Al Rasheed College of Dentistry
Oral Histology
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Lecture 17

Shedding of primary teeth

The human dentition, like those of most mammals, consists of two generations (deciduous and permanent dentition). The necessity for two dentitions exists because infant jaws are small and the size and number of teeth they can support is limited. Since teeth, once formed, cannot increase in size, a second dentition, consisting of larger and more teeth, is required for the larger jaws of the adult.

Shedding is the loss of the primary dentition caused by physiologic resorption of the roots, the loss of bony supporting structure, and therefore the inability of these teeth to withstand the masticatory forces.

Mechanism of resorption and shedding:

This mechanism is not fully understood. It seems clear that pressure from the erupting successional tooth plays a key role. The resorption of deciduous tooth occur by action of different cells at site of pressure of erupting permeant tooth like: Osteoclast/bone resorption, Odontoclast (cementoclast; dentinoclast), Fibroblasts(collagen fibers resorption).

The acid phosphatase content of the vesicles close to ruffled border suggests that these structures are phagosomes in which break. Down of ingested material is taking place.

<u>The most likely sequence of events in resorption of dental hard tissue are</u>

1. Extracellular phase - in which mineral is separated from collagen and is broken into small fragments.
2. Intracellular phase - in which the resorbing cells ingests these mineral fragments and continues the dissolution of this mineral.
3. Fibroblasts cells are believed to destroy the remaining collagen fibers secondarily by ingesting them in an intracellular phagolysosome system. Amino acids resulting from this breakdown are used in the formation of collagen within this same cell and can be used in this same area for bone formation.

   Although pressure exerted by permanent successor has a key role in initiating tooth resorption, other factors must be involved. The forces of mastication applied to the deciduous tooth are also capable of initiating the

resorption. As an individual grows, the muscles of mastication increase in size and exert forces on the deciduous tooth greater than its PDL can withstand. This leads to trauma to the ligament and the initiation of resorption.

Odontoclasts:

The resorption of dental hard tissue is achieved by cells with a histologic feature similar to that of osteoclasts, but because of their involvement in the removal of dental hard tissue, they are called odontoclasts. Its derived from monocytes and migrate from B.V. to the resorption sites, where they fuse to form the multinucleated odontoclast with a clear ruffled (brush) border. Histochemically, a characteristic feature of this cells is a high level of activity of the enzyme acid phosphates which occur within vacuoles and these vacuoles are concentrated in the cytoplasm near the ruffled border. Ruffled border produced by extensive folding of the cell membrane into a series of invaginations 2-3 microns deep.

Odontoclasts are most commonly found on surfaces of the roots in relation to the advancing permanent tooth and they have also been found in the root canals and pulp chambers of resorbing teeth. Different patterns of resorption exist for different teeth. For example, single-rooted teeth are usually shed before root resorption is complete, therefore odontoclasts are not found within pulp chamber of these teeth and the odontoblasts layer remains intact. In molars, however, the roots are usually completely resorbed and the crown is also partially resorbed before shedding.

PATTERN OF SHEDDING

The shedding of deciduous teeth is the result of progressive resorption of the roots of teeth and their supporting tissue, the periodontal ligament. In general, the pressure generated by the growing and erupting permanent tooth dictates the pattern of deciduous tooth resorption.

At first this pressure is directed against the root surface of the deciduous tooth itself. Because of the developmental position of the permanent incisor and canine tooth germs and their subsequent physiologic movement in an occlusal and vestibular direction, resorption of the roots of the deciduous incisors and canines begins on their lingual surfaces.

Later, these developing tooth germs occupy a position directly apical to the deciduous tooth, which permits them to erupt in the position formerly occupied by the deciduous tooth.

Resorption of the roots of deciduous molars often first begins on their inner root surfaces because the early developing bicuspids are found between them. This resorption occurs long before the deciduous molars are shed and reflects the expansion of their growing permanent successors. However, as a result of the continued growth of the jaws and occlusal movement of the deciduous molars, the successional tooth germs come to lie apical to the deciduous molars.

This change in position provides the growing bicuspids with adequate space for their continued development and also relieves the pressure on the roots of the overlying deciduous molars. When the bicuspids begin to erupt, resorption of the deciduous molars is again initiated, and this time continues until the roots are completely lost and the tooth is shed. The bicuspids thus erupt in the position of deciduous molars.

Clinical comment:

1. **Submerged**: Teeth are considered submerged when eruption is prevented because of crowding or tipping of the adjacent teeth into the space created by a missing tooth.
2. **Retained primary teeth** may be due to lack of development of permanent successor.

<u>The six/four rule for primary tooth emergence</u>

Four teeth emerge for each 6 months of age

1. 6 months: 4 teeth (lower centrals & upper centrals)
2. 12 months: 8 teeth (1. + upper laterals & lower laterals)
3. 18 months: 12 teeth (2. + upper 1st molars & lower 1st molars)
4. 24 months: 16 teeth (3. + upper canines & lower canines)
5. 30 months: 20 teeth (4. + lower 2nd molars & upper 2nd molars)

Summary:

a) By 5 months in utero, all crowns started calcification
b) By 1 year old, all crowns completed formation

c) By 2.5 years, all primary teeth erupted
d) By 4 years old, all primary teeth completed root formation

The rules of "Fours" for permanent tooth development (3rd molars not included)

1. At birth, four 1st molars have initiated calcification
2. At 4 years of age, all crowns have initiated calcification
3. At 8 years, all crowns are completed
4. At 12 years, all crowns emerge
5. At 16 years, all roots are complete