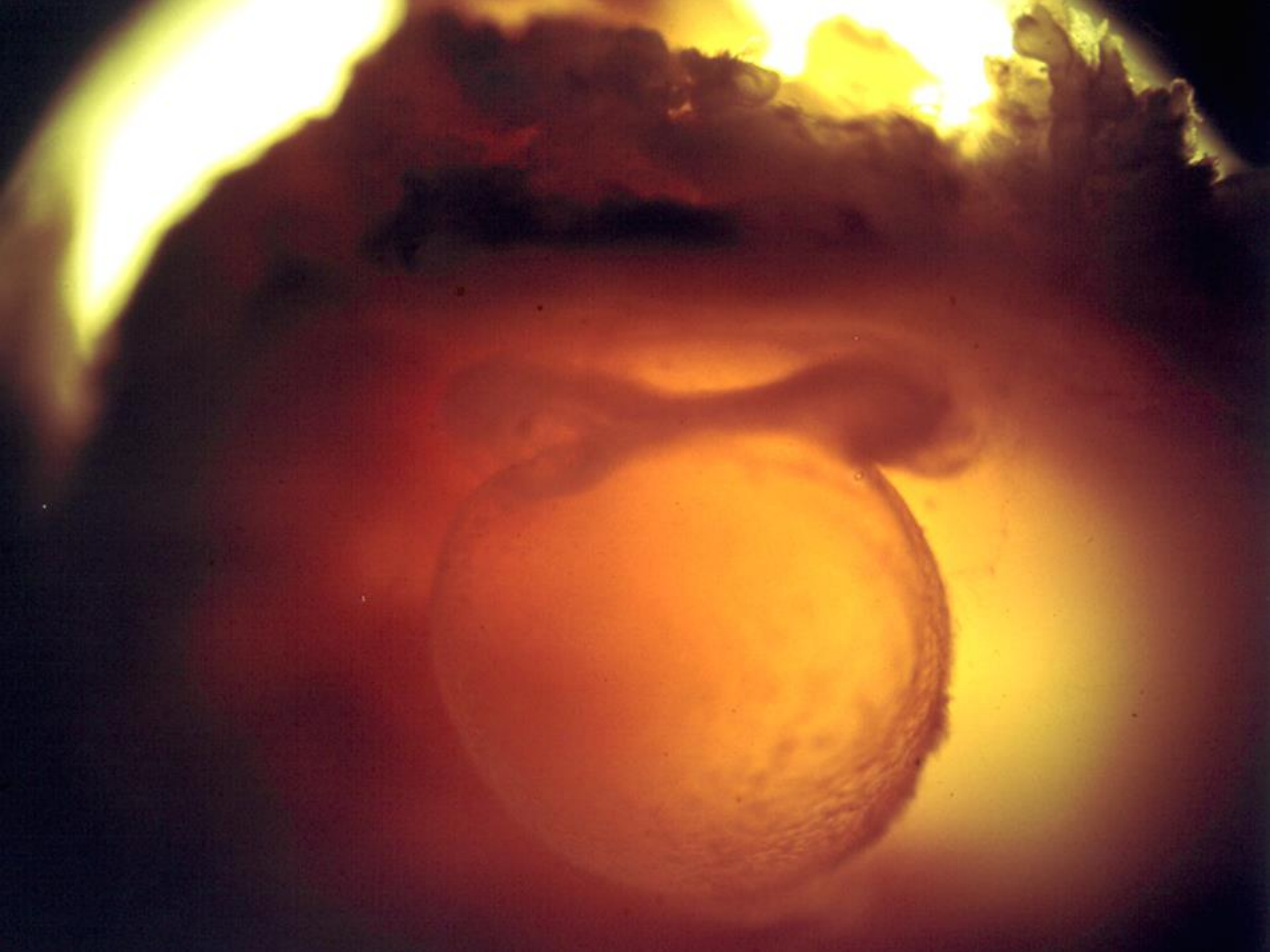
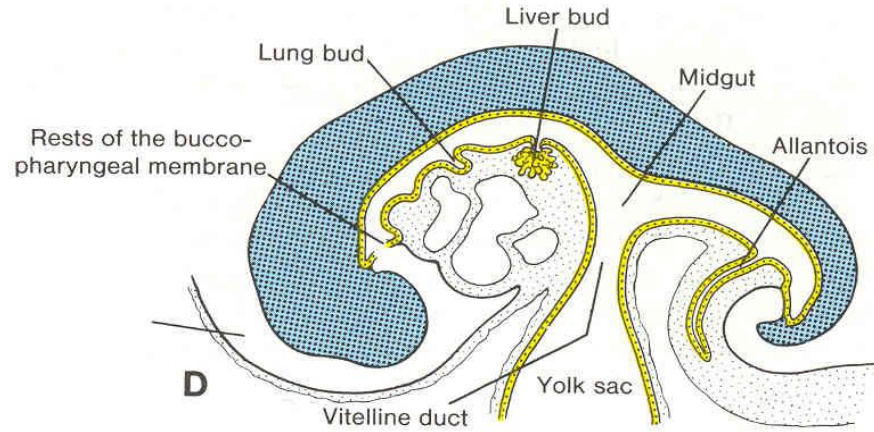
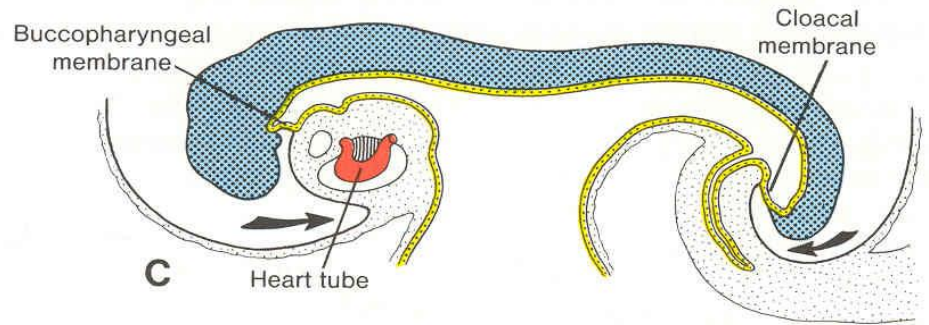
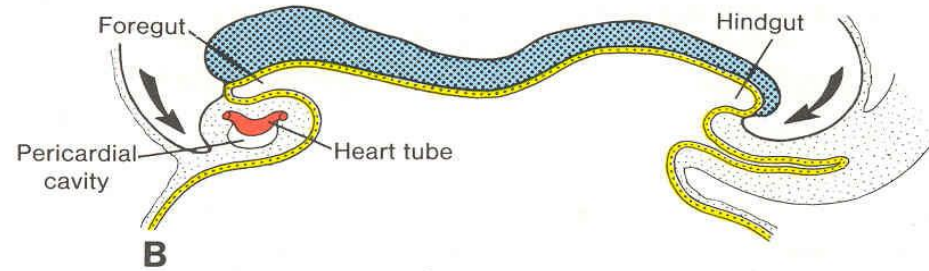
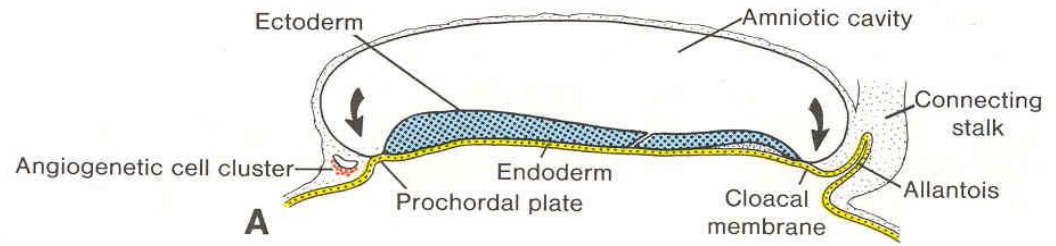


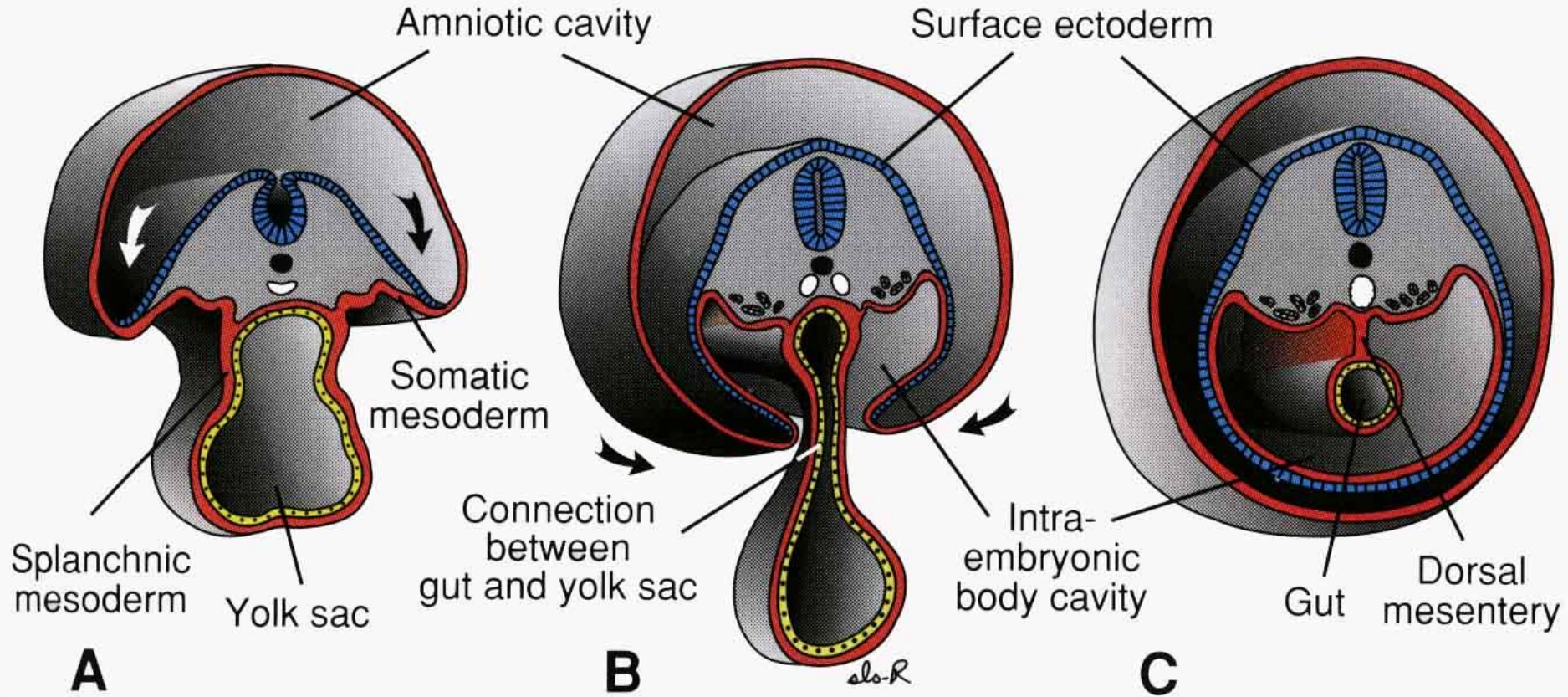
# VÝVOJ HLAVY A KRKU



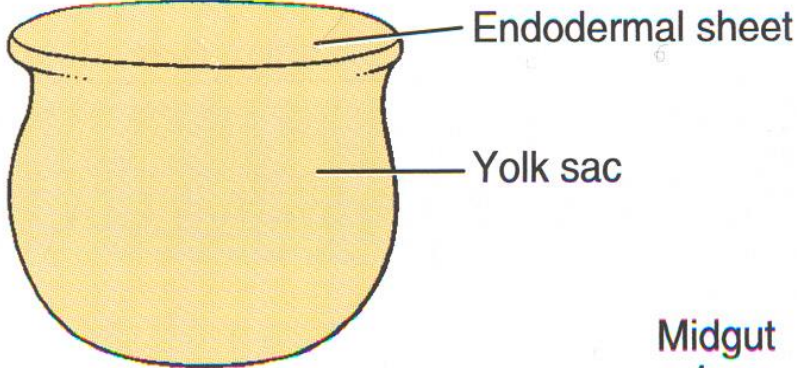
**vznik ohraničujících rýh  
vytvoří z trilaminárního  
zárodečného terčíku  
trojrozměrnou trubici**



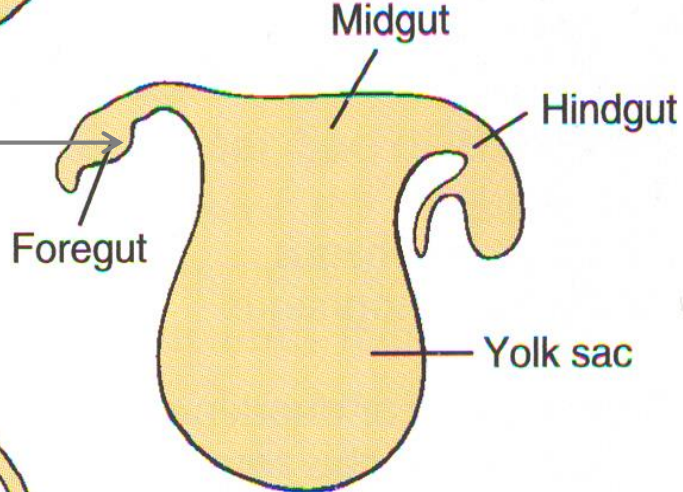
**žloutkový váček, vytváření trávicí  
trubice  
ductus omphaloentericus  
uzavírání střeva, mesenterium, coelom**



**vývoj trávicí trubice  
vliv ohraničujících rýh**

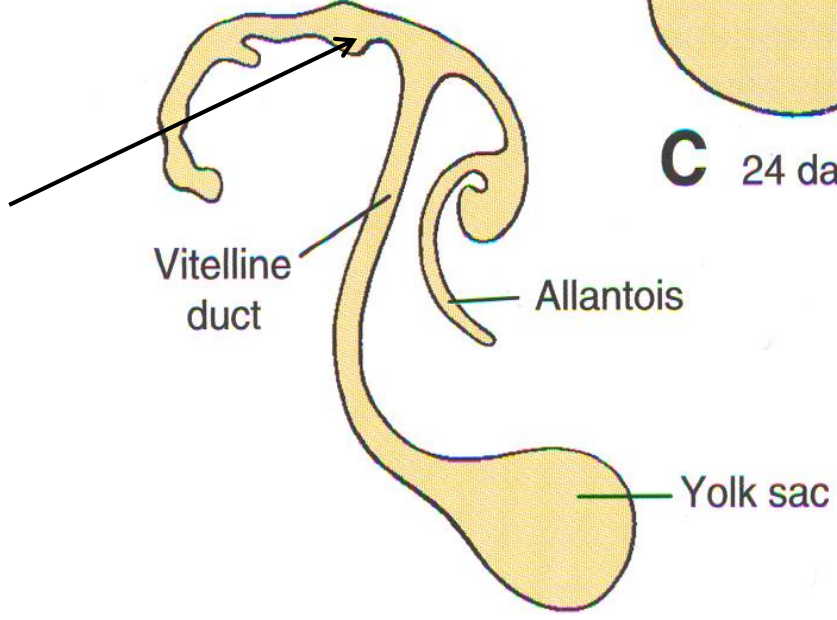


**B** 20 days

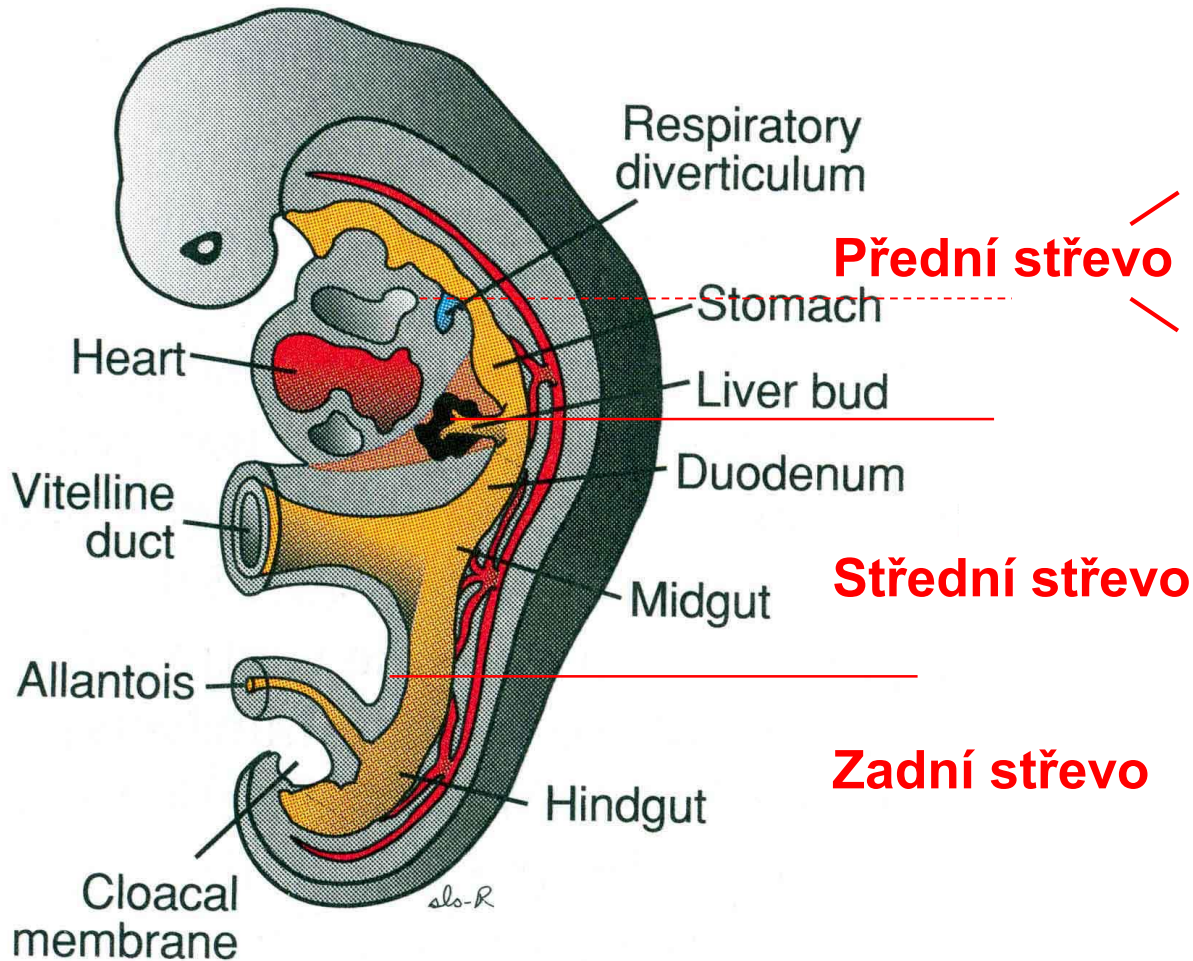


**C** 24 days

**formování trávicí trubice**



**D** 26 days

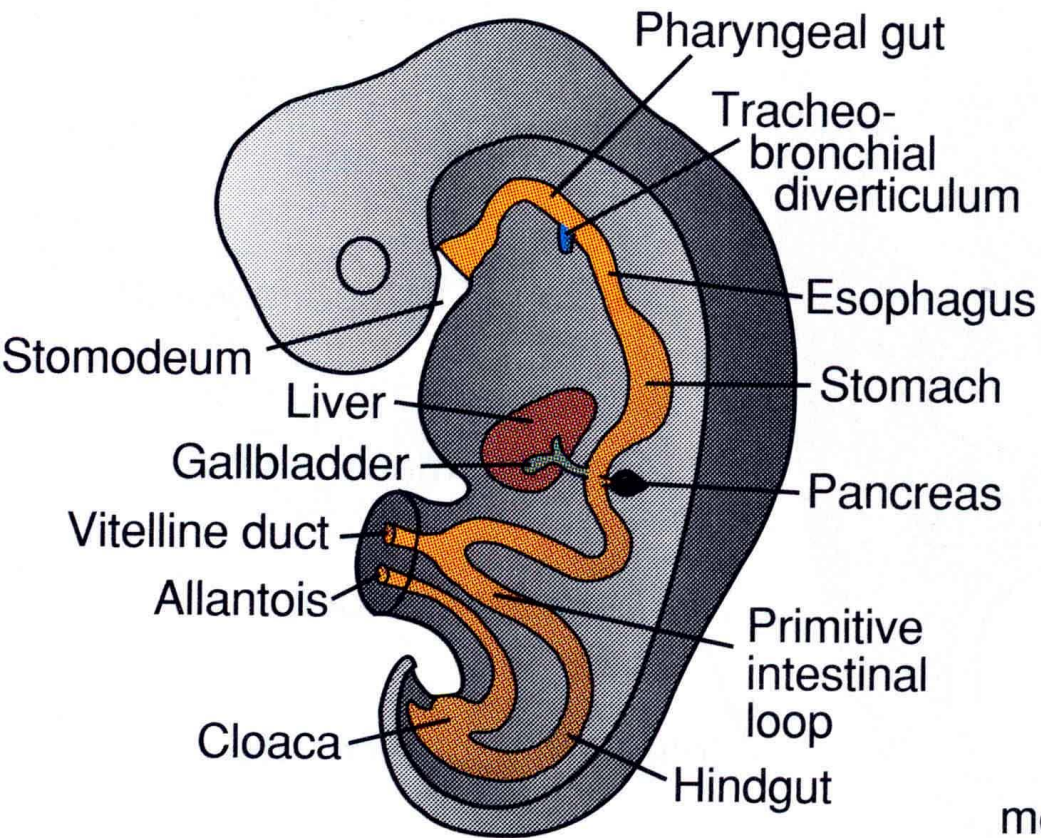


faryngové střevo  
(primitivní farynx)

