

Oculomotor

Oculomotor palsy examples

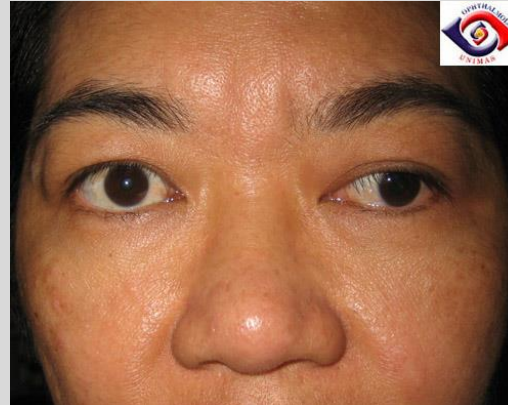
Ptosis



weak or paralyzed levator
palpebrae superioris

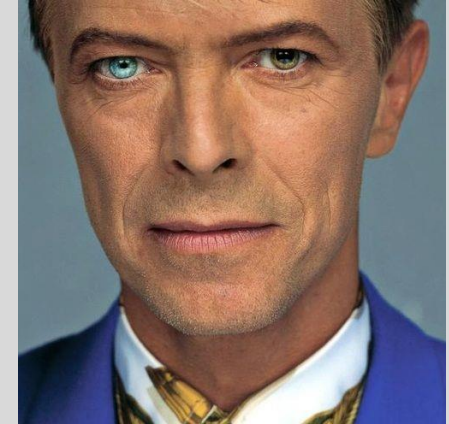
lesion located in the
superior division

Complete lesion



weakness or paralysis of 4
of the 6 extraocular muscles.
Unopposed muscles pull eye
down and out

Anisocoria



Weakness or paralysis of
sphincter pupillae.
Affected eye remains
more dilated than
contralateral eye.



medial rectus palsy
lesion located in
inferior division

Trochlear

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Trochlear nerve (Fourth Nerve) Palsy

Small size of trochlear makes it susceptible to damage

Lesion produces weakness / paralysis of superior oblique

Unopposed muscles draw the affected eye up and in



This is an extreme example of trochlear nerve palsy. The effect is often more subtle than this.

Clinical Correlate

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Abducens Palsy

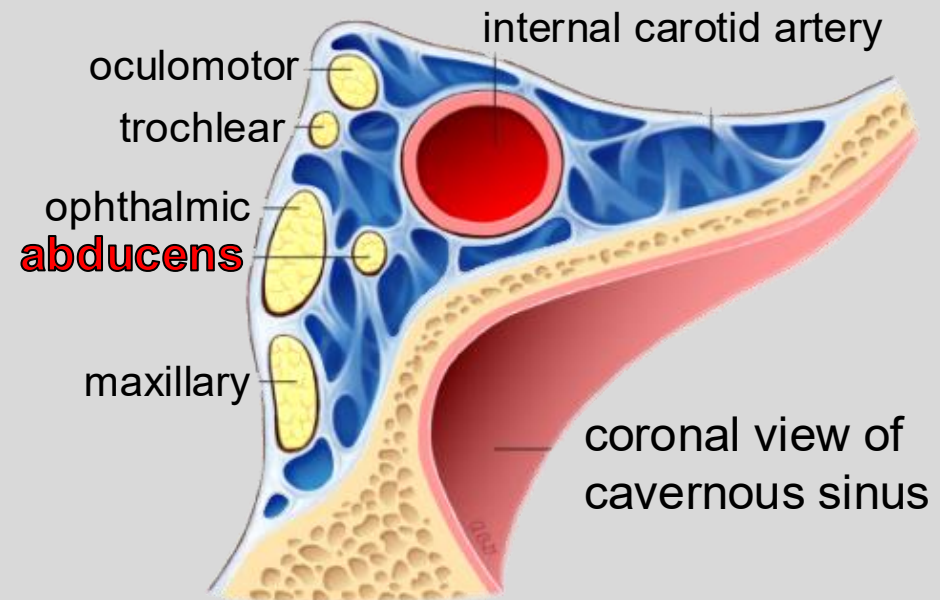
Lesion produces weakness / paralysis of the lateral rectus muscle

Unopposed medial rectus pulls eye towards nose



Abducens lies most medial in the cavernous sinus

This placement puts the nerve ***the most at risk*** for compression related to aneurysms and blood clots





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Paths and Functions of Somatic Afferents and Efferents of the Head and Neck

Jason Bourke, Ph.D.

Department of Biomedical and Anatomical Sciences

jbourke@nyit.edu

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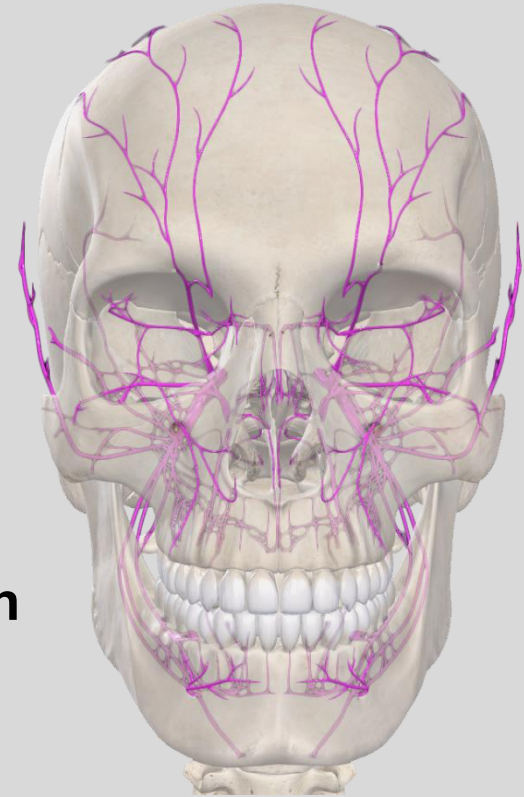
Trigeminal

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Trigeminal is the largest cranial nerve

It provides sensation to most of the head and neck

The name trigeminal, refers to the unique trifurcation taken off the brain



CN V₁ — Ophthalmic

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Smallest division of trigeminal

