Post concepts are changing

Fixed prosthodontic procedures continue to be accomplished in significant quantities, and it does not appear that this trend will decline. Many of the teeth being crowned require endodontic therapy as a part of the tooth preparation, and some require endodontic therapy after crowns or fixed prostheses have been placed. Post-and-core build-ups are necessary in some of these teeth. During the last few years, there has been a major shift away from metal custom-cast posts and cores toward prefabricated metal posts and resin-based composite cores, and recently there is a clearly observable movement toward use of fiber-reinforced resin-based composite posts used with bonded resin-based composite build-ups.1,2

In this column, I will critique the significant change in types of posts available and their evolving use in practice as judged by current use patterns and research.

Determining When and What Type of Posts Are Needed

A few decades ago, it was considered to be necessary to place posts and cores in every tooth that had endodontic therapy. At that time, posts were thought to “reinforce” the overall strength of endodontically treated teeth. Subsequently, it was concluded in many research projects that posts are used primarily to connect the root portion of endodontically treated teeth to the build-up material placed on the coronal portion of the teeth.

The following suggestions are based on numerous clinical research projects and my own clinical experience during many years of practice.

Post not needed. A post may not be needed if an endodontically treated tooth to be crowned as an abutment, or restored with an intracoronal restoration, is missing no tooth structure other than the endodontic access hole. In such a situation, the access hole and the instrumented canal size should be very small to indicate lack of need for a post.

A few other prerequisites should be considered before the decision is made not to use a post. Horizontal cracks should not be observable in the coronal portion of the tooth, and the planned tooth restoration should not be expected to be subjected to excess occlusal stress, such as a canine rise, heavy incisal guidance or the lateral stresses of bruxism. If such situations are present, a crown or onlay restoration and a post are recommended to increase the overall strength of the tooth/restoration complex and increase the potential for long-term service. If an intracoronal restoration, such as a resin-based composite or an amalgam, is being used, I suggest bonding the restoration into place to add strength to the overall tooth/restoration complex by connecting the facial and lingual portions of the tooth. In the event of an extracoronal restoration, such as an onlay or crown, the coverage of the facial and lingual cusps of the tooth provides mechanical reinforcement of the tooth and near-optimum strength. Bonding agents are used by most dentists, and this concept still should be a standard technique for extracoronal restorations.

Post recommended and good prognosis expected. If a significant portion of the coronal tooth structure of the endodontically treated tooth is missing, but no more than one-half of the coronal portion is missing, I recommend a post to connect the...
coronal portion of the tooth build-up to the root portion. What type of post? As I have observed in my many continuing education courses, very few dentists use custom-cast posts. There are several reasons for this lack of use. Custom-cast posts require more removal of tooth structure than do prefabricated posts and cores, a second appointment to seat the post, a difficult provisional restoration, a significant laboratory cost and higher clinical costs—and they offer questionable, if any, clinical advantages over prefabricated posts and cores.

Most dentists are using prefabricated posts. A recent research project changed my opinions about the relative usefulness of the various types of prefabricated posts. The common belief among dentists, including myself, has been that metal prefabricated posts were stronger than the popular fiber-reinforced resin-based composite posts. The referenced study evaluated the relative strength characteristics of extracted, endodontically treated teeth that received metal posts (titanium alloy or stainless steel), or fiber-reinforced resin-based composite posts. Strength was measured with the resin-cemented posts alone in the teeth or with the resin-cemented posts followed by resin-based composite build-ups. As one might have expected, the fiber posts alone were much weaker than the metal posts. However, to my great surprise, the resin-cemented fiber posts followed by resin-based composite build-ups were as strong as the metal posts used with resin-based composite build-ups.

The results reported in this study are significant, because in terms of most of the necessary post characteristics, the fiber-reinforced resin-based composite posts are superior to metal prefabricated posts. They are tooth-colored and do not impart a gray color to the remaining tooth. Additionally, they are easy to place, are relatively inexpensive, can be bonded to resin cement and are easy to remove if the tooth needs to be retreated endodontically. Often, clinical factors are present that make clinicians wonder whether or not to place a post in a tooth that is missing as much as one-half of its coronal structure. Some of the factors are heavy occlusion, bonding agents are used by most dentists, and this concept still should be a standard technique for extracoronal restorations.

such as is present in those patients who brux or clench their teeth; canine rise supported by the endodontically treated tooth; incisal guidance supported by the tooth; need for the tooth to serve as an abutment for a fixed or removable prosthesis; or presence of visible horizontal cracks in the remaining coronal tooth structure. If there is any question in the mind of the clinician about whether or not to place a post, I recommend that the post be placed.

