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Department : Periodontics

Topic : Cementum

Staff name : Dr. Gnanasagar W R





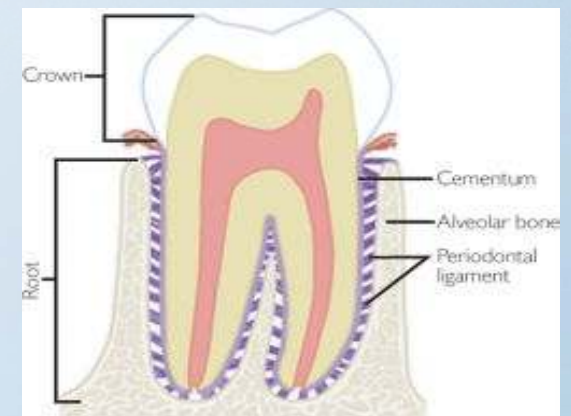
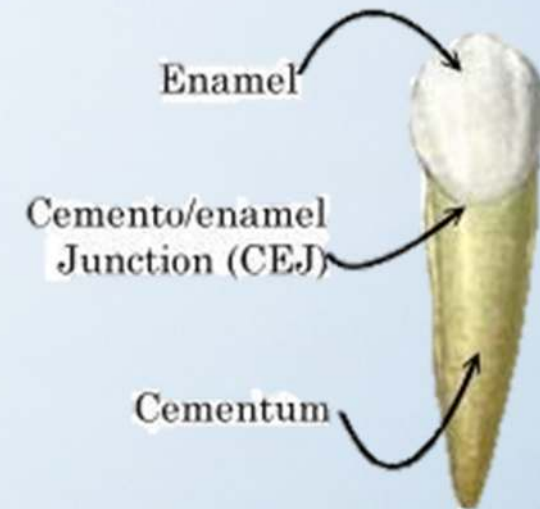
CEMENTUM

Dr.W.R.GNANASAGAR
DEPT OF periodontics

- Overview
- Properties
- Composition
- cementogenesis
 - Cells involved
 - Formation
 - Cementoblast differentiation
- classification
- Types of CEJ
- Functions
- Clinical consideration

OVERVIEW

- Hard, avascular, mineralized dental connective tissue covering the root of anatomic tooth.
- 1st demonstrated in the year 1835
- Extending from cervical portion of tooth and continues to the apex.
- Medium for attachment of collagen fibers that binds tooth to surrounding structures



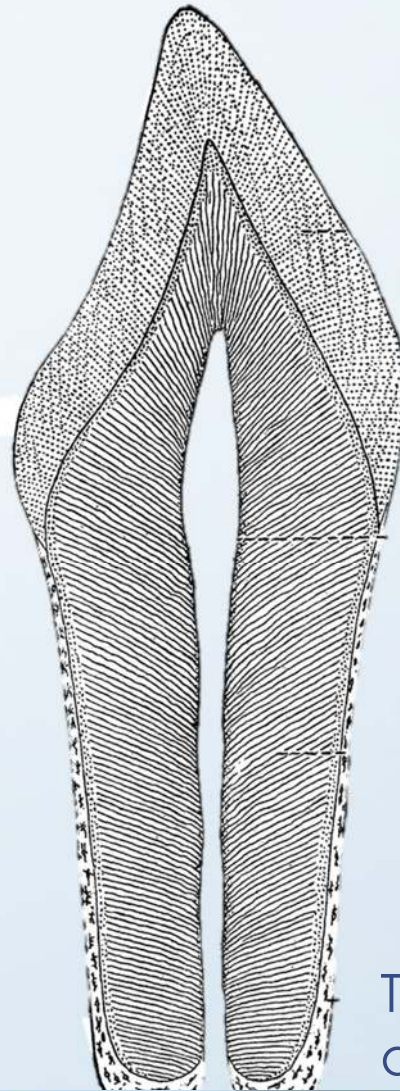
Physical characteristics

- Hardness is less than dentin
- pale yellow to dark yellow in colour
- Lack of lustre- cemental surface -dull
- Dark hue (but lighter than dentin)
- Permeable to a variety of minerals



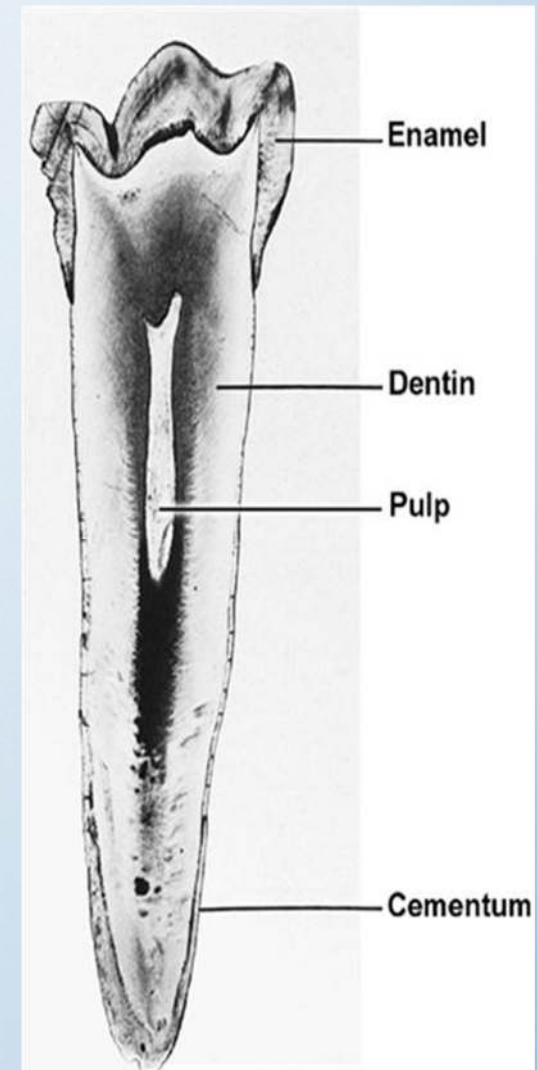
Properties

- Avascular, Non innervated
- Thickness varies in different teeth and different region of the same tooth

