Investigação

INFLUENCE OF FLUORIDATED PROPHYLAXIS PASTE ON SEALANT ADHESION

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RESUMO

Objectivo: *Estudar a influência de uma pasta porfiláctica fluoretada na força de tensão de um selante de fissuras à superfície de esmalte.* ***Material e Método:*** *40 molares humanos extraídos foram seccionados em duas partes, vestibular e lingual, e divididos em dois grupos com vinte amostras cada. No grupo F, a profilaxia fez-se com pasta fluoretada enquanto que no grupo P, foi utilizada uma pasta de pedra-pomes. Todas as amostras foram condicionadas com ácido fosfórico a 37% durante 15 segundos. Selante de fissuras foi aplicado a cada superfície previamente tratada e fotopolimerizado durante 40 segundos. Todas as amostras foram submetidas ao teste de força de adesão à tensão utilizando um aparelho de testes Instron®.* ***Resultados:*** *Os resultados em MPa foram: F) 4,14(±1,11) e P) 3,98(±1,17). O teste U de Mann Whitney demonstrou que não existe diferenças significativas ente grupos (P<0,05).* ***Conclusão:*** *O uso de pasta profiláctica fluoretada antes do condicionamento ácido não deve ser desencorajada na técnica de selante de fissuras.*

Palavras-Chaves: flúor, selante de fossas e fissuras, profilaxia.

ABSTRACT

Objective: *To study the influence of a fluoridated prophylaxis paste on the tensile bond strength of a fissure selant to enamel surface.* ***Material and method:*** *Forty extracted human molars were sectioned in two parts, buccal and lingual, and diveded in two groups of twenty samples each. In group F, the prophylaxis was performed with a fluoridated paste while in group P, a pumice slurry was used. All samples were conditioned with 37% phosphoric acid for 15 seconds. Fissure sealant was applied to each pretreated surface and photo-polymerized for 40 seconds. All samples were submitted to tensile bond strength test using an Instron® Testing Machine.* ***Results:*** *The results in MPa were: F) 4.14(±1.11) and P) 3.98(±1.17). Mann Whiney-U test showed no significant diferences between groups (p<0.05).* ***Conclusion:*** *The use of a fluoridated prophylaxis paste before acid etching should not be discouraged in the fissures sealing technique.*

Key-words: fluoride, pit and fissure sealant, prophylaxis.

INTRODUCTION

Occlusal surfaces are the most susceptible to dental decay. By the beginning of the last century, it was already known that decay appeared easier in pits and fissures of permanent molars.[1] Caries

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prevalence has decreased in developed countries for the last years. Fluoride has played a main role in prevention. Smooth surfaces are better protected by fluoride than pits and fissures.[2-5]

Since Buonocore introduced the etching technique in 1955, adhesive dentistry has become a main issue in today's dentistry.[6-8]

Enamel prophylaxis takes plaque away from the tooth surfaces and leaves it ready for acid etching and resin application.

Traditionally a pumice slurry has been employed as prophylaxis paste and fluoridated pastes have been contraindicated since they could interfere with the acid etch solution on the enamel surface getting finally less retention of the sealant.[5]

Fluoride reacts with the enamel forming calcium fluoride and fluorapatite which act as slow releasing agents, enhancing the remineralization of the etched enamel and making resistant to acid dissolution.

Gwinnett et al.[9], found that certain topically applied fluorides could significantly reduce bond strength by disrupting the formation of enamel tags.

However, other studies looking for the influence of fluoride on the acid etch technique, did not find a significant decrease in the bond strength between the resin and the enamel surface.

The aim of this study was to analyze the effect of a fluoridated prophylaxis paste on the adhesion of a photoactivated sealant using a tensile stregth test. The results of the fluoridated group would be compared with the ones gotten from the classical pumice paste prophylaxis group.

The enamel in both groups was etched for fifteen seconds, since various authors have already shown that it is effective in getting aproper etching pattern.[10-13]

MATERIAL AND METHOD

Twenty freshly extracted non carious third molars that had been stored in distilled water for no longer than one month, were used in this study.

The crowns of the teeth were separated from the roots and sectioned mesiodistally. Dental stone was used to embed each split crown in a rectangular mould with the buccal or lingual surface parallel to and projecting above the lip of the mould. These exposed surfaces were lathe to produce cylindrical pegs (3 mm in diameter, 1 mm in height).

Samples were randomly distributed into two groups of twenty surfaces, each one treated as follows:

Group P: cleaned with fine flour of pumice, using a rubber prophylaxis cup on a slowspeed handpiece. A 37% phosphoric acid gel applied was for 15 seconds. The tooth was rinsed with a steady stream of water for 20 seconds and dried with oil free compressed air for 15 seconds.

Group F : cleaned with a fluoridated prophylaxis paste NUPRO® (Dentsply Int., Milford-Delaware, USA) and etched as in group P.

As an adherent, a composite cylinder (3mm in diameter, 1mm in height) was inserted in the end of a methacrylate rectangular mould.

The inserted composite mould was assemble in the upper brass, whereas the tooth specimen mould was mounted in the lower brass of an Instron machine (Instron Corporation, Canton, USA). Both moulds were aligned (figure 1). A light-cured sealant (Delton® Dentsply Int., Milford-Delaware, USA) was applied on the prepared circle of enamel. The upper mould was lowered so the end of the composite cylinder contacted the sealant. Any excess sealant was carefully removed with a cotton pellet before hardening. Sealant was photocured for 40 seconds and a tensile strength test was performed.

