FINAL HEAD AND NECK PART 2
DISCUSSION SESSION: GROSS ANATOMY

ONN BLOCK

Feb 12, 2021

Discuss A Little Bit of Everything

SPINAL REFLEXES

SPINAL REFLEXES AND DISORDERS

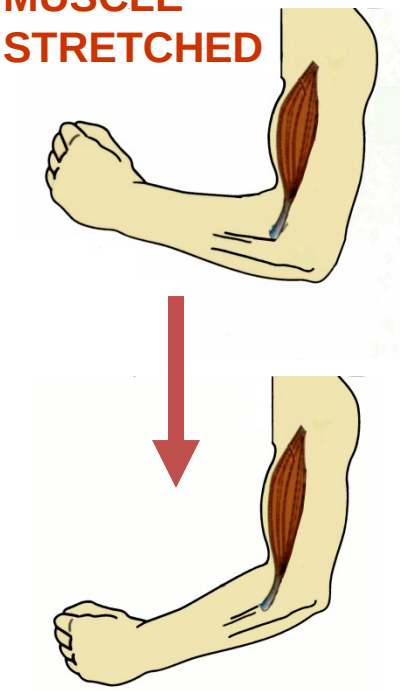
REFLEX	STIMULUS/SENSE ORGAN(S) EXCITED	NORMAL RESPONSE	UPPER MOTOR NEURON DISORDERS
Stretch (Myotatic, Deep Tendon) Reflex – Compensatory maintain position (ex. riding on moving bus)	Rapid Stretch of muscle (test: tap on muscle tendon) Excites Muscle Spindle Primary (Ia) and Secondary (II) sensory neurons (NOT Golgi Tendon Organ)	Stretched muscle contracts rapidly (monosynaptic connection); also Excite synergist and Inhibit antagonist Note: Gamma motor neurons can enhance stretch reflexes, tell patient to relax before test	Hyperreflexia - (increase) - characteristic of Upper Motor Neuron lesions (ex. spinal cord injury, damage Corticospinal tract); note: Clonus = hyperreflexia with repetitive or sustained contractions to single stimulus
Autogenic Inhibition - Limits Muscle Tension	Large force on tendon excites Golgi Tendon Organ Ib (test: pull on muscle when resisted)	Muscle tension decreases; Also inhibit synergist muscles; excite antagonist muscles	Clasped Knife Reflex - occurs in Upper Motor Neuron lesions - forceful stretch of muscle is first resisted then collapses
Flexor Reflex - Protective avoidance reflex	Sharp, painful stimulus, as in stepping on nail; Excites - Cutaneous and pain receptors (test: stroke foot with pointed object)	Limb is rapidly withdrawn from stimulus; protective reflex; also inhibit extensors of same limb and excite extensors of opposite limb (Crossed Extensor Reflex)	Babinski sign- toes extend (dorsiflex) to cutaneous stimulus of sole of foot (normally plantar flex); characteristic of Upper Motor Neuron lesion

STRETCH REFLEX

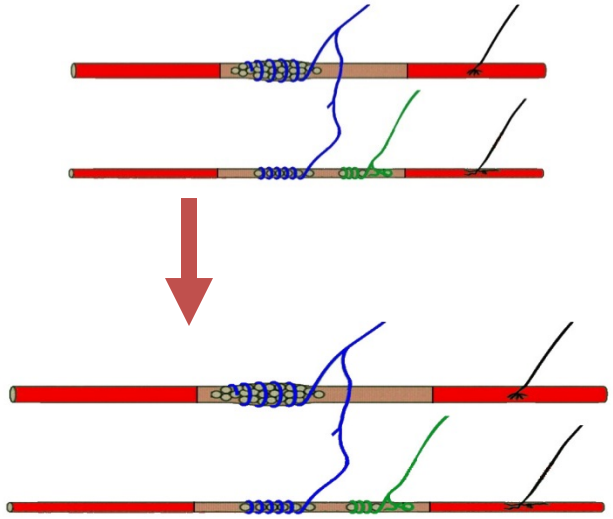
STIMULUS

RESPONSE

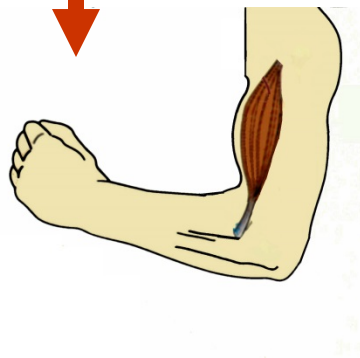
BICEPS MUSCLE STRETCHED



BICEPS MUSCLE SPINDLE



BICEPS MUSCLE CONTRACTS



1) Stimulus - <u>fast stretch</u> of muscle

2) Sense organ excited - Muscle spindle Ia and II sensory neurons

3) Primary response - muscle that is stretched <u>contracts rapidly</u>

OTHER COMPONENTS OF STRETCH REFLEX

**

1) Excite synergist muscles - spindle afferents also make excitatory monosynaptic connections with synergist muscles

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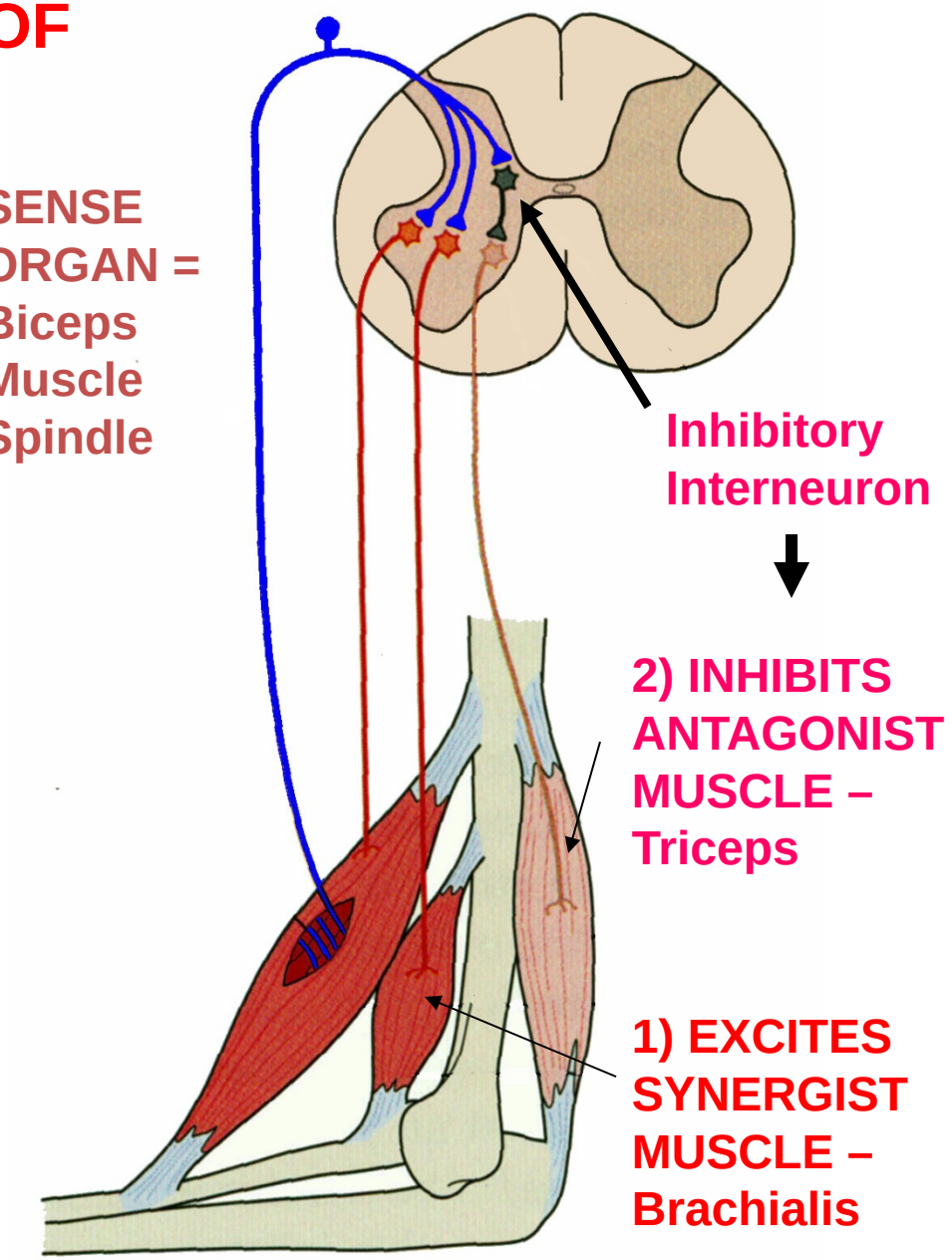
2) Inhibit antagonist muscles - RECIPROCAL INHIBITION - Spindle activity also excites interneurons that make inhibitory synapses on motor neurons to antagonist muscles (polysynaptic)



FLEXOR REFLEX: OTHER EFFECTS
ALL ARE POLYSYNAPTIC BY INTERNEURONS

1) Excite synergist muscles - excite other flexors in same leg (other joints)

2) Inhibit antagonist muscles - inhibit Extensors in same leg

3) CROSSED EXTENSION REFLEX - EXCITE EXTENSORS AND INHIBIT FLEXORS IN OPPOSITE LEG

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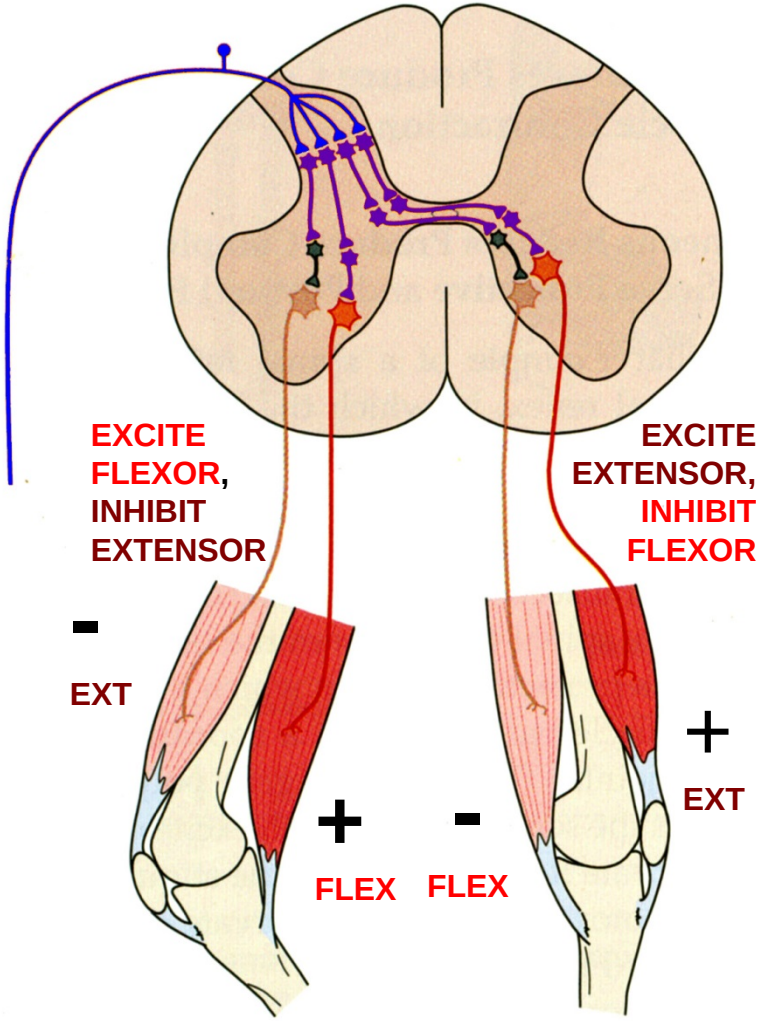

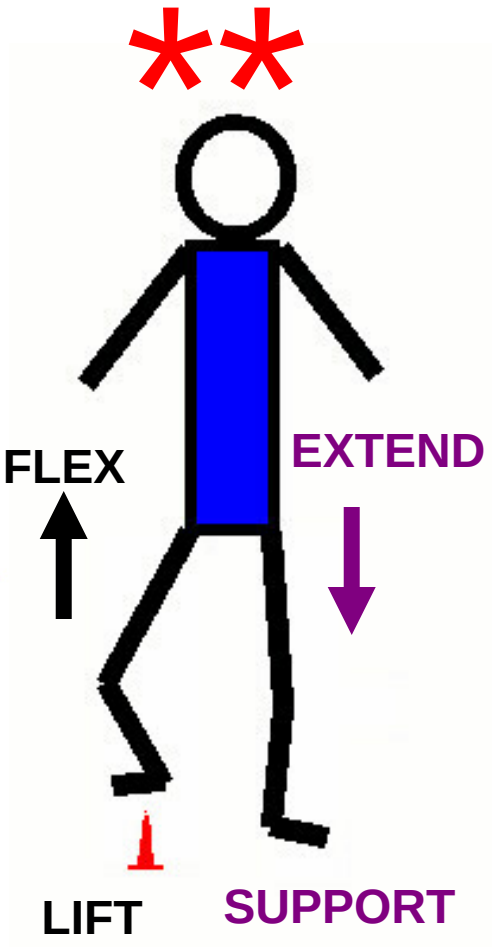

FUNCTION: OTHER LEG PROVIDES SUPPORT WHEN FIRST LEG IS LIFTED

FLEXOR REFLEXES CAN CHANGE AFTER LESIONS, DISEASE PROCESSES

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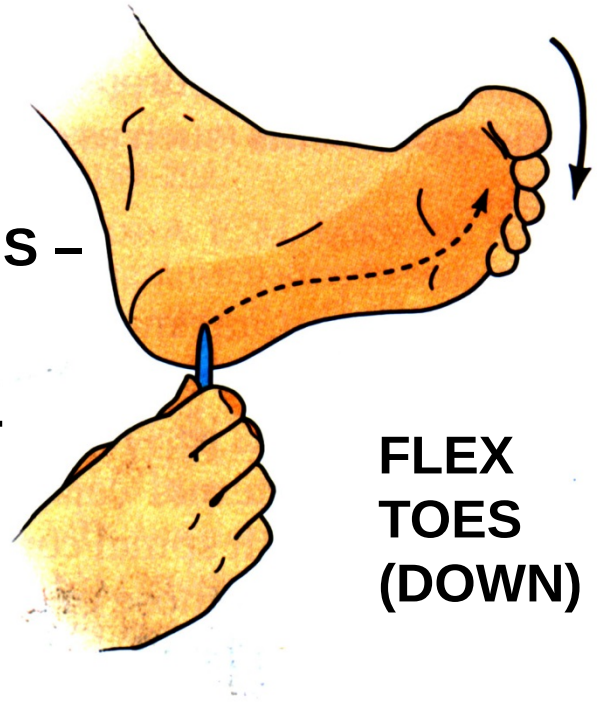
NORMAL RESPONSE

STIMULUS – TO SKIN OF SOLE OF FOOT



FLEX TOES (DOWN)

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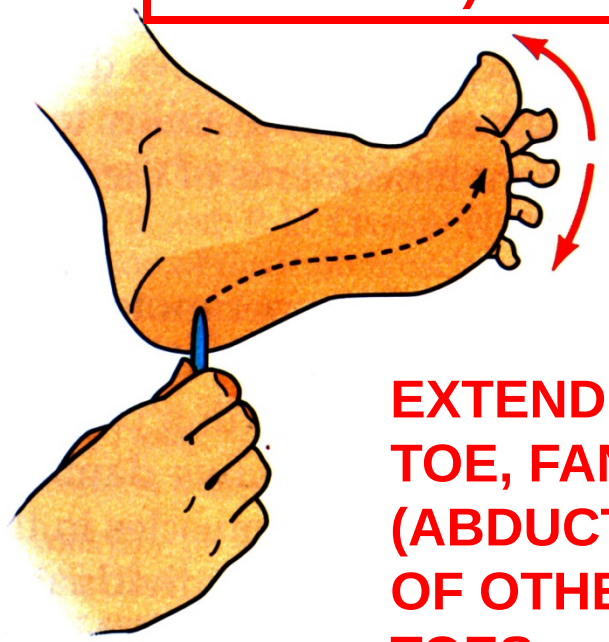
BABINSKI SIGN – (EXTENSOR PLANTAR RESPONSE)



