Cranial Nerves IX, X, XI, XII

Lecture Objectives

- Follow up the course of glossopharyngeal, vagus, accessory, and hypoglossal nerves from its central connections, exit from the brain and down to its target organs.
- Make a list of types of nerve modalities conveyed by these nerves.
- Review your knowledge of its target organs.
- Make note of plexuses X nerve creates in the thorax and abdomen.

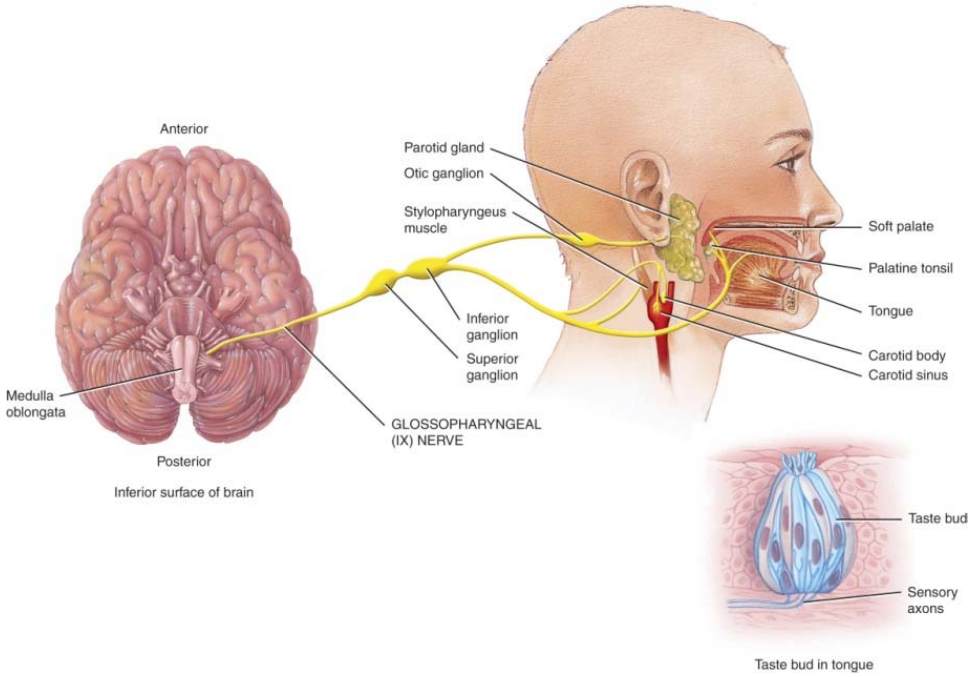
Glossopharyngeal Nerve (IX)

- Mixed nerve
- Originate from **medulla** (between olive & inferior cerebellar peduncle) → **Jugular foramen**

Motor Modalities

- Motor fibers originate from the medulla
  - SVE Innervate the stylopharyngeus muscle
  - GVE Parasympathetic motor neurons via **otic ganglion** innervate parotid gland

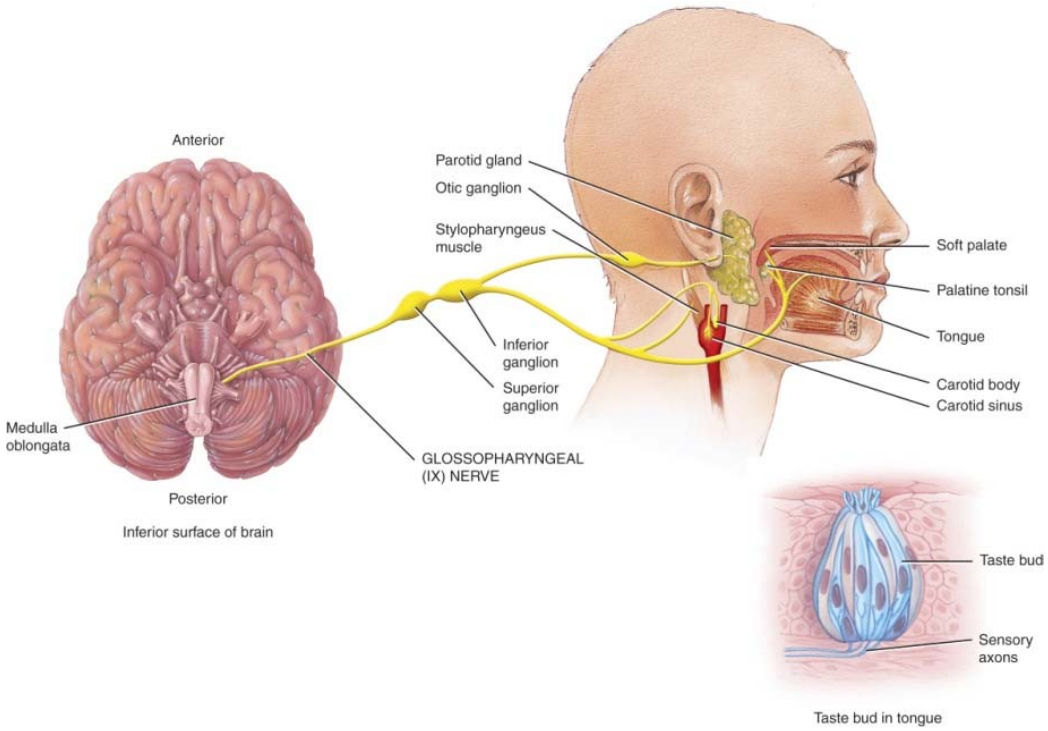
➢Major motor function is regulation of **secretion of saliva**



Glossopharyngeal Nerve (IX)

