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Influence of Flowable Composites on Marginal Adaptation of Class-II-Restorations

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Authors:
Katja Sauerzweig, Dr. Christian Ralf Gernhardt, Prof. Dr. Hans-Günter Schaller, Department of Operative Dentistry and Periodontology, Martin-Luther-University, Halle-Wittenberg

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Introduction

Adaption has been defined as the degree of proximity and interlocking of a filling material to the cavity wall. Factors which influence the marginal quality are polymerization shrinkage, bond strength, wetting properties and cavity geometry (1). The percolation of oral fluid and bacteria along the restoration margins may be responsible for pulpal irritation, recurrent caries, hypersensitivity and failure of the restoration. Detection of microleakage and marginal adaption around dental restorations in vitro has been widely described in the dental literature. The commonly applied method employs the use of dyes and a single, midline section of the tooth (2,3,4,5).

Objectives

The aim of the present study was to evaluate the marginal adaptation of class II restorations after using two different dentine bonding agents in vitro following a clinical relevant procedure.

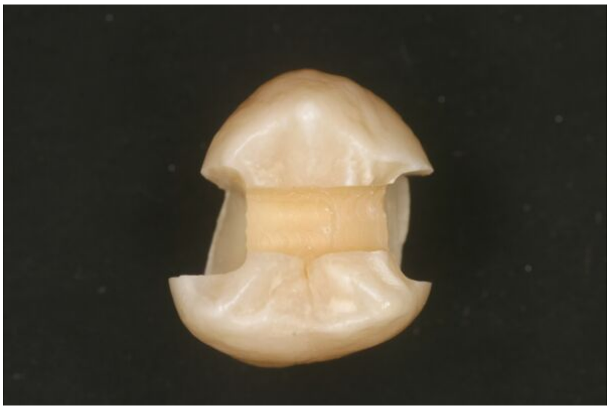

Fig. 1: Standardized preparated classII-cavity.

Fig. 2: Special apparatus used for preparation of standardized cavities.

Material and Methods

Sixty freshly extracted human molars, free from any cracks, caries or restorations were used. To simulate the clinical situation as closely as possible, during restorations placement, teeth were imbedded in a model of plaster and put in a phantome head (Fig. 4). In the mesial and distal part of each tooth a standardized class II cavity was prepared (Fig. 1, 2). The cervical margin was located 0.5mm below the cemento-enamel-junction. After preparation, the teeth were randomly assigned into four groups with fifteen teeth each. Group 1: Excite/ Tetric; group 2: Excite/ Tetric/ Tetric Flow; group 3: Xeno/ Spectrum; group 4: Xeno/ Spectrum/ X-Flow. Metall matrix bands and cervically wedges were placed. The above mentioned materials were applied according to the instructions of the manufacturer and light cured (Fig. 6, 7). All teeth were then subjected to 1150 thermal cycles (5°C-55°C). After thermocycling the specimens were stored for 24h in methylen blue and rinsed off (Fig. 5). Each sample was bisected using a band saw under constant water cooling. Penetration depths were measured under a light microscope.

	Group 1 Excite/ Tetric	**Group 2 Excite/ Tetric/ Tetric Flow**	**Group 3 Xeno/ Spectrum**	**Group 4 Xeno/ Spectrum/ X-Flow**
Penetration depth (microns)	4145	3492	4161	2872
Standard Deviation	± 604	± 593	± 782	± 1748

Tab. 1: Mean value and standard deviation within the different groups.

Results

For the four experimental groups following penetration depths were evaluated (mean values and stadard deviations in microns): Group 1: 4145 (± 604); group 2: 3492 (± 593); group 3: 4161 (± 782); group 4: 2872 (± 1748). Statistical analysis showed a significant influence of the different material combinations (ANOVA, $p<0.001$). Pairwise comparison showed significantly decreased penetration depths for both groups used with flowable composites (group 2,4) compared to the corresponding subgroups 1 and 3 ($p<0.05$, Tukeys test) (Fig. 3 and Tab. 1).

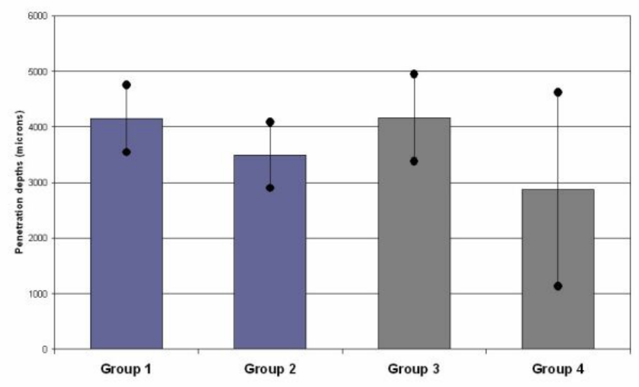

Fig. 3: Mean value and standard deviation within the different groups.

Fig. 4: The fillings were placed using a common clinical procedure in a phantom head.

Fig. 5: Specimens after storage in methylen blue in order to measure the penetration depth.

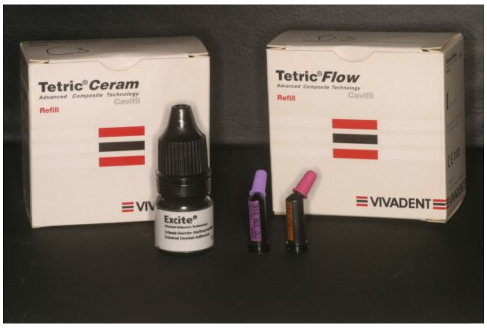

Fig. 6:Materials used in group A1 and A2.

Fig. 7: Materials used in group B1 and B2.

Conclusions

Within the limitations of an in vitro investigation it can be concluded that the use of flowable composites might improve marginal adaption in class-II-restorations. .

Literature

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This poster was submitted by Dr. Christian Ralf Gernhardt.

Correspondence address:
Dr. Christian Ralf Gernhardt
Department of Operative Dentistry and Periodontology
Martin-Luther-University Halle - Wittenberg
Große Steinstrasse 19
D-06108 Halle (Saale)
Germany

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