

# *Development of teeth, eruption of teeth, anatomy of primary teeth*

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Semmelweis Egyetem  
Gyermekfogászati és Fogszabályozási Klinika

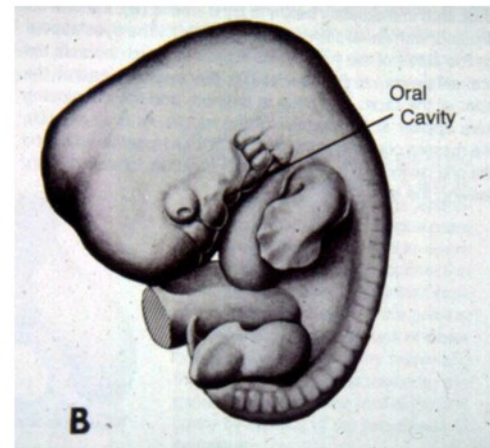
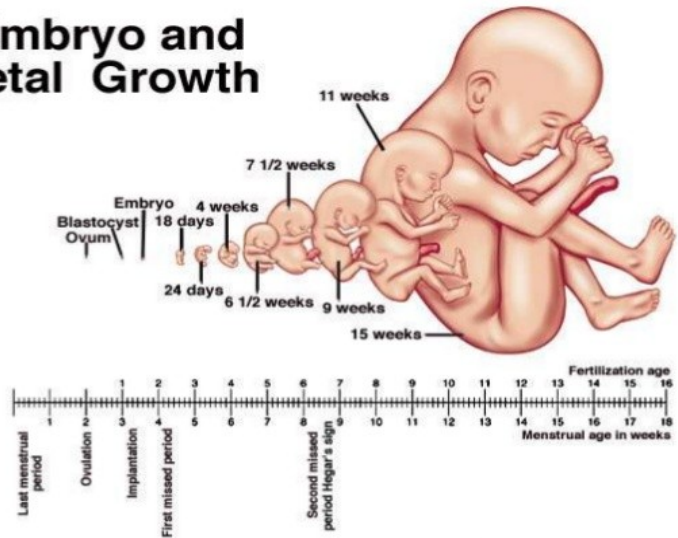


SEMMELWEIS  
EGYETEM 1769

# Tooth development

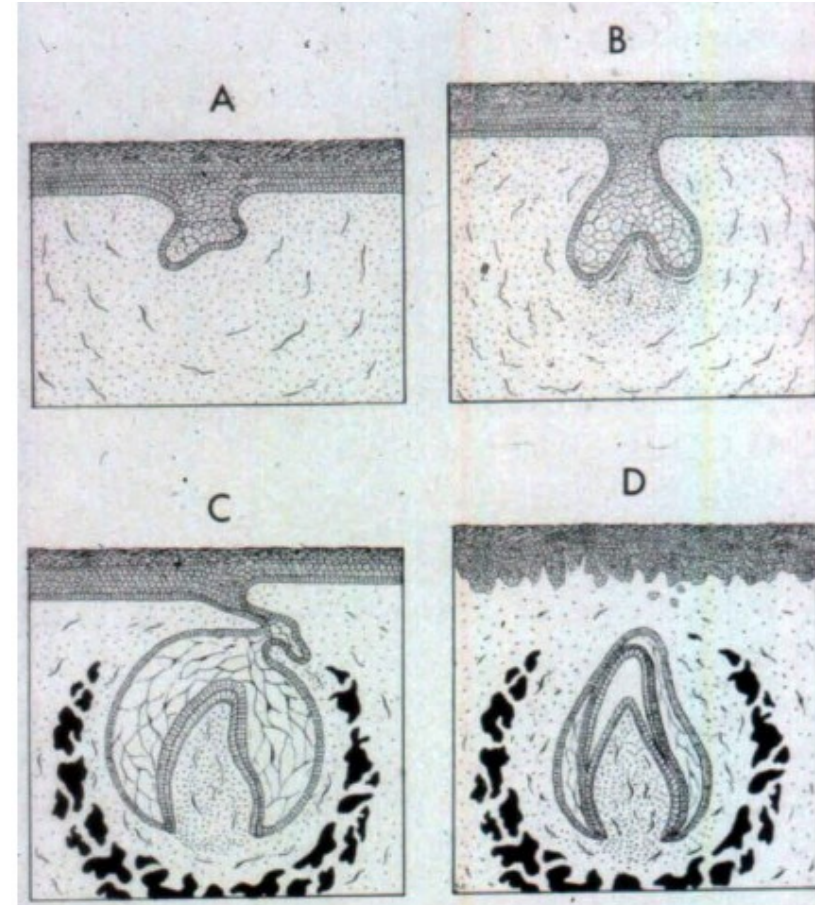
Human- Diphyodont: two types of dentition (primary and permanent)  
Tooth development starts in the embrional 6-8 week

## Embryo and Fetal Growth



# Tooth development

- 1. Dental lamina
- 2. Bud stage
- 3. Cap stage
- 4. Bell stage
- 5. Dental germ

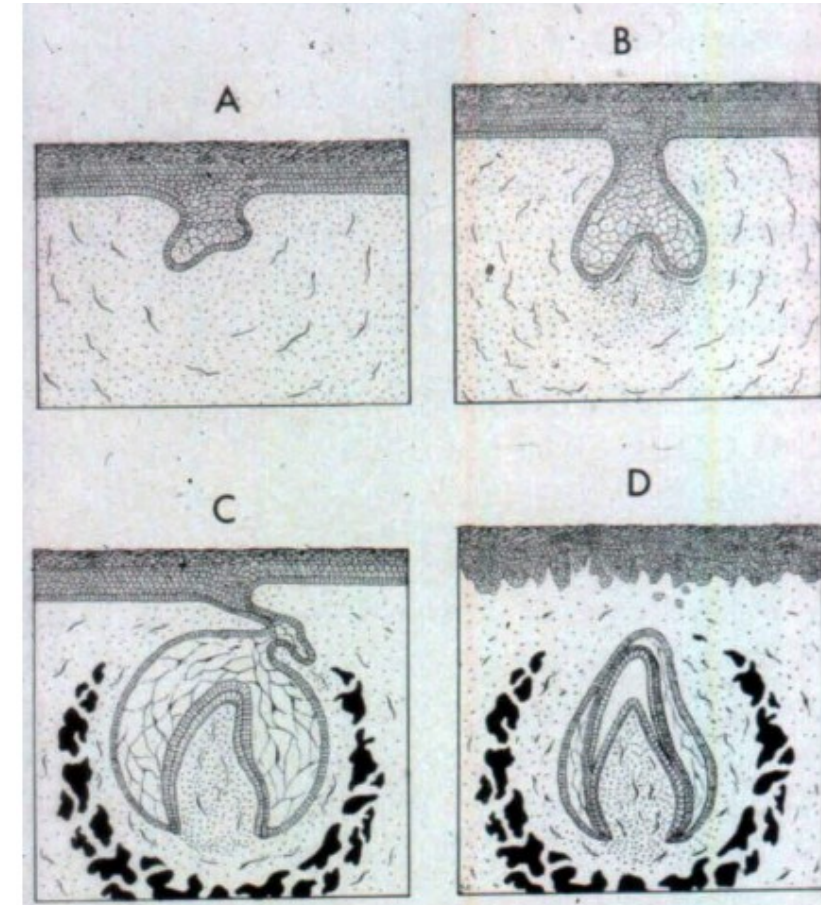


*Rózsa N., Gábris K., Tarján I.: Gyermek és Ifjúsági Fogászat, Semmelweis Kiadó, 2023 Budapest*



# Tooth development

- **Inductio** (6-7th week i.u.)
  - Initiation stage
  - dental lamina
- **Proliferatio**
  - Tooth bud (8th week i.u.)
  - Cap stage (9-10th week i.u.)
- **Histodifferentiatio**
  - Bell stage (11-12th week i.u.)
  - Toothgerm
- **Calcificatio**
  - Enamel
  - Dentin
- **Eruptio**
  - Root (Hertwig's epithelial seath)



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# Tooth development

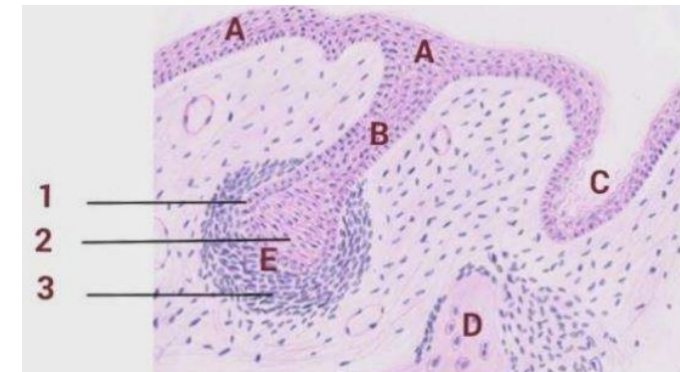
## 1. Induction ( 6-7 week)

- Medial nasal process + maxillary process--> superior processus alveolaris
- Mandibular process 2 side--> lower alveolar process
- 10-10 primary teeth germs appear in both jaw

In the elementary oral cavity (stomodeum) a horseshoe-shaped epithelial thickening appears on the upper and lower edge, pushes deep, splits in a Y shape

- Outer part: lip bar
- Inner part: dental lamina (lamina dentalis) (can be an eruptive cyst)

A- stomodeum epithelium  
B- lamina dentalis  
E- Tooth bud



*Rózsa N., Gábris K., Tarján I.: Gyermek és Ifjúsági Fogászat, Semmelweis Kiadó, 2023 Budapest*

