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Bond Strength of Different Adhesive Materials to Root Canal Dentin

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

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Introduction

Successful root canal treatment depends on the thorough debridement of the root canal system, the elimination of pathogenic organisms and finally the complete sealing of the canal space to prevent ingress of bacteria from the oral environment and spread to the periapical tissue1. The physical properties necessary for this function include adaptation and adhesion of the filling material to the root canal wall, because gutta-percha does not directly bond to the dentine surface (2). Advances in adhesive technology have reinforced the search for means to minimize apical and coronal marginal leakage by increasing the sealing between the filling material and the root canal walls (3, 4).

Objectives

The aim of the present study was to evaluate regional microtensile bond strengths (mTBS) to root canal dentin using different adhesive systems- two dentin adhesives (Syntac (Ivoclar Vivadent), Futurabond NR (Voco)), one resin cement (Panavia F (Kuraray)) and one adhesive root canal sealer (Resilon (Sybron Endo)).

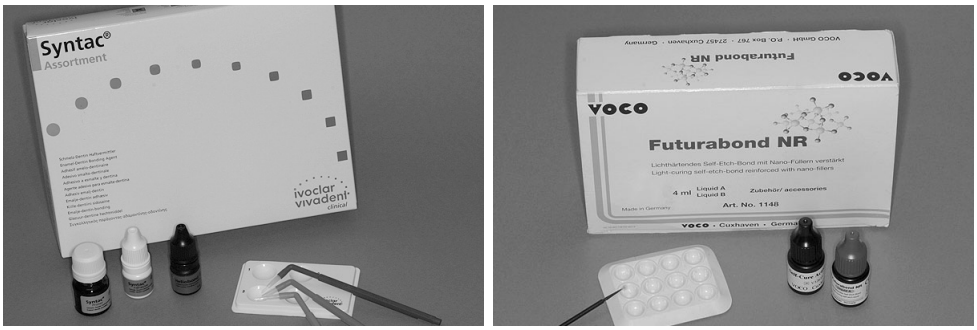

Fig. 1-2: Materials used in this study: Two dentin adhesives (Syntac and Futurabond NR).

Fig. 3-4: Materials used in this study: One resin cement (Panavia F (Kuraray)) and one adhesive root canal sealer (Resilon (Sybron Endo)).

Material and Methods

The study was carried out on 120 human extracted single rooted incisors which were selected for standard size and quality. The teeth were radiographed to check for a single canal and stored in 0.9% saline during the whole experimental period. Crowns were removed at the CEJ. The roots were bisected along their long axis and sectioned into three thirds: apical (a), middle (m) and coronal (c). Flat root dentin specimens were prepared and embedded in Technovit.

