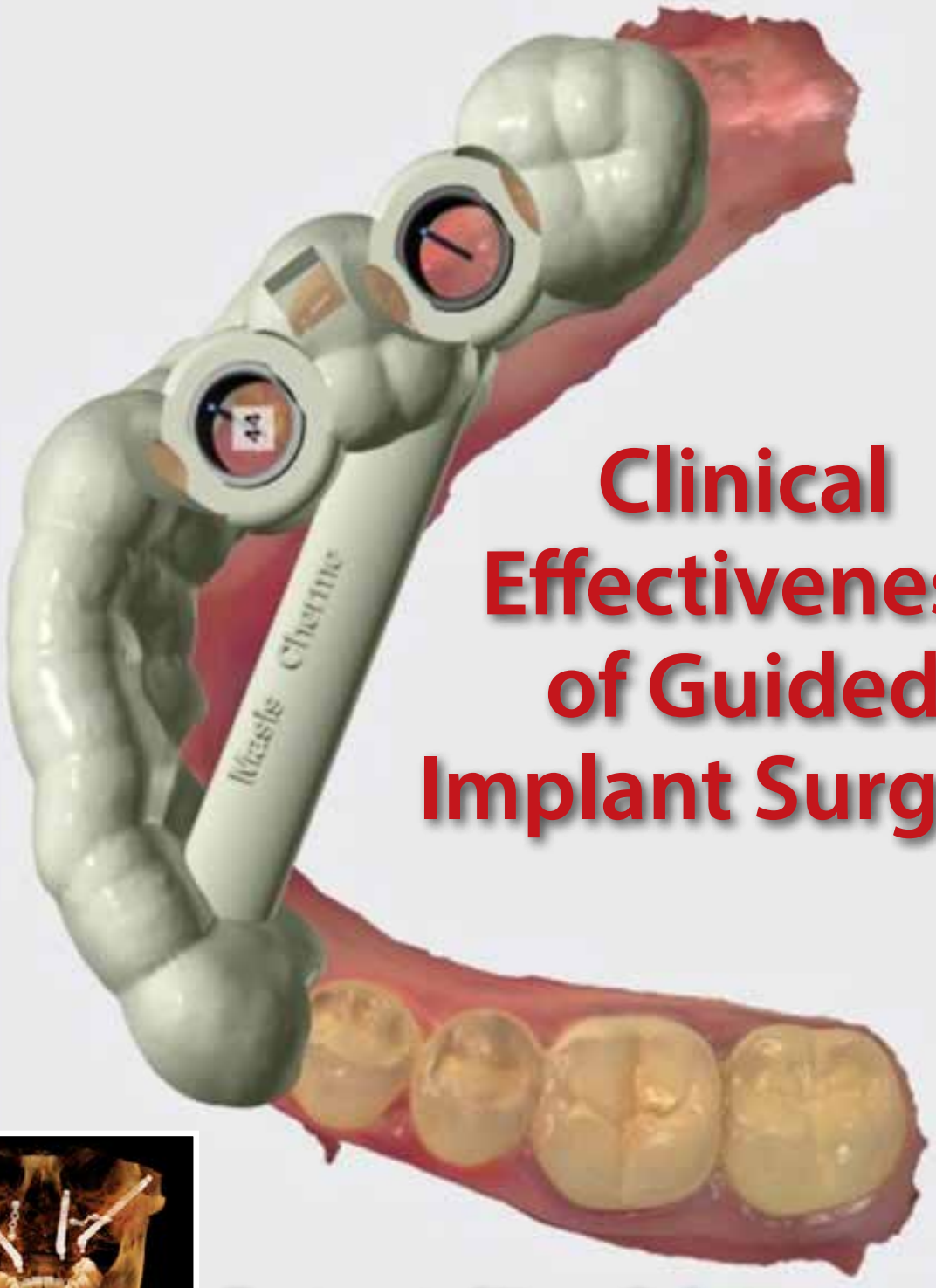
Volume 11, No. 2 May 2019

JIACD

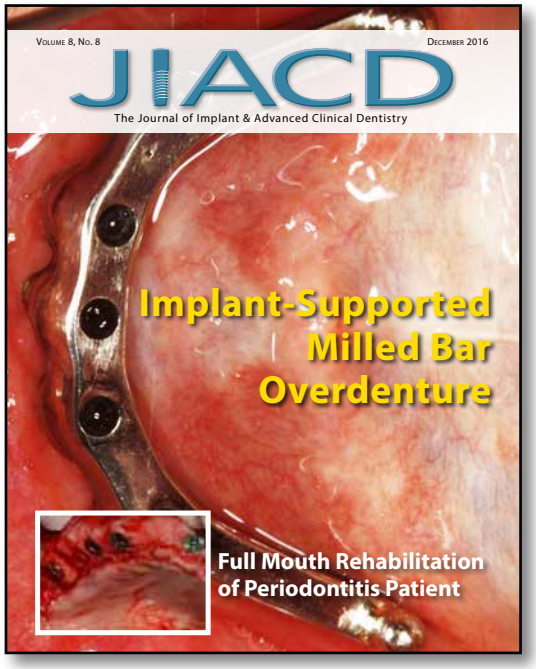
The Journal of Implant & Advanced Clinical Dentistry

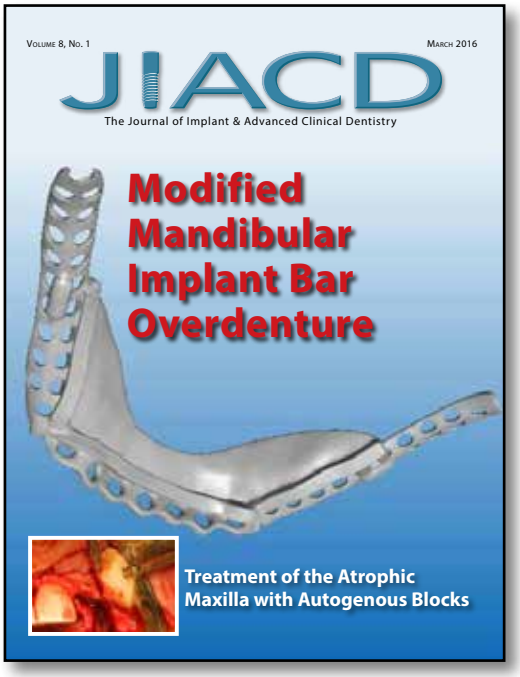


Clinical Effectiveness of Guided Implant Surgery

Treatment of Noma Defect with Zygomatic Implants

The Best Things in Life Are FREE!





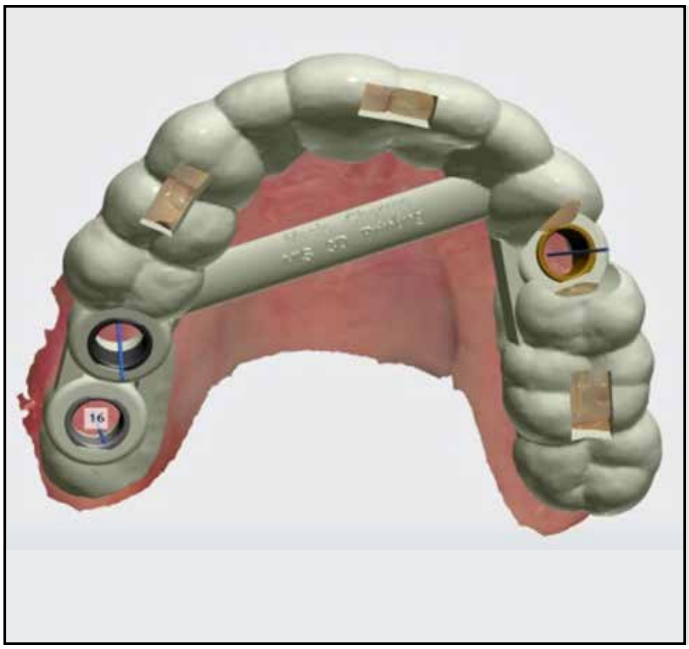
Subscribe now to enjoy articles **free of charge** that will benefit you, the actively practicing dental provider. With each JIACD issue, readers are afforded the opportunity to assess clinical techniques, cases, literature reviews, and expert commentary that can immediately impact their daily dental practice.

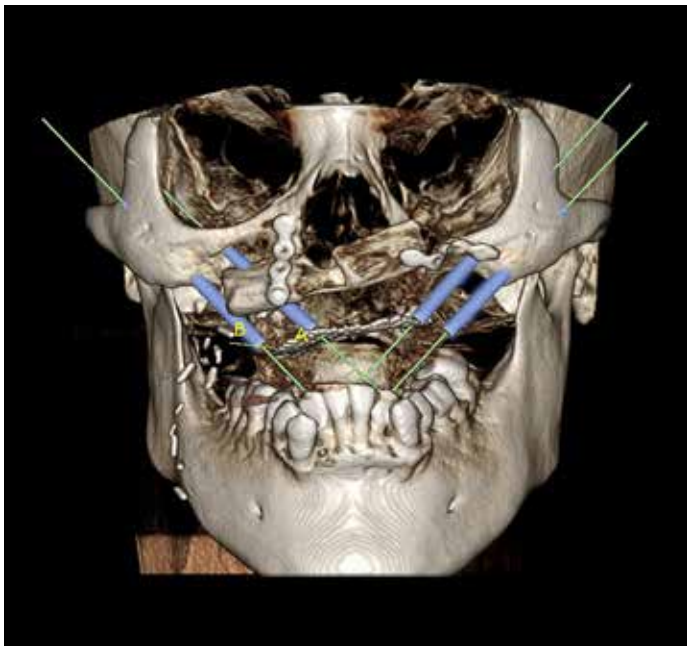
Email notification when new issues are available online.

Start your FREE subscription today at www.jiacd.com

JIACD
The Journal of Implant & Advanced Clinical Dentistry
Volume 11, No. 2 • May 2019

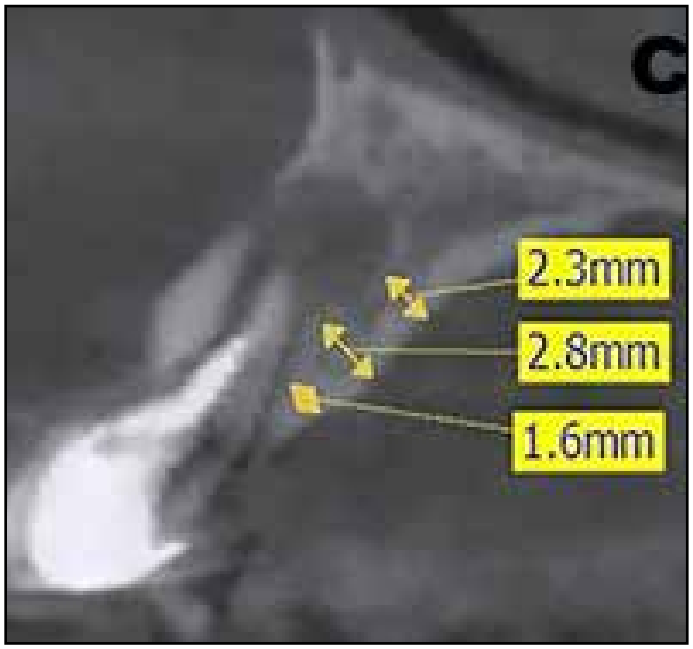
Table of Contents

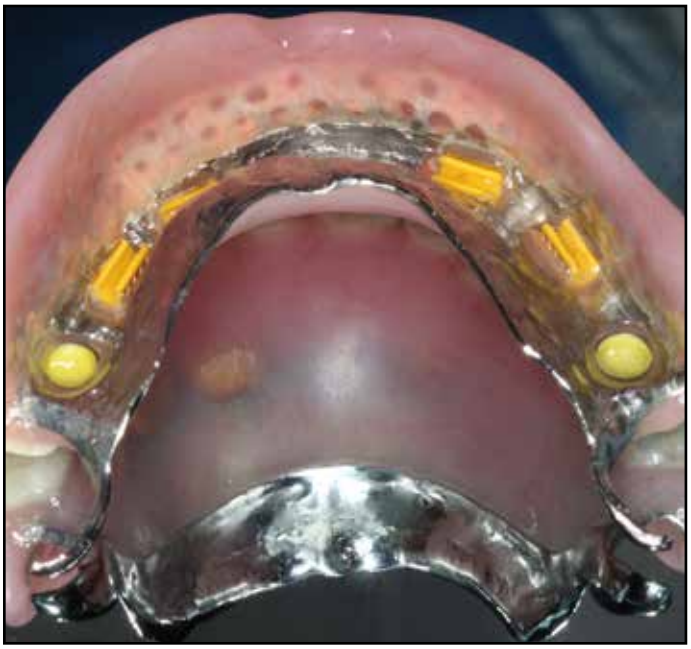




JIACD
The Journal of Implant & Advanced Clinical Dentistry
Volume 11, No. 2 • May 2019

Table of Contents





JIACD
The Journal of Implant & Advanced Clinical Dentistry
Volume 11, No. 2 • May 2019

Publisher
LC Publications

Design
Jimmydog Design Group
www.jimmydog.com

Production Manager
Stephanie Belcher
336-201-7475 • sbelcher@triad.rr.com

Copy Editor
JIACD staff

Digital Conversion
JIACD staff

Internet Management
InfoSwell Media

Subscription Information: Annual rates as follows: Non-qualified individual: $99(USD) Institutional: $99(USD). For more information regarding subscriptions, contact info@jiacd.com or 1-888-923-0002.

Advertising Policy: All advertisements appearing in the Journal of Implant and Advanced Clinical Dentistry (JIACD) must be approved by the editorial staff which has the right to reject or request changes to submitted advertisements. The publication of an advertisement in JIACD does not constitute an endorsement by the publisher. Additionally, the publisher does not guarantee or warrant any claims made by JIACD advertisers.

For advertising information, please contact:
info@JIACD.com or 1-888-923-0002

Manuscript Submission: JIACD publishing guidelines can be found at http://www.jiacd.com/author-guidelines or by calling 1-888-923-0002.

Disclaimer: Reading an article in JIACD does not qualify the reader to incorporate new techniques or procedures discussed in JIACD into their scope of practice. JIACD readers should exercise judgment according to their educational training, clinical experience, and professional expertise when attempting new procedures. JIACD, its staff, and parent company LC Publications (hereinafter referred to as JIACD-SOM) assume no responsibility or liability for the actions of its readers.

Opinions expressed in JIACD articles and communications are those of the authors and not necessarily those of JIACD-SOM. JIACD-SOM disclaims any responsibility or liability for such material and does not guarantee, warrant, nor endorse any product, procedure, or technique discussed in JIACD, its affiliated websites, or affiliated communications. Additionally, JIACD-SOM does not guarantee any claims made by manufact-urers of products advertised in JIACD, its affiliated websites, or affiliated communications.

Conflicts of Interest: Authors submitting articles to JIACD must declare, in writing, any potential conflicts of interest, monetary or otherwise, that may exist with the article. Failure to submit a conflict of interest declaration will result in suspension of manuscript peer review.

Erratum: Please notify JIACD of article discrepancies or errors by contacting editors@JIACD.com

JIACD (ISSN 1947-5284) is published on a monthly basis by LC Publications, Las Vegas, Nevada, USA.

JIACD
The Journal of Implant & Advanced Clinical Dentistry

Clinical Effectiveness of Guided Implant Surgery

Hakobyan Gagik DMSc, PhD[1] • Hakobyan David DDS[2]
Nariman Samadbin, DDS[3]

Abstract

Background: The purpose of this study is to evaluate the clinical effectiveness of guided implant surgery.

Patients and Methods: The present study aimed at investigating the 5-year clinical treatments outcomes of 93 patients with partial and complete edentulism. To conduct a comparative analysis of the clinical effectiveness of guided implant surgery, two groups were formed: Group A (experimental group) 56 patients who had guided implant surgery, Group B (control group) 37 patients who had non-guided implant surgery. Guided surgery software (3 Shape Implant Studio) was used to plan the surgeries in patients Group A and to design guides that were fabricated with a desktop 3D printer (Stratasys).

Results: No intra-operative or immediate post-operative complications were noted. The success rate at 1 year from the final loading was similar in all groups with no implants lost. No significant differences in peri-implant marginal bone loss could be also observed between groups. The average surgical time for guided implants was 10.6 ± 2.9 min per implant, while the average surgical time for non-guided implant surgery was 16.4 ± 1.5 min per implant.

Conclusion: Guided implant surgery represents a clinically predictable surgical procedure to restore partially and totally edentulous patients. Guided surgery presents higher cost compared to conventional implant placement surgery and requires more pre-surgical planning time. Surgical guides can greatly reduce the risks and surgical time required for the dental implant surgery.