EXTEND BIG TOE, FANNING (ABDUCTION) OF OTHER TOES

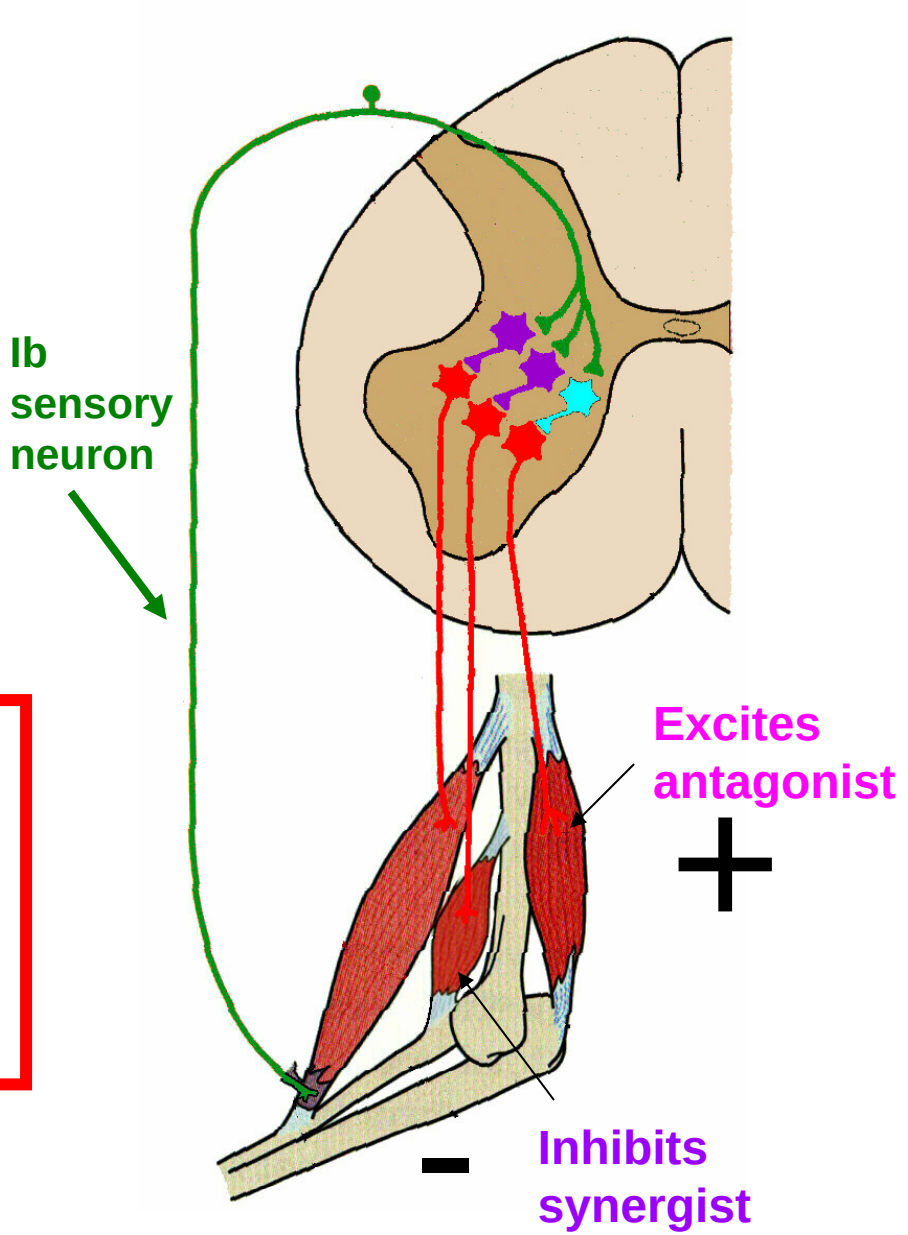
Babinski sign - seen after **Upper Motor neuron lesion**
-direction of movement **changes from flexing toes to extending and fanning (abducting) toes**

AUTOGENIC INHIBITION

Other effects

a. Inhibit synergist muscles
b. Excites antagonist muscles -

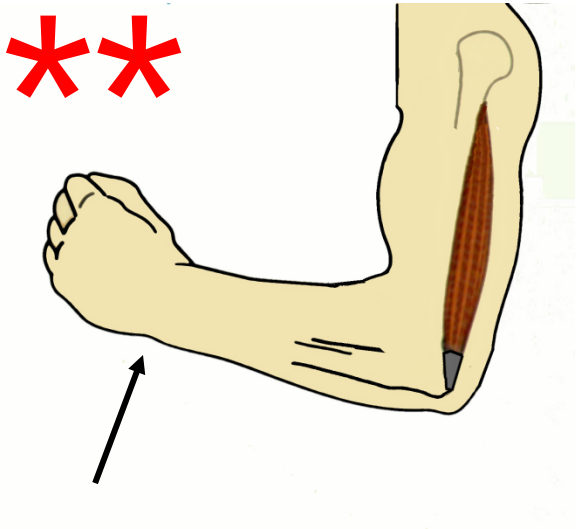
CLASPED KNIFE REFLEX: in Upper motor neuron lesions, tonus increases, resistance to stretch increases; if sufficient force is applied, limb resistance suddenly decreases (like pocket knife snapping shut)



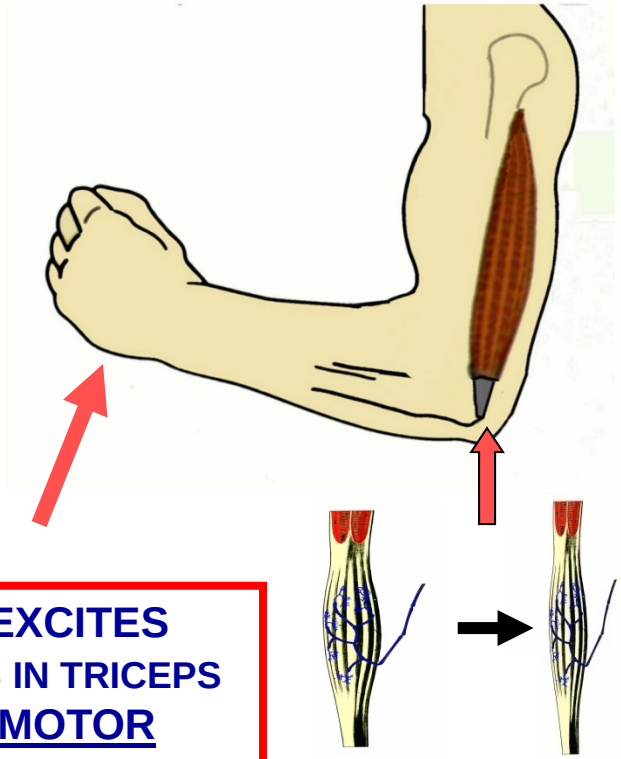
CLASPED KNIFE REFLEX: is an example of Autogenic inhibition.

It is elicited in patients with UMN lesions due to high tonus in muscle.

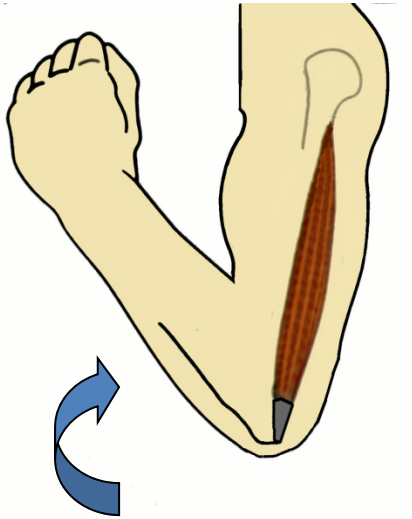
1) PHYSICIAN TRIES TO FLEX ELBOW JOINT OF PATIENT WITH UPPER MOTOR NEURON LESION



2) KEEP TRYING AND TENSION ON TRICEPS TENDON EXCITES GOLGI TENDON ORGANS



3) TRICEPS RELAXES AND RESISTANCE SUDDENLY DECREASES: ELBOW JOINT FLEXES



HIGH IMOSED FORCE EXCITES GOLGI TENDON ORGANS IN TRICEPS TENDON WHICH INHIBITS MOTOR NEURONS TO TRICEPS MUSCLE

ELBOW JOINT SNAPS SHUT LIKE A POCKET KNIFE = CLASPED KNIFE REFLEX

REFLEXES OF CRANIAL NERVES

REFLEXES OF CRANIAL NERVES

REFLEX	STIMULUS	SENSORY	RESPONSE	CLINICAL
Pupillary Light Reflex (II to III)	Test: Shine light in eye	Light detected by Optic Nerve	Excite Constrictor of pupil of eye (III Short Ciliary nerves (Ciliary Ganglion, parasympathetic)	Extensively used to check CN II; Absence of Pupillary Light Reflex can indicate catastrophe (brain herniation)
Corneal Reflex (V to VII)	Touch cornea of eye with cotton	Touch detected by Long Ciliary nerves (V1), Somatic sensory	Close eye (VII to Orbicularis Oculi muscle) Branchiomotor	Absence of Corneal Reflex; Test for damage to V1 sensory, VII motor
Gag Reflex (IX to X)	Test: Touch posterior tongue, oropharynx;	Excites Visceral Sensory endings in Glossopharyngeal N. (IX)	Excite muscles of pharynx, palate; Vagus N. (X), Branchiomotor	Other symptoms of Vagus damage (X); Patient Say's Ahh: soft palate not elevated on ipsilateral side (paralyze Levator Palati); uvula deviated away from side of lesion
Jaw Jerk Reflex Stretch (Deep Tendon) Reflex (V to V)	Test: tap down on mandible; Stretch muscles of mastication (ex. Masseter)	Excites Muscle Spindle sensory neurons in Trigeminal nerve (V)	Contract muscles that elevate mandible Motor - V3	Hyporeflexia - indicates Trigeminal nerve damage

1. PUPILLARY LIGHT REFLEX - II TO III

AFFERENT ARM OF REFLEX

SENSORY STIMULUS

LIGHT IN EYE

EFFERENT ARM OF REFLEX

MOTOR RESPONSE

CONSTRICT PUPIL

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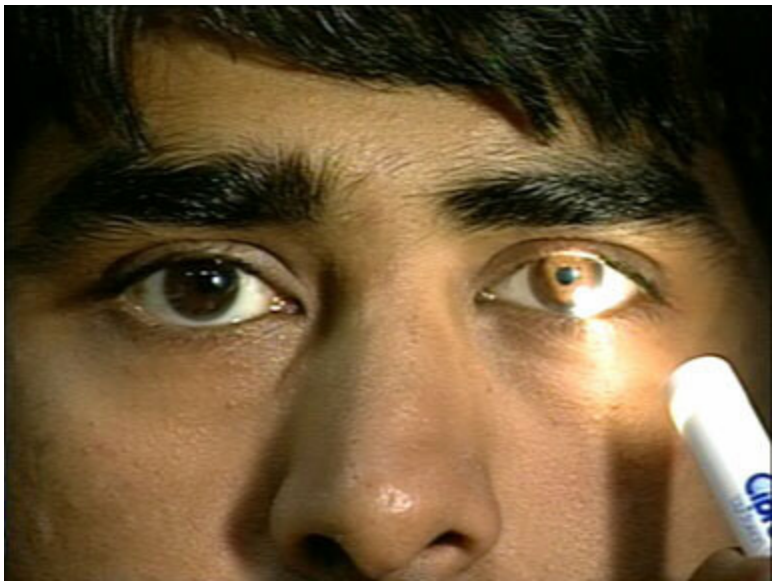
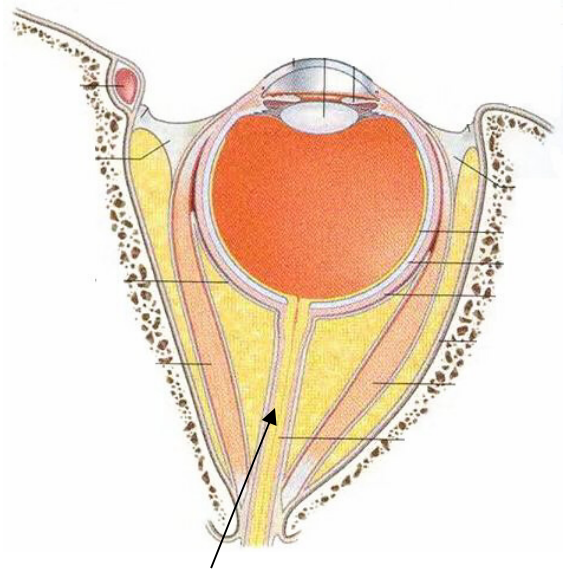


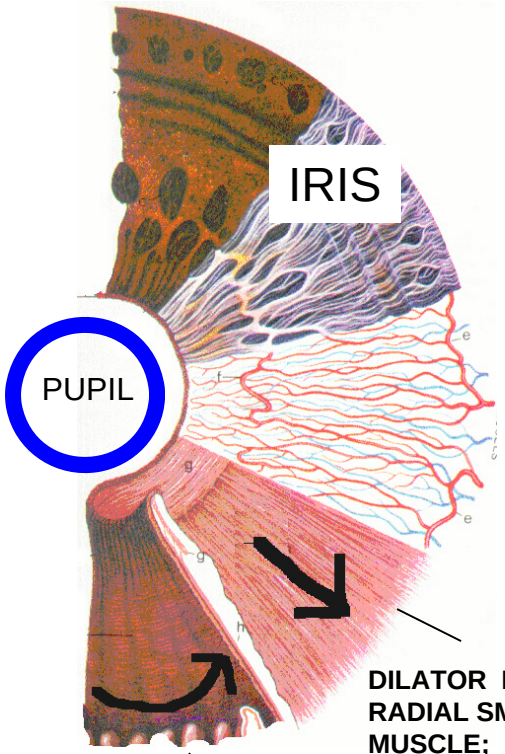
PUPILLARY LIGHT REFLEX

CN II - OPTIC NERVE - DETECTS LIGHT

CN III - OCULOMOTOR - parasympathetics from Ciliary Ganglion in Short Ciliary nerves

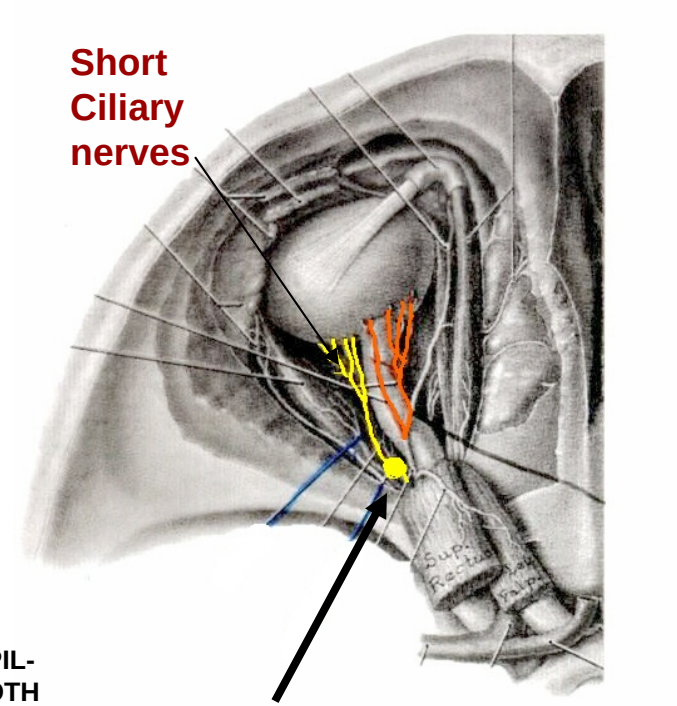


OPTIC NERVE - CN II VISION



DILATOR PUPIL- RADIAL SMOOTH MUSCLE; SYMPATHETICS

CONSTRICTOR PUPIL- CIRCULAR SMOOTH MUSCLE; PARASYMPATHETICS - CN III



Ciliary Ganglion of CN III

2. CORNEAL REFLEX - V TO VII

AFFERENT ARM OF REFLEX

SENSORY STIMULUS

TOUCH CORNEA

TRIGEMINAL - V1 - LONG CILIARY NERVES TO CORNEA

EFFERENT ARM OF REFLEX

MOTOR RESPONSE

CLOSE EYELID

FACIAL - VII - MOTOR TO ORBICULARIS OCULI (SVE)

CORNEAL REFLEX - V to VII

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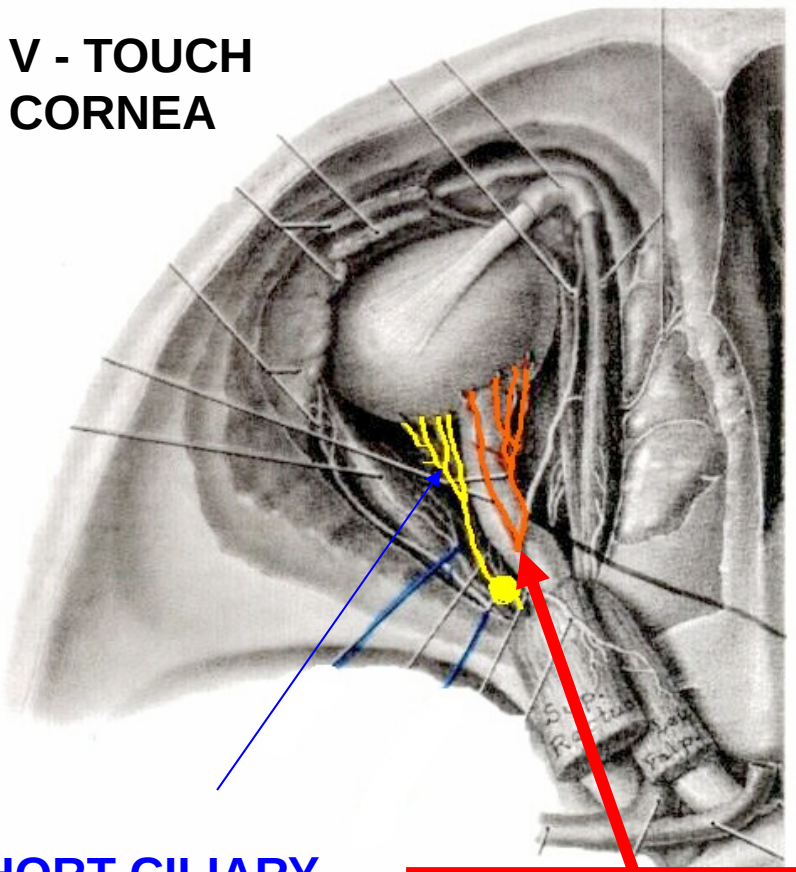
V - TOUCH CORNEA