Travels in lateral wall of cavernous sinus

Exits endocranium through superior orbital fissure

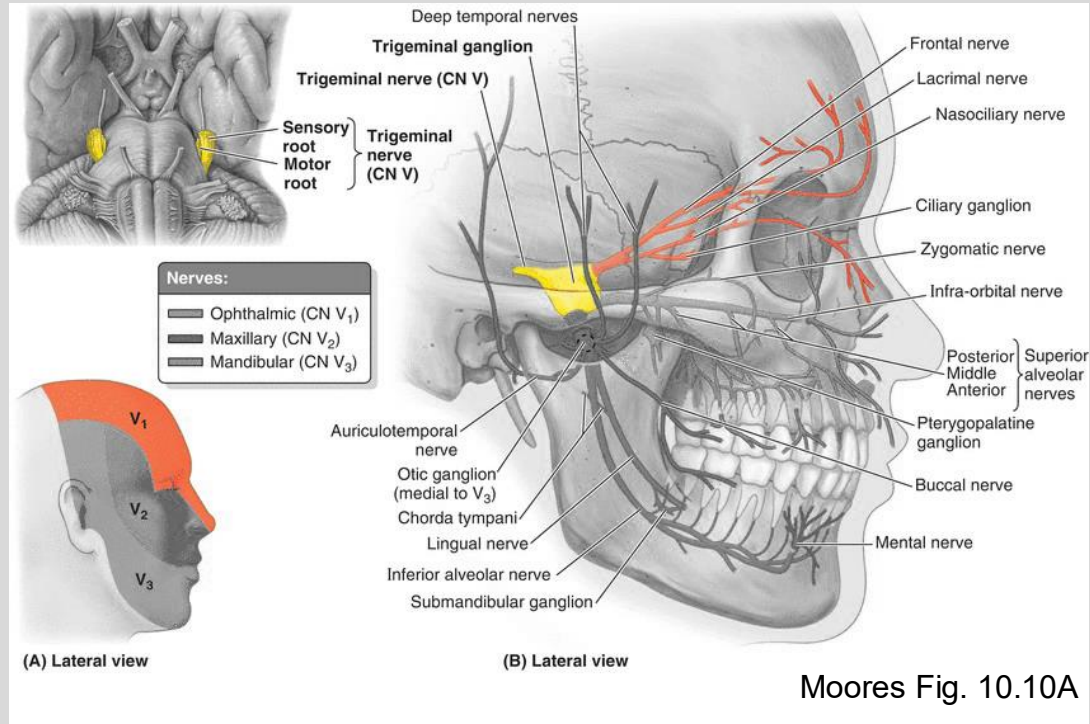
100% sensory

Provides sensation from upper eyelid through the scalp, cornea and most of external nose

Has three main branches

- Frontal nerve
- Nasociliary nerve
- Lacrimal nerve

Greek: ophthalmikos = *of the eye*



CN V₃ — Mandibular

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Inferior Alveolar Nerve

The only nerve to *enter* the mandible
enters at mandibular foramen
travels in the mandibular canal

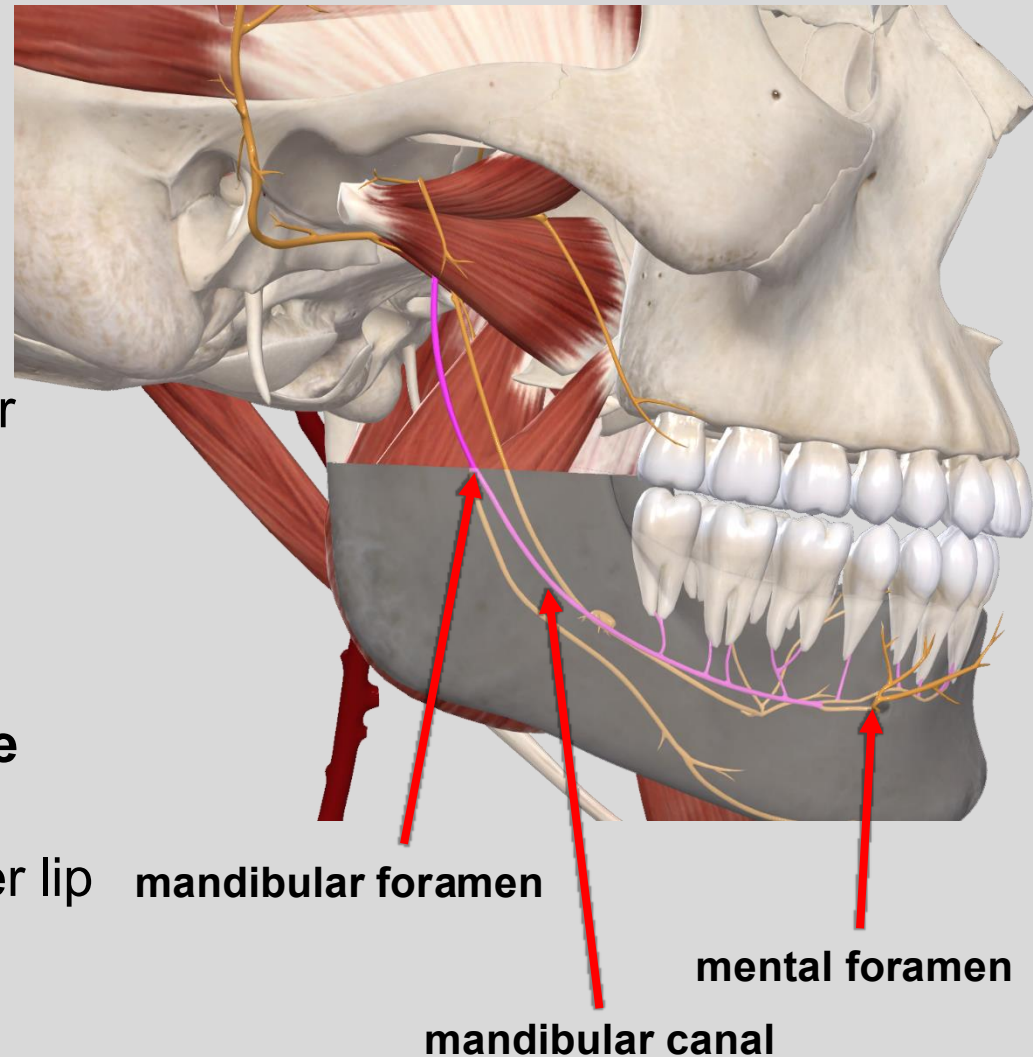
Innervates most or all the mandibular
teeth

