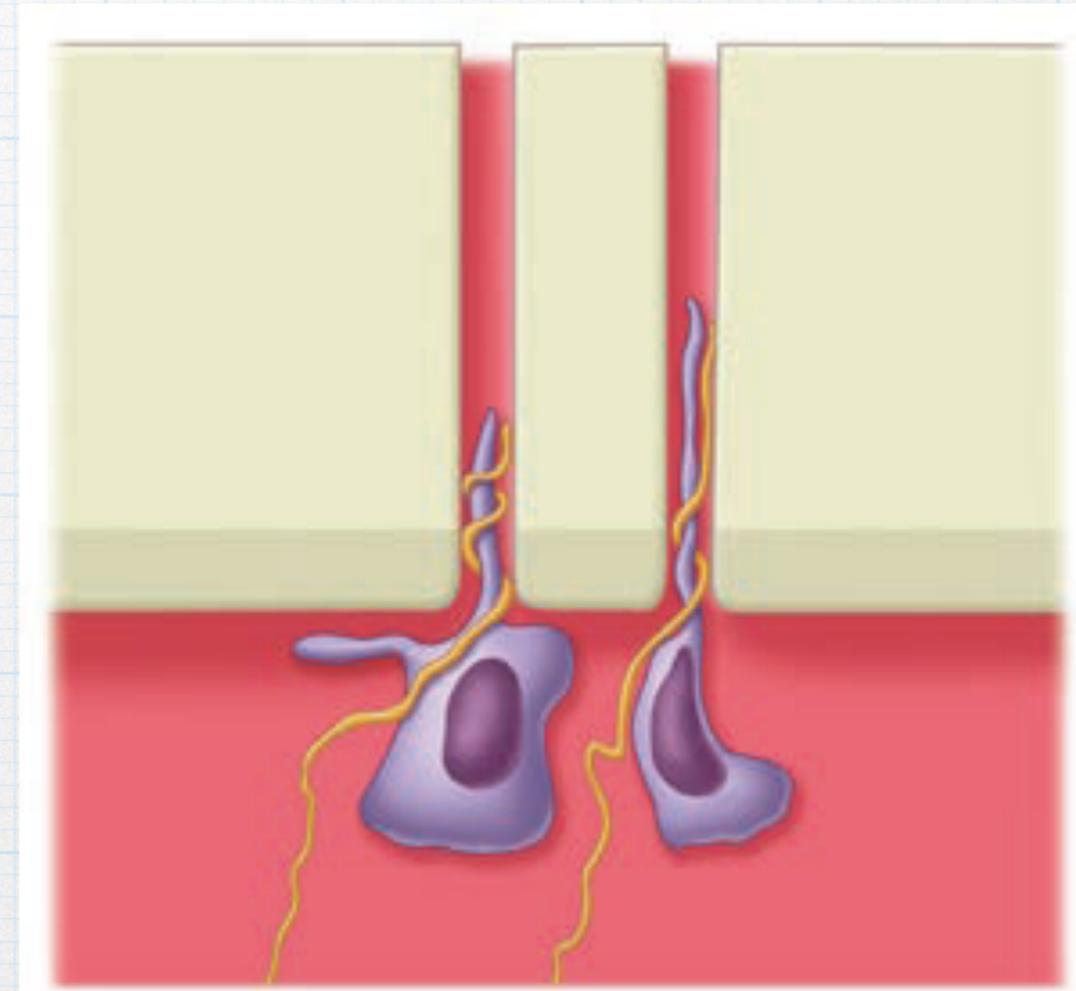


DENTIN

- * Dentin formation, dentinogenesis, is accomplished by cells called odontoblasts. Odontoblasts are considered part of pulp and dentin tissues because their cell bodies are in the pulp cavity, but their long, slender cytoplasmic cell processes (Tomes fibers) extend well (100-200 μm) into the tubules in the mineralized dentin.



- * Because of these odontoblastic cell processes, dentin is considered a living tissue, with the capability of reacting to physiologic and pathologic stimuli.
- * Odontoblastic processes occasionally cross the DEJ into enamel; these are termed enamel spindles when their ends are thickened.

- * They may serve as pain receptors, explaining the enamel sensitivity experienced by some patients during tooth preparation.

