A Sequential Approach to Implant-Supported Overdentures

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INTRODUCTION

Conventional maxillary complete dentures have been created for our patients for years. Function may be an acceptable alternative to no teeth at all, but comfort may be compromised with acrylic resting on the full palate. Taste is inhibited. Throughout time, resorption of bone results in instability, and this requires relining on the existing prosthesis or creation of a new appliance. Modern osseointegrated dental implants have been around more than 30 years now, providing an increased quality of life and dramatically improved function of any prosthesis. Improvements in engineering principles, materials, and design have made implant therapy a successful and popular alternative to conventional denture techniques.

Implant dentistry has provided a service with which the risks are minimal when the health of the patient is good, the quality and quantity of available bone is appropriate, and the dentist is well versed in the anatomy. We are able to remove disease and replace poor teeth with an appliance that is relatively pleasing to look at and allows the patient to have improved chewing function. The gagging reflex associated with conventional dentures is eliminated when the palate is removed with an overdenture.

The purpose of this article is to describe a simplified surgical and restorative system whereby teeth areatraumatically removed, allowing for ideal placement of dental implants. The temporary palateless appliance is an easier transition to accept than an immediate full-palate denture.

Options for the Edentulous Patient

There are many options available for edentulous patients today, from surgical placement of a few dental implants to support and retain a removable appliance, to more advanced techniques that allow for fixed bridges or hybrids to be seated. The amount of available bone, the desire of the patient to have invasive surgical replacement of bone, the economic circumstances, and the experience of the clinician will determine which type of therapy will be followed. The use of removable or fixed implant-retained appliances both seem to increase form and function for the patient. The ability to chew food properly and completely is significantly improved. This may lead to better health and a positive outlook.

Patients often present either with a fully edentulous condition or with teeth that are decayed, periodontally involved, and/or unaesthetic. As the popularity of dental implants increases in the public domain, many of these patients seek an alternative to conventional techniques. It is our responsibility as dentists to discuss the benefits and risks of each mode of therapy. Simply increasing the stability of the prosthesis may improve mastication and speech. A stable implant-retained denture is more comfortable to wear. Most importantly, the implants may preserve the maxillary bone structure, minimizing future bone resorption.

Advantages of the Implant-Supported Overdenture

For any implant-supported overdenture with dental implants strategically positioned in the edentulous arches, the implants and abutments/attachments provide a significantly more stable base. The benefits created by this support system include minimization of residual ridge bone loss. Misch states that following extraction of mandibular teeth, an average of 4 mm of vertical bone loss occurs during the first year after treatment. This bone loss continues over time. However, the bone under an overdenture may resorb as little as 0.6 mm vertically during the course of 5 years. Upper implant-retained overdentures help support the lips and tissue around the mouth. Aesthetics are notably improved and facial form is created, and function is dramatically increased. Hygiene is easily performed because the patient can remove the appliance and maintain the implant attachments with proper, thorough instruction. The maxillary implant-retained overdenture can be a great improvement for our patients compared to traditional full-palate covered complete dentures. With increased stability, the palate can be removed, eliminating the gag reflex often associated with
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full-palatal coverage. These prostheses, however, are both implant and soft-tissue supported; thus, some movement may occur. The cost of these removable implant-retained overdentures is reasonable as fewer implants are required, and the laboratory costs are less than fixed appliances and our patients seem to tolerate the results well.

Creating stable implant-retained overdentures requires careful diagnosis and planning. Vertical and horizontal bone availability must be analyzed using conventional digital radiography, or CBCT diagnosis can be completed visualizing the position of the implants in bone and the angles created. We can also virtually place our implants prior to any surgical intervention.

