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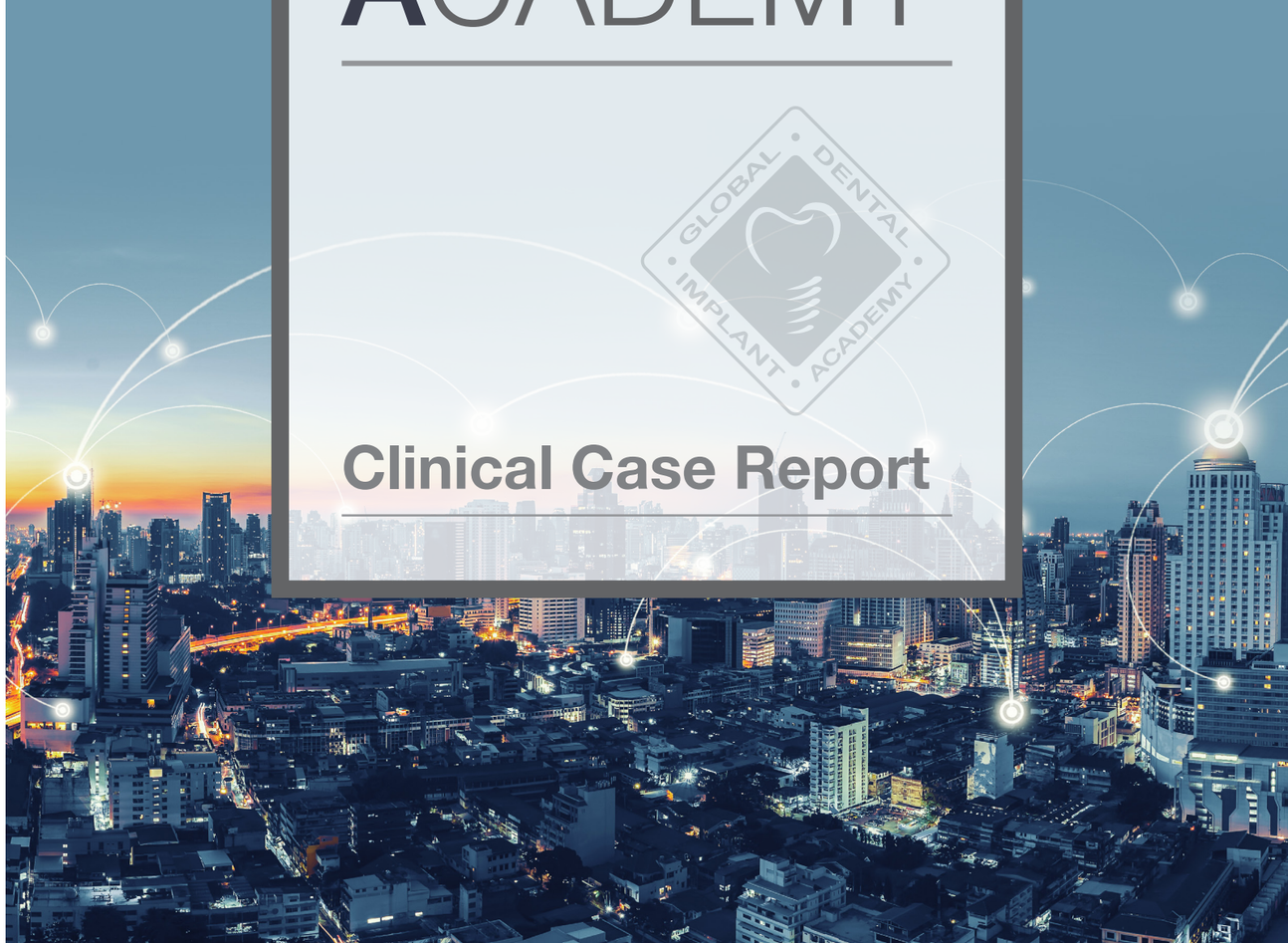
GLOBAL DENTAL IMPLANT ACADEMY

Clinical Case Report



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Clinical Case Report

PREFACE

Endosseous implants are important for comprehensive treatment planning in patients who have missing teeth. Dental implants are now included in dental school and graduate program curricula and have gained widespread acceptance in world-wide dental practices. The use of dental implants has evolved historically into a definitive treatment option. This rapid improvement in techniques demand from dental practitioners to keep up with the literature, to be an attentive member of an implant study club, and to share individual experience with other colleagues. For these reasons, we have created “GDIA case reports” publication.

It was and still with a great pleasure and honor that I embrace the opportunity to be the editor-in-chief of a such publication. Also, with a deep appreciation to the editorial board Drs. Jin Kim, W. Eric Park, Cary Brown, Alex Parsi, Cameron Torabi, Arash Hakhamian, Charles Park and Stephen Kallaos, for their support and help in this project.

The present album consists of a collection of case reports that were published during the last year. Its purposes are 1) to share globally the clinical experience of many clinical implant practitioners (world-wide); 2) to boost globally the practice of implant dentistry using DENTIS implant system; 3) to allow the reader to appreciate why and how to utilize basic and advanced implant dentistry concepts for the restoration of missing soft and hard oral tissues.

These case reports are presented in a format that allows the clinician to utilize DENTIS implants successfully by following the fundamentals of implant dentistry. This album contains basic information for the beginner in this implant dentistry field, as well as an introduction to many comprehensive procedures for the more experienced clinician challenged with complicated reconstructions of failing dentitions.

A key observation has been that there are certain universal, fundamental principles that apply to each clinical situation, making it predictable at the end of the treatment. Shortcutting these principles diminish that predictability and result in costly remakes, loss of patient trust and even a tarnished reputation.

We hope this publication is a good benefit for your practice and motivate you to take the practice of implant dentistry to a higher level. This album would not be possible if it were not for their unselfish sharing of information of all the authors who have sent us these enclosed case reports.

“Today is truly a remarkable time in dentistry.’

Acknowledgment

We would like to thank the following individuals for their help and support in the realization of this album of GDIA case reports:
Ms. Ellie Kim. Continuing Education Program Manager;
Mr. Sun Kim, Marketing and Communication Manager;
Ms. Dami Chung, Graphic Designer; and especially
Mr. Gi Bong (Dennis) Sim, President of DENTIS Implant Korea.

Tony Daher DDS, MSEd, FACP, FICD

Editor-in-Chief, GDIA Co-Director of GDIA USA

01. About GDIA

02. GDIA Clinical Case Report

01

About GDIA

Global Dental Implant Academy (GDIA)

Global Dental Implant Academy (GDIA) was formed in 2012, with a simple mission in mind to advance the field of implant dentistry by providing quality education and training to the dedicated clinicians. Global Dental Implant Academy (GDIA) is committed to achieving this goal through sharing of resources, scientific and clinical knowledge, and collegiality through clinicians, academics, and the dental industry, both locally and globally. With this in mind, Global Dental Implant Academy (GDIA) provides clinical training courses, international symposiums, and research opportunities with leading clinicians from the US, Europe, and south America, and Asia. Global Dental Implant Academy (GDIA) provides our students, the general dentist, the instruction and opportunity to maximize their clinical practice in performing dental implant surgery. We do this by employing qualified, committed mentors who believe in our mission to provide and assist in meeting our student's needs in a private one-to-one session at the student's convenience. By providing a private mentor program our students will receive the proper knowledge and attention needed for the student to advance their clinical skill and practice.

Objectives

1. To share our experience with each other, to expand our knowledge and to incite among all the love of learning globalization.
2. To strive to make the academy one of the strongest implant education at the national and international level.
3. To recruit more passionate dentists to join our mission of teaching and to excel in this field of implant dentistry.
4. To promote a professional atmosphere for learning. To us, learning is a serious matter.
5. To participate in any educational events such as Study Clubs, National and International Meetings and Conventions.

Educational Programs in USA

Online Education

- Live Webinar & On-Demand View
- E-Learning

Introduction to Implant Dentistry

- 4-Day Basic Implant Program
- 12-Day Implant Continuum

Implant Mentorship Program

- One-on-One Implant Training Program
- 4 Day Implant Mentorship Program

Study Club

- Monthly Clinical Case Study Club

Hands-On Workshop

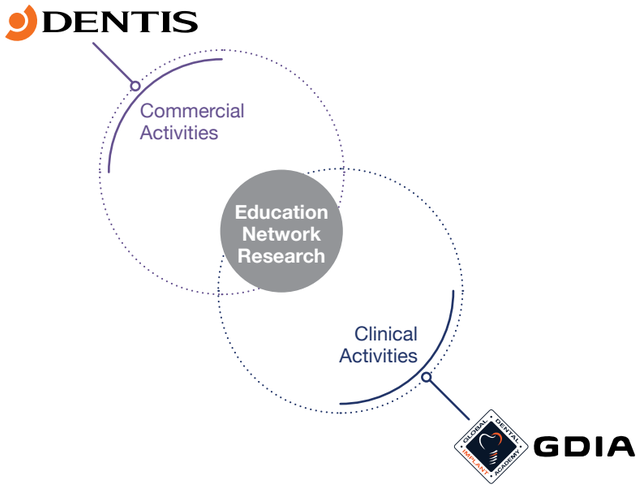
- Advanced Hands-on Training

Live-Patient Surgical Training Program

- 3-Days Program : Building Confidence in Implant Surgery
- 4-Days Program : Mastering Complex Surgical Techniques
- 4-Days Program : Fast Track to Fellowship Credentials

Partnership & Sponsorship

DENTIS also offers dental professionals and their patients the benefits of a unique partnership with the Global Dental Implant Academy (GDIA).
This partnership has led to many technological and therapeutic advances in the field and has created a platform in which to disseminate evidence-based educational principles to a constantly growing professional audience. GDIA provides an important link between DENTIS, academia and dental professionals.



