CEMENTUM

Dr. Sachin Bhagat
MDS

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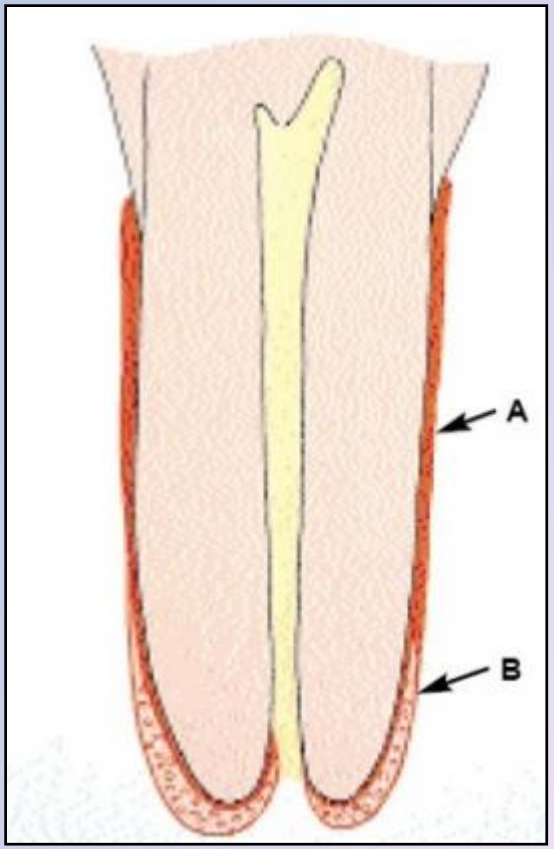
CEMENTUM

DEFINITION

‘’Cementum is the calcified, avascular mesenchymal tissue that forms the outer covering of the anatomic root’’.

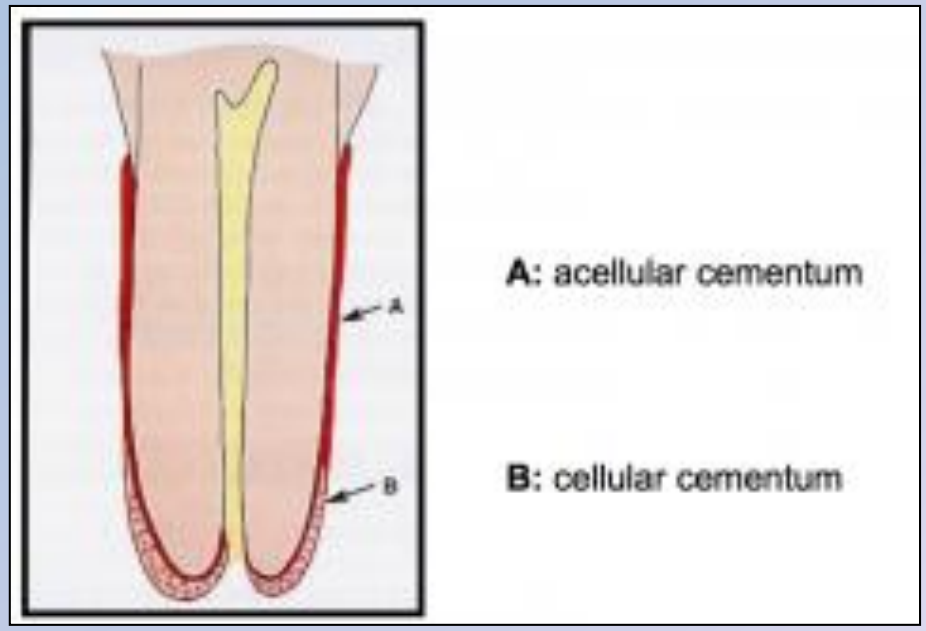


TYPES

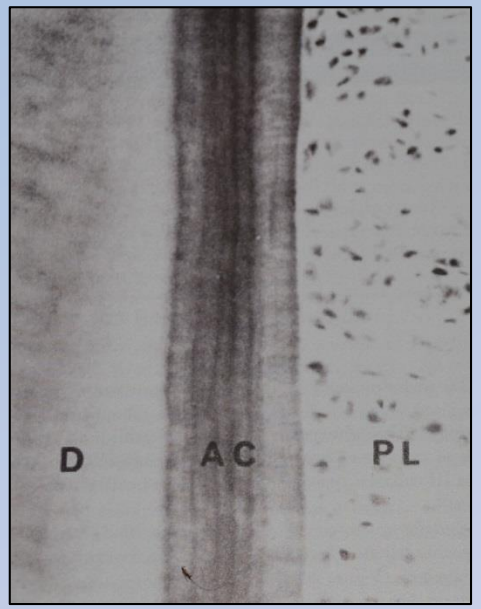
- Acellular and Cellular
- Primary and Secondary
- Coronal, Radicular and Intermediate
- Schroeder’s Classification

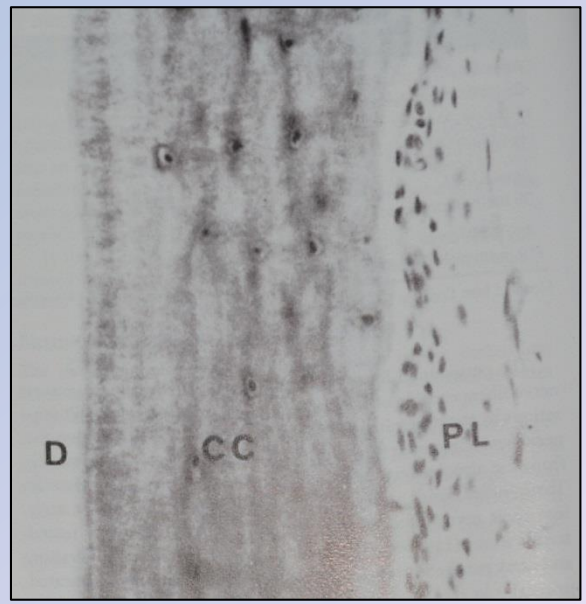
TYPES

- **Acellular cementum**
  (primary cementum)
- **Cellular cementum**
  (secondary cementum)



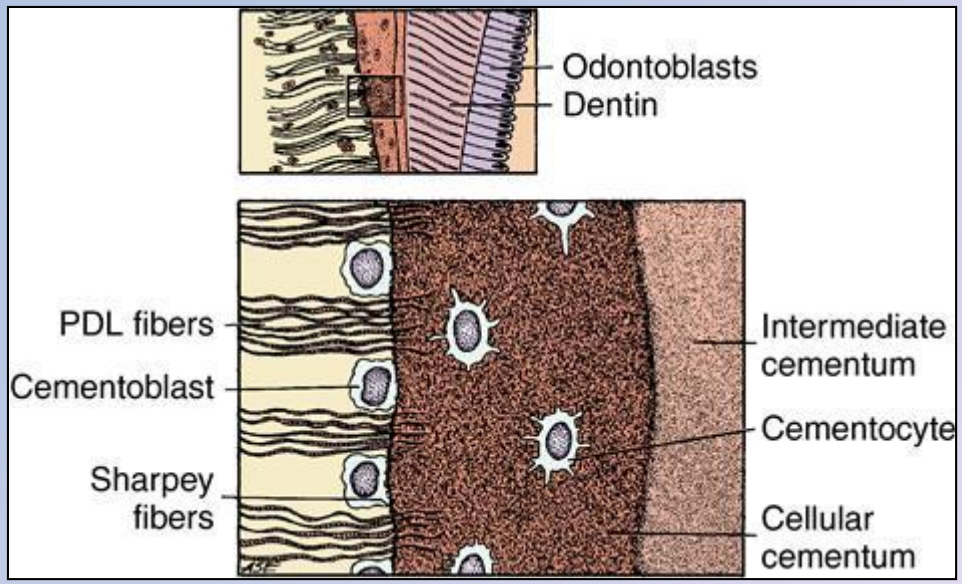
Acellular Cementum	Cellular cementum
First formed	Formed later
Cervical 2/3rd	Apical 1/3rd
No cells	Cementocytes
During active eruption	During passive eruption
Thickness – less	Thickness - more
Sharpey's fibres – more	Sharpey's fibres – less
More calcified	Less calcified
Incremental lines - more	Incremental lines – less





INTERMEDIATE CEMENTUM

- ill defined zone near cementodentinal junction
- contains remnants of **HERS** embedded in calcified ground substance.