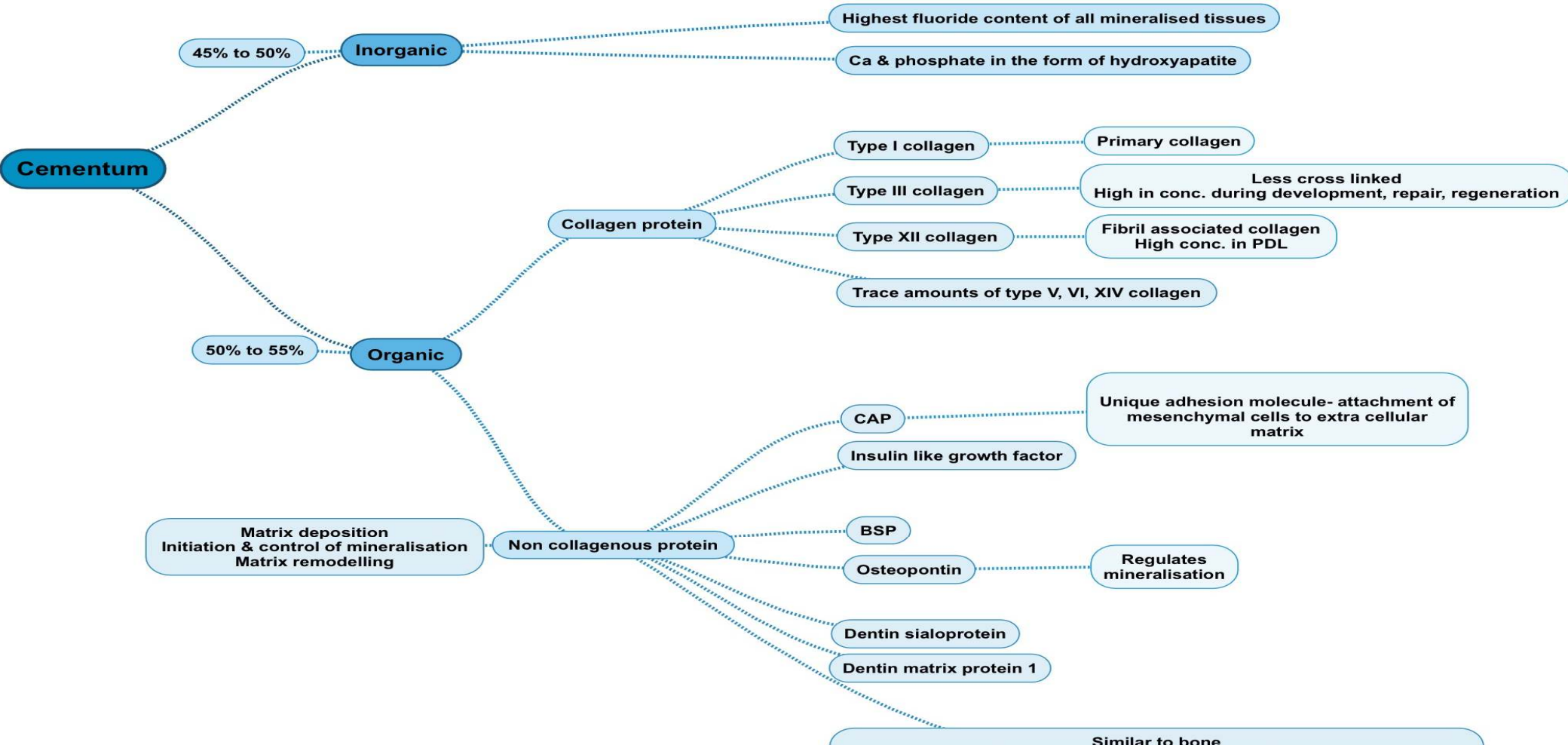


Thinnest at CEJ
(20-50 μ m)

Thickest towards
apex (150-



Chemical composition



classification

- By cellularity
- Origin of collagenous fibers of the matrix
- By presence or absence of fibrils

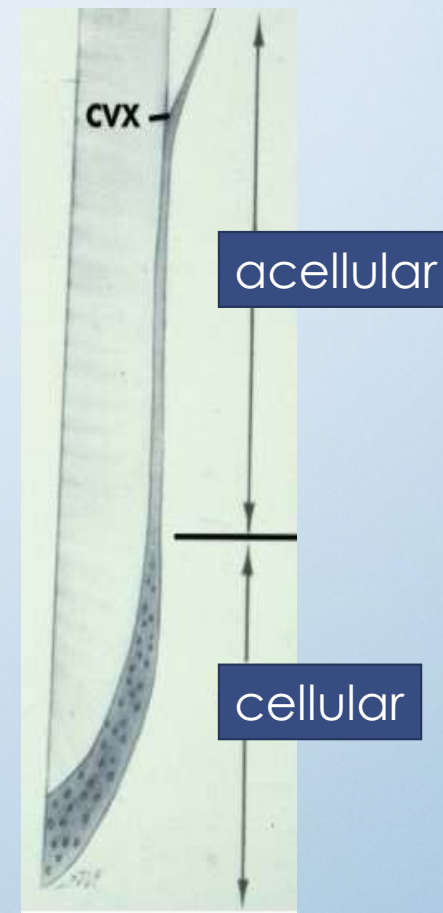
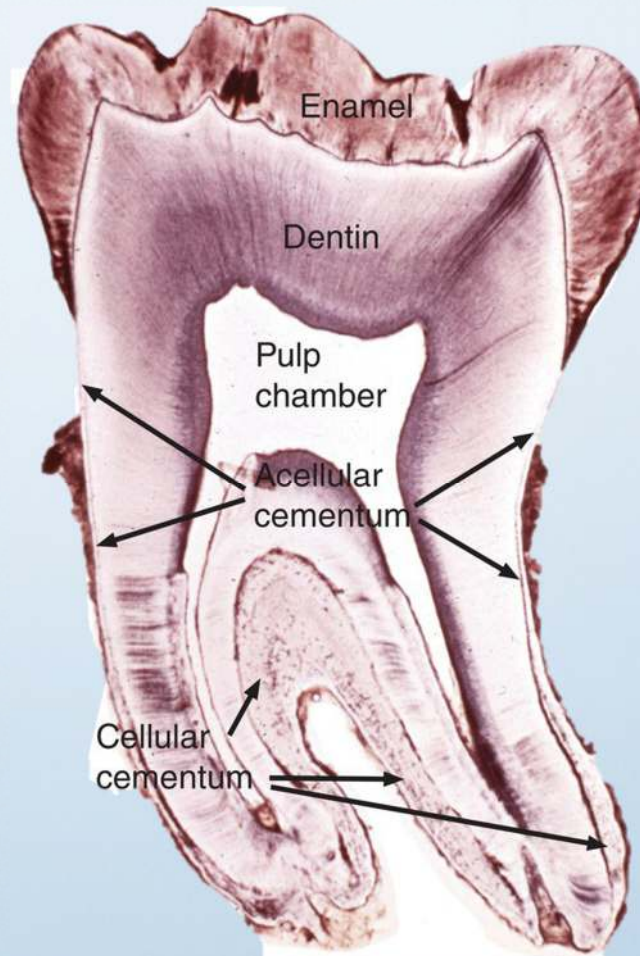
BY CELLULARITY

Acellular cementum

Cementum without any cells in its matrix

Cellular cementum

Cementum containing cementocytes in lacunae within the cementum matrix.



BY THE PRESENCE OF COLLAGEN FIBRILS IN THE MATRIX

Fibrillar cementum → contains well-defined fibrils of type I collagen

Afibrillar cementum → matrix devoid of detectable type I collagen fibrils. Instead, the matrix tends to have a fine, granular consistency.