Continuing Education Providers Accreditation in USA

DENTAL BOARD OF CALIFORNIA
Approved CE Provider
Provider #5282

ADA C·E·R·P® | Continuing Education Recognition Program

Global Dental Implant Academy (GDIA) is an ADA CERP Recognized Provide. ADA CERP is a service of American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

Academy of General Dentistry
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GDIA Affiliated Implant Education in USA

ICOI
International Congress of Oral Implantologist
Courses are applicable to ICOI advanced credentials

02

GDIA
Clinical Case Report

Clinical Case I

Rehabilitation of A Non-Restorable Maxillary Central Incisor Tooth for Function and Esthetic Utilizing An Immediate Placement and Provisionalization Protocol

Jin Y. Kim, DDS, MPH, MS, FACD
Dr. Jin Y. Kim is a dual board-certified periodontist. He is a diplomate of the American Board of Periodontology (ABP), American Board of Oral Implantology / Implant Dentistry (ABOI / ID), and of the International Congress of Oral Implantologists (ICOI). Jin is also a fellow of American Academy of Implant Dentistry (AAID), and an inducted fellow of the American College of Dentists (ACD). He is the co-founder and program director of Global Dental Implant Academy (GDIA) and operates private practices in Diamond Bar and Garden Grove, California, USA.

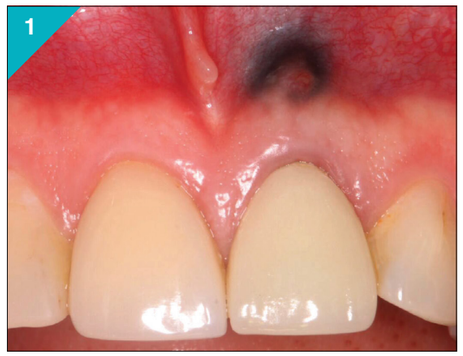


Figure 1. Pre-treatment clinical view.

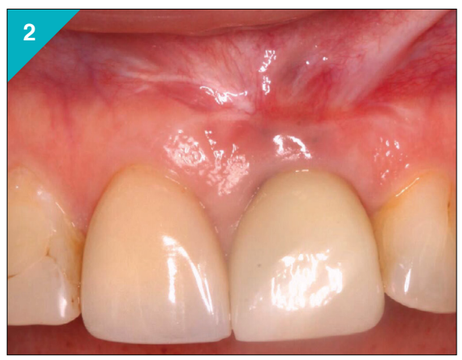


Figure 2. Post-treatment clinical view.

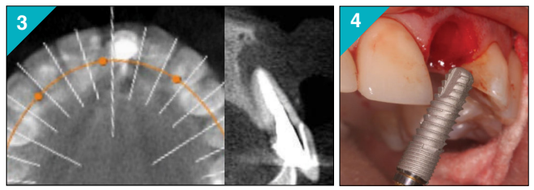


Figure 3. Cross-sectional CT of upper left central incisor.
Figure 4. DENTIS™ implant being placed into the prepared socket site.

Case History

A healthy 47-years old female patient presented with fracture of a endodontically treated upper central incisor tooth. The tooth had a history of apical surgery that did not resolve well. A CT study revealed significant bone destruction at the peri-apical region as well as the major portion of the facial bone plate. Patient desired to have the amalgam tattoo from previous surgery removed. Immediate implant placement into the extraction socket, non-functional implant tooth (NFIT), and use of autologous biologic enhancers were used with a “poncho” technique, and custom impression technique, followed by milled titanium abutment was utilized to make this unique case a clinical success.

Implant Surgery

In a single surgery, under intravenous conscious sedation anesthesia, the tooth was removed without raising a sulcular flap. There was a thin bridge of buccal bone close to the gingival margin, which was to be preserved at all cost. An internal hexed, conical connection implant (4.3mm x 14mm, DENTIS™ s-Clean) was placed towards the palatal part of the socket, hugging the palatal lamina dura of the socket. Implant site preparation was carried out with ultrasonic piezoelectric surgery device (Surgybone™) and rotary drills. Primary stability was obtained by apical engagement of the long implant. Implant stability was recorded at 61 ISQ (implant stability quotient) on Ostell™ device.

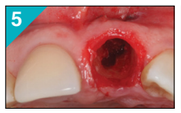


Figure 5. Osteotomy completed in the socket.

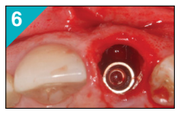


Figure 6. Implant securely placed in the palatal aspect of the socket.

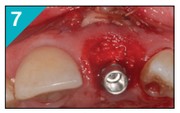


Figure 7. Socket and facial defect is grafted with “sticky bone,” and CGF membrane.

Immediate provisional restoration was constructed with the porcelain portion of the extracted tooth and a hexed titanium abutment, bonded with light-cured composite resin. This restoration was kept out of occlusion, and patient was instructed to avoid chewing on the front teeth.

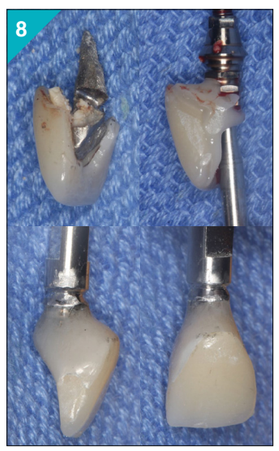


Figure 8. Non-functional implant tooth(NFIT) is being made with retrieved porcelain tooth, a titanium abutment, and light cured resin.

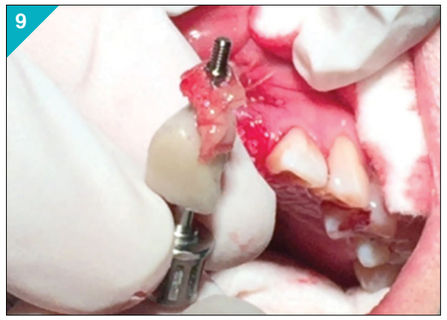


Figure 9. Immediately prior to installing the NFIT, a double layer of CGF was pierced by the restoration for a “poncho technique” of delivery.

The remaining soft and hard tissue defect, including the vestibular area with amalgam tattooed soft tissue was excised widely. This area was grafted with “sticky bone” and CGF (Concentrated Growth Factors, Medifuge™).

“Sticky bone” was made with xenograft (Bio-Oss™) and mineralized allograft (LifeNet™). In order to seal the gingival margin with graft material and to enhance healing potential, a double layer of CGF was pierced through the NFIT restoration immediately before it’s installation.

This “poncho technique” of delivering CGF assured secure placement of the biologic enhancer, exactly where it was needed, at the edge of the gingival margin, without the use of conventional sutures. The mass of CGF at the tattoo site was secured with 4.0 chromic gut sutures.

Series of Clinical Views

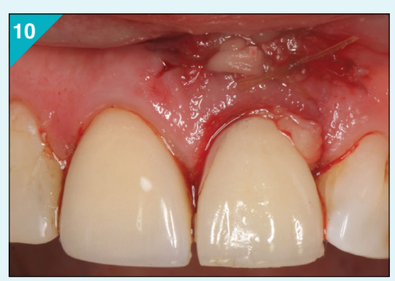


Figure 10. Clinical presentation, immediate post-surgery, showing stable placement of all graft material, and the NFIT.

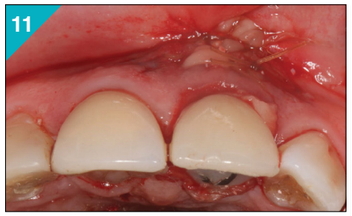


Figure 11. Immediate post-surgery view shows over grafting of the buccal ridge to compensate for future post-surgical contraction.

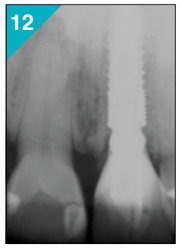


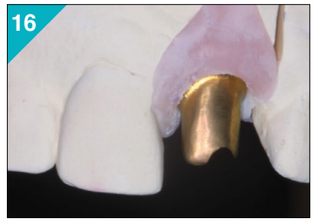
Figure 12. Post-surgical peri-apical(PA) radiograph.

Restorative Phase

Approximately 3 months after the surgery, NFIT was removed and the ISQ remeasured. It recorded 76, representing a 15-point increase. Definitive restorative work commenced with customized impression technique to accurately record and convey the 3D peri-implant tissue contour to the dental laboratory. A milled titanium abutment was fabricated, and a layer of gold hue titanium nitrate coating was applied by electroplating technique.

