Pathogenesis of Dental Anomalies

Initiation

Disturbances in number

a. **Hypodontia:** Agenesis of one or more teeth. Related terms:
Oligodontia – few teeth.
Anodontia – no teeth.
- Associated findings:
  - microdontia
  - conical teeth
  - part of syndrome
- Can be single or multiple
- Systemic Factors: low birth weight, multiple birth, increase in maternal age, systemic disease (rubella), or cleft palate.
- Syndrome Related:
  - Ectodermal Dysplasia: dysplasia/aplasia of ectoderm derived structures (hair, nails, skin, teeth, sebaceous glands). **X-linked Recessive (more common in males)** and causes hypodontia or anodontia. Also noted is partial or total absence of sweat glands.
  - Down Syndrome
- Management: teamwork of pediatric, orthodontists and prosthodontist. May require speech therapy

b. **Hyperdontia:** Extra normal tooth or extra supplemental tooth (smaller than normal). Related terms:
Mesiodense – supplemental between central incisors
Paramolar/Distomolar
- Possible causes: genetic, on both sides of a cleft, part of a syndrome or complete division of a tooth bud
- Syndrome Related (Multiple):
  - Cleidocranial Dysostosis: **Autosomal Dominant,** most cases are inherited but some are spontaneous. Causes defective ossification of the clavicles & cranium, delayed fontanelle closure, underdeveloped maxilla, high narrow palate, cleft palate formation, prolonged retention of primary dentition, supernumerary teeth, short roots, or abnormal cementum.
  - Gardner's Syndrome: **Autosomal Dominant,** causes hyperdontia, impacted supernumerary teeth, odontomas and jaw osteomas.
- Management: Removal by simple or surgical extraction – to prevent ectopic or disturbed eruption and prevent cystic degeneration.

c. **Double Teeth (Fusion)**: Union between enamel and dentin of two separately developed teeth (One is missing). Radiographically, roots appear separate.

d. **Double Teeth (Germination)**: Incomplete division of a single tooth bud. One root is visible radiographically and notching of incisal edge is seen clinically. Double teeth are common in primary dentition.

Morphodifferentiation

Disturbances in size

a. **Microdontia**: one or more teeth are smaller than normal, can be associated with hypodontia.
Single – Lateral Incisor & Upper 3rd Molar
General – Ectodermal Dysplasia, Pituitary Dwarfism, Sanjad Sakati Syndrome (Microdontia, micrognathia, dwarfism)
Management: Build up when available space is convenient, consider extraction and orthodontic treatment.

b. **Macrodontia**: any tooth larger than normal. Affects single tooth only. Idiopathic, unknown etiology, or Pituitary Gigantism.
Management: crown reduction to 1mm, consider extraction and prosthesis, implants or other orthodontic treatments.

Disturbances in crown shape

a. **Shoveling**
b. **Peg-shaped teeth**
c. **Abnormal cusps**
1. Dens evaginatus
   - Enamel covered tubercle projecting from occlusal surface of **premolar** or less commonly **canine or molar**.
   - Management: Composite build-up to support the tubercle / gradual enamel reduction.
2. Accessory buccal cusp (Supernumerary Cusps)
   - Management: if occlusal interference present – gradual reduction of enamel and elective pulpotomy/RCT
3. Mulberry molars
4. Abnormal incisors of syphilis
5. Talon cusp
   - Horn link projection of cingulum of **maxillary incisor teeth.** It mare reach and contact incisal edge of the tooth.
6. Enlarged cingulum
7. Palatal pits
8. Dens invaginatus (Dens in dente)
   - Developmental invagination of cingulum pit (**anteriors**) with only a thin hard tissue barrier between oral cavity and pulp.

Disturbances in root shape

a. Taurodontism (Bull-like tooth): enlarged pulp chamber with greater apico-occlusal height than in normal teeth. Histologically, there is no constriction at the amelocemental junction → failure of hertwigs epithelial root sheath to invaginate at horizontal level. Present in associated with **Klinefelter & poly-x syndromes.** (Turner)

Apposition, Calcification (Mineralization) & Maturation

Regardless of whether enamel abnormalities are local or generalized, clinical expression of abnormality will be either:
- **Hypoplasia:** defective quantity of enamel
- **Hypocalcification**: defective quality of enamel
- **Combination**

