Cementum-II

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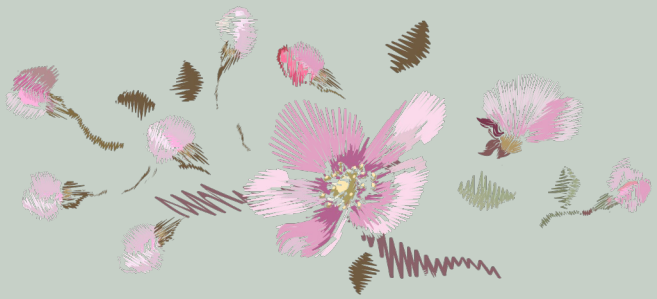
LEARNING OUTCOMES

- Describe the clinical importance of cementum
- Explain its relation to Periodontal ligament and bone
- Compare cementum with bone



Introduction

- The main function of cementum is to provide a *medium for attachment of periodontal ligament fibers*

- Continuous formation of cementum helps to maintain the width of periodontal ligament

CLINICAL IMPORTANCE OF CEMENTUM

FUNCTIONS OF CEMENTUM

1. Anchorage

- The primary function is *attachment of collagen fibers* that bind the tooth to alveolar bone

- *Hypophosphatasia*, a rare hereditary disease in which loosening and premature loss of anterior deciduous teeth occurs is characterized by an *almost total absence of cementum*

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2. Adaptation

- **Cementum makes functional adaptation of teeth possible**
  For e.g., deposition of cementum in an apical area can compensate for loss of tooth substance from occlusal wear

- ***Cementum is not resorbed under normal conditions***

- **As the most superficial layer of cementum ages, a new layer of cementum must be deposited to keep the attachment apparatus intact**

3. Repair

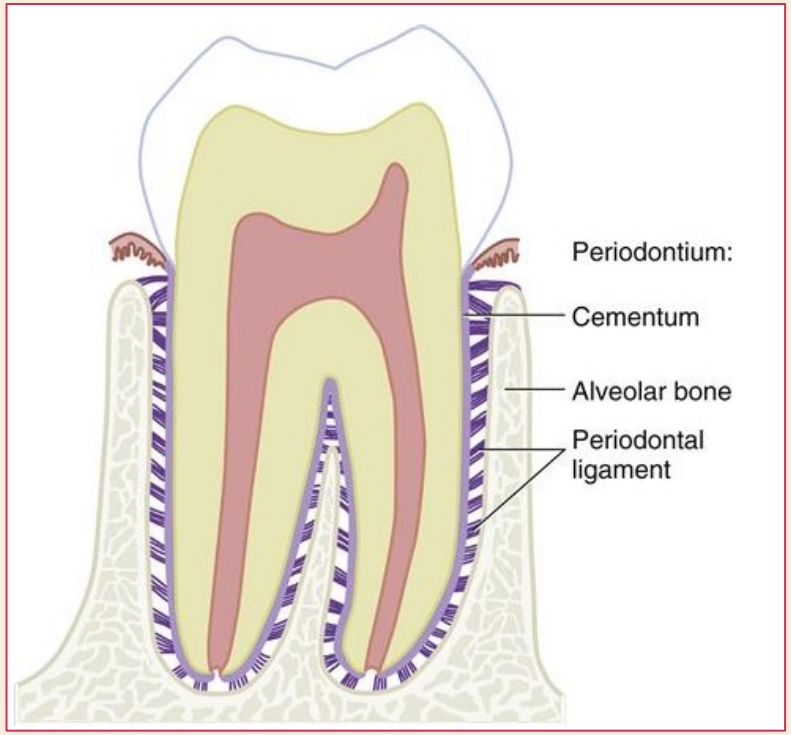
- *Damage to roots such as fractures and resorptions* --repaired by the deposition of new cementum
- Cementum formed during repair *-- cellular cementum* because it forms faster
- If the repair takes place slowly, it cannot be differentiated from primary cementum

Type, distribution and function of cementum

Type	Origin of Fibers	Location	Function
Acellular (primary)	Extrinsic (some intrinsic fibers initially)	From cervical margin to the apical third	Anchorage
Cellular (secondary)	Intrinsic	Middle to apical third and furcations	Adaptation and repair
Mixed (alternating layers of acellular and cellular)	Intrinsic and extrinsic	Apical portion and furcations	Adaptation
Acellular afibrillar	—	Spurs and patches over enamel and dentin	No known function along the cementoenamel junction