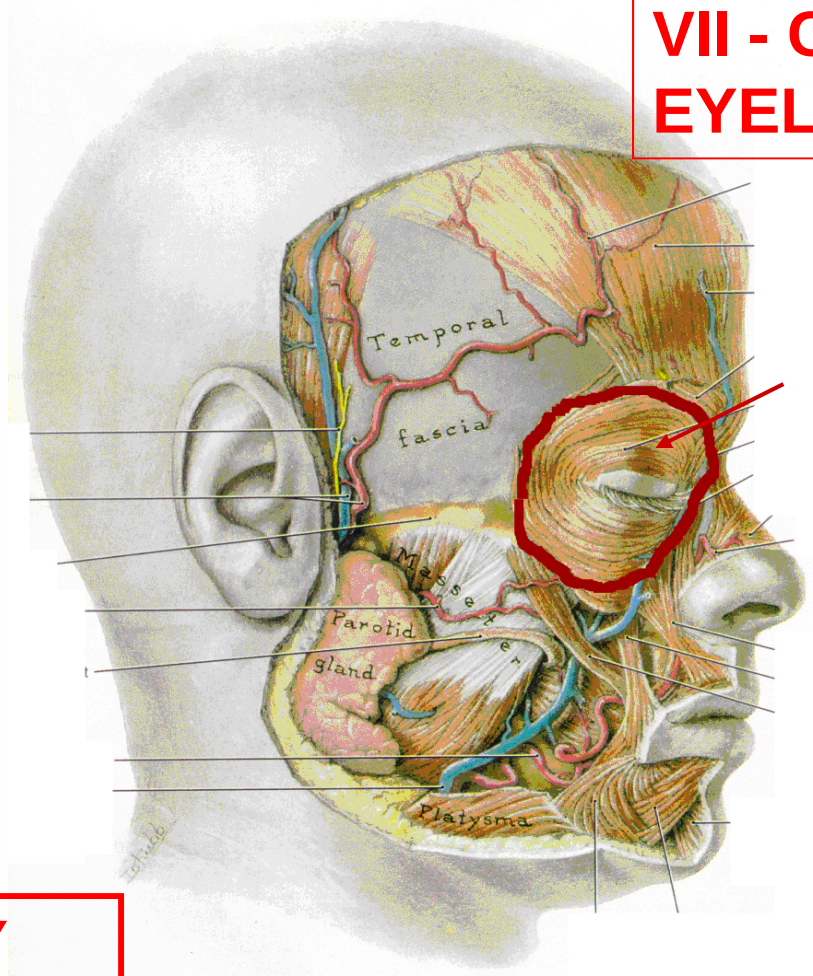
SHORT CILIARY NERVES (III),

CILIARY GANGLION

PARASYMPATHETIC

LONG CILIARY NERVES (V1) - SOMATIC SENSORY TO CORNEA

VII - CLOSE EYELID

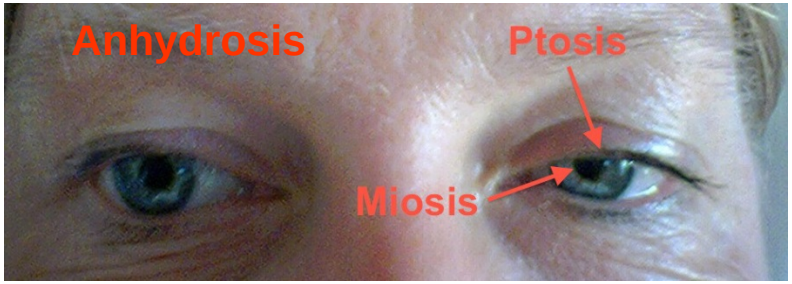


ORBICU-LARIS OCULI M.

- Palpebral part - Close eyelids
- Orbital part - Buries eyelids, Ex. sandstorm
BRANCHIOMOTOR - VII

LESIONS OF SYMPATHETICS PRODUCE SYMPTOMS IN EYE: HORNER'S SYNDROME

HORNER'S SYNDROME



CLINICAL

CAN DAMAGE SYMPATHETIC CHAIN IN NECK; SHOW SYMPTOMS IN EYE AND FACE

HORNER'S SYNDROME - damage to Sympathetic pathways: symptoms involve structures of eye and head -

SYMPTOMS -

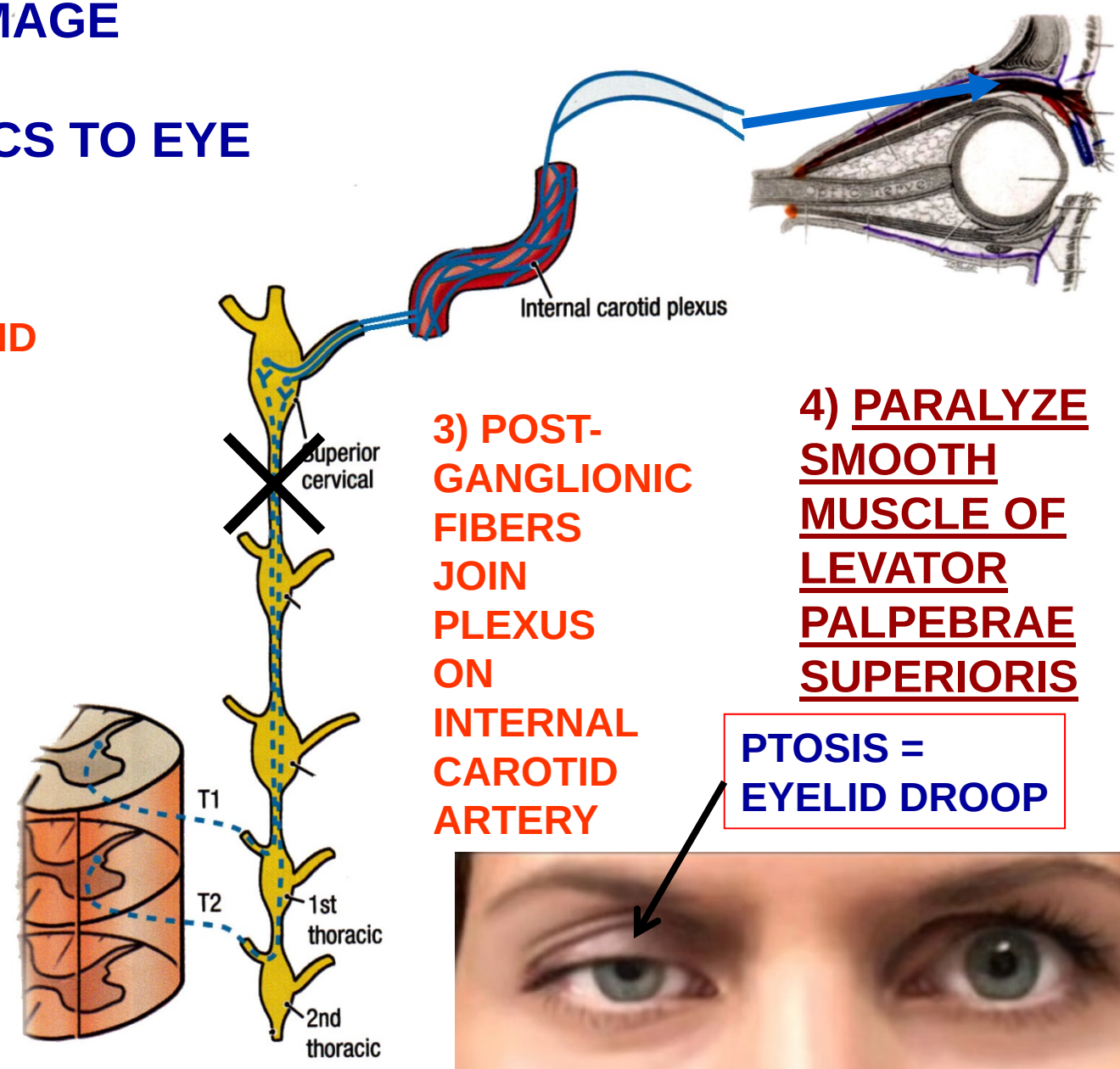
1) MIOSIS - pupillary constriction;
PARALYSIS OF PUPILLARY DILATOR MUSCLE

2) PTOSIS - drooping eyelid;
PARALYSIS OF SMOOTH MUSCLE PART OF LEVATOR PALPEBRAE SUPERIORIS

3) ANHYDROSIS - lack of sweating;
LOSS OF INNERVATION OF SWEAT GLANDS

PTOSIS - DAMAGE PATHWAY OF SYMPATHETICS TO EYE

2) PRE-GANGLIONIC AXONS ASCEND CHAIN AND SYNAPSE IN SUPERIOR CERVICAL GANGLION



1) OUT T1, T2

3) POST-GANGLIONIC FIBERS JOIN PLEXUS ON INTERNAL CAROTID ARTERY

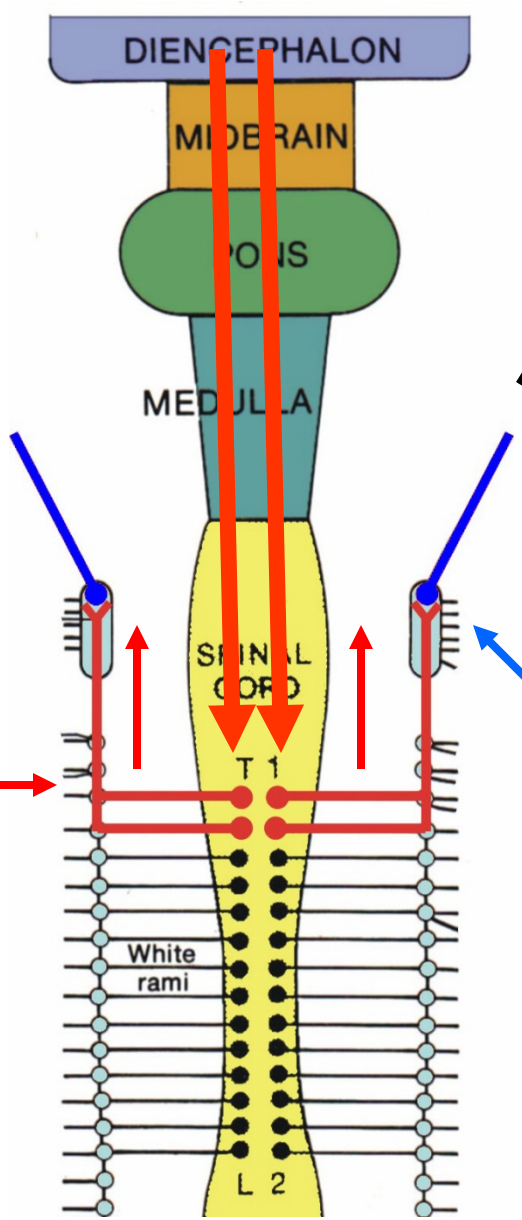
4) <u>PARALYZE SMOOTH MUSCLE OF LEVATOR PALPEBRAE SUPERIORIS</u>

PTOSIS = EYELID DROOP

HYPOTHALAMUS

LESIONS CAN OCCUR IN MANY PLACES IN PATHWAY

HYPOTHALAMO-SPINAL TRACT



to Target Organ

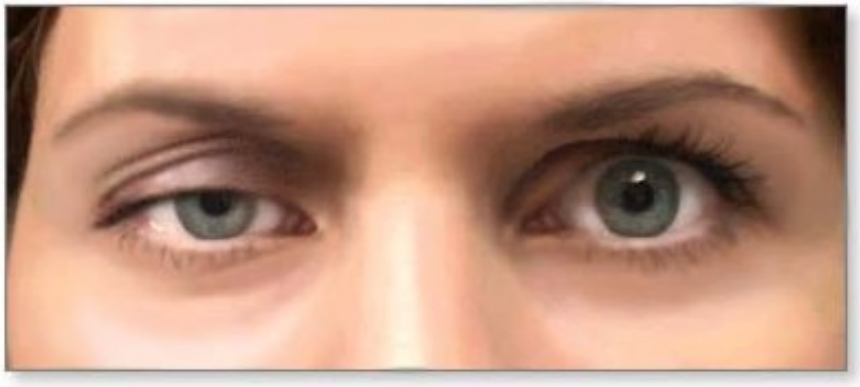
PATHWAY TO HEAD -

1) Neuron 1 (Preganglionic neuron) in spinal cord at T1, T2

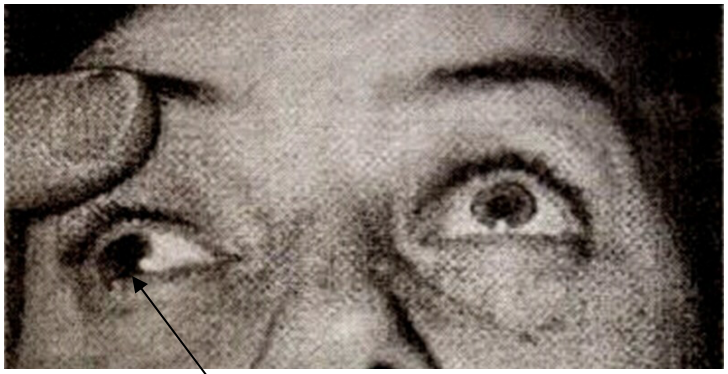
2) Neuron 2 (Postganglionic neuron) In Superior Cervical Ganglia

PTOSIS = DROOPING EYELID; CAN BE SIGN OF DAMAGE TO <u>OCULOMOTOR NERVE (III) OR</u> SYMPATHETICS

Ptosis (drooping of the eyelid)

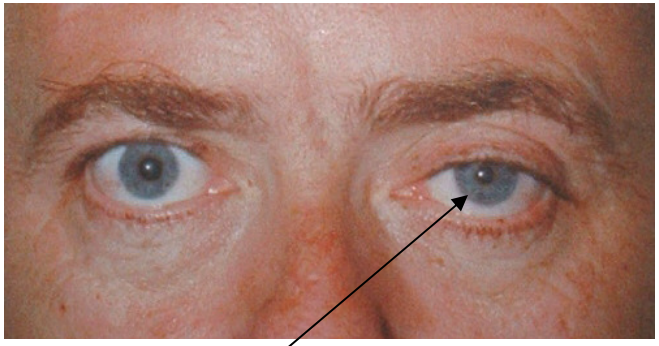


SKELETAL MUSCLE PART



OCULOMOTOR NERVE PALSY
other symptoms:
- <u>Pupil is dilated - denervate Pupillary constrictor (Mydriasis)</u>
- Also affect Eye movements
- Accommodation

SMOOTH MUSCLE PART



SYMPATHETICS - HORNER'S SYNDROME -
- <u>Miosis - denervate Pupillary dilator; constricted pupil</u>
- Anhydrosis - lack of sweating

