DISCUSSION SESSION: GROSS ANATOMY

ONN BLOCK

Feb 5, 2021

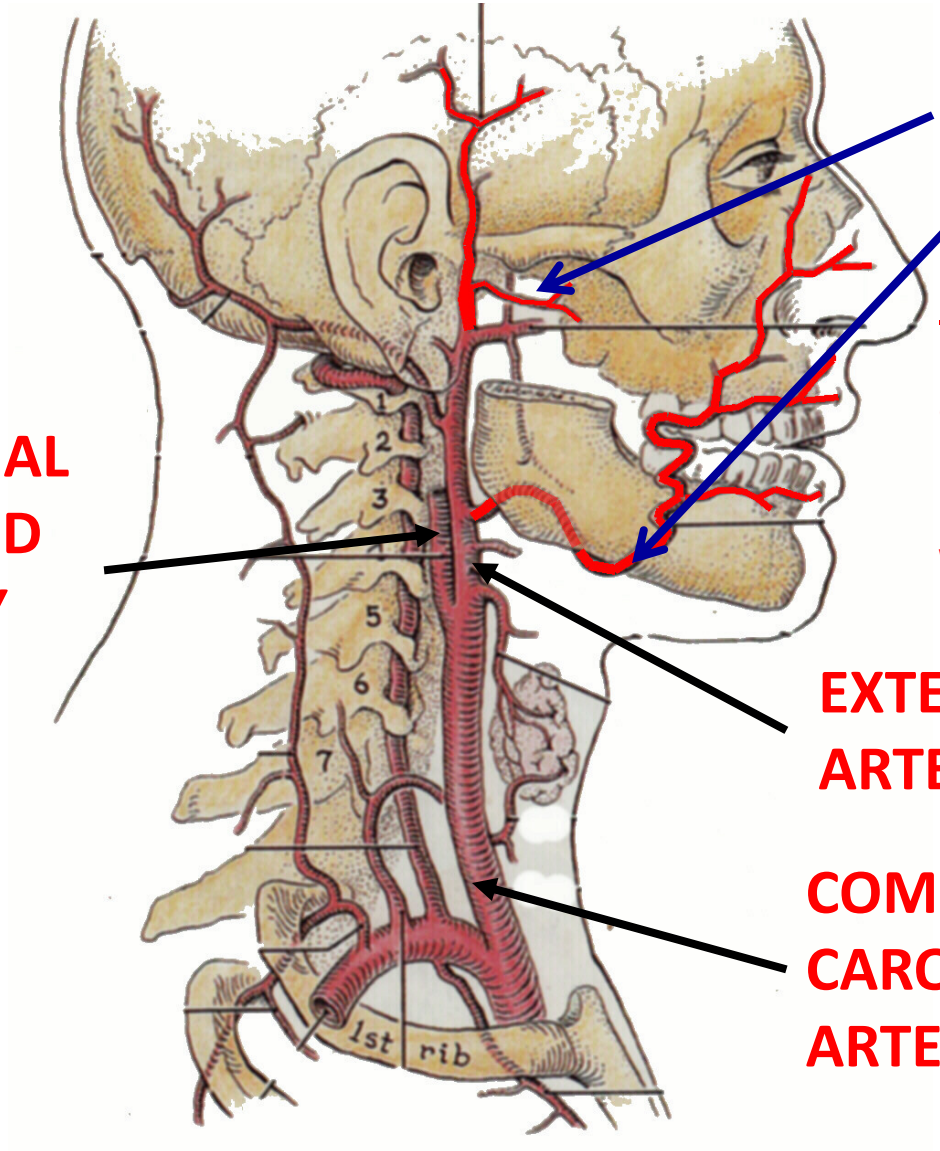
Discuss Face, Embryology Cranial Nerves with Practice Questions

FACE

- Arteries, Pulses
- Venous Drainage – Spread of Infection
- Bell's Palsy – Facial nerve paralysis, clinical tests, practice question
- Embryology - Cleft Lip. Nasolacrimal duct; practice question

ARTERIAL SUPPLY TO FACE: CAROTID ARTERY

SUPERFICIAL TEMPORAL ARTERY



TAKE PULSE HERE

FACIAL ARTERY
- extremely winding and tortuous course (skin moves) – DESCRIPTIVE TERM – wiggle, wiggle, wiggle