KEY WORDS: Dental implants, guided surgery, surgical guide, 3D printed guides, success

1. Professor, Head of the Department of Oral and maxillofacial surgery Yerevan State Medical University after M. Heratsi, Armenia

2. Assistant Professor Department of Oral and maxillofacial surgery Yerevan State Medical University after M. Heratsi, Armenia

3. Oral Surgery Resident at Department of Oral and maxillofacial surgery Yerevan State Medical University after M. Heratsi, Armenia

INTRODUCTION

The long-term success of dental implant surgery is dependent, in part, on accurate planning and placement of the implant.[1] Correct implant positioning has a number of advantages such as favorable esthetic and prosthetic outcomes and the potential to ensure optimal occlusion and implant loading.[2] Even a minor variation in comparison to ideal placement causes difficulties in fabrication of final prostheses.[3,4] Optimal three-dimensional placement reduces biomechanical complications and the odds of implant failure. Dental literature illustrates a strong correlation between improper implant position and marginal bone resorption.[5,6] Incorrect angulation of the implant often leads to periimplant bone destruction, marked bone resorption, and mechanical complications.[5,6] Inaccurate implant placement can result in short-term complications, such as damage to adjacent vital structures, as well as a long-term increase in implant failure.[7] Incorrect implant placement near the adjacent teeth not only leads to interproximal bone loss but may also cause tooth vitality loss and the failure of the implant.[8] Serious consequences such as paresthesias[9,10] and infections[11] may arise from invasion of anatomic structures such as the inferior alveolar nerve or the maxillary sinus, both during the preparation of the implant site and during implant insertion.[12] Proper treatment planning with respect to dental implant placement can preclude such complications. Modern digital technologies are significantly changing the classic approach when planning implant treatment. Dental scan examination using a Cone Beam Computer Tomography (CBCT) is becoming a standard procedure for precise and detailed examination of the bone substrate prior to implant placement. Furthermore, there is an increasing use of 3-dimensional (3)D imaging applications for pre-surgical planning and transfer of oral implant treatment.[13,14] The resulting planning information is then used to fabricate drill guides, and this process ultimately results in the transfer of the planned implant position from the computer to the patient with the drill guide directing the implant osteotomy and implant insertion. This entire process can be performed in such a way that the ideal implant position can be achieved without damaging the surrounding anatomical structures when the surgery is properly executed.[15] The purpose of this study is to evaluate clinical advantages and disadvantages of guided implant surgery compared to classic implant surgery.

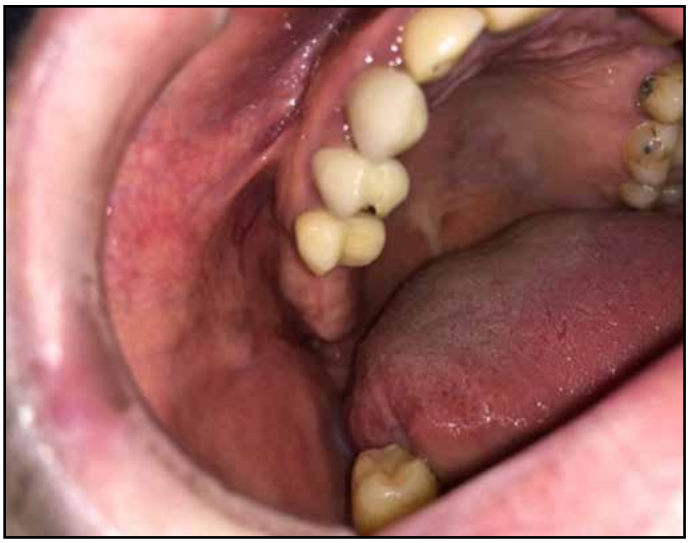


Figure 1: Pre-operative situation (Occlusal view).

MATERIALS AND METHODS

This prospective study was carried out from 2014 to 2018. A total of 93 generally healthy patients (44 males, 49 females; age range 29-67 years) with partial or total edentulism (72 patients par-

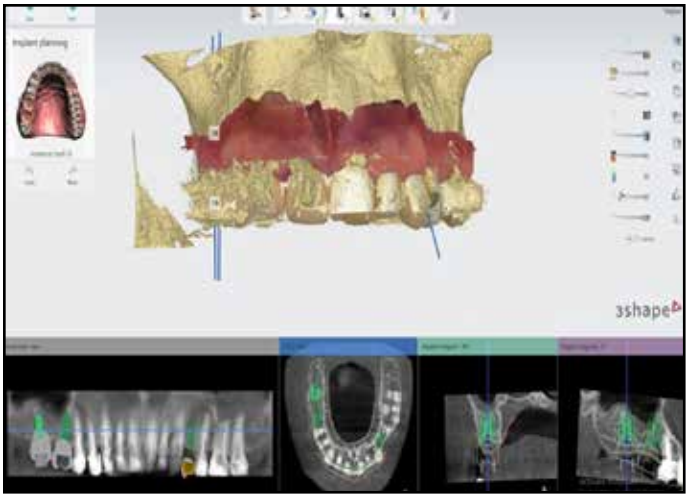


Figure 2: The 16 implant (FDI tooth numbering system) positions planned with the aid of guided software (3 Shape Implant Studio) in the maxilla.

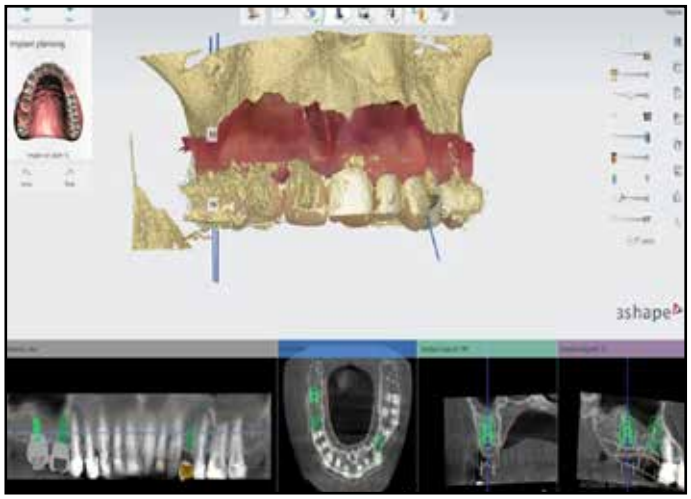


Figure 3: The 24 implant (FDI tooth numbering system) positions planned with the aid of guided software (3 Shape Implant Studio) in the maxilla.

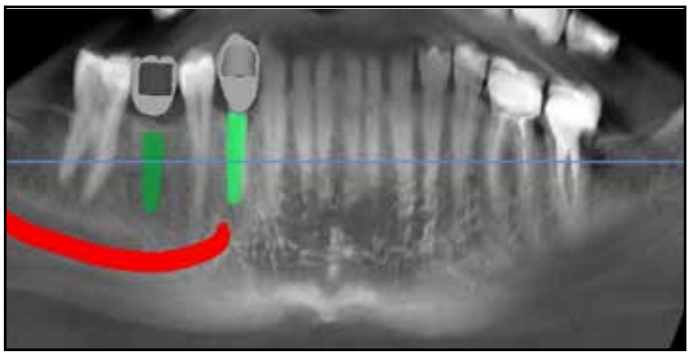


Figure 4: Panoramic view. Adequate nerve tracing in areas where implant placement is evaluated during treatment planning.

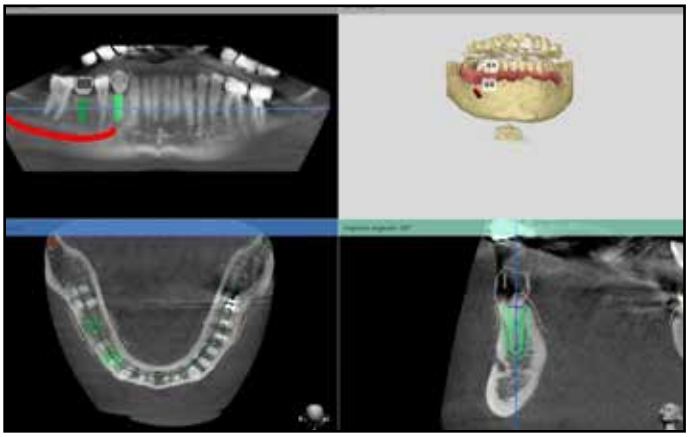


Figure 5: The 44 implant (FDI tooth numbering system) positions planned with the aid of guided software (3 Shape Implant Studio) in the mandible.

tially edentulous, 21 patients fully edentulous) in either the maxilla or mandible, associated with sufficient bone volumes were selected for this study. To conduct a comparative analysis of the clinical effectiveness of guided implant surgery, the patients were divided into two group: Group A (experimental group) of 56 patients who had guided implant surgery with a flapless surgery and guided preparation of the dental implant site and Group B (control group) of 37 patients who had traditional dental implant surgery with a full-thickness flap and non-guided preparation of the implant site. All patients were fully informed of the protocol of the present study and signed a detailed informed consent. Before surgery, the patients were examined and a comprehensive

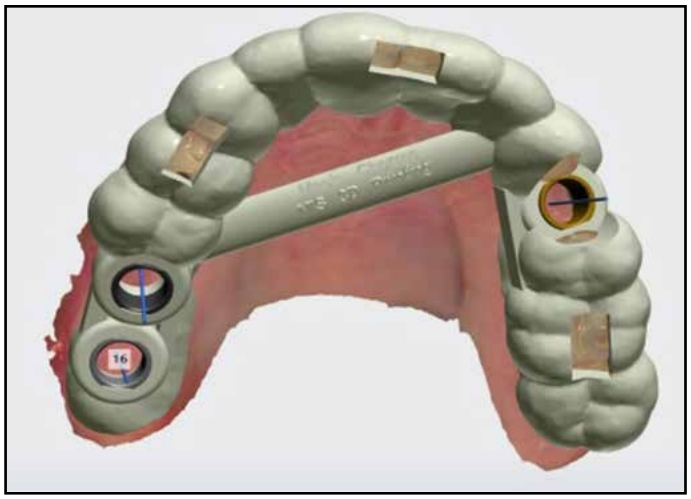


Figure 6: Computer assisted guided design project in the maxilla.

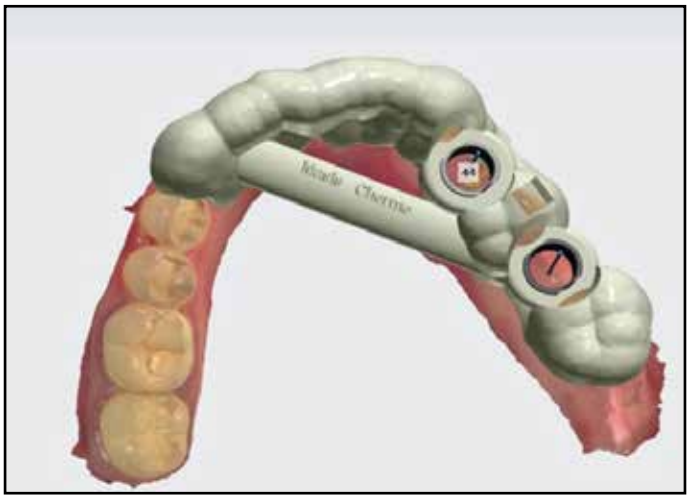


Figure 7: Computer assisted guided design project in the mandible.

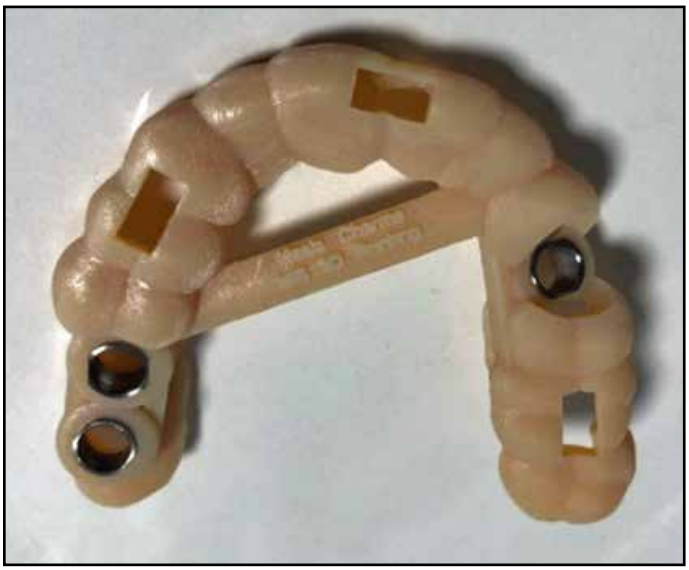


Figure 8: Finished 3D printing surgical guide with metal sleeves

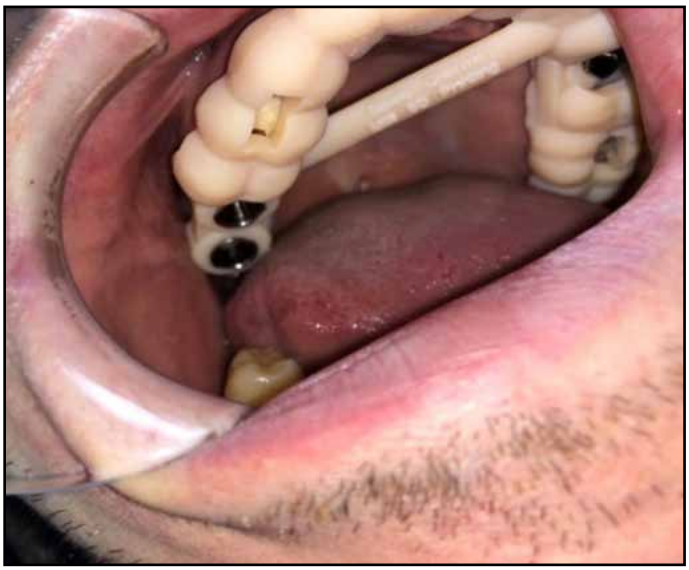


Figure 9: The surgical guide with the inserted sleeve in position in the maxilla.

examination and treatment plan was drawn up. Clinical, laboratory, radiological methods (panoramic x-ray, periapical x-rays, cone beam computed tomography) were used in the examination of patients. Data obtained from CBCT scan was analyzed from different angles using the software to customize the treatment plan (selection of number, diameter, and length of the implants). Software programs were used to calculate the existing preoperative residual bone height in millimeters.

Control group implants were inserted using only CBCT images and measures from the

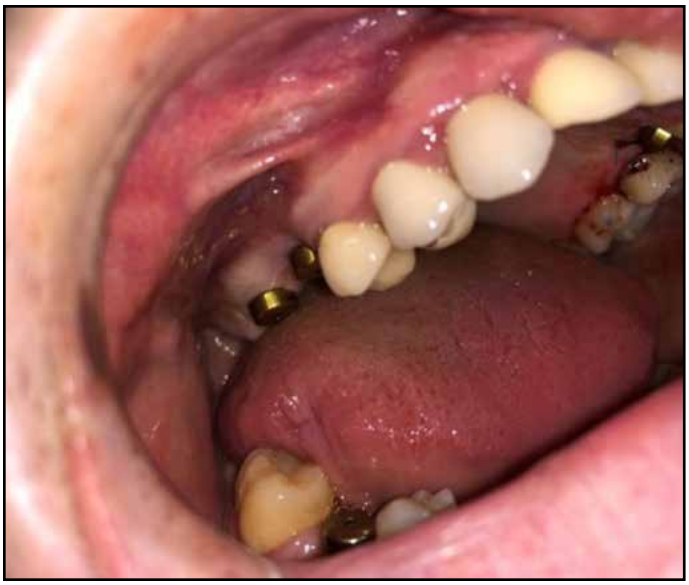


Figure 10: The healing abutments positioned in 16,17 implants (FDI tooth numbering system).

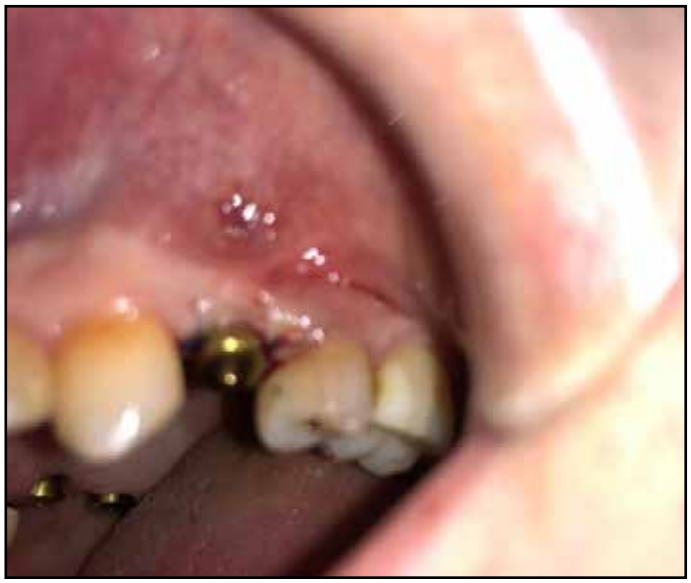


Figure 11: The healing abutments positioned in 24 implant (FDI tooth numbering system).

Figure 12: The healing abutments positioned in 44,46 implants (FDI tooth numbering system).

