

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

Language: English

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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.

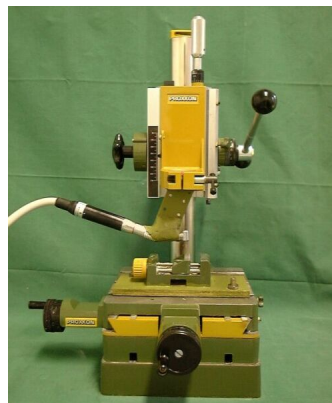


Fig. 1: Standardized prepared classII-cavity.

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 standard deviations in microns): Group 1: 4145 (\pm 604); group 2: 3492 (\pm 593); group 3: 4161 (\pm 782); group 4: 2872 (\pm 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).

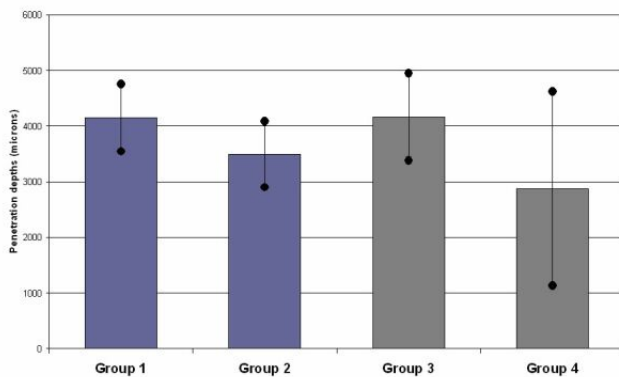


Fig. 3: Mean value and standard deviation within the different groups.



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



Fig. 5: Specimens after storage in methylen were placed using a common clinical procedure in a phantom head.



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.


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



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Introduction

Adaptation 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 geometry¹. The penetration of oral fluid and bacteria along the restoration margins may be responsible for pulp irritation, recurrent caries, hypersensitivity and failure of the restoration. Detection of microleakage and marginal adaptation 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, occlusal section of the tooth^{2,3,4}.

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.

	Group 1 Excite/ Tetric	Group 2 Excite/ Tetric/ Tetric Flow	Group 3 Xeno/ Spectram	Group 4 Xeno/ Spectram/ X-Flow
Penetration depth (microns)	4145	3492	4161	2872
Standard deviation	+/- 604	+/- 593	+/- 782	+/- 1748

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

Results

For the four experimental groups following penetration depths were evaluated (mean values and standard 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). *Post-hoc* 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, Tukey-test) (Fig. 3 and Tab. 1).




Fig. 1: Prepared standard class II cavity.




Fig. 2: Dental specimen used for preparation of standard class II cavity.

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 embedded in a model of plaster and put in a phosphate bowl (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/ Spectram; group 4: Xeno/ Spectram/ X-Flow. Metal matrix bands and cervical 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 thus subjected to 1150 thermal cycles (5°C-55°C). After thermocycling the specimens were stored for 24h in methylene blue and stained off (Fig. 5). Each sample was bisected using a hand saw under constant water cooling. Penetration depths were measured under a light microscope.

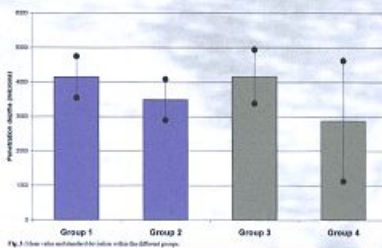


Fig. 3: Mean value and standard deviation for the four different groups.




Fig. 4: The filling was placed using a composite manual procedure in a phosphate bowl.




Fig. 5: Specimens after staining in methylene blue in order to detect the penetration depth.




Fig. 6: Adhesive used for group 01 and 02.




Fig. 7: Materials used for group 03 and 04.

Conclusions

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

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