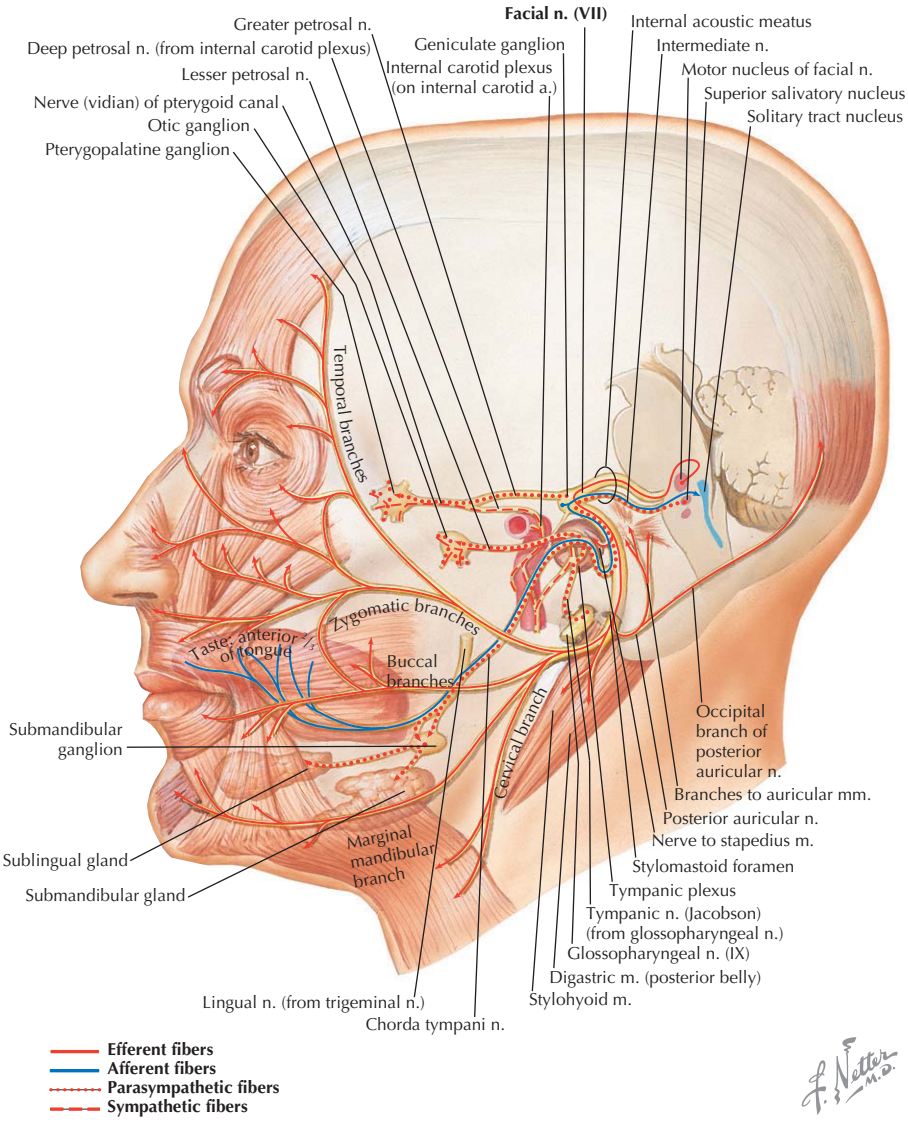
CRANIAL NERVE VII: FACIAL NERVE

Functional Column	Origin of Fibers	Termination of Fibers	Summary	Comment
GSA	Afferent fibers begin in the various receptors (nociceptors, mechanoceptors, proprioceptors) of the skin of the external ear and tympanic membrane	Pain and temperature fibers terminate in the spinal nucleus of V	GSA fibers are carried in the nervus intermedius portion of the facial n. GSA fibers are responsible for providing sensory innervation to a portion of the external ear and tympanic membrane GSA fibers of the facial n. utilize the trigeminothalamic lemniscus to carry their sensory impulses to consciousness	Facial nerve provides a very small area of GSA distribution Nerve cell bodies for the primary fibers are located in the geniculate ganglion
SVA	Afferent fibers begin in the taste receptors of the anterior 2/3 of the tongue	Primary afferent fibers travel in the tractus solitarius and terminate in the nucleus solitarius	SVA fibers are carried in the nervus intermedius portion of the facial n. SVA fibers are responsible for carrying the taste fibers from the taste buds on the anterior 2/3 of the tongue	Nerve cell bodies for the primary fibers are located in the geniculate ganglion
GVA	Afferent fibers begin in the various receptors (such as nociceptors) of the mucous membranes of the nasopharynx	Primary afferent fibers travel in the tractus solitarius and terminate in the nucleus solitarius	GVA fibers are carried in the nervus intermedius portion of the facial n. GVA fibers utilize the same pathway as for the SVA fibers	Nerve cell bodies for the primary fibers are located in the geniculate ganglion
GVE	Preganglionic parasympathetic fibers begin in the superior salivatory nucleus	Postganglionic parasympathetic fibers innervate the lacrimal, nasal, submandibular, and sublingual glands	GVE fibers are carried in the nervus intermedius portion of the facial n.	GVE fibers utilize 2 ganglia: • Pterygopalatine • Submandibular
SVE	Begins in the motor nucleus of the facial n.	Innervates the muscles of facial expression, stylohyoid, posterior digastric, and stapedius mm.	SVE fibers are carried in the motor root of the facial n. SVE fibers are responsible for innervating the muscles of the 2nd pharyngeal arch	In Bell's palsy, the easiest symptom to observe is that the muscles innervated by the SVE fibers are paralyzed

