Removal Efficiency and Effectiveness of Four Different Fiber Posts Using Five Different Drill Systems in Multirooted Teeth

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Abstract

Aim: In comparing the effectiveness and efficiency of different types of post removal systems in removing different types of fiber posts (FPs), this study aims to shed light on the currently available drill systems.

Materials and methods: A total of 200 maxillary first molars, were root canal treated and prepared to receive posts. The molars were divided into four groups corresponding to four different FPs: Group RX, Radix FP; Group RF, Reforpost Glass Fiber; Group HI; Hi-Rem Endodontic Post; and Group DT, D.T. Light-Post Illusion X-RO. Fiber posts were done with luting by Gradia Core (GC America, Inc.). Groups were again divided into five subgroups corresponding to the technique by which the FP was removed into as follows: Subgroup P, PD-25-1.1 Drill; subgroup G, GC FP Drill; subgroup E, EasyPost Precision Drill; subgroup R, Reaccess Carbide Double Taper Kit; and subgroup H, H-Endodontic Drill. After posts were removed, effectiveness and efficiency were documented. Data were tabulated and statistically analyzed.

Results: Strong significant differences regarding efficiency among groups (FP type) and subgroups (drills used) (p = 0.00) were shown by the one-way analysis of variance (ANOVA) test. Subgroup DT-G scored the lowest mean removal time (20.9 minutes) while Subgroup RX-R scored the shortest mean removal time (1.4 minutes) Regarding effectiveness, strong significant differences among groups (p = 0.00) and subgroups (p = 0.00) were shown by one-way ANOVA. Subgroup RF-G scored the highest scale (5.2) whereas subgroup HI-R scored the lowest mean scale (1.2).

Conclusion: The difference was strongly significant between tested post-removal kits and between tested FPs. Re-access Carbide Double Taper Kit performed superiorly in both effectiveness and efficiency, followed by PD-25-1.1 Drill. Hi-Rem post showed the best retrieving results among other FPs.

Clinical significance: Knowing the best technique and tools for post removal could spare the practitioner any unwanted complications during post removal.

Keywords: Easy removal fiber posts, Effectiveness, Efficiency, Fiber post, Removal.

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Introduction

Fiber posts (FPs) are commonly used in esthetic dentistry for restoring endo-treated teeth. These posts have several advantages in esthetic dentistry. Their esthetic integration, due to the tooth being colored and translucent, makes them an excellent choice for restoring anterior teeth. Being minimally invasive, attributed to their adhesive nature which allows for minimal removal of tooth structure during post placement. They reduce the risk of fracture due to their elastic modulus that is close to dentin, which reduces the risk of stress concentration and root fractures, a common concern with metal posts. Their excellent bonding capabilities can enhance the overall stability and longevity of the restoration. Added to their biocompatibility which reduces the risk of allergic reactions or adverse tissue responses.1-3

On the other hand, FPs also have some potential disadvantages. It is important to consider both the advantages and disadvantages when choosing a post material for restorative dentistry.4 Their lower radiopacity compared to metal posts. This can make them less visible on X-rays, which might hinder the ability to detect any complications or recurrent caries around the post area. Added to their fracture risk in high-stress areas, influenced by factors such as post diameter and design. Their higher cost compared to metal posts, which can impact the overall cost of a dental restoration. Added to bonding challenges, the success of bonding depends on proper isolation and technique, and failure to achieve a reliable

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The removal of an FP may become necessary in certain situations, such as post fracture, endodontic complications, recurrent caries, post dislodgment, or replacement of restoration. Deciding to remove an FP should only be after careful assessment of the particular clinical situation, taking into consideration the patient’s needs, the condition of the tooth, and the overall treatment plan. The FP removal can be a delicate procedure that should be carried out with precision to avoid damaging the tooth structure. Several methods can be used for FP removal, and the selection of the method may depend on the specific clinical situation. Among these methods is manual extraction with pluggers or heated instruments to soften and remove the FP from the root canal. It is a controlled and minimally invasive technique. Ultrasonic removal to vibrate the post within the root canal, facilitating its loosening and removal. This method is minimally invasive and helps preserve tooth structure. Drilling and tapping FP to be loosened and tapped out of the canal. This method requires caution to avoid damage to the root. Chemical softening may be used to weaken the bond between root dentine and the FP. After softening, the post can be gently removed. Laser removal of FPs also offers several advantages, including precise control, reduced damage to surrounding tissues, and minimized patient discomfort. In some cases, a combination of the previous methods may be necessary to safely and effectively remove an FP.

