

Topographic regions of the head. Local anaesthesia in dentistry.
Odontogenic infections.

Illustrations

Anatomy 1 - R. Čihák

Atlas of Human Anatomy – Netter

Regional Anatomy – M. Grim

Oral surgery (Fragiskos D. Fragiskos, DDS, PhD)

Martin Bartoš, MD, DMD, PhD

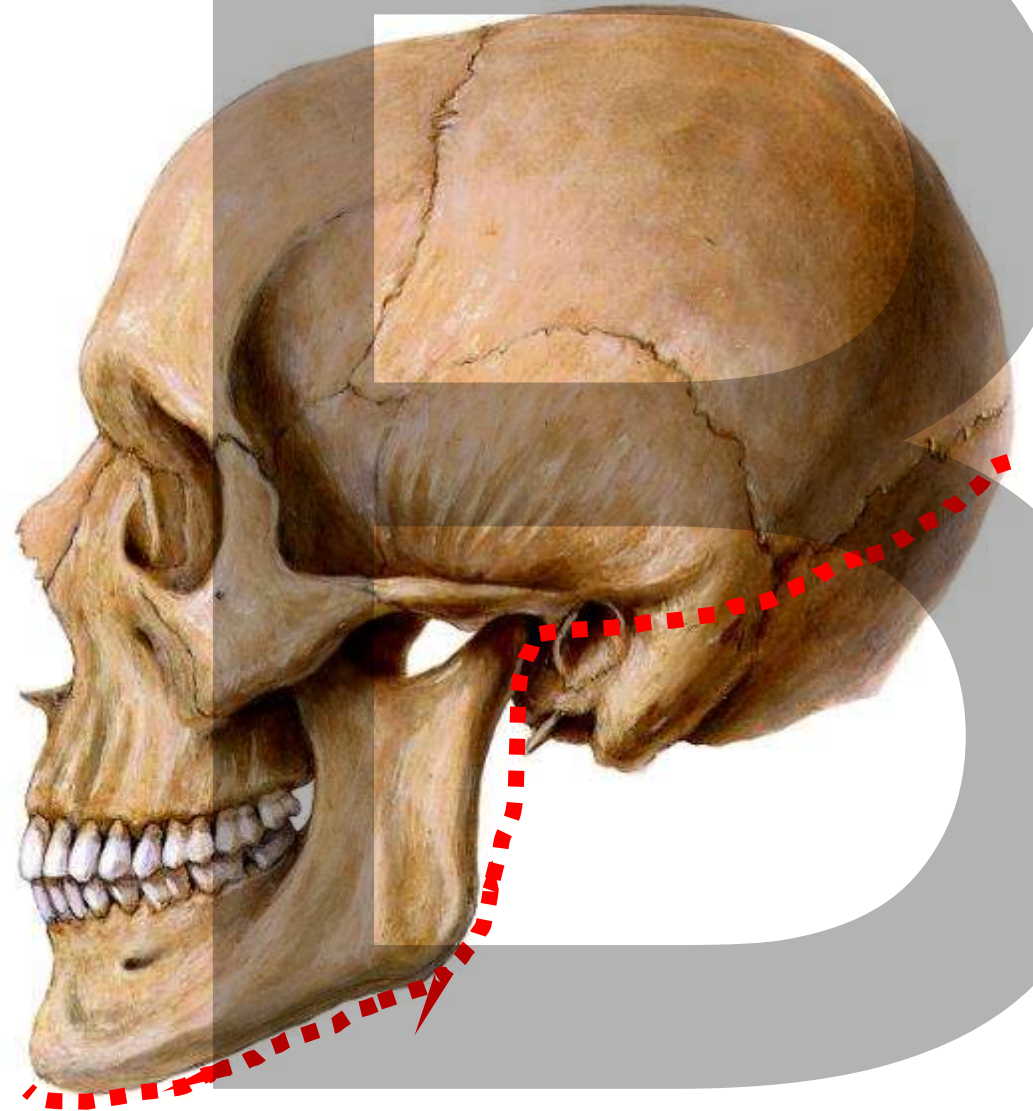
Institute of Dental Medicine

Institute of Anatomy

First Faculty of Medicine, Charles university

Head?

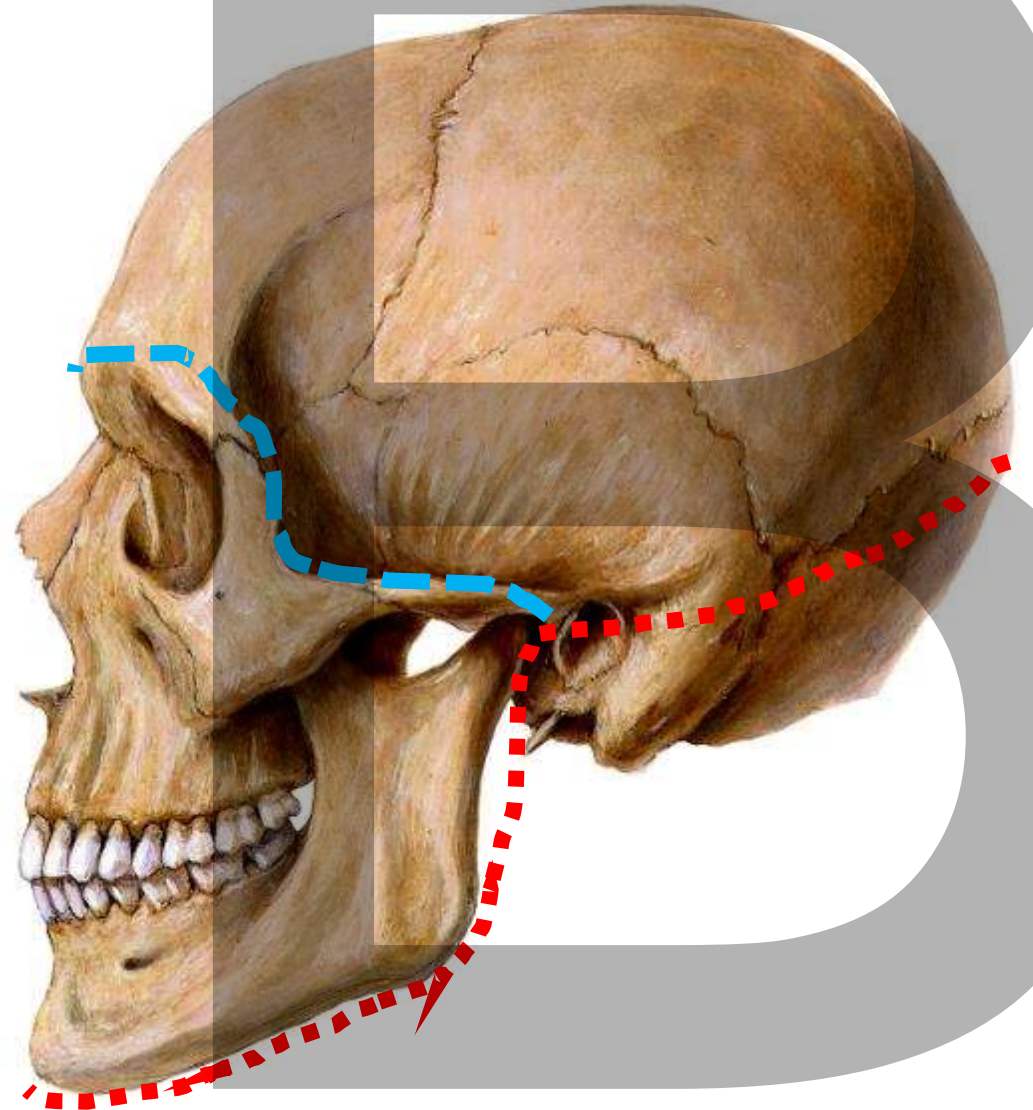
- Defined from the neck...
 - External occipital protuberance
 - Superior nuchal line
 - External acoustic meatus
 - Margin of the mandible



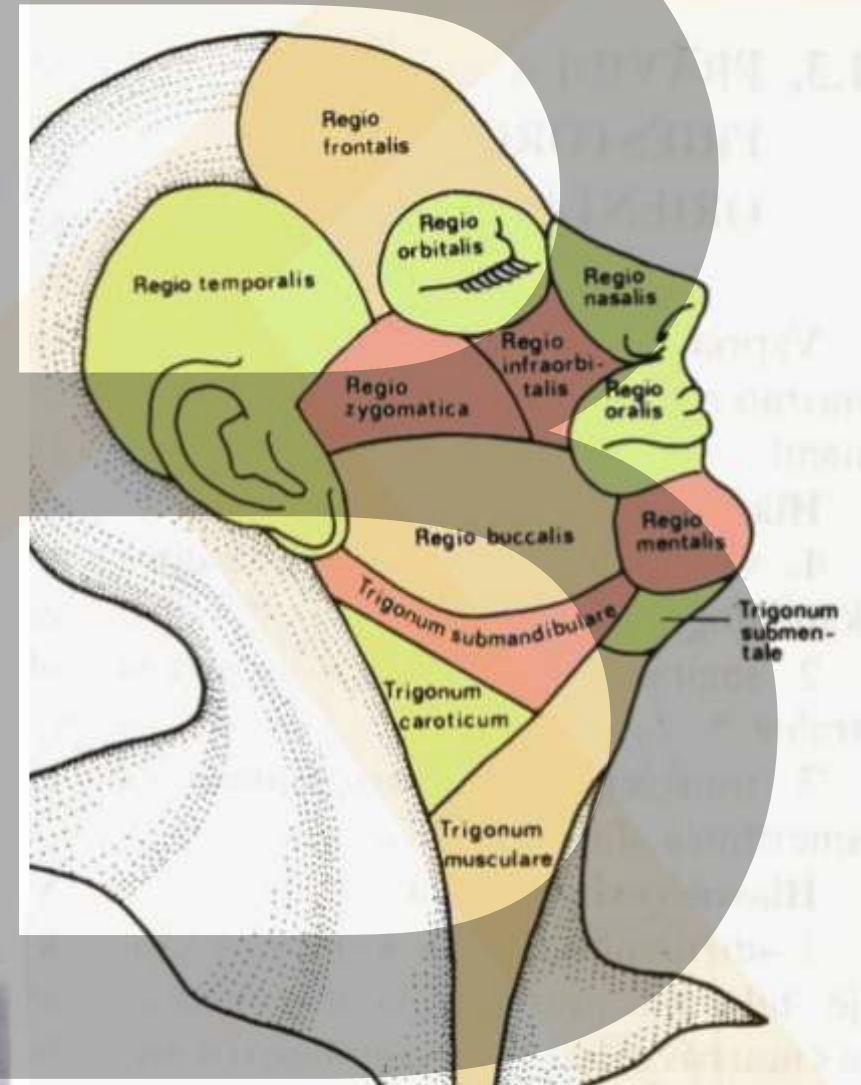
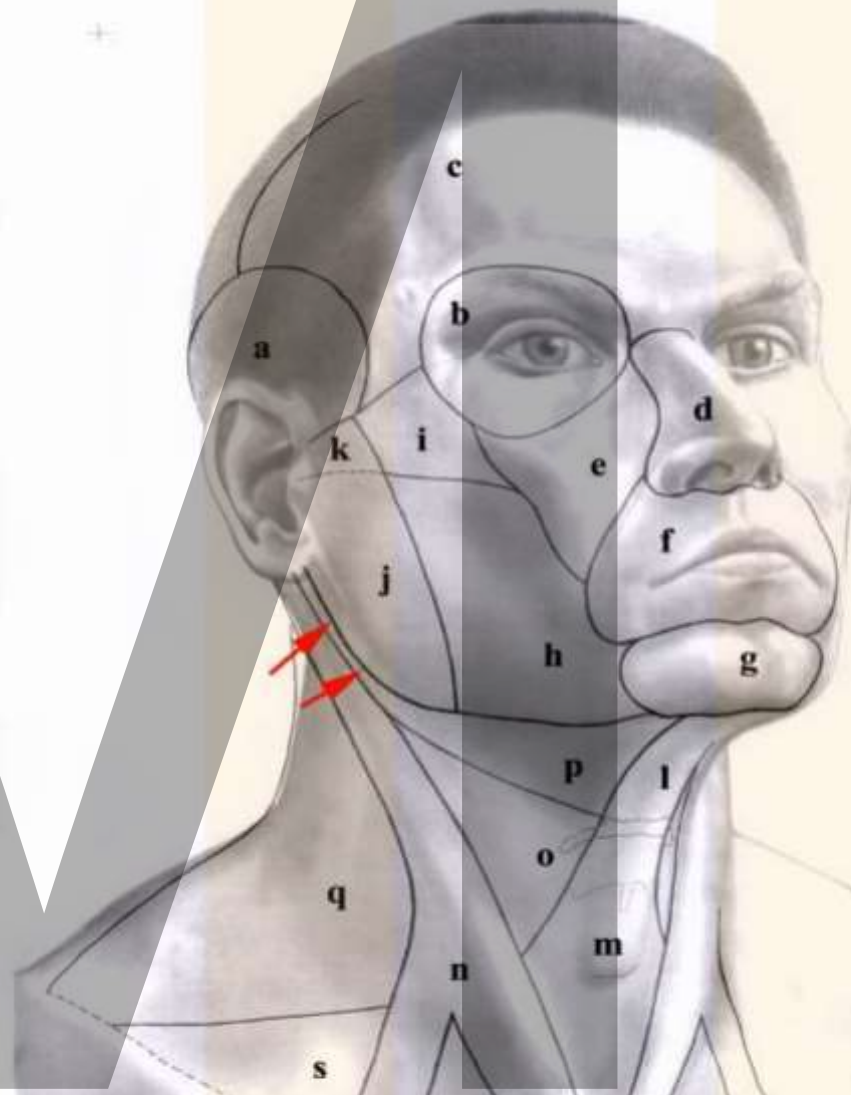
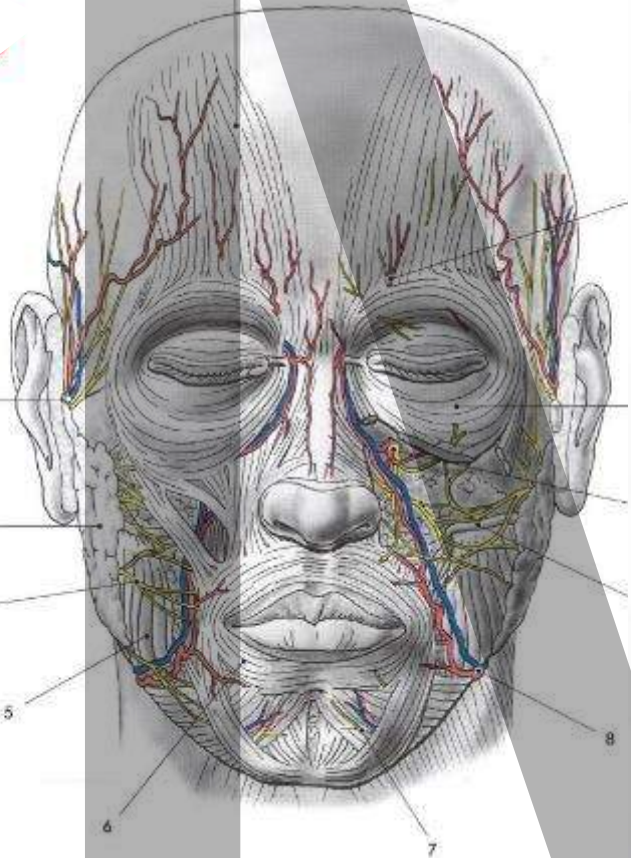
Head

- **Neurocranium**
x **splanchnocranium (face)**

- Superficial borders
 - External acoustic pore
 - Zygomatic arch
 - Superciliary arch
 - Glabella
- Deep borders
 - External cranial base

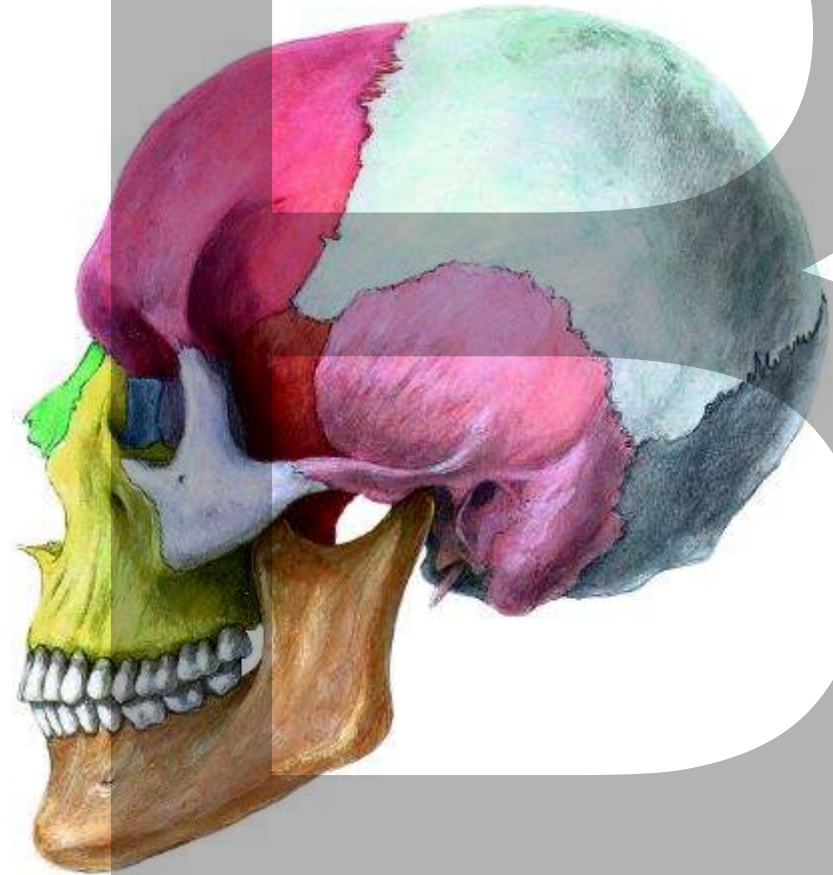


Head regions - review



from a lecture by MUDr. I. Klepáček, CSc.

The brain case – superficial regions



Regions are defined by underlying bones (calvarial bones)

The brain case – superficial regions



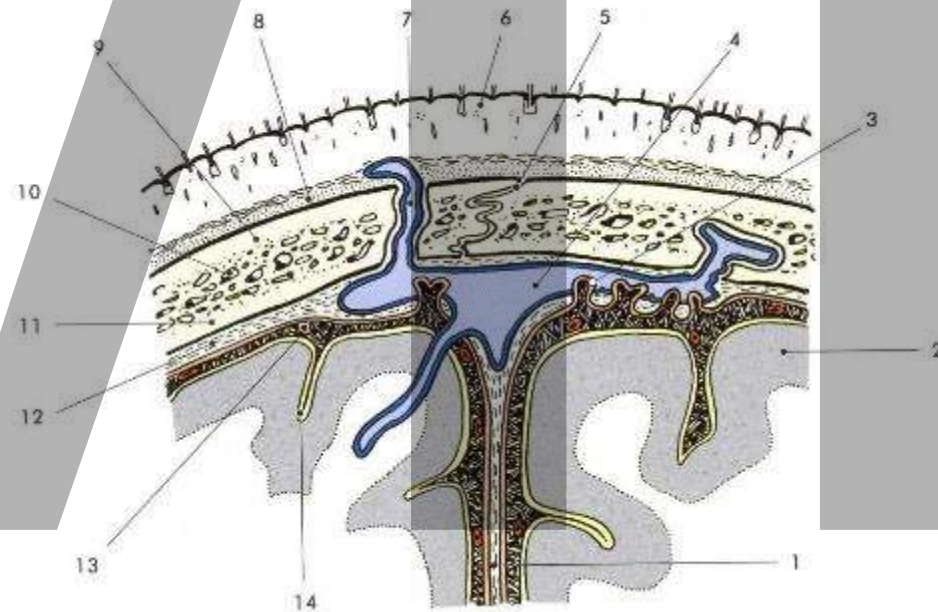
Region:

- Frontal
- Parietal
- Temporal
- Occipital



Scalp – soft tissue

- Skin
- Subcutaneous connective tissue
- Galea aponeurotica (dense)
- Loose conn.t.

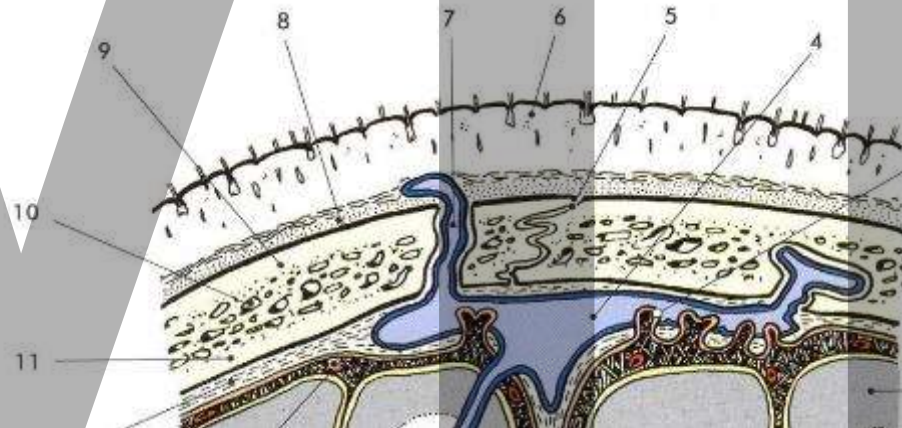
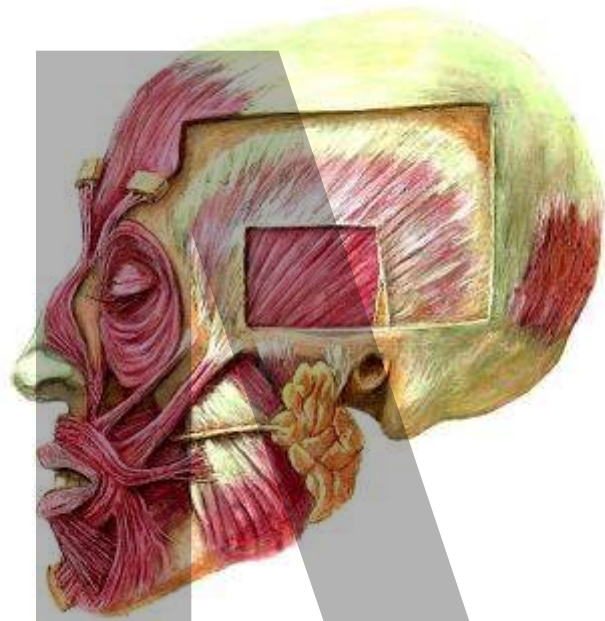


Scalp – soft tissue

- Skin
- Subcutaneous connective tissue
- Galea aponeurotica (dense)
- Loose conn.t.
- Pericranium (periosteum)

Minimal movements

Scalping injuries
Gaping wounds



Scalp – soft tissue

- Skin
- Subcutaneous connective tissue
- Galea aponeurotica (dense)
- Loose conn.t.

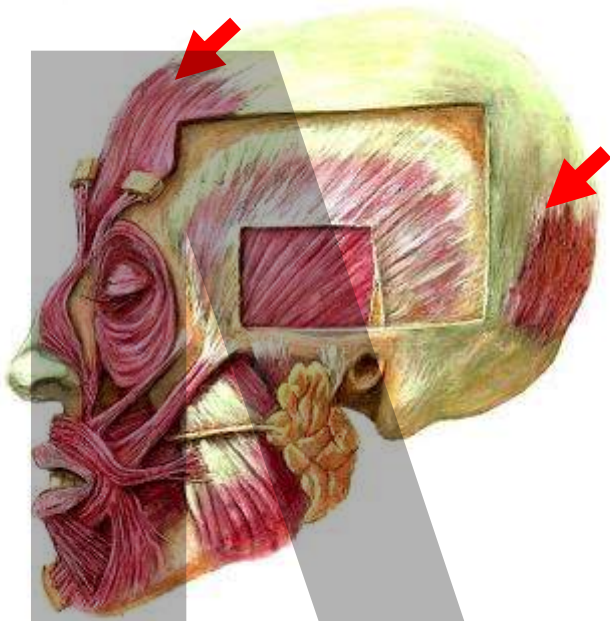
Muscles

m. epicranii

- m. occipitofrontalis

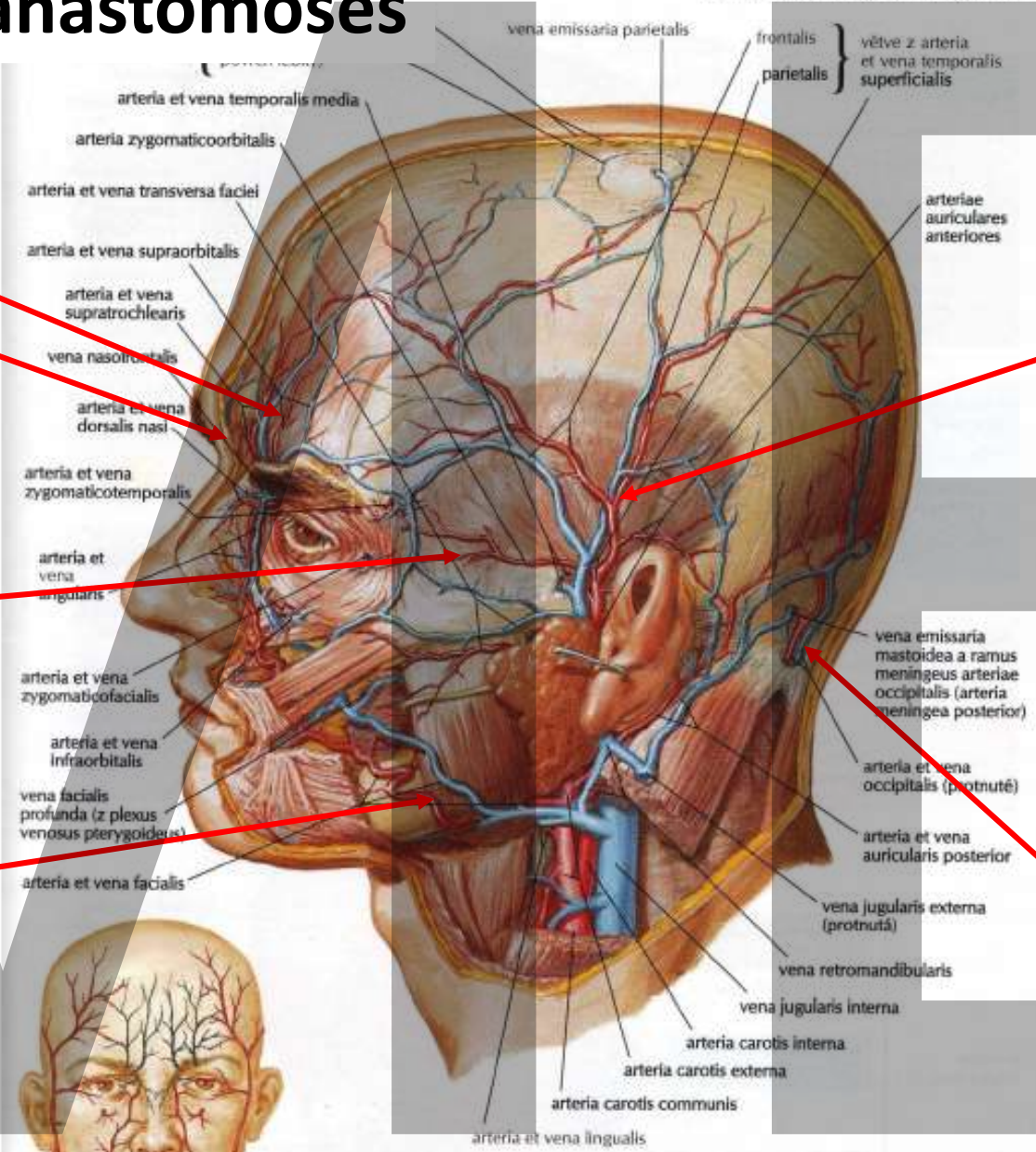
- m. temporoparietalis

n. VII



Arteries and their anastomoses

VIZ TAKÉ TABULE 30, 36, 65, 66, 81, 98



Supraorbital a.
Supratrochlear a.
(internal carotid a.)

Spf. Temporal a.

zygomaticoorbital

Facial a.

Occipital a.

External carotid a.



cévní zásobení obličeje:
 černě: z arteria carotis interna (prostřednictvím arteria ophthalmica)
 červeně: z arteria carotis externa

F. Netter
© 1984

Arteries and their anastomoses

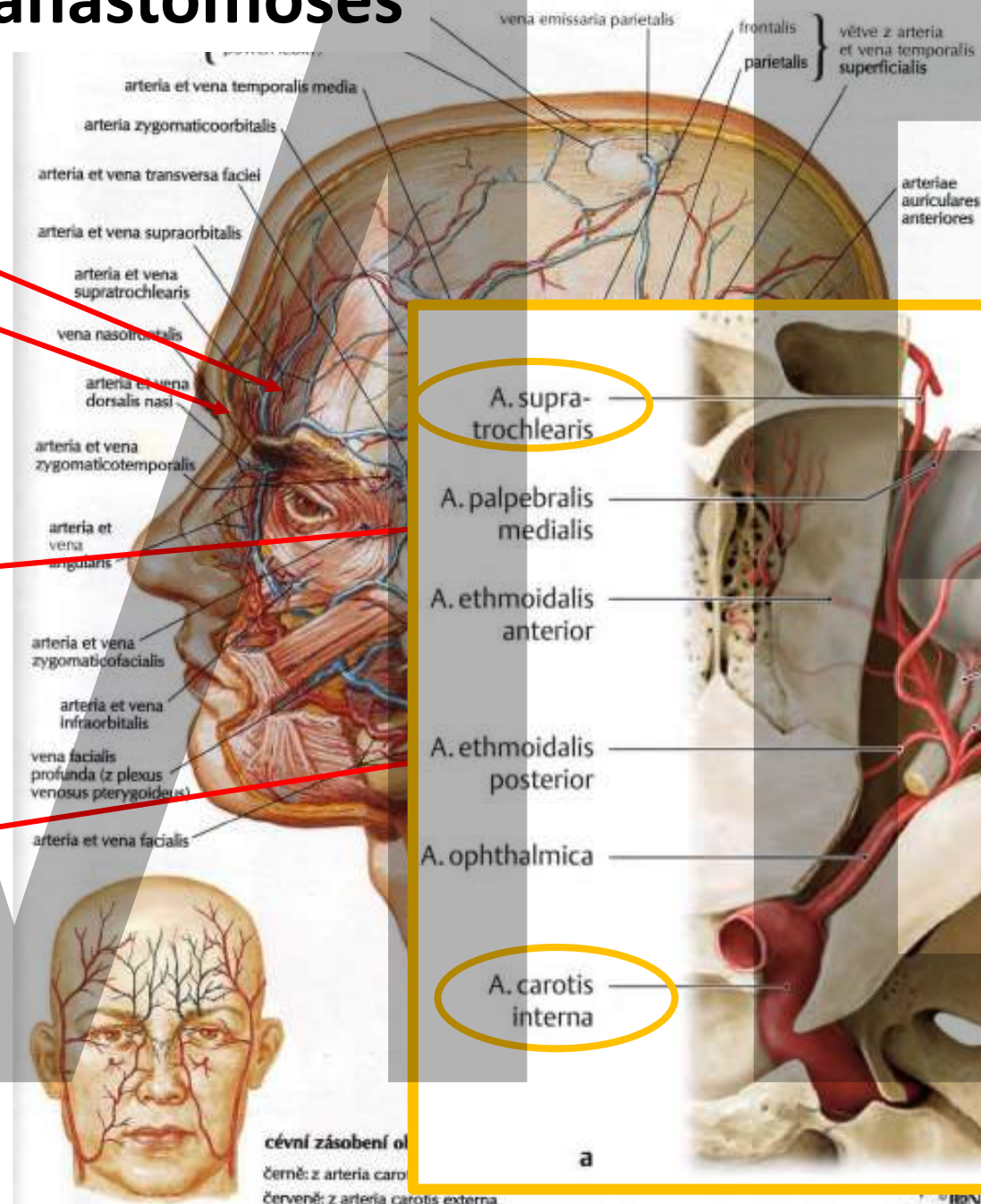
VIZ TAKÉ TABULE 30, 36, 65, 66, 81, 98

Supraorbital a.
Supratrochlear a.
(internal carotid a.)

zygomaticoorbital




Facial a.

External carotid a.

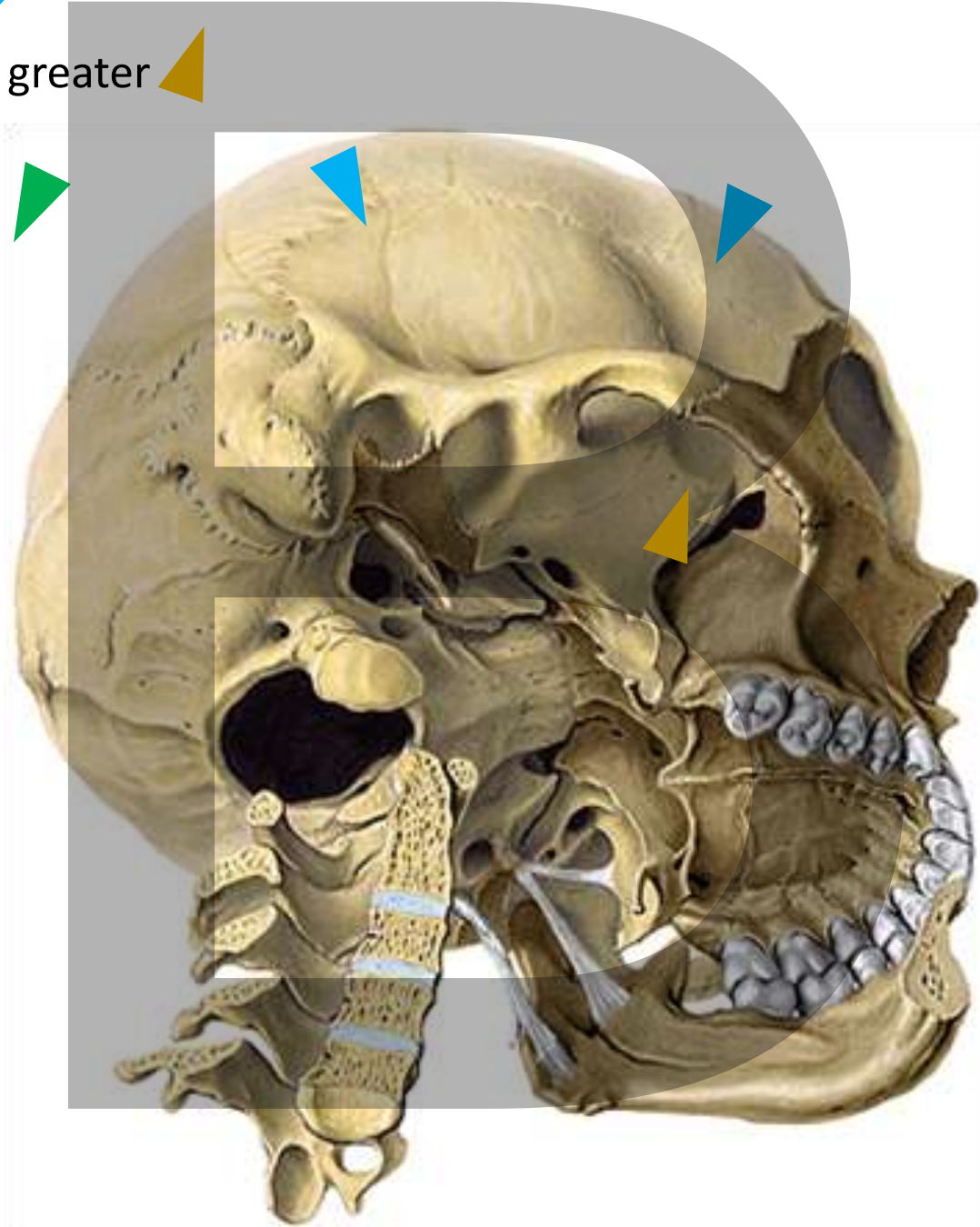
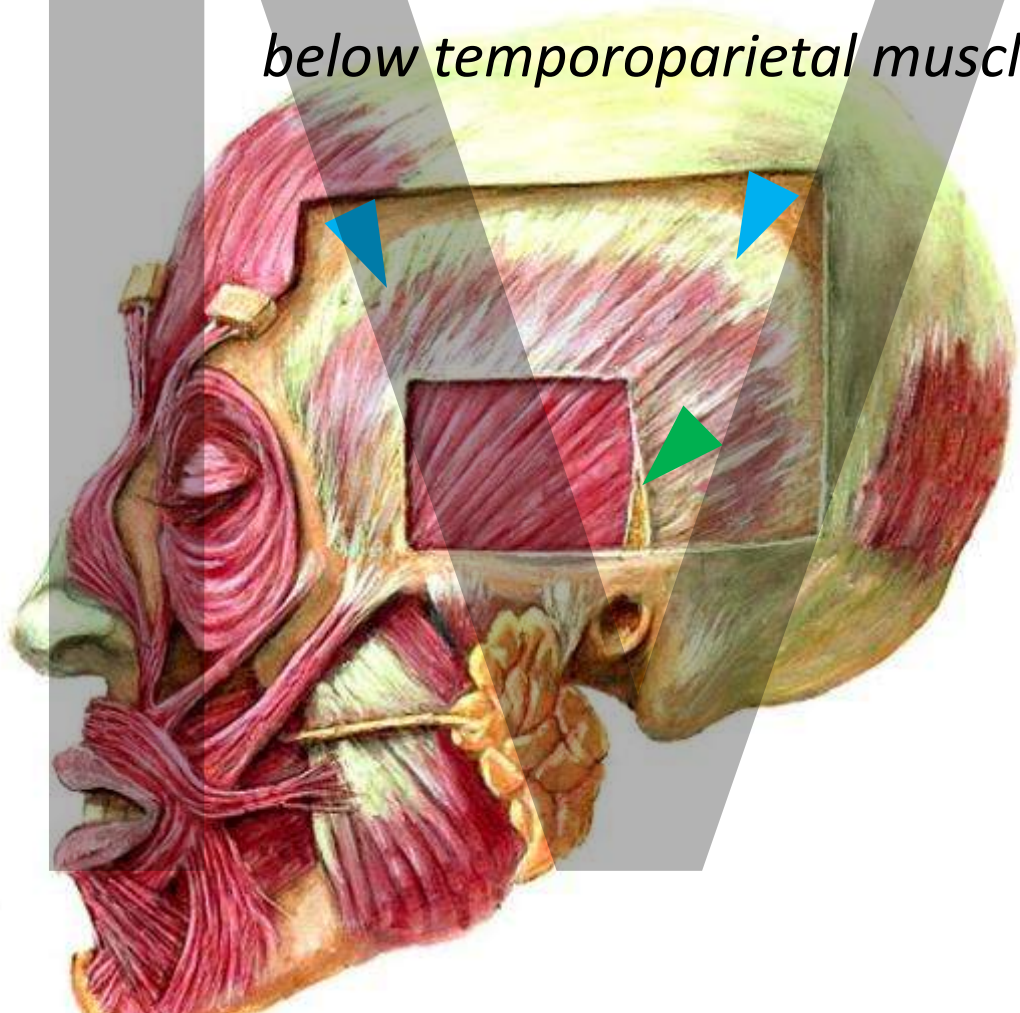


cévní zásobení ol
černě: z arteria caro
červeně: z arteria carotis externa

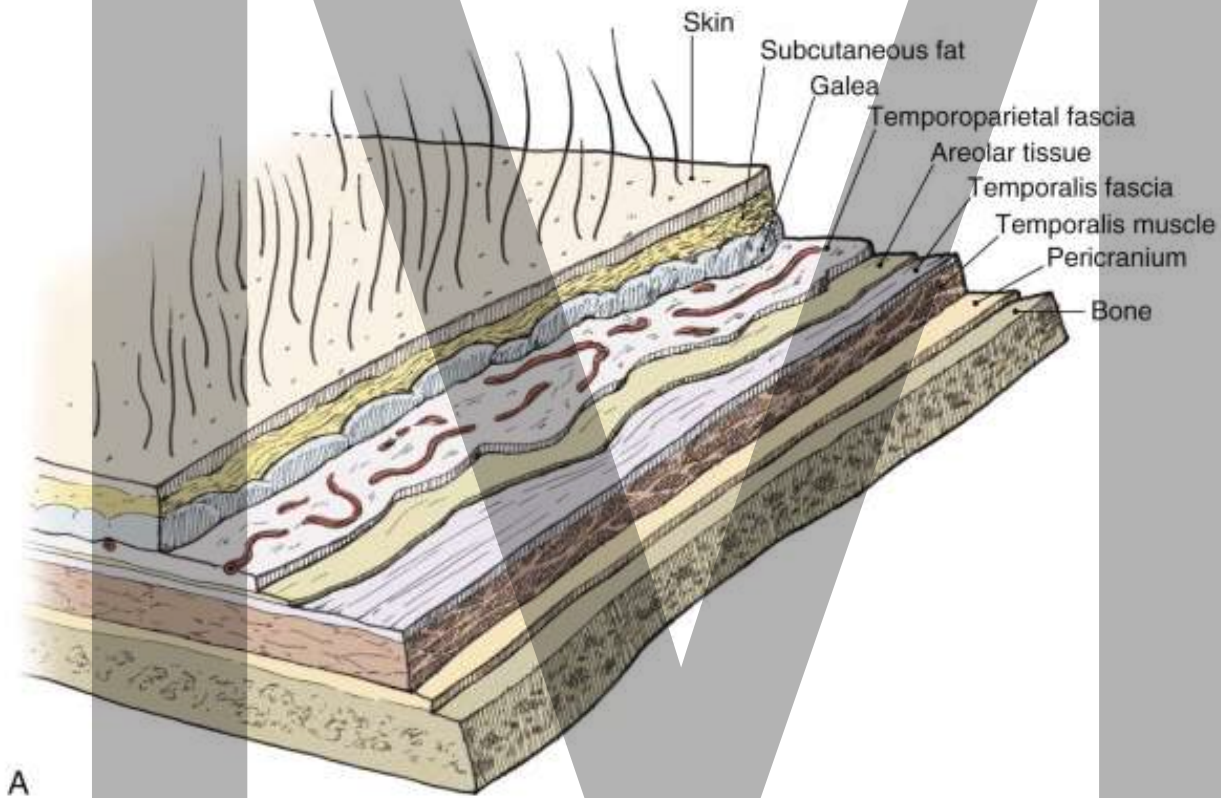
Temporal fossa

- Superior temporal line 
- Infratemporal crest of the greater wing of the sphenoid 
- Temporal fascia (2 layers) 
- Temporal muscle

