QUIZ

1/2 point CDT documented scientific credit. See Page 38.

When Teamwork is the Best Way

A multidisciplinary approach to a patient's surgery and prosthodontic rehabilitation.

By Robert Schneider, DDS, FACP, CDT (honorary) and Danny Roberts, CDT

Removal and restoration of oral/dental tumors require multidisciplinary treatment planning. Today's CAD/CAM technology and advances in dental technology frequently allow the successful and predictable treatment outcome for the patient.[1-4]

Figure 1
Frontal view of patient's pre-surgery occlusion that will serve as an excellent guide to the reconstruction.

In this article, we share a multidisciplinary approach to a patient's surgery and prosthodontic rehabilitation utilizing CAD/CAM designed and milled custom components and the fabrication of the definitive CAD/CAM prosthesis framework. This approach has proven superior to the previous techniques of waxing and casting metallic frameworks in regards to time and accuracy in addition to less chairside time by the prosthodontist and relative ease of fabrication by the dental technician.

Patient Treatment

A 43 year old female was referred to the maxillofacial prosthodontic clinic prior to the definitive treatment of a right mandibular swelling previously diagnosed via biopsy as an ameloblastoma. An ameloblastoma is a non-malignant lesion which can be rapidly enlarging and destructive to the bone and teeth. Mounted diagnostic casts were fabricated for evaluation and as a reference source following the extractions and tumor removal. The patient stated she would

prefer a fixed restoration if possible following the surgery which was discussed and would be implant retained following an adequate healing period (**Figures 1-3**).

Teeth No. 23-31 were extracted and the sites allowed to heal prior to removal of the tumor to allow adequate soft tissue coverage of the area. An acrylic resin removable partial denture was fabricated for the patient to wear to minimize drift and movement of her remaining dentition. The plan for an en-bloc surgical resection of the mandible from the left parasymphysis to the right mandibular mid body. The area was to be reconstructed with a pre bent reconstruction plate with the use of a stereolithic medical model (Medical Modeling Inc.) made with a maxillofacial CT with 3D reconstruction and bilateral hip iliac crest grafts, which was completed uneventfully.

Following an adequate healing period mounted diagnostic casts were made and discussion held with the dental laboratory technician that would be fabricating the definitive prosthesis. A diagnostic wax-up was completed utilizing the patient's previous dental condition/casts to fabricate a relatively non-restrictive surgical guide for implant placement. A concern is the placement of the reconstruction bar retaining screws so implant placement potentially is compromised. The decision was made that four dental implants would provide adequate support for a screw retained fixed partial denture processed in injection molded/heat polymerized acrylic resin. A porcelain fused to metal restoration could also be fabricated, however the author prefers processed acrylic resin for this type of reconstruction due to ease of adjustment, reparability, lack of abrasiveness to the opposing occlusion, relative ease of fabrication and the possibility of recurrence of the ameloblastoma requiring removal/modification of the prosthesis.

The guide was fabricated and the implants placed (Thommen Medical).

☛ QUICK TAKE

Robert Schneider, DDS, and Danny Roberts, CDT, share a multidisciplinary approach to a patient's surgery and prosthodontic rehabilitation utilizing CAD/CAM designed and milled custom components and the fabrication of the definitive CAD/CAM prosthesis framework.

Figure 2 *(right)*
Occlusal view of occlusion pre-surgery.

Figure 3 *(below)*
Lateral view of occlusion pre-surgery.

Figure 4 *(below)*
Implants in place with healing caps removed, very good placement with use of a surgical guide from the pre-surgery casts.

The patient was allowed to heal for three months before making final impressions (**Figure 4**). The abutments were placed (SPI Vario Multi, Thommen Medical) to bring the level of the implant above the soft tissues for improved soft tissue health and optimize the oral hygiene procedures for the patient (**Figures 5 and 6**). Final abutment level impressions were made with a custom tray and polyvinyl siloxane impression material to be mounted on the articulator with a facebow.

Figure 5 *(above)*
Variomulti abutments in place to bring margins to a crestal or supragingival level.

Figure 6 *(above)*
View of interocclusal distance with abutments in place.

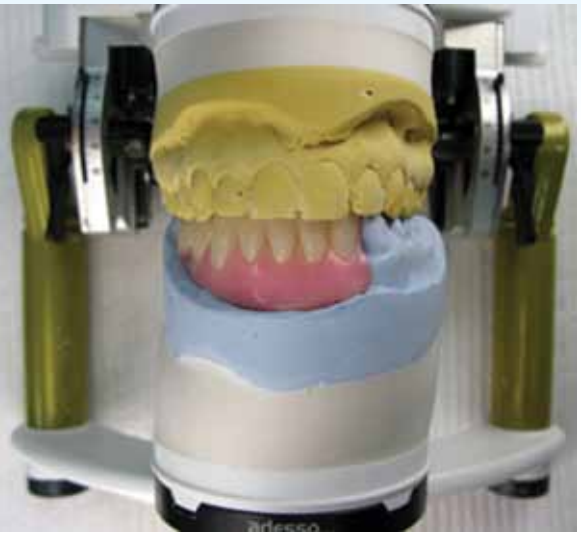

Figure 7 *(above)*
Frontal view of wax-up on articulator.

