

Resilon™ Obturation Material - The new standard of care?

Gutta-percha is the weak link of endodontic treatment. While the requirements for optimal instrumentation of the root canal are well known and achievable, it is not possible to hermetically fill the root canal using gutta-percha. In fact the coronal restoration (and not gutta-percha) is one of the reasons for the success of endodontic treatment.

Many materials used for the coronal seal would perform a better job in sealing the root canal if they were able to be placed effectively in the long narrow canal and if they could be removed (retreated) if apical periodontitis were to develop or fail to heal after treatment.

Resilon™* Material is a thermoplastic synthetic polymer based root canal filling material. Based on polymers of polyester, *Resilon* Material contains bioactive glass and radiopaque fillers. It performs like gutta-percha, has the same handling properties, and for retreatment purposes may be softened with heat, or dissolved with solvents like chloroform. Similar to gutta-percha, there are master cones in all ISO sizes and accessory cones in different sizes available (Figure 1,2).

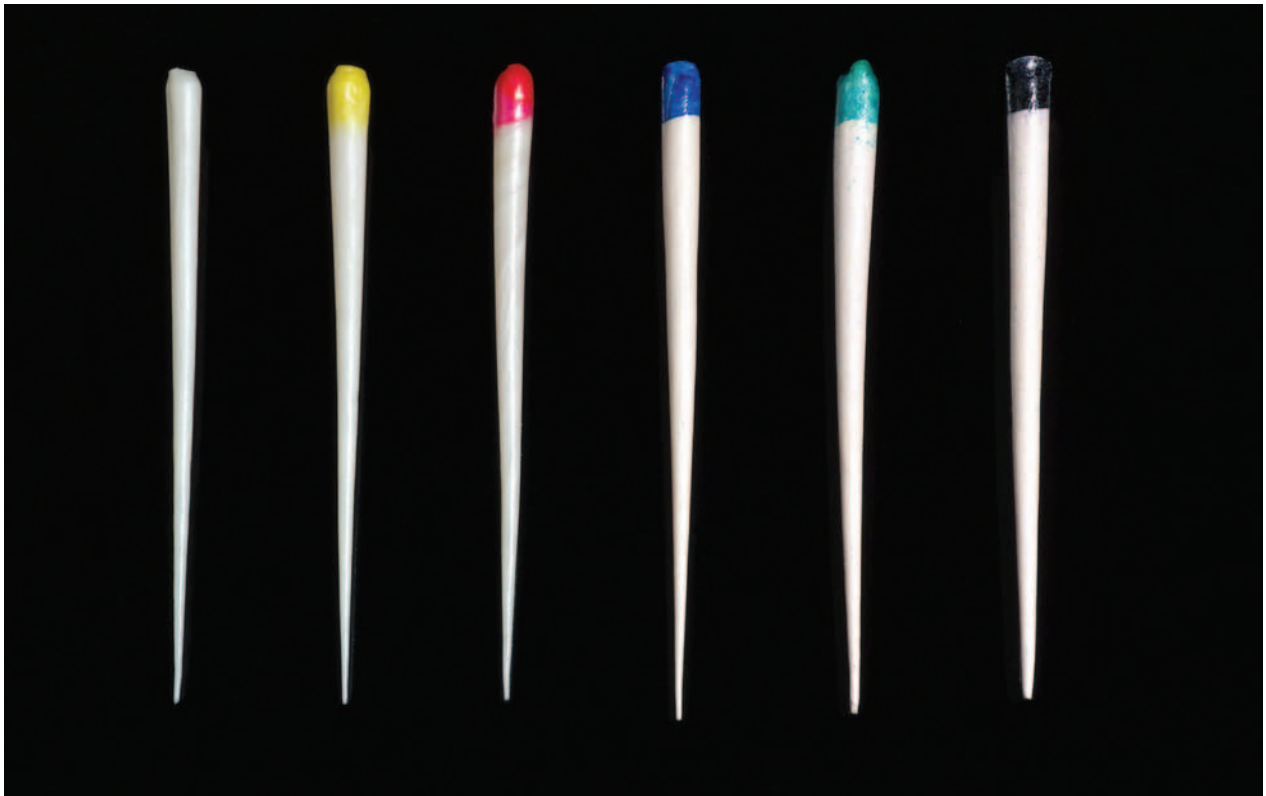


Figure 1. Resilon cones

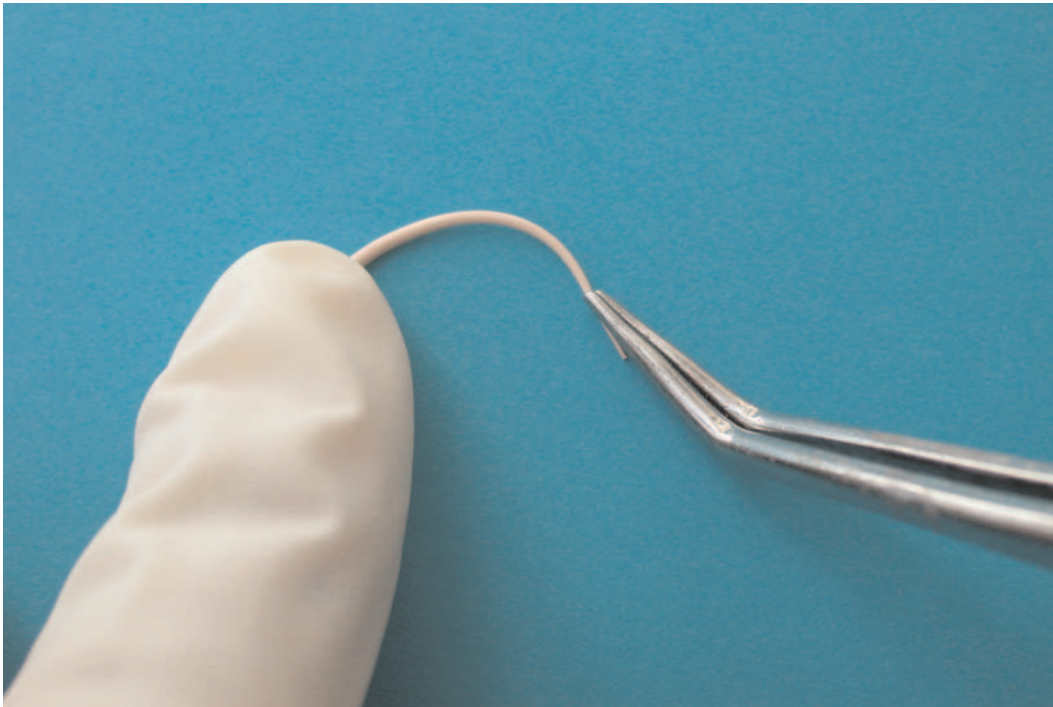


Figure 2. #35 0.04 tapered cone bent to show the flexibility of the cones.

In addition, *Resilon* Pellets are available which can be used for the backfill in the warm thermoplasticized techniques (Figure 3,4).



Figure 3. Resilon Pellet



Figure 4. Thermoplastic Resilon Material through an Obtura gun (150°C).

Epiphany™** Sealer is a dual curable dental resin composite sealer (Figure 5).



Figure 5. Epiphany Sealer

*** Epiphany is a trademark of Pentron® Clinical Technologies, LLC Wallingford, CT.*

In addition to 17 % EDTA used in conjunction with instrumentation, *Epiphany* Primer (Figure 6) is applied to the dentin walls of the root canals which are to be filled with *Resilon* Obturating Material. *Epiphany* Primer is a self-etch primer, which contains sulfonic acid terminated functional monomer, HEMA, water, and polymerization initiator. The preparation of the dentin through these chemical agents may prevent shrinkage of the resin filling away from the dentin wall and aid in sealing the roots filled with *Resilon* Material.