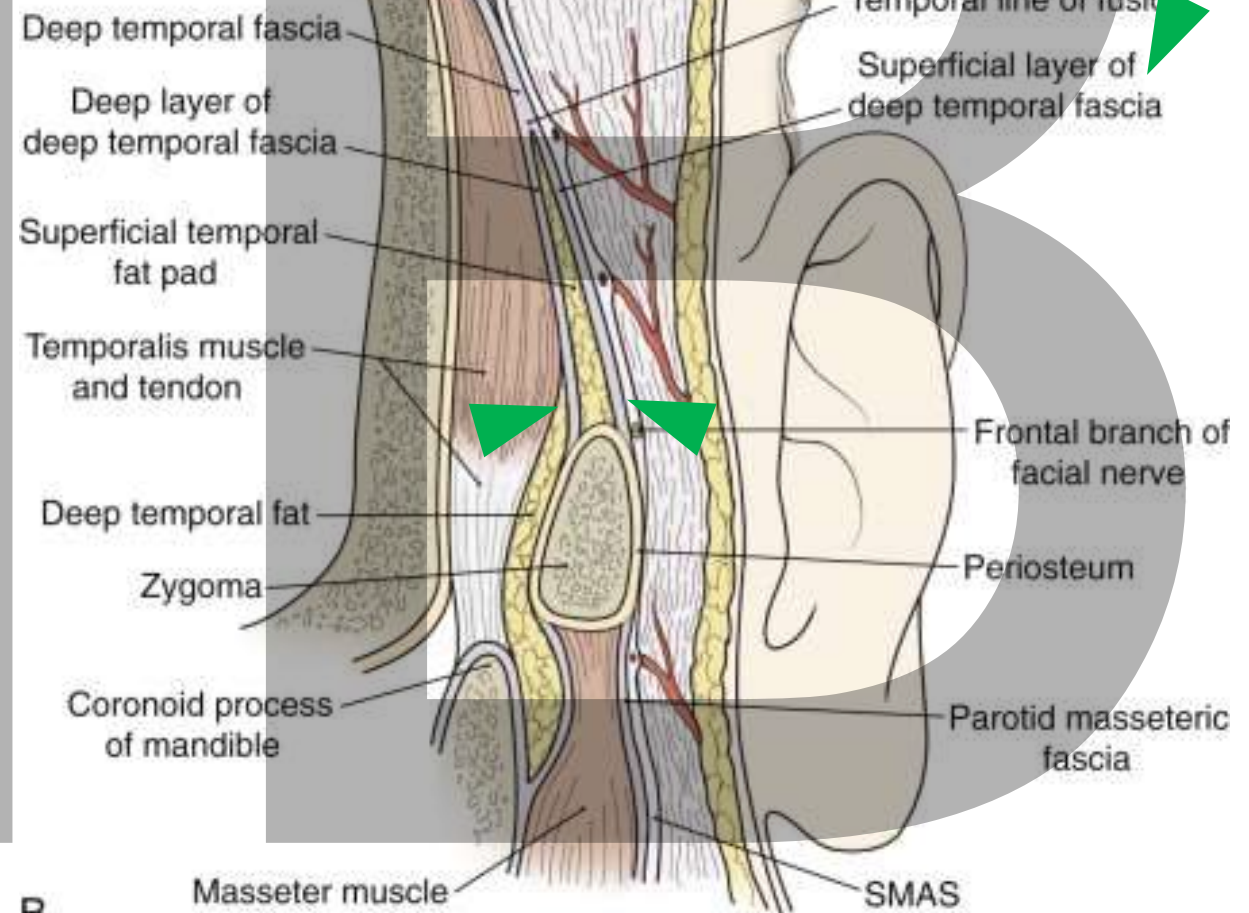
below temporoparietal muscle



Temporal fascia



A



B

Face

Superficial regions:

Orbital

Infraorbital

Nasal

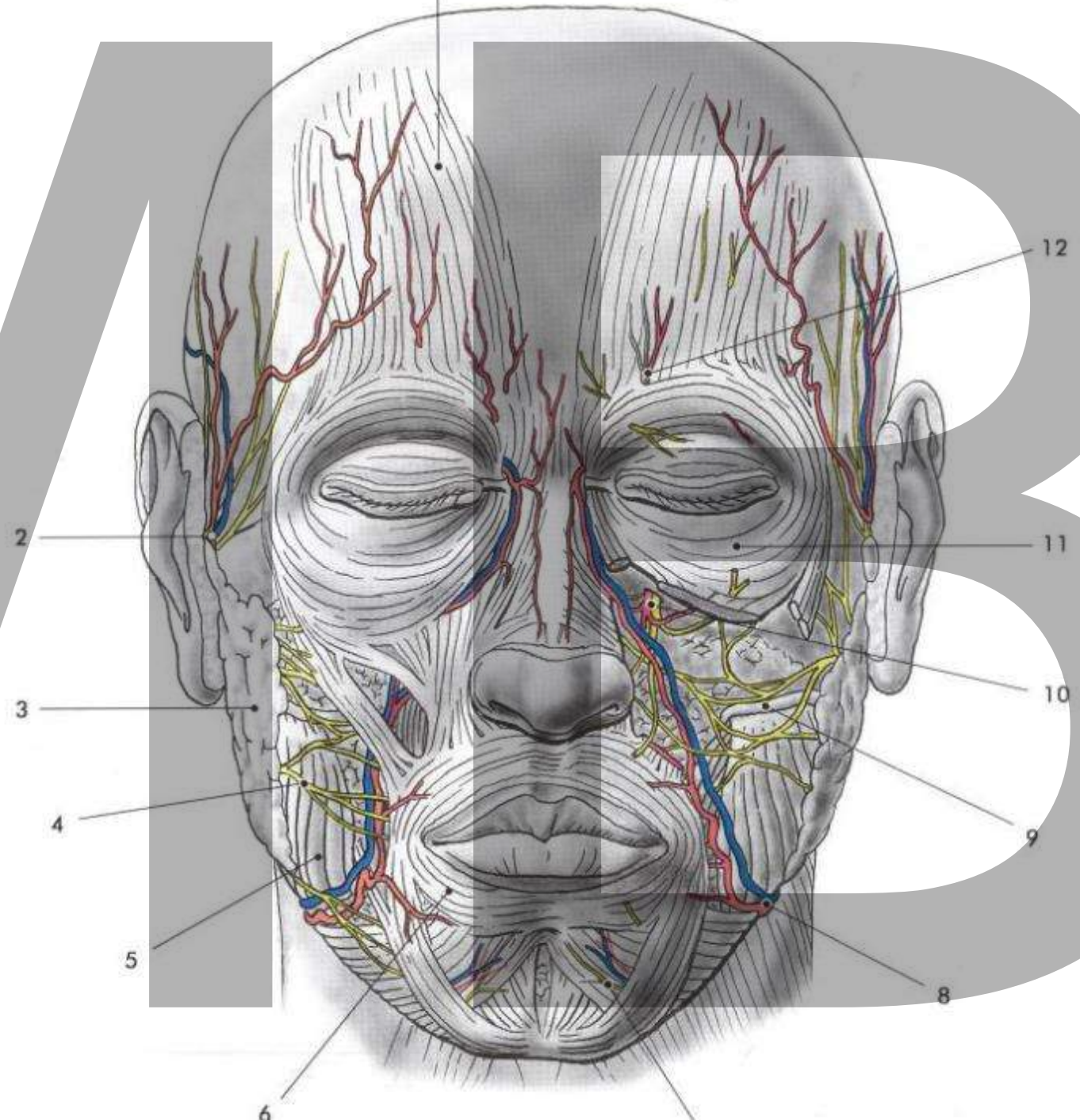
Oral

Buccal

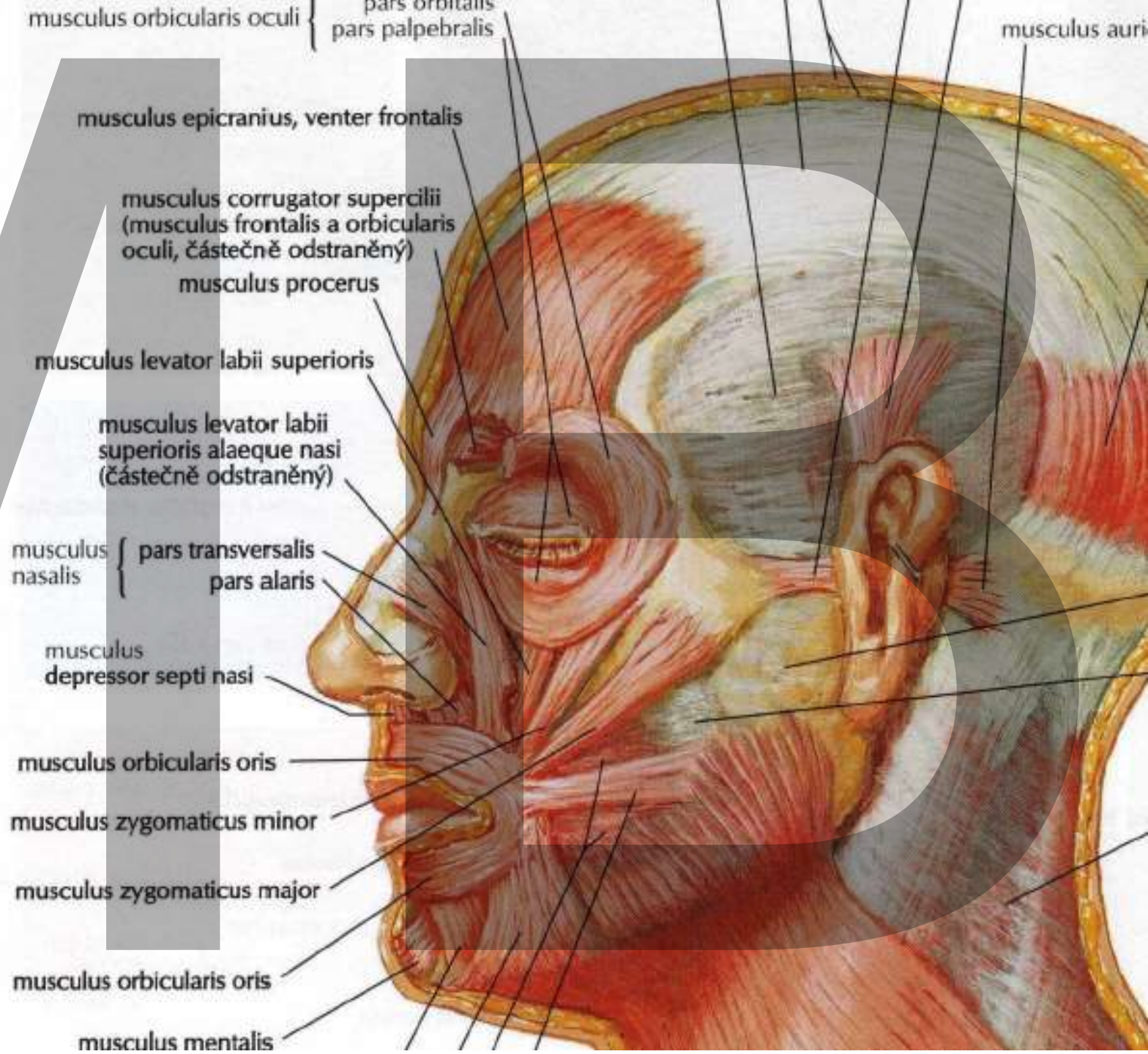
Parotidomasseteric

Mental

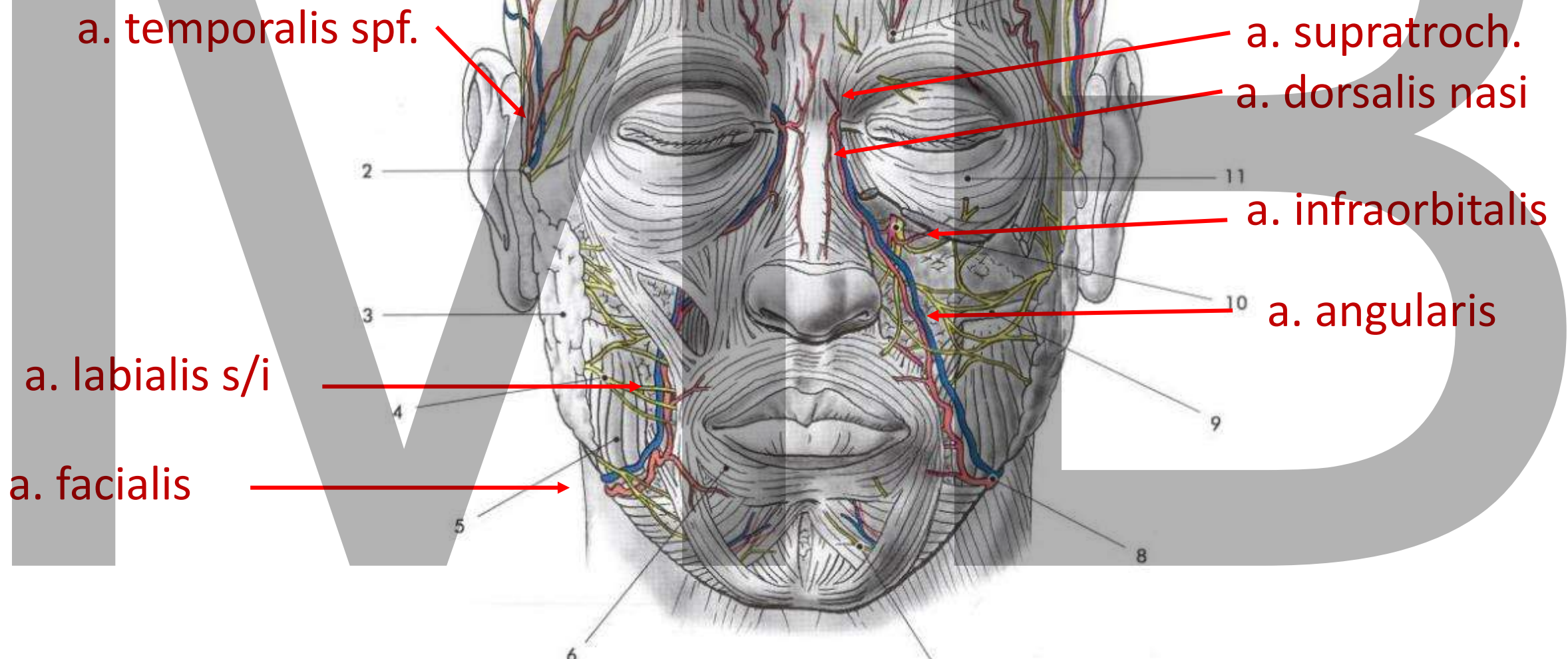
Zygomatic

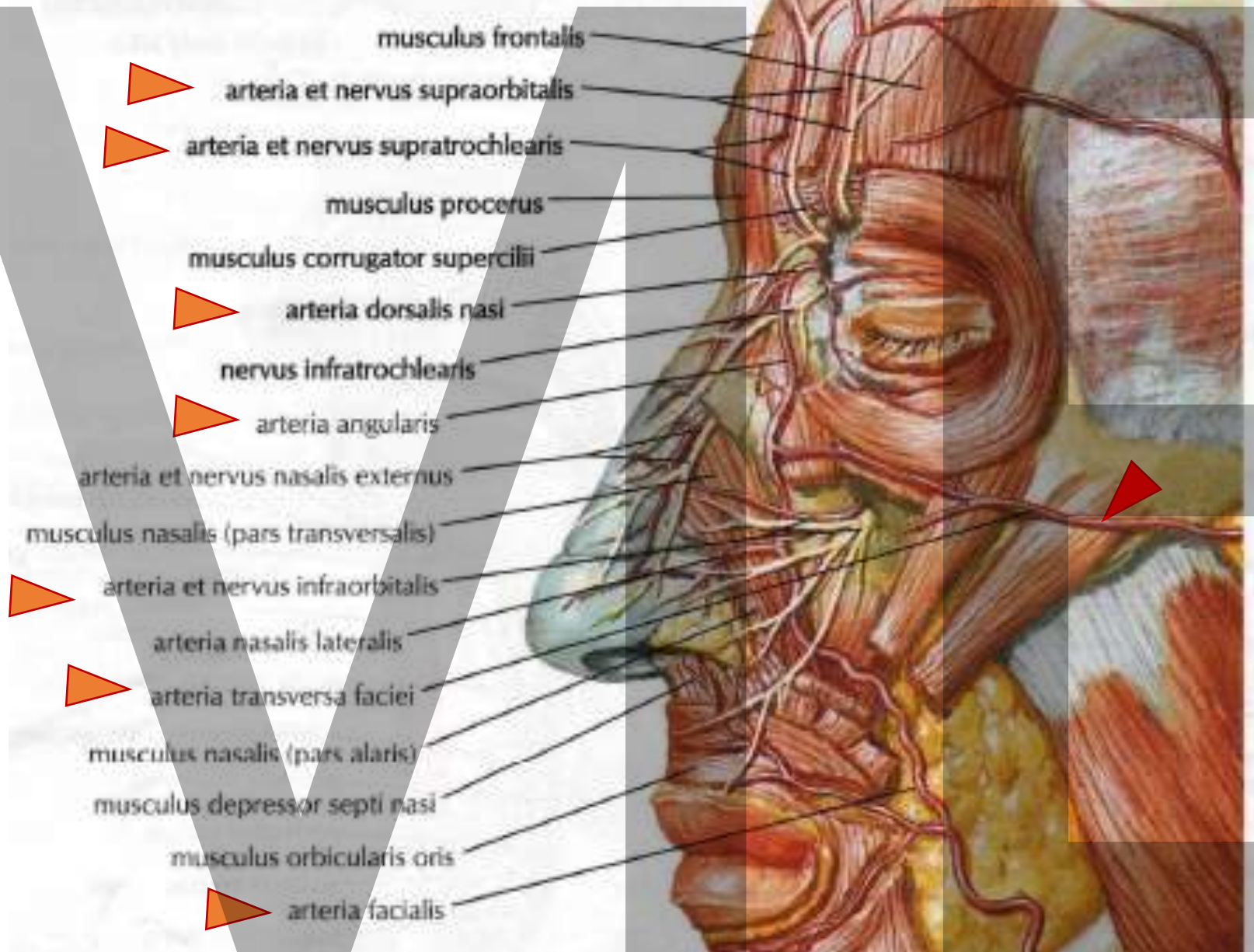


Mimic/ facial muscles



Arteries





musculus frontalis

arteria et nervus supraorbitalis

arteria et nervus supratrochlearis

musculus procerus

musculus corrugator supercilii

arteria dorsalis nasi

nervus infratrochlearis

arteria angularis

arteria et nervus nasalis externus

musculus nasalis (pars transversalis)

arteria et nervus infraorbitalis

arteria nasalis lateralis

arteria transversa faciei

musculus nasalis (pars alaris)

musculus depressor septi nasi

musculus orbicularis oris

arteria facialis

Arterial arches

arteria carotis interna

pohled zepředu

ramus frontalis z arteria temporalis superficialis

arteria palpebralis lateralis superior

arteria palpebralis lateralis inferior

arteria zygomaticofacialis

arteria transversa faciei

arteria infraorbitalis

arteria supraorbitalis

arteria supratrochlearis

arteria dorsalis nasi

arteria palpebralis medialis superior

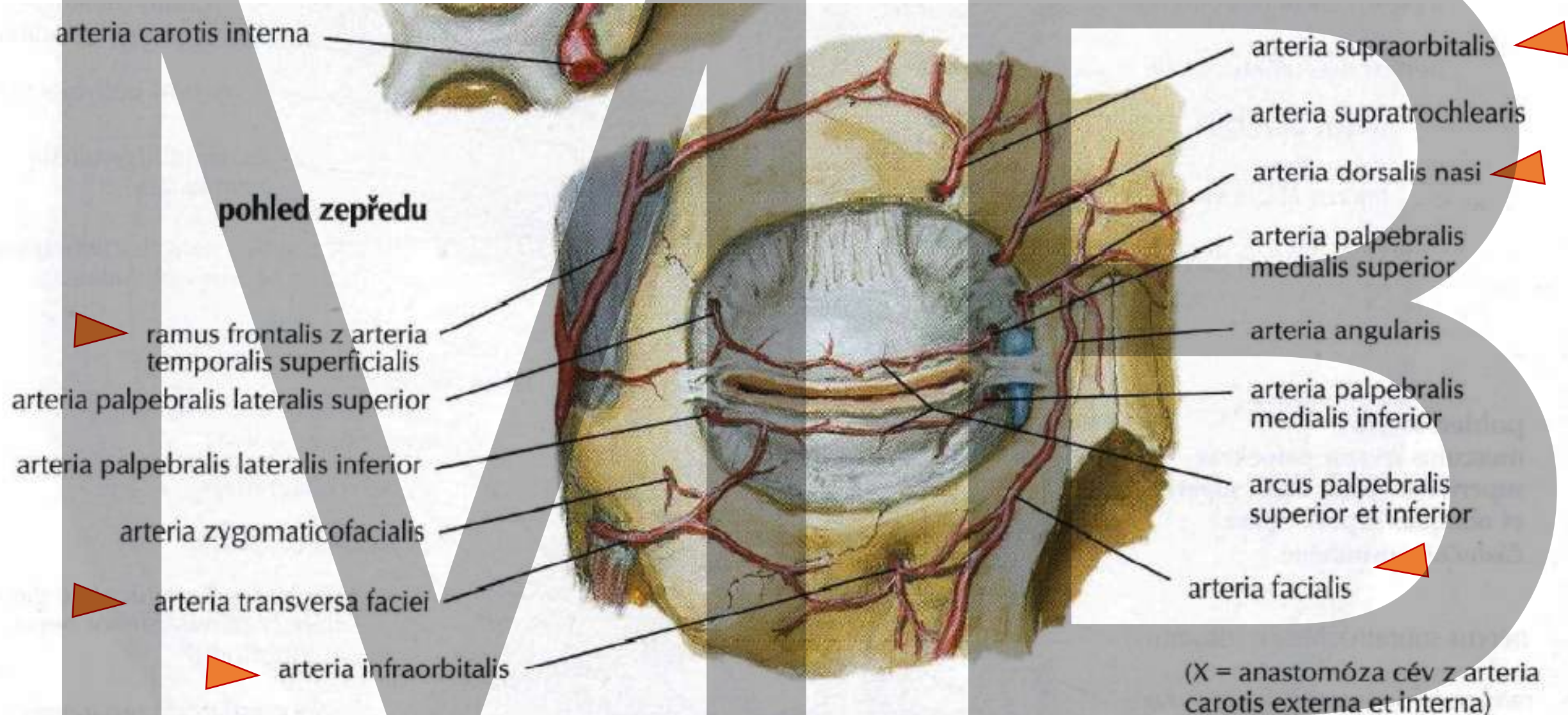
arteria angularis

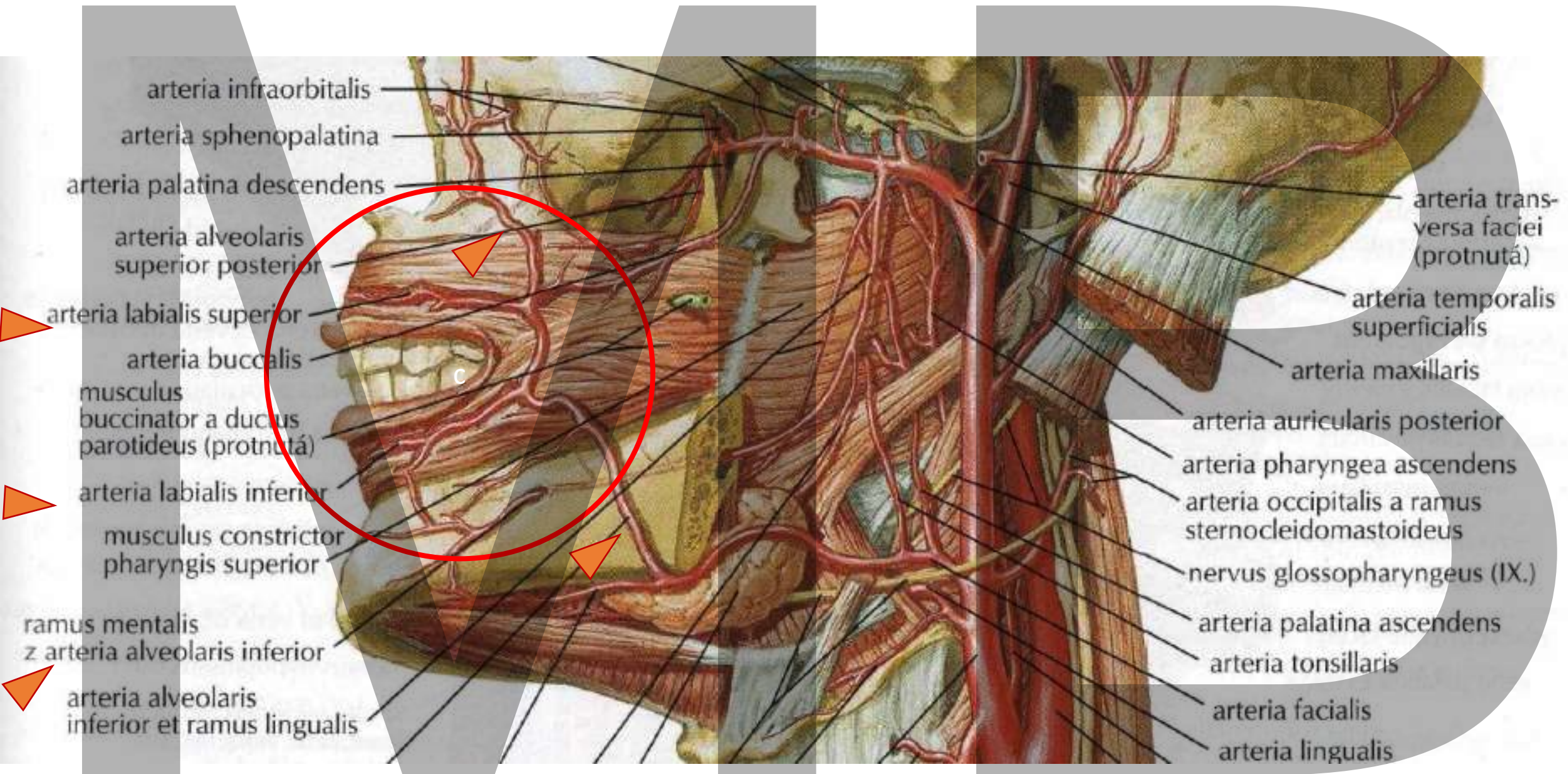
arteria palpebralis medialis inferior

arcus palpebralis superior et inferior

arteria facialis

(X = anastomóza cév z arteria carotis externa et interna)





arteria infraorbitalis

arteria sphenopalatina

arteria palatina descendens

arteria alveolaris superior posterior

arteria labialis superior

arteria buccalis

musculus buccinator a ducus parotideus (protrudatá)

arteria labialis inferior

musculus constrictor pharyngis superior

ramus mentalis z arteria alveolaris inferior

arteria alveolaris inferior et ramus lingualis

arteria transversa faciei (protrudatá)

arteria temporalis superficialis

arteria maxillaris

arteria auricularis posterior

arteria pharyngea ascendens

arteria occipitalis a ramus sternocleidomastoideus

nervus glossopharyngeus (IX.)

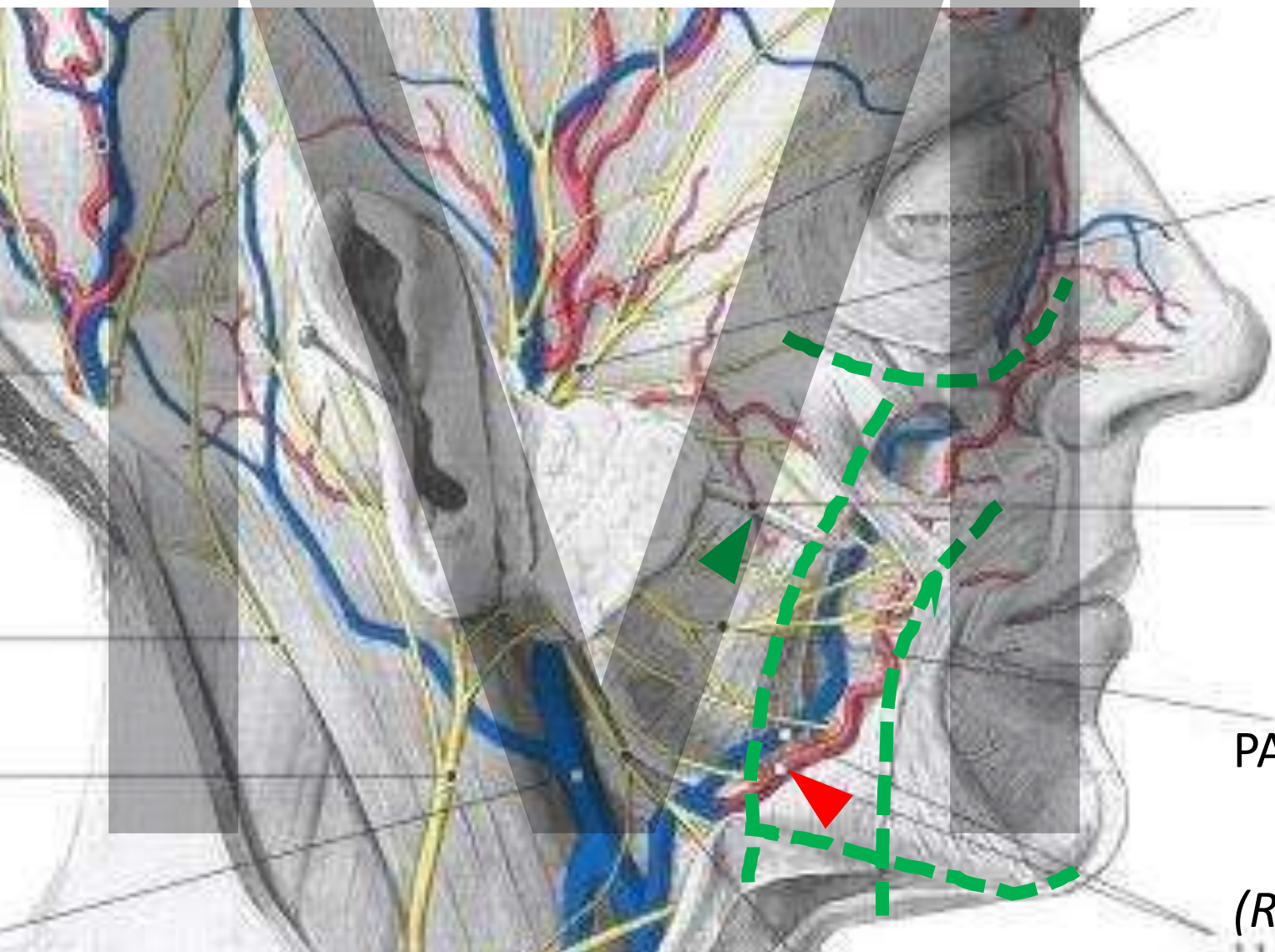
arteria palatina ascendens

arteria tonsillaris

arteria facialis

arteria lingualis

Buccal region



Facial art., facial vein

parotid duct

Deep facial vein

(facial v. – pterygoid plexus)

Lower eyelid

PAR-MAS reg.

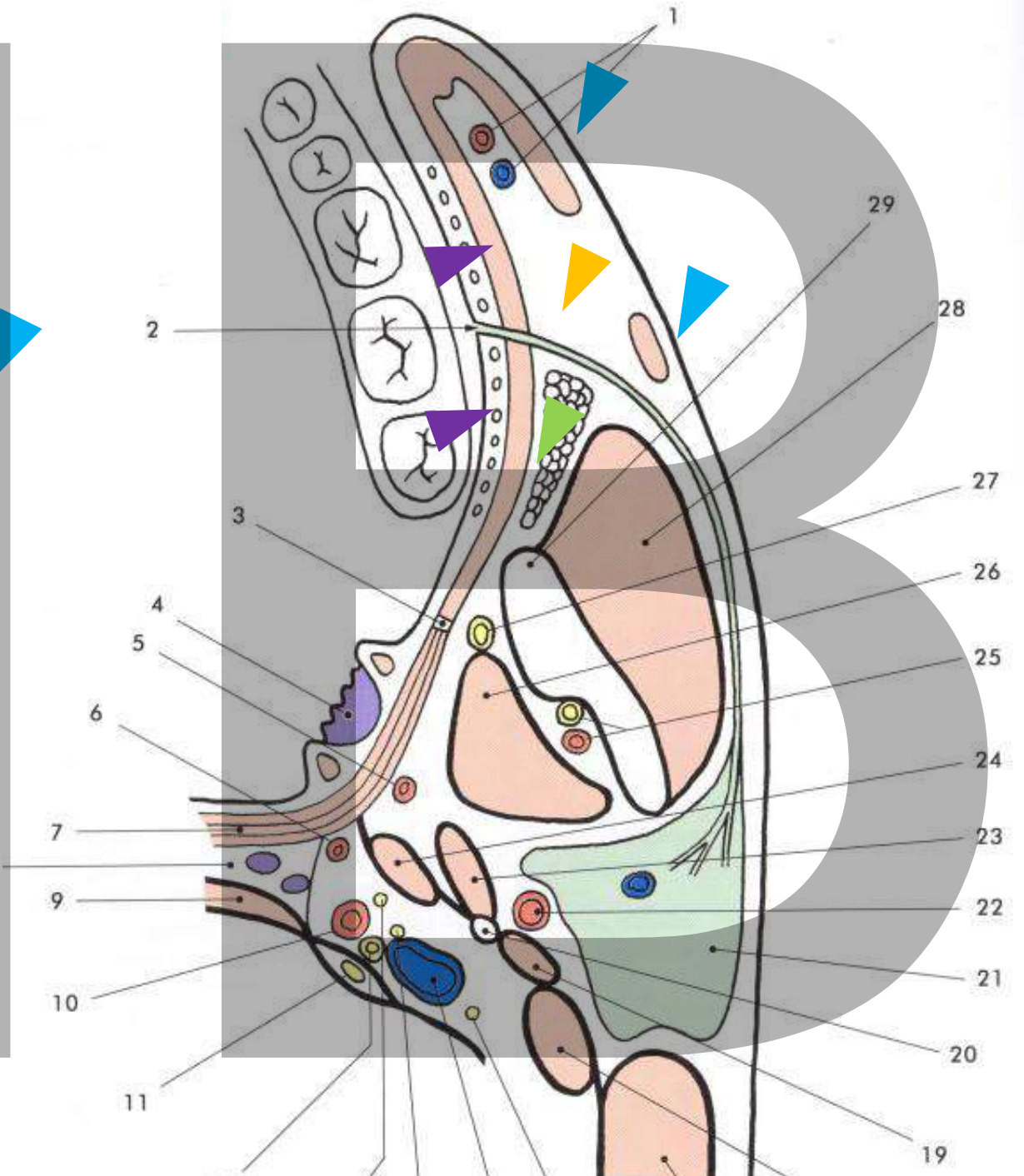
Nasolabial fold

Mandible

(Regional anatomy, prof. Grim)

Buccal region

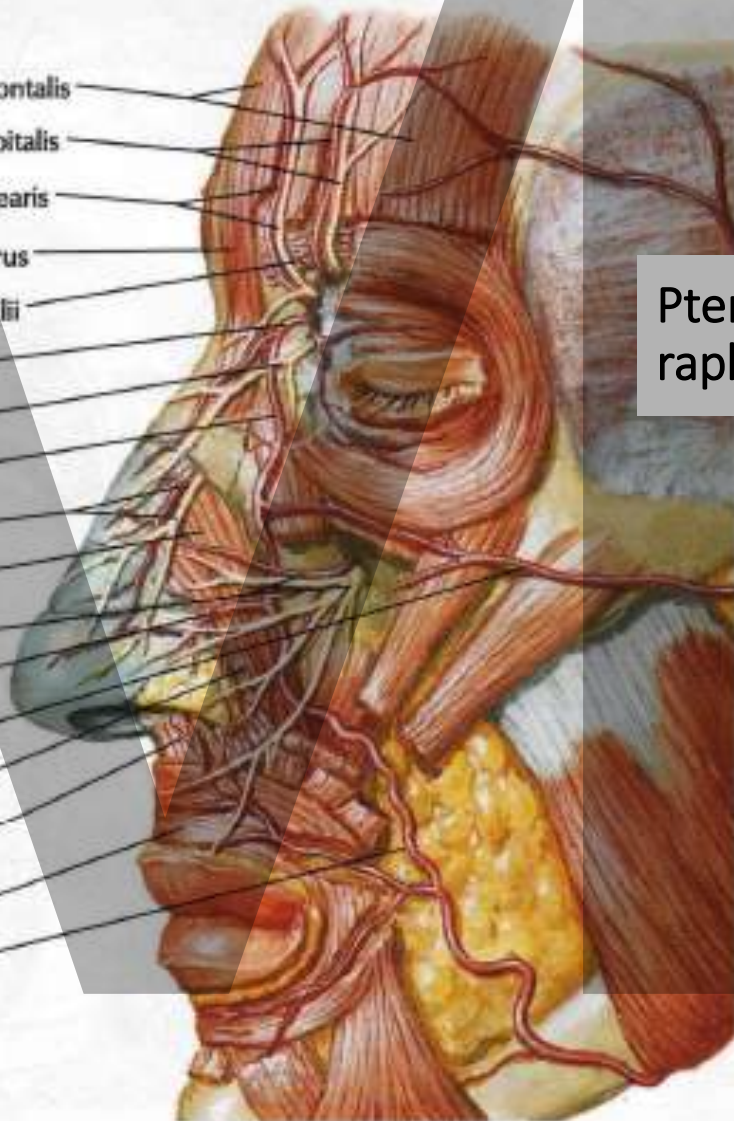
- Superficial layer – facial muscles
- Intermuscular space + buccal fat pad
- Buccinator muscle



