Kharkiv National Medical University,
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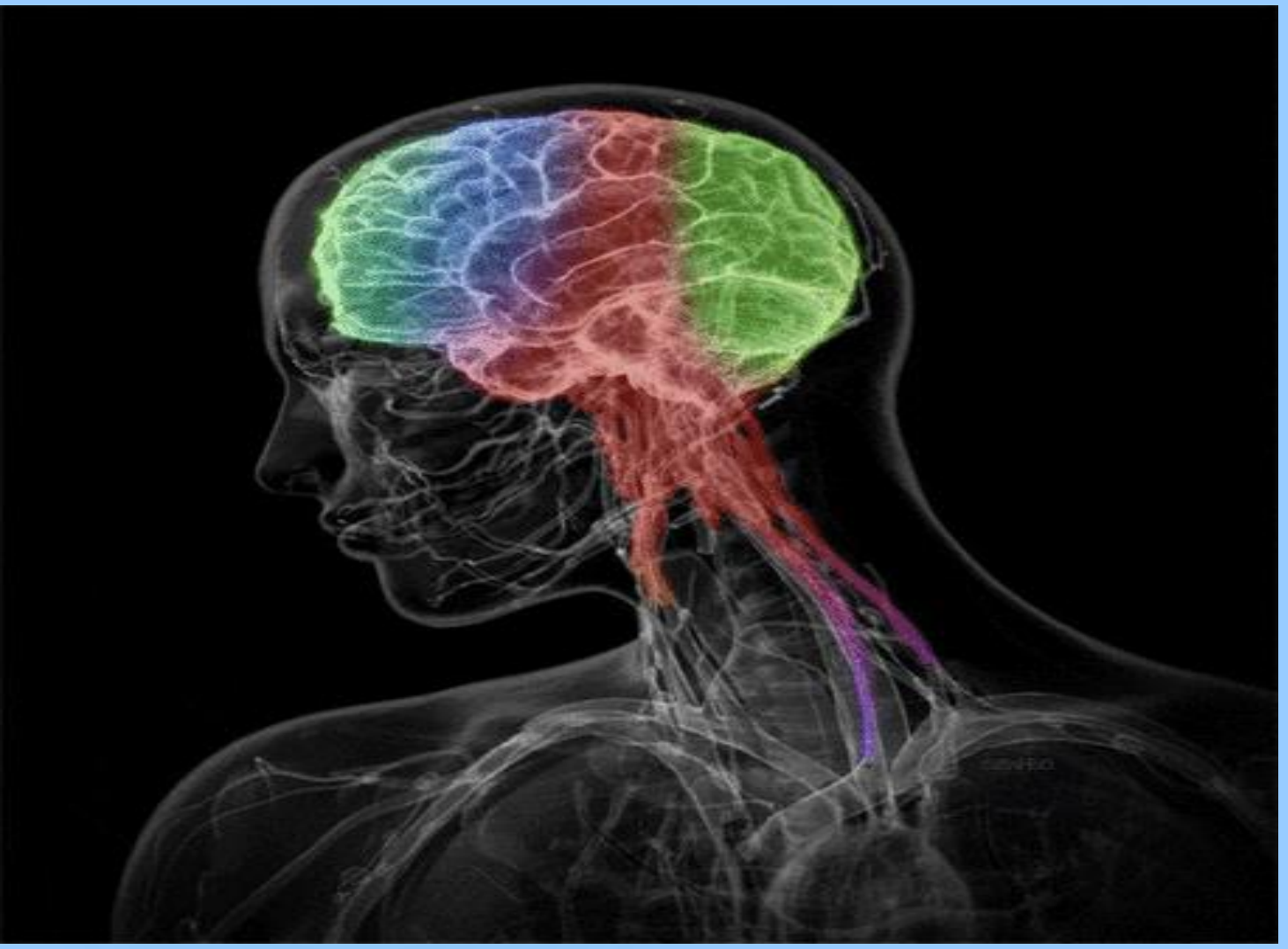
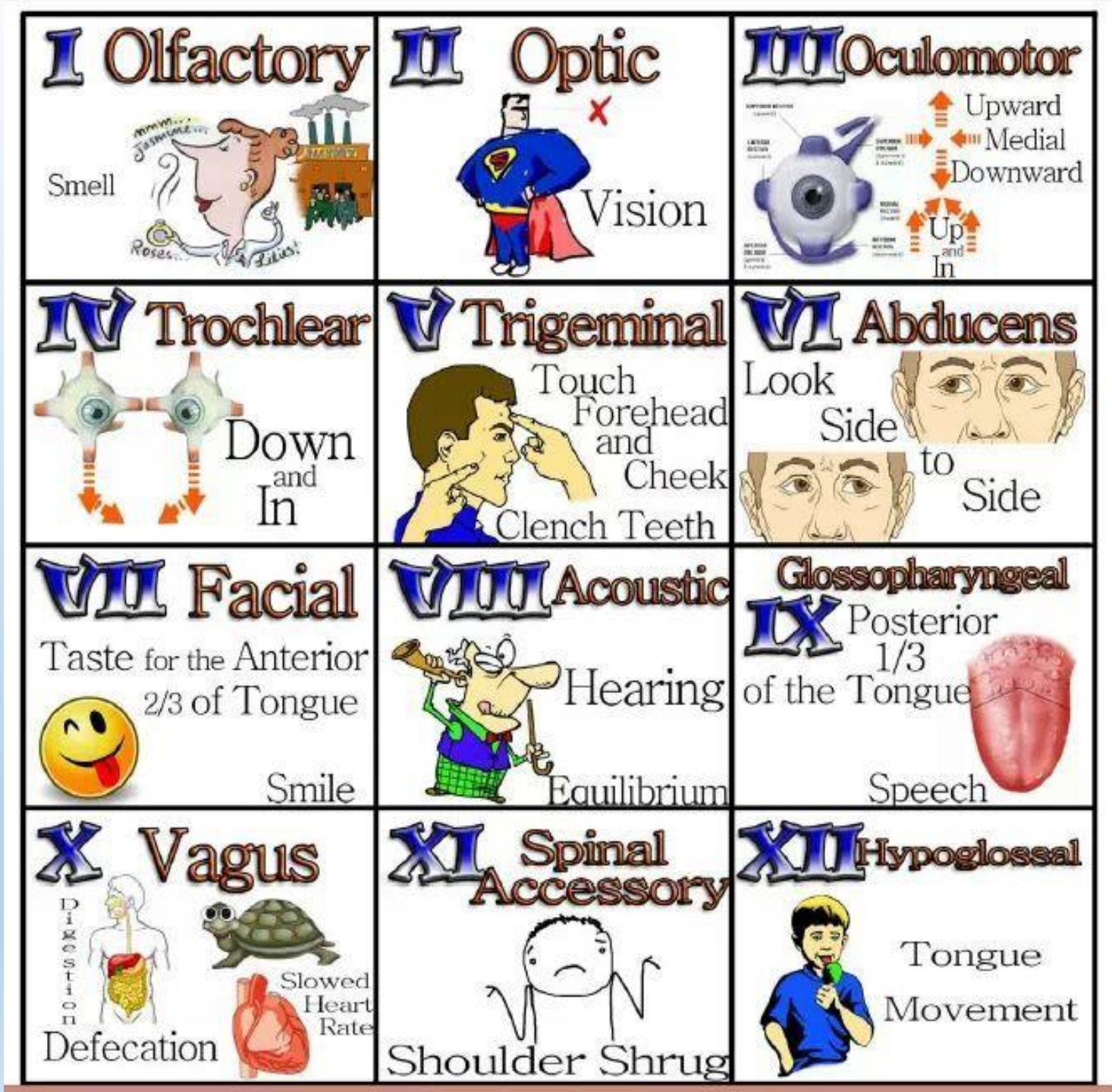


