Implants and Treatment Planning

Implant prosthodontics is limitless in its scope for rehabilitation. Whether a treatment requires a definitive or interim prosthesis, it is the expertise and guidance of the prosthodontist that positively affect the outcome. This issue of Report on Prosthodontics presents a potpourri of treatment protocols that a prosthodontist is best suited to provide.

A Simplified Approach to Fixed Metal-ceramic Reconstructions

Restoring the edentulous patient with an implant-supported fixed complete denture prosthesis is a challenging procedure. Fixed metal-ceramic reconstructions are inherently different from fixed complete dentures or implant overdentures. From a prosthodontic perspective, there are 3 phases of treatment for these types of rehabilitations:

1. diagnosis and treatment planning, followed by implant placement;
2. clinical assessment of post-implant placement; and
3. design of the definitive prosthesis.

Simon and Marchack from the University of Southern California clearly defined these phases of therapy, focusing on the importance of phase 2 and the clinical evaluation of the tentative treatment plan through evaluation of the provisional prosthesis. It is this phase that sets the experienced practitioner apart from the novice. Often the inexperienced clinician will choose the traditional approach of provisionalization with a removable prosthesis and then move directly to a definitive fixed restoration. The inherent problem with this approach is that the contours of a provisional removable prosthesis are vastly different from those of a fixed prosthesis; the patient's esthetics, phonetics and lip support are significantly different without denture flanges and palatal coverage. To overcome some of these differences, the authors suggested provisionalization with a fixed prosthesis to evaluate the proposed prosthesis.

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determine the need for modification to the proposed design and provide information to be communicated to the dental laboratory. They described a technique to convert an interim denture to a screw-retained fixed implant-supported provisional restoration, developing the embrasure and soft-tissue contours. The restoration may then be used to evaluate the patient's speech and ability to maintain hygiene, the need for connective tissue grafting, the use of tissue-colored restorative materials, the existence of any nocturnal parafunctional activity and the determination of the appropriate fixed restoration occlusal scheme. Once the provisional restoration is finalized, it can be duplicated and sent to the laboratory to provide a 3-dimensional blueprint.

This study clearly demonstrated the special considerations that must be taken into account when creating and placing esthetically demanding fixed metal-ceramic implant-supported prostheses. Limitations of the traditional removable provisional restoration can be overcome when a patient is treated using this approach. Not only is the prosthodontist able to make critical decisions with regard to the prosthesis design, but he or she can use the information obtained to maximize the treatment outcome by better communication with the dental laboratory.


### Immediate Function Using Zygoma Implants

Bone resorption in the posterior maxilla is quite common. Various techniques have been developed to treat the atrophic maxilla with dental implants. Grafting with various materials is one example. However, these procedures typically result in delayed protocols in which grafting is performed first, followed by increased healing time for the graft as well as after implant surgery, ultimately resulting in longer treatment times and delay of the fabrication of the prosthesis. The zygoma implant, developed to deal with this situation, has proven to be an excellent alternative to conventional dental implants.

In a retrospective study, Davo et al from the International Medimar Hospital, Spain, evaluated the survival rate of zygoma implants (Brånemark System; Nobel Biocare AB, Göteborg, Sweden) placed using an immediate loading protocol for 18 consecutively treated patients with atrophic maxillae. The inclusion criteria included:

- the need for complete rehabilitation of the edentulous maxilla and
- the need for sinus grafting, wide implants or pterygoid implants in the posterior maxilla.

The distribution of implants is shown in Table 1. The authors' aim was to evaluate the survival rate of 36 immediately loaded zygomatic implants after a minimum of 6 months follow-up.

One hundred percent of the zygoma implants survived over a mean follow-up of 14 months. Due to the difficulty in radiographic analysis of this area, only clinical survival was reported.

Within the limitations of this study, these data show that zygoma implants, in combination with 2–5 anterior conventional dental implants placed in atrophic maxillae, can be loaded immediately to support a fixed screw-retained, acrylic resin implant denture. Because of the short evaluation period and the small sample size, further research in this area is needed. However, the preliminary results from this study are promising. It should be noted that the prosthetic techniques of this treatment protocol are very exacting and require the skill of the provider.


<table>
<thead>
<tr>
<th>Table 1. Size and number of zygoma implants placed in 18 patients</th>
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<td>Size of implants (mm)</td>
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<td>30</td>
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<td>35</td>
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<td>42.5</td>
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<td>47.5</td>
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<td>52.5</td>
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<td><strong>Total</strong></td>
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Goteborg, Sweden)
Gingival-colored Ceramics in Bone-deficient Regions of The Jaw

A prosthodontist has the ability to look at a situation from various standpoints and develop alternative treatment options to address complex, esthetically demanding situations. As clinicians, we often see patients who exhibit loss of soft tissue and supporting bone. Many times, the lost structures can be re-created with surgical intervention. However, there are times when surgical procedures are not feasible or have limited results that may not totally resolve the problem; therefore, the patient's clinical presentation may compromise the esthetic outcome. Restoration of the anterior dentition using dental implants can be technically demanding when conditions are ideal; loss of the supporting hard- and soft-tissue structures further diminishes the clinician's ability to obtain optimal results. The use of gingival-colored ceramics offers an effective method of developing esthetics when reconstructive surgery is not an option.