Figure 6. Epiphany Primer

Research

This study is submitted to the Journal of Endodontics

An evaluation of microbial leakage in roots filled with a thermoplastic synthetic polymer based root canal filling material (*Resilon*) or with gutta-percha

Authors:

Guy Shipper, BDS, MDent, Dag Ørstavik, DDS, PhD, Fabricio Batista Teixeira, DDS, MS, PhD and Martin Trope, BDS, DMD

The primary function of a root canal filling material is to seal the canal. As stated previously gutta-percha fails miserably in this function. The first test that was performed on the material was a bacterial leakage test in comparison to gutta-percha and AH26 sealer.

Abstract

The purpose of this study was to compare bacterial leakage using *S. mutans* and *E. faecalis* through gutta-percha and a *Resilon* thermoplastic synthetic polymer based root filling using 2 filling techniques over a 30 day period. Teeth were decoronated, roots prepared to a length of 16 mm and instrumented to size 40.

A total of 120 roots were randomly divided into 8 groups of 15 roots. Roots were filled using lateral and vertical condensation techniques with gutta-percha and AH26 sealer (Groups 1 and 2) or with gutta-percha and *Epiphany* Sealer (Groups 3 and 4). Groups 5 and 6 were filled with *Resilon* Material and *Epiphany* Sealer using the lateral or vertical condensation techniques. A split chamber microbial leakage model was used where *S. mutans* placed in the upper chamber could reach the

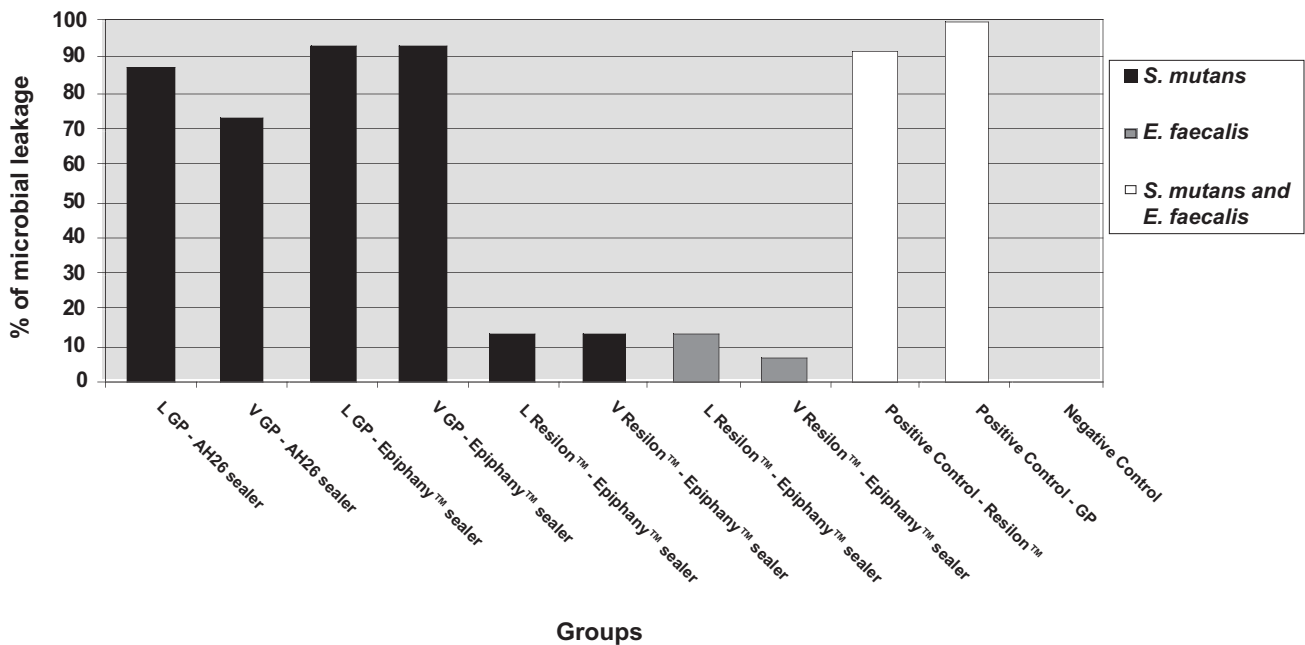
lower chamber only through the filled canal. Groups 7 and 8 were identical to Groups 5 and 6 respectively; however *E. faecalis* was used to test the leakage. Positive Controls were filled with *Resilon* Material (12 roots) and gutta-percha (12 roots) without sealer and tested with bacteria; while the Negative Controls (12 roots) were sealed with wax to test the seal between chambers. All but one positive control leaked within 24 h, while none of the negative controls leaked. *Resilon* Material showed minimal leakage (Group 8 – one leakage; Groups 5, 6, 7 – each with two leakages) that was significantly less than gutta-percha, in which approximately 80% of specimens with either technique or sealer leaked.

