

# INNOVATIONS IN THE FIBER POST FIELD: THE "CHAMELEON" POST

NICOLAS CHELEUX

## Introduction

Fiber posts offer the practitioner a viable alternative to traditional metallic posts or cast post/ cores. Numerous studies have shown that the mechanical behaviour of a fiber post is similar to that of dentin, as opposed to that of the more rigid cast core. This is evidenced through improved distribution of stresses along the post, which leads to a reduced risk of radicular fracture. The purpose of this paper is to introduce a new quartz fiber post featuring innovative optical properties, as well as a step-by-step description of the various phases of clinical reconstruction.

## Why a coloured post?

The DT Light-Post Illusion post was recently launched into the market by RTD (St. Egreve, France). The resin matrix and the type of fiber which make up the posts correspond to those of the DT Light-Post, except for the addition of a small amount of special colourants, which impart a specific colour to each post according to its diameter. These colourants are in the form of microcapsules made up of colour pigments encased in an acrylic resin layer. This combination induces a reversible, temperature-dependent colour change. It also serves to protect the pigments from the environment in which it must survive. These pigments operate according to the well-known chemistry principle of colour change with variances in pH and ambient temperature. The DT Light-Post Illusion is coloured at room temperature, while retaining a certain translucency:

# 0.5 - black, # 1 - red, # 2 - yellow, # 3 - blue. However, at body temperature (37°C) all the posts become completely translucent almost immediately.

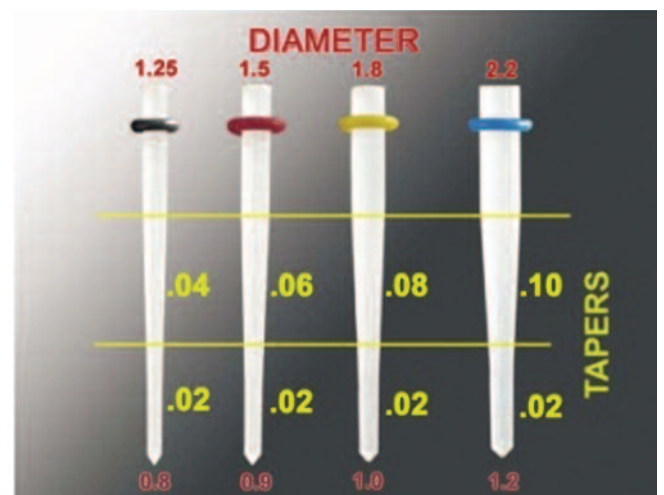
## Advantages of coloured posts

Although the posts are packaged in individual "blisters", the practitioner can distinguish the diameter of the post at a glance. However, this feature is most important in cases where the root canal has to be re-accessed. In addition to making localization easier, the colouration facilitates identification of the size of the post to be removed and, therefore, the corresponding drill requirements.

*School of Odontology, Paul Sabatier University,  
Toulouse III, France*



**Figure 1: The DT Light-Post Illusion: # 0.5 - black  
# 1 - red  
# 2 - yellow  
# 3 - blue**



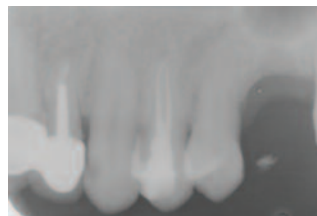
**Figure 2: The double taper and the three size varieties of DT light-posts**

According to many clinical studies<sup>1-3</sup>, root canal re-treatment is necessary in 8 to 15 % of all cases (apical pathology). While the removal of a carbon fiber post is a delicate operation, the removal of a glass or quartz fiber post can be even more challenging, owing to its more rigid post composition. For this reason, RTD has designed removal drill kits, which allow drilling along the post's long axis.

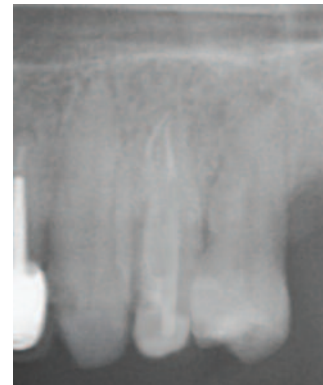
The removal of carbon fiber posts generates a black graphite particles, which guide the practitioner. The removal of a glass or quartz fiber post does not generate debris which is as visible as that from the carbon post. It is therefore vital that the post's axis is displayed. The colouration of DT posts can visually guide the practitioner to stay within the appropriate axis while drilling through the post. Nonetheless, below a certain depth, the visual effect disappears, and only x-ray guidance will allow



Figure 3: Upper premolar after endodontic treatment



NB X-ray before and after post placement can be usefull.



complete removal of the post.

The post's conservative, anatomic morphology remains unchanged with respect to the previous DT Light-Post (2001-2006). The double taper, which is specific to this brand of post, has the same configuration (figure. 2), ensuring good adaptation while preserving as much healthy dentin <sup>4</sup> as possible.