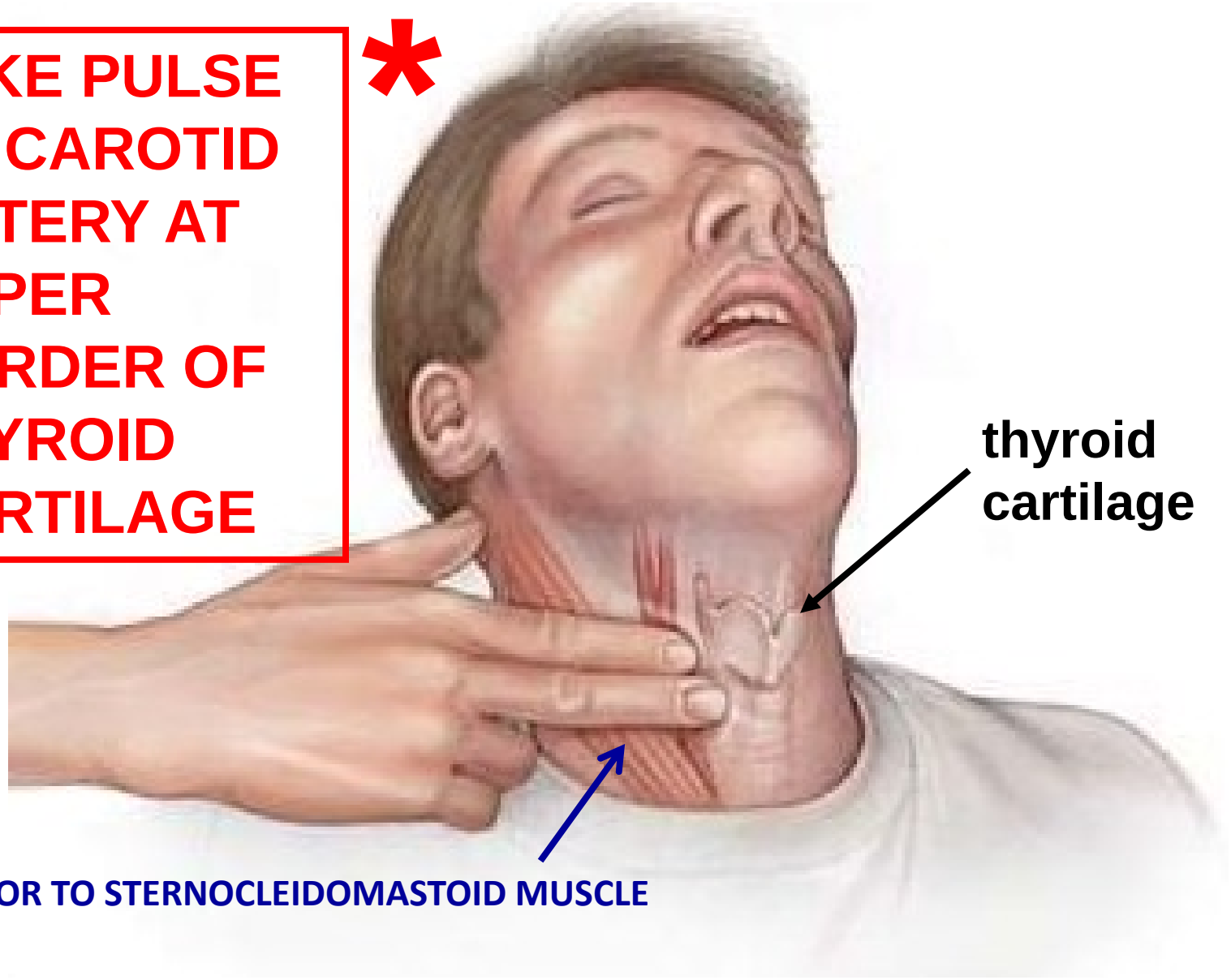
INTERNAL CAROTID ARTERY

EXTERNAL CAROTID ARTERY

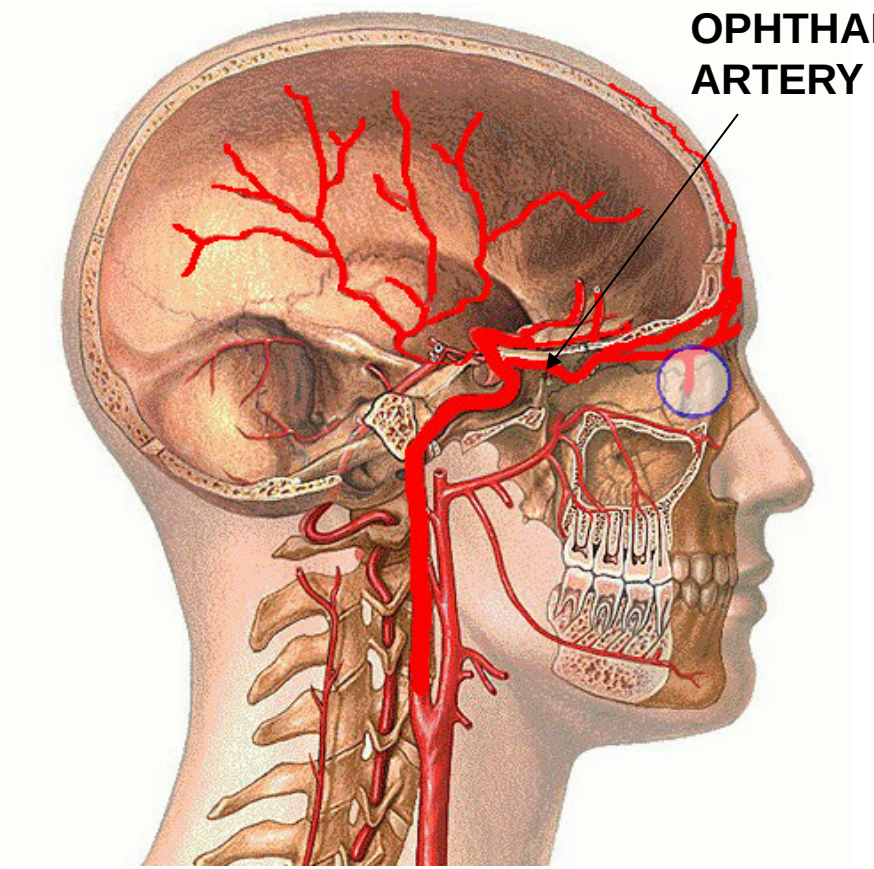
COMMON CAROTID ARTERY

PALPATE CAROTID BIFURCATION AT UPPER BORDER OF THYROID CARTILAGE

TAKE PULSE OF CAROTID ARTERY AT UPPER BORDER OF THYROID CARTILAGE *



INTERNAL CAROTID ARTERY



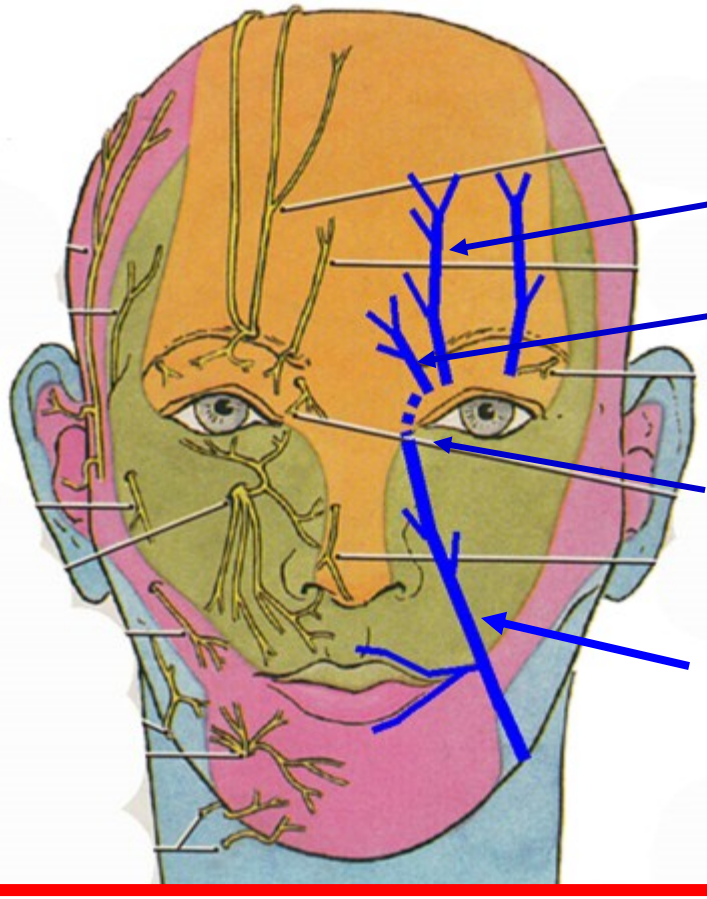
Note: Carotid = Karatikos in Greek = stupor; Named by Galen; Compression causes black out

Enters skull without Branching

Branches to:
A. Brain
B. Ophthalmic Artery-
Major blood supply
To eye (orbit)

Note: Branches of Ophthalmic artery leave orbit to supply Face, Forehead, Nasal cavity

VENOUS DRAINAGE - branches follow arteries



to Ophthalmic veins -
1) Supraorbital Vein
2) Supratrochlear Vein

1) Facial Vein - straight course ANASTOMOSE WITH OPHTHALMIC VEINS

*

- NOTE: Veins of Face have no (OR FEW AND VARIABLE) valves; drain to neck and into skull; Extensive anastomoses between branches of Facial AND Ophthalmic Veins

PRACTICE QUESTION CLINICAL VIGNETTE

A teenager patient develops a pimple on the face lateral to the nose and scratches the sore. In time, the sore becomes infected but remains untreated. The patient then develops neurological symptoms and has the major complaint of 'blurred vision' which is diagnosed as Diplopia.

The physician suspects that the infection has spread to a structure inside the cranial cavity.

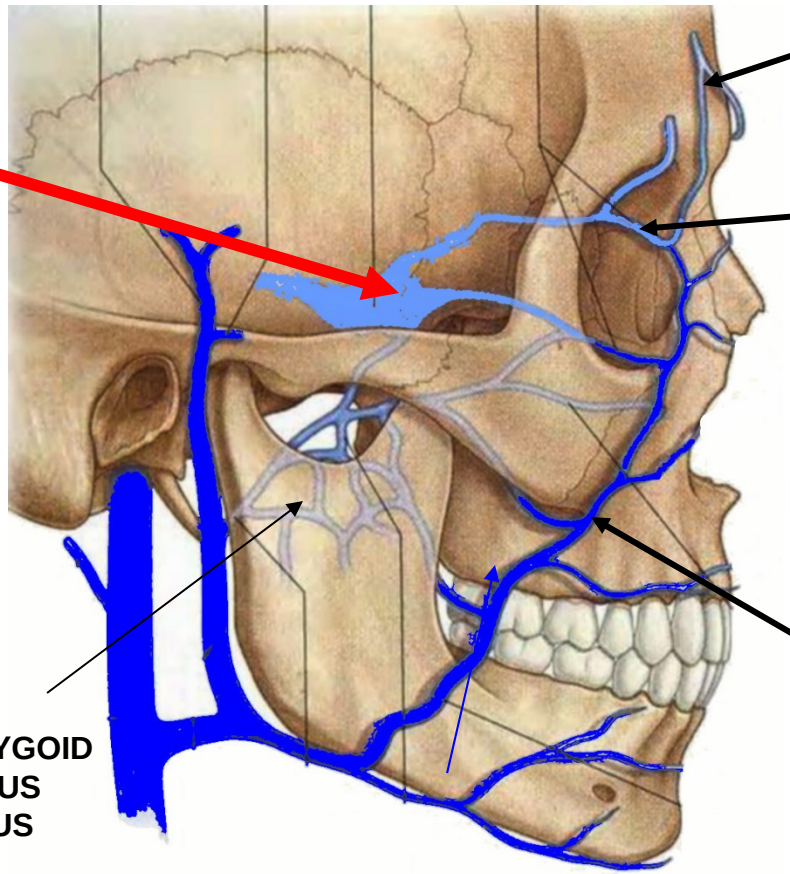
What is likely to be the structure and the route by which the infection has spread?

