PERIODONTAL LIGAMENT

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DEPARTMENT OF PERIODONTOLOGY

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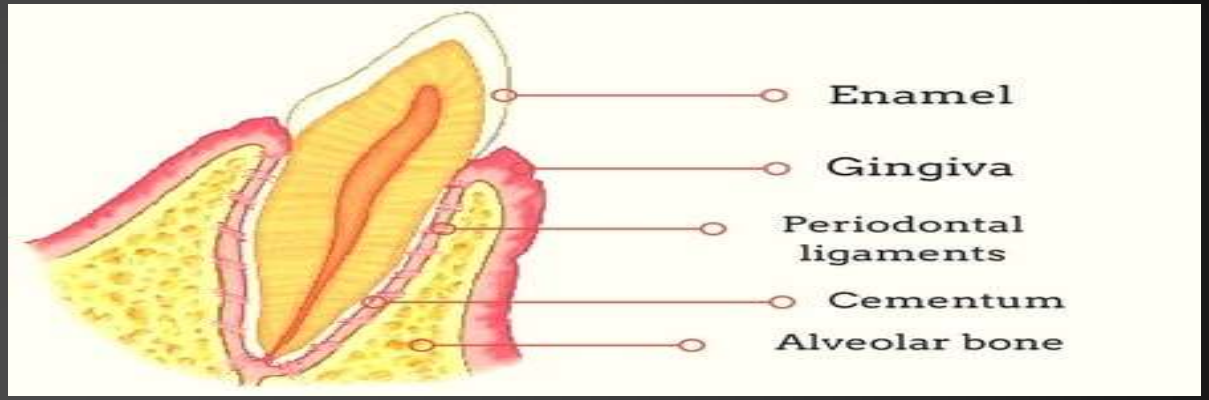
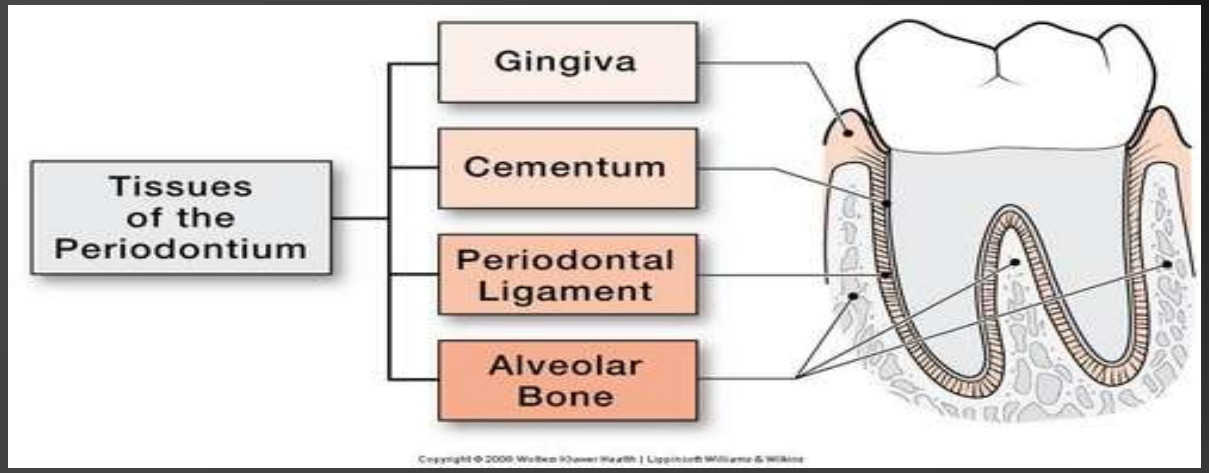
INTRODUCTION

- Term Periodontium arises from Greek word "peri" meaning around and "odont" meaning tooth.
- Tissue that invest and support the teeth are collectively termed PERIODONTIUM





DEFINITION

- **ACCORDING TO CARRANZA AND BERNARD**

  The periodontal ligament is the connective tissue that surrounds the root and connect it to the bone. It is continuous with connective tissue of the gingiva and communicates with the narrow spaces through vascular channels in the bone

- **ACCORDING TO BERCOVITZ AND HOLLAND**

  It is the dense fibrous connective tissue that occupies the periodontal space between the root of the tooth and the alveolus. It is derived from the dental follicle, above the alveolar crest is continuous with the connective tissue of gingiva, at the apical foramen it is continuous with the dental pulp.

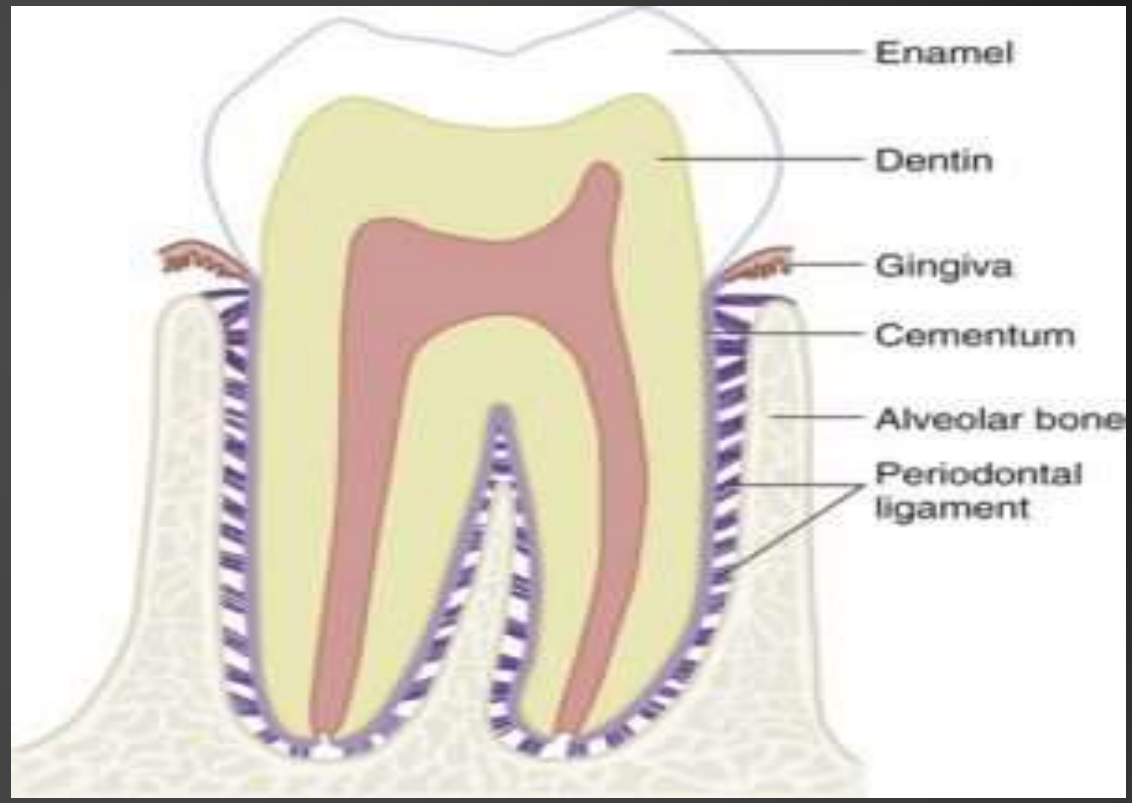
CONT….

- **ACCORDING TO ORBANS**

  The periodontal ligament occupies the periodontal space which is located between the cementum and the periodontal surface of alveolar bone and extends coronally to the most apical part of the lamina propria of the gingiva.

SYNONYMS

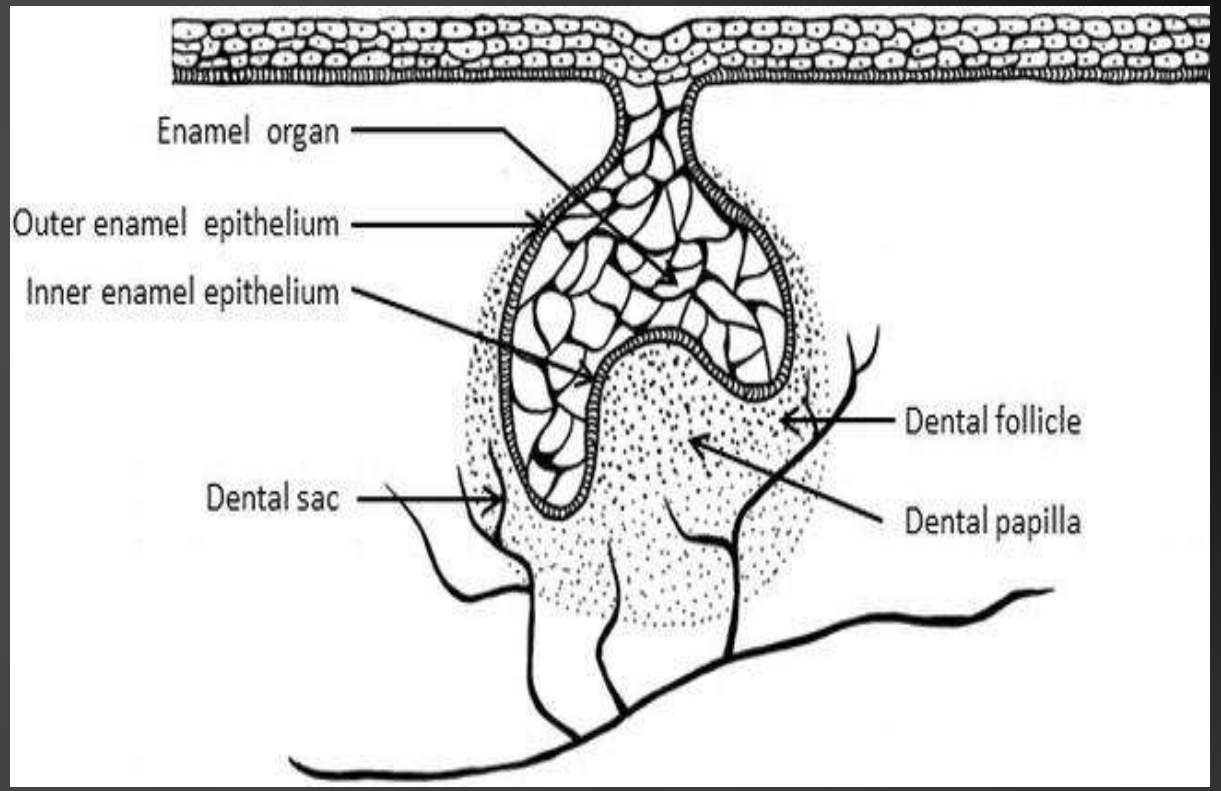
- Periodontal membrane
- Alveolo-dental ligament
- Desmodont
- Pericementum
- Dental periosteum



DEVELOPMENT OF PDL

DEVELOPMENT

- All the periodontal tissue are derived from dental follicle
- Osborn proposed that mesenchyme deriving the periodontium may have two different compartments.
  - Alveolar clade: fibroblast and osteoblasts
  - Cemental clade : fibroblast and cementoblasts