Post recommended but questionable prognosis expected. When an endodontically treated tooth is missing all of the coronal tooth structure to the level of the gingival tissue, in my opinion, long-term service of the restored tooth is questionable, regardless of the type of post or the restoration. An even worse prognosis is expected for the tooth that has no coronal tooth structure above the bone level. I have treated many such compromised teeth with custom posts and cores, or prefabricated posts and cores of various types, and these restorations have been some of the least successful restorations I have accomplished. In my experience, restorations of severely broken-down endodontically treated teeth fail early. Sometimes, with a long-rooted tooth broken off to the levels described, orthodontic extrusion is indicated to obtain more clinical crown length. However, in consideration of the time involved to accomplish and stabilize the orthodontic procedure, the relatively compromised crown-root ratio, and the expense, a properly placed dental implant is a better choice. In cases in which the coronal build-up has questionable ability to resist rotation during service, at least two pins placed mesial and distal to the post are recommended. (I prefer the pure titanium Filhol Retention Pin [Filhol Dental USA, Baltimore].) When endodontically treated teeth appear to have questionable restorative longevity potential, patients should be advised of this.

POSTS AND THEIR USES IN 2004

The following suggestions on prefabricated posts are my personal recommendations based on dentist use, worldwide research and my own observations:

Stainless steel. This long-used type of post is strong, but its potentially allergenic nickel content, rigidity and potential
for gray color transfer to the surrounding structures and subsequent restoration should limit or eliminate its use. Many companies produce stainless steel posts.

Titanium alloy or pure titanium. When a metal post is desired, titanium alloy (available from many manufacturers) is my choice. These posts are moderately radiopaque, are relatively easy to use and do not contain any objectionable elements.

Zirconia. Strong, tooth-colored zirconia posts are highly radiopaque and rigid. However, they are difficult to use, are expensive and, unless they are rough on the surface, do not offer optimal retention. When a tooth-colored post of maximum strength is desired, these posts should be considered, but their extreme rigidity may contribute to vertical tooth fracture when stressed.

Carbon. Carbon posts have limited use because of minimal radiopacity and black color. However, their ease of use and removal and their flexibility are favorable.

Fiber-reinforced resin-based composite. Tooth-colored fiber-reinforced resin-based composite posts are easy to use, strong when supported with build-up material, relatively radiopaque (some brands) and easily removed, and they do not impart any objectionable color to the tooth. As I have observed in my interactions with practicing dentists, among the most used brands are the FibreKor Post (Pentron, Wallingford, Conn.), the Para-Post (Coltène Whaledent, Cuyahoga Falls, Ohio) and Snowpost (Danville Materials, San Ramon, Calif.). The future for this type of post is promising.

A SUGGESTED TECHNIQUE FOR POST AND CORE: 2004

State-of-the-art technique can be identified easily when one observes practicing dentists. The following technique is representative of the practicing profession at this time, as I have observed it in many continuing education courses.

- Endodontic therapy. Post canal should be made to the depth of about one-half the bony supported length of the tooth and no longer than 3 millimeters from the apex of the tooth.
- Fit the selected post. Fiber-reinforced resin-based composite or titanium alloy posts are recommended.
- Roughen the internal surface of the post channel with a slowly rotating rough diamond to create mechanical retention in the post channel.
- Place a bonding agent in the canal. Among the most used products are ED Primer II (Kuraray America, New York) and Linkmax Primer (GC America, Alsip, Ill.).
- Seat the post in the canal using a resin cement such as Panavia F2.0 (Kuraray America) or Linkmax (GC America), allowing a thin layer of the coronal cement to cover the coronal portion of the tooth. Light cure the portion of the dual-cure cement accessible to the light.
- Immediately place a resin-based composite build-up.

- Wait a few minutes for the dual-cure cement and/or build-up material to set.
- Prepare the post and core for the subsequent restoration.

SUMMARY

Use of post-and-core restorations has changed markedly in the past several decades. Current use and research supports techniques using tooth-colored, fiber-reinforced resin-based composite posts or titanium alloy posts cemented with resin cement, followed by resin-based composite build-ups. Although fiber-reinforced resin-based composite posts appear to be very promising, long-term clinical observation is needed. I have made suggestions about when to use posts, what type of post to use and how to use them.

The views expressed are those of the author and do not necessarily reflect the opinions or official policies of the American Dental Association.

Educational information on topics discussed by Dr. Christensen in this article is available through Practical Clinical Courses and can be obtained by calling 1-800-223-6609.