# Tooth development

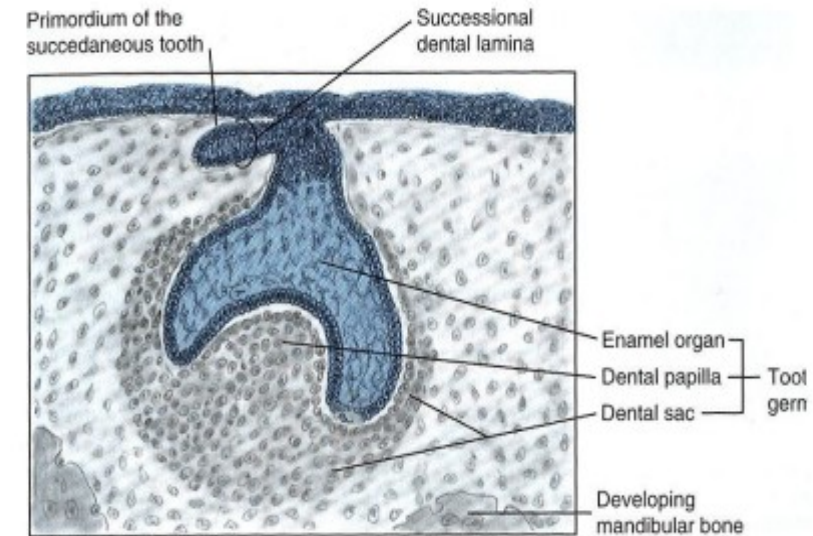
## 2.Proliferation:

-Bud stage (8th week)

-On the outer side of the dental lamina, epithelial globules appear- enamel buds (10-10)

-A compaction of ectomesenchyma around it = dental papilla  
Dental papilla + enamel bud = tooth germ

-Enamel organ is connected to the surface's multilayered non-keratinized squamous epithelium by the dental lamina



*Rózsa N., Gábris K., Tarján I.: Gyermek és Ifjúsági Fogászat, Semmelweis Kiadó, 2023 Budapest*

# Tooth development

## 3. Histodifferentiation:

- Cap stage (weeks 9-10):
- On the aboral side of enamel bud a mesenchymal compaction presents - dental papilla
- Dental papilla pushes in the cells.

Differentiation:

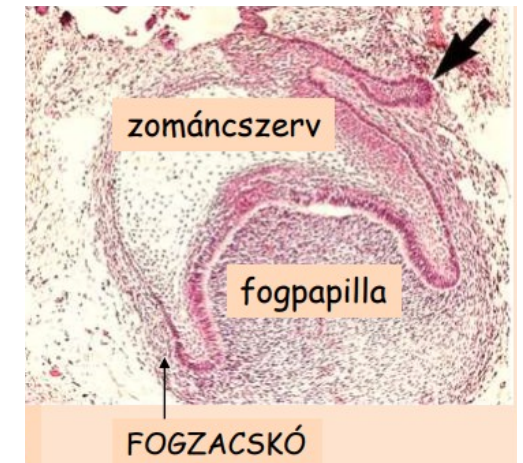
*Enamel organ*

outer enamel - outer cell cubical shape

enamel pulp (str. reticulare) - star-shaped

str. Intermedium enzymes (enzymes)

internal enamel epithelium - cylindrical cells,  
preameloblast-ameloblast



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Gallatz K: Fogak fejlődése – Tantermi előadás



# Tooth development

## 3. Histodifferentiation:

- Bell stage (10-12 weeks)
- Induction: to the mesenchyme to epithelium
- Tooth bud grows, change the shape to bell shape and the *formation of dental crown hard tissues begin.*

Enamel organ:

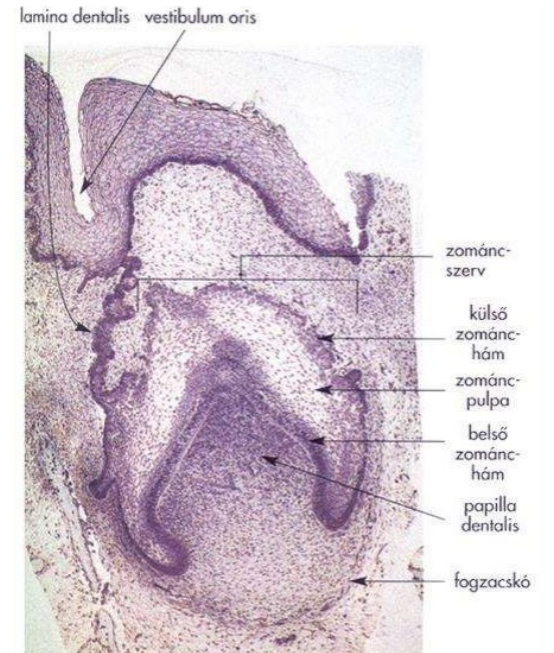
external enamel

str. Reticular (GAG)

str. Intermedium (enzymes)

inner enamel epithelial cells- preameloblast-ameloblast

their nutrition come from the dental papilla



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# Tooth development

## 5. Calcificatio (10-20 weeks, then 3-4 years of life)

- Enamel is produced from the tip of the tooth towards the cervical region
- Enamel thickness increases - ameloblasts are pushed towards the enamel pulp
- When they contact with the outer enamel layer - completion of enamel formation

### *Maturing phase:*

- Mineralization is taking place!
- 97% mineral material, 2-3% organic material
- Final product Nasmyth membrane / cuticle dentis
- End of enamel production: ameloblasts die

Fehér E: Fogfejlődés, fogáttörés in: Fábián G, Gábris K, Tarján I Gyermekefogászat, Fogszabályozás és Állcsont-Ortopédia,  
Gallatz K: Fogak fejlődése – Tantermi előadás

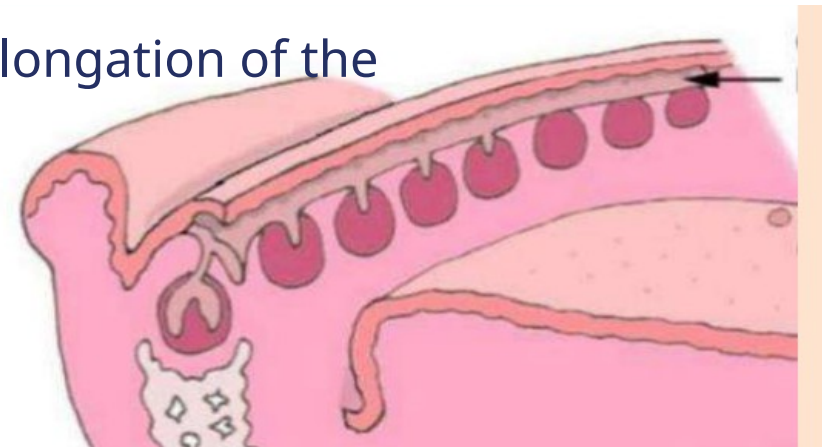
# Tooth development

## Primary tooth:

- on the lamina dentalis of the lower and upper jaw, 10-10 primary teeth are formed
- by the 6th intrauterine month, all primary teeth develop

## Permanent tooth:

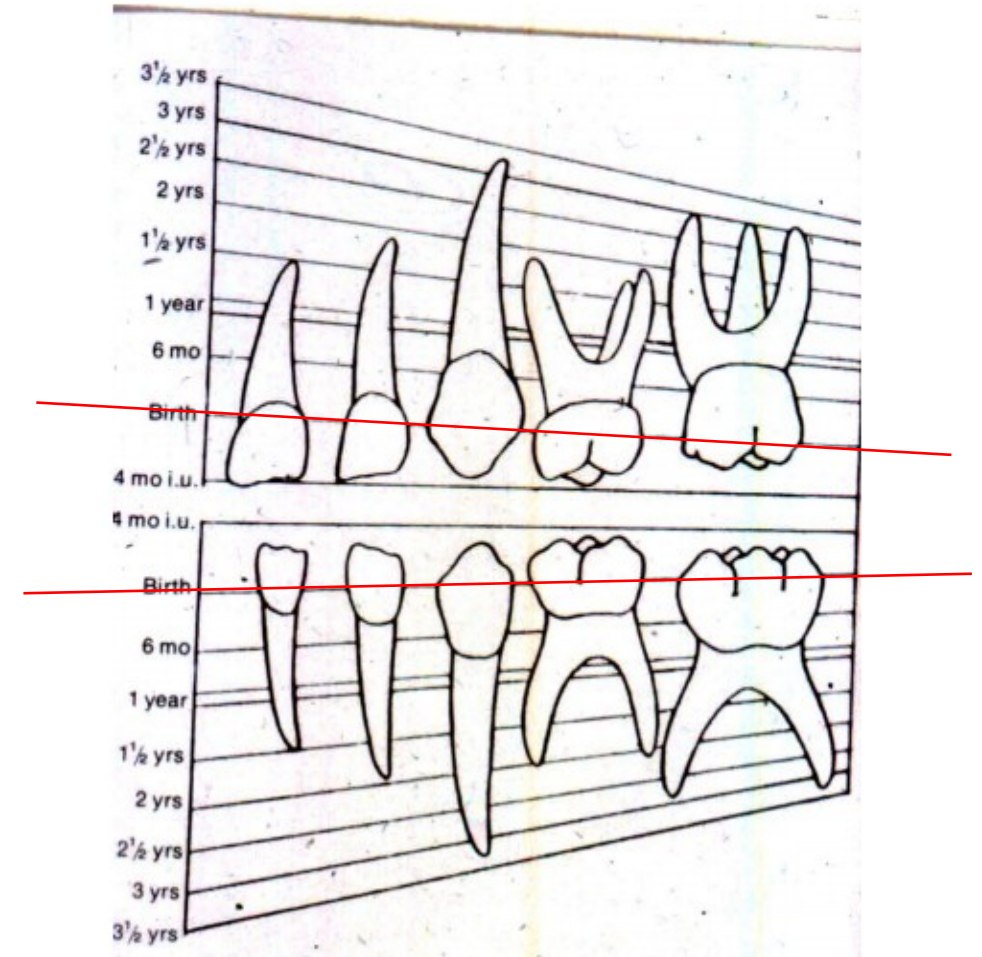
- Permanent tooth buds develop lingually/palatally compared to primary tooth buds
- They are mute until the age of 6
- Molars, on the other hand, develop in connection with the elongation of the lamina dentalis
- Gubernaculum Cordii is responsible for the correct position



