

DISCUSSION SESSION 2: GROSS ANATOMY

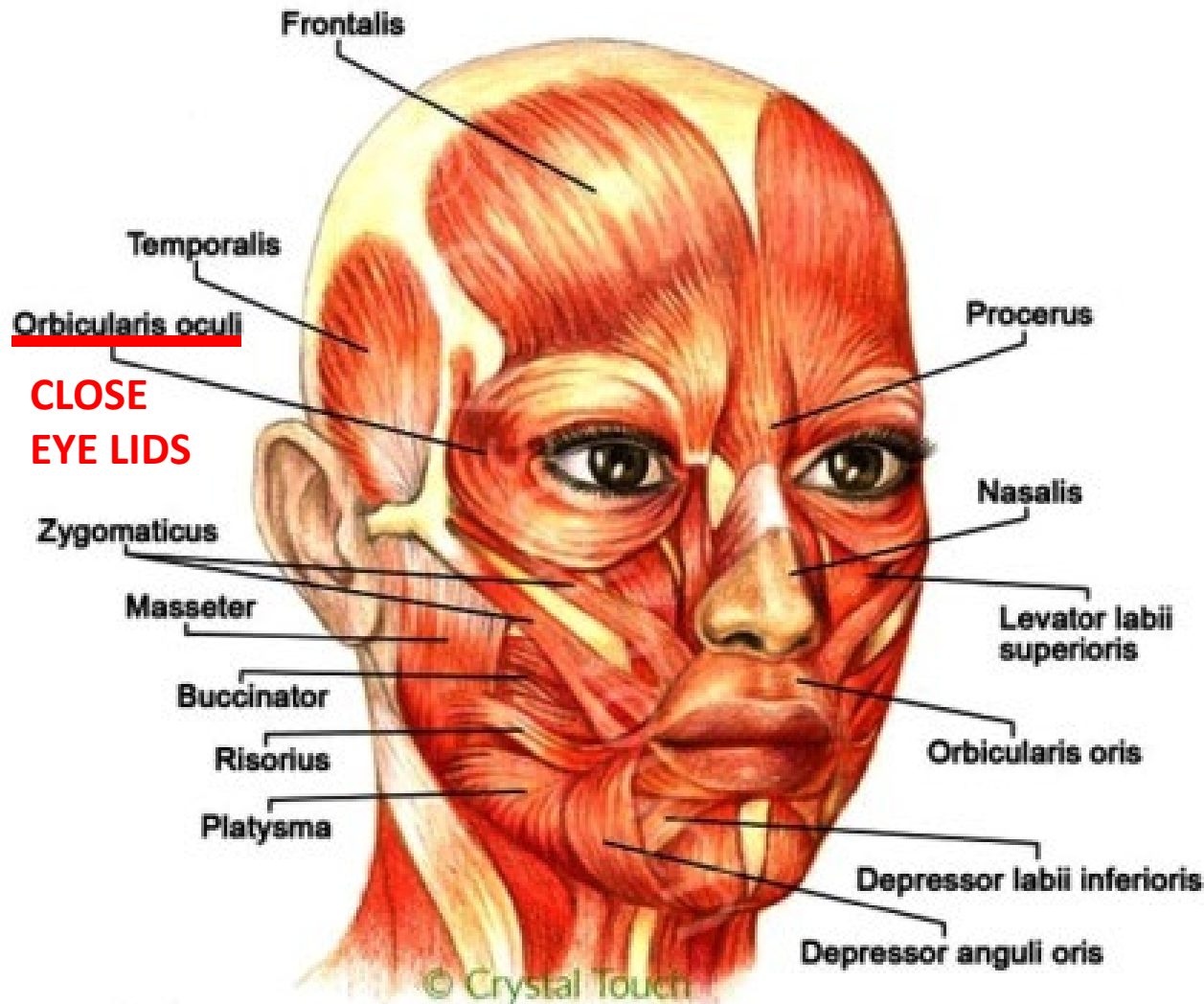
ONN BLOCK

Feb 7, 2024

**Discuss Face (Bell's palsy),
Embryology (Cleft Lip, Palate),
Meninges (Hematomas), CSF
resorption (Hydrocephalus)**

MUSCLES OF FACIAL EXPRESSION

FACE



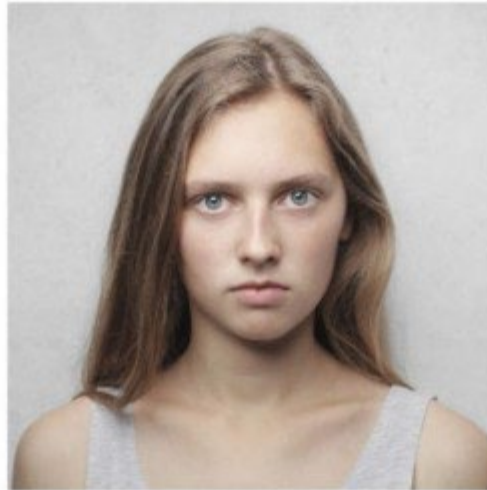
Skeletal muscles - under voluntary control (CN VII Facial) and 'emotional' control (ex. amygdala inputs)

Insert to skin - repair limited to facial transplants (skin and muscles)

No muscle (or very few) spindles. Monitoring thought to occur by stretch of skin.

FACIAL EXPRESSIONS CAN CONVEY EMOTIONS

'NEUTRAL?'



CONTRACTIONS OF
MUSCLES OF FACIAL
EXPRESSION CAN BE
'READ' TO INDICATE
THE EMOTIONAL
STATE OF A PERSON



ANGER

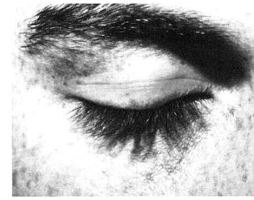


JOY

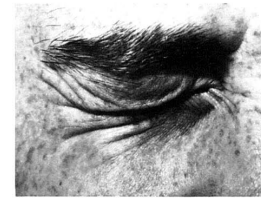


FEAR

PRACTICE USING FACIAL MUSCLES SELECTIVELY IN FRONT OF MIRROR



Palpebral Part



Orbital Part

Orbicularis Oculi

**Sneering –
Procerus**



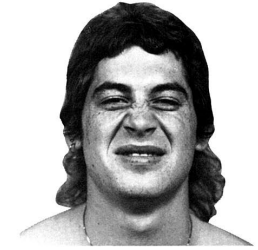
Procerus



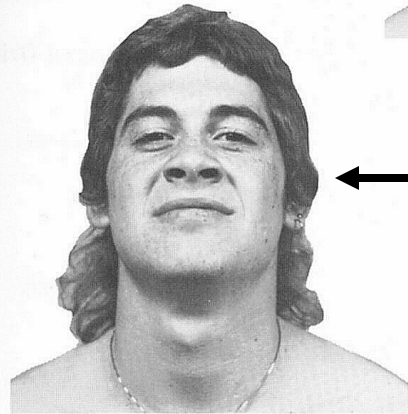
Frontalis



Corrugator Supercilii



Procerus



Nasalis



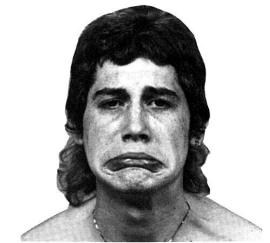
**Contempt –
Dilator Naris**



Nasalis

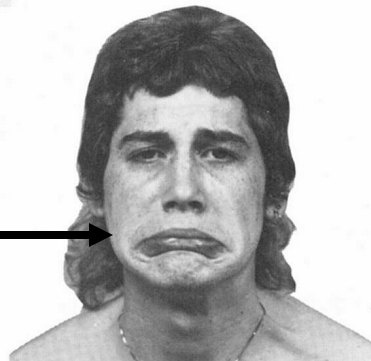


Risorius



Depressor Anguli Oris

**Grading Policy -
Depressor Anguli
Oris**



Depressor Anguli Oris



Orbicularis Oris



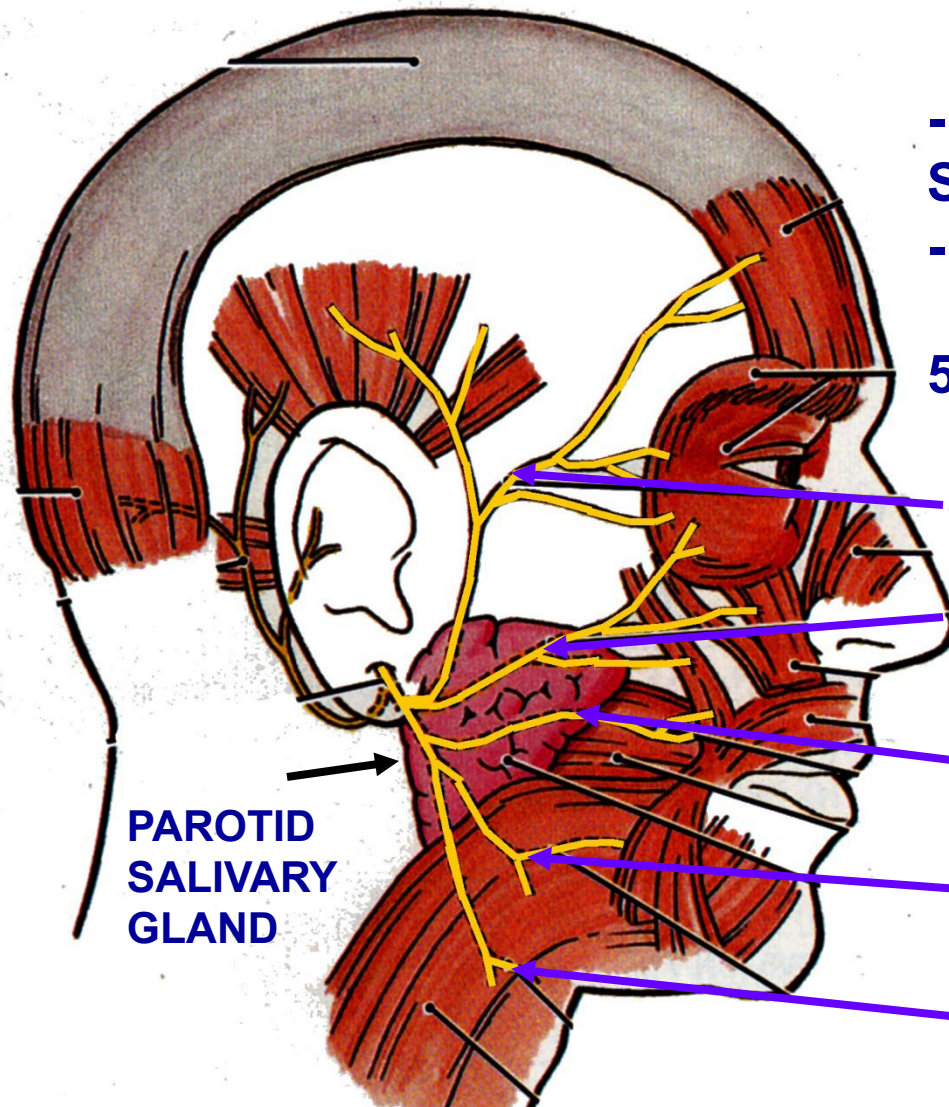
Zygomaticus Major



Mentalis

7-15B MUSCLES OF EXPRESSION IN ACTION

MOTOR INNERVATION TO MUSCLES OF FACIAL EXPRESSION - FACIAL NERVE (CRANIAL NERVE VII)



- leaves skull via Stylomastoid foramen
- divides in parotid gland into

5 terminal branches

1. TEMPORAL

2. ZYGOMATIC

3. BUCCAL

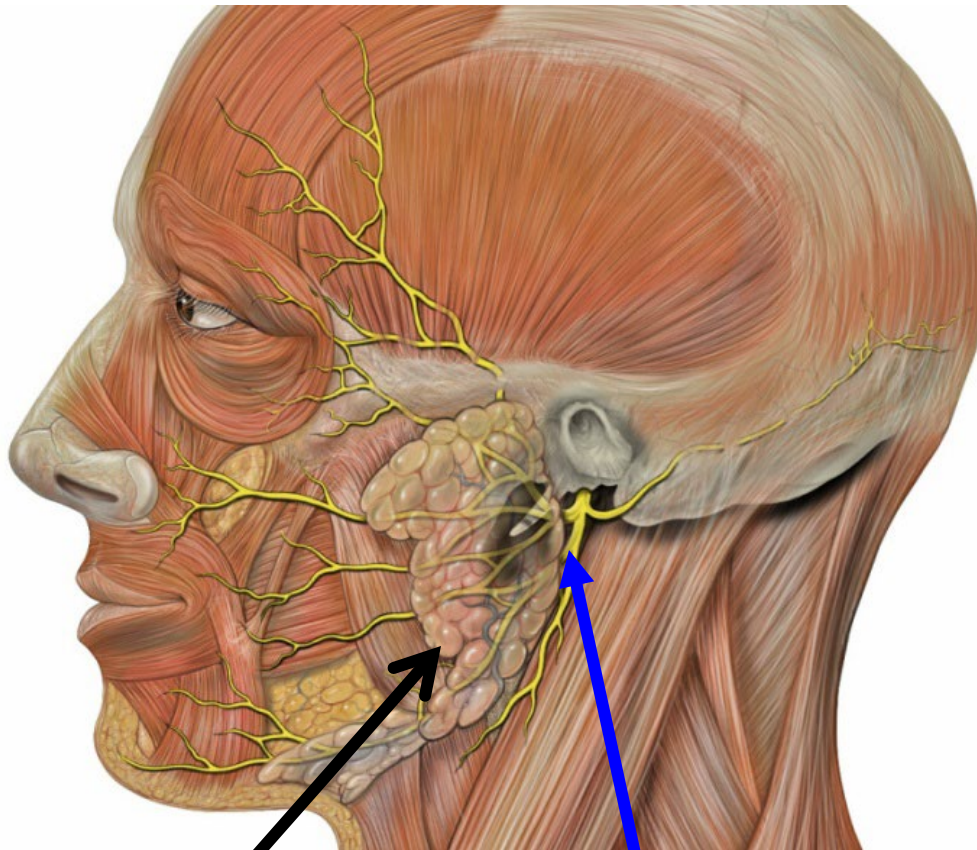
4. MANDIBULAR

5. CERVICAL

PAROTID SALIVARY GLAND

Note: Buccal Br. VII = Motor; Buccal Br. V = Sensory

FACIAL NERVE DAMAGE



Parotid
Salivary
gland

FACIAL NERVE
(Cranial Nerve VII)

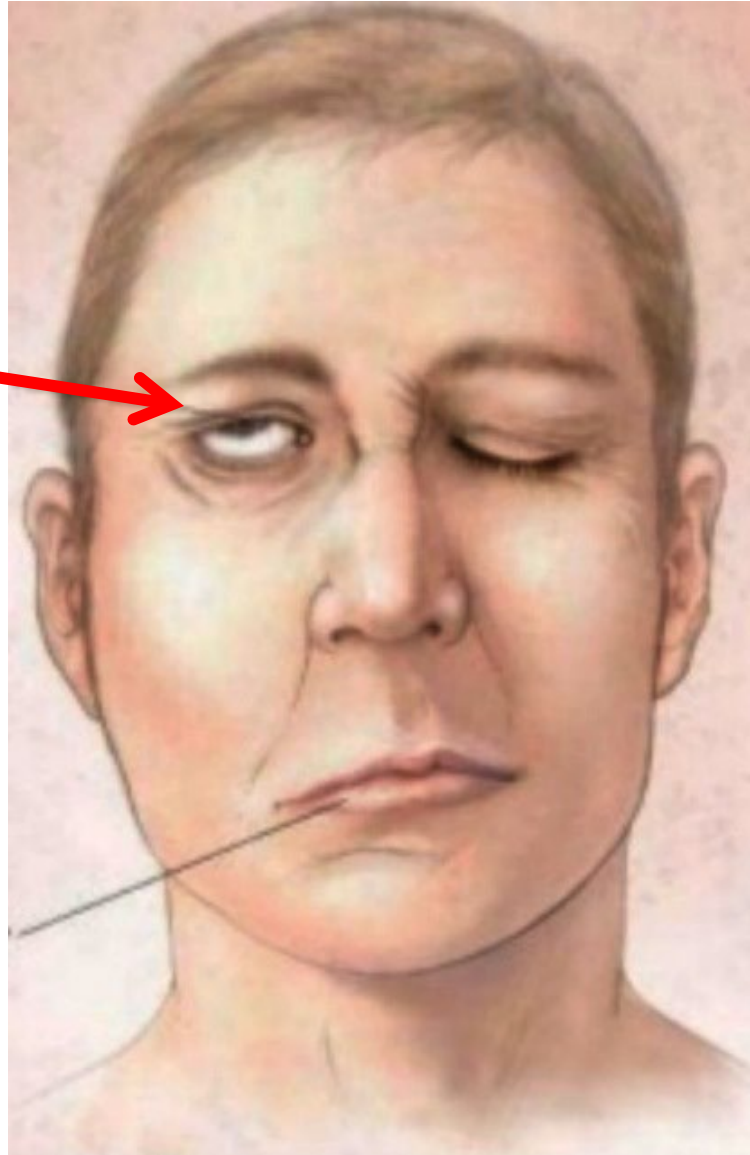
- Facial nerve exits skull via Stylomastoid foramen (base of skull)
- Facial nerve passes through and branches in Parotid salivary gland
- can be **damaged by Parotid tumors.**
- more common, may be associated with viral infections:
 - Bell's palsy** - loss of function of Facial nerve
 - others - ex. Ramsay-Hunt syndrome**