- * Dentin forms the largest portion of the tooth structure, extending almost the full length of the tooth. Externally, dentin is covered by enamel on the anatomic crown and cementum on the anatomic root.



| | MİNE | DENTİN | SEMENT | KEMİK |
|------------------------------|------------------------------|--|--|---|
| Orgin | EKTODERM | MESODERM | MEZODERM | MEZODERM |
| CELLS | AMELOBLAST | ODONTOBLAST | SEMENTOBLAST | OSTEOBLAST |
| CELLS | ODONTOKLAST | ODONTOKLAST | ODONTOKLAST (SEMENTOKLAST) | OSTEOKLAST |
| MINERAL CONTENT (%VOLUME) | 90-92 | 70 | 45-50 | 67 |
| ORGANIC CONTENT | MİNE PROTEİNLERİ | TYPE 1 KOLLAGEN (%20) | TİP 1 KOLLAGEN | TİP 1 KOLLAGEN |
| | TAMİR YADA REMODELİNG YOK | NO REMODELING / REPAIR WITH SECONDARY AND REPERATIVE DENTİN | REMODELİNG YOK/ YENİ SEMENT DEPOZİSYONU İLE TAMİR VAR | YÜKSEK REMODELİNG/TAMİR İÇİN YÜKSEK POTANSİYEL |

Organic and inorganic content of enamel and dentin (% by weight)

| | ENAMEL | DENTIN |
|---------------------|--------|--------|
| Mineral content (%) | 95-98 | 75 |
| organic matter(%) | 1-2 | 20 |
| water(%) | 3-4 | 5 |