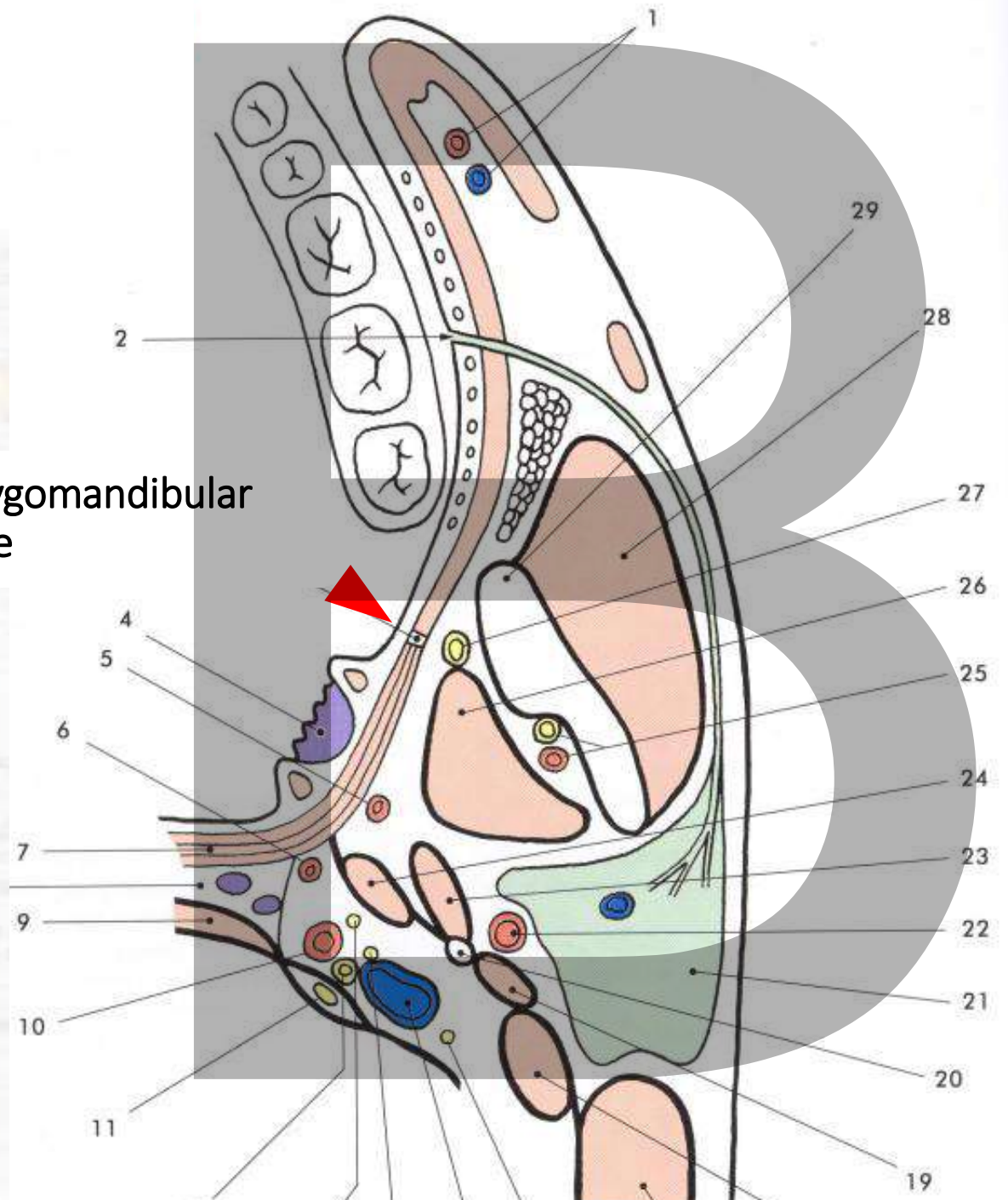
Buccal region

TOTIENEN ENTAFERDIEDE

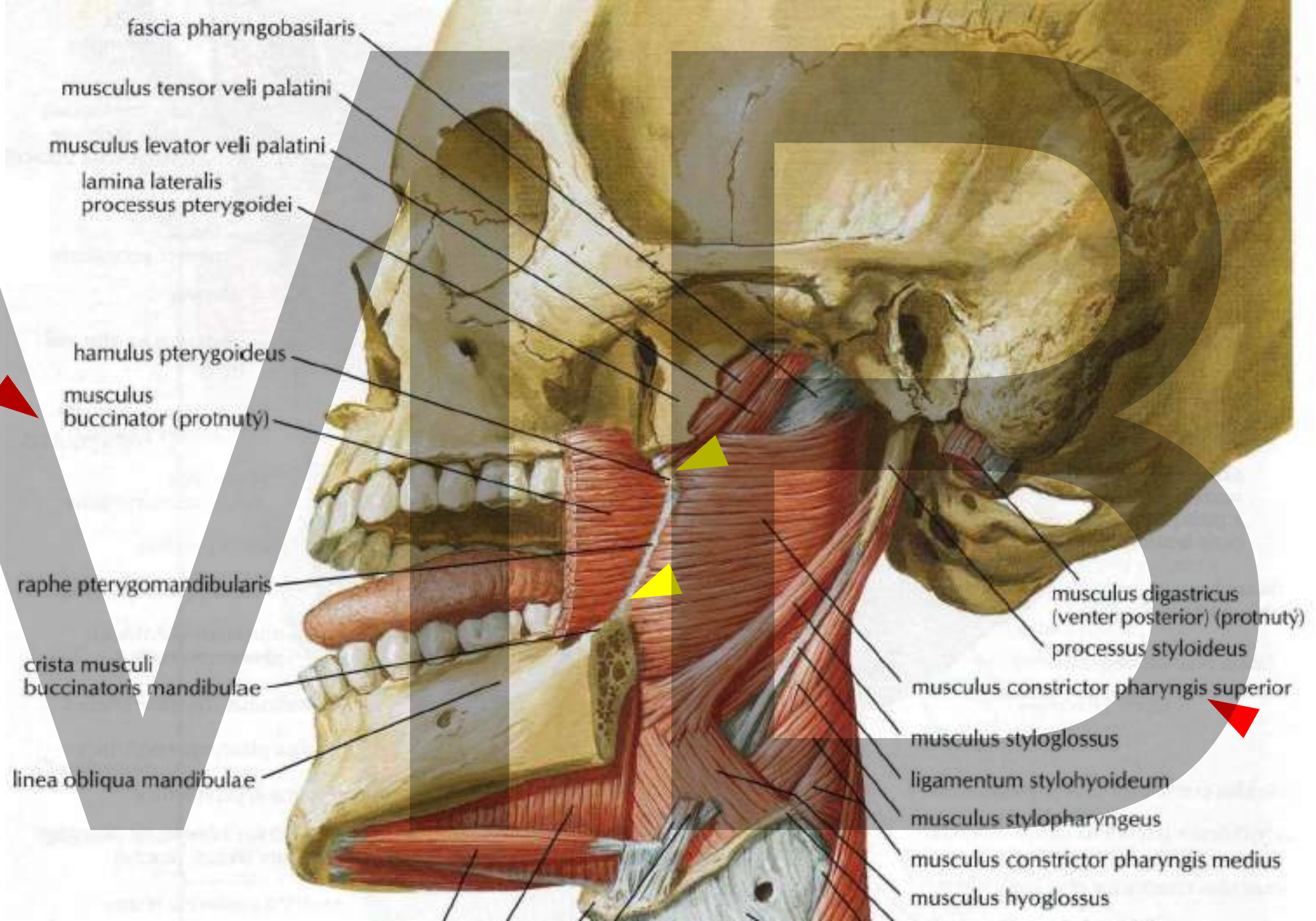
- musculus frontalis
- arteria et nervus supraorbitalis
- arteria et nervus supratrochlearis
- musculus procerus
- musculus corrugator supercilii
- arteria dorsalis nasi
- nervus infratrochlearis
- arteria angularis
- arteria et nervus nasalis externus
- musculus nasalis (pars transversalis)
- arteria et nervus infraorbitalis
- arteria nasalis lateralis
- arteria transversa faciei
- musculus nasalis (pars alaris)
- musculus depressor septi nasi
- musculus orbicularis oris
- arteria facialis





Pterygomandibular raphe

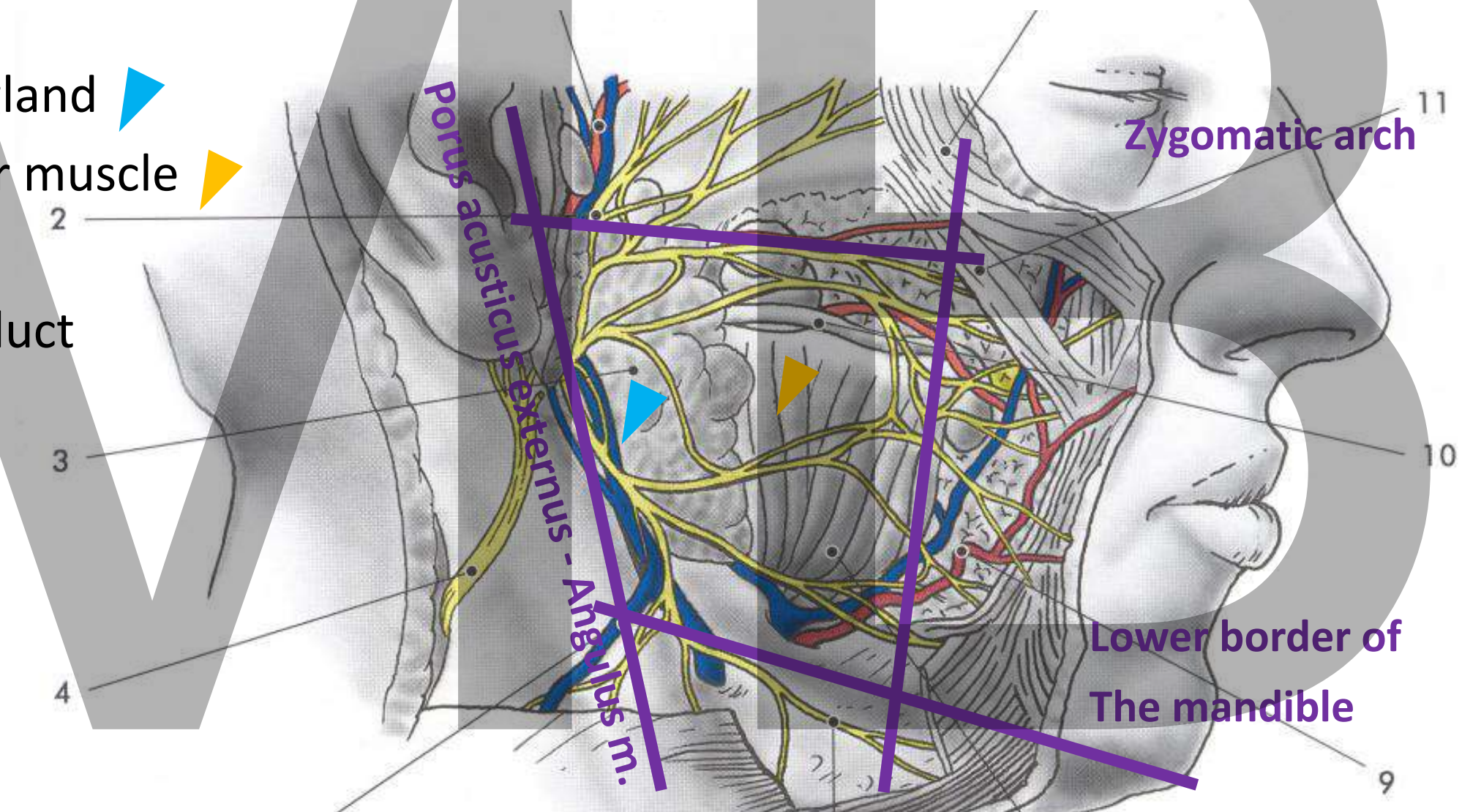


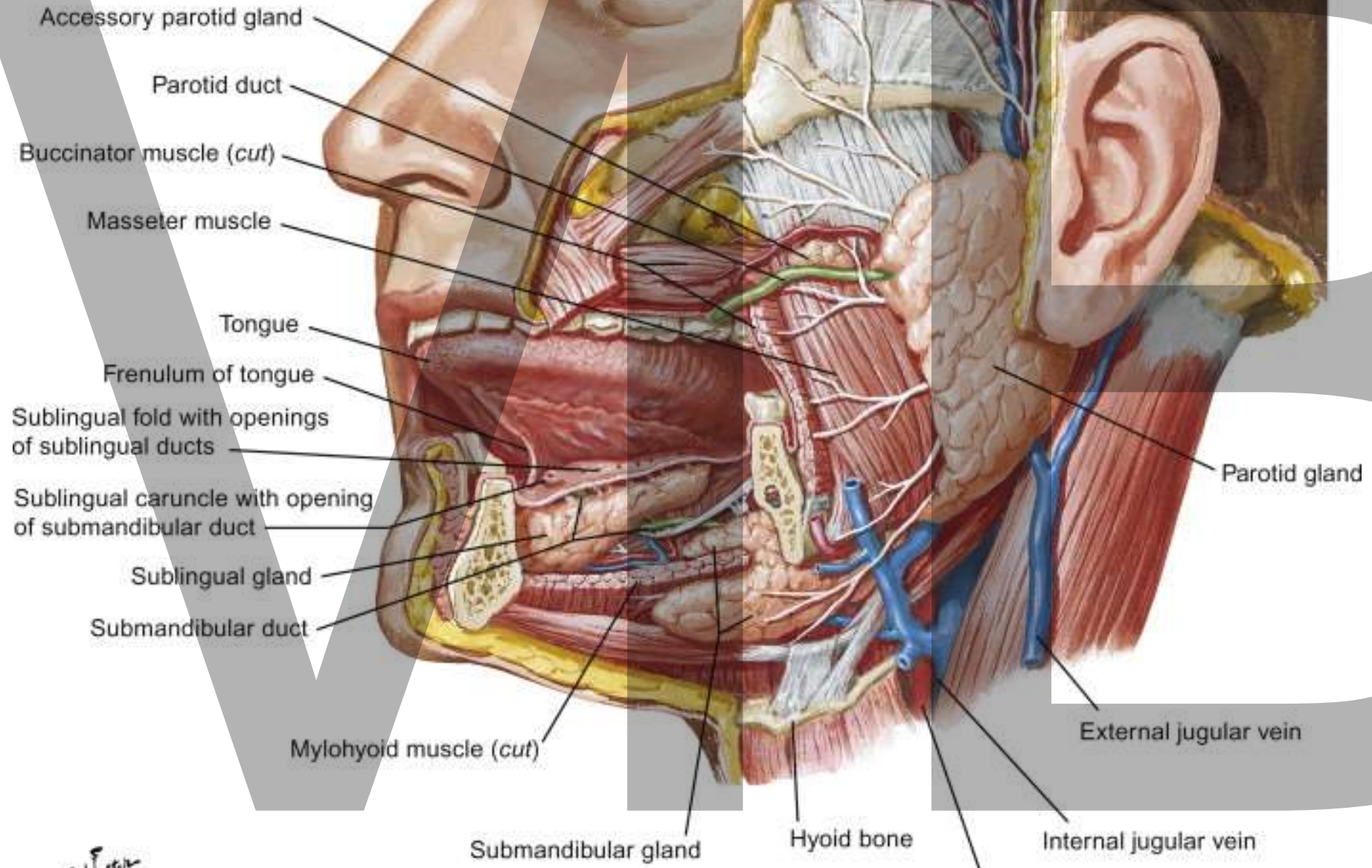
Pterygomandibular raphe



Parotidomasseteric region

- Parotid gland 
- Masseter muscle 
- Parotid duct
- Fascia

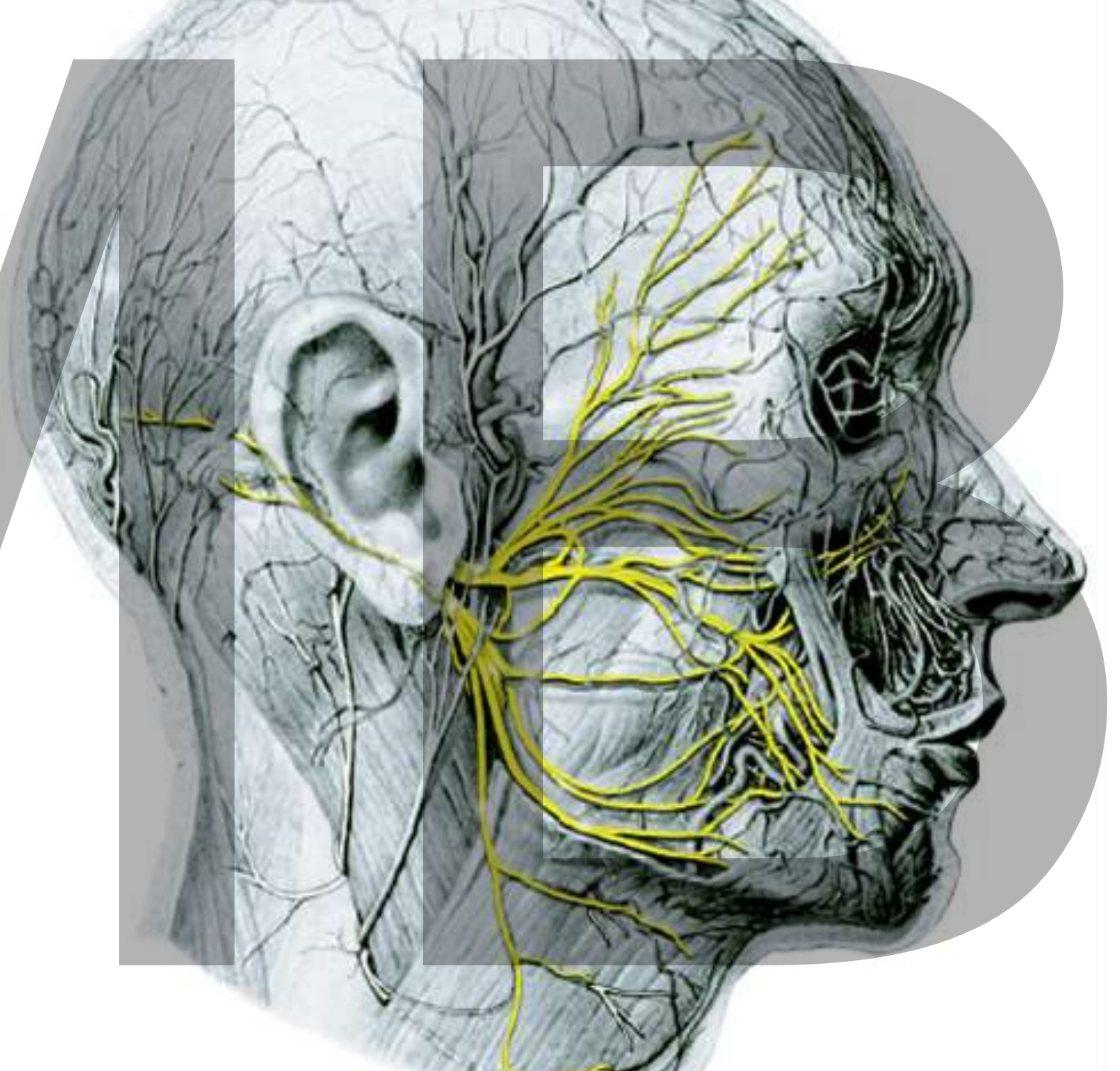




F. Netter M.D.

Branches of n. VII (parotide plexus)

- Temporal
- Zygomatic
- Buccale
- Marginal mandibular
- Cervical



horizontální řez

musculus pterygoideus medialis

ramus mandibulae

musculus masseter

glandula parotis

ramus temporalis

rami zygomatici

rami buccales

ramus marginalis mandibulae

ramus cervicalis

hlavní kmen nervus facialis

processus mastoideus

temporofaciální kmen

nervus auricularis posterior

hlavní kmen nervus facialis

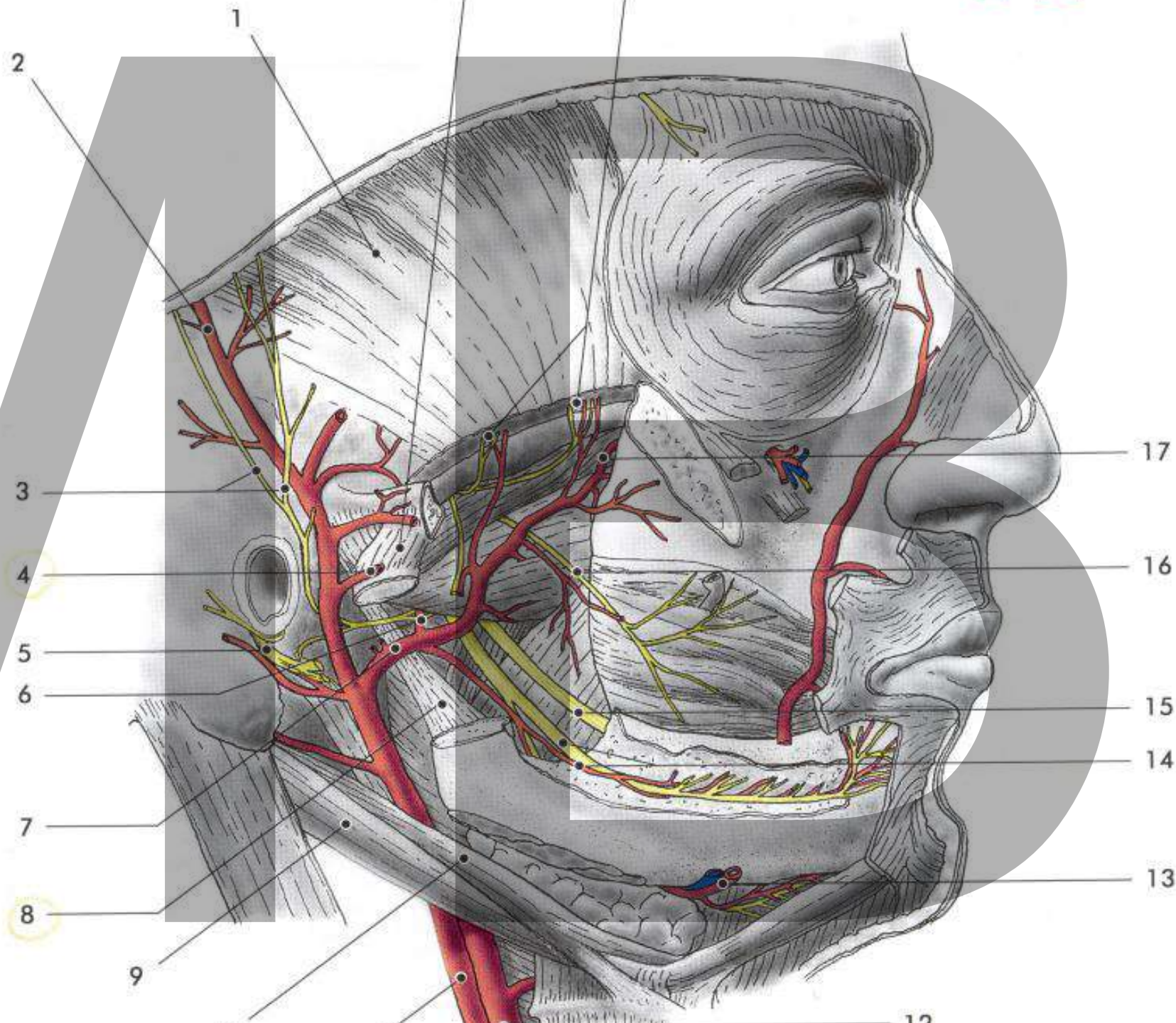
ramus digastricus et stylohyoideus
(pro inervaci zadního břicha
musculus digastricus
a musculus stylohyoideus)

cervikofaciální kmen

Temporofacial branch




Cervicofacial branch

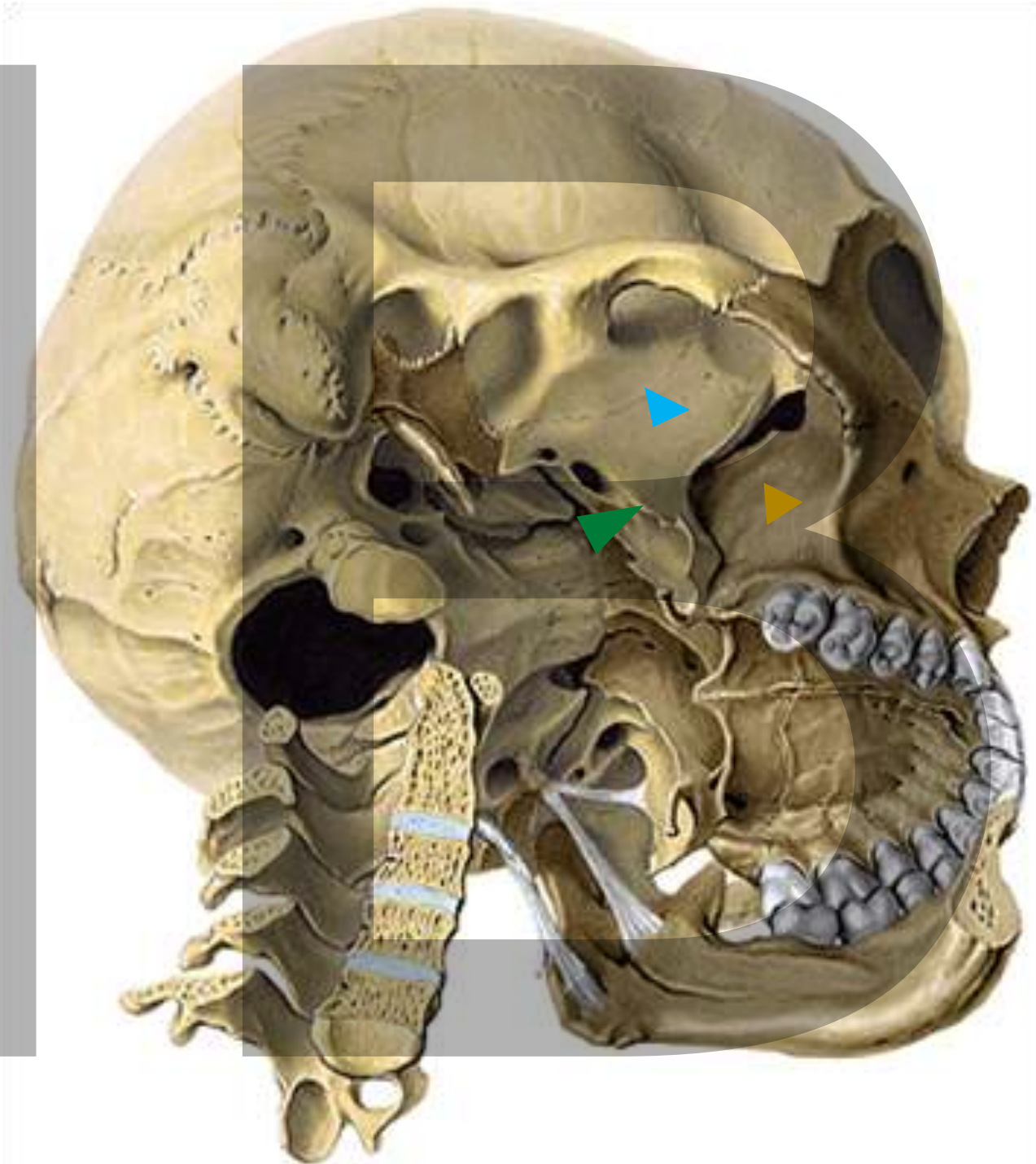
**This region medially
transitions into
intratemporal region**



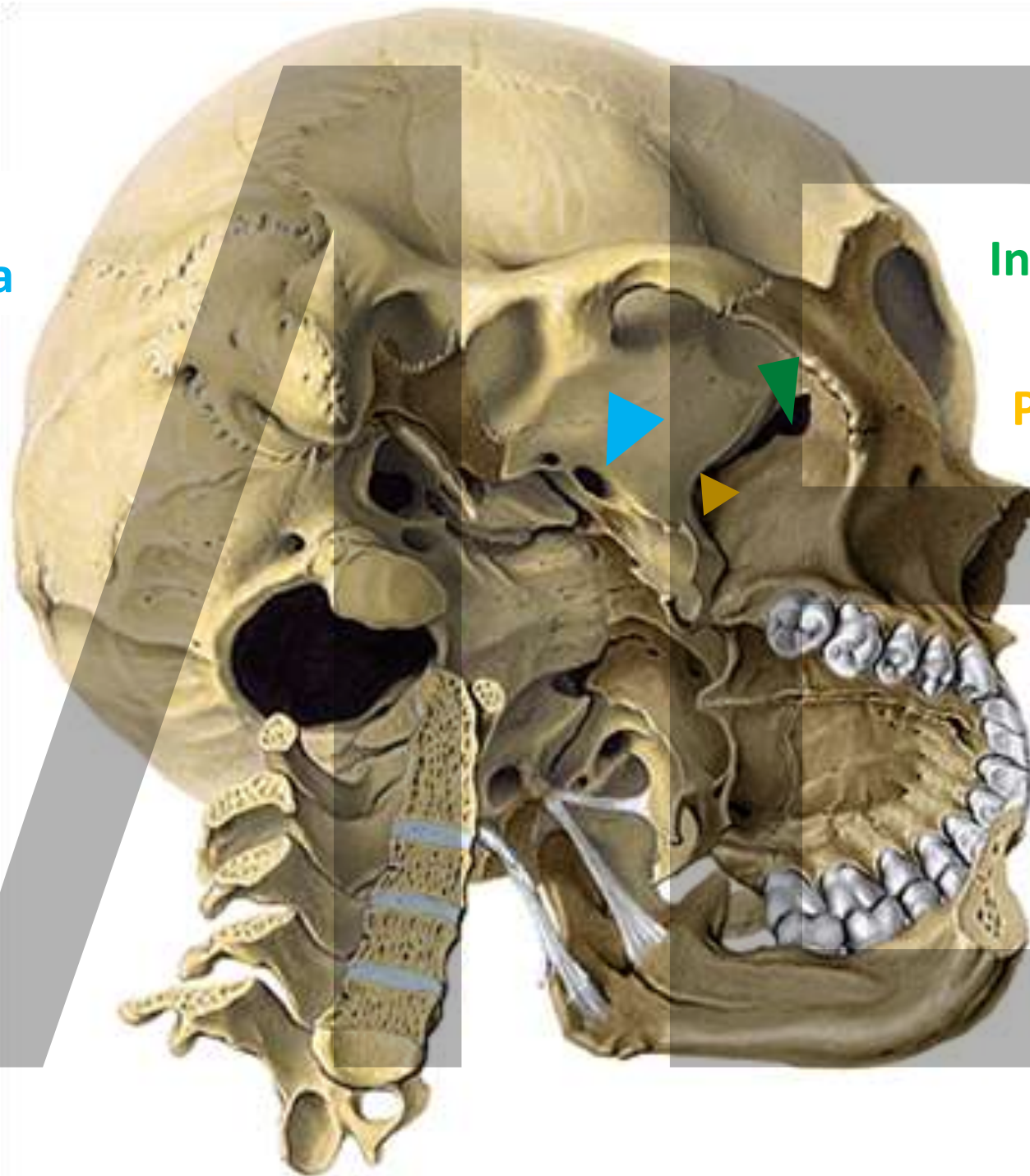
Intratemporalis fossa

Borders/ walls:

- ROOF: Large wing of sph. bone 
- MED: medial plate of ptg. proc. 
- ANT: maxillary tuberosity 
- LAT: ramus of mandible
- DORS: styloid septum



Foramen ovale
Middle cranial fossa



Inferior orbital fissure

Pterygopalatine fossa

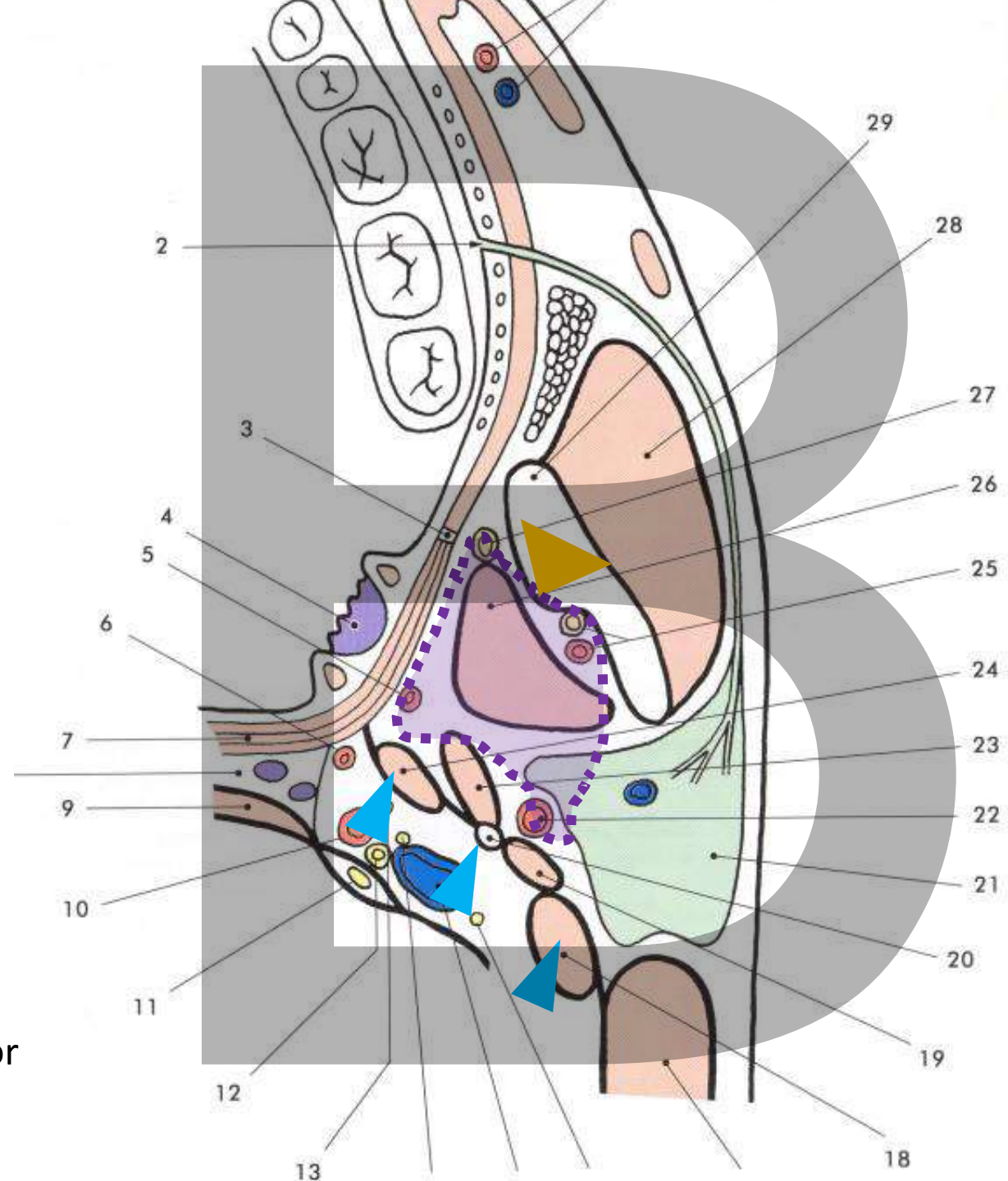
Fossa intratemporalis

Borders / walls

- ROOF: Large wing of sph. bone
- MED: medial plate of ptg. proc.
- ANT: maxillary tuberosity
- LAT: ramus of mandible
- DORS: styloid septum

Styloid septum

- Pharynx – Sternocleidomastoid m.
- m. stylohyoideus, m. styloglossus,
- m. stylopharyngeus, m. digastricus - venter posterior



Fossa intratemporalis

Inside:

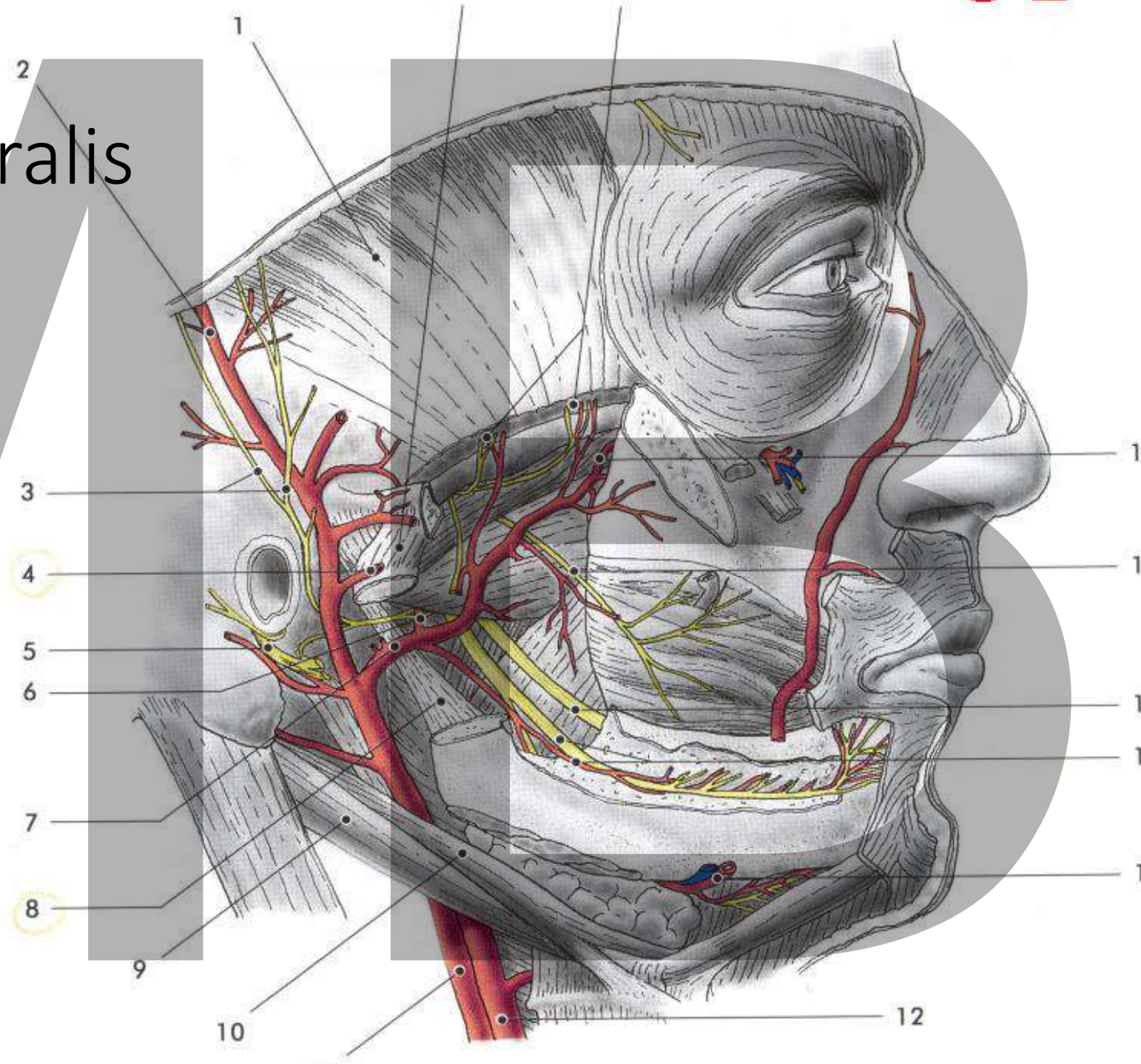
Pterygoid muscles
Part of parotid gland

Vessels

- Maxillary a.
- Pterygoid pl.