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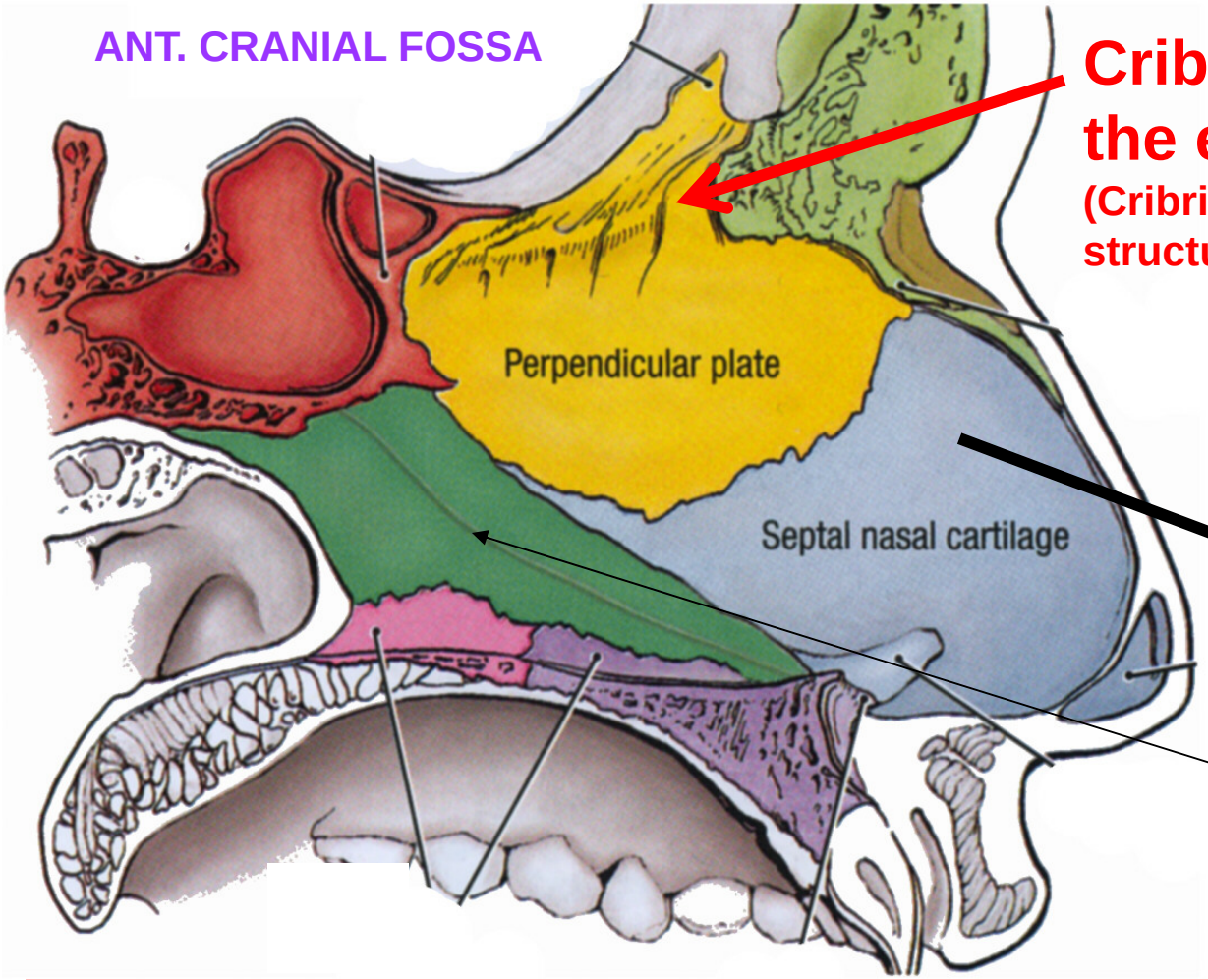
SYMPTOM – EYELID DROOP + CONSTRICTED PUPIL

MEDIAL WALL OF NASAL CAVITY = NASAL SEPTUM



Cribriform plate of the ethmoid bone
(Cribriform; definition = structure with numerous holes)

Nasal Septum
1) Septal Cartilage
2) Ethmoid (Perpendicular Plate)
3) Vomer

**

CLINICAL – Fracture of nose can break Cribriform plate, floor of Ant. Cranial fossa - leak CSF from nose; can result in Meningitis

NERVES of NASAL CAVITY

Nerves

1. Olfactory N. - SMELL Olfactory Area

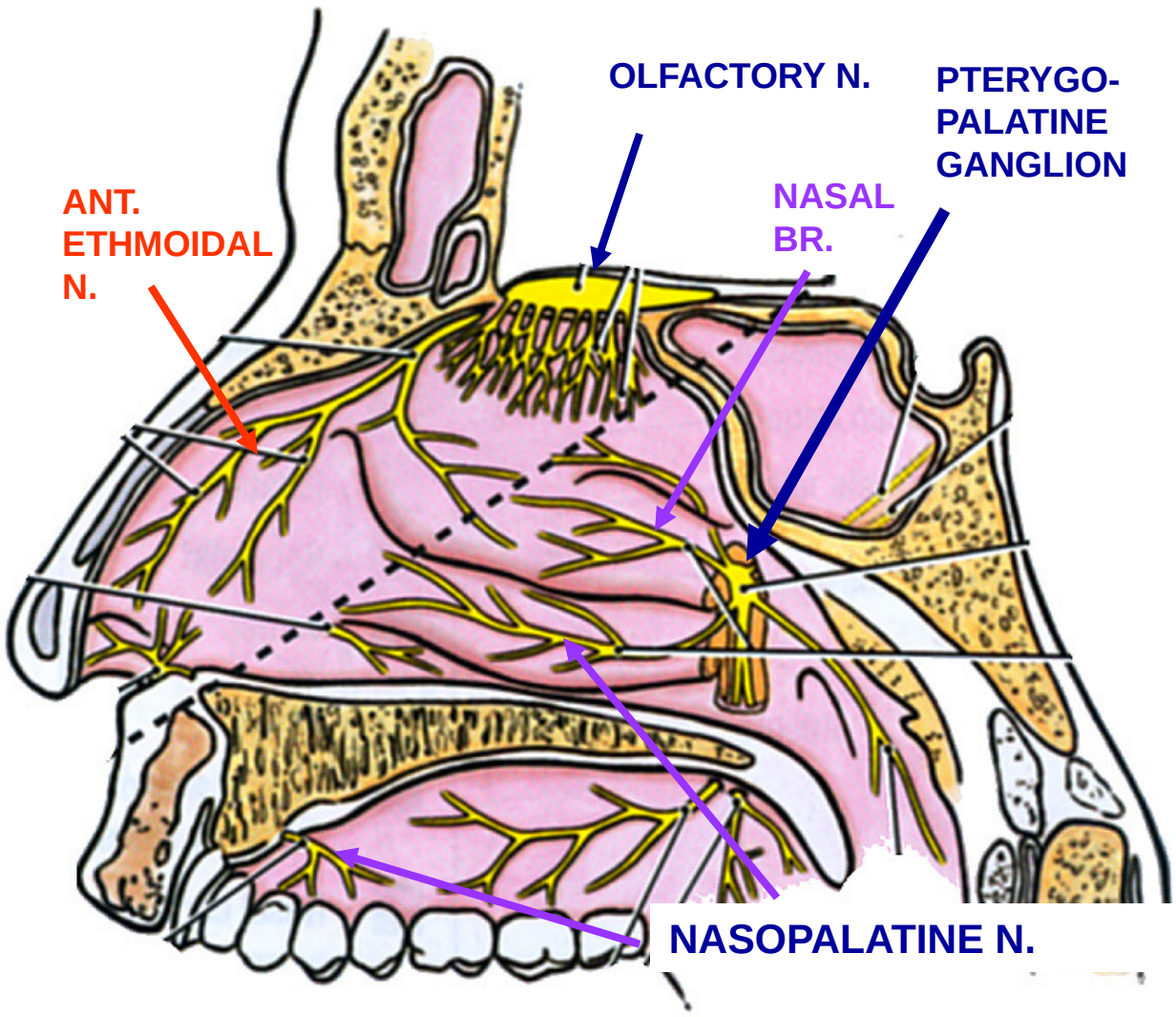
2. General Sensation -

ALL SOMATIC SENSORY touch, pain, etc.

V1 + V2 *

- V1 Anterior Ethmoidal N.
- V2 Nasal Branches
- V2 Nasopalatine N.

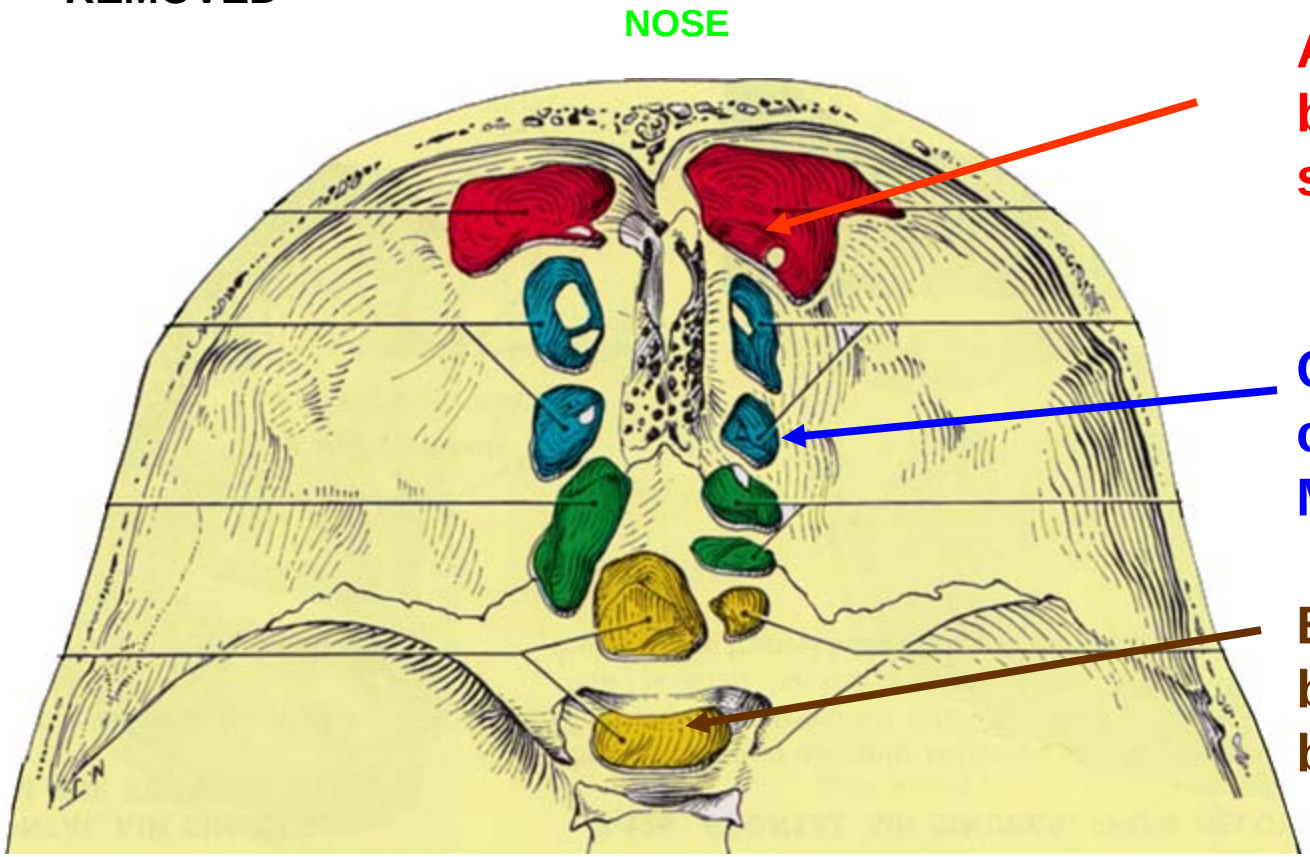
3. Mucous Glands of nose - VISCERAL MOTOR PARASYMP. - VII - Facial N. by Pterygopalatine Ganglion *



PARANASAL AIR SINUSES

VIEW: FLOOR OF ANT. CRAN. FOSSA WITH BONE REMOVED

All usually paired



A. Frontal - separate by septum, variable size

C. Ethmoid- also called air cells (Ant., Mid., Post.)

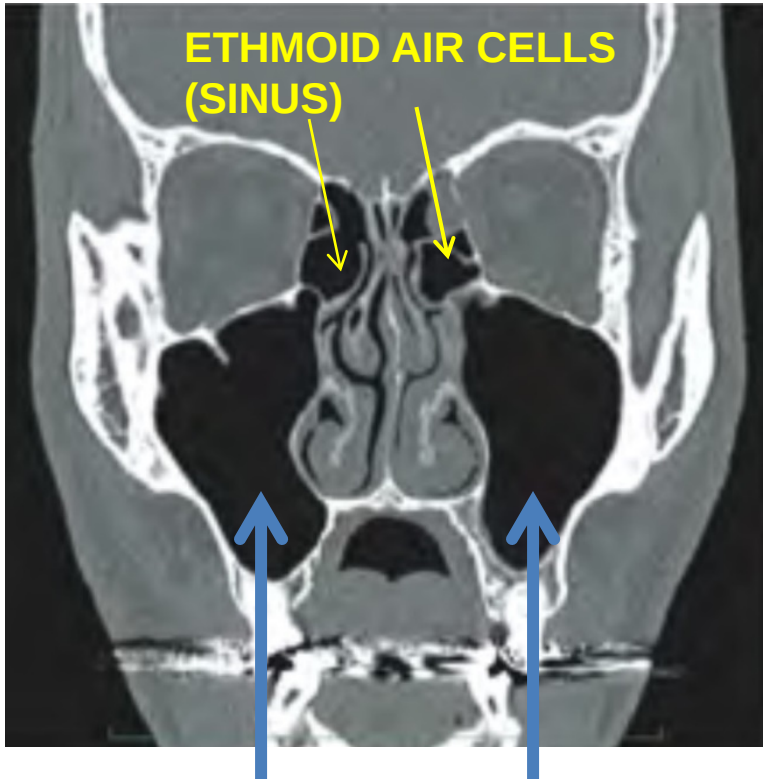
B. Sphenoid - in body of Sphenoid bone

*

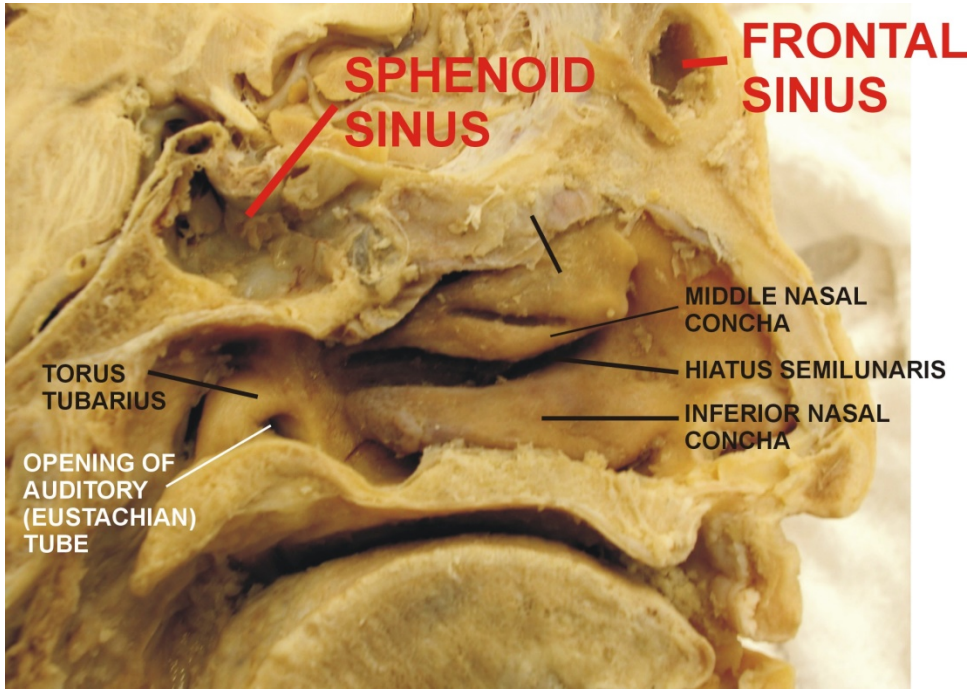
Ethmoid - Blocked Sinus Infection Can Spread to Orbit

SINUSES ON CT AND PROSECTION PICTURES

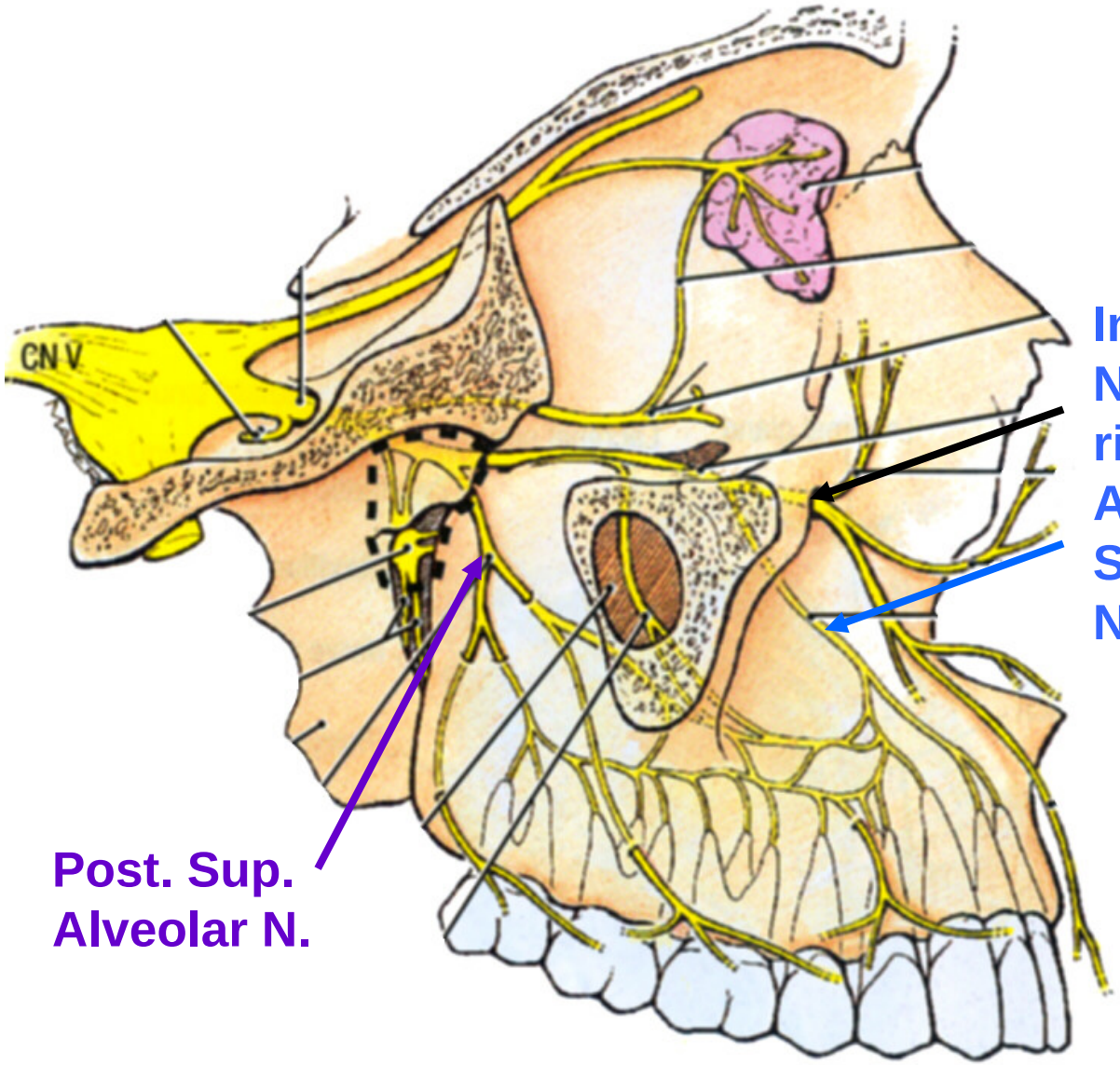
CT IN CORONAL PLANE



PROSECTION 75 – NASAL CAVITY



PARANASAL AIR SINUSES: NERVES



Infraorbital N. - gives rise to Ant. Sup Alveolar N.

