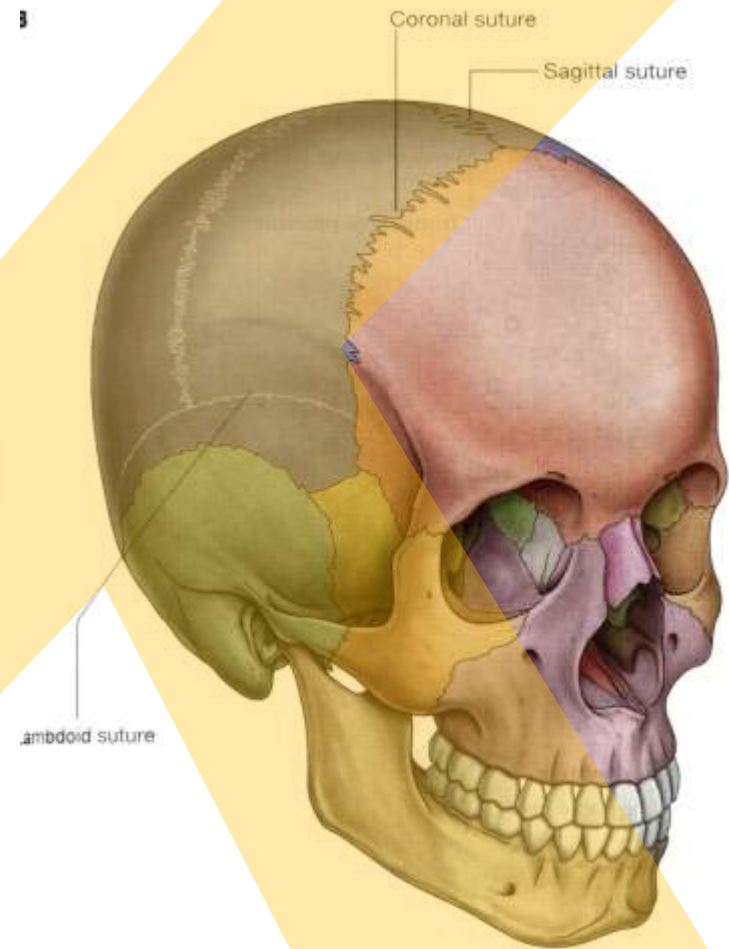


Lebka , cranium:
Principy stavby a vývoje.
Růst lebky. Lebka novorozence.

Přehled kostí neurocrania
a splanchnocrania; orientace, RTG
zobrazení.

Ivo Klepáček

Lebka **cranium**





**Cranium:
basis,
calvaria**



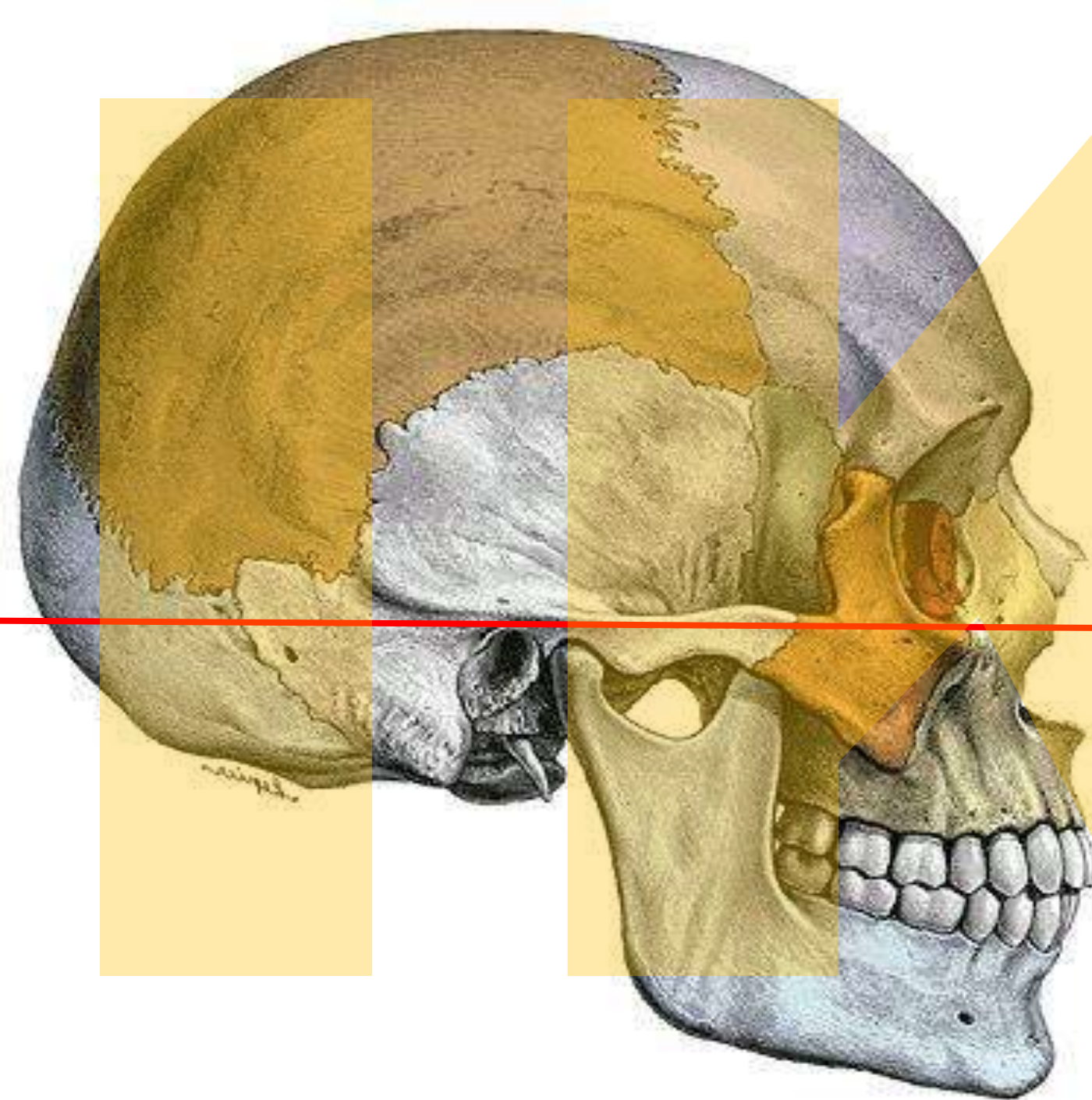
Norma lateralis

Fossa
temporalis

Fossa
infratemporalis

Frankfurtská
horizontála

Porion
(tragion)
Orbitale

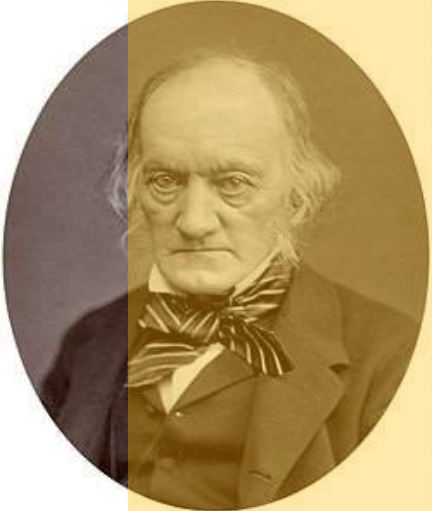




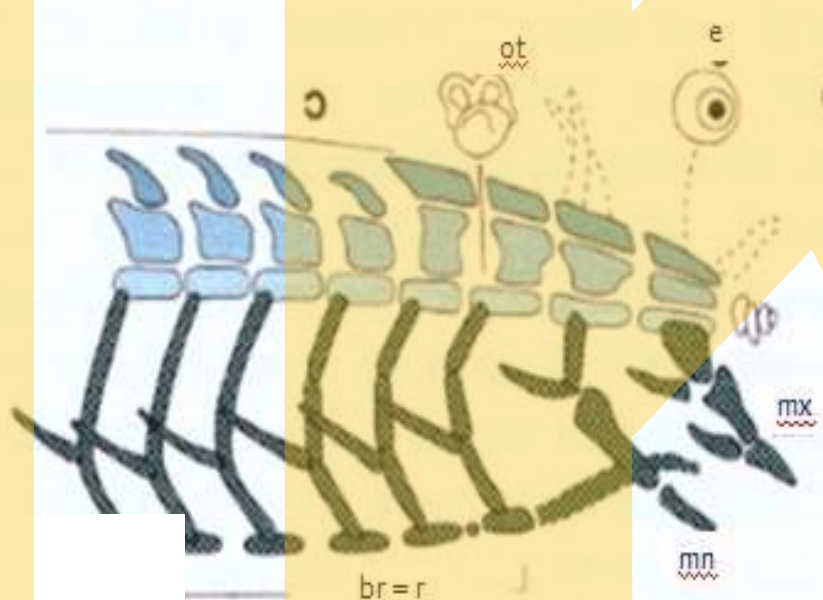
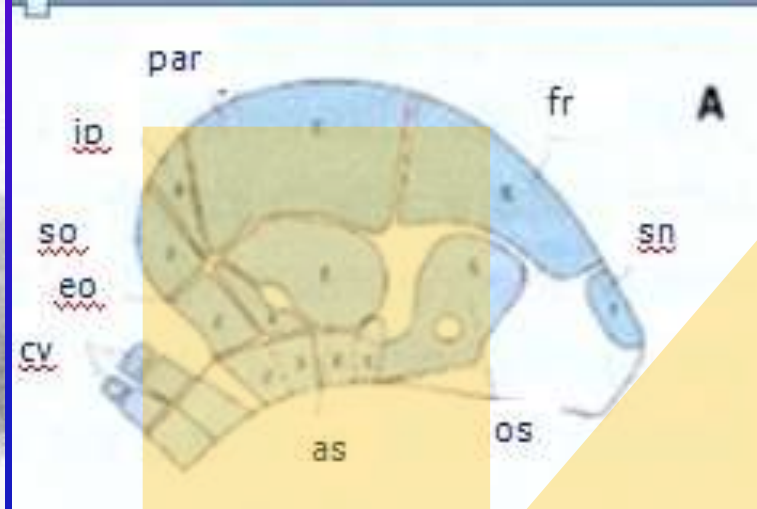
Johann Wolfgang von Goethe
1746-1832



Lorenz Okenfuss
1799-1851,
a German naturalist



Richard Owen
1804-1892
an English comparative anatomist,
biologist



S. Kuratani, 2005: Craniofacial development and the evolution of the vertebrates (the old problems on a new background. Zool. Science 22:1-19)

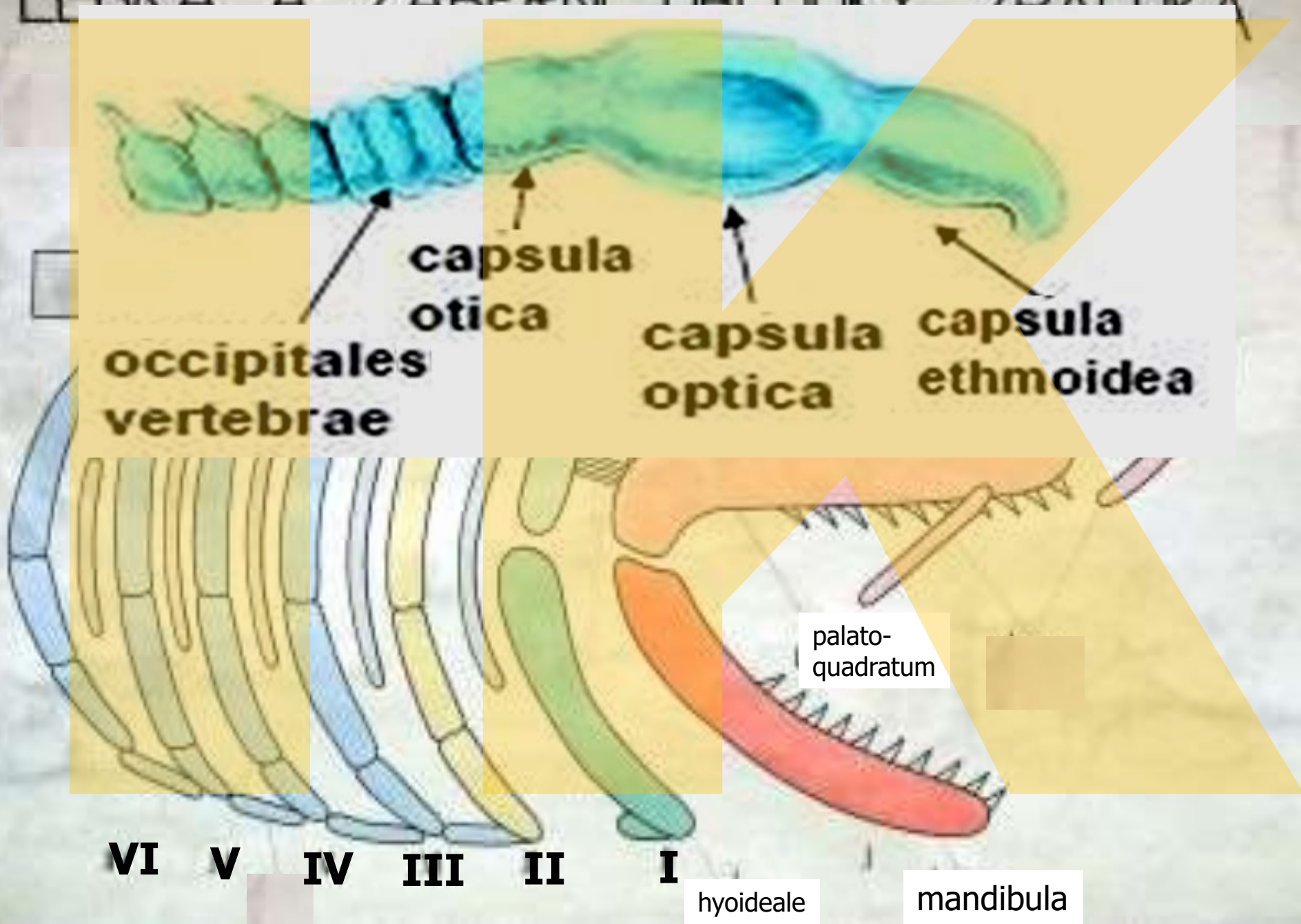
Abbreviations: as, alisphenoid; cv, cervical vertebrae; e, eye; eo, exoccipital; ip, interparietal; os, orbitosphenoid; ot, inner ear; par, parietal; so, supraoccipital.

vertebrate theory

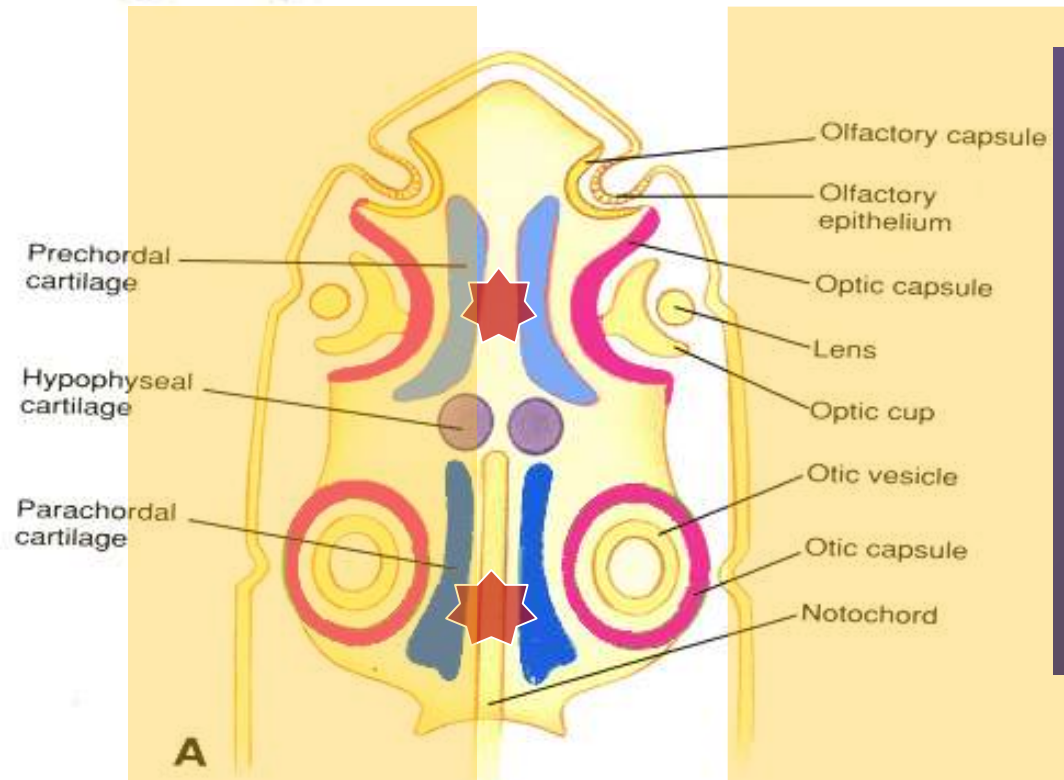
XVIII.-XIX.
century

segmental
and
branchial theory

LERKA A ŽABERNÍ ORLOVY ŽRALOKA



Vývoj kostí base lební



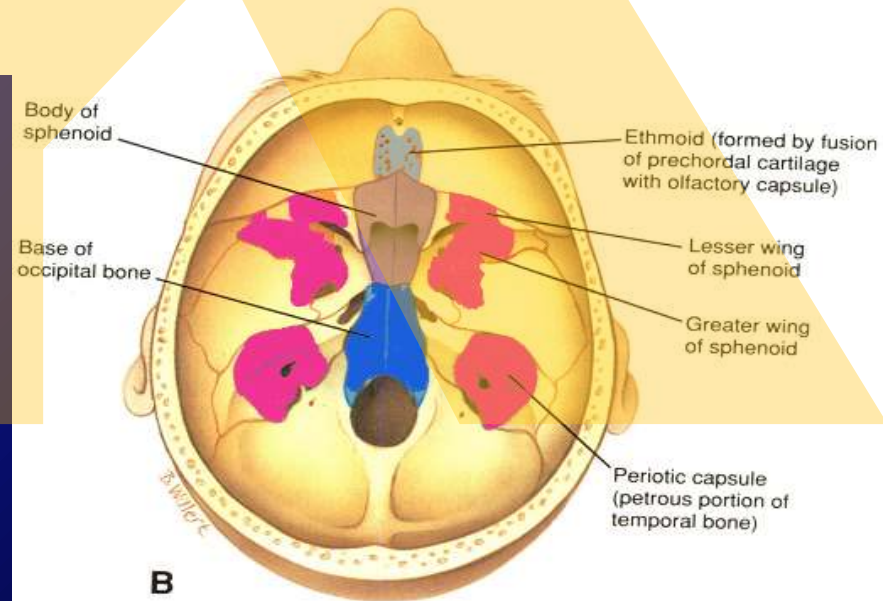
Chrupavky Cartilages

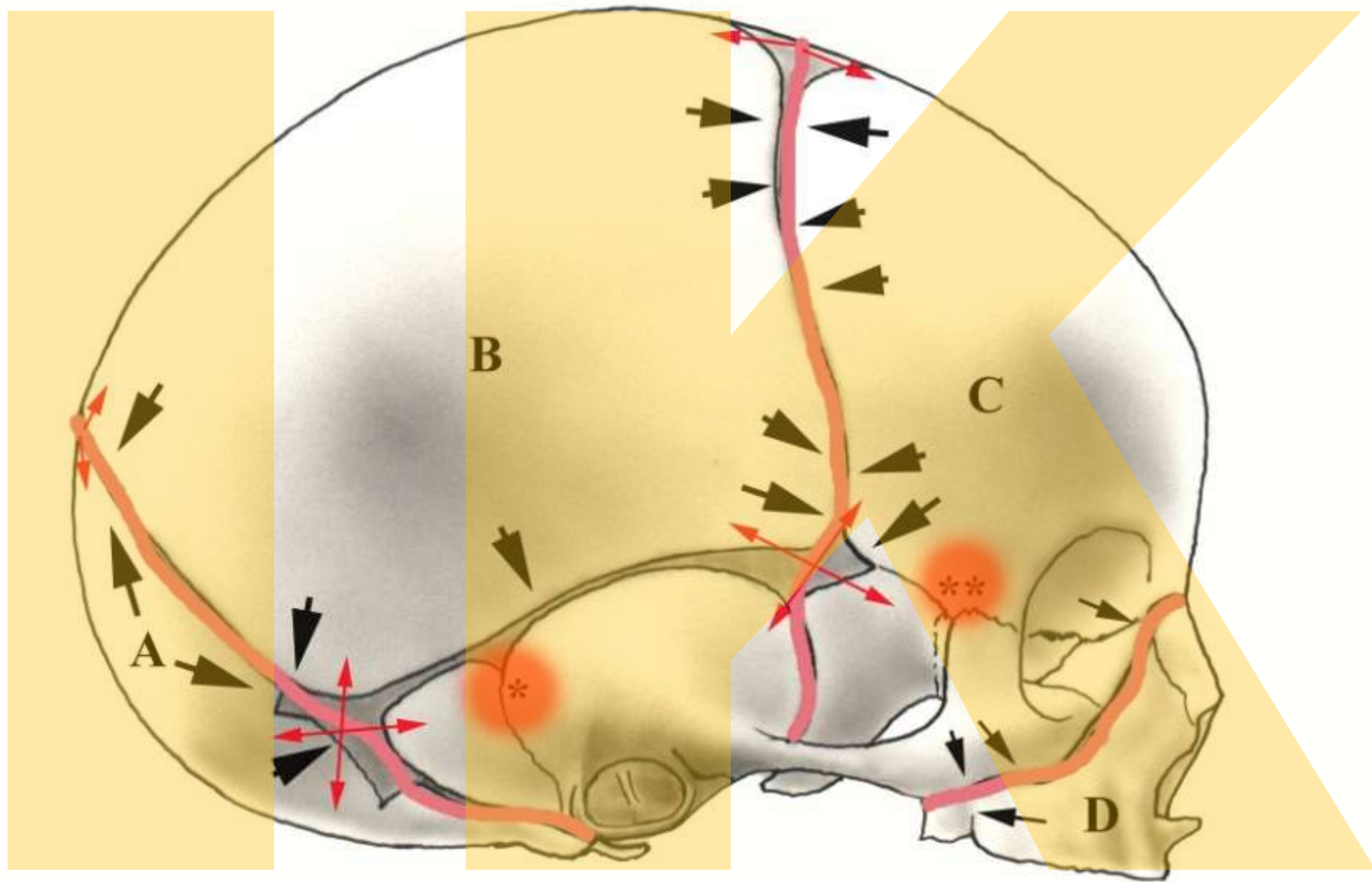
Prechordální
Hypophysialní
Parachordální
Chordální



Edwin Stephen Goodrich
1868-1946

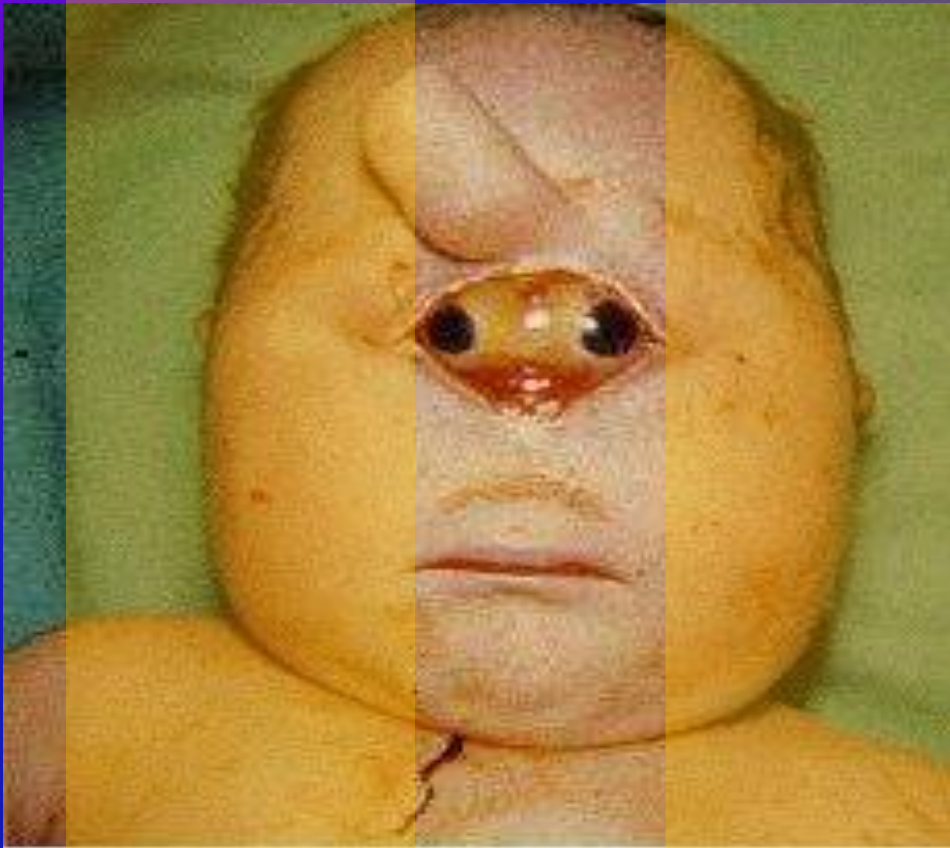
Studies on the Structure & Development of Vertebrates
The evolution of living organisms





Holoprosencephalia

příklad: Cyclopia



Cyclopia. S.S. Gellis and
M. Feingold. Atlas of Mental
Retardation Syndromes. 1968.



Anencephaly

Acrania

příklad: Anencephalia



otocephalia, otoencephalia, agnathia



Hranice mezi hlavou a krkem
(kostrou hlavy a krku)

Nasion

Glabella

Opisthokranion
(inion)

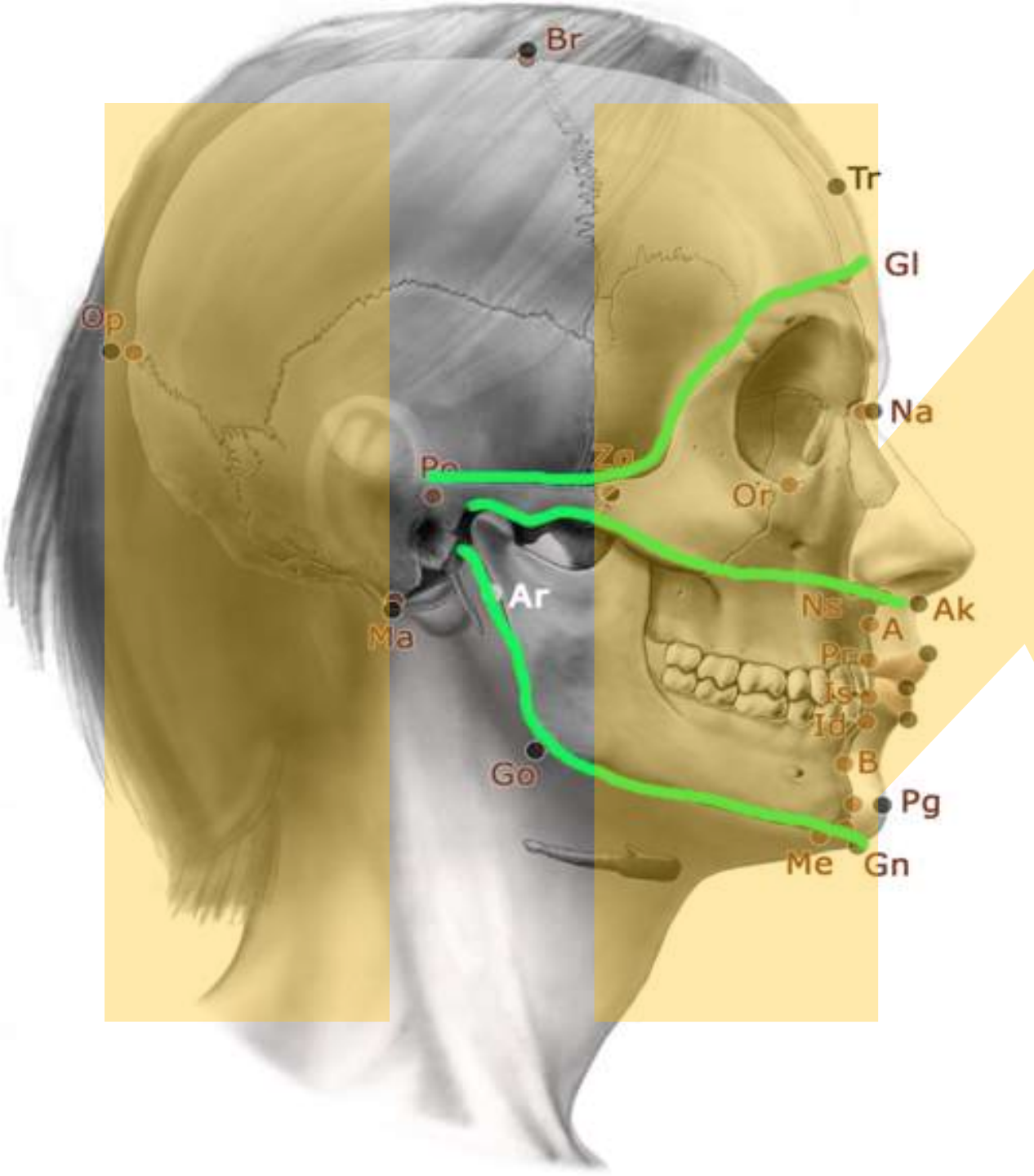
Mastoideale

Gonion

Pogonion

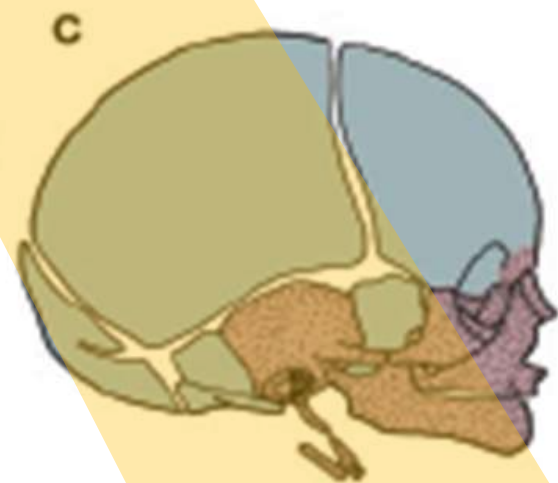
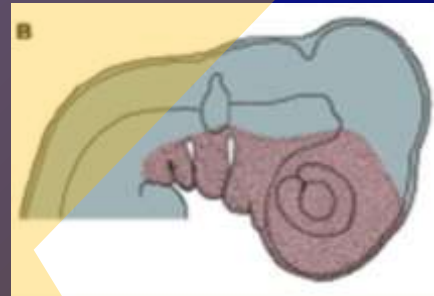
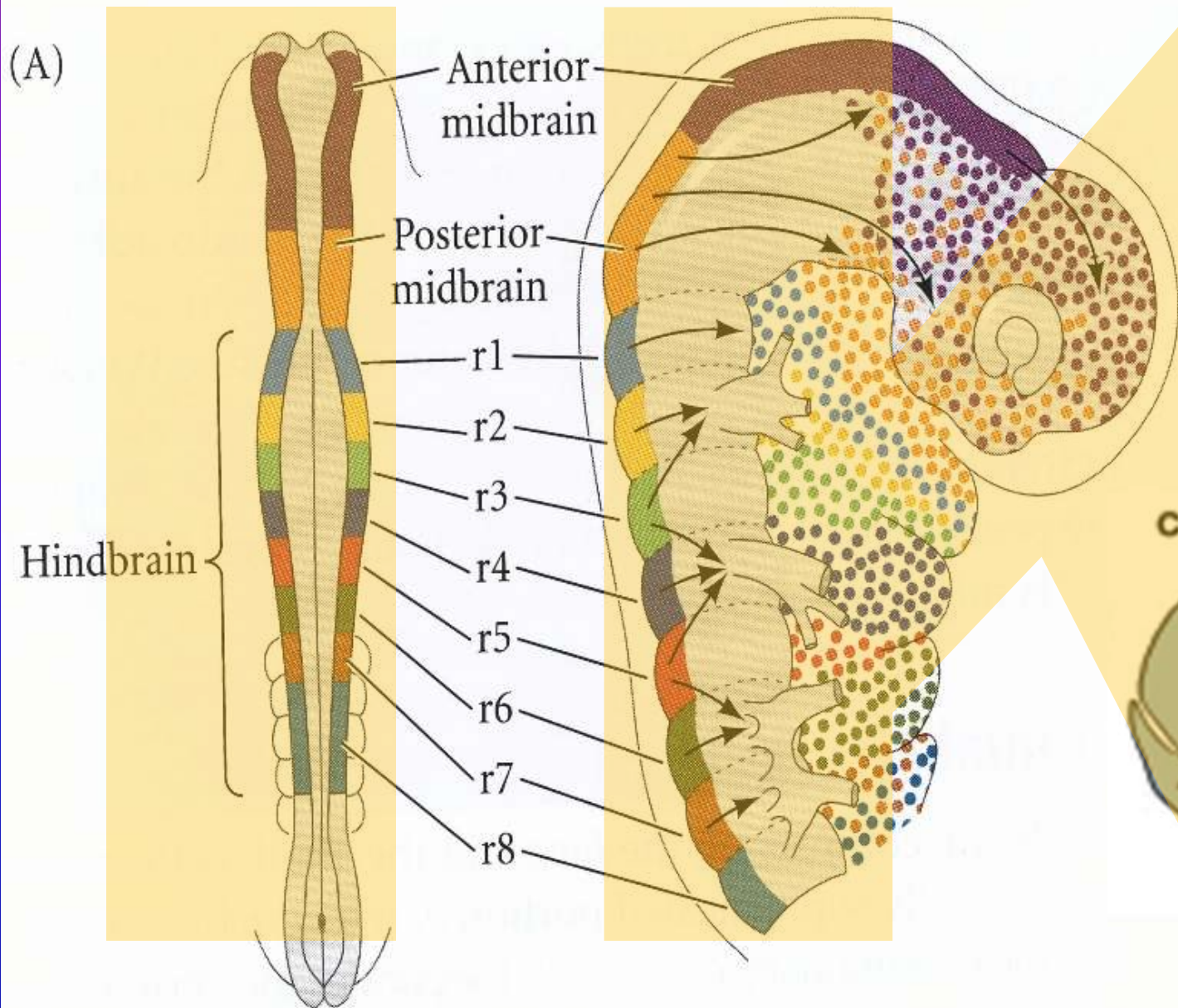
Gnathion

