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SEMMELWEIS UNIVERSITY
FACULTY OF DENTISTRY

DEPARTMENT OF PAEDIATRIC DENTISTRY AND ORTHODONTICS

Assoc. Prof. Rózsa Noémi Katinka,
DMD, MSc, PhD

Developmental anomalies of primary and permanent teeth

Assoc. Prof. Rózsa Noémi Katinka,DMD, MSc, PhD

Semmelweis University,

Department of Paediatric Dentistry and Orthodontics

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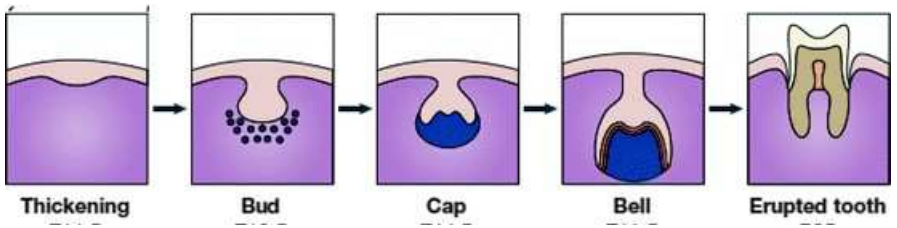
Developmental anomalies of primary and permanent teeth

- Numerical variations
  - Polydontia/hyperodontia
    - Dens supernumerarius
    - Dens supplementarius
    - Dens connatalis/neonatalis
  - Olygodontia/ hypodontia
    - Aplasia
    - Anodontia partialis, anodontia totalis
  - Double formations (fusio, geminatio)
- Morphological variations
  - Supernumerary cusps
  - Supernumerary roots
  - Dilaceratio dentis
  - Invaginatio dentis
  - Size variations- macrodontia/microdontia
- Structural anomalies
  - Endogen
  - Exogen
  - Genetic
- Eruption problems

Disturbances in the different developmental stages



- Initiation stage(6-7.week)
  - Numerical variations(hypodontia, hyperodontia)
- Bud stage (8.week)
  - Macrodontia, microdontia
- Cap stage(9-10 week)
  - Double formations (geminatio, fusio)
  - Invagination (dens in dente)
  - Supernumerary cusps
- Bell stage (11-12. week)
- Apposition and maturation stages
  - Enamel and dentin hypoplasia
- Root formation
  - Supernumerary roots
  - Dilaceration
- Cement formation
  - Concrescence

Numerical variations

Hyperodontia

- Dens connatalis
- Dens neonatalis
- Dens supplementarius
- Dens supernumerarius

HYPODONTIA

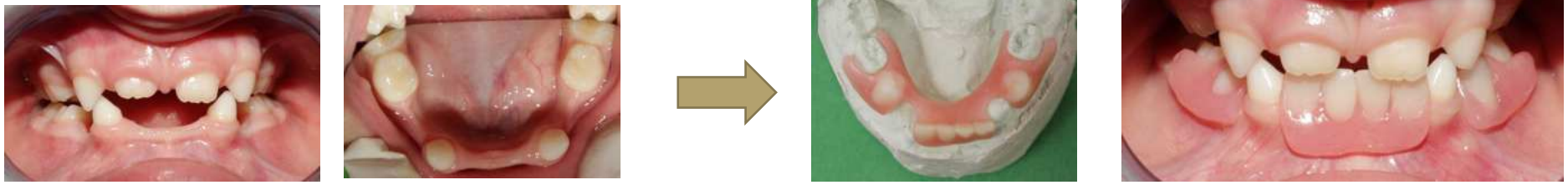
- Aplasia (1 missing germ)
- Oligodontia (6/more missing germ)
- Partial anodontia
- Totalis anodontia

Numerical variations

- **Hypodontia**
  - Primary/ permanent dentition
  - Etiology:
  - inheritance, infection, trauma, dystrophy, developmental or nutrition problems
  - Ectodermal dysplasia -triad
    - **Primary dentition:** anodontia partialis/ totalis +structural deficiency+Dentitio difficilis
    - **Hypotrichosis**
    - **Hypo/anhydrosis**
  - Bolk's terminal reduction theory:
    - Last element of each toothgroup is often agenetic or reduced in size
    - Maxilla : 2. incisor, 2. premolar, 3. molar
    - mandible: **1. incisor**, 2. premolar,3. molar