Relation of cementum to periodontal ligament and bone

- **Cementum attaches the teeth to the alveolar bone by anchoring the periodontal ligament**
- **Cementum has *no nerve supply and is avascular*, receiving its nutrition from the surrounding vascular periodontal ligament**
- **Like other dental hard tissues, cementum can form throughout the life of the tooth**



Age changes of cementum

- ***Thickness of cementum increases with age*, particularly at the apex--due to active eruption**
- **Increased deposition on the *lingual surface compared* to other surfaces**
- ***Cementum triples its thickness from 10 years to 75 years***
- **As the width of the cementum increases, cementocytes gradually die due to decreased accessibility to nutrition and poor elimination of waste products**

HYPERCEMENTOSIS

- *Abnormal thickening of cementum--diffuse or circumscribed*
- **It may affect all teeth, a single tooth, or only parts of one tooth**
- **Occurs as a *generalized thickening* of the cementum, with *nodular enlargement of the apical third of the root***
- **Sometimes *spikelike excrescences* -- coalescence of cementicles that adhere to the root or the calcification of periodontal fibers at the sites of insertion into the cementum**

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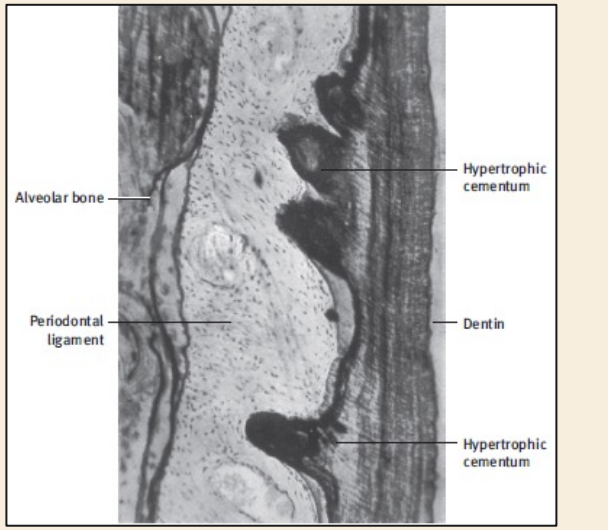
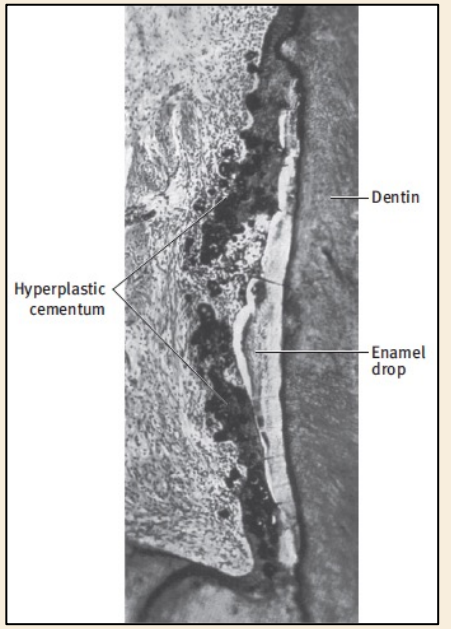
- **Localized hypertrophy/ hypercementosis**

1. ***spur or prong like extension*** **of cementum formed in teeth exposed to great stress--*larger surface area for the attaching fibers*--- firmer anchorage of tooth to bone**