Fiber post removal in dentistry, while often necessary, can be a challenging procedure with potential drawbacks and complications. As the bonding agents used can be strong, removing the post without damaging the tooth can be a potentially difficult and time-consuming process. During the removal process, there is a risk of damaging the tooth’s structure, especially if the removal is not performed carefully or by an inexperienced practitioner. Tooth fractures or microfractures can occur. Patients may experience discomfort or pain during the removal process, which can be a drawback, especially if multiple attempts are needed. There is a risk of the FP fracturing during removal, which can complicate the procedure and potentially require more invasive techniques. In cases where a crown covers the FP, its removal can damage the crown or necessitate a new one. In some cases, the removal process may lead to root perforations or fractures, which can be a serious complication. The success of FP removal can be unpredictable, depending on factors such as the type of post, the quality of the adhesive, and the technique used. If complications arise during the removal, additional dental procedures or restorations may be required, leading to extra costs and more time for the patient. The available clinical evidence and guidelines on FP removal are limited, making it important for dental professionals to have the necessary skills and experience.

One common technique is the drilling and tapping method. This procedure involves carefully drilling a small access hole into the FP using a high-speed dental handpiece. Then after creating an access hole, a specialized instrument called a post remover or extractor is used. This instrument is inserted into the hole, and it grips the FP with small taps, allowing it to be unscrewed from the tooth. The FP is gradually unscrewed and removed from the tooth. The process is slow and controlled to minimize the risk of fracturing the post or damaging the tooth. While this method is commonly used, it is important to note that the specific instruments and techniques employed by dental professionals may vary. Additionally, the success of FP removal is dependent on numerous factors, such as the type of FP, the quality of the post cement, and the experience of the dentist.

It is somewhat easy to locate the FP and its alignment in single-rooted teeth that are parallel to the tooth’s long axis. However, in premolars and molars, the state differs, where the used FPs are often narrower, although luted in the widest canals; lower distal and upper palatal canals that are never aligned with the long axis of these teeth. Because of this, it is challenging to guide the post removal drill within the vicinity of FP. Consequently, root perforations may be the result of off-axis drilling. Only Lindemann et al. compared the time for FP removal with the time of titanium post removal. This in vitro research compared the required time for metal and FP removal and examined the role of luting cements on the time needed to remove titanium posts.

In our work, the null hypothesis was that the difference between tested subgroups is non-significant.

**Materials and Methods**

**Study Design**
This study is conducted as a randomized, experimental, single-blind (dental practitioners) comparative study.

**Study Setting**
Teeth preparations were done at the simulation lab of Sinai University. The study design was approved by the Institutional Review Board (IRB) Committee for Experimental Studies, Cairo, Egypt, with approval No. REC-PD-24-01. The study was done in 2023. Teeth were marked and put in similar containers so that dental practitioners were blind to the post being removed.

**Calculating Sample Size**
PASS 15 (NCSS LLC, Texas, USA) software was utilized to calculate the sample size using a one-sample t-test formula (target power was adjusted to 80% and alpha to 0.05). Therefore, a total of 200 teeth were used, 10 for each subgroup.

**Study Sample**
It consisted of 200 maxillary first molars placed in readymade transparent resin containers. Molars were divided into 4 main groups of 50 specimens determined by the type of FP used. Group RX: Radix FP (Maillefer, Dentsply); group RF: Reforpost Glass Fiber (Angelus Dental Products Industry); Group HI: Hi-Rem Endodontic Post (Overfiber S.r.l.); and group DT: D.T. Light-Post Illusion X-RO (RTD 3 Rue Louis Neel Technoparc). Each group was then divided into five subgroups corresponding to drill type: Subgroup P: PD-25-1.1 Drill (Dentso1-5, Galsan-Dong); subgroup G: GC FP Drill (GC America, Inc.); subgroup E: EasyPost Precision Drill (Maillefer, Dentsply); subgroup R: Reaccess Carbide Double Taper Kit (Bisco Dental Products Canada, Inc.) and subgroup H: H-Endodontic Drill (Overfiber S.r.l) (Table 1; Flowchart 1).

