Anomalies of the teeth

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Anomalies of the teeth

- Anomalies in number
- Abnormality of tooth size
- Anomalies of shape
- Abnormalities of tooth structure
Anomalies in number

Alteration in tooth number results from problems during the initiation, or dental lamina stage, of dental development

• Hypodontia- absence of tooth
• Hyperdontia- supernumerary teeth
Hyperdontia – additional teeth

• Prevalence of supernumerary teeth is about 1%-3% (higher rate in Asians), more in male
• Single tooth hyperdontia represent 75%-85% of cases
• More common in permanent dentition
• Almost 90% in maxilla, front region (mesodens)
• Maxillary incisor region is the most common site then 4th molars, premolars and canines
• If multiples, usually in mandibular premolar region
Developmental Alterations in the Number of Teeth

- **Mesiodens** – supernumerary tooth in maxillary anterior incisor region
- **Distomolar/Distodens** – accessory fourth molar
- **Paramolar** – posterior supernumerary tooth situated lingually or buccally to a molar tooth
- **Natal teeth** – teeth present in newborns; teeth arising during the first 30 days of life; (85% mandibular incisor region)
Syndromes associated with hyperdontia

- Cleidocranial dysplasia
- Oral-Facial-Digital
- Craniometaphyseal dysplasia
- Apert
• Natal teeth
• Usually prematurely erupted primary teeth
• Present at birth
• Prevalence- 1 in 2000
• Neonatal teeth erupt within first month
• 85% are lower incisors, 11% maxillary incisors
• Treatment
Treatment of Developmental Alterations in the Number of Teeth

- Hyperdontia – early removal of accessory tooth; delayed in therapy can delay eruption of adjacent teeth or cause displacement.
- Natal teeth – may be removed if they are loose; if stable, they should be retained; Riga-Fede disease (ulceration of ventral tongue associated with breast-feeding) can often be treated without removal of the teeth.
• 1) supernumerary teeth and 2) supplemental teeth.

• **Supernumerary** teeth are small, malformed extra teeth, for example mesiodens, distomolar and paramolar.

• **Supplemental teeth** are extra teeth of normal morphology, for example extra premolars and lateral incisors.
Hypodontia

- Hypodontia is a common dental anomaly
- Occures in 3.5%-8% (excluding third molars)
- Female : male ratio is around 1.5:1
- Rare in primary dentition (<1%)
- The wisdom tooth is missing in about 20-23% of population
- Followed by the second premolars and lateral incisors
Syndromes associated with hypodontia

- Ectodermal dysplasia
- Chondroectodermal dysplasia (Ellis-van Creveld)
- Incontinentia pigmenti
- Progeria
- Down
- Hallermann-Streiff
- Rieger
- Crouzons
- Albright hereditary osteodystrophy
Abnormality of tooth size

One or more teeth are smaller or bigger than the normal.

Classification:
• True generalized
• Relative generalized
• isolated
Abnormality of tooth size

- **Microdont** – frequency for permanent teeth 2.0%.
- The isolated microdontia – ped-shaped laterals

**Macrodont- megadont**
Developmental Alterations in the Size of Teeth (1)

- **Microdontia** – small teeth. Can also be related to tooth size relative to jaw size. More common in females. Isolated microdontia within otherwise normal dentition is not uncommon (peg-shaped lateral 0.8-8.4%). Diffuse microdontia occurs in some hereditary disorders and sometimes associated with hypodontia. Increased in Down’s, pituitary dwarfism & a few other syndromes.