What is a likely cause of the blurred vision?

SPREAD OF INFECTION FROM FACE TO BRAIN

CAVERNOUS SINUS

Anastomoses of Facial and Ophthalmic Veins
- Ophthalmic veins drain to cavernous sinus (venous sinus inside skull)



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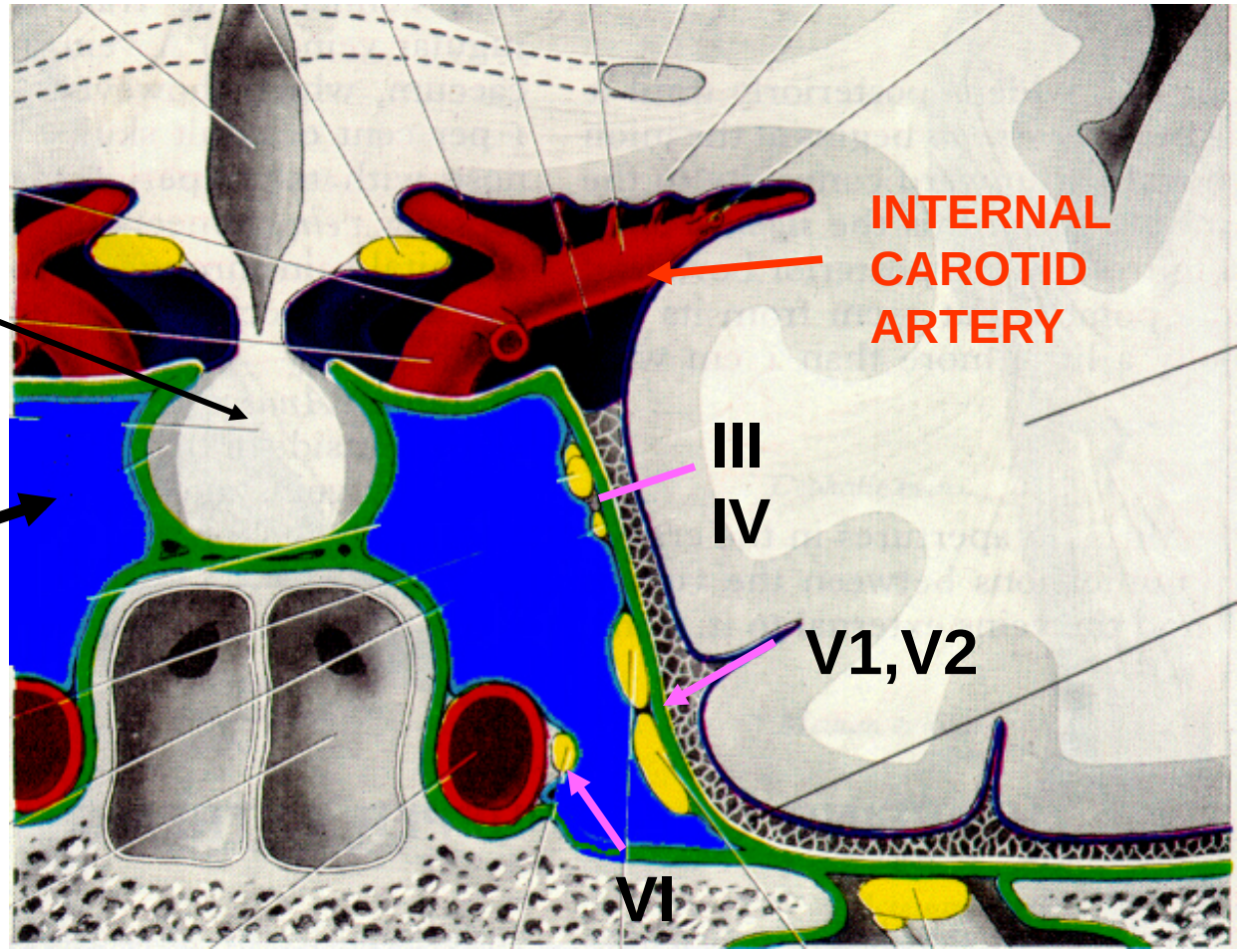
- Prolonged infections spread via veins (pressure low, no valves)
- Pass through orbit to Cavernous Sinus - <u>CAVERNOUS SINUS THROMBOSIS</u>; infections lateral to nose particularly dangerous
- Clinical sign: 'Blurred' vision (actually DIPLOPIA) (cranial nerves to eye muscles pass through Cavernous sinus)

NERVES TO EYE MUSCLES PASS IN WALL OF CAVERNOUS SINUS

STRUCTURES PASSING THROUGH WALL OF CAVERNOUS SINUS - Int. Carotid A., Cranial N.'s III, IV, V1, V2, VI;
Clinical sign of Infection in Sinus – 'BLURRED' VISION (Diplopia)



CN III, IV, VI – EYE MOVEMENTS

PRACTICE QUESTION CLINICAL VIGNETTE

PHOTO FROM: FIRST AID FOR THE USMLE STEP 1 - 2021

A 54 year-old patient awakes to find her face feels like it is 'sagging' on her left side. The image at left was taken when she tried to smile and raise her eye brows. She also complains that she cannot close her left eye and it feels like it is 'drying out'. She tries to eat breakfast but has difficulty chewing and food leaks from the corner of her mouth.

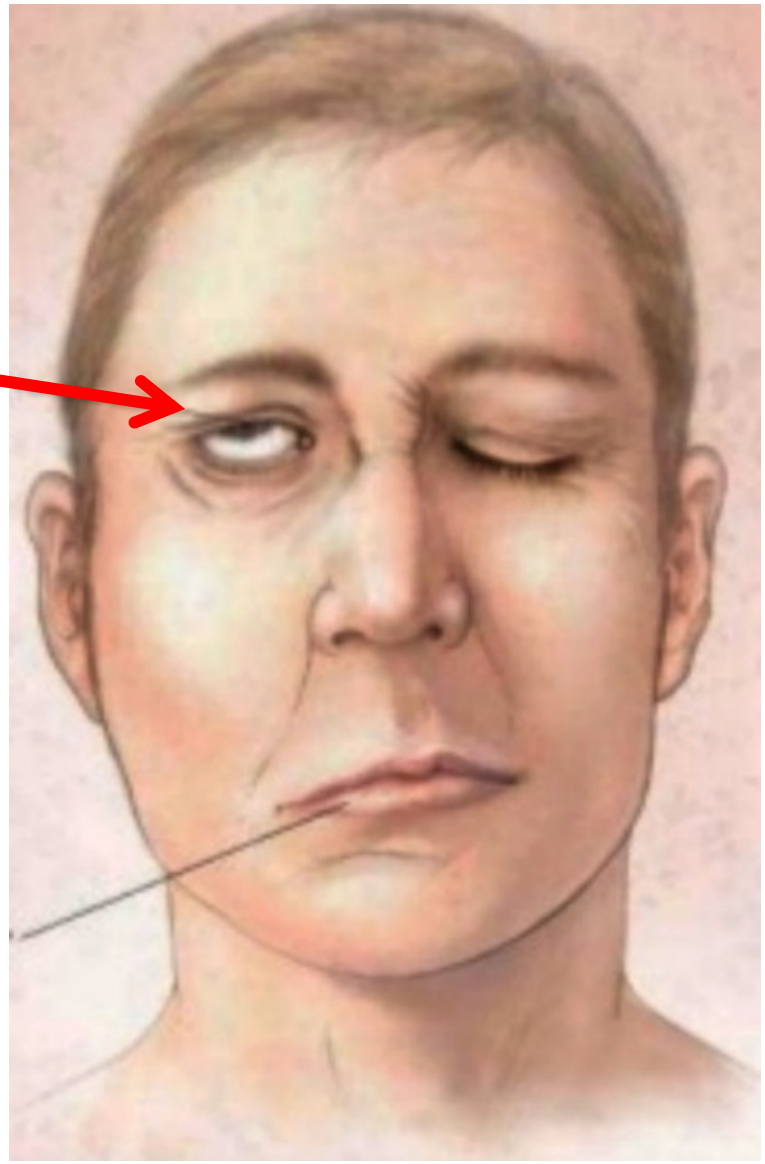
1) WHAT IS THE PHYSICIAN' S DIAGNOSIS?

