Orbit, tympanic cavity, nasal cavity, paranasal sinuses

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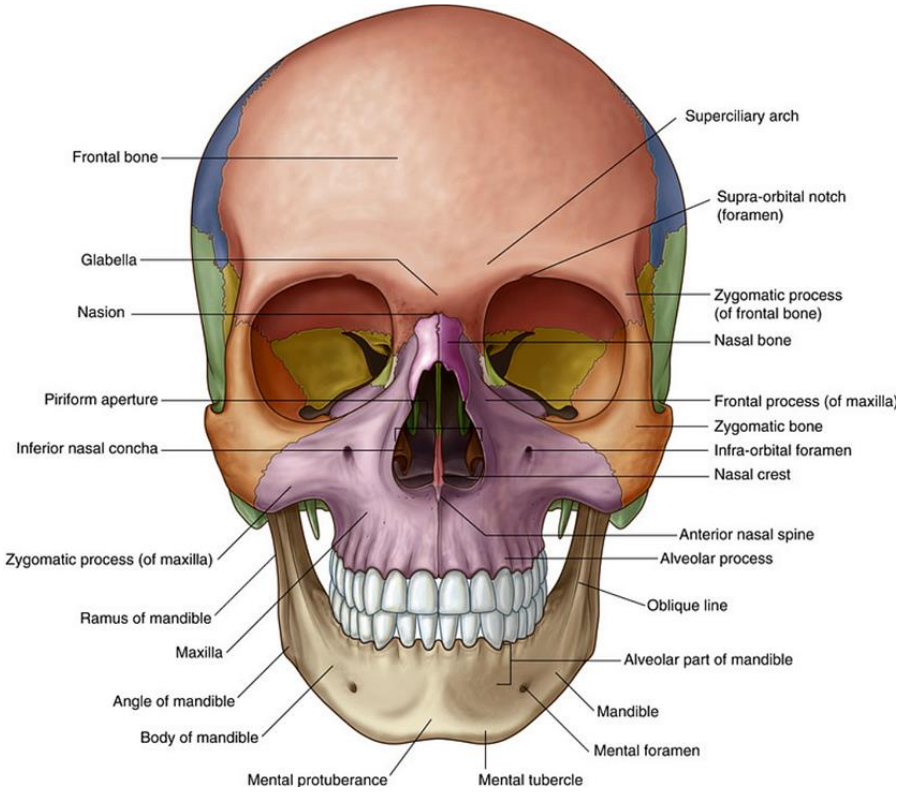

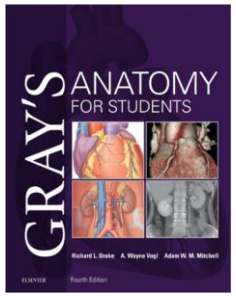

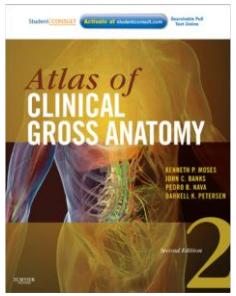

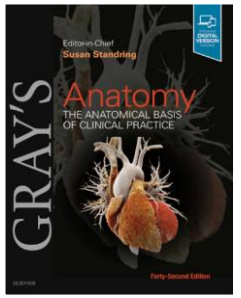

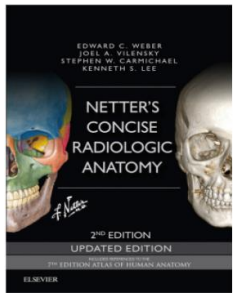

LÉKAŘSKÁ FAKULTA V PLZNI
Univerzita Karlova

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Introduction, ie. What is this good for?!

Dear students, colleagues,

This presentation summarizes the content of the lecture. It also contains a list of required knowledge and allows its practice with regard to clinical use.

The following pictograms will accompany you:

 to recall or remember

 clinical notes

 to be completed

How much do you remember?

1 Cranial nerves – names, numbers

2 Bones of the skull – which of them are pneumatized?

Learning objectives:

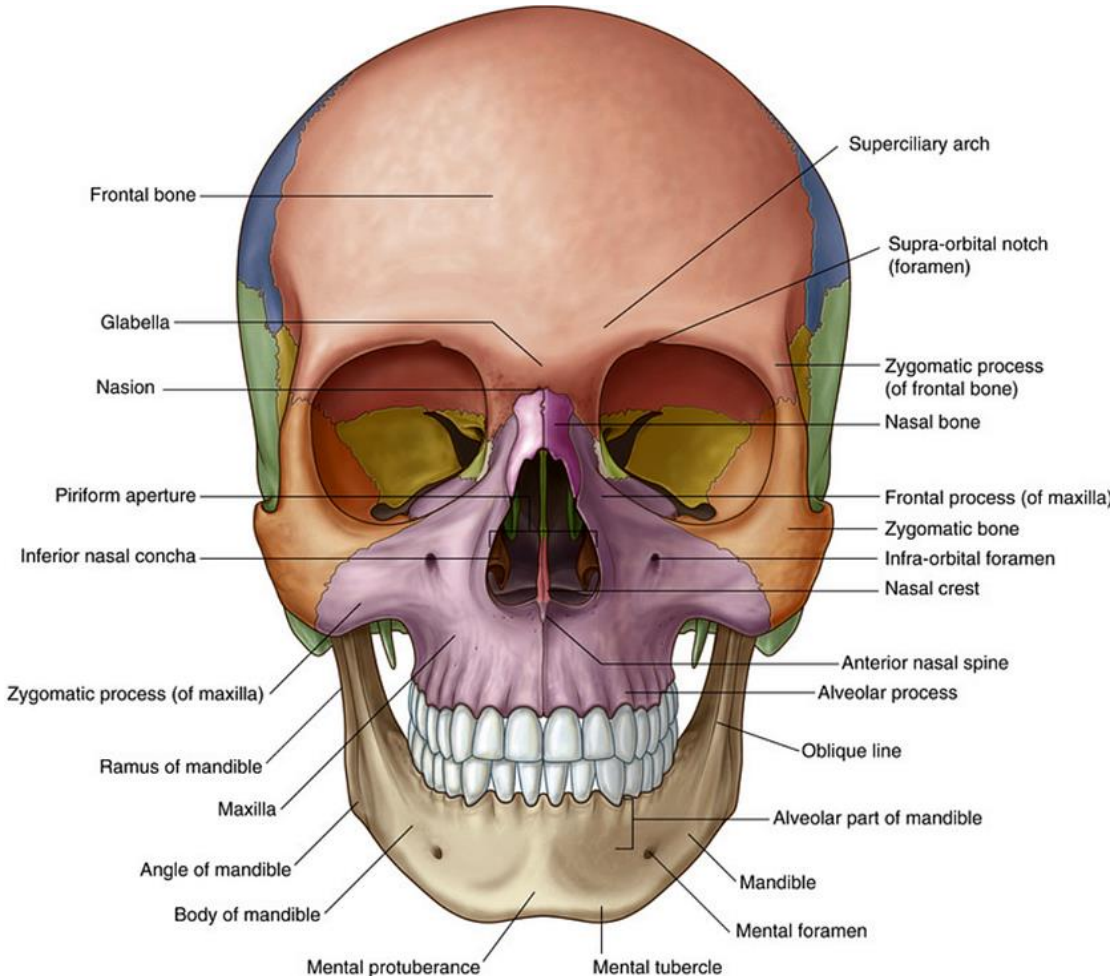
Orbit, tympanic cavity, nasal cavity, paranasal sinuses: bones, contents, syntopy

Bones of the skull

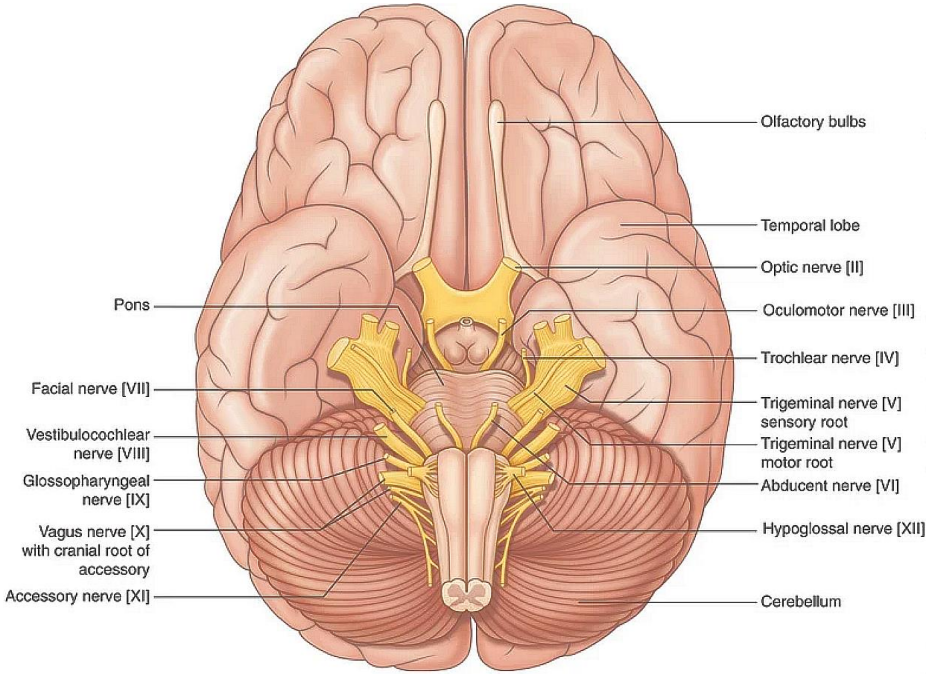
Cranium (skull) = **calva + base**

Neurocranium – covers the brain and sensory organs

Splanchnocranium – facial part

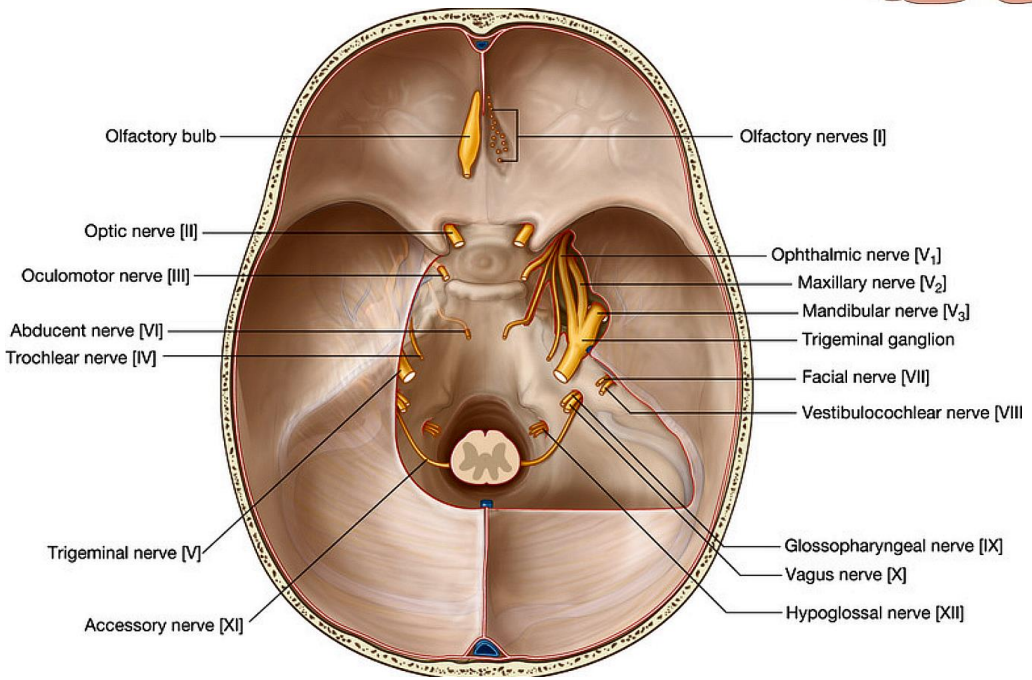


How much do you remember?
Name the marked structures. Not sure? The key is on the next slide.



