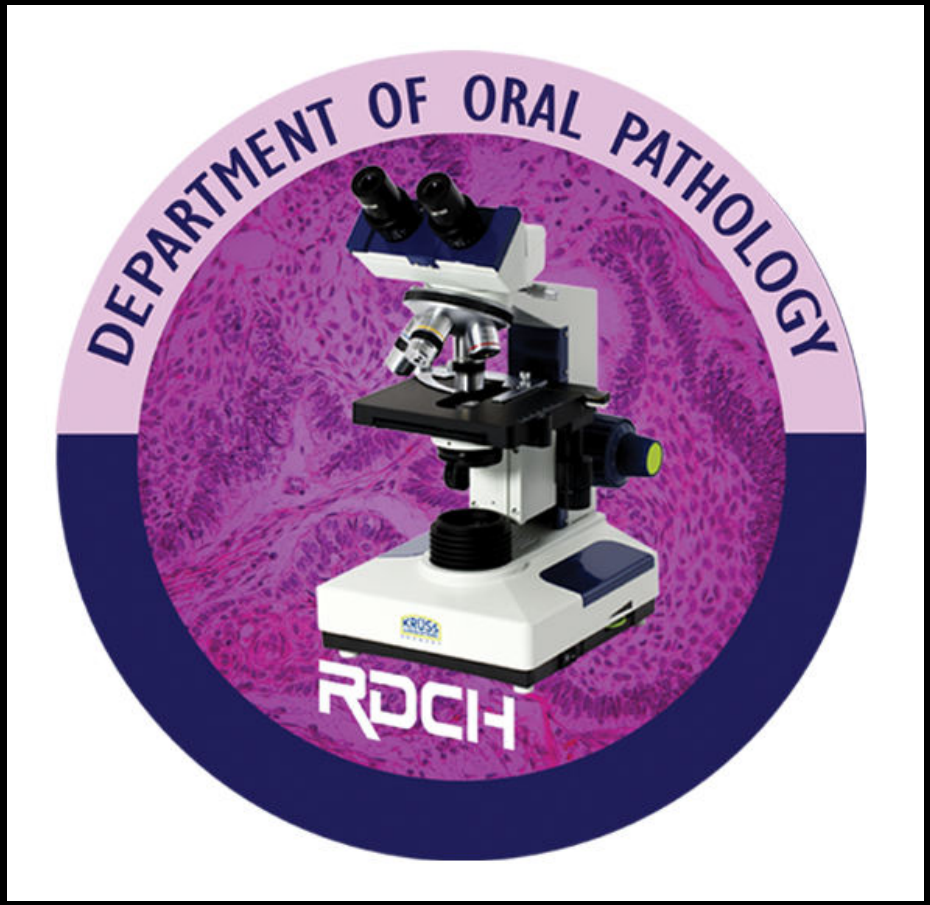
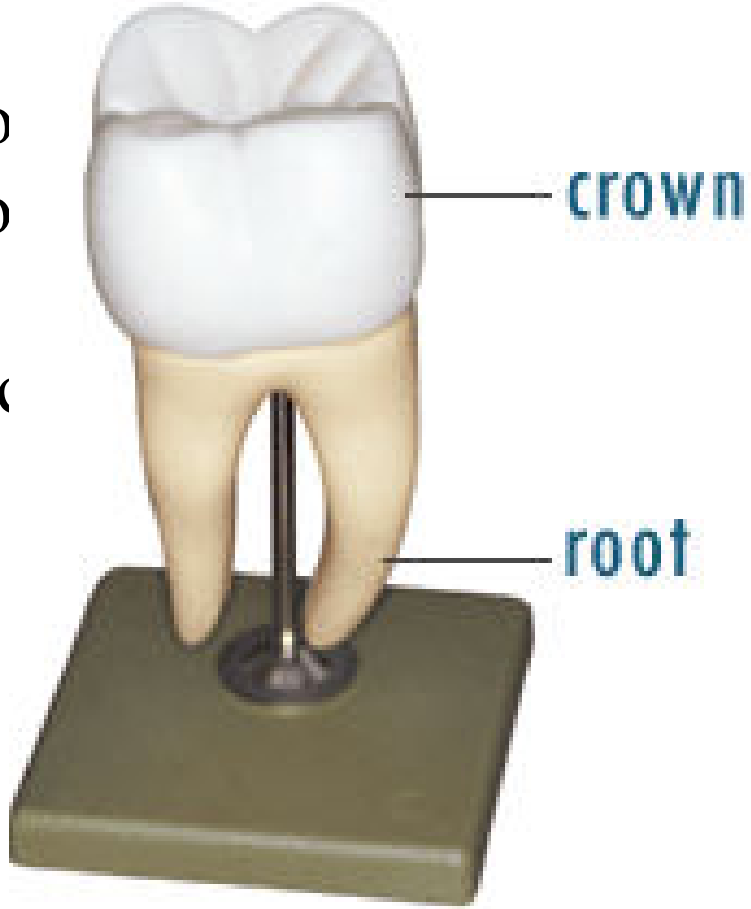
CEMENTUM



Introduction

- A layer of hard, specialized co covers the dentin of the roots o human teeth
- First demonstrated microscopi pupils of Purkinje.



CONTENTS

- [II] Nature & origin of organic matrix
- Types of cementum
- Cementogenes
- Growth Pattern
- Cementoenamel junction

[II] Nature & origin of organic matrix

- Cementum derives organic matrix from
  - inserting Sharpeys fibers of the PDL
  - cementoblasts
- When derived from PDL Extrinsic fibers
- Sharpeys fibers continue into the cementum in same direction as principle fibers: perpendicular/oblique to the root surface

- When derived from cementoblasts kn/s Intrinsic fibers : parallel to the root surface & perpendicular to the extrinsic fibers.

- When both extrinsic & intrinsic fibers kn/s Mixed fiber cementum

Types of cementum

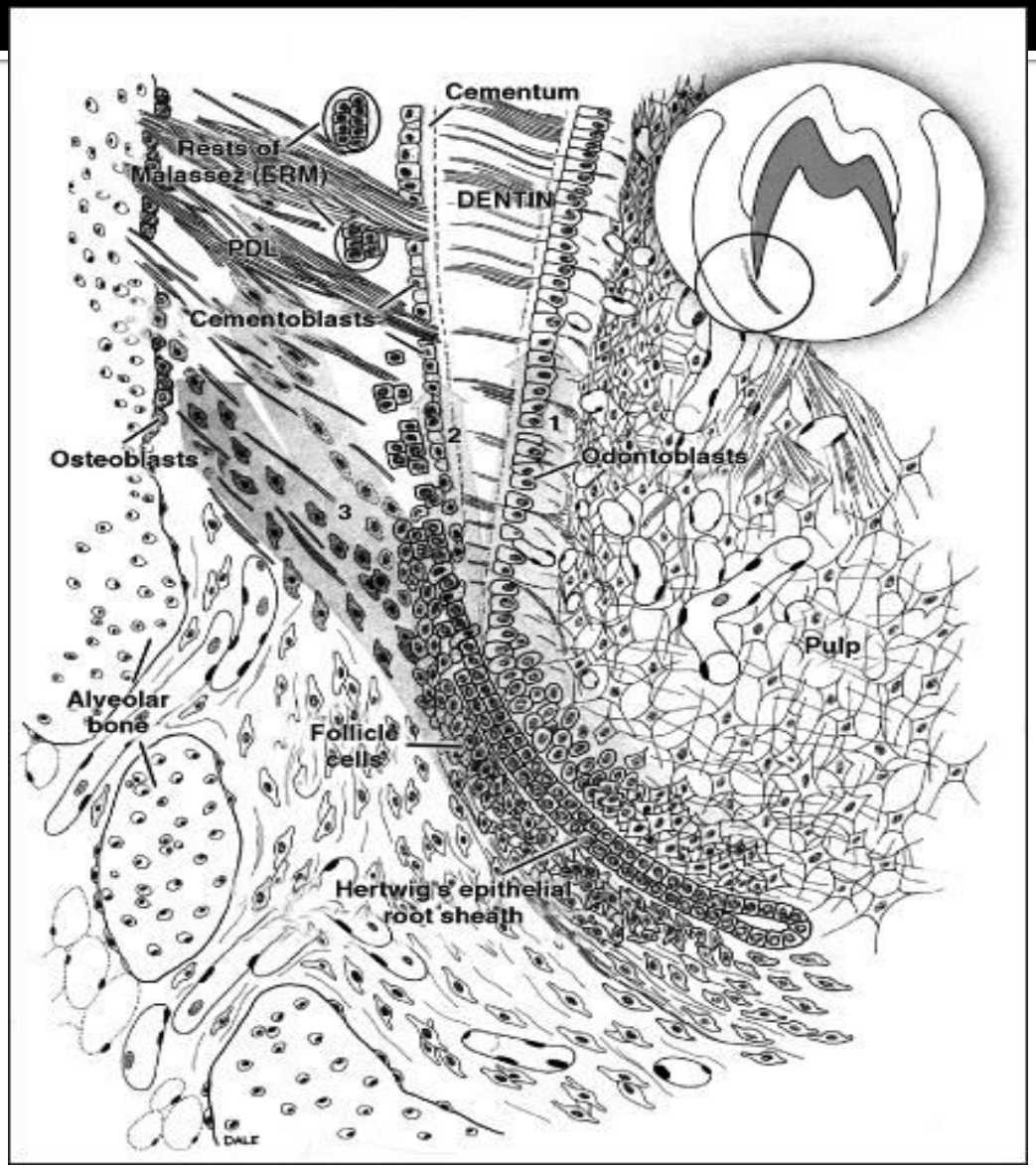
Type	Origin of fiber	Location	Function
Acellular (primary)	Extrinsic (some intrinsic fibers initially)	cervical margin to apical 3rd	anchorage
Cellular (secondary)	intrinsic	Middle to apical furcations	Adaptation & repair
Mixed (alternating layer of acellular & cellular)	Intrinsic & extrinsic	-apical portions -furcations	adaptation
Acellular afibrillar	-	Spurs & patches over enamel & dentin along CEJ	No known function

AEFC	CIFC
From cervical to apical third	Apical third to furcation
Formed earlier	Later & during repair
Non-coll proteins absent	Present
Growth factors TGF & IGF not seen	Present
Cementoid is usually absent	Seen on the surface
Extrinsic fibers from PDL	Only intrinsic fibers from cementoblasts

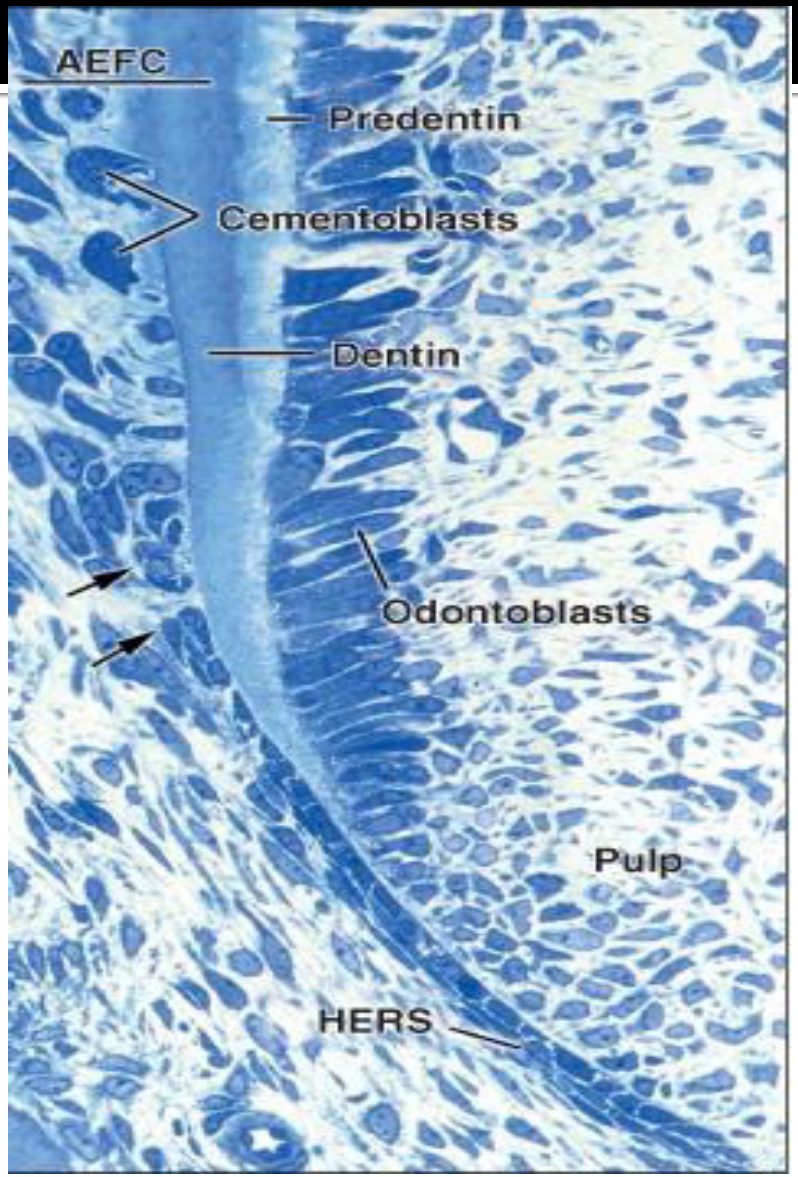
AEFC	CIFC
Only type of cementum in single rooted teeth	May be seen in single rooted teeth
Anchorage	Adaptation & repair.
Slow formation	Rapid formation
Closer incremental lines	Farther apart incremental lines
No cementocytes	Varying degree & depth of Cementocytes
Cementoblasts derived from HERS	Derived from inner cells of dental follicle
No PTHR receptor	Express PTHR receptor.

CEMENTOCYTES	OSTEOCYTES
Form cementum	Form bone
Lacunae are ovoid/tubular	Lacunae are oval
Canaliculi are less tortuous & sparse, Face PDL.	Canaliculi are dense, complex network. Radiating
Immunopositive for fibromodulin & lumican	Negative

Cementogenesis



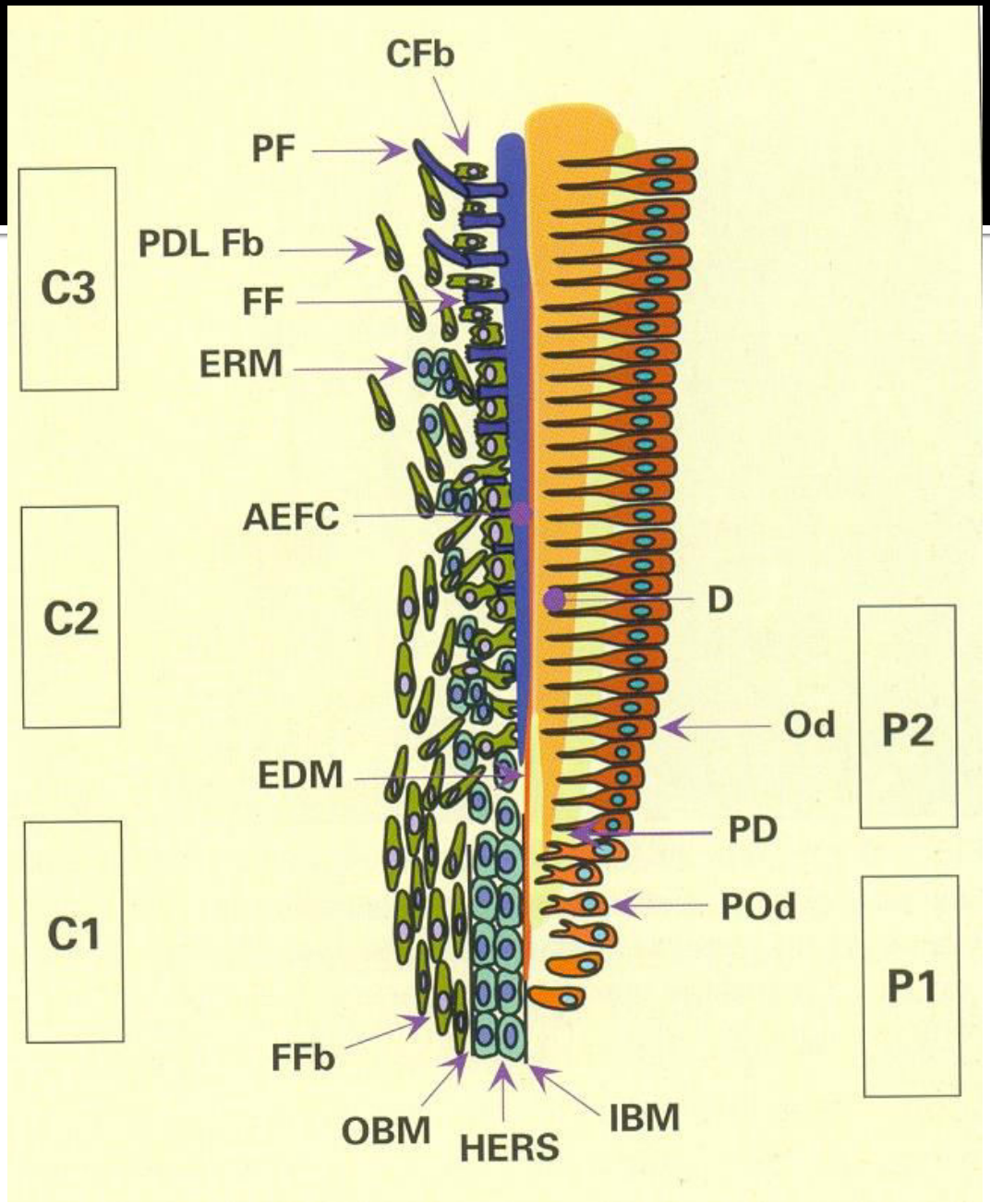
Cementogenesis



In developing teeth it is preceded by the deposition of dentin along the inner aspect of HERS.

Break in HERS- Allowing the newly formed dentine to come in direct contact with connective tissue of the dental follicle.

Differentiate into cementoblasts.



Ultrastructurally-

- Degeneration or loss of its basal lamina.
- Appearance of collagen fibrils and cementoblasts

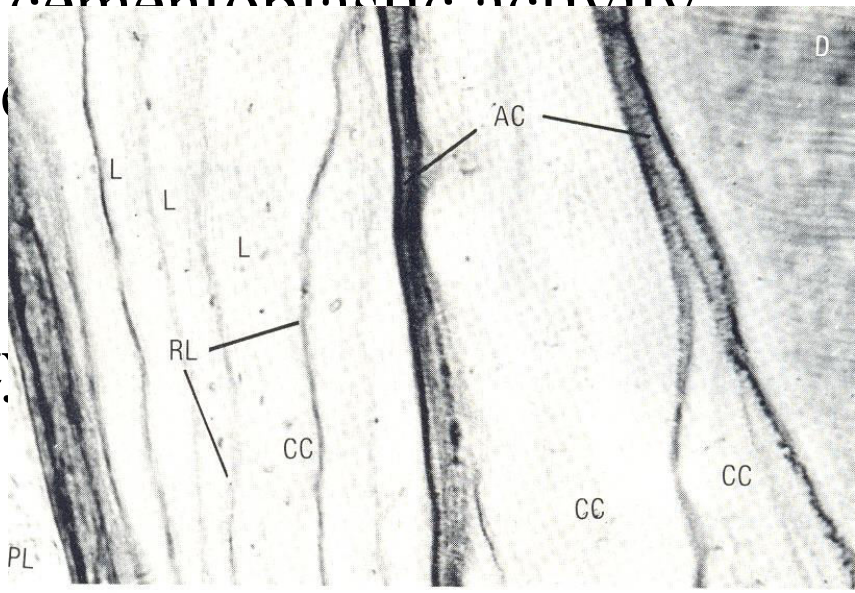
Growth Pattern

- Incremental lines – Cementogenesis proceeds continuously with cyclic activity outward into the PDL resulting in successive layers of cementum.
- Cyclic activity is registered as imbrications or **Incremental lines of Salter.**
- Appear as narrow lines which follow contour of the root.

- The fine lines represent periods between cementogenic activity.
- In acellular cementum lines tend to be even closer together and thin.
- In cellular cementum lines are farther apart thicker and more irregular.