kaudální část  
předního střeva

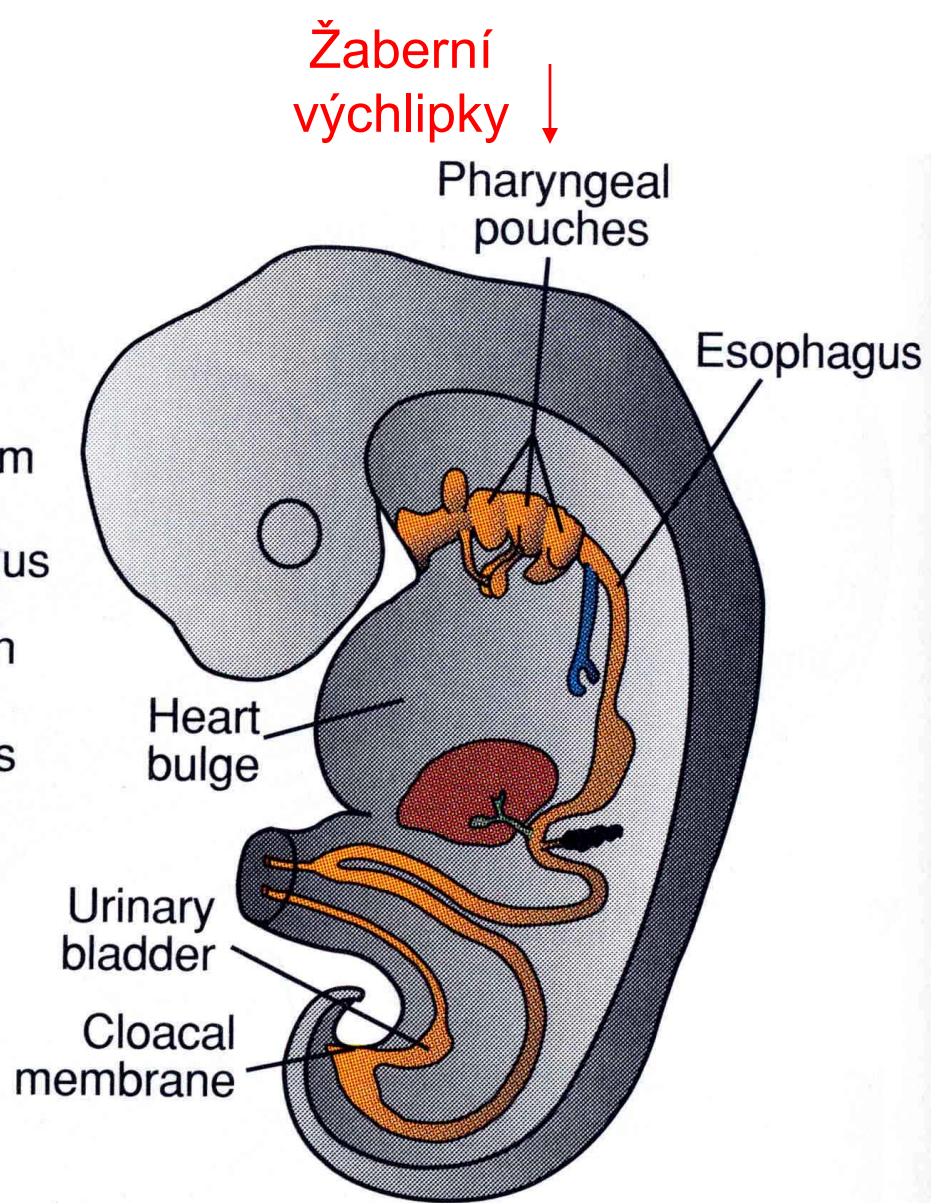
**A**

**DIFERENCIACE PRIMITIVNÍHO FARYNGU  
(FARYNGOVÉHO STŘEVA), ŽABERNÍ  
VÝCHLIPKY, VKLESLINY A OBLOUKY**



**A**

*als-R*



**B**

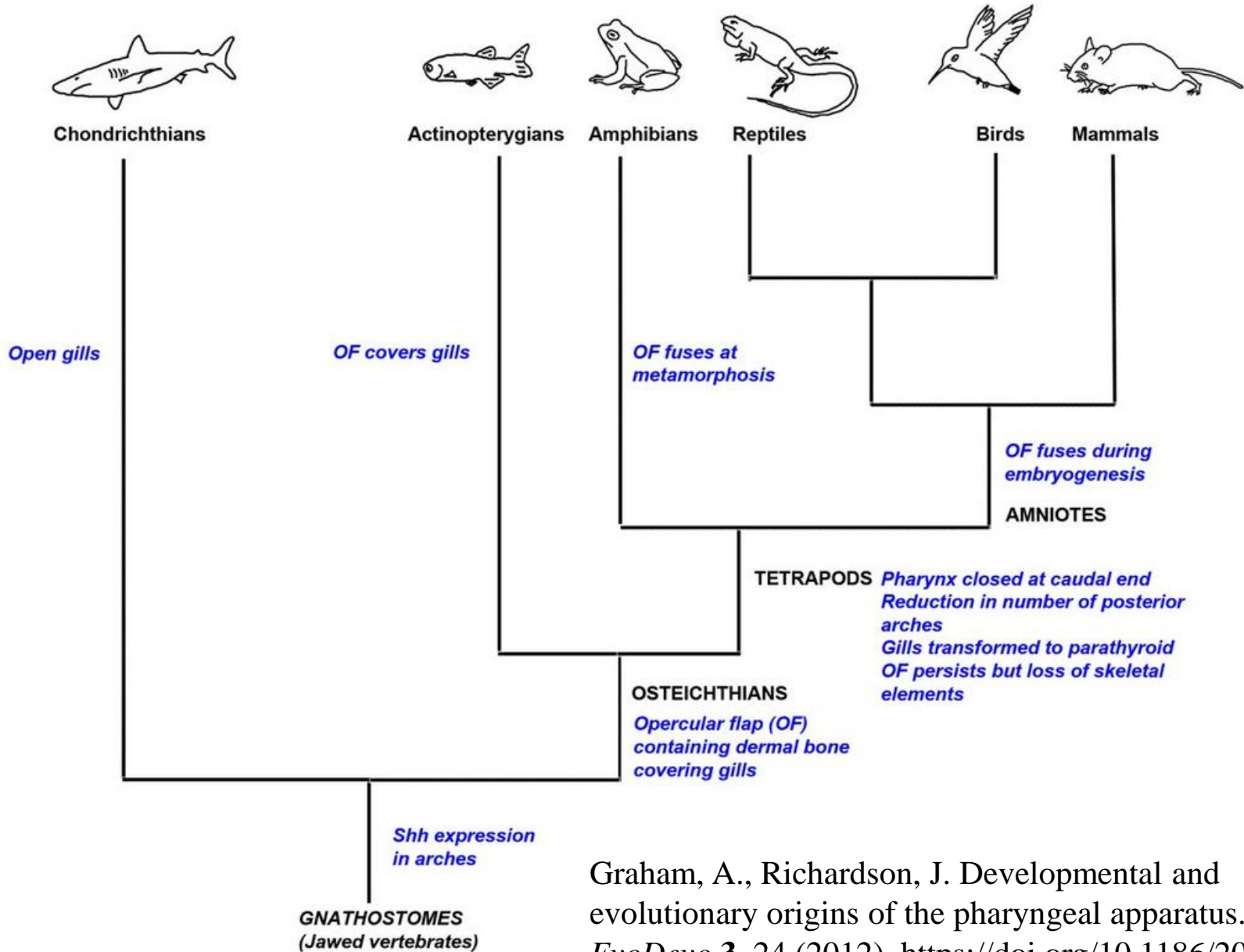




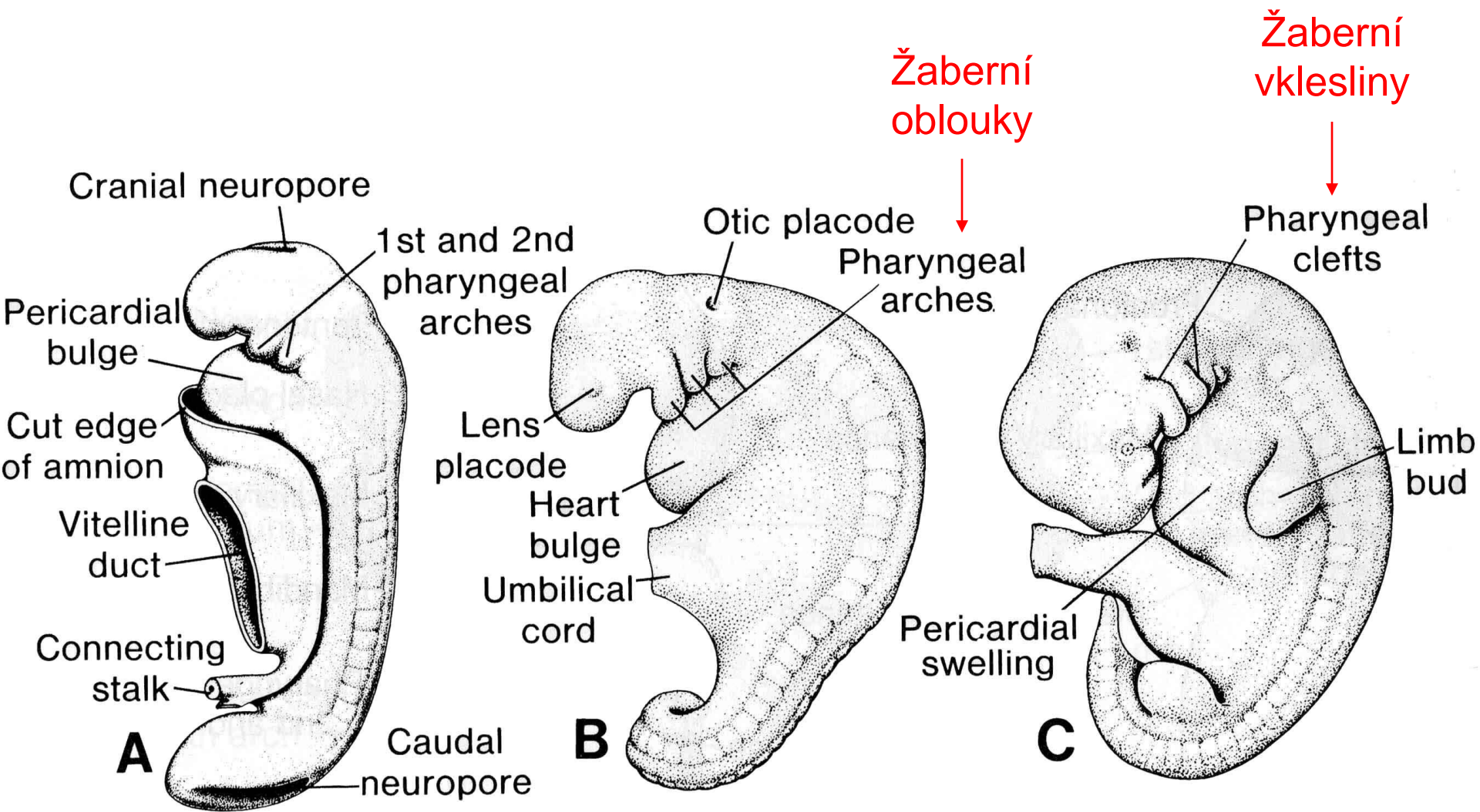
Při pohledu do  
tlamy štiky jsou  
vidět 4 páry  
žaberních oblouků  
nesoucích žábry.

# Figure 4

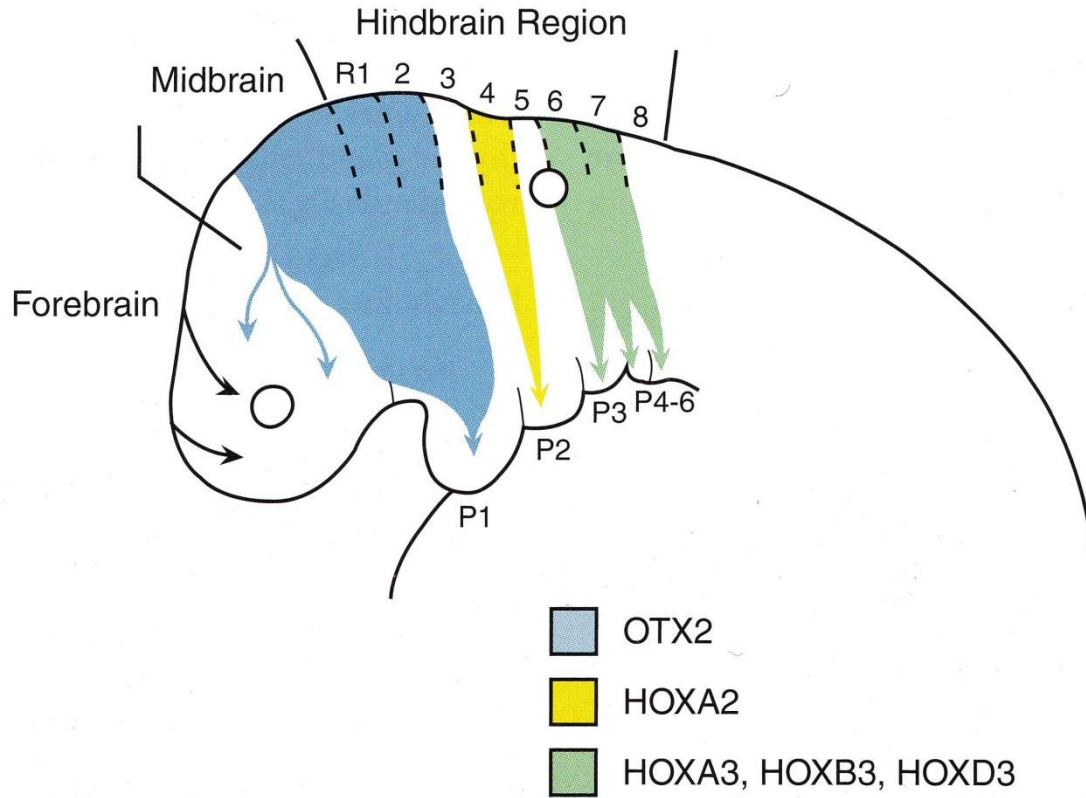
From: [Developmental and evolutionary origins of the pharyngeal apparatus](#)



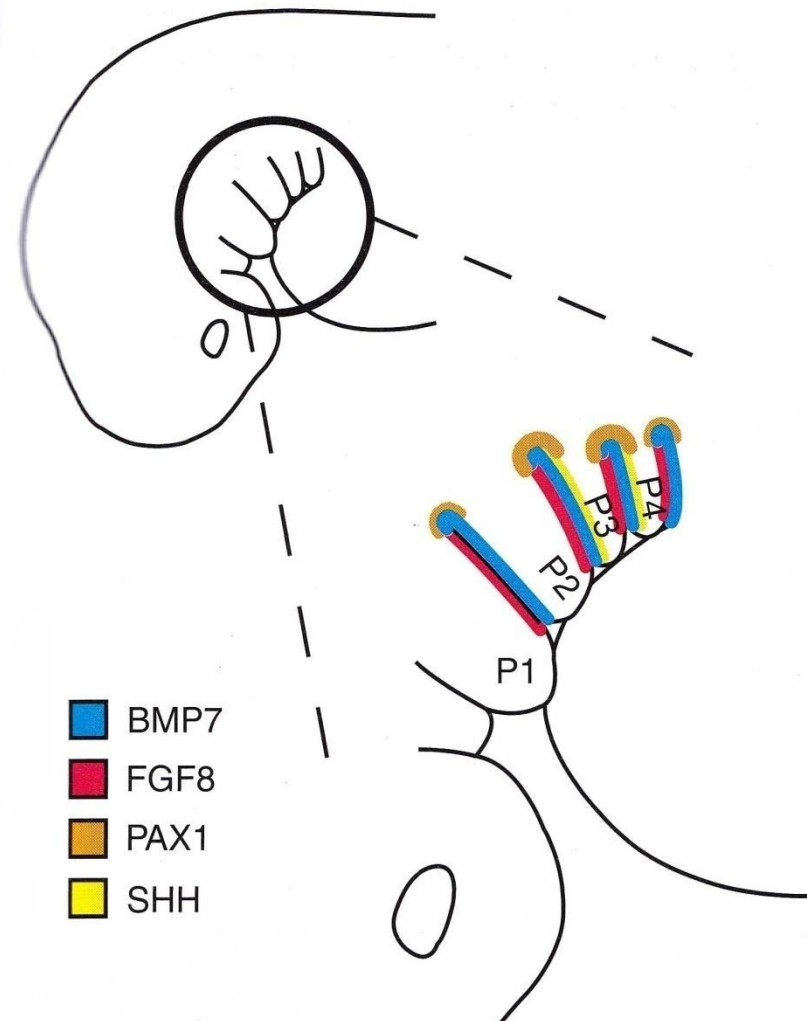
Graham, A., Richardson, J. Developmental and evolutionary origins of the pharyngeal apparatus. *EvoDevo* 3, 24 (2012). <https://doi.org/10.1186/2041-9139-3-24>



# Molekulární řízení vzniku žaberních oblouků



exprese genů v migračních proudech buněk neurální lišty



exprese genů v entodermu žaberních výchlipek

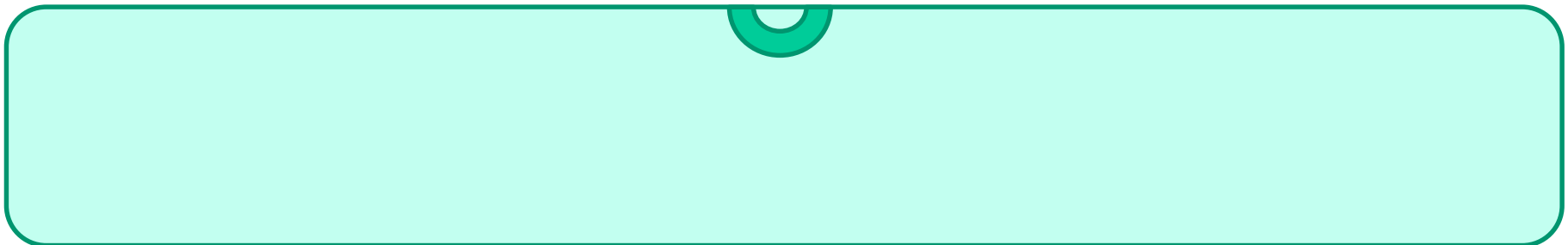
neuroektoderm

Goosecoid

(via chordin elevation) together with noggin a follistatin - BMP4 inhibition



BMP 4   BMP 4   BMP 4   BMP 4   BMP 4   BMP 4



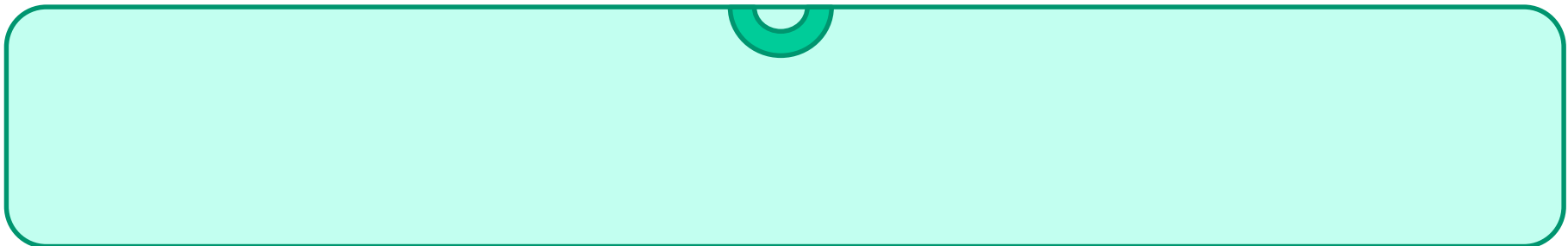
neuroektoderm

Goosecoid

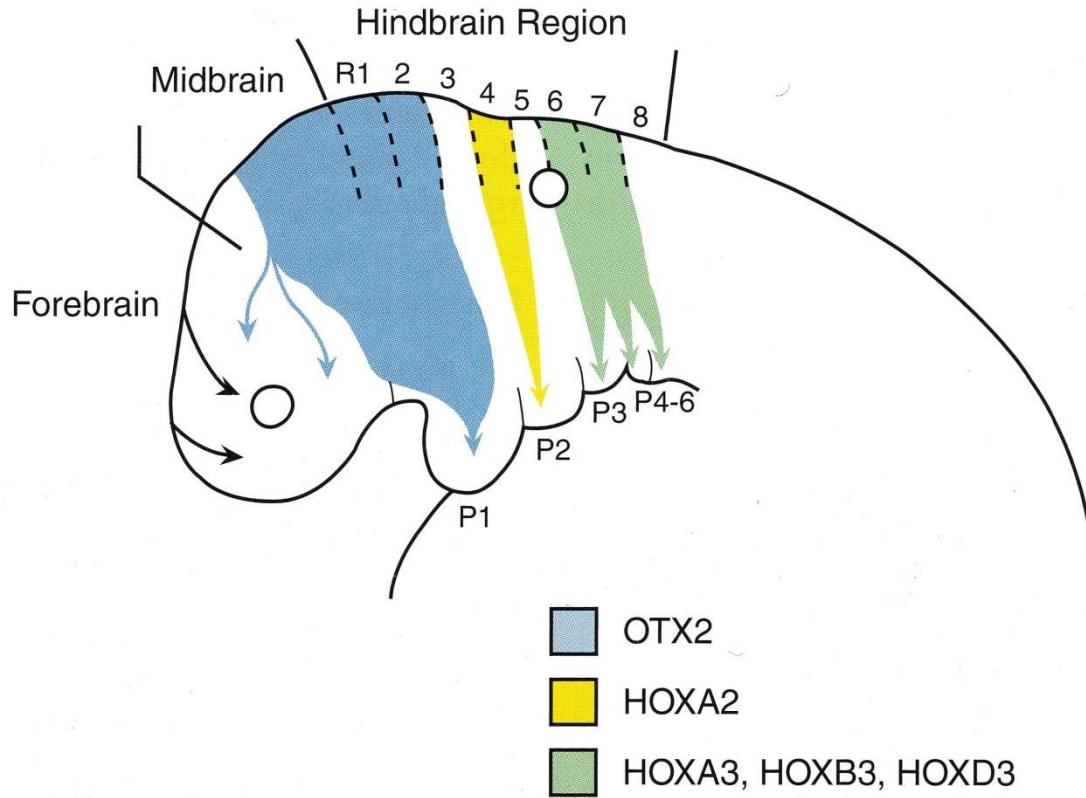
(via chordin elevation) together with noggin a follistatin - BMP4 inhibition

WNT – neural crest

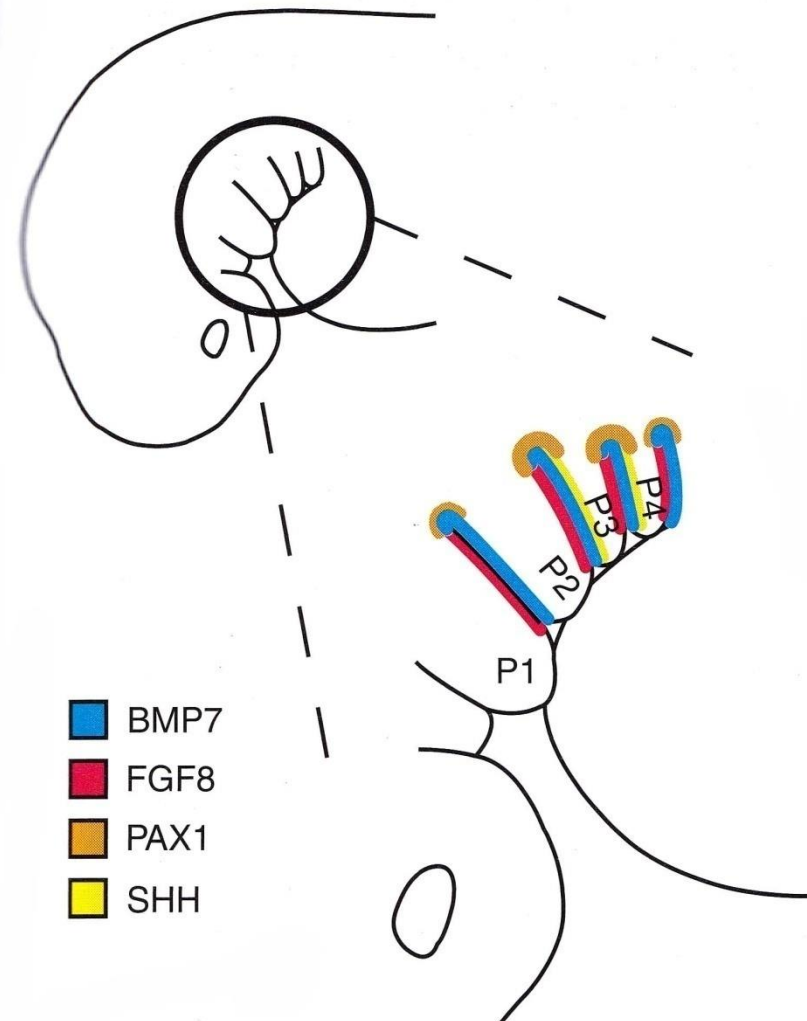
BMP 4   BMP 4   BMP 4   BMP 4   BMP 4   BMP 4



# Molekulární řízení vzniku žaberních oblouků



exprese genů v migračních proudech buněk neurální lišty



exprese genů v entodermu žaberních výchlipek

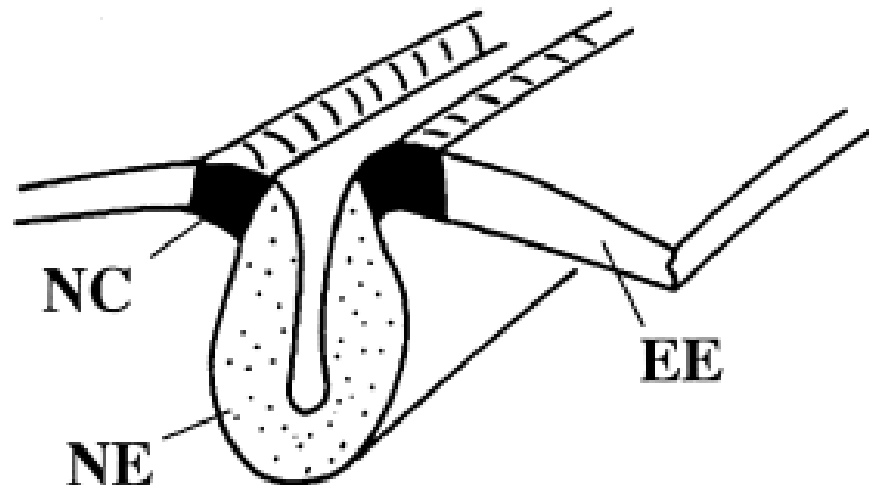
Full Access

## The neural crest as a fourth germ layer and vertebrates as quadroblastic not triploblastic

Brian K. Hall

First published: 24 December 2001 | <https://doi.org/10.1046/j.1525-142x.2000.00032.x> | Citations: 142

✉ (email: [BKH@is.dal.ca](mailto:BKH@is.dal.ca))

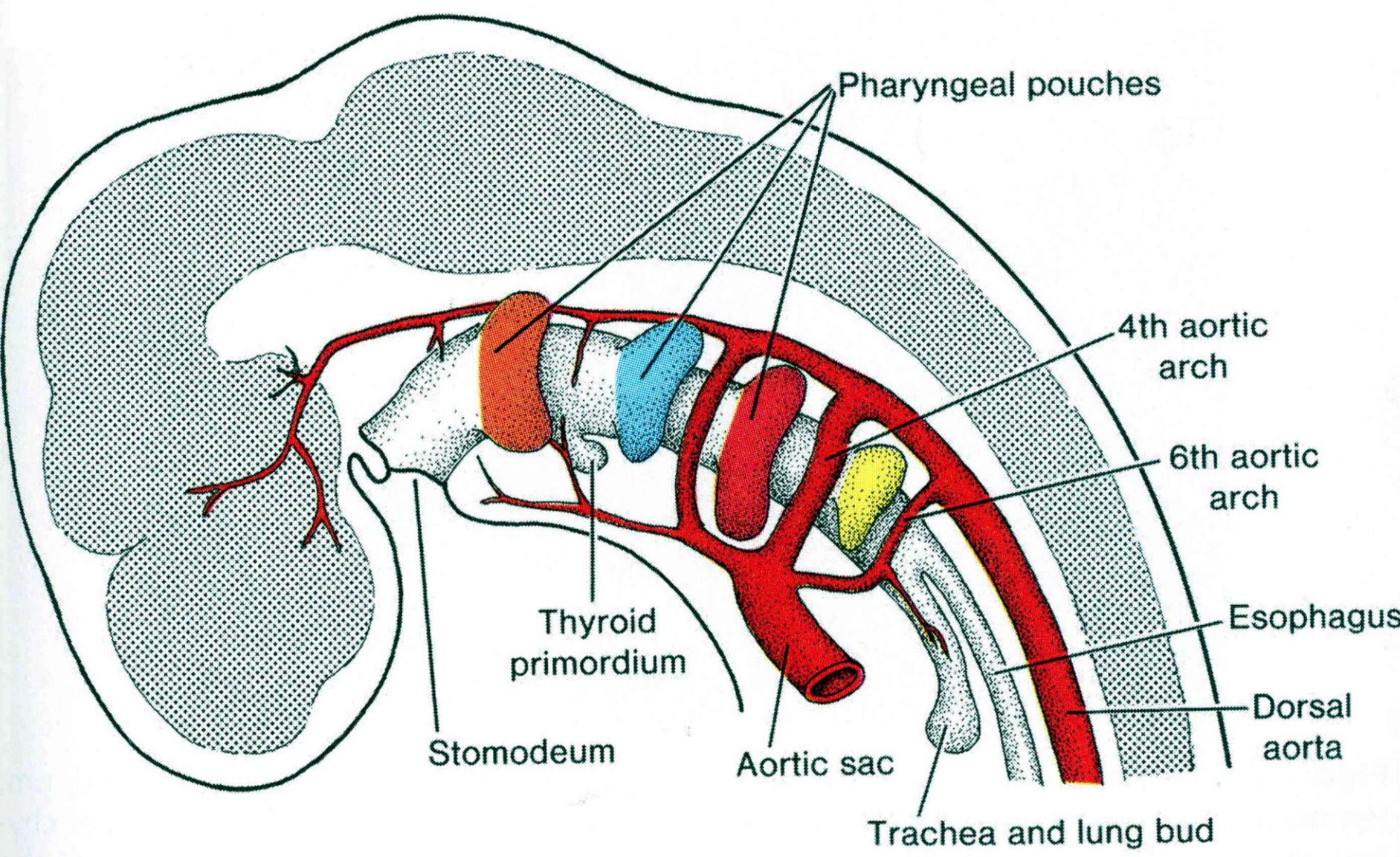




Mesoderm is recognized as a germ layer because of the tremendous diversity of cell and tissue types that originate from it; mesoderm breaks up into recognized populations of cells (sclerotome, dermamyotome, lateral plate, somatic, and splanchnic mesoderm) and forms the same tissues and structures across the animal kingdom. Neural crest breaks up into populations of cells that are conserved in all vertebrates and form the same tissues and organs across the vertebrates ( [Hall 1999](#)). Indeed, neural crest produces an even greater array of cells and tissues than does mesoderm, including neural, pigment, skeletal, connective tissue, cardiac, dental, and endocrine cells. Mesoderm and neural crest both give rise to embryonic mesenchyme. On all points, if mesoderm qualifies as a secondary germ layer, so does neural crest ( [Hall 1998a](#)).