Polack and Mahn, private practitioners from Virginia, reported on a patient's treatment that created a prosthetic solution to this compromised state. The 43-year-old, non-smoking male patient presented with missing mandibular incisors, which resulted in a narrow, irregular residual alveolar ridge deficient vertically and horizontally. A diagnostic wax-up revealed the expected esthetic problems associated with unnaturally long teeth. A minimal amount of calcified bone allograft was used to allow implant placement 5 weeks after the initial extraction.

The prosthetic treatment plan called for replacing the mandibular incisors and the hard and soft tissues with a 4-unit fixed partial denture (FPD) using gingival-colored ceramic. The study detailed the prosthetic treatment of establishing the prosthesis contours and determining the amount of gingival-colored porcelain required through a provisionalization process, and the use of a silicone matrix developed from the provisional to guide the fabrication of the definitive FPD.

The authors presented several prosthetic treatment alternatives, including a conventional FPD and removable partial dentures. These options would have compromised either the esthetics or the stability of the prosthesis, or both. The ability of the gingival-colored ceramic to restore interdental papilla and gingival tissues that otherwise could not be replaced make it a viable treatment alternative to compromised esthetics. The key to its predictable success, however, is the thorough treatment planning and execution by the prosthodontist.


Modified Complete Dentures as an Interim Cement-retained Prosthesis

Advances in implant dentistry have afforded the patient and the prosthodontist many treatment alternatives. One such is whether to immediately place the definitive or provisional restorations. Although immediate loading has proven to be successful, many clinicians have chosen to load provisionally, allowing for positional modification from the proposed implant site, site soft-tissue changes post-healing and the ability to develop soft-tissue contours.

Wat et al from the University of Hong Kong, China, summarized a patient treatment in which a mandibular complete denture was converted to a cement-retained prosthesis immediately post-implant placement. The flanges of the relined denture were contoured for easy cleaning and provisionally cemented. Table 2 lists the criteria needed for making such a decision.

<table>
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<th>Table 2. Clinical criteria for patient selection</th>
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<tr>
<td>Patient should be medically fit for implant surgery and intravenous sedation.</td>
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<td>The bone quality and quantity of the anterior mandible should be adequate for the insertion of 4–6 implants.</td>
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<td>The jaw relation of the existing complete dentures should be correct.</td>
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<td>The oral surface of the denture and tooth positions should be satisfactory.</td>
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<tr>
<td>There should be sufficient bulk in the mandibular complete denture to provide room for the implant abutments.</td>
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Although not shown in this study, the prosthesis could have been further contoured to develop a profile for the definitive restoration. In all likelihood, most prosthodontists would take this technique a step further by developing the framework or pontic form. However, this method does provide an inexpensive method to provide immediate function, satisfy esthetics, splint the dental implant and aid in patient comfort with a fixed provisional prosthesis. Meticulous planning and execution are required.


Endodontic vs Implant Treatment Outcomes

Dentists must make treatment decisions on a daily basis. As implant therapies have become more commonplace, decisions must be made whether to endodontically treat a tooth or to extract it and place an implant. The aim of both implant and endodontic therapy is to facilitate rehabilitation of patients’ masticatory systems.

Endodontic therapy is intended to retain teeth. The need for endodontic therapy is most commonly due to caries, but may also be due occasionally to traumatic injury. Implant therapy is intended to replace missing teeth and address tooth loss most commonly caused by periodontal disease, although caries and trauma may also be causes. White et al from the University of California, Los Angeles, reviewed the endodontic and implant literature to determine differences between the therapies that can assist dentists in making treatment decisions.

Outcome data was inconclusive and not suited for direct comparison of the 2 therapies. Even data, such as survival rate, could not be compared because implant or implant prosthesis survival rate is evaluated by a 2-tier “success or failure” approach, whereas endodontic therapy is a 3-tier “success, failure or uncertain” approach. As a result, outcome information cannot be used to derive treatment matrices. To date, rigorous cost and benefit comparisons have not been made nor have consensus statements been developed that provide the detail needed to guide the dentist.

Without the information needed to make a direct comparison between endodontic and implant therapies, prognostic factors can be helpful in the decision-making process. Preoperative diagnosis, extent of existing disease and degree of tooth loss are factors that can have an impact on the long-term clinical success of a tooth requiring endodontic therapy. There is a long list of factors that may affect implant success, including

- medical and oral health;
- bone quality and quantity; and
- prosthesis type.

Identification and quantification of prognostic indicators would be a valuable tool in formulating standard treatment protocols and developing individual treatment plans. Until long-term, clearly defined, outcome-measured studies evaluating the clinical performance of endodontic and implant therapies are completed, the patient must rely on the expertise of the clinician as a guide to making treatment-planning decisions.


In the Next Issue:

- Pretreatment preliminary screening for edentulous maxilla
- Treatment planning of the edentulous maxilla
- The Marius bridge
- Retrospective study of the Marius bridge

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