Technical Considerations: Implants and Attachments

Simplicity in using freestanding abutments, such as LOCATOR (ZEST Anchors) or GPS (Implant Direct) attachments, is one way of attempting to increase retention in removable prosthetics. Splinting of implants with bars and screws was a popular method of overdenture fabrication, but with the advent of the LOCATOR attachment and, more recently, the GPS attachment, we now have options. If bone quantity and quality allow, single freestanding attachments can be utilized. It is imperative to space the implant properly to maximize the anterior-posterior spread, and to balance the rocking motion to improve retention. Freestanding implants need to be nearly parallel to allow for proper draw. A minimum of 6 mm of interocclusal distance is needed when using LOCATOR or GPS attachments for retention of an overdenture. When necessary, due to imperfect spacing of implants with diminished bone quantity and quality, the implant may be splinted, thus improving the stability of the implants. If there is adequate interocclusal space (a minimum of 10.0 mm per arch), LOCATOR or GPS attachments can be positioned onto the bar (Glidewell Laboratories) to provide outstanding stability. It is critical that all bars attaching implants fit passively. Any stress placed on the implants can result in bone resorption.

Maxillary spacing of implants needs to respect the arch form; that is, wide arches and narrow
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Careful Planning is Critical

So how does one create ideal positioning and angulation of an implant under a removable implant-retained overdenture? Careful planning and design are critical. Understanding tooth position of the eventual prosthesis is important. Therefore, a proper denture with aesthetic and functional tooth position should be created prior to surgical placement. Once this has been completed, the experienced practitioner can use techniques to maximize implant position. A more modern approach is to use CBCT analysis. The author uses Vatech America, which has a minimal 5.9-second radiation exposure. Once a proper denture is created that has good tissue contact
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and occlusion, the denture can be duplicated with barium sulfate in the teeth areas and a CT taken. This allows analysis of the existing bone including height and width, anatomic restrictions (such as the maxillary sinuses and mandibular nerves), and virtual placement of dental implants in the available sites. At this time, the practitioner can determine the type of prosthesis that is possible and whether a splinting bar will be required. All this is completed prior to any surgical intervention.

**GPS Attachments**

What is ideal about the GPS attachments is the simplicity in chairside curing of the retentive device and then the ability to later change out the attachments as retention diminishes. The attachments are made of nylon that wears well; they are normally changed once per year or about 56,000 cycles. The color-coded attachments provide various levels of retention (1, 2, 3, or 4.5 lbs). The GPS nylon males that are placed inside the overdenture and held by a metal housing have dual retention. There are both externally and internally designed GPS attachments. External ones are best suited when many implants are placed, and when the implants are relatively parallel. The internally designed GPS attachments are used in cases when rotation is needed. These attachments will work with implants that have between zero and 30° of divergence. It is imperative that the practitioner parallel the surgically placed implants to allow for proper draw, maximal retention, and to limit the wear of individual attachments.

**CASE REPORT**

A 64-year-old white male presented with a 46-year history of smoking and the eventual development of emphysema. There were no other significant medical findings. He came to our office after learning about implants via the Internet. A thorough oral examination revealed maxillary teeth that were not restorable and would require extraction. Options discussed included a conventional maxillary complete denture, 4 implants, and a palateless overdenture or 6 to 8 implants with the fabrication of a fixed screw-retained hybrid bridge. Our patient elected for the simplified approach of a staged surgical procedure where most of the maxillary teeth would be removed. A temporary horseshoe-shaped denture would be immediately placed following the extraction of all the maxillary teeth except the cuspids, and then the placement of 4 implants. This would allow our patient to function without full-palatal coverage, since he was a tremendous gagger and could not tolerate a full denture. Figures 1 and 2 illustrate the poor aesthetics of the decayed and periodontally involved teeth. The preoperative CBCT (Vatech America) (Figure 3) illustrated the available bone for potential immediate implant placement in the bicuspid and lateral incisor areas. The teeth to be extracted were all atraumatically removed using the Physics Forceps (Golden Dental Solutions). The beak of the forceps was positioned 1.0 to 3.0 mm subgingivally on the palatal aspect of the tooth. Then, tension was created by using a rotational force with the wrist. The bumper of the Physics Forceps with a green silicone cover is positioned high up in the vestibule and only acts as a fulcrum for the instrument (Figure 4). As tension is created on the palatal root surface, physiologic enzymatic action...
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breaks down the periodontal ligaments, allowing the tooth to disengage down and out of the socket (Figure 5), maintaining the facial bone and leaving a socket with all 4 walls intact. This is ideal for immediate placement of an implant in the socket site. Following the removal of all the maxillary teeth except the right and left canines (Figure 6), an inexpensive immediate palateless transitional denture was placed, preventing any gagging reflex from occurring and allowing the patient to function relatively well during the 4 month integration period and fabrication of the final implant-retained overdenture.