Hyaline layer of Hopewell-Smith (Intermediate Cementum)

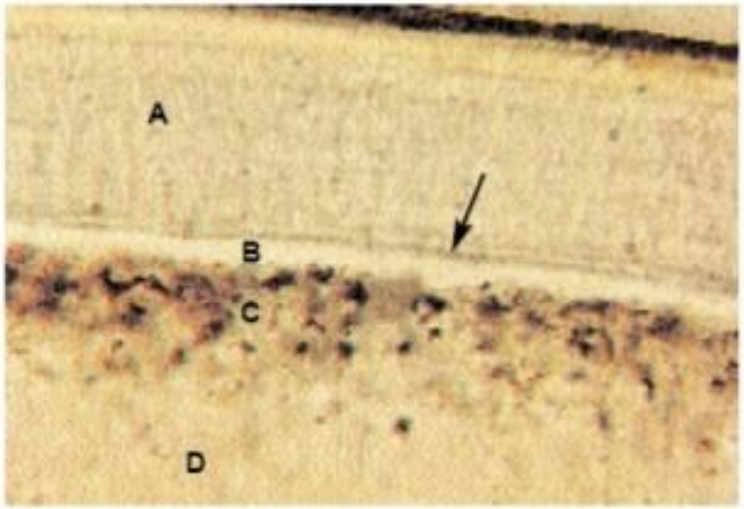


Fig. 11.7 The appearance of acellular cementum (A). B = Hyaline layer (of Hopewell-Smith); C = granular layer (of Tomes); D = root dentine. Note that the dark layer arrowed between the hyaline layer and the acellular cementum may be related to the afibrillar cementum patchily present at this position (Ground section; × 200).

First layer of cementum is actually formed by the inner cells of the HERS and is deposited on the root's surface is called intermediate cementum or Hyaline layer of Hopewell-Smith

Deposition occurs before the HERS disintegrates. Seals of the dentinal tubules

Intermediate cementum is situated between the granular dentin layer of Tomes and the secondary cementum that is formed by the cementoblasts (which arise from the dental follicle)

Approximately 10 µm thick and mineralizes greater than the adjacent dentin or the secondary cementum

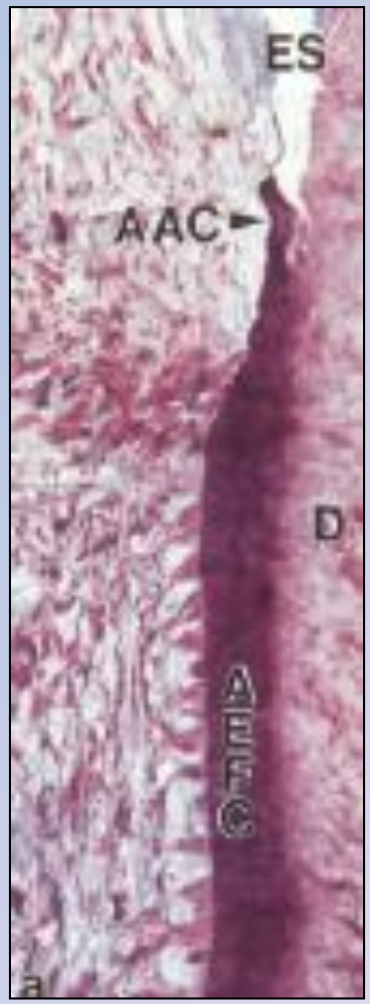
SCHROEDER'S CLASSIFICATION

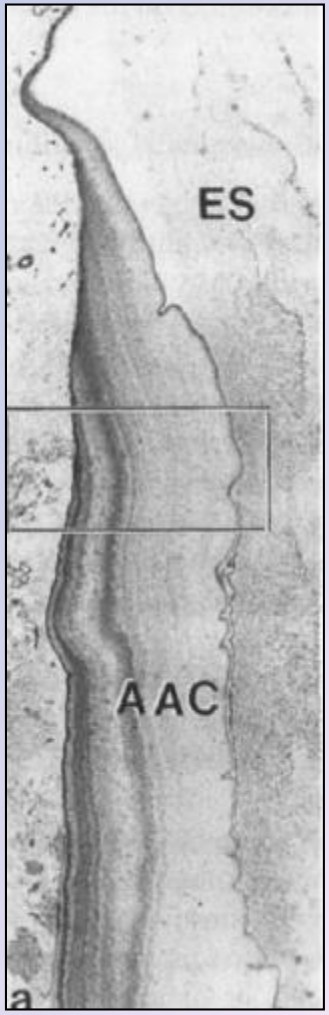
1. Acellular afibrillar cementum (AAC)
2. Acellular extrinsic fibre cementum (AEFC)
3. Cellular mixed stratified cementum (CMSC)
4. Cellular intrinsic fibre cementum (CIFC)

SCHROEDER'S CLASSIFICATION

1. **ACELLULAR AFIBRILLAR CEMENTUM (AAC)**

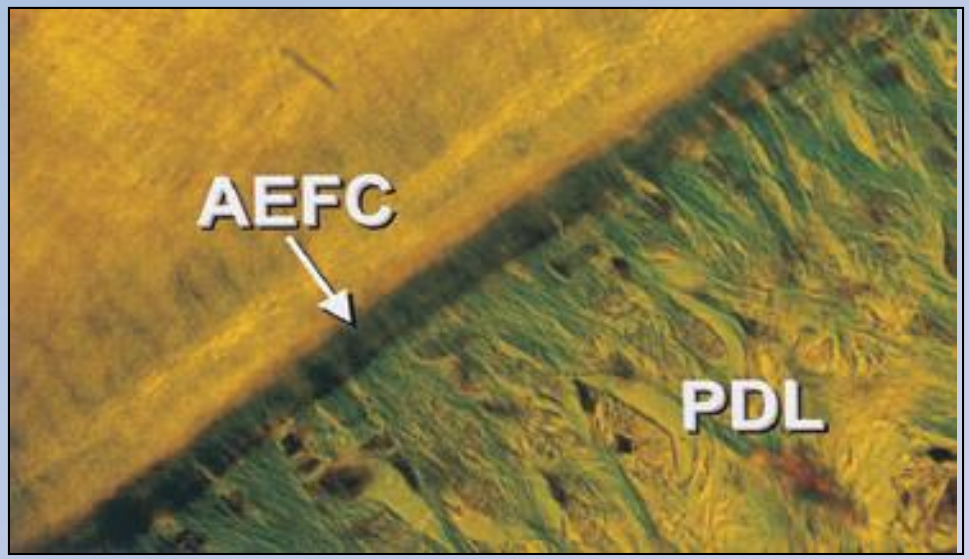
   - No cells / fibres
   - only mineralised ground substance
   - product of cementoblasts
   - found in coronal cementum
   - thickness - **1-15** µ





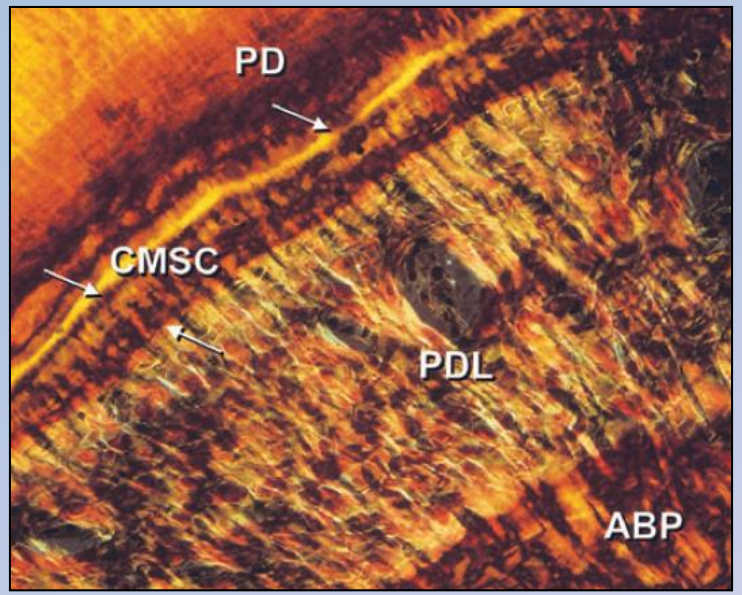
2. ACELLULAR EXTRINSIC FIBRE CEMENTUM (AEFC)