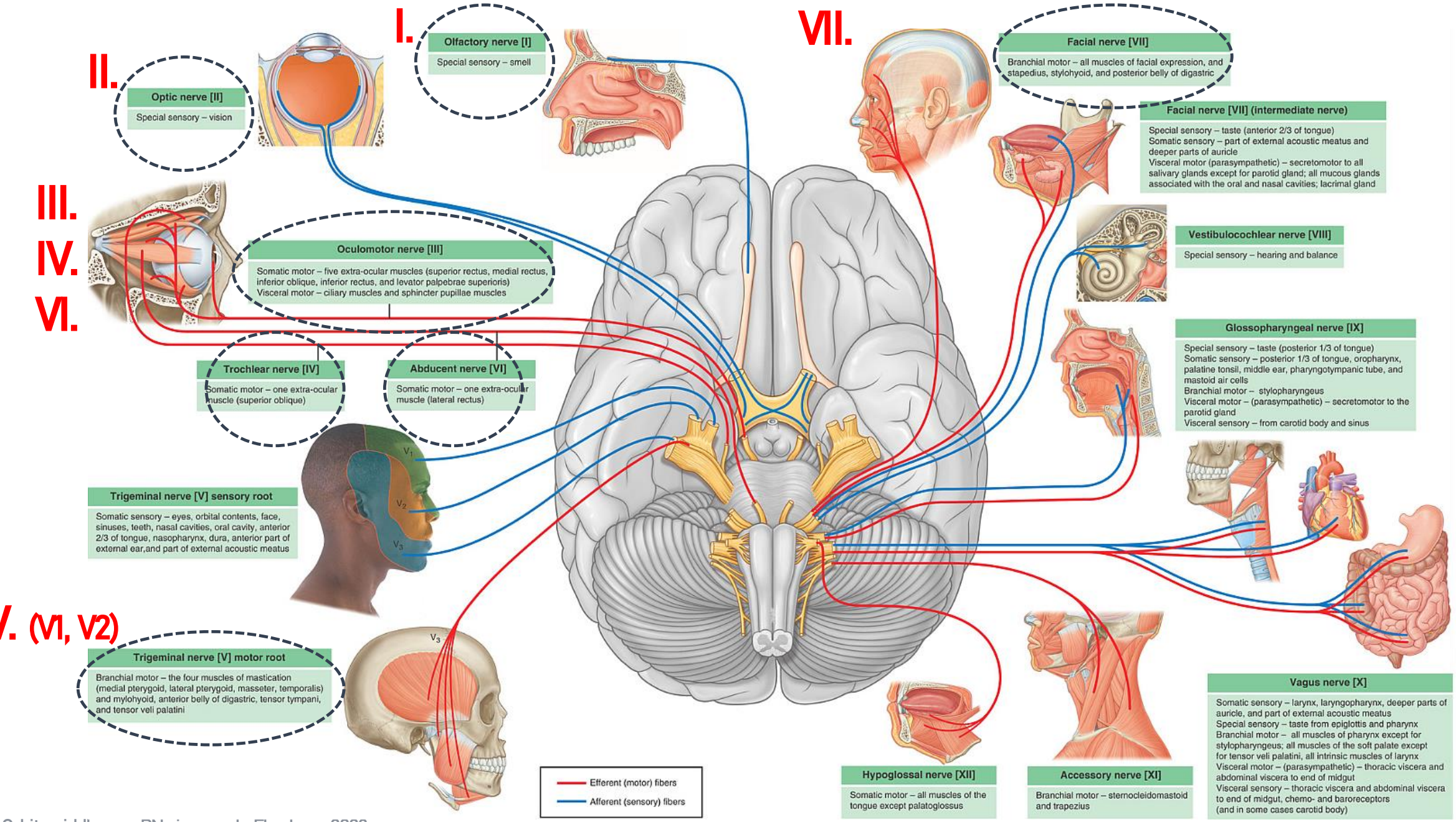
Cranial nerves

CNI – olfactory
CNII – optic
CNIII – oculomotor
CNIV – trochlear
CNV – trigeminal (V1 – ophthalmic, V2 – maxillary, V3 – mandibular)
CNVI – abducens
CNVII – facial
VIII – vestibulocochlear
CNIX – glossopharyngeal
CNX – vagus
CNXI – accessory
CNXII – hypoglossal

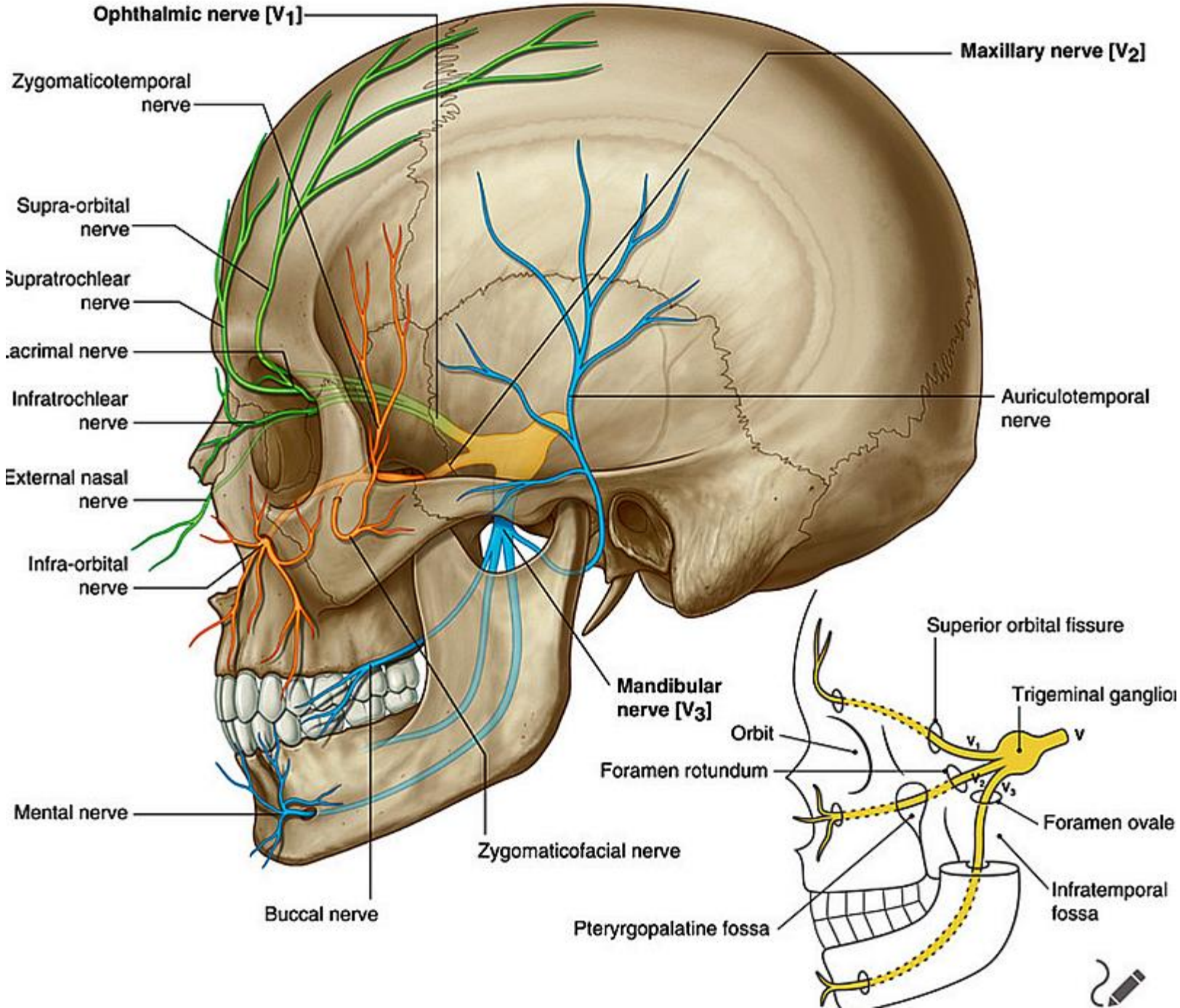


Cranial nerves: origin, course, quality, branching

Origin: brain / sensory organs; course: skull; quality: sensory? motor?



Trigeminal nerve



How much do you remember?
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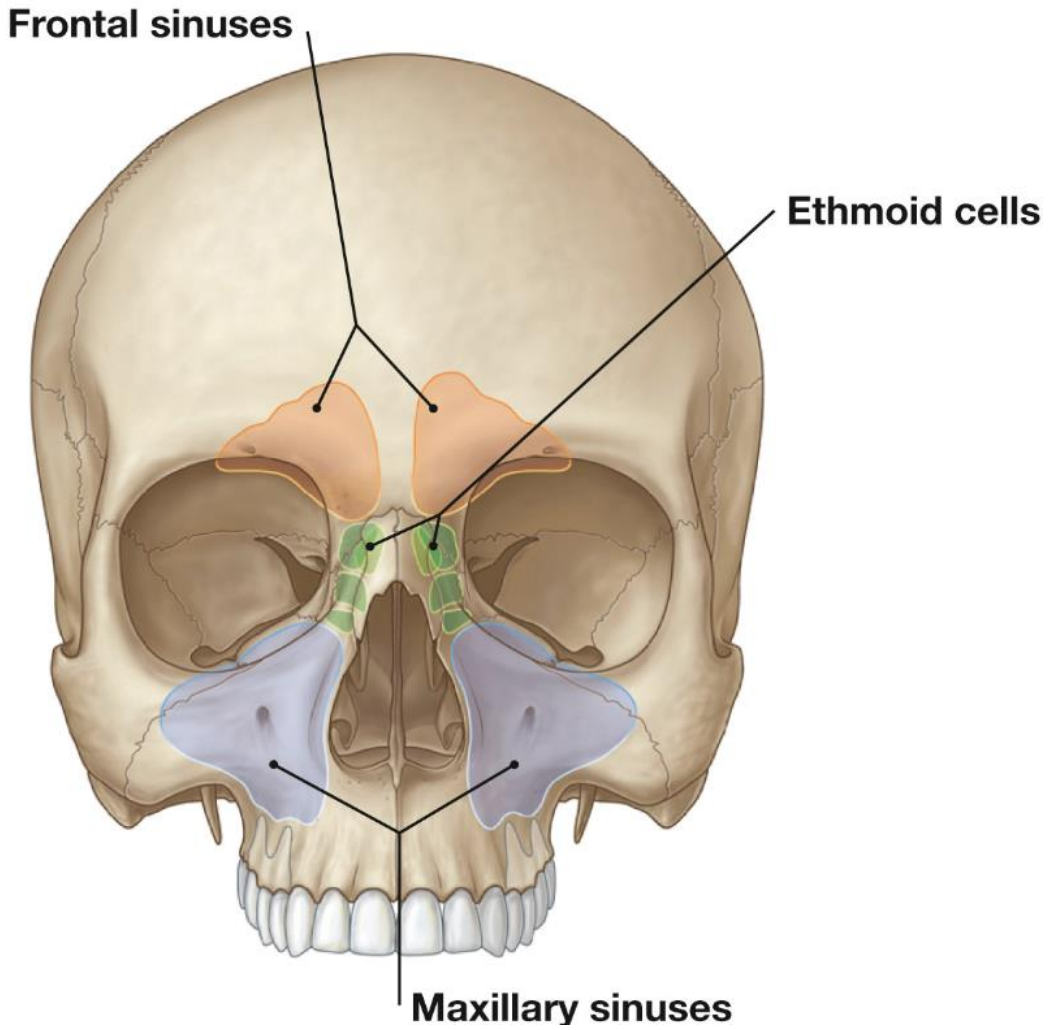


Fig.: Paranasal sinuses

Skull: Moodle Anatomy
ELAng Topic 5

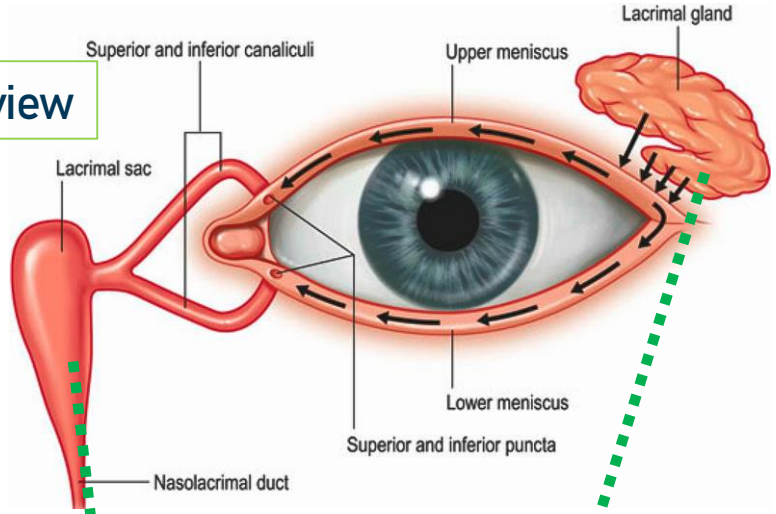
Bones of neurocranium:
os occipitale – occipital
os parietale – parietal
os frontale – frontal
os ethmoidale – ethmoid
os temporale – temporal
os sphenoidale – sphenoid
os lacrimale – lacrimal
os nasale – nasal
vomer – vomer
concha nasalis inferior – inferior nasal concha