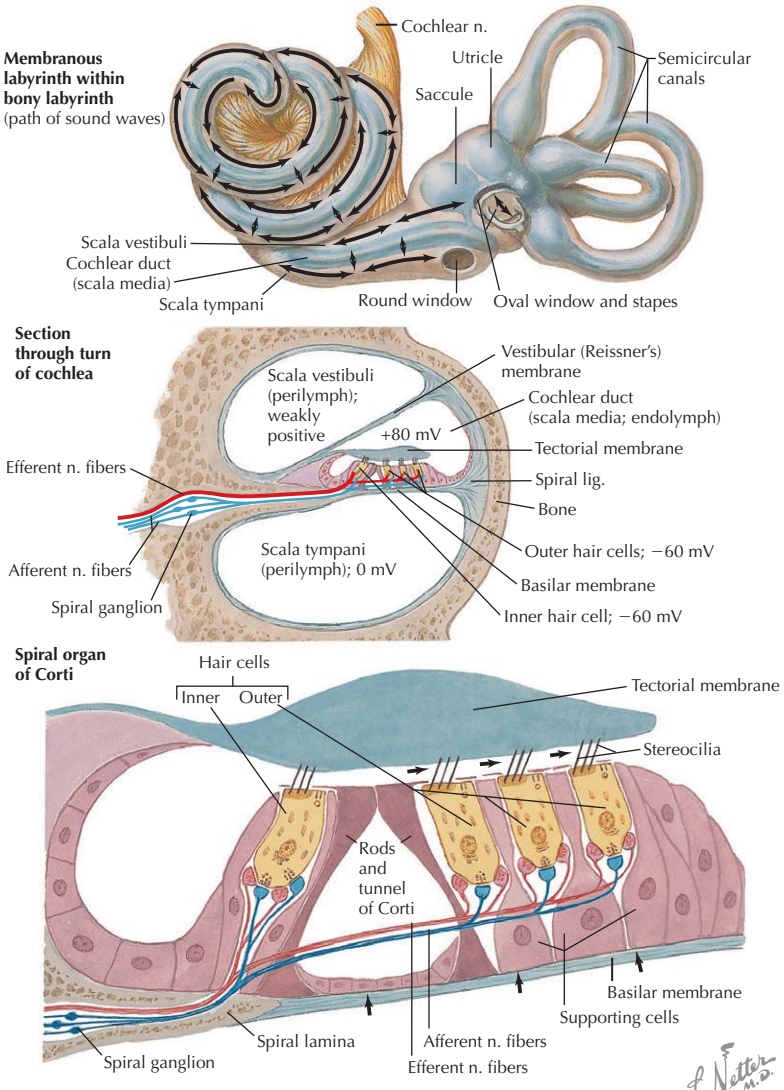
CRANIAL NERVE VII: FACIAL NERVE *CONTINUED*



Cranial Nerves

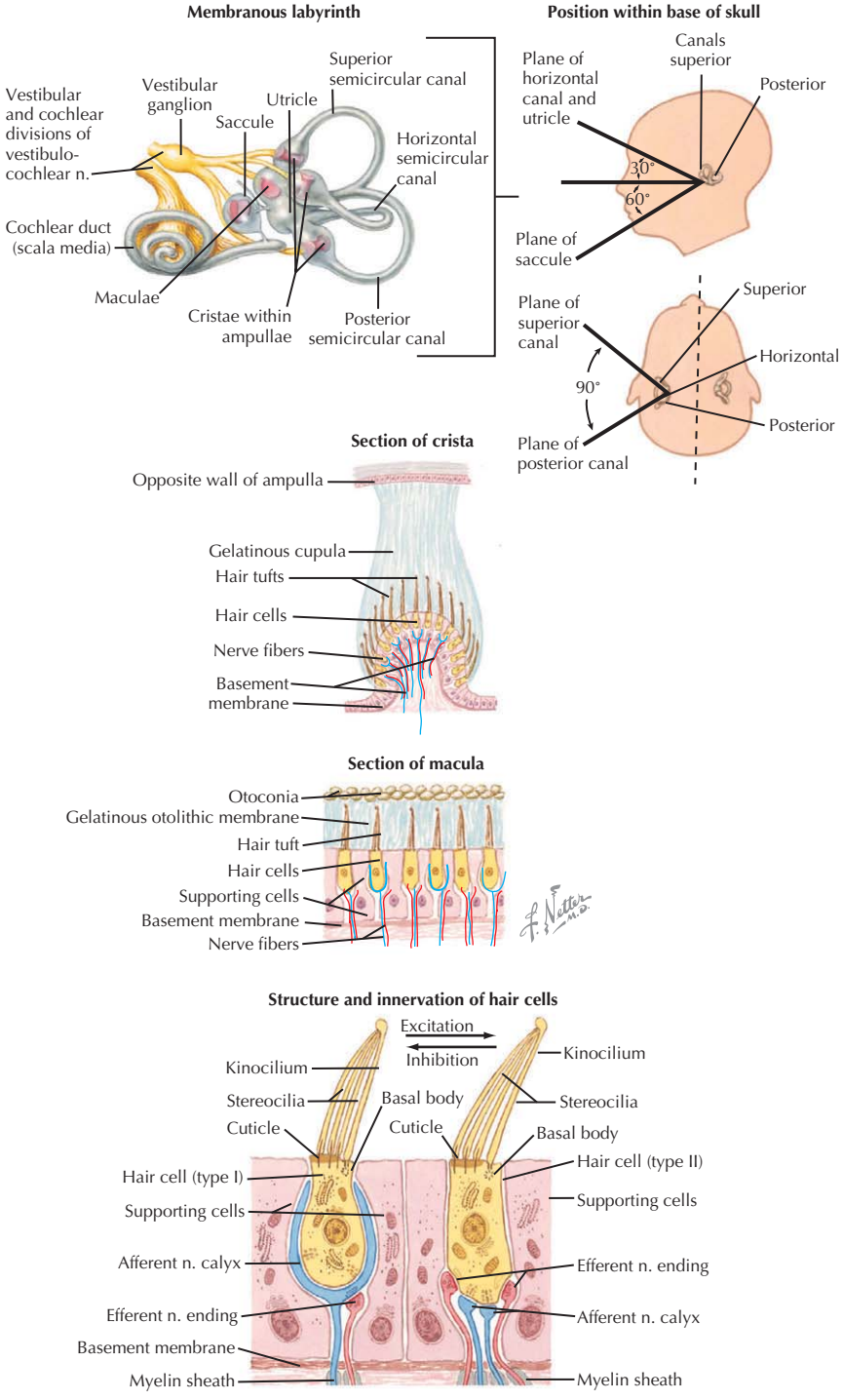
CRANIAL NERVE VIII: VESTIBULOCOCHLEAR NERVE