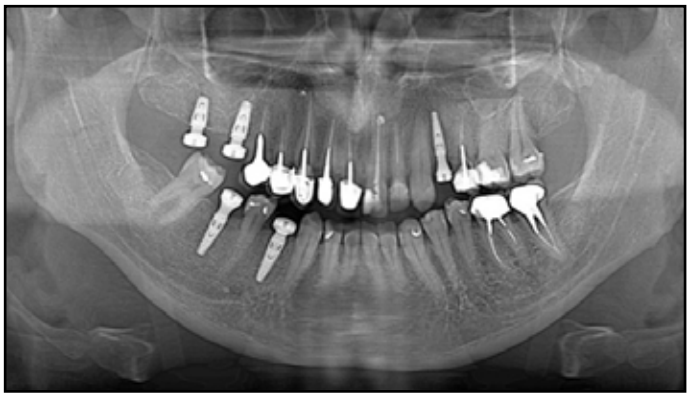


Figure 13: Post-surgical radiograph of the implants and healing abutments.

planning software. The surgical procedure for patients in the control group included full thickness flap protocol. After anesthesia was administered, a crestal incision was made on the edentulous ridge and the full thickness flap was elevated and bone was exposed. The implant bed was prepared with sequential increases in implant drill diameters according to manufacturer's directions. The implants were inserted by torque wrench to the level of the margin of

the implant bed in the ridge and healing screws were placed. The flap was replaced and fixed in position with 4-0 Vicryl sutures. The sutures were then removed after 1week. Control group consisted of 37 patients with an insertion of 124 implants. Stage II surgery was performed 2-5 months later. Prosthodontic treatment was performed one month after Stage II surgery.

Patients in the experimental group were subjected to intraoral scan of the arches (3 Shape). This scan consisted of a scan of the master model (site of the edentulism), of the antagonist arch, and of the bite (occlusion). In the same session, the patient was then subjected to radiological examination with cone beam computed tomography (CBCT). The files acquired were saved and intraoral scanning data were subsequently loaded into guided surgery software (3 Shape Implant Studio). The planning of the case involved the use of software for 3D planning of implant placement and the design of the surgical guide. Software was used to determine the implant positions in accordance with anatomical structures, such as the mental foramina, mandibular nerves, and sinuses. After finalizing the planning, the virtual dental implant placement guide was designed. Tools of the software made it possible to adjust the width of the outside diameter of the hole in the template, for the insertion and fixation of the sleeve. The virtual guide was converted into a surgical guide by using a 3D printer (Stratasys) in dental office. The surgical guide can guide both the drills and the implant placement. Surgical guides were sterilized in advance by submergence into 70% ethanol solution for 20-25 min and rinsing with chlorhexidine solution.[16] Before surgery, it was necessary to check stability of the guide in the mouth and make corrections if necessary. In the case of optimal guide stability, the template offered a certain resistance to the insertion, allowed it to be blocked perfectly by the clamps and the surgical guide was used without any modification. If the guides had slight movement, the guide required some minor modification (such as polishing of one or more surfaces). On the day of surgery, preoperative antibiotics (Amoxicillin 1 g 12 hourly) were given orally 1 day prior to surgery and were continued for another 5 days postoperatively. Local anesthetic was administered and the surgical guide was positioned and stabilized with anchorage screws fixed with a 1.5 mm drill or the guide was seated over the adjacent teeth. A circular mucosal access was performed with a surgical mucotome to remove the gingival plug from the implant site. According to the protocol, the osteotomes for the implants were prepared through metallic cylinders in the surgical guide with the series of the different diameter drills under abundant irrigation of saline solution. Drilling was performed until the drill is blocked by the depth-control stops. These steps were repeated until the implant site was prepared at the desired diameter. The implants were then placed to the desired depth using the same surgical guide. The implant was inserted at the correct position, inclination, and depth as planned in the 3D software. Using this protocol the implant position was precisely transferred from digital position to the mouth. At the end of the insertion, the surgical guide was removed and a transmucosal healing abutment was attached to the dental implant. Post-surgical radiographs were then taken to make sure the position of the implant in the bone corresponded to the planned positions. In total, 84 guides were designed for insertion of 248 implants. The diam-

Table 1: Complications of Surgery		
Complications	Number of Basic Group Patients (n=56)	Number of Control Group Patients (n=37)
Membrane Perforation	0	1
Errors in the Implants Position	0	2
Implants Inclination	0	8
Pain in the Operative Area	1	4
Swelling	2	12

Table 2: Crestal Bone Loss of Implants After One Year.		
	Number of Basic Group Patients (n=56)	Number of Control Group Patients (n=37)
The Mean Crestal Bone Loss	0.51mm ± 0.25	0.54mm ± 0.29

eter of the implants used was 3.75 or 4.2mm in a variety of lengths (10-13 mm), depending on the bony morphology. Postoperative clinical and radiographic controls were made regularly and the criteria for implant success were assessed. Dental prosthetic rehabilitation was performed after 2 to 4 months of healing. The prosthetic phases started with a optical impression with an intraoral scanner after scan body positioning. The files deriving from the intraoral scan were imported into the prosthetic CAD, where the virtual waxing of the restoration was carried out, taking into account the volumes, shapes, and interproximal contacts of the adjacent and occlusal teeth with the antagonist arch (Figs. 1-13).

A total 14 patients received single crowns, 62 patients received implant-fixed prostheses, and 17 patients received implant-supported overdentures. Outcome measures were: prosthesis success; implant success; complications; probing pocket depths; marginal bleeding; and crestal bone levels. Post-surgical change in crestal bone level was assess by digital x-ray were taken immediately (base line for comparison) and one year post operatively.

RESULTS

In Group A, 81 guides exhibited optimal fit and stability while 3 guides required some minor correction. In Group A, no intra-operative or immediate post-operative complications were noted (no errors in the position, inclination, and

depth of the implants), no anatomical risk structures (inferior alveolar nerve, maxillary sinus) were invaded, and no cortical bone perforations occurred (Table 1). In Group A, the average surgical time from time of anesthesia to the placement of the healing abutment was 10.6 ± 2.9 min per implant. Of the 248 implants placed in 56 patients of Group A, 6 implants were lost after 5 years producing a survival rate of 97.6%.

In Group B, the average surgical time was 16.4 ± 1.5 min per implant. Of the 124 implants placed in 37 patients for Group B, 4 implants were lost after 5 years resulting in a survival rate of 96.8%.

Evaluation of bleeding and pocket probing depth recorded after 1 year of follow-up demonstrated no statistically significant difference between the groups. All of the patients presented with healthy soft tissue. No significant differences in peri-implant marginal bone loss could be also observed (Table 2). Patient satisfaction with aesthetics and function 3 years after prosthetic placement was the same for the two groups. The success rate at 5 year from the final loading in the 2 groups showed no significant difference. For the computer-guided group, there were extra costs due to the protocol and an increase in pre-surgical preparation time (ie. time required to digitally plan the surgery and fabricate the surgical guides).

DISCUSSION

Accuracy in planning and execution of surgical procedures is important in securing a high success rate without causing iatrogenic damage. Accurate surgery planning may help avoid bone augmentation procedures which are associated to an extension of treatment time and sometimes, unfortunately, with major clinical complications.[17] These complications may be overcome by computed tomography, intraoral scanners, and 3D implant planning software and using surgical guides for implant positioning. Using these technologies it is possible to acquire accurate information on bone, dental, and soft tissue anatomy, combining this information in a virtual environment to allow the clinician to work in a predictable manner, within a completely digital workflow.[18-20] However, to date, only a few surgeons routinely use guides in implant surgery.

In the present prospective clinical study, 93 partially and totally edentulous patients were included. Surgical guides were used in 56 patients with flapless placement of 248 implants possible without any intra-operative complications. Time and costs required for guided implant presurgical planning is definitely longer compared to traditional protocols. Five years after prosthetic placement, we did not find significant differences between groups for survival rate (97.6% vs. 96.8% dental implant survival for Groups A and B respectively). Carrying out a comparative analysis of the different approaches we came to the conclusion guided implant surgery offers many clinical advantages compared to classic implant placement surgery including: 1) implant placement through the precision surgical guide is more accurate than freehand placement into the osteotomy; 2) the guides allow installation of dental implants in the most optimal position for future prosthetic work; 3) the guides allow control of the implant position, depth, and inclination; 4) guides reduce surgical complications to a minimum; 5) guides allow avoidance of bone augmentation procedures by optimizing the use of available jaw bone; 6) guides allow flapless surgery with the preservation of the periosteal microcirculation and less chance of swelling; 7) with the guided implant

surgery procedure, patients experienced pain less intensely and for shorter periods of time; 8) guided implant surgery was an easier treatment option for patients with strong anxiety of surgery; 9) the guided implant surgery technique reduces surgery time compared to conventional implant placement surgery. However, guided surgery presents higher cost compared to conventional implant placement surgery and requires significantly more pre-surgical preparation time. Although guided implant surgery presents higher cost and requires more steps than the conventional technique, the satisfactory result reduces errors and ensures treatment predictability and accuracy.

CONCLUSION

Surgical dental implant guides can greatly reduce the risks and the surgical time required for dental implant surgery. Guided implant surgery may be a more comfortable and predictable procedure for both patients and clinicians provided the surgery is done accurately and with care. The technique should be performed by experienced professionals who have a previous knowledge about the conventional technique.

Correspondence:
Professor Gagik Hakobyan DMSc, PhD
prom_hg@yahoo.com

Disclosure:
The authors report no conflicts of interest with anything mentioned within this article.

References

1. Azari A, Nikzad S. Computer-assisted implantology: historical background and potential outcomes – a review. Int J Med Robotics Comput Assist Surg 2008;4(2):95-104.
2. Kola MZ, et al. Surgical templates for dental implant positioning; current knowledgeand clinical perspectives. Niger J Surg 2015;21(1):1-5.
3. Widmann G, Bale RJ. Accuracy in computer-aided implant surgery: A review. Int J Oral Maxillofac Implants 2006; 21:305-313.
4. Takeshita F, Suetsugu T. Accurate presurgical determination for implant placement by using computerized tomography scan. J Prosthet Dent 1996;76:590-591.
5. Vidyasagar L., Apse P. Dental Implant Design and Biological Effects on Bone-Implant Interface.Stomatologija 2004; 6:51-54.
6. Saab, X.E., Griggs, J.A., Powers, J.M. and Engelmeier, R.L. Effect of Abutment Angulation on the Strain on the Bone around an Implant in the Anterior Maxilla: A Finite Element Study. The Journal of Prosthetic Dentistry 2007;97: 85-92
7. de Almeida EO, Pellizzer EP, Goiatto MC, et al. Computer-guided surgery in implantology: review of basic concepts. J Craniofacial Surg 2010;21:1917-1921.
8. Thilander, B., Odman, J. and Jemt, T. Single Implants in the Upper Incisor Region and Their Relationship to the Adjacent Teeth. An 8-Year Follow-Up Study. Clinical Oral Implants Research, 1999; 10:346-355.
9. Shavit, I., Juodzbalys G. Inferior alveolar nerve injuries following implant placement-Importance of early diagnosis and treatment: A systematic review. J.Oral Maxillofac. Res 2014,5, e2.
10. Scarano, A. Sinjari, B. Murmura, G. Lorusso, F. Neurosensory Disturbance of the Inferior Alveolar Nerve After 3025 Implant Placements. Implant Dent 2017; 26:735-743
11. Galindo-Moreno, P. Padial-Molina, M. Avila, G. Rios, H.F. Hernández-Cortés, P.Wang H.L. Complications associated with implant migration into the maxillary sinus cavity. Clin. Oral Implants Res 2012; 23:1152–1160.
12. Bartling, R., Freeman, K. and Kraut, R.A. The Incidence of Altered Sensation of the Mental Nerve after Mandibular Implant Placement. Journal of Oral and Maxillofacial Surgery 1999;57: 1408-1412.
13. Van Assche N, Vercruyssen M, Coucke W, Teughels W, Jacobs R, Quirynen M. Accuracy of computer-aided implant placement. Clin Oral Implants Res 2012;23:112–23.
14. Vercruyssen M, Laleman I, Jacobs R, Quirynen M. Computer-supported implant planning and guided surgery: a narrative review. Clin Oral Implants Res 2015;26(l):69-76.
15. Hoffmann J, Westendorff C, Gomez-Roman G, Reinert S. Accuracy of navigation-guided socket drilling before implant installation compared to the conventional free-hand method in a synthetic edentulous lower jaw model. Clin Oral Implants Res 2005;16(5):609-614.
16. Smith PN, Palenik CJ, Blanchard SB Microbial contamination and the sterilization/disinfection of surgical guides used in the placement of endosteal implants. Int J Oral Maxillofacial Implants 2011; 26: 274-281.
17. Fortin T, Isidori M, Bouchet H. Placement of posterior maxillary implants in partially edentulous patients with severe bone deficiency using CAD/CAM guidance to avoid sinus grafting: a clinical report of procedure. Int J OralMaxillofac Implants 2009;24(1):96-102.
18. Chanseop P. et al.Accuracy of implant placement using precision surgical guides with varying occlusogingival heights:An in vitro study.The Jour. of Prosthetic Dentistry 2009;101(6):372-381.
19. Mangano, F.,Gandolfi, A.,Luongo, G., Logozzo, S. Intraoral scanners in dentistry: A review of the current literature. BMC Oral Health 2017;17: 49.
20. Joda, T.,Derksen,W.,Wittneben, J.G., Kuehl, S. Static computer-aided implant surgery (s-CAIS) analyzing patient-reported outcome measures (PROMs), economics and surgical complications: A systematic review. Clin Oral Implants Res 2018; 29(16): 359-373.

Rehabilitation of Severe Maxillary Noma Defect with Zygomatic Implants: A Case Report

Nguyen Khanh Long DDS, PhD • Hoang Phong My DDS
Dinh Van Truong DDS • Nguyen Thanh Tung, DDS
Nguyen Dinh Phuc, DDS, PhD • Mai Van Cuong, DDS

Abstract

Zygomatic implants have been recently used for prosthetic rehabilitation in patients with large maxillary defects. A 40 year old patient presented to our clinic with Noma treated with free vascularized osteocutaneous fibula flaps. The resultant defect encompassed the total maxilla up to the lower rim of the orbital and maxillary zygomatic arch. Four zygomatic dental implants were placed successfully and a full arch screw-retained fixed prosthesis was later completed. The current Case Report documents treatment of this case.

KEY WORDS: Zygomatic dental implants, full arch, maxilla, Noma

INTRODUCTION

Noma (cancrum oris) is an ulcerative-necrotizing gingivostomatitis that leads to severe tissue destruction of the face and is associated with a high mortality rate. An ideal treatment of complex maxillofacial defects requires the reconstruction of bone, dental implants, and soft tissue of the oral and paranasal cavities.[1] There are several possibilities of surgical reconstruction such as microvascular free flaps or regional flaps. Prefabricated composite grafts from the fibula are an option to restore the maxilla and nasal floor in patients with this disease. It is very important to consider that this kind of facial defect has a big impact on the patient's quality of life.[1,2] Recently, zygomatic implants have been documented for dental rehabilitation of large maxillary defects, even in cases with no indication to grafting procedures.[3,4] This case report describes the rehabilitation of large defect of maxilla due to Noma reconstructed by vascularized fibular flap. Prosthetic rehabilitation was supported by four zygomatic implants positioned in the defect maxilla in order to create a full arch screw-retained fixed prosthesis.

CLINICAL REPORT

A 40 year-old male with a severe maxillary defect was admitted to the Department of Maxillofacial Surgery, VNCB Friendship Hospital, Hanoi, Vietnam with history of microsurgical fibular flap treatment of a maxillary defect due to Noma. Clinical and CBCT examination revealed complete defect of the maxilla up to the orbital rim and zygomatic arch. The cutaneous fibular flap reconstructed base of the nose, total palate covered by cutaneous flap. Vertical dimension was completely lost.

PREOPERATIVE PLANNING WITH 3D DIGITAL PLANNING

A temporary denture was applied to restore vertical dimension and used as a guide for implant positioning. Cone beam computed tomography (CBCT) 3D digital planning software for 4 zygomatic implants was applied using Invivo-5 (Anatomage, San Jose, CA). A transparent tray was fabricated for a surgical template during surgery.

SURGICAL PROCEDURE

Surgery was performed under general anesthesia. A mucogingival flap was raised, and fibular flap, zygomatic arch, lower rim of orbital was exposed. Four Nobel Biocare (Branemark System Zygoma, Zygoma TiUnite® Implant, Nobel Biocare, Goteborg, Sweden) zygomatic implants were placed and platelet rich fibrin (PRF) was used to cover implant collars. The reflected flap was then sutured with resorbable suture. A postoperative 7-day cycle of antibiotic therapy (amoxicillin 1000 mg TID) was administered. Analgesics were administered as required. Sutures were removed 15 days after surgery. A soft diet was recommended for the first 2 weeks.

A removable denture was used during healing period over the implant plastic caps.

PROSTHETIC PROCEDURE AND FOLLOW-UP

Four months after implant placement, the temporary cylinders were used to transform the removable temporary denture to a fixed denture. The denture was trimmed and adjusted to maintain hygiene and stability. After 2 months, a definite impression was taken and a final acrylic resin fixed full arch prosthesis was completed. The patient was re-examined at 1 week, 3 months, 6

months, and 12 months post-insertion of the final prosthesis. The patient was satisfied with the esthetics and function of the maxillary prosthesis.