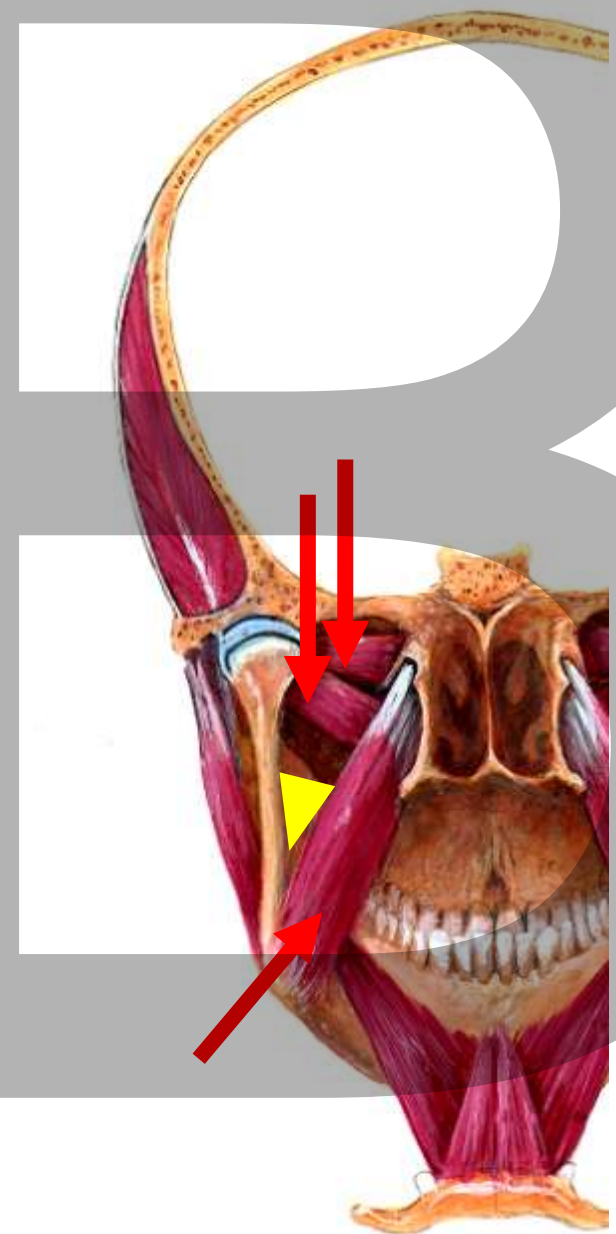
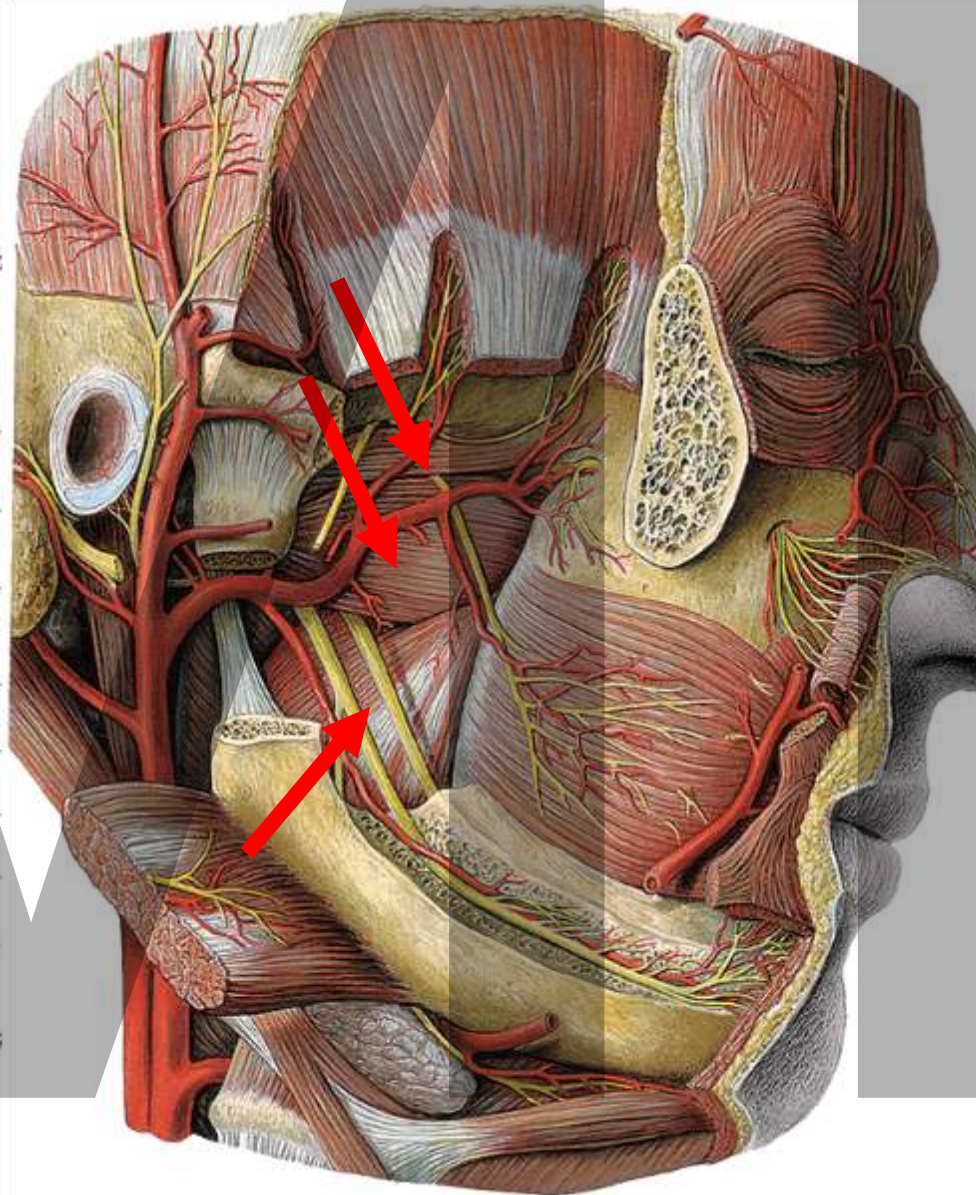
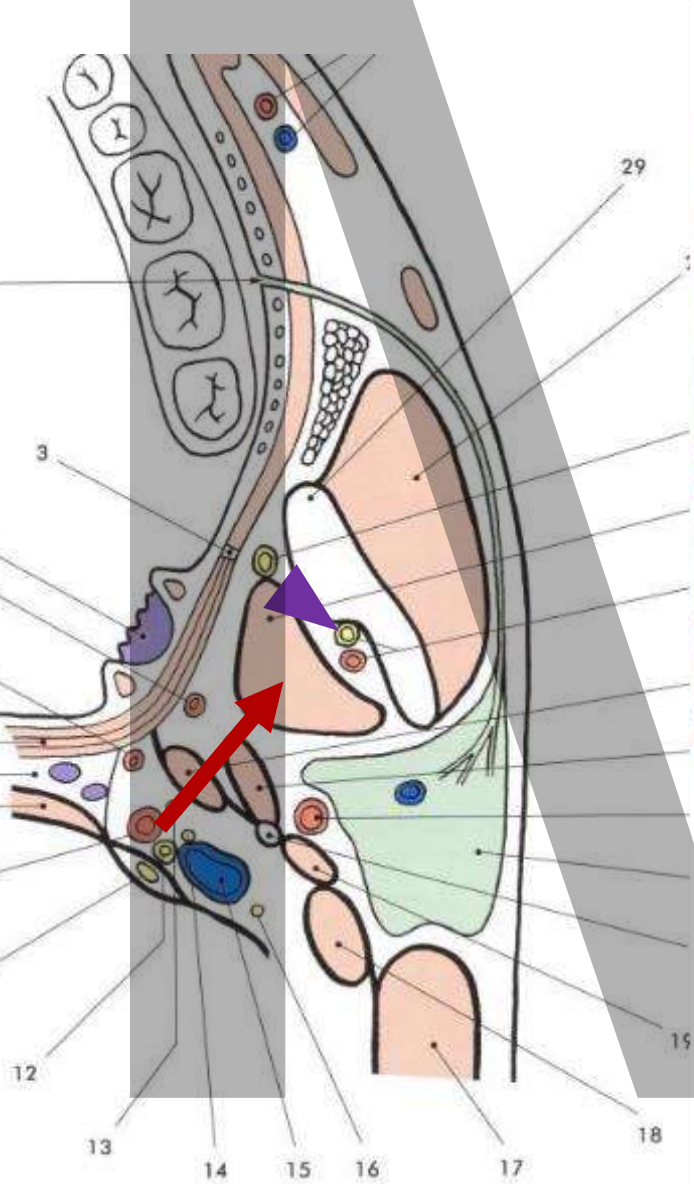
Nerves

- Mandibular nerve (3V)



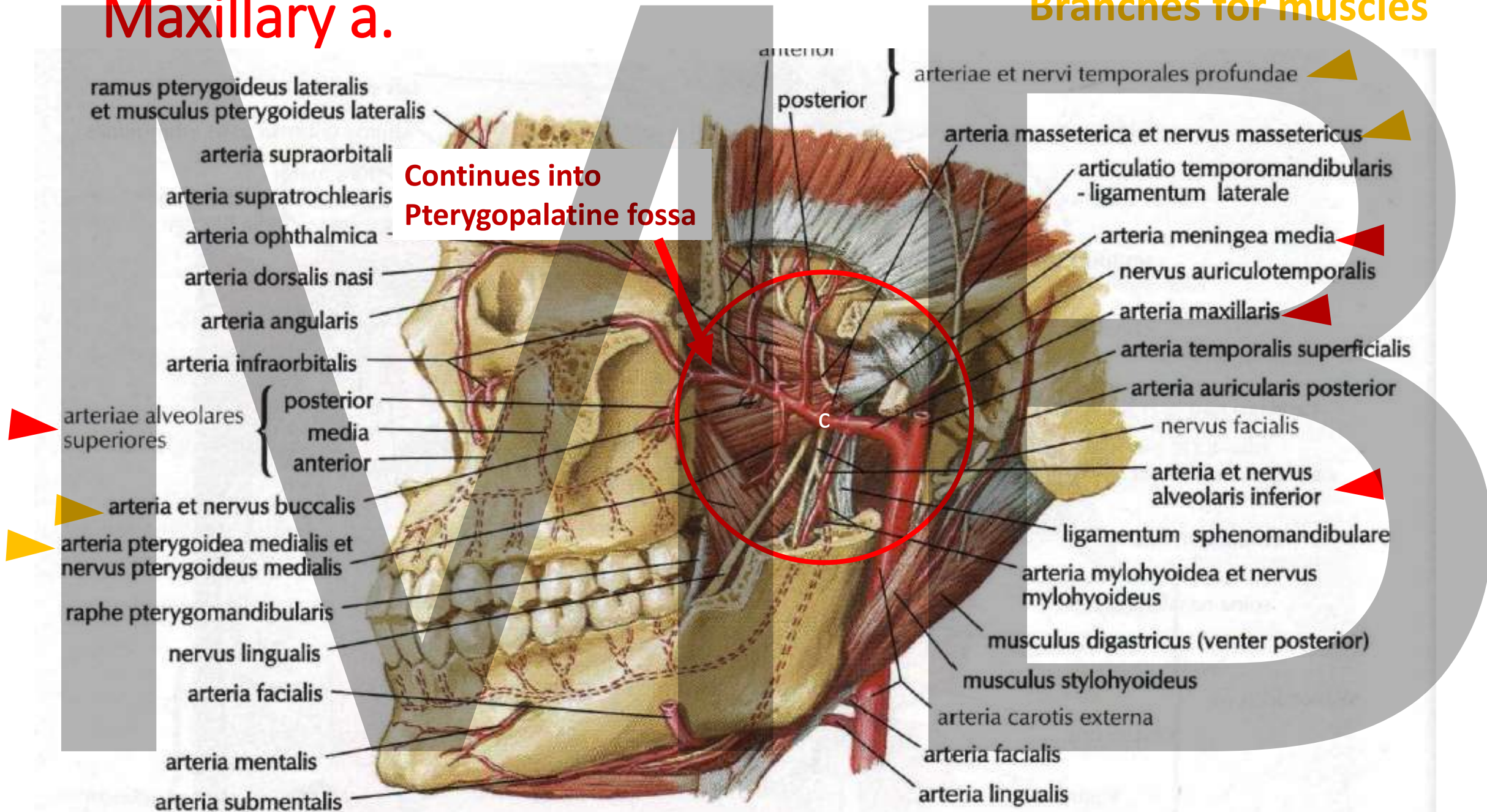
Pterygoid m.

between med. pterygoid m. and ramus of the mandible – pterygomandibular space



Maxillary a.

Branches for muscles

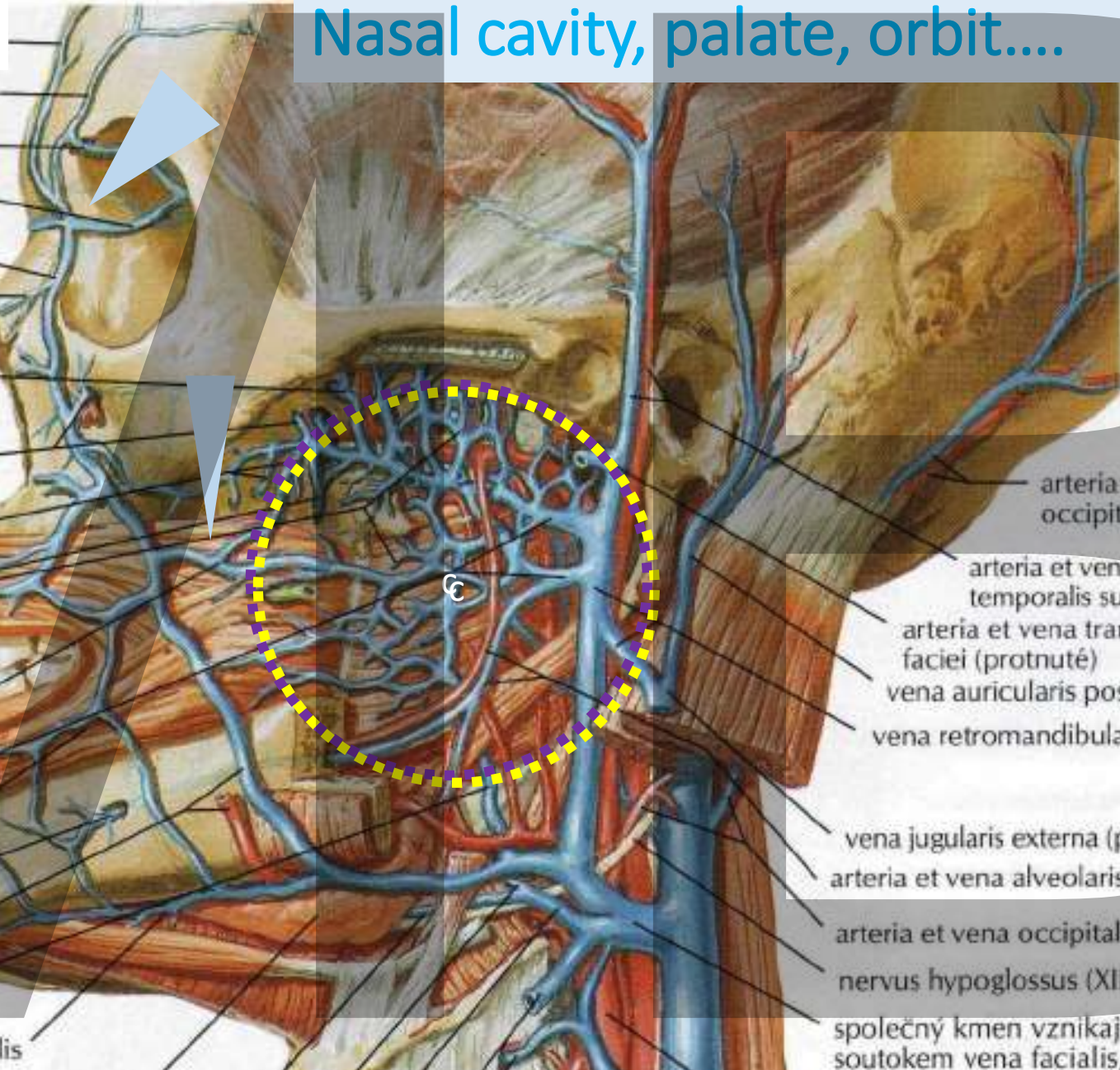


Pterygoid plexus

Nasal cavity, palate, orbit....

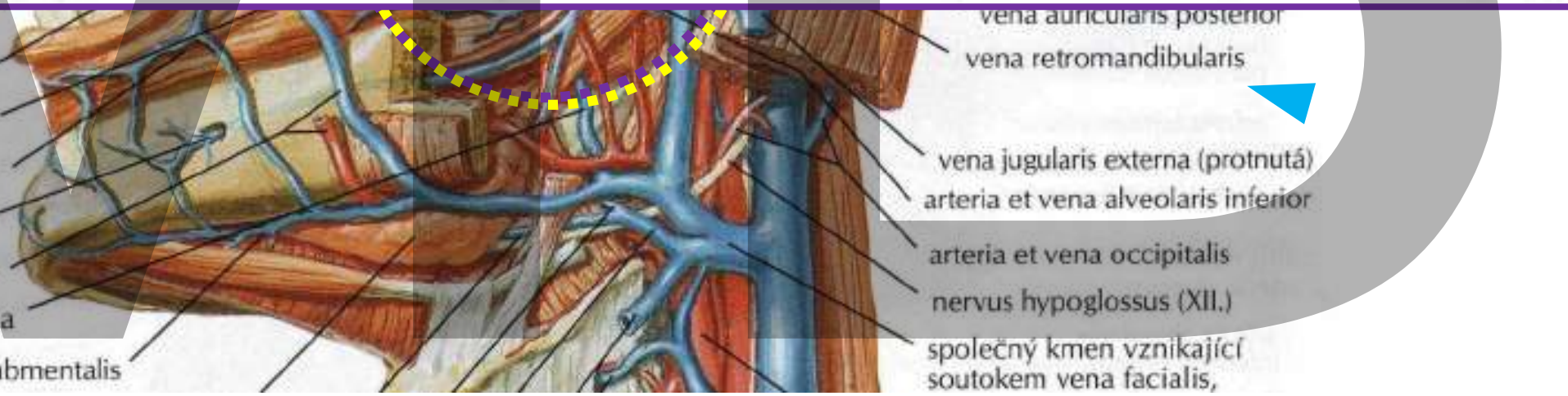
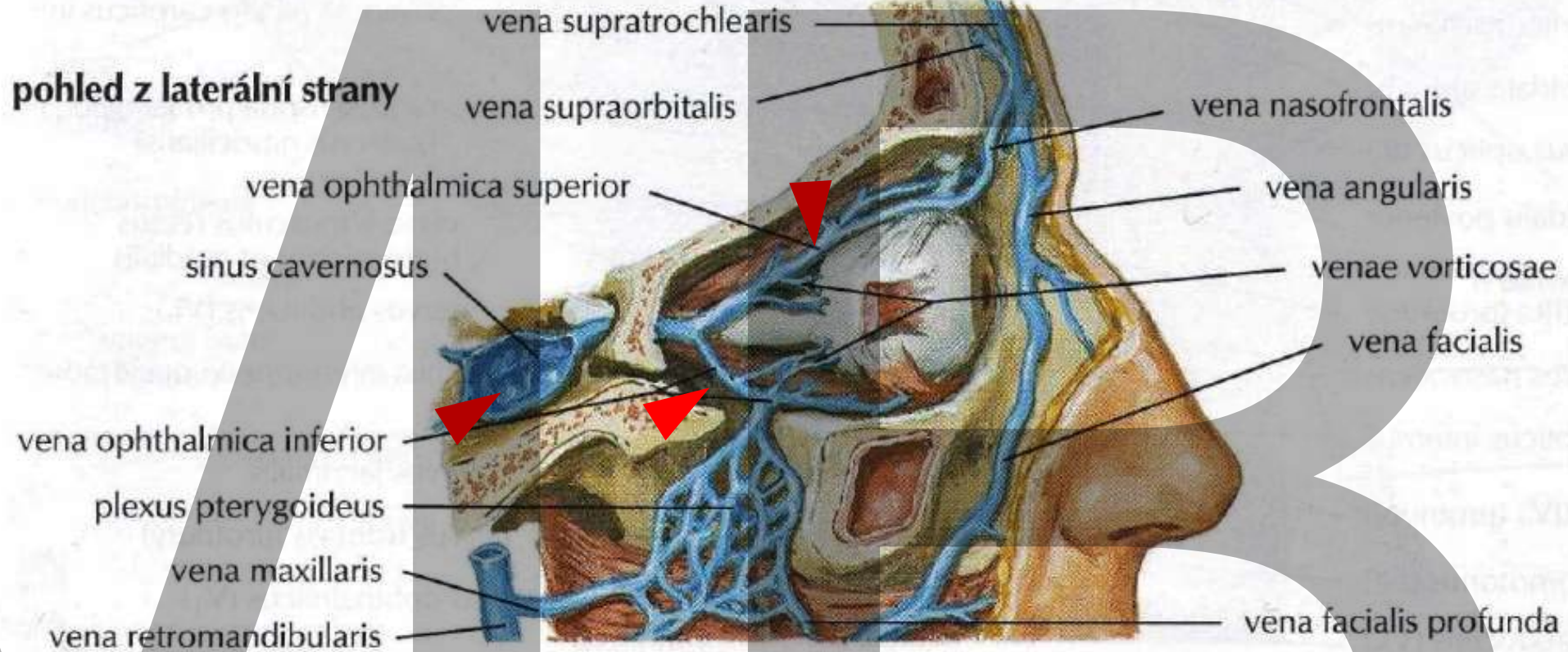
- vena supraorbitalis
- vena nasofrontalis
- vena ophthalmica superior
- vena angularis
- vena nasalis externa
- vena emissaria (vena Vessalii) komunikující se sinus cavernosus
- vena infraorbitalis
- venae alveolares superiores posteriores
- vena palatina
- plexus pterygoideus
- vena labialis superior
- vena facialis profunda
- venae maxillares
- vena labialis inferior
- vena mentalis
- arteria et vena facialis
- vena palatina externa
- vena submental

- arteria et vena occipitalis
- arteria et vena temporalis superficialis
- arteria et vena transversa faciei (protnuté)
- vena auricularis posterior
- vena retromandibularis
- vena jugularis externa (protnutá)
- arteria et vena alveolaris inferior
- arteria et vena occipitalis
- nervus hypoglossus (XII.)
- společný kmen vznikající soutokem vena facialis,



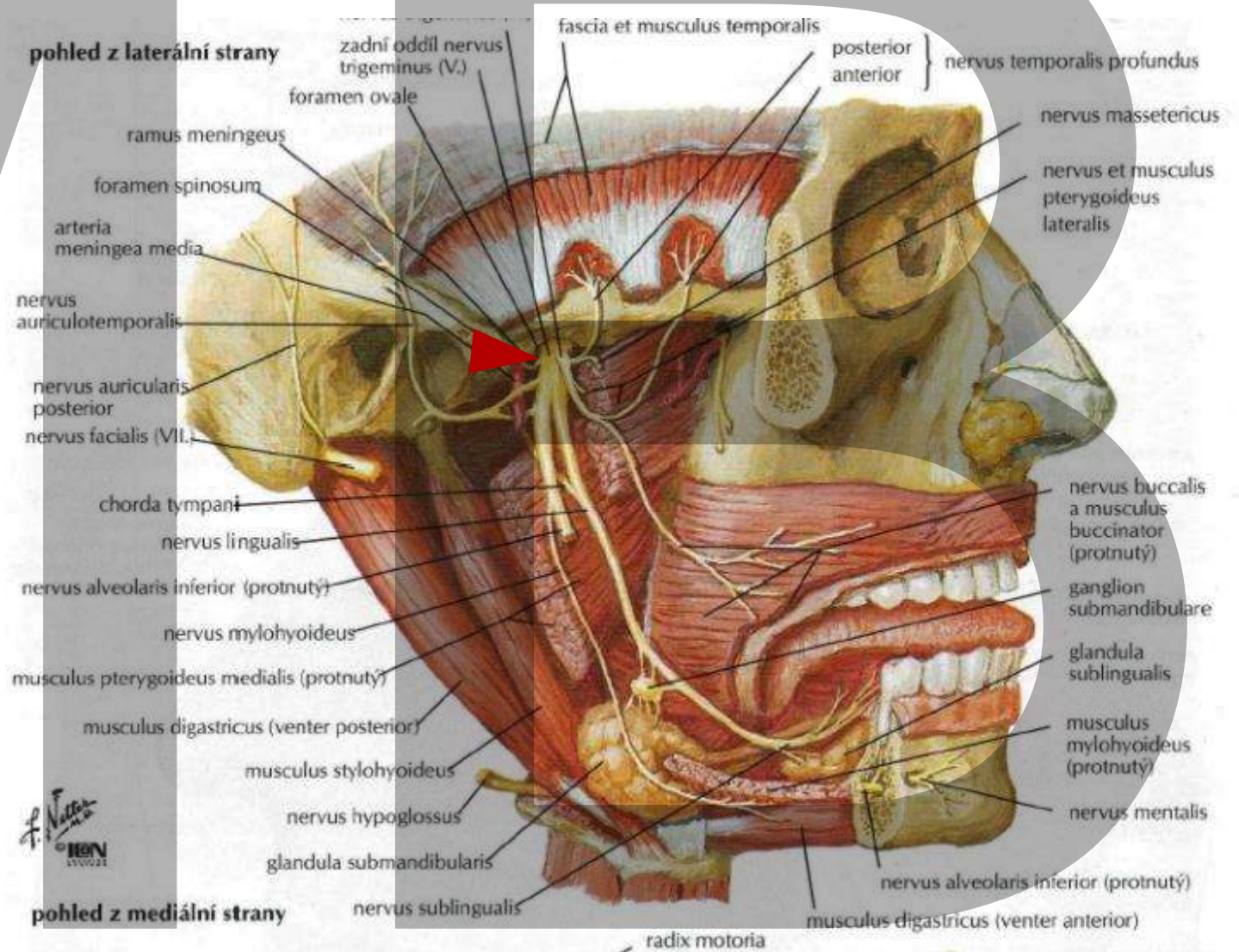
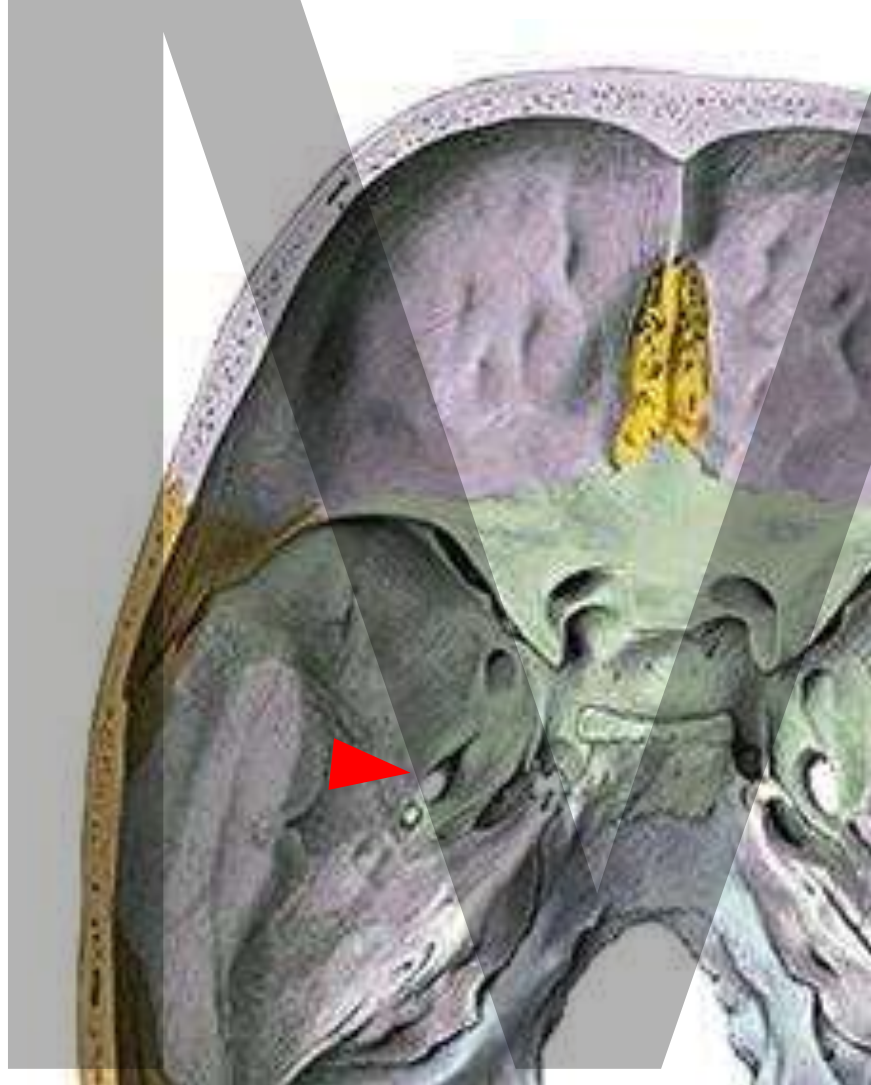
pohled z laterální strany

- vena supra
- vena sup
- vena naso
- vena ophthalmica s
- vena ang
- vena nasalis ex
- vena emissaria (Vessalii) komu se sinus cavern
- vena infra
- venae alveolares superiores posterior
- vena palatin
- plexus pterygoideus
- vena labialis superior
- vena facialis profunda
- venae maxillares
- vena labialis inferior
- vena mentalis
- arteria et vena facialis
- vena palatina externa

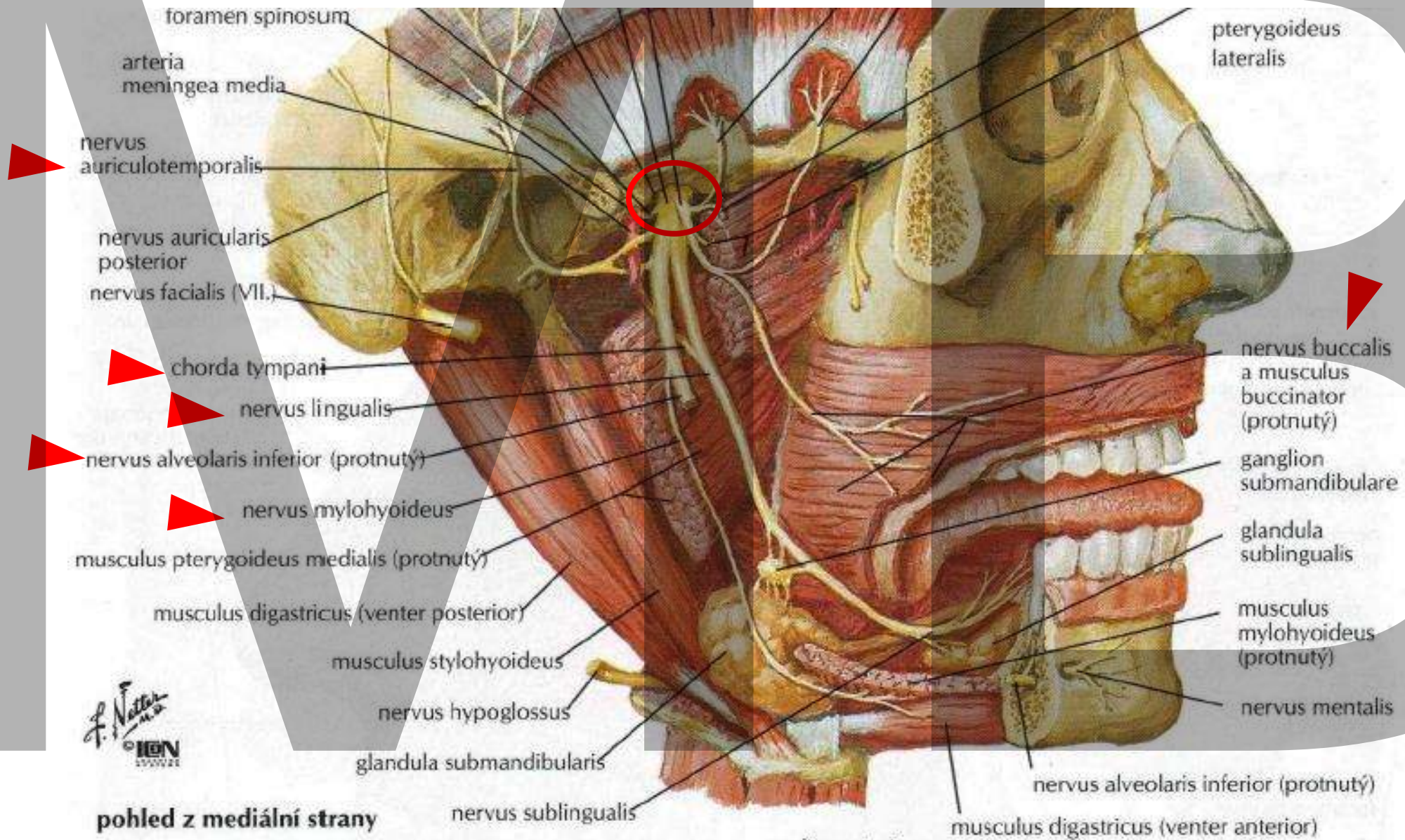


Mandibular n.

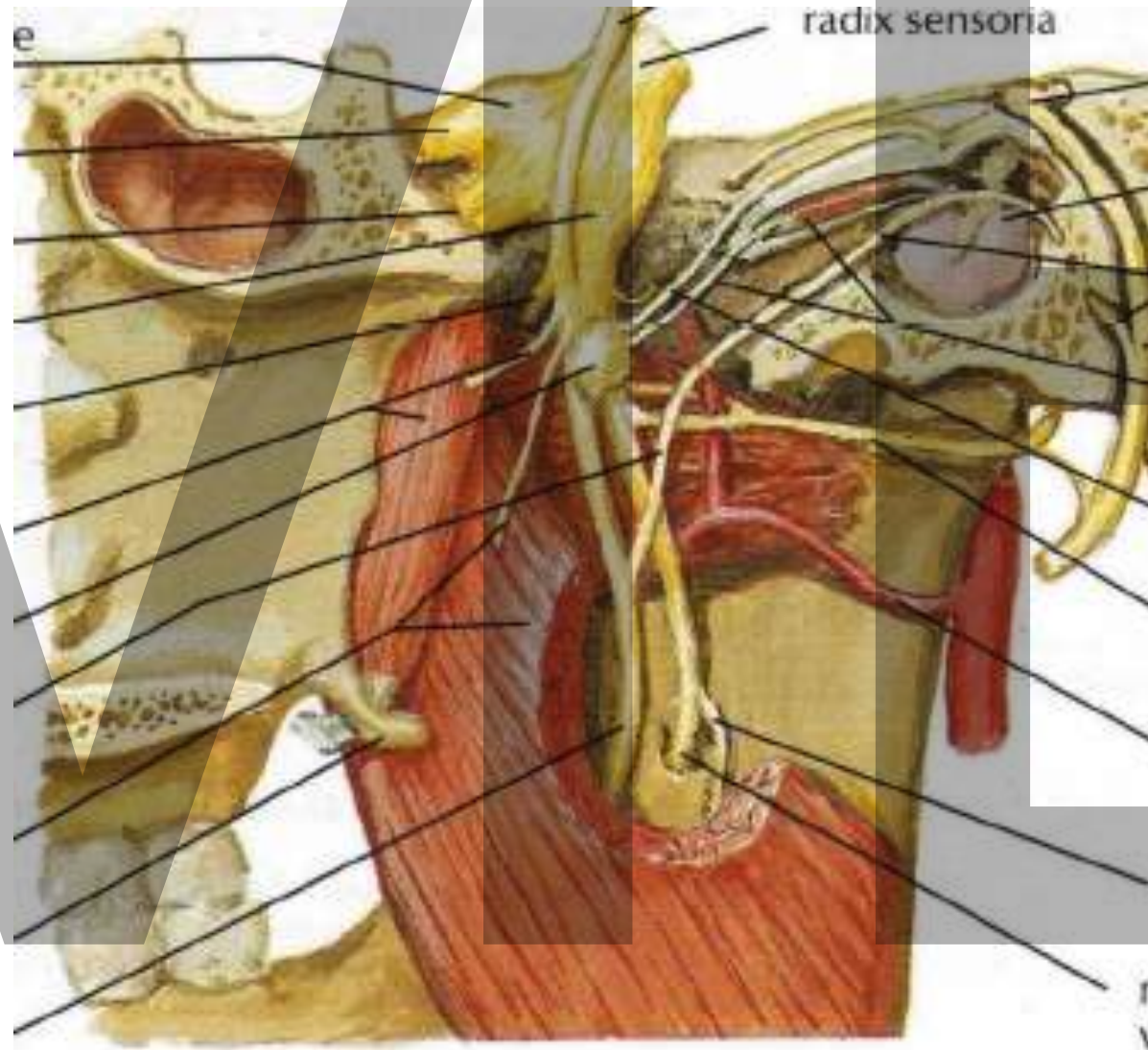
- exit from foramen ovale



Mandibular n.



Entering mandibular foramen

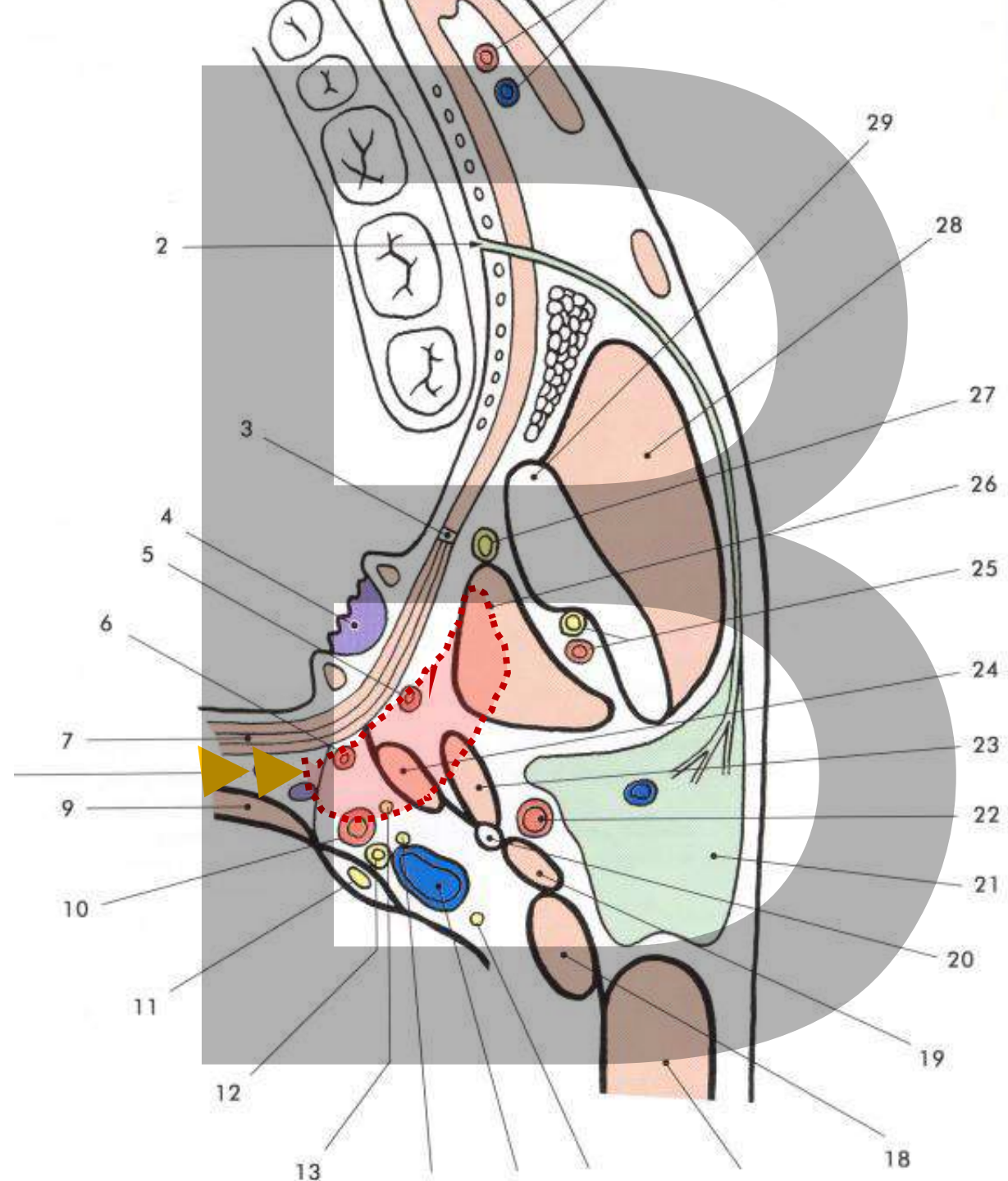


Parapharyngeal space

- pre/retrostyloid

Retropharyngeal space

- pharynx
- prevertebral layer of cervical fascia



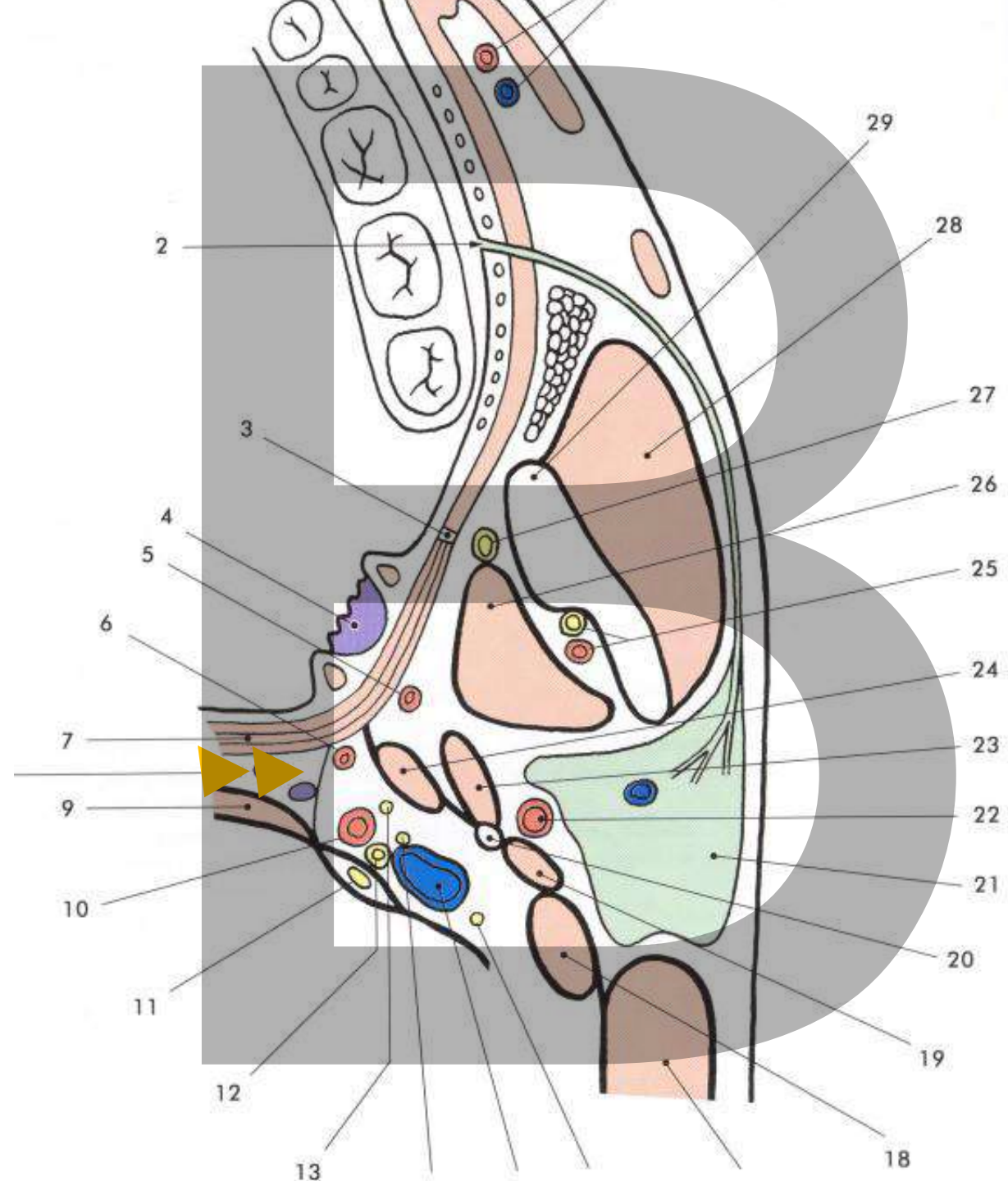
Parapharyngeal space

- prestyloid

external carotid a.
ascending palatal a.