### Cementation protocol for the DT Light-Post Illusion

Cementing fiber posts can be a complex clinical step, since the practitioner is faced with challenges linked to the presence of two different interfaces: the post-adhesive interface on the one hand, and the radicular dentin/adhesive interface on the other. The adhesive elements must attach to both the post and the dentin.

Once surrounded by the cement composite, the post absorbs the stresses and dissipates them more favourably than do metal posts <sup>5</sup>.

In the case of prosthetic reconstruction (figure. 3), the coronal-periphery preparation is made before inserting the post

to evaluate the number and thickness of the residual walls available for the cementing. The operating field is then set up (figure. 4).

Post space preparation requires the use of an end-cutting drill, (Universal Starter Drill), to penetrate (figure. 5) followed by a series of side-cutting finishing drills (figure. 6), which are all included in the product kit. These drills are about 60 microns wider than the post's diameter so that the post is not in direct contact with the post space walls; it is "passively luted".

Once the post space is made, the post is tried in (figure. 7) and assessed for good adaptation. It must then be adjusted to the appropriate length, ie the presumed height of the core build-up or, where possible, slightly inserted, to cover the coronal end of the post (figures. 8 and 9). The post's length adjustment must be made using a diamond disk or diamond drill under spray. Using scanning electron microscopy, Grandini et al showed that there was no difference between these two trimming techniques (5). The post must then be cleaned with alcohol and dried.

Endodontic procedures change the composition and qualities

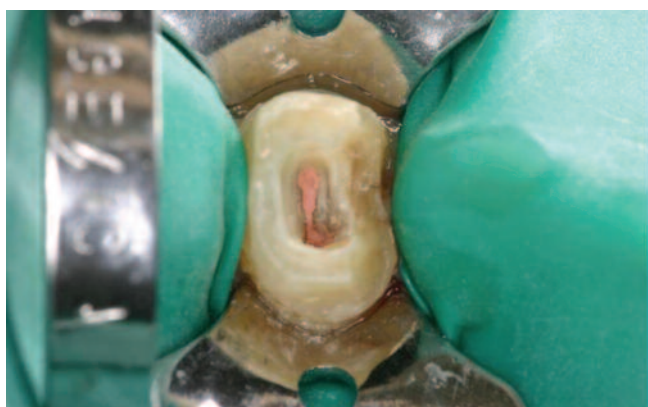
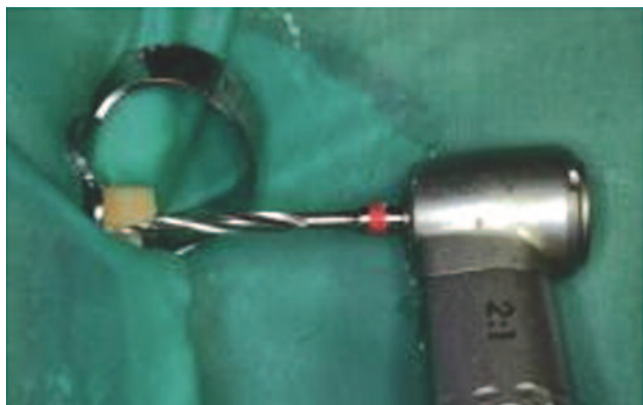


Figure 4: Coronal periphery preparation is made and rubber dam is used



Figure 5: Universal starter drill is use to penetrate



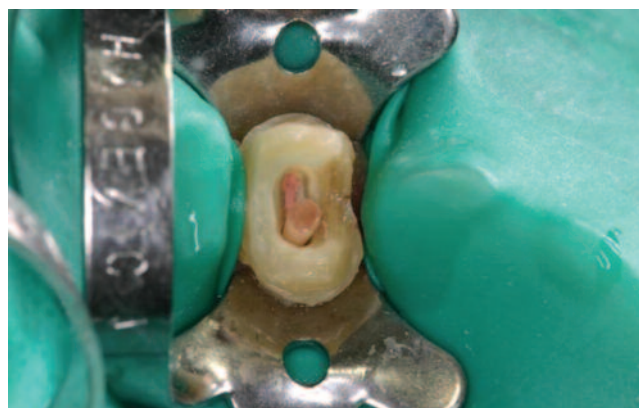
**Figure 6: Finishing drill slightly wider than the post**



**Figure 7: The post is tried-in**



**Figure 8&9: The post should be cut with a bur or a diamond disk at the working length and tried again**



of the dentin's organic matrix and, in particular, its principal constituent, the collagen frame. The collagen network of the radicular dentin is denatured, becomes denser and less permeable to adhesives over time. Dentin is a heterogeneous substrate with a different morphology depending on whether it is located at the coronary or apical third. The number of tubules gradually decreases in coronal-apical direction <sup>7</sup>. The same study shows that etching with H<sub>3</sub>PO<sub>4</sub> acid at 37 % increases the cement surface by 200 % in the coronal third and by 113 % in the apical third. The acid plays a basic role in cementing to the radicular dentin; it causes the elimination of dentin sludge and opens the collagen network. Ferrari and Scotti have even proposed the temporary immersion of the post during the etching of the canal, which pushes the etchant agent and applies it more closely against the post space walls. Degreased by the etching agent, the post is then rinsed and dried and the adhesive applied <sup>8</sup>.