DISCUSSION

Recently, zygomatic implant solutions have achieved important successes as the procedure shows effective treatment results, cost-effectiveness, improvements in healing time, and reduction of the temporary inability to work, as is the case of major grafting surgeries.[3,6] As a result, zygomatic implants help to minimize major surgery related to collecting and grafting bone, reducing the morbidity of treatment especially in patients with advanced age or type of pathology that determines the surgical indications such post-traumatic sequelae, post-oncological resections and severe malformations.[4,5] In addition, bone grafting usually requires extensive healing time before fixture placement and prostheses can be loaded with consequent discomfort and limitation to social life. In the present case, due to Noma defects and history of reconstruction with fibula flap, large resultant bony defects still persisted resulting in a lack of vertical dimension and stability. Zygomatic implants, introduced by Branemark in 1997 for the prosthetic rehabilitation of patients with serious and extended defects of the jaws caused by post-oncological resections, trauma or congenital malformations, have proven over the years a valid alternative in the treatment of atrophy of the jaws, presenting high success rates (96% in 10 years).[3,4,6] In this case, the zygomatic implants had good primary stability that made early loading of a removable denture possible. Free vascularized osteocutaneous fibula flap skin provided to cover total palate and gingival soft tissues. Two implants were placed half through fibular and half into zygoma or lower orbital rim to increase stability of implant and fibular flap as well. Since the patient lost all hard tissue landmarks of the maxilla, the implants were placed manually into planned positions. One implant was inserted at lateral side of left nasal cavity rim that was different from original plan. All implants were placed with primary stability more than 50 Ncm. The temporary fixed denture created excellent transitional occlusion, good function and esthetic appearance during the healing time. While the success rate of zygomatic implants is above 80%, peri-implantitis may occur in zygomatic rehabilitations.[3,6] Peri-implantitis is commonly found when a free soft tissue flap was used to cover the defect. Even after debunking, keratinized tissue grafts, and multiple debridements, it remains difficult to control. Silver nitrate usually works well to control the peri-implant granulation tissue. These patients are required follow-up closely to ensure long-term success. In the case with absence of maxillary alveolar bone, this peri-implantitis does not compromise osseointegration, because the support of the implants is on the zygomatic bone.[6] In this case, there was no palatal or gingival keratinized tissues and that made one implant collar exposed, but there were not any significant problems of the surrounding tissue after one year. In terms of ongoing clinical implant follow-up, no attempt was made at peri-implant probing for the zygomatic implants perforating the soft-tissue flap as it was deemed important not to disturb the soft tissue seal of the skin flap around the implant abutments. At one year after surgery, the patient was satisfied with the esthetics and function of the maxillary prosthesis. Photographs documenting treatment of this case are presented in figures 1-24.

Figure 1: Preoperative photos frontal view.

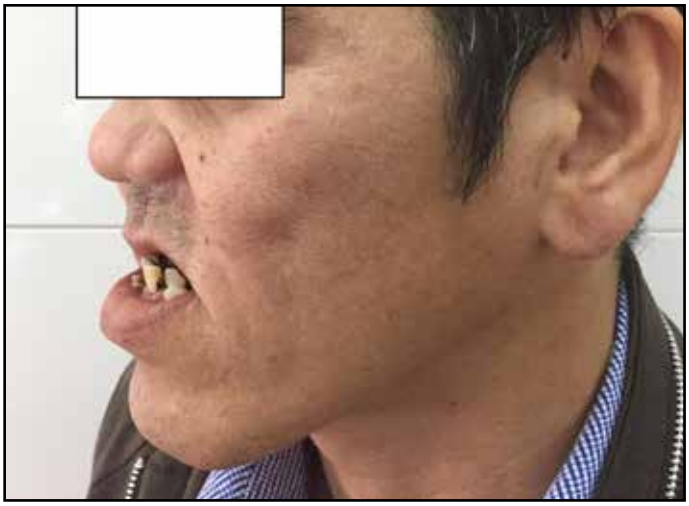


Figure 2: Preoperative photos profile view.

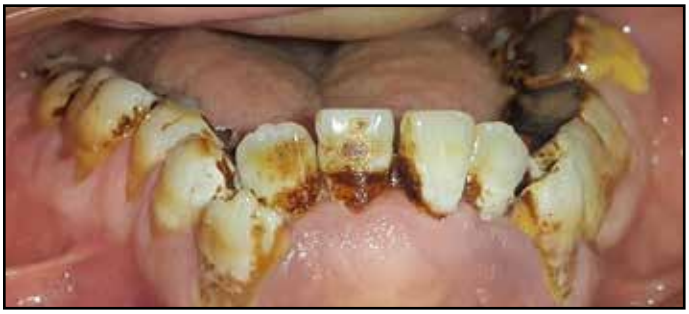


Figure 3: Intraoral photos with total palate covered by cutaneous flap.

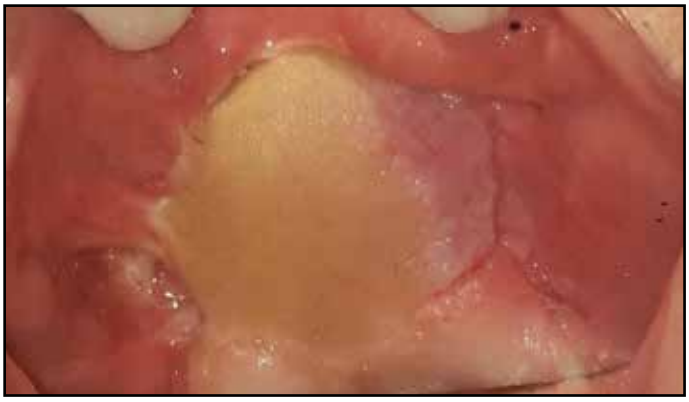


Figure 4: Intraoral photos with total palate covered by cutaneous flap.

Figure 5: Preoperative planning with 3D digital planning for 4 zygomatic implants.

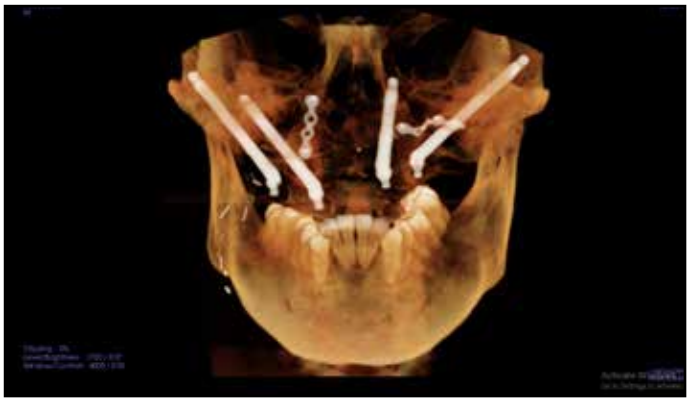


Figure 6: Postoperative surgery CBCT.

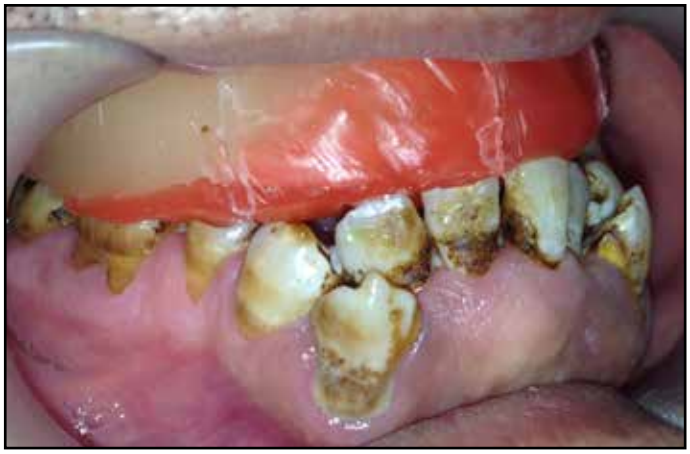


Figure 7: Preoperative wax and denture try-in.

Figure 8: Preoperative wax and denture try-in.

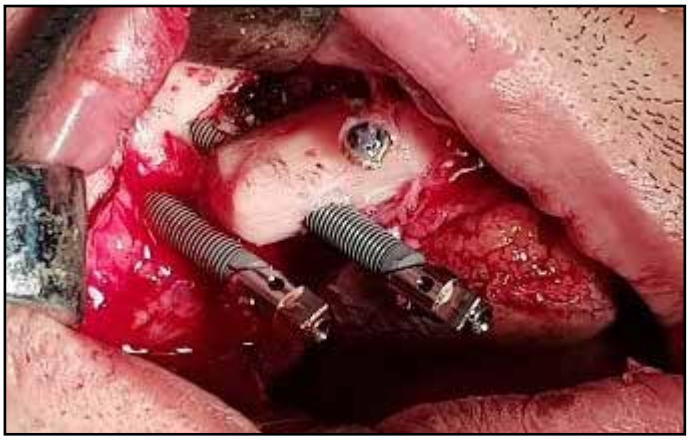


Figure 9: Intraoperative photos of four nobel biocare zygomatic implants placed (Branemark System Zygoma, Zygoma TiUnite® Implant). PRF was used to cover implants collar.

Figure 10: Intraoperative photos of four nobel biocare zygomatic implants placed (Branemark System Zygoma, Zygoma TiUnite® Implant). PRF was used to cover implants collar.

Figure 11: Intraoperative photos of four nobel biocare zygomatic implants placed (Branemark System Zygoma, Zygoma TiUnite® Implant). PRF was used to cover implants collar.

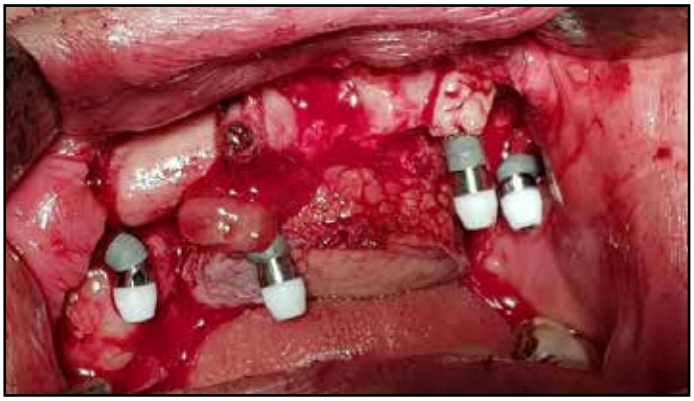


Figure 12: Intraoperative photos of four nobel biocare zygomatic implants placed (Branemark System Zygoma, Zygoma TiUnite® Implant). PRF was used to cover implants collar.

Figure 13: Temporary cylinders were used to transform removable temporary denture to fixed denture.

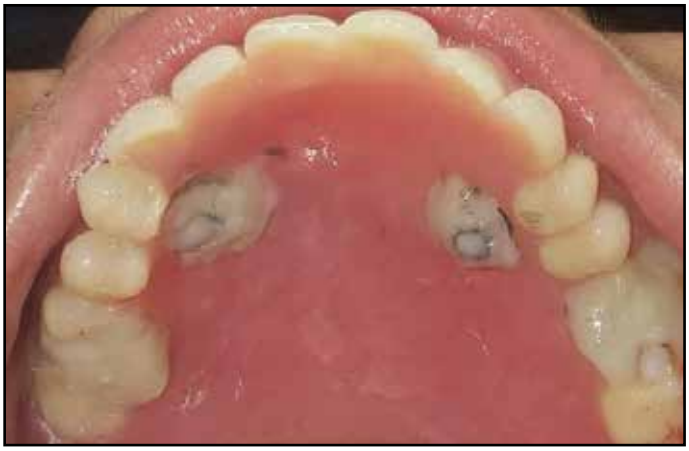


Figure 14: Temporary cylinders were used to transform removable temporary denture to fixed denture.

Figure 15: Temporary cylinders were used to transform removable temporary denture to fixed denture.

Figure 16: Temporary cylinders were used to transform removable temporary denture to fixed denture.

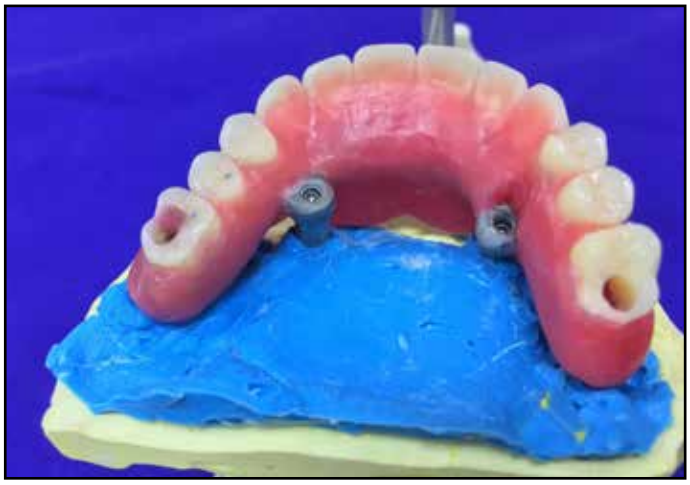


Figure 17: Final prosthetic wax try in. Patient evaluation and occlusal registration.

Figure 18: Final prosthetic wax try in. Patient evaluation and occlusal registration.

Figure 19: Final prosthetic wax try in. Patient evaluation and occlusal registration.

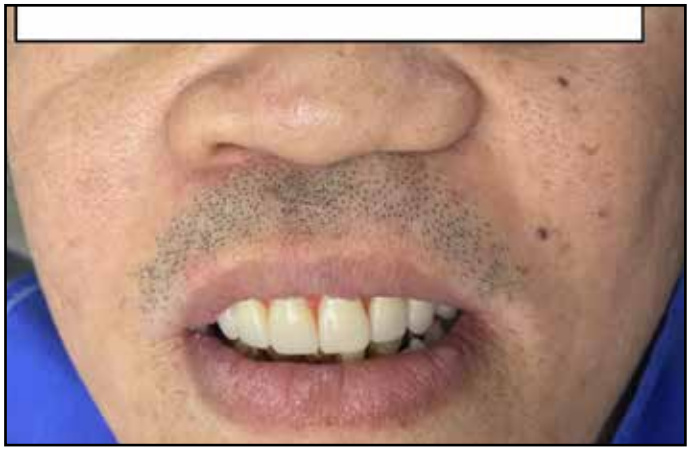


Figure 20: Final prosthetic wax try in. Patient evaluation and occlusal registration.

Figure 21: Final acrylic resin fixed full arch prosthesis.

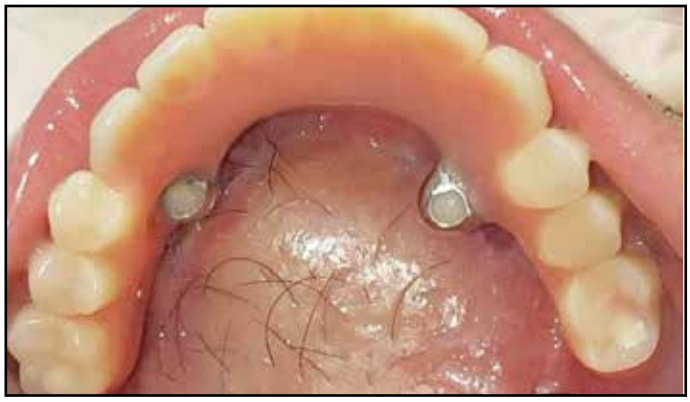


Figure 22: Final acrylic resin fixed full arch prosthesis.

Figure 23: Final acrylic resin fixed full arch prosthesis.

Figure 24: Final acrylic resin fixed full arch prosthesis.

CONCLUSION

Zygomatic implant-supported prosthesis is a reliable option to restore large defect of maxilla of patients and offers a good chance to social reintegration. Zygomatic implant seems to be a safe and effective treatment option to rehabilitate extensive maxillary defects such as that which was seen with the case presented in this report.

Correspondence:
Dr Nguyen Khanh Long
Drlongvncb@gmail.com

Disclosure
The authors report no conflicts of interest with anything mentioned in this article.

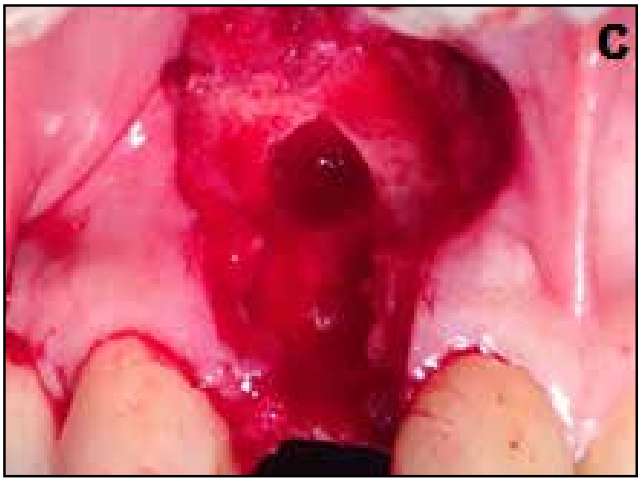
References

1. Vinzenz, Kurt. Reconstruction of the Maxilla with Prefabricated Scapular Flaps in Noma Patients. Plastic and Reconstructive Surgery 2008;121(6):1964-73.
2. Rodgers W, Lloyd T. Microvascular reconstruction of facial defectsin settings where resources are limited. British Journal of Oral and Maxillofacial Surgery 2016;54:51–56.
3. I. Balan, M. Di Girolamo. Treatment of severe atropic maxilla with zygomatic implants: a case series. Oral & Implantology - Anno X - N. 3/2017
4. Trevisiol L, Procacci P. Rehabilitation of a complex midfacial defect by means of a zygoma-implant supported prosthesis and nasal epithesis: a novel technique. International Journal of Implant Dentistry 2016; 2:7.
5. Butterworth , Rogers. The zygomatic implant perforated (ZIP) flap: a new technique for combined surgical reconstruction and rapid fixed dental rehabilitation following low-level maxillectomy. International Journal of Implant Dentistry 2017;3:37.
6. Vega LG. Zygoma Implant Reconstruction of Acquired Maxillary Bony Defects. Oral Maxillofacial Surg Clin N Am 2013;25:223–239.

