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# Apical sealing ability of EndoRez using different obturation techniques

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## Introduction

Beside proper cleaning and shaping of the root canal, the complete obturation of the root canal sytem is one of the main goals of endodontic treatment. Several techniques have been developed to improve the obturation quality. Recently, obturation techniques based on heated or preheated gutta-percha have been introduced in order to achieve three-dimensional filling of spaces and isthmuses(1). Two methods of obturation using warmed gutta-percha are the Thermafil system and the warm vertical condensation. A maximum volume of gutta-percha and a thin layer of sealer are preferred because sealer may shrink during setting and dissolve, thus causing leakage(2).

## Objectives

The purpose of this study was to compare the apical seal in root canals obturated with EndoRez and different gutta-percha techniques (single cone technique, lateral condensation, vertical condensation, Thermafil) using a dye penetration model.


Fig. 1: Sealer EndoRez (Ultradent Products)



Fig. 2, 3: Root canal filling systems used in the present study: Warm vertical condensation system EndoTwinn (VDW) and Thermafil system (Dentsply Maillefer).

## Material and Methods

The study was carried out on forty extracted single rooted incisors which were radiographed to check for a single canal and stored in saline. Access was prepared and apical patency was confirmed with a #10 K-file. Working length was recorded 1 mm shorter than root length. The canal system was prepared using the Hero 642 (Micro-Mega, Besancon, France) system following a standard protocol to a maximum size of #40 under sodium hypochloride (1%) and chlorhexidine digluconate (0.1%) irrigation. The prepared teeth were randomly subdivided into four groups of ten each (Fig. 4-7):

Group A: Single cone technique
Group B: Cold lateral condensation
Group C: Warm vertical condensation
Group D: Thermafil obturators

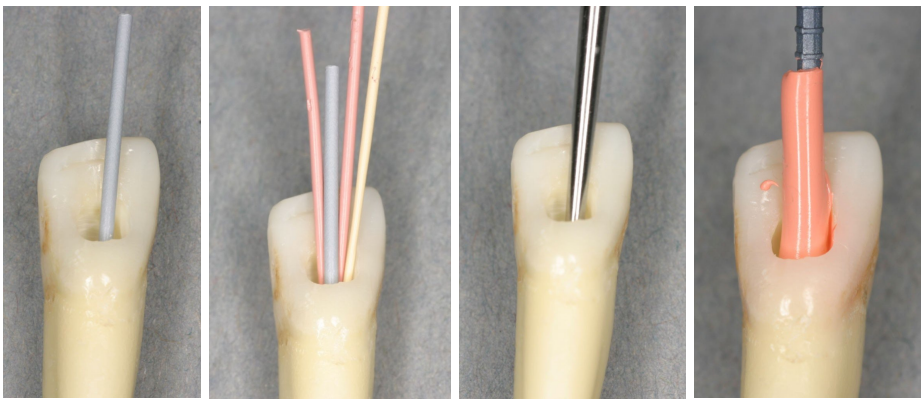

Fig. 4-7: Filling techniques used in the present study.

After root canal filling, a coronal filling of the endodontic access was done according to a common restorative procedure using dentin bonding agents (Excite; Vivadent, Ellwangen, Schaan, Liechtenstein) and composite material (Tetric Ceram, colour A2; Vivadent). The teeth were checked radiographically for complete obturation.
For evaluation of penetration depth, the specimens were dried and coated with two layers of nail varnish, leaving the apical foramen exposed. Each tooth was subsequently immersed in a freshly prepared 5% aqueous methylene blue dye solution (pH 7.0) for seven days at 37°C. Teeth were rinsed in distilled water and sectioned horizontally in 1.0 mm increments using a diamond saw under continuous water cooling. Teeth were oriented so that the sections were perpendicular to their long axis. The first transverse section was made 1mm above working length, including the removal of 1 mm of root at the apical foramen to the limit of apical preparation. Four subsequent sections were made.
After sectioning, each of the four sections was digitally viewed at 10x magnification with a stereomicroscope (Fig. 8-15). The borders of gutta-percha, sealer and voids could be distinguished clearly because of their different colours. The total area of each canal section and the areas of its contents (gutta-percha (G), sealer (S) and voids (V)) were measured in a metric system and converted to percentages using a software program (Fig. 16). Statistical analysis was performed using SPSS 10.0. ANOVA and Tukey's test were used to determine significant differences among the groups.

## Results

Recorded distributions (in %) are shown in Table 1.The total area of gutta-percha was not statistically different among the different obturation techniques ($p < 0.05$, tukey's test). the total area of gutta-percha was not statistically different among the groups b, c, d ($p < 0.05$, tukey's test). thermafil and warm vertical condensation showed significant fewer voids and low amounts of sealer ($p < 0.05$, tukey's test).