Kruskal-Wallis test showed statistical significance when all groups were compared ($p < 0.05$). Mann-Whitney test compared the respective groups and found *Resilon* groups superior to gutta-percha groups ($p < 0.05$).

1. Toxikon Corporation (ISO Project Number: 01-4421-G1) performed *Salmonella typhimurium* and *Escherichia coli* Reverse Mutation Assay which demonstrated that this material (*Resilon*) is non-mutagenic. The *Epiphany* Sealer was evaluated and scored using the Skin Sensitization Kligman Maximization Test and received a Grade 1 reaction which is not considered significant according to “Magnusson B, Kligman AM. The identification of contact allergens by animal assay. The guinea pig maximization test. *J Invest Dermatol* 1969; 52(3): 268-76.

Resilon Material is non-toxic and is FDA approved.

% Microbial leakage over 30 days



Discussion

The *Resilon* core is able to bond to the resin sealer which in turn attaches to the self etched root. This forms a monoblock which is highly resistant to bacterial penetration (Figures 7-11)

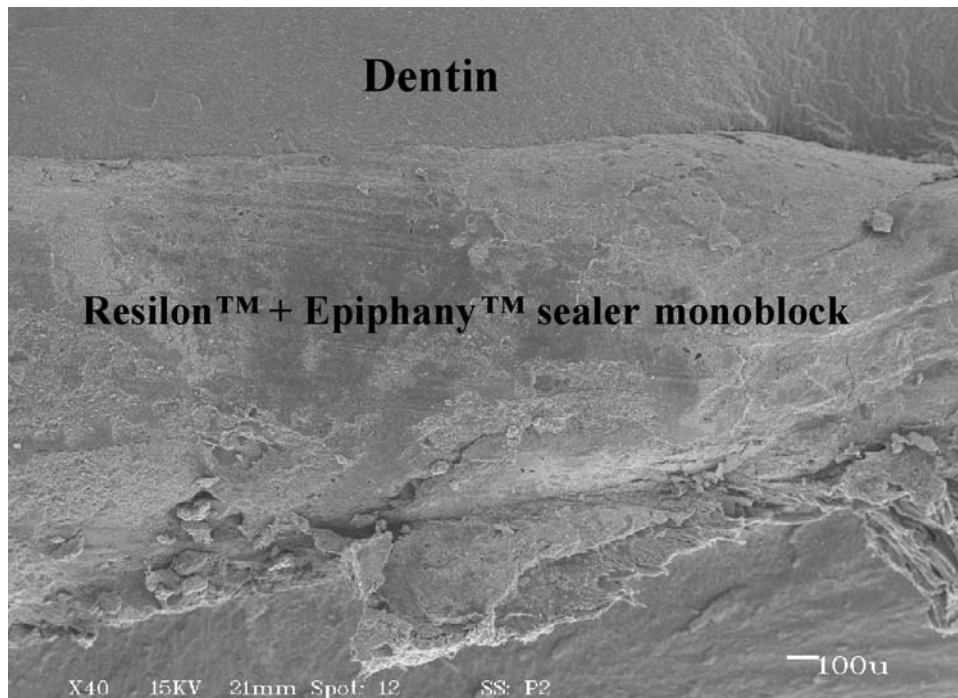


Figure 7. "Low" magnification showing the intimate fit of the Resilon core, sealer and root canal wall (monoblock).