Abnormalities of Enamel – Injury to ameloblasts can be genetic (AI), chemical (fluorosis), physical (turner, dilaceration), metabolic (rickets) or infection (syphilis)

a. Microscopic
   - Pathologic Striae of Retzius
   - Neonatal Line

b. Macroscopic
   - **Localized** – Common and affects mostly perm. teeth (one or more). Aesthetics and differentiation from caries are occasional problems.
     - May present as: hypoplastic pits or grooves, hypomineralized spots or lines ranging in color from chalky white to yellow/brown.
     - Turner's Hyperplasia: localized infection/trauma to deciduous tooth affecting enamel formation of underlying permanent tooth. May affect matrix formation or calcification and is clinically seen as localized opacity, pits or single irregular hypoplastic crown. Common in **maxillary incisors & premolars.**
   - **Generalized** – Rare, usually affect both dentitions and provide significant clinical problems.
     - Fluorosis: due to excess systemic intake of fluoride ion during odontogenesis. Endemic in some regions and can affect both dentitions (more common in permanent). Clinically, varies from patchy white spots to yellow/brown marks and sometimes is associated with enamel hypoplasia.
     - Amelogenesis Imperfecta: teeth have normal size and shape, normal dentine and pulp but abnormal enamel (hypoplastic/ hypomineralized/ both).

Abnormalities of Dentine-Pulp – Affects both dentitions, most disturbances have a genetic aetiology or metabolic aetiology (rickets/ hypoparathyroidism). **Defect of collagen formation transmitted as an autosomal dominant trait**.

a. Dentinogenesis Imperfecta: Hereditary development disturbance of dentin (alone or in conjunction with osteogenesis imperfecta). teeth have normal contour at eruption but present with a distinctive amber-like hue. Although enamel is normally, it is weakly attached to dentine and is rapidly lost (teeth show marked attrition). 3 Types: **[D1— w/osteogenesis imperfecta] [D2—w/out systemic involvement] [D3—brandywine type with large pulp chambers]**.

b. Regional odontodysplasia (ghost teeth): affects both primary & secondary dentitions. Seen most in **anterior maxilla** and is usually unilateral – Features: yellowish-brown crown, delayed eruption, irregular tooth shape with poorly mineralized enamel and a thin dentin. Root apex is wide open with pulp stones present.

Abnormalities of Root

a. Dilaceration: Crown of tooth is displaced from its normal alignment with the root due to an acute trauma. Tooth is bent along its long axis

b. Concrescence: roots of one or more teeth are united by cementum. Frequently seen in permanent dentition.

Abnormalities of Cementum

a. Hypercementosis: Abnormally high cementogenesis due to periapical inflammation, mechanical stimulation, functionless teeth, Piaget's disease or idiopathic. It may also be associated with root concrescence, or ankylosis.

b. Hypocementosis: Uncommon, reported in cleidocranial dysostosis and hypophosphatasia.

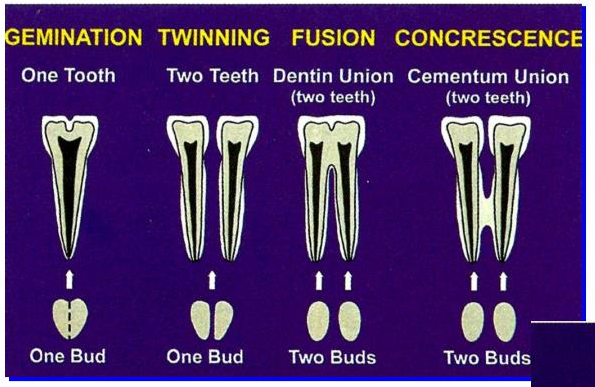
Eruption

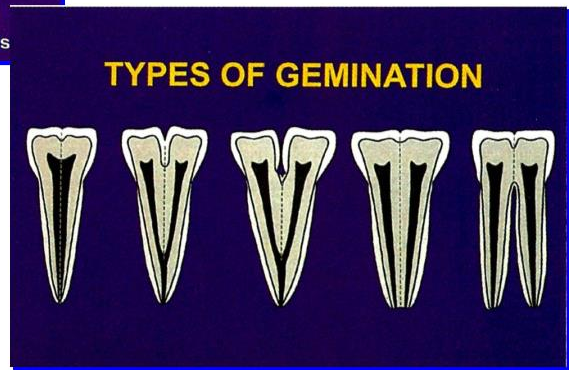
Abnormal Eruption Time

a. **Precocious (Early)**: natal teeth (normal or supernumerary)

Abnormal Eruption Position

a. **Ectopic Teeth**





Classification of Supernumeraries