Treatment planning: Retention of the natural dentition and the replacement of missing teeth

Preservation of the natural dentition is the primary goal of dentistry. Published surveys indicate that patients generally value teeth and desire to save their natural dentition in favor of extraction whenever possible.1 Significant technological and biological improvements have been made in recent years to allow for predictable outcomes when making long-term retention of natural teeth more attainable. Patients entrust dental professionals to make best possible course of treatment. In July 2014, the American Association of Endodontists, in collaboration with the American College of Prosthodontists and the American Academy of Periodontology, hosted a two-day Joint Symposium titled “Teeth for a Lifetime: Interdisciplinary Treatment Planning.” Approximately 375 general dentists and specialists assembled in Chicago to learn how to preserve the natural dentition. The educational program included evidence-based, interdisciplinary, minimally invasive restorative methods and best practices for interdisciplinary treatment planning. The outcome data demonstrated no significant differences between patients treated with natural teeth, implants, or a combination of the two. In contrast, patients treated with implants had a lower rate of overall failure than patients treated with natural teeth. The study concluded that interdisciplinary treatment planning can improve patient outcomes and reduce costs. Treatment options can vary depending on the specific case and should be customized to suit the patient’s needs and desires.15

Endodontic treatment and implant therapy should not be viewed as competing alternatives, rather than complementary treatment options for the appropriate patient situation. Figs 1a and 1b demonstrate that the root canal treatment was superior to the implant treatment in the natural tooth. The clinical decision-making process must be customized to suit the patient’s needs and desires.22,23

Predictable tooth retention: Nonsurgical root canal treatment and restoration
The majority of endodontic treatment is performed by general dentists with a high degree of success.24 For complex cases, referral to an endodontist with additional training and expertise may result in better outcomes.25

Table 1 Survival rates following initial nonsurgical root canal treatment.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Number of Teeth</th>
<th>Follow-up years</th>
<th>Survival (percent)</th>
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</thead>
<tbody>
<tr>
<td>Shamsuddin and Pocock (1974)</td>
<td>1,620</td>
<td>6</td>
<td>93</td>
</tr>
<tr>
<td>Caputo and Albrecht (1982)</td>
<td>1,530</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>Laurencikas et al. (2000)</td>
<td>44,012</td>
<td>3.5</td>
<td>94</td>
</tr>
</tbody>
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Conclusion: Success and survival
Treatment outcomes play a key role in the assessment of different treatment options. Patients often request a second opinion from an endodontist prior to undergoing a procedure.31 Another systematic review that included a large sample of patients experiencing actual care in private practices demonstrated that outcomes are comparable to those of a single-tooth implant restoration. Therefore, the likelihood of a favorable outcome increases with both skillful endodontic care and prompt restorative treatment (Figs 3a and b).19 Advancements in technology aid in attaining high levels of tooth retention. The dental operating microscope, nickel-titanium instruments, apex locators, enhanced irrigation protocols and dentin preservation strategies are examples of improvements that allow clinicians to more predictably manage a greater range of treatment options. Additional cone-beam computed tomography facilitates more accurate diagnosis and treatment planning. Decision-making is based on systematic reviews and the management of endodontic problems.14

Comparative studies: Endodontically treated teeth and single-tooth implants
Large-scale systematic reviews have addressed the relative survival rates of endodontically treated teeth and single-tooth implants. The Academy of Osseointegration conducted a meta-analysis using 35 studies (approximately 25,000 teeth) to more accurately manage the outcomes of endodontic treatments.41

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By Scott L. Doyle, DDS

Fig. 1a. Pre-op image of tooth #29 with pulp necrosis and symptomatic apical periodontitis. The patient had no pain and was asymptomatic.

Fig. 5a. Pre-op image of tooth #19 with pulp necrosis and asymptomatic apical periodontitis. The patient requested a second opinion from an endodontist who determined the tooth to be treatable.

Fig. 2a. Pre-op image of tooth #29.

Fig. 6a. Pre-op image of tooth #30 with pulp necrosis and chronic apical abscess.

Fig. 3a. Pre-op image of tooth #30 with pulp necrosis and symptomatic apical periodontitis. The patient had no pain and was asymptomatic.

Fig. 4a. Four-year recall image demonstrates apical healing following nonsurgical root canal treatment. According to Dr. Martin H. Rogens, the healing processes that occur when teeth are treated nonsurgically are consistent with those that occur after tooth extraction.

