CLINICAL BRIEFS

Quick considerations for treatment success.

CAD/CAM Technology in Restoring Implants

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Today, more and more companies are creating the most precise products using CAD/CAM technology. It seems that one cannot even walk into a store or showroom where the products large or small have not had some sort of CAD/CAM technology used in their fabrication. Within the last decade, the dental profession has seen its share of CAD/CAM technology. Whether it has involved milling porcelain blocks with the CEREC System (Sirona Dental Systems, Charlotte, NC) or shaping orthodontic aligners (Invisalign®, Align Technology, Inc, Santa Clara, CA), CAD/ CAM technology is being applied in dentistry whenever precision has been perceived.

With the rise of aging baby boomers demanding implant therapy, there has been an increase in implant treatment. The increasing number of patients wanting implant therapy has risen so quickly within the last few years that more and more general dentists are getting involved in offering dental implants to their patients. With this increase, there is a desire to predictably and easily provide restorative options for implant therapy.

CASE PRESENTATION

A patient in her late 40s presented with a loose bridge extending from tooth No. 11 to tooth No. 13. Upon closer examination and radiographic interpretation, it was apparent that there was a vertical fracture in tooth No. 13, and failing root canals and lesions in teeth Nos. 11 and 13. The radiographs also revealed that these teeth had received previous endodontic treatment. While probing, certain areas around the abutment teeth had 10-mm to 11-mm readings, indicating areas of fracture and disease. All risks, benefits, and alternatives were reviewed with the patient regarding the recommended treatment.

The treatment accepted by the patient involved surgically removing the abutment teeth along with the bridge and then placing a veneer graft of autogenous bone to restore the ridge area to proper form. The patient was referred to an oral surgeon for atraumatic extractions and bone grafting followed by placement of three implants 4 to 6 months later. Before the surgical implant appointment, diagnostic models were made and mounted on an articulator. A diagnostic wax-up of the upper left quadrant was produced to an ideal contour and occlusion. A surgical template was fabricated from the diagnostic wax-up to allow for assistance during placement of the implants.[1]

Once the oral surgeon had removed the abutment teeth and placed bone-grafting material, the area was allowed to heal for about 4 months (Figure 1). After the area healed, the surgical guide was used to place three dental implants to the level of bone (Figure 2). The goal was to place the implants so that their long axis lined up exactly with the desired root position and that the emergence of the crown from the gingiva looked natural.[2,3]

Approximately 3 months after the surgical placement of the implants, radiographs were taken to determine healing and osseointegration and the implants were uncovered[4] (Figure 3). The cover screws were removed (Figure 4), and the fixture level impression copings were placed for a open-tray impression using Take-1® (Kerr Corporation, Orange, CA) polyvinyl siloxane material in a custom fabricated tray for the entire arch (Figure 5 and Figure 6). Before taking the impression, it was essential to confirm full seating of the impression copings by taking a periapical x-ray. Once the impression was accepted, the impression copings were removed and the healing caps were placed over the implants.

The final impression, an opposing model, a bite registration, photographs, and diagnostic wax-up were sent to the dental laboratory (Burbank Dental Lab, Burbank, CA). The rest of the restorative process was to be completed in the dental laboratory. In this case, Atlantis abutments (Astra Tech, Waltham, MA) were selected for the abutments and porcelain-fused-to-high-noble-metal for the restorations. With an implant-level impression, the dental laboratory prepared a standard master cast and submitted the preoperative master cast together with the opposing cast and bite to Astra Tech. Using a virtual design process, Astra Tech then created the patient-specific abutments. Dental casts were scanned, creating a virtual model so that a virtual abutment was created per the prescription of the restoring dentist and laboratory. A rigid index made of DuraLay (Reliance Dental, Worth, IL) material aided in the precise transfer of abutments from the model to the mouth. Also, the abutments were labeled on the facial aspect with an engraving of the appropriate tooth number for easier identification (Figure 7).

At the cementation appointment, the healing caps were removed one at a time and the Atlantis abutments were seated

Figure 1 Preoperative occlusal view of the ridge after grafting.

Figure 2 Surgical placement of the implants.

Figure 3 Occlusal view of the healing abutments.

Figure 4 Occlusal view of the healing abutments removed.

Figure 5 Impression copings were placed and verified with x-rays.

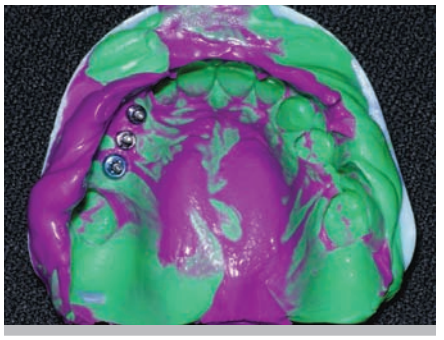

Figure 6 Full-arch impression of the maxillary arch.

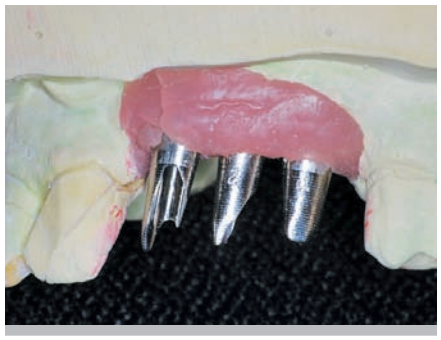

Figure 7 Close-up lateral view of the Atlantis abutments.

Figure 8 Occlusal view of the Atlantis abutments placed.

Figure 9 Occlusal view of the crowns seated in the mouth.

using the DuraLay index to assist in the precise placement of the abutments (Figure 8). A periapical radiograph was taken to confirm full seating of the abutments. The screw access was then closed with sterile cotton along with placement of a composite. Next, the crown restorations for teeth No. 12 through No. 15 were removed from the model and tried in, confirming full seating with an x-ray. Once everything was verified for an accurate fit, the restorations were seated using Maxcem Elite™ cement (Kerr Corporation) (Figure 9).

The patient was very pleased with the esthetic result of the implants and the corresponding restorations. Also, the cosmetic and functional results achieved at the gingival abutment/crown interface were indeed impressive using the Atlantis abutment system.

More complex, multiple-abutment implant restorations require a high degree of accuracy and parallelism to achieve a passive fit.[5] These worrisome issues of parallelism and passivity are overcome by the Computer Milled Abutment process of the Atlantis system, adding a new level of confidence for dentist, surgeon, and patient.[6,7] Using this system, the virtual abutment created through computer-aided design can be evaluated for proper morphology before the milling process. Once accepted by the restoring dentist, the final abutment has proper emergence, gingival contours, and contact points to promote healthy papilla formation.

CONCLUSION

Computer-milled abutments have been shown to have significant advantages as compared to stock and custom-cast abutments. These advantages include overall simplicity, reduction in the number of impressions, accuracy of fabrication, ability to create duplicate abutments, ability for accelerated treatment protocols, superior fit of copings to the abutment, significant reduction in chair time associated with the restoration phase, and a decrease in cost, especially with multiple abutments.[6,7]

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DISCLOSURE

To Come

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