forward between the superior and middle constrictor muscles to give sensory branches to the mucous membrane of the pharynx and the posterior third of the tongue.

Glossopharyngeal (IX) Cranial Nerve

Components of the Fibers & Deep Origin:

Type of fibers	Nuclei	Structure Innervated
SVE Fibers (Special Visceral Efferent)	Nucleus Ambiguus (NA)	Supplies Stylopharyngeus Muscle
GVE Fibers (General Efferent Visceral)	Inferior Salivatory Nucleus (ISN).	Relay in Otic Ganglion , the postganglionic fibers supply parotid gland .
SVA Fibers (Special Visceral Afferent)		<p>Fibers arise from the cells of inferior ganglion, their:</p> <ol style="list-style-type: none"> 1- Central processes terminate in (NST). 2- Peripheral processes carry sensation from the taste buds on posterior third of tongue.
GVA Fibers (General Visceral Afferent)		Fibers carry visceral sensation from mucosa of posterior third of tongue, pharynx, auditory tube, tympanic cavity and carotid sinus, end in NST.



Glossopharyngeal (IX) Cranial Nerve

Branches

1. Tympanic:

- Relays in the otic ganglion and gives secretomotor to the **parotid gland**.

2. Pharyngeal:

- To the **mucosa of pharynx**.

3. Tonsillar

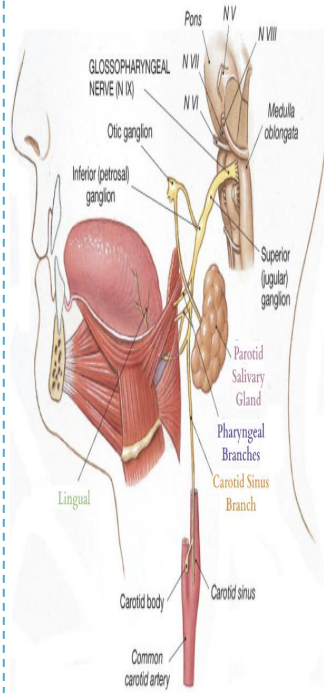
4. Lingual:

- Carries sensory branches, general and special (taste) from the posterior third of the tongue.

5. Nerve to Stylopharyngeus muscle (**Muscular Branch**)

6. Sensory Branches from the **Carotid Sinus and Body** (pressoreceptors and chemoreceptors)

Mnemonic: Tom Says To Never Leave Peter



Glossopharyngeal (IX) Nerve lesions:

Female Slides

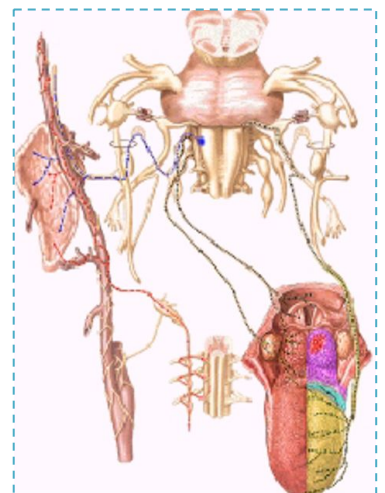
It Produces:

Difficulty of swallowing.

Impairment of taste sensation over the posterior one-third of the tongue, palate and pharynx.

Absent gag reflex.
(patient won't vomit)

Dysfunction of the parotid gland



Glossopharyngeal (IX) Cranial Nerve

Glossopharyngeal (IX) Nerve lesions:

Male
Slides

Lesion is extremely rare, usually post cranial fossa tumors.

Glossopharyngeal neuralgia a rare condition in which there are repeated episodes of severe pain in the tongue, throat, ear, and tonsils. This can last from a few seconds to a few minutes.

Possible causes :

- Blood vessels pressing on the glossopharyngeal nerve
- Growths at the base of the skull pressing on the glossopharyngeal nerve
- Tumor or infections of the throat and mouth pressing on the glossopharyngeal nerve

How to test for Glossopharyngeal (IX) Nerve lesion?

Use a **tongue blade** to depress the base of the tongue gently if necessary.

Observe the **palatal arches** as they contract and the soft palate as it swings up and back in order to close off the nasopharynx from the oropharynx.

With paralysis there is no elevation or constriction of the affected side.