CRANIAL NERVES IX, X,XI, XII.

Associate professor, PhD, Hordiichuk Daria

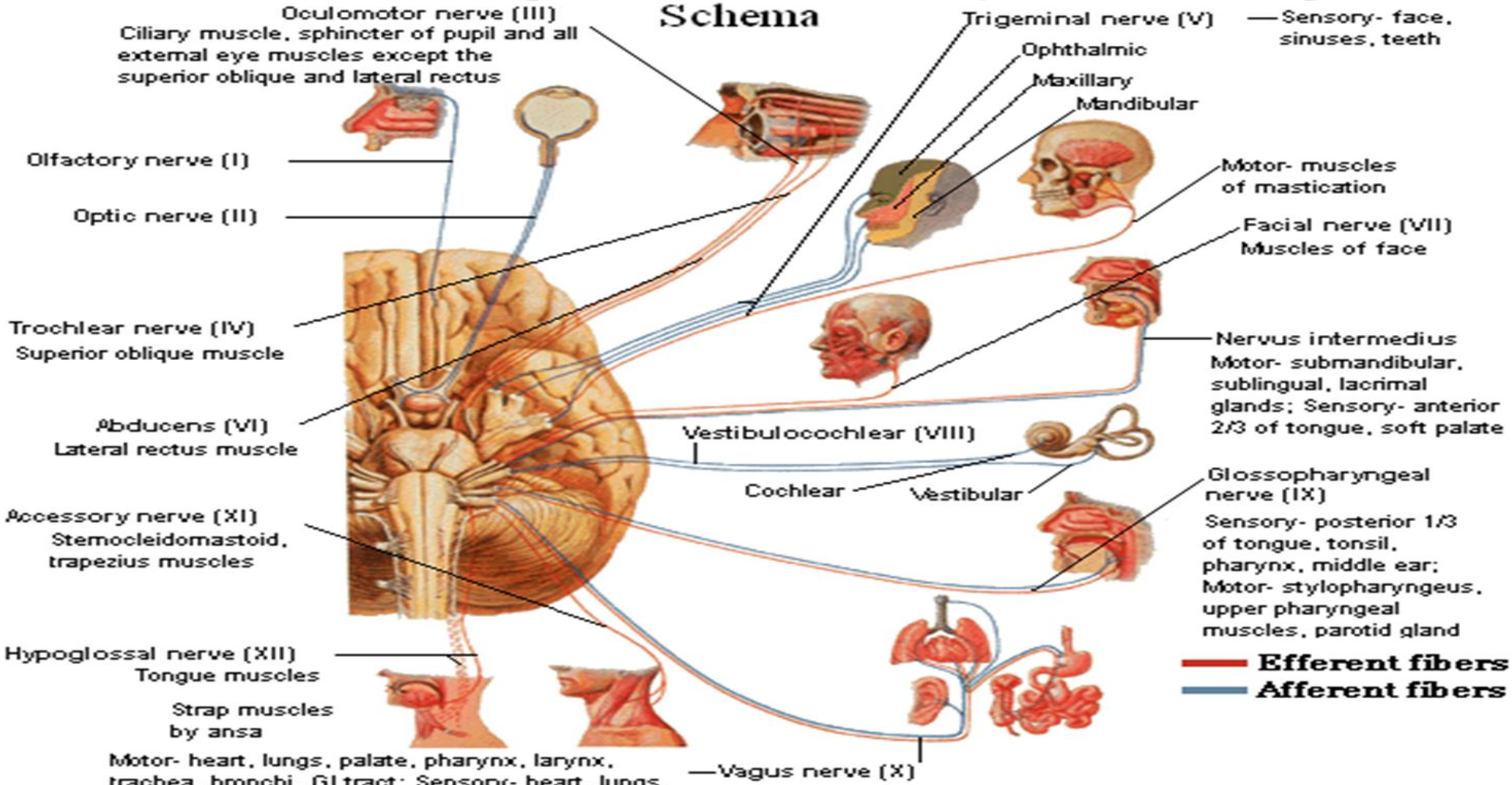
PLAN OF LECTURE:

1. Glossopharyngeal nerve (IX)
2. Vagus nerve (X)
3. Accessory nerve (XI)
4. Hypoglossal nerve (XII)



Cranial Nerves [Motor and Sensory Distribution]

Schema



CN IX

- Also called "a poor man's facial nerve", it is very similar to CNVII.
- Upon leaving the ventrolateral medulla below CNVIII, it traverses the subarachnoid space to exit via the jugular foramen.
- Upon exiting, it forms two sensory ganglions, where afferent general sensation, touch and pain of the tongue, pharynx and middle ear are relayed, alongside taste.
- The only muscle it innervates is the stylopharyngeus, and so it follows its course eventually reaching the tongue. It passes further inferiorly to convey inputs to the baro and chemoreceptors in the carotid body.
- Parasympathetic fibers leave via the tympanic nerve to join the lesser petrosal to synapse with the otic ganglion (associated with CNV3), innervating the parotid gland.

Glossopharyngeal nerve (CN IX)

Lesser petrosal nerve

Tympanic plexus in middle ear

Mastoid cells

Tympanic nerve (CN IX)

Auriculotemporal nerve (CN V_3)

Secretomotor branch to parotid gland

Trigeminal ganglion

Mandibular nerve (CN V_3)

Otic ganglion

Parotid gland and duct

(A)

Lesser petrosal nerve

Glossopharyngeal nerve (CN IX) traversing jugular foramen with internal jugular vein

