Introduction:

The following article documents the advantage of using both heat and vibration obturation techniques versus heat-only techniques. This research was conducted using the EndoTwinn Device, the predicate device to the DownPak, which utilized both heat and vibration. EI recognized the advantages of using both heat and vibration, and has incorporated additional features into the DownPak to provide clinicians with the most effective obturation device and optimal clinical outcomes.

ACTA research report published in 2004 - Abstract:

The obturation results of the System B were inferior to the results of the EndoTwin Heat-only and Endo Twinn Heat and Vibration mode. The superior results of the EndoTwinn Heat and Vibration over the EndoTwinn heat-only method is caused by the vibration function. The low level of vibration, combined with heat produces increased flow properties in the gutta percha, which results in higher PGP (Percentage of Gutta Percha) value. This indicates that the combination of heat and vibration in obturation techniques produces superior clinical outcomes by creating a more complete filling of the root canal space than other obturation methods.

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this study is submitted for publication

An In Vitro Comparison of the apical filling quality of the root canal of the mesial root of the lower molar filled with the System B device and the EndoTwinn using the continuous wave[1)] of gutta-percha technique

[1)] The continuous wave of gutta-percha technique described by Buchanan in Dentistry Today Jan. 1996:60-67

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INTRODUCTION

The technique of vertically compacting warm gutta-percha in the root canal was popularized by Schilder 1967 and was recently described in detail by Ruddle 1994. After heating gutta-percha in the root canal using an electronic device the thermoplasticized gutta-percha is vertically compacted with pluggers. The adaptation of gutta-percha achieved by this technique has been found superior to that provide by cold lateral compaction (Smith 2000, Wu 2001).

Good apical cleaning and adaptation of the gutta-percha is important for the success of a root canal treatment. Using the continuous wave of gutta-percha with the System B described by Buchanan not always results in good apical adaptation (Silver et al. 1999). In this study sometimes single cone filling were seen in the apical part. The depth of heat application has an influence on the gutta-percha adaptation (Wu et al. 2002). The deeper the heat application the better the gutta-percha adaptation.
Ultrasound has a positive effect on the compaction of gutta-percha when used in a cold lateral compaction technique (Baumgartner et al. 1990,). In a new device which is constructed, EndoTwinn, the possibility of application of heat and vibration are combined. The tip design is constructed in a way that deep apical penetration of the pluggers is possible also in curved canals.

Although the frequency of ultrasound is much higher than the vibration of the EndoTwinn we were interested in:
- the apical adaptation of gutta-percha in curved canals using the continuous wave of gutta-percha with the EndoTwinn pluggers which could be placed more apically than the System B
- the combination of heat and vibration.

GOAL

To compare the apical filling quality of the root canal of the mesial root of the lower molar filled with the System B device and the EndoTwinn, the heat function as well as the heat and vibration combined, using the continuous wave of gutta-percha described by Buchanan (Dentistry Today Jan. 1996: 60-67).

METHOD

Forty-five mesial roots of lower molars are selected. Mesio-distal and bucco-lingual radiographs were made to determine the diameter of the root canals and the Schneider curvature and the roots were divided in three equal groups.
The roots are prepared with the GGD:2 in the straight portion of the root canal and with the Flexofiles till #20 till the foramen, #30 1 mm shorter of the foramen, #35 2mm shorter, #45 3 mm shorter, #50 4 mm shorter and #60 5 mm shorter of the foramen. The location of the foramen is determined by inserting a file 10 in the root canal till the file just leaves the foramen. After each file the root canals were irrigated with 2 ml sodiumhypochlorite 2%. After the preparation had been finished the root canals are ultrasonically irrigated 3 min. at speed 3 with a file 15 using the Satalec device. The root canals were dried with paper points. Sealer (AH26) is placed in the root canal using a bidirectional spiral (EDS).

Group one (n=30) is filled with the System B following the continuous wave of gutta-percha. The heated tip of the System B is placed 5mm coronal of the apical foramen as the original protocol describes. Non standardized gutta-percha points are used medium-fine or fine (Analytic). Conefit is described by Buchanan in Dentistry Today Jan. 1996: 62.
Group two (n=30) is filled with the EndoTwinn following the continuous wave of gutta-percha with the difference that the plugger is inserted till 3 mm coronal of the apical foramen instead of 5 mm in group 1.
Group three (n=30) is filled with the EndoTwinn as group 2 but now also with vibration of the tip in combination with heat. The vibration is 100 Hz.
Sections of the teeth are made 3 mm from the anatomical apex and the sectioned surfaces of the canal were photographed using a microscope with a digital camera at 40 magnification.
These images will be saved as Tagged Image File Format (TIFF) images. Of each section the percentage of gutta-percha (PGP) in the root canal was measured. The PGP gives an indication of the filling quality of the root canals at the place of the section.