Treatment of a Complex Buccal Dehiscence with an Immediately Placed Dental Implant in an Infected Site: A Case Report

Dr. Britto Falcón-Guerrero[1]

Abstract



Introduction: Different procedures to regenerate the bone loss are used with different levels of success to achieve an adequate osseointegration of the immediate implants. The use of platelet-rich fibrin (PRF) with graft materials enhance and accelerate the normal guided bone regeneration (GBR) pathways. This report describes the use of PRF as an enhancer for the stability of an immediate implant with a 1 year follow-up period in infected site.

Case report: this report describes a 41-year-old female with chronic infection of tooth 12, who is on loose and presents the total loss of the buccal plate, identifying a complex bone defect. It was treated with an increase in the alveolar ridge using a xenograft and platelet-rich fibrin (PRF). The tomographic results were reviewed 6 months after the increase and the immediate placement of the implant, and a one-year follow-up is evaluated.

Conclusion: The current case report suggests that the use of PRF can aid the clinical success of bone augmentation of the infected alveolar crest together with the immediate placement of the implant with little primary stability. To confirm this finding of this single case, additional studies may be warranted.

KEY WORDS: Dental implants, immediate placement, infection, prosthetics

1. Private Practice. Tacna- Perú.

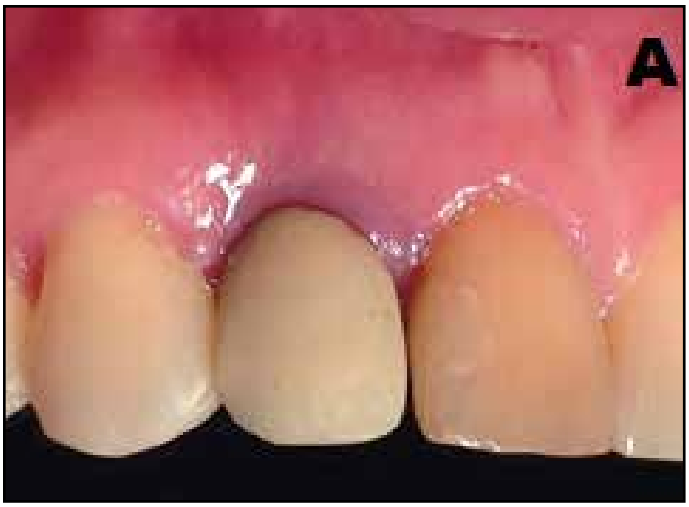


Figure 1a: Preoperative view of tooth #12 (FDI tooth numbering system).

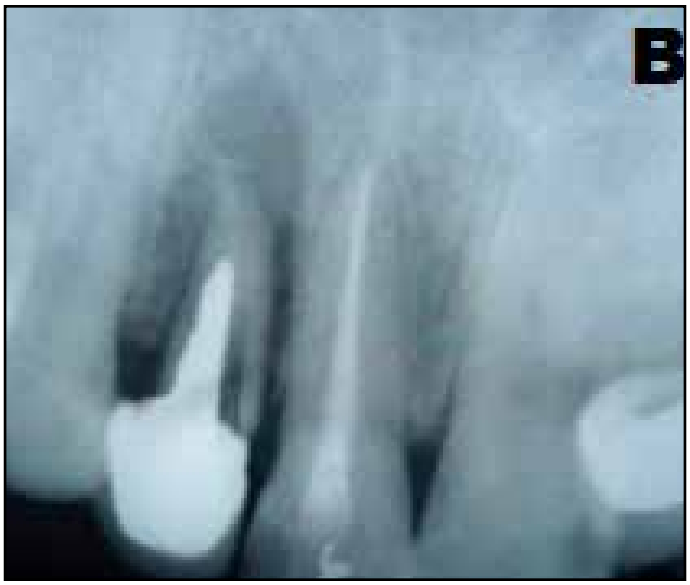


Figure 1b: Periapical radiograph.

INTRODUCTION

The infective process represents a contraindication to implant insertion as the infection may interfere with the healing process, hinder osseointegration, and ultimately lead to implant failure. Recently, Zuffetti et al. reported that the placement of implants into infected sites immediately after tooth extraction is a safe option, even when the implants are loaded immediately or early.[1] Guided bone regeneration (GBR) is a widely used technique with predictable results in terms of bone augmentation with immediate placement of dental implants. Several materials and membranes have been used along with the GBR over the years. GBR with non-absorbable membrane can produce a success close to 100% for vertical increase of the alveolar ridge, however it has some disadvantages.[2,3]

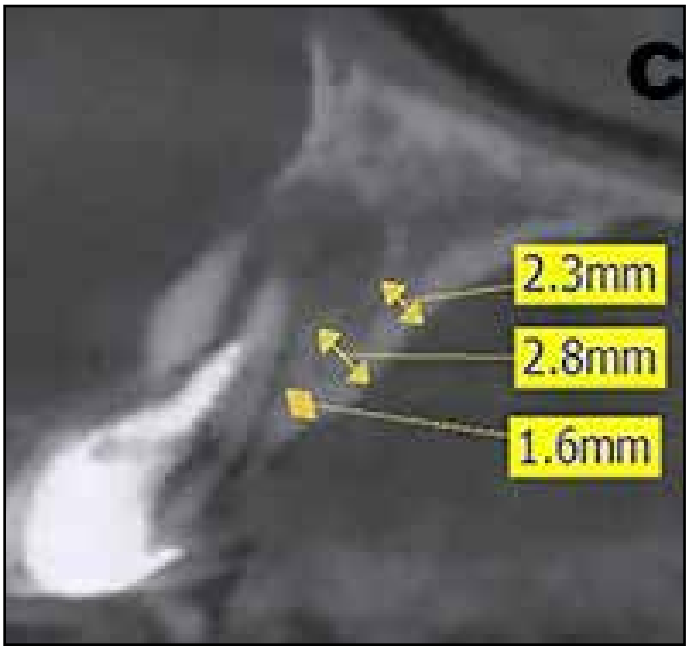


Figure 1c: Cone beam computed tomography (CBCT) study.

Platelet rich fibrin (PRF) is a three-dimensional autogenous biomaterial that is obtained by simple and rapid centrifugation from patient blood samples. Currently, PRF membranes are receiving more attention, essentially because of their simplicity, cost-effectiveness, user-friendliness,

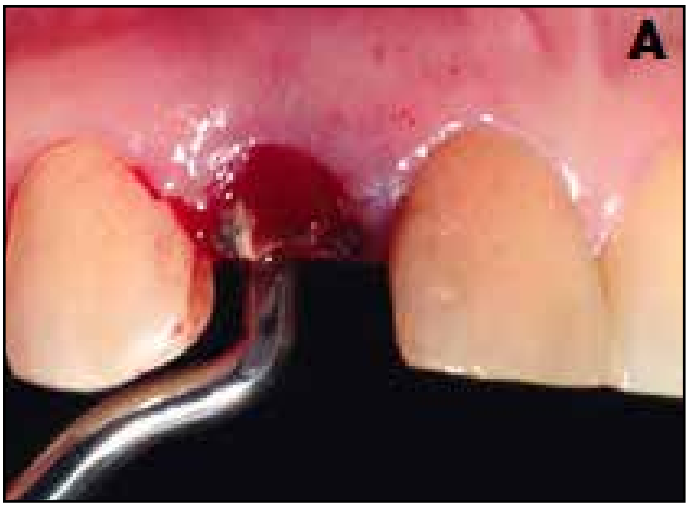


Figure 2a: Atraumatic extraction with periotome.

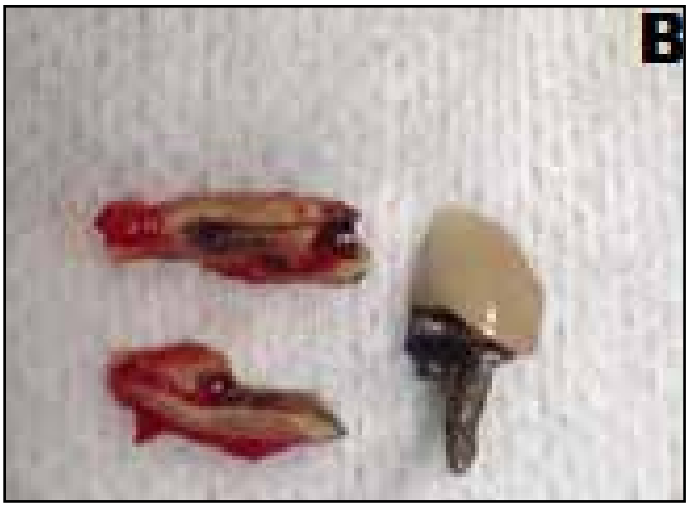


Figure 2b: Anatomic piece.

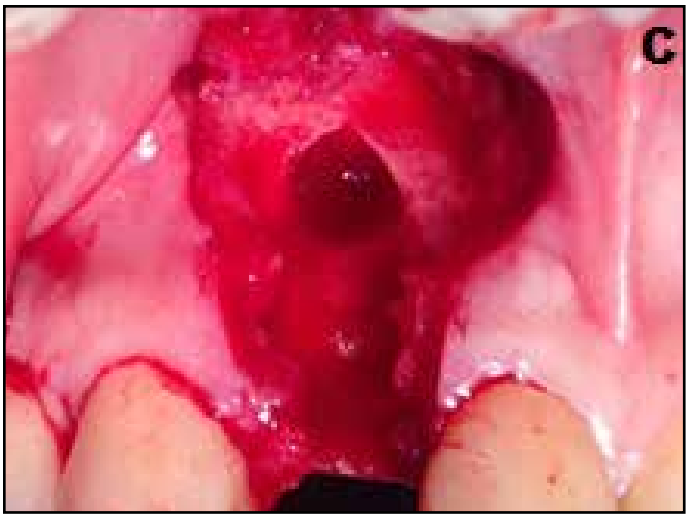


Figure 2c: Trapezoidal full-thickness surgical flap.

and being a new "revolutionary" alternative in therapies based on platelet concentration.[4] The use of platelet concentrate derivatives, enriched with growth factors and leukocytes, improves osteogenic differentiation and bone formation. A recently developed product has been introduced to manufacture bone graft matrix enriched with growth factors (also known as "Sticky bone") that uses autologous fibrin glue. The sticky bone provides stabilization of the bone graft in the defect and, therefore, accelerates tissue healing and minimizes bone loss during the healing period. Being an alternative to the titanium mesh or block bone procedure.[5]

The aim of this report is to evaluate the management of a complex alveolar dehiscence in an infected site with a combination of xenograft, PRF and immediate placement of an implant with minimal primary stability during the same surgery.

CASE REPORT

A 41-year-old female presented with a mobile tooth #12 (FDI tooth numbering system) in August 2017 to the author's dental office. The patient indicated increasing mobility of the tooth over a year's period of time and desired to replace the tooth with a dental implant. Intraoral examination revealed an acrylic crown on tooth #12, with chronic infection, mobility, and edema. The periapical radiograph showed an intra-radicular pin (without endodontic treatment), radicular fracture, and a wide periapical radiolucent image. This was confirmed by the cone beam tomography (CBCT) study, showing a total loss of the vestibu-

Figure 3a: Collection tubes with A-PRF clots.

Figure 3b: i-PRF with xenograft.

lar plate, a thin cortical palatal bone, and the presence of a wide periapical reaction (Figs. 1a-c).

The autor proposed to perform the extraction of the affected tooth and installation of an immediate implant, accompanied by GBR with PRF and resorbable collagen membrane, finishing later with a screwed Crown. The patient accepted the treatment plan and provided informed consent. She was treated 24 hours before surgery with 500 milligrams of amoxicillin / clavulanic acid every 8 hours for 7 days and 0.12% chlorhexidine gluconate every 12 hours for 2 weeks. Complete mouth scaling was performed before the surgery to reduce the risk of bacteremia. Atraumatic surgical extraction of the fractured tooth #12 was performed under local anesthesia with 2% lidocaine. Then, a full-thickness trapezoidal flap was raised above the margins of the defect, exposing it in its entirety and the lesión was curetted clean (Figs 2a-c). A small osteotomy was performed in the apical third for the implant. The PRF was prepared before the implant was installed. 20cc of venous blood was taken from the forearm vein and blood was divided equally in 6 ml tubes with-

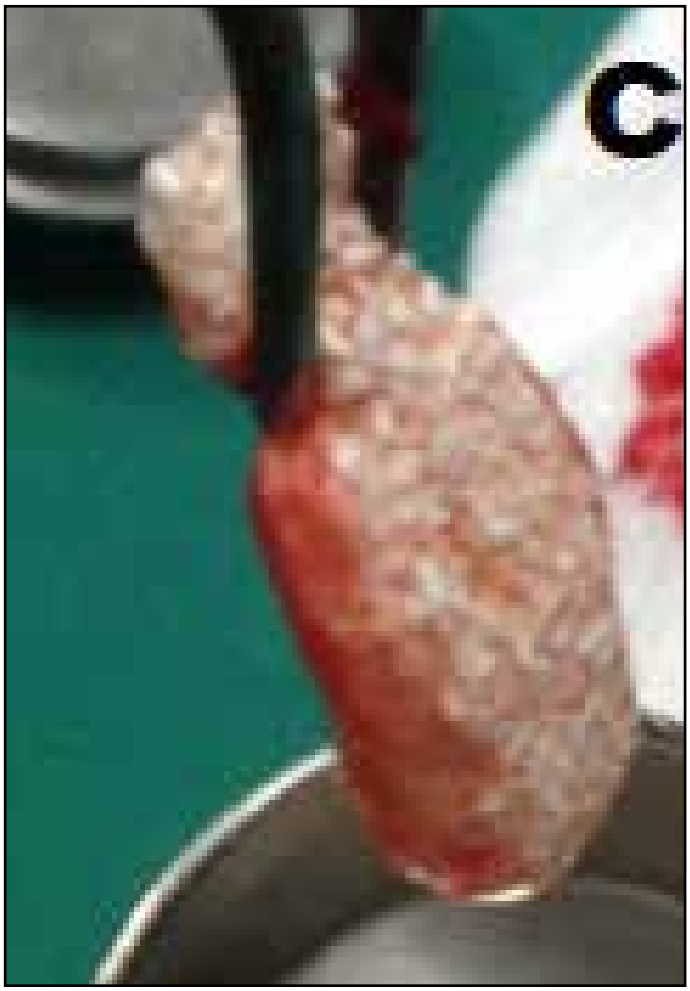


Figure 3c: Sticky bone.

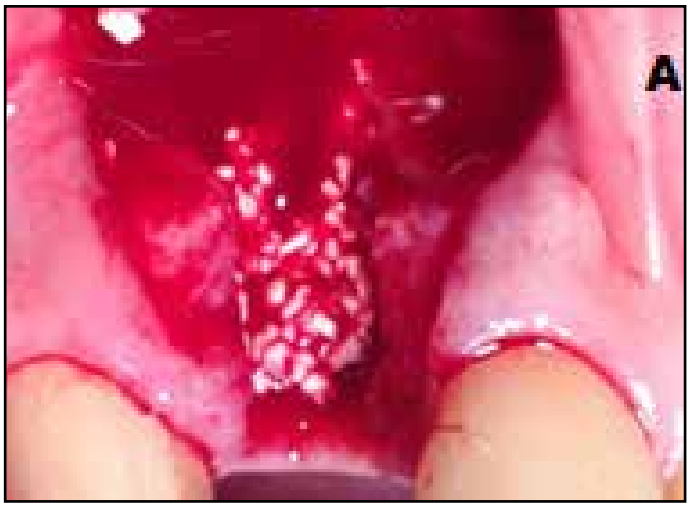


Figure 4a: First layer of sticky bone.