- No cells
- densely packed extrinsic sharpey's fibres
- product of cementoblasts & fibroblasts
- found in cervical 3rd
- thickness - **30-230** µ



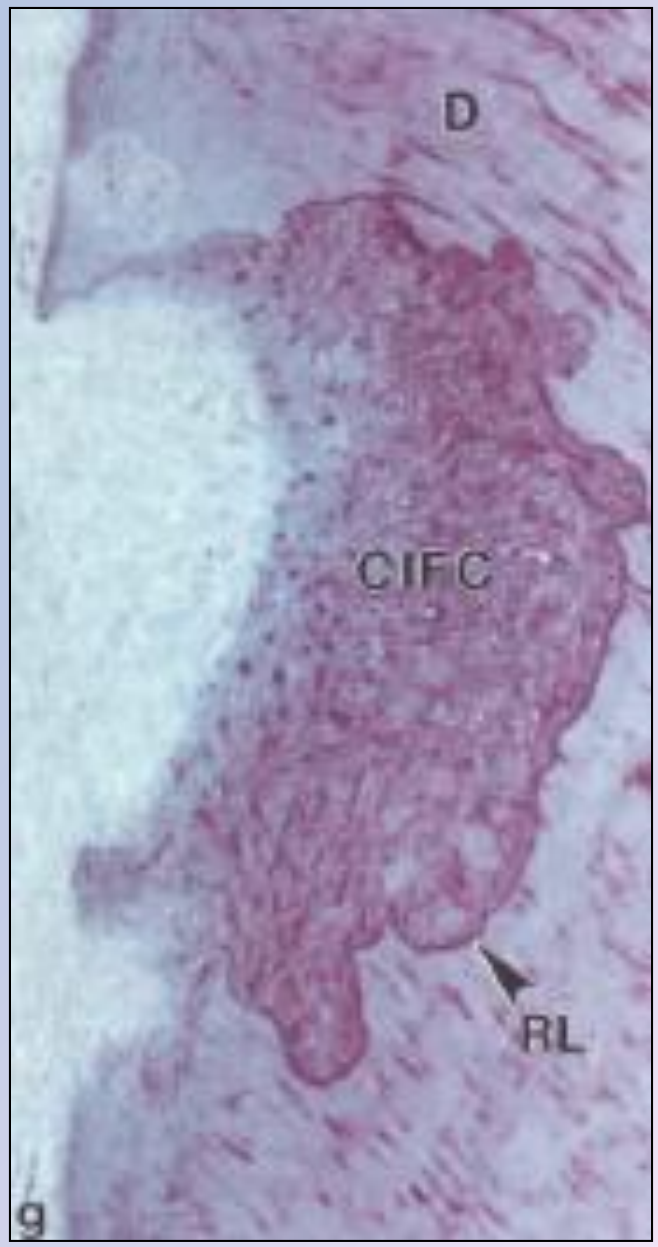
3. CELLULAR MIXED STRATIFIED CEMENTUM (CMSC)

- Contains cells
- densely packed extrinsic sharpey's fibres & intrinsic fibres
- product of cementoblasts & fibroblasts
- found in apical 3rd of root and furcation areas
- Thickness - **100-1000** µ

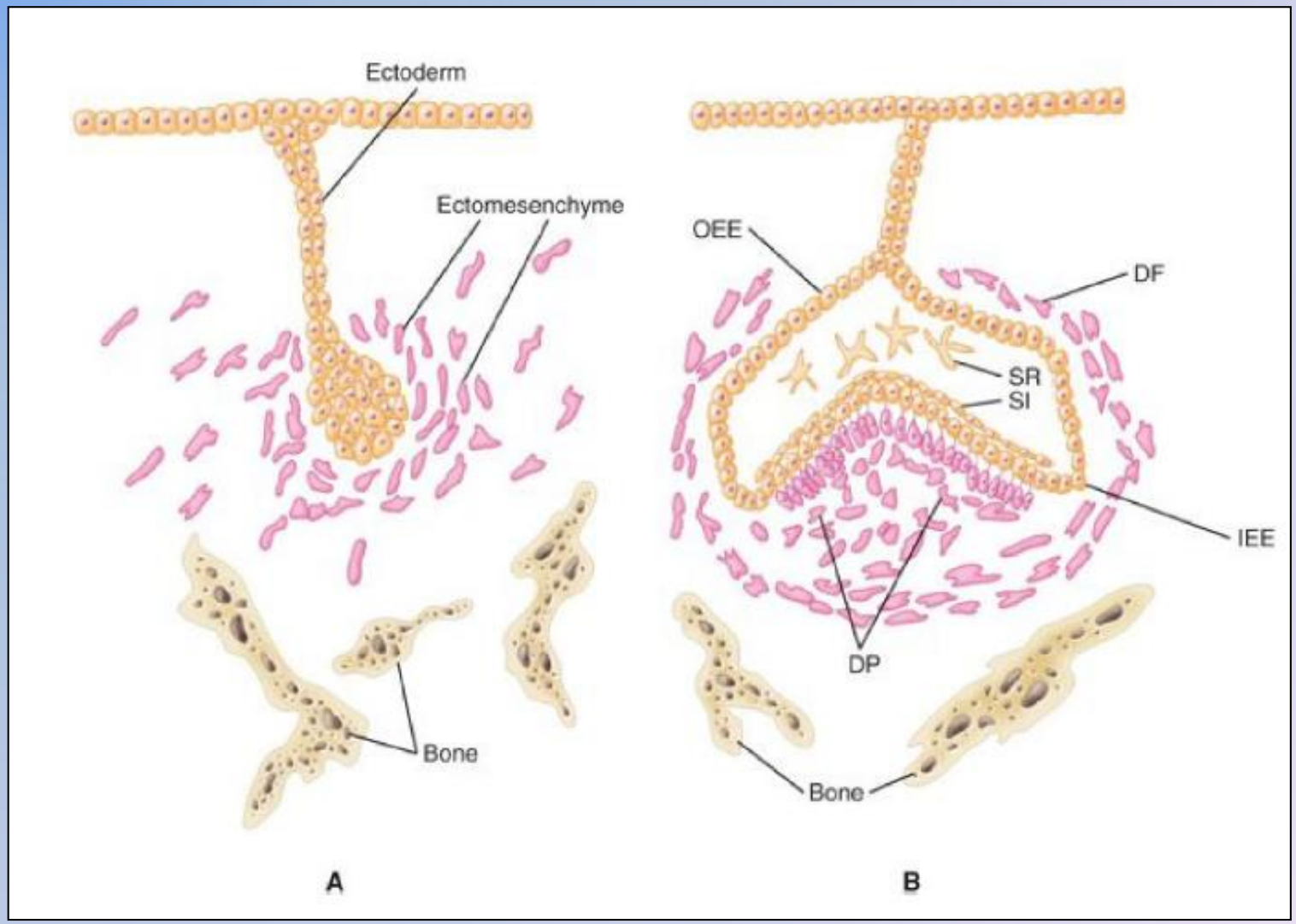


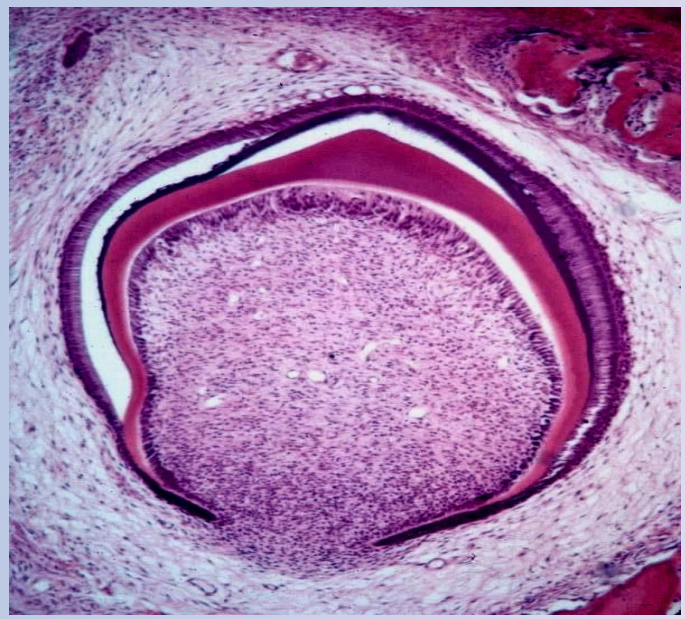
4. CELLULAR INTRINSIC FIBRE CEMENTUM (CIFC)

- Contains cells
- no extrinsic fibres
- product of cementoblasts
- fills resorption lacunae.