Gallatz K: Fogak fejlődése – Tantermi előadás

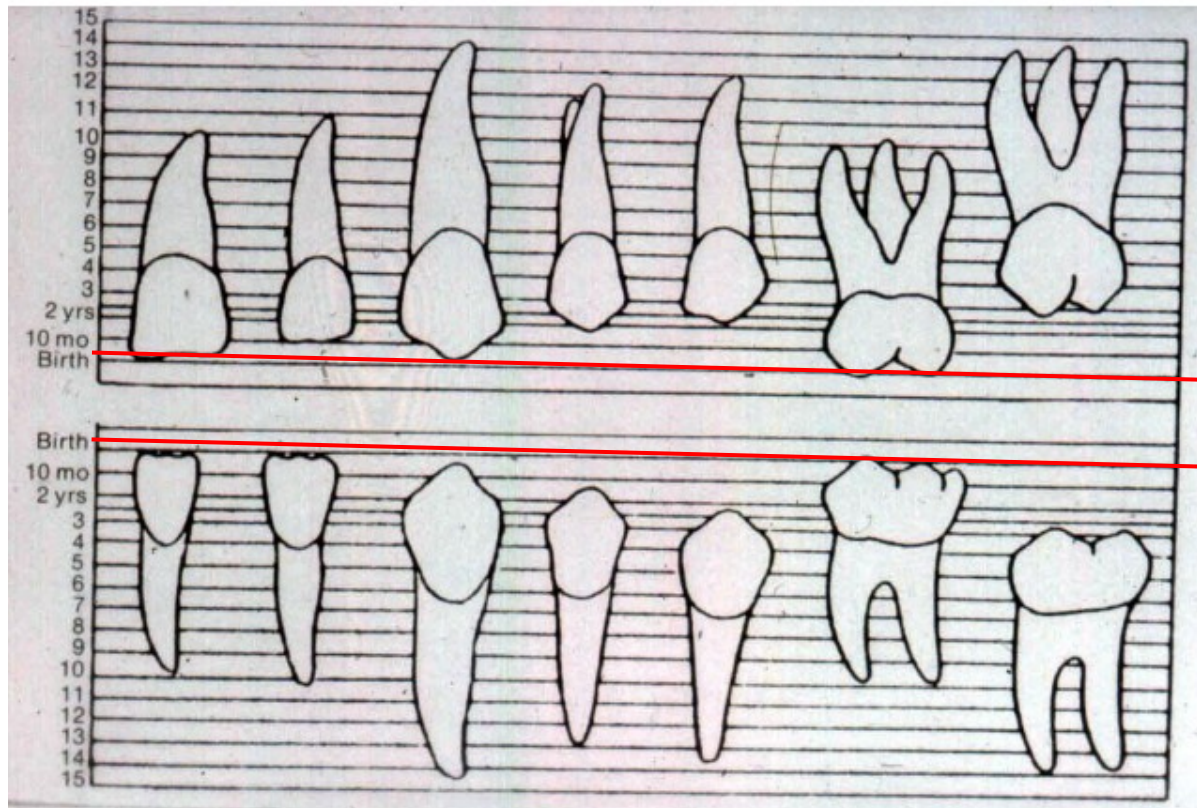
# Chronology of the mineralization of primary teeth

- It starts intrauterine and ends extrauterine
- Incisors: 17th embryonic week
- Molars: approx. 20th embryonic week
- Birth: The crowns of the incisors and canines are almost completely formed. The crowns of the molars are approx. semi-mineralized.



# Chronology of mineralization of permanent teeth

- Extrauterin





# Eruption of primary teeth

The thinned enamel epithelium merges with the oral epithelium, the hydrostatic pressure of surrounding tissues increases, collagen shrinks...

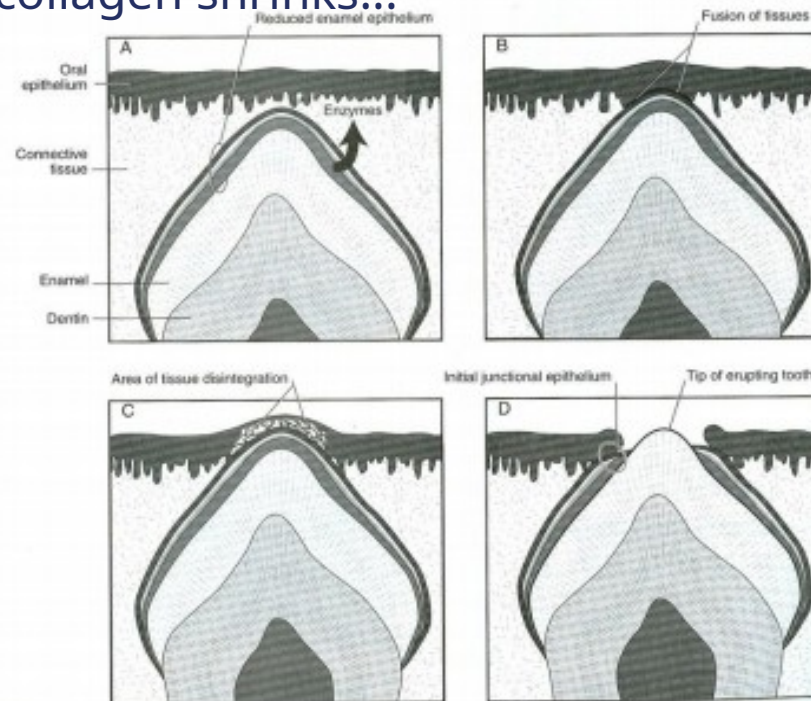
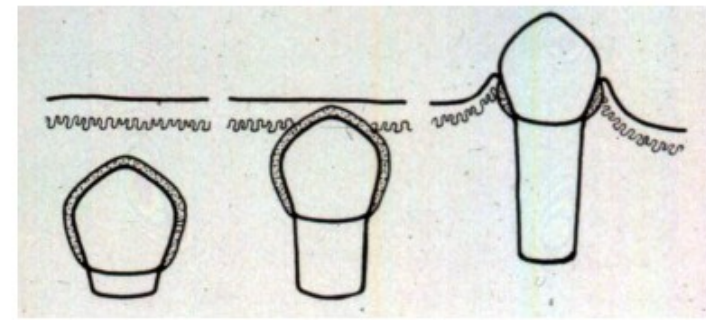
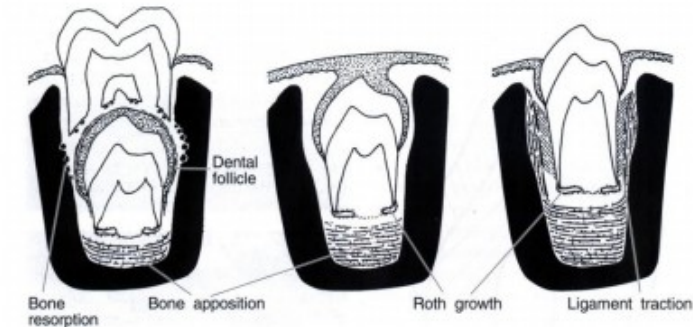
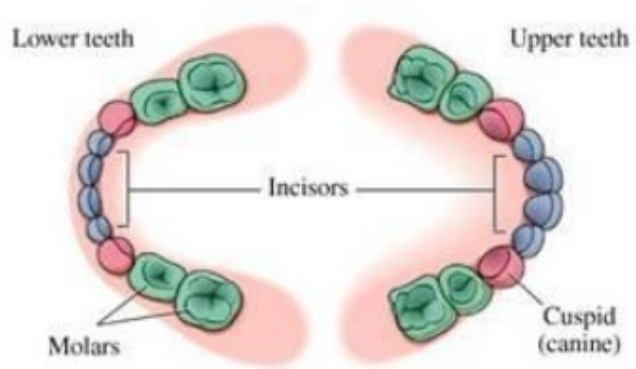


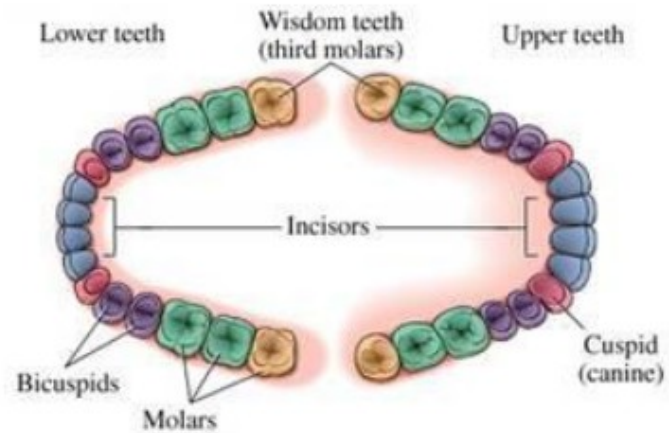
Figure 6-28  
Stages in the process of tooth eruption. A: Oral cavity before the eruption process begins. Reduced enamel epithelium covers the newly formed enamel. B: Fusion of the reduced enamel epithelium with the oral epithelium. C: Disintegration of the central fused tissue, leaving a tunnel for tooth movement. D: Coronal fused tissues peel back from the crown during eruption, leaving the initial junctional epithelium near the cementoenamel junction.



