Preservation of the natural dentition is the primary goal of dentistry. Published surveys indicate that patients generally value preserving their teeth and desire to save their natural dentition in favor of extraction whenever possible. Significant technological and biological improvements have been made in recent years, making it possible to conserve many teeth previously lost due to caries or gingival disease. The use of minimally invasive restorative methods and best practices for interdisciplinary treatment planning has allowed dentists to repair teeth damaged by both caries and periodontal disease.

Dental implants are one of the most important aspects of modern dentistry. These small titanium cylinders are surgically inserted into the bone of the jaw and provide a supportive base for restorative structures. Implant dentistry provides a viable alternative for the replacement of missing teeth.

There has been an increasing trend toward replacing diseased teeth with dental implants. Often, an inaccurate or inappropriate indication for tooth extraction has resulted in the removal of teeth that may have been salvageable. Teeth compromised by pulpitis or periodontal disease are of value and should not be extracted without thoroughly evaluating restorability and potential treatment therapies.

A recent systematic review published in the Journal of the American Dental Association highlights a key issue: “Survival data for the long-term survival rate of dental implants comparable to that of periodontally compromised natural teeth that are adequately treated and maintained.” Nineteen studies with a follow-up period of at least 15 years were included in the analysis. The results show that implant survival rates do not exceed those of compromised but adequately treated and restored natural teeth. These findings support other studies comparing long-term survival of implants and natural teeth, providing important messages. Periodontally compromised teeth should be treated aggressively with quality treatment and appropriate maintenance. Therefore, it may be advisable to postpone implant consideration for the periodontally susceptible patient to fully utilize and extend the capacity of the natural dentition.

Treatment planning options
A key focus of the Joint Symposium involved treatment planning decisions regarding endodontic treatment and implant therapy. Should a tooth with a nonrestorable crown or root canal treatment be replaced with a crown or root canal treatment and restoration, or be extracted and replaced with a dental implant prosthetic restoration? This assessment involves a challenging and complex decision-making process that must be customized to suit the patient’s needs and desires. The topic has received considerable attention in the literature, the media, and at dental conferences and meetings.

Endodontic treatment and implant therapy should not be viewed as competing alternatives, rather, as complementary treatment options. The appropriate situation for each treatment option will depend on factors such as patient and treatment preferences, location of the root canal treatment, and post-treatment endodontic considerations. Endodontic treatment on teeth with nonrestorable crowns should be the treatment of choice. Endodontic treatment on teeth with nonrestorable crowns or teeth with nonrestorable periodontal conditions is contraindicated, and other options such as implant placement should be considered.

When making treatment decisions, the clinician should consider factors including outcome assessment, local and systemic case-specific issues, cost, the patient’s needs, and esthetics, potential adverse outcomes and ethical factors.

Outcome assessment: Success and survival
Treatment outcomes play a key role in the assessment of different treatment options. Patients often ask us whether a procedure is going to be successful or not. This question can be challenging for a clinician to answer due to the variety of reported outcomes in the literature. There are different methodologies and criteria used to evaluate the outcomes for root canal treatment and implant prosthetics, which makes comparisons between success rates difficult, if not impossible.

Multiple large-scale studies including millions of teeth have used survival to assess the outcome following root canal treatment. An investigation using an insurance database of more than 1.4 million root canal-treated teeth demonstrated that 97 percent were retained within a five-year follow-up period. Other studies show similarly high survival rates (Table 1). An epidemiological approach allows for the assessment of tooth retention from a large sample of patients experiencing actual care in private practices. Systematic reviews and controlled studies from academic settings complement the previous findings. Two prospective trials each reported 95 percent survival rates at four years and four to six years, respectively, after initial root canal treatment.

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.

For complex cases, referral to an endodontist with additional training and expertise may result in more favorable outcomes and patient experiences. Interdisciplinary care is important for the number of factors involved in the management of endodontically treated teeth.

The restorative dentist plays a significant role in the outcome of endodontically treated teeth. The restorative dentist is responsible for the final appearance of the tooth and the overall function. It is essential to employ an evidence-based, interdisciplinary approach that involves endodontists and specialists assembled in Chicago to evaluate the long-term survival of implants.

Dental implants are considered to be an asymptomatic tooth/implant that is present and functioning in the patient’s mouth. Therefore, the likelihood of a favorable outcome increases with both skillful endodontic care and prompt restorative treatment.

Advancements in technology aim to attain higher levels of tooth retention. The dental operating microscope, nickel-titanium instruments, apex locators, enhanced irrigation protocols and dentin preservation techniques are examples of improvements that allow clinicians to reliably treat and manage a greater range of treatment options. Advances in cone-beam computed tomography facilitates more accurate diagnosis and improved decision-making for the management of endodontic problems.