DEVELOPMENT





Dental ectomesenchyme

Dental papilla

Dental follicle

odontoblasts

Pulp cells

osteoblast

PDL fibroblast

cementoblast

Dentin

pulp

bone

PDL

Cementum

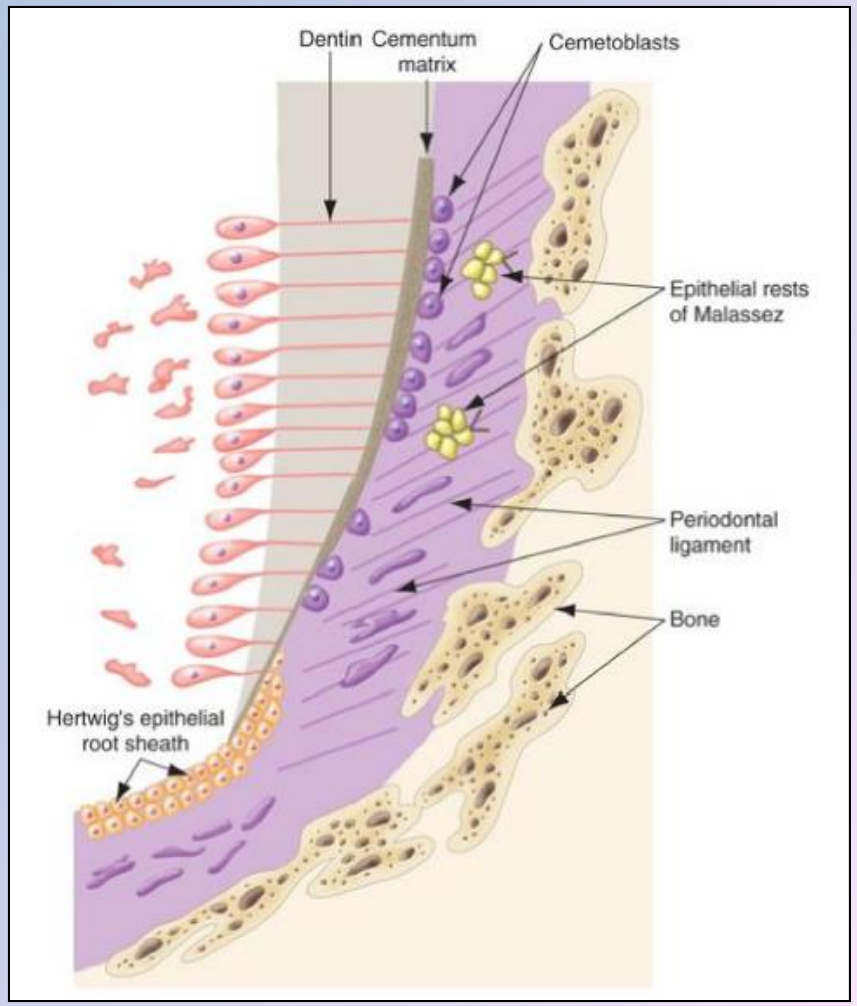
Initiation of cementum formation

1. After crown is complete, cervical margins of enamel organ grow down as root sheath.

2. Dental papilla cells differentiate into odontoblasts and deposit dentine.

3. Root sheath disintegrates without producing enamel.

4. Dental follicle cells differentiate into cementoblasts and fibroblasts to create cementum and periodontal ligament.



CEMENTUM

Collagen fibrils

Noncollagenous interfibriller matrix

Extrinsic

Intrinsic

Non collagenous components

- Proteoglycans
- Glycoproteins
- Phoshoproteins

INORGANIC CONTENT

- Hydroxyapatite – 45-50%
- highest fluoride content

ORGANIC CONTENT

- 90% - Type 1 collagen
- 5% - Type 3 collagen

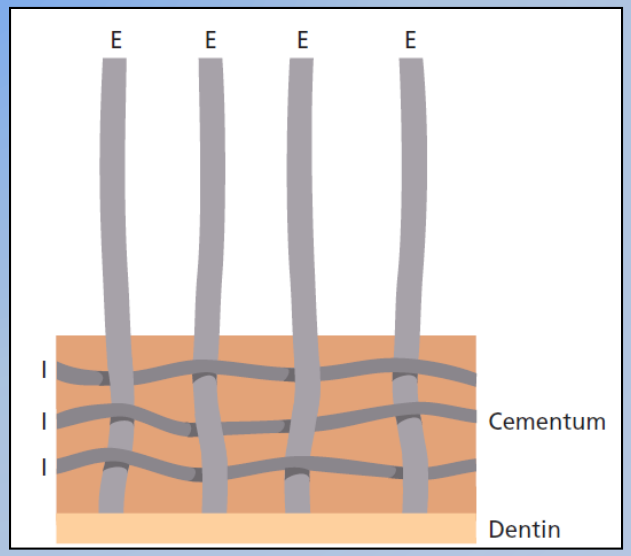
Non collagenous proteins

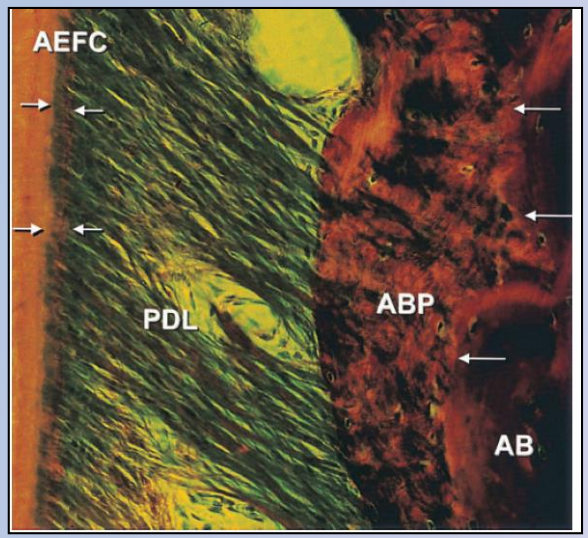
- bone sialoprotein
- Osteopontin
- Osteonectin
- CAP

