

PERIPHERAL NERVOUS SYSTEM

Facial Nerve (CN VII)

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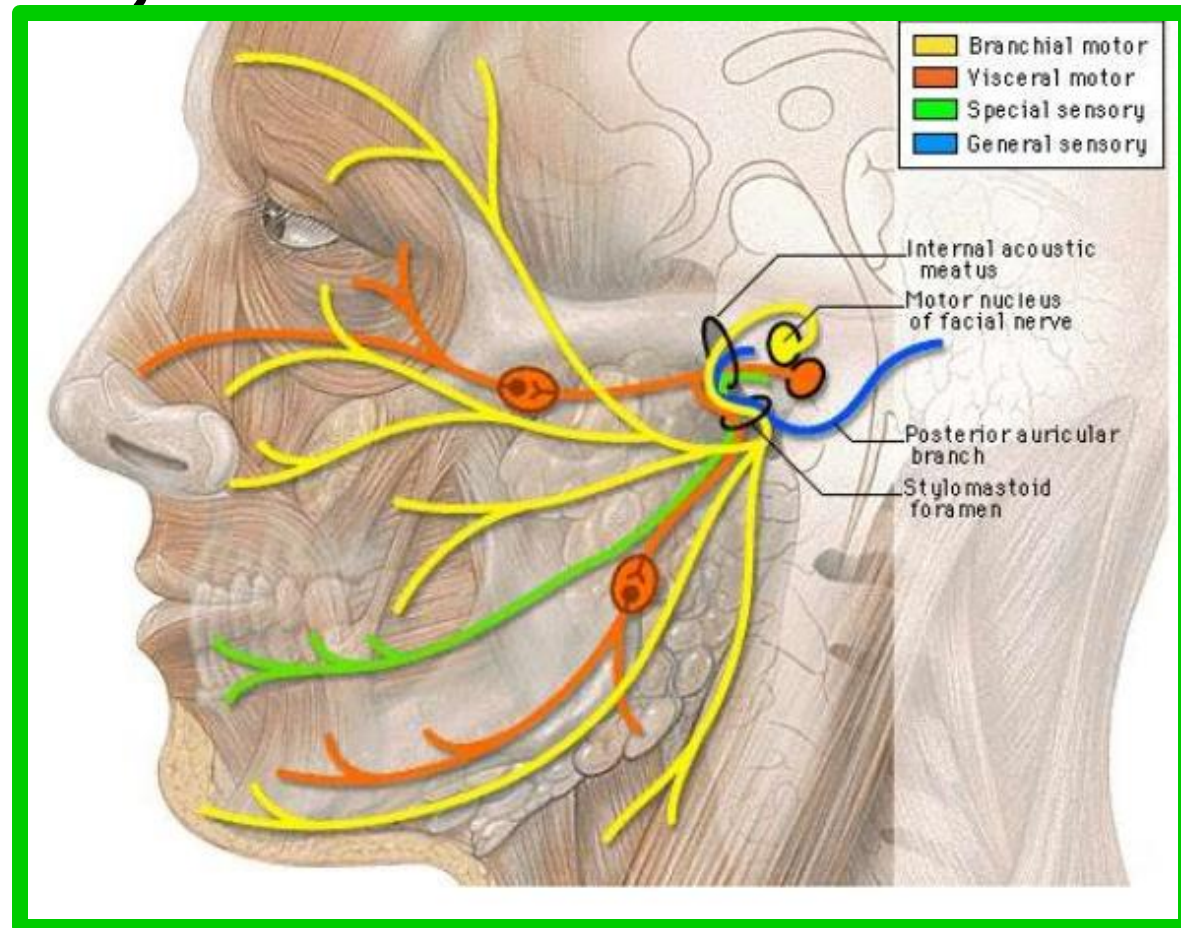
2023-2024

Tuesday 27 February 2024

FACIAL NERVE (CN VII)

Functions:

- ❖ **Sensory**— **Somatic sensory (general)** and **special sensory (taste)**
- ❖ **Motor**— **Somatic motor** and **visceral motor (parasympathetic)**
- ❖ **It also carries proprioceptive fibers from the muscles it innervates.**



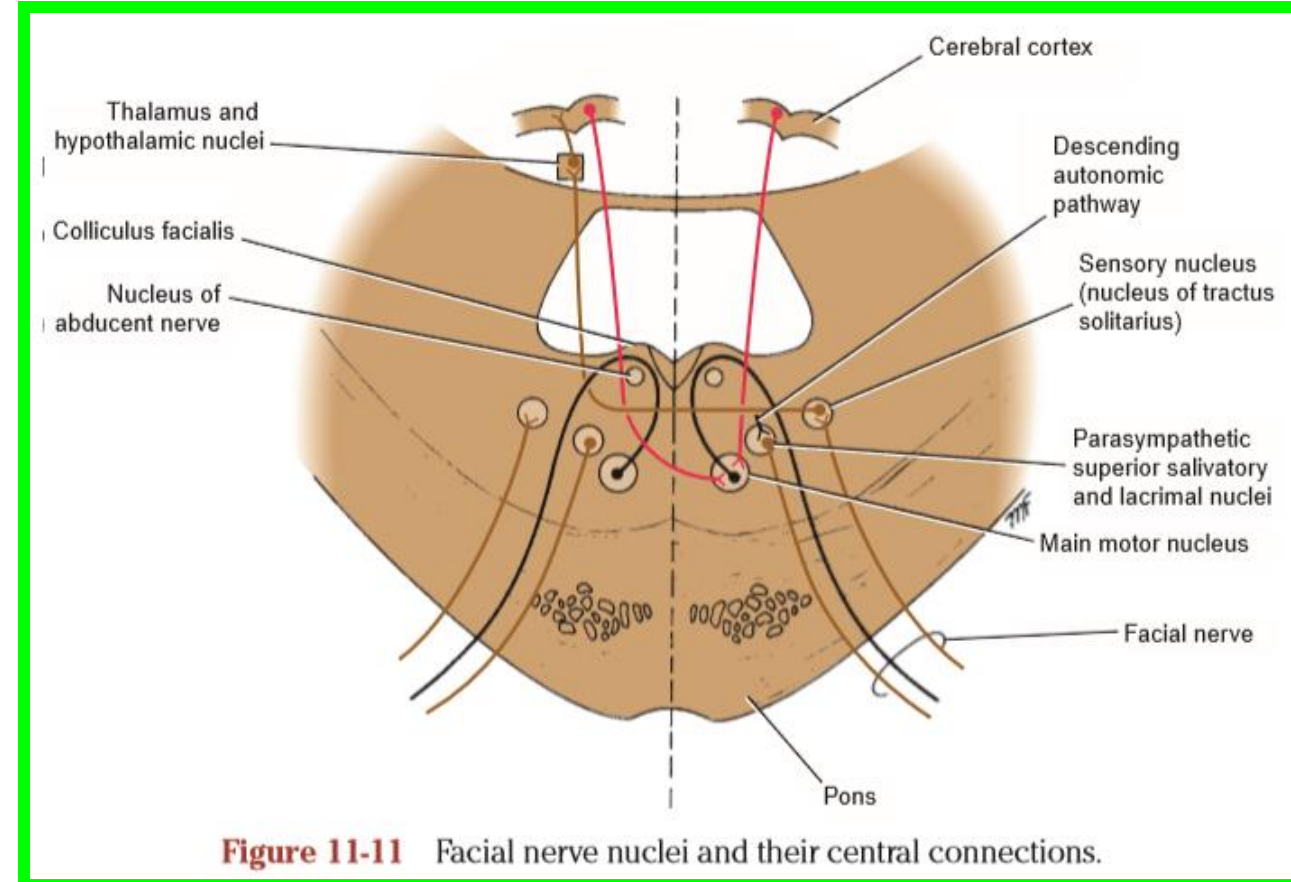
FACIAL NERVE (CN VII)

1. Main Motor Nucleus

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- ✓ The main motor nucleus lies deep in the reticular formation of the lower part of the pons
- ✓ The part of the nucleus that supplies the muscles of the upper part of the face receives corticonuclear fibers from both cerebral hemispheres

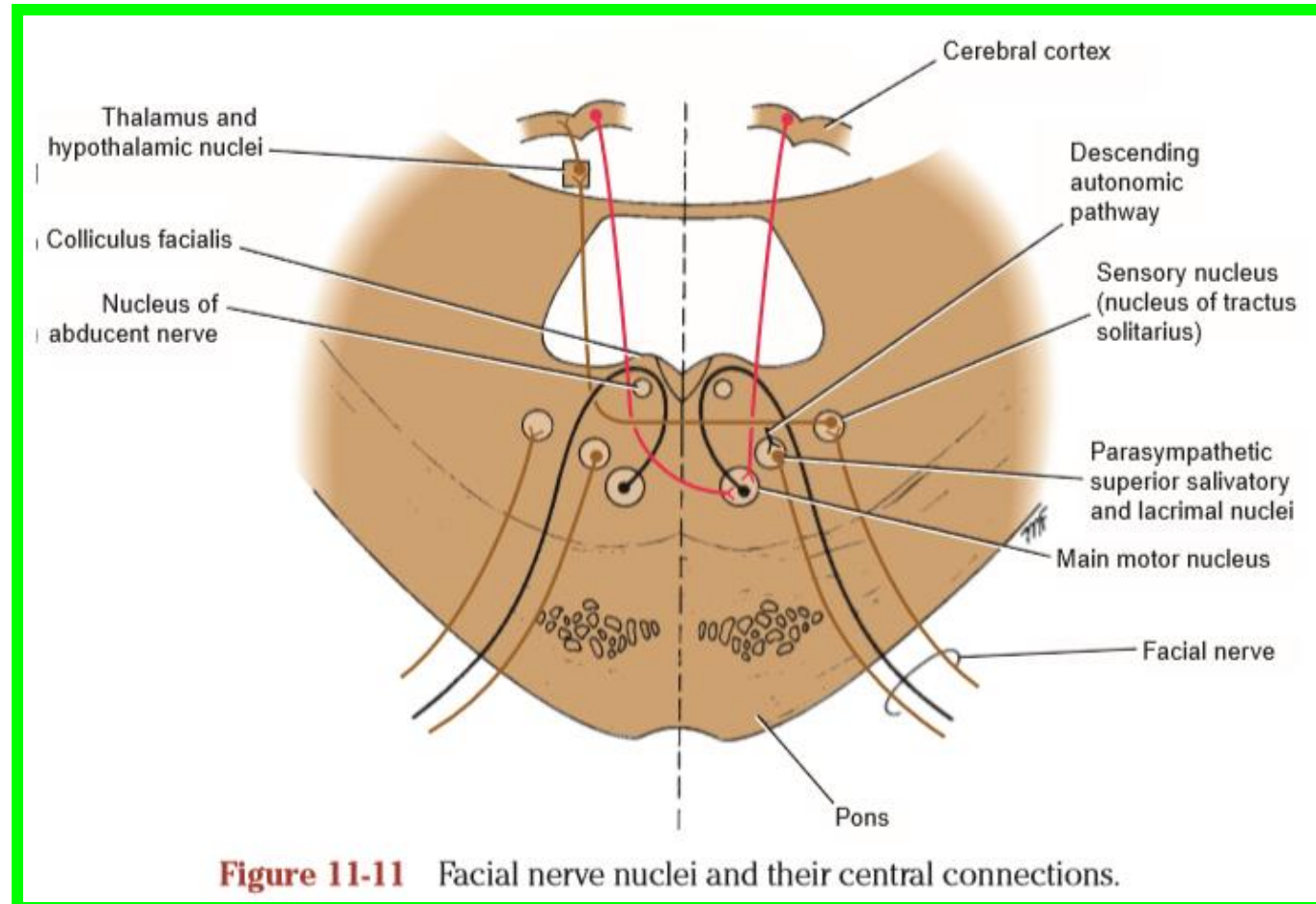
- ✓ The part of the nucleus that supplies the muscles of the lower part of the face receives only corticonuclear fibers from the opposite cerebral hemisphere.



Parasympathetic nuclei lie posterolateral to the main motor nucleus. They are the: **A. superior salivatory** and **B. lacrimal nuclei**

✓ **A. The superior salivatory nucleus** receives afferent fibers from **the hypothalamus** through the **descending autonomic pathways**.

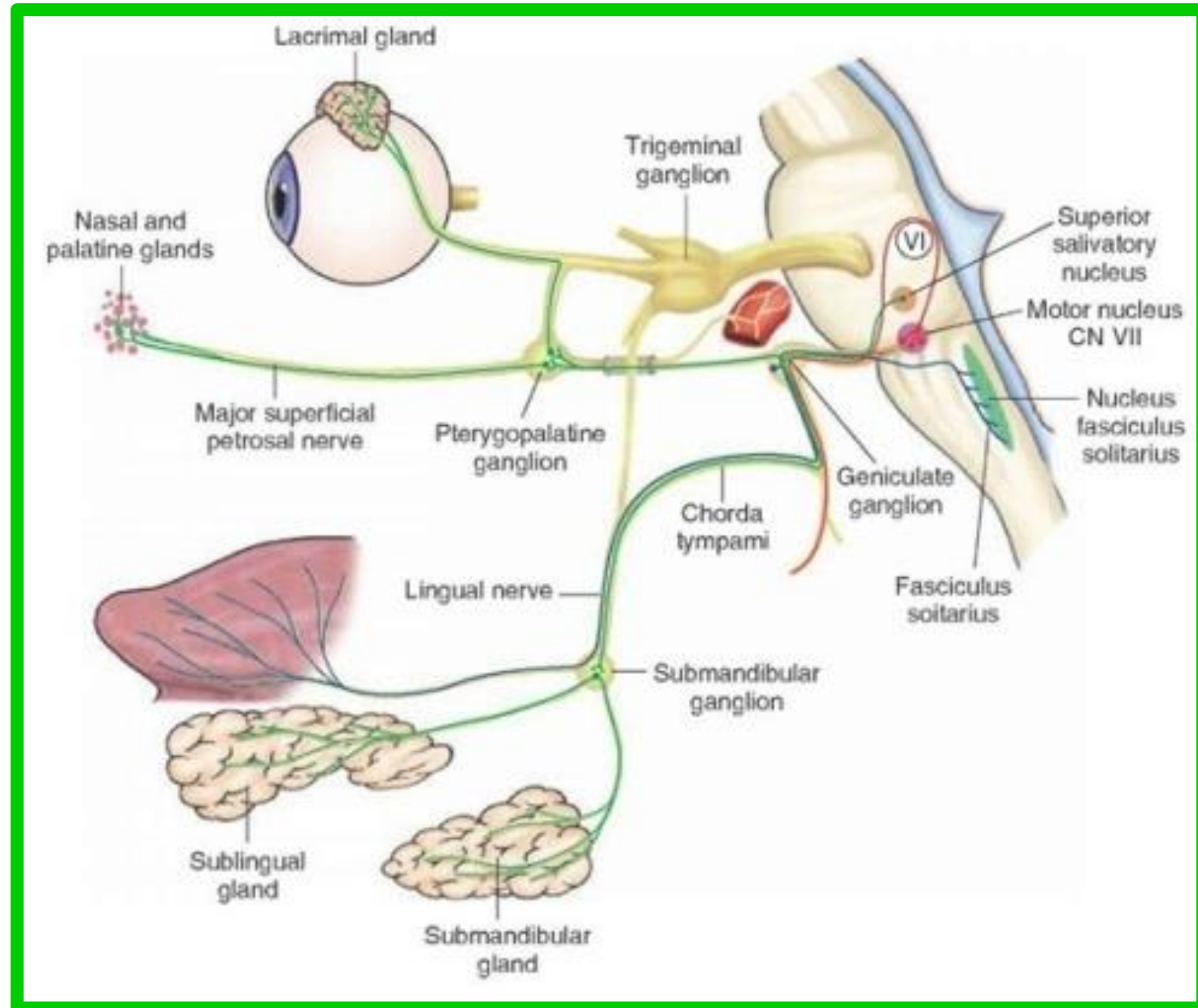
✓ Information concerning taste also is received from the **nucleus** of the solitary tract from the **mouth cavity**.



