Overdenture Design to Maximize Stability and Function

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About the Author

Dr. Kosinski received his DDS degree from the University of Detroit Mercy Dental School and his mastership in biochemistry from Wayne State University School of Medicine. He is a Diplomate of the American Board of Oral Implantology/Implant Dentistry, the International Congress of Oral Implantologists, and the American Society of Osseointegration. He is a Fellow of the American Academy of Implant Dentistry and received his Mastership in the AGD. He has received many honors, including Fellowship in the American and International Colleges of Dentists and the Academy of Dentistry International. He is a member of OKU and the Pierre Fauchard Academy. He is currently an affiliate adjunct clinical professor at the University of Detroit Mercy School of Dentistry, serves on the editorial review board of REALITY and the Michigan Dental Association Journal, and became the editor of the Michigan AGD Update, an organization of which he is immediate past president. He has published more than 180 articles on the surgical and prosthetic phases of implant dentistry and was a contributor to the textbooks Principles and Practices of Implant Dentistry and 2010’s Dental Implantation and Technology. He was the University of Detroit Mercy School of Dentistry Alumni Association’s “Alumnus of the Year,” and in 2009 and 2014 received the AGD’s Lifelong Learning and Service Recognition Award. He was featured on Nobel Biocare’s Nobelvision and lectures extensively. He can be reached at (248) 646-8651 or via email at drkosin@aol.com.

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INTRODUCTION

Having placed many dental implants during the past 30 years, I have witnessed significant improvements in the procedures and materials used in implant therapy. Design improvements of the implants themselves allow for greater initial stability, advanced osseointegration, and the ability to place abutments/attachments that are torqued into place and thread timed. Years previously, the splinting of implants with infrastructures or bars was routine. As the surgical protocol treatment time and cost of implants have been significantly reduced, and the success rates of implants significantly increased, other methods of retaining overdentures have been created. These include the use of the LOCATOR attachment (Zest Anchors), which allows for a wide range of retention, easy maintenance, replacement, and patient satisfaction. Although bar-retained overdentures provide a nice method of stability, the cost of creating this design may be prohibitive to some patients. Also, if implant loss occurs, the entire prosthesis could also be lost. Proper design and placement of our modern dental implants and sophisticated tolerance of the attachments designed for each individual implant system have made fabrication of these implant-retained overdentures a simple and cost effective method of restoring dental patients.

Fabrication of conventional dentures may no longer be the primary choice of treatment for our patients who lose their teeth for any number of reasons, including decay, periodontal disease, and trauma. Proper surgical placement of implants in the edentulous spaces has proven to be an excellent option. As the Internet educates the public on the advantages of our comprehensive dental techniques, many patients come to our practices asking about implant options. Of course, while there are many treatment options available, and several different attachment systems to retain and stabilize an overdenture appliance, this article focuses on the design using LOCATOR attachments.

Using Modern Dental Implants and Components

Implants provide a better denture-bearing foundation and can improve the patient’s quality of life as form and function are greatly improved. When considering the use of LOCATOR attachments, the final location of the implants in relation to the available bone and the final denture tooth position is important. To allow for the best retention, the implants need to be placed relatively parallel to each other. The newest protocols using CBCT analysis, diagnosis, and fabrication of surgical guides allow for virtual placement of the implants using computer software and CAD/CAM design prior to any actual surgical intervention. When implants cannot be ideally positioned due to compromised anatomy, a bar can be used to connect the implants, and the attachments are then placed upon the bar. Bars are also useful when a ridge is very atrophic/resorbed and the vestibule is shallow, thus creating issues as a result of the denture rocking. This cross-arch stabilization is useful in eliminating issues with ill-fitting implant overdentures.

It is important for the clinician to understand the complications involved in each individual situation and to decide upon a proper treatment plan option prior to surgical placement. It is only fair that our patients understand their financial responsibilities and, in return, have their expectations met with a proper fitting, retentive, stable, and aesthetic final appliance.