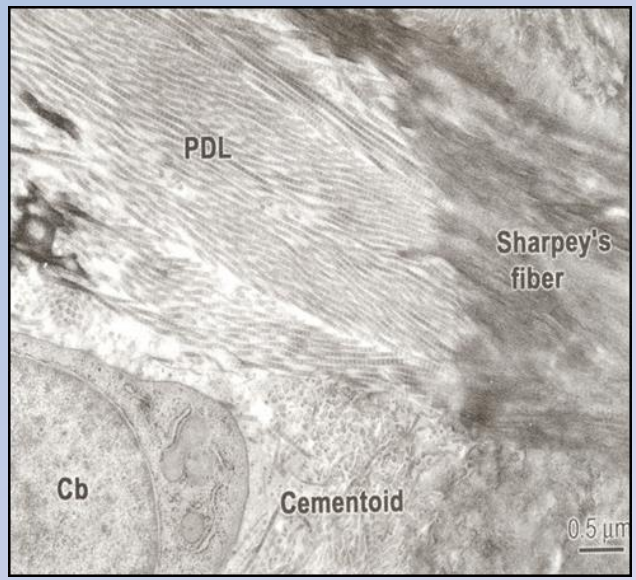
Function

- Promotes cell attachment
- Promotes cell migration
- Synthesis of cells

SHARPEY'S FIBRES







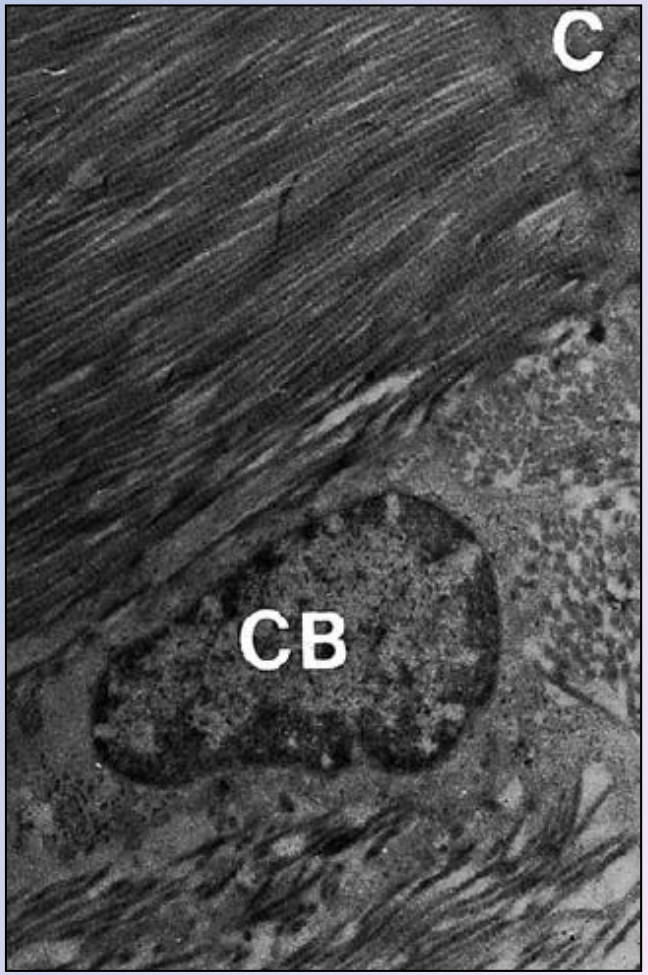
CEMENTOBLASTS

Origin – ectomesenchymal cell of dental follicle

Function

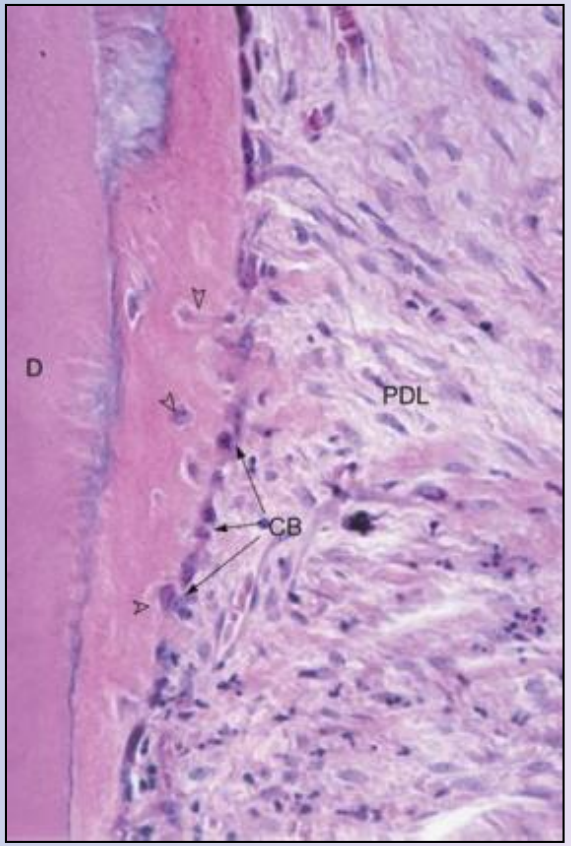
- formation of cementoid
- Formation of intrinsic fibres of cementum
- Secretion of BMPs

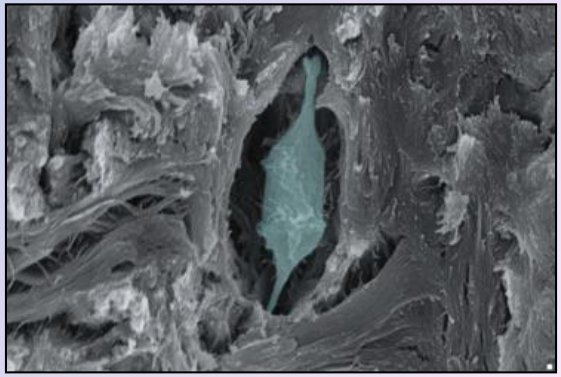
Neoplasm - cementoblastoma



CEMENTOCYTES

- Cementoblasts incorporated in the cementum
- Communicate – cytoplasmic processes – canaliculi
- **Function**
  - transportation of nutrients through the cementum
  - maintenance of the vitality of this mineralized tissue.





FIBROBLASTS

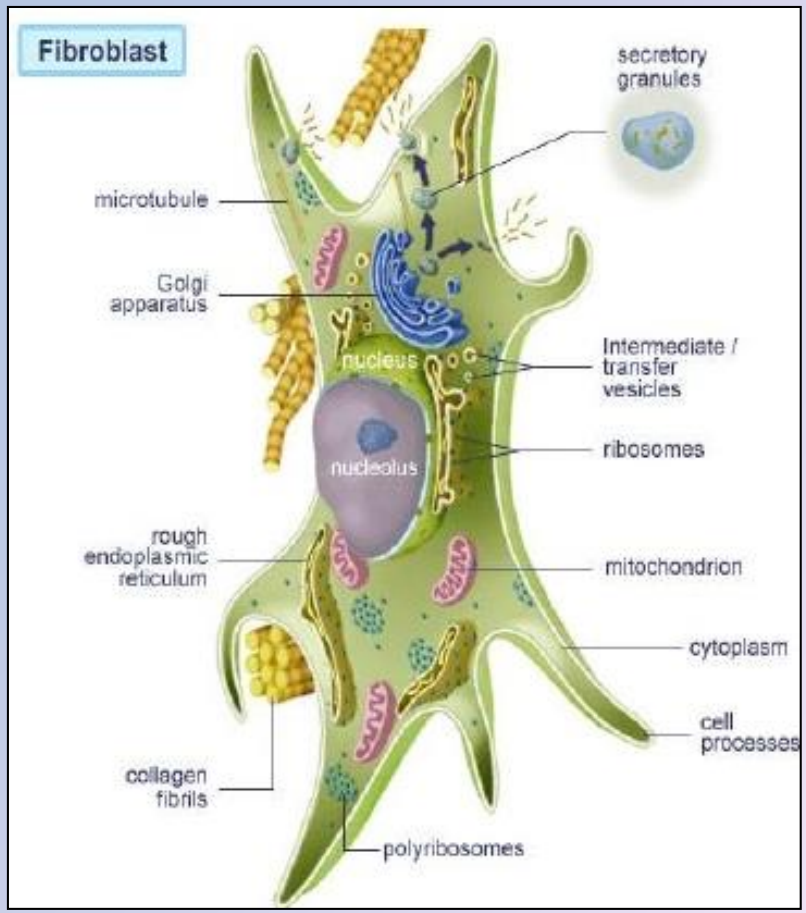
Origin - ectomesenchymal cell of dental follicle

Shape - **elongated** and **stellate**

Most common cell of PDL – 65%

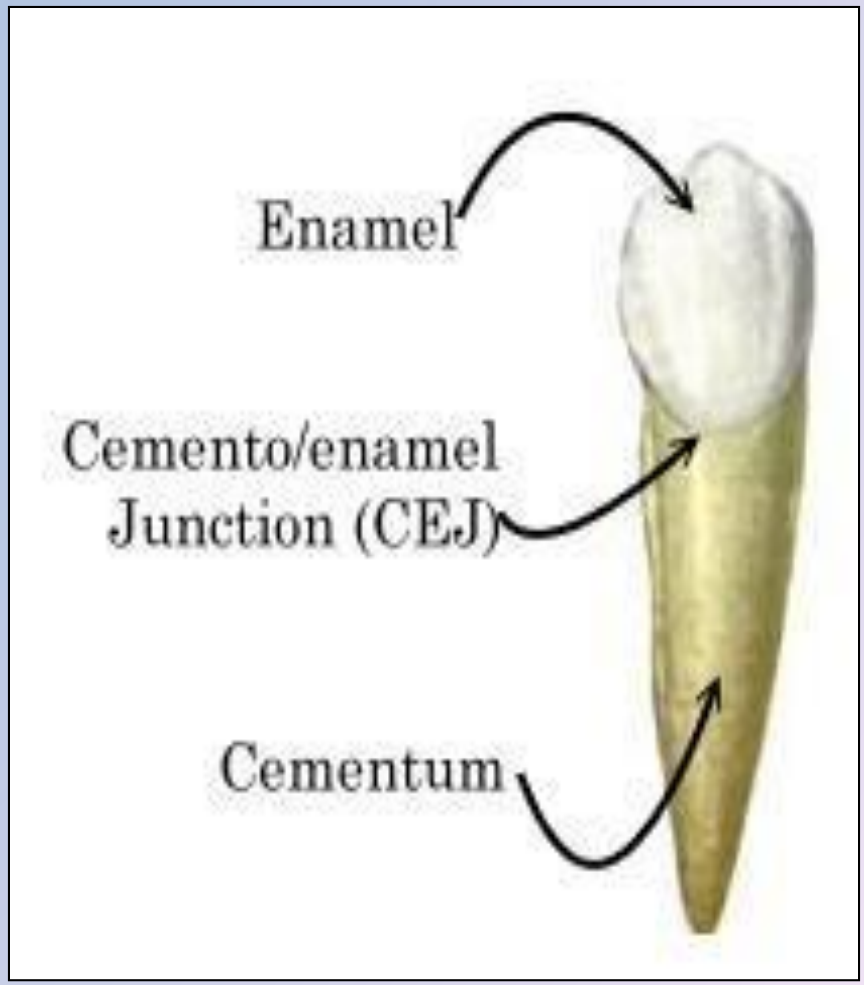
Function

- Remodelling of PDL
- Formation of **extrinsic fibres** of cementum



PHYSICAL PROPERTIES

- Colour - **Pale yellow** with dull surface
- **Softer and more permeable** than dentin
- **Permeable** to dyes and radioactive substances,
- permeability **decreases** with age.
- **Relatively brittle** - traumatic injury leads to fracture .

