

Eruptions of teeth

Eruption of teeth generally refers to emergence or appearance of teeth in the oral cavity. In a wider context it refers to movement of teeth in the oral cavity from its developmental position within the jaws to its functional position in the oral cavity and maintenance of this position throughout life.

However, eruption is only part of total pattern of physiologic tooth movement, as teeth also undergo complex movements related to maintaining their position in the growing jaws and compensating for.

Types of physiologic teeth movements:

1. Axial or vertical movement- primary eruption movement along the axis of tooth.
2. Drifting- it is a bodily movement in a direction perpendicular to the long axis of tooth like: A-Mesial drift., B- Distal drift.
3. Torsion - it is a rotatory movement around the longitudinal axis of tooth.
4. Tipping- movement around the transverse axis of tooth is called tipping.

Phases of tooth movements:

1. Preemptive tooth movement
2. Eruptive tooth movement
3. Posteruptive tooth movement

Superimposed on these movements is the replacement of the entire deciduous dentition by the permanent dentition.

Pre-eruptive tooth movement:

These are the movements made by both the deciduous and permanent tooth germs within the tissues of jaws before they begun to erupt.

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These movements occur in association with growth of the jaws, and when deciduous teeth first differentiate, there is a good space between them. This space is utilized with the growth of tooth germs, which is more than the growth of bone and thus, crowding occurs in the incisors and canine region. A lengthening of the jaws, which permits the deciduous second molars tooth germs to move backward and the anterior germs to move forward gradually, reduce this crowding.

At the same time the tooth germs are moving bodily outward and upward (or downward in the upper jaw) with the increasing length and width and height of the jaws.

In the beginning the permanent anterior tooth germs develop on the lingual aspect of their deciduous predecessors in the same bony crypt. Then, as jaws develop, the tooth germ shifts from this position and occupy a position in their own bony crypts. These changes in the relative position are basically because of growth of the permanent tooth and eruptive movement of deciduous tooth.

The bony crypt remodels according to the movements of developing tooth , thus pre-eruptive movements of teeth are a combination of two factors and are reflected in the patterns of bone remodeling within the crypt wall (developing bone socket), these factors are:

- a) **Total bodily movement** of the tooth germ: For example, during bodily movement in a mesial direction, bone resorption by osteoclasts occurs on the mesial surface of the crypt wall, and bone deposition occurs by osteoblasts on the distal wall as a filling-in process.
- b) **Eccentric growth**: In which one part of the tooth germ remains fixed while the rest continues to grow, leading to a change in the center of the tooth germ. During eccentric growth, only bony resorption occurs, thus altering the shape of the crypt to accommodate the altering shape of the tooth germ.

Eruptive tooth movement:

The mechanisms of eruption for deciduous and permanent teeth are

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similar, resulting in the axial or occlusal movement of the tooth from its developmental position within the jaw to its final functional position in the occlusal plane. Four major events occur during eruptive movement, which are:

- a) **Root formation occurs**, requiring space for the elongation of the root. Epithelial root sheath proliferation is the first step in root formation, which in time causes the initiation of root dentin and formation of pulpal tissue of the forming root. Fibrous tissue of surrounding dental follicle also increase as a result of root formation.
- b) **Movement is the second step** of erupting tooth. This action occurs incisally or occlusally through the bony crypt of the jaws to reach the oral mucosa. This movement is due to a need for the elongating roots to have space to form. The reduce enamel epith. covering the enamel next contact and fuses the oral epith. and then gives rise to a thin epith. layer overlying the erupting crown.
- c) **Penetration of the crown tip's** through the fused epith. layer is the next step. This action allows entrance of the enamel into the oral cavity.
- d) **Intraoral occlusal** or incisal movement of the erupting tooth continues until clinical contact with the opposing crown occurs. The crown moves farther through the mucosa causing a gradual exposure of more crown surface, with an increasingly apical shift of the attachment epith.