BELL'S PALSY - SYMPTOMS REFLECT ANATOMY OF FACIAL NERVE

UNABLE TO
CLOSE EYE DUE
TO PARALYSIS
OF
ORBICULARIS
OCULI MUSCLE

NOTE: CONTROL
OF EYELIDS

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



FACIAL PARALYSIS
(as in Bell's Palsy)

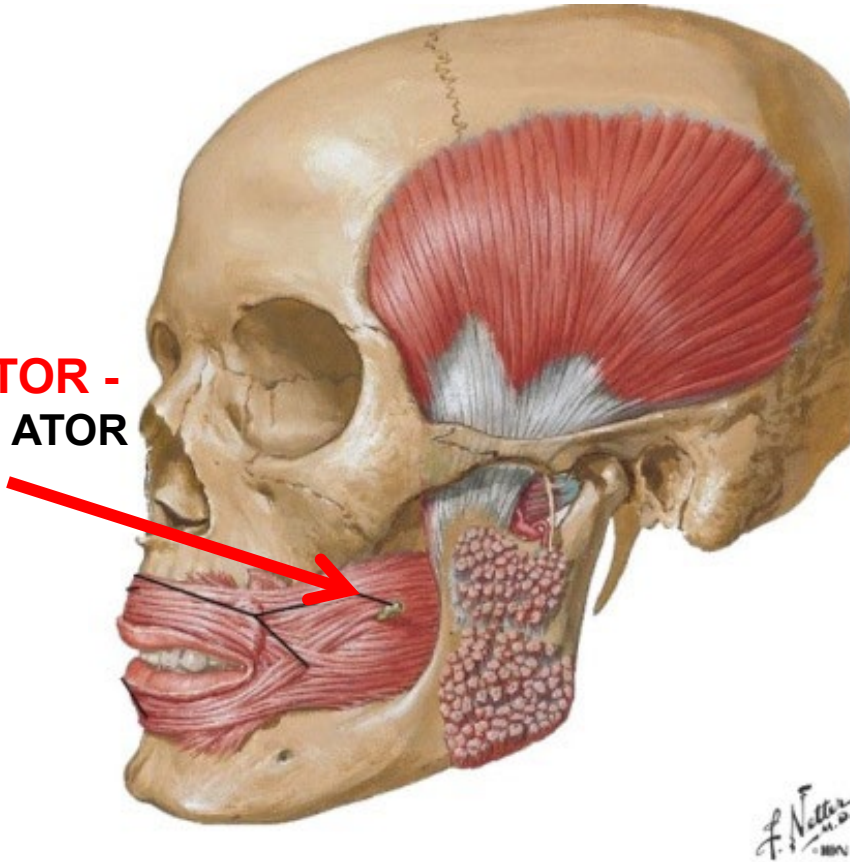
can paralyze
ORBICULARIS
OCULI MUSCLE

- 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

CLINICAL * *

BUCCINATOR -
BUCK, SIN, ATOR



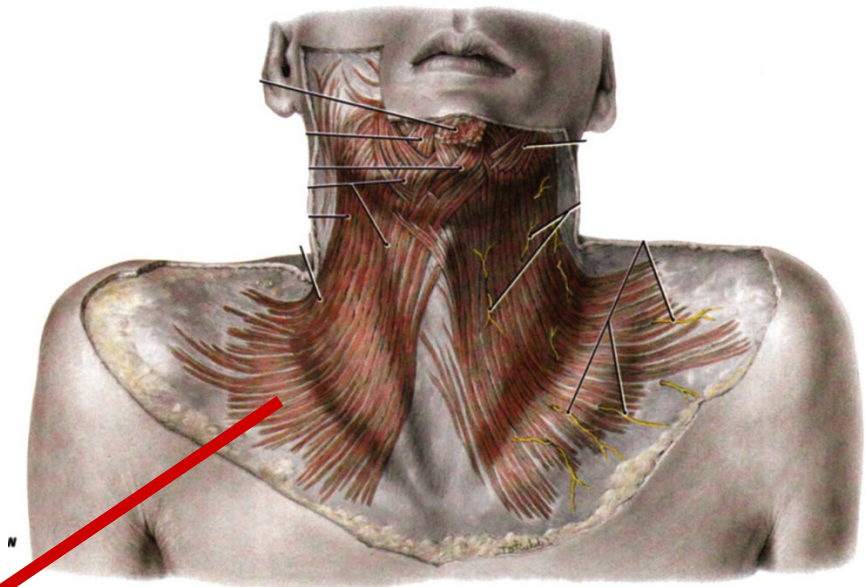
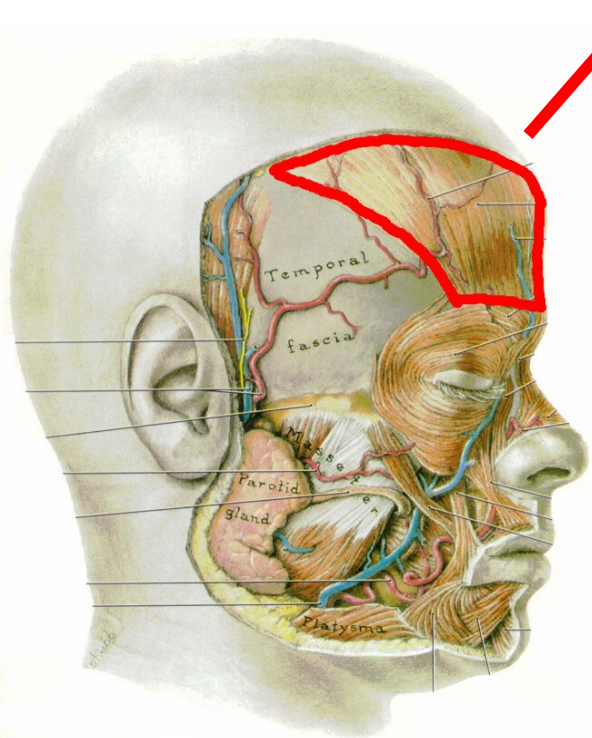
FACIAL PARALYSIS
can paralyze
BUCCINATOR

- patient is unable to
hold food between
teeth

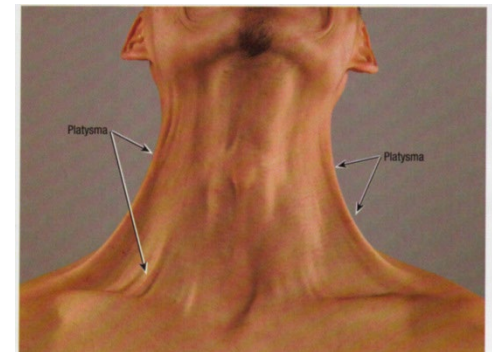
- **DIFFICULTY IN**
CHEWING FOOD

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

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



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

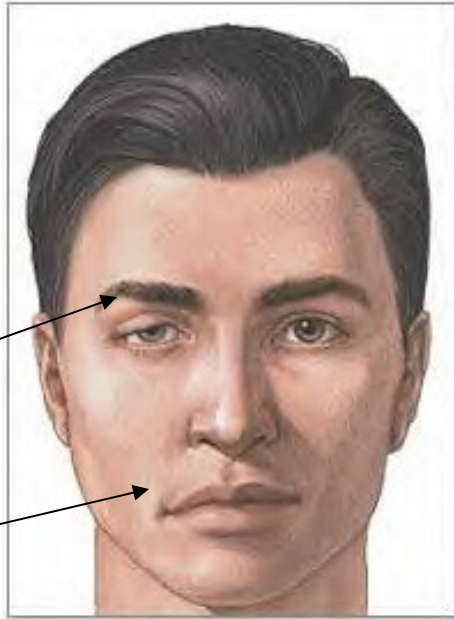


OVERVIEW OF FACIAL MUSCLES: FACIAL PARALYSIS

FACIAL PARALYSIS - BELL'S PALSY - CN VII

'drooping' eyebrow

'drooping' upper lip

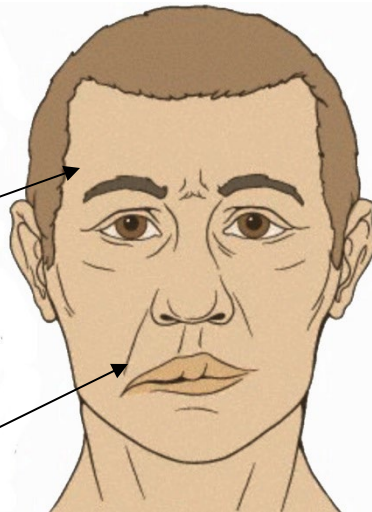


BELL'S PALSY- Lower Motor Neuron (Alpha motor neuron) disorder of Facial Nerve (CN VII): associated with viral infection (herpes simplex); Symptoms unilateral: sudden onset paralysis of all facial muscles on one side; **SYMPTOMS:** drooling; inability to close eye; loss of taste to anterior tongue; pain in or behind ear; hyperacusia

UPPER MOTOR NEURON LESIONS

MUSCLES OF UPPER FACE NOT AFFECTED

'drooping' upper lip



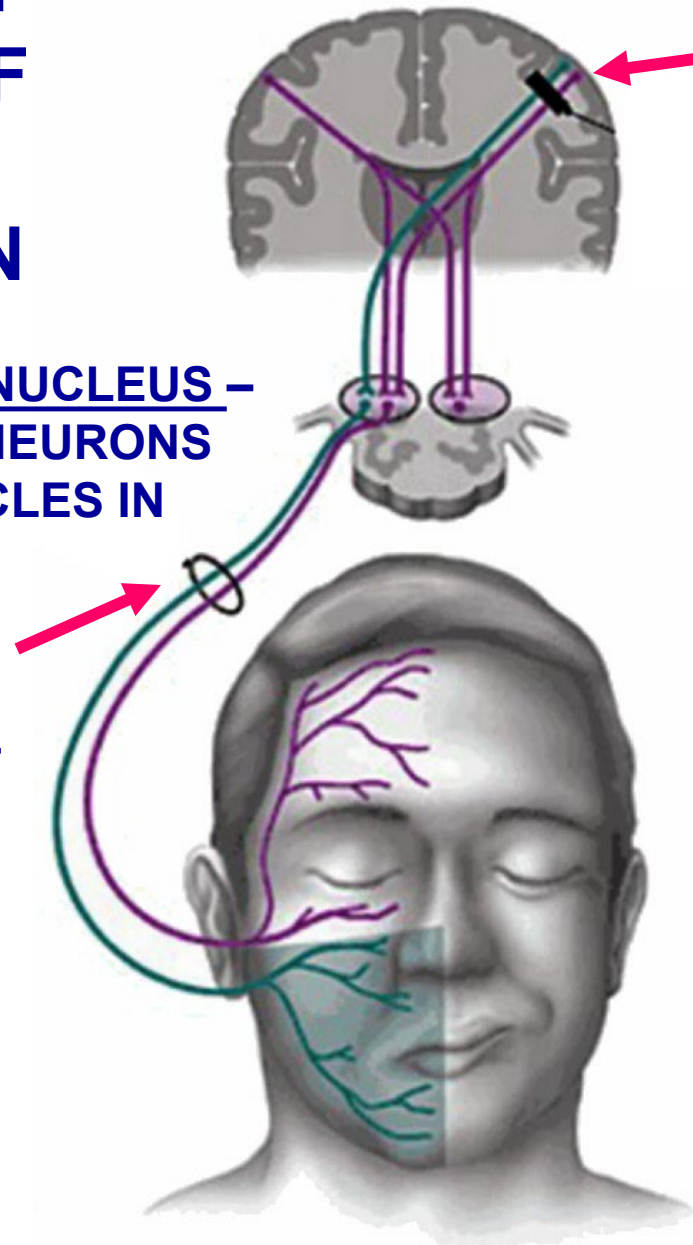
UPPER MOTOR NEURONS DISORDERS OF VII - 'sparing' of upper face - After cortical strokes, often only muscle of lower face are paralyzed on one side, muscles of upper face are not paralyzed (ex. brow, orbicularis oculi); cortical projections are bilateral to upper face.

CONTROL OF MUSCLES OF FACIAL EXPRESSION

FACIAL MOTOR NUCLEUS –
ALPHA MOTOR NEURONS
TO FACIAL MUSCLES IN
BRAINSTEM

LOWER MOTOR
NEURON LESION
- ex. BELL'S
PALSY -

AFFECTS ALL
MUSCLES OF
FACIAL
EXPRESSION



UPPER MOTOR
NEURON LESION -
ex. CORTICAL
STROKE (vascular
occlusion)

AFFECTS ONLY
MUSCLES OF LOWER
FACE ('SPARING OF
UPPER FACE')

UPPER FACE
CONTROL IS
BILATERAL (both sides
of Cortex)
LOWER FACE
CONTROL IS
UNILATERAL (ONLY
CONTRALATERAL
CORTEX)

ARTERIAL SUPPLY TO FACE: CAROTID ARTERY

SUPERFICIAL TEMPORAL ARTERY

FACE

**TAKE PULSE
HERE**

**INTERNAL
CAROTID
ARTERY**

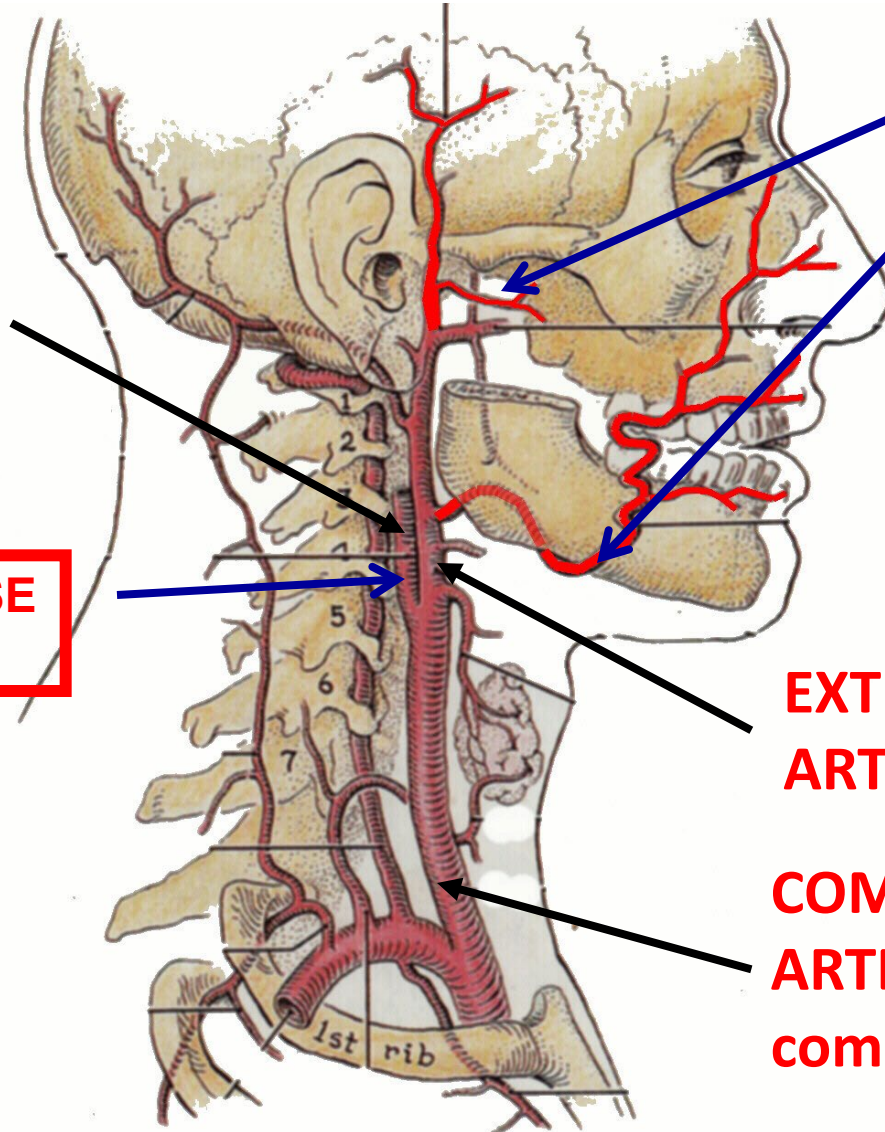
FACIAL ARTERY
- extremely winding
and tortuous course
(skin moves) –
**DESCRIPTIVE TERM –
wiggle, wiggle, wiggle**