The custom abutment and resin provisional restoration was installed at 6-months post-surgery. Porcelain fused to metal full coverage restoration was fabricated and delivered at 12-months post-surgery, after allowing a 6-month period of tissue maturation.

Figure 15. Custom impression technique, using duplicated contours of NFIT as a custom impression coping.



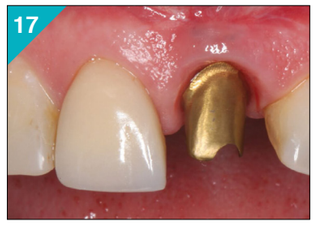
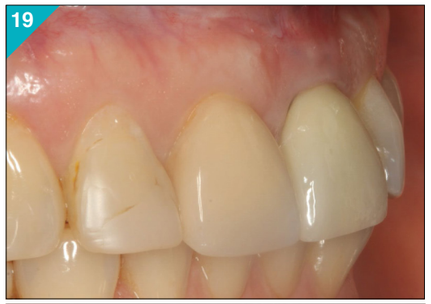


Figure 16 & Figure 17. Custom milled abutment.



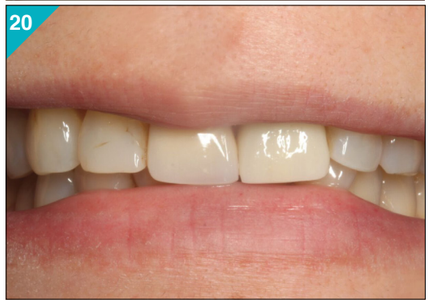


Figure 19 & 20. Full restoration of function and esthetics was achieved in this case, with a highly satisfied and compliant patient.

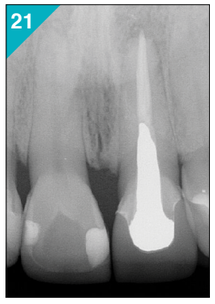


Figure 21.
Pre-treatment PA.

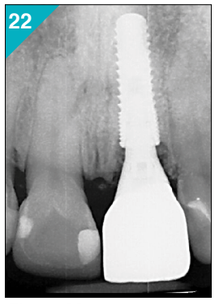


Figure 22.
Post-treatment PA.

Figure 13. Healing at 2-weeks.

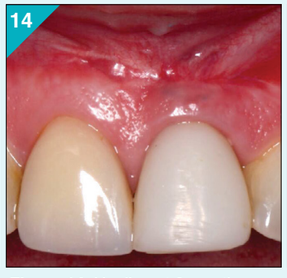


Figure 14. Healing at 6-months.

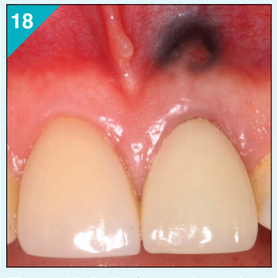


Figure 18 & 19. Comparison of pre- and post-treatment (at 12-months).

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1. Koh R.U. *et al.* Immediate implant placement: positives and negatives. *Implant Dent*, 2010, 19(2):98-108.
2. Sohn D-S. *et al.* Sticky Bone use in implant dentistry. *J Implant Adv Clinical Dent,* 2015, 7(10):11-29.
3. Kim J.Y. Preserving and maintaining optimal peri-implant soft tissue complex for function and aesthetics. *Dent Implantology Update,* 2004 15(9):65-72.

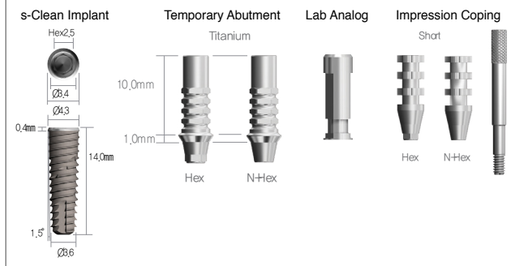
Acknowledgment

This case was restored by Dr. Lily Namsinh, general practitioner of Garden Grove, CA USA. Laboratory dentistry was carried out by Mark Tillman, CDT, at Spectrum Dental Laboratory, Tustin CA, USA.

Products Used

DENTIS USA (La Palma, CA, USA)

- DENTIS™ s-Clean implant Ø4.3 x 14mm (DSFR4314S)
- Temporary abutment, 4.5mm titanium, hexed (DSTA45HS)
- Implant lab analog (DSCLA)
- Pick-Up Impression Coping 4.5mm, hex, short (DSIH45SS)



DENTIS

SILFRADENT (Santa Sofia FC, Italy)

- Centrifuge for CGF & “sticky bone”: Medifuge™
- Piezoelectric surgery device: Surgybone™

Other Products

- Xenograft from Bio-Oss™, Gleistlich Pharma AG, Switzerland

Clinical Case II

All-on-Four™ 4 Peek-Composite Restoration Using the Simple Guide Concept: A Case Report

Amr H Elkhadem, BDS, MSC, PhD, FICOI
Dr. Amr Elkhadem is assistant professor of Prosthodontics at-Cairo University, a Fellow of the International Congress of Oral Implantologists, and Program Director of the Master Degree in Oral Implantology at Cairo University. He is inventor of DENTIS™ Simple Guide Kit®.

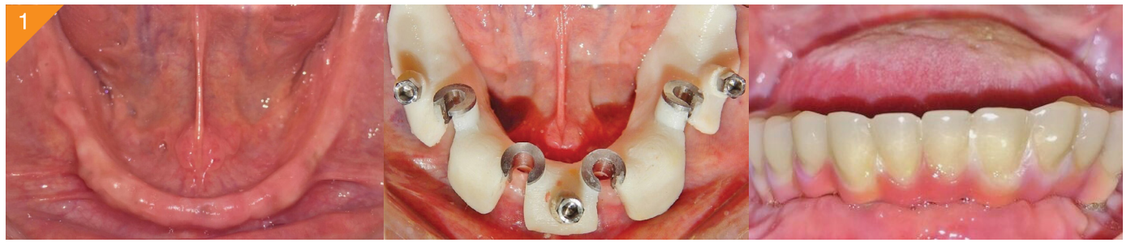


Figure 1a-c. a) Clinical photograph of the patient's lower arch, b) Open Sleeve guided surgery in use with DENTIS™ Simple Guide Kit®, c) Final restoration

Case History

The 64-year old male patient presented in this case had fully edentulous arches. He complained of a loose mandibular denture despite it having been recently made. Upon examination, he was found to have an atrophied lower jaw with insufficient ridge height (Figure 1a). The patient required a fixed lower denture. CBCT examination showed bilateral low ridge height in the posterior part of the mandible. The patient had planned to receive a two stage screw-retained fixed prosthesis retained by four implants following the standard All-on-Four™ protocol. Due to the long crown height space, the PEEK-Composite structure was planned to provide a passive light weight framework with aesthetic pink composite cervical restoration (FP3).

Methods

The patient's denture was examined for proper stability and occlusion. The denture was duplicated into a radiopaque scan appliance (with a 4:1 ration of acrylic resin to barium sulphate). The scan was completed while the patient wore the scan appliance. Next, the scan appliance was optically scanned over the patient model and finally, the patient edentulous model was optically scanned, following triple scan protocol.

Four 3.7mm x 12mm implants (S-Clean® by DENTIS™ – Korea) were planned virtually. The two anterior implants were placed in the lateral incisor region while the posterior implants were planned to emerge cervically in the second premolar region, with their apices were directed mesially to avoid the inferior alveolar nerve (Figure 2,3,4).

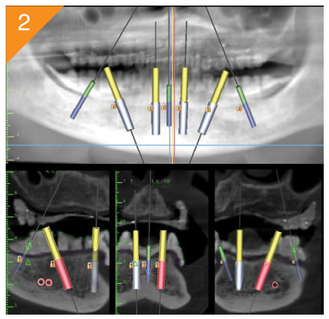


Figure 2. implant planning on CBCT sections.

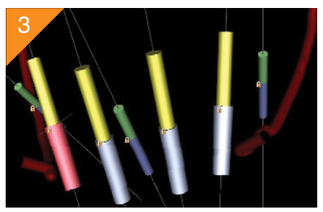


Figure 3. 3D implant views in relation to the nerve.

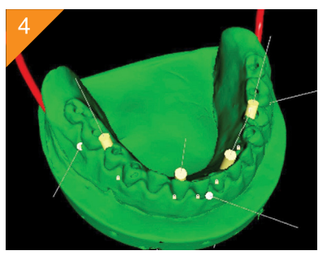


Figure 4. 3D implant positions in relation to patient setup.

After adding three fixation screws, a virtual guide was designed and printed for use with the simple guide protocol (Figure 5).

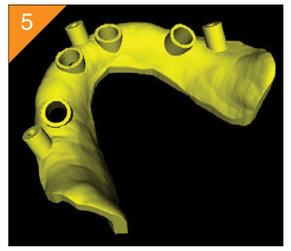


Figure 5. Virtually designed implant guide.