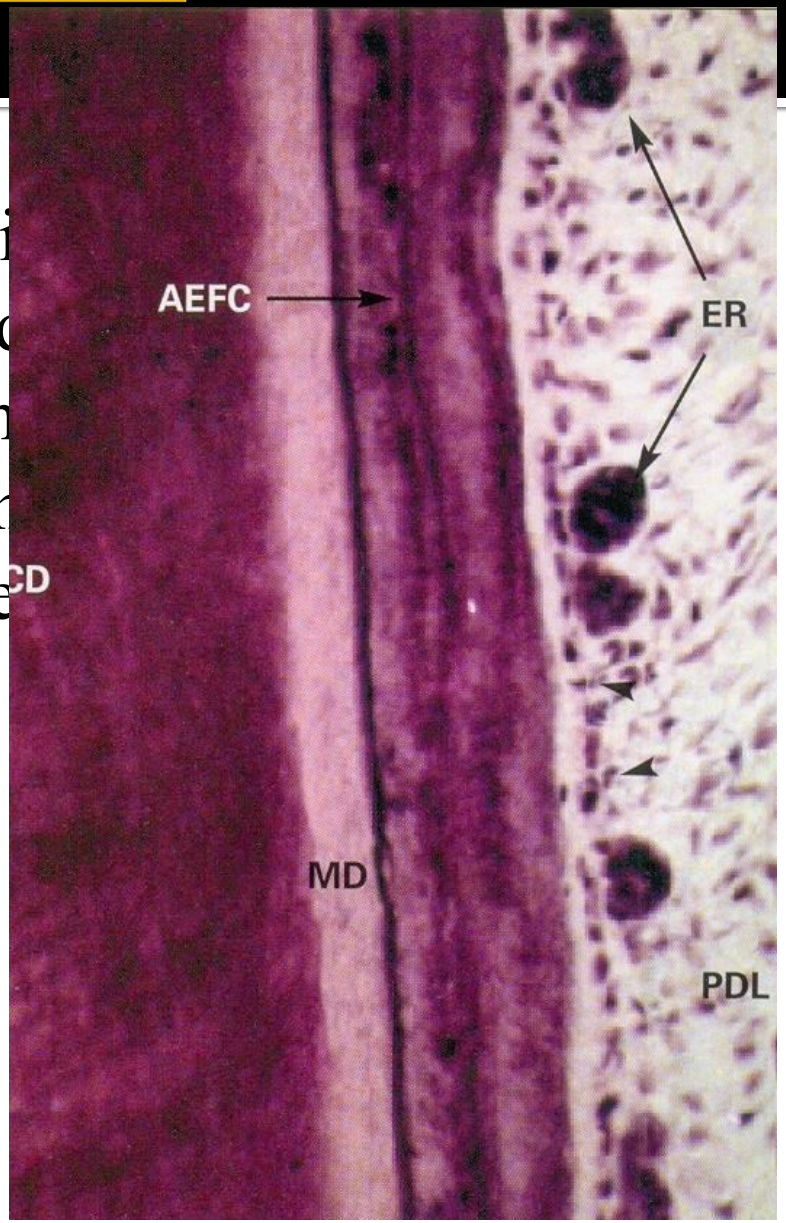
Lamellae

- Cementum responds only by cementoblastic activity in which new functional ceme the less vital cementum.
- Successive layers are termed
- Width depends on the severit

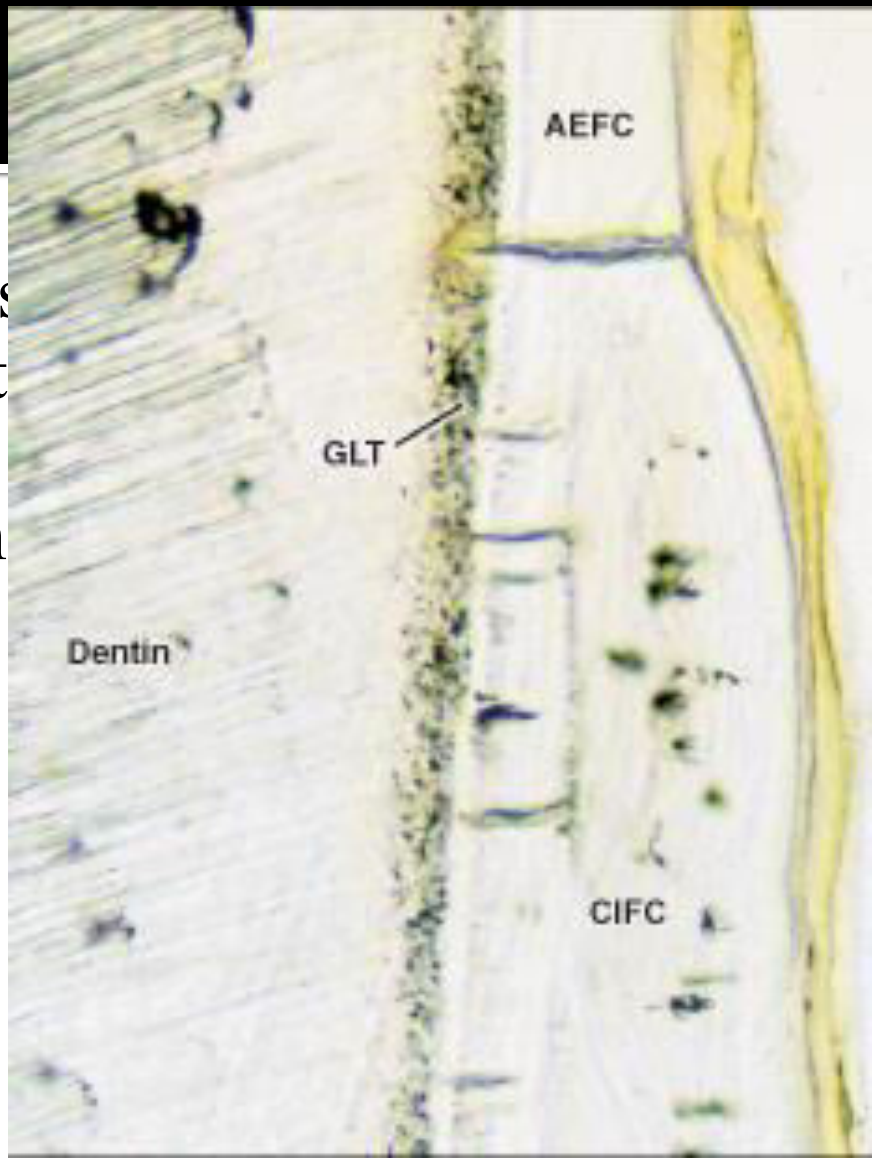


CEMENTODENTINAL JUNCTION

- Interface is smooth & straight i
  the primary it may be scalloped
- Cellular cemental fibers interm
  dentin than acellular cementum
- Intermediate layer exists betwe
  dentin…..

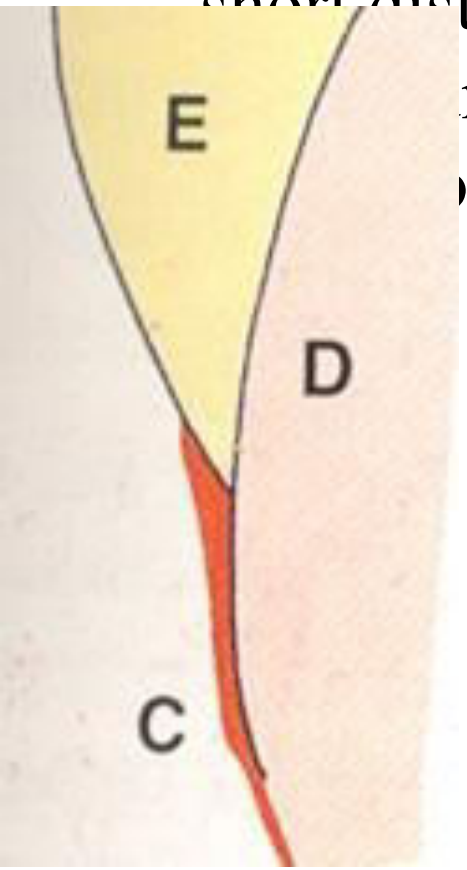


- Appears hyaline (structureles
- Seen in apical 2/3rd of post. t
- Layer involved in anchoring
- Clinical significance – regen following PDL surgery



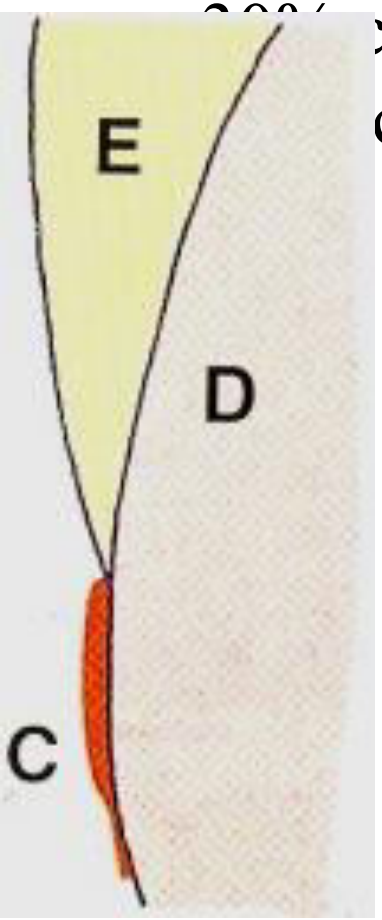
Cementoenamel junction

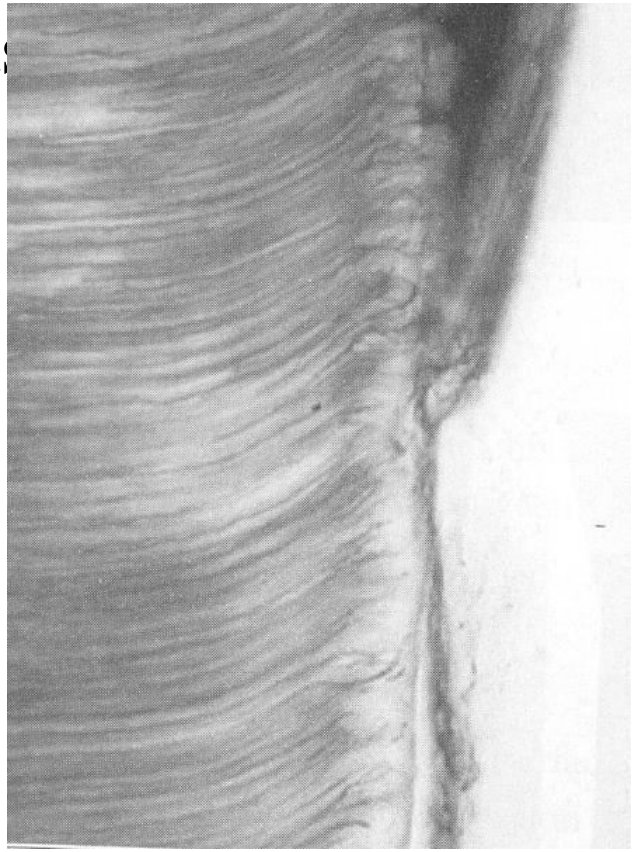
- Pattern I - Where cementum overlaps enamel for short distance. 60% of cases Seen when enamel m degenerate
  blasts lay dov



CEJ..

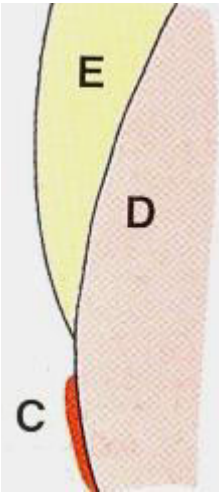
- Pattern II - Cementum & enamel meet at butt joint.
  - 30% cases.
  - common in deciduous





CEJ..

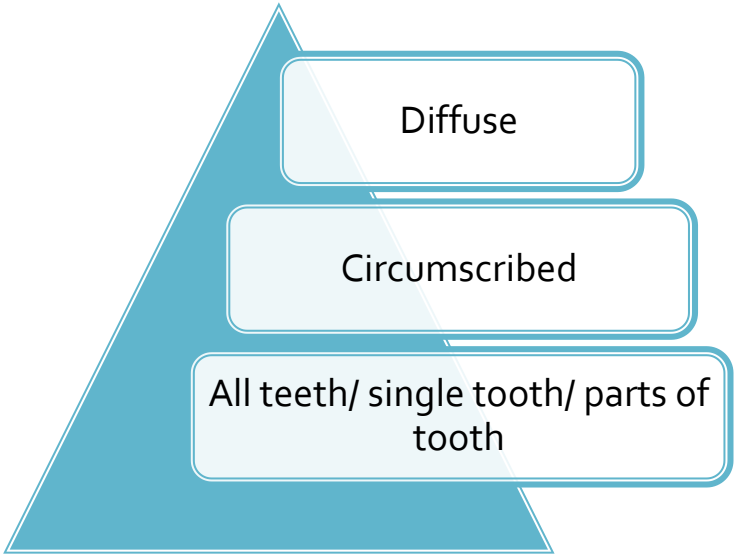
- Pattern III
  - cementum & enamel fail to meet each other. Dentin is exposed in between
  - 10% cases



Differences can be noted from repair tissue & normal

- Degree of mineralization is less , its crystals are smaller & calcific globules are present, suggest that mineralization does not progress evenly
- These differences may be related to the speed of formation of the repair tissue
- If repair is slow repair tissue cannot be distinguished from normal whereas if repair is fast it can be distinguished

- Hypercementosis –



- Hypercementosis – localised hypertrophy – spur / prong like extensions in teeth with heavy occlusal load – better anchorage.
- Localised hypercementosis – teeth with enamel drops.
- Also occurs around chr. periapical inflammation, non functional teeth (reduction of Sharpey's fibers).

Resorption & repair

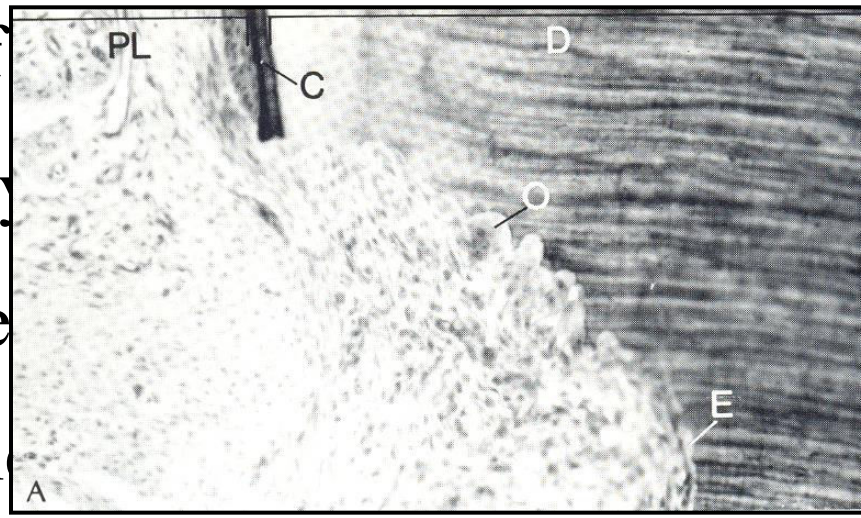
- Cementum responds to adaptational stimuli by apposition
- With same pressure exerted cementum shows less susceptibility to resorption than bone but with microtrauma localised areas of resorption do occur.
- Responsive path taken depends on the severity of stimulus

- Cementum dissolution is characterized by surface concavities (Howship's lacunae) with or without cementoclasts

- Injury to PDL affects the cementoblasts which may resorb superficial cementum

- Conditions producing resorption are
- Excessive trauma may be due to extra masticatory forces
- Excessive pressure due to orthodontic treatment
- Disease (cysts, infection, tumors)

- Howship's lacuna are formed which represent eroded concavities upon cessation of
- Newly formed cementum may depending upon the rate of ce
- Reversal line may separate th normal

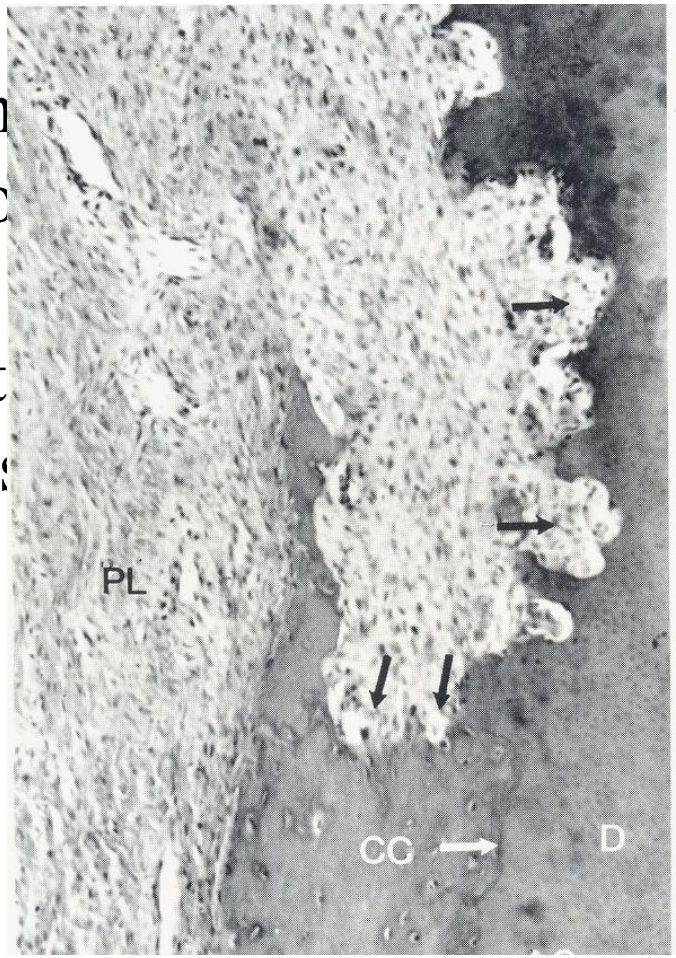


- Differences can be noted from repair tissue & normal
- Reparative cementum - 15µm
- Precementum – 5-10µm
- Degree of mineralization is less , its crystals are smaller & calcific globules are present suggest that mineralization does not progress evenly

- These differences may be related to the speed of formation of the repair tissue
- If repair is slow repair tissue cannot be distinguished from normal whereas if repair is fast it can be distinguished

Anatomic Repair

- In most cases of repair there is a ten
  reestablish the former outline of roc
  known as ***Anatomic Repair***
- If thin layer of cementum is deposit
  of deep resorption the root outline i
  & a bay like recess remains



Functional repair

- In such areas sometimes the P
  its normal width by formation
  that a proper functional relatic
- The outline of the alveolar b
  follows that of the root surfac
- This type of repair is known a

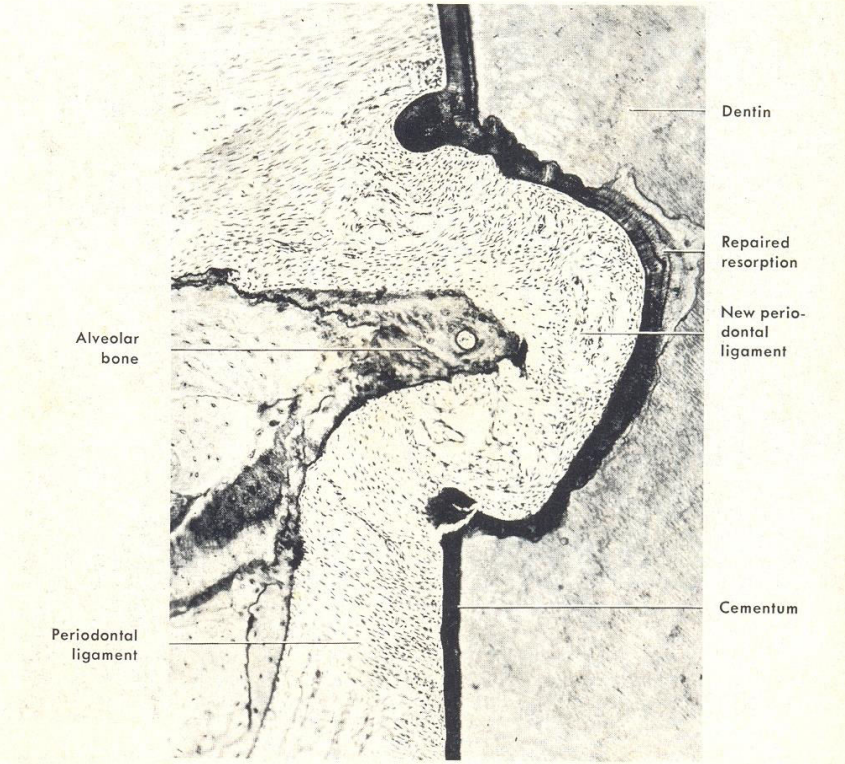
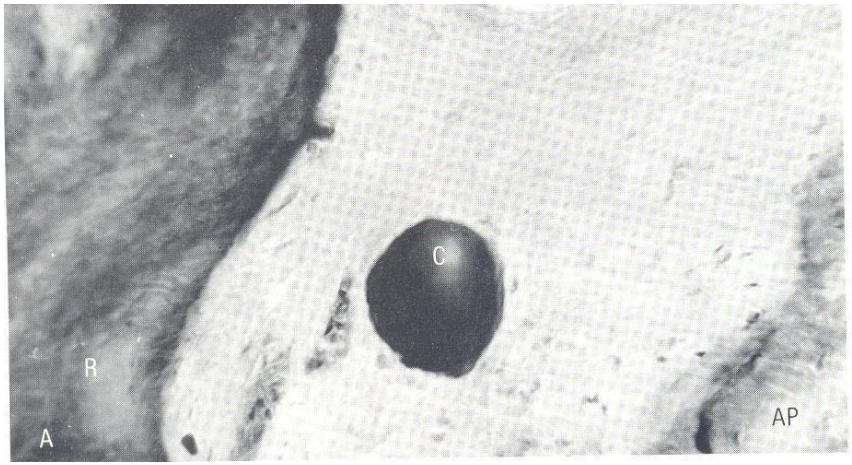


Fig. 6-24. Functional repair of cementum resorption by bone apposition. Normal width of periodonta ligament reestablished.

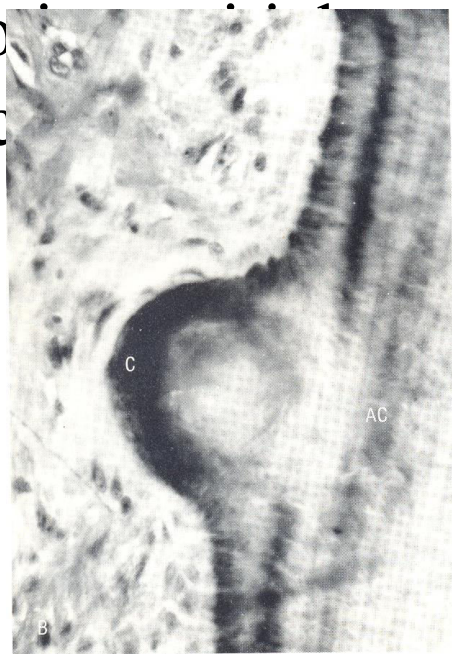
Cementicles

- They are small, globular masses of cementum found in approx. 35% of human roots in PDL ligament
- May result when extra stress on sharpeys fibers causes a tear in cementum from microtrauma
- Nidus for calcification –moribund or dead cells associated with cell rests of malassez, mineralized sharpeys fibers & phleboliths.

- The continued growth of the numerous situated cementicles fuse with the cementum



- The adherent cementicles may develop into
cementicles as further development of the c
envelops them.