Exits skull at mental foramen

Changes names to the **mental nerve**

Provides sensory innervation to lower lip
and chin

Latin: mentālis = chin



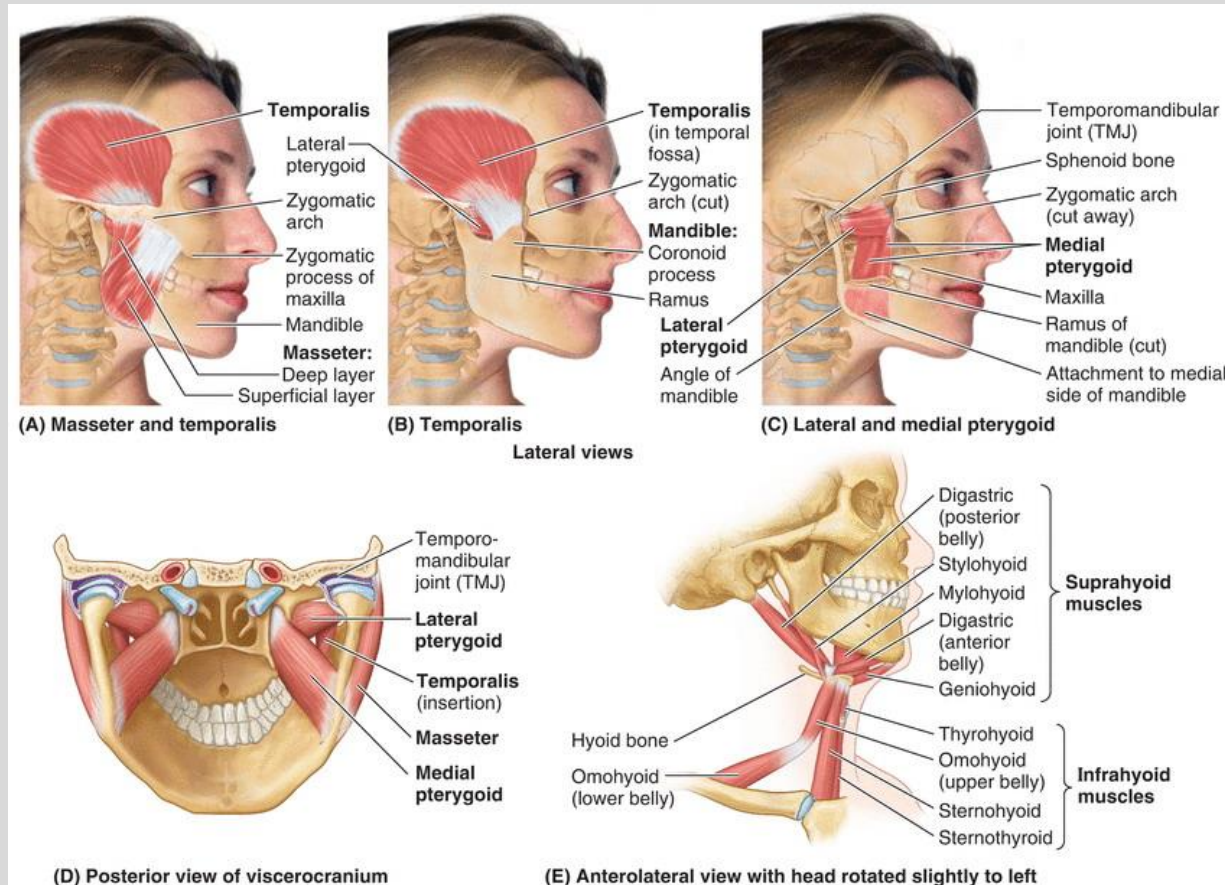
CN V₃ — Mandibular

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Muscles of Mastication

Mastication = chewing

This is a complicated process involving multiple muscles acting together



CN V₃ — Mandibular

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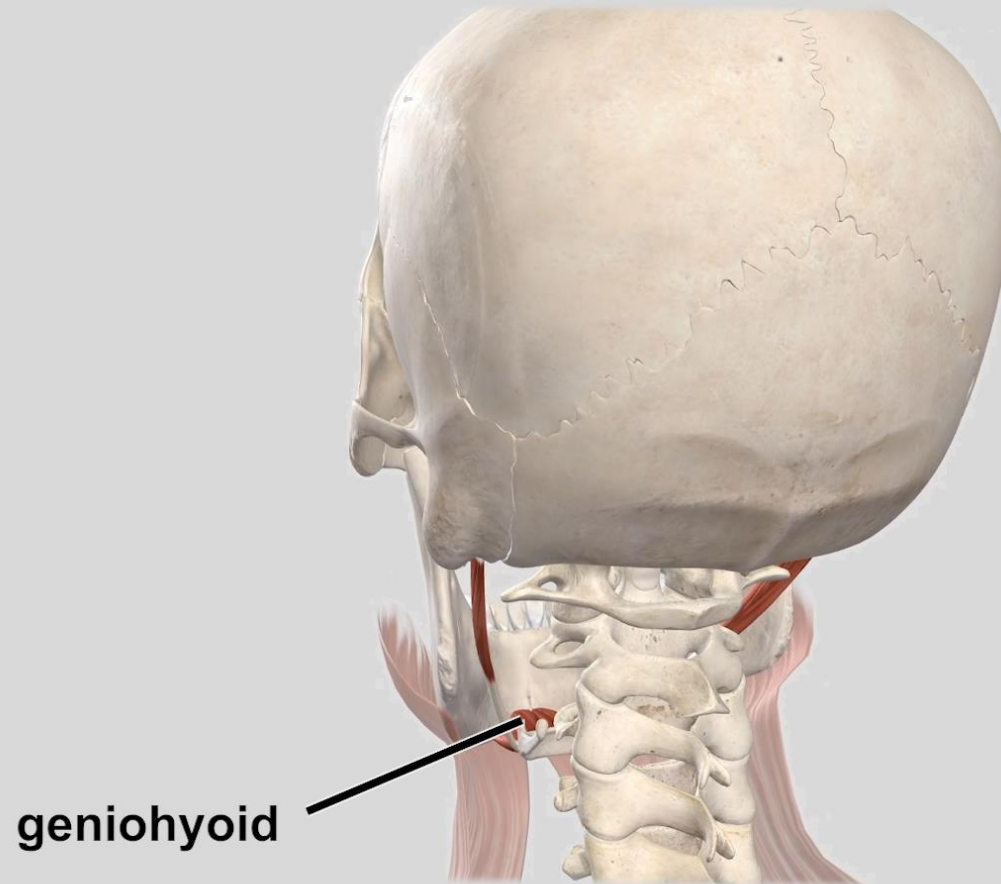
Muscles of Mastication

