Making The

Right Move:

Planning Your Clinical *Strategy*

By Allison M. DiMatteo, BA, MPS

The concept of deciding between saving a tooth (ie, performing endodontics) and placing a substitute (ie, performing implant placement and restoration) hinges on several aspects of decision-making that are linked indisputably to the specific clinical situation at hand. Unfortunately, some segments of the dental profession—whether marketers, manufacturers, lecturers, or others—have pitted one specialty against the other as being better or worse for patients in the long run. As a result, the public and even some clinicians are encountering the plethora of the mixed and controversial messages and potentially opting to put the cart before the clinical horse.

Any controversy between endodontics and implants is primarily economic and more artificially manufactured than exists in reality, believes Richard E. Mounce, DDS, an endodontist based in Vancouver, WA. In essence, there is not nor should there be any competition or controversy between endodontics and implants, he says.

"There are clear indications for endodontic therapy and clear indications for implant therapy," Mounce explains. "Rarely are these treatment options so evenly weighted that when considered side by side (as to their advantages and disadvantages) that there should be a 'competition' or 'controversy,' most especially when the patient's best interest is put first."

Mike Murphy, senior category manager for implants and bone grafting for Tulsa Dental Specialties, has observed the debate within the industry as to whether endodontic treatment is the best option for the patient versus extraction or implants. Although the sides disagree, he says there are some individuals or organizations that claim that endodontic treatment is eventually doomed to fail and that implants offer a better, more favorable outcome.

"We think this is simply not true as a general rule. The fact is both treatment options have high success rates and comparable ones at that. The decision that must be made involves the probability for success of an endodontic treatment for each individual case, not as a general rule," Murphy emphasizes. "At the end of the day, it is all about what is best for the patients when diagnosing and planning treatment. The clinician should responsibly make that determination and reach the proper decision—along with the patient and the referring general practitioner—not industry experts or manufacturers quoting incomplete or suspect data."

According to Ali Nasseh, DDS, MMSc, clinical instructor at Harvard University School of Dental Medicine, what is taking place and contributing to controversy is a comparison of apples and oranges, whereas the most important consideration should be what is of the most value to the patient. He elaborates that usually what patients care the most about are health, function, and esthetics. However, consideration of "value" must take into account the manner in which the profession values the natural dentition, Nasseh says.

"Is it only a matter of function and esthetics, or do we really value our own biological tissues in a deeper, more meaningful way? If an implant or a root canal has the same 90% success rate in a given situation, it's obviously reasonable to say that a root canal is the more logical approach, since it involves saving our own biological tooth," Nasseh proposes. "But what if an implant is 90% successful and a root canal is 80% successful in a given situation? Are we to merely make decisions based on numbers, or does the intrinsic value of our own tissues and preserving them account for anything? We need to come to terms with these non-tangible factors as a profession because we've spent the past 60 years convincing patients that they should preserve their own teeth and not think of them as dispensable."

Dennis Brave, DDS, and Kenneth A. Koch, DMD, co-founders of Real World Endo, being endodontists, see the first choice as trying to save the natural dentition, if possible. This makes sense from different perspectives, including tissue management, they say. If the tooth for some reason is not restorable, that's another issue; then you have the option of an implant.

Robert A. Levine, DDS, clinical associate professor in post-graduate periodontics, perio-prosthesis, and implantology at the University of Pennsylvania School of Dental Medicine, speaking as a periodontist, notes that clinicians should always try to save teeth. "I think there is nothing that is better than a tooth," he explains. "However, when a tooth appears

"At the end of the day, it is all about what is best for the patients when diagnosing and planning treatment."

to be non-restorable for whatever reason, then an implant is a very good alternative."

According to Jon Julian, DDS, a private practitioner in McPherson, Kansas, who performs both endodontic and implant procedures, any controversy that there is probably arises when there is a case that is not straightforward, such as difficulties in performing a restoration on an endodontically treated tooth (eg, a tooth that has been fractured). In such instances, the clinician now has to make a judgment call. In the past, that judgment has gone toward endodontic treatment, he explains.

