

Preserving the Integrity of Facial Structures with Implant-Retained Overdentures



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The Centers for Disease Control and Prevention (CDC) has reported that by age 50, Americans have lost an average of 12 teeth and, among adults aged 65 to 74 years, 26 percent are completely edentulous. Care of the edentulous patient has been changed by the emergence of implant-supported restorations, which are a viable alternative to traditional denture fabrication. However, there are still many general practitioners who have not committed to making dental implant treatment a significant part of their practice. They may let potential drawbacks such as surgical or prosthetic training, perceived cost, concern about the profitability of implant cases, or lack of insurance coverage stand in their way of providing innovative and successful dental implant treatment services to their patients.

Implant manufacturers and dental laboratories such as Glidewell Laboratories (Newport Beach, Calif.) are presenting product innovations that have made implant dentistry simpler for dentists restoring implants and easier for patients receiving implant therapy. Implant placement and immediate implant function have become popular as long as there is an absence of infection, and adequate bone quantity and quality. These innovations make implant dentistry more attractive to both patients and the restorative dentist.

As clinicians, it is imperative that we educate and counsel our patients as to the benefits of quality care irrespective of insurance benefits or financial limitations. A patient should be made aware of all available options without tailoring discussion solely to his or her dental insurance benefits. We should encourage the best overall care plan and provide alternatives to treatment in order of most effective to least effective, including no treatment at all.



Many people are unaware of the relationship between their teeth and the bone that supports them. Along with the maxillary and mandibular bone, teeth provide the support for facial contours. Changes in these structures, then, will cause changes in facial features. The loss of teeth can result in wrinkles around the mouth and lips and the collapse of facial structures, causing an overall “caved-in” appearance. When teeth are absent over a prolonged period of time, the bone that supported these teeth will gradually resorb. Dental implants can preserve the integrity of facial structures by minimizing this bone resorption. The implants act like natural teeth in that they provide stress to the bone, which helps stimulate blood flow and maintain the existing bone contours. Dental implants are thus used to create a more stable foundation for replacement teeth, whether they are used under removable or fixed appliances.

Maintaining the natural appearance of the face and smile can be challenging, but dental implants have proven to be an excellent starting point compared to conventional complete dentures. For one, the generation of baby boomers does not like to look and feel old. When the corners of the mouth droop, wrinkles appear around the lips and the distance between the nose and chin decreases, esthetics are compromised. Second, even well-fitting dentures result in a decrease in natural chewing function, which may in turn lead to digestive issues resulting in a myriad of potential health issues. Third, while conventional dentures do serve the basic purpose of replacing missing teeth and providing structural support to the lips, they may actually accelerate the resorption process by pressing down on the gingiva and underlying bone as the wearer eats. Regardless, the inevitable, continued bone loss will cause the facial structures to further collapse over time, necessitating prosthetic relines to compensate for the physical changes.

This article aims to demonstrate just a few of the prosthetic options available today in restoring form and function using dental implant-retained overdentures. Our hope with these designs is to dramatically enhance our patients’ quality of life by achieving one or more of the following goals: to preserve the integrity of facial structures not only immediately but over time, restore the mouth area to as natural a state as possible, increase stability and the patient’s sense of security that his or her teeth will not become dislodged or fall out during basic activities (eating, laughing, sneezing, kissing), improve physical appearance, improve health by facilitating proper digestion and nutrition, improve the taste of food, eliminate the need for denture adhesives, and improve self-confidence and self-esteem.

To reiterate, the advantages of conventional complete dentures is that they restore some basic tooth function in edentulous situations and provide lip support. Disadvantages include accelerated bone resorption, relatively frequent replacement or relines, and the inability to eat some foods properly, affecting digestion and overall health. Dental implant-supported overdentures, however, provide greater comfort and stability than conventional dentures, and they do a better job of restoring lip support, maintaining facial structures and minimizing bone resorption.

The fabrication of any stable removable appliance begins with careful diagnosis and case planning. Regardless of the patient’s age, it is imperative that his or her concerns and desires be taken into account in order to make the final prosthesis acceptable. Improving form and function can be a difficult challenge in any complete denture situation. Fortunately, implants represent an outstanding treatment option for dramatically improving denture stability and increasing chewing ability. Endosseous implant designs have proven to offer an excellent prognosis and are reliable retainers for overdentures.