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2. Parasympathetic Nuclei

B. The lacrimal nucleus receives afferent fibers from the hypothalamus for **emotional responses** and from the sensory nuclei of the trigeminal nerve for **reflex lacrimation secondary to irritation of the cornea or conjunctiva.**

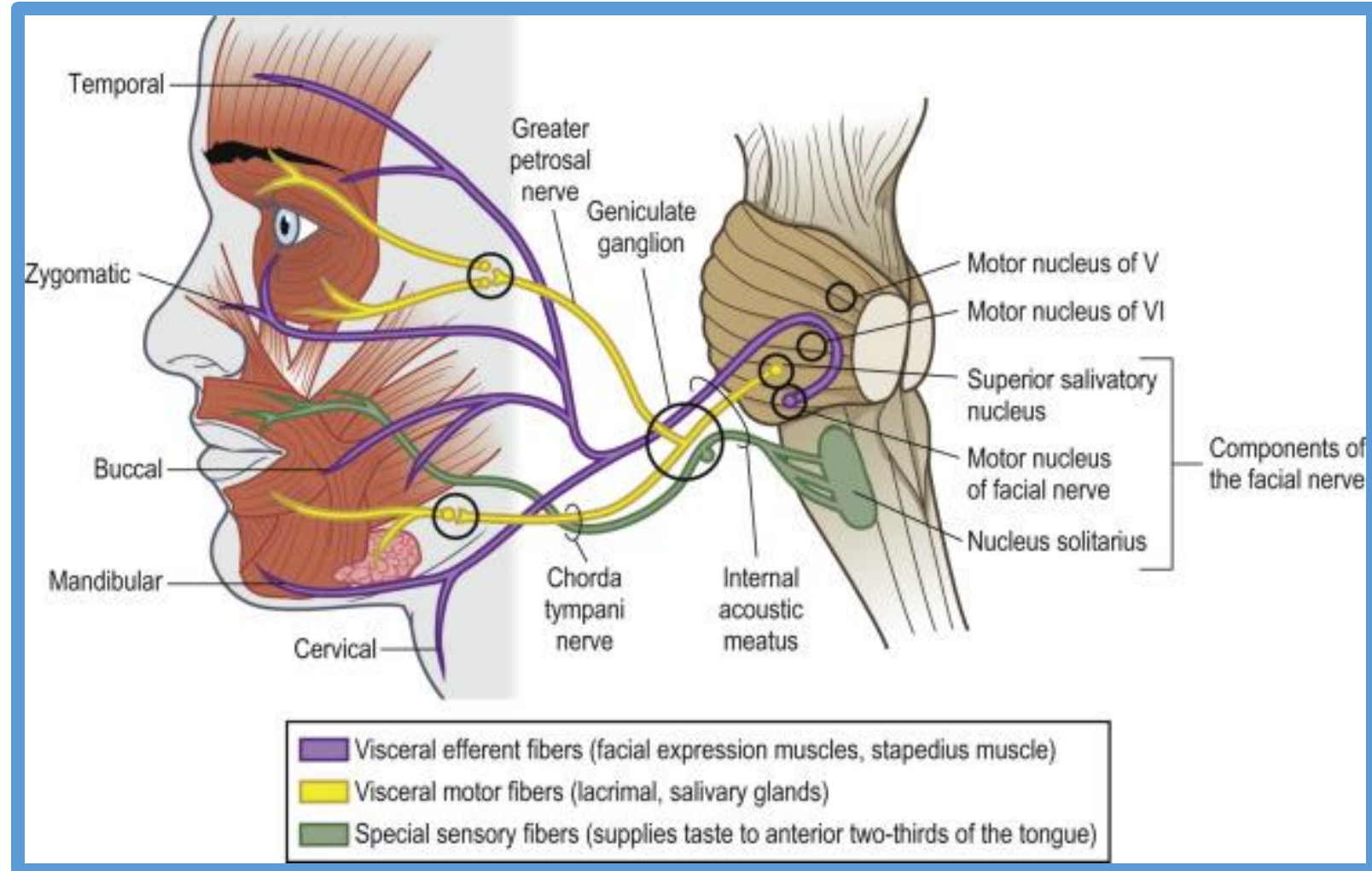


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3. Sensory Nucleus

The sensory nucleus is the upper part of *the nucleus of the tractus solitarius* and lies close to the motor nucleus

Sensations of taste travel through the peripheral axons of nerve cells situated in *the geniculate ganglion* on the seventh cranial nerve



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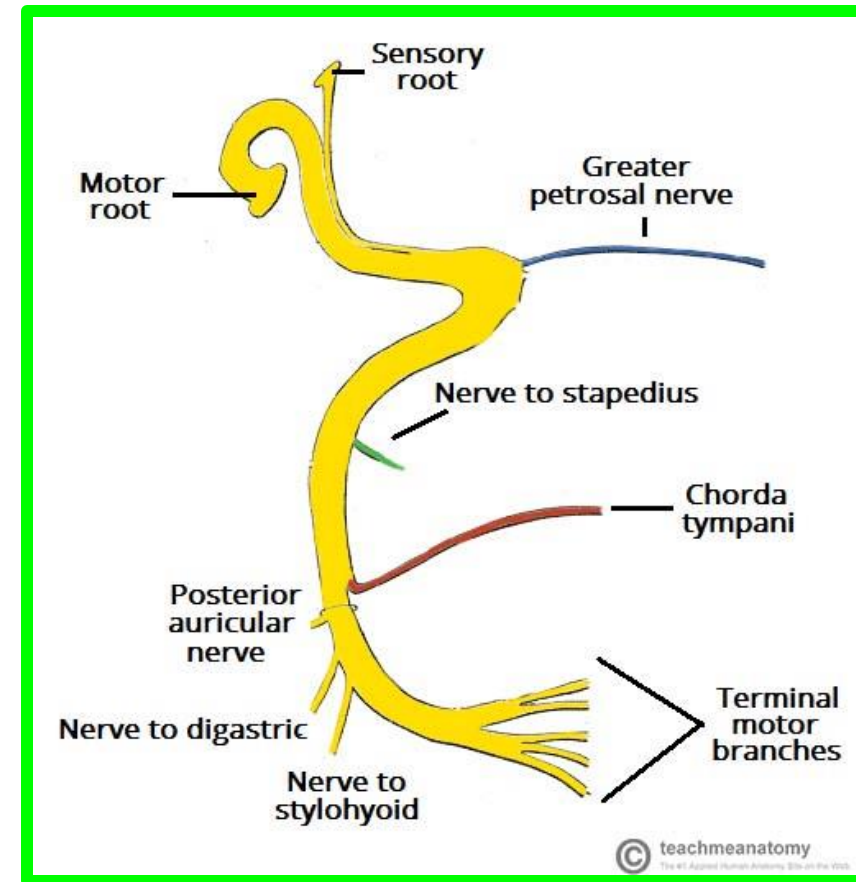
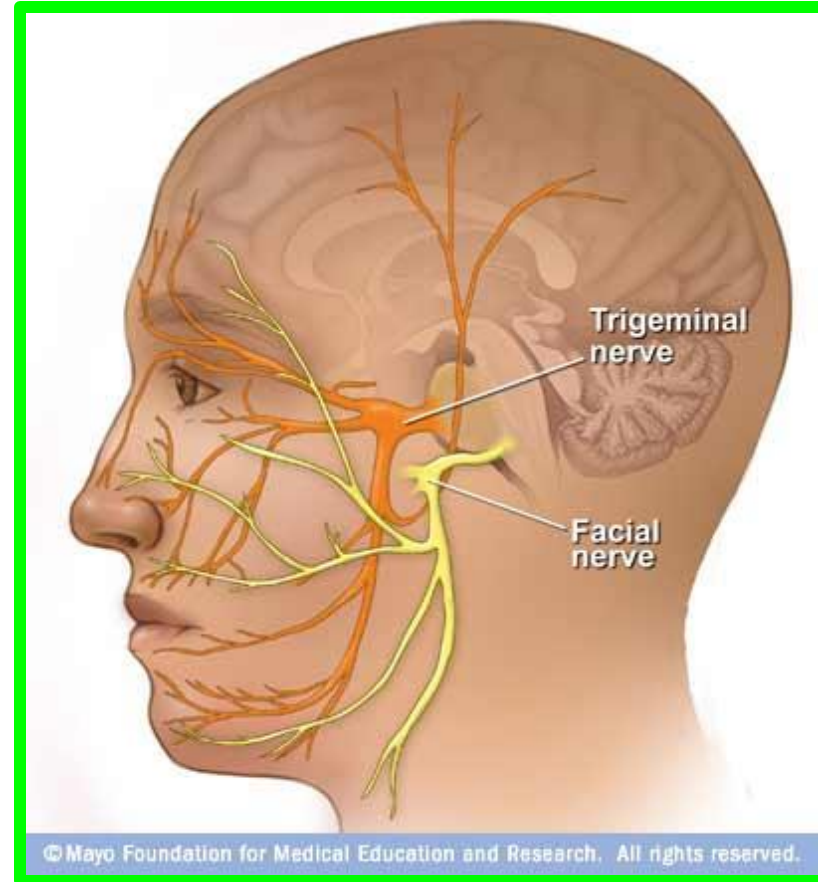
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❖ The facial nerve (CN VII) emerges from the junction of the pons and medulla as two divisions: **the motor root** and **the intermediate nerve**.

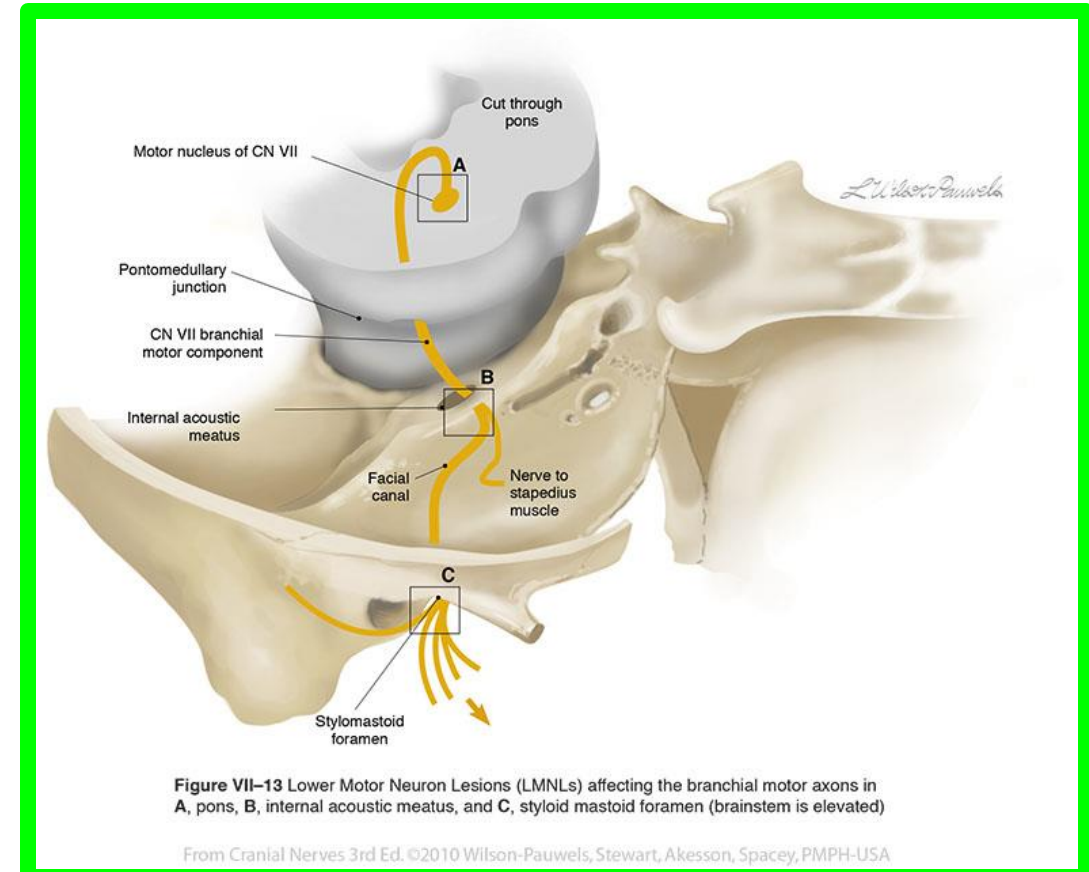
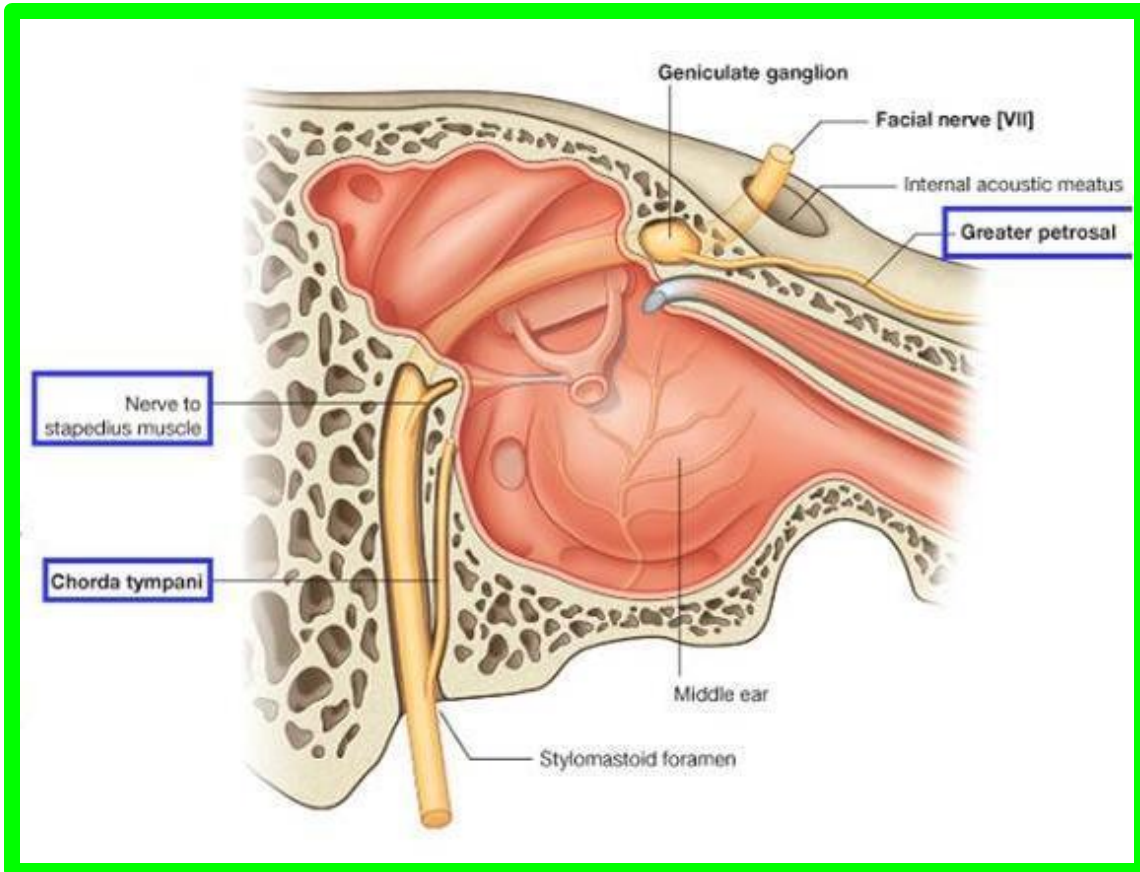
❖ The larger **motor root (facial nerve proper)** innervates the muscles of facial expression, and **the smaller intermediate nerve** carries taste, parasympathetic, and somatic sensory fibers.