- **Macrodontia** – larger than average teeth. More common in males. Typically only a few teeth are abnormally large. Diffuse macrodontia may occur in pituitary gigantism. It can be associated with hyperdontia.
• Microdontia
  • Teeth are smaller than usual
  • Diffuse true microdontia is uncommon but may occur in Down syndrome and pituitary dwarfism
  • Prevalence of isolated microdontia is between 1% and 8%
  • Maxillary lateral incisor most frequently affected
Microdontia

- Smaller than average
- Most commonly involved:
  - Maxillary 3rd molars
  - Maxillary laterals
    (sometime called “peg” laterals)
  - Maxillary premolars
• Macrodontia – teeth are larger than average or normal teeth. More common in males. Typically only a few teeth are abnormally large. Diffuse macrodontia may occur in pituitary gigantism and hemifacial hyperplasia. It can be associated with hyperdontia
Macrodontia

- Tooth size larger than average
- Unknown cause
- May involve a single tooth or group of teeth
- Rarely present with hemangioma in the same region
- Detectable by clinical examination and X-ray
Macrodont teeth
(size, shape and number abnormality)

• Fusion – dentinal union of two embryologically developing teeth
  Less in number!

• Gemination
  Represents an incomplete division of a single tooth bud resulting in a bifid crown with a single pulp chamber
  More in number!
Gemination and fusion

- May have very similar clinical appearance
- Higher frequency in upper anterior region
- Rate is about 0.1% in permanent dentition and 0.5% in case of deciduous teeth
- Bilateral cases rare
- Etiology unknown but trauma has been suggested
Fusion

Fusion is a developmental union of two or more adjacent tooth germs. Although the exact cause is unknown, it could result from contact of two closely positioned tooth germs which fuse to varying degrees before calcification or from a physical force causing contact of adjacent tooth buds. The union between the teeth results in an abnormally large tooth, or union of the crowns, or union of the roots only, and must involve the dentin. The root canals may be separate or fused.
Gemination

Gemination is the incomplete attempt of a tooth germ to divide into two. The resultant tooth has two crowns or a large crown partially separated, and sharing a single root and root canal. The pulp chamber may be partially divided or may be single and large. The etiology of this condition is unknown. Gemination results in one more tooth in the dental arch. It is not always possible to differentiate between gemination and a case in which there has been fusion between a normal tooth and a supernumerary tooth.
Abnormalities of shape

Abnormalities in shape originate during the morphodifferentiation of tooth development and are manifested as alteration in crown and root form

- Dens evaginatus
- Invaginated teeth
- Accessory cusps - talon cusps - carabelli tubercle
- Taurodont (bull-like) teeth
- Dilaceration
Dens Evaginatus

• Dens evaginatus also known as a central tubercle
• A cusp like elevation located in the central groove
• Typically occurs in the front region or in case of permanent mandibular premolars
• Usually bilateral
• Rare in whites with higher prevalence in Asians, native Americans and Alaskans
Dens evaginatus (talon cusps)

- Dankner et al. in a radiographic study of 15,000 anterior teeth, found that dens evaginatus was present in 1% of the cases, being more frequently found in the maxilla, particularly in the lateral incisor.
Talon cusp

• Well-delineated additional cusp on the surface of an anterior tooth and extends 1/2 the distance from CEJ to incisal edge
• Vast majority on lingual surface
• Prevalence studies vary from <1% to 8%
• 3/4 found in permanent dentition, most commonly maxillary lateral then central
• In deciduous dentition, maxillary central most common site
• Has been associated with other dental anomalies
Merril divides the various kinds of evagination into two groups:

1) the nodule originates from the lingual crest of the buccal cusp, and

2) the nodule originates from the middle of the occlusal surface and commonly obliterates the central sulcus.
Dens evaginatus (DE) is an uncommon dental anomaly, having been well documented since 1925

Composed of normal enamel and dentin, a talon cusp may or may not contain pulp tissue. Shay reported that pulp tissue can extend to the center of the tubercle and, once fractured, the pulp is exposed. Güngör et al. in a histologic evaluation, reported the existence of pulp tissue in the bilateral talon cusps of primary maxillary central incisors.
Dens evaginatus (DE) is a developmental aberration of a tooth resulting in formation of an accessory cusp whose morphology has been variously described as an abnormal tubercle, elevation, protuberance, excrescence, extrusion, or bulge. This uncommon anomaly projects above the adjacent tooth surface, exhibiting enamel covering a dentinal core that usually contains pulp tissue that on occasion may have a slender pulp horn which extends various distances up to the full length of the tubercle’s dentin core.
The presence of pulp within the cusp-like tubercle has great clinical significance and distinguishes the anomaly from supplemental cusps, such as the cusp of Carabelli which contain no pulp.