Internal jugular vein

Carotid branch

Branches to stylopharyngeus

Carotid body and sinus

Pharyngeal branches

Inferior pharyngeal constrictor

Nerve to pharyngotympanic tube

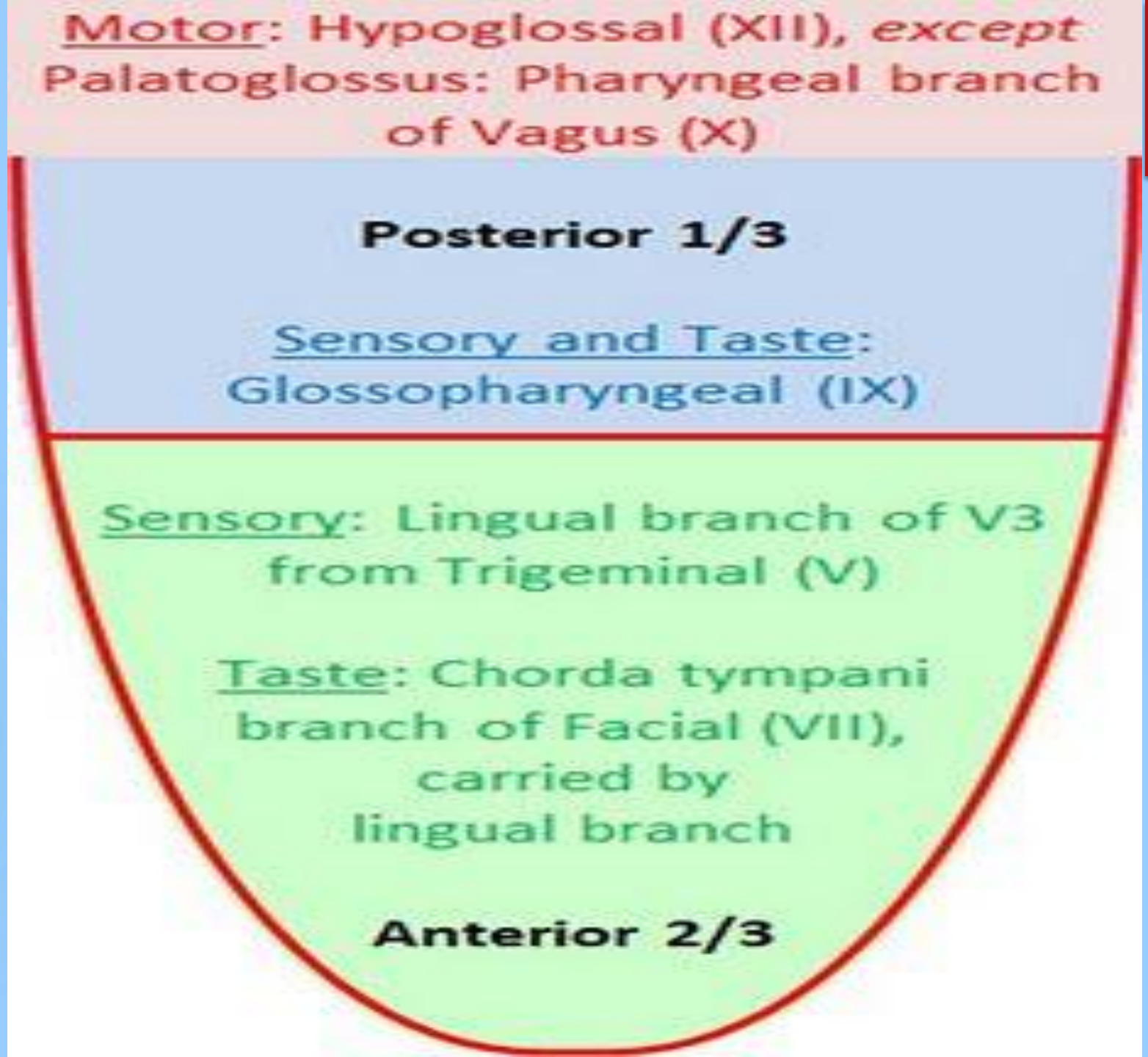
Tympanic nerve

Nerve to posterior wall of pharyngeal plexus

Nerve to palatine tonsil

Tongue

(B)


Motor: Hypoglossal (XII), except Palatoglossus: Pharyngeal branch of Vagus (X)
Posterior 1/3
Sensory and Taste: Glossopharyngeal (IX)
Sensory: Lingual branch of V3 from Trigeminal (V)
Taste: Chorda tympani branch of Facial (VII), carried by lingual branch
Anterior 2/3

