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on the cover

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Inconspicuous anterior implant-supported restorations: Combining clinical and laboratory expertise

Author_Larry R. Holt, DDS, FICD, director of clinical education and research, Drake Precision Dental Labs

_c.e. credit part I

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_The ultimate goal of tooth replacement in the esthetic zone is an inconspicuous transition from dental restoration to the patient's natural, biologic tissues.[1] This transition is evaluated at many levels.[2] Color and contour of gingiva at the interface must mimic the natural contours and color of adjacent and contralateral teeth.

The dental restoration must match contour and blend seamlessly into the existing dentition. Color matching of final crown must be consistent with existing dentition. (hue, chroma and value) This case study explores the management and correction of a previously treated implant-retained maxillary central incisor.

The patient presented as a healthy, 48-year-old female with no contributory health history to prohibit dental treatment. Recent dental history revealed an Ankylos implant to replace tooth #9 had been placed approximately five months prior to this visit. The implant had been uncovered and a temporary abutment was placed.

A ridge lap provisional restoration was fabricated to fit the coronal portion of the abutment. The resultant provisional was not only unesthetic but also was the source of considerable tissue inflammation and patient discomfort (Figs. 1-3). Patient reported dissatisfaction with the provisional treatment and was seeking a more desirable solution.

Clinical evaluation revealed a well-placed implant with acceptable position both facio-lingually and mesio-distally.[3] Additionally, there was good volume of soft tissue and ridge form was ideal.[4] Surgeon reported that the implant was well-integrated in bone. There was a poorly adapted provisional restoration over an inadequately contoured provisional abutment. Radiograph revealed excess acrylic that extended well into the dental sulcus all the way to the implant platform (Fig. 4). This acrylic did not provide any emergence profile support of transmucosal tissue.

The provisional restoration was poorly adapted to both the abutment and to the ridge crest soft tissue. Intaglio surface was rough and made in such a manner as to create a ridge lap profile. The facial and proximal surfaces of the provisional were fitted over soft-tissue crest. There had been no attempt to modify gingival tissue emergence profile or to create the environment for inconspicuous transition from restoration to biologic tissues.

Techniques for managing emergence profile are well-documented in the literature. Interproximal tissues will point and form papillae when appropri-

Fig. 1_Initial appearance. (Photos/Provided by Dr. Larry R. Holt)

Fig. 2_Provisional removed.


Fig. 3

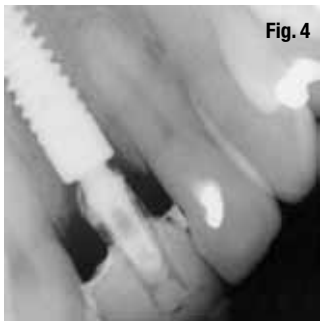
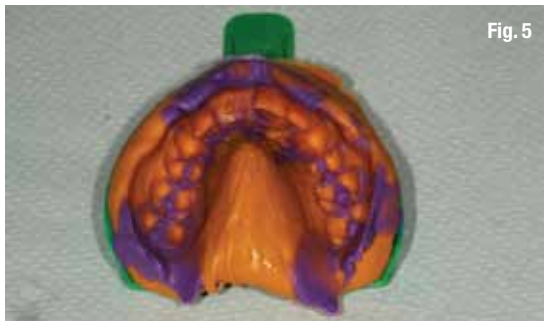


Fig. 4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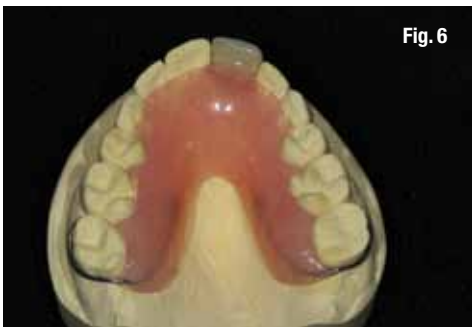
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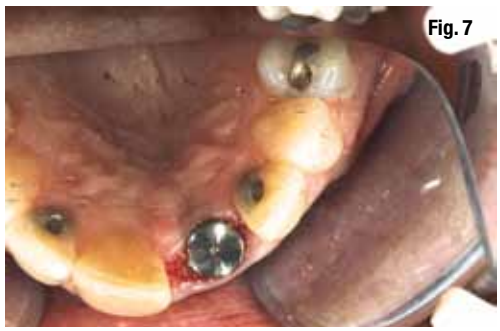
Fig. 7