Functional Column	Origin of Fibers	Termination of Fibers	Summary	Comment
SSA	Organ of Corti Cristae of semicircular canals Maculae of utricle and saccule	Cochlear and vestibular nuclei	SSA fibers travel from the various vestibulocochlear receptors to their respective nuclei in the brainstem	Vestibulocochlear and facial nn. both enter the internal acoustic meatus and can be affected by tumors in the region



As basilar membrane moves up, hairs are deflected outward, causing depolarization of hair cells and increased firing of afferent nerve fibers

CRANIAL NERVE VIII: VESTIBULOCOCHLEAR NERVE *CONTINUED*

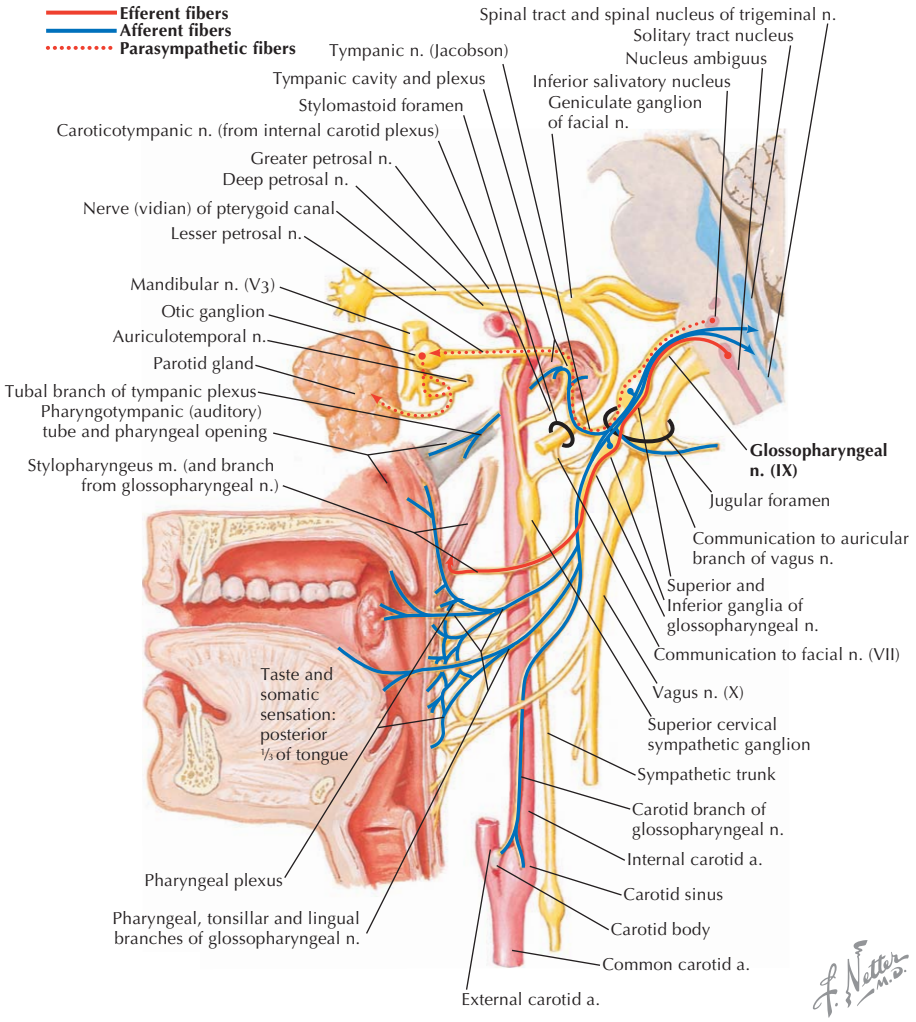


Cranial Nerves

CRANIAL NERVE IX: GLOSSOPHARYNGEAL NERVE

Functional Column	Origin of Fibers	Termination of Fibers	Summary	Comment
GSA	Afferent fibers begin in the various receptors of the skin of the external ear and the posterior 1/3 of the tongue	Pain and temperature fibers terminate in the spinal nucleus of V	GSA fibers are responsible for providing sensory innervation to a small portion of the external ear and posterior 1/3 of the tongue GSA fibers of the glossopharyngeal n. utilize the trigeminothalamic lemniscus to carry their sensory impulses to consciousness	Nerve cell bodies for the primary fibers are located in the superior ganglion of IX
SVA	Afferent fibers begin in the taste receptors of the posterior 1/3 of the tongue	Primary afferent fibers travel in the tractus solitarius and terminate in the nucleus solitarius	SVA fibers are responsible for carrying the taste fibers from the circumvallate papillae and the taste buds on the posterior 1/3 of the tongue	Nerve cell bodies for the primary fibers are located in the inferior ganglion of IX
GVA	Afferent fibers begin in the various receptors of the mucous membranes of the nasopharynx. oropharynx, middle ear, carotid body, and carotid sinus	Primary afferent fibers travel in the tractus solitarius and terminate in the nucleus solitarius	GVA fibers utilize the same pathway as for the SVA fibers	The nerve cell bodies for the primary fibers are located in the inferior ganglion of IX GVA fibers are predominantly the sensory portion of the pharyngeal plexus
GVE	Preganglionic parasympathetic fibers begin in the inferior salivatory nucleus	Postganglionic parasympathetic fibers innervate parotid gland	The GVE fibers are responsible for providing the parasympathetic innervation to the parotid gland	GVE fibers utilize 1 ganglion: • Otic
SVE	Begins in the nucleus ambiguus	Innervates the stylopharyngeus m.	SVE fibers are responsible for innervating the muscles of the 3rd pharyngeal arch	Stylopharyngeus is the only muscle innervated by the glossopharyngeal n.