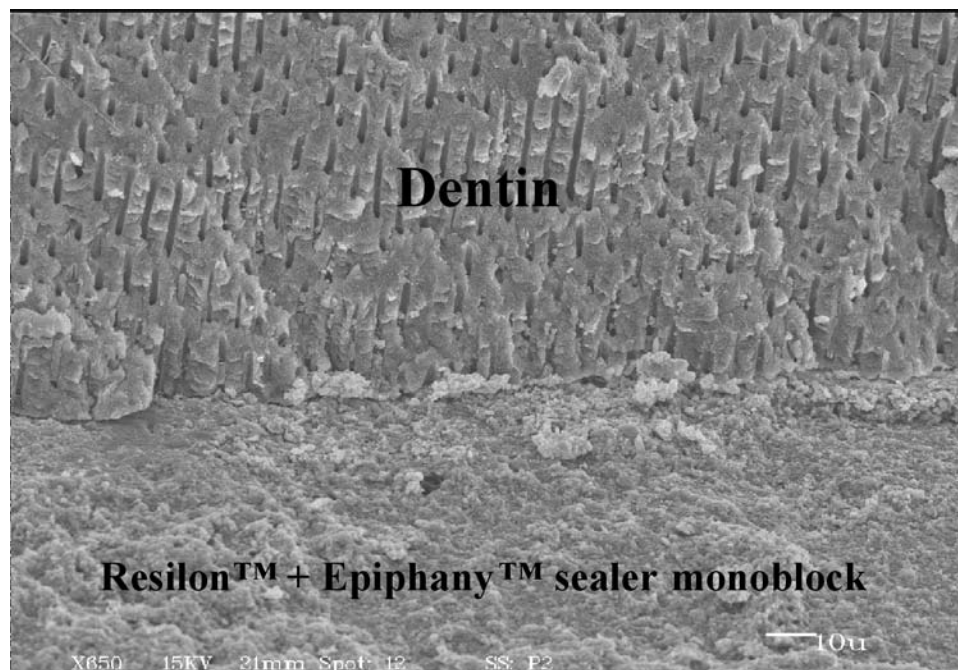


Figure 8. Higher magnification showing the Resilon, sealer, dentin interface.

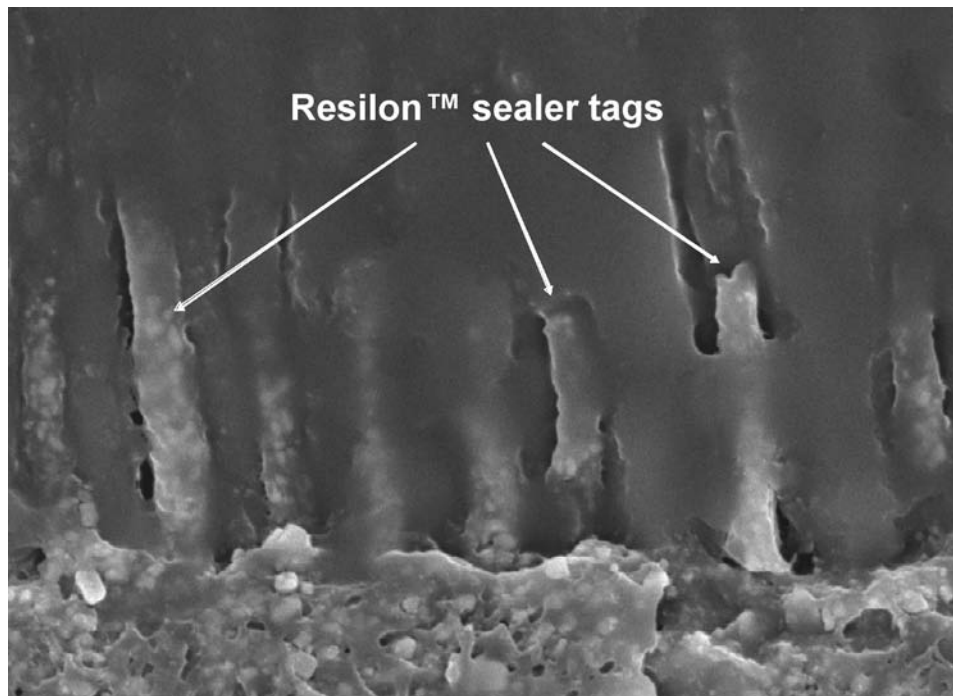


Figure 9. Even higher magnification showing resin tags entering the dentinal tubules.