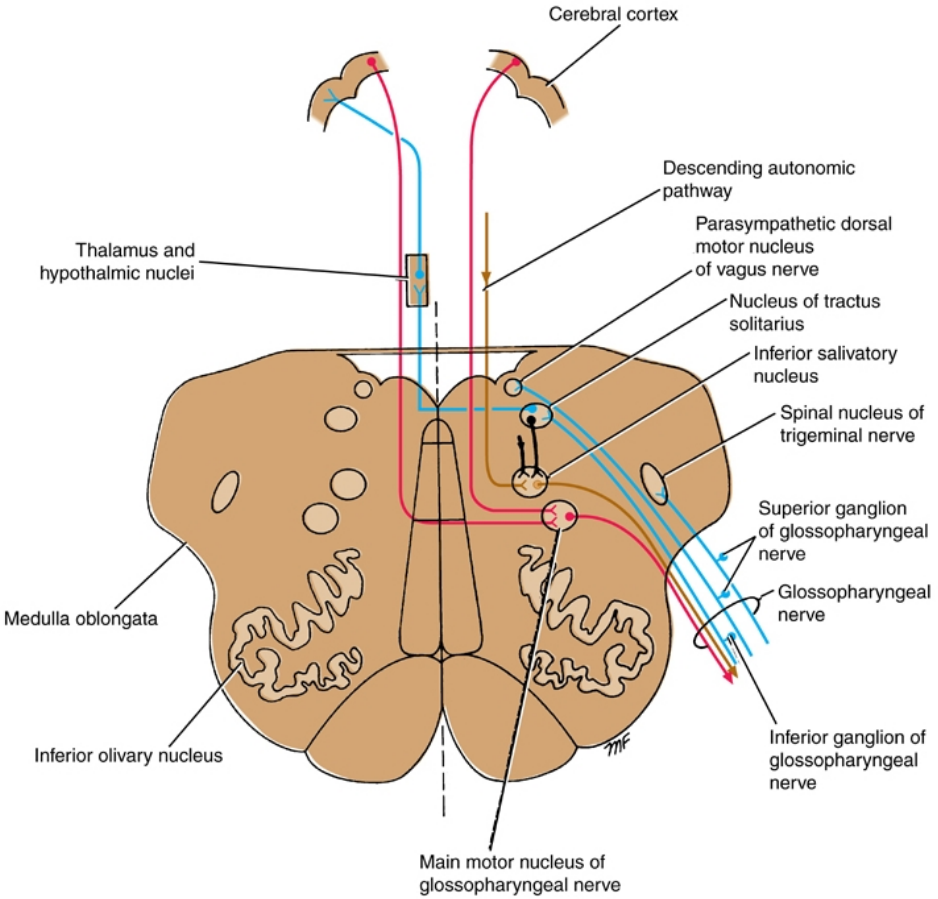
Sensory Modalities

- Sensory fibers originate from:
  - GSA – superior ganglion – external ear
  - GVA – inferior ganglion
    - The pharynx & posterior ⅓ of tongue
    - Carotid sinus baroreceptors
    - Carotid body chemoreceptors
  - SVA Taste buds of the posterior third of the tongue (taste) – inferior ganglion



Glossopharyngeal Nerve Nuclei

- Main motor nucleus (SVE) (nucleus ambiguus)
  - Location
  - Connections – cortex
- Parasympathetic nucleus (GVE) (inferior salivatory nucleus)
  - Connections – hypothalamus
- Sensory nucleus (nucleus of the tractus solitarius) (SVA, GVA)



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Glossopharyngeal Nerve (IX): Branches

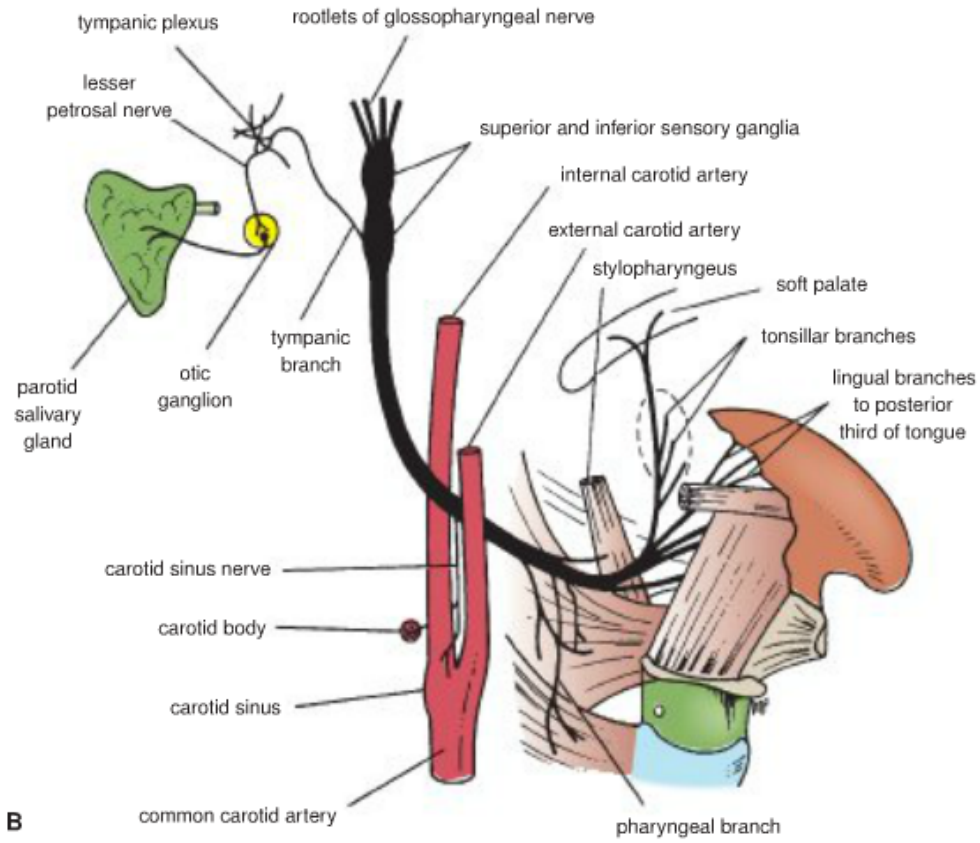
- Tympanic n. → tympanic plexus (tympanic cavity)→ lesser petrosal n. → fissure between petrous portion & greater wing of sphenoid → otic ganglion
- Carotid sinus n.
- Nerve to stylopharyngeus m.
- Pharyngeal branches → pharyngeal plexus*
- Lingual branch