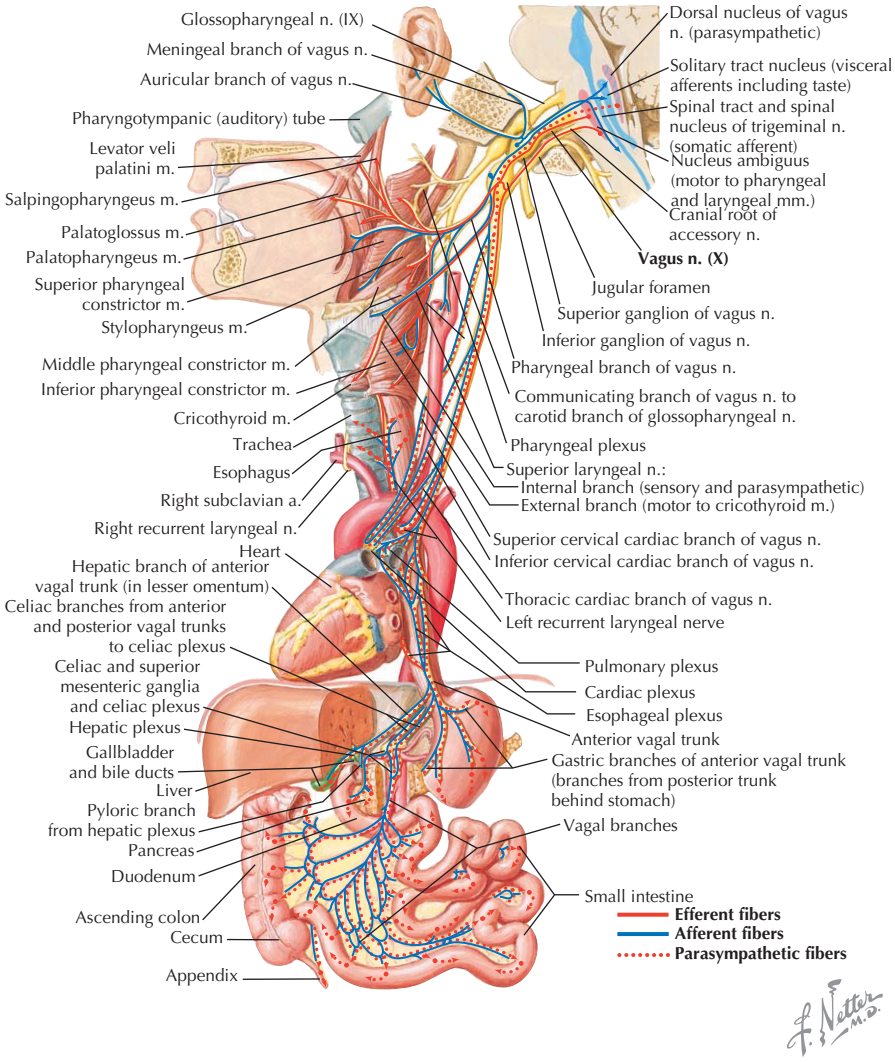
CRANIAL NERVE IX: GLOSSOPHARYNGEAL NERVE *CONTINUED*



CRANIAL NERVE X: VAGUS NERVE

Functional Column	Origin of Fibers	Termination of Fibers	Summary	Comment
GSA	Afferent fibers begin in the various receptors on a small part of the skin of the external ear	Pain and temperature fibers terminate in the spinal nucleus of V	The GSA fibers are responsible for providing sensory innervation to a very small portion of the external ear The GSA fibers of the glossopharyngeal n. utilize the trigeminothalamic lemniscus to carry their sensory impulses to consciousness	The nerve cell bodies for the primary fibers are located in the superior ganglion of X
SVA	Afferent fibers begin in the taste receptors of the epiglottic region and are scattered on the palate	Primary afferent fibers travel in the tractus solitarius and terminate in the nucleus solitarius	The SVA fibers are responsible for carrying the taste fibers from the epiglottic region and are scattered on the palate	The nerve cell bodies for the primary fibers are located in the inferior ganglion of X
GVA	Afferent fibers begin in the various receptors of the mucous membranes of the laryngopharynx, larynx, thorax, and abdomen	Primary afferent fibers travel in the tractus solitarius and terminate in the nucleus solitarius	The GVA fibers utilize the same pathway as for the SVA fibers	The nerve cell bodies for the primary fibers are located in the inferior ganglion of X
GVE	Preganglionic parasympathetic fibers begin in the dorsal motor nucleus of the vagus n.	Postganglionic parasympathetic fibers innervate thoracic and abdominal viscera	The GVE fibers are responsible for providing the parasympathetic innervation to the thoracic and abdominal viscera	The GVE fibers utilize: • Intramural ganglia
SVE	Begins in the nucleus ambiguus	Innervates the muscles of the pharynx (via the pharyngeal plexus) and the larynx	The SVE fibers are responsible for innervating the muscles of the 4th pharyngeal arch	The SVE fibers are the motor component to the pharyngeal plexus (muscles of pharynx) Lesions of the vagus paralyze the muscles of the larynx on the affected side

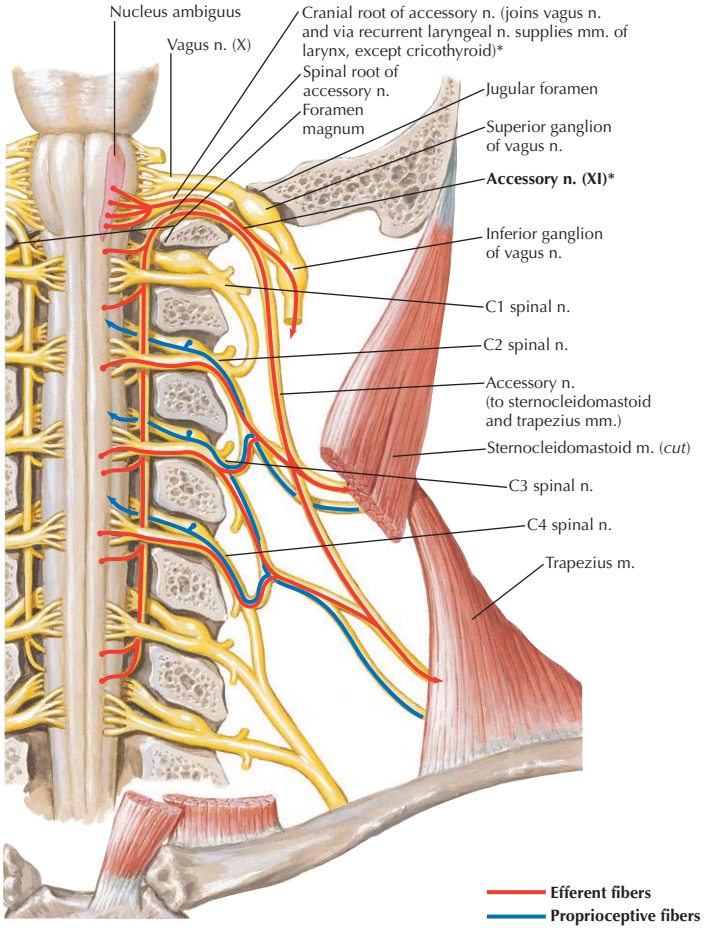
CRANIAL NERVE X: VAGUS NERVE *CONTINUED*



