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# Decisive Factors for Selection of Treatment between Implant Therapy and Endodontic Therapy: A Critical Review

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## Abstract

Case selection and treatment plan are critical aspects of dental treatment. Dentists should coordinate the treatment plan based on their experience, abilities, and most importantly, the preference and dentition of the patient. The treatment plan is obviously exclusive and "tailor-made" for each patient and cannot be used for all patients.

The choice between extraction and implant placement or a complex endodontic procedure is currently one of the most difficult aspects of dentistry. Although neglecting other alternatives, overemphasis on one treatment plan not only misleads the dentist, but also imposes unreasonable charges on the patients.

Good long-term success rates and greater clinical management versatility suggest that in most cases, RCT or retreatment should be done first unless the tooth is deemed un-restorable. When determining whether a damaged tooth of uncertain prognosis should be preserved or replaced by an implant, local, site-specific and more general patient-related factors should be considered.

This review best describes a systematic process to aid the treatment planning decision of whether to preserve teeth by root canal treatment (RCT) or extract and provide an implant.

**Keywords:** Case selection, Treatment plan, Extraction and placement of implant (EPI), Root canal treatment (RCT).

## Introduction

The controversy on the acceptance of Implant as a mainstream treatment procedure over traditional root canal therapy is creating a problem for both patients and doctors at the moment when dentistry is experiencing its most

impressive developments in terms of treatments and materials. However among clinicians, the ultimate decision to correctly choose the treatment remains variable, and is still very much affected by the interest of the patient.

By means of randomized controlled trials and critical review of the available database, the standard protocol for such clinical conditions has yet to be developed. An attempt is made here to provide dental clinicians with advice on the selection of the right treatment for the best interest of the patient, taking into account important factors such as:

1. Prosthetic restorability of the tooth
2. Quality of bone
3. Esthetic demands
4. Cost-benefit ratio
5. Systematic factors
6. Patient preferences
7. Complications.
8. Prognosis

**Prosthetic Restorability of the Tooth**

Option for saving tooth by root canal therapy should be explored only if the tooth is restorable with a long term survival rate. The obvious primary factor for any treatment is patient's wishes and needs but the restorability depends upon the expected function and esthetics of the involved tooth, its pulpal status, remaining tooth structure, possible vertical fractures, remaining bone support, periodontal health (mobility, gingival tissue health), oral hygiene, medical history (especially patients undergoing radiation and chemotherapy to the head and neck), dental history, bruxism and parafunctional habits, presence or absence of pulpal vitality, the quality of the previous cleansing, shaping and obturation; patient anxiety, arch position, tipping, rotation, calcified canals, atypical (dilacerated) root anatomy, resorptive defects and endo perio lesions. If these parameters create an unfavorable prognosis for a long-term function, then implant therapy is a definite indication.

A systematic analysis of approximately 55 studies related to single-tooth implants and 13 studies related to restored root canal-treated teeth were included in the MEDLINE, EMBASE and PubMed databases and the decision to treat or replace a tooth with an endodontic implant was found to be based on factors other than the treatment results of the procedures themselves. For the treatment of compromised teeth, both nonsurgical root canal therapy accompanied by adequate reconstruction and single-tooth implants are excellent treatment modalities.

**Quality of Bone**

Bone quality and quantity have little effect on the results of endodontic surgery, but they definitely have an impact on implant therapy prognosis. It is a well-established concept that the implant placement site's bone density directly affects the effectiveness of the implant therapy.

The clinician can place an implant immediately in the root socket after extracting a tooth, thus preventing much of the bone resorption that follows extraction.

However if a significant infection is associated with an extracted tooth, the clinician must have to delay the placement of the implant to allow the infection to be resolved.

By the time the tooth is eventually extracted, retaining a tooth with a poor long-term prognosis through endodontic treatment, especially a cracked tooth, can lead to significant bone loss. The esthetic outcome may be significantly affected by the resulting bone defect. As a result, early tooth removal and immediate placement of a dental implant can create an atmosphere that is more appropriate for the positioning of the implant and result in optimal esthetics.

**Esthetic Demands**

When both endodontic treatment and a ceramic crown are needed for a tooth with complex color characteristics, it may not be possible to achieve an acceptable color match due to thickness limitations imposed by the amount of tooth reduction required. While a ceramic crown made for an implant may not be perfect, since the implant can be produced with a thicker amount of porcelain that improves the color-matching potential particularly in the difficult cervical areas, the dentist can typically achieve a better color outcome.

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. Choquet and colleagues reported that soft tissue fills the cervical embrasure around dental implants when the incisocervical distance from the proximal contact to the interproximal bone crest is 5 mm or less.

The periodontal biotype also influences the ability of soft tissue to fill the space around implants for cervical embrasure. Papillae adjacent to implants seldom be re-created in the presence of a thin biotype when the gap between the interproximal bone crest and the optimal height of the interdental papillae is more than 4 mm. When the biotype is thin yet secure around a natural tooth, endodontic therapy preservation of the tooth can provide more appropriate soft-tissue esthetics than extraction of the tooth and placing of dental implant.

**Cost-Benefit Ratio**

In general, RCT including a restoration with a single crown is less expensive, and entails fewer dental visits in a shorter time period than Implant rehabilitation. According to a cross-sectional study, even Implant therapy performed as one- or two-stage procedure or as immediate placement had a longer time-to-function than RCT teeth (median 250 days for Implant restoration vs. 67 days for RCT) (Doyle et al. 2006).