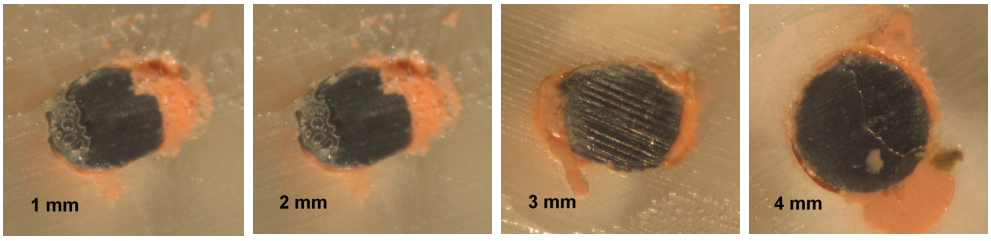


Fig. 8-11: EndoRez / Thermafil (section 1-4 mm from the apex)

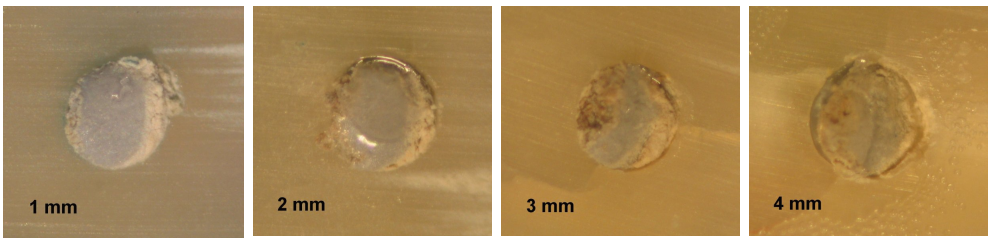


Fig. 12-15: EndoRez / vertical condensation (section 1-4 mm from the apex)

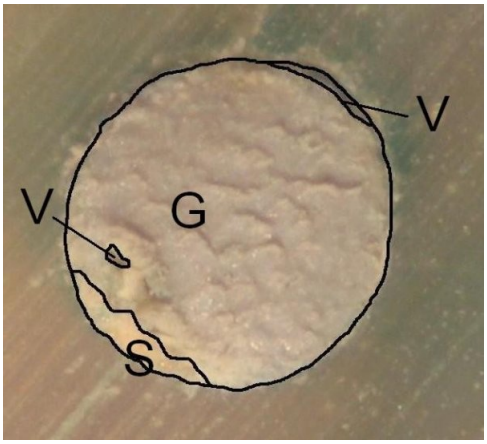


Fig. 16: Borders of gutta-percha (G), sealer (S) and voids (V).

| | Group A | | | Group B | | | Group C | | | Group D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **G** | **S** | **V** | **G** | **S** | **V** | **G** | **S** | **V** | **G** | **S** | **V** |
| **1 mm** | 79.29 | 18.07 | 2.64 | 89.87 | 9.32 | 0.81 | 94.06 | 5.94 | 0.00 | 94.67 | 5.03 | 0.29 |
| **2 mm** | 79.08 | 18.01 | 2.91 | 91.38 | 7.69 | 0.93 | 95.30 | 4.08 | 0.62 | 97.12 | 2.88 | 0.00 |
| **3 mm** | 77.73 | 19.82 | 2.46 | 93.63 | 4.70 | 1.67 | 96.39 | 3.30 | 0.31 | 98.17 | 1.83 | 0.00 |
| **4 mm** | 77.75 | 19.44 | 2.81 | 93.64 | 4.60 | 1.76 | 97.54 | 2.22 | 0.24 | 98.42 | 1.46 | 0.12 |

Tab. 1: Distributions of gutta-percha (G), sealer (S) and voids (V) in %.

## Conclusions

Although leakage studies are controversial and should be interpreted with caution (3), under the conditions of this study, canals obturated with Thermafil obturators had a comparable seal to canals obturated with vertical condensation. Single cone technique had greater leakage than thermomechanical compaction. However, the clinical relevance must be viewed with caution. Further in vitro and clinical studies have to prove these findings.

## Literature

1. Pommel L, Camps J: In vitro apical leakage of system B compared with other filling techniques. J Endod 2001; 27: 449-51.
2. DuLac KA, Nielsen CJ, Tomazic TJ, Ferillo PJ Jr, Hatton JF. Comparison of the obturation of lateral canals by six techniques. J Endod 1999; 25: 376-380.
3. Gilhooly RMP, Hayes SJ, Bryant ST, Dummer PMH. Comparison of cold lateral condensation and warm multiphase gutta-percha technique for obturating curved root canals. Int Endod J 2000; 33: 415-20.