Numerical variations

- **Hypodontia treatment**:
- Primary dentition: rare, generally 1-2 missing tooth, treatment is not necessary
- Permanent dentition: complex treatment
  - Guided eruption
  - Orthodontic space closure
  - Preprosthetic orthodontic treatment
  - Prosthodontics
  - Implant-prosthodontics
  - Autotransplantation



Numerical variations

- **<u>Hyperodontia</u>**
- Prevalence
  - 75-90% upper front region
  - Primary dentition: 0.3%

Types:

- **Dens connatalis:** tooth present at birth
- **Dens neonatalis:** tooth erupting after birth in a month
- **Dens supplementarius:** normal morphology
- **Dens supernumerarius:** abnormal morphology

Numerical variations

Hyperodontia

- Dentitio praecox- early eruption:
- *Dens connatalis*: supernumerary tooth, at birth
- *Dens neonatalis*: supernumerary tooth, after birth
- If it is mobile, risk of exfoliation (swallowing/ aspiration) extraction
- Differential diagnostic:
  - Dentitio praecox
  - Epstein pearl-cyst gingivalis
  - Bohn knot

Epstein pearl on the palate

Numerical variations

Hyperodontia

- Dens supplementarius/supranumerarius
  - Supernumerary tooth with normal shape and morphology
- Dens supernumerarius
  - Supernumerary tooth with abnormal morphology
  - Types: based on the localisation
    - Mesiodens:
      - Midline or close to midline
      - Prevalence 0.5-0.7% boys>girls
      - 25% spontaneous eruption, sometimes retroinclinated
      - Rare 2-3 tooth
    - Paramolar/perimolar
    - Distomolar/retromolar

Morphological variations

- Variataions in size
  - Macrodontia, microdontia
- Supernumerary cusps
  - Carabelli , Talon
- Supernumerary roots
- Dilaceration
- Invagination dentis
- Dens evaginatus
- Double formations
  - Geminatio, fusio, concrescence
- Taurodontism
- Enamel pearl

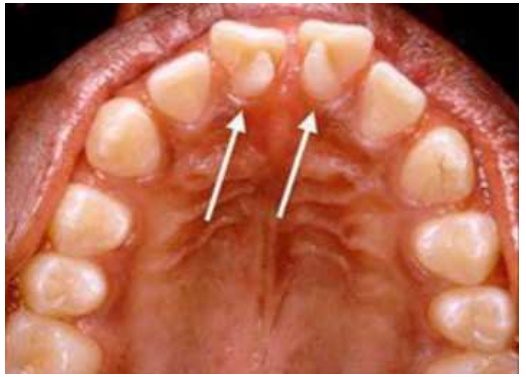
Morphological variations

- **Variations in size**:
- 1 tooth/ total dentition
- *Macrodontia*
  - Bigger tooth size→ aesthetic problem, crowding
  - All part of the tooth affected
  - Gigantismus coronae- just the crown is affected
  - Gigantismus radicis- just the rott is affected

- *Microdontia*
  - Smaller size →esthetic, diastema
  - Often upper 2. incisor (Bolk's terminal reduction)
  - Small size of the root
    - Orthodontic-resorption
    - Odontodysplasia-abnormal form
    - Chemoterápia under root development

Morphological variations

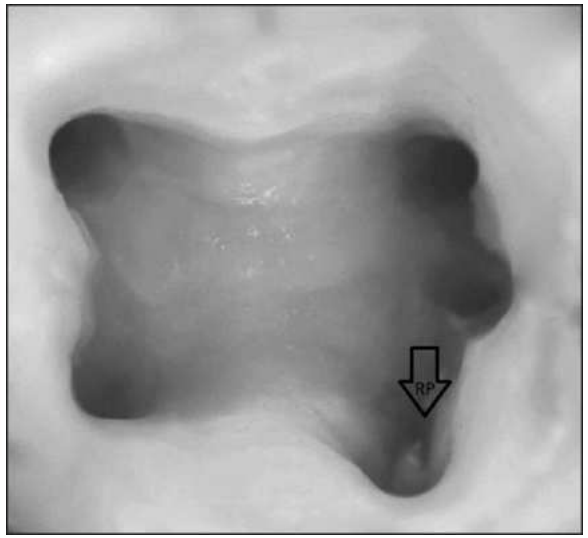
- **Supernumerary cusp:**
- *Carabelli-cusp*
  - On upper 6, near the mesiopalatinal cusp palatinally
  - Sometimes on the upper second primary tooth
  - Dahlberg scale: 7 different size
- *Talon-cusp*
  - incisors <2. incisors palatinal cusp