BY THE ORIGIN OF THE MATRIX FIBERS

Extrinsic fiber cementum

- contains primarily extrinsic fibers, i.e. Sharpey's fibers
- perpendicularly to the cementum
- Anchorage

Intrinsic fiber cementum

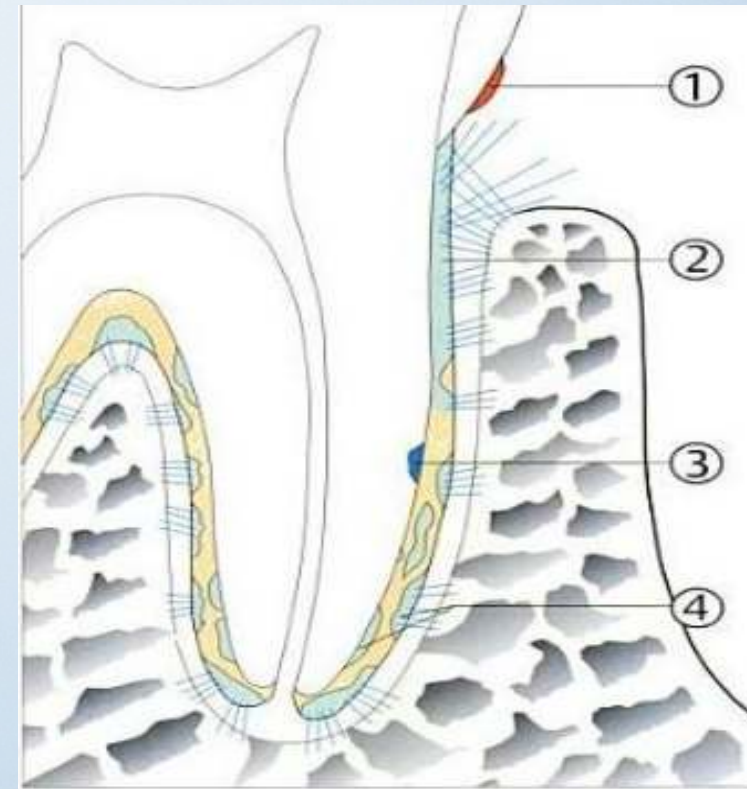
- primarily intrinsic fibers, i.e. fibers produced by cementoblasts
- parallel to the cementum surface

Mixed fiber cementum

- mixture of extrinsic and intrinsic fiber

SCHROEDER CLASSIFICATION

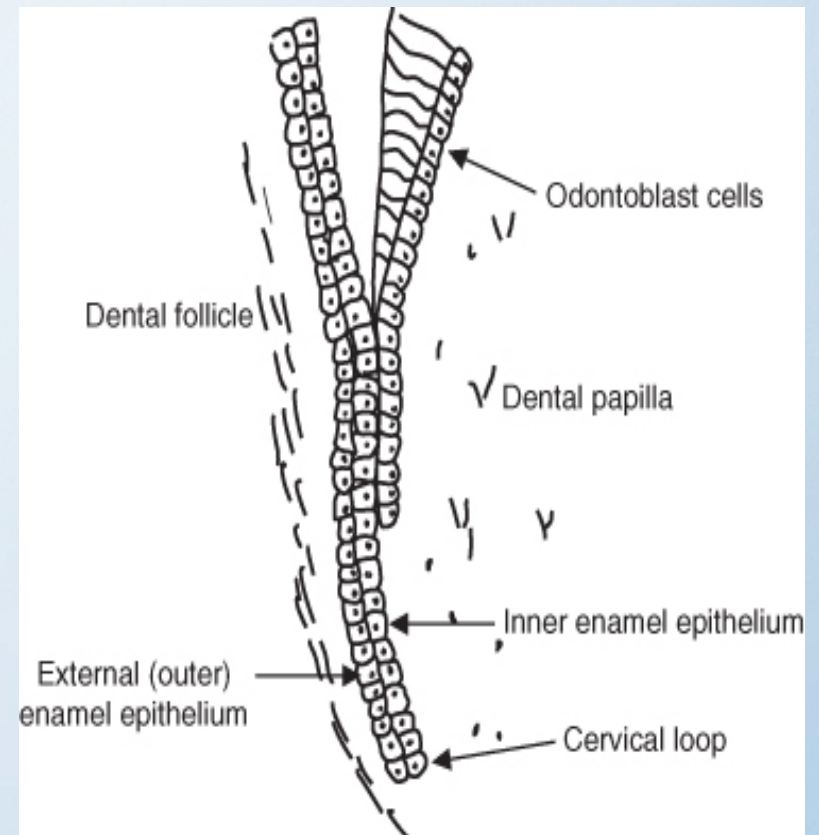
Acellular, afibrillar cementum	<ul style="list-style-type: none"> • mineralized matrix, without detectable collagen fibrils or cementocytes • produced by cementoblasts • Seen in coronal portion
Acellular, extrinsic fiber cementum	<ul style="list-style-type: none"> • Well defined matrix of type I collagen and densely packed Sharpey's fibers • Produced by fibroblast • cervical two-thirds of the root • Anchorage
Cellular, intrinsic fiber cementum	<ul style="list-style-type: none"> • contains cementocytes in a matrix composed of intrinsic fiber cementum • sites of cementum repair • Produced by cementoblast
Cellular, mixed fiber cementum	<ul style="list-style-type: none"> • Contains both intrinsic and extrinsic fibers • Cementocytes are seen • found on the apical third of the root and in furcation • Fibroblast and cementoblasts are involved



1. Acellular, afibrillar cementum
2. Acellular, extrinsic fiber cementum
3. Cellular, intrinsic fiber cementum
4. Cellular, mixed fiber cementum

Cementogenesis

- Formation of cementum is called cementogenesis
- Inner enamel epithelium and outer enamel epithelium extends coronopically to form the Hertwig's epithelial root sheath (HERS)
- HERS initiates formation of cementum
- This initiation is limited to advancing root edges



Cementogenesis

*HERS send inductive message
(secretes some enamel protein-facing
cells of dental papilla)*



These cells differentiate into Odontoblast

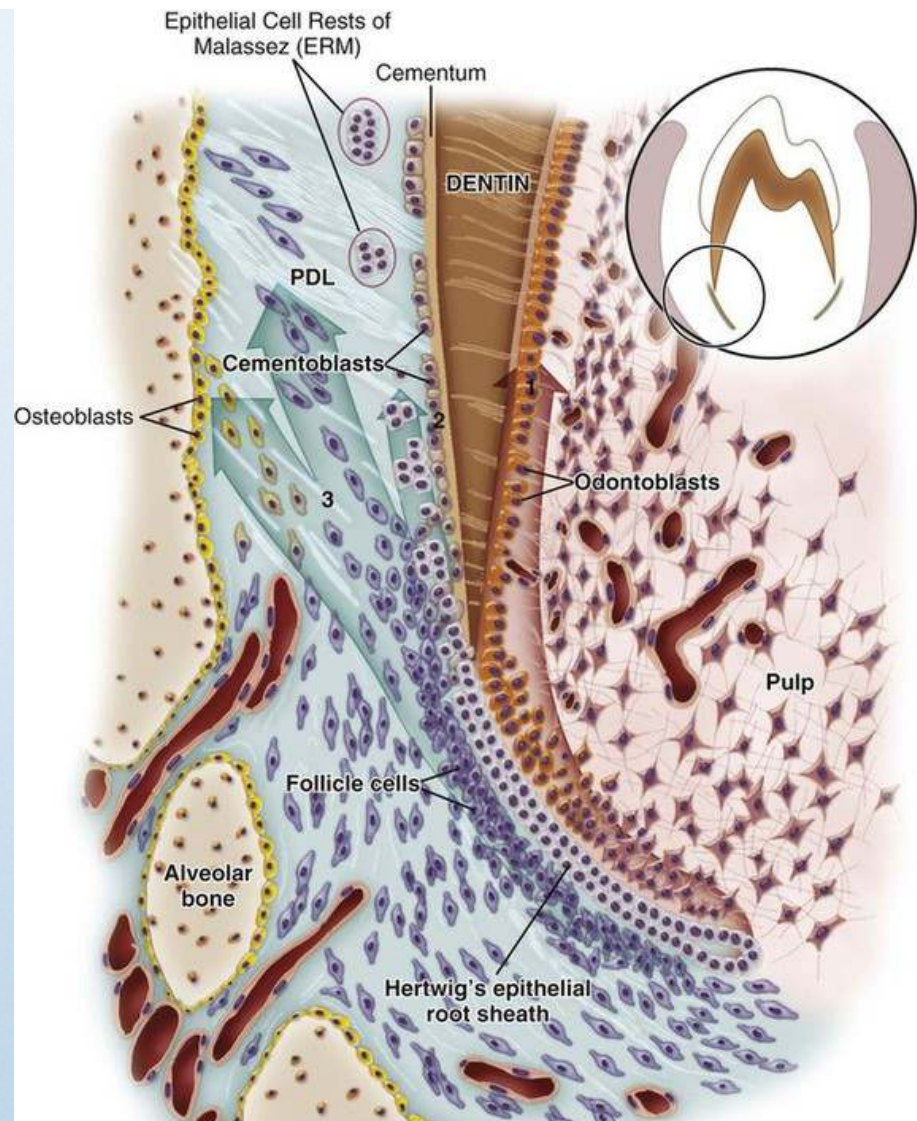


*A layer of predentin is formed
(along inner aspect of HERS)*



HERS continuity becomes interrupted

- Some HERS undergo apoptosis.
- Some HERS migrate away from dentin- cell rests of malassez
- Some remain near developing tooth, gets incorporated into