*This Poster was submitted by Dr. Katrin Bekes.*

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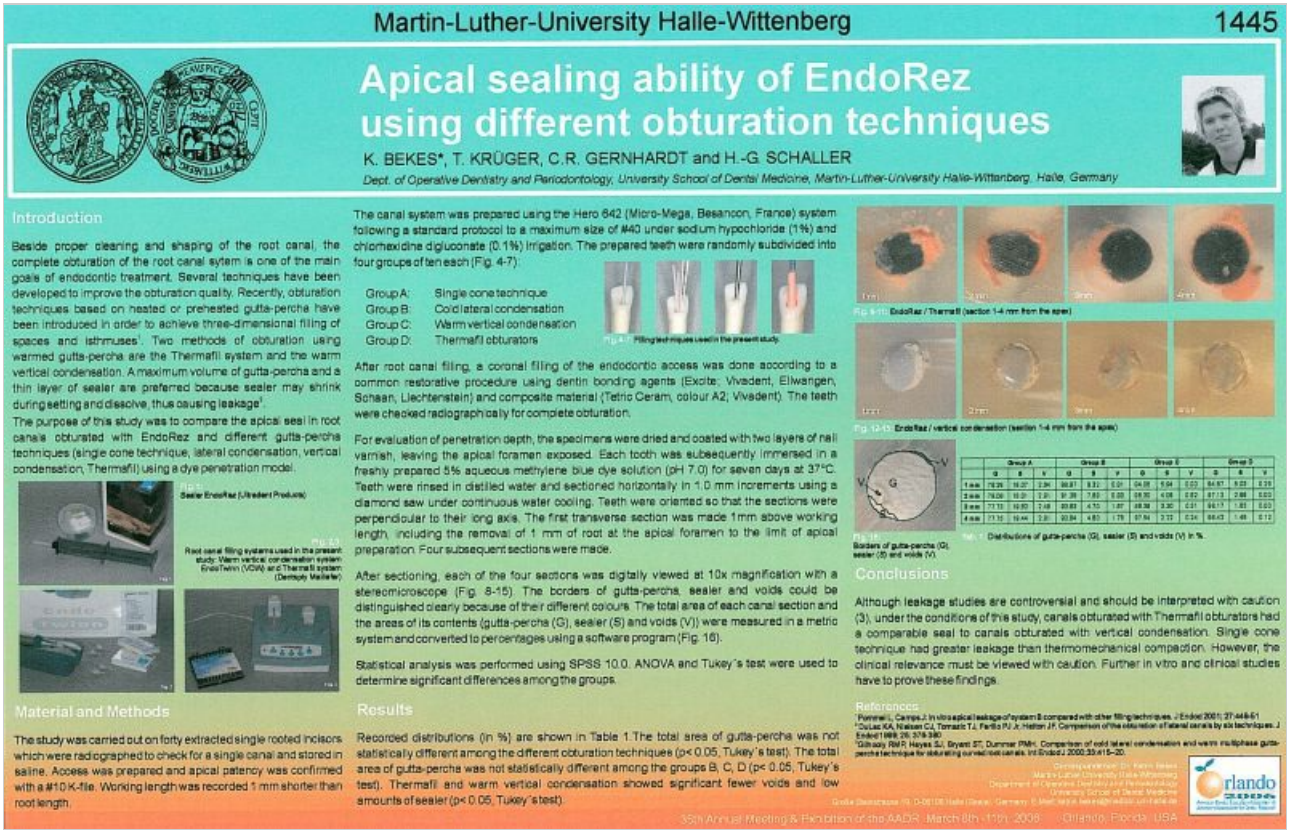
**Poster Faksimile:**



Martin-Luther-University Halle-Wittenberg 1445

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Fig. 8-11: EndoRez / Thermafil (section 1-4 mm from the apex)

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Table 1: Distributions of gutta-percha (G), sealer (S) and voids (V) in %.

| | Group A | | | Group B | | | Group C | | | Group D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | G | S | V | G | S | V | G | S | V | G | S | V |
| 1 mm | 79.26 | 16.37 | 2.94 | 98.81 | 0.72 | 0.01 | 94.08 | 5.84 | 0.02 | 94.87 | 5.03 | 0.10 |
| 2 mm | 79.06 | 16.01 | 2.91 | 91.38 | 7.60 | 0.05 | 88.50 | 4.08 | 0.02 | 87.13 | 2.86 | 0.03 |
| 3 mm | 77.10 | 16.80 | 2.48 | 89.83 | 4.70 | 1.87 | 88.38 | 3.30 | 0.01 | 86.17 | 1.83 | 0.03 |
| 4 mm | 77.10 | 16.44 | 2.31 | 90.84 | 4.80 | 1.79 | 87.94 | 2.72 | 0.04 | 86.43 | 1.48 | 0.12 |

## Conclusions

Although leakage studies are controversial and should be interpreted with caution (3), under the conditions of this study, canals obturated with Thermafil obturators had a comparable seal to canals obturated with vertical condensation. Single cone technique had greater leakage than thermomechanical compaction. However, the clinical relevance must be viewed with caution. Further in vitro and clinical studies have to prove these findings.

## References

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[2] DeLuca KA, Nielson CJ, Torrealdi TJ, Ferillo PJ Jr, Hatton JF. Comparison of the obturation of lateral canals by six techniques. J Endod 1999; 25: 378-380

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