Cementosis (Hypercementosis, cementum Hypertrophy, cementum Hyperplasia)

- Hypercementosis –abnormal thickening of cementum
- May be diffused or circumscribed
- May affect all or a single tooth
- Thickness increases in between 16-70 yrs of life

- If the overgrowth improves the functional qualities of the cementum it is termed as cementum hypertrophy
- If overgrowth occurs in non functional teeth or not associated with increased function it is kn/s hyperplasia

- Limited hypercementosis occurs as
  radiate from root obliquley ,directe
- Principal fibers are inserted over th
- These increase the surface area & r
  toot stability

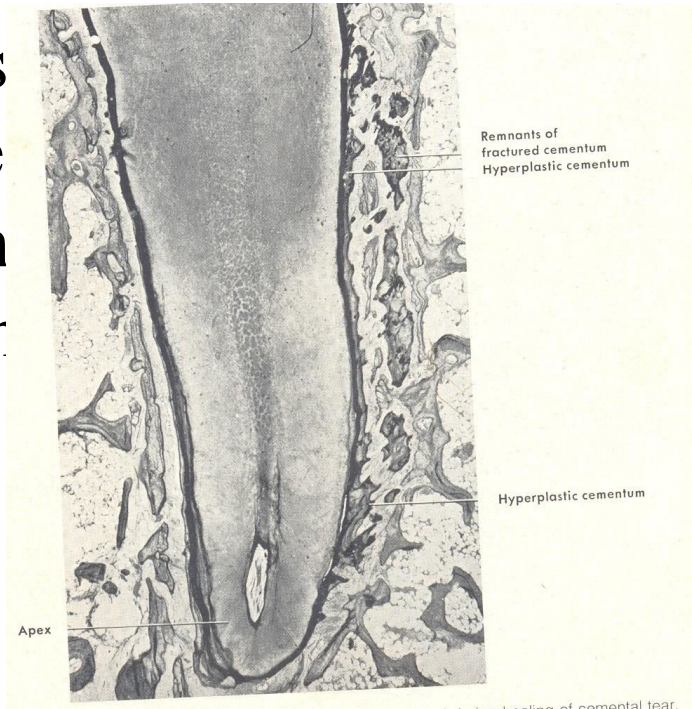
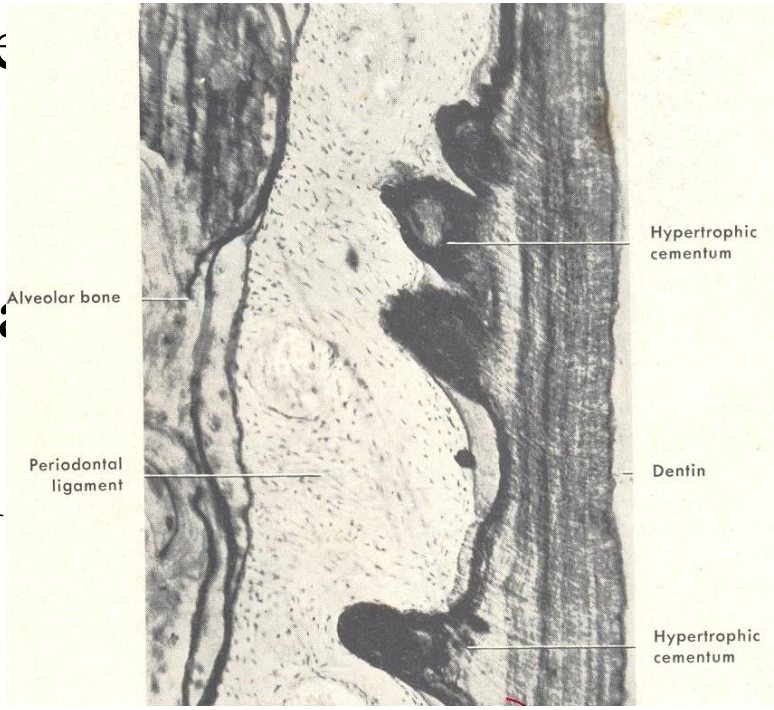


Fig. 6-22. Extensive spikelike hyperplasia of cementum formed during healing of cemental tear.

- Localised hypercementosis some areas on enamel drops
- Irregular or calcifying epithelial of round bodies are found in loca hyperplastic cementum
- Such projections are kn/s excem



- Extensive hyperplasia is also assoc
periapical inflammation which is c
surrounds the root like a cuff
- Hyperplasia of cementum in non fi
characterized by reduction in no. o
embedded in the root

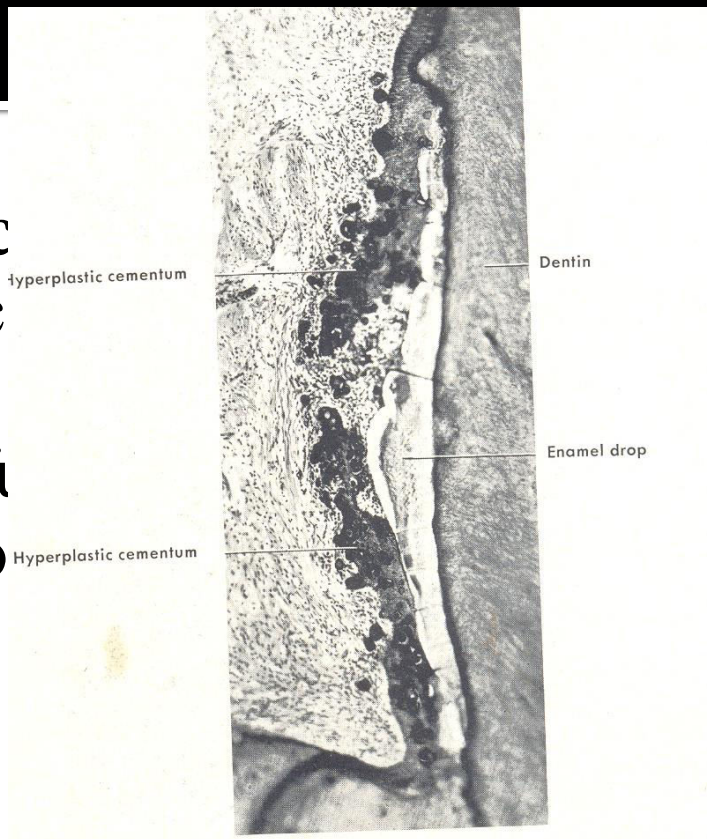


Fig. 6-20. Irregular hyperplasia of cementum on surface of enamel drop.

Clinical consideration

- As cementum is more resistant to resorption than bone tooth movement is made possible orthodontically.
- If teeth are subjected to severe blow cemental tears occur. If minor trauma cemental repair occurs (eg. Transverse fractures)
- Extraction becomes difficult in hypercementosis

Clinical consideration..

- In PDL pockets pathologically exposed cementum becomes hypermineralised because of the incorporation of calcium, phosphorous & fluoride from the oral environment

- Cementum is not only deposited over the apex but also for the short distance (usually 0.5-1.5mm) from the anatomical apex this results in narrowing of the canal at this point in clinical procedure in RCT cleansing should be extended to till this point

- At ultrastructural level there is loss or decrease in the cross striations of collagen near the surface
- Alteration in exposed cementum interferes during healing of periodontal therapy
- Principle function – assisting anchorage of the tooth

CONTENTS

- Functions of cementum
- Acellular Cementum (G.S.-10x)
- Cellular Cementum (G.S.-10x)
- Sharpey's fibres (G.S.-10x)

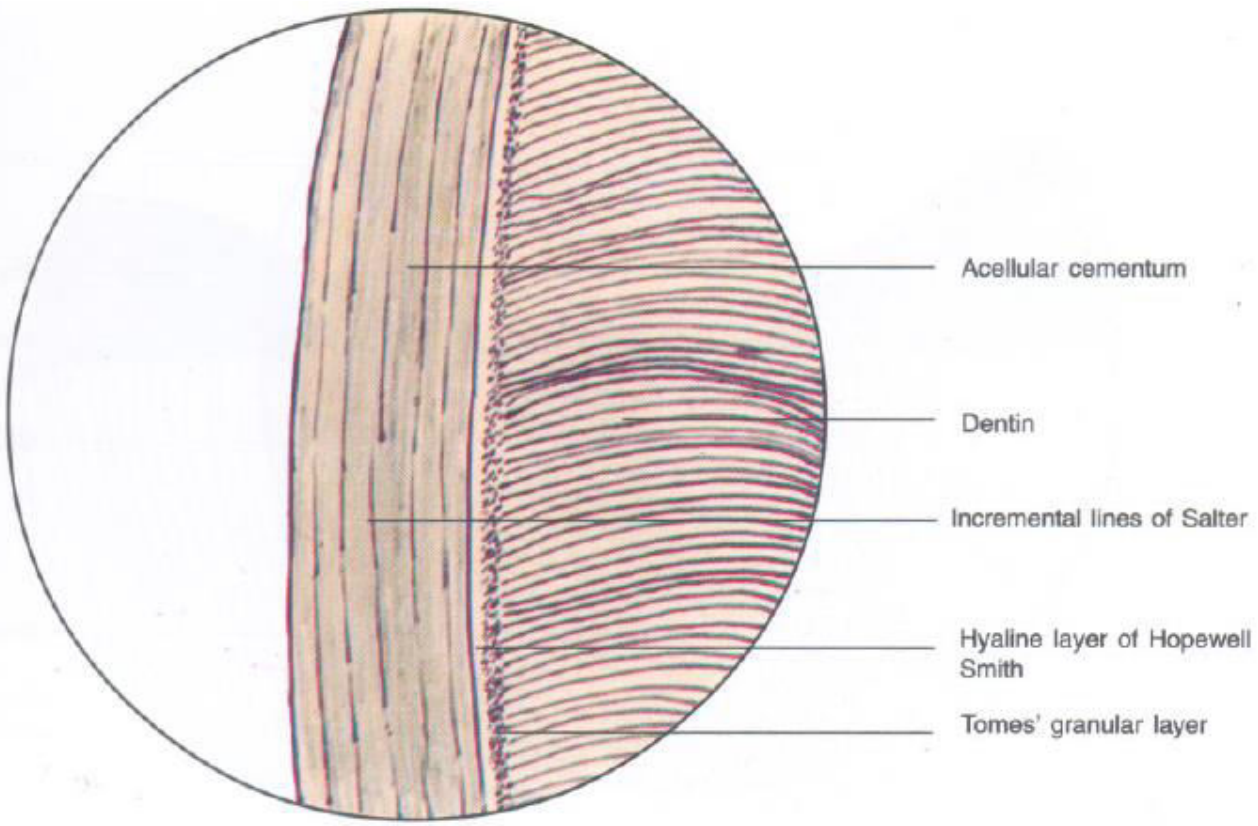
Functions of cementum

- Anchorage
- Apical cementogenesis to maintain occlusal functional relationship thereby compensating for attrition of enamel tips & edges

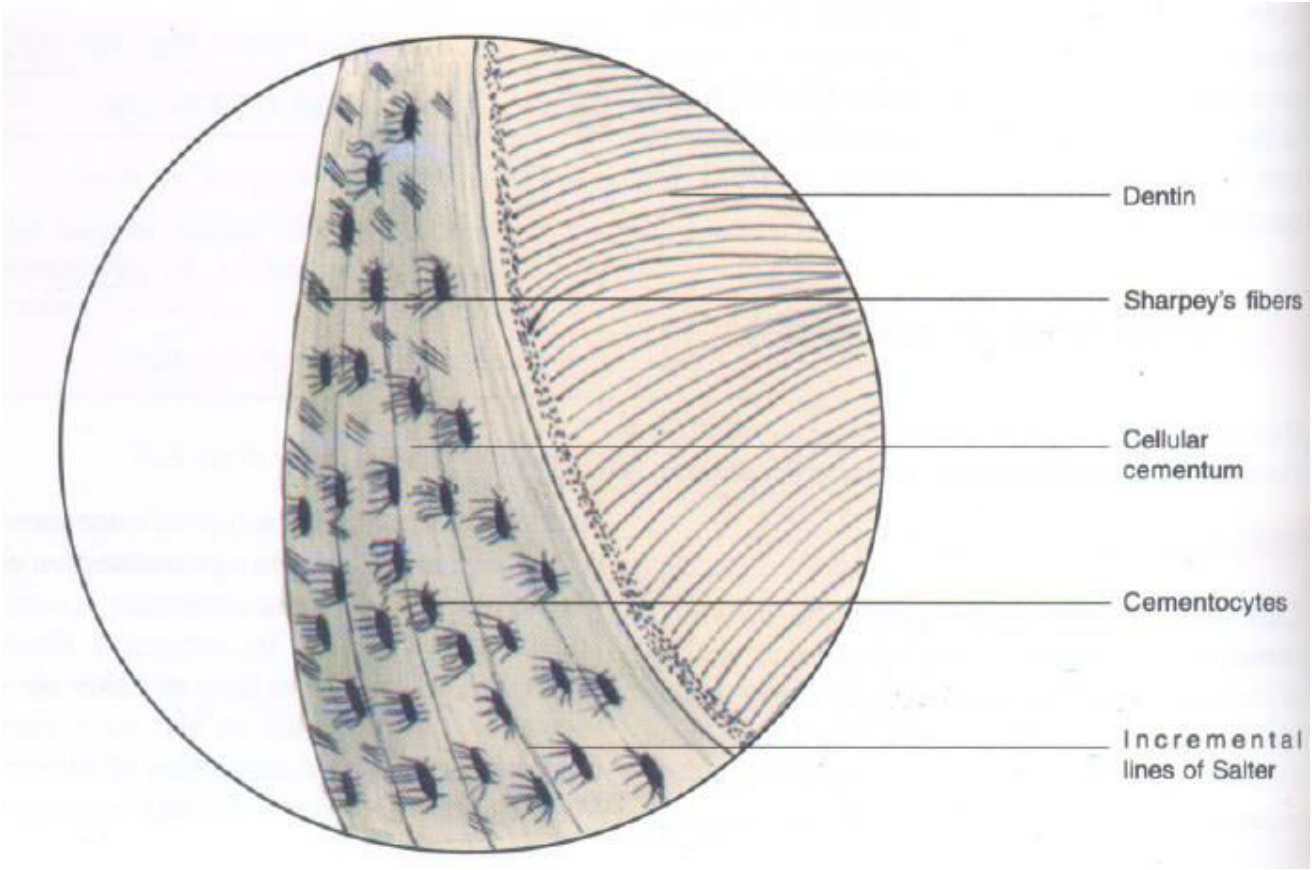
- Provides fiber reattachment & relocation due to mesial & occlusal shifting of teeth by deposition of new layer of cementum.
- Maintenance of width of PDL

- Other functions include assisting in
  - Repairing roots (horizontal fractures)
  - Walling-in filled canals
  - Sealing of necrotic pulps by occluding the apical foramen
  - Protecting underlying dentin
  - Modifying the affect of bone resorption
  - Effecting bone formation

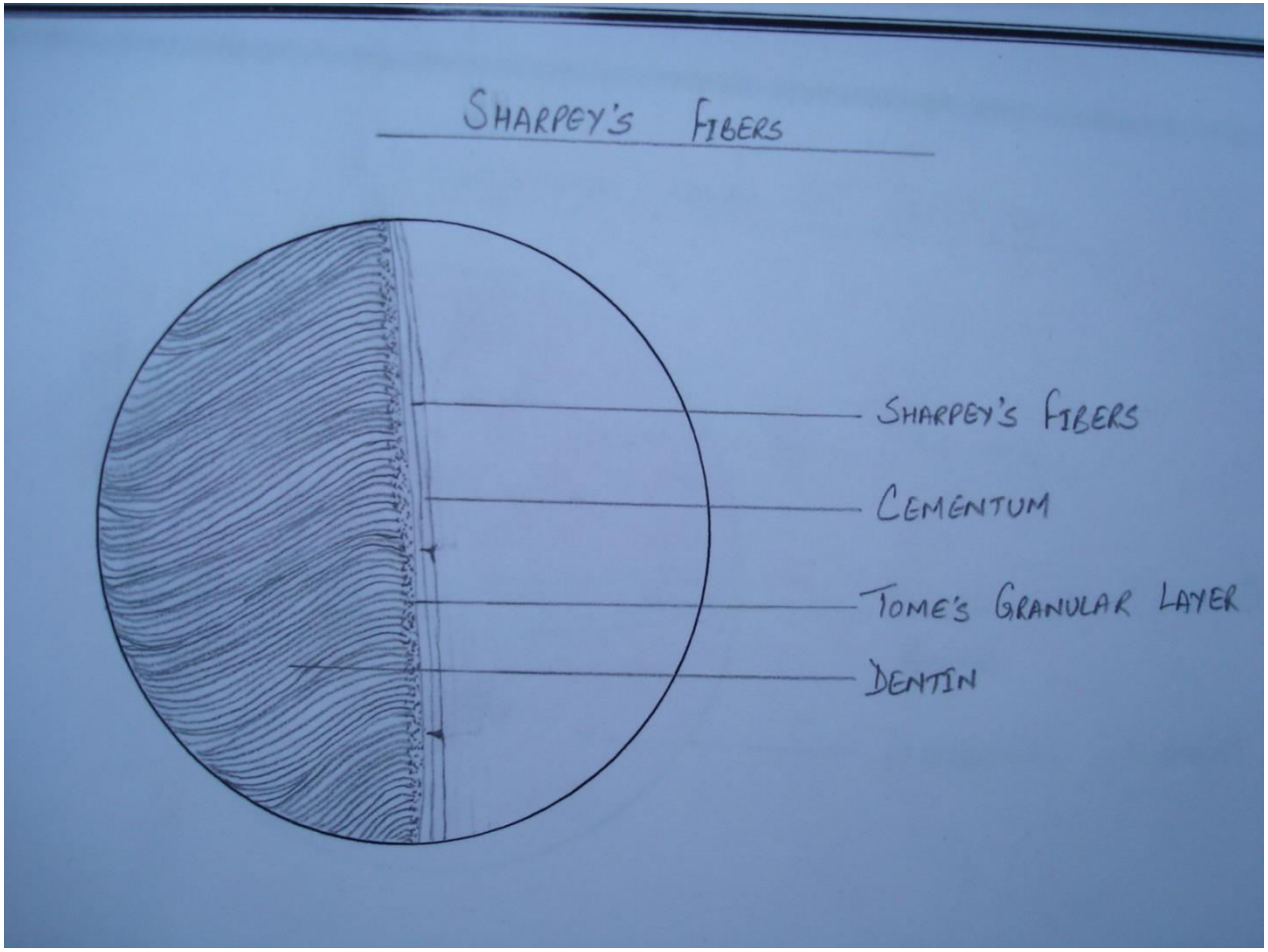
Acellular Cementum (G.S.-10x)



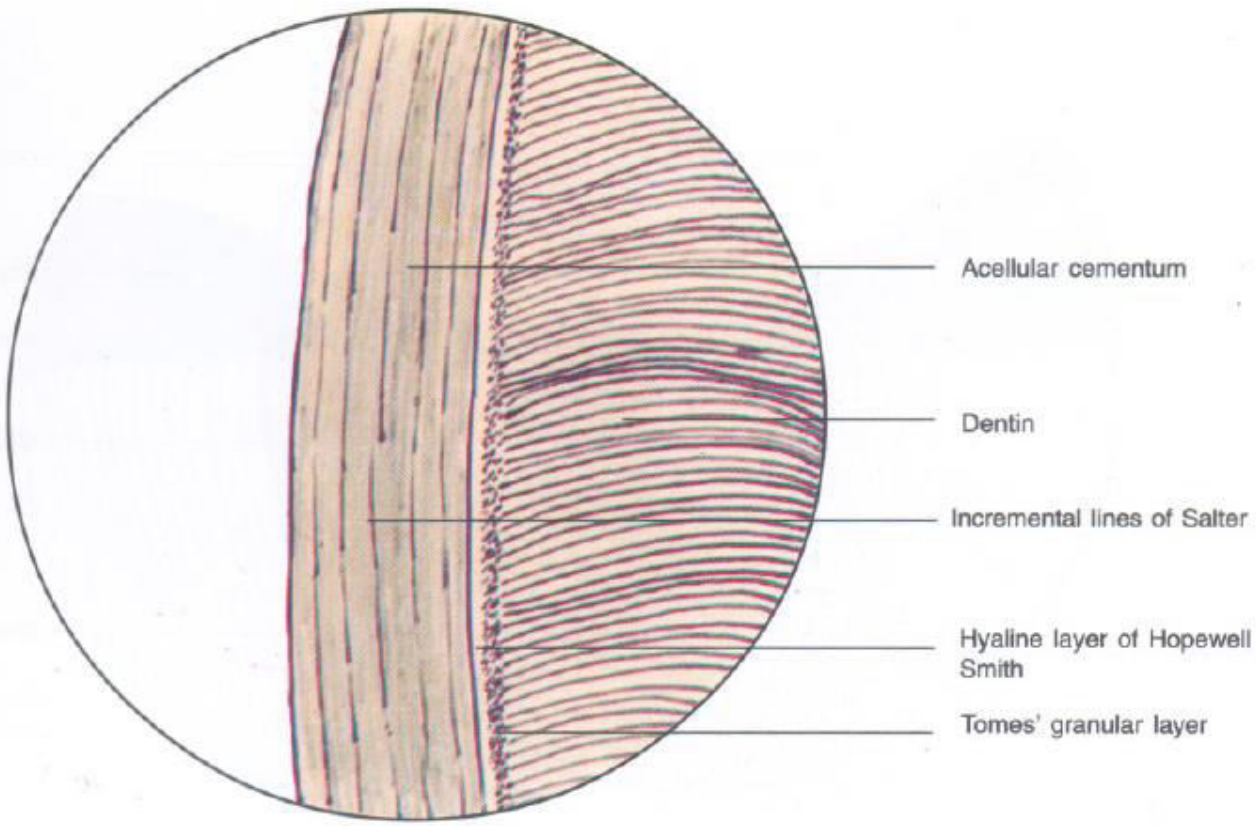
Cellular Cementum (G.S.-10x)