**Specimen Grouping**
Each FP (D.T. Light-Post Illusion X-RO, Hi-Rem Endodontic Post, Reforpost Glass Fiber, and Radix FP) consisted of 50 specimens. (Fig. 1) For each 50 specimens, 10 were removed using each post drill (H-Endodontic Drill, EasyPost Precision Drill, Reaccess Carbide Double Taper Kit, GC FP Drill, and PD-25-1.1 Drill) (Fig. 2).
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Subgroups

washing out debris was followed using RC-Prep (Premier Dental
Consistent lubrication–irrigation scheme to ensure efficient action
were performed by dental practitioners. Palatal roots were
Molars were washed and autoclaved for 40 minutes at 121
radiographically and by digital microscope (Dino-Lite, 241 Taiwan).
molars had minimal to moderate decay with no fractures detected

Table 1: Sample grouping

<table>
<thead>
<tr>
<th>Group</th>
<th>Post type (n = 50)</th>
<th>Drill type (n = 10)</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Radix FP (Maillefer, Dentsply)</td>
<td>PD-25-1.1 Drill</td>
</tr>
<tr>
<td>RX</td>
<td>(Maillefer, Dentsply)</td>
<td>(Dentsply, 1-5, Galsan-Dong)</td>
</tr>
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<td>IIA</td>
<td>GC FP Drill</td>
<td>(Maillefer, Dentsply)</td>
</tr>
<tr>
<td>RX-G</td>
<td>(GC America Inc.)</td>
<td>(Bisco Dental Products Canada Inc.)</td>
</tr>
<tr>
<td>IIIA</td>
<td>EasyPost Precision Drill</td>
<td>(Bisco Dental Products Canada Inc.)</td>
</tr>
<tr>
<td>RX-E</td>
<td>(Maillefer, Dentsply)</td>
<td>(Bisco Dental Products Canada Inc.)</td>
</tr>
<tr>
<td>IVA</td>
<td>Reaccess Carbide Double Taper Kit</td>
<td>(Bisco Dental Products Canada Inc.)</td>
</tr>
<tr>
<td>RX-R</td>
<td>(Bisco Dental Products Canada Inc.)</td>
<td>(Bisco Dental Products Canada Inc.)</td>
</tr>
<tr>
<td>VA</td>
<td>H-Endodontic Drill</td>
<td>(Overfiber S.r.l.)</td>
</tr>
<tr>
<td>RX-H</td>
<td>(Overfiber S.r.l.)</td>
<td>(Overfiber S.r.l.)</td>
</tr>
<tr>
<td>B</td>
<td>Reforpost</td>
<td>PD-25-1.1 Drill</td>
</tr>
<tr>
<td>RF</td>
<td>Glass Fiber (Angelus Dental Products Industry)</td>
<td>(Dentsply, 1-5, Galsan-Dong)</td>
</tr>
<tr>
<td>IIB</td>
<td>GC FP Drill</td>
<td>(Maillefer, Dentsply)</td>
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<td>RF-H</td>
<td>(Overfiber S.r.l.)</td>
<td>(Overfiber S.r.l.)</td>
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<td>C</td>
<td>Hi-Rem Post (Overfiber S.r.l.)</td>
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<td>HI</td>
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<td>(Overfiber S.r.l.)</td>
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<tr>
<td>D</td>
<td>D.T. Light-Post Illusion (RTD 3 Rue Louis Neel Technoparc)</td>
<td>PD-25-1.1 Drill</td>
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<td>(Dentsply, 1-5, Galsan-Dong)</td>
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<td>GC FP Drill</td>
<td>(Maillefer, Dentsply)</td>
</tr>
<tr>
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<td>(Bisco Dental Products Canada Inc.)</td>
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<td>(Bisco Dental Products Canada Inc.)</td>
</tr>
<tr>
<td>VD</td>
<td>H-Endodontic Drill</td>
<td>(Overfiber S.r.l.)</td>
</tr>
<tr>
<td>DT-H</td>
<td>(Overfiber S.r.l.)</td>
<td>(Overfiber S.r.l.)</td>
</tr>
</tbody>
</table>