- retrostyloid

internal carotid a.
internal jugular v.
n. IX, X, XI, XII



Infratemporal fossa

communications:

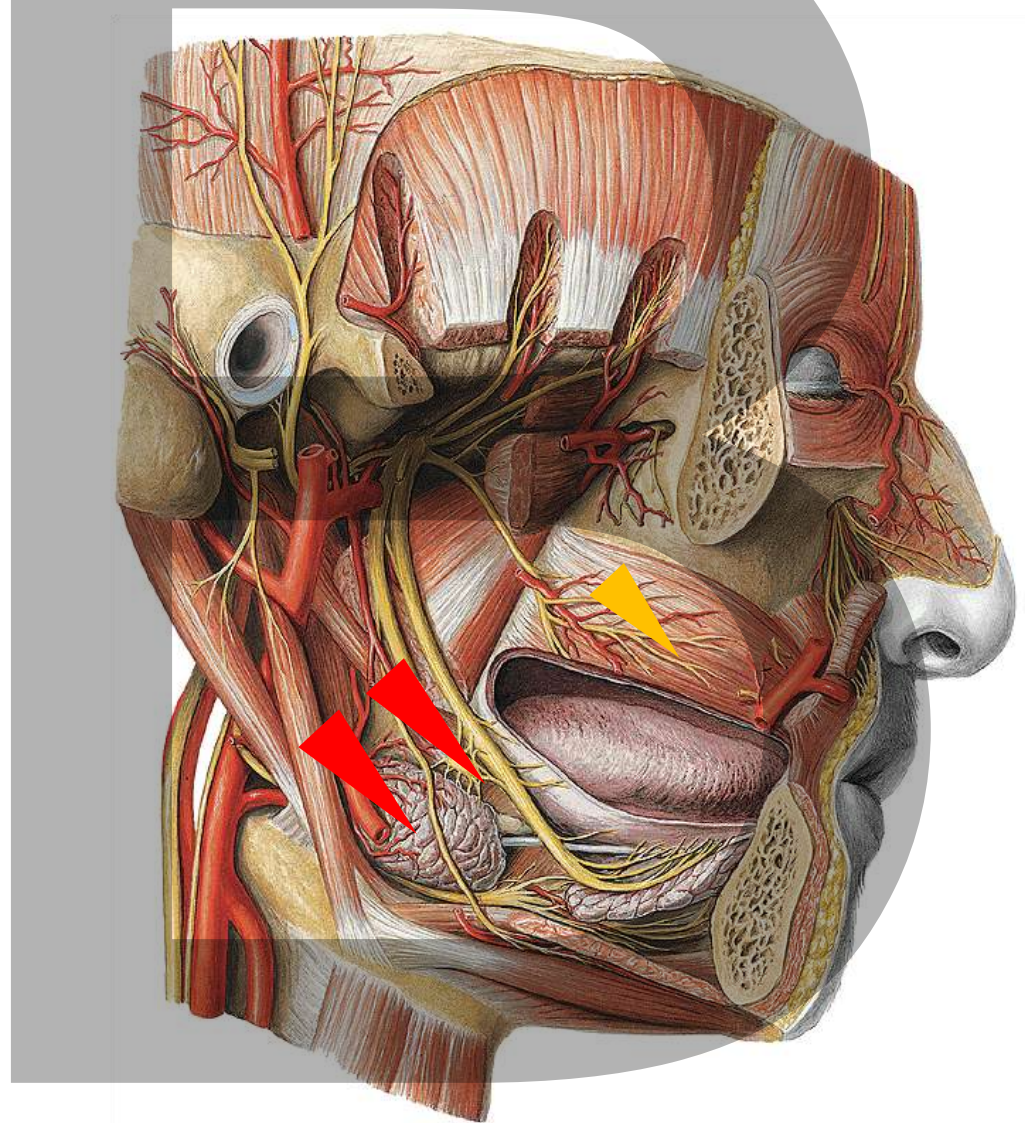
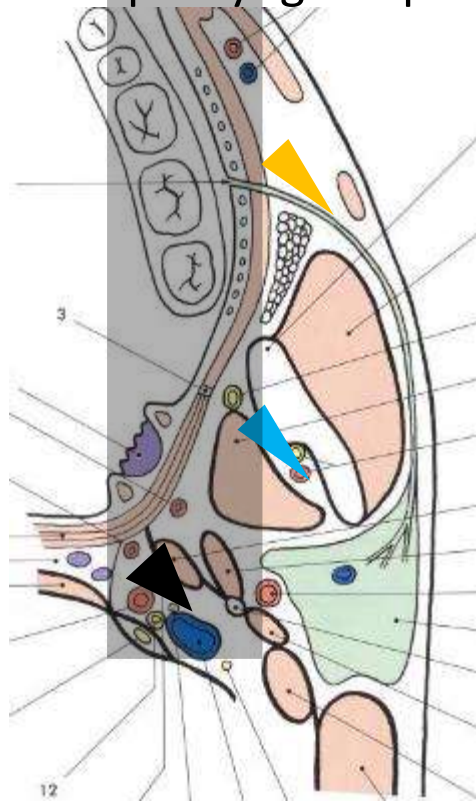
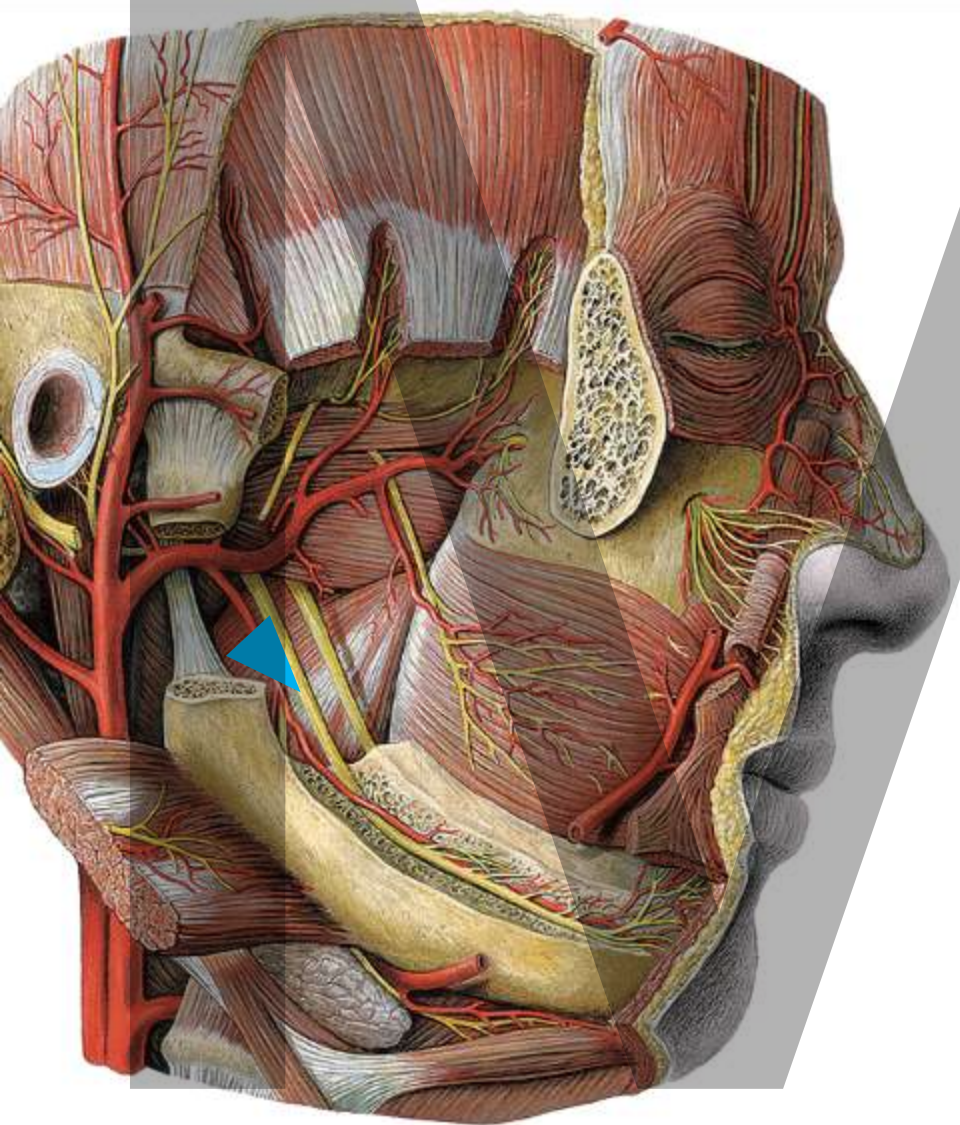
Pterygomandibular sp.

Intermuscular buccal sp.

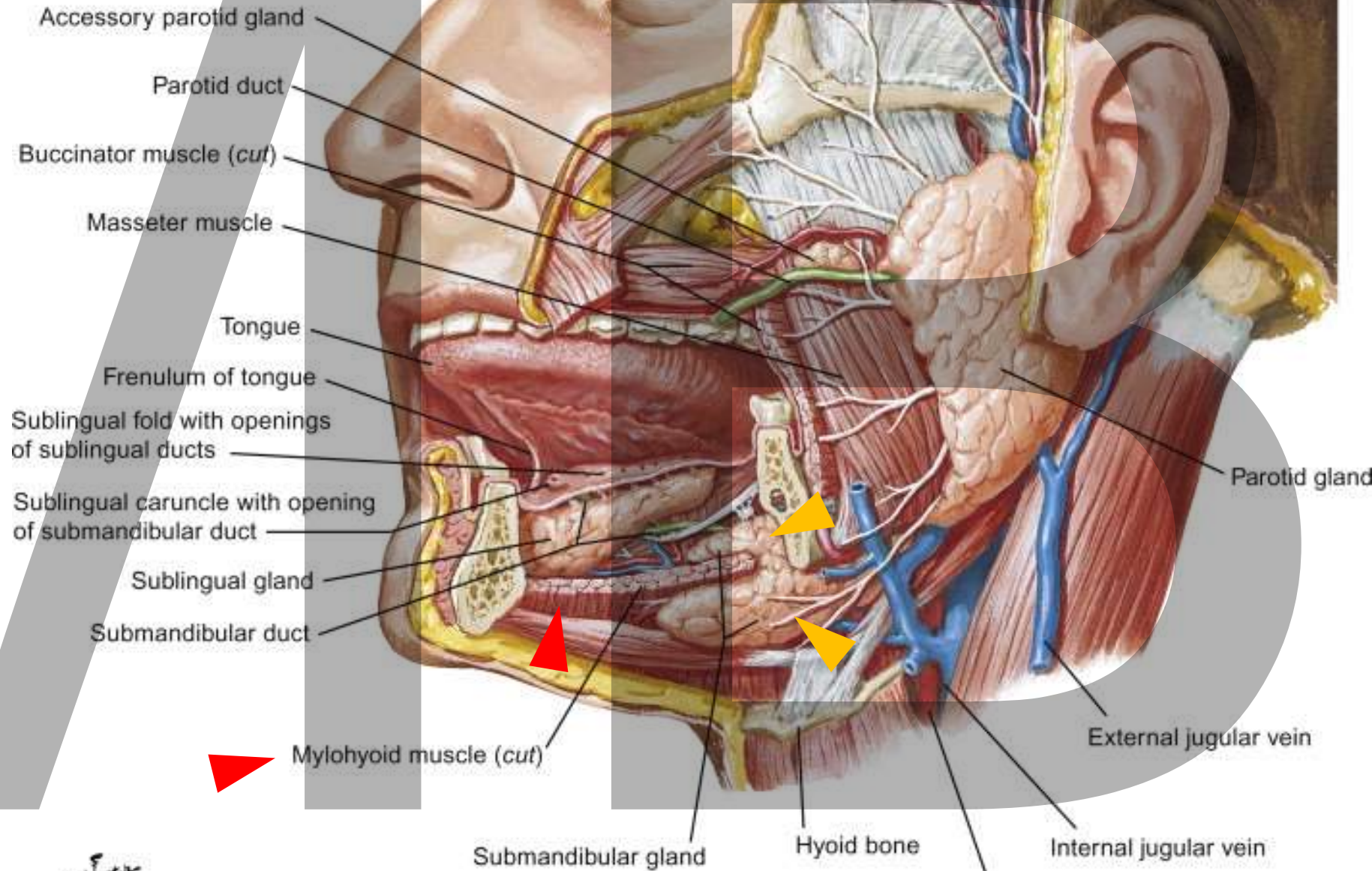
Submandibular sp.

Sublingual sp.

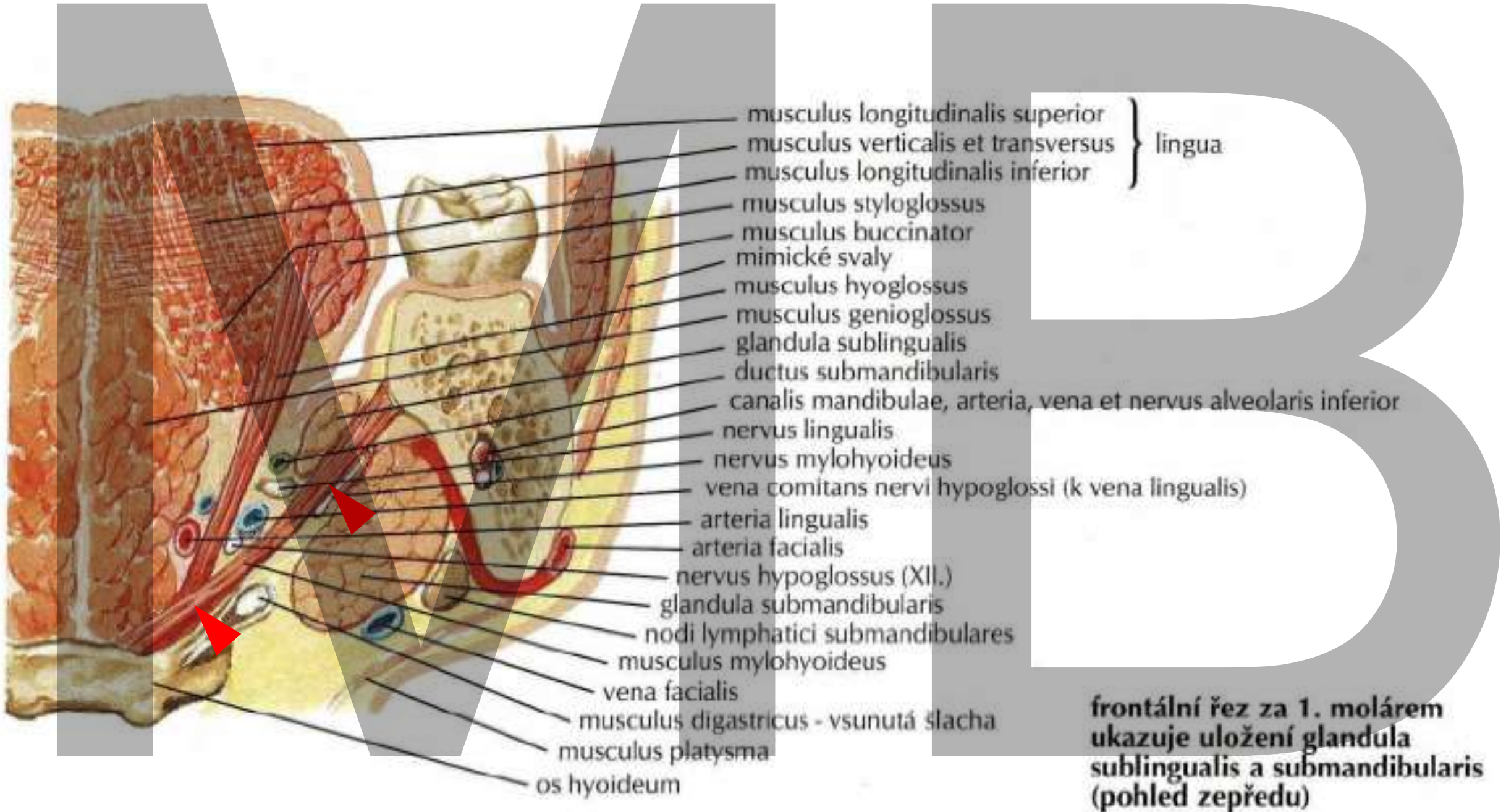
Parapharyngeal sp.



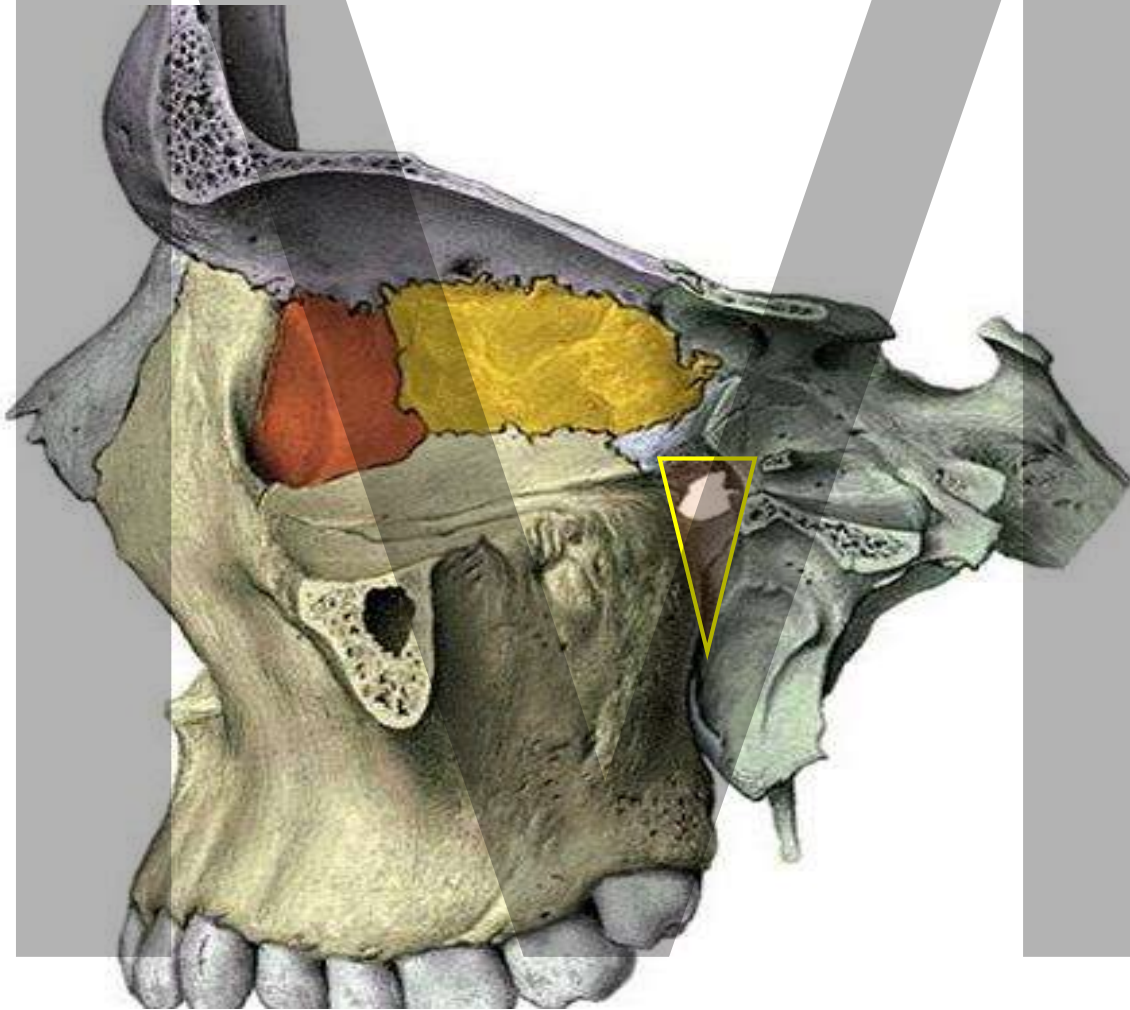
Sublinguale sp.



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M.D.



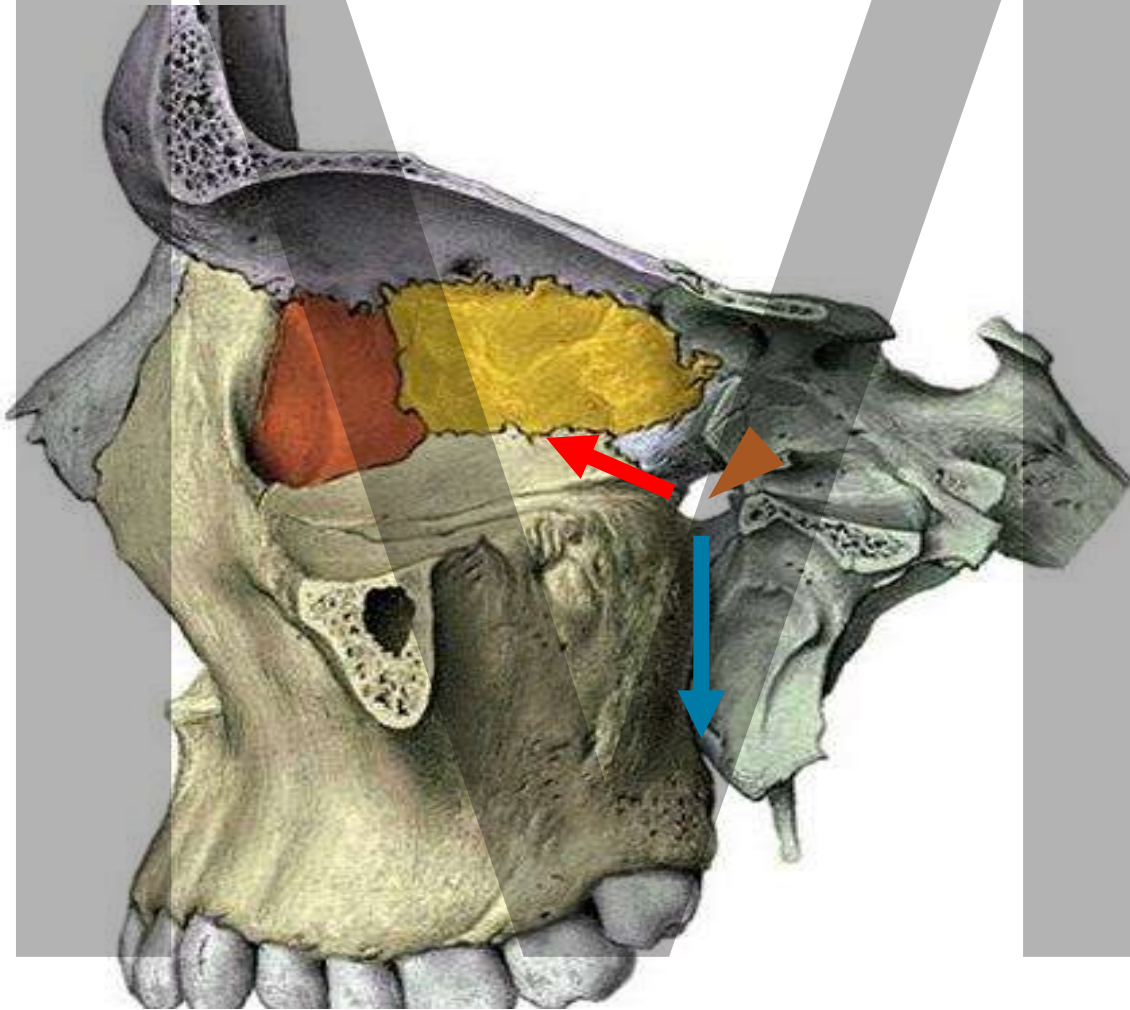
Pterygopalatine fossa – medial proces of infratemp. region



Borders:

- ROOF: Sphenoid bone
- MED: palatal bone – vertical plate
- ANT: maxillary tuberosity
- LAT: infratemp. space
- DORS: pterygoid process

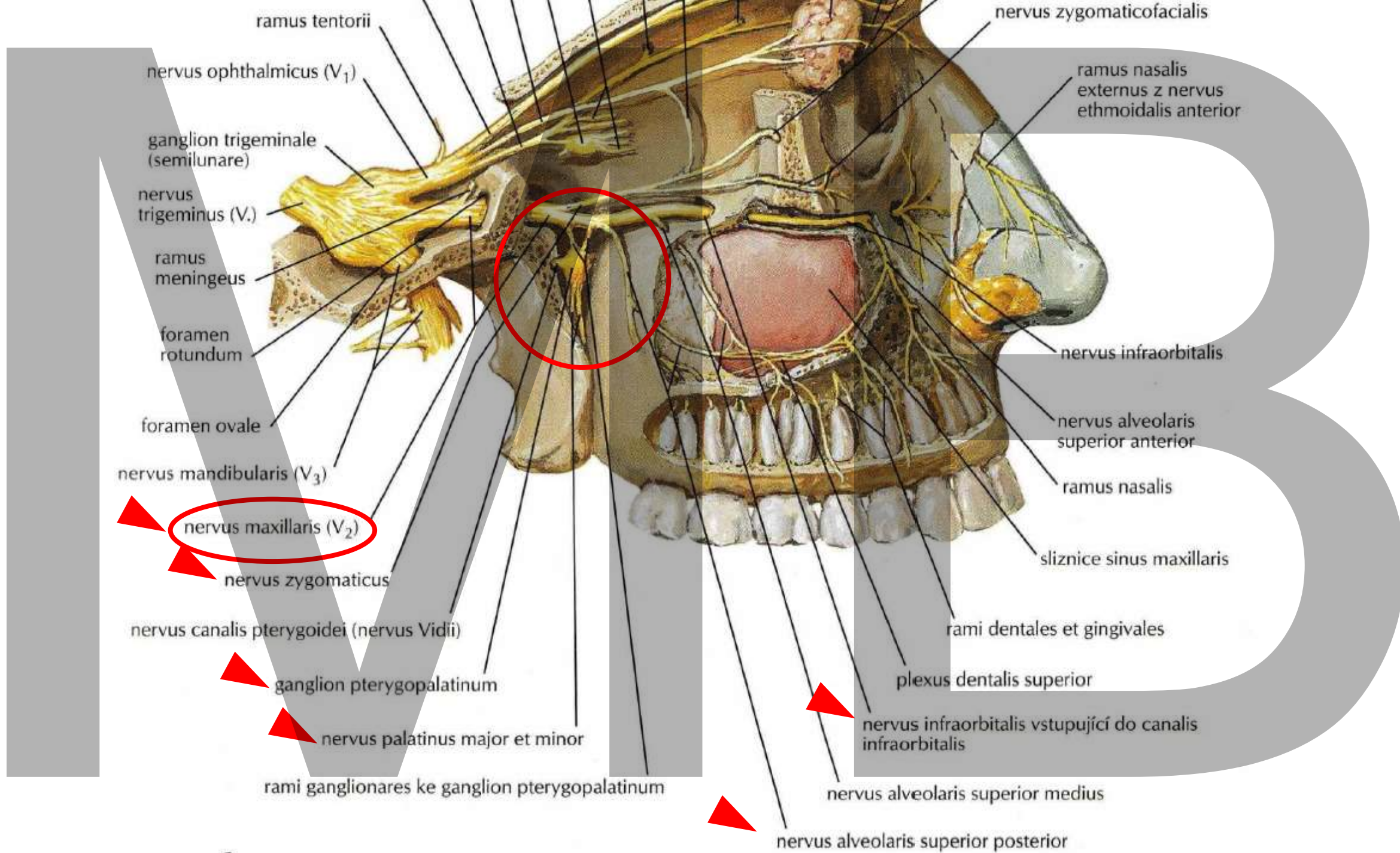
Pterygopalatine fossa – medial proces of infratemp. region

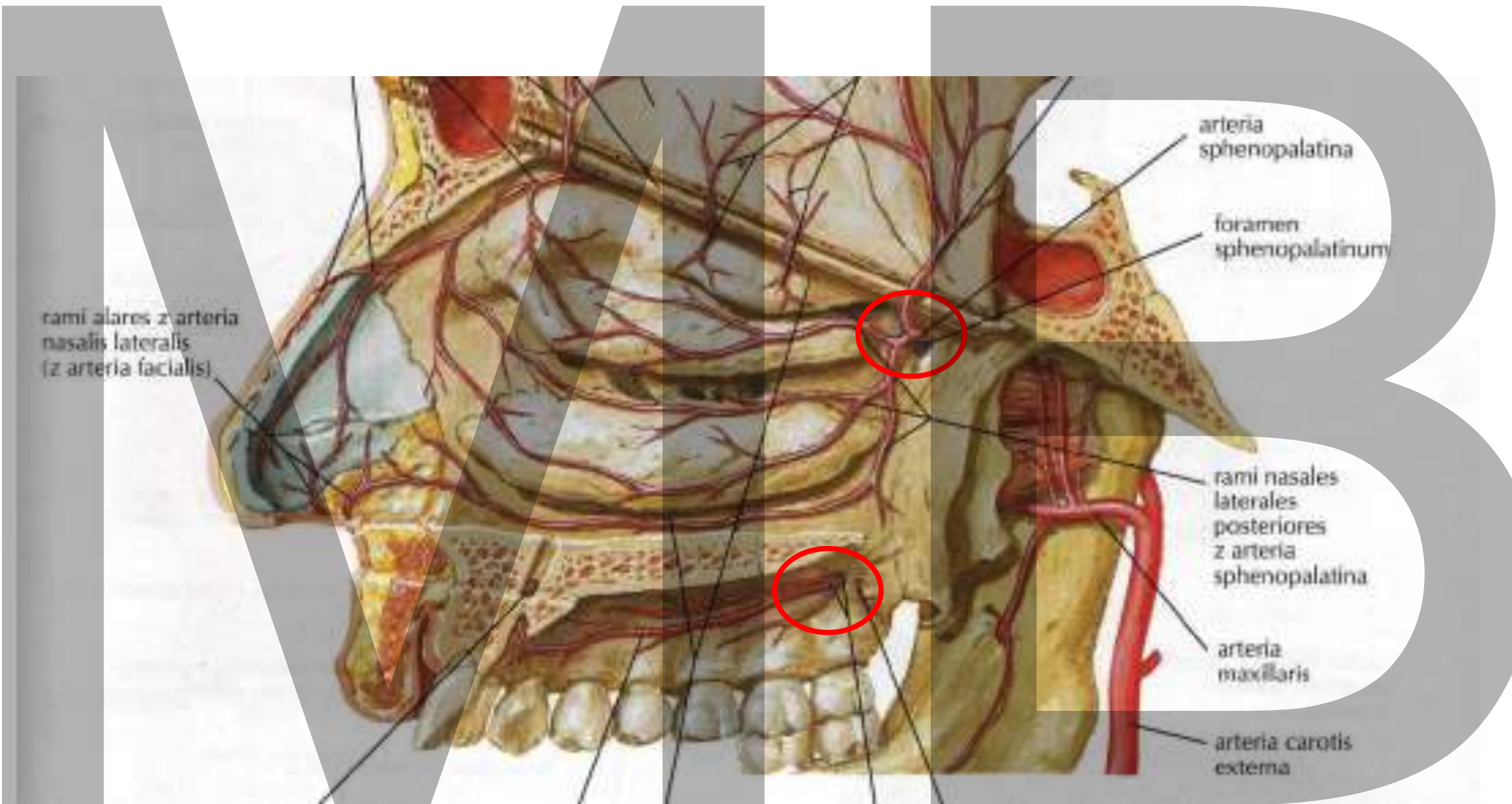


Communications:

- Sphenopalatine for. – nasal cavity
- Major palatine canal – palate
- Inferior orbital fissuere - orbit







rami alares z arteria nasalis lateralis (z arteria facialis)

arteria sphenopalatina

foramen sphenopalatinum

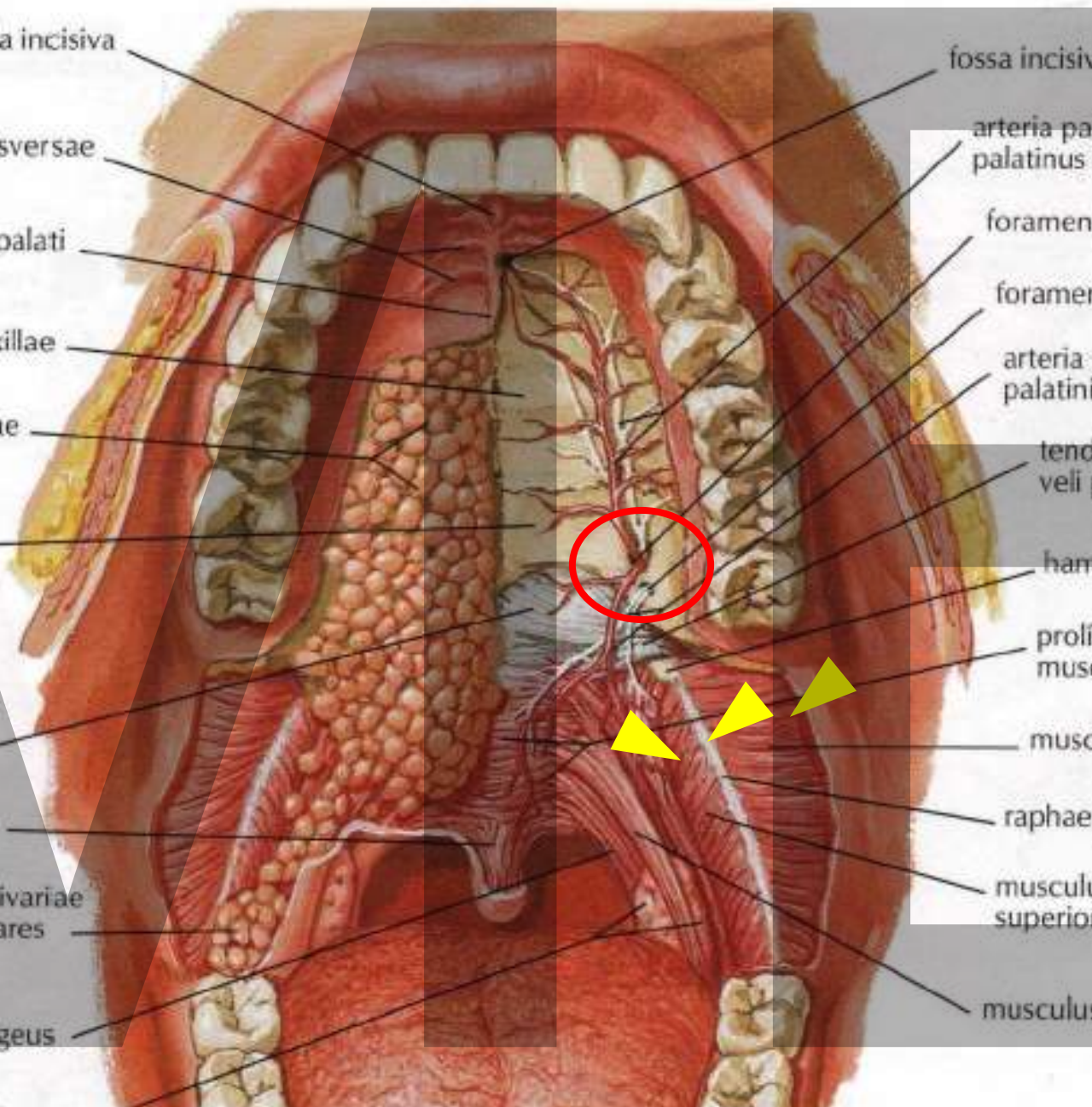
rami nasales laterales posteriores z arteria sphenopalatina

arteria maxillaris

arteria carotis externa

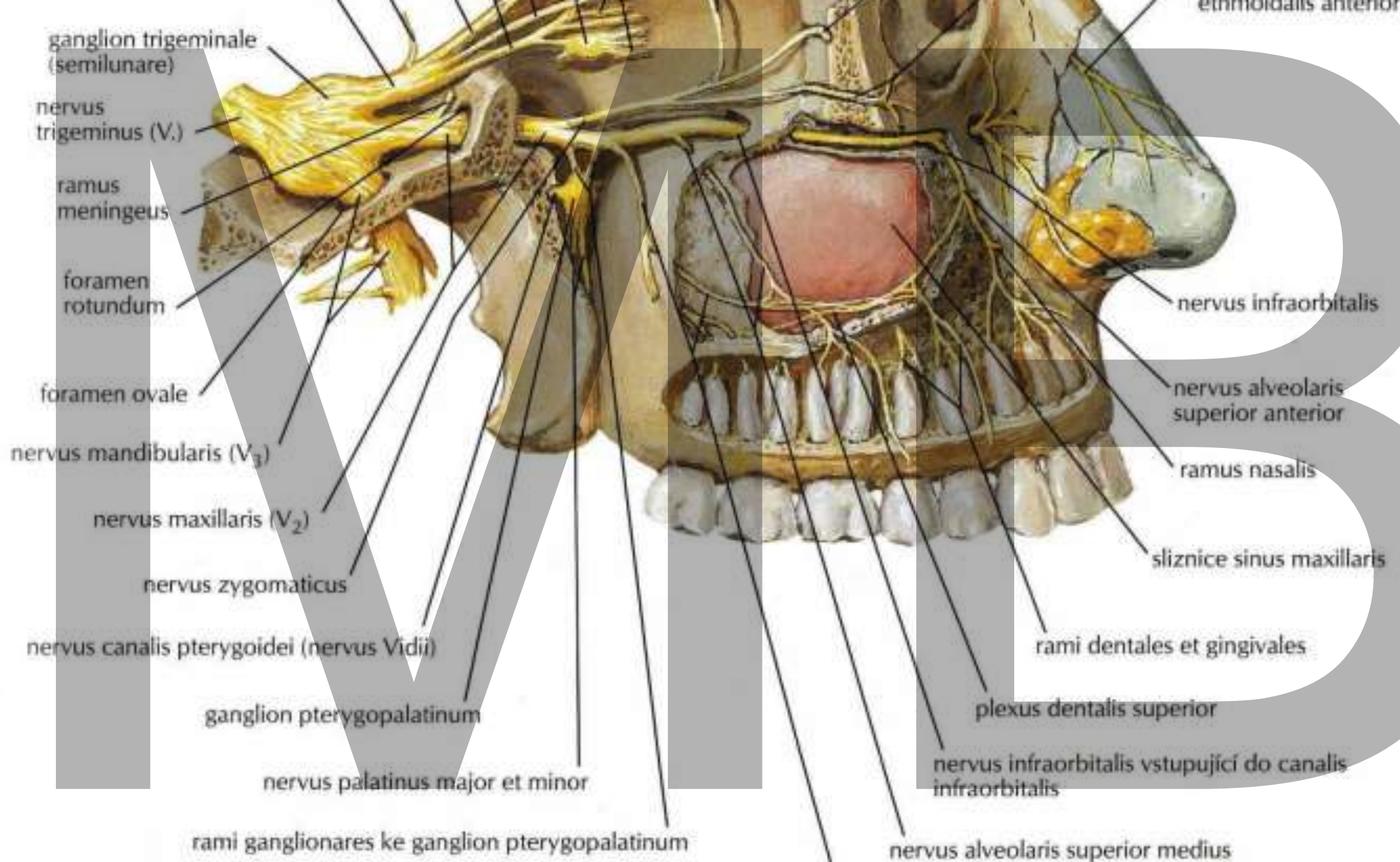
papilla incisiva
rugae palatinae transversae
raphe palati
processus palatinus maxillae
glandulae palatinae
lamina horizontalis ossis palatini
aponeurosis palatina z musculus tensor veli palatini
musculus uvulae
glandulae salivariae minores molares
musculus palatopharyngeus
tonsilla palatina

fossa incisiva
arteria palatina major et nervus palatinus major
foramen palatinum majus
foramen palatinum minus
arteria palatina minor et nervi palatini minores
tendo musculi tensoris veli palatini
hamulus pterygoideus
prolínající se vlákna musculus levator veli palatini
musculus buccinator
raphae pterygomandibularis
musculus constrictor pharyngis superior
musculus palatoglossus



MMB

Local anaesthesia in dentistry.



ganglion trigeminale (semilunare)

nervus trigeminus (V.)