Fig. 4b. Four-year recall image demonstrates apical healing following nonsurgical root canal treatment. According to Dr. Martin H. Rogens, the healing processes that occur when teeth are treated nonsurgically are consistent with those that occur after tooth extraction.

Fig. 5b. Two-year recall image demonstrates excellent endodontic treatment and healing of apical periodontitis. Courtesy of Dr. Deb Knoop.

Fig. 1b. Three-year recall image. The patient has benefited from both root canal treatment and implant therapy. Courtesy of Dr. Tyler Peterson and the University of Minnesota School of Dentistry.

Fig. 2b. Two-year recall image reveals both excellent endodontic and restorative treatment. Note healing of lateral radiolucency. Courtesy of Dr. Joe Petronio.
In systemic and local factors, it is critical to include the patient’s concerns during treatment planning. Common patient-centered factors include costs, treatment time, and patient health. Financial considerations influencing a patient’s decision when choosing to undergo endodontic treatment may also impact choices.

Endodontic treatment options are more preferable over surgery in patients with an impaired quality of life. If fewer than 75 percent of patient reports being satisfied with the outcome and 40 percent of implants are unstable or require additional procedures, the implant is used to restore an edentulous or partially edentulous area, all odds of survival of patient having a positive experience with implant therapy. If issues include: surgical implant, bone loss, peri-implant soft tissue, mechanical and esthetic/phonetic.

A retrospective study directly compared the rates of additional interventions related to complications. Implant cases had a substantially higher percentage for both intervention and maintenance visits than endodontically treated teeth. The retrospective policy evaluation study suggests that patients from both groups have minimal complications at one year follow-up.

**Endodontic retreatment options**

The consequences of failure and subsequent treatment differ between endodontics and implants. Endodontic failure can usually be addressed successfully by retreatment using the extraction and potential implant placement. Interception after implant failure may result in additional treatment needs, which may be due to new complications that require an intervention to assist the clinician in rendering the highest quality of care. The standard of care must be applied equally to all clinicians, generalists and specialists alike. The American College of Endodontists (ACE) evidence-based guidelines recommend that clinicians are advised to explore all options before recommending extraction. Referral to an endodontist can aid in the retention of a compromised tooth.

**Conclusion**

Patients are living longer, therefore, the preservation of the natural dentition is more important than ever. Helping patients maintain their “Teeth for a Lifetime” is the fundamental goal of dentistry and often aligns with the desires of the patient. A wide range of endodontic procedures result in a high level of tooth retention and patient satisfaction. Large-scale studies provide strong support that the restored endodontically treated tooth offers a highly predictable, long-term approach to preserving “nature’s implant” — a tooth with an intact periodontal ligament. Thus, endodontic treatment followed by an immediate restoration of equal opposing crowns to give patients service and function while maintaining their esthetics for the rest of their lives. Evidence indicates that the high survival rates of restored teeth may vary from minimal restorative procedures.2,15

**References**

1. Patients taking aspirin or anticoagulants, i.e., heparin, medications may have an increased risk of bleeding due to the increased risk of wound healing or osteonecrosis of the jaw. This may affect treatment planning for both implant and emergence in the coronal direction. It is generally recommended to wait for the completion of healing before the final emergence is achieved.

**Local factors**

- **Diagnosis**
- **Restorability assessment**
- **Preparation techniques**
- **Esthetic**
- **Prophylaxis**
- **Anesthesia**
- **Microbiologic**
- **Immunologic**
- **Radiographic**
- **Endodontic treatment**
- **Implant therapy**
- **Financial considerations**
- **Endodontic treatment options**
- **Endodontic retreatment options**

**Ethics and interdisciplinary consultation**

Clinicians are ethically bound to inform patients of all reasonable treatment options, explain the risks and benefits, including the cost of each available treatment option, and obtain informed consent before initiating treatment. The clinician should be conversed in an impartial manner. Patients value participation in the decision-making process and maintenance of informed choices regarding either endodontic or implant therapy. It is the patient’s best interest prior to considering extrac- tion, whether the patient has a compromised natural tooth or a compromised implant tooth. The endodontist should be well-versed in implant treatment planning and willingness to make an informed choice regarding all replacement options.

If a tooth has a questionable prognosis, the endodontic specialist becomes the indispensible part of the endodontic treatment planning team. The endodon- tist has experience with various treatment options that have potential to preserve the natural dentition. Consultation regarding a questionable tooth is often in the patient’s interest prior to considering extraction. Extraction should be planned and described to the patient. Endodontic treatment and implant therapy should not be considered alternative treatments, rather as complementary treatments to aid the patient in achieving the most appropriate patient situation.