Note: (Med439) When the glossopharyngeal gets damaged, there is a high chance that the other nearby nerves (such as the accessory and vagus) are also damaged. Why? Because they're so close to each other. So the probability of a single nerve lesion of those nerves is pretty low.

Have the patient open the mouth and **inspect** the palatal arch on each side for asymmetry.

Ask the patient to say "**ahhh**" as long as possible.

Normal palatal arches will **constrict** and **elevate**, and the uvula will remain in the midline as it is elevated.

Warn the patient that you are going to test the **gag reflex (take consent)**. Gently touch first one and then the other palatal arch with a tongue blade, waiting each time for gagging.

Vagus (X) Cranial Nerve

COMPONENTS

Motor (GVE,SVE)
Sensory(GVA,SVA,GSA)

FUNCTIONS

- Heart , great thoracic blood vessels.
- Larynx, trachea, bronchi, lungs.
- Alimentary tract from pharynx to splenic flexure of colon.
- Liver, kidneys, and pancreas

EXIT FROM SKULL

Jugular foramen

Male
 Slides

It is a **Mixed** nerve

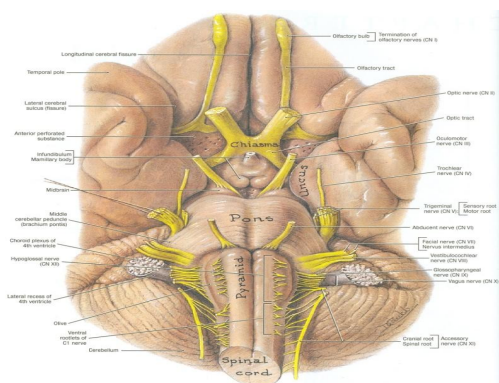
The **longest** and most widely distributed cranial nerve. Its name means wandering (it goes all the way to the abdomen).

The principal role of the vagus is to provide parasympathetic supply to organs throughout the thorax and upper abdomen

It also gives **sensory** and **motor** supply to the **pharynx and larynx**

Superficial Attachment (Brain Stem Surface)

- Its rootlets exit from medulla between **olive** and **inferior cerebellar peduncle**. (the same with Glossopharyngeal)
- Leaves the skull through **jugular foramen**.
- It occupies the posterior aspect of the carotid sheath between the **internal jugular vein** laterally and the **internal and common carotid arteries** medially.



Communications

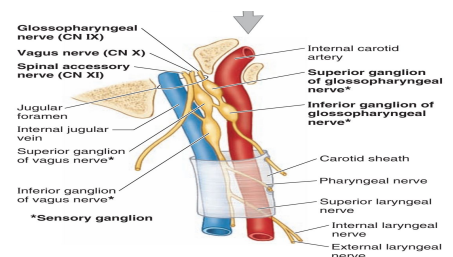
It has two ganglia:

1. **Superior Ganglion** (in jugular foramen) **with:**

- Inferior ganglion of glossopharyngeal nerve, superior cervical sympathetic ganglion and facial nerve.

2. **Inferior Ganglion** (just below the jugular foramen) **with:**

- Cranial part of accessory nerve, Hypoglossal nerve. Superior cervical sympathetic ganglion and 1st cervical nerve.



Vagus (X) Cranial Nerve

Vagus Nerve Nuclei:

Male Slides

Main Motor Nucleus (Nucleus ambiguus)	Parasympathetic Nucleus (dorsal nucleus of the vagus)	Sensory Nucleus (tractus solitarius & spinal nucleus of the 5th CN)
<p>-Lies deep in RF of the medulla oblongata and it is formed by the nucleus ambiguus.</p> <p>-Receives corticonuclear fibers from both cerebral hemispheres.</p> <p>-Supply constrictor muscles of the pharynx and the intrinsic muscles of the larynx.</p>	<p>-Receives AFFERENT fibers from:</p> <ul style="list-style-type: none"> • The hypothalamus • The olfactory system • Information concerning taste from the nucleus of the solitary tract. <p>-EFFERENT are distributed to the involuntary muscle of: Bronchi, heart, esophagus, stomach, small intestine, and large intestine as far as the distal one-third of the transverse colon.</p>	<p>-Lower part of the nucleus of the tractus solitarius (taste and from carotid sinus).</p> <p>-Common sensation (auricle, external acoustic meatus and cerebral dura mater) enters the brainstem through the superior ganglion of the vagus nerve but ends in the spinal nucleus of the trigeminal nerve.</p>