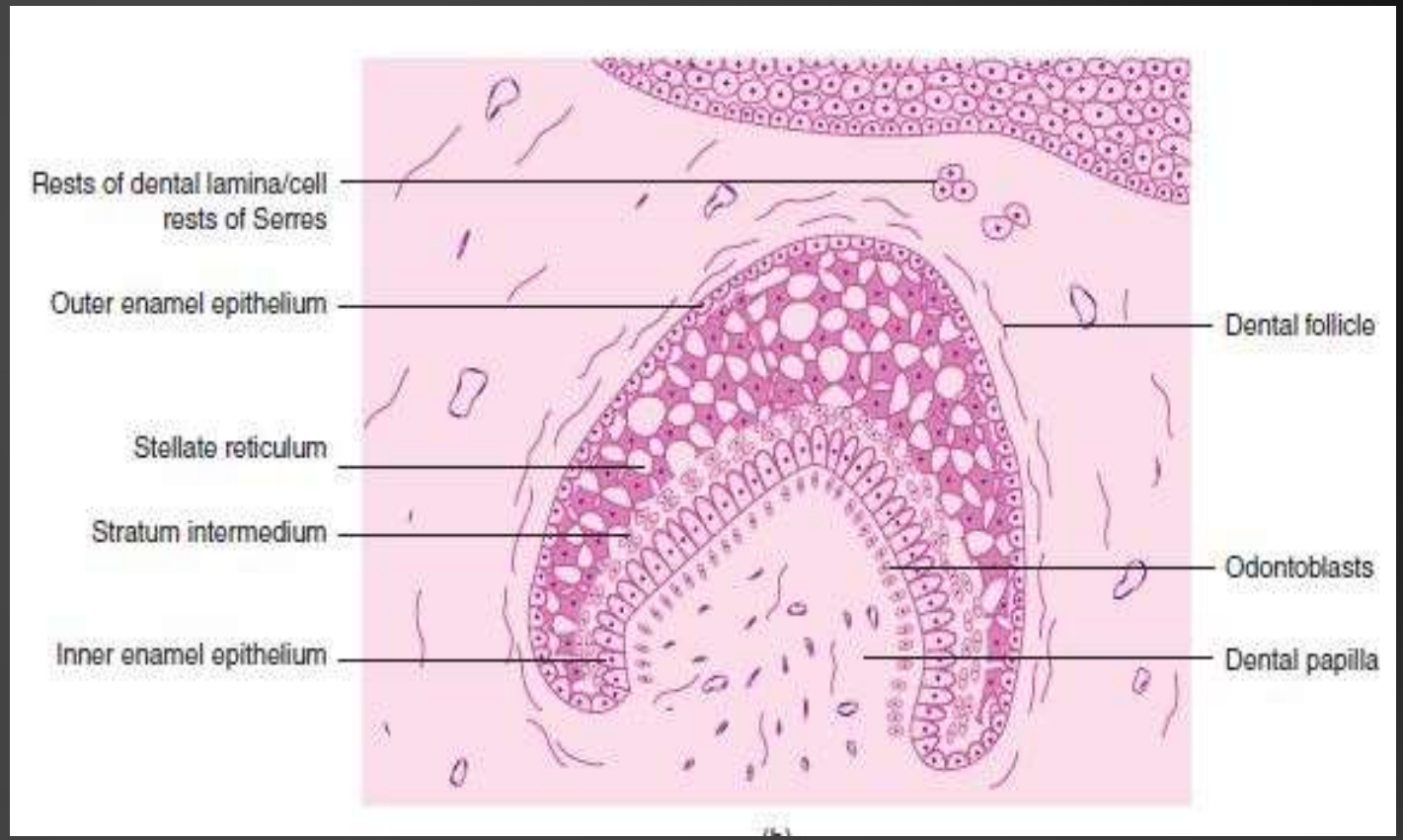


DEVELOPMENT

At late bell stage, IEE and OEE forms cervical loop

Double layered epithelial root sheath

Proliferates apically and map out the shape of root



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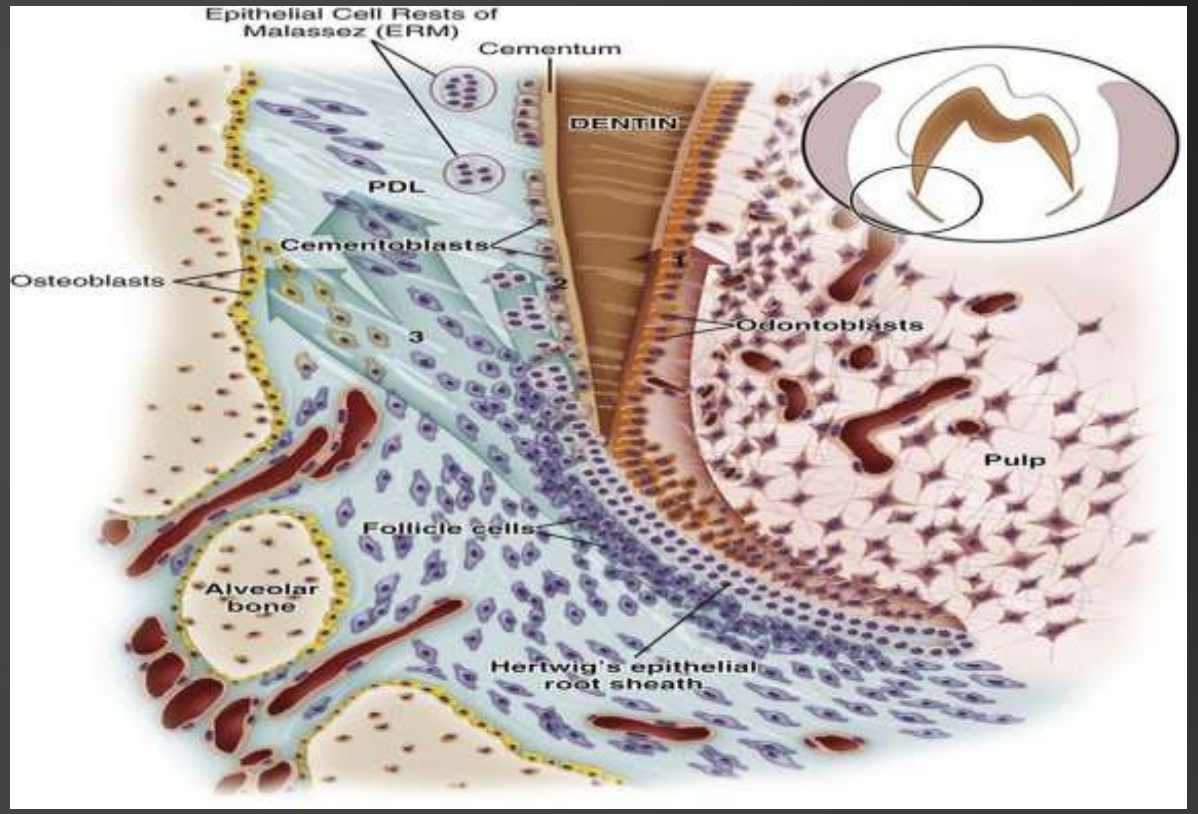
HERS loses structural continuity

↓

Epithelial rests of malassez

↓

CT cells of dental follicle migrate to newly formed root dentin



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As the root formation continues, cells in the perifollicular mesenchyme gain their polarity, cellular volume and synthetic activity increases

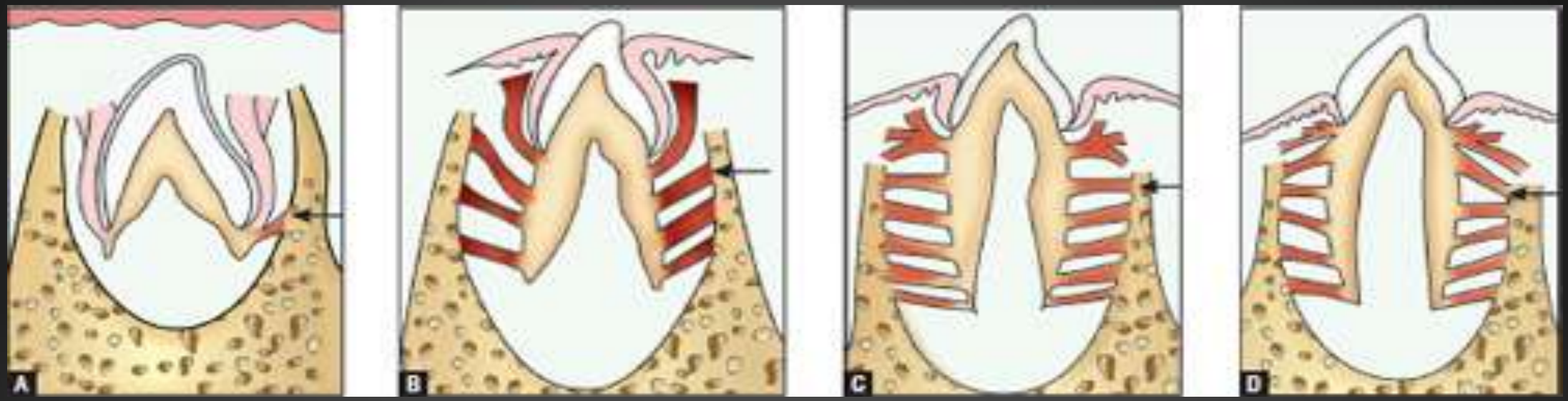
Synthesize and deposit collagen fibrils and glycoproteins in developing PDL

Type 1 collagen is secreted

Assembles as collagen bundles on the bone and cementum surface.

Establish continuity across the ligament space

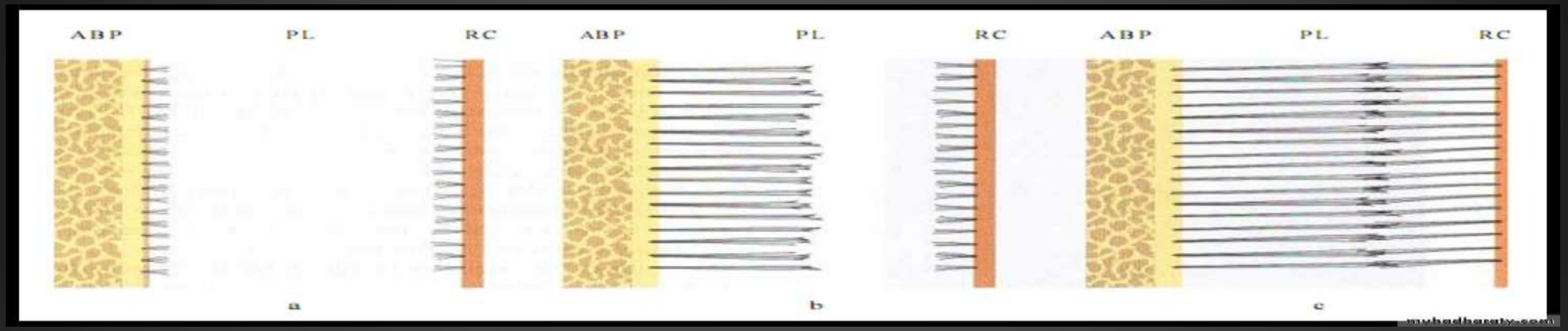
DEVELOPMENT OF PDL



As the teeth begins to erupt, the orientation of ligament fibers changes according to the stage of eruption

DEVELOPMENT OF PRINCIPAL FIBERS

The alveolar bone proper(ABP) Is seen to the left, the periodontal ligament (PL) is depicted in the center and the root cementum(RC) is seen to the right



- Small fine brush like fibrils from root cementum
- Radiating thin collagen fibrils from bone

- Fibers originating from cementum are still short
- Number, length and thickness of fibers originating the bone increase

- Fibers originating from the cementum and bone fuse in the periodontal ligament space
- Fibers → intermingle to form plexux

PERIODONTAL LIGAMENT HOMEOSTASIS

- PDL maintains its width between 2 hard tissues.
- Cells of PDL during development and regeneration secrete molecules which regulate mineralization
- Various molecules proposed which play a role in maintaining an unmineralized PDL
  - **Prostaglandins** : inhibit mineralized bone nodule formation
  - **Msx2**: prevents osteogenic differentiation of PDL fibroblasts by repressing transcriptional activity of Runx2.
  - **Matrix Gla protein** : inhibitor of mineralization

CONT……

- **GAGs** : maintains unmineralized state of pdl
- Balance between activities of **bone sialoproteins** and **osteopontin**- maintains unmineralized PDL region.
- PDL has capacity to adapt to functional changes:

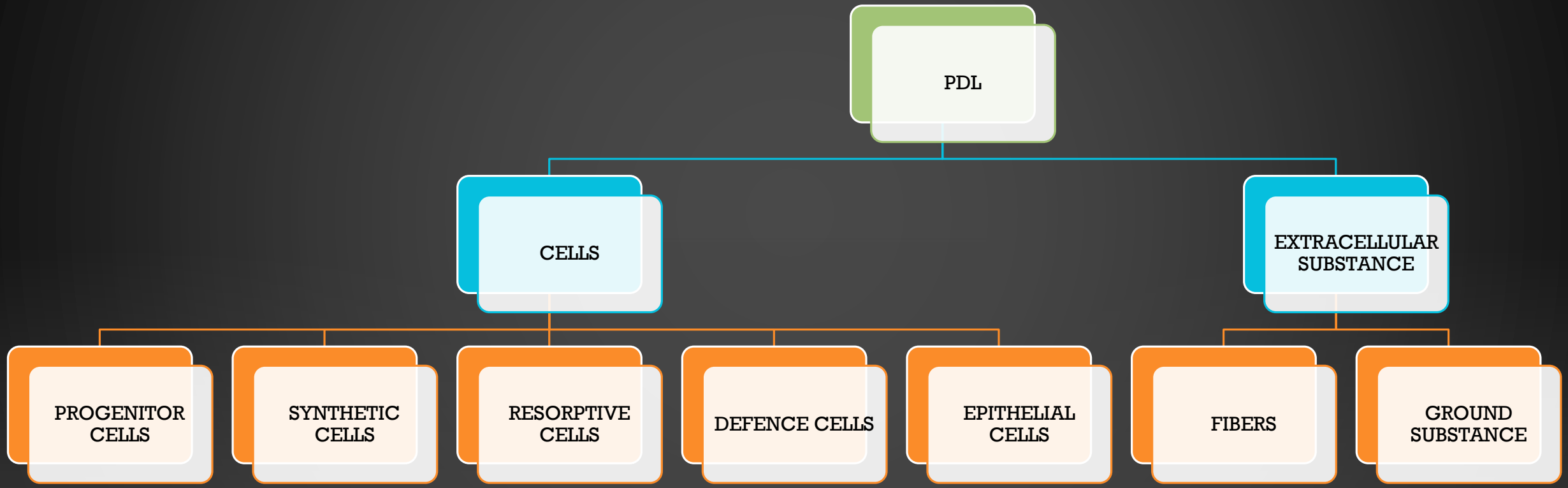
FUNCTIONAL DEMAND INCREASES:

- Width of PDL increases by as much as 50%
- Fiber bundle increases in thickness

FUNCTIONAL DEMAND DECREASES:

- Narrowing of PDL
- Decrease in number and thickness of fiber bundle

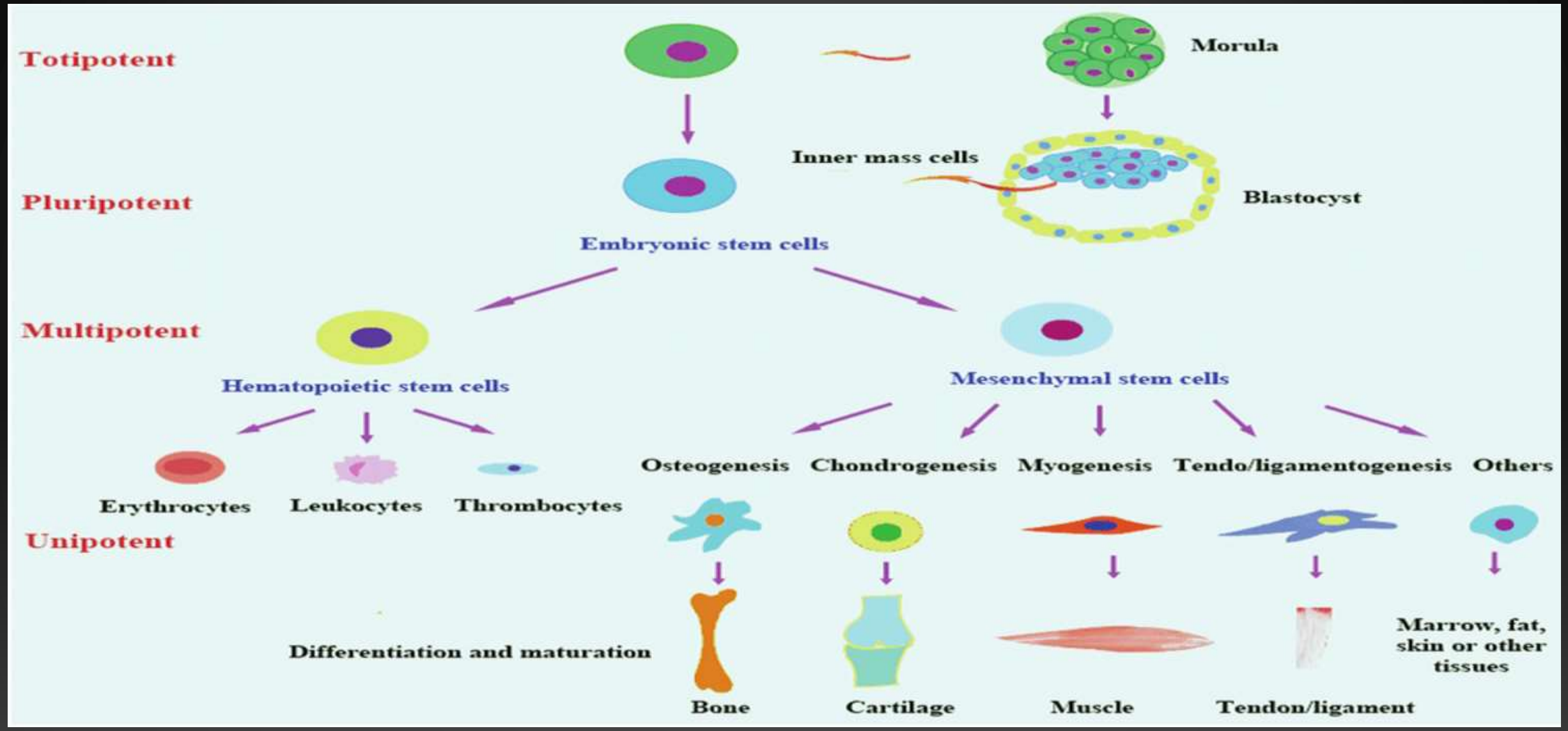
STRUCTURE

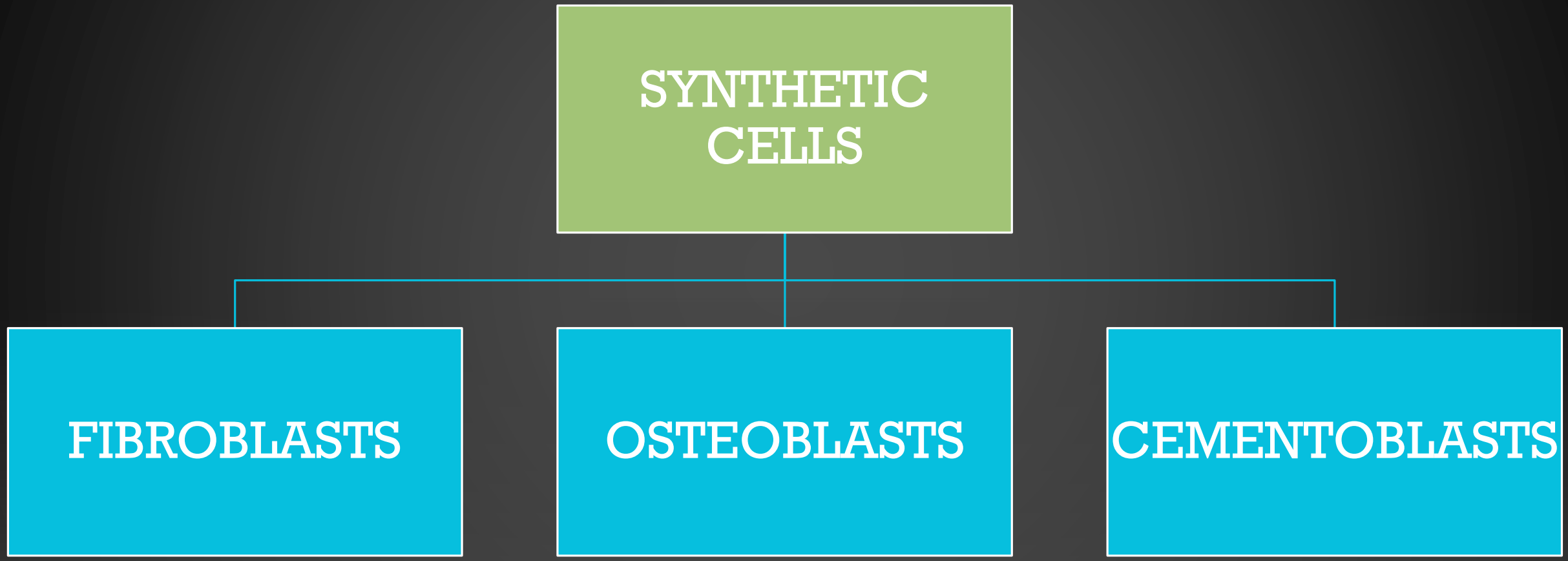

PDL
CELLS
EXTRACELLULAR SUBSTANCE
PROGENITOR CELLS
SYNTHETIC CELLS
RESORPTIVE CELLS
DEFENCE CELLS
EPITHELIAL CELLS
FIBERS
GROUND SUBSTANCE

PROGENITOR CELLS

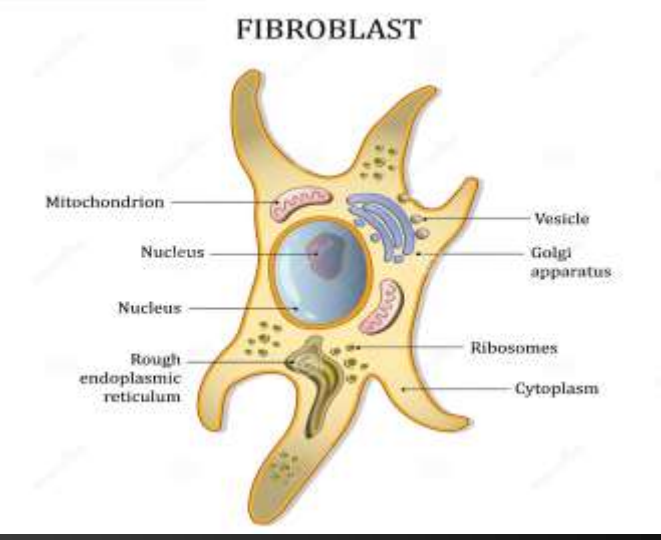
- All connective tissue including PDL contain progenitor cells that have capacity to undergo mitotic division.
- Undifferentiated mesenchymal cells : perivascular location within 5 micrometers of blood vessels.
- Small in size , closed faced nucleus and very little cytoplasm
- When stimulated appropriately, these cells undergo mitotic division and can differentiate into fibroblast, osteoblast or cementoblast

PROGENITOR CELLS




SYNTHETIC CELLS
FIBROBLASTS
OSTEOBLASTS
CEMENTOBLASTS

FIBROBLASTS



Regeneration of tooth support apparatus

Plays essential role in the adaptive responses to the mechanical loading of the tooth

- SHAPE

❖ Variety of shapes with many fine cytoplasmic processes

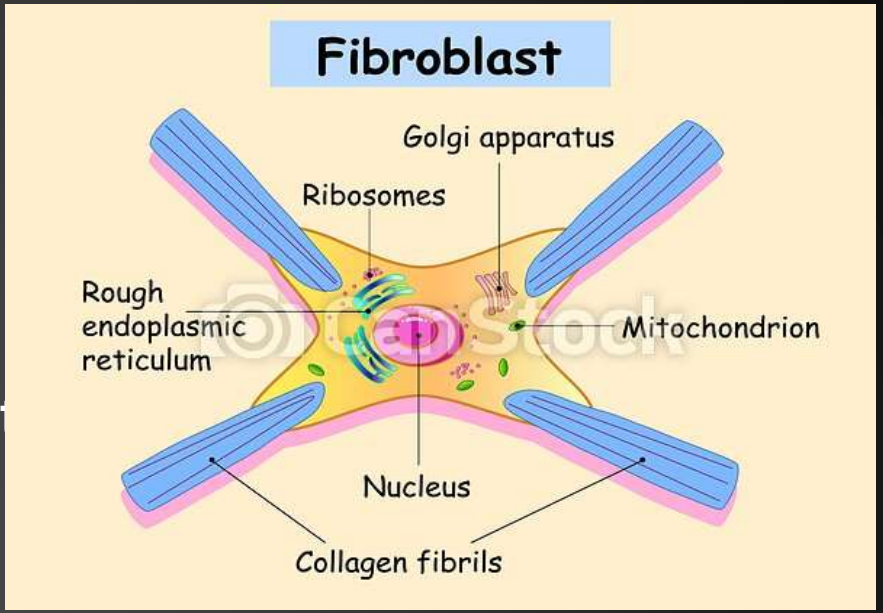
❖ Appear as flattened, disc shaped cells

❖ Active cells have low nuclear cytoplasmic ratio and each nucleus contains 1 or more prominent nucleoli.

❖ PDL fibroblasts are large cell with an extensive cytoplasm , all organelles associated with protein synthesis and secretion.

IN-VITRO STUDIES ON FIBROBLAST

- The behavior and appearance of fibroblast in vitro depends upon the method of culture.



CELLS CULTURED ON PLASTIC

- Cells appear to be thin and motile and highly polarized with respect to both shape and location of organelles
- Numerous microtubules and microfilaments that run along the length of the cells

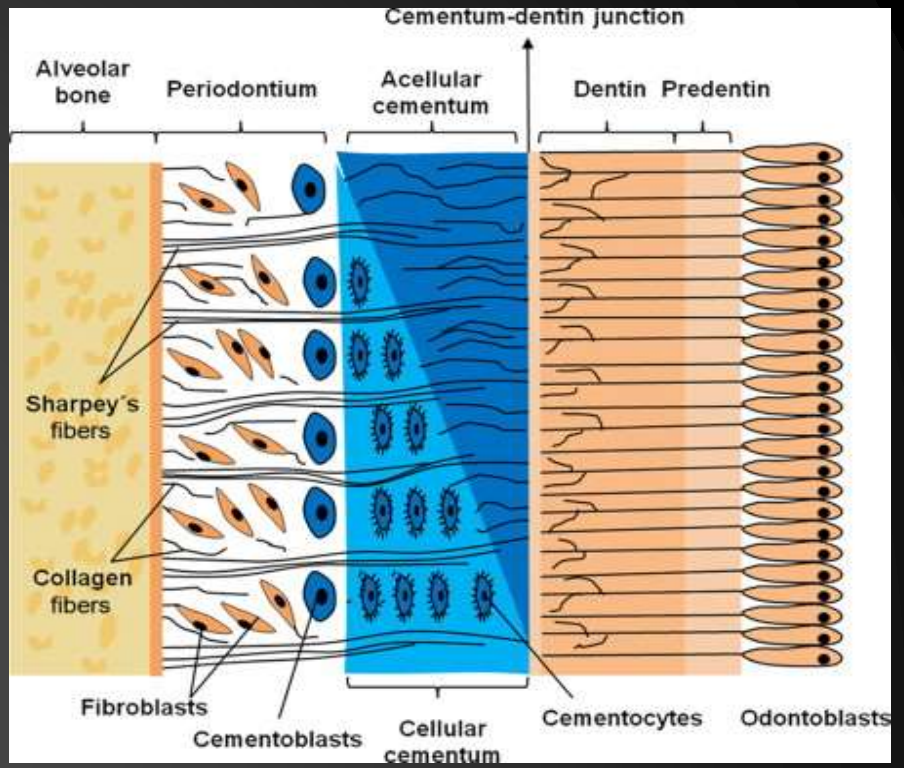
CELLS CULTURED ON COLLAGEN GELS

- During contraction of the gel, assume the appearance of myofibroblasts.
- Myofibroblast characterized by having the polarity of shape, crenulated nuclei, and numerous microfilaments.
- Adjacent cells contact by means of gap junctions

- Cells with these characteristics have not been seen in periodontal ligament in vivo.
- Periodontal fibroblasts in vivo may show occasional gap junctions and they show no other features characteristics of myofibroblast
- Thus , although the evidence from in vitro studies suggests that the periodontal fibroblasts have the potential to be migratory or contractile cells , but under normal functional conditions the cells are primarily involved in protein synthesis and secretion.

- FUNCTIONS OF FIBROBLASTS:
  - Synthesize collagen
  - Synthesize fibrils
  - Organize fibrous network and generates force for tooth eruption
  - Produce extracellular matrix of PDL
  - Have capacity to give rise to cementoblasts and osteoblasts.
  - Maintain normal width of PDL
  - Regulate collagen turnover by phagocytosing old collagen fibers.

CEMENTOBLASTS



Cement forming cells lining the surface of cementum.

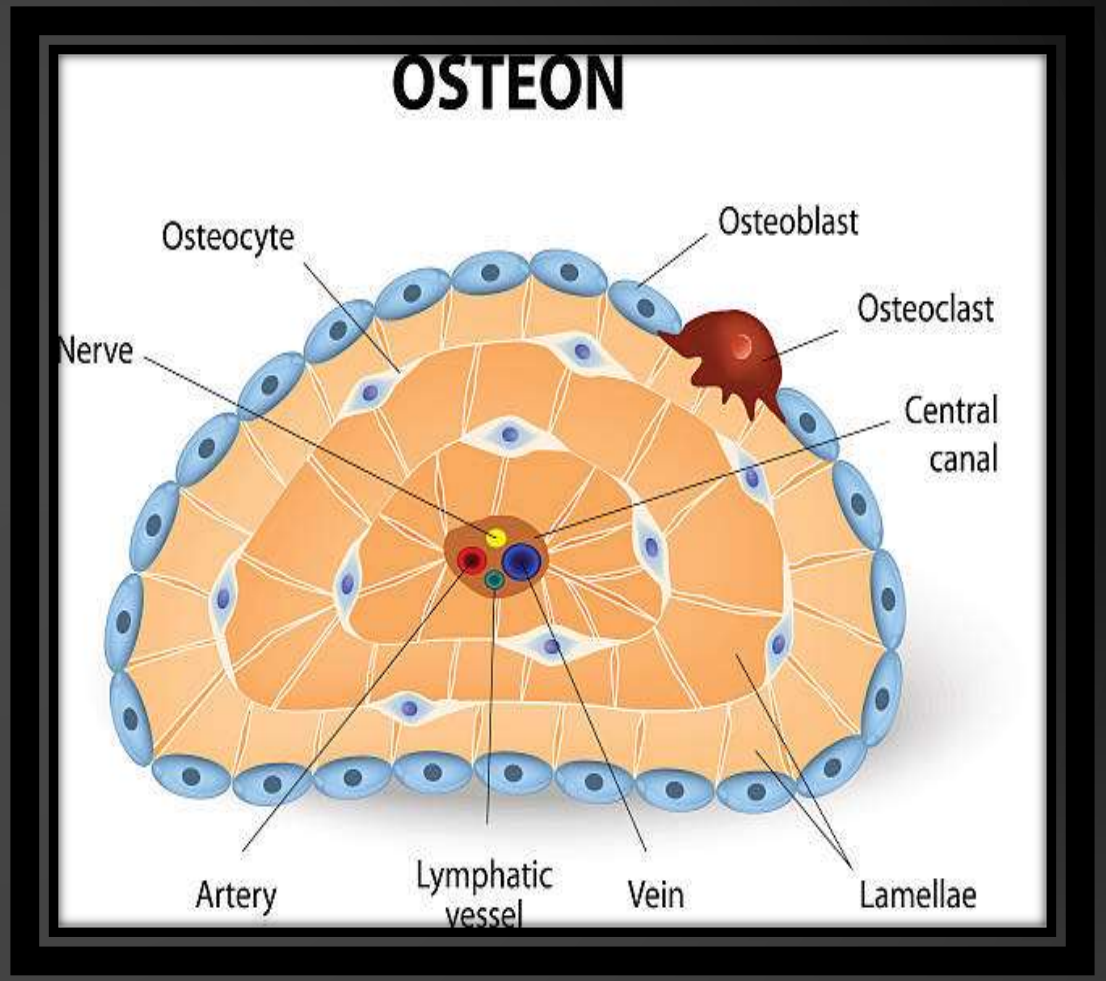
❖Shape and structure:

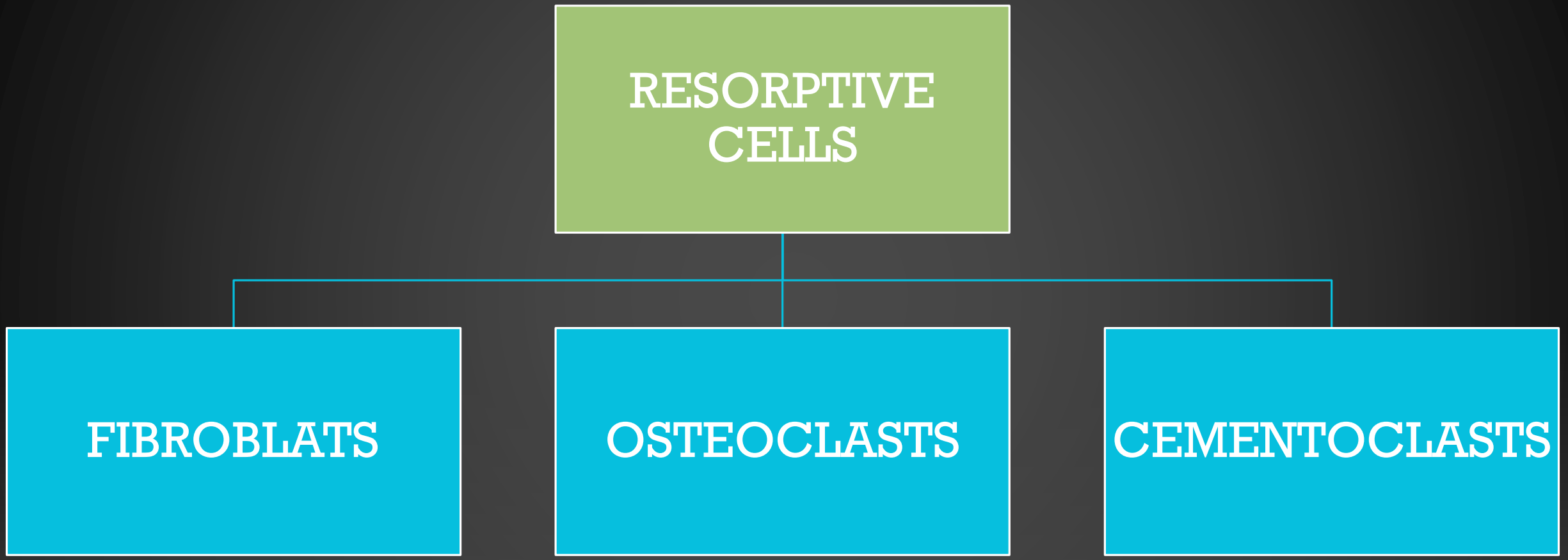
- Not as elongated as periodontal fibroblasts
- Rich in cytoplasm and have large nuclei
- Contain all the intracytoplasmic organelles necessary for protein synthesis and secretion.
- Nucleus is distinctly vesicular with 1 or more nucleoli

OSTEOBLASTS

- Bone forming cells lining the tooth socket closely resembling cementoblasts.
- Layer of osteoblasts is prominent only when there is active bone formation.
- Shape and structure:
  - Osteoblast appears cuboidal and exhibit basophilic cytoplasm
  - Prominent round nucleus tends to lie towards the basal end of the cell
  - Pale juxtanuclear area indicates the site of Golgi bodies

- Shape and structure:
  - Microfilaments are prominent beneath the cell membrane at the secreting surface
  - Cells contact with desmosomes and tight junctions
  - Cell surface adjacent to the bone has many fine cytoplasmic processes, some of which contact underlying osteocytes by tight junctions to form part of transport system throughout the bone




RESORPTIVE CELLS
FIBROBLATS
OSTEOCLASTS
CEMENTOCLASTS

FIBROBLASTS

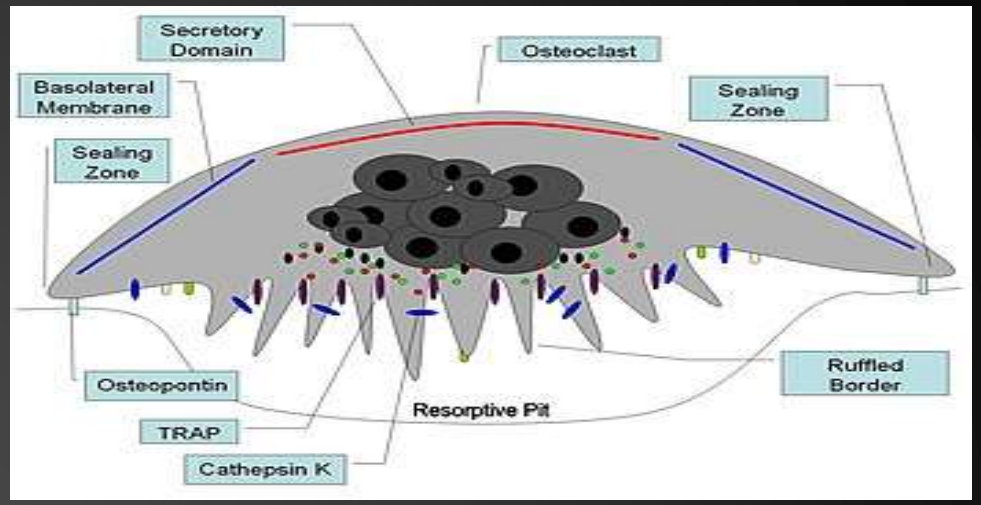
EXTRACELLULAR

- Involves collagenase
- Cleave triple helical structure
- Rest of molecule undergo further proteolysis

INTRACELLULAR

- Intracellular collagen profiles
- Phagolysosomes
- Enzyme lysosomal cysteine proteinase degrades the fibril

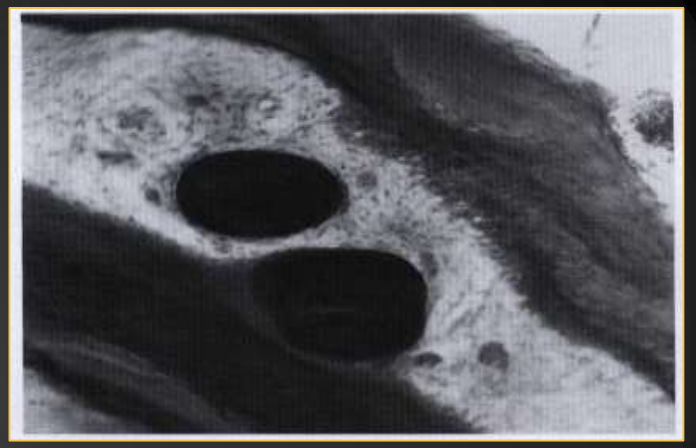
OSTEOCLASTS AND CEMENTOCLASTS



- Osteoclasts and cementoclasts are found in areas where bone and cementum are being resorbed.
- Osteoclasts and cementoclasts has same cytoplasmic features
- These cell are known to arise from blood cells of macrophage type
- When osteoclasts resorb alveolar bone, the surface of alveolar bone shows resorption concavities termed HOWSHIP'S LACUNAE in which lie the osteoclasts

- Shape and structure:
  - Variation in shape and size
  - Part of the cell that lies adjacent to the bone often has a striated appearance, called BRUSH BORDER
  - Osteoclasts contains numerous mitochondria distributed throughout the cytoplasm except for the region immediately beneath the brush border.
  - Most of the remaining cytoplasm contains large number of vesicles of different sizes and types: some contains acid phosphatase.

EPITHELIAL CELLS



- Aggregation of epithelial cell rests, the rests of malassez are a normal feature of PDL.
- These are the remanents of HERS
- PDL contains epithelial cells that lie about 25 microns from the cemental surface
- Persist as networks, strands, islands or tubule like structure near and parallel to the surface of the root.

EPITHELIAL CELLS

- Their function is not yet clear but they could be involved in periodontal repair and regeneration
- Most common in apical area and cervical area
- These cells may undergo calcification to become CEMENTICLES
- Structure and shape:
  - Nucleus of each cell is prominent and often shows invagination.
  - Scanty cytoplasm characterized by the presence of tonofibrils
  - Mitochondria are distributed throughout the cytoplasm

DEFENCE CELLS

MACROPHAGES

- 4% of PDL cells
- Responsible for phagocytosing particulate matter and invading organisms
- Synthesize range of molecules like IF and PG's

MAST CELLS

- Associated with blood vessels
- Shows large number of intracytoplasmic granules. These granules are dense membrane bound vesicle.
- Production of heparin, histamine etc.

EOSINOPHILS

- Occasionally seen in the normal PDL
- They possess granules (peroxisomes) that consists of 1 or more crystalloid structures.
- These cells are capable of phagocytosis.

EXTRACELLULAR SUBSTANCES

FIBERS

- COLLAGEN
- ELASTIC
- RETICULAR
- SECONDARY
- INDIFFERENT FIBER PLEXUS
- OXYTALAN

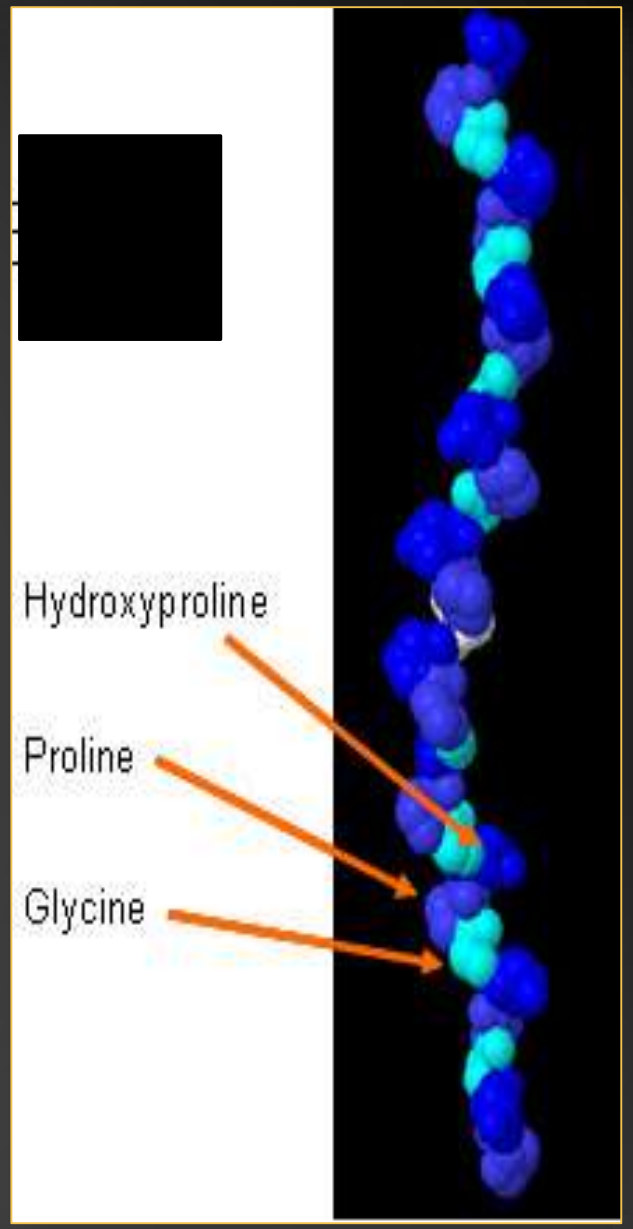
GROUND SUBSTANCE

- PROTEOGLYCANS
- GLYCOPROTEINS

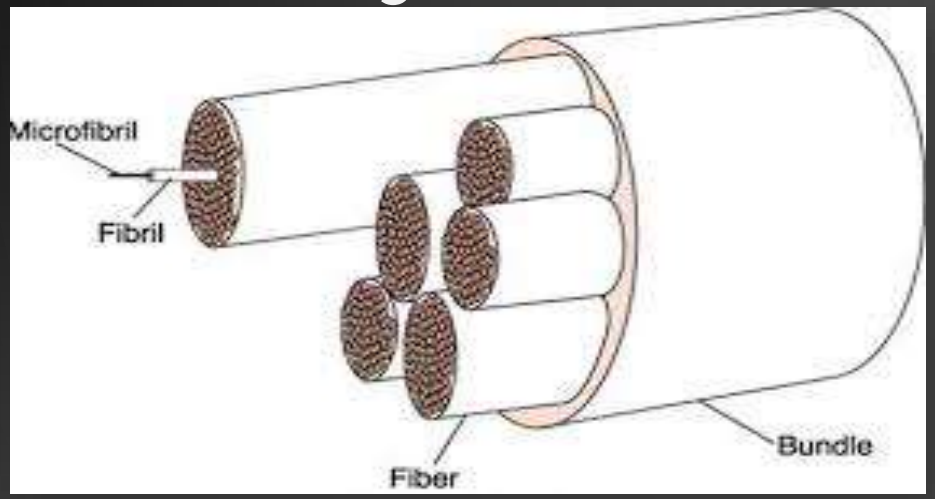
FIBERS

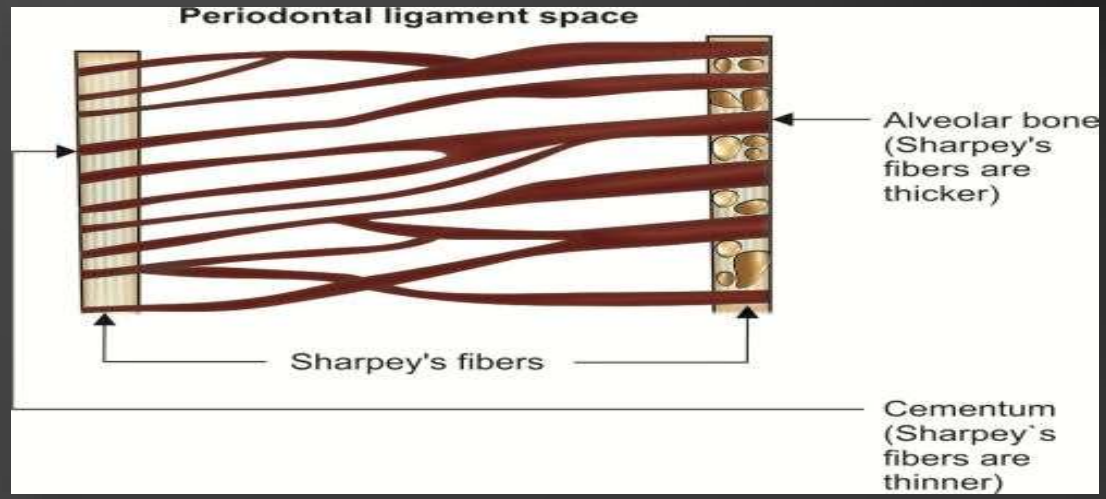
COLLAGEN

- The main type of collagen in the PDL are: TYPE 1 AND TYPE 3
- More than 70% of PDL is type 1 and it is uniformly distributed in the ligament.
- Type 3 collagen accounts for about 20% of collagen fibers, found in the periphery of sharpey's fiber attachments into alveolar bone
- Type 4 and type 7 are associated with epithelial cell rests and blood vessels.
- Type 12 collagen is believed to occur within the PDL only when ligament is fully functional