- Plaque retenction area
- May disturb occlusion (selective grinding)

Morphological variations

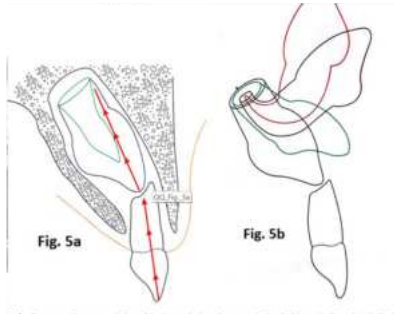
- **Supernumerary roots:**
  - Molar and premolar teeth
  - Radix entomolaris, paramolaris
  - Root canal treatment difficulties



Morphological variataions

Dilaceration:

- Prevalence 1%
- Mainly by upper front teeth
- crown+ root curve or contact in angle (angulatio)
- Reason: homolog primary tooth trauma
- Diagnose: x-ray from different direction or CBCT
- No spontaneous eruption
- treatment: surgical-orthodontic alignment/ extraction



Morphological variations

Invagination dentis („dens in dente”)

- Tooth formation in the tooth
- Reverse order of hard tissues (enamel is closer to lumen)
- Mainly first and second incisor

Diagnose

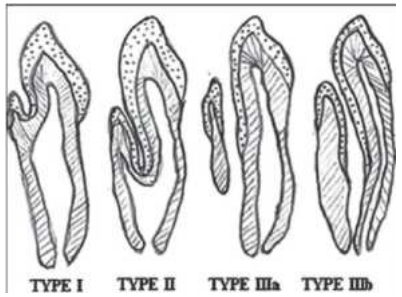
deep foramen coecum→RTG

contact with oral flora through the foramen

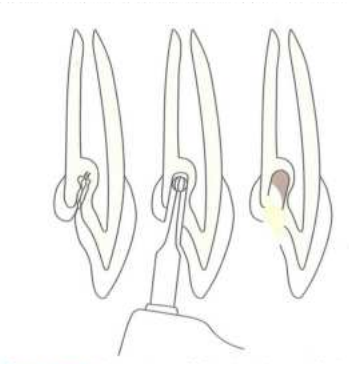
Treatment:

fissure sealing even under eruption time

root canal treatment- bad prognose



Oehler classification

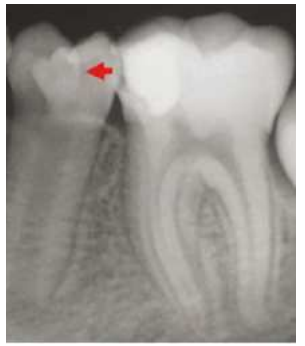


Morphological variations

- **Dens evaginatus**
- Mostly premolar tooth
- Tuberculum on the occlusal surface
- Fractures easier
- Sometimes pulp tissue inside- RTG

<u>Treatment:</u>

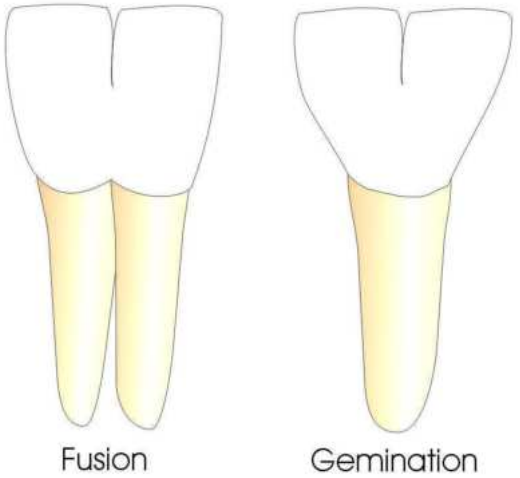
- Disturbing occlusion- selective grinding
- Waiting for reactive dentin building
- Pulpotomia



Morphological variations

Double formations:

- Mainly front teeth
- Esthetic problem, crowding, fissure caries
- Geminatio/fusio/concretio dentium



