Pharyngeal arches
Tongue and Salivary glands development

Permanent dentition
Defects

26. 4. 2023

Pharyngeal arches

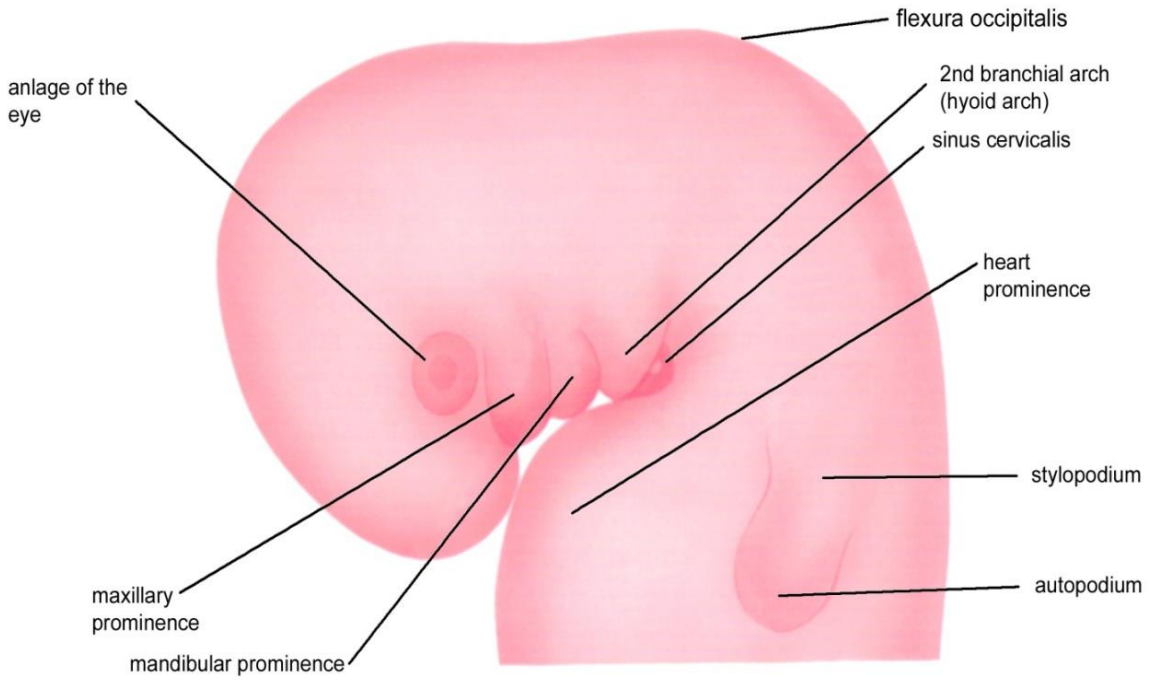
https://www.youtube.com/watch?v=oP1-ejJdZyc

Pharyngeal arches

Phylogenetically conserved organ, serves as a carrier for gills (which work as a respiratory organ)

First appears in sharks, around the pharyngeal gut

In vertebrates, transforms and forms the basis of important organs - branchiogenic organs



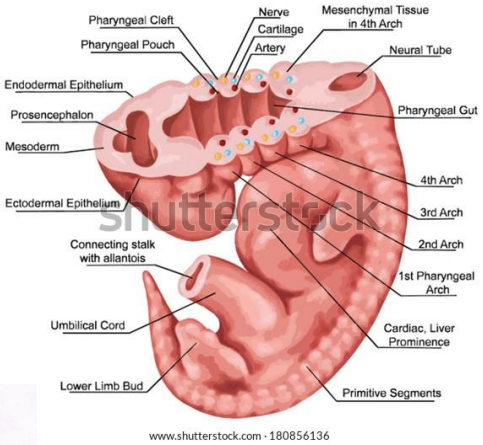
Wikipedia

Pharyngeal arches

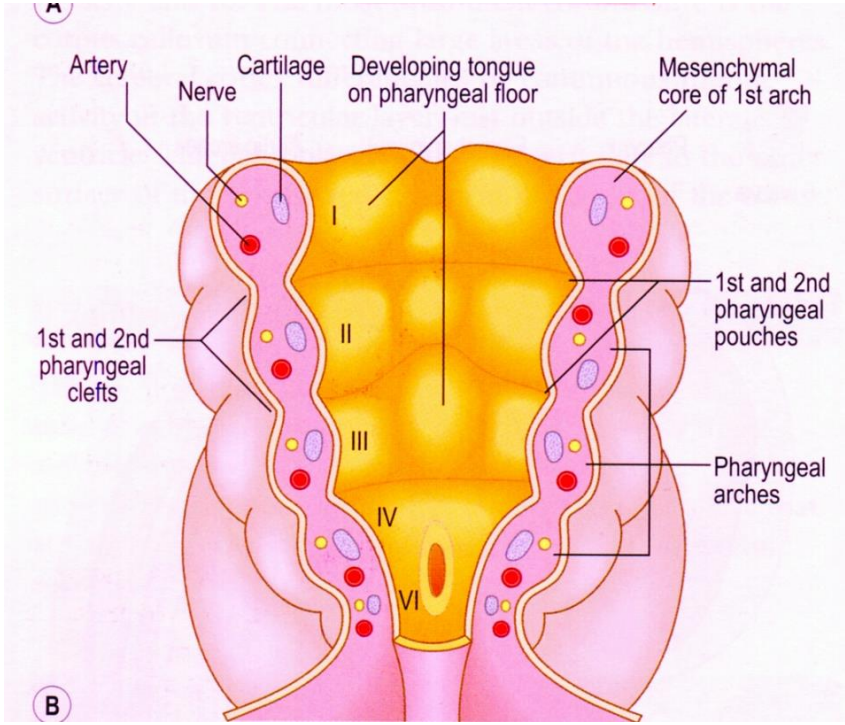
The pharyngeal apparatus starts to develop in human embryos in the neck region behind the frontal (frontonasal) prominence in the second half of the 4th week

Pharyngeal arches	**6**
Pharyngeal pouches (entodermal)	**5**
Pharyngeal clefts (grooves) (ectodermal)	**4**
Membranae obturantes	**4**

All structures are paired



Derivates of pharyngeal folds	Arch number	Aortic arch	Cranial nerv	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, stapedia 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 thymus parathyr. gland ultimobranch. body

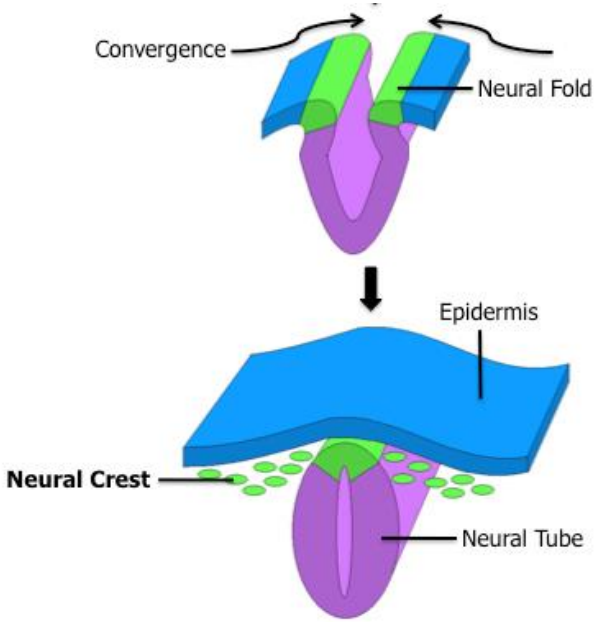


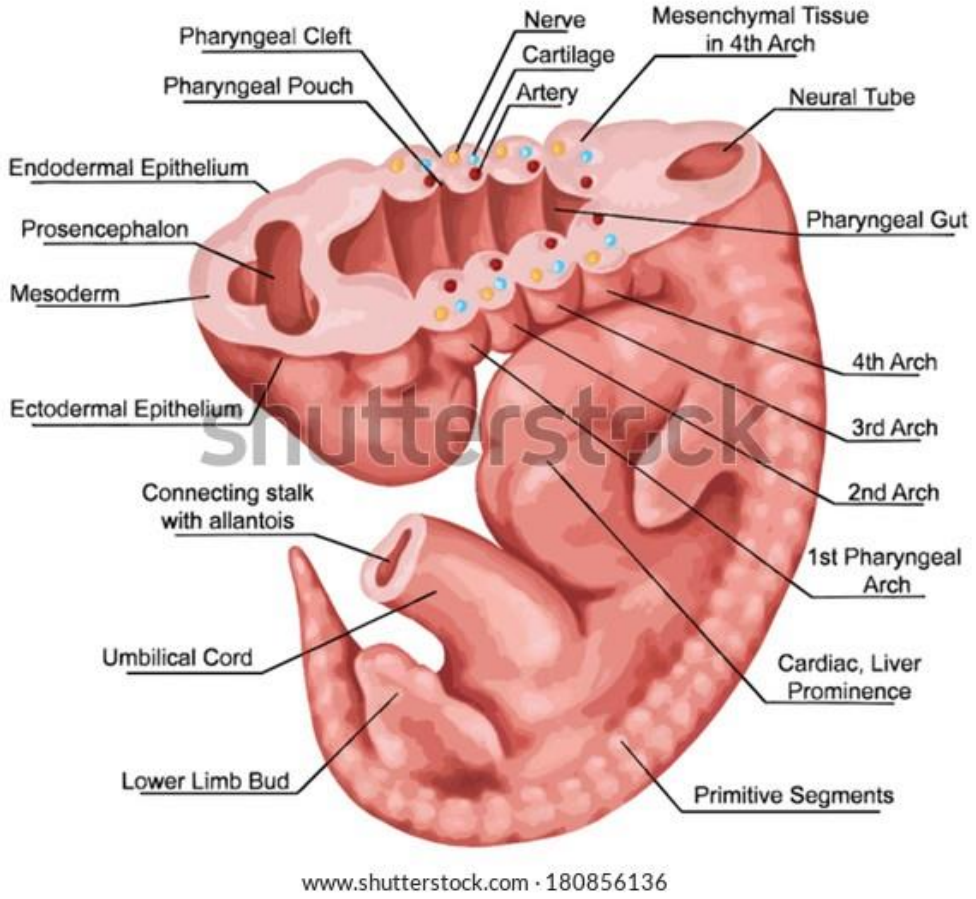
Pharyngeal (branchial) arches (6)

The first four - cause an obvious segmented structure of the neck (5th and 6th are rudimentary)

Cells of the **mesencephalic and rhombencephalic part of neural crest migrate** into the paraaxial mesoderm of the first cervical somites and contribute to formation on arches and subsequently organs

The formation of pharyngeal arches is controlled by the endoderm of the pharyngeal arches



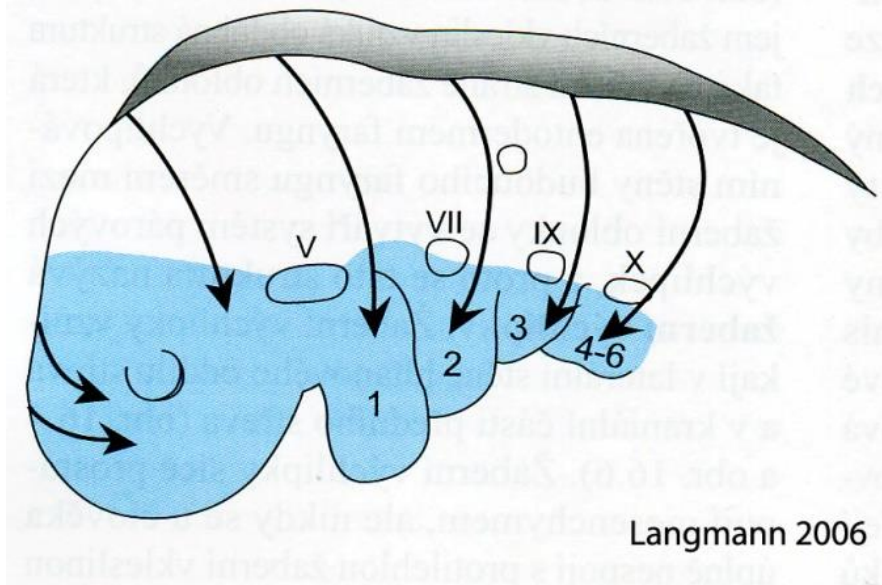


Ectomesenchymal derivatives: ligaments, cartilages, bones

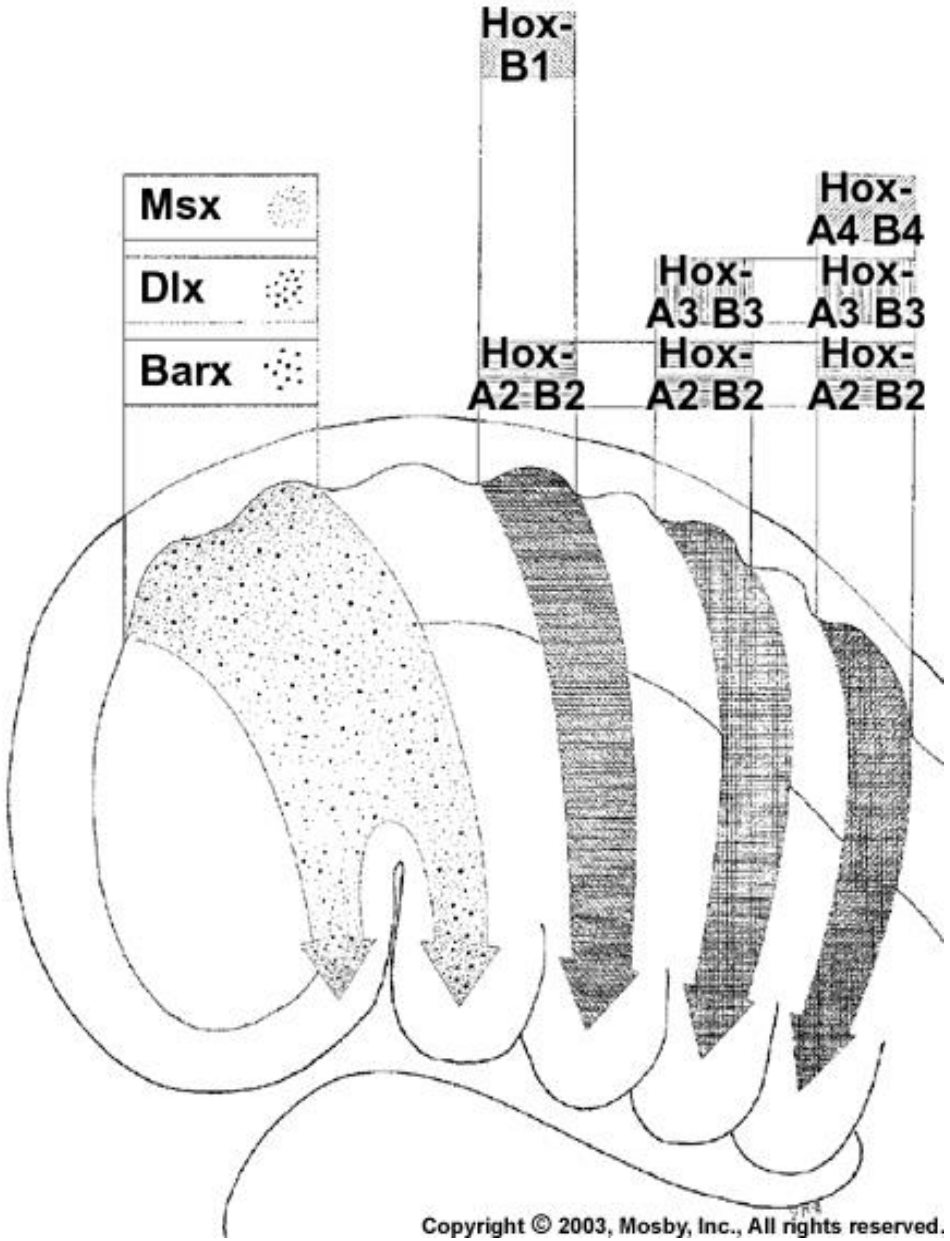
Paraaxial mesoderm derivatives: muscles of pharyngeal arches and branchial arteries

Migration of neural crest (ectomesenchyme) in several migratory pathways

Controled by **Hox genes** which regulate expression of transcription factors with effectory function



Langmann 2006

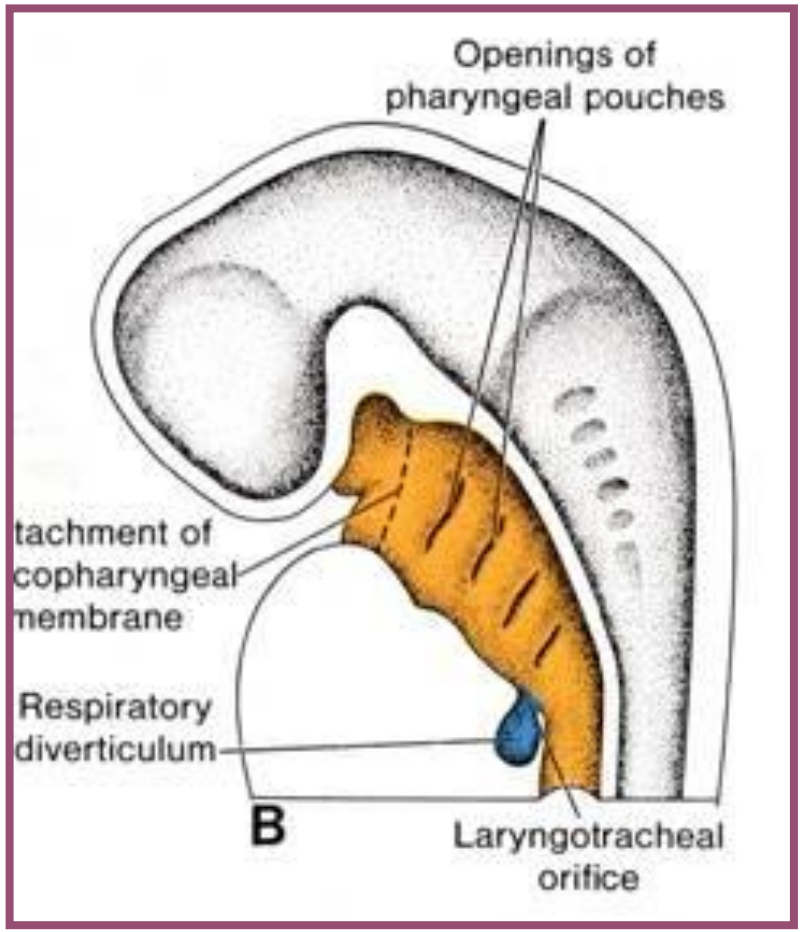


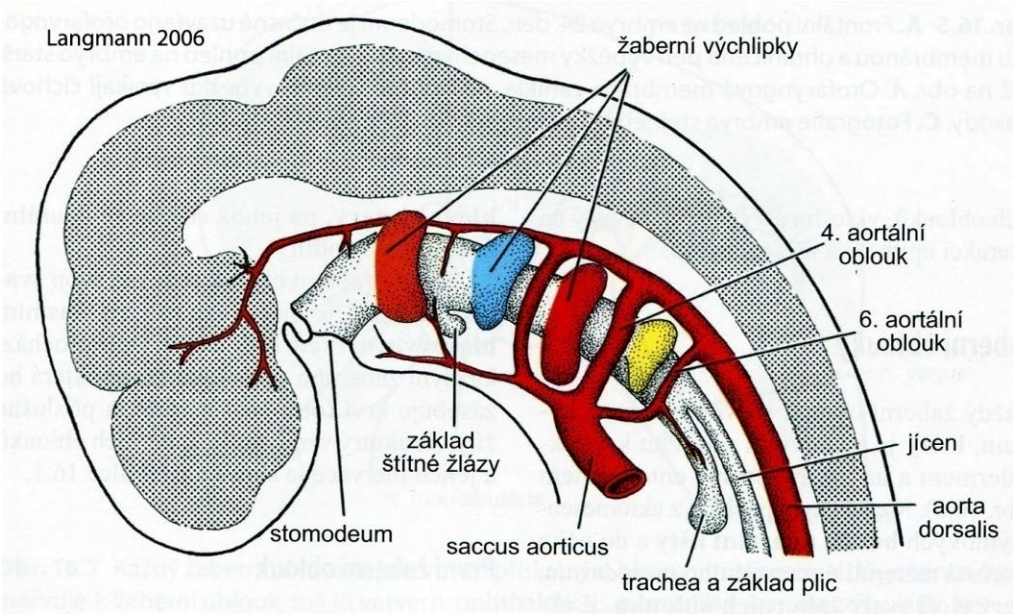
Pharyngeal pouches - 5

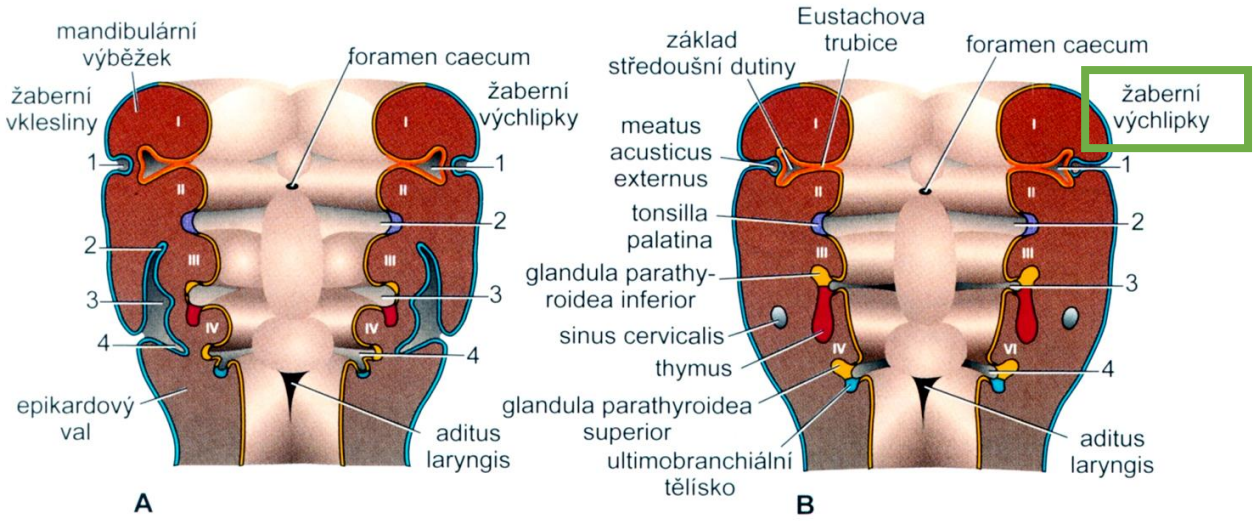
The first starts to develop on the stage of 5 somites