“Accessory muscles” of mastication

digastric (post belly)

geniohyoid

infrahyoid muscles



CN V₃ — Mandibular

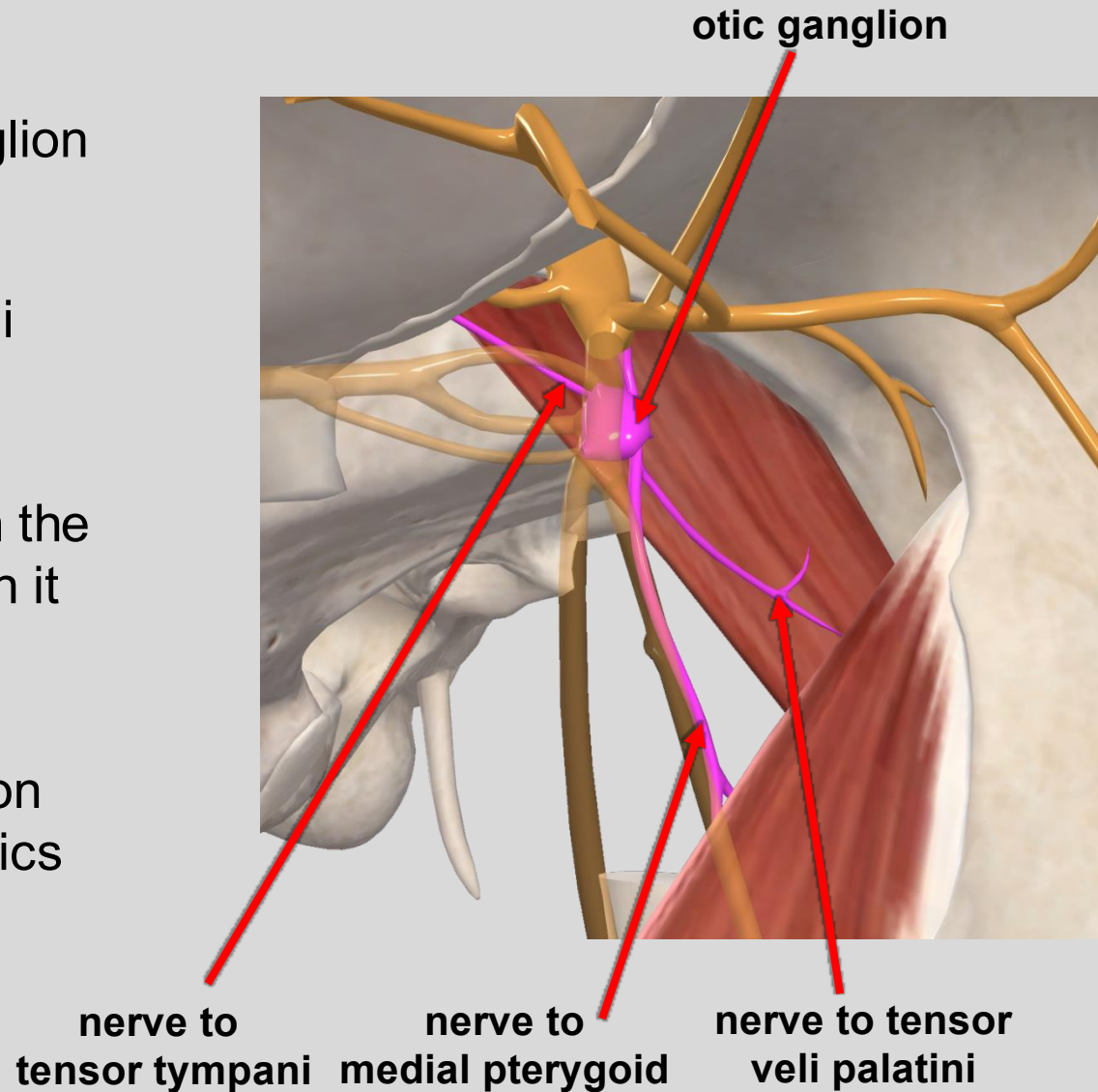
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3 nerves pass through otic ganglion

1. Nerve to medial pterygoid
2. Nerve to tensor veli palatini
3. Nerve to tensor tympani

These nerves *do not synapse* in the ganglion. They just pass through it

Otic and pterygopalatine ganglion are more important for autonomics (CN VII, CN IX)



CN V — Trigeminal

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Clinical Correlates

Trigeminal neuralgia (tic douloureux)

Misfiring of one or more branches of trigeminal

Patients complain of acute, intense pain on face

Can be stimulated by a slight breeze

Most cases are idiopathic

Treatment varies from local anesthesia to nerve resection



CN V — Trigeminal

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Clinical Correlates

TMJ disorders

Problem related to the temporomandibular jaw joint

Unbalanced muscle firing produces

- Misaligned teeth

- Can lead to tooth grinding (bruxism)

- Jaw tenderness

- Headaches

- Lock jaw

- Ear pain (e.g., through auriculotemporal nerve aggravation)



CN VII — Facial

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Main motor nerve for the face

Innervates all the muscles of facial expression (20+ muscles)

Major autonomic nerve for the face

Facial consists of 2 roots

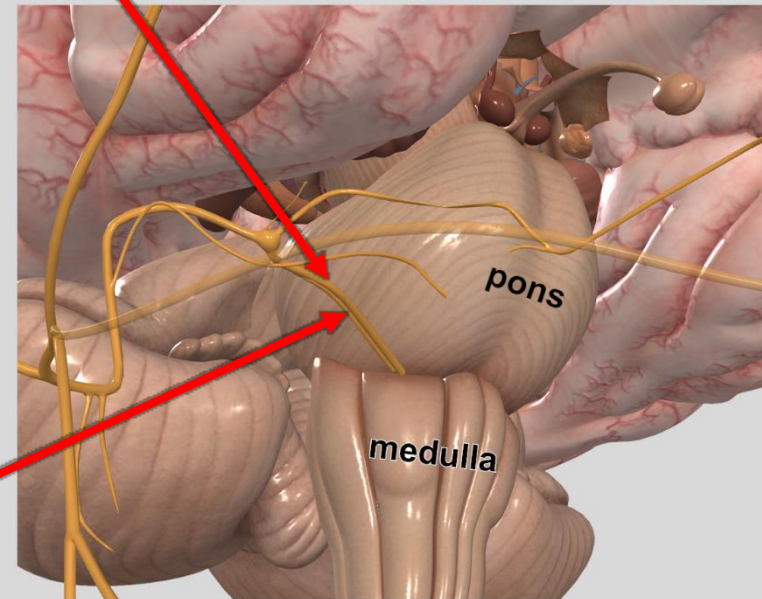
1. Primary motor root
(facial nerve proper) = somatic motor

