SHEDDING OF PRIMARY TEETH
Aim

1. To know the Pattern of shedding of anterior deciduous teeth
2. To know the Pattern of shedding of deciduous molars
3. To understand Histology of shedding
4. To explain the Mechanism of Resorption and shedding
   (A) Resorption of hard dental tissues
   (B) Resorption of dental soft tissue
5. To understand clinical consideration, abnormalities and factors may affects in shedding
Definition
1. Pattern of shedding of anterior deciduous teeth
2. Pattern of shedding of deciduous molars

Histology of shedding
Function of odontoclast

Mechanism of resorption and shedding
Resorption of hard dental tissues
Resorption of dental soft tissue

Retained Deciduous Teeth
Remnants of Deciduous Teeth
Ankylosis and submerged deciduous teeth

Factors that determine the pattern and rate of deciduous teeth shedding
1. Genetic Factors
2. Local Factors
   a) Local pressure
   b) Masticatory forces

Clinical considerations
Retained Deciduous Teeth
Remnants of Deciduous Teeth
Ankylosis and submerged deciduous teeth
Shedding is the physiologic exfoliation of the primary teeth caused by progressive physiologic resorption of their roots and their supporting tissue at specific age to be replaced by its permanent successor.
1- **Loss of root.** Pressure from growing and erupting permanent teeth induce the **differentiation of odontoclasts**, which result in resorption of the primary roots. Resorption shorten the roots and causes loss of attachment fibers of the periodontal ligament.

2- **Loss of bone.** Weakening of supporting tissues of the primary teeth occur as a result of **root resorption and modification of the alveolar bone**.

3- **Increased the masticatory forces.** Increase masticatory forces on the weakened teeth are a result of **muscular growth**. This amplifies compression of the periodontal ligament and promotes resorption of teeth and alveolar bone.
The resorption process is initiated by the odontoclast, the osteoclast and the fibroblast cells.

During resorption, the pressure of the erupting permanent tooth is directed to the bone separating the crypts of the permanent tooth from the alveolus of the primary tooth.

After this area is resorbed, the eruptive force is directed at the root of the primary tooth, which results in resorption of the cementum and dentine.
The fact that **programmed cell death** is seen in the **PDL** during shedding that occurs at specific ages is consistent with the concept that shedding is a genetically determined process.

It should be emphasized that the **pulp tissue** in teeth undergoing shedding appears histologically **normal** except that neural **elements** seem to be missing. Thus the pulp does not contribute to the process of shedding and **plays a passive role in this process.**
Odontoclasts:
Odontoclasts: Odontoclasts are similar to osteoclasts, they originate from the fusion of circulating blood monocytes.

Under light microscope:
- Multinucleated cells with a clear attachment zone and ruffled border.
- Occupying resorption bays (Howships lacunae).
- Their cytoplasm is vacuolated.
Under electronic microscope:

- Extensive folding of the cell membrane with mineral crystallites ions seen within the depth of these invaginations.
- Mitochondria and many vacuoles.
Four regions can be seen:
1. Ruffled border.
2. A clear zone (no organelles – only granular cytoplasm).
3. Vesicular region.
4. Basal region (containing the cytoplasmic organelles).

1. Histochemically
A high level of activity of enzyme acid phosphatase, occurs within their vacuoles.
- Tooth resorption is not continuous.
- Loss of PDL fibers.
- Apoptotic fibroblasts death occurs at specific times.

- Odontoclasts are found on the surfaces of:
  1. Resorbed roots.
  2. In root canals.
  3. Pulp chambers.
  4. Replacing the odontoblast layer.
Root Resorption

- Resorbing alveolar bone
- Resorbing root dentin
- Osteoclasts
Root Resorption

Osteoclasts

Dentin of root
Resorption of hard tissue occurs in two phases:

**Extracellular Phase**: involves initial breakdown of small area of hard tissue into partially dissolved fragments.

**Intracellular Phase**: where odontoclasts appear to ingest and complete the dissolution of breakdown products.

Clast cells act by isolating an area of hard tissue (bone, cementum, dentin or even enamel) using clear cytoplasmic areas (no organelles) and through plasma membrane associated enzymes that act as proton pumps, add H+ to that area. The isolated area’s pH is lowered making it acidic.

This acidity breaks down the hydroxyapatite crystals of the inorganic content and also denature the collagenous organic matrix. Essentially denaturating makes the tightly assembled collagen fibrils looser. The proteolytic enzymes (cathepsin K, matrix metaloprotease) both secreted and within lysosomes in the clast cells are then able to break down this collagenous organic matrix.
It begins at **4-5 years** for the **incisors** and **6 years** for the **canine**.

At this time the crowns of permanent teeth are completed and situated in their own crypts lingual to the apical third of the roots of the corresponding primary teeth.

The **eruptive movement proceeds first in an incisal and labial direction**.
Pressure is first directed at the bone separating the crypts of the permanent successors and the alveolus of the primary roots then directed at the primary roots.

Thus, resorption of the primary anterior teeth first occurs along the lingual surfaces of the apical third of the root.

When the permanent tooth crown lie directly below the deciduous tooth, resorption proceeds horizontally in an incisal direction.
Sometimes, particularly in the region of the **mandibular incisors**, the labial movements of the permanent teeth do not cause complete loss of the primary roots.

This may result in the primary **incisor remaining in the jaw and attached to the labial alveolar bone**. Then when the crown of the permanent incisor emerges through the gingival, they appear lingual to the primary ones that is still in place.

Removal of the primary crown and remaining root assist the permanent ones in correcting their position.
Permanent central incisors

Primary central incisors
RESORPTION PATTERN OF THE POSTERIOR PRIMARY TEETH
The growing premolar crown is initially located between the roots of the primary molar teeth.

The first signs of resorption around these crowns occur in the supporting interradicular bone. This is followed by resorption of the adjacent surfaces of the primary tooth roots.
The premolars continue to erupt as the primary molars further resorb, and these teeth then exfoliate. The premolars then erupt in place of primary molars.
In general:

- The pattern of shedding is symmetric for the right and left sides.
- Mand. primary teeth are shed before their max. counterparts (except 2nd. molars).
- Exfoliation occurs in girls before boys.
- The sequence of shedding in the mandible follows the ant. to post. order.
- In max., the first molar exfoliates before canine.
Shedding is an intermittent process with periods of resorption involving alveolar bone, cementum and root dentin resorption by clast cells, osteoclasts and odontoclasts, respectively.

This is followed by recovery periods when osteoblasts and cementoblasts replace part of the resorbed tissues. Eventually more resorption takes place and when the tooth loses its supporting periodontal tissues, it is shed.

During this process the primary teeth become loose during the periods of resorption and tighten during the brief periods of apposition.

A, Reversal line; B, Cementoblasts; C, Cementocyte.
Deciduous dentition (milk teeth) (names of teeth are here followed by the usual age of eruption)

Upper teeth

4 First molar (12th–16th month)
3 Canine (15th–20th month)
2 Lateral incisor (8th–12th month)
1 Central incisor (6th–8th month)

5 Second molar (20th–40th month)

6 Replacement of deciduous teeth (milk teeth) by adult teeth (deciduous teeth are indicated with a heavy line)

6a 5 years
6b 8 years
6c 9 years
6d 11 years
6e 13 years
6f Adult

© Diagram Visual Information Ltd.