"I believe the reason for this is because most of the diagnosing of the tooth's condition has been done by general dentists, and it's only been just recently—within the last 5 years—that more general dentists are starting to refer out for implants," Julian observes. "Clinicians have gone to great lengths to perform a root canal, to perform heroic dentistry and restore a tooth, where maybe it wasn't indicated and perhaps an implant would have been more appropriate."

Further, Julian suggests that any issues surrounding an endodontics vs implants debate most likely stem not from initial, beginning stage root canal therapies. Rather, he says the issue occurs when a tooth that has been treated with a root canal is having a problem and the question is whether to retreat that tooth with endodontic surgery in order to save it, or extract it and place an implant.

But again, it's a matter of diagnosing the specific case and making proper decisions in the treatment-planning process. This month, *Inside Dentistry* explores this supposed controversy and provides information and insight to help readers better understand the issues they may face when deciding between saving a tooth with endodontics and extracting it and placing an implant as a substitute.

TO SAVE OR NOT TO SAVE

Keith D. Rossein, DDS, president of International Dental Consultants and the editor/publisher of *Implant News & Views*, commented that the question of choosing between endodontics and implants is an improper one. The only way to have implant dentistry is if the tooth is removed. "So, the questions are really, 'When can you save the tooth with endodontics?' and 'When should it be extracted and an implant placed?'" he says. "As a general rule, it's always better to save the tooth, in my opinion, if you can." See *Some Questions to Ask When Determining Whether to Save a Tooth*, page 128.

According to Gregori M. Kurtzman, DDS, MAGD, DICOI, a key question to ask when determining whether or not to proceed with endodontics is, "Is the tooth restorable as is?" He explains that it doesn't matter that the canal system within the tooth can be instrumented and obturated if the tooth cannot be predictably restored and maintained in the long term.

Restorability is determined by what is left of the tooth following removal of decay and any existing restorative material, Kurtzman elaborates, offering several questions to help with this determination. Can the new restoration's margins be placed coronal to the crestal bone and not violate biological width? In multi-rooted teeth, is the remaining tooth structure internally in the furcation area thick enough to provide structural strength to the remaining tooth? Are cracks apparent internally in the tooth that may increase the chance of structural failure of the tooth?

"Deciding which plan to recommend and follow must take these factors into account and examine which treatment has the best prognosis, keeping the patient's health and lifespan into account," Kurtzman explains. "If a tooth can be restored without compromise to adjacent teeth, then it is better to maintain the natural tooth due to the proprioception that implants do not have."

Robert A. Horowitz, DDS, clinical assistant professor in the departments of periodontology and implant dentistry,

biomaterials, and biomimetics at New York University College of Dentistry, recalls seeing a number of patients recently with catastrophic fractures of the maxillary premolars. When an upper premolar tooth fractures below the gingival level, once the pulp chamber is exposed, saving the tooth would require endodontic therapy, crown lengthening, fabrication of a post, and then placement of a crown restoration, he explains.

"All of these are procedures that are done routinely. However, teeth that have undergone endodontic therapy are often more brittle and more likely to fracture in the long run," Horowitz says. "Adding that risk to a tooth that has already fractured and—if you have to eliminate some of the hard and soft tissue support of that tooth by performing a crown lengthening procedure—leaving a greater crown-to-root ratio and more chance of mobility of the tooth, you have an even greater chance of fracture of the tooth."

Further, if the tooth is fractured facially and clinicians need to remove bone and gingiva, then an esthetic compromise could result, Horowitz notes. If the tooth fractures interproximally, bone or gingiva may need to be removed from an adjacent tooth, which could lead to functional or esthetic problems, or could potentially even open furcations and put the adjacent tooth at greater risk, he says.

"When you take these factors into account, sometimes even if a non-restored or restored tooth has fractured that has not yet had endodontic therapy, it may be in the patient's best interest to preserve the maximal bone and gingival support, extract the tooth, augment the site, and place an implant," Horowitz suggests.

Kurtzman says that natural teeth can be modified to improve restorability by moving the crestal bone in relation to the restoration's margin and permitting a restorative ferrule to be placed. Doing so may involve osseous crown lengthening. However, the drawback to this approach is that surgically, bone needs to be removed mesial and distal to the tooth requiring crown lengthening. In multi-rooted teeth, this may create furcation exposure leading to periodontal issues, difficult home care, and loss of the tooth long term, he adds.