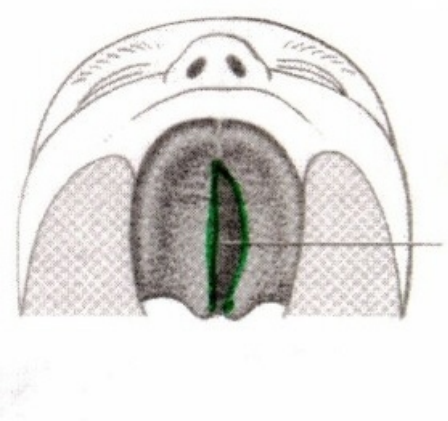
Post. Sup. Alveolar N.

* *

V2 - Ant. & **Post.** Sup. Alveolar N. supply Max Sinus & Teeth;
(Infected MAXILLARY sinus can feel like a tooth ache)

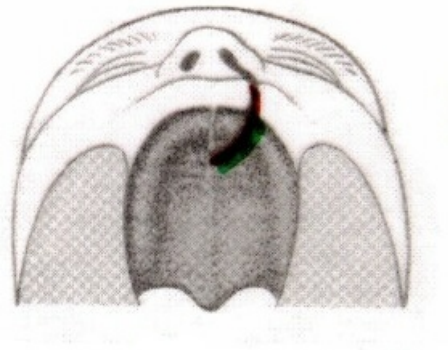
MALFORMATIONS: CLEFT PALATE

2) Posterior Cleft Palate - Not fuse Secondary palate (not fuse Maxillary Processes each side) *



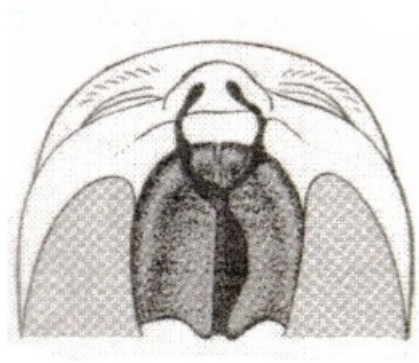
1:2500 births

1) Anterior Cleft Palate - Not fuse Medial Nasal Process and Maxillary Process *



1:1000 Births

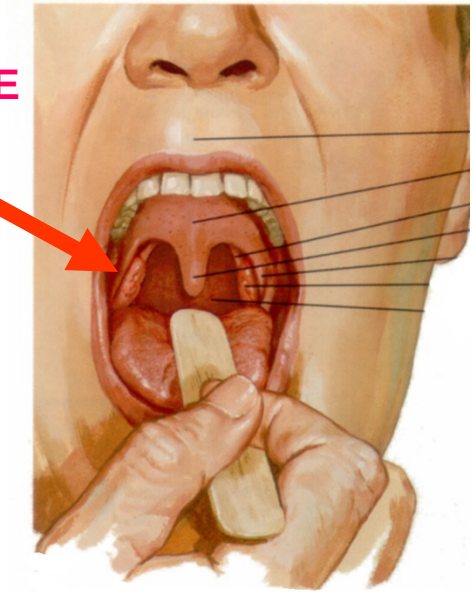
Can be unilateral or bilateral

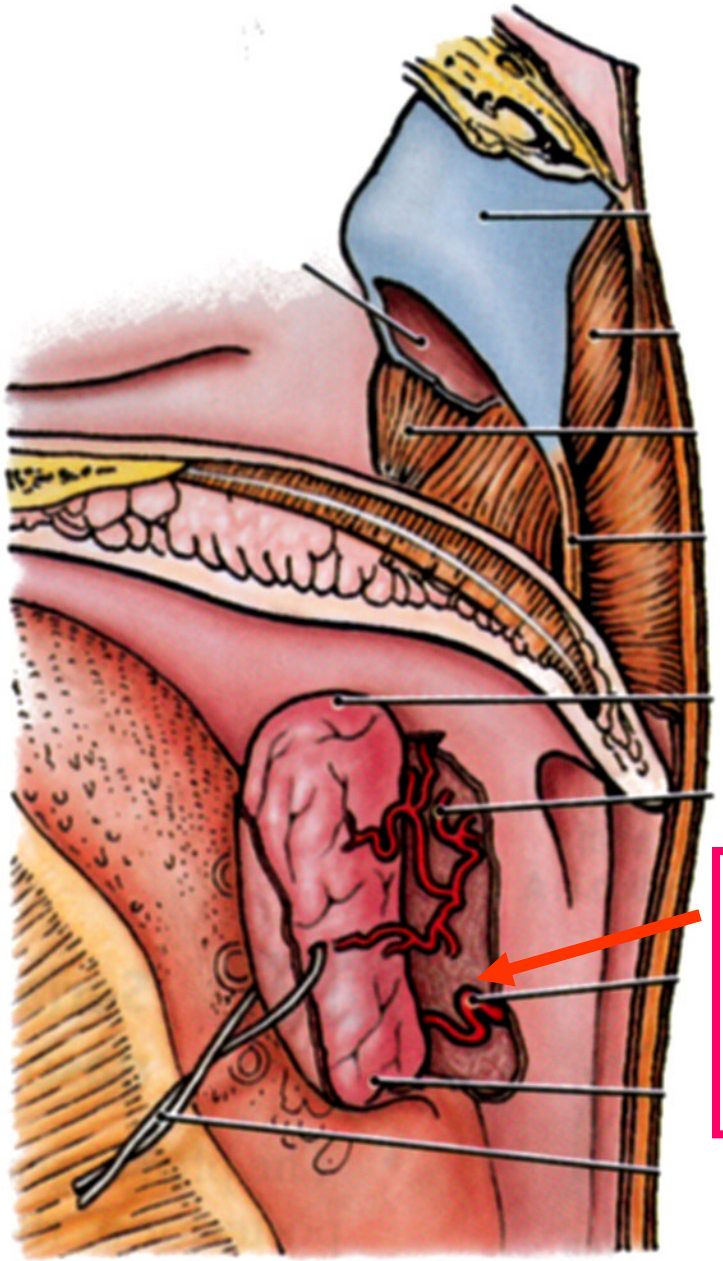


Note: Ant. Cleft Palate is same as Cleft Lip

FACIAL ARTERY- BRANCHES MEDIAL TO MANDIBLE

PALATINE TONSIL



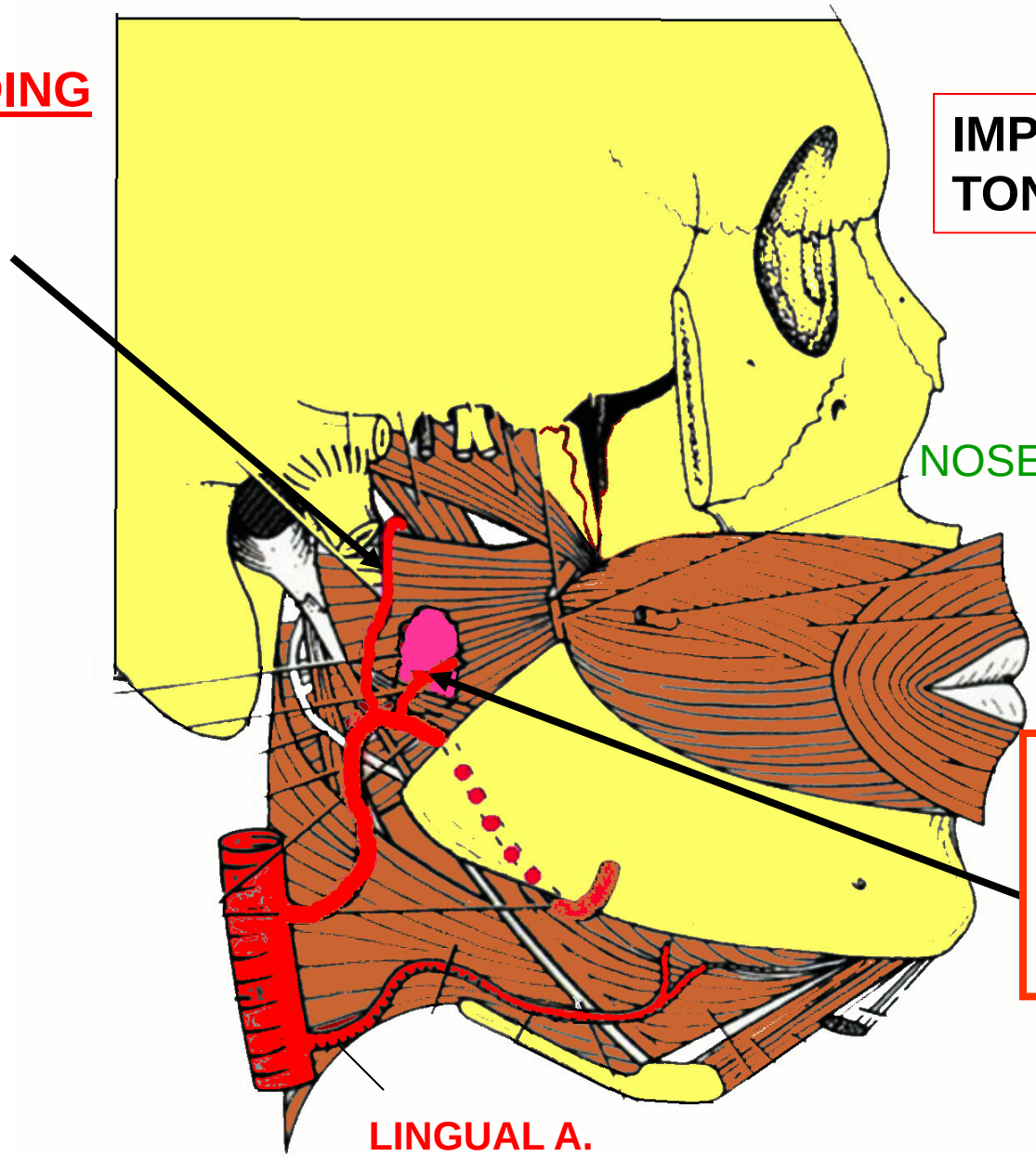


NOTE: TONSILLECTOMY - Post-operative bleeding of Tonsillar branch of Facial artery is complication of removal of palatine tonsils; also damage IX **

b) **TONSILLAR BRANCH** - PALATINE TONSIL

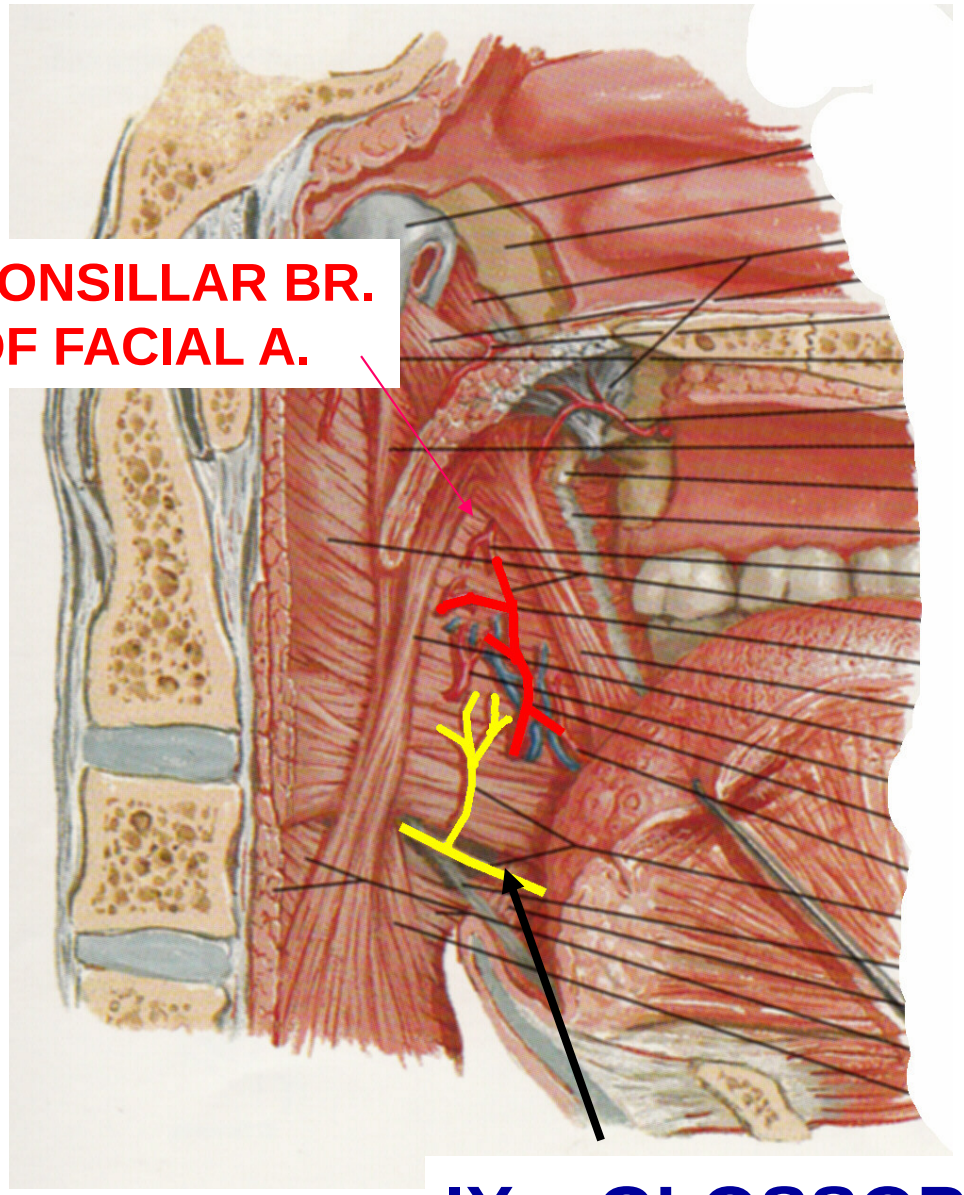
FACIAL ARTERY- BRANCHES MEDIAL TO MANDIBLE

a) ASCENDING PALATINE ARTERY - PALATE



IMPORTANT IN TONSILLECTOMY

b) TONSILLAR BRANCH - PALATINE TONSIL



PALATINE TONSILS

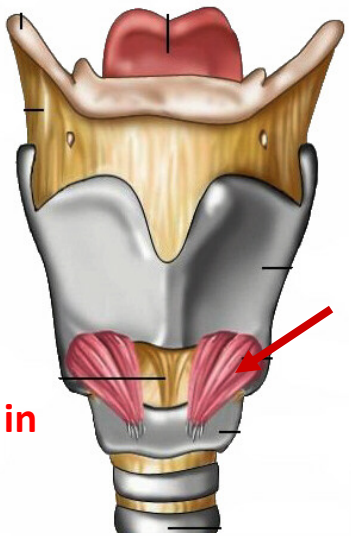
Arteries-
From Tonsillar branch of Facial Artery - can be large
Extensive bleeding after tonsillectomy

Note:
1) Glossopharyngeal Nerve only covered by Fascia; can be damaged in tonsillectomy

