Developmental alterations of teeth

1. Alterations in the number of teeth:

Anodontia: Absence of teeth or failure of the development of teeth.

- Complete anodontia: when all teeth are missing; this condition is extremely rare. If the permanent dentition fails to form, the deciduous dentition is retained for many years. If the teeth survive caries, attrition will eventually destroy the crowns. Lack of alveolar bone growth may make implant placement difficult.
- Partial anodontia (hypodontia) when one or several teeth are missing. Failure of development of one or two teeth is relatively common and often hereditary teeth most frequently missing are (third molars, second premolars, and maxillary second incisors) (the last teeth in each series).
- Pseudoanodontia: when teeth are absent clinically because of impaction or delayed eruption
- false anodontia: when teeth have been exfoliated or extracted.

Anodontia (particularly hypodontia) may associated with complex group of inherited disorders known collectively as **Ectodermal dysplasia** (**ED**) in which two or more ectodermally derived anatomic structures (skin, hair, nails, teeth, sweat glands, salivary glands) are fail to develop. The characteristic Signs and Symptoms of ED include:

1. Dry, scaly skin (eccrine hypoplasia)
2. Anodontia (complete or partial) with abnormal tooth morphology (peg-shaped)
3. Sparse, fine hair
4. Dystrophic nails (poorly developed nails)
5. Pyrexia (eccrine hypoplasia and an inability to sweat)
6. Defective hearing

7. Dysphagia (mucosal gland hypoplasia)
8. Xerostomia (mucosal gland hypoplasia) and caries
9. Xerophthalmia (lacrimal hypoplasia) and associated conjunctivitis

ED may be inherited as autosomal dominant, autosomal recessive, or X-linked recessive patterns.

Hyperdontia (Supernumerary teeth, extra teeth)

Extra, or supernumerary, teeth in the dentition most probably result from continued proliferation of the permanent or primary dental lamina to form a third tooth germ. The resulting teeth may have a normal morphology or may be rudimentary and small in size. Most cases of supernumerary teeth are *isolated events*, although some may be *familial* and others may be *syndrome associated* (Gardner's syndrome and cleidocranial dysplasia). Supernumerary teeth are found more often in the permanent dentition than in the primary dentition and are much more commonly seen in the maxilla than in the mandible. The anterior midline of the maxilla is the most common site, in which case the supernumerary tooth is known as a **mesiodens**. The maxillary molar area (**fourth molar or paramolar**) is the second most common site. The significance of supernumerary teeth is that they occupy space. When they are impacted, they may block the eruption of other teeth, or they may cause delay in eruption or maleruption of

adjacent teeth. If supernumerary teeth erupt, they may cause malalignment of the dentition and may be cosmetically objectionable.

Supernumerary teeth are divided into:

1. Supplemental (normal size and shape)
2. Rudimentary (abnormal shape and smaller size).

Rudimentary supernumerary teeth are classified further into: -

1. Conical (small, peg-shaped)
2. Tuberculate (barrel-shaped anterior with more than one cusp)
3. Molariform (small premolar-like or molarlike).

Note: Occasionally, normal teeth may erupt into an inappropriate (misplaced) position (e.g., a canine present between two premolars). This pattern of abnormal eruption is called dental transposition (not hyperdontia).

Teeth that appear at the time of birth are known as **natal teeth**, and those appearing within 6 months following birth are called **neonatal teeth**. Most of these teeth represent prematurely erupted deciduous teeth, usually mandibular central incisors. A small percentage represents supernumerary teeth. Prematurely erupted primary teeth should be preserved (provided they cause no injury to the infant or the mother), and supernumeraries should be extracted. Supernumerary teeth appearing after loss of the permanent teeth are known as post permanent dentition. This is generally regarded as a rare event. Most teeth appearing after extraction of the permanent teeth are believed to arise from eventual eruption of previously impacted teeth.

The etiology of supernumerary teeth is still uncertain. Number of theories have been postulated including:

1. Atavism (evolutionary throwback)
2. Tooth germ dichotomy
3. Hyperactivity of the dental lamina
4. Genetic (hereditary) and environmental factors

Impaction

Impaction of teeth is a common event that most often affects the mandibular third molars and maxillary canines. Impaction occurs because of the following: -

1. Obstruction from crowding or from some other physical barrier.

2. An abnormal eruption path, presumably caused by unusual orientation of the tooth germ.

3. Ankylosis, the fusion of a tooth to surrounding bone. The reason for ankylosis is unknown, but it is believed to be related to periapical inflammation and subsequent bone repair. With focal loss of the periodontal ligament, bone and cementum become inextricably mixed, causing fusion of the tooth to alveolar bone.

2. Alterations in size of teeth

Microdontia

In generalized microdontia, all teeth in the dentition appear smaller than normal. Teeth may *actually* be smaller than normal, as in (pituitary dwarfism), or they may be *relatively* small in comparison with a large mandible and maxilla.

In focal or localized microdontia, a single tooth is smaller than normal. The shape of these microdonts is often altered with the reduced size. This phenomenon is most commonly seen with maxillary lateral incisors in which the tooth crown appears cone-or peg-shaped, prompting the designation (peg lateral). Peg laterals are of no significance other than cosmetic appearance. The second most commonly seen microdont is the maxillary third molar, followed by supernumerary teeth.

Macrodontia

Generalized macrodontia is characterized by the appearance of enlarged teeth throughout the dentition. This may be *absolute*, as seen in (pituitary gigantism), or it may be *relative* to small maxilla and mandible. The latter results in crowding of teeth and possibly an abnormal eruption pattern caused by insufficient arch space.

Focal or localized macrodontia is characterized by an abnormally large tooth or group of teeth. This relatively uncommon condition usually is seen with mandibular third molars. In the rare condition known as **hemifacial hypertrophy**, teeth on the affected side are abnormally large compared with the unaffected side.

3. Alterations in shape of teeth

Gemination

Gemination is the fusion of two teeth from a single enamel organ. The typical result is partial cleavage, with the appearance of two crowns that share the same root canal. Complete cleavage, or twinning, occasionally occurs, resulting in two teeth from one tooth germ. Although trauma has been suggested as a possible cause, the cause of gemination is unknown. These teeth may be cosmetically unacceptable and may cause crowding.

Fusion

Fusion is the joining of two developing tooth germs, resulting in a single large tooth structure. The fusion process may involve the entire length of the teeth, or it may involve the roots only, in which case cementum and dentin are shared. Root canals may also be separate or shared. It may be impossible to differentiate fusion of normal and supernumerary teeth from gemination. The cause of this condition is unknown, although trauma has been suggested.

Concrescence

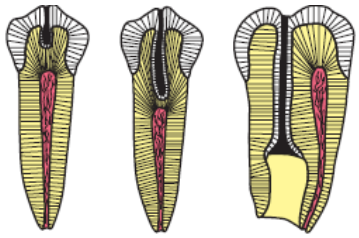
Concrescence is a form of fusion in which adjacent, already formed teeth are joined by cementum. This may take place before or after eruption of teeth and is believed to be related to trauma or overcrowding. Concrescence is most commonly seen in association with the maxillary second and third molars. This condition is of no significance, unless one of the teeth involved requires extraction. Surgical sectioning may be required to save the other tooth.

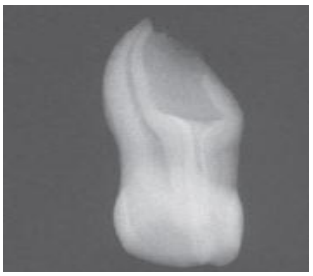
Dilaceration

Dilaceration is an extraordinary curvature or angulation of tooth roots. The cause of this condition has been related to trauma during root development. Movement of the crown or of the crown and part of the root from the remaining developing root may result in sharp angulation after the tooth completes development. Eruption generally continues without problems. Extraction of dilacerated tooth may be difficult also root canal filling procedure is challenging.

Dens Invaginatus

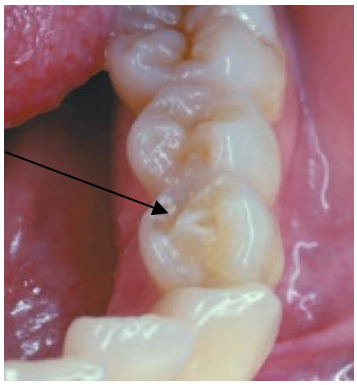
Dens Invaginatus (dens in dente or tooth within a tooth) is an uncommon tooth anomaly that represents an exaggeration or accentuation of the lingual pit. This defect ranges in severity from superficial, in which only the crown is affected, to deep, in which both the crown and the root are involved. The permanent maxillary lateral incisors are most commonly involved. Bilateral involvement is commonly seen. Because the defect cannot be kept free of plaque and bacteria, dens invaginatus predisposes the tooth to early decay and subsequent pulpitis. Prophylactic filling of the pit is recommended to avoid this complication.





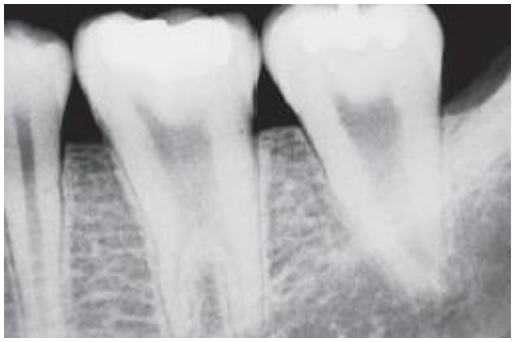
Dens evaginatus

Dens evaginatus is a relatively common developmental condition affecting predominantly premolar teeth (Leung's premolars). The defect, which is often bilateral, is an anomalous tubercle, or cusp, located at the center of the occlusal surface. Because of occlusal abrasion, the tubercle wears relatively fast, causing early exposure of an accessory pulp horn that extends into the tubercle. This may result in periapical pathology in young, caries-free teeth, often before completion of root development and apical closure, making root canal fillings more difficult. Careful grinding of the opposing tooth or the accessory tubercle to stimulate secondary dentin formation may prevent the periapical sequelae associated with this defect. Sealants, pulp capping, and partial pulpotomy have been suggested as measures to allow complete root development.



Taurodontism

Taurodontism is a variation in tooth form in which teeth have elongated crowns or apically displaced furcations, resulting in pulp chambers that have increased apical-occlusal height. Because this abnormality resembles teeth in bulls and other ungulates, the term taurodontism was developed. Various degrees of severity may be seen. Taurodontism may be an isolated incident, in families, and in association with syndromes such as (Down syndrome and Klinefelter's syndrome). Although taurodontism is generally an uncommon finding, it has been reported to have a relatively high prevalence in Eskimos. Other than a possible relationship to other genetically determined abnormalities, taurodontism is of little clinical significance unless the tooth becomes nonvital, in which case it becomes a challenging endodontic problem. No treatment is required.



Enamel pearls

Enamel pearls are droplets of ectopic enamel may occasionally be found on the roots of teeth. They occur most commonly in the bifurcation or trifurcation of teeth. Maxillary molars are more commonly affected than mandibular molars. These deposits are occasionally supported by dentin and rarely may have a pulp horn extending into them, so they have no or little clinical significance.


Post developmental alterations in shape of teeth

Attrition

Attrition is the physiologic wearing of teeth as a result of mastication. It is an age-related process that varies from one individual to another. Factors such as diet, dentition, jaw musculature, and chewing habits can significantly influence the pattern and extent of attrition.

Abrasion

Abrasion is the pathologic wearing of teeth caused by an abnormal habit or abnormal use of abrasive substances. Pipe smoking, tobacco chewing, aggressive toothbrushing, and use of abrasive dentifrices are among the more common causes. The location and pattern of abrasion are directly dependent on the cause, with so-called toothbrush abrasion along the cementoenamel junction an easily recognized pattern.

Erosion

Erosion is the loss of tooth structure through a nonbacterial chemical process. Most commonly, acids are involved in the dissolution process from an external or an internal source. Externally, acid may be found in the work environment (e.g., battery manufacturing) or in the diet (e.g., citrus fruits, acid-containing soft drinks).

The internal source of acid is most probably regurgitation of gastric contents. This may be seen in any disorder of which chronic vomiting is a part. Self-induced vomiting, as a component of bulimia or, less commonly, anorexia nervosa, has become an increasingly important cause of dental erosion and other oral abnormalities. The pattern of erosion associated with vomiting is usually generalized tooth loss on the lingual surfaces of maxillary teeth. However, all surfaces may be affected, especially in individuals who compensate for fluid loss by excessive intake of fruit juices.

Abfraction

Abfraction appears as wedge-shaped defects limited to the cervical area of the teeth and may closely resemble cervical abrasion or erosion. Clues to the diagnosis include defects that are deep, narrow, and V-shaped (which do not allow the toothbrush to contact the base of the defect) and often affect a single tooth with adjacent unaffected teeth.