ramus meningeus

foramen rotundum

foramen ovale

nervus mandibularis (V₃)

nervus maxillaris (V₂)

nervus zygomaticus

nervus canalis pterygoidei (nervus Viddi)

ganglion pterygopalatinum

nervus palatinus major et minor

rami ganglionares ke ganglion pterygopalatinum

ethmoidalis anterior

nervus infraorbitalis

nervus alveolaris superior anterior

ramus nasalis

sliznice sinus maxillaris

rami dentales et gingivales

plexus dentalis superior

nervus infraorbitalis vstupující do canalis infraorbitalis

nervus alveolaris superior medius

rami nasales
interni z nervus
infraorbitalis (V₂)

ramus nasalis z nervus
alveolaris anterior
superior (V₂)

komunikace mezi nervus palatinus
major a nervus nasopalatinus
v canalis incisivus

laterální stěna dutiny nosní

foramen sphenopalatinum
(odstraněno)

ganglion
pterygopalatinum

nervus canalis
pterygoidei
(nervus Vidiani)

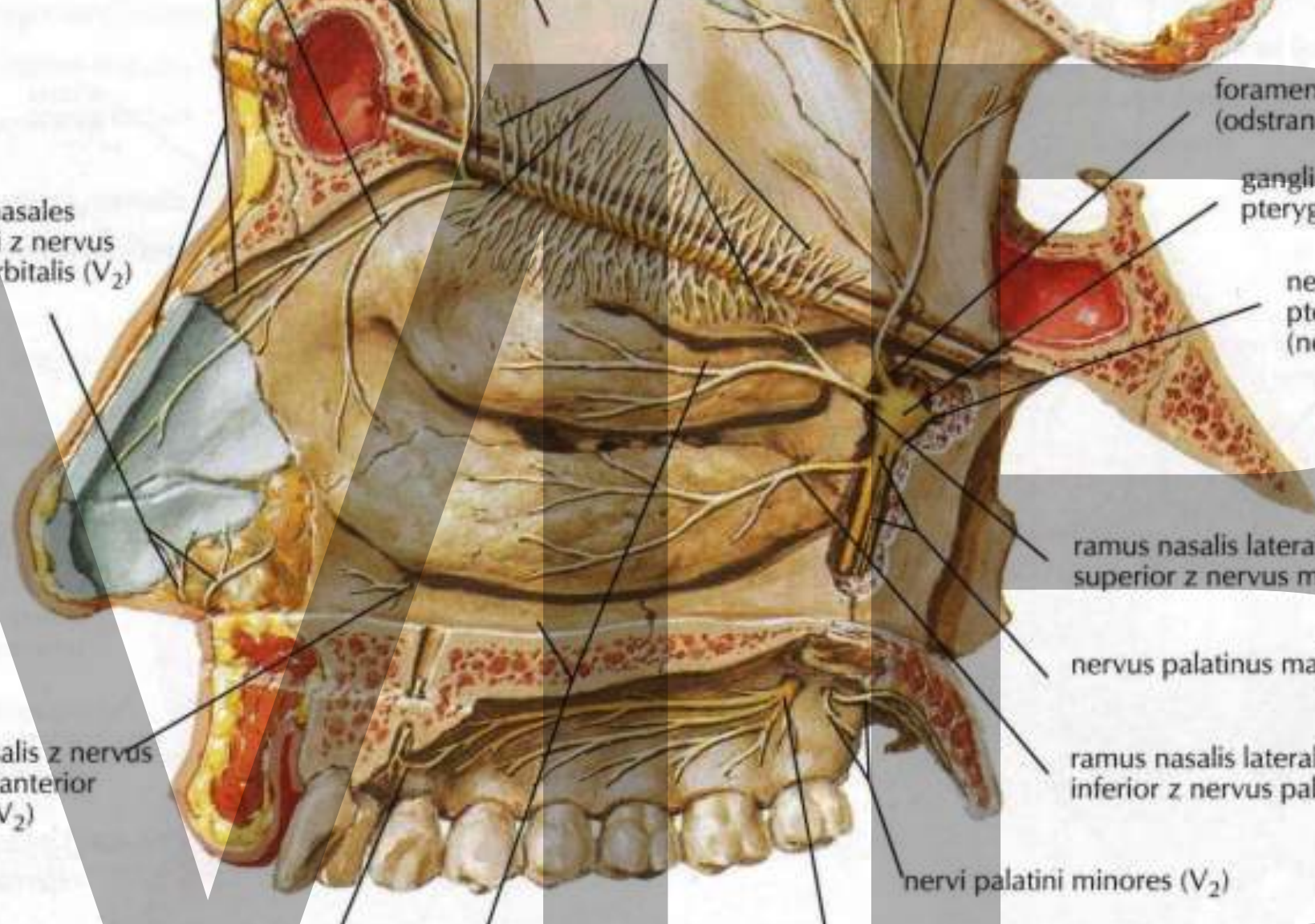
ramus nasalis lateralis posterior
superior z nervus maxillaris (V₂)

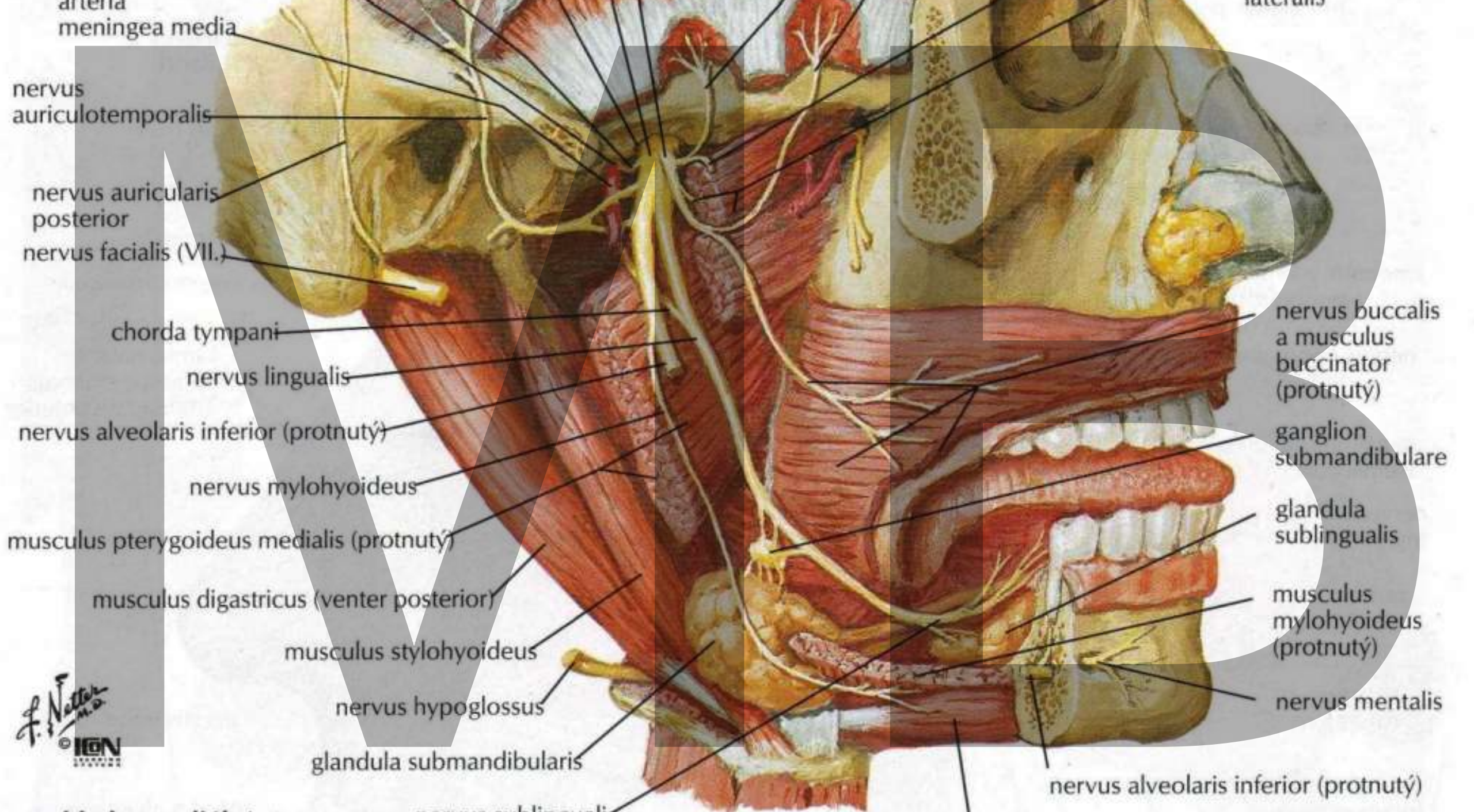
nervus palatinus major et minor (V₂)

ramus nasalis lateralis posterior
inferior z nervus palatinus major (V₂)

nervi palatini minores (V₂)

nervus palatinus major (V₂)





arteria meningeae media

nervus auriculotemporalis

nervus auricularis posterior

nervus facialis (VII.)

chorda tympani

nervus lingualis

nervus alveolaris inferior (protnutý)

nervus mylohyoideus

musculus pterygoideus medialis (protnutý)

musculus digastricus (venter posterior)

musculus stylohyoideus

nervus hypoglossus

glandula submandibularis

nervus buccalis a musculus buccinator (protnutý)

ganglion submandibulare

glandula sublingualis

musculus mylohyoideus (protnutý)

nervus mentalis

nervus alveolaris inferior (protnutý)

F. Netter M.D.
I.G.N.

pohled z mediální strany

nervus sublingualis

radix motoria

radix sensoria

musculus digastricus (venter anterior)

ganglion trigeminale
(semilunare)

nervus ophthalmicus (V₁)

nervus maxillaris (V₂)

nervus mandibularis (V₃)

přední oddíl

nervus muscoli tensoris
veli palatini a musculus
tensor veli palatini

ganglion oticum

chorda tympani

nervus et musculus
pterygoideus medialis
(protnutý)

hamulus pterygoideus

nervus lingualis

ganglion geniculi

cavum tympani

chorda tympani

nervus facialis (VII.)

musculus tensor tympani
et nervus muscoli tensoris
tympani

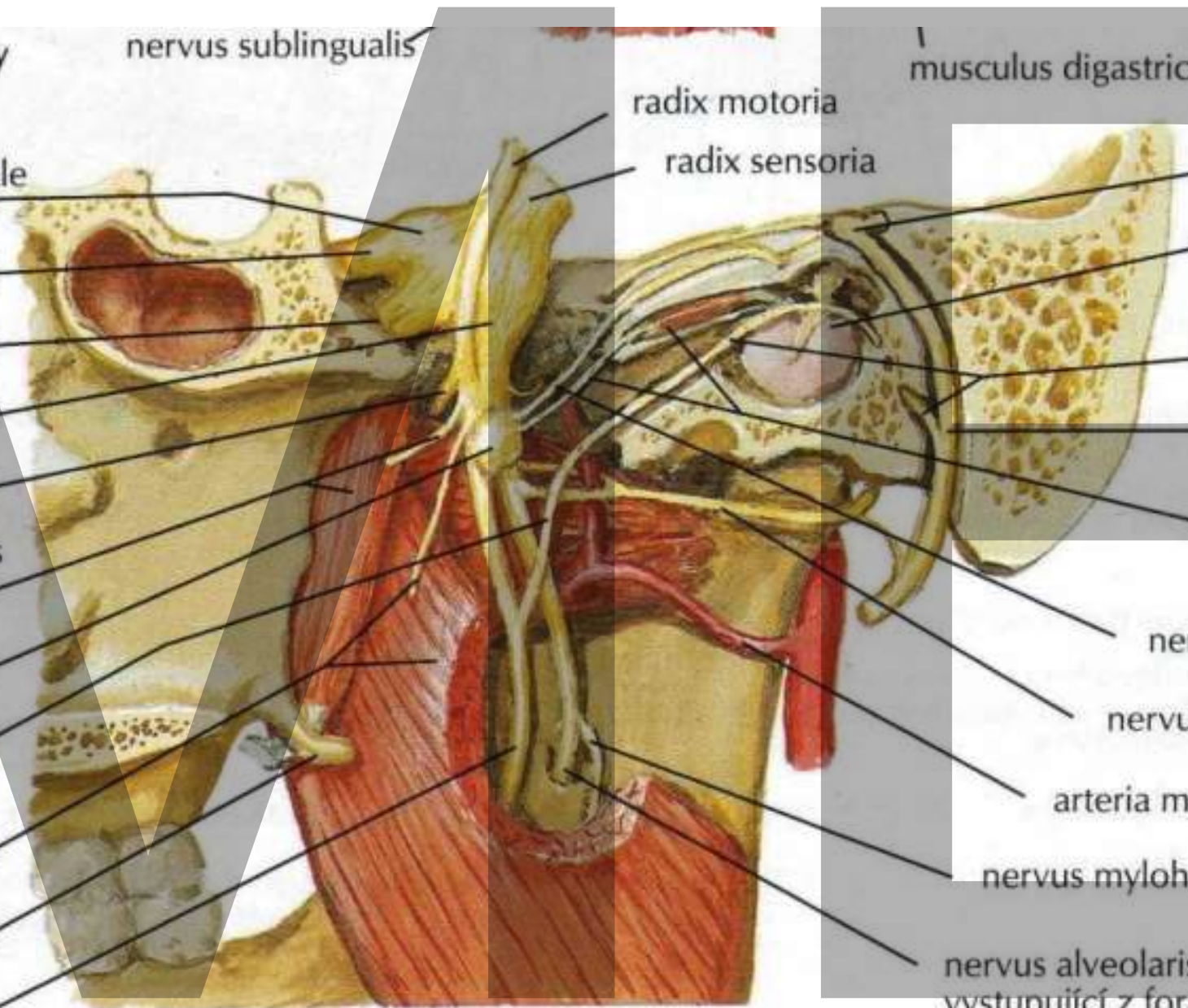
nervus petrosus minor

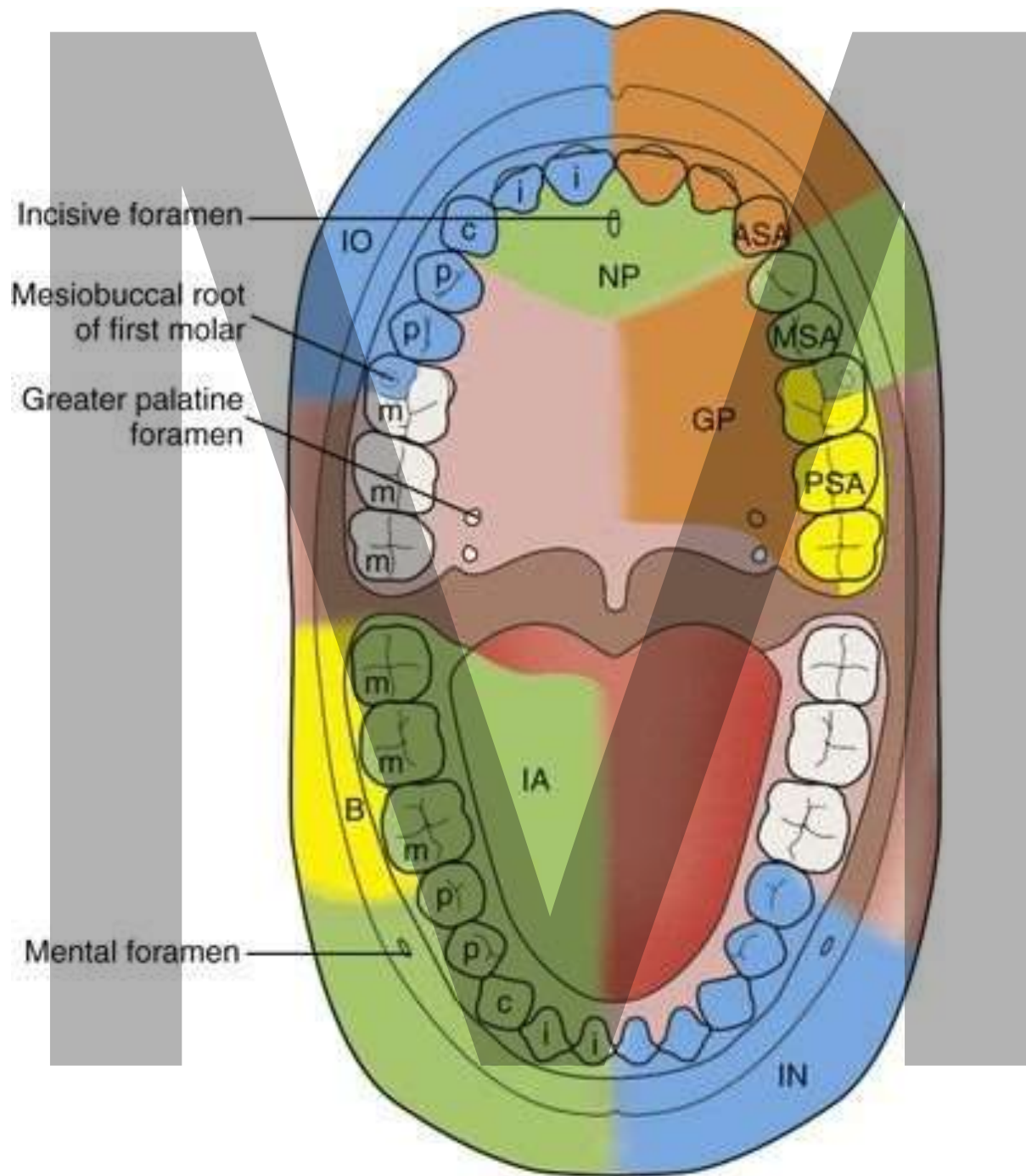
nervus auriculotemporalis

arteria maxillaris

nervus mylohyoideus

nervus alveolaris inferior
vystupující z foramen mandibulae





- IO** Infraorbital block
- ASA** Anterior superior alveolar block
- MSA** Middle superior alveolar block
- PSA** Posterior superior alveolar block
- NP** Nasopalatine block
- GP** Greater palatine block
- B** Buccal block
- IA** Inferior alveolar block
- IN** Incisive block

MM

Odontogenic infections.

BB

Odontogenic infections

- Regions surrounding jaws, bacterial infection
- Spreading may lead to life threatening conditions
- **Aetiology:** pericoronitis, apical periodontitis, periodontal disease, dry socket...
- **Symptoms:** pain, swelling, redness
limited mouth opening, fever
difficulty with swallowing
airway compromise...



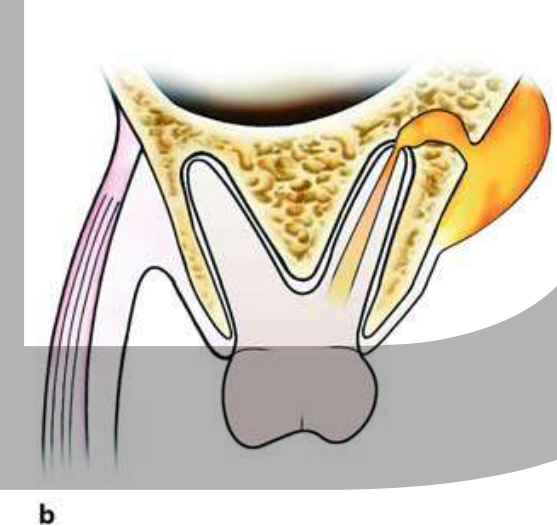
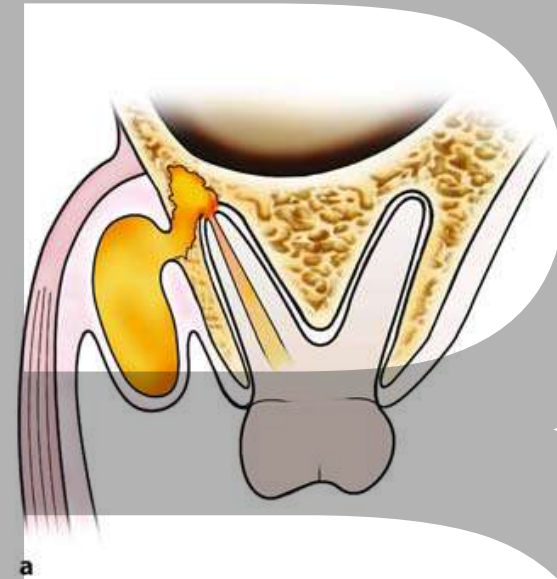
Odontogenic infections

- **Spreading:**
 - Directly to adjacent regions
 - Lymphatic vessels
 - Blood vessels



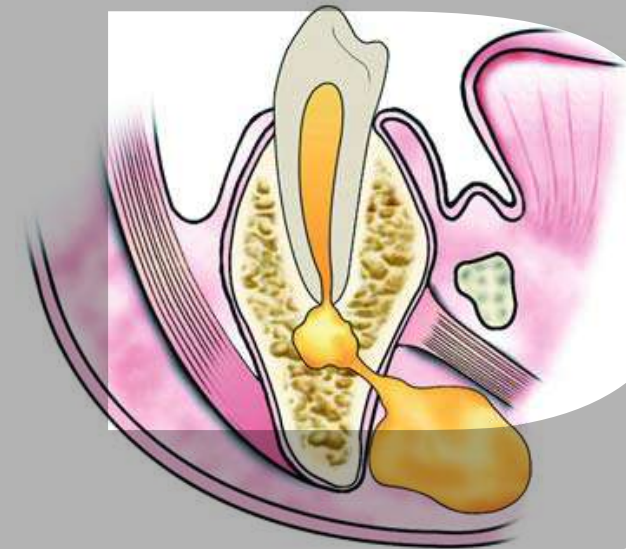
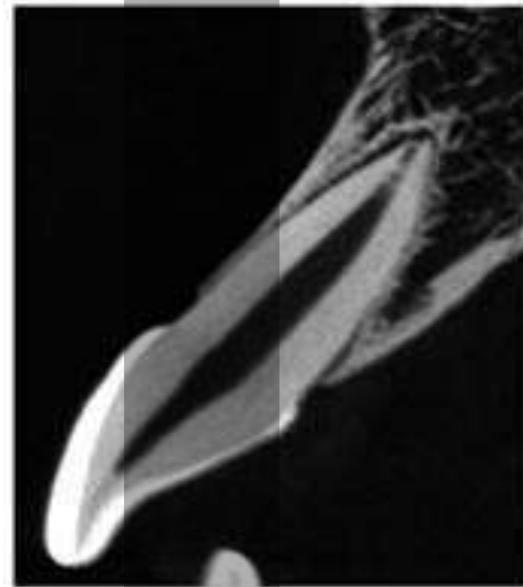
Why anatomy?

- **Tooth position in jaw**
- **Localization** of pathological process (e.g. apical periodontitis)
- **Boundaries of anatomical regions**
- Possibility of spreading
- **Importance for treatment**
- **Access and anatomical risk factors**



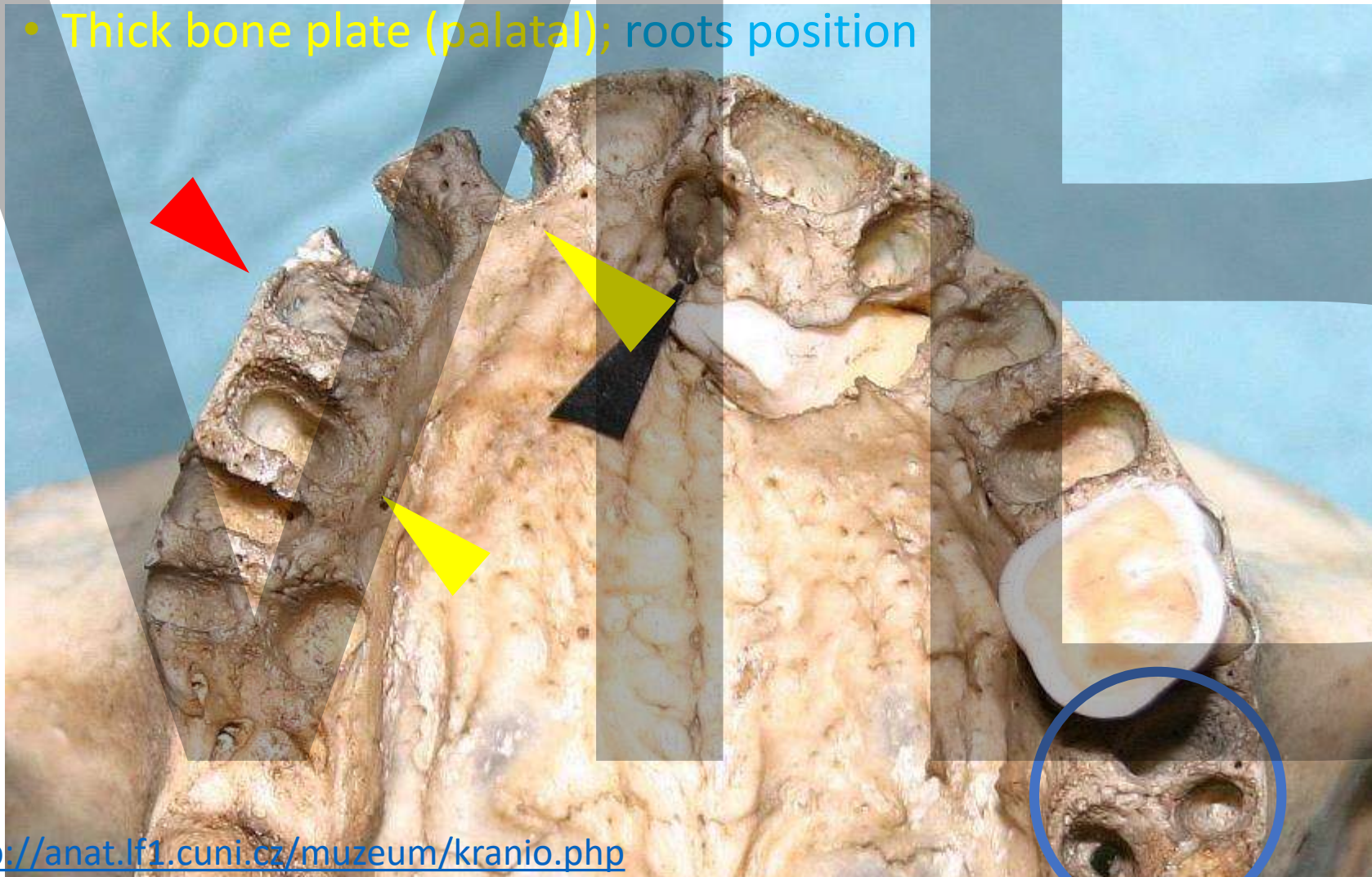
Teeth position in jaw

- Number and localization of roots?
- Bone plate thickness?



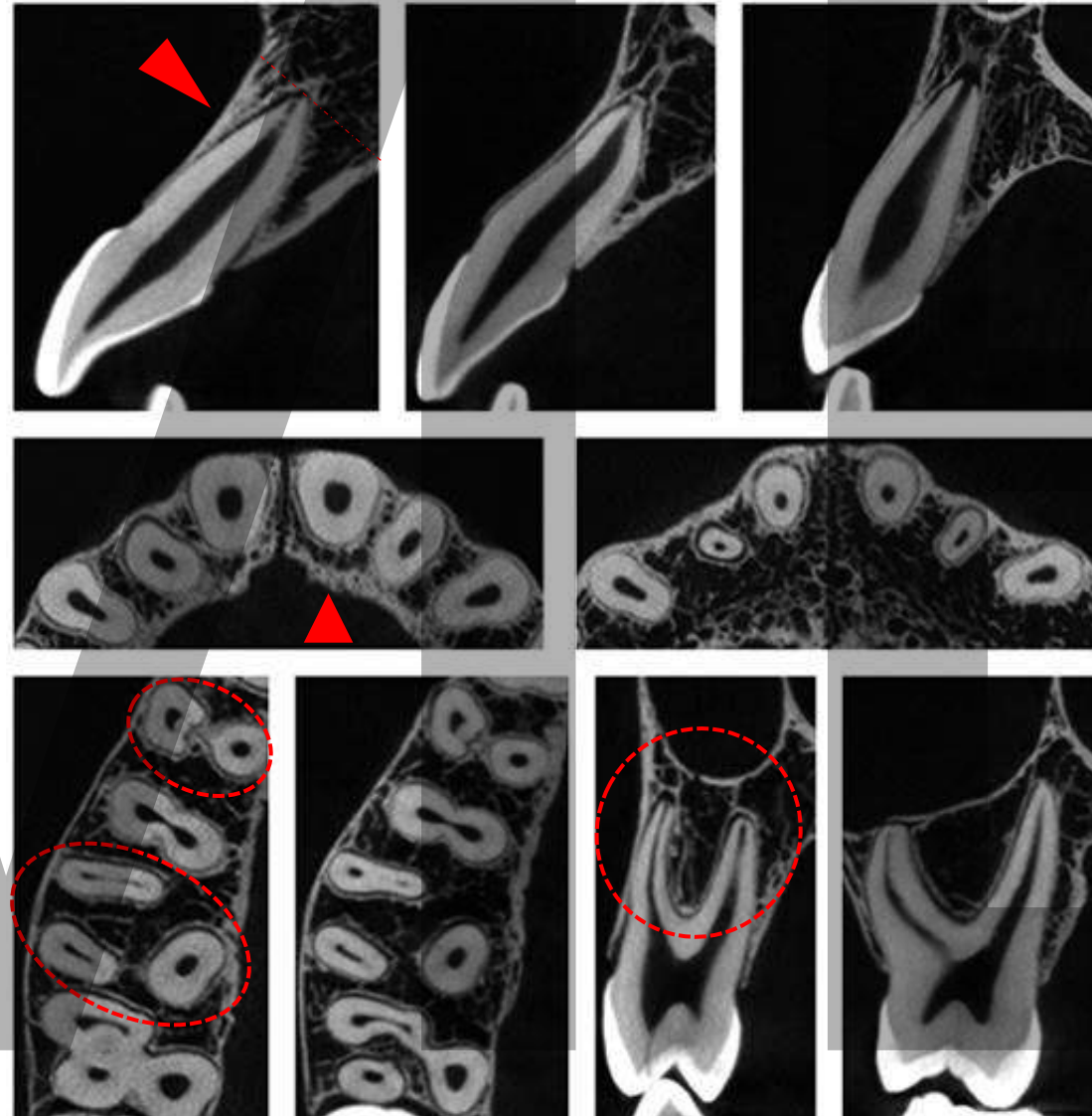
Teeth position in jaw

- Thin bone plate (vestibular)
- Thick bone plate (palatal); roots position



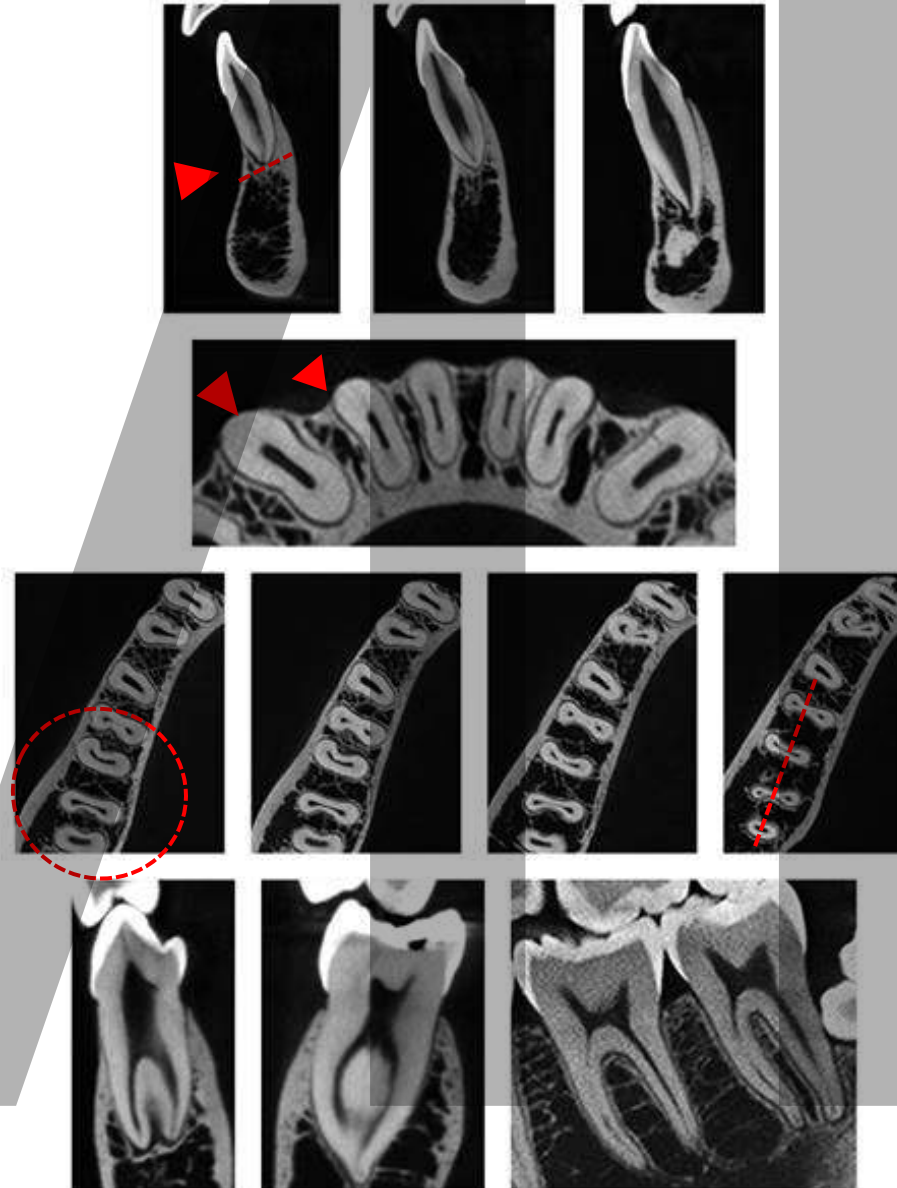
CBCCT: Teeth position in jaw

Maxilla



CBCCT: Teeth position in jaw

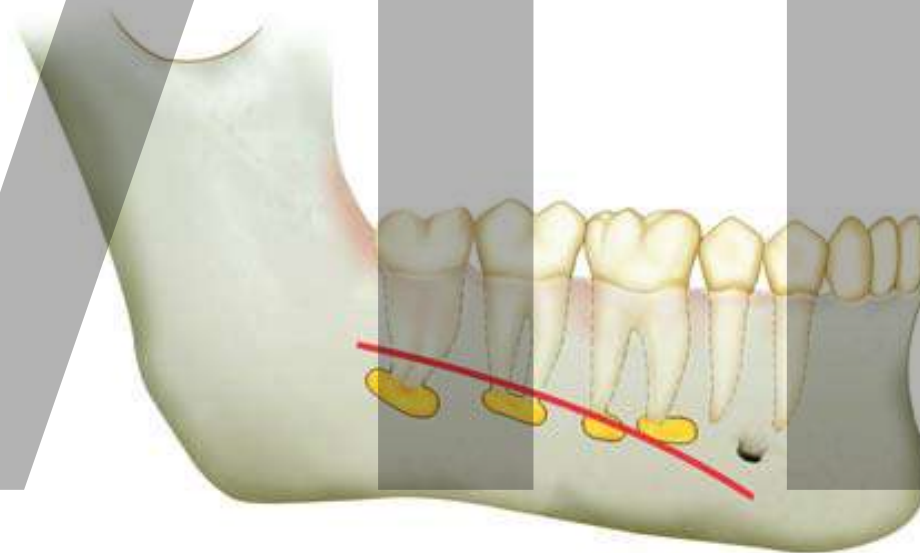
Mandible



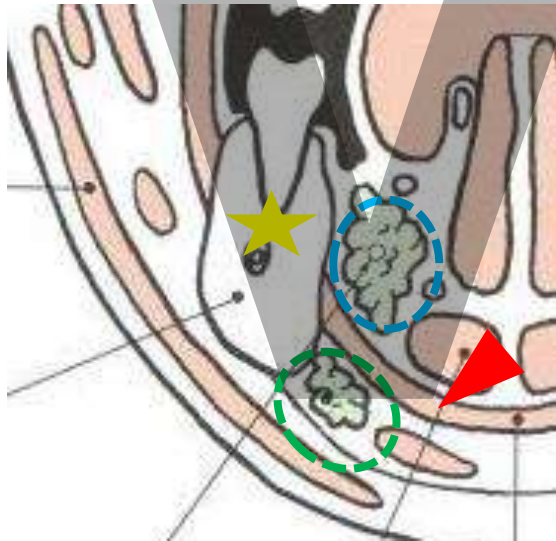
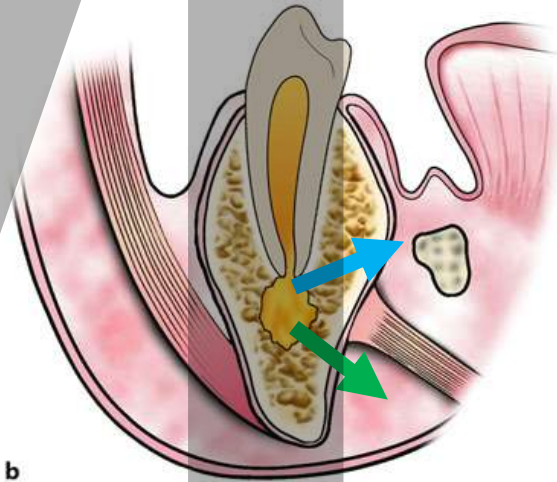
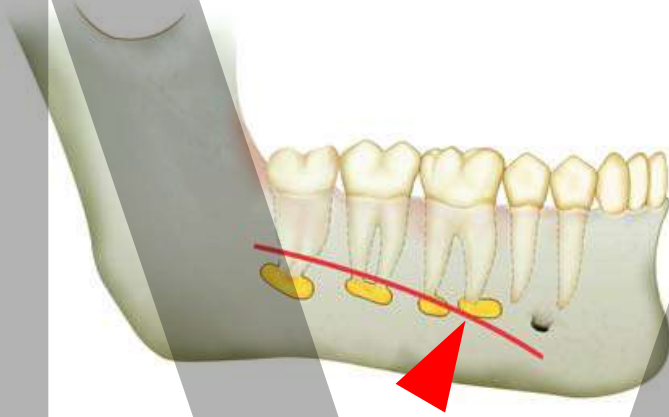
Molar roots are distally more lingually

Region boundaries and muscles insertion

- E.g. Mylohyoid muscle insertion
on mylohyoid line of the mandible
– separation of sublingual space from submandibular sp.



