

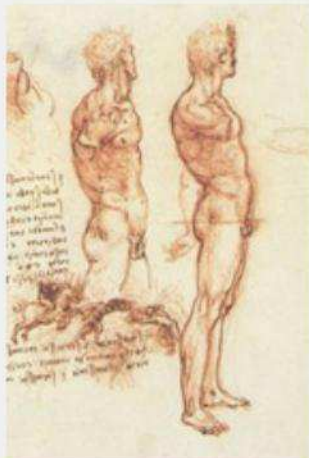
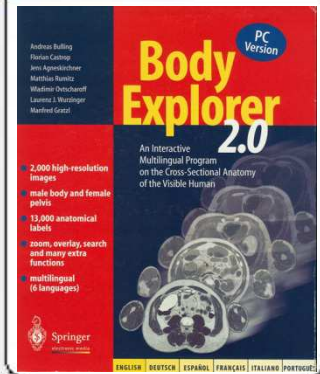
Topographical anatomy of the head

1. Basic concepts of topographical anatomy
2. Topographical anatomy of the head:
 - ✓ head regions
 - ✓ base of the skull – internal surface
 - ✓ facial regions – lateral aspect of the head
3. Anterior aspect of the head – major cavities:
 - ✓ orbital region
 - ✓ nasal region, paranasal sinuses
 - ✓ oral region



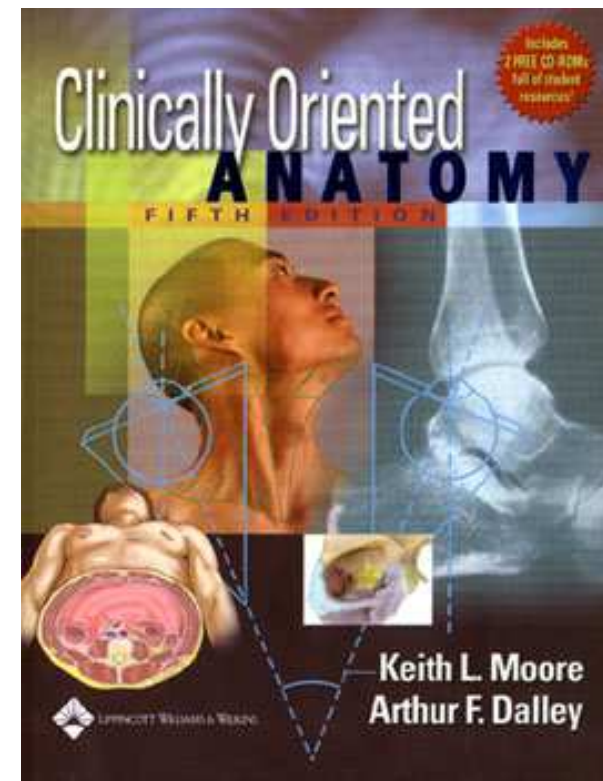
Aims and scope
Basic principles
and its relation to
clinical anatomy

Body Explorer



Topographical anatomy

- **Definition of topographical anatomy:**
 - ✓ the study of anatomy based on regions or divisions of the body and emphasizing the relations between various structures in that region
- **Related to:**
 - ✓ clinical practice
 - ✓ surgical diagnosis and treatment (operative surgery)
- **Major approach – regional dissection**
- **Synonyms:**
 - ✓ **Regional anatomy**
 - ✓ **Topology**



Cornea

Lens

Vitreous body

Optic nerve

Zygomatic bone (Frontal process)

Orbital fat body

Lateral rectus

Temporalis

Sphenoid bone (Greater wing)

Sphenoid bone (Lesser wing)

Squamous suture

Superficial temporal artery and vein

Temporal bone (Squamous part)

Temporal lobe

Squamous suture

Parietal bone

White matter

Cerebral cortex

Lambdoid suture

Occipital lobe

Angular vein

Nasal bone

Maxilla (Frontal Process)

Nasal cavity

Ethmoid bone (Perpendicular plate)

Medial rectus

Ethmoidal cells

Subthalamus

Parahippocampal gyrus

Third ventricle

Habenular commissure

Hippocampus

Lateral ventricle (Temporal (Inferior) horn)

Caudate nucleus (Tail)

Collateral trigone

Vermis of cerebellum

Longitudinal cerebral fissure

Cerebral falx

Superior sagittal sinus

Occipital bone (Squamous part)



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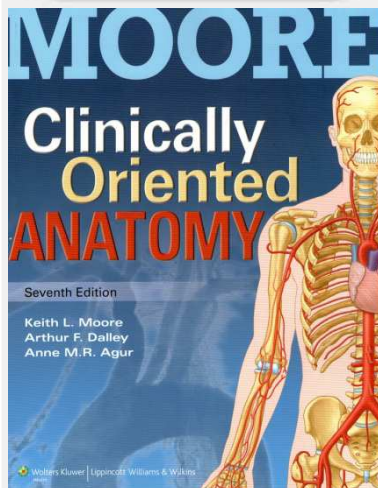
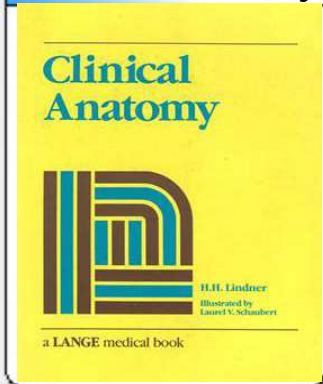
- Arteriae
- Cranium
- Meninges
- Musculi
- Ossa
- Systema cardiovasculare
- Systema digestorium
- Systema nervosum centrale
- Systema respiratorium
- Systema visuale
- Textus connectivus



Aims and scope

**Basic principles
and its relation to
clinical medicine**

Clinical Anatomy

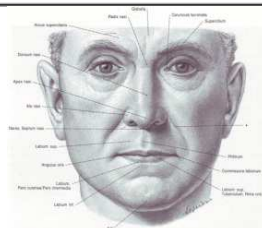
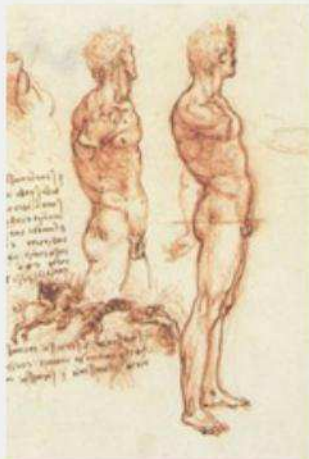
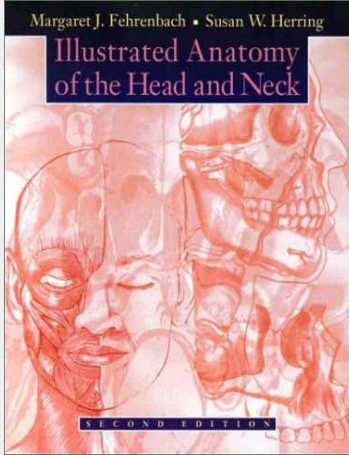


Topographical anatomy vs. Clinical anatomy

- **Definition:**
 - ✓ the practical application of anatomical knowledge to diagnosis and treatment
 - ✓ anatomy applied to patient care
- **The basis of clinical examination in:**
 - ✓ medicine
 - ✓ dental medicine
- **Teaching and learning approach:**
 - ✓ regional and systemic dissection
 - ✓ surgical and anatomy imaging techniques
- **Synonym – Applied anatomy**

head vs. face

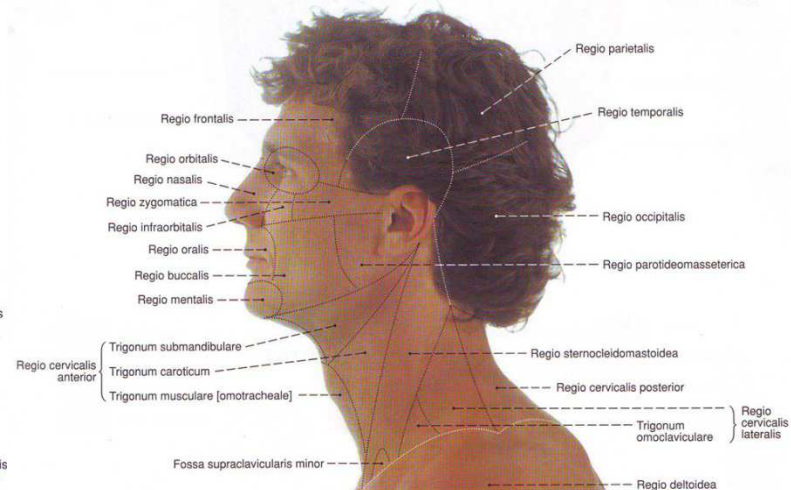
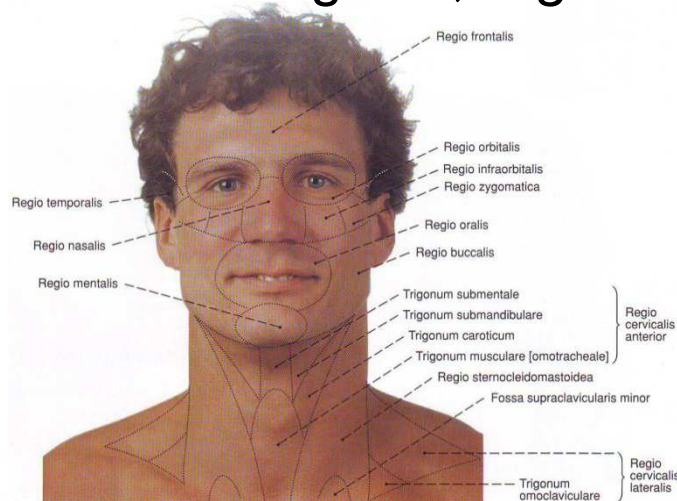
**head vs.
facial regions**



Head, *caput*

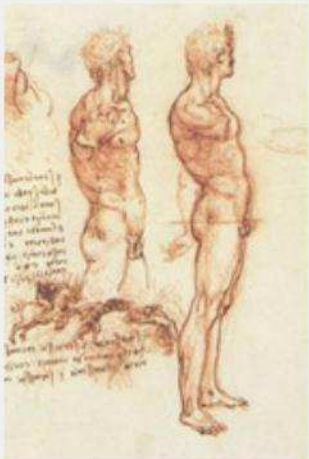
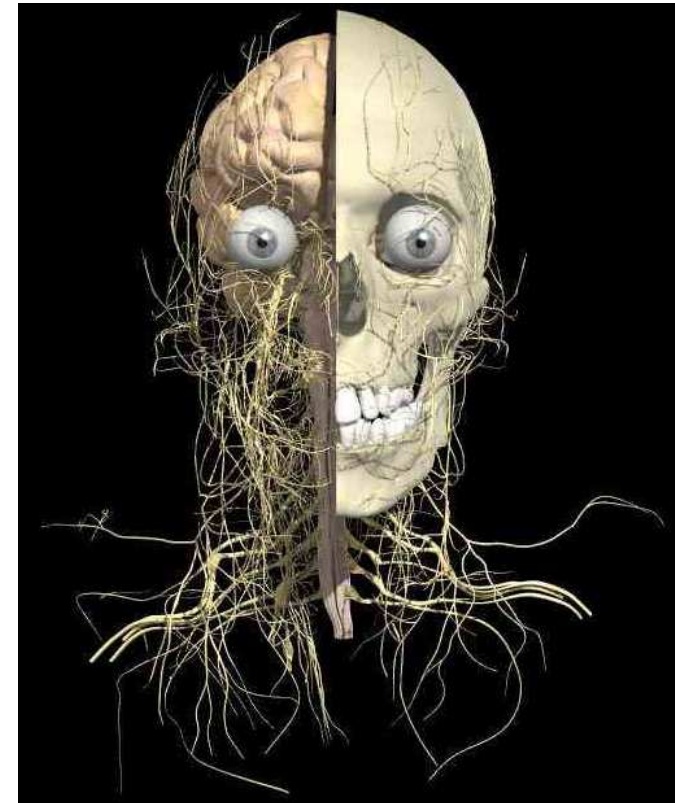


- inferior boundary:
 - ✓ *protuberantia mentalis mandibulae*
 - ✓ *basis mandibulae* to *proc. mastoideus*
 - ✓ *linea nuchalis (nuchae) superior*
 - ✓ *protuberantia occipitalis externa*
- head regions, *regiones capitis*
- facial regions, *regiones faciei* (anterior and lateral)



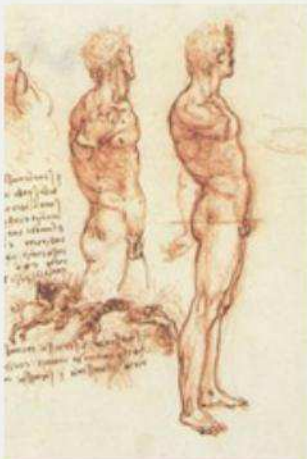
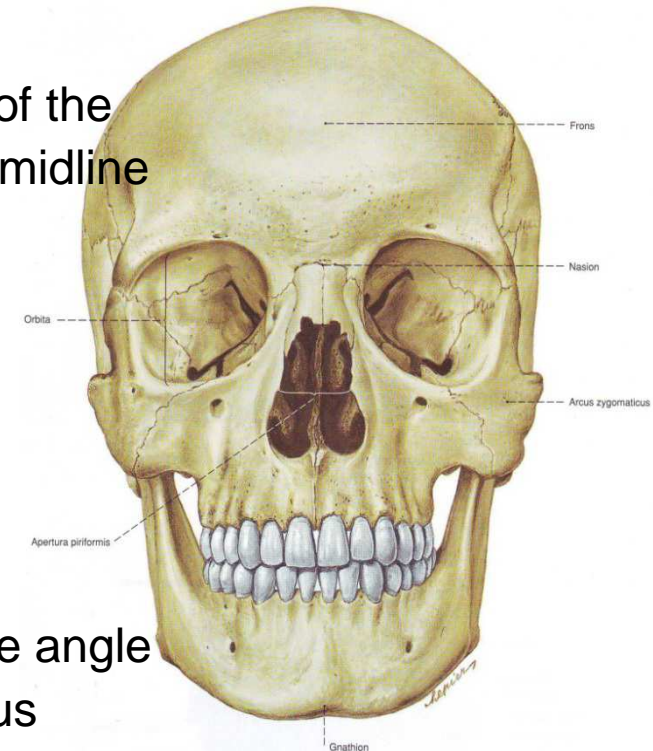
Head, *caput*

- Skull, *cranium*
- Brain, *encephalon*
- Meninges, *meninges*
- Sense organs, *organa sensuum (sensoria)*
- Cranial nerves, *nn. craniales*
- The first parts of:
 - ✓ digestive system – oral cavity, *cavitas oris*
 - ✓ respiratory system – nose, *nasus (ep. rhis, rhinos)*



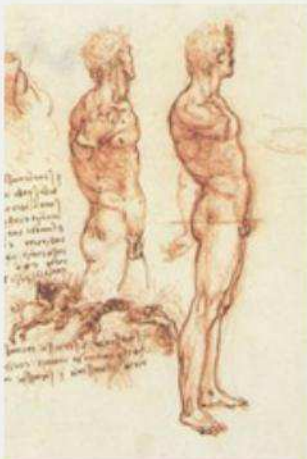
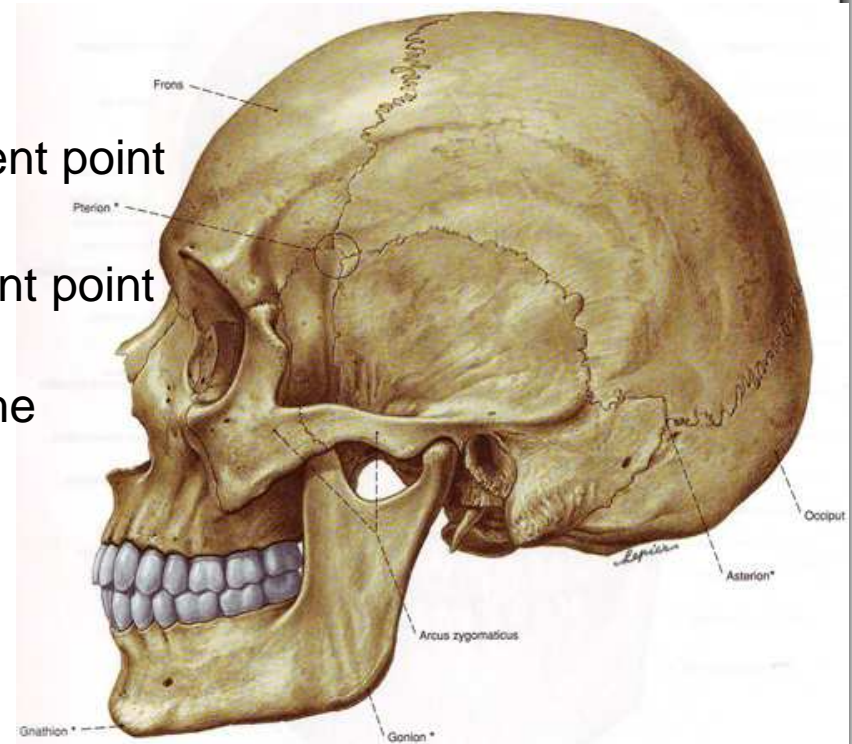
Anthropologic landmarks of the skull – anterior view:

- ✓ *Frons* – the most prominent point of the forehead in the midline
- ✓ *Nasion* – the midpoint of the sutures of the frontal and nasal bones or the point of intersection of the nasofrontal suture in the anterior-midline
- ✓ *Glabella* – the most prominent point of the forehead, which occurs in the anterior midline at the lower margin of the frontal bone
- ✓ *Gnathion* – the midpoint on the lower border of the mandible in the midsagittal plane
- ✓ *Progonion* – the most anterior point on the chin in the midline
- ✓ *Gonion* – the most lateral point on the angle made by the body and ascending ramus
- ✓ *Zygion* – the most lateral point on the zygomatic arch



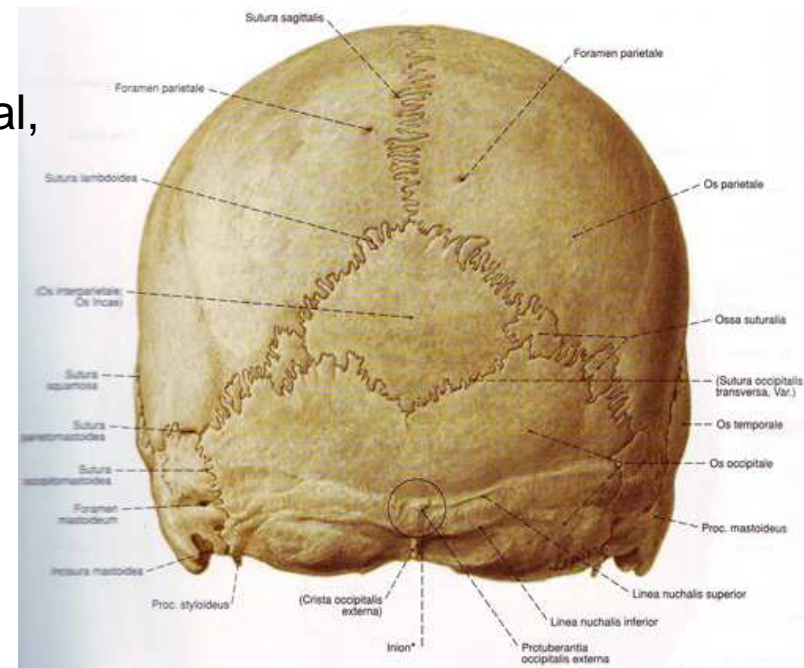
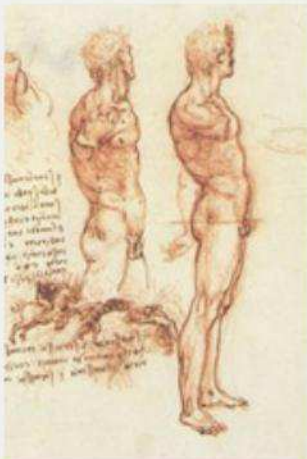
Anthropologic landmarks of the skull – lateral view

- ✓ **Vertex** – highest point on the convexity of the calvarium
- ✓ **Occiput** – the posterior (back) portion of the head or skull
- ✓ **Frons** – the most prominent point of the forehead in the midsagittal plane
- ✓ **Gnathion** – the midpoint of *basis mandibulae*
- ✓ **Gonion** – the most prominent point of *angulus mandibulae*
- ✓ **Zygion** – the most prominent point of *arcus zygomaticus*
- ✓ **Pterion** – the midpoint of the *sutura sphenoparietalis* = *fonticulus sphenoidalis*
- ✓ **Asterion** – the point where the temporal, parietal and occipital bones meet = *fonticulus mastoideus*



Anthropologic landmarks of the skull – posterior view

- ✓ **Lambda** – point of juncture of the left and right lambdoidal sutures and superior sagittal suture = *fonticulus posterior s. minor* (JNA)
- ✓ **Inion** – the most prominent point in the posterior aspect of the occipital calvarium = *protuberantia occipitalis externa*
- ✓ **Asterion** – the point where the temporal, parietal and occipital bones meet corresponding to the posterior end of the parietomastoid suture = *fonticulus posterolateralis (mastoideus)*



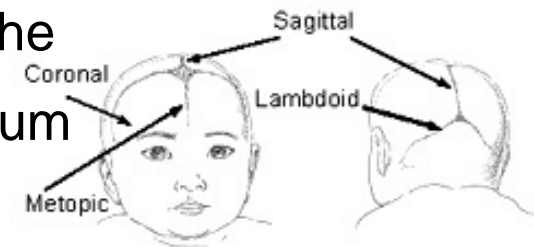
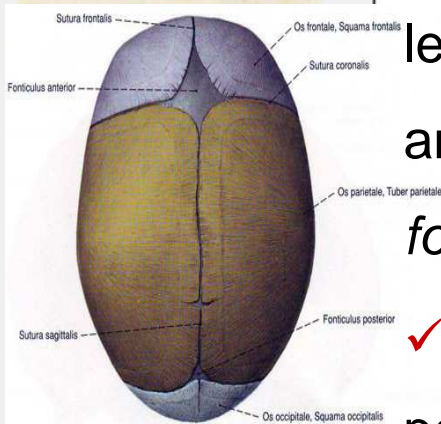
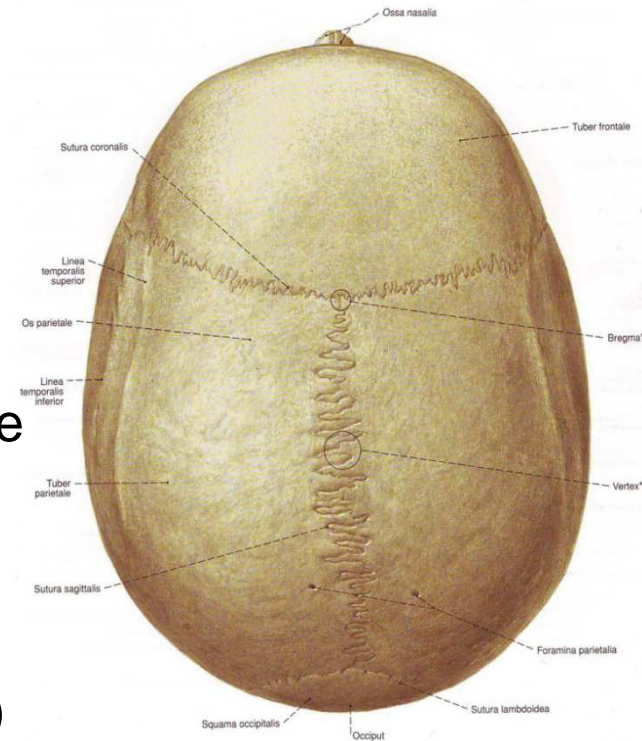
Anthropologic landmarks of the skull vault

✓ **Vertex** = highest point on the convexity of the calvarium

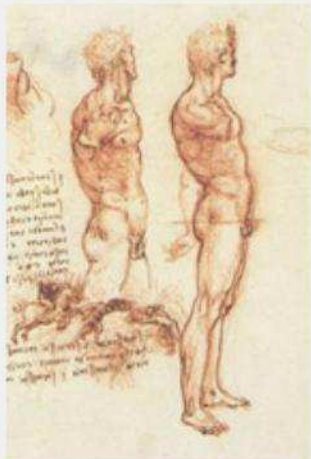
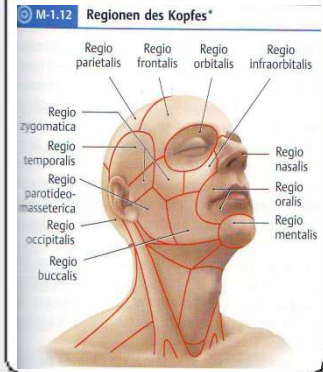
✓ **Bregma** = point of juncture of the left and right coronal sutures and the superior sagittal suture = *fonticulus anterior s. major* (JNA)

✓ **Lambda** = point of juncture of the left and right lambdoidal sutures and superior sagittal suture = *fonticulus posterior s. minor* (JNA)

✓ **Inion** = the most prominent point in the posterior aspect of the occipital calvarium = *protuberantia occipitalis externa*