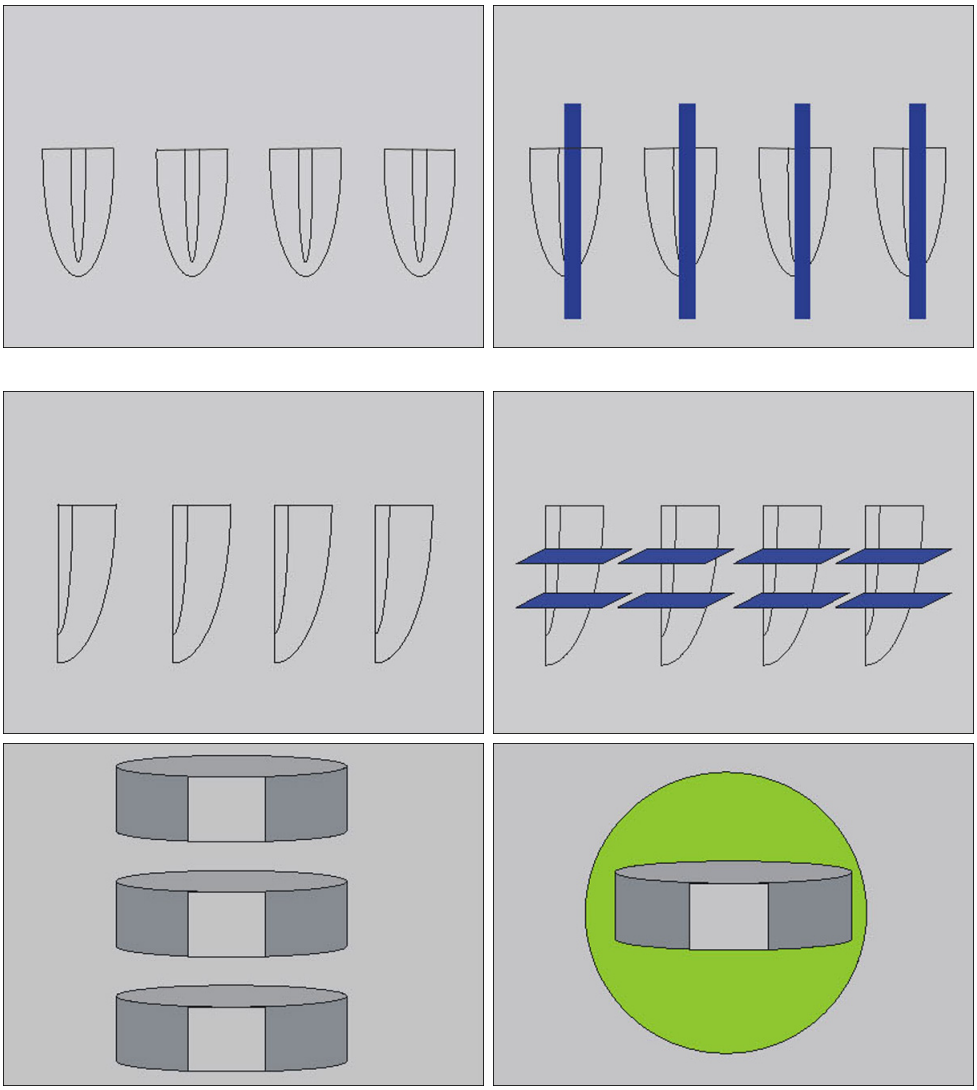

Fig. 5a-5f: Preparation of the specimens to test mTBS

The specimens were randomly assigned to four experimental groups of ten samples each: Group S: Syntac; group F: Futurabond NR; group P: Panavia F 2.0; group R: Resilon. The different adhesive materials were applied as recommended by the manufacturer. A composite build up (Ø 1mm) was created over each root canal section to allow mTBS tests. The root canal dentin was conditioned as suggested by the manufacturers and, after the application of the dental adhesives, a layer of resin-based composite was polymerized over the adhesive layer of each root canal section to allow mTBS tests. After the composite had completely set, mTBS tests were performed. Tensile tests were carried out using a special device in a universal testing machine (Z005, Zwick; crosshead speed 1 mm). 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, statistical significance was set at $p < 0.05$.

Results

For the four test series following mTBS were evaluated (mean value and standard deviation in MPa): Statistical analysis showed a significant influence of the used materials and the different regions on mTBS ($p < 0.001$, ANOVA). In each group significantly increased mTBS were observed in the coronal third of the root ($p < 0.05$, Tukey's Studentized Range test).

	Group S			**Group F**			**Group P**			**Group R**		
Root section	a	m	c	a	m	c	a	m	c	a	m	c
Mean	6.37	10.65	15.62	8.38	10.03	11.49	4.82	8.18	12.63	4.66	8.20	10.22
±	± 2.24	± 2.74	± 3.55	± 2.27	± 3.23	± 2.98	± 1.67	± 3.03	± 2.71	± 1.56	± 3.09	± 2.17

Tab. 1: Microtensile Bond Strength within the different groups

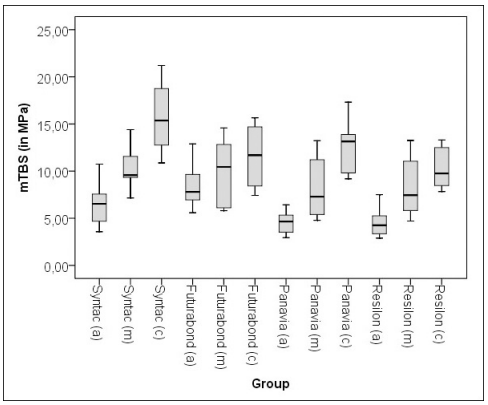

Fig. 6: Graphically expression of the results

Conclusions

It can be concluded that all adhesive materials - bonding agents, the resin cement and the adhesive root canal sealer - used in this study were able to establish bond strength on root canal dentin. Regional variations of dentin modified mTBS in all groups.However, the clinical relevance must be viewed with caution. Further in vitro and clinical studies have to prove these findings.

Literature

1. Sundqvist G, Figdor D, Persson S, Sjögren U (1998): Microbiologic analysis of teeth with failed endodontic treatment and the outcome of conservative re-treatment. Oral Surg Oral Med Oral Pathol Oral Radiol Endod
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Abbreviations

mTBS = Microtensile Bond Strength

This Poster was submitted by Dr. Katrin Bekes.

Correspondence address:
Dr. Katrin Bekes
Martin-Luther-University Halle-Wittenberg
Department of Operative Dentistry and Periodontology
Steinstraße 19
06108 Halle
Germany

Poster Faksimile:

Martin-Luther-University Halle-Wittenberg 1753

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K. BEKES*, J. FELDMANN, H.-G. SCHALLER and C.R. GERNHARDT

Dept. of Operative Dentistry and Periodontology, University School of Dental Medicine, Martin-Luther-University Halle-Wittenberg, Halle, Germany

Introduction

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Fig. 1: Materials used in this study: Two dentin adhesives (Syntac and Futurabond NR), one resin-cement (Panavia F (Kuraray)) and one adhesive root canal sealer (Resilon (Sybron Endo)).

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Specimen preparation

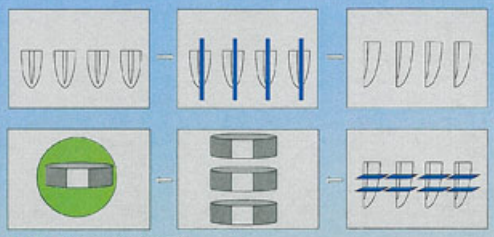

Fig. 2: Preparation of the specimens to test mTBS.

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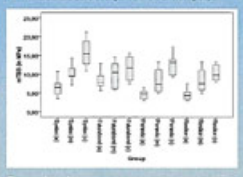

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