Components of the Fibers & Deep Origin:

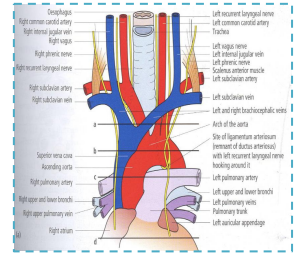
Female Slides

Type of Fiber	Nucleus of Origin	Function	Picture
GVE Fibers (General Visceral Efferent)	Dorsal Nucleus of Vagus (Parasympathetic)	Synapses in parasympathetic ganglia, short postganglionic fibers innervate cardiac muscle, smooth muscles, and glands of viscera.	
SVE Fibers (Special Visceral Efferent)	Nucleus Ambiguus (NA) (Motor)	To muscles of pharynx and larynx.	
GVA fibers (General Visceral Afferent)	Nucleus of Solitary Tract (NST)(Sensory)	Carry impulse from viscera in neck, thoracic and abdominal cavities to NST.	
SVA fibers (Special Visceral Afferent)	Spinal Tract & Nucleus of Trigeminal (Sensory)	Sensation from auricle, external acoustic meatus, and cerebral dura mater to spinal tract & nucleus of trigeminal..	

Vagus (X) Cranial Nerve

Course:

Femal
eSlides



The vagus runs down the neck on the prevertebral muscles and fascia.

The internal jugular vein lies behind it. The internal and common carotid arteries are in front of it, all the way down to the superior thoracic aperture.

It lies on the prevertebral muscles and fascia.

Enters thorax through its inlet:
Right Vagus descends in front of the subclavian artery.
Left Vagus descends between the left common carotid and left subclavian artery.

Course:

Male
Slides

Leaves the medulla oblongata in a groove between the olive and the ICP, and passes laterally and leaves the skull through the jugular foramen.

Possesses **two sensory ganglia**:

- **A rounded superior ganglion**, situated on the nerve within the jugular foramen,
- **A cylindrical inferior ganglion**, which lies on the nerve just below the foramen.

Below the inferior ganglion, the cranial root of the accessory nerve joins the vagus nerve and is distributed mainly in its pharyngeal and recurrent laryngeal branches

Descends vertically in the neck within the carotid sheath with the internal jugular vein and the internal and common carotid arteries.

Vagus (X) Cranial Nerve

Cont. Course:

Male
Slides

Left vagus nerve

Enters the thorax, descends **between the left common carotid and subclavian arteries.**

Crosses the left side of the aortic arch and descends behind the root of the left lung.

Then descends on the anterior surface of the esophagus, enters the abdomen and continue as the anterior vagal trunk.

Divides into several branches, which are distributed to the stomach, liver, upper part of the duodenum, and head of the pancreas.

Right vagus nerve

Enters the thorax, descends **in front of the subclavian artery.**

Passes behind the right lung root and esophagus then enters the abdomen and continue as the posterior vagal trunk.

Contributing to the pulmonary plexus, esophageal plexus.

Distributed to the stomach and the duodenum, liver, kidneys, and small and large intestines as far as the distal third of the transverse colon.

Vagus (X) Cranial Nerve

Branches

Meningeal:

- To the dura

Auricular nerve :

- To the external acoustic meatus and tympanic membrane.

Pharyngeal:

- It enters the wall of the pharynx. It supplies the mucous membrane of the pharynx, constrictor muscles, and all the muscles of the palate except the tensor palati.

