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Influence of Irrigation Solutions on Bond Strength of Resin Cements

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Introduction

The retention of fiber posts in roots is dependent upon the adhesion between the resin cement and the dentin, as well as on the adhesion between the resin cement and posts. However, the adhesion between resin and dentin is considered to be a weak point in luting a fiber post (1, 2). It is known that dentin walls are covered by a heavy smear layer containing debris and remnants of gutta-percha and sealer after post preparation. Furthermore, etching, chemical irrigation, and ultrasonic treatment have been reported to be effective in the removal of the smear layer on endodontically treated dentin. Chemical irrigants, such as solutions of sodium hypochlorite (NaOCl), or EDTA in combination with NaOCl, have been used in previous studies to clean the post space (3, 4). The effect of chemical irrigation on the retention of fiber posts remains uncertain.

Objectives

The aim of this study was to evaluate microtensile bond strength of a self-etching resin cement (Bifix SE, Voco, Germany) after irrigation with different endodontic irrigants (0.2% chlorhexidine, 1% sodium hypochloride, 19% EDTA) on root dentin in vitro (Figure 1, 2).

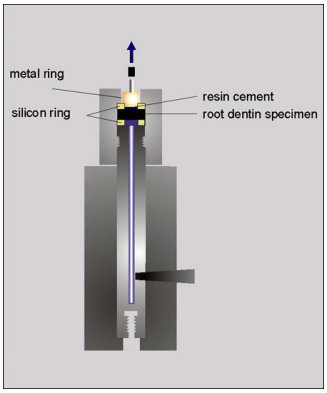

Fig. 1: Special disgned apparatus to test microtensile bond strength

Fig. 2: Experimental device mounted in an universal testing maschine

Material and Methods

75 single rooted extracted teeth, stored in saline for a maximum of fourteen days after extraction were included. All teeth were specially prepared allowing the evaluation on root canal dentin (Figure 3). The specimens were randomly assigned to five experimental groups of fifteen samples each:
Group 1: Control, Bifix SE/ no irrigation solution; group 2: Bifix SE/ chlorhexidine (CHX); group 3: Bifix SE/ sodium hypochloride (NaOCl); group 4: Bifix SE/ chlorhexidine and sodium hypochloride; group 5: Bifix SE/ EDTA. The different solutions were applied five times for 2 minutes each (Figure 4).
Microtensile bond strength was measured 15 minutes after application using an universal testing machine (Z005, Zwick) (Figure 1, 2). All materials were applied as recommended by the manufacturer and light-cured for 60 seconds. Statistical analysis was performed using SPSS 15.0. The data of mTBS were analysed by one-way anova a. Post hoc pair-wise comparisons were performed using Tukey multiple comparisons and Bonferroni Holm correction. For each outcome, statistical significance was set at $p<0.05$.

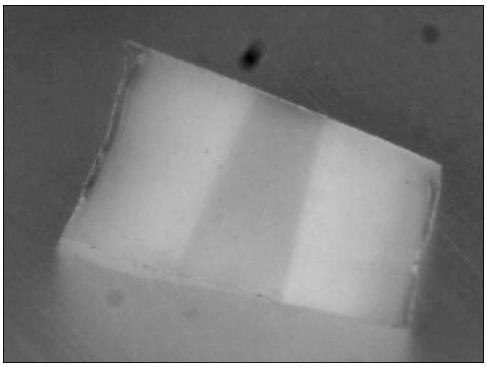

Fig. 3: Example of a root dentin specimen used in this study to test mTBS

Fig. 4: Irrigation solutions used in this study (NaOCL, EDTA, Chlorhexidine (CHX)). The solutions were applied five times for 2 minutes each

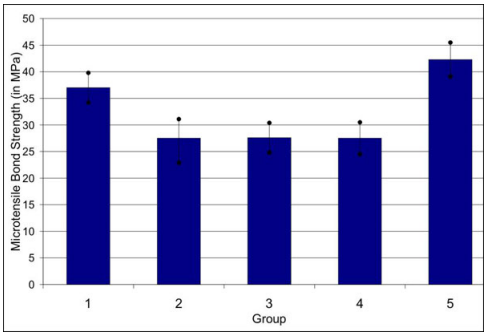

Fig. 6: Graphically expression of the results

Results

For the five test series following microtensile bond strengths were evaluated. Mean value and standard deviation in Mpa were shown in table 1 and graphically expressed in figure 5.
Bifix SE showed the highest bond strengths after the use of EDTA as irrigation solution ($p<0.05$, Bonferroni-Holm). Focusing on the different solutions, significant lower bond strengths values compared to the control were observed in group 2, 3 and 4 ($p<0.05$, Bonferroni-Holm).

Group	1	2	3	4	5
Irrigant	None	CHX	NaOCl	CHX/NaOCl	EDTA
Bond Strength	37.0	27.5	27.6	27.5	42.3
±	2.8	3.6	2.8	3.0	3.2

Tab. 1: Mean value and standard deviation (in Mpa) within the different experimental groups

Conclusions

Within the limitations of an in vitro investigation it can be concluded that all irrigation solutions used in this study influenced bond strength of the self-etching resin cement. Only the use of EDTA improved microtensile bond strength significantly.

Literature

1. Sahafi A, Peutzfeldt A, Asmussen E, Gotfredsen K. Retention and failure morphology of prefabricated posts. Int J Prosthodont 2004; 17: 307-312.
2. Boschian PL, Cavalli G, Bertani P, Gagliani M. Adhesive postendodontic restorations with fiber posts: push-out tests and SEM observations. Dent Mater 2002; 18: 596-602.
3. Akgungor G, Akkayan B. Influence of dentin bonding agents and polymerization modes on the bond strength between translucent fiber posts and three dentin regions within a post space. J Prosthet Dent 2006; 95: 368-378.
4. Bouillaguet S, Krejci I, Wataha JC, Krejci I, Meyer JM, Pashley DH. Microtensile bond strength between adhesive cements and root canal dentin. Dent Mater 2003; 19: 199-205.

Abbreviations

MPa = megapascals

This Poster was submitted by PD Dr. Christian R. Gernhardt.

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Influence of Irrigation Solutions on Bond Strength of Resin Cements

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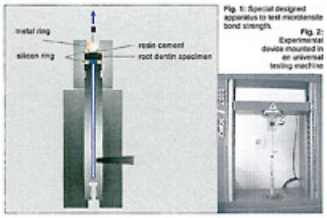

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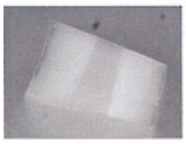

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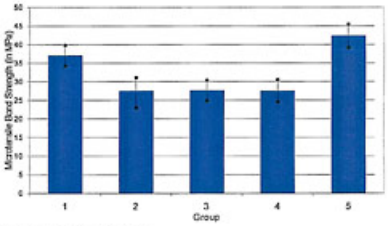

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