The cusp of Carabelli has been reported in 17.4 to 90% of the white population, occurring most often on the palatal aspect of the mesiolingual cusp of maxillary first molars, but is a rare occurrence in Asians.
• Though DE was first reported in 1892 (3), and has been well documented since 1925 (4), the etiology remains undetermined.
• Both autosomal dominant and X-linked dominant inheritance patterns have been proposed.
DE is thought to develop from an abnormal proliferation and folding of a portion of the inner enamel epithelium and subjacent ectomesenchymal cells of the dental papilla into the stellate reticulum of the enamel organ during the bell stage of tooth formation. The resultant formation is defined as a tubercle, or supplemental solid elevation on some portion of the crown surface.
Schulge (1987) distinguishes the following five types of DE for posterior teeth by the location of the tubercle (5).

1. A cone-like enlargement of the lingual cusp.
2. A tubercle on the inclined plane of the lingual cusp.
3. A cone-like enlargement of the buccal cusp.
4. A tubercle on the inclined plane of the buccal cusp.
5. A tubercle arising from the occlusal surface obliterating the central groove.
Oehlers identified the evagination according to the pulp contents within the tubercle by examining the histological appearance of the pulp using decalcified serial sections of extracted teeth with DE. These categories are listed as follows along with their percentage of occurrence:

1. Wide pulp horns (34%)
2. Narrow pulp horns (22%)
3. Constricted pulp horns (14%)
4. Isolated pulp horn remnants (20%)
5. No pulp horn (10%)

Rare in whites; 15% Asians
Dens invaginatus

- Dens in dente
- Deep surface invagination of crown that is lined by enamel
- Represents an accentuation of the lingual pit
- Depth varies
- Prevalence studies vary from <1% to 10%
- Lateral incisors most commonly affected
- Bilateral involvement common
Aetiology of dens invaginatus

- Over the last few decades, several theories have been proposed to explain the aetiology of this malformation but it is still unclear.
  - Growth pressure of dental arch resulting in buckling of enamel organ.
  - Kronfeld suggested that it results from a focal failure of growth of internal enamel epithelium.
  - Rushton proposed that the invagination is a result of rapid and aggressive proliferation of a part of internal enamel epithelium invading the dental papilla.
  - Oehlers considered that distortion of the enamel organ during tooth development and subsequent protrusion of a part of the enamel organ will lead to the formation of an enamel-lined channel ending at the cingulum or occasionally at the incisal tip.
Dens invaginatus

• The ‘twin-theorie’ suggested a fusion of two toothgerms.
• Infection was considered to be responsible for the malformation.
• Gustafson and Sundberg discussed trauma as a causative factor.
• Genetic factor cannot be excluded.
• It may result from a deep infolding of foramen caecum during tooth development which in some cases may result in a second apical foramen.
• Ectomesenchymal signaling system between dental papilla and the internal enamel epithelium can affect tooth morphogenesis. These signals have specific roles such as tooth morphogenesis and the folding of enamel organ.
Oehlers in 1957 described the anomaly occurring in three forms (coronal invaginations);

**Type I:** An enamel-lined minor form occurring within the confines of the crown not extending beyond the cemento-enamel junction.

**Type II:** An enamel-lined form which invades the root but remains confined as a blind sac. It may or may not communicate with the dental pulp.