Properly Placed Implants Provide Optimal Treatment

Denture fabrication follows the same rules that we have always used in proper denture construction. Determining occlusal design, proper tooth position, aesthetics, vertical dimension of
occlusion (VDO), and denture border design are all important. The designs, which will be demonstrated in this article, create implant-supported overdentures that are both implant-and tissue-supported. Obviously, with a bar, there is less tissue contact. The patient's history with conventional dentures should be determined. A bar may result in fewer tissue sore spots. However, a bar creates a need for more involved patient hygiene. The point being that either approach has advantages and disadvantages that need to be determined prior to fabrication. There is not just one method that will work completely for all patients.

**Splinted Bars Are Useful When Possible**
Available interocclusal space must also be determined. For LOCATOR attached prostheses, a minimum of 6.0 mm of distance is needed, and bars may need an additional 7.0 or 8.0 mm of room. Here, both of the overdenture appliances created had metal horseshoe-shaped partial frameworks. This creates cross-arch strength in the appliance and eliminates the possibility for the horseshoe-shaped denture breaking.

When evaluating the dental condition of our patients, we must also assess their desires and expectations. It is our job to describe and provide the options available to them, including conventional dental techniques, such as traditional dentures, fixed bridgework over many implants, or the popular hybrid dentures over 4 to 6 dental implants. Anatomic considerations need to be addressed as well as each patient’s financial abilities.

I have found that the fabrication of implant-retained overdentures has provided outstanding functional and aesthetic results that have a positive impact on my patients’ quality of life as well as easier periodontal maintenance throughout time. When properly designed, the implant overdenture provides retention and stability and allows for creation of an appliance that is palateless (designed with no palatal coverage), so that taste is not compromised, and any gag reflex is eliminated.

Dental implants can provide additional benefits to stability and retention of an overdenture. The implants can minimize future bone loss of an edentulous ridge (due to nonfunction) to maintain proper VDO. Patients feel and look younger and are able to masticate more efficiently, maintaining a diet that has substance, and have some semblance of proprioception.

**IMPLANT-SUPPORTED OVERDENTURES**
**Both Implant- and Tissue-Supported**

Two patient cases that involved maxillary implant-retained overdenture design will now be described. The first patient presented with functional issues related to having only 3 remaining maxillary teeth. There was adequate bone height and width for dental implant consideration. After discussion of several options—including removal of the remaining periodontally involved and nonrestorable maxillary teeth and fabrication of a conventional maxillary complete denture, placement of 6 implants and fabrication of a hybrid implant retained appliance, or placement of 4 dental implants and fabrication of a removable palateless overdenture—the patient decided upon the palateless overdenture. This seemed like an appropriate treatment option because of the available bone and his financial limitations. He had no interest in a conventional denture with a full palate. The removal of his remaining 3 teeth, no matter how unsound, still had a large psychological effect on him. So, it was determined that those 3 teeth would be maintained during the integration healing time of the implants that were strategically placed in the posterior maxilla and during the fabrication of the palateless transitional appliance. This would allow us to determine how much coverage of the palate could be tolerated. Inclusive Tapered Dental Implants (Glidewell Dental Laboratories)
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were placed with conventional implant surgical techniques (Figure 2).

After approximately 4 months of integration, the implants were uncovered and LOCATOR attachments were threaded and torqued (30 Ncm) into position (Figure 3). The 4 LOCATOR attachments are a cost effective and retentive method to maintain stability with this palateless overdenture. These attachments are available in various degrees of retention, and they are easily maintained and changed out as wear occurs. When determining the proper positioning of the implants for overdentures, the clinician must remember that the mesial and distal cantilevers of the prosthesis should be about 1.5 times the anterior-posterior (A-P) spread (Figure 4). The greater the A-P spread, the better the stability obtained. Placing the implants along a single plane with little A-P spread will result in rocking of the overdenture upon function and, eventually, functional failure.