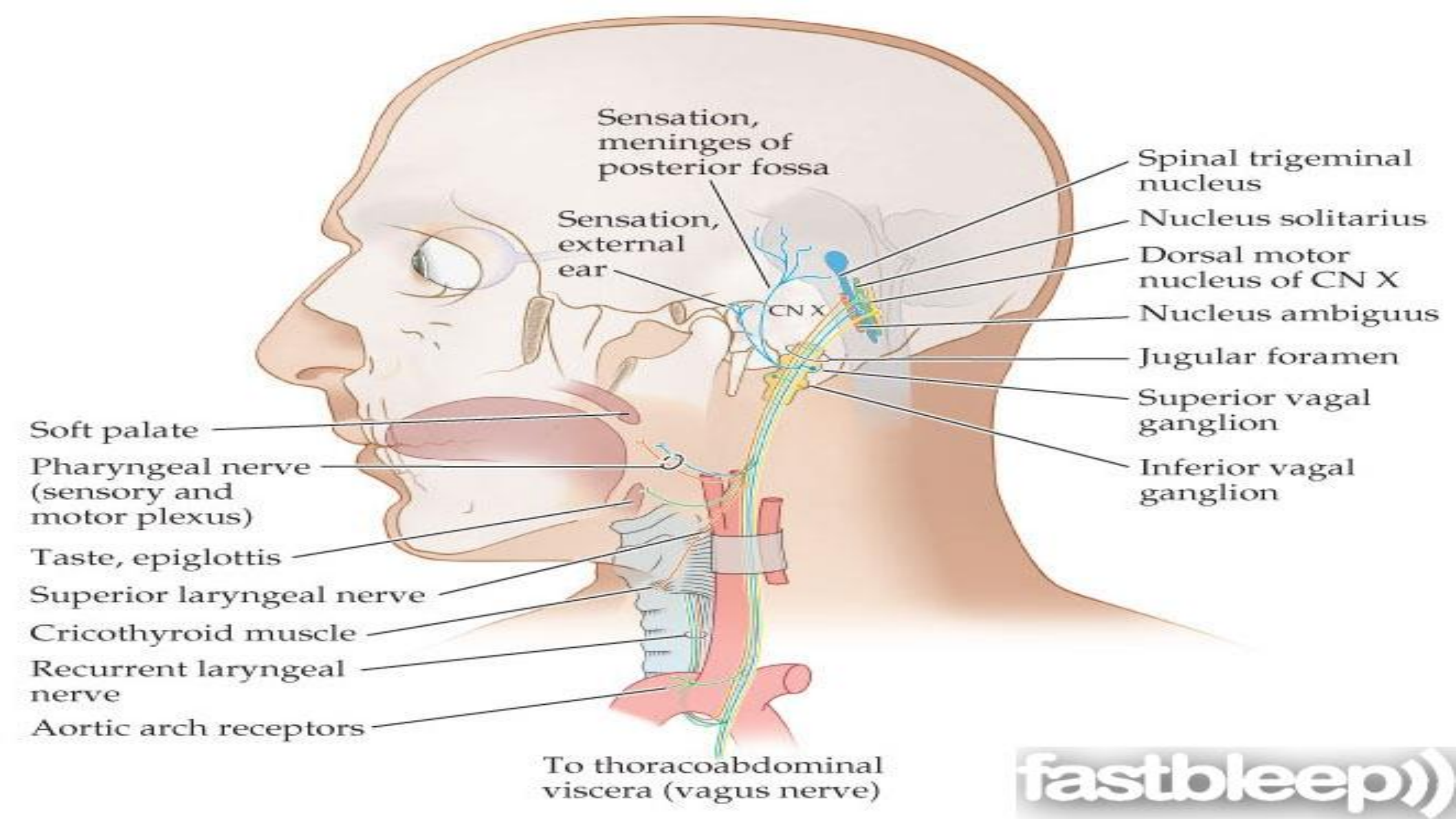
CLINICAL CORRELATION OF CN IX

- Usually isolated lesions of CNIX are fairly uncommon. However when they occur, taste is absent on the posterior 1/3 of the tongue, alongside an absence of the gag reflex (as the afferent limb is derived from CNIX). However, due to roughly 25% of the population having an absent gag reflex, this is usually not alone a diagnostic marker.
- Due to the fact that CN IX, X and XI all exit via the jugular foramen, it is common for tumours, infection or trauma to involve these adjacent cranial nerves. Infact tumours in this region cause "jugular foramen syndrome" leading to cranial nerve palsies.
- Glossopharyngeal neuralgia is very similar to trigeminal neuralgia, but limited to the throat and ear and worsens during eating by sensory stimulation, usually initiated by swallowing.

CN X

- The vagus nerve is named after the latin for wanderer, due to it having the longest course and extensive distribution.
- CNX leaves as several rootlets below CNIX on the ventrolateral medulla, crossing the subarachnoid space and exiting the cranium through the jugular foramen between CN IX and XI.
- Upon exiting, CNX forms 2 ganglions:
- the superior ganglion of vagus nerve- synapses with CNIX and the superior cervical ganglion. It is responsible for general sensation.
- the inferior ganglion of the vagus nerve- responsible for taste and chemoreceptors from aortic arch.

- As it descends CNX supplies all pharyngeal, laryngeal and upper oesophageal muscles.
- CNX continues inferiorly within the carotid sheath; from here it extends into the thorax, supplying parasympathetic sensation to the heart, lungs and bronchi.
- Upon reaching the eosophageal hiatus, it passes through with the eosophagus entering the abdomen. From here it innervates the oesophagus, stomach and intestines up to the colic flexure.


Sensation, meninges of posterior fossa
Sensation, external ear
CN X
Spinal trigeminal nucleus
Nucleus solitarius
Dorsal motor nucleus of CN X
Nucleus ambiguus
Jugular foramen
Superior vagal ganglion
Inferior vagal ganglion
Soft palate
Pharyngeal nerve (sensory and motor plexus)
Taste, epiglottis
Superior laryngeal nerve
Cricothyroid muscle
Recurrent laryngeal nerve
Aortic arch receptors
To thoracoabdominal viscera (vagus nerve)