Teeth Selection and Root Obturation

200 extracted maxillary first molars were chosen. The selected
molars had minimal to moderate decay with no fractures detected
radiographically and by digital microscope (Dino-Lite, 241 Taiwan).
Molars were washed and autoclaved for 40 minutes at 121°C, 15 psi.
They were contained in self-cure resin blocks (Vertex-Dental B.V.,
The Netherlands) till 2 mm below the cement–enamel junction
(CEJ). Blocks were of 10 × 10 × 20 mm size. All endo treatments
were performed by dental practitioners. Palatal roots were
prepared using a crown-down technique by K-files (Dentsply
Maillefer, Switzerland) with No. 25 being the master apical file.
Consistent lubrication–irrigation scheme to ensure efficient action
of the lubricant–irrigation in lubricating files within the canals and
washing out debris was followed using RC-Prep (Premier Dental
Products), NaOCl of 5.25% concentration (The Clorox Company,
USA) as well as K-file No. 25 till working length. Final washing
with 2 mL of distilled water was done, followed by drying using
absorptive paper points) and obturation by lateral condensation
using gutta–percha (GP) (Dentsply Maillefer, Switzerland) with root
channel sealer (AH Plus, Dentsply, De Trey, Germany). Palatal and mesial
walls were ground under water spray till 1 mm occlusal to CEJ, by
round-end tapered diamond burs (Komet, Brasseler, Germany).
Molars were immersed at room temperature in distilled water for
72 hours. Radicular preparation started by removing 9 mm of GP
and no. 1 Gates Glidden reamers (Dentsply Maillefer, Switzerland),
followed by No. 1 till No. 3 Peeso reamers (Largo, Dentsply Maillefer,
Switzerland). The post drills supplied by the manufacturer were
utilized for the final preparation of the post space.

FP Cementation and Tooth Preparation

All post spaces were thoroughly washed with NaOCl followed by
distilled water then dried using paper points. Fiber posts were
tried and cemented in the canals after dispensing the self-adhesive
Grada Core (GC Corporation, Japan). Light-emitting diode (LED)-
curing was applied for 20 seconds at the FP head. Grada Core
was syringed to fill the coronal cavity around the post. A 1.5-mm
ferrule and 0.5-mm chamfer finish lines were prepared utilizing
No. 8881 P round-end tapered diamond bur with guiding pin
(Komet, Brasseler, Germany) on a parallel meter (Amann Girrbach,
Germany).

FP Removal

Molars were given randomly to 10 dental practitioners, 20 molars
for each, one of each subgroup. Practitioners were instructed
about the drills they were going to use following a demonstration
for each drill type.

Data Collection

Efficiency represented as time for FP removal from each tooth was
recorded. Time recording started when the first bur was mounted
and ended when GP appeared in the canal or when drilling failed
to continue.

Evaluation of the Effectiveness of FP Removal

When FP’s were removed, longitudinal grooves were made on
palatal and buccal surfaces using a carbide-tipped bur mounted on
a water-cooled high-speed turbine. Palatal roots were cleaved by
chisel. Split root halves were put in their position in the containers
for later assessment. The effectiveness of FP removal was graded
using an X-ray and digital microscope on a 5-point scale ordinal
depending on the surface of the split root after FP removal:

- Only dentin is visible.
- Only cement is visible.
- Fiber post remnants of less than 25% are visible.
- Fiber post remnants of 25–50% are visible.
- More than 50% of fibers remained.
- Perforating the root or drilling away from the canal axis.

Statistical Analysis

Scores were recorded and analysis for quantitative variables was
done using descriptive statistics [mean and standard deviation
(SD)]. Data distribution revealed normality by the Shapiro–Wilk
test. Differences between groups were significant as shown by
parametric one-way ANOVA test. About 95.5% level of confidence
Results

Efficiency

The standard deviation and mean for each test group regarding efficiency (speed of post removal) were documented in Table 2. A significant difference between groups was strongly revealed by one-way ANOVA, which represented the tested FP's ($p = 0.000$), and between subgroups, which represented the tested drills ($p = 0.000$). Subgroup RX-R, the Reaccess Carbide Double Taper Kit used to remove the Radix FP, recorded the shortest mean for removal time (1.4 minutes) while Subgroup DT-G, the GC FP Drill used to remove the DT Light-Post Illusion X-RO, recorded the longest mean for removal time (20.9 minutes).