Hall, B.K. (2000), The neural crest as a fourth germ layer and vertebrates as quadroblastic not triploblastic. *Evolution & Development*, 2: 3-5. <https://doi.org/10.1046/j.1525-142x.2000.00032.x>





Pharyngeal pouches

4th aortic arch

6th aortic arch

Esophagus

Dorsal aorta

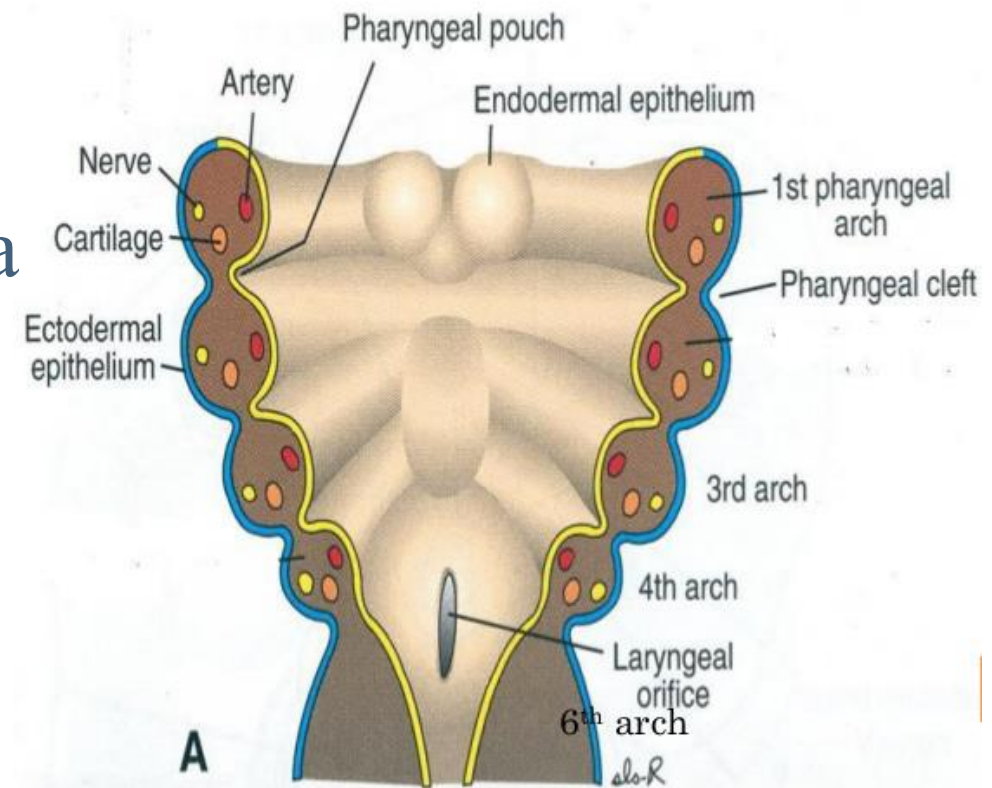
Trachea and lung bud

Aortic sac

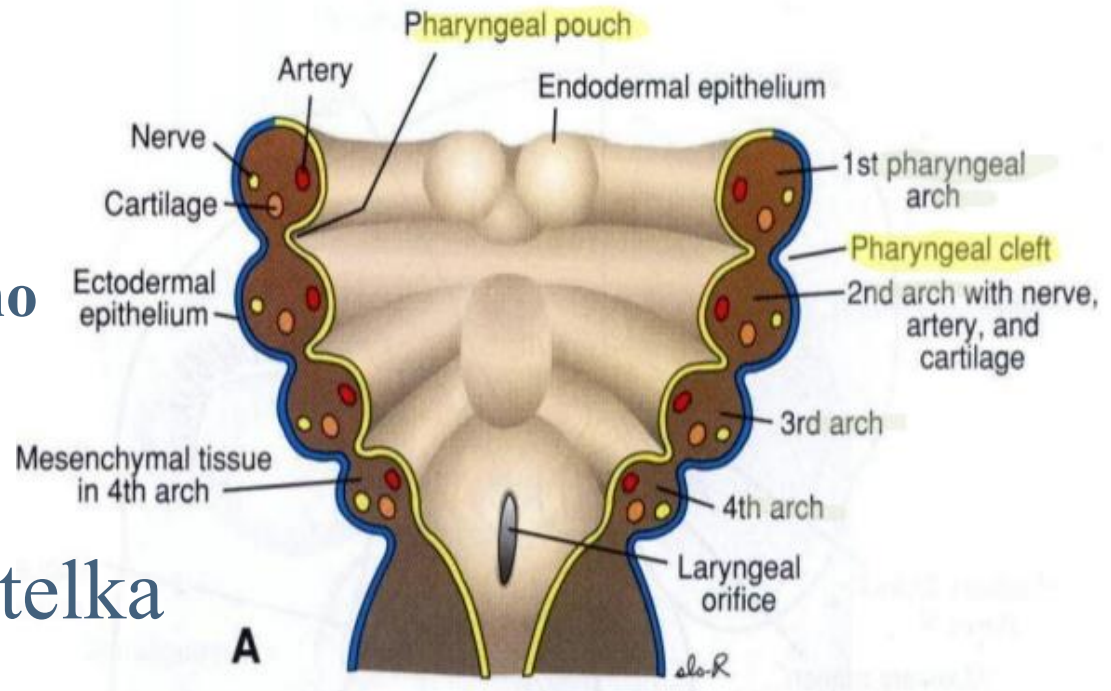
Stomodeum

Thyroid primordium

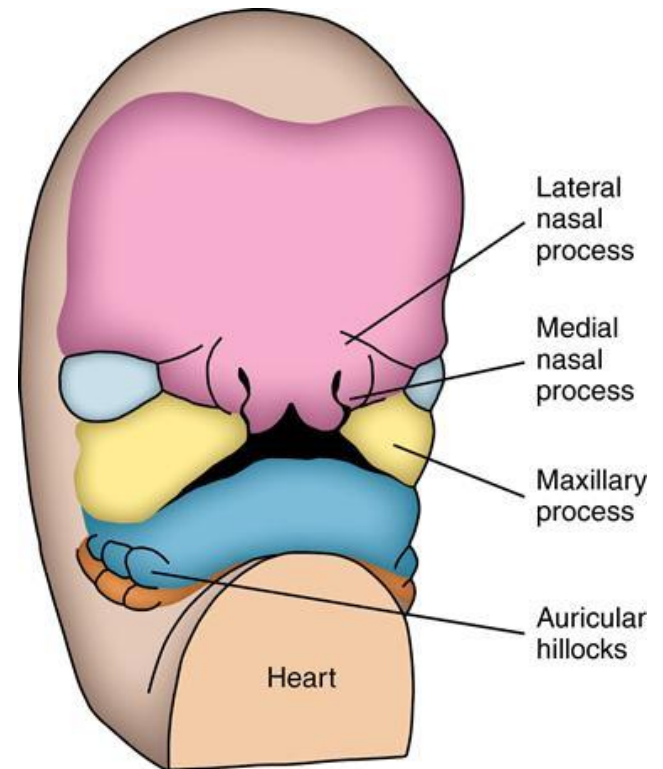
- Faryngový oblouk
- Faryngová výchlipka
- Faryngová štěrbin
- Faryngová membrána



- Povrch kryt ektodermem
- Mezenchymové jádro (mezoderm + **buňky neurální lišty**)
- Aortální oblouk
- Chrupavka
- **Komponenta kosterního svalu** inervovaná specifickým nervem
- Endodermální výstelka



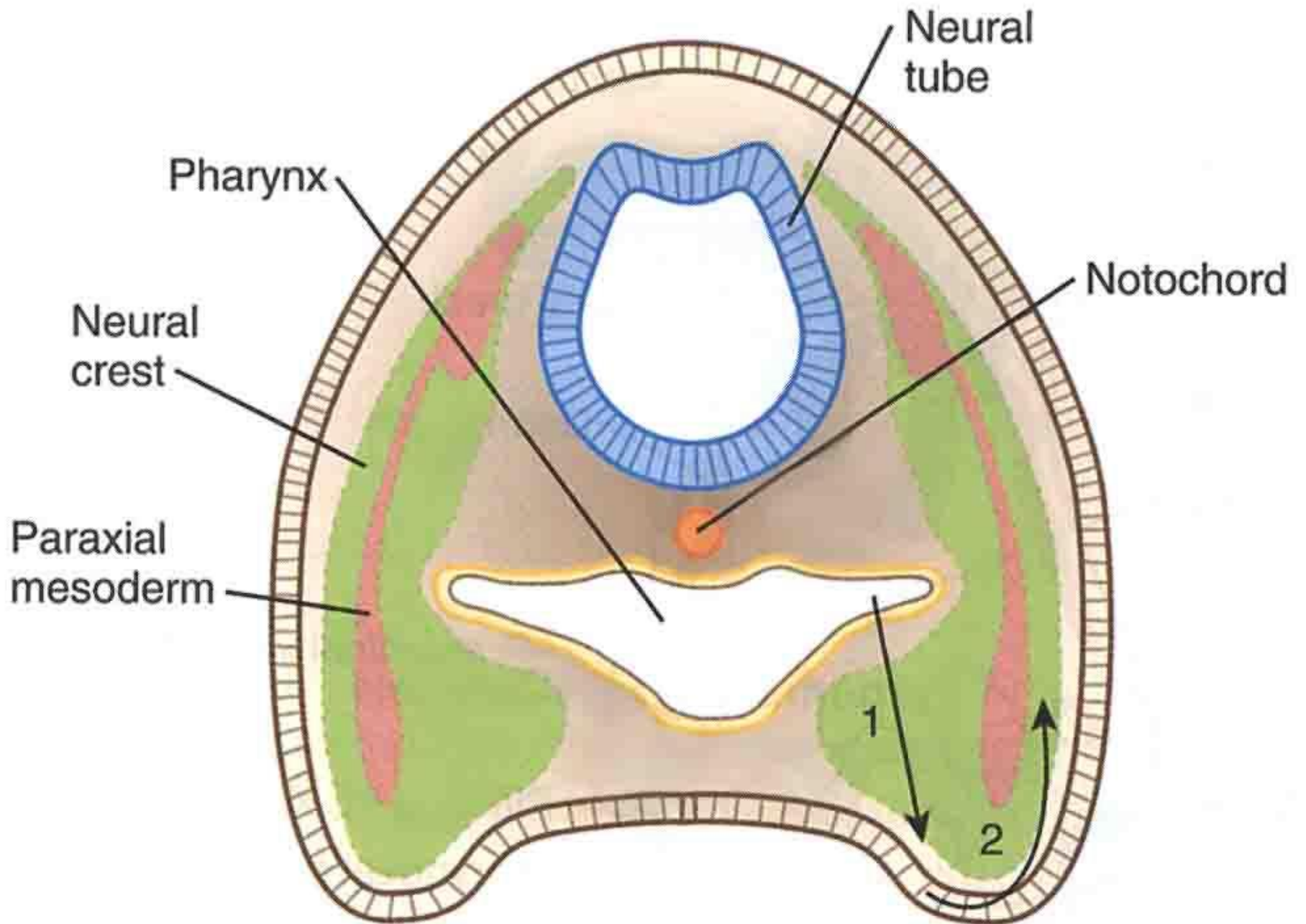
- 4. – 10. týden vývoje
- Frontonasální výběžek
- 1. FO
  - Párový maxilární výběžek
  - Párový mandibulární výběžek

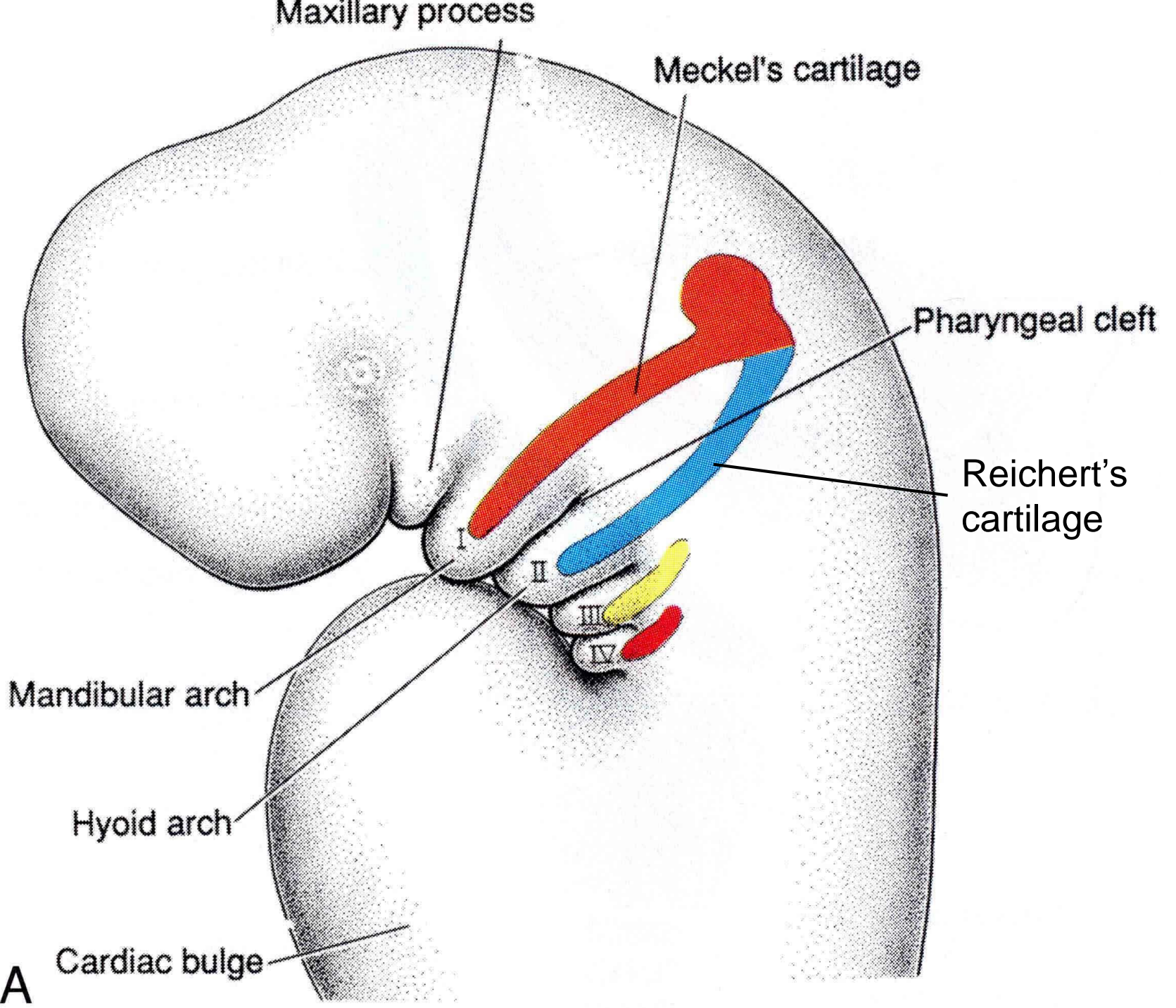


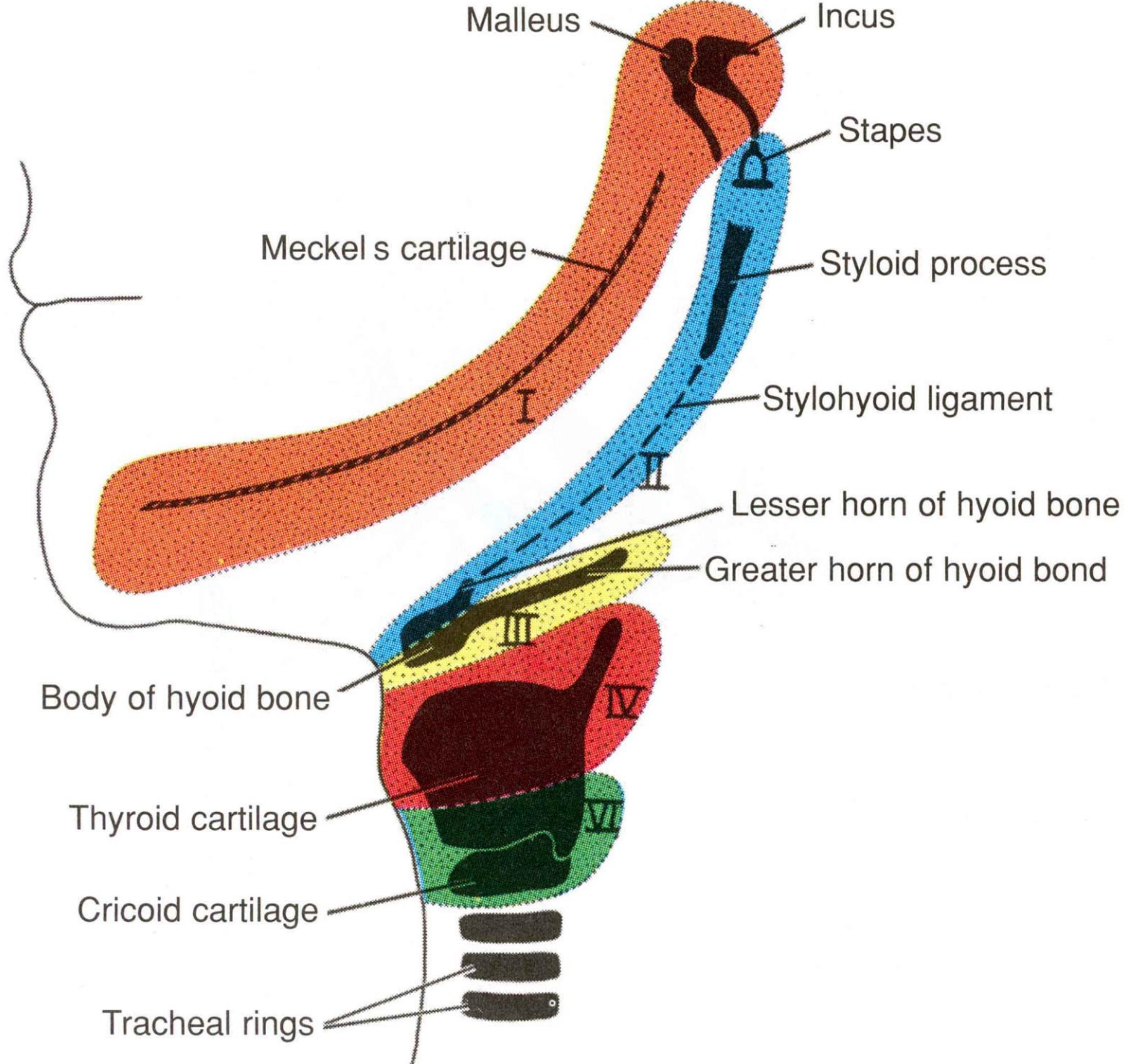
# Faryngeální oblouky

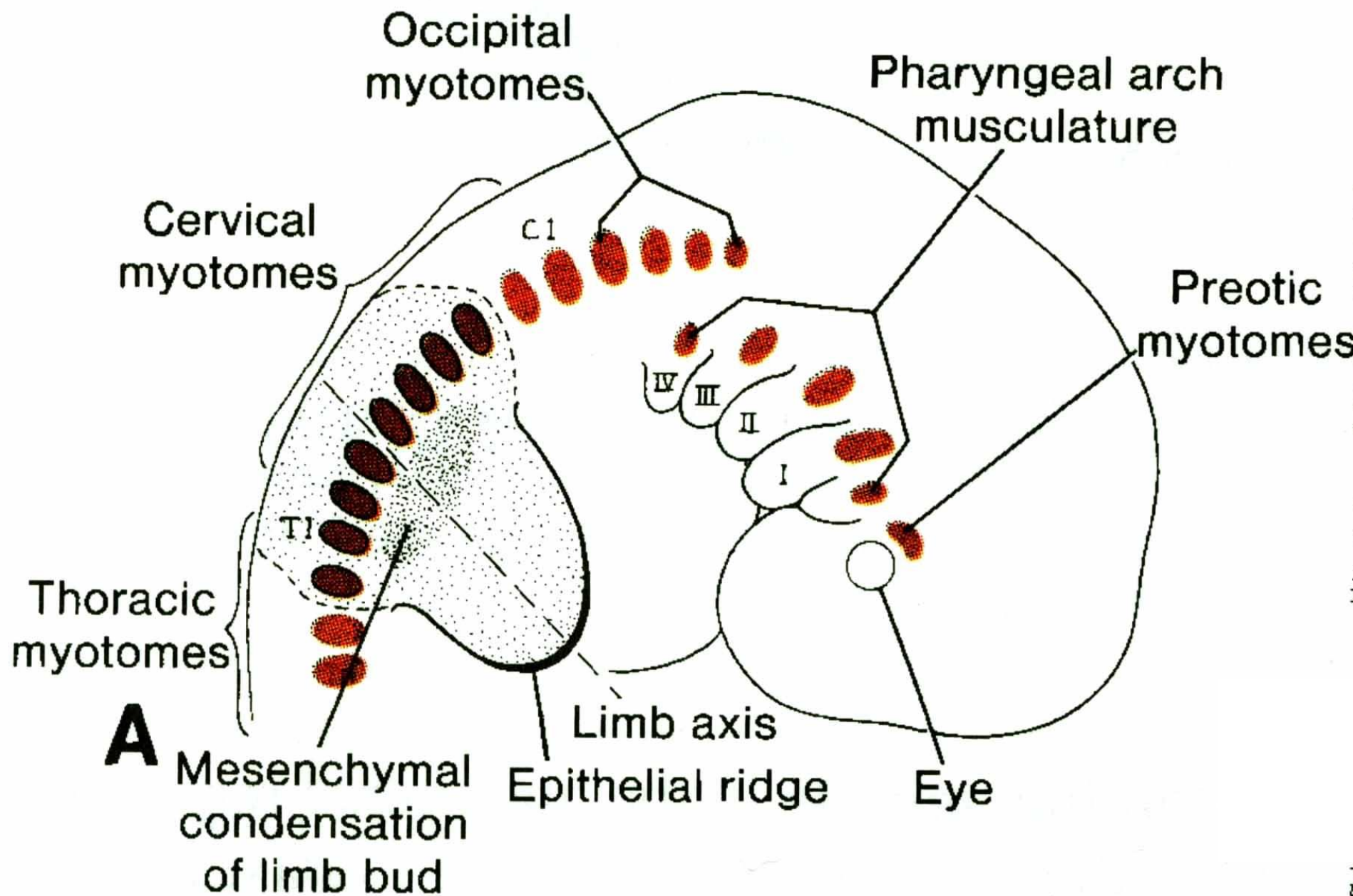
Derivates of pharyngeal folds	Arch number	Aortic arch	Cranial nerve	Examples of branchiomeric muscles	Skeletal derivates	Derivates of pharyngeal pouch
external auditory meatus	I mandibular	maxillary artery	V trigeminal	muscles of mastication etc.	malleus, incus spheno- mandibular lig. Meckel cart.	I middle ear auditory tube
	II hyoid	hyoid, stapedial artery	VII facial	muscles of facial expression etc.	stapes, styl. proc., stylohyoid lig., part of hyoid cart.	II supra- tonsillar fossa
neck	III	internal carotid artery	IX glosso- pharyng.	m. stylopha- ryngeus	parts of hyoid cart.	III thymus, parathyr. gland
	IV	right subclavian artery, aorta	X vagus	pharyngeal and laryngeal musculature	laryngeal cart.	IV parathyr. gland ultimobranch. body
	VI					

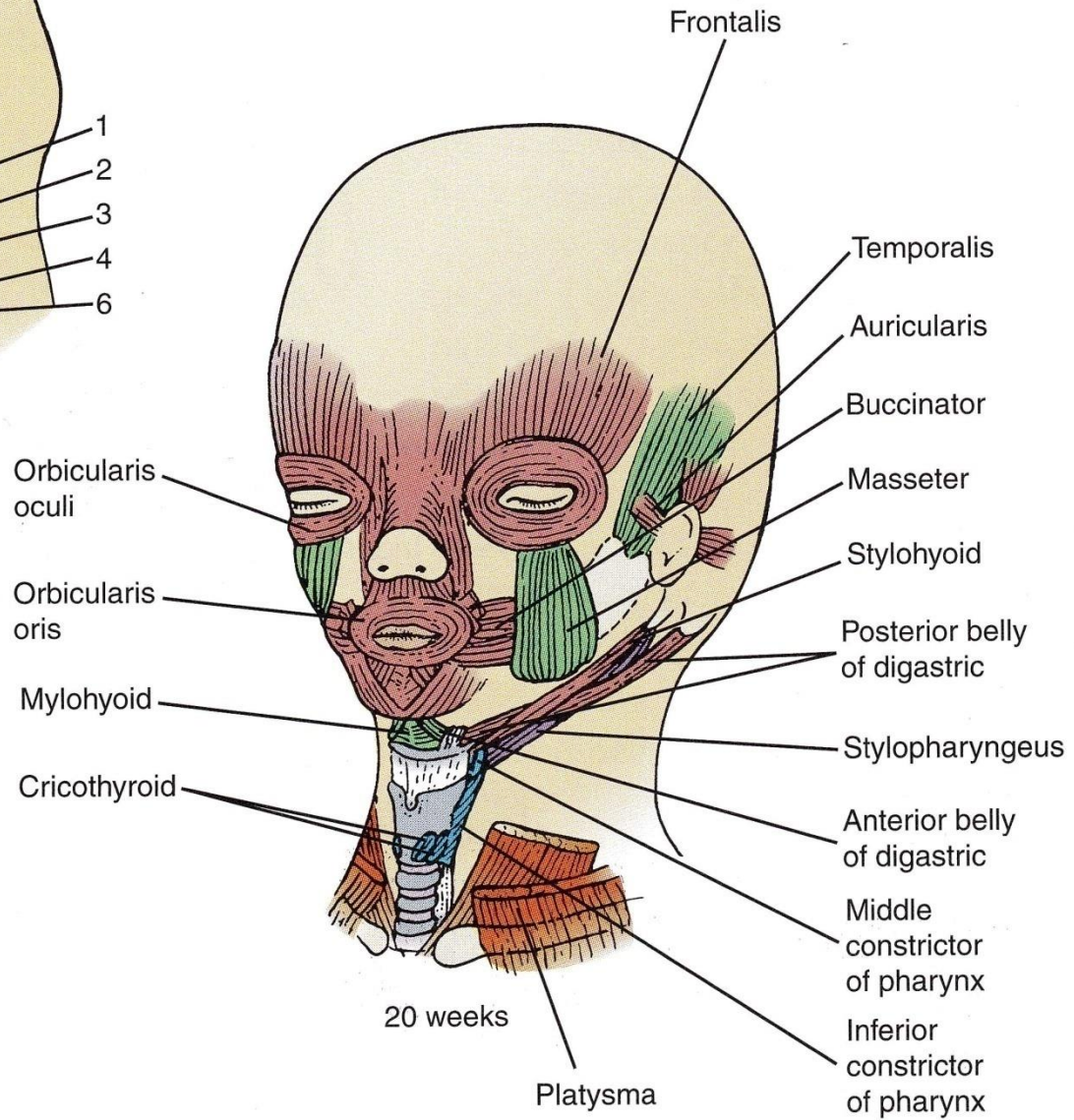
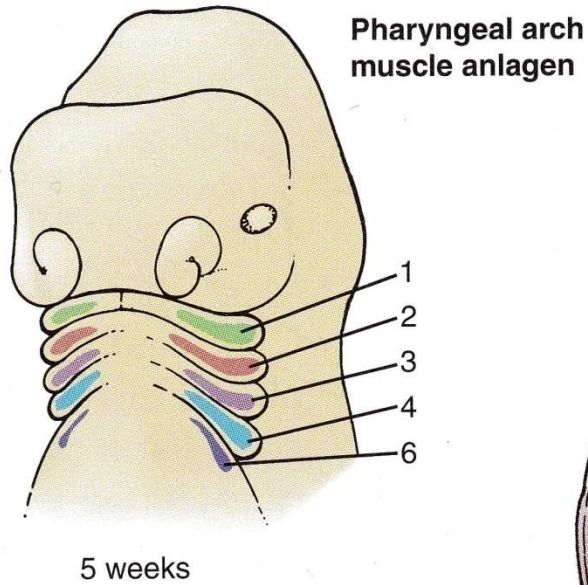