An alternative to crown lengthening when additional tooth structure is needed to place a ferrule is forced orthodontic eruption. This permits treatment of only the tooth in question, with no periodontal compromise, and it works well in teeth with sufficient root length that can afford a change in the crown-to-root ratio, Kurtzman explains. As with crown lengthening, this can create issues in multi-rooted teeth, since the forced eruption may expose the furcation area, he says.

Internal cracks also compromise the structural integrity of the tooth and may be warning signs to ultimate failure of the tooth under function. If these cracks do not extend across the pulpal floor or into the roots, then restoration of the tooth with a bonded core and full-coverage restoration may offer good long-term results, Kurtzman says.

However, when even after endodontic treatment the tooth remains symptomatic, this may indicate deeper structural issues than are visually appreciated, and extraction and replacement with an implant is the more prudent treatment

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choice with better predictability, Kurtzman emphasizes.

Further, Michael Sonick, DMD, a private practitioner and lecturer, notes that even when endodontic therapy is successful, it usually requires a crown restoration on that area that may need to be redone at some point. He says that according to published data, the average crown lasts only approximately 7 to 10 years before it must be replaced on a natural tooth because it usually decays. When placed on an implant, decay is not an issue.[1]

"Dentists should understand that endodontics must be performed with the ultimate restoration in mind. When performed properly—and that's the key thing, when performed properly—endodontics and endodontically treated teeth can have as excellent a long-term prognosis as implants," Koch explains. "You have to perform endodontics in such a way that you can really successfully enhance the long-term retention of the tooth."

DISCLOSING THE ALTERNATIVES TO PATIENTS

When viewed objectively, 99.9% of the time there is a best choice for the patient, explains Mounce. This "best choice" should be a decision made by the patient after being fully informed of the risks and benefits of each procedure. If bias, empiricism, economics, and opinion are taken out of the treatment planning, each procedure (ie, endodontics or implants) has a set of predictors for success (and failure) that are quite well-defined, he says.

"Abide by the principles that govern optimal execution of the service, and success and healing are very predictable," Mounce suggests. "In the most general terms, most patients, when faced with the costs, time, and treatment requirements, will opt to keep their natural teeth if possible."

It's that "if possible" question that becomes important. According to Kurtzman, if a tooth that has had a previous endodontic treatment can be retreated conventionally and the tooth is restorable with good osseous support, then endodontic retreatment is the treatment of choice. But when an endodontically failing tooth will require apical surgery or has a periodontal factor that has led to support issues, then a more prudent long-term prognosis may be found with extraction and implant placement, he says.

"Financial decisions also play a factor in these cases," Kurtzman says. "Should the patient invest in endodontic retreatment, which, as with all treatment options clinicians offer, does not have a 100% success rate, or use those funds toward the more predictable treatment of implant placement?"

Currently Murphy estimates that the cost for molar endodontics ranges from $1,200 to $1,400 without any restoration (eg, crown). A single implant placement without any restoration or laboratory fees is estimated at about $2,000, he says.

"There are a number of issues surrounding an implant that are not problems faced with the restorative effort of a natural tooth. Some implants will require a sinus lift, tissue grafting, or bone augmentation (many times multiple procedures), in order to give them the best chance of success. These are all, in general, added to the fees that a patient has to deal with when they're choosing an implant," Brave explains. "I think it's rather clear that under normal circumstances when an implant includes these adjunctive procedures, it's going to be considerably more expensive than endodontic treatment and restoration of that endodontically treated tooth."