- *Gemination*
- Incomplete devision of a tooth germ
- RTG: 1 pulp chamber + 1 root canal
- Prevalence primary > permanent
- When counting gemination for 1 tooth- normal number of teeth

Morphological variations

- *Fusion*
- Union in dentin and/or enamel between two separately developed in normal tooth
- ED fusion+ pulp chamber partly/ totally/ 2 separated pulp chamber and root canal
- When counting fusion for 1 tooth: fewer tooth in dentition
- Often permanent tooth aplasia

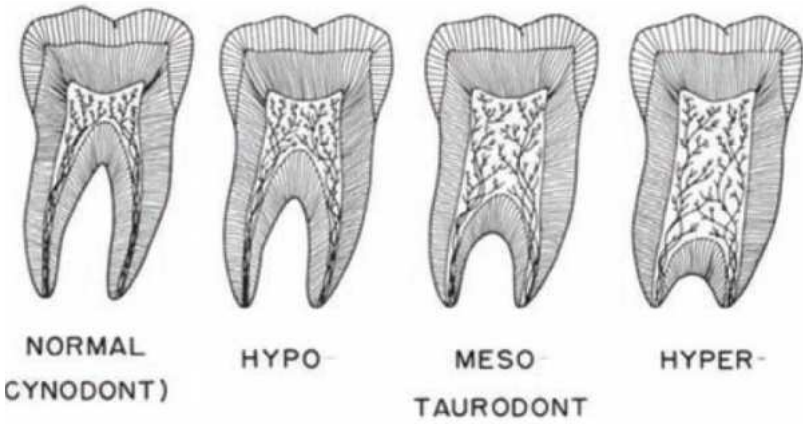
Treatment: fissure sealing between the tooth segment

- *Concrescence*
- Under root development
- Often by upper 7,8 teeth
- The roots of two teeth are fused only in the cementum
- Reason: crowding or position disorder

Morphological variations

Taurodontism

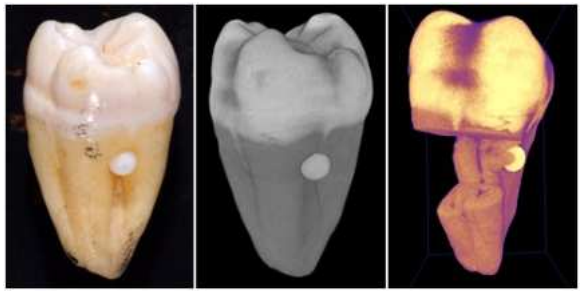
- Enamel-cement junction no invagination
- Crownn, pulp chamber bigger
- Root furcation more apical
- Root is straight and widening
- Depending on the size of the pulp chamber:
  - Hipo/ meso/ hypertaurodont forms
- For ex.by amelogenesis imperfecta, ectodermal dysplasia



Morphological variations

Enamel pearl

- Round enamel formation
- On the root surface- near the enamel cement junction/ near bifurcation
- Not at all or few dentin/ pulp tissue
- Reason: amelobast migration
- DD: tartar-this cannot be removed with scaling



Structural anomalies

Etiology

- Endogen
  - Hypoplasia
  - Hypophosphataemia (rachitis)
  - Hypocalcaemia (tetania)
  - Fluorosis
  - Tetraciklin
  - Endokrin problem
  - Hypocalcaemia
  - Vitamin deficiency
  - Infection
- Exogen
  - Trauma
  - Inflammation
  - Radiation
- Genetic
  - Amelogenesis immperfecta
  - Dentinogenesis imperfecta

Structural anomalies

Hypoplasia

Endogen:

Hypoplasia

- Calcification stage
- Developmental problem of the enamel –macroscopic anomalia
- Short term disturbance: enamel striated disturbance till dentin layer
- Long term disturbance: more serious enmel defect, fragile
- Mild form:
  - Normal surface, discoloration
- Moderate form:
  - Porous enamel, macroscopic deficiency
  - Strict line beween hypoplastic and normal enamel
  - Localisation shows when was the endogen harm
- Reason:
  - Local factor when just 1 tooth has anomalia
  - Trauma-primary molar intrusio-permanent ameloblast injury (exogen reason)
  - Inflammation-ameloblast derangement: Turner tooth
  - Systematic factor: symmetric anomalia by more teeth