Cranial Nerves

CRANIAL NERVE XI: SPINAL ACCESSORY NERVE

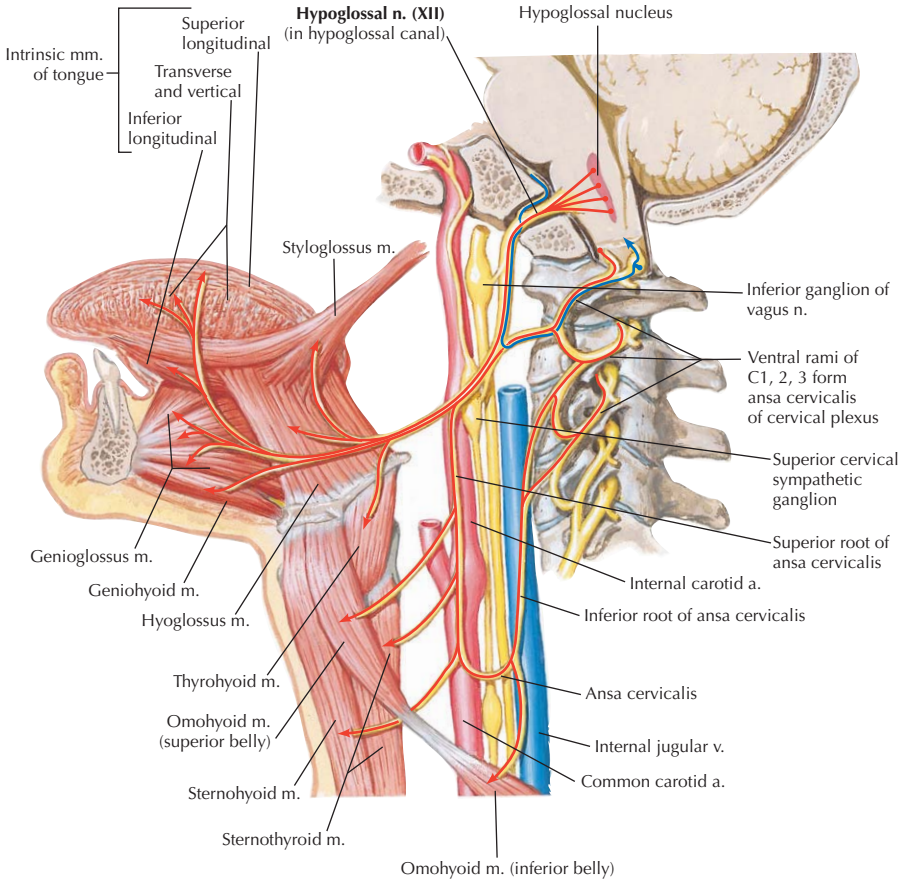
Functional Column	Origin of Fibers	Termination of Fibers	Summary	Comment
SVE	Cranial part: Begins in the nucleus ambiguus Spinal part: Begins in the upper cervical levels of the spinal cord	Cranial part: Innervates the muscles of the pharynx (via the pharyngeal plexus) Spinal part: Innervates the trapezius and sternocleidomastoid mm.	These SVE fibers of the cranial part travel with the vagus n. and arise from the same nucleus (nucleus ambiguus) and often are considered to be the same	The cranial and spinal parts separate so the cranial part can join the pharyngeal plexus and the spinal part can innervate the sternocleidomastoid m. and pass through the posterior triangle until reaching the trapezius m.