2. Intermediate root / nerve = sensory & parasympathetics

Exits endocranium through internal acoustic meatus

facial nerve proper

intermediate root



anteroventral view

CN VII — Facial

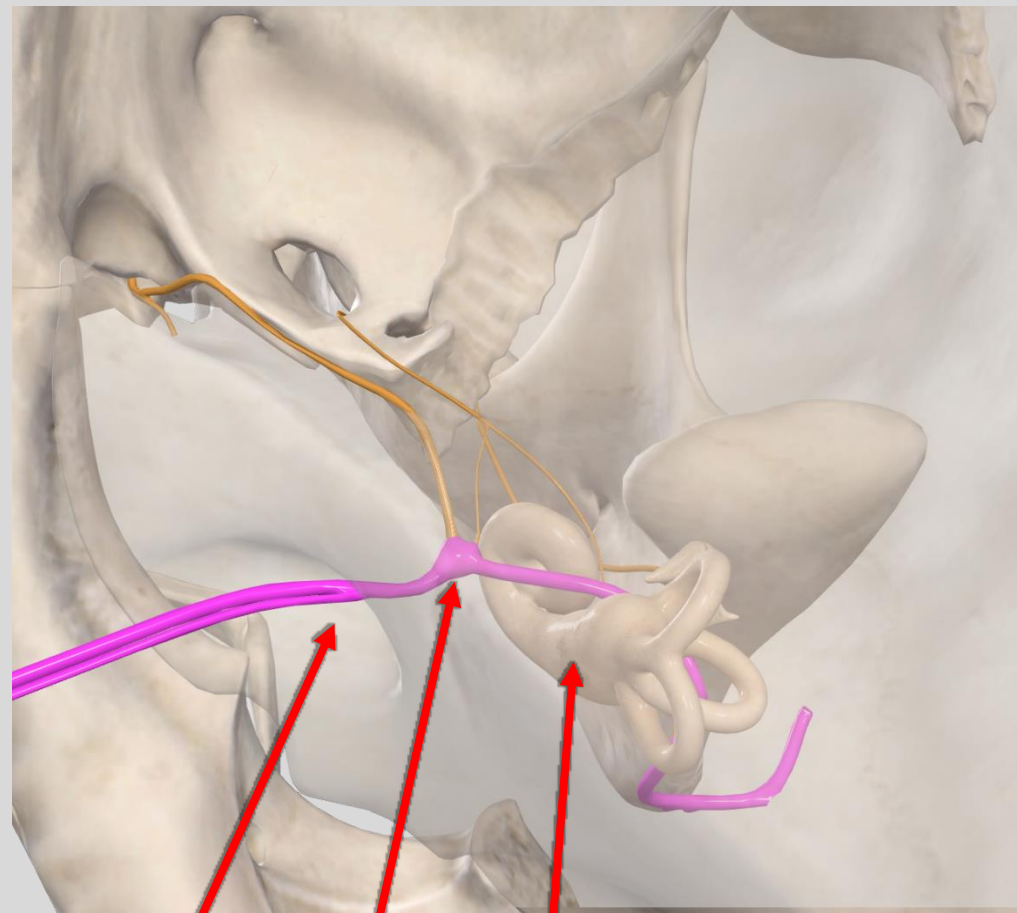
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Facial nerve takes the *longest intraosseous course* of any cranial nerve

Facial nerve travels through the facial canal

At geniculum, facial nerve expands into geniculate ganglion

Geniculate ganglion is important for the autonomic component of facial



internal acoustic meatus

middle ear cavity

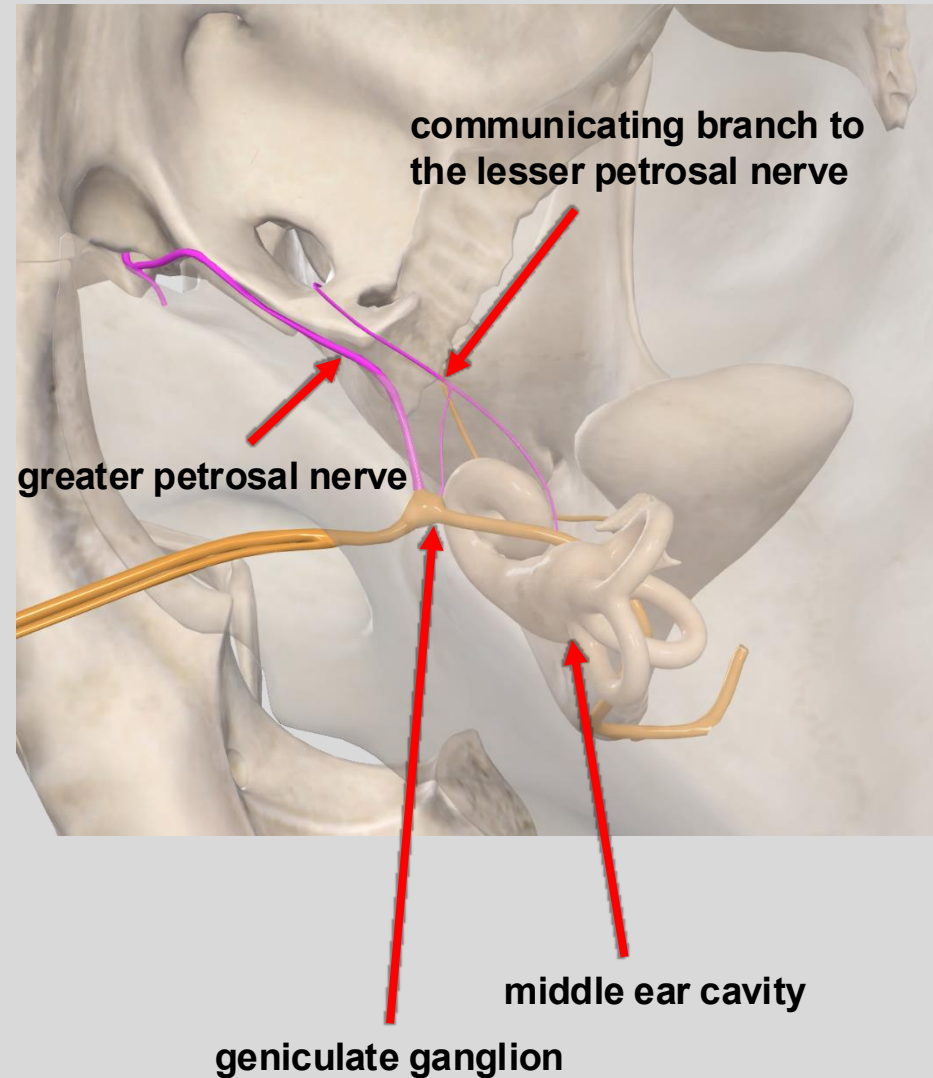
geniculate ganglion

Latin: *genu* = knee

3 branches exit the geniculate ganglion

- 1) Greater (superficial) petrosal nerve
- 2) Communicating branch to the lesser petrosal nerve
- 3) External petrosal nerve
(not shown in Complete Anatomy)