The 5th is rudimentary and develops as a part of the fourth pouch at end of the 1st month

Endodermal origin







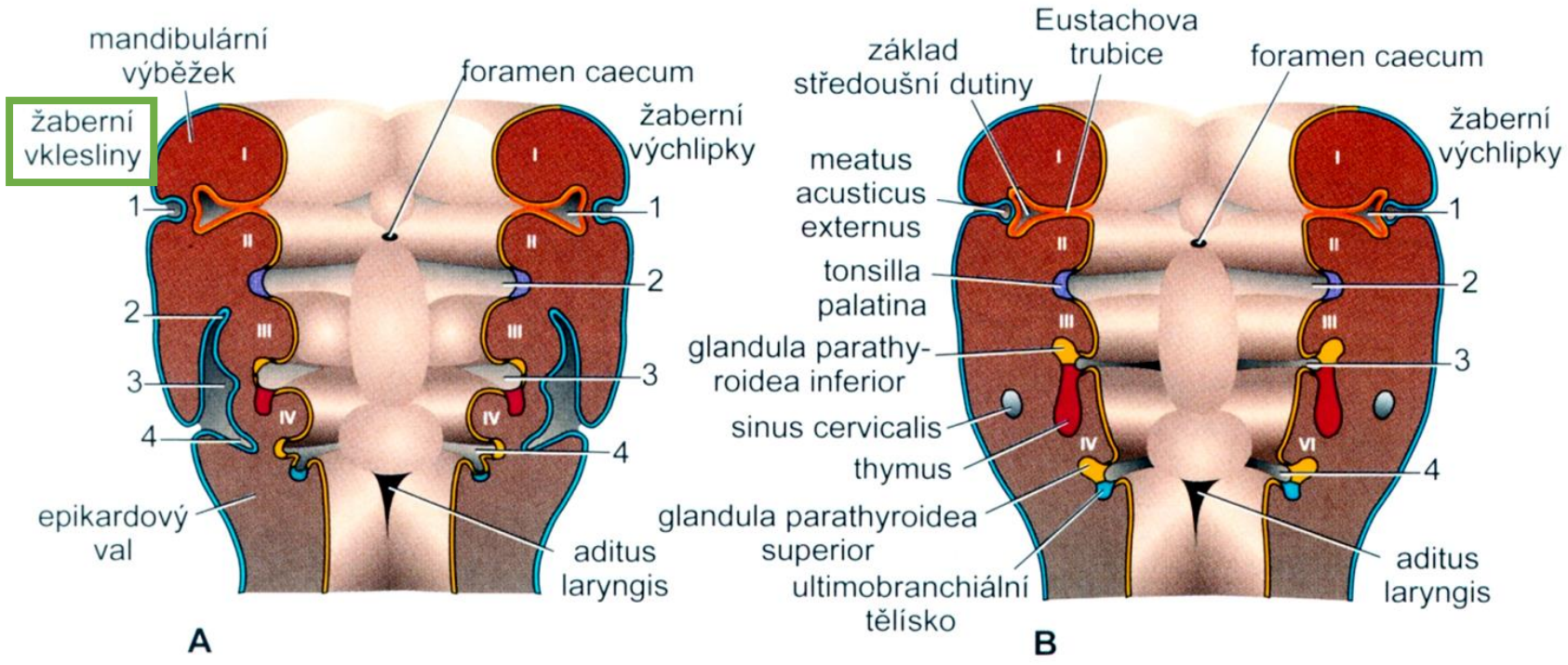
Pharyngeal clefts - 4

Form of shallow grooves

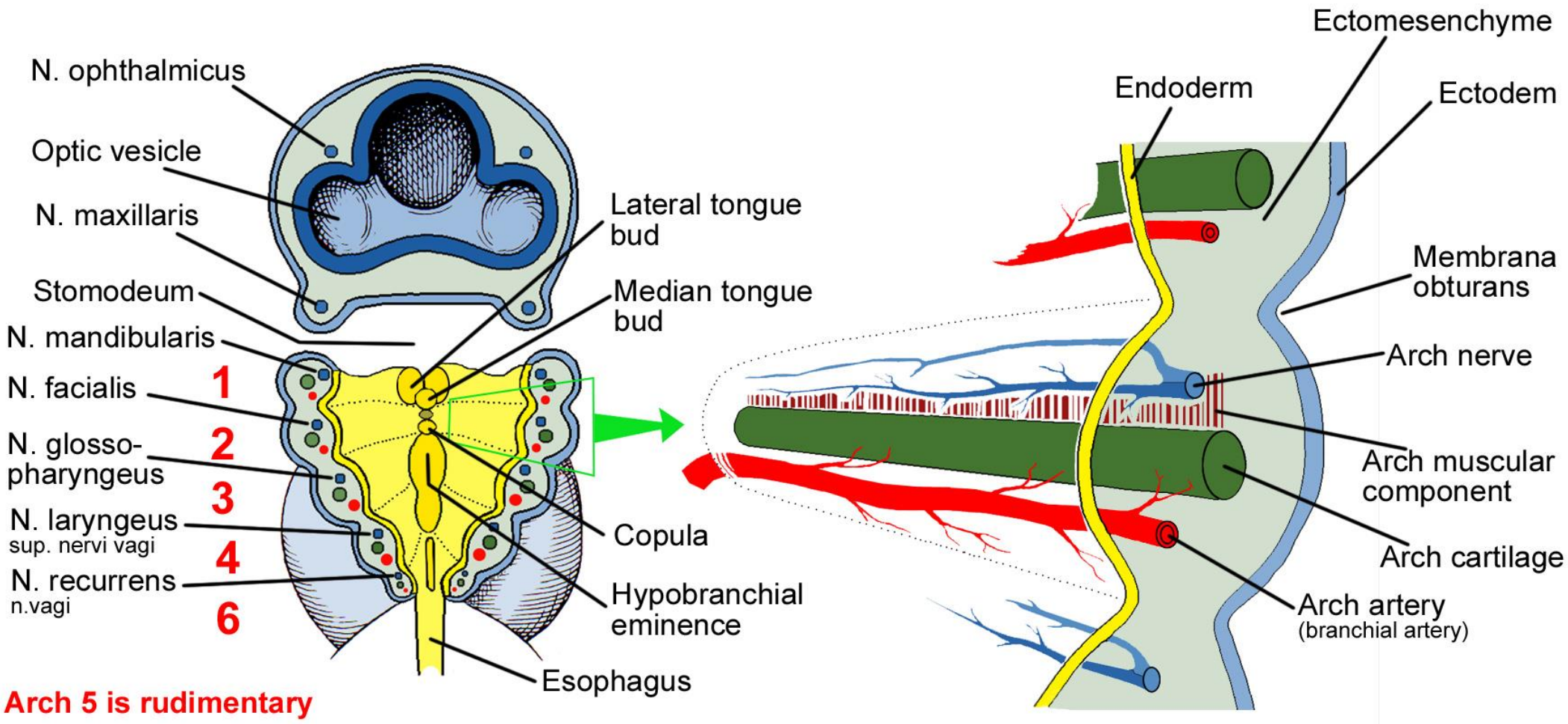
Ectoderm origin

Membranae obturantes - 4

Two-layer membranes that separate each ectoderm and entoderm groove (physiologically do not perforate in humans)



Frontal section through apparatus and branchial arch components



In each arch is:

Cartilage

Skeletal muscle basis (mezoderm)

Arch artery

Branchial arch nerve

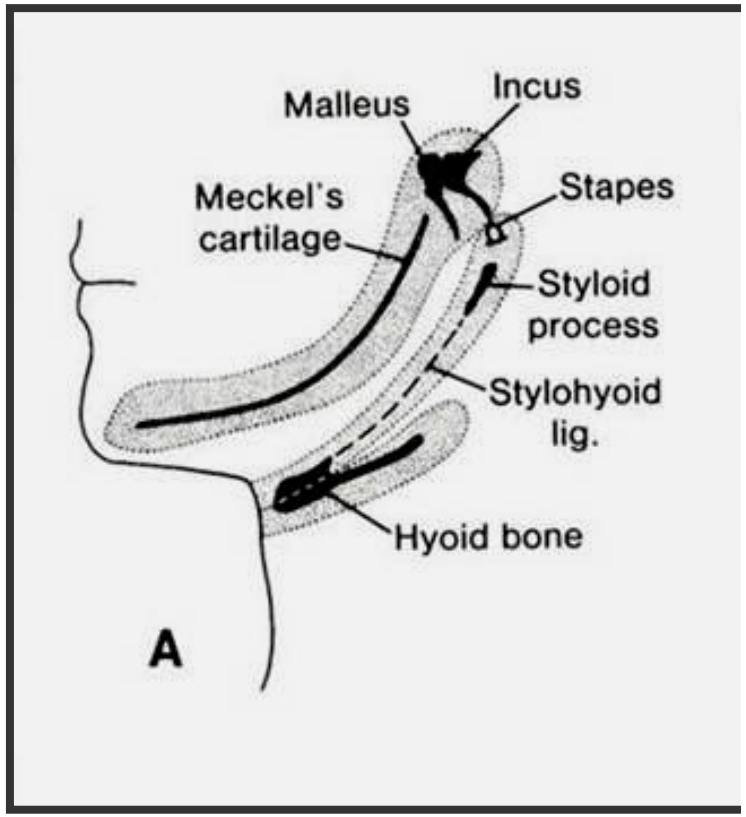
1. Pharyngeal arch (mandibular)

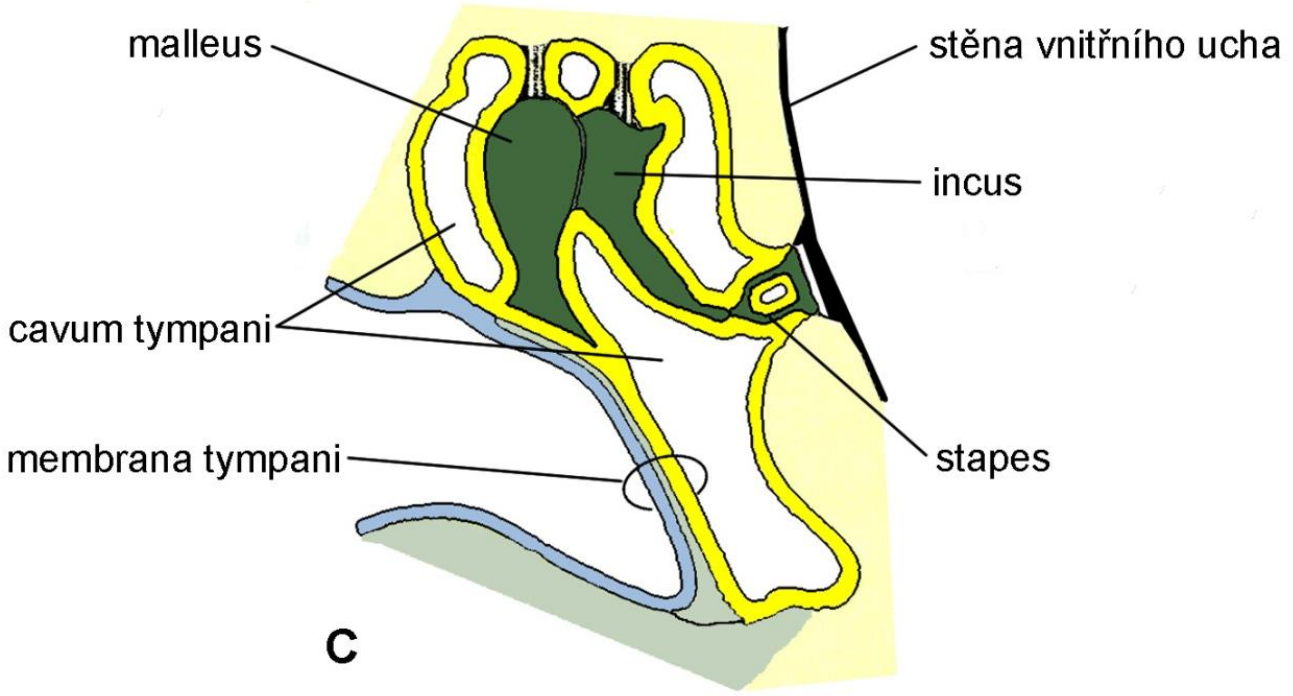
arch cartilage (Meckel´s cartilage) - malleus, incus, lig. mallei ant., sphenomandibulare lig.

muscles of mastication, mylohyoid and anterior belly of digastric, tensor tympani, tensor veli palatini

the 1st aortic arch - disappears (a small portion may persist and form maxillary artery)

the 1st branchial nerve - trigeminal





2. Pharyngeal arch (hyoid):

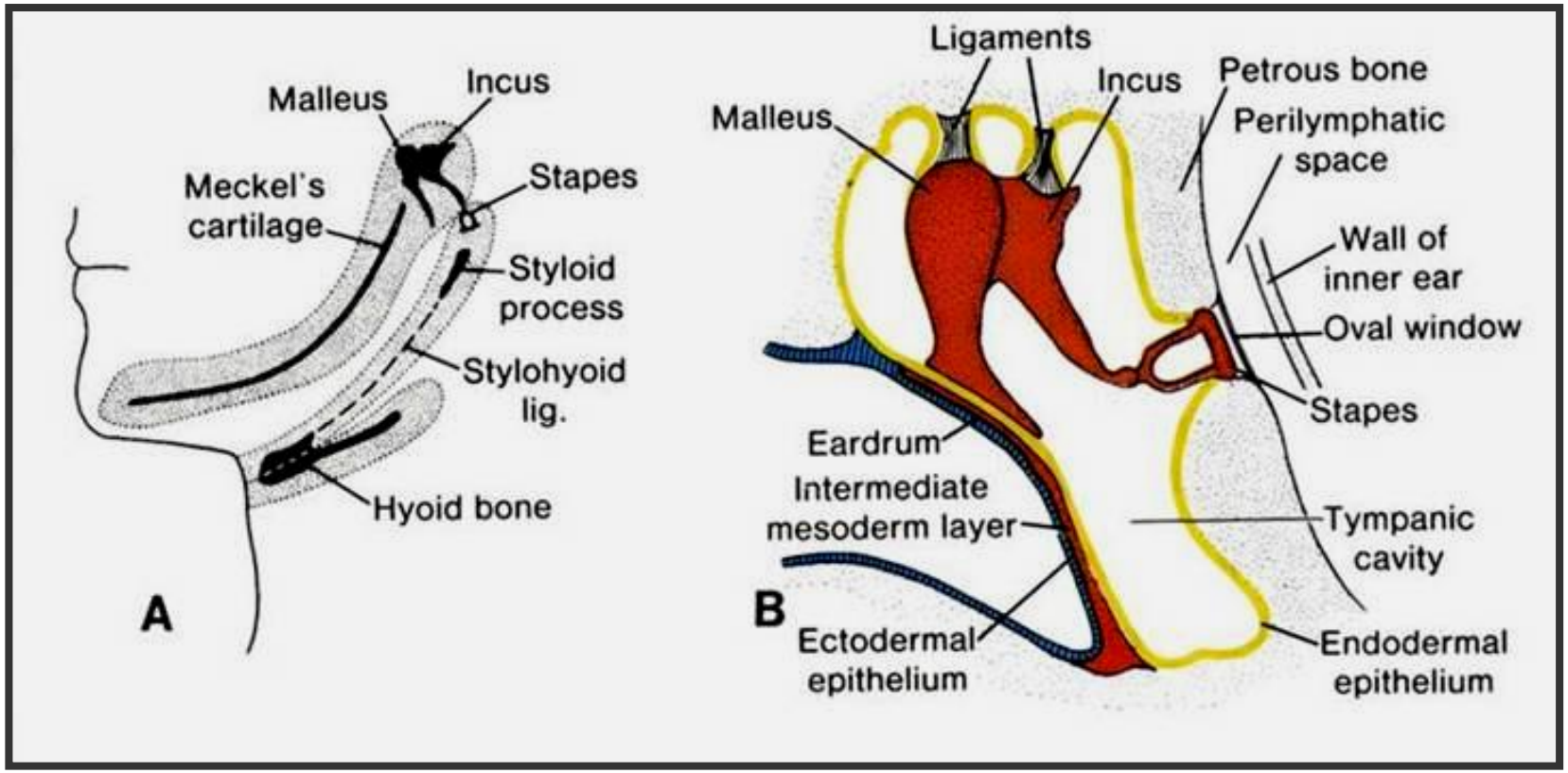
Derivatives of pharyngeal arches

arch cartilage (Reichert´s cartilage) - stapes, styloid process, lesser cornu of hyoid, upper part of body of the hyoid bone

muscles of facial expressions, stapedial and stylohyoid muscle, posterior belly of digastric

the 2nd aortic arch - disappears (small portions of this arch contributes to the hyoid and stapedial arteries)

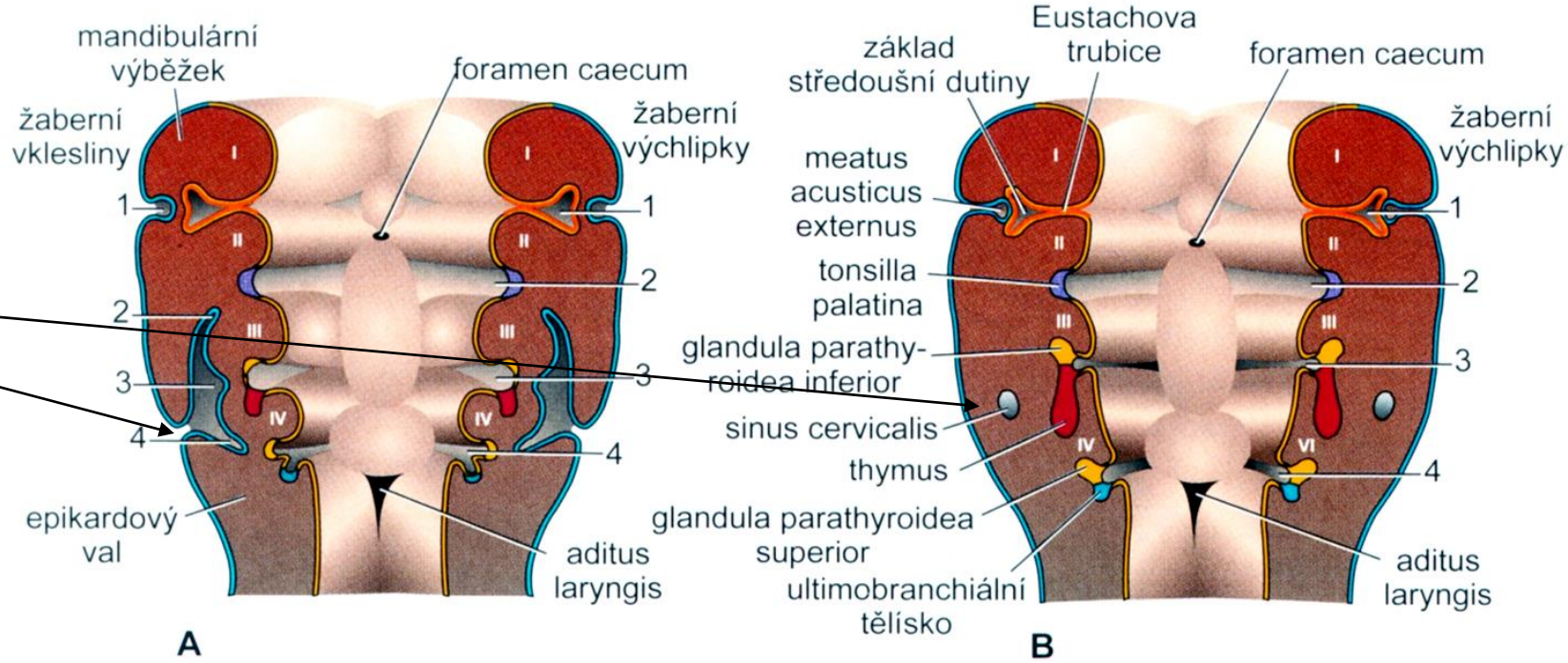
the 2nd branchial nerve - facial

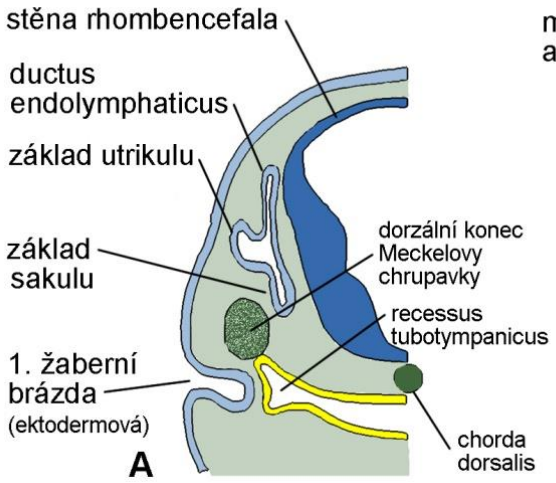


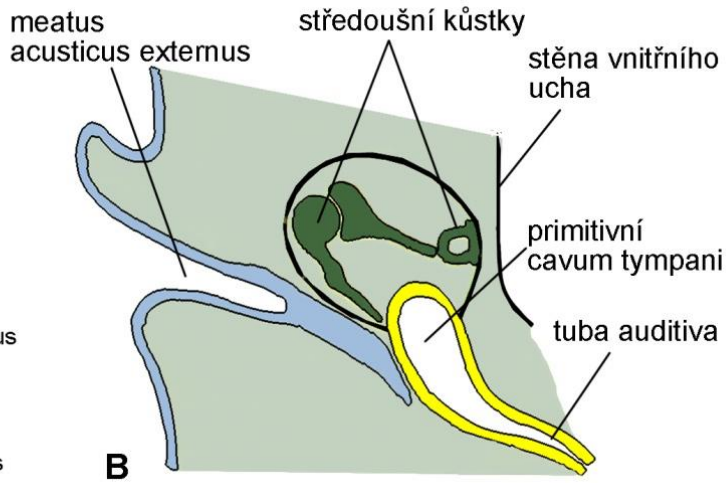
Pharyngeal clefts (ectodermal)