Flapless implant bed preparation and implant insertion was then performed. First, the guide was temporarily fixed with three anchor screws. The Simple Guide Kit® (DENTIS™ – Korea) was used to prepare the site. Once the guide was removed, free hand final drilling was completed and the implant was inserted using the DENTIS™ S-clean® implant kit (Figures 6-9).

Figure 6. Simple Guide Kit®.

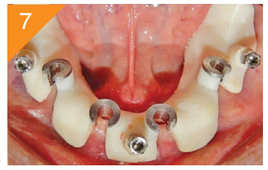


Figure 7. Fixing the surgical guide intraorally with anchor screws.

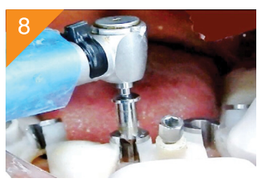


Figure 8. Guided implant osteotomy for pilot and intermediate drilling.

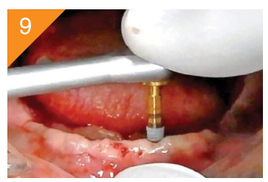


Figure 9. Freehand implant insertion.

After 2 months, the multi-unit transmucosal abutments were attached to the implants following a localized crestal incision to preserve the limited keratinized mucosa. For the anterior implants, straight abutments were used while 17-degree abutments were utilized for the posterior implants. A splinted open-tray abutment-level impression was made for the four abutments placed. Impression accuracy was checked using the single screw test with a verification jig (Figure 10-12).

Figure 10. Second stage multi-unit abutments installation.
Figure 11. Open-tray splinted impression.
Figure 12. Verification jig for checking passivity.

Titanium cylinders were attached to the analogues on the model. Excess height was trimmed. The model was scanned for designing a wax framework that connected the four titanium cylinders. The milled wax was attached to the cylinder to form a single framework. The wax-titanium assembly was sprued and invested using PEEK pressing methods (For2 Press® by Bredent™ - Germany). Ceramic-filled PEEK material (Bio HPP®, Bredent™) was injected into the mold after wax elimination. The finished framework was checked for passivity and seating over the model. It was rescanned over the model to create CAD/CAM composite veneers that fit over the framework. The milled composite veneers (HIPC®, Bredent™) were mounted to the frame with laboratory bonding composite (Combolign®, Bredent™) along with a transparent silicone key. The reproduction of the cervical pink portion was performed using Crealign composite (Bredent™, Figure 13-21). The polished framework was examined in the patient's mouth for passivity and occlusion. The prosthesis was then attached to the abutment and the screws were torqued to 20Ncm. Access holes were sealed were composite restorative material (Figure 22.)

Discussion

The use of the All-on-Four™ strategy is now considered a widely approved approach to restor the dentition of fully edentulous patients.[1,2] The placement of implants is critical in regard to both the anatomical and prosthetic points of view. Computer guided planning and placement procedures effectively enhance the patient's safety during implant placement by improving the practitioner's ability to avoid unnecessary injury to the patient's inferior alveolar nerve or fenestration of the cortical plates. In this case, it also allowed for flapless implant installation that reduced surgical time and produced minimal postoperative pain.[3] From the prosthetic perspective, it allowed the implant's inclination and setting to suit ideal prosthetic axis channels for the planned screw-retained restoration. Failure to achieve such inclination would have complicated the prosthetic procedures and compromised the final aesthetic outcome.

In this case report, ceramic-filled PEEK with composite veneers were used as a final restorative material to overcome the pitfalls of metal-ceramic, or all-zirconium screw-retained frames. The modulus of elasticity for PEEK is close to that of bone, allowing for shock absorption and better mechanical adaptation.[4] The press-to technique aided in overcoming common casting errors encountered in large reconstruction cases that involve significant inter-arch distance. It also assures better security and long term connection between the titanium cylinders and the PEEK, instead of relying on a bonding cement.

Conclusion

The simplified guided implant placement combined with pressed PEEK restoration yields a predictable treatment modality for All-on-Four™ restorations.

Series of Clinical Views

Figure 13. A scanned model after attaching titanium cylinders.

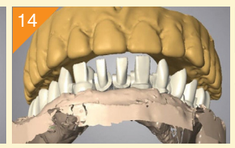


Figure 14. Designing a cut wax pattern for the prosthesis.

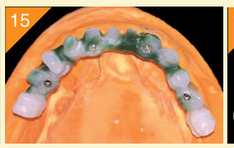


Figure 15. Attaching the milled wax to the titanium cylinders.

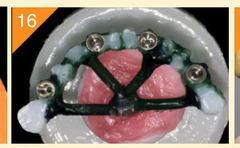


Figure 16. Preparing the wax-titanium framework for investing.

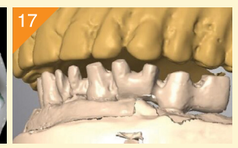


Figure 17. TPressed framework scanned for veneer design.

Figure 18. The virtual CAD of the composite veneers.

Figure 19. The CAD CAM composite veneers temporarily attached to PEEK frame with wax.

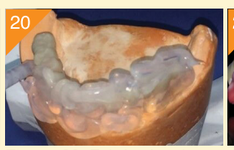


Figure 20. Fabricating the transparent silicone index.

Figure 21. Pink composite characterization after veneer placement.

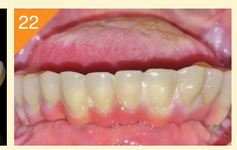


Figure 22. Placing the final restoration intraorally

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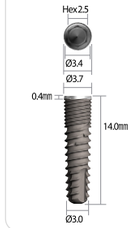
Products Used

Bredent
- BioHPP
- For2Press machine
- HIPC composite Blanks 98.5x14mm
- Combolign and Crealign veneering composites

Planning Software
- Bluesky Plan3 for implant planning
- Dental Wings software of implant prosthesis

S-Clean Implant



DENTIS USA (La Palma, CA, USA)
- S-Clean® implant 3.7x14 (DSFM3714S)
- MU couple abutments(DSMCA4830HS) MU angled abutment 17-degree(DSMAA48740HS), MU transfers(DMTICS), MU lab analogues(DMLA) and temporary titanium cylinders(DMTCS)
- Simple Guide Kit®

MU Angled Abutment

MU Transfers

MU Lab Analog

MU Temporary Cylinder

Simple Guide Kit

DENTIS

Clinical Case III

Correcting Implant Angulation Using New Stern Snap Angled Attachment in an Implant Overdenture Situation

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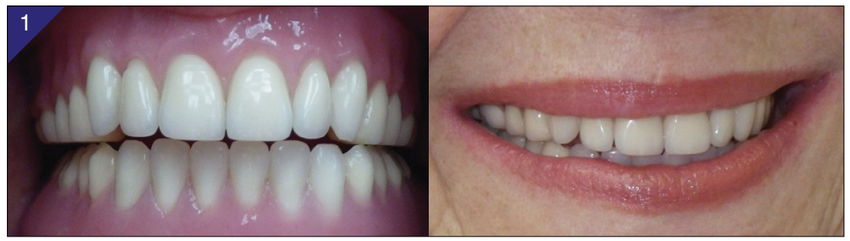

Figure 1a-b. a) Final restoration, b) Overdenture on patient's mouth

Abstract

The objective of this patient case presentation is to present a simple, cost-effective technique to achieve enhance retention and stability of the overdenture prosthesis on non-parallel implants utilizing a new attachment Stern Snap Angled attachment. A case report is presented that illustrates the use of a new 2-piece Stern Snap Angled overdenture abutment to accommodate non-parallel implants.

Background and Aim

Implant overdenture treatment has become a popular treatment modality with considerable patient's acceptance and has good impact on patient's quality of life.[1] When individual implants and retentive mechanisms will be used, placing the implants so they are parallel to each other or have their long axes nearly aligned with each other facilitates the prosthodontic phase of treatment by allowing the use of standardized components.[2,3]

Most implant overdenture abutments and related components require parallelism within approximately 10 degrees to function properly.

This may preclude the use of conventional implant overdenture abutment and corresponding attachment.[4] Custom abutments then may be used to correct for implant angulation variations.

Malalignment of individual implants with abutments can make prosthesis placement more difficult and the plastic retentive element are pinched more often during placement and removal, producing excessive wear and earlier loss of retention. A common complication (30% of the prostheses) is the need for activation or replacement of the mechanical retention.[5] The purpose of the article is to demonstrate how to use a newly designed attachment, Stern Snap angled, made to correct the angulation of mis-aligned implants. The features and the benefits of this attachment are as follow:

It is used to retain overdentures on most of the popular implants. It has a very low profile and takes up only 2.5mm of height in the denture. Its plastic retention cap comes in three retention levels (1lb., 2lbs., 3lbs.) and are extremely long lasting.

No metal housing is needed, making it more economical.