These branches send autonomic innervation around the head



CN VII — Facial

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The rest of facial *exits the skull* through the stylomastoid foramen

After exiting, facial sends out the posterior auricular nerve

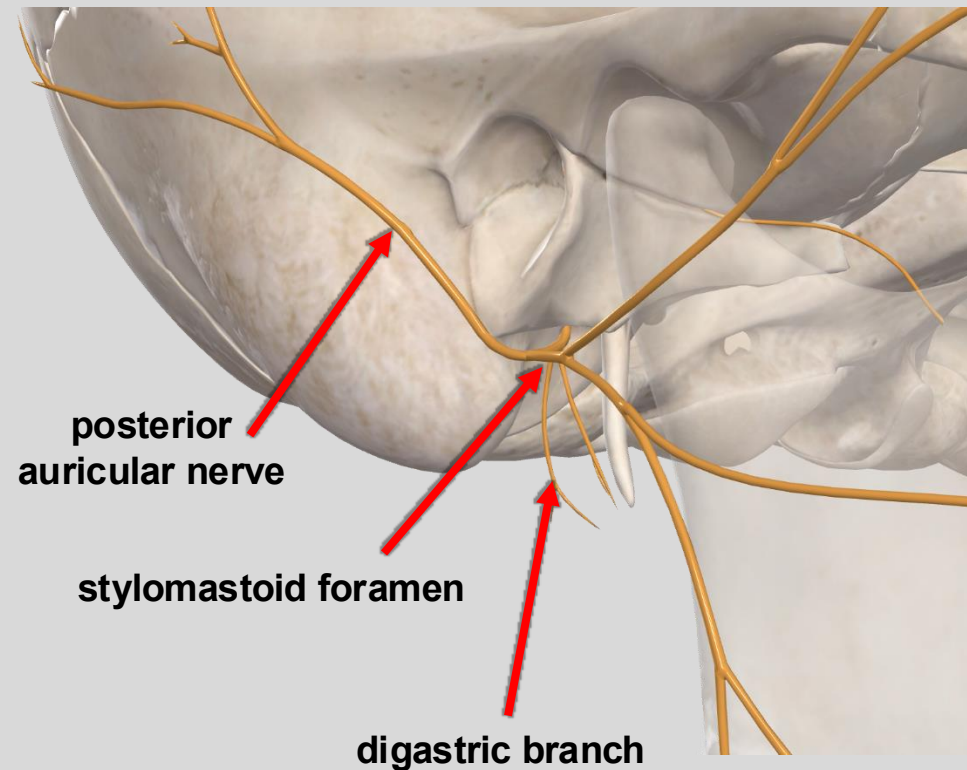
innervates vestigial ear muscles

The digastric branch innervates the posterior belly of digastric

Digastric muscle has dual innervation

Anterior belly = CN V₃

Posterior belly = CN VII



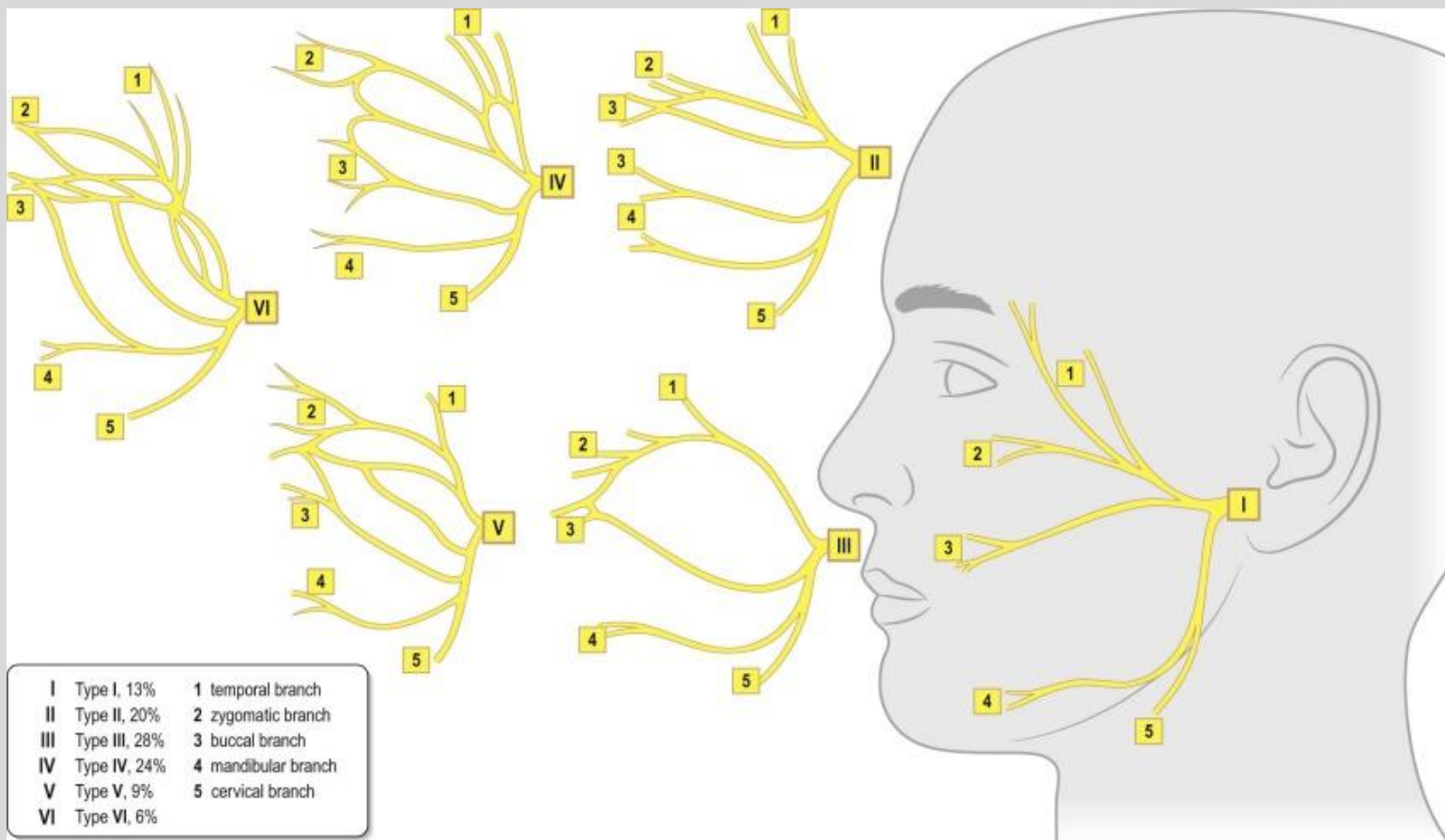
The rest of facial continues on to form the **parotid plexus**