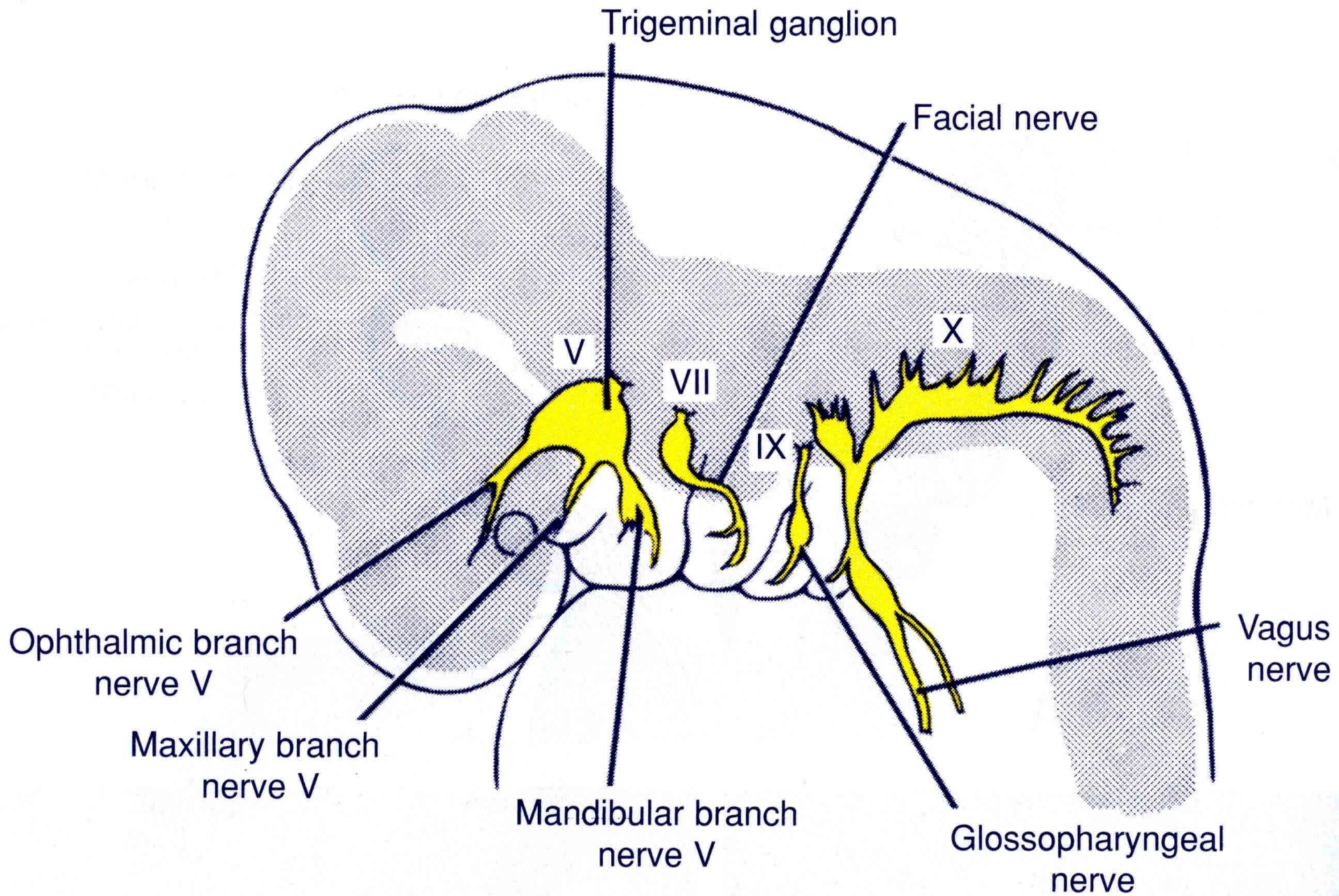




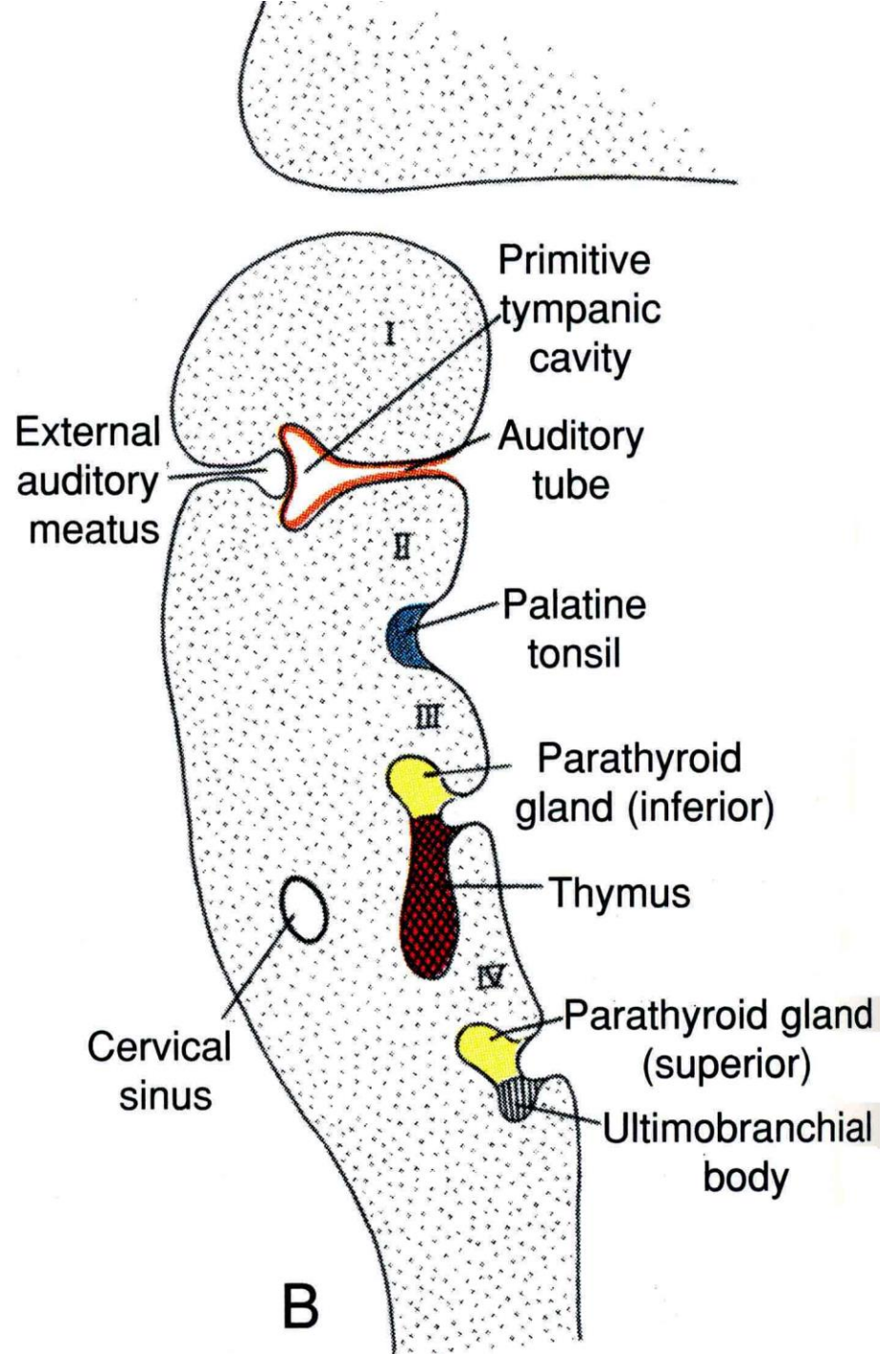
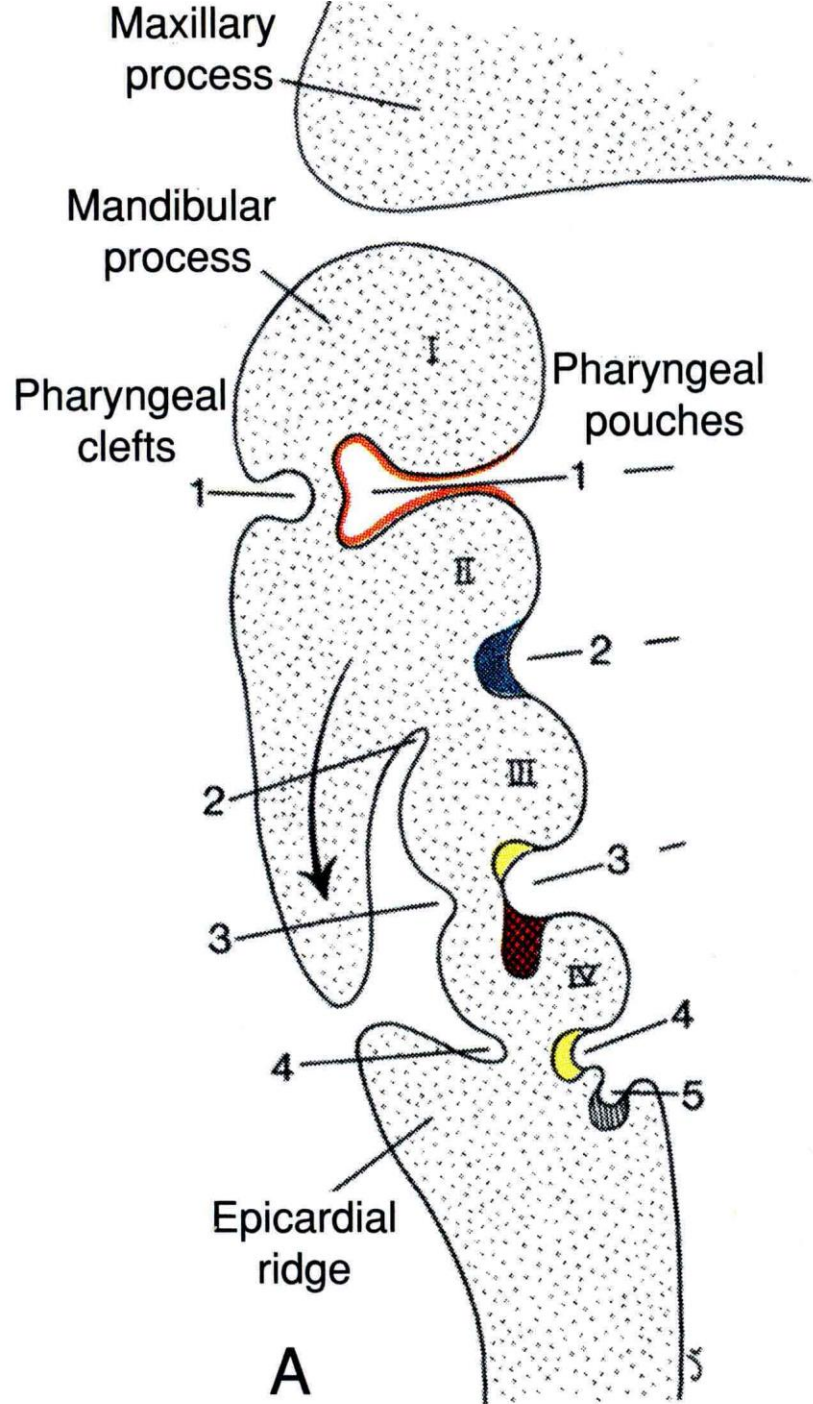




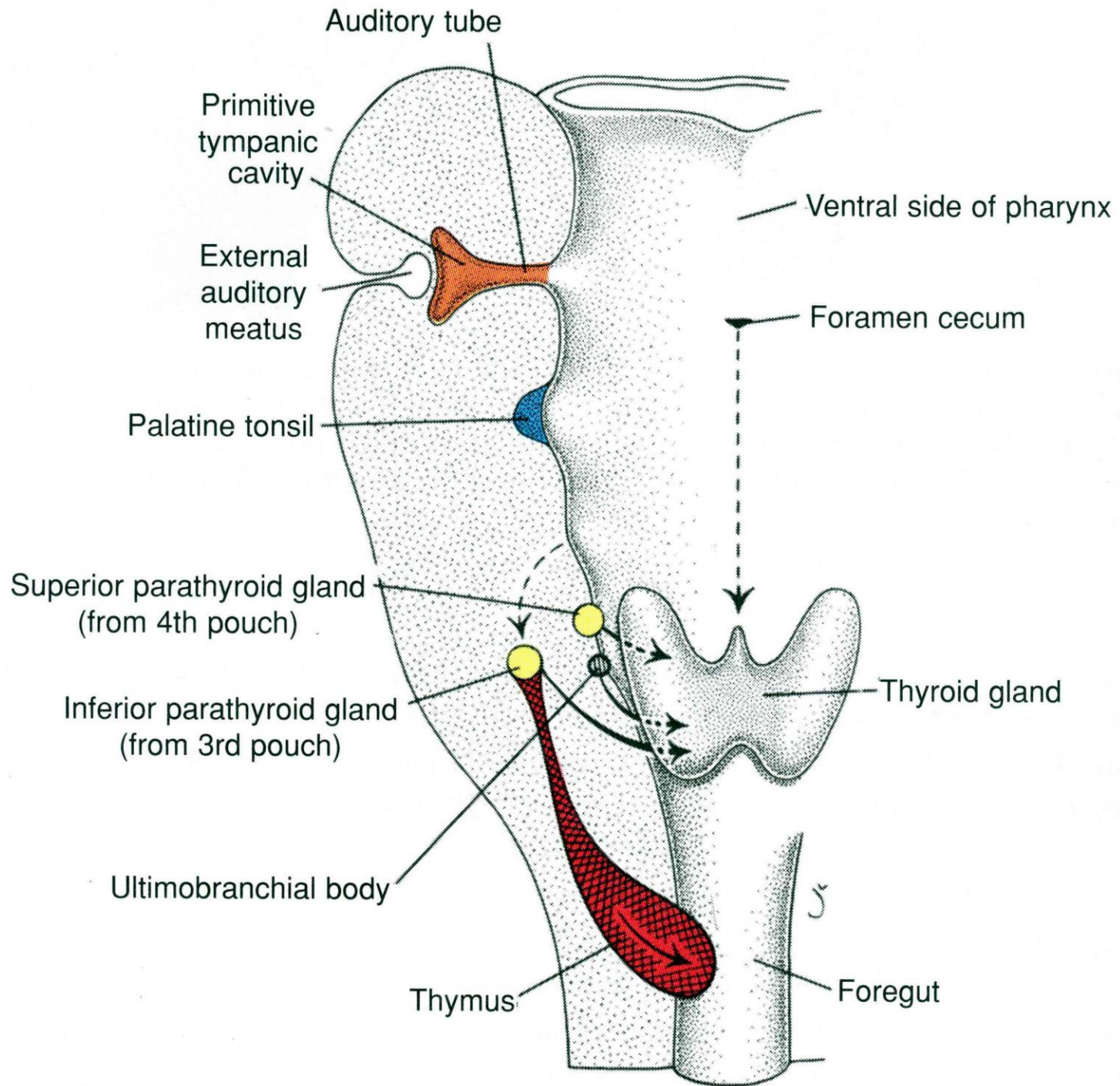




# Faryngeální výchlípky



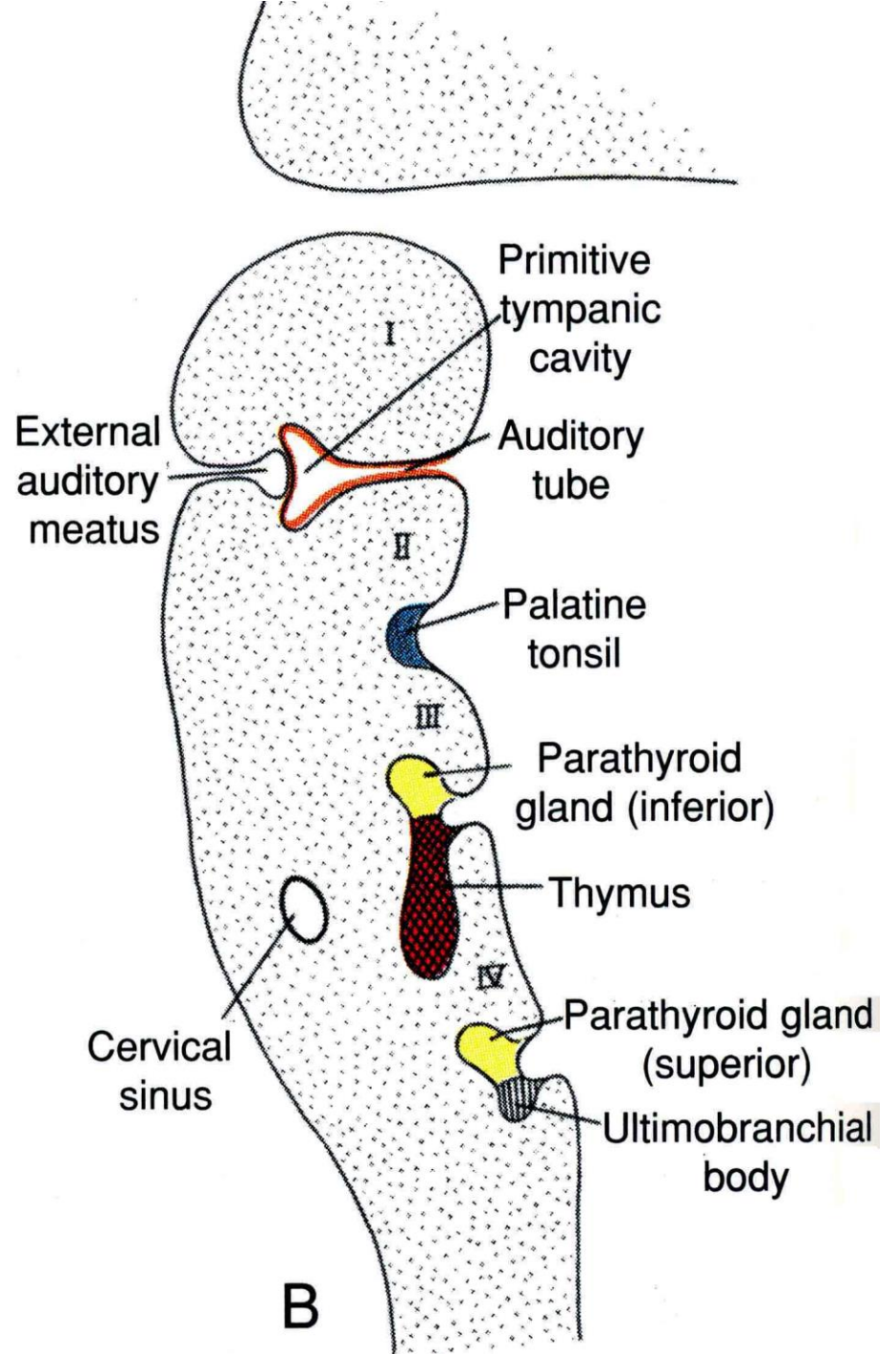
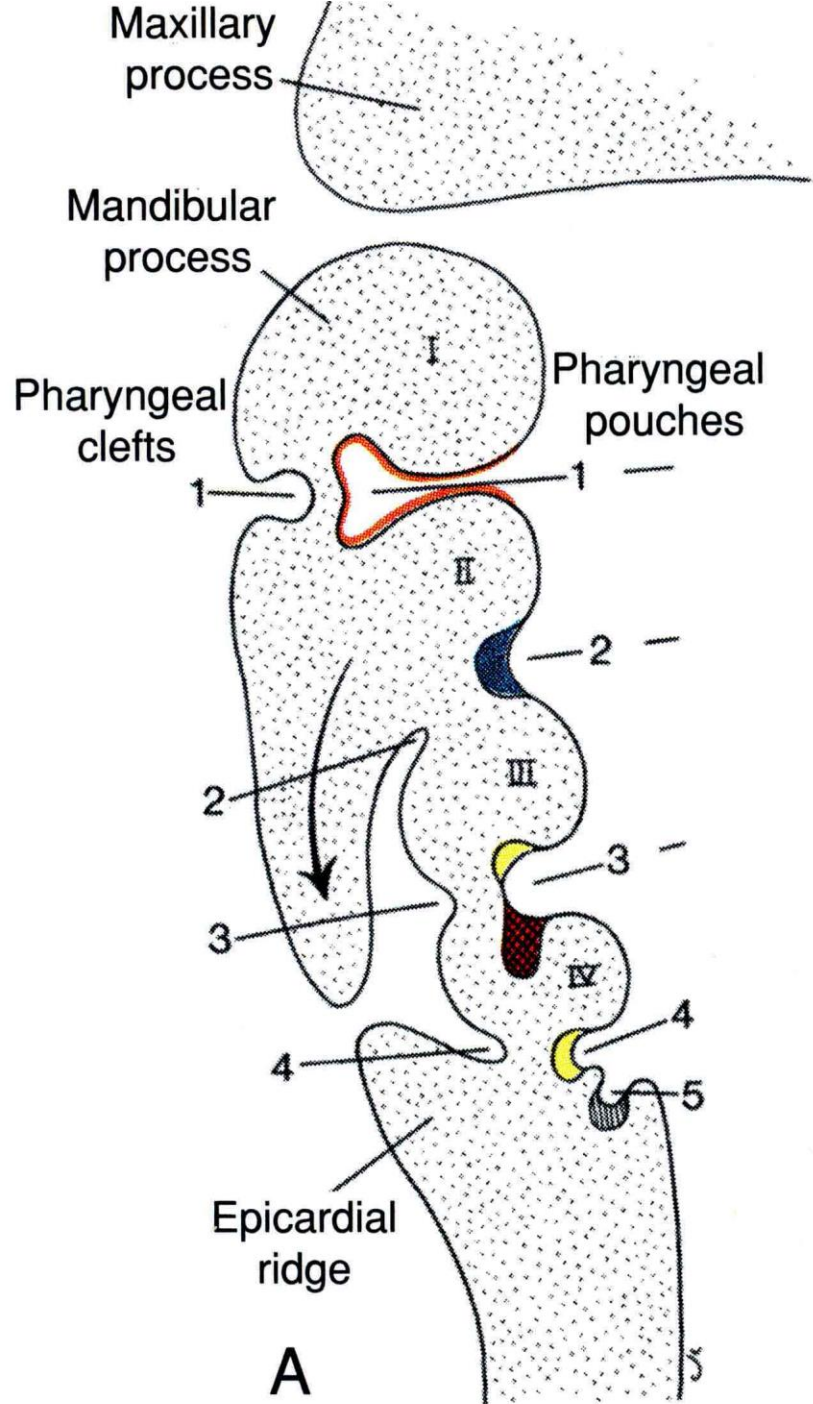


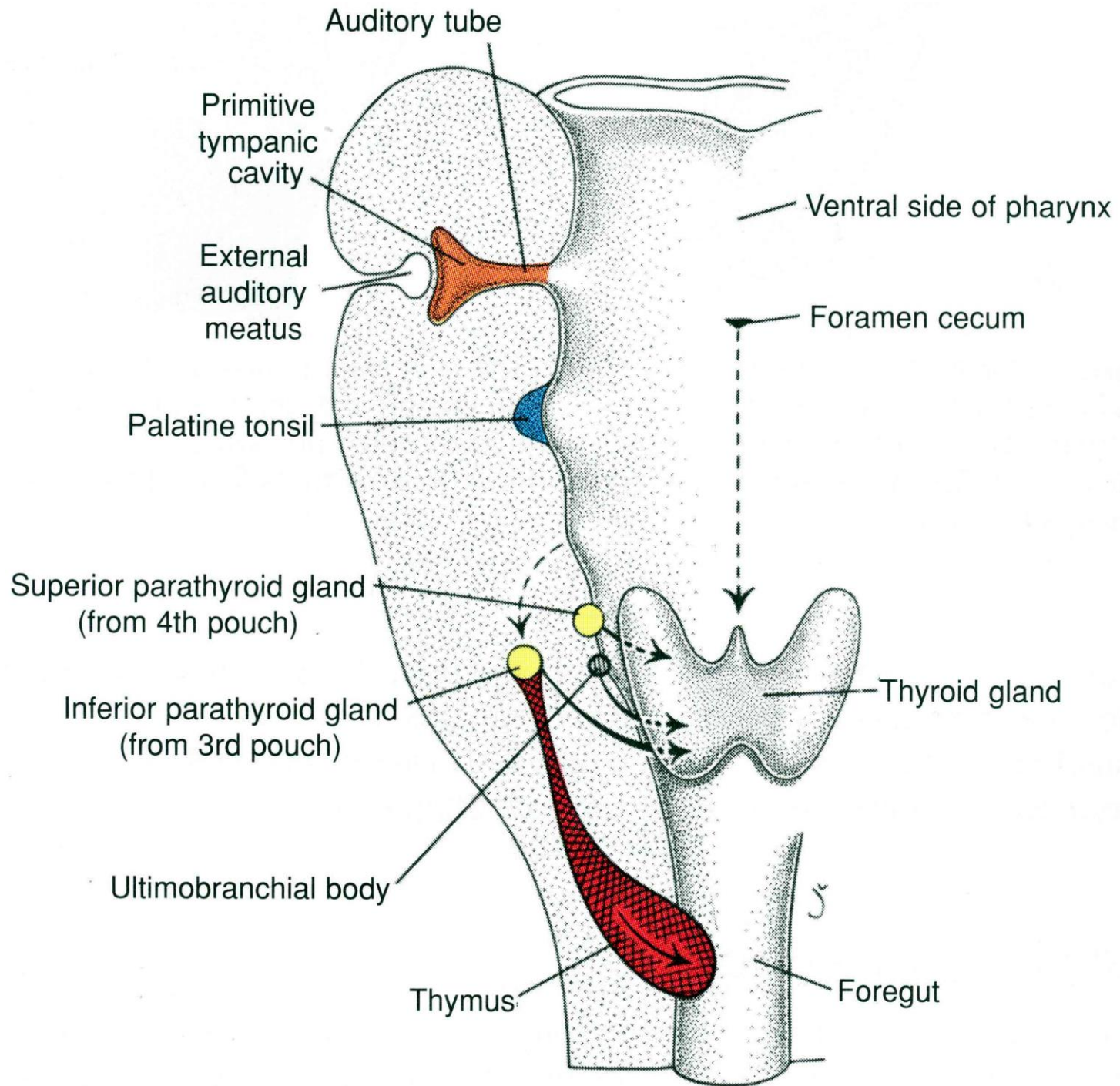


**TABLE 17.2** Derivatives of the Pharyngeal Pouches

Pharyngeal Pouch	Derivatives
1	Tympanic (middle ear) cavity Auditory (eustachian) tube
2	Palatine tonsils Tonsillar fossa
3	Inferior parathyroid gland Thymus
4	Superior parathyroid gland ultimobranchial body (parafollicular [C] cells of the thyroid gland)