Menton

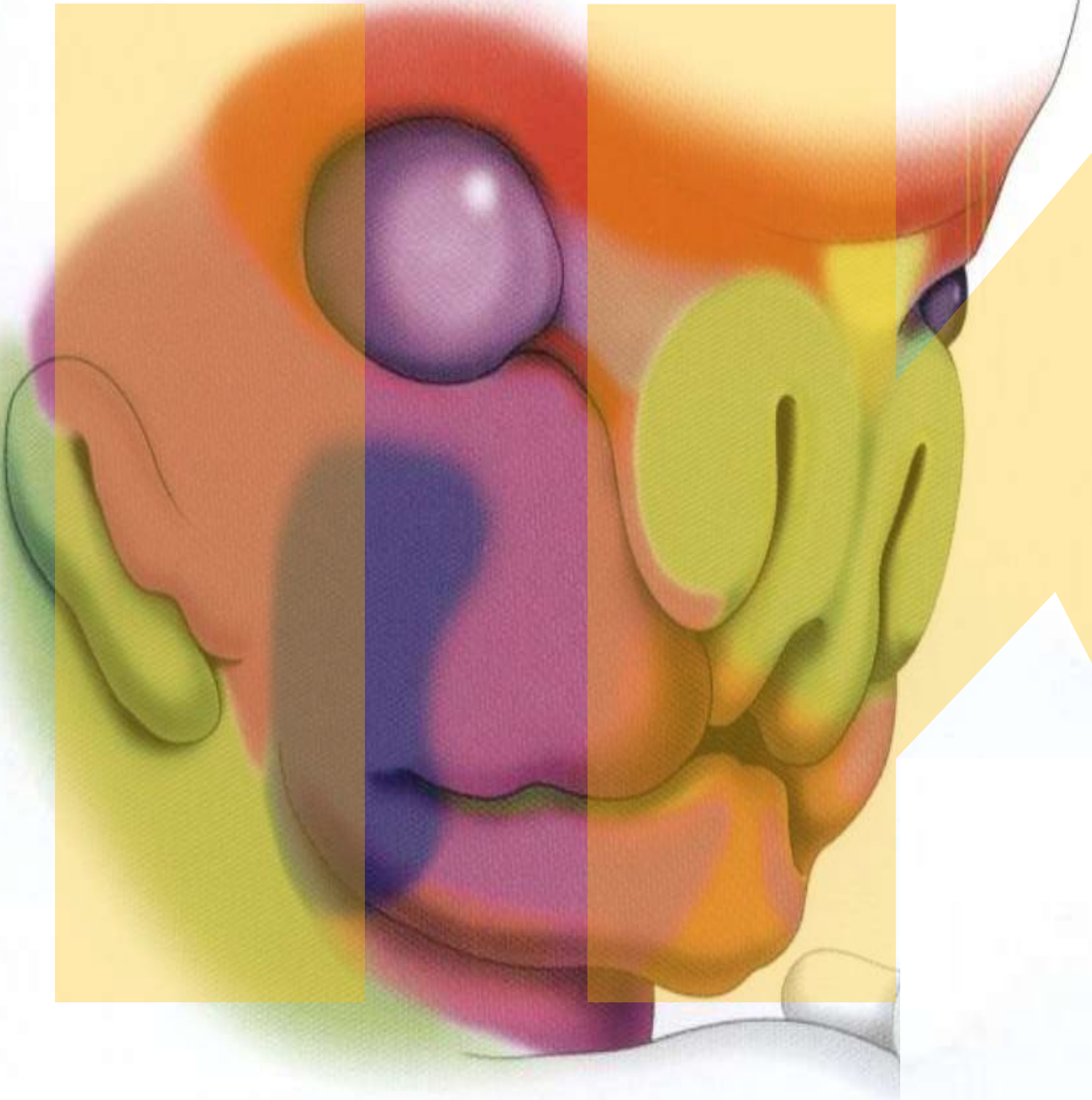


Hranice
mezi
etážemi
obličejového
skeletu

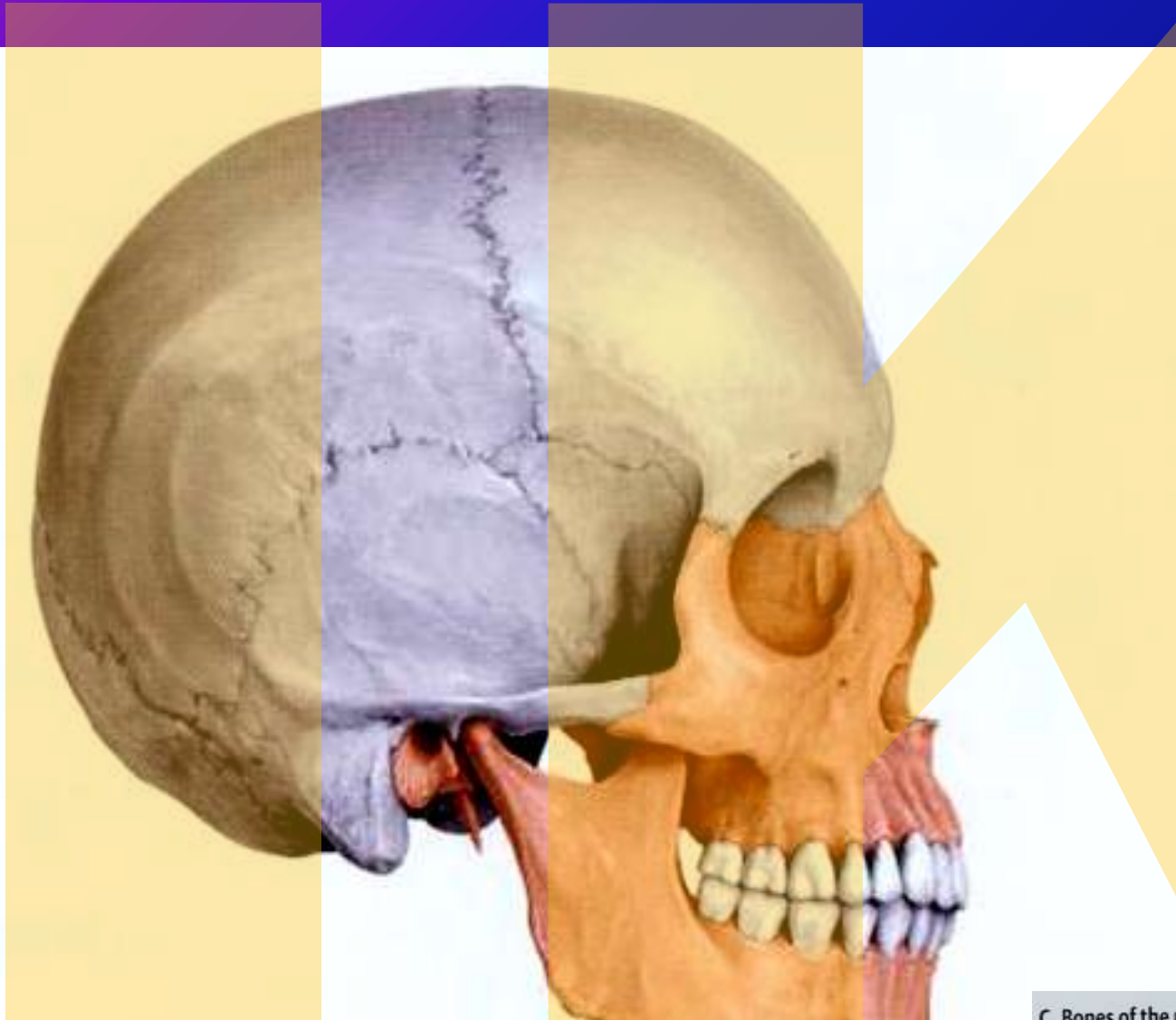
(A)



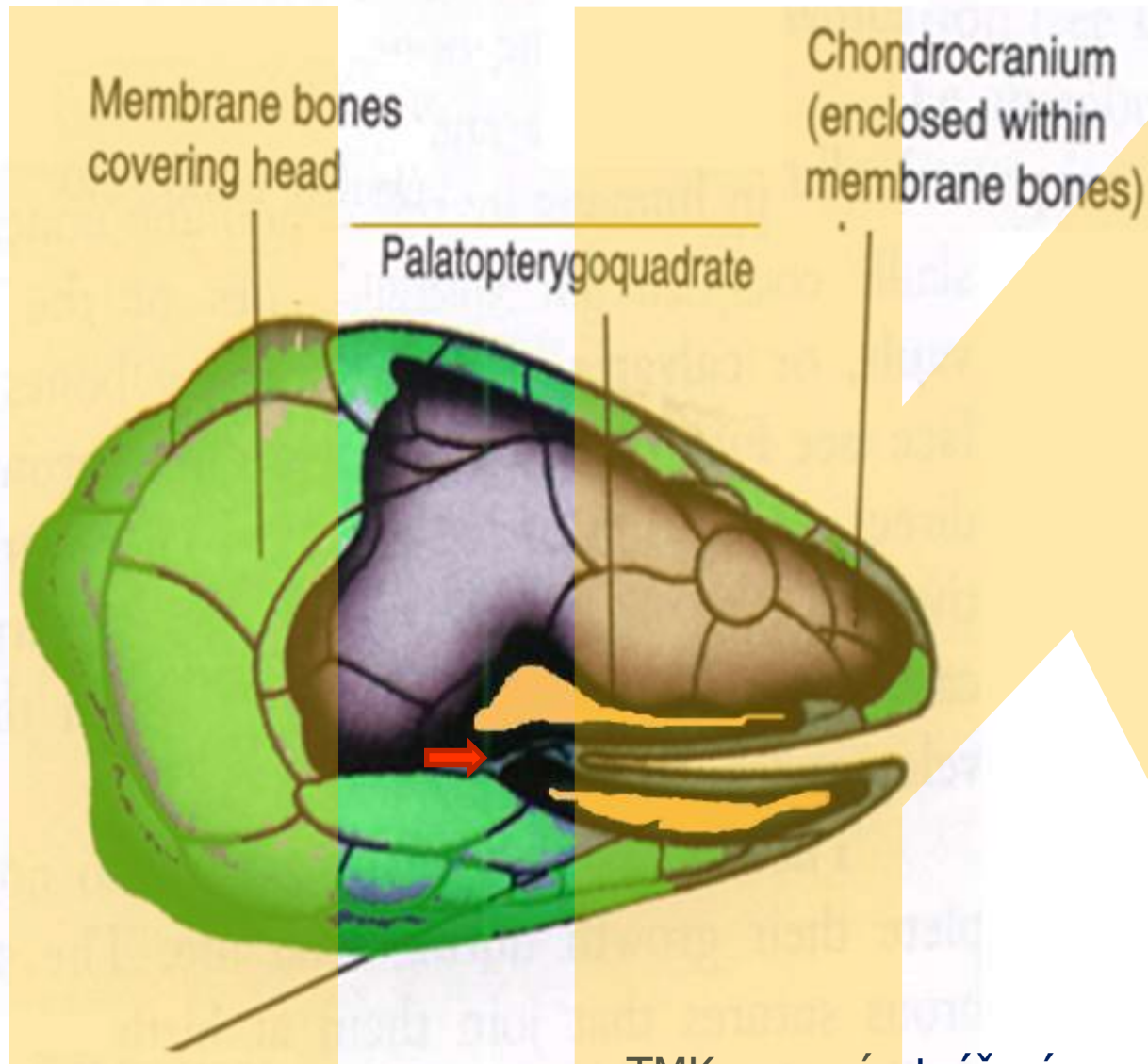
Expresse
vybraných
geneticky
aktivních
faktorů

- 
-  WNT: Wingless type
 -  PAX6: Paired box 6
 -  DLX: Distal-less homeobox
 -  BARX: Barx homeobox
 -  GSC: Goosecoid homeobox
 -  BMP: Bone morphogenetic protein
 -  FGF8: Fibroblast growth factor 8
 -  PAX9: Paired box 9

neurocranium a viscerocranium (splanchnocranium)

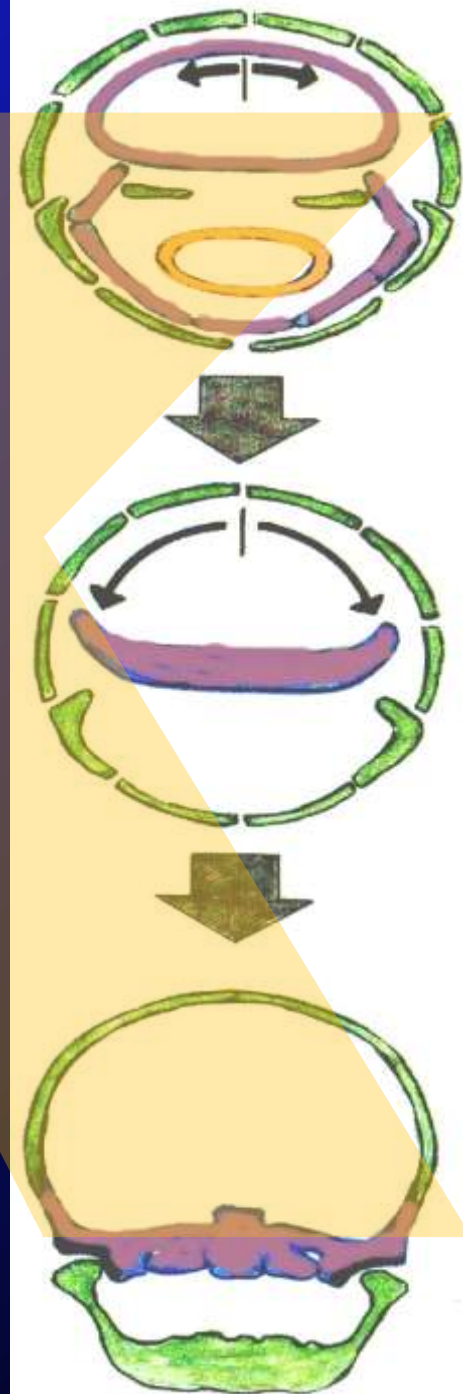


C Bones of the neurocranium (gray) and viscerocranium (orange)
Left lateral view. The skull forms a bony capsule that encloses the brain, sensory organs, and viscera of the head. The greater size of the neurocranium (cranial vault) relative to the viscerocranium (facial skeleton) is a typical primate feature directly correlated with the larger primate brain.



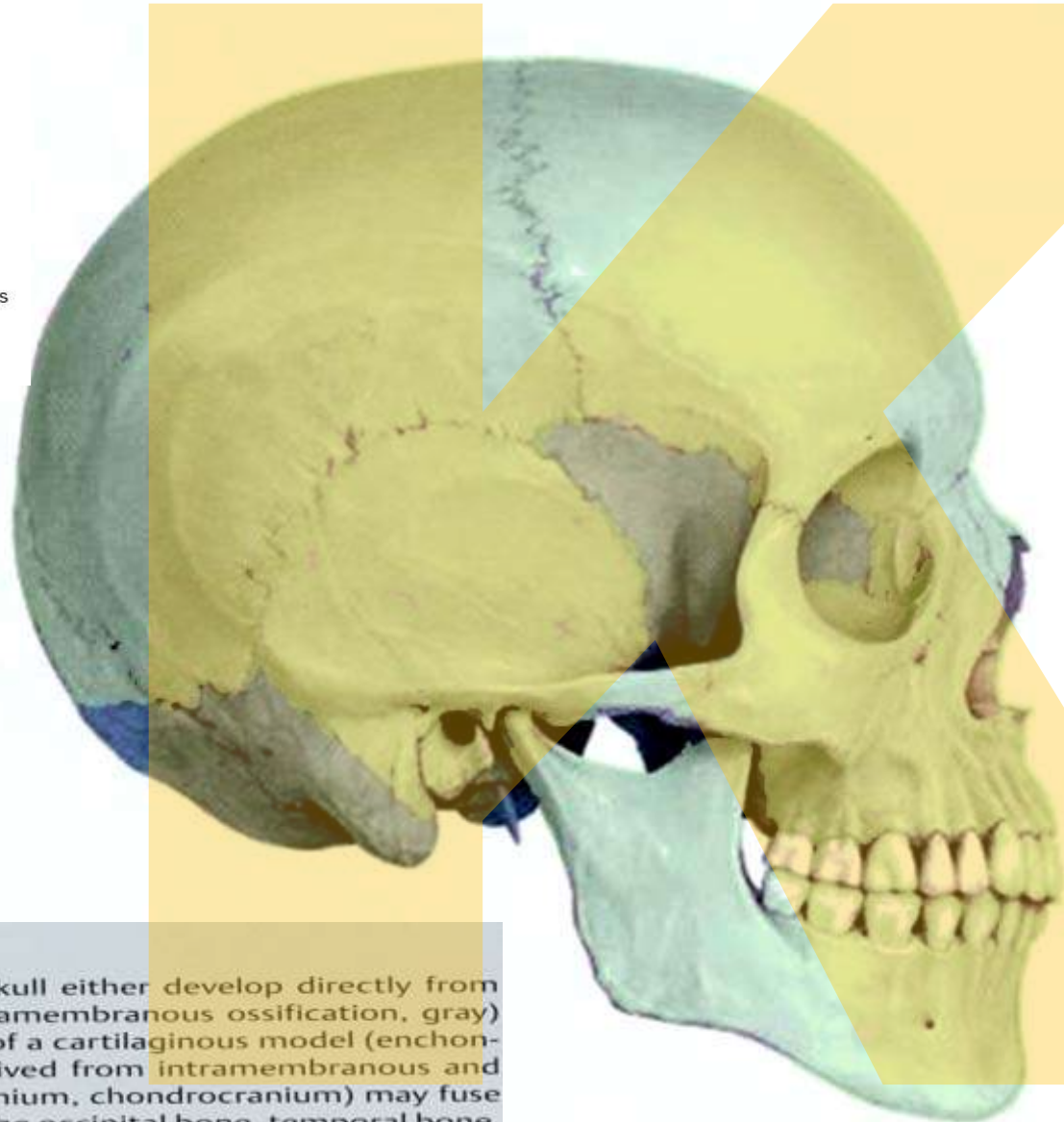
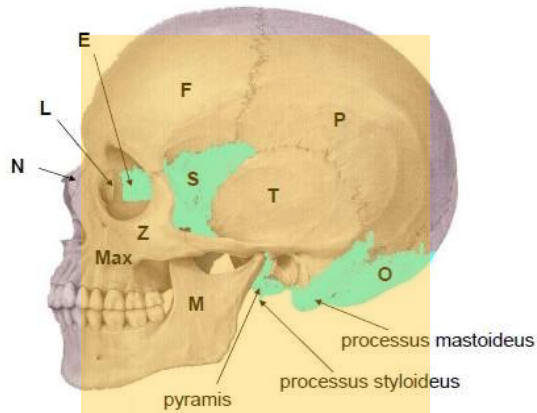
Meckel's

→ TMK - rané utváření
TMJ - early formation



desmocranium

chondrocranium



D Ossification of the cranial bones

Left lateral view. The bones of the skull either develop directly from mesenchymal connective tissue (intramembranous ossification, gray) or form indirectly by the ossification of a cartilaginous model (enchondral ossification, blue). Elements derived from intramembranous and endochondral ossification (desmocranium, chondrocranium) may fuse together to form a single bone (e.g., the occipital bone, temporal bone, and sphenoid bone).

The clavicle is the only tubular bone that undergoes membranous ossification. This explains why congenital defects of intramembranous ossification affect both the skull and clavicle (*cleidocranial dysostosis*).

Osifikace

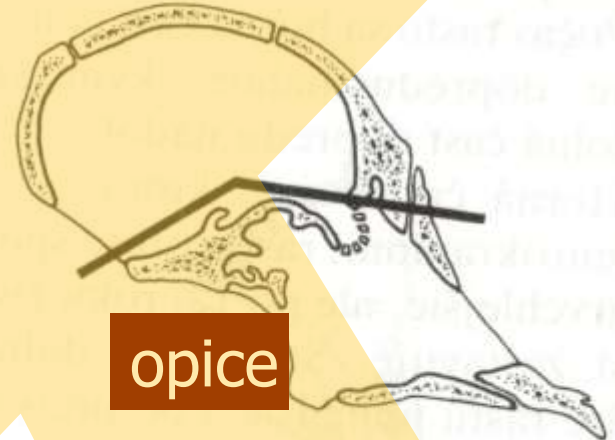
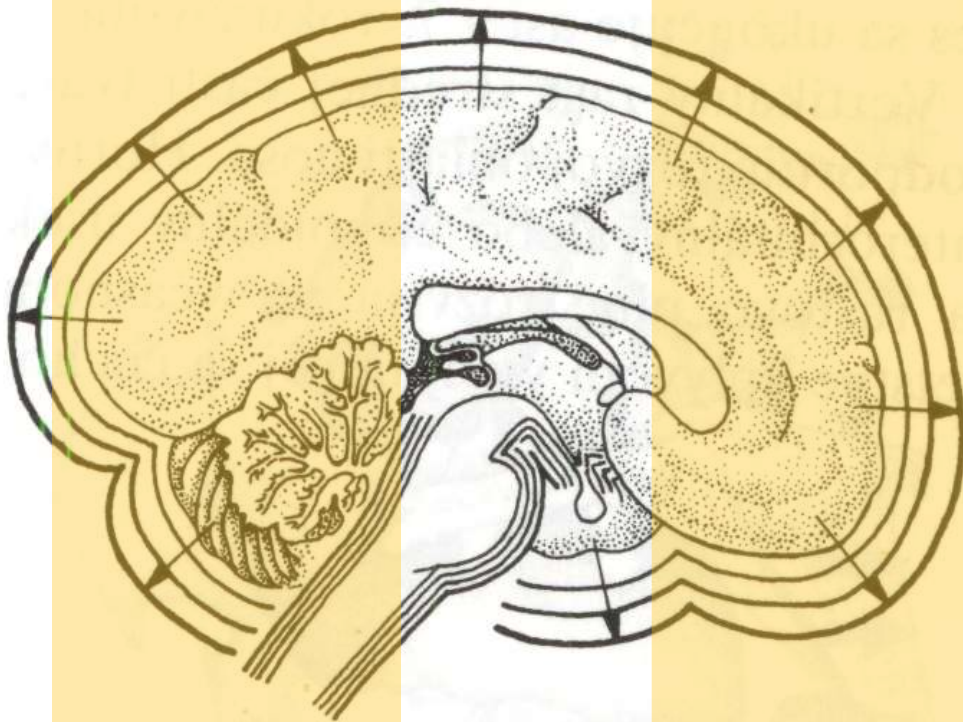
Chondrocranium

- os occipitale –basis a partes laterales
- os temporale – pyramis a processus mastoideus
- os sphenoidale (kromě lamina medialis processus pterygoidei)
- os ethmoidale
- concha nasalis inferior
- malleus, incus stapes
- processus styloideus
- os hyoideum

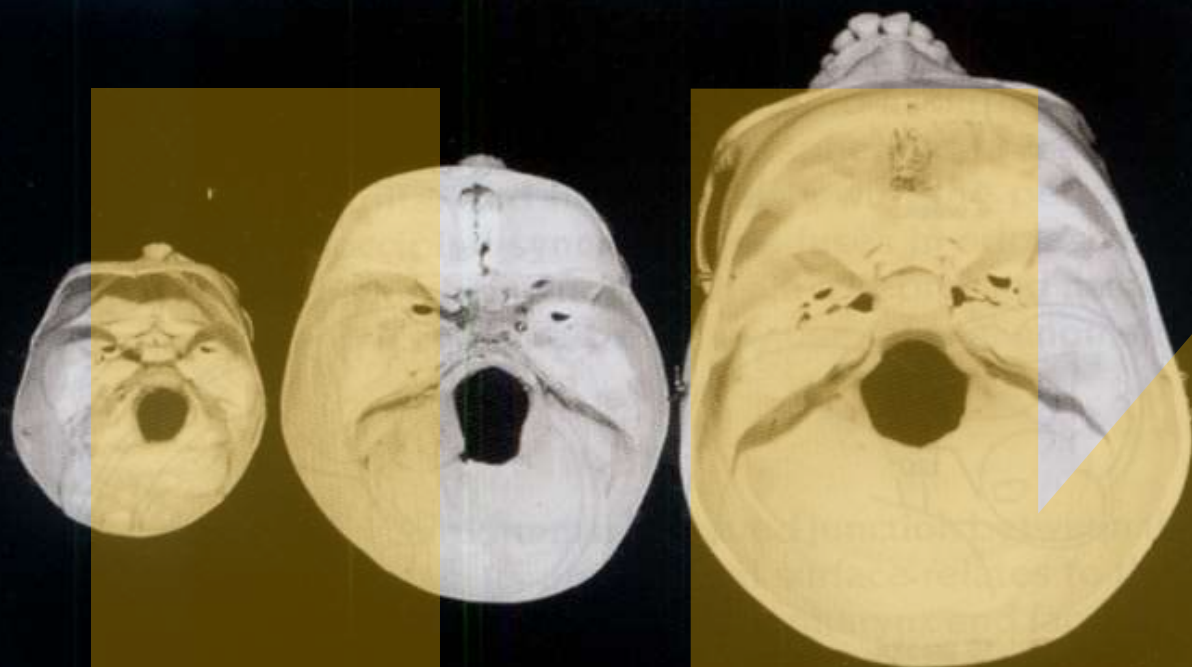
Desmocranium

- os occipitale – squama
- os parietale
- os frontale
- os temporale –squama
- os tympanicum
- os nasale
- os lacrimale
- vomer
- lamina medialis processus pterygoidei
- os palatinum
- os zygomaticum
- maxilla
- mandibula (Meckelova chrupavka)

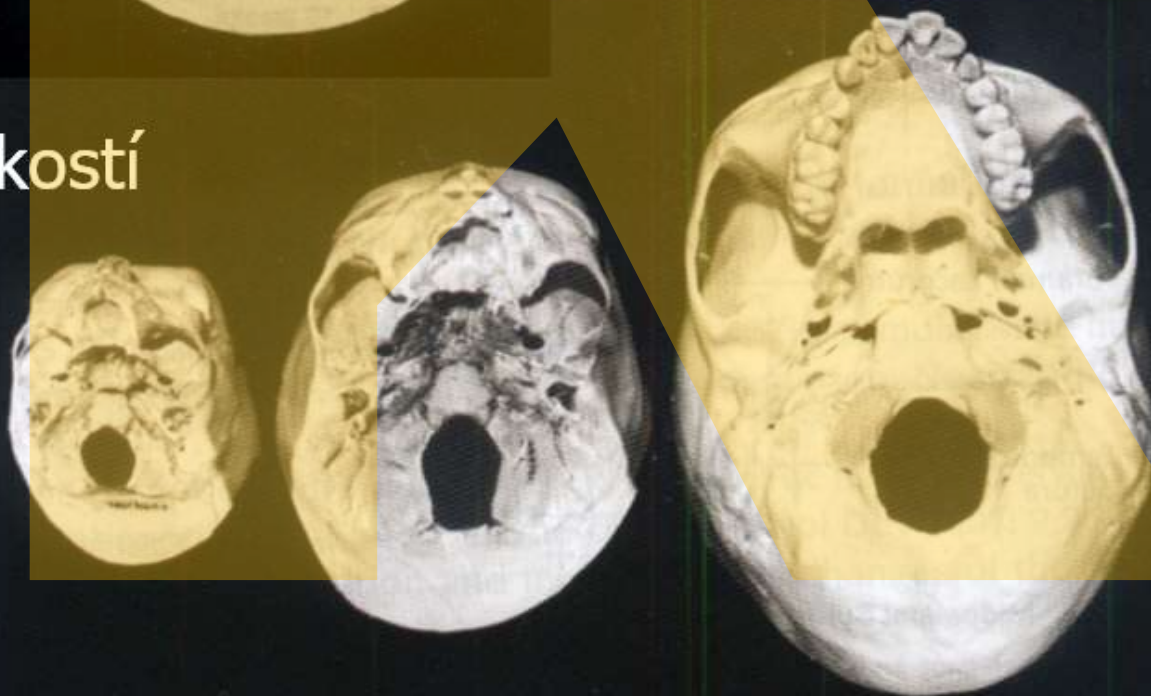
Rozšiřování lebeční dutiny
souvisí s „ohýbáním“ rostoucí
lebeční base



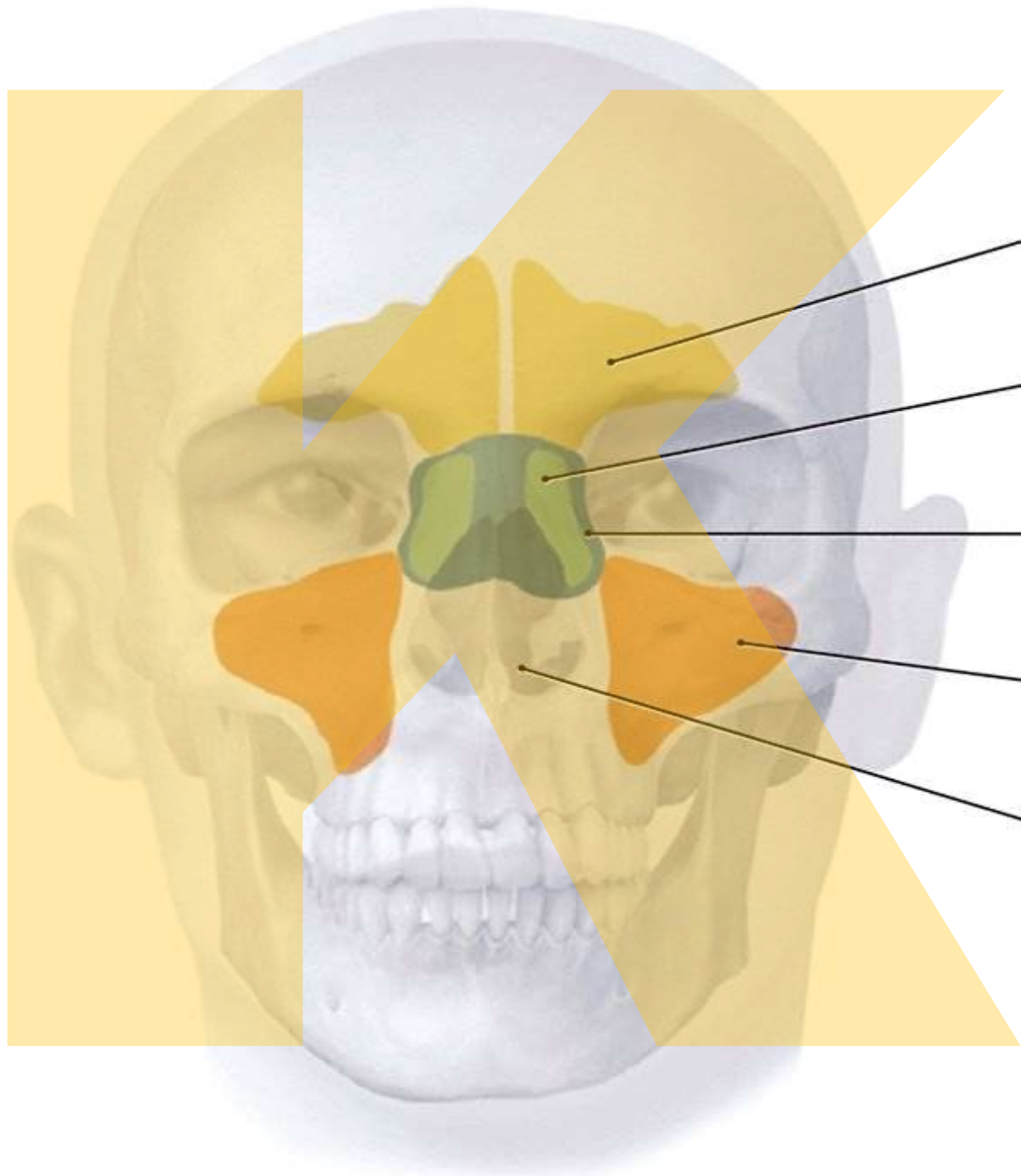
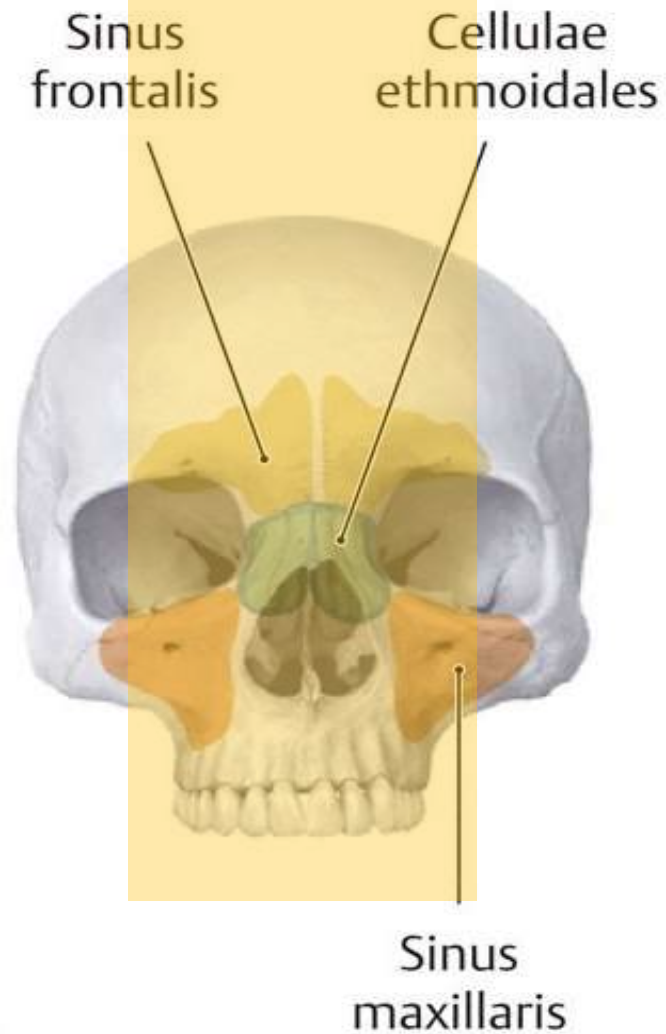
! Vývoj tzv. úhlu base
(kyfosa lbi) !