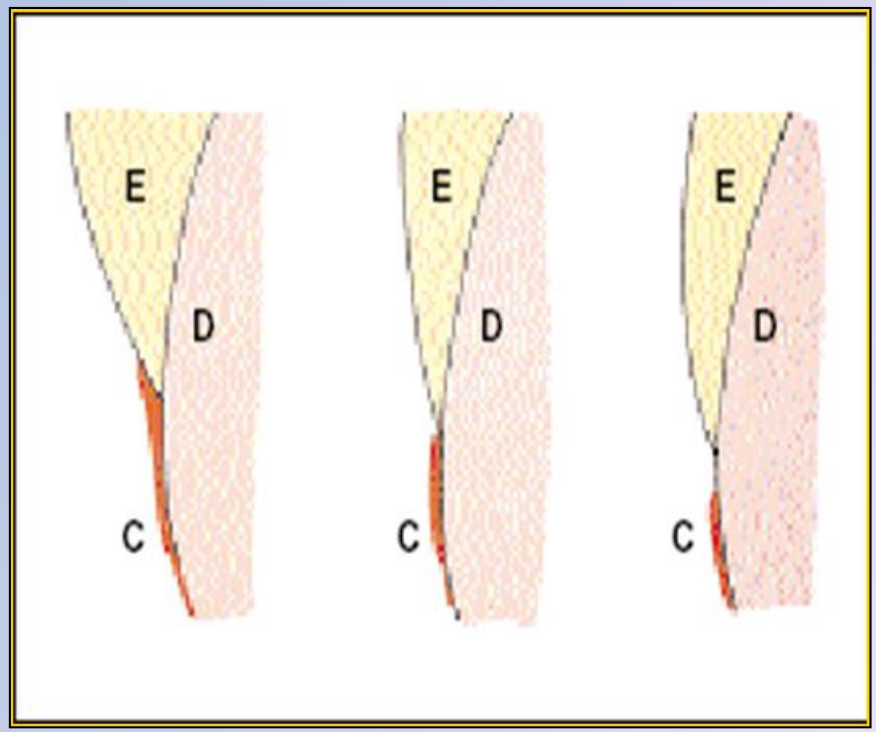


CEMENTO ENAMEL JUNCTION

- **60-65% -** Cementum overlapping the enamel

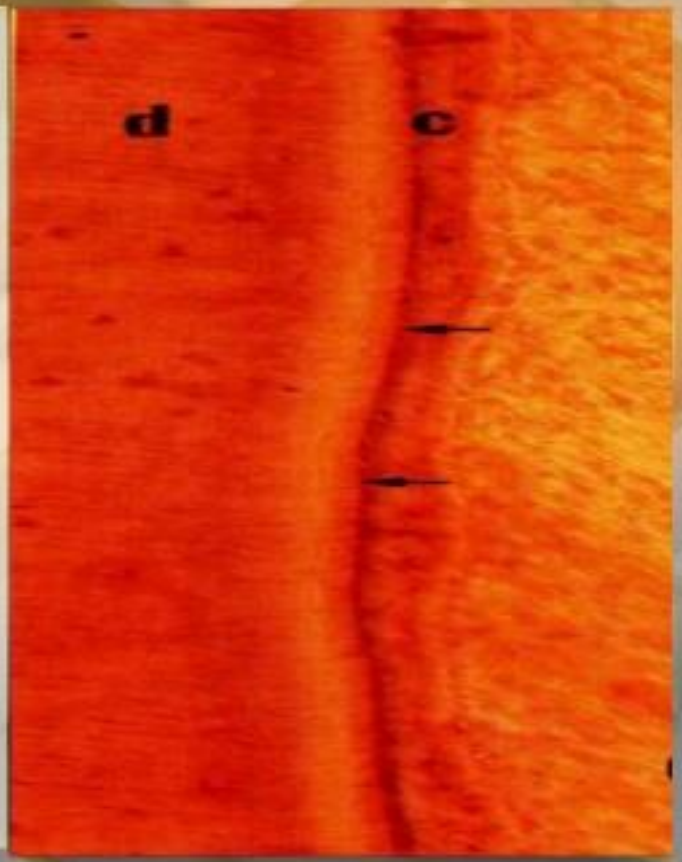
- **30% -** End-to-end relationship of enamel and cementum

- **5% to 10% -** enamel and cementum fails to meet

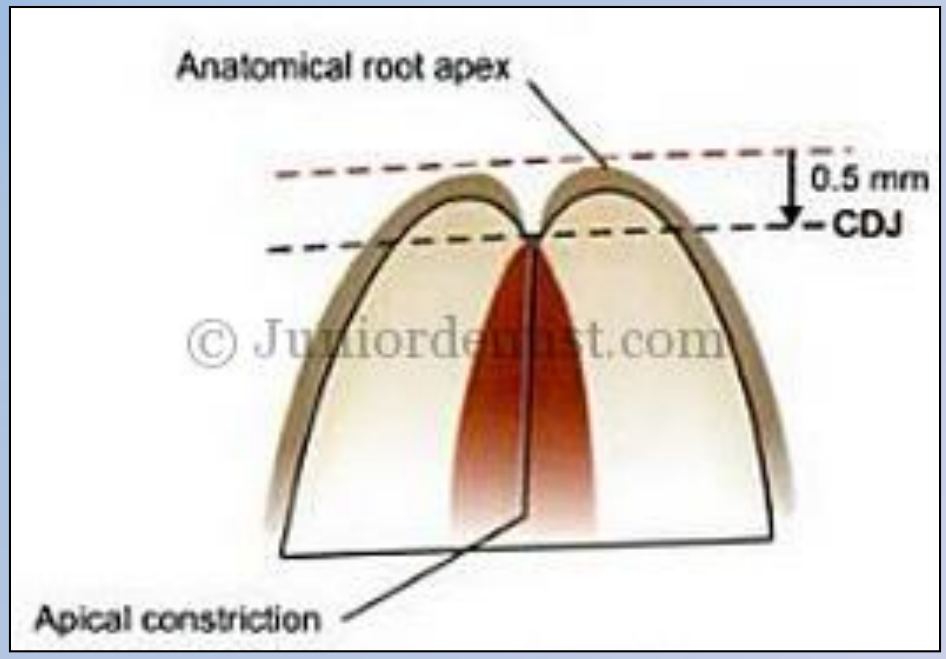


Dentino-cemental junction:

- There is a smooth line junction between the dentin and cementum in permanent teeth.
- The cemento-dentinal junction in deciduous teeth is sometimes scalloped.