Four implants (Implant Direct) were surgically placed using the proper protocol around the retained cuspid teeth (Figures 7 and 8). Initial stability was achieved by torquing to 35 Ncm. The postoperative CBCT illustrates initial implant placement in adequate bone (Figure 9). Following integration, conventional denture fabrication techniques were implemented. An accurate final impression of the implant bodies was taken using a medium- and heavy-body vinyl polysiloxane (VPS) material (Panasil [Kettenbach]) for the fabrication of the master cast, a stable record base, and an occlusal rim. Teeth selection was done with the patient’s input. The proper height GPS male attachments were selected to protrude approximately 1.5 mm above the gingiva (Figures 10 and 11). The GPS attachments were torqued into the implants at 30 Ncm.

The implants were strategically placed in front of the maxillary sinus area, but as far posterior as was possible. An arch form was designed in implant position to allow for maximal stability of the overdenture. The appliance fabricated in this case was both implant- and tissue-supported. It could be easily removed by the patient for simple maintenance. The attachments are intended to last about one year with normal use but can be easily changed by the dentist (Figures 12 to 14). Oral hygiene instruction must be provided, as the appliance should be brushed regularly. Figure 15 illustrates an improved aesthetic result and a thrilled patient, whose quality of life has been dramatically improved.

IN SUMMARY

Fabrication of implant-supported maxillary or mandibular overdentures can seem to be difficult procedures. Many things could go wrong and/or unnoticed until the fabrication has been completed. Implants must be correctly surgically placed in viable bone at the proper angulation and spacing within an arch. The type of attachment must be considered and future treatment of the appliance should be simple and efficient. The appliance must function not only initially, but also for many years to come. The author has found the use of the GPS attachment to be an ideal tool to achieve the goals of retention and stability. Careful planning is the most important part of this process, and understanding the benefits and risks of creating overdentures should be well understood by the dentist. By sequentially planning and treating these types of cases, the patient is able to function reasonably during the stages of implant healing. The final prosthesis is created and remaining teeth that held the transitional appliance in place are removed on the day of final seating.

This is an excellent simplified retentive system option for those patients who are anxious about losing their teeth, even those teeth that are diseased and ugly.

References

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1. The gagging reflex associated with conventional dentures is eliminated when the palate is removed with an overdenture.
   a. True     b. False

2. The use of removable or fixed implant retained appliances both seem to increase form and function for the patient.
   a. True     b. False

3. Simply increasing the stability of the prosthesis rarely improves mastication and speech.
   a. True     b. False

4. Misch states that following extraction of mandibular teeth, an average of 4.0 mm of vertical bone loss occurs during the first year after treatment; however, this bone loss does not continue throughout time.
   a. True     b. False

5. Creating stable implant-retained overdentures requires careful diagnosis and planning; vertical and horizontal
   bone availability must be analyzed using conventional digital radiography, or CBCT diagnosis can be completed visualizing the position of the implants in bone and the angles created.
   a. True     b. False

6. A minimum of 8.0 mm of interocclusal distance is needed when using LOCATOR or GPS attachments for retention of an overdenture.
   a. True     b. False

7. There are both external and internal designed GPS attachments.
   a. True     b. False

8. The author has found the use of the GPS attachment to be an ideal tool to achieve the goals of retention and stability.
   a. True     b. False
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