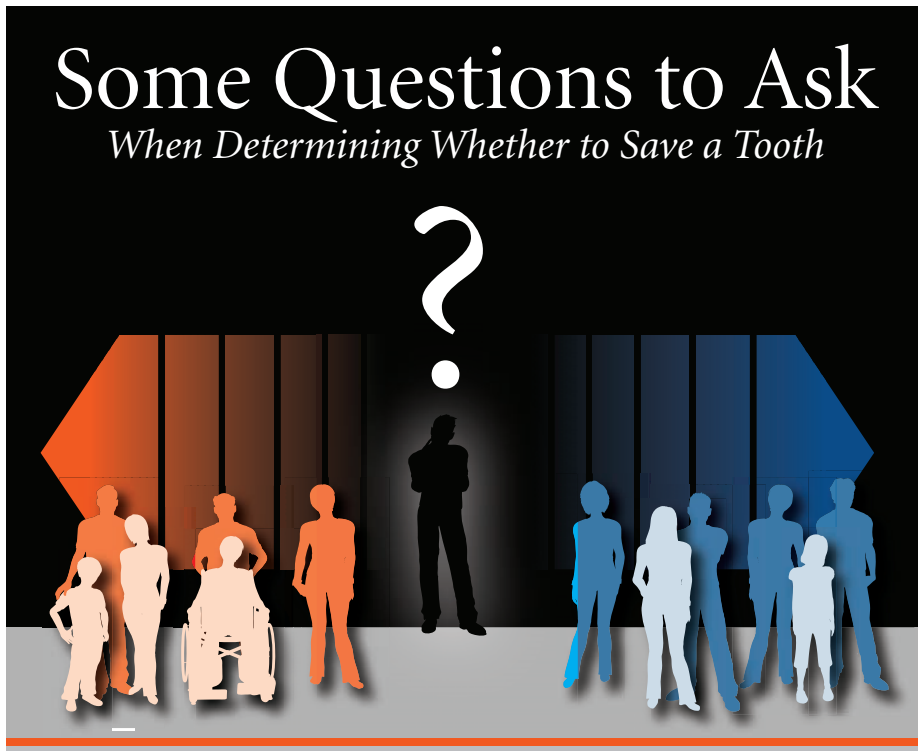
According to Horowitz, the entire treatment planning and diagnosis area is gray, with no black or white; the prognosis of a tooth is different depending on the age of the patient, the patient's caries index, the gingival and bone support, and the patient's periodontal susceptibility. But one thing remains clear: the need for disclosure as far as predictability of endodontic therapy or implant therapy in terms of esthetics, restoration, potential need for retreatment, and anatomy (eg, proximity to the inferior alveolar canal).

"I think probably the most important item when you're interviewing patients regarding treatment possibilities is to give them the options that are available to them, along with the prognoses and various success rates," believes Sonick. "What I don't like to see are treatments being successful for a short period of time and then saying, "Well, we can get a few years out of something and then we'll consider the options." I like to go forth and give the patient the option of doing something that would have a very, very high long-term success rate."

Levine notes that regardless of the prognosis of the tooth, clinicians still need to present patients with all of their other options, such as a three-unit bridge, endodontics, or an implant. "I think the clinician needs to guide the patient as to what is in their best interest long-term," he says. "In a tooth that's mobile, has a short root length, that is missing a lot of the sound tooth structure, that needs a surgical crown-lengthening procedure and has good apical bone for an implant, those are good indications to do an implant."

Nasseh echoes the comments of others, noting the importance of informing

[1] Priest G. Predictability of soft tissue form around single-tooth implant restorations. *Int J Periodontics Restorative Dent*. 2003;23(1):19-27.



In developing this feature presentation, several *Inside Dentistry* editorial board members provided background and insight into the issues and questions surrounding the topic of when to save a tooth with endodontic treatment and when to consider extraction and placing an implant. The questions that resulted from their input appear below.

However, significant to determining whether a tooth can be saved or not is using a team approach to diagnosis, something that Robert A. Levine, DDS, believes is imperative to the process. The team, he says, is comprised of the patient, general practitioner, oral surgeon, periodontist, endodontist, and restorative dentist.

"Unless it's very clear cut, I want the opinion of my colleagues," Levine emphasizes. "I never make the decision alone if I have any questions about apical periodontitis, tooth mobility, a crown-to-root ratio problem, or insufficient tooth structure. These are things we look at collectively to determine if the tooth can be saved or not be saved."

Additionally, Ali Nasseh, DDS, MMSc, notes that decisions regarding endodontic treatment cannot be made without full knowledge. For this reason, he also believes that a team approach involving the periodontist, endodontist, and oral surgeon enables clarification of any limitations to treatment and development of the best solution for the patient.

"Ultimately, it's about the patient and making the right decision that serves his or her purposes in the long run based on their value system," Nasseh says. "The decision about what to do should be based on the principle of saving the patient's oral tissues and dentition using ideally minimally invasive procedures. If we abide by these basic principles, we should develop the right answer for what's best for any given patient."