*Recent evidence suggests that the accessory nerve lacks a cranial root and has no connection to the vagus nerve. Verification of this finding awaits further investigation.

CRANIAL NERVE XII: HYPOGLOSSAL NERVE

Functional Column	Origin of Fibers	Termination of Fibers	Summary	Comment
GSE	Begins in the hypoglossal nucleus	Innervates the genioglossus, hyoglossus, and styloglossus mm. and the intrinsic mm. of the tongue	The GSE fibers are responsible for innervating the major portion of the tongue musculature	Lesions of the hypoglossal n. cause the tongue to deviate to the side of the lesion on protrusion



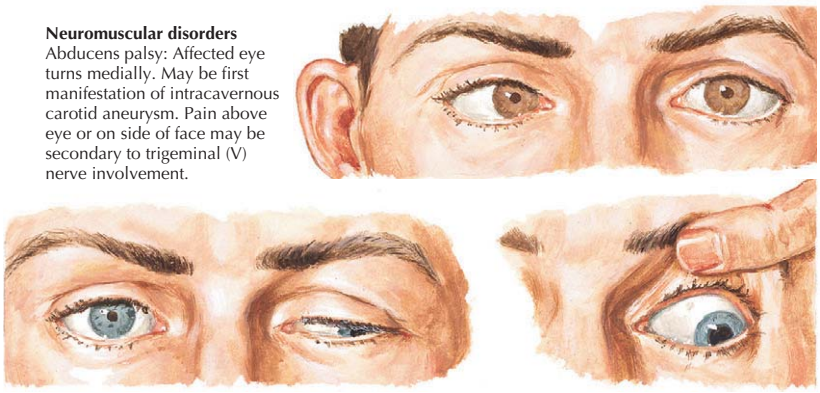
Clinical Correlate

CEREBRAL ANEURYSMS CAUSING OPHTHALMOPLEGIA

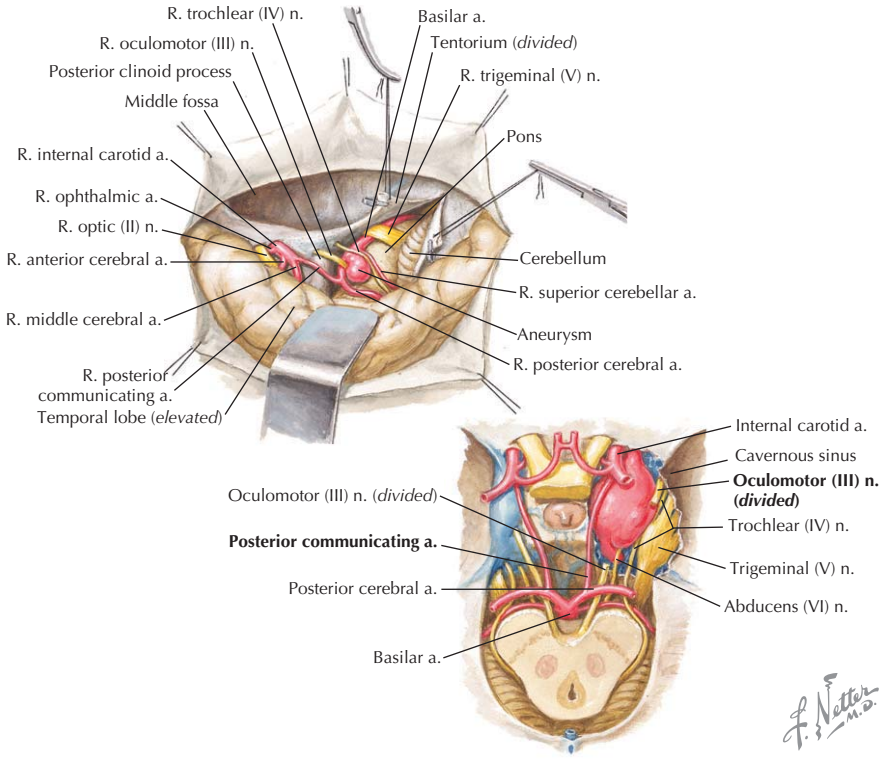
Because of the close proximity of the oculomotor, trochlear, and abducens nerves to blood vessels supplying the brain, aneurysms along these vessels may lead to a paralysis of the muscles that they innervate