Ectomesenchymal cells from inner portion of dental follicle comes in contact with predentin

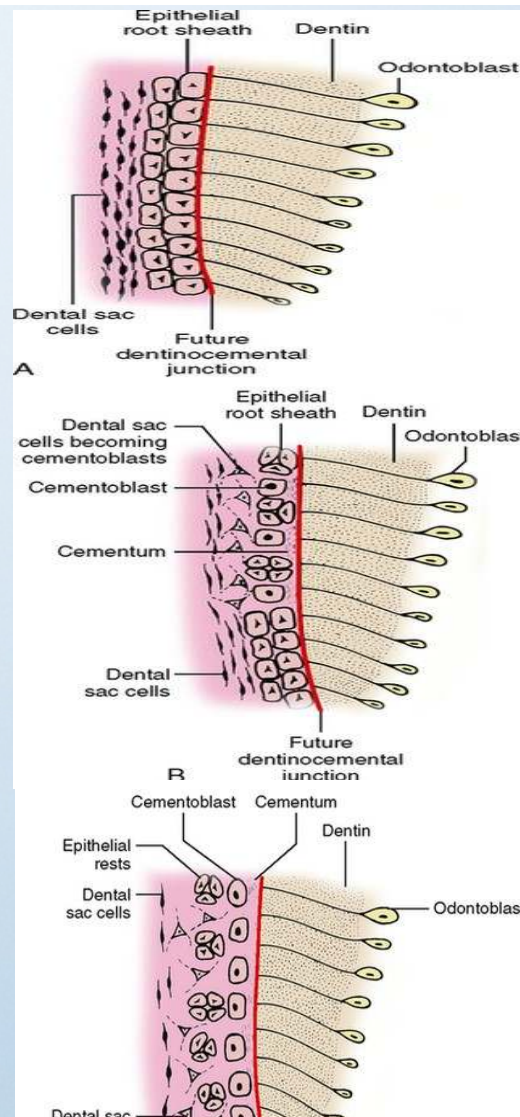


Infiltrating follicle cells receive reciprocal inductive signal from dentin or *HERS*



Undifferentiated mesenchymal cells from the follicle differentiates into cementoblasts
Some cementoblasts are also differentiated from *HERS*

- Cementoblasts synthesise organic matrix: collagen and protein polysaccharide

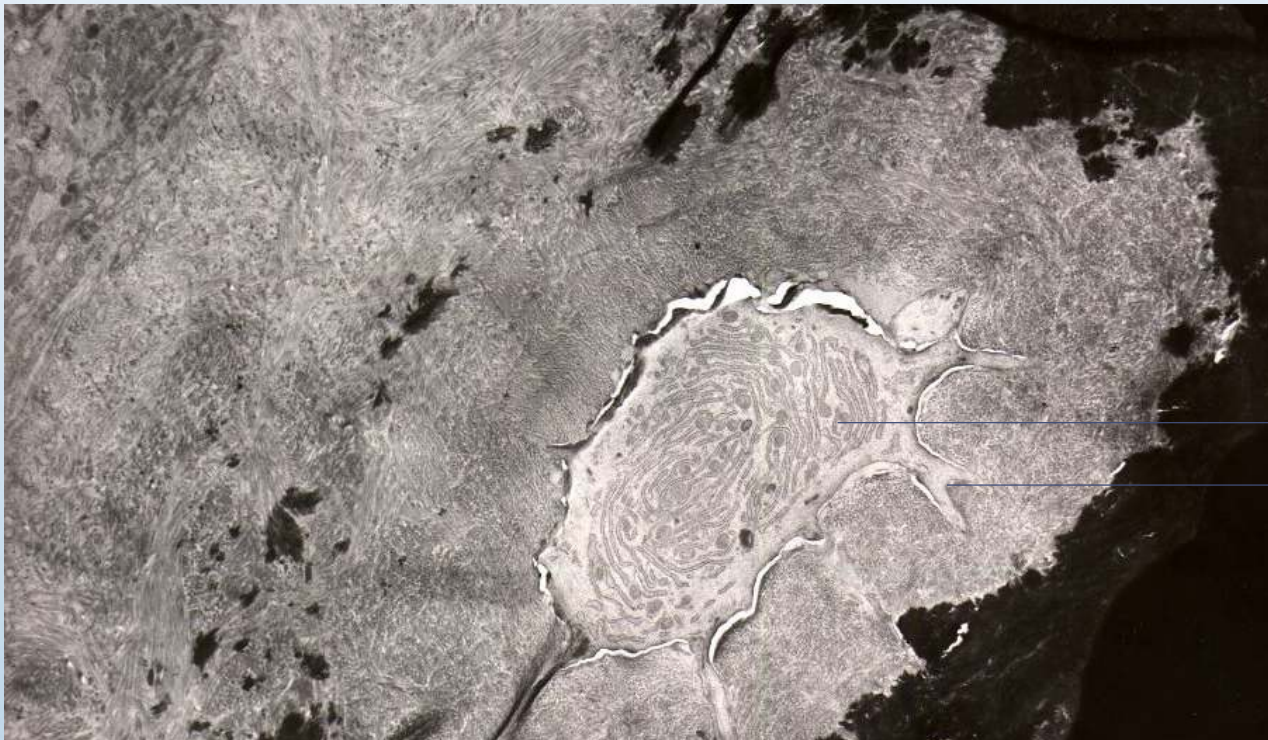


Cells of cementum

- Cementoblasts
- Cementocytes
- Cementoclasts

Cementoblasts

- Line the root surface
- Synthesizes organic matrix of cementum → Collagen and protein polysaccharides
- Has numerous mitochondria, well formed Golgi apparatus & open faced nucleus



*Transmission Electron
Microscopy image of
cementoblast and its
processes*

→ Cementoblasts

→ Cytoplasmic processes

cementoblasts

- Size – 8-12
- Cuboidal to squamous – shape
- Centrally placed large vesicular nucleus and prominent nucleoli
- Cytoplasm – strongly basophilic
- Numerous mitochondria, golgi apparatus and rough endoplasmic reticulum
- Cementoblastic processes – many cytoplasmic extensions arise from the cell body of cementoblast
- Processes – directed towards periodontal ligament as they derive nutrition from it.

