Cementum Lect.11 ا.د.عذراء

Periodontium

- Gingiva(fibrous CT)
- Periodontal Ligament(fibrous CT)
- Alveolar bone(minerlaized CT)
- Cement(minerlaized CT)

PERIODONTIUM

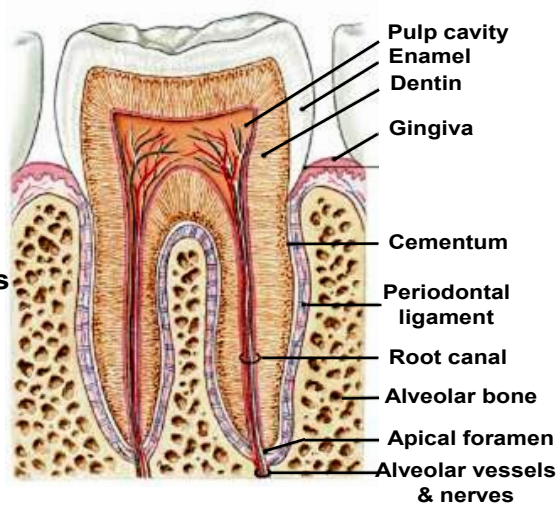
Cementum

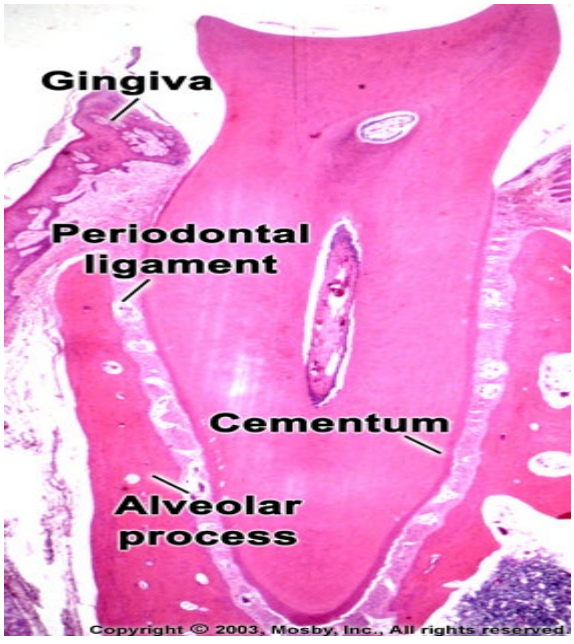
PDL

Alveolar bone

Sharpey's fibers

Attachment organ





1.Cementum

It is a **hard avascular mineralized connective tissue** that covers the roots of teeth.

Physical properties: Cementum is **pale yellow** with a dull surface.

- Cementum is **more permeable than other dental tissues**

- Relative softness and the **thinness at the cervical portion** means that **cementum is readily removed by the abrasion when gingival recession exposes the root surface to the oral environment**

Chemical Composition of Cementum

45% to 50% hydroxyapatite (inorganic)

50% to 55% collagenous and noncollagenous matrix proteins (organic)

Role of Cementum

1)It covers and protects the root dentin .

2) It provides attachment to the periodontal fibers

3) It compensates for tooth resorption

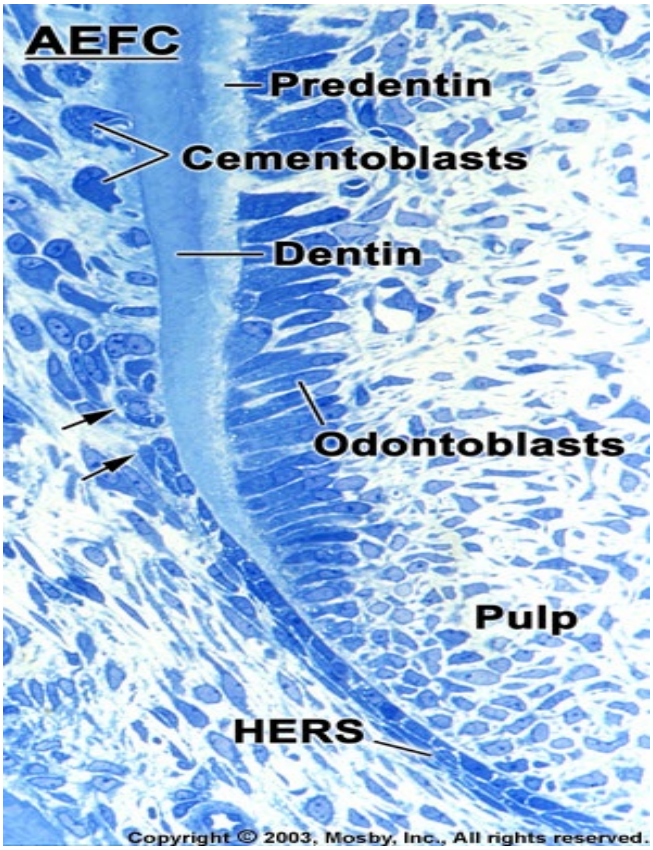
Varies in thickness: **thickest in the apex** and in the inter-radicular areas of multirooted teeth, and **thinnest in the cervical area** 10 to 15 μm in the cervical areas .

