

Clinical Significance of Dentinal Tubules in Dentistry and its Functions

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DESCRIPTION

Dentinal tubules are microscopic channels that traverse the dentin, the calcified tissue that makes up the majority of the tooth structure. These tubules play a vital role in dental health and function. They house the dentinal fluid and transmit sensory stimuli, such as temperature and touch, to the dental pulp. Understanding the structure, function, and clinical significance of dentinal tubules is crucial for various aspects of dentistry, including restorative procedures, dental sensitivity, and pulp pathology.

Function of dentinal tubules

Transmission of sensory stimuli: One of the primary functions of dentinal tubules is to transmit sensory stimuli from the tooth surface to the dental pulp. These stimuli include temperature, pressure, touch, and pain. The fluid within the tubules, known as dentinal fluid, allows for the conduction of these sensory signals. Changes in the dentinal fluid flow can result in tooth sensitivity or pain.

Nutrient supply: Dentinal tubules also play a role in the transport of nutrients from the pulp to the mineralized dentin. The fluid within the tubules carries essential substances, such as oxygen and nutrients, to maintain the vitality and health of the dentin.

Dentinal tubules and dental sensitivity

Dental sensitivity, commonly known as dentin hypersensitivity, is a condition characterized by sharp, transient pain in response to various stimuli, such as cold, heat, touch, or sweet substances. The underlying mechanism of dental sensitivity involves the stimulation of the nerve endings located in the dental pulp through the movement of dentinal fluid within the tubules. When the tubules become exposed due to factors like enamel erosion, gum recession, or tooth wear, the external stimuli can trigger fluid movement and result in discomfort.

Clinical significance of dentinal tubules

Restorative dentistry: The presence of dentinal tubules influences the success and longevity of restorative procedures, such as dental fillings and bonding. The tubules must be adequately sealed to prevent the ingress of bacteria, which can cause secondary tooth decay and other complications.

Pulp pathology: Dentinal tubules also play a role in the progression of pulp pathology, such as pulpitis or pulp infection. Bacteria or their byproducts can enter the tubules and reach the pulp, leading to inflammation and infection. Understanding the relationship between tubules and pulp pathology is important for diagnosis and appropriate treatment planning.

Dental bonding and adhesion: In contemporary dental bonding techniques, dentinal tubules play a significant role in achieving durable adhesive bonds between tooth structure and restorative materials. The bonding agents penetrate the tubules, creating a micromechanical interlocking effect that enhances the bond strength and longevity of restorations.

Dentinogenesis imperfecta: Dentinogenesis imperfecta is a hereditary condition characterized by abnormal dentin development. The structure and arrangement of dentinal tubules in affected individuals are altered, leading to weakened teeth with increased susceptibility to fracture. Understanding the structural changes in dentinal tubules is crucial for the management of this condition.

Dentinal tubules are essential components of the dentin, contributing to tooth sensitivity, nutrient supply, and dental health. Their structure, function, and clinical significance have significant implications in various aspects of dentistry, including restorative procedures, dental sensitivity, and pulp pathology. Dentists must have a thorough understanding of the dentinal tubules' role to effectively diagnose, treat, and manage dental conditions related to these microscopic channels.

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