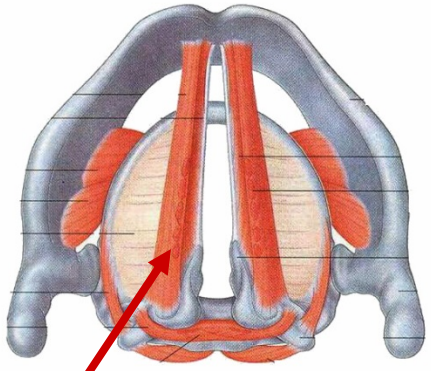
IX – GLOSSOPHARYNGEAL NERVE

MUSCLES OF LARYNX: RAISE/LOWER PITCH

ADAM'S APPLE - longer vocal folds in males

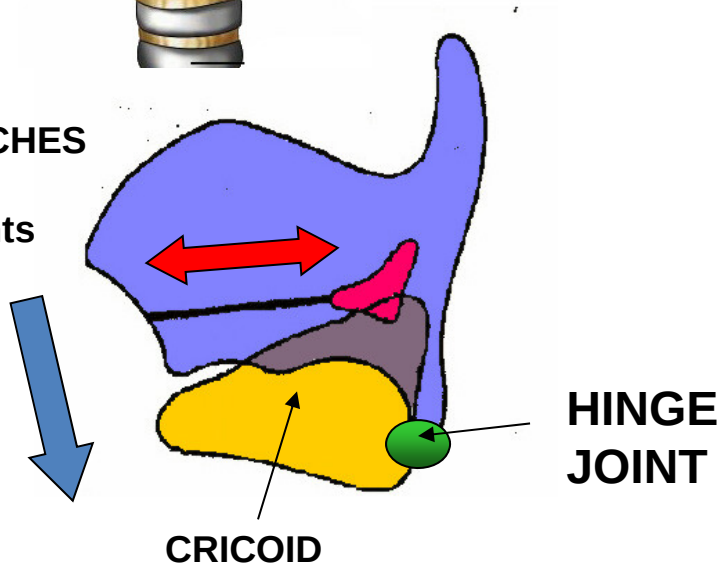


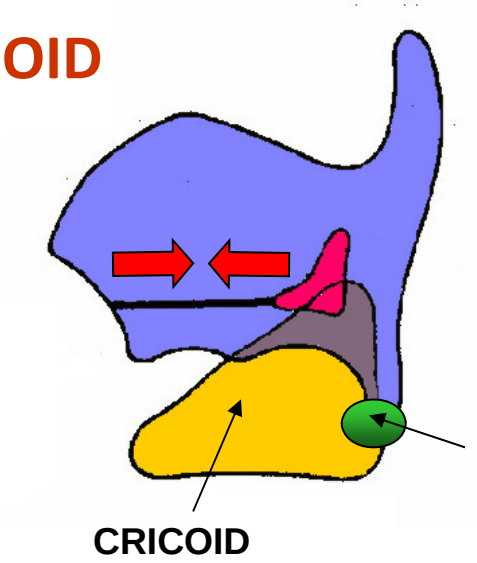
CRICO-THYROID



THYRO-ARYTENOID

Tilting - STRETCHES vocal ligaments



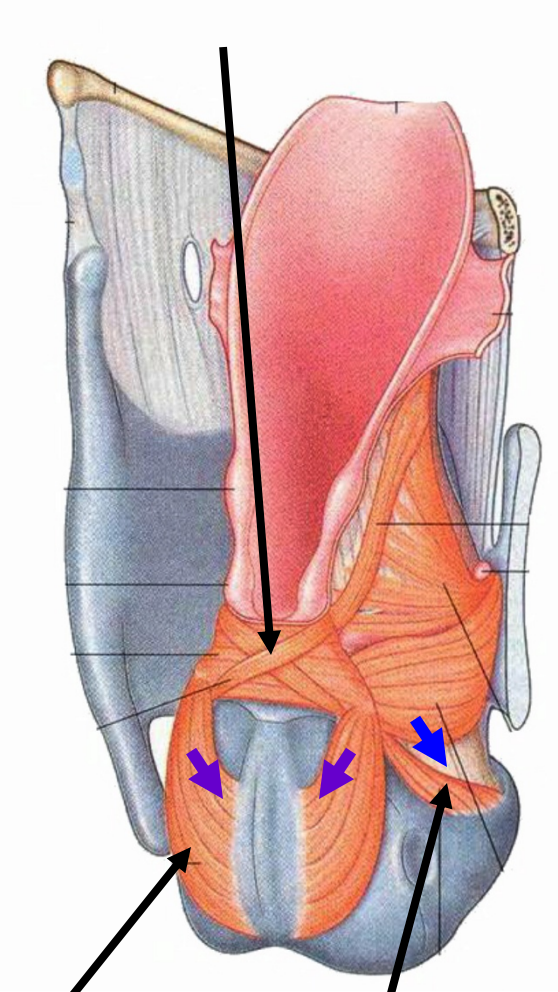


STRETCH vocal ligament
INCREASE PITCH -
CRICOTHYROID

RELAX vocal ligament
DECREASE PITCH -
THYROARYTENOID

OPEN AND CLOSE LARYNX –
(OPENING CALLED RIMA GLOTTIDIS)

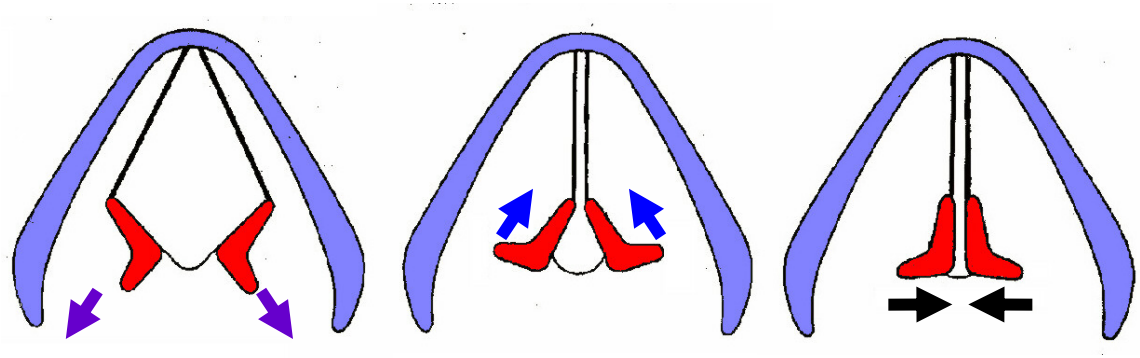
ARYTENOIDEUS



POSTERIOR CRICO-ARYTENOID

LATERAL CRICO-ARYTENOID

OPEN	CLOSE	CLOSE
POST. CRICO-ARYTENOID	LATERAL CRICO-ARYTENOID	ARYTENOIDEUS



Open - deep breathing

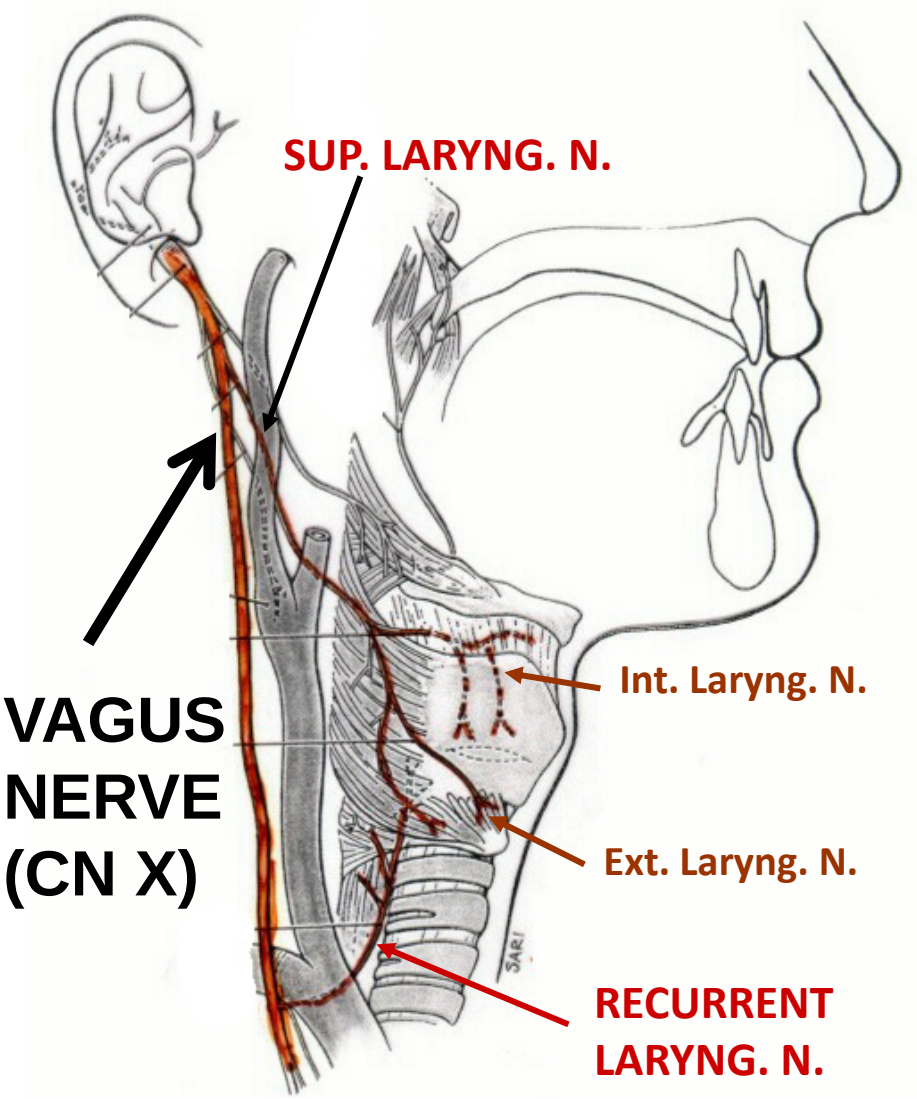
Close - speech; also raise abdominal pressure (childbirth, defecation, micturition = empty urinary bladder)

CHART: ACTIONS OF LARYNGEAL MUSCLES

**

MUSCLE	ACTION	NERVE
Cricothyroid	Tenses vocal fold, Raises pitch of sound	External Laryngeal n. (X)
Thyroarytenoid	Relaxes vocal fold, Decreases pitch of sound	Recurrent Laryngeal n. (X)
Posterior cricoarytenoid	Abducts vocal folds, opens rima glottides (open larynx)	Recurrent Laryngeal n. (X)
Lateral cricoarytenoid	Adducts vocal folds, closes rima glottides (close larynx)	Recurrent Laryngeal n. (X)
Arytenoid (Transverse arytenoid)	Adducts vocal folds, closes rima glottides (close larynx)	Recurrent Laryngeal n. (X)

DAMAGE TO RECURRENT LARYNGEAL NERVE



ALL NERVES ARE BRANCHES OF VAGUS (CN X)

A. Superior Laryngeal N.
divides to -
1. Internal Laryngeal N. Sensory
2. External Laryngeal N.
Branchiomotor to Cricothyroid

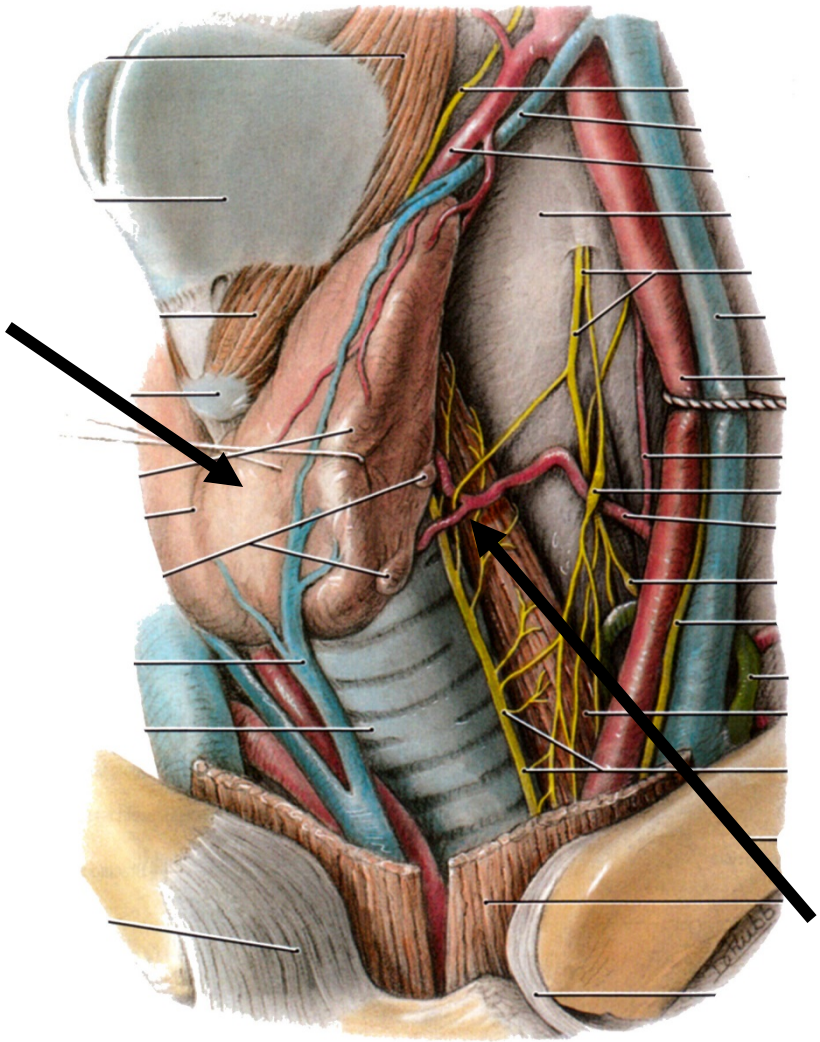
B. Recurrent Laryngeal N. Sensory AND - Branchiomotor - All other Muscles of Larynx

**

DAMAGE TO RECURRENT LARYNGEAL NERVE - can occur in Thyroid Surgery; paralyze all muscles one side except Cricothyroid; permanent hoarse voice

DAMAGE RECURRENT LARYNGEAL NERVE IN THYROID AND OTHER NECK SURGERY

Thyroid Gland



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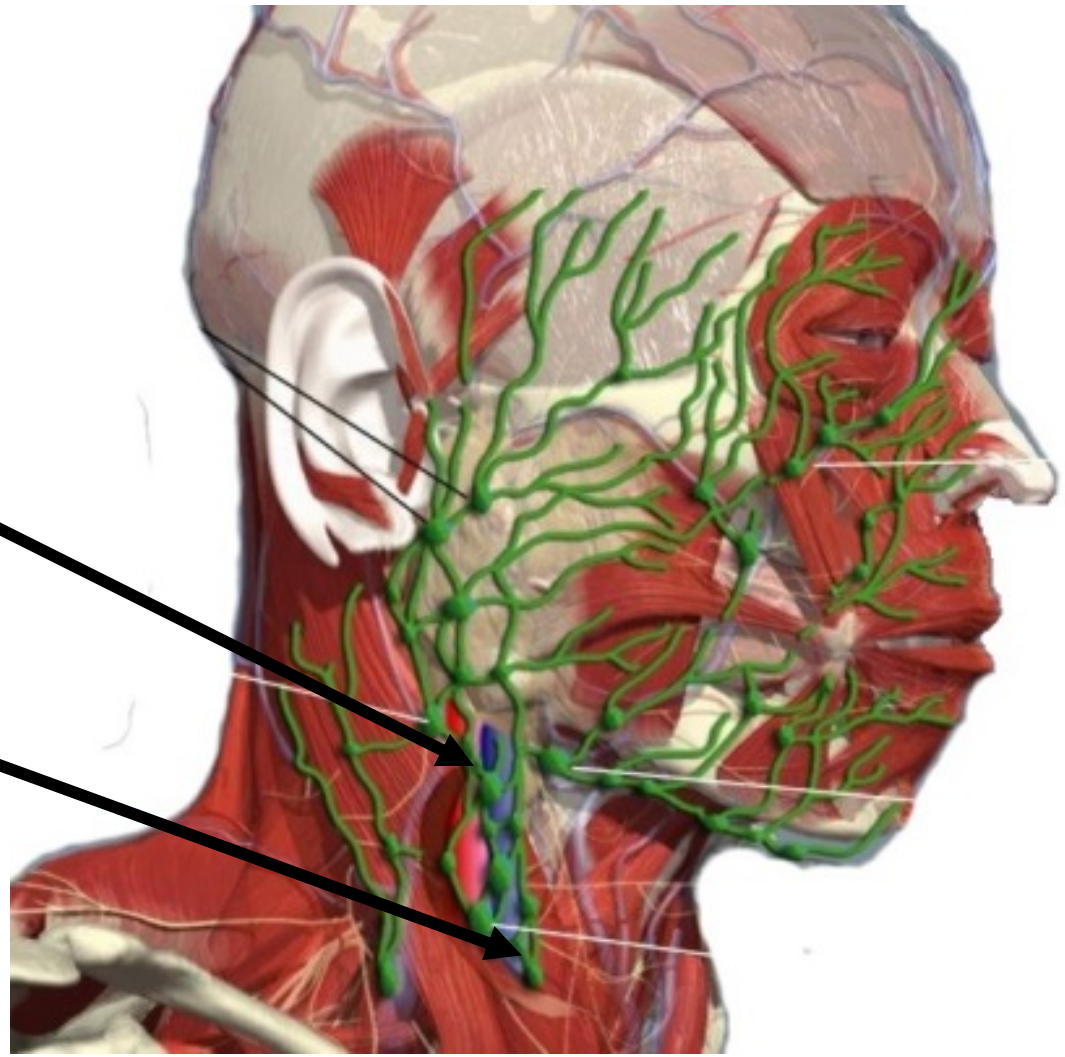
DAMAGE TO RECURRENT LARYNGEAL NERVE - can occur in Thyroid Surgery; paralyze all muscles one side except Cricothyroid; permanent hoarse voice