Fig. 8

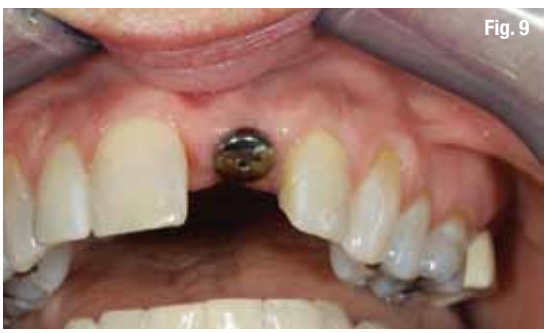
Fig. 9


Fig. 10

ate lateral pressure is applied with a temporary abutment when natural teeth are on either side of the implant. The adjacent bone height will dictate the level of the papillae assuming the restoration and its associated abutment properly support them.[5] Facial contour can be manipulated to create appropriate gingival zenith height by increasing or decreasing facial emergence profile. Increasing the profile will move the gingival zenith apically and reduction of contour will move the crest incisally.[6]

Treatment plan consisted of removal of temporary abutment/provisional crown, fabrication of a temporary partial denture (Figs. 5,6) and placement of an appropriate temporary abutment that did not retain a provisional crown (Ankylos sulcus former) (Fig. 7).

This sulcus former, as its name implies, would provide soft-tissue emergence profile support. The partial denture was to be placed to avoid interference with the sulcus former when fully seated (Fig. 8). Patient was to be recalled in one-week intervals to evaluate the response to this treatment. Once healed, a final, customized abutment and cementable all-ceramic crown would be delivered.

The plan was followed per previous description. Postoperative visits were uneventful. Patient comfort was immediate. Tissue health and emergence profile were deemed appropriate at the second week recall visit (Figs. 9, 10).

At a subsequent appointment, the sulcus-forming abutment was removed, a closed tray impression coping was placed and an impression (Identium, Kettenbach) was taken for fabrication of final restoration (Figs. 11,12). Appropriate opposing model, bite registrations and facebow accompanied the case to the laboratory. A careful shade map and clinical photography were included.

Clinically, it was determined that this would be a difficult shade because of surface characteristics and maverick colors of the adjacent central incisor. Arrangements were made to have a laboratory technician available at the delivery appointment. Sulcus former and temporary partial were reinserted and patient was dismissed and scheduled for delivery appointment.

All model work was accomplished. The laboratory was given the option of fabricating a custom abutment or customizing a stock abutment. This

Fig. 3_Provisional lateral intaglio.

Fig. 4_Provisional abutment and crown.

Fig. 5_Impression for temporary partial.

Fig. 6_Temporary partial.

Fig. 7_Ankylos sulcus former.

Fig. 8_Temporary partial placed.

Fig. 9_Tissue healed and emergence profile established at two weeks.

Fig. 10_Sulcus former removed.

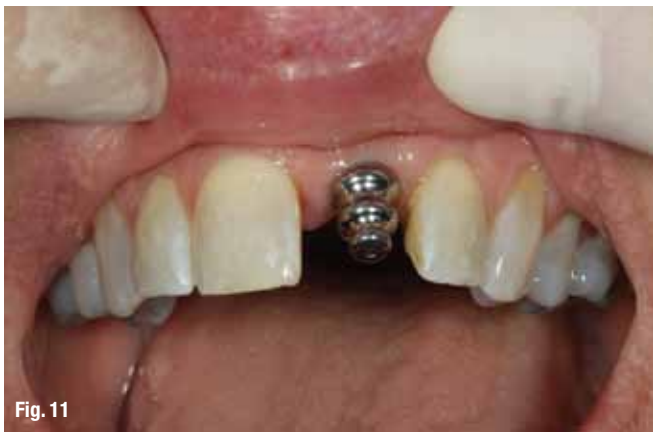
Fig. 11

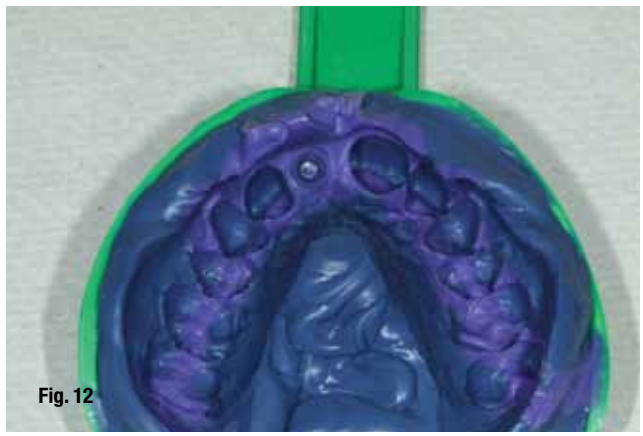
Fig. 12


Fig. 13


Fig. 14

Fig. 11_Ankylos impression coping placed.