1. **Preeruptive phase** (dental crown grows, osteoblasts)
2. **Eruptive** (prefunctional) phase (tooth root grows, bone resorption, bone regeneration)
3. **Posteruptive** (functional) phase (occlusion, tooth loss)



## Primary teeth



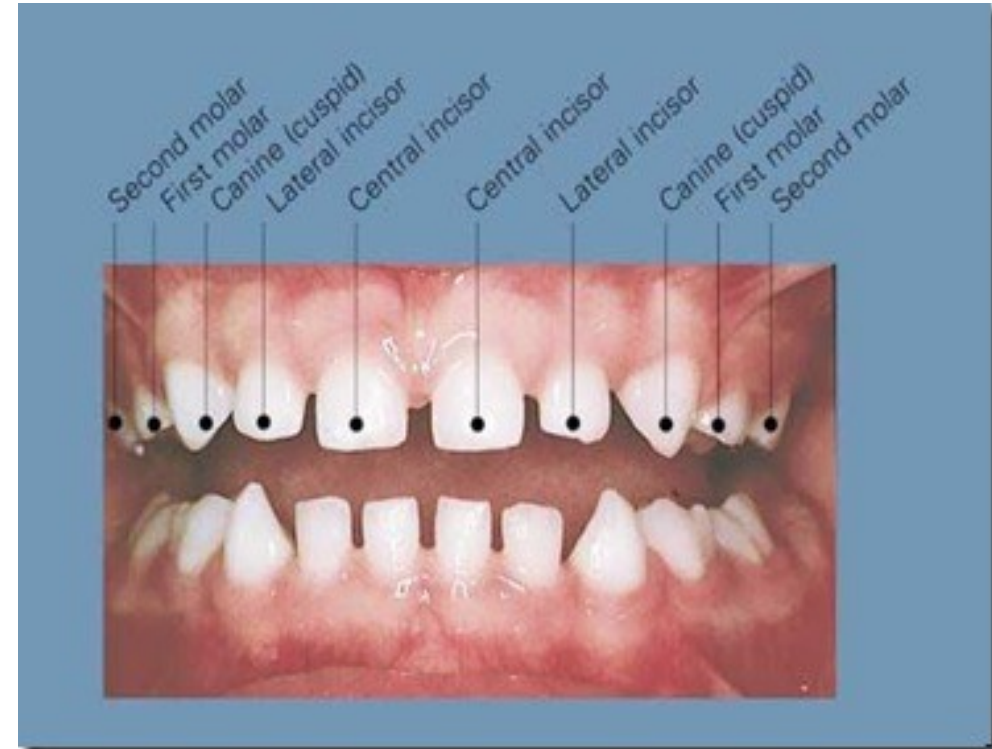
## Permanent teeth

# Eruption of primary teeth

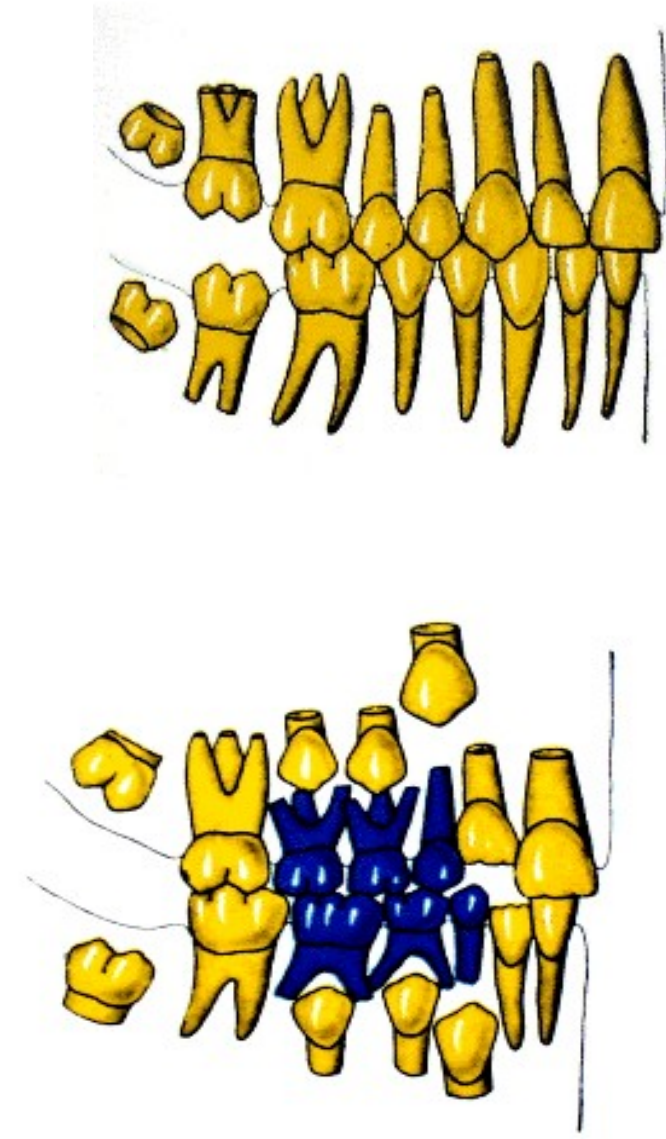
- Eruption of primary teeth ( 6 months-2.5-3 years): girls (usually) earlier, symmetrical, at the age of 2.5-3 years they all erupt
- medial incisor: 8-12 months (lower earlier than upper)
- lateral incisor: 9-13 months
- 1 molar: 13-19 months
- caninus: 16-22 months
- 2nd molar: 25-33 months

## Variations of abnormal eruption of deciduous teeth

- Dens connatalis
- Dens neonatalis
- Dentitio praecox
- Dentitio tarda
- Dentito difficilis