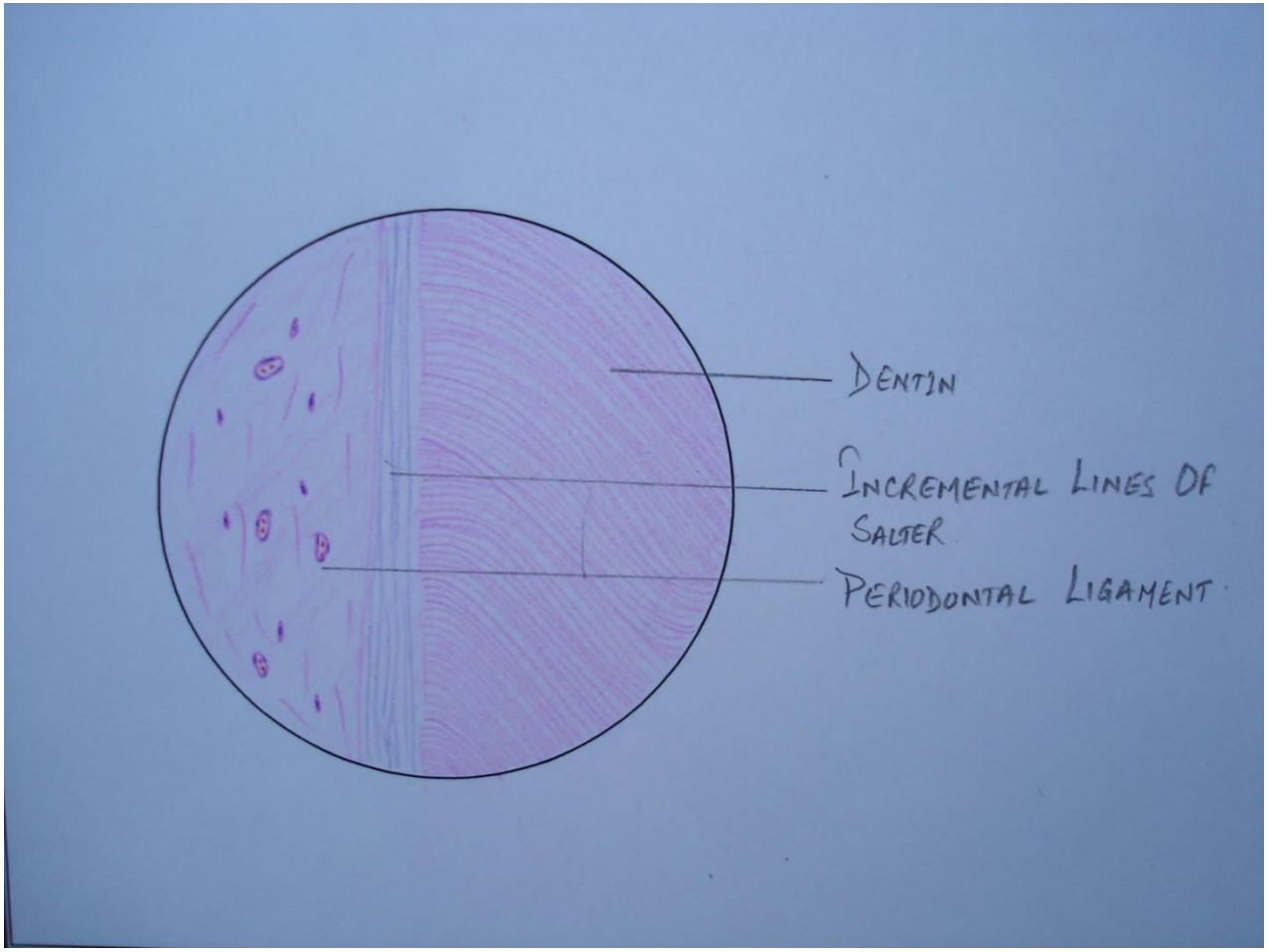
Sharpey's fibres (G.S.-10x)



Incremental lines of Salter (G.S.-10x)

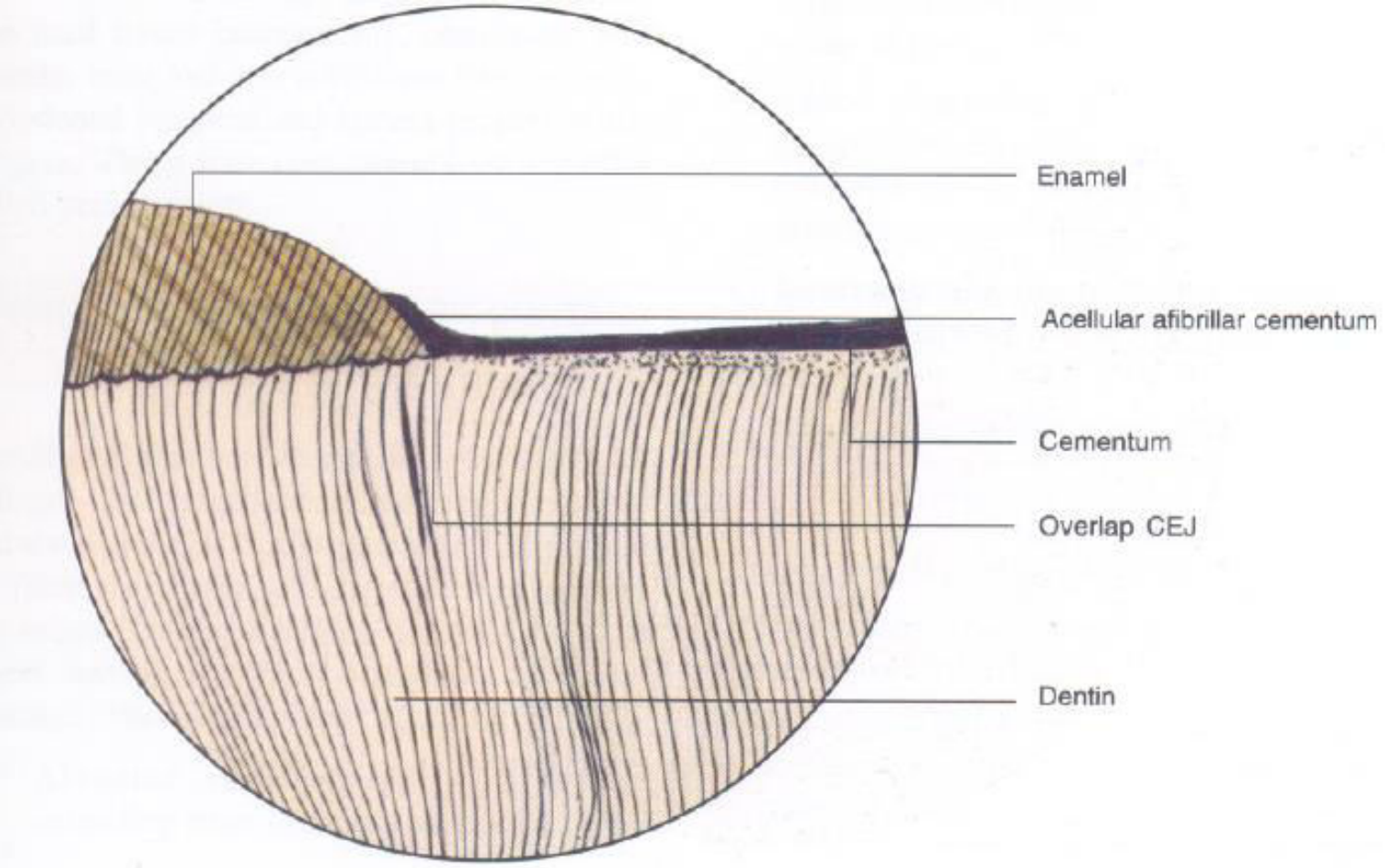


Incremental lines of Salter (D.S) (H&E-10x)



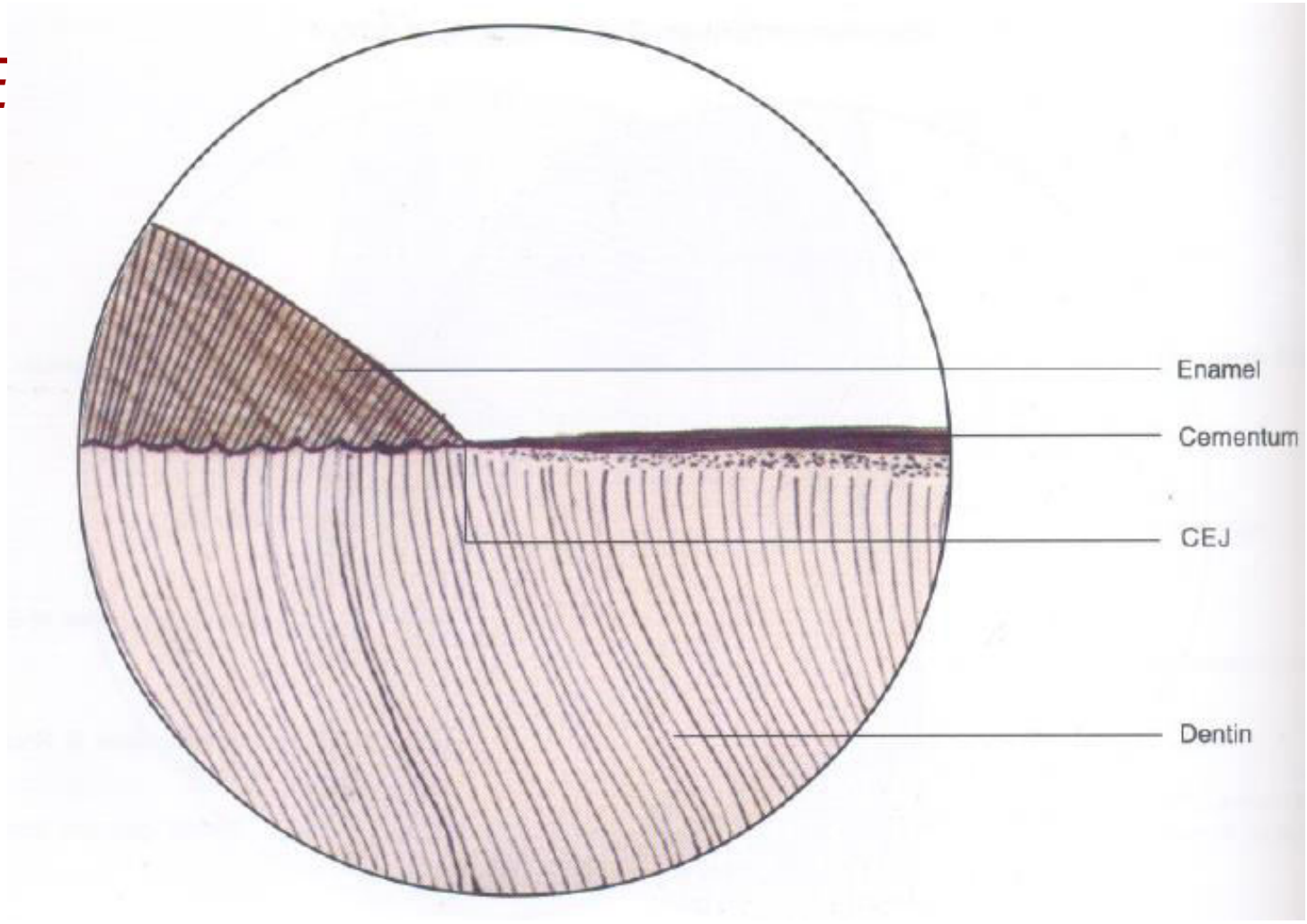
Cementoenamel Junction (G.S.-10x)

- C



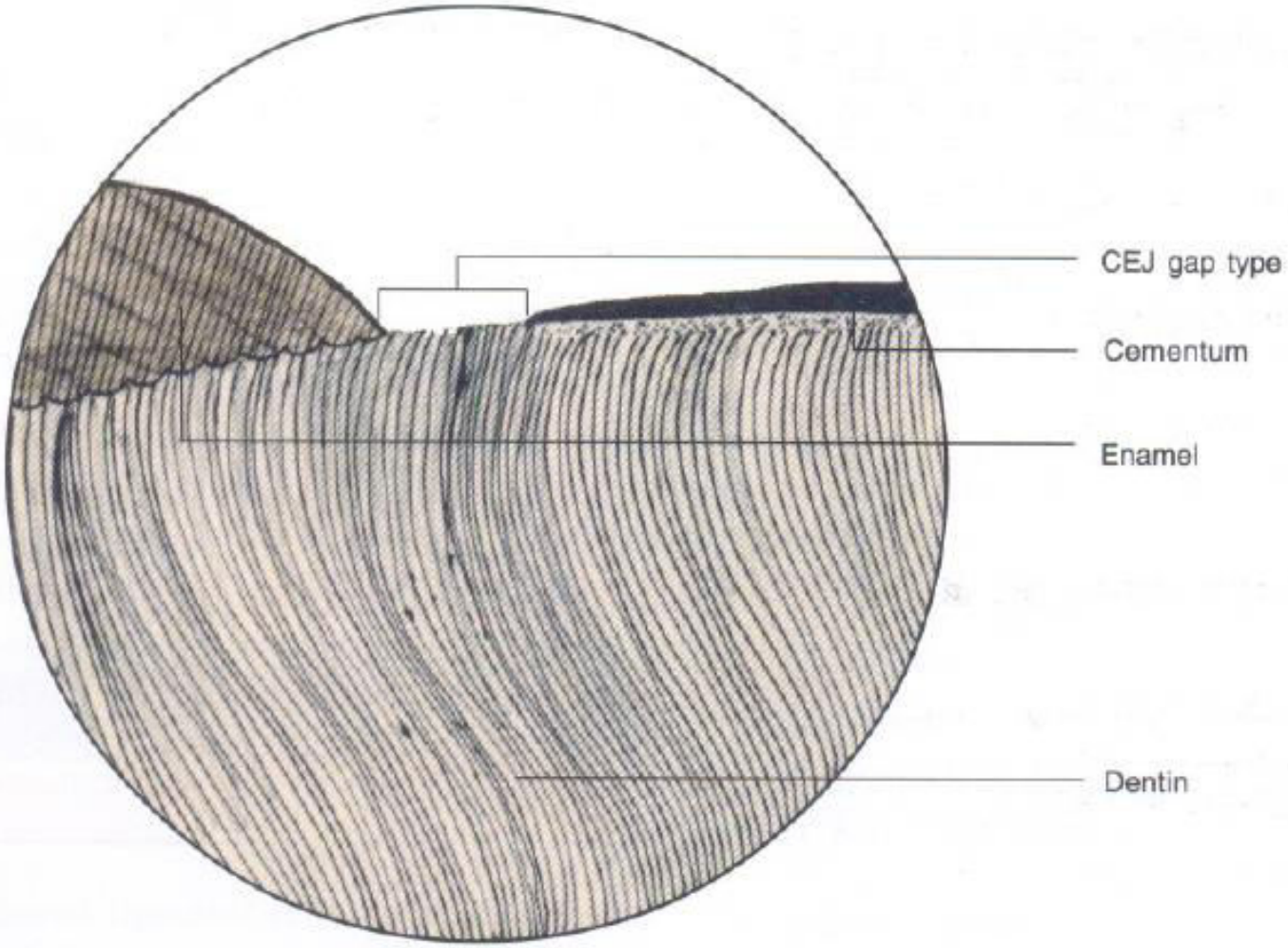
Cementoenamel Junction (G.S.-10x)

- *E*

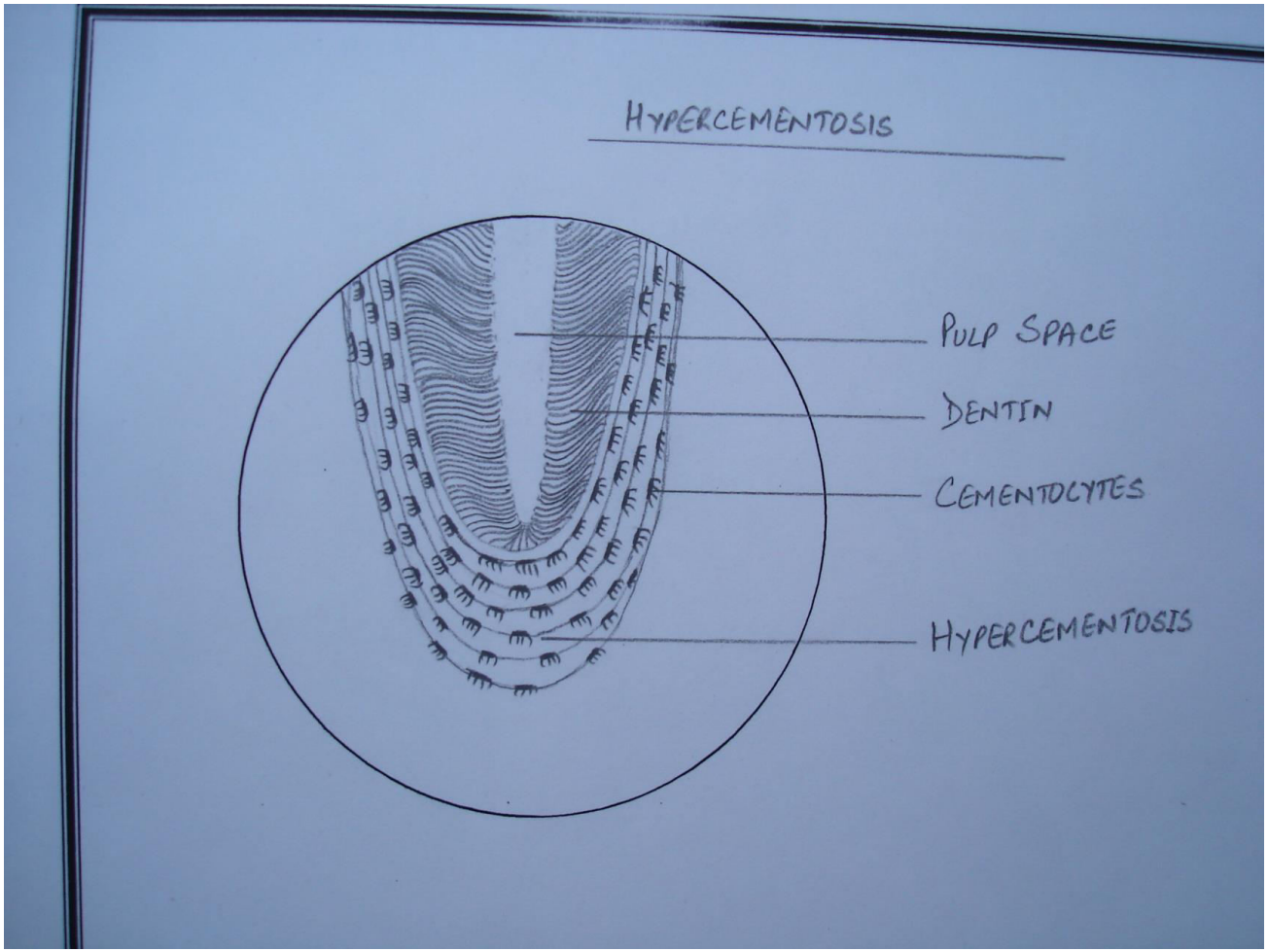


Cementoenamel Junction (G.S.-10x)

- (



Hypercementosis (G.S.-10x)



- Extends from CEJ to Apex of tooth …..
- Similar to bone except is avascular & uninnervated

Functions -

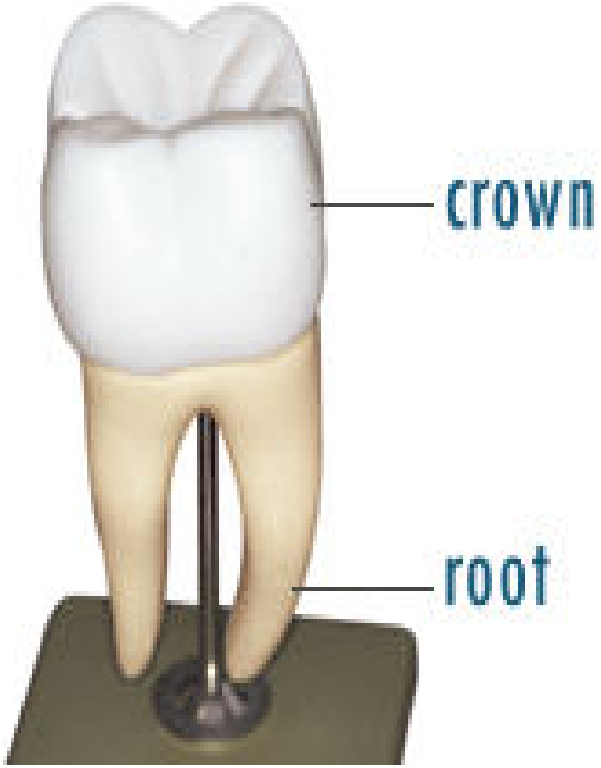
- Supports the tooth.
- Maintains the tooth in the functional position.
- Acts as a medium for attachment of tooth.
- Slowly formed throughout life.

Thickness – thinnest at CEJ – 20-50 μm

- 150-200 μm

Physical properties

- Colour - Pale yellow
- Permeability - more permeable than
- Softer than dentine, lighter in color t
- Distinguished from the enamel by la
  and its darker hue.
- Removed by abrasion



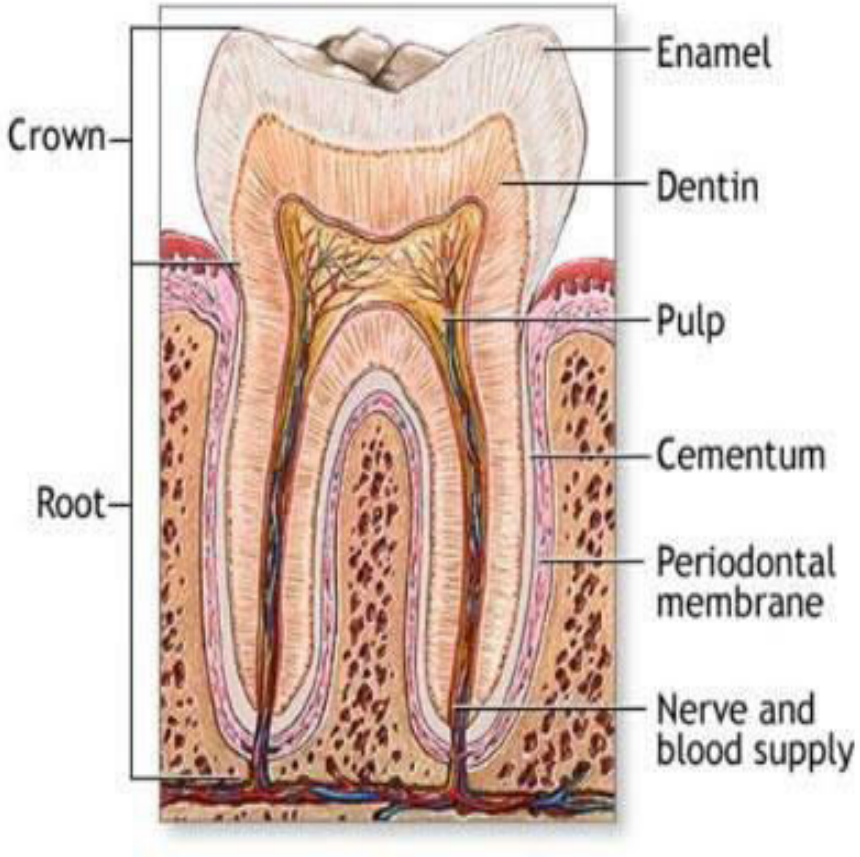
Chemical properties

- On dry weight basis

-45% - 50% inorganic
- 50% - 55% organic
-approx12% water

- By volume

-45% inorganic
-33% organic
-22% water



Inorganic component

- Principle- hydroxyapatite
  - thin & plate like
  - 55nm wide & 8nm thick
  - Length varies
- Calcium & Phosphate- dominant
- Trace amount-Cu, **Fluoride**, iron, Mg, potassium, Si, Na & Zn

Organic component

- Type I collagen 90%
- Type III collagen–during development, repair & regeneration.
- Type XII (fibril associated collagen) binds Type I & non collagenous proteins
- Type V & XIV – found in mature cementum

Noncollagenous proteins

- Alkaline phosphatase
- Bone sialoprotein
- Fibronectin
- Osteocalcin
- Osteonectin
- Osteopontin
- Proteoglycans
- Proteolipids
- Vitronectin
- Several growth factors

Chemical properties..

