

Bond Strength of Resin Cements on Different Root Dentin Localizations

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Introduction

Fiber posts, in combination with resin cements, have been widely used to restore endodontically treated teeth. Variations in the structure of the root canal dentin such as accessory root canals, areas of resorption, embedded and free pulp stones, and varying amounts of irregular secondary dentin may affect bond strength to root canal dentin (1). The evaluation of dentin morphology in root canals in terms of tubule orientation and density reveals a higher tubule density in the cervical compared with the central and apical parts of the root canal (2). The regional effect of dentin on the retention of resin cements is controversially discussed and remains uncertain (3, 4).

Objectives

The aim of this study was to compare microtensile bond strength of a self-etching resin cement (Bifix SE, Voco, Germany) with an established resin cement system (Bifix, Futurabond DC, Voco, Germany) on different root canal dentin localizations (coronal, cervical and apical) in vitro (Figure 1, 2).

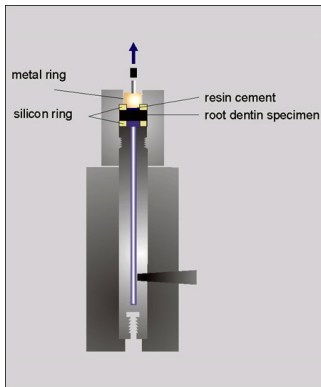


Fig. 1: Special designed apparatus to test microtensile bond strength



Fig. 2: Experimental device mounted in an universal testing machine (Zwick 005)

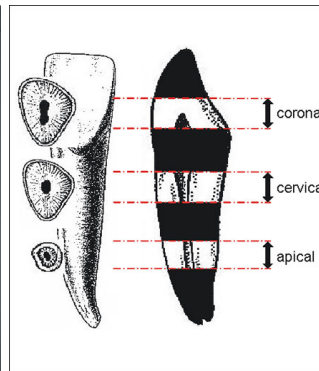


Fig. 3: Specimen preparation (apical, cervical, coronal)

Material and Methods

In this study 90 single rooted extracted teeth, stored in saline for a maximum of thirty days after extraction were used. All teeth were specially prepared allowing the evaluation of microtensile bond strength on root canal dentin (Figure 3). The specimens were randomly assigned to six experimental groups of fifteen samples each: Group 1: Bifix/ coronal dentin; group 2: Bifix/ cervical dentin; group 3: Bifix/ apical dentin; group 4: Bifix SE/ coronal dentin; group 5: Bifix SE/ cervical dentin; group 6: Bifix SE/ apical dentin (Figure 4, 5). 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. For each outcome, level of significance was set at 5%.



Fig. 4, 5: Resin Cements tested in this study (Futurabond DC, Bifix SE)

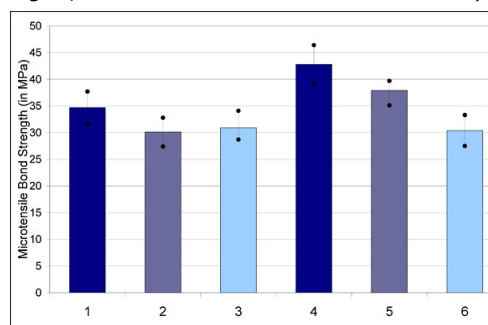


Fig. 6: Graphically expression of the results

Results

For the six test series microtensile bond strengths as shown in table 1 and graphically expressed in figure 6 were evaluated (mean value and standard deviation in Mpa):

Regarding both resin cements, Bifix SE showed significantly higher bond strengths on coronal and cervical dentin ($p < 0.05$, Tukey's Test). Focusing on the different localizations, significant lower bond strengths values could only be detected on apical root canal dentin after the use of Bifix SE. In all other groups no significant influence of the localization could be evaluated.

Group	1	2	3	4	5	6
Material	Bifix / futurabond DC			Bifix SE		
Localization	Coronal	Cervical	Apical	Coronal	Cervical	Apical
bond Strength	34.7	30.1	30.9	42.8	37.0	30.4
±	3.0	2.7	3.2	3.6	2.8	2.9

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 the new self-etching resin cement showed promising results compared to an established resin cement system regardless of the root dentin localization.

Literature

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Abbreviations

MPa= Megapascals

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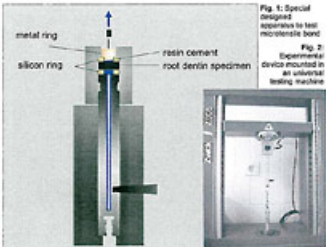
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Introduction

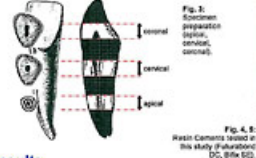

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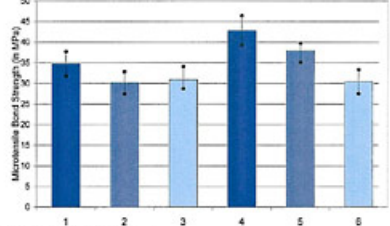



Results

For the six test series following microtensile bond strengths were evaluated (mean value and standard deviation in Mpa) (Table 1, Figure 6):

Group	1	2	3	4	5	6
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Table 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 the new self-etching resin cement showed promising results compared to an established resin cement system regardless of the root dentin localization.

References

1. Vignola, G.M., Ferracane, J.L., Ferracane, M., Mazzoni, F. (2007) The structure of dentine in the apical region of human teeth. *International Endodontic Journal* 34, 346-355.
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