Commonly affected vessels include the basilar, posterior cerebral, and posterior communicating arteries

Neuromuscular disorders
Abducens palsy: Affected eye turns medially. May be first manifestation of intracavernous carotid aneurysm. Pain above eye or on side of face may be secondary to trigeminal (V) nerve involvement.



Oculomotor palsy: Ptosis, eye turns laterally and inferiorly, pupil dilated; common finding with cerebral aneurysms, especially carotid-posterior communicating aneurysms



3 Clinical Correlate

LESIONS AFFECTING THE VOICE

The vagus nerve provides all of the motor and sensory innervation to the larynx

The superior laryngeal nerve divides into the internal laryngeal (sensory) and external laryngeal (motor to the cricothyroid)

The recurrent laryngeal provides sensory and motor innervation to the remainder of the muscles of the larynx

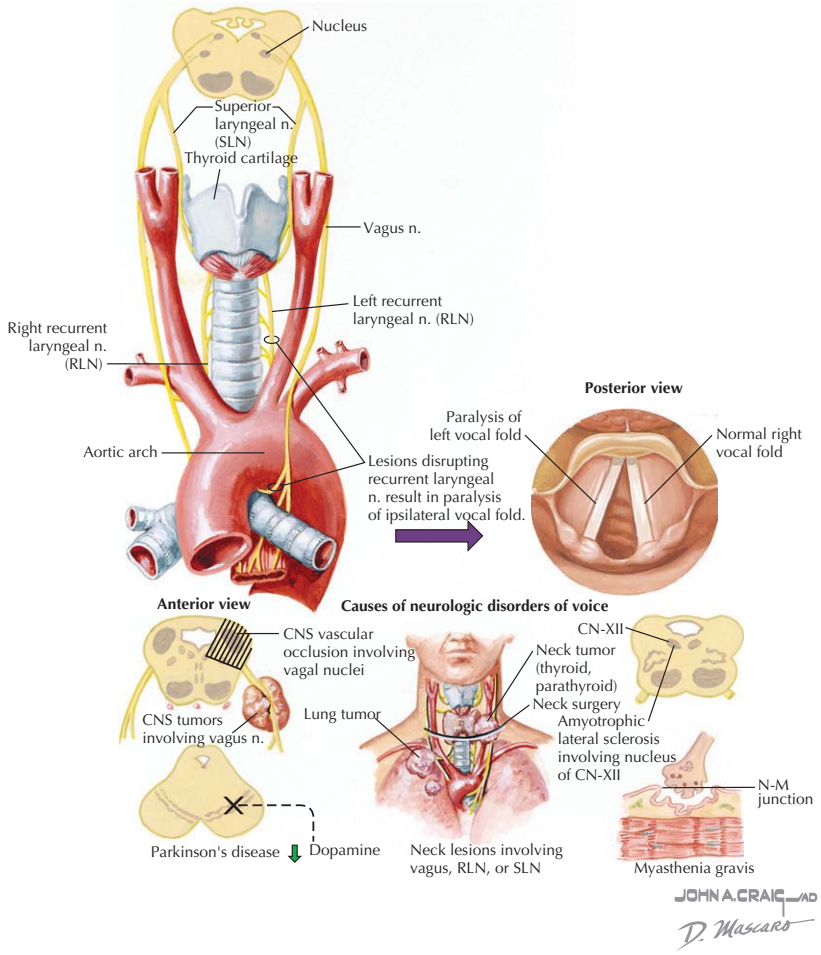
Lesions of the recurrent laryngeal nerve result in a paralysis of the ipsilateral vocal fold

This problem usually manifests clinically as hoarseness with an ineffective cough

Common causes include:

- Thyroid tumors
- Neck tumors
- Cerebrovascular accidents
- Lung tumors
- Surgery
- Thyroiditis

The voice also may be affected in Parkinson's disease and myasthenia gravis



Clinical Correlate

LESIONS AFFECTING THE SPINAL ACCESSORY NERVE

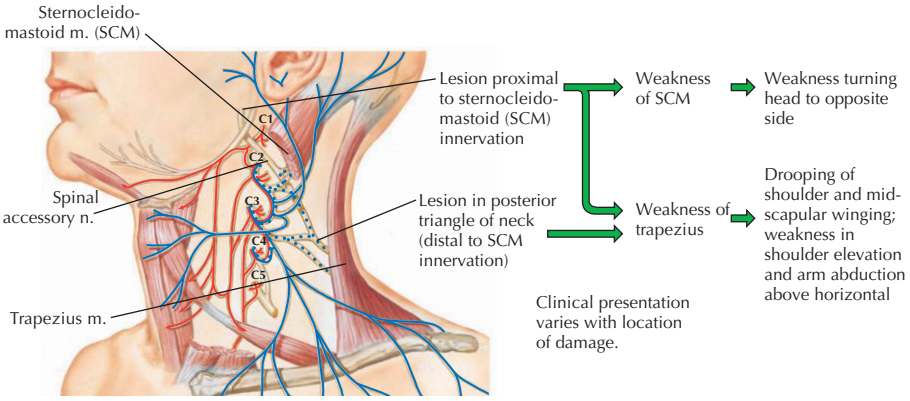
The spinal accessory nerve provides motor innervation to the sternocleidomastoid and trapezius muscles