Cementoblasts are derived from

- Inner cells of dental follicle
- Differentiate from HERS

Cementoblast from dental follicle

- Similar phenotype to osteoblast
- Common precursor like that of osteoblast from → dental follicle
- Forms Cellular Intrinsic Fiber Cementum

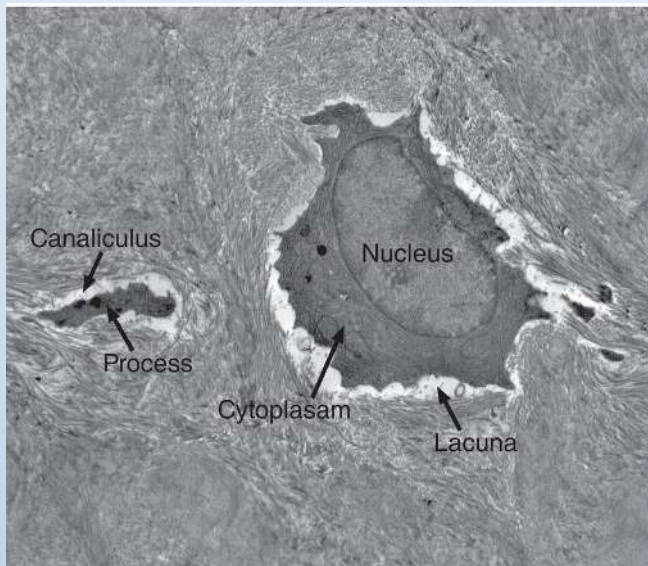
Cementoblast from HERS

- Different phenotype than osteoblast
- Forms Acellular Extrinsic Fiber Cementum

Cementocytes

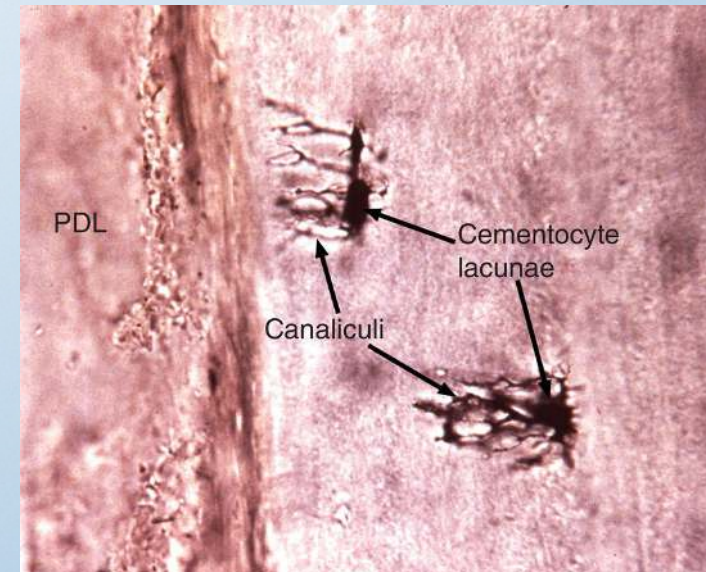
Cementoblasts entrapped within the forming cemental matrix

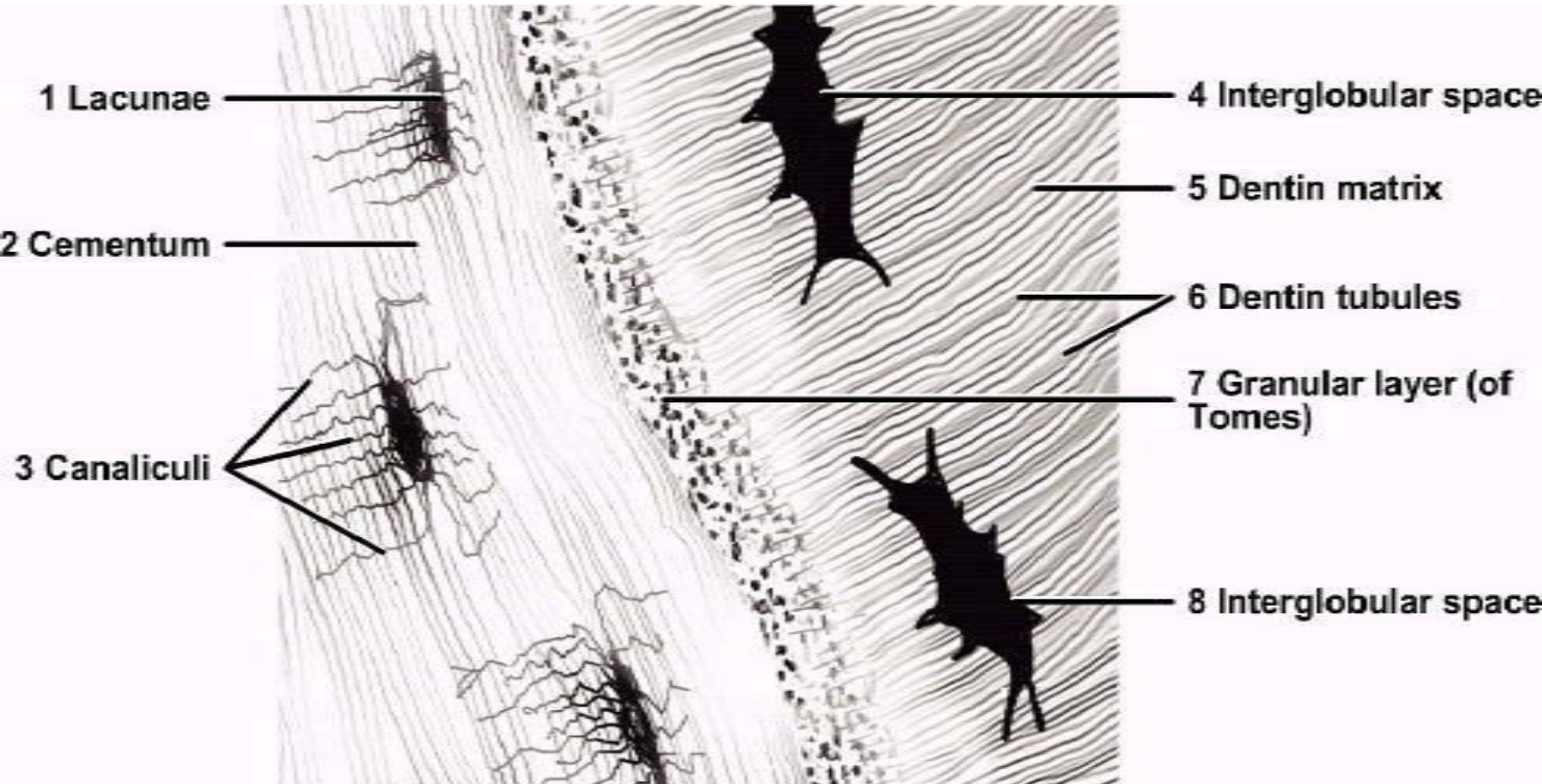
Located in lacunae of cementum and has processes in canaliculi