Fig. 12_Final impression.

Fig. 13_Abutment with soft-tissue moulage.

Fig. 14_eMax crown on abutment.

decision was to be based on the trajectory of the abutment relative to the position of the implant. The placement of the implant was ideal and the use of a lab-modified, stock abutment was selected (0 degree Cercon Balance Abutment, Dentsply Implant).

The contour correlation between the sulcus former and the emergence profile of the stock abutment complement one another. The margins were placed 1 mm subgingivally on facial, mesial and distal. The lingual margin was placed at .5 mm.

Once the abutment was perfected, an all-ceramic crown was fabricated (eMax, Ivoclar). This crown was waxed to full contour, and then the facial was cut back to provide a field into which a customized facial surface could be developed from added porcelain. The wax pattern was invested and pressed. The resultant crown was then modified with additional application of porcelain and was left preglazed in anticipation of chairside staining[7] (Figs. 13,14).

The delivery appointment was uneventful. The lab provided a seating jig that simplified the positioning of the customized abutment (Fig. 15). The abutment was torqued to manufacturer's specification (Figs. 16, 17).

The crown was tried in and adjustments were made to proximal contacts and to occlusion. A dental laboratory technician was enlisted to provide custom chairside staining to perfect the color match. Both patient and clinician were satisfied with the resultant restoration (Fig. 18). The patency of the abutment screw channel was protected with compacted silicone tape, and the restoration was seated with implant cement (Premier Implant Cement, Premier).

Great care was taken to avoid excess cement and to protect the sulcus from any incursion of residual cement extrusion from margins.[8] A crown-seating jig was provided by the laboratory to be used for removal of excess cement prior to seating of the crown.

Patient was rescheduled at a two-week interval for a final evaluation and photography. She was extremely satisfied with both the esthetics and comfort of the definitive restoration. Clinically, the restoration met the criteria for an inconspicuous restoration (Figs. 19, 20).

_Conclusion

Understanding of the soft-tissue interface with implant-supported restorations is critical, fundamental knowledge. All practitioners whose goal is to deliver inconspicuous restorations should practice these concepts. This case study revealed the stark contrast between tissue-management protocols. There is no place in contemporary implant dentistry for ridgelap crowns assuming appropriate pretreatment parameters are met.

The esthetic zone must be evaluated prior to implant placement and any modification of the ridge form should be taken into consideration well in advance of implant placement surgery.[9-11]