# Faryngeální štěrbiny





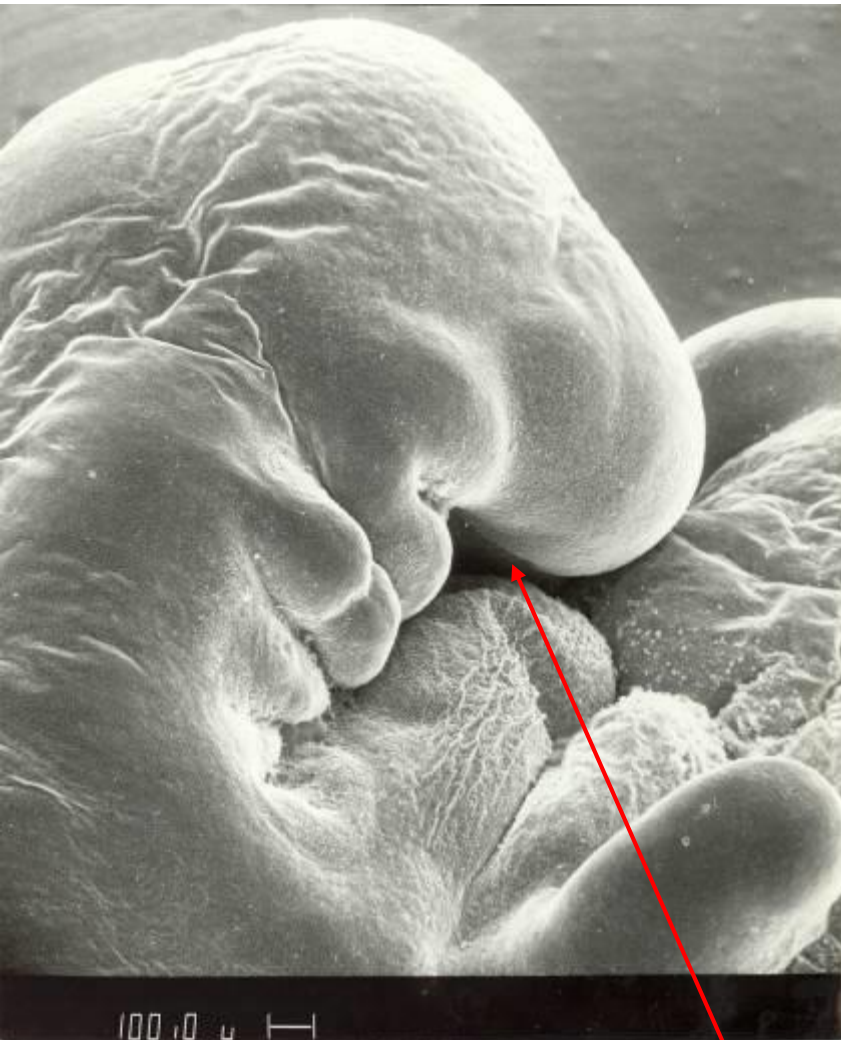
# Malá Beátka dobývá svět. Do osvěty o Treacher-Collins syndromu se zapojují i celebrity



**úterý, 12. února 2019, 18:54**

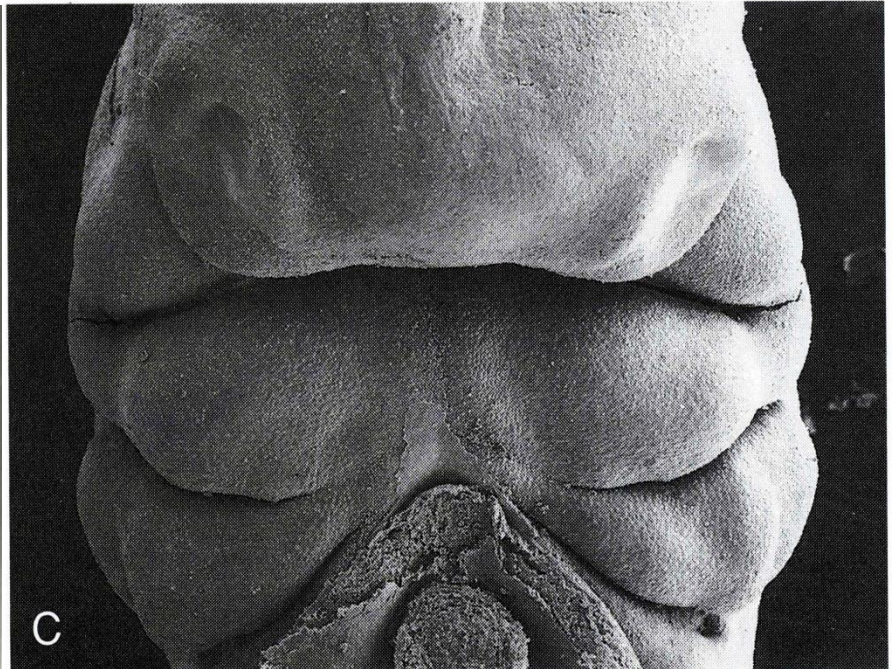
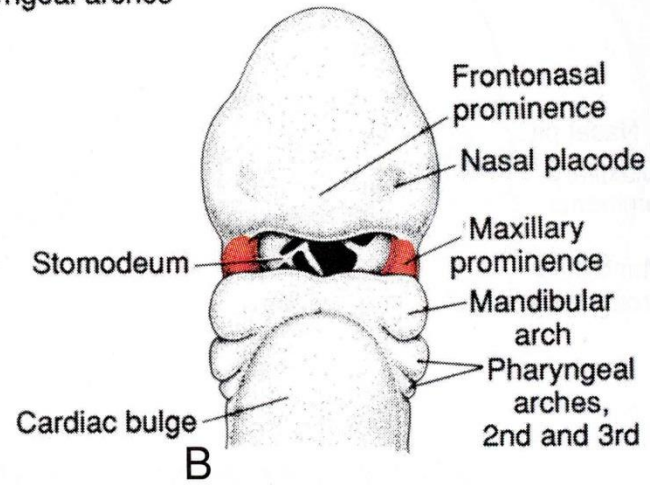
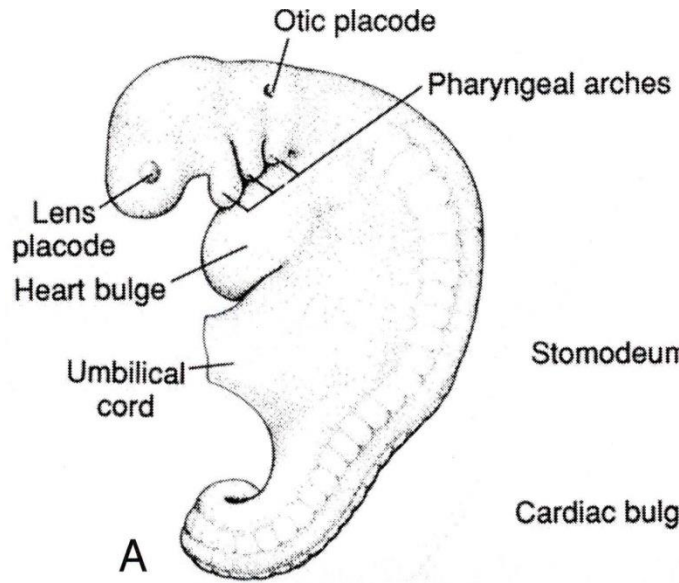
O malé Beátce, která trpí Treacher-Collins syndromem (TCS), už jsme psali v jednom z dílů pravidelného seriálu (Ne)Obyčejní. Její rodiče, Eliška a Dalibor, už se v té době snažili dostat do povědomí lidí, co vlastně TCS je. Jejich osvěta nabrala obrovských rozměrů a zapojují se do ní i slavné osobnosti.

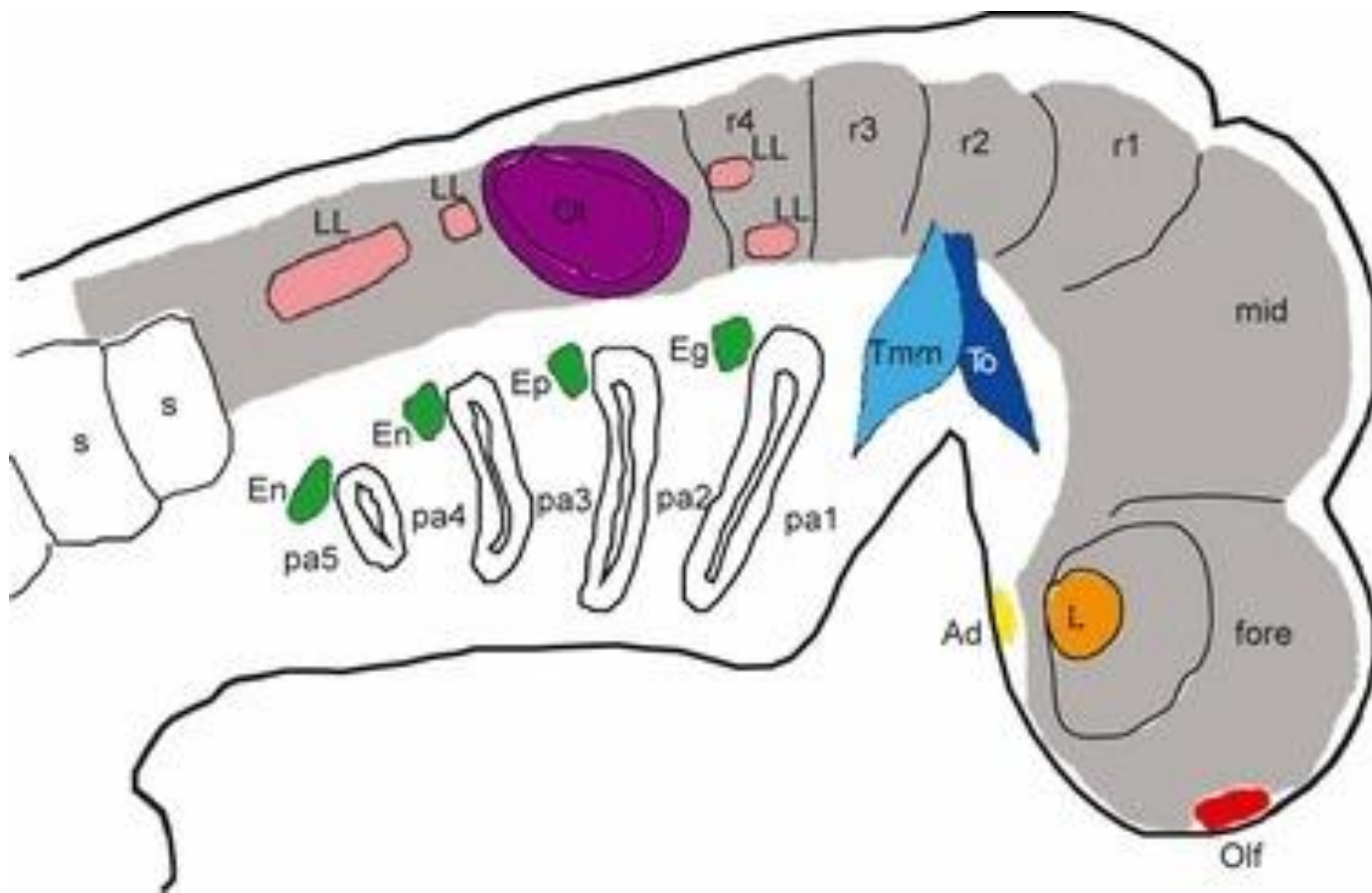
# **VÝVOJ OBLIČEJE, ÚSTNÍ A NOSNÍ DUTINY, PATRA A JAZYKA**

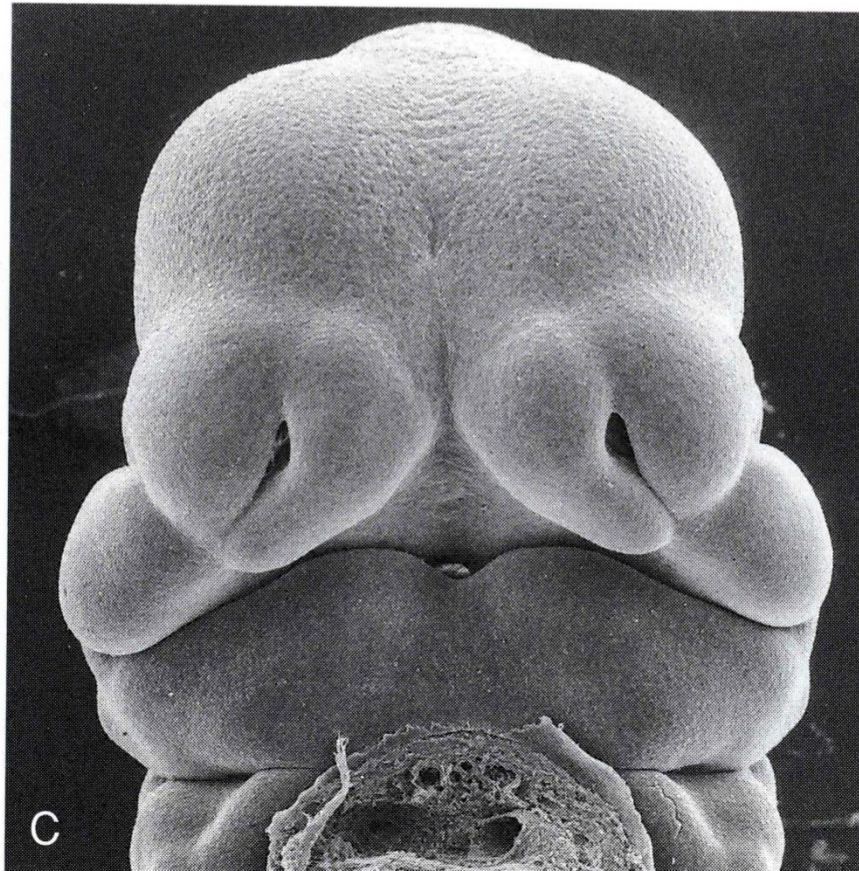
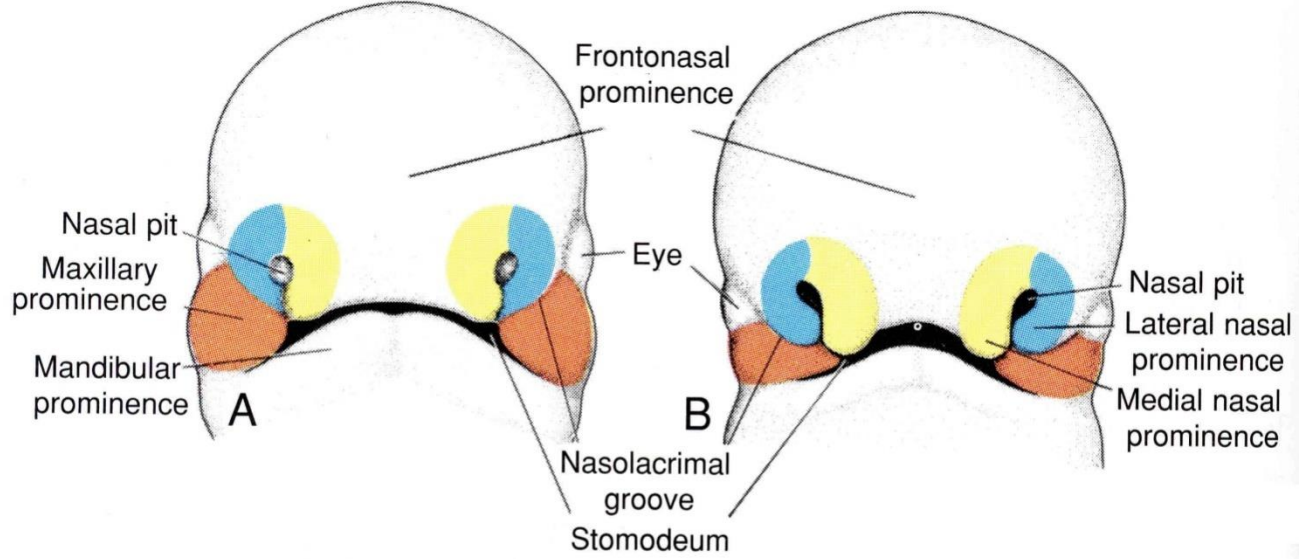


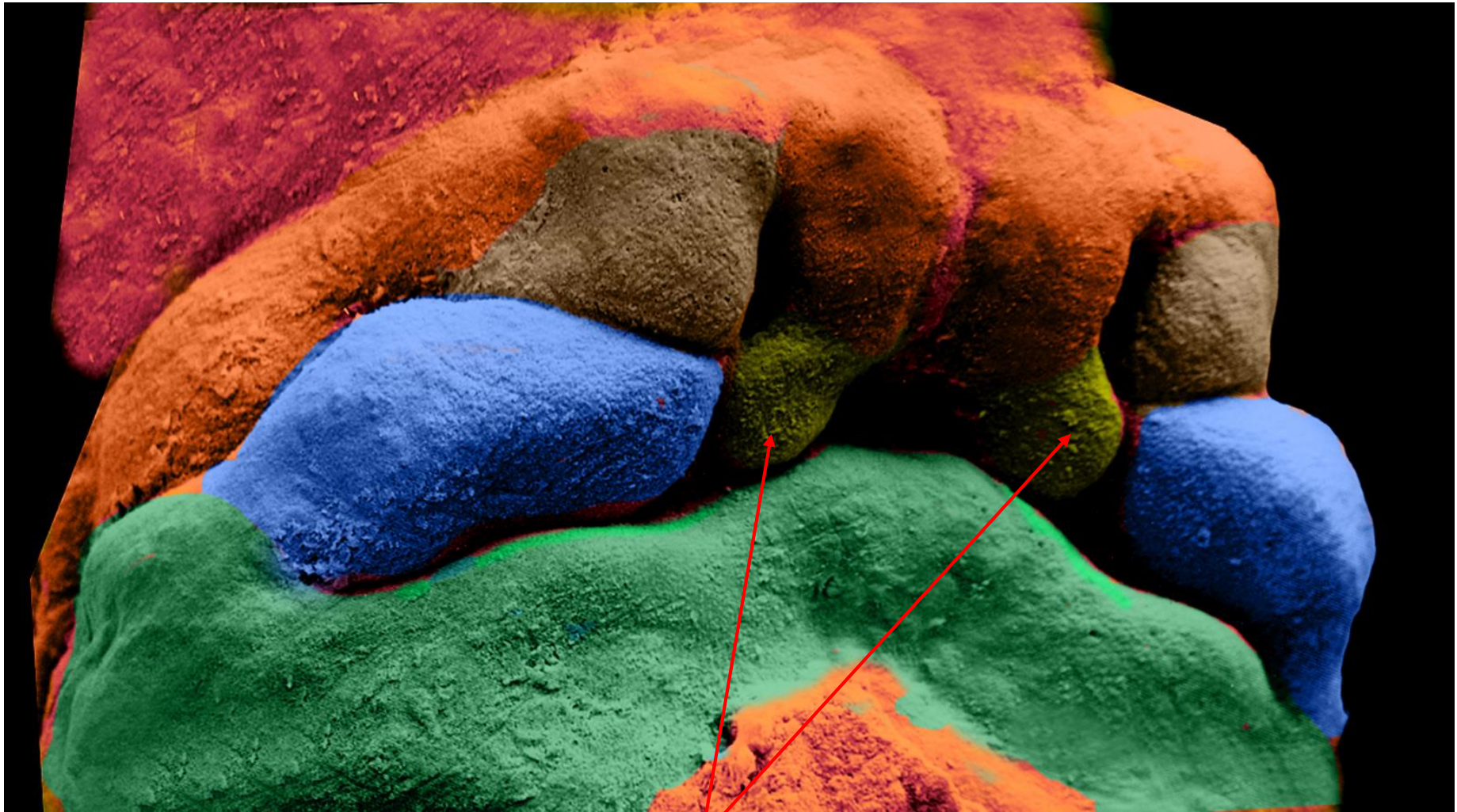
**stomodeum**



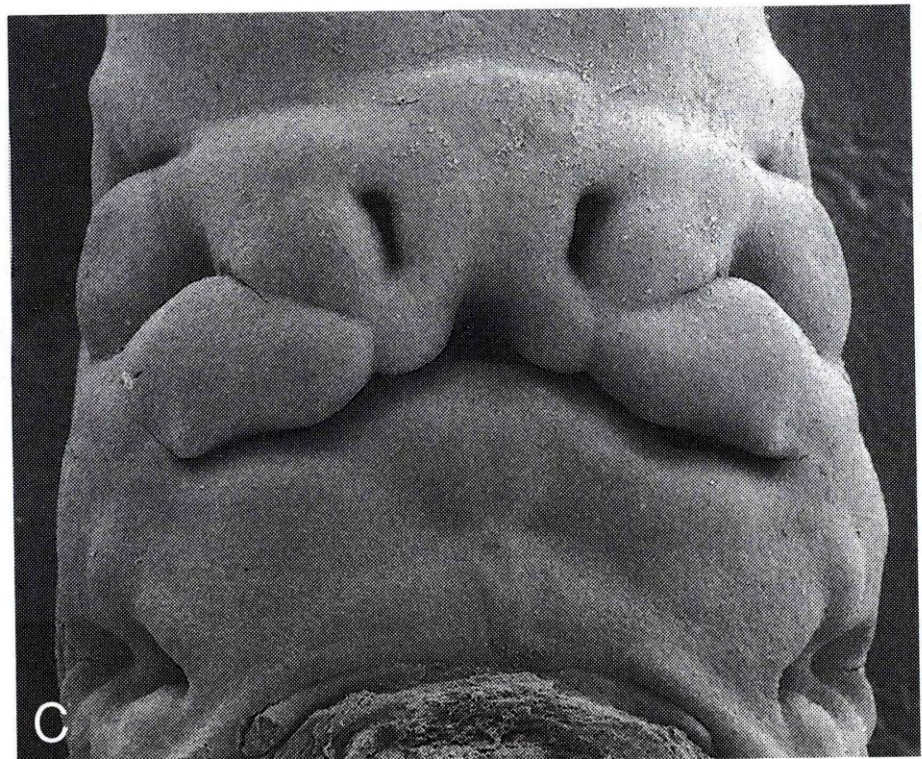
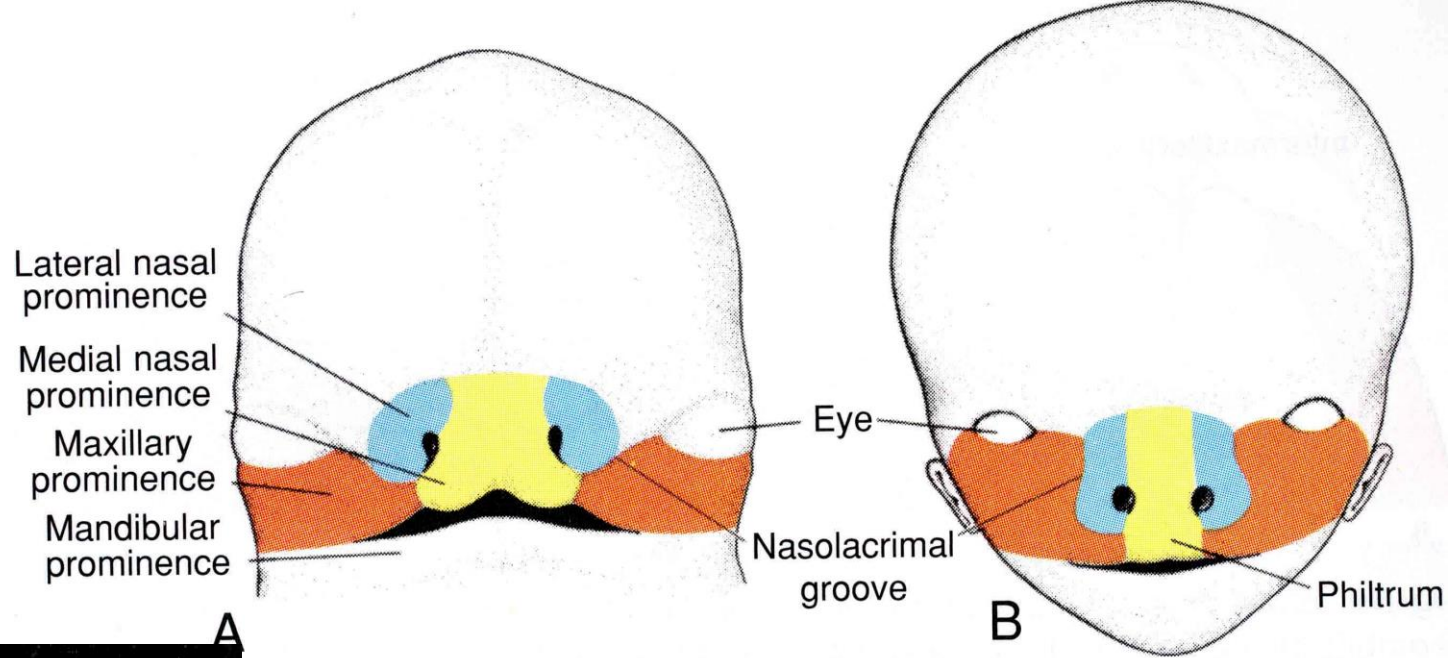