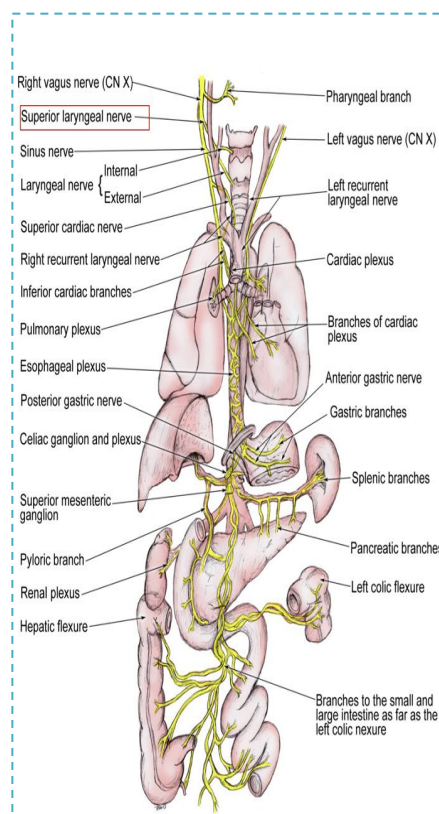
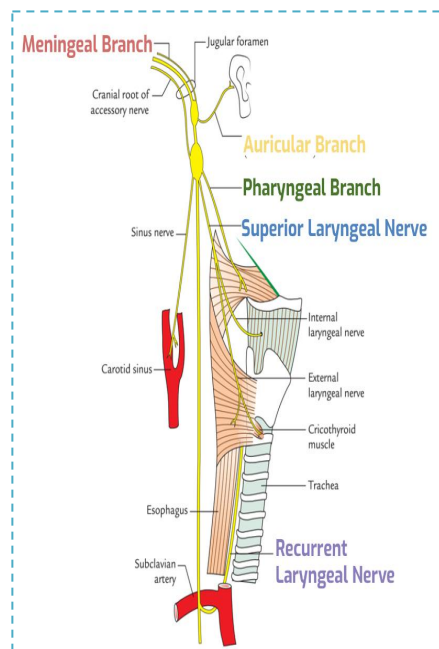
Superior Laryngeal:

- **Internal Laryngeal:** Provides sensation to the hypopharynx, epiglottis, and part of the larynx that lies above the vocal folds.
- **External Laryngeal:** Supplies the cricothyroid muscle

Recurrent Laryngeal:

- The recurrent laryngeal nerve goes round the subclavian artery on the right, and round the arch of the aorta on the left.
- It runs upwards and medially alongside the trachea, and passes behind the lower pole of the thyroid gland
- The recurrent laryngeal nerve gives motor supply to all the muscles of the larynx, **except** the cricothyroid. It also provides sensation to the larynx below the vocal folds.

The carotid body



Vagus (X) Cranial Nerve

Vagus (X) Nerve lesions:

Femal
eSlides

Vagus Nerve Lesion produce:

1. Palatal **Paralysis**
2. Pharyngeal **Paralysis**
3. Laryngeal **Paralysis**.
4. Abnormalities of esophageal motility, gastric acid secretion, gallbladder emptying, heart rate, and other **autonomic dysfunctions**.

How to diagnose for Vagus (X) Nerve injury:

A

Listen to the patient talk as you are taking the history.

B

Notice any Hoarseness, whispering, nasal speech, or the complaint of aspiration or regurgitation of liquids **through the nose should make you especially mindful of abnormality**.

C

Give the patient a glass of water to see if there is choking or any complaints as it is swallowed.

D

Laryngoscopy **is necessary to evaluate the vocal cord**.

Causes of Nerve Lesions in CNs (IX) and (X)

1

Lateral Medullary Syndrome:

Degenerative disorder seen over the age of 50 mostly, due to **thrombosis** of the **inferior cerebellar artery**.

2

Tumors:

Compressing the cranial nerves in their exiting foramina **from the cranium via the skull base**.

Manifested By:

1. Ipsilateral paralysis of the muscles of the palate, pharynx and larynx **leading to dysphagia, dysarthria, and dysphonia because the nucleus ambiguus is involved**.
2. Ipsilateral loss of taste from the posterior third of tongue.

The Examination of vagus Nerve

The examination of vagus nerve depends on testing the function of the branches to the **pharynx**, **soft palate**, and **larynx**.

Pharynx

- The pharyngeal or gag reflex may be tested by touching the lateral wall of the pharynx with a spatula. This should immediately cause the patient to gag (the pharyngeal muscles will contract).
- The **AFFERENT** of the pharyngeal reflex run in the IX CN.
- The **EFFERENT** run in
 - IX- CN (to the stylopharyngeus muscle)
 - X -CN (pharyngeal constrictor muscles).
- Unilateral lesions of the vagus will show little or no gag reflex on that side.

Soft palate

- The innervation of the **SOFT PALATE** may be tested by asking the patient to say “ah.” Normally, the soft palate rises and the uvula moves backward in the midline.