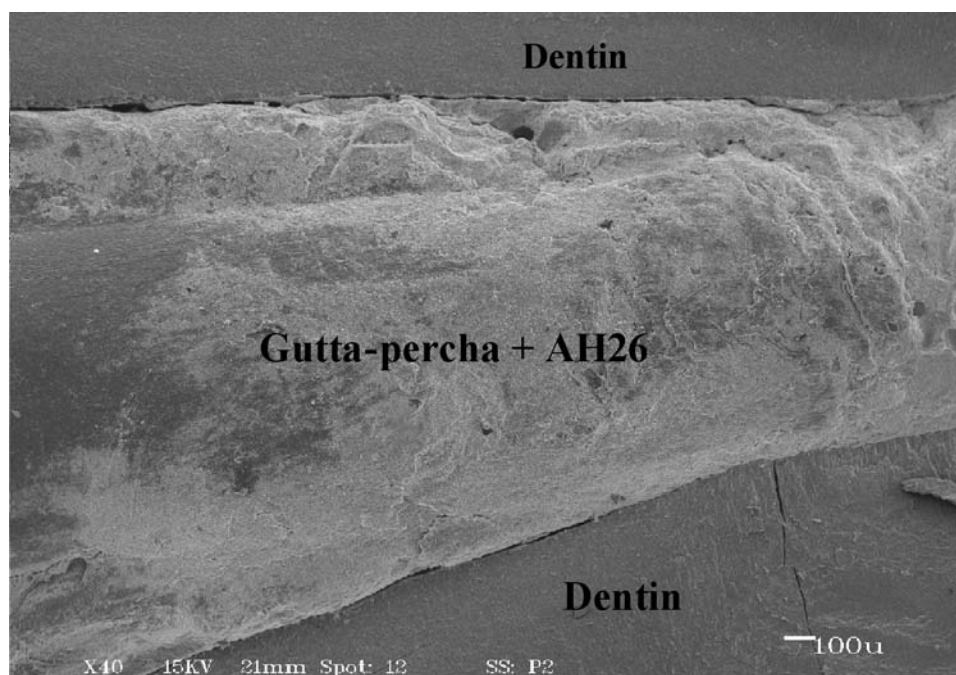


Figure 10. "Low" magnification of canal filled with gutta-percha and AH26. A gap exists between the gutta-percha and the canal wall.