FACIAL NERVE (CN VII)

During its course, CN VII traverses the **posterior cranial fossa**, **internal acoustic meatus**, **facial canal**, **stylomastoid foramen of the temporal bone**, and **parotid gland**.

After traversing the internal acoustic meatus, the nerve proceeds a short distance anteriorly within the temporal bone and then turns abruptly posteriorly to course **along the medial wall of the tympanic cavity**.



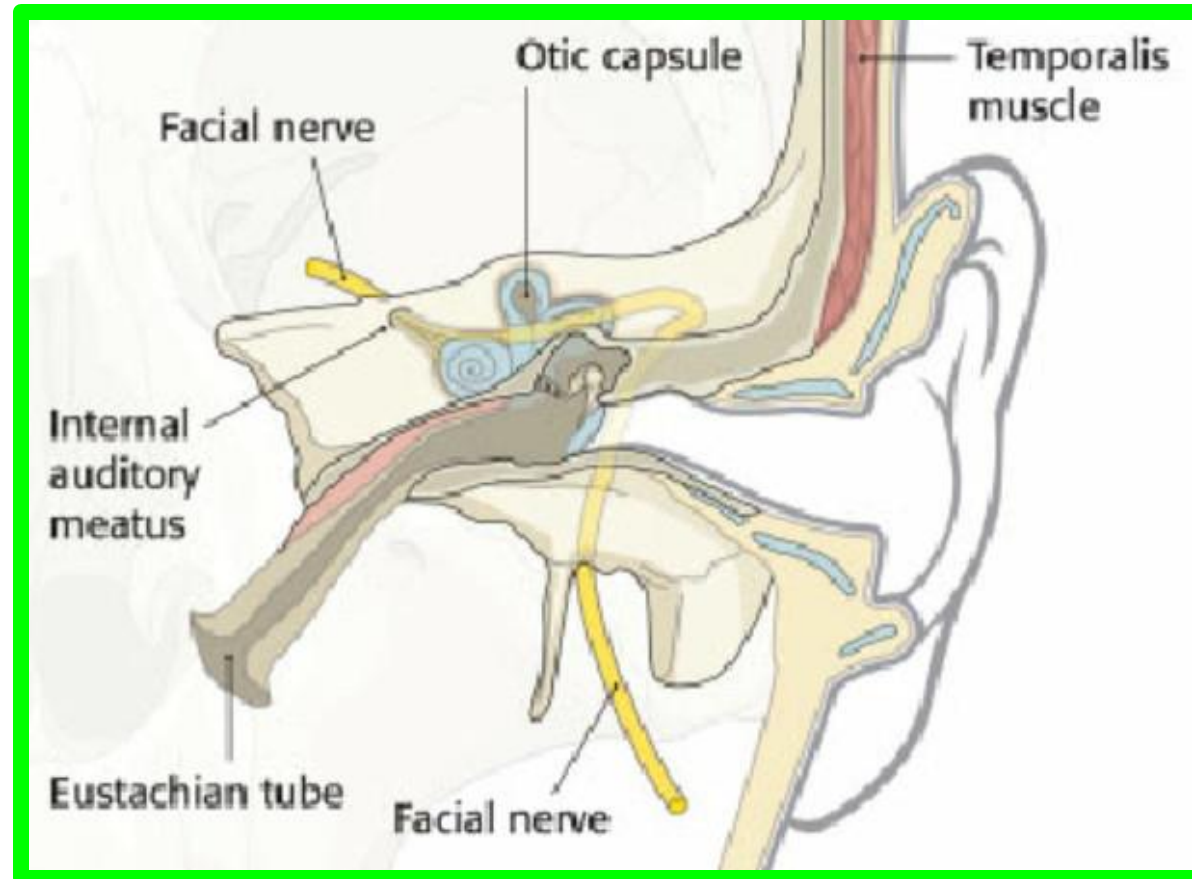
FACIAL NERVE (CN VII)

▪ Course and relations;

A- Intracranial course of the facial nerve

(1) It leaves the cranial cavity by entering **the internal auditory meatus**.
it runs through a bony canal (**facial canal**) inside **petrous part of temporal bone**
as follows:

(a) It runs first laterally
**above the vestibule of the
inner ear.**



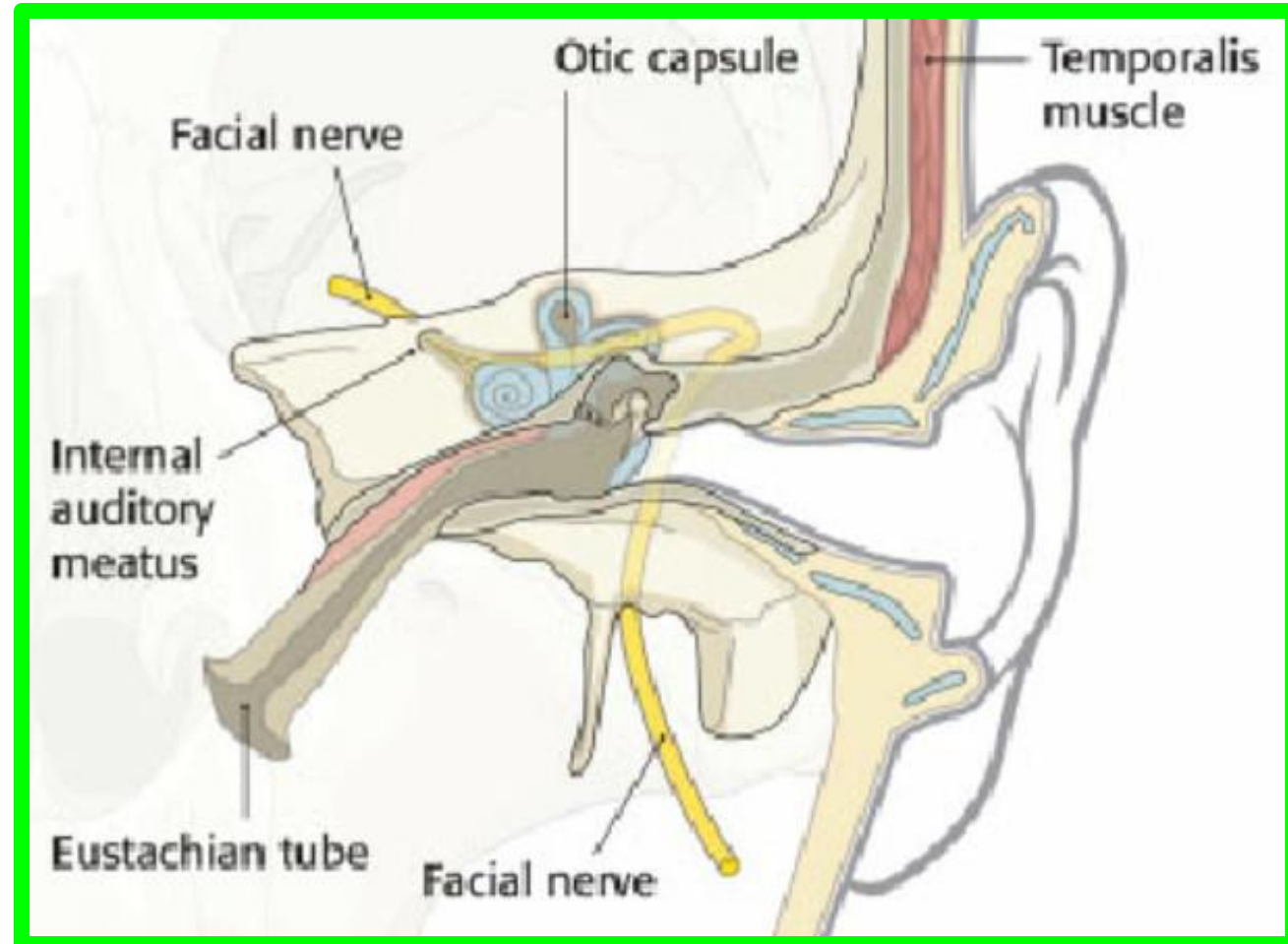
FACIAL NERVE (CN VII)

(b) Then, it bends sharply backwards **above the promontory** in the medial wall of middle ear cavity.

- This sharp bend is called **geniculum** and carries the **geniculate ganglion**.

(c) Finally, it passes downwards behind the **middle ear**.

(d) It exits from the **stylomastoid foramen**.



Course and relations;

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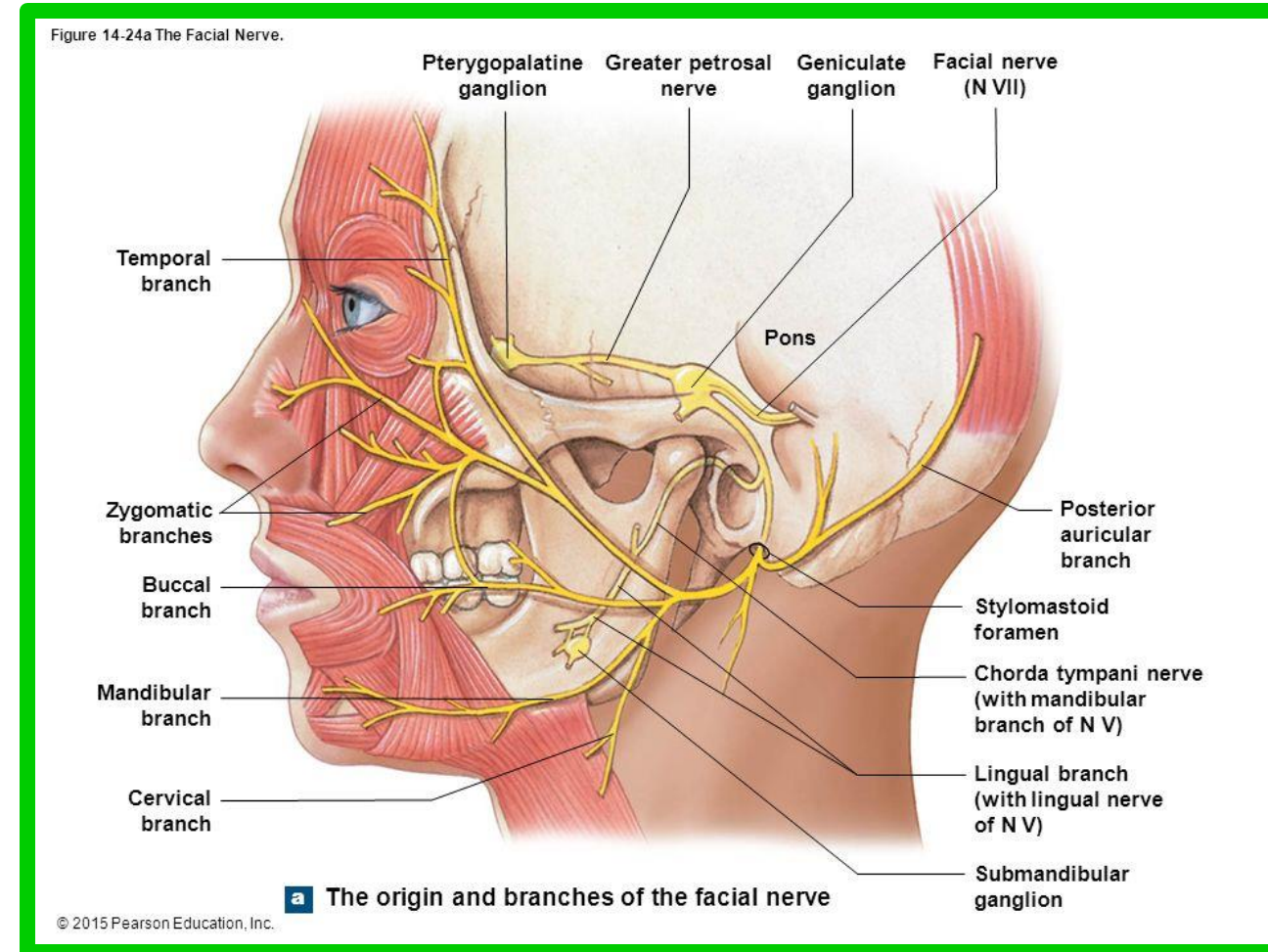
B – Extracranial course of facial nerve:

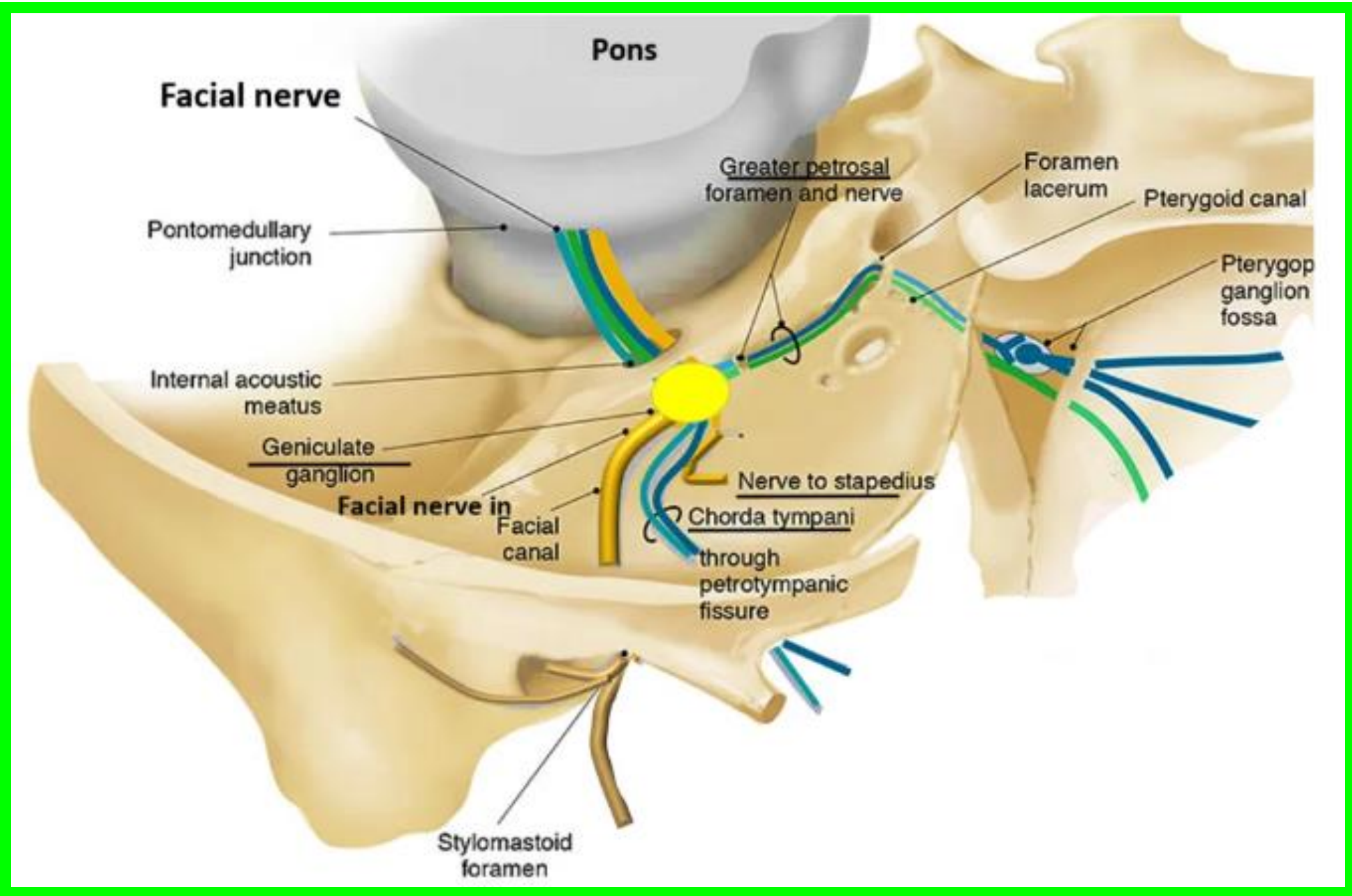
(1) It leaves the **facial canal** through the **stylomastoid foramen**.

(2) It turns forwards making a curve around the **lateral side of the styloid process**.

(3) It enters the **posteromedial surface of parotid gland** (lying superficial to **external carotid artery** and **retromandibular vein**)

(4) It ends inside the substance of the gland by **dividing into 5 terminal branches**



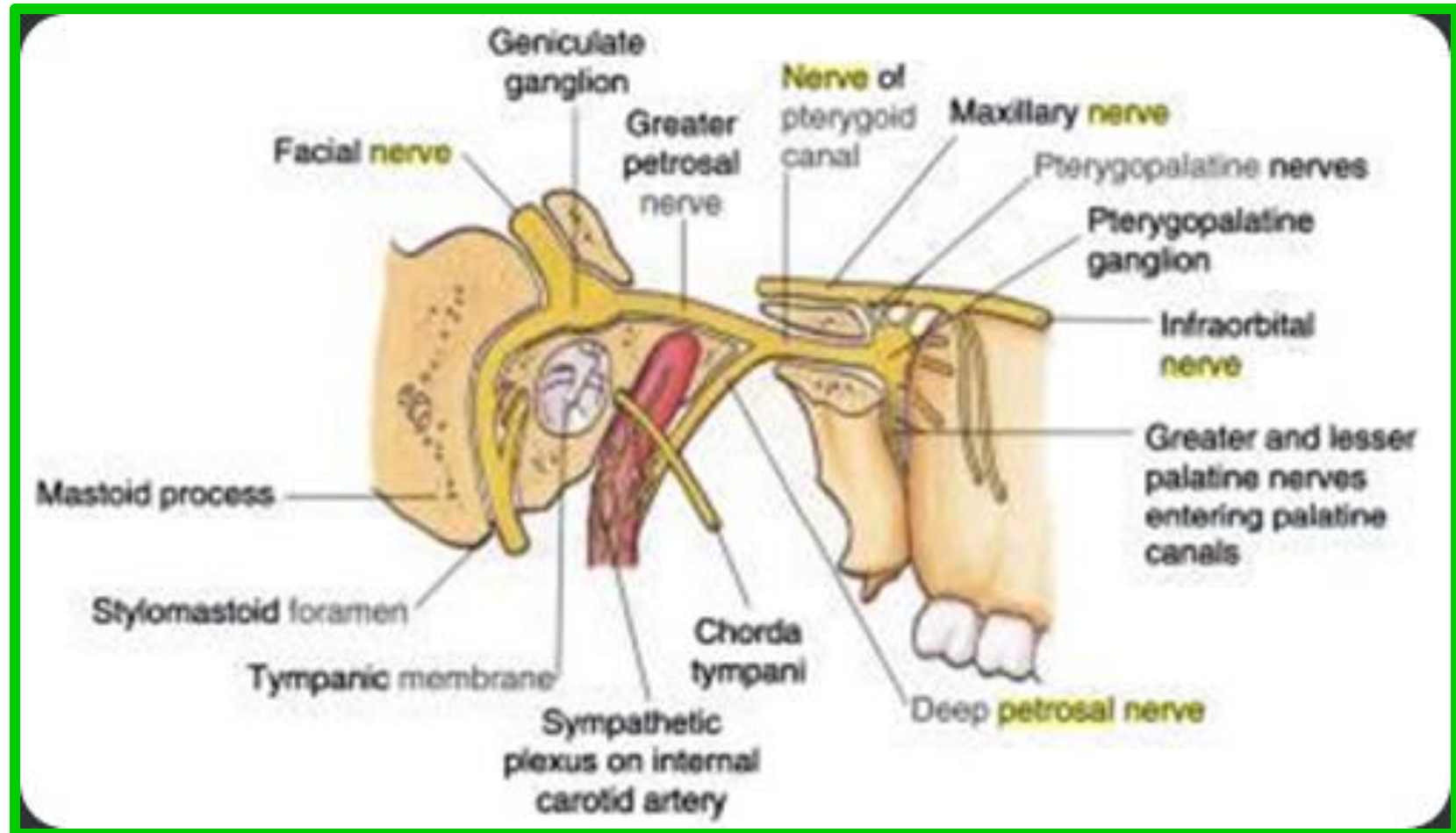


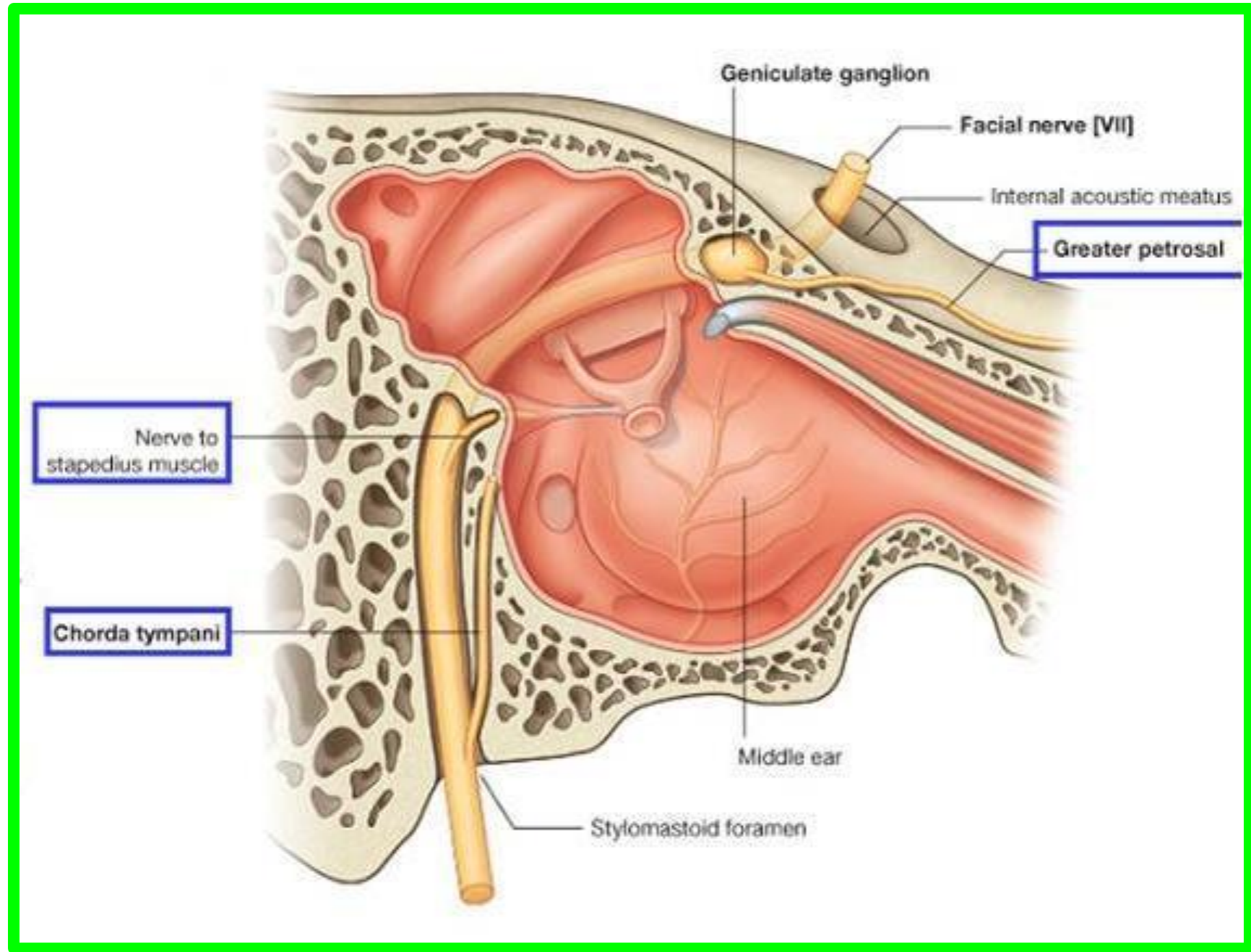
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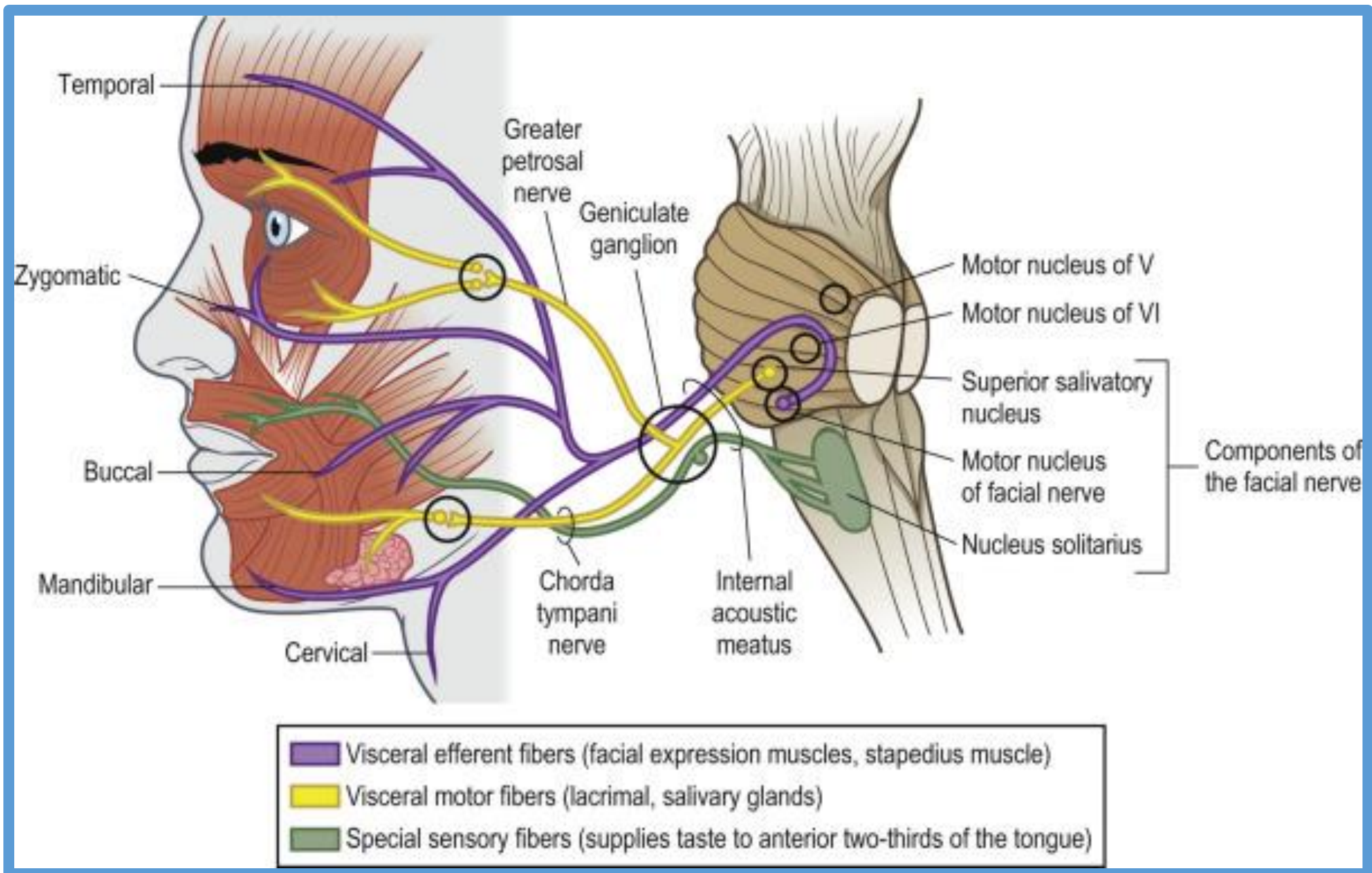
The sharp bend, the geniculum of the facial nerve is the site of **the geniculate ganglion**, the **sensory ganglion of CN VII**