CN VII — Facial

Parotid Plexus

Arbourization pattern of the parotid plexus is highly variable

You will only be tested on the “textbook” version



CN VII — Facial

Clinical Correlate

Bell's Palsy

40

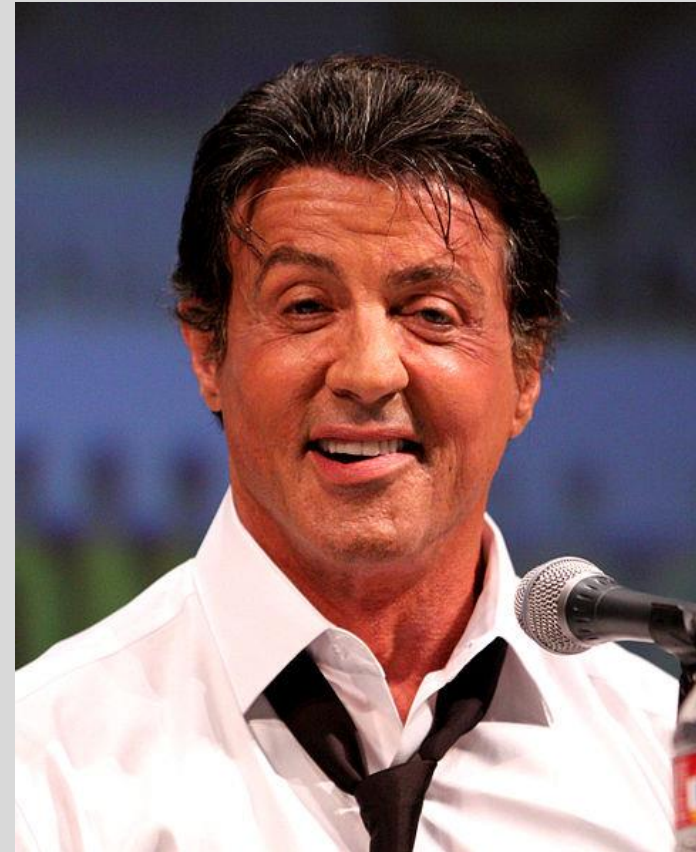
Lesion to one or more branches of parotid plexus

Causes partial / total paralysis of ipsilateral facial muscles

Most cases are idiopathic

Symptoms usually to resolve over weeks / months

Occasionally Bell's Palsy is permanent



Sylvester Stallone
(permanent partial Bell's Palsy)

Cranial nerves: IX, X, XI & XII



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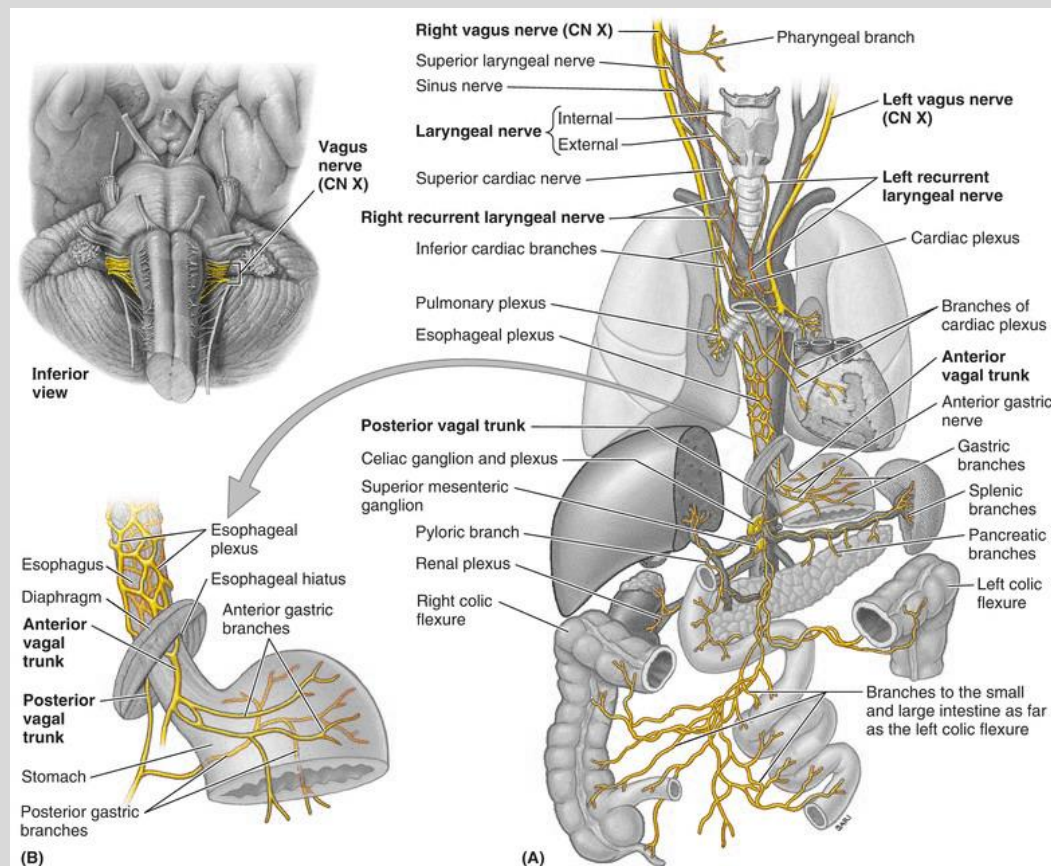
CN X — Vagus