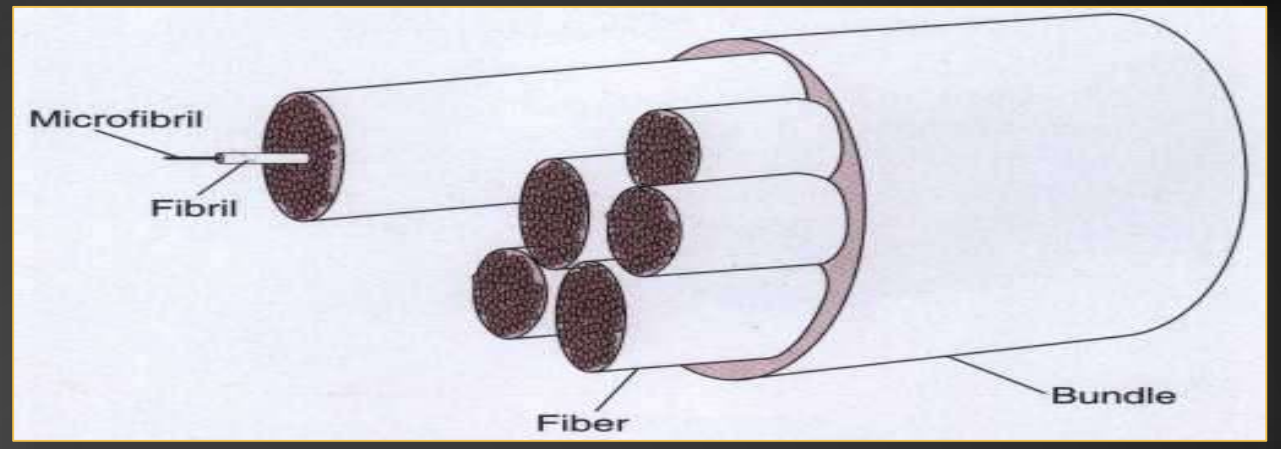
- The collagen is gathered to form bundles approximately 5 micrometer in diameter. These bundles are termed as principal fibers.
- Within each collagen bundle, subunits are present called Collagen fibrils.

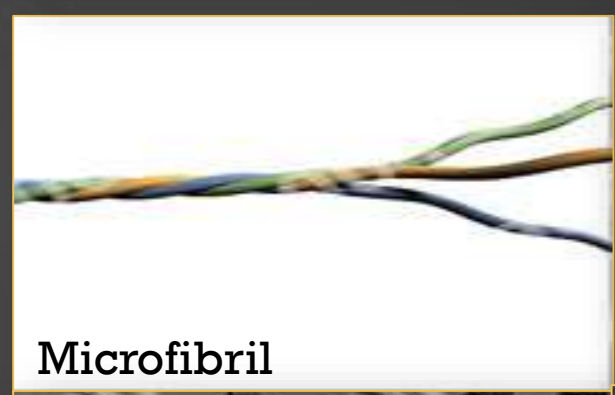




COLLAGEN SYNTHESIS

- PROCESS
  - Tropocollagen
  - Microfibril
  - Fibril
  - Collagen fiber (type 1 and 3)
  - Collagen bundles (type 1)




Microfibril


Fibril

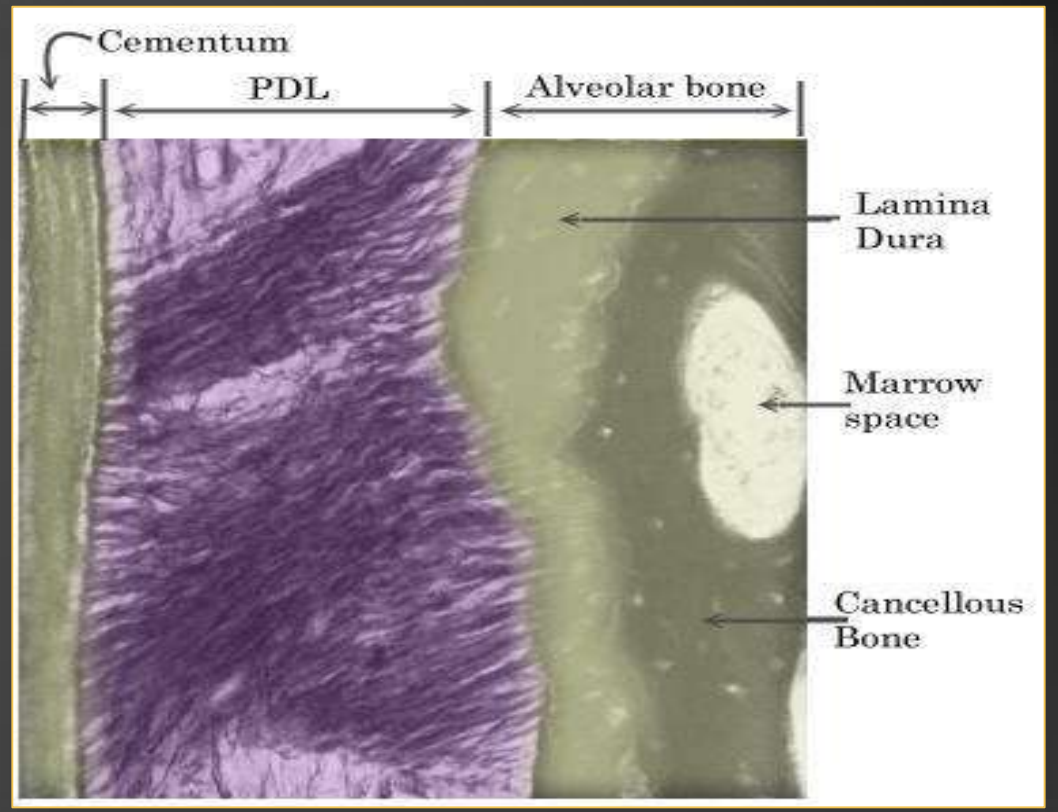

Collagen fibre


Collagen bundle

- Turnover rate of collagen:
- The rate of turnover of collagen within the PDL is faster than all other connective tissues.
- The rate appears to be highest towards the root apex.
- The collagen on the tooth side has low turnover rate than that on the bone where it shows high turnover rate.

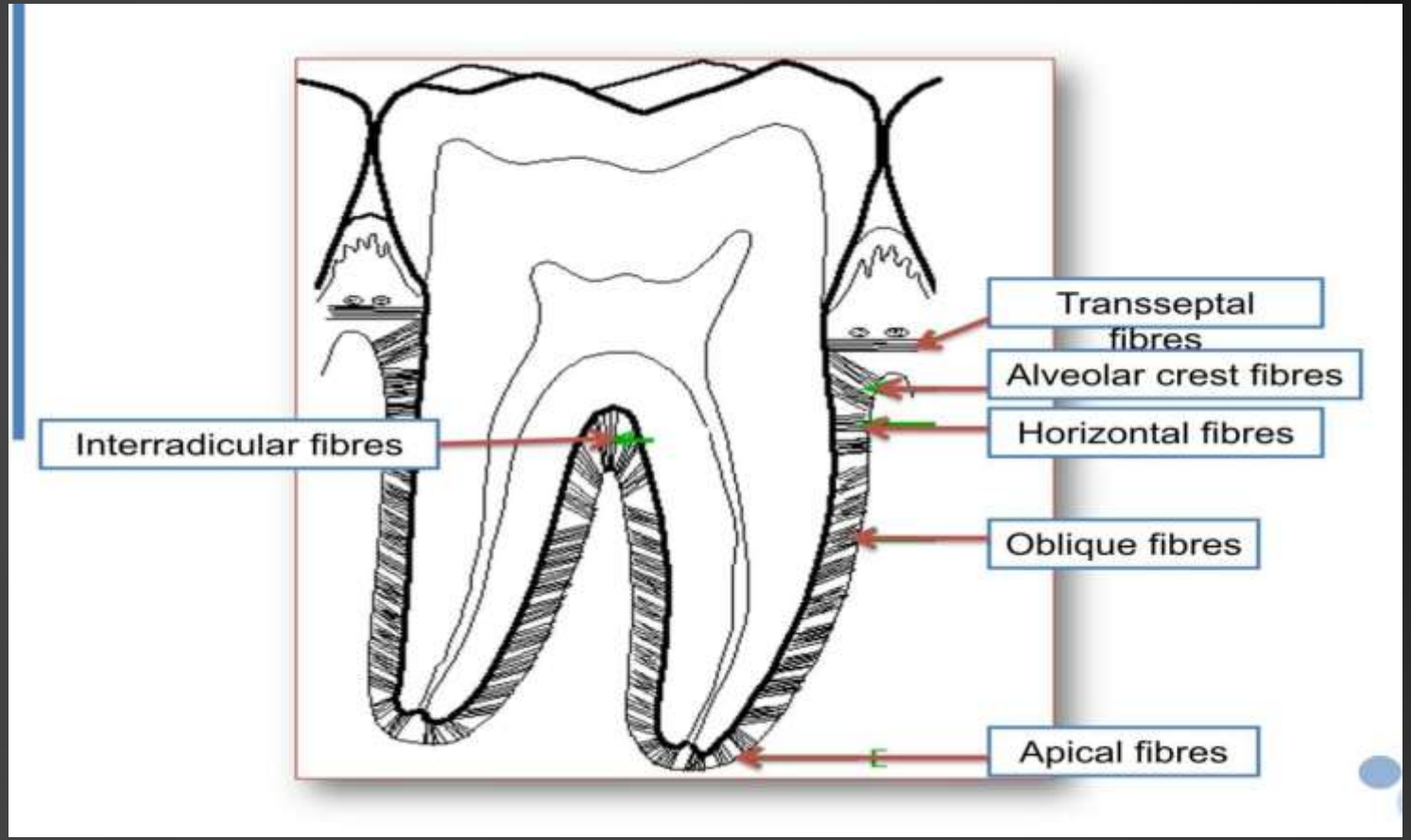
PDL PRINCIPAL FIBERS

- These are collagenous and follow a wavy pattern when viewed in longitudinal section.
- They are thought to contribute to the regulation of mineralization and to tissues cohesion at sites of increased biomechanical strain.
- The adult human PDL fibers : 54-59 nm in diameter.



PDL PRINCIPAL FIBERS

- Transseptal fibers
- Alveolar crest group
- Horizontal group
- Oblique group
- Apical group
- Interradicular group



PRINCIPAL PDL FIBERS

Type of Fiber	Origin and Insertion	Function
Alveolar crest group	• Extend obliquely from cementum just beneath junctional epithelium to alveolar crest • Also extend from cementum over the alveolar crest to fibrous layer of periosteum covering alveolar bone	Resist tilting, intrusive, extrusive, and rotational forces
Horizontal group **limited to coronal one-fourth of PDL space**	• Extend at right angles to the long axis of the tooth from cementum to the alveolar bone and parallel to occlusal plane • Gets inserted into alveolar process as Sharpey's fibers	Resist horizontal and tipping force
Oblique group **most numerous and occupy two-thirds of ligament**	Extend into alveolar bone coronal to their attachment to cementum	Resist vertical and intrusive forces
Apical group **not seen in incompletely formed roots**	Extend from root tip and radiate through the periodontal space into fundus of bony socket	Resist luxation, prevent tooth tipping, protect delicate lymph and blood vessels and nerves traversing the PDL space at the root apex
Interradicular group **fibers lost if furcation area is exposed**	Extend into cementum from the crest of inter-radicular septum of multirooted teeth	Resist tooth tipping, torque, and luxation

INTERMEDIATE PLEXUS

Earliar it was believed that principle fibers follow a wavy course from cementum to bone and are joined in the mid region of the periodontal space giving rise to a zone of distinct appearance i.e. the intermediate plexus

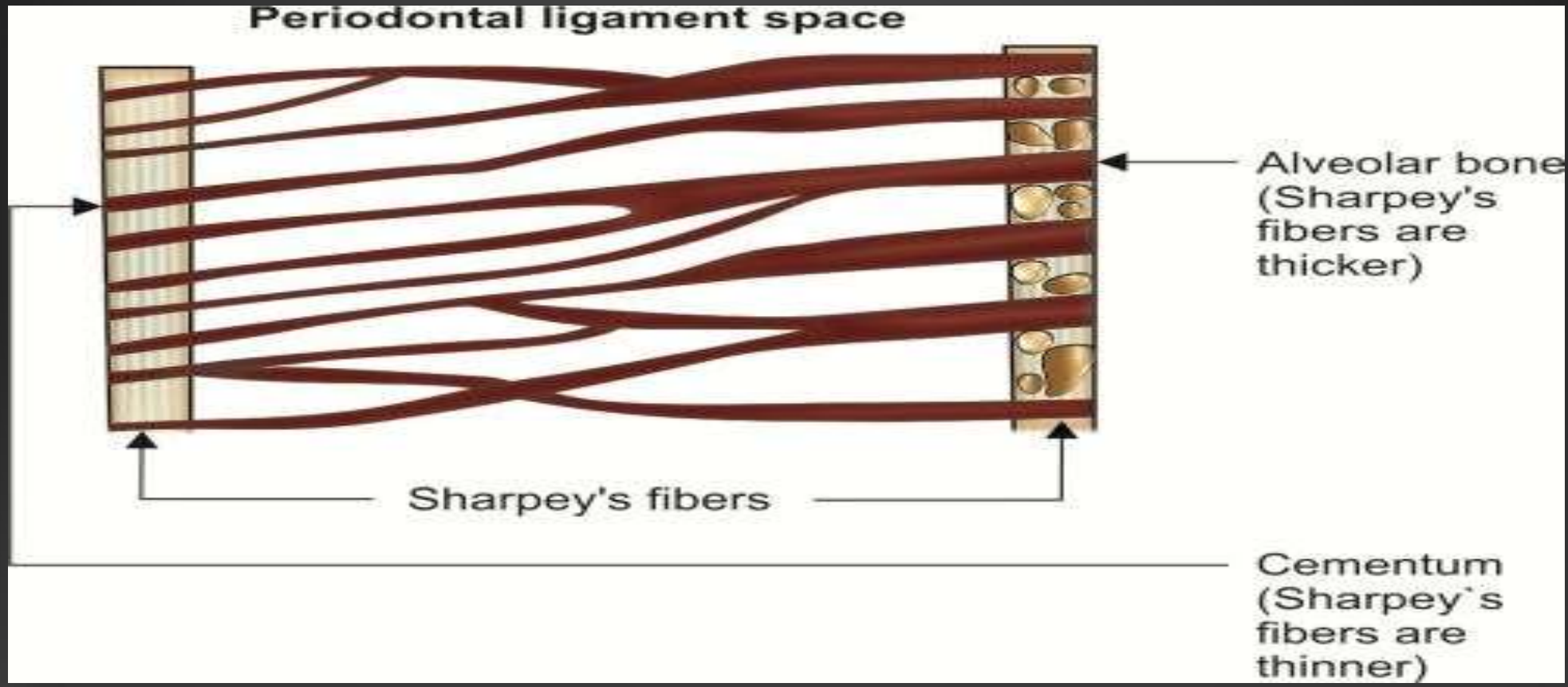
Research over past years suggests that cemental fibers meet and fuse with osseous fibers, no such plexus remains. Secondly the entire PDL is metabolically active, not just the middle or intermediate zone

The recent concept is that, fibers cross the entire width of periodontal space but branch en route and join neighbouring fibers to form a complex three dimensional network.