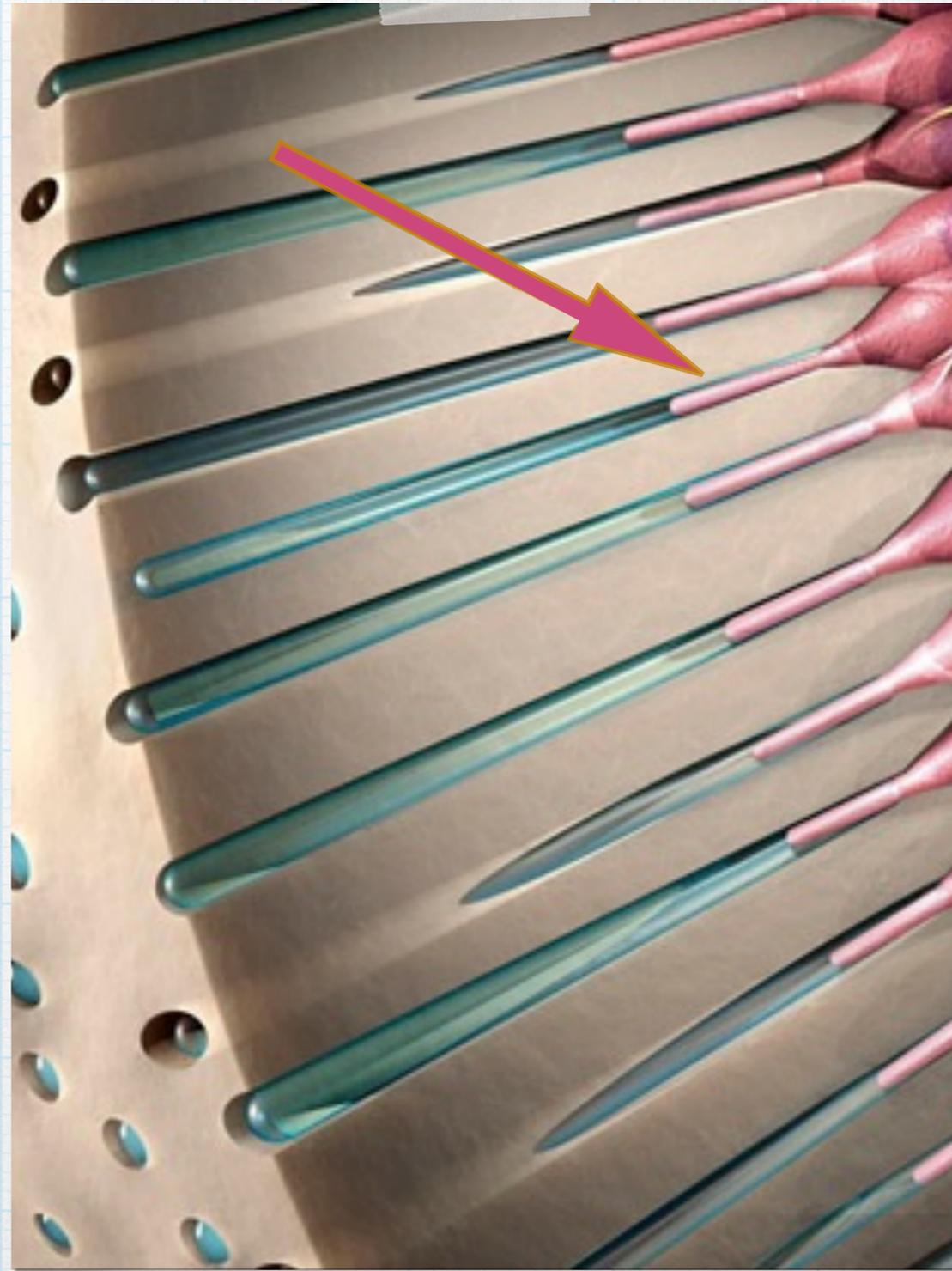
Dental Materials at a Glance-2013

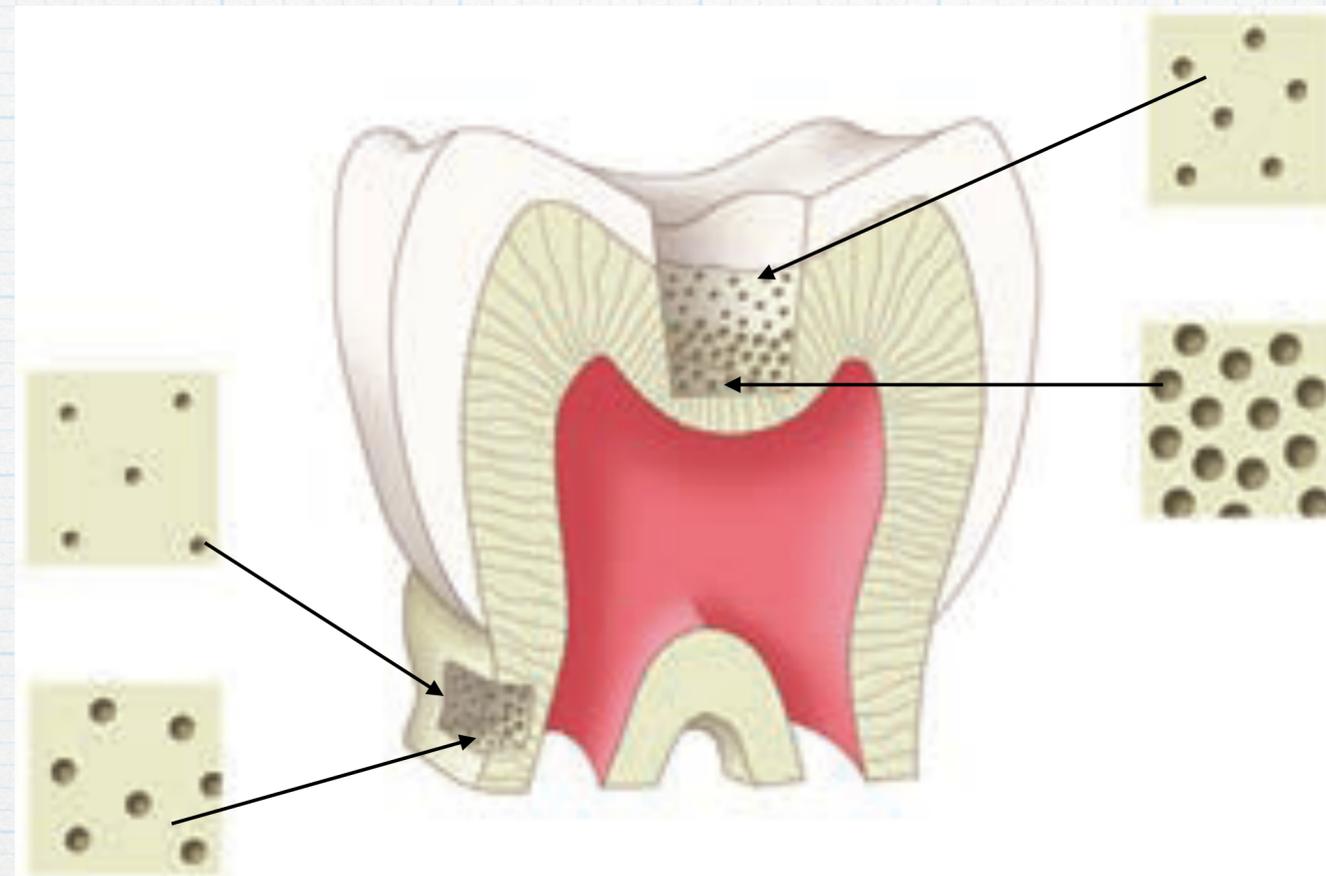
| | modulus of elasticity | tension strength | compression strength |
|--------|--------------------------|------------------|----------------------|
| DENTIN | 1,67X10 ⁶ PSI | 40 MPa | 260 MPa |

- * **Dentin formation begins immediately before enamel formation. Odontoblasts generate an extracellular collagen matrix as they begin to move away from the adjacent ameloblasts.**
- * **Mineralization of the collagen matrix, facilitated by modification of the collagen matrix by various noncollagenous proteins, gradually follows its secretion**
- * **The most recently formed layer of dentin is always on the pulpal surface.**
- * **This unmineralized zone of dentin is immediately next to the cell bodies of odontoblasts and is called **predentin**.**

- * In contrast to enamel formation, dentin formation continues after tooth eruption and throughout the life of the pulp.
- * The dentin forming the initial shape of the tooth is called **primary dentin** and is usually completed 3 years after tooth eruption (in the case of permanent teeth).