2) WHY IS SHE UNABLE TO CLOSE HER LEFT EYE AND WHY IS IT 'DRYING OUT'

3) WHY DOES SHE HAVE DIFFICULTY WITH KEEPING FOOD IN HER MOUTH?

BELL'S PALSY

UNABLE TO CLOSE EYE DUE TO PARALYSIS OF ORBICULARIS OCULI MUSCLE



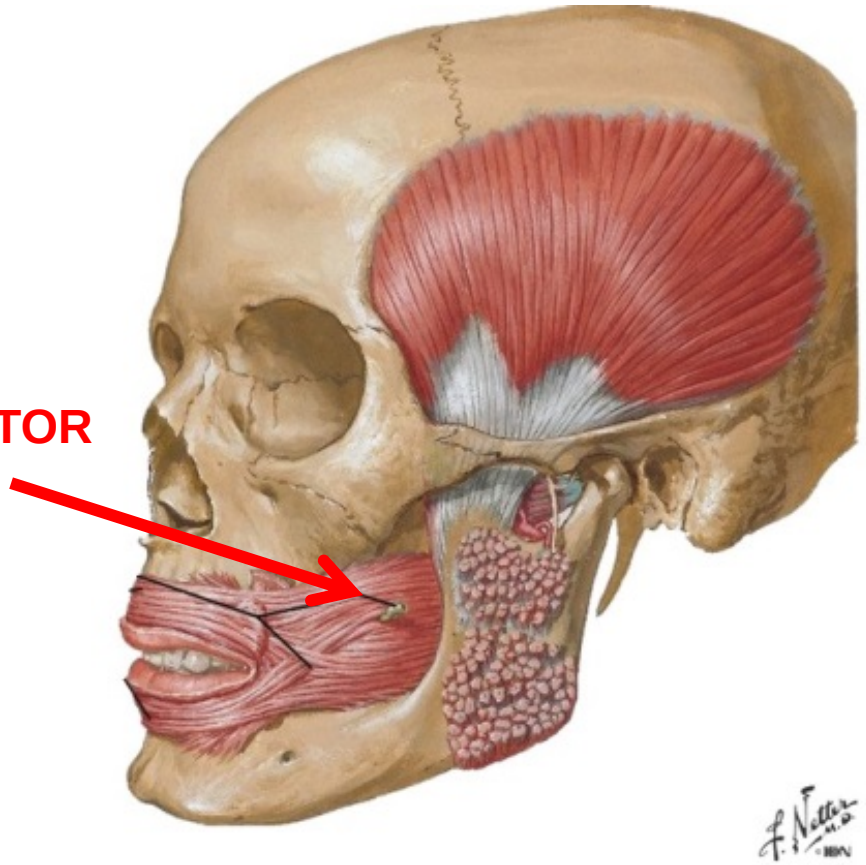
NOTE:
1) **CLOSE EYELIDS**
= CRANIAL NERVE VII (FACIAL N.)
2) **OPEN EYELIDS**
- CRANIAL NERVE III (OCULOMOTOR) + SYMPATHETICS

**

FACIAL PARALYSIS (as in Bell's Palsy) can paralyze ORBICULARIS OCULI MUSCLE
- patient is unable to close eye
- can damage cornea of eye
- in newborns, can sew eyelid shut to prevent corneal damage

PARALYSIS OF BUCCINATOR MUSCLE

BUCCINATOR



BUCCINATOR FORMS WALL OF MOUTH - PARALYZE UNABLE TO HOLD FOOD BETWEEN TEETH

CLINICAL **

FACIAL PARALYSIS can paralyze BUCCINATOR

- patient is unable to hold food between teeth

- DIFFICULTY IN CHEWING FOOD

FRONTALIS - muscle in scalp attached to Epicranial Aponeurosis; raises eyebrows (used in clinical test of Facial nerve)

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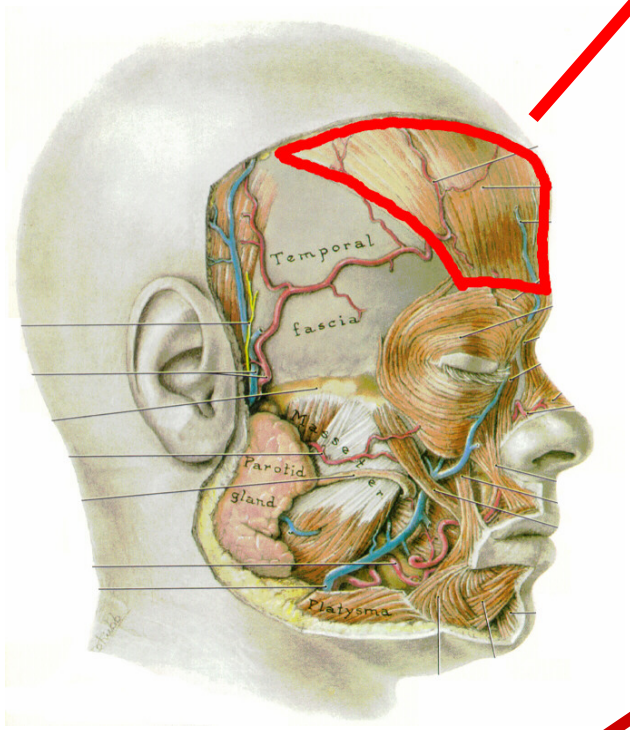
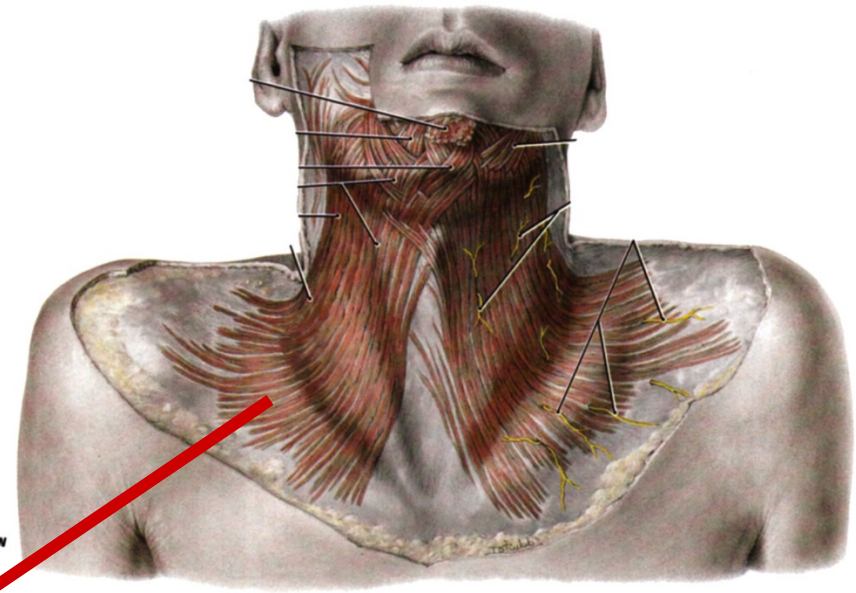
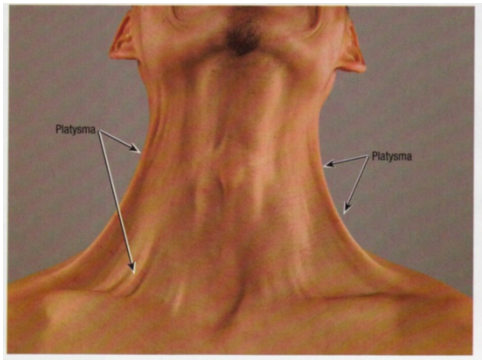




PLATYSMA - extends from mandible to fascia over Pectoralis Major; tenses, moves skin of neck