SHARPEY'S FIBERS

- The collagen bundles of PDL embedded into cementum and alveolar bone are called SHARPEY'S FIBERS.
- Orientation is similar to that of adjacent periodontal ligament bundles
- Are more numerous but smaller at their attachment into cementum than alveolar bone
- Sharpey's fibers in Acellular cementum is fully mineralized while in alveolar bone and cellular cementum it is partially mineralized
- Few sharpey's fibers pass uninterruptedly through bone of alveolar process – TRANSALVEOLAR FIBERS.

SHARPEY'S FIBERS



ELASTIC FIBERS

MATURE ELASTIC FIBERS

- Consists of microfibrillar component surrounding an amorphous core of elastic protein
- Restricted to walls of blood vessels

OXYTALAN FIBERS

- Are microfibrils, run in apicocoronal direction to bend and attach at cervical third of root
- They may support the blood vessels of pdl

ELAUNIN FIBERS

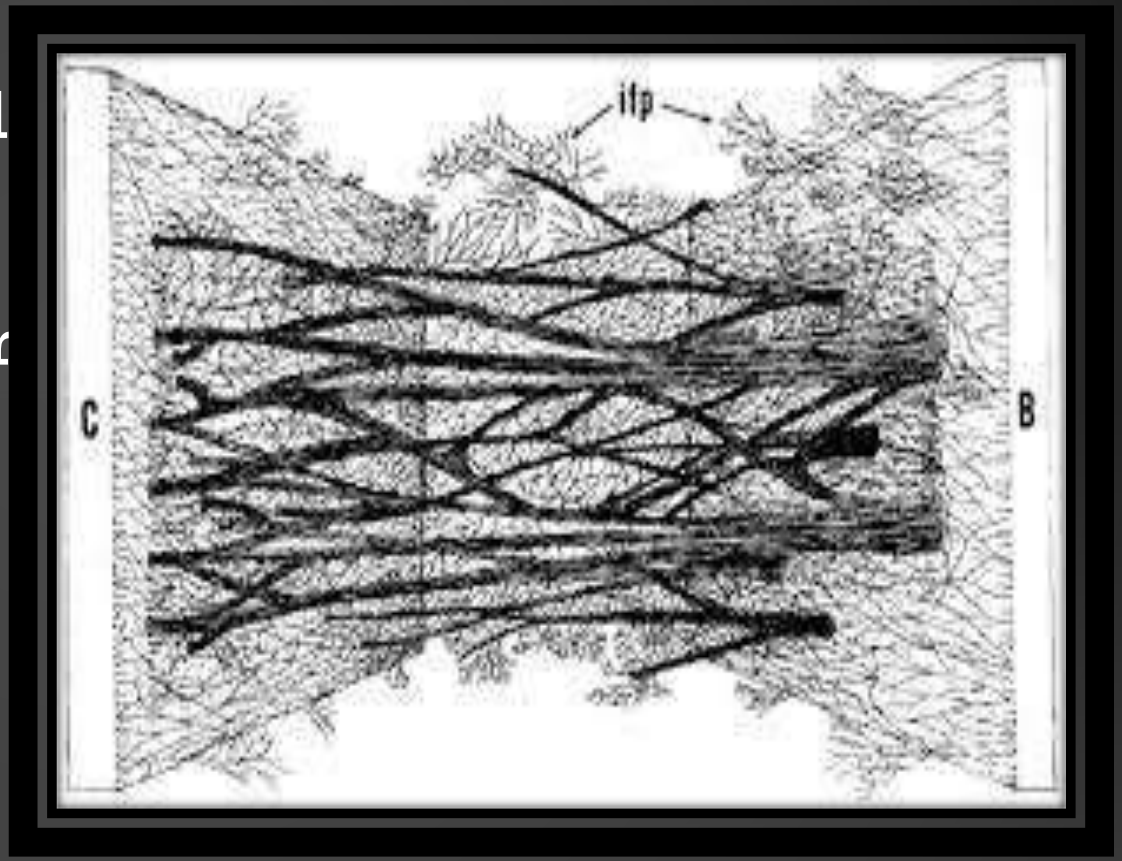
- Are bundles of microfibrils embedded in a small amount of amorphous elastin
- Regulate vascular blood flow, supports tooth, facilitates fibroblast attachment and migration

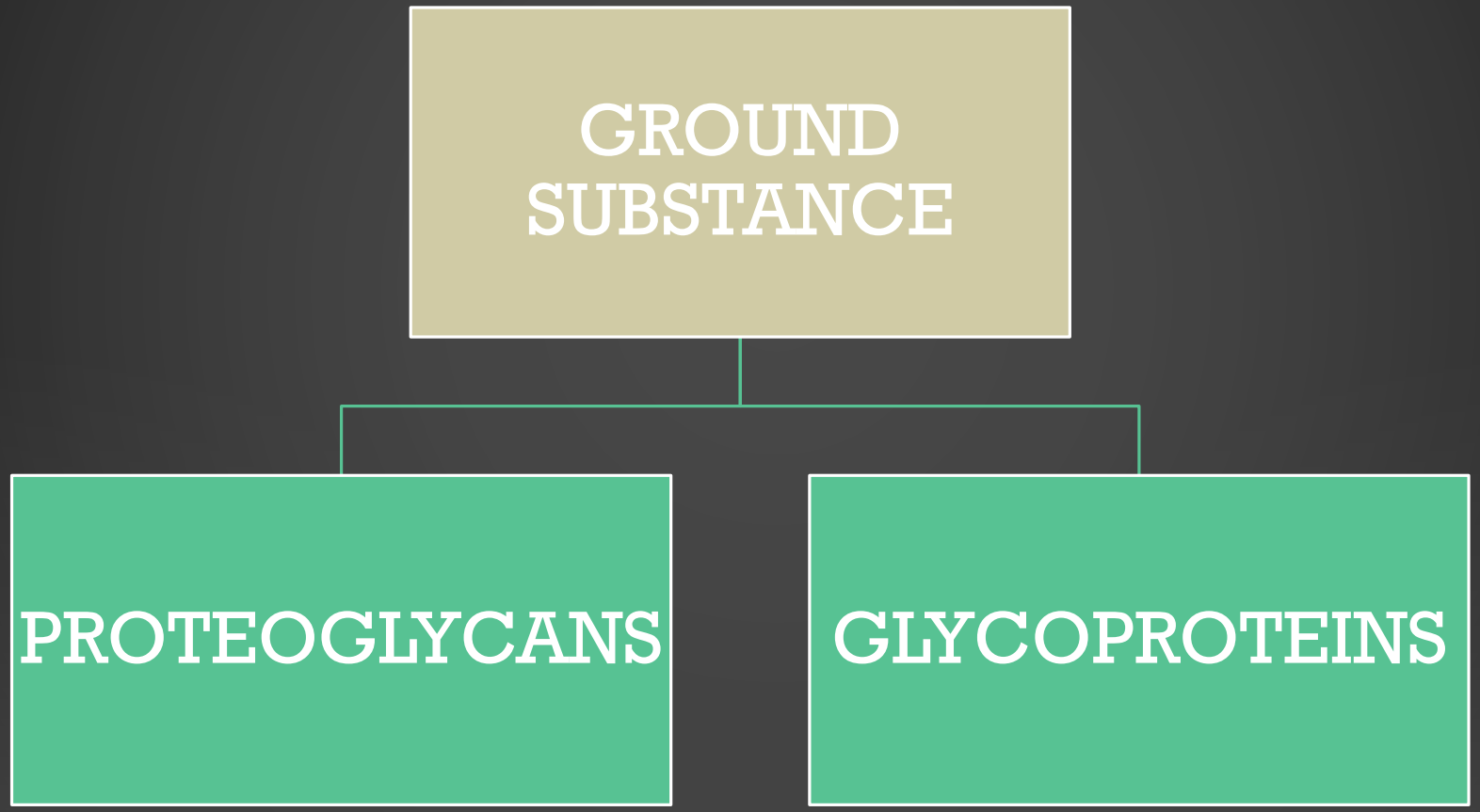
RETICULAR AND SECONDARY FIBERS

- RETICULAR FIBERS : immature collagen fibers with argyrophilic staining properties and are related to basement membrane of blood vessels and epithelial cells which lie within the periodontal ligament.
- SECONDARY FIBERS:
  - Newly formed collagenous elements, not yet incorporated into principal fiber bundle.
  - Located between and among the principal fibers.
  - Relatively non-directional and randomly oriented

INDIFFERENT FIBER PLEXUS

- Described by shackleford
- Small collagen fibers in association with the larger principle collagen fiber.
- Run in all directions forming a plexus




GROUND SUBSTANCE
PROTEOGLYCANS
GLYCOPROTEINS

GROUND SUBSTANCE

- Ground substance is the gel like matrix synthesized by the fibroblast family and fills the space between the fibers and cell

COMPOSITION

- Consists of a biochemically complex, highly hydrated, semisolid gel
- Water content of 70%
- Glycosaminoglycans- hyaluronic acid, proteoglycans (versican, decorin)
- Glycoproteins- fibronectin, laminin, tenascin

PROTEOGLYCANS

- Large group of anionic macromolecules that consists of a protein core to which are attached hexose amine containing polysaccharides called GAG chains.

1. Decorin : regulate growth of collagen fibrils
2. Versican : binds cell surface glycoprotein to ECM
3. Prelecan: binds to fibronectin and helps anchor fibroblasts to ECM
4. Syndecan: binds to collagen and other glycoproteins
5. CD44: binds to glycoproteins.

CONT…

- With the exception of hyaluronic acid, the other glycosaminoglycans are sulphated and covalently attached to the core proteins at the reducing terminus of Proteoglycans
- The major GAGs are

1. Chondriotin sulphate
2. Dermatan sulphate
3. Heparin sulphate
4. Hyaluronic acid
5. Keratan sulphate

GLYCOPROTEINS

- Three distinctly related glycoproteins of the extra cellular matrix have been localized in the decalcified sections of human periodontal ligament, namely:

❑FIBRONECTIN

- It promotes the attachment of cells to the substratum especially to collagen
- It is expressed strongly along attachment sites of the PDL collagen fibers to cementum but not bone
- In addition to its function as an adhesion protein it is also involved in blood coagulation, wound healing and chemotaxis.

TENASCIN:

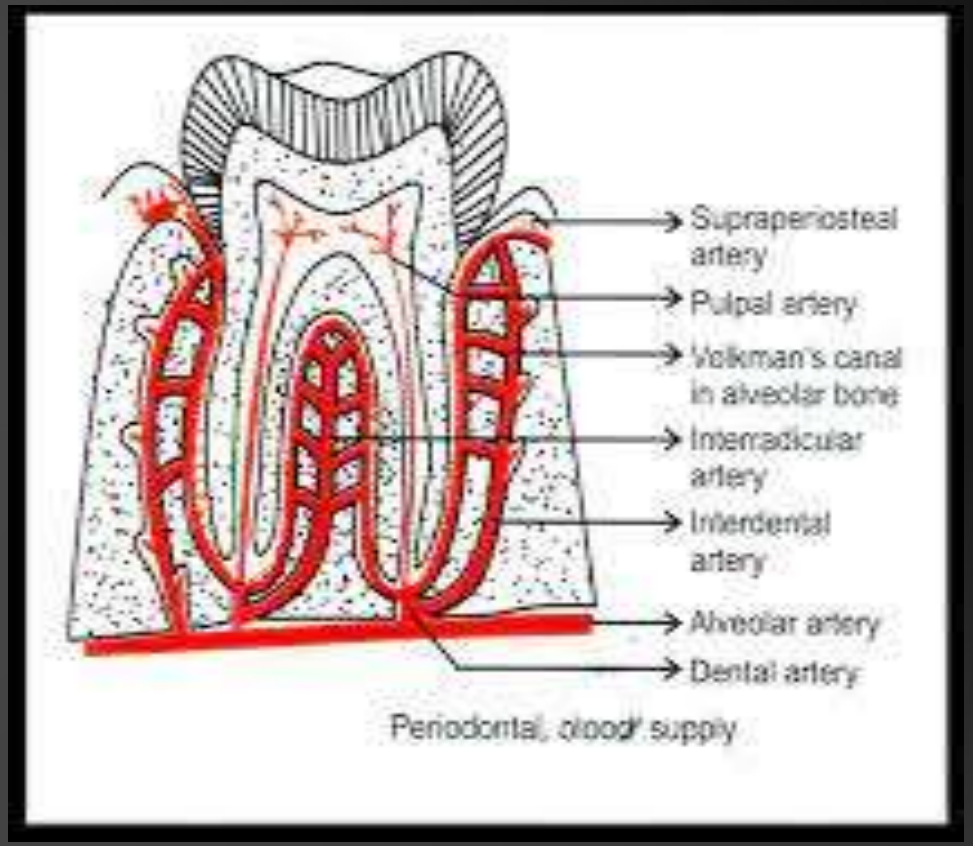
- Also known as cytotactin
- It is found mostly in healing wounds
- Unlike fibronectin it is not uniformly distributed through out the PDL
- It is concentrated in between the less densely packed collagen fibrils near cementum and alveolar bone
- Present in the glycoproteins of PDL with smaller role in cell attachment and organization of basement membrane.