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Figure 1: Pre-op smile with conventional maxillary complete denture in position

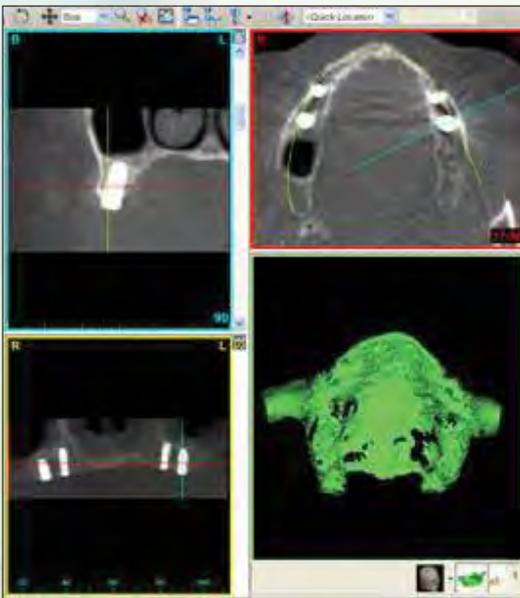


Figure 2: Post-surgical CT scan illustrating final position of integrated dental implants



Figure 3: Conventional occlusal rim positioned to increase the vertical dimension of occlusion

Case 1

The first case demonstrated here involves a female patient who had worn a conventional maxillary complete denture for more than 20 years. Opposing the conventional maxillary denture was an implant-retained mandibular overdenture that had also been in place for many years. Having appreciated the stability and function of the mandibular overdenture, she had requested investigation of a similar prosthesis in the maxilla. This desire increased over time because her maxillary denture needed to be relined several times, and the form and function of her existing conventional denture diminished. The patient exhibited no significant medical concerns other than severe horizontal bone loss in the premaxillary area. Ridge augmentation had been discussed many times in the past, but the invasive procedure had always been declined.

Current options were discussed with the patient, including fabrication of a new conventional denture and ridge augmentation procedures followed by dental implant therapy. The patient elected a simple approach in the surgical placement of four dental implants in the posterior maxilla. The surgical design was determined with CT diagnosis and placement using a CT surgical stent. The implant planning software was used to visualize the patient's entire mouth anatomy in three dimensions. The computer software accurately simulated the placement of dental implants prior to ever touching the patient. We found adequate bone in the posterior maxilla, but not acceptable bone in the anterior maxilla. This implant planning and placement software provided a high level of comfort and safety for the patient, reducing surgical and restorative time by giving us an accurate 3-D plan prior to implant placement.

Figure 1 illustrates the closed vertical dimension of occlusion. Figure 2 illustrates the postoperative CT scan, showing proper positioning of the four dental implants. Conventional techniques

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were used to visualize tooth position using stable record bases and occlusal rims. The intent was to increase the vertical dimension to give the patient a younger look (Fig. 3). Anterior teeth were set to the desired esthetics. Following integration of the implants, accurate impressions of the fixtures were taken intraorally using traditional impression copings splinted together with acrylic. The intent was to maximize the stability of the impression technique (Fig. 4). The stable record base with anterior teeth waxed into position was hollowed out (Fig. 5) and an impression made with polysiloxane materials (Fig. 6). The laboratory then created an extremely accurate master cast with tissue approximations (Fig. 7).

In this case, Locator® attachments (Zest Anchors; Escondido, Calif.) were used as the retentive devices for a maxillary, horseshoe-shaped overdenture. Because of the posterior position of the implants and the relatively porous quality of the bone in the area, I considered placing a cross-arch bar splint with attachments to retain the overdenture. However, a careful evaluation incorporating the esthetic concerns of the patient resulted in an inability to increase the vertical dimension of occlusion excessively. It was therefore determined that there was not enough intraocclusal space to provide for proper bar fabrication — not while maintaining the preferred esthetics. The use of Locator attachments eliminated my concern with intraocclusal distance and final esthetics (Fig. 8). These attachments resist wear and maintain satisfactory retention for up to 56,000 cycles of function. This system proved appropriate where occlusal clearance became an issue. The Locator attachments come in a variety of retention strengths, from extra light to heavy. This type of prosthesis allowed for excellent retention and stability for this patient. The attachments were positioned extracoronally to allow for good tissue adaptation and easy maintenance with a toothbrush or end-tufted brush.