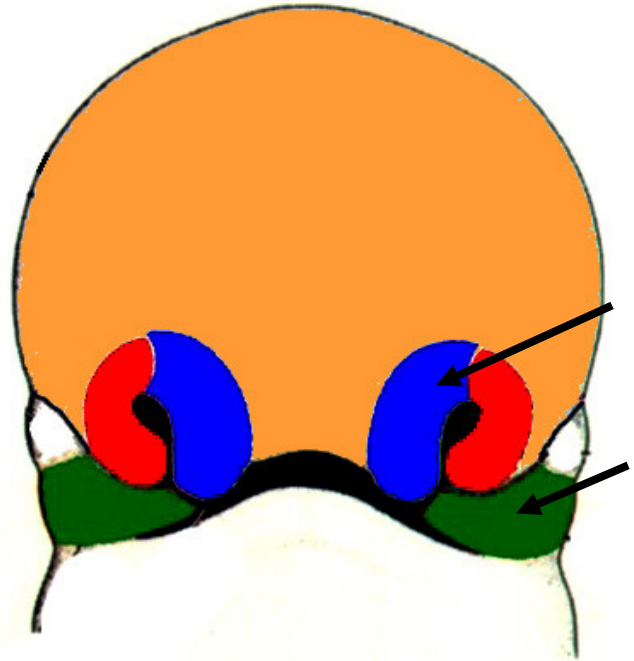


PRACTICE QUESTION: EMBRYOLOGY

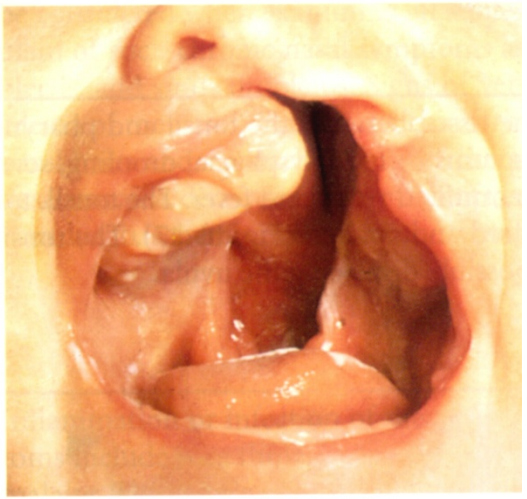
1. A neonate is examined and found to have a large defect located at the philtrum of the upper lip (photo). This condition arises because of failure of fusion of structures in embryonic development. Failure of fusion of which structures would result in this condition?

CLEFT LIP = CHEILOSCHISIS

– failure of fusion of Medial Nasal Process and Maxillary process



- 1/1000 Births, can be unilateral or bilateral
- At philtrum of lip



CLEFT LIP (cheiloschisis) CAN OCCUR IN COMBINATION WITH CLEFT PALATE (palatoschisis)

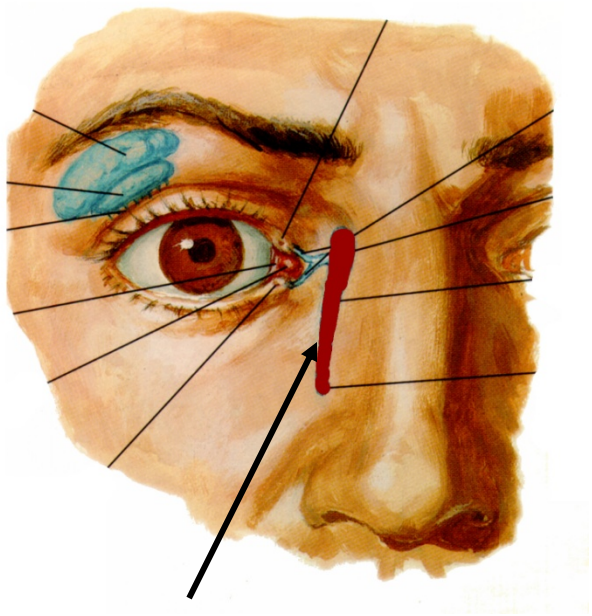
Gk. Cheilos, Lip;
Pronounce - KAI-LOS'-KESIS

PRACTICE QUESTION: EMBRYOLOGY

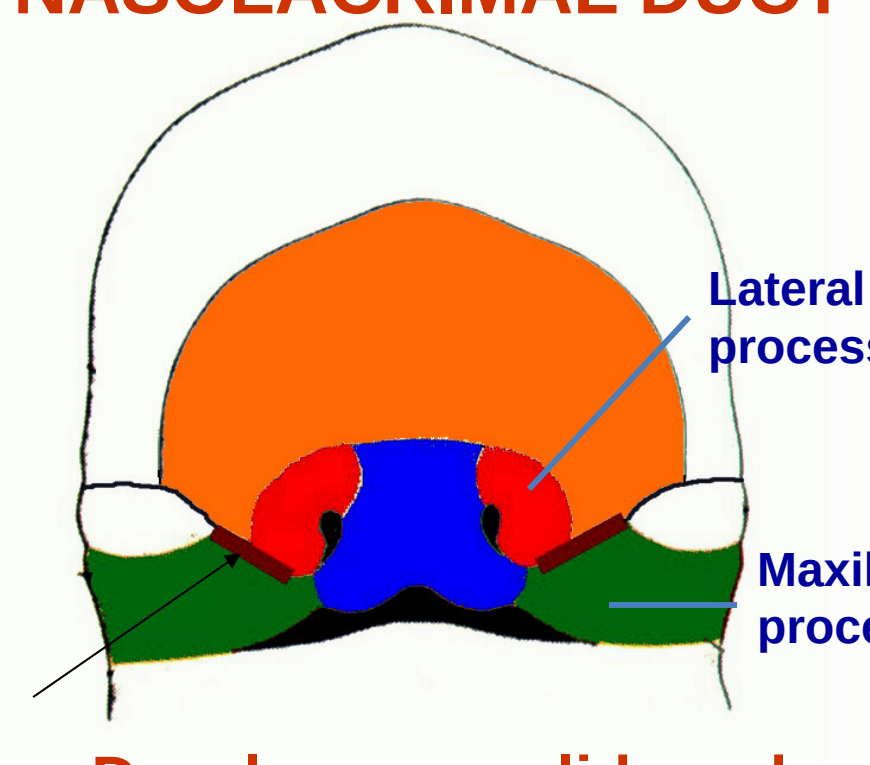
An infant has a continuous secretion of tears from the left eye (photo above). MRI of the orbit appears normal and the lacrimal gland is not enlarged. The physician suspects that the condition the result of a developmental abnormality.

What structure has not developed normally?

DEVELOPMENT OF NASOLACRIMAL DUCT



NASOLACRIMAL DUCT



– connects anterior eye to nasal cavity

- Develops as solid cord from medial angle of eye to nasal cavity
- becomes canalized.

* **Obstructed Duct - failure of duct to canalize; opened surgically for tears to drain to nasal cavity**

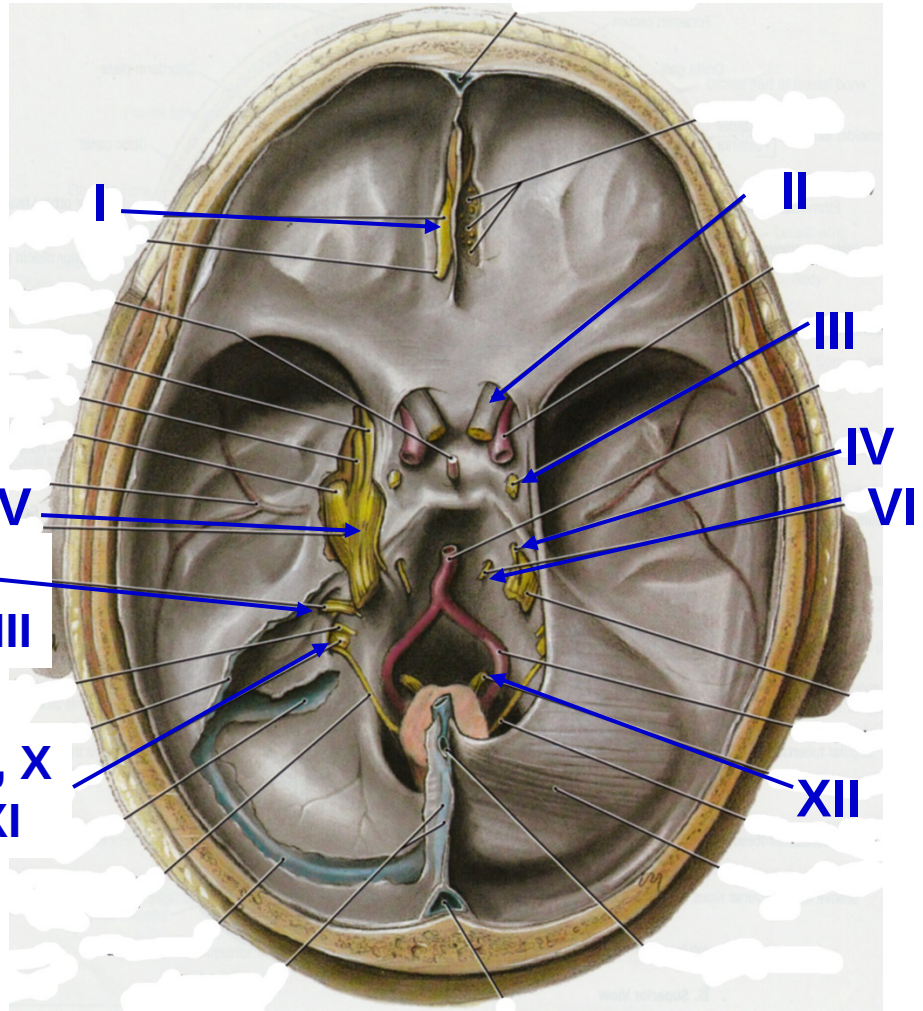
CRANIAL NERVES

Types of neurons – important in Neuro;