Změna tloušťky kostí

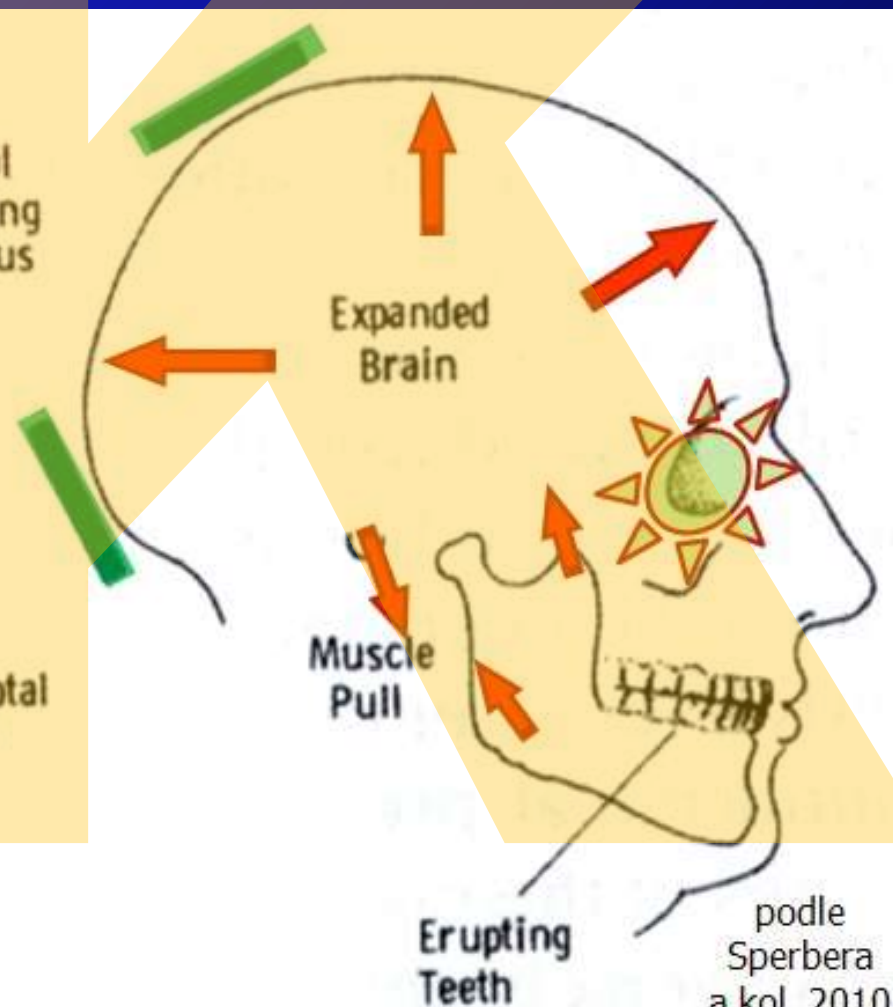
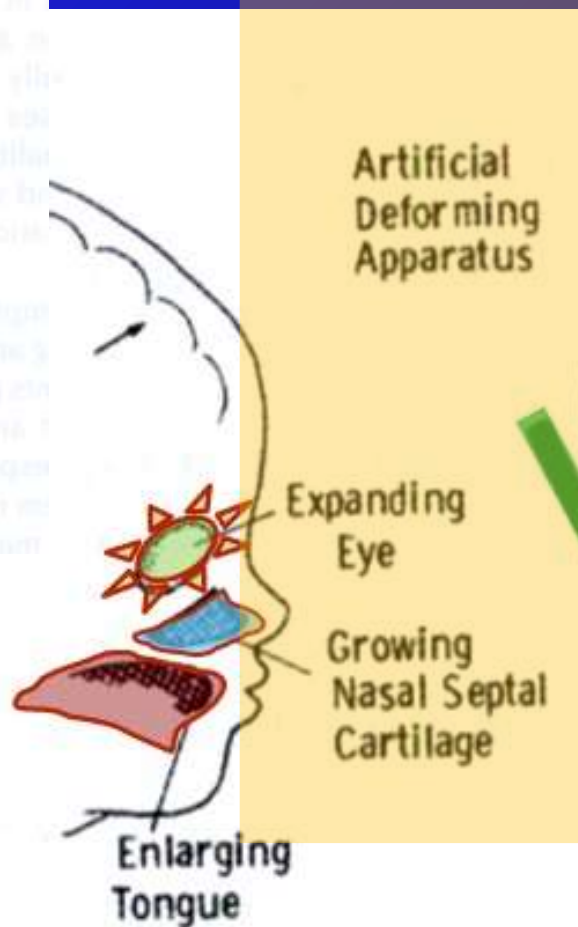
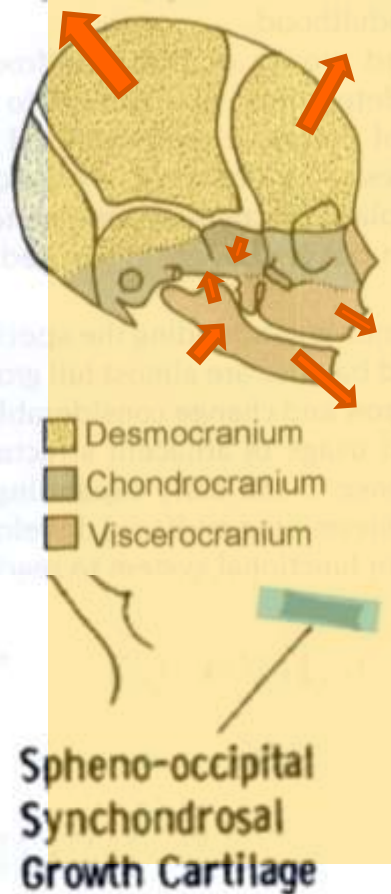


Paranasální dutiny se
podílejí na utváření lebky
a její obličejové kostry

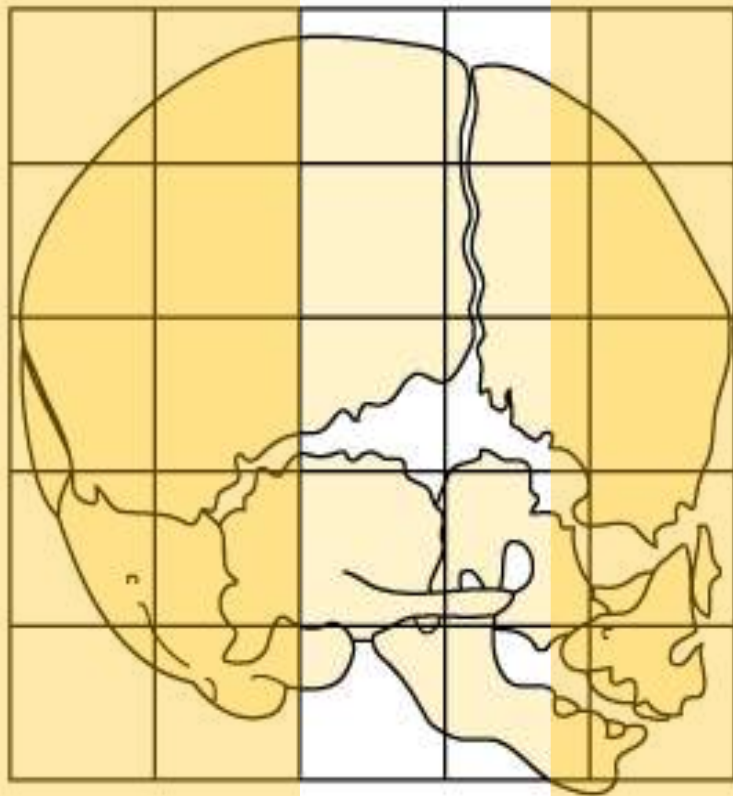


Hlavní děje, které určují tvar lebky

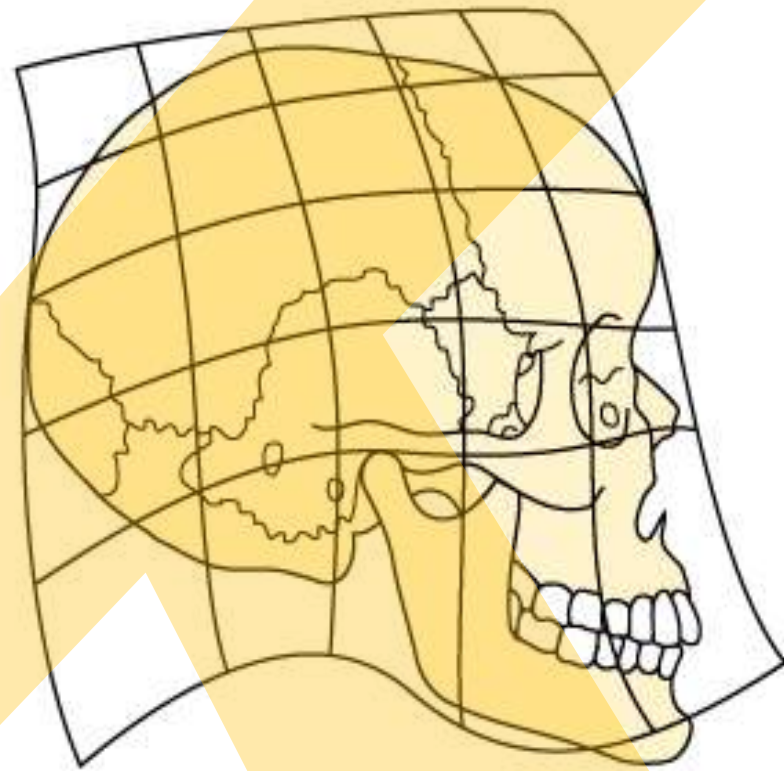
zvětšování mozku; osifikace švu synchondrosis sphenoccipitalis;
zvětšování očního bulbu, tah svalů; rostoucí nosní přepážka;
prořezávání zubů



podle
Sperbera
a kol. 2010



Human newborn



Human adult

(a)

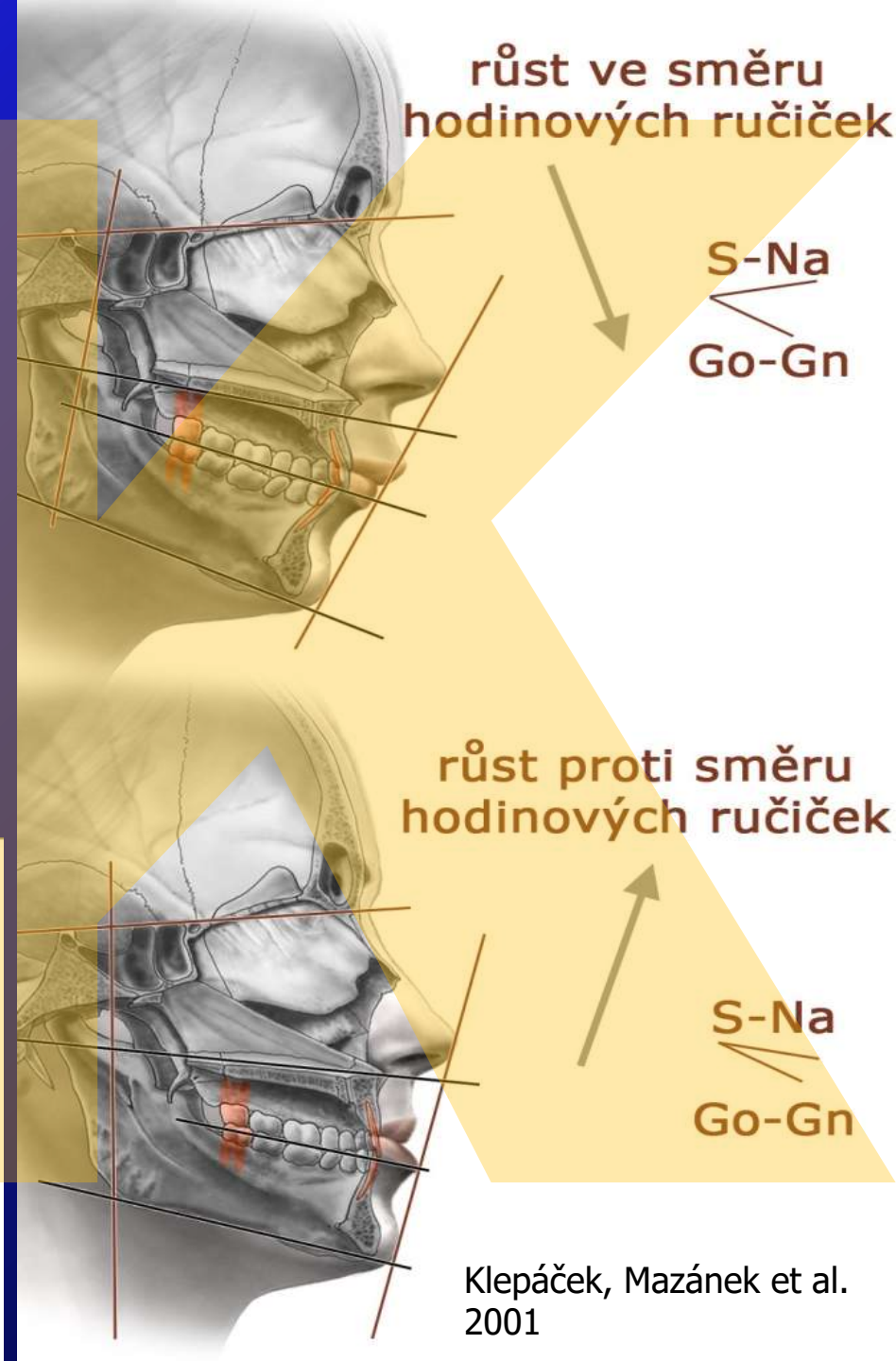
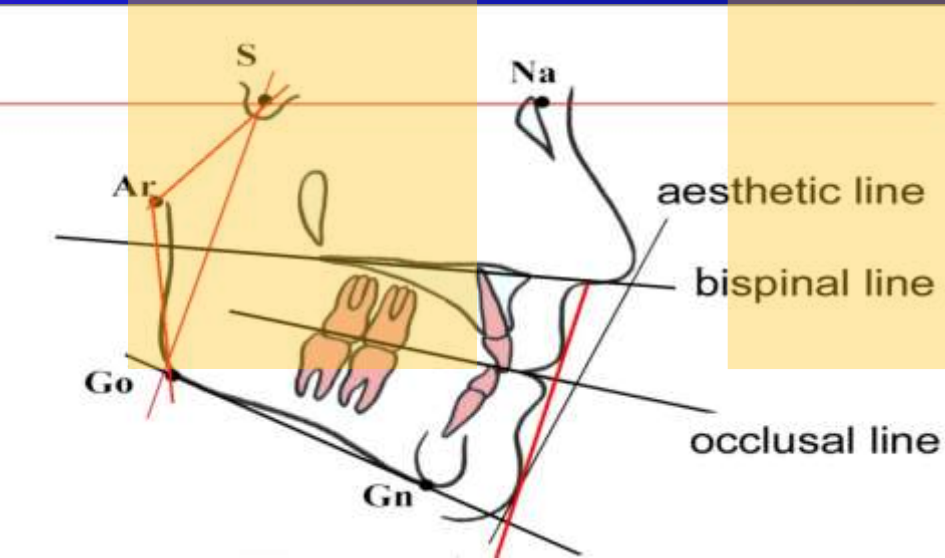
Copyright © 2001 Benjamin Cummings, an imprint of Addison Wesley Longman, Inc.

Vztah mezi obličejovými liniemi během růstu obličeje

(podle Jarabaka 1975)

Profilová linie obličeje

Pomáhá stanovit sagitální vztahy mezi
čelistmi a polohou brady v závislosti
na množství měkkých tkání.



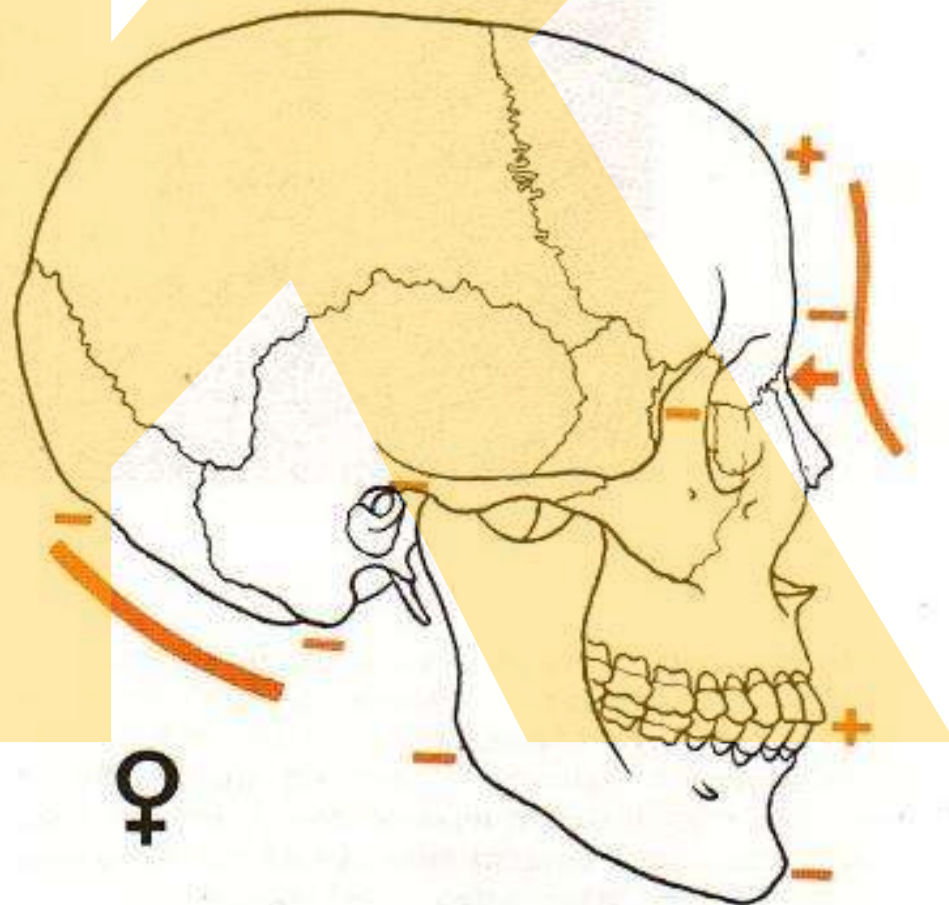
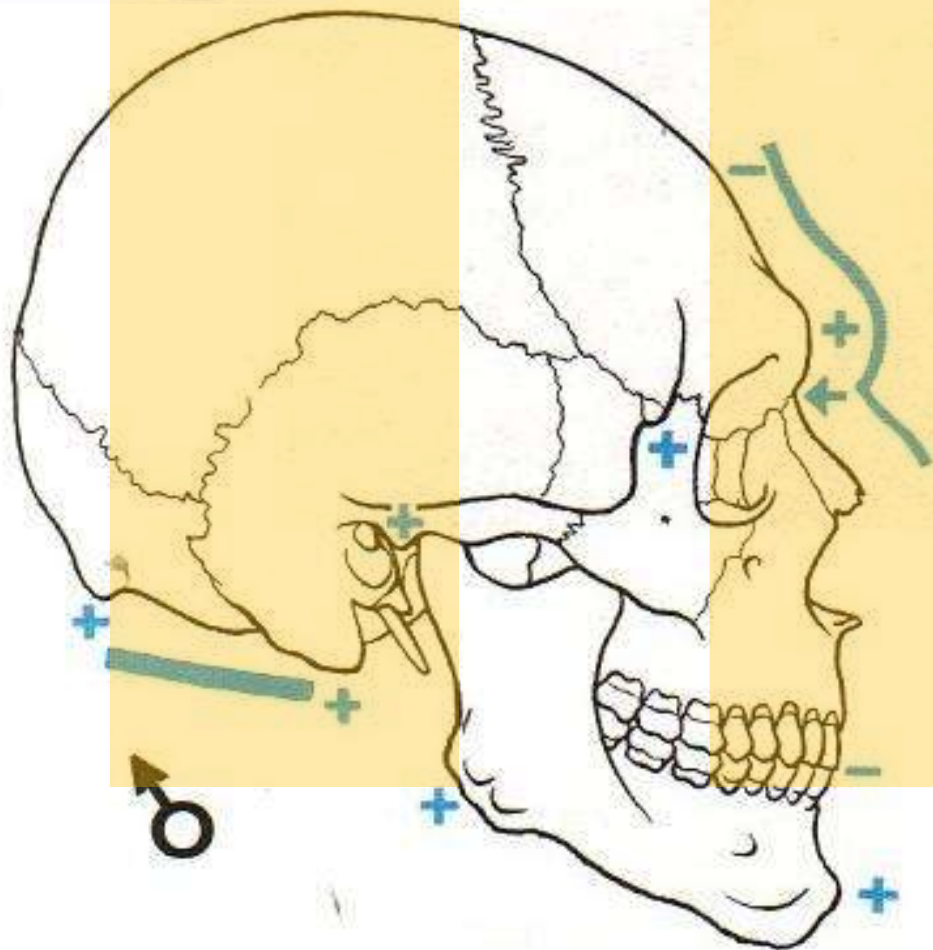
Klepáček, Mazánek et al.
2001

Pohlavní rozdíly v utváření lebky

muže

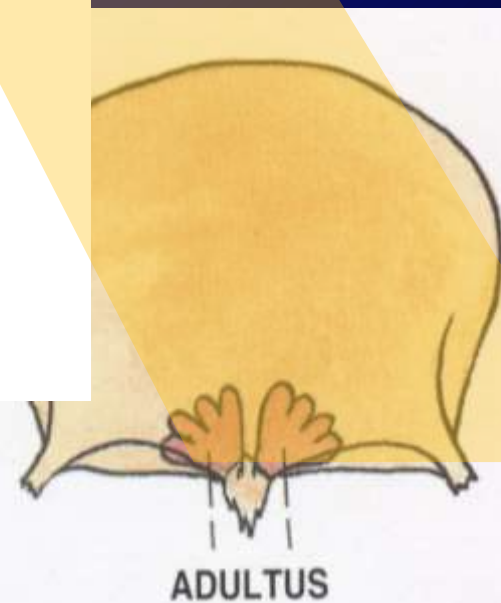
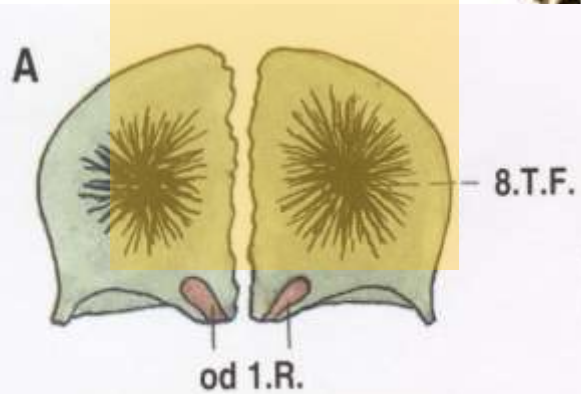
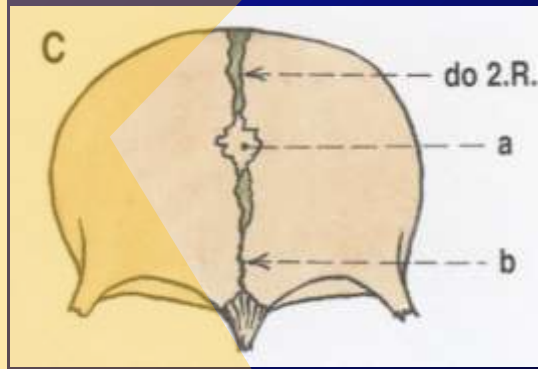
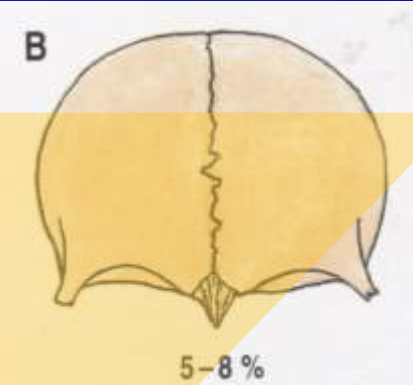
a

ženy



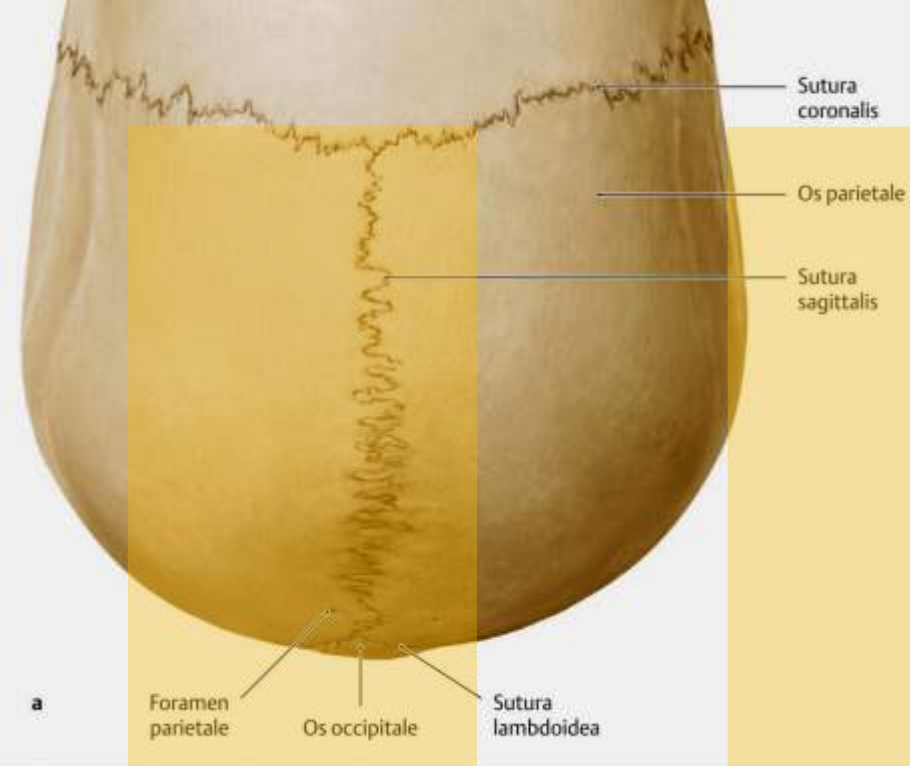


Jednotlivé kosti



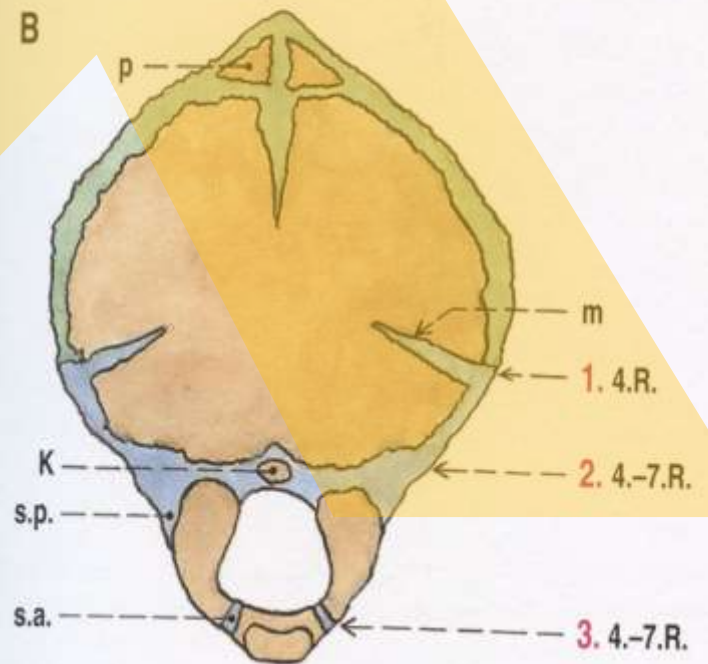
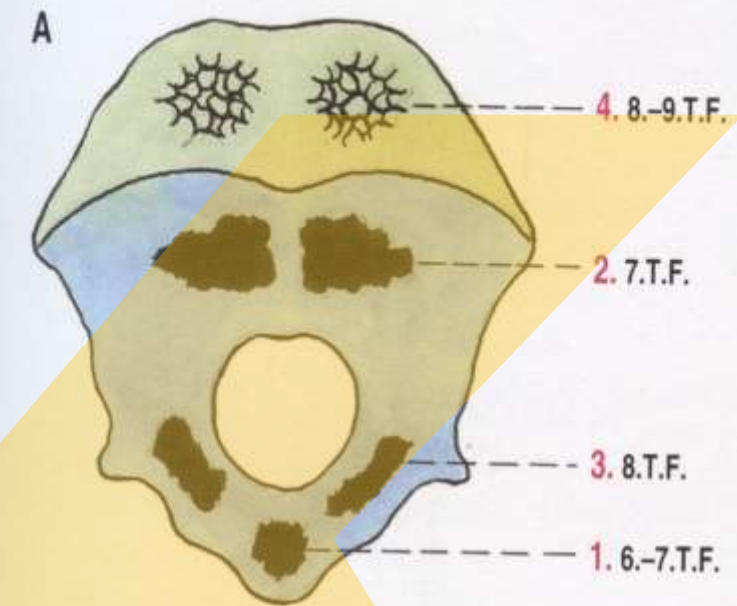
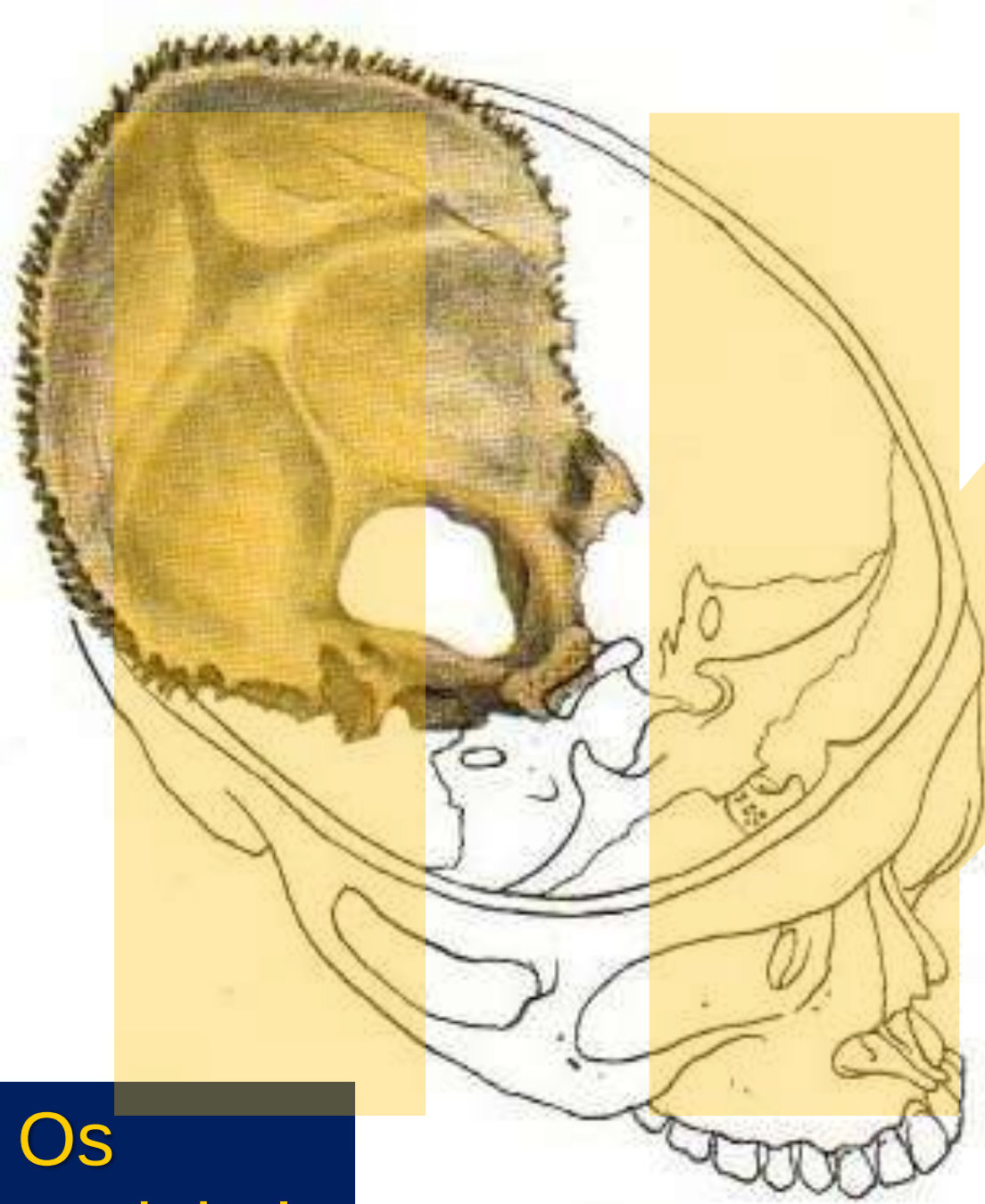
Os frontale