Structural anomalies

Structural anomalies

Endogen:

Molaris-incisivus hypomineralisatio

MIH

- Epidemiology: more frequent enamel disturbance
- Prevalence: 2,8%-25% , incidence growing
- A multifactorial ameloblast cell dysfunction – the process of amelogenesis is faulted
  - Less phosphate and calcium infiltrate in the matrix builded by the ameloblasts
  - Amelogenesis- permanent incisors 3 months-5 years of age permanent molars: embrionary 8. months - 4 years of age

Structural anomalies

Endogen

Molar-incisor hypomineralisation

- Etiology is multifactorial
- Hypothesis: from embrionary till young age some desease which cause metabolic problem can influence the enamel development
- Etiological factors:
  - High dose of dioxin and polychlorinated biphenyls in maternal milk
  - Hypoxia in early childhood
  - Respiratory diseases: Asthma, bronchitis, COPD
  - Infective diseases: Diphtheria, Mumps
  - D vitamin deficit, malnutrition, malabsorption, metabolic disorders

Structural anomalies

MIH

Endogen

Molar-incisoe hypomineralisation MIH

- Detailed anamnesis should be taken up
- Oral hygiene and nutritional habits need to be investigated
- The clinical picture includes:
  - Matt white and yellowish-brown spots
  - Dental hard tissues with high porosity
  - Adequate enamel thickness
  - Rapid caries development

- Histology: from enamel-cement junction till the occlusal surface less mineralisation

Structural anomalies

MIH

Structural anomalies

MIH

Endogen

Molar-incisiv hypomineralisatio differential diagnose

- Amelogenesis imperfecta:
  - Genetic disease,
  - dentin normal, enamel structure anomaly, all teeth are affected
- Enamel hypoplasia:
  - Disturbance in the secretion stage of amelogenesis
  - Local disturbance
  - Between hypoplastic and normal enamel regular borders
- Fluorosis:
  - More fluoride absorption in mineralisation stage
  - Symmetric, diffuse, decay resistance
- Caries:
  - Predilection areas
- Tetracycline administration under pregnancy or under 6 years of age:
  - Calcium + tetracykline -chelate complex irreversible binding on enamel or dentin

Structural anomalies

Endogen Rachitis

Hypophosphataemia-rachitis

- Rare disease
- D avitaminosis-Ca, phosphor metabolic problem
- Under development-mainly affecting permanent teeth
- Eruption problems in primary dentition
- Fragile teeth, caries incidence higher
- Maxilla and mandible growing slower
- Narrow maxilla, gotic palate
- O or X shaped leg

Structural anomalies

Fluorosis

Endogen

- *Fluorosis*
- Under enamel development time, higher serum fluoride concentration→Ameloblast derangement
- Enamel crystals, prism development and enamel maturation derangement
- Amoxicillin 2,5 x higher incidence
- Severity depends on:
  - Absorbed fluoride dose
  - Exposition time
  - Tooth development stage
  - Individual sensitivity

Structural anomalies

Fluorosis

Endogen

Fluorosis

<u>Severity depending on the drinking-water fluoride amount:</u>

- Mild: 2 ppm
- Moderate: 3-5 ppm
- Severe: 5-6 ppm

Structural anomalies

Endogen

- *Tetracycline*
- Administration under 8 years of age/pregnancy cause primary and permanent teeth discoloration
- Severity depending on the dosage
- Ca Mg, Al+ tetracycline -chelate complex irreversible binding to enamel, dentin
- High dose- ameloblast derangement- hypoplasia
- Types depending on severity:
  - Light yellow/ brown discoloration
  - Intensive darker brown discoloration
  - Dark bluish, greyish discoloration

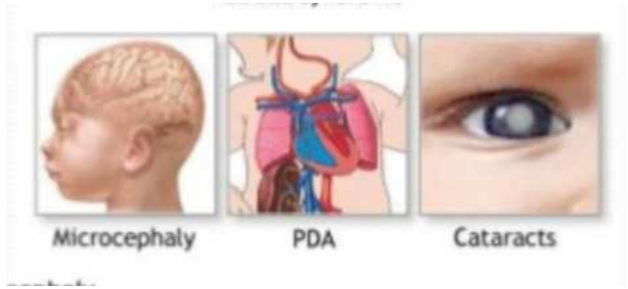
Structural anomalies

Rubeola

Endogen

Rubella

- Intrauterine virus infection (1. trimester)
- Micro/ hydrocephalus
- Cataract
- Microphtalmus
- Septum defect-heart
- Dentition:
  - Structural anomaly
  - Hypodontia
  - Dentitio tarda