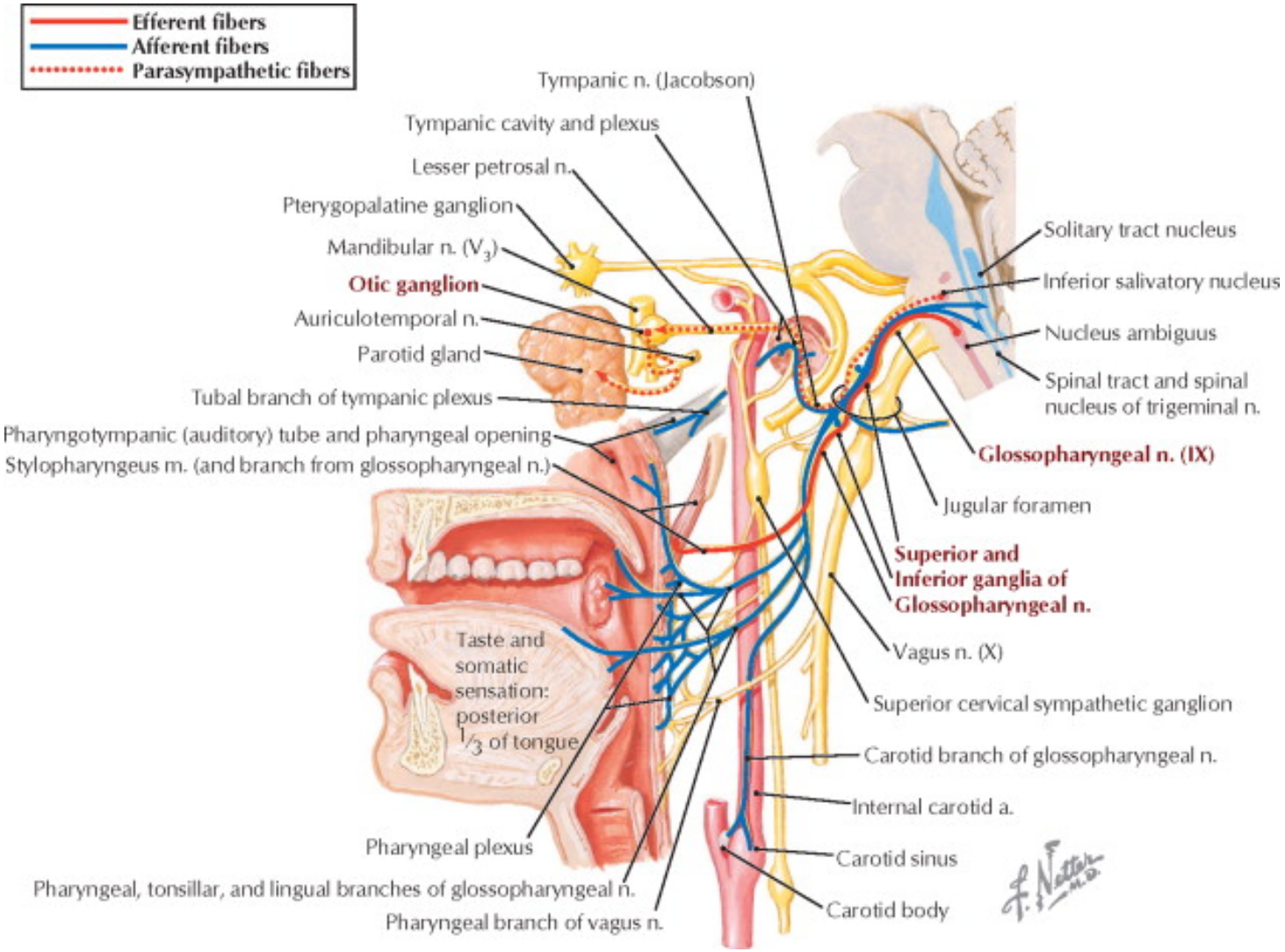
*Contains fibers from:

IX – sensory

X – motor

sympathetic – vasomotor




Efferent fibers
Afferent fibers
Parasympathetic fibers
Tympanic n. (Jacobson)
Tympanic cavity and plexus
Lesser petrosal n.
Pterygopalatine ganglion
Mandibular n. (V3)
Otic ganglion
Auriculotemporal n.
Parotid gland
Tubal branch of tympanic plexus
Pharyngotympanic (auditory) tube and pharyngeal opening
Stylopharyngeus m. (and branch from glossopharyngeal n.)
Taste and somatic sensation: posterior 1/3 of tongue
Pharyngeal plexus
Pharyngeal, tonsillar, and lingual branches of glossopharyngeal n.
Pharyngeal branch of vagus n.
Solitary tract nucleus
Inferior salivatory nucleus
Nucleus ambiguus
Spinal tract and spinal nucleus of trigeminal n.
Glossopharyngeal n. (IX)
Jugular foramen
Superior and Inferior ganglia of Glossopharyngeal n.
Vagus n. (X)
Superior cervical sympathetic ganglion
Carotid branch of glossopharyngeal n.
Internal carotid a.
Carotid sinus
Carotid body