CEMENTO DENTINAL JUNCTION



- Terminal apical area of the cementum where it joins the **internal** root canal dentin
- Obturating material should **end** at CDJ
- Width of CDJ – **no change with age** – 2 to 3µ

THICKNESS OF CEMENTUM

- Cementum deposition is a **continuous** process
- Most rapid in the **apical region**
- Thickness - Coronal half – **16 to 60** μ

  - Apical third and furcation – **150 – 200** μ
- Thicker at the **distal** surfaces

Abnormalities

- Cemental Aplasia
- Cemental Hyperplasia/ Hypercementosis

HYPERCEMENTOSIS

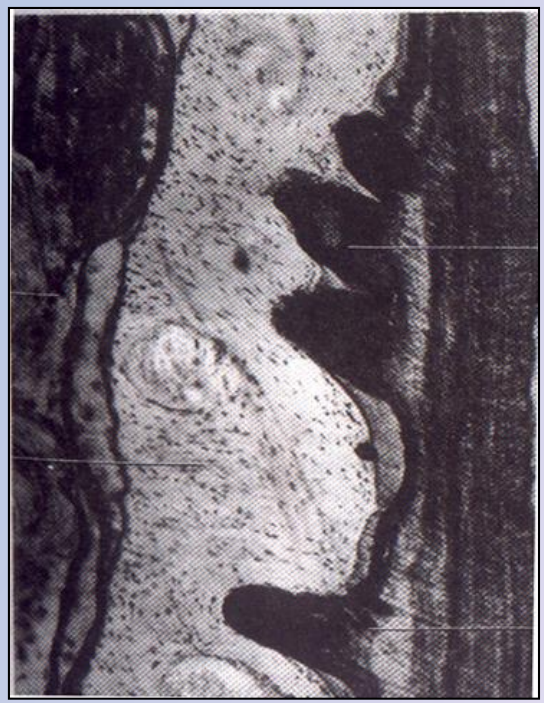
- **nodular enlargement** of the cementum in the apical third of the root
- **R/G** – radiolucent PDL space and radioopaque lamina dura are present **outside** the area of hypercementosis
- **D/D** – condensing osteitis, focal periapical osteopetrosis

- **Etiology**
  - **Local** – teeth without antagonist,

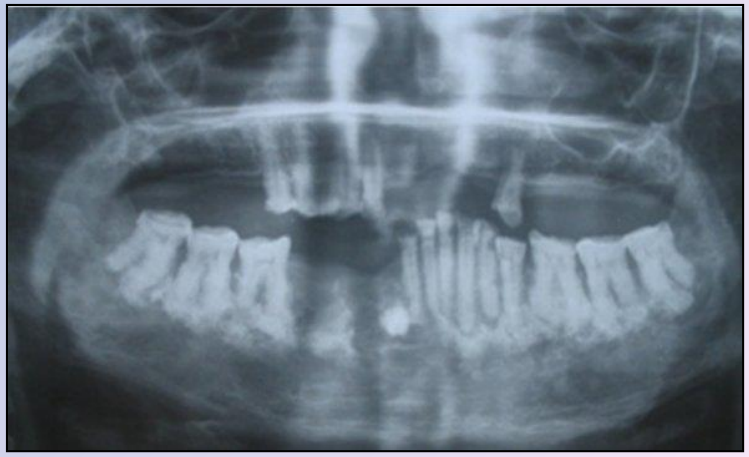
    Low grade periapical infection

    Spikelike – orthodontic

    appliances or occlusal forces



  - **Systemic** – paget's disease, acromegaly, arthritis, thyroid goiter, rhematic fever



- **Treatment**
  - No treatment
  - Extraction – section the teeth

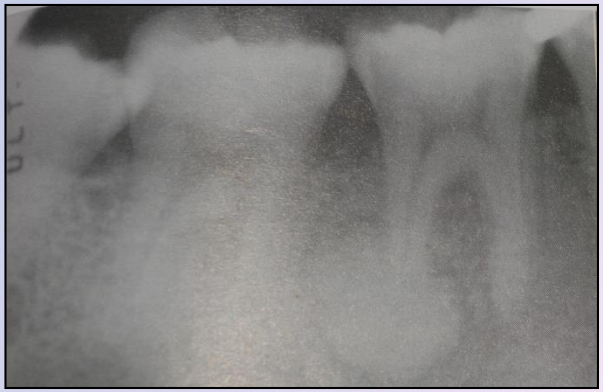
CEMENTOBLASTOMA

Common site – premolar and molar region

C/f – bony expansion, cortical erosion, displacement of adjacent teeth, maxillary sinus involvement, Infiltration of pulp

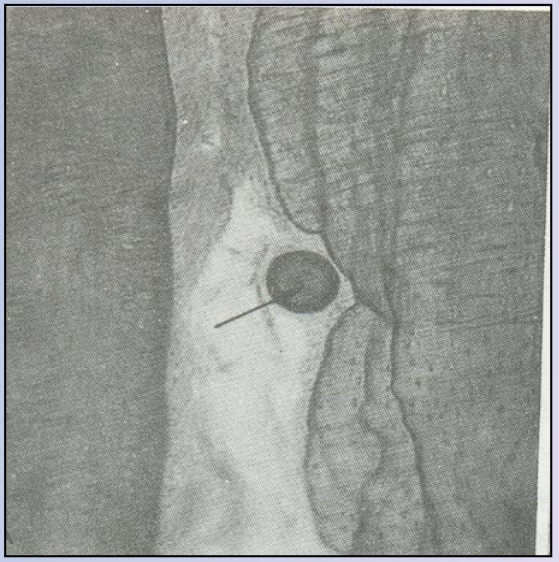
R/f – radiopaque mass fused to the root and surrounded by radiolucent rim

T/t - endodontic t/t and root amputation, surgical excision of the mass

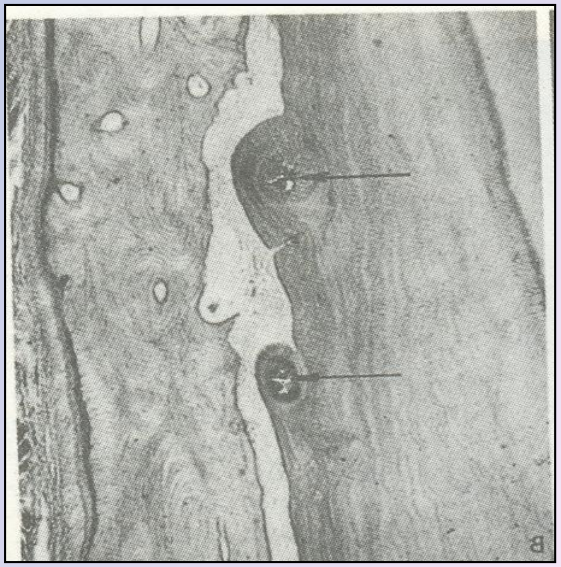


CEMENTICLES

- **globular masses** of acellular cementum
- concentric appositional layers of **afibrillar** or **fibrillar cementum**
- generally less than **0.5mm** in diameter
- form within the PDL
- No clinical significance
- When exposed-plaque retention



FREE



ATTACHED

ANKYLOSIS

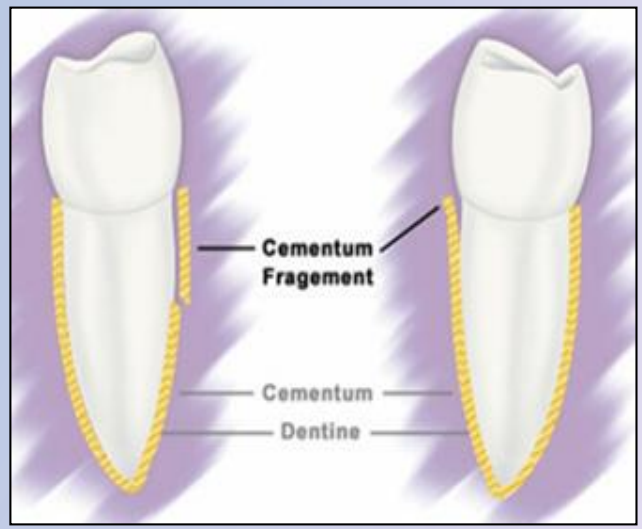
- **Fusion** of cementum and alveolar bone with obliteration of the PDL
- Commonly seen in **primary dentition**
- Etiology
  - Tooth replantation
  - Occlusal tauma
  - Chronic periapical inflammation

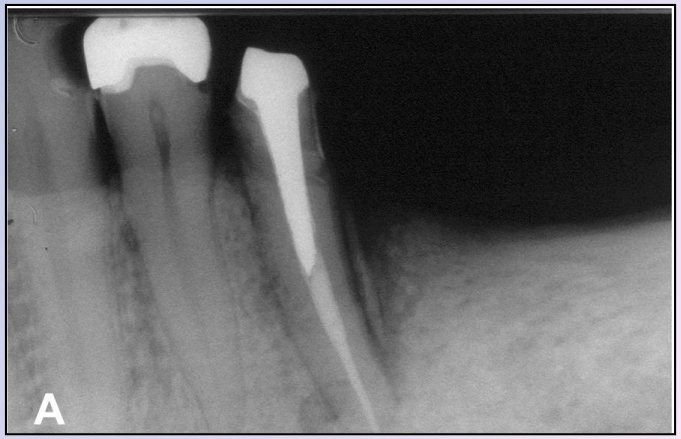
- **Diagnosis**
  - C/F – metallic purcussion, infraocclusion
  - R/G – absence of PDL space

