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The pulp tissue is encased in the root canal system, is surrounded by dentin, and communicates with the periodontium through the apical foramen and occasionally, small channels known as accessory or lateral canals. Iatrogenic pathways of communication between the root canal system and the periodontium are created during accidental procedures such as perforations during root canal treatment. In addition, removal of enamel and dentin by decay or by traumatic injuries as well as removal of cementum during periodontal treatment may result in communication between the root canal system, its dental pulp, and the periodontium.

Apical foramen The apical openings of roots are the main pathways between the root canal system, its contents, and the periradicular tissues cementum, periodontal ligament, and alveolar bone. The apical foramen is initially very large Fig. As tooth eruption and its formation continue, the root canal space is narrowed by apposition of dentin and the apical foramen is modified by cementum apposition Fig. Continuous passive eruption of the teeth and mesial drifting cause apposition of new layers of cementum at the root apices. As the tooth matures, the apical foramen is reduced in size. Single-rooted teeth usually have a single foramen. However, multi-rooted teeth often contain multiple foramina at each apex Green , Egress of irritants from pathologically involved necrotic pulps via the apical foramen into periapical tissues initiates and perpetuates an inflammatory response and its consequences, such as destruction of apical periodontal ligament and resorption of bone, cementum, and even dentin Fig. Lateral canals When the epithelial root sheath breaks down before the root dentin is formed, or the blood vessels that run between the dental papilla and dental sac persist, a direct contact may be established between the periodontal ligament and the dental pulp. This channel of communication is called a lateral or accessory canal. Despite these variations, there is no doubt that a patent lateral canal can contain and carry toxic substances from the root canal system into the periodontium and induce periradicular inflammation.

Dentinal tubules The dentinal tubules extend from the pulp to the dentinoenamel and cementodentinal junctions. The diameters of these tubules are approximately 2. Although an actual count of the dentinal tubules has not been performed, their numbers are high, with approximately 15,000 dentinal tubules present in a square millimeter of dentin near the cementoenamel junction Harrington The dentinal tubules contain tissue fluid, odontoblastic processes, and nerve fibers Fig. As the tooth ages or experiences irritation, these tubules tend to reduce in diameter or calcify, thus reducing patency. Theoretically, these tubules could carry the toxic metabolites produced during pulpal or periodontal disease in both directions.

Dental caries Carious dentin and enamel contain numerous species of bacteria such as *Streptococcus mutans*, lactobacilli, and actinomyces McKay As a result of the presence of microorganisms and their byproducts in dentin, the pulp tissue is infiltrated locally at the base of tubules involved in the caries by chronic inflammatory cells such as macrophages, lymphocytes, and plasma cells. As the decay progresses toward the pulp, the inflammatory process markedly changes in intensity and character Fig. Bacteria can colonize in the area of liquefaction necrosis and persist. Pulpal tissue may stay inflamed for long periods before undergoing eventual necrosis, while in other instances the pulp may die quickly. Virulence of bacteria, host resistance, amount of circulation, and most importantly, the amount of drainage play a major role in this process.

Role of microorganisms As a consequence of pulp exposure to the oral cavity, the root canal system acquires the ability to harbor bacteria and their byproducts. Because of its location, general lack of collateral circulation, and its low compliance Van Hassel ; Heyeraas , the pulp does not have the ability to defend itself against the invading bacteria. To show the importance of bacteria in pathogenesis of pulp and periradicular diseases, Kakehashi et al. Pulpal and periapical lesions were developed in conventional rats. In contrast, they were absent in germ-free rats. After 6-7 months, their clinical, radiographic, and histological examinations showed absence of any pathologic changes in the periapical tissues in teeth that had been sealed with sterile amputated pulps. In contrast, teeth sealed with infected pulps had developed inflammatory reactions in their periapical tissues. These studies show the importance of microorganisms in the pathogenesis of pulpal and periapical lesions. B Absence of

pulp and periapical pathosis in a molar of a germ-free rat exposed to its oral cavity. Reproduced with permission of Elsevier. Log In or Register to continue Share this:

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