While traversing the temporal bone within the facial canal, CN VII gives rise to the:

- ✓ **Greater petrosal nerve.**
- ✓ **Nerve to the stapedius.**
- ✓ **Chorda tympani nerve.**







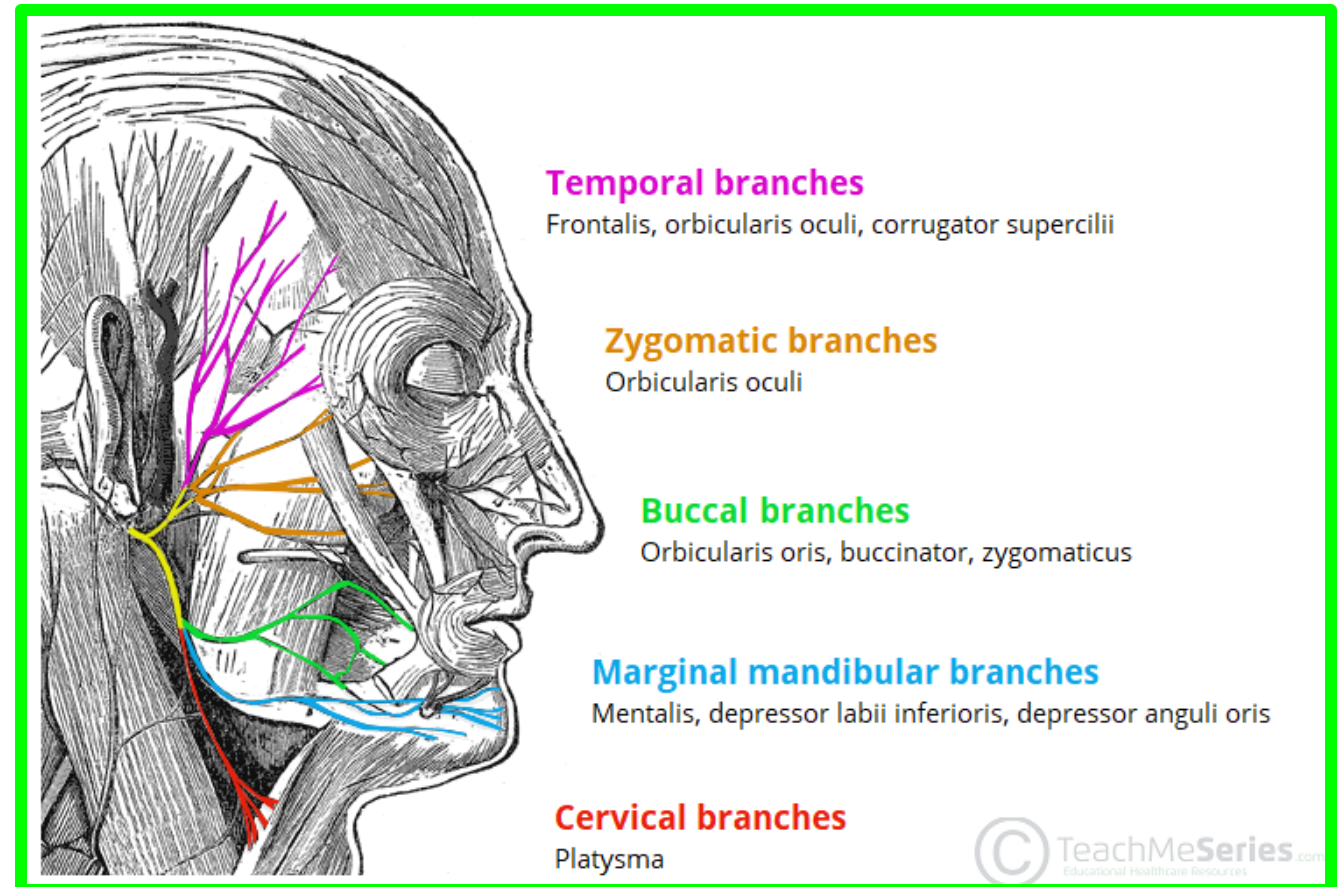
FACIAL NERVE (CN VII)

- ✓ **CN VII** emerges from the cranium via **the stylomastoid foramen**;
- ✓ Gives off **the posterior auricular branch**;
- ✓ Enters **the parotid gland**; and forms **the parotid plexus**, which gives rise to the following five terminal motor branches:

- **Temporal,**
- **Zygomatic,**
- **Buccal,**
- **Marginal mandibular,**
- **Cervical.**

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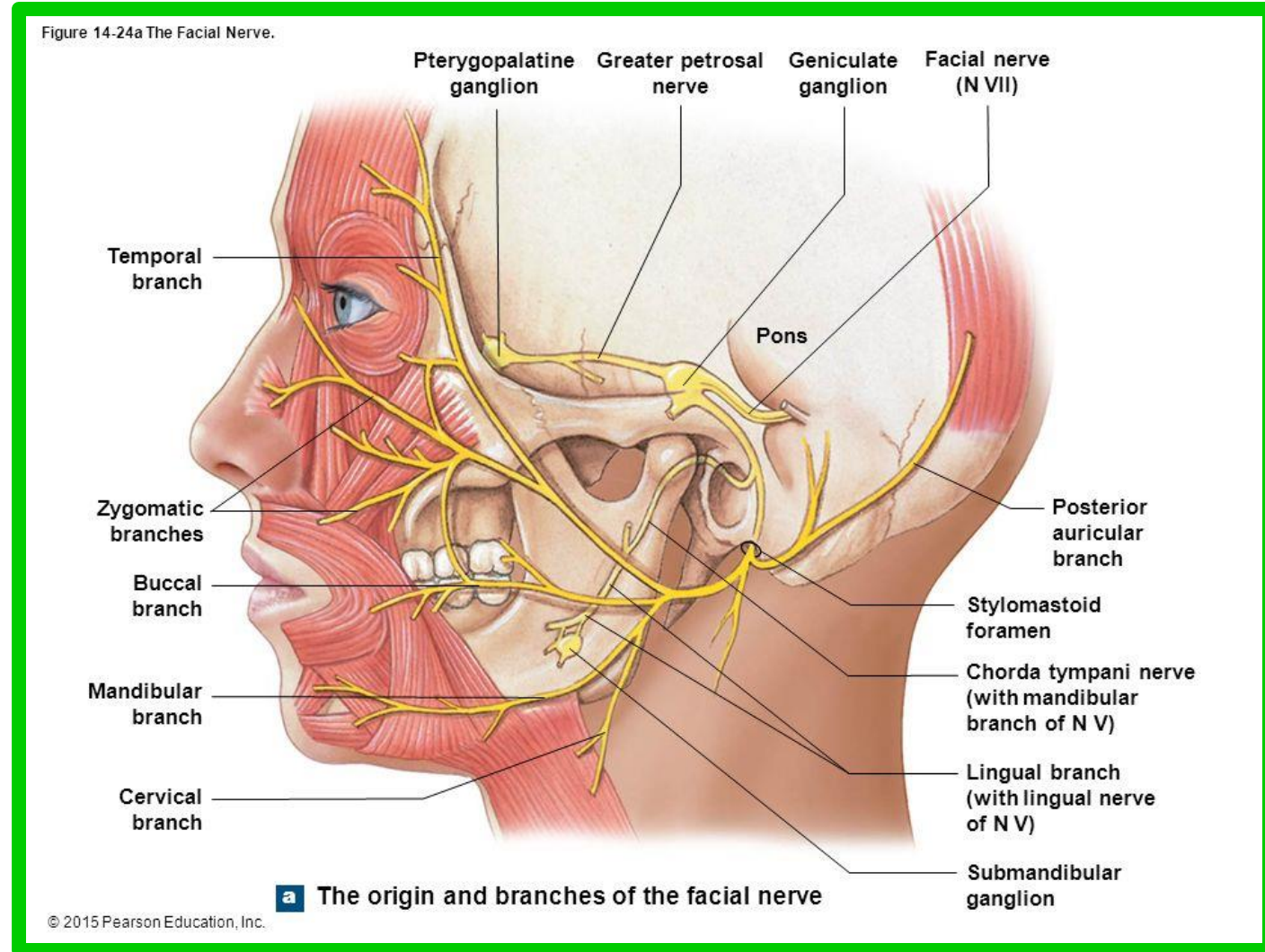


FACIAL NERVE (CN VII)

□ Somatic Motor

The facial nerve supplies the muscles of *facial expression* and *auricular muscles*.

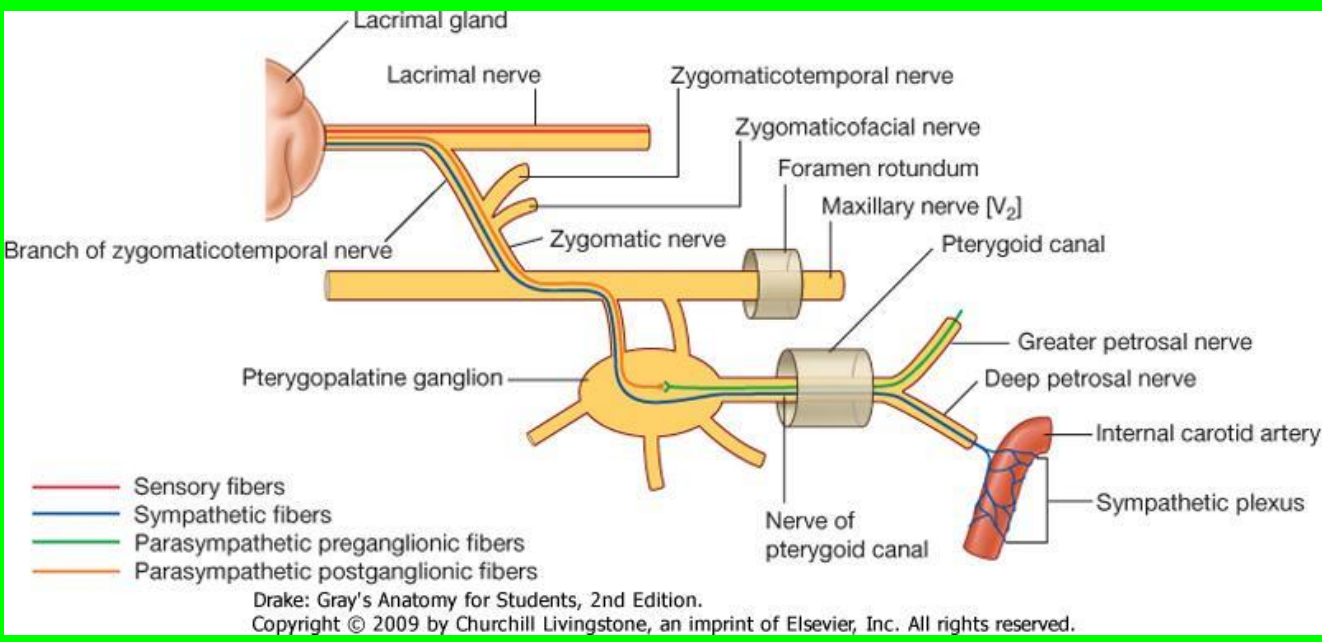
It also supplies the posterior bellies of the digastric, stylohyoid, and stapedius muscles.



