

## **SUMMARY**

**Introduction:** Dentin hypersensitivity (DH) is a common condition characterized by tooth pain in response to stimuli such as cold, heat, or touch, resulting from the exposure of dentinal tubules. Teeth are composed of four layers: enamel, dentin, pulp, and cementum—each serving specific protective, nutritional, and mechanical functions. The key mechanism behind hypersensitivity is Brännström's hydrodynamic theory, which proposes that fluid movement within the dentinal tubules stimulates nerve endings, causing pain. The development of DH is influenced by anatomical, dietary, behavioral, and dental treatment-related factors. Saliva plays a vital protective role, while a low-pH, high-sugar diet contributes to enamel demineralization and caries formation. Preventive and therapeutic approaches include the use of toothpastes containing arginine with calcium carbonate and potassium nitrate, which occlude dentinal tubules and alleviate pain symptoms. Despite available treatments, further research is needed to optimize clinical effectiveness.

**Objective:** The aim of this study is to evaluate the effectiveness of a novel toothpaste in relieving hypersensitivity through: (1) reducing enamel and dentin demineralization, (2) occluding dentinal tubules, and (3) assessing resistance to a demineralizing solution.

**Materials:** The study used premolars extracted for orthodontic reasons. The teeth were disinfected, cleaned, and evaluated for enamel condition, then sectioned coronally to prepare test samples. Two toothpastes were tested: an experimental formulation containing potassium nitrate, arginine, and silica, and a reference product—Sensodyne Rapid Relief—containing strontium acetate. Additionally, artificial saliva (SAGF type) was prepared to simulate oral conditions, along with a demineralizing solution at pH 4.4, designed to produce enamel lesions similar to natural caries.

**Methods of Measurement:** The analytical methods used in the study included digital microscopy, scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), and Raman spectroscopy.

**Results and Conclusions:** The study evaluated the enamel and dentin surfaces of teeth at various stages: before and after etching, after applying toothpaste, and after demineralization. Optical microscopy, SEM, EDS, and Raman spectroscopy were used. Initially, all samples showed features of healthy structure. After etching, dentinal tubules became exposed, and dentin showed decreased mineral content with an increased presence of organic components. Raman spectroscopy confirmed dentin demineralization and partial loss of the ordered hydroxyapatite structure. The findings were used to further analyze the effectiveness of remineralizing toothpastes.