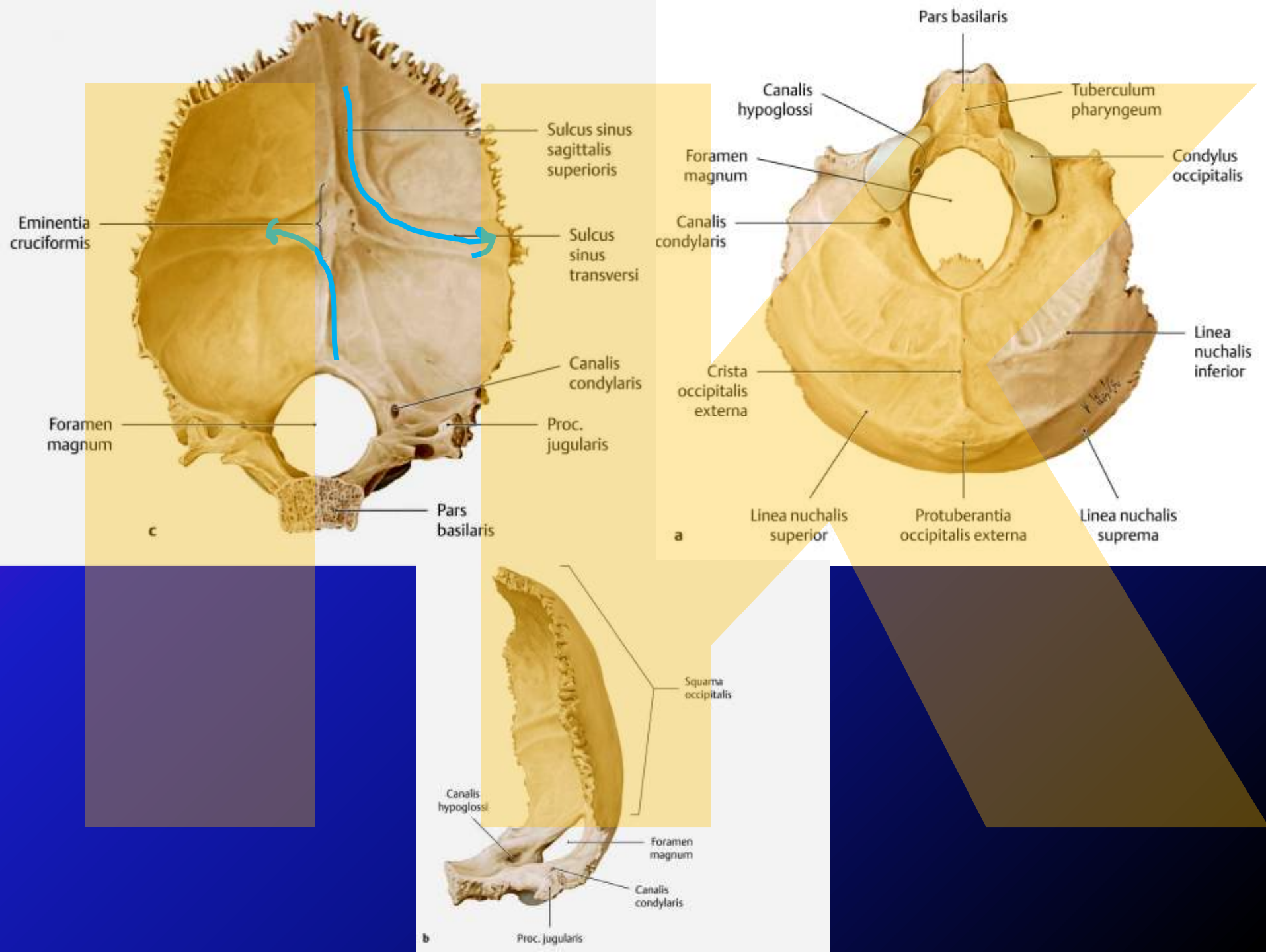
Os parietale



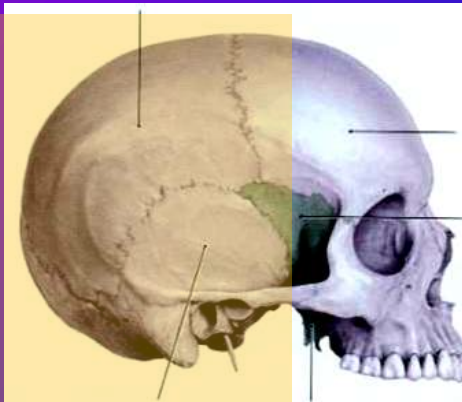
Sulcus arteriae meningeae mediae

Os occipitale

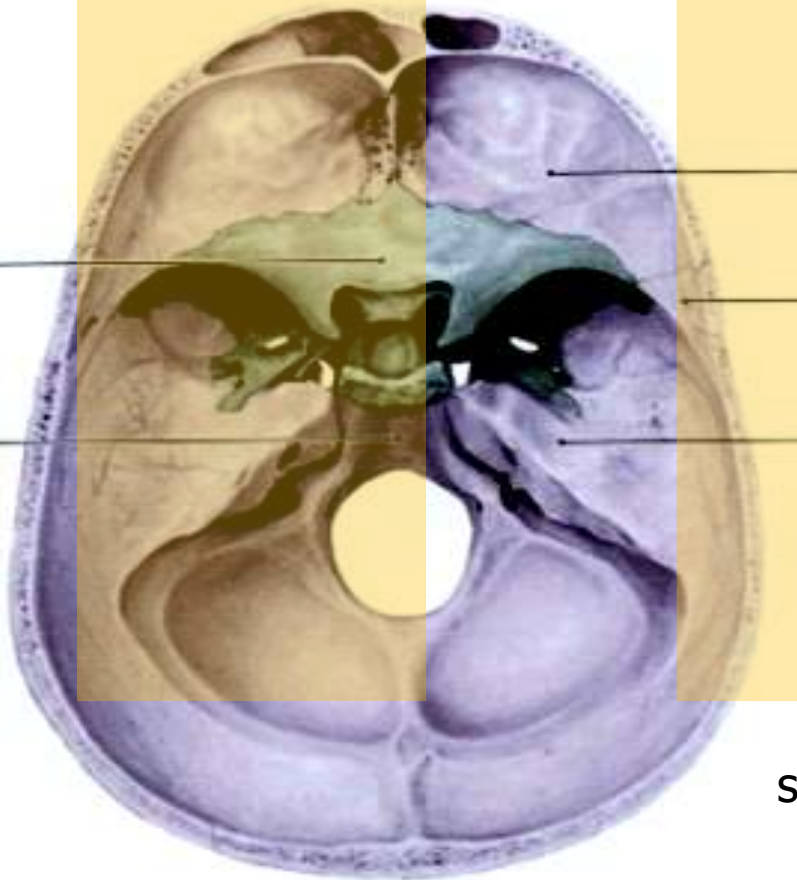




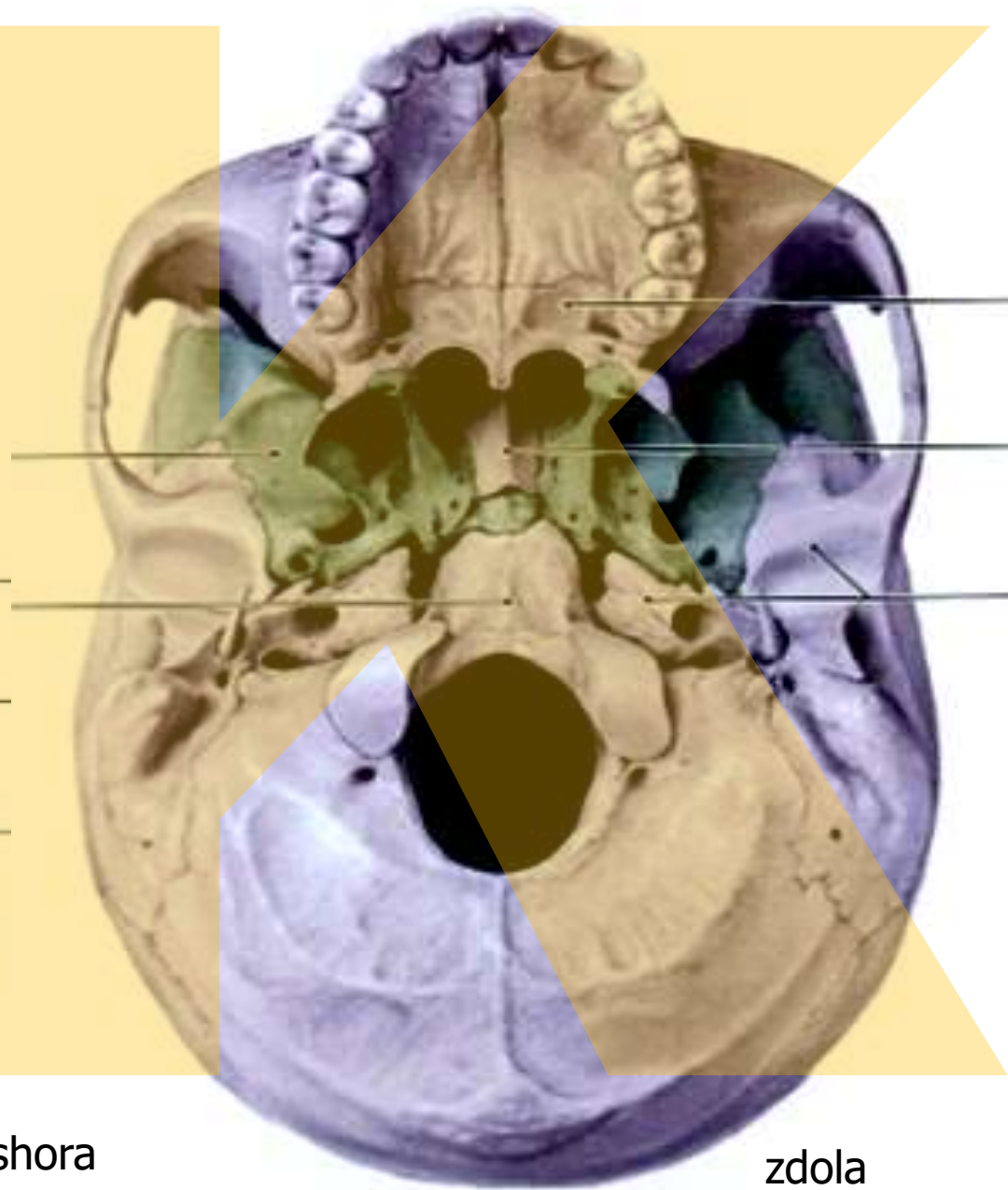
Os sphenoidale



zboku

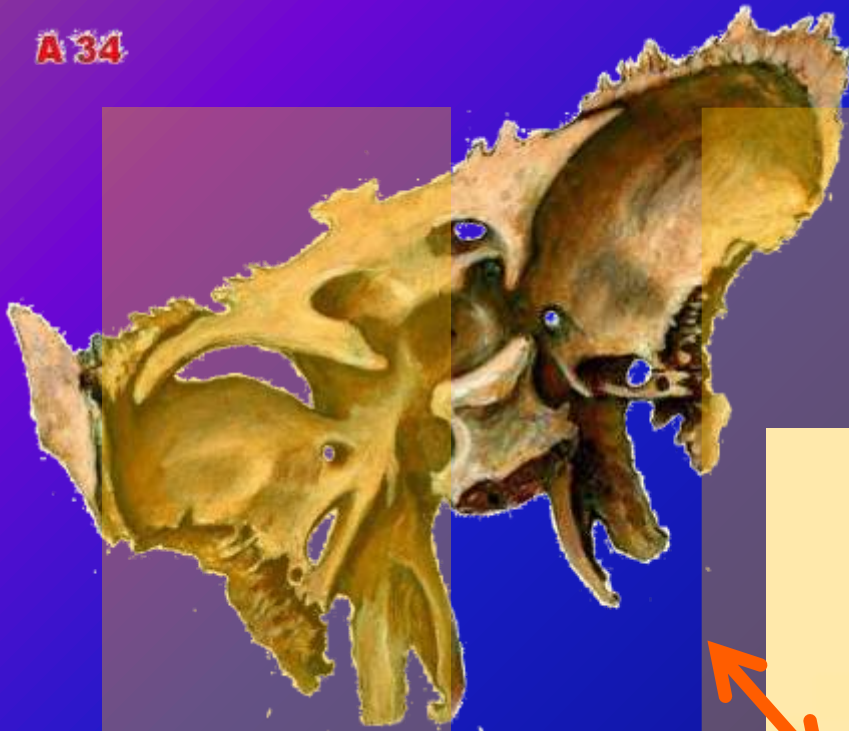


shora

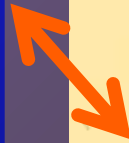


zdola

A 34



view from the dorsolateral aspect
+ vomer/sphenoid bone
connection



Ala minor

Canalis opticus

Jugum sphenoidale

Fissura orbitalis superior

Ala major

Foramen ovale

Foramen spinosum

Foramen rotundum

Proc. clinoideus anterior

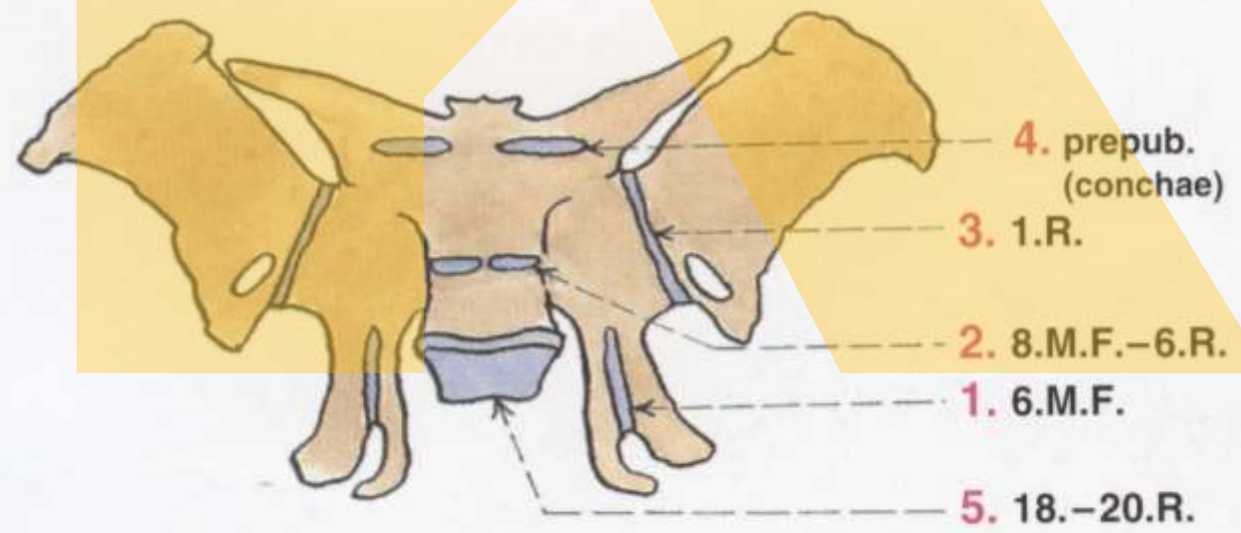
Sella turcica

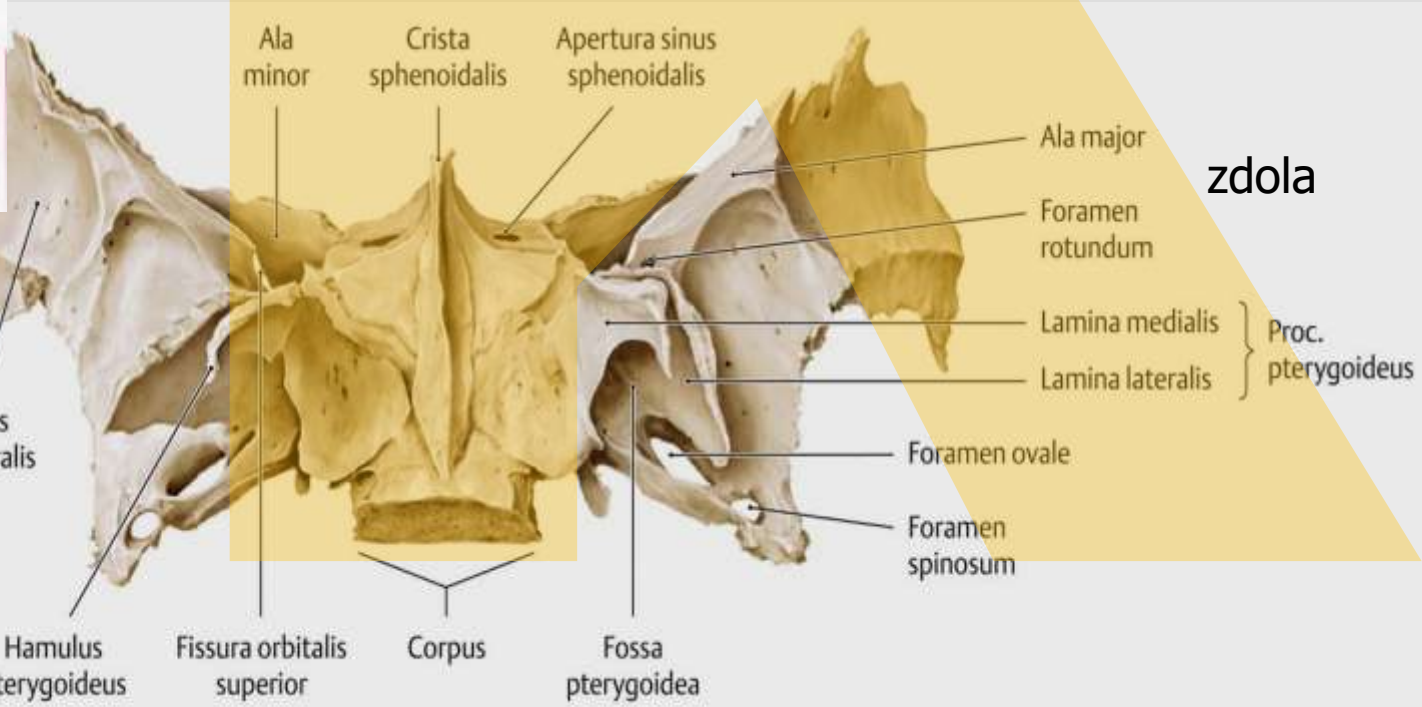
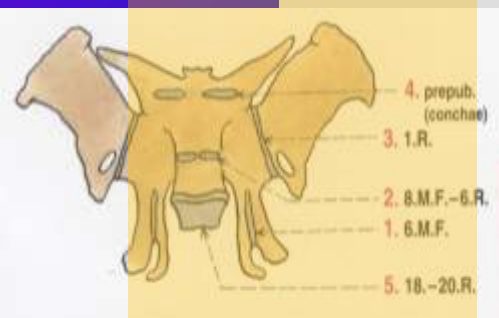
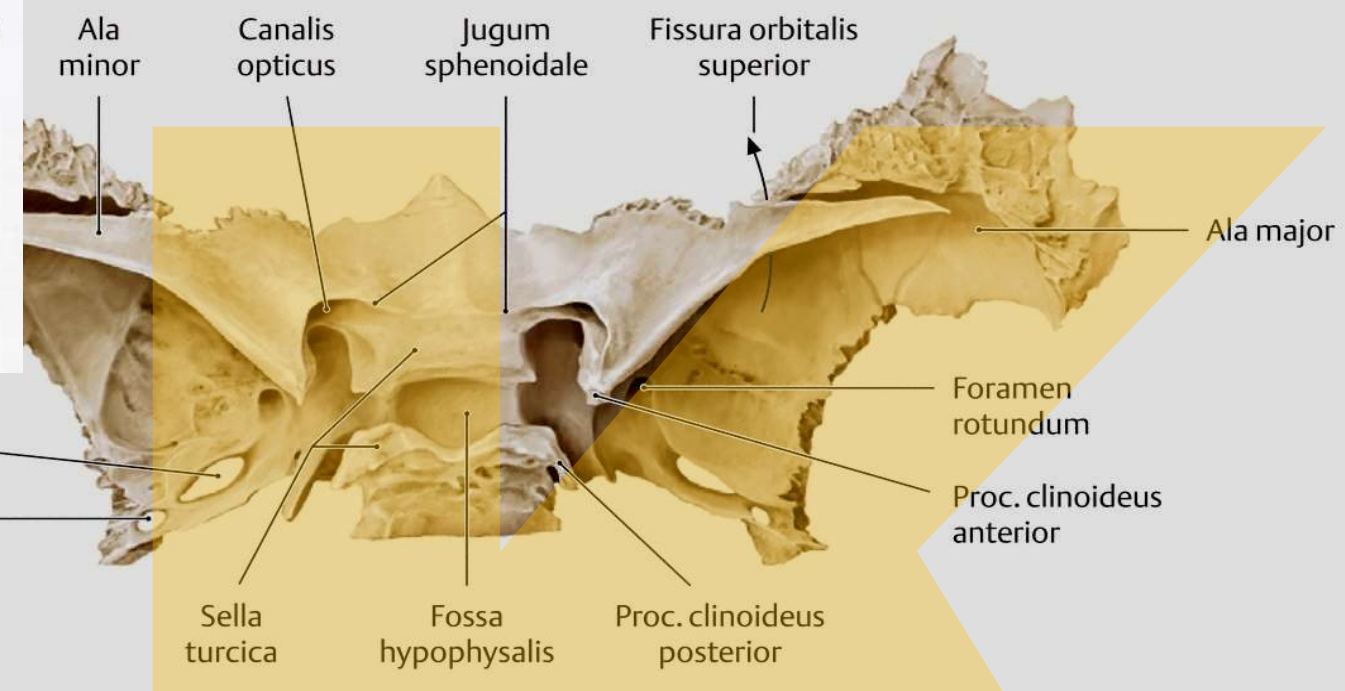
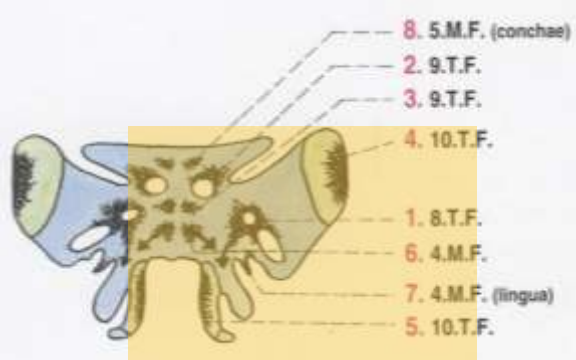
Fossa hypophysialis

Proc. clinoideus posterior

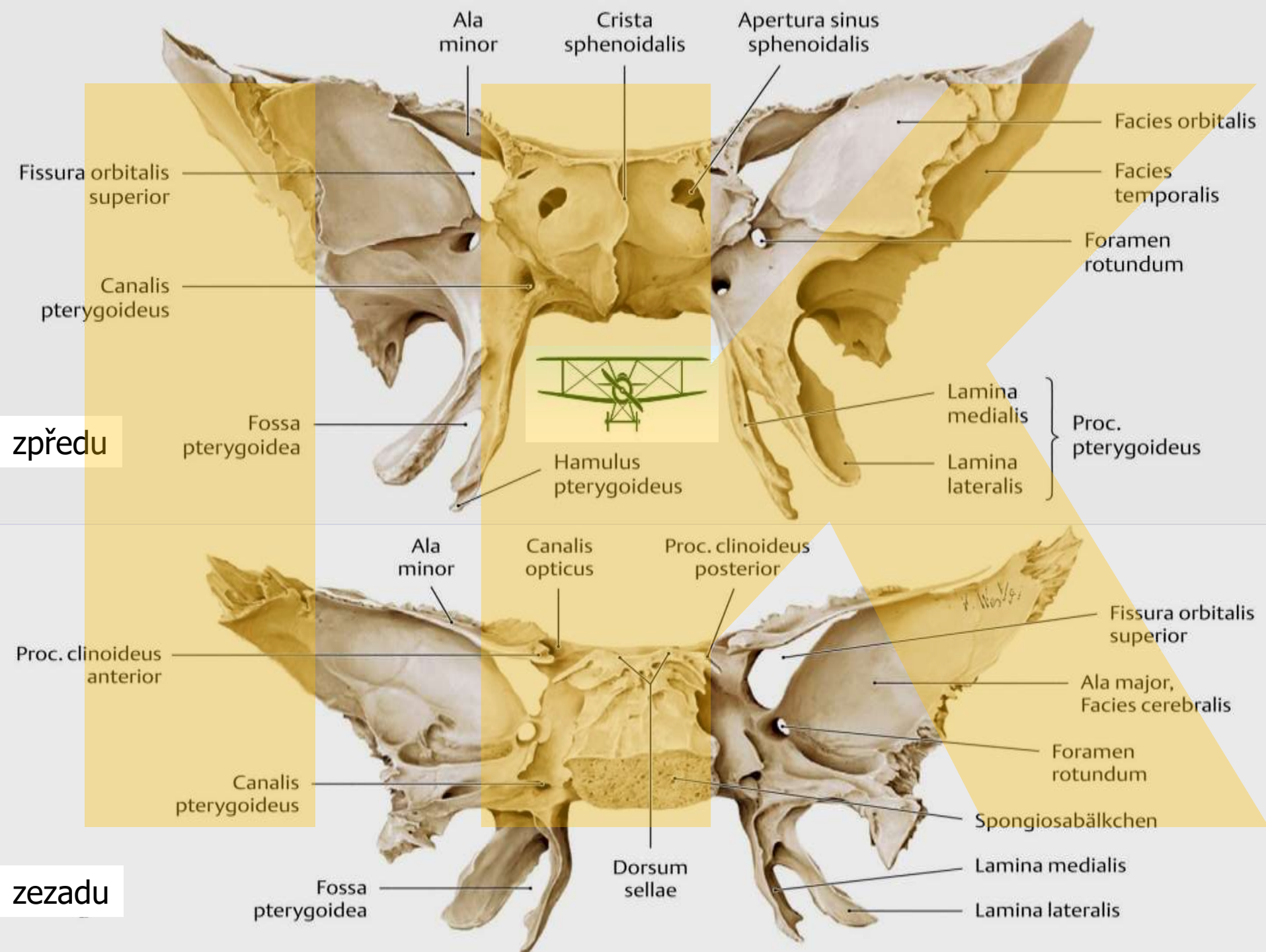
shora

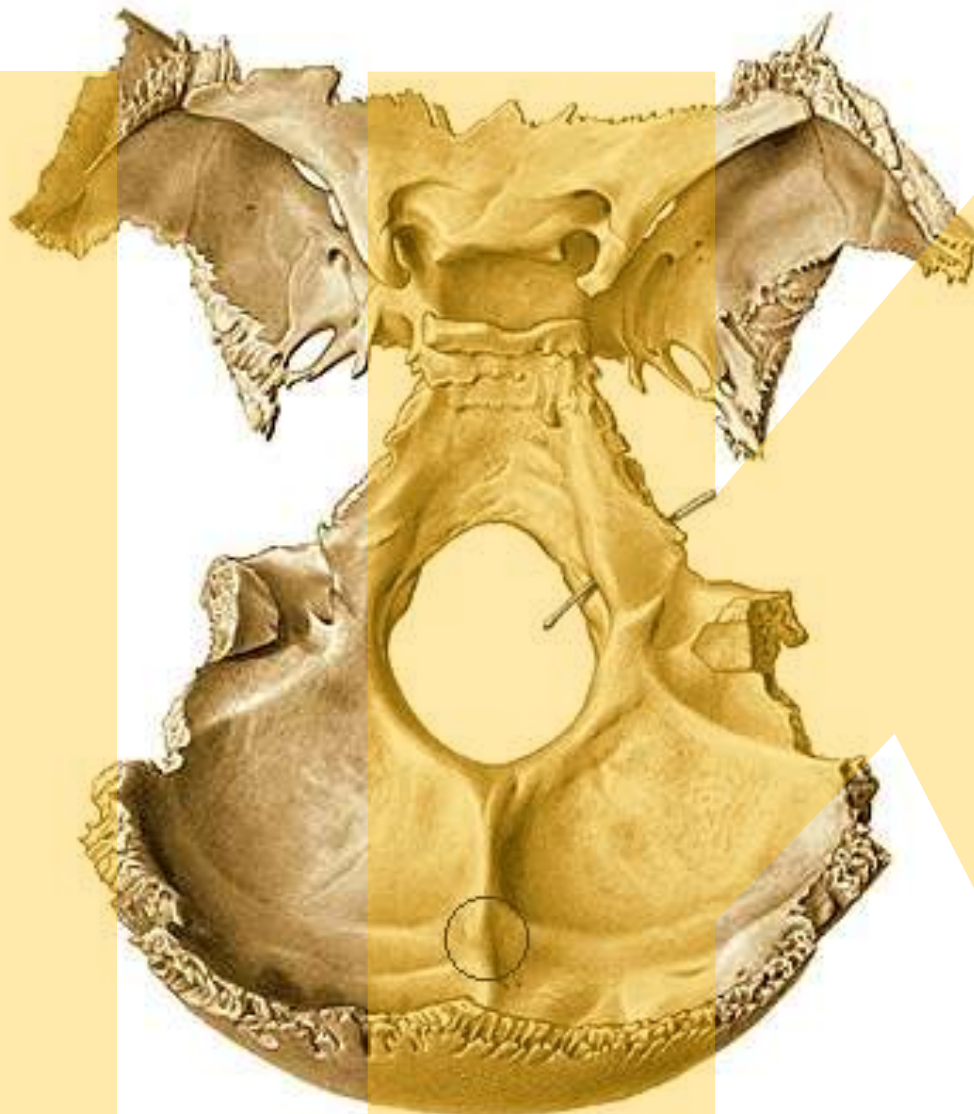
Os sphenoidale





a

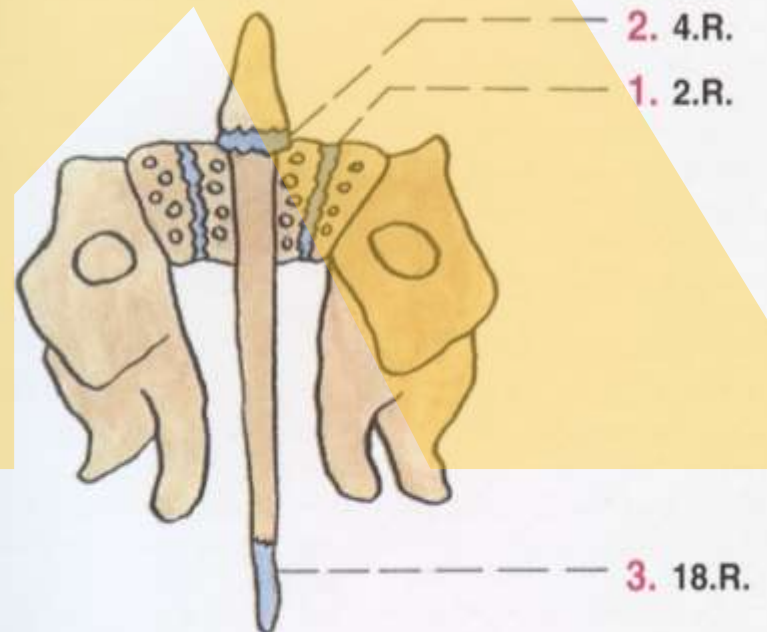
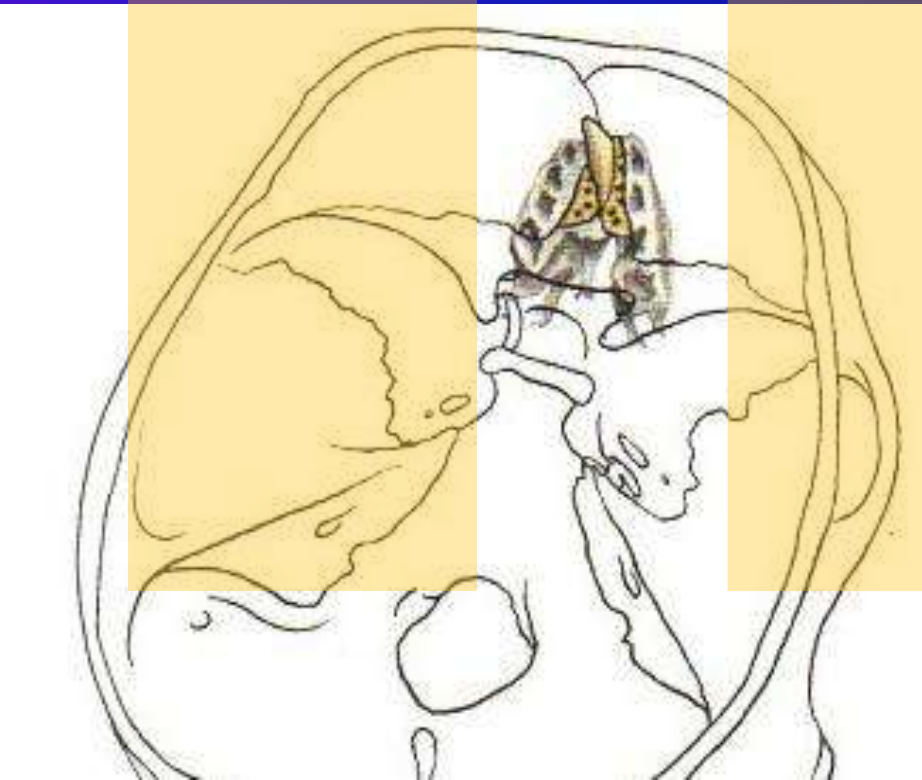
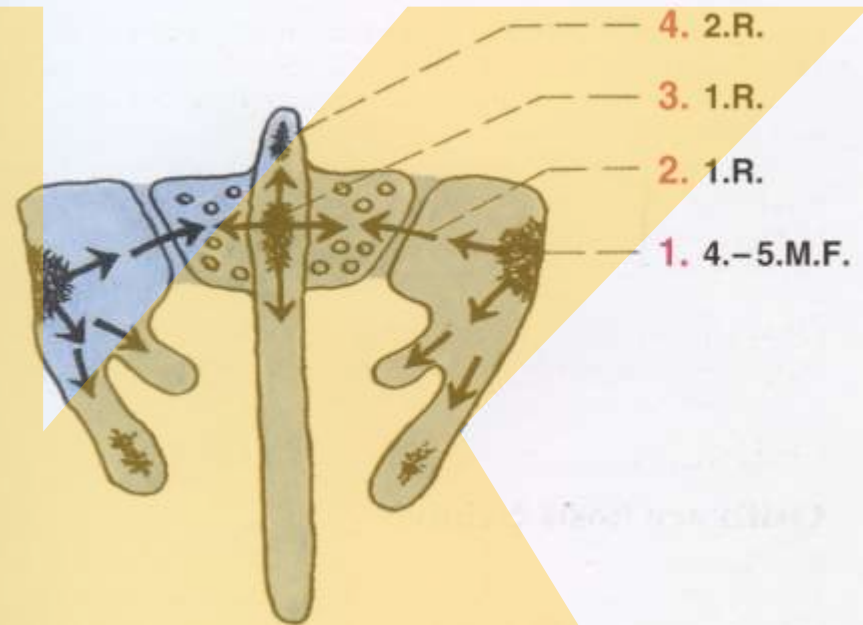
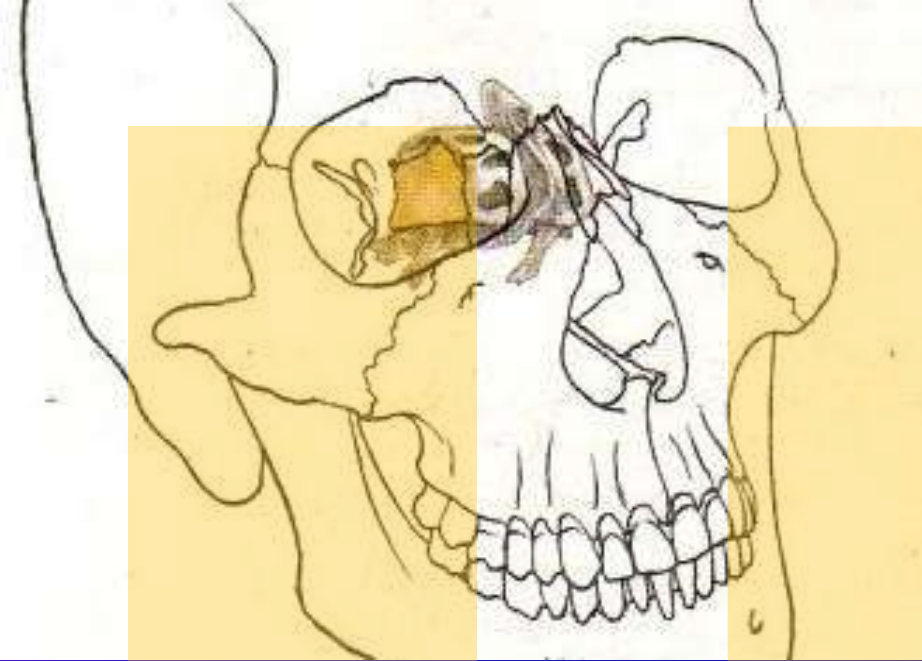