Glossopharyngeal Nerve (IX): Lesion

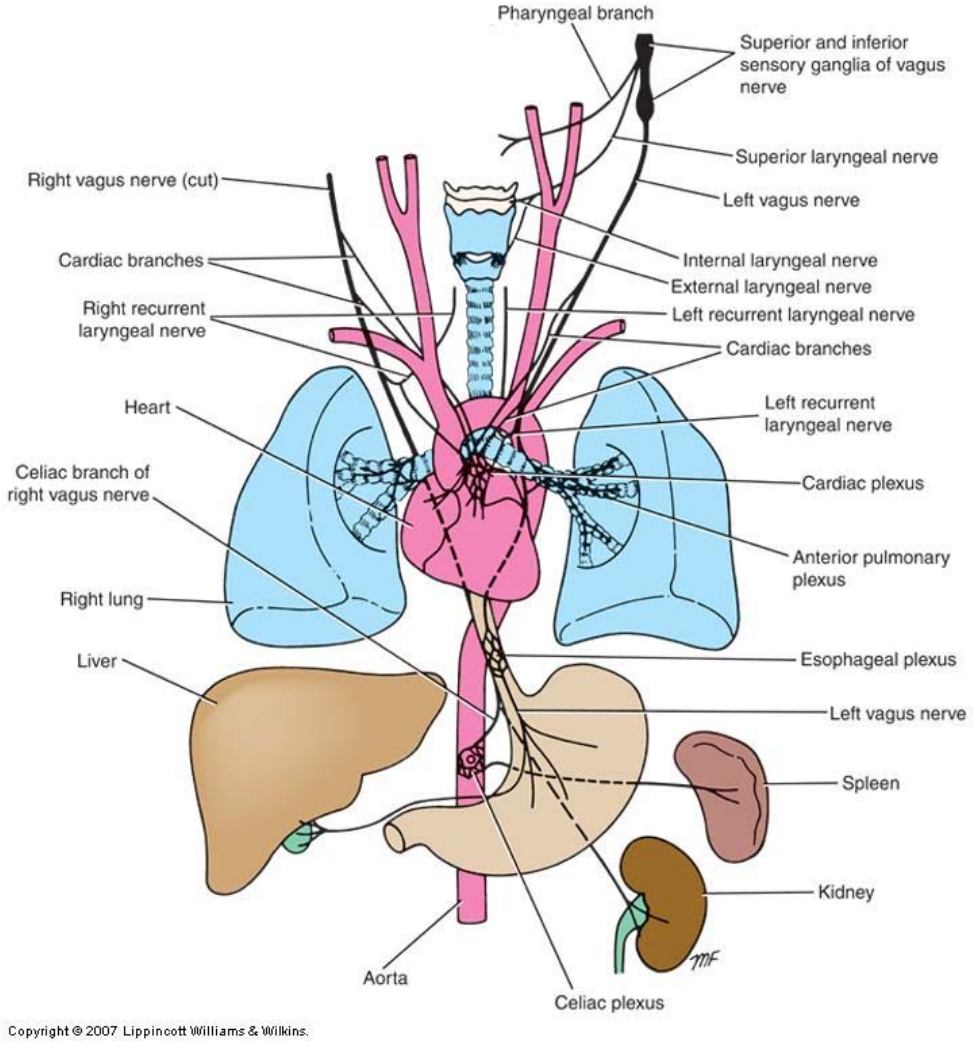
- Loss of gag reflex (afferent limb)
- Hypersensitive carotid sinus reflex (syncope)
- Loss of general sensation in the oropharynx
- Loss of taste from posterior ⅓ if the tongue
- Glossopharyngeal neuralgia

Vagus Nerve (X)

- Mixed cranial nerve
- Widely distributed from the head and neck into the thorax and abdomen

<u>Motor Modalities</u>

- Motor fibers originate from medulla
  - SVE Muscles in the respiratory passageways
  - GVE Lungs, heart, esophagus, stomach, small intestine, most of the large intestine and the gallbladder
    - Glands of the gastrointestinal tract



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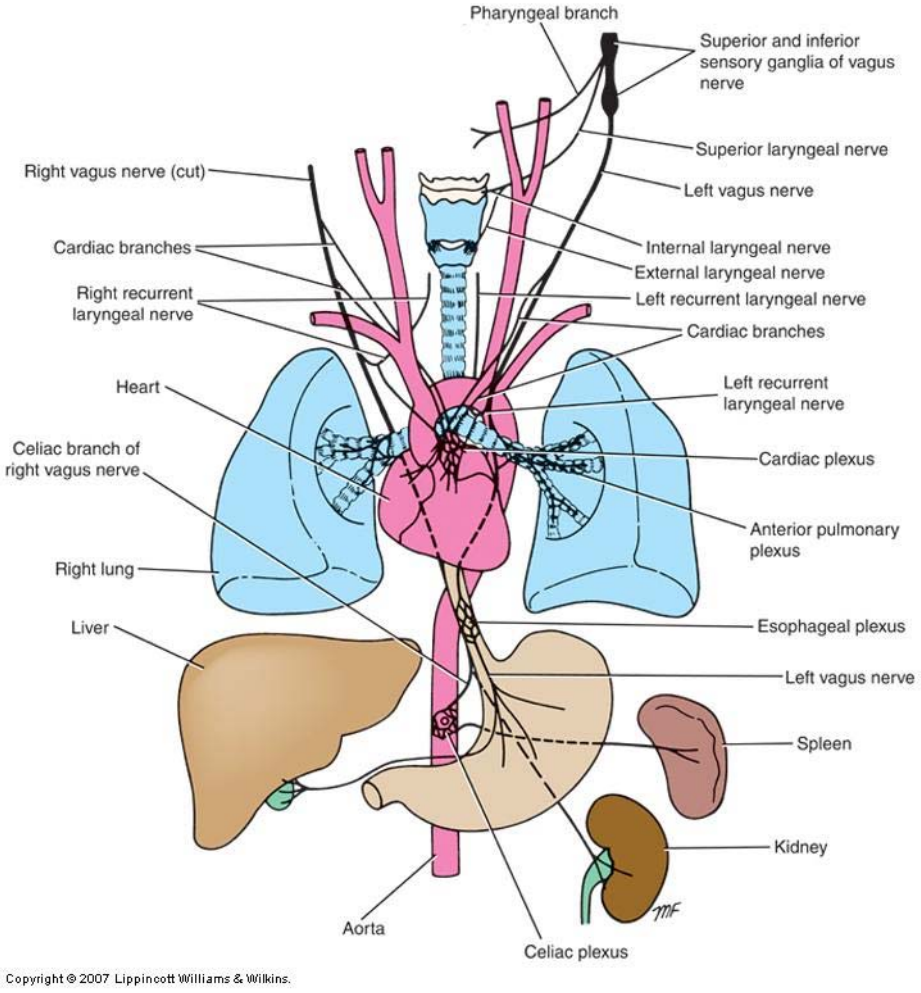
Vagus Nerve (X)