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 32 studies (approximately 5000 teeth treated endodontically and treated teeth and 27 studies [approximately 12,000 implants] on single-tooth implants. The outcome data demonstrated no difference between the two groups during any of the observation periods. Another systematic review supported the Academy of Osseointegration’s conclusion that the outcomes of endodontically treated teeth with those of single-tooth implant-replaced crowns were comparable. The only difference was that implant prostheses were longer lasting.

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Fig. 2a. Pre-op image of tooth #23 with pulp necrosis and symptomatic apical periodontitis. The patient requested a fixed partial restoration from an endodontist who determined the tooth to be treatable. Fig. 2b. Two-year recall image reveals both excellent endodontic and restorative treatment. Note healing of lateral radiolucency. Courtesy of Dr. Joe Petrosa.

Table 1. Survival rates following initial nonsurgical root canal treatment. (Table Provided by American Association of Endodontists)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Number of Teeth</th>
<th>Follow-up (years)</th>
<th>Survival (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sabath and Newhals</td>
<td>346,016</td>
<td>5</td>
<td>87</td>
</tr>
<tr>
<td>Oen et al.</td>
<td>1,350</td>
<td>8</td>
<td>81</td>
</tr>
<tr>
<td>Lacour et al.</td>
<td>48,912</td>
<td>3.5</td>
<td>94.4</td>
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</tbody>
</table>

Fig. 4a. Pre-op image of tooth #30 with previous endodontic therapy and endodontic periodontitis. A dentist initially recommended extraction and removal of this tooth with an implant. The patient requested a second opinion from an endodontist who determined the tooth to be treatable.

Fig. 4b. Four-year recall image demonstrates apical healing following nonsurgical root canal treatment. Accurate diagnosis prevented the unnecessary treatment of tooth #30. Courtesy of Dr. Martin Rogers.

Fig. 5a. Pre-op image of tooth #19 with pulp necrosis and chronic apical abscess. Fig. 5b. Three-year recall image.
In systemic and to local factors, it is critical to include the patient’s concerns during treat-
ment planning. Common patient-centered factors include, treat-
ments that are significantly higher cost, and potential implant placed.
ment intervention. After implant failure may occur, and are typically 
post-treatment apical periodonti-
The root end was resected, ultrasoni-
come with smoking, as well as genet-
ics and determining whether to treat
nonhealing, and poor oral hygiene.28
factors that should be considered in making this treatment decision.

Systemic factors
• Presence of crack(s), root fracture(s),
• Periodontal assessment: tissue bio-
• Strategic nature of the tooth as it 
• Implant esthetics in the anterior re
• Large-scale studies provide strong support for the likelihood that the restored endodontically treated tooth offers a significantly better, long-term approach to preserving “nature’s implant”—a tooth with an intact periodontal ligament. Thus, excellent endodontic treat-
ment followed by an immediate res-
toration of equal gingival symmetry may be necessary, as well as careful case selection to ensure that the high survival rates that have been reported for the restored single-tooth implant. Therefore, clinicians must consider additional factors when making treatment planning decisions, all of which must be in the best interest of the patient. Endodontic treatment and implant therapy should not be considered as competing options, but rather as complementary treatment options, depending on the specific treatment needs of the patient.

Endodontic retreatment op-
tions. A detailed explanation of the risks and

Ethics and interdisciplinary consultation
Clinicians are ethically bound to infor-
ment planning decisions, all of which must be in the best interest of the patient. Endodontic treatment and implant therapy should not be considered as competing options, but rather as complementary treatment options, depending on the specific treatment needs of the patient.

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ciation of Endodontists, ©2015. The AAE Clinical Newsletter is available at 
www.aae.org/colleagues.

Case report
A case report (Figs. 7c-o) demon-
strates an alternative treatment op-
tion for a patient to save a natural tooth. A 57-year-old female patient 
post-treatment apical periodonti-
verses outcomes.50 Endodontic 
and oral hygiene.28 Patients taking anticonvulsants or antiepileptic drugs may have an increased risk of osteonecrosis.28 Bisphos-
phates, which may impact financial cost and 

Case report contributed by Dr. Rob-
ert S. Roda.

Fig. 8. Root-end filling with MTA.

Fig. 4b. Two-year recall image. Dentist #18 had received and was receiving extensive periodontal therapy. Two dental implants have restored the maxillary sinus, inferior alveolar 
canals, and that must be observed.33,41 Several factors influence the survival of root canal-treated teeth 

The root end was resected, ultrasonic-
ate clinical profes-

Scott L. Doyle, DDS, MS

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ciate clinical professor for the Department of Endodontics at the University of Minnesota. Doyle is a Howard Hughes Medical Institute investigator, a diplomate of the American Board of Endodontics. He is a past president of the Minnesota Academy of Endodontists and chair of the AAE Continuing Education Committee and serves as a reviewer for numerous periodontal and endodontic journals, as well as a chapter on the “En-
dodontic Challenges of CBCT” on an upcoming textbook.