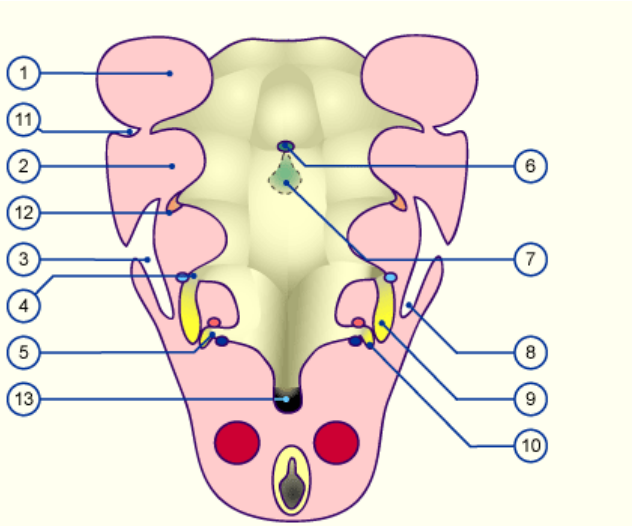
Functional in the future is only the
1. pouch

2. - 4. obliterates and form a sinus cervicalis









Defects caused by maldifferentiation of the pharyngeal apparatus

1. **Branchial (cervical) cysts**
2. **Branchial (cervical) fistulae**
3. Branchial (cervical) vestiges (rudiments of branchial arches)
4. Preauricular cysts a fistulae
5. **Syndrome of the 1. branchial arch**
6. **DiGeorge syndrome**
7. Ectopia of thymus

Branchial cysts (lateral neck cysts)

Origin from persisting sinus cervicalis, positioned under angulus mandibulae

Subcutaneously or deep around the pharynx (possibly larynx)

When a cyst ruptures, communication occurs with the body surface or pharynx

Lined with stratified squamous epithelium

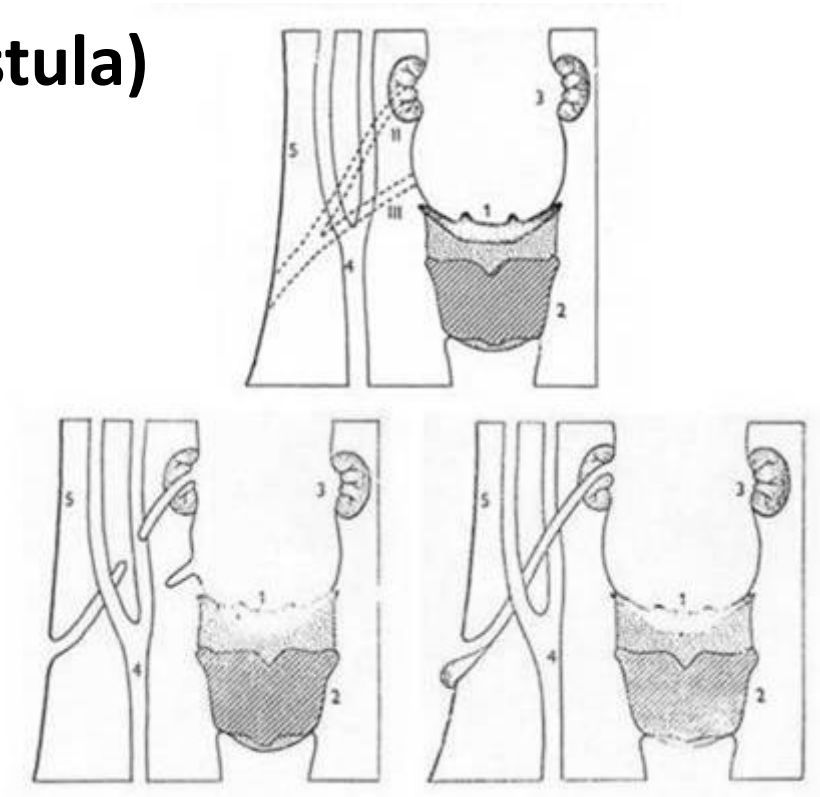
They may contain a liquid content with cholesterol crystals

Usually clinically not important

Figure 1 Branchial cleft cyst in the neck

https://subent.com/removal-of-branchial-cleft-cyst

Branchial fistula (lateral cervical fistula)



Abnormal communication of the pharyngeal cavity with the body surface

Between 2. pouch and cleft

(fossa tonsillaris - sternocleidomatoideus muscle)

Between 3. pouch and cleft

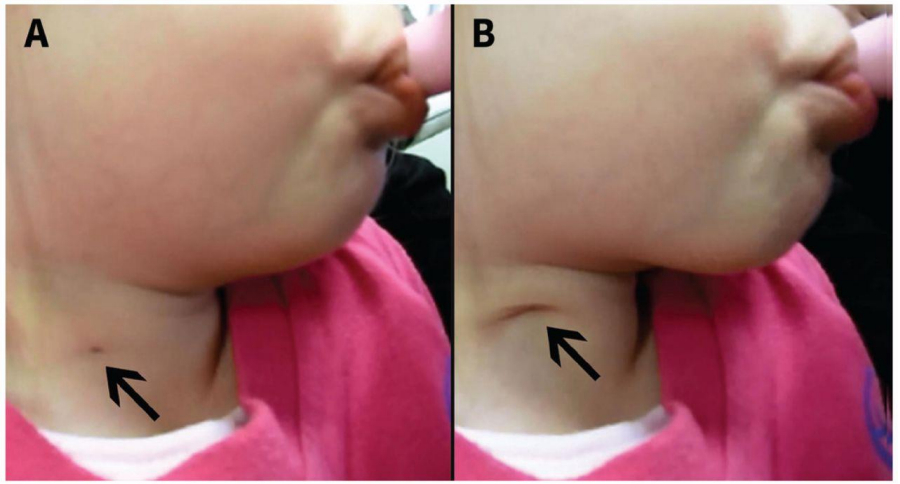
(tongue - art. sternoclavicularis)

Complete

at the surface of the skin

Incomplete

external, internal



Koltsidopoulos et Skoulakis, CMAJ, 2018

Branchial vestiges (rudiments of branchial arches)

Residues of some components of the pharyngeal arches, usually cartilage.

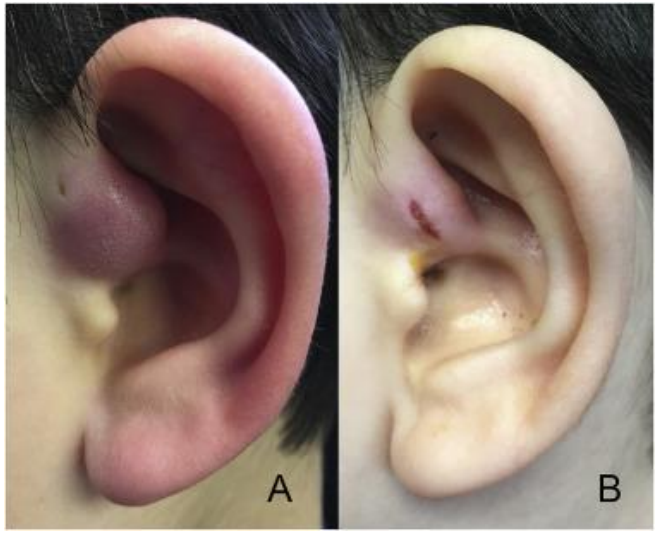
Occurrence: in the subcutaneous ligament of the neck above the lower 1/3 m.sternocleidomastoid

Rare

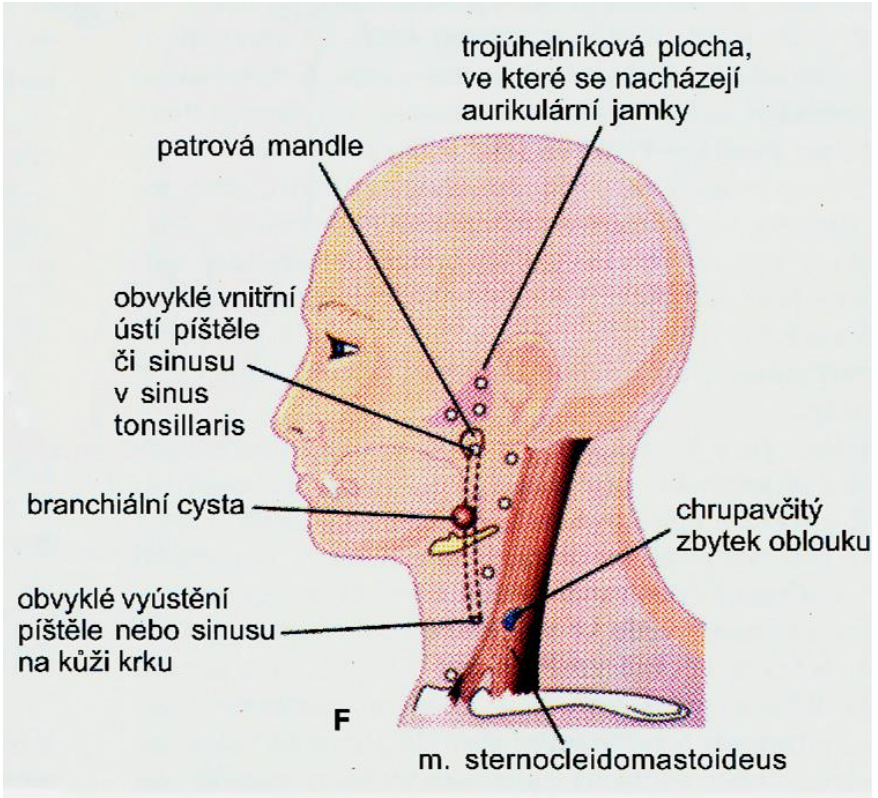
Preauricular cysts and fistulae

Small grooves, pits or cysts in skin in triangular area anteriorly to the pinna (auricle)

Origin: by persistence of sulci separating auricular hillocks



Isaacson, IJPO, 2019



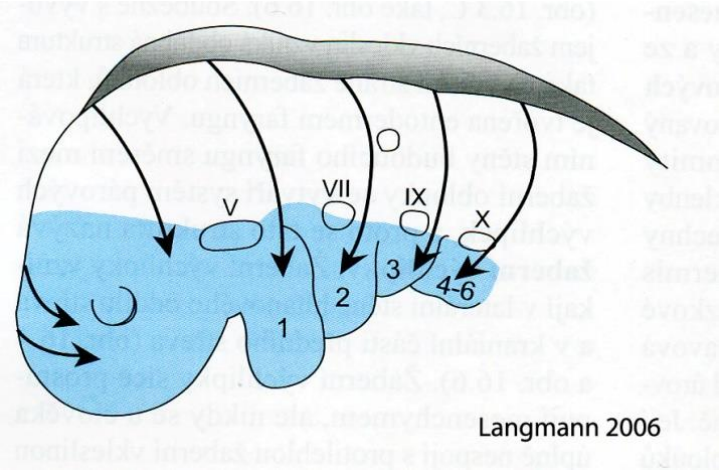
The First pharyngeal arch syndrome

Complex malformation of the skeleton of the face (both jaws, palate), eye and ear, **caused by delay or non-migration of crista neuralis** into the 1st pharyngeal arch

Types:

1) **<u>Treacher-Collins syndrome</u>** - dysostosis mandibulofacialis – autosomal dominant hereditary malformation

anatomically: hypoplasia to aplasia of zygomatic bones, hypoplasia of the upper and lower jaw, macrostomy, gothic floor, hypoplastic and sparse teeth, malocclusion - the face shows a characteristic physiognomy



2) Pierre-Robin syndrom

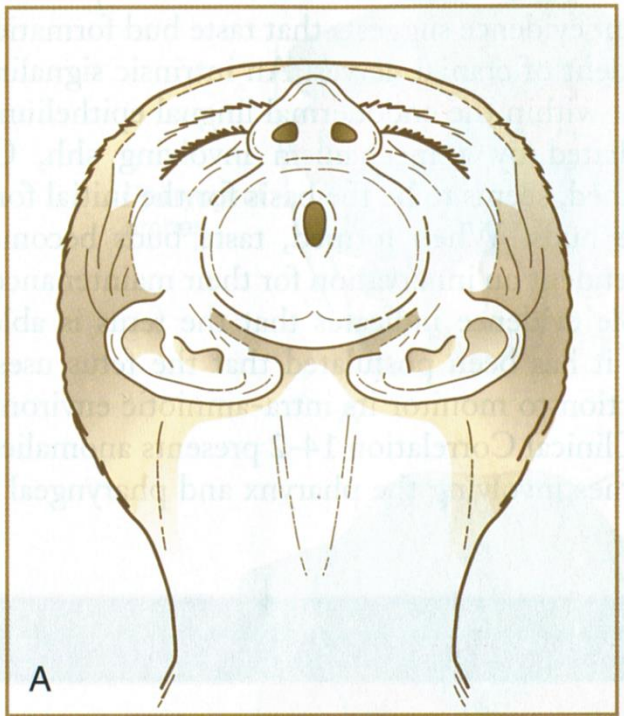
Hypoplasia of the mandible, gothic floor or posterior cleft palate, glossoptosis, ear defects

Autosomal recessive inheritance, X chromosome - linked

The intellect of individuals is not affected

Symptoms: due to the shortened base of the oral cavity, individuals after birth have difficulty feeding and breathing (stridor - caused by a disproportion between the lower jaw and the tongue)

Agnathia



Resnick et at, 2019

DiGeorge syndrome

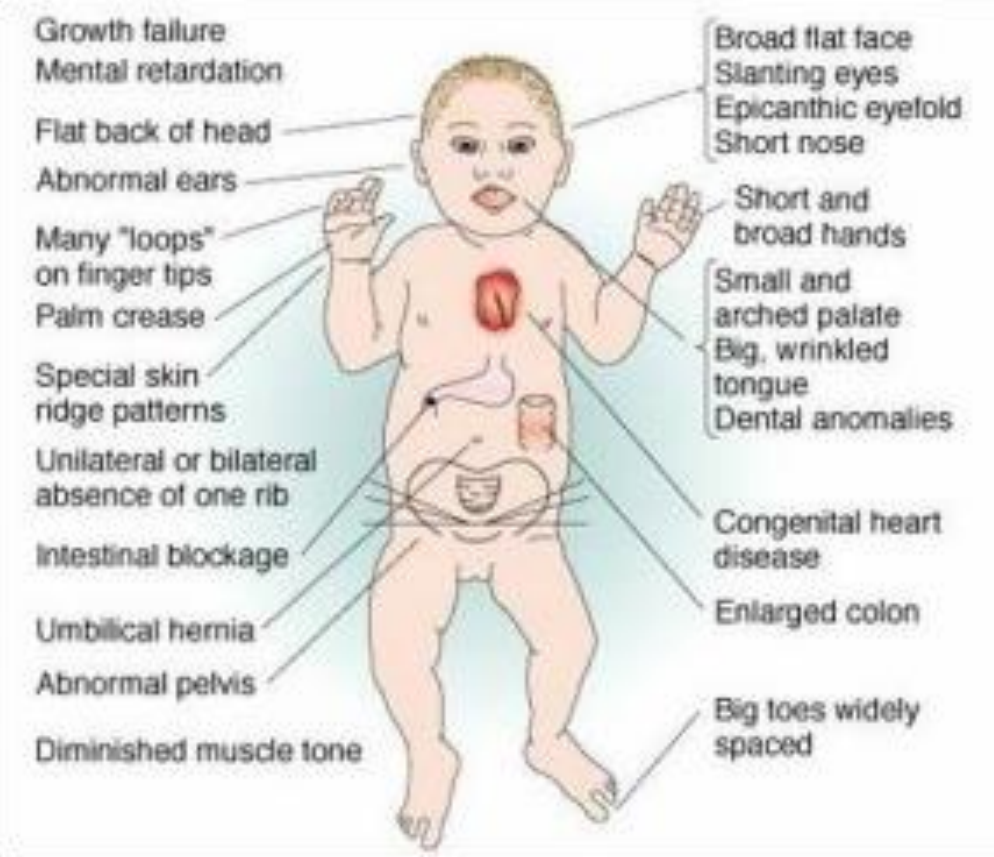
Incorrect development of the 1st pharyngeal arch. **Caused by improper migration of neural crest cells.**

Anatomically: hypoplasia of the mandible, shortened philtrum - nasal hypoplasia, congenital aplasia of the thymus and parathyroid glands, hypoplasia of the thyroid gland, defects of the heart and large vessels (right aortic arch), external ear defects

Clinically: hypoparathyroidism (hypocalcemic seizures), absence of cellular immunity, manifestations of heart defect

Incidence 1: 50 000

Etiology: Most frequently deletion on chromosome 22 - (22q11)



Tongue development

The development of the tongue begins in the **5th week** at the interface of the stomodeum and the beginning of the primitive pharynx

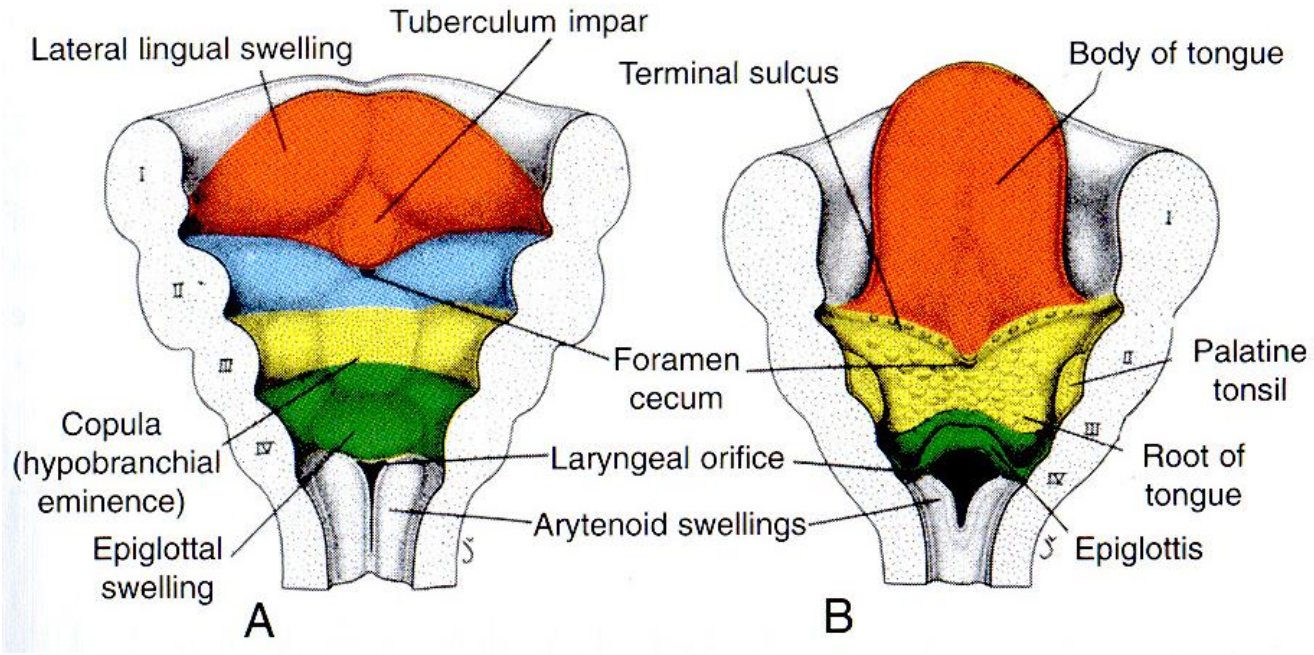
Anterior 2/3 of the tongue	Apex and corpus linguae	Formed from the mandibular process of the 1st pharyngeal arch
Posterior 1/3 of the tongue	Radix linguae	Formed from the 3rd and 4th pharyngeal arch

