

Pediatric Dentistry

Pediatric Dentistry is an age-defined specialty that provides both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs.

Pedodontics: is a branch of dentistry that is concerned with the dental care of children its origin came from a Greek words (pedo-child + odous, odont- 'tooth').

Eruption of teeth

The process of tooth eruption can be defined as the movement of the tooth through the tissues of the jaw towards occlusion into the oral cavity. The formation and eruption of teeth are two essential processes which may be influenced by:

1. Genetic factors
2. Environmental factors
3. Hormonal factors

* * Each tooth starts to move toward occlusion at approximately the time of crown completion, and the interval from crown completion and the beginning of eruption until the tooth is in full occlusion is approximately 5 years for permanent teeth.

Pattern of tooth movement

A considerable movements are required to bring the teeth to the occlusal plane and then into functional occlusion.

Types of tooth movements:

1. Pre- eruptive tooth movement: includes all movements of the deciduous and permanent tooth germs within the tissues of the jaw, from the time of early initiation and formation to the time of crown completion and this phase terminates with the initiation of root development, during this phase the growing tooth moves in two directions to maintain its position In the expanding jaws.

Bodily movement: it occurs continuously as the jaw grows by which the movement of the entire tooth germ cause bone resorption at the direction of tooth movement and bone apposition behind it.

Eccentric movement: one part of the tooth germ remains fixed while the rest continues to grow causing a shift in the center of the tooth germ.

"The root elongates when the crown does not increase in size.

2. Eruptive tooth movement: it is the axial movement of the tooth from its crypt within the bone of the jaw to its functional position in occlusion (to occlude with its antagonist).

3. Post - eruptive tooth movement: it occurs primarily to maintain the position of the erupted tooth while the jaw continues to grow and to compensate for the occlusal and proximal wear. This movement occur in axial direction.

Theories of tooth eruption

1. Root formation: It was believed that root formation is an obvious cause of tooth eruption because it causes an overall increase in length of the tooth that must be accommodated by the growth of the root into the bone, an increase in jaw height or by the occlusal movement of the crown (eruption). Root growth theory suggested the presence of the cushion hammock ligament at the base of the socket that transmits the force to cause eruption but the ligament was never found histologically. However, rootless teeth erupt and some teeth erupt a greater distance more than the length of their roots Teeth still erupt even following root completion also when the tissues forming the root are excised surgically teeth continue to erupt all these events mean that root formation is not required for tooth eruption.

2. Bone remodeling: An inherent growth pattern of the maxilla and mandible supposedly moves teeth by selective deposition and resorption of bone. This

theory is not accepted. Bone resorption and formation is as a result of eruptive forces applied by tooth over the bone.

3. Vascular pressure: The Vascular Pressure theory supposes that a local increase in tissue fluid or blood pressure in the periapical region is sufficient to move the tooth. But since surgical excision of the growing root and associated tissue eliminates the periapical vasculature without stopping eruption, this means local vessels are not absolutely necessary for tooth eruption.

4. Periodontal ligament: Eruptive force resides in the dental follicle-periodontal ligament complex. Formation and renewal of the PDL has been considered a factor in tooth eruption because of the traction power that fibroblasts have which may pull the tooth out during eruption.

5. Dental follicle theory: It is clear that the dental follicle is essential to achieve the bony remodeling required to accommodate tooth movement, for it is from this tissue that the osteoblasts differentiate.

Development of teeth

Tooth development or odontogenesis is the complex process by which teeth form from embryonic cells, grow, and erupt into the mouth (starts as early as 28 days of IUL and continues to the end of eruption of permanent molars). For human teeth to have a healthy oral environment, all parts of the tooth must develop during appropriate stages of fetal development.

Primary teeth start to form between the sixth and eighth week of prenatal development, and permanent teeth begin to form in the twentieth week. If teeth do not start to develop at or near these times, they will not develop at all, resulting in hypodontia or anodontia. Development of teeth passes through the following stages:

A. Development in the prenatal period: in this period three overlapping phases occur:

1. Beginning of the deciduous dentition development

The development of teeth starts at 3rd week of IUL, then the odontogenic epithelium proliferates in the 5th week to form the dental lamina which form invaginations that develop into tooth buds.

2. The formation of the successional lamina

It is the lingual extension of the dental lamina develops in the 5th months of IUL (permanent central incisor) to 10th months of age (2nd premolar).

3. Initiation of the permanent dentition

It is initiated in the 4th month of IUL.

B. Status of development at birth:

The teeth are in different stages of development at birth.

C. Development in the postnatal period: it shows completion of the crowns of all primary teeth and initiation of root formation. The permanent teeth continue to develop in different stages till their root formation is completed.

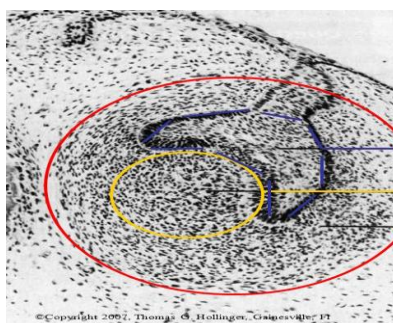
Life cycle of the tooth

A number of physiological changes take place in the progressive development of teeth:

1. Growth:

a) Initiation (bud stage): first stage of tooth development occurs around 6-7 weeks IUL. One of the earliest signs in the formation of a tooth that can be seen microscopically is the distinction between the vestibular lamina and the dental lamina. The dental lamina connects the developing tooth bud to the epithelial layer of the mouth for a significant time.

b) Proliferation (cup stage): second stage of development known as the cap stage. It results from cellular division and multiplication of cells. As a result of unequal growth in the different parts of the bud, a cap is formed. A shallow invagination appears on the deep surface of the bud. The peripheral cells of the cap later form the outer and inner enamel epithelium.



Cap Stage of Tooth Development

Dental (enamel) organ

Dental papilla

dental follicle

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Oral Histology, 5th edition, A R Ten Cate

As with a deficiency in initiation, a deficiency in proliferation results in failure of the tooth germ to develop and in less than the normal number of teeth. Excessive proliferation of cells may result in epithelial rests. If the cells become more fully differentiated or detached from the enamel organ, they produce enamel and dentin, which results in an odontoma or a supernumerary tooth. The degree of differentiation of the cells determines whether a cyst, an odontoma, or a supernumerary tooth develops.

c) Histodifferentiation: The epithelium continues to invaginate and deepen until the enamel organ takes on the shape of a bell, during this stage there is a differentiation of the cells of the dental papilla into odontoblasts and of the cells of the inner enamel epithelium into ameloblasts. Histodifferentiation marks the end of the proliferative stage as the cells lose their capacity to multiply. This stage is the forerunner of appositional activity. Disturbances in the differentiation of the formative cells of the tooth germ result in abnormal structure of the dentin or enamel. One clinical example of the failure of ameloblasts to differentiate properly is amelogenesis imperfecta.

d) Morphodifferentiation: the formative cells are arranged to outline the form and size of the tooth. This process occurs before matrix deposition. The morphologic pattern of the tooth becomes established when the inner enamel epithelium is arranged so that

the boundary between it and the odontoblasts outlines the future dentinoenamel junction. Disturbances and aberrations in morphodifferentiation lead to abnormal forms and sizes of teeth. Resulting conditions include peg teeth, other types of microdontia, and macrodontia.

e) Apposition: appositional growth is the result of a layer-like deposition of a nonvital extracellular secretion in the form of a tissue matrix. This matrix is deposited by the formative cells, ameloblasts, and odontoblasts, which line up along the future dentinoenamel and dentinocemental junction at the stage of morphodifferentiation. These cells deposit the enamel and dentin matrix according to a definite pattern and at a definite rate.

Any systemic disturbance or local trauma that injures the ameloblasts during enamel formation can cause an interruption or an arrest in matrix apposition, which results in enamel hypoplasia. Hypoplasia of the dentin is less common than enamel hypoplasia and occurs only after severe systemic disturbances.

F) CALCIFICATION: calcification (mineralization) takes place following matrix deposition and involves the precipitation of inorganic calcium salts within the deposited matrix. The process begins with the precipitation of a small nidus, and further precipitation occurs around it. The original nidus increases in size by the addition of concentric

laminations. There is an eventual approximation and fusion of these individual calcospherites into a homogeneously mineralized layer of tissue matrix. If the calcification process is disturbed, there is a lack of fusion of the calcospherites. These deficiencies are not readily identified in the enamel, but in the dentin they are evident microscopically and are referred to as interglobular dentin.

2. Eruption:

Includes two processes intrabony phase and intra oral phase. They take 5 years to be completed. The tooth emerge when 3/4 its root formation has occurred. The tooth usually reaches the occlusal plane before its root development is completed.

3. Attrition:

A physiological process characterized by wearing of a tooth during tooth - to - tooth contact as in mastication. The surfaces involved are incisal, occlusal and proximal. Basically attrition is an aging process and it continues throughout the life.