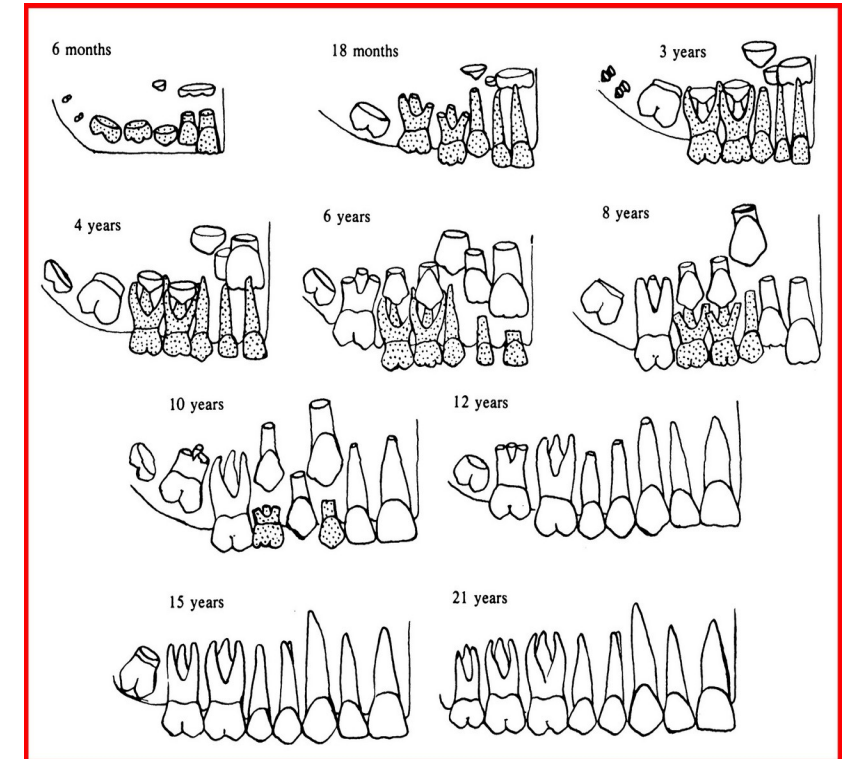
# Tooth eruption



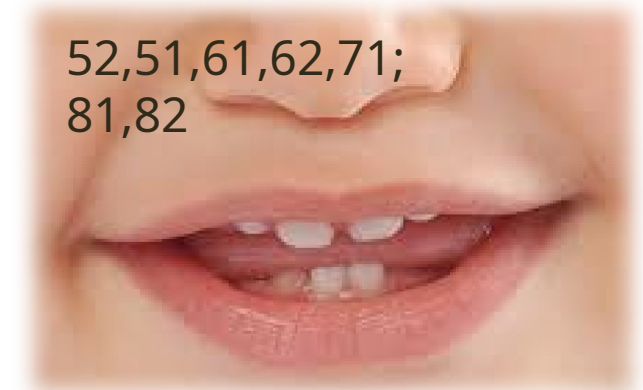


# Tooth eruption:

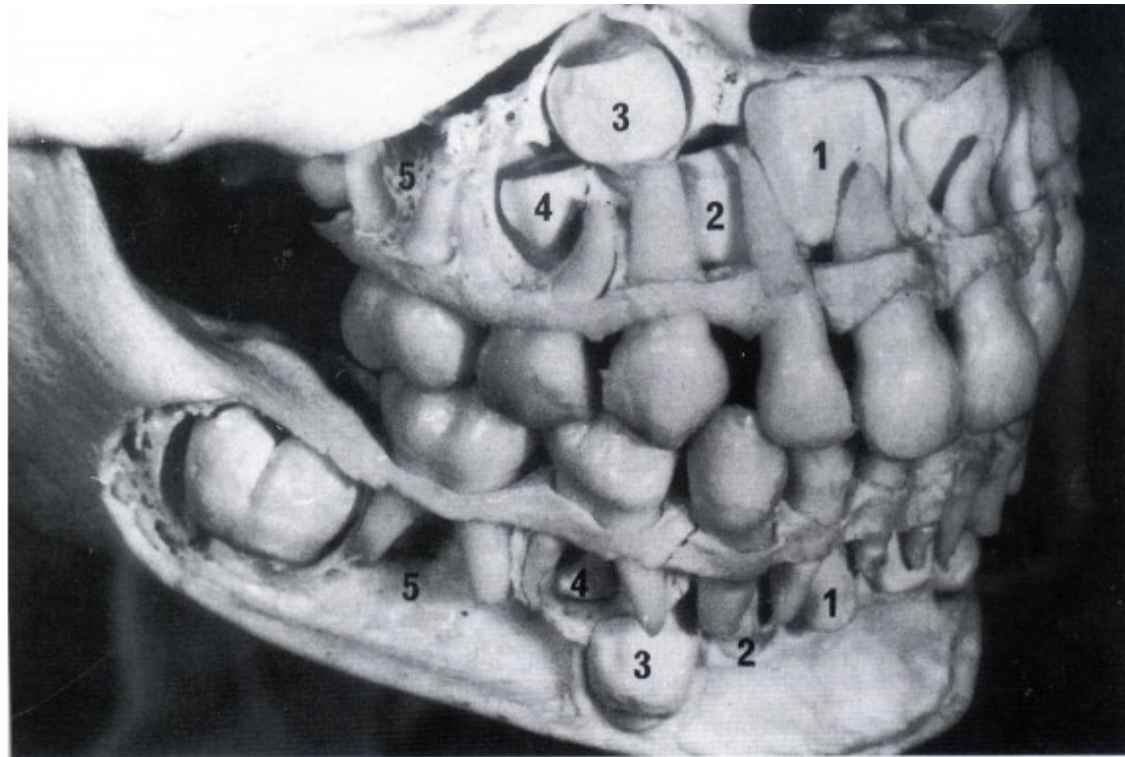
- ↩ 0-3 years - eruption of primary teeth
- ↩ 3-6 years of primary teething period
- ↩ 6-12 years mixed dentition
  - Early mixed 6-8 years
  - Late mixed 8-12 years
- ↩ 12-year permanent dentition



# Tooth eruption

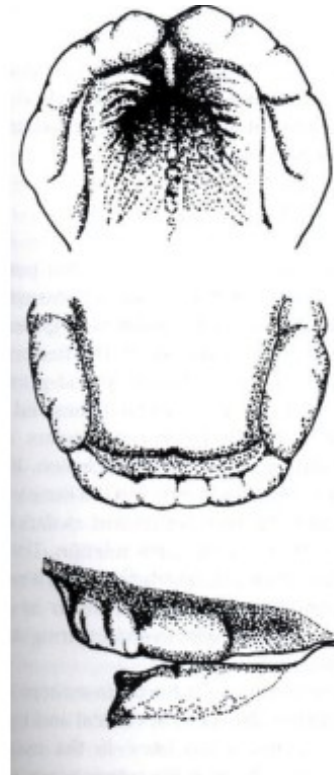


# Relations between the roots of primary teeth and the developing crowns of the permanent teeth during the functional stage of the primary dentition



# Jaw relations during primary tooth eruption

The eruption of primary teeth is accompanied by the development of the alveolar processes with considerable increase in facial height



At birth:

The gum pads are low, slightly lobulated and the palatal vault is flat; the mandible is retruded



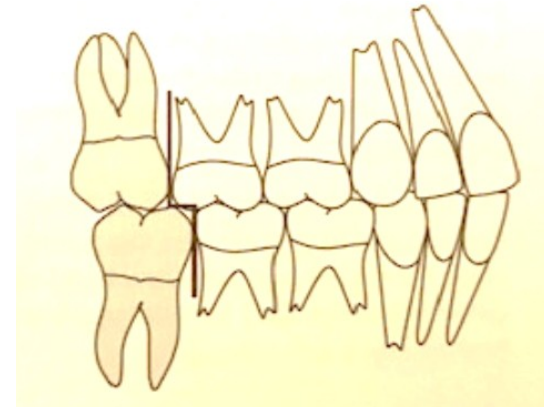
# Primary dentition-gaps

- Physiological diastema (treme)

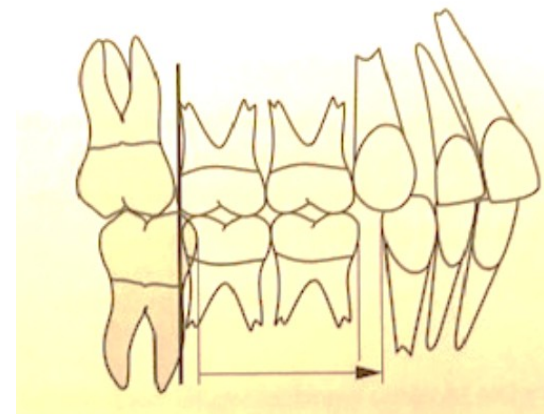


# Mesial step

When there is a mesial step in the terminal plane of the primary dentition, the permanent molars may erupt directly into normal occlusion

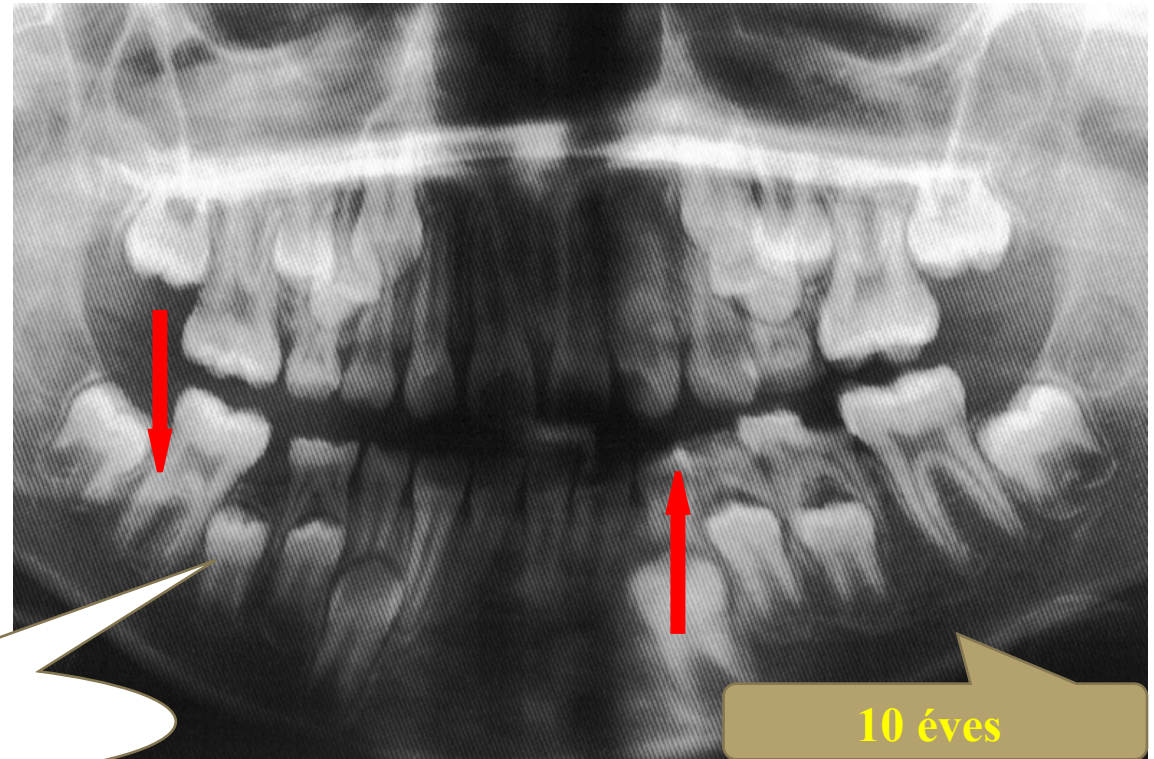


- If the primary dental arches end in the same vertical plane, the permanent molars will erupt into cusp-to-cusp relation





# Early extraction of primary tooth



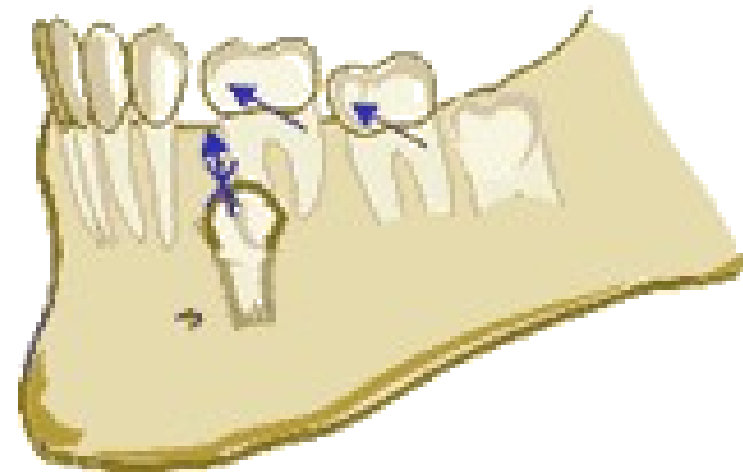
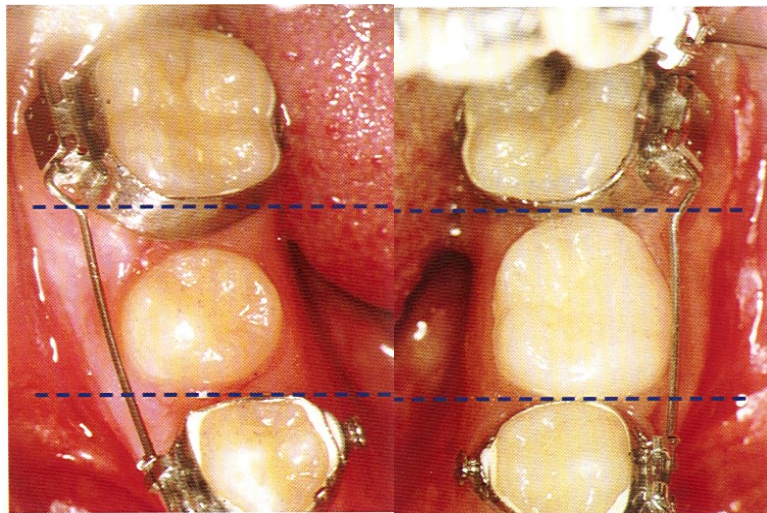
**Impakció**