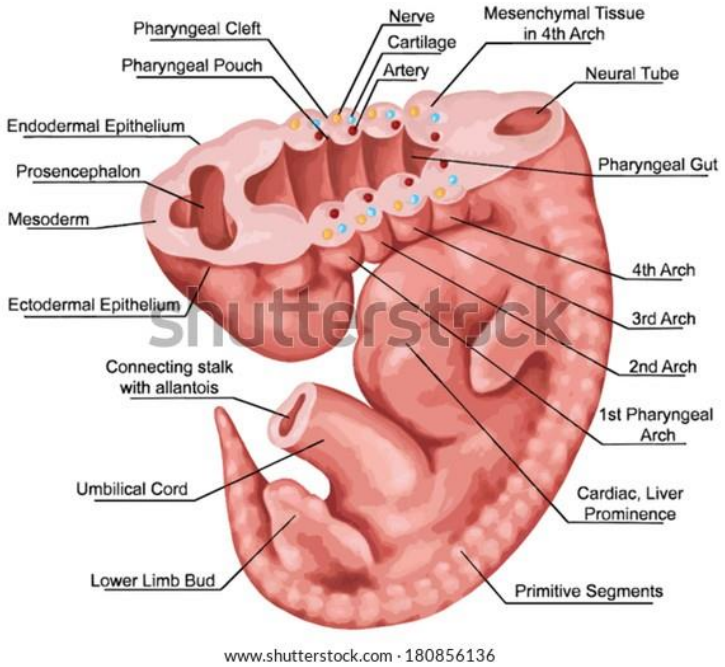
<u>Apex and corpus</u>

On the mandibular prominence are 3 mesenchymal protrusions covered with **ectoderm**:

Paired **tuberculum linguale laterale** (dx et sin) - distal lingual protrusion

Middle unpaired **tuberculum impar** (tuberculum linguale mediale) - middle tongue protrusion - more caudally





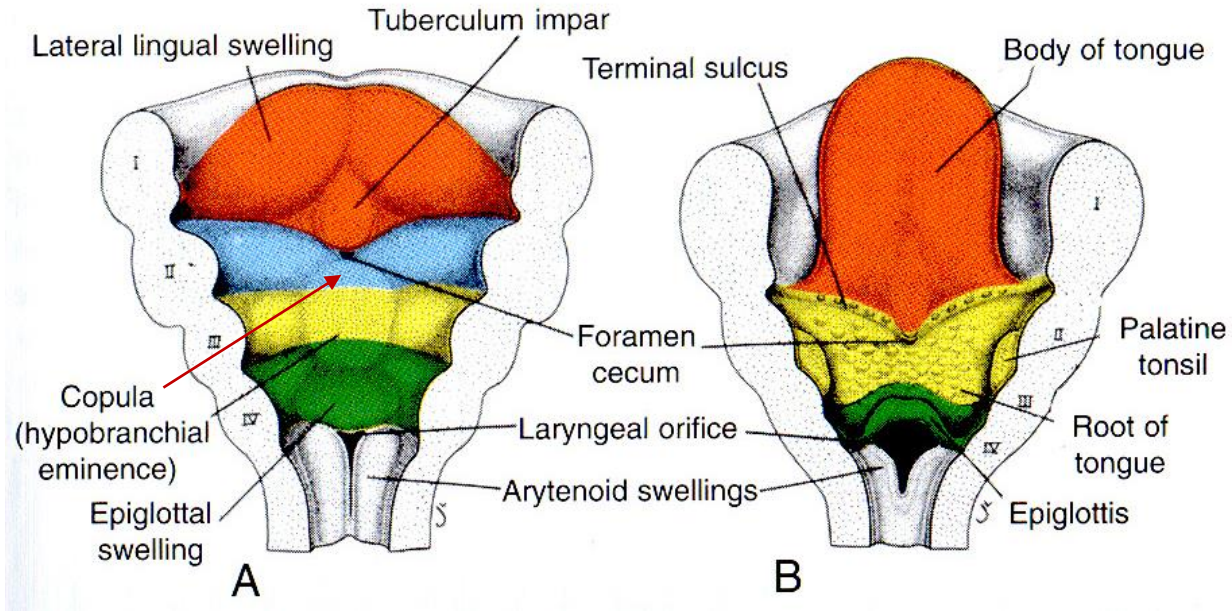
Radix linguae

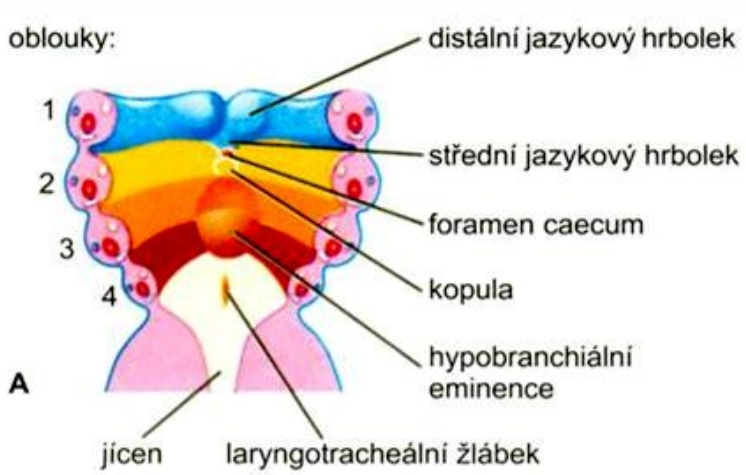
2 foundations: **copula** - fused ectomezenchyme of the ventral ends of the hyoid arch

eminentia hypobranchialis - formed by fusion of ventral ends of 3rd and 4th pharyngeal arch

both the copula and the hypobranchial eminence are covered by the **endoderm**

Endoderm between the tuberculum impar and the dome very intensively proliferates and grows caudally, its luminization creates a ductus thyreoglossus (see thyroid gland)



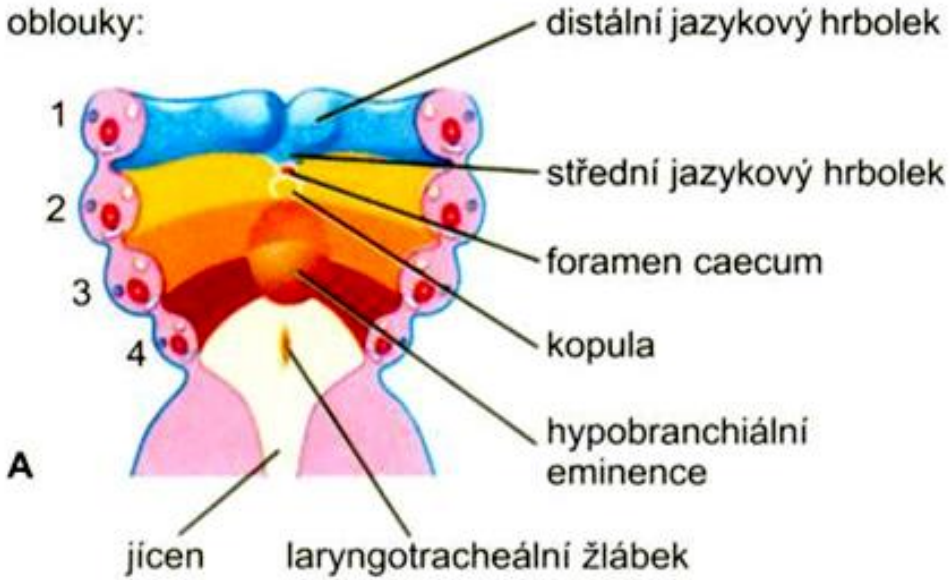


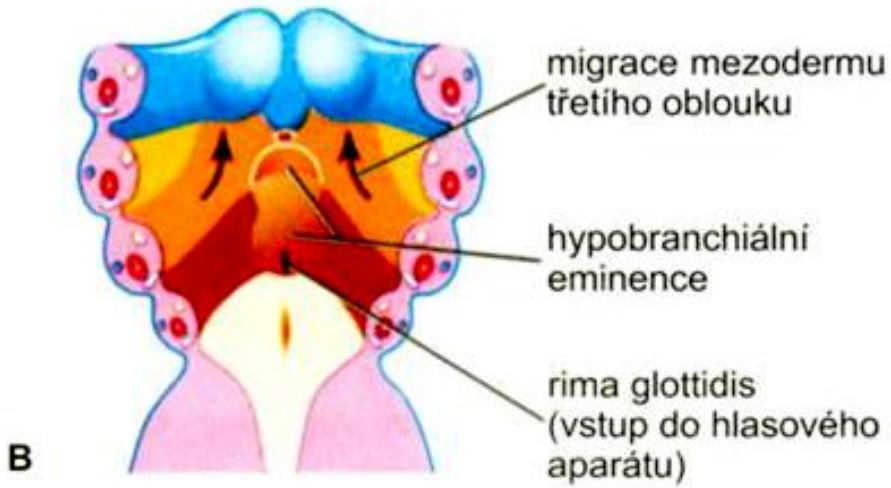
During the **6th week**, the protrusions begin to fuse together

Lateral protrusions enwrap the unpaired **tuberculum impar** - a uniform apex and corpus linguae is formed

In definitive proportions, it resembles the original symmetrical origin of the tip and body of the tongue **sulcus medianus linguae** (+septum linguae)

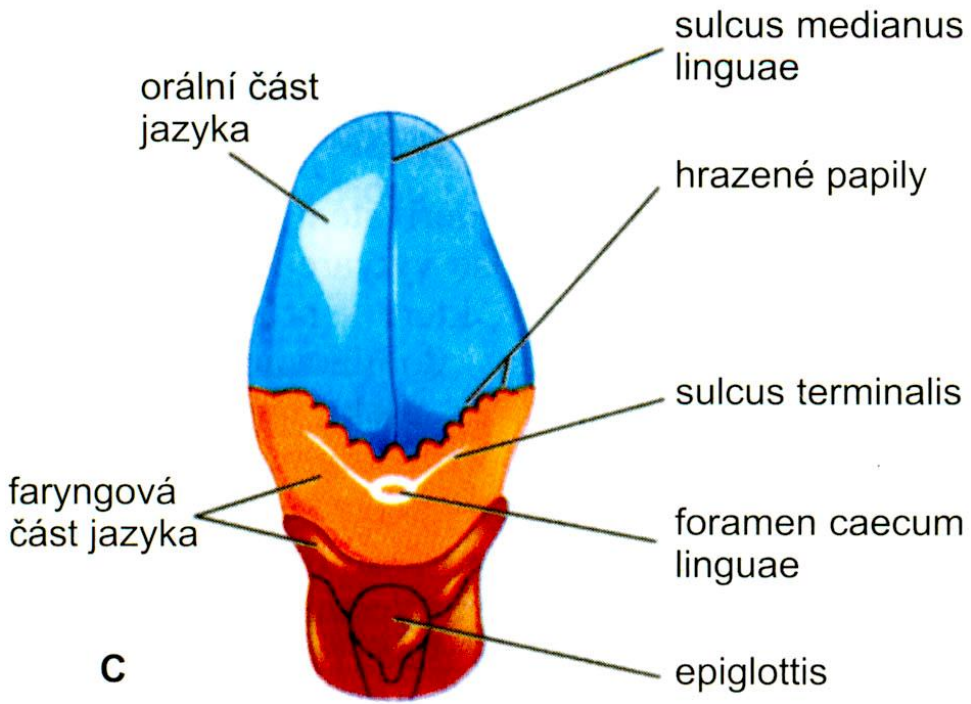
Only a small part of the body near the root of the tongue comes from the tuberculum impar)

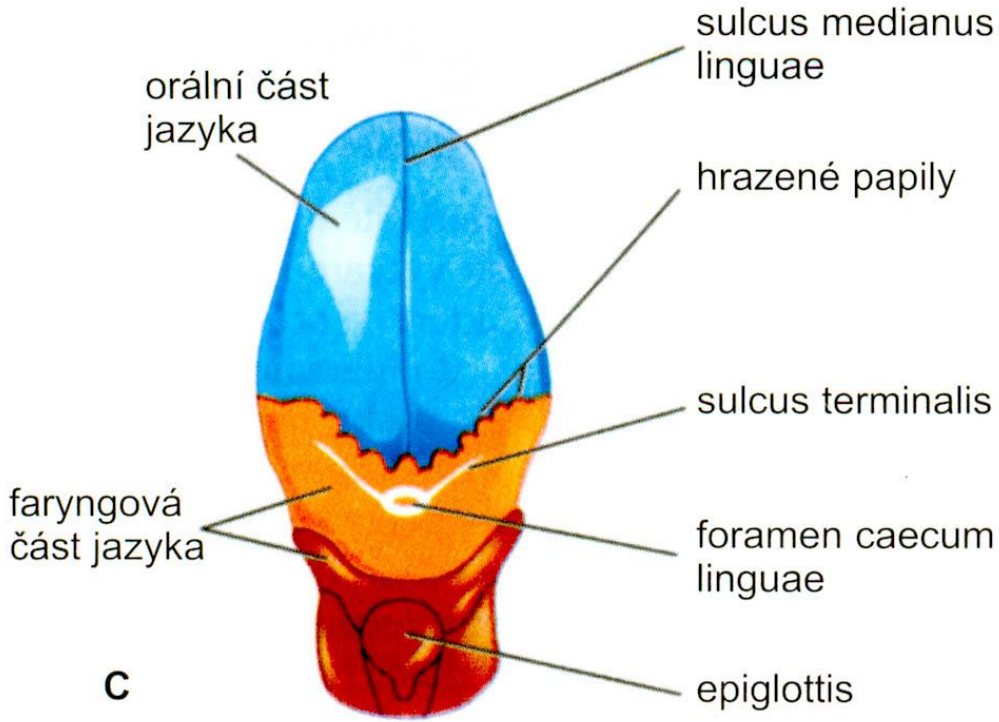




The hypobranchial process merges with copula and moves forward - approaching the base of the corpus with which it merges

Radix - Pharyngeal part of the tongue





Deriváty faryngových oblouků obsažené v jazyku

1. faryngový oblouk (CN V – ramus mandibularis)
2. faryngový oblouk (CN VII – chorda tympani)
3. faryngový oblouk (CN IX – glossopharyngeus)
4. faryngový oblouk (CN X – vagus)

The fusion line is visible until adulthood as a shallow "V" - shaped groove - **Sulcus terminalis**

At the top of the "V" is a short channel: **Foramen caecum**, remnant of the proximal end of the **ductus thyreoglossus**

Tongue development

The ectoderm and entoderm of the common base of the tongue differentiate into stratified squamous epithelium, taste bud cells, and secretory compartments and ducts of the tongue glands

From ectomesenchyme of fused protrusions, the ligament of the tongue, blood and lymph vessels develop, incl. lymphatic tissue of the root of the tongue

Muscles of the tongue come from the occipital myotoms, which move to its base and merge together.

During the fusion of myotomes, their motor nerves also merge (segmental arrangement) - the **hypoglossus nerve** is formed

Development of tongue papillae - in the 8th week – firstly papillae vallatae, foliatae (near the branches of the n. IX.), fungiformes (branches of the n. Lingualis), filiformes (the 11th-12th week)

Taste buds - weeks 11-13

Sensitive innervation: **Apex and corpus - trigeminal nerve** (n. mandibularis)
Radix - n. Glossopharyngeus

Innervation of taste buds:

- Taste buds in papillae fungiformes fungal **- n. facialis** - chorda tympani
- Taste buds in papillae foliatae and circumvallatae - **n. glossopharyngeus**
- Taste buds in another location (radix lingue, isthmus faucium) - **n. vagus**

Overview of tongue development defects

Ankyloglossia (lingua accreta) - short frenulum, limited mobility of the tip of the tongue, it is not possible to stick out the tongue (difficulty breastfeeding), 1: 300 births. The frenulum usually lengthens spontaneously (surgery is not needed)

Congenital lingual cysts and fistulas - persistence of ductus thyreoglossus – clinically usually non important, causes problems only when enlarged (discomfort in the pharynx or dysphagia)

Macroglossia - a rare, abnormally large tongue (associated with some syndromes, e.g. Down sy.)

Microglossia - a rare, abnormally small tongue (mostly associated with micrognathia; microglossia in combination with limb defects - Hanhart's syndrome)

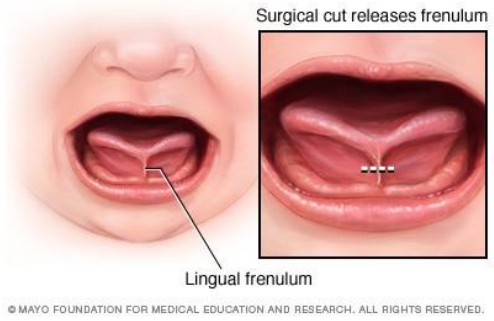
Glossoptosis - displacement of the tongue dorsally. Pushes on the epiglottis, narrowing of the pharynx.

Lingua bifida (lingua fissa, glossoschisis) - a very rare anomaly, incomplete fusion of the tubercula lingualia lateralia

complete cleft - including the tip of the tongue (associated with the cleft of the lower lip and jaw)

partial cleft - deep longitudinal groove (groove) in the body of the tongue

Aglossia – tongue not developed



Development of salivary glands

Salivary glands as derivatives of the lining of the stomodea or other structures: the oral side of the palate, the tip (ectoderm) and the root of tongue and the oral base (entoderm)

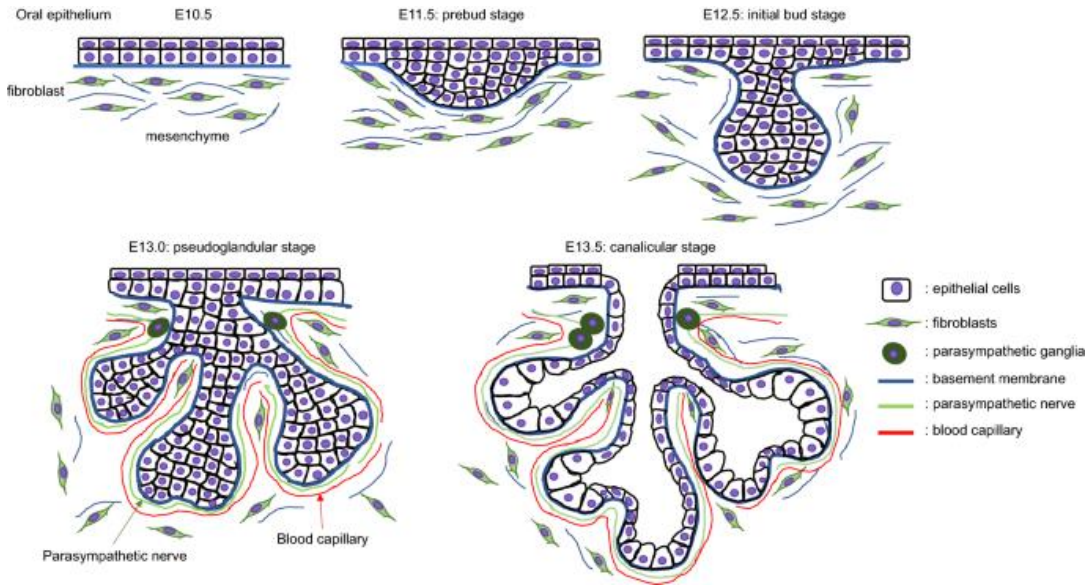
ectoderm: small salivary glands of lips and face, palate, gl. apicis lingue and parotid gland

entoderm: Weber's and Ebner's glands of the tongue, gl. submandibularis and gl. sublingualis

They all develop in a similar way:

From the epithelium (ecto- or entoderm) at the site of the future gland(s): cells begin to proliferate against adjacent mesenchyme

They lengthen and branch - the basis for the glandular duct system is created, the last 6th generation form **terminal branches**



Development of salivary glands

At the ends of the terminal branches (6th-7th generation) clusters of small spherical clusters of cells are subsequently formed - singular acins

The secretion starts during the **5th month** of development, followed by gradual lumen formation during the **6th month** of development

During this period, the division of the parenchyma into lobules begins, and thin septa are formed in glandular parenchyma from the superficial mesenchyme.