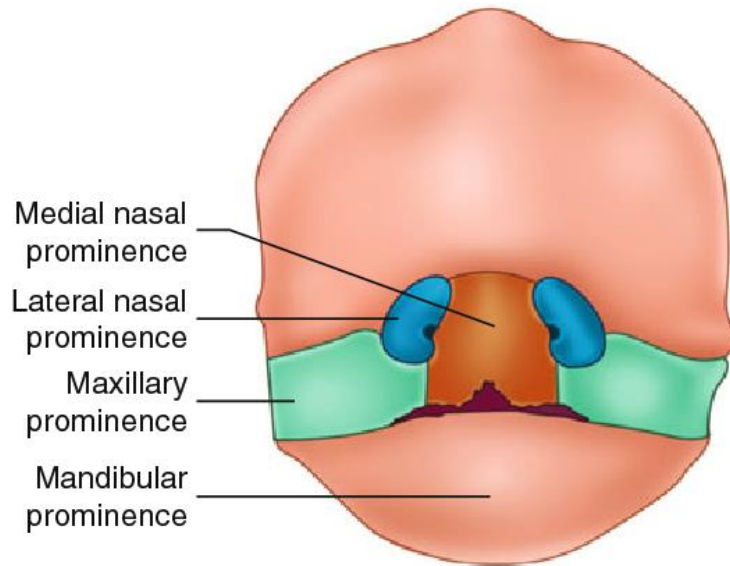
**premaxilární výběžky**



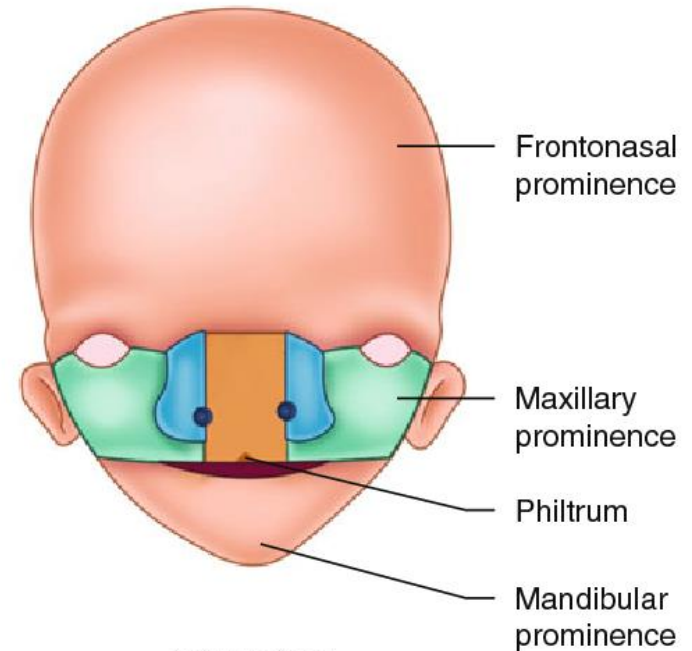
# intermaxilární segment



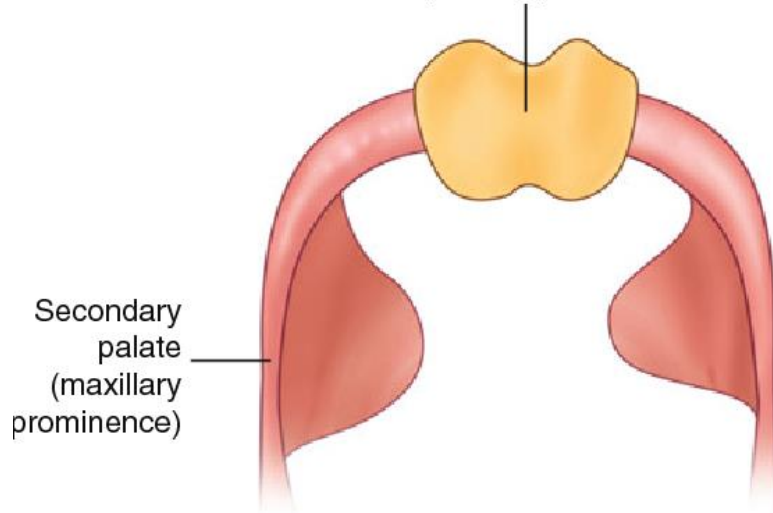
### Face



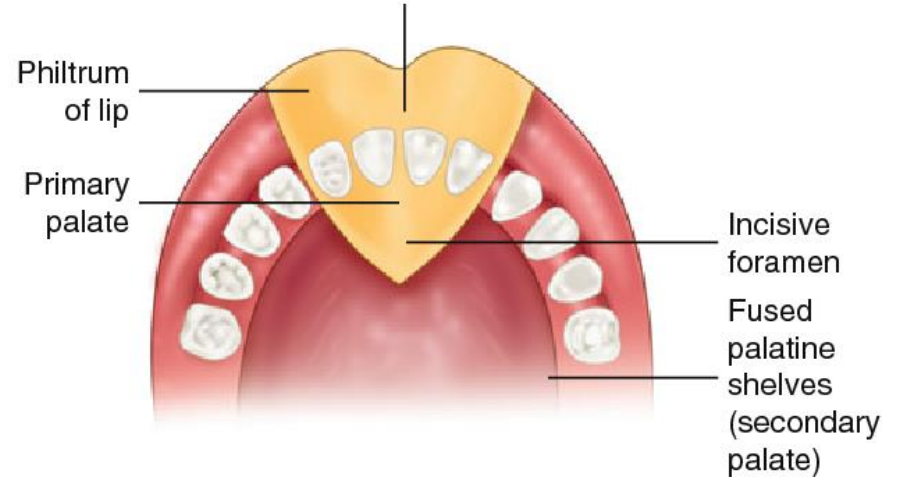
### Development



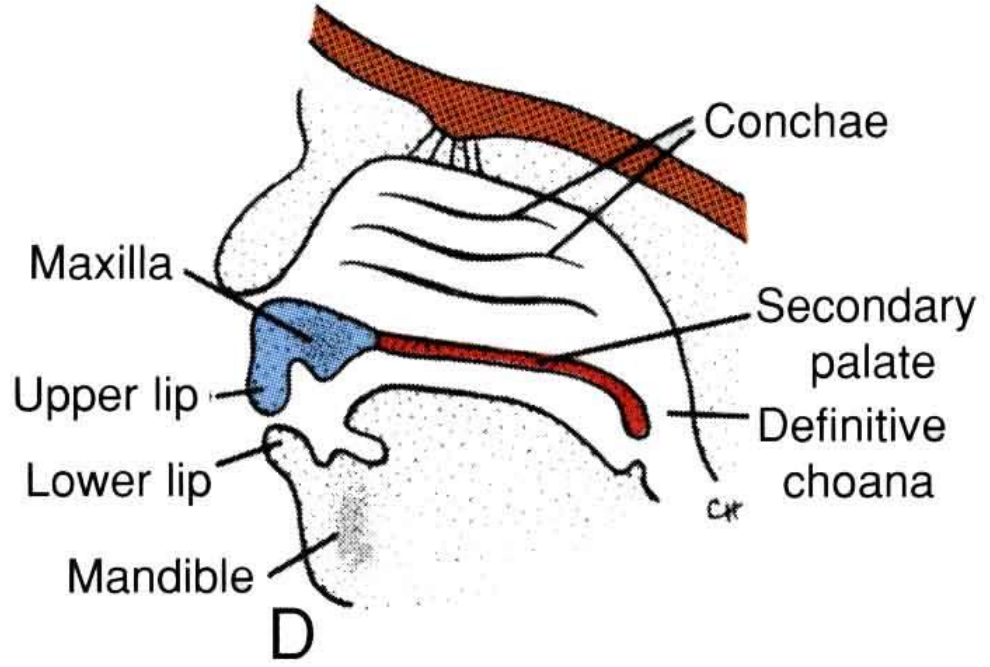
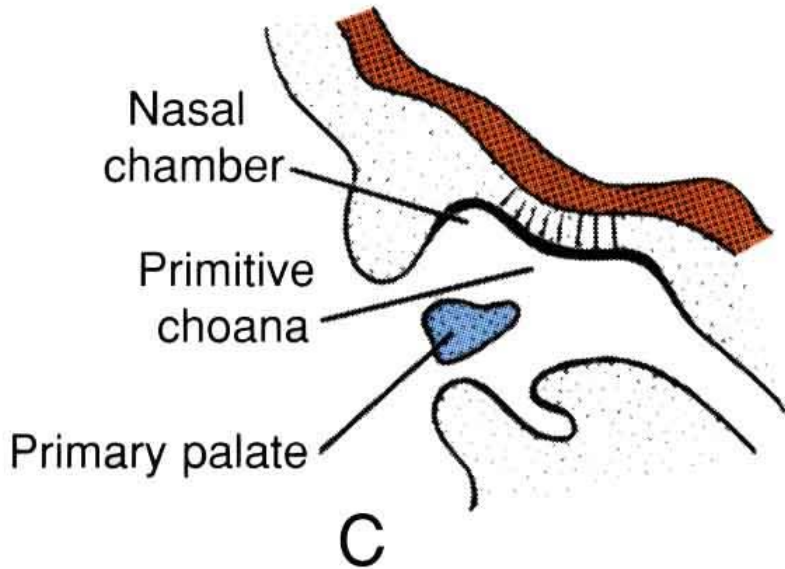
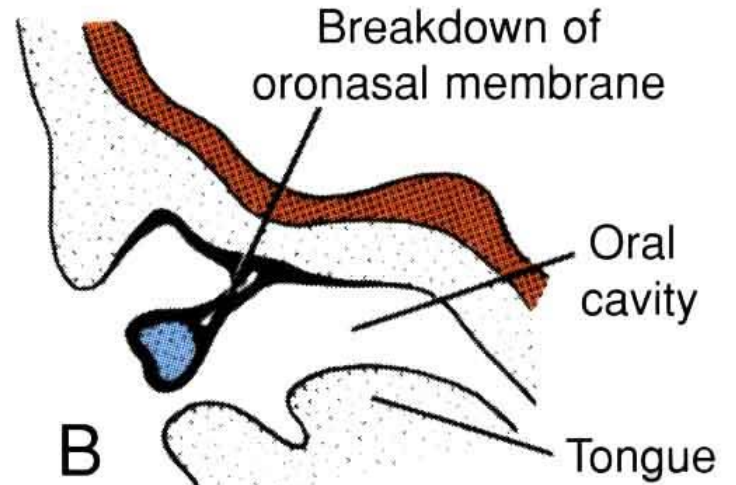
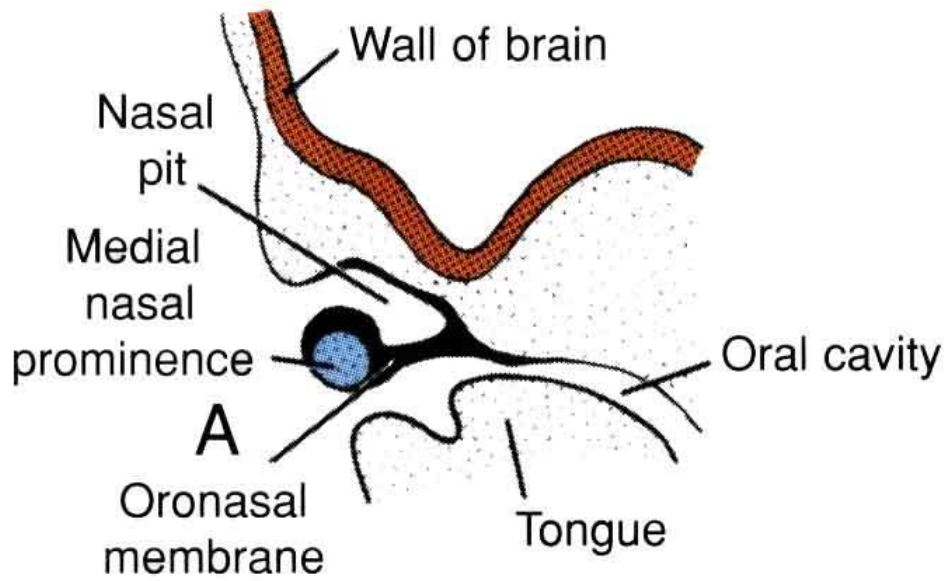
### Intermaxillary segment primary palate



### Four incisor teeth

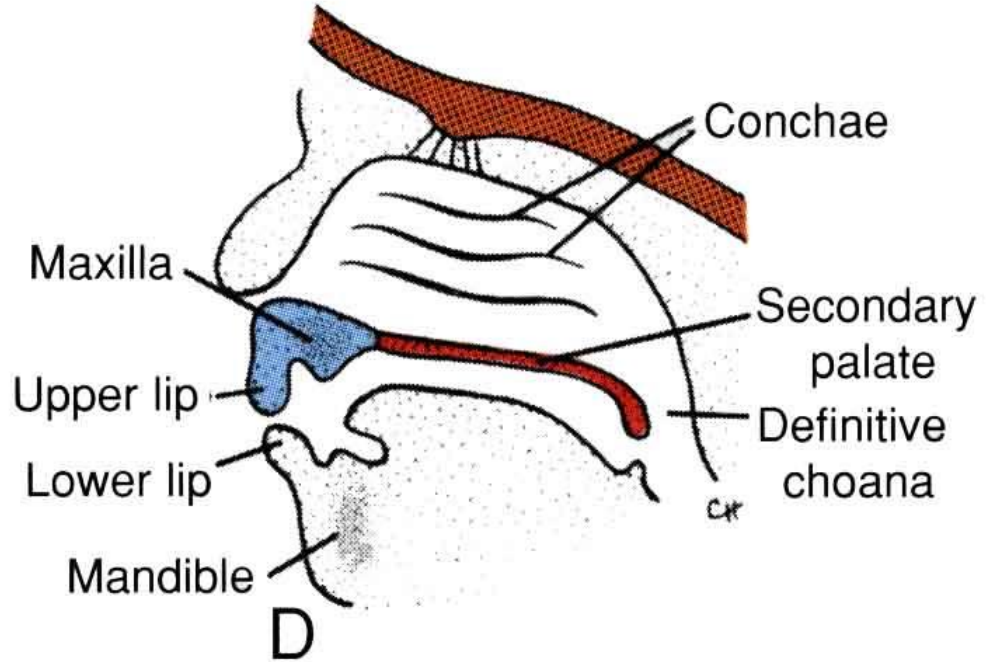
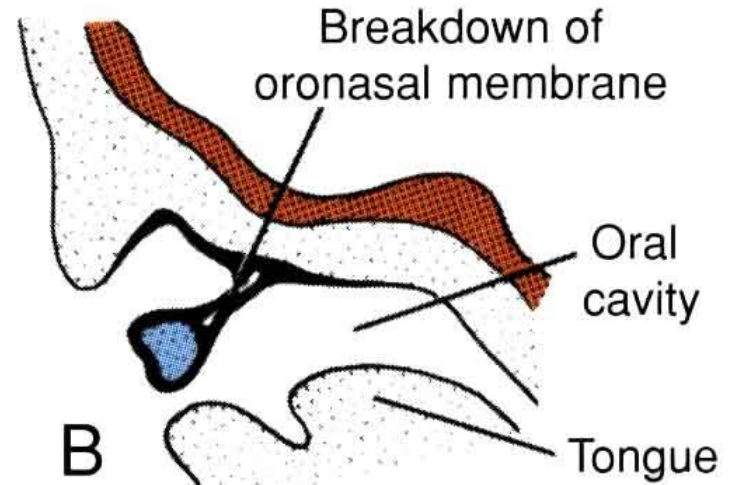
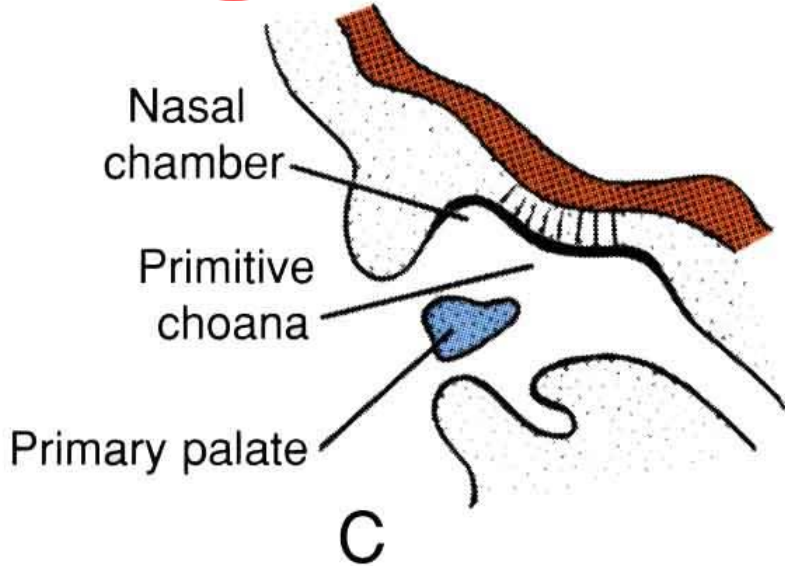
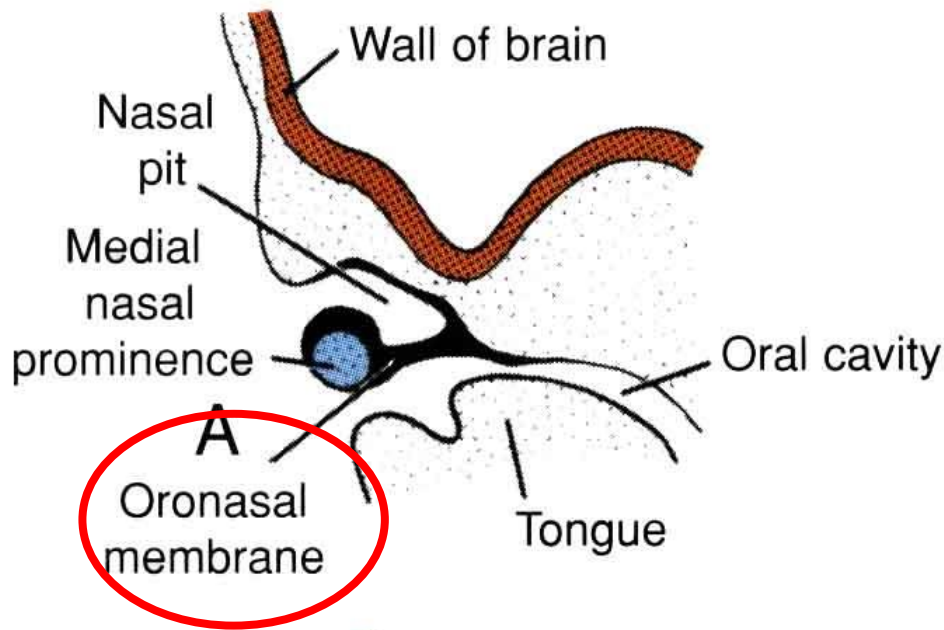