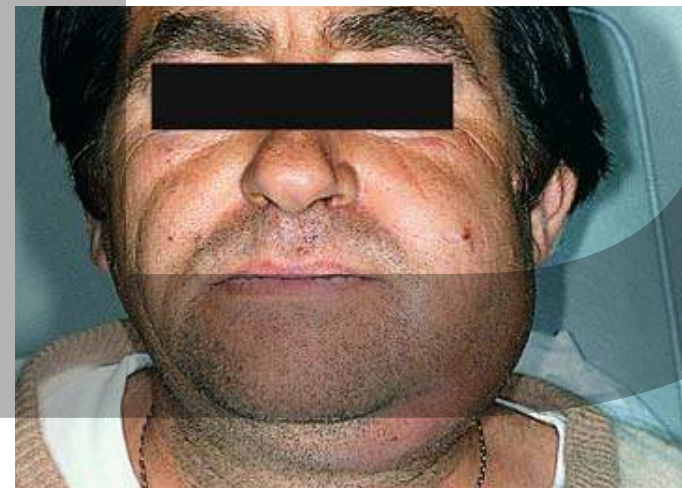
Region boundaries and muscles insertion



sp. sublinguale
m. mylohyoideus
sp. submandibulare



abscessus sublingualis

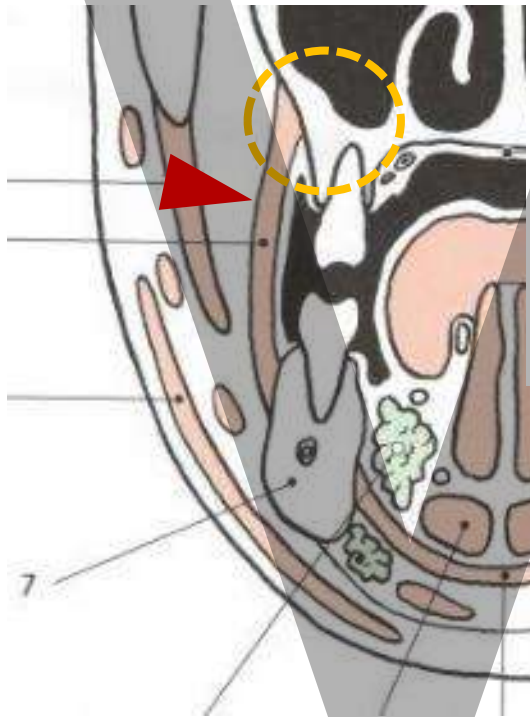


abscessus submandibularis

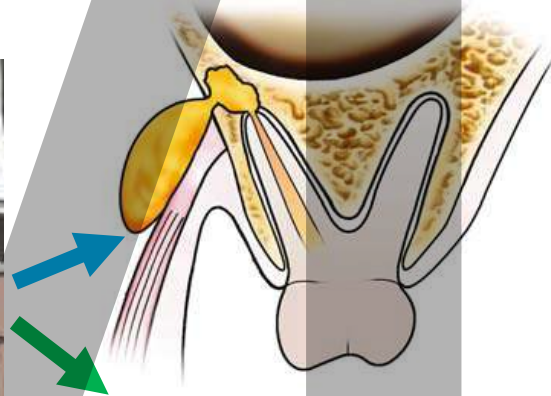
Region boundaries and muscles insertion

- Buccinator muscle insertion – relation to roots

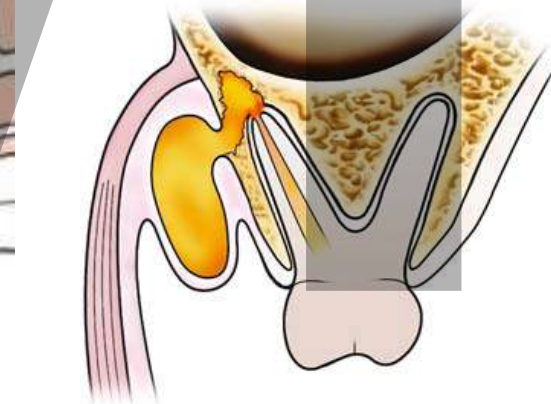
m. buccinator



Abscessus buccae

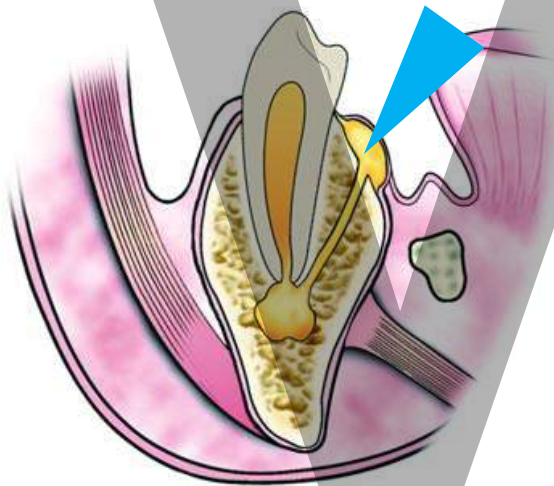


Abscessus vestibularis



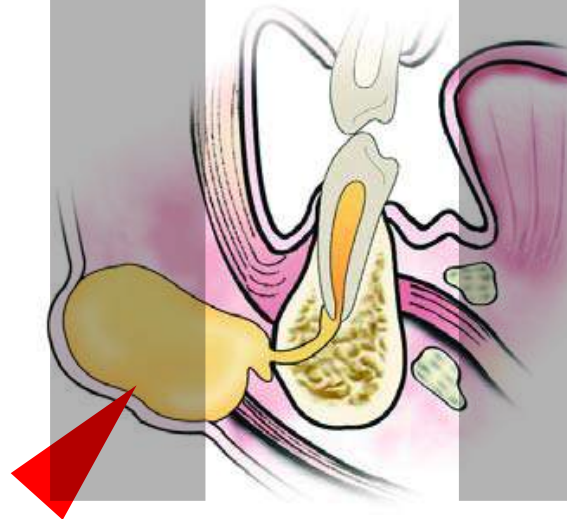
Treatment and anatomy

- Surgical treatment = drainage of abscess (+ causal treatment)
- **Intraoral or extraoral access ?**

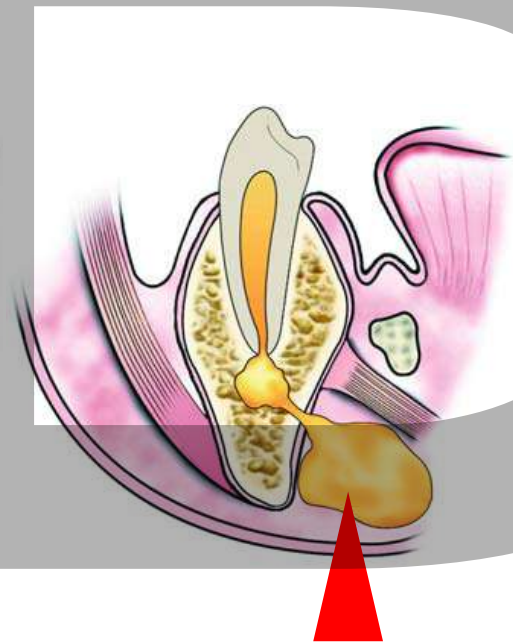


Intraoral incision

X

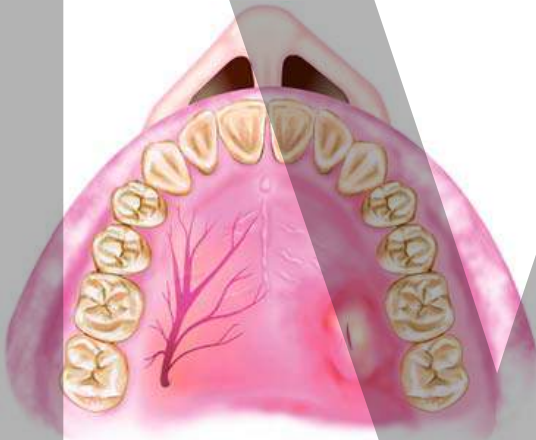


Extraoral incision

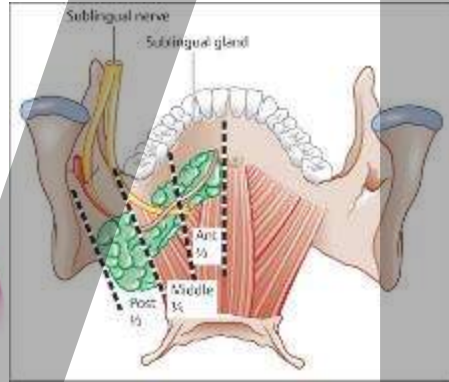


Treatment and anatomy

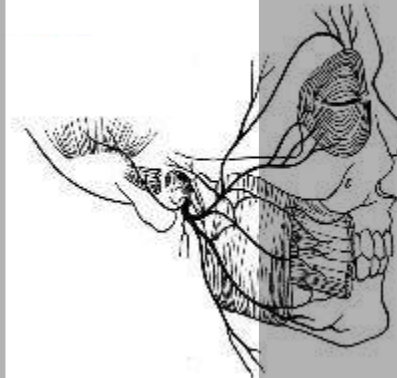
- Risk of injury to important structures?



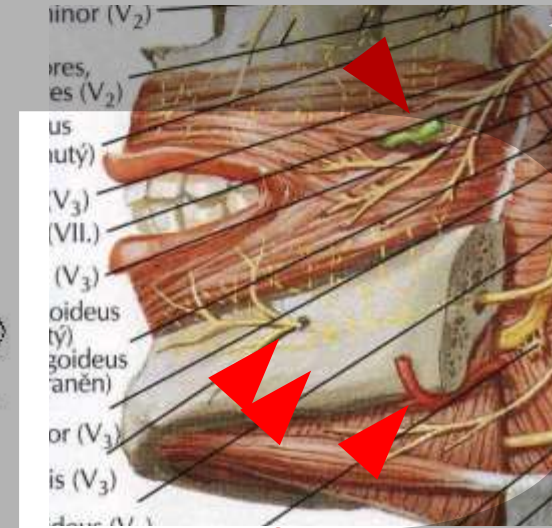
Palatine a.



Lingual n.
duct. gl. submandibularis



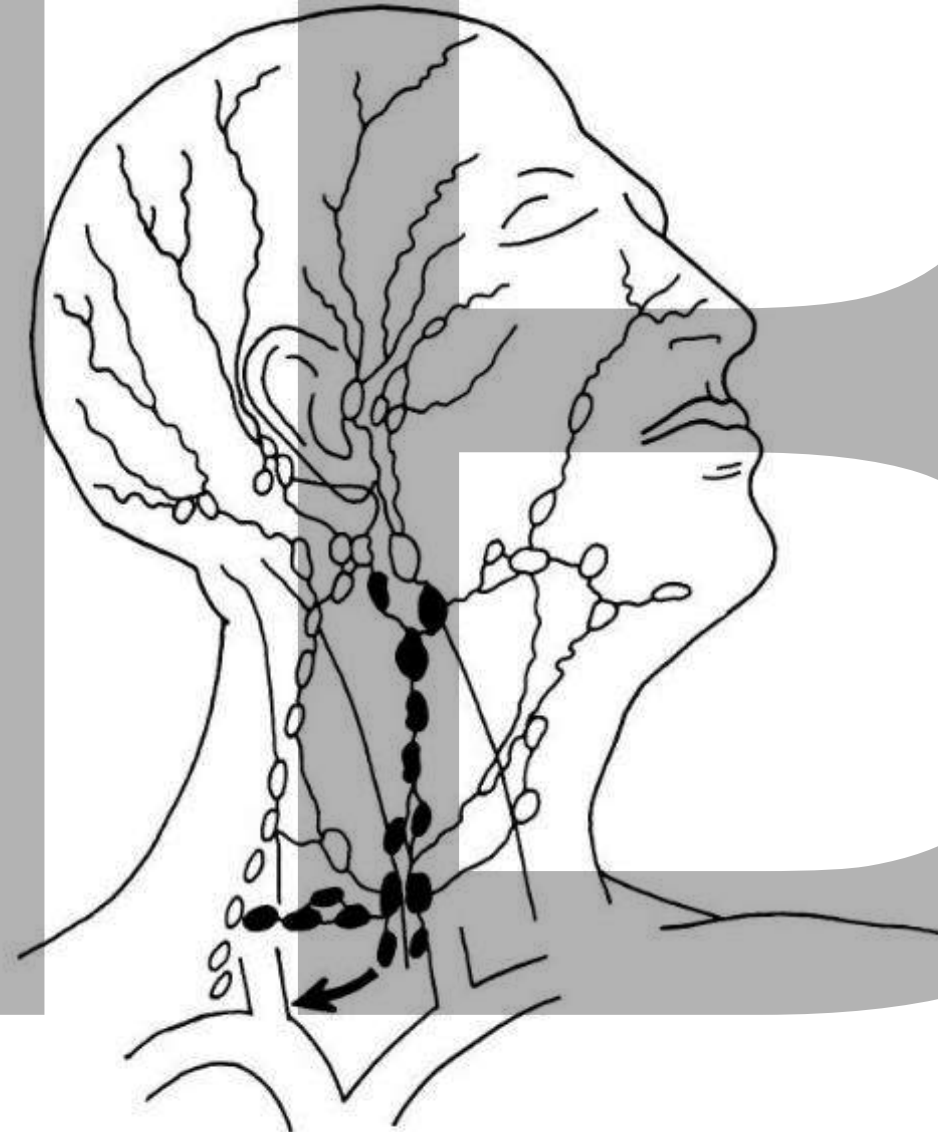
n. VII



Mental n.
Parotid duct
Facial a.

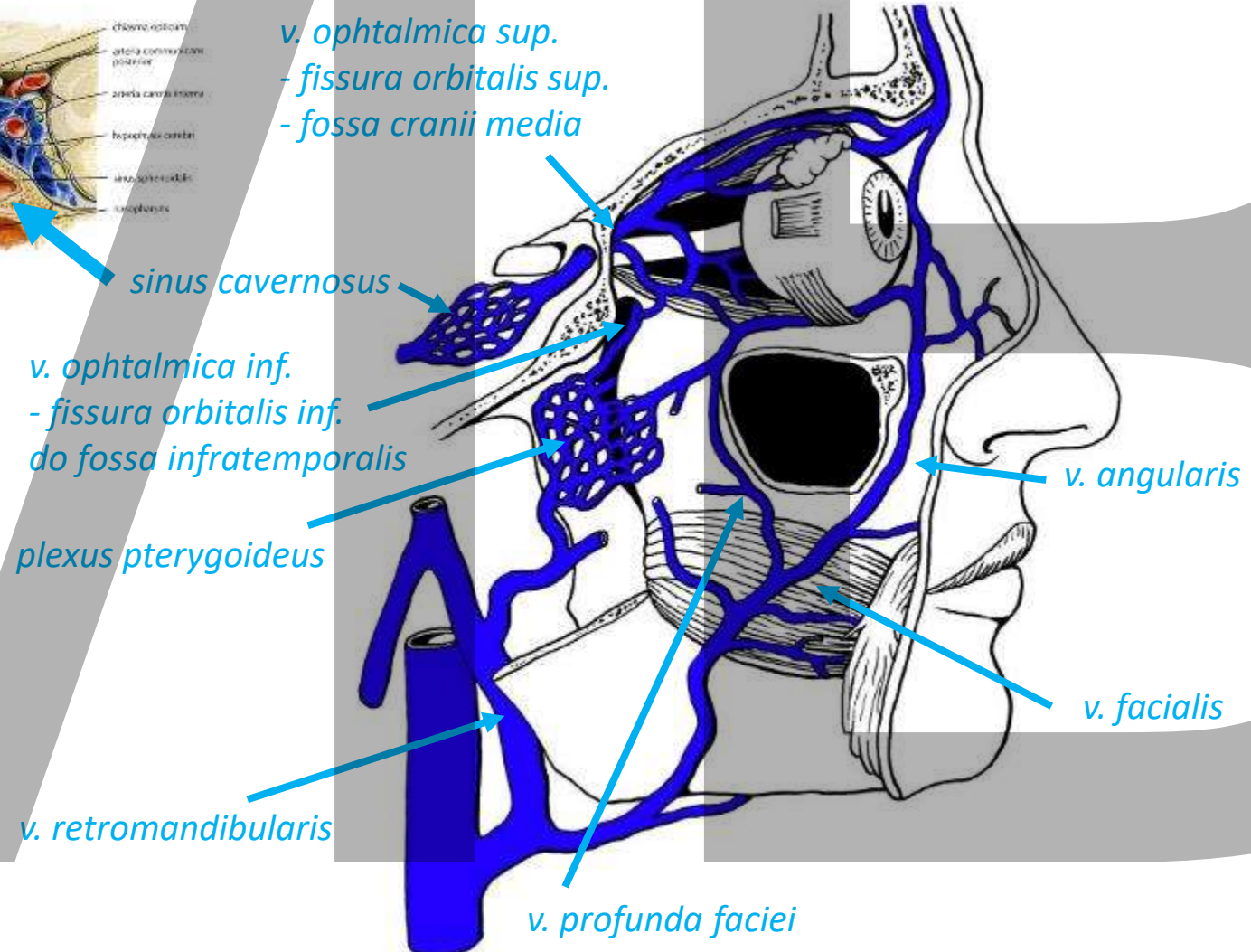
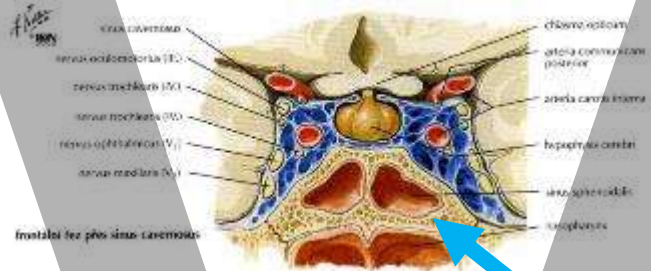
Lymphatic vessels

- Activation of regional lymph nodes
- Inflammation spreading



Veins

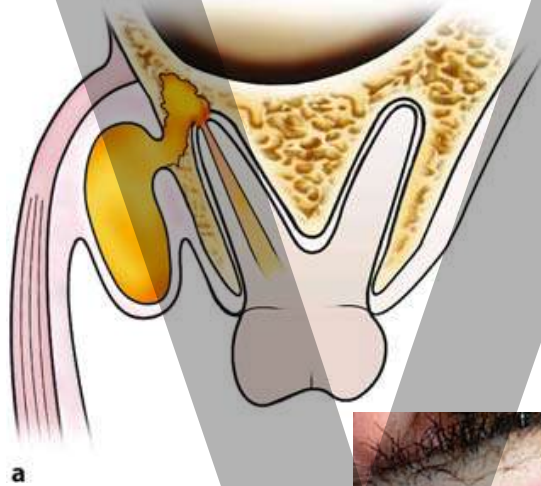
- Risk of intracranial spreading (*cavernous sinus thrombosis*)



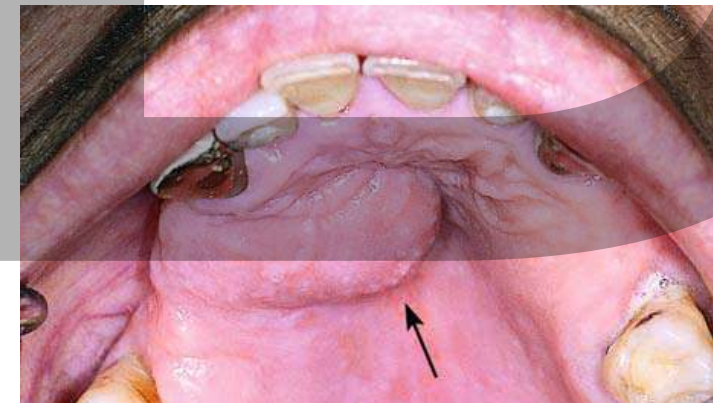
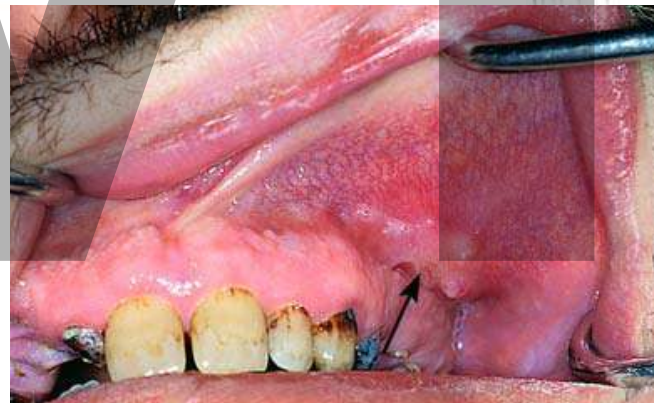
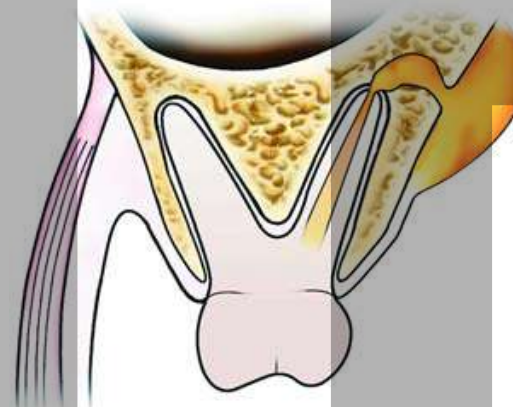
Maxilla

- Vestibular spreading – vestibular abscess
- Palatal roots – palatal abscess
- *Possibly to maxillary sinus*

Vestibular abscess

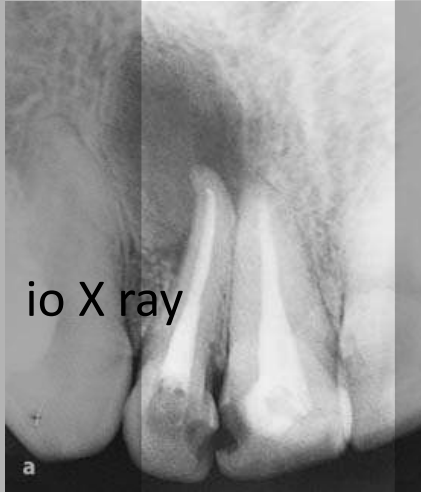


Palatal abscess



Vestibular abscess

Scheme



Swelling in the vestibule



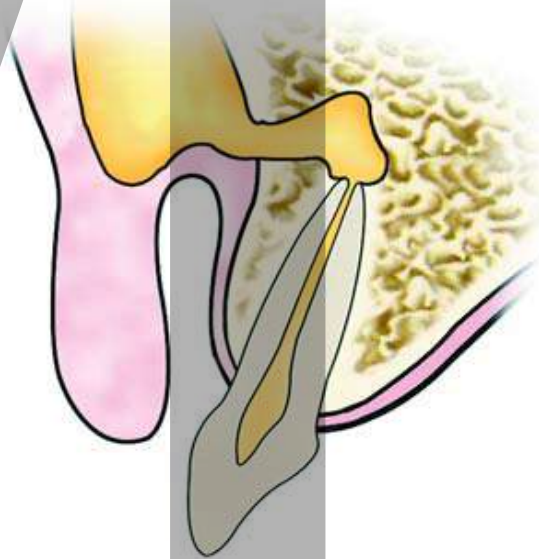
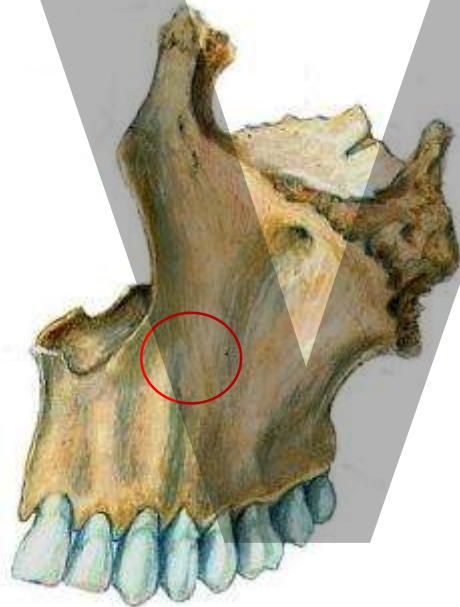
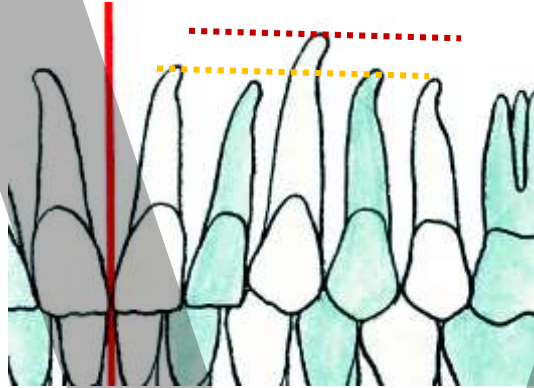
Intraoral incision



Abscess drainage

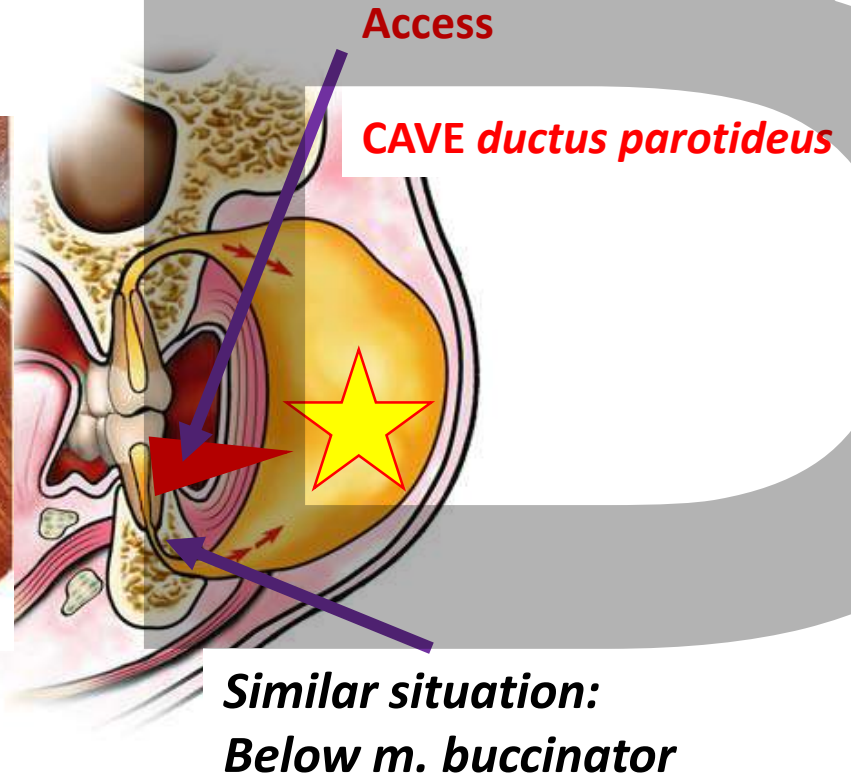
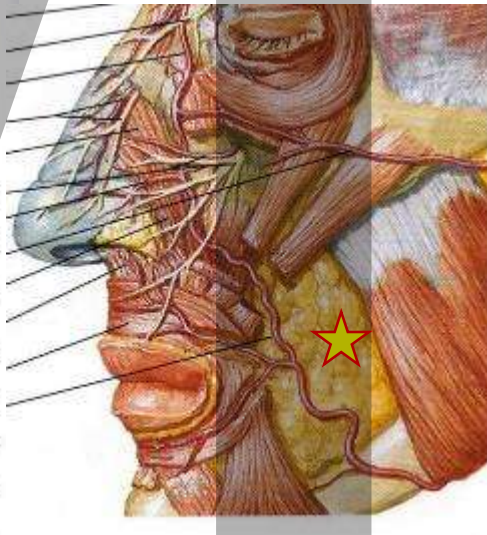
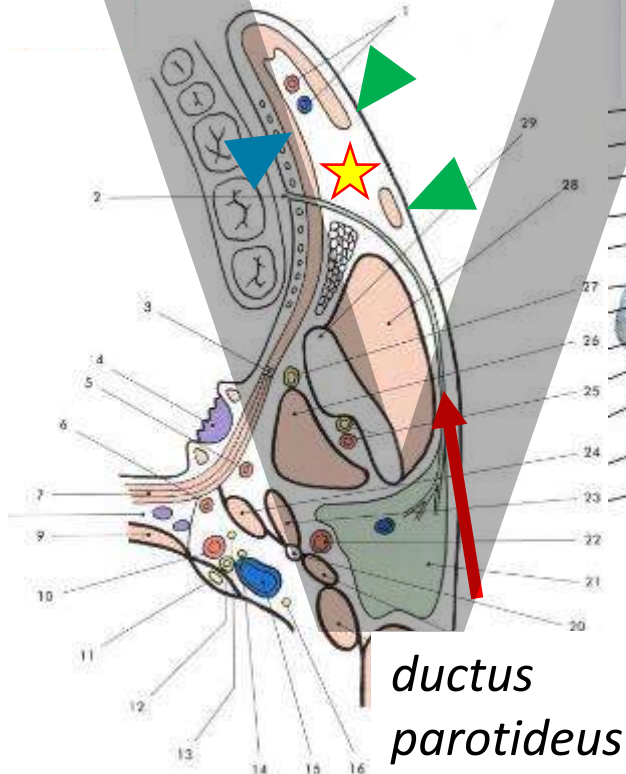


Canine – inflammation above *fornix of the vestibule* (apex position) – abscessus fossae caninae



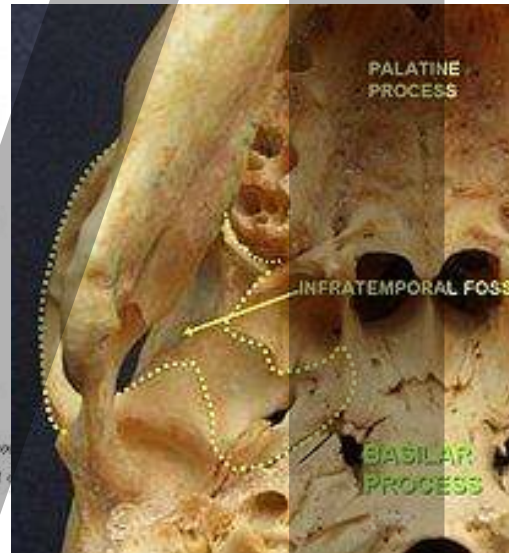
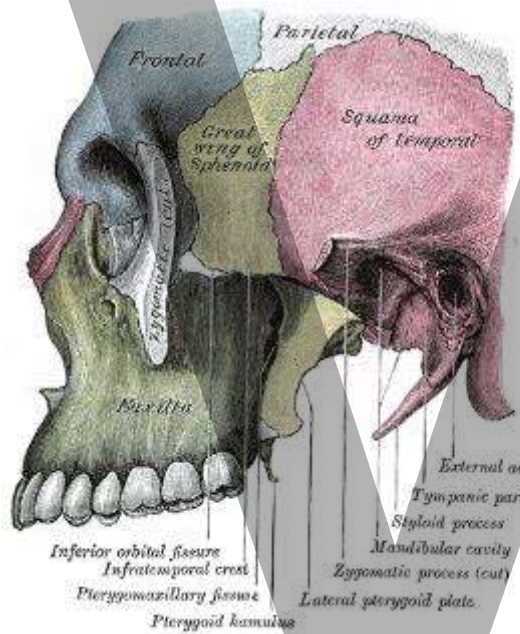
Spreading above *buccinator* m. – buccal abs.

- Infection between **superficial** (mimic muscle) and **deep** (*buccinator* m.) layer of buccal region- *spatium intermusculare*;



Upper molars (esp. M3) – spreading distally – abscessus retromaxillaris

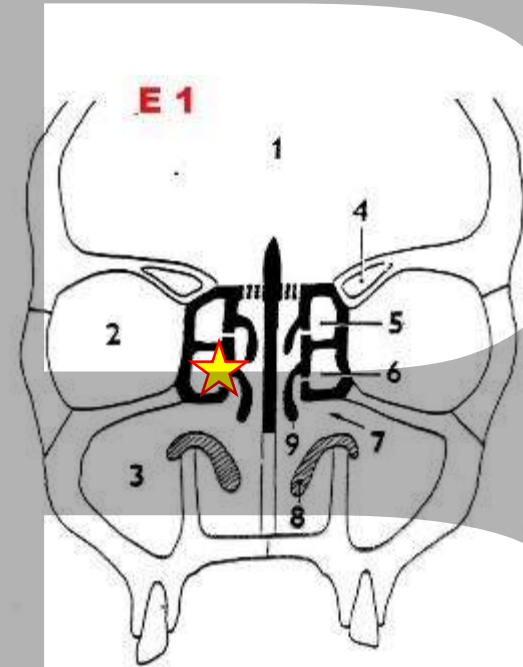
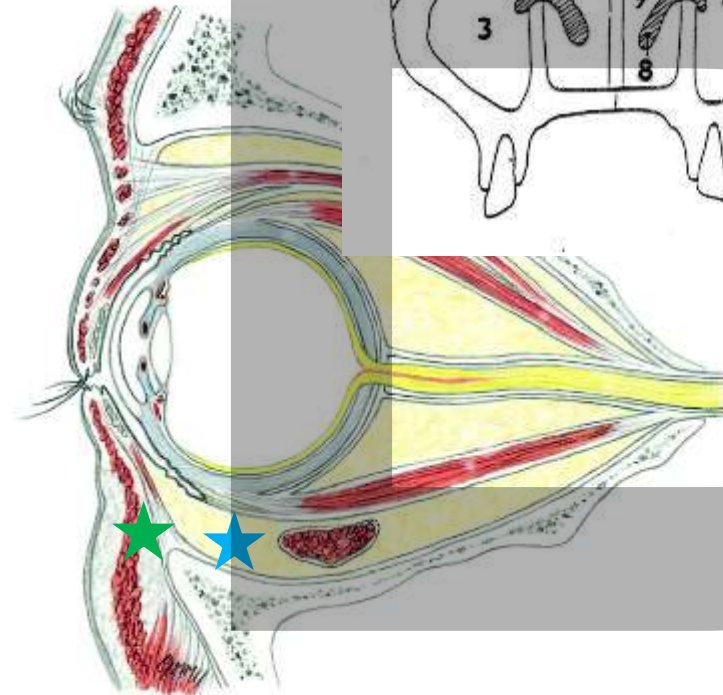
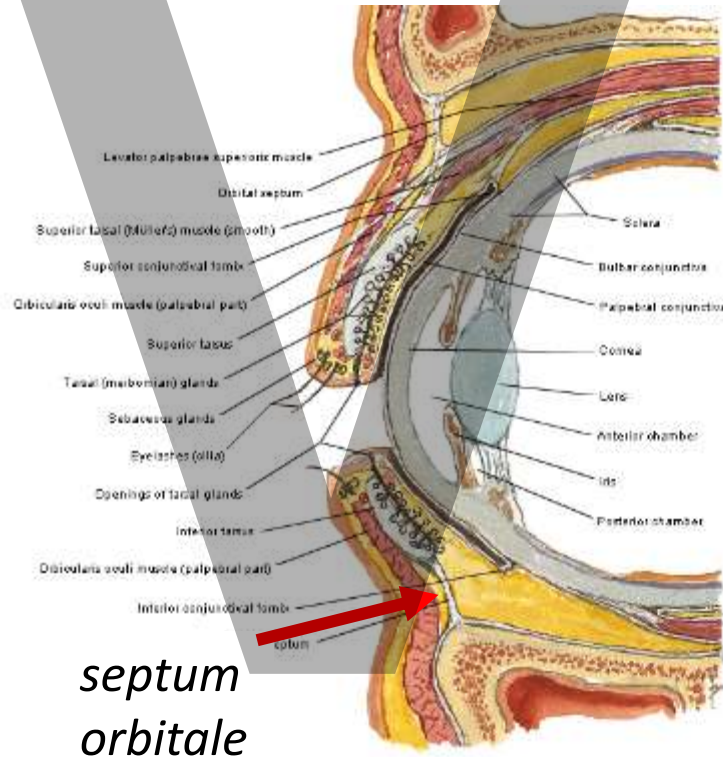
- Anterior portion of *infratemporal space*
 - risk of spreading to surrounding regions



https://en.wikipedia.org/wiki/Infratemporal_fossa

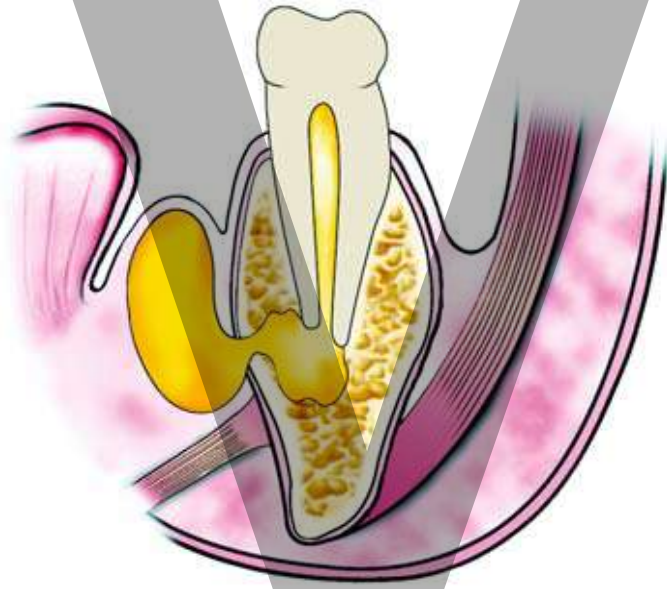
Spreading into the orbit pre/retroseptal orbitocellulitis

- via
 - *Canine fossa/* perimaxillar abscess
 - *tromboflebitis v. angularis*
 - *Maxillar sinusitis / cellulae ethmoidales* ★

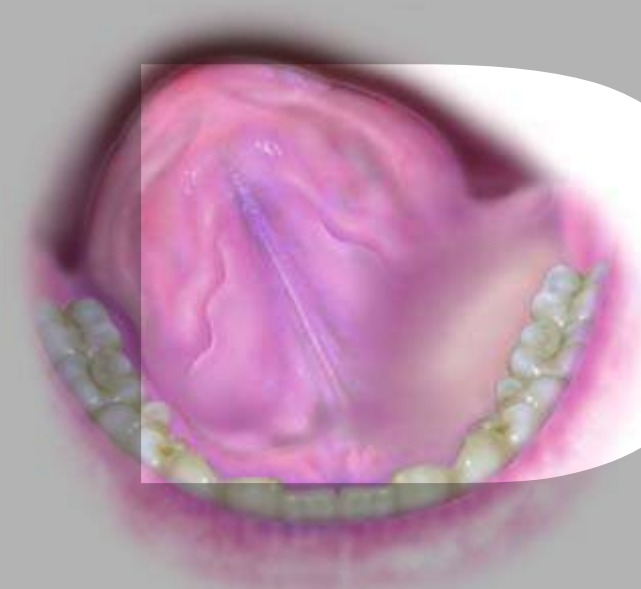


Mandible

- Vestibular spreading – vestibular abscess
- Oral spreading – above mylohyoid muscle insertion – sublingual abscess

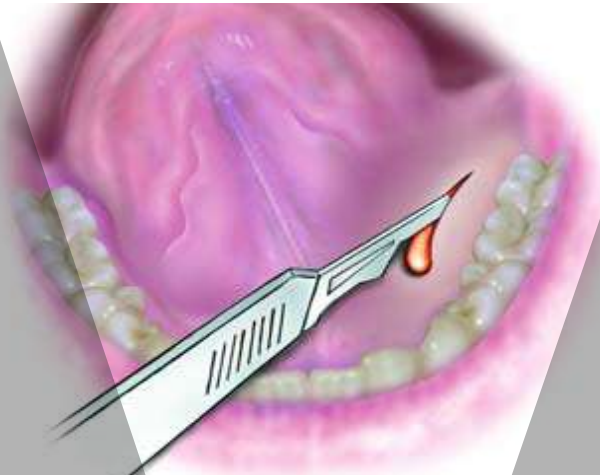


OPG: periapical inf. 37

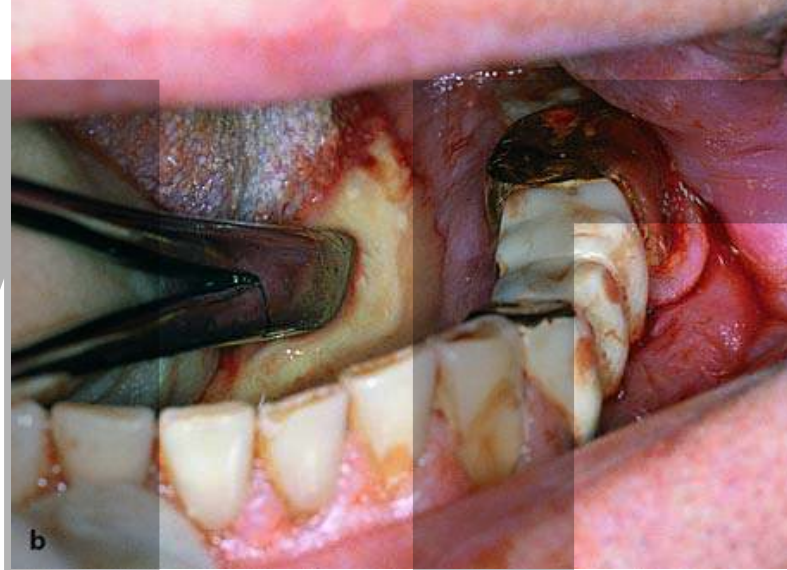


swelling

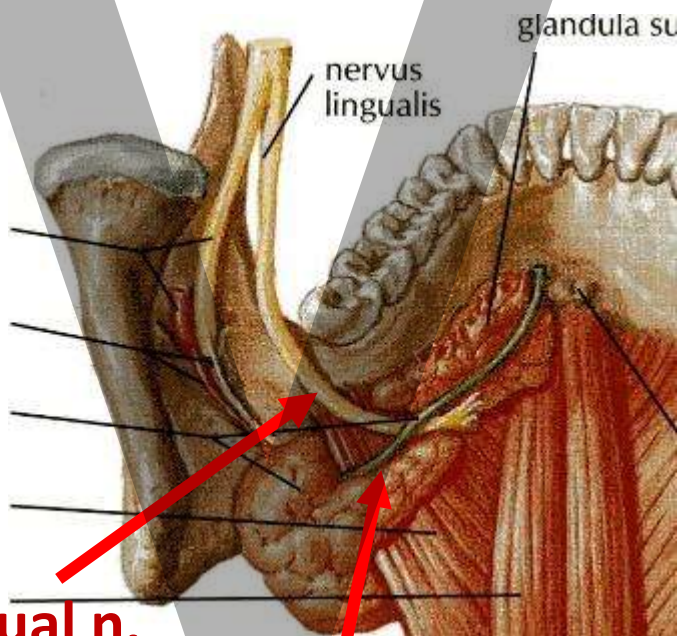
Sublingual abscess



a Incision through mucosa

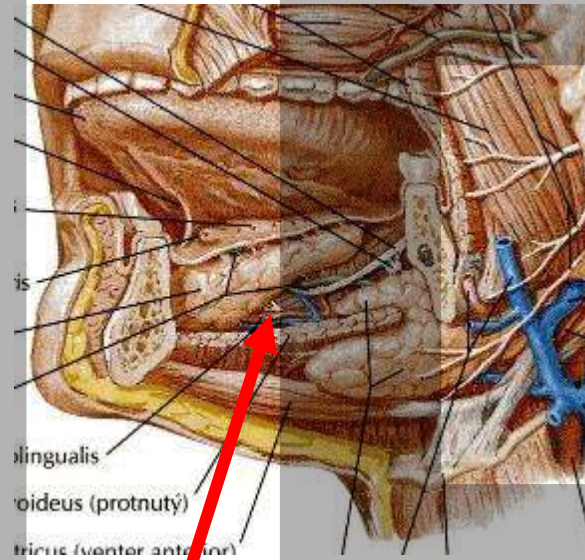


abscess drainage



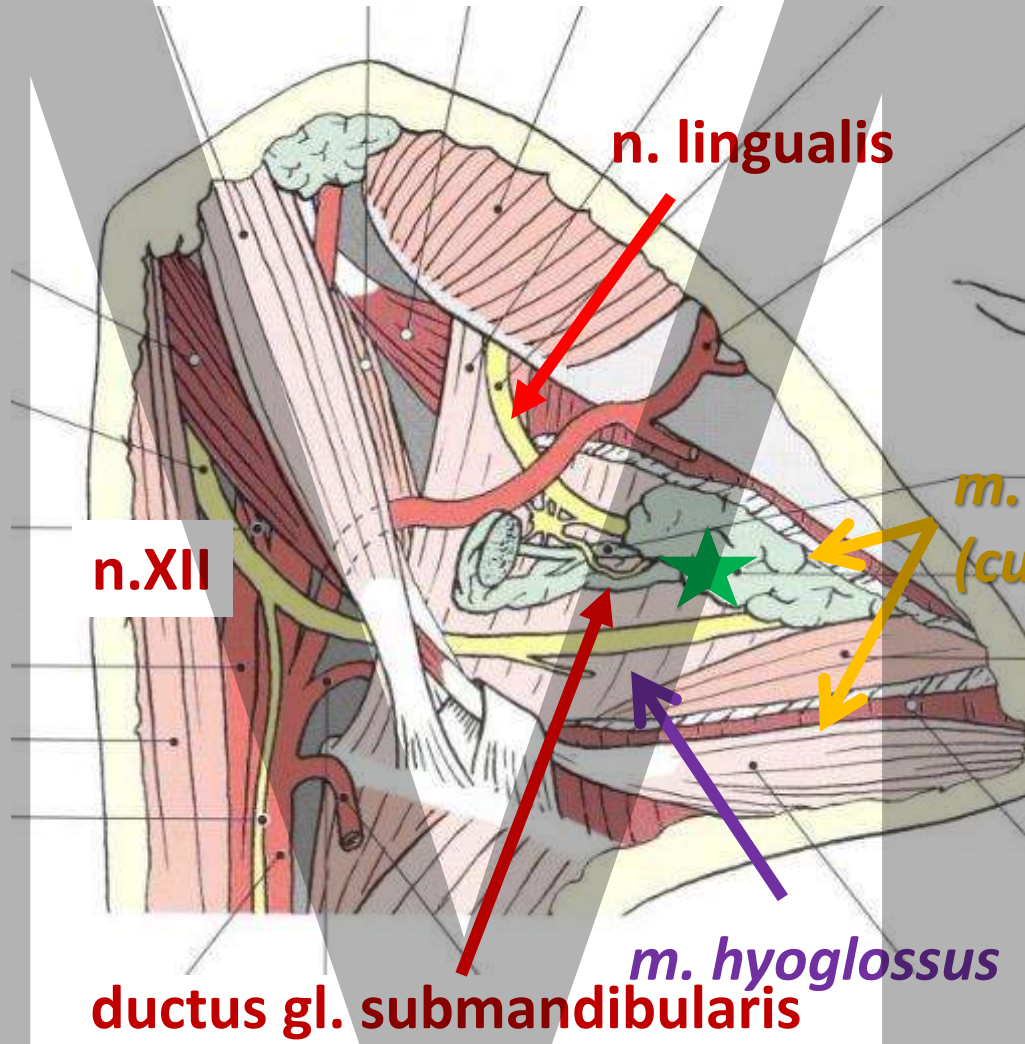
Lingual n.