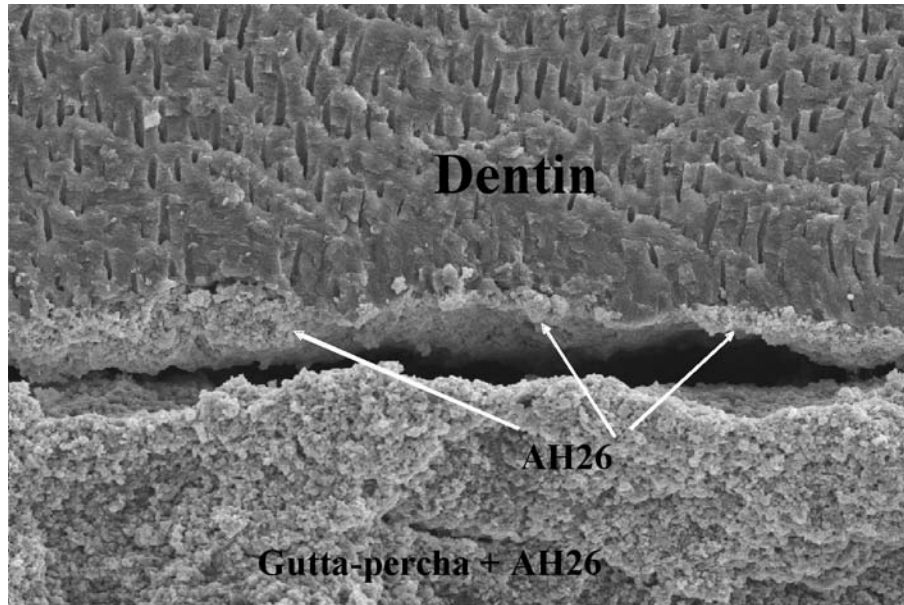


Figure 11. Higher magnification shows AH26 on the dentinal surface and the gap appears between the Ah26 and the gutta-percha.

One of the potential disadvantages of root canal treatment is the weakening of the root through removal of dentin during instrumentation and also due to the filling techniques (lateral or vertical condensation). Since *Resilon* Obturating Material is a bonded resin system it has the potential to strengthen the root. The following in-vitro study suggests that filling the canal with this material in fact does strengthen the root compared to gutta-percha techniques.

Submitted to Journal of American Dental Association (JADA)

Fracture Resistance of endodontically treated roots using a new type of resin filling material.

Authors: **Fabricio B. Teixeira DDS, MSC, PhD 1**
 Erica C. N. Teixeira DDS, MSC 2
 Jeffrey Y. Thompson BS, PhD 3
 Martin Trope DDS, DMD 4

Abstract

Background The fracture resistance of endodontically treated teeth filled with gutta-percha and a new resin-based obturation material were evaluated.

Methods Eighty single-canal extracted teeth were prepared and randomly divided into five groups: lateral and vertical condensation with gutta-percha, lateral and vertical condensation with *Resilon* Material, and a control group with no filling material. The specimens were stored in 100% humidity for 2 weeks, mounted in polyester resin and loaded to failure.

Results

Data were subjected to Analysis of Variance (ANOVA) and Fisher's PLSD tests at 95% level of confidence using the SPSS 9.0 software (Chicago, IL). Comparison among groups was performed. Table 1 indicates the means and standard deviations for each experimental group. The ANOVA revealed significant difference between treatments ($P=0.037$). The root resistance fracture values of *Resilon* Material vertical and lateral groups were superior to gutta-percha/AH 26 sealer lateral and vertical groups. However, no significant difference was observed among filled groups and non-filled group (control).

Table 1. Force measured in Newtons required to cause vertical root fracture (n=16)

Groups	Mean	Standard Deviation
1 - Control-no obturation	465.39ab	76.85
2 - Lateral Gutta-percha	391.51a	146.79
3 - Vertical Gutta-percha	392.37a	77.03
4 - Lateral <i>Resilon</i>	504.22b	195.94
5 - Vertical <i>Resilon</i>	498.23b	135.32

Different superscript letters represent statically significant differences ($p < 0.05$)

Conclusions

Filling the canals with *Resilon* Material increased the in vitro resistance to fracture of endodontically treated single-canal extracted teeth when compared to standard gutta-percha techniques.

Clinical Implications: If other properties of *Resilon* Material compare favorably to gutta-percha for filling the root canal it should be considered as a replacement for gutta-percha, as the results of this study indicate that it could provide enhanced resistance to tooth fracture.

Ongoing Research

Animal study:

The effectiveness of different obturation techniques in infected and non infected root canals: a histological study in dogs

Guy Shipper BDS, Martin Trope BDS, DMD

Human outcomes study:

CAROLINA

Radiographic Healing of Apical Periodontitis Using a New Obturation Material

Michelle Grim, D.M.D.
Graduate Endodontics

Mentor: Dr. Martin Trope
Committee Members: Drs. Linda Levin,
Asgeir Sigurdsson, Donald Tyndall

Example case:

The canal was cleaned and shaped, *Epiphany* Self-Etch Primer placed, the canals dried with paper points after which *Epiphany* Sealer was placed with a lentulo-spiral filler. Root canal filling with a 0.04 tapered *Resilon* Point in the apical third and *Obtura* backfill with *Resilon* Pellet.

Photo courtesy Dr. William R. Watson Jr.