**TAKE PULSE
HERE**

**EXTERNAL CAROTID
ARTERY**

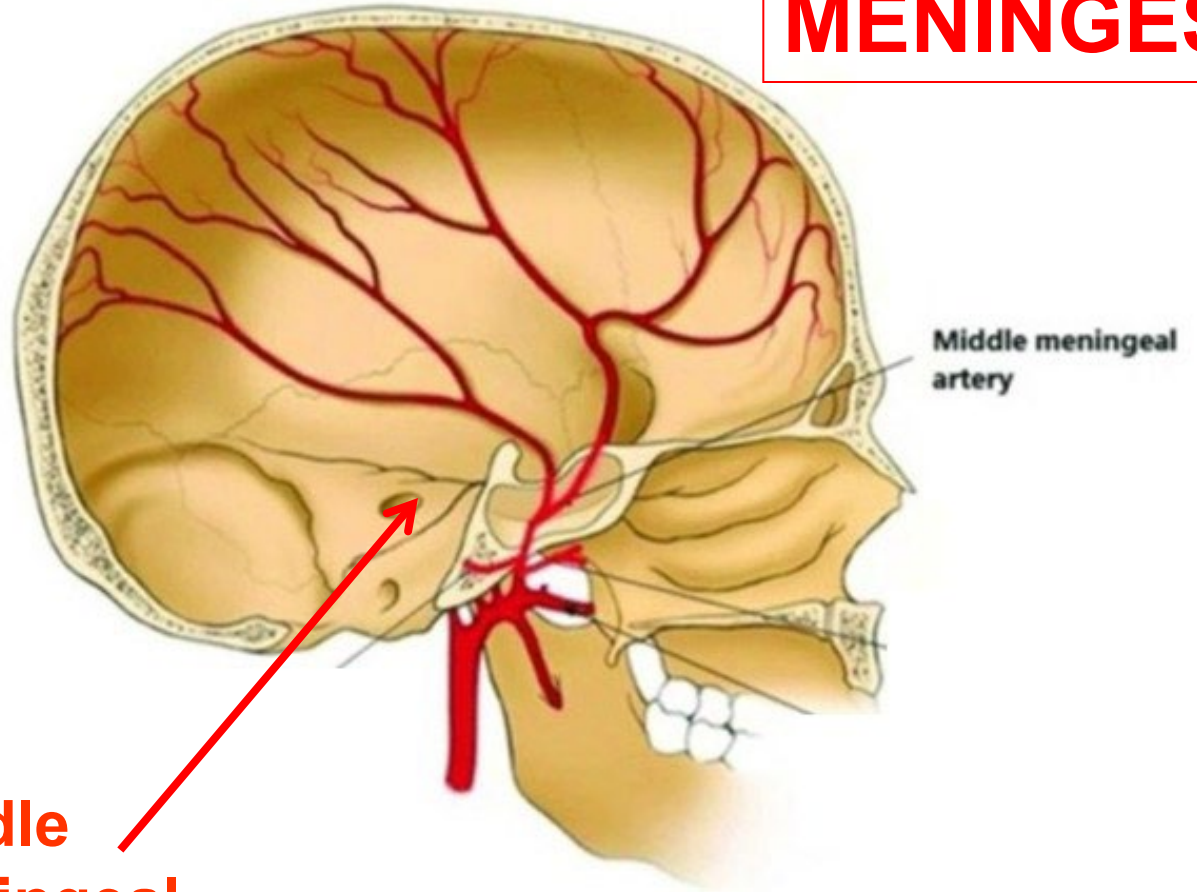
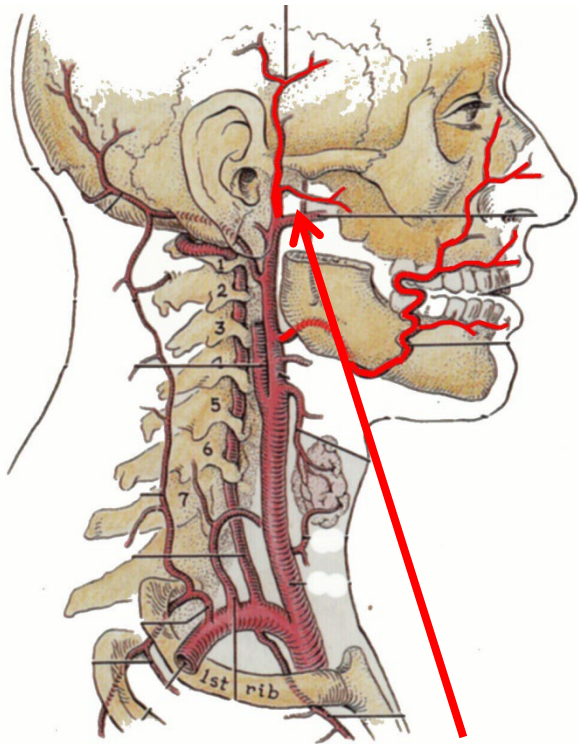
**COMMON CAROTID
ARTERY - can
compress at C6**

**CAROTID = Gk.,
STUPEFY**



Middle Meningeal Artery – branch of External Carotid artery courses inside skull, outside dura – supplies calvarium (bones of skull 'cap')

MENINGES

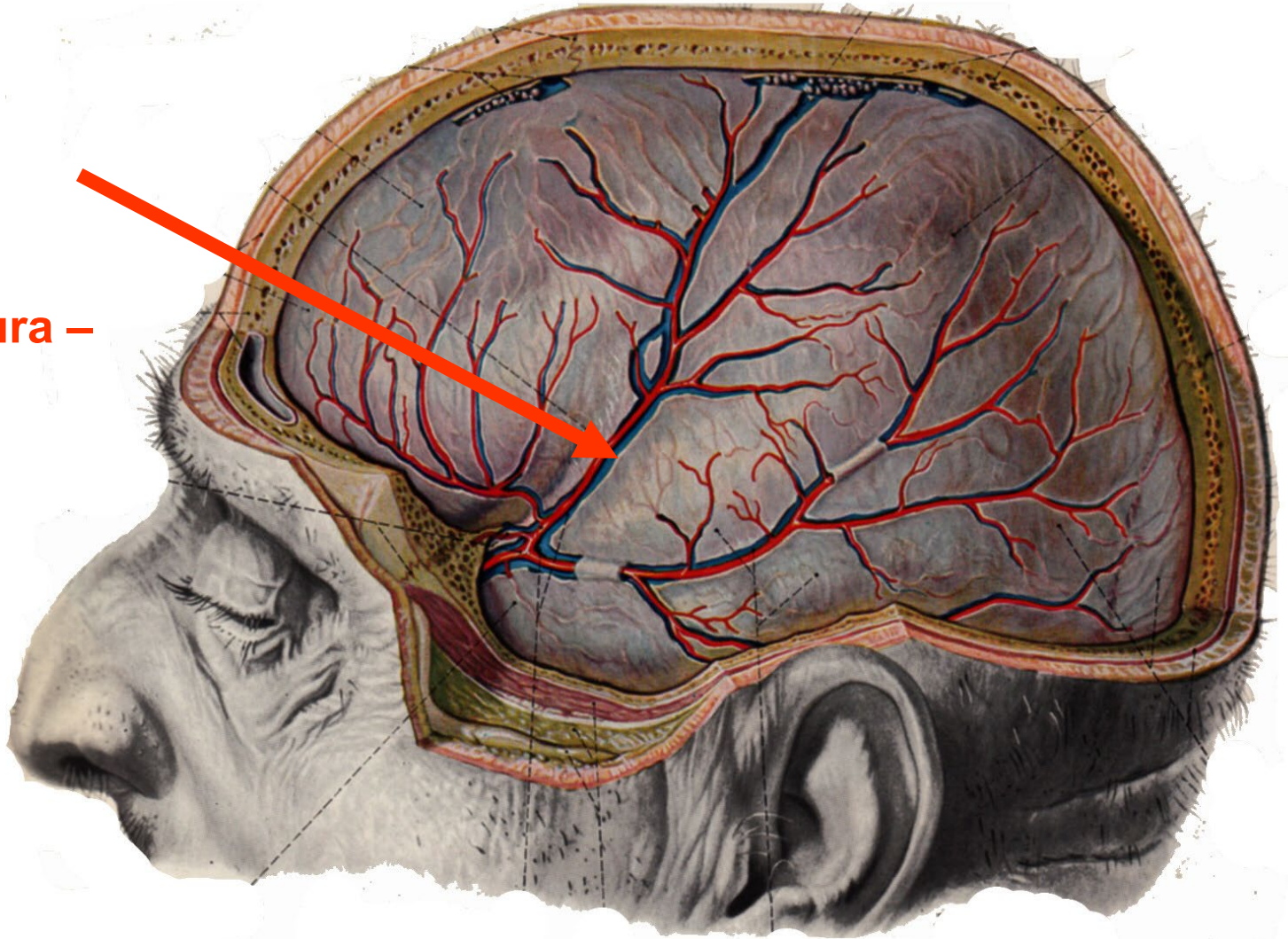


**Middle
Meningeal
Artery**

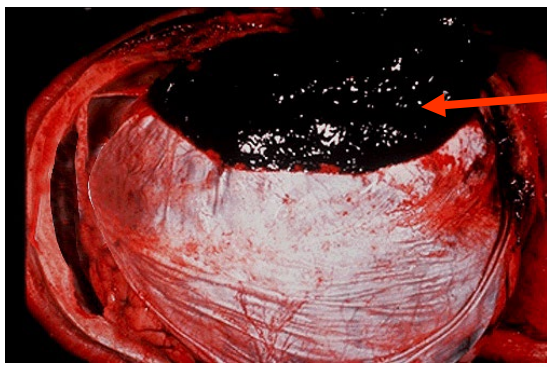
HEMATOMAS - INTERNAL BLEEDS

Middle
Meningeal
Artery –
courses
outside dura –
supplies
calvarium

HEMATOMA
= abnormal
mass of
blood outside
blood vessel



A. EPIDURAL HEMATOMA - bleeding between dura and bone



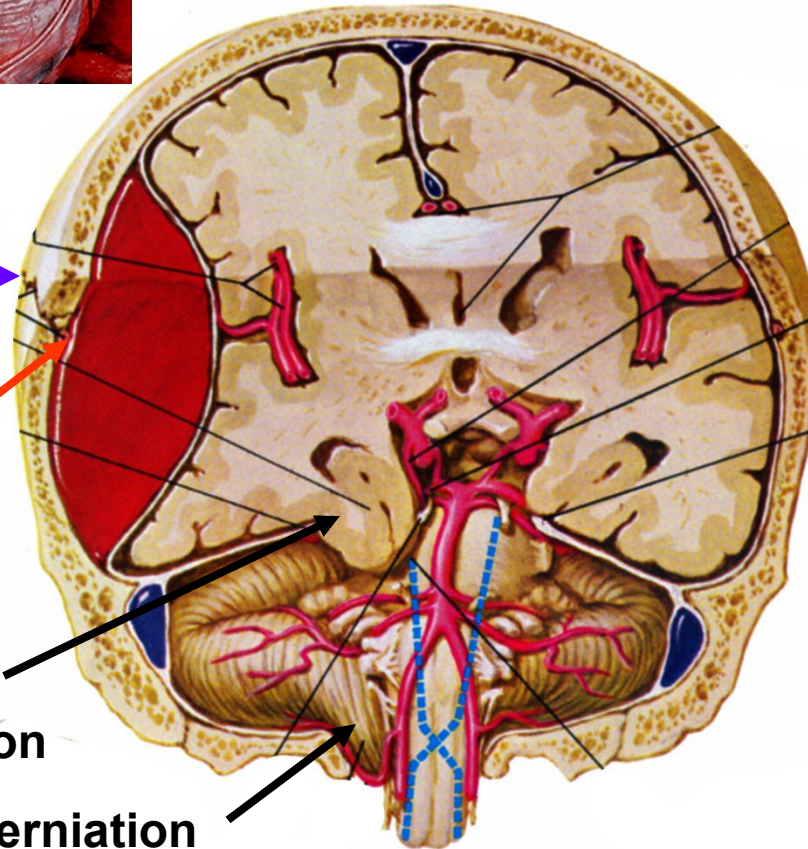
EPIDURAL HEMATOMA

Skull Fracture Near Pterion

Tear Middle Meningeal Artery

Uncal herniation

Tonsillar herniation



- 1) Skull fracture near Pterion
- 2) Tear Middle Meningeal Artery
- 3) Blood 'peels' dura from bone
- 4) Lens shaped (biconvex) mass on CT

EPIDURAL HEMATOMA – **

- 1) **ARTERIAL – often MIDDLE MENINGEAL ARTERY**
- 2) **'LENS' SHAPED MASS**
- 3) **RAPID**

Clinical - bleeding is arterial; can be profuse and rapid (ex, car accident); patient lucid at first; can be fatal within hours if herniation occurs

EPIDURAL HEMATOMA



**'LENS'
SHAPED**

ARTERIAL SUPPLY TO FACE: CAROTID ARTERY

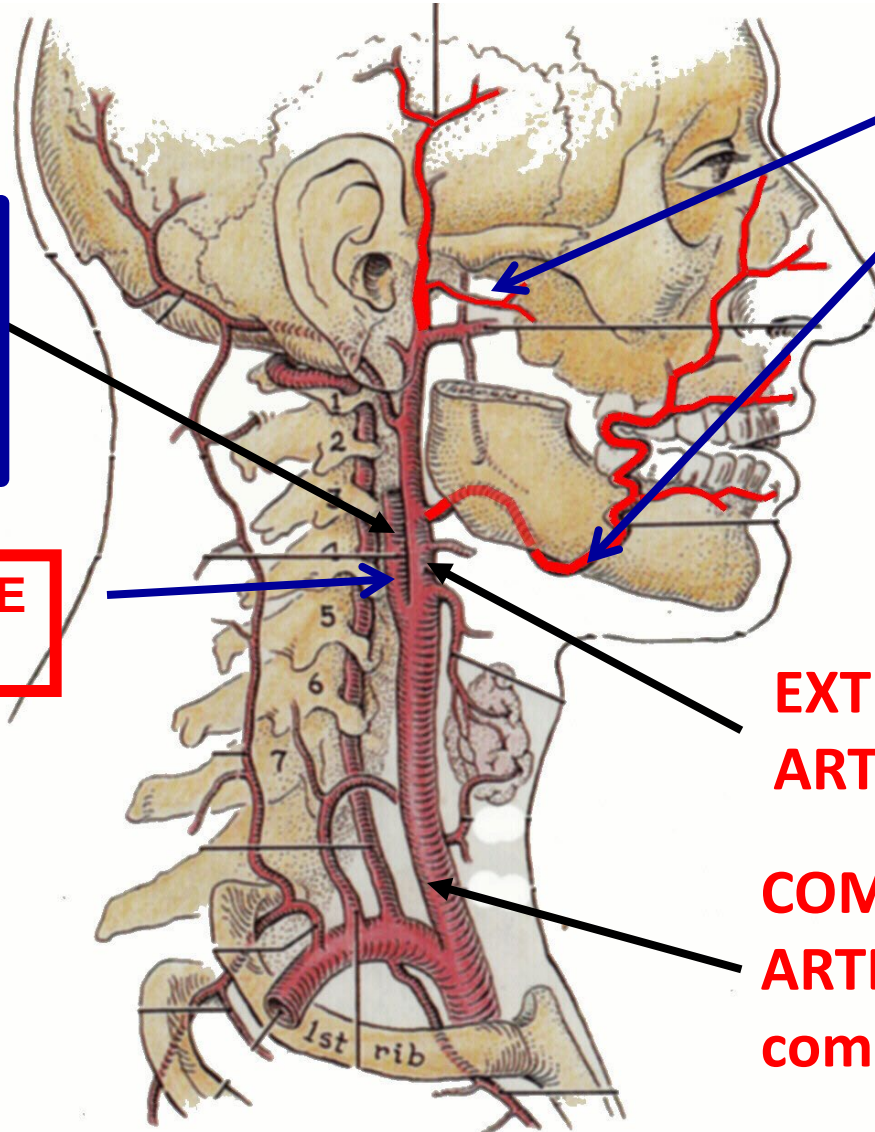
SUPERFICIAL TEMPORAL ARTERY

FACE

**INTERNAL
CAROTID
ARTERY**

**TAKE PULSE
HERE**

**CAROTID = Gk.,
STUPEFY**



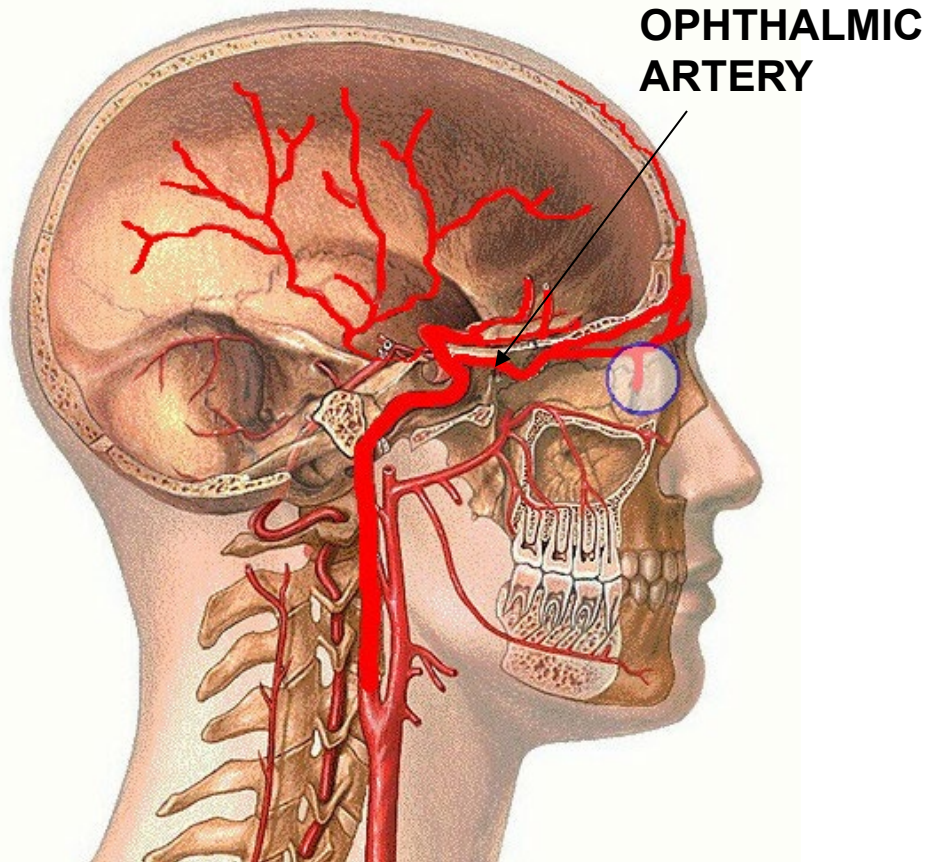
**TAKE PULSE
HERE**

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

**EXTERNAL CAROTID
ARTERY**

**COMMON CAROTID
ARTERY - can
compress at C6**

INTERNAL CAROTID ARTERY



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

Enters skull without Branching

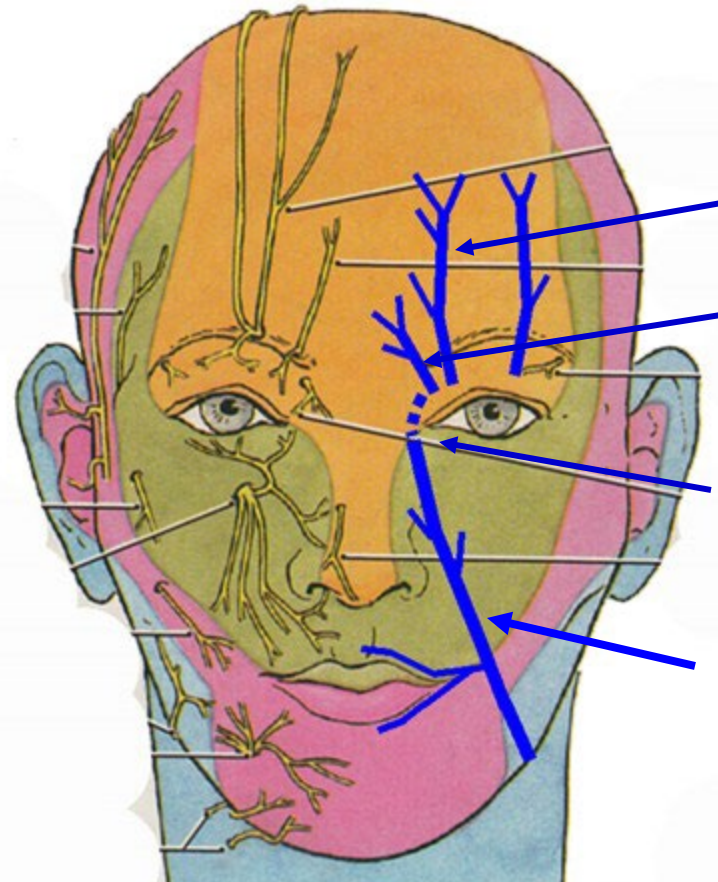
Branches to:

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 OF FACE - branches follow arteries



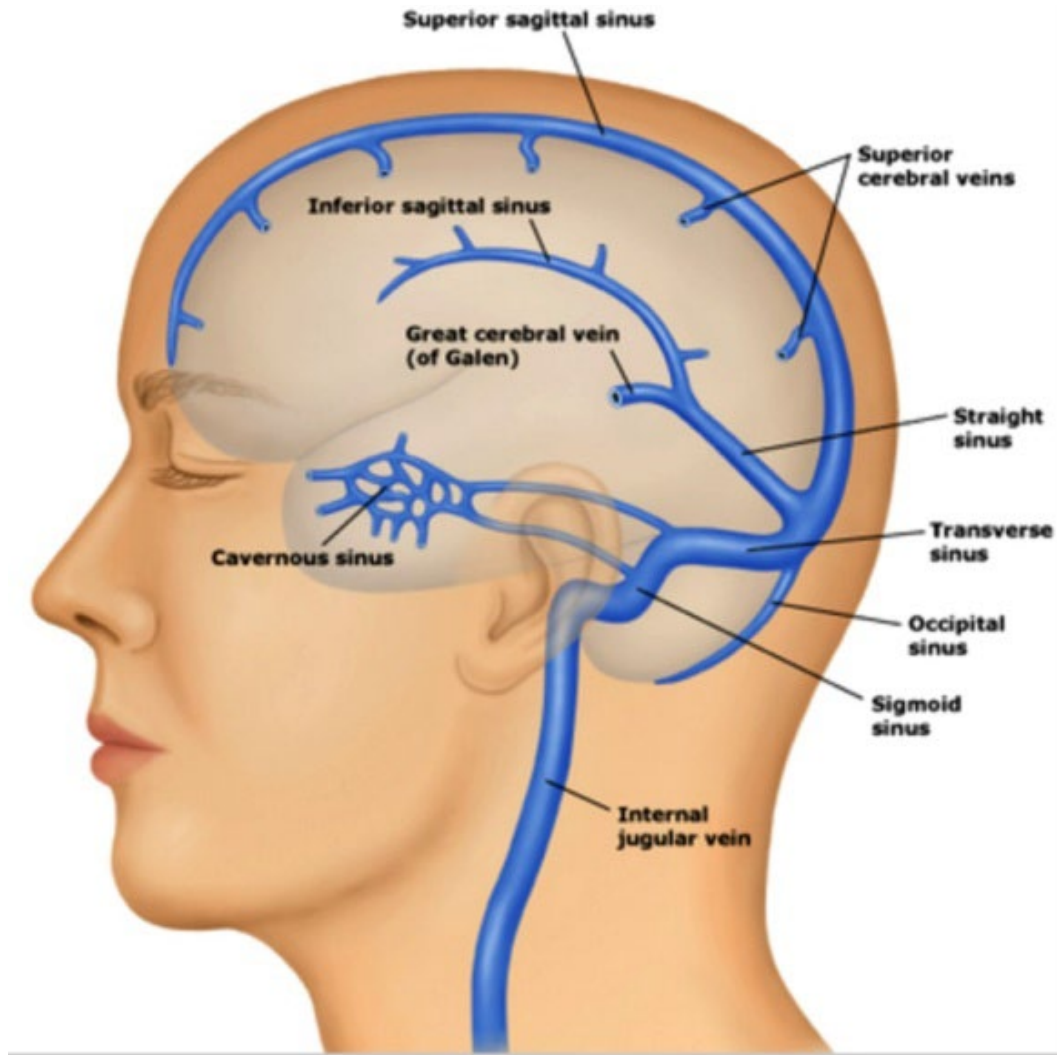
to Ophthalmic veins -
1) Supraorbital Vein
2) Supratrochlear Vein

1) Facial Vein -
straight course
ANASTOMOSE WITH
OPHTHALMIC VEINS

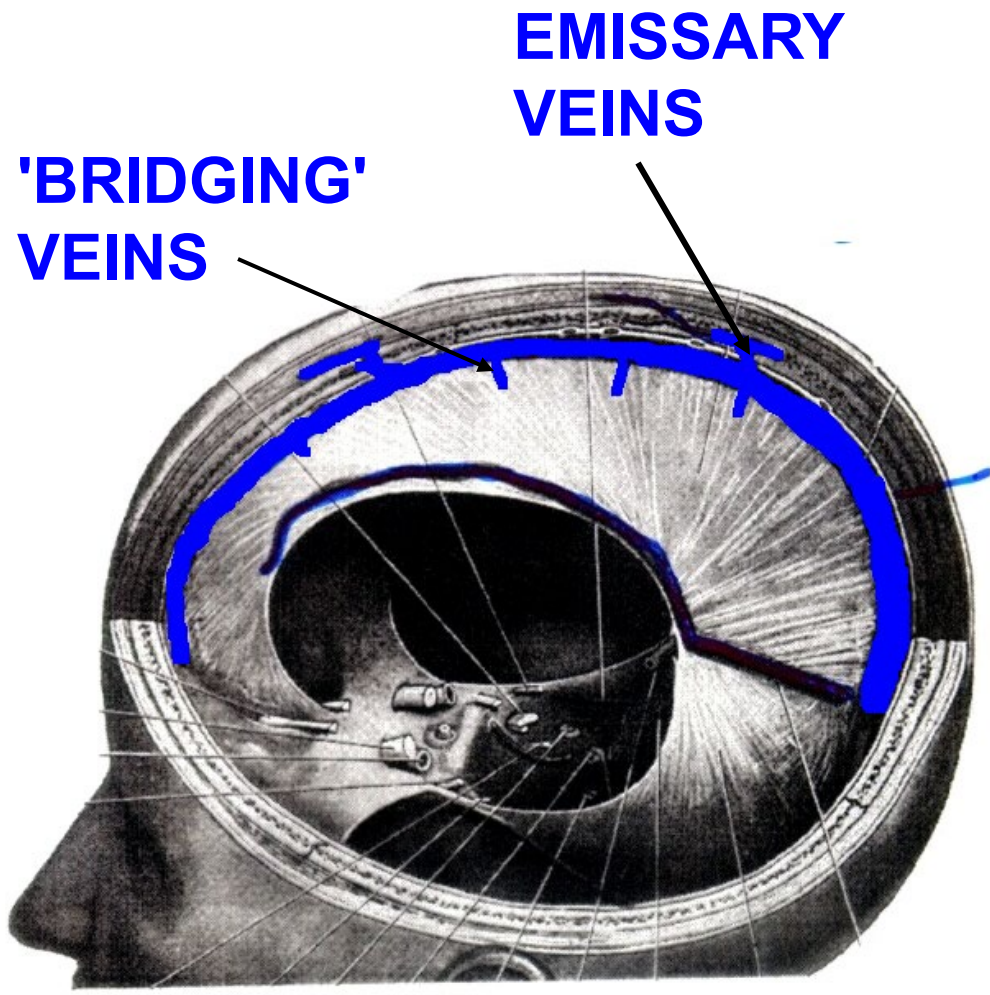


- NOTE: Veins of Face have no (OR FEW AND VARIABLE) valves; drain to neck and into skull;
Extensive anastomoses between branches of Facial
AND Ophthalmic Veins

VENOUS DRAINAGE OF BRAIN IS DIFFERENT - VENOUS SINUSES - inside cranial cavity



III. VENOUS SINUSES – BETWEEN 2 LAYERS OF DURA



Brain removed

Receive blood from brain, orbit, emissary veins

1. VEINS from brain (inside) -
a. 'BRIDGING' VEINS - inside cranial cavity - drain blood from surface of brain

b. named veins - ex. GREAT CEREBRAL VEIN OF GALEN

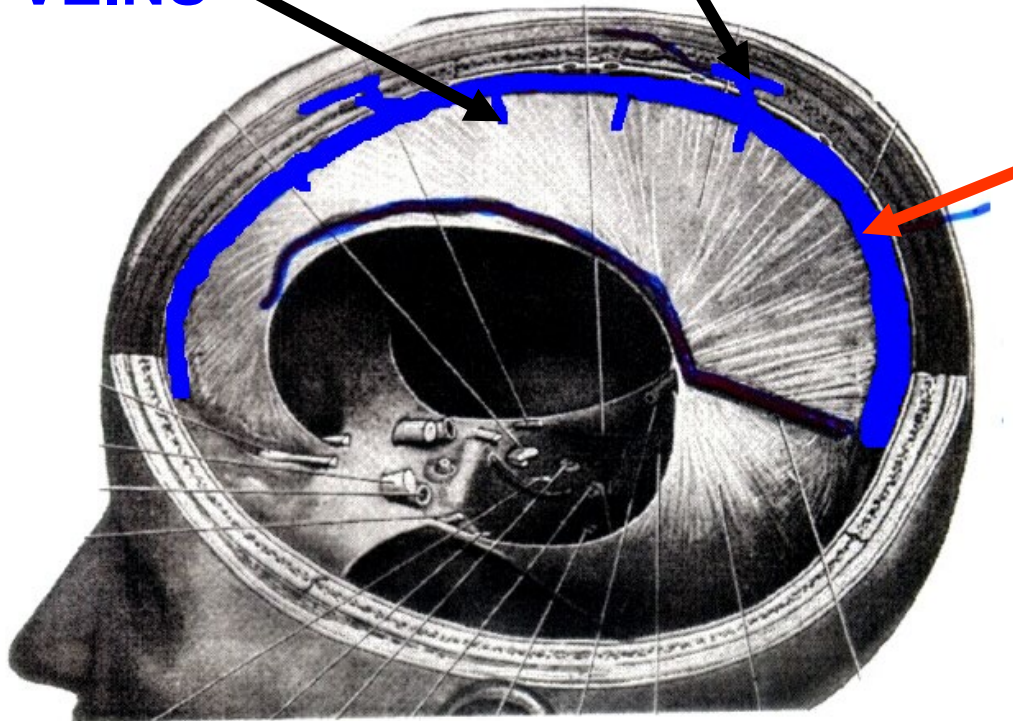
2. VEINS from outside (ex. scalp)
a. EMISSARY VEINS - drain blood from scalp, to venous sinuses

b. named veins - OPHTHALMIC VEINS from eye (orbit)

III. VENOUS SINUSES – BETWEEN 2 LAYERS OF DURA

'BRIDGING' VEINS

EMISSARY VEINS



Brain removed

Receive blood from brain, orbit, emissary veins

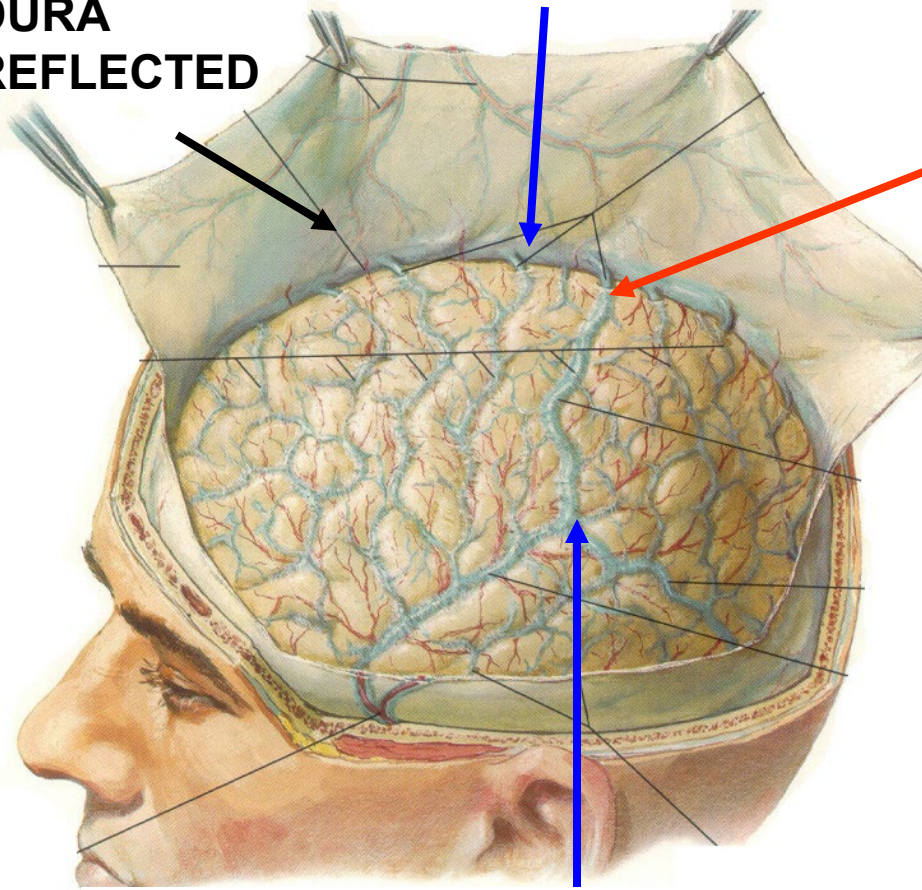
1. Superior Sagittal Sinus – in upper border of falx cerebri; ant. - foramen cecum; post- transverse sinus; - communicates laterally with venous lacunae; blood from Superior Cerebral veins through 'bridging veins'; blood also from emissary veins

NOTE: Venous sinuses are like large veins – only have endothelial lining

SUPERIOR SAGITTAL SINUS receives blood from Superior Cerebral veins through 'BRIDGING' VEINS