Differences between cementum and bone

- **Not vascularized – a reason for it being resistant to resorption**
- **Minor ability to remodel**
- **More resistant to resorption compared to bone**
- **Lacks neural component – so no pain**
- **70% of bone is made by inorganic salts (cementum only 45-50%)**
- **Cementum is more resistant to resorption: Important in permitting orthodontic tooth movement**

Development of Cementum

- Cementum formation occurs along the entire tooth **Hertwig's epithelial root sheath (HERS) – Extension of the inner and outer enamel epithelium HERS sends inductive signal to ectomesenchymal pulp cells to secrete predentin by differentiating into odontoblasts** HERS becomes interrupted **Ectomesenchymal cells from the inner portion of the dental follicle come in with predentin will differentiating into cementoblasts .Cementoblasts form Cementoid: (Young matrix that becomes secondarily mineralized**).



<u>Classification of Cementum</u> (according to the followings)

1.Presence or absence of cells(<u>Cellular and Acellular Cementum)</u>

2.Origin of collagenous fibers of the matrix(<u>Extrinsic fibers,intrinsic fiber,mixed fiber)</u>

Classification of cementum Based on the presence or absence of cell

Acellular cementum:

1. Has No cells(cementocyte) and has no structure

2. covers the root adjacent to dentin

3.Is primary cementum

Cellular:

1. Has cells (Cementocyte)

2. found in apical area and overlying acellular cementum. Also common in interradicular areas

3. Is secondary cementum

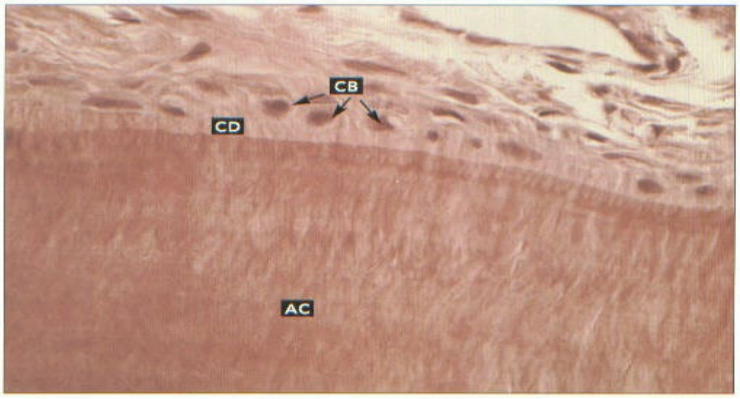


FIG 5-4
Acellular cementum
Cementoblasts (CB) and cementoid (CD) on the surface of acellular cementum (AC) (H and E stain; ×640).

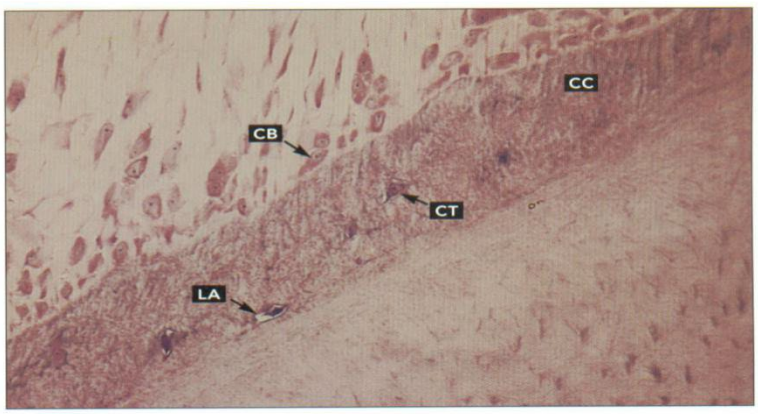


FIG 5-11
Cellular cementum
Cellular cementum (CC). Cementoblasts (CB) cover the periodontal surface. Cementocytes (CT) occupy lacunae (LA) in the deeper layers (H and Lee stain; ×640).