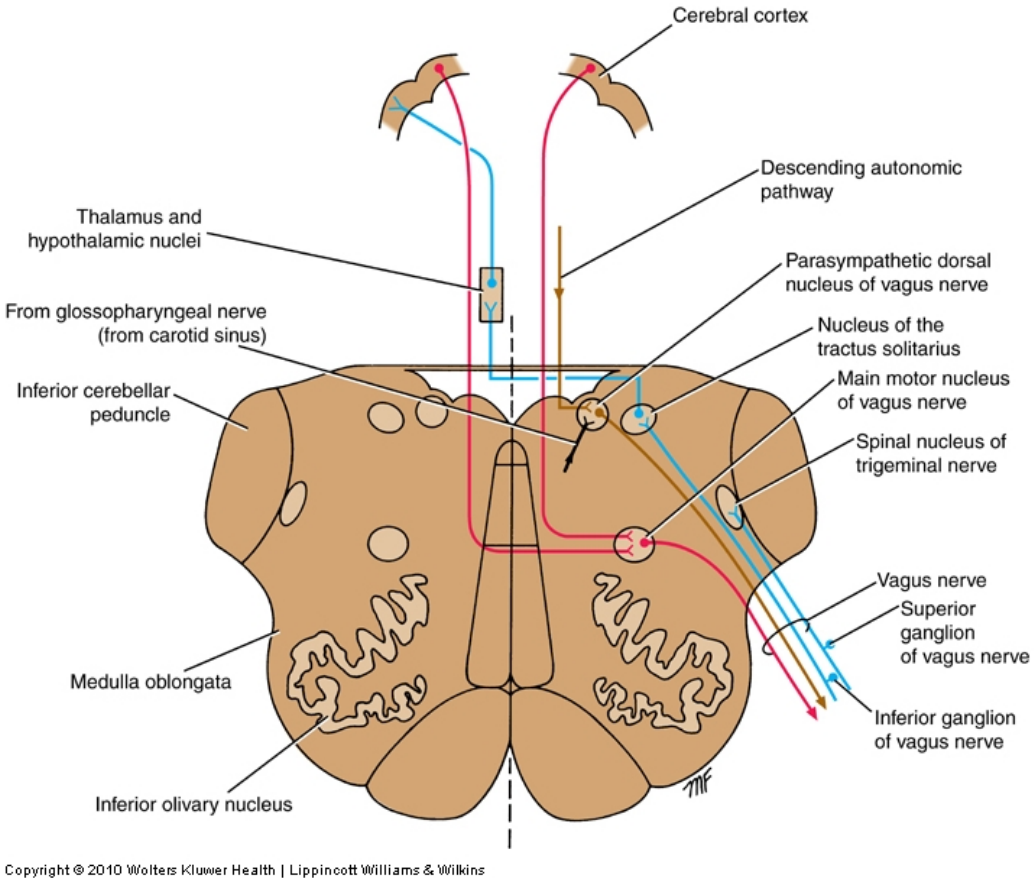
Sensory Modalities

- Sensory fibers travel from:
  - GVA Visceral sensory receptors of thoracic and abdominal organs – inferior nodose ganglion
  - GSA The ear – superior jugular ganglion
  - SVA Some taste buds – inferior nodose ganglion



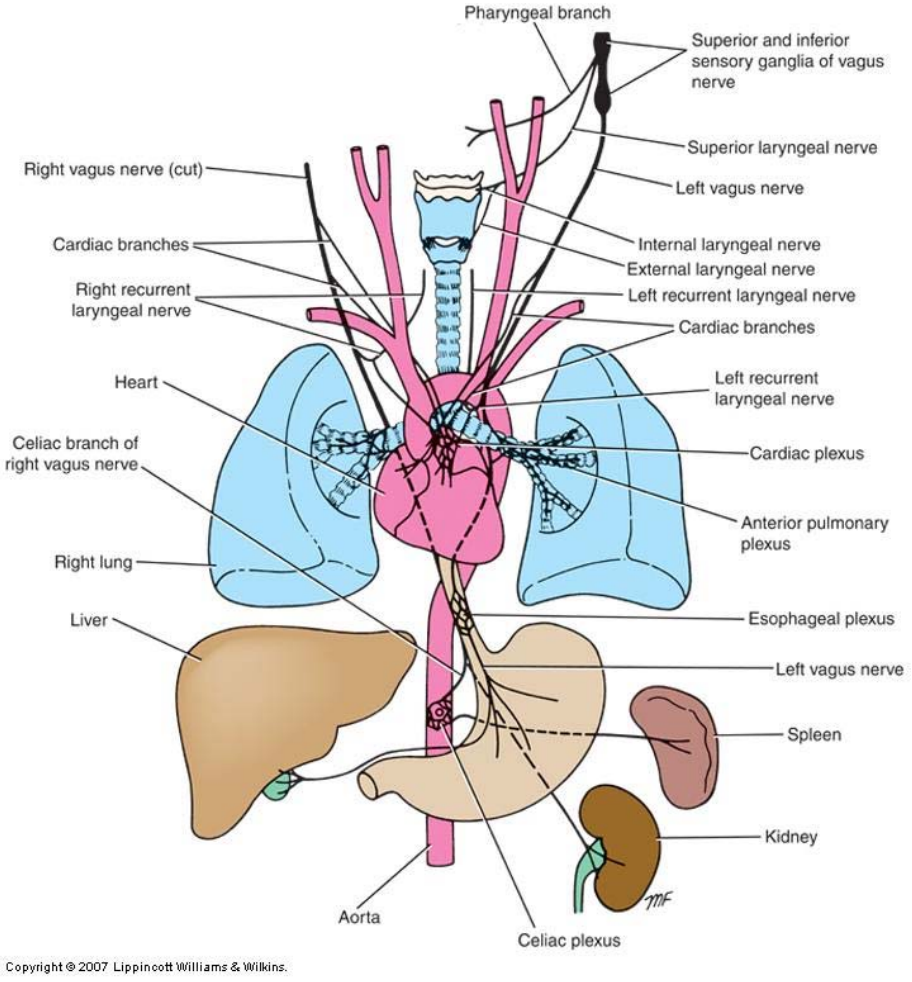
Vagus Nerve Nuclei

- Main motor nucleus (nucleus ambiguus) (SVE)
- Parasympathetic nucleus (dorsal nucleus of the vagus) (GVE)
  - Location
  - Connections - hypothalamus
- Sensory nucleus (nucleus of the tractus solitarius) (SVA, GVA)