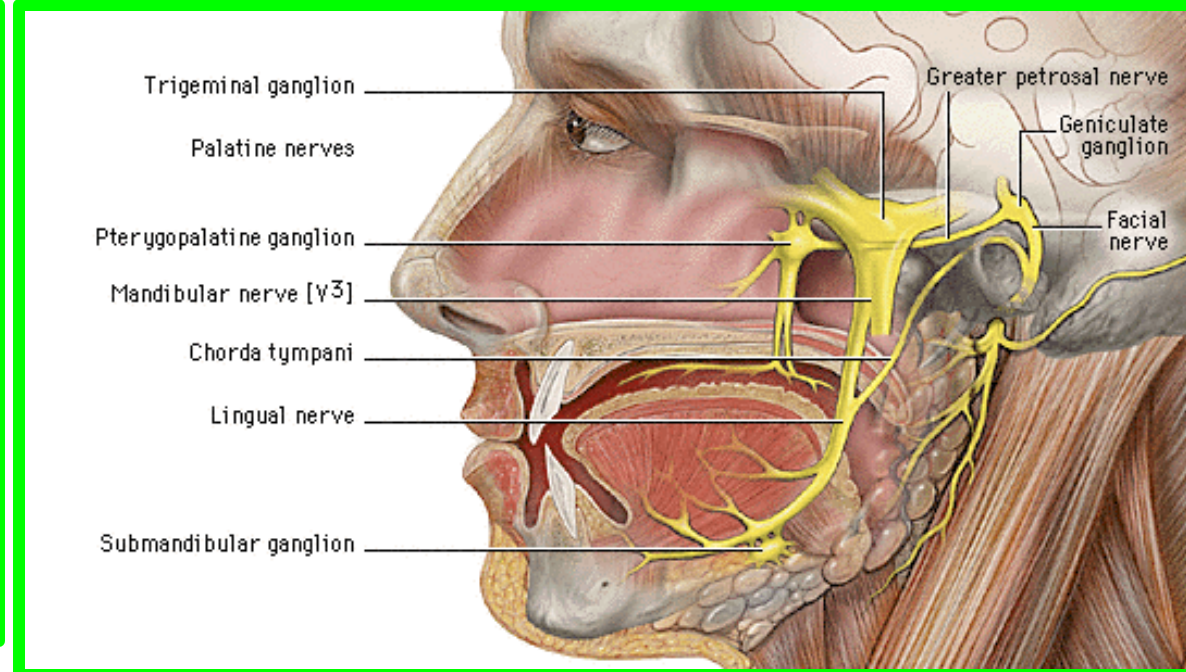
FACIAL NERVE (CN VII)

❑Visceral (Parasympathetic) Motor:

CN VII provides presynaptic parasympathetic fibers to the pterygopalatine ganglion for innervation of **the lacrimal glands** and to the submandibular ganglion for innervation of **the sublingual and submandibular salivary glands**.



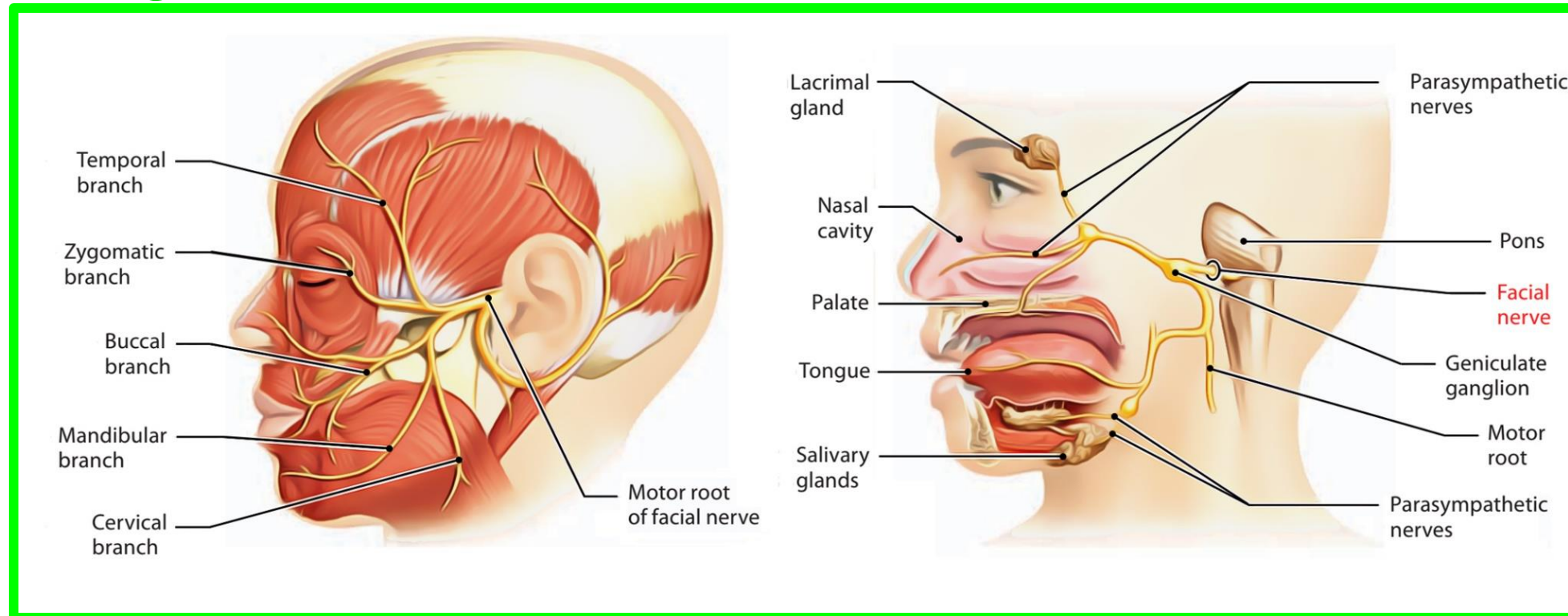
Drake: Gray's Anatomy for Students, 2nd Edition.
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❑ The **pterygopalatine ganglion** is associated with **the maxillary nerve (CN V₂)**, which distributes its postsynaptic fibers, whereas **the submandibular ganglion** is associated with **the mandibular nerve (CN V₃)**.

❑ **Parasympathetic fibers synapse in these ganglia, whereas sympathetic and other fibers pass through them.**



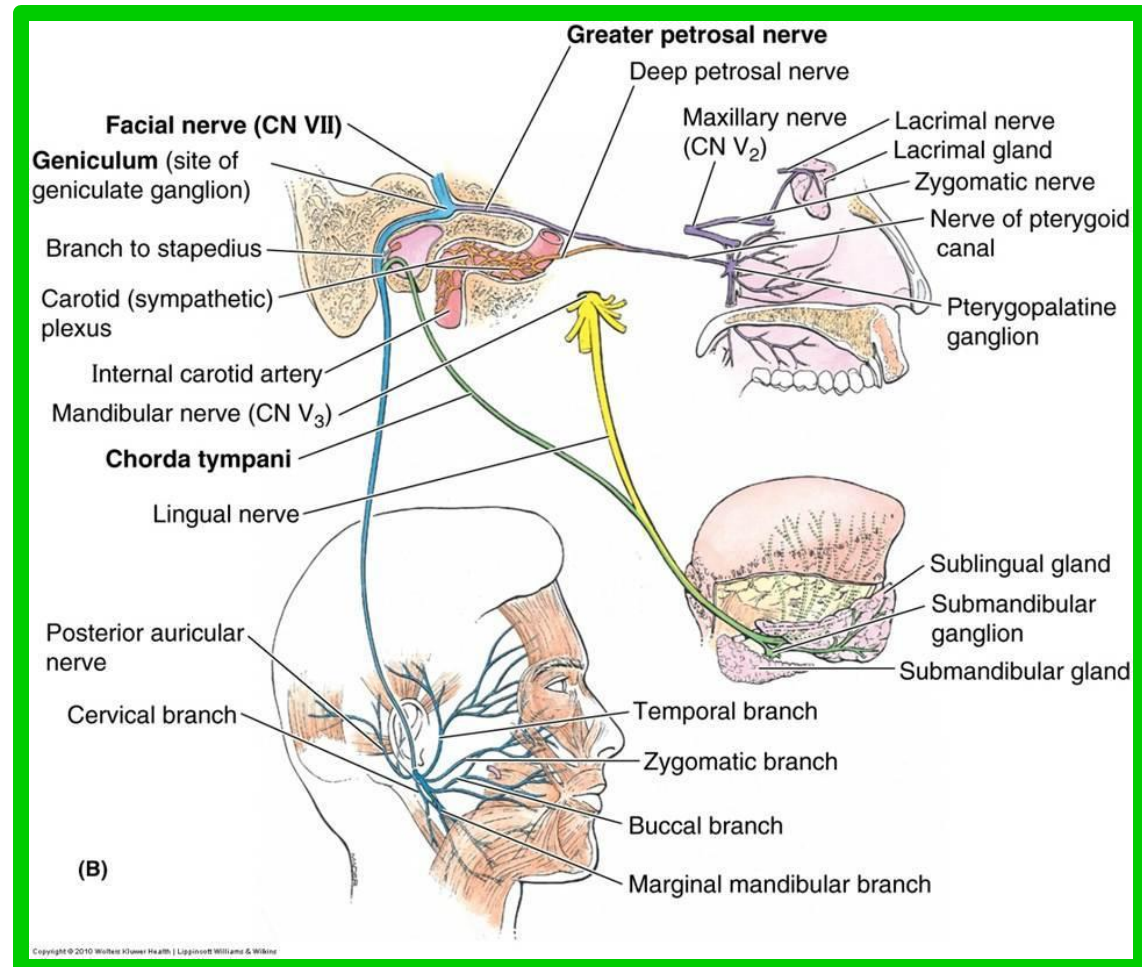
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□ General Sensory (Somatic)

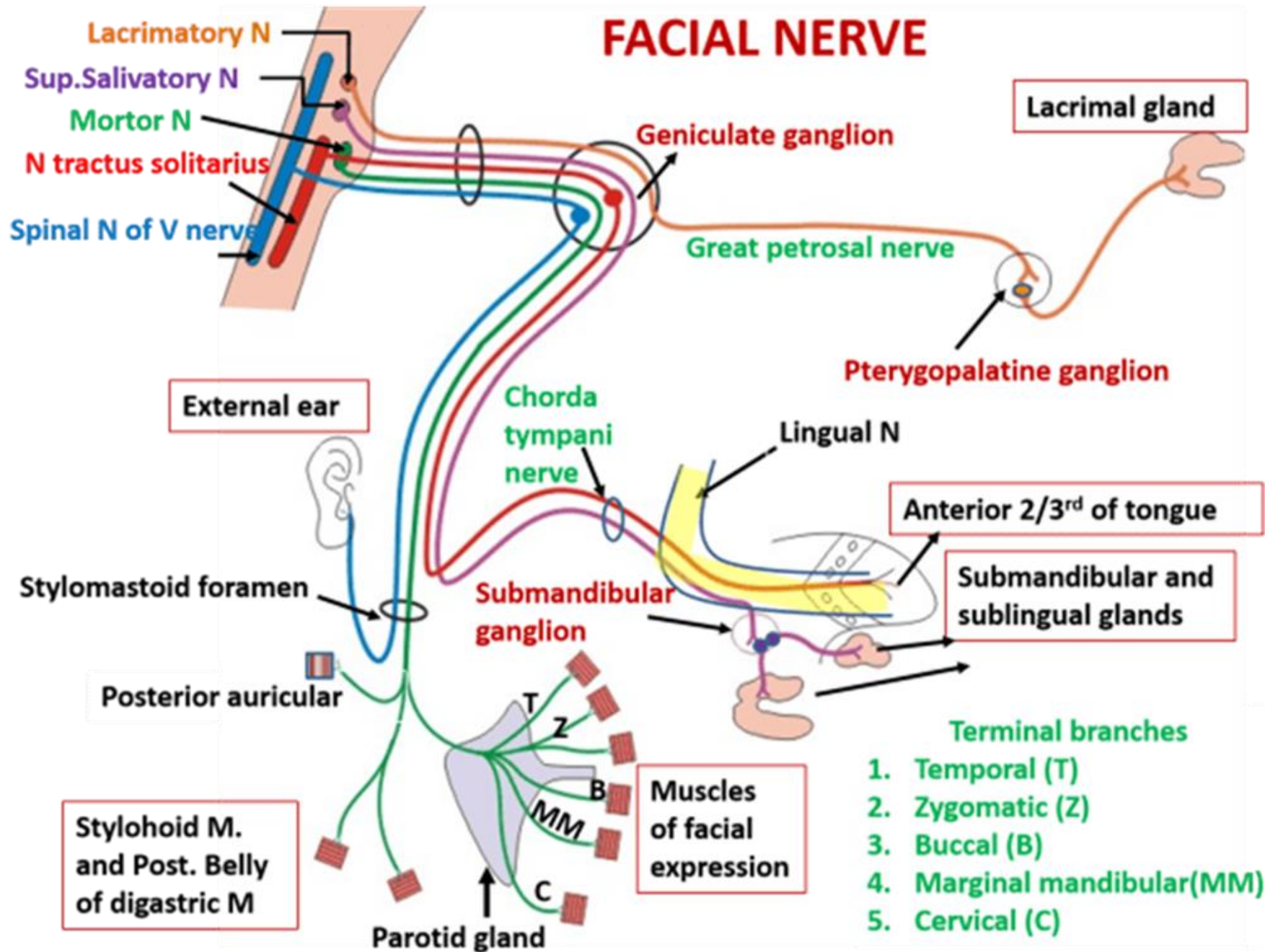
Some fibers from the geniculate ganglion supply a **small area of the skin of the concha of the auricle**, close to external acoustic meatus.

□ Special Sensory (Taste)

Fibers carried by **the chorda tympani** join the **lingual nerve** to convey taste sensation from the **anterior two thirds of the tongue and soft palate**.