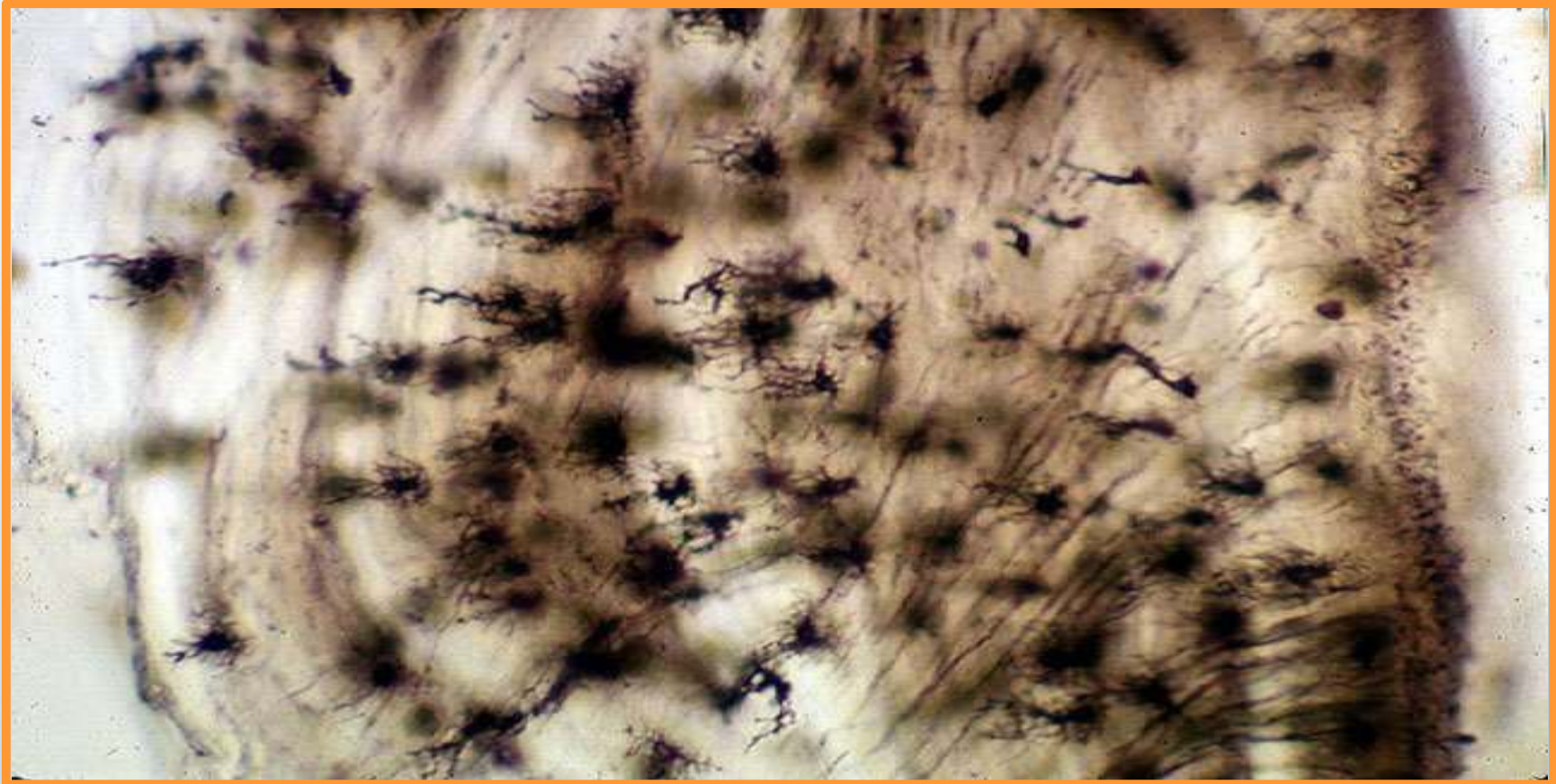


These processes anastomosis with adjacent cementocytes

These processes are seen oriented towards PDL for nutrition







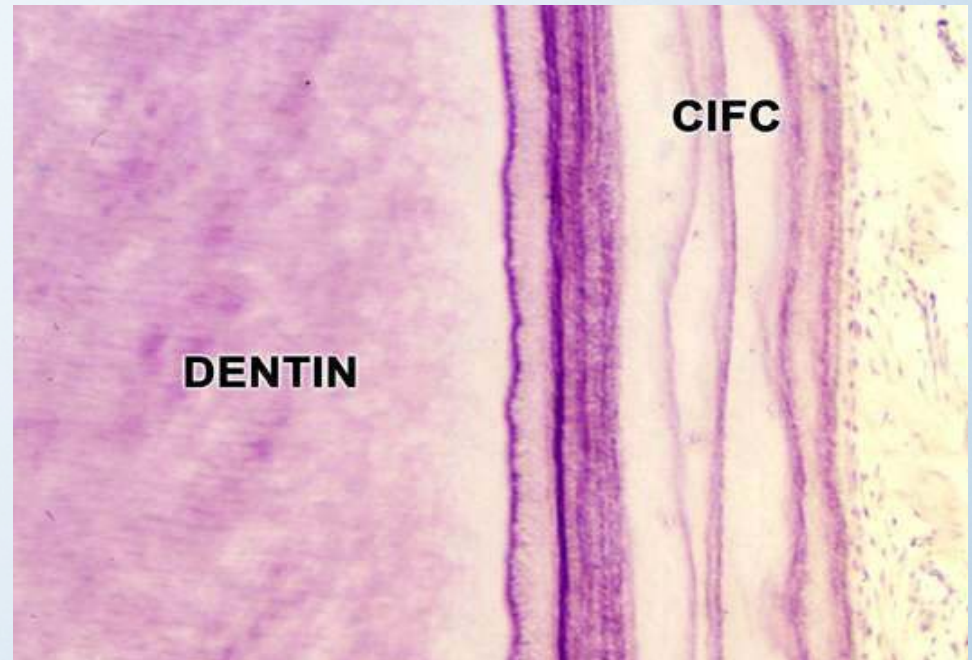
Cementocyte lacuna

- Incremental lines of Salter

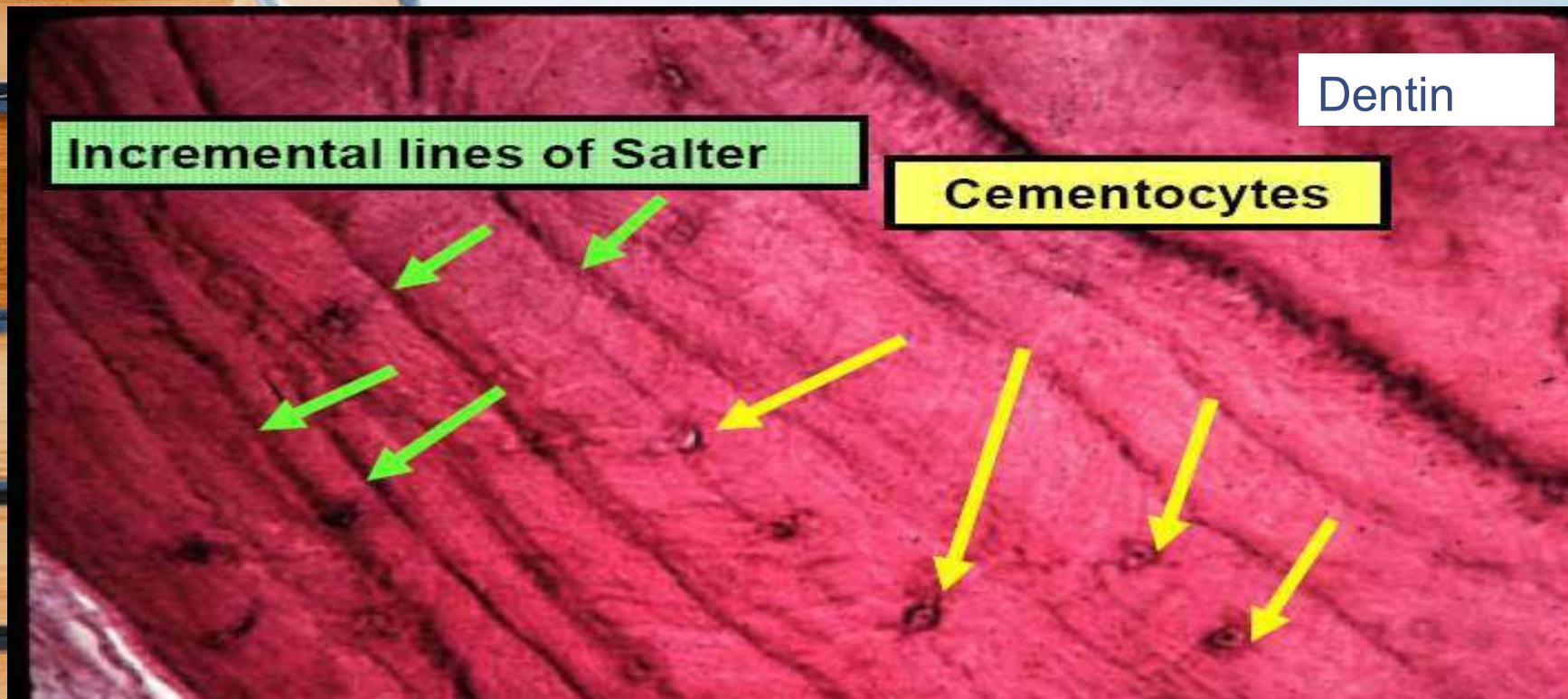
- Rhythmic deposition of cementum
- Phase of activity and rest