Bone Vs Cementum

- Degree of mineralization varies – Osteopontin
- Cementum derived attachment protein – unique to cementum
- Both have same proteoglycans,
- Similar growth factors in the matrix.
- Osteoprotegerin in cementum – prevents resorption

CELLS

- Cementoblasts
- Cementocytes

CEMENTOBLASTS

- Formed cementum lines the root surface interposed between PDL fibers
- Primary & secondary cementum are formed by different cementum forming cells
- Active cementoblasts-round plump cells with basophilic cytoplasm indicative of extensive RER & have open faced nuclei

- In EM show phagolysosomes suggest that these cells have role in remodelling of ligament
- Resting cementoblasts have a closed nucleus & little cytoplasm

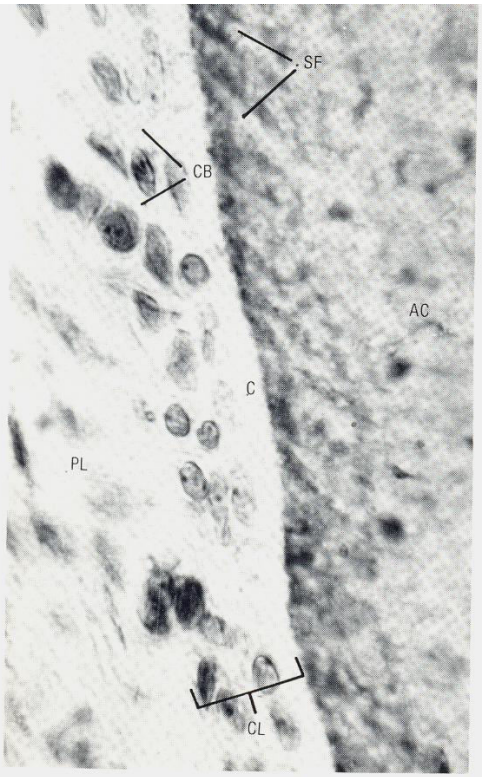
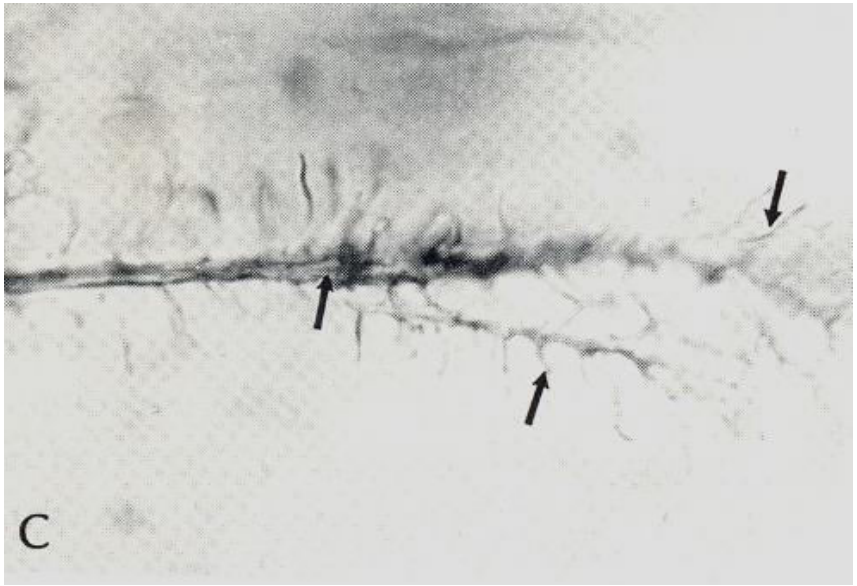


Fig. 8–4. Cementogenic layer of cementoblasts (CL) abutting a layer of acellular cementum (AC). The shape of the nucleus tends to indicate the shape of the cell. On this basis, it is noted that the cementoblasts range in shape from flat to cuboidal. Also labeled are Sharpey's fibers (SF), collagen bundles (CB), cementoid (C), and periodontal ligament (PL). Decalcified longitudinal section of a root region. (Hematoxylin and eosin stained; × 970.)

Cementocytes

- During formation of cellular cementum cementoblasts become trapped in lacunae within their own matrix kn/s cementocytes.
- During acellular cementum cementoblasts retreat & leave behind cementum matrix



- Golgi apparatus, ER & mitochondria similar quantitatively to osteocytes.
- From a single cell body 30 protoplasmic process may project
- May be 1µm dia in & 15µm length
- Spaces left - kn/s lacunae
- Channels which they possess kn/s canaliculi

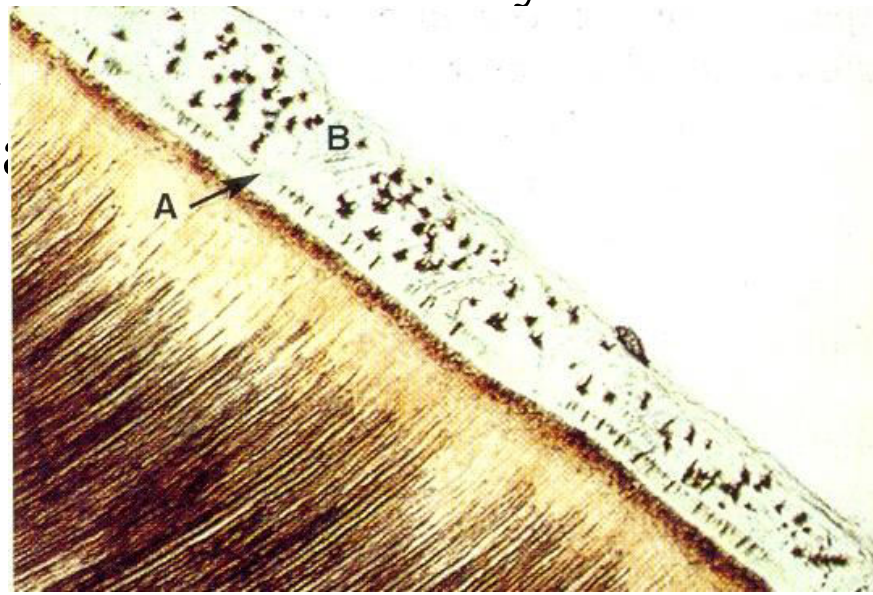
- Adjacent canaliculi often connected.
- Processes within them exhibit gap junction.
- In GS cellular contents are lost.
- In decalcified cellular contents are retained.

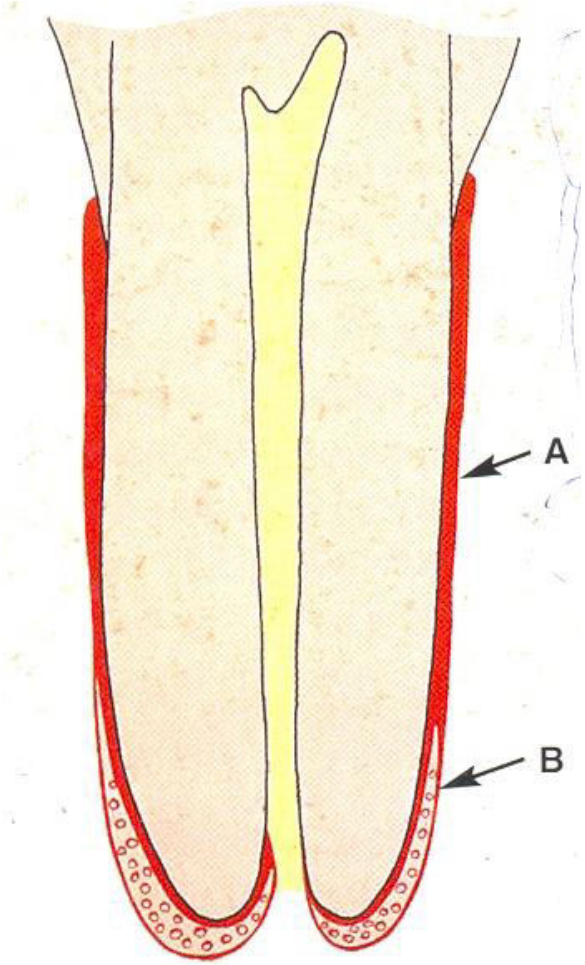
Classification

- Presence or absence of cells- cellular & acellular
- Nature & origin of organic matrix
- Presence or absence of cells & on the nature & origin of organic matrix

[I] Presence or absence of cells- cellular & acellular

- Cellular cementum- contains cells : cementocytes whereas acellular cementum
- Cellular variety overlies the




A
B

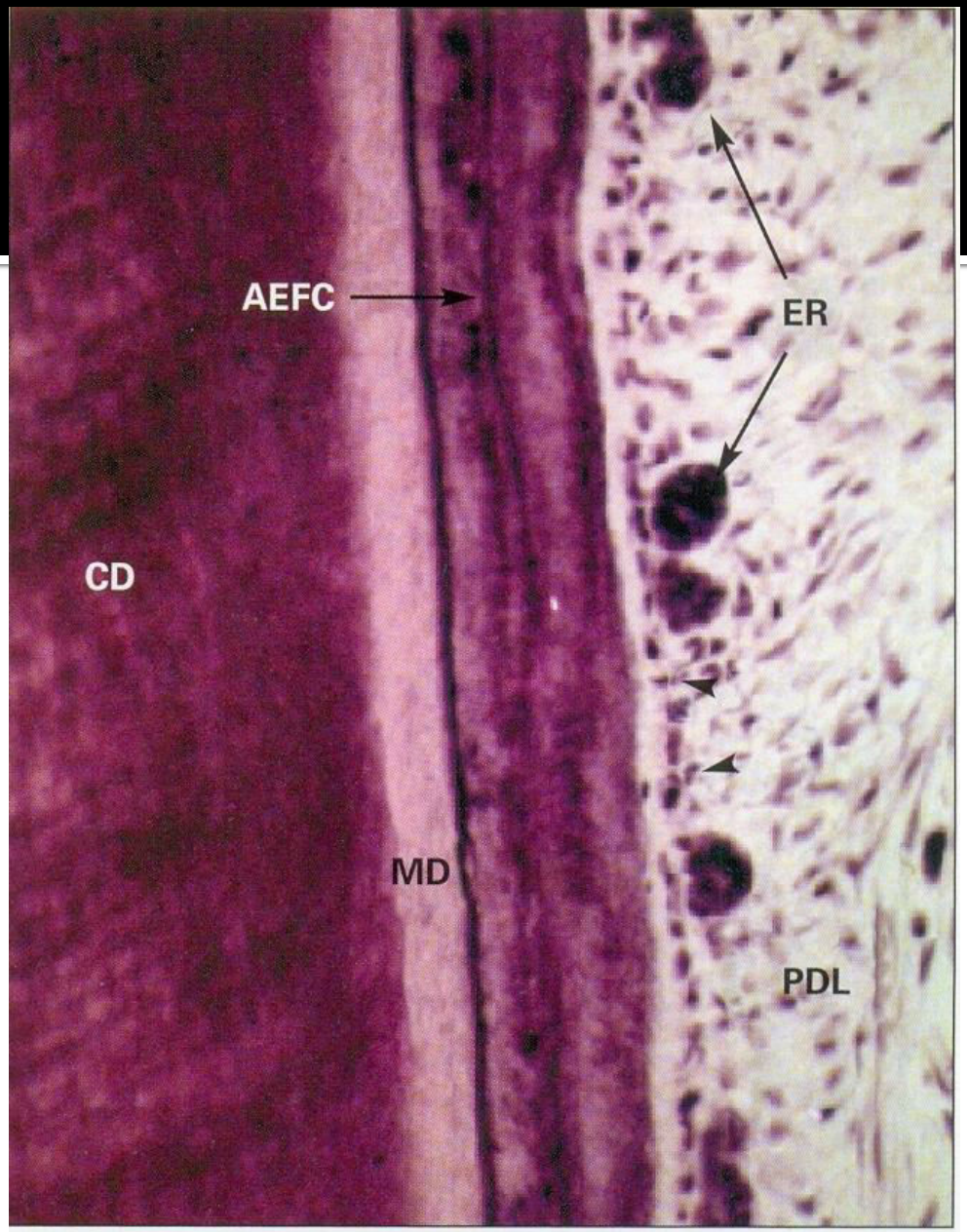
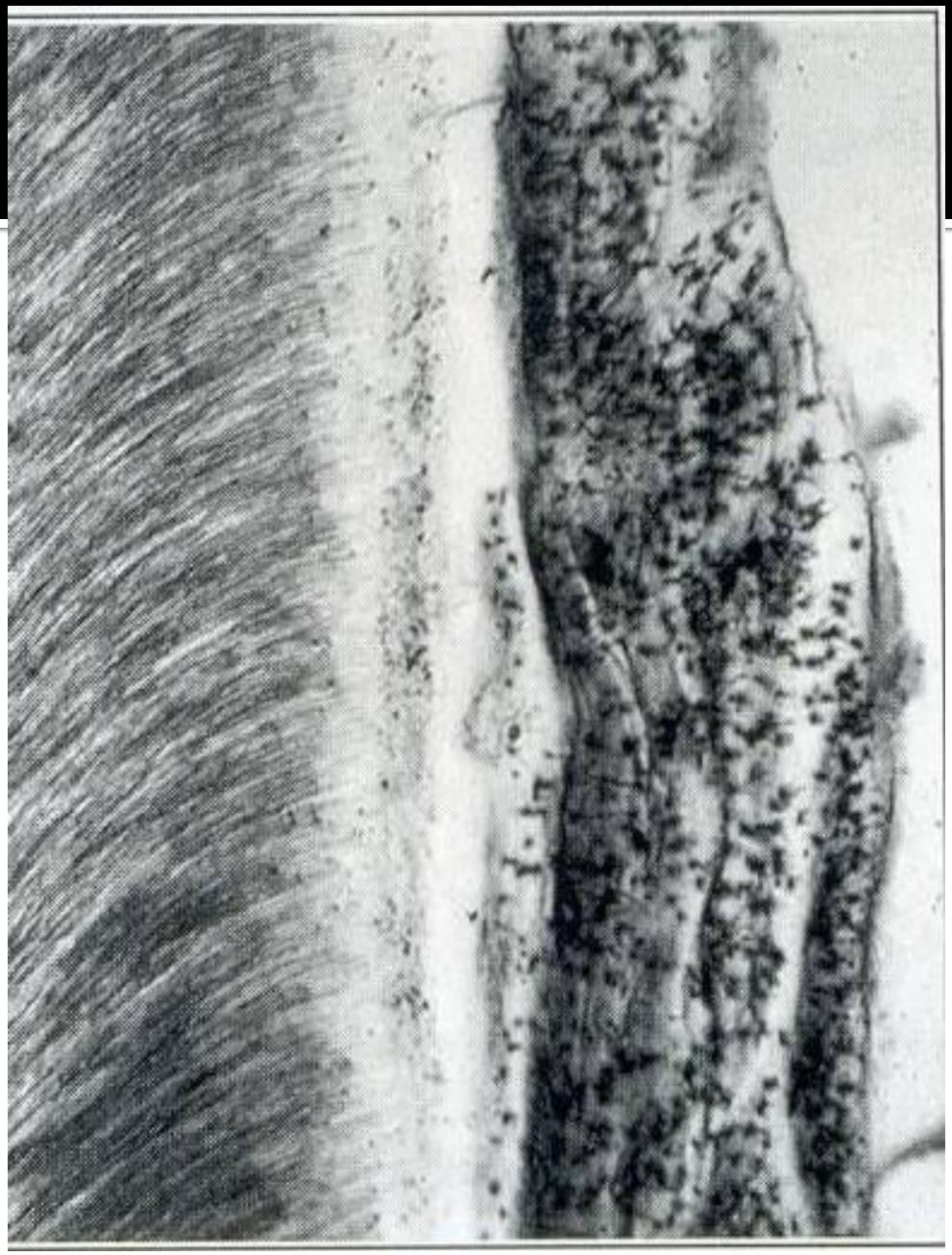
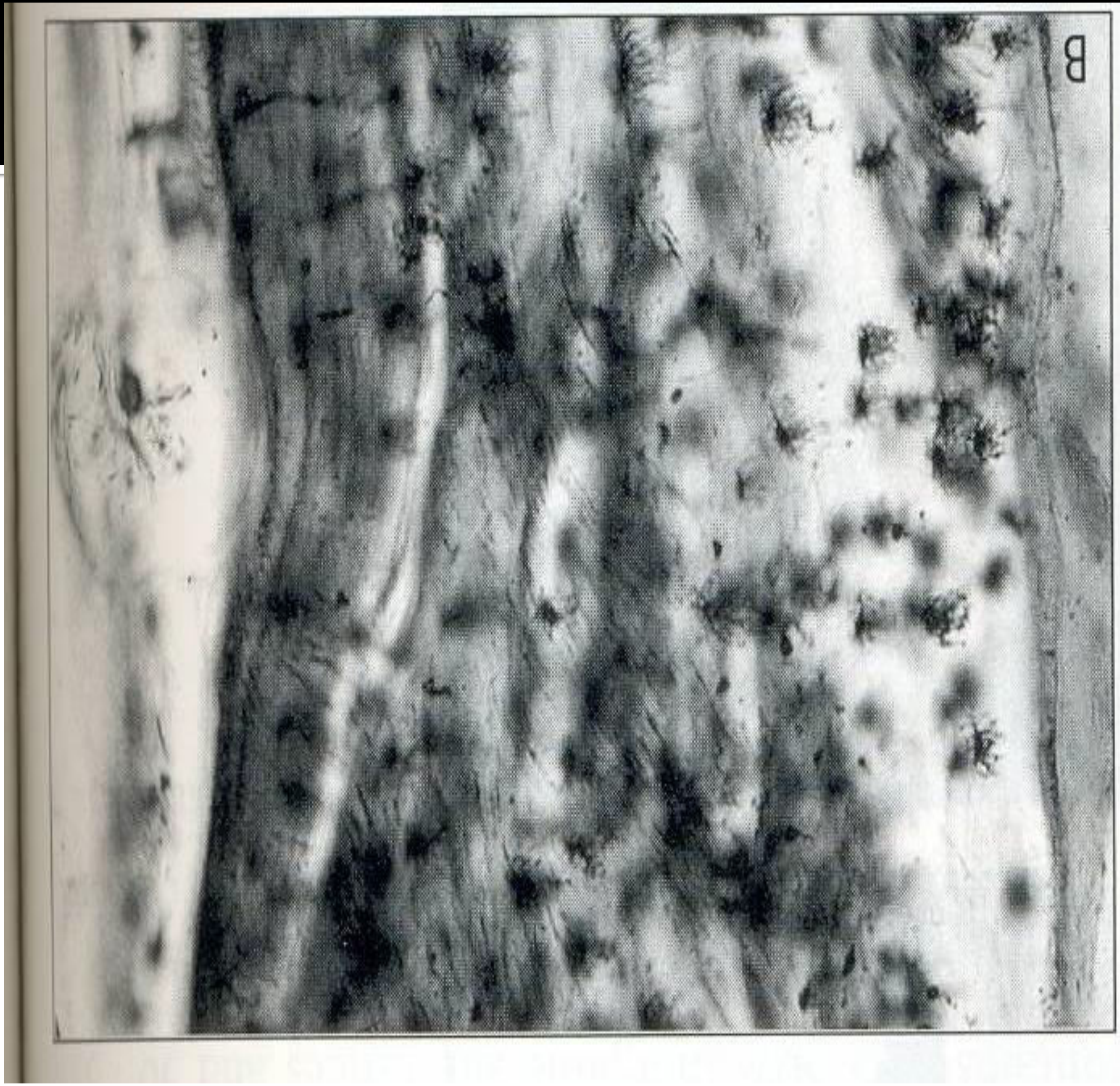


Fig 7-3 Histologic section depicting acellular extrinsic fiber cementum (AEFC) covering the mantle dentin (MD). Remnants




B

- Acellular -primary cementum
- Cellular-secondary cementum
- Cellular cementum-found apical region
- Acellular- structureless

Differences between acellular & cellular cementum

Acellular cementum	Cellular cementum
Present in cervical to apical areas	Restricted to more apical third & furcations of root
Thickness-less	Thickness-more
No cementocytes	Lacunae & canaliculi containing cementocytes & their processes

Precementum layer virtually absent	Precementum layer present
Has only extrinsic fibers from PDL	Has only intrinsic fibers from cementoblasts.
Border with dentin not clearly demarcated	Border with dentin clearly demarcated
Rate of development relatively slow	Rate of development relatively fast

Incremental lines close together	Incremental lines wide apart
Main function - anchorage	Main function – adaptation & repair
Cementoblasts from HERS	Cementoblasts from dental follicle
Do not express PTHR receptor	Express PTHR receptor

[II] Nature & origin of organic matrix

- Cementum derives organic matrix from
  - inserting Sharpeys fibers of the PDL
  - cementoblasts
- When derived from PDL Extrinsic fibers
- Sharpeys fibers continue into the cementum in same direction as principle fibers: perpendicular/oblique to the root surface

- When derived from cementoblasts kn/s Intrinsic fibers : parallel to the root surface & perpendicular to the extrinsic fibers.