The presence of eugenol in endodontic sealing cements has frequently been cited as the reason for unsuccessful cementation, as it inhibits the chemical polymerization of the cement composite. While many eugenol-free sealers are

available and have been tested without significant results, the controversy over this matter persists <sup>9,10</sup>. Consequently, excess guttapercha or canal sealing cement should be eliminated completely along the dentin walls, as they represent a potential obstacle, reducing the available cementing surface and the dentin permeability to the adhesive. A recent study shows that post space preparation under spray enhances the elimination of a portion of dentin sludge. Injecting a sodium hypochlorite solution at 5.25 % also proves useful and complementary between each passage with the preparation drills. It has not been demonstrated that EDTA, in addition to the use of sodium hypochlorite, was effective <sup>11</sup>. The ideal etching period is around 20 seconds and it is necessary to use a relatively fluid gel through a fine tip to inject it adequately into the post space (figure. 10). The coronal section is also etched at the same time (figure. 11). Rinsing must be for at least 20 seconds and drying should take place slightly away from the site and for around 5 seconds. This dispels or evaporates excess water without desiccating the dentin. Achieving the proper level of moisture on the internal surfaces may be the most critical aspect of post cementation.



Figure 10: Canal etching is performed with orthophosphoric acid



Figure 11: The etchant is applied for 15 sec



Figure 12: Canal and coronal portions are rinsed and a paper point is used to remove excess water



Figure 13: Adhesive is applied in the canal and the coronal portions with a "composibrush"



Figure 15: The adhesive is applied to the surface of the post



Figure 16: Resin cement is directly injected in the post space

Special precautions must be taken with respect to etching the post space. Gels containing too much silica (thickening agent) are not easily removed. In fact, if the etching gel is not completely removed, the paper tip will be impregnated. A calibrated paper point allows elimination of excess water and serves as a control (figure. 12). A dual-cure adhesive system

should be used to guarantee polymerisation, not only by light source initiation, but chemically as well.

Numerous authors have shown the effectiveness of tufted micro-brushes to allow "brushing" of the dentin and, therefore, result in better adhesive penetration. The hybrid



Figure 17: The post is placed immediately

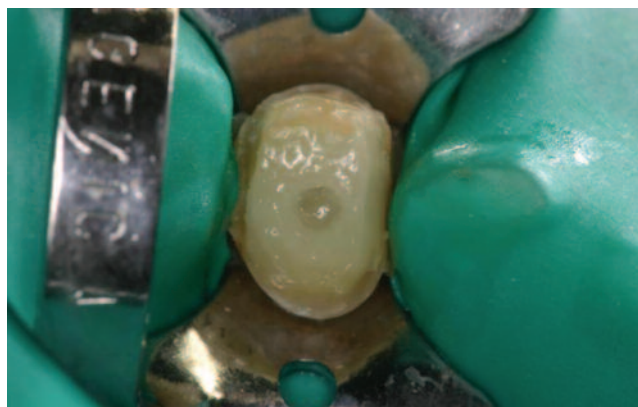


Figure 18: Core built-up is realized



Figure 19&20: The abutment after rubber dam removal

layer is more homogeneous. At a canal depth of about 10 mm, anatomic obstacles can prevent the apical progress of the brush, which has led to the introduction of the “Composi-brush” (RTD, France) to the market. The Composi-brush is a cylindrical brush with a very fine tapered end, which allows the moistened tuft to move to the apical third, coating the dentin at this spot (figure. 13). Ferrari<sup>12</sup> showed the effectiveness of these micro-brushes. The adhesive is also applied at the coronal level. It is generally acknowledged that application of adhesive layers increases cementing effectiveness. A “light” drying of 5 seconds evaporates the solvents and spreads the adhesive without the risk of making the collagen network collapse<sup>13</sup>. Excess adhesive is eliminated with a paper point (figure. 14). The adhesive used for the conditioning of the post space is also applied to the surface of the post using a micro-brush (figure. 15) and then photo-polymerized for 20 seconds. The use of a

dual-cure cement composite is recommended by many authors<sup>14-16</sup>. “Dual-purpose” injectable resin composites which are indicated for post cementation have recently appeared on the market, (figures. 16 and 17), and core build-up (figures. 18 to 20). Photo-polymerization of 20 seconds is advisable immediately after the post is inserted and for at least 40 seconds once the reconstruction is finished. These new systems reduce operating times and confer a most homogeneous (monoblock) character to the reconstruction.

### Conclusion

The patented DT Light-Post Illusion, with a reversible colouration, offers an innovative and encouraging concept without affecting aesthetic expectations. It virtually guarantees the durability of the tooth, thanks to the mechanical properties of quartz fiber posts, but also guides the practitioner who would have to re-access a root canal treatment. However, although colouring is a clinically beneficial visual guide, (1) staying aligned with the drilling axis through the post, and (2) taking x-rays to allow controlling the progression, remain the only assurance of clinical success.

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