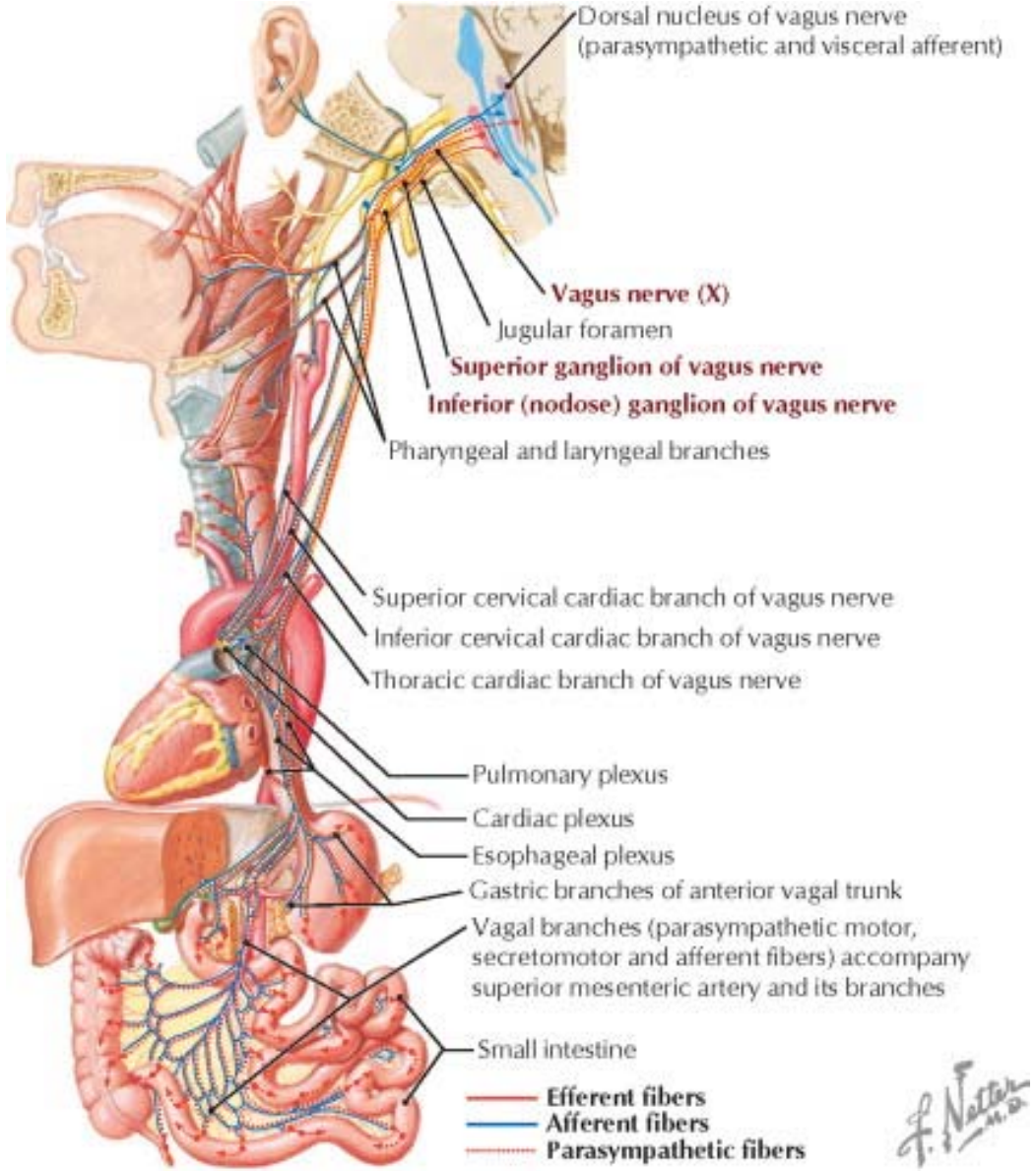
Vagus Nerve (X): Branches

- Meningeal branch
- Auricular branch
- Pharyngeal branches → pharyngeal plexus
- Superior laryngeal n.
  - Internal laryngeal n.
  - External laryngeal n.
- Recurrent laryngeal n. – left & right….
  - Inferior laryngeal n.
- Cardiac branches → cardiac plexus



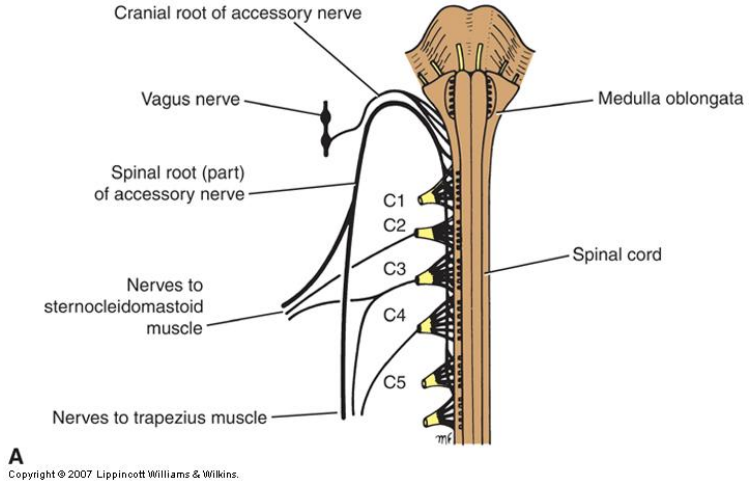
Vagus Nerve (X): Lesion

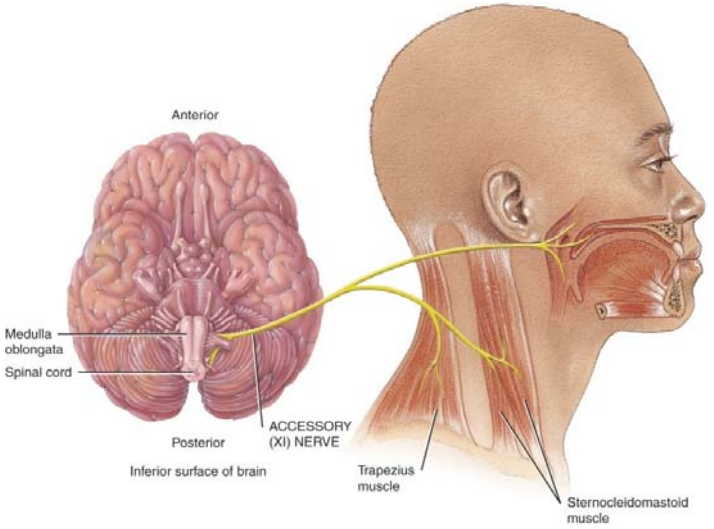
- Ipsilateral paralysis of the soft palate, pharynx, larynx mm. – dysphonia, dyspnea, dysarthria & dysphagia
  - Inability to raise the palate
  - Hoarseness or loss of voice
- Loss of gag reflex (efferent limb)
  - Inability to generate the reflex upon touching the lateral pharyngeal wall
- Anesthesia of pharynx & larynx


