Research Article

Remineralizing Efficacy of Fluorohydroxyapatite Gel on Artificial Dentinal Caries Lesion

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e aim was to evaluate the remineralizing e cacy of uorohydroxyapatite (FHA) gel on arti cial dentinal caries lesion in vitro. Arti cial carious lesions were made on occlusal cavities of teeth by exposing the dentin surface to a demineralizing solution. Each cavity was capped with a 3 mm thick FHA gel for 4 weeks. A er the FHA gel was removed, the surface morphology and structure of the dentin were characterized by scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), X-ray di raction (XRD), and Fourier transform infrared spectroscopy (FT-IR). e dentin mineral density (DMD) was measured by micro-computed tomography (Micro-CT). A layer of dense and orderly hexagonal crystal structure, with average diameter of 1 m and thickness of 4 5 m, could be observed on dentin surface. ese crystals exhibited elemental peaks for calcium, phosphorus, carbon, and oxygen and characteristic peaks of hydroxyapatite (HA) and uorapatite (FA) via XRD and FT-IR. e DMD of dentin surface layer signi cantly increased a er it was capped with FHA gel (< 0.05). In the present study, the FHA gel could rapidly construct apatite on the arti cial dentin caries surface and signi cantly increase the mineral density, which suggests that FHA gel might be a proper IPT material with remineralizing function.

1. Introduction

Minimally invasive dentistry (MID) is the application of a systematic respect for the original tissue. is implies that the dental profession recognizes that an artifact is of less biological value than the original healthy tissue [1]. In deep caries dentin discoloration occurs far in advance of the infection by microorganisms, and as much as 2 mm of the so ened or discolored dentin is not infected but is reversibly denatured [2, 3]. Residual a ected dentin has been suggested to be retained so as to keep its potential of being remineralized, which is otherwise removed in traditional carious excavation procedures. Indirect pulp-capping therapy (IPT) is considered as a minimally invasive treatment, in which caries are excavated and the tooth is restored with a suitable material [1, 3]. In doing so, the caries process can be halted, and the residual a ected dentin can be remineralized, which can be promoted by bioactive and ion-releasing base materials [4]. e key success factor is the application of remineralized materials during indirect pulp-capping therapy (IPT).

Over the years, calcium hydroxide ($Ca(OH)_2$) has emerged as a gold standard for IPT. e bene ts of $Ca(OH)_2$ include its antimicrobial and anti-in ammatory e ects, low thermal conductivity, and an ability to act as a bu er against the direct restorations [5 7]. However, it is still unknown whether this kind of material could remineralize dentin beneath $Ca(OH)_2$. It merely provides hydroxide and calcium ions upon dissolution, but not the phosphate ion needed during remineralization.

Another IPT material, mineral trioxide aggregate (MTA), has been found to be important in dentistry due to its