Lobulization continues until birth when glands become fully functional and begin to excrete saliva

Basis for gl. parotis **4th - 6th week**, at the upper edge of both corners of the mouth; after narrowing of the rima oris, the ductus parotideus opens into the vestibule on the buccal side

Basis for gl. submandibularis **6th week**

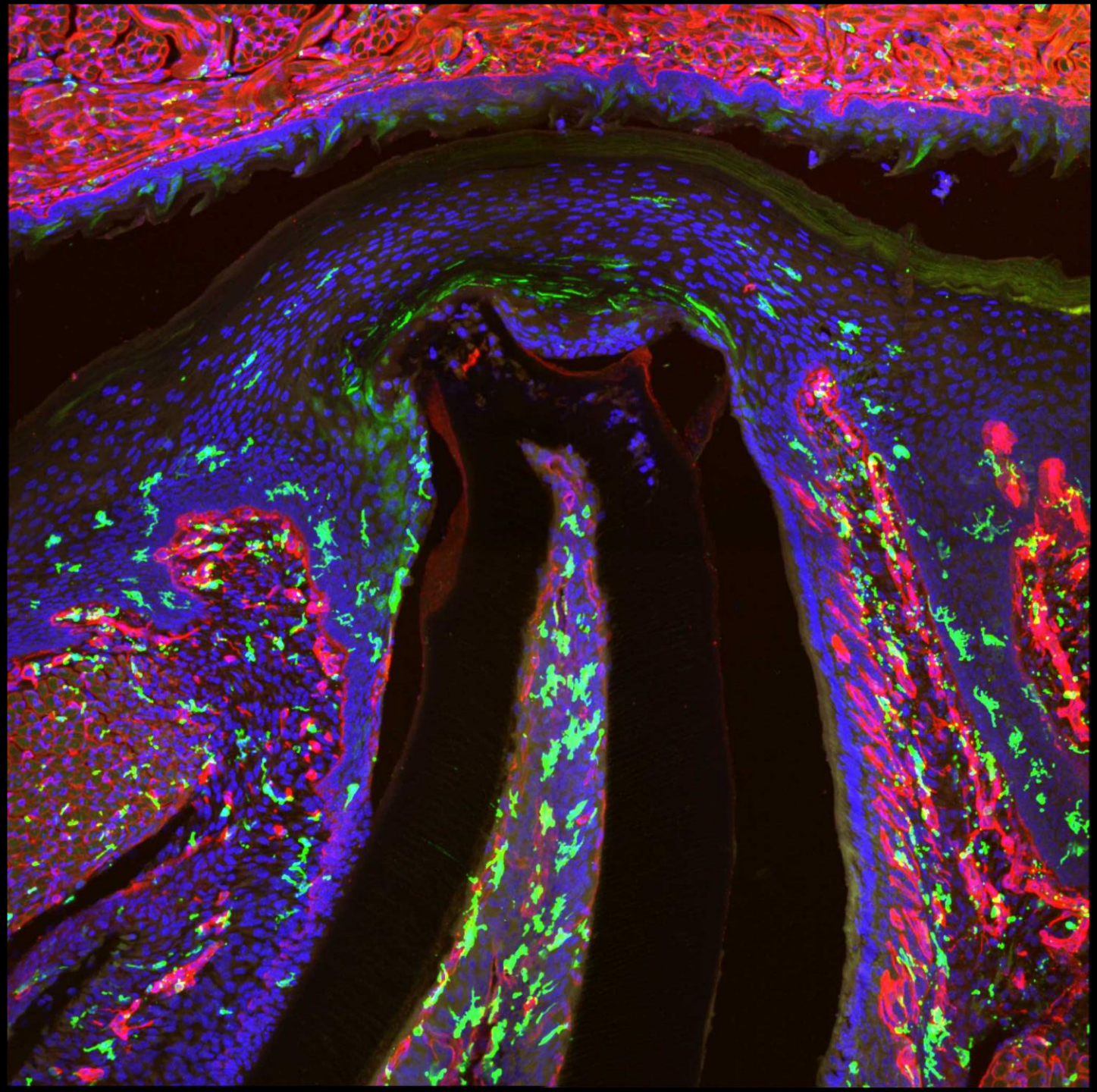
Basis for gl. sublingualis **8th week**

Small salivary glands **during 3rd month** of development

Permanent dentition Development

Defects

Eruption

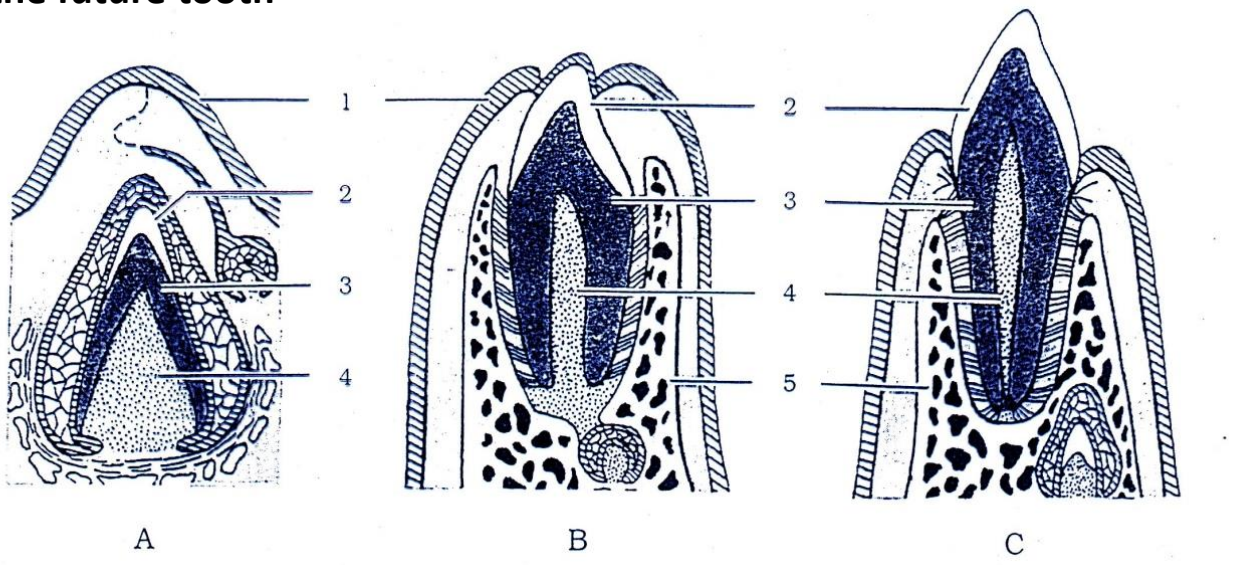


Eruption

Tooth eruption = growth process
It is manifested by the fact that the dental crowns protrude from the gingiva at a certain time, reach the oral cavity and eventually the occlusion plane.

Primary dentition: **5. - 30. month after born**

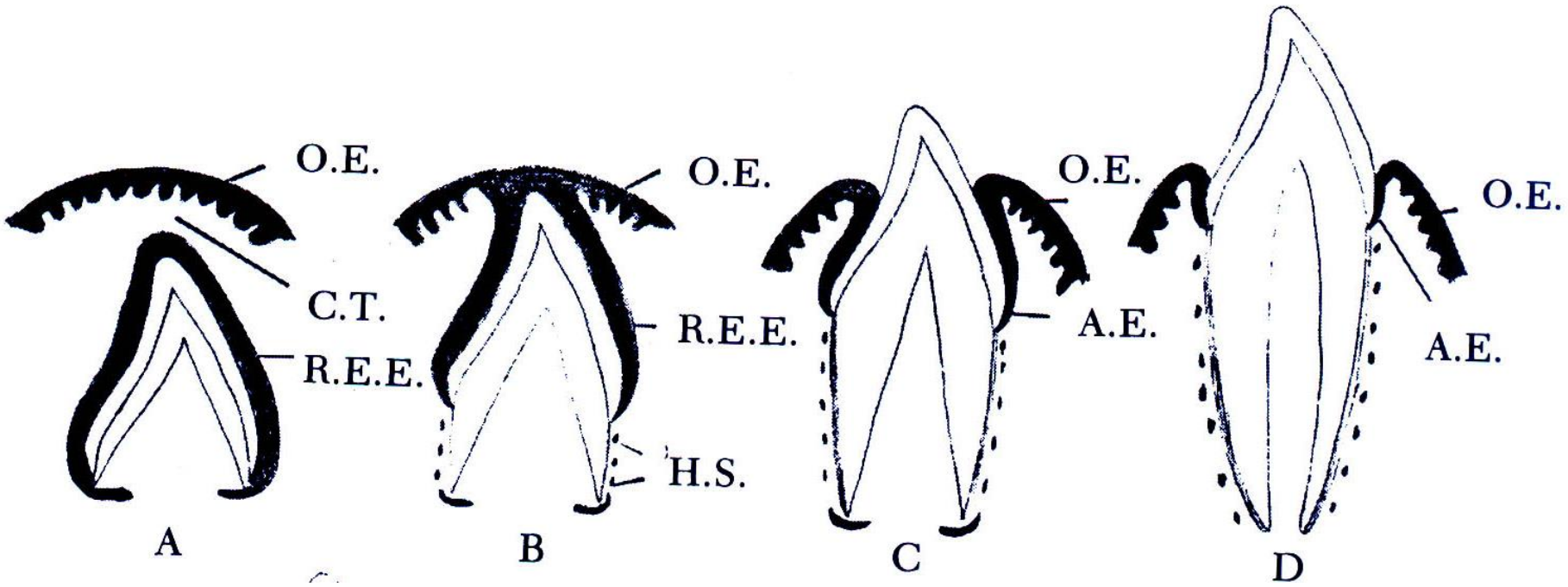
Growth and elongation of the root of the future tooth



Progress:
The root of the tooth grows to the bottom of the ossified alveolar bone
During further growth it rises and pushes the dental crown to the surface of the gingival wall
Gingival compression - vascular supply disorder and necrosis in the terminal phase
After the dead tissue is removed, a dental crown hole is created

Eruption

During eruption, the crown is protected by the enamel residue: **reduced enamel epithelium (REE)**



When the crown reaches the gum wall, **the reduced enamel epithelium fuses with the oral epithelium**

During the crown eruption, the reduced enamel epithelium gradually separates from the enamel surface

Eruption

When the tooth crown reaches the occlusion plane, there is a 1-2 mm wide stripe around the cervical part of the crown – **dento-gingival epithelium**

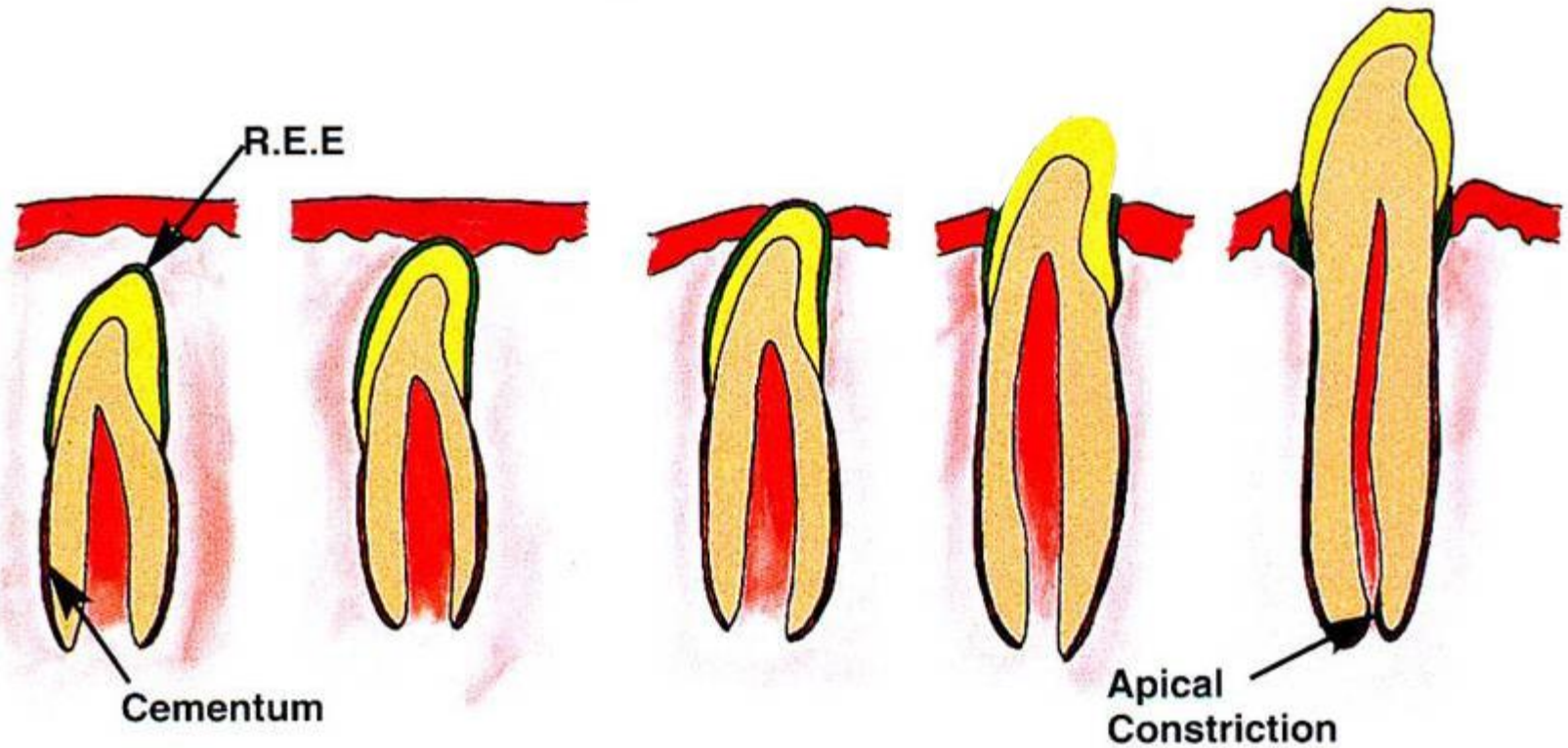
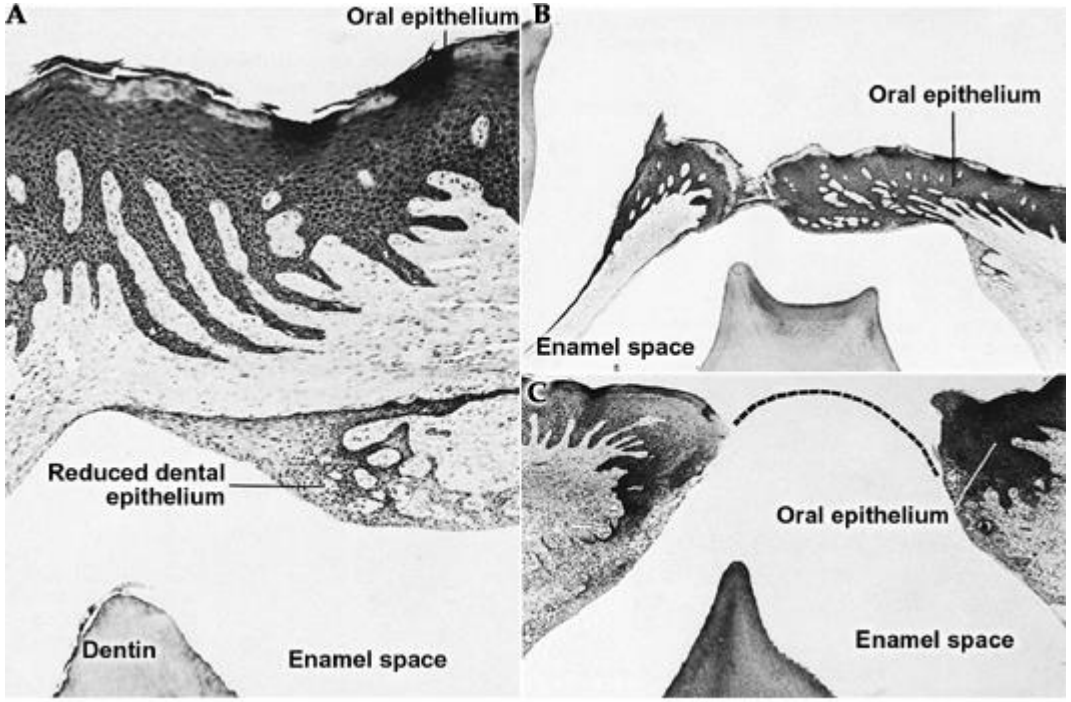
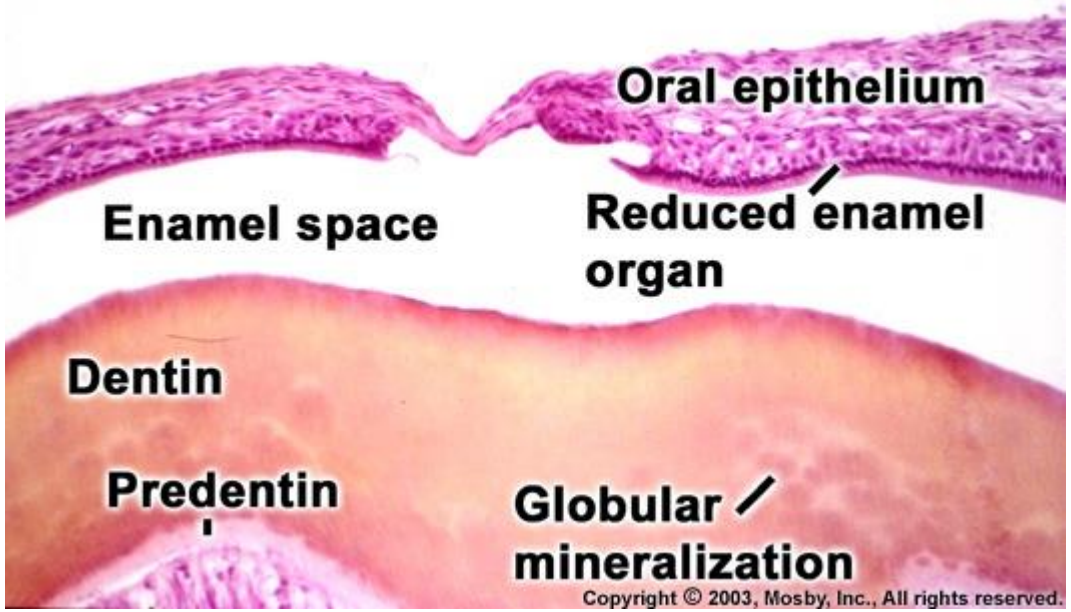
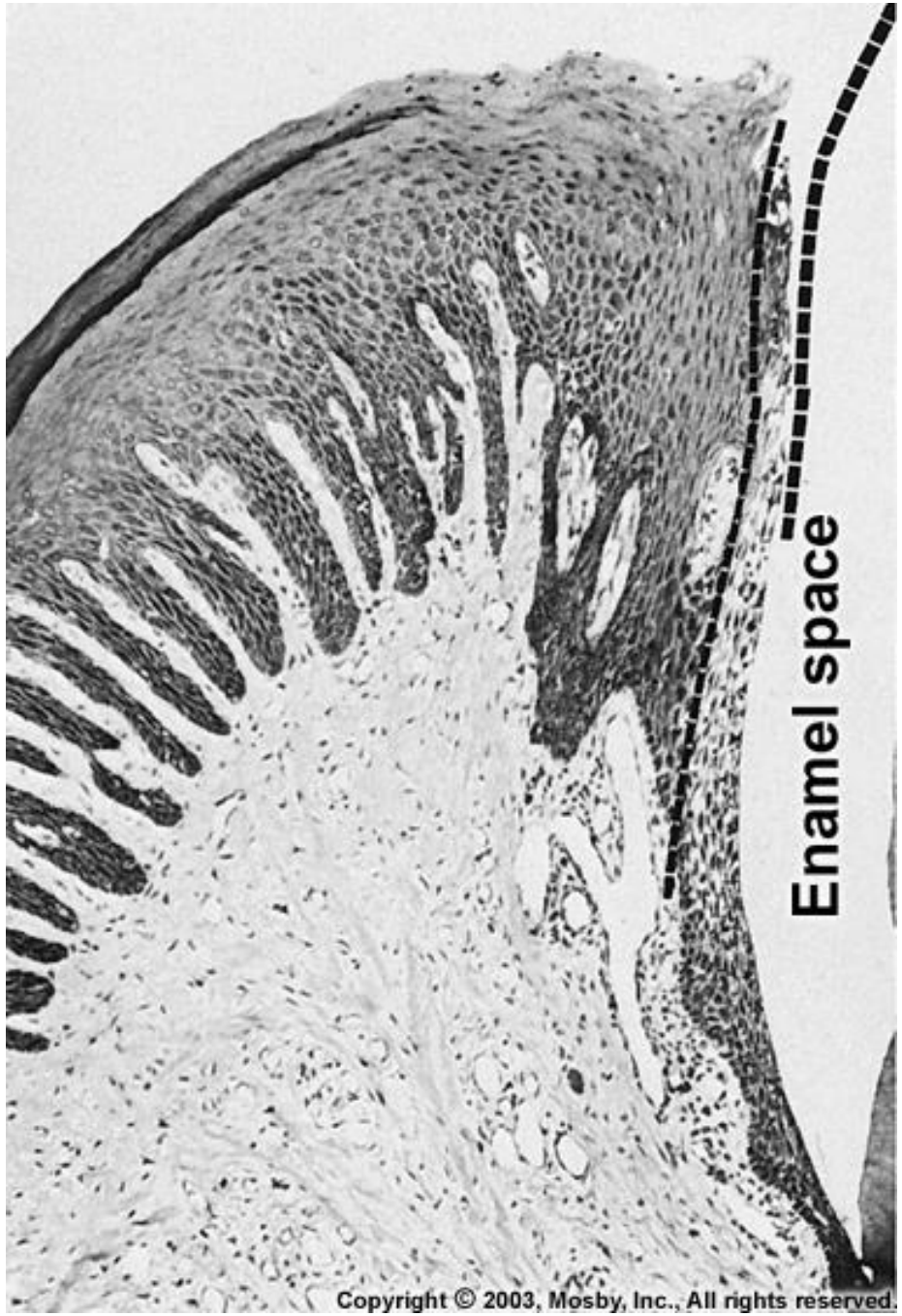


Fig. 26.6 Diagrammatic representation of the development of the dentogingival junction during the eruption of a tooth. R.E.E. = Reduced enamel epithelium (green). Red outline delineates oral epithelium.