**Type III A:** A form which penetrates through the root and communicates laterally with the periodontal ligament space through a pseudo-foramen. There is usually no communication with the pulp, which lies compressed within the root.
AUTHORS YEAR SAMPLE FREQUENCY

- Muhlreiter in 1873  500 maxillary lateral incisors 2.8%
- Atkinson in 1943  500 maxillary lateral incisors 10% of teeth
- Boyne in 1952  1000 maxillary incisors 8%
- Shafer in 1953  2542 Full-mouth surveys 1.3% of patients
- Hallet in 1953  586 Full-mouth surveys 6.6% of lateral incisor 0.5% of central incisors
- Amos in 1955  1000 Full-mouth surveys 5.1% of patients
- Amos in 1955  203 Full-mouth surveys 6.9% of students of dentistry
- Grahn et al. in 1959  3020 right maxillary incisors 2.7% of patients
- Ulmansky & Hermel in 1964  500 Full-mouth surveys 2% of patients
- Poyton & Morgan in 1966  5000 Full-mouth surveys 0.25% of patients
- Miyoshi et al. in 1971  Extracted maxillary lateral incisors 38.5% of teeth
- Fujiki et al. in 1974  2126 Lateral maxillary incisors 4.2% of teeth
- Thomas in 1974  1886 Full-mouth survey 7.74% of patients
- Gotoh et al. in 1979  766 Maxillary lateral incisors 9.66% of teeth
- Ruprecht et al. in 1986  1581 Full-mouth surveys 1.7% of patients
- Ruprecht et al. in 1987  300 Full-mouth surveys 10% of patients
- Thongudomporn and Freer in 1998  111 Full-mouth surveys 26.1% of patients
- Backman & Wahlin in 2001  739 Full-mouth surveys 6.8% of patients
- Hamasha & Al-Omari in 2004  1660 Full-mouth survey 2.95% of patients and 0.65% of teeth
- Ezoddini et al. in 2007  480 Dental panoramic Tomographs 0.8%
- Cakici et al. in 2010  1012 Full-mouth surveys 1.3%
Dens invaginatus and other syndromes or disorders

• Microdontia (Casamassimo et al. Desai et al.)
• Macrodontia (Ekman-Westberg & Julin).
• Hypodontia (Hulsmann)
• Oligodontia (Conklin, Ruprecht et al.)
• Taurodontism (Casamassimo et al)
• Germination and Fusion (Ruprecht et al)
• Supernumerary teeth (Petz, Beynon, Morfis)
• Amelogenesis imperfect (Kerebel et al)
• Invagination in an odontome (Hitchin & McHugh)
• Multiple odontomes (Robbins & Keene)
• Coronal agenesis (Hicks & Flaitz)
• William’s syndrome (Oncaget al)
• Mesiodens (Sannomiya et al)
• Talon cusp (Tiku et al)
• Dens evaginatus (Anthonappa et al)
• Crouzon and Apert syndromes (Melero)
ENAMEL PEARL (Enameloma)

Enamel pearl, also known as enameloma, is an ectopic mass of enamel which can occur anywhere on the roots of teeth but is usually found at the furcation area of roots. The maxillary molars are more frequently affected than the mandibular molars. An enamel pearl does not produce any symptom, and when explored with a dental explorer it may be mistaken for calculus. On a radiograph, the enamel pearl appears as a well-defined round radiopacity.
Taurodontism

- Taurodontism is a developmental anomaly in tooth morphology characterized by lack of constriction at the level of cementoenamel junction, vertically elongated pulp chamber and apical displacement of pulpal floor.
- Enlargement of the body and pulp chamber of a multirooted tooth with apical displacement of the pulpal floor.
- More commonly seen in permanent dentition.
- Prevalence is highly variable 2%-3% in the USA.
- Much higher in Eskimos and Middle Eastern populations.
- Increased frequency in patients with Down, Klinefelter, ectodermal dysplasia, tricho-dento-osseous.
Taurodontism is a morpho-anatomical change in the shape of the tooth in which the body of the tooth is enlarged and the roots are reduced in size. The bifurcation or trifurcation may be only a few millimeters above the apices of the roots.