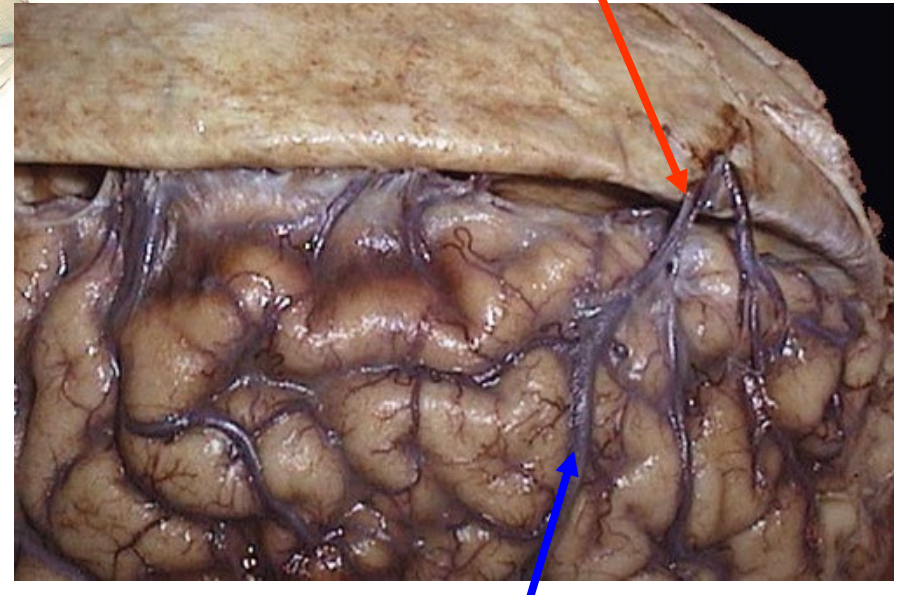
Superior Sagittal Sinus

DURA REFLECTED



Superior Cerebral veins

'BRIDGING' VEINS



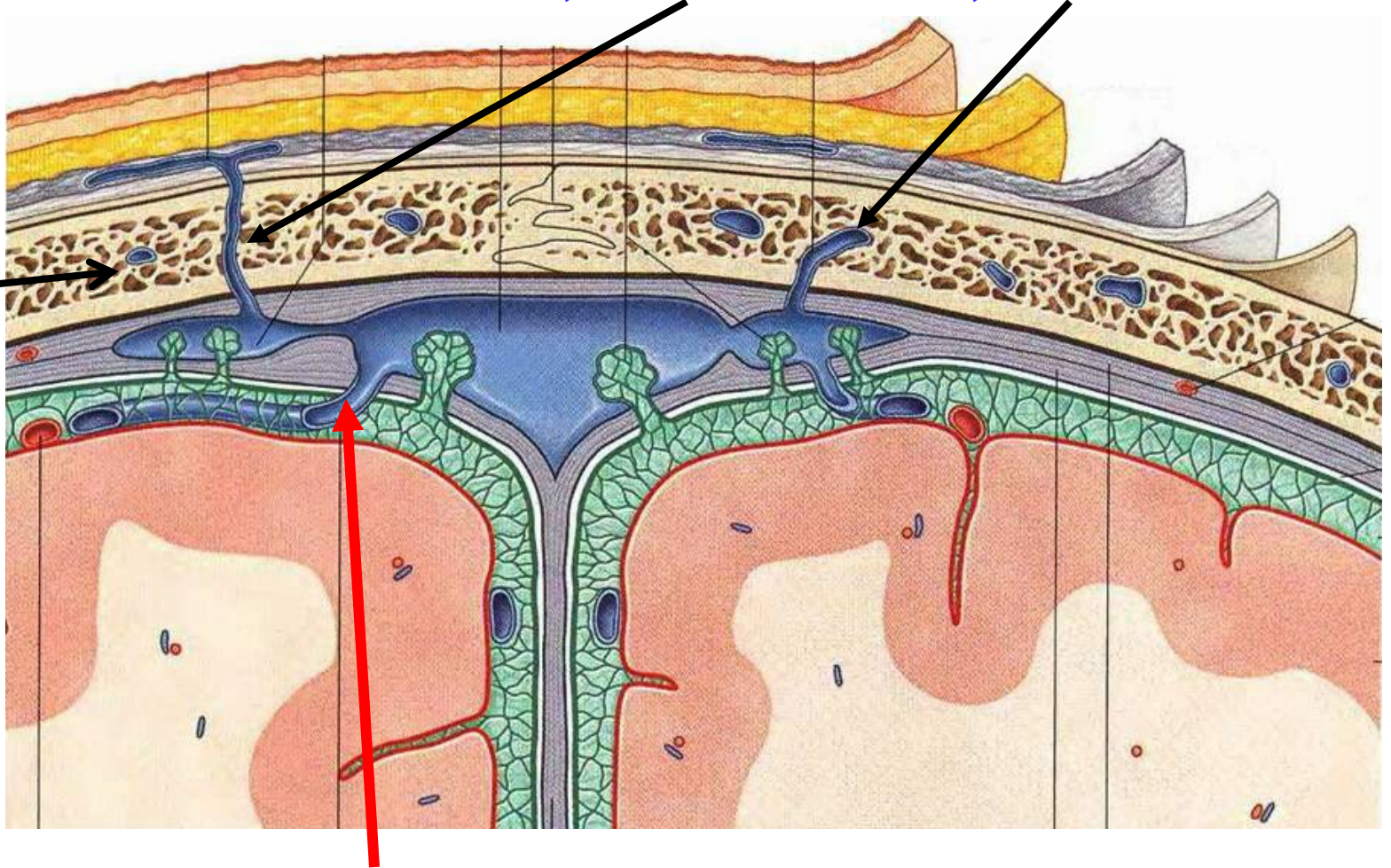
Superior Cerebral veins

Photo from lecture of Dr. Nancy Norton

EMISSARY VEINS VS BRIDGING VEINS

EMISSARY VEIN - SCALP TO SINUS, SCALP TO DIPLOE, DIPLOE TO SINUS

DIPLOIC
VEIN

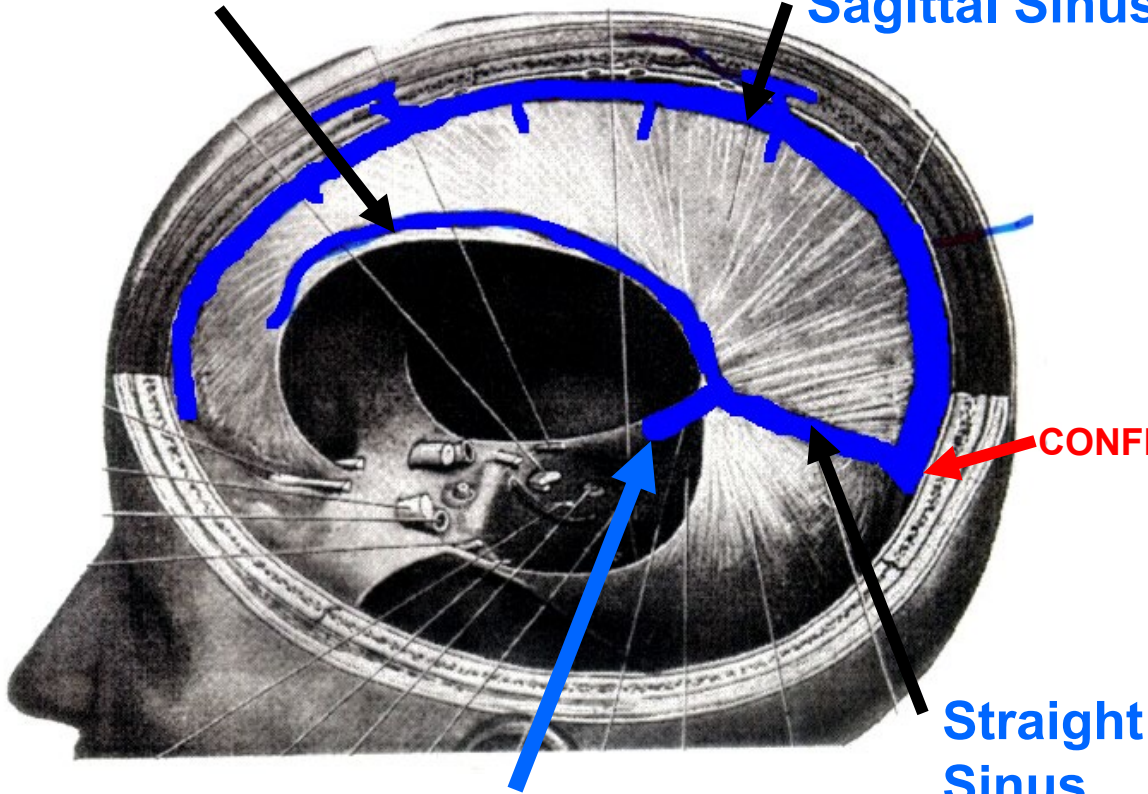


BRIDGING VEIN - CEREBRAL VEIN (BRAIN) TO SINUS

VENOUS SINUSES

Inferior Sagittal Sinus

Superior Sagittal Sinus



Great Cerebral Vein (of Galen)

Straight Sinus

CONFLUENS

2. Inferior Sagittal Sinus - in lower (free) border of falx cerebri; - joins Great Cerebral V. form Straight Sinus

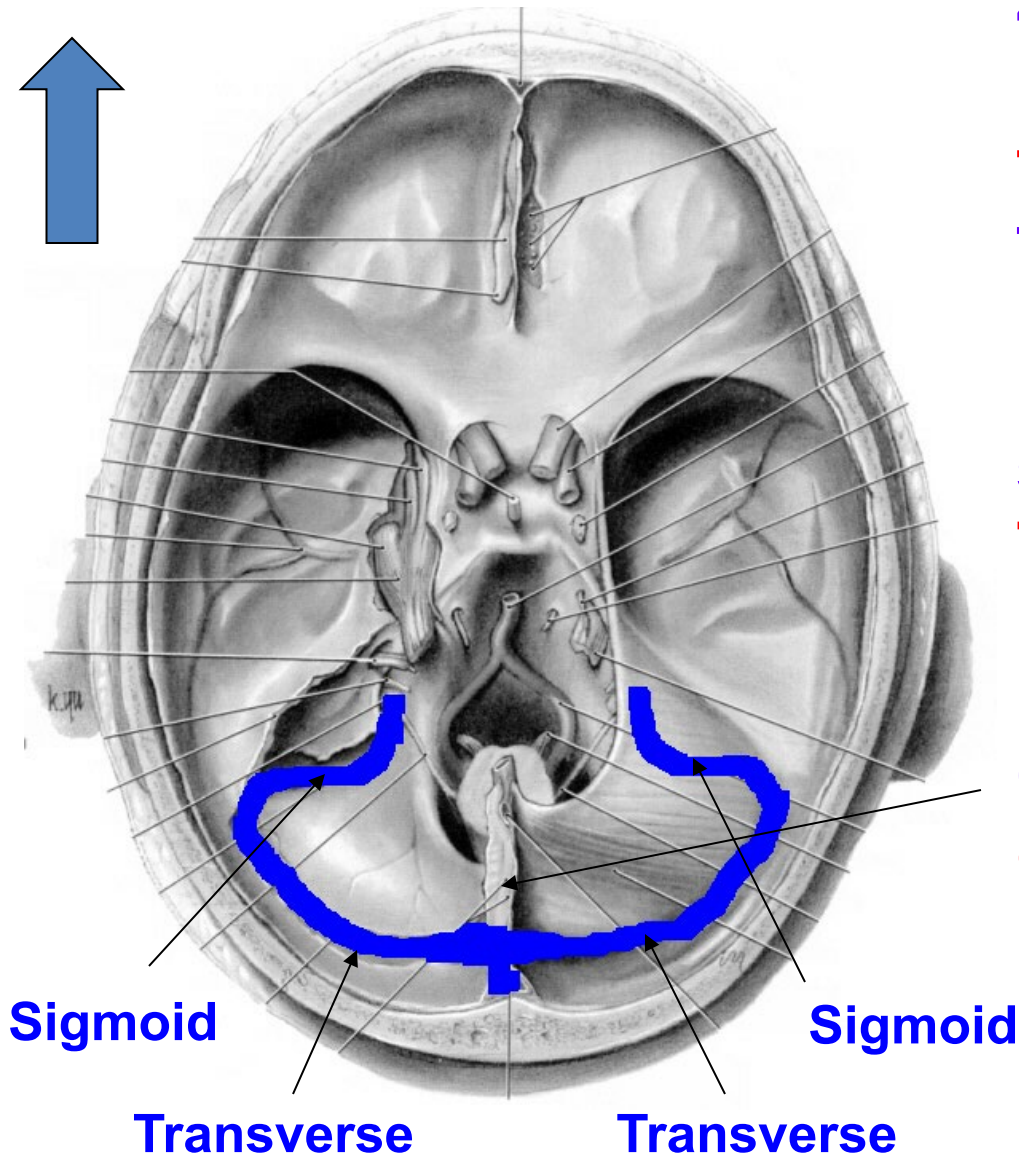
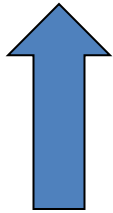
3. Straight sinus - at junction of falx cerebri and tentorium

NOTE: INFERIOR SAGITTAL SINUS DOES NOT DIRECTLY JOIN SUPERIOR SAGITTAL SINUS **

Straight Sinus can join Superior Sagittal Sinus at Confluens of Sinuses or turn left

VENOUS SINUSES

NOSE

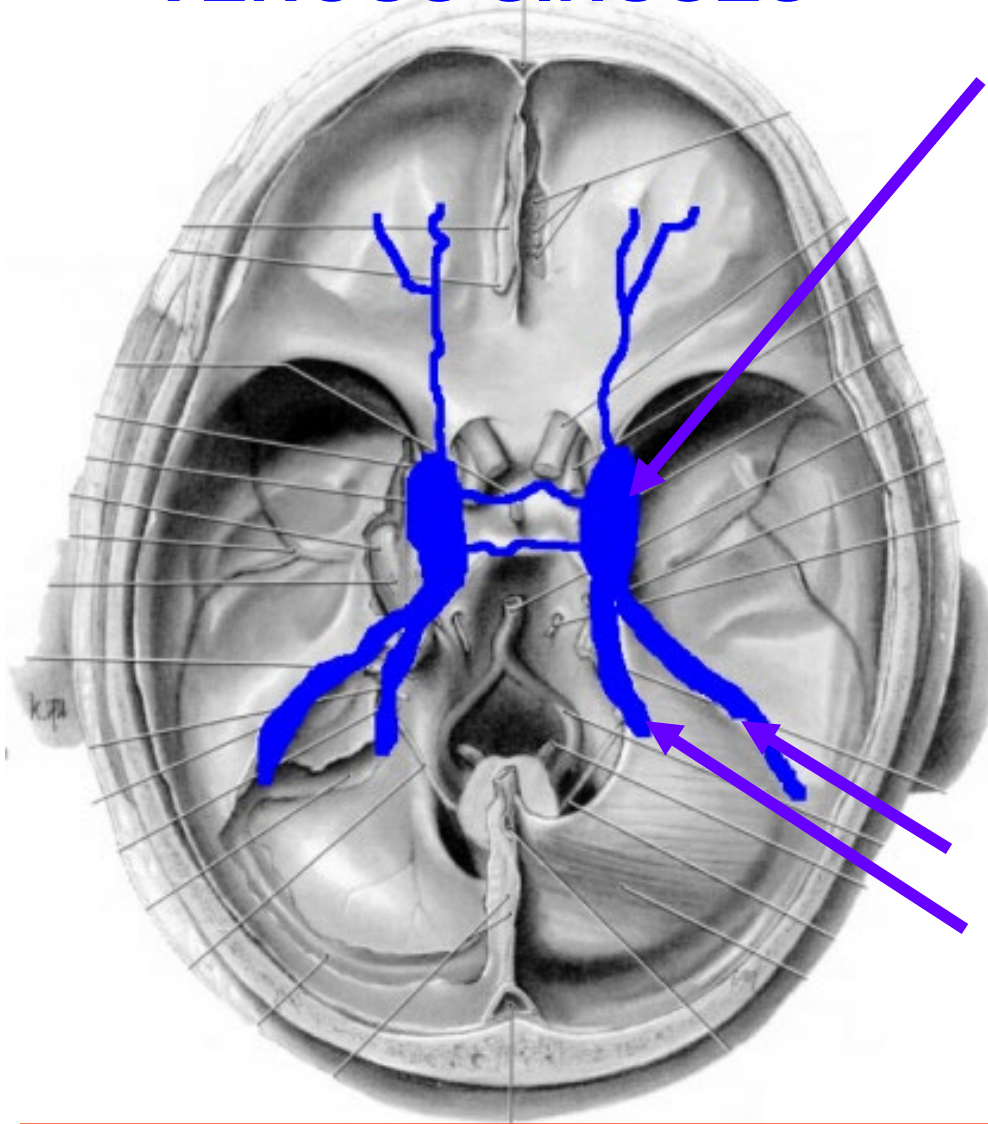


4. Transverse sinuses - in lateral fixed part of tentorium; receives blood from Sup. Sagittal or Confluens

5. Sigmoid sinuses - S-shaped continuation of Transverse; end in Jugular Foramen; form Internal Jugular Vein

6. Occipital Sinus - in Falx cerebelli; drain to Confluens

VENOUS SINUSES



7. Cavernous sinuses - in middle cranial fossa; on side of the body of the sphenoid bone; connected by Intercavernous sinus; receive blood from Sup. and Inf. Ophthalmic veins, Cerebral veins; drain to Sup. and Inf. Petrosal sinuses

8. Sup. and Inf. Petrosal sinuses - on petrous part of temporal bone
Sup. drains to Transverse
Inf. Drains to Internal Jugular

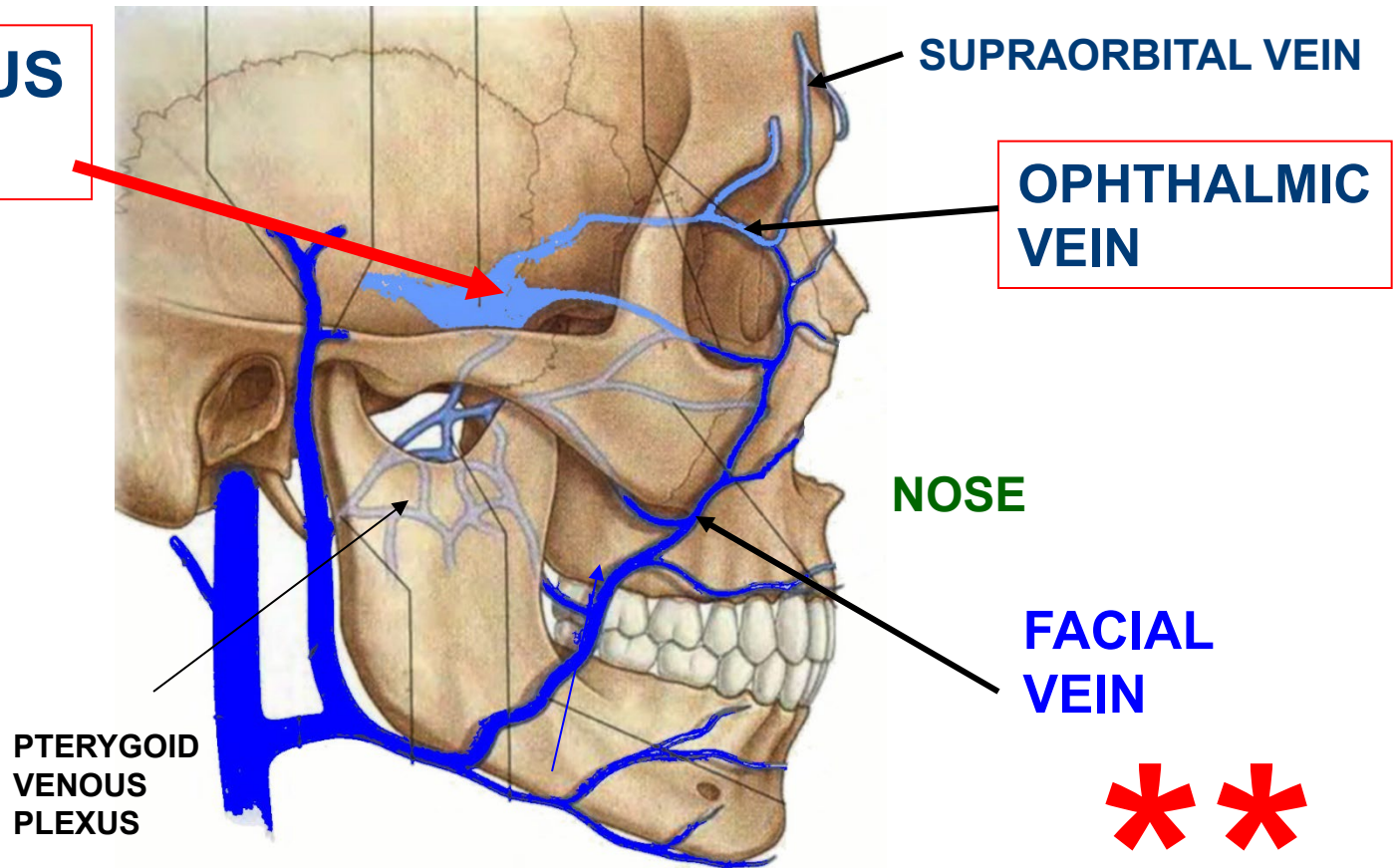
Infection can spread from Face to Cavernous sinus via anastomoses of Ophthalmic veins and Facial veins