Voluntary Skeletal muscle (somatic, branchial)

Somatic sensory - Precise localization

LEARN NAMES AND NUMBERS OF CRANIAL NERVES



I. OLFACTORY - sense of smell
II. OPTIC - vision
III. OCULOMOTOR - eye movement
IV. TROCHLEAR - eye movement
V. TRIGEMINAL - touch, general sensation to skin, oral cavity, nasal cavity + more
VI. ABDUCENS - eye movement
VII. FACIAL - muscles of facial expression + lots more
VIII. VESTIBULO-COCHLEAR - hearing and balance
IX. GLOSSOPHARYNGEAL - sensory to pharynx +more
X. VAGUS - larynx, pharynx + rest of body
XI. ACCESSORY - sternocleidomastoid, trapezius
XII. HYPOGLOSSAL - muscles of tongue

SUMMARY TYPES OF NEURONS IN CRANIAL NERVES

TYPES OF NEURONS	INNERVATE	ASSOCIATED CRANIAL NERVES	CLINICAL
SOMATIC MOTOR (GSE)	Motor to voluntary skeletal muscles (derived from somites)	CN III, IV, VI - 1) Extraocular muscles (pre-otic somites) CN XII - muscles of tongue (occipital somites)	see ORBIT, TONGUE lectures
SOMATIC SENSORY (GSA)	Precise sensation Sensory to skin, joints (oral cavity, nasal cavity)	CN V - mostly V1 - Ophthalmic (above angle of eye) V2 - Maxillary (angle of eye to angle of mouth) V3 - Mandibular (below angle of mouth) also Skin of External (Outer) Ear - V, VII, IX, X	1) Trigeminal Neuralgia - pain in region of affected division 2) Bell's palsy (VII)- pain in outer ear
VISCERAL MOTOR (GVE) (Parasympathethics in Cranial Nerves)	Smooth muscles, Glands, etc. (ganglia close to target organ)	III - Ciliary ganglion - Pupillary constrictor, Ciliary muscle VII - Pterygopalatine ganglion - Lacrimal gland, mucous glands of nose and palate VII - Submandibular ganglion - Submandibular, Sublingual salivary glands IX - Otic ganglion - Parotid	see Associated lectures (Orbit; Nasal, Oral Cavities; Ear)
VISCERAL SENSORY (GVA)	Imprecise sensation: Innervation of Gut, Blood Vessels, etc. Specific for Innervation of Pharynx, Middle Ear	Pharynx VII - Nasopharynx IX - Oropharynx X - Laryngopharynx also Middle Ear - IX	Imprecise localization in Choking on food; Middle ear infections
SPECIAL SENSES (SSA)	Vision, Audition, Balance	II - Vision VIII - Audition (hearing), Balance (vestibular apparatus)	many; see associated lectures
CHEMICAL SENSE (SVA)	Taste, Smell	Taste is distributed: VII - anterior 2/3 of tongue IX - posterior 1/3 of tongue X - taste buds anterior to epiglottis Smell - I - olfaction	Damage produces loss of taste in region of innervation
BRANCHIO-MOTOR (SVE)	Voluntary skeletal muscles derived from Branchial Arches	V - muscles of First Branchial Arch VII - muscles of Second Branchial Arch IX - muscles of Third Branchial Arch X - muscles of Fourth and Sixth Branchial Arches XI - muscles of caudal Sixth Branchial arch (disagreement among authors)	see Branchial artch chart (above); also Branchial Arch Lecture, etc.

Note: No questions on quiz require knowledge of three letter description of types of neurons (ex. GSE)

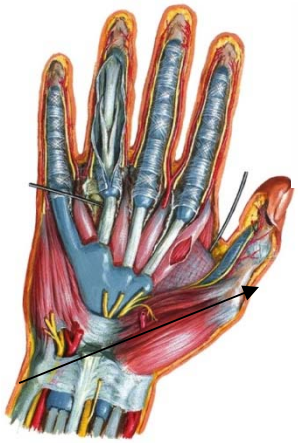
However, may appear in future lectures in Neuro

'INCANTATION)

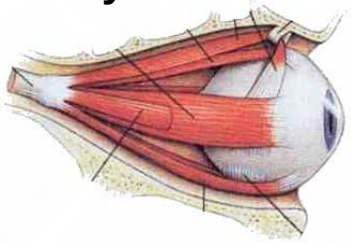
SOMATIC MOTOR – SKELETAL MUSCLE

SOMATIC MOTOR - motor axons to skeletal muscles

ex. muscles of hand



eye muscles



move eyes

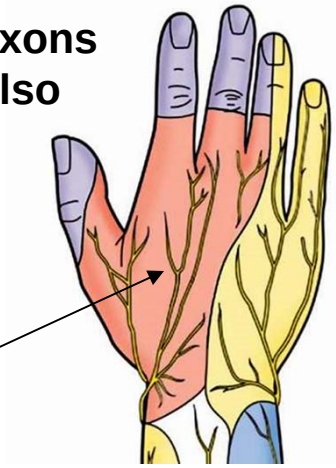
muscles of tongue

move tongue

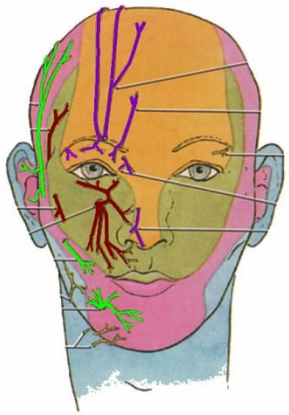
IN HEAD

SOMATIC SENSORY- sensory axons to skin ; also joints, body position

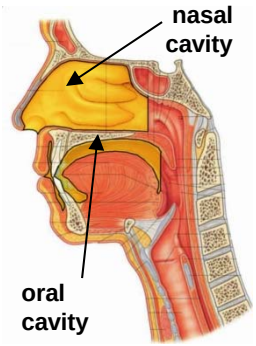
ex. skin of hand



skin of head



oral, nasal cavities

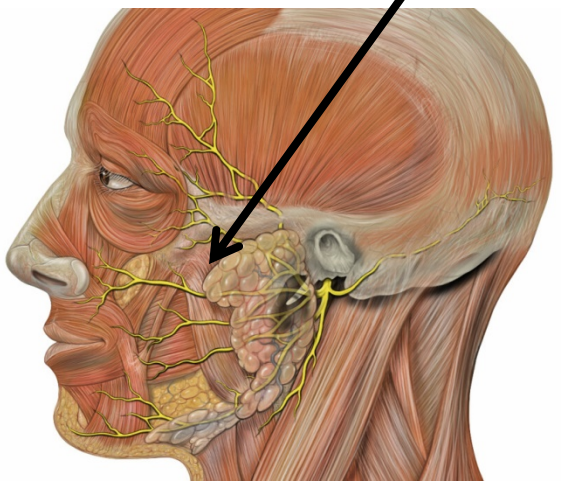


SOMATIC MOTOR IN HEAD - limited to two groups

1. **EYE MUSCLES** - extraocular muscles that move eye (and lift upper eyelid)
2. **MUSCLES OF TONGUE**

SOMATIC SENSORY IN HEAD - precise sensation sensory to skin ; also oral cavity (inside mouth), **nasal cavity** (inside nose)