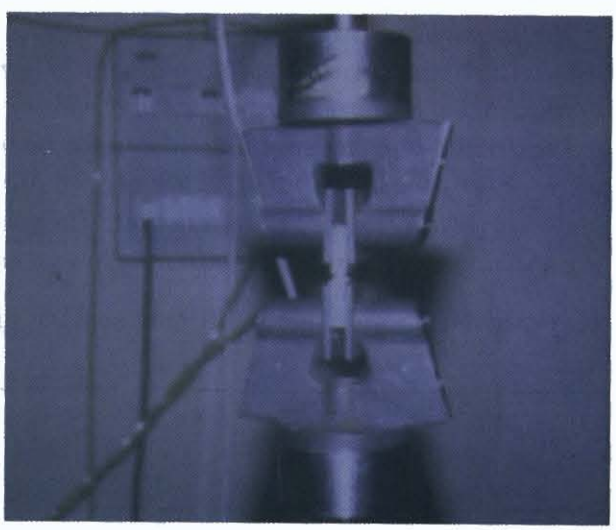

Fig. 1. Moulds aligned in the Instron machine.

Debonded specimens were mounted on aluminum stubs and coated with gold in a high

vacuum evaporator. The coated specimens were studied in a scanning electron microscope.

RESULTS

Mean tensile bond strengths in MPa, standard deviations (SD), ranges (minimum and maximum value) for the two prophylactic pastes are summarized in table I.

Table I. Summary of resuts

GROUPS	TENSILE STRENGTH (MPa)	STANDARD DEVIATION	RANGE
p	3.9886	1.7256	1.9805-4.6826
F	4.1442	1.1178	2.4757-6.0395

Analysis of the data by non parametric, Mann-Whitney U test with a significance level of $p<0.05$ showed no significant differences between both groups.

Scanning electron microscopic observations showed that most of the bond failures were enamel or resin cohesive fractures and appeared almost equally in both groups (figures 2-3).

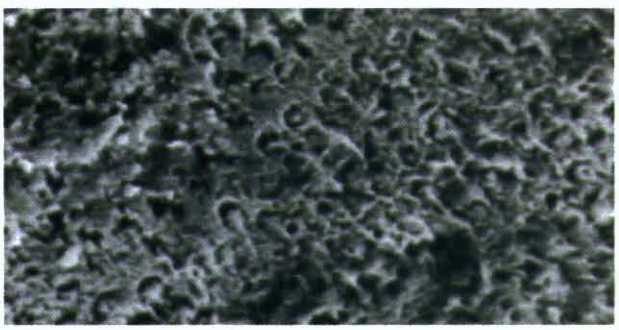

Fig. 2. Debonded surface of the fluoride prophylaxis gruop. Cohesive fracture and resin tags can be observd.

Fig. 3. Debonded surface of one sample of the pumice prophylaxis group. Cohesive enamel fracture.

DISCUSSION

There have been many reports concerning the use of fluoride in the acid etch technique. They can be grouped into three categories:
1) Use of fluoride before etching; 2) use of fluoride during etching; and 3) use of fluoride after etching.

Low et al. found that the aplication of an acidulated phosphate fluoride solution (APF) for 4 minutes prior to acid etching significantly reduced the tensile bond strength of a pit and fissure sealante. Howenver, Garcia-Godoy et al. reported that resin composite shear bond stregth to enamel previously treated for 1 or 4 min. with APF gel was not significantly affected. Perhaps the lower etching time and new adhesion agents used account for the results obtained in this study. Increasing the enamel etching time as in Low's study (60 seconds) produces greater loss of substance that could weaken the enamel prisms rendering them more fragile to resist traction forces.[14-16]

Other studies have shown that the incorporation of low amouns of fluoride to phosphoric acid solution or application of fluoride acid solutions after acid etching before placement of resin dit not significanthly influence the bond strength of the adhesive material to the enamel surface. [17]

The uptake of fluoride by the enamel surface is a function of: the fluoride concentration, the pH of the solution, and the exposure time of the full concentration solution on the enamel.

In our study we have observed that the prophylaxis with fluoridated paste does not negatively affect the adhesion of the sealant.

Other investigators also found no significant differences when comparing fluoridated pastes with other pastes. It could be explained since the fluoride concentration in the paste is low and the time contacting the enamel surfaces is stort, not allowing the formation of enough crystals of calcium fluoride and fluorapatite, which could interfere, in the acid etching.[18,19]

The tensile bond strength of all specimens showed low values ranging from 1.9805 MPa to 6.3095 MPa that could be explained because the surfaces of each specimen were not flattened or abraded, since the natural contour would better simulate the clinical condition.

Evalution of the fracture mechanisms displayed showed that a majority of the tensile bond failures were predominantly cohesive in both groups. This indicates that the bond of the fluoridade pretreated enamel with the sealant resin was stronger than the cohesive strength of either the enamel or the sealant resin.

CONCLUSIONS

There was no statistical difference in tensile bond strength between pumicewater and fluoridated paste. A majority of the bond failures were cohesive in both groups.

As a result, the use of a fluoridated prophylaxis to clean the teeth before acid etching should not be discouraged as part of the bonding protocol to seal pits and fissures.

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