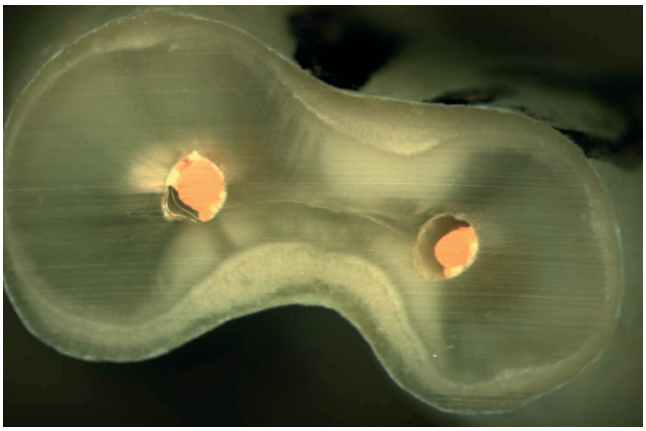
Table 1. Comparison of percentage gutta percha, PGP (%) between groups

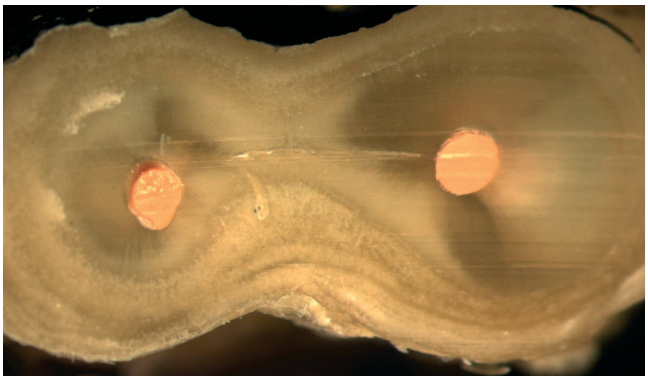
Group	Description	N	Mean PGP (%)	Std Deviation
1	System B with heated 0.5 mm Plugger Tip	30	70.6000	16.6290
2	EndoTwinn with heated 0.3 mm Plugger Tip	30	77.3667	12.6013
3	EndoTwinn with heated and vibrating 0.3 mm Plugger Tip	30	88.3667	11.2571

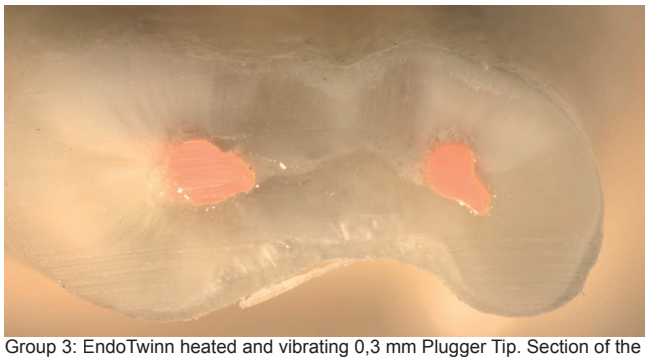
RESULTS

The results of the System B were worse than the results of the EndoTwinn heat and EndoTwinn heat and vibration. We can explain this result because the penetration depth of the pluggers in the System B group was less apical than in the EndoTwinn group and this has a negative effect on the PGP values (Wu et al. 2002, Il-Young Jung et al. 2003, Bowman et al. 2002). We used however the System B following the instructions and the video tape.

The difference in results between the EndoTwinn heat and EndoTwinn heat and vibration has to be explained by the vibration function. We already know that ultrasound has a positive effect on the adaptation of gutta-percha however we do not have any other information of the effect of low frequency vibration. Probably the low vibration in combination with the heat is enough to give the gutta-percha more flow properties which results in a higher PGP value.
The PGP values differ in the different studies which have been done. The variation of the PGP values depends of many variables. The highest PGP scores are always related to straight canals. The values obtained in this study are comparable to others done under the same conditions.


Group 1: System B with heated 0.5 mm Plugger Tip. Section of the teeth at 3 mm from the anatomical apex


Group 2: EndoTwinn with heated 0,3 mm Plugger Tip. Section of the teeth at 3 mm from the anatomical apex


Group 3: EndoTwinn heated and vibrating 0,3 mm Plugger Tip. Section of the teeth at 3 mm from the anatomical apex

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