

# Clinical trial of fiber posts luted with a self-adhesive cement

Franklin Garcia-Godoy,<sup>1</sup> Marco Ferrari<sup>2</sup>

## Abstract

**Purpose:** To evaluate the 24-month clinical effectiveness of VDW (DT Light SL9) (VDW GhB, Munich, Germany), a quartz fiber translucent, radiopaque fiber post. **Methods:** 40 subjects showing clinical need of endodontic treatment and a single indirect restoration on premolars were included in the study. The clinical and radiographic exams also demonstrated the need for root canal treatment. The subjects were informed and their written consent was obtained to be enrolled in this clinical study. The root canal walls were enlarged with a low-speed bur provided by the manufacturer. The depth of the post space preparation was 9-10 mm. The cement (Calibra, Denstply, Kostanz, Germany) was used according to the manufacturer's instructions. The diameter of the fiber post used was related to the diameter of the canal. FlexMaster Ni-Ti (VDW) mechanical instrumentation technique was used strictly following the manufacturer's instructions. Prime & Bond XP (Denstply) self-activated in combination with Calibra resin cement were used for bonding/luting procedures following manufacturer's instructions. The cement was applied with a lentulo (and/or with a special plastic tip) into the post surface and the post was inserted into the canal and allowed to set, and the crown was build-up with X Flow (Denstply) resin composite. Immediately after, the treated teeth were restored according with the treatment plan of each subject, with an Empress 2 porcelain crown or with a porcelain-fused-to-metal crown. The subjects were recalled at 6, 12 and 24 months after treatment for clinical and radiographic evaluation of the endodontically-treated teeth. The restorations were assessed for stability and longevity with the following parameters: Periapical lesions, marginal leakage, marginal integrity, color stability, surface staining, retention: (a) due to fracture of the post; (b) due to fracture of the build-up material, surface crazing (micro-cracks). **Results:** At baseline, no periapical lesions were evident. The teeth were restored with Empress 2 or with porcelain-fused-to-metal crowns.

## Introduction

When a significant horizontal loss of dental tissue occurs at the coronal level and a small ferrule can be created in the residual tooth structure, a post-and-core build up is needed with the purpose of achieving the most reliable retention for the prosthetic crown.<sup>1-5</sup>

Fiber-reinforced composite (FRC) posts have been used for the restoration of endodontically-treated teeth has been

prompted by the introduction of fiber-reinforced composite (FRC) posts.<sup>6,7</sup> With an elastic behavior more closely resembling that of dentin, fiber posts have limited the occurrence of irreparable root fractures as compared with metallic posts.<sup>8,9</sup> Moreover, higher fracture resistance and more favorable failure patterns were reported in vitro<sup>7,10-12</sup> for teeth restored with FRC posts than in the absence of any endocanal retention.

This clinical trial evaluated the 24-month clinical effectiveness of VDW (DT Light SL9) (VDW GhB, Munich, Germany), a quartz fiber translucent, radiopaque fiber post.

## Materials and Methods

40 subjects showing clinical need of endodontic treatment and a single indirect restoration on premolars were included in the study. The clinical and radiographic exams also demonstrated the need for root canal treatment. The subjects were informed and their written consent was

<sup>1</sup> Professor and Senior Executive Dean for Research, Director, Bioscience Research Center, College of Dentistry, University of Tennessee Health Science Center

<sup>2</sup> Marco Ferrari, MD, DDS, PhD, Professor and Chair, Department of Dental Materials and Fixed Prosthodontics, University of Siena, Siena, Italy.

**Corresponding author:** Franklin Garcia-Godoy, DDS, MS Professor and Senior Executive Dean for Research, Director, Bioscience Research Center, College of Dentistry, University of Tennessee Health Science Center, 875 Union Avenue, Memphis, Tennessee 38163, USA .E-mail: fgarciagodoy@gmail.com

**Table 1**

Results after 24 months of clinical service

	<b>A Present</b>	<b>B Partial loss</b>	<b>C Completely loss</b>
<b>Retention (n=40)</b>			
Baseline	40	0	0
6 month recall	38	2*	0
12 month recall	38	2	0
18 month recall	34	2	3
24 month recall	34	2	3

\*(debonding of the post + dislodgment of the crown); the posts and corresponding crowns were recemented. The failed crowns showed less than 50% coronal residual structure at baseline.

18 month recall: 39 patients were revisited. 2 restorations were partially debonded (the posts were removed inside the crowns and then recemented) and two showed a complete loss (one debonded post was also partially fractured and in two other cases the post was fractured)

**Table 2**

	<b>A Absent</b>	<b>B Present but without symptoms</b>	<b>C Present to be retreated</b>
<b>Periapical lesions (n=40)</b>			
Baseline	40 (100%)	0	0
6 month recall	40	0	0
12 month recall	40	0	0
18 month recall	35	3	1
24 month recall	35	3	1*

\* Retreated successfully

obtained to be enrolled in this clinical study.