Bones of splanchnocranium:
maxilla – maxilla
os palatinum – palatine
os zygomaticum – zygomatic
mandibula – mandible
malleus - malleus
incus - incus
stapes - stapes
os hyoideum – hyoid

Pneumatized bones

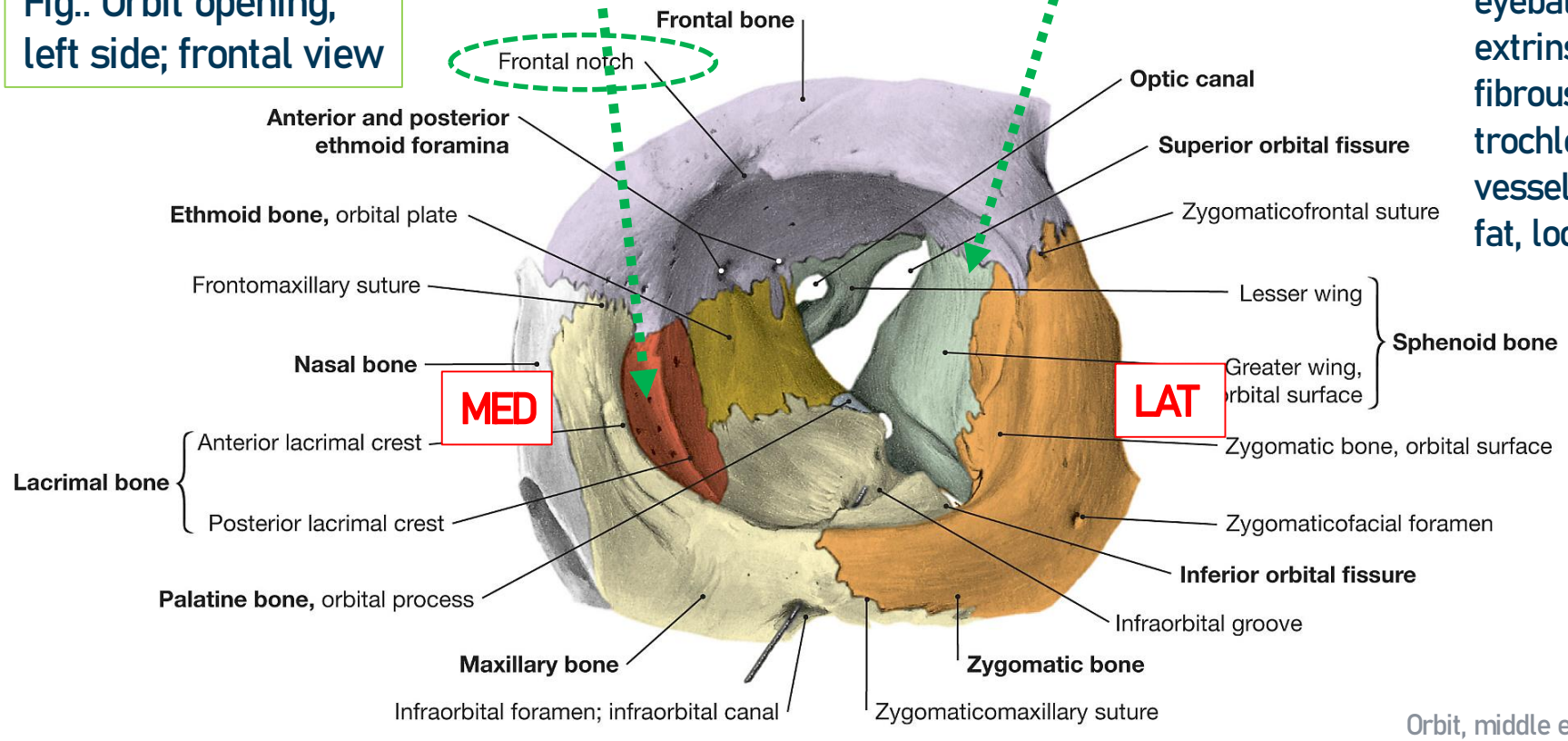
ORBIT

Fig.: Tear dynamics, left side; frontal view



The orbits are **quadrilateral pyramidal** skeletal cavities that serve as sockets for the eyes and associated structures. Each orbit has an **opening**, narrowing posteromedially to its **apex**. The **4 walls**: **floor, roof, medial and lateral**.

Fig.: Orbit opening, left side; frontal view



Orbital contents:
eyeball
extrinsic muscles (1 striated and 1 smooth)
fibrous structures (eg. tendinous ring, trochlea)
vessels, nerves
fat, loose connective tissue

Skull: Moodle Anatomy
ELAng Topic 5, review tables

ORBIT, anterior view

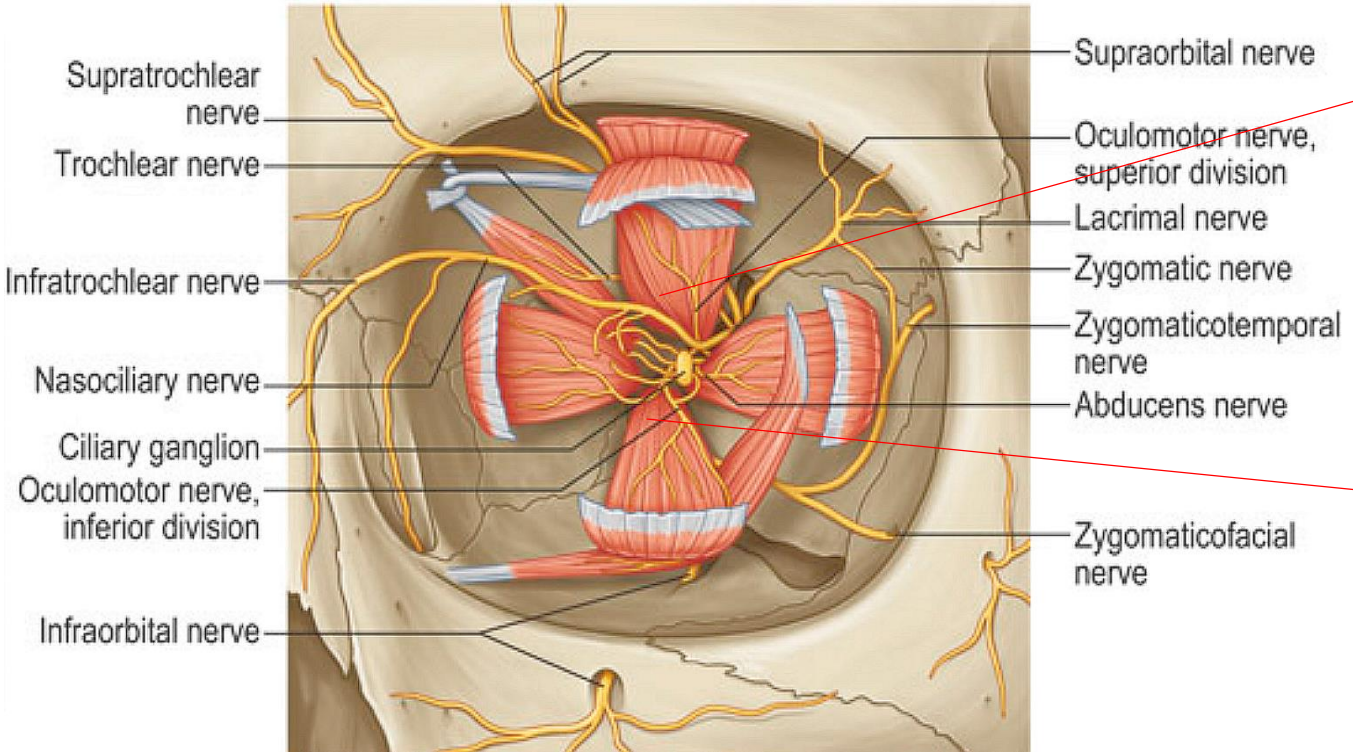


Fig.: The left orbit viewed from in front, showing motor and sensory nerves and the origins of the extraocular muscles.

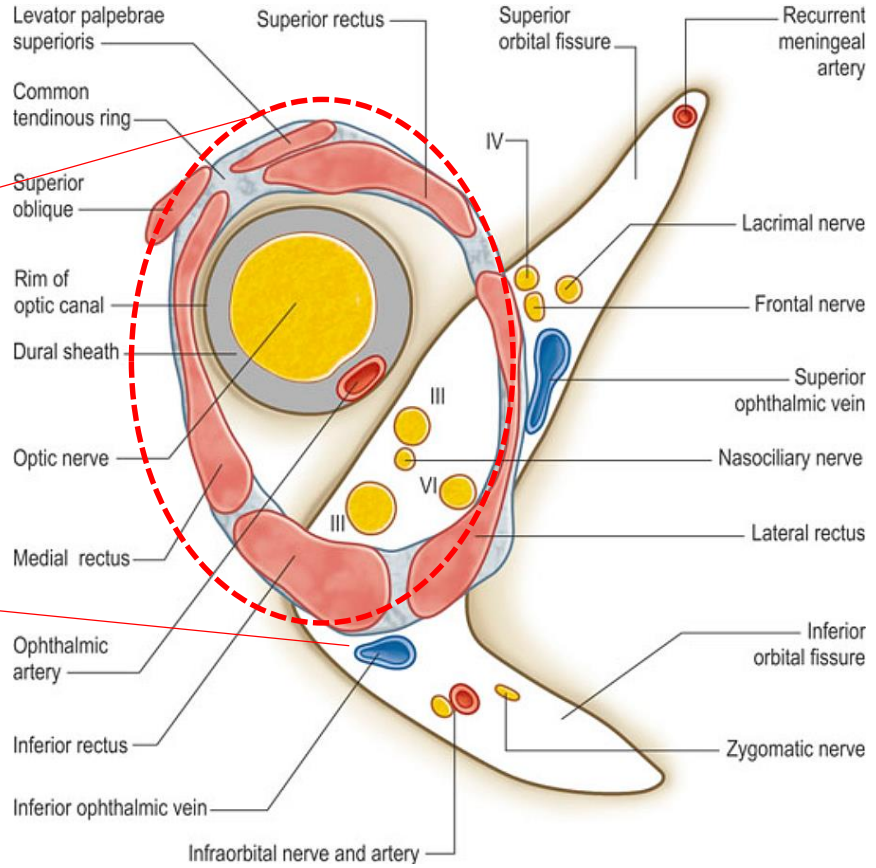


Fig.: **The common tendinous ring** (CN II, III, VI, VI); superior and inferior orbital fissures

Which of the structures of the superior orbital fissure pass through the common tendinous ring? See also the middle layer of the orbit.