- LAMININ :
  - Major glycoprotein component of basement membrane of epithelial cell rests of malassez
  - Implicated in variety of functions including
    - Cell adhesion
    - Migration
    - Differentiation
- Other glycoproteins like
  - Entactin (Nidogen) : dumb bell shaped glycoproteins
  - Vitronectin
  - Thrombospondin : may also be present in the glycoproteins of PDL with a smaller role in cell attachment and organization of basement membrane

BLOOD SUPPLY

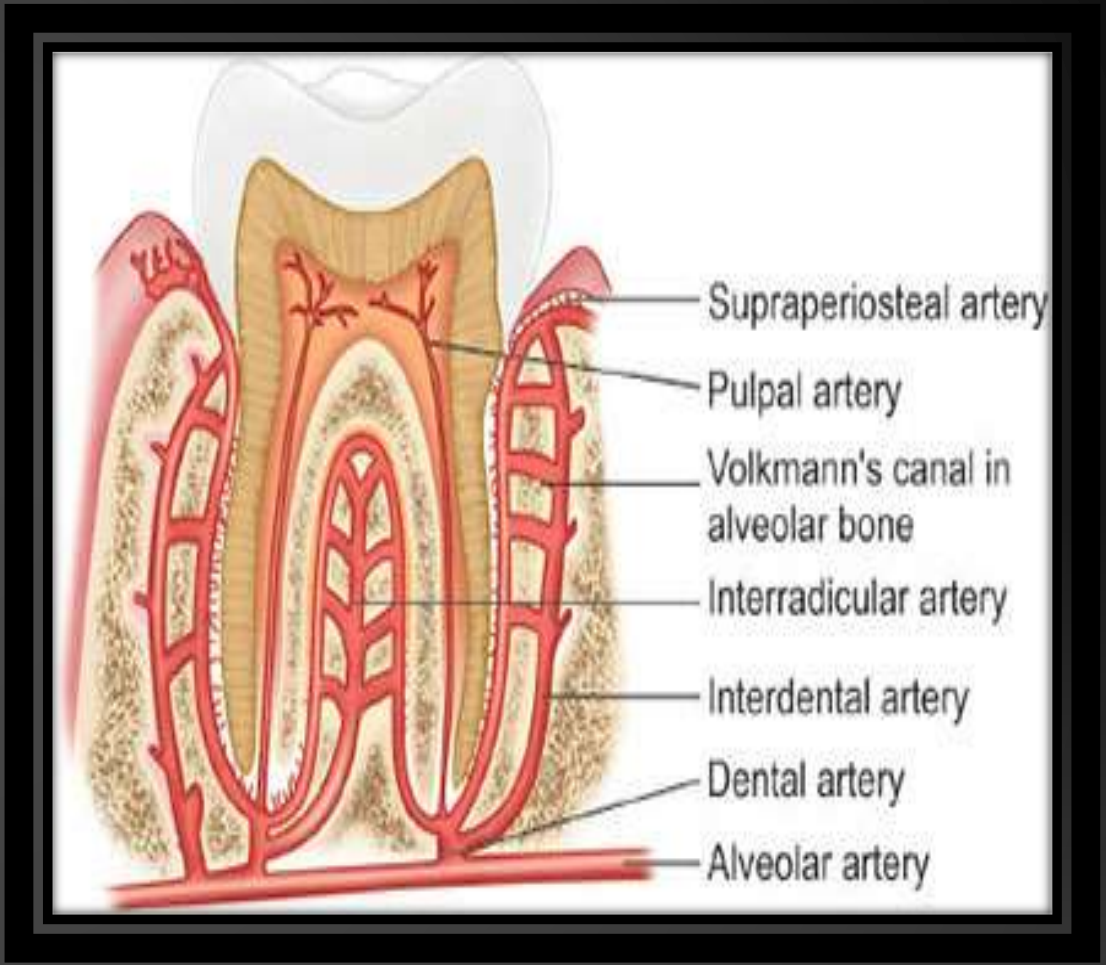
- Blood supply is derived mainly from inferior and superior alveolar arteries to mand. And max respectively from 3 sources:

1. Apical vessels (Dental artery) supply dental pulp
2. Transalveolar vessels (series of perforation arteries passing through the alveolar bone)
3. Intraseptal vessels (anastomosing vessels from the gingiva)



BLOOD SUPPLY

- Major vessels of PDL lie between the principal fiber bundles, close to the wall of alveolus
- They have average diameter of 20micrometer
- The vessel branch anastomose to form capillary plexus around the teeth
- Blood supply : posterior teeth > anterior teeth
- Blood supply : gingival third>apical third> middle third



NERVE SUPPLY

- Nerve fibers supplying PDL are functionally of two types: sensory and autonomic
- The sensory fibers are associated with nociception and mechanoreception.
- Autonomic fibers are associated mainly with the supply of periodontal blood vessels.
- The nerve fibers entering the PDL are derived from 2 sources. Some nerve bundles enter near the root apex and pass up through the PDL, others enter the middle and cervical portion of ligament as finer branches through opening in the alveolar walls.

NERVE SUPPLY

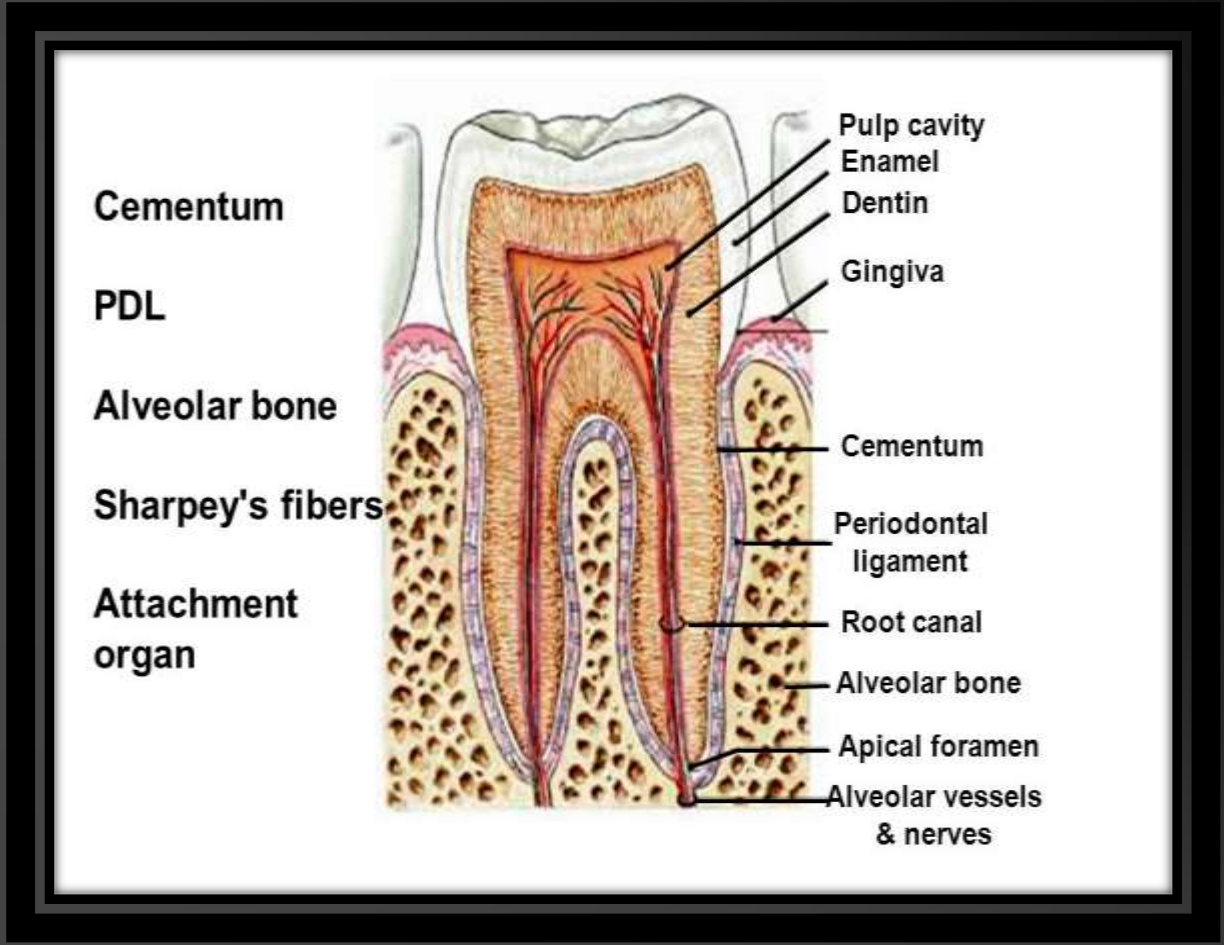
- Periodontal nerve fibers are both myelinated and unmyelinated.
- Myelinated fibers are on average about 5 microns in diameter and are sensory only.
- The unmyelinated fibers are about 0.5 microns in diameter and are both sensory and autonomic

LYMPHATIC DRAINAGE

- Lymph vessels: follow the course of blood vessels.
- Course apically : pass through the fundus of the socket or they may pass through the cribriform plate to empty into larger channels pursuing intraosseous paths

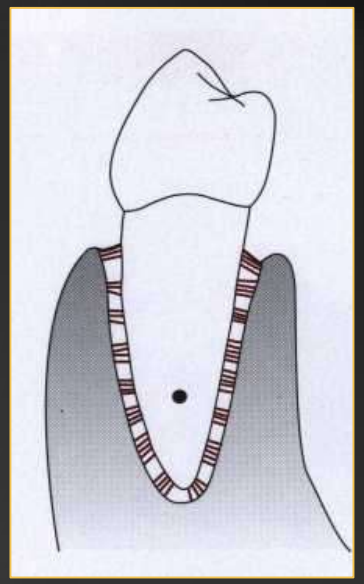
EXTENT

- In the coronal direction it is continuous with lamina propria of gingiva and it is demarcated by alveolar crest fibers.
- At the root apex it merges with the dental pulp
- It ranges in width from 0.15-0.38mm



SHAPE

- It is thinnest around the middle third of the root with an hourglass appearance.
- The ligament appears as a radiolucent area of 0.4-1.5mm between the radiopaque lamina dura of the alveolar bone and cementum.