**10 éves**



# Space maintainer

E-space

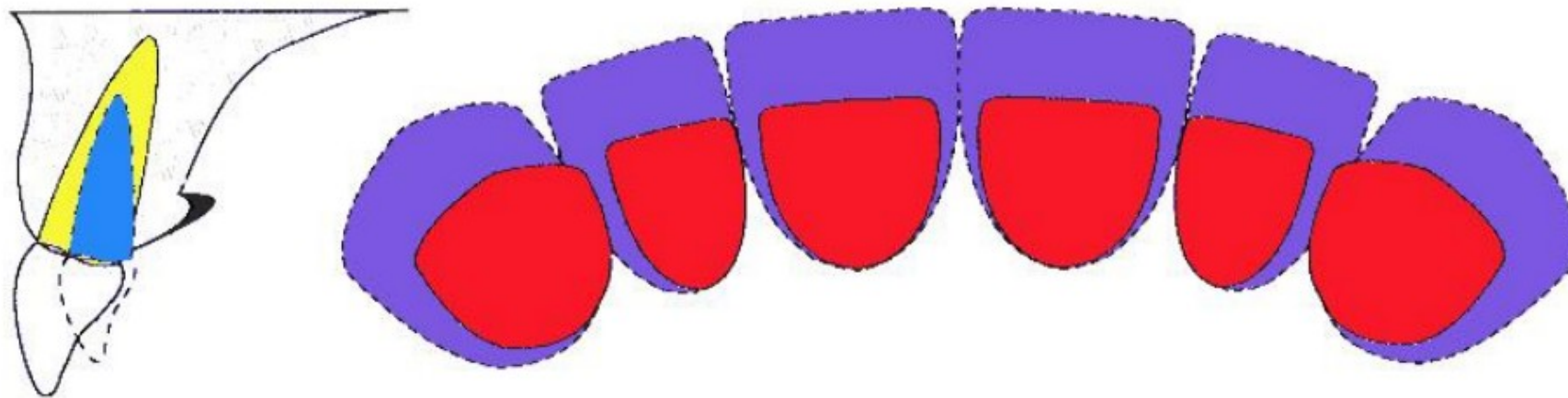


*Képek forrása: Ch. Splieth: Kinderzahnheilkunde in der Praxis, Quintessence Verlag, 2002.*



# The position of the germs of permanent incisors

- The permanent upper incisors are more labially inclined than their primary predecessors. Consequently, the dental arch becomes wider and longer



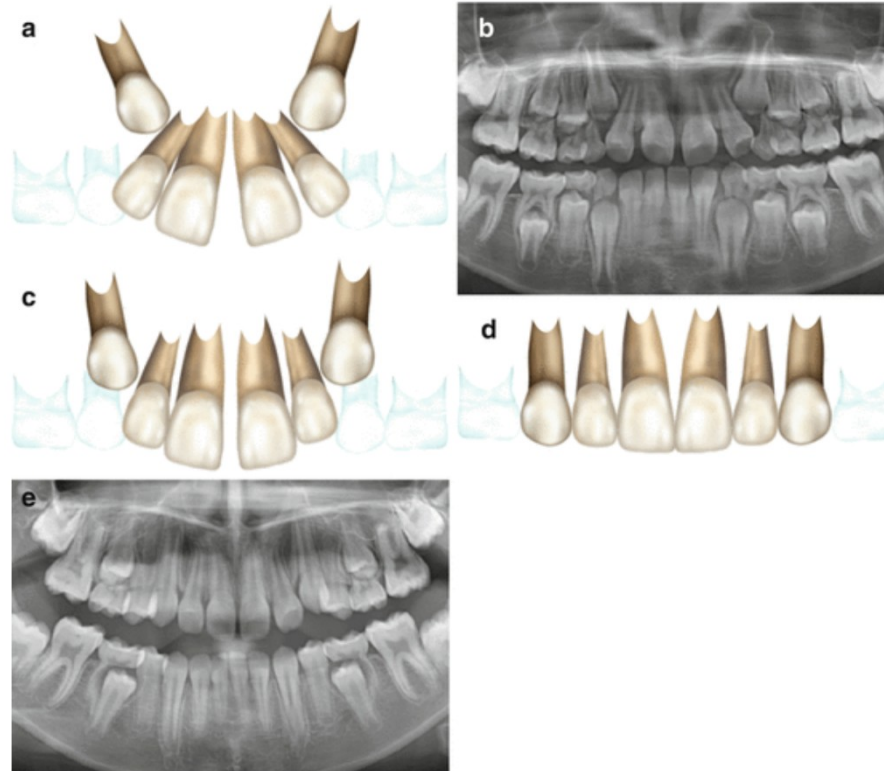
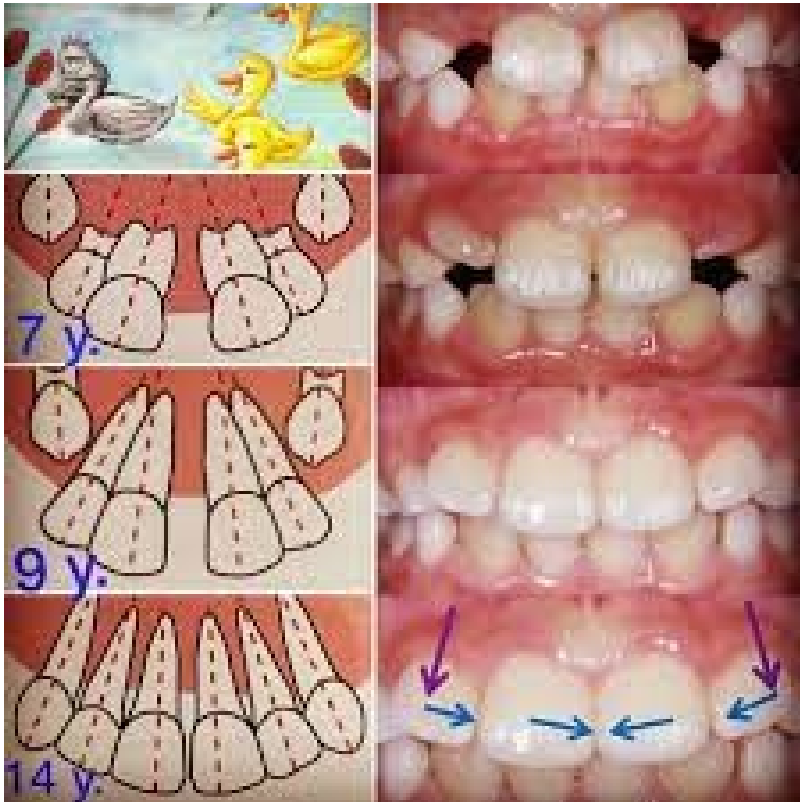
*Képek forrása: Ch. Splieth: Kinderzahnheilkunde in der Praxis, Quintessence Verlag, 2002.*

