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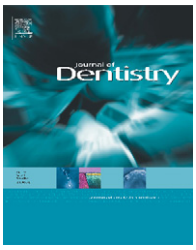

Artificial enamel dental caries treated with different topical fluoride regimes: An *in situ* study

J.J. Jardim, M.A. Pagot, M. Maltz *

Department of Social and Preventive Dentistry, Faculty of Dentistry, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

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ABSTRACT

Objectives: To evaluate whether the topical fluoride application (acidulated phosphate fluoride, APF) at high concentration has an additional effect on the control of enamel lesions compared to fluoride dentifrice (FD; low concentration). The frequency of APF treatment on the arrestment of caries lesions and the amount of fluoride deposited on enamel after application of high and low fluoride concentrations were also evaluated.

Methods: Five subjects wore partial dentures with *in vitro* demineralized blocks during 35 days. All specimens (5 p/subject) were brushed three times daily for 1 min with FD (1100 ppm F). Besides the FD treatment, four specimens were submitted to APF gel topical applications (12,300 ppm F) on weekly intervals (one to four applications). The enamel blocks were analyzed at baseline, after demineralization and after intraoral procedures regarding: surface roughness (SR), clinical aspects (brightness and texture), surface microhardness (SMH) and enamel fluoride content. Friedman's test was used to compare SMH and SR among the treatments. Analysis of variance, followed by Tukey's studentized range test, was used to evaluate fluoride content and SR among the groups. The significance level used was 5%.

Results: Changes in surface brightness, texture and SR were not detected. FD + 3 APF and FD + 4 APF were the only treatments capable of increasing SMH values and fluoride content compared to demineralized blocks ($p < 0.001$), although no differences could be observed within the treatments.

Conclusions: This study showed that ≥3 APF in addition to FD enhance enamel rehardening and produce a larger reservoir of fluoride.

1. Introduction

The effectiveness of topical fluoride as a cariostatic agent is well established. Fluoride incorporated into the enamel crystal, forming a fluorapatite like mineral, improve it is resistance to the acid challenge.[1,2] During the caries process, some of the mineral dissolves, and this apatitically bound fluoride can be released to act in the de-remineralization process.[3] After fluoride topical applications (>100 ppm F), loosely bound fluoride or a calcium fluoride like material is formed on the enamel or in caries lesions.[4] Depending on the oral conditions, such as pH in saliva and/or in plaque fluid, this CaF_2 layer, which has an increased solubility over hydroxyapatite and fluorapatite, will be dissolved, releasing fluoride to react with calcium and phosphate ions.[5] The ending products of these reactions may be fluorapatite crystals or CaF_2 incorporated on tooth surface. The calcium fluoride coating could be considered a reservoir of fluoride ions

* *Corresponding author at*: Faculdade de Odontologia, UFRGS, Departamento de Odontologia Preventiva e Social, Ramiro Barcelos 2492, CEP 90035-003, Bom Fim, Brazil. Tel.: +55 51 33085193; fax: +55 51 33085189.
E-mail address: mmaltz@ufrgs.br (M. Maltz).

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available to inhibit demineralization and enhance remineralization.[6,7]

The fluoride constantly present in the oral fluid is an important factor in caries control. Thus, lower levels of fluoride, more frequently delivered in the oral environment, as obtained with fluoride dentifrices, are considered effective on caries prevention and control.[3,8]

Although professional topical fluoride has been used to improve the arrestment of active caries lesions,[9] it is not clear if there is an additional effect of fluoride at high concentrations on the remineralization process, especially with the widespread use of frequent low concentration of fluoride (toothpaste). An *in situ* study showed that high fluoride concentration applications, at high frequencies, caused an enhancement of remineralization, with significant increase in loosely bound and structurally bound fluoride concentrations, when compared to toothpaste only.[10] However, some *in vitro* studies showed that single applications of fluoride gel or fluoride varnish with daily use of F-dentifrice does not offer additional effect on enamel remineralization and fluoride uptake than the use of toothpaste only.[11,12]