The spinal accessory nerve courses close to the superficial cervical lymph nodes

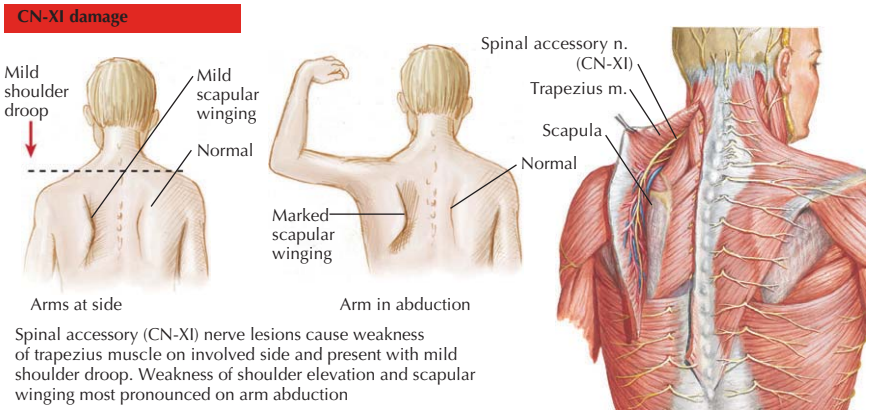
- This course makes it vulnerable to damage during biopsy or radical neck dissection in the posterior triangle
- Damage to the spinal accessory nerve also may result from a carotid endarterectomy

In lesions located in the posterior triangle, the sternocleidomastoid muscle is unaffected, but the trapezius muscle is deinnervated

- The shoulder droops, with mild winging of the scapula
- Abduction of the arm also is affected when patient attempts to raise it above the horizontal plane



Comparison of clinical findings in CN-XI and long thoracic nerve damage



Spinal accessory (CN-XI) nerve lesions cause weakness of trapezius muscle on involved side and present with mild shoulder droop. Weakness of shoulder elevation and scapular winging most pronounced on arm abduction

F. Netter M.D. with CMI

3 Clinical Correlate

LESIONS AFFECTING THE HYPOGLOSSAL NERVE

The hypoglossal nerve provides motor innervation to a majority of the muscles of the tongue, including:

- Genioglossus
- Hyoglossus
- Styloglossus

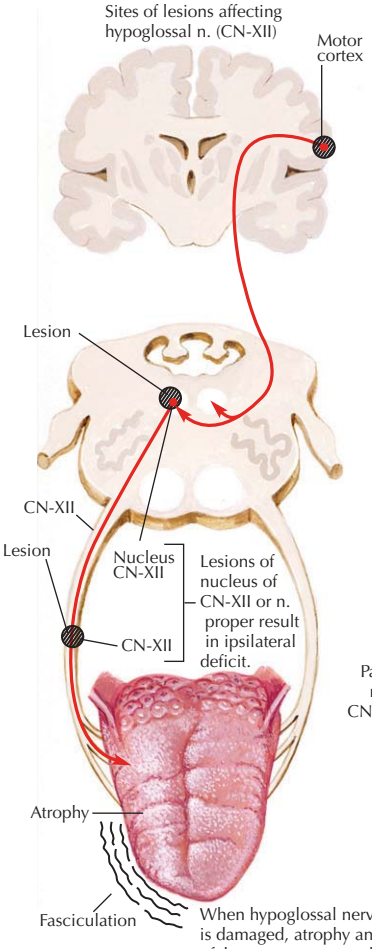
Protrusion of the tongue is accomplished by the bilateral actions of the genioglossus muscles

Paralysis of a genioglossus muscle causes the protruded tongue to deviate to the paralyzed side

Paralysis of the hypoglossal nerve can be caused by:

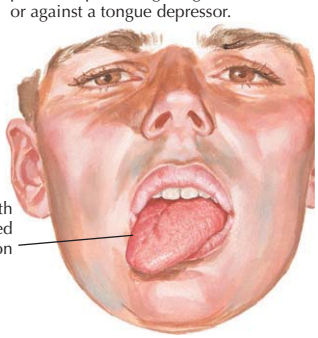
- Tumors
- Neck trauma
- Radiation therapy

A similar paralysis can be caused by a stroke affecting the upper motor neurons on the side contralateral to the paralyzed muscles, owing to the crossing fibers of the upper motor neurons



When hypoglossal nerve or its nucleus is damaged, atrophy and fasciculation of the tongue are noted on evaluation.

Subtle weakness of tongue may be tested by asking patient to press tongue against cheek (shown) or against a tongue depressor.



If hypoglossal nerve is affected on one side, the tongue often deviates toward the side of the lesion on protrusion (due to imbalance of genioglossus contraction).

F. Netter M.D. JOHN A. CRAIG MD with E. Hatton