# Vývoj nosní dutiny

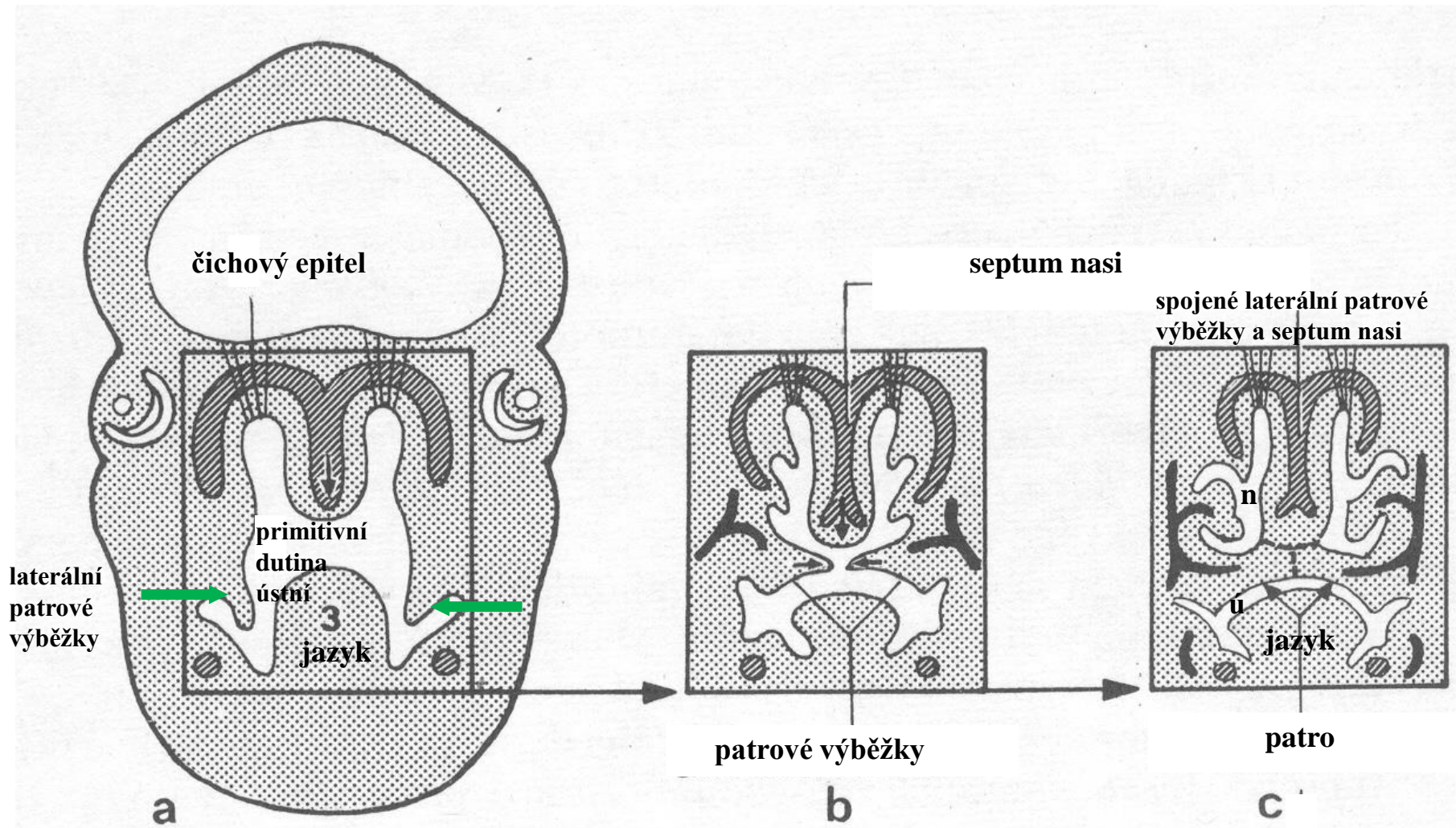




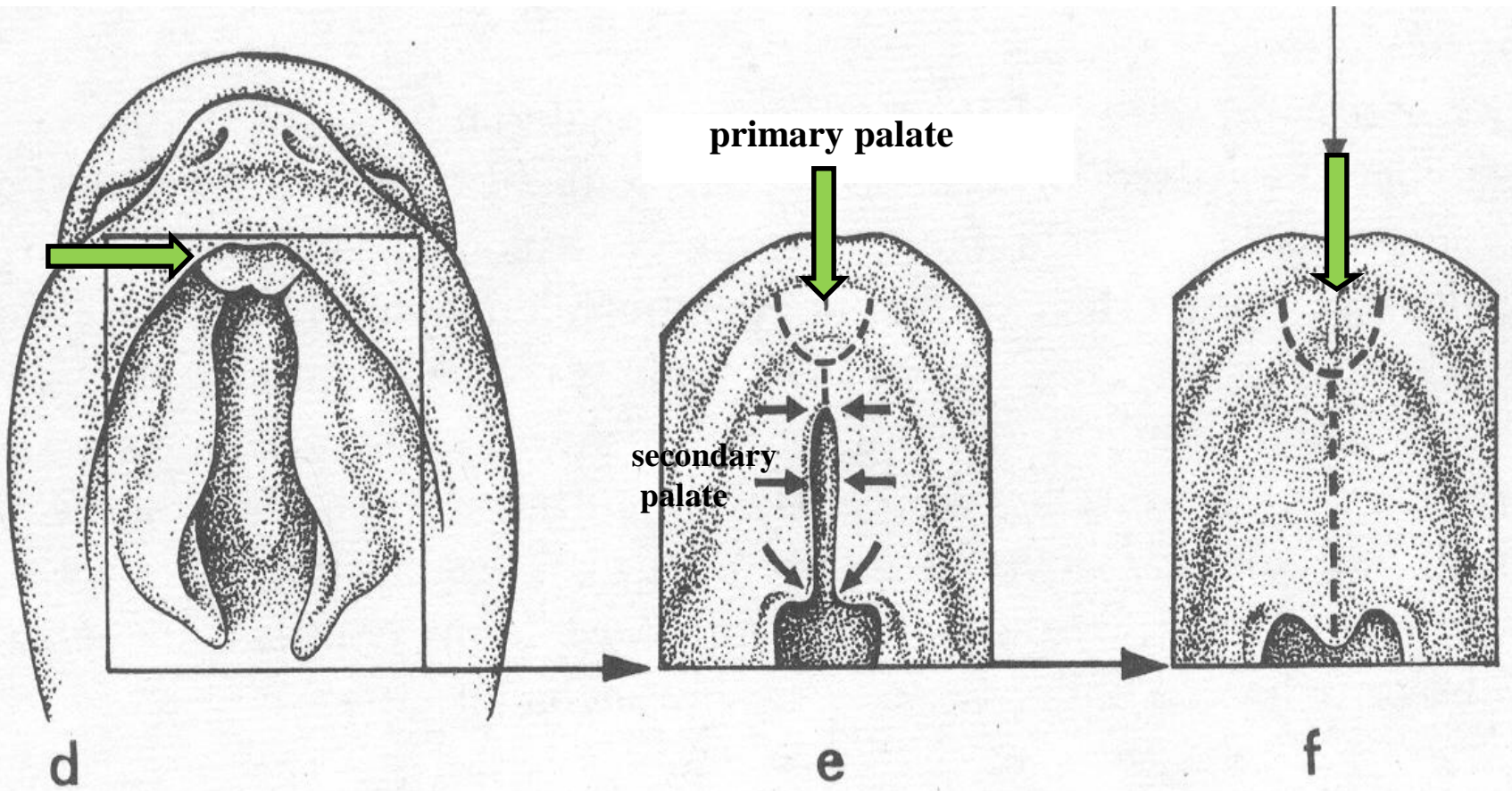
# Vývoj nosní dutiny

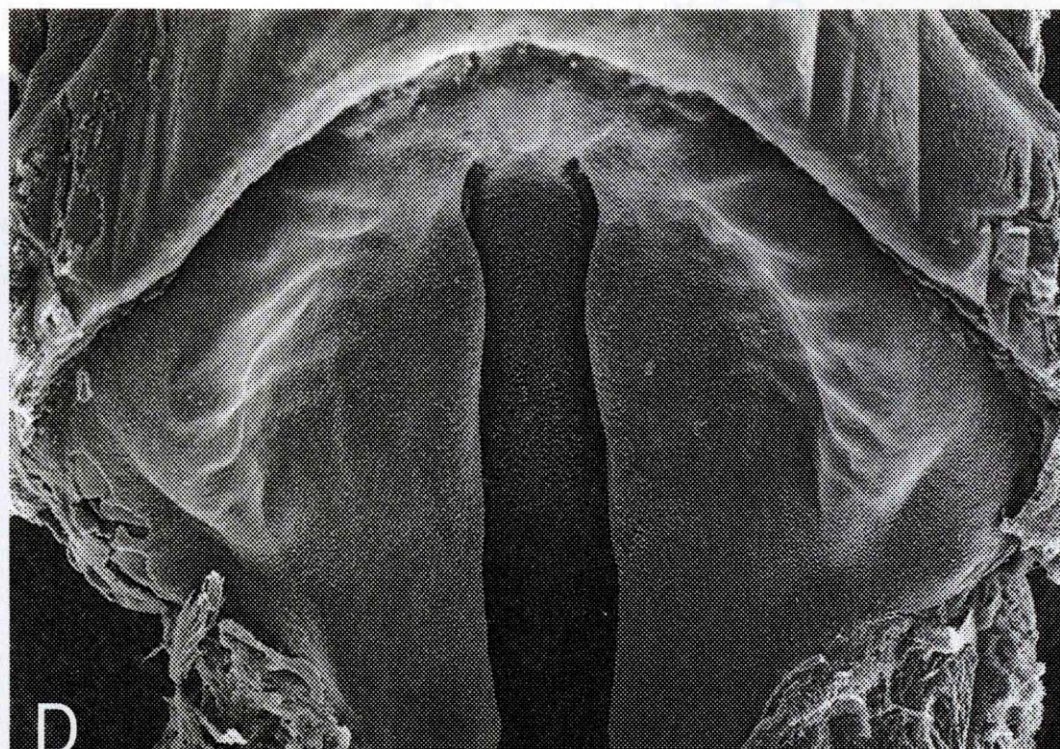
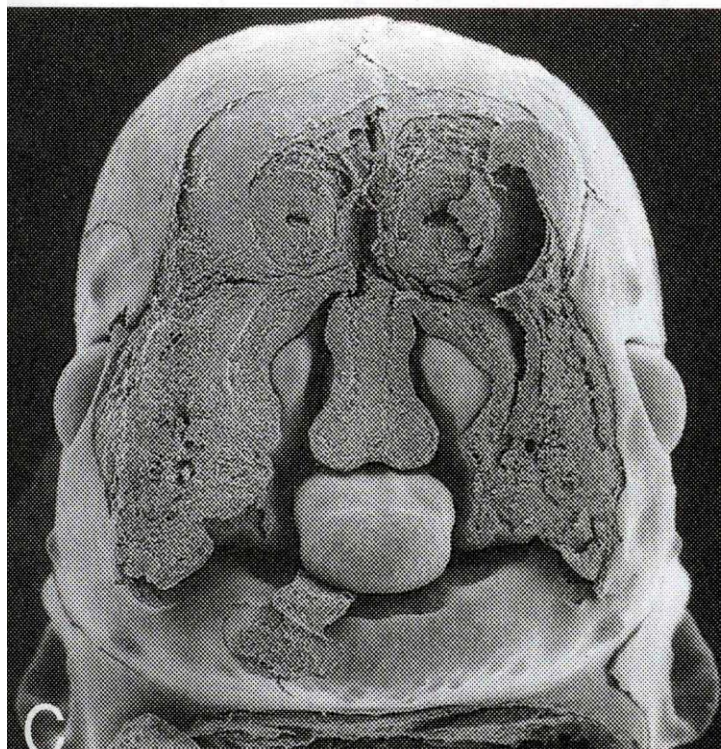
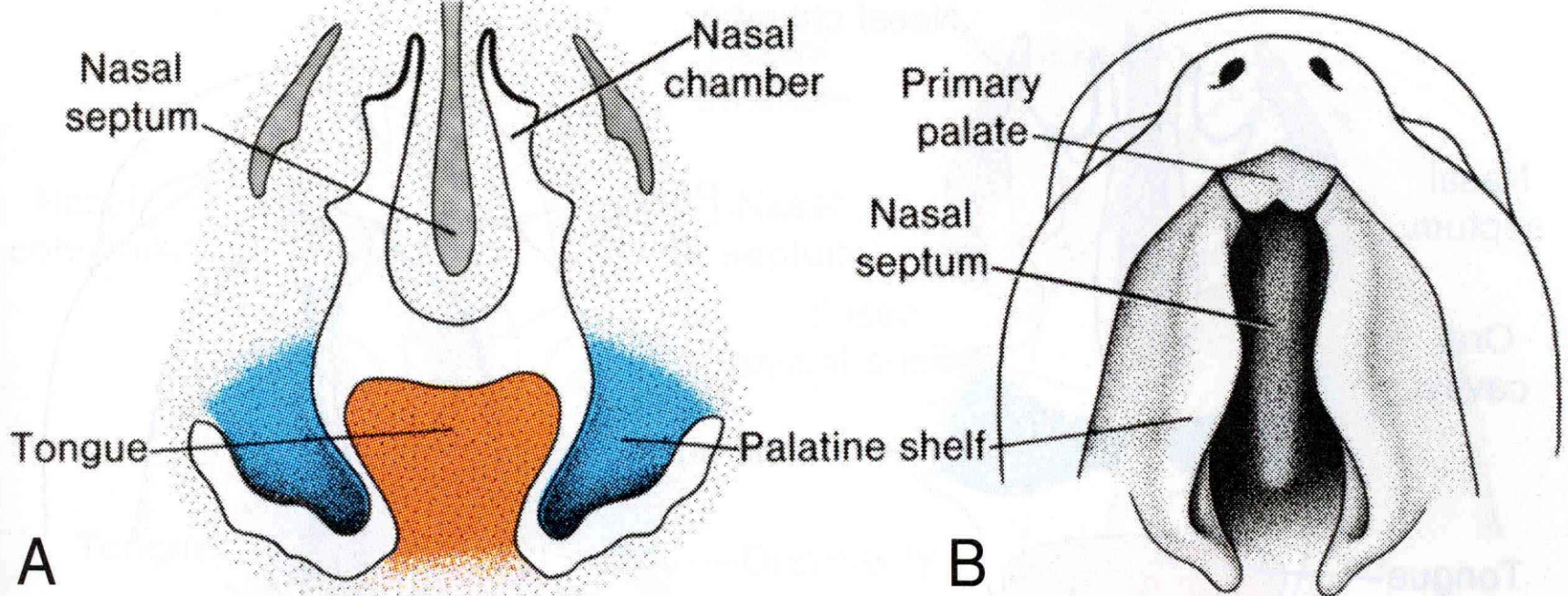


# vývoj patrových výběžků, patra, vývoj dutiny nosní, dutiny ústní

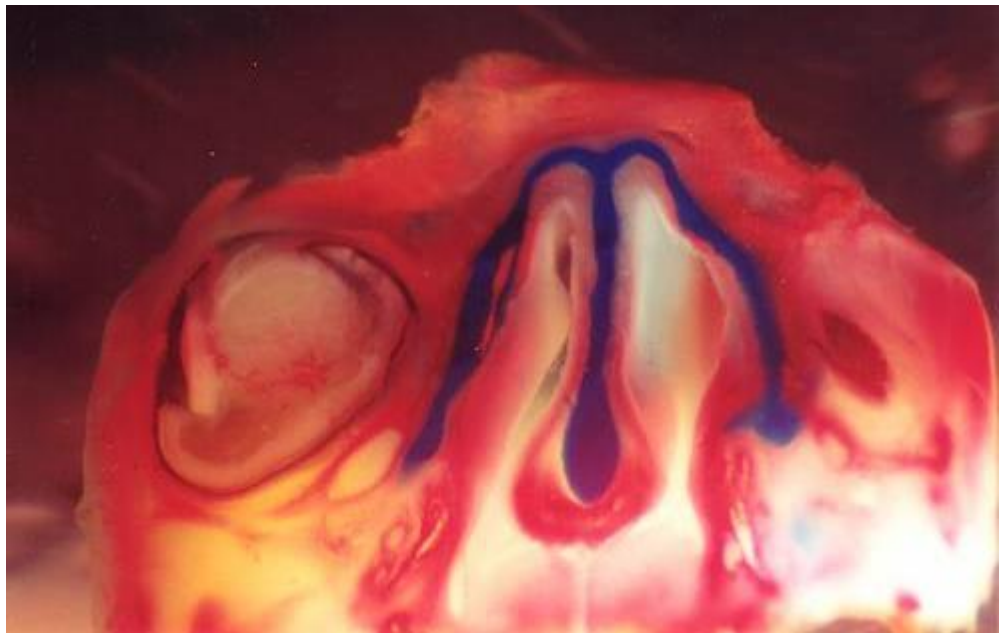


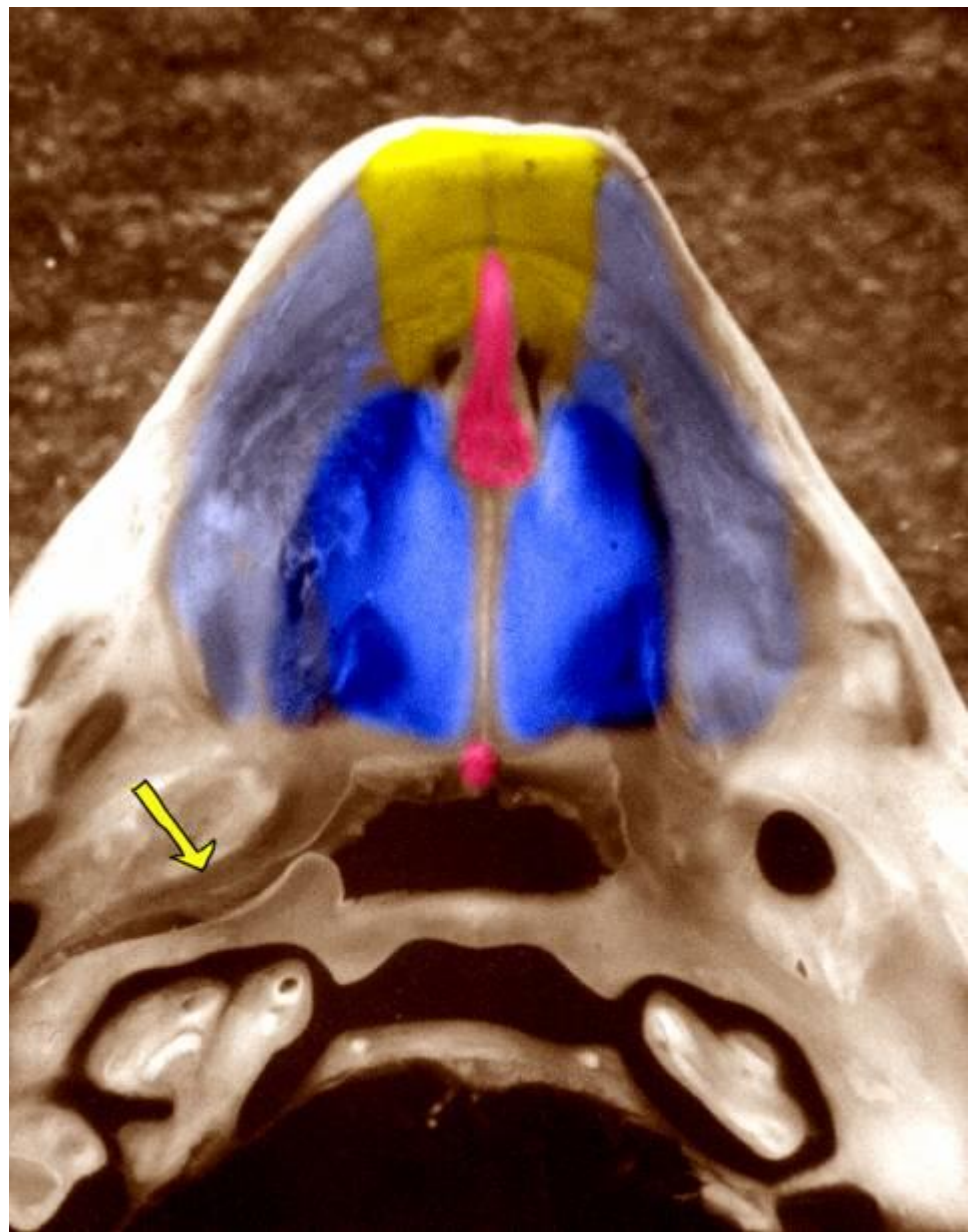
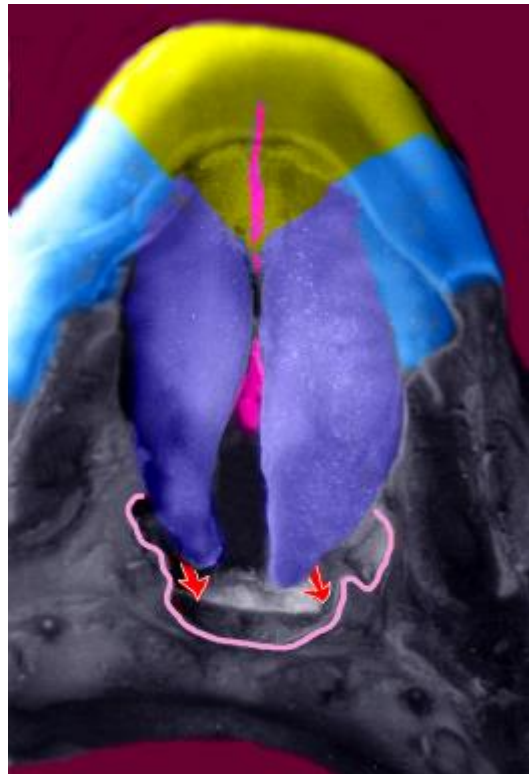
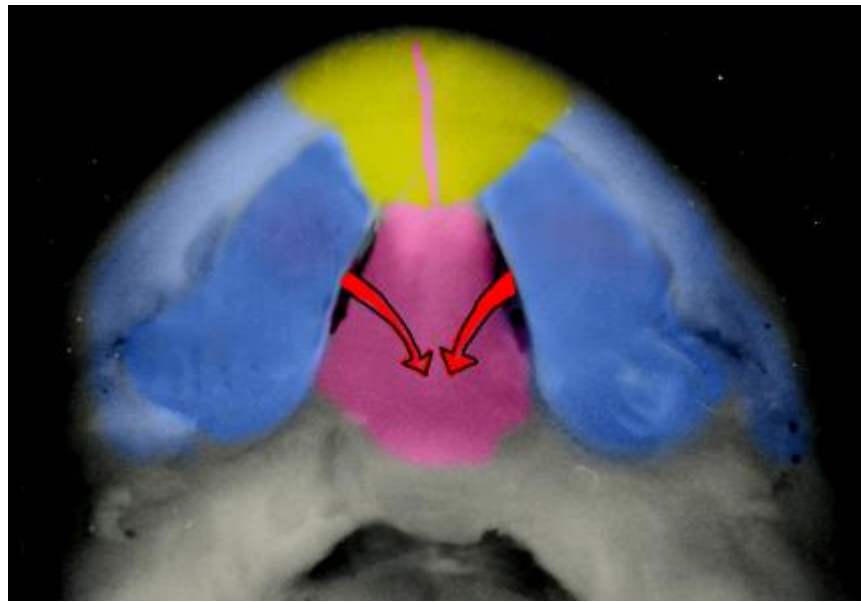
n= dutina nosní  
ú= dutina ústní





**uzavírání sekundárního patra**





# Hypoplázie vyvíjejícího se orgánu

Potlačení nebo  
snížení intenzity  
proliferace

hypoplázie  
vyvíjejícího se  
orgánu

# Hypoplázie vyvíjejícího se orgánu

Porucha proliferace  
obličejových  
výběžků

Obličejové  
rozštěpy







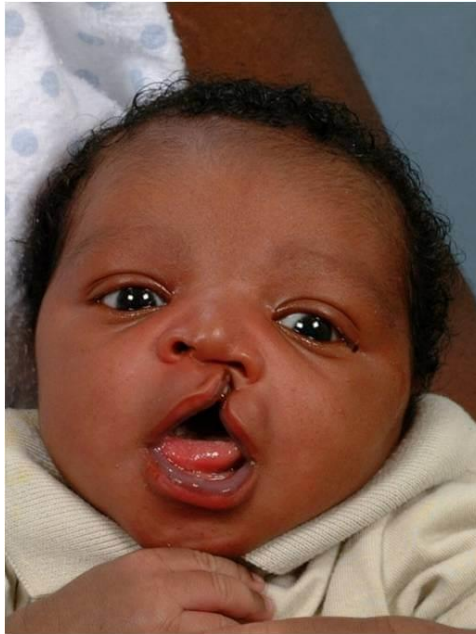
Unilateral Cleft Lip



Bilateral Cleft Lip



Cleft Palate



# Vývoj jazyka

*Will form anterior two thirds of tongue*

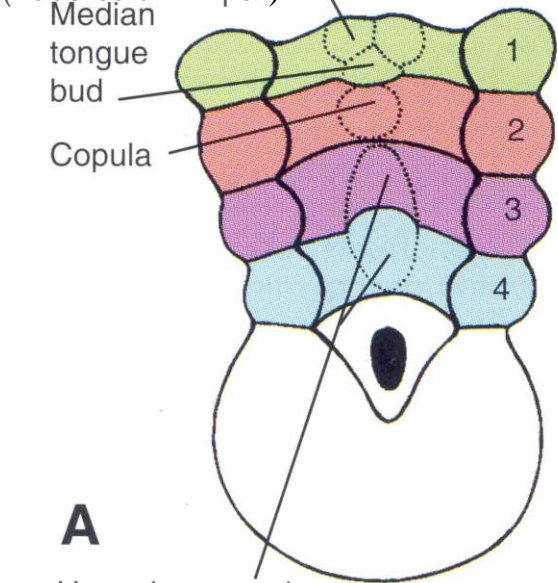
Foramen cecum

Terminal sulcus

(Lateral lingual swelling)  
Distal tongue bud

(Tuberculum impar)  
Median tongue bud

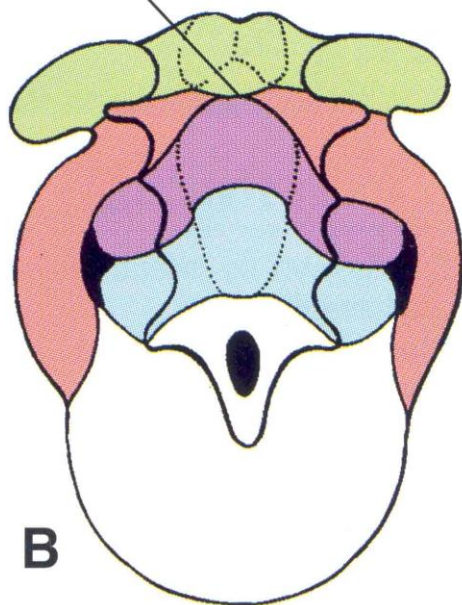
Copula



**A**

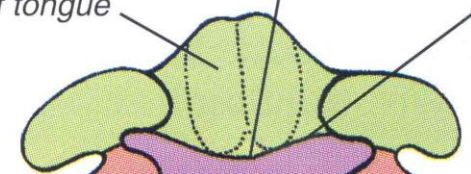
Hypopharyngeal eminence (hypobranchial) 4 weeks

Foramen cecum



**B**

5 weeks



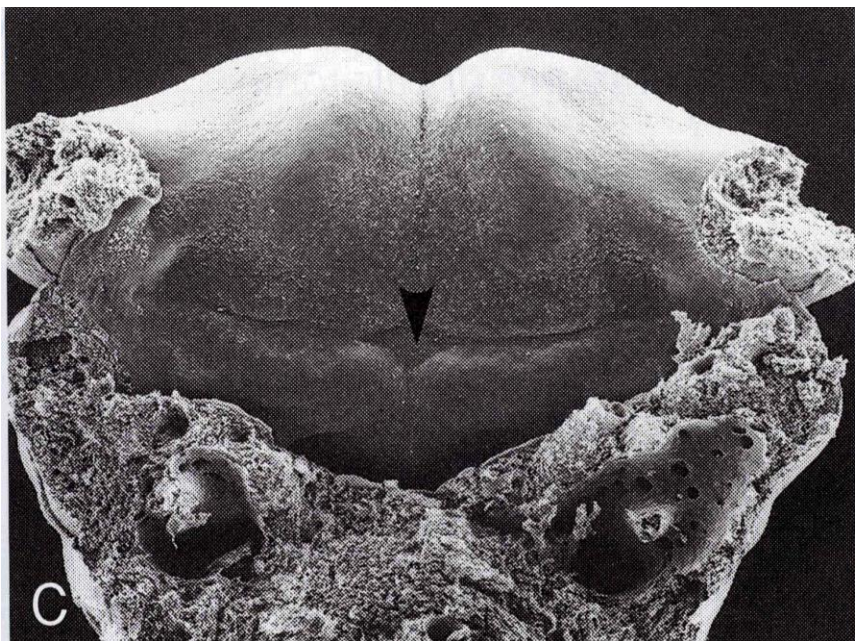
**D**

*Will form posterior one third of tongue*

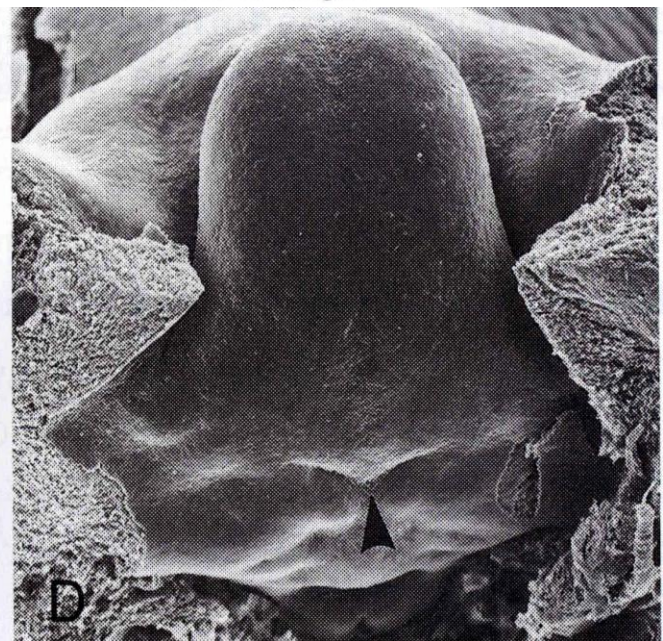
6 weeks

Palatine tonsil

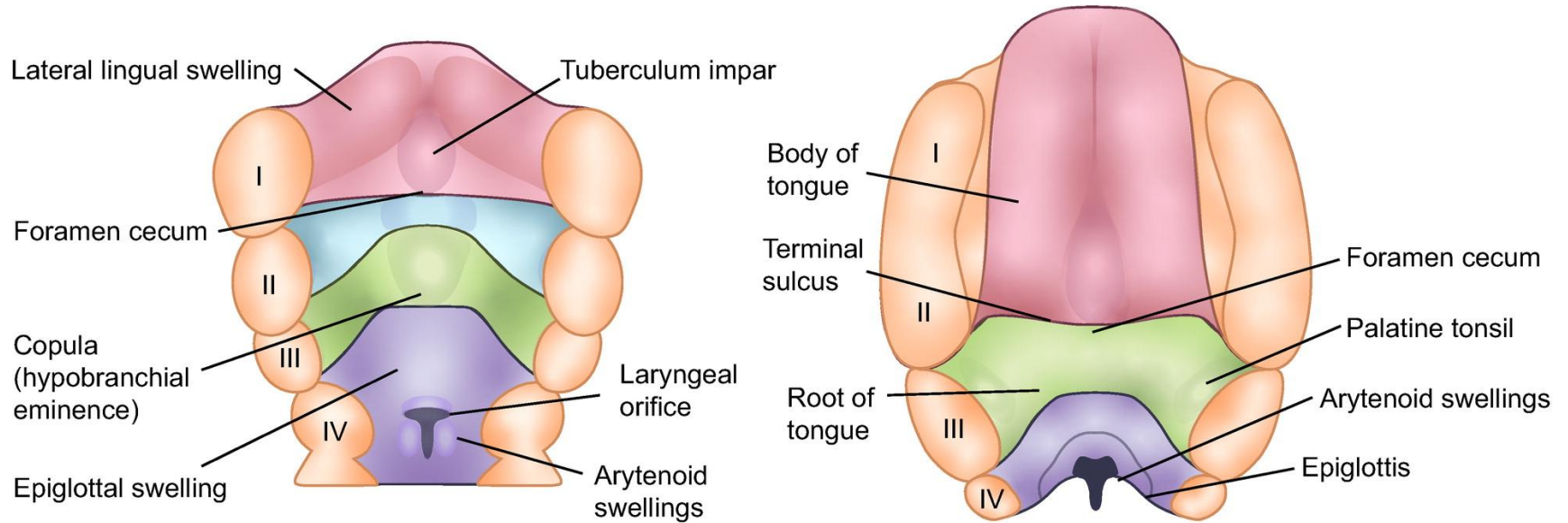
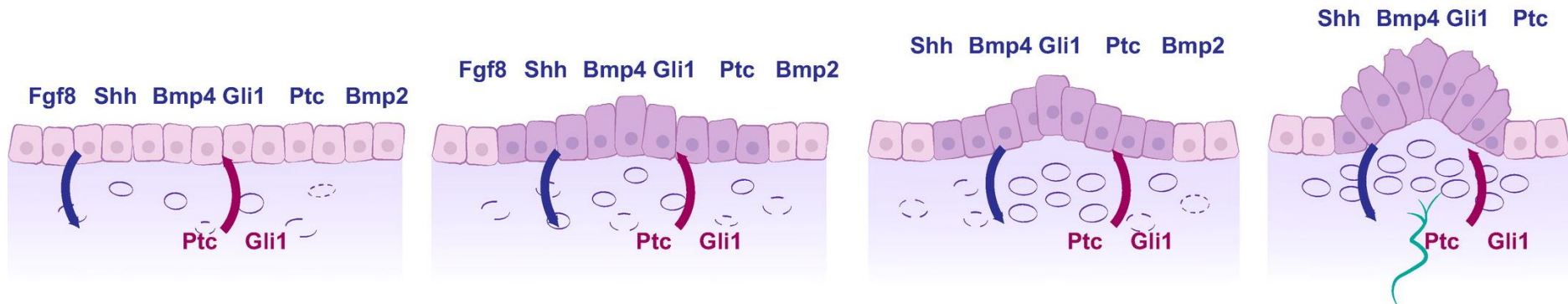
Epiglottis