Clinical Correlation of CN X

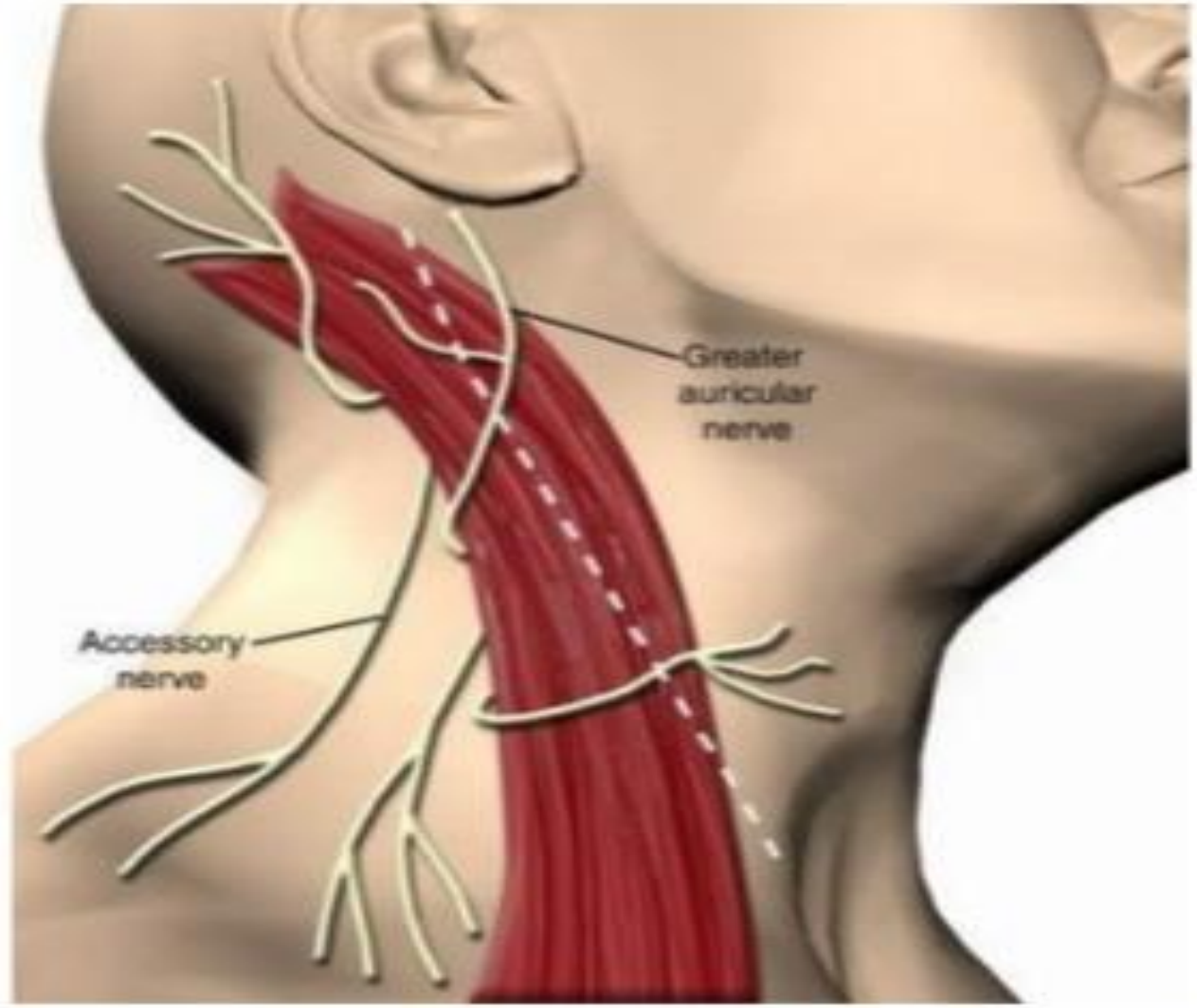
- Isolated lesions are very uncommon, however CNX damage to the pharyngeal branches can lead to dysphagia, and aphonia can develop due to paralysis of the laryngeal muscles.
- The recurrent laryngeal nerve (CNX branch) commonly occurs with surgery of the neck. thyroid surgery and carotid endarterectomy, or cardiac surgery due to the recurrent laryngeal looping around the arch of aorta on the left side. Aortic aneurysms and apical lung cancers can also damage the recurrent laryngeal. Damage to the recurrent laryngeal leads to loss of voice and inspiratory stridor.
- An abnormal gravelly voice is common in Parkinson's disease due to interference of basal ganglia dysfunction with articulation.
- Usually dysphagia and dysarthria occur together and can be caused by infarcts, cerebellar/brainstem lesions and alcohol. Commonly any dysphagia can lead to aspiration pneumonia due to impaired swallowing in an individual, and is frequently a cause of death.

CN XI

- This cranial nerve does not arise from the brainstem, rather from C1-5.
- These rootlets leave the spinal accessory nucleus between the dorsal and ventral nerve roots and ascend through the foramen magnum. Upon entering the cranium it exits the cranium via the jugular foramen by descending alongside the internal carotid artery. It eventually supplies the sternocleidomastoid (SCM) and the upper portion of the trapezius muscle. As it is leaving the cranium, some rootlet fibres from the nucleus ambiguus in the medulla join CNXI briefly before leaving immediately and rejoining CNX to form the recurrent laryngeal nerve. It is mentioned within literature that there are cranial contributions from the medulla, these fibers however do not connect with the spinal component and only travel with CNXI for a few cm, so functionally these fibers can be assumed still part of CNX.