Structural anomalies

Endogen

- *Syphilis connatalis*
- The mother's treponema infection is infecting the baby at birth or transplacental (from the 2. phase of pregnancy)
- Early connatalis syphilis:
  - pemphygus syphiliticus: palmo-plantaris papulae- infective
  - parrot- scar: around lips fissures, scars
  - osteogenetic problems
- late connatalis syphilis
  - Diagnose with serology
  - Parrots ostechondritis, saddle nose, gothic palate, Hutchinson teeth)

Hutchinson-triad:

- **keratitis parenchymatosa, n. cochlearis degeneration, tooth degeneration**

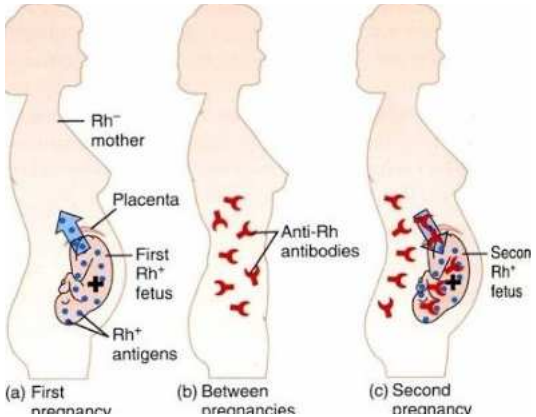
- **barrel shaped incisor**
- **diastema**
- **lacerated molar occlusal surface**

Structural anomalies

Endogen

- Erythroblastosis foetalis
- RH incompatibility
- New born-hemolysis→ hemosyderin
- Dentin absorption brown-blue discoloration
- Prevention:
  - In 72 h human anti D globulin fir the baby

Erythroblastosis foetalis



Structural anomalies

hyperbilirubinaemia

Endogen

Hyperbilirubinaemia

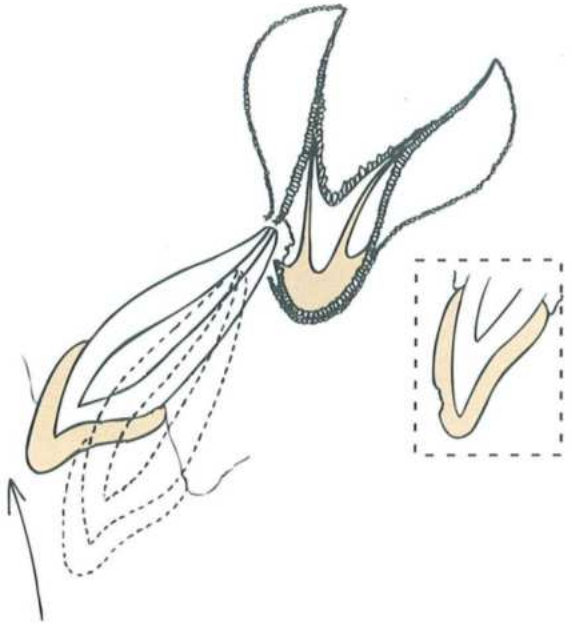
- Liver disease, bile atresia
- Bilirubin→biliverdin
- Deposited in developing enamel and dentin
- Green-grey discoloration-lightening

Structural anomalies:

Exogen

Turner fog-hypoplasia

- Calcification stage
- Enamel development disturbance-macroscopic
- reason: **trauma, homologue primary tooth inflammation**
- Homologue primary tooth shift
- mainly intrusio or buccal luxatio



Radiation:

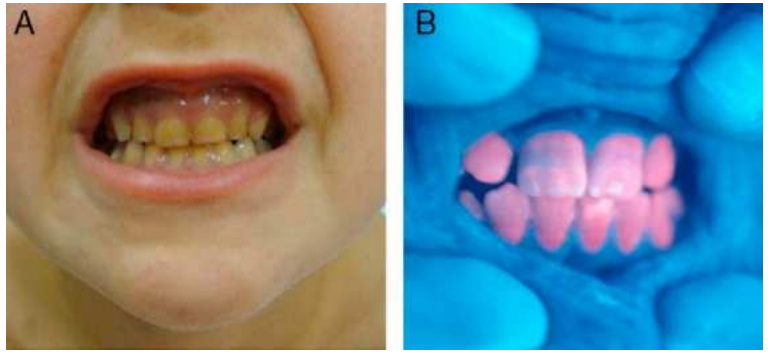
- Crown: hypoplasia
- Root developing disturbance-short roots
- After tooth development finished-local disturbance in the alveolar bone, one defect