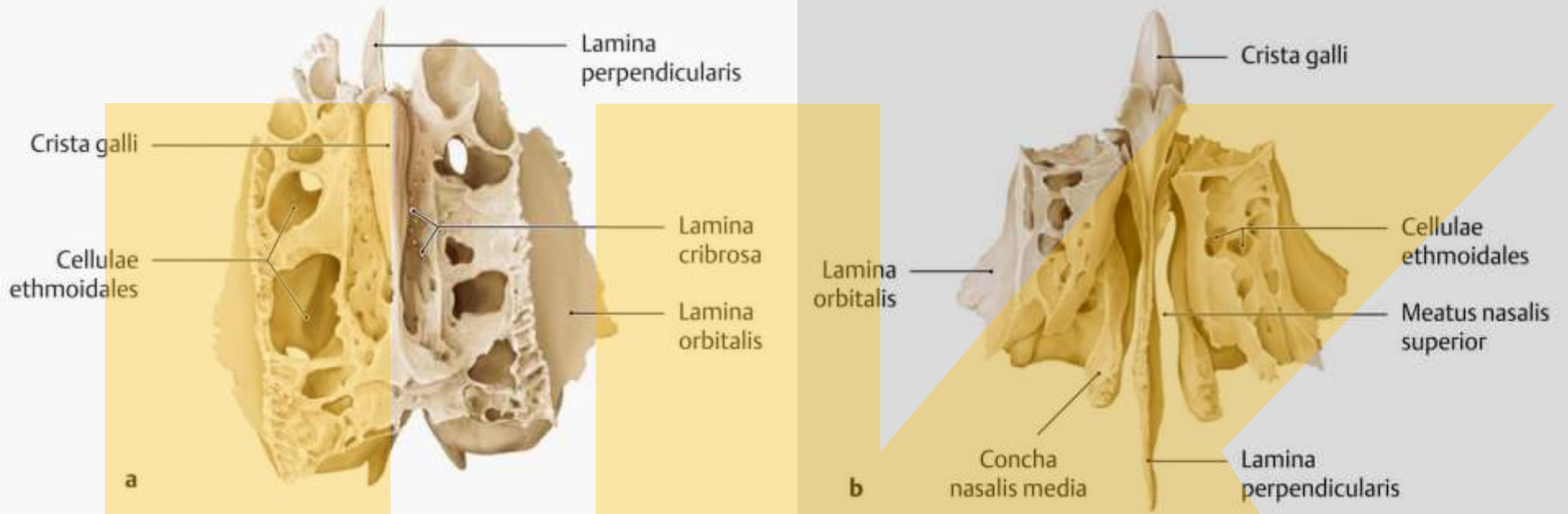


Obě kosti
vytvářejí
lože
pro kmen
mozkový

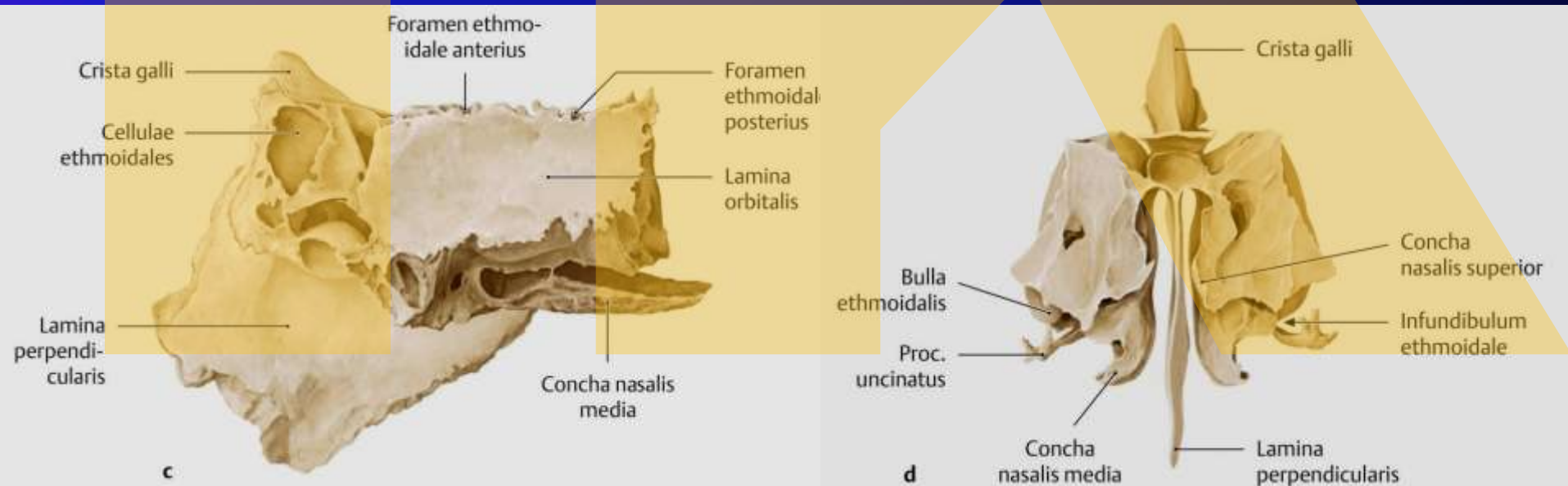
Os sphenoidale et os occipitale

Os ethmoidale

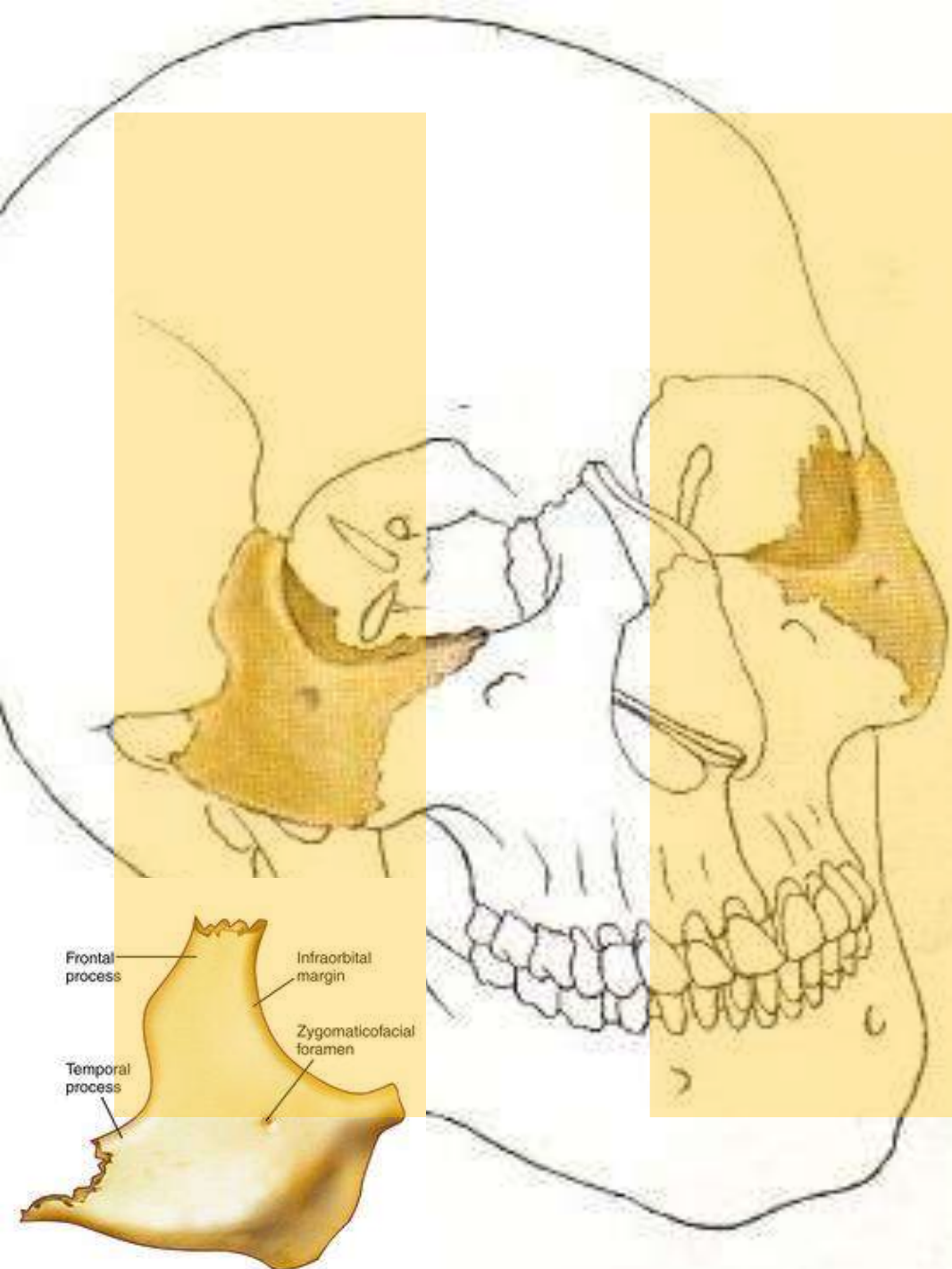


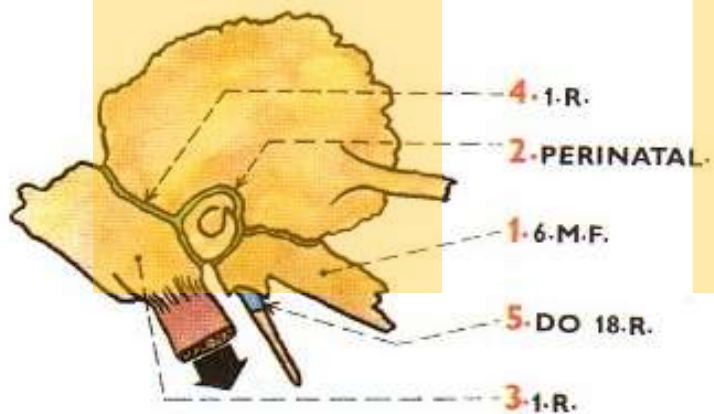
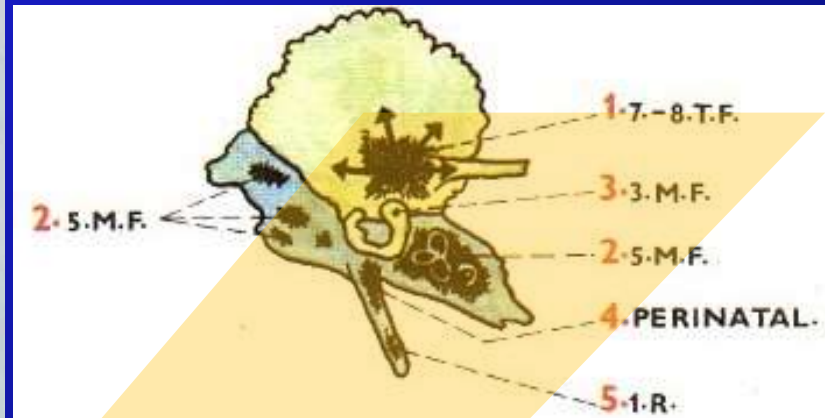
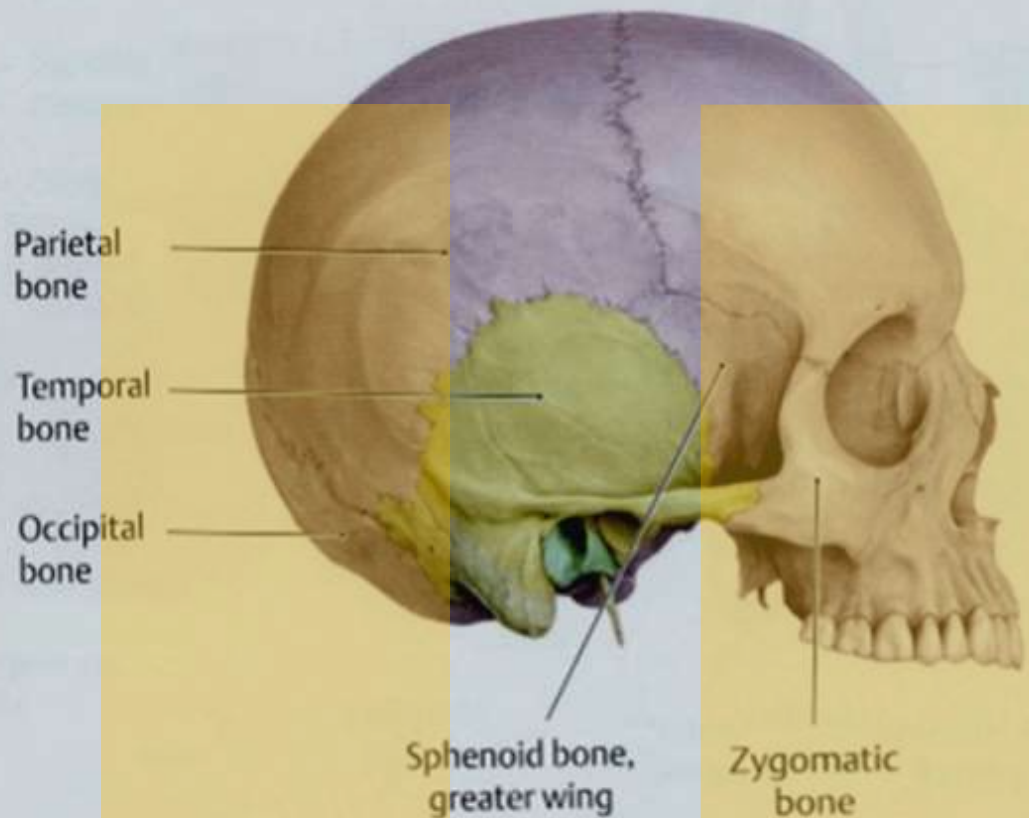