Questions to Ask

- Is the tooth periodontally involved?
- Can you complete the root canal successfully?
- Would there be sufficient tooth structure remaining to restore the tooth and ensure structural support/integrity?
- Is the tooth restorable as is or does it require periodontal surgery (ie, crown lengthening to restore the tooth)?
- If crown lengthening is necessary, will it have a major impact on the bony support, periodontal status, and esthetics of the adjacent teeth?
- Is this an endodontic retreatment?
- If so, what will be done differently to provide for better success and prognosis of the tooth?
- What is the prognosis of the endodontic treatment? If the prognosis is guarded or marginal, is an implant more predictable?
- What is the caries susceptibility of the patient? Are they taking any medications causing dry mouth and generalized root caries with Sjögren-like symptoms?
- What is the periodontal status of the teeth in the arch?
- How important is the affected tooth to the overall case? A compromised tooth can affect a full-mouth rehabilitation and, in such instances, placing an implant may be more appropriate.

patients of the possibilities down the line of one modality versus the other, and making a decision based on what's good for the patient in the long term. "What I've found is oftentimes dentists may make decisions for patients without spending enough time asking questions to find out what it is that's important to them," he says.

After elaborating on the benefits and risks of the different treatment options, it's important to give patients a list of things they should consider when they make their decision, Sonick explains. The first thing might be cost (ie, what are the differences in cost between an implant and a crown and endodontics?) What are the short-term costs and the long-term costs? The second consideration might be esthetics, he says, and the third consideration might be prognosis (ie, long-term vs short-term). Finally, Sonick suggests that patients consider any pain that may be associated with the options presented.

"I find that very few patients are ever given an opportunity to make a decision in their own healthcare. Most of them just go along with what the doctor has suggested to them," Sonick has observed. "Sometimes it's better to let the patient make those decisions because then they can get what's more appropriate for them. You have to disclose to the patient all of the options that are available to them regardless of what your personal feelings may be."

SCRUTINIZING STUDIES AND SUCCESS RATES

When looking at success rates for either implants or endodontic treatments, it's important to emphasize that both types of dentistry demonstrate success. Both types of treatments have caveats and cautions, and to compare the failures rates of the two types of treatments is to compare apples and oranges, our interviewees suggest. Some studies are retrospective, examine only certain symptoms or presentation criteria, and inclusion criteria may not be universal.

Levine comments that there are not enough studies of endodontically treated teeth versus teeth that have been restored with implants in which the researchers examined similar teeth (ie, single-tooth implants, single-rooted tooth root canals). Further, it's not clear if the teeth have been restored with a crown, what type of post was done, or whether there was any apical disease remaining. In past studies, it has been hard to trust in the results presented, he suggests.

"We really need, number one, a study that is going to compare exactly what I

Developments in Endodontics and Implants

In the areas of endodontics and implant dentistry, both have excellent technologies and proven techniques that achieve high comparable success rates, according to our interviewees. Available materials and practice protocol lend themselves to predictability in the clinical practice. The advancements and developments that have occurred in both arenas ultimately benefit patient care by enhancing treatment comfort and long-term prognosis.

Endodontics

While others may have their own beliefs about the optimal methods for endodontic treatment and may champion those methods, Richard E. Mounce, DDS, believes that the highest endodontic success can be accomplished with a surgical operating microscope, unconditional use of the rubber dam, achievement and maintenance of apical patency, rotary nickel titanium instrumentation, ultrasonically activated bactericidal irrigation with a combination of solutions, smear layer removal, warm bonded obturation, and early coronal seal. He further notes that these should be applied in an environment where 1) the patient has been fully informed of the risks and benefits of treatment and 2) treatment is performed with adequate time to optimize all variables.

"With the advent of nickel titanium rotary files, ultrasonics, better magnification and light sources, the surgical operating microscope, and greater advancement in surgical techniques and materials, teeth today that we once thought were not treatable have been able to undergo very routine procedures in today's dental clinic," explains Jim Tinnin, DDS. "All of those developments have opened a lot of doors for people that before would have just had teeth extracted."

