

RESEARCH ARTICLE

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Influence of fluoride characteristics on tooth surface protection in an erosive condition: A multifaceted characterization approach

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Abstract

Objective: To evaluate the effect of fluoride consistency and composition to protect enamel and dentin against the dental erosion.

Materials and Methods: Bovine enamel and dentin specimens were treated with artificial saliva, neutral fluoride gel (NFG), acidulated phosphate fluoride gel (AFG), neutral fluoride foam (NFF), and acidulated phosphate fluoride foam. The samples were subjected to cycling. Micro energy-dispersive X-ray fluorescence spectrometry, surface roughness (Ra), contact angle (CA), and scanning electron microscopy (SEM) were performed. Composition, CA and Ra data were analyzed by ANOVA and multiple comparison test ($p < 0.05$).

Results: The dentin protected had a significantly higher mineral content than in the control. Eroded unprotected enamel had higher Ra values than normal surfaces. Fluoride treatments increased the Ra in dentin samples. AFG increased the CA in enamel. Fluoride foams increased CA in dentin with reduced mineral loss. SEM analysis found a deposited layer on enamel treated with AFG and remnants of deposits on dentin treated with NFG and NFF.

Conclusion: Regardless of the form of application, fluoride provided protection against erosion, however with different levels.

Clinical Significance: Applying the adequate fluoride form is relevant since the formulations have different effects on both enamel and dentin.

KEYWORDS

contact angle, fluoride, micro energy-dispersive X-ray fluorescence spectrometry, scanning electron microscopy, surface roughness

1 | INTRODUCTION

Dental erosion is a condition where occurs loss of dental tissues caused by the action of acids without the involvement of bacteria. The acids could be from an intrinsic or extrinsic source.¹ Erosion occurs when teeth are exposed to acids repeatedly over a short period of time. The rate at which the teeth dissolve is an important

factor in this process and is influenced by the structure of the dental tissues as well as the properties of the solution.²

In the erosion process, the H⁺ ions contained in the food and beverages are one of the responsible for tooth demineralization.² The main mineral component of enamel and dentin is hydroxyapatite (HAp), which is directly dissolved in the erosion process.^{3,4} Enamel and dentin mineral phase have a different distribution. Dentin is more