Acellular cementum – thin and close because it is laid down slowly

Cellular cementum- thick and far apart as it is laid down rapidly.



Incremental lines of Salter



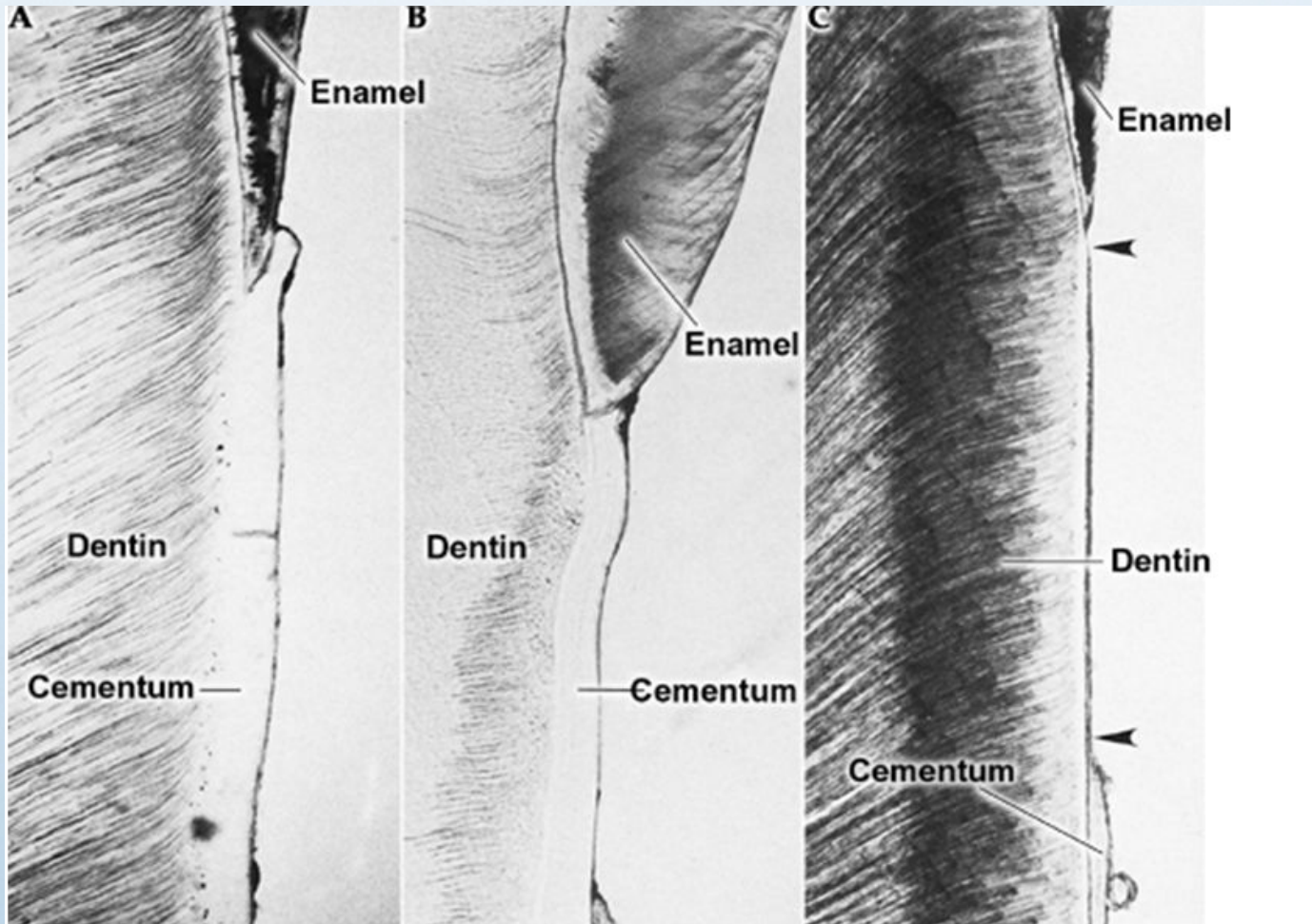
GRANULAR LAYER of DENTIN tomes granular layer



- Due to **coalescing & looping** of terminal Tubules
- Seen in **root**, adjacent to cementum
- More toward apex
- **Unmineralized** (like interglobular dentin)

CEMENTO-ENAMEL JUNCTION

Anatomical juncture of the enamel and cementum



A- Cementum overlaps enamel
60%

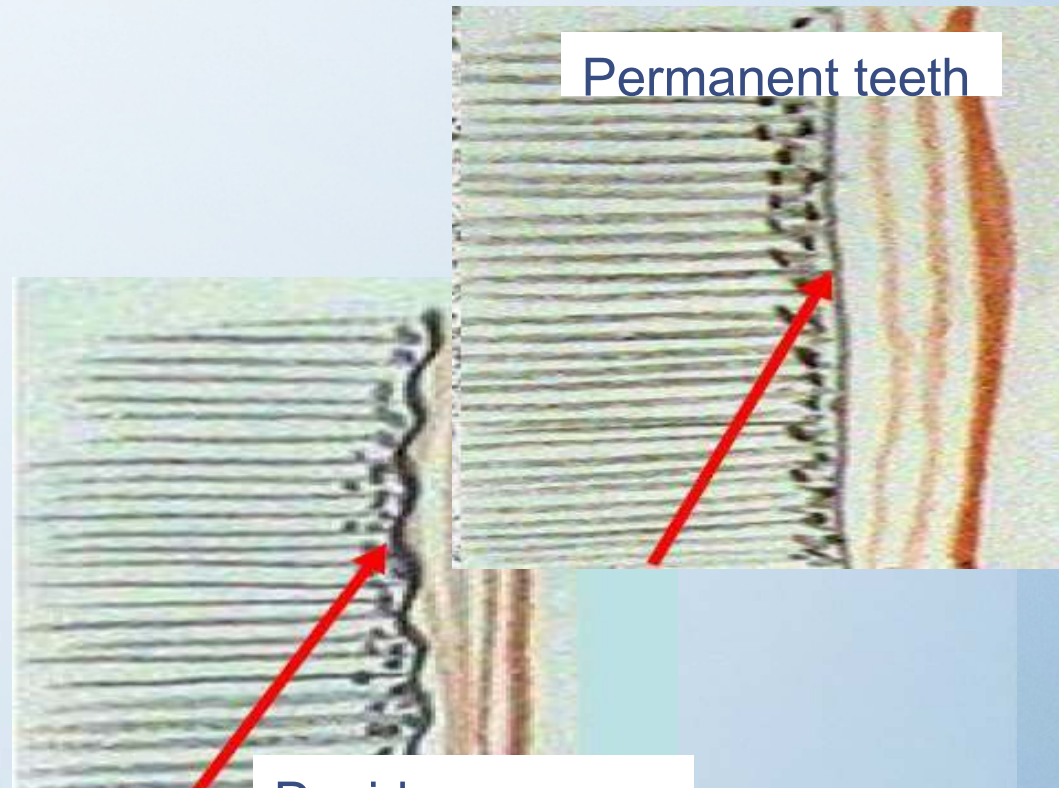
B- Butt joint between enamel
and cementum
30%