- The dentinal tubules are small canals that extend through the entire width of dentin, from the pulp to the DEJ.
- Each tubule contains the cytoplasmic cell process (Tomes fiber) of an odontoblast and is lined with a layer of peri-tubular dentin, which is much more mineralized than the surrounding intertubular dentin





Dental Materials at a Glance-2013

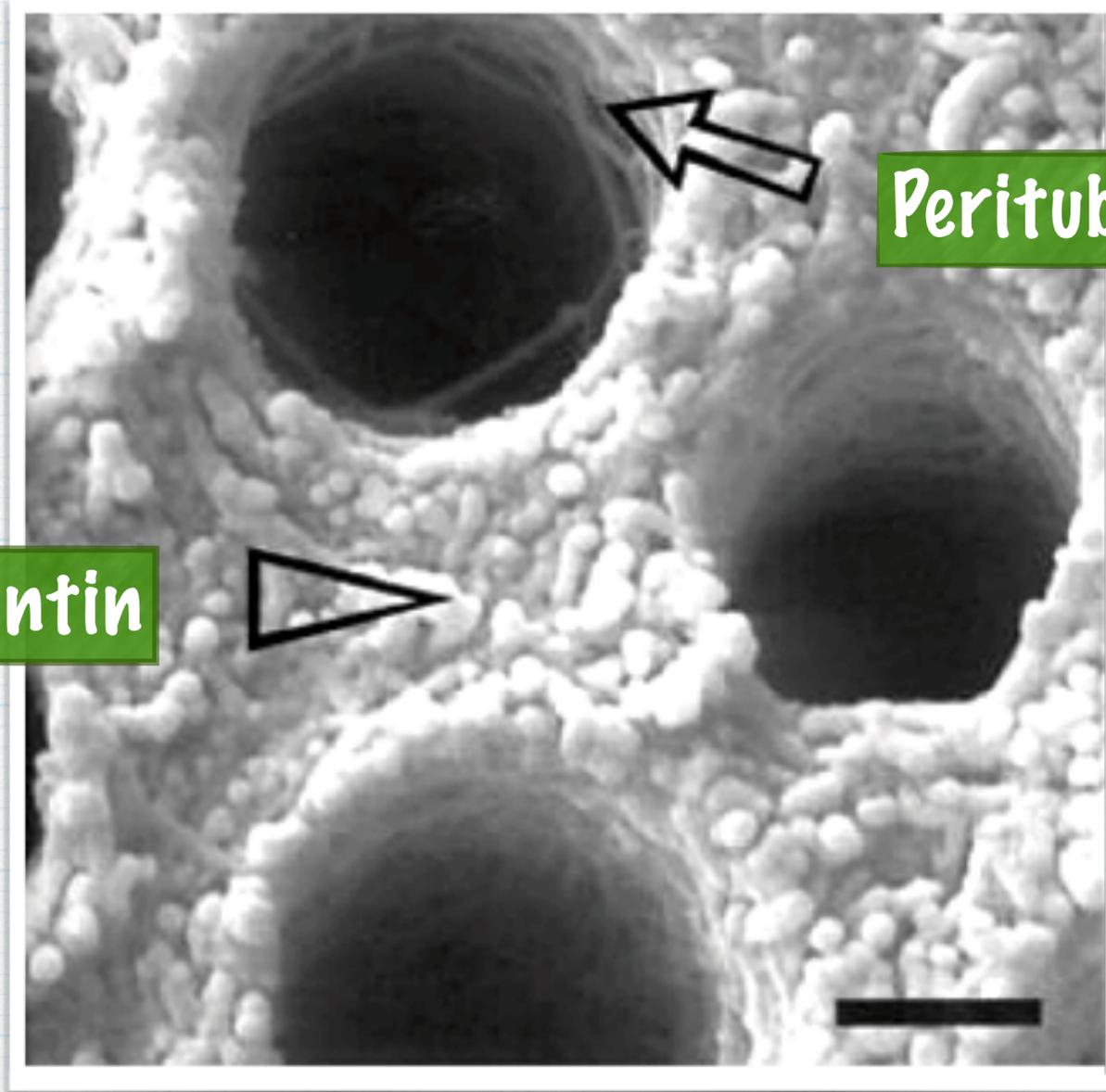
Tubules in superficial dentin close to the dentinoenamel junction (DEJ) are smaller and more sparsely distributed compared to tubules in deep dentin (B). The tubules in superficial root dentin and deep root dentin are smaller and less numerous than those in the depths of coronal dentin.

