New Directions for Posts in Restoring Endodontically Treated Teeth

The traditional guidelines presented at most dental schools state that all endodontically treated teeth are in need of a post before placement of the final restoration. This philosophy has prevailed for more than half of a century and is still a part of a large number of curricula throughout North American dental schools. Furthermore, the cast post-and-core technique, which is usually cast in a noble alloy, continues to be the standard of care in many dental school curricula. However, modifications have recently been introduced to minimize the amount of tooth preparation to prevent weakening of the tooth, which may lead to root fractures. In contrast, there appears to be a large disparity between general practices and dental schools regarding the use of posts in restorative procedures. A recent survey has reported that general dental practitioners will use a post almost without question when a tooth is to be restored with a single crown or is used as an abutment for a fixed partial denture. Only a few responding clinicians reported using a post most of the time when only a filling was placed as the final restoration. In this same survey, a surprisingly large number of dentists were of the opinion that posts were used to reinforce a root-filled tooth. The literature, however, has firmly established that posts provide the distribution stresses evenly along the remaining tooth structure and contribute to retention of a core material.

In general practices, prefabricated posts of various materials and shapes are being used with greater frequency than custom cast posts and cores. An abundance of laboratory studies and limited clinical trials have consistently reported more root fractures with cast posts and cores as well as resulting restorative failures. Furthermore, the economic advantages associated with one-appointment procedures influences clinical decision making.

Metallic prefabricated posts have dominated the market for a number of years. Yet, in the past several years, polymeric, ceramic, carbon- or fiber-reinforced, and other novel systems have emerged into the post material market. These newer systems have focused on physical properties, such as modulus of elasticity (rigidity) more closely matched to dentin, to reduce stress concentrations within the root canal and reduce the incidence of fractures. An additional feature with the newer posts has been the esthetics with composite core materials. The newer posts are not as visible as the metallic posts. Minimal clinical research or simulation studies are available; however, results have been favorable with high retention rates and a lack of root fractures.

Nonmetallic posts have been available for several years. Recent innovations are the result of refinements of earlier versions with regard to shape, composition, and properties. Advantages reported for the increasing introduction of nonmetallic posts include biocompatibility (nongalvanic), a closer modulus of elasticity to dentin, esthetics when used with composite
core build-ups, and the ability to recover the post if a failure occurs.

Nonmetallic Systems

The DT Light Post™, is an example of a fiber-reinforced composition that is representative of the new direction of esthetic posts for endodontically treated teeth (Figure 1). The dual-taper configuration is suggested to allow better adaptation to the prepared root canal walls. The esthetic advantages are easily observable because the post appears almost translucent when a composite core is placed over the post. In fact, the post can be used to assist with the photopolymerization of resin cements that are not dual-cured. Because of the nature of added fillers, the post is radiopaque on radiographs almost to the extent of metallic posts. A prospective study of 59 carbon fiber-reinforced posts with similar mechanical and physical properties resulted in no fractures of root surfaces and a final survival rate of almost 90% when followed for an average of 28 months.20

A similar post system is the Dentatus Luscent Anchor™ (Figure 2). These tapered resin-reinforced fiberglass light-transmitting posts assist with photopolymerization of luting resins within the canal. Furthermore, their optical properties are focused at providing an esthetic end result as well within the final core material or through the remaining tooth structure at soft tissue interfaces.

Figure 3 shows the ParaPost® Fiber White Esthetic Post System. With the familiar parallel post design of the previous metallic posts marketed by this company. The new fiber-reinforced white post of the ParaPost® System offers some transparency. A further attraction of the ParaPost® system is the retentive head built into the post head. Whereas a tapered post must preserve the apical anatomy of the post, the parallel post can reduce the post length at the expense of the apical length. Therefore, the tapered systems must rely on chemical bonding to the subsequent core material.

As shown in Figure 4, Brasseler Corporation has added a fiber-reinforced tapered post3 to their product line. The Brasseler post kit comes with matched size twist drills as well as a set of final preparation.
diamond hand-operated instruments, which are positive point. This allows the clinician to have control in sizing the canal as needed for maximum post adaptation. Yet to be fully established is the nature or stability of the chemical bond to the nonretentive coronal aspect of the post.

The IntegraPost® System® (Figure 5) has been introduced by Premier as an esthetic post addition to its line of titanium posts. The IntegraPost® is a parallel post system and can take advantage of the mechanical retention of the coronal post area. The titanium has a history of success and is biocompatible as a result of its lack of destructive corrosion when used in endodontically restored teeth. The fracture strength of titanium posts has been shown to be favorable in the laboratory, but the long-term clinical behavior has not yet been established.

Figure 6 shows a final new post system. Pentron Clinical Technologies has launched the FibreFill™ System®. Unique to this system is the simultaneous obturation of the prepared endodontic canal with the insertion of a fiber-reinforced post system. There are obvious time and cost savings evident with this concept. Innovations such as this will bring about a high level of controversy from conservative dental clinicians and academicians; however, historical literature and logic encourages the further development of such a concept. Nevertheless, controlled clinical trials are necessary to fully understand the scientific merits of this new approach.

Conclusion

It is now time to examine the dental school academic curriculums concerning post insertion techniques. A post is seldom used without a core material in the restoration of endodontically treated teeth. As core materials themselves are undergoing rapid changes, the issue can become quite complex. (A future issue of Materials Review will attempt to sort out the recent innovations in core materials.)

With the abundance of literature demonstrating that metallic posts have a greater number of disadvantages over selective modern...
technologies, and adhering to an evidence-based practice, it's easy to see why dentists have moved forward on this issue. As more clinical data becomes available, the guidelines for post selection in restoring endodontically treated teeth should become more defined and a general consensus may be reached.

References