Chapter 11 Dental Implants Therapy

INTRODUCTION

The history of implants and their surgical placement, indications, healing process, etc. have been discussed in great detail in a previous book (Dibart, 2007). The purpose of this chapter is a little bit more challenging. What evidence do we have that the treatments we are rendering are really necessary or effective? And if so, how effective? We looked at systematic reviews in our attempt to answer these questions in light of the most recent evidence-based research literature available. Such reviews of the existing literature can be found in various databases (MEDLINE, Cochrane, EMBASE). Several authors have described the value of systematic reviews in dental research, and as a result they have been recognized as powerful research tools in evidence-based dentistry. Systematic reviews are inherently less biased, more reliable, and more valid than narrative reviews (Carr, 2002; Bader, 2004). The treatment decisions we make need to be based on the scientific study of clinical outcomes taken from properly documented and executed clinical research.

INDICATIONS

Implant therapy is aimed at replacing natural teeth that have been lost in the past or had to be recently extracted, leaving an area edentulous. So let us look at a few reasons why we would need to extract natural teeth. The decision to extract is made when the restorability of the tooth is in doubt. The usual scenario involves incipient or recurrent caries, trauma, endodontic failure, root fracture, and periodontal disease.

EVIDENCE-BASED OUTCOMES

The Tooth Extraction Dilemma: Root Canal Therapy, Fixed Partial Denture, or Implant-supported Crown?

There are enormous benefits in retaining a natural tooth; we have to remember that we, as periodontists, have the duty to preserve the natural dentition as long as possible and that dental implants, as wonderful as they are, may never replace fully natural teeth. The advantages of retaining a natural tooth include:

- Preservation of the alveolar bone
- Preservation of the papilla
- Preservation of pressure perception
- Preservation of natural structures (crown, root)
- Lack of movement of the surrounding teeth

Torabinejad et al., in 2007, after a thorough systematic review of the literature, tried to compare the long-term success rate of endodontic treatment vs. fixed partial denture (FPD) or implant-supported crown (ISC). This proved to be an arduous task, because the evidence identified by the authors did not permit them to definitively answer all of the questions posed. The evidence available for answering the questions came from mainly indirect comparisons, hence the warning that these conclusions are tentative and that there is a need for additional studies.

The concept of success is also reported differently in the literature when we compare the outcomes of RCT, FPD, or implant-supported crowns (ISC). An implant that has had some marginal bone loss and is still functional is not generally considered a failure, whereas FPD's failure can be reported as presence of recurrent decay, root fracture, porcelain fracture, loss of retention, etc. The endodontic literature is far more precise in documenting/defining success and failure. Because RCT is aimed at treating an existing disease, the evaluation of a successful outcome via radiographic monitoring or patient's lack of symptoms is much easier.

In Torabinejad's analysis, looking at 6+ years follow-up, the weighted survival data indicated that in patients with periodontally sound teeth having pulpal and/or periradicular pathosis, root canal therapy resulted in a survival rate of 97% (Table 11.1). The same rate (97%) was also found for extraction and replacement of a missing tooth with an implant. On the other hand, an extraction and replacement with FPD had a survival rate of 82%, well below that of RCT and ISC at six years. The authors also reported that FPD success rates continued to drop steadily over time beyond 60 months. This was confirmed by another review of the literature, by Salinas et al. (2004), which stated that at 15 years the rate of survival of the FPD had dropped to 69%, whereas at 11 years the cumulative success rate for implants was 93% (Naert et al., 2000). This indicates that an implant-supported crown would be the better choice when deciding on how to restore a missing tooth in a dentition.

In 2007, Stavropoulou and Koidis conducted a systematic review of the literature to test the hypothesis that the placement of a prosthetic crown on an endodontically treated

Table 11.1. Comparative long-term survival rates of root canal treatment plus crown, root canal treatment without crown, implant-supported crown, and fixed partial denture.

Treatment option	6 years	10 years	11 years	15 years
Root canal treatment with crown	97%	81 ± 12%		
Root canal treatment without crown		63 ± 15%		
Implant-supported crown	97%		93%	
Fixed partial denture	82%			69%

tooth was associated with improved survival rates. They found that the cumulative survival rates after 10 years for RCT with crowns and RCT without crowns were 81 ± 12% and 63 ± 15%, respectively. Hence, the necessity to crown the teeth that have been endodontically treated.