Prior to placement of the overdenture, the remaining teeth were removed without trauma using the Physics Forceps (Golden Dental Solutions) (Figure 5). The 4-walled socket sites were then grafted using OsteoGen (Impladent) to minimize future bone loss (Figure 6). Figures 7 and 8 illustrate the proper design of the overdenture with the palate removed, and reinforcement done using a metal partial framework. This design allows for proper seating, and it also eliminates the possibility of fracture along the maxillary suture lines. The LOCATOR attachments have varying degrees of retention, from 1.5 pounds of retention with the blue attachment, to 3 pounds with the pink attachment, and 5 pounds with the clear attachment. Extended range attachments in red, orange, and green provide one, 2, and 4 pounds (respectively) of retention when the implants are not ideally parallel.

Figure 9 shows a postoperative CBCT (Vatech Green CBCT [Vatech America]) of an implant in proper position, with the LOCATOR attachment completely seated. The final smile of our patient clearly demonstrated his satisfaction with the completed result (Figure 10). Form and function were maintained, gagging reflex was eliminated, masticatory ability was acceptable, and home care was simple to achieve and maintain. Patients who attain this type of overdenture fabrication are appreciative and seem to function extremely well.3

When anatomic restrictions prevent ideal placement of our dental implants, or angulation of the implants prevents near parallelism, or if the palate is rather shallow, then splinting of the implants with a precision bar will alleviate the complications. Again, if the attachments are not properly positioned, they will wear excessively, or the appliance will just not fit or function properly. A bar allows for the male part of the retentive system to be made parallel by the dental laboratory team and to also be spaced properly to prevent anterior posterior rocking (Figure 11).

The second clinical case (Figures 12 to 15) demonstrates a
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situation in which bone morphology did not allow for implants to be ideally spaced. The medullary bone quality was not ideal, so it was determined that a splinting bar was most appropriate. The appliance was made as in the first case presented, and the attachments were ideally spaced for maximal retention and stability. The palateless, implant-retained overdenture improves quality of life and improved function.

CLOSING COMMENTS

As clinicians, our desire to provide outstanding care should always be the treatment goal. Dental implants have become a viable option to conventional denture techniques. As long as the clinician understands and implements the principles of proper VDO, lip support, and phonetics, then fabrication of implant-retained overdentures is no more complicated than that of conventional dentures. Surgical placement of implants must be analyzed and considered to maximize the final retention and stability of the final appliance. Providing a palateless result is a huge positive reinforcement to our patients. Maintenance can be achieved and retention easily maintained by interchangeable components. Whether using the option of free-standing LOCATOR attachments, or those attached to a stabilization splinting bar, the benefits to the patient are immense.

References

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1. Although bar-retained overdentures provide an effective method of stability, the cost of creating this design may be prohibitive to some patients.
   a. True       b. False

2. When considering the use of LOCATOR attachments (Zest Anchors), the final location of the implants in relation to the available bone and the final denture tooth position is not important.
   a. True       b. False

3. It is important for the clinician to understand the complications involved in each individual situation and to decide upon a proper treatment plan option prior to surgical placement.
   a. True       b. False

4. For LOCATOR attached prostheses, a minimum of 8.0 mm of distance is needed; and bars may need an additional 7.0 or 8.0 mm of room.
   a. True       b. False

5. Implants can minimize future bone loss of an edentulous ridge (due to nonfunction) to maintain proper vertical dimension of occlusion.
   a. True       b. False

6. Placing the implants along a single plane with little anterior-posterior spread will result in rocking of the overdenture upon function and, eventually, functional failure.
   a. True       b. False

7. The palateless implant-retained overdenture has been demonstrated to improve quality of life and provide for improved function.
   a. True       b. False

8. Surgical placement of dental implants must be analyzed and considered to maximize the final retention and stability of the final appliance.
   a. True       b. False
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Please check the correct box for each question below.

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