Dental implants or Endodontic Therapy: A review of factors affecting treatment planning

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Abstract

When considering the complex question of whether a tooth should be treated endodontically or extracted and replaced with an implant, there are many factors to be considered. Coronal breakdown of the involved tooth, type and condition of the bone supporting the affected tooth, occlusion, gingival health, the presence of periodontal disease, the patient’s overall health, the time required for treatment and the practitioner’s proficiency must all be considered before rendering a decision. The best decisions are evidence-based, implying the availability of valid studies, ideally, randomized controlled trials which compare two treatment modalities. This article reviews the evidence based factors which will help the clinician to decide between the two viable treatment options i.e. restoration of the natural teeth endodontically or the extraction of the natural teeth followed by prosthodontic rehabilitation of the edentulous space.

Introduction

For decades, all disciplines of dentistry have strived to prevent and treat caries and periodontal disease, as well as to restore
function and esthetics to patients affected by oral diseases or traumatic injuries. One of the major issues confronting the contemporary dental clinician is the treatment decision between preserving the natural tooth by root canal treatment or extracting a tooth with placement of a dental implant. From the days preceding the landmark study by Branemark et al until very recently, the available options for restoring compromised teeth were limited to root canal treatment. Currently, in addition to root canal treatment, single-tooth implants are also being proposed to patients who have compromised teeth. However, the precise role of single-tooth implants in the management of patients with compromised teeth has remained uncertain, controversial, and the subject of considerable debate.1-7

The decision between retention of endodontically involved teeth as opposed to extraction and implant treatment is a clinical decision that requires a careful evaluation of the pre-, intra-, and postoperative factors that may influence the outcome of the proposed treatment.

Factors influencing treatment planning

Systemic and local health factors: Systemic and local health factors can affect outcomes of endodontic treatment and implant therapy. Clinical data show that a history of diabetes may have a negative effect on the healing of periapical lesions8 which is the main preoperative factor associated with less favorable outcomes of endodontic treatment. People who have uncontrolled or poorly controlled diabetes8, are immune-suppressed9 or smoke have an elevated risk of developing complications after implants have been placed. Saving a tooth by endodontic treatment may be indicated in certain patients taking bisphosphonates10 to reduce the risk of bisphosphonate-associated osteonecrosis of the jaw.

Patients’ perception of treatment: Patients’ perception of the psychological and physiological trauma related to each therapy may be one of the key factors in their decision.

Pulpal and periodontal conditions: Indications for endodontic treatment include teeth with irreversible pulpitis, necrotic pulps, restorable crowns, treatable periodontal conditions, salvageable resorptive defects and a favorable crown-to root ratio.11 Endodontic treatment is contraindicated when there is limited remaining tooth structure and the definitive crown will not be able to engage at least 1.5 to 2.0 millimeters of tooth structure with a cervical ferrule.12 Implants are indicated when teeth cannot be prepared with adequate retention and resistance form.
**Teeth with unique color characteristics:** Color matching can be a significant challenge for certain highly visible teeth with unique dentin colorations or large areas of enamel translucency or transparency. When such a tooth requires endodontic treatment but does not need a ceramic crown, the clinician may find it to be esthetically advantageous to retain the tooth through endodontic treatment, rather than extract it and place an implant crown that does not match the surrounding environment. Because of these color matching challenges, it sometimes is prudent to perform challenging and difficult endodontic treatment rather than to extract such teeth and replace them with implants. When a tooth with challenging color characteristics requires both endodontic treatment and a ceramic crown, it may not be possible to achieve an appropriate color match because of thickness limitations imposed by the amount of required tooth reduction. Although a ceramic crown made for an implant may not be ideal, the dentist usually can achieve a better color result because the implant can be fabricated with a thicker amount of porcelain that enhances the color-matching potential, particularly in the challenging cervical areas.

**Quantity and quality of bone:** Bone quality also affects implant success, with type 4 bone resulting in less success compared with types 1 through 3 bone. Goodacre and colleagues reported that the success rate was lower when short implants (that is, those 10 mm or less in length) were used than when longer implants were used. Although new implant surfaces and geometries have produced promising results that may overcome the lower success rates associated with short implants, the available clinical data are limited. After extracting a tooth, the clinician may have to postpone implant placement to permit resolution of the infection. However, when substantial infection is associated with an extracted tooth, the clinician may have to postpone implant placement to permit resolution of the infection. The posterior maxilla usually has poor bone density and, therefore, a reduced chance of implant success. Any area with questionable or abnormal bone density or the presence of potentially problematic anatomical structures should persuade practitioners to retain teeth and choose the endodontic alternative.

**Soft-tissue anatomy:** The esthetic result around crowns can be affected negatively by an interdental papilla that does not fill the cervical embrasure space. This can occur around crowns that attach to endodontically treated teeth or dental implants. When the biotype is thin but healthy around a natural tooth, preservation of the tooth through
endodontic therapy may provide more appropriate soft-tissue esthetics than does extracting the tooth and placing a dental implant.