Possible causes of tooth eruption:

Although all the factors associated with tooth eruption are not yet known, the followings may be the possible causes of tooth eruption:

1-Root growth and pulpal pressure., 2-Bone remodeling., 3-Vascular pressure in periapical area., 4-Periodontal ligament traction., 5-Enzymatic degradations., 6-Endocrine influence.

Histological changes in tissues during eruptive movement:

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The eruptive tooth movement is characterized by significant histological changes that take place in the tissues overlying, surrounding, and underlying the erupting teeth.

Overlying the teeth:

The dental follicle becomes altered, forming a pathway for the erupting teeth. There first appears a zone of degenerating C.T. fibers and cells immediately overlying the teeth. During this process, B.V. decrease in number and N.F. break into pieces and degenerate. The tissue space overlying the teeth becomes visible as an inverted triangular area, known as eruptive pathway (**gubernacular canal**). In the periphery of this zone, the follicular fibers, regarded as the **gubernacular cord**, are directed toward the mucosa, and this cord guide the teeth in eruptive movement.

Macrophages appear in the soft tissue; these cells release hydrolytic enzymes that aid in the destruction of tissues and loss of B.V. Osteoclasts are found along the borders of the resorptive bone overlying the teeth and this loss of bone keeps space during eruptive movement.

Surrounding the teeth:

The tissues around the teeth change from delicate fibers lying parallel to the tooth surface to bundles of fibers attached to the tooth surface and extend toward the periodontium. The first F. to appear are those in the cervical area as root formation begins. As the root elongates further, bundles of F. appear on the tooth surface. Fibroblasts are active cells in the formation and degradation of the collagen F. With tooth eruption, the alveolar bone of the crypt increases in height to accommodate the forming root. After the teeth attain functional occlusion, the F. gains their mature orientation.

Special fibroblasts have been reported in the periodontium of erupting teeth called **myofibroblasts** have contractile properties. During eruption, collagen F. formation and turnover are very rapid, occurring within 24 hours. This mechanism enables F. to attach and release and reattach in rapid succession. Gradually, the F. organize, increasing in number and density as the tooth erupts in the oral cavity. B.V. then become more prominent in the

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developing ligament and then additional pressure on the erupting tooth.

Underlying the teeth:

As the crown of the tooth begins to erupt, it gradually moves occlusally, providing space underlying the tooth for the root to lengthen. Fibroblasts appear in great number in fundus area (bone enclosing the apex of the tooth root), and bone trabeculae form a network, or bony ladder like arrangement, at the tooth apex, which believed to fill the space and compensate for the eruptive movements of the teeth. Dense bone then forms around the tooth apex, and bundles of fibers attach to the apical cementum and the alveolar bone (apical group fibers of PDL) to further support the teeth.

Posteruptive tooth movement:

This takes place after the teeth are in function and continues as long as the teeth are present in the mouth. During this period of root completion, there is a compensating increase in the height of the alveolar process. The alveolar plates resorbed to adjust for formation of the root tip apex. The root canal narrows as a result of root tip maturation, at which time apical fibers develop to help cushion the forces of occlusal impact. The

Posteruptive tooth movement occur to:

- a) Movements to accommodate the growing jaws. Mostly occurs between 14 and 18 years by formation of new bone at the alveolar crest and base of socket to keep pace with increasing height of jaws.
- b) Movements to compensate for continued occlusal wear. Compensation primarily occurs by continuous deposition of cementum around the apex of the tooth. However, this deposition occurs only after tooth moves. Similar to eruptive tooth movement.
- c) Movements to accommodate interproximal wear. Compensated by mesial or approximal drift. Mesial drift is the lateral bodily movement of teeth on both sides of the mouth. Very important in orthodontics.

Clinical situations: The teeth which are directly attached to the bone (**tooth**

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ankylosis) do not undergo posteruptive movement and lie below the occlusal level. They are called **submerged teeth**. Local and systemic factors influence the rate of eruption. Impaction of third molars and delayed eruption are commonly seen in dental practice while premature eruption and natal teeth are rarely seen.