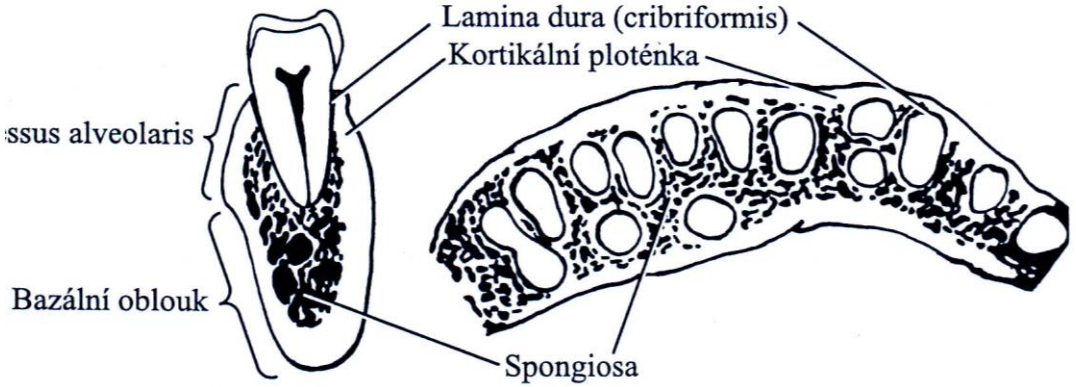




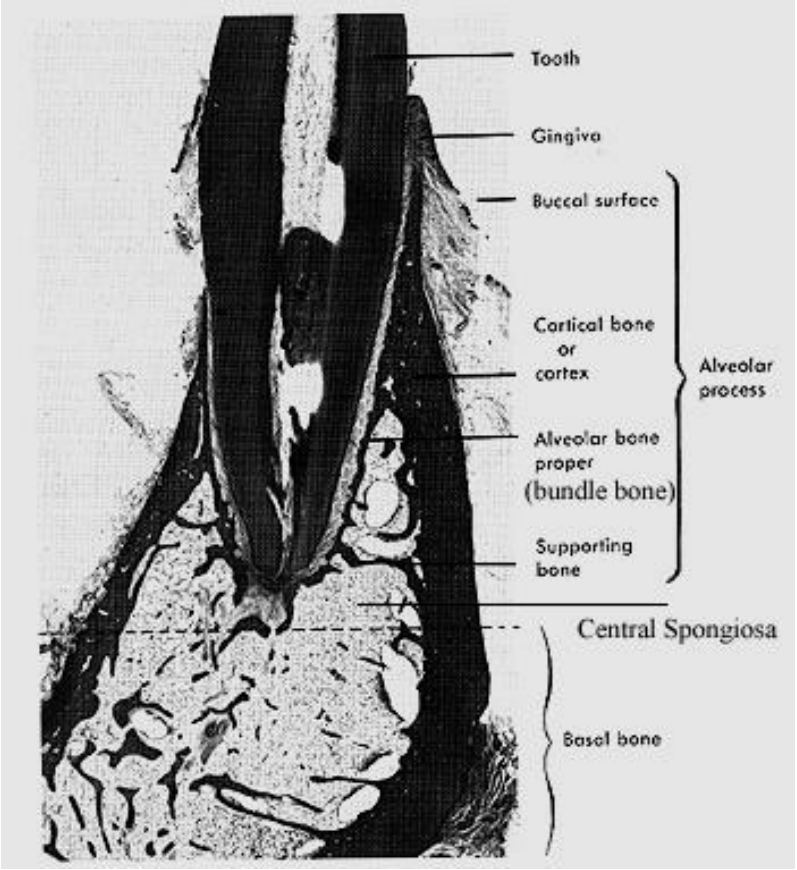
Alveolar process development

It is established together with the other parts of the upper and lower jaw. **Intramembranous ossification**

Initially, it is low and develops with the development of tooth roots and during eruption of the dentition.
It is distinguished into
a) Cortical bone (*lamina vestibularis, lamina oralis*)
b) Proper alveolar bone (*os alveolare*)
c) Supporting bone (*spongiosa*)



: 25–5. Podélný a příčný (horizontální) řez mandibulou demonstruje stavbu alveolárních výběžků a alveolární kosti.



Timeline of primary dentition eruption

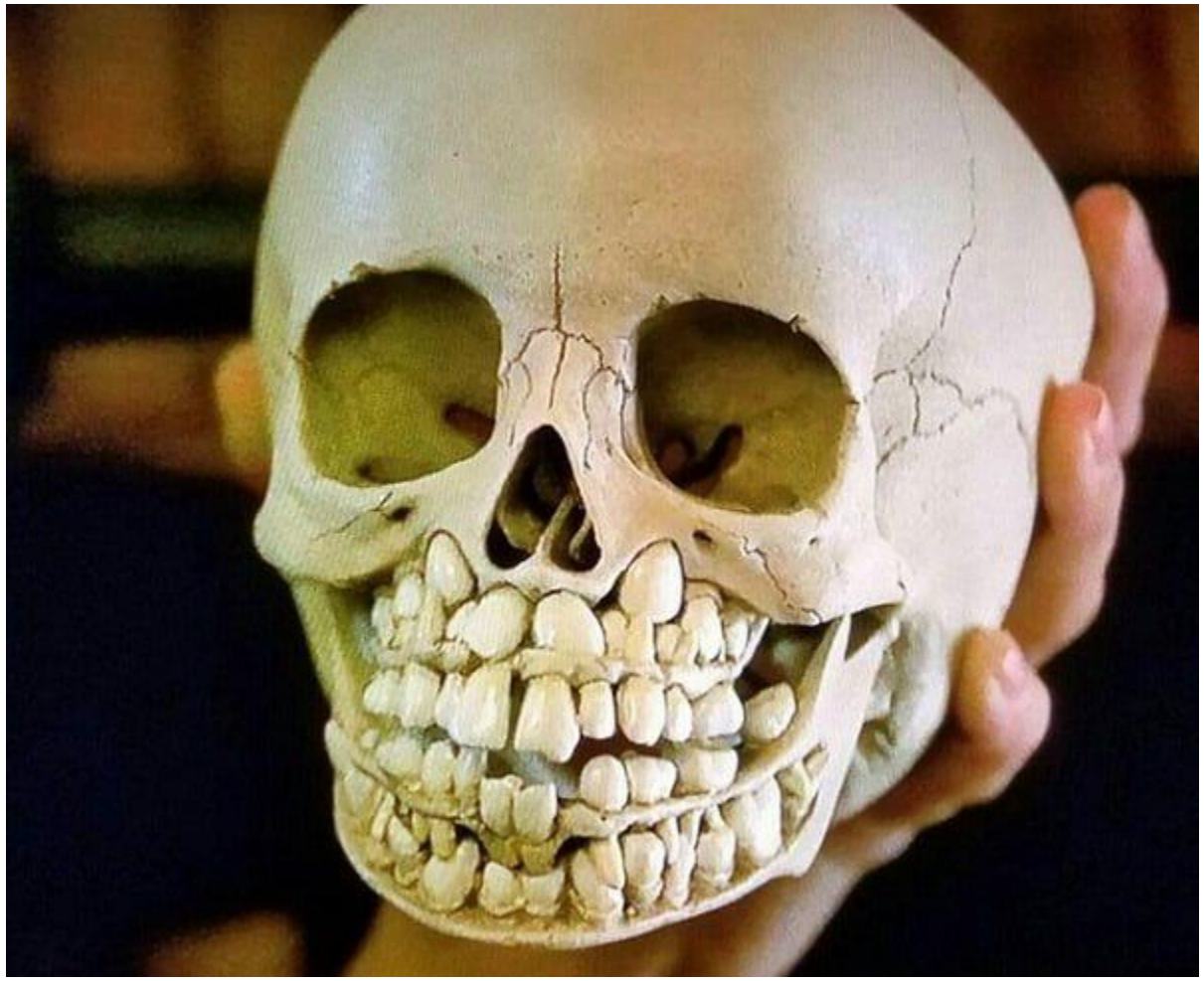
		Exfoliation (shedding)
i1	6. - 8. months	7 year
i2	7. - 12. months	8 year
c	15. - 20. months	12 year
m1	12. - 16. months	10 year
m2	20. - 30. months	11-12 year

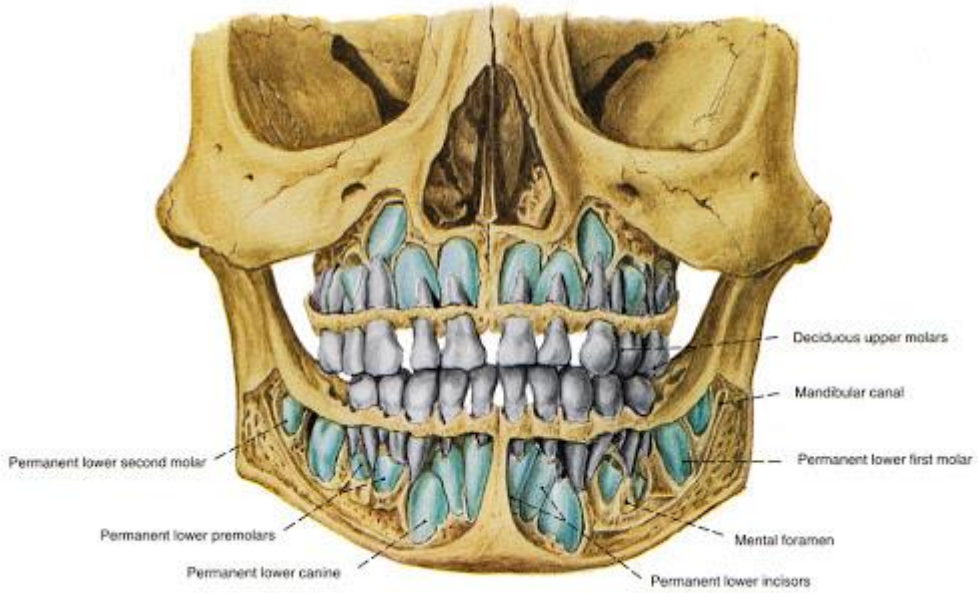
Temporary dentition erupts between 5 - 30 months after birth

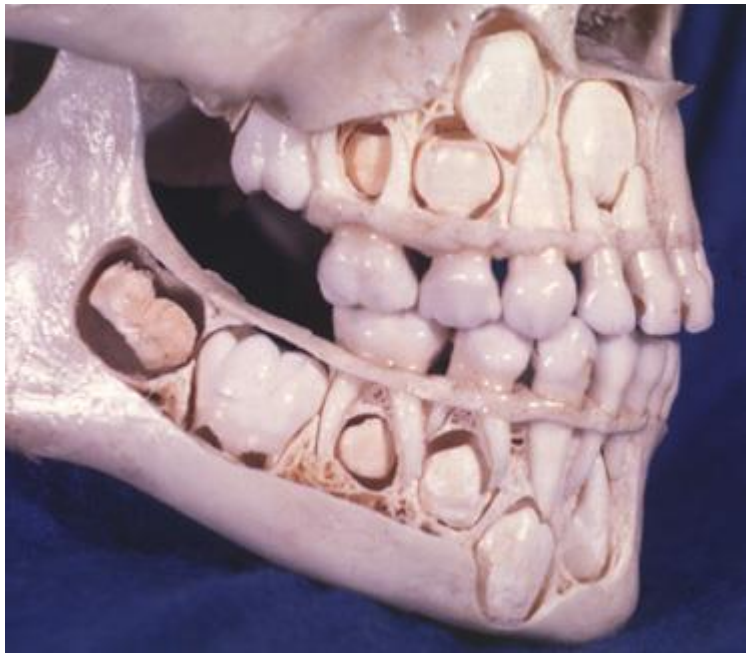
Temporary dentition is fully functional until 6. year, then is being changed with secondary dentition

Exfoliation of temporary dentition follows the eruption of secondary dentition

Permanent dentition development







Permanent dentition development

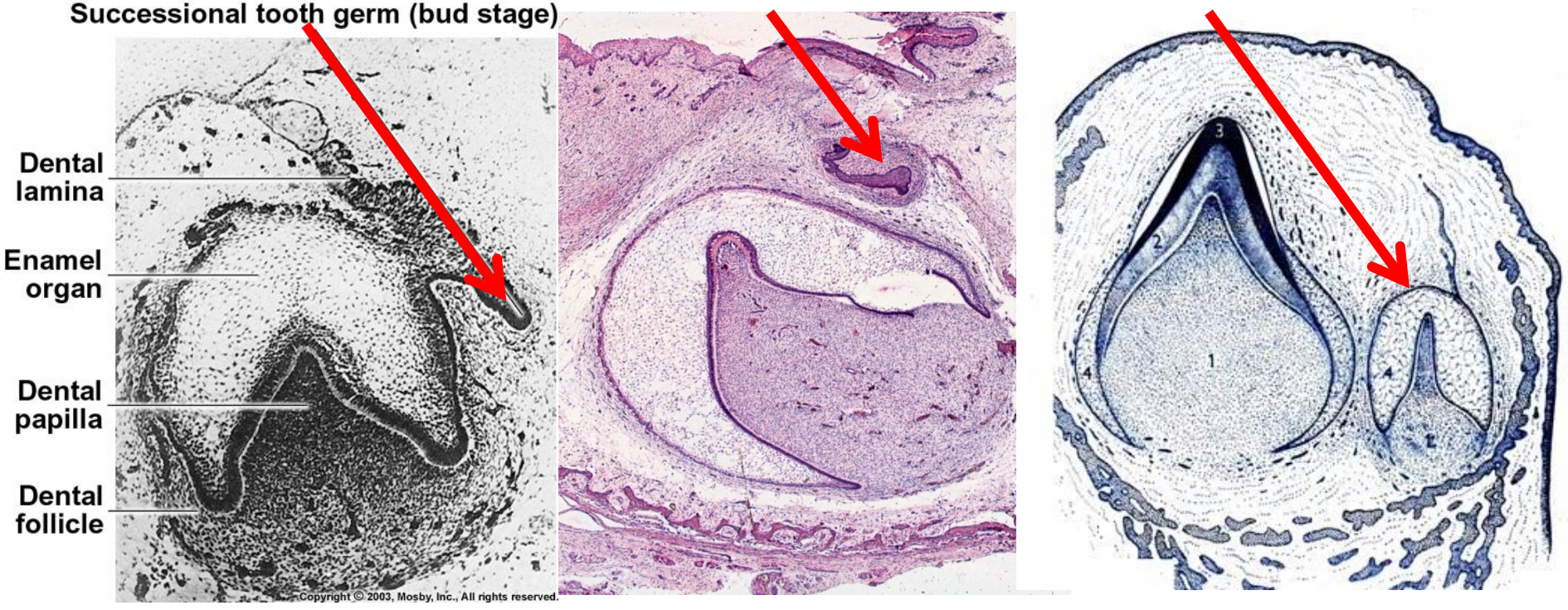
Takes a substantially longer period than primary dentition

Starts in the **middle of the 2nd trimester** (approx. 4 months of prenatal development) and ends with eruption between 7. - 17. (40). year of age

Mechanisms and developmental **stages similar to temporary dentition**

I_1,I_2, C, P_1,P_2, develop from a **<u>successional dental lamina</u>**

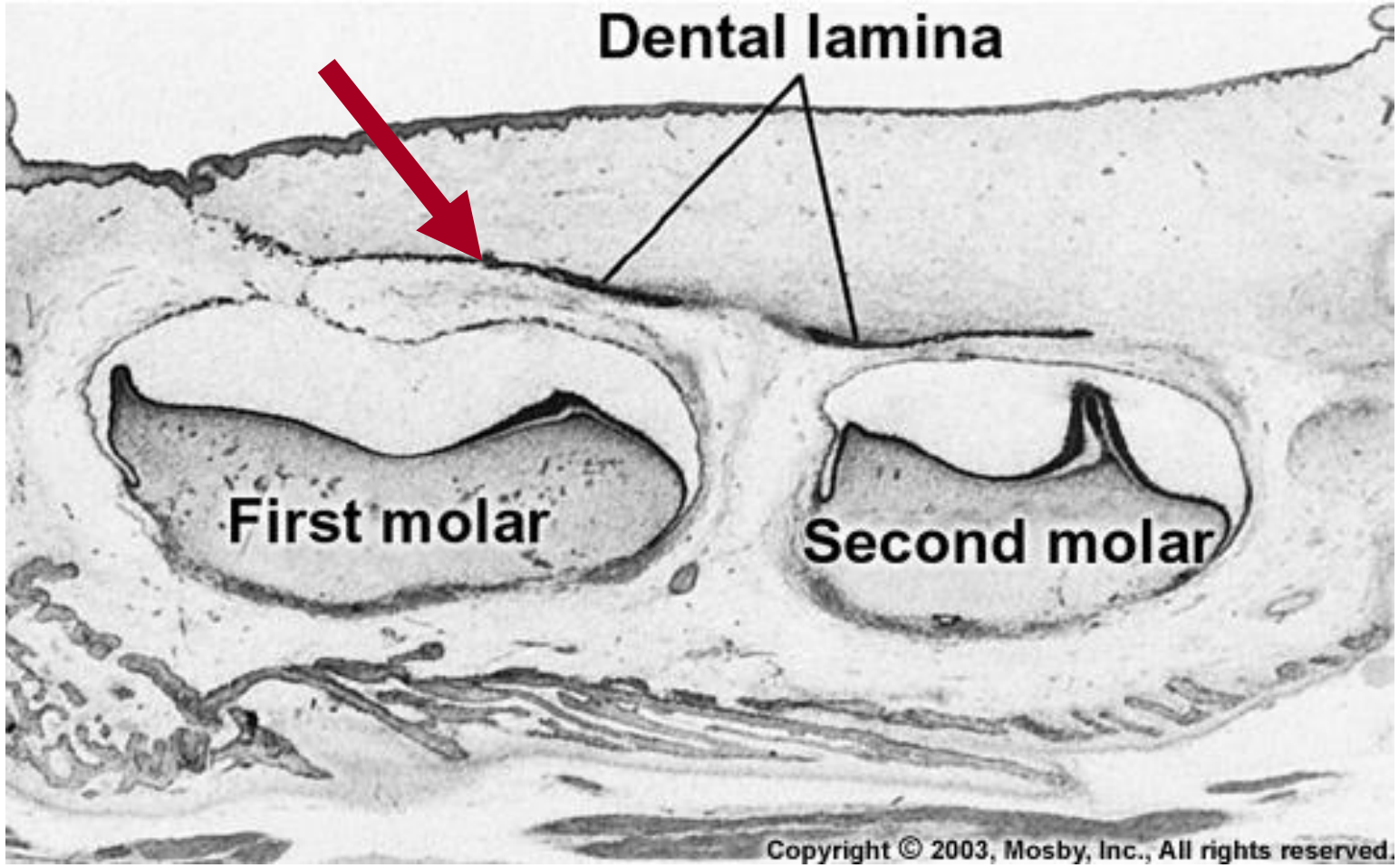
Successional dental lamina is a derivative of primary dental lamina and is segmented (in contrast to primary dental lamina)



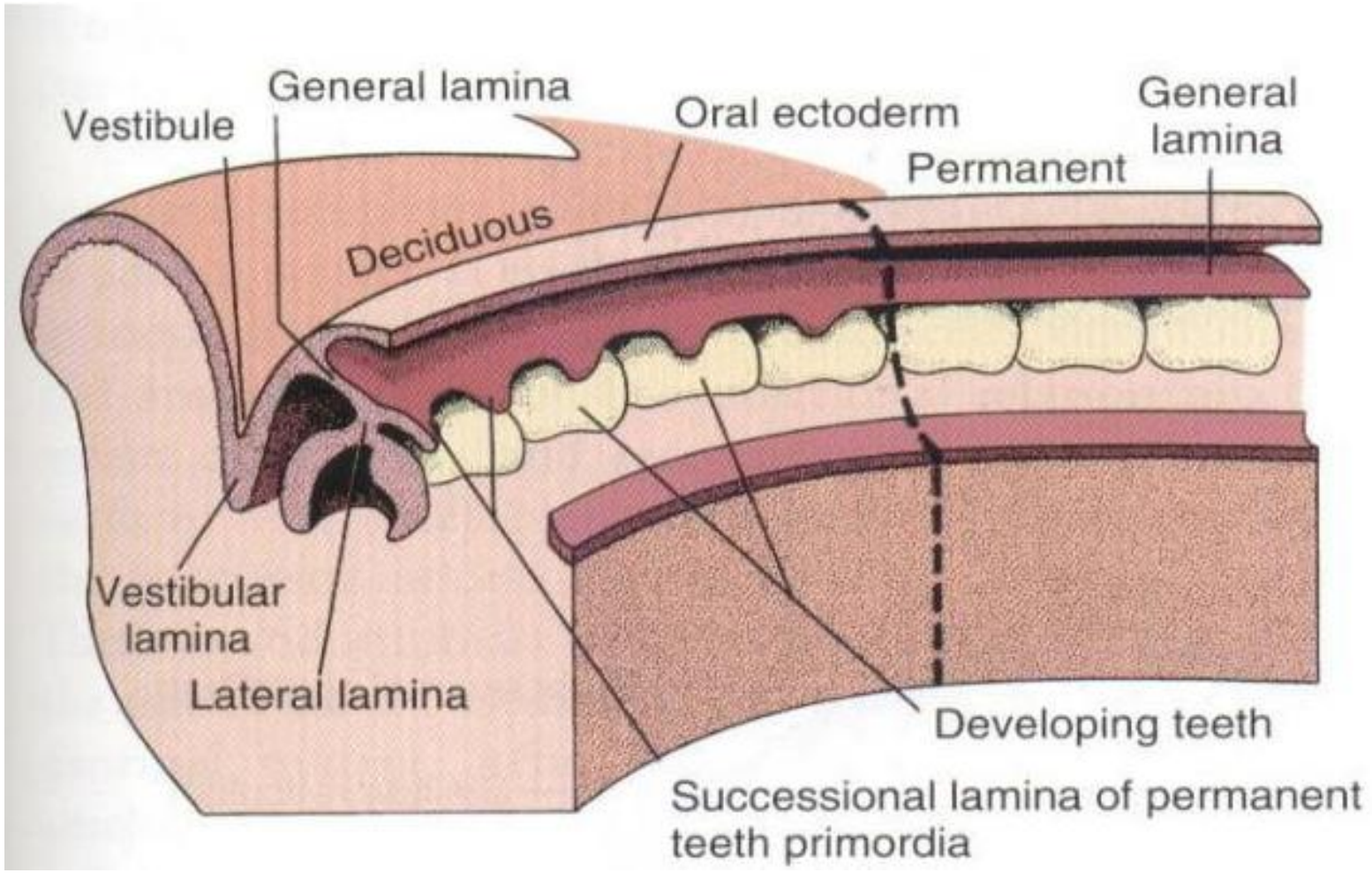
Permanent dentition development

M1, M2, M3 develop from the <u>elongation of the primary dental lamina</u>

Developmentally molars from the secondary dentition belong to the teeth of primary dentition