C- gap between cementum
and enamel
10%

Cementodentinal junction

The dentin surface upon which cementum is deposited is relatively smooth in permanent teeth.

The cementodentinal junction in deciduous teeth, however, is sometimes scalloped.



FUNCTIONS

Anchorage

Cementum

Serves as an attachment medium of tooth for Sharpey's fiber



Sharpey's fibers

Mediates attachment of tooth to gingival connective tissues and PDL



Hence attachment with Alveolar bone

Adaptation

Cemental deposition in the apical portion of the root

Compensates for occlusal attrition

some degree for the slow tooth eruption that takes place throughout life

Repair

Major reparative tissue of root

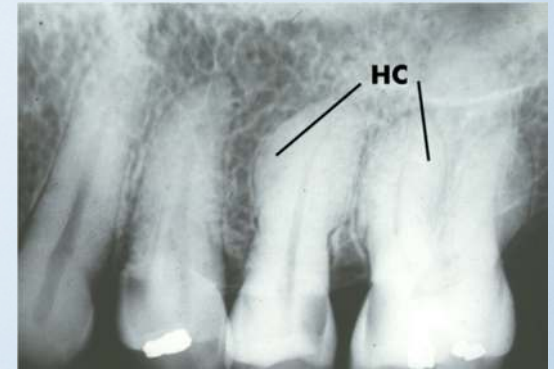
Fracture and resorption can be repaired by deposition of new cementum that resembles cellular cementum.

Forms fast, wider cementoid zone, smaller apatite

HYPERCEMENTOSIS

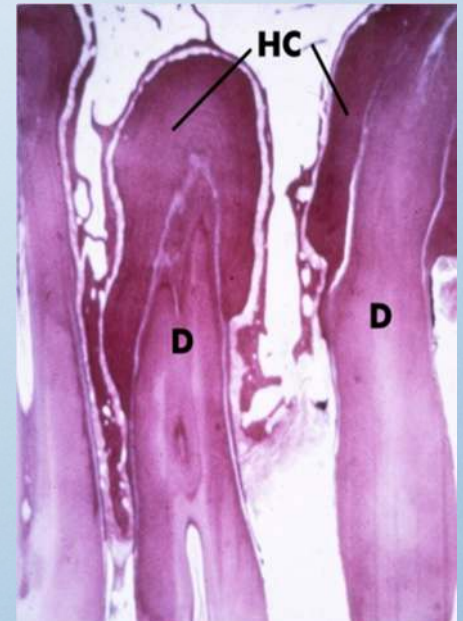
Non-neoplastic deposition of excessive cementum

- In chronic periapical inflammation
- Surrounds tooth like cuff
- Also seen in non-functioning teeth
- Can affect all teeth of a dentition/ confined to a single tooth/ affects only a part of the tooth



Localised hypertrophy → prong like extension of cementum

- In teeth exposed to stress
- Large surface area for fiber attachment → firm anchorage



CEMENTICLES

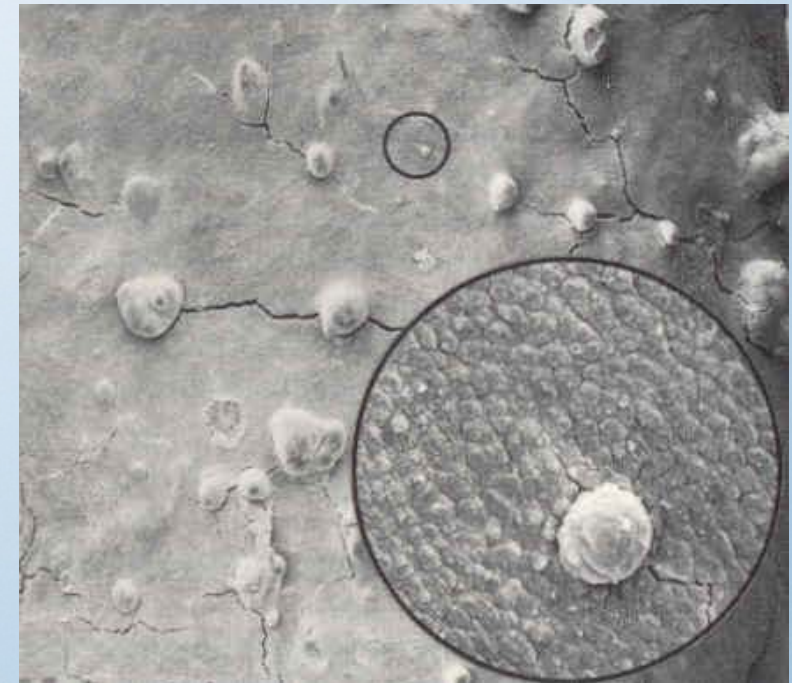
Cementicles are small, spherical particles of cementum that may lie free in the periodontal ligament adjacent to the cementum surface.

Free cementicles

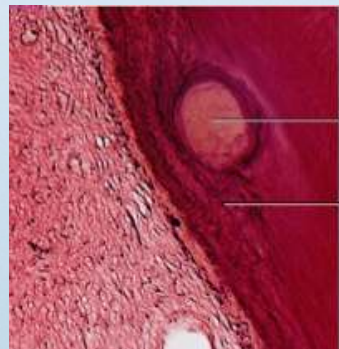
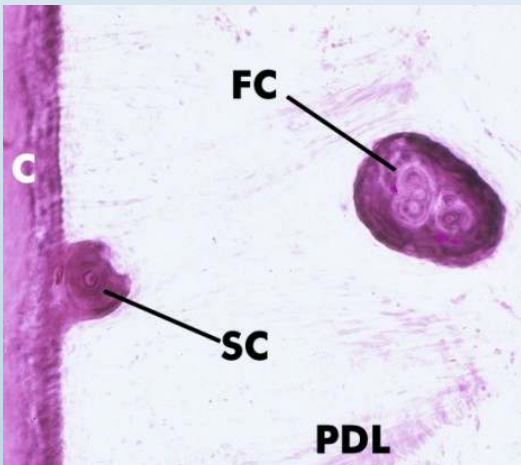
Attached cementicles

sessile

Embedded



Scanning electron micrograph of root



Embedded
cementum
cementum