The root canal walls were enlarged with a low-speed bur provided by the manufacturer. The depth of the post space preparation was 9-10 mm. The cement (Calibra, Denstply, Kostanz, Germany) was used according to the manufacturer's instructions. The diameter of the fiber post used was related to the diameter of the canal. FlexMaster Ni-Ti (VDW) mechanical instrumentation technique was used strictly following the manufacturer's instructions. Prime & Bond XP (Denstply) self-activated in combination with Calibra resin cement were used for bonding/luting procedures following manufacturer's instructions. The cement was applied with a lentulo (and/or with a special plastic tip) into the post surface and the post was inserted into the canal. The cement was allowed to set, and the crown was build-up with X Flow (Denstply) resin composite. Immediately after, the treated teeth were restored according with the treatment plan of each subject, with an Empress 2 porcelain crown or with a porcelain-fused-to-

metal crown.

The subjects were recalled at 6, 12 and 24 months after treatment for clinical and radiographical evaluation of the endodontically-treated teeth.

The restorations were placed between January 2007 and April 2007.

The Subjects were recalled before the end of October 2007 in order to complete first recall data. Then, they were recalled after 6, 12 and 24 months. During the recalls, the restorations were assessed for stability and longevity with the following parameters:

1. Periapical lesions
2. Marginal leakage
3. Marginal integrity
4. Color stability
5. Surface staining
6. Retention: (a) due to fracture of the post; (b) due to fracture of the build-up material.
7. Surface crazing (micro-cracks)

**Table 3**

	A	B	C
<b>Marginal leakage (n=40)</b>			
Baseline	40 (100%)	0	0
6 month recall	38	2*	0
12 month recall	40	0	0
18 month recall	34	2	3
24 month recall	33	3	3

Legends: A= excellent continuity at the restorative-tooth interface, no discoloration; B= Slight discoloration at the interface; C= Moderate discoloration at the restorative-tooth interface measuring 1 mm or greater or recurrent decay at margins.

\* The 2 crowns that were debonded/dislodged were considered with leakage

**Table 4**

	A	B	C
<b>Marginal leakage (n=40)</b>			
Baseline	40 (100%)	0	0
6 month recall	38	2*	0
12 month recall	40	0	0
18 month recall	34	2	3
24 month recall	33	3	3

Legends: (A) excellent continuity at the restorative-tooth interface, no ledge, no discoloration; (B) Slight ledge or ditch at the interface detectable with explorer; (C) Visible marginal ditch or ledge or actual separation of interface between the restoration and tooth.

\* The 2 crowns that were debonded/dislodged were considered with no marginal integrity

**Table 5**

	A	B	C
<b>Color stability (n=40)</b>			
Baseline	40 (100 %)	0	0
6 month recall	40	0	0
12 month recall	40	0	0
18 month recall	39	0	0
24 month recall	39	0	0

Legends: (A) No mismatch; (B) Slight discoloration not requiring replacement; (C) Discoloration requiring replacement

## Results

At baseline, no periapical lesions were evident. The table shows the results for 6, 12, and 24 months. The teeth were restored with Empress 2 or with porcelain-fused-to-metal crowns.

## Discussion

The present was designed to evaluate the clinical performance of a new (at the time of placement) FRC. These posts were precoated (silanized) in an industrial process exclusive to the manufacturer. This process made these posts

**Table 6**

	A	B
<b>Surface staining (n=40)</b>		
Baseline	40 (100 %)	0
6 month recall	40	0
12 month recall	40	0
18 month recall	39	0
24 month recall	39	0

Legends: (A) Absent; (B) Present

**Table 7**

	A	B	C
<b>Surface crazing (micro-cracks) (n=40)</b>			
Baseline	40 (100 %)	0	0
6 month recall	40	0	0
12 month recall	40	0	0
18 month recall	39	0	0
24 month recall	39	0	0

Legends: (A) Absent; (B) Slight crazing not requiring replacement; (C) Crazing requiring replacement

different than the others in the market at the time of placement. In order to standardize as much as possible variables that can affect the clinical service, such as tooth type and function in the dental arch, only premolars with natural teeth as adjacent and antagonist elements, as well as type of the final restoration (single unit crowns), were included in the study.

The present results showed excellent clinical performance of the FRC tested. A possible explanation may be the mechanical properties of this prefabricated post closely as their elastic modulus closely resembles that of dentin. Due to the improvement in mechanical properties of FRC the manufacturing step of fiber pre-stressing may have also contributed to the excellent results. This procedure involves soaking in the resin fibers that are pre-stressed in tension. On the final cure of the resin, the tension in the fibers is released and, consequently, the resin surface is left under compression, enabling the post to favorably absorb tensile stress during function.

Concerning the role of residual coronal dentin,

indications can be found in the literature that the survival of restored pulpless premolars is greatly affected by the amount of crown structure preserved.<sup>13-19</sup> The present study's findings confirms this observation. All failures such as post debonding and fractures of non-posted root all occurred when only one wall or even less coronal structure remained.

The D.T. Light-Post System requires a multi-step resin-cementation technique, which may result in longer treatment times. According to the manufacturer the fiber-optic construction allows light to be transmitted through the post so it can be cemented with light- or dual-cured materials. Laboratory studies, however, recommend the use of dual-cured systems to assure adequate polymerization. This 24-month clinical study showed excellent results, but longer-term follow-up is necessary to determine whether having a flexible post allows movement of the core, resulting in increased microleakage under the crown, especially when restoring teeth with minimal remaining tooth structure.

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