2. **Observed in areas in which *enamel drops have developed on the dentin***



Prong like excementoses



Irregular hyperplasia of cementum on surface of enamel drop

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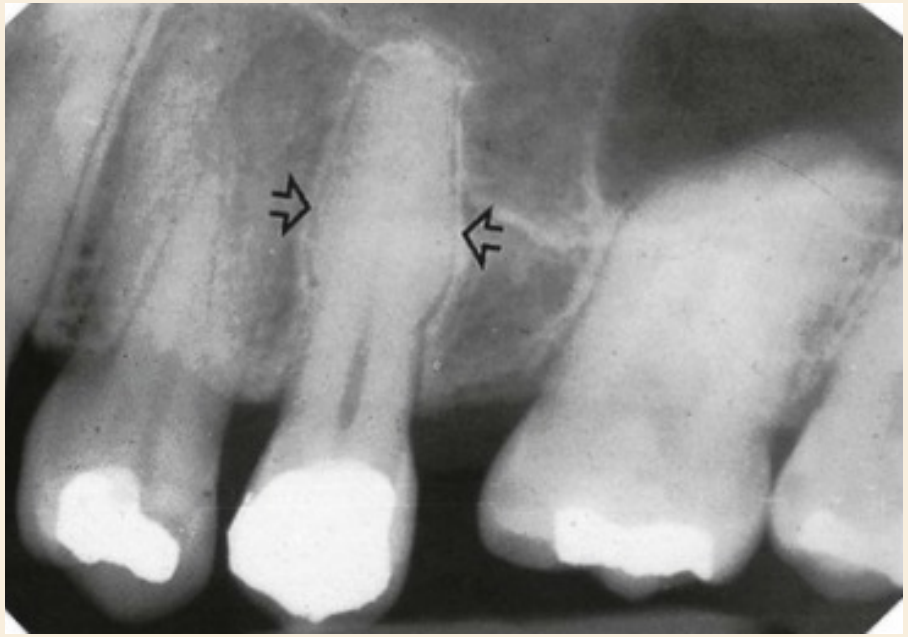
- **Hypercementosis--associated with many neoplastic and non-neoplastic diseases**

  1. Generalized hypercementosis-- *Paget's disease*

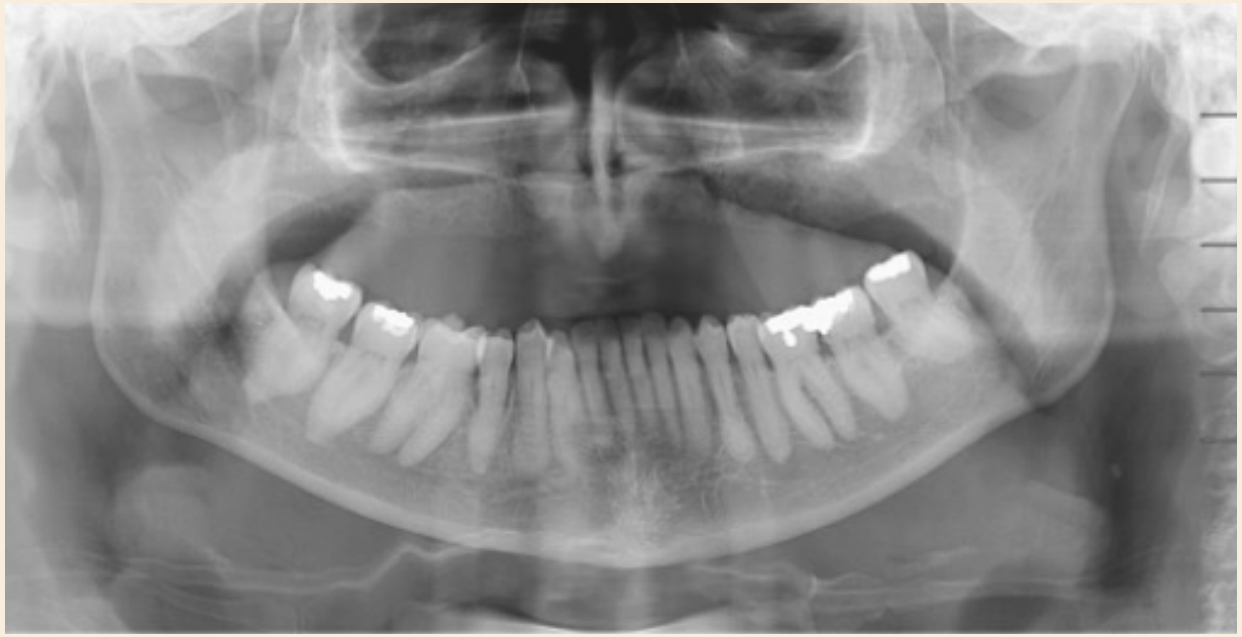
  2. Localized forms-- in *benign cementoblastoma, cemento-osseous dysplasia, acromegaly, calcinosis and some forms of arthritis*

- **Hypoplasia or aplasia of cementum---associated with *hypophosphatasia***

Hypercementosis itself does not require treatment. If an affected tooth (multi-rooted) requires extraction, sectioning of the tooth may be required