Submandibular duct



sublingual a

Sublingual region – inferior aspect



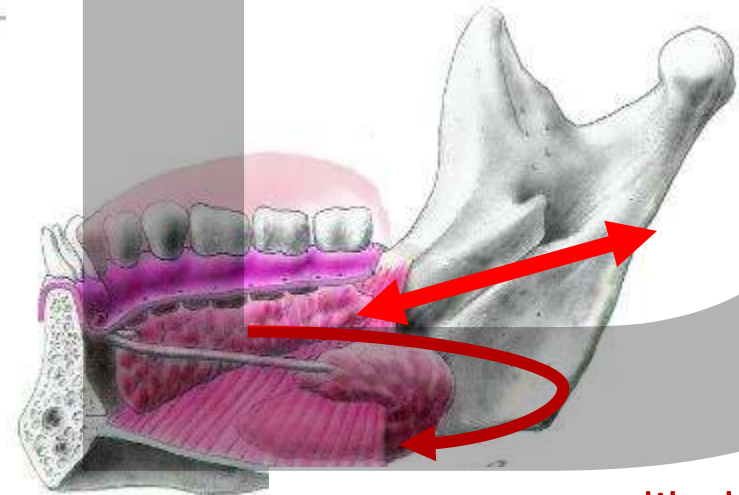
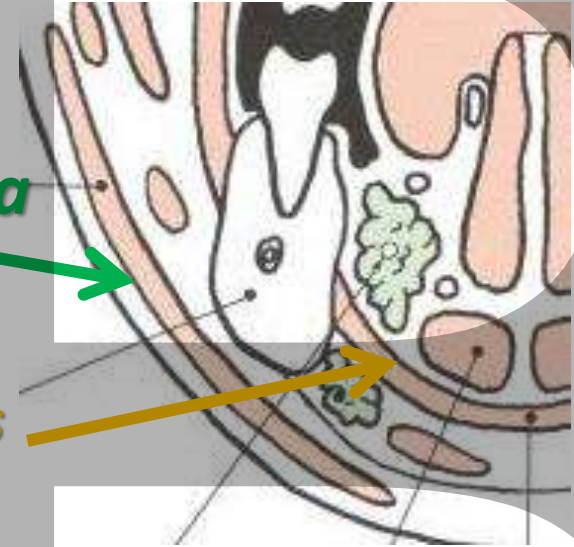
gl. sublingualis

m. platysma

m. mylohyoideus (cut)

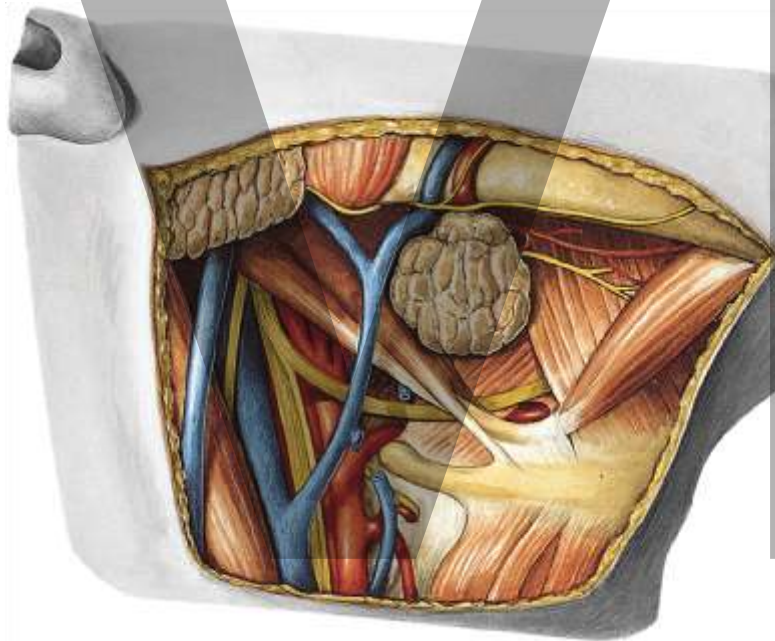
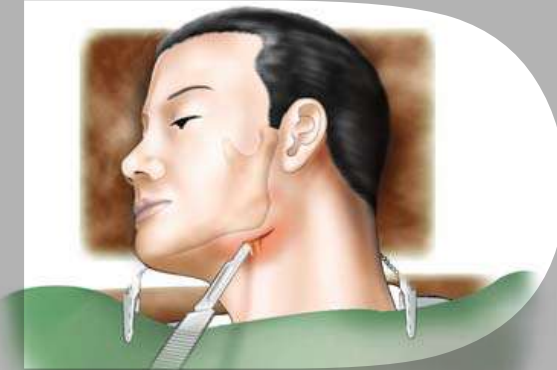
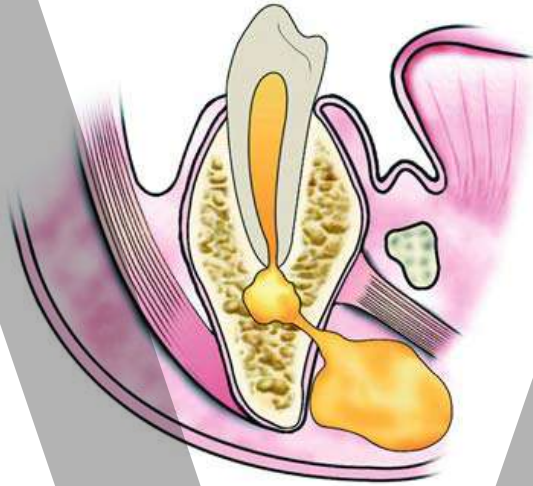
15

13



sp. pterygomandibulare
sp. submandibulare

Spreading below *mylohyoid m.* – submandibular abscess



Submandibular region borders

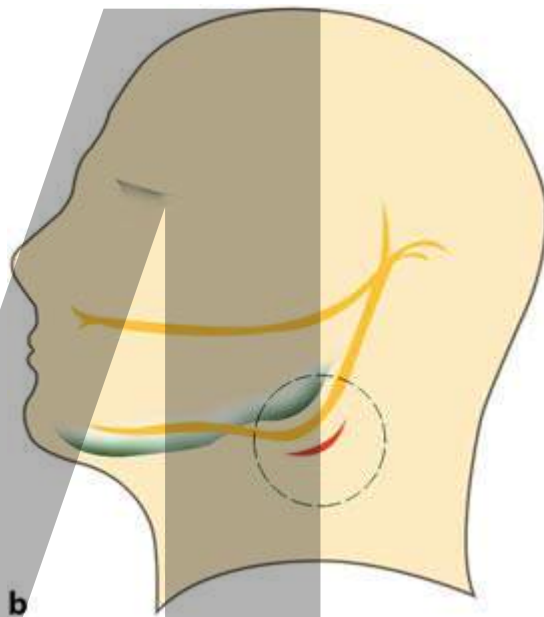
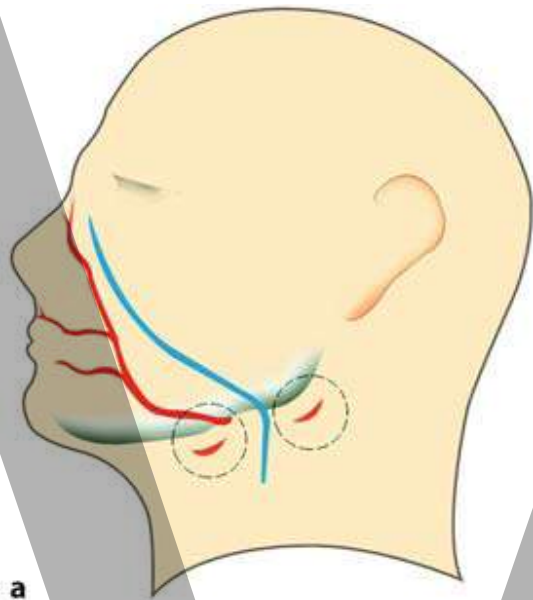
Cran.: mandible

Ant.: digastric m., ant. belly

Post.: digastric m., post. belly

Floor: mylohyoid m.

Spf.: cervical fasc. – spf. layer

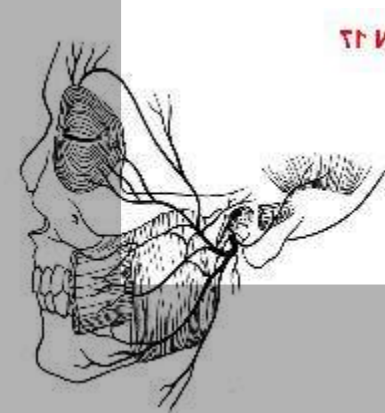


Extraoral incision

CAVE

a. + v. facialis

r. marginalis mandibulae n. VII

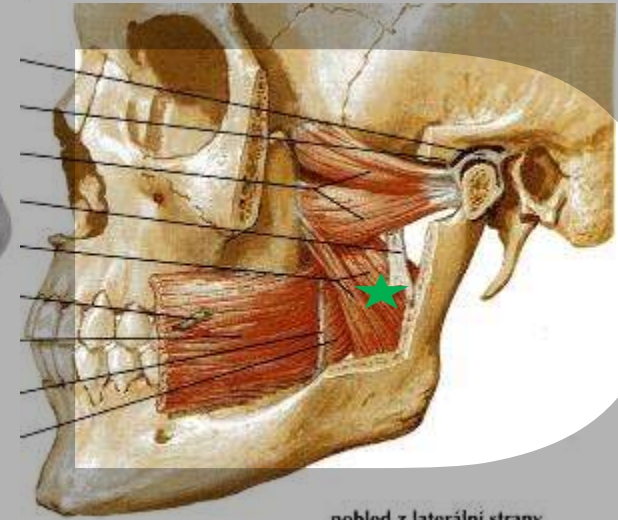
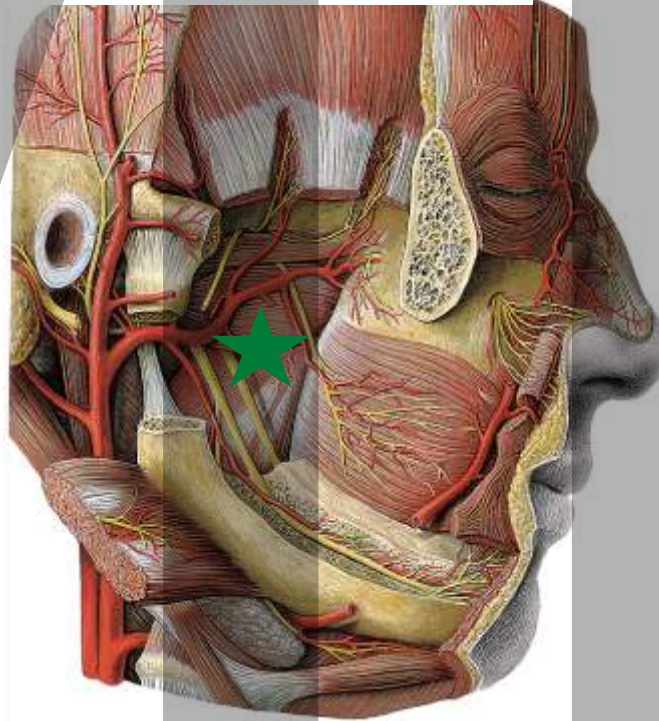


Spreading to *pterygomandibular sp.*
– pterygomandibular abscess

*m. pterygoideus
medialis et lateralis*
- **contracture**

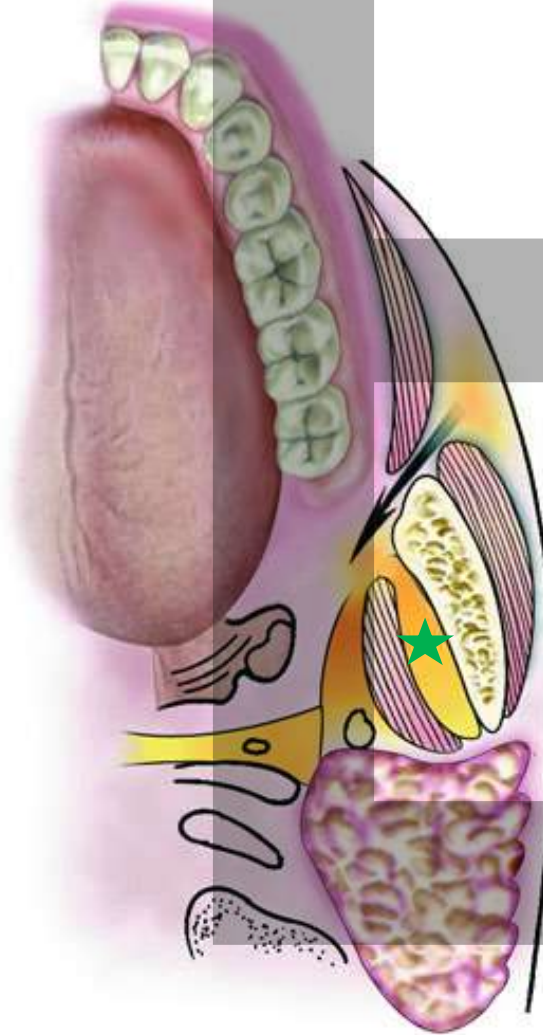
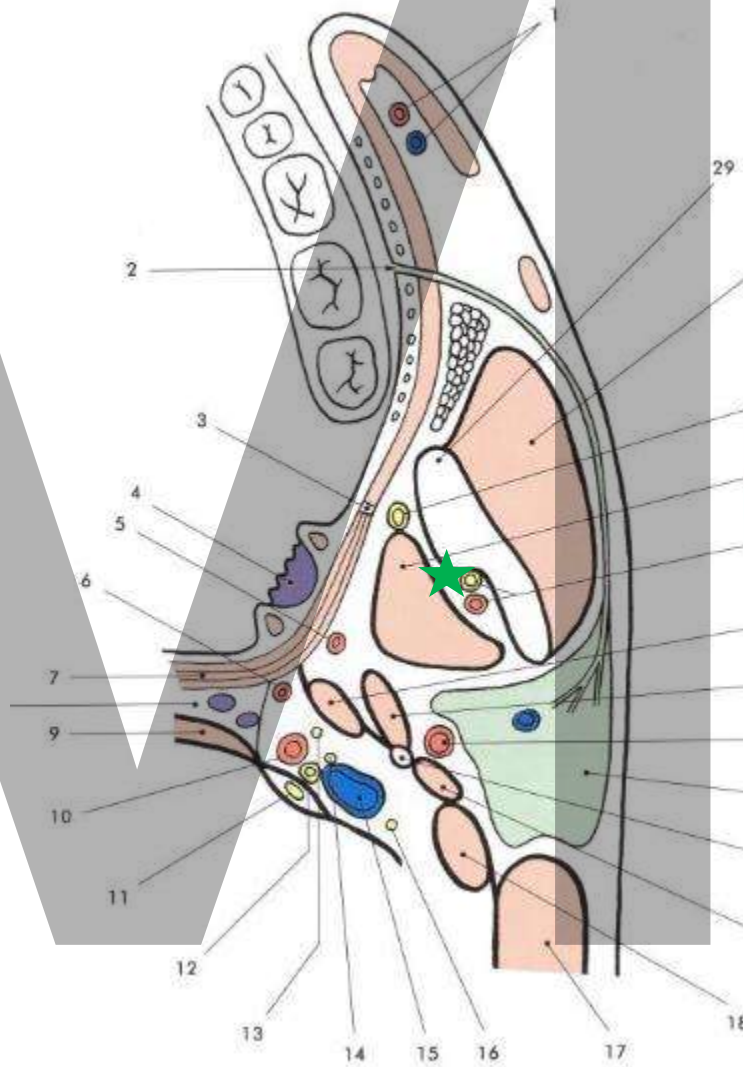


ramus mandibulae

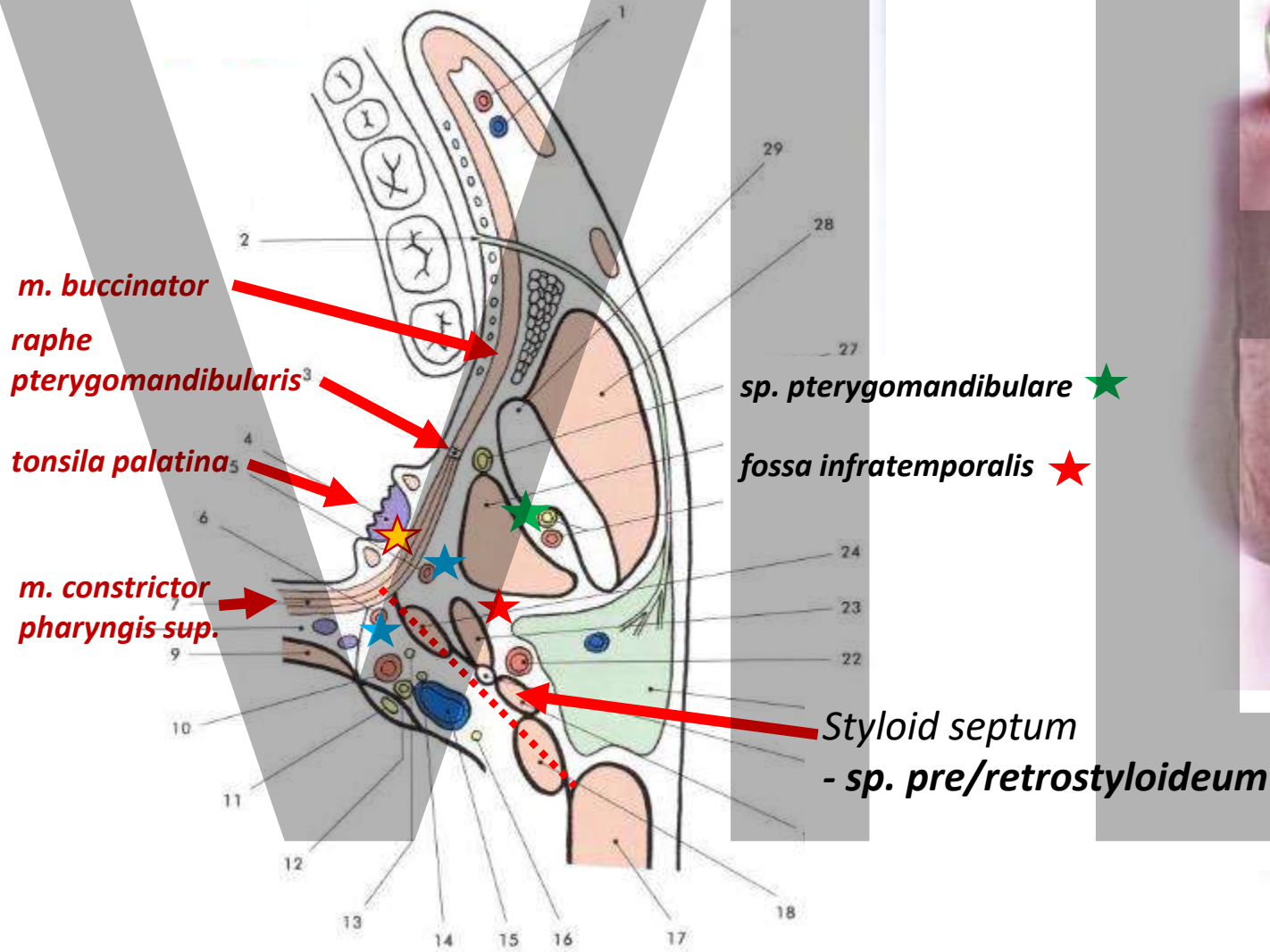


pohled z laterální strany

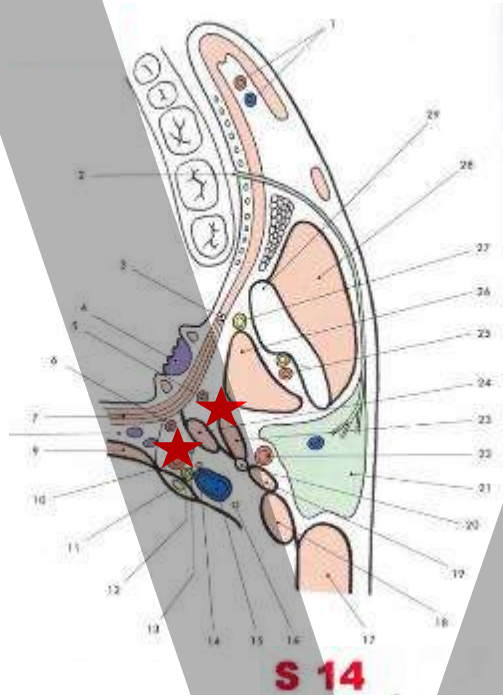
Spreading to *pterygomandibular sp.*
– pterygomandibular abscess



Spreading to para/retropharyngeal sp.

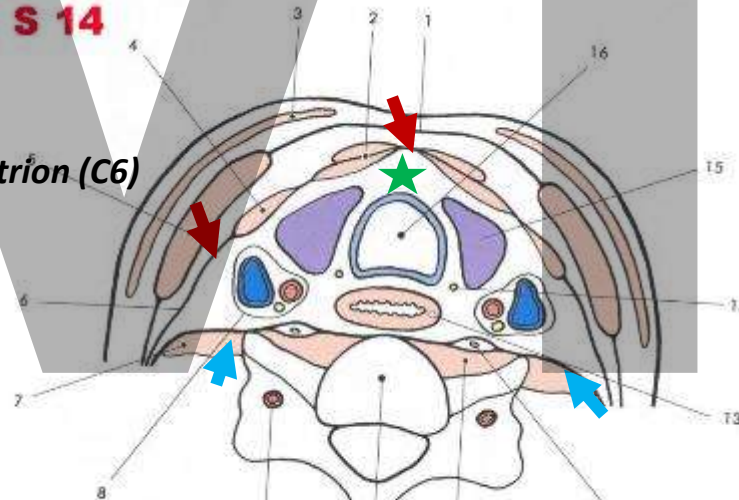


Spreading to *visceral space of the neck*
 no anatomical barriers towards mediastinum



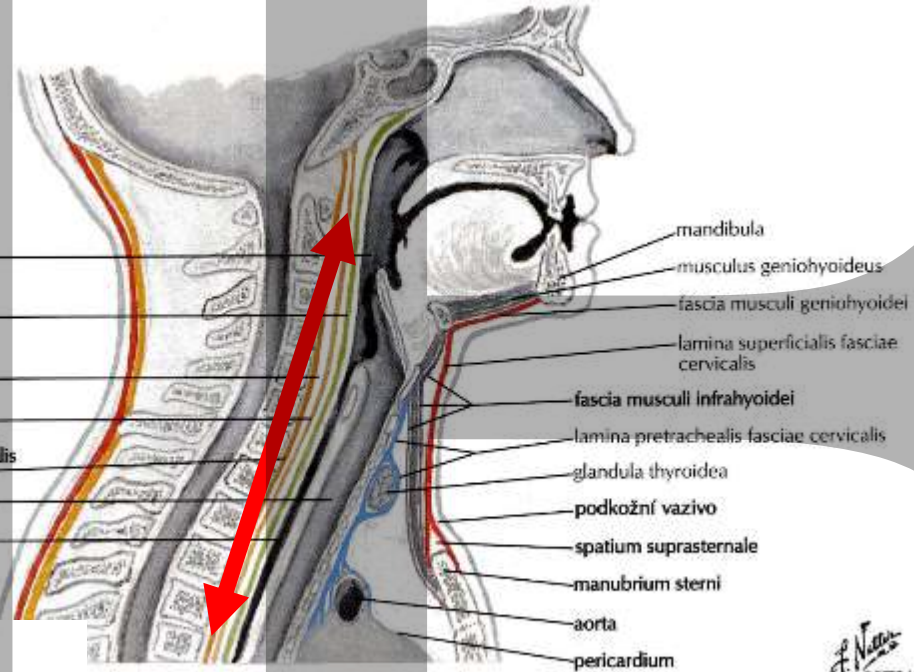
S 14

Transversal section (C6)



sagitální řez

- pharynx
- fascia buccopharyngea
- retrofaryngeální prostor
- fascia alaris
- lamina prevertebralis fasciae cervicalis
- trachea
- oesophagus



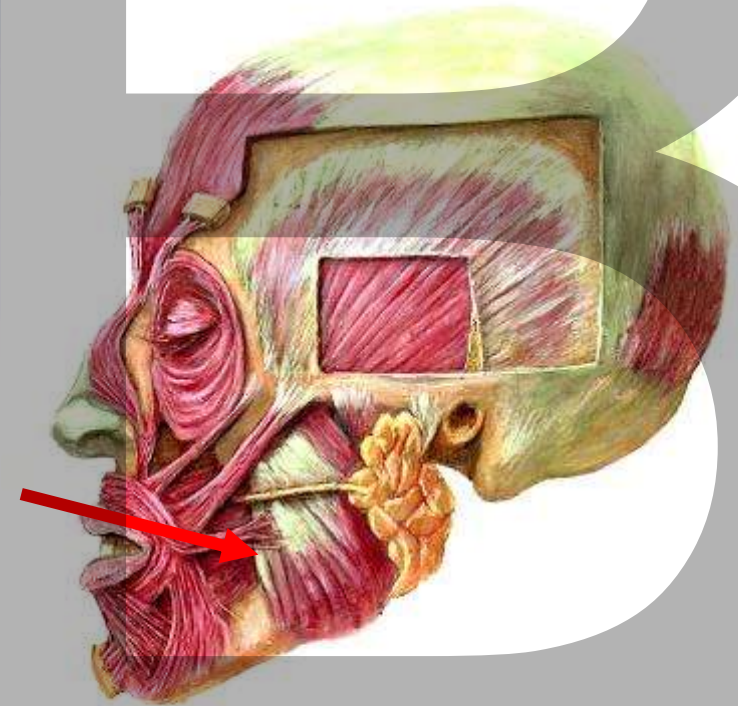
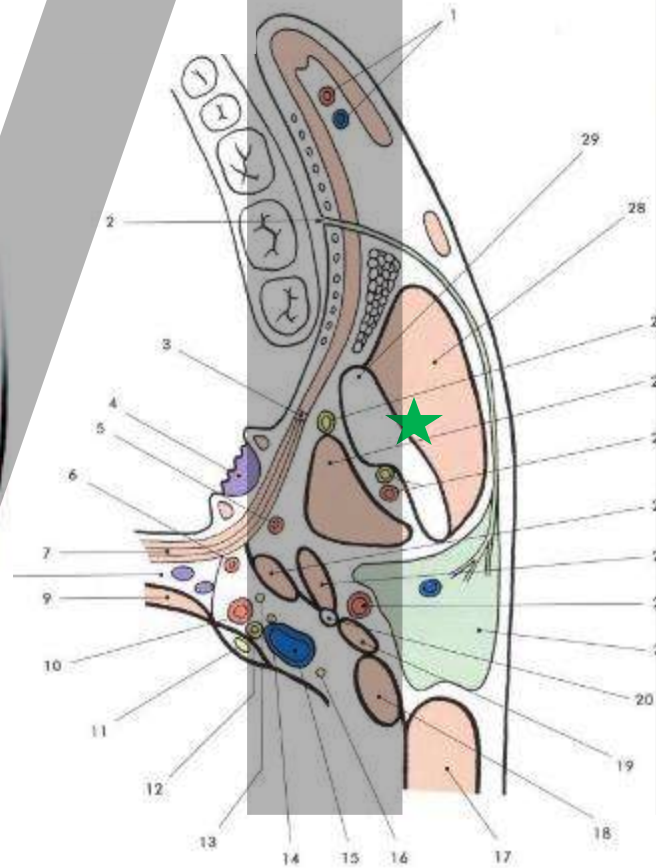
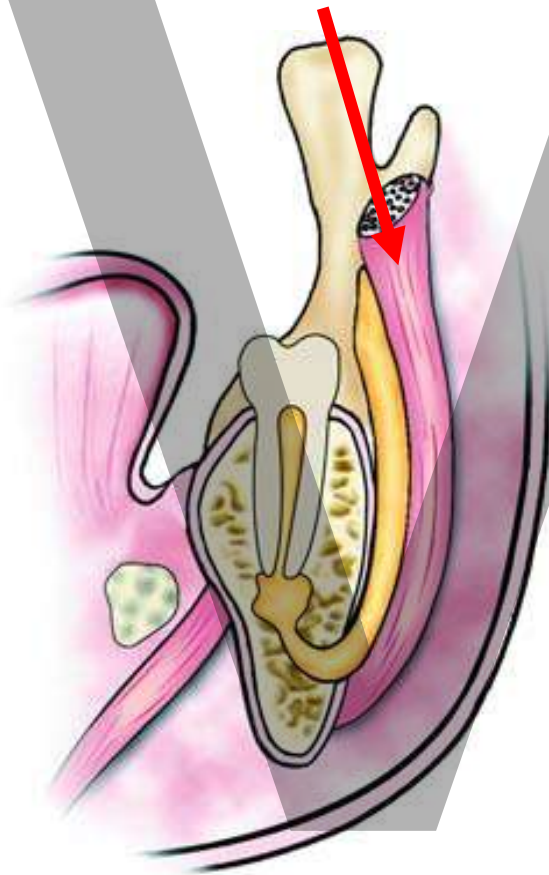
visceral space of the neck
 between *pretracheal layer*
 and *prevertebral layer of cervical fasc.*

trachea, oesophagus
 Thyroid gl.

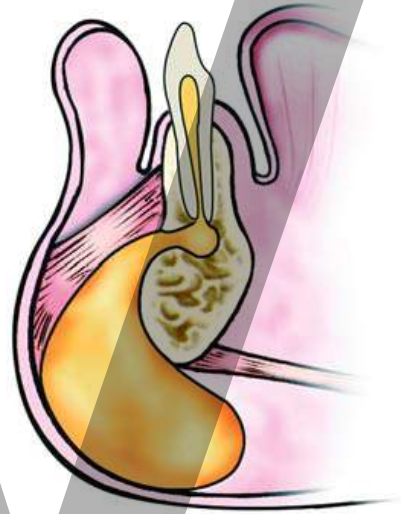
...

Spreading between *ramus mandibulae* a *m. masseter* – submasseteric muscle

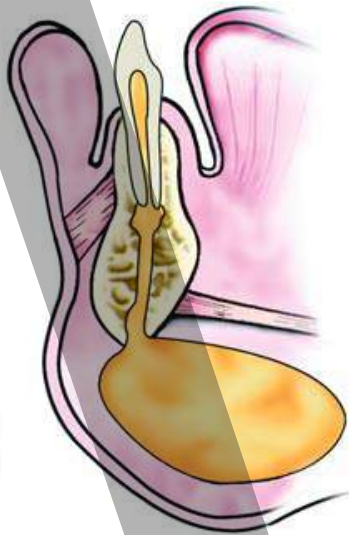
m. masseter
- contracture



Spreading bellow *mental m.* – mentalis abs.



Submental abscess

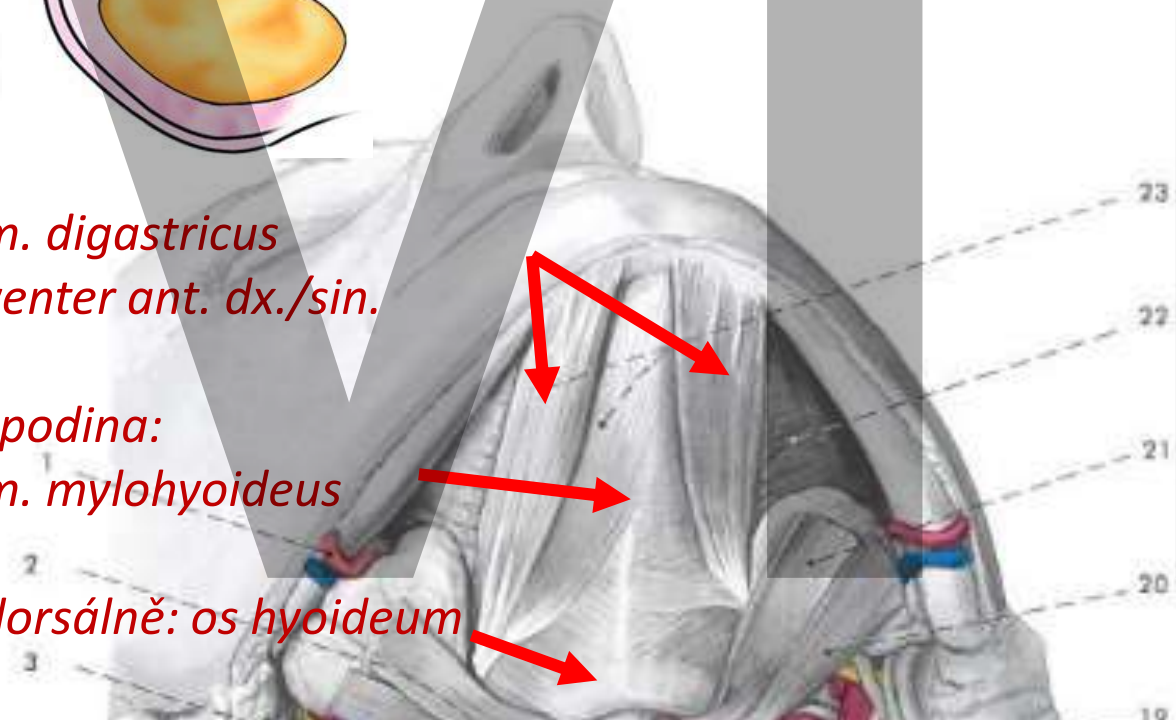


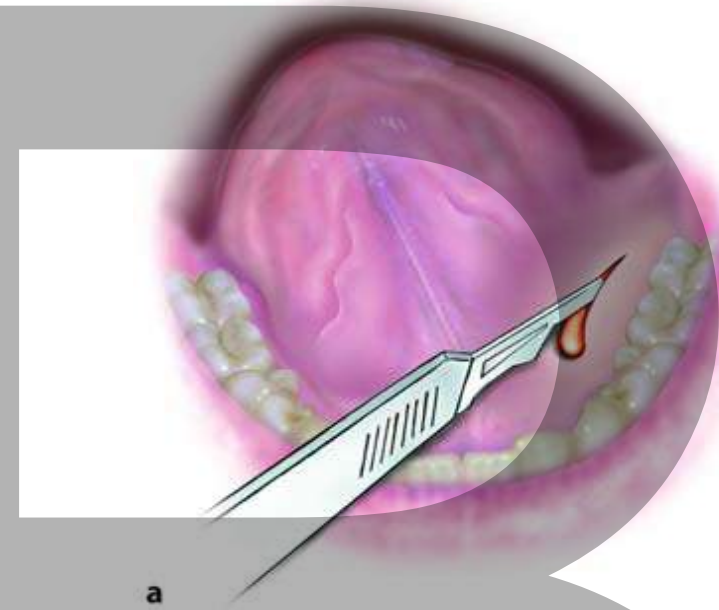
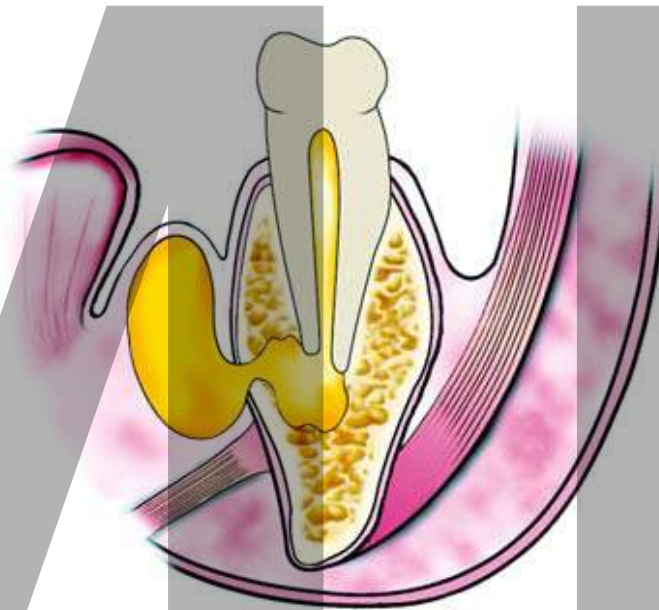
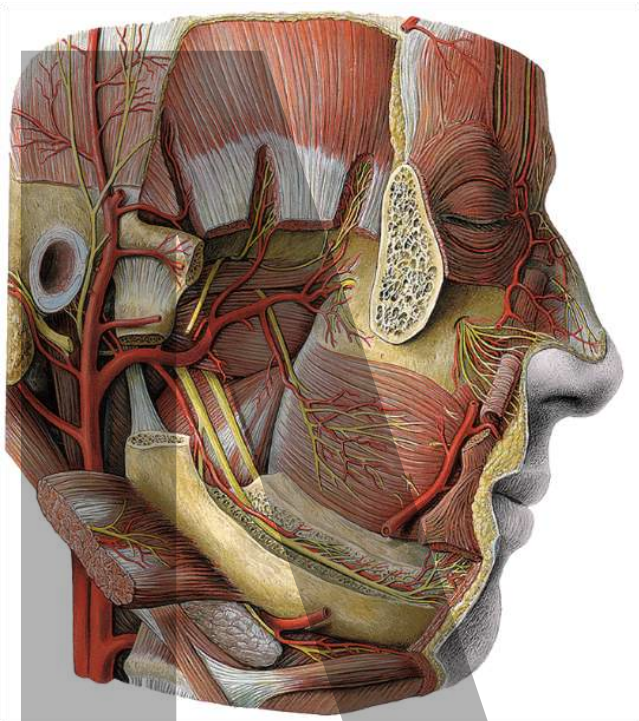
a

*m. digastricus
venter ant. dx./sin.*

*spodina:
m. mylohyoideus*

dorsálně: os hyoideum





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