Effectiveness

The effectiveness of post removal was scored using the aforementioned index ranging from 1 to 6. The mean and SD of the test groups were listed in Table 3. Similar to the data regarding efficiency, a significant difference was strongly revealed by one-way ANOVA between the groups and between the subgroups ($p = 0.00$ for both). Subgroup HI-R, the Reaccess Carbide Double Taper Kit used to remove the Hi-Rem Endodontic Post, had the lowest mean score on a scale of 1–6 (1.2), while subgroup RF-G, the GC FP Drill...
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Table 2: Mean and SD of efficiency of each of the tested groups and subgroups

<table>
<thead>
<tr>
<th></th>
<th>PD-25-1.1 (Subgroup I)</th>
<th>GC FP Drill (Subgroup II)</th>
<th>EasyPost Precision Drill (Subgroup III)</th>
<th>Reaccess Carbine Double Taper Kit (Subgroup IV)</th>
<th>H-Endodontic Drill (Subgroup V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radix FP (Group A)</td>
<td>3.26 ± 0.2</td>
<td>15.5 ± 1.2</td>
<td>7.7 ± 0.7</td>
<td>1.4 ± 0.1</td>
<td>15 ± 1.3</td>
</tr>
<tr>
<td>Reforpost Glass Fiber (Group B)</td>
<td>3.26 ± 0.4</td>
<td>15 ± 1.4</td>
<td>7.3 ± 1.2</td>
<td>2.2 ± 0.2</td>
<td>4.5 ± 0.8</td>
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<tr>
<td>Hi-Rem Endodontic Post (Group C)</td>
<td>4.1 ± 0.2</td>
<td>4.3 ± 0.2</td>
<td>6.5 ± 0.3</td>
<td>3.7 ± 0.2</td>
<td>8 ± 0.3</td>
</tr>
<tr>
<td>D.T. Light-Post Illusion X-RO (Group D)</td>
<td>5.3 ± 0.0</td>
<td>20.9 ± 1.4</td>
<td>6.8 ± 0.8</td>
<td>3.7 ± 0.8</td>
<td>19.6 ± 1.6</td>
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</table>

Table 3: Mean and SD of effectiveness of each of the tested groups and subgroups according to 1–6 scale

<table>
<thead>
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<th></th>
<th>PD-25-1.1 (Subgroup I)</th>
<th>GC FP Drill (Subgroup II)</th>
<th>EasyPost Precision Drill (Subgroup III)</th>
<th>Reaccess Carbine Double Taper Kit (Subgroup IV)</th>
<th>H-Endodontic Drill (Subgroup V)</th>
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</thead>
<tbody>
<tr>
<td>Radix FP (Group A)</td>
<td>1.5 ± 0.5</td>
<td>3.4 ± 0.8</td>
<td>1.8 ± 0.9</td>
<td>1.7 ± 0.9</td>
<td>3.4 ± 0.8</td>
</tr>
<tr>
<td>Reforpost Glass Fiber (Group B)</td>
<td>2.1 ± 1</td>
<td>5.2 ± 1.2</td>
<td>2.8 ± 0.9</td>
<td>1.7 ± 0.9</td>
<td>4.3 ± 1.3</td>
</tr>
<tr>
<td>Hi-Rem Endodontic Post (Group C)</td>
<td>1.6 ± 0.9</td>
<td>3.3 ± 0.7</td>
<td>1.4 ± 0.5</td>
<td>1.2 ± 0.4</td>
<td>3.7 ± 0.9</td>
</tr>
<tr>
<td>D.T. Light-Post Illusion X-RO (Group D)</td>
<td>1.5 ± 0.5</td>
<td>3.6 ± 0.5</td>
<td>2.2 ± 0.9</td>
<td>1.4 ± 0.5</td>
<td>3.7 ± 0.5</td>
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</table>

used on the Reforpost Glass FP, received the highest mean score (5.2).

Discussion

A similarity was observed among most of the previously done studies related to the selection of teeth that are used in the specimens. They were performed on single-rooted teeth, mainly maxillary central incisors which necessitate the placement of the widest diameter FPs that are easily directed along the long axis of the roots. A notable example of such research was conducted by De Rijk,25 who illustrated the procedure of post removing as simple and quick. moreover, he posed that the structure of FPs is unique in its parallel fibers, stretched within a resinous matrix, which can supposedly guide the removal drill, keeping it within the post’s confines, and thus removing the risk of accidental perforations in the root. In his study, De Rijk25 worked with carbon FPs, which give distinctive black shavings during drilling. This means that during post drilling, as long as the shavings are black the operator is still drilling within the post. On the contrary, tooth-colored shavings indicate off-axis drilling. However, tooth-colored FPs now dominate the market and thus shavings from both the tooth and the post are white. As a result, there is no longer a color difference between dentine and post shavings which had previously provided an easy indicator of off-axis drilling.

