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Welcome to ENDODONTICS: Colleagues for Excellence...the newsletter covering the latest in endodontic treatment, research and technology. We hope you enjoy our coverage on the full scope of options available for patients through endodontic treatment and conventional prosthodontics, and that you find this information valuable in your practice. Future issues of ENDODONTICS will keep you up to date on the state of the art and science in endodontic treatment.

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The advent of dental implants presents treatment options that practitioners have not been able to attain in the past. However, research on the long-term efficacy and success of dental implants is still ongoing. Practitioners should have a comprehensive understanding of the needs of patients and a full appreciation of what endodontic therapy and dental implants bring as modern dental therapies. Patients should be fully educated so they understand the benefits and drawbacks of all treatment plans presented, as well as the length of treatment, projected outcomes and cost considerations.
Treatment Choices and Outcomes
Modern endodontics provides a greatly increased scope of treatment modalities available to the dental practitioner. Endodontic treatment options now offer patients a wide range of choices for tooth retention. These plans include initial nonsurgical root canal treatment and retreatment; surgical intervention such as periradicular surgery, perforation repairs, root or tooth resections with the retention of viable and sound root structures; root submergence for ridge stability; and intentional replantation or autotransplantation. Practitioners are able to manage the challenges of various types of root resorption predictably, whether iatrogenic or secondary to trauma, thereby retaining a sound dentition. Adjunctive services of significant value that enhance tooth retention include root/tooth extrusion and crown lengthening. The test of time still advocates that the best “implant” is a natural root.

Studies and research have consistently shown that even outstanding root canal treatment will not be successful when covered by a leaking coronal restoration. A higher level of tooth retention results only when there is excellent synergy between the restorative and endodontic treatments. With a commitment from patients to a daily regimen of home care that promotes a healthy and sound periodontium, teeth can be retained many years in symptom-free function at a 90 percent or greater level of success. Without a natural periodontal ligament, this challenge to the patient escalates dramatically.

The literature strongly suggests that persistent intraradicular or secondary infections, and in some cases extraradicular infections, are the major causes of failure in both poorly and well-treated root canals. Some patients may not heal even with meticulous and conscientious endodontic treatment, often for unknown reasons. Practitioners can offer these patients a multitude of treatment options, such as nonsurgical retreatment or surgical intervention, or in more compromised cases, intentional replantation or autotransplantation. The literature also supports retreatment of these cases when periradicular radiolucencies and clinical signs and/or symptoms are present. Subsequent survival rates are over 90 percent.

Tooth retention in conjunction with conventional prosthetics, as opposed to an extraction in favor of a conventional/implant-supported prosthetic replacement, is still a desirable goal. Teeth that may be perceived as “endodontic failures” or that lack healing can still be saved. Practitioners and their patients can benefit from a team approach to determine the cause of refractory endodontic cases and to provide successful treatment.

Assessment of Teeth for Possible Removal and Artificial Replacement
Tooth retention decisions involving poor prognoses usually include the following considerations:
- Need to manage a compromised dental pulp in the presence of severe periodontal disease, deep carious or fractured tooth margins;
- Ability of a particular tooth or teeth to serve as abutments for fixed or removable prostheses if treated endodontically;
- Quality of prior endodontic treatment and the ability to retreat/perform surgery and retain;
- Ability to repair or salvage roots/teeth with iatrogenic defects; and/or
- Presence of teeth with suspected cracks or fractures.

Some of these situations present insurmountable obstacles to successful endodontic treatment. In these situations, practitioners should advise patients about extraction. Patients have several good options available for tooth replacement when extraction is the treatment of choice. Both the endodontist and the referring dentist should explain these options to patients to facilitate informed choices. At this point, it may be necessary to refer these patients to other specialists, i.e., periodontists, prosthodontists or orthodontists, to meet the unique needs of the clinical situation presented.

Treatment Options When a Tooth Cannot be Retained
The following options should be considered in the treatment planning process when endodontic, periodontal and restorative treatments cannot be used to retain a natural tooth:
- Replacement with a tooth-supported, fixed prosthesis (fixed partial denture);
- Replacement with a removable prosthesis or modification of an existing prosthesis (removable partial denture);
- Replacement with an implant-supported prosthesis (crown/fixed partial denture);
- Replacement by transplanting a nonfunctional (impacted) third molar tooth;
- Orthodontic movement to reposition teeth; or
- No replacement, as in the case of a second or third molar where there is no opposing dentition.

The prognosis for tooth replacement with the listed options varies significantly within the treatment plan and the status of the remaining dentition. For example, placement of a fixed prosthesis will require preparation...
of the adjacent teeth. Conventional prosthetics offer clinicians many conservative choices to conserve tooth structure, a removable prosthesis, etched retained fixed partial dentures, partial veneer prosthesis, etc. Before initiating treatment, practitioners should evaluate the pulpal status of each tooth serving as an abutment.