Dentin tübüllerinin karakteristiği

| | Near DEJ | Near Pulp |
|------------------------------------|---------------|---------------|
| Density (tubules/mm ²) | 15.000/20.000 | 45.000/60.000 |
| Diameter(micron) | 0.5/0.9 | 2/3 |

Dental Materials at a Glance-2013

Intertubuler dentin



Peritubuler dentin

Peritübüler ve intertübüler dentin

Dentinal tubules are filled with dentinal fluid, a transudate of plasma.

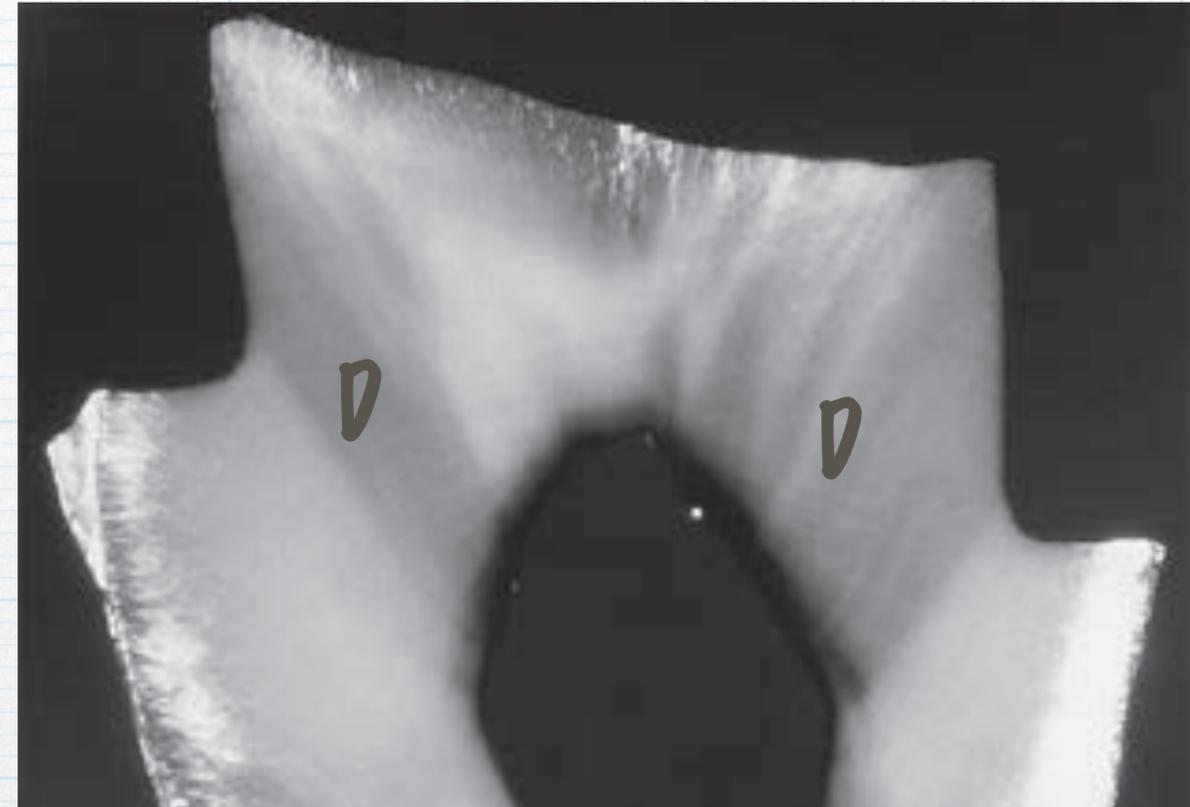
When enamel or cementum is removed during tooth preparation, the external seal of dentin is lost, allowing tubular fluid to move toward the cut surface.

Pulpal fluid has a slight positive pressure that forces fluid outward toward any breach in the external seal.

Dentin permeability is not uniform throughout the tooth. Coronal dentin is much more permeable than root dentin. There also are differences within coronal dentin.