Author's Views/Comments: The longevity of the classical treatment—RCT, possible crown lengthening when needed, and prosthetic crown—depends on the quality of each of the steps performed by the general dentist or the specialists involved. Not all dentists are created equal, hence the variability of long-term success/survival. It is much easier and less technique-sensitive to remove a questionable tooth and place an implant followed by a crown.

Dental Implant Placement: Immediate, Immediate Delayed, or Conventional Delayed Placement?

Dental implants can be placed in fresh extraction sockets, just after tooth extraction. These are called immediate implants. They have the advantage of shortening the treatment time for the patient as well as reducing the number of surgical procedures. They also can be placed without raising a flap in most cases. The disadvantages are enhanced risk of infection and failure, the presence of a gap between the implant and alveolus, and the necessity sometimes of bone grafting (Rosenquist, 1997; Takeshita, 1997). An alternative is the immediate-delayed option. These implants are placed in the healing socket after four to eight weeks to allow for the soft tissue healing that will permit primary closure of the coronal gingiva when using a two-stage system. Finally, conventional or delayed implants are those placed several months after extraction in a partially or completely healed socket.

Esposito et al. (2008), after a very thorough review of the existing literature, found only two randomized control trials (Lindeboom, 2006; Schropp, 2003) that could be used to shed some light on which therapeutic conduct to adopt

Table 11.2. Failure rate comparison between immediate, immediate delayed, and delayed implants.

Study	Immediate	Immediate delayed	Delayed
Lindeboom, 2006 N=50	2/25 (8%)		0/25 (0%)
Schropp, 2003 N = 44		2/22 (9%)	1/22 (4.5%)

(Table 11.2). They concluded that based on the outcome from these two well-designed and -conducted studies, immediate and immediate delayed implants were viable treatment options. Looking at the raw numbers, these groups both had more implant failures and complications than the delayed implant group. Esposito et al. mentioned that patients prefer immediate delayed implants, which may provide a better esthetic outcome, even though they might be associated with increased failures and complication rates. They also mentioned that there is not enough reliable evidence supporting or refuting the need for augmentation procedures at immediate implant placements in fresh extraction sockets and that there is no reliable evidence supporting the efficacy of platelet-rich plasma (PRP) in conjunction with implant placement. Finally, they emphasized the fact that these are only preliminary results and that more randomized, controlled trials are necessary to confirm these findings.

Author's Views/Comments: All of these options are viable, but immediate implants are quite technique-/operator-sensitive. They seem to be more prone to complication/failure when compared to the delayed implants. If one does not have much experience with implant placement, one should do many delayed placements before attempting the immediate implant placement.

Is Antibiotherapy Justified to Prevent Implant Failures?

We routinely give patients antibiotics to avoid complications, but with the alarming increase in antibiotic-resistant bacteria, is this reasonable? Are we really helping the patient or are we helping ourselves to a better night's sleep? Once again, let us look at the pertinent literature. Esposito et al. (2009), in the Cochrane database of systematic reviews of 2008, tried to identify suitable randomized, controlled trials to assess the effects of prophylactic antibiotics for implant placement vs. no antibiotics or placebo administration. They found no randomized, controlled trial that could pass rigorous scrutiny (some had flaws in the methodology, others had flaws in data extraction, etc.). They concluded that there is no appropriate scientific evidence to recommend or discourage the use of prophylactic systemic antibiotics to prevent

complications and failures of dental implants. They stated, "It seems sensible to recommend the use of prophylactic antibiotics for patients at high and moderate risk for endocarditis, patients with immunodeficiencies, metabolic diseases, irradiated in the head and neck area and when an extensive or prolonged surgery is anticipated." This implies that every single healthy patient who receives an implant may not necessarily need to be premedicated and that antibiotherapy should be reserved for medically compromised patients and those undergoing long or traumatic procedures (multiple implant placement, external sinus lifts, guided bone regeneration, bloc grafts, surgery performed in infected sites, etc.).