**UGLY  
DUCKLING  
STAGE**

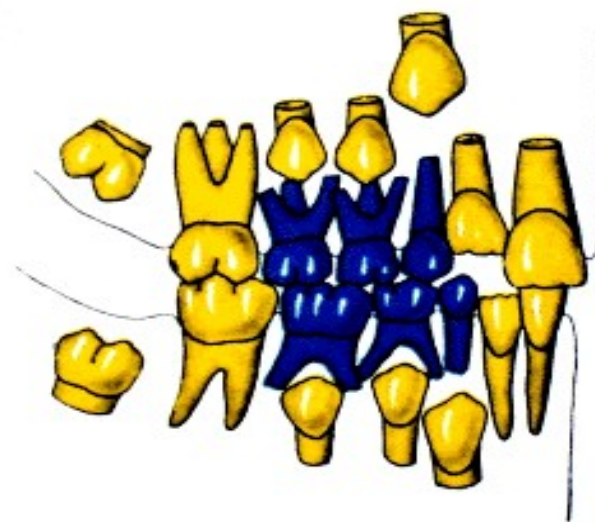
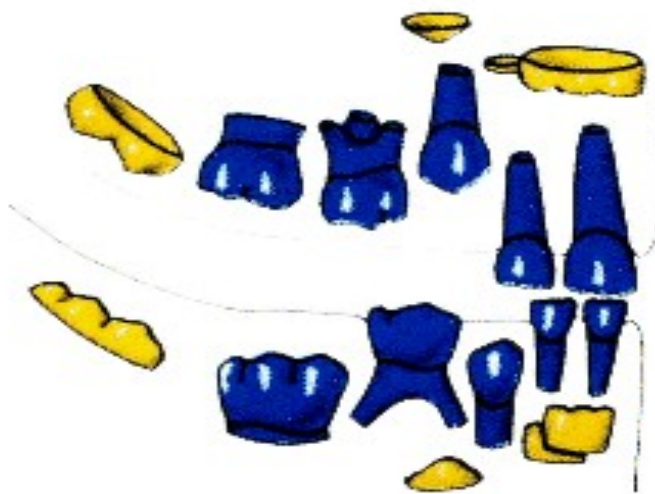
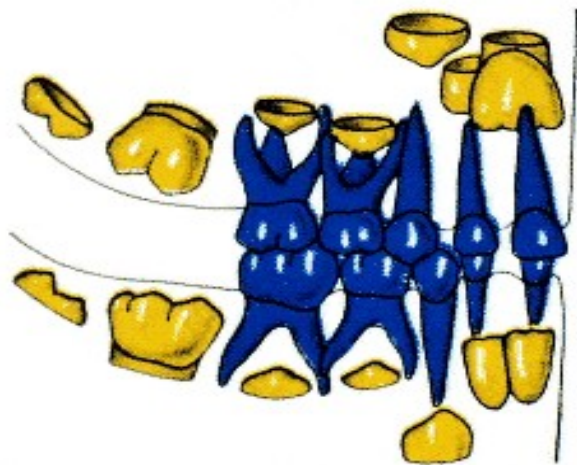
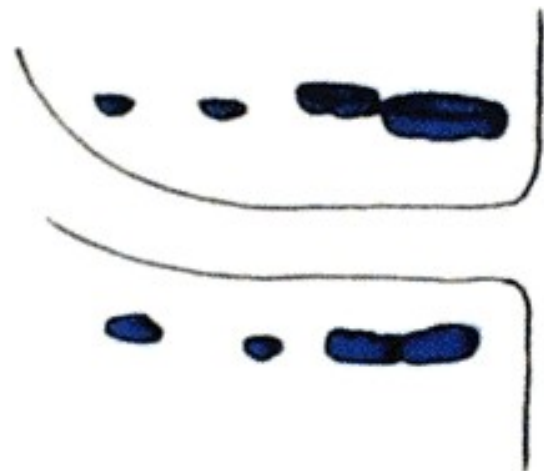


Ugly? Me? Well,  
they need glasses!

*Dr. Beck*



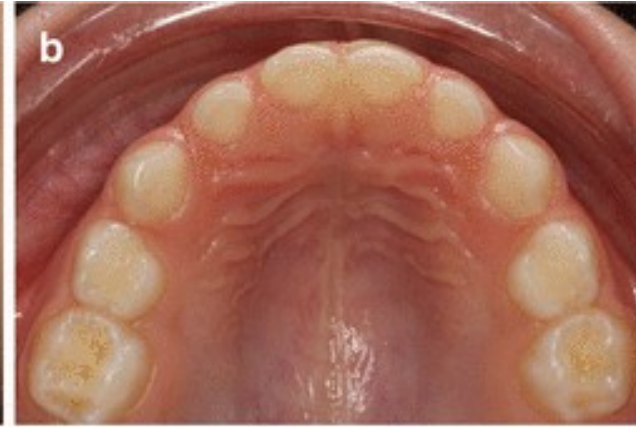
- Diastema medianum
- Eruption of upper canines
- Root pressure of lateral incisors



# In case of primary dentition the focus should be on:

- Prevention
- Primary tooth filling
- Consequences of tooth decay
- Space mainteteners
- Prevention of bad habits





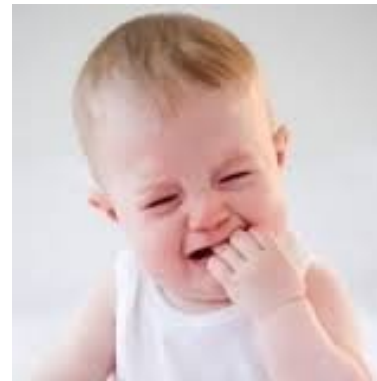
During dentition, the wider deciduous molars are replaced by narrower premolars in the mesio-distal direction.

Physiological root resorption in deciduous teeth is a genetically determined feature of human dentition. Its smooth flow is one of the conditions for problem-free tooth changing.

<https://pocketdentistry.com/definition-and-causes-of-diastema/>

# Symptoms of tooth eruption

- Feeling of pressure and pain
- Itch
- Increased salivation
- diarrhea / foul-smelling stools/ obstipation
- Increase body temperature, very rarely fever (37 - 38°C),
- Restlessness, irritability, even aggressiveness?
- Sleep disturbance, insomnia





Cooled chews (but not from the freezer!)

Gentle massage of the dental ridge

Alternative remedy: massaging the reflex zones of the toes





# Medicines:

**Dentinox®-Gel N:** Active ingredients: Chamomile tincture, lidocaine hydrochloride, macrogollauryl ether

Carrier material: xylitol, Free from dyes and preservatives

Effect: Pain relief, anti-inflammatory, promotion of wound healing,



**Dologel:** contains Valeriana, chamomile and propolis

**Gengigel-** From the first teeth: Contains Sodium Hyaluronate

**Anaftyn Baby:** Water, PVP, propylene glycol, PEG-40 hydrogenated castor oil, Aloe barbadensis, xanthan gum, aroma, potassium sorbate, sodium benzoate, disodium EDTA, sodium hyaluronate, xylitol, cetylpyridinium chlorid<sup>1</sup>-glycyrrhetic acid, Crocus sativus.



**Bedegel:** chamomile flower, valerian root, propolis, medicinal sage

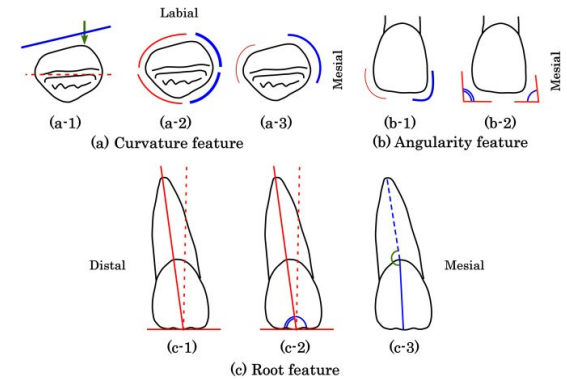




# Anatomy of primary teeth



- 🦷 they are usually smaller than the permanent
- 🦷 rare individual variation
- 🦷 colour: blue-white
- 🦷 enamel mineralisation
- 🦷 cervically: cingulum
- 🦷 thinner layer of enamel and dentin
- 🦷 roots are small, fracturing often
- 🦷 Wide pulp chamber
- 🦷 physiological root resorption: genetical



Mühldreiter's signs:  
 curvature sign  
 root sign  
 angle mark

*Forrás: Ch. Splieth: Kinderzahnheilkunde in der Praxis, Quintessence Verlag, 2002*

*. Shintaro Kondo et al. The biological significance of tooth identification based on developmental and evolutionary viewpoints Journal of Oral Biosciences 2022. 64,3;287-302*

# FDI: 51, 61



- wide, mesiodistal curvature more pronounced than incisocervical
- there is no tuberculum dentis
- expressed cingulum
- expressed palatal marginal edge
- deep fovea dentis
- cutting edge is smooth, straight (initially jagged, then wears off)

Beginning of calcification	3-4 month intrauterin
Crown developing	4 month
Eruption to occlusion	7,5 month
Root development	1,5 years

## FDI:52,62



- similar to the upper medial incisor, but! Smaller
- incisio-cervically longer than mesiodistally

Beginning of calcification	4,5 month intrauterin
Crown developing	5 month
Eruption to occlusion	8-9 month
Root development	1,5-2 years

# FDI: 71, 81



lingually smooth

-expressed cingulum

- the marginal edge (limbus dentis) is not pronounced

-shallow fossa lingualis

-CEJ: mesially larger than distally

-chewing edge: divides the lingual and labial parts equally

-root: long, straight, round cross-section

Beginning of calcification	4,5 month intrauterin
Crown developing	4 month
Eruption to occlusion	6,5 month
Root developement	1,5-2 years



## FDI: 72, 82



- crown wider, longer
- expressed cingulum
- deep lingual fossa
- chewing edge slopes distally
- distoincisor angle rounded
- crown is not symmetrical
- the cingulum is towards the distal
- root: lower 1/3 slopes towards the distal, can be a longitudinal furrow distally

Beginning of calcification	4,5 month intrauterin
Crown developing	4,5 month
Eruption to occlusion	7 month
Root development	1,5-2 years

## FDI:53,63



longer crown

-expressed peaks

- mesial and distal edges are rounder

- the mesial slope of the apex is longer than the distal one

-expressed cingulum, limbus dental, palatal crest

- root length is twice the length of the crown

Beginning of calcification	5 month intrauterin
Crown developing	9 month
Eruption to occlusion	16-20 month
Root development	2,5-3 years

## FDI:73,83



Labio-lingually smaller than the upper

- the distal slope of the tip is longer than the mesial

- the lingual surface is smoother than the upper one

-shallow fossa lingual

-root: long, narrow, twice the length of the crown

Beginning of calcification	5 month intrauterin
Crown developing	9 month
Eruption to occlusio	16-20 month
Root developement	2,5-3 years

# FDI:54,64



- MB. enamel thickening: tuberculum molare
- occlusally brick or buccopalatally compressed elliptical
- 4 nipples: MB, MP, DB, DP
- occlusally H-shaped depression: central fossa + mesial+distal
- buccal groove
- root: similar to permanent molar, but shorter root trunk, thinner roots
- The palatal root is the longest, there are also MB and DB