Recurrent Laryngeal Nerve

LARYNX - LYMPHATICS

Superior Deep Cervical Nodes - drain Larynx above true vocal folds

Inferior Deep Cervical Nodes - drain Larynx below true vocal folds



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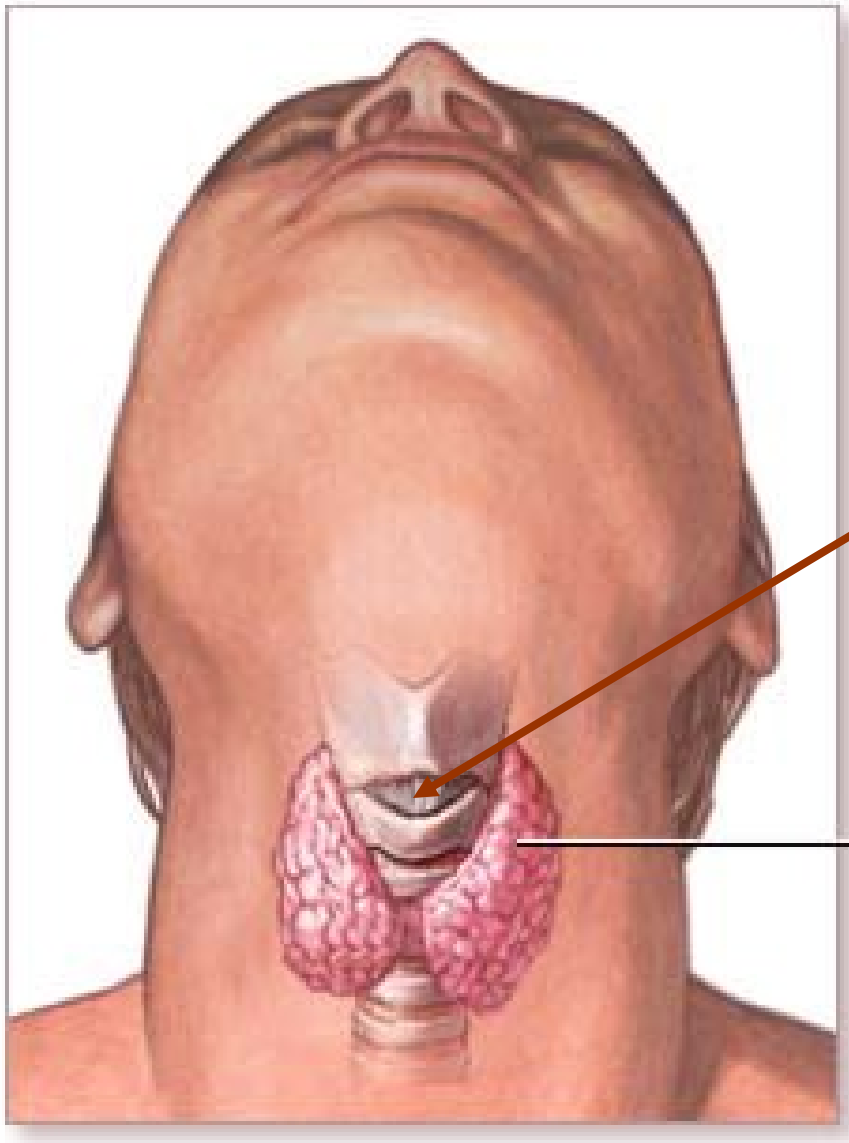
CLINICAL Note: Mucosa is tightly attached to vocal folds; in Anaphylactic Shock (acute allergic reaction) swelling of Vestibular folds can constrict airway and lead to Suffocation)

OBSTRUCTION OF LARYNX: CRICOTHYROTOMY



CLINICALLY IMPORTANT:
IN ANAPHYLACTIC SHOCK, INSERT TUBE TO CRICOTHYROID MEMBRANE (LESS BLEEDING THAN TRACHEOTOMY)

Cricothyroid Membrane

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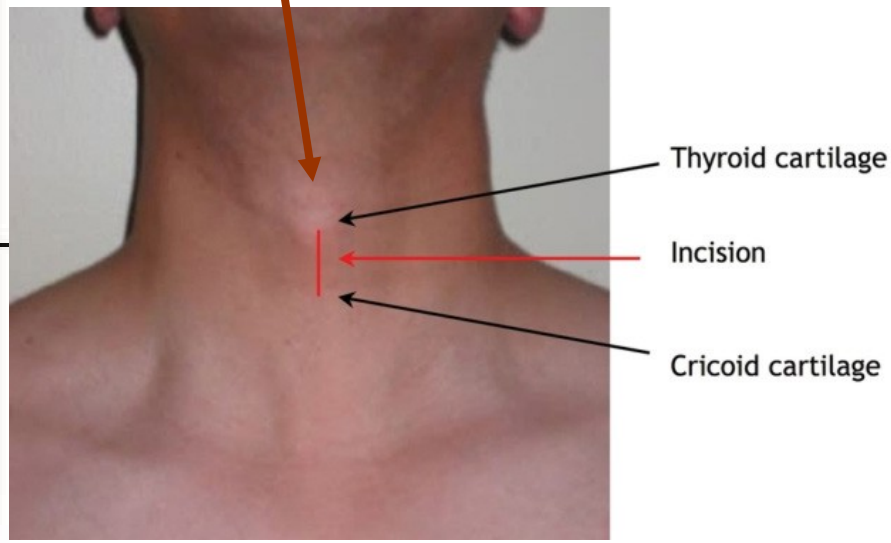

MIDDLE EAR - BOUNDARIES

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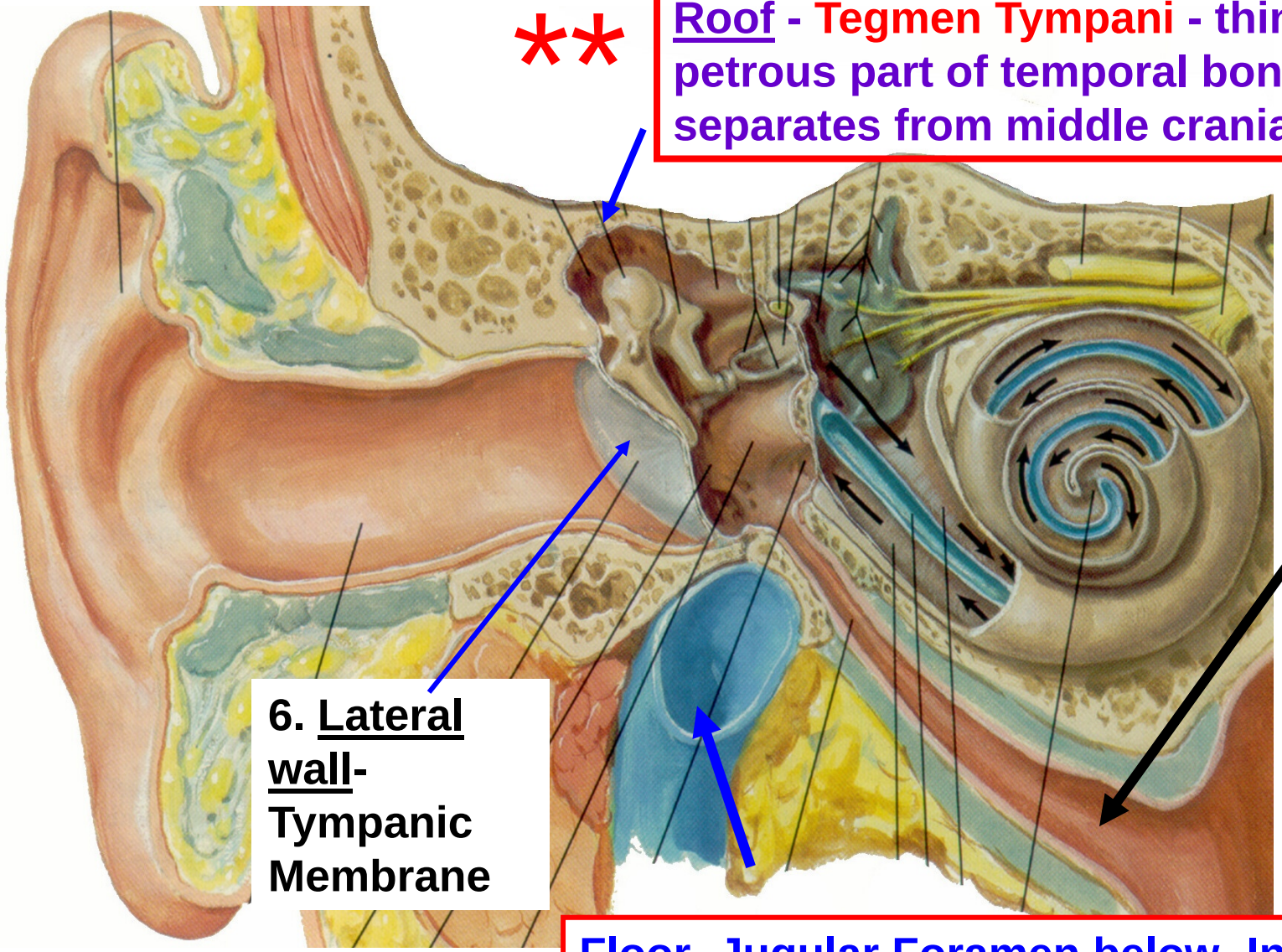
Roof - Tegmen Tympani - thin plate of petrous part of temporal bone; separates from middle cranial fossa



3. Ant. wall -

Opening of Auditory Tube (ant. 2/3 cartilage; post. 1/3 bone

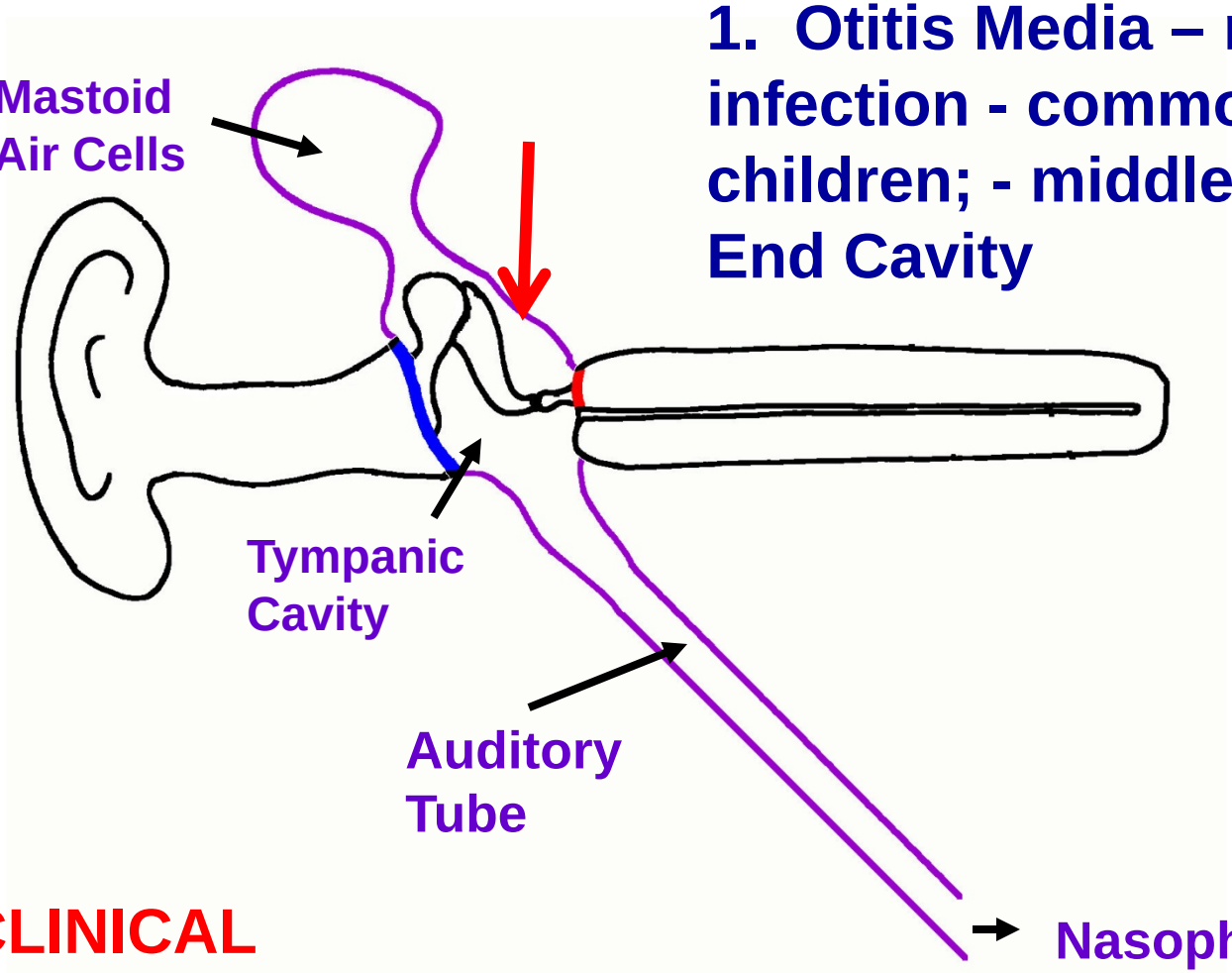
6. Lateral wall- Tympanic Membrane

Tegmen = L. roof

Floor- Jugular Foramen below- Internal Jugular vein can rupture to middle ear

OTITIS MEDIA

1. Otitis Media – middle ear infection - common in children; - middle ear is Dead End Cavity

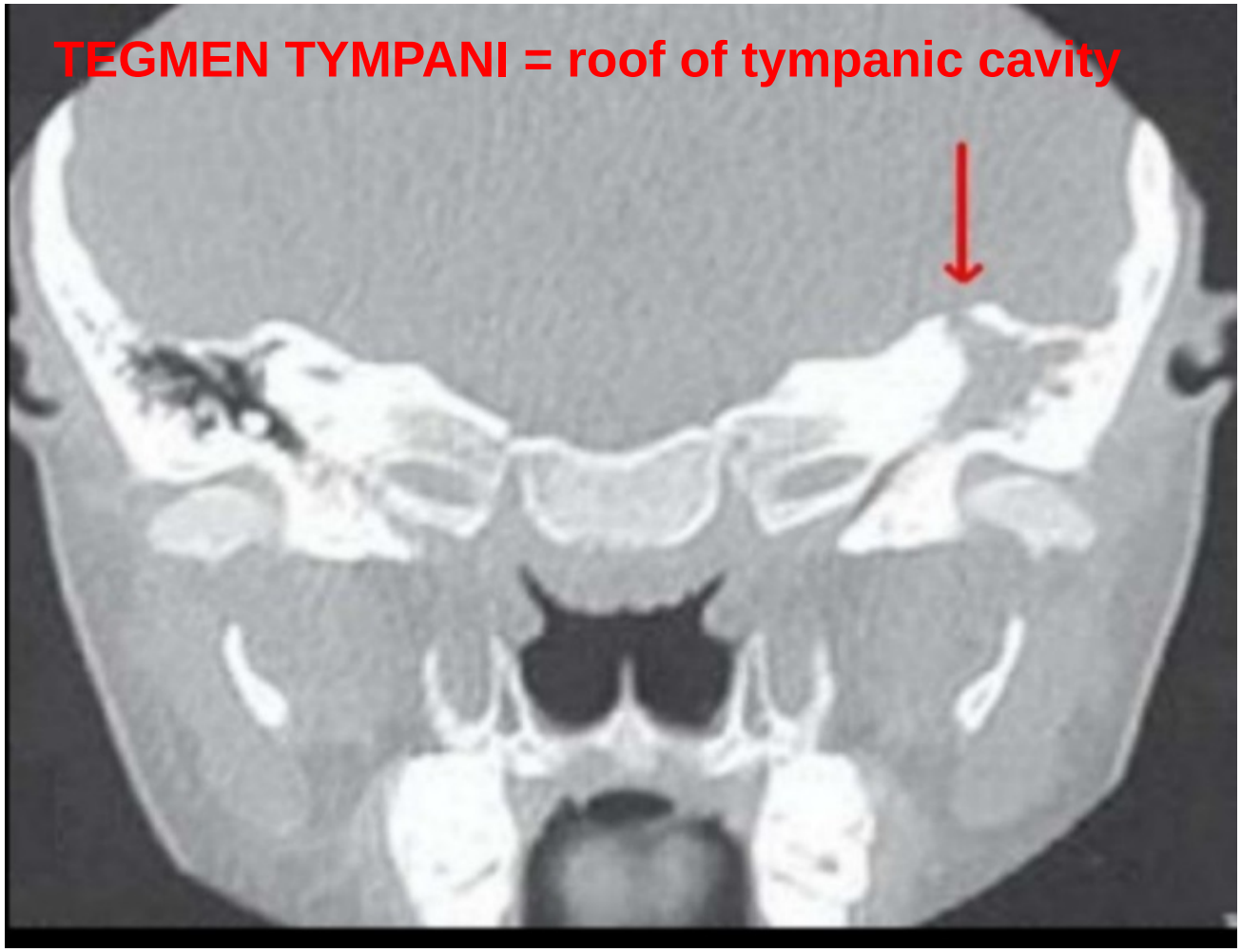


CLINICAL **

Spread of infection from Respiratory System can damage Auditory Ossicles - Hearing Loss; Prolonged infection - Tegmen Tympani to Brain; treatment tympanostomy - tube through tympanic membrane