Case Report of an Overdenture on Non-aligned DENTIS™ Implants

- The overdenture is placed and fitted over the healing abutments and the soft tissues; the balanced occlusion is refined.
- The healing abutments are then removed and the gingival cuff height of the attachment abutment is measured with a periodontal probe.
- Select the implant(s) that is (are) well situated under the denture teeth. Place the selected straight Stern Snap(s) over the implant and tighten to 20Ncm using 1.25 hex driver. (Fig.2)

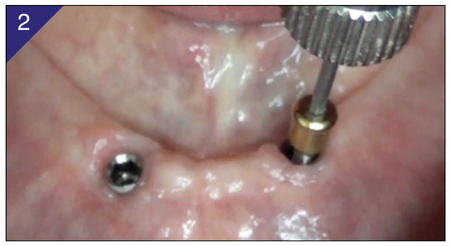

Figure 2. The Stern straight Snap abutment is placed first and tighten with 1.25 hex driver to 20Ncm.

- Screw the appropriate tissue cuff height Stern Snap SFI Abutments into each implant. The abutments are tightened to 30 Ncm. (Fig.3,4)

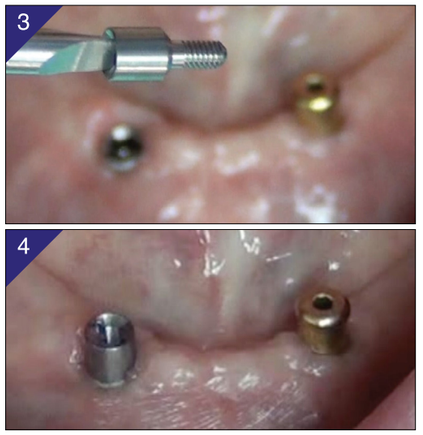

Figure 3, 4. The gingival cuff piece of the Stern angled abutment (SFI abutment) is place first with slotted driver and tighten to 30Ncm

- While holding the Stern Snap Handle of Stern Snap Angled attachment, insert the 1.25 hex driver through the slot in the Stern Snap white plastic Alignment Post and engage the head of the screw. Position the attachment onto the hemispherical occlusal surface of the abutment and begin to turn the screw into the abutment. (Fig. 5)

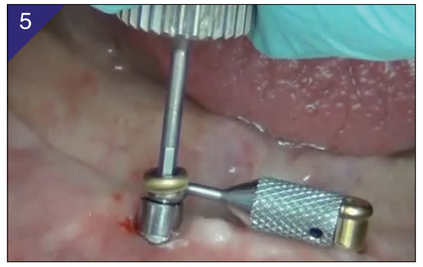

Figure 5. Placement of the second piece that looks like a ball over the SFI abutment.

Series of Clinical Views

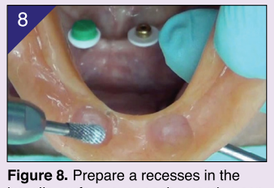

Figure 8. Prepare a recesses in the intaglio surface over each retention cap.

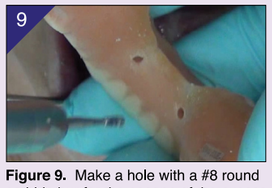

Figure 9. Make a hole with a #8 round carbide bur for the escape of the excess acrylic pick-up material.

- Using the Stern Snap Handle, move the attachment until the alignment white plastic post aligns with the desired path of insertion of the prosthesis or aligned it with the straight snap abutment. Hand tighten the screw. (Fig. 6, 7)

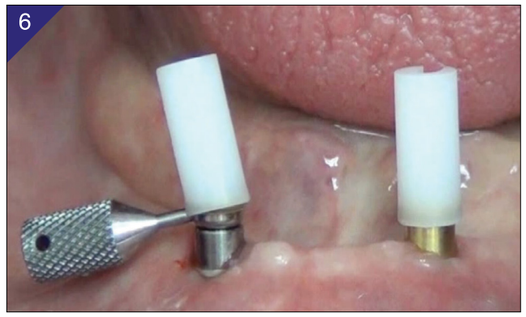

Figure 6. Using the Stern Snap Handle, move the attachment until the alignment white plastic post aligns with the desired path of insertion of the prosthesis.

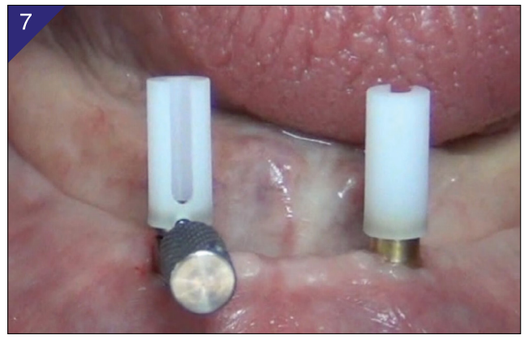

Figure 7. When both attachments are aligned tighten the screw of the Stern angled to 20Ncm with the hex driver.

- Remove the Alignment Post. While holding the handle to prevent movement, torque the screw to 20 Ncm using 1.25 hex driver. Unscrew the Stern Snap Handle.
- Place a retention cap onto each attachment, any exposed parts of the abutment are blocked out, and the cap is processed into the denture. Pick up one at a time, and clean the excess resin before attaching the next one. (Fig. 8-13)
- The retention caps can easily be changed when necessary. The Stern Snap Insertion/Removal Tool is a double ended tool.
- The removal end has the longer neck and has sharp edges. The removal tool is pushed straight into the retention cap. Pull straight back to remove the cap from the denture. The cap may be removed from the tool by bending the tool sideways.
- Place a new cap onto the insertion end of the tool, (Fig. 14) which is shorter and smooth. Push the new cap firmly into the recess in the denture and pull the tool back out. The cap will remain in the denture.

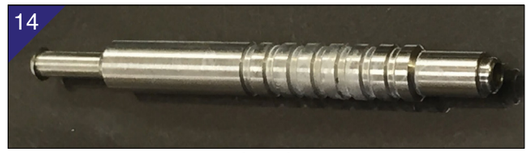

Figure 14. The double ended Stern Snap insertion / removal tool

Cleaning and Maintenance

In the Office :

Place in an ultrasonic cleaner with an enzymatic detergent diluted with tap water per the manufacture's guidelines. Sonicate for 10 minutes. Rinse with tap water for three minutes.

At Home :

Brush gently the overdenture inside out and soak overnight using a denture cleansing tablet in water. Brush the implant abutment and the gingiva with soft brush.

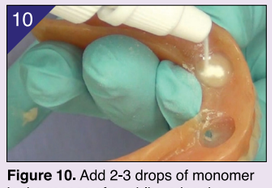

Figure 10. Add 2-3 drops of monomer in the recess after obliterating the escape hole with your finger. Then saturate the monomer with tooth colored auto-polymerizing resin.

Figure 11. The retention caps are in place with the with white nylon ring that prevents the resin to be in contact with the gingival cuff.

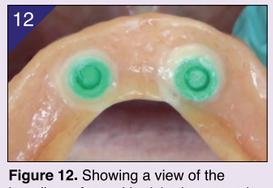

Figure 12. Showing a view of the intaglio surface with picked up retention caps.

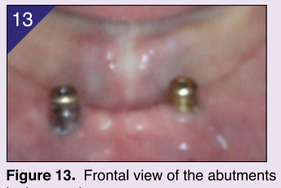

Figure 13. Frontal view of the abutments in the mouth.

Conclusion

A technique has been presented to attach an implant overdenture with non-aligned implants using new commercially available Stern Snap Angled attachment. (Fig. 15,16)

Figure 15. The Stern Snap straight attachment complex.

Figure 16. The Stern Snap angled attachment complex.

This technique minimizes laboratory expense and is a viable alternative to costlier bar-fabricated overdenture.

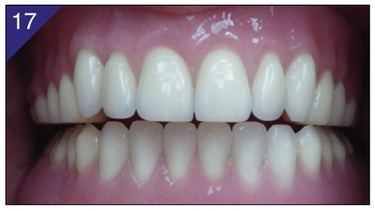

Figure 17. Frontal view of the finished dentures.

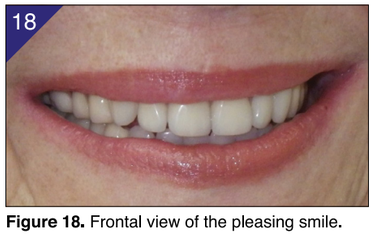

Figure 18. Frontal view of the pleasing smile.

Products Used

DENTIS USA (La Palma, CA, USA)
- DENTIS™ s-Clean® tapered implant Ø4.1 x 12mm (DSFR4112S)

Sterngold Dental LLC (Attleboro, MA, USA)
- Stern Snap attachment and abutments

DENTIS

Presented at the ICOI meeting in San Diego, August 25-27, 2016.

