Fixed and Removable Implant Restorations: A Solution for Every Arch

By Dr. Paresh B. Patel, USA

When a patient presents with an edentulous arch or terminal dentition, implant treatment can be provided that improves not only form and function, but also quality of life. For patients desiring better chewing capability, stability, esthetics and comfort than a traditional denture can offer, both removable and fixed implant restorations are superior alternatives. While the appropriate implant solution can vary depending on the patient’s oral health, anatomy, quality and quantity of bone, and financial resources, full-arch prosthetics have progressed to the point where virtually every patient can be restored. Although fixed, implant-supported restorations offer the highest levels of stability, function and patient satisfaction, removable overdentures are a dramatic improvement over conventional complete dentures as well. Both treatment options effectively mitigate the bone resorption that occurs following the loss of teeth, helping to preserve the oral and facial structures and, by extension, the self-confidence of the fully edentulous patient. Determining which solution is appropriate requires a careful evaluation of the individual patient’s circumstances and desires. Even when an implant overdenture is delivered, the prosthesis can eventually be converted to a fixed restoration. As evidenced by the case that follows, in which one arch is restored with an implant overdenture and the other with a BruxZir® Full-Arch Implant Prosthesis, practitioners today have a great deal of clinical flexibility. Whatever prosthetic approach is adopted, immediate, life-changing relief can be provided to patients suffering from terminal dentition or an uncomfortable, poorly functioning traditional denture. Further, the dramatic overhaul of this patient’s oral health demonstrates the life-changing capabilities of implant therapy, which helped him overcome severe functional and esthetic challenges that were impacting practically every facet of his life prior to treatment.

Case Presentation

A 47-year-old male presented with terminal dentition in both arches resulting from periodontal disease and severe caries (Figs. 1a–1c). The patient had already lost many of his teeth, and the dentition that remained had been rendered unstable by his periodontal condition (Fig. 2). He had saved up enough money for a fixed implant restoration for his upper arch, for which he desired the most functional, lifelike prosthesis possible. While he couldn’t afford such a restoration for both arches, he wanted a removable implant overdenture so that he could upgrade to a fixed prosthesis. The patient accepted a treatment plan in which his maxilla would be restored with a BruxZir Full-Arch Implant Prosthesis and his mandible with an Inclusive® Locator Implant Overdenture. Fabricating his mandibular restoration from monolithic zirconia would ensure maximum long-term durability. This was important provided the relatively young age of the patient, who would not have to worry about his upper prosthesis succumbing to fractures, chips or stains.

His lower appliance would be held in place by connecting to the implants via Locator® attachments (Zest Anchors, Escondido, Calif.), which are an economical means of improving prosthetic retention and stability. The overdenture caps that connect to the Locator attachments would be incorporated in the prosthesis chairside, though it should be noted that many clinicians elect to have the laboratory handle this step. The surgical phase of treatment called for the extraction of the patient’s remaining teeth followed by

![Figure 1a–1c: Preoperative condition of the patient. Note the high lip line, severe cervical decay present on the patient’s remaining teeth, and lack of gingival support.](image1)

![Figure 2: Preoperative panoramic X-ray exhibits periodontal disease, cervical caries, terminal state of the patient’s dentition, and the compromised state of the surrounding periodontium, which had rendered the teeth mobile.](image2)

![Figure 3: Maxillary implants with parallel pins in place exhibit the axial placement of the anterior implants and the tilted angulation of the posterior implants.](image3)

![Figure 4a–4c: The Inclusive Tapered Implants were threaded into place, achieving excellent initial stability.](image4)

![Figure 5: Multi-unit abutment with canine in place illustrates connection of the implant’s angulation to establish a uniform prosthetic platform around the arch.](image5)

![Figure 6: Traditional dentures were fabricated in advance of the surgical appointment so they could be immediately converted to serve as temporary appliances during the healing phase.](image6)

![Figure 7a, 7b: Same-day conversion of the maxillary denture to an immediate fixed prosthesis was achieved by adding multi-unit temporary cylinders using cold-cure acrylic and trimming the appliance into a horseshoe shape.](image7)

![Figure 8a, 8b: Note the dramatic change in the appearance of the patient, who left with chairside-converted dentures in place on the same day as surgery, including a screw-retained, fixed provisional for his upper arch.](image8)

![Figure 9: Postoperative panoramic radiograph illustrates All-on-4 configuration of maxillary implants and axial placement of the mandibular implants, which would facilitate a passive fit of the lower overdenture. Note the temporary cylinders attaching the provisioned maxillary denture to the implants.](image9)
the immediate placement of eight dental implants. CBCT scans were taken to help determine the optimal placement of the implants within the available bone and away from the patient’s vital oral anatomy. Evaluation of the CBCT scan determined that there was sufficient height, width and quality of bone to place the implants in the appropriate locations and angulations via freehand surgery. Four mm Inclusive® tapered implants (Gledhill Direct, Irvine, Calif.) would be placed in each arch to support the fixed maxillary restoration and the removable mandibular prosthesis.

At the surgical appointment, the patient’s remaining teeth were removed, and a flap was raised to visualize the socket sites and areas of implantation. Bone level was performed on the patient’s maxillary arch to elevate the patient’s smile transition line above the upper lip. The maxillary osteotomies were positioned to facilitate an All-On-4 configuration, with the posterior implants tilted to maximize the anterior-posterior (A-P) spread, avoid the sinus, and accommodate the patient’s bone limitations (Fig. 3). Osteotomies were created for the placement of four mandibular Locator overdentures, as opposed to the minimum of two required for a mandibular Locator overdenture. This would enhance retention of the overdenture while allowing for the possibility of upgrading to a fixed restoration at a later time.

Following creation of the osteotomies, the implants were placed (Figs. 4a–4c). Inclusive® Multi-Unit Abutments (Gledhill Direct) were attached to the maxillary implants, correcting for the divergent angulation of the implants. This would both position the restorative platform in a manner that would situate the screw access holes of the eventual prosthesis toward the lingual aspect and allow for a molar-to-molar restoration (Fig. 5).

Note that when patients present for treatment with terminal dentition, they are commonly anxious about losing their teeth and the effect this will have on their speech and chewing capabilities. For this reason, it is important to make every effort to ensure that the patient leaves with functional appliances in place. Thus, traditional dentures were fabricated from preliminary impressions in advance of the surgical appointment for modification and delivery following placement of the implants (Fig. 6).

Having achieved sufficient primary stability, the Inclusive Tapered Implants placed in the patient’s maxilla could be immediately loaded. Thus, the upper denture was trimmed and modified to connect to the multi-unit abutments through temporary cylinders (Figs. 7a, 7b). This would satisfy the patient’s desire to leave the surgical appointment with a fixed, fully functional maxillary prosthesis in place. Note that the two distal-most molars were removed to minimize the cantilevers and the force transmitted to the implants during occlusal interferences. Healing abutments were placed in the mandibular implants to begin developing the transmucosal passages. The lower immediate denture was then modified and relined to seat over the implants during healing. This approach provided the patient with same-day temporary restorations, and he walked out of the office with properly functioning teeth for the first time in many years. The effect this had on the patient’s comfort, function and appearance was immediate and profound (Figs. 8a, 8b). The final radiograph taken after seating the temporary appliances confirmed excellent positioning of the implants (Fig. 9). The implant verification jig was attached to the maxillary implants tilted to maximize the angulation of the surgical access holes of the eventual prosthesis, as the lab could be immediately loaded. Thus, the Inclusive Tapered Implants were seated over Locator impression caps. The jaw relationship was recorded and a bite registration was made to serve as the basis for the working cast the lab would use to begin designing the restoration. Note that a closed-tray impression was taken for the upper implant overdenture.

At the next appointment, the wax rims were removed, the jaw relationship was recorded using conventional techniques, and a bite registration was taken (Figs. 10a, 10b). The temporary cylinders through which screws could connect to the dental implants were retained prior to milling the final restoration so that the verification jig could be attached to the implants so a precise final impression could be taken (Figs. 11a–11c). Because this digital model containing the verification jig, screw access holes were created in precise alignment with the positions of the maxillary implants.

The case was returned to the lab, and new master casts of the maxilla and mandible were made using the Inclusive Locator Implant Overdenture by seating over the Locator abutments and keeping the appliance in place during function. A new master cast of the maxilla was produced based on the custom open-tray final impression. The new master cast and final-approved wax setup were scanned. A virtual model was generated upon which the final monolithic prosthetic design was designed using CAD software (Figs. 12a, 12b).

The implant verification jig was attached to the implants so a precise final impression could be taken (Figs. 12a–12c). The custom tray provided by the lab was filled with VPS material and seated over the implant verification jig. As the VPS material set, the relative positions of the implants represented on the cast were maintained, fixed, ensuring an extremely accurate final impression. The approved wax setups and final maxillary impression were returned to the lab so the final mandibular implant overdenture and mandibular provisional implant prosthetic design could be produced. The final lower wax setup was fabricated on the master cast and included aSteel wax to evaluate fit, esthetics, occlusion, and the gingival contours of the proposed overdenture.

The lab in designing an overdenture that fully rests on the tissue instead of the implants. The case was returned to the lab, and the setup was evaluated to confirm the vertical dimension of occlusion, interocclusal relationship, phonetics, esthetics, mandible, teeth arrangement, tooth color and shape, incisal edges, and function (Figs. 14a–14c).

After final approval of the wax setups, the restorative protocols for the two prostheses diverged, as the lab moved directly to the final implant overdenture from the approved wax setup, while the process for the BruxZir Full-Arch Implant Prosthesis included an implant verification jig, custom final impression, and provisional implant prosthetic design. These extra measurements were taken to make absolutely certain that the definitive prosthetic design was accurate before milling the final restoration from monolithic zirconia.

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relationship was checked (Figs. 22a, 22b). Minor occlusal adjustments were made directly to the maxillary provisional implant prosthesis, as PMMA is easily modified.

Slight alterations were also made to the lower implant overdenture. Then, blockout shims and the reten-
tive overdenture caps were seated over the Locator attachments (Figs 23a, 23b). Quick Up self-cure mate-
rial (VOCO America; Indian Land, S.C.) was added to the recess wells of the overdenture caps pro-
duced by the lab. The implant overdenture was seated, providing excellent retention, stability and function for the patient. With the final mandibular restoration in place, the patient wore the provisional full-arch implant prosthesis for a trial period of two weeks (Fig. 26). This opportunity to wear the appliance during actual day-to-
day function instilled a high degree of confidence in the prosthesis design. The final BruxZir Full-Arch Implant Prosthesis was digitally fabricated with precision (Fig. 27). As an exact reproduction of the test-driven pro-
visional, the definitive prosthesis fits perfectly and offered the esthetics and function the patient had come to expect (Figs. 24a, 24b). The final restoration effectively addressed the unique circumstances of the case, providing the most durable, stable prostheses possible for his upper, and a lower restoration that greatly improves prosthetic retention and can be upgraded to a fixed prosthesis should the patient’s situation change.

Conclusion
Practitioners now have the clinical flexibility to offer patients a wide range of treatment options, from entry-level, economical restorations like the inclusive Locator Implant Overdenture, to the fixed, highly durable BruxZir Full-Arch Implant Prosthesis. There is a viable means of treating nearly all patients, whatever their oral health, needs and finances. Provided the life-changing benefits of implant therapy and the straight-
forward restorative protocols of to-
day, this service should be offered to all patients confronting the chal-
enges presented by complete edentulous patients: sat-

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