ORBIT, extrinsic muscles of the eyeball: 4 straight, 2 oblique

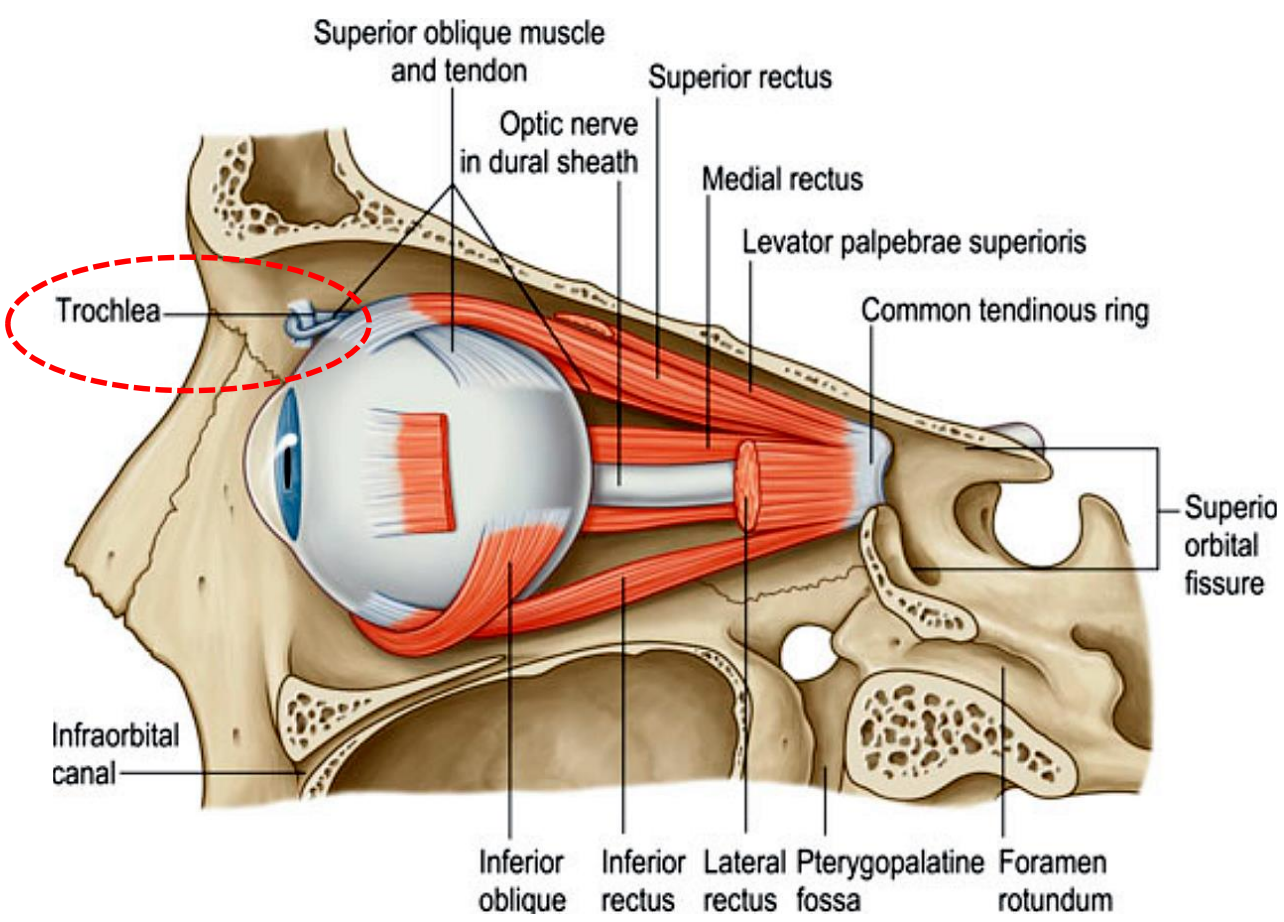


Fig.: The muscles of the left orbit, lateral view

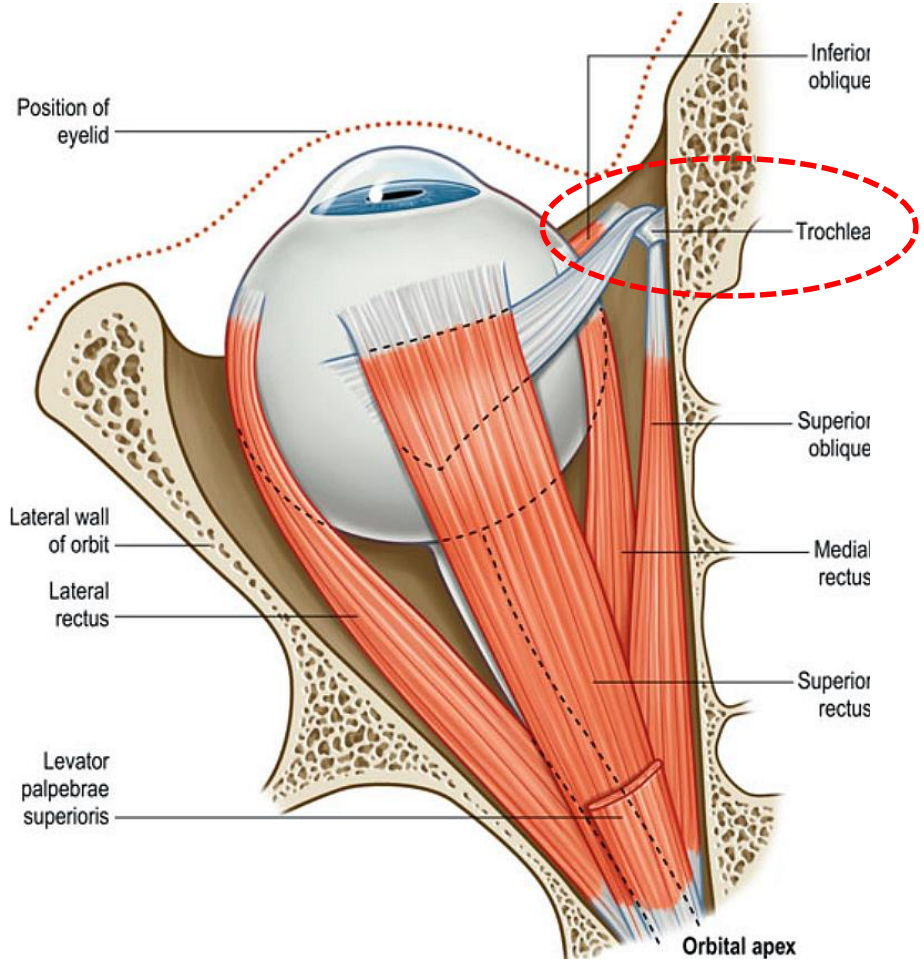


Fig.: Extraocular muscles viewed from above

Levator palpebrae m., orbitalis m.

Orbit – review table

wall	bones	openings, spaces	structures passing through
roof	orbital part of the sphenoid lesser wing of the sphenoid	frontal foramen supraorbital foramen trochlear fovea fossa for the lacrimal gland	frontal nerve (CN V_1)
lateral wall	zygomatic bone ala major ossis sphenoidalis	zygomaticoorbital foramen	zygomaticoorbital nerve (V_2)
medial wall	frontal process of maxilla lacrimale bone lamina orbitalis ossis ethmoidalis ala minor ossis sphenoidalis	nasolacrimal canal anterior ethmoid foramen posterior ethmoid foramen	nasolacrimal duct ethmoidal nerve and vessels
inferior wall	zygomatic bone body of maxilla	infraorbital canal	infraorbital nerve (V_2)
superior orbital fissure	between the greater and lesser wings of the sphenoid	opens into the middle cranial fosaa	CN III, IV, V_1, V_2, VI superior ophthalmic vein
inferior orbital fissure	between the greater wings of the sphenoid and maxilla	opens into the infratemporal and pterygopalatine fossa	zygomatic nerve infraorbital nerve infraorbital nerve inferior ophthalmic vein
optic canal	sphenoid bone		CN II ophthalmic artery

ORBIT, extrinsic muscles of the eyeball

Name	Origin	Insertion	Innervation	Movement of the eyeball
Superior rectus muscle	Annulus of Zinn	Anterior to the eye´s equator	Oculomotor nerve	Upward and medially
Inferior rectus muscle				Downward and medially
Medial rectus muscle				Medially
Lateral rectus muscle			Abducent nerve	Laterally
Superior oblique muscle	The inner wall of the orbit	Posterior to the eye´s equator	Trochlear nerve	Downward and laterally
Inferior oblique muscle			Oculomotor nerve	Upward and medially

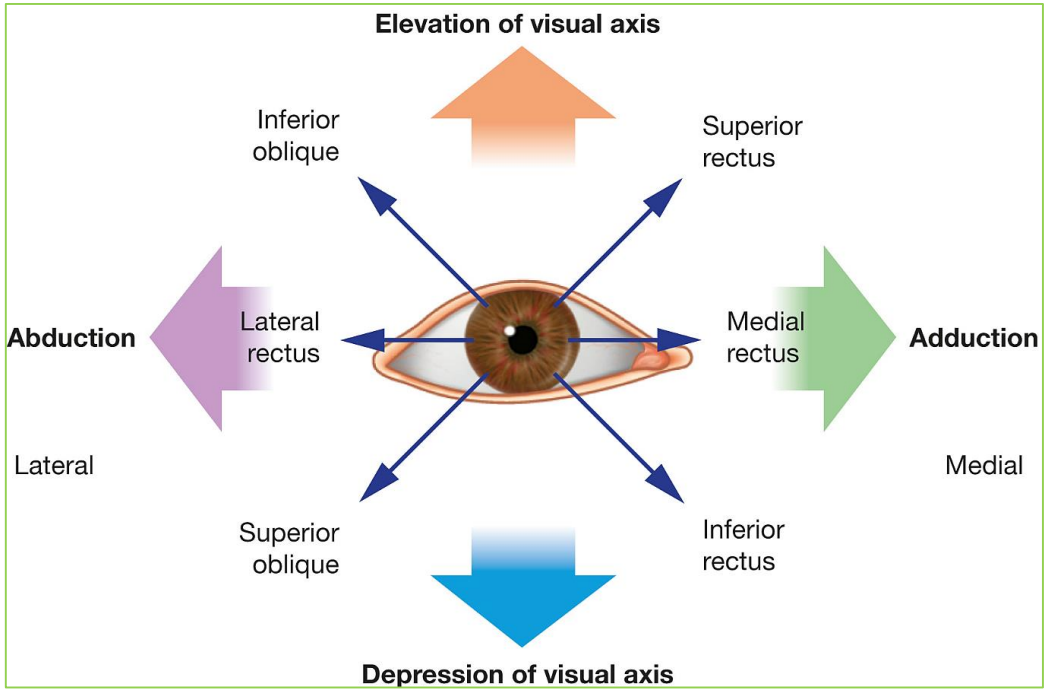


Fig.: Extraocular muscles function, right side

Fig.: Palsy of the oculomotor nerve [CN III] results in the paralysis of all extraocular muscles , except for the lateral rectus (abducens nerve [CN VI]) and the superior oblique (trochlear nerve [CN IV]).

ORBIT, arteries and veins

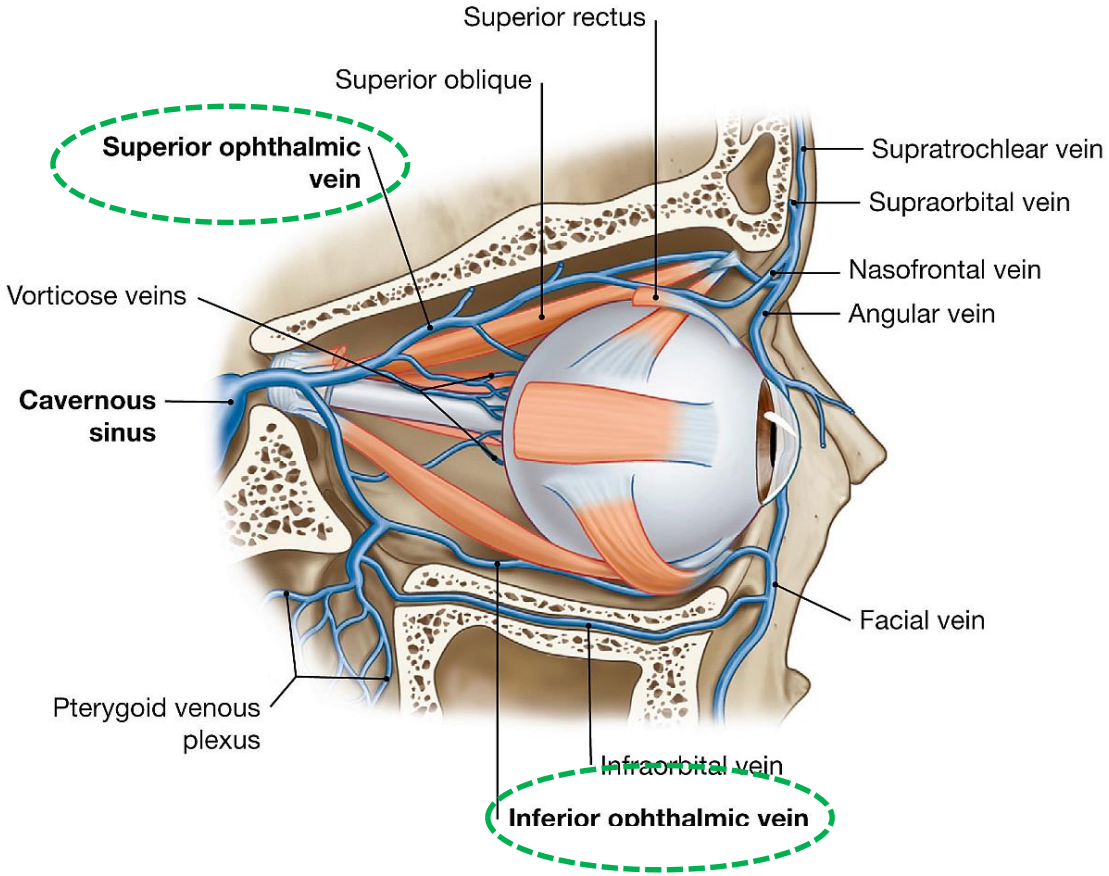


Fig.: Principal veins of the orbit, lateral view into the right orbit

CAUTION! Veins of the orbit interconnect the intra- and extracranial veins!
Superior ophthalmic vein – cavernous sinus
Inferior ophthalmic vein – pterygoid plexus