Figure 9 illustrates the underside of the palateless maxillary implant-retained overdenture with the Locator attachments. Note that a cast framework was incorporated to provide strength to the prosthesis and secondary splinting of the implants. Figure 10 shows how the palate is exposed, allowing for better tasting of

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Figure 4: Splinted impression copings

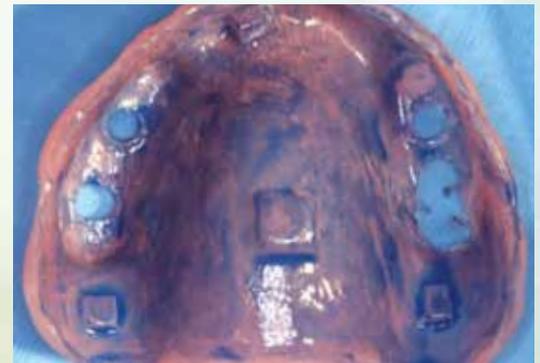


Figure 5: Hollowed-out record base used to pick up the splinted impression copings



Figure 6: Final, accurate pickup impression using polysiloxane materials



Figure 7: Accurate master cast



Figure 8: Locator attachments seated intraorally



Figure 9: Underside of palateless implant-retained maxillary overdenture with Locator attachments precisely positioned



Figure 10: Intraoral occlusal view of palateless overdenture



Figure 11: Final smile design

food and elimination of the gag reflex, yet still providing outstanding stability and retention. Figure 11 illustrates our final smile design, which created a younger look for the patient. This patient exhibited a positive end result because of her understanding of the limiting factors involved in this case and her desire to limit more aggressive, invasive surgical procedures. However, she was made aware that bone loss was continuing in her maxilla and appreciated our attempt to minimize that bone loss in the future. Her chewing function was deemed more efficient, and her speaking was excellent. The patient no longer worried about her prosthesis slipping or loosening during function.

Case 2

The second case demonstrated here involves a woman who had had conventional maxillary and mandibular complete dentures for many years. Because of the lack of horizontal bone thickness, conventional dental implant placement would be difficult. However, the patient's quality of life was diminished because her conventional mandibular denture was unstable and had begun to create functional problems. Small-diameter implants were chosen to restore stability in a mandibular overdenture due to their size. Four small-diameter implants were surgically placed in the symphysis without complication. CT diagnosis and a CT surgical stent were used to ensure proper angulation and depth.

Figure 12 illustrates the preoperative, narrow mandibular ridge responsible for the patient's complaint. Figure 13 shows the parallel position of four small-diameter implants, which will be used to stabilize a new implant-retained overdenture. The I-Mini® Dental Implant System (OCO Biomedical; Albuquerque, N.M.) used here incorporates a rather simple impression technique that utilizes plastic snap-on impression copings (Fig. 14). Vinyl polysiloxane impression material is injected around the pickup impression copings using a well-made custom tray (Fig. 15). Laboratory analogs are placed into the copings after removal from the mouth, to be used to fabricate an accurate master cast (Fig. 16). Simple O-ring attachments seated in metal housings serve as the retentive mechanism (Figs. 17a, 17b). Combining a new conventional maxillary complete denture with the patient's very stable small-diameter mandibular implant overdenture improved her vertical dimension of occlusion and final esthetics (Fig. 18).

Placing conventional-sized implants in this patient's mandible would have been difficult, due to the minimal size of the alveolar crest. Small-diameter implants gave me an option to restore function and stability to the patient's prosthesis. This treatment option represents a great service to a group of patients who may not otherwise experience the benefits of implant dentistry.