Os ethmoidale



Os zygomaticum





Zygomatic
process

Articular
tubercle

Mandibular
fossa

External
acoustic opening

Mastoid
process

Mastoid
notch

Mastoid
foramen

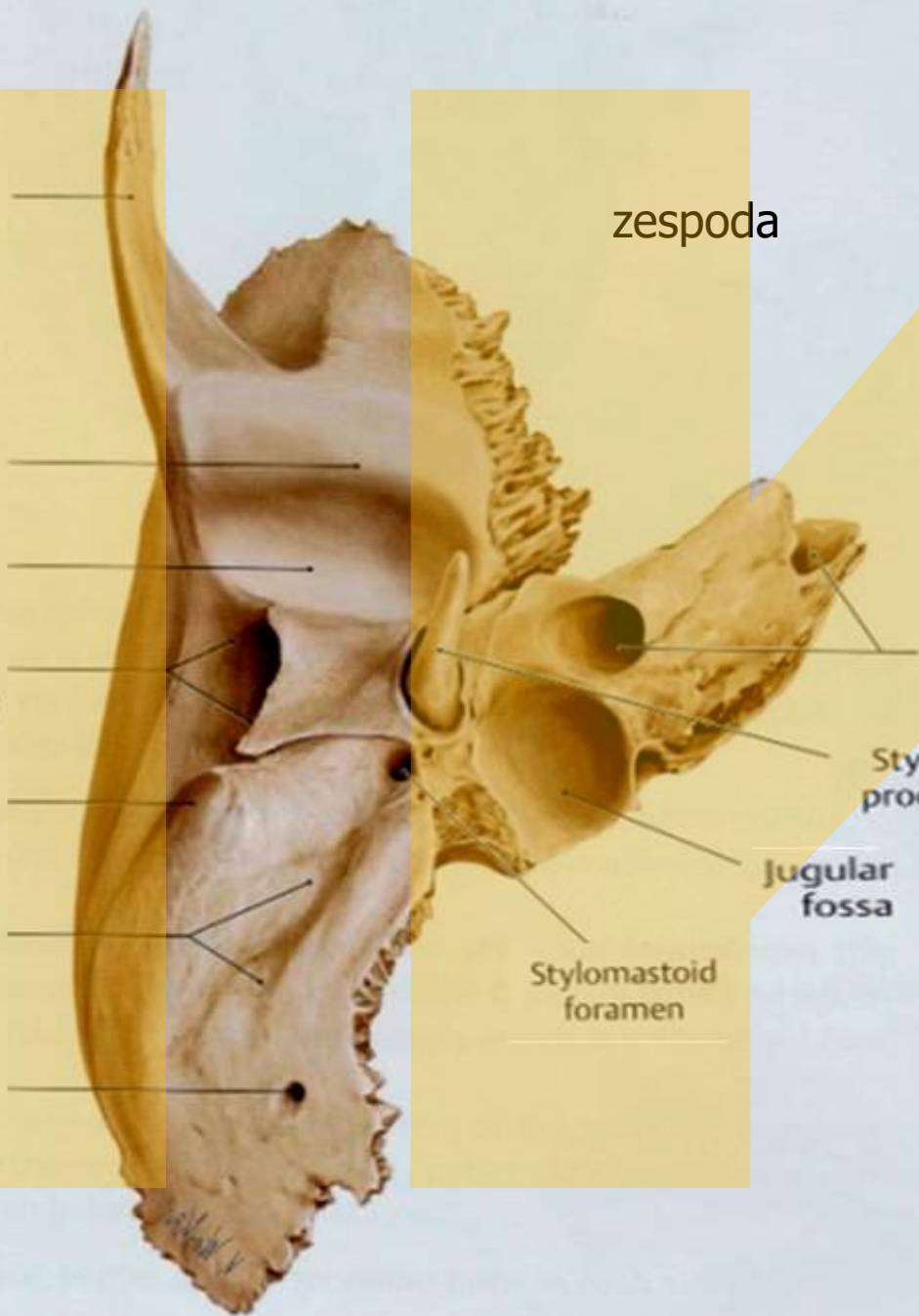
zespoda

Carotid
canal

Styloid
process

Jugular
fossa

Stylomastoid
foramen



Sulcus
arteriosus

zevnitř

Proc.
zygomaticus

Porus acusticus
internus

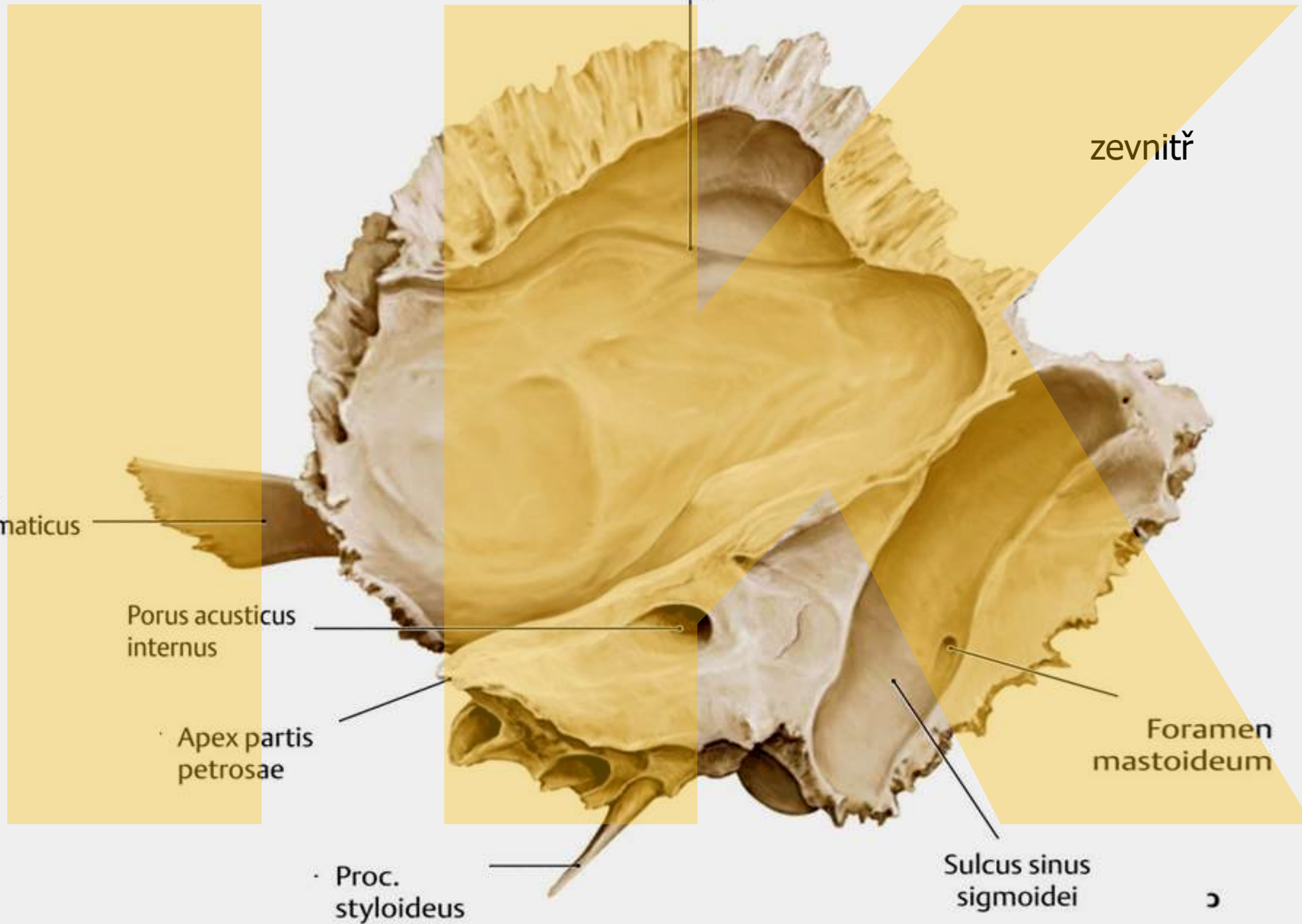
Apex partis
petrosae

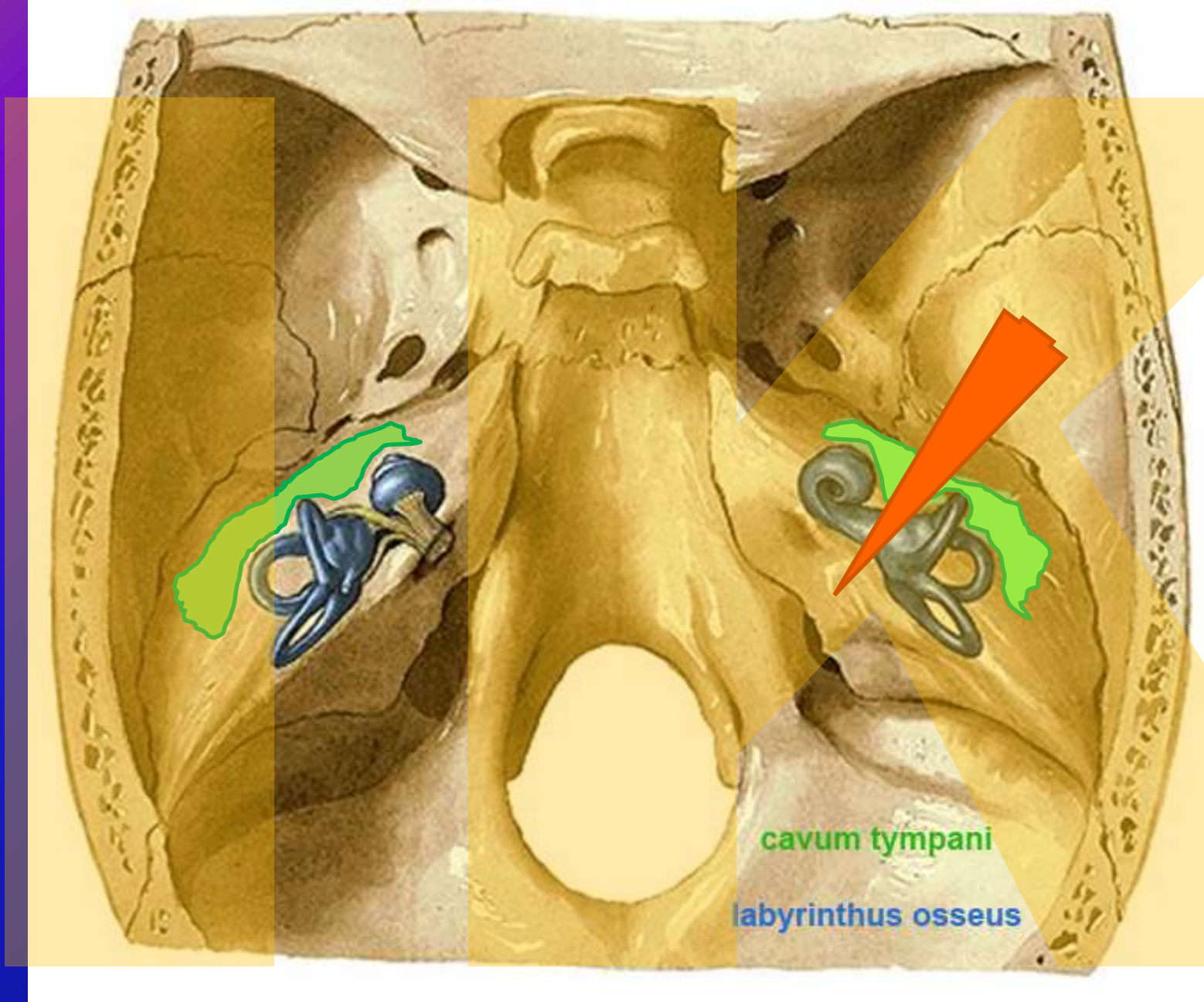
Proc.
styloideus

Foramen
mastoideum

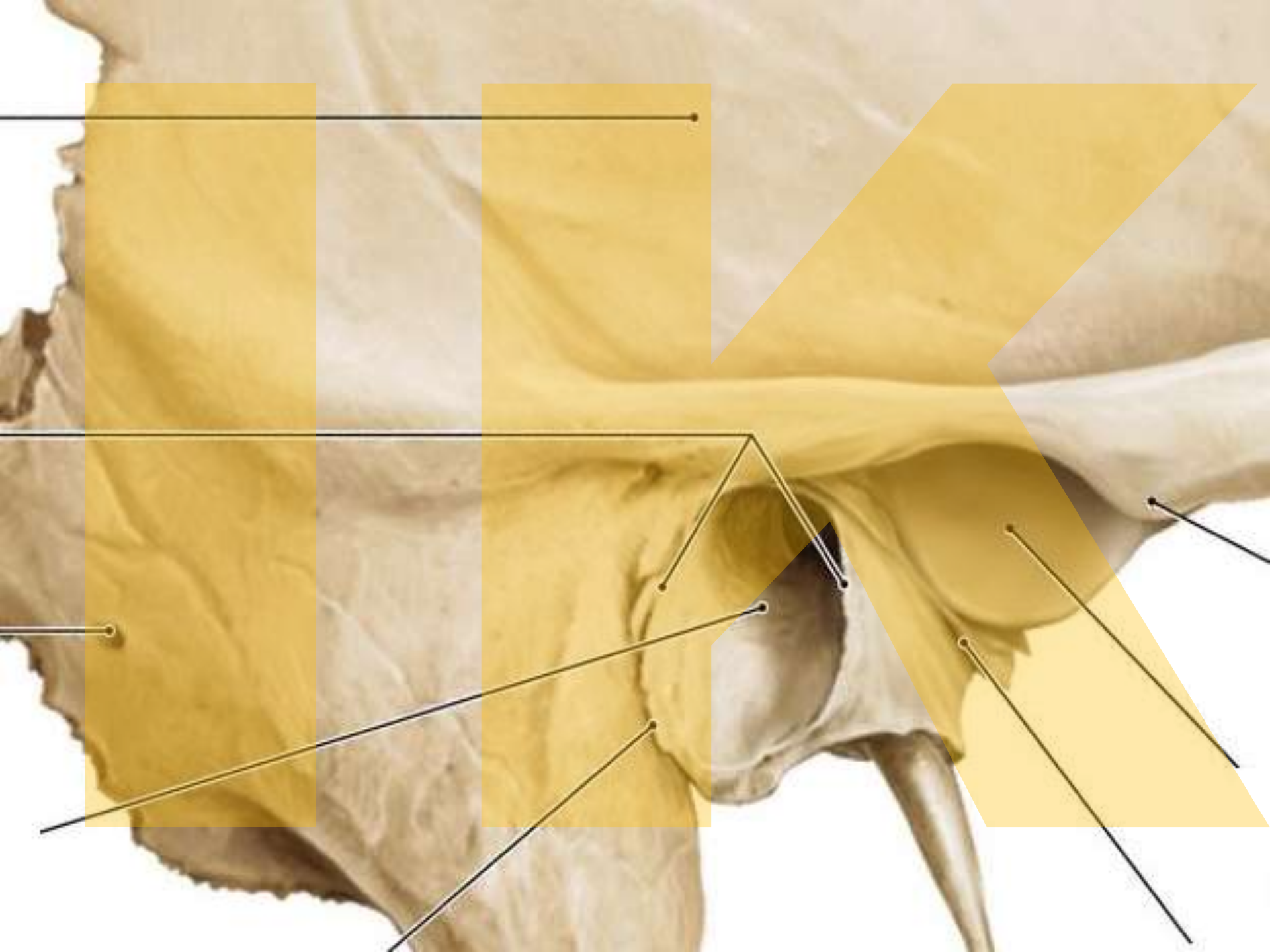
Sulcus sinus
sigmoidei

5

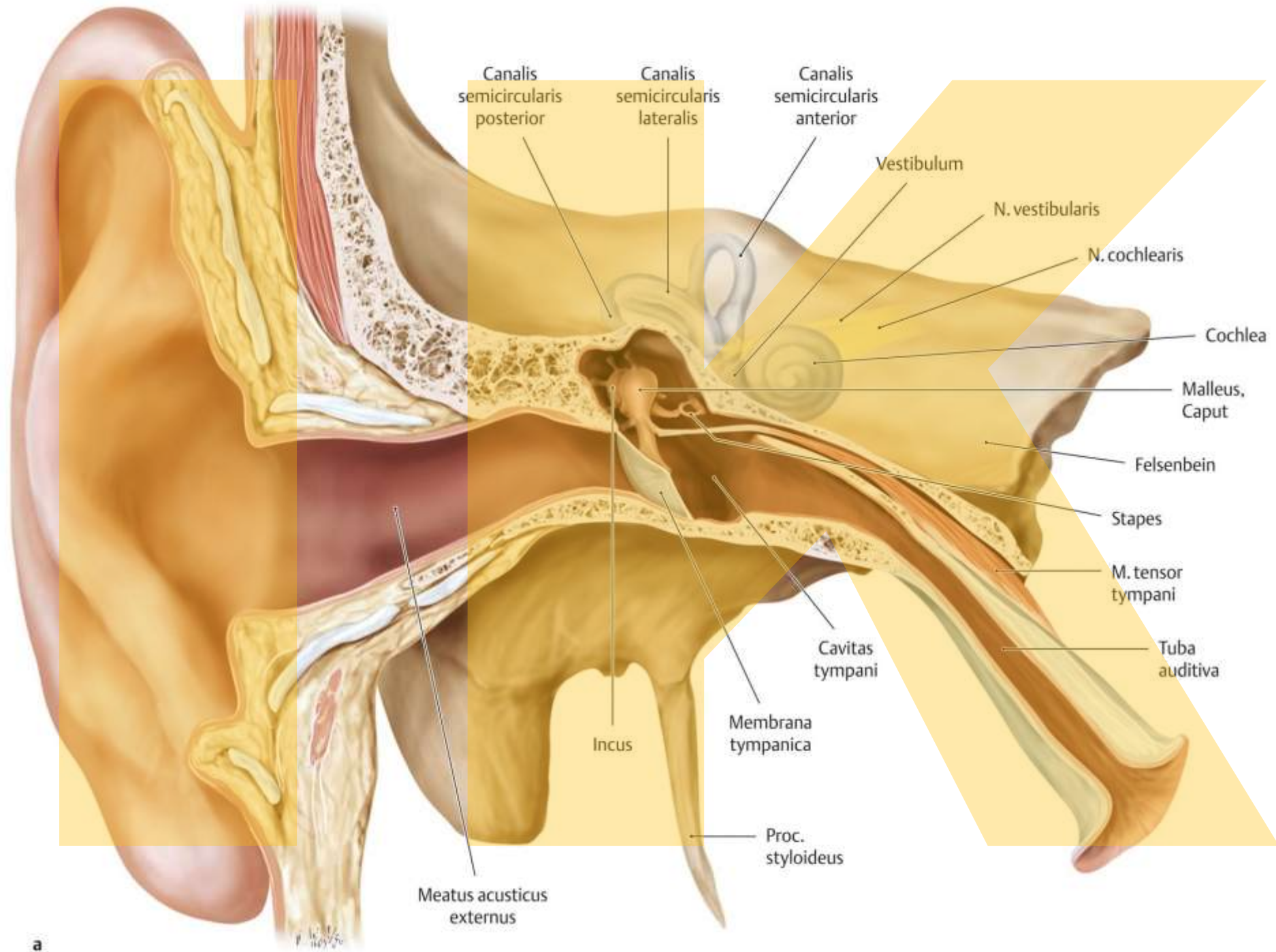




Dutinky vnitřního a středního ucha uvnitř os petrosum

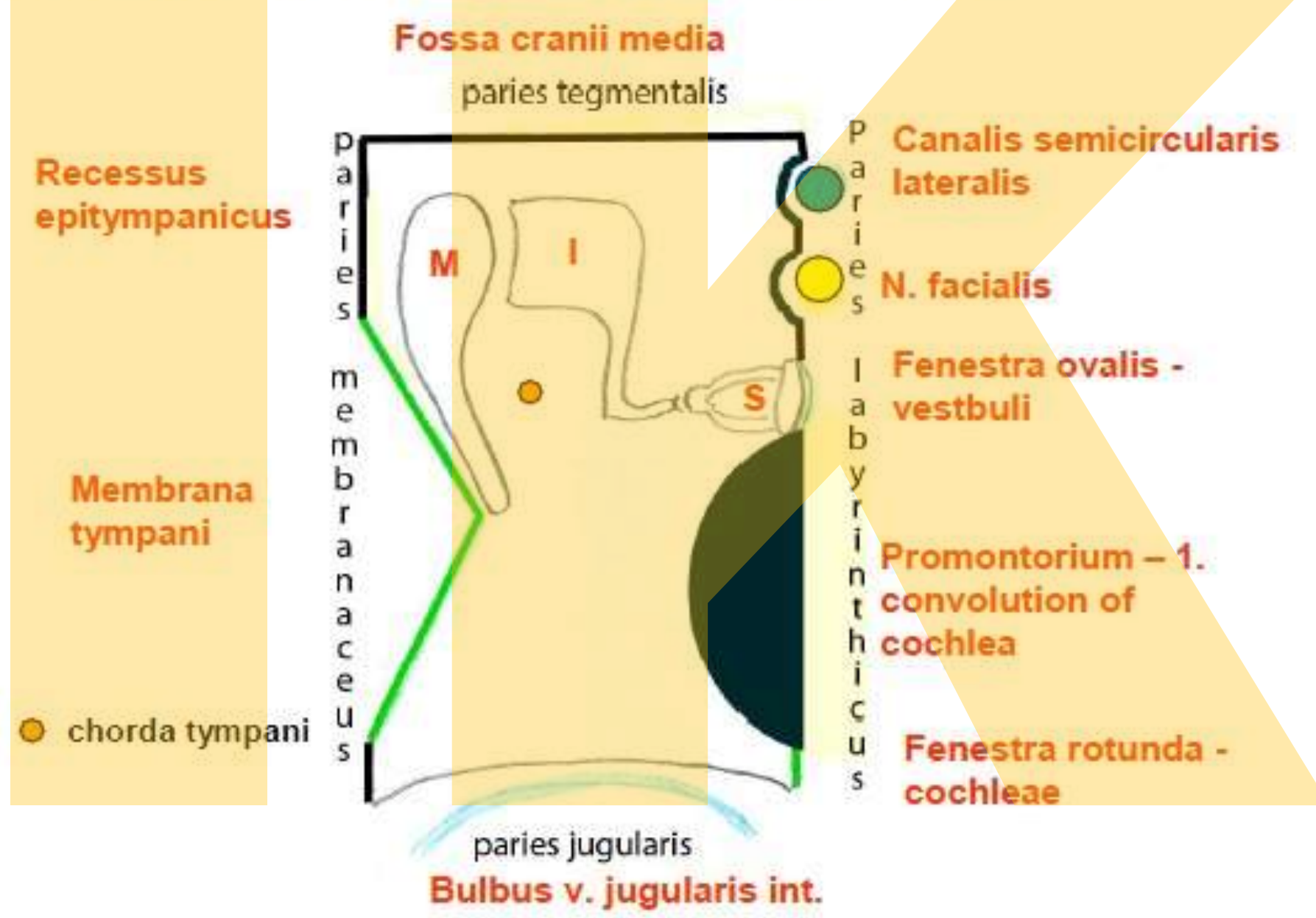


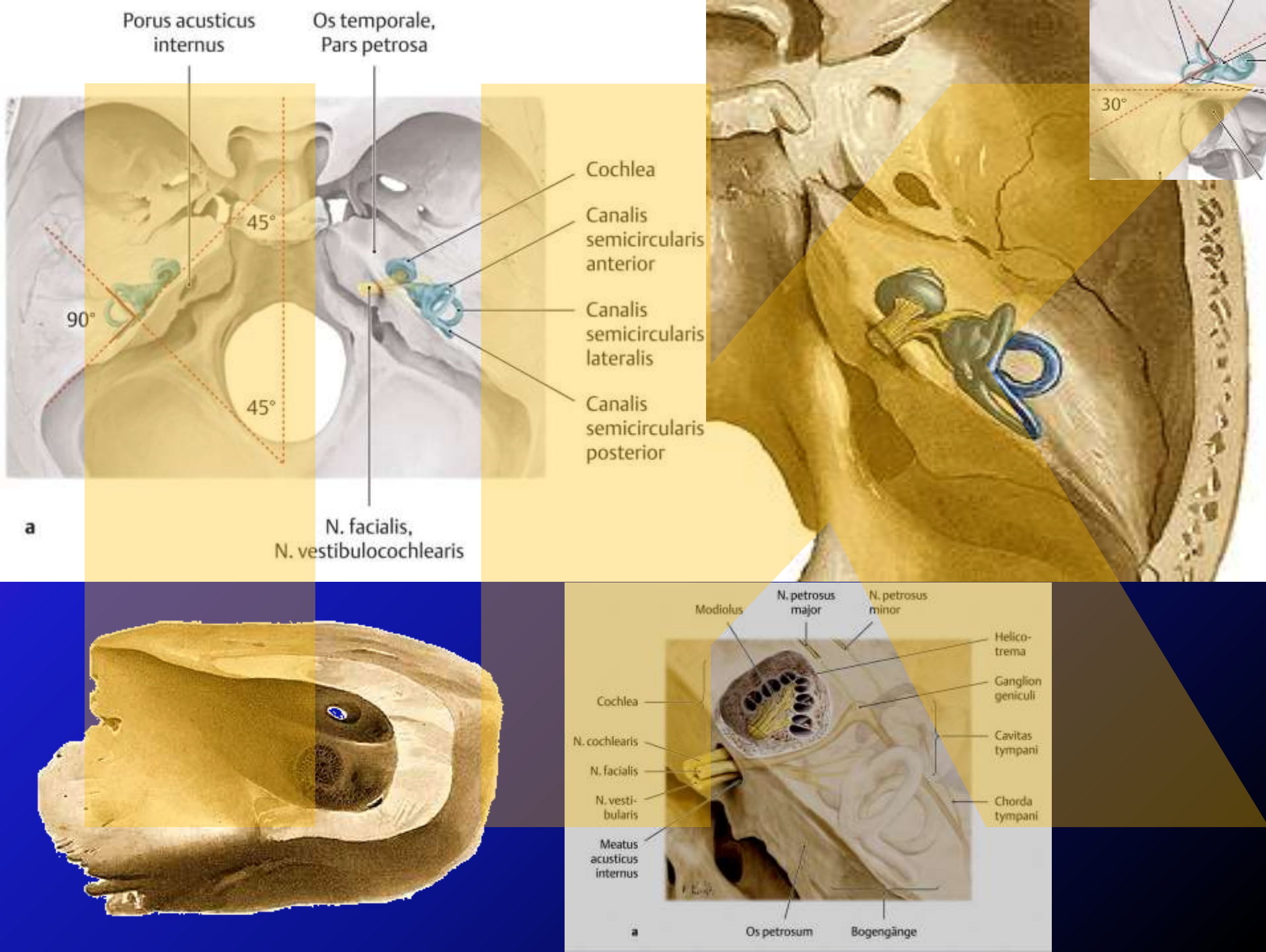


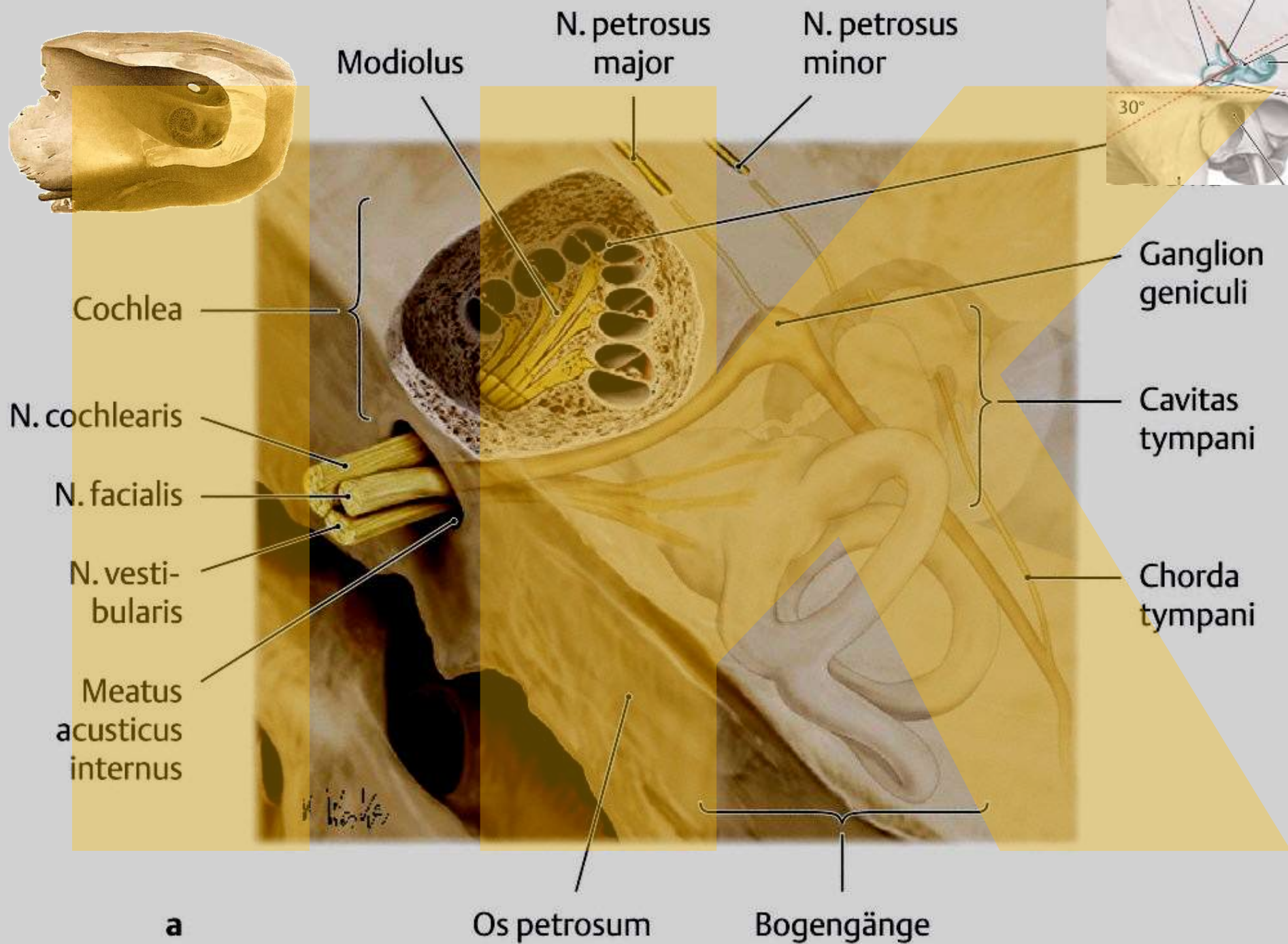


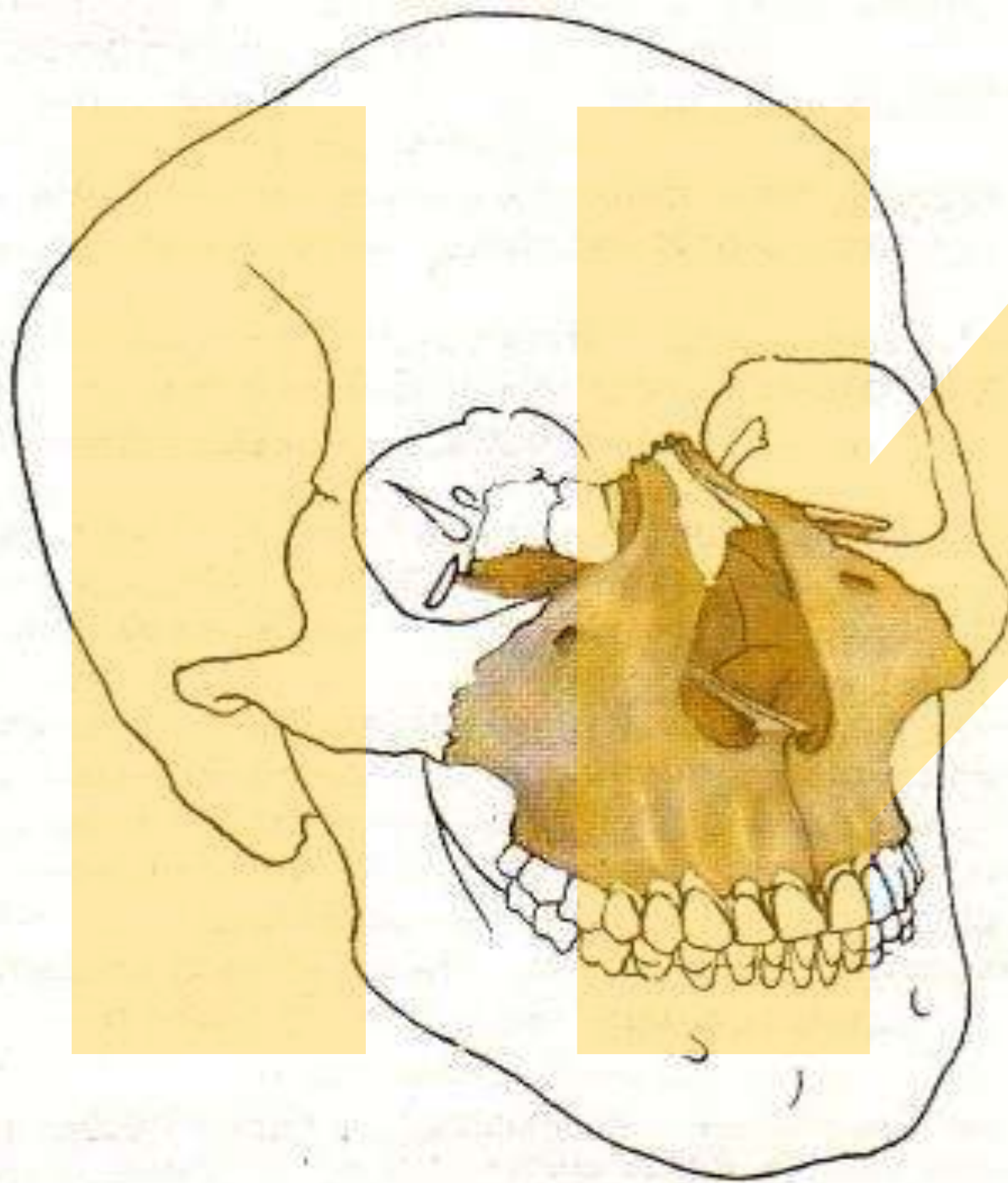
Cavum tympani– schematický frontální řez

Paries labyrinthicus – ventrobasální stěna os petrosus









Maxilla

Maxilla

Corpus

Proc. frontalis

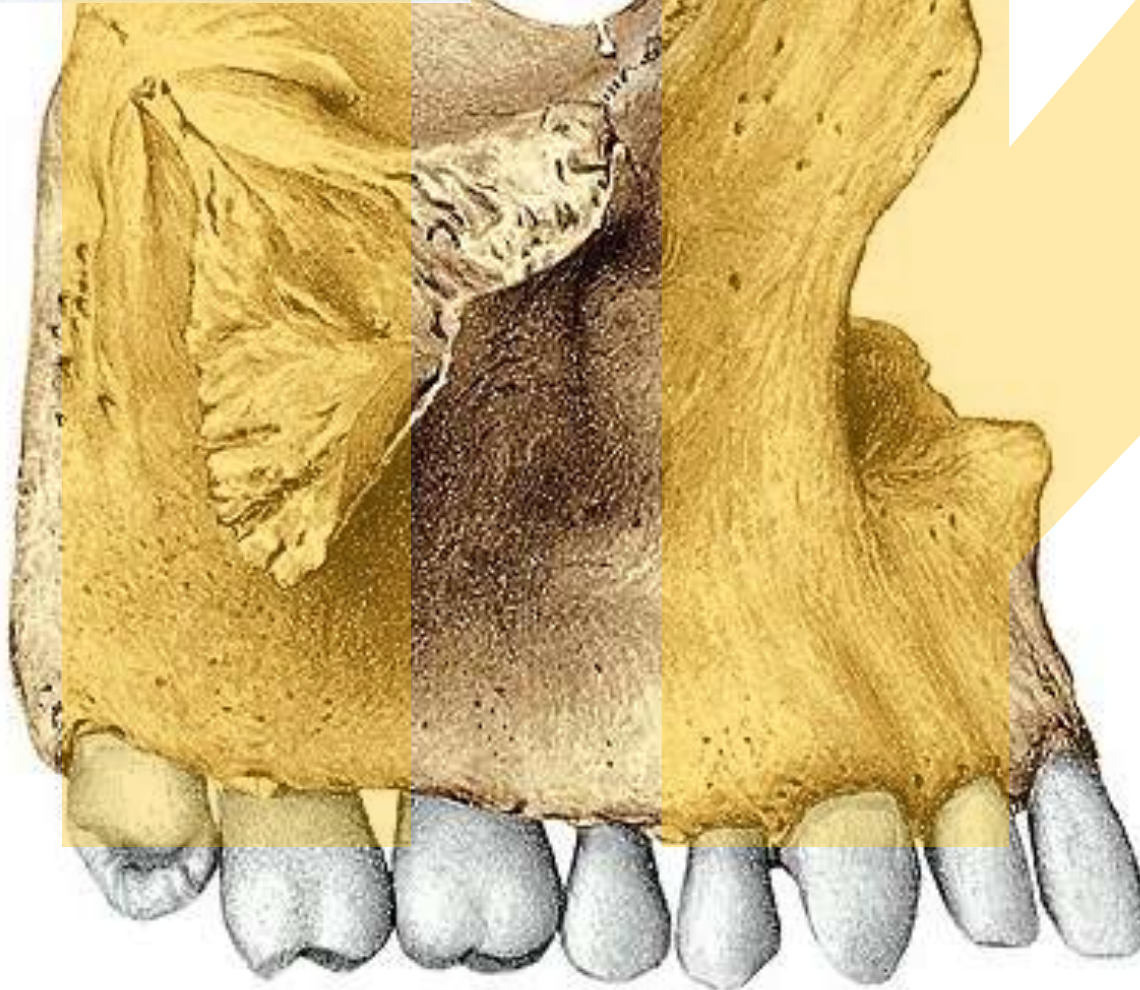
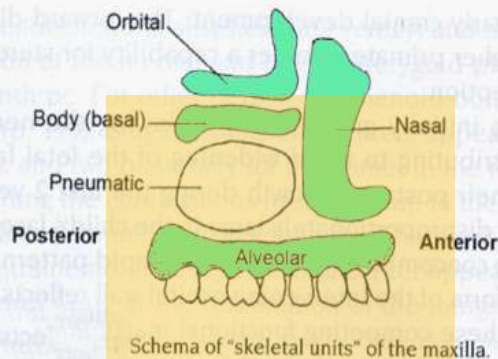
Proc. zygomaticus

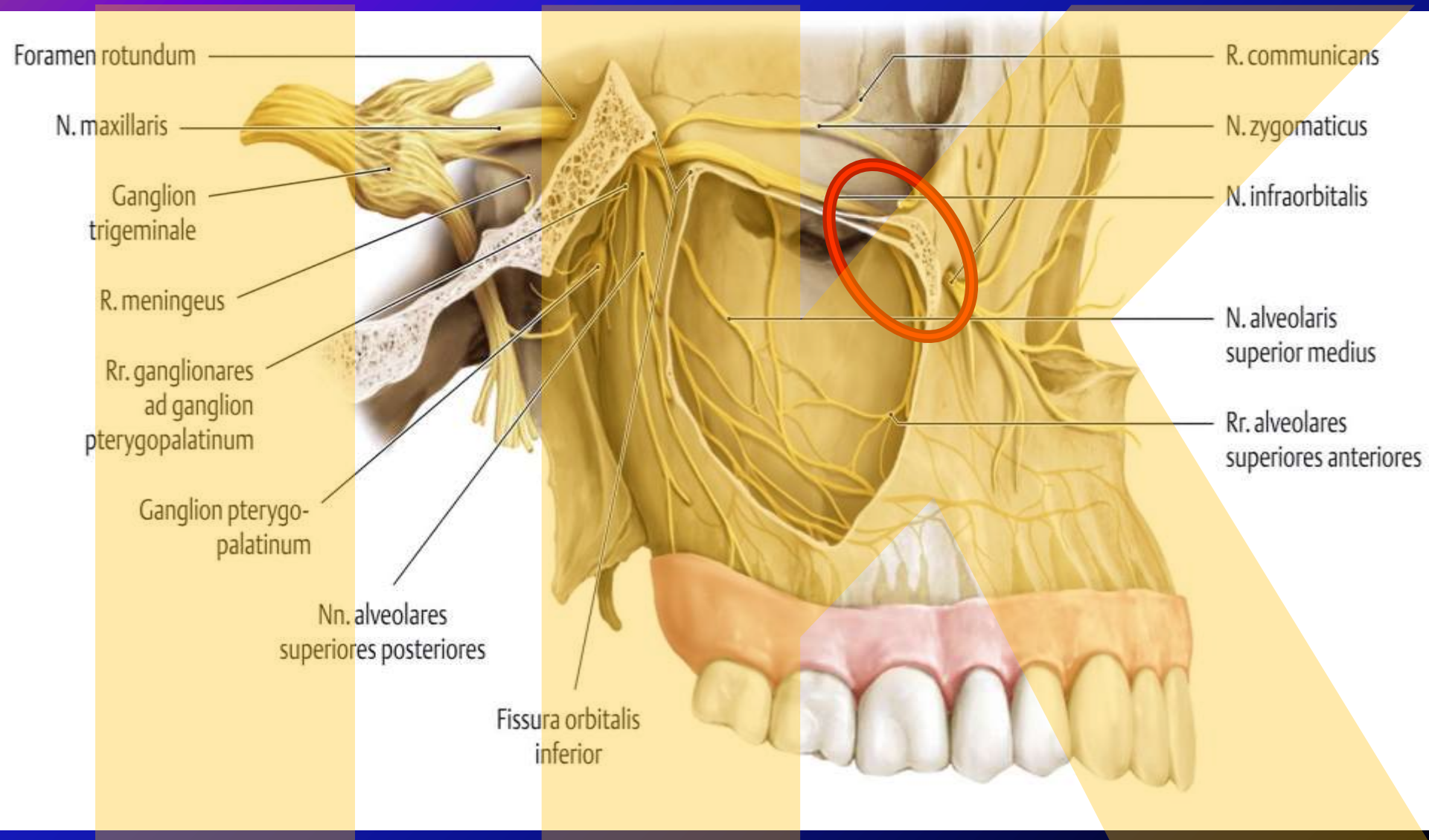
Proc. Alveolaris

Processus palatinus

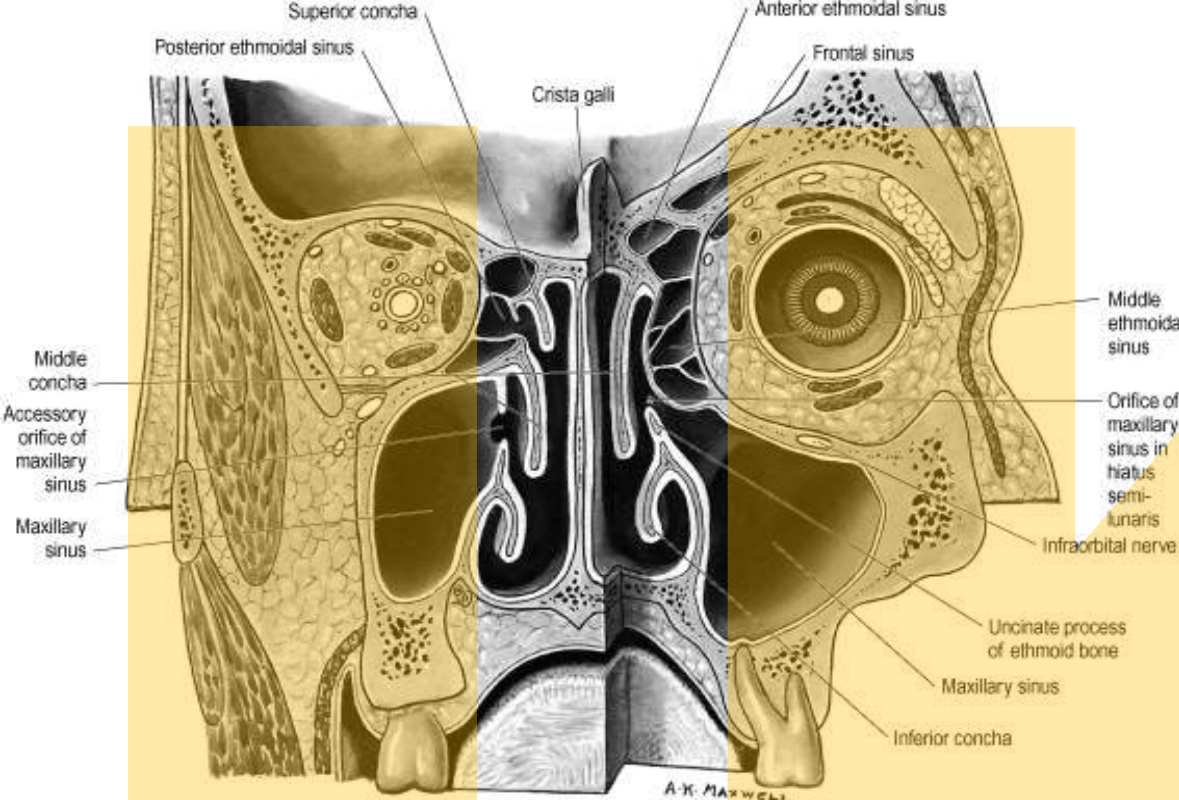
Sinus maxillaris
(antrum Highmori) –
otevřen do dutiny
nosní jako hiatus
maxillaris

Fossa lacrimalis



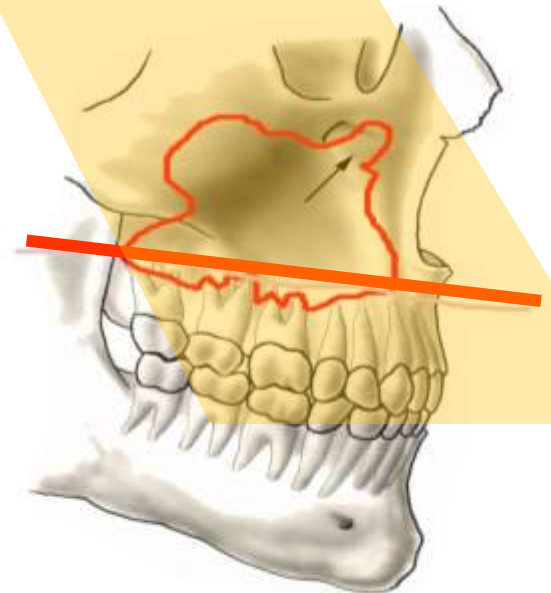
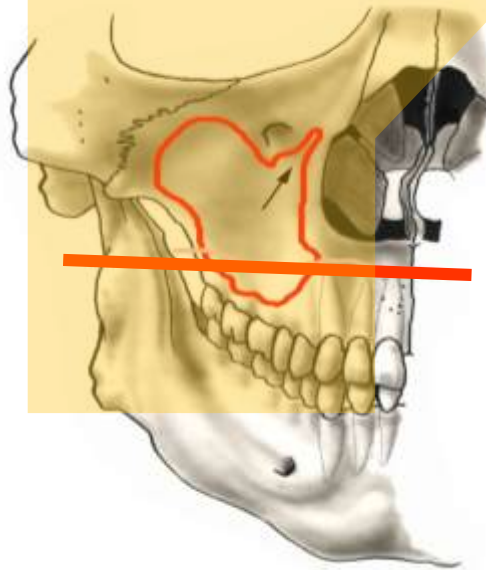


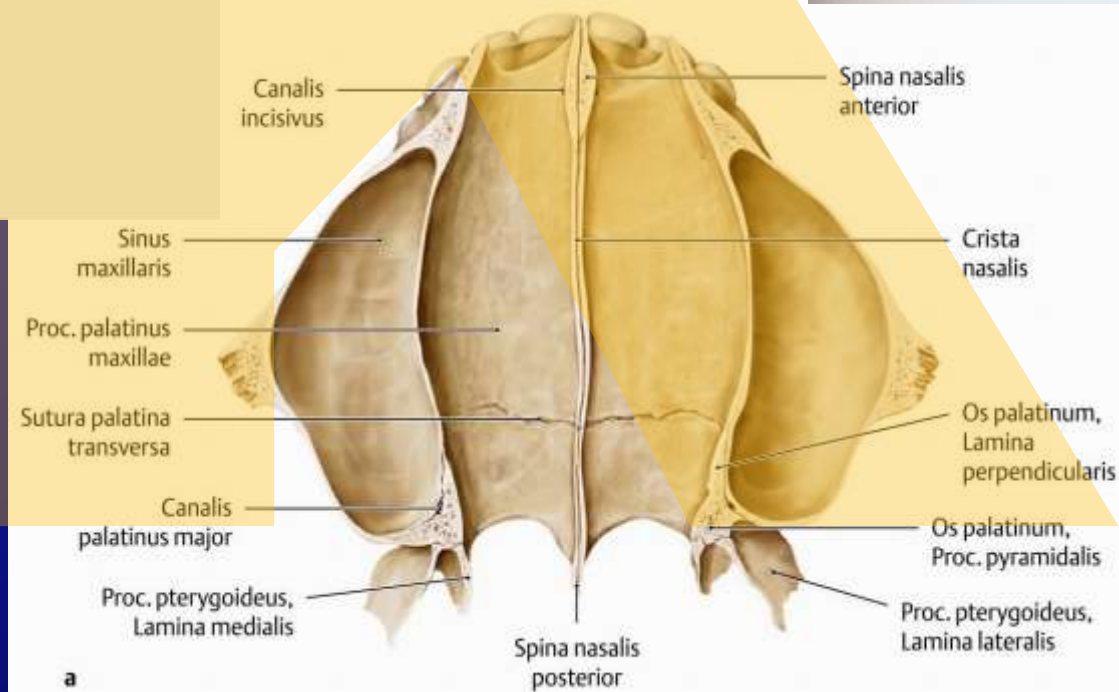
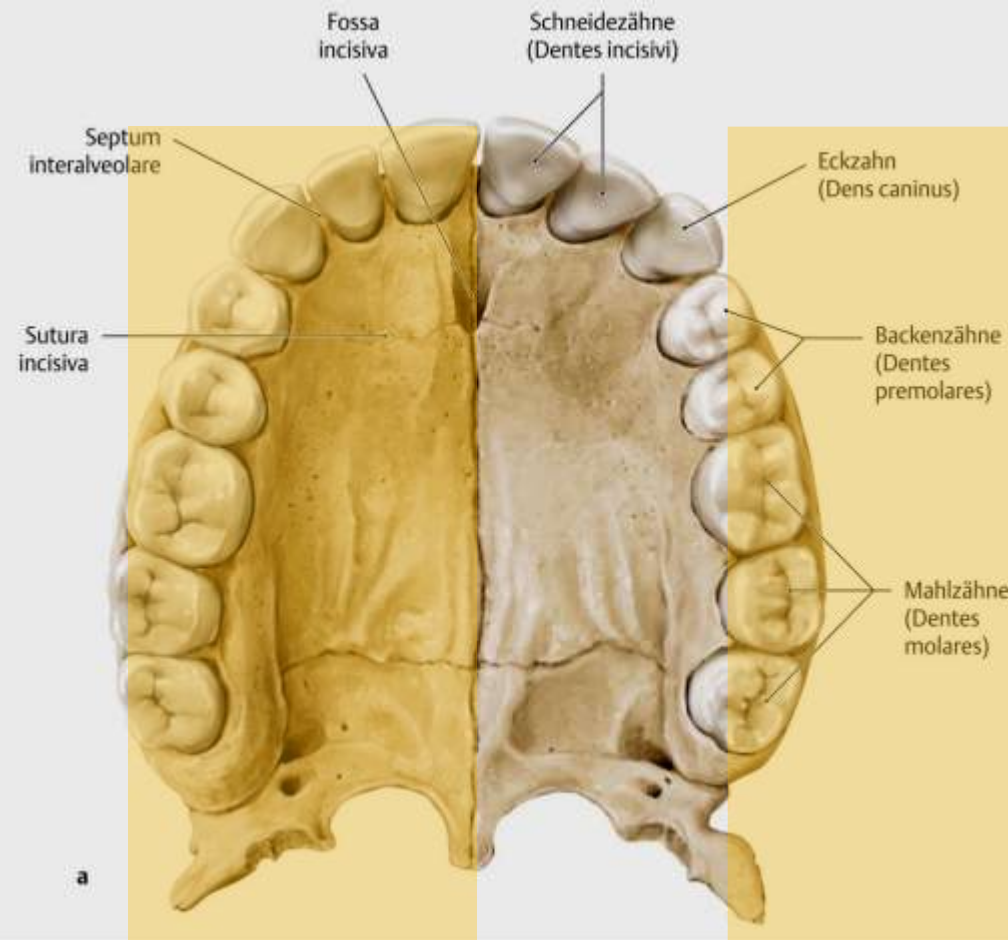
Canalis 'sinuosus'



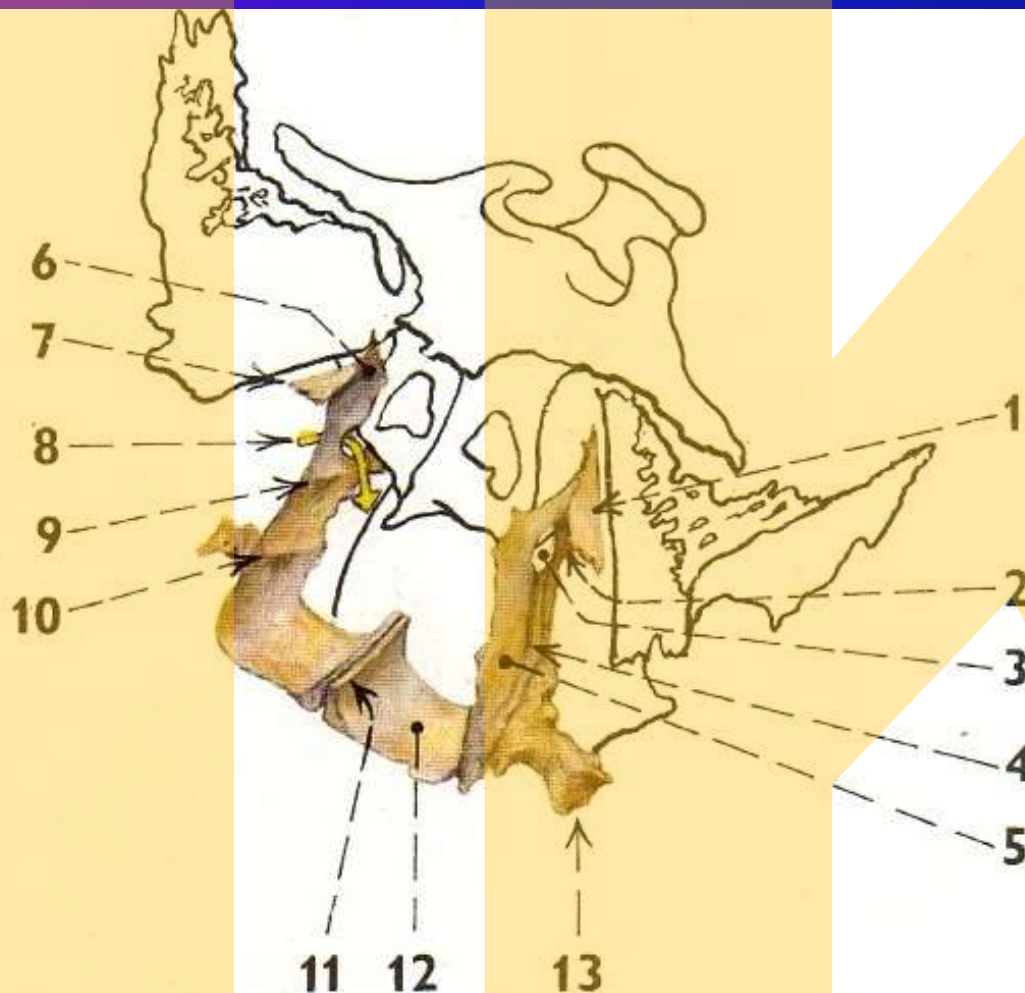
Stšna recessus frontalis
je velmi tenká

Linie patra
palatum
(palatal line)





Os palatinum

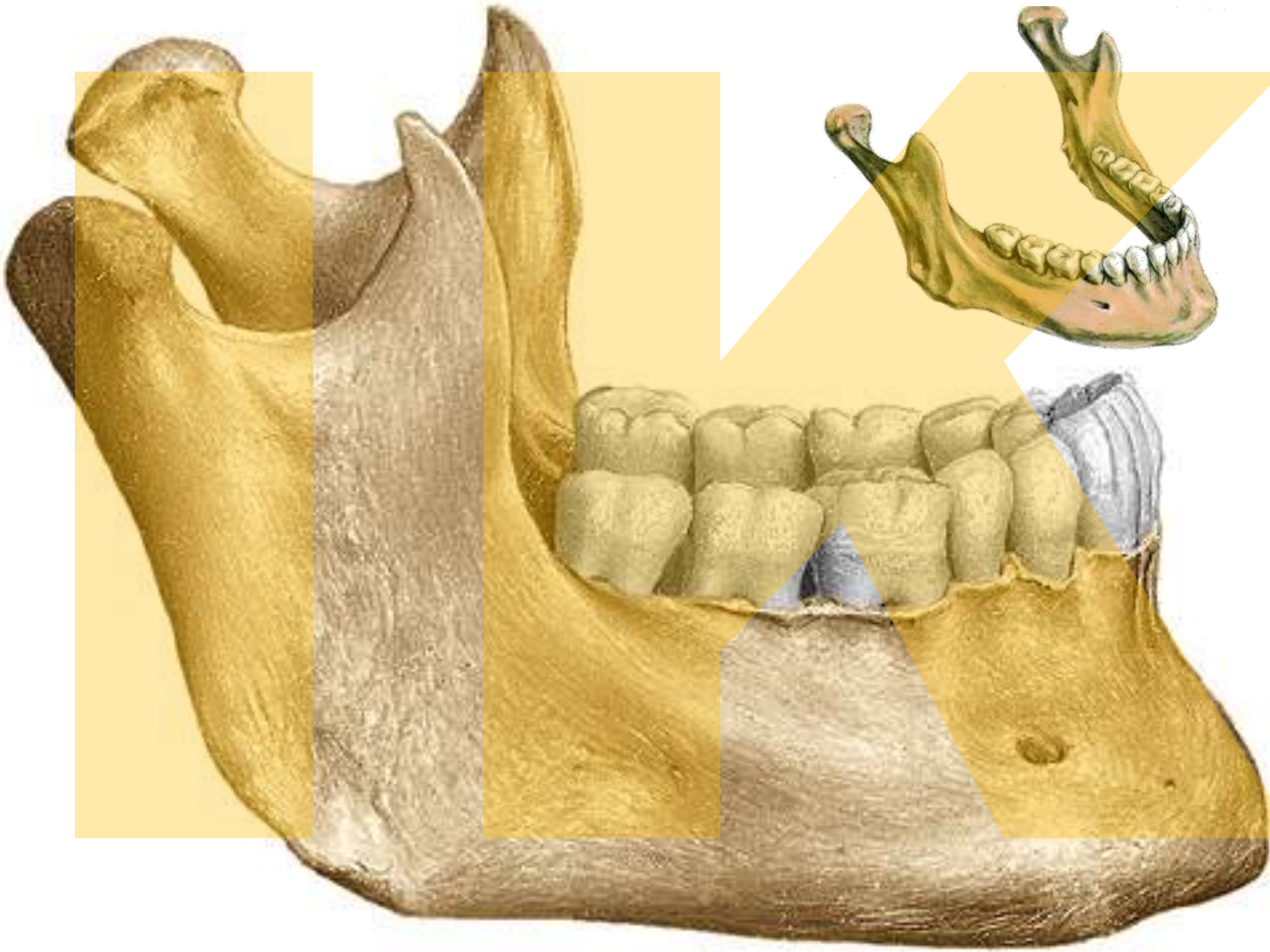


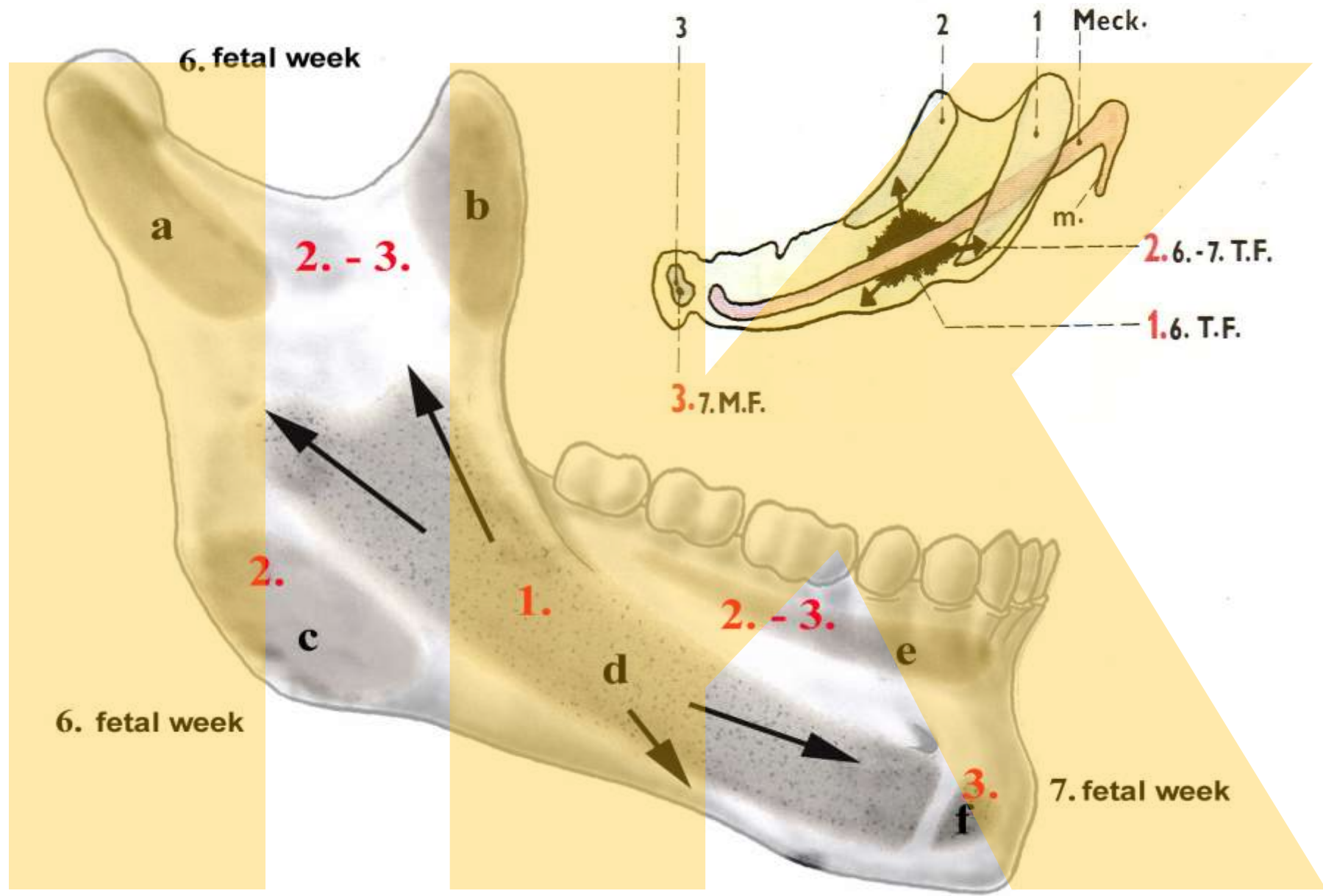
199. OSSA PALATINA (obou stran) ve spojení s os sphenoidale – pohled zleva shora zepředu