Larynx

- All the muscles of the larynx are supplied by the **recurrent laryngeal branch of the vagus**, except the cricothyroid muscle, which is supplied by the external laryngeal branch of the superior laryngeal branch of the vagus. Hoarseness or absence of the voice may occur as a symptom of vagal nerve palsy.
- The movements of the **VOCAL CORDS** may be tested by means of a laryngoscope examination.

Lesions involving the vagus nerve in the posterior cranial fossa commonly involve the **glossopharyngeal, accessory, and hypoglossal nerves** as well.

Summary

Glossopharyngeal (IX) Cranial Nerve

- A **MIXED** nerve, carries motor fibers to pharyngeal muscles for swallowing and parasympathetic motor fibers to salivary glands (Salivation).
- Sensory fibers carry messages from the pharynx, tonsils, posterior of tongue (taste).
- Glossopharyngeal fibers also carry afferent messages from the carotid sinus baroreceptors.
- It also carries impulses, which influence the arterial blood pressure and respiration, from the carotid sinus and carotid body.

Vagus (X) Cranial Nerve

- Medulla oblongata–jugular foramen–carotid sheath–thorax–abdomen.
- **Vagus (X) NERVE** is a **MIXED** nerve, it has the most extensive distribution of all the cranial nerves. It contains afferent, motor, and parasympathetic fibers.
- The afferent fibers convey information from: esophagus, tympanic membrane, external auditory meatus and part of cochlea of the middle ear, end in **Trigeminal sensory nucleus**, Chemoreceptors in aortic bodies and baroreceptors in aortic arch.
- Receptors from thoracic & abdominal viscera, end in nucleus **Solitarius**.
- The motor fibers arise from **Nucleus Ambiguus** of medulla to innervate muscles of soft palate, pharynx, larynx, and upper part of esophagus.
- The parasympathetic fibers originate from **Dorsal Motor Nucleus of Vagus** in medulla distributed to cardiovascular, respiratory, and gastrointestinal systems.
- It also supplies glands associated with the alimentary tract, such as the liver and pancreas.

MCQs

Q1. Which one of the following branches of the glossopharyngeal nerve carries secretomotor fibers to the parotid gland?

- | | | | |
|------------|--------------|-------------|---------------|
| A. Lingual | B. Tonsillar | C. Tympanic | D. Pharyngeal |
|------------|--------------|-------------|---------------|

Q2. Which of the following cranial nerves exits the cranial cavity through the jugular foramen?

- | | | | |
|--------------------|---------------------|-------------------|----------------------|
| A. Accessory nerve | B. Oculomotor nerve | C. Abducens nerve | D. Hypoglossal nerve |
|--------------------|---------------------|-------------------|----------------------|

Q3. What's the nucleus that receives taste fibers in glossopharyngeal nerve?

- | | | | |
|--------------------------|------------------------------------|--------------------------------|----------------------------|
| A. Nucleus ambiguus (NA) | B. Nucleus of solitary tract (NST) | C. Inferior salivatory nucleus | D. Dorsal nucleus of vagus |
|--------------------------|------------------------------------|--------------------------------|----------------------------|

Q4. Which nucleus sends preganglionic parasympathetic fibers to the glossopharyngeal?

- | | | | |
|--------------------------------|-------------------------|-----------------------|---------------------|
| A. Inferior salivatory nucleus | B. Dorsal vagus nucleus | C. Nucleus solitarius | D. Nucleus ambiguus |
|--------------------------------|-------------------------|-----------------------|---------------------|

Q5. Which one of the following is a manifestation of Vagus nerve injury?

- | | | | |
|-----------------------|---------------------|--------------|---------------------------|
| A. Loss of gag reflex | B. Absence of tears | C. Dysphonia | D. Loss of corneal reflex |
|-----------------------|---------------------|--------------|---------------------------|

Q6. Which of the following deep nuclei of the vagus nerve gives motor fibers to supply pharyngeal muscles?

- | | | | |
|----------------------------|-----------------------|-----------------------|---------------------|
| A. Dorsal nucleus of vagus | B. Salivatory nucleus | C. Trigeminal nucleus | D. Nucleus ambiguus |
|----------------------------|-----------------------|-----------------------|---------------------|

A1. C A2. A A3. B A4. A A5. C A6. D

FOR ANKI FLASHCARDS





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