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)

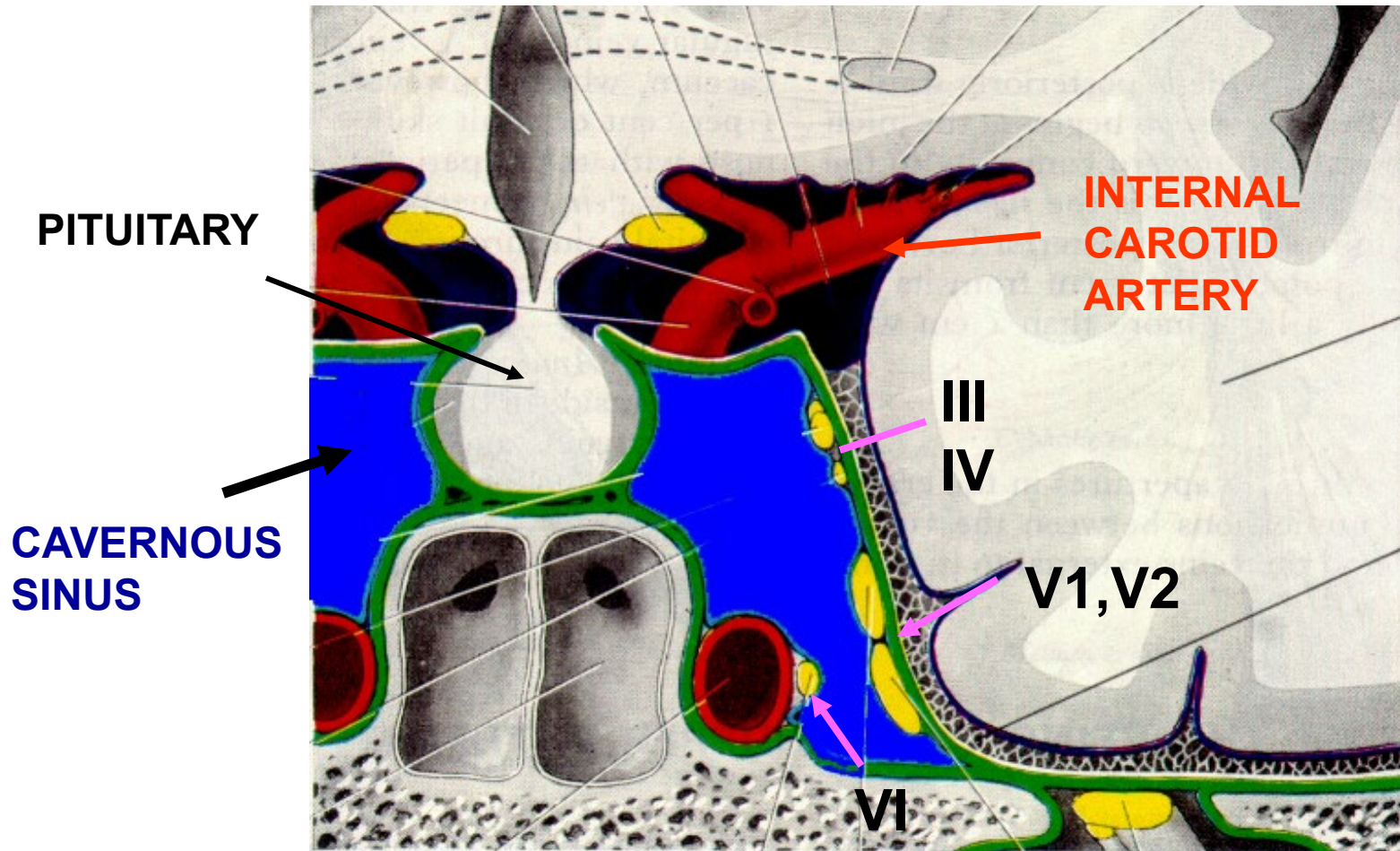


- **Prolonged infections** spread via veins (pressure low, no valves)
- Pass through orbit to Cavernous Sinus - **CAVERNOUS SINUS THROMBOSIS**; infections lateral to nose particularly dangerous
- **Clinical sign: 'Blurred' vision (actually DIPLOPIA)** (cranial nerves to eye muscles pass through Cavernous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

NERVES TO EYE MUSCLES PASS IN WALL OF CAVERNOUS SINUS

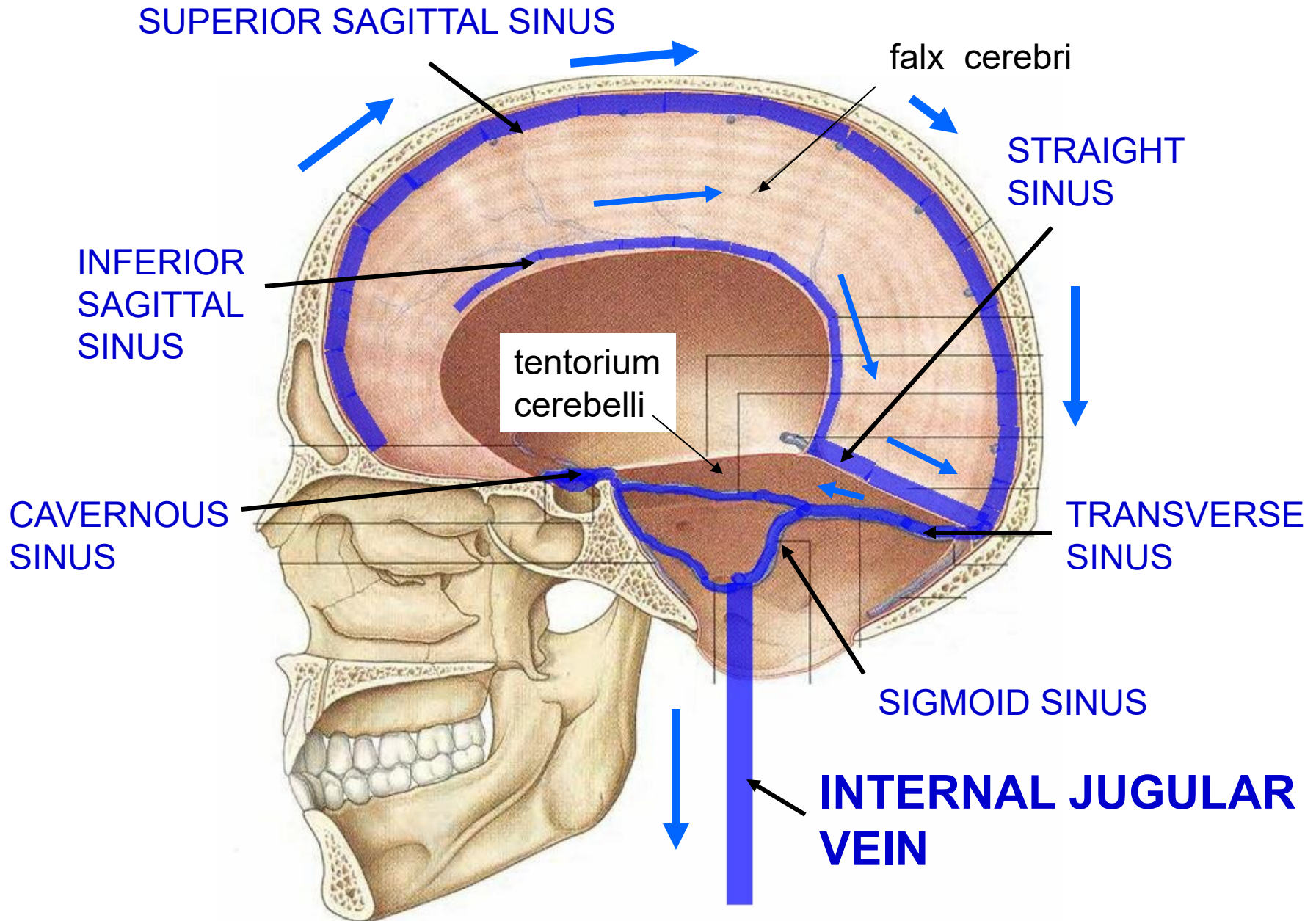
STRUCTURES PASSING THROUGH WALL OF CAVERNOUS SINUS - Int. Carotid A., Cranial N.'s III, IV, V1, V2, VI;

Clinical sign of Infection in Sinus – **'BLURRED' VISION (Diplopia)**



CN III, IV, VI – EYE MOVEMENTS

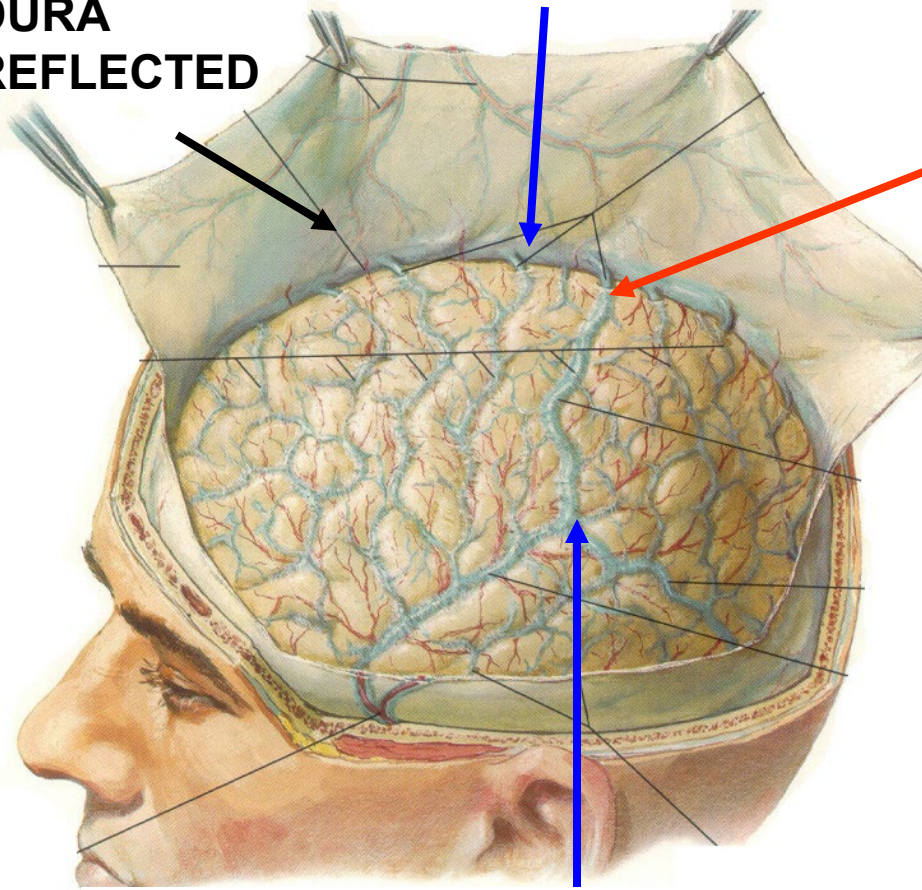
VENOUS SINUSES OF BRAIN



SUPERIOR SAGITTAL SINUS receives blood from Superior Cerebral veins through 'BRIDGING' VEINS

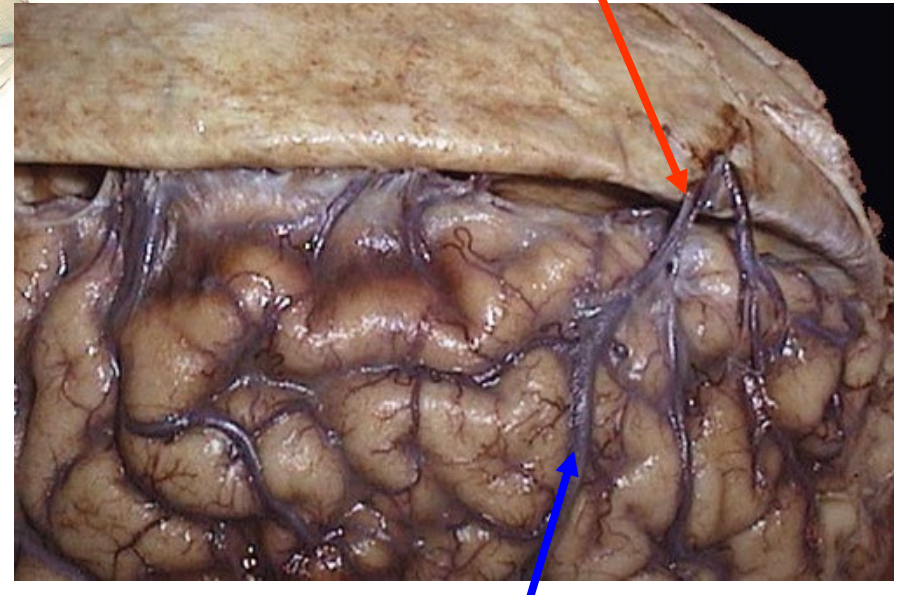
Superior Sagittal Sinus

DURA REFLECTED



Superior Cerebral veins

'BRIDGING' VEINS



Superior Cerebral veins

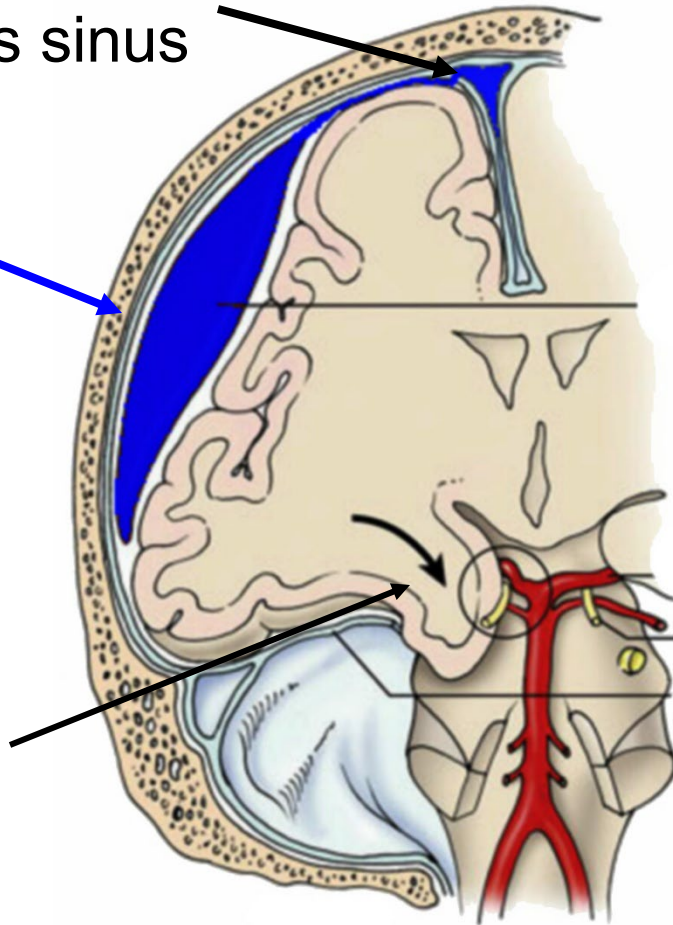
Photo from lecture of Dr. Nancy Norton

SUBDURAL HEMATOMA

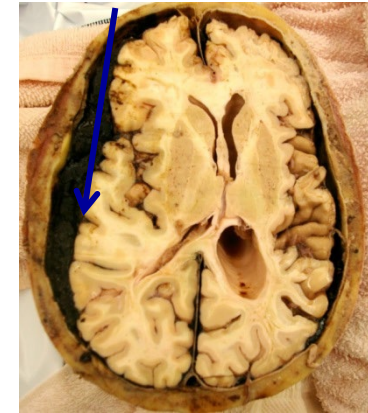
Tear 'bridging' vein
or venous sinus

Crescent
shaped
hematoma
on CT/MRI

Herniation
of uncus (L.
hook) of
temporal
lobe
through
Tentorial
notch



SUBDURAL HEMATOMA
BLOOD



**SUBDURAL **
HEMATOMA –
1) VENOUS – often
BRIDGING VEIN
2) CRESCENT
SHAPED MASS
3) SLOW**

**Clinical: bleeding slow (venous); Chronic Subdural Hematomas
can remain undetected; can result in herniation if untreated**