- 1/ processus orbitalis (ploška hledící do očníce)
- 2/ processus sphenoidalis
- 3/ incisura sphenopalatina (doplněná stykem s kostí klinovou ve foramen sphenopalatinum)
- 4/ sulcus palatinus major
- 5/ lamina perpendicularis

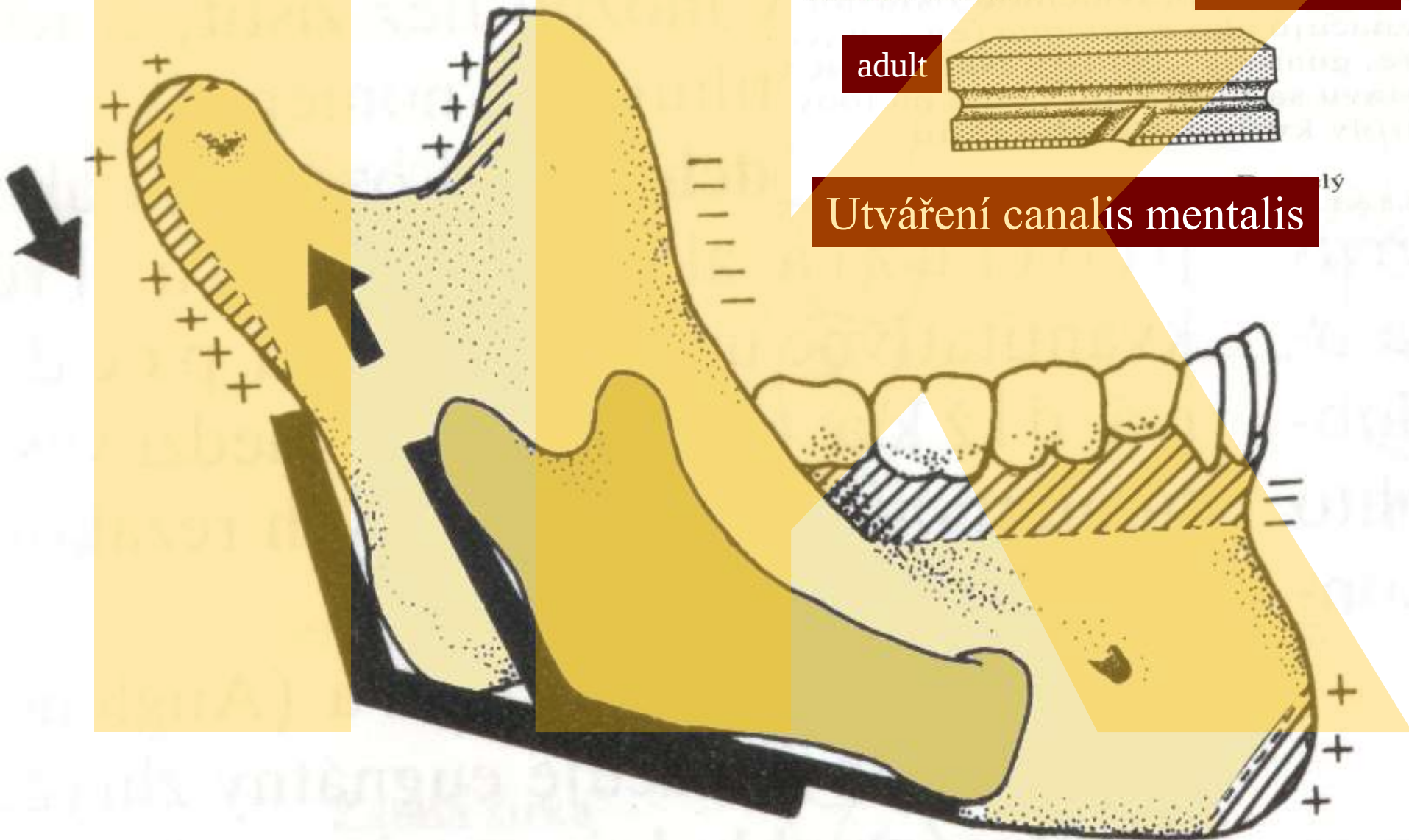
- 6/ processus orbitalis (ploška obrácená do dutiny nosní)
- 7/ processus orbitalis – okraj plošky hledící do očníce
- 8/ průchod útvarů skrze foramen sphenopalatinum
- 9/ crista ethmoidalis
- 10/ crista conchalis
- 11/ crista nasalis
- 12/ lamina horizontalis
- 13/ processus pyramidalis

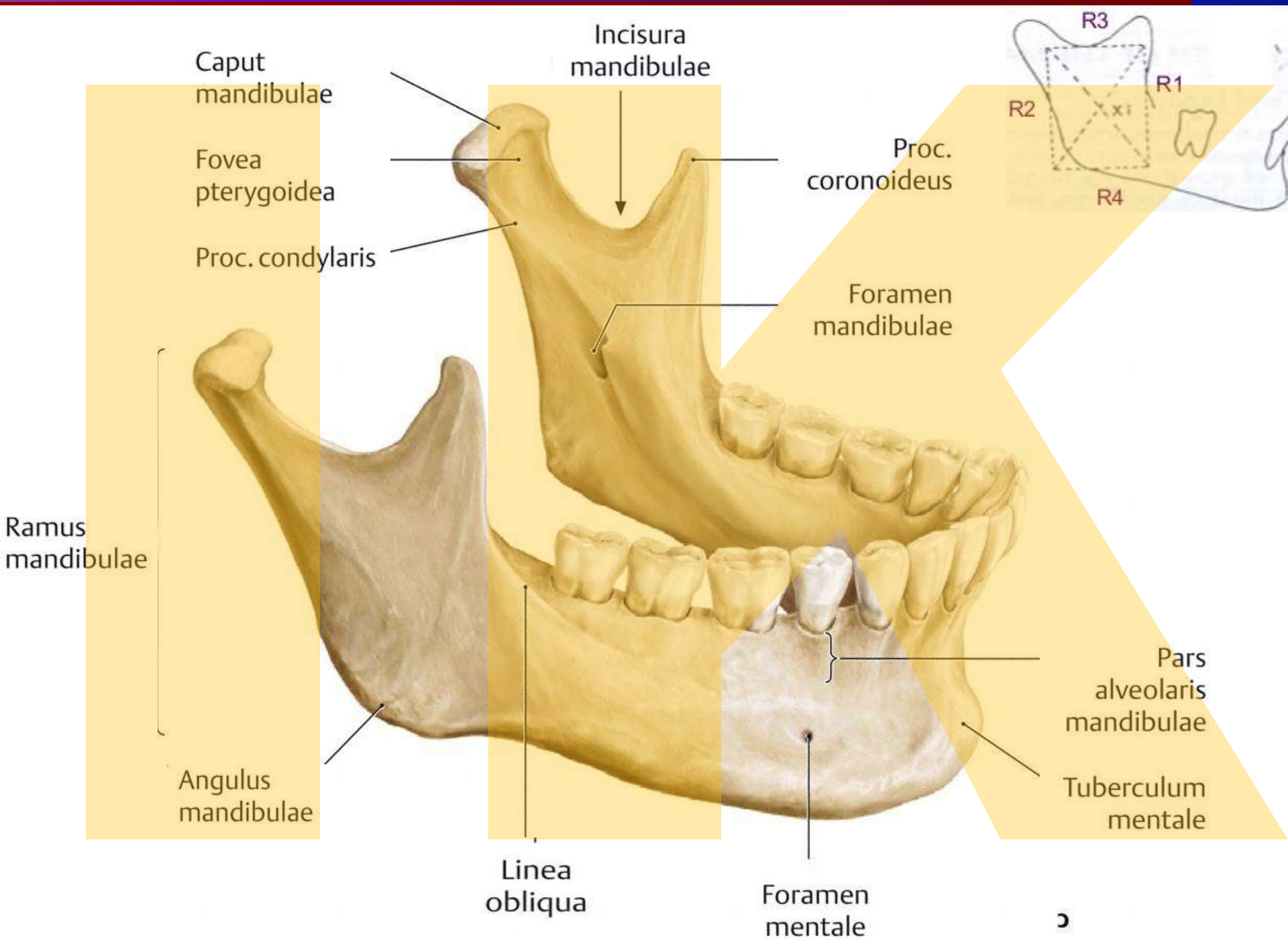


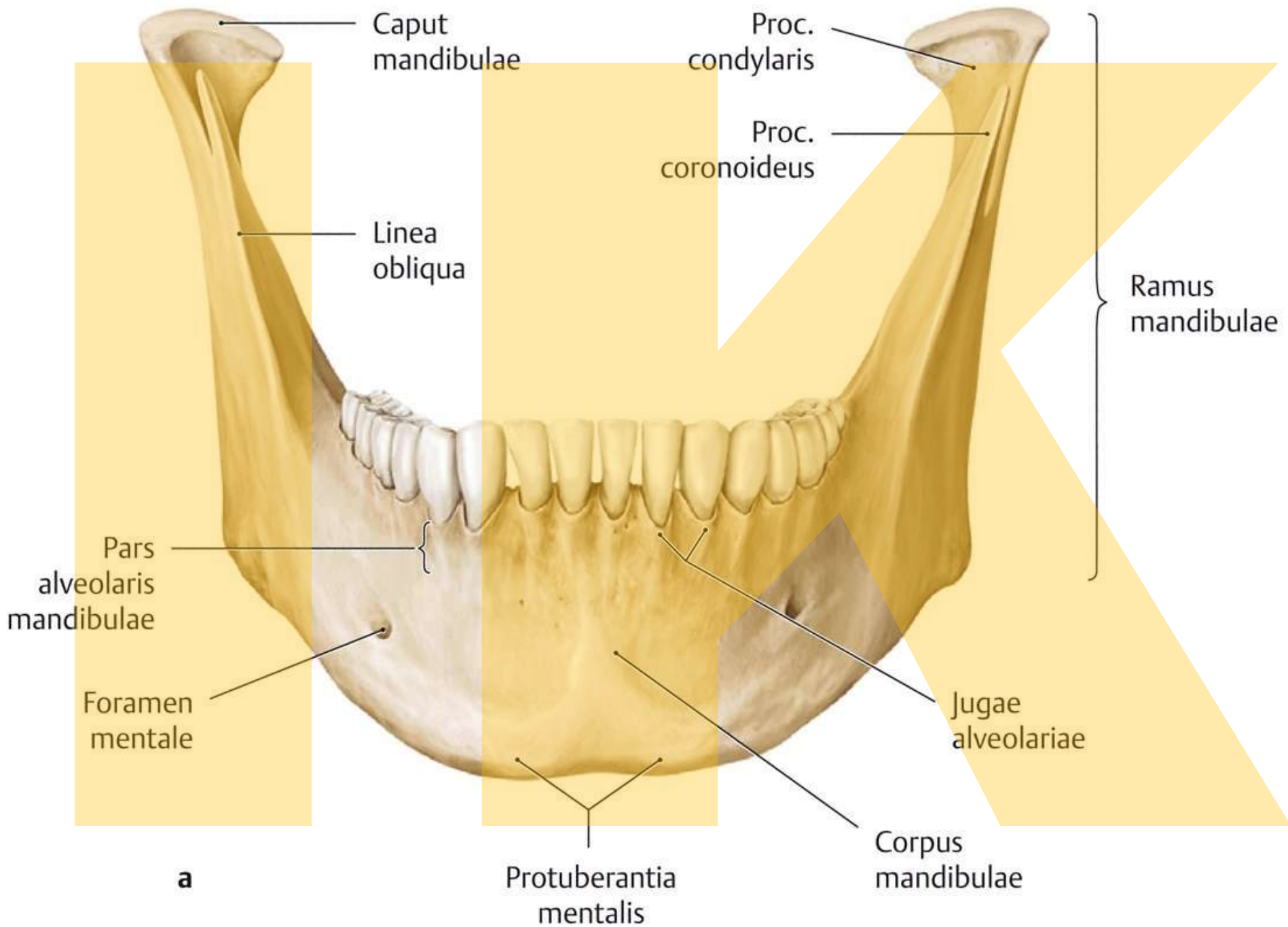




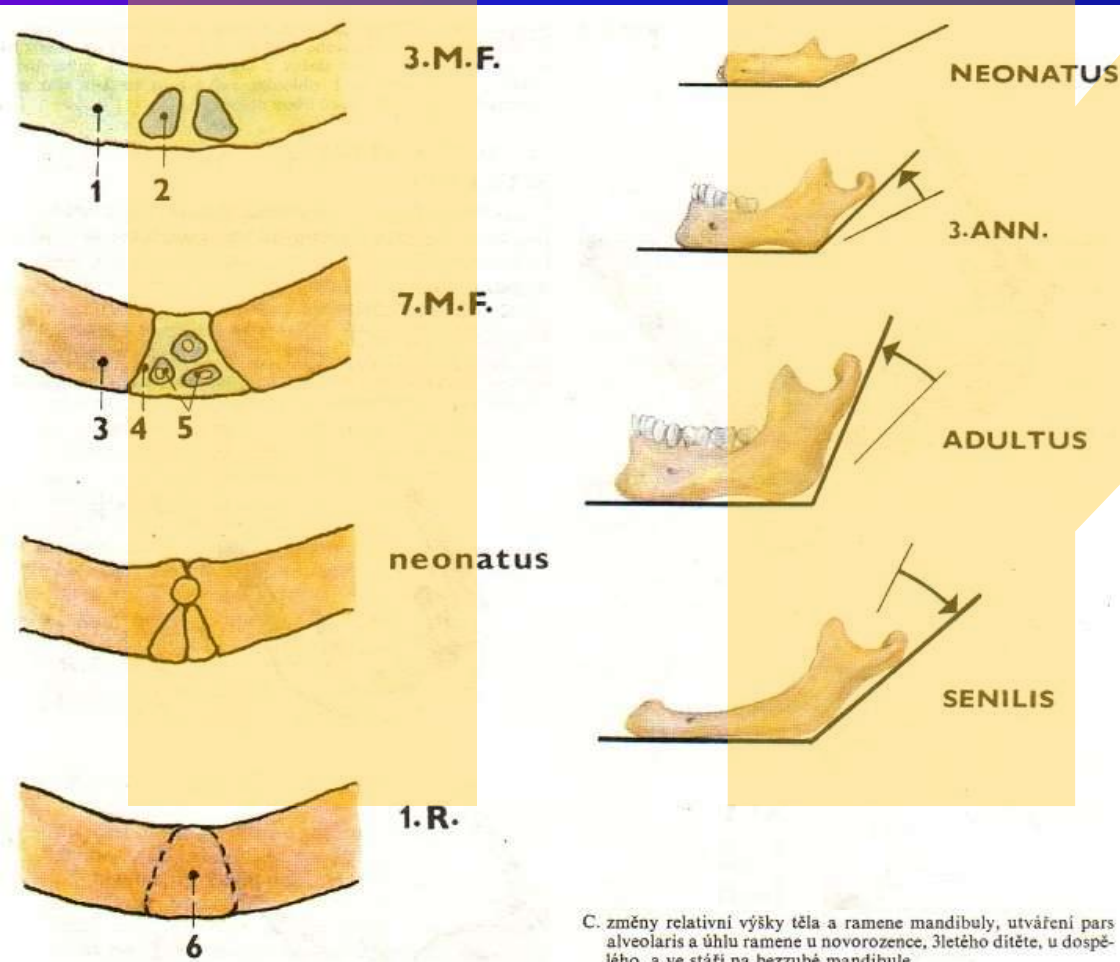
Růst mandibuly



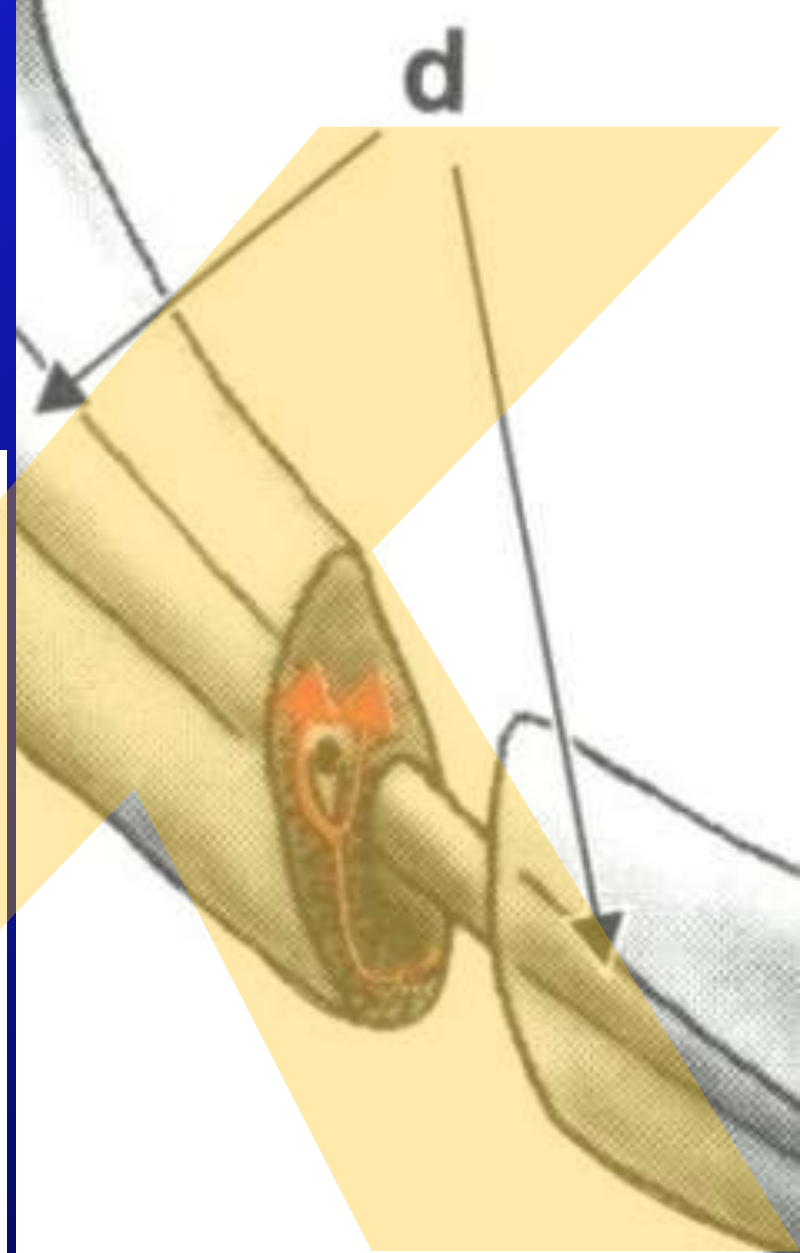




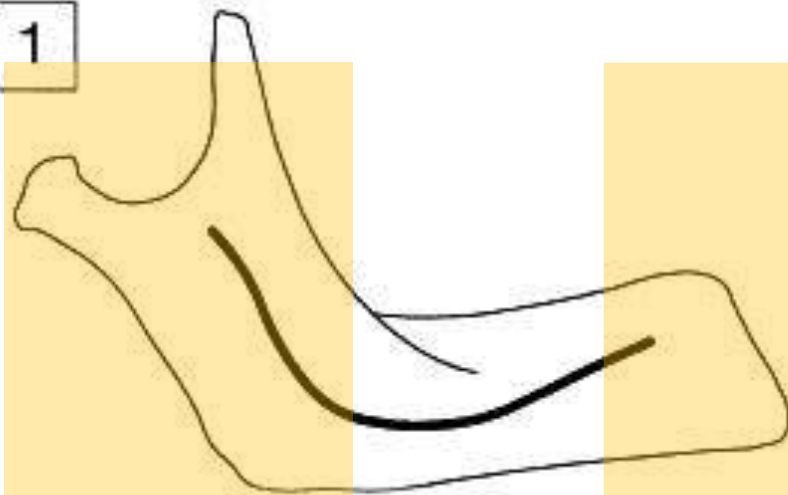
Utváření canalis alveolaris inferior a symphysis menti



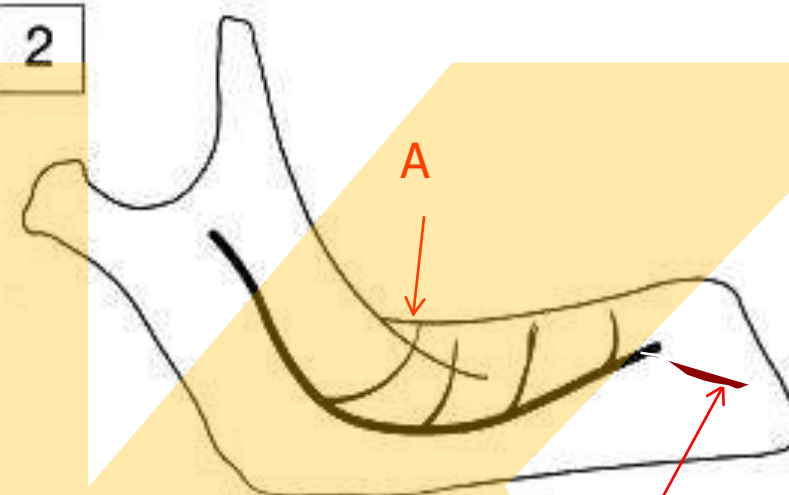
C. změny relativní výšky těla a ramene mandibuly, utváření pars alveolaris a úhlu ramene u novorozence, 3letého dítěte, u dospělého, a ve stáří na bezzubé mandibule



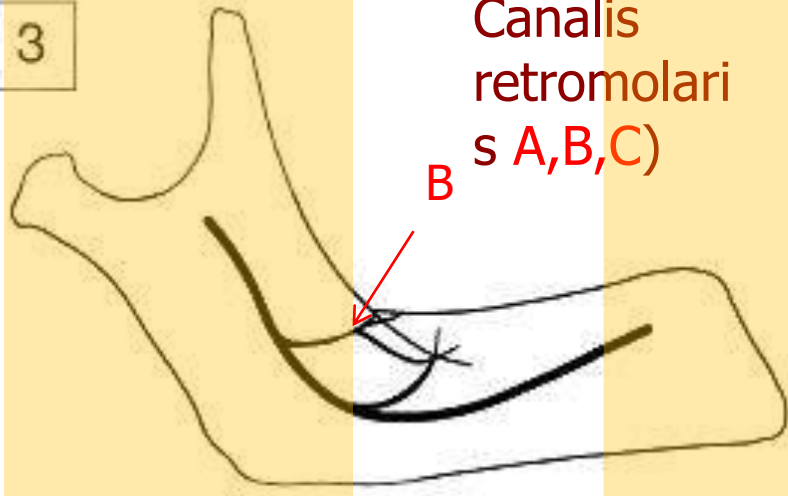
1



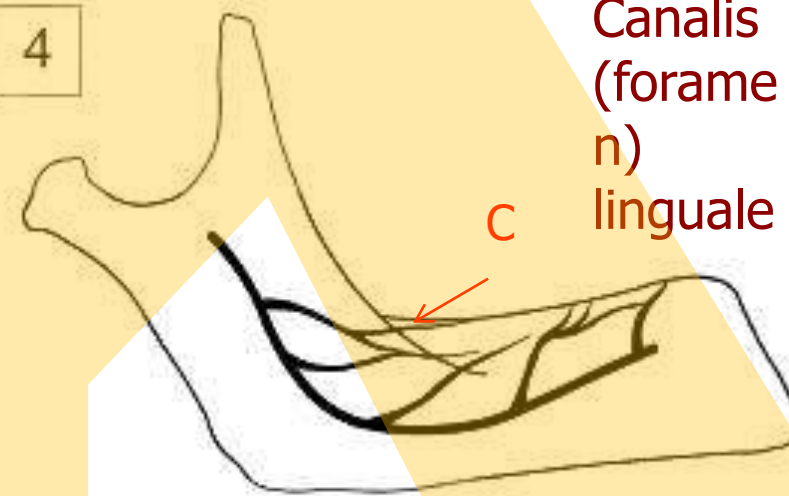
2



3

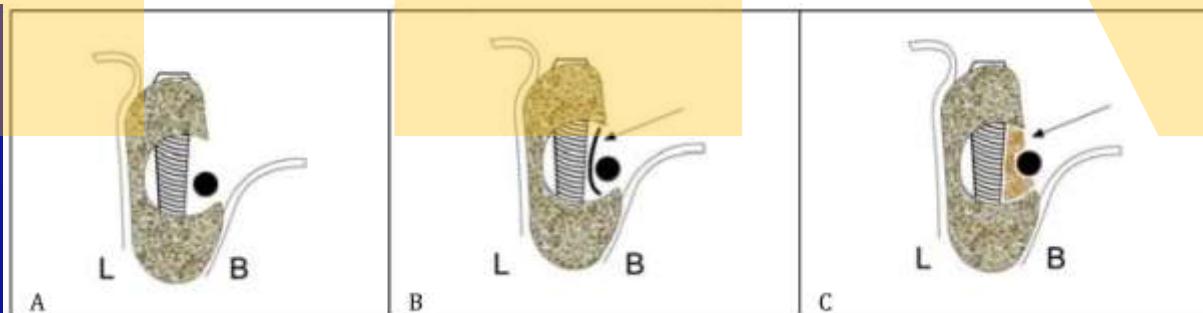


4

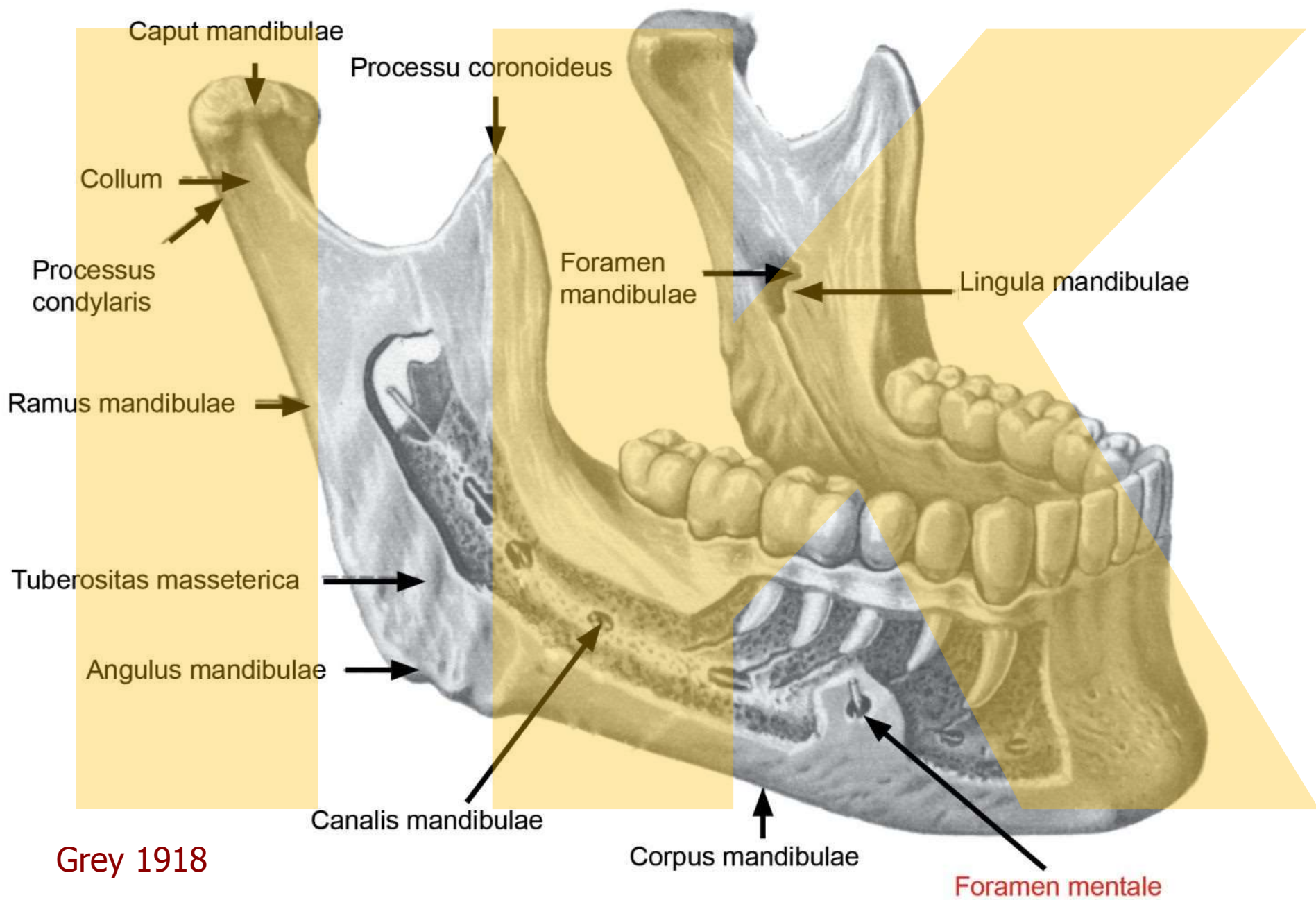


Canalis
retromolari
s A,B,C)

Canalis
(forame
n)
linguale



After Lang et
al. 2002



Grey 1918

Caput
mandibulae

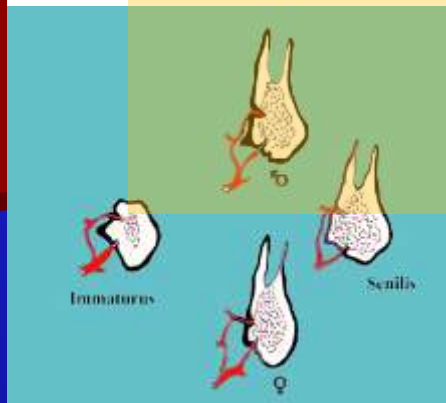
Proc.
coronoideus

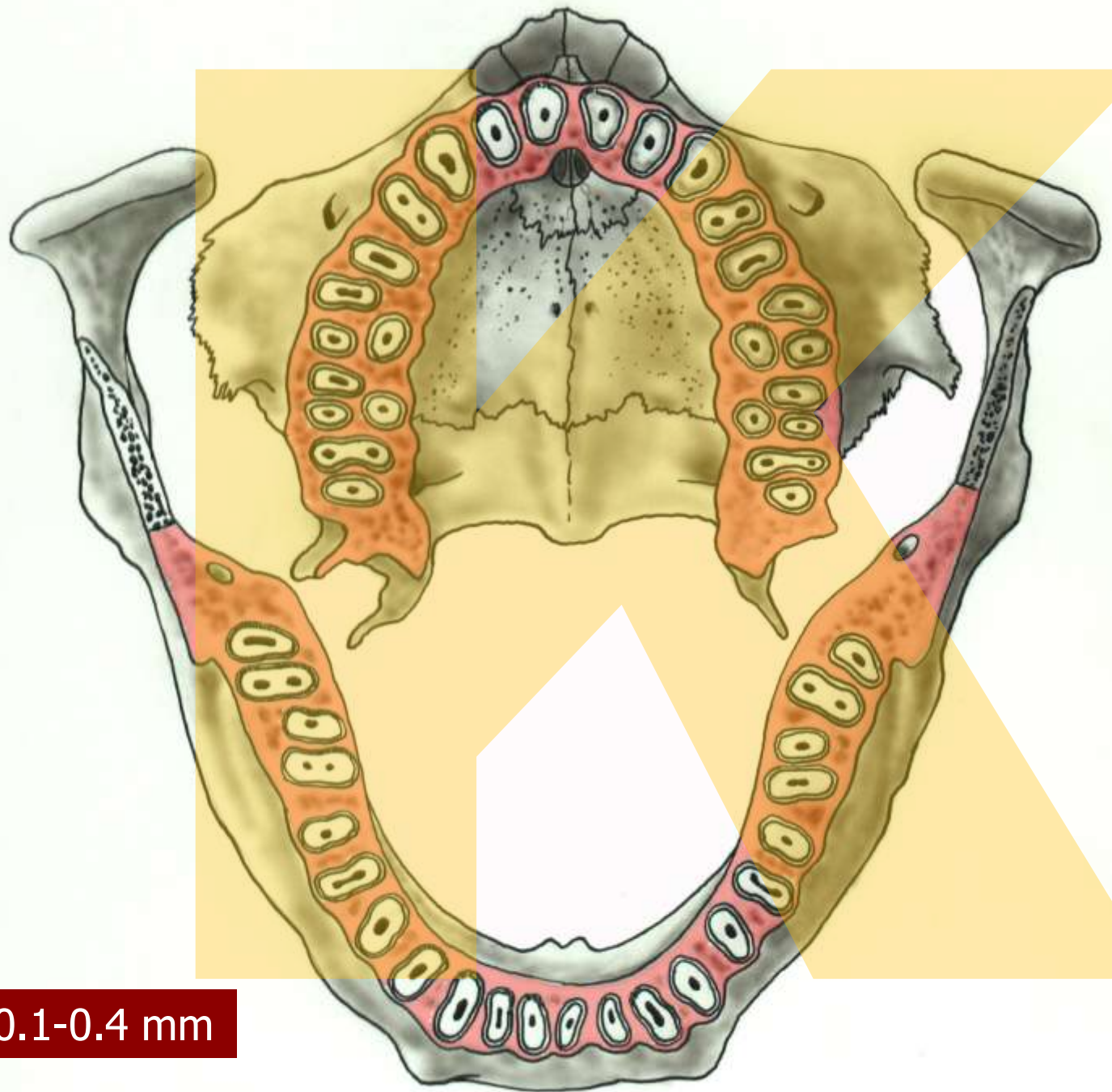
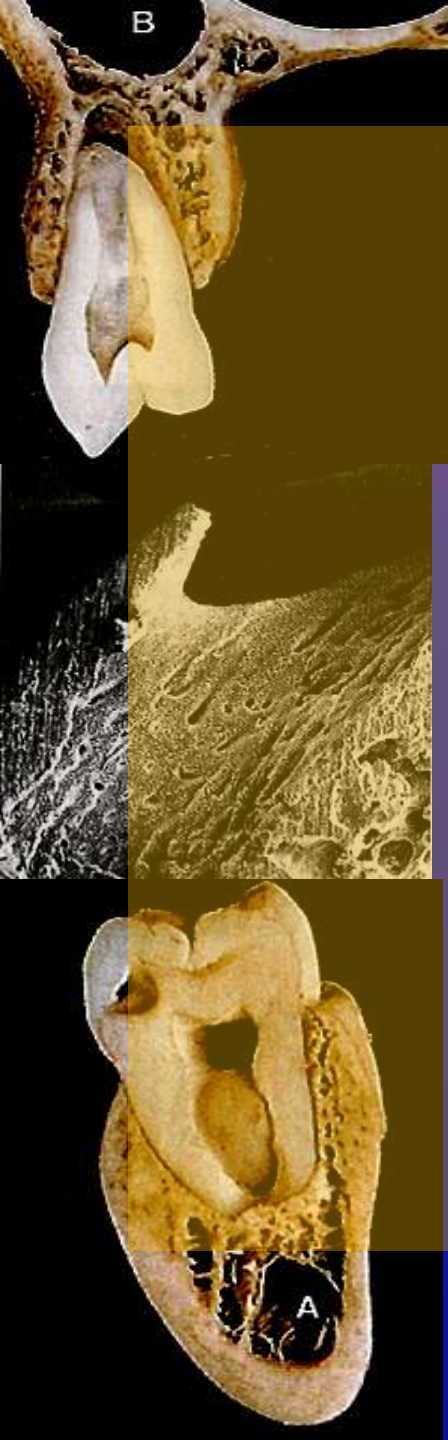
Foramen
mandibulae