Alternative treatment choices such as an implant can create challenges for both practitioners and their patients. Implants can fail biologically, functionally or iatrogenically, and may require pretreatment sinus lift or ridge augmentation to alter ridges that are too narrow or have insufficient bulk to support an implant. Another important cause for concern is the possible loss of proprioception. Additional complications to choosing an implant may include pain or sensitivity, mobility or periodontal disease that affects the implant. Implants and conventionally restored natural teeth share many of the same post-treatment complications, including pain or sensitivity, mobility and periodontal disease. Implants have a unique complication—the loss of proprioception leading to occlusal over-load complications.

If circumstances for a transplant were optimal, a surgical extraction may be indicated with an accompanying surgical preparation of the recipient site. Finally, with some patients, replacement of the tooth is not an option for various reasons, and treating dentists should recognize and respect this option. All treatment possibilities, including no treatment, should be explained to patients objectively, with the option to seek additional opinions from other experts.

**Risk Assessment of Tooth Retention Versus Removal and Replacement**

Parameters for assessing the outcomes for the entire range of endodontic treatment have been limited primarily to clinical and radiographic criteria. Until the 1990s, the terms “success” and “failure” were in vogue with endodontic treatment. Now choices include “healed,” “tendency to heal,” “not healed” and “regression,” because patients can relate to the process of disease, treatment and healing. However, mere changes on a radiograph cannot determine the extent of the periradicular healing process. The absence of clinical signs and symptoms is not an accurate barometer for healing. Regrettably, this concept is used on a global basis for case assessment and determination of further treatment or no treatment at all.

An assessment of past “success-failure” studies in endodontics is difficult because of multiple variables. These studies have erroneously included failures due to periodontal disease, root fractures, inappropriate restorations and the presence of coronal leakage. These are not endodontic failures. Historically and contemporarily, without substantiation, endodontically treated teeth have been considered “weak links” in the restorative-periodontal continuum.

However, contemporary scientific studies on the structure of dentin and the impact of endodontic procedures do not support these beliefs. The key is to combine endodontic and prosthodontic treatment to retain the greatest amount of sound dentin. When the studies are considered “en masse,” endodontic treatment results in more than a 90 percent success rate when microbial challenges are eliminated through thorough canal cleaning, shaping and three-dimensional obturation; coronal leakage is negated through proper, sound restorations; and the patient practices preventive oral self care. Outcomes following more contemporary treatment modalities and incorporating biologically based parameters of care are presently being determined to provide further predictable directives for the practitioner.
Endodontic treatment and tooth retention, especially when endodontic treatment and reconstructive dentistry are indicated, should be selected. By not choosing this option, the patient can incur an increased potential for dental complications, further damage to oral tissues, a significant time without full function, a less than satisfactory outcome and increased costs. The 10-year survival rate for conventional prosthodontic treatment and those teeth treated endodontically are the same. Removable prostheses have a significantly poorer prognosis for the abutment teeth adjacent to the edentulous space.

While survival rates are comparable to endodontic treatment with the placement of some types of implants, these rates are not true for all designs and all areas of the mouth. Complications associated with the placement of implants rarely exist with quality endodontic services. However, potential complications could include:

- paresthesia (numbness);
- mechanical trauma to bone and bone loss;
- perforations or intrusions into vital anatomical structures;
- infections;
- implant and superstructure breakage;
- inappropriate placement and inability to restore;
- premature loading followed by lack of healing/integration and implant mobility; and/or
- loss of proprioception.

Multiple, lengthy visits are required, along with longer healing periods and increased costs that are not likely borne by third-party insurers. Most importantly, no consensus exists on what constitutes implant survival versus true success, and many studies that extol high rates of success can be misleading.

Currently, there is a lack of prospective, randomized clinical trials in all areas of dentistry, including tooth retention incorporating endodontic services versus tooth removal and replacement by various means. Direct comparison of tooth retention rates versus tooth replacement rates with any type of restorative modality would essentially be comparing “apples to oranges.”

Patients would benefit from practitioners considering the entire range of available treatment options. These options should be based on sound biological principles and individually tailored treatment plans that consider patients’ best interests and preferences, and deliver the quality of care that will result in the highest level of success for the patients.

Because many important and integrated concepts have been addressed in this issue of ENDODONTICS: Colleagues for Excellence, the AAE encourages readers to review the enclosed reading list to obtain further information or support for the clinical and evaluative parameters regarding the importance of tooth retention, outcomes, rationale for choices and alternative considerations in the maintenance of arch integrity for the patient.

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Endodontic Treatment Outcomes–Nonsurgical–Retreatment–Surgical


**Restorative Options–Outcomes–Tooth Retention–Strength of Endodontically Treated Teeth**


**Implants–Outcomes–Survival–Success**