Although recent guidelines promote immediate loading, the completion of treatment takes several months for most implant circumstances to ensure undisturbed osseointegration and soft tissue maturation. Good long-term prognosis and greater versatility in clinical management suggest that RCT and even retreatment should first be undertaken in most cases, according to the specialists, unless the tooth is deemed untreatable when implants are considered. The time and cost efforts associated with the RCT might be questionable as soon as other compromising factors or threats occur, such as inadequate coronal tooth structure and/or moderate to extreme periodontal involvement.

As every other field in dentistry has seen remarkable improvements RCT has also been benefited from improvements in techniques and equipment such as nickel–titanium rotary instruments, electronic apex locators and microscopic magnification for nonsurgical and surgical therapies (Manning 2000, John et al. 2007). Improvements in long-term success of surgical or nonsurgical RCT applying new technical developments have, however, not yet been proven on the basis of outcome of treatment provided by general dental practitioners (effectiveness) (Ng et al. 2007).

In particular, negative outcomes also seem to be associated with re-treatment of teeth that have been previously treated endodontically. Implant-supported single crowns tend to have a success rate that is generally higher than the nonsurgical endodontic therapy-related success rate. Indeed, if the study is limited to only prospective trials, implant therapy seems to be more predictable. Implant treatment tends to be more predictable in cases where the likelihood of endodontic

failure is higher (eg, chronic periapical infection). This can be true with endodontic re-treatment as well.

**Systematic Factors**

In patients with high caries activity, possibly related to dry mouth as a common side effect of several medications (e.g., antihypertensive, diuretics, antidepressants,

Atropine, anticonvulsants, spasmolysants and appetite suppressants) or associated with syndromes (e.g., Sjogren), less effort will be made to maintain a questionable tooth, and implant treatment may be favoured.

It is evident today that hyposalivation and/or the signs of xerostomia do not affect the peri-implant tissues. In addition, decreased bone mineral density in osteoporotic patients results in decreased bone-to-implant contact, while osseointegration does not appear to be hindered.

In addition, patients with diabetes tend to have a somewhat increased risk of endodontic complications following nonsurgical RCT (symptomatic periapical diseases and flare-ups), particularly in cases with preoperative periradicular lesions (Fouad & Burleson 2003). Although the systemic health status of the patient can also affect the outcome of implant therapy. However there are still few total and permanent implant contraindications, followed by some temporary constraints such as incomplete cranial development, (Zitzmann & Berglundh 2008, Zitzmann et al. 2008) uncontrolled or poorly regulated diabetes, immuno-compromised conditions or smoking, etc.

**Patient Preferences**

With limited patient inconvenience and complications, most endodontic and implant procedures are performed. The positive and negative experiences of a patient with either procedure however will influence his or her decision as to which modality should be followed. Clancy and colleagues reported general satisfaction, comfort, esthetics and function for patients who acquired dental implants. The patients in their study reported feeling some pain related to the procedure, but they encountered little discomfort after healing. They suggested that implant therapy was "worth the time and expense investment" and that they would again consider a similar treatment package. Further factors taken into account during treatment planning are the patient's preferences, medical contraindications and his/her financial status.

**Complications**

Like other fields of dentistry, endodontic care is occasionally associated with procedural injuries. During access repair, cleaning and shaping, and obturation, as well as during post space preparation, these mishaps may occur. Any of these events have an adverse effect on endodontic treatment outcomes. In addition, the prognosis for endodontic treatment is influenced by the extension of root canal filling materials and the quality of obturation.

In addition to dental implants, complications may also occur. Operational complications, such as hematomas, ecchymosis and neurosensory disruption, are included. As a result of the implant's failure to integrate with the bone or bone loss following integration, implant loss may occur. Complications of soft tissue such as proliferation, fenestration and/or dehiscence of soft tissue before stage II surgery and fistulas have been documented. There can also be mechanical problems, such as screw loosening, screw fracture, fracture of the prosthesis and implant fracture. Some of these problems are readily corrected, such as screw loosening, while others may result in clinical failure.

**Prognosis**

A good prognosis of an RC treated tooth is determined by the absence of clinical symptoms and a radiograph with an intact periodontal ligament space in the apical region,

along with a decrease in periapical radiolucence over a period of time.

According to a recent meta-analysis, when strict performance criteria (absence of periapical radiolucency) were used the pooled outcome of primary RCT was 75 percent and reached 85 percent based on loose criteria (reduction in size of radiolucency). To enhance the outcome of primary RCT, pre-operative absence of periapical radiolucency, root canal filling with no voids, root canal filling extending to 2 mm inside the radiographic apex, and adequate coronal restoration were found.

During the 1st year following implant placement, bone remodeling may cause bone resorption in the marginal area (average 1.3-1.5 mm around implants placed at the bone level). Any further bone loss, particularly reaching ± 2.5 mm, is considered disease manifestation.

**Ailing implants**

An implant that may demonstrate bone loss with deeper clinical probing depths but appears to be stable when evaluated at 3−4 months interval. Ailing implants are those showing radiographic bone loss without inflammatory signs or mobility.

**Failing implants**

An implant may demonstrate bone loss, increasing clinical probing depths, bleeding on probing, and suppuration. Bone loss may be progressive. Failing implants are characterized by progressive bone loss, signs of inflammation and no mobility.

**Failed implants**

An implant that demonstrates clinical mobility, a peri-implant radiolucency, and a dull sound when percussed. A failed implant is non-functional and must be removed. Failed implants are those with progressive bone loss, with clinical mobility and that which are not functioning in the intended sense.

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