FACIAL NERVE



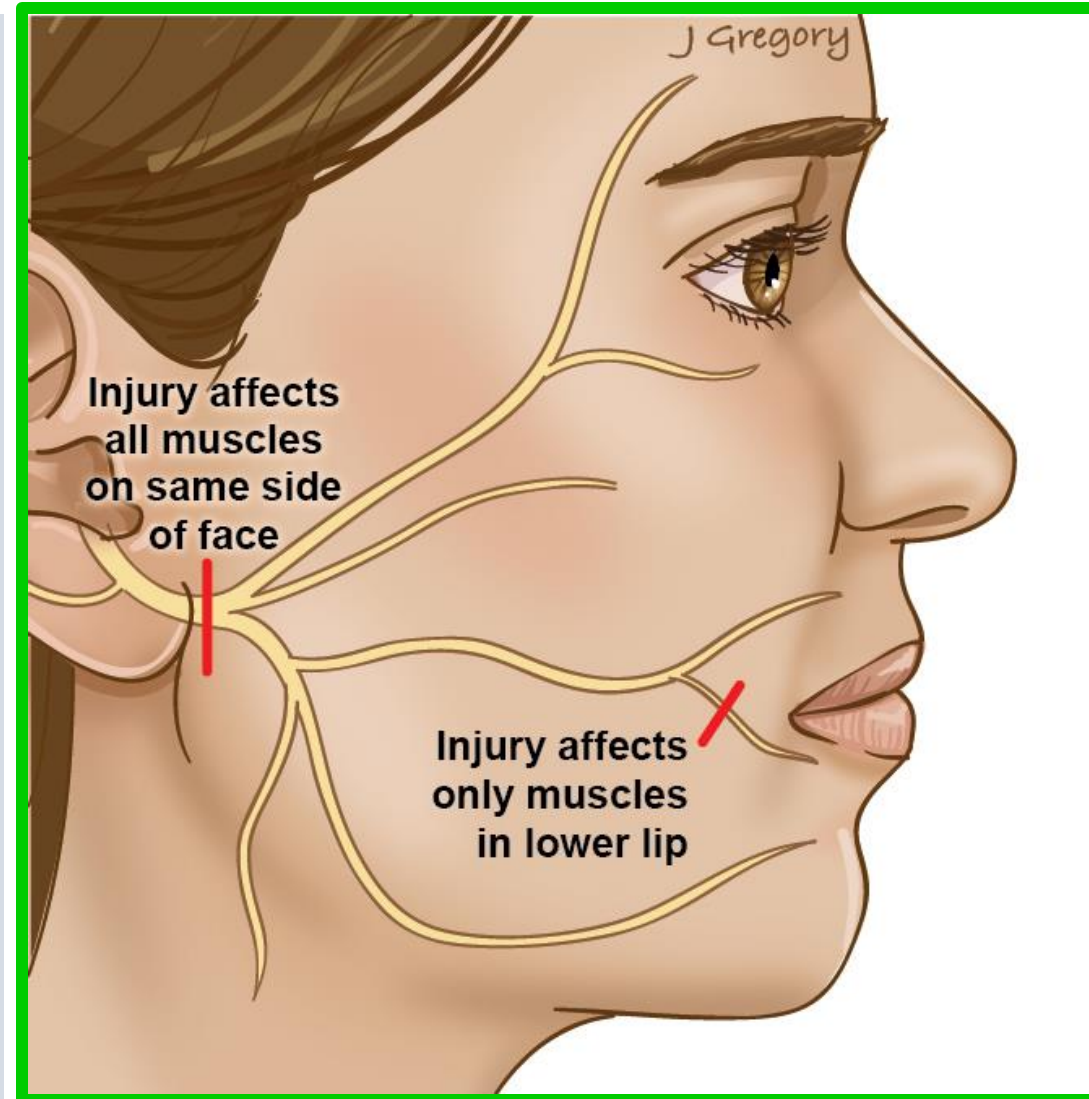
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Facial Injury

Because the branches of **CN VII** are superficial, they are subject to injury from knife and gunshot wounds, cuts, and birth injury.

Damage to **CN VII** is common with fracture of the temporal bone and is usually detectable immediately after the injury.

CN VII may also be affected by tumors of the brain and cranium, aneurysms, meningeal infections, and herpes viruses.



A lesion of **CN VII** near its origin or *near the geniculate ganglion* is accompanied by loss of motor, gustatory (taste), and autonomic functions. The motor paralysis of facial muscles involves superior and inferior parts of the face on the ipsilateral side

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❖ *ipsilateral facial plegia,*

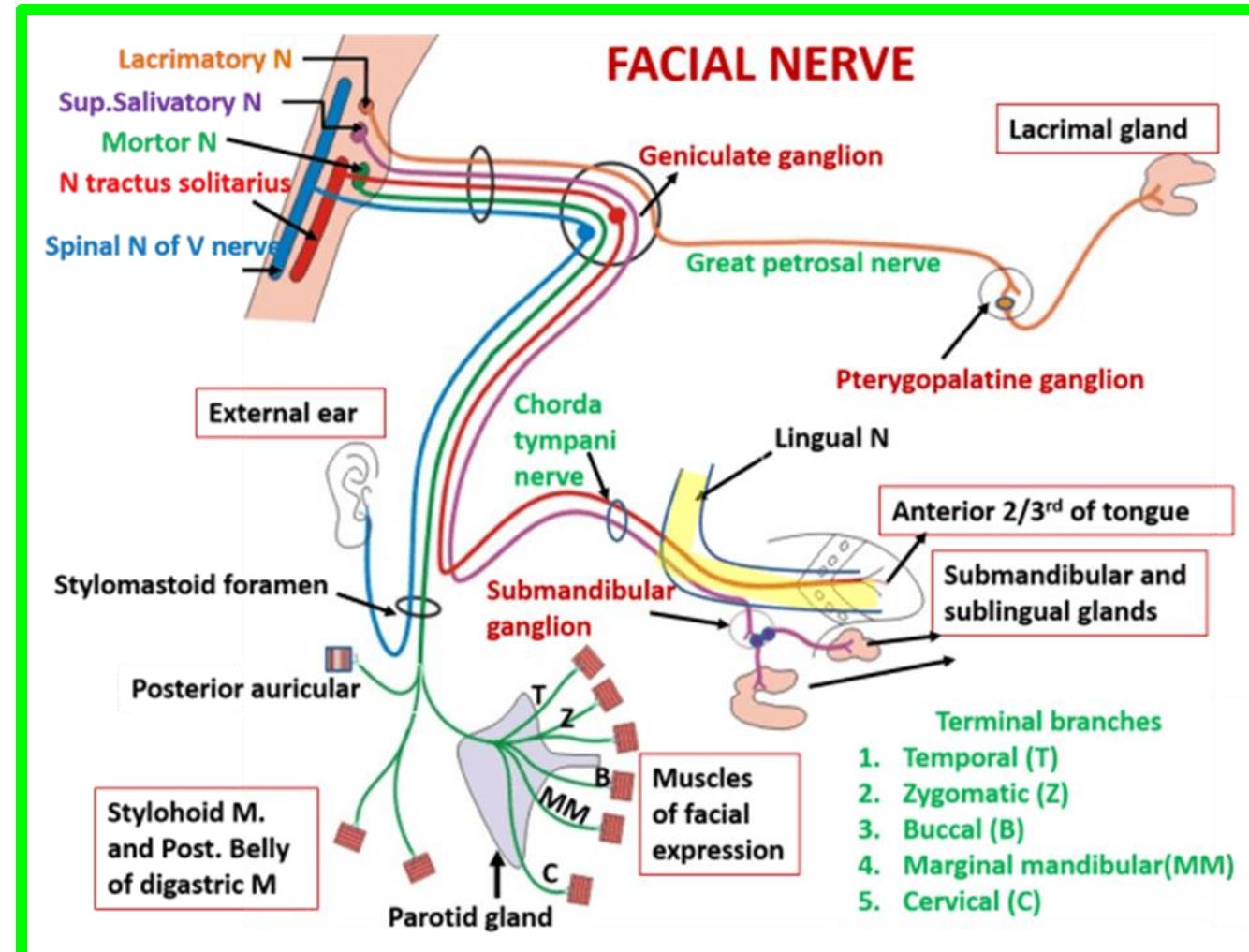
❖ *decreased secretion of saliva and tears,*

❖ *hyperacusis and*

❖ *ageusia to anterior two-thirds of the ipsilateral part of the tongue*

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The part of the facial nucleus that controls the muscles of the upper part of the face receives corticonuclear fibers from both cerebral hemispheres. Therefore, it follows that with a lesion involving **the upper motor neurons**, only the muscles of the lower part of the face (**Contralateral side**) will be paralyzed

in patients with a lesion of the facial nerve motor nucleus or the facial nerve itself--that is, **a lower motor neuron lesion**--all the muscles on the affected side of the face will be paralyzed

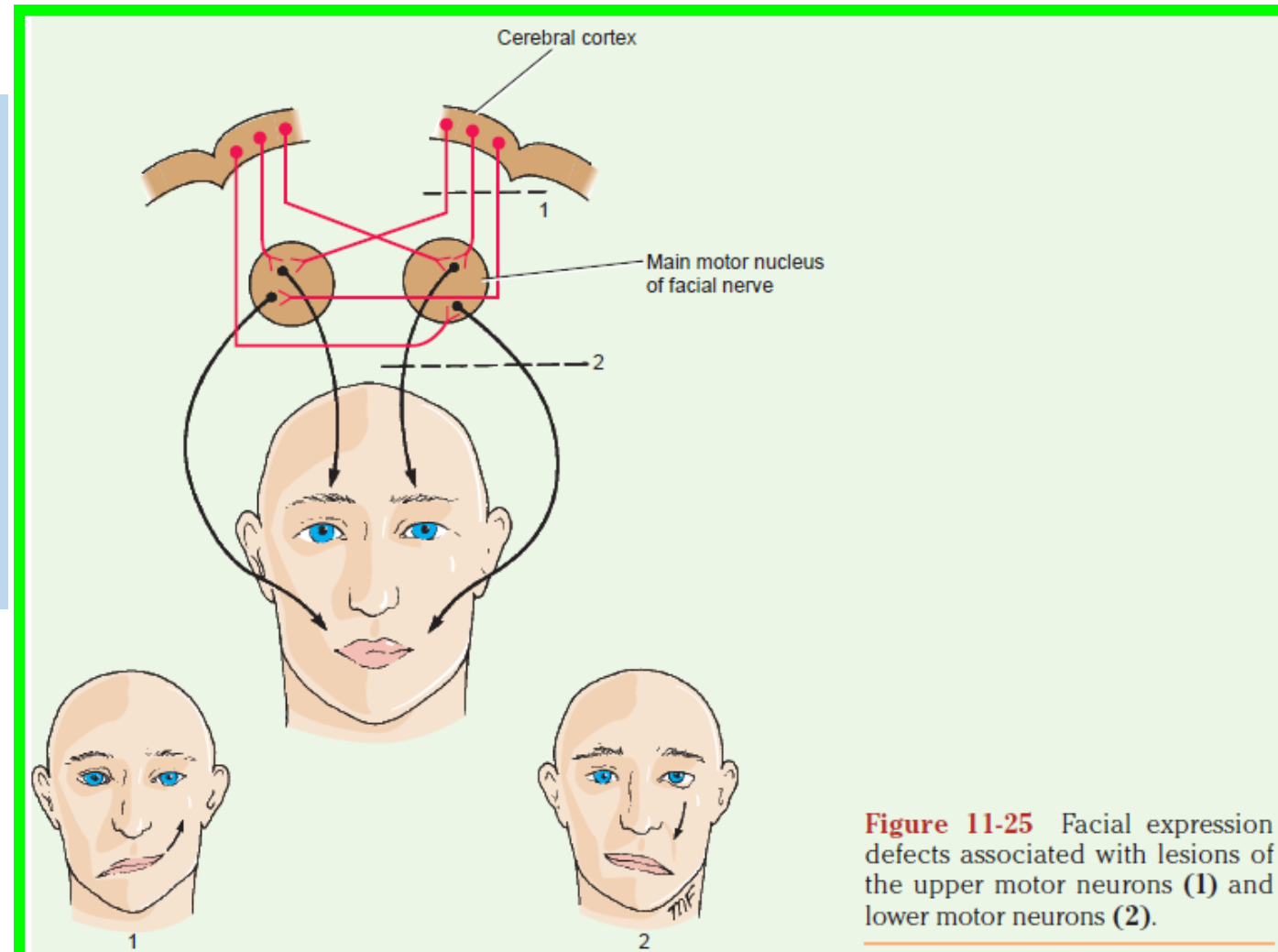
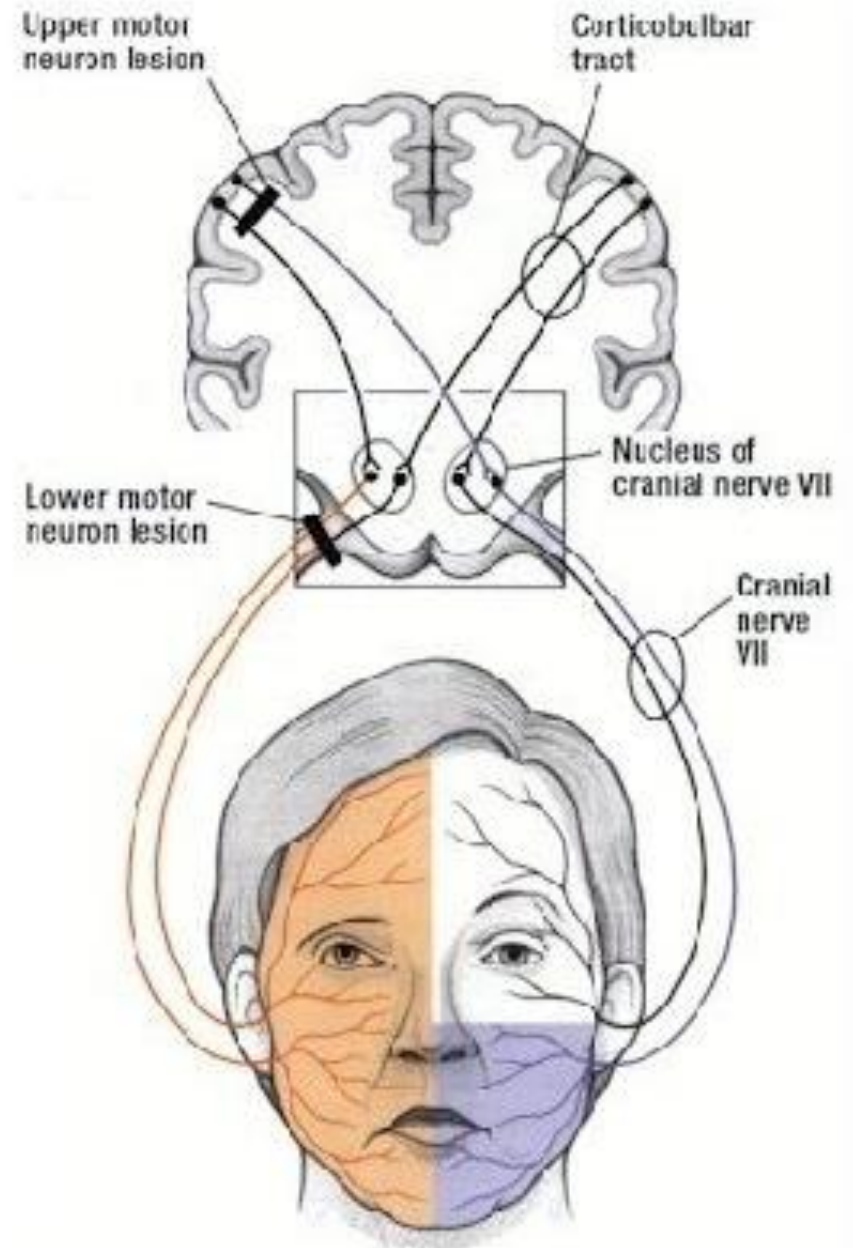


Figure 11-25 Facial expression defects associated with lesions of the upper motor neurons (1) and lower motor neurons (2).