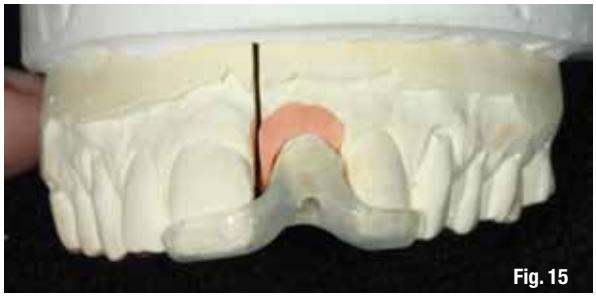
Fig. 15

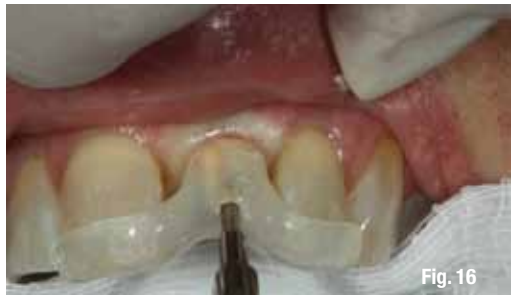
Fig. 16


Fig. 17

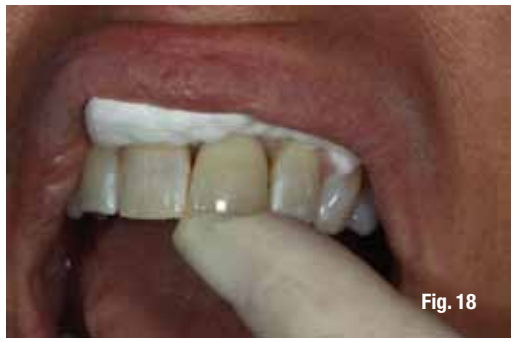
Fig. 18

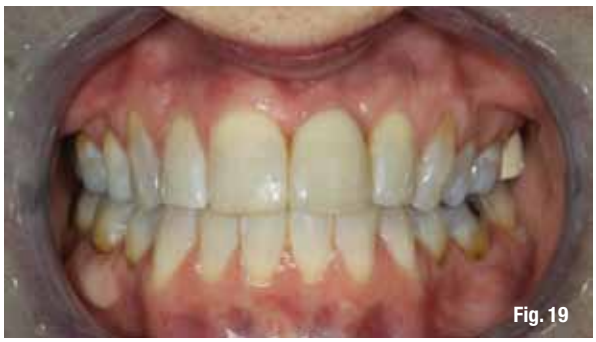
Fig. 19


Fig. 20

Fig. 15_Seating jig.

Fig. 16_ Placing abutment with seating jig.

Fig. 17_Abutment torqued and ready for crown seat.

Fig. 18_Seating crown.

Fig. 19_Final restoration at two weeks.

Fig. 20_Patient postoperative smile.

Surgery should be driven by prosthetic requirements. Once surgery is accomplished, it is imperative that restorative clinicians understand how to manipulate the peri-implant soft tissues.

All of this tissue management is critically important. However, then comes fabrication of the final restoration. The abutment must be designed in such a way as to conceal the crown/abutment interface. Furthermore, it must allow for adequate crown thickness to have appropriate strength to withstand mastication forces and still remain retentive. The final contours of the crown must be managed in such a way as to blend into the existing dentition.

This patient did not have a symmetrical arch form. The lateral incisiors were not bilaterally symmetrical nor were the incisal edges consistent. Finally, the color match of the restoration, especially a central incisor, must be as identical as possible to the existing dentition. None of these parameters can be accomplished without precise communication and excellent laboratory workflow.

This case was a success based upon all previously described parameters. The gingival contour was essentially mirror image identical to the adjacent central incisor. Papillae were intact.[12] The laboratory was skilled at modification of the abutment so that the margins were concealed within the sulcus. The axial and incisal contours of the abutment provided adequate clearance so that a proper thickness crown could be developed.

This is critical for both esthetics and for long-term strength and stability of the definitive restoration. The technician selected the appropriate ingot of ceramic material to serve as substrate for the subsequent application of modifying porcelain and surface staining. Final color matching could not have been accomplished without skilled hands and eyes of a technician at chairside.

Close communication and strong laboratory relationships, along with appropriate clinical understanding of soft-tissue management, leads to success. The inconspicuous final result of this case could never have been accomplished without strong support from the dental laboratory._

Note: Dr. Holt would like to extend thanks to the exceptional team at Drake Precision Laboratories for providing all laboratory support for this case.

_about the author

Larry R. Holt, DDS, FICD, graduated from the UNC School of Dentistry in 1978. He was in private practice from 1978-2008. Since 2008, he has been the director of clinical education and research at Drake Precision Dental Laboratories in Charlotte, N.C.

Case report: Immediate loading of intraorally welded implants

Authors_Drs. Luca Dal Carlo, Paolo Squillantini, Mike Shulman, Sheldon Winkler, Enrico Moglioni, Roberto Donati, Marco Pasqualini and Franco Rossi

_c.e. credit part II

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_The 'Auriga Protocol'

_Dr. Luca Dal Carlo developed the "Auriga Protocol" for general dentists and specialists. The Auriga technique is indicated for implant rehabilitation in edentulous patients.

The purpose of the Auriga technique is to facilitate treatment from the partially or completely edentulous state to a full-arch fixed implant-supported restoration. There is no down time when the patient has a removable prosthesis. Through all phases of the Auriga treatment technique, the patient has fixed teeth. The Auriga protocol can also eliminate costly and complicated sinus augmentation procedures. Auriga protocol can be used for lower jaw rehabilitations as well.

This technique was presented for the first time in 2007 at the seventh AISI International Implant Congress in Bologna, Italy, and has been improved upon throughout the years.

Ten-year statistics for 14 full-arch cases with 121 implants and 193 prosthetic teeth, completed by the authors of this article, confirm the validity and reliability of this procedure.

No failed cases were observed during this time period.

_Advantages of the Auriga Protocol for the clinician

The need for a provisional denture, either complete or partial is eliminated. A maxillary sinus grafting procedure is unnecessary. Occlusal function will be restored with the benefit of a complete posterior tooth arrangement.