Beginning of calcification	5 month intrauterin
Crown developing	6 month
Eruption to occlusio	16-20 month
Root developement	2-2,5 years



## FDI:55,65



the crown is bigger than the top first one

- similar first permanent, only smaller
- has Tuberculum Carabelli

Beginning of calcification	6 month intrauterin
Crown developing	10-12 month
Eruption to occlusio	1,75-2 év
Root developement	3 years

## FDI:84,74



cervically located buccal edge

-crown mesio-lingually rounder

-irregular chewing surface: brick or ellipse compressed in the buccolingual direction

- there is an enamel bump

-4 cusps

-2 roots

Beginning of calcification	5 month intrauterin
Crown developing	6 month
Eruption to occlusio	12-16 hó
Root developement	2-2,5years

# FDI: 85,75



- greater than first first
- similar to a first molar
- 5 cusps (3 buccal)
- oval occlusal surface

Begining of calcification	6 month intrauterin
Crown developing	10-12 month
Eruption to occlusio	1,75-2,5 hó
Root developement	3 years

<http://www.leeds.ac.uk/dental/Oroface/TEETH/choice.html>

# Problems of eruption

## ➤ Eruptiv cyst



## ➤ Problems with physiological root resorption



**Erupciós ciszta  
11, 21**

Dentitio connatalis  
...neonatalis  
...praecox  
...tarda

**Erupciós ciszta  
54**



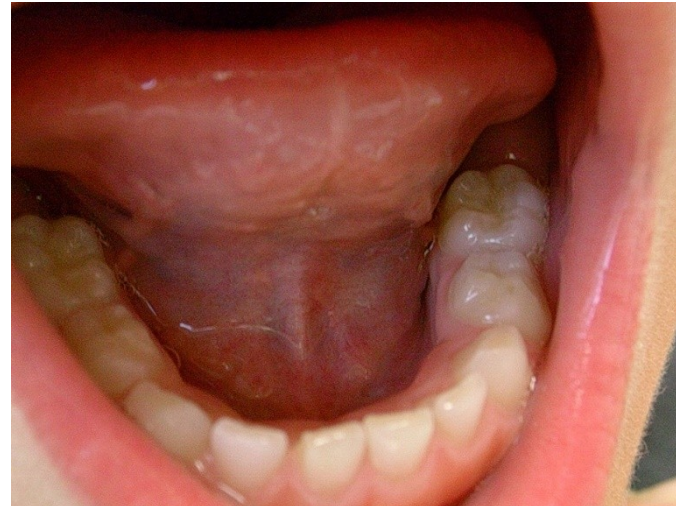
**Erupciós ciszta  
16**

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# Occlusal wear of primary teeth

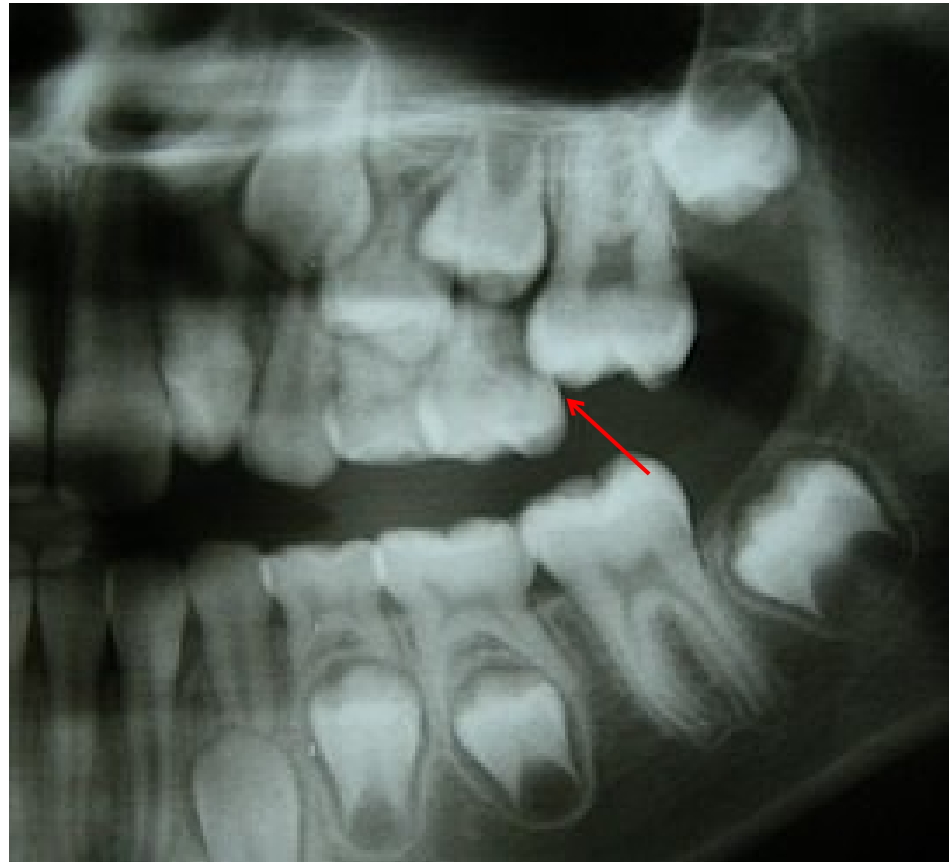
- **0 - missing**
- **1 - enamel**
- **2 - dentin**



# Mixed dentition-contact caries



# Undermining resorptio







# Difference between the primary and permanent teeth (clinical examination)

**Form**

**Size**

**Color**

**Attrition**

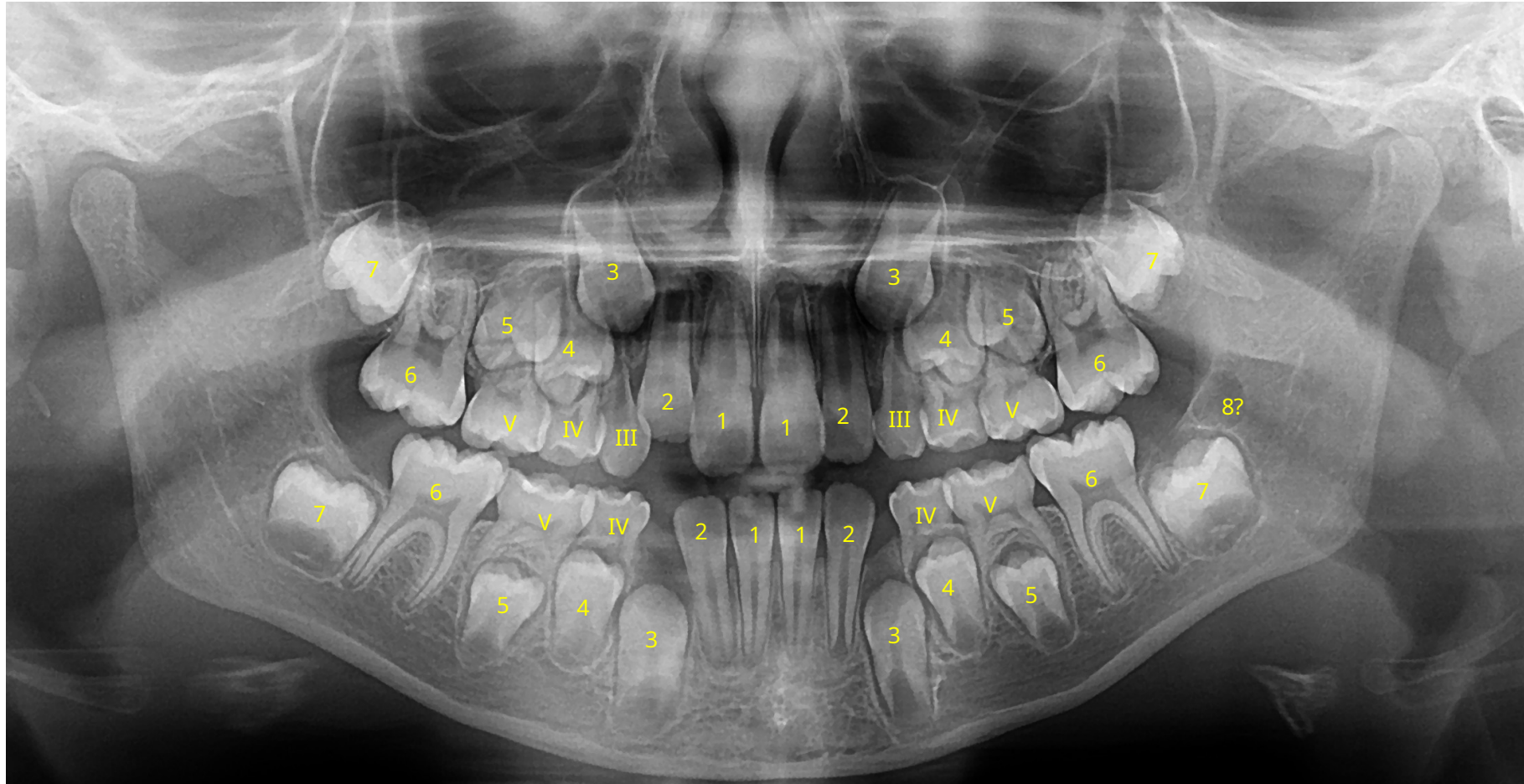
**Mobility**

**Count!!**



# According to the dental status, how old is the patient?

4→5→3



3→4→5

Thank you for your attention



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**SEMMELWEIS**  
EGYETEM 1769

Semmelweis Egyetem  
Gyermekefogászati és Fogszabályozási Klinika

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