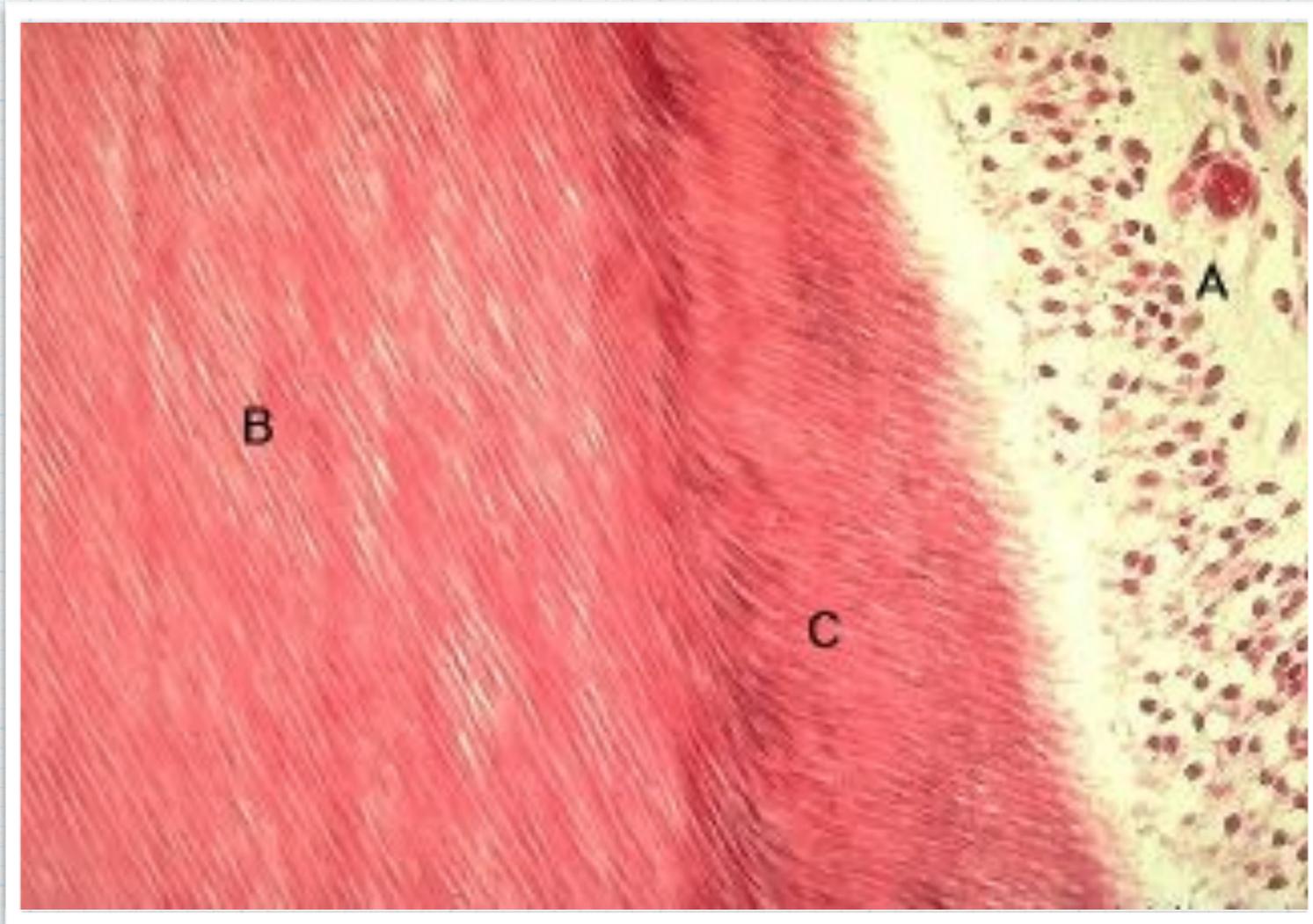
Dentin permeability primarily depends on the remaining dentin thickness (i.e., length of the tubules) and the diameter of the tubules. Because the tubules are shorter, more numerous, and larger in diameter closer to the pulp, deep dentin is a less effective pulpal barrier compared with superficial dentin.

Ground section of MOD (mesio-occluso-distal) tooth preparation on the third molar. Dark blue dye was placed in the pulp chamber under pressure after tooth preparation. Dark areas of dye penetration (D) show that the dentinal tubules of axial walls are much more permeable than those of the pulpal floor of preparation.