Linea
mylohyoidea

Foramen linguale ? _ _

b

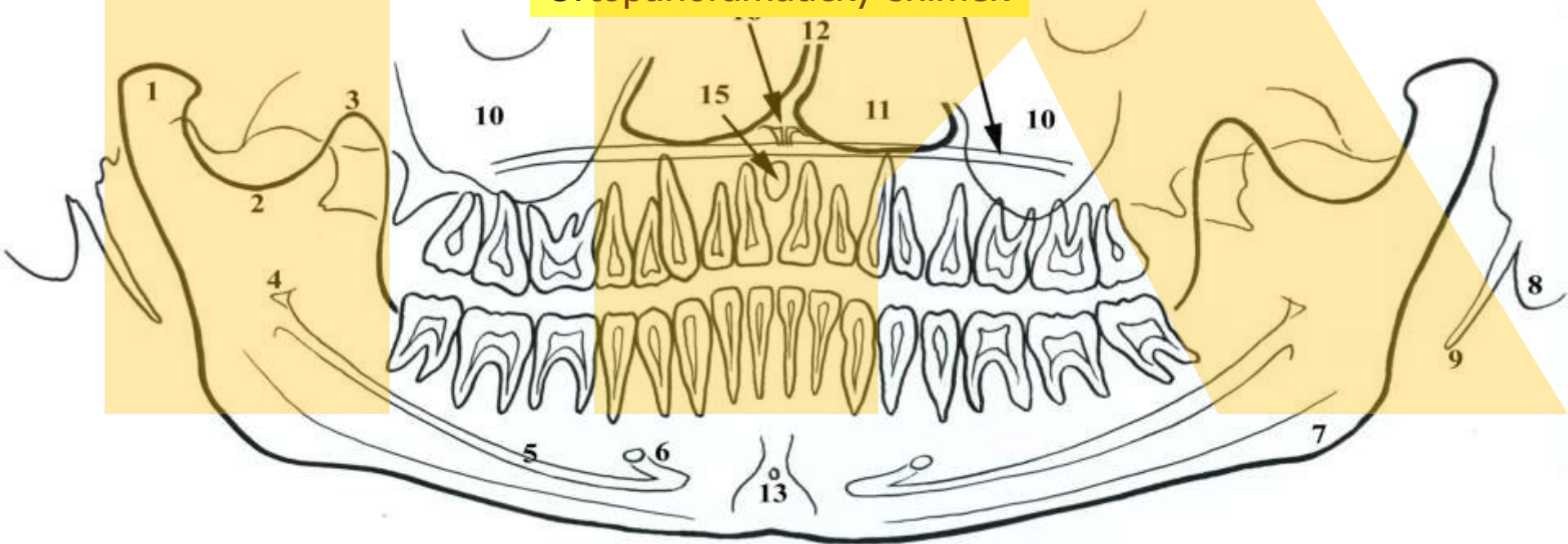


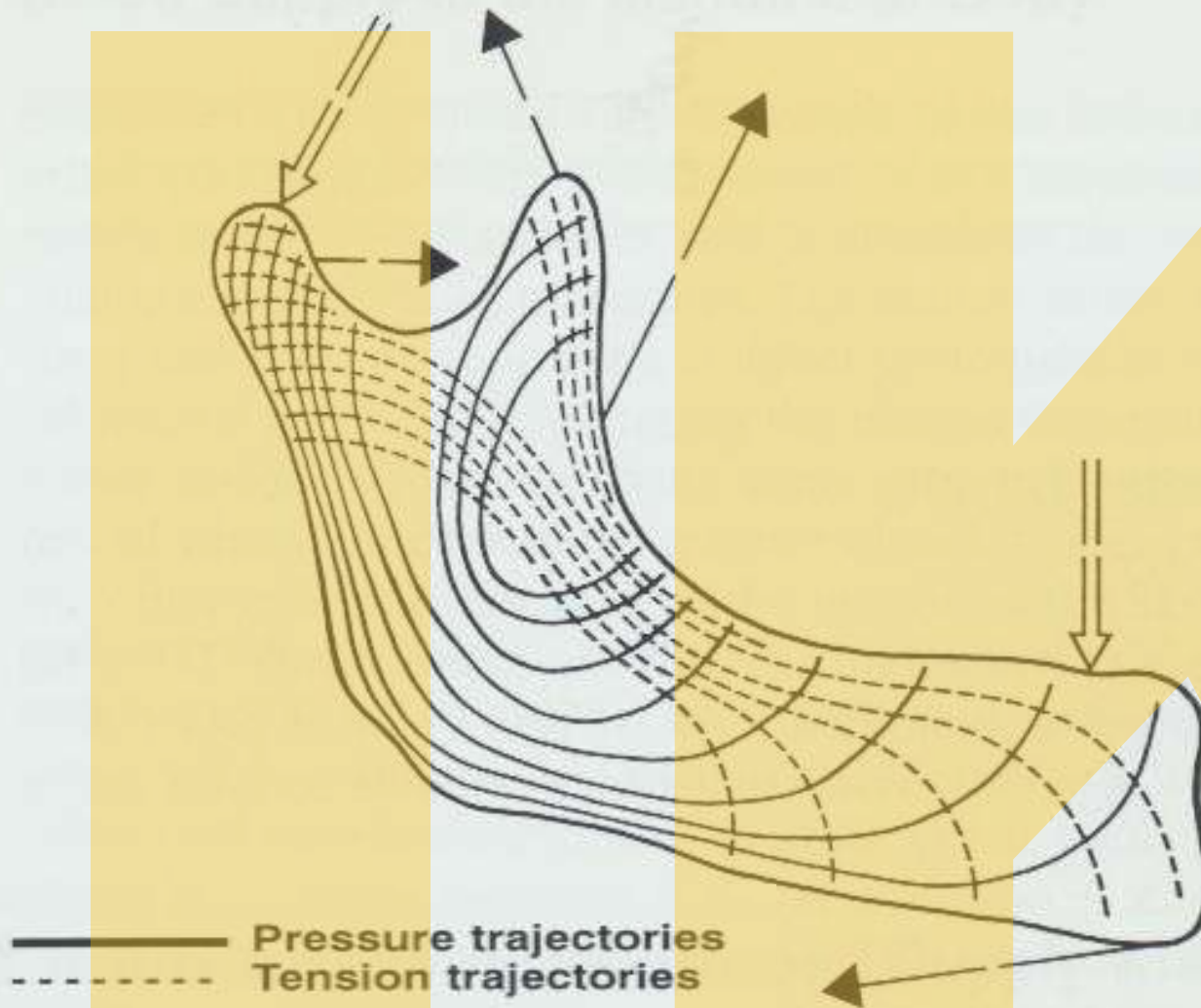


0.1-0.4 mm



Ortopanoramatický snímek

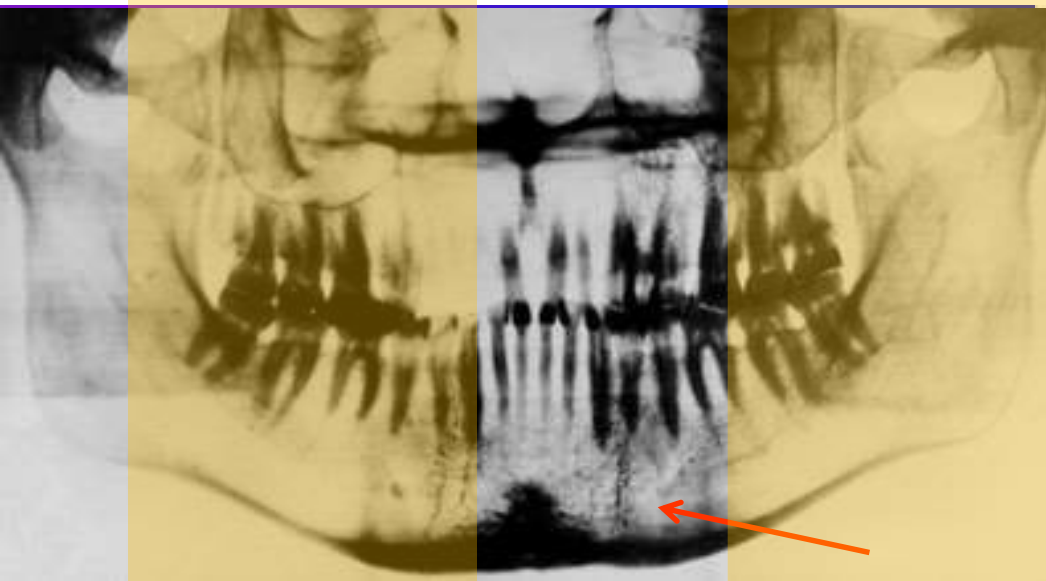




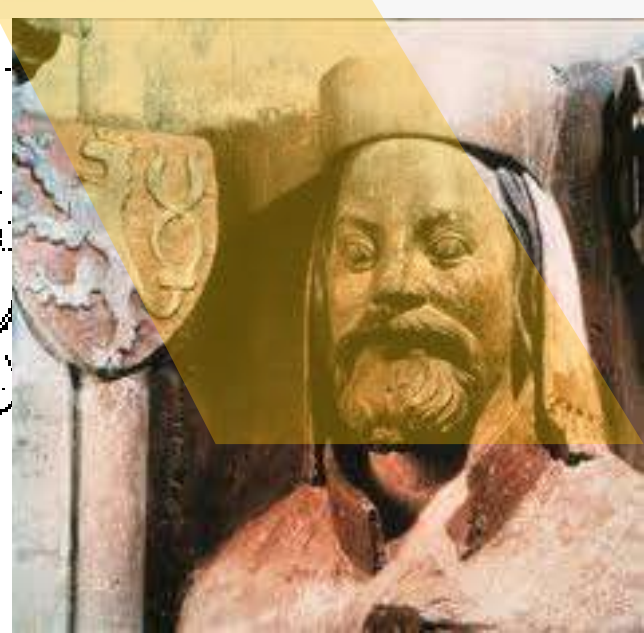
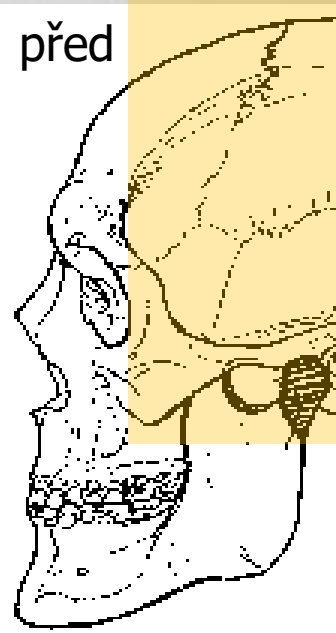
Tahové a tlakové linie dolní čelisti

Tillmann et al. 1983)

Dolní čelist Karla IV.



Post traumatic changes A-C
Correction of the occlusion

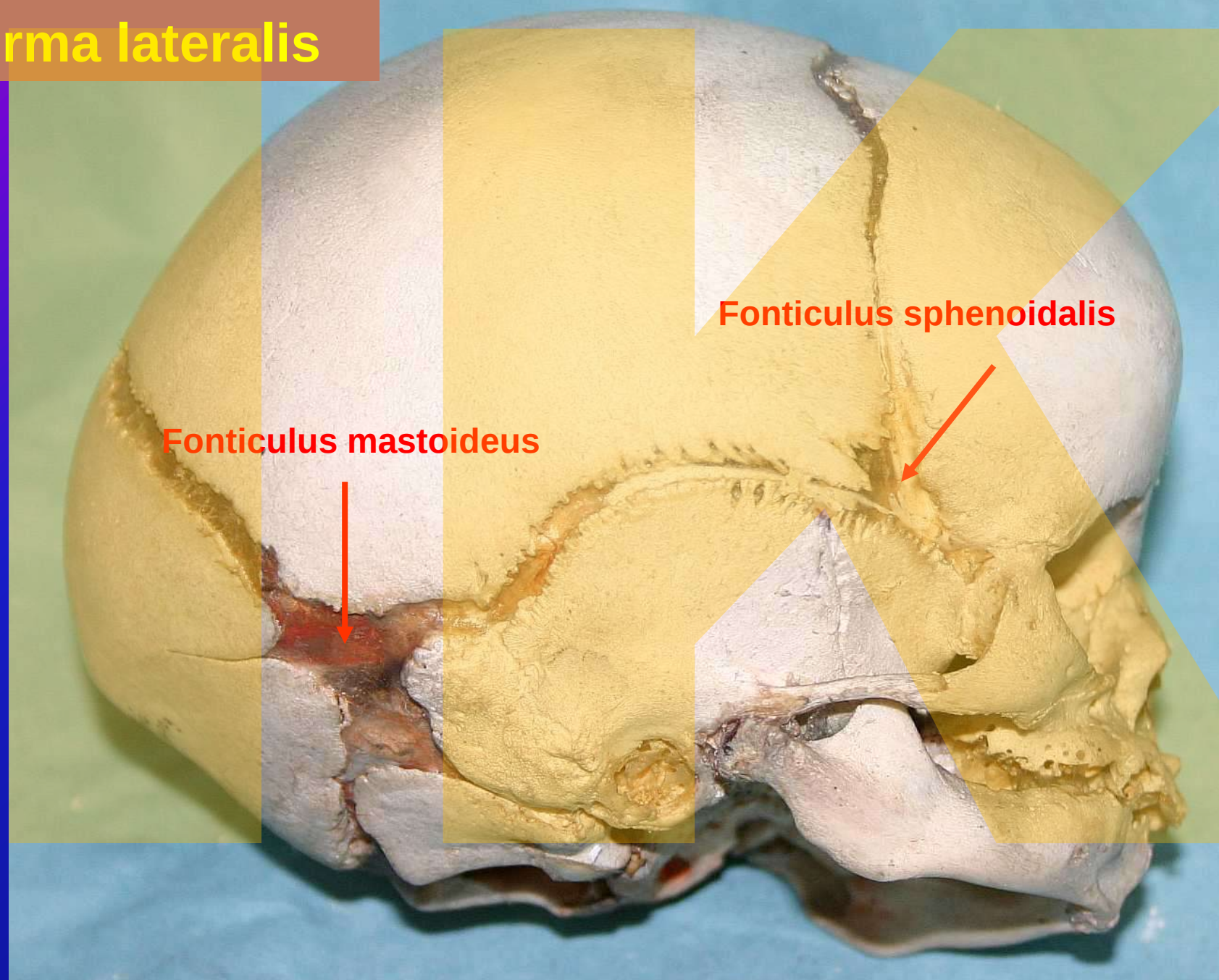


Lebka novorozence



Fetální lebka

Norma lateralis

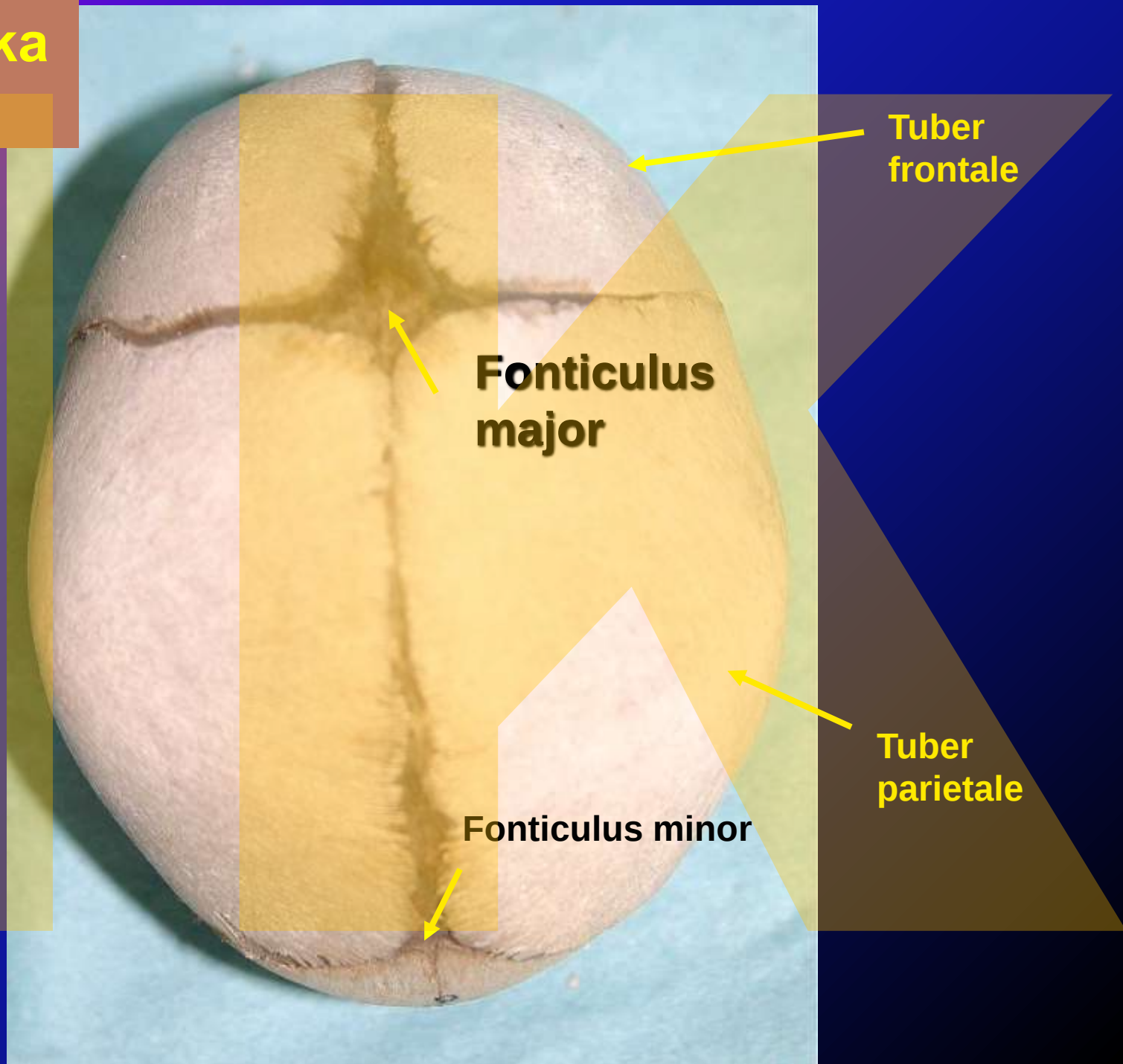


Fonticulus mastoideus

Fonticulus sphenoidalis

Fetální lebka

Calva

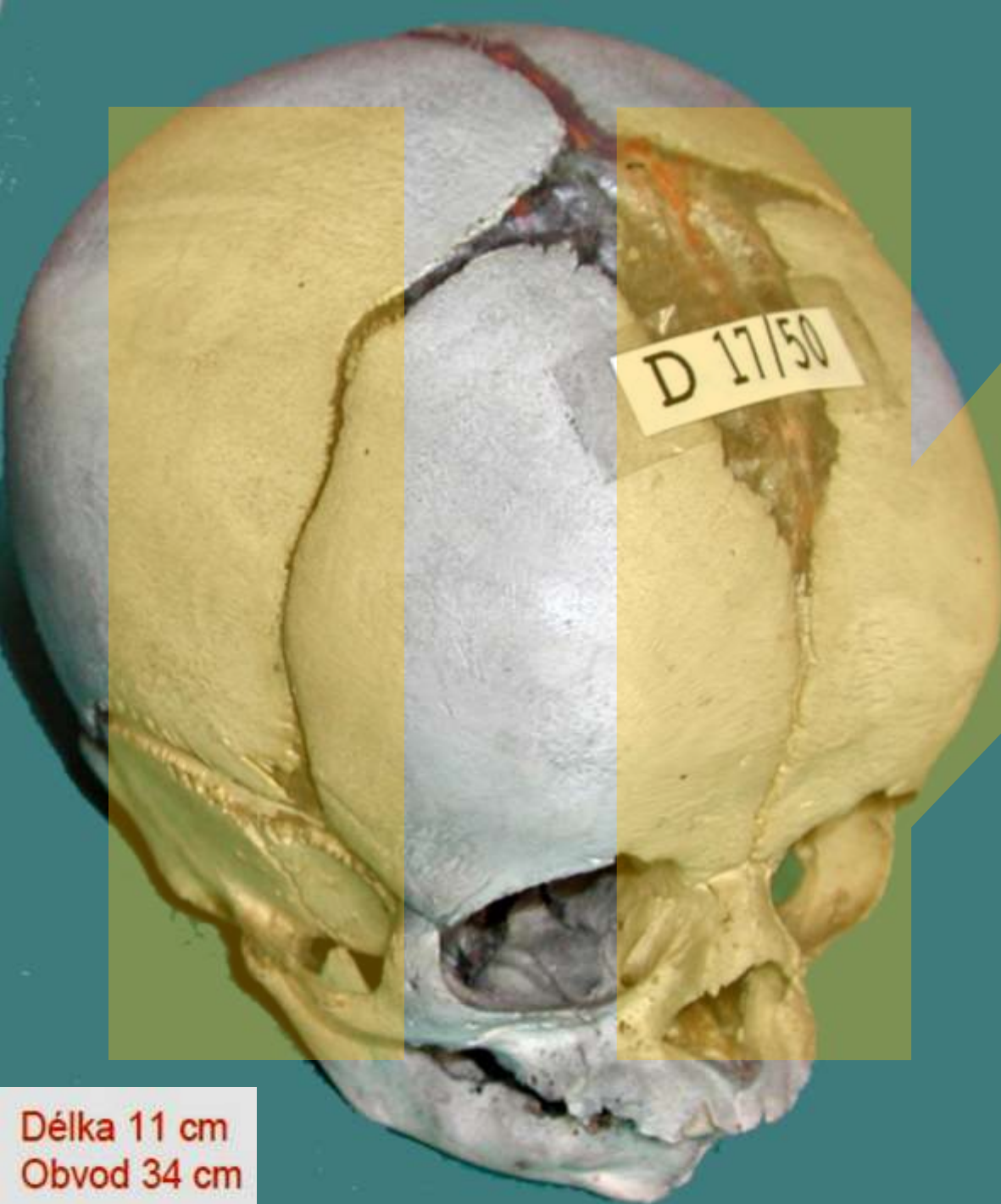


Fontanelles fonticuli

anterior (major),
posterior, mastoideus,
sphenoideus

Vzhledem ke pružným
vzájemným spojením se
mezi sebou mohou
omezeně pohybovat:

konfigurace lebky se
přizpůsobí poměrům v
porodním kanálu. Velké
stlačení lebky novorozence
vede k nebezpečné
deformitě - **konformaci**



Délka 11 cm
Obvod 34 cm

Lebka novorozence

Velké neurocranium

Nízké splanchnocranium

Prominují tubera frontalia et parietalia (počátky osifikace)

Fonticuli cranii

Vazivové pásy mezi kostmi klenby lebeční - pohyblivost

Nejsou vyvinuty paranasální dutiny

Os frontale rozdělené švem

Patrný šev mezi maxillou a premaxillou

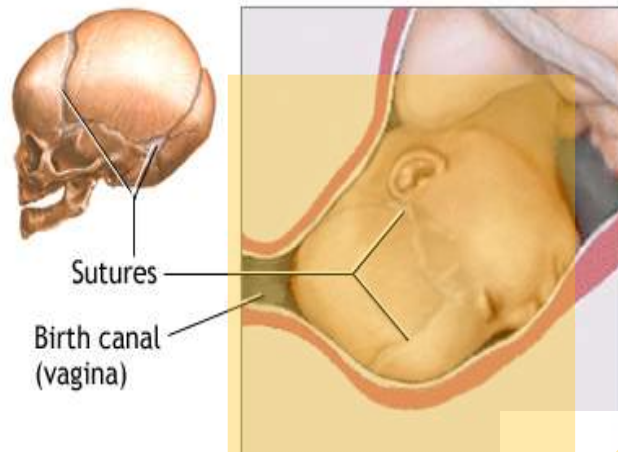
Symphysis menti

Angulus mandibulae -150-160 stupňů

Os tympanicum – anulus tympanicus



Fetal head molding



Minutes after birth



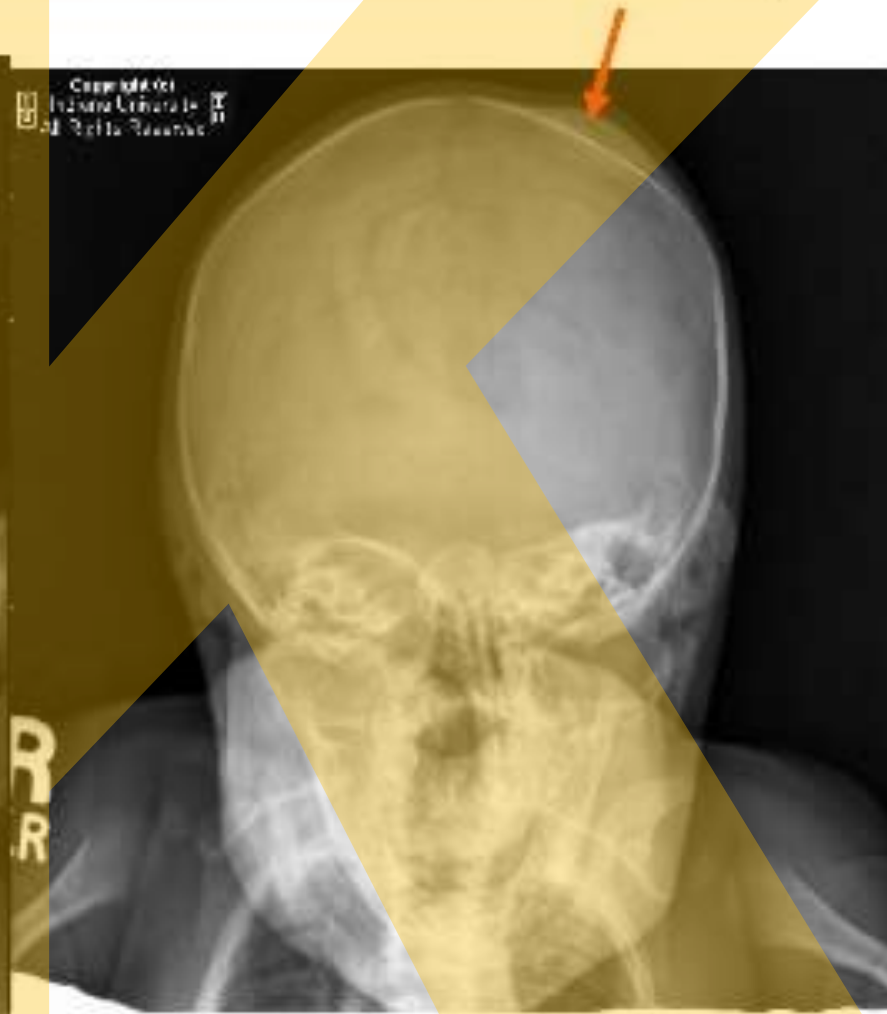
After 24 hours

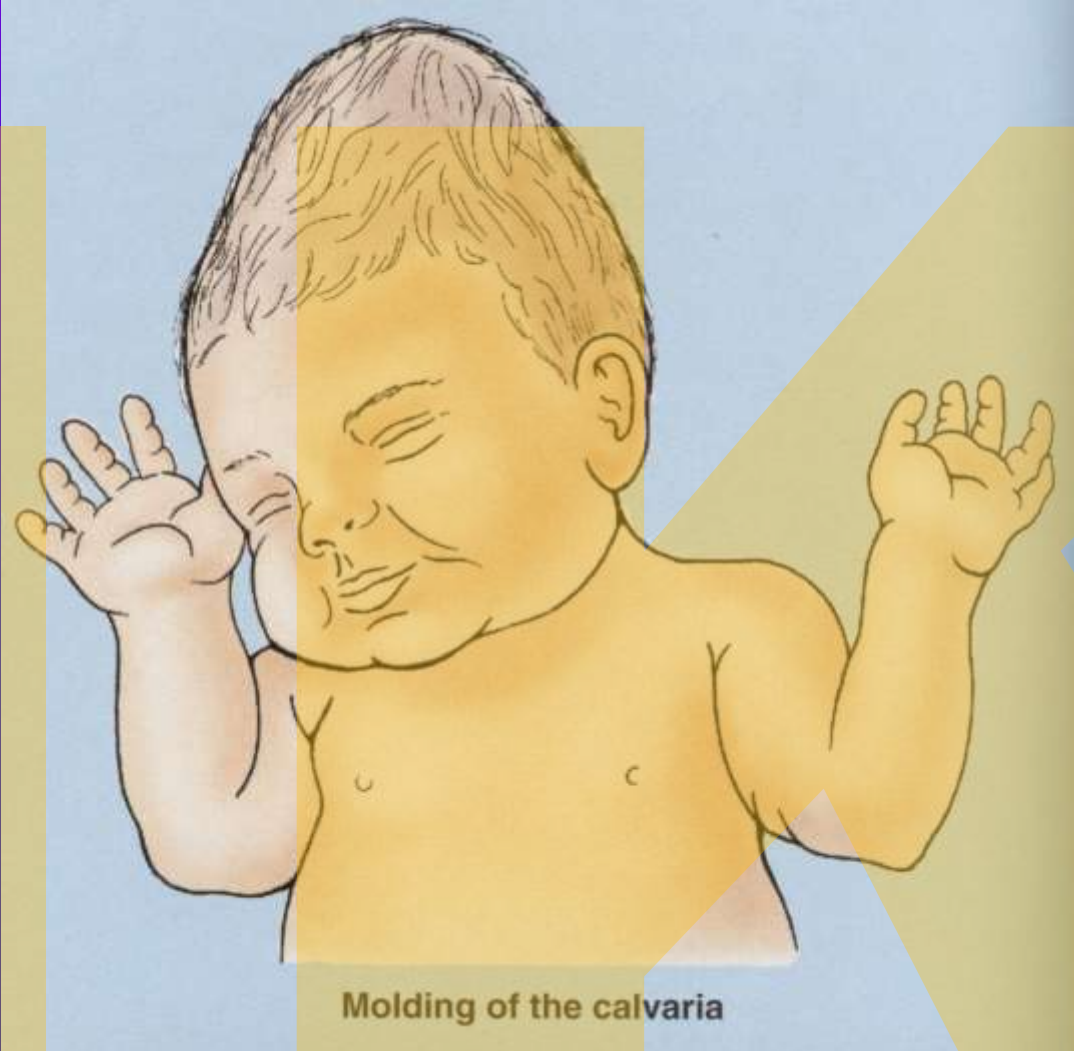
Poporodní subperiostální cephalohematom

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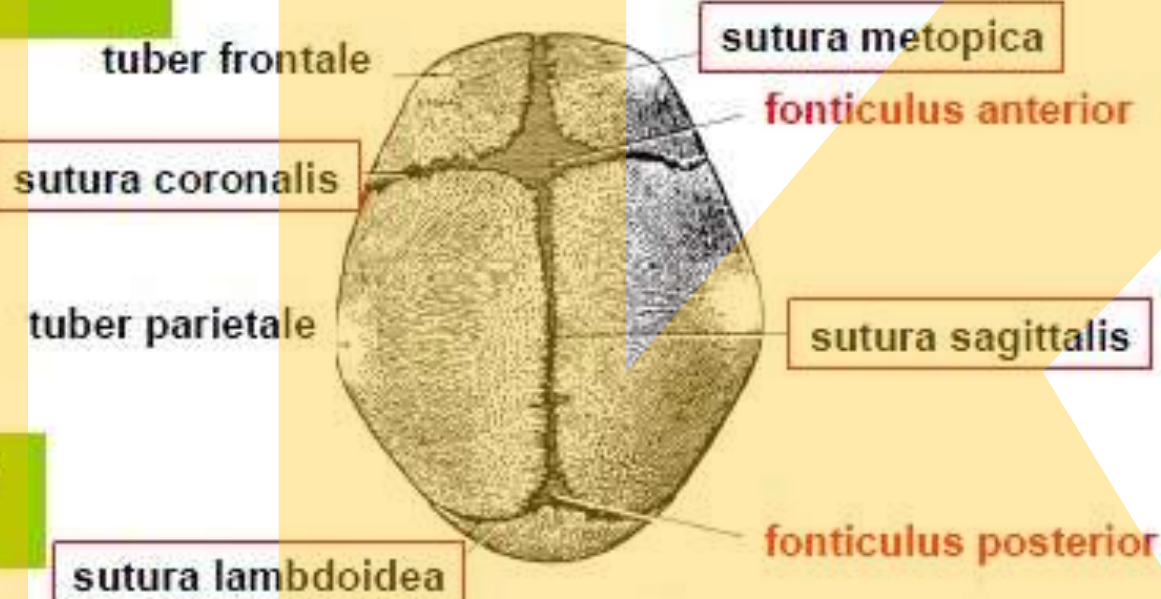




configuratio x conformatio

změna tvaru novorozené lebky z původního převážně mesokefalického na jiný
změna tvaru novorozené lebky vyvolaná přisouváním (podsouváním)
lupínků v důsledku tlaku

Kraniosynostozy



předčasný uzavěr
švů

trigonocephalie

brachycephalie

anterior
plagiocephalie

posterior plagiocephalie

dolichocephalie
(scaphocephalie)

Hydrocephalus
Dívka 2,5 roku
Obvod 61,5 cm

Hydrocephalus
chlapec 4 roky