CN XI - SPINAL ACCESSORY NERVE

- **ORIGIN:** Medulla
- **INNERVATION:** Sternocleidomastoid & trapezius muscles
- **FUNCTION:** Motor function Sternocleidomastoid & trapezius
- **DYSFUNCTION:** Muscle weakness.



CLINICAL CORRELLATION OF CNXI

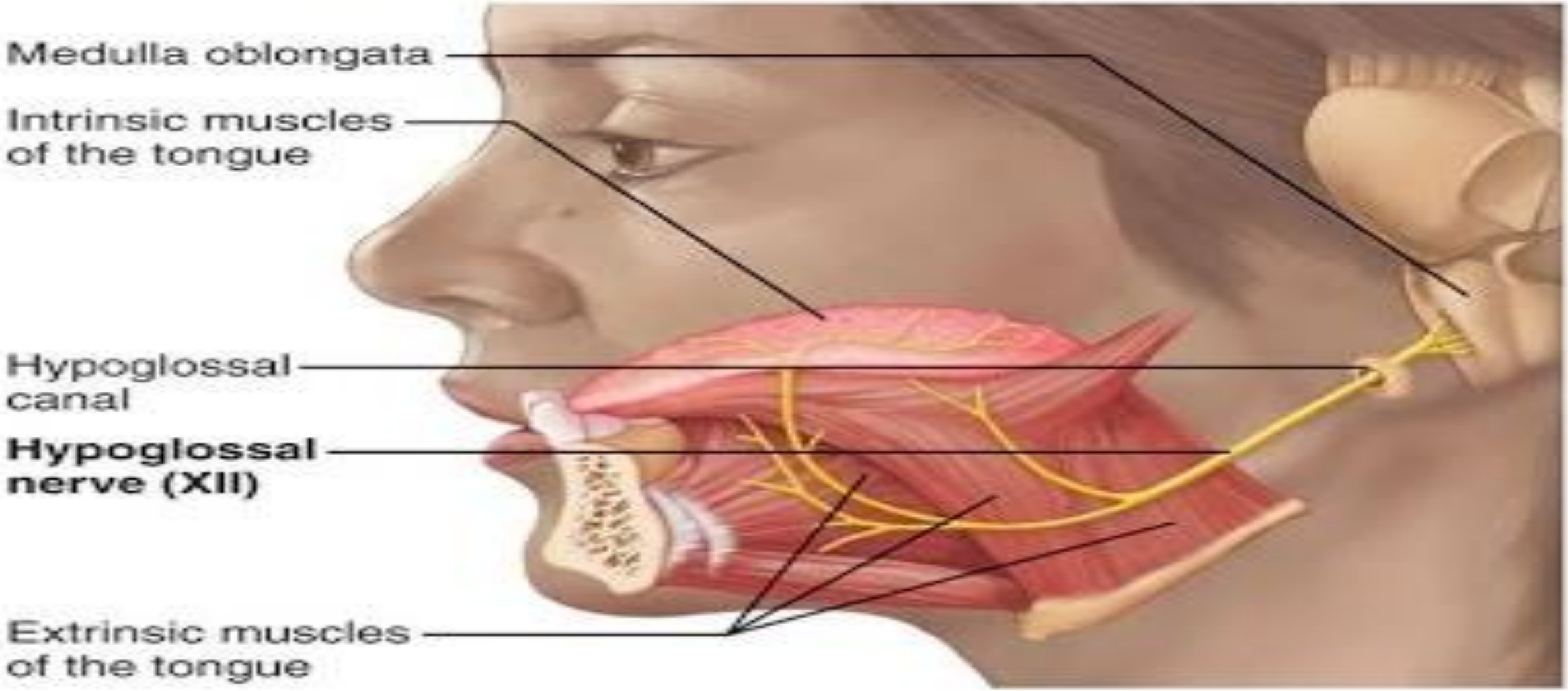
- lesions of CNXI cause ipsilateral weakness of the shoulder shrug due to trapezius damage and a weakness of the head turning away from the lesion, this is due to the left SCM turning the head right (and vice versa).
- Due to a tendency of other neck muscles to compensate for the SCM, it is essential to palpate the SCM to detect its contraction.
- Due to its very superficial course through the cervical region, it is very commonly damaged in surgery, especially lymph node biopsies, internal jugular vein cannulation and carotid endarterectomy.

CN XII

- Arising from several rootlets from the ventral medulla it leaves the cranium via the hypoglossal canal.
- Upon leaving the hypoglossal canal, it is joined by branches of the cervical plexus which use CNXII to reach the hyoid muscles.
- Upon reaching the angle of the mandible it travels anteriorly to innervate all intrinsic and extrinsic muscles of the tongue (except the palatoglossus).