Taurodontism was first described in 1908 by Gorjanovic-Kramberger a 70,000 year old pre-Neanderthal fossil, discovered in Kaprina, Croatia
The term ‘taurodontism’ was however first stated by Sir Arthur Keith in 1913. The origin of this term is from Greek “tauros” which means “bull” and “odontos” which means “tooth”.

Shaw reported the incidence to be as high as 30 per cent in hybrids of Australoids and the Bush people of South Africa.

The prevalence is reported in normal population to range from 2.5 to 11.3%. It can be unilateral or bilateral. No sex predilection was reported. Mandibular molars are found to be affected more often than maxillary molars and mandibular second molar is most frequently involved tooth.
Theories regarding the etiology of taurodontism have been many. It has been suggested that the anomaly represents a primitive pattern, a mutation, a specialized or retrograde character, an atavistic feature, an X-linked trait, familial or an autosomal dominant trait. Although taurodontism has been reported in association with certain syndromes and some genetic defects its true significance is still obscure. According to Hamner et al. it can be due to failure of Hertwigs epithelial root sheath diaphragm to invaginate at proper horizontal level. It can also be an unusual developmental pattern, a delay in calcification of pulp chamber or changes in the mitotic activity of cells of the developing teeth that can affect root formation or influence from external factors on the development of the teeth.
 Syndromes associated with taurodontism

Down’s syndrome, ectodermal dysplasia, Klinefelter syndrome, tricho-dento-osseous syndrome, Mohr syndrome, Wolf-Hirschhorn syndrome and Lowe syndrome. Taurodontism has also been reported to present with other rare syndromes such as Smith-Magenis syndrome, Williams syndrome, McCune-Albright syndrome and Van der Woude syndrome.
In 1928 Shaw classified this condition as hypotaurodontism, mesotaurodontism and hypertaurodontism based on the relative displacement of the floor of the pulp chamber.

Feichngger and Rossiwall stated that the distance from the bifurcation or trifurcation of the root to the cemento-enamel junction should be greater than the occluso-cervical distance for a taurodontic tooth.

Shifman and Chanannel in 1978 proposed a new classification and is the widely used system till now.
• Shifman and Chanannel proposed an index to calculate the degree of taurodontism. According to this index, taurodontism is present if the distance from the lowest point at the occlusal end of pulp chamber to highest point at the apical end of the chamber divided by distance from occlusal end of pulp chamber to the apex and multiplied by 100 is 20 or above (Hypotaurodontism TI 20-30, Mesotaurodontism TI 30-40 and Hypertaurodontism TI 40-75). Taurodontism can also be determined if the distance from the highest point of the pulp chamber floor to the cemento enamel junction is more than 2.5 mm.
• Its prevalence has been reported to range between 5.67% and 60% of subjects. In a recent study, it has been accounted for 18% of all of the anomalies.

• The prevalence of taurodontism in children was found in 0.3%.
Dilaceration

• Abnormal angulation or bend in the root
• Thought to be related to trauma during root development
• Permanent maxillary incisors most commonly affected followed by mandibular incisors
• Rare in primary dentition
• Treatment depends on severity
Concrescence

- Concrescence of teeth is actually a form of fusion that occurs during root formation or after the radicular phase of development is complete. It may occur due to traumatic injury, over-crowding of the teeth with resorption and interdental bone loss, distal inclination of crown of molar, space restriction during development, excessive occlusal trauma and local infection after development. In order for concrescence to take place, the roots of the affected teeth must be in close proximity to each other, and an excess layer of cementum must be deposited to form the union between the roots of the adjacent teeth.
Concrescence

- Union of two adjacent teeth by cementum alone
- May occur before or after eruption
- Seen most commonly posterior and maxillary regions
- Etiology believed to be trauma or overcrowding