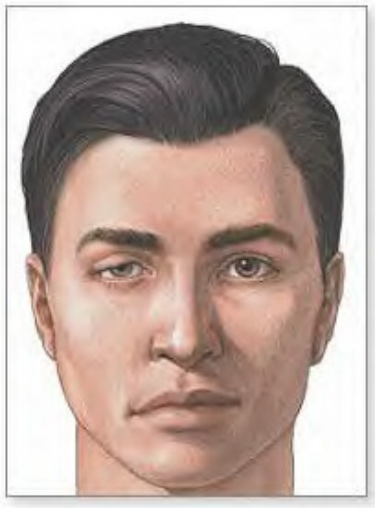
MUSCLES OF FACIAL EXPRESSION



BRANCHIOMOTOR – also voluntary skeletal muscle; same as Somatic motor; except different embyology, different located of nuclei in brainstem

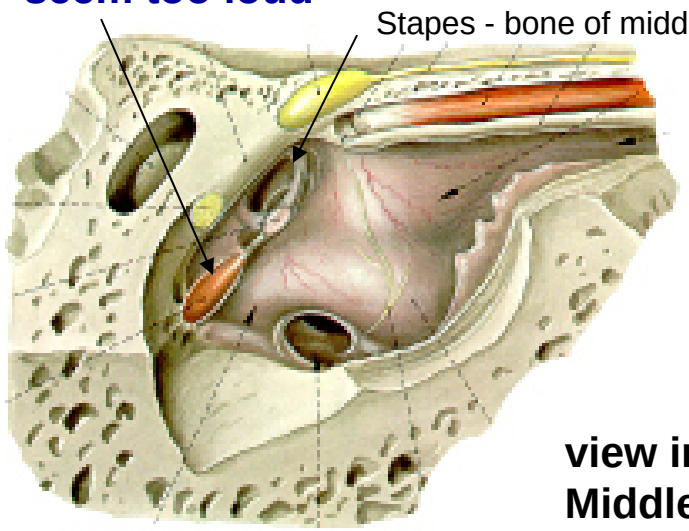
FACIAL PARALYSIS

sagging face
loss of naso-labial fold
inability to close eye



also HYPERACOUSIS – sounds seem too loud

STAPEDIUS - dampens sound - DAMAGE HYPERCOUSIA - sounds seem too loud



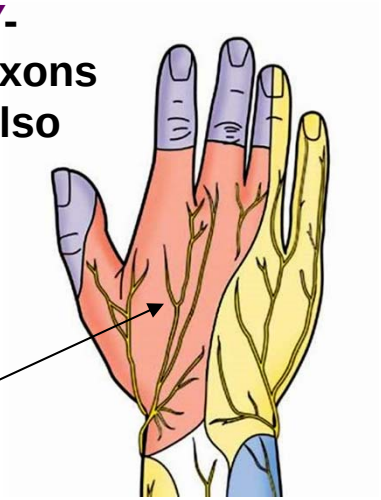
view inside Middle ear

SOMATIC SENSORY – PRECISE LOCALIZATION

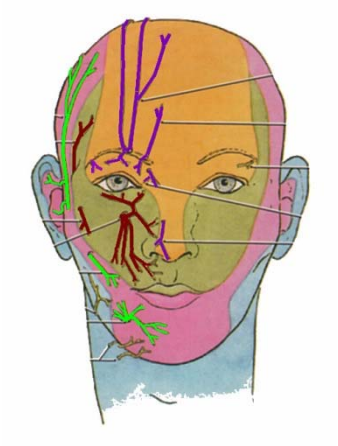
IN HEAD

SOMATIC SENSORY- sensory axons to skin ; also joints, body position

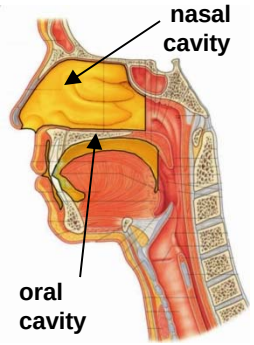
ex. skin of hand



skin of head

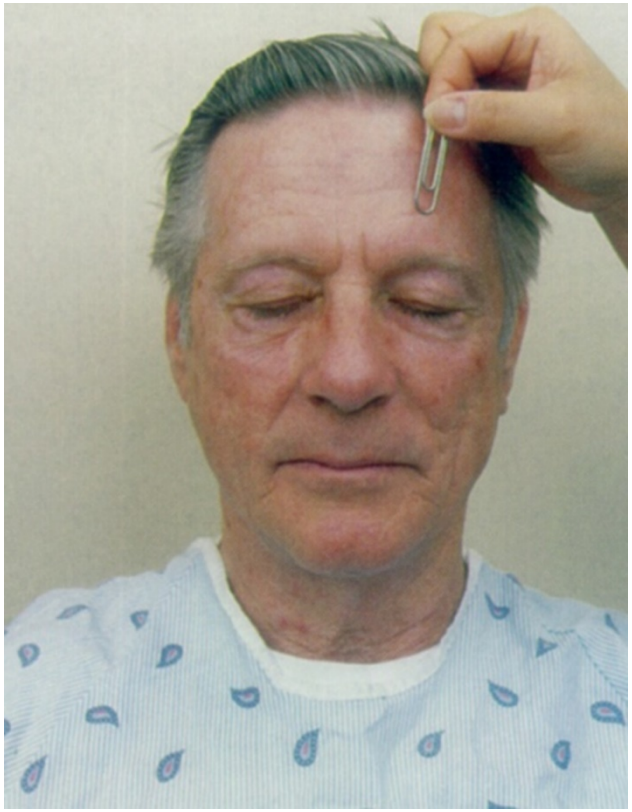


oral, nasal cavities



SOMATIC SENSORY IN HEAD - precise sensation sensory to skin ; also oral cavity (inside mouth), nasal cavity (inside nose)

PRACTICE QUESTION: CRANIAL NERVES



A patient complains that he has lost sensation on his face and that the skin of his face feels numb. The physician tests tactile acuity by touching the forehead and finds severe loss of sensation.

Which cranial nerve is being tested (be specific)?

What is othe location of the sensory neuron cell bodies the skin of the face?

TRIGEMINAL NERVE - 3 DIVISIONS (MAJOR BRANCHES)