Besides the questionable necessity of topical applications of high fluoride concentration to caries control, the appropriate intervals for fluoride varnish and gel application remains undetermined.[13,14] There is a very clear need of research on the best fluoride regimen to assist in the remineralization of early carious lesions.[14]

The aim of the present *in situ* study was to evaluate whether the application of high fluoride concentration has an additional effect on control of enamel lesions compared to F-dentifrice. Furthermore the frequency of high fluoride concentration applications on the arrestment of caries lesions was tested. The amount of fluoride deposited on enamel surface after applications of high and low concentrations of fluoride was also evaluated.

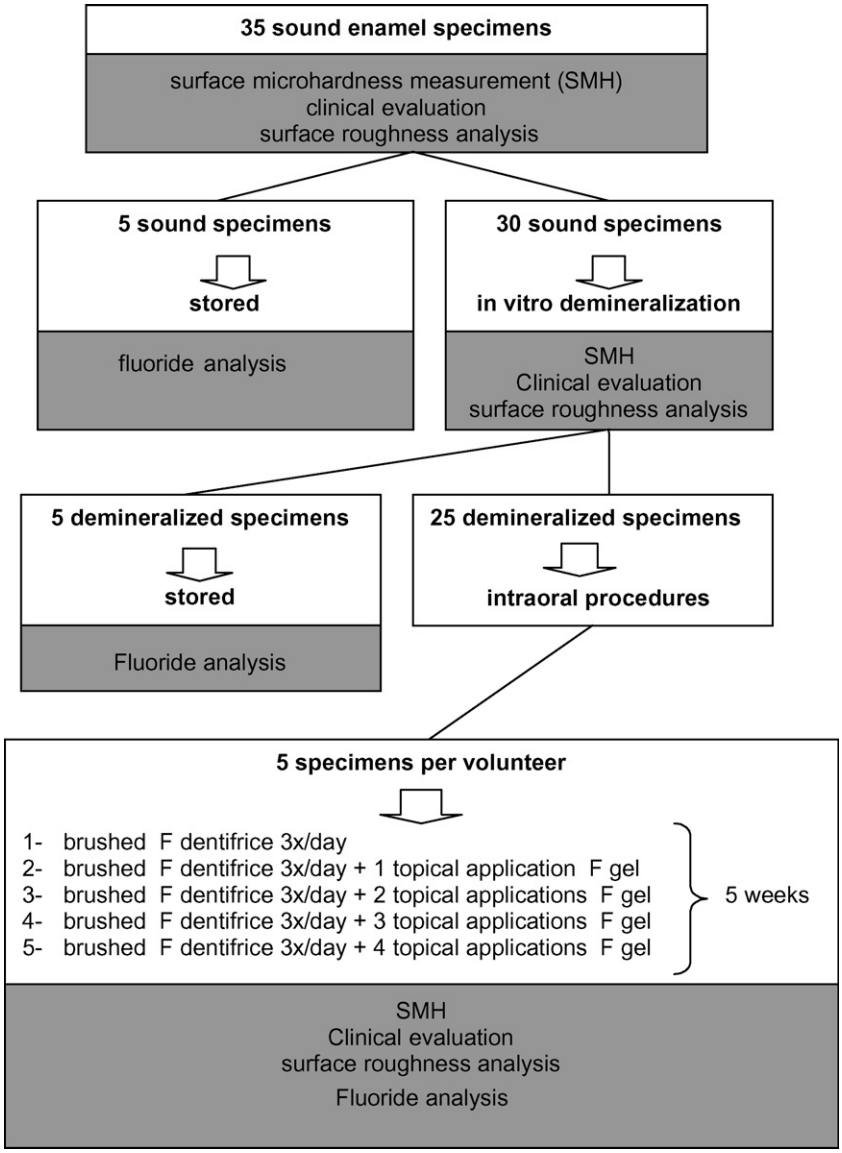

Fig. 1 – Illustration of the study experimental design.