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CN X has the most complicated distribution of all the cranial nerves

Main conduit of parasympathetic innervation below the neck

This lecture will only focus on the branches active in the head and neck



Moores Fig. 10.16

CN X — Vagus

Inferior Laryngeal Nerve

Main innervation for the larynx

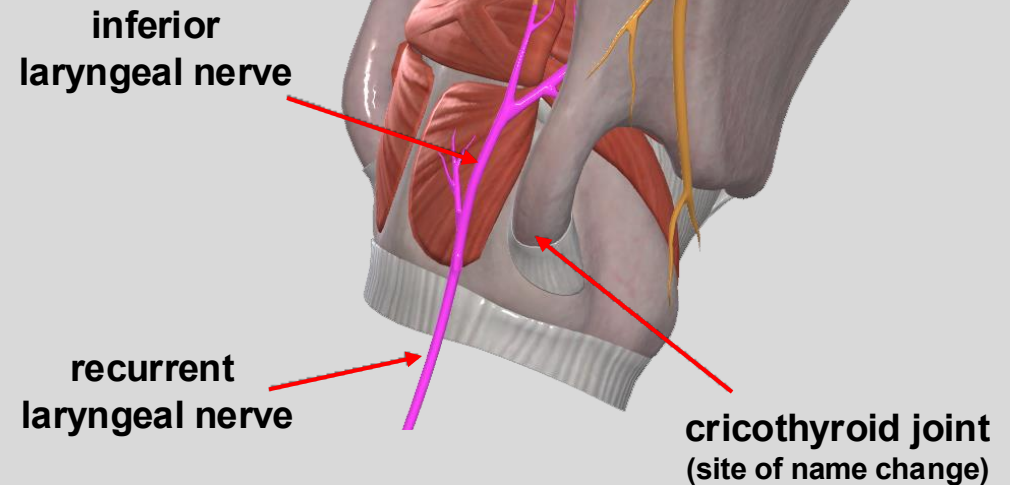
Afferent component = sensation to inferior glottic cavity

Efferent component = motor to all intrinsic laryngeal muscles (*except cricothyroid*)

Divides into 2 terminal branches

Anterior branch

Posterior branch



Note: You *do not* need to know which branch innervates which muscle

CN X — Vagus

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Clinical Correlates

Recurrent laryngeal nerve damage

Result of surgical accidents

e.g. thyroid tumour removal

Consequence of compression from tumours or aneurysms

Lesion produces partial / total paralysis of most laryngeal muscles

Unilateral lesion result in a voice that sounds hoarse

Bilateral lesion produces muteness and trouble breathing (vocal folds can't abduct)

Only muscle left unaffected is the cricothyroid



CN XI — Spinal Accessory

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Clinical Correlates

CN XI can be damaged in whiplash accidents or during birth

Shoulder drop



Trapezius weakness / paralysis
Shoulder slopes towards side of lesion

Torticollis



Sternocleidomastoid hypertonicity
or entrapment

Head tilts towards lesion. Face turns away

Stern's Law

Two muscles of the palate and tongue region have innervation exceptions
tensor veli palatini and palatoglossus

Jack Stern came up with a helpful way to remember this relationship

Stern's Law



-tensor = CN V₃

-palate = CN X

-glossus = CN XII

CN XII — Hypoglossal

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Clinical Correlate

Hypoglossal lesion test (Genioglossus test)

Lesions to hypoglossal present as weakness or paralysis of most tongue muscles

A common test for hypoglossal damage is to have patient stick out tongue

Weakened / paralyzed genioglossus will present asymmetric activation

Results in the tongue deviating to the lesion side

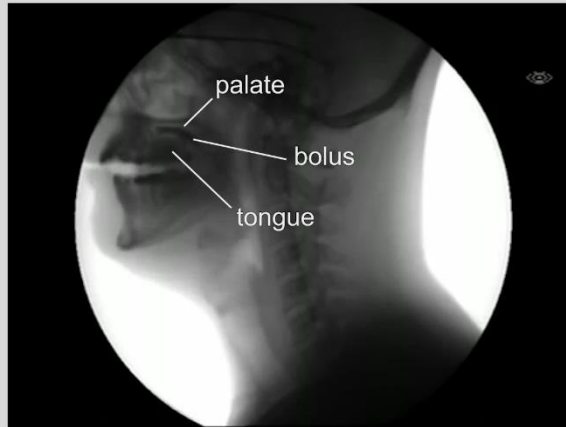


Swallowing (Deglutition)

3 stages to swallowing

Stage 1 — CN XII

Tongue pushes food bolus to back of mouth



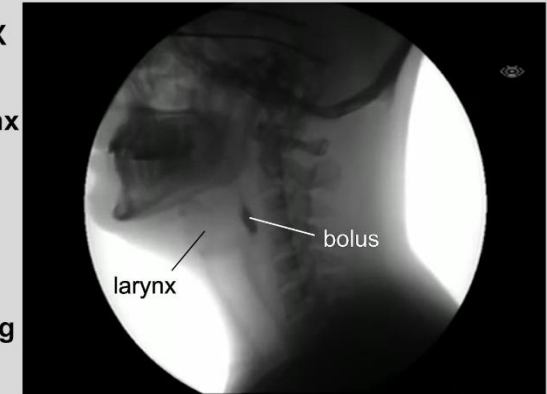
Michael Farnan (YouTube)

Stage 2 — CN V₃, IX, X

Soft palate is lifted sealing the nasopharynx (CN V₃, X)

Pharynx is lifted and widened (CN IX, X)

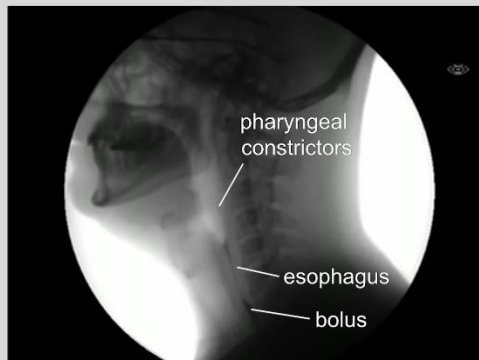
Epiglottis shuts, closing off trachea



Michael Farnan (YouTube)

Stage 3 — CN X

Rhythmic contraction of pharyngeal constrictors



Michael Farnan (YouTube)

Misfiring nerves produce dysphagia (trouble swallowing)

Ianessa Humbert (<https://shorturl.fm/jVAR9>)

Michael Farnan (<https://www.youtube.com/watch?v=umnnA50IDIY>)