Structural anomalies

Porphyria

Genetic:

- Porphyria
- Hemoglobin metabolism problem
- boy>girl
- Primary and permanent dentition
- Tooth is reddish-brown, underUV light lilac



Structural anomalies

Genetic

- *Amelogenesis imperfecta*
- **AD**/ AR/ X
- enamel-ectodermal origin
- Primary and permanent dentition
- Enamel disturbance –quantitative and qualitative
- Dentin structure normal
- Types: 12, most frequent:

1-Hipoplastic

- Yellow-white-lightbrown discoloration
- Enamel surface is smooth, hard but thin

2-Hipomineralised

Two types- hypocalcificated, hypomaturated

- yellow-brown discoloration
- Enamel thickness normal
- Enamel surface rough, unequal, soft

Both type:

- Enamel fractures soon
- Caries frequency depending on type, periodontal diseases higher

Structural anomalies

1.2.3. picture: Hypomaturated type

4.Hypocalcificated type

5. Hypoplastic type

6. Hypoplastic and hypomaturated form

Structural anomalies

Genetic

Dentinogenesis imperfecta

- AD
- primary> permanent dentition
- Dentin structure deficiency,
- dentin canals are irregular
- Enamel fracture fast- dark brown remaining hard tissue
- Tooth colour: reddish, brownish
- Often with osteogenesis imperfecta

Types:

- 1. dentin problem
  - Root and pulp chamber underdeveloped
  - primary>permanent dentition
- 2. dentin problem
  - No skeletal defect
  - Pulp chamber larger
- 3. large pulp chamber
  - Dentin on x-ray thin „shell” teeth

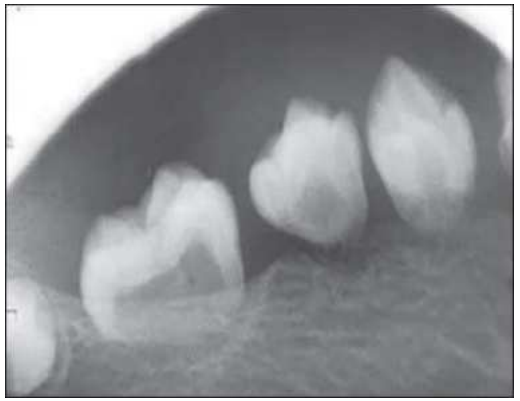
Structural anomalies

Odontodysplasia

- Etiology unknown
- Localised in few part of the jaw
- Root don’t or partly developing
- X-ray „ghost tooth” transparent

Dentin dysplasia

- Genetic disease
- Root/ crown can be affected
- Pulp chamber is large when the crown is affected
- Root small and thin
- Histology. Irregular hard tissue structure



Eruption problems

Dentitio praecox

- Early eruption
- Dentes connatalis, neonatalis
- Most frequent- lower first incisor
- permanent dentition-rare
- Locally permanent dentition-in case of homologue primary tooth early extraction
- Sometimes hormone problems (thyroid , growth hormon)

Eruption problems

- **Dentitio tarda**
- Late eruption
- Systematic:
- Hypofunctional thyroid
- Syndromes :
  - Disostosis cleidocranialis- lot of supernumerary tooth, not erupting
  - Apert syndrome (acrocephalosyndactilia)

- Local:
- Lack of space (crowding, supernumerary tooth)
- Trauma
- Persisting primary tooth- ankyloses, aplasia
- Cyst

Eruption problems

- **Dentitio difficilis**
- Primary >permanent dentition
- Gum swelling in the place of eruption- leukocyte cells
- Bacterium flora change

Symptom:

- Swelling, increased saliva production
- High temperature, diarrhoea, lack of appetite

Treatment

- Teething toys
- Inflammation and painkiller gel locally
- Dentinox/ Osanit / Dologel

Thank you for your attention!