- When both extrinsic & intrinsic fibers kn/s Mixed fiber cementum

Types of cementum

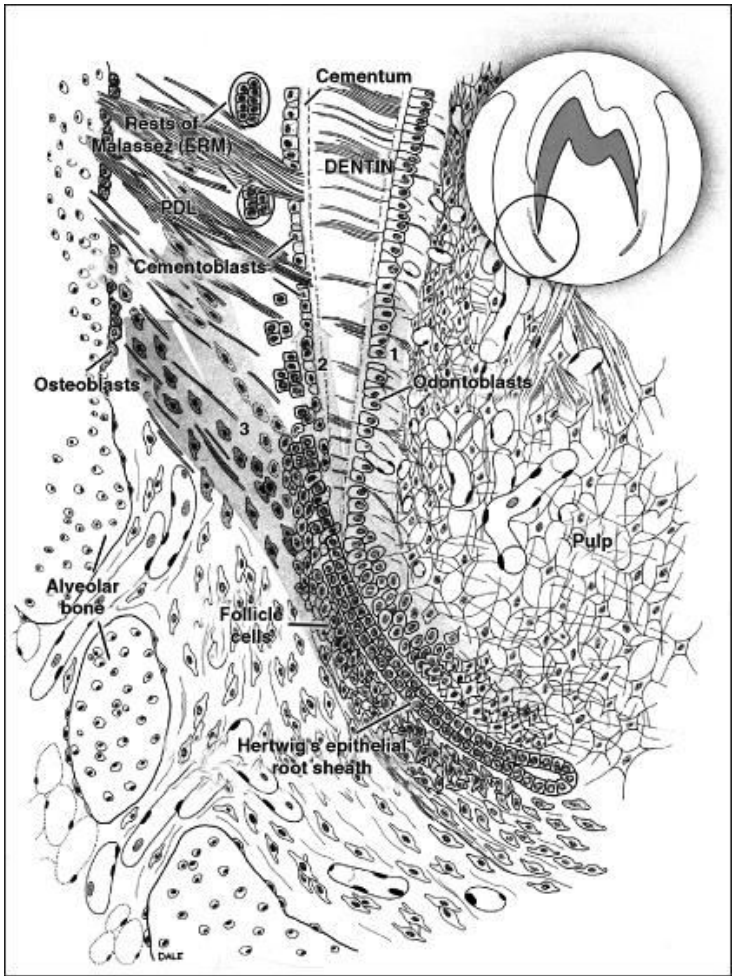
Type	Origin of fiber	Location	Function
Acellular (primary)	Extrinsic (some intrinsic fibers initially)	cervical margin to apical 3rd	anchorage
Cellular (secondary)	intrinsic	Middle to apical furcations	Adaptation & repair
Mixed (alternating layer of acellular & cellular)	Intrinsic & extrinsic	-apical portions -furcations	adaptation
Acellular afibrillar	-	Spurs & patches over enamel & dentin along CEJ	No known function

AEFC	CIFC
From cervical to apical third	Apical third to furcation
Formed earlier	Later & during repair
Non-coll proteins absent	Present
Growth factors TGF & IGF not seen	Present
Cementoid is usually absent	Seen on the surface
Extrinsic fibers from PDL	Only intrinsic fibers from

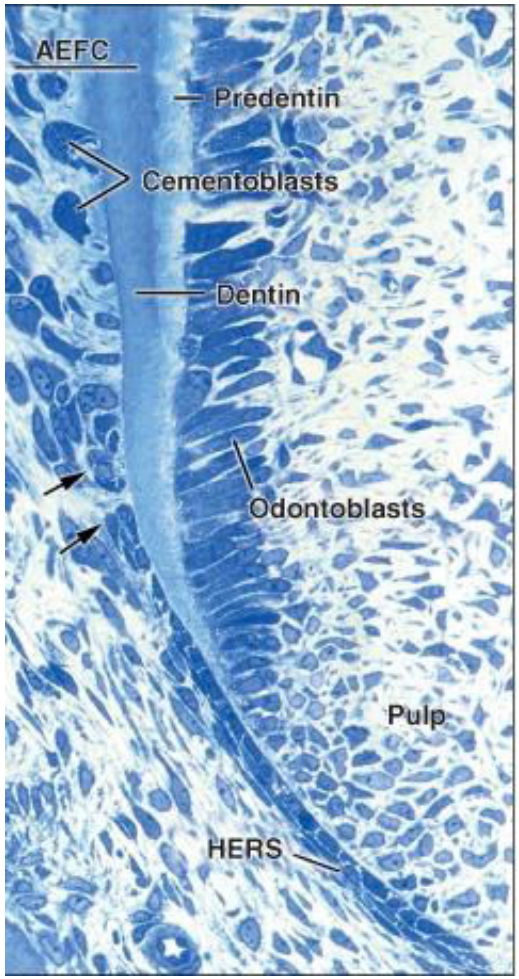
AEFC	CIFC
Only type of cementum in single rooted teeth	May be seen in single rooted teeth
Anchorage	Adaptation & repair.
Slow formation	Rapid formation
Closer incremental lines	Farther apart incremental lines
No cementocytes	Varying degree & depth of Cementocytes
Cementoblasts derived from HERS	Derived from inner cells of dental follicle
No PTHR receptor	Express PTHR receptor.

CEMENTOCYTES	OSTEOCYTES
Form cementum	Form bone
Lacunae are ovoid/tubular	Lacunae are oval
Canaliculi are less tortuous & sparse, Face PDL.	Canaliculi are dense, complex network. Radiating
Immunopositive for fibromodulin & lumican	Negative

Cementogenesis

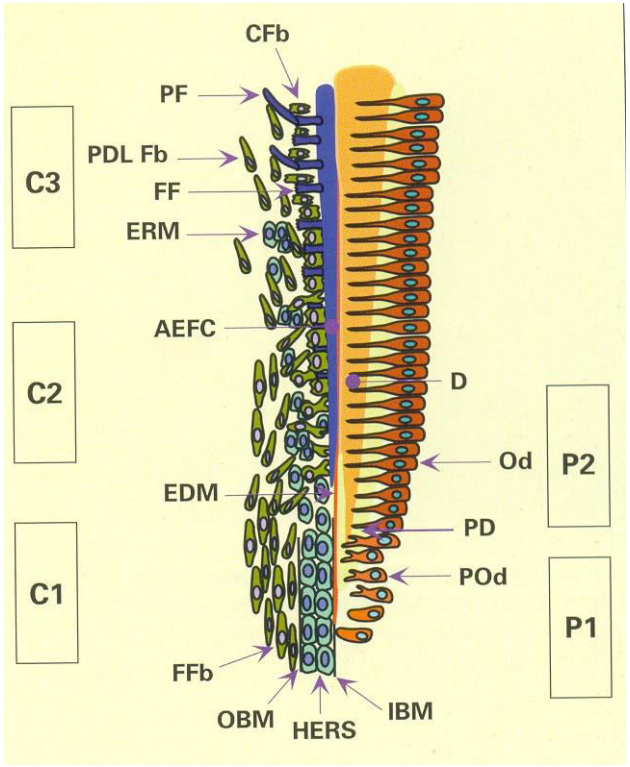


Cementogenesis



- In developing teeth it is preceded by the deposition of dentin along the inner aspect of HERS.
- Break in HERS- Allowing the newly formed dentine to come in direct contact with connective tissue of the dental follicle.
- Differentiate into cementoblasts.

Cementogenesis



- Ultrastructurally-
- Degeneration or loss of its basal lamina.
- Appearance of collagen fibrils and cementoblasts

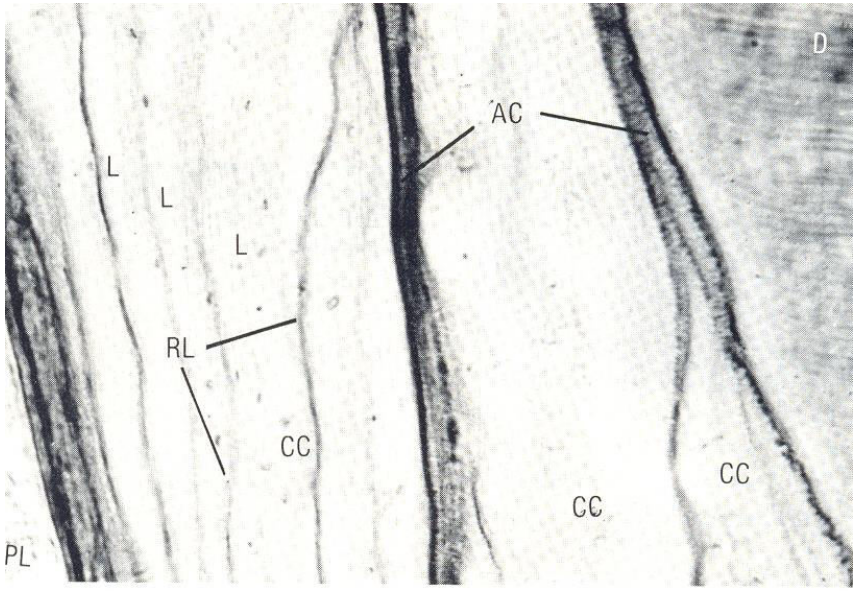
Growth Pattern

- Incremental lines – Cementogenesis proceeds continuously with cyclic activity outward into the PDL resulting in successive layers of cementum.
- Cyclic activity is registered as imbrications or **Incremental lines of Salter.**
- Appear as narrow lines which follow contour of the root.

- The fine lines represent periods between cementogenic activity.
- In acellular cementum lines tend to be even closer together and thin.
- In cellular cementum lines are farther apart thicker and more irregular.

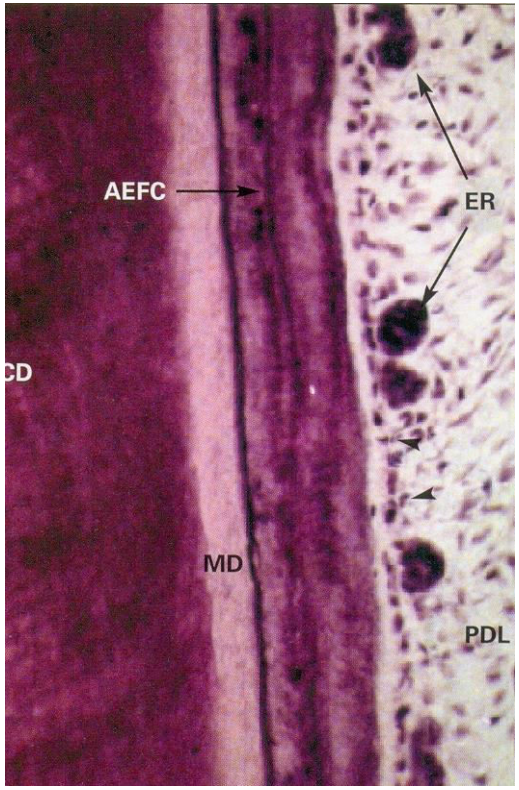
Lamellae

- Cementum responds only by cementoblastic activity in which new functional cementum is deposited over the less vital cementum.
- Successive layers are termed as the lamellae
- Width depends on the severity of the stimulus

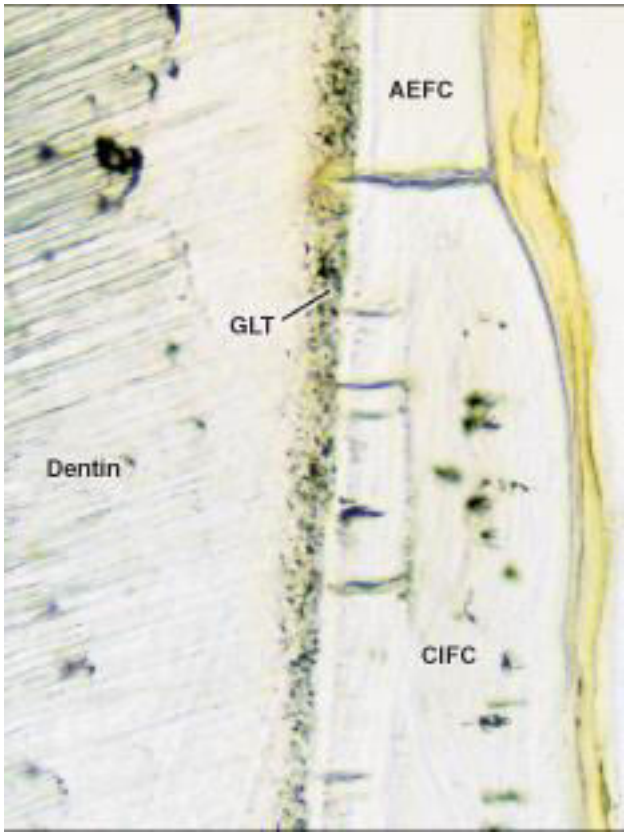


CEMENTODENTINAL JUNCTION

- Interface is smooth & straight in permanent teeth.. in the primary it may be scalloped.
- Cellular cemental fibers intermingle more with dentin than acellular cementum.
- Intermediate layer exists between cementum & dentin…..

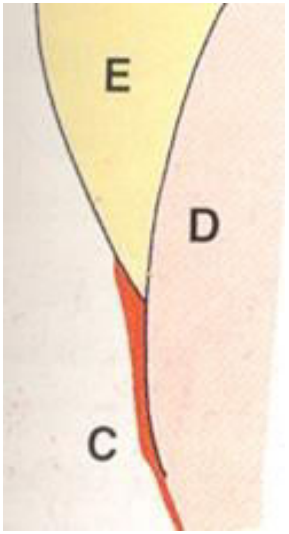


- Appears hyaline (structureless) – hyaline layer
- Seen in apical 2/3rd of post. teeth.
- Layer involved in anchoring the PDL & dentin.
- Clinical significance – regeneration of periodontium following PDL surgery



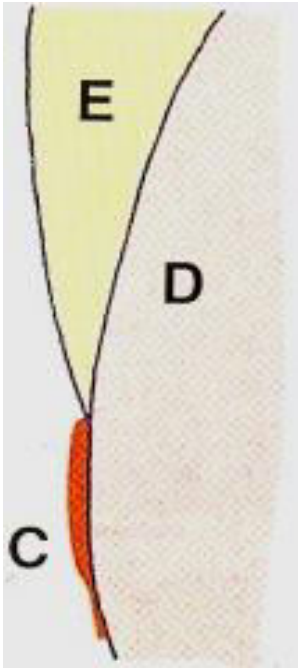
Cementoenamel junction

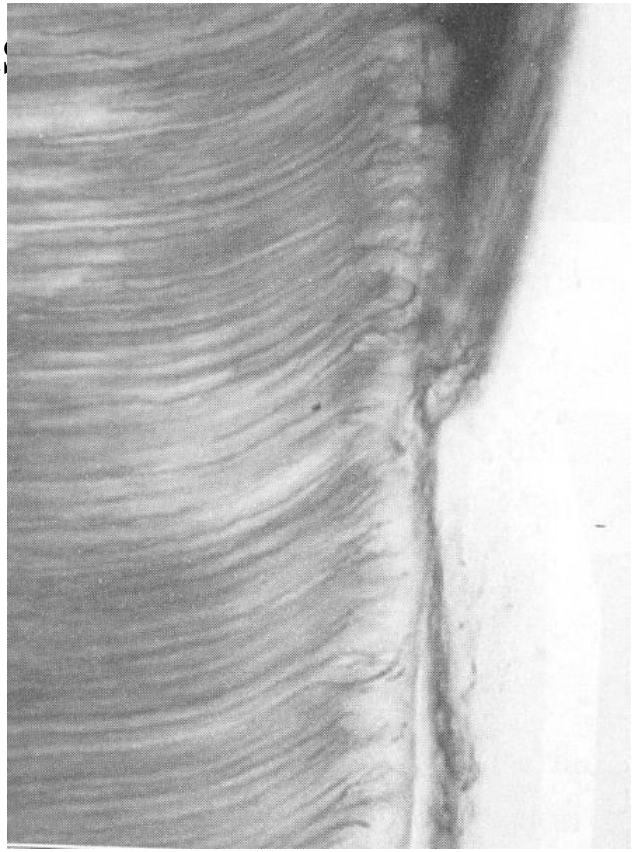
- Pattern I - Where cementum overlaps enamel for short distance. 60% of cases Seen when enamel epithelium degenerates at its cervical termination.
- Cementoblasts lay down afibrillar cementum



CEJ..

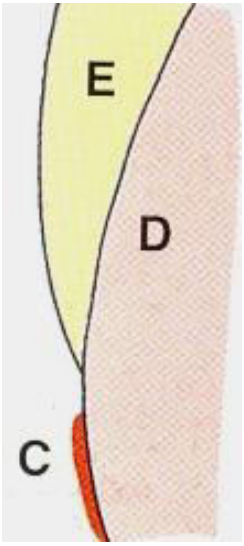
- Pattern II - Cementum & enamel meet at butt joint. 30% cases.
- Most common in deciduou





CEJ..

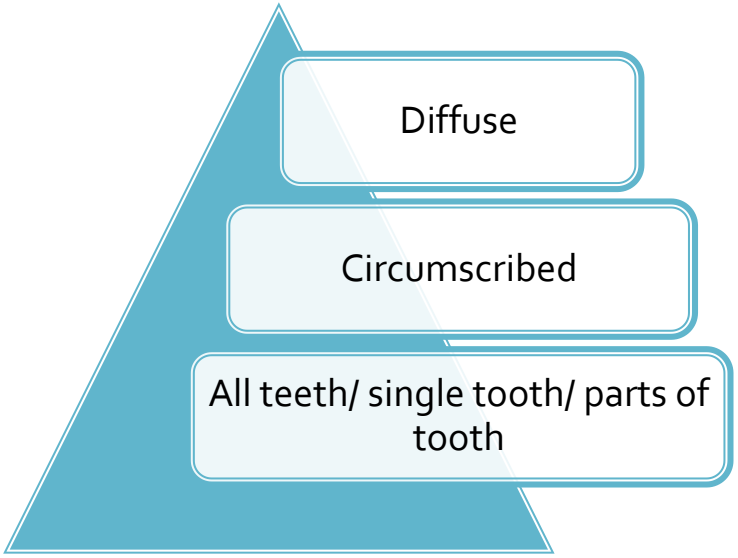
- Pattern III
  - cementum & enamel fail to meet each other. Dentin is exposed in between
  - 10% cases



Differences can be noted from repair tissue & normal

- Degree of mineralization is less , its crystals are smaller & calcific globules are present, suggest that mineralization does not progress evenly
- These differences may be related to the speed of formation of the repair tissue
- If repair is slow repair tissue cannot be distinguished from normal whereas if repair is fast it can be distinguished

- Hypercementosis –



- Hypercementosis – localised hypertrophy – spur / prong like extensions in teeth with heavy occlusal load – better anchorage.
- Localised hypercementosis – teeth with enamel drops.
- Also occurs around chr. periapical inflammation, non functional teeth (reduction of Sharpey's fibers).

Resorption & repair

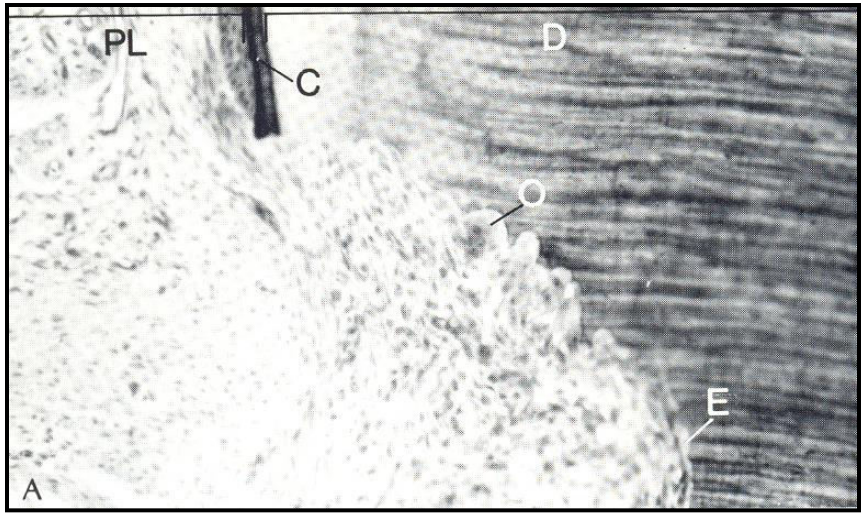
- Cementum responds to adaptational stimuli by apposition
- With same pressure exerted cementum shows less susceptibility to resorption than bone but with microtrauma localised areas of resorption do occur.
- Responsive path taken depends on the severity of stimulus

- Cementum dissolution is characterized by surface concavities (Howship's lacunae) with or without cementoclasts

- Injury to PDL affects the cementoblasts which may resorb superficial cementum

- Conditions producing resorption are
- Excessive trauma may be due to extra masticatory forces
- Excessive pressure due to orthodontic treatment
- Disease (cysts, infection, tumors)

- Howship's lacuna are formed which represent eroded concavities upon cessation of resorptive process
- Newly formed cementum may be acellular or cellular depending upon the rate of cementogenesis
- Reversal line may separate the repair tissue from normal

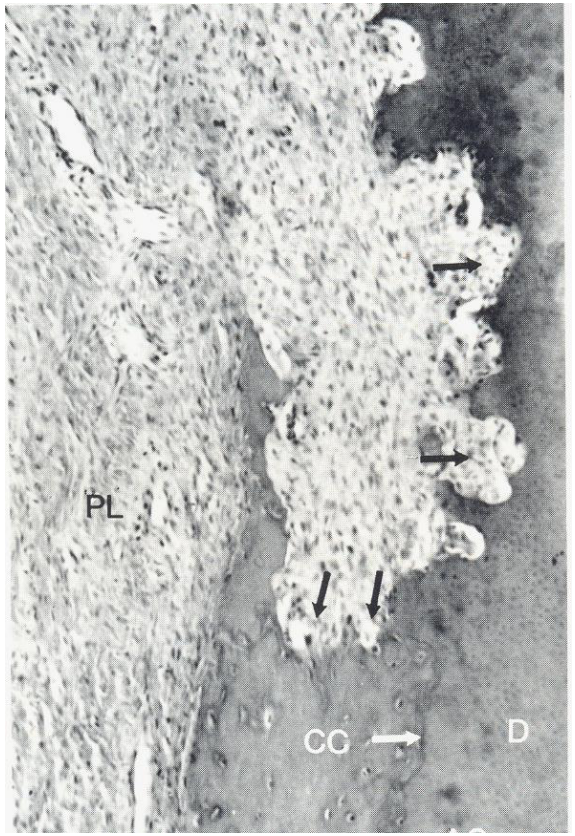


- Differences can be noted from repair tissue & normal
- Reparative cementum - 15µm
- Precementum – 5-10µm
- Degree of mineralization is less , its crystals are smaller & calcific globules are present suggest that mineralization does not progress evenly

- These differences may be related to the speed of formation of the repair tissue
- If repair is slow repair tissue cannot be distinguished from normal whereas if repair is fast it can be distinguished

Anatomic Repair

- In most cases of repair there is a tendency to reestablish the former outline of root surface. This is known as ***Anatomic Repair***
- If thin layer of cementum is deposited on the surface of deep resorption the root outline is not reconstructed & a bay like recess remains



Functional repair

- In such areas sometimes the PDL space is restored to its normal width by formation of a bony projection so that a proper functional relationship will result
- The outline of the alveolar bone in these cases follows that of the root surface
- This type of repair is known as ***Functional repair***

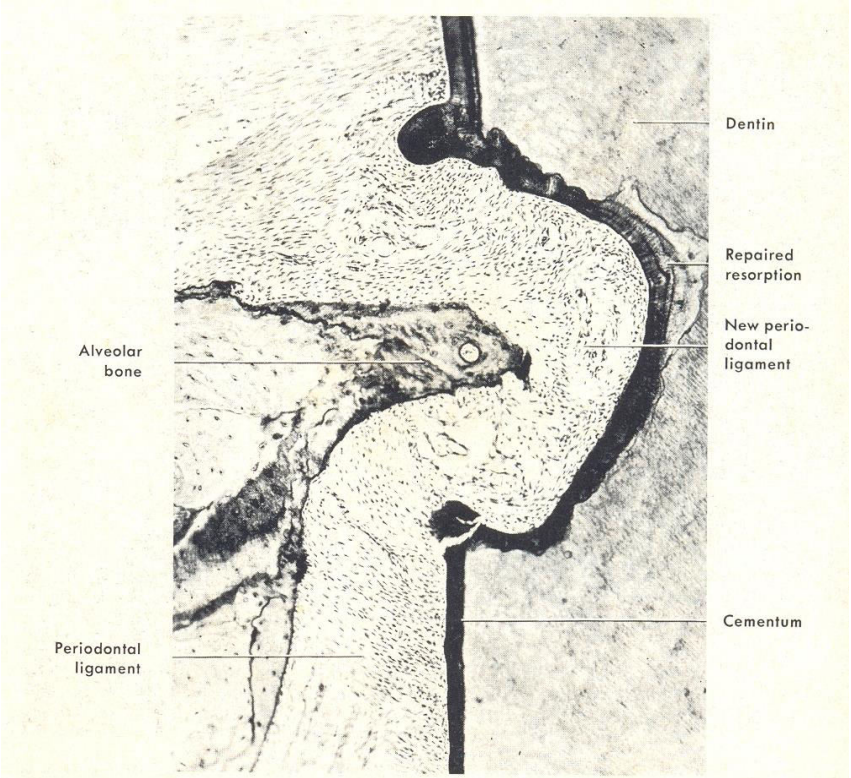
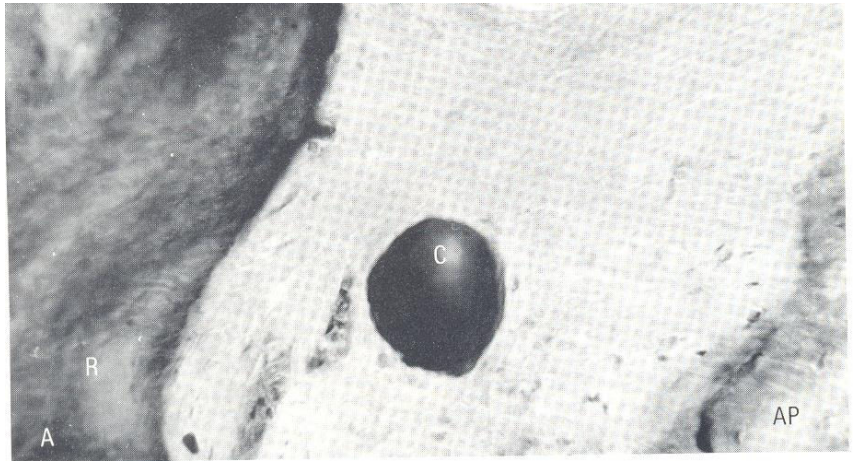


Fig. 6-24. Functional repair of cementum resorption by bone apposition. Normal width of periodontal ligament reestablished.