According to Kenneth A. Koch, DMD, co-founder of Real World Endo, in the past and even currently, there have been different endodontic techniques for shaping the canal, and these produce either a constant tapered shaped or a variable tapered shape, dependent upon the different instrumentation systems available. Going forward, Koch believes professionals will move toward a more conservative shape at the top of the canal in order to help preserve the integrity of the tooth.

"The preservation of that radicular dentin is going to enhance the long-term retention of the endodontically treated tooth," Koch believes. "As a result, you're going to see more use of a constant taper preparation that allows anyone doing endodontics the ability with irrigation protocol to satisfy all of the biologic requirements in such a way that it enhances the long-term retention of the tooth."

Dennis Brave, DDS, co-founder of Real World Endo, elaborates that endodontics today is about choosing to do minimally-invasive techniques that do not destroy tooth structure, but which maintain the structural integrity of the tooth. This follows through from instrumentation all the way to obturation and restoration, he says.

Implants

Primarily a clinical endodontist and not an implant surgeon or restorative dentist, Mounce's knowledge of the advancements in implants is based on the literature and extensive discussions with other colleagues. A recent recipient of implants himself, he says he was reassured by the fact that his periodontist used an ICAT during the treatment planning and execution of his surgery, as well as the fact that there are many systems that can provide excellent clinical results.

"With the application of CT scans and cone beam technology to the diagnosis and treatment planning process has allowed my treatment of patients that years ago weren't treatable," Tinnin says. "We, as clinicians, enjoy higher success rates with implants because of these technologies, and patients have options based on a modality that is going to last them a lifetime."

Tinnin adds that implant case planning and engineering is now more of a prosthetically driven function rather than a bone-driven function. Using guided stents and bone grafting materials that are available today, the techniques and science behind implantology have been enhanced to the extent that these treatment opportunities are much better for patients, he says.

In recent years, the category of narrow-body implants has changed the manner in which patients with congenitally missing lateral incisors (eg, extremely small maxillary space usually filled by orthodontic movement) or missing mandibular incisors are treated, explains Keith D. Rossein, DDS. These very thin, very narrow implants (ie, anywhere from 1.8 mm to 2.5 mm in diameter) have been accepted for long-term use, giving clinicians an option to place a fixed implant-supported restoration for patients with these types of missing teeth.

Further, Robert Horowitz, DDS, who performs extensive research on implant surfaces and bone regeneration, adds that other advancements in implants include their design and surface technology. Newer surfaces improve the stability and speed of osseointegration. In terms of placement techniques, bone grafting in sockets, sinuses, and ridges has also been improved. Enhancements such as predictable bone regeneration enable surgeons to graft a deficient alveolar site and replace the missing volume with living, vital bone, not just non-resorbable scaffolds.

BRIDGING THE GAP

Jon Julian, DDS, a private practitioner who performs both endodontic and implant procedures, personally tries to avoid bridgework whenever possible and instead place single-tooth implants. However, he notes that if a patient decides that a bridge is their choice, rather than an implant, then he will provide it.

"A root canal treated tooth may have more difficulty down the road depending on what it's supporting. If that tooth is going to support a large span bridge, it may fail," Julian says. "Implants have no carious failure rates and do not fracture. So, over an extended period of time, the lifetime of the patient, the option for a root canal is a good conservative choice, but the implant probably has a higher success rate over the lifetime of the patient compared to a bridge."

According to Keith D. Rossein, DDS, because a tooth won't ever be as strong as it was once it's been treated endodontically, such teeth may not be good choices for abutment teeth or a bridge since too much stress may be placed on it.

"There are a lot of reasons to believe that a single-tooth implant now is better or longer-lasting and will do the patient more service over a long period of time compared to a three-unit bridge," explains Rossein. "Over a 10-year period of time, bridges have been shown to develop recurrent decay at the edge of the abutment crowns, porcelain fractures, periodontal problems, and cement failure.[a] This doesn't take into account that in the area where the tooth is now missing, the pontic area, that bone is continuing to resorb because there is no tooth."

Rossein adds that when bridges are used to replace a missing tooth, the abutment teeth used to anchor the fixed prosthesis are often "virgin" teeth that are—or at least were—fairly strong. However, he notes that once they've been prepared, the damage is done.

"When you place the single-tooth implant, you're not touching the abutment teeth," Rossein explains. "Also, you're continuing to stimulate the bone properly so you don't have bone resorption in that particular area."

[a] Misch CE. The importance of dental implants. *Gen Dent* 2001;49(1):38-45.

"...regardless of the prognosis of the tooth, clinicians still need to present patients with all of their other options..."

mentioned regarding teeth that have been restored with a root canal, that have no apical disease, that have been crowned, versus an implant in the same mouth or in somebody else's mouth over the same period going for 5 years or 10 years," Levine suggests. "I think that's where you'll have some value.[2]"

Julian has observed high success rates for both endodontics and implant therapies in his 30 years of experience, but he notes that the treatment plan should boil down to what is in the best interest of the patient. What is in the best interest of the patient should be based on clinical decisions, the experience of the doctor, and the patient's desires.

"I don't think a study is going to give us clarity," Julian says. "I think the research is beneficial, but clinical dentistry requires judgment and decisions based on myriad factors that research doesn't always address."

Anecdotally, Horowitz has observed the survival rates of dental implants in the literature to be much higher than the survival rates of endodontically treated teeth, especially if the endodontically treated teeth have a periapical lesion, which often predisposes them to failure or the need for retreatment. In particular, he cites a 1997 report by Hepworth and Friedman in which the authors state that if there is a periapical lesion on a previously endodontically treated tooth, the success rate of the retreatment is only 66%.[3]

Sonick notes, however, that the success rate for initial root canal therapy approximates 90% to 95% if no apical periodontitis is present, especially for single-rooted teeth. An investigation at the University of Toronto by Farzaneh and colleagues showed that the presence of apical periodontitis lowers the success rate by 10% to 15% or so and lowers the success rate to 80% over 4 to 6 years, he explains. If a tooth needs retrograde treatment for periapical lucencies, the predictability drops even further, increasing the chance of failure, he says.[4,5]

"As I mentioned, there are widely different criteria being used to measure the success rates of implants and root canal treatment," Levine says. "Because the studies that do exist are 5, 10, or more years old, things have changed so much. Until we have better studies, it's difficult to compare the success rates of the two modalities."

According to James M. Tinnin, DDS, MSD, a diplomate of the American Board of Endodontics in private practice in Fayetteville, Arkansas, there are studies available, and there have been for quite some time, showing the treatment success rates of both modalities. Unfortunately, some implant manufacturers misrepresent the endodontic success rates, he says.

"For example, in the literature from 1977 to 1989, there are some 35 articles that use a criteria for implant success by which the implant is still in the mouth, where usually criteria for endodontic success is more on a histological basis, along with radiological data and patient's symptoms," Tinnin explains. "It's a more scientific approach."

He notes that some implant researchers are starting to move in such a direction, but that there are still implant studies in which some failures (eg, patient comfort, damage to the adjacent teeth, violations of the maxillary sinus) have been considered separately. When failures are removed from the start, the "successes" are going to appear better, Tinnin says.

"Success rates in implant studies and success rates in endodontic studies have very different criteria as to what is considered a success," reiterates Koch. "In my opinion, there are indications for both treatment modalities, but the research in magazines is skewed toward implants. I don't want dentists to forget all of the excellent benefits that endodontic therapy can offer their patients."

According to Nasseh, over the past 50 years, there have been approximately 50 or 60 outcome studies in endodontics with a range of successes, anywhere from 60% up to nearly 100%. Therefore, when people are trying to make a point for implants, they tend to pick those studies with the lowest success rates, he says.

"If you were to just compare survival of a tooth, then a recent, very large epidemiological study on root canal therapy that included about 1.4 million endodontically treated teeth across a population of 1.12 million people in the United States shows that 97% of teeth that were treated endodontically were still in the mouth after eight years[6]," Nasseh says. "Survival was the criteria for the study, which is basically the same criteria used in implant studies. Only 3% of those endodontically treated teeth were extracted and, of those,

[2] Iqbal MK, Kim S. For teeth requiring endodontic treatment, what are the differences in outcomes of restored endodontically treated teeth compared to implant-supported restorations. *Int J Oral Maxillofac Implants*. 2007;22(Suppl):96-116. From: State of the Science on Implant Dentistry, Consensus Conference Proceedings.

[3] Hepworth MJ, Friedman S. Treatment outcome of surgical and non-surgical management of endodontic failures. *J Can Dent Assoc*. 1997;63(5):364-371.

[4] Farzaneh M, Abitbol S, Lawrence HP, Friedman S. The Toronto Study. Treatment outcome in endodontics—the Toronto Study. Phase II: initial treatment. *J Endod*. 2004;30(5):302-309.

[5] Farzaneh M, Abitbol S, Friedman S. Treatment outcome in endodontics: the Toronto study. Phases I and II: Orthograde retreatment. *J Endod*. 2004;30(9):627-633.

[6] Salehrabi R. Endodontic treatment outcomes in a large patient population in the USA: An epidemiological study. *J Endod*. 2004;30(12):846-850.

THE *Inside* Look FROM...

Issue after issue, the feature presentations in ***Inside Dentistry*** *deliver coverage of the relevant and thought-provoking topics specifically affecting the dental profession, as well as oral healthcare in general. The publishers and staff could not bring the underlying concerns surrounding these timely issues to the forefront without the insights shared by our knowledgeable and well-respected interviewees. For their collective generosity of time and perspectives, we extend our sincere gratitude.*

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a great majority was not restored. So it's possible that they were extracted because of the lack of restoration."

Further, Nasseh points to another study—one conducted at the University of Minnesota—that suggests that the success rates for non-surgical endodontic treatment and single-tooth implants are the same.[7] However, he notes that what this study also showed was that implant therapy demonstrates a longer time to function and higher incidence of postoperative complications than endodontic treatment.

"When failures do occur, you cannot blame the root canal procedure itself for the failure," Nasseh emphasizes. "Research has demonstrated that in cases of endodontic failure, a large percentage of them have been performed below the standard of care.[8,9] Therefore, in my opinion, when endodontics are performed properly according to the standard of care and using modern techniques, the treatments have a very high success rates."

CONCLUSION

When taken in the context of what the patient needs rather than the modalities that a dentist does, the decision about whether to save a tooth or extract it and place an implant as a substitute becomes is pretty simple, believes Tinnin. "In today's clinical practice, there are very, very few either/or situations," he says. "If a diagnosis is correct, both modalities (ie, endondontics or implants) enjoy a very high degree of success. Each patient must be evaluated on a case-by-case basis and not categorized as an implant or an endodontic treatment option."

Further, although it's been noted that additional studies are needed to help determine when and to what extent certain treatment modalities are appropriate and successful, they cannot provide the skill and technical care needed to carry out an implant placement or a root canal to the highest level, emphasizes Mounce. An excellent final result is ultimately a function of sound treatment planning and optimal technical service.

"While comparing implants versus endodontics on a Meta analysis or literature basis has a place and provides some guidance, the procedure has to be planned and carried out correctly, irrespective what the success or failure studies might show," Mounce says.

"We think endodontics and implants are equally terrific. But whichever modality of treatment is chosen, we hope that the clinician performs it in such a way that it enhances the long-term prognosis," Koch explains. "In terms of endodontics, we think right now that the person doing root canals has to be very cognizant not to remove an excessive amount of coronal, radicular dentin."

In the end, conservation and preservation of nature should—whenever possible—be the goal. "The natural tooth is the best implant, and no material we have today meets the gold standard of the healthy, natural tooth. But as with the natural tooth, every treatment we perform today also has a life cycle, and it eventually needs to be replaced," explains Tinnin. "It is our mission as clinicians to properly diagnose, treatment plan, and perform treatment to the highest level of care. The longer we can extend this life cycle, the healthier the patient is and the more economical a treatment has become."

7 Doyle SL, Hodges JS, Pesum IJ, et al. Retrospective cross sectional comparison of initial nonsurgical endodontic treatment and single-tooth implants. *JOE*. 2006;32(9): 822-827.

8 Sjögren U, Figdor D, Persson S, Sundqvist G. Influence of infection at the time of root filling on the outcome of endodontic treatment of teeth with apical periodontitis. *Int Endod J*. 1997;30(5):297-306.

9 Sundqvist G, Figdor D, Persson S, Sjögren U. Microbiologic analysis of teeth with failed endodontic treatment and the outcome of conservative re-treatment. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 1998; 85(1):86-93.