INFECTION IN OTITIS MEDIA CAN SPREAD TO MIDDLE CRANIAL FOSSA

tegman L. = covering



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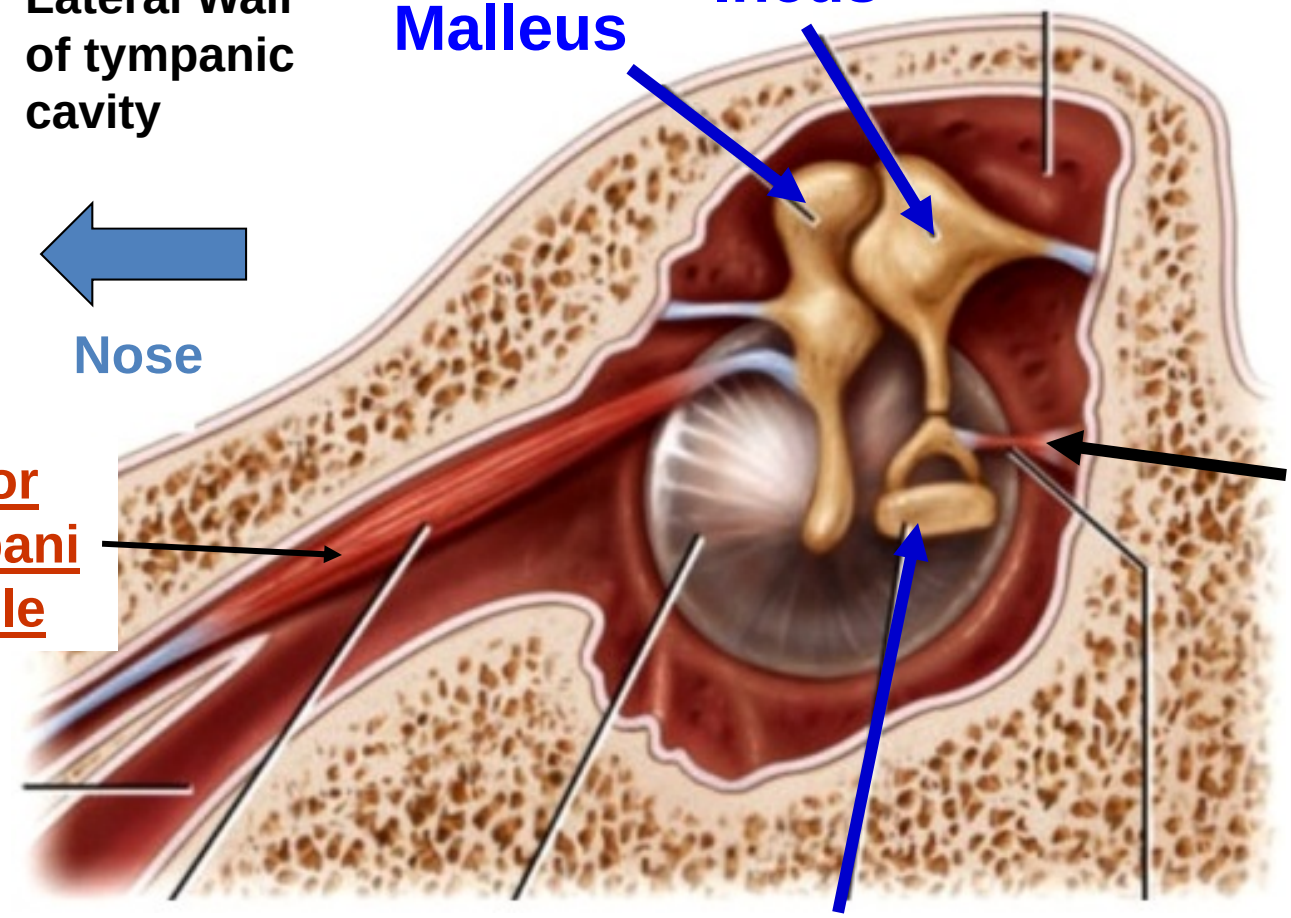
In prolonged Otitis media, infection can spread to Middle Cranial Fossa by eroding Tegmen Tympani (roof of tympanic cavity, middle ear)

MUSCLES OF MIDDLE EAR - dampen sound

View of Lateral Wall of tympanic cavity



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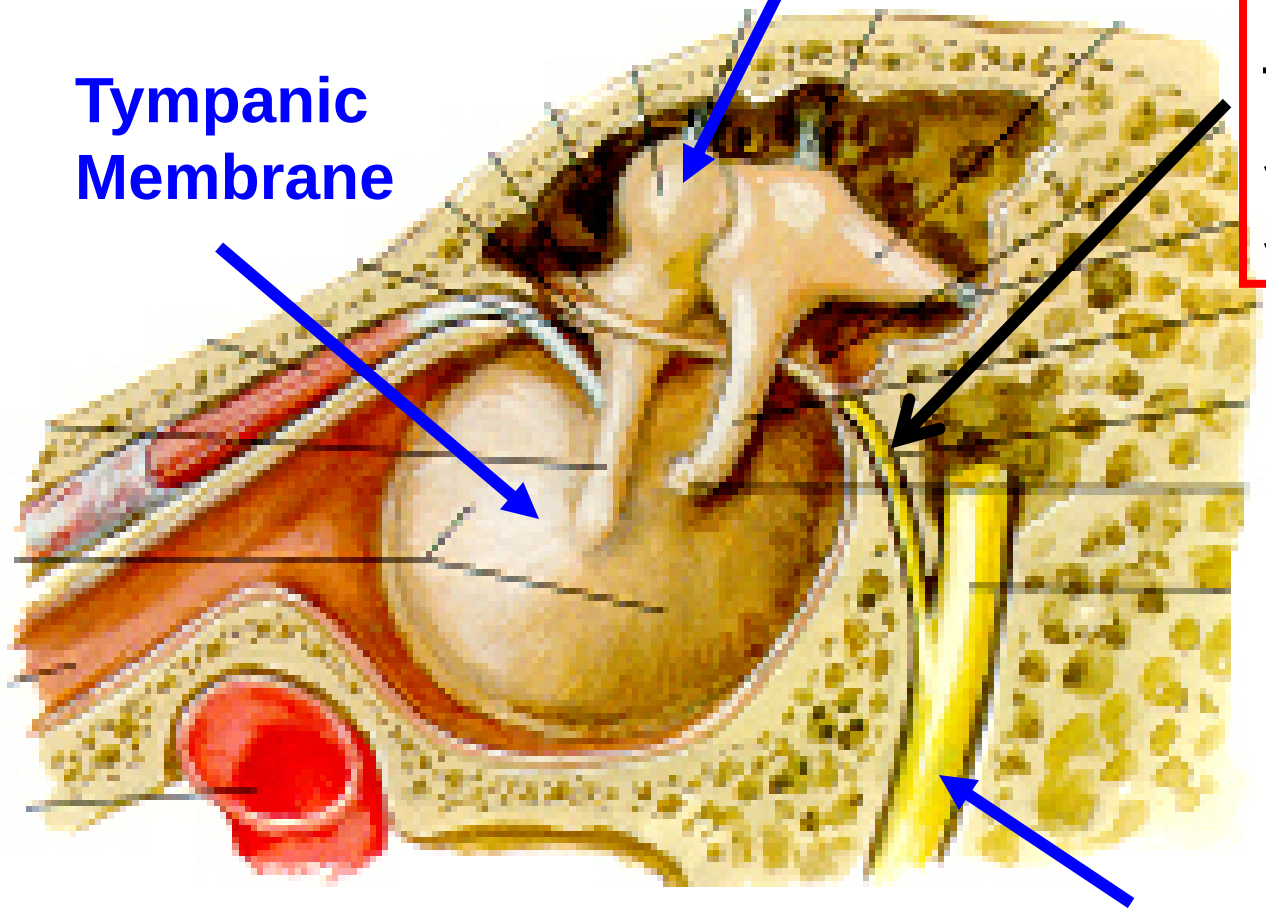
Damage to VII - Hyperacousia - sounds seem too loud

CHORDA TYMPANI

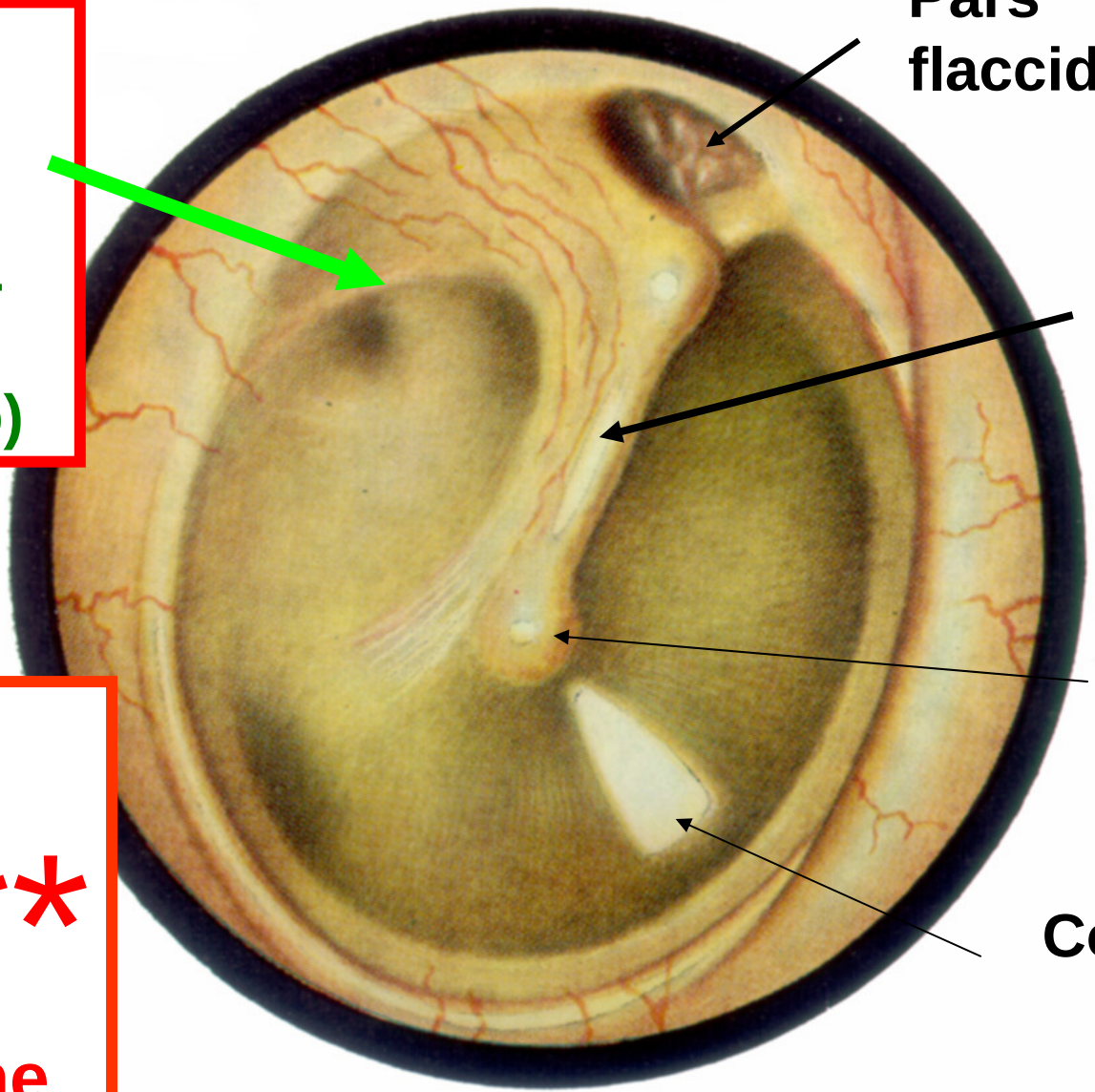


CLINICAL

Taste to ant. 2/3 of tongue
Parasympathetic to Submandibular, Sublingual Salivary glands

- Chorda Tympani has no function in middle ear
- Crosses through tympanic cavity
- Over handle of malleus

OTOSCOPE VIEW OF TYMPANIC MEMBRANE



CHORDA TYMPANI: TASTE, VISCERAL MOTOR (parasymp)

Pars flaccida

MALLEUS – manubrium (handle)

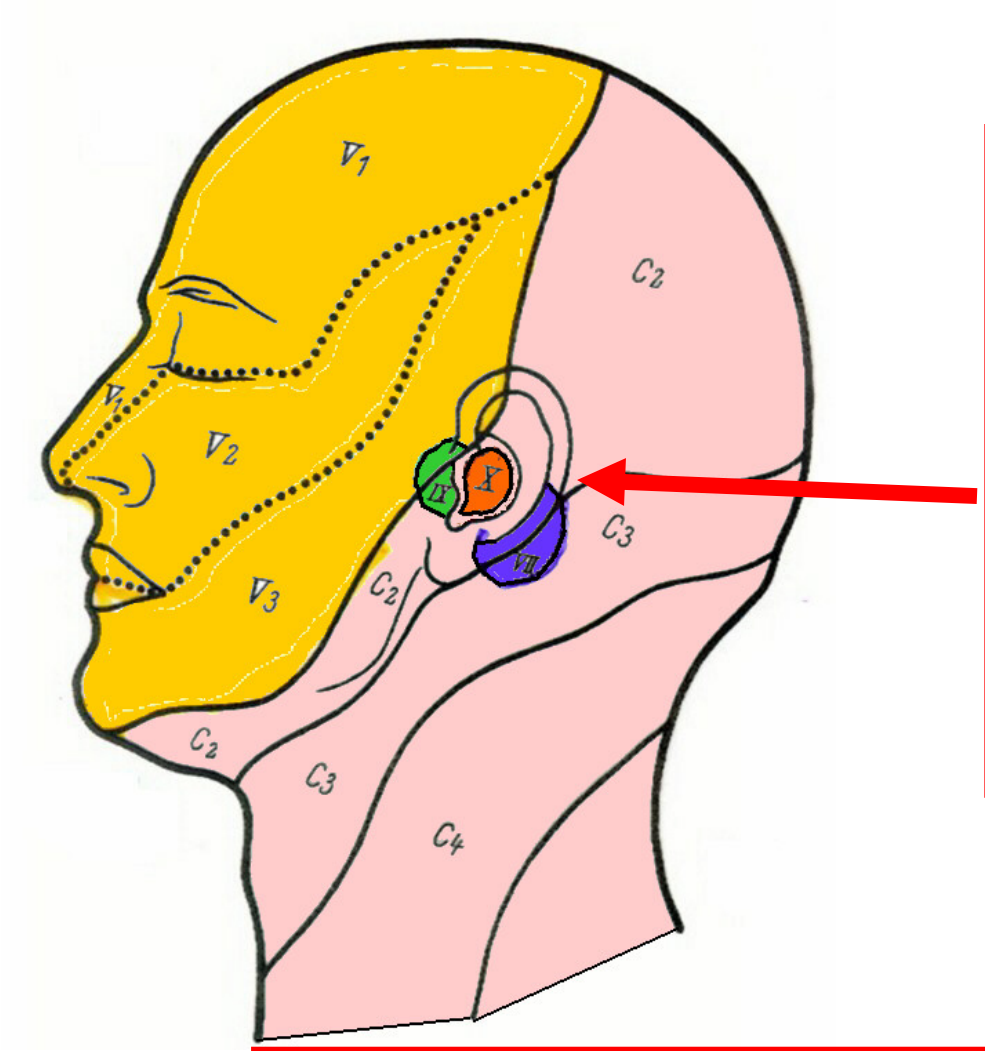
Umbo

Cone of light

CLINICAL*

Lose taste if pierce ** tympanic membrane

SOMATIC SENSORY TO OUTER EAR



ALMOST ALL TRIGEMINAL V EXCEPTION:
SKIN OF OUTER EAR – <u>FOUR CRANIAL NERVES</u>
1) V - TRIGEMINAL
2) VII- FACIAL
3) IX - GLOSSO-PHARYNGEAL
4) X - VAGUS

**

BELL'S PALSY (VII) - PARALYSIS OF FACIAL MUSCLES; IN RECOVERY, PATIENTS COMPLAIN OF EARACHES