Dorsal nucleus of vagus nerve
(parasympathetic and visceral afferent)
Vagus nerve (X)
Jugular foramen
Superior ganglion of vagus nerve
Inferior (nodose) ganglion of vagus nerve
Pharyngeal and laryngeal branches
Superior cervical cardiac branch of vagus nerve
Inferior cervical cardiac branch of vagus nerve
Thoracic cardiac branch of vagus nerve
Pulmonary plexus
Cardiac plexus
Esophageal plexus
Gastric branches of anterior vagal trunk
Vagal branches (parasympathetic motor, secretomotor and afferent fibers) accompany superior mesenteric artery and its branches
Small intestine
Efferent fibers
Afferent fibers
Parasympathetic fibers

Accessory Nerve (XI)

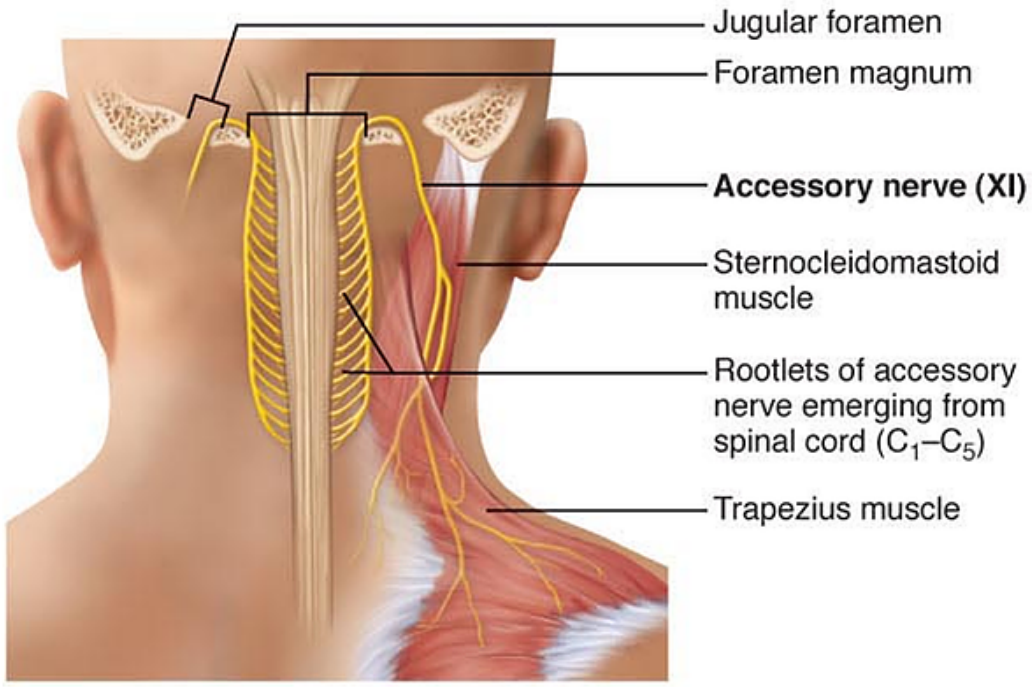
- Mixed nerve; <u>primarily</u> motor
- **Cranial root** originates from medulla (between medulla & olive)
  - Joins Vagus nerve
  - Innervates the skeletal muscles of the pharynx, larynx, and soft palate that are used in **swallowing**





Accessory Nerve (XI)

- **Spinal root** (SVE) originates in the anterior gray horn of the first five segments of the cervical spinal cord;
  - The fibers converge → foramen magnum → jugular foramen
  - Innervates the sternocleidomastoid and trapezius muscles to **coordinate head movements**



Accessory Nerve (XI): Lesions

- Difficult moving the head
- Shoulder droop

Source: Patel DR, Greydanus DE, Baker RJ: *Pediatric Practice: Sports Medicine:* www.accesspediatrics.com

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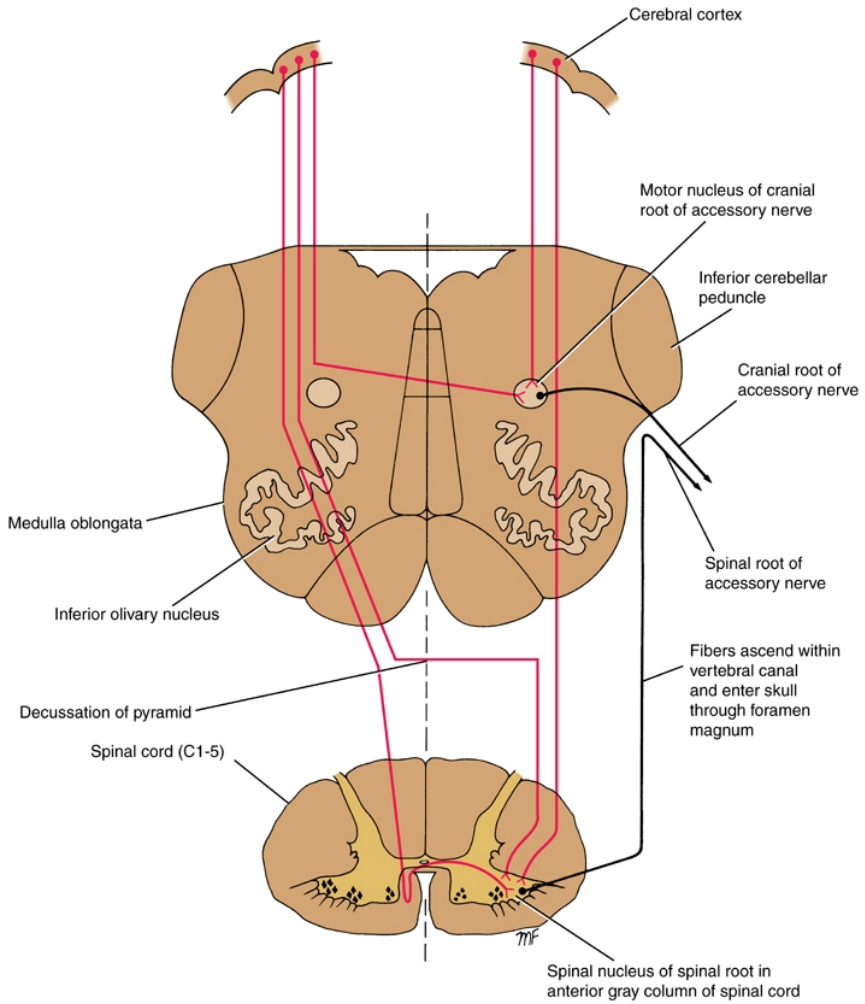
Accessory Nerve Nuclei