Figure 8 *(right)*
Occlusal view of wax-up duplicating the patients pre surgery occlusion.

QUIZ:

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CONTINUING EDUCATION APPROVED

NADL National Association of Dental Laboratories

A verification index was fabricated in the laboratory for intraoral try-in to confirm the accuracy of the master cast. Following the verification process the dental laboratory completed the accurate tooth arrangement on the master cast trying to as closely as possible duplicate the patient's pre-surgery tooth position (**Figures 7 and 8**). Following confirmation of accuracy of the wax prosthetic tooth arrangement by the prosthodontist and the patient, the wax-up and master cast was sent to a scanning/milling facility (Cagenix, Memphis, TN) to fabricate the prosthesis substructure with the design selected by the prosthodontist and the technician. A wax try-in can also be completed at this stage, however the author has not requested this step from the laboratory for several years due to the verification index confirmation. The prosthodontist requested a high-water design for this patient to help facilitate oral hygiene procedures.

Several basic design concepts are available and can be utilized and modified (**Figure 9**). An advantage to this approach is the CAD design is performed at the scanning facility via a double scan. Both the wax-up and master cast are scanned so that the design, predetermined by the sending laboratory technician can be reviewed and modifications made before the final milling process. The technician and the prosthodontist can both evaluate the design with a 3D viewing program that allows evaluation from any angle with or without the tooth overlay (**Figures 10-13**). This allows critical analysis of the framework design to provide satisfactory support/retention and thickness of material of the final prosthesis.

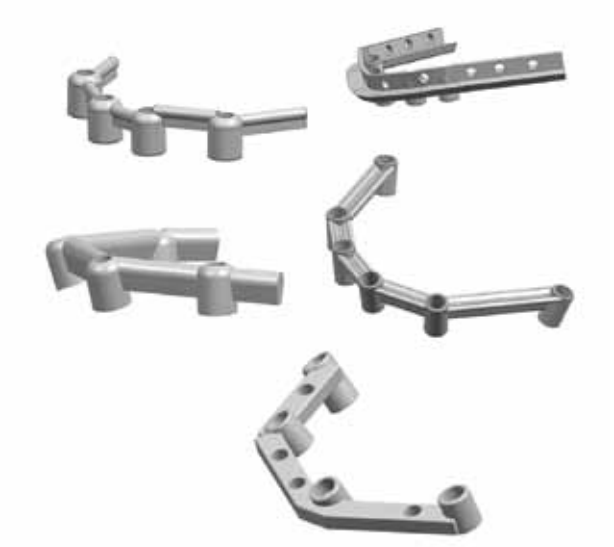


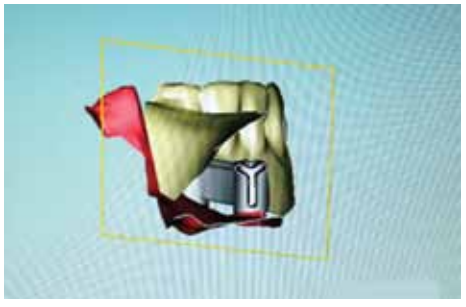
Figure 9 *(above)*
Various basic CAD/CAM designs from Cagenix utilizing either Hader bar, Dolder bar, Y design, screw retained Locator and fixed hybrid design that can be modified by the technician and dentist prior to milling.

Figure 10 *(above)*
3D view of wax-up over the proposed framework design.

Figure 11 *(below)*
3D wax-up removed to view the framework design directly.

Figure 12 *(above)*
3D occlusal view with a section of the wax-up removed to more accurately access tooth position to the framework.

Figure 13 *(below)*
3D section removed facial-lingual to evaluate clearance of Y framework to the prosthetic teeth. Electronic modifications can be made to the framework at this time to provide optimal support for the prosthetic teeth prior to milling.



When the final framework design is satisfactory to both the prosthodontist and the technician the milling process is completed using type IV titanium. The final prosthesis can then be opaqued, if desired to block out the grayness of the metal and the prosthetic teeth arranged and processed utilizing an injection molded technique which helps eliminate stress/potential distortion to the framework (Ivoclar Vivadent). When the polymerization and deflasking process is complete the prosthesis can then be finished a routine manner and returned for delivery (**Figure 14-19**).

At completion the prosthesis was delivered from the laboratory for insertion. The healing caps were removed and the prosthesis went to place passively. The occlusion checked and very minor adjustments made with a remount procedure. The patient was given oral

Figure 14 *(above)*
Final milled Y framework design on master cast.

Figure 15 *(right)*
Completed wax-up on the framework prior to processing.