Another commonality among all previous studies done before was their in-vitro nature. Within these in-vitro studies, it was reported that FPs can be removed relatively quickly and effectively.23,26–28 In fact, being done in vitro and not intraorally reduces the challenge of post removal. It is one thing to negotiate and retrieve FP in a laboratory, handling a tooth that is easily accessible, and another thing to remove it under clinical conditions. Removing a post from a tooth in a patient’s mouth comes with obstacles of access, limitations of space, and hindered instrument maneuverability. Without a direct view of the tooth root, any dentist knows that during the clinical procedure of post removal, it is most difficult to align the drill along the axis of the unseen post. Under these circumstances, the operator can only verify the position of the drill by frequent radiographs, prolonging procedure time and exposing the patient to excessive radiation. In the event of the drill obliquely penetrating the post, it can cause serious damage to the radicular tooth structure.29,30

This study includes a special category of FPs known as “Easy Removal FPs” (ERP). They were selected to be compared with the standard FP used as a control. Manufacturers of these ERP’s claim that they possess a unique feature that allows easy removal of the post whenever needed. The Hi-Rem post is an ERP with a soft and colored polymer core consisting of microfiber which supposedly guides the post removal drill along the center through a procedure of internal reaming. During removal, the colored microfiber can be clearly visualized at the post’s center.31 Accordingly, the drill can be inserted into the soft polymer microfiber at medium speed allowing the drill to penetrate the established full depth of the post. Then using Gates Glidden drills, the operator grinds the internal walls of the post until the cement and dentine are reached. Another unique post, the DT Light Post Illusion XRO exhibits an intrinsic color-coding of the post that can appear, disappear, and reappear on command. Upon applying a cold-water spray just for a few seconds, a color change occurs in the post, which supposedly can visually guide the operator in correctly directing the drill (Figs 3 and 4). Reforpost is composed of 85% glass fiber and 15% epoxy resin. It has been claimed that its composition and its longitudinal
Removal of Four Fiber Posts Using Five Different Drill Systems

Unfortunately, there has only been one comparable research studying the removal of FPs in multirooted teeth, and it was conducted in 2014.32 The study resulted in no significant difference between the tested groups. The shortest mean post removal time was 9.5 minutes. It was concluded that the techniques that were used were not significantly effective or efficient in removing FP. This current study reached conflicting results to the aforementioned findings considering the reported shortest mean removal time was 1.4 minutes, and a strong significant difference (p = 0.00) was found regarding both types of posts and drill systems used. This demonstrates that FP removal depends on the FP type as well as the used drill system. However, it must be noted that a post that is easy to remove does not necessarily have the optimum mechanical properties, and that brings to light another important parameter in the selection of an ideal FP.

In addition to being conducted on multirooted teeth, the choice of drills used in this study is another strong point. This is especially true for the PD-25-1.1 orthodontic microimplant pilot drill, which was manufactured for a different purpose and was never intended for post removal. It was found, however, that its short shank may pose a problem when attempting to remove longer posts. A similar drill, the PD-31-101, has a longer handle, though its shank is the same length as that of the PD-25-1.1. The manufacturer of these drills may be advised to fabricate a drill more suitable for FP removal, by lengthening the drill shank.

However, in vivo studies on the removal of FPs are extremely difficult to implement and properly standardize. A significant sample size must be gathered of patients having the same type of post cemented in the same tooth number using the same resin cement, and all indicated for removal. It is difficult to successfully execute such a study without facing an ethical dilemma. A third and final drawback that must be mentioned is the lack of correlation between the post’s ease of removal and its mechanical properties. As previously mentioned, it would be undesirable to place an FP that is weak yet easy to remove. A fracture strength test could have been conducted alongside the study. This was not accomplished due to the large number of teeth (140) needed for this study. Future research of such scope is therefore justified.

**CONCLUSION**

Within the impediments of this work, the following can come to conclusion:

- Significant difference existed among all tested subgroups.
- Both tested FPs and drills had significant effect on post removal efficiency and effectiveness.
- The Reaccess Carbide Double Taper Kit performed superiorly with regards to both effectiveness and efficiency. PD-25-1.1 Drill followed.
- The Hi-Rem FP exhibited top outcome in removal as compared to the other posts.

**REFERENCES**