Sekonder Dentin

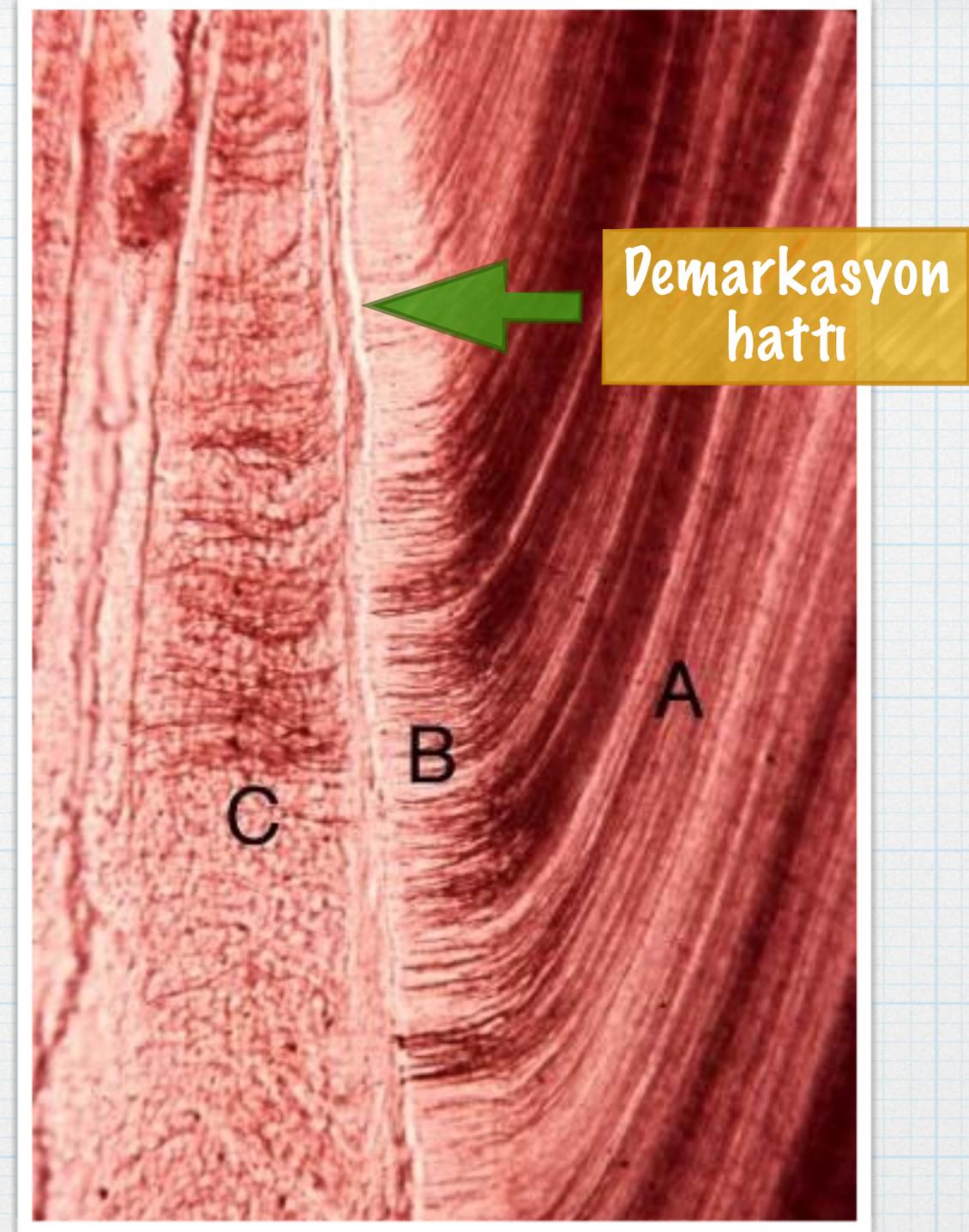
- * After the primary dentin is formed, dentin deposition continues at a reduced rate even without obvious external stimuli, although the rate and amount of this physiologic secondary dentin vary considerably among individuals. In secondary dentin, the tubules take a slightly different directional pattern in contrast to primary dentin.



A: pulp
B: primer dentin
C: secondary dentin

Reperative Dentin

When moderate stimuli are applied to dentin, such as caries, attrition, and some operative procedures, the affected odontoblasts may die. Replacement odontoblasts (termed secondary odontoblasts) of pulpal origin then begin to form reparative dentin (tertiary dentin).