Figure 18 *(below)*
Occlusal view of finished and polished prosthesis.

Figure 19 *(right)*
Gingival view of finished and polished prosthesis. This is the desired design for a so called high water pontic design to allow for optimal hygiene with uniform convex surface contours and a high polish.

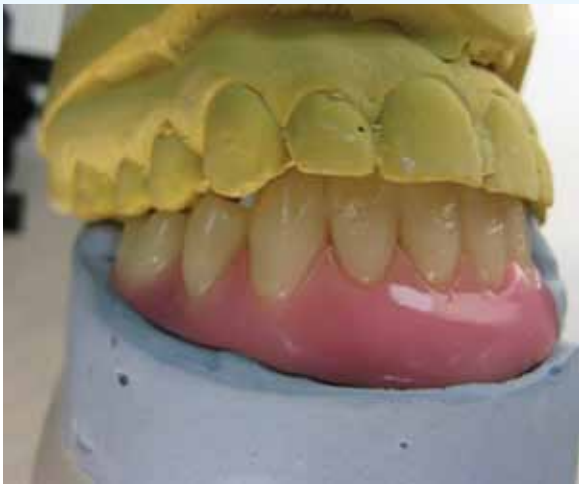


Figure 16 *(left)*
Wax-up sprued and partially invested prior to injection of acrylic resin.

Figure 17 *(below)*
Prosthesis deflasked prior to removal of the sprues.

hygiene instructions and the appropriate hygiene instruments were provided to her (**Figure 20-22**). A delivery radiograph was taken to verify accuracy of fit of the framework and to serve as a baseline evaluation for alveolar bone levels around the implants (**Figure 23**).

The use of a multi-disciplinary approach can lead to a very predictable outcome for the reconstruction of oral tumors. The dental technician is a very integral member of the team and must have an in-depth knowledge of dental implants, surgical outcomes, dental biomaterials, esthetics, occlusion and CAD/CAM procedures. Advancements in the CAD/CAM treatment procedures for our patients is increasing rapidly requiring continuous education and participation in continuing education courses, attended by all members of the implant/reconstruction team. **JDT**

Figure 20
Frontal intra oral view of prosthesis as delivered.

Figure 21
Close up view of characterized acrylic resin, illustrating very intimate fit of the milled CAD/CAM framework. These frameworks are milled to a 10 micron accuracy.

Figure 22
Patient's smile with completed fixed prosthesis.

Acknowledgement

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References

1. Moore D, Mitchell D. Rehabilitating dentulous hemi-mandibulectomy patients. J Prosthet Dent 1976;35(2):202-206.
2. Taylor TD: Clinical maxillofacial Prosthetics. Chicago, Quintessence, 2000.
3. de Freitas R, Kaizer OB, Hamata MM, et al. Prosthetic rehabilitation of a bone defect with a teeth-implant supported removable partial denture. Implant Dent 2006;15:241-247.
4. Cawood JI, Stoelinga PJ. International Academy for Oral and Maxillofacial Rehabilitation-Consensus Report. Int J Oral Maxillofac Surg 2006;35:195-198.
5. Cheung LK, Leung AC. Dental implants in reconstructed jaws: implant longevity and peri-implant tissue outcomes. J Oral Maxillofac Surg 2003;61:1263-1274.
6. Reshad M, Coscione D, Aalam AA. Fabrication of the mandibular rimplant-supported fixed restoration using CAD/CAM technology: A clinical report. J Prosthet Dent 2009;102:271-278.
7. Roberts D, Schneider R. Fabrication of a laser welded framework supported by dental implants. J Dent Tech 2009;26:8-14.
8. Schneider R. Full mouth restoration on dental implants utilizing titanium laser welded frameworks. J Esthet Restor Dent 2009;21:215-228.

Figure 23
Delivery radiograph with prosthesis in place. Note intimate radiographic fit of framework and maintenance of alveolar levels around the implants.

About the Authors

Schneider works at the University of Iowa Hospitals and Clinics, Hospital Dentistry Institute, Division Director of Maxillofacial Prosthodontics, and holds the rank of Professor. He received his DDS from the University of Southern California and practiced general dentistry in Arizona for five years before earning his MS and certificate in prosthodontics from the University of Iowa in 1983. He has published extensively in the prosthodontic literature and is very active in many prosthodontic and dental laboratory organizations. Schneider regularly lectures for the Kirkwood Community College Dental Technology program in Cedar Rapids, Iowa, and has been on the Kirkwood Dental Technology Advisory Committee for more than 20 years. He is a former trustee of the National Board for Certification in Dental Laboratory Technology and been involved with NADL activities for many years.

Roberts has 26 years experience. He started his dental laboratory career in 1983 and successfully completed his certification in 1989. He owns and operates Hawkeye Dental Studio of Cedar Rapids, Iowa, and specializes in aesthetic removable, laser assembled titanium bars and attachments for removable partial denture/fixed partial denture combination cases.