Permanent dentition development



Timeline of primordia of permanent dentition formation

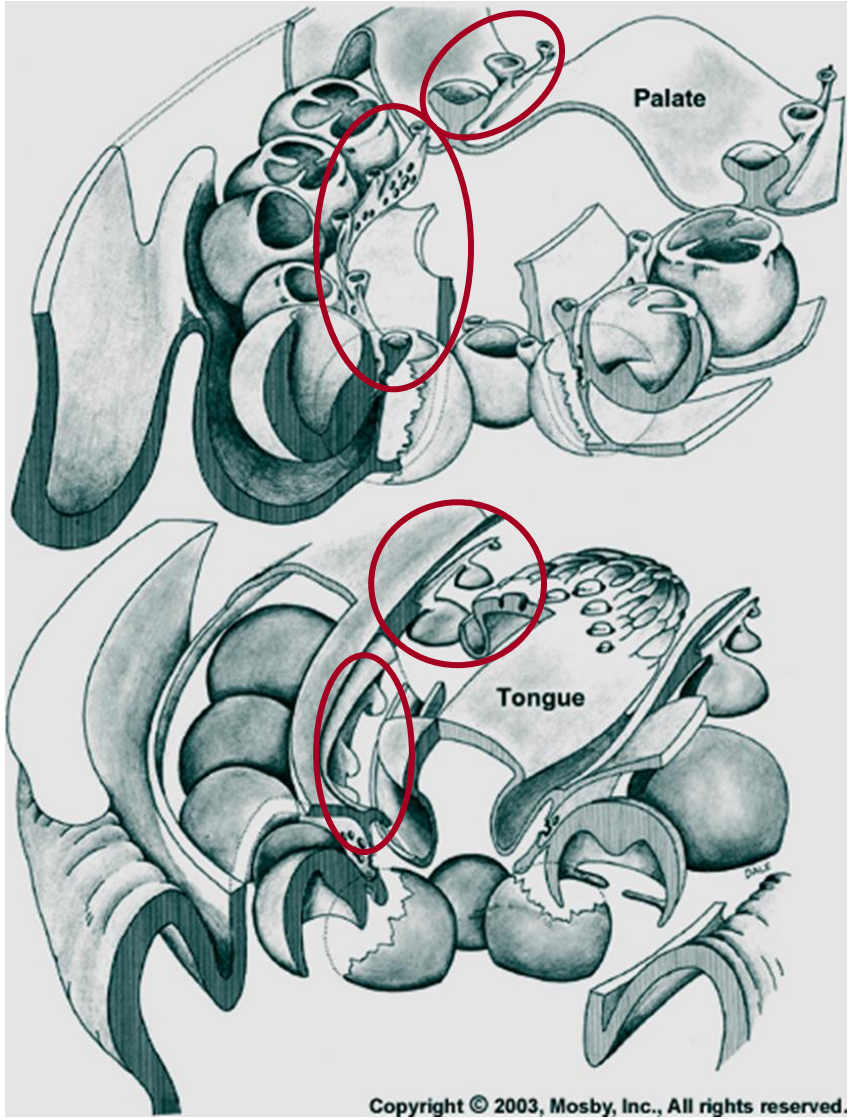
Prenatally:

M_1	4. month – *primary lamina*
I_1, I_2	5 - 6. month
C	8. month

Postnatally:

M_2	6. month – *primary lamina*
P_1	10. - 12. month
P_2	18. month (1,5 year)
M_3	5. year – *primary lamina*

Permanent molars developmentally belong to teeth of primary dentition



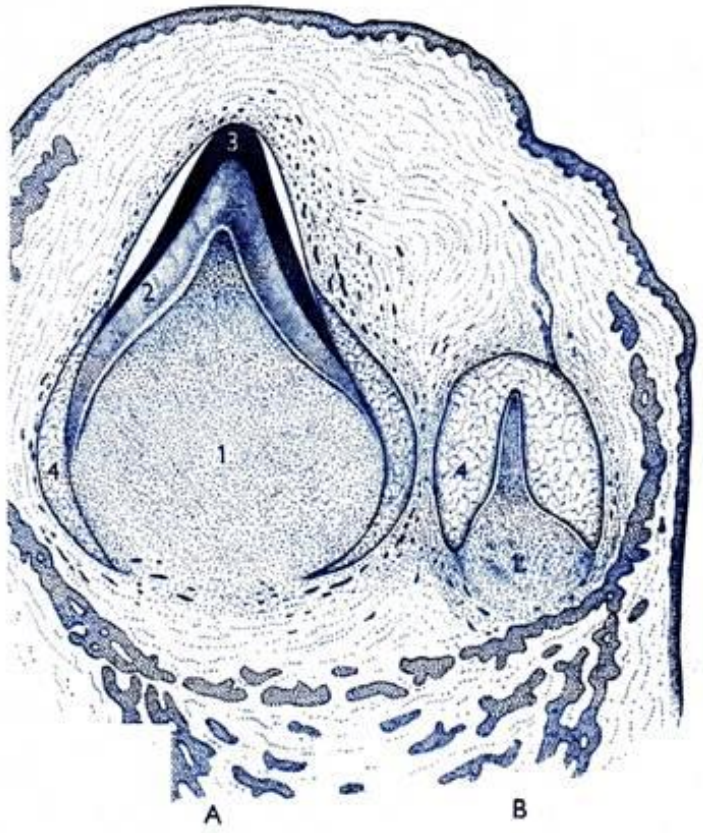
foetus - 6 month old

Permanent dentition development

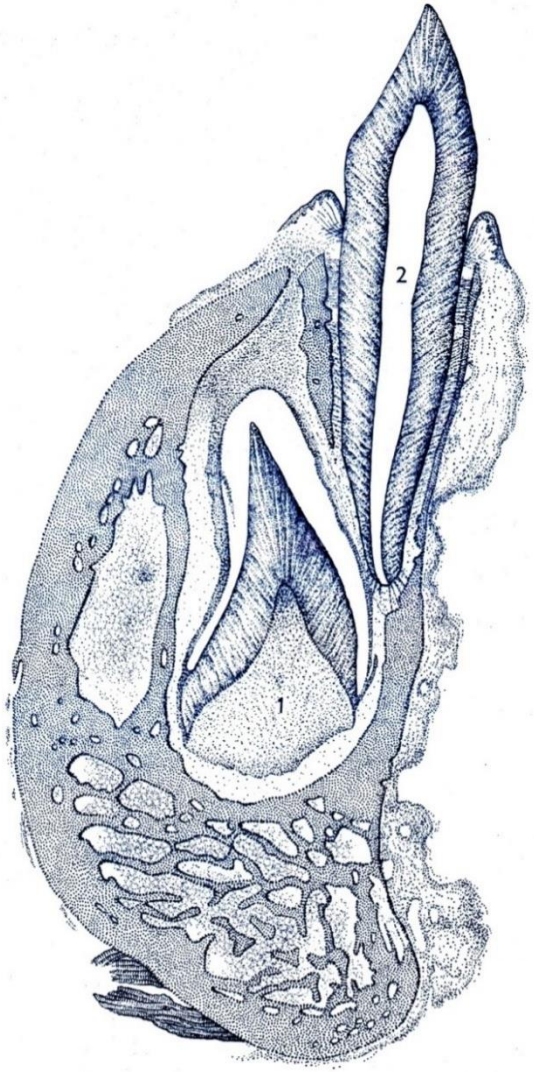
The follicle of temporary and definitive tooth is initially at the same level, both surrounded by ectomezenchyme and sharing part of the dental follicle

During development, the primary tooth grows and secondary takes place under the root of the temporary tooth

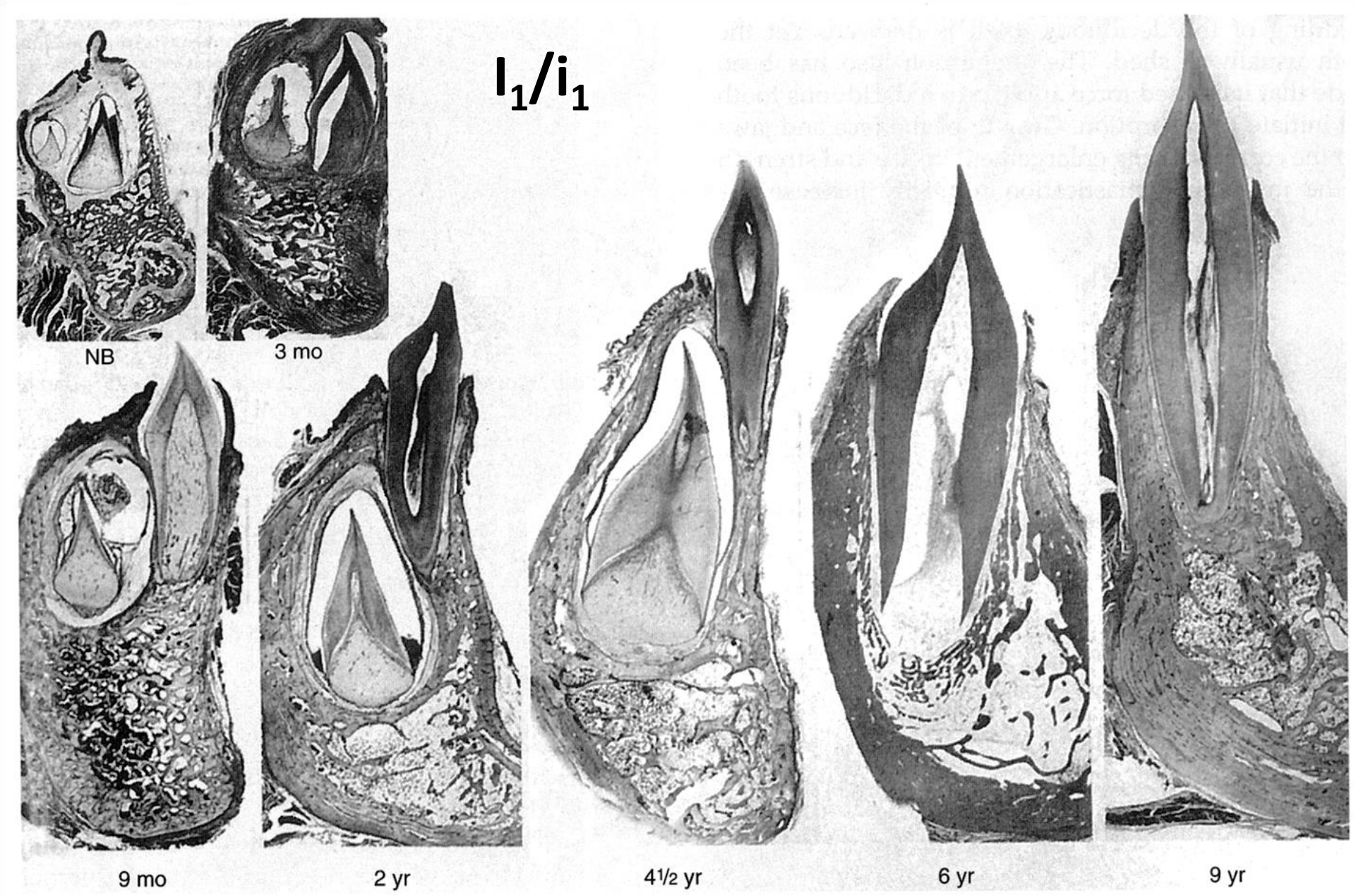
The follicles of both teeth separates the bony barrier



Obr. 83.



Bucolingual crossections through incisors (newborn - 9 years)



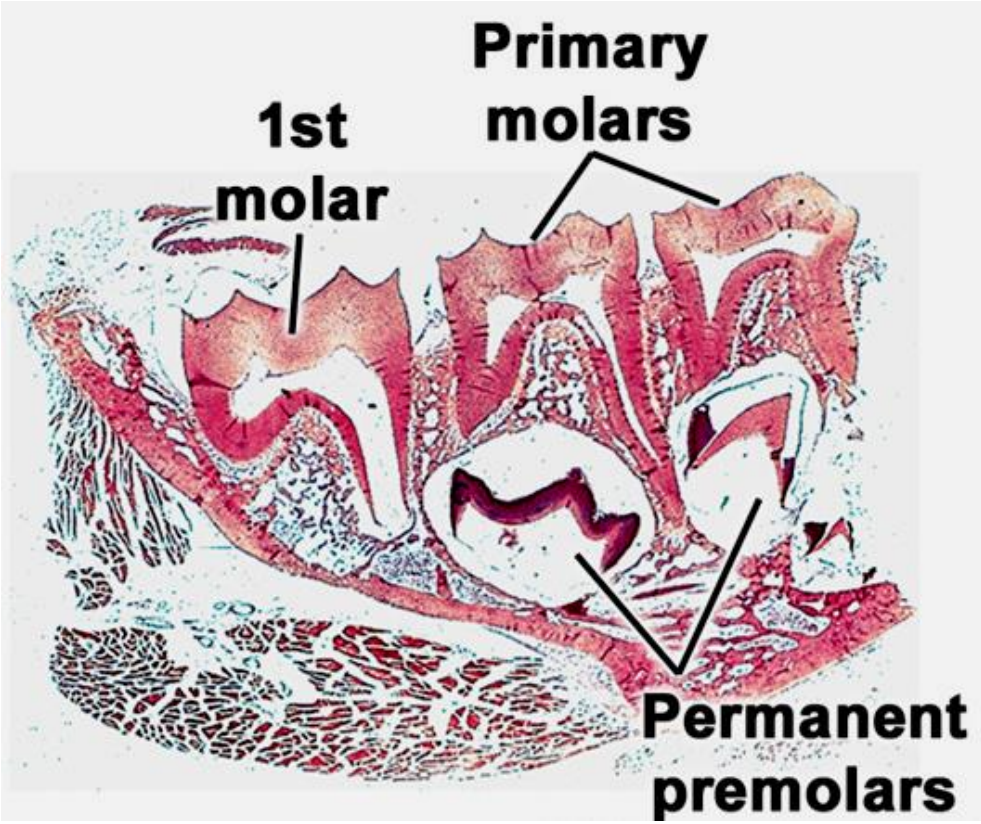
Eruption of permanent teeth

Eruption of permanent molars are similar to temporary teeth
For permanent incisors, canines and premolars primary dentition needs to be removed

With the growth of the permanent root, the crown pushes the bone barrier, which separates both teeth. After resorption of the bone, the crown cause pressure on root of primary dentition which initiate radix resorption
Role of „-clasts“

The result is a gradual shortening root of a temporary tooth

In parallel there are changes in dental pulp,
periodontium and epithelial tissue



Eruption of permanent teeth

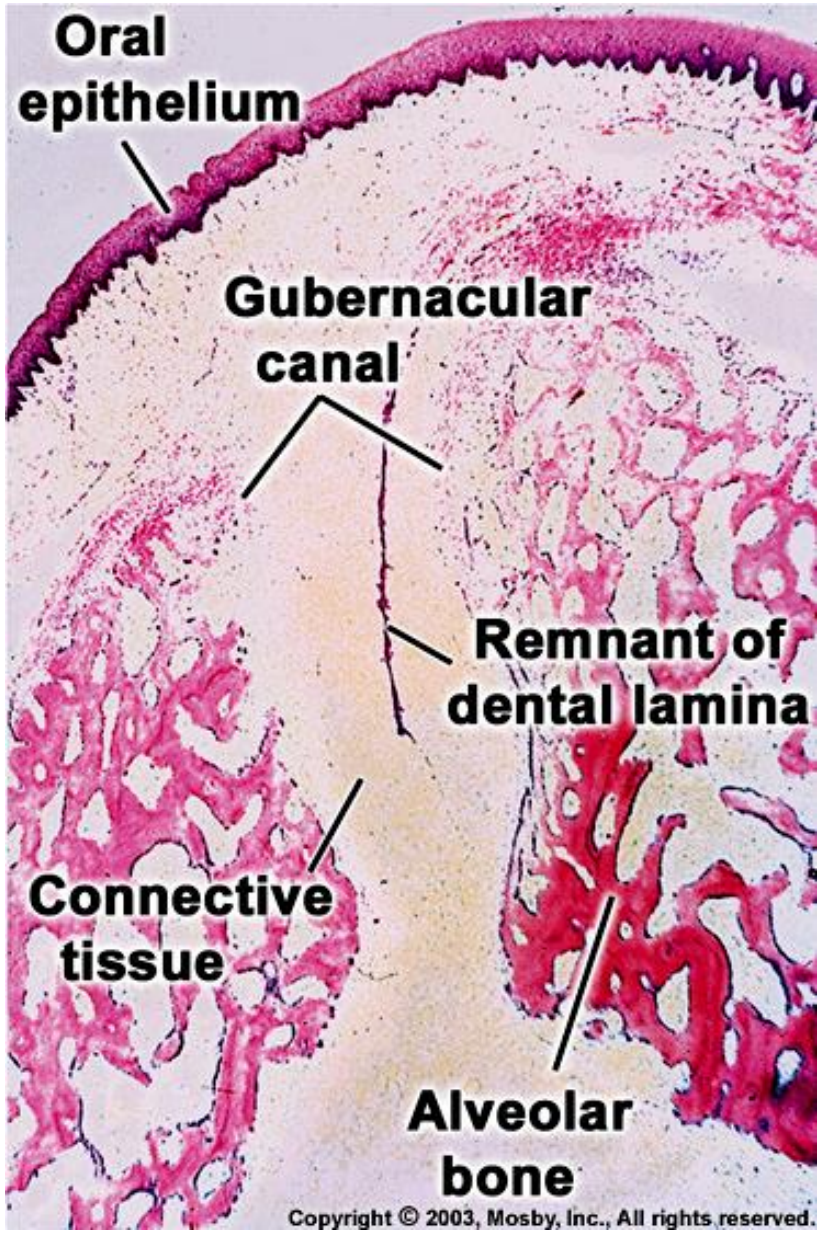
Periodontium loses its ligamentous character
conversion into loose collagenous connective tissue (it still retains the ability of redifferentiation because it provides material for the definitive periodotium)

Epithelial junction is disintegrated and cementum is exposed.

Dental pulp - transformation into stripes of dense connective tissue

… In case of increased load, when the ligaments are no longer sufficient to fix and stabilize the tooth when biting and chewing, the stripes break and the temporary tooth falls out (exfoliation)

The channel formed after the temporary tooth has fallen out (called **gubernacular**)**,** will be used by a permanent crown for easier eruption into the oral cavity



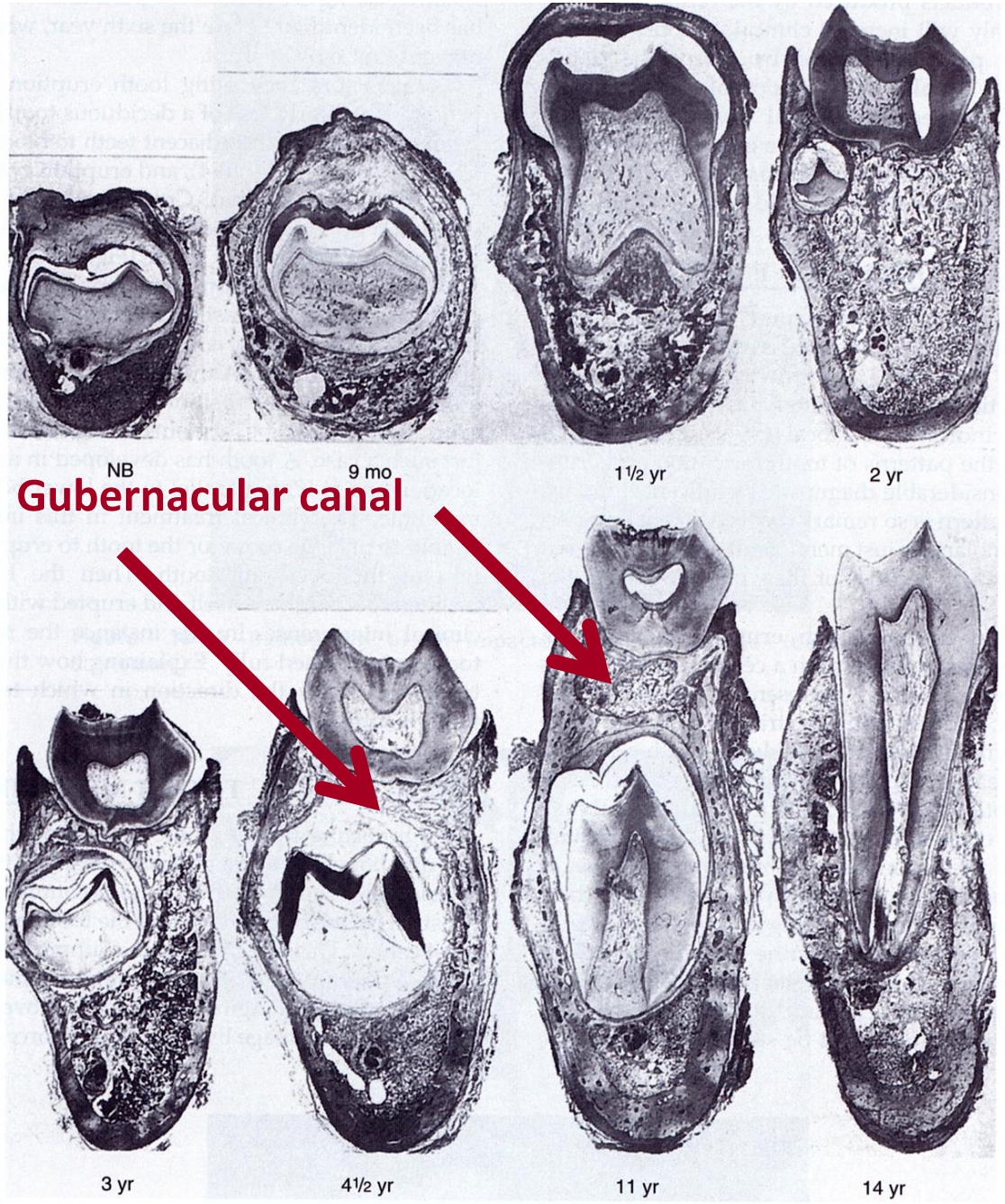


Figure 10-22—cont'd **B,** Buccolingual sections through the deciduous first molar and permanent first premolar of the mandible at representative stages of develop-

Table 26.1 *Chronology of tooth development and the order of eruption*

Chronology of the deciduous dentition

Tooth	*First evidence of calcification (months in utero)*	*Crown completed (months)*	*Eruption (months)*	*Root completed (years)*
Maxillary				
A	3–4	4	7	$1\frac{1}{2}$–2
B	$4\frac{1}{2}$	5	8	$1\frac{1}{2}$–2
C	5	9	16–20	$2\frac{1}{2}$–3
D	5	6	12–16	2–$2\frac{1}{2}$
E	6–7	10–12	21–30	3
Mandibular				
A	$4\frac{1}{2}$	4	$6\frac{1}{2}$	$1\frac{1}{2}$–2
B	$4\frac{1}{2}$	$4\frac{1}{2}$	7	$1\frac{1}{2}$–2
C	5	9	16–20	$2\frac{1}{2}$–3
D	5	6	12–16	2–$2\frac{1}{2}$
E	6	10–12	21–30	3

Unless otherwise indicated all dates are postpartum. The teeth are identified according to the Zsigmondy system.

