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The Single Compromised Tooth - Where Are We Going?

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The two main principal treatment-planning preferences for a single diseased tooth are endodontic treatment coupled with coronal restoration, and extraction with an implant. The issue of which approach to pursue in any given case is important for students, educators, clinicians, and most importantly, patients. When deciding on a treatment plan, numerous factors must be considered and the resulting decision should be made based on the best available evidence and information. From a patient's perspective, the key item to consider is the likely post-procedure prognosis of each treatment, and the pertinent factors. If the clinician presents the relevant treatment options in a biased manner, it is extremely likely that an uninformed patient will favour the clinician's recommended option. A careful and extensive consideration by the parties of the relevant risks, benefits, and contraindications are required for informed patient consent. This paper reviews comparable factors that influence a general dentist's treatment plan for a patient presenting with a diseased tooth.

To address conflicting indications, guidelines should be developed to assist a patient in obtaining sufficient information to select the optimal procedure that fits appropriately with the overall treatment plan. However, it is difficult to formulate such guidelines since a precise definition of a tooth with a poor prognosis has not been formulated or referred to in current literature on the subject. Iqbal and Kim define a compromised tooth as a complex clinical syndrome that may result from any structural or pathologic disorder that impairs the ability of the tooth to function properly without some type of restoration.

There is a major lack of standardization in outcome measures in relation to the two principal treatment modalities. Endodontic clinical trials delineate success by clinical, subjective, and radiographic evaluations. In contrast, retention of the tooth or implant as an outcome variable is defined by the term 'survival', which is absence of persistent pain or dyesthesia, absence of peri-implant infection with suppuration, absence of mobility, absence of continuous peri-implant radiolucency but with marginal bone resorption greater than the radiographic values proposed by albrektsson et al.

Recent reports have indicated that implant survival rates are relatively high in the short term, with undetermined long-term results although endodontic survival rates are positive in both the short and long term. Since a fundamental goal of dentistry is preservation of the dentition, survival rates provide a measure of outcome that is easily understood by patients. In a systemic review that compared single tooth implants and restored root canal treated teeth, the median follow up period for Root Canal Treated (RCT) treated teeth was 7.8 years, whereas the fifty-six studies measuring implants had a median follow up period of five years. The lack of standardization of successful outcome criteria increases the difficulty of comparing implant and RC treated teeth. Current literature indicates that survival is the superior outcome for comparing RC treated teeth to single tooth implants. However, no standard and consistent measure has been developed to directly compare the relative success of the two treatment modalities.

Coronal restoration of endodontically treated teeth represents the current standard of care and therefore this treatment should be reflected in outcome studies comparing implants. A major systemic review excluded all studies except for one, which included both treatment groups in the same setting. In this systemic review, the proportion estimate of implant survival at last exam was 95 percent, whereas the estimate for restored root canal treated teeth was 94 percent, with both having 95 percent confidence intervals. Using the Wilson score method, no statistical difference was noted between the two treatment modalities. Therefore, the decision to pursue a treatment plan should be based on criteria other than the anticipated long-term outcome.

When pursuing a treatment plan for a diseased tooth, a measure to consider is the past dental and medical history of the patient including the potential for a reduced successful outcome. For example, an immune-suppressed patient will not have a favorable healing response to the insertion of a dental implant. As well, patients that smoke, or have uncontrolled or poorly controlled diabetes, may have an elevated risk of developing complications following implant placement. Furthermore, the healing of periapical lesions could be negatively influenced by diabetes and smoking. Factors that alter the host response to inflammation, such as sickle cell anemia, may also indirectly influence the risk of infection in both implants and root canal treatment groups. A dental history that would favour the placement of an implant is that of uncontrollable caries since cariogenic bacteria have less of a role in implant-supported restorations.

Aesthetics is a topic of significant concern to the majority of patients when considering treatment options. The preservation of the soft tissue is essential to the preservation of a natural and therefore aesthetically positive appearance. Clinicians face numerous potential difficulties when placing implants in aesthetic zones, particularly in the anterior region. Potential complications include a poor emergence profile and the loss or distortion of the dental papilla that can lead to the appearance of 'black triangles', which is an inferior outcome during restorative treatment. Although aesthetic failures far outweigh mechanical failures in the anterior region, research studies often fail to address complications such as aesthetic failures when reporting success and survival rates between treatment planning options. In addition, the periodontal biotype plays a significant role in aesthetic outcomes. To avoid aesthetic challenges, root canal treatment with full coverage restoration should be favored in a patient with a thin periodontal biotype. With endodontic treatment procedures, the natural tooth remains in place, which reduces the concern that the soft tissue will not fill the cervical embrasure. The retention of a natural tooth and preservation of dental papilla through endodontic treatment can be superior when faced with an aesthetic anterior region and thin periodontal biotypes. Restoring a natural tooth is a complex process and it requires both endodontic treatment and follow-up restorative treatment. By combining the expertise of excellent endodontic care and subsequent restorative treatment the natural teeth of a patient can be saved with years of satisfaction and improved quality of life.

An additional factor to consider when deciding between endodontic treatment and restoration versus extraction and replacement with dental implants is the quality of the patient's bone. Bone quality is vital when making a determination of the potential survivability of a dental implant. There are four different types of bone, with Type IV being the most inferior. Type IV bone is most often located in the posterior maxilla area and is comprised of a thin cortex with poor medullary strength and low trabecular density. Iqbal has reported a failure rate of up to 35 percent for type IV bone. An increased amount of implants placed in the maxilla fail compared to the mandible, and this failure is often considered to be due to bone quality. Notably, bone quality is not a significant factor that influences success in the context of root canal treatment procedures.

Pain should be a subject of comparison as patients often consider pain to be a major consideration for a tx modality. A study by Hashem et al revealed implant placement to be a mild to moderately painful as well as anxiety provoking procedure. A visual analog score for average pain in an implant procedure was used and demonstrated that on day one, average pain was 24 on a 0-100 scale, and then dropped by fifty percent on day three. Similar results have been reported when post-operative pain was evaluated following non-surgical root canal treatment. Notwithstanding these results, pain experienced after root canal treatment and implant surgery falls within the guidelines for adequate pain control of pre-operative pain.

The landscape of treatment planning is changing, particularly in the context of the education of dental students. In the past, implants were excluded in the pre-doctoral programs and reserved for oral surgery. Presently, implant is an integral part of all dental school curriculums and patients are often offered implant 'deals' or credits toward implants and their supported restorations. This adjustment complicates treatment-planning decisions for patients and dental students alike, as a root canal with post/core and crown is similar to the cost of an extraction implant placement and restoration. With a heavy emphasis on the implant curriculum, many compromised teeth are being prematurely extracted and replaced with implants. Although the survival rate when properly restored is extremely high for implants, the number of post treatment complications that can arise is also quite high.

When making treatment planning decisions, it is essential for the dental professionals and patients to consider additional factors including local and systemic case-specific issues, economics, a patient's personal considerations, aesthetics, potential adverse outcomes and ethical factors. Although the treatment planning is continually emerging, appropriate treatment must give precedence to the patient's best interests and long-term quality of life. **OH**

DISCLAIMER: Both authors deny any financial interest in any companies.

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*Oral Health welcomes this original article. **References***

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