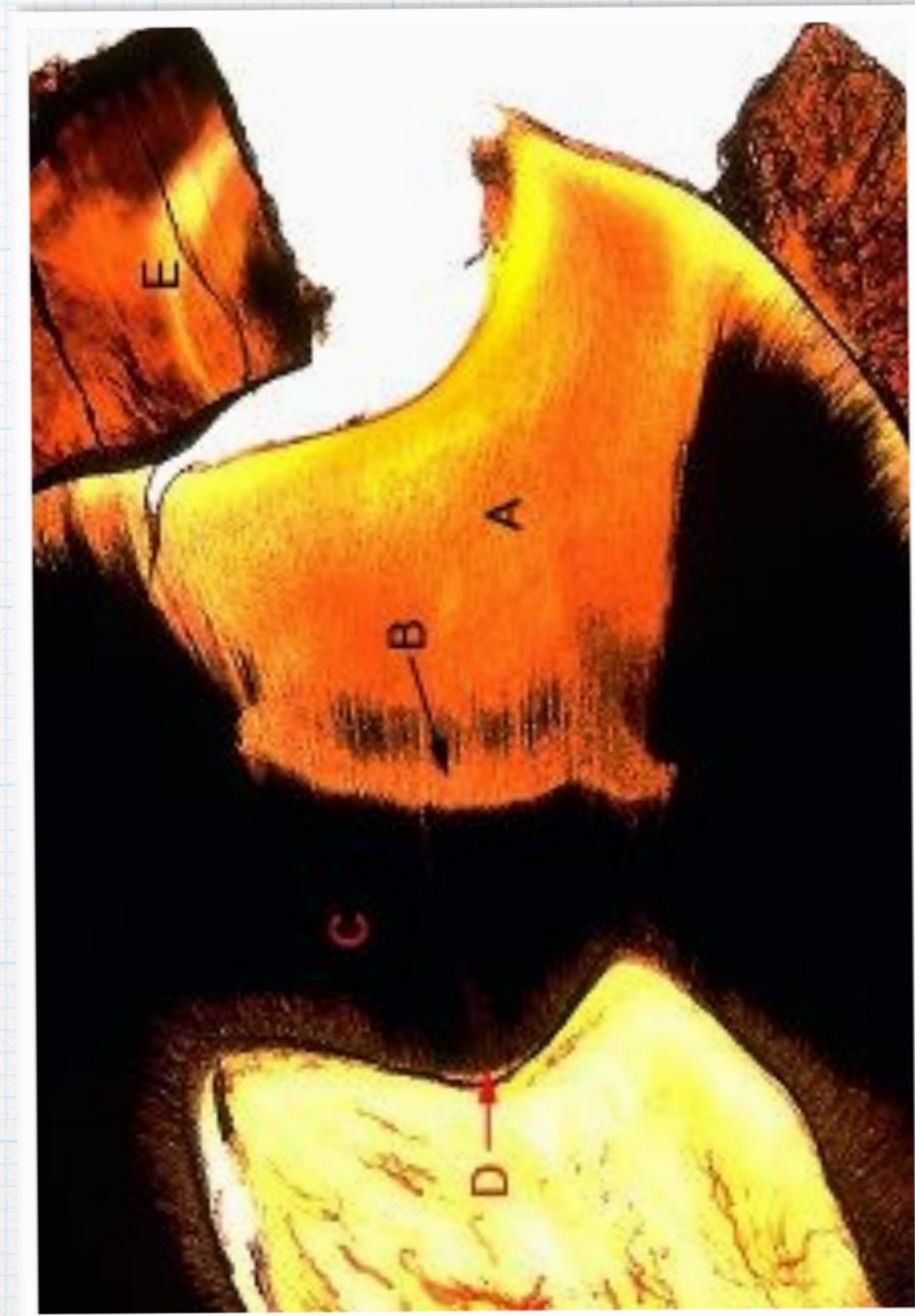
A: primer dentin
B: secondary dentin
C: tamir/reperatif/tersiyer dentin

Reparative Dentin

- * The reparative dentin usually appears as a localized dentin deposit on the wall of the pulp cavity immediately subjacent to the area on the tooth that has received the injury (a dentin deposit underneath the affected tubules). Being highly atubular, the reparative dentin is structurally different from the primary and secondary dentin

Sclerotic dentin

- * Sclerotic dentin results from aging or mild irritation (e.g., slowly advancing caries) and causes a change in the composition of the primary dentin. The peritubular dentin becomes wider, gradually filling the tubules with calcified material, progressing pulpally from the DEJ



- A: Caries
- B: Sclerotic dentin
- C: ölü alanlar
- D: reparative dentin
- E: mine

Sclerotic dentin

- * These areas are harder, denser, less sensitive, and more protective of the pulp against subsequent irritations.
- * Sclerosis resulting from aging is called **physiologic dentin sclerosis**; sclerosis resulting from a mild irritation is called **reactive dentin sclerosis**.
- * Reactive dentin sclerosis often can be seen radiographically in the form of a more radiopaque (lighter) area in the S-shape of the tubules.