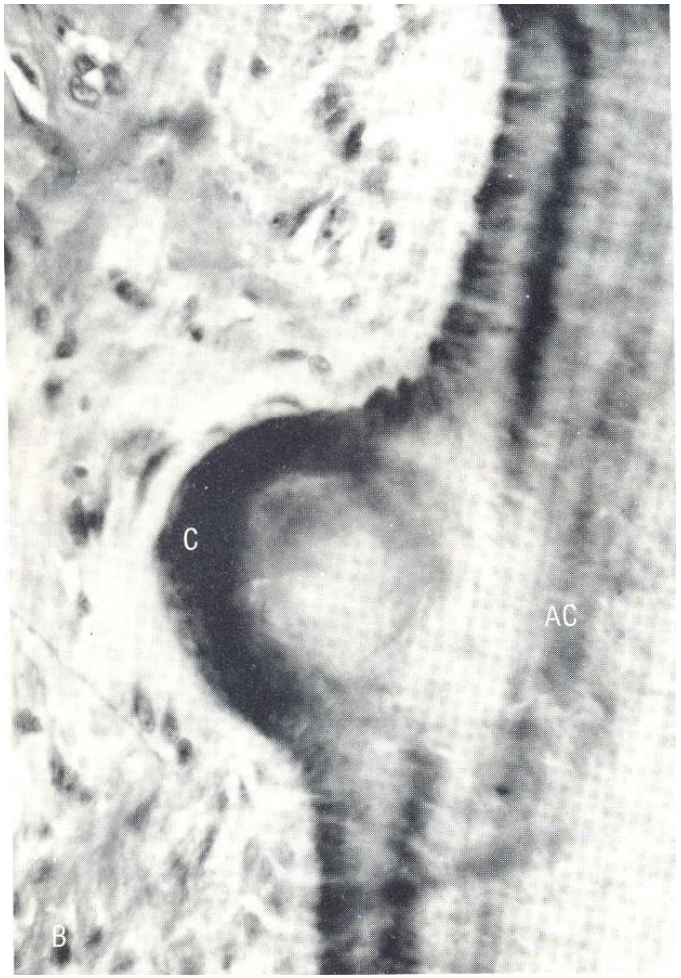
Cementicles

- They are small, globular masses of cementum found in approx. 35% of human roots in PDL ligament
- May result when extra stress on sharpeys fibers causes a tear in cementum from microtrauma
- Nidus for calcification –moribund or dead cells associated with cell rests of malassez, mineralized sharpeys fibers & phleboliths.

- The continued growth of the numerous situated cementicles fuse with the cementum



- The adherent cementicles may develop into intrestitial cementicles as further development of the cementum envelops them.



Cementosis (Hypercementosis, cementum Hypertrophy, cementum Hyperplasia)

- Hypercementosis –abnormal thickening of cementum
- May be diffused or circumscribed
- May affect all or a single tooth
- Thickness increases in between 16-70 yrs of life

- If the overgrowth improves the functional qualities of the cementum it is termed as cementum hypertrophy
- If overgrowth occurs in non functional teeth or not associated with increased function it is kn/s hyperplasia

- Limited hypercementosis occurs as spurs which radiate from root obliquley ,directed cervically
- Principal fibers are inserted over the surface
- These increase the surface area & maintain greater toot stability

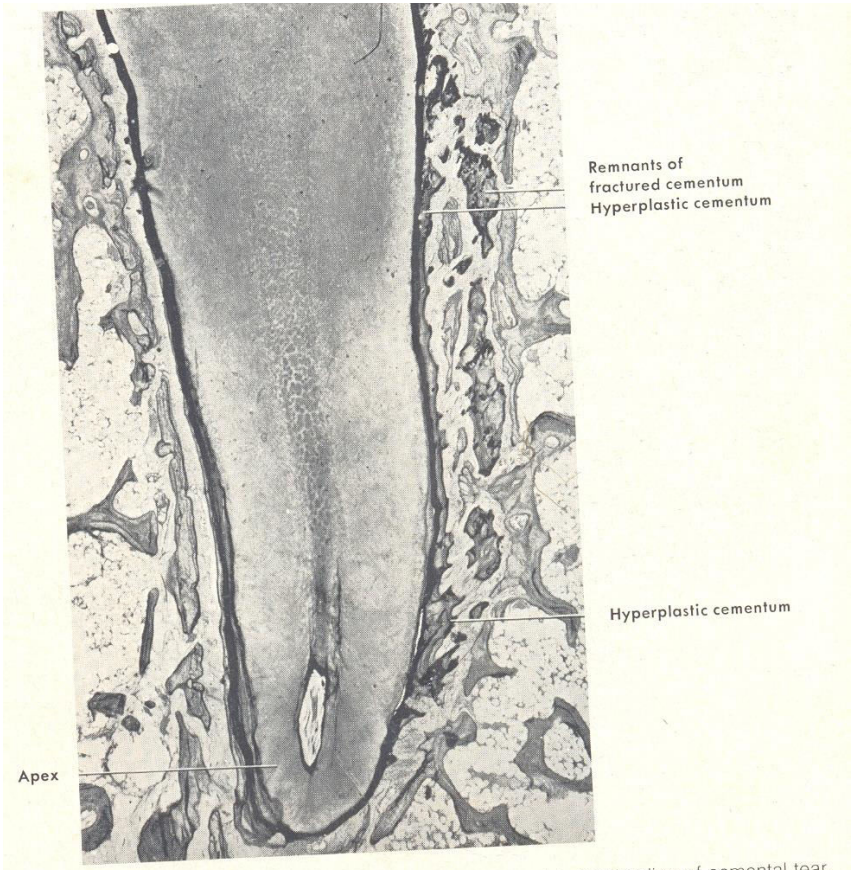
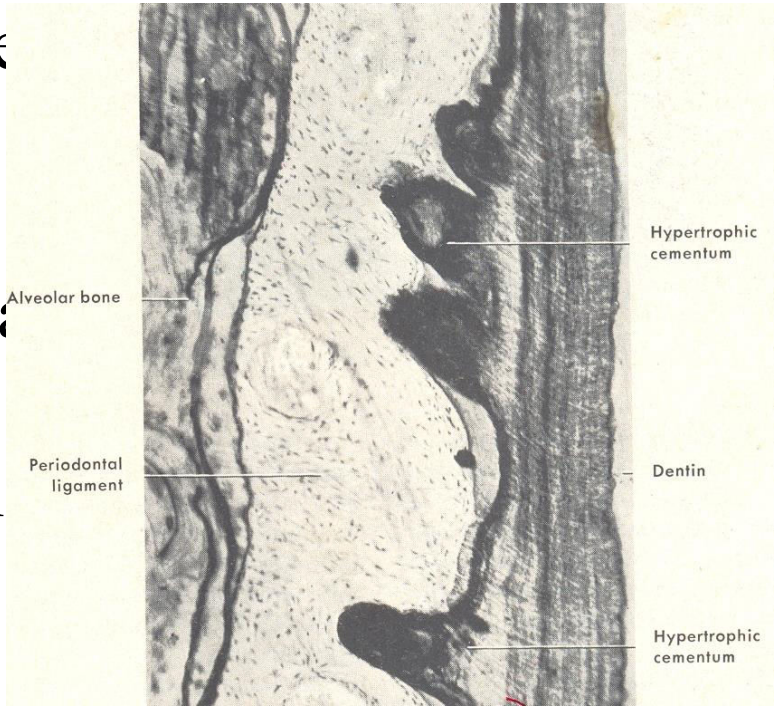


Fig. 6-22. Extensive spikelike hyperplasia of cementum formed during healing of cemental tear.

- Localised hypercementosis some areas on enamel drops
- Irregular or calcifying epithelial of round bodies are found in loca hyperplastic cementum
- Such projections are kn/s excem



- Extensive hyperplasia is also associated with chronic periapical inflammation which is circumscribed & surrounds the root like a cuff
- Hyperplasia of cementum in non functioning teeth Is characterized by reduction in no. of sharpeys fibers embedded in the root

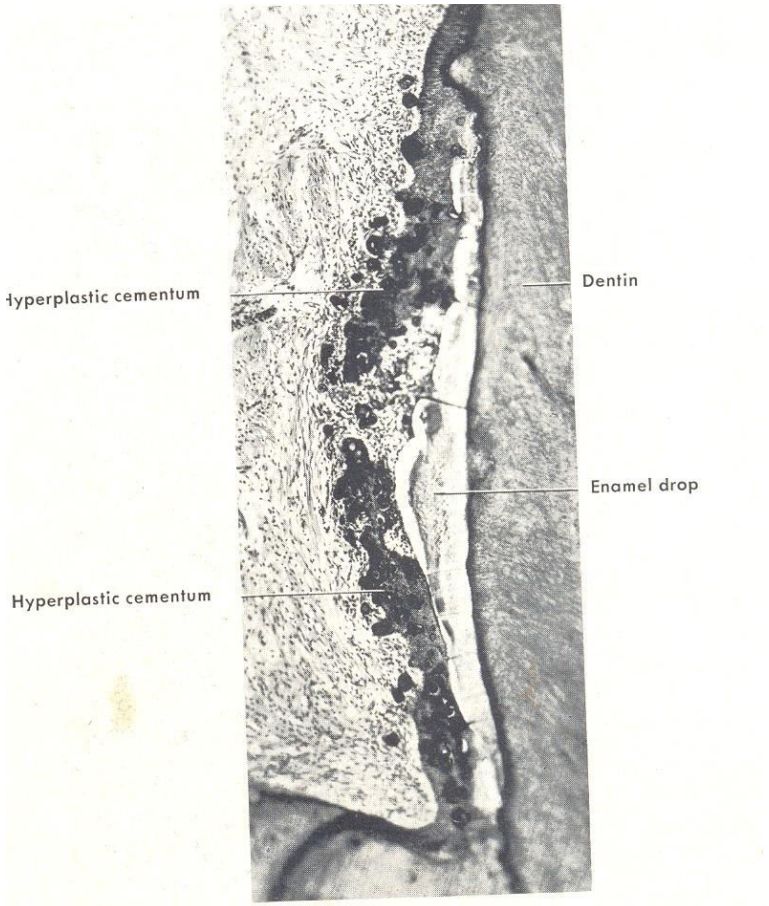


Fig. 6-20. Irregular hyperplasia of cementum on surface of enamel drop.

Clinical consideration

- As cementum is more resistant to resorption than bone tooth movement is made possible orthodontically.
- If teeth are subjected to severe blow cemental tears occur. If minor trauma cemental repair occurs (eg. Transverse fractures)
- Extraction becomes difficult in hypercementosis

Clinical consideration..

- In PDL pockets pathologically exposed cementum becomes hypermineralised because of the incorporation of calcium, phosphorous & fluoride from the oral environment

- Cementum is not only deposited over the apex but also for the short distance (usually 0.5-1.5mm) from the anatomical apex this results in narrowing of the canal at this point in clinical procedure in RCT cleansing should be extended to till this point

- At ultrastructural level there is loss or decrease in the cross striations of collagen near the surface
- Alteration in exposed cementum interferes during healing of periodontal therapy
- Principle function – assisting anchorage of the tooth

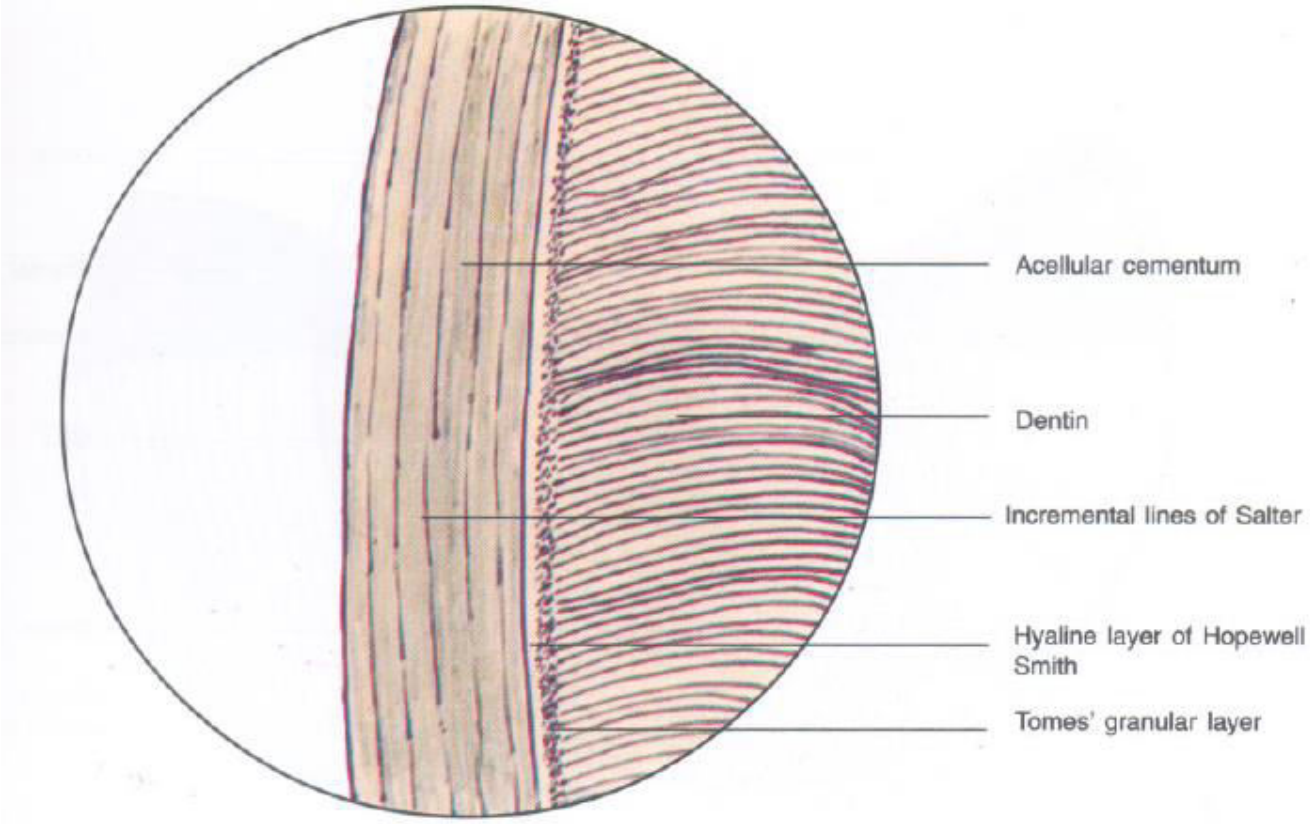
Functions of cementum

- Anchorage
- Apical cementogenesis to maintain occlusal functional relationship thereby compensating for attrition of enamel tips & edges

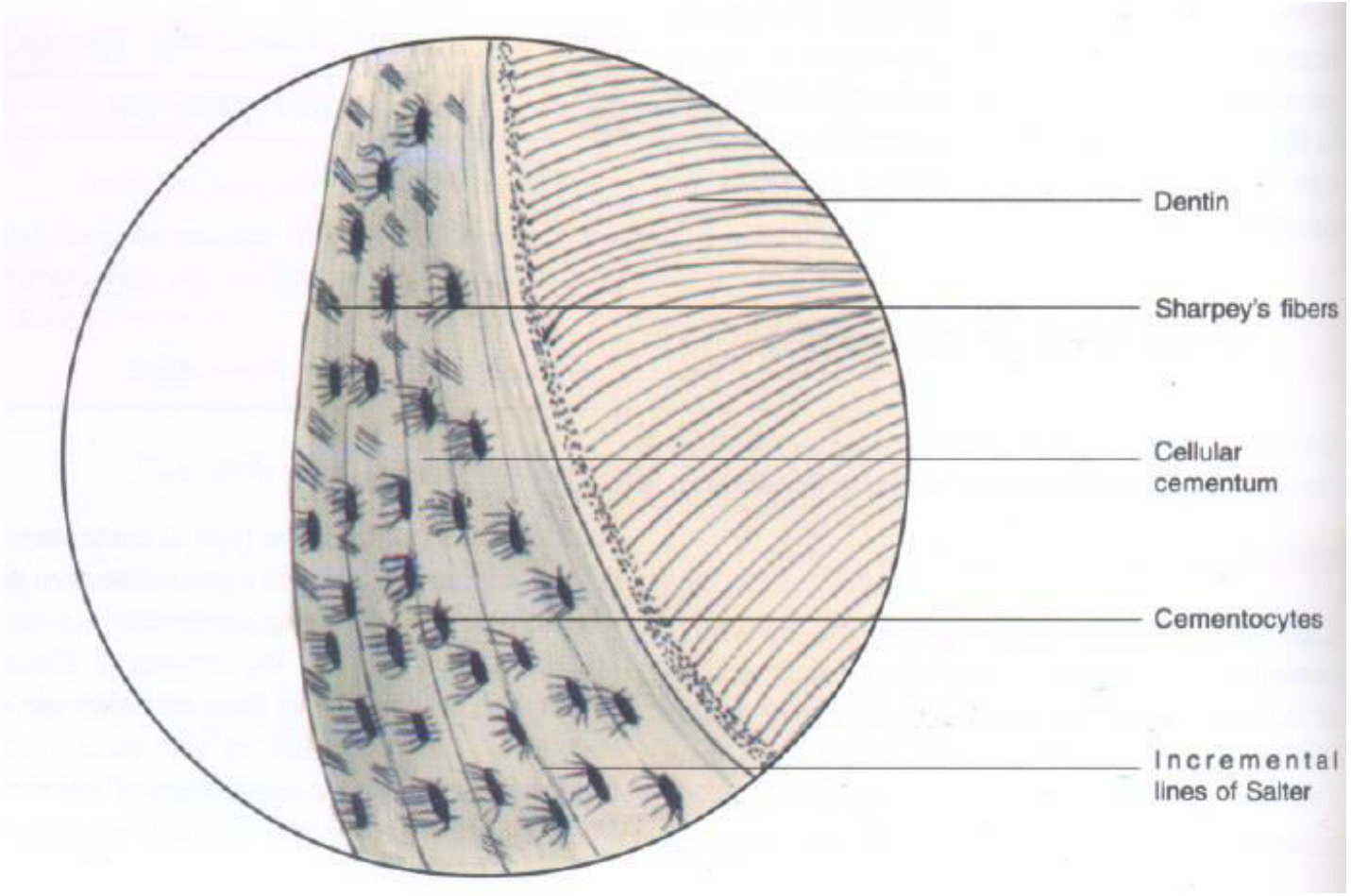
- Provides fiber reattachment & relocation due to mesial & occlusal shifting of teeth by deposition of new layer of cementum.
- Maintenance of width of PDL

- Repairing roots (horizontal fractures)
- Walling-in filled canals
- Sealing of necrotic pulps by occluding the apical foramen
- Protecting underlying dentin
- Modifying the affect of bone resorption
- Effecting bone formation