- Upper motor lesions spare the upper facial muscles and affect the contralateral lower face
- Lower motor lesions affect all the ipsilateral facial muscles

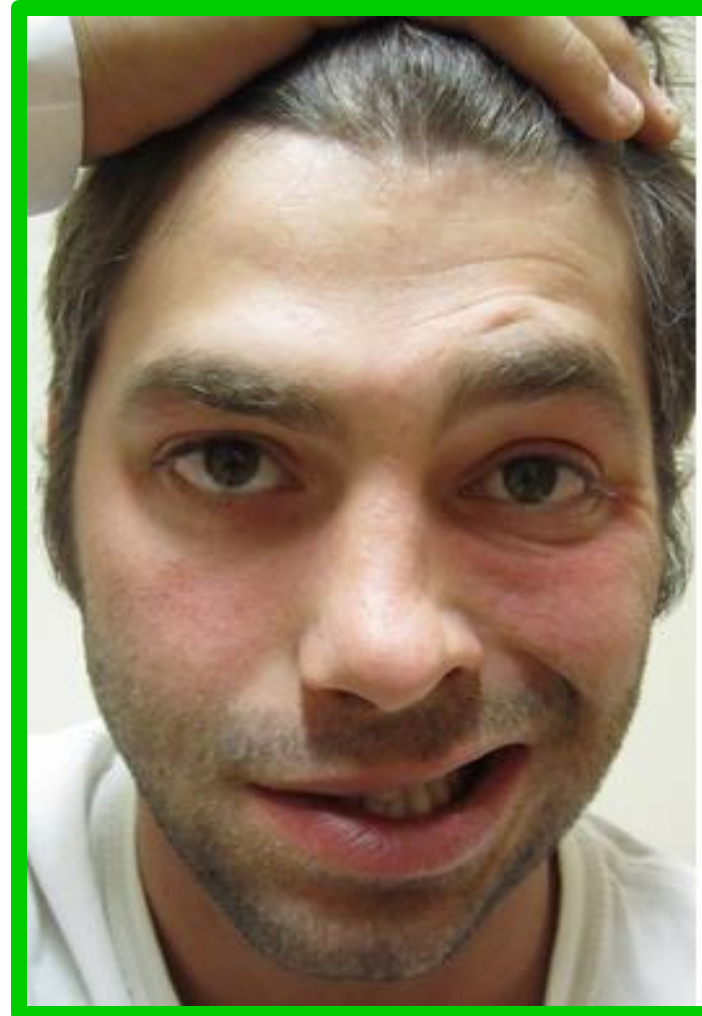


Bell's palsy

Bell's palsy is a temporary facial paralysis that affects movements like **smiling and blinking, resulting in a droopy effect**. It is caused by nerve damage that interrupts the relay of messages from the brain to the face – usually on just one side of the face.

- ✓ Sudden weakness or paralysis on one side of the face
- ✓ Difficulty smiling or closing the eyelid on the affected side
- ✓ Jaw or ear pain on the affected side
- ✓ Drooling
- ✓ Dryness in the eye and mouth
- ✓ Ringing in the ear or sensitivity to sound (**hyperacusis**)
- ✓ Impaired speech or taste
- ✓ Difficulty eating and drinking
- ✓ Reduced tear production.

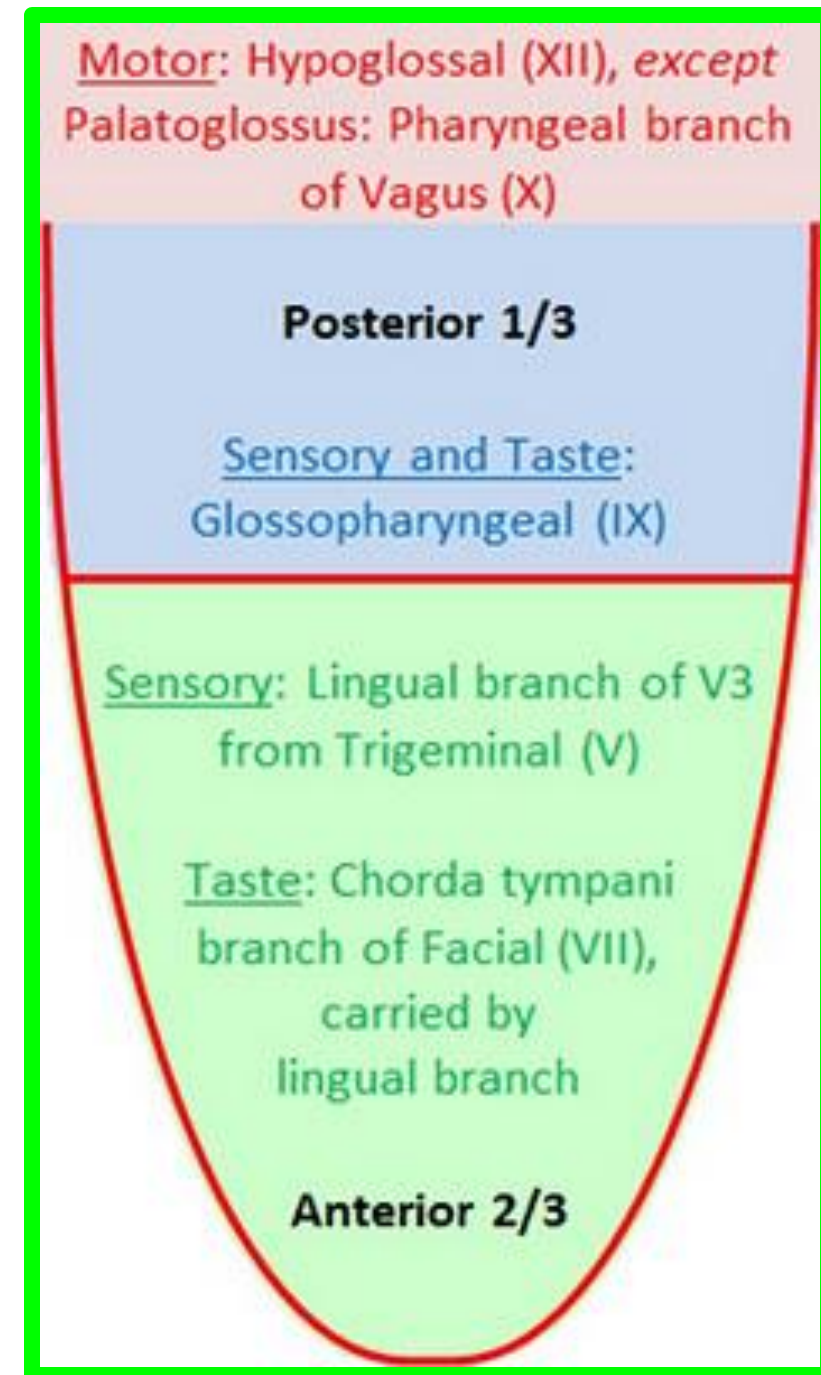
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Sense of the taste

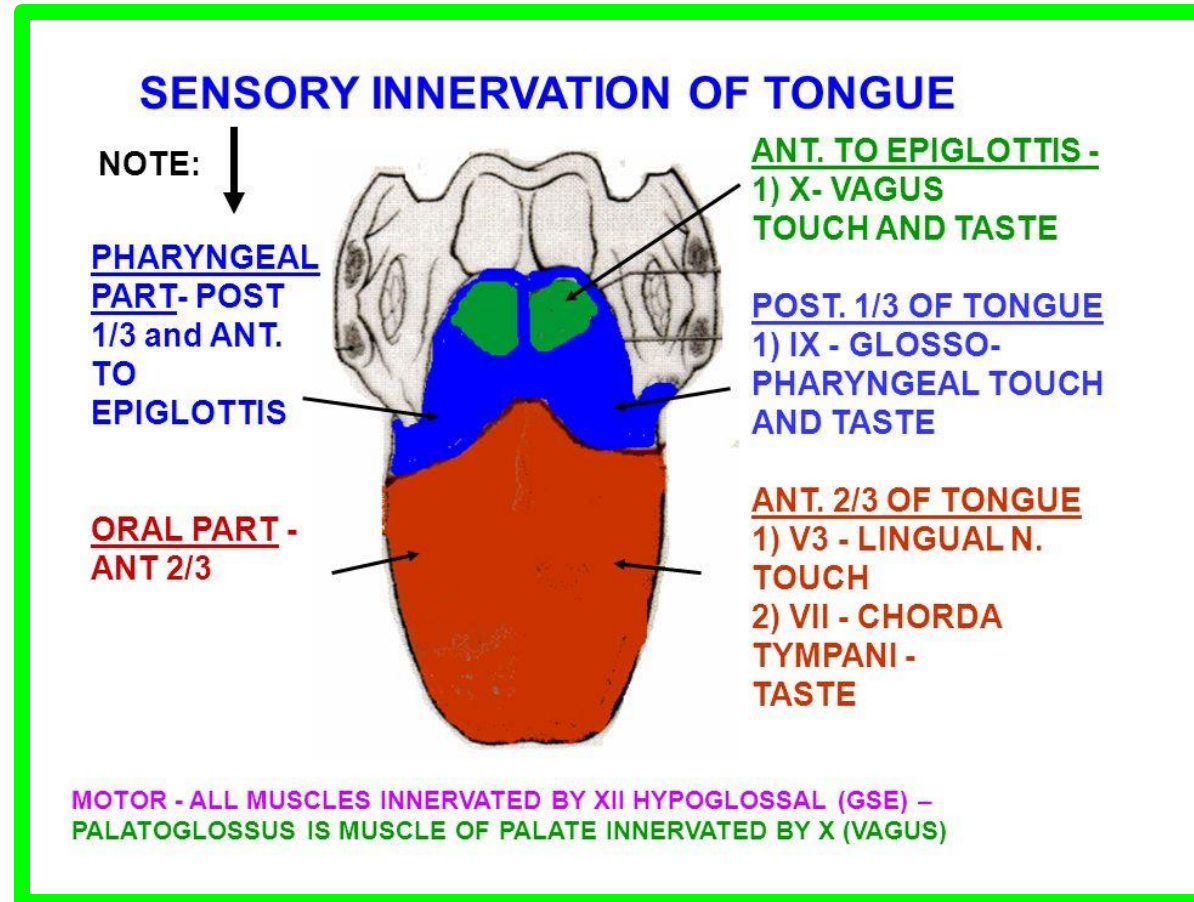
For general sensation (touch and temperature), the mucosa of the anterior two thirds of the tongue is supplied by the lingual nerve, a branch of CN V₃

For special sensation (taste), this part of the tongue, except for the vallate papillae, is supplied through the chorda tympani nerve, a branch of CN VII



Sense of the taste

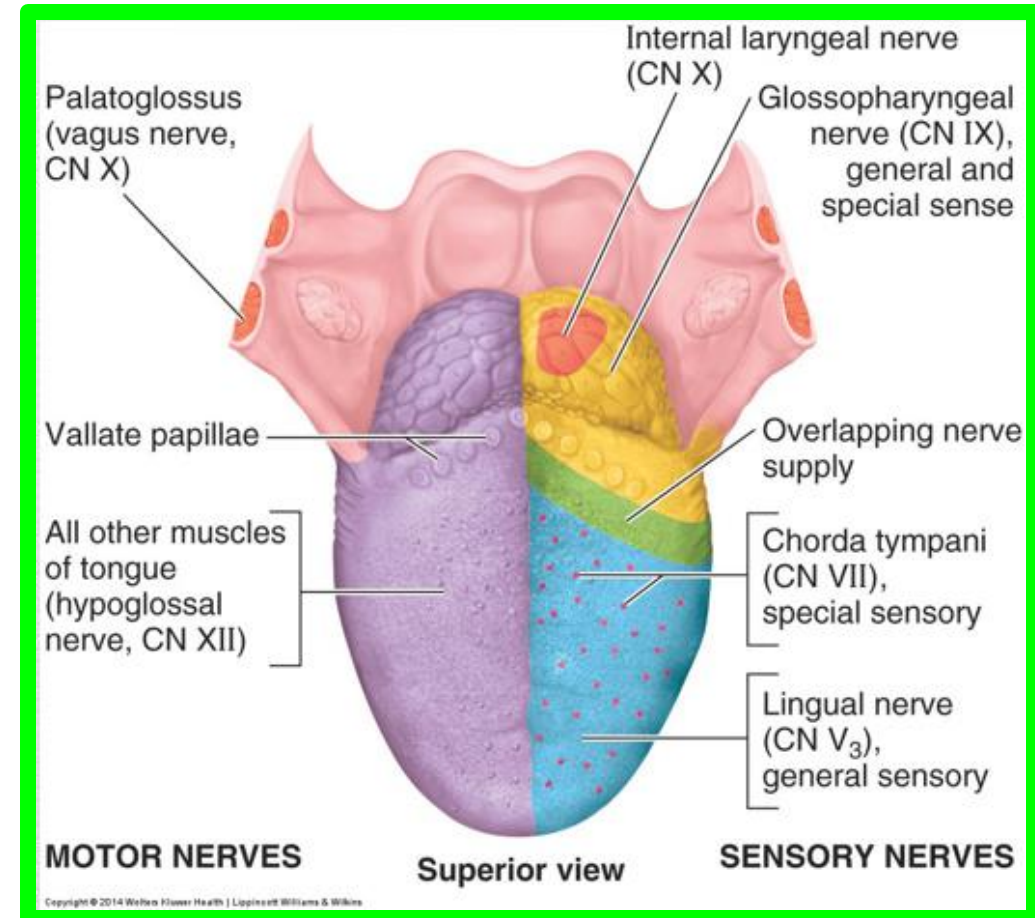
The chorda tympani joins the lingual nerve and runs anteriorly in its sheath. The mucous membrane of the posterior third of the tongue and the vallate papillae are supplied by the lingual branch of the glossopharyngeal nerve (CN IX) for both general and special sensation.



Sense of the taste

- ❖ Twigs of the *internal laryngeal nerve*, a branch of the *vagus nerve (CN X)*, supply *mostly general but some special sensation to a small area of the tongue just anterior to the epiglottis*.
- ❖ These mostly sensory nerves also carry *parasympathetic secretomotor fibers to serous glands in the tongue*.

❖ Parasympathetic fibers from **the chorda tympani nerve** travel with the lingual nerve to the submandibular and sublingual salivary glands. These nerve fibers synapse in **the submandibular ganglion**, which hangs from **the lingual nerve**



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