Chronology of the permanent dentition

Tooth	*First evidence of calcification*	*Crown completed (years)*	*Eruption (years)*	*Root completed (years)*
Maxillary				
1	3–4 months	4–5	7–8	10
2	10–12 months	4–5	8–9	11
3	4–5 months	6–7	11–12	13–15
4	$1\frac{1}{2}$–$1\frac{3}{4}$ years	5–6	10–11	12–13
5	2–$2\frac{1}{2}$ years	6–7	10–12	12–14
6	Birth	$2\frac{1}{2}$–3	6–7	9–10
7	$2\frac{1}{2}$–3 years	7–8	12–13	14–16
8	7–9 years	12–16	17–21	18–25
Mandibular				
1	3–4 months	4–5	6–7	9
2	3–4 months	4–5	7–8	10
3	4–5 months	6–7	9–10	12–14
4	$1\frac{3}{4}$–2 years	5–6	10–12	12–13
5	$1\frac{1}{4}$–$2\frac{1}{2}$ years	6–7	11–12	13–14
6	Birth	$2\frac{1}{2}$–3	6–7	9–10
7	$2\frac{1}{2}$–3 years	7–8	12–13	14–15
8	8–10 years	12–16	17–21	18–25

All dates are postpartum. Teeth are identified according to the Zsigmondy system.

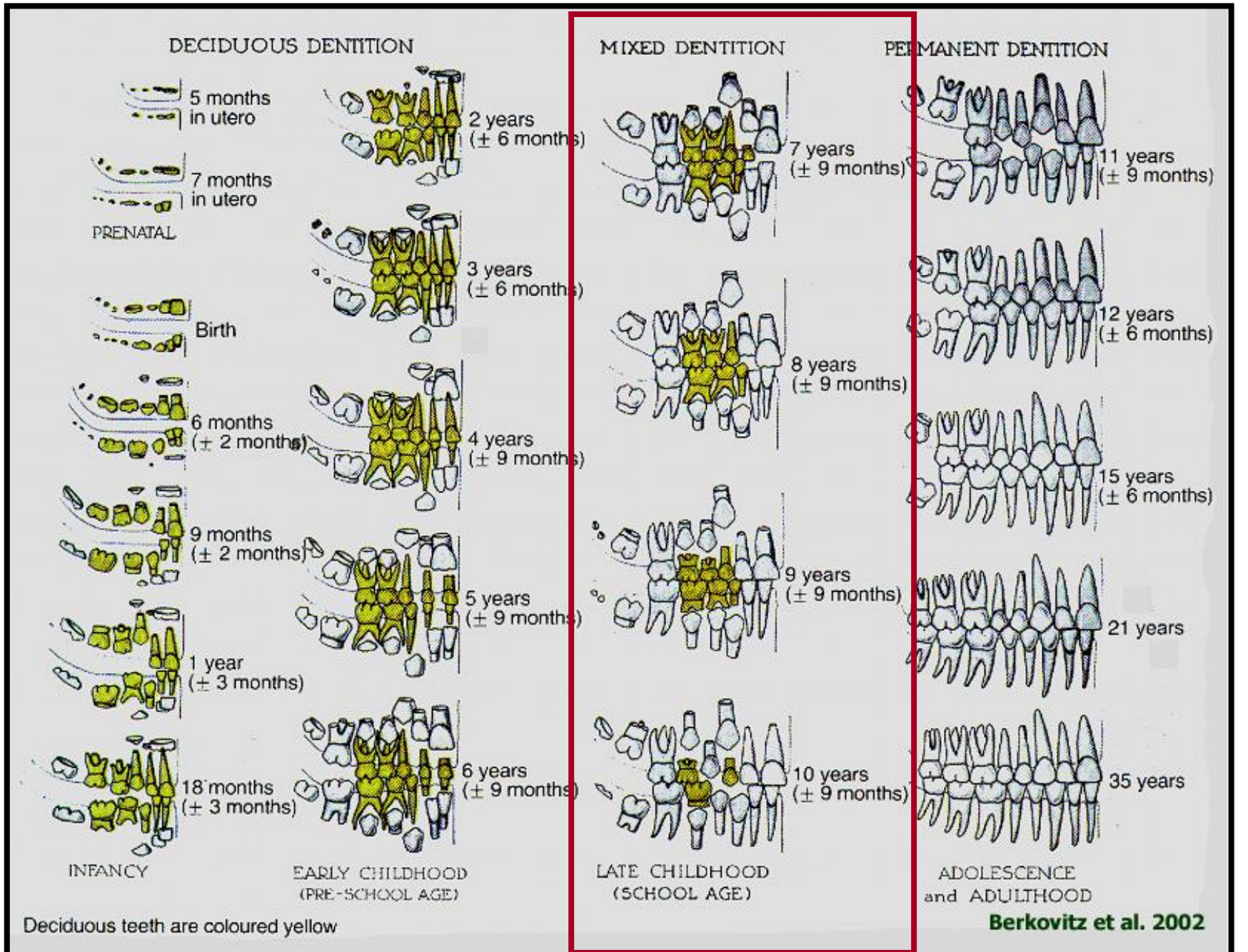
Mixed dentition

Dentition, in which temporary and permanent teeth are both present
Mixed dentition period - starts **by eruption of the first permanent molar (M_1) and** ends **by exfoliation of the second temporary molar (m_2)**
Lasts between **6. - 12. year**

Exfoliation (shedding) of deciduous teeth recapitulate their eruption

i1	**6. – 8. month**	**7. year**
i2	**7. – 12. month**	**8. year**
c	**15. – 20. month**	**12. year**
m1	**12. – 16. month**	**10. year**
m2	**20. – 30. month**	**11. – 12. year**

Mixed dentition



Congenital dental malformations

Teeth number anomaly
- Increased number of teeth
  - Rudimentary
  - Suppmenental
- Decreased number of teeth
  - Hypodontia
  - Oligodontia
  - Anodontia

Fused teeth
- dentes confusi
- dentes concreti
- dental druse

Tooth shape anomalies

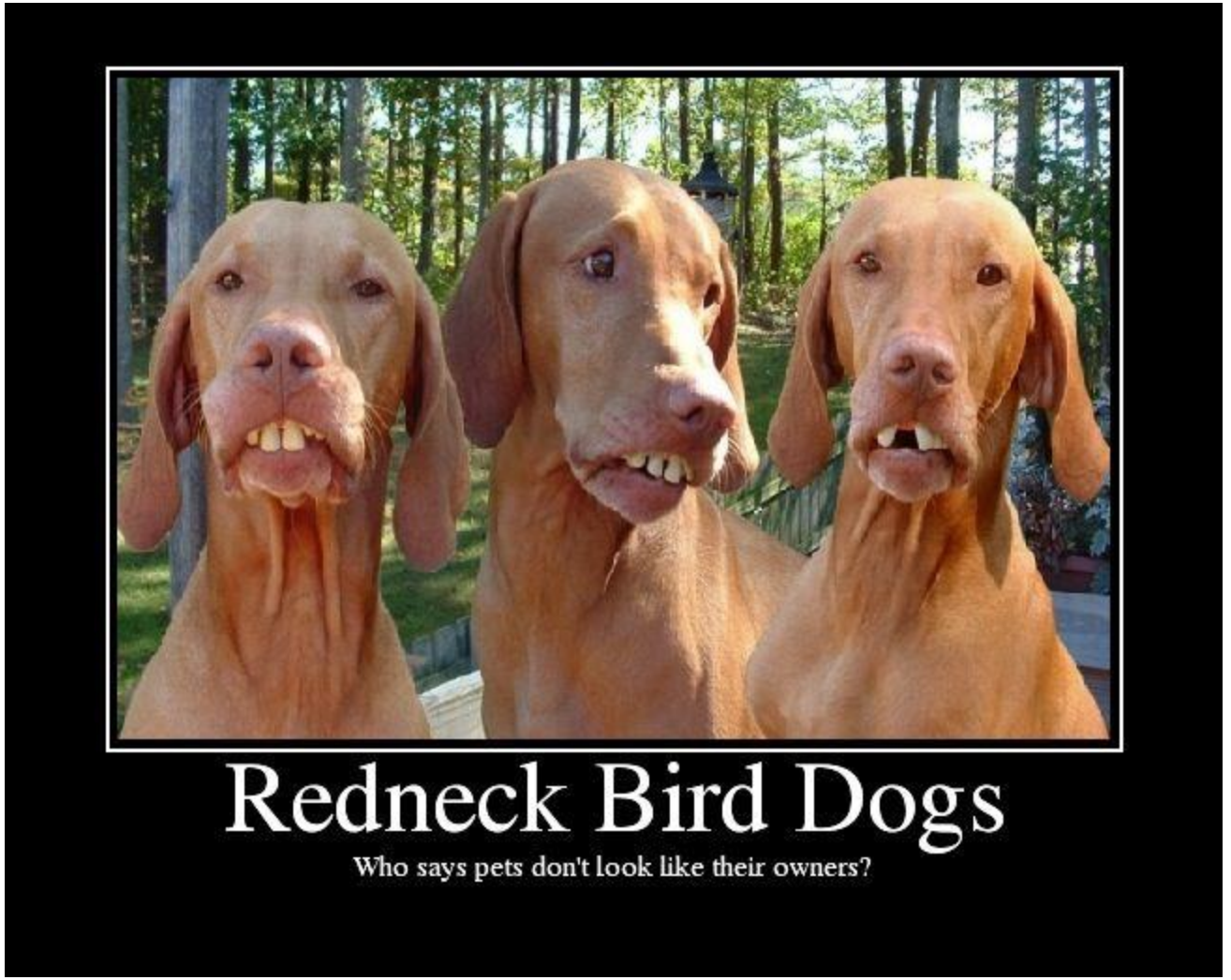
Size anomalies
- Macrodontia
- Microdontia

Anomalies in the hard tissues formation
- Enamel
- Dentin
- Cementum

Tooth positions anomalies
- protrusion
- transposition
- rotation
- heterotopy
- retention

Anomalies in eruption (related to time)
- dentitio tarda
- dentitio praecox

Odontomas



Numerical abnormalities

a) Dentes supernumerarii (hyperdontia)

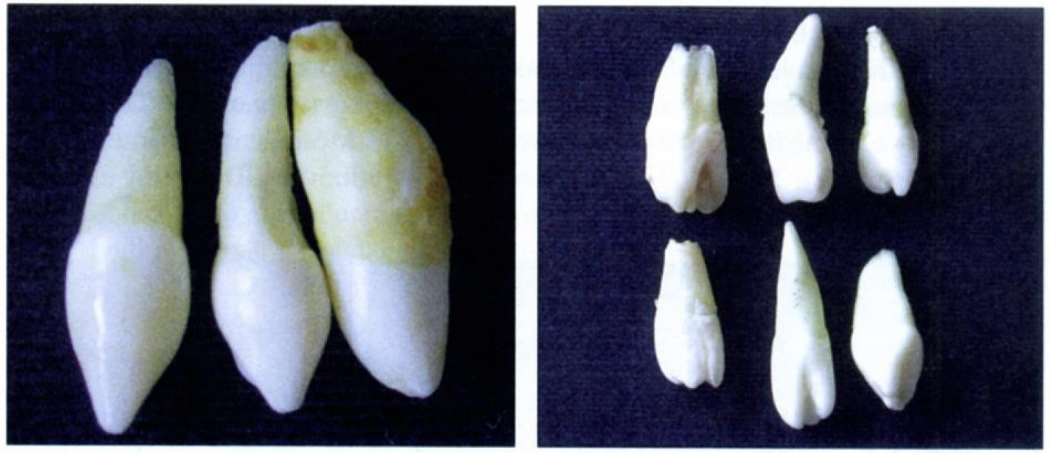
more frequent in permanent dentition, the shape of teeth is a normal or garbled (odontoid)
paramolar - molars located labial to molars //distomolar - molars located distal to molars

parapremolars, distopremolars

mesiodens - the upper middle

incisor (maxillary central uncisor)


dysostosis cleidocranialis


Obr. 22, 23 Extrahované mesiodenty čípkovité (vlevo); hrbolkového a soudkovitého typu (vpravo).


Obr. 24, 25a Prořezaný čípkovitý mesiodens (vlevo); totéž v dočasném chrupu (vpravo).

Mesiodens - in the gap between the upper middle incisors (spherical or conical shape)

Dens parapremolaris - supernumerary tooth on the bucal or palatal side or **dens distopremolaris** (between P2 and M1)

Dens paramolaris - between the first and second molars on the vestibular side

Dens distomolaris - supernumerary 4th molar (located distally to the 3rd molar)

Dentes prelactales (dentes natales) - rare; small supernumerary teeth present at birth, with a small crown and no root (occurring in the region of the lower incisors)

diferenc. dg.: ***dentitio precox***

b) Hypodontia

number of lacking teeth is **lesser than 6** - most often M_3, I_2**,** P_2 (lower jaw)

Occurence: 0.7% (temporary), **2%** (perm.) of individuals (M3, I2 , P2 /lower)

c) Oligodontia

number of lacking teeth is **more than 6**,

mostly teeth of the same type lack

familiar occurrence, AD inheritance

c) Anodontia

rare, associated with total dysplasia of the ectoderm and ectomesenchyme

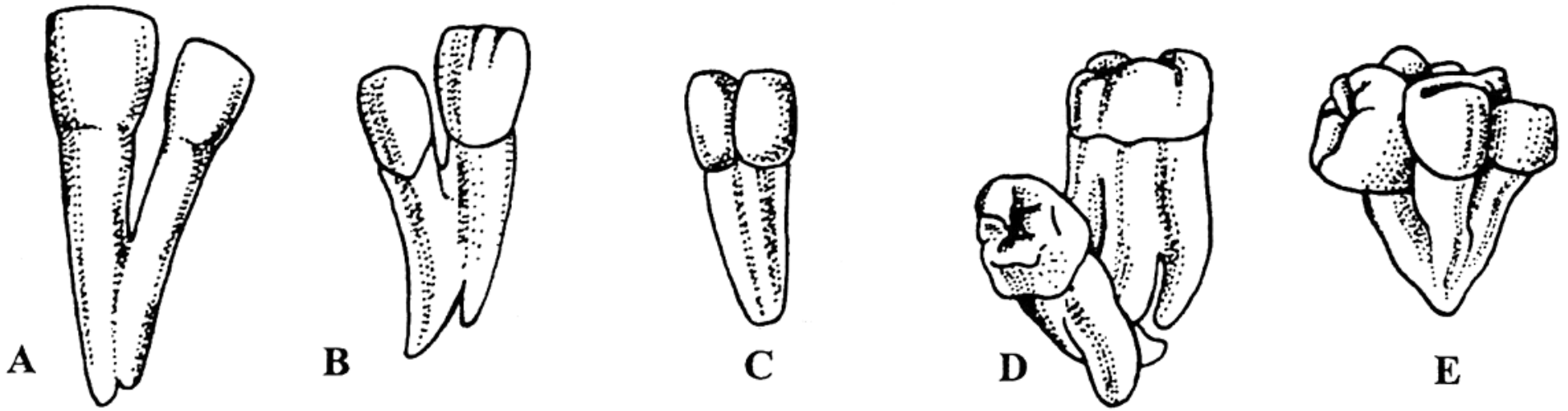
Fused teeth

Dentes concreti and **dentes confusi (double teeth)**

concreti - adjacent teeth coupled with their roots - **A,B** (separate dental cavities)

confusi - adjacent teeth coupled in the full length (from the crown to the apex) **- C**
have a common dental cavity

most often caused by a fusion of tooth buds
(rarely by division of one tooth bud - dentes geminati)

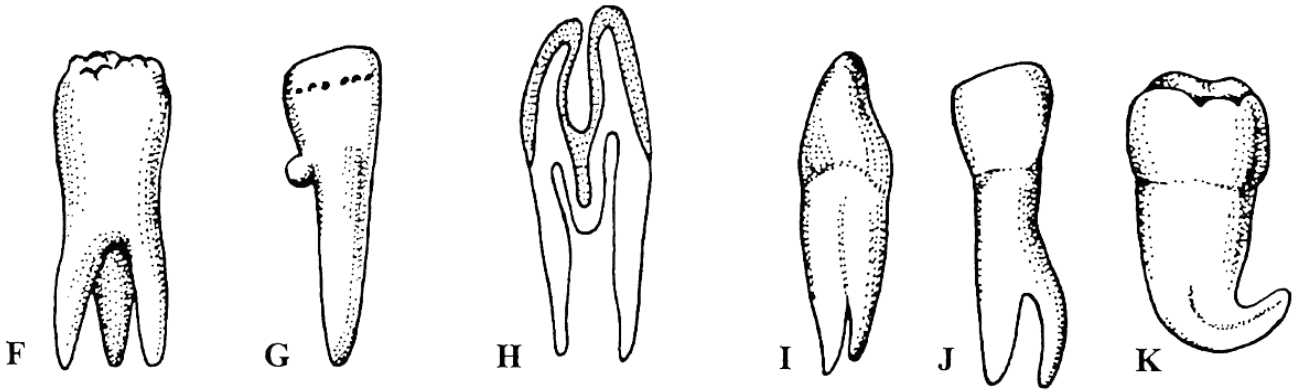


Anomalies of tooth shape

Common – manifested in a crown, neck or root

Caused by activity of aberrant ameloblasts or by defectly developed Hertwig´s epithelial sheath

Examples: conically shaped crowns of lateral incisors, reduced or increased length of the root, reduced or increased number of the root branches etc.



Obr. 68 Kolénkovité zahnutí radixů horních řezáků.

Size of teeth

Macrodontia and Microdontia - increased/decreased activity of individual parts or the entire dental bar (disproportion between the size of teeth and jaws)

Isolated (*microdontia, macrodontia*)

Complete (*macrodontism, microdontism)*

Anomalies of hard tooth tissues

<u>Enamel hypoplasia</u>

occurs when activity of ameloblasts is finished earlier than should be

findings: crown shows usually abnormal shape; enamel is thinner; fissures, scratches, and holes

isolated teeth or group of teeth

Causes:

rachitis, hypoparathyroidism

syphilis congenita (**Hutchinson incisors** with semilunar edges, „mulberry“ molars)

Inflammatory affections of deciduous teeth connected **with affections of tooth germs of permanent teeth** - enamel of permanent teeth crowns has fissures and is pigmented - Turner´s teeth)

treatment of tetracyklin antibiotics

Amelogenesis imperfekta

Always hereditary cause, inheritance of AD, AR, but also linkage to the X chromosome
3 forms: hypoplastic, hypomaturation and hypomineralization

Hypoplastic: local defects (fissures, pitting) or overall thinned enamel, affecting both dentition, temporary or permanent, AD inheritance
(ameloblasts are not functional throughout amelogenesis)

Hypomaturation: normal enamel thickness, but pigmented appearance and yellow-white to brown colour compared to healthy enamel, softer and easily peels away from dentin
Occurrence temporary, permanent or both dentitions, AR inheritance

Hypomineralisation: the enamel is of normal thickness after eruption, but is very soft. Soon disappears during natural attrition (it can also be removed with sharp objects)
patients complain of sensitivity to cold and heat
1 in 20 000 school-age children

Dentin

Dentinogenesis imperfecta

disorder in the development of dentin, which is pinkish to brownish and contains a reduced number of dentinal tubules

teeth are smaller, gray-blue color to **brownish color**

enamel is normal, but is easily separated from dentin (fast abrasion), the in temporary teeth are usual crown fracture

rare, AD inheritance

Sclerosis of dentin

caused by obliteration of dentinal tubules

Cementum

hypercementosis (hereditary)

aberrant cementum

in the periodontium **cementicles**

Anomalies of tooth position

Protrusion - longitudinal axis inclined labially

Retrusion - longitudinal axis inclined orally (into the oral cavity)

Transposition - exchange of space between 2 adjacent teeth in the dental arch (canine / incisor or first molar / canine)

Rotation - rotation of the tooth around the longitudinal axis (mesiorotation, distorotation)

Heterotopia (anomalous eruption) (heteros other, topos - site location)
the tooth was established and developed at an atypical site (isthmus faucium, hard palate) or cut outside the maxillary arch (vestibularly or lingually)

Anomalies in eruption (time)

Dentitio tarda - no tooth is erupted until the end of the 10th month

Dentitio praecox - the first temporary tooth erupt before the 4th month of age