

## THE INFLUENCE OF SILANES ON MICROLEAKAGE IN CLASS II COMPOSITE FILLED-CAVITIES

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**INTRODUCTION:** In clinical practice, several types of tooth-colored materials can be used for restoration of class II cavities. Tooth colored restoratives including composites are subjected to marginal leakage [1]. Thermally induced stresses may lead to gap formation and, consecutively, microleakage as a result of mismatch of the coefficients of thermal expansion between the restorative material and the hard dental tissues [2, 3]. The purpose of this study was to investigate to what extent the use of silanes as chemical adhesion promoters influences microleakage in class II cavities restored with a composite resin (Filtek Supreme 3M ESPE).

**METHODS:** In this study, 30 crack-free and noncarious erupted mandibular third molars were used. A standardized mesial class II cavity (buccolingual width 3 mm, occluso-gingival width depending on the tooth and a depth of 2mm) was prepared on each tooth using a regular grit fissure diamond bur. The gingival margin was located approximately 1 mm below the cemento-enamel junction. All teeth were then randomly distributed into three groups, each containing ten teeth. The prepared cavities were restored as follows:

Group 1 – total acid etch (Scotchbond Etchant Phosphoric Acid), Vitremer Primer application (3M ESPE) and Filtek Supreme (dentin A3 shade, 3M ESPE)

Group 2 - total acid etch (Scotchbond Etchant Phosphoric Acid), adhesive application (Adper Single Bond, 3M ESPE) and Filtek Supreme (dentin A3 shade, 3M ESPE)

Group 3 - total acid etch (Scotchbond Etchant Phosphoric Acid), application of silane solution (Monobond S, Schaan, Vivadent, Liechtenstein), Adper Single Bond and Filtek Supreme. The silane solution was applied in ample amounts on the gingival margin, left undisturbed 60 seconds, followed by a gentle air dry. Before the application of the adhesive, all surfaces were left moist.

The specimens were stored in distilled water (37°C) for seven days then subjected to 1000 thermocycles between 5 and 55°C with a dwell time of 25 seconds in each bath (transit time 5 seconds). All specimens were then immersed for 24 hours in 2% basic fuchsin with their roots pointing upwards. In this position, the level of dye

was 1 mm above the gingival margins of the preparations. Using this technique, dye penetration through improper insulated root areas was avoided. The teeth were sectioned through the middle of the fillings with a water cooled fine grit diamond disc, following a mesial-distal plane. The sections were examined at the gingival interfaces with an optical microscope (model FT MIC 2665, Euromex, Arnhem, Netherlands) at 40X and 100X magnifications. The microleakage scores were chosen as follows: 0 - no dye penetration; 1 - dye penetration up to 1/2 of the cavity depth; 2 - dye penetration to the full depth of the cavity wall (not including the axial wall); 3 - dye penetration along the axial wall.

**RESULTS:** Microleakage was found in each experimental group. Statistically significant differences were found among the groups (Kruskal-Wallis test,  $\alpha=0.05$ ,  $P=0.012$ ). The Mann-Whitney U test revealed statistically significant differences among groups 1-3 ( $\alpha=0.01$ ,  $P=0.007$ ) and 2-3 ( $\alpha=0.05$ ,  $P=0.033$ ), respectively. No significant differences were found among groups 1-2 ( $\alpha=0.05$ ,  $P=0.194$ ).

**DISCUSSION & CONCLUSIONS:** Because microleakage at the gingival interfaces (dentin/cementum) of class II composite direct restorations nearly always occurs, the efficiency of the adhesive systems to hybridize the cementum layer must be questioned. In this study, the role of silane application in reducing microleakage at the dentin/cementum interface might be explained by its ability in producing chemical bonds with the substrate. Within the limitations of this study it can be concluded that the additional silane treatment of the acid etched gingival margins significantly reduces microleakage in class II composite-filled cavities. Future studies must investigate (1) the chemical mechanism of silane bonding to dentin (2) the ultramorphology of the adhesive/dentin interface and (3) the effects of silane solution on the pulp.

**REFERENCES:** <sup>1</sup>B.M.Owens (2003), *J. Contemp. Dent. Pract.* **15**:1-9. <sup>2</sup>A. Versluis, W.H. Douglas and R.L. Sakaguchi (1996), *Dent. Mater.* **12**:290-294. <sup>3</sup>K.J. Rossomando and S.L. Wendt Jr. (1995), *Dent. Mater.* **11**: 47-51.