**Location of tooth:** The esthetic zone especially in the anterior region often represents a challenge for implants. A patient’s natural smile is a thing of beauty and quality of life is an important benefit of all dental care. Large-scale surveys of hundreds of post-endodontic patients have demonstrated that endodontic treatment not only saves the natural tooth, resulting in more than 97 percent of surveyed patients reporting being satisfied with their endodontic treatment, but also significantly improves their quality of life. Our treatment choices should be based not only on the expected overall benefit to oral health, but should include improvements in quality of life. Thus, quality of life is an important factor when considering alternative procedures such as single-tooth implants, where both esthetic problems and multiple repair appointments can impact this important patient issue. Implant survival may be lower in the posterior maxilla compared to mandible. Proximity to anatomical structures (sinus, nerve canals etc.) also poses some difficulty for implant placement.

**Coronal breakdown of the involved tooth:** If at least one-half of the coronal tooth structure is remaining and the root canal anatomy does not present an atypical appearance, endodontic therapy probably is the best choice.

**Time needed for treatment:** Although some implant placement situations allow immediate loading with the restoration, many implant situations require several months for adequate osseointegration to occur before the restoration can be placed. If the dentist anticipates a major difference between the two types of therapies in terms of the time required to complete them, patients should be encouraged to express their opinions related to selection of one or the other treatment on that basis.
The practitioner’s proficiency: Practitioners have differing degrees of expertise in the various areas of dentistry. Unfortunately, many patients do not want to be referred to other practitioners for a portion of their treatment. In such cases, general dentists should advise the patient about the expected potential for success for each of the therapies if they were to accomplish the treatment themselves without referral to specialists. If the patient feels that because of the clinical expertise of the practitioner, one or the other therapy has the greatest chance for success, that therapy is the one to choose in that situation.

Treatment outcomes

Torabinejad and colleagues performed a systematic review of the literature between January 1966 and September 2004 pertaining to the success and failure of nonsurgical endodontic therapy, and they assigned levels of evidence to these studies. The data show a radiographic success rate of 81.5% during the five-year period. Friedman and colleagues reported similar healing rates (81% overall) in their clinical and radiographic assessment of the four- to six year outcome of endodontic treatment. Based on survival rates, it appears that more than 95% of teeth that have undergone endodontic treatment remain functional over time. The findings does not however reflect new advances and innovations in the art and science of endodontics. A massive study of more than 1,400,000 root canal-treated teeth in a nationwide survey of outcomes of root canal treatment in patients insured by Delta Dental Insurance, demonstrated that 97% of root canal-treated teeth were retained within an eight-year follow-up period.

On the basis of the results of studies published after 1996, the American Dental Association’s Council on Scientific Affairs reported high implant survival rates for various clinical situations. With regard to the single-tooth implant, the Council’s evaluation of 10 studies involving more than 1,400 implants revealed survival rates ranging from 94.4 to 99%, with a mean survival rate of 96.7%. In a systematic review of clinical studies of implants, Creugers and colleagues reported a four-year survival rate of 97% for single tooth implants. In another report, Lindh and colleagues performed a meta-analysis of implant studies involving partially edentulous patients. They reported a success rate of 97.5% after six to seven years for a single-implant crown.

Until very recently, there has been little evidence directly comparing survival of post-endodontically treated teeth with the single-tooth implant. However, a recent study by
Doyle and colleagues has compared the outcomes of 196 post-endodontically treated teeth with 196 matched, single-tooth implants, with both treatments provided in the same setting. Interestingly, both the groups had 94% survival rates. Even though the survival rates were similar, the implant group experienced a much greater incidence of post-operative complications (e.g., prosthetic repairs).

A recently published meta-analysis provides a detailed examination of the relative survival rates of single-tooth implants versus endodontically treated and restored natural teeth. This study reported the results of a comprehensive review of the literature using a database and search strategy organized by the Academy of Osseointegration, which was presented at an international consensus meeting, entitled the State of the Science on Implant Dentistry in August 2006. Once again, the outcomes for the two treatments were equivalent. There was no difference between the implant and endodontically treated teeth in any of the observation periods. Based upon this analysis, the authors concluded that “…the decision to treat a compromised tooth endodontically or replace it with an implant must be based on factors other than treatment outcome”.

Conclusion

An ideal treatment plan should address the chief complaints of the patient; provide the longest-lasting, most cost-effective treatment; and meet or exceed the patient’s expectations whenever possible. Recent large-scale studies involving literally millions of patients provide strong support that the restored endodontically treated tooth offers a highly predictable, long-term way of saving nature’s implant—the tooth. Thus, excellence in endodontics followed by an immediate restoration of equal quality promises to give our patients service and function while maintaining their esthetics for years. Both matched-pair study designs and meta-analyses indicate that these high survival rates are similar to those reported for the restored single tooth implant. Therefore, in making treatment planning decisions, the clinician must consider additional factors including local and systemic case-specific issues, economics, the patient’s desires and needs, esthetics, potential adverse outcomes and ethical factors.

References


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