The Hypoglossal Nerves - XII

- Runs inferior to the tongue
  - Innervates the tongue muscles



CLINICAL CORRELATION OF CNXII

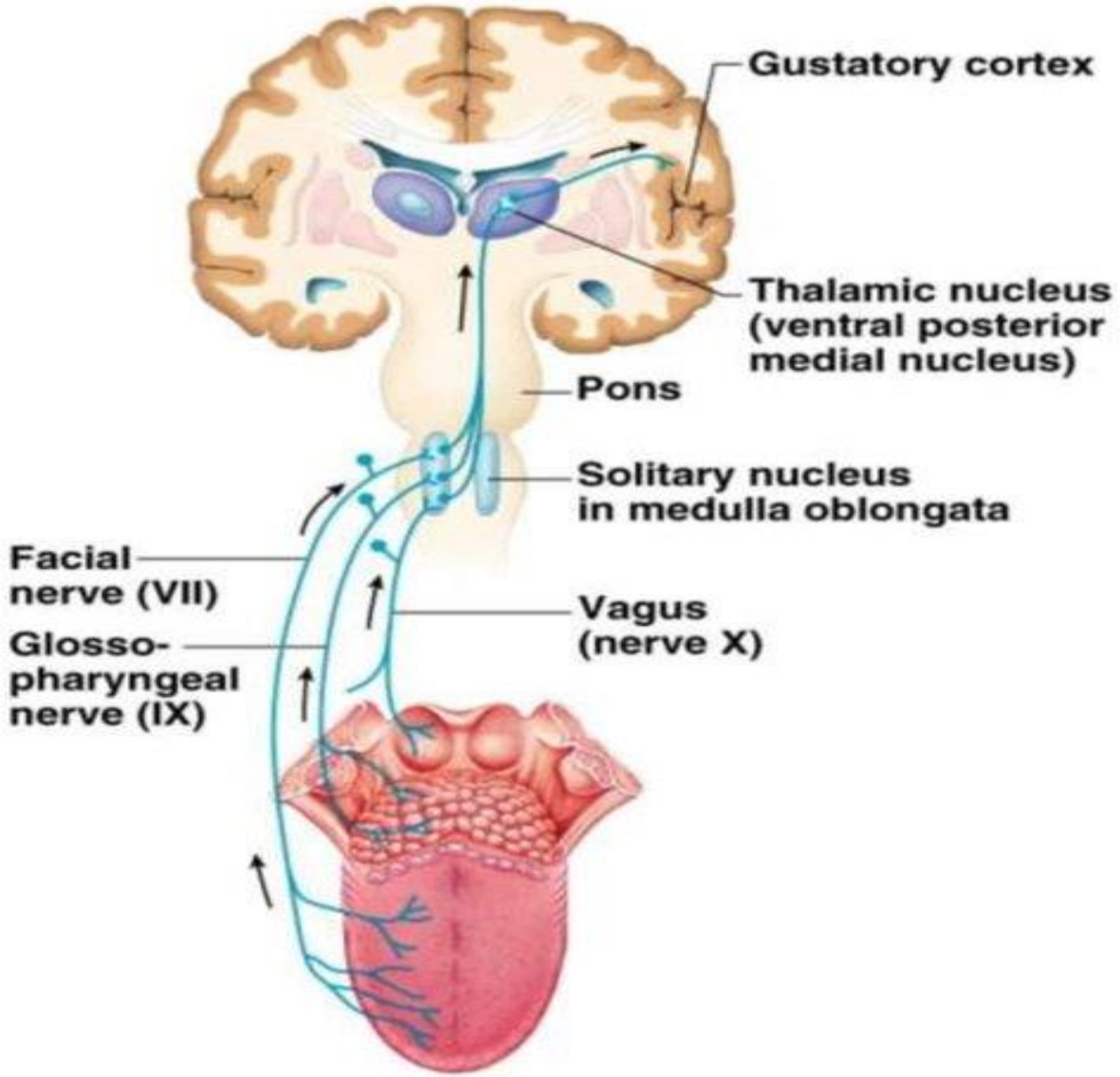
- Upper motor neurones that control tongue movement decussate within the corticobulbar tracts before arriving at the hypoglossal nuclei. This means lesions of the primary motor cortex/internal capsule cause contralateral weakness of the tongue, whereas lesions of the hypoglossal nuclei cause ipsilateral weakness of the tongue.
- Tongue weakness causes the tongue upon protrusion to deviate towards the weak side due to overactive compensatory action of the other hypoglossal nerve. CNXII damage also causes tongue muscles to atrophy.

Taste (gustatory) pathway

- 1. Receptors Taste buds on tongue, lips, palatal arch and soft palate. Each "bud" contains several cell types in microvilli (taste hairs) that project through taste pore.
- Gustatory receptor cells communicate with cranial nerve axon endings to transmit sensation to brain.
- Cranial Nerves of taste
- Anterior 2/3 tongue: chorda tympani→ Facial nerve
- Posterior 1/3 tongue: Glossopharyngeal nerve
- Most posterior part of the tongue: Vagus nerve

Gustatory Pathway from Taste Buds

- Taste information reaches the cerebral cortex
  - Primarily through the facial (VII) and glossopharyngeal (IX) nerves
  - Some taste information through the vagus nerve (X)
  - Sensory neurons synapse in the medulla
    - Located in the solitary nucleus



Thx for your attention!!!!