CAVERNOUS SINUS SYNDROME



**SPREAD OF INFECTION TO
CAVERNOUS SINUS**

CAUSES

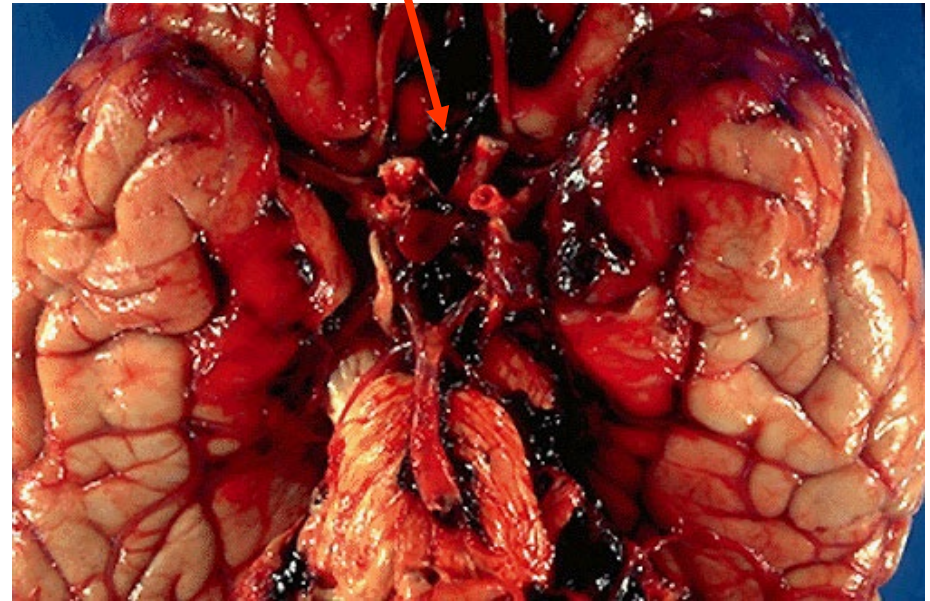
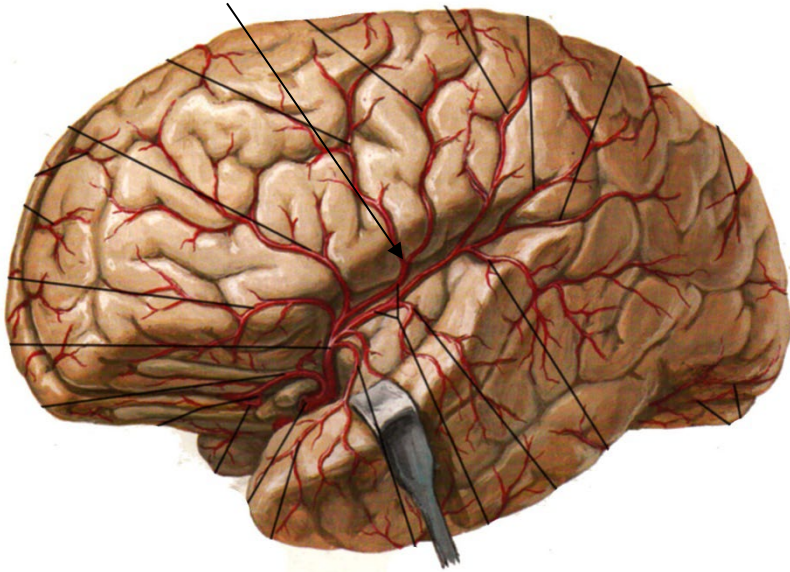
1) an aneurysm of the internal carotid artery in the cavernous sinus, 2) infection or venous thrombus (blood clot) in cavernous sinus, or by 3) pituitary tumor encroaching into sinus.

NERVES EFFECTED

III, IV, V1, V2, and VI and Sympathetic fibers to orbit (travel on Internal Carotid)

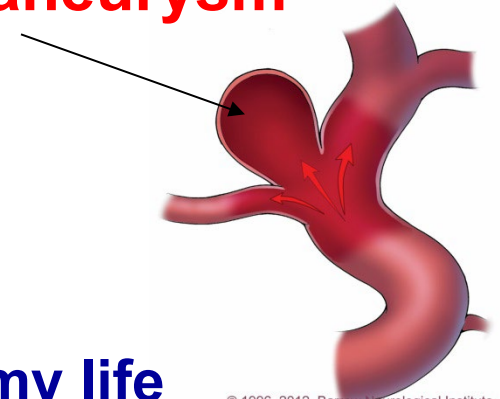
C. SUBARACHNOID HEMATOMA

Cerebral artery



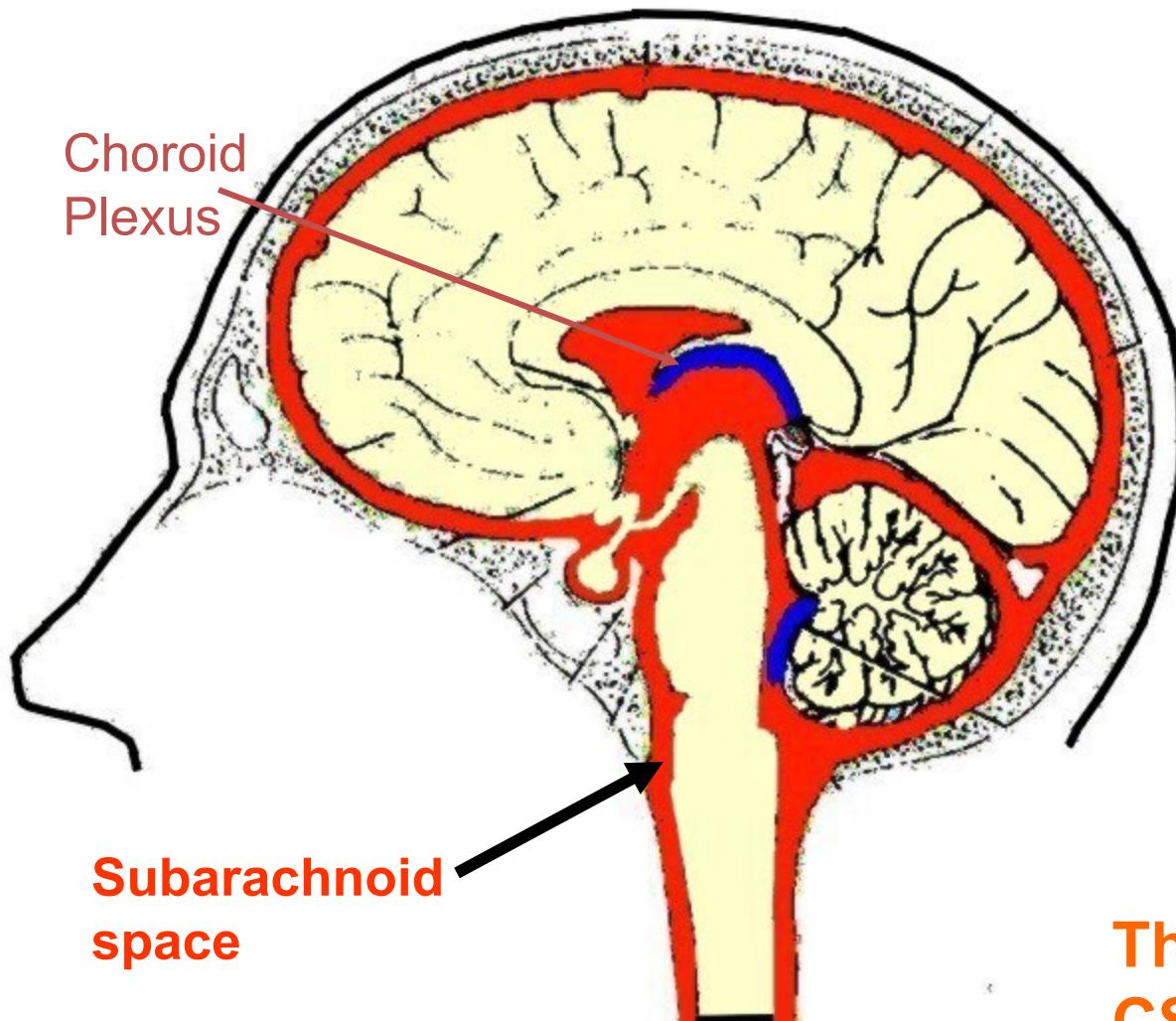
Tearing cerebral artery or aneurysm (ex, berry aneurysma = swelling of vessel wall) or cerebral vein; If arterial can be rapid and fatal

Berry aneurysm



**Thunderclap headache - Worst headache of my life
Sudden death 12%; 30 day mortality 45% (reported)**

IV. CEREBRO-SPINAL FLUID (CSF)



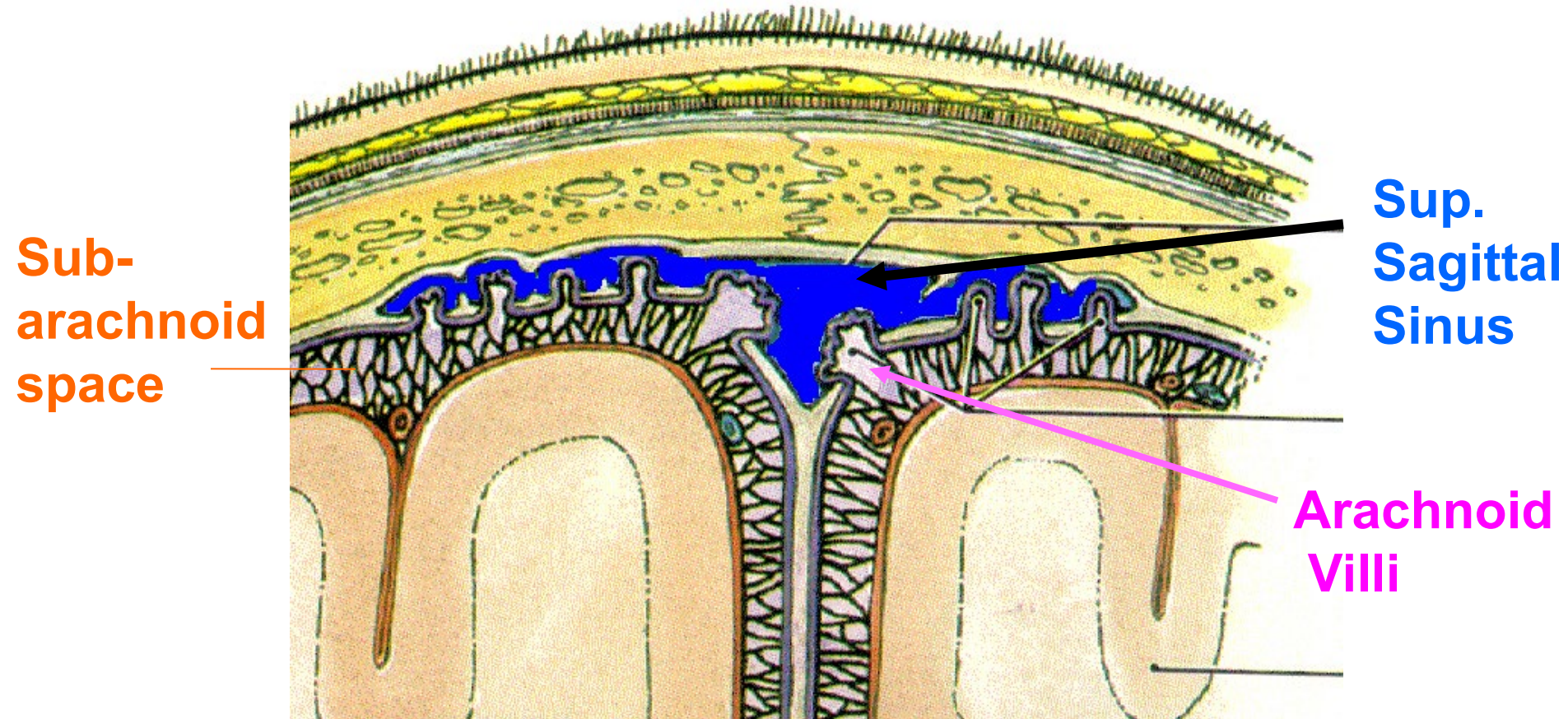
Choroid
Plexus

Subarachnoid
space

made inside
brain in Choroid
Plexus; flows
out of brain to
Subarachnoid
Space

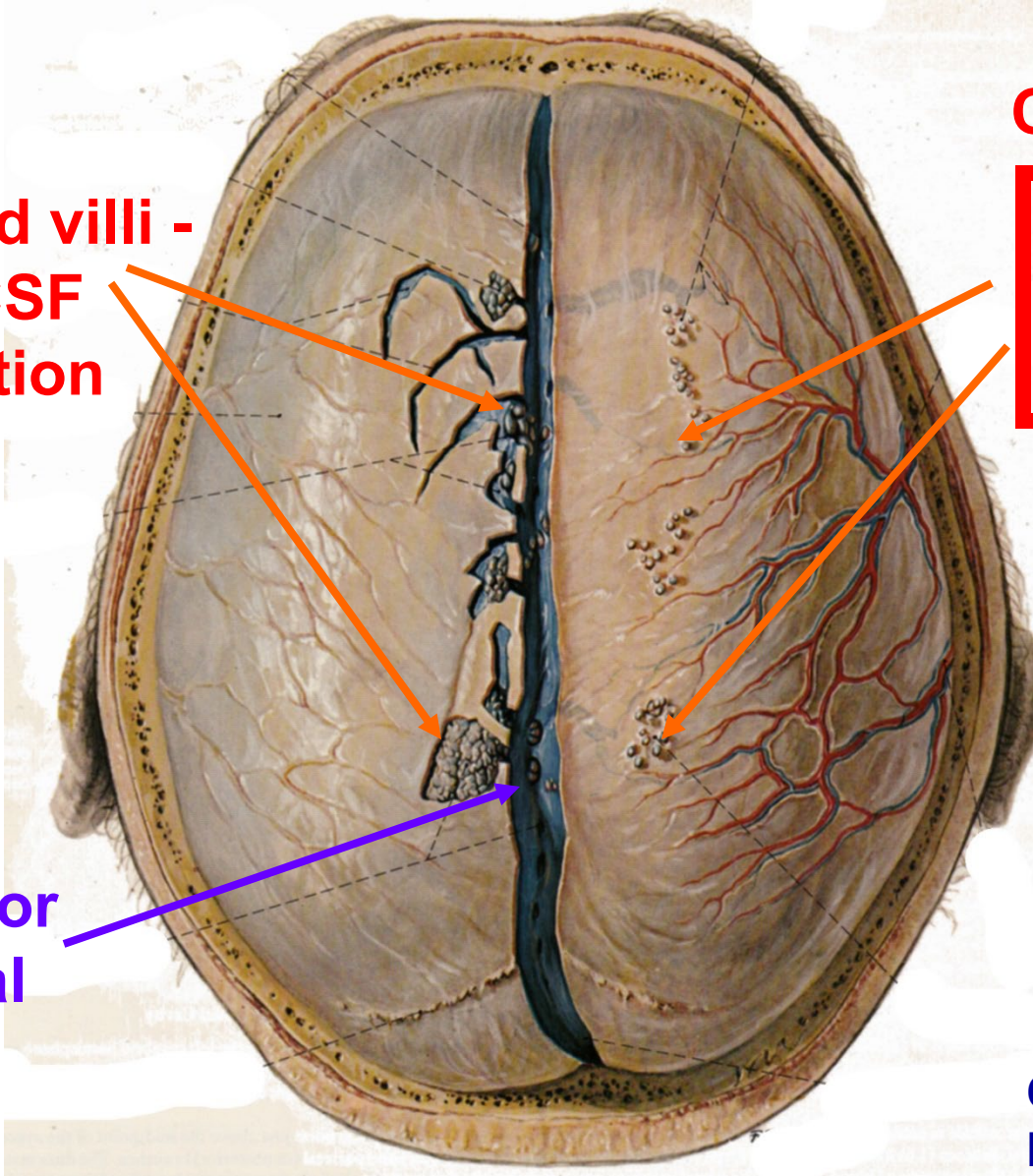
The brain floats in
CSF - Shock
Absorber

CSF REABSORBED INTO VENOUS SINUSES



CSF reabsorbs into venous sinuses at Arachnoid Villi; - In elderly arachnoid villi can become calcified- Arachnoid Granulations; Reduced Re-Absorption can produce Communicating Hydrocephalus **

CSF REABSORBED INTO VENOUS SINUSES



CLINICAL **

Arachnoid villi - sites of CSF reabsorption

Calcification of Arachnoid Villi is common in elderly; can cause hydrocephalus due to decreased reabsorption of CSF

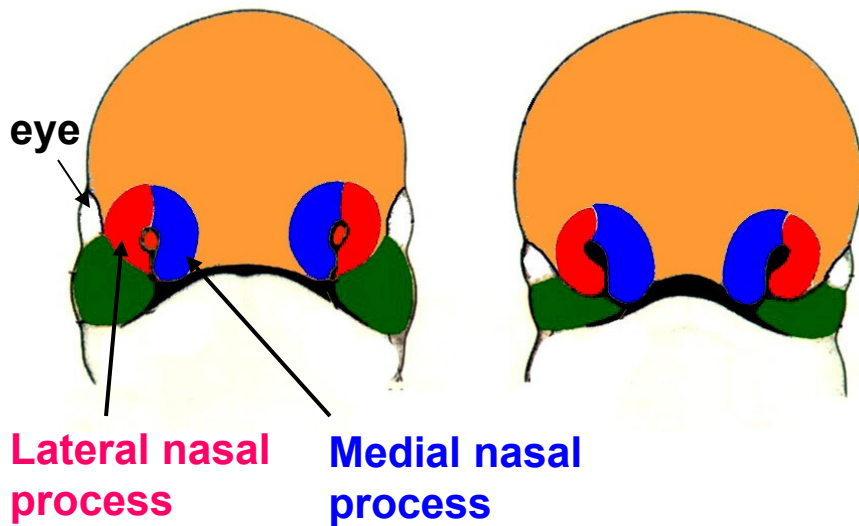
Arachnoid villi - sites of CSF reabsorption