- Cranial root (SVE)
  - Nucleus ambiguus
    - Join vagus outside the skull
- Spinal root (SVE)
  - Spinal nucleus (anterior horn C1—C5)
    - Connection – cortex
  - Fibers course
    - From SC – between the roots of spinal nerves



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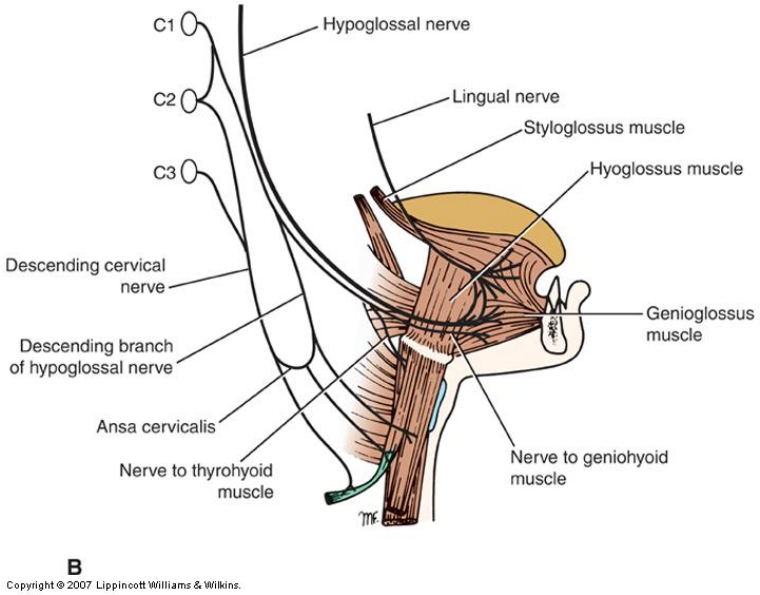
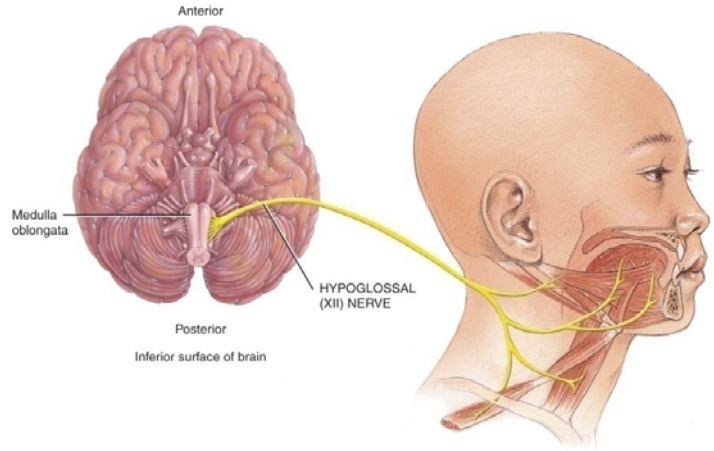
Hypoglossal Nerve (XII)





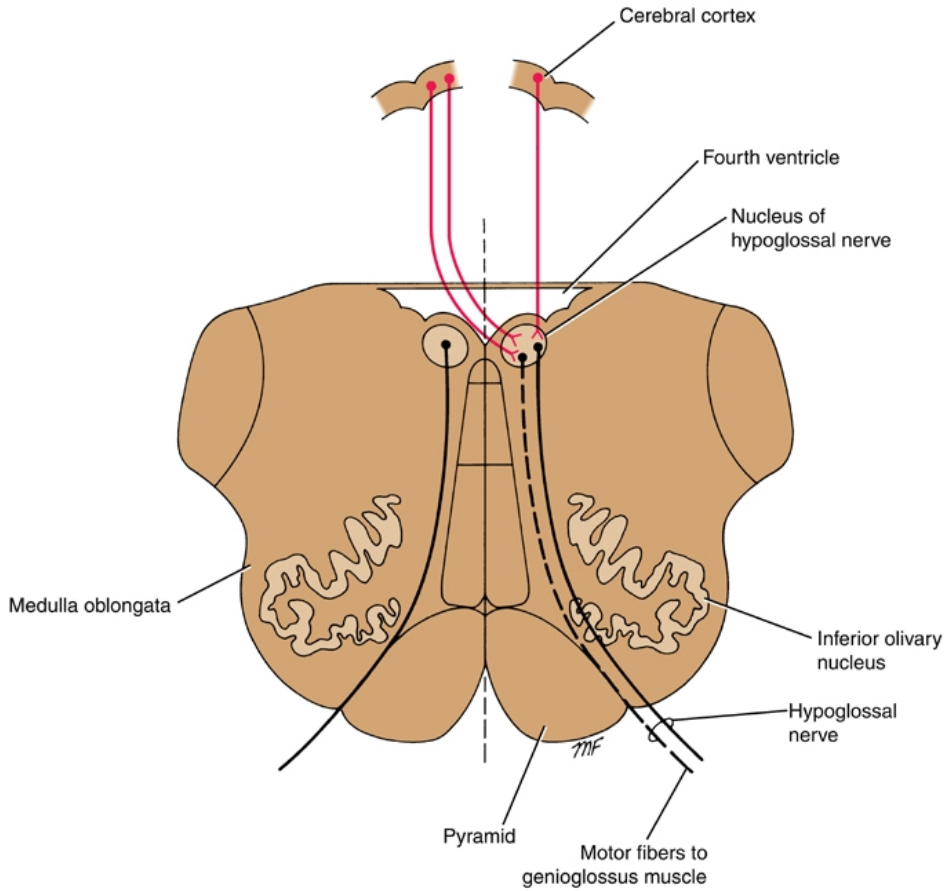
- Mixed, primarily motor
- Originates from medulla (between pyramid & olive)
- Exit through the **hypoglossal canal**
- Controls muscles of tongue during speech and swallowing

Hypoglossal Nerve (XII): Injury

- Injury deviates tongue to injured side when protruded

Hypoglossal Nucleus

- Hypoglossal nucleus (GSE)
  - Location - 4th ventricle
  - Connections – cortex
  - Fibers course



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