_Advantages of the Auriga Protocol for the patient

All of the advantages of a fixed prosthesis as compared to a removable prosthesis apply, including primarily the added comfort and experience of not having to function with a removable appliance.

The need for a maxillary sinus augmentation

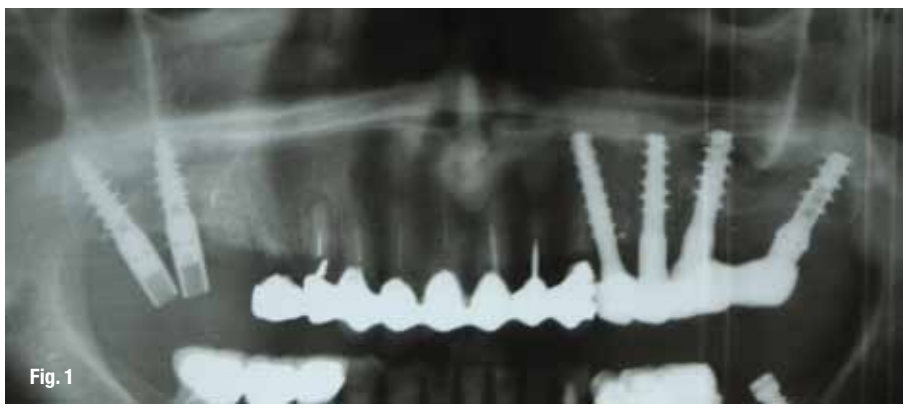
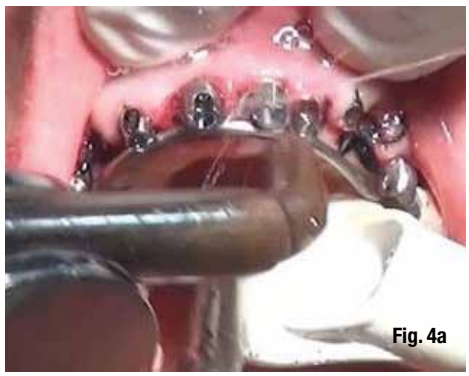


Fig. 1_Radiograph after implant placement in the upper right tuberosity region. (Photos/Provided by Dr. Shulman)



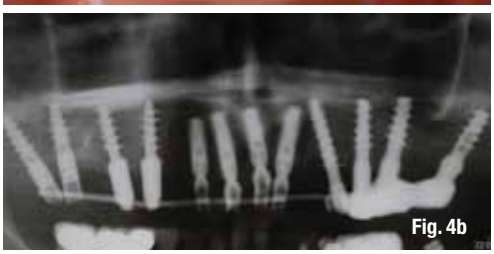


Fig. 2_ Intraoral photograph showing implants placed in the upper right tuberosity region.

Figs. 3a, 3b_Six new implants are placed immediately after extraction of the remaining teeth.

Fig. 4a, 4b_New implants welded with the titanium bar to the existing implants.

Fig. 5_A provisional fixed prosthesis is immediately cemented with temporary cement at the time of the surgery.

with its cost, possible discomfort and potential complications are eliminated.

Additionally, advantages include a restored physiological occlusion with improved masticatory efficiency results.

_Technical procedures

The Auriga technique consists of placing one piece of submerged screw implants in the right and left tuberosity regions. After four to six months, the patient's remaining periodontaly involved teeth are extracted and replaced with implants.

All of the implants are stabilized by means of intraoral welding to a titanium bar and a provisional prosthesis cemented with temporary cement. There is no need for a removable interim prosthesis.

The definitive fixed prosthesis is fabricated and inserted after the implants' integration.

_Case report

A healthy 63-year-old Caucasian woman presented for treatment at the office of one of the co-authors (LDC) with a metal-ceramic fixed prosthesis supported by natural teeth on the upper center right side and an implant-supported prosthesis on the left side.

All of the teeth supporting the prosthesis had massive secondary decay and endo/perio problems. Patient's remaining teeth were non-restorative.

The first step of the Auriga technique involved the insertion of endosteal implants in right maxillary tuberosity region (Figs. 1, 2).

After allowing for six month of healing, all remaining natural teeth were extracted along with the fixed prosthesis. Six root-form titanium implants were inserted immediately after extractions (Figs. 3a, 3b) and welded with the existing implants to a titanium bar (Figs. 4a, 4b.). A provisional prosthesis was cemented with temporary cement (Fig. 5).

By inserting a prosthesis with adequate retention and stability the same day as the surgery, patient complaints and discomfort can be avoided or substantially reduced. The instantaneous sta-