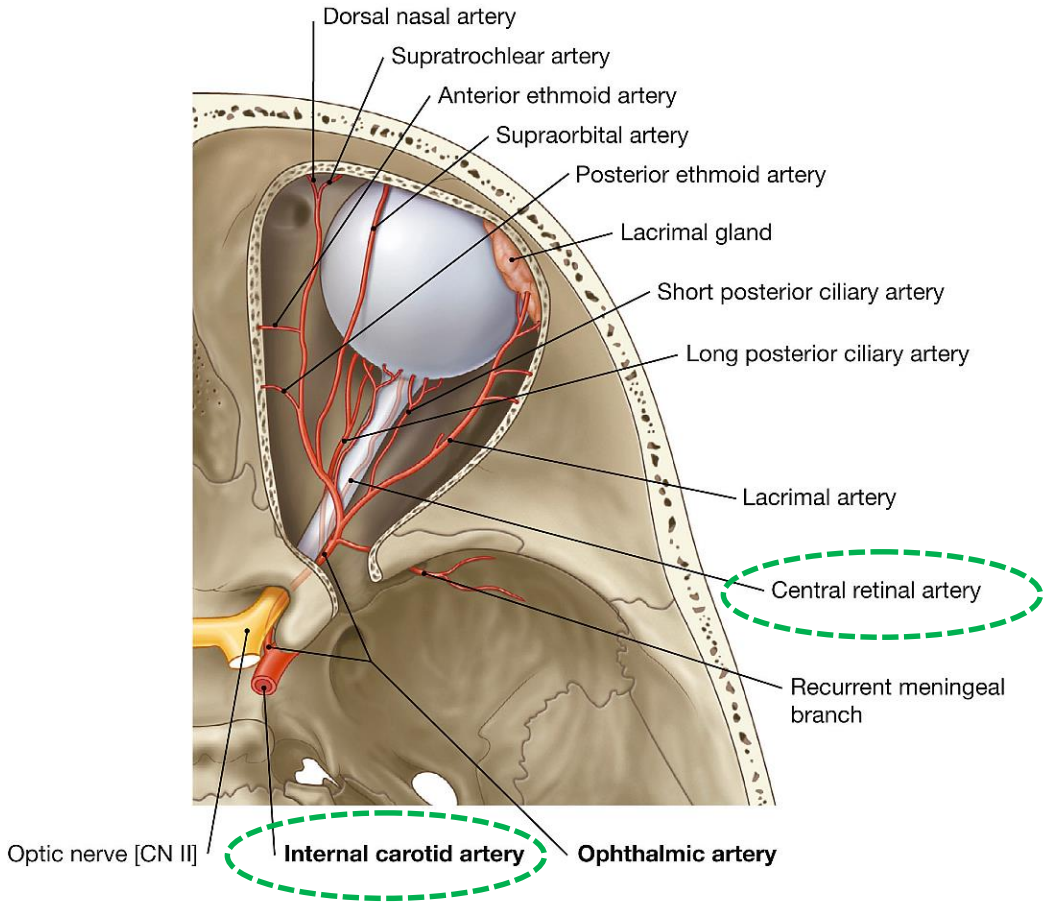
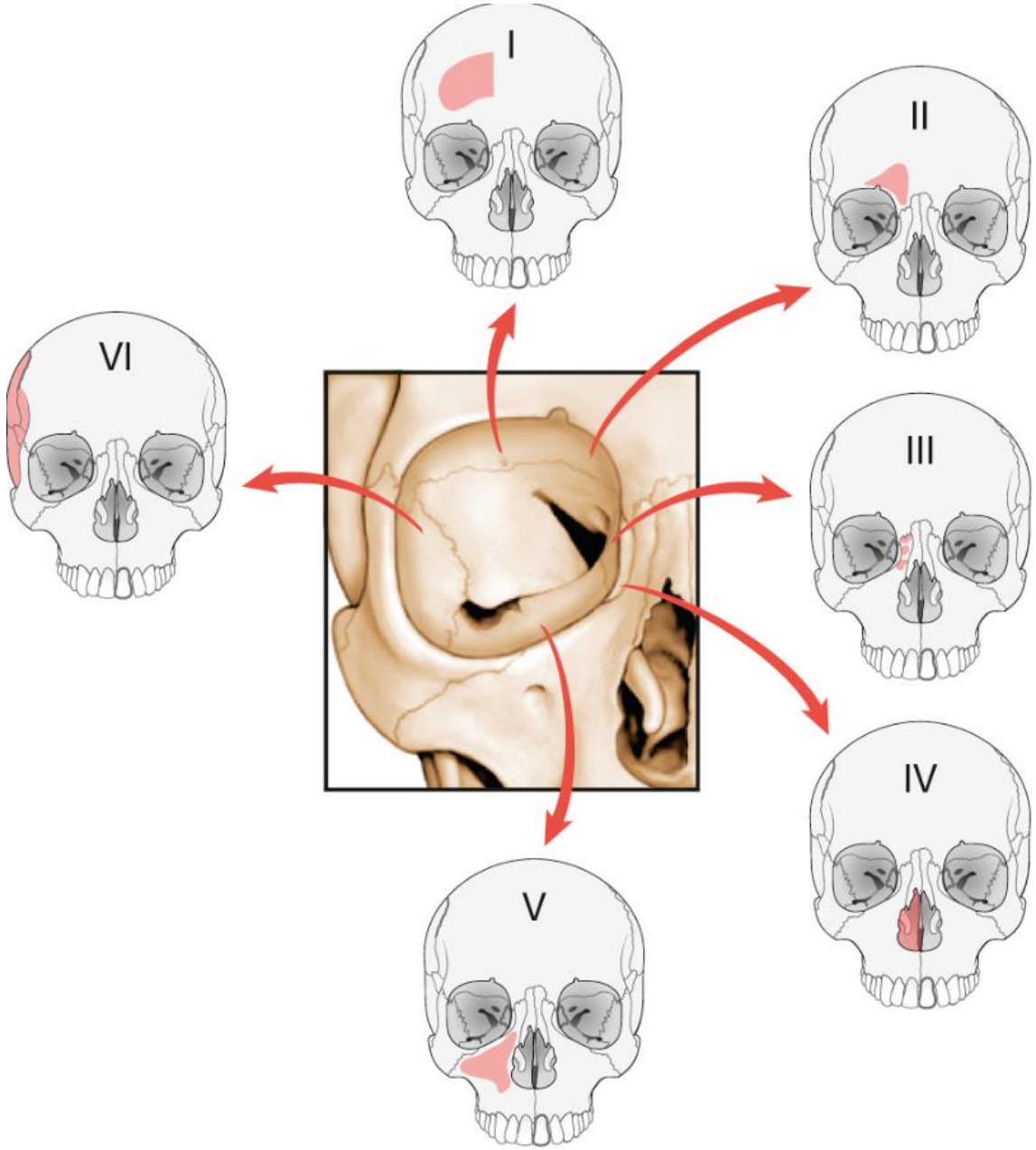


Fig: Ophthalmic artery, dorsal view of the right orbit

The ophthalmic artery (OA) is the main artery of the orbit, it derives from the internal carotid artery (ICA). OA supplies the eyeball and orbital structures. Its branching is considerably variable. OA anastomoses with the external carotid artery (eg. with the facial artery), however, the central retinal artery is the end-artery.

Topographical relationships of the orbit with neighboring regions (= orbit syntopy)



CAUTION!!!
Infections in these paraorbital regions can spread to the orbit and vice versa. Bony separations are often thin and pose no real barrier to the spread of aggressive germs.

I. Anterior cranial fossa
II. Frontal sinus
III. Ethmoid cells .....
IV. Nasal cavity .....
V. Maxillary sinus .....
VI. Temporal fossa .....

via the superior orbital fissure

Nasal cavity

Roof: nasal bones, nasal part of the frontal bone, cribriform plate of the ethmoid, body of the sphenoid
Floor: praemaxila, palatine process of maxilla, horizontal plate of the palatine bone
Entrance: piriform aperture
Exit: choans

Table 1.3: Divisions of the nasal cavity, paranasal sinuses

level	border	communication
superior nasal meatus	between the middle nasal concha roof of nasal cavity	sphenoidal sinus posterior ethmoid cells
middle nasal meatus	between the middle and inferior nasal concha	anterior (middle) ethmoid cells maxillary sinus frontal sinus
inferior nasal meatus	between the inferior nasal concha and floor	nasolacrimal duct

Paranasal sinuses develop as a protrusion of the nasal muchosa – they are enlined by the respirátory epithelium, and develop postnatally