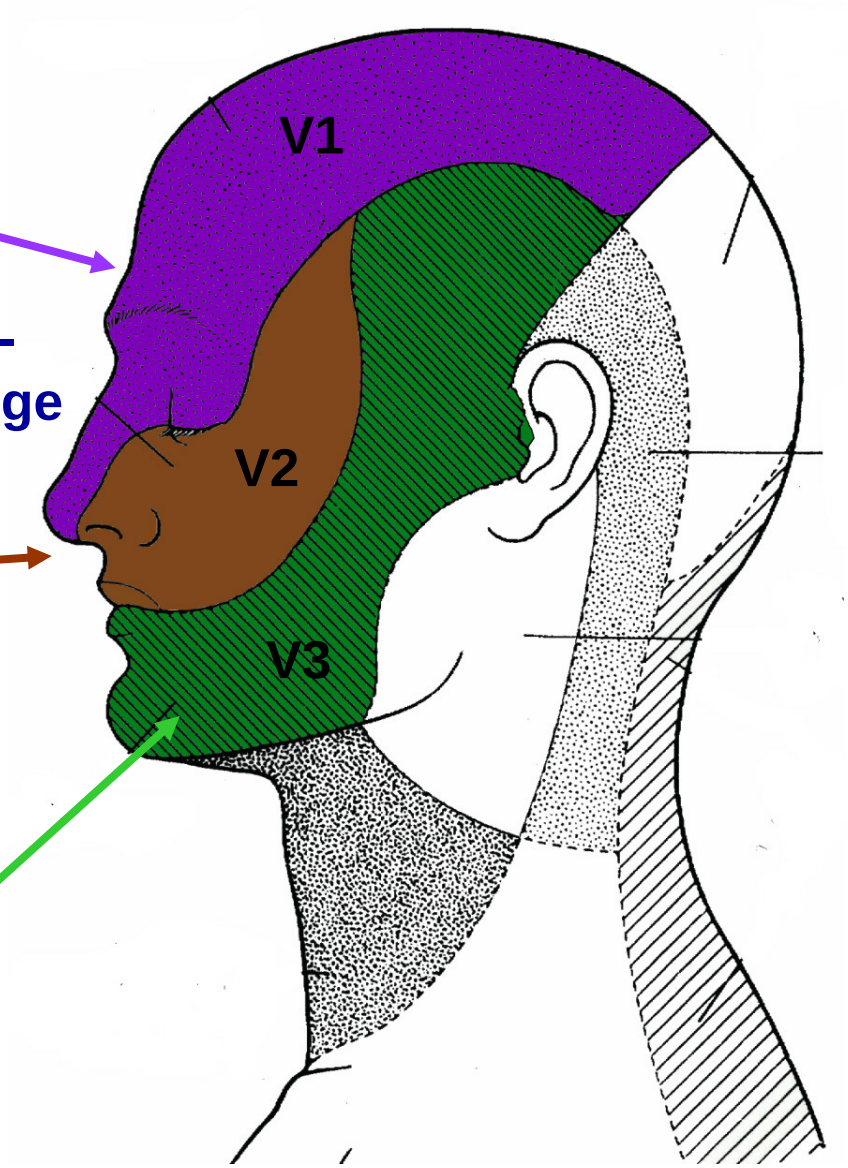
V1 – OPHTHALMIC DIVISION

Boundary- Lateral edge of eye

V2 – MAXILLARY DIVISION

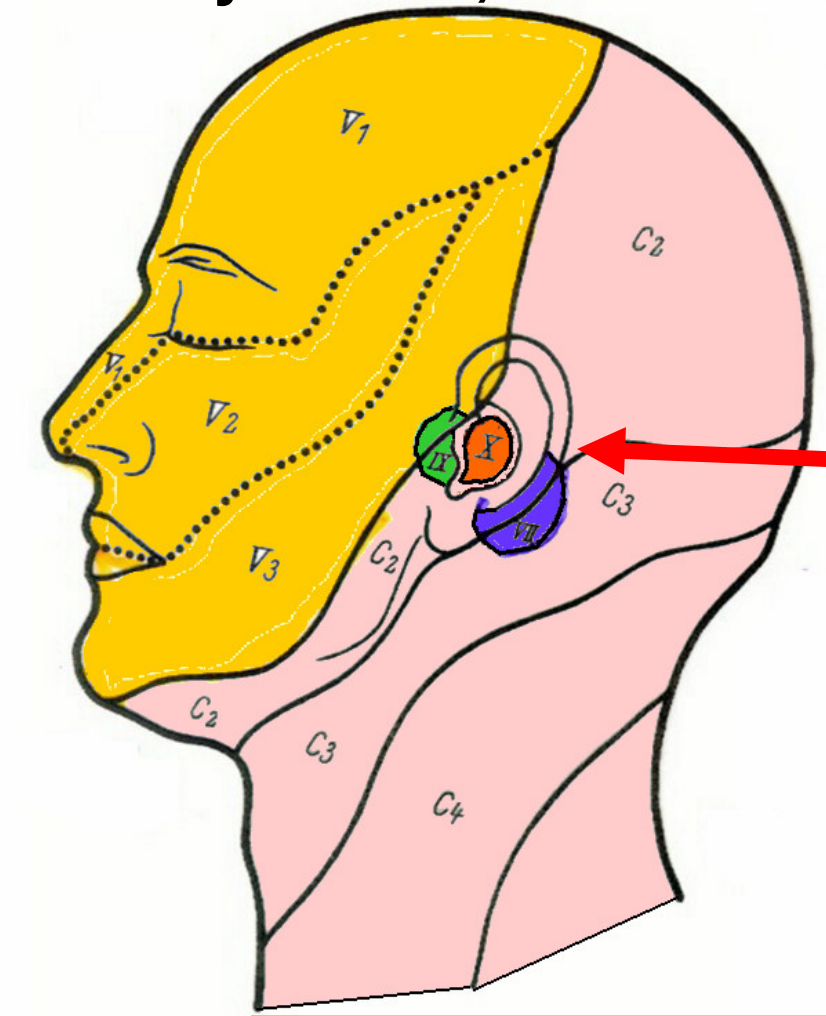
Boundary Lateral edge of mouth

V3 – MANDIBULAR DIVISION



SOMATIC SENSORY

sensory to skin, ORAL cavity, NASAL cavity, joints, muscles



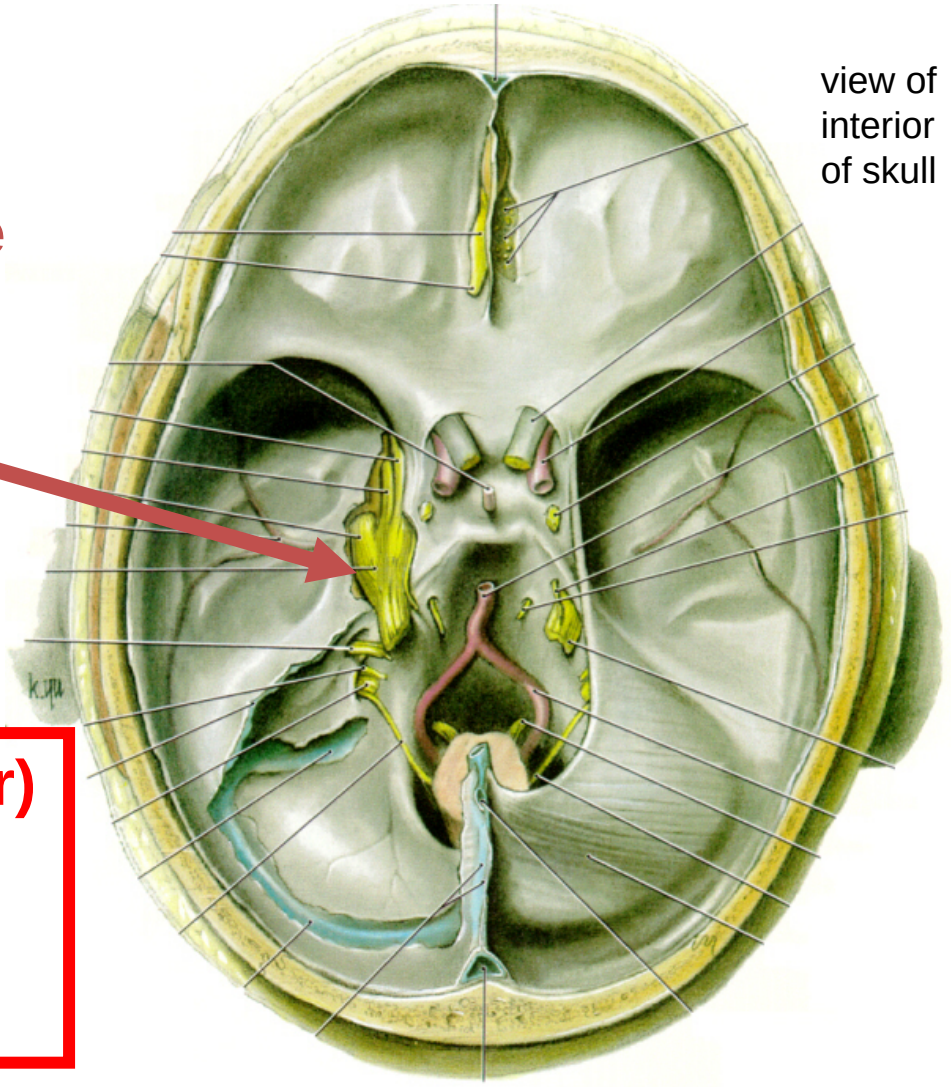
ALMOST ALL
TRIGEMINAL V
EXCEPTION:
SKIN OF OUTER EAR – FOUR CRANIAL NERVES
1) V - TRIGEMINAL
2) VII- FACIAL
3) IX - GLOSSO-PHARYNGEAL
4) X - VAGUS

**

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

SENSORY GANGLIA ARE ATTACHED TO CRANIAL NERVES

- cell bodies of sensory neurons in Trigeminal Nerve are in **Trigeminal (Semilunar) Ganglion**



view of interior of skull

Clinical - Mass (ex. tumor) pressing on Trigeminal Ganglion can produce numbness, intense pain

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Cell bodies of sensory neurons in VII (Facial Nerve) in Geniculate Ganglion