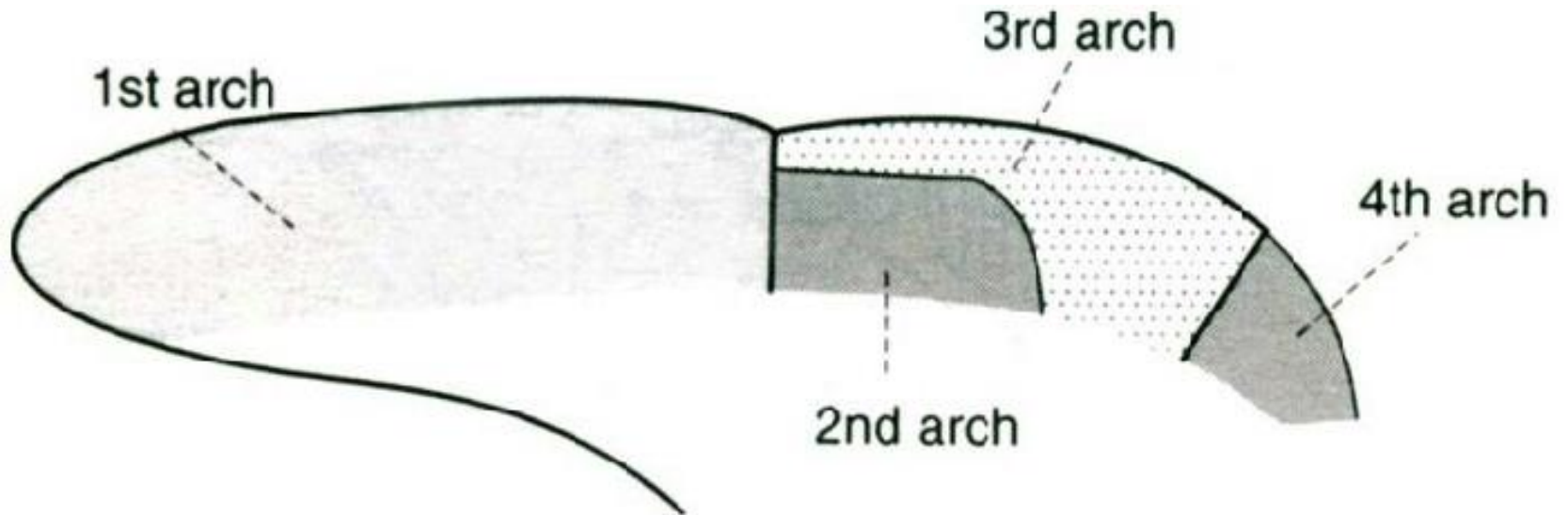
**C**



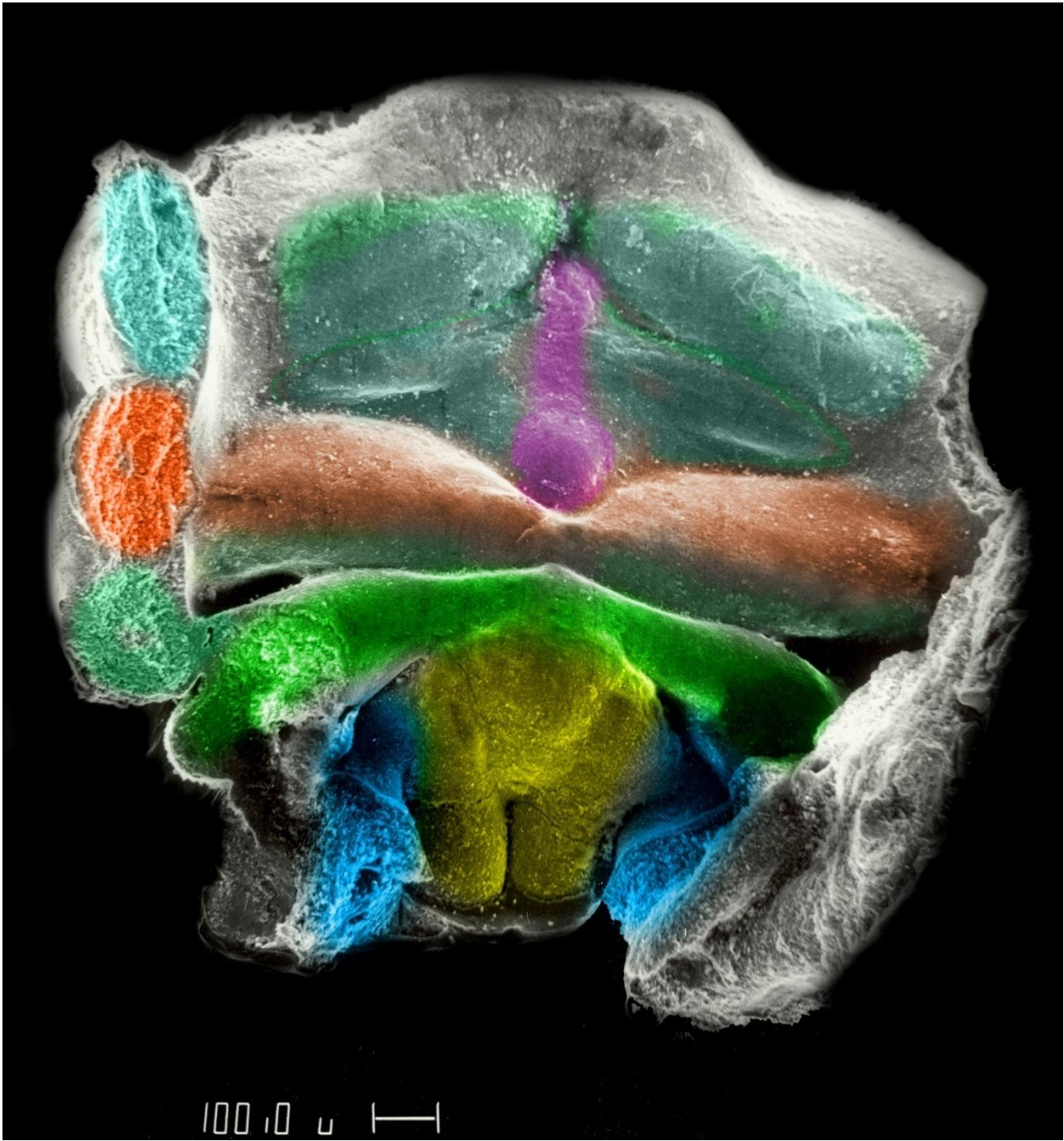
**D**

**A****B**

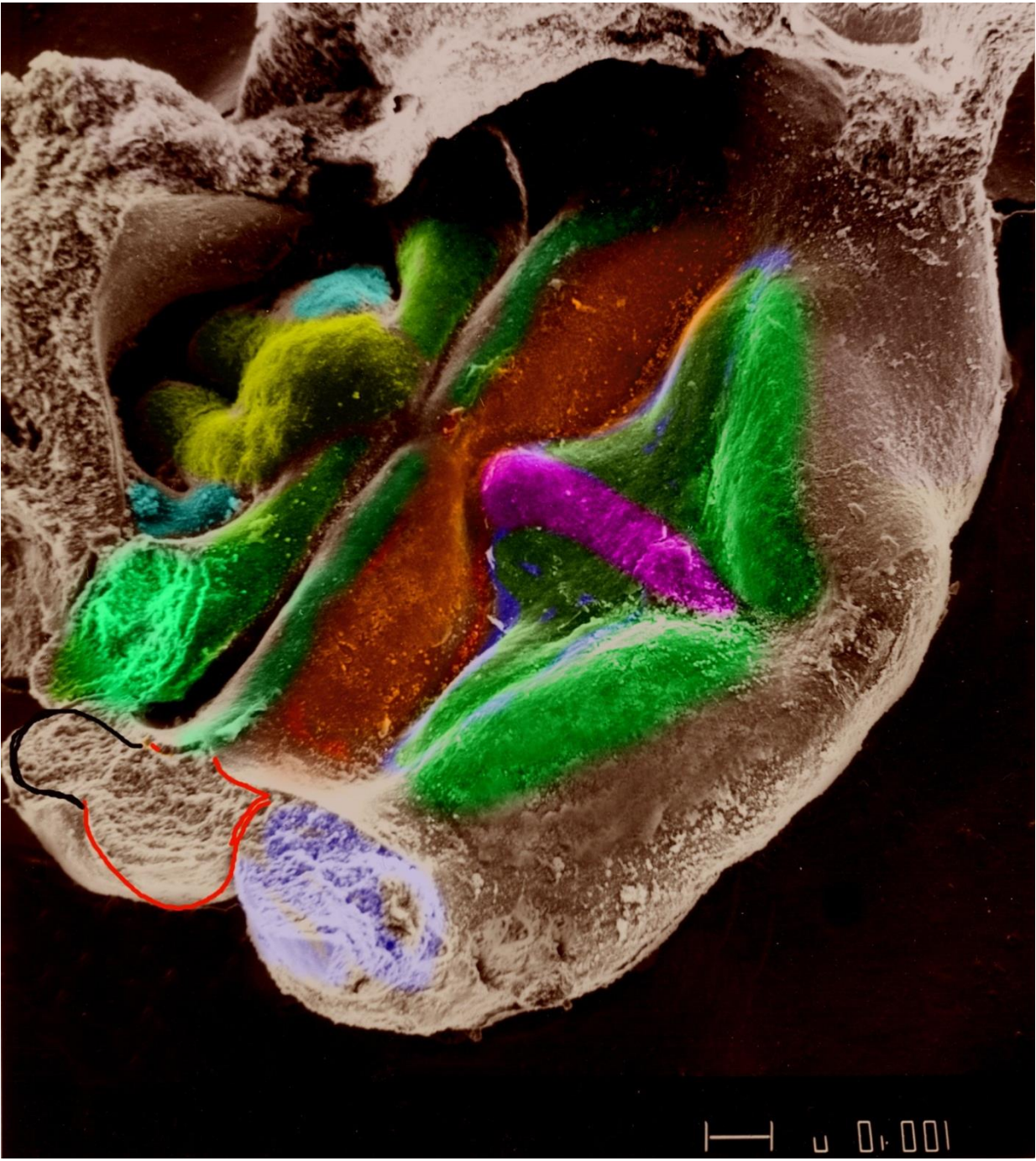
Doyle ME, Premathilake HU, Yao Q, Mazucanti CH, Egan JM. Physiology of the tongue with emphasis on taste transduction. *Physiol Rev.* 2023 Apr 1;103(2):1193-1246. doi: 10.1152/physrev.00012.2022. Epub 2022 Nov 24.



Surender, K. & Vasudev, K. & Balaram, Balamarathi & Raj, C. & Jadi, Lingaiah. (2015). A Pierre Robin Syndrome with Absent Anterior 2/3 Tongue—A Case Report. *International Journal of Otolaryngology and Head & Neck Surgery*. 04. 417-422. 10.4236/ijohns.2015.46067.



100.0 μm



# Vývoj jazyka

*Will form anterior two thirds of tongue*

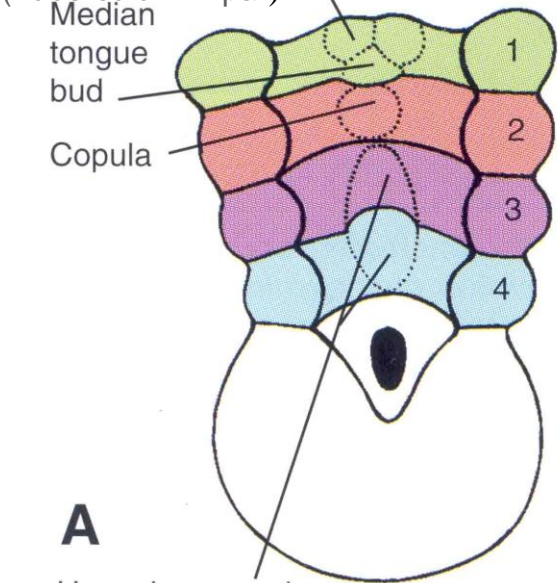
Foramen cecum

Terminal sulcus

(Lateral lingual swelling)  
Distal tongue bud

(Tuberculum impar)  
Median tongue bud

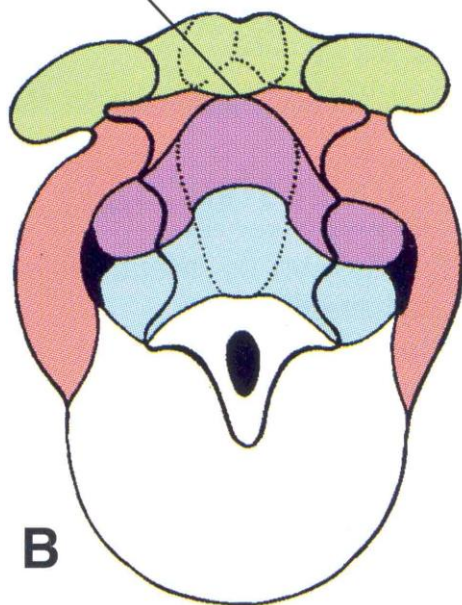
Copula



**A**

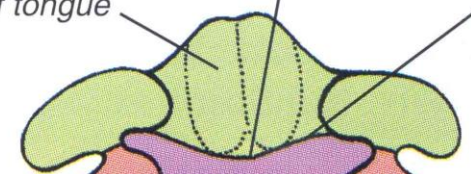
Hypopharyngeal eminence (hypobranchial) 4 weeks

Foramen cecum



**B**

5 weeks



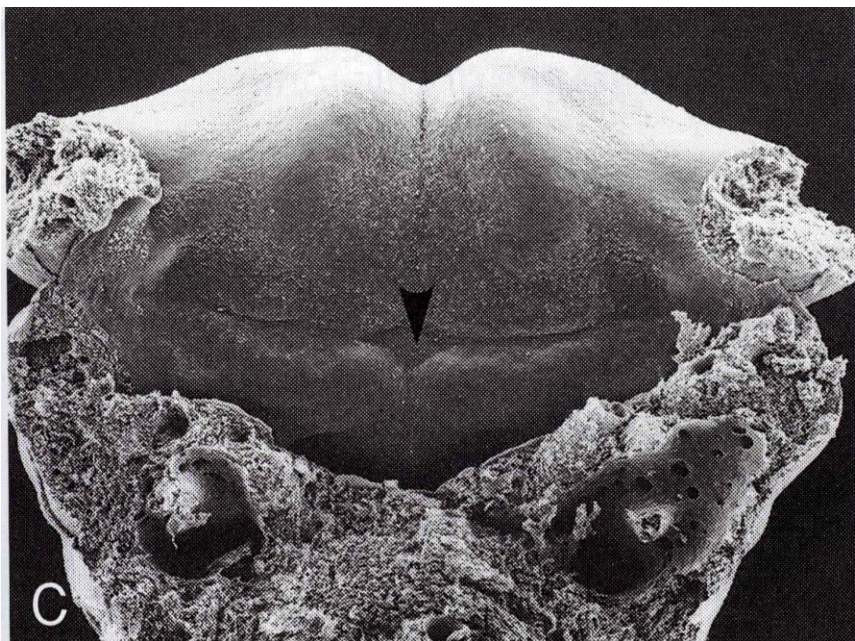
**D**

*Will form posterior one third of tongue*

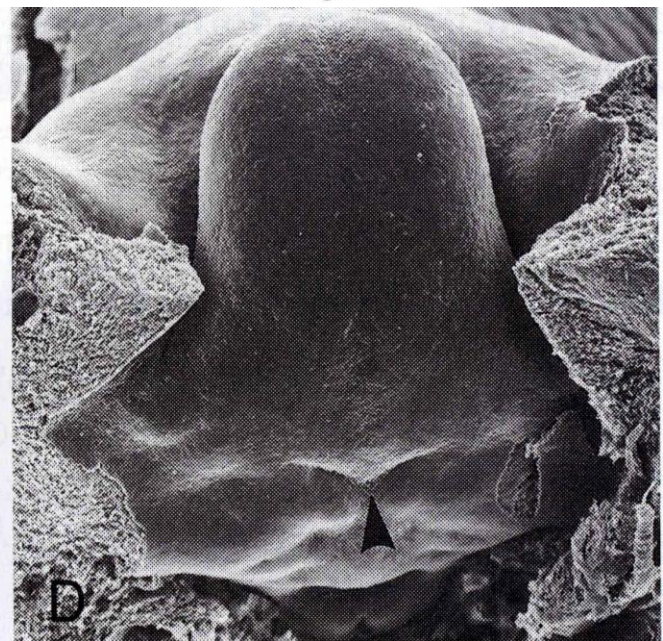
6 weeks

Palatine tonsil

Epiglottis



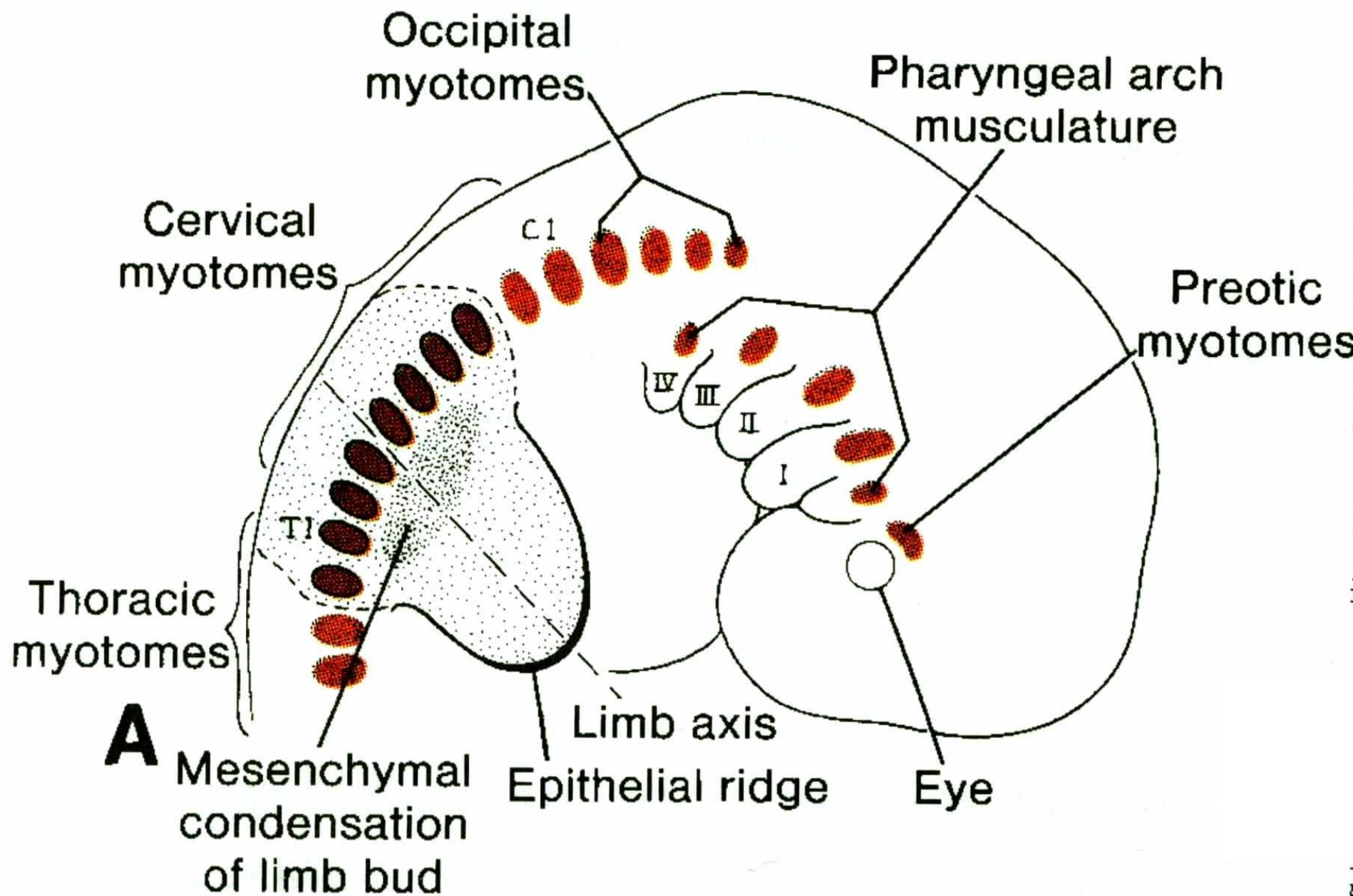
**C**

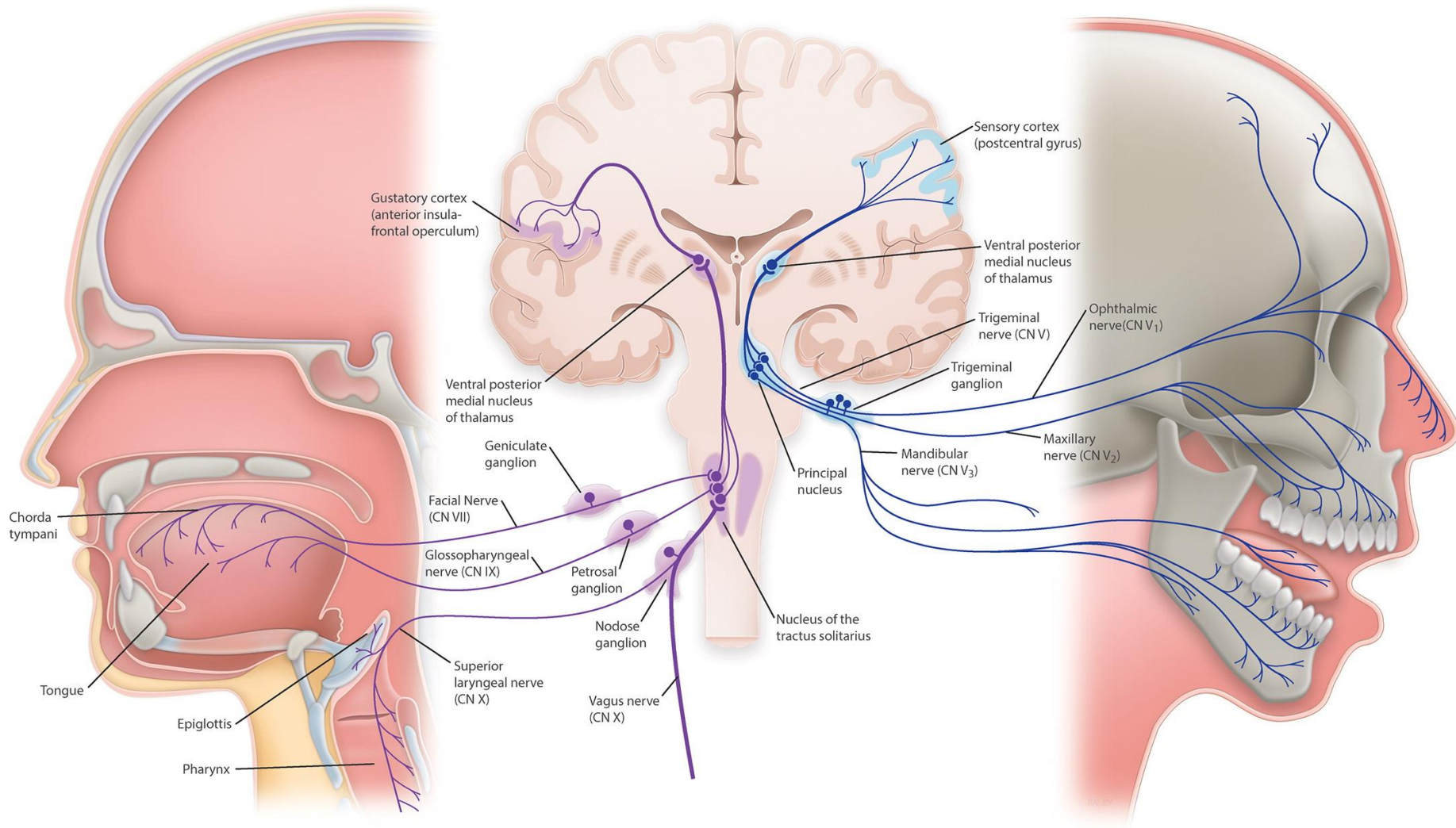


**D**

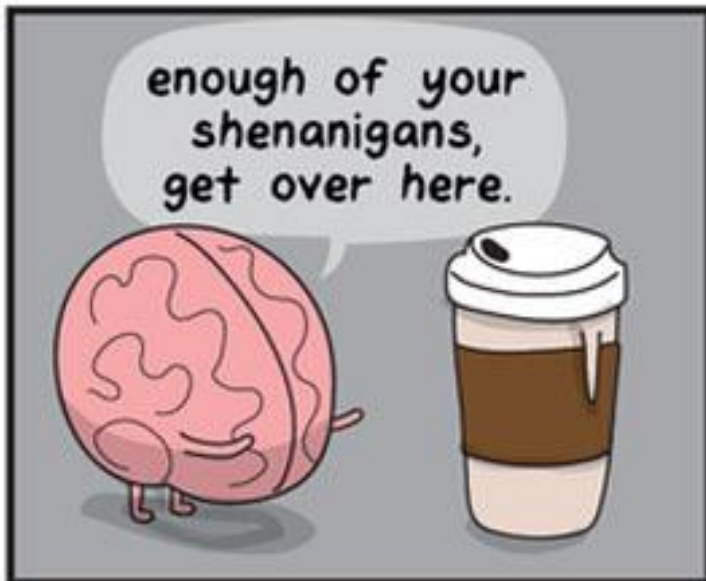
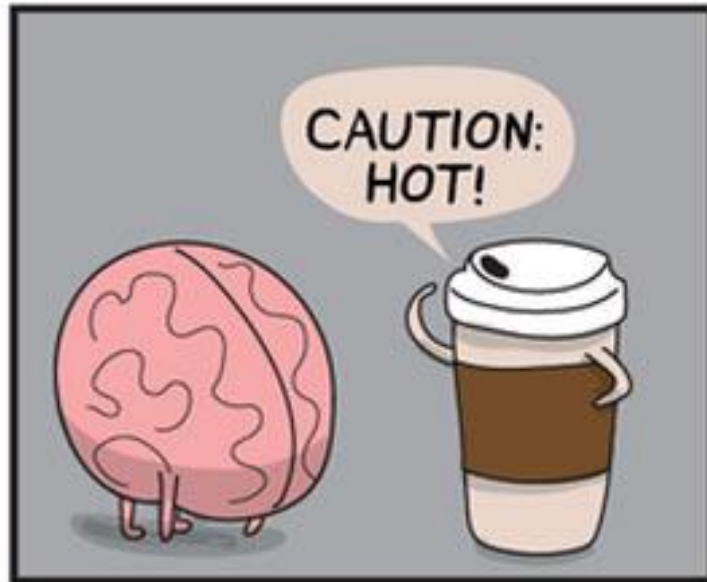
Derivates of pharyngeal folds	Arch number	Aortic arch	Cranial nerve	Examples of branchiomeric muscles	Skeletal derivates	Derivates of pharyngeal pouch
external auditory meatus	I mandibular	maxillary artery	V trigeminal	muscles of mastication etc.	malleus, incus spheno- mandibular lig. Meckel cart.	I middle ear auditory tube
	II hyoid	hyoid, stapedial artery	VII facial	muscles of facial expression etc.	stapes, styl. proc., stylohyoid lig., part of hyoid cart.	II supra- tonsillar fossa
neck	III	internal carotid artery	IX glosso- pharyng.	m. stylopha- ryngeus	parts of hyoid cart.	III thymus, parathyr. gland
	IV	right subclavian artery, aorta	X vagus	pharyngeal and laryngeal musculature	laryngeal cart.	IV parathyr. gland ultimobranch. body
	VI					







Doyle ME, Premathilake HU, Yao Q, Mazucanti CH, Egan JM. Physiology of the tongue with emphasis on taste transduction. *Physiol Rev.* 2023 Apr 1;103(2):1193-1246. doi: 10.1152/physrev.00012.2022. Epub 2022 Nov 24.



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