Al Rasheed College of Dentistry
Oral Histology
Dr. Omar Faridh Fawzi
Lecture 12

Alveolar bone or process

Alveolar bone is a specialized part of the mandibular and maxillary bones that forms the socket of the teeth. Alveolar bone is subjected to continual and rapid remodeling associated with tooth eruption and force of mastication.

The alveolar process starts to developed near the end of the second month of the fetal life. The maxilla and the mandible form a continuous groove at its free surface that it opens toward the surface of the oral cavity. The tooth germs are contained in this groove, which also includes the alveolar nerves and vessels. An alveolar process develops during eruption of the teeth and gradually diminished with the loss of the teeth.

Chemical composition:

Bone consist of about **67% inorganic and 33% organic materials**. The inorganic material is hydroxyapatite crystals, while the organic materials is mainly collagen fibers (28%) which lies in a ground substance of glycoproteins with small amount of non-collagenous proteins (5%).

- **Bone cells: There are four types of cells in bone tissue:**

1. **Osteoprogenitor cells:**
   These are undifferentiated mesenchymal cells located in the deepest layer of periosteum, and lining the Haversian canals of the compact bone. These cells have the capacity to divide and give rise to any other type of bone cells.
2. **Osteoblasts:**
   These cells are responsible for bone formation, found in relation to the bone surface of bone when bone matrix is being deposited. Osteoblasts are responsible for secretion of osteoid tissue (unmineralized matrix of bone) which will be later mineralized by deposition of hydroxyapatite to form mature bone tissue.
3. **Osteocytes:**
   Are osteoblasts which trapped in bone tissue and they are the principal cells of bone tissue. The cell bodies of osteocytes are located in lacunae and their processes in canaliculi. Function of osteocytes are to maintain bone tissue and play an important role in its mineral storage in the bone.

4. **Osteoclasts:**
   These cells are responsible for bone resorption. The cells are large multinucleated present in Howship's lacunae, and have ruffled border. Origin of osteoclasts are from the circulating monocytes but may also differentiate from the osteoprogenitor cells.

- **Incremental lines in bone:**

1. **Resting lines**: Are smooth straight lines, they stain dark blue with H&E stain. They represent the resting period of osteoblasts during bone formation.
2. **Reversal lines:** Are scalloped line because they represent the outlines of Howship's lacunae of osteoclasts. They also stain dark blue with H&E stain as in the resting line.

- **Structures of the alveolar process:**
  The alveolar process consists of alveolar bone proper and supporting alveolar bone.
  1. **Alveolar bone proper:**
     This part of the alveolar process consists of two types of bone:
     a) **Bundle bone:** Is the inner wall of the sockets , is the bone of attachment as it provides attachment for the fibers of PDL(Sharpey's fibers). Its perforated by many foramina transmitting nerves and B.V. to the PDL and is, therefore sometimes, referred to as cribriform plate. The bundle bone is also called lamina dura in x-ray because of an increased radiopacity.
     b) **Lamellated bone**: Its thicker layer of lamellar bone formed of longitudinal lamellae. Its lies between the bundle bone and the spongy bone.
  2. **Supporting alveolar bone:** The supporting alveolar bone consist of two types of bone:
     a. **Cortical bone:**
        It consists of compact bone and form the outer (labial or buccal) and inner (lingual) plates of the alveolar process. The cortical plates are much thinner in the maxilla than in the

mandible. In the maxilla the outer cortical plate is perforated by many small openings through which blood and lymph vessels pass. In the region of the anterior teeth of both jaws, the supporting bone usually very thin, no spongy bone is found here and the cortical plate is fused with alveolar bone proper.

b. Spongy bone:

It fills the space between the alveolar bone proper and cortical plates. Histologically the spongy bone consists of bone trabeculae of various sizes and shaping enclosing irregular medullary cavities containing bone marrow. There are two types of spongy bone :

a)Type I: This type present in the interdental and interradicular septa where the trabeculae arranged horizontally in a regular ladderlike manner. This type is more common in the mandible and more resistant to the force of mastication.

b)Type II: The bone trabeculae show irregular arrangement, they are numerous sand more delicate. They are common in maxilla.

- **Bone resorption:**

Occurs as three processes taking place by action of osteoclasts which are:

1. **Decalcification of inorganic material:**
   This is achieved at the ruffled border of the osteoclasts by secretion of acids mainly citric and lactic acid that chelate bone and increase solubility of hydroxyapatite.
2. **Degradation of organic matrix:**
   This occur by the activity of lysosomal acid protease and collagenase enzymes takes place. These enzymes are secreted by the osteoclasts which cause break down the collagen extracellularly.
3. **Transport of soluble products:**
   The soluble products will be transported to the extracellular fluid or to blood vascular system.

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- **Bone remodeling:**
  This mean bone deposition by osteoblasts after bone resorption by the action of osteoclasts. This bone remodeling is important in orthodontic treatment because this enables the orthodontist to move the teeth without disrupting their relations to the alveolar bone. Bone resorption occur in the pressure side and bone deposition occur in the tension side.

- **Functions of alveolar bone:**
  1. Anchors the teeth with the help of Sharpy's fibers.
  2. Protect the developing tooth bud.
  3. Supply blood to the PDL.
  4. Absorb and distribute the occlusal forces.
  5. Organize and controls the eruption of teeth.