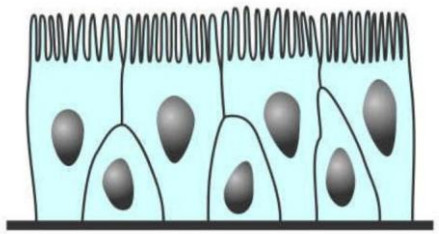


Fig.: Respiratory epitelium

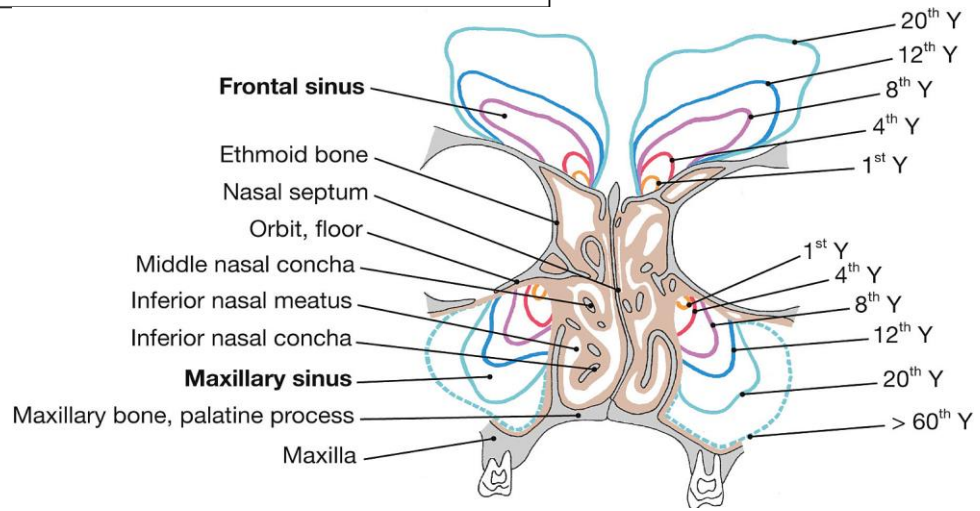


Fig.: Development of the maxillary and frontal sinuses. Y: year of life

Paranasal sinuses, syntopy and communication

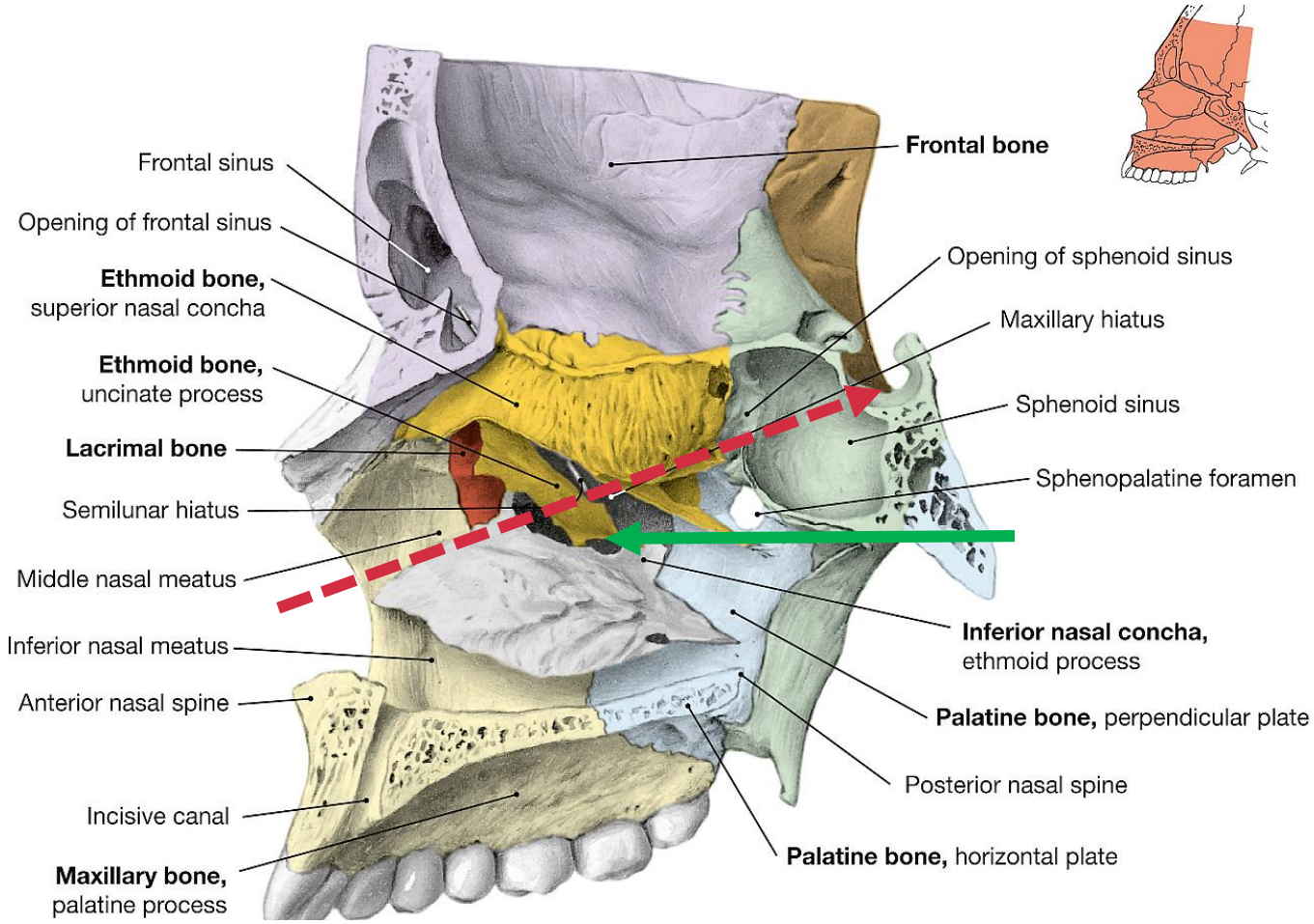


Fig.: Lateral wall of the nasal cavity, right side
red arrow – surgical access into the hypophyseal fossa
green arrow – maxillary hiatus

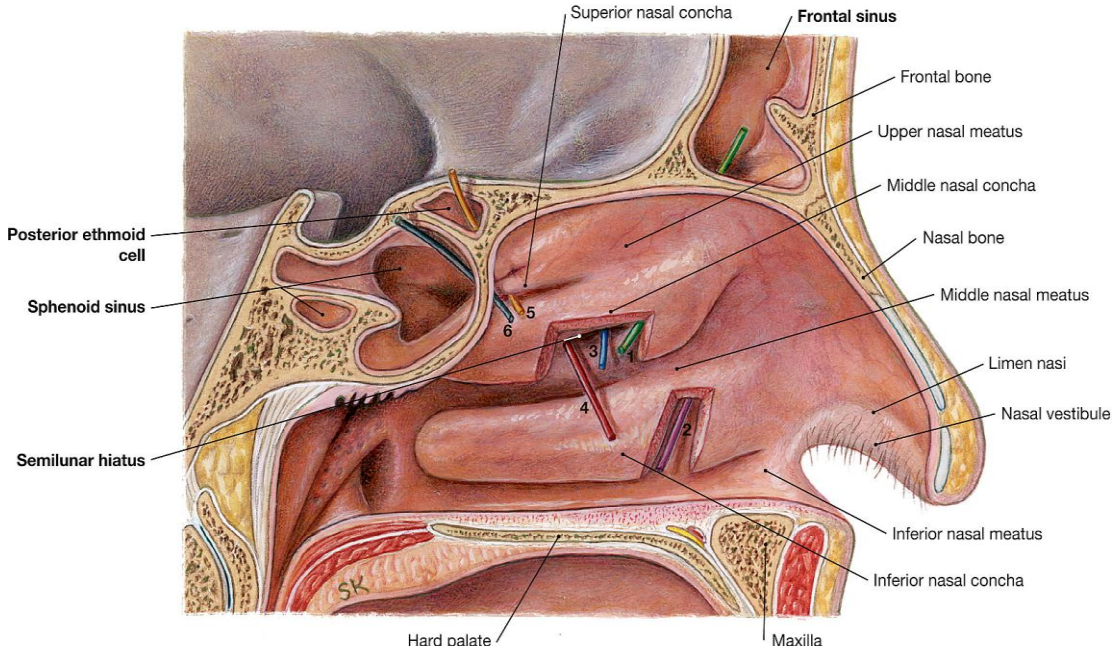
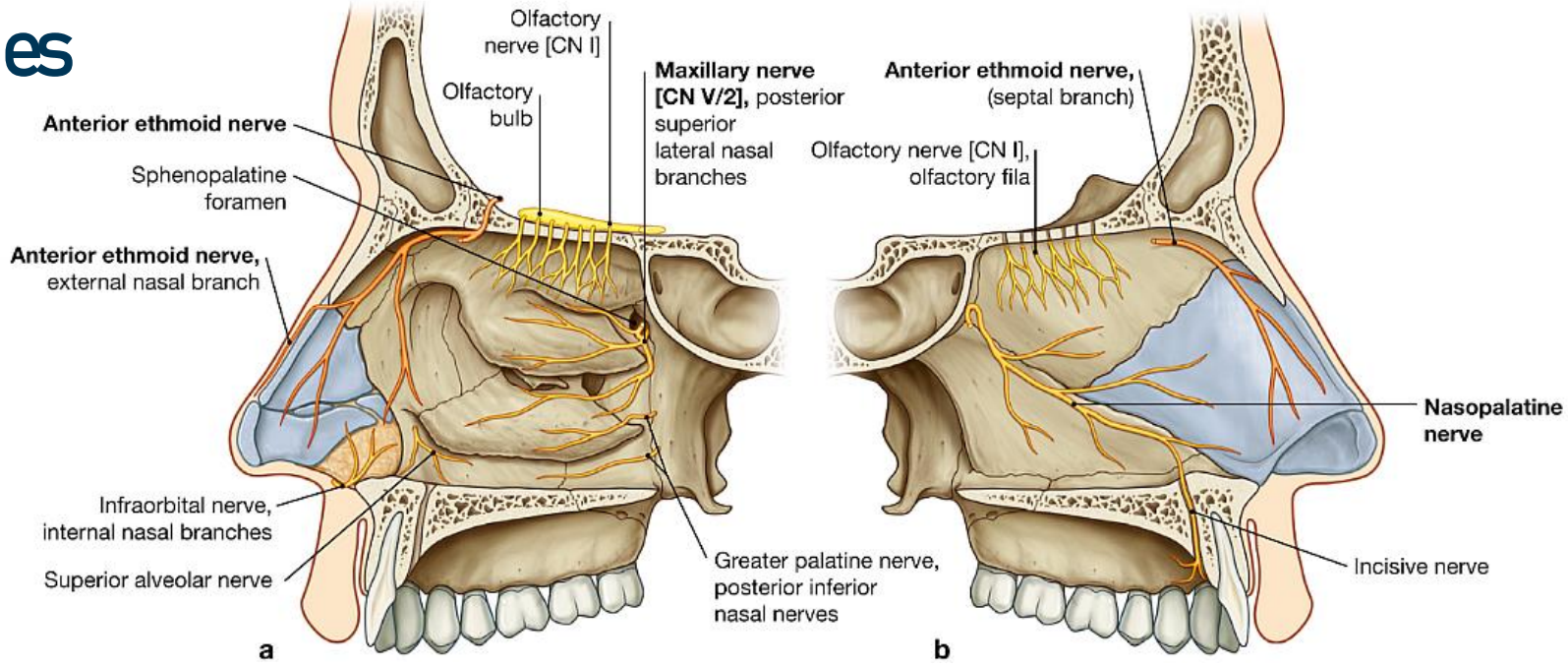
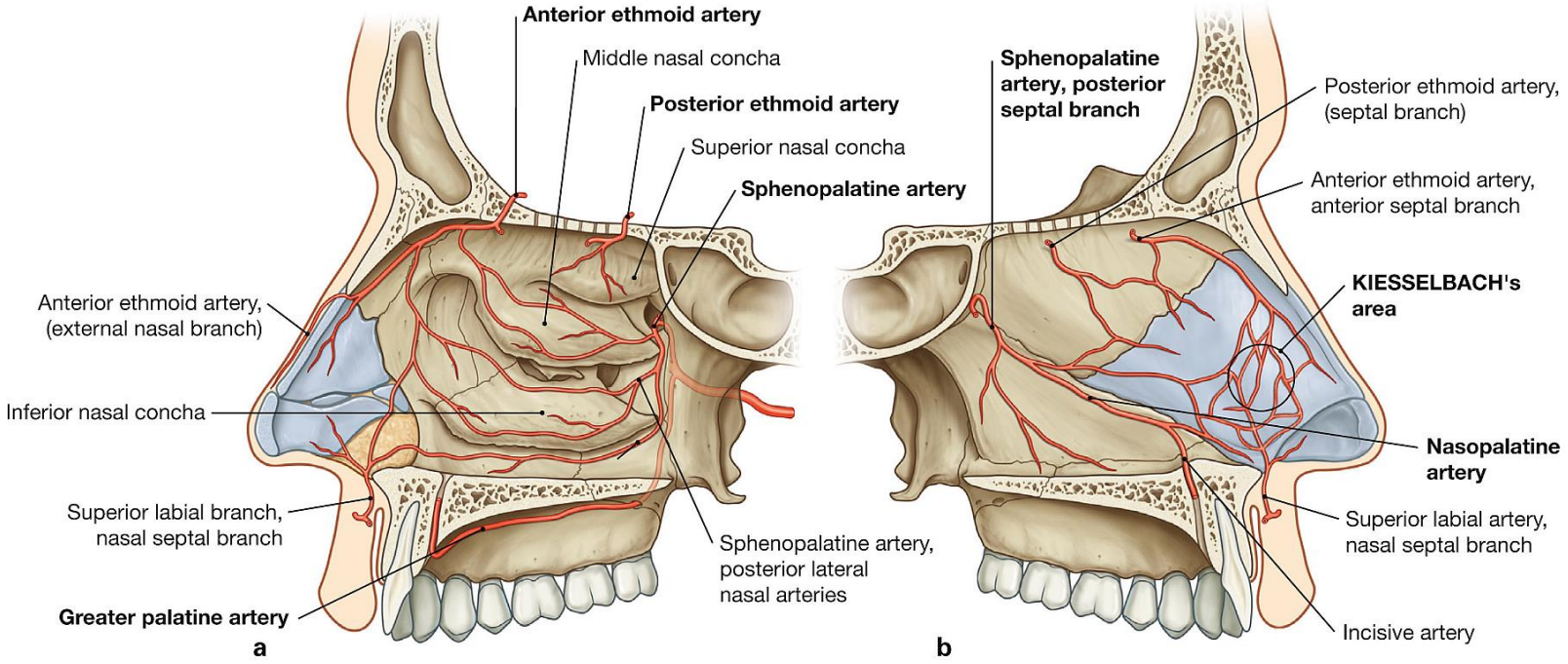


Fig.: Lateral nasal wall, right side; view from the left side

Nasal cavity nerves and arteries

Sources:
Maxillary nerve (CN V2)
Maxillary artery (external carotid a.)





Clinical notes

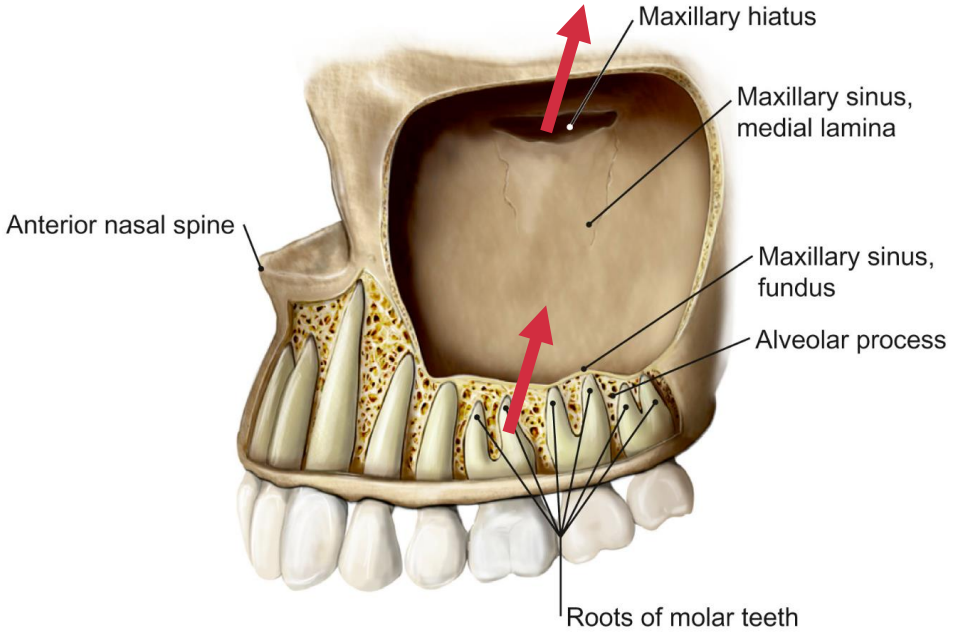


Fig.: Maxillary sinus, oroantral communication

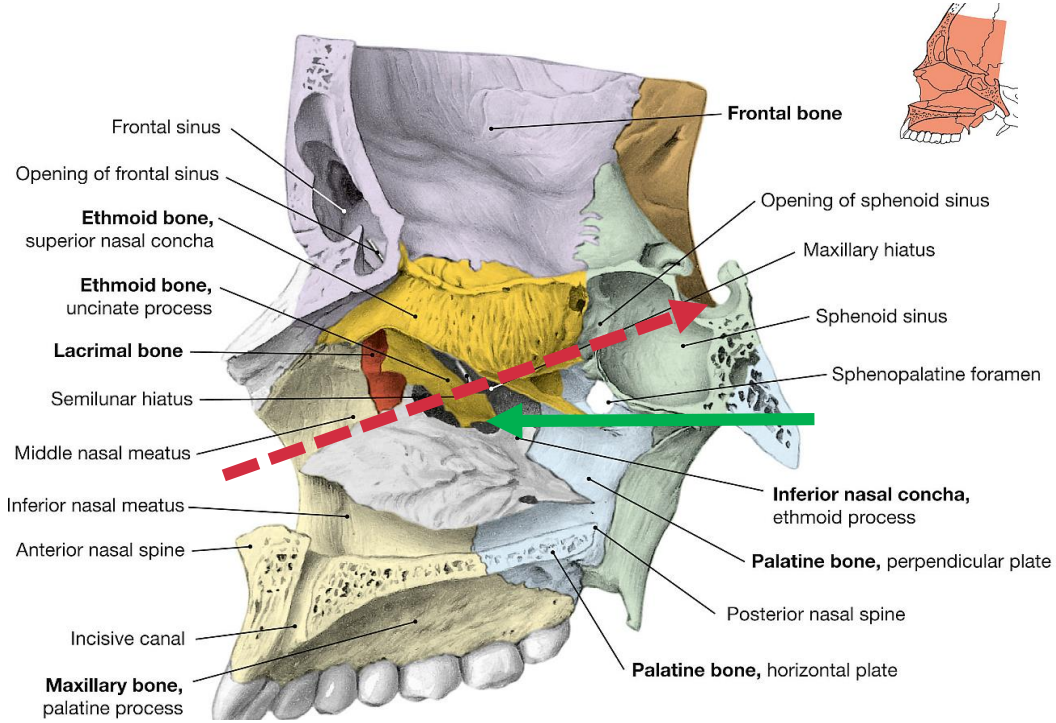


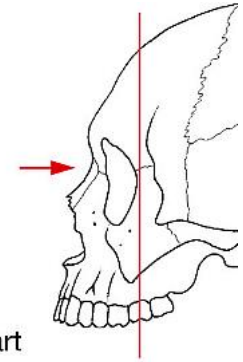
Fig.: Lateral wall of the nasal cavity, right side; red arrow – surgical access into the hypophyseal fossa; green arrow – maxillary hiatus

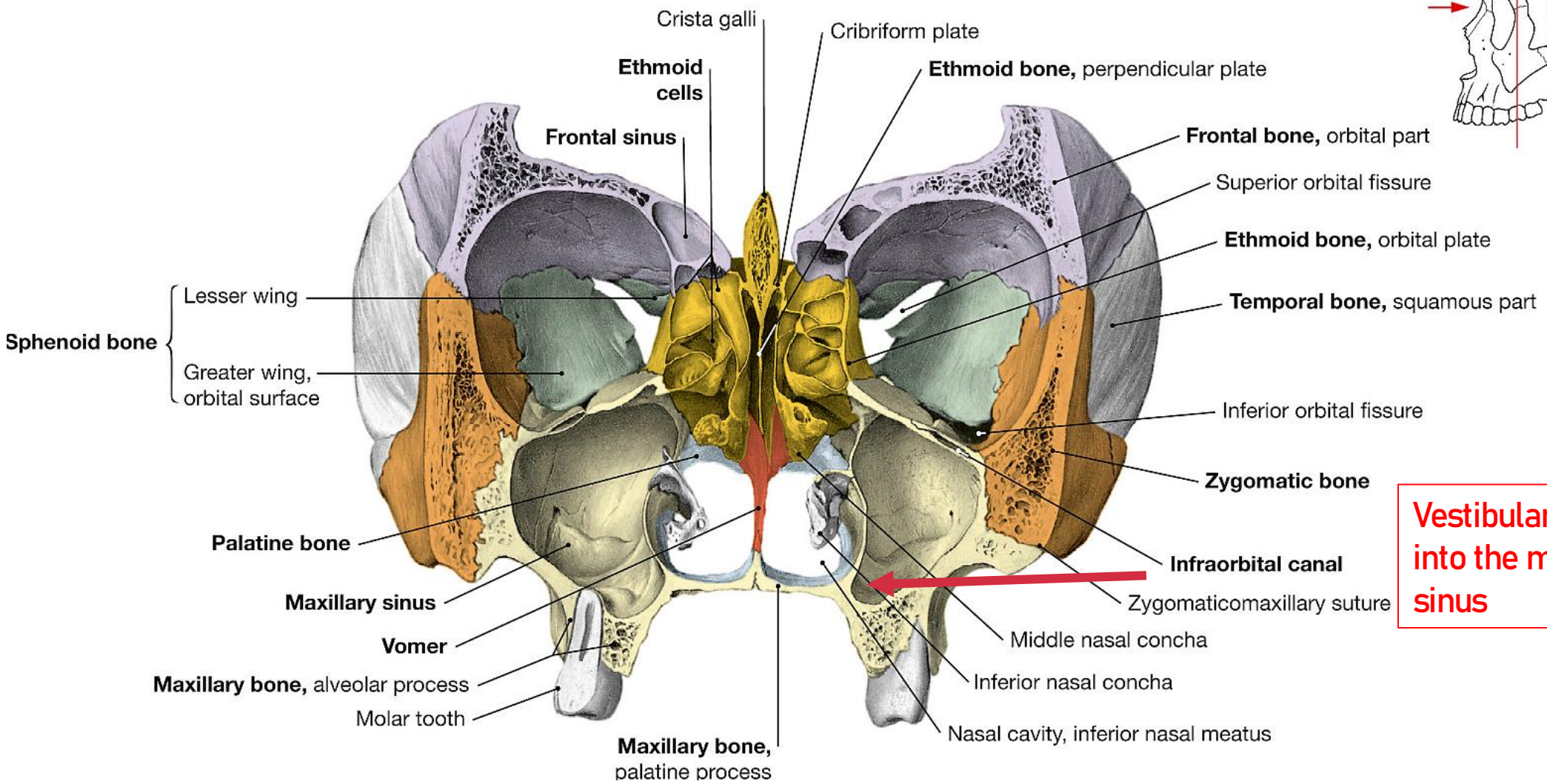
Kieselbach´s area – nasal septum

A fracture of the nasal roof (cribriform plate of ethmoid bone) frequently results in the rupture of the dura mater. This can cause cerebrospinal fluid (CSF) to leak from the nose as clear transparent fluid (rhinorhea).

Paranasal sinuses develop as a protrusion of the nasal muchosa – they are lined by the respiratory epithelium, and develop postnatally

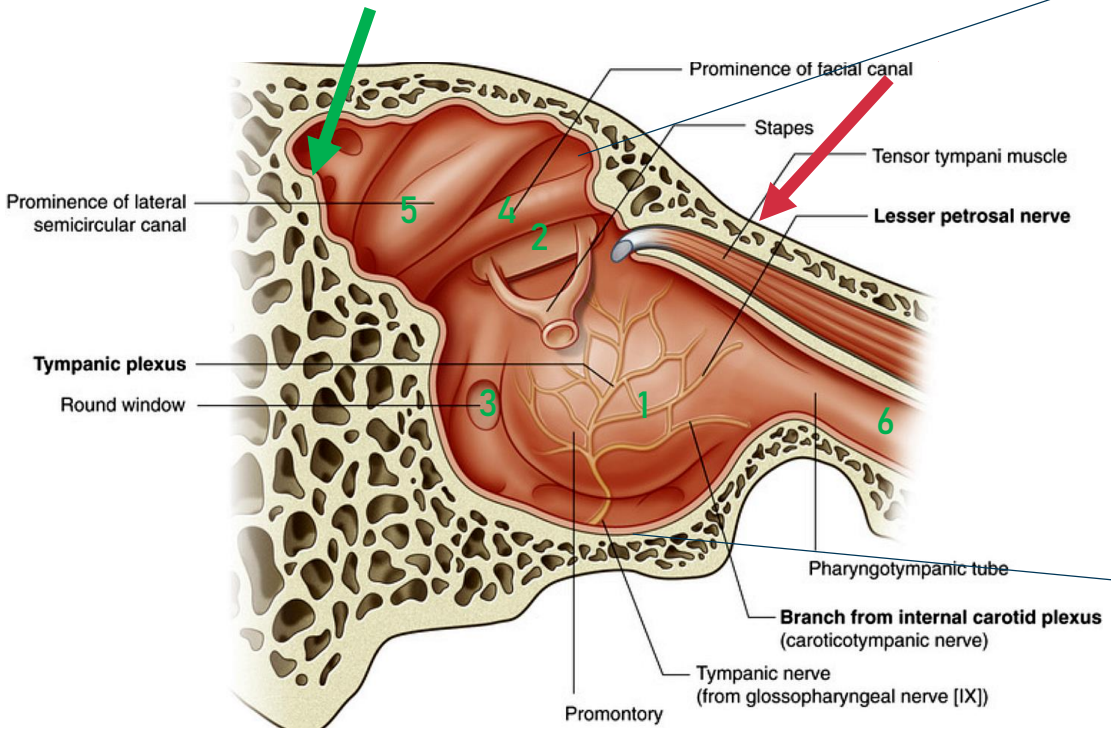
Paranasal sinuses





Vestibular access into the maxillary sinus

Tympanic (middle ear) cavity: petrsous part of the pyramid, temporal bone



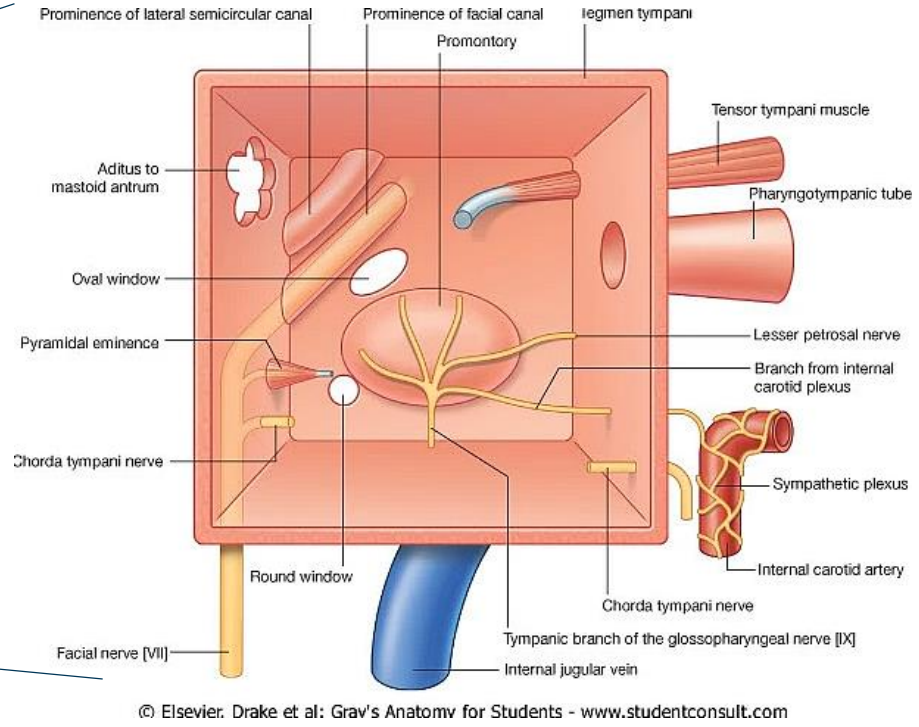


Fig.: **Tympanic cavity, labyrinthine wall**
promontory (1)
stapes in the oval window (2)
membrane in the round window (3)
prominence of the facial nerve (4)
prominence of the lateral semicircular canal (5)
phryngotympanic (Eustachian) tube (6)
tegmen tympani (red arrow)
mastoid antrum (green arrow)

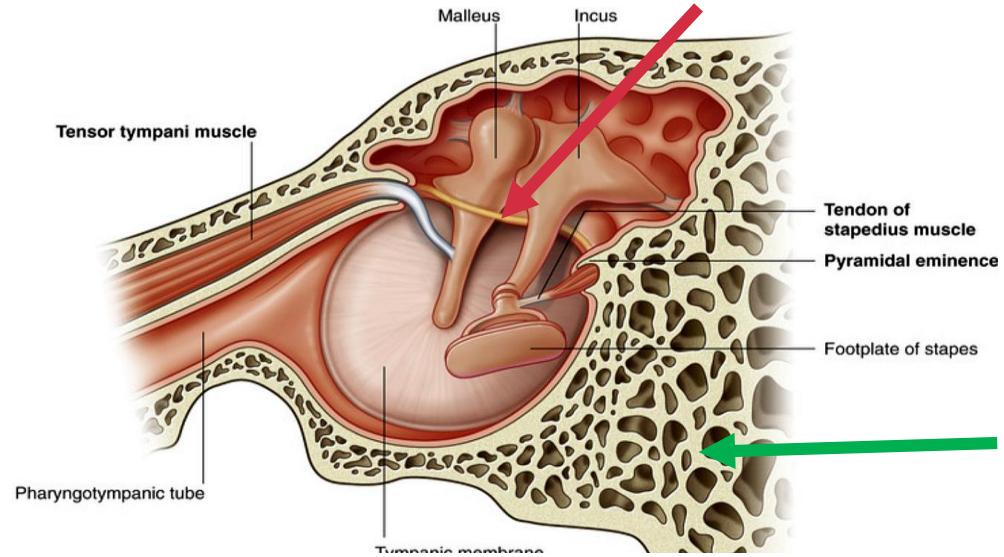
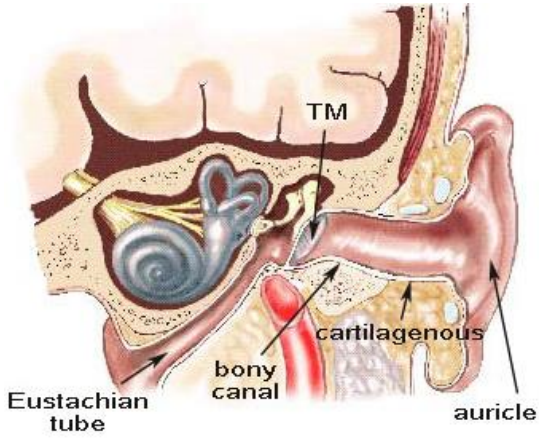


Fig.: Tympanic cavity, auditory ossicles, chorda tympani (red arrow), mastoid cells (green arrow)

Tympanic (middle ear) cavity



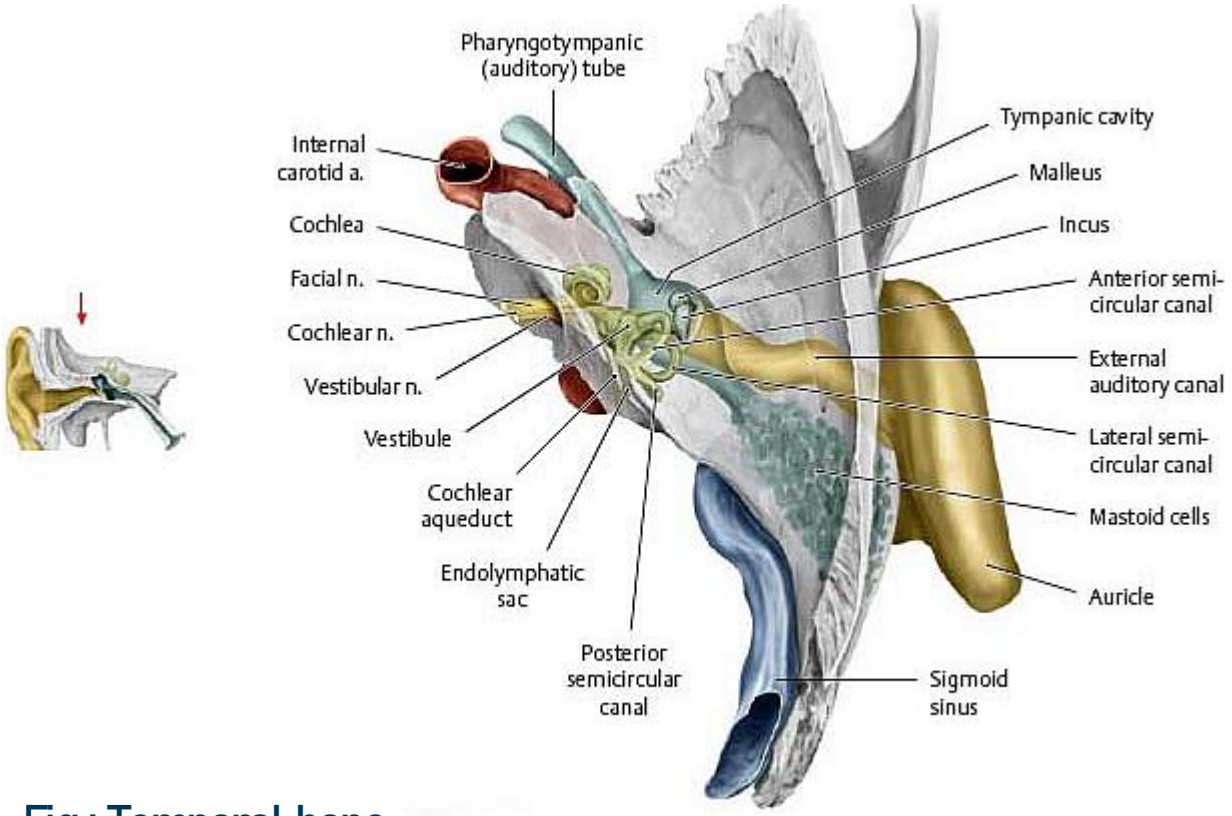


Fig.: Temporal bone

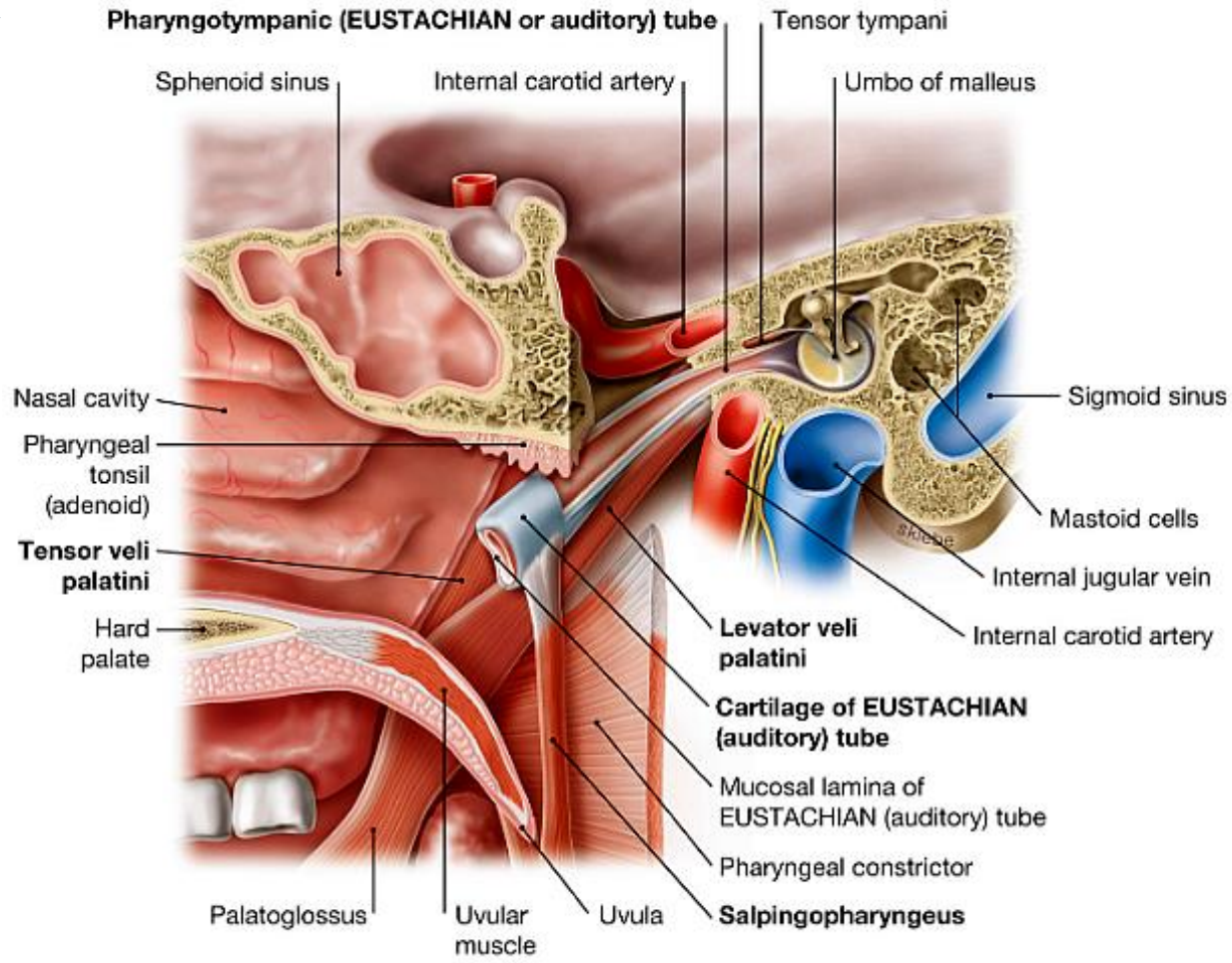


Fig.: Pharynx, pharyngotympanic tube