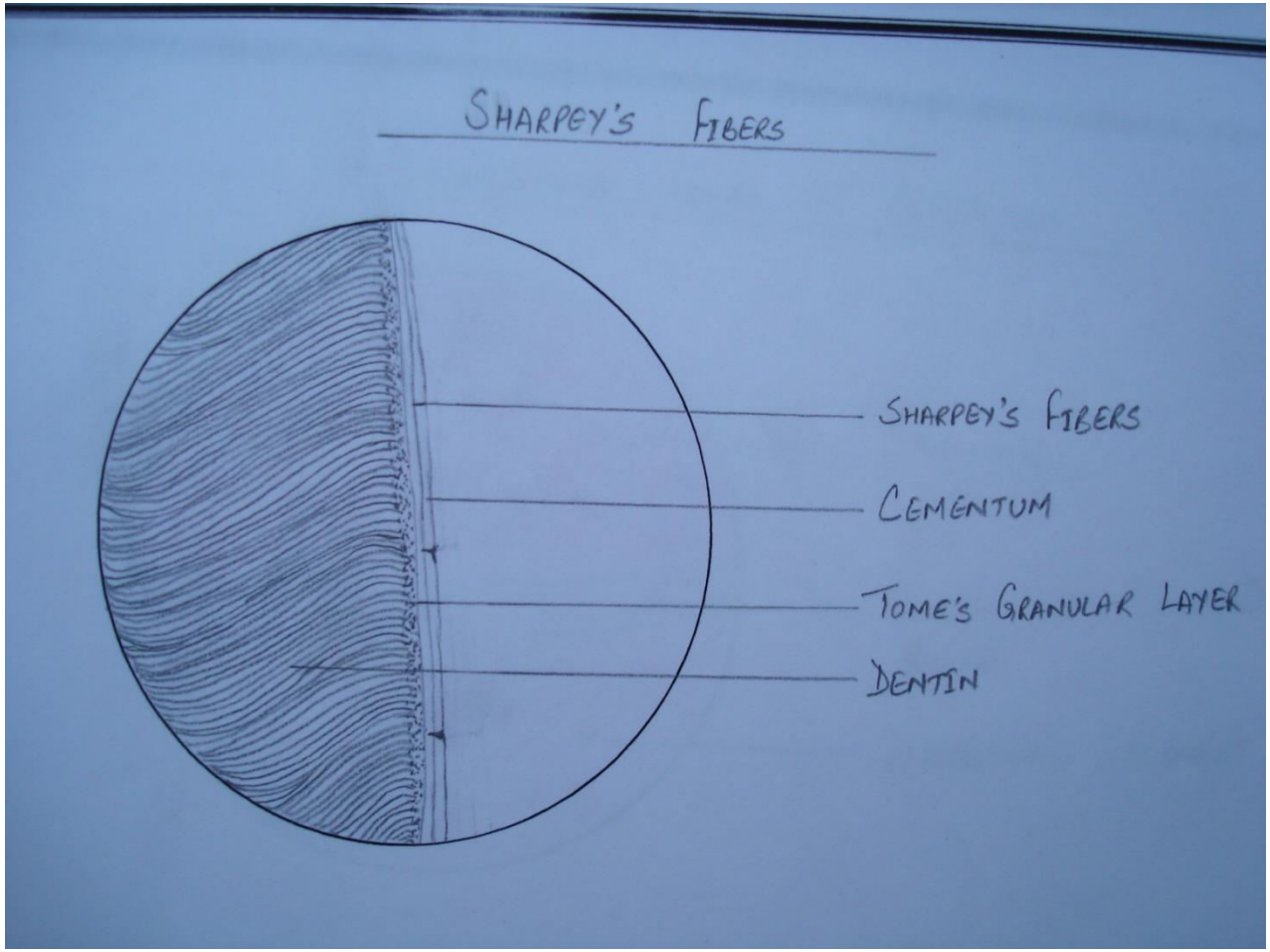
Acellular Cementum (G.S.-10x)



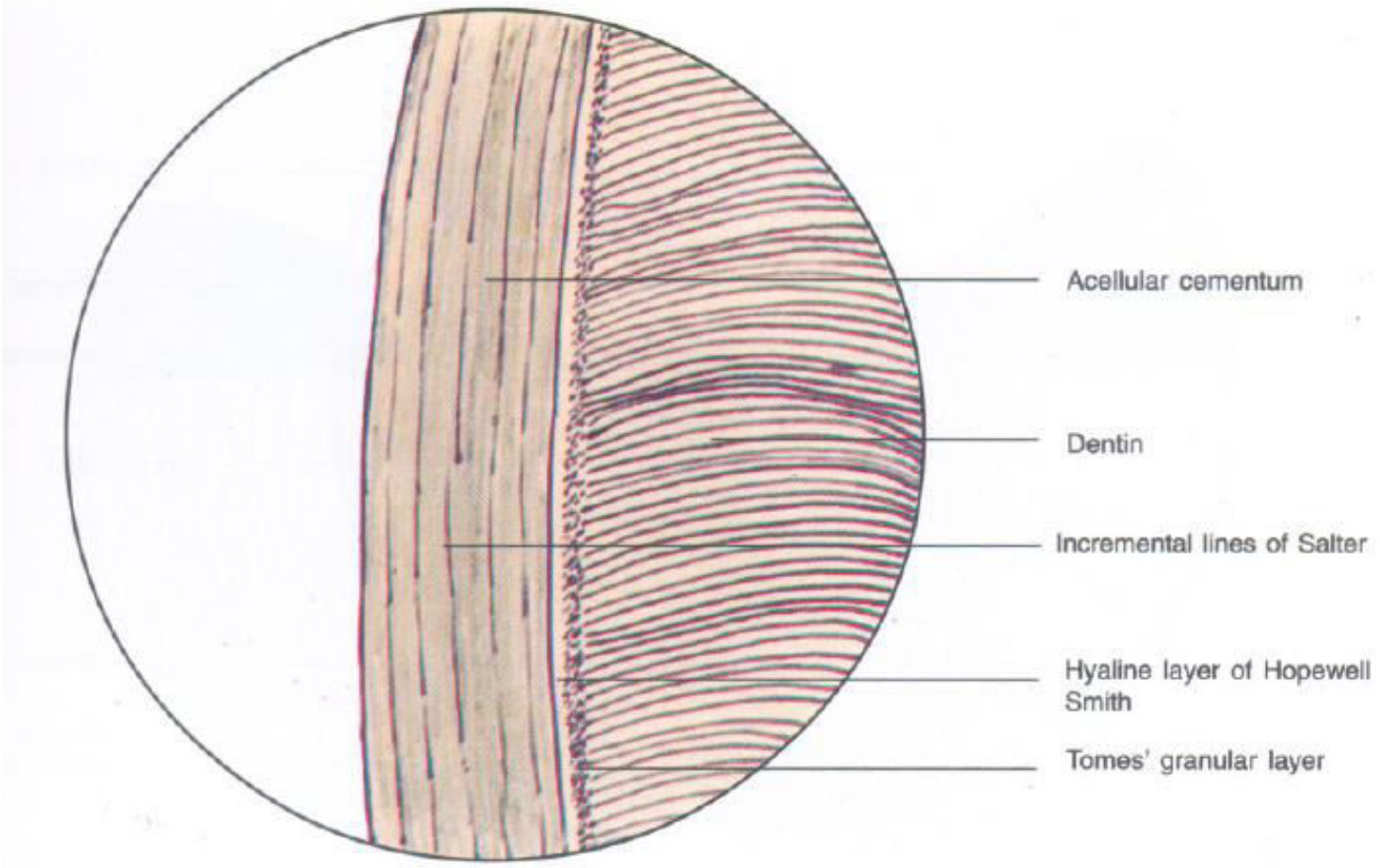
Cellular Cementum (G.S.-10x)



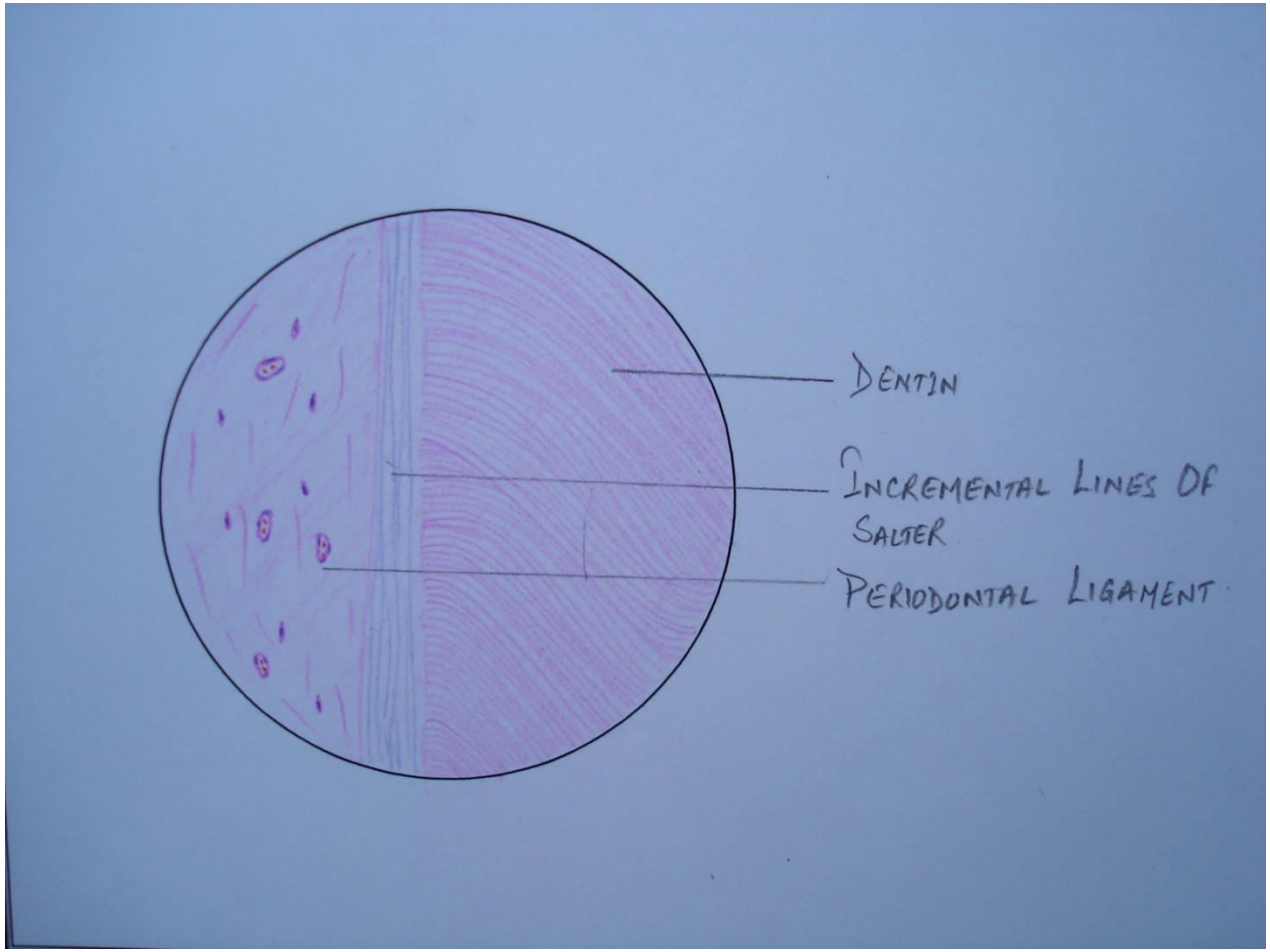
Sharpey's fibres (G.S.-10x)



Incremental lines of Salter (G.S.-10x)

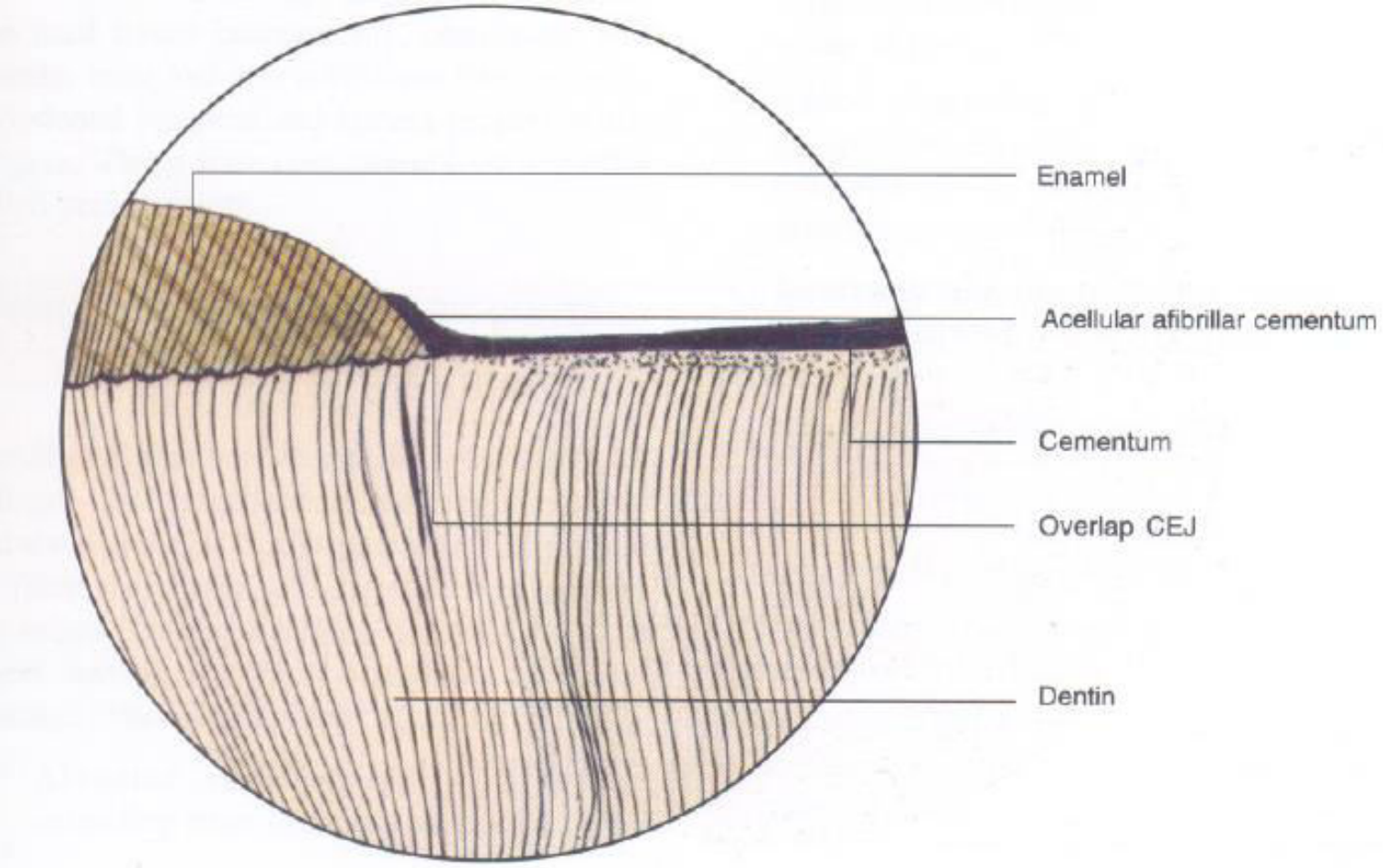


Incremental lines of Salter (D.S) (H&E-10x)



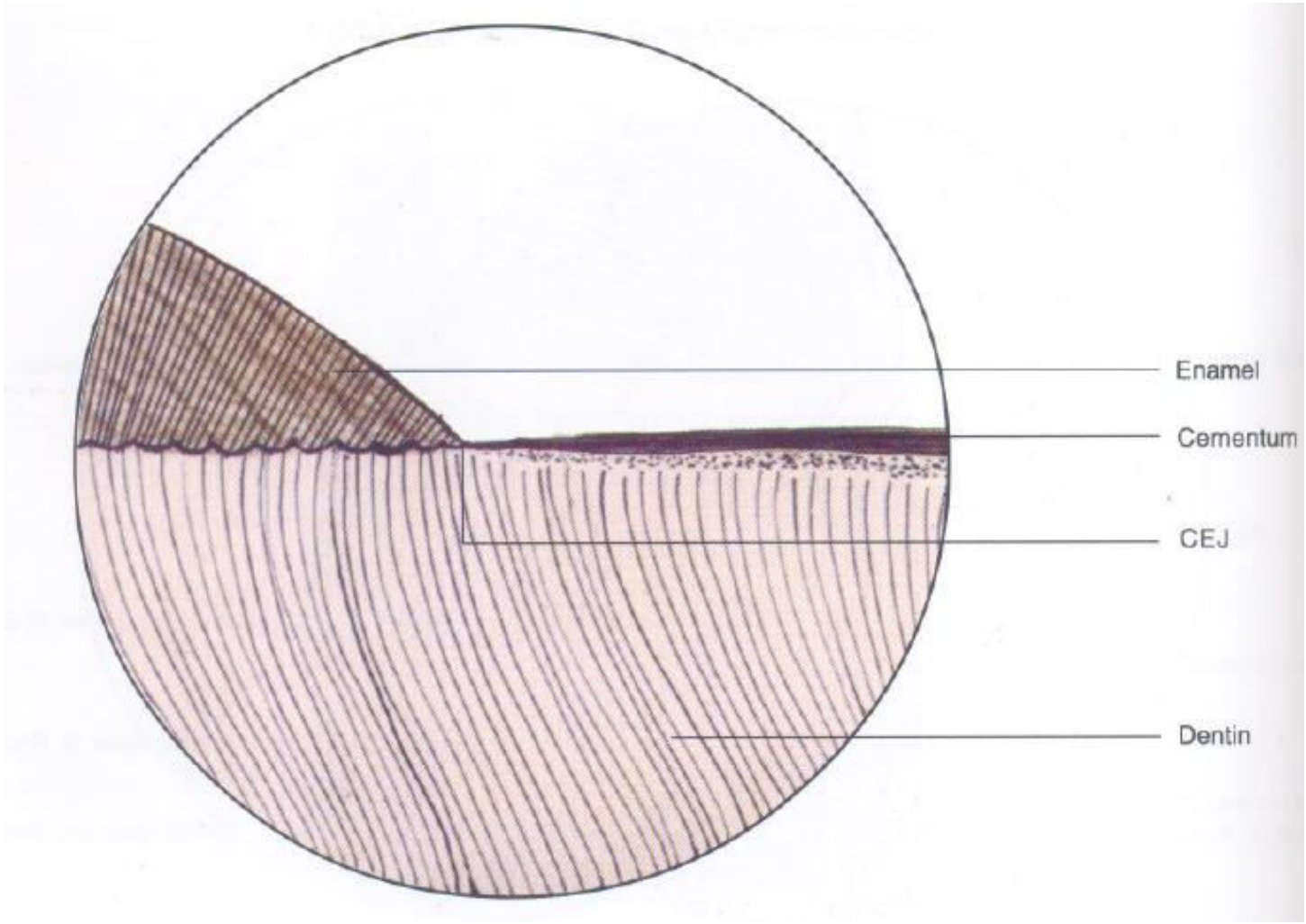
Cementoenamel Junction (G.S.-10x)

- *Overlap-60%*



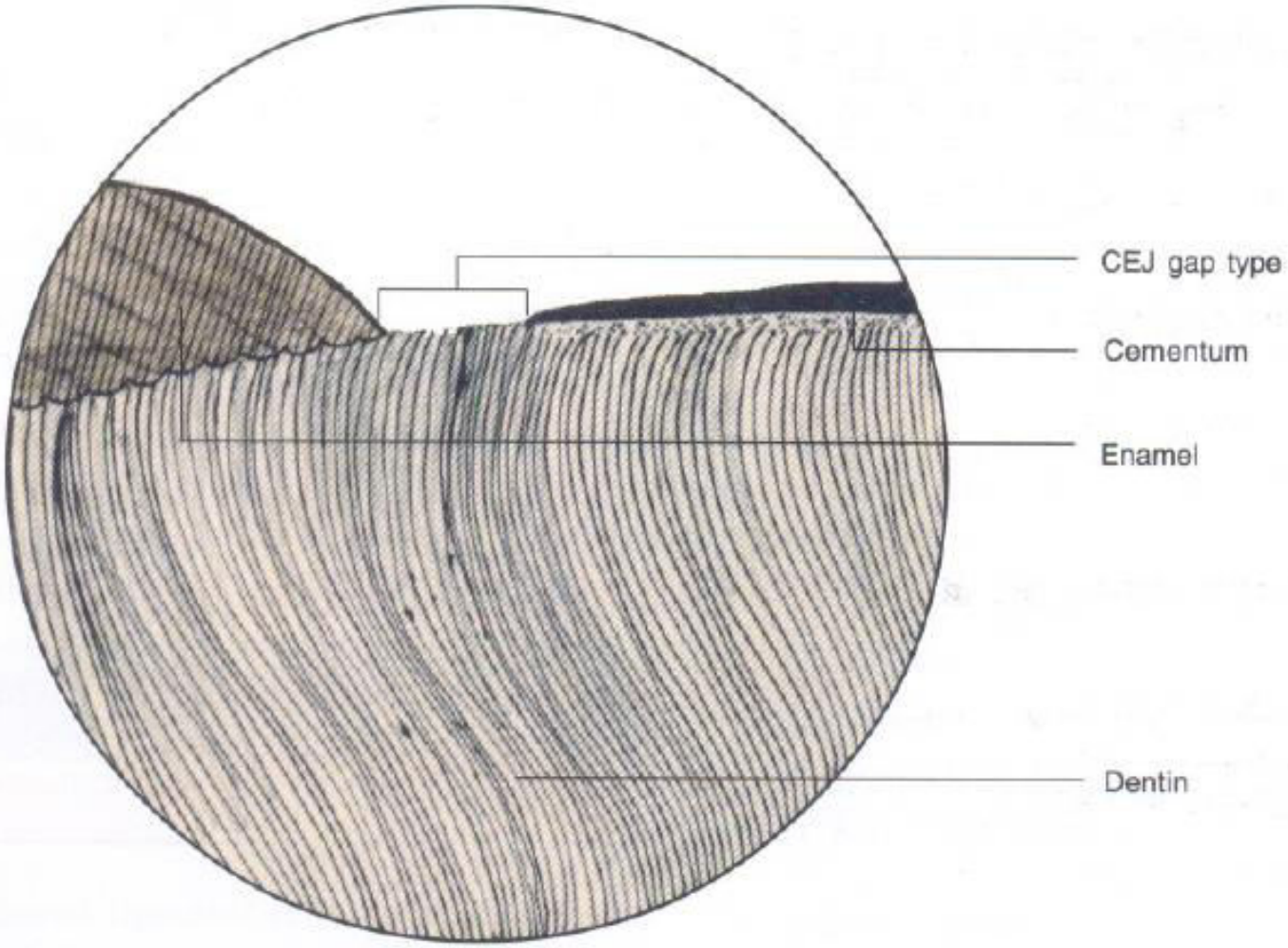
Cementoenamel Junction (G.S.-10x)

- *Edge to edge-30%*



Cementoenamel Junction (G.S.-10x)

- *Gap-10%*



Hypercementosis (G.S.-10x)