Superior Sagittal Sinus

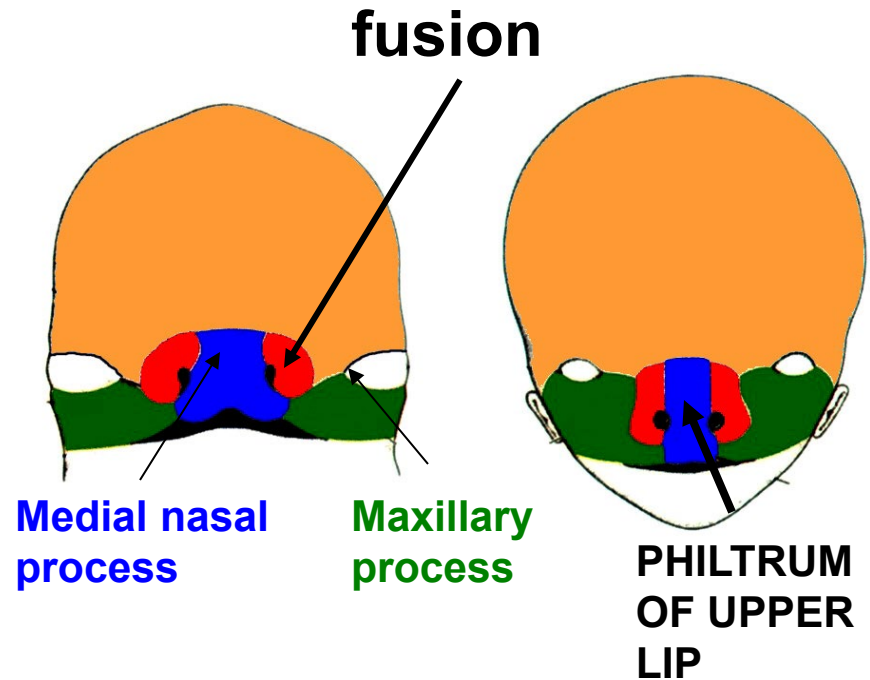
COMMUNICATING HYDROCEPHALUS

DEVELOPMENT OF FACE

2. Medial and Lateral Nasal Processes - form at margins of nasal placodes



3. Medial nasal process and Maxillary Process - fuse to form upper lip



Terminology: process = prominence

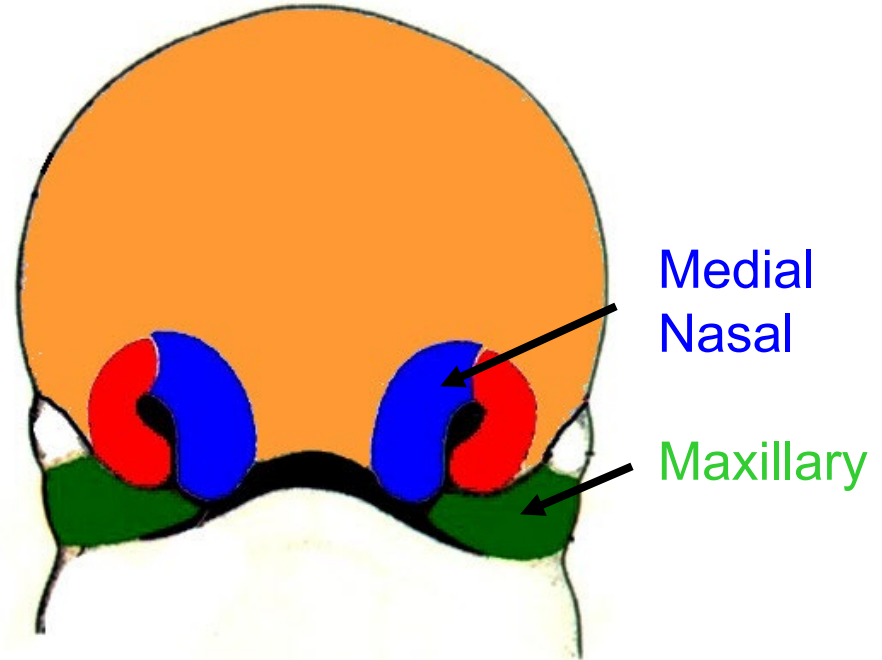
Weeks 10-12

CLEFT LIP = CHEILOSCHISIS



– failure of fusion of Medial Nasal Process and Maxillary process

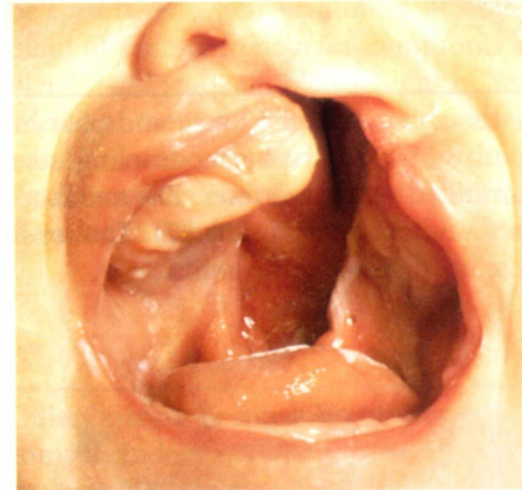
- 1/1000 Births, can be unilateral or bilateral
- At philtrum of lip



Medial Nasal

Maxillary

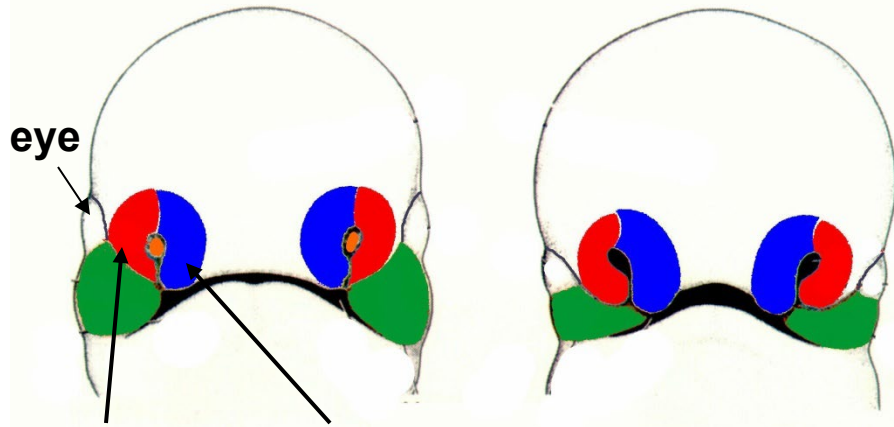
**CLEFT LIP (cheiloschisis)
CAN OCCUR
IN COMBINATION WITH
CLEFT PALATE
(palatoschisis)**



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

DEVELOPMENT OF FACE

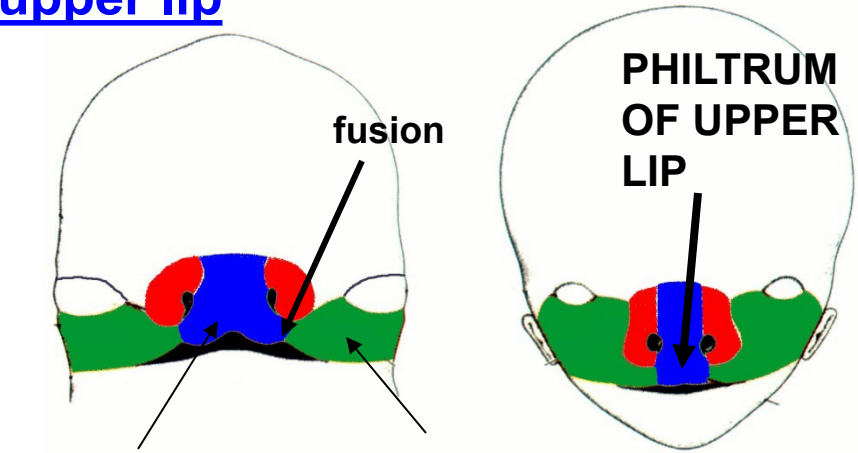
2. Medial and Lateral Nasal Processes – form at margins of nasal placodes



Lateral nasal process

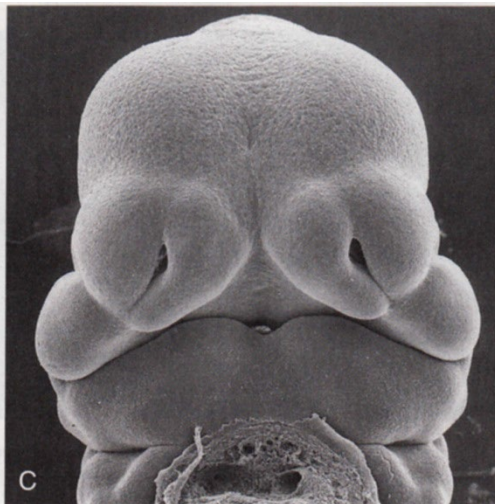
Medial nasal process

3. Medial nasal process and Maxillary Process – fuse to form upper lip



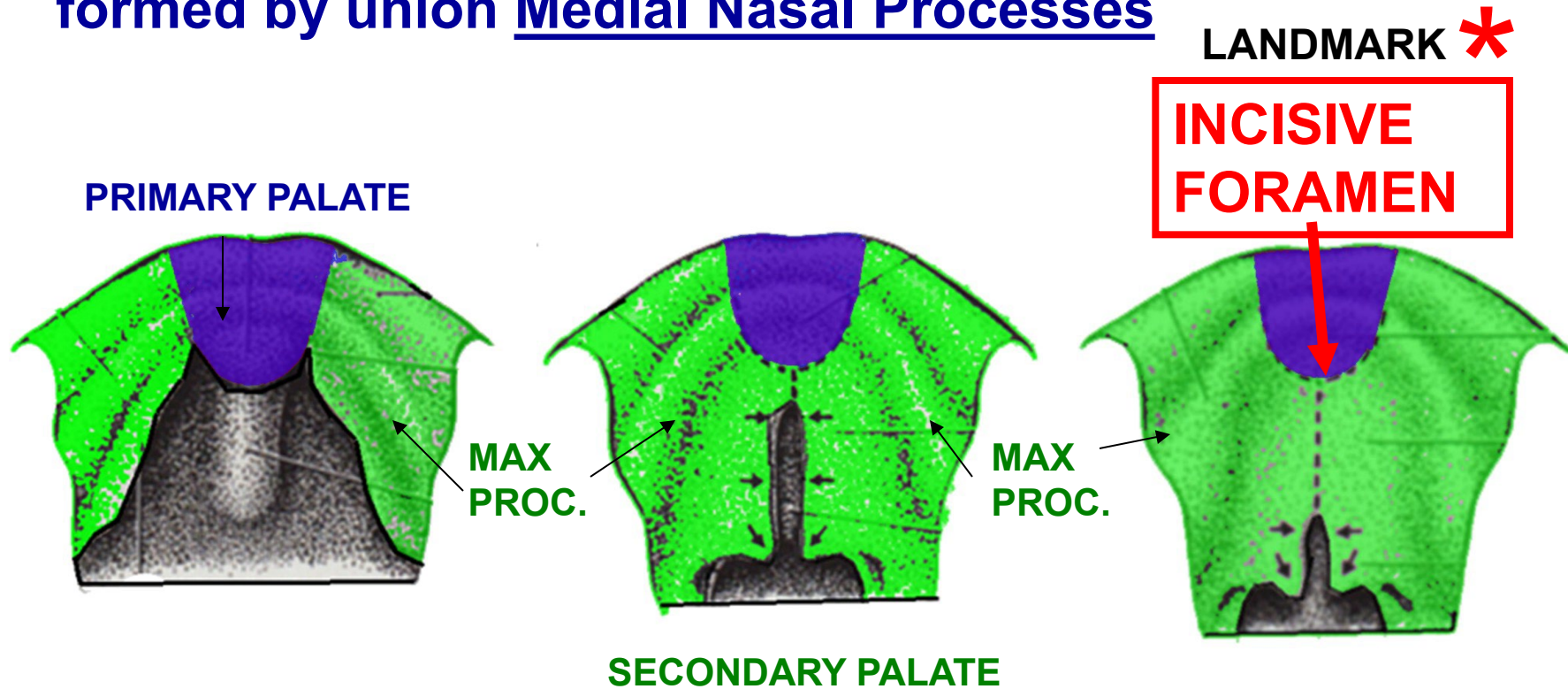
Medial nasal process

Maxillary process



A. PALATE DEVELOPMENT

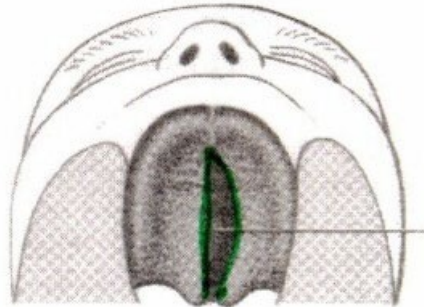
a. Primary Palate – Anterior to Incisive Foramen formed by union Medial Nasal Processes



b. Secondary Palate – Posterior to Incisive Foramen-
formed by fusion of Maxillary processes

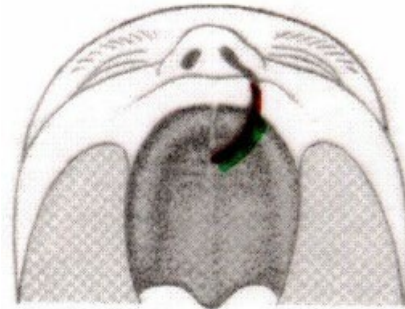
MALFORMATIONS: CLEFT PALATE

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



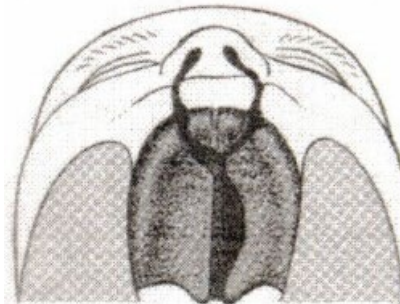
1:2500
births

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



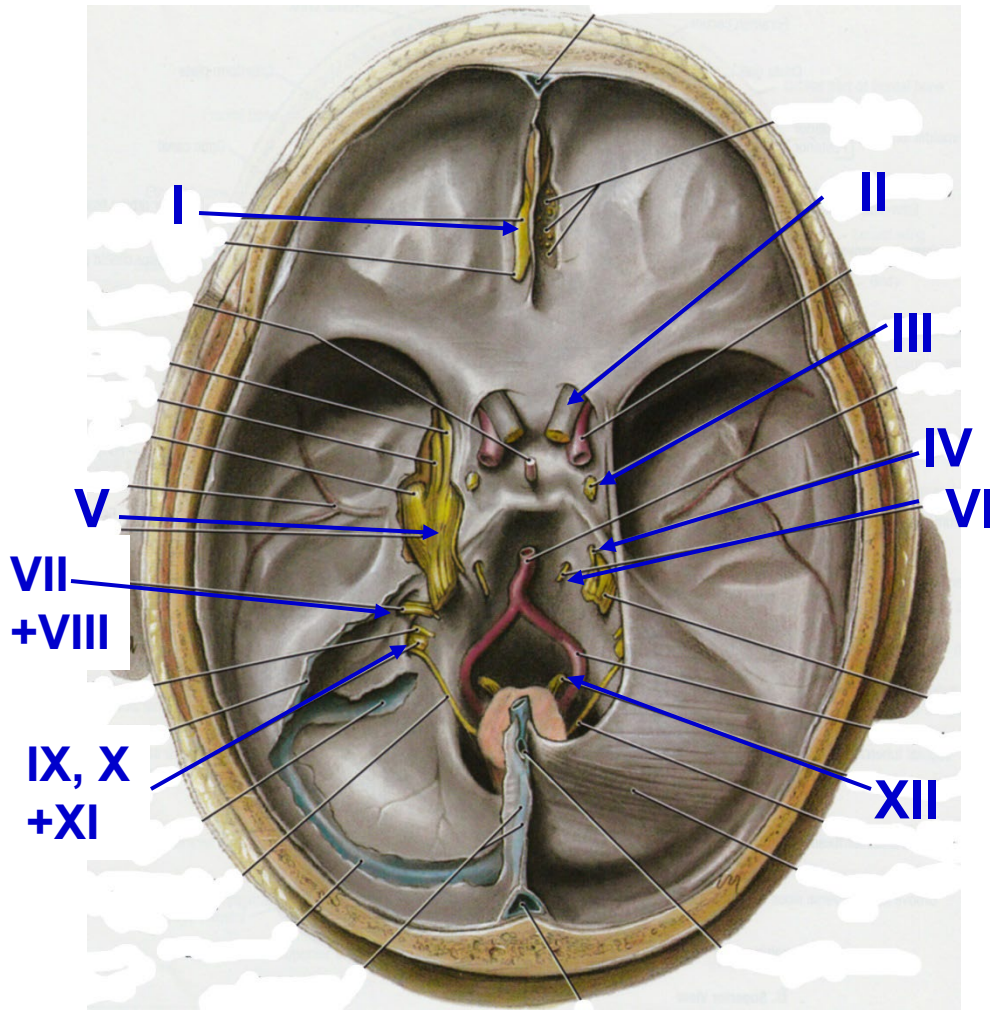
1:1000
Births

Can be unilateral
or bilateral



Note: Ant. Cleft Palate is same as Cleft Lip

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