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Clinical Case IV-1

Utilization of Decalcified Autologous Tooth Block Bone and Powder Bone for Ridge Augmentation in Implant Dentistry

Part I Simplified three-dimensional ridge augmentation performed with “Ring technique”, utilizing decalcified autologous tooth block

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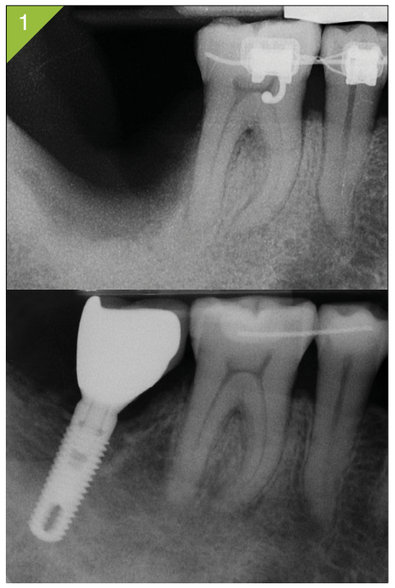

Figure 1a-b. a) Pre-operative radiograph, b) 2 years post-operative radiograph

Background and Aim

Bone graft materials play an important role in regenerating the atrophic edentulous alveolar bone. There are various type of bone grafts: autogenous graft, decalcified autologous tooth bone, allograft, and xenograft. The best choice of graft is autogenous bone because it has both osteoinductivity and osteoconductivity. However obtaining autogenous bone requires second surgery site causing morbidity to the patient with extended surgical and healing time.

Hence for some time, other graft materials such bovine bone or synthetic bone have been an alternative choice over autogenous bone grafting. However these substitutes are osteoconductive and mainly function as space makers with volume preservation. Autologous tooth bone is recently introduced as the best new alternative to autogenous bone graft as it has osteoinductivity. An extracted tooth from the patient can be utilized as bone graft material after appropriate preparation and decalcification process, in block or powder form. The decalcification process can be effective under vacuum pressure and ultrasonic vibration, allowing the tooth to still retain its protein contents and collagen structures that aid in bone regeneration.

A Case Report

A 40 years old male visited the department requiring his lower right 2nd molar tooth extracted. Due to chronic periodontitis, severe bone resorption with class III mobility were present. Along with the 2nd molar extraction, it was decided that the lower left 3rd molar should also be removed and prepared as bone graft material for future implant surgery.

To ensure appropriate preparation of bone graft material from the 2nd right molar tooth, the amalgam filling and pulp tissues were completely removed using a high speed bur. The extracted tooth was crushed with a mallet and particulate tooth bone graft was prepared after 10 min-decalcification process. In addition, the extracted lower left 3rd molar tooth was prepared as a block form. Tooth block bone was prepared after 20 minutes of decalcification.

Both extracted teeth were buffered and treated with sterilization solution, then placed in a machine and reagents (VacuaSonic® and DecalSi-DM®; Cosmobiomedicare, Seoul, Korea) to undergo vacuum compression and ultrasonic vibration.

Six weeks after extraction, healthy soft tissue healing was achieved but due to severe ridge resorption, required vertical and horizontal augmentation with implant placement. (Fig. 2,3)

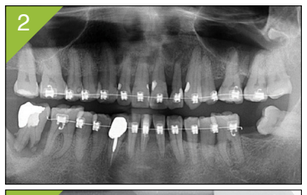

Figure 2. Preoperative orthopantogram showing hopeless lower right 2nd molar. This tooth and lower left 3rd molar was extracted to prepare for bone grafting in powder and block form.

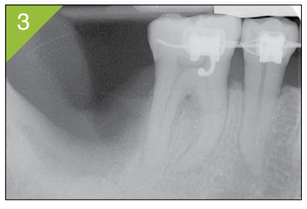

Figure 3. A radiograph showing severe vertical and horizontal bone resorption after 6 weeks post extraction.

The apical portion of the tooth block graft was resected, before positioning the implant fixture directly through the crown portion of the tooth block. Centering the implant fixture directly into the desired position and allowing the block graft to house the fixture achieved great stability with vertical and horizontal augmentation at the same time. This “Ring technique” allowed simplified ridge augmentation for a case that is often more challenging. (Fig. 4-6)

Figure 4. Autologous tooth powder bone prepared from extracted lower right 2nd molar.

Figure 5. Autologous tooth block bone prepared from extracted lower left 3rd molar.

Figure 6. Tooth Block Bone-implant complex. The “Ring technique”, where the fixture is engaged to the block bone graft in desired position.

Series of Clinical Views

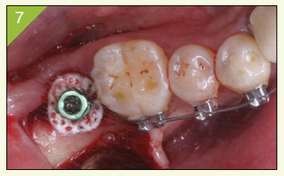

Figure 7. The tooth block bone-implant complex placed into the socket site with good apical stability of the implant.

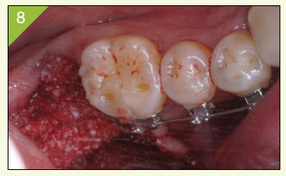

Figure 8. The defect between implant and extraction socket was grafted with sticky tooth bone and covered with CGF membrane.

The implant surgery was performed under local anesthesia. Patient's venous blood was taken from the forearm to make autologous fibrin glue (AFG) and concentrated growth factors membrane (CGF). The patient's venous blood is placed in the centrifuge machine (Medifuge™, Silfradent s.r.l., Sofia, Italy) using non-coated vacutainers to obtain AFG. After drawing the AFG portion with a syringe it is mixed with tooth bone particulates to form polymerization for 5-10 minutes. AFG was used to prepare Sticky Bone™. The beauty of sticky bone is that the graft material does not separate or fall apart, even with shaking due to it's interlinked fibrin networks. Use of Sticky Bone™ prevents migration of bone graft material when correcting defects and the healing period is also minimized. This convenient graft form does not require bone tack or titanium mesh to stabilize or secure the graft as it is self-holding. CGF membrane was also prepared using four glass coated test tubes excluding anticoagulants. The blood in the vacutainers were placed in a special centrifuge at 2400-2700 rpm with a rotor turning at alternated and controlled speeds for 12 minutes.

Granulation tissue at the extraction socket of lower right 2nd molar was completely curetted prior to osteotomy. Under-preparation with osteotomy ensured apical stability of the implant and secured the tooth block bone-implant complex.

Remaining gaps between the socket and the implant block graft was filled with sticky tooth bone. CGF membrane was placed covering the bone graft to accelerate wound healing. Finally, primary closure with tension free sutures were placed to allow good healing and regeneration. (Fig. 7-10)

The final restoration was delivered after 5 months healing. (Fig. 11,12)

Discussion and Conclusion

Implant supported dental restoration has become a major option in the treatment of edentulous alveolar ridge for the past several decades. Extensive loss of alveolar bone presents a complex challenge for reconstruction.To reconstruct a three-dimensional ridge defect, autologous bone block procedure or conventional GBR techniques can be utilized. When particulate bone graft is used, titanium mesh is required to contain particulate bone graft during healing but these procedures are surgically time consuming, and technique sensitive. Early exposure of titanium mesh can cause bone loss and infection hindering regeneration of bone.

To stabilize particulate bone grafts, the use of AFG is recommended and it has several advantages, such as fast tissue regeneration, simplified ridge augmentation and reduced surgical time. Autologous bone is considered gold standard for bone grafting procedures because of its osteoinductivity, especially when three-dimensional ridge augmentation is required.

But this technique has several disadvantages such as early exposure of bone graft, neurosensory disturbance, increased postoperative pain, delayed surgical time, additional surgery from donor site and costs.

Decalcified tooth bone has similar components as human bone and is known to release diverse growth factors, and contains type I collagen after appropriate decalcification.[1,2]

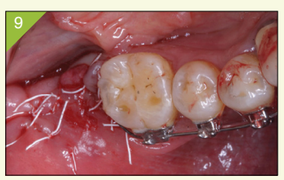

Figure 9. Primary closure with tension free sutures.

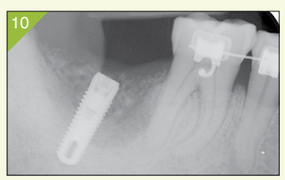

Figure 10. A postoperative radiograph showing implant and bone graft at extraction socket.

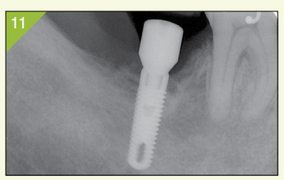

Figure 11. Mature bone regeneration after 5 months of healing.

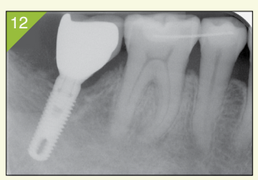

Figure 12. Radiograph, 2 years postoperative, note stable alveolar crestal height and volume.

Recently, a method to prepare decalcified tooth block and powder bone by chairside was introduced. A machine (Vacuasonic®, Cosmobiomedicare Co, Seoul, Republic of Korea) that produces vacuum compression and ultrasonic vibration to control decalcification, along with buffering and sterilization process. This machine is able to transform a patient's extracted tooth into osteoinductive bone in block and powder form at the same time directly chairside.

In comparison with other bone graft types, autologous tooth bone has several advantages:

1. No risk of cross contamination from animal and human bone origin.
2. Faster bone regeneration due to its osteoinductivity.
3. Tooth block is malleable, easy to handle, and provides substantial stable volume.
4. Similar components as human bone.
5. Avoids need for autologous block bone harvesting, reducing morbidity for patients.
6. The clinician is able to prepare graft material by chairside.