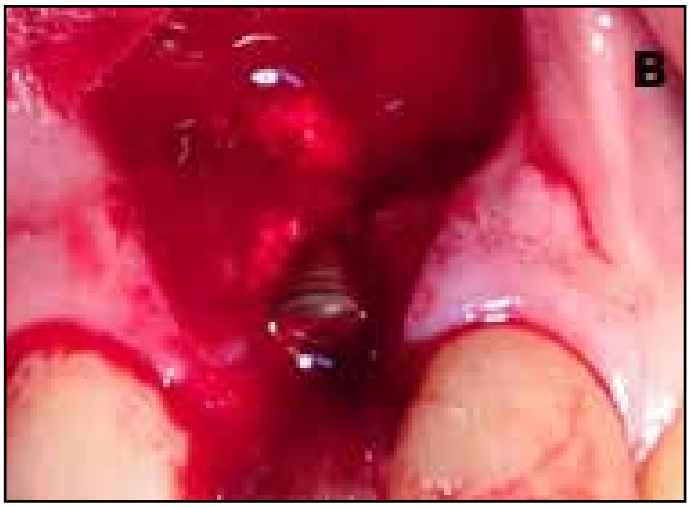


Figure 4b: Immediate implant placement.

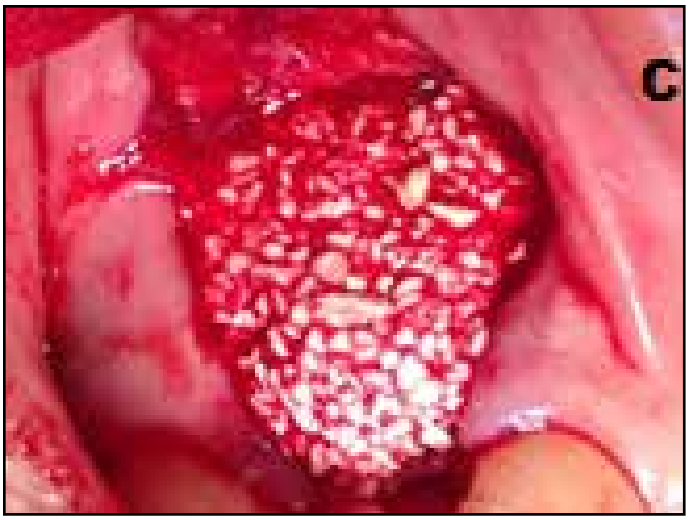


Figure 4c: Second layer of sticky bone that covers the implant and the entire surgical area.

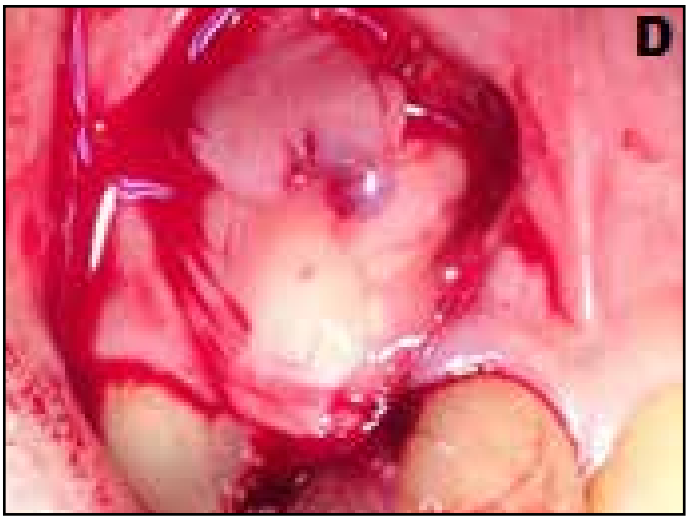


Figure 4d: PRF membrane placement.

out any type of anticoagulants. To obtain the autologous fibrin glue (i-PRF), the tubes were placed in a centrifuge at 700 rpm for 3 minutes. This was used to make "sticky bone." This was combined with a bone matrix of bovine particulate origin (xenograft). For the PRF membrane (a-PRF), the blood was centrifuged for 8 minutes at 1200 rpm6; The a-PRF membrane was formed from four clots of a-PRF, which were then dried in a metal box (Figs. 3a-c). Next, a portion of the sticky bone was placed in the apical base of the defect and a conical internal hexagon implant of 3.3 x 11.5mm was placed achieving only minimal stability. We covered everything with a larger portion of sticky bone around the implant and then covered everything with the PRF membranes. Finally, a collagen membrane of porcine origin was placed and sutured with 5-0 polyglycolic acid suture until it

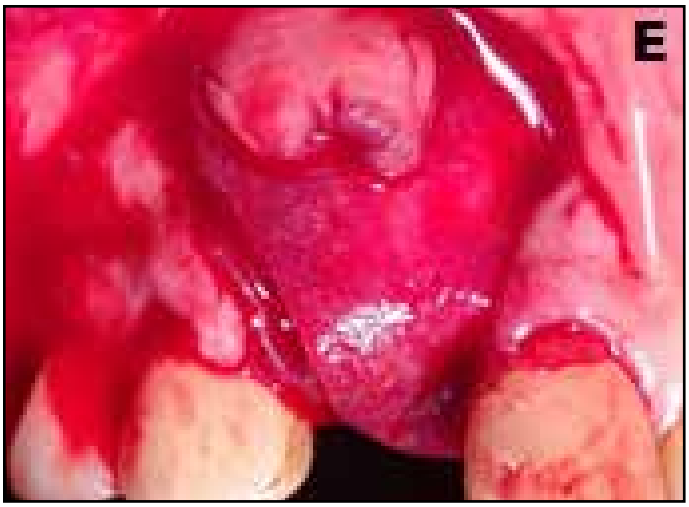


Figure 4e: Collagen membranes placed.

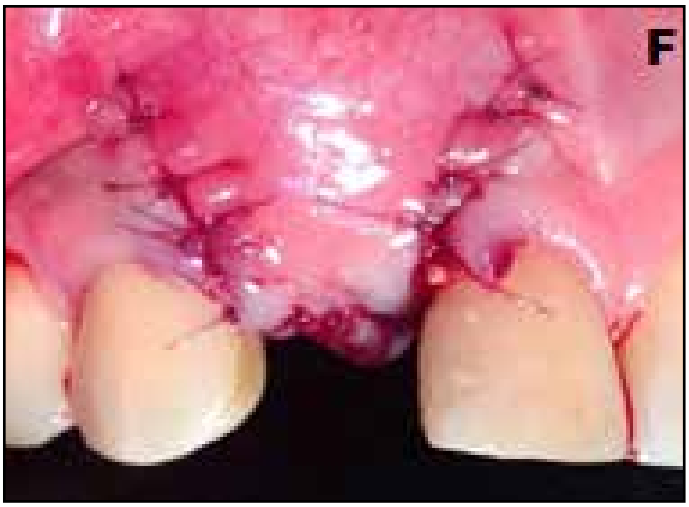


Figure 4f: Suture closure.

was closed. A removable provisional prosthesis was installed, to be used only for aesthetic reasons (Figs. 4a-f). Celecoxib (200 milligrams) with ketorolac (10 milligrams) was prescribed to control discomfort and inflammation every 8 hours for 4 days. The patient was instructed not to brush the surgical sites for 7 days, but instead to rinse twice daily with 0.12% chlorhexidine gluconate for two weeks. After 6 months the patient was evaluated with a tomographic study evidencing the bone gain. The case was finiahed with the installation of a screw metal-ceramic crown (Figs. 5a-d). One year following final restoration, the implant site was found to be healthy and with stable bone levels, managing to satisfy the aesthetic and functional needs of the patient (Figs. 6a-d).

DISCUSSION

To preserve the alveolar bone level from the collapse caused by healing and to reduce treatment time, some clinicians began to install the implant immediately into the postextraction socket, including in sites exhibiting pathology. The high survival rate obtained in several studies supports the hypothesis that implants may be successfully osseointegrated when placed immediately after extraction of teeth presenting endodontic and periodontal lesions.[7] Le et al.[8] found that in healthy bone ridges with large defects (more than 5 mm deep), a partial improvement is achieved in 90% of cases, without achieving any total regeneration. In comparison, our case was performed in an infected site with immediate implantation and minimal primary stability with a total loss of the buccal plate, and still achieved complete bone regeneration. In GBR procedures, the non-resorbable membrane has been accepted as the gold standard despite its many disadvantages, including a second surgery for removal of the membrane, increased patient morbidity, early exposure of the membrane if there is a lot of tension of the flap and the dehiscence of the wound with subsequent contamination.[2,9] Grunder et al.[10] used a bone substitute and a membrane reinforced with titanium, together with the implants in sites where buccal bone walls were missing, obtaining a horizontal and vertical bone gain. However, they installed the implants 8 weeks

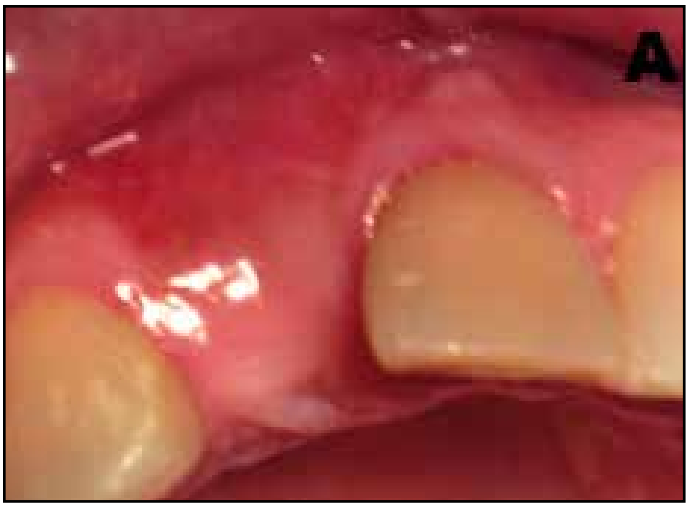


Figure 5a: Results after 6 months.

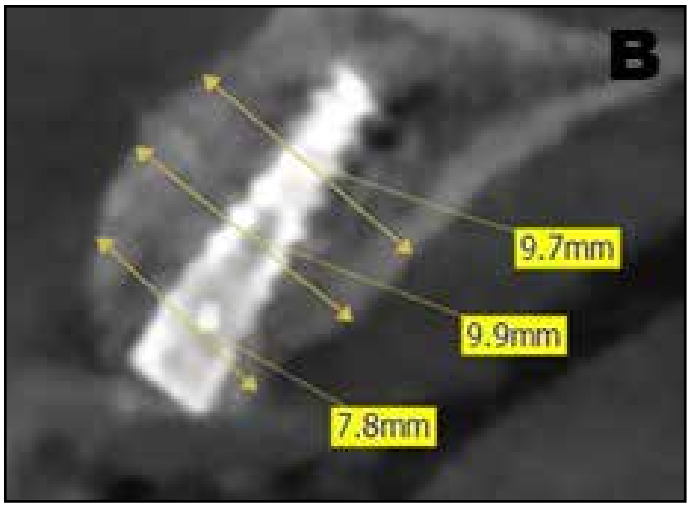


Figure 5b: Cone beam study.

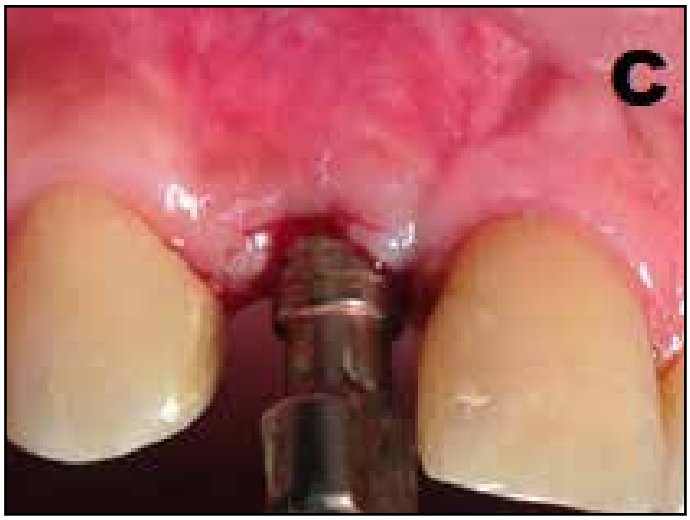


Figure 5c: Activation and impression to open tray.

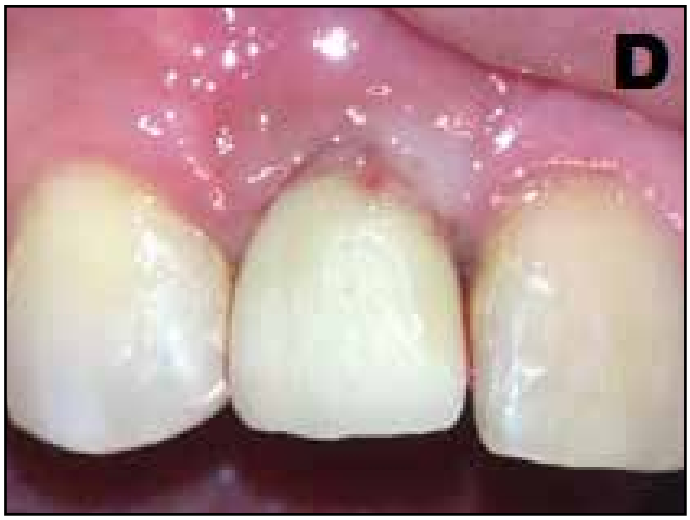
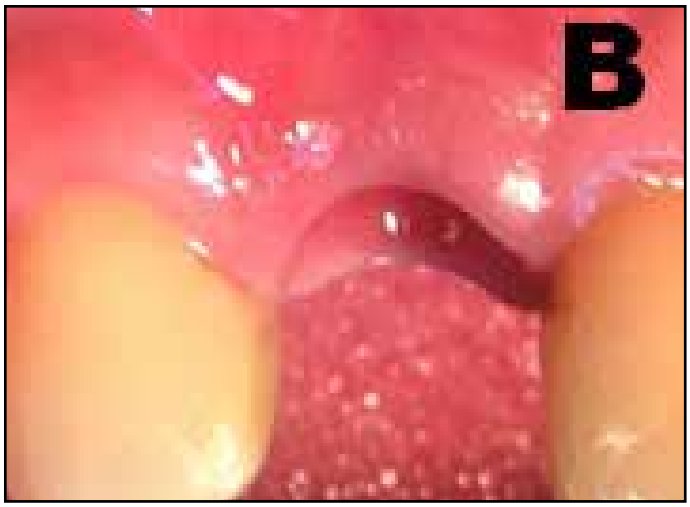


Figure 5d: Screw secured Crown.

after the tooth extraction. Unlike in this case, we installed the implant immediately together with the bone regeneration, accompanied with PRF and reabsorbable collagen membrane.

Reports often associate autologous PRF with early bone formation and maturation; accelerated healing of soft tissues, and reduction of post-surgical edema, pain and discomfort. Being an advanced and original tool in regenerative dentistry, PRF represents a strong alternative and a supposedly profitable biomaterial for repair and regeneration. Some consider them as a new era of "super" biomaterials.[4,5] Miron et al.[11] reported that i-PRF demonstrated the ability to release higher concentrations of various growth factors and induced greater fibroblast migration and expression of platelet-derived growth factor (PDGF), transforming growth factor-beta1 (TGF-β) and collagen.[11] Varela et al.[12] reported that i-PRF is a good method for the

Figure 6a: Rradiographic control 1 year follow-up.



Fibure 6b: Emergence profile.

Figure 6c: Clinical view.

healing of soft and mineralized tissues considering the formation of a three-dimensional network of fibrin that includes platelets, leukocytes, type I collagen, osteocalcin and growth factors.

"Sticky bone" is a homogeneous product that contains important elements for bone formation. It contains the mineral scaffold for the bone cells necessary for bone formation. And it also contains the growth factors necessary for the stimulation of differentiation or migration of cells.[13] However, Dragonas et al.[14] found that the use of i-PRF in ridge augmentation procedures could not be adequately evaluated. Waleed et al.[15] evaluated the effectiveness of the sticky bone and the PRF membrane in the treatment of the dehiscence defect around the dental implant in a narrow maxillary rim and concluding that this can increase the quality (density) of newly formed bone and improve the rate of new bone formation. Zhanget et al.[16] proposed the freeze-drying of PRF to address storage problems and the delayed clinical application of fresh fibrin rich in platelets. Finding that lyophilization at -1960C does not influence to a large extent the expression of bioactive factors, the microstructure of fibrinogen or the clinical effects of PRF. Sarnachiaro et al.[17] conclude that tooth extraction without a flap and the immediate placement of the implant in an alveolus with labial bone dehiscence is a viable clinical technique to reconstruct the absence of the vestibular bony table, finding a gain of 3 mm. In our case, we

found a bone gain of up to 4.5 mm from the vestibular plate using PRF. Chenchev et al.[18] found that the use of a-PRF and i-PRF may be beneficial for bone augmentation of the alveolar ridge 4 months before implant installation. In our case, we immediately installed the implant and with better results in bone augmentation and implant stability.

CONCLUSION

The current case report suggests that the use of PRF can aid the clinical success of bone augmentation of the infected alveolar crest together with the immediate placement of the implant with little primary stability. To confirm this finding of this single case, additional studies may be warranted.

Correspondence:
Dr. Britto Falcón-Guerrero
artdent2000@hotmail.com

Disclosure:
The author reports no conflicts of interest with anything in this article.