Localized hypercementosis



Generalized hypercementosis

Radiographically, the radiolucent shadow of the periodontal ligament and the radiopaque lamina dura are always seen on the outer border of an area of hypercementosis, enveloping it as it would in normal cementum

CLINICAL CONSIDERATIONS

- **Cementum is more resistant to resorption than bone as it is *avascular***
- **Cemental resorption can occur after *trauma or excessive occlusal forces*. After resorption has ceased, the damage usually is repaired, either by formation of *acellular or cellular cementum or by alternate formation of both***
- **After repair, if the outline of the root surface is re-established --- *anatomic repair***
- **If only a thin layer of cementum is deposited and the root outline is not reconstructed, periodontal space is then restored to its normal width by *formation of a bony projection* --- *functional repair***

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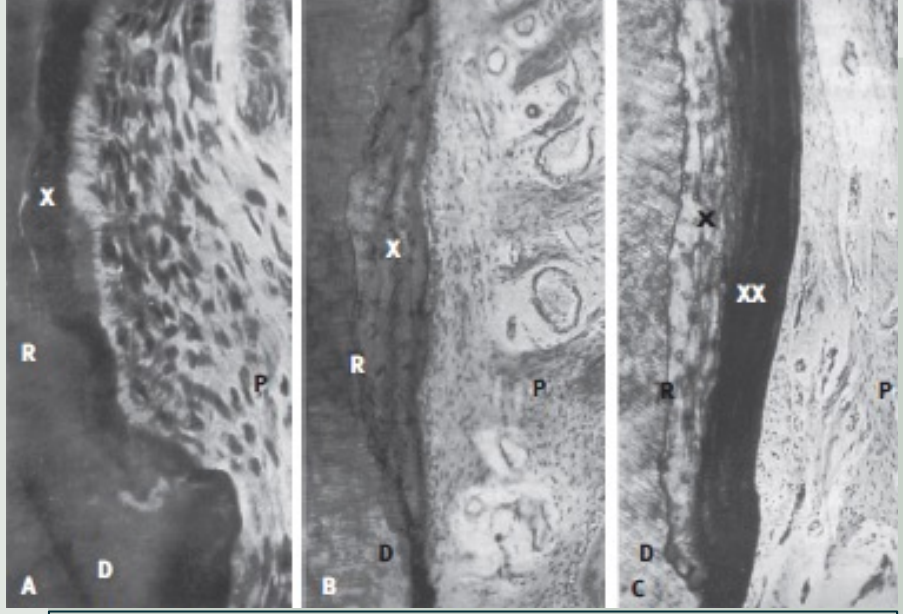
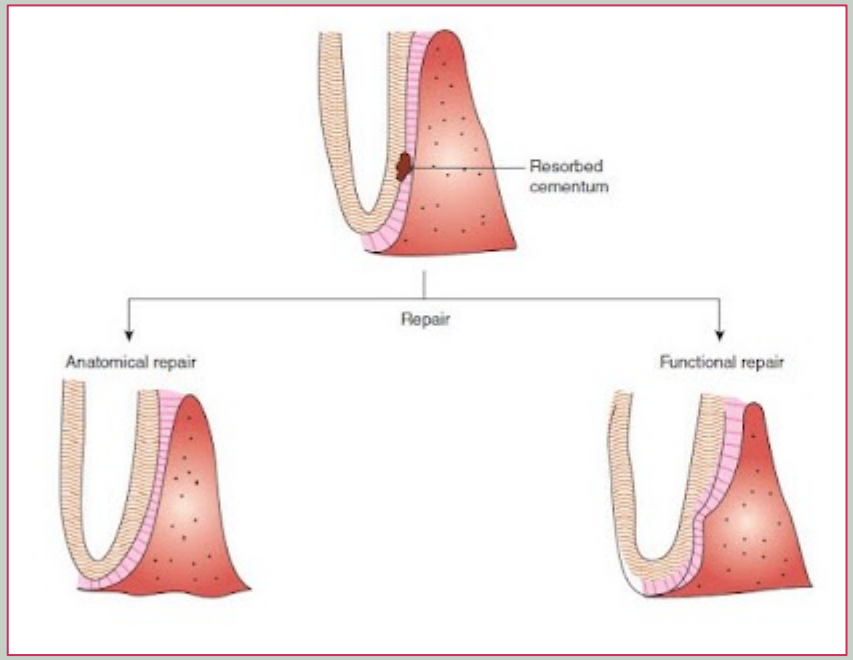


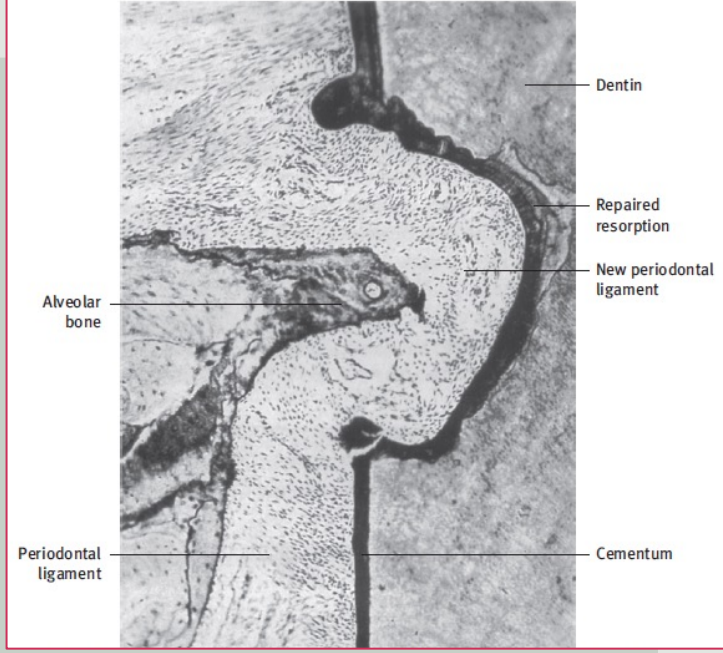
Repair of resorbed cementum.

(A) Repair by acellular cementum, (X)

(B) Repair by cellular cementum, (X)

(C) Repair first by cellular, (X), and later by acellular, (XX), cementum. D, Dentin. R, Line of resorption. P, Periodontal ligament.





Functional repair of cementum resorption by bone apposition. Normal width of periodontal ligament re-established.

- **Teeth subjected to severe blow -- *Cemental tears [fragments of cementum may be severed from the dentin]***

- **Hypercementosis -- *secondary to periapical inflammation or extensive occlusal stress ---* extraction necessitates the removal of bone**

- **In periodontal pockets, plaque and its by-products can cause numerous *alterations in the physical, chemical, and structural characteristics* of cementum**

- *Alterations of exposed cementum may interfere with healing during periodontal therapy --* **mechanical and chemical procedures to remove the altered cemental surface**

- **Abnormal cemental deposition -- fusion of bone and cementum--** ***ankylosis*** **of the tooth**

- ***Cemental caries --*** **on exposed surfaces of cementum**

Similarities between cementum and bone

Feature	Cementum	Bone
Cells	Cementoblasts, cementocytes and odontoclasts	Osteoblasts, osteocytes and osteoclasts
Extacellular matrix	Predominantly Type I and Type III collagen	Predominantly Type I collagen
Non-collagenous proteins	Bone sialoprotein and Osteopontin--present in small quantities	Bone sialoprotein and Osteopontin--present
Inorganic component	Predominantly calcium and phosphate in the form of hydroxyapatite	Predominantly calcium and phosphate in the form of hydroxyapatite

Differences between cementum and bone

Feature	Cementum	Bone
Composition	45% inorganic, 55% organic material and water	67% inorganic and 33% organic material
Rate of apposition	0.005-0.01μm/day (acellular cementum)	1-2 μm/day (lamellar bone)
Vascularity	Avascular	Vascular
Nerve supply	Lacks nerve supply	Richly innervated
Ability to remodel	Limited	Effective remodeling capacity
Resistance to resorption	More resistant than bone	Resorbs quickly

Conclusion

- All the types of cementum are produced by cementoblasts which are derived either from HERS or from the dental follicle
- Structurally cementum are classified based on the presence or absence of cementocytes and also based on the presence and absence of fibers and their origin
- The main function of cementum is to provide a medium for attachment of periodontal ligament fibers. Continuous formation of cementum helps to maintain the width of periodontal ligament

References

1. Orban's Oral Histology and Embryology-14th Edition. Chapter 7: Cementum; Page no: 116-130

2. Tencate's Oral Histology 8th edition. Chapter 6: Periodontiu9; Page no: 205-232

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