Regiones capitii



Regions of the head

■ *Regiones capitii:*

✓ *regio frontoparietooccipitalis:*

- *regio frontalis*
- *regio parietalis*
- *regio occipitalis*

✓ *regio temporalis*

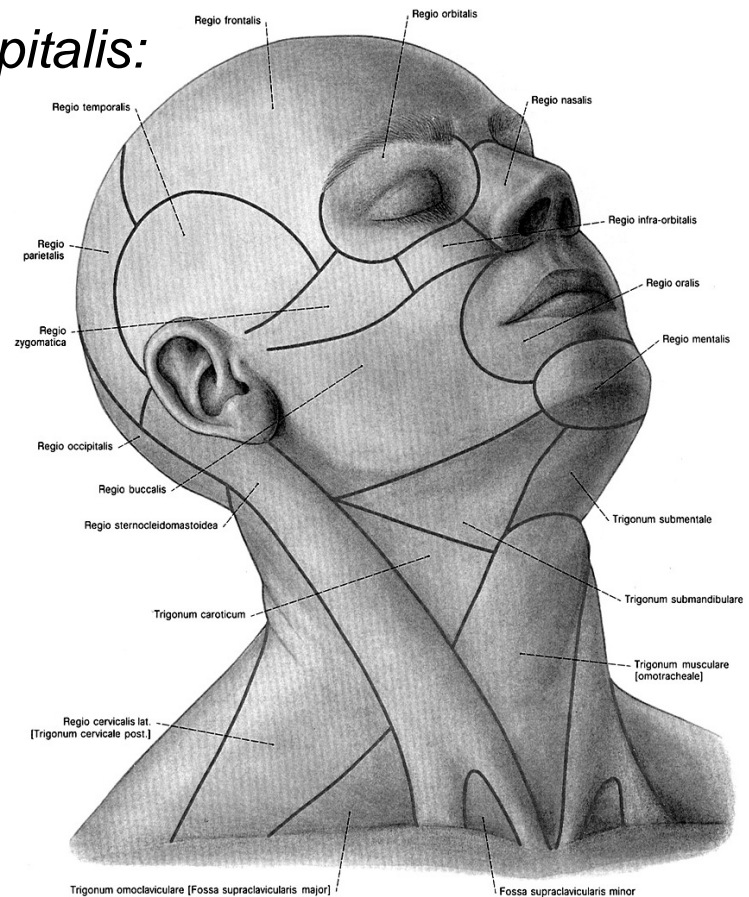
✓ *regio infratemporalis*

✓ *regio mastoidea*

✓ *regio auricularis*

✓ *basis cranii:*

- *basis cranii interna*



location

layers

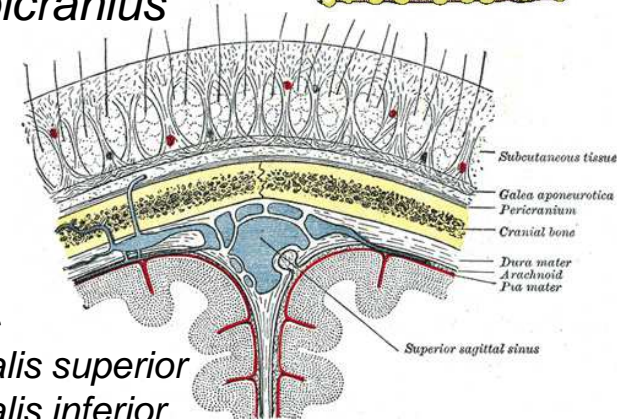
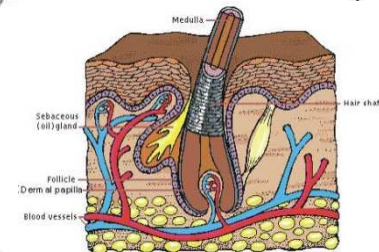
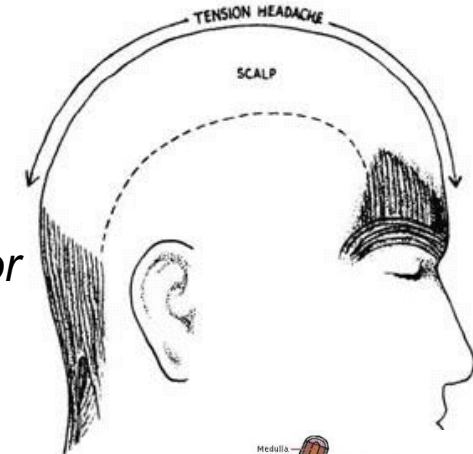
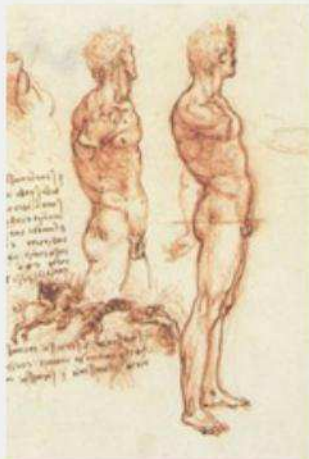
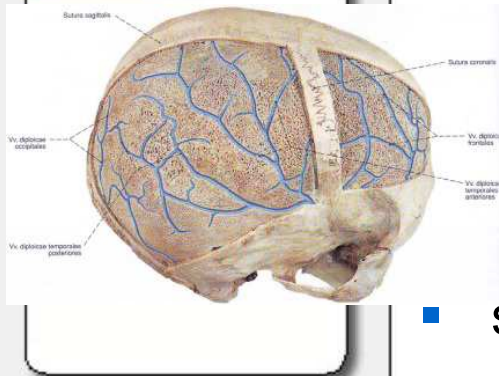
Frontal-parietal-occipital region

- boundaries:

- ✓ anterior – supraorbital margin
- ✓ lateral – *linea temporalis superior*
- ✓ posterior – along *linea nuchae superior* until *protuberantia occipitalis externa*

- surface anatomy – 5 layers:

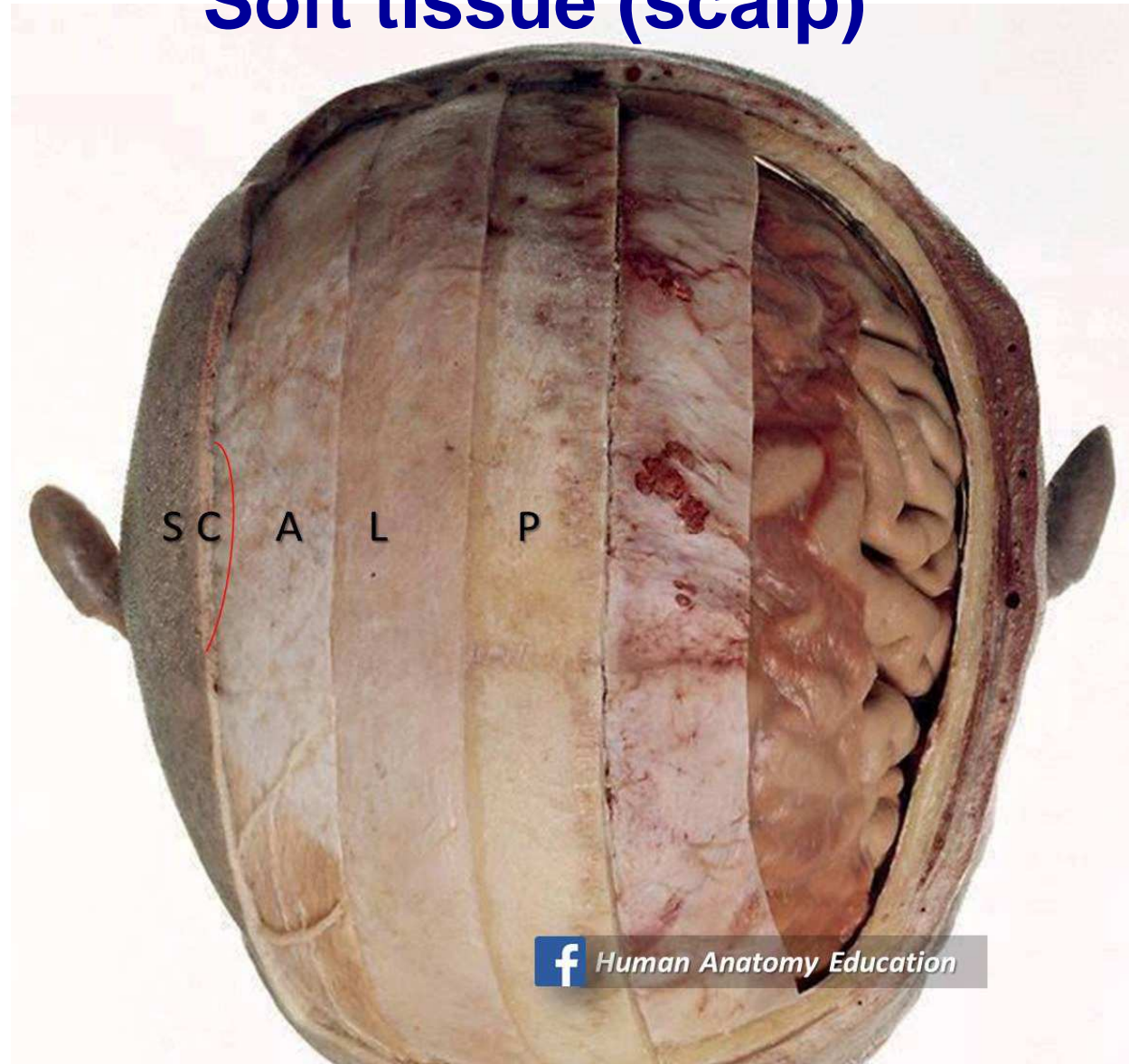
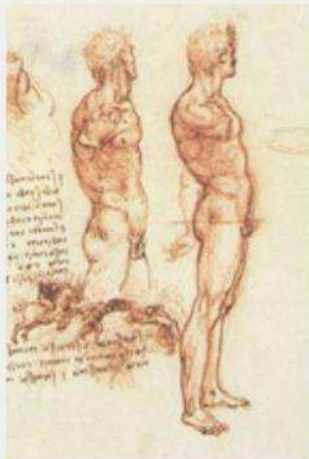
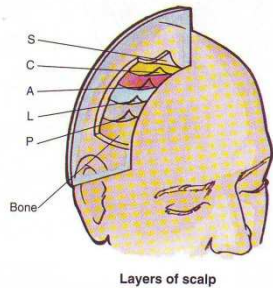
- ✓ skin – thick and hairy with numerous sebaceous glands (cysts)
- ✓ subcutaneous tissue – richly vascularized
- ✓ epicranial aponeurosis – *m. epicranius* and *galea aponeurotica*
- ✓ loose areolar tissue
- ✓ **periosteum (pericranium)**
- ✓ bones – *squama frontalis*, *os parietale*, *squama occipitalis*
- ✓ *dura mater encephali* *sinus sagittalis superior*
sinus sagittalis inferior




Soft tissue (scalp)

Soft tissues

(scalp)



 Human Anatomy Education

Clinical relevance

- skin:

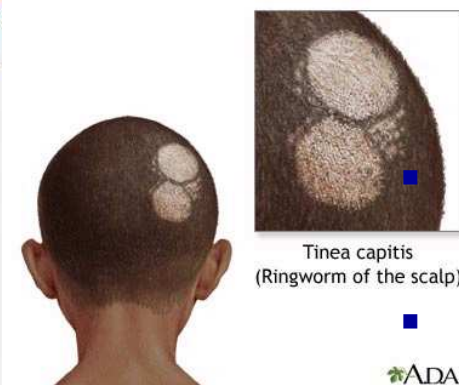
- ✓ sebaceous cyst (atheroma)
- ✓ alopecia (loss of hair from the head)
- ✓ trichophytia

- subcutaneous tissue:

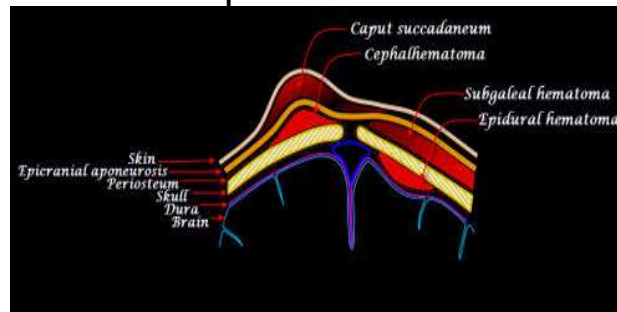
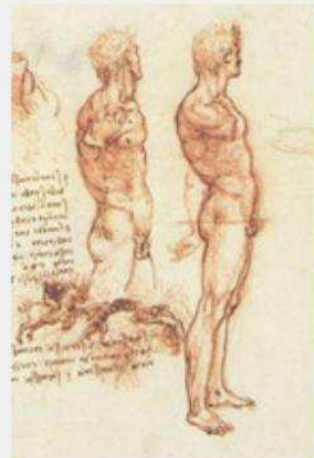
- ✓ scalp lacerations
- ✓ hemorrhages ⇒ sutures

- subaponeurotic space:

- ✓ subgaleal hemorrhage or subperiosteal hematoma

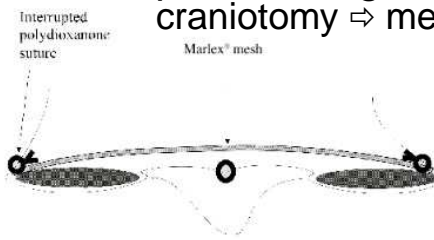


Tinea capitis
(Ringworm of the scalp)



- pericranium:

- ✓ poor osteogenic ability:
craniotomy ⇒ metal (titanium) plates



superficial nerves and vessels

✓ six bundles



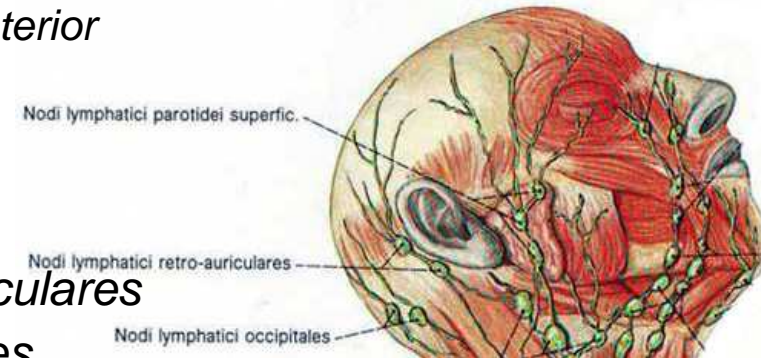
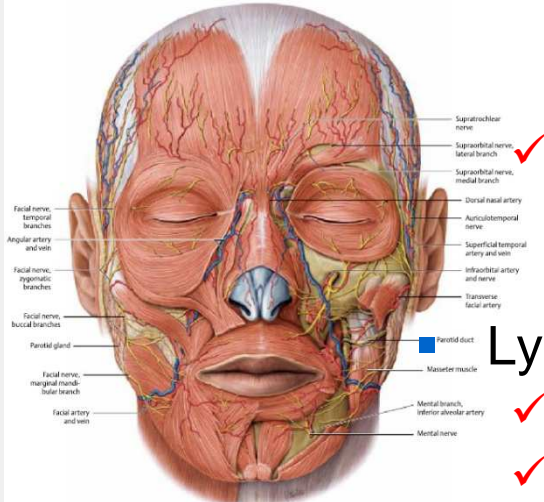
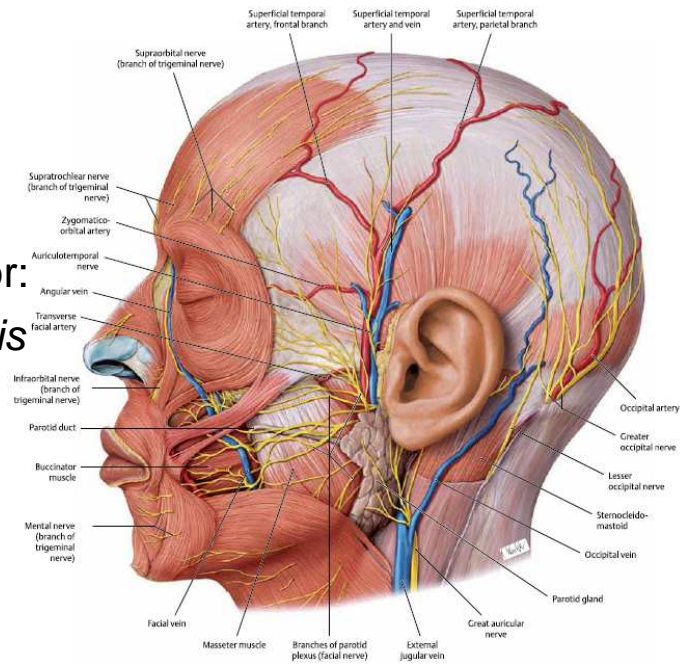
Frontal-parietal-occipital region

Neurovascular bundles:

- ✓ frontal – medial and lateral:
 - *a., v. et n. supratrochlearis*
 - *a., v. et n. supraorbitalis*
- ✓ temporal – anterior and posterior:
 - *a. et v. temporalis superficialis*
 - n. auriculotemporalis*
- ✓ occipital:
 - *a. et v. occipitalis*
 - n. occipitalis major*
- ✓ retroauricular:
 - *a. et vv. auricularis posterior*
 - n. occipitalis minor*

Lymphatic vessels:

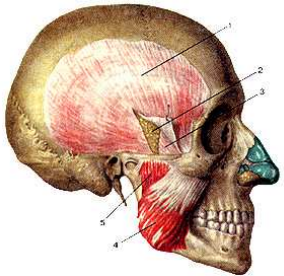
- ✓ *nodi lymphatici parotidei*
- ✓ *nodi lymphatici retroauriculares*
- ✓ *nodi lymphatici occipitales*



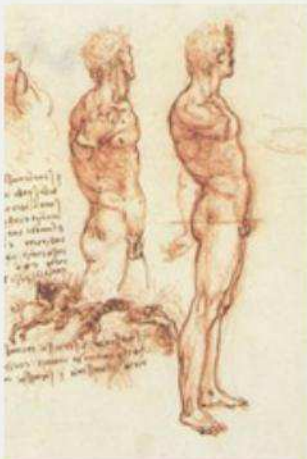
location

layers

Temporal fossa

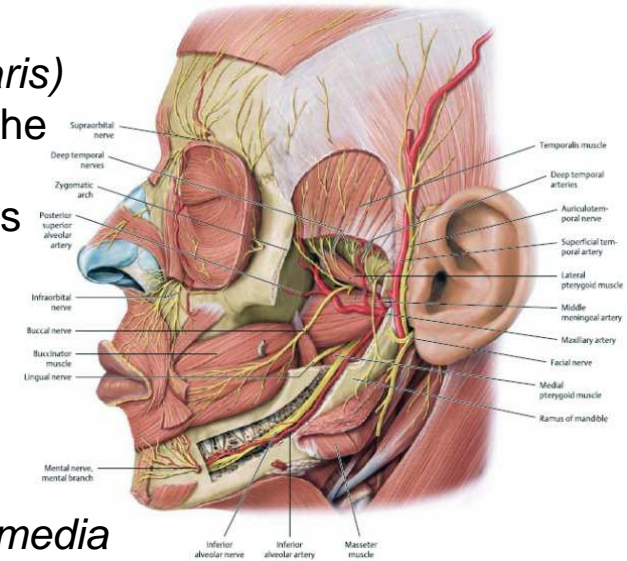
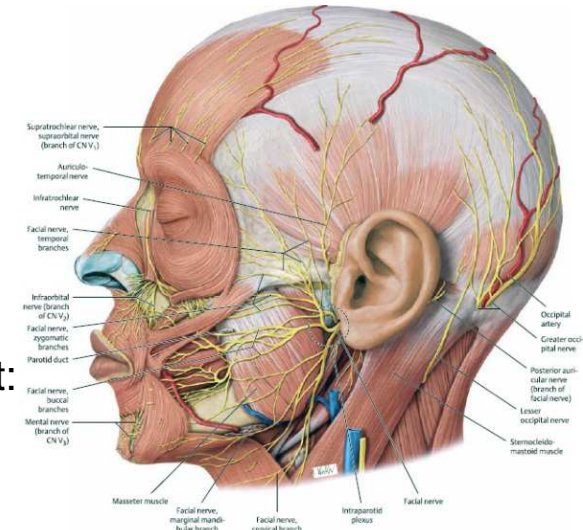


Temporal fascia



Temporal region

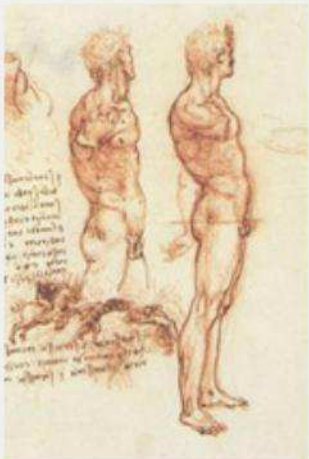
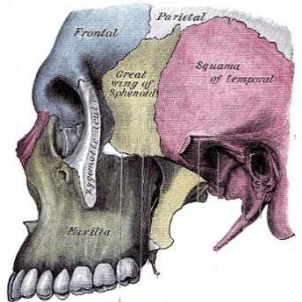
- boundaries (boundaries of *temporalis muscle*):
 - ✓ inferior boundary – zygomatic arch
 - ✓ anterior, superior and posterior – superior temporal line
- surface anatomy:
 - ✓ skin – thin and partly hairy
 - ✓ subcutaneous tissue – less prominent:
mm. auriculares anterior et superior
⇒ neurovascular complex –
a. et v. temporalis superficialis,
n. auriculotemporalis
n. zygomaticotemporalis (n. maxillaris)
 - ✓ superficial fascia – continuation of the epicranial aponeurosis
 - ✓ temporal fascia – two distinct sheets
⇒ interfascial temporal space – fat tissue
 - ✓ subaponeurotic fat tissue
 - ✓ temporalis muscle ⇒
aa., vv. et nn. temporales profundi
 - ✓ indistinct periosteum and bone –
squama temporalis ⇒ *a. meningea media*



location

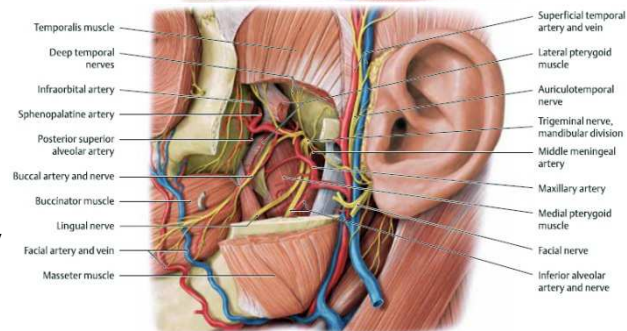
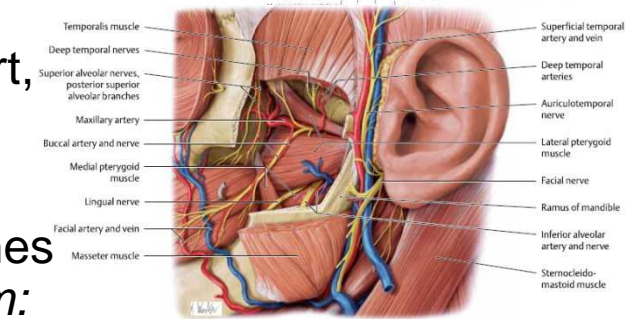
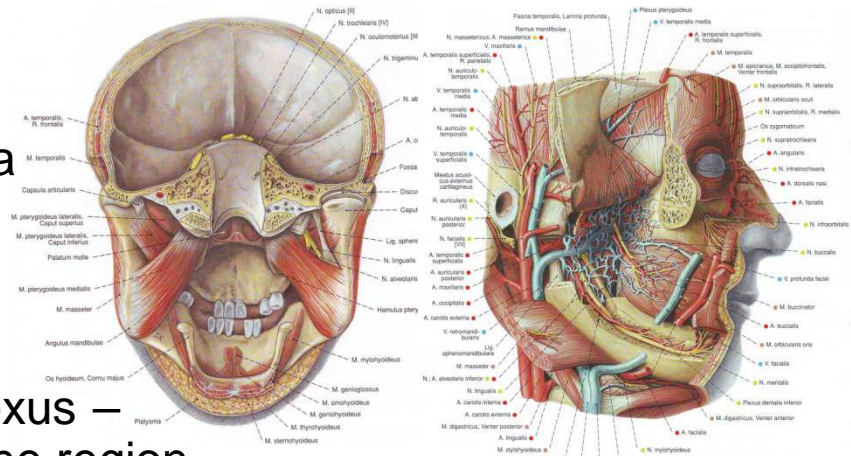
layers

Infratemporal fossa



Infratemporal (deep temporal) region

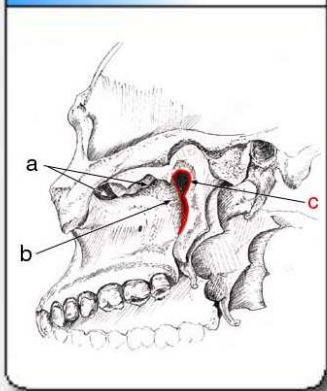
- location:
 - ✓ infratemporal fossa
 - ✓ pterygopalatine fossa
- content:
 - ✓ pterygoid muscles, medial and lateral
 - ✓ pterygoid venous plexus – in the upper part of the region
 - ✓ maxillary artery – mandibular part, pterygoid part and pterygopalatine part
 - ✓ mandibular nerve and its branches in *interstitium interpterygoideum*:
 - otic ganglion ⇒ parotid gland
 - motor branches ⇒ masticatory muscles
 - sensory branches – longer
 - ✓ part of the buccal adipose body (Bichat's fat pad)



content

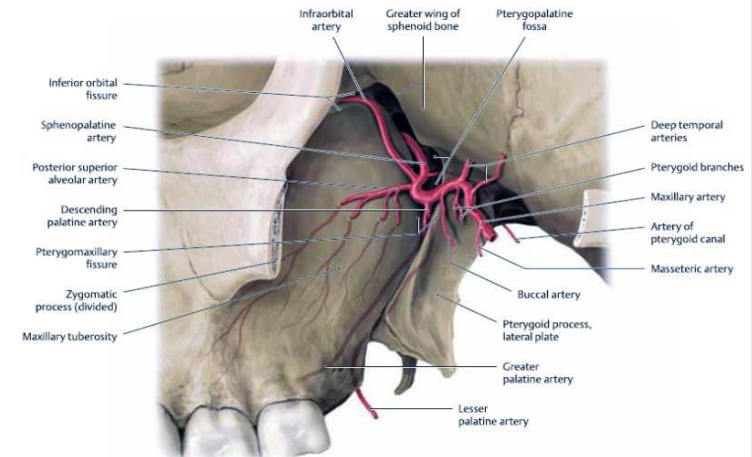
passageways

Pterygopalatine fossa

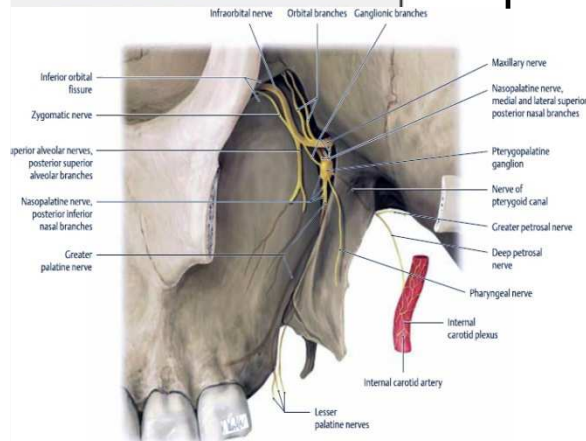


Pterygopalatine fossa

- content:
 - ✓ the third pterygopalatine part of maxillary artery ⇒ infraorbital artery
 - ✓ venous vessels – part of the pterygoid venous plexus
 - ✓ maxillary nerve, pterygopalatine ganglion



- passageways – openings and channels:

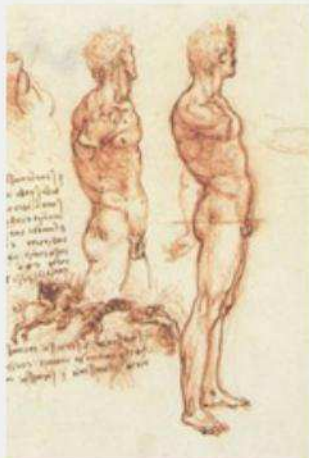
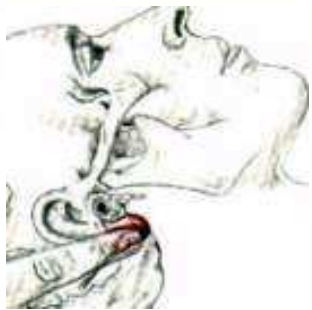


| Passageway | Comes from... | Transmitted structures |
|--------------------------|-------------------------------------|---|
| Foramen rotundum | Middle cranial fossa | <ul style="list-style-type: none"> • Maxillary nerve (CN V₂) |
| Pterygoid canal | Base of the skull (inferior aspect) | <ul style="list-style-type: none"> • Nerve of pterygoid canal (greater and deep petrosal nerves) • Artery of pterygoid canal with accompanying veins |
| Greater palatine canal | Palate | <ul style="list-style-type: none"> • Greater palatine nerve • Descending palatine artery • Greater palatine artery |
| Lesser palatine canals | Palate | <ul style="list-style-type: none"> • Lesser palatine nerves • Lesser palatine arteries (terminal branches of descending palatine artery) |
| Sphenopalatine foramen | Nasal cavity | <ul style="list-style-type: none"> • Sphenopalatine artery (and accompanying veins) • Medial and lateral superior and inferior posterior nasal branches (from nasopalatine nerve, CN V₂) |
| Inferior orbital fissure | Orbit | <ul style="list-style-type: none"> • Infraorbital nerve • Zygomatic nerve • Orbital branches (from CN V₂) • Infraorbital artery (and accompanying veins) • Inferior ophthalmic vein |

location

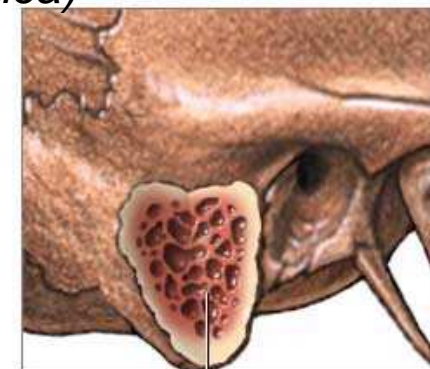
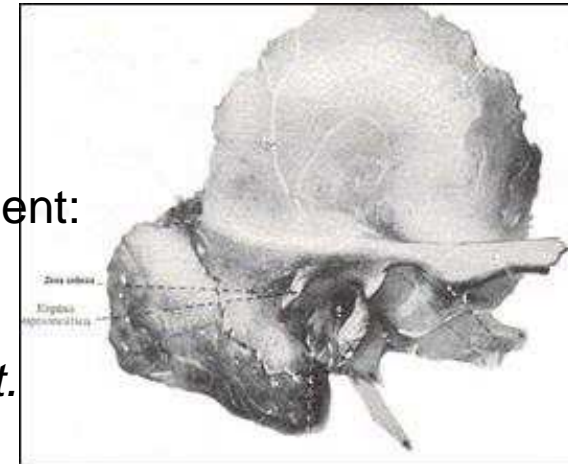
layers

Regio mastoidea

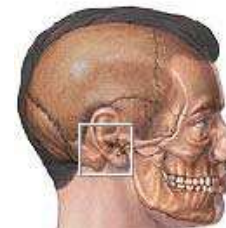


Mastoid region

- boundaries (correspond to the contour of the mastoid process):
 - ✓ a triangle with a base upwards
- surface anatomy:
 - ✓ skin – thinner and firm fixed
 - ✓ subcutaneous tissue – less prominent:
 - ⇒ *m. auricularis posterior*
 - ⇒ *a. et vv. auriculares posteriores*
 - ⇒ *nodi lymphatici auriculares postt.*
 - ✓ fascia – thinner end portion of epicranial aponeurosis (*galea aponeurotica*)
 - ✓ periosteum – firm fixed
 - ✓ trepanation triangle (triangle of *Chipault*)
 - ⇒ sigmoid sinus; facial canal
 - ✓ bone – mastoid process (mastoid air cells and mastoid antrum)
 - ⇒ *mastoiditis*



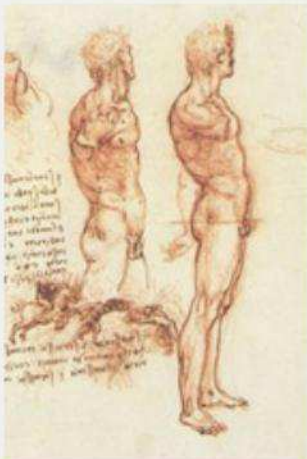
Infection of mastoid air cells (mastoiditis)



location

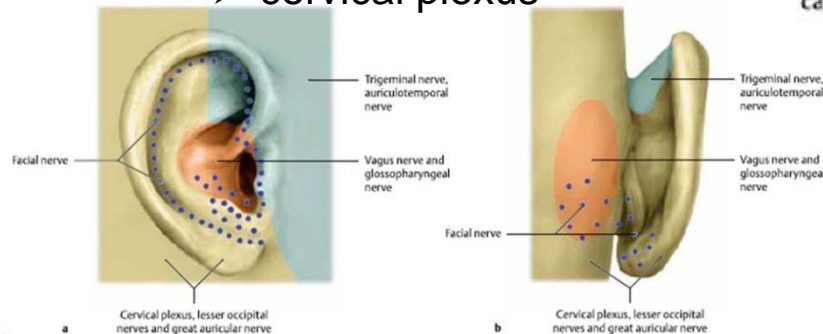
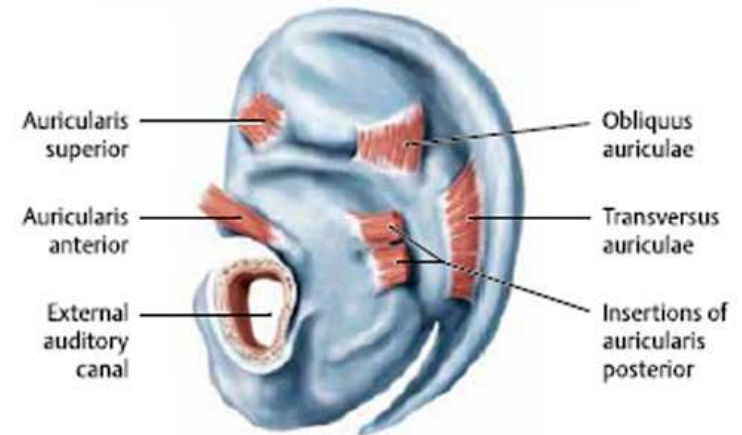
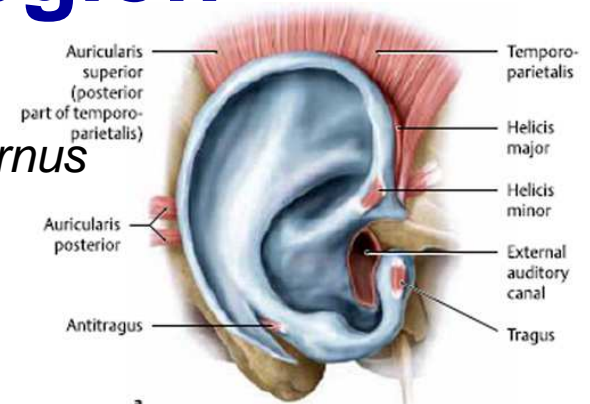
layers

Regio auricularis



Auricular region

- area of:
 - ✓ pinna or auricle, *auricula*
 - ✓ ear canal, *meatus acusticus externus*
- surface anatomy – auricle:
 - ✓ thin skin with fine hairs
 - ✓ perichondrium
 - ✓ elastic fibrocartilage
 - ✓ rudimentary muscles
 - ✓ sensory innervation:
 - trigeminal nerve
 - facial nerve
 - glossopharyngeal and
 - vagus nerves
 - cervical plexus



location

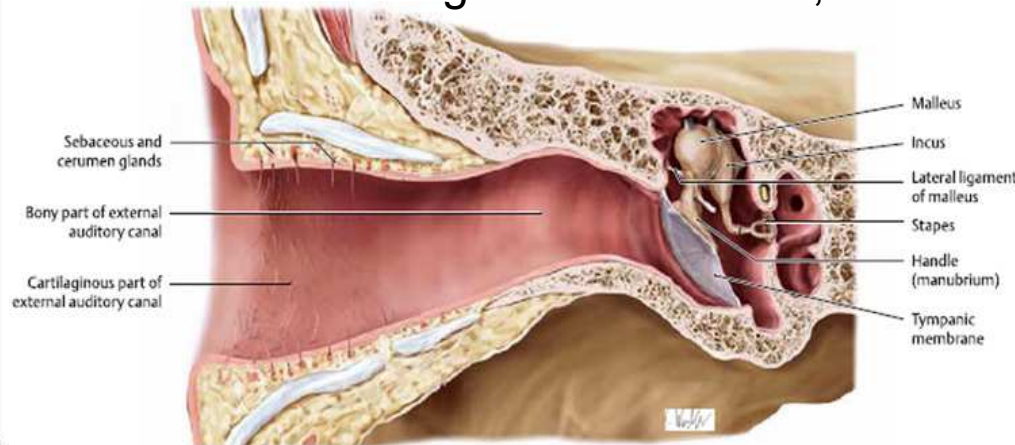
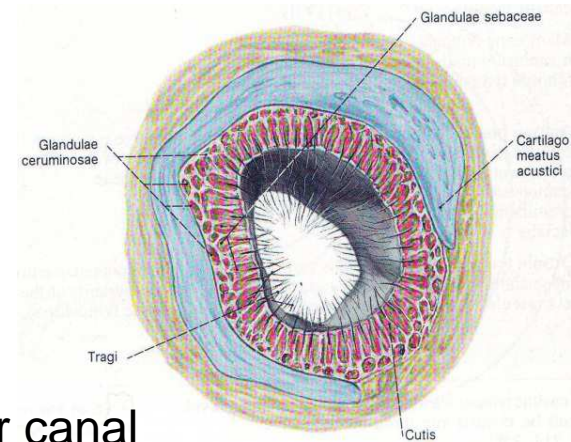
layers

Regio auricularis



Auricular region

- surface anatomy – ear canal:
 - ✓ cartilaginous part
 - outer $\frac{1}{3}$ (~8 mm long), *cartilago meatus acustici*
 - ✓ osseous part
 - inner $\frac{2}{3}$ (~16 mm long), *meatus acusticus externus*
 - ✓ thin skin
 - ✓ the thicker cerumen-producing ear canal skin has fine hairs, *tragi*
 - ✓ sebaceous glands \Rightarrow in the hair follicles
 - ✓ ceruminous glands \Rightarrow ear wax, *cerumen*



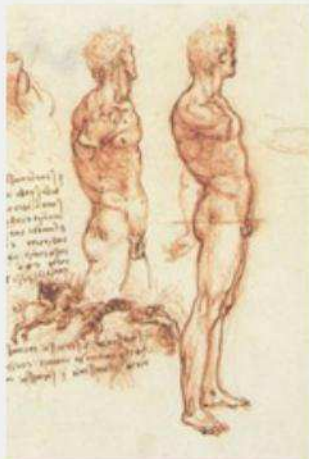
Rudolf Ulrich Krönlein

(1847-1910)

RUDOLF ULRICH KRÖNLEIN



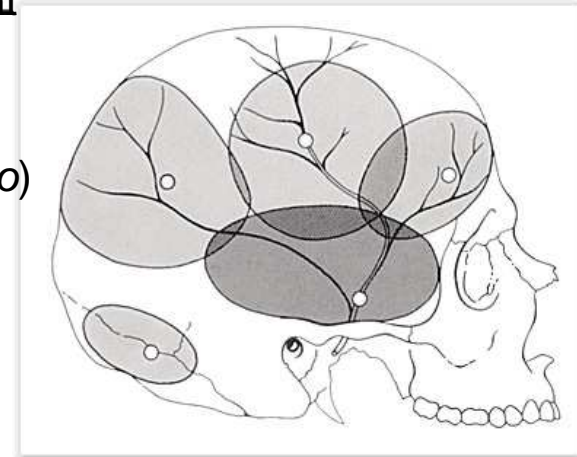
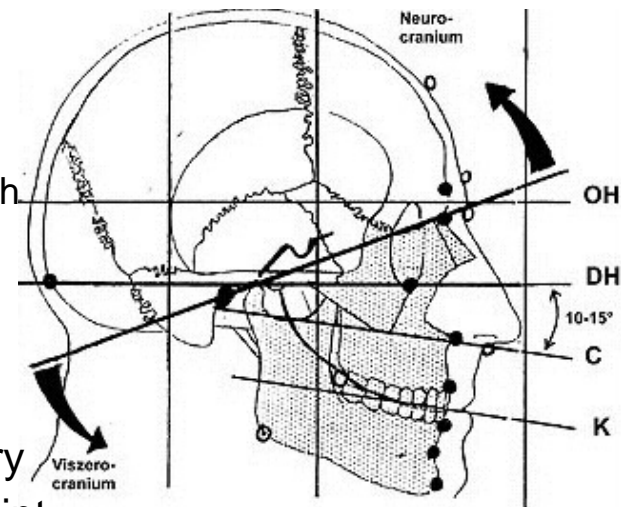
© Krönlein



Linear scheme of craniocerebral topography

■ craniocerebral topography after *Krönlein*:

- ✓ two horizontal lines:
 - upper line (OH) – posterior branch of middle meningeal artery
 - lower line (DH)
- ✓ three vertical lines:
 - anterior – zygomatic arch ⇨ trunk of middle meningeal artery
 - middle – temporomandibular joint
 - posterior – mastoid process
- ✓ upper diagonal of the scheme:
 - central sulcus (fissure of *Rolando*)
 - precentral gyrus
 - anterior branch of middle meningeal artery
- ✓ lower diagonal of the scheme:
 - lateral sulcus (Sylvian fissure)

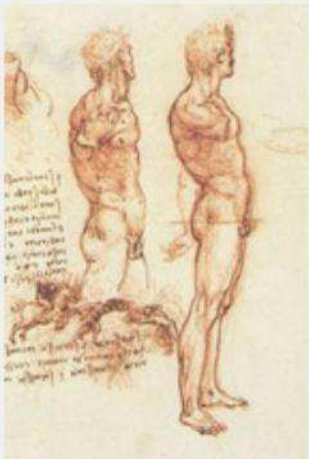
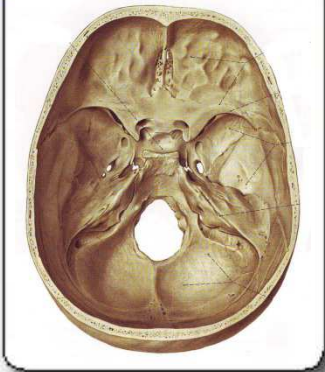


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Basis cranii

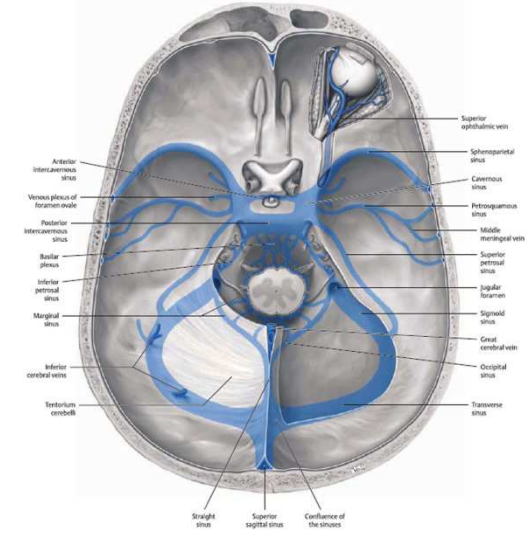
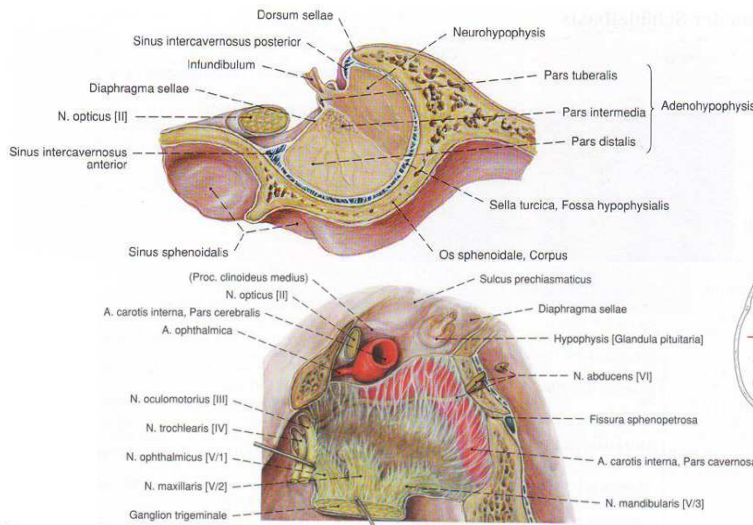
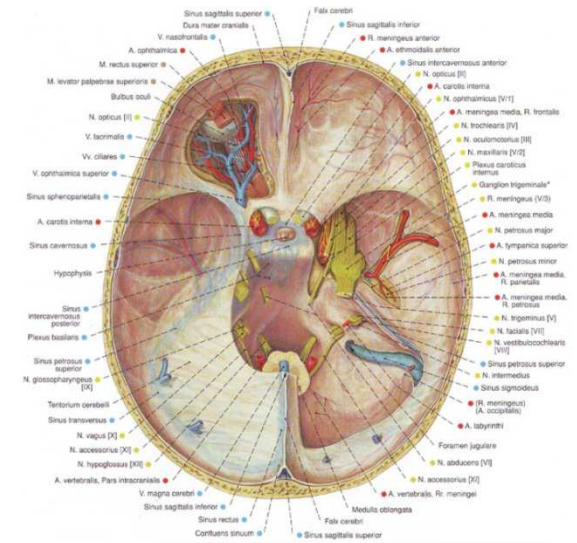
Basis cranii externa
Basis cranii interna

Basis cranii interna



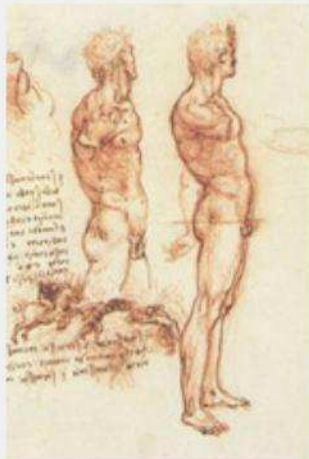
Base of skull, *basis cranii*

- *basis cranii interna*
- *basis cranii externa*:
 - ✓ rostral – facial region
 - ✓ caudal – neck region
- *dura mater encephali*:
 - ✓ *diaphragma sellae*
 - ✓ *cavum trigeminale (Meckel)*



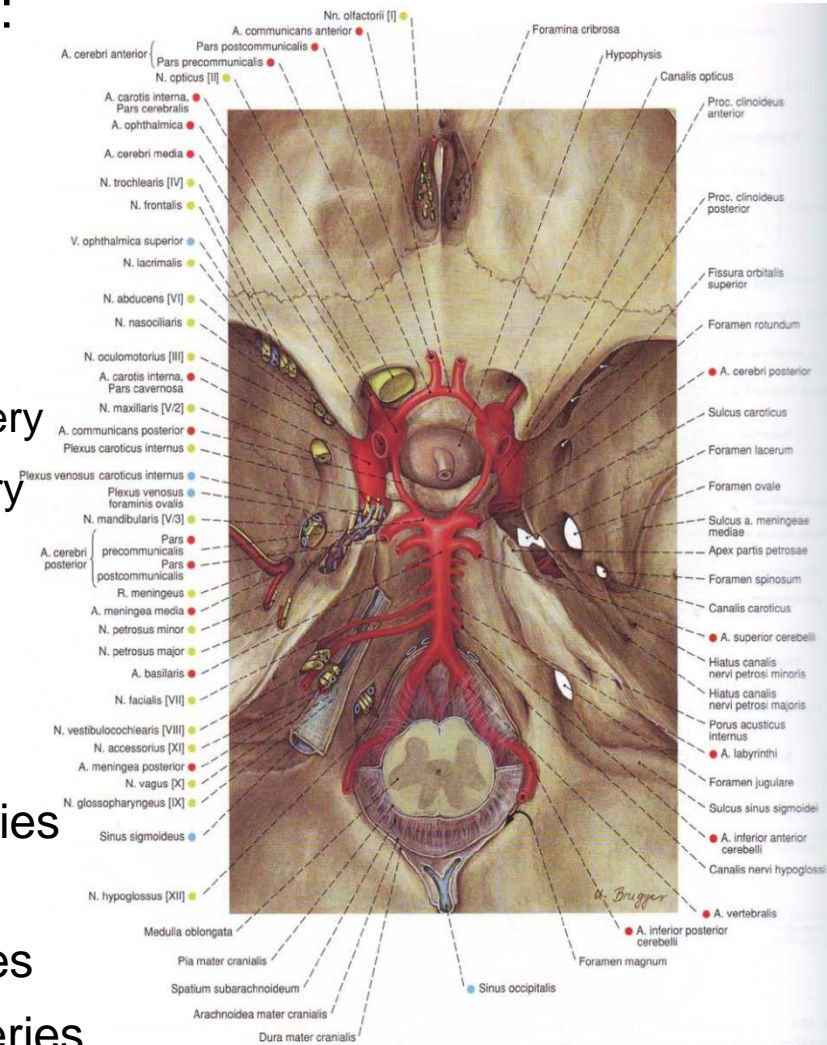
✓ *sinus durae matris*

Thomas Willis
(1621-1675)



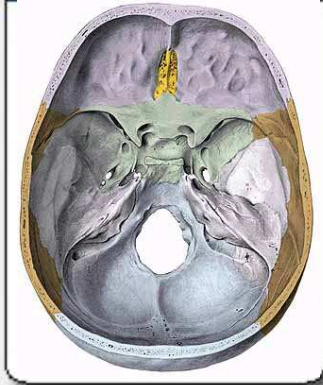
Circulus arteriosus cerebri (Willis)

- **Vertebrobasilar system:**
 - ✓ vertebral arteries ⇔ basilar artery
- **Carotid system:**
 - ✓ internal carotid artery (cerebral part):
 - anterior cerebral artery
 - middle cerebral artery
- **Circle of Willis: (heptagon of Willis)**
 - ✓ anterior communicating artery
 - ✓ anterior cerebral arteries
 - ✓ posterior communicating arteries
 - ✓ posterior cerebral arteries



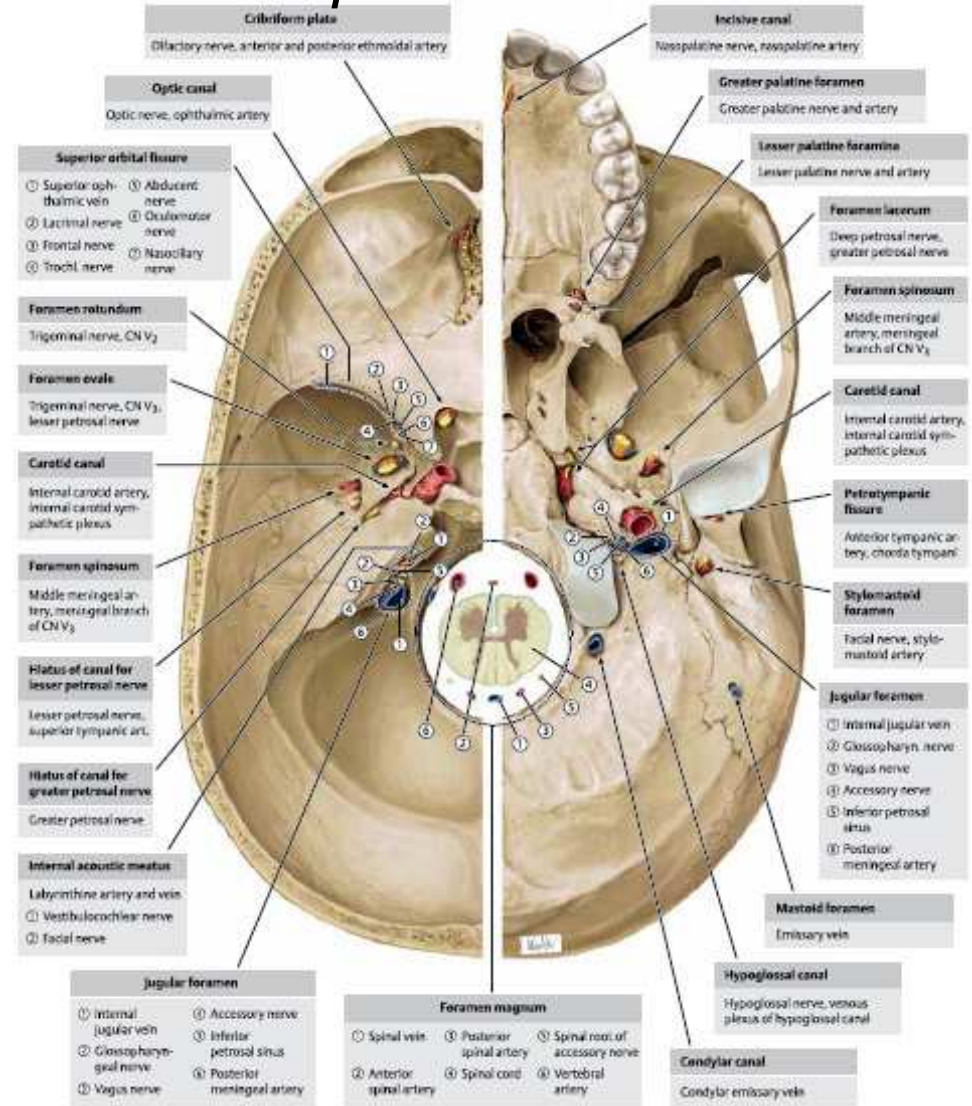
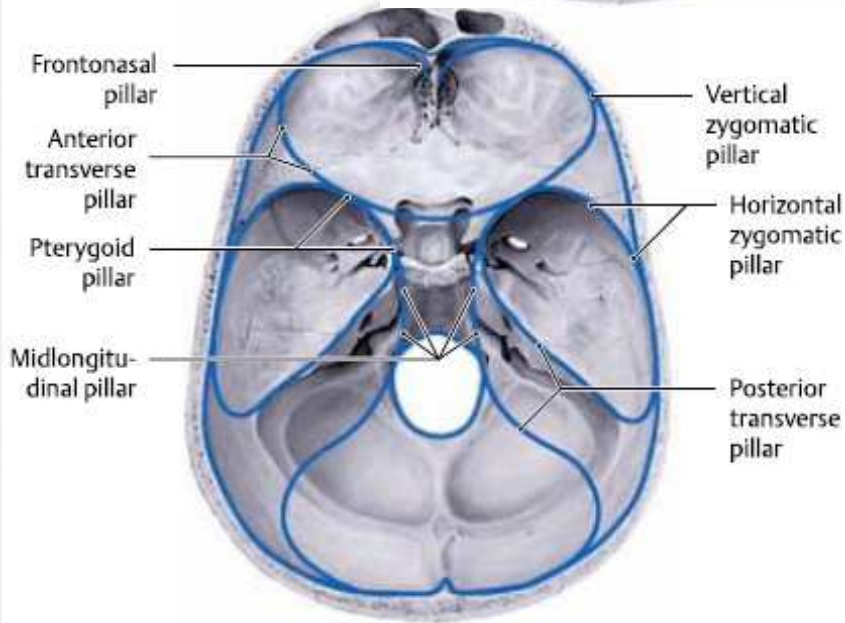
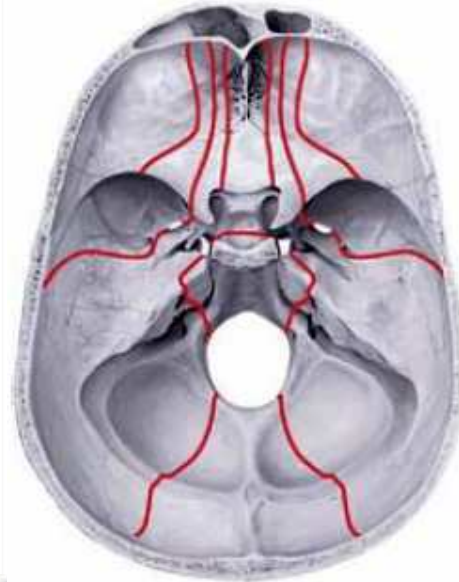
Basis cranii interna

Fossae cranii



Cranial fossae

- anterior cranial fossa
- middle cranial fossa
- posterior cranial fossa



Anterior cranial fossa

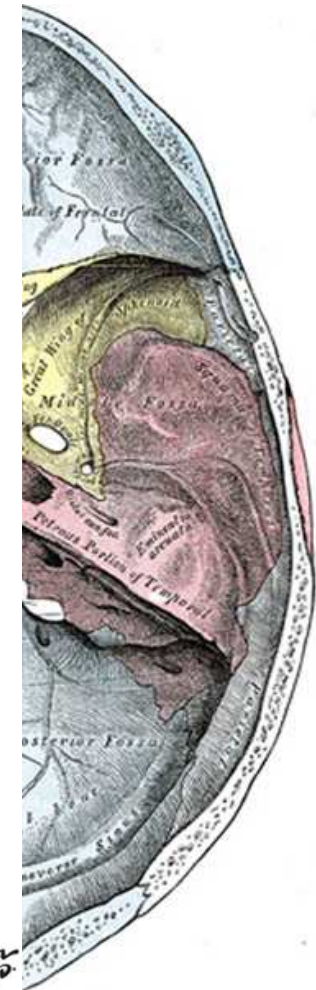
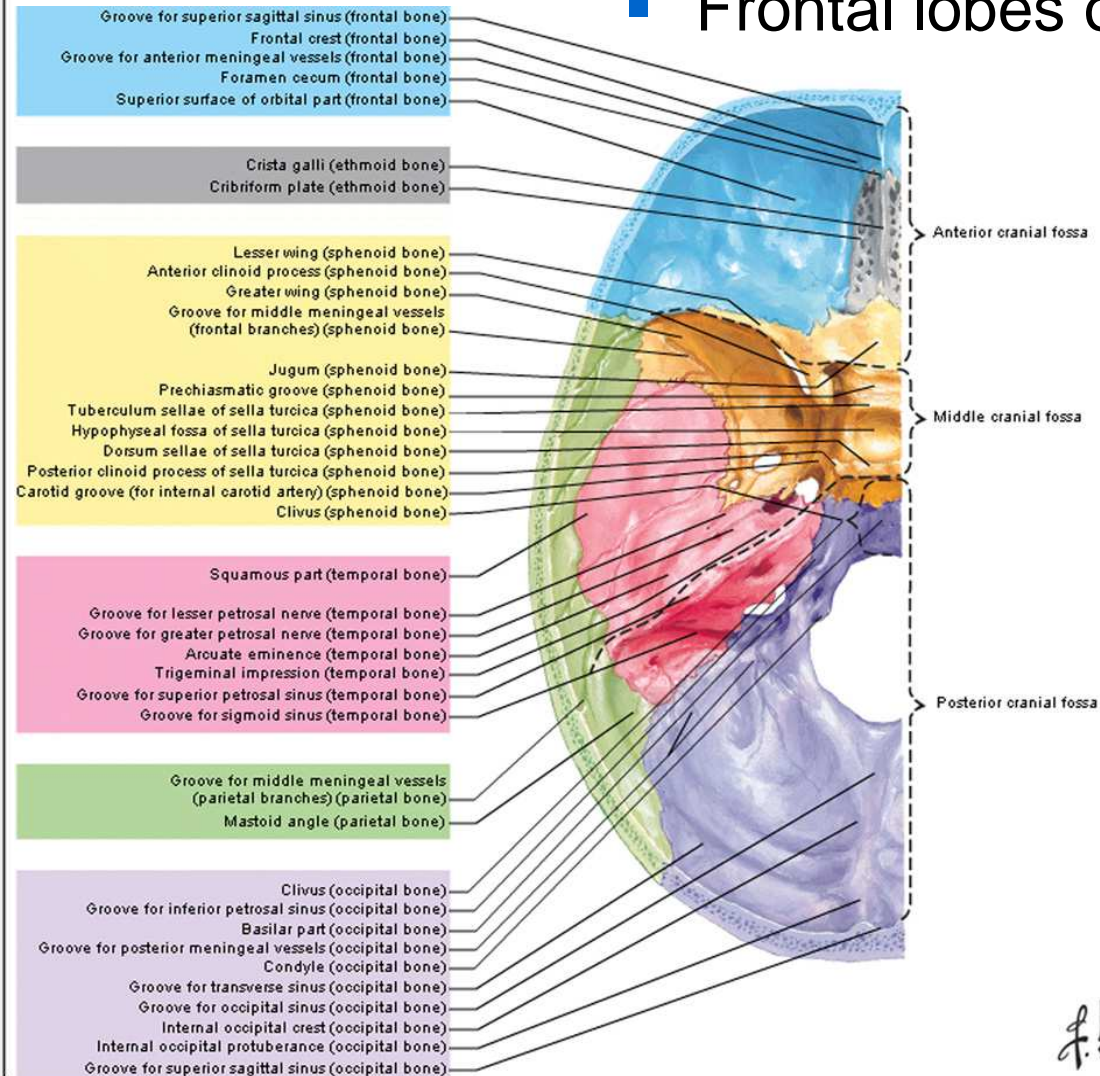
- Frontal lobes of the brain

Fossa cranii anterior

- ✓ Pars orbitalis ossis frontalis
- ✓ Lamina cribrosa ossis ethmoidalis
- ✓ Ala minor ossis sphenoidalis



Brillenhaematom



F. Netter M.D. © IGB

Anterior cranial fossa

Fossa cranii anterior

✓ **Pars orbitalis ossis frontalis**

✓ **Lamina cribrosa ossis ethmoidalis**

✓ **Ala minor ossis sphenoidalis**



Brillenhaematom

Groove for superior sagittal sinus (frontal bone)
Frontal crest (frontal bone)
Groove for anterior meningeal vessels (frontal bone)
Foramen cecum (frontal bone)
Superior surface of orbital part (frontal bone)

Crista galli (ethmoid bone)
Cribriform plate (ethmoid bone)

Lesser wing (sphenoid bone)
Anterior clinoid process (sphenoid bone)
Greater wing (sphenoid bone)
Groove for middle meningeal vessels (frontal branches) (sphenoid bone)

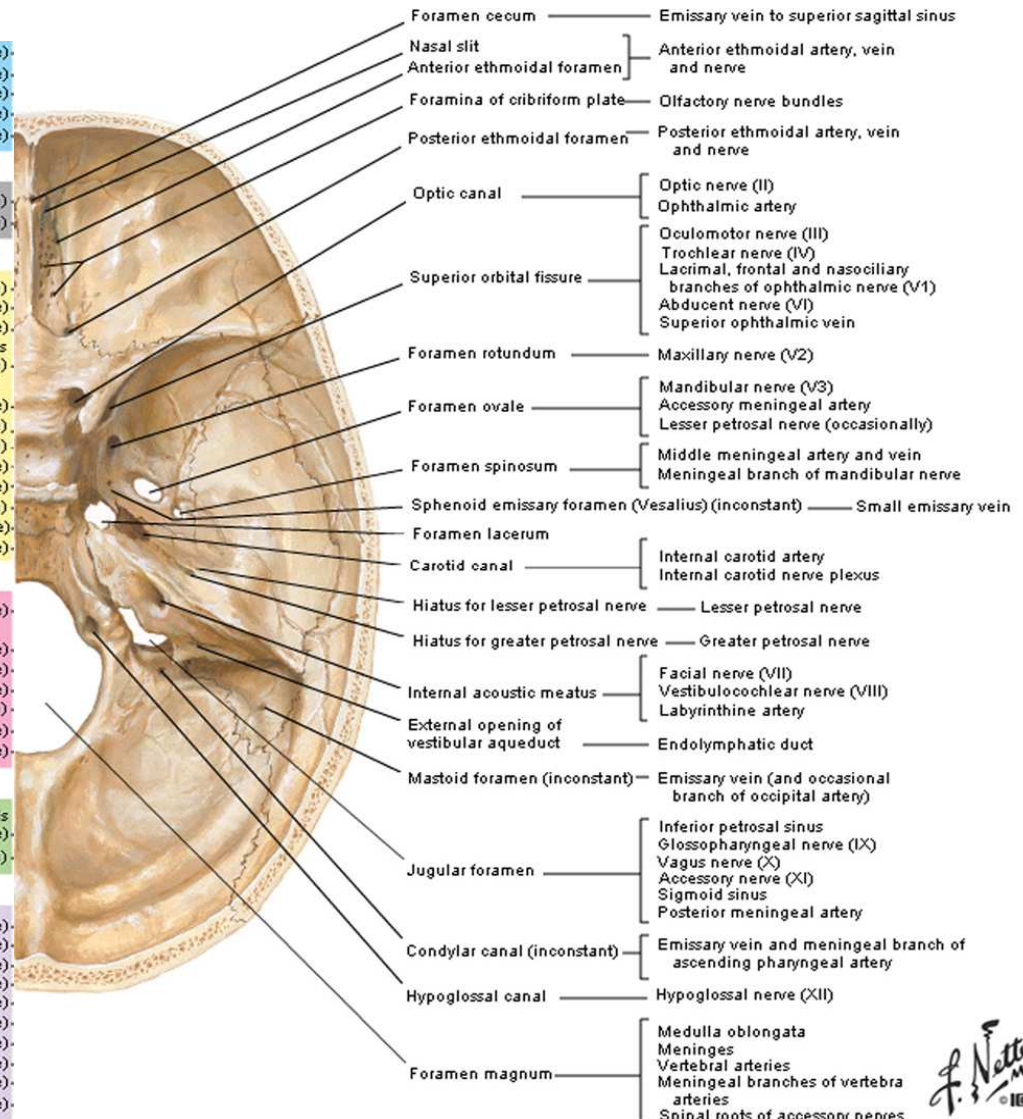
Jugum (sphenoid bone)
Prechiasmatic groove (sphenoid bone)
Tuberculum sellae of sella turcica (sphenoid bone)
Hypophyseal fossa of sella turcica (sphenoid bone)
Dorsum sellae of sella turcica (sphenoid bone)
Posterior clinoid process of sella turcica (sphenoid bone)
Carotid groove (for internal carotid artery) (sphenoid bone)
Clivus (sphenoid bone)

Squamous part (temporal bone)

Groove for lesser petrosal nerve (temporal bone)
Groove for greater petrosal nerve (temporal bone)
Arcuate eminence (temporal bone)
Trigeminal impression (temporal bone)
Groove for superior petrosal sinus (temporal bone)
Groove for sigmoid sinus (temporal bone)

Groove for middle meningeal vessels (parietal branches) (parietal bone)
Mastoid angle (parietal bone)

Clivus (occipital bone)
Groove for inferior petrosal sinus (occipital bone)
Basilar part (occipital bone)
Groove for posterior meningeal vessels (occipital bone)
Condyle (occipital bone)
Groove for transverse sinus (occipital bone)
Groove for occipital sinus (occipital bone)
Internal occipital crest (occipital bone)
Internal occipital protuberance (occipital bone)
Groove for superior sagittal sinus (occipital bone)



Middle cranial fossa

Temporal lobes of the brain

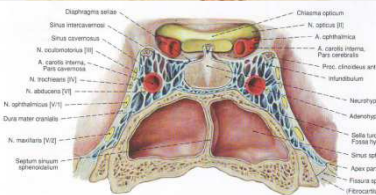
Fossa cranii media

✓ **Sella turcica**

✓ **Ala major ossis sphenoidalis**

✓ **Pars petrosa (pyramis) ossis temporalis**

✓ **Squama temporalis**



Groove for superior sagittal sinus (frontal bone)
Frontal crest (frontal bone)
Groove for anterior meningeal vessels (frontal bone)
Foramen cecum (frontal bone)
Superior surface of orbital part (frontal bone)

Crista galli (ethmoid bone)
Cribriform plate (ethmoid bone)

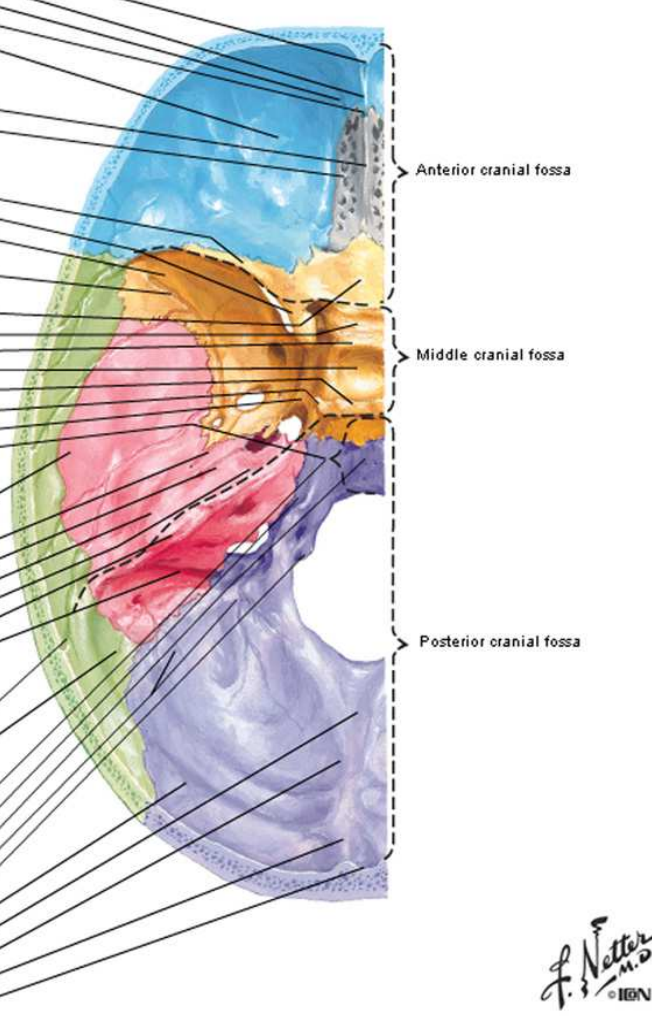
Lesser wing (sphenoid bone)
Anterior clinoid process (sphenoid bone)
Greater wing (sphenoid bone)
Groove for middle meningeal vessels (frontal branches) (sphenoid bone)

Jugum (sphenoid bone)
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Hypophyseal fossa of sella turcica (sphenoid bone)
Dorsum sellae of sella turcica (sphenoid bone)
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Groove for middle meningeal vessels (parietal branches) (parietal bone)
Mastoid angle (parietal bone)

Clivus (occipital bone)
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Basilar part (occipital bone)
Groove for posterior meningeal vessels (occipital bone)
Condyle (occipital bone)
Groove for transverse sinus (occipital bone)
Groove for occipital sinus (occipital bone)
Internal occipital crest (occipital bone)
Internal occipital protuberance (occipital bone)
Groove for superior sagittal sinus (occipital bone)



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■ **Cavernous sinus**

■ **Pituitary gland**

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Middle cranial fossa

Fossa cranii media

✓ **Sella turcica**

✓ **Ala major ossis sphenoidalis**

✓ **Pars petrosa (pyramis) ossis temporalis**

✓ **Squama temporalis**



Groove for superior sagittal sinus (frontal bone)
Frontal crest (frontal bone)
Groove for anterior meningeal vessels (frontal bone)
Foramen cecum (frontal bone)
Superior surface of orbital part (frontal bone)

Crista galli (ethmoid bone)
Cribriform plate (ethmoid bone)

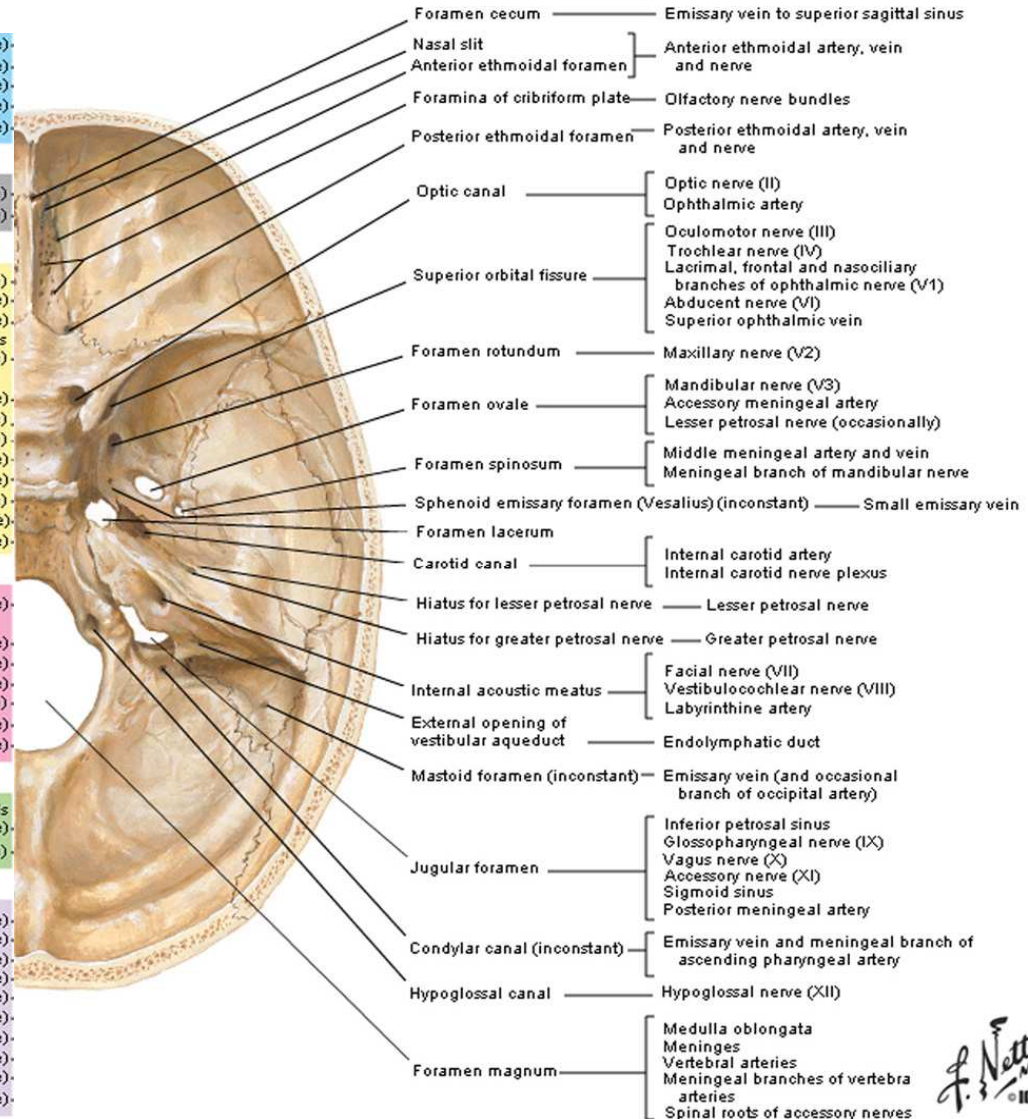
Lesser wing (sphenoid bone)
Anterior clinoid process (sphenoid bone)
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Groove for occipital sinus (occipital bone)
Internal occipital crest (occipital bone)
Internal occipital protuberance (occipital bone)
Groove for superior sagittal sinus (occipital bone)



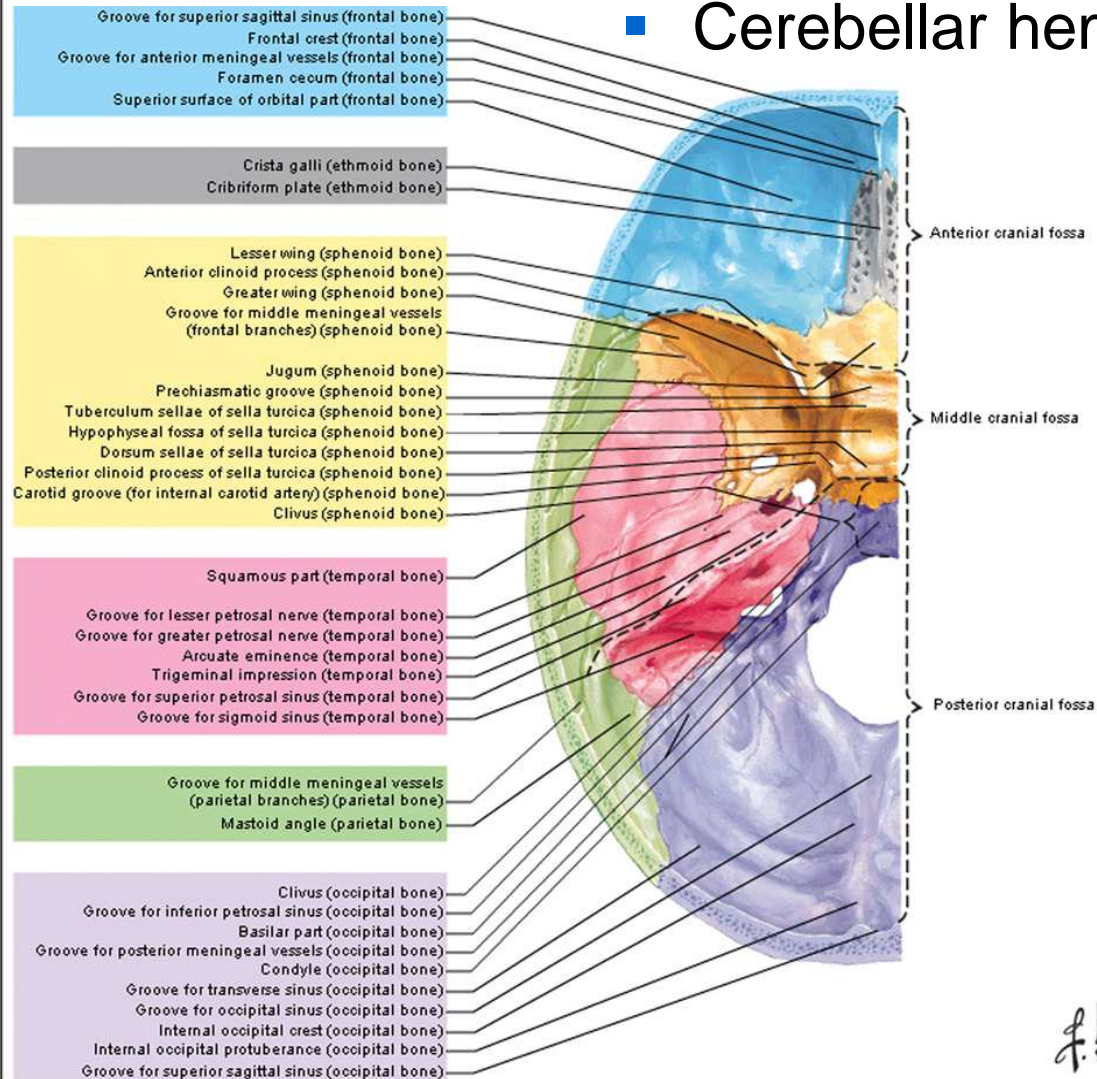
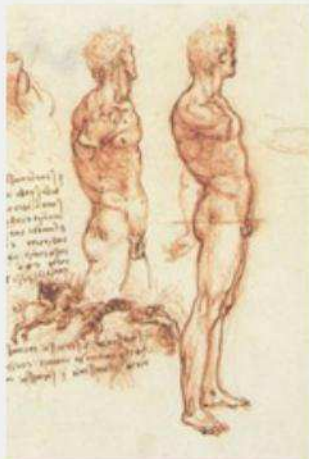
Posterior cranial fossa

■ Cerebellar hemispheres

Fossa cranii posterior

✓ *Pars petrosa ossis temporalis – posterior surface*

✓ *All parts of os occipitale, incl. clivus*



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■ Medulla oblongata and pons

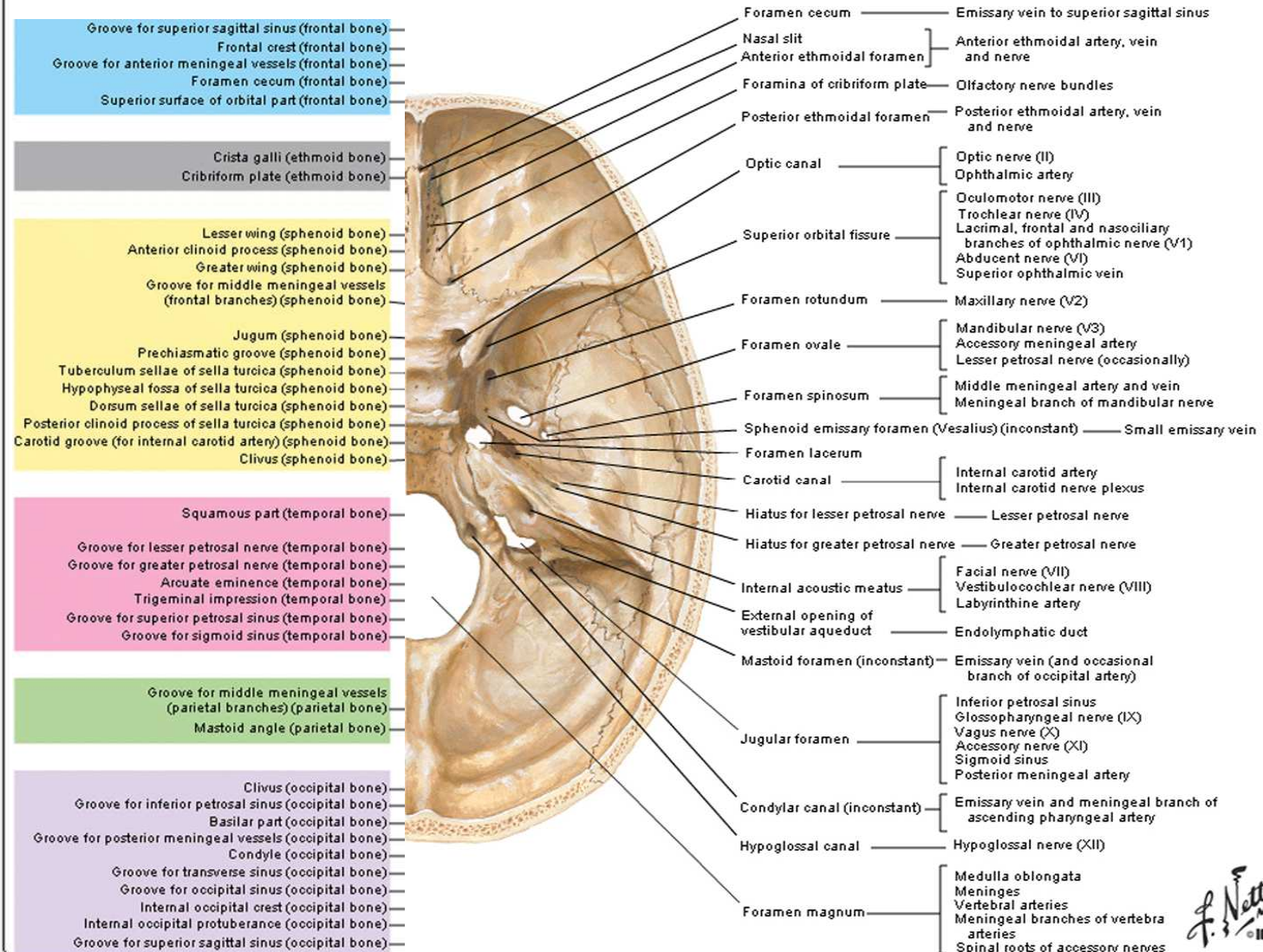
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Posterior cranial fossa

Fossa cranii posterior

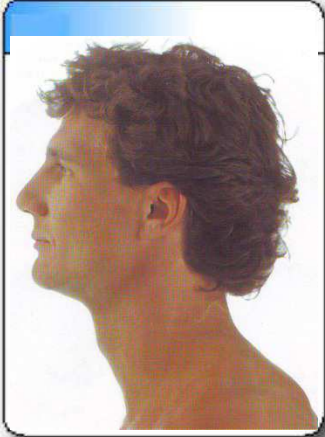
✓ *Pars petrosa ossis temporalis – posterior surface*

✓ *All parts of os occipitale, incl. clivus*



head vs. face

**head vs. face
regions**



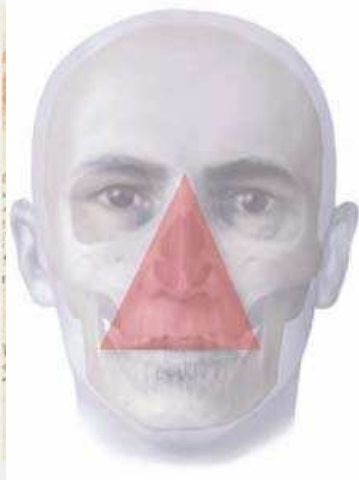
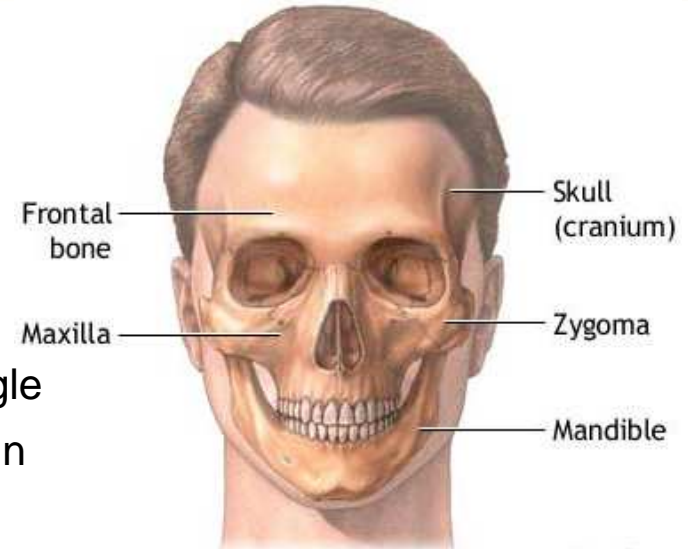
Face, *facies*

- boundaries:

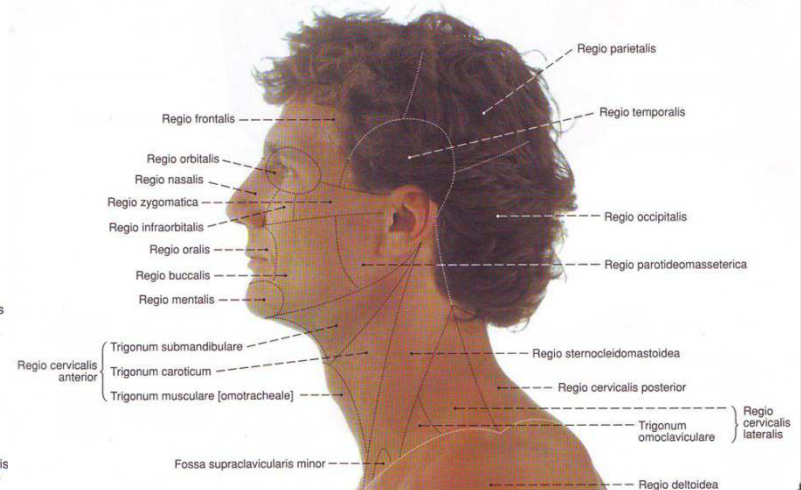
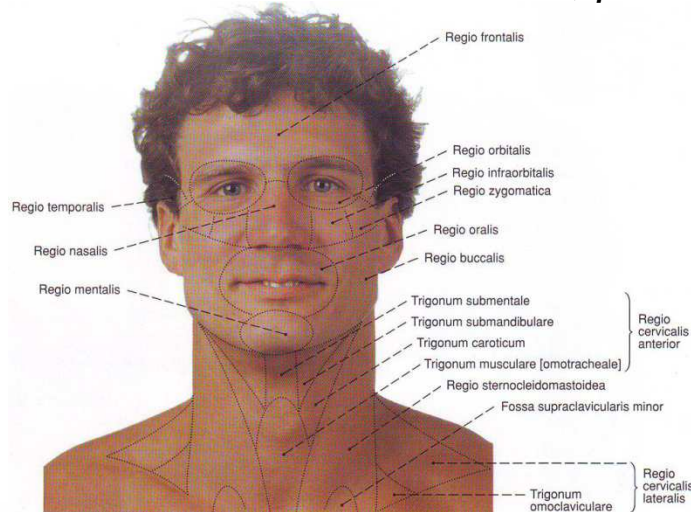
- ✓ *glabella* ⇒ supraorbital margin
- ✓ zygomatic arch ⇒ mandibular angle
- ✓ mandibular base down to the chin

- bone-muscle points:

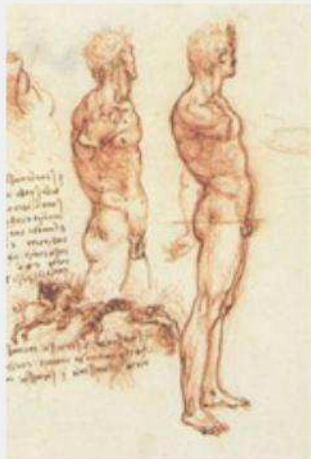
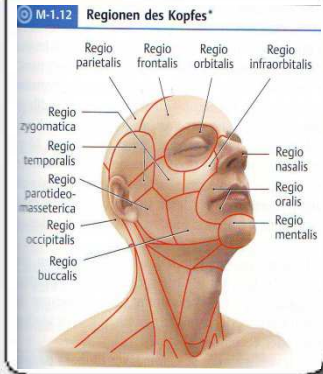
- ✓ *nasus, margo infraorbitalis, angulus oris, m. masseter, angulus et ramus mandibulae, protuberantia mentalis, os zygomaticum*



*Triangular danger
zone in the face*



Regiones faciei



Regions of the face, *regiones faciei*

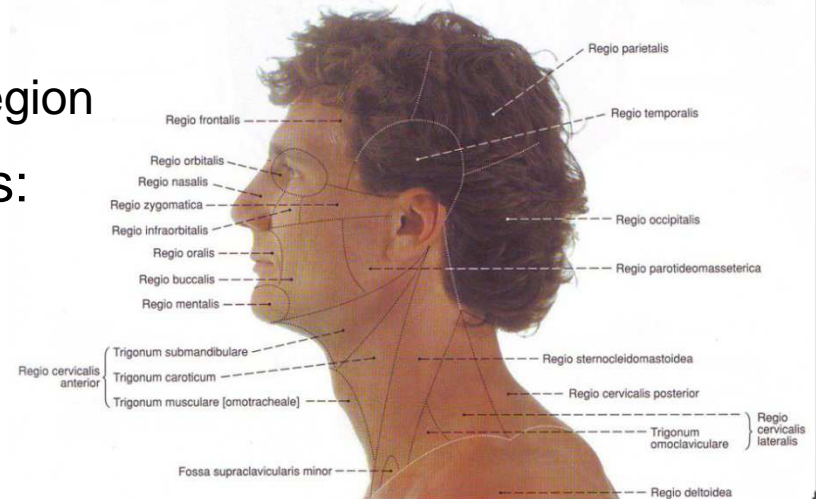
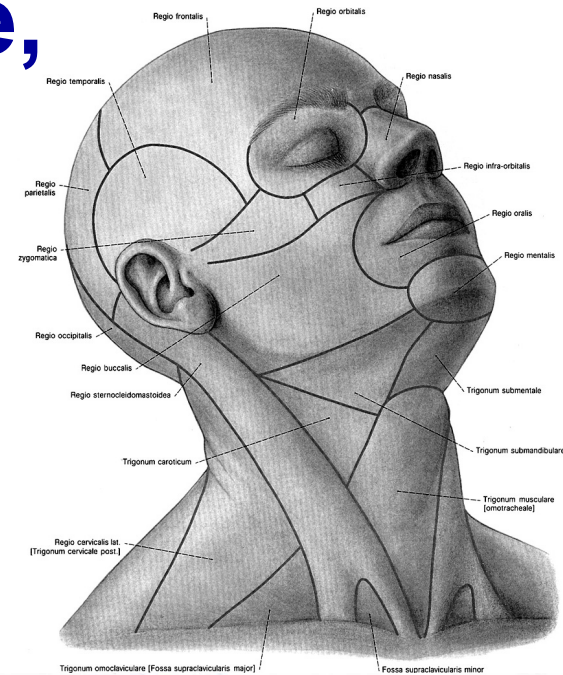
■ Facial regions:

✓ lateral facial regions:

- zygomatic region
- infraorbital region
- mental region
- buccal region
- parotid-masseter region

✓ anterior facial regions:

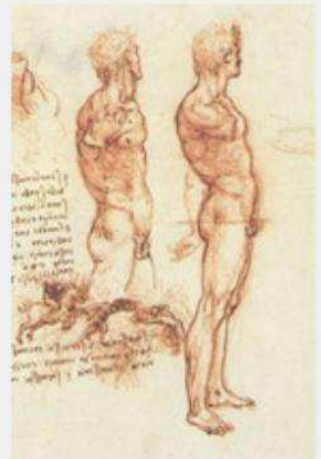
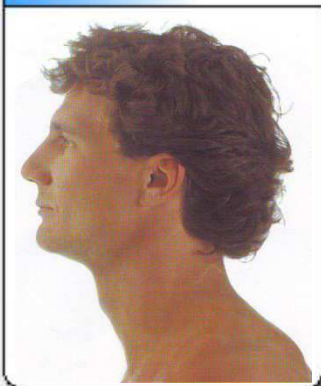
- orbital region
- nasal region
- oral region



location

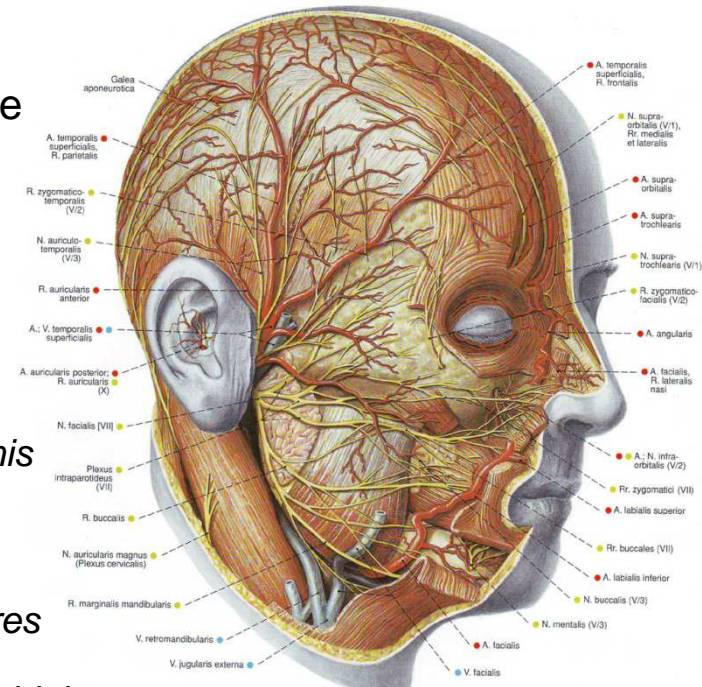
layers

Regio facialis lat.

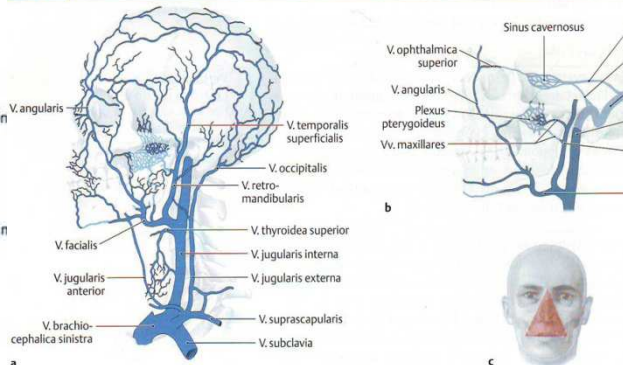
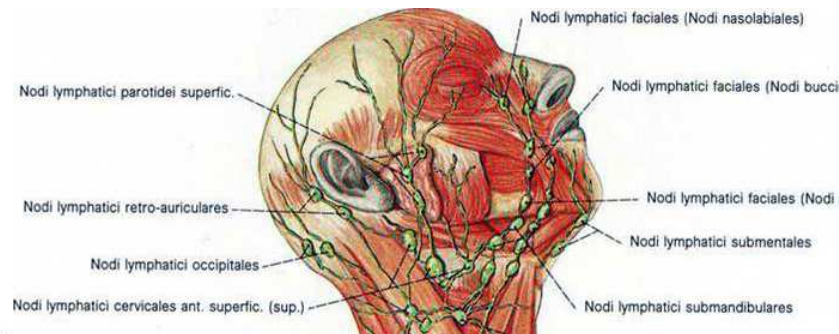


Lateral facial region

- Surface anatomy:
 - ✓ skin – thin, movable and hairy
 - ✓ subcutaneous tissue – fat tissue
 - ⇒ mimic muscles
 - motor innervation – facial nerve
 - ✓ blood supply – rich:
 - *a. facialis*
 - *a. temporalis superficialis*
 - *a. maxillaris*
 - ✓ venous drainage:
 - *v. facialis* ⇒ *v. facialis communis*
 - *v. temporalis superficialis*
 - *plexus venosus pterygoideus*
 - ✓ lymphatic drainage:
 - *nodi lymphatici submandibulares*
 - *nodi lymphatici submentales*
 - *nodi lymphatici buccales, parotidei et retroauriculares*

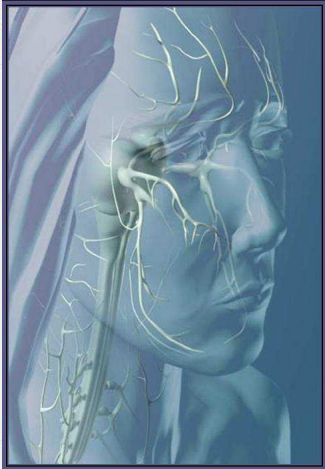


M-2.4 Venen und ihre Verbindungen im Kopfbereich



N. trigeminus

- ✓ n. ophthalmicus
- ✓ n. maxillaris
- ✓ n. mandibularis



Sensory innervation of the face

■ N. trigeminus:

✓ n. ophthalmicus (n. frontalis):

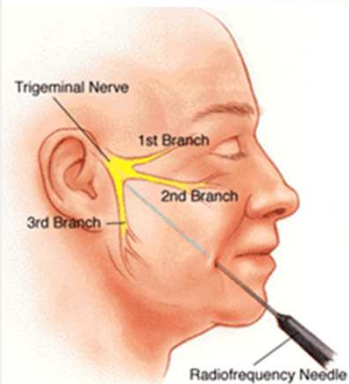
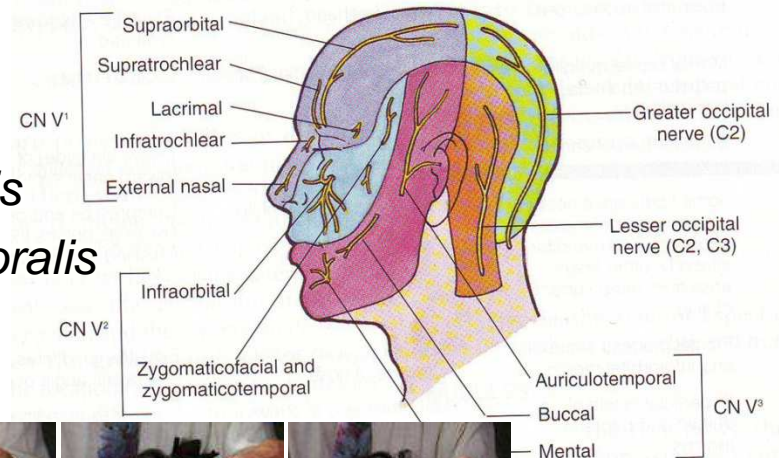
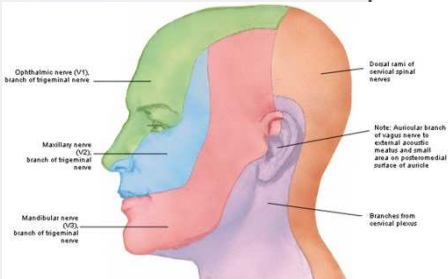
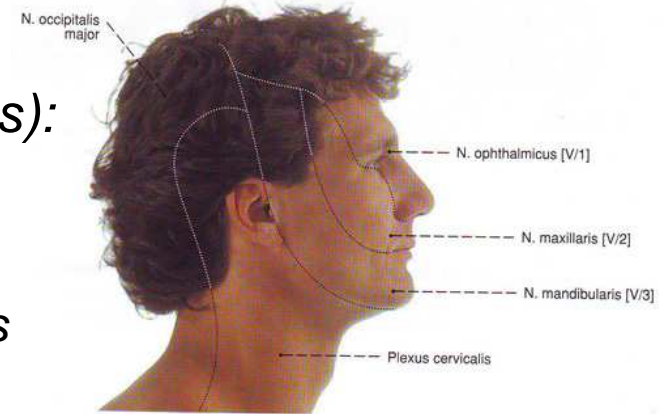
- n. supraorbitalis
- n. supratrochlearis
- branches of n. nasociliaris
- branches of n. lacrimalis

✓ n. maxillaris:

- n. infraorbitalis
- n. zygomaticofacialis
- n. zygomaticotemporalis

✓ n. mandibularis:

- n. mentalis
- n. buccalis



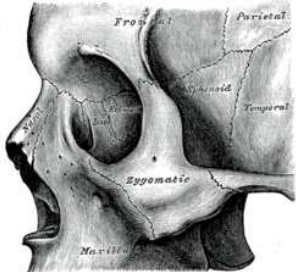
of N. trigeminus



location

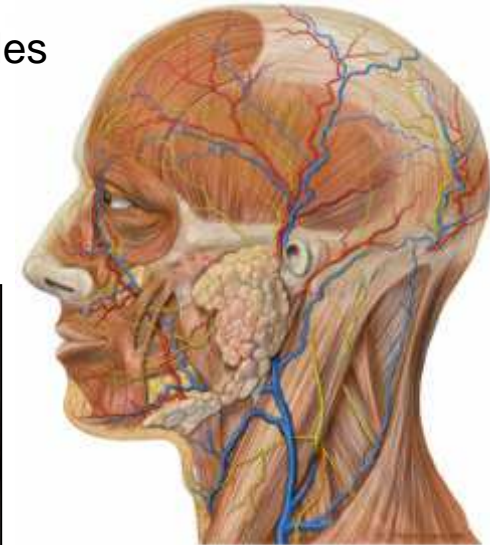
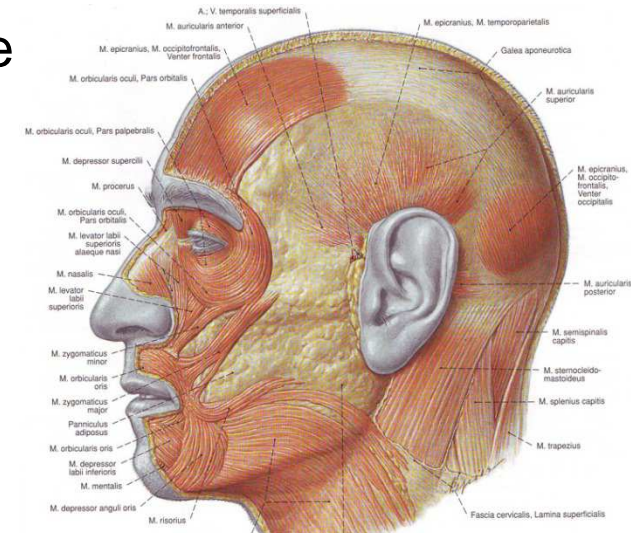
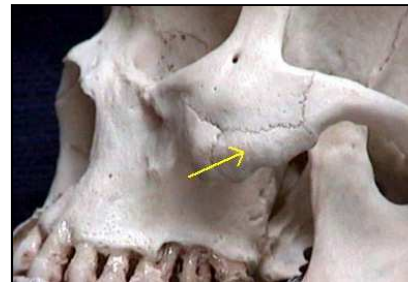
layers

Bone fractures



Zygomatic region

- boundaries – boundaries of the zygomatic bone
- surface anatomy – layers:
 - ✓ skin – thin and fine
 - ✓ subcutaneous tissue – abundant adipose tissue
 - ✓ muscle layer:
 - orbicularis oculi muscle
 - zygomaticus major and minor muscles
 - ✓ innervation:
 - infraorbital nerve
 - zygomaticofacial nerve
- *os zygomaticum*
 - ✓ *bipartitum et multipartitum (os japonicum)*

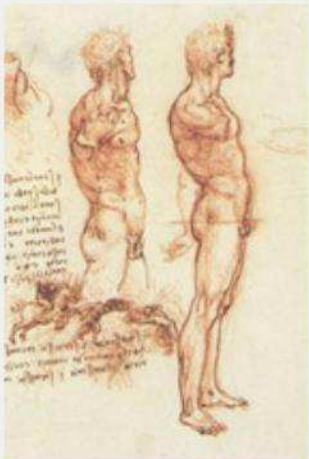


location

layers

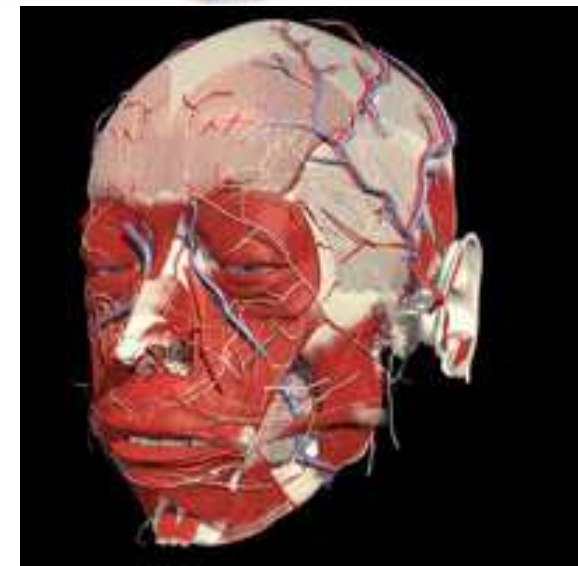
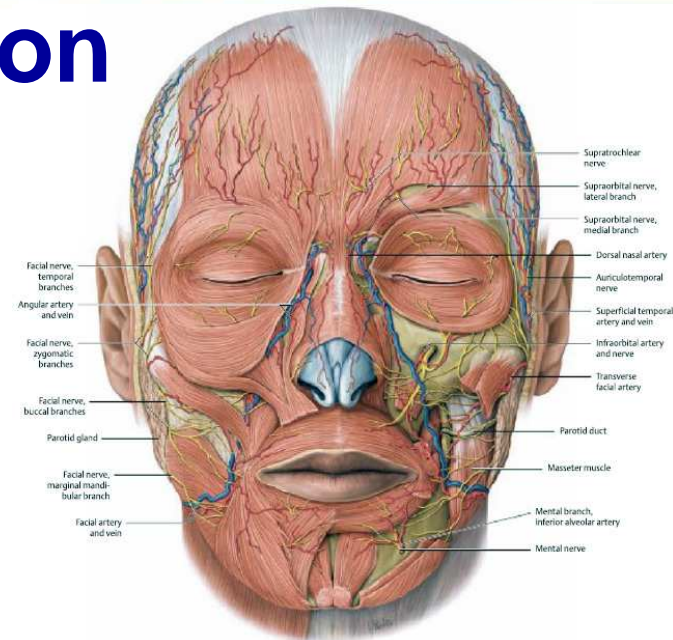
TBC

osteomyelitis



Infraorbital region

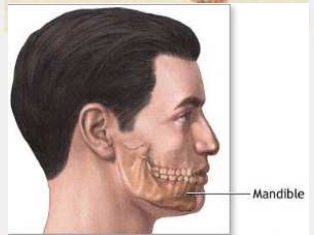
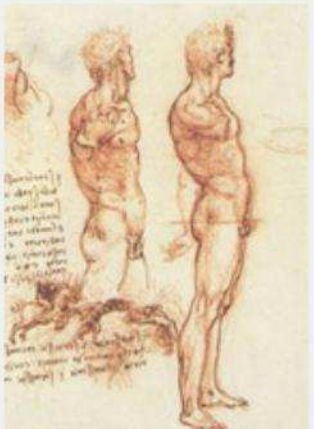
- boundaries:
 - ✓ superior – infraorbital margin
 - ✓ inferior – gingivobuccal fold
 - ✓ medial – nasolabial sulcus
 - ✓ lateral – zygomatic region
- surface anatomy – layers:
 - ✓ skin – thin and fine
 - ✓ subcutaneous tissue – well developed fat tissue
 - ✓ sensory nerves – infraorbital nerve
 - ✓ motor nerves – *rr. buccales n. facialis*
 - ✓ facial artery and vein ⇒ anastomoses
 - ✓ muscle layer:
 - *m. orbicularis oculi*
 - *m. caninus*
 - *m. levator labii superioris*
 - *m. levator labii sup. alaeque nasi*
 - ✓ bone ground – *fossa canina*
⇒ infraorbital foramen
(infraorbital artery, vein and nerve)



location

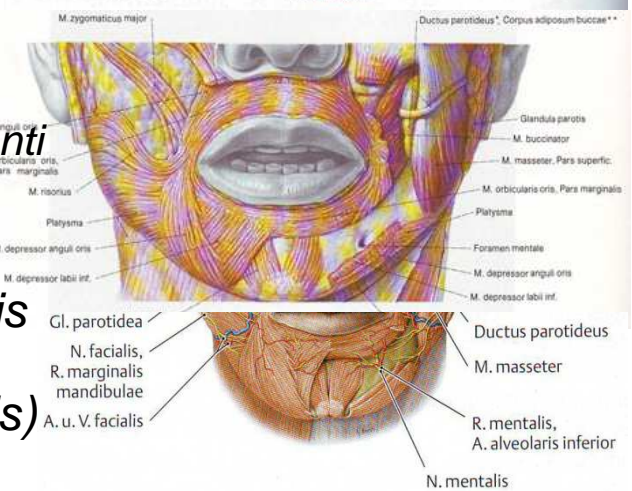
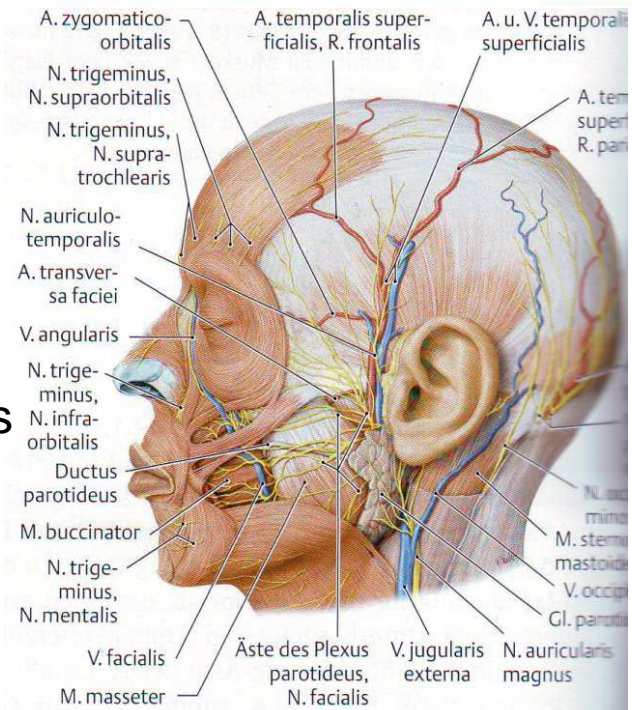
layers

Regio mentalis



Mental region

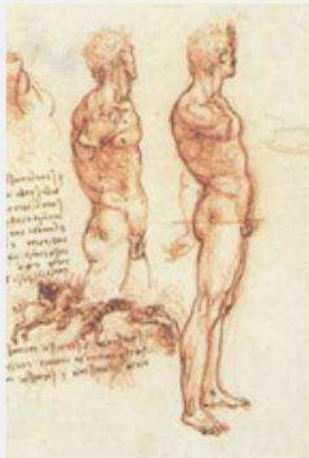
- boundaries:
 - ✓ superior – gingivobuccal fold
 - ✓ inferior – mandibular base
- surface anatomy:
 - ✓ skin – thick and hairy, abundance of sebaceous glands
 - ✓ subcutaneous tissue – lobular appearance
 - ⇒ fibrous bundles
 - ⇒ mimic muscle bundles
 - ✓ muscle layer:
 - *m. depressor anguli oris*
 - *m. depressor labii inferioris*
 - *m. mentalis, m. transversus menti*
 - ✓ *a. et v. facialis*, lymph node
 - ✓ *a. labialis inferior et a. mentalis*
 - ✓ sensory innervation – *n. mentalis*
 - ✓ motor innervation – *ramus marginalis mandibulae (n. facialis)*
 - ✓ bone ground – mandible



location

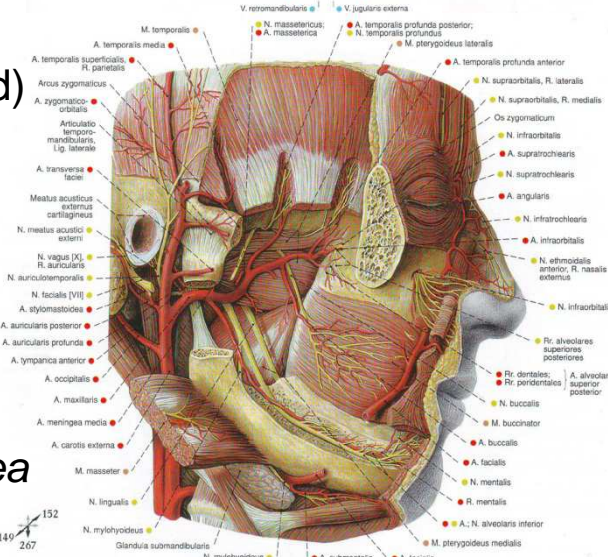
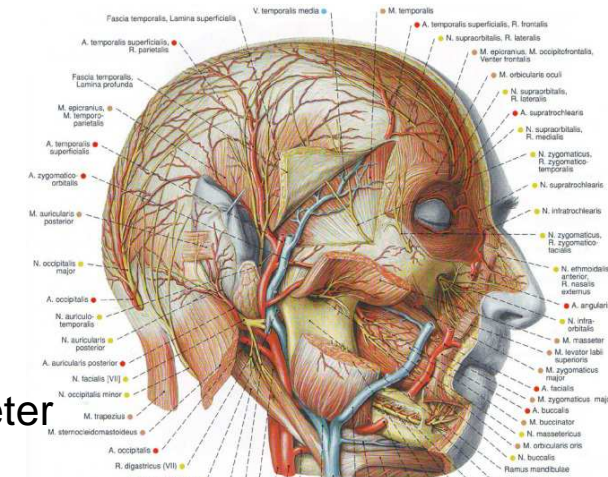
layers

Regio buccalis



Buccal region

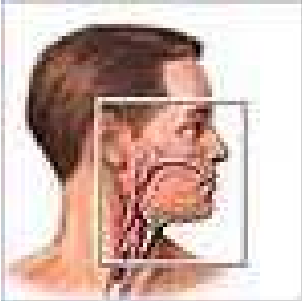
- boundaries – the buccal soft tissue without bone ground:
 - ✓ superior – zygomatic region and infraorbital region
 - ✓ inferior – mental region
 - ✓ anterior – oral angle
 - ✓ posterior – anterior border of masseter
- surface anatomy:
 - ✓ skin – fine and pink, hairy
 - ✓ subcutaneous tissue – well-developed and age-varying fat tissue
 - ✓ buccal adipose body (Bichat's fat pad)
 - ✓ *m. risorius*
 - ✓ facial artery and vein
 - ✓ sensory innervation – *n. buccalis*, *n. mentalis*, *n. infraorbitalis*
 - ✓ motor innervation – *rami buccales n. facialis*
 - ✓ muscle layer – *mm. zygomatici*, *m. buccinator*, *fascia buccopharyngea*
 - ✓ buccal mucosa – parotid duct eponym – Stenon (Stensen's) duct



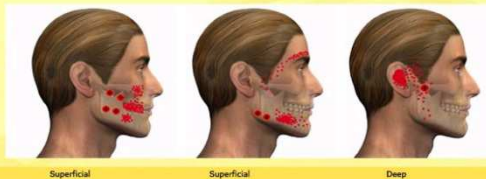
location

layers

Regio parotideo-masseterica

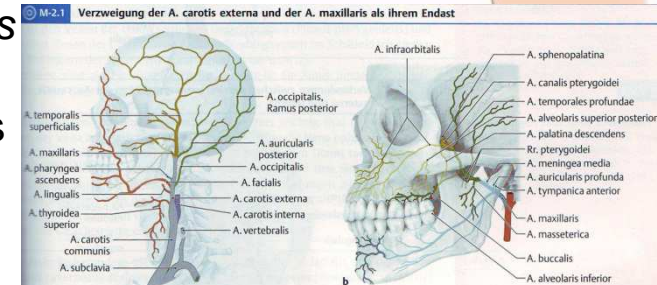
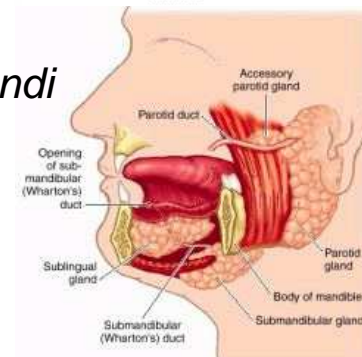
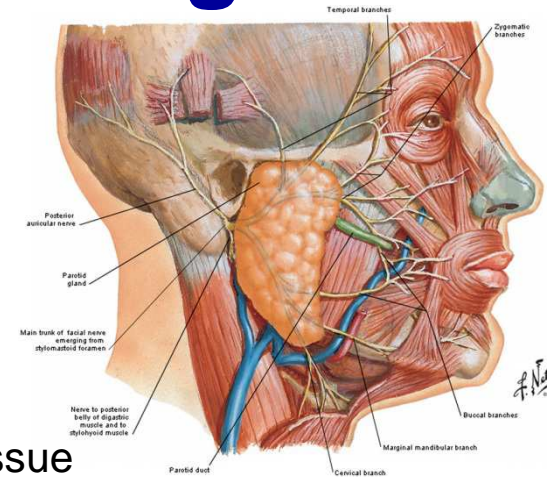


Trigger Points in the Masseter Muscle



Parotid-masseter region

- boundaries:
 - ✓ superior – zygomatic arch
 - ✓ inferior – mandibular base and angle
 - ✓ anterior – anterior border of masseter
 - ✓ posterior – external acoustic porus and mastoid process
- surface anatomy:
 - ✓ skin – relatively thick and hairy
 - ✓ subcutaneous tissue – abundant fat tissue
 - ⇒ branches of *n. auricularis magnus*
 - ⇒ *nodi lymphatici parotidei superficiales et profundi*
 - ✓ *fascia parotidea et masseterica*
 - ✓ *a. et v. temporalis superficialis, n. auriculotemporalis*
 - ✓ *a. auricularis posterior, r. auricularis n. facialis*
 - ✓ *ductus parotideus, a. et v. transversa faciei*
 - ✓ *n. facialis* ⇒ *plexus intraparotideus*
 - ✓ *v. retromandibularis*
 - ✓ *carotid bifurcation* – end branches
 - ✓ ***m. masseter***
 - ✓ *a., v. et n. massetericus*

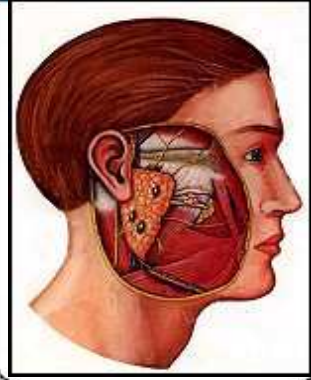


Prof. Dr. Nikolai Lazarov

location

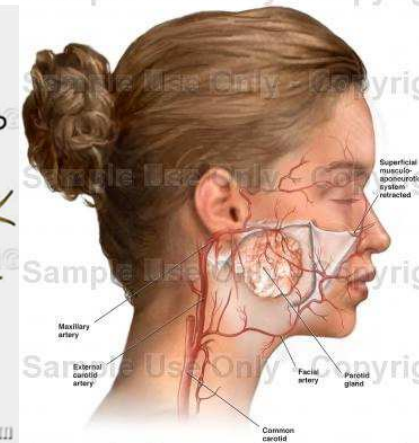
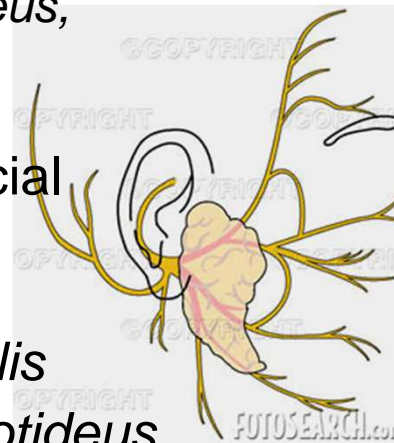
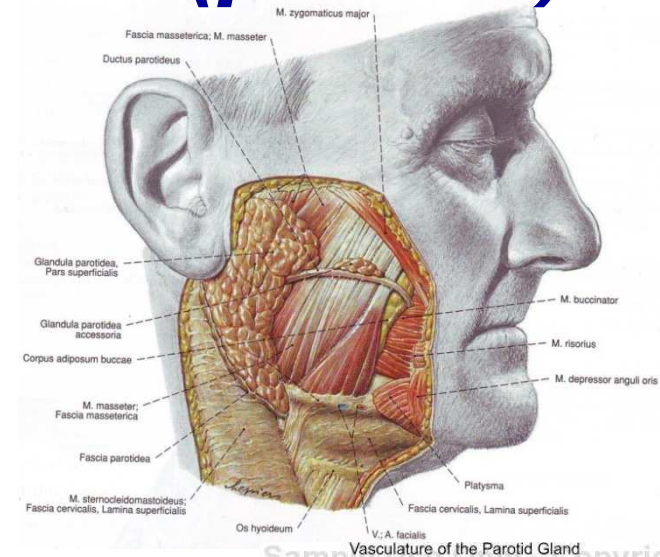
structure

Glandula parotis



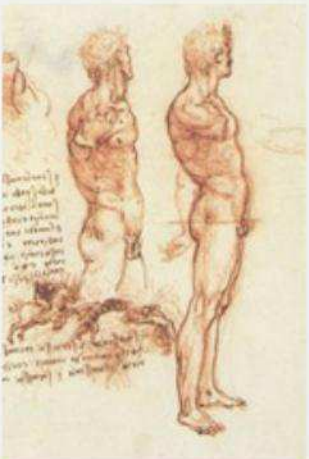
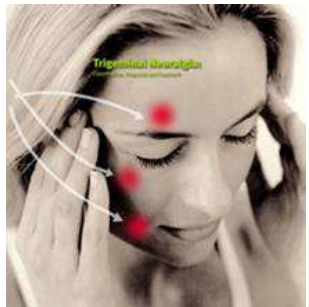
Parotid gland, *glandula parotidea (parotis)*

- Location – retromandibular fossa:
 - ✓ in front – *ramus mandibulae*, *m. pterygoideus medialis*, *m. masseter*
 - ✓ behind – *proc. mastoideus*, *m. sternocleidomastoideus*
 - ✓ below – *m. stylohyoideus*, *venter posterior m. digastrici*
 - ✓ medial – *proc. styloideus*,
⇒ *m. styloglossus*,
⇒ *m. stylopharyngeus*
- *parotid fascia* – superficial and deep laminae
- end branches of *a. temporalis superficialis*
- *n. facialis* ⇒ *plexus parotideus*



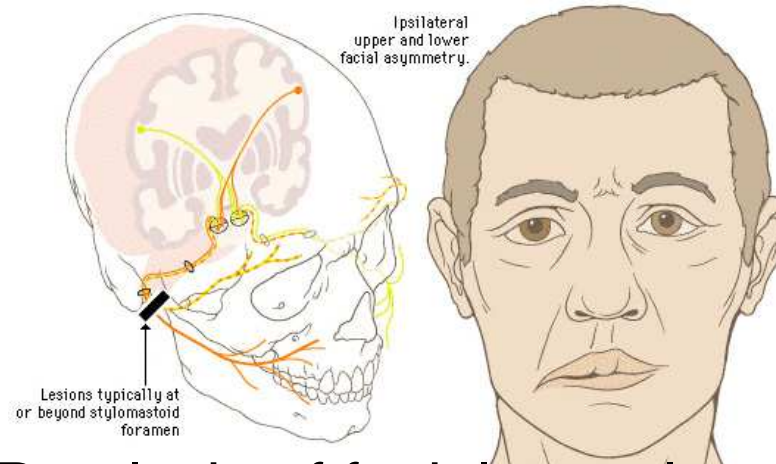
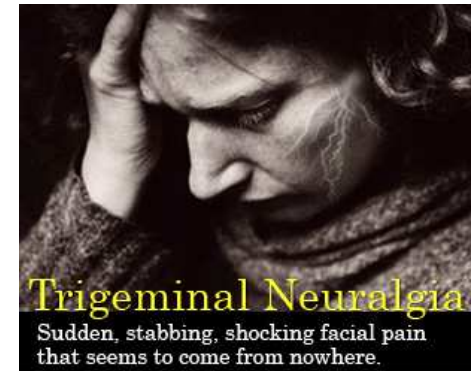
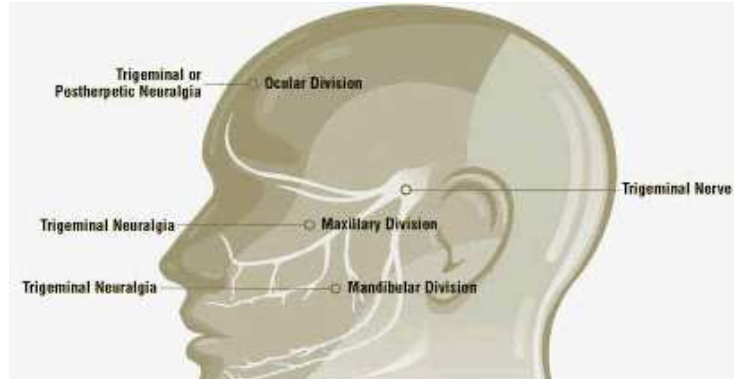
Facial regions

clinics



Facial regions: clinical significance

✓ Trigeminal neuralgia (tic douloureux)

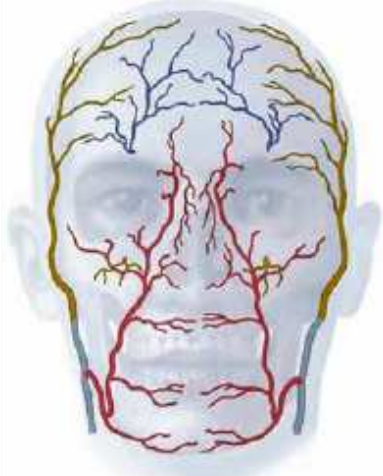
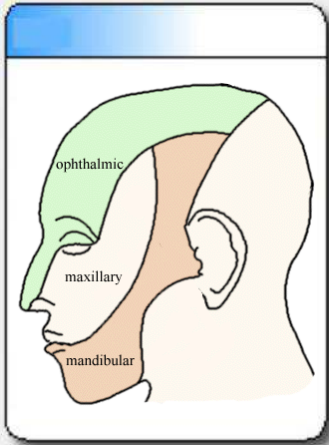


✓ Paralysis of facial muscles –
Bell palsy

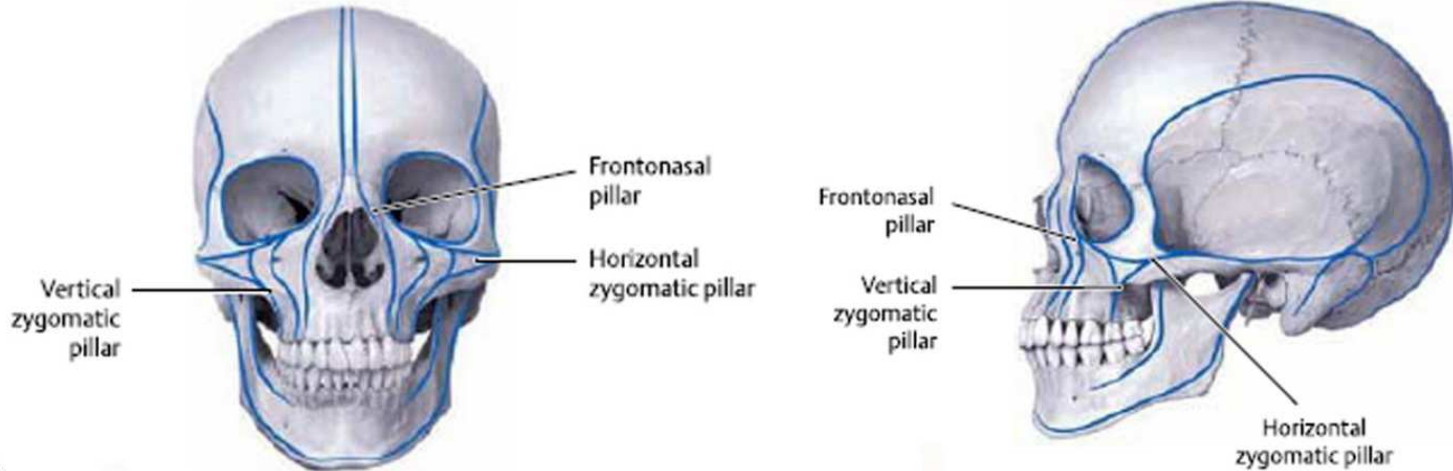
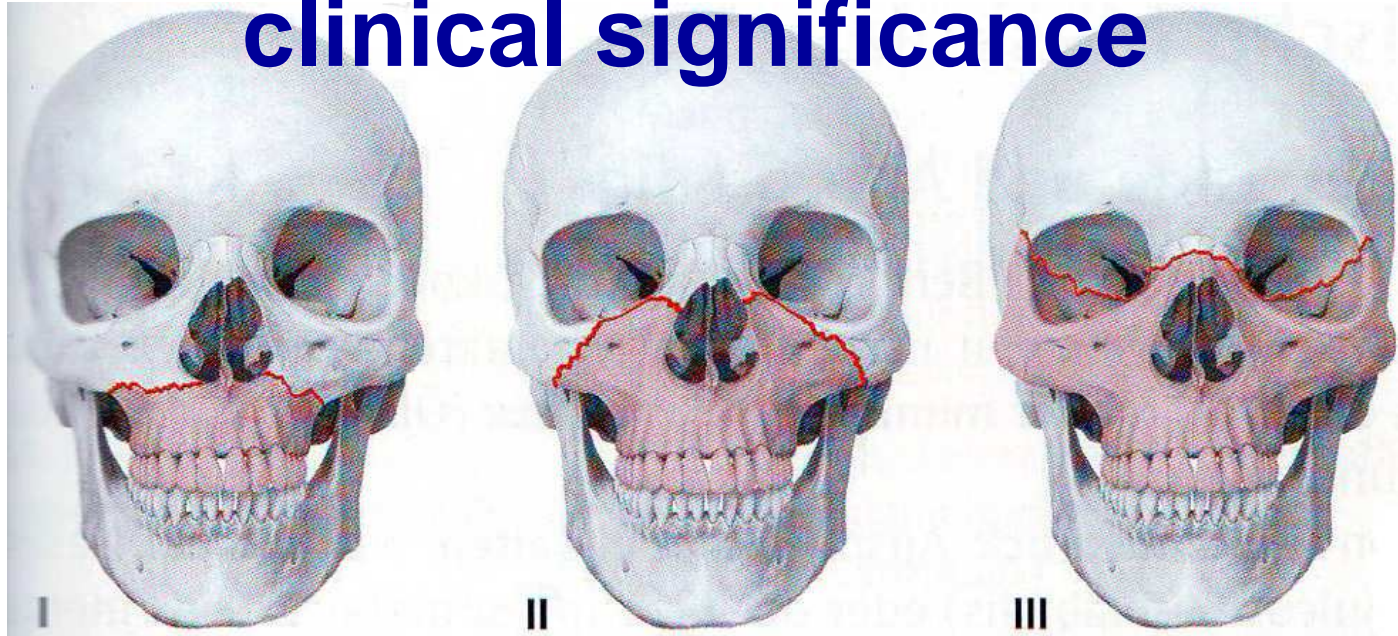


Facial regions

clinics

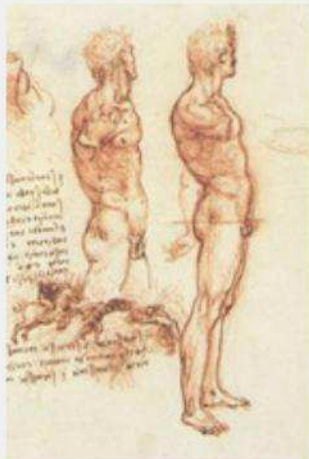
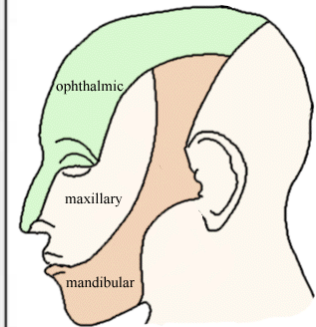


Facial regions: clinical significance

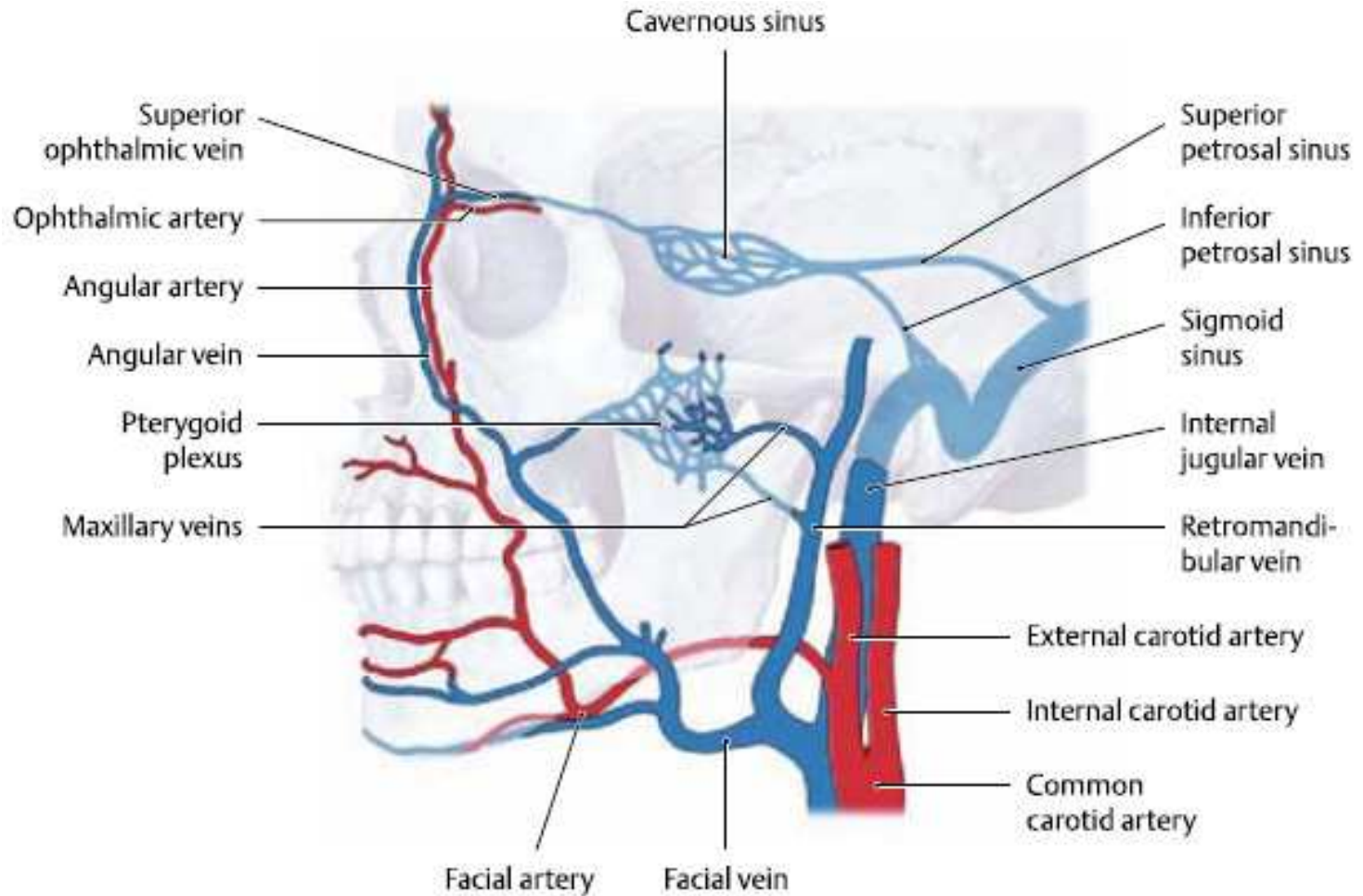


Facial regions

clinics



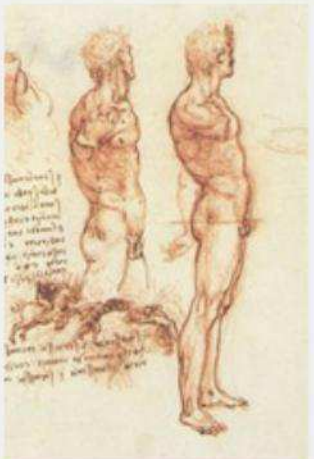
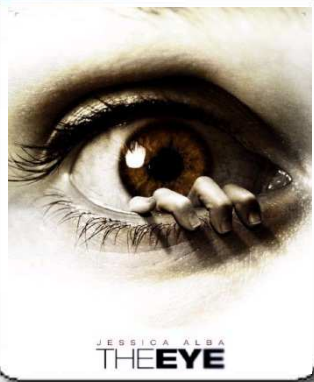
Facial regions: clinical significance



location

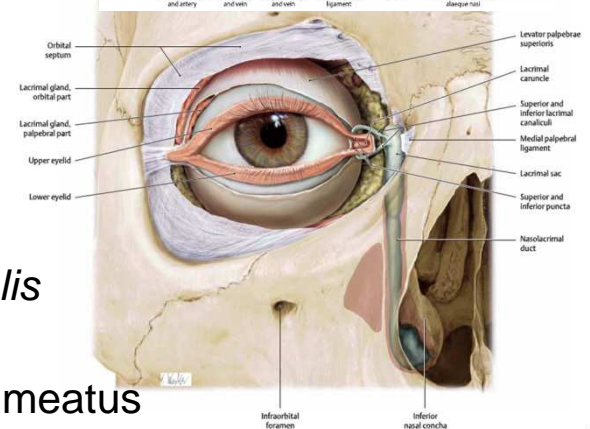
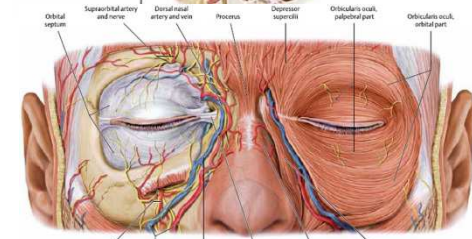
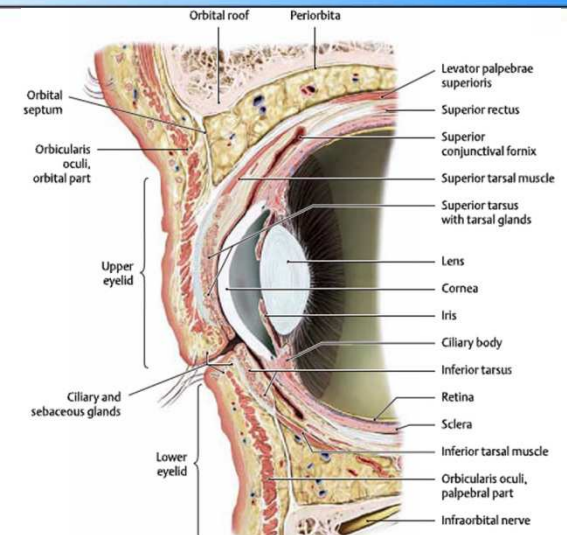
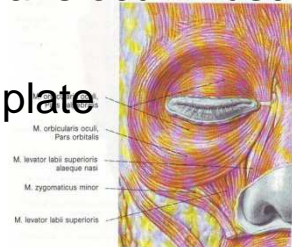
structure

Oculus



Orbital region

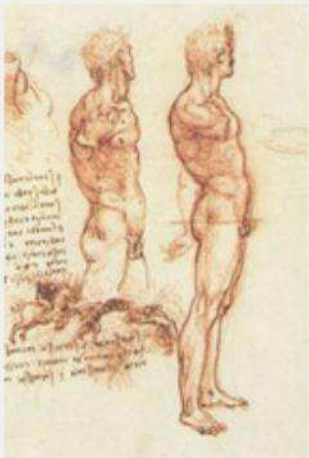
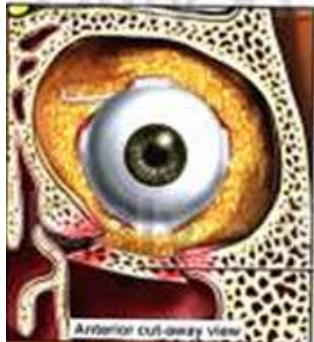
- boundaries – boundaries of the orbit:
 - ✓ superficial (palpebral) layer
 - ✓ deep layer – orbit
 - ✓ divided by orbital septum
- palpebral layer – surface anatomy:
 - ✓ palpebral skin – thin and fine; sebaceous (Zeis) glands, tarsal (Meibom) glands, ciliary (Moll) glands
 - ✓ subcutaneous tissue – sparse, loose connective tissue
 - ophthalmic nerve, infraorbital nerve
 - angular artery, superficial temporal artery
 - ✓ muscle layer – orbicularis oculi muscle
 - ✓ fibrous tissue layer – orbital septum, tarsal plate
 - ✓ conjunctiva – fornix
- lacrimal pathways:
 - ✓ *puncta lacrymalia, superius et inferius*
 - ✓ *canaliculi lacrymales* ⇒ *saccus lacrymalis*
 - ✓ *m. lacrymalis, lig. palpebrale mediale*
 - ✓ *ductus nasolacrymalis* ⇒ inferior nasal meatus



location

structure

Orbita



Orbit

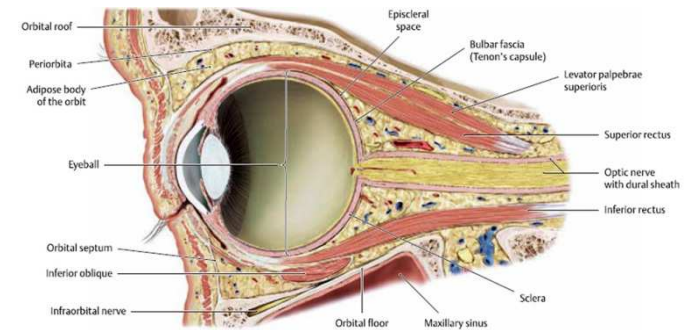
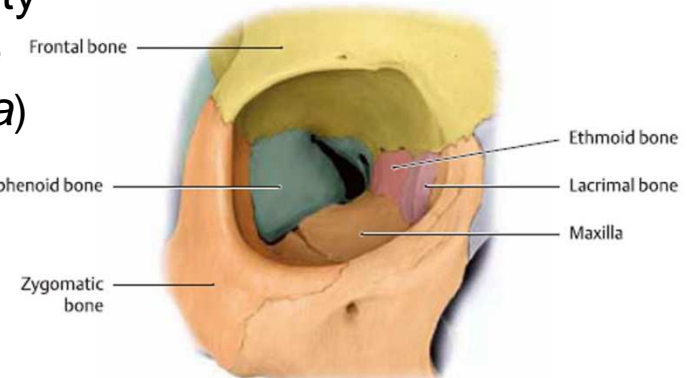
■ walls of the orbit:

- ✓ superior ⇒ frontal sinus
⇒ anterior cranial fossa (“Brillenhaematom”)
- ✓ inferior ⇒ maxillary sinus
- ✓ medial (internal) ⇒ nasal cavity
⇒ ethmoid cells, orbital plate
(*lamina orbitalis s. papyracea*)
- ✓ lateral (external) – thickest



■ contents:

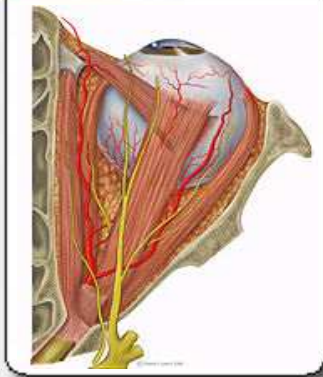
- ✓ eye ball, *bulbus oculi*
- ✓ accessory structures:
 - extraocular muscles
 - lacrimal gland, *gl. lacrimalis*
- ✓ adipose body of the orbit, *corpus adiposum orbitae*
- ✓ optic nerve, *n. opticus*



location

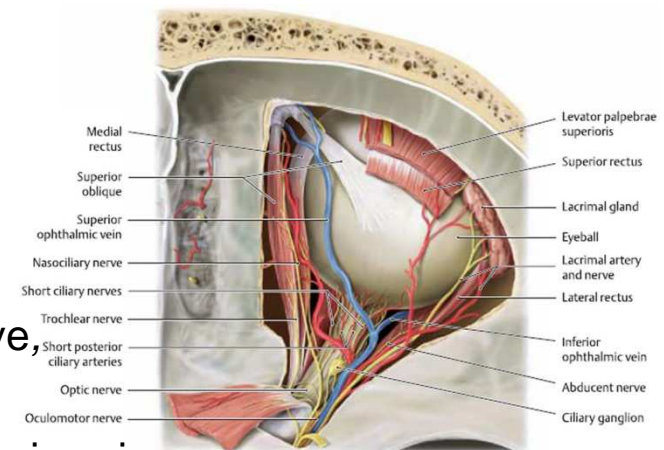
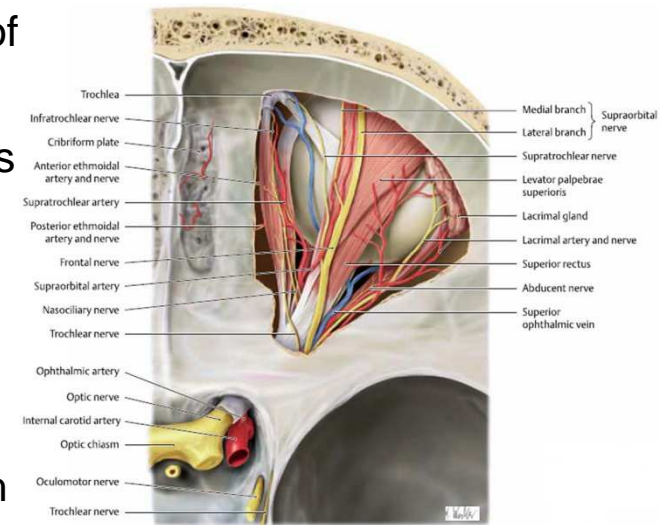
structure

Orbita



Orbital levels

- upper level – between the orbital roof and the levator palpebrae superioris:
 - ✓ frontal, trochlear & lacrimal nerves
 - ✓ supraorbital, supratrochlear and lacrimal arteries and veins
- middle level – between the superior rectus and the optic nerve:
 - ✓ nasociliary nerve, superior branch of oculomotor, and abducent nerves
 - ✓ ciliary ganglion
 - ✓ ophthalmic artery, superior ophthalmic veins
- lower level – between the optic nerve and the orbital floor:
 - ✓ inferior branch of oculomotor nerve, infraorbital and zygomatic nerves
 - ✓ infraorbital artery, inferior ophthalmic vein

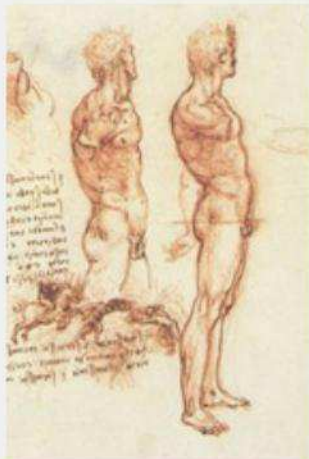
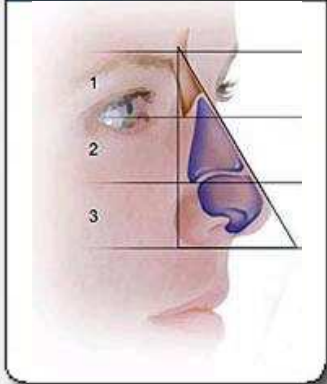


| Level | Contents |
|--------------|--|
| Upper level | <ul style="list-style-type: none"> • Lacrimal nerve • Lacrimal artery • Lacrimal vein • Frontal nerve • Supraorbital nerve and supratrochlear nerve • Supraorbital artery • Supraorbital vein • Trochlear nerve |
| Middle level | <ul style="list-style-type: none"> • Ophthalmic artery • Central retinal artery • Posterior ciliary arteries • Nasociliary nerve • Abducent nerve • Oculomotor nerve, superior branch • Optic nerve • Short ciliary nerves • Ciliary ganglion • Parasympathetic root • Sympathetic root • Nasociliary root • Superior ophthalmic vein |
| Lower level | <ul style="list-style-type: none"> • Oculomotor nerve, inferior branch • Inferior ophthalmic vein • Infraorbital nerve • Infraorbital artery |

location

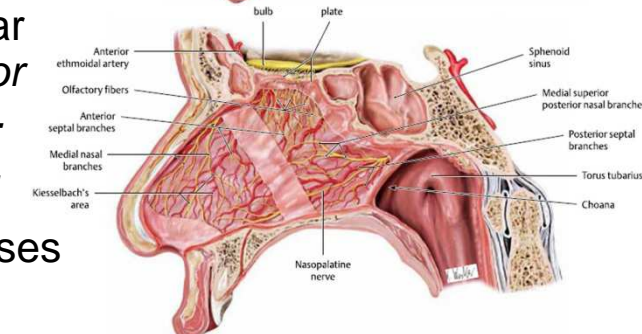
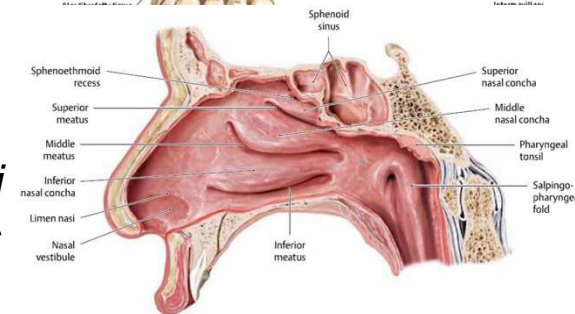
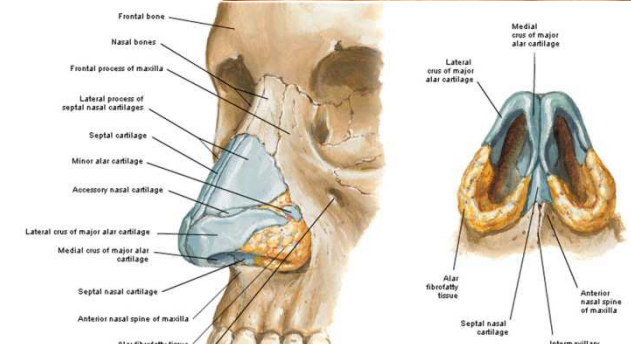
structure

Nasus (rhis, rhinos)



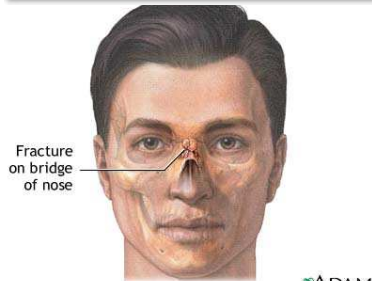
Nasal region

- boundaries:
 - ✓ superior – medial parts of the eyebrows
 - ✓ inferior – line of attachment of nasal septum
 - ✓ lateral – nasolabial sulcus
- external nose, *nasus externus* – bone and cartilaginous parts:
 - ✓ skin – varying in thickness and mobility in its root, ala and apex
 - ✓ subcutaneous tissue – no fat tissue
m. compressor nares, m. procerus, m. levator labii superioris alaeque nasi
a. dorsalis nasi, branches of a. facialis and a. ethmoidalis anterior, v. facialis
 - ✓ sensory innervation – infratrochlear nerve (root), *n. ethmoidalis anterior*
- nasal cavity, *cavum (cavitas) nasi*:
 - ✓ vestibule of nose, *vestibulum nasi*
 - ✓ nasal cavity proper – walls, meatuses and content, *cavum nasi osseum*

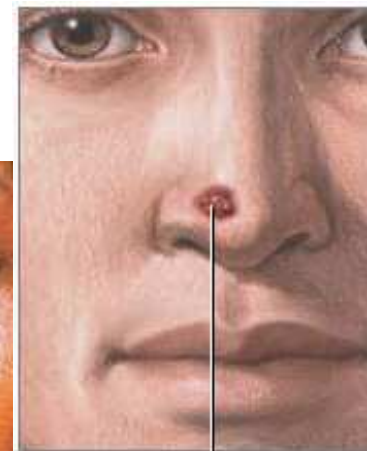
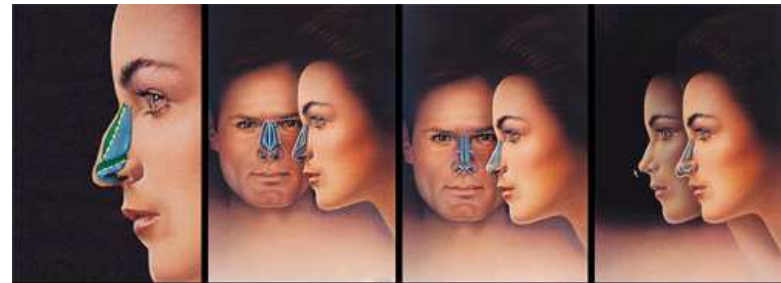


Nose – clinical significance

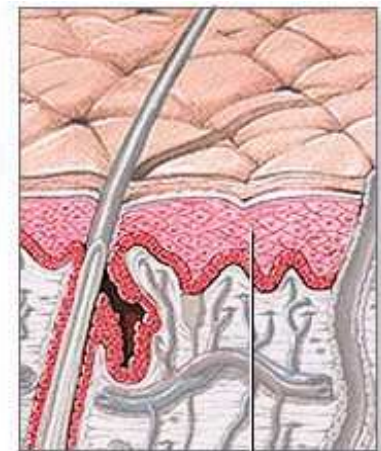
- *rhinoscoliosis*
- *rhinolordosis* – saddle nose
- *rhinokyphosis* – a hump deformity of the nose
- *rhinophyma*
- nasal trauma and fracture (broken nose)
- basal cell skin cancer of the nose
- anomalies of the external nose



ADAM



Squamous cell carcinoma

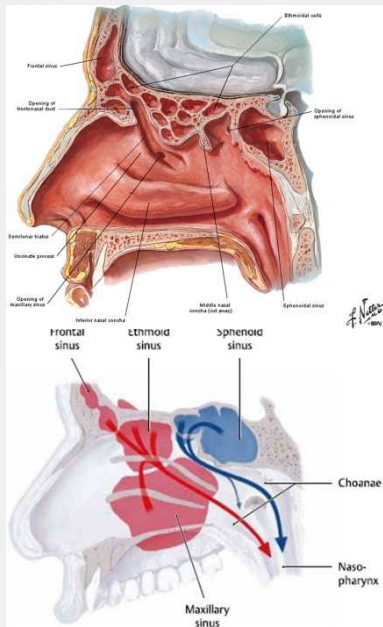


Squamous skin cell layer

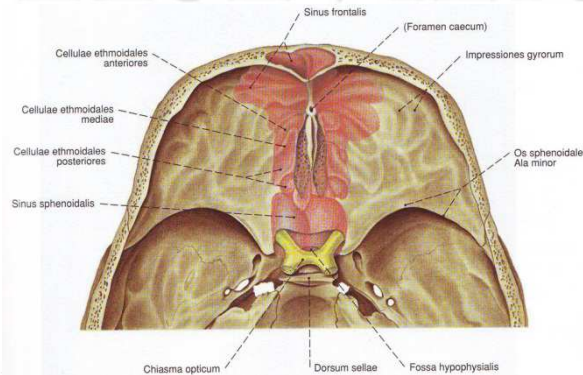
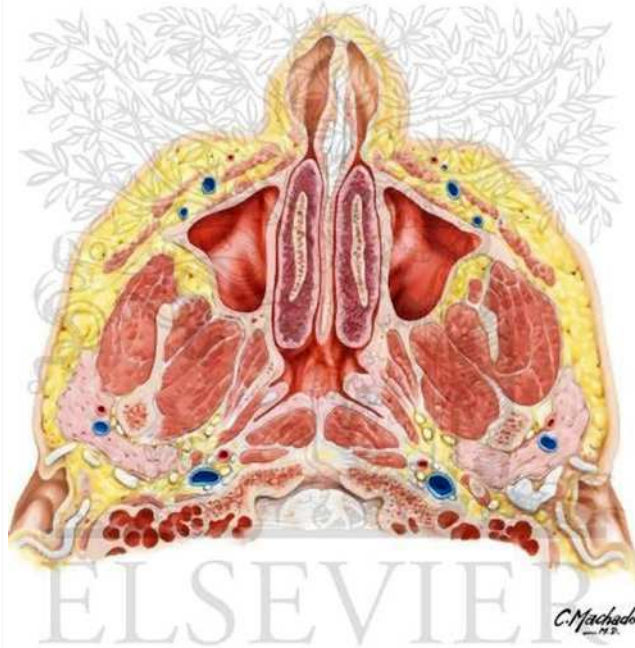
location

structure

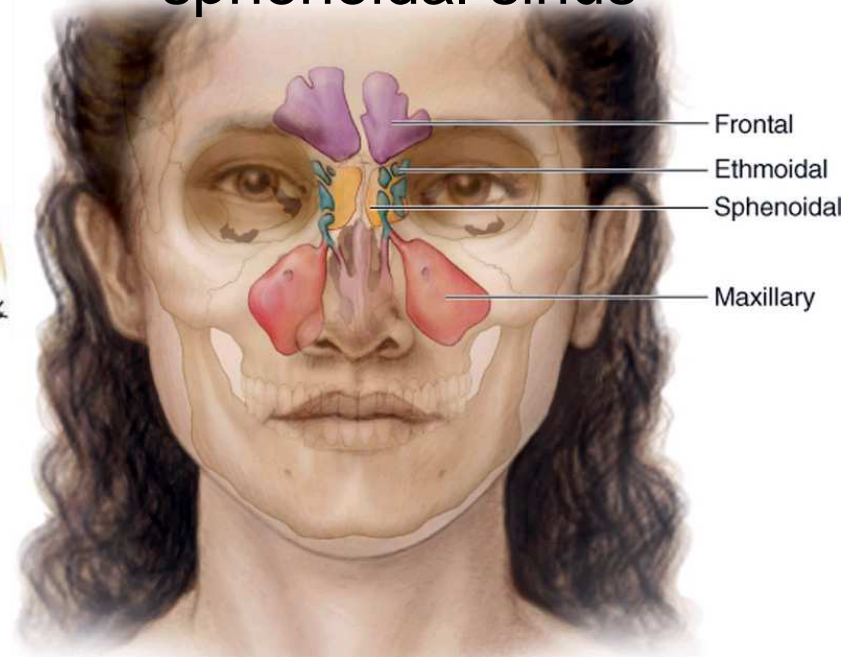
Sinus paranasales



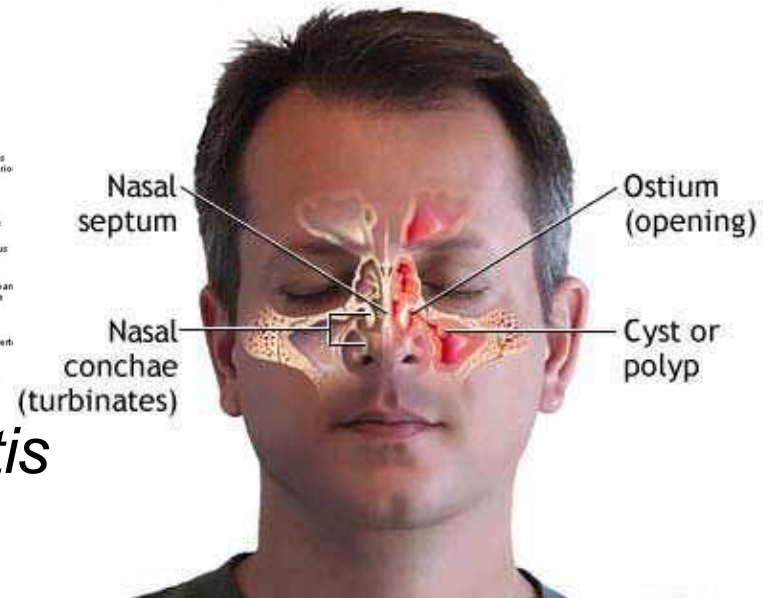
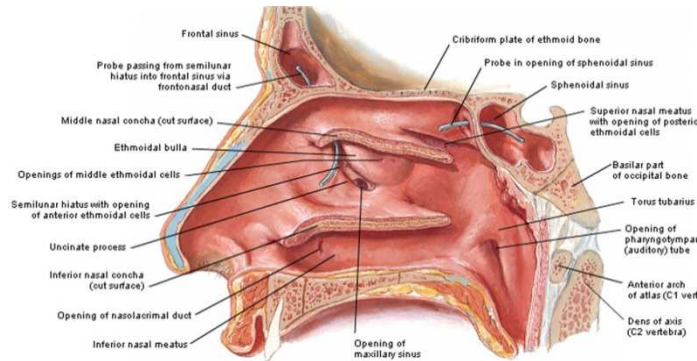
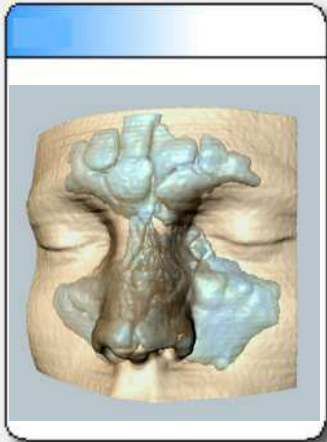
Paranasal sinuses, *sinus paranasales*



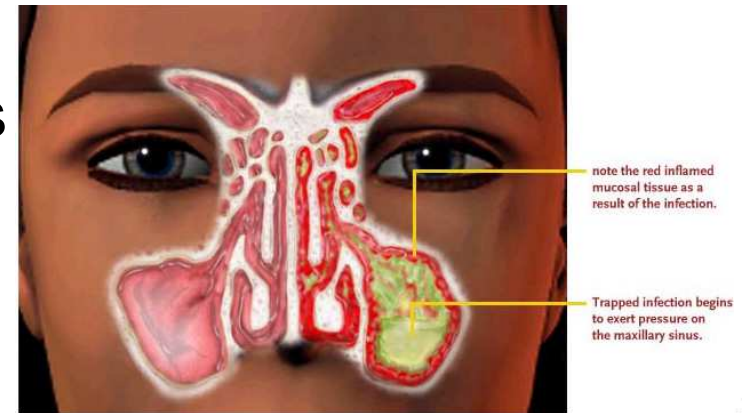
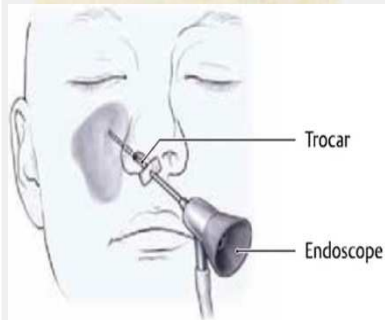
- ✓ maxillary sinus (*antrum Highmori*)
- ✓ frontal sinus
- ✓ ethmoidal sinus
- ✓ sphenoidal sinus



Clinical relevance



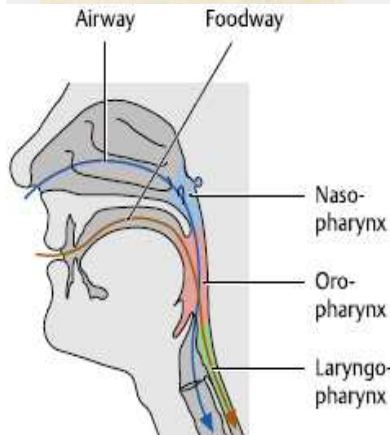
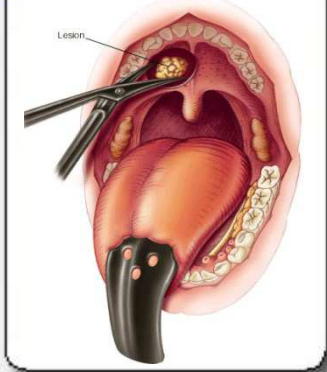
- inflammation – *sinuitis*
- tumors, cysts
- sinus drainage
- damage of neighboring structures



location

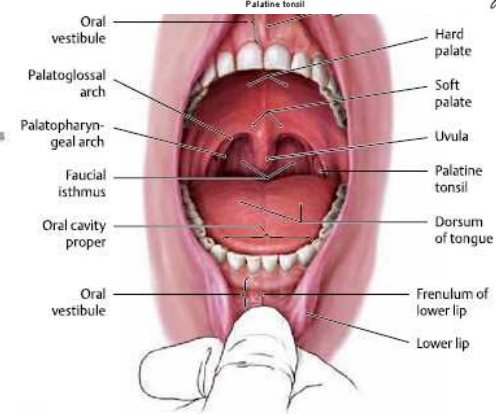
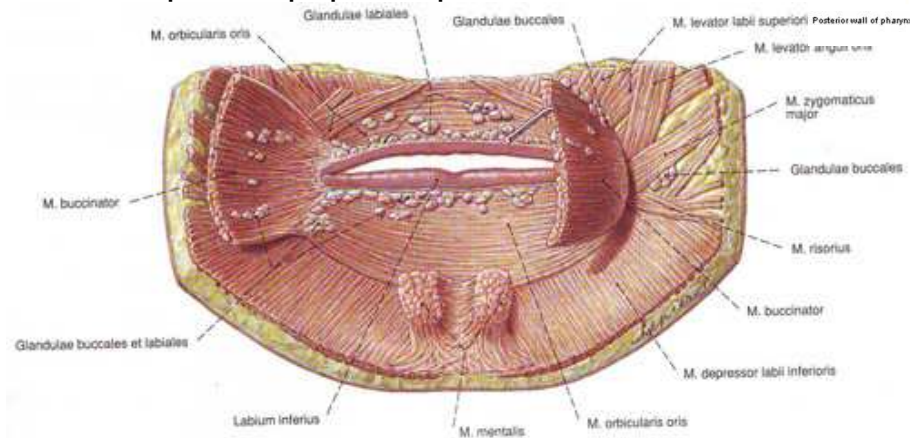
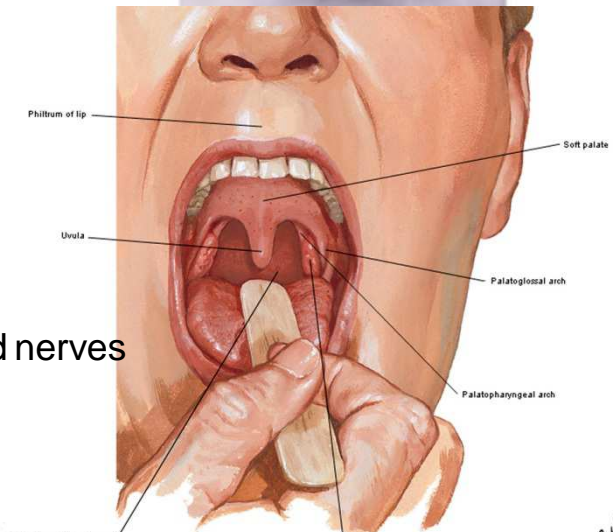
structure

Regio oralis



Oral region

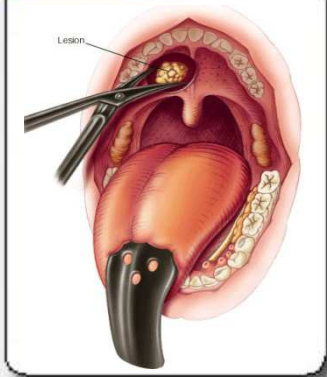
- boundaries:
 - ✓ superior – line of attachment of nasal septum
 - ✓ inferior – mentolabial sulcus
 - ✓ lateral – nasolabial crease
- lips, *labia oris*:
 - ✓ skin – thin and hairy
 - ✓ vermilion border (reddish area)
 - ✓ muscle layer – orbicularis oris muscle
 - ✓ oral mucosa – labial glands, vessels and nerves
- oral vestibule, *vestibulum oris*:
 - ✓ *frenula labiorum, superius et inferius*
 - ✓ parotid papilla ⇔ parotid duct



location

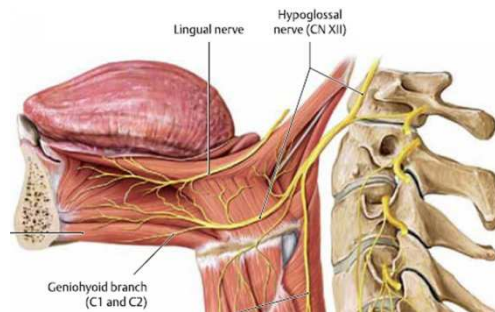
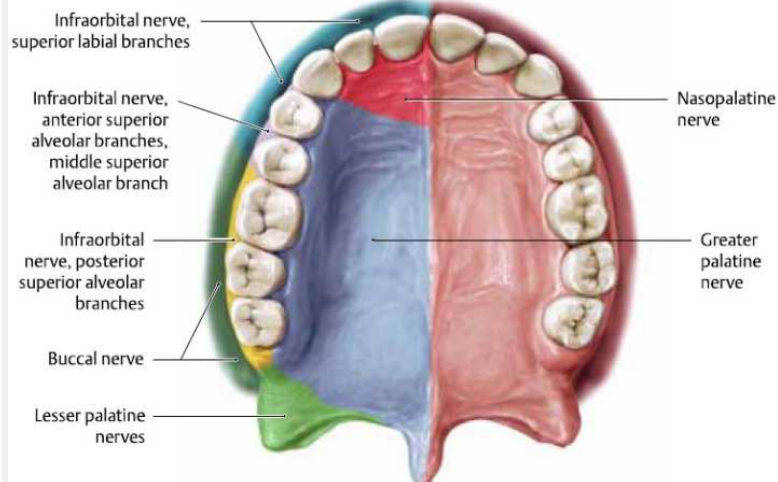
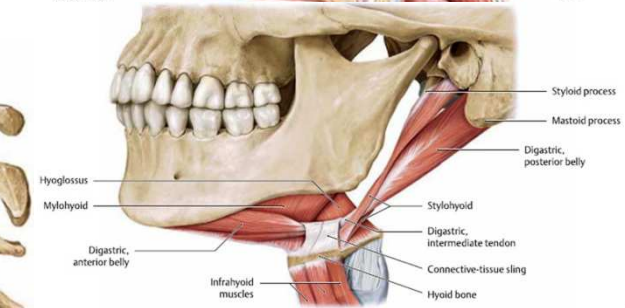
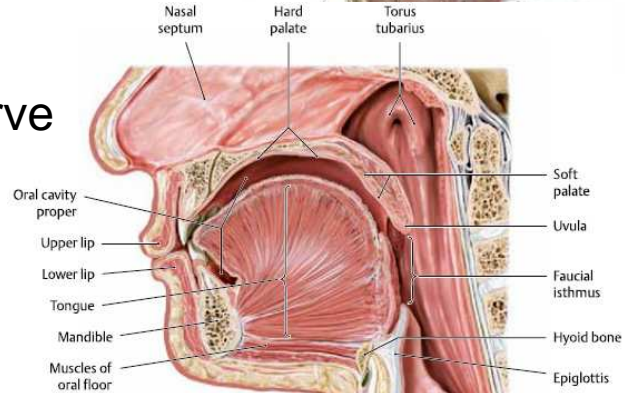
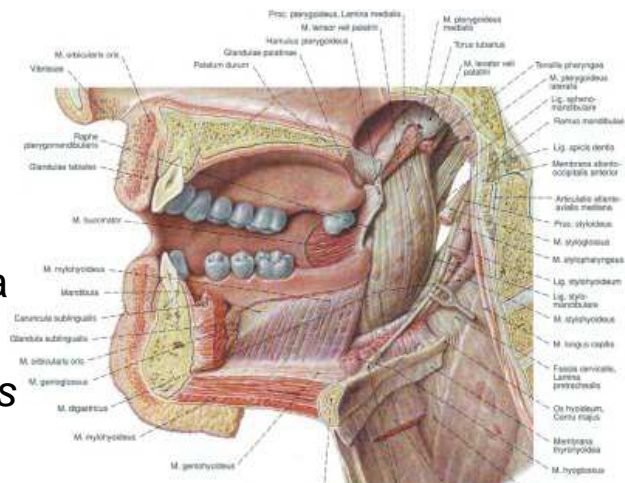
structure

Regio oralis



Oral region

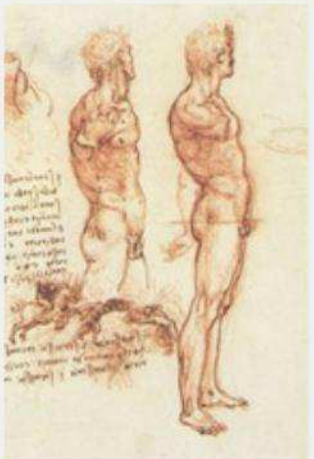
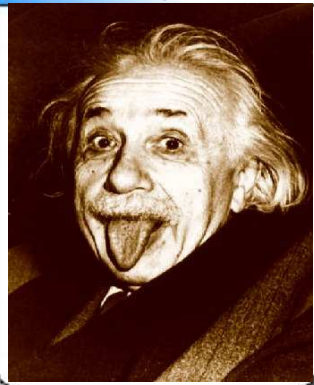
- oral cavity proper, *cavitas oris*
- palate, *palatum* – hard and soft
- palatine tonsil, *tonsilla palatina*:
 - ✓ tonsillar fossa ⇒ supratonsillar fossa
- oral floor, *diaphragma oris*:
 - ✓ *m. mylohyoideus*, *m. geniohyoideus*
 - ✓ *m. genioglossus*, *m. hyoglossus*, *m. styloglossus*
- tongue, *lingua* (Gr. γλᾶσσα, *glossa*)
- lingual nerve, glossopharyngeal nerve
- lingual artery, deep lingual vein



location

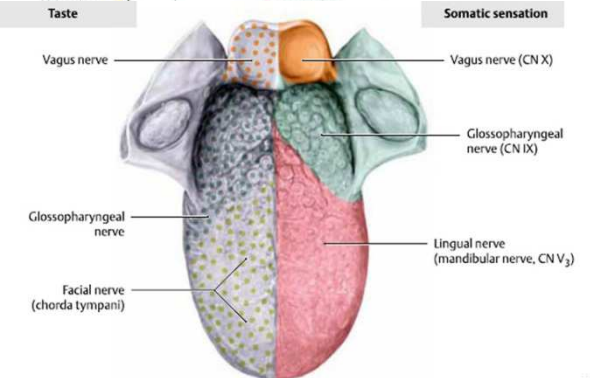
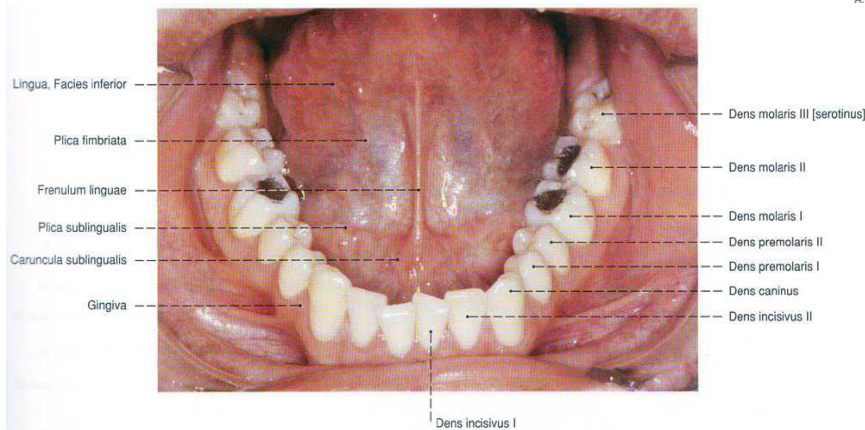
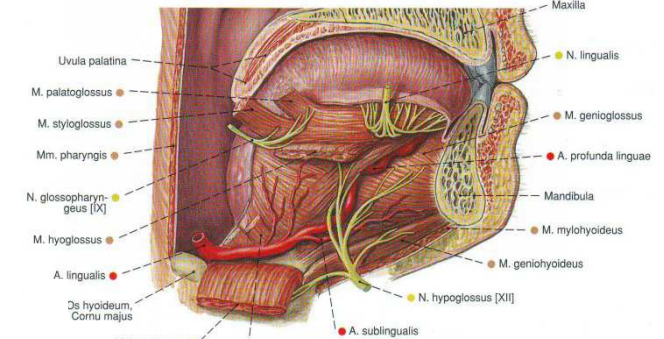
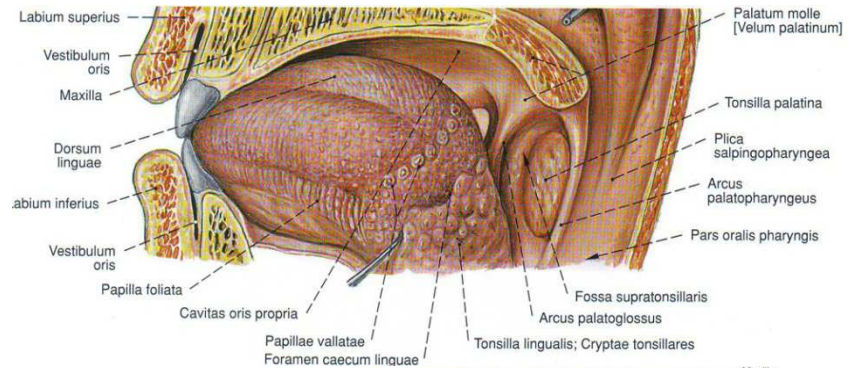
structure

Lingua



Tongue, *lingua*

- *dorsum linguae*:
 - ✓ *papillae linguales*
 - ✓ *tonsilla lingualis*
- *facies inferior*:
 - ✓ *frenulum linguae*
 - ✓ *plica fimbriata*
 - ✓ *plica sublingualis*
 - ✓ *caruncula sublingualis*



Franz Joseph Gall
(1758-1828)

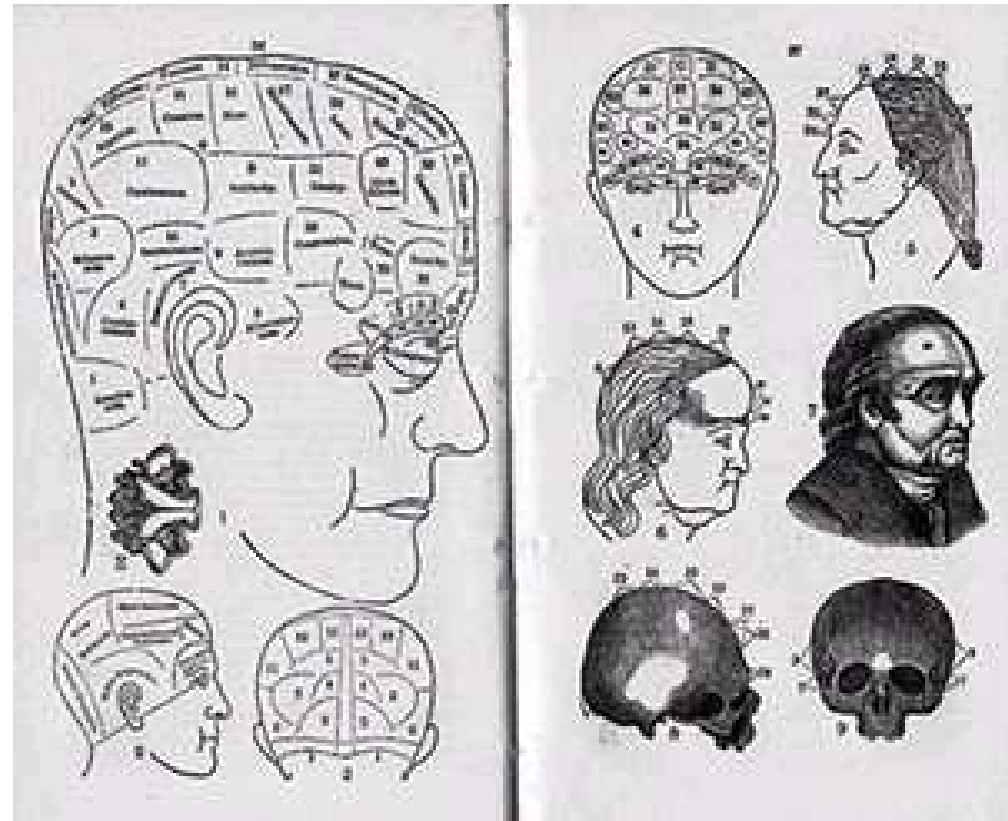


phrenology
today

Phrenology

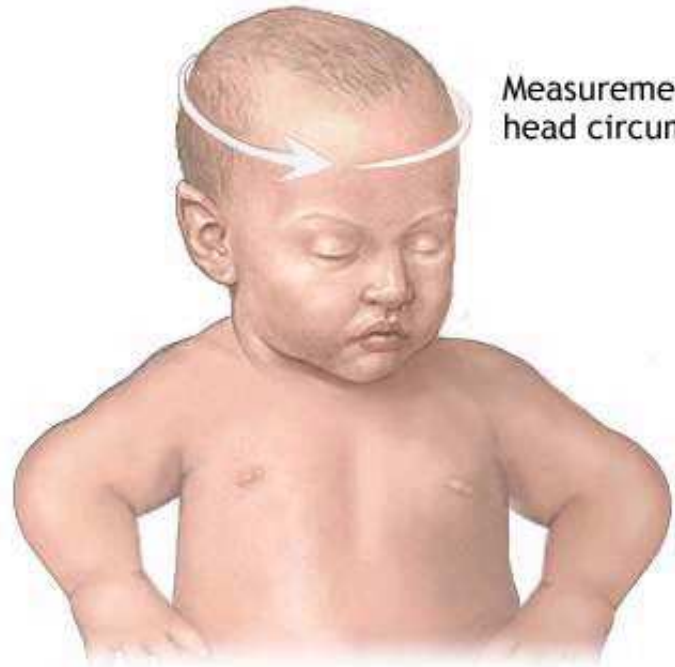
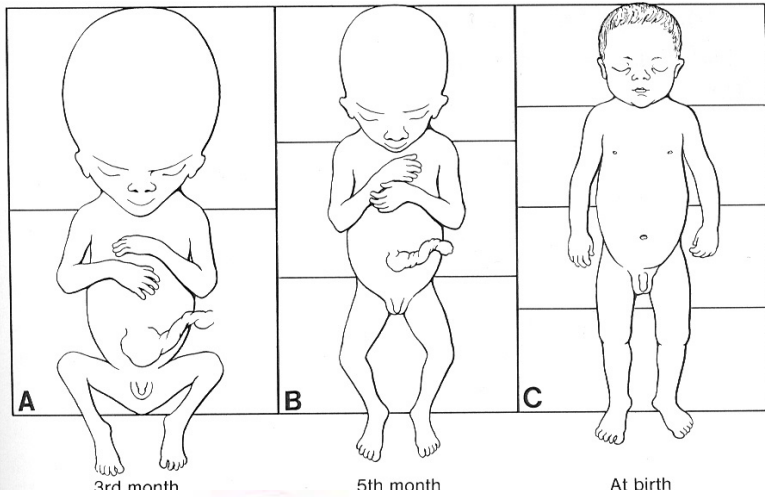
Gr.: φρήν, *phrēn*, “mind“ + λόγος, *logos*, “knowledge“

the science which studies the relationships between a person's character and the morphology of the skull



27 brain regions = 27 “brain organs”

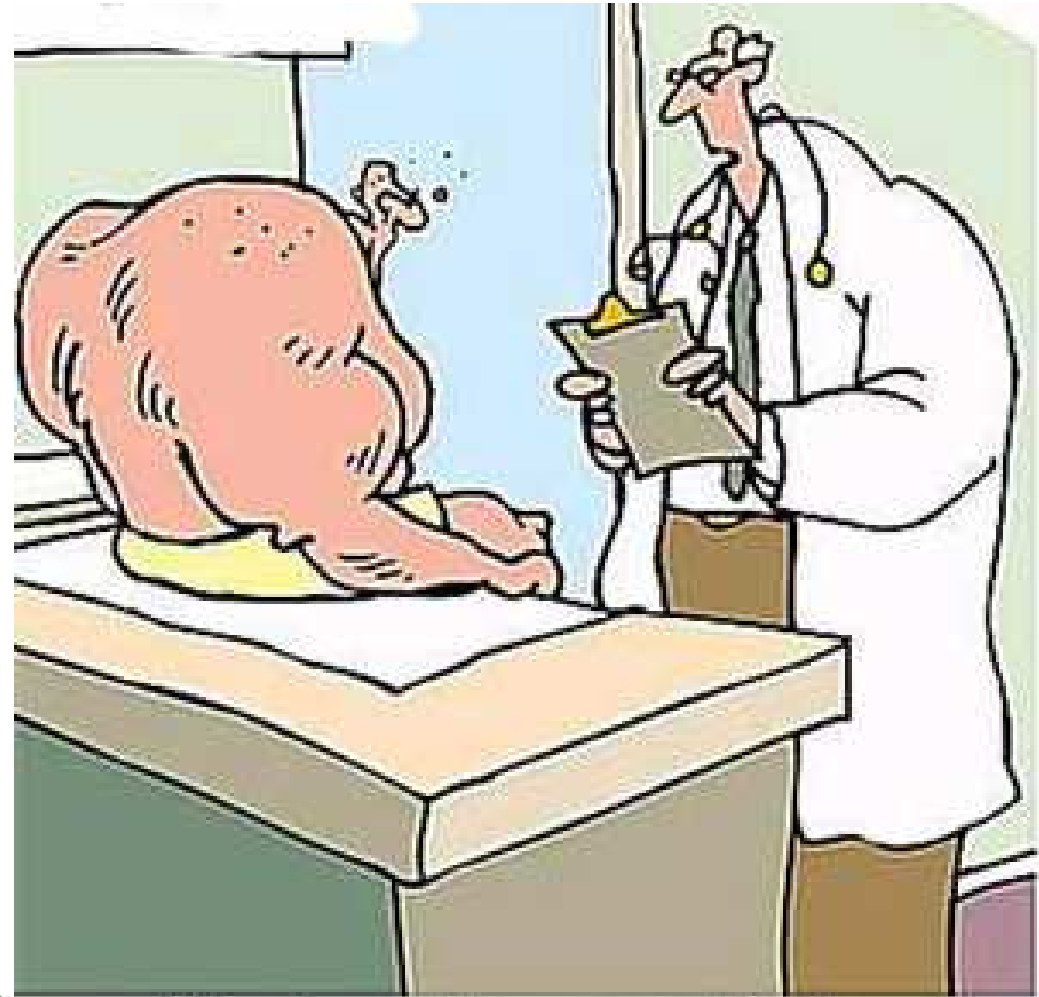
Prof. Dr. Nikolai Lazarov



Measurement of head circumference

ADAM.

Head vs. body



"Try to get less exercise."

Thank you ...

Prof. Dr. Nikolai Lazarov