References

1. Zuffetti F, Capelli M, Galli F, Del Fabbro M, Testori T. Post-extraction implant placement into infected versus non-infected sites: a multicenter retrospective clinical study. Clin Implant Dent Relat Res. 2017: 19(5), 833–840.
2. Arunjaroensuk S, Panmekiate S, Pimkhaokham A. The stability of augmented bone between two different membranes used for guided bone regeneration simultaneous with dental implant placement in the esthetic zone. Int J Oral Maxillofac Implants. 2018;33(1):206–216.
3. Plonka AB, Urban IA, Wang HL. Decision tree for vertical ridge augmentation. Int J Pperiodontics Restorative Dent 2018;38:269–275.
4. Zumarán CC, Parra MV, Olate SA, Fernández EG, Muñoz FT, Haidar ZS. The 3 r's for platelet-rich fibrin: a "super" tri-dimensional biomaterial for contemporary naturally-guided oro-maxillo-facial soft and hard tissue repair, reconstruction and regeneration. Materials (BASEL). 2018;11(8). pii: e1293.
5. Ayoub AH, Belal SM. Clinical and radiographic evaluation of socket preservation using autologous concentrated growth factors enriched bone graft matrix (Sticky bone): a case report. EC Dental Scienc. 2016; 5(4): 1128-1135.
6. Choukroun J, Ghanaati S. Reduction of relative centrifugation force within injectable platelet-rich-fibrin (PRF) concentrates advances patients' own inflammatory cells, platelets and growth factors: the first introduction to the low speed centrifugation concept. Eur J Trauma Emerg Surg. 2018 feb;44(1):87-95.
7. Chrcanovic BR, Martins MD, Wennerberg A. Immediate placement of implants into infected sites: a systematic review. Clin Implant Dent Relat Res. 2015;17 suppl 1:e1-e16.
8. Le BT, Borzabadi-Farahani A. Simultaneous implant placement and bone grafting with particulate mineralized allograft in sites with buccal wall defects, a three-year follow-up and review of literature. J Craniomaxillofac Surg. 2014 jul;42(5):552-9.
9. Falcón Guerrero BE. Manejo de los defectos horizontales del reborde alveolar. JPAPO 2017; 2(1):30-39.
10. Grunder U, WenzB, Schupbach P. Guided bone regeneration around single-tooth implants in the esthetic zone: a case series.Int J Periodontics Restorative Dent 2011;31:613–620.
11. Miron RJ, Fujioka-Kobayashi M, Hernandez M, Kandalam U, Zhang Y, Ghanaati S, Choukroun J. Injectable platelet rich fibrin (i-PRF): opportunities in regenerative dentistry?. Clin Oral Investig. 2017;21(8):2619-2627.
12. Varela HA, Souza JCM, Nascimento RM, Araújo RF Jr, Vasconcelos RC, Cavalcante RS, Guedes PM, Araújo AA. Injectable platelet rich fibrin: cell content, morphological, and protein characterization. Clin Oral Investig. 2018 Jul 12. doi: 10.1007/s00784-018-2555-2.
13. Ayoub AH, Ramadan OR, Agbor MA . Tissue engineering, platelets concentrates and its role in dental implant treatment". EC Dental Science.2016; 5(1): 969-980.
14. Dragonas P, Katsaros T, Avila-Ortiz G, Chambrone L, Schiavo JH, Palaiologou A. Effects of leukocyte–platelet-rich fibrin (l-PRF) in different intraoral bone grafting procedures: a systematic review. Int J Oral Maxillofac Surg. 2019 feb;48(2):250-262.
15. Atia WM, Khalil AA, Melek LN. Sticky bone in dehiscence defect around dental implant. Alexandria Dental Journal. 2018;.43:35-40
16. Zhang J, Qi X, Luo X, Li D, Wang H, Li T. Clinical and immunohistochemical performance of lyophilized platelet-rich fibrin (Ly-PRF) on tissue regeneration. Clin Implant Dent Relat Res. 2017;19:466–477.
17. Sarnachiaro GO, chu SJ, Sarnachiaro E, Gotta SL, Tarnow DP. Immediate implant placement into extraction sockets with labial plate dehiscence defects: a clinical case series. Clin Implant Dent Relat Res. 2016;18(4):821-9.
18. Chenchev IL, Ivanova VV, Neychev DZ, Cholakova RB. Application of Platelet-Rich Fibrin and Injectable Platelet-Rich Fibrin in Combination of Bone Substitute Material for Alveolar Ridge Augmentation - a Case Report. Folia Med (Plovdiv). 2017;59(3):362-366.

JIACD OsseoFuse International Inc.

The Journal of Implant and Advanced Clinical Dentistry has been providing high quality, peer reviewed dental journals since 2007. We take pride in knowing that tens of thousands of readers around the world continue to read and contribute articles to JIACD. As you can imagine, there is a lot of expense involved in managing a top quality dental journal and we sincerely appreciate our advertisers purchasing ad space in both the journal and on the website which allows our monthly journals to continue to be free to all of our readers.

In an effort to streamline our business practice and continue to provide no-fee, open access journals, JIACD is now sponsored exclusively by Osseofuse International Inc., a cutting edge dental implant company that provides exceptional implants and prosthetics and believes in the free distribution of information towards clinical advancements to dentists in the U.S. and around the world.

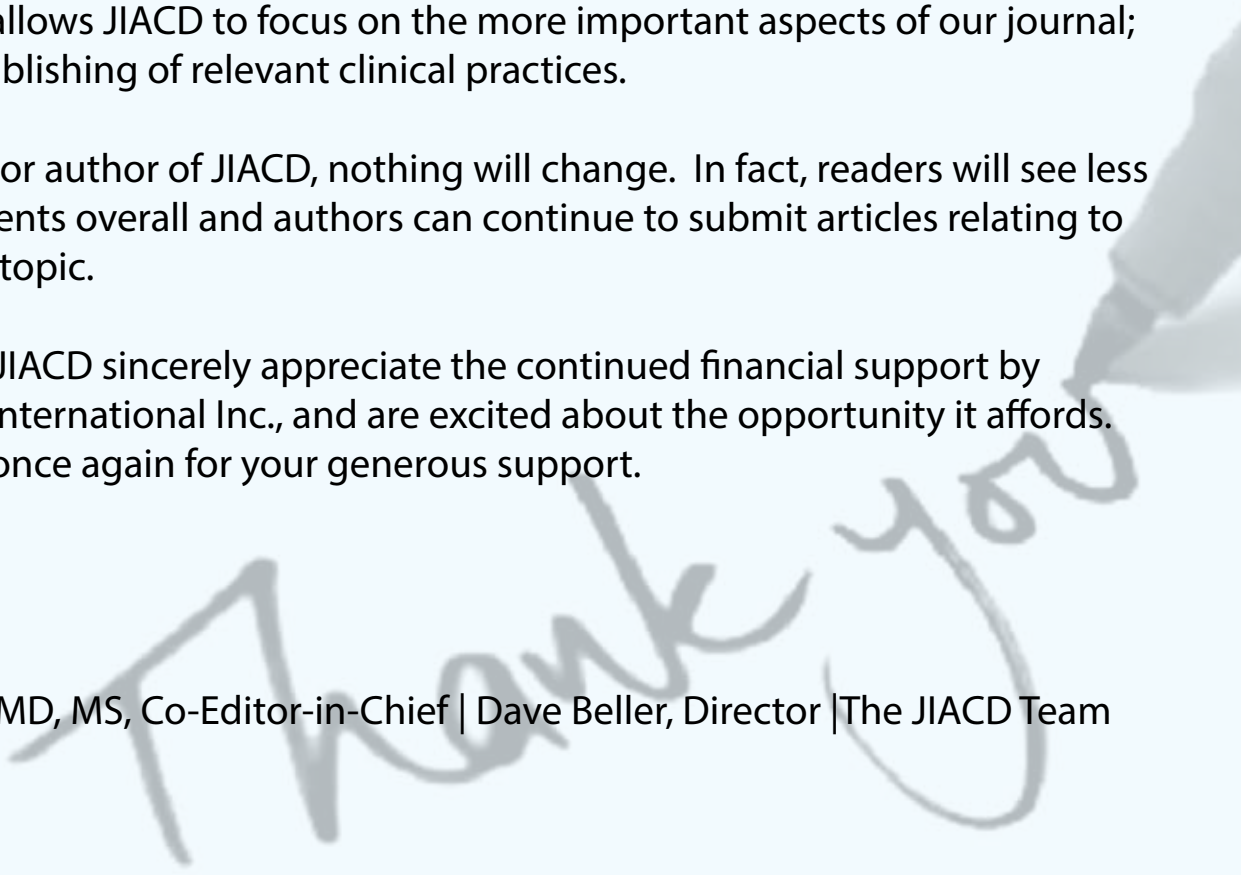
This generous sponsorship, which provides funding towards our operating expenses, allows JIACD to focus on the more important aspects of our journal; monthly publishing of relevant clinical practices.

As a reader or author of JIACD, nothing will change. In fact, readers will see less advertisements overall and authors can continue to submit articles relating to any clinical topic.

We here at JIACD sincerely appreciate the continued financial support by Osseofuse International Inc., and are excited about the opportunity it affords. Thank you once again for your generous support.

Sincerely,

Leon Chen MD, MS, Co-Editor-in-Chief | Dave Beller, Director |The JIACD Team



Revision Treatment of Failed Iliac Crest Grafts with a Small Diameter Dental Implant: A Case Report

Rohit Mathur, BDS, MPH, MS[1] • Jack Piermatti, DDS[1] • Chiu-Jen Hsu, DDS[1]
Max Nahon, DDS[2] • Thomas J. Balshi DDS, FACP, PhD[1]

Abstract

Background: Using dental implants to restore completely edentulous patients is rapidly becoming the top adopted treatment protocol. When restoring completely edentulous patients, there are 2 main options: removable or fixed prosthetics. However, when a patient has limited to no bone, there are fewer options for the patient.

Methods: A 64-year female presented with 2 implants in the position of teeth #'s 3 and 14. The patient had a history of an iliac crest transplant graft with endosseous implants following which the patient had received a fixed screw retained prosthesis. The graft underwent resorption and the patient lost 2 of the 4 original implants. Consequently, the patient then received an overdenture with locator attachments on 2 implants. At that time, the patient's chief complaint was "the denture does not stay in" and she wanted to investigate alternative treatment options. She had no available residual bone for implant placement but was a candidate for a fixed restoration using zygomatic and pterygomaxillary implants. The patient, however, declined any major surgical procedures and thus was not treated with these particular dental implants. CBCT revealed a small amount of bone in midline and a 3 mm diameter implant was placed. A bar was designed with Hader clips and locators. A Vitallium 2000 frame was designed to strengthen the denture and a bar supported partial overdenture was delivered.

Results: The current treatment adding one 3.0 mm diameter implant at the midline does provide stability for the overdenture bar and removable prosthesis. The 1 year follow up shows promising results.

Conclusion: Treatment history demonstrates the frequent sequalae to iliac crest transplant procedures to the atrophic maxilla. When patients decline extensive surgery a bar overdenture supported by 3 implants serve as a viable treatment option.

KEY WORDS: Small diameter dental implant, severe maxillary defect, dental prosthetics, Hader Bar, Case Report

1. Department of Prosthodontics, NOVA Southeastern University College of Dental Medicine, Fort Lauderdale, Florida, USA.
2. Director, Postgraduate Prosthodontics, NOVA Southeastern University College of Dental Medicine, Fort Lauderdale, Florida, USA.

BACKGROUND

Dental implants are commonly used in restoring edentulous and partially edentulous patients. In order to place dental implants, an adequate amount of bone is required in all three dimensions. In the maxilla, bone loss can be so severe that less than a millimeter of bone remains between the oral cavity and nasal or sinus cavities.[1] Several augmentation procedures using autogenous, allogeneic, xenogeneic, and synthetic materials have been described and are used routinely. Autogenous grafting involves bone which that is harvested and grafted from the same patient. Autogenous bone can be harvested from intraoral sources like chin, mandibular ramus, maxillary tuberosity, or they can be harvested from extraoral sources such as the iliac crest, the fibula, and even parts of the skull.[2]

Dental literature has shown that predictable results can be achieved when fixed restorations are done on implants placed in sites that received bone augmentation.[3] The gold standard for grafting deficient ridges/jaws is still autogenous bone. Anterior iliac crest bone block grafting is a well-documented and established treatment option to gain sufficient bone volume for placing dental implants. This technique involves an extraoral donor site and is used for extensive alveolar ridge augmentation.[4] Using iliac crest as a donor site has an advantage of simple accessibility and the potential abundant for an amount and quality of Bone.[5]

When planning for the restoration of dental implants, there are 2 main options: either removable or fixed with each having its own advantages and disadvantages. Many factors need to be taken into account during the decision process on whether an implant-fixed complete denture or implant overdentures are best suited for patients.[6] It is shown that patients are satisfied with their implant-supported prostheses in the edentulous maxilla with regard to their well-being and the cost-utility, irrespective of whether the restoration was fixed or a removable bar overdenture.[7]

In terms of the overdenture retention mechanism, either a bar or stud/locator attachments can be used. The choice of attachment is influenced by the amount of retention, arch morphology, cost and patient expectations.[8] In addition, implant angulation plays an important role.[9] Splinting maxillary implants for a maxillary overdenture is shown to have significantly lower stress levels in the immediate surrounding bone.[10] There is an increased possibility of peri-implant bone loss when unsplinted implants are used in maxilla.[11]

It is shown that implants that are placed in sites that received block autogenous block bone grafts have an implant success rate of 97%.[12] However a recent systematic review concluded the range of implant survival and success rates in autogenous block bone grafts to be 73.8% to 100% and future studies with longer follow-ups are required.[13] A history of previous implant loss can also be an indicator of future implant loss.[14] It is of significant concern when all the grafting, implants and restoration fails in these patients. With limited to no bone, there are few options for the patient. The patient can go back to a conventional denture or they can receive either zygomatic and pterygomaxillary implants which have shown predictable results.[15,16] Additionally, the patient can also receive sinus elevations or Re grafting.[1,17]

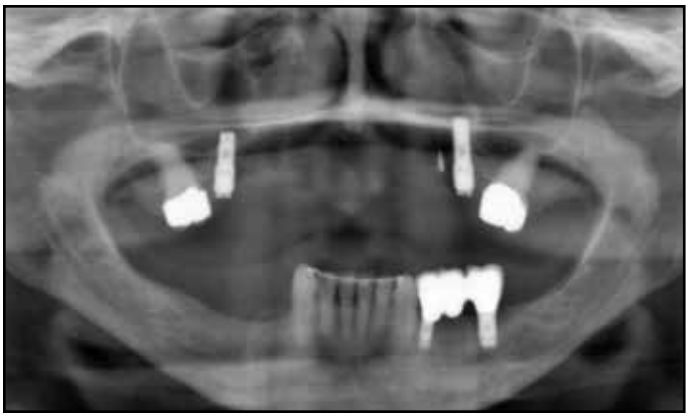


Figure 1: Pre-op Panoramic radiograph.

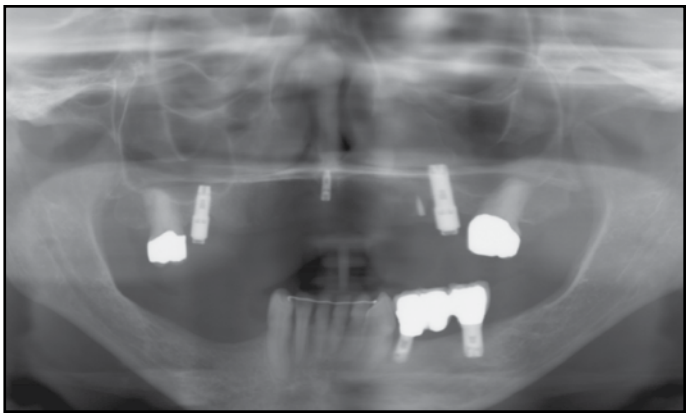


Figure 2: Panoramic radiograph after implant placement.

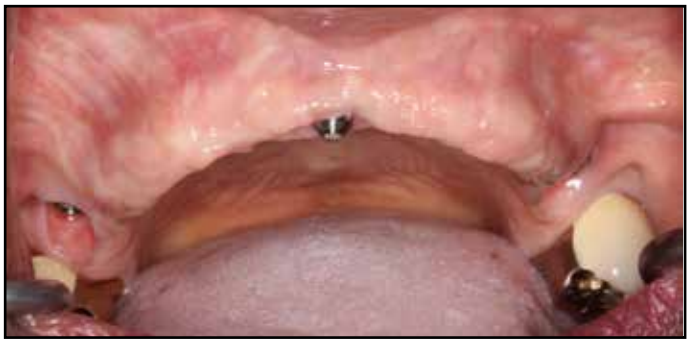


Figure 3: **Intra oral view after implant placement.**

CASE REPORT

A 64-year old female presented to the postgraduate clinic at NOVA Southeastern University College of Dental Medicine with two Branemark implants in the position of #'s 3 and 14 with locator abutments. The patient had teeth #'s 2 and 15 present and had survey crowns with mesio-occlusal rest seats. The patient's chief complaint was "the denture keeps getting loose every 4 to 6 weeks and I need to frequently change the nylon attachments. Also I hate having my denture cover the roof of my mouth." A pre-treatment panoramic radiograph is shown in Figure 1. She had a history of iliac crest grafts about 14 years ago.