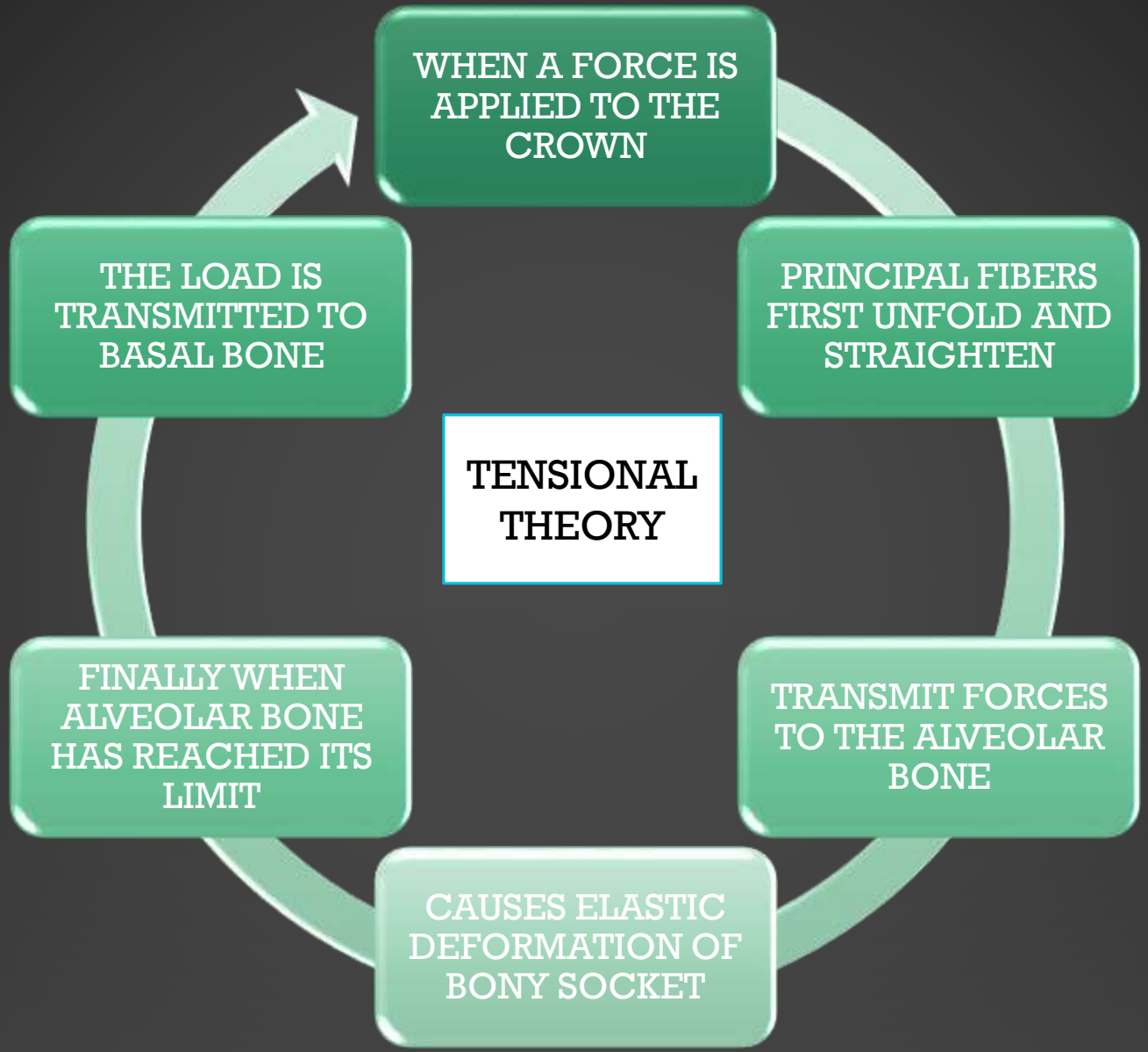


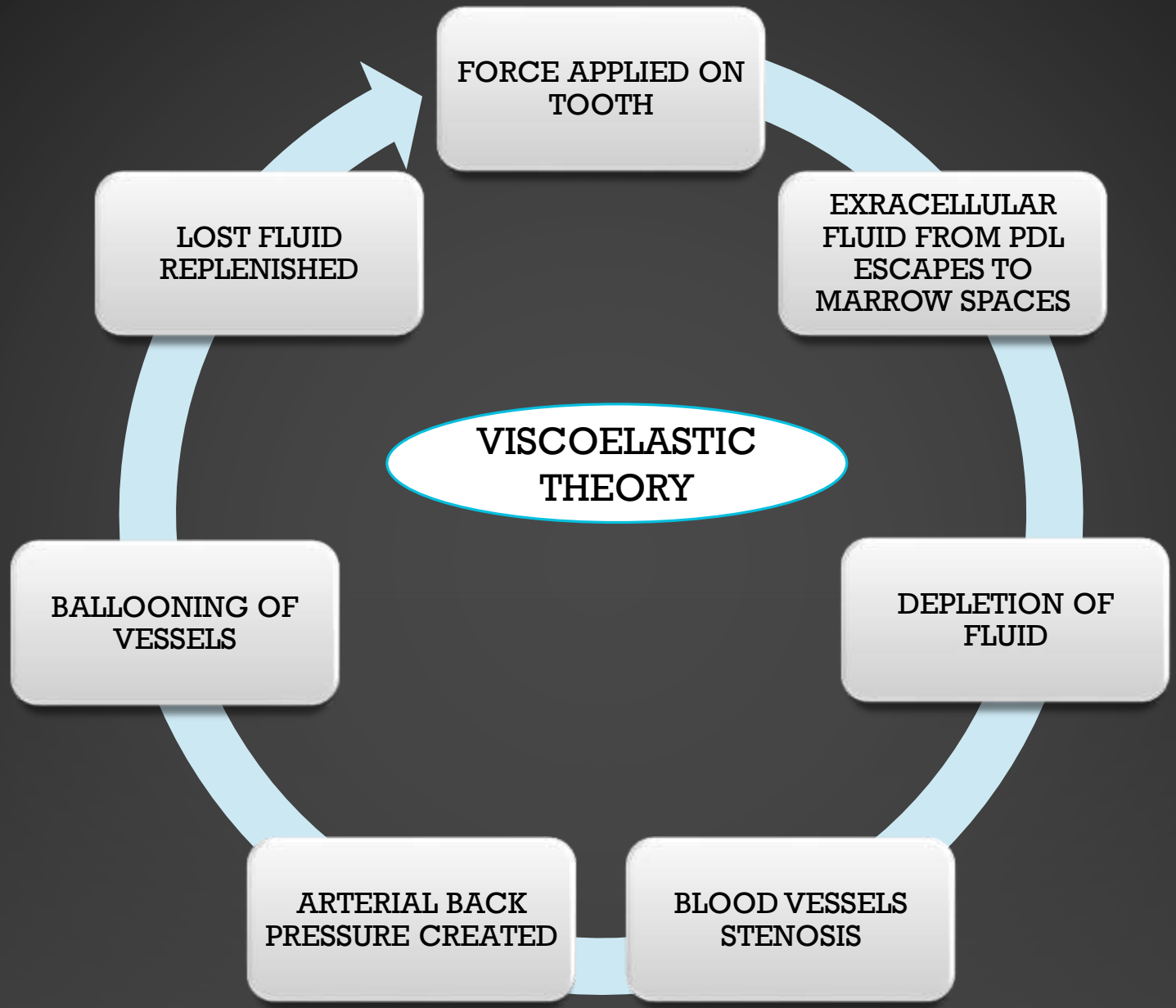
AVERAGE WIDTH

- Depending on age
  - 11-16 yrs : 0.21mm
  - 32-52 yrs: 0.18mm
  - 51-67 yrs: 0.15mm
- According to functional state of tissues
  - Time of eruption : 0.1-0.5mm
  - At function : 0.2-0.35mm
  - Hypofunction : 0.1-0.15mm

FUNCTIONS OF PDL

- PHYSICAL FUNCTIONS
  - Provision of a soft tissue casing to protect the vessels and nerves from injury by mechanical forces.
  - Transmission of occlusal forces to the bone
  - Maintainance of gingival tissues in their proper relationship to the teeth
  - Resistance to the impact of occlusal forces (SHOCK ABSORPTION)


TENSIONAL THEORY
WHEN A FORCE IS APPLIED TO THE CROWN
PRINCIPAL FIBERS FIRST UNFOLD AND STRAIGHTEN
TRANSMIT FORCES TO THE ALVEOLAR BONE
CAUSES ELASTIC DEFORMATION OF BONY SOCKET
FINALLY WHEN ALVEOLAR BONE HAS REACHED ITS LIMIT
THE LOAD IS TRANSMITTED TO BASAL BONE


VISCOELASTIC THEORY
FORCE APPLIED ON TOOTH
EXRACELLULAR FLUID FROM PDL ESCAPES TO MARROW SPACES
DEPLETION OF FLUID
BLOOD VESSELS STENOSIS
ARTERIAL BACK PRESSURE CREATED
BALLOONING OF VESSELS
LOST FLUID REPLENISHED

FUNCTIONS OF PDL

- FORMATIVE AND REMODELLING FUNCTION:
  - Cells of the PDL participate in the formation and resorption of cementum and bone, which occur in
    - Physiologic tooth movement
    - Accommodation of periodontium to occlusal forces
    - In the repair of injuries
  - PDL is constantly undergoing remodeling, old cells and fibers are broken down and replaced by new ones, and mitotic activity can be observed in the fibroblasts and endothelial cells

FUNCTIONS OF PDL

- NUTRITIONAL:
  - PDL supplies nutrients to the cementum, bone, and gingiva by way of blood vessels and provides lymphatic drainage.
  - The PDL contains blood vessels, which provide anabolites and other substance to the cementum, bone and gingiva, & removes catabolites.

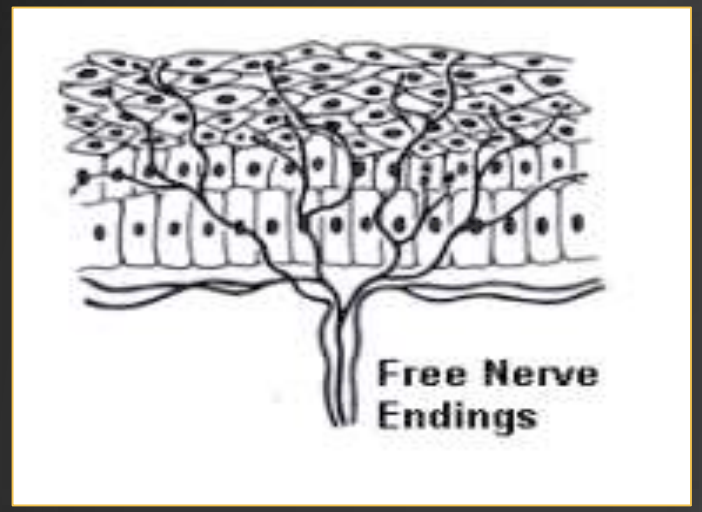
FUNCTIONS OF PDL

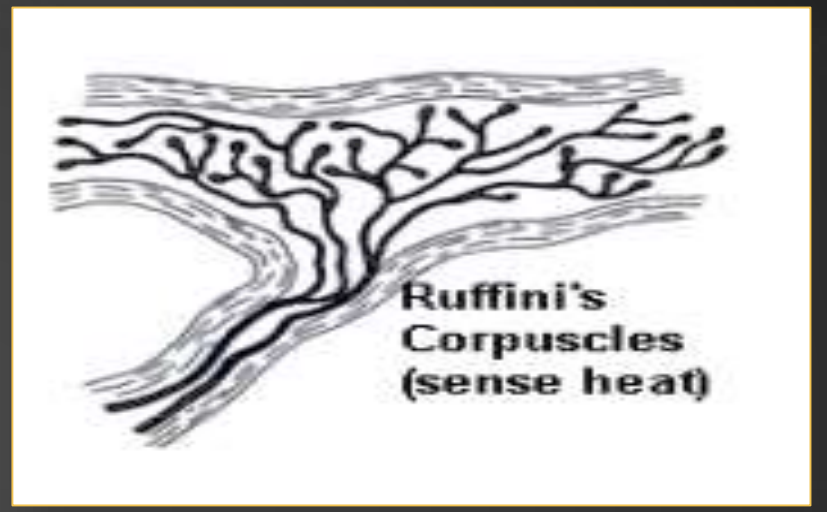
- HOMEOSTATIC:
  - Adaptability to rapidly changing applied forces and its capacity to maintain its width at constant diameter throughout life.
  - It is evident that the cells of PDL have ability to resorb and synthesize the extracellular substance of connective tissue of ligament, alveolar bone and cementum.

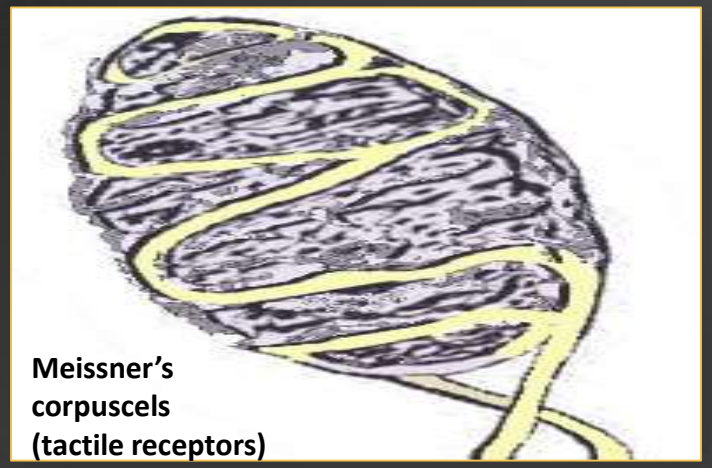
FUNCTIONS OF PDL

- SENSORY FUNCTION:
  - The PDL is abundantly with sensory nerve fibers capable of the repair of transmitting tactile, pressure and pain sensations by the trigeminal pathway.
  - The PDL provides a most efficient proprioceptive mechanism.
  - 4 types of neural termination are seen:
    - Free nerve endings- pain (at regular intervals along the length of the root)
    - Ruffini like mechanoreceptors- (apical area)
    - Meissner's corpuscles- mechanoreceptors (middle 3rd)
    - Spindle like pressure and vibration endings (apex)

NEURAL TERMINATION





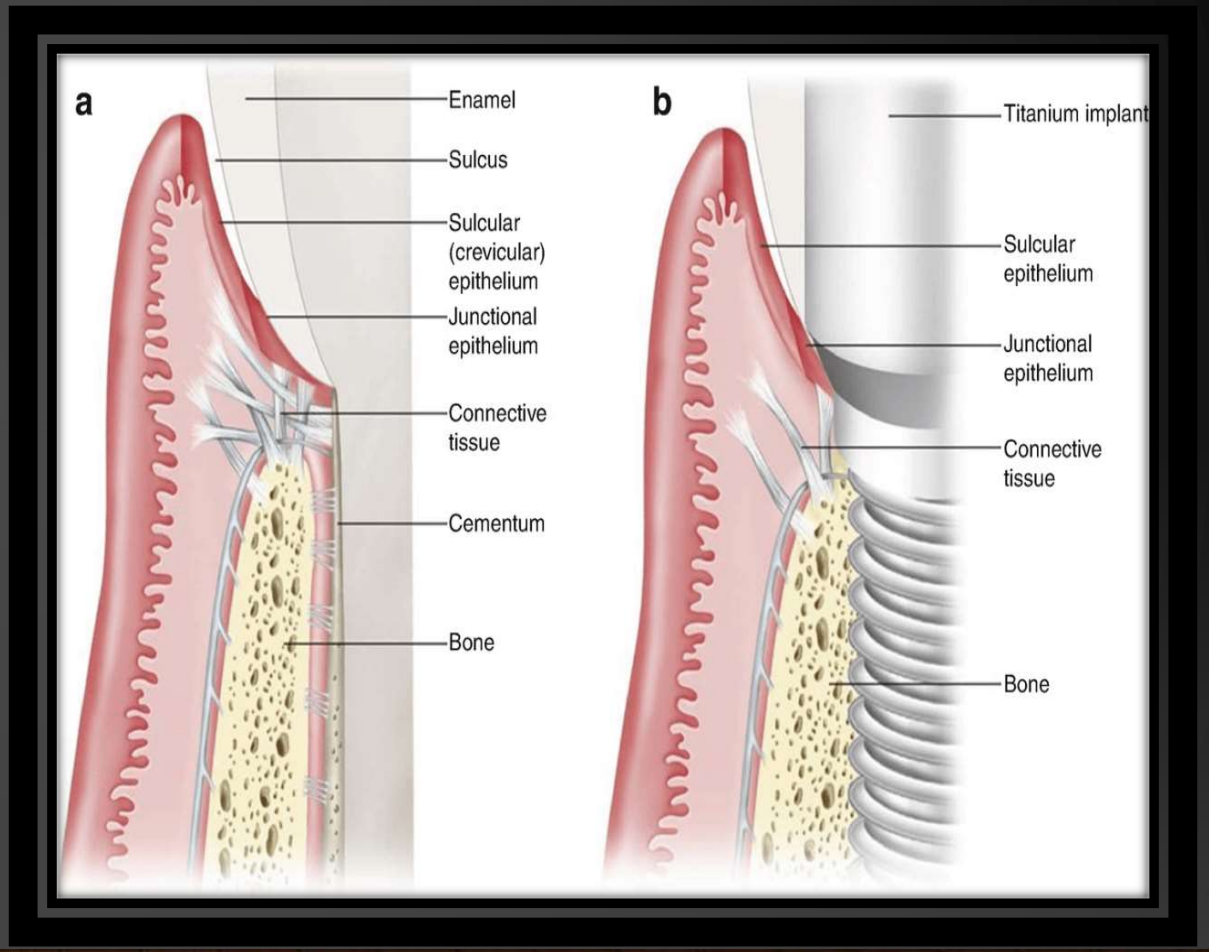


AGE CHANGES IN PDL

- Increase in collagen fibrosis & decrease in cellularity
- Areas of hyalinization are present.
- Sporadic mineralization of fibers also occur.
- Decrease in cellularity & formation of multinucleated fibroblasts.
- Decrease in collagen synthesis.
- The surfaces od periodontal alveolar bone are jagged & uneven & and irregular insertion of fibres is seen.
- Replacement of some of PDL space by interstitial areas & fat cells.
- Structural organization of ligament degenerates with age.

PDL RELATIONSHIP WITH IMPLANTS

- Implants do not employ a gomphosis to provide support and attachment to the jaw bones as does the PDL, but it still it serves as a replacement of natural teeth
- The absence of PDL around implants – absence of resilient connection between teeth and jaw bone thus any occlusal disharmony will have repercussions at bone to implant interface.
- Absence of PDL leads to : reduced tactile sensitivity and reduced reflex function



CONCLUSION

- Periodontal ligament is a fibrous connective tissue forming important part of periodontium.
- PDL is a physically small, but functionally important tissue in tooth support, proprioception and regulation of alveolar bone volume.
- PDL is an absolute requirement for rapid remodeling of alveolar bone when forces are applied to the teeth.
- Cells of PDL are pluripotent and helps in the regeneration of all the components of periodontium lost in the periodontal disease process

REFERENCES

- CLINICAL PERIODONTOLOGY 10TH EDITION : F.A. CARRANZA
- CLINICAL PERIODONTOLOGY AND IMPLANT DENTISTRY : JAN LINDHE
- ORBANS ORAL HISTOLOGY AND EMBRYOLOGY
- ORAL ANATOMY HISTOLOGY AND EMBRYOLOGY : BERKOVITZ et.al.