INJURIES TO THE CEMENTUM

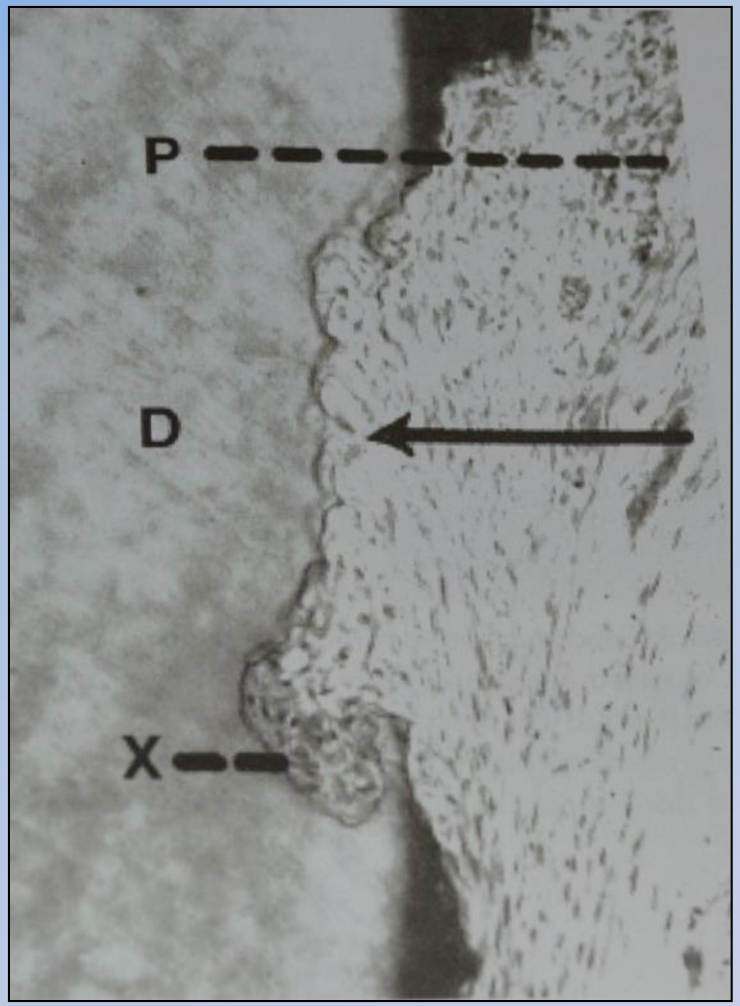
CEMENTAL TEARS AND FRACTURES

- **Total** or **partial separation** of the cementum
- occurs at the CDJ
- **Etiology**
  - traumatic occlusion
  - dental trauma
- **C/F** - localized periodontal pockets with pain and exudation
- **T/t** – SRP, open flap debridement, regenerative therapy, extraction





RESORPTION

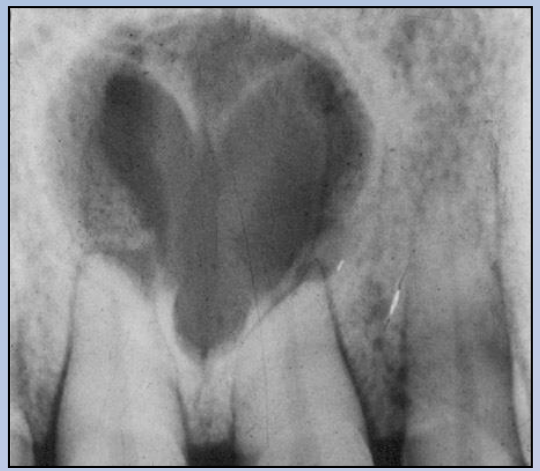


Resorption bay

Local causes

Orthodontic movement

Pressure from malaligned erupting teeth



Cysts and tumours

Periapical disease

Repair and Regeneration

Epi. rests of malessez

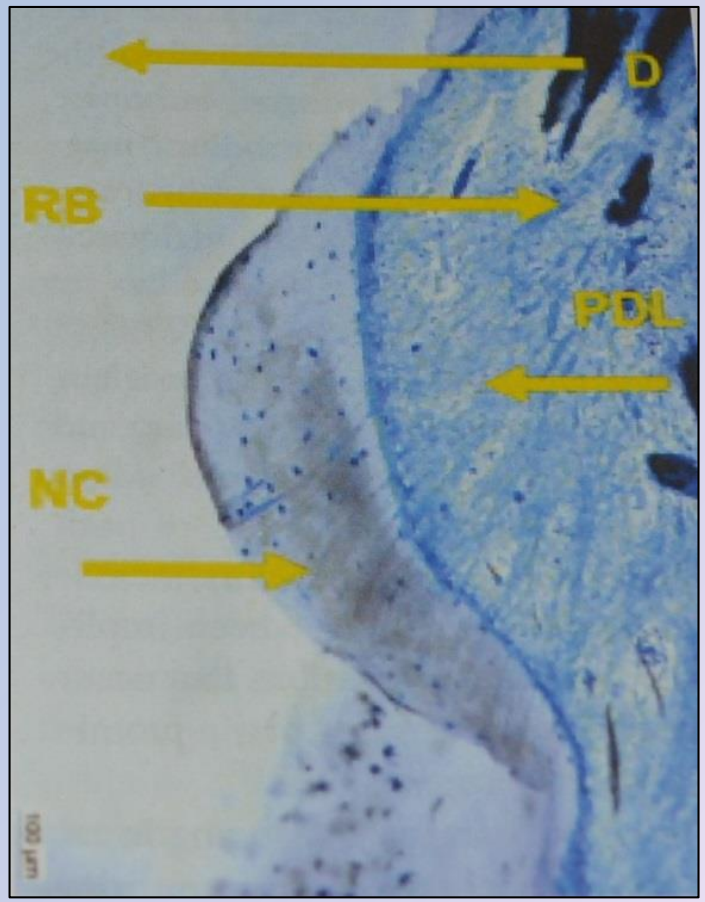
Matrix proteins

- Amelogenins
- Enamelins
- Sheath proteins
- BMPs
- EMDs

Growth factors

- TGF
- ILGF
- PDGF

Regeneration



Reversal line

ROOT SURFACE CHANGES

1. Areas of increased mineralization
2. Areas of demineralization
3. Areas of cellular resorption of cementum and dentin

Pocket/recession

Cementum exposed to the oral environment

⇩

Destruction of the sharpey's fibres

⇩

Bacterial penetration

⇩

Necrotic cementum

IMPORTANT QUESTIONS

LAQ

- Cementum in health and disease

SHORT NOTES

- Define and classify cementum
- Hypercementosis
- Anomalies of cementum

VIVA

- Definition
- Intermediate cementum
- Calculus cementum
- Thickness of cementum
- Permeability
- Difference between acellular and cellular cementum

THANK YOU

1 . Areas of increased mineralisation

2. Areas of demineralisation

Exposure to oral fluid

⬇

proteolysis of the Sharpey's fibers

⬇

fragmentation and cavitation of the cementum

⬇

root caries

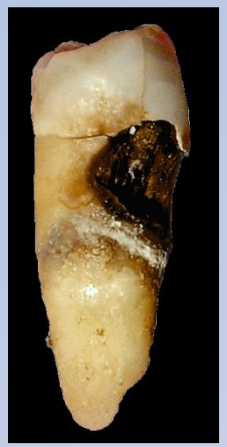
ROOT CARIES

Active root caries

- well-defined **yellowish or light-brown** areas
- have a **softened or leathery consistency** on probing.

Inactive root caries

- well-defined **darker** lesions
- have a **harder consistency** on probing



3. Areas of cellular resorption of cementum and dentin

- Seen in roots **unexposed** by periodontal disease
- appear as **isolated cavitations** that penetrate into the dentin
- Differentiated from root caries by their **clear cut outline and hard surface**
- **T/T** - if unexposed – no T/t

  If exposed - restoration