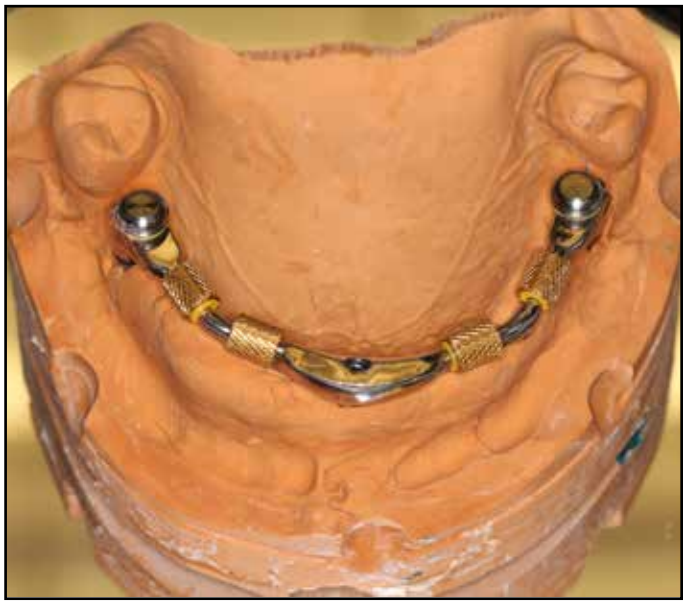


Figure 4: Bar on the cast.

The patient had received a screw retained fixed detachable restoration supported by four implants. Four years after grafting two implants failed and the patients fixed restoration was taken out and new implant placement was planned. However, there was no bone available for implant placement and the patient declined aggressive grafting/major surgical procedures as she claimed, "it took her a few years to recover from the hip

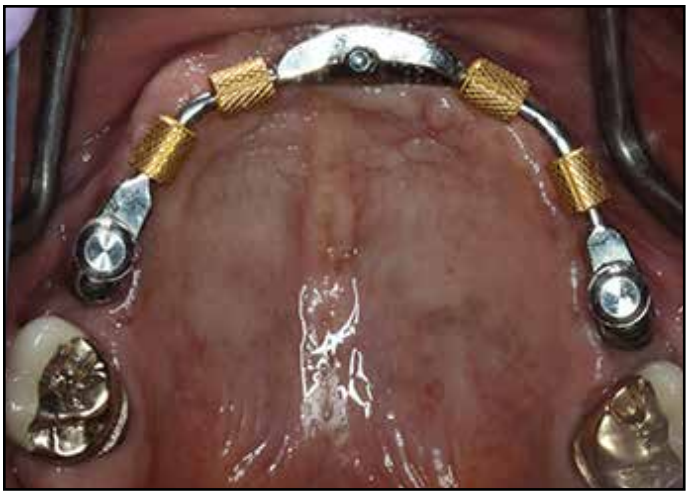


Figure 5: Intra oral view of the bar.

Figure 6: Wax try-in with frame.

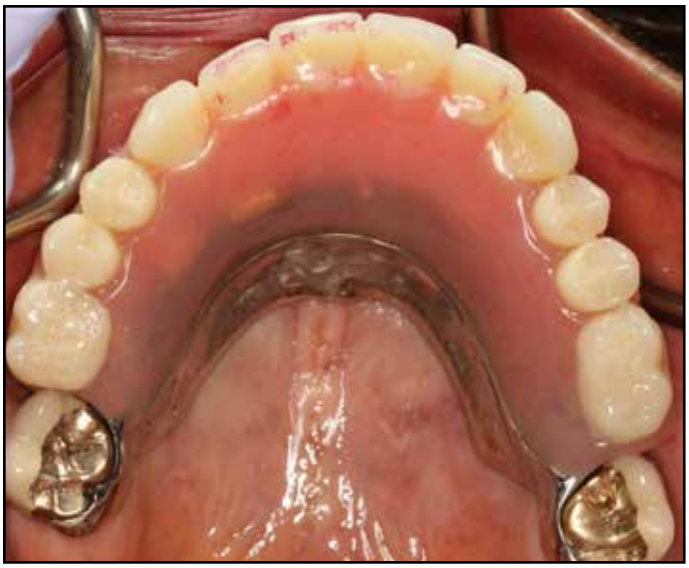


Figure 7: Final restoration.

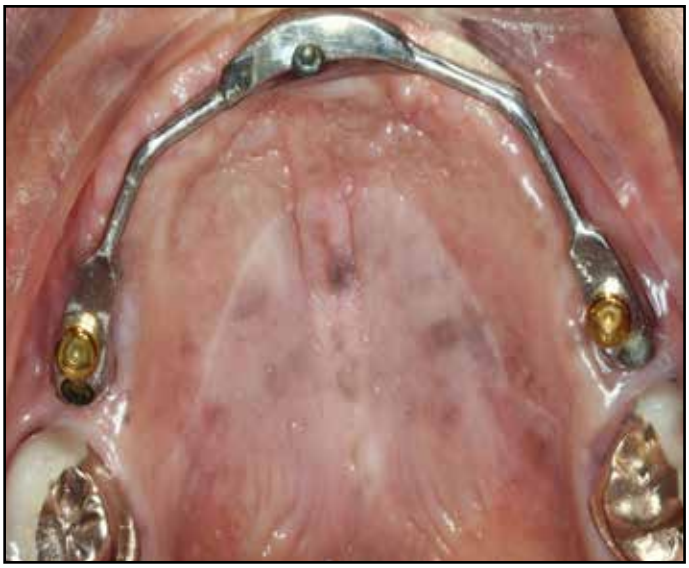


Figure 8: 1 year follow up of bar.

grafts and she does not want to go through any of it again". As a result, the patient received a maxillary overdenture retained with two implants.

For the last 8 years patient has not been satisfied with that treatment and wanted to investigate an alternative form of treatment. A new CBCT scan was taken that revealed a knife edge ridge but small amount of bone for implant placement in #8/9 area. The patient was then referred to the Oral Surgery department. A Dentsply Astra EV 3.0 X 8.0mm implant was placed with a cover screw in the #8/9 site for unloaded bone healing. Four months later, a second stage surgery uncovered that implant. The implant was mechanically stable and appeared to be osseointegrated. The patient returned to the prosthodontic department for restorative treatment. It was decided to construct a bar overdenture as the patient is high risk

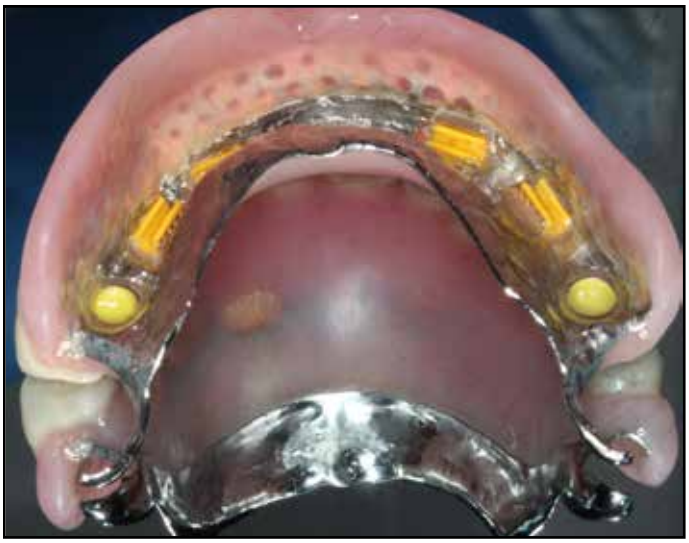


Figure 9: 1 year follow up of the prosthesis.

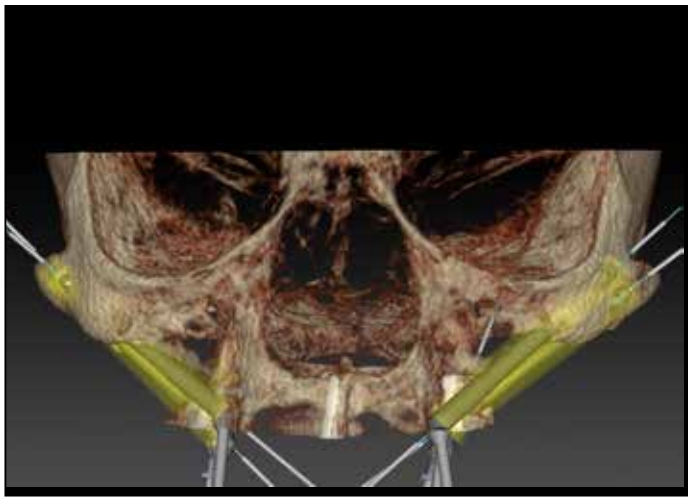


Figure 10: Planning of Zygomatic and Pterygomaxillary implants.

for implant failure and bar overdenture seems to show better result than unsplinted implants.[10, 11]

The patient now presented with 3 implants in the area of #'s 3,8,14 and two survey crowns on natural teeth #'s 2 and 15 as seen in the panoramic radiographic of Figure 2. Since Astra does not make a castable abutment to the fixture, a uni-abutment was placed on the #8/9 implant (Figure 3). A fixture level for #3 and 14 and an abutment level #8 open tray impression was made after splinting the impression copings with GC pattern resin (GC America Inc, Alsip, IL). A soft tissue master cast was poured in resin rock (Whip Mix Corp, Louisville, KY). Tooth setup was done and tried in. A verification jig was made to verify position of the implants. The patient approved the esthetics and case was sent to the lab and a cast metal screw retained bar was fabricated.

The bar had four Hader clip attachments, two locator attachments in the posterior and a vertical stop in the anterior for a positive seat of the metal framework in the overdenture (Figure 4). The bar was tried in and the one screw test (Sheffield test) was performed to verify passive seating (Figure 5). After the bar was tried in, a custom tray was used to do border moulding and the bar was picked up in Polyvinylsiloxane impression material. Case was sent back to the lab and a refractory cast was made. Vitallium 2000 (Dentsply Sirona, York, PA) frame was made around the bar extending bracing arms on the lingual portion of #'s 2 and 15 and having a knife edge surface to blend with the palatal soft tissue. The frame along with the wax try in is shown in Figure 6. After the wax try in and final patients' esthetics approval the overdenture was sent to the lab for processing. Once the final processed denture was received all the attachments (Hader clips and locators) were processed in the denture. Final restoration is shown in Figure 7. The patient was satisfied with the fit and retention of the new prosthesis. She was seen for a 1 year follow up and did not require any of the plastic overdenture attachments replaced. Figures 8 and 9 show the bar and denture at 1 year follow up.

DISCUSSION AND CONCLUSION

For this patient, a revision treatment protocol is presented in which a patient received secondary treatment after the iliac crest bone graft underwent massive resorption. It is a challenge trying to revise a treatment of failed grafting. As the patient did not want any more extensive surgery the treatment options are very limited. Although the use of zygomatic implants could provide support for a fixed screw retained prosthesis, they also require extensive surgery.[18]

Hader clips are one of the most common methods of retention for bar overdenture. However locator attachments provide better retention than Hader bar/yellow clips but a smaller loss of retention force is seen with Hader clips.[19] In order to have advantages of both, the bar was designed to include Hader clips and locator attachment system.

Vitallium 2000 (Dentsply Sirona, York, PA) is a Co-Cr-Mo alloy. It was used as a frame inside the overdenture because it has higher surface hardness than the Co-Cr-Mo-Ni alloy because of the high content of Co and Cr. In addition, the alloy had better corrosion resistance at pH values of 5.0 and 2.5 because of increased resistance of the oxide film.[20]

This patient treatment history demonstrated the frequently found sequalae to iliac crest transplant procedure to the atrophic maxilla. Intra graft implants are often difficult to maintain osseointegration. Once implants are lost the graft deteriorates with subsequent denture pressure on residual ridge.

Zygomatic implants according to DTX studio plan (Nobel Biocare, Yorba Linda, CA) shown in Figure 10 indicate that a fixed prosthesis would be a possible revision treatment but requires rigorous surgery. The current treatment adding one 3.0 mm diameter implant at the midline does provide stability for the overdenture bar and removable prosthesis. Should any of the 3 implants loose osseointegration, the patient could elect to have zygomatic and Pterygomaxillary implant placed to support a screw retained fixed Prosthesis. The one year follow up however, appears to be providing the patient with sufficient stability and function.

Correspondence:
Dr. Rohit Mathur
mathur.rohit90@gmail.com

Disclosure:
The authors report no conflicts of interest with anything mentioned within this article.

References

1. Spencer KR. Implant based rehabilitation options for the atrophic edentulous jaw. Aust Dent J 2018;63 Suppl 1:S100-S07.
2. Borgonovo AE, Marchetti A, Vavassori V, et al. Treatment of the atrophic upper jaw: rehabilitation of two complex cases. Case Rep Dent 2013;2013:154795.
3. Sbordone C, Toti P, Guidetti F, et al. Volume changes of iliac crest autogenous bone grafts after vertical and horizontal alveolar ridge augmentation of atrophic maxillas and mandibles: a 6-year computerized tomographic follow-up. J Oral Maxillofac Surg 2012;70(11):2559-65.
4. Gultekin BA, Cansiz E, Borahan MO. Clinical and 3-Dimensional Radiographic Evaluation of Autogenous Iliac Block Bone Grafting and Guided Bone Regeneration in Patients With Atrophic Maxilla. J Oral Maxillofac Surg 2017;75(4):709-22.
5. Schaaf H, Lendeckel S, Howaldt HP, Streckbein P. Donor site morbidity after bone harvesting from the anterior iliac crest. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;109(1):52-8.
6. Goodacre C, Goodacre B. Fixed vs removable complete arch implant prostheses: A literature review of prosthodontic outcomes. Eur J Oral Implantol 2017;10 Suppl 1:13-34.
7. Zitzmann NU, Marinello CP. Treatment outcomes of fixed or removable implant-supported prostheses in the edentulous maxilla. Part I: patients' assessments. J Prosthet Dent 2000;83(4):424-33.
8. Trakas T, Michalakis K, Kang K, Hirayama H. Attachment systems for implant retained overdentures: a literature review. Implant Dent 2006;15(1):24-34.
9. Evtimovska E, Masri R, Driscoll CF, Romberg E. The change in retentive values of locator attachments and hader clips over time. J Prosthodont 2009;18(6):479-83.
10. Geramy A, Habibzadeh S. Stress Distribution in Splinted and Unsplinted Implant-Supported Maxillary Overdentures: A 3D Finite Element Analysis. Implant Dent 2018;27(1):56-62.
11. Narhi TO, Hevinga M, Voorsmit RA, Kalk W. Maxillary overdentures retained by splinted and unsplinted implants: a retrospective study. Int J Oral Maxillofac Implants 2001;16(2):259-66.
12. Elo JA, Herford AS, Boyne PJ. Implant success in distracted bone versus autogenous bone-grafted sites. J Oral Implantol 2009;35(4):181-4.
13. Motamedian SR, Khojaste M, Khojasteh A. Success rate of implants placed in autogenous bone blocks versus allogenic bone blocks: A systematic literature review. Ann Maxillofac Surg 2016;6(1):78-90.
14. Curtis DA, Lin GH, Fishman A, et al. Patient-Centered Risk Assessment in Implant Treatment Planning. Int J Oral Maxillofac Implants 2019.
15. Balshi SF, Wolfinger GJ, Balshi TJ. Surgical planning and prosthesis construction using computer technology and medical imaging for immediate loading of implants in the pterygomaxillary region. Int J Periodontics Restorative Dent 2006;26(3):239-47.
16. Balshi TJ, Wolfinger GJ, Petropoulos VC. Quadruple zygomatic implant support for retreatment of resorbed iliac crest bone graft transplant. Implant Dent 2003;12(1):47-53.
17. Raghoebar GM, Onclin P, Boven GC, Vissink A, Meijer HJA. Long-term effectiveness of maxillary sinus floor augmentation A systematic review and meta-analysis. J Clin Periodontol 2019.
18. Balshi TJ, Wolfinger GJ, Shuscavage NJ, Balshi SF. Zygomatic bone-to-implant contact in 77 patients with partially or completely edentulous maxillas. J Oral Maxillofac Surg 2012;70(9):2065-9.
19. Uludag B, Polat S, Sahin V, Comut AA. Effects of implant angulations and attachment configurations on the retentive forces of locator attachment-retained overdentures. Int J Oral Maxillofac Implants 2014;29(5):1053-7.
20. Qian C, Wu X, Zhang F, Yu W. Electrochemical impedance investigation of Ni-free Co-Cr-Mo and Co-Cr-Mo-Ni dental casting alloy for partial removable dental prosthesis frameworks. J Prosthet Dent 2016;116(1):112-8.

Get Social
with
JIACD

@JIACD
on twitter

"JIACD dental journal"
on LinkedIn

JIACD on FB

The Best Things in Life Are FREE!

Subscribe now to enjoy articles **free of charge** that will benefit you, the actively practicing dental provider. With each JIACD issue, readers are afforded the opportunity to assess clinical techniques, cases, literature reviews, and expert commentary that can immediately impact their daily dental practice.

Email notification when new issues are available online.

Start your FREE subscription today at www.jiacd.com