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Bond Strength of Sealants on Saliva Contaminated and Demineralized Enamel

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Introduction

Pit and fissure sealants have been considered an outstanding adjunct to oral health preventive strategies in the decrease of occlusal caries onset and/or progression (1). The sealing material is mechanically bonded to the tooth surface and acts as a physical barrier to plaque retention, thus minimizing the harmful action of cariogenic microorganisms on enamel (1). The efficacy of applied fissure sealants in prevention of caries depends on retention and resistance to wear (2). Two important aspects of sealant technique are: 1. bond strength; and 2. the penetration of the sealant into the occlusal fissures previously etched to increase the bonding of the sealant resin to the tooth surface. It is known that several factors can influence the strength of the sealant-etched enamel bond. Salivary contamination and demineralised tooth surfaces are factors that may disturb the sealing process and interfere in the longevity of pit and fissure sealants.

Fig. 1-3: Pit and fissure sealants used in this study: Fissurit F (Voco), Smartseal (Detax), Delton (Dentsply).

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Objectives

The aim of the present study was to evaluate the effect of saliva contamination and in vitro demineralisation on microtensile bond strengths (mTBS) of one self-etching (Delton) and two multi-step fissure sealants (Fissurit F, smartseal&Ioc) to enamel.

Material and Methods

135 freshly extracted molars stored in saline were included. The molars were sectioned at the cement-enamel junction and the roots were discarded. The crowns were sectioned in the mesio-distal direction, and flattened with wet no. 220-grit silicon carbide (SiC) paper in a polishing machine to expose, flatten, and smooth the enamel surface. Flat enamel specimens were embedded in Technovit. All specimens were randomly assigned to nine experimental groups of 15 samples each: Fissurit (FC, FS, FD), Smartseal (SC, SS, SD), Delton (DC, DS, DD). In groups FS, SS, DS 5 µl arificial saliva was placed on the enamel before the sealant was applied. In groups FD, SD, DD the enamel surface was demineralised using acidified gel technique (HEC, pH 4.8, 37°C) for 14 days before fissure sealant application. Groups FC, SC, DC served as controls. In these groups the enamel was sound. All sealants were applied as recommended by the manufacturer. MTBS was measured 15 minutes after application of the fissure sealant using an universal testing machine (Zwick Z005). Statistical analysis was performed using SPSS 15.0. The data of mTBS were analysed by one-way anova. Post hoc pair-wise comparisons were performed using Tukey multiple comparisons. For each outcome, statistical significance was set at $P < 0.05$.

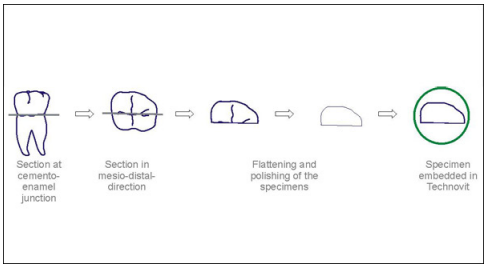

Fig.4: Preparation of flat enamel specimens.

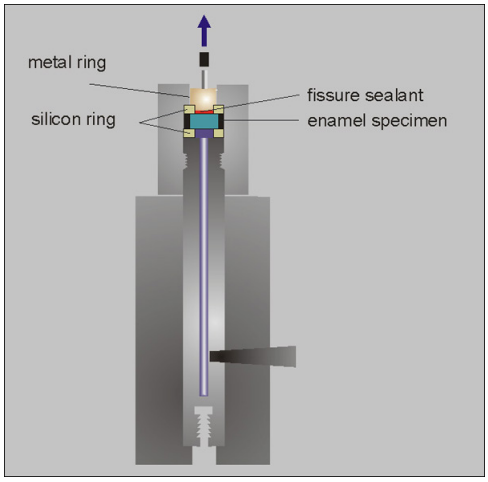

Fig. 5, 6: Special designed apparatus to test microtensile bond.

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Results

The mean values (±SD) of the mTBS of the three materials tested in this study are presented in Table 1. Statistical analysis showed a significant influence of the used pit and fissure sealant and the contamination on mTBS ($p < 0.001$, ANOVA). Within the different sealants, the untreated controls (FC, SC and DC) revealed the highest mTBS. The highest values for adhesion were observed using the self-etching pit and fissure sealant Delton (25.78 MPa). Saliva contamination and demineralisation decreased mTBS. In case of Fissurit and Smartseal this increase was significant ($p < 0.05$, Tukey's test).

	FC	FS	FD	SC	SS	SD	DC	DS	DD
mTBS	18.14	11.47	9.59	16.27	9.33	8.62	25.78	21.07	20.94
+ / -	4.34	4.51	3.19	2.37	1.55	5.09	9.62	5.92	8.09

Table 1: Bond Strength (in MPa) and standard deviation within the different groups.

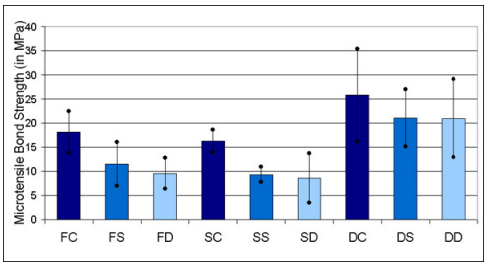

Fig. 7: Graphically expression of the results (mean values and standard deviation in MPa).

Conclusions

All fissure sealants used in this study were able to establish mTBS on enamel. Saliva contamination and in vitro demineralisation showed a significant impact on mTBS. However, the clinical relevance must be viewed with caution. Further in vitro and clinical studies have to prove these findings.

Literature

1. Simonsen RJ (2002). Pit and fissure sealant: review of the literature. Pediatr Dent 24:393-414.
2. Pérez-Lajarin L, Cortés-Lillo O, García-Ballesta C, Cózar Hidalgo A (2003). Marginal microleakage of the fissure sealants: A comparative study. J Dent Child 70:24-8.

Abbreviations

mTBS = Microtensile Bond Strength
MPa = Megapascals

This Poster was submitted by Dr. Katrin Bekes.

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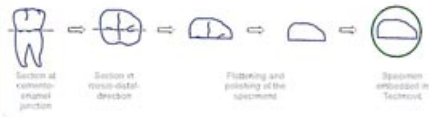

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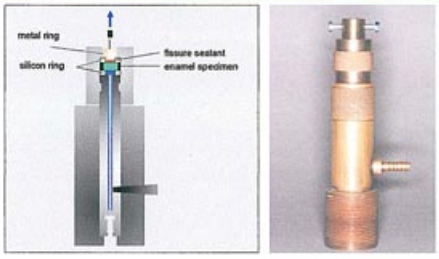

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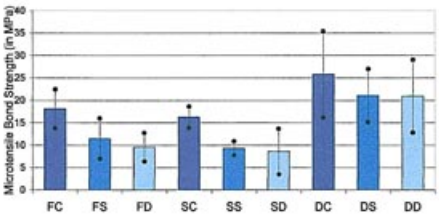

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