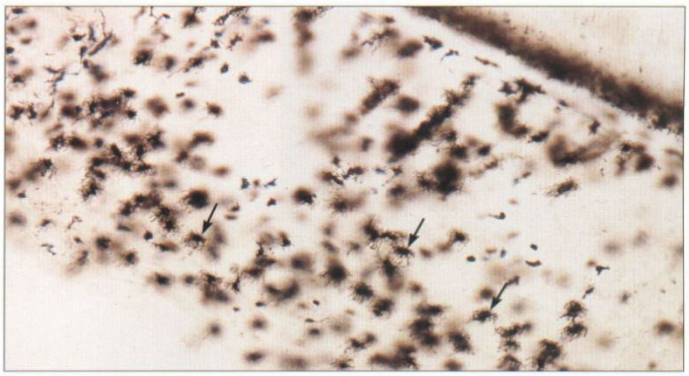


FIG 5-15
Cementocytes
Cementocytes *(arrows)* in cellular cementum. The cell processes reach in the direction of the periodontal surface (×160).

Classification of cementum Based on the Origin of Collagen Fibers

1.Extrinsic fibers cementum

1.derived from(fibroblast cell in PDL).

2.These are in the same direction of the PDL principal fibers named as **sharpey's fiber**.

2.Intrinsic fibers cementum

1.derived from cementoblasts.

2.Run parallel to the root surface and at right angles to the extrinsic fibers

3.mixed fiber cementum

The area where both extrinsic and intrinsic fibers is mixed

Distribution of Cementum on the Root

- Acellular afibrillar: cervical enamel
- Acellular extrinsic: Cervix to practically the whole root (incisors, canines) increasing in thickness towards the apical portion 50→200µm
- Cellular: Apical third, furcations

. **Cementum and Root formation**

. **Cementogenesis** It takes place in two phases:

. • Matrix formation

. • Mineralization

. There are 3 cell types responsible for the cementogenesis:

. •Cementoblasts

. • Cementocytes

. • Fibroblasts . All of these cells are derived from the ectomesenchymal cells.

. Cementogenesis Cementum formation in the developing tooth is preceded by the deposition of dentin along the inner aspect of Hertwig‘s ep. Root sheath . Once dentin formation is underway breaks occur in the epithelial root sheath allowing the newly formed dentin to come in direct contact with the connective tissue of the dental sac , the undifferentiated mesenchymal cells derived from the dental sac differentiate into cementoblasts . The main product of cementoblasts is collagen and ground substances , both constitute the organic component of cementum .The inorganic material of cementum is calcium phosphate Hydroxy apatite .

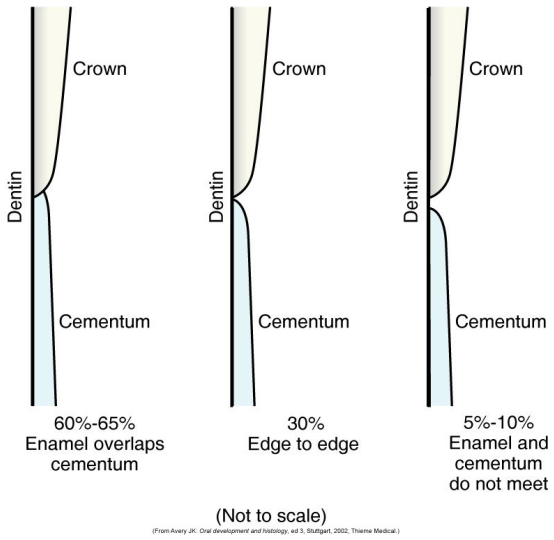
. Growth of cementum is a rhythmic process and as a new cementoid is formed, the old one is calcified . A thin layer of cementoid can be observed on cemental surface which is covered by cementoblasts .The mineralization begins after forming the first layer of matrix.The mineral crystals is deposited within and between the collagen fibers, the long axes of the crystals are arranged parallel to the long axis of the collagen fibers .

. After reaching the full thickness the cementoblasts enter a quiescent stage. Remnants of the Hertwig`s root sheath, which disintegrate into the PDL are then called ep. Rest of Malassez cells.

. While cementum is being deposited, cementoblasts retreat leaving behind the formed cementum matrix. Occasionally, however, cementoblasts become entrapped in the forming matrix and then known cementocytes .

Cemento-enamel junction(CEJ)

Cementum overlaps enamel	**60%**
Cementum just meets enamel	**30%**
Small gap between cementum and enamel	**10%**



Aging of cementum

1. **Smooth surface becomes irregular**
2. **Continues deposition of cementum** occurs with age in the apical area.

   [Good: maintains tooth length compensate the attrition in enamel; bad: obstructs the foramen]
3. **Cementum resorption**.
4. **Resorption of root dentin occurs with aging** that **is covered by cemental repair**
5. **Cementicle is Calcified ovoid or round nodule found in the PDL.**