Figure 12: Severely resorbed mandibular ridge



Figure 13: Four small-diameter implants ideally positioned

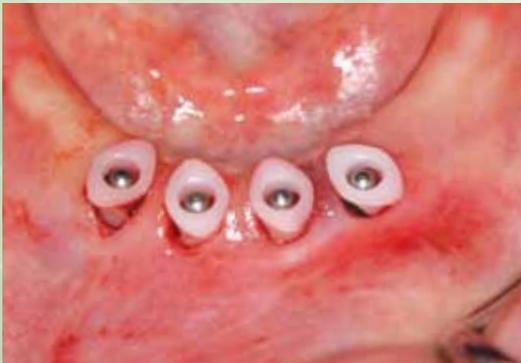


Figure 14: Impression pickup copings snapped into place



Figure 15: Vinyl polysiloxane impression material used in an accurate custom tray to pick up the impression copings



Figure 16: Laboratory analogs placed into the pickup copings for the fabrication of an accurate master cast



Figures 17a, 17b: Conventional O-ring attachments provide retention for the overdenture



Figure 18: Final smile design with increased vertical dimension

A custom milled bar would be used, which would splint the maxillary implants and allow for fabrication of parallel attachments.

Case 3

Our final case involves a completely edentulous patient who had never worn any type of prosthesis. Figure 19 illustrates the wrinkles present around the patient's mouth and loss of lip support. Although in her forties, she looked and felt much older. Conventional dental implant surgical procedures were completed, with four implants placed in the edentulous mandible and five implants placed in the edentulous maxilla. At the time of surgery, it was determined that a sixth dental implant in the maxillary left cuspid area could not be predictably placed due to the thinness of the bone. A dental CT was not performed prior to this surgical intervention, so a typical flap procedure was used to allow for a more detailed visual examination of the subgingival structures during the placement procedure.

After discussing prosthetic options with the patient, it was determined that removable implant-retained overdentures would provide her proper lip and tissue support, help maintain the quantity of bone in both arches over time and dramatically improve function. The patient had tried a conventional, full-palate maxillary complete denture, but was unable to tolerate it due to a severe gag reflex. This is another example of where it is imperative that we listen to the patient's concerns and desires if we hope to make the final prosthesis acceptable. Doing so ensures the quality of life enhancement provided by dental implants will be rewarding to the dentist and gratifying to the patient.

Following integration of the mandibular dental implants, a conventional impression was made by seating impression copings into the properly placed and parallel implants (Fig. 20) using a custom tray (Fig. 21). Due to the ideal positioning of the four mandibular implants, Locator attachments were used as the retentive mechanism for the overdenture. Because of their design, the patient is able to easily align and seat the overdenture into position. Figure 22 illustrates the four mandibular Locator attachments intraorally positioned. Figure 23 shows the intaglio surface of the overdenture with the four Locator housings and retentive male attachments. It was more difficult to parallel the five maxillary dental implants, and therefore it was determined that, rather than use single Locator attachments, a custom milled bar would be used (Fig. 24), which would splint the maxillary implants and allow for fabrication of parallel attachments to be built into the framework (Fig. 25). In the final analysis, we were able to predictably provide the patient dramatic improvement in esthetics, function and support for the facial soft tissue. Figure 26 illustrates the beaming smile of the very happy patient.



Figure 19: Facial photograph of our third patient, who presented with complete edentulism



Figure 20: Impression copings placed intraorally



Figure 21: Final impression with impression copings picked up using an open-tray technique



Figure 22: Four mandibular Locator attachments ideally positioned



Figure 23: Underside of the mandibular implant-retained overdenture showing the four Locator housings and retentive male attachments



Figure 24: Maxillary implant-retained custom milled bar



Figure 25: Maxillary implant-retained overdenture



Figure 26: Final esthetic result of maxillary and mandibular implant-retained overdentures



Conclusion

Follow-up care for implant-retained overdentures includes clinical assessment for abutment stability, mobility of the implants and plaque accumulation. Because the perimucosal seal is vital to protecting the underlying connective tissue, probing healthy implants is not advised. Radiographs should be taken yearly to determine bone position and contour. Metal scalers and ultrasonic instruments may damage the titanium abutment surface; therefore, plastic or graphite scalers are preferred.

The general dentist has an obligation to provide patients with the most innovative and proven techniques available. CT scans and scanning software make surgical placement of implants rather routine. Anatomical anomalies are virtually determined before ever touching the patient. With good implant placement comes more routine and predictable prosthetic reconstruction. Because the general practitioner is the professional the patient consults with and trusts concerning their dental condition, all clinicians should educate themselves on the newest treatment modalities.