In a 2009 update, Esposito et al. concluded that there was some evidence suggesting that 2 g of amoxicillin given orally on hour preoperatively significantly reduced failures of dental implants placed in ordinary conditions. Various prophylactic systemic antibiotic regimens are available, and the current recommendation is to keep the prophylaxis short (i.e., a single dose of amoxicillin—2 g—given one hour prior to surgery) with the understanding that with each administration, adverse events may occur, ranging from diarrhea to life-threatening allergic reactions.

Author's Views/Comments: I personally believe that we are too quick in prescribing antibiotics. But this is also a reflection on the type of litigious society we are living in—40% of the world's lawyers practice in the USA! In my opinion, a good presurgical intraoral rinse with chlorhexidine, followed by thorough cleansing of the skin (lips, nose, cheeks, etc.) and the use of surgical drapes and aseptic surgical technique should cut down on the use of antibiotics tremendously, especially when the patient is healthy and the procedure is short and atraumatic (i.e.. single implant placement).

When Should Implants Be Loaded?

Primary implant stability and lack of micro-movements are considered to be two of the main factors necessary for achieving predictable high success of osseointegrated oral implants (Albrektsson, 1981). The presence of micro-movements during the healing period may impair successful osseointegration of the implant by allowing a soft tissue interface to develop between the bone and the implant (Brunski, 1979), hence the original recommendation to keep the implants load-free during the healing period (three to four months for the mandible and six to eight months for the maxilla) (Branemark, 1977). With the current desire to reduce the length of treatment, achieve better esthetics, and reduce the annoyance of removable temporaries, we are restoring and loading the implants at a different pace. The immediately placed implant can be restored immediately (within 72 hours) and can be occlusally loaded or not (immediate provisionalization). The early loading of an implant takes place six to eight weeks after surgical placement; finally, the conventional loading takes place according to Branemark's recommendations.

Whether implants can be loaded immediately after their placement or months later has important clinical repercussions. Patients like to leave the office with teeth, and do not enjoy wearing a transitional partial denture while waiting for the process of oseointegration to take place. Furthermore, in this fast-paced society, short treatment times are appealing to the patient and dentist alike—so is this a viable option? Esposito et al. (2007) conducted a systematic review of the subject and retained 11 articles out of the 20 originally selected. They found no statistically significant difference at six months to one year follow-up between the various loading regimens.

An interesting finding that is directly correlated to the success of immediate loading is the initial insertion torque of the implant. In fact, Ottoni et al. (2005) demonstrated a strong correlation between implant failures and the initial insertion torque of the implant. Nine of the 10 immediate nonocclusal load implants inserted with a 20 Ncm torque failed, vs. only one failure out of 10 placed with an insertion torque of 32 Ncm torque (90% failure vs. 10%!) (Table 11.3). This demonstrates the imperative need to have a high degree of primary stability at implant insertion for a successful immediate or early loading procedure.

Another question that comes to mind is: Is immediate nonocclusion loading safer than immediate occlusal loading, where there is full occlusal contact with the opposing dentition? Lindeboom et al. attempted to answer this question in a randomized, controlled trial in 2006. They concluded that there is no statistically significant difference nor clinical increased failure when comparing immediate occlusal loading and nonocclusal loading.

Author's Views/Comments: It is important to use caution when reading the above-mentioned findings, because the number of patients and trials is relatively small and the follow-up period short (six months to one year). There is a need for more randomized, controlled studies to gain the definitive answers. This being said, and reviewing the relevant current literature, one notices that in the very successful trials only the "ideal" patients were recruited, using stringent selection

Table 11.3. Correlation of insertion torque values and failure rates of immediate nonocclusal load implants (after Ottoni, 2005).

Torque value	Failure rate
20 Ncm	90%
32 Ncm	10%

criteria and being treated by very skilled operators. Therefore, the chances of failure were minimized. When less experienced operators were involved, failure rates could be as high as 42% (Tawse-Smith, 2002). One constant seems to be the necessity of a high degree of primary stability (torque value of at least 32 Ncm) for the immediate loading to be successful. This could be achieved during the surgical phase by "under preparing" the osteotomy site and inserting the implant slowly, avoiding unnecessary heating of the bone. Another critical component, in my opinion, is the control of the occlusion and the necessity of avoiding lateral forces and excessive load after provisionalization.

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