Therefore, it is highly recommended to utilize the patient's extracted tooth for immediate or future surgery that may require ridge augmentation. After proper decalcification process, an extracted tooth can be reformed into noble osteoinductive bone graft for the patient.

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Clinical Case IV-2

Utilization of Decalcified Autologous Tooth Block Bone and Powder Bone for Ridge Augmentation in Implant Dentistry

Part II Simplified ridge augmentation utilizing decalcified autologous particulate tooth bone graft

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Jin Y. Kim, DDS, MPH, MS, FACD*, Charles C. Park DDS*†, Grace Eun Ah Kim, DDS*††

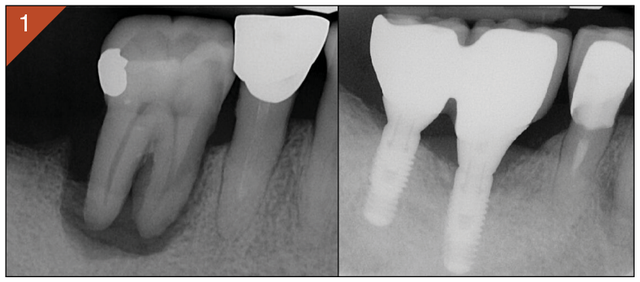

Figure 1a-b. a) Pre-operative radiograph b) 4 years post-operative radiograph

Background and Aim

Use of autogenous bone is preferred when correcting greater defects, because of its osteoinductivity when compared to other available graft materials. However harvesting autogenous bone is not favorable for the patient as it involves secondary surgery site causing greater post-operative discomfort with longer healing time and additional costs. Some other disadvantages include early exposure, potential resorption, and neurosensory disturbance. Autograft procedures also require higher level of training with experience and need to be better equipped.

Hence for some time, allogenic, xenograft, or synthetic bone materials have been alternative choices over autogenous bone grafts. Although these bone substitutes are sufficient to serve as scaffolds or spacers for volume preservation, they are only osteoconductive biomaterials. They are known to have a very slow resorption rate, and limits the newly formed bone to wholly replace the augmented ridge. In addition, the risk of cross contamination from animal and human origins are very low but cannot be disregarded.

Use of tooth derived bone graft has been recommended in the literature, to overcome disadvantages of autograft procedures.[1,2]

Utilizing of an extracted tooth from the patient is safe, and effective in promoting regeneration of bone. Efficacy of autogenous demineralized dentine has been studied, and its similar components to human bone has shown favorable outcomes. Organic composition in dentin mainly include type 1 collagen, and various growth factors such as IGF, PDGC, FGF,TGF-b and BMP (Bone Morphogenetic Proteins) that provide scaffolding and induce bone formation.

The remaining components are non collagenous proteins including phosphophoryn, dentin matrix protein 1, and many more that trigger bone resorption and generation process.

After effective demineralization procedure, the inorganic composition of enamel can be reduced, and decalcified dentine can induce release of BMP allowing osteoinductivity.

If treated with specific acid protocols, the tooth can better retain beneficial protein contents. Without undergoing decalcification process, a crushed or grinded tooth will only have osteoconductivity, which would not have any greater benefits in regenerating bone when compared to xenograft or alloplast material.

This case report evaluates the efficacy of grafted particulate tooth bone in the extracted socket with long-term follow up.

Case Report

A 68 year old male patient visited our department requesting implant retained restorations for the lower right central incisor, and lower left lateral incisor, canine, and first molar. (Fig 2,3)

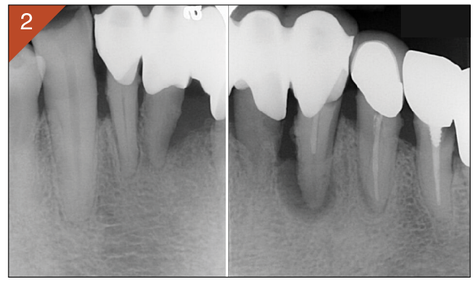

Figure 2. Severe bone resorption on the lower central incisor due to chronic periodontitis. Severe bone resorption around lower left canine due to periapical and periodontal lesion.

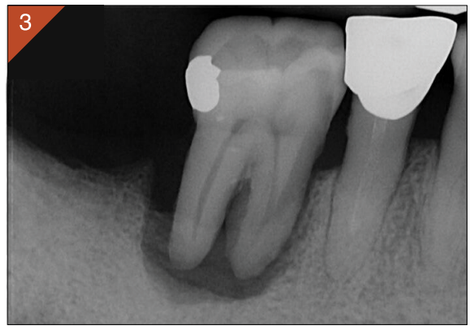

Figure 3. Severe bone resorption on lower right first molar due to chronic periodontitis.

Series of Clinical Views

Figure 7. A postoperative radiograph.

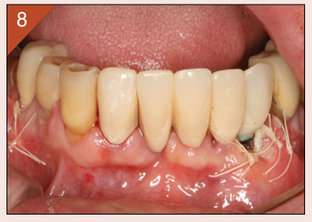

Figure 8. Immediate restoration was delivered on the next day.

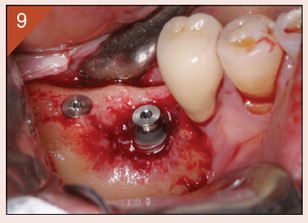

Figure 9. Severe bone defects around the molar implant.

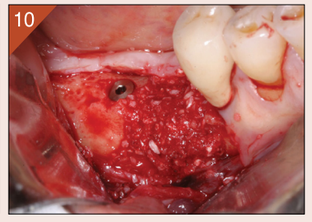

Figure 10. Sticky tooth bone is self holding, and does not require titanium mesh.

Extraction and implant surgery was performed under local anesthesia using 2% lidocaine HCl (1:80,000 epinephrine). All soft tissues adherent to the extracted teeth, pulp tissue and restorative materials were removed using a pear-shaped carbide bur. The autologous decalcified tooth graft was prepared chairside within 30 minutes for granule type and 2 hours for block type. Effective and rapid demineralisation through vacuum compression and ultrasonic vibration was made possible using the VacuaSonic® machine with specified reagents. (Cosmobiomedicare, Seoul, Republic of Korea) As mentioned in previously published journals, sticky tooth bone and concentrated growth factor (CGF) membranes were prepared, using the patient's venous blood and centrifuge machine (Medifuge®, Silfradent srl, Sofia, Italy). Inflammatory tissues in the extraction sockets were completely curetted prior to osteotomy, and apical stability of implants were achieved. Decalcified autologous tooth bone was then placed to fill any remaining socket defect, and for vertical and horizontal defects around the implants. CGF membrane was placed over the augmented ridge and secured with tension free sutures. Nonfunctional immediate provisional restorations were provided for the anterior region, but primary closure over the molar implant for two stage surgery was done.

After 4months, all implants healed uneventfully, and the molar implant was uncovered, showing newly formed bone, and healing around the implant. (Fig 4-16)

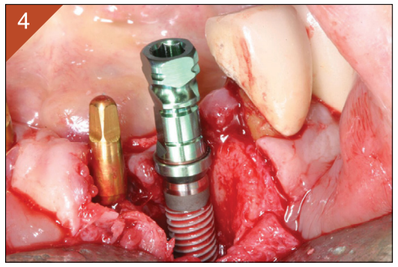

Figure 4. Apical stability of the implant was achieved but large bony defect requiring ridge augmentation is seen.

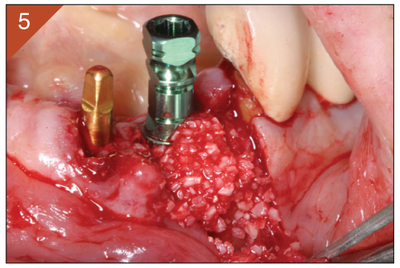

Figure 5. Sticky tooth bone graft was place in the bony defect. The interlinked fibrin network of sticky bone prevents migration of bony particles from the graft site and enhances healing.

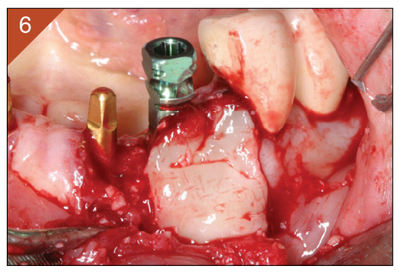

Figure 6. A layer of CGF membrane was placed over the bone graft to accelerate wound healing.

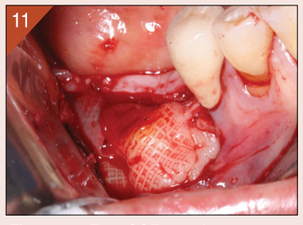

Figure 11. Two CGF membranes were placed to cover the graft to accelerate wound healing.

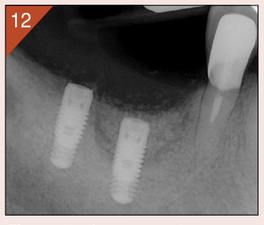

Figure 12. A postoperative radiograph showing augmented ridge with autologous tooth bone graft.

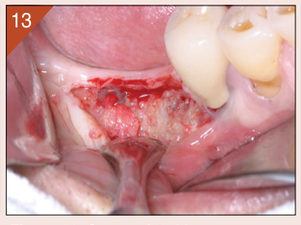

Figure 13. Successful ridge augmentation after 4 months of healing. Final restoration was delivered 4 weeks after soft tissue healing around the abutment.

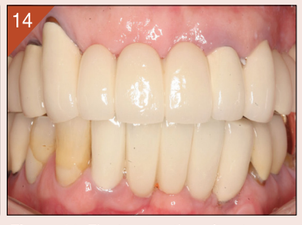

Figure 14. Final restoration after 4 years loading.

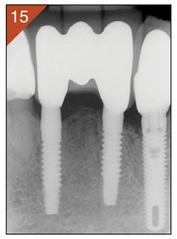

Figure 15.
A radiogram after 4 years loading shows stability of augmented ridge aroud implant.

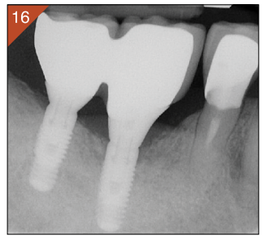

Figure 16.
A radiograph 4 years after loading at molar implant. Note stable augmented ridge.

Discussion and Conclusion

An extracted tooth from the patient can be utilized as noble bone graft material after appropriate preparation and decalcification process, in block or powder form. Chairside preparation of fresh autogenous demineralized tooth is a great alternative option over autogenous bone or other graft materials for ridge augmentation.

Favorable bone regeneration in alveolar defects have been reported clinically and histologically due to its osteoinductivity.[3] As shown on this case report, fast tissue regeneration and long term stability of tooth bone assisted augmentation is achieved, with minimum morbidity to the patient, and reduced surgery and healing time.

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3. Kim ES. Autogenous fresh demineralized tooth graft prepared at chairside for dental implant. Maxillofac Plast Reconstr Surg. 2015 Feb 18;37(1):8

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Clinical Case V

Mandibular Posterior Ridge Augmentation Utilizing Autologous Sticky Augmentation Procedure (ASAP) Protocol: A Case Report

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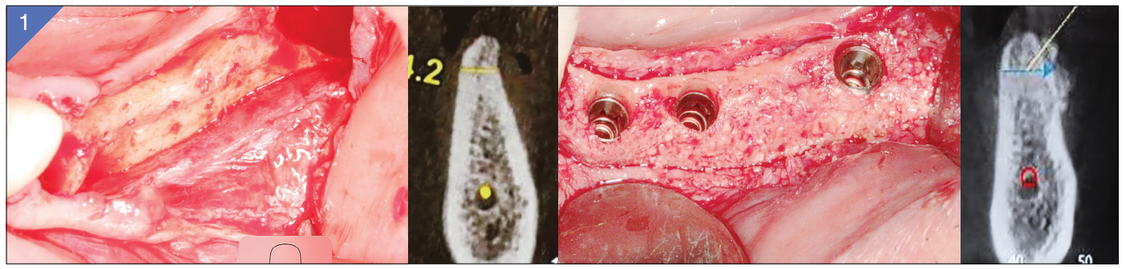

Figure 1a-d. a) Pre-operative mandibular ridge. b) Pre-operative 3D CBCT. Cross-sectional of the first molar area. c) Three DENTIS Cleanlant s-Clean™ implants placed during second surgical procedure. d) Post-operative CBCT. Cross-sectional of the first molar area.

Introduction

Increasing the volume of alveolar bone utilizing principles of guided bone regeneration (GBR) is essential in contemporary implant dentistry. To date, a number of surgical techniques and methods are available and are clinically viable.[1]

Recently, biologically enhanced bone regeneration utilizing concentrated autologous platelet has been showing widespread interest and potential.[2, 3]

The use of "sticky bone," that consists of platelet enhanced bone graft material has been reported.[4] This report illustrates a case where edentulous posterior mandibular ridge is augmented predictability using a novel protocol for GBR utilizing concentrated growth factors and sticky bone, coined autologous sticky augmentation procedure (ASAP) protocol.

Case History

A 64-years old, healthy male patient presented with failing long-span fixed partial denture in his lower left mandible (site #18-22).

He desired to have the implant supported fixed restorations. Radiographic evaluation including cone-beam computed tomography (CBCT) and clinical examination revealed advanced horizontal and moderate vertical bone resorption of the lower left alveolar ridge (Figs. 2). Very small zone of keratinized tissue (less than 3mm in width) was observed on the crest of edentulous part of the mandibular ridge (Fig. 3).

Two surgical options were presented and discussed. Extraction of teeth #18 & #22 with immediate implant placement in these sockets, with simultaneous ridge splitting & bone grafting, with another implant placement in the prepared #19, and #20 sites was considered. A second method was a staged approach with guided bone regeneration utilizing the ASAP protocol, followed by placement of dental implants after 6 months healing period. The patient chose to go forth with the two-stage surgical approach because of its better predictability.

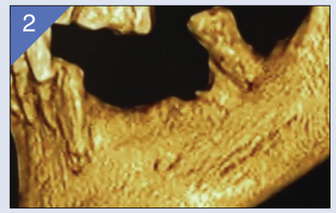

Figure 2. Pre-operative 3D CBCT view of the lower left posterior region.

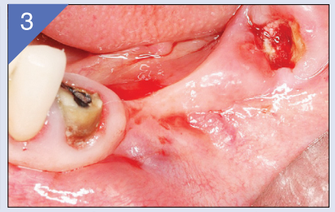

Figure 3. Clinical presentation of non-restorable teeth and moderately resorbed edentulous ridge.

Materials & Methods

Surgery was performed under local anesthesia. Crestal alveolar technique (CAT) and infiltration technique was utilized by using 2% lidocaine with 1:100,000 epinephrine. Non-restorable teeth #18 (LL second molar) & #22 (LL canine) were carefully removed, and full thickness mucoperiosteal flap was elevated to expose edentulous alveolar mandibular ridge defect. Site preparation including decortication and careful removal of soft tissue tags from the alveolar ridge surface was carried out to enhance regional accelaratory phenomenon (RAP)[7, 8] (Figs. 4 & 5).

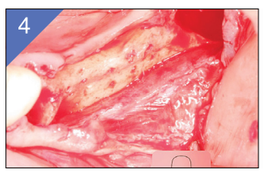

Figure 4. Crestal alveolar incision with full mucoperiosteal flap.

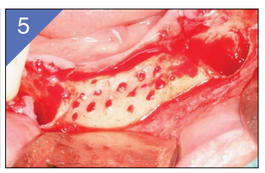

Figure 5. Decortication of the ridge for readily accessible blood flow to the wound, and therefore, regional acceleratory phenomenon (RAP).

"Sticky bone" was prepared with a mixture of mineralized allograft (Puros™, Zimmer Dental, Carlsbad, CA) and inorganic xenograft (OCS-B™, NIBEC, Korea), formed into a gel state utilizing autologous

Series of Clinical Views

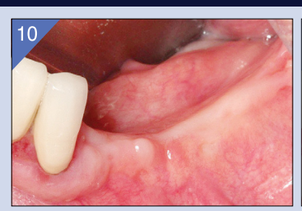

Figure 10. Clinical appearance, 6 months after the first surgery.

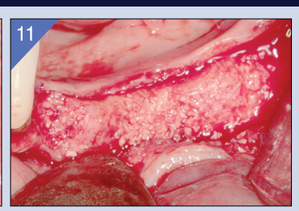

Figure 11. Clinical appearance of the exposed ridge, 6 months after ASAP surgery

Figure 12. Clinical appearance of osteotomy in preparation for implant insertions. Bone quality was deemed excellent.

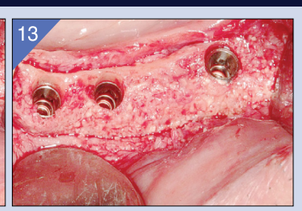

Figure 13. Implants were inserted into the prepared sites. Three DENTIS Cleanlant s-Clean™ implants were utilized.

fibrin glue[4]. Venous blood (40cc) was drawn from venipuncture in the antecubital fossa to prepare "sticky bone" as well as concentrated growth factors (CGF), also known as platelet-rich fibrin (PRF). Because of its plastic and sticky nature, "sticky bone" can be effortlessly adapted on the prepared ridge defect and extraction socket defects to the ideal ridge shape (Fig. 6).

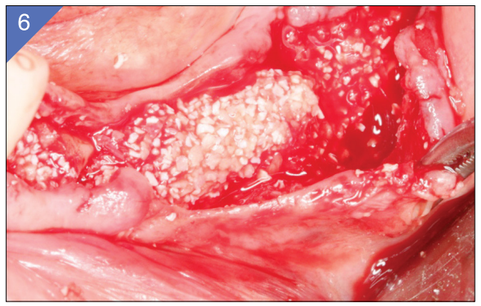

Figure 6. Adaptation of "sticky bone" over the prepared ridge defect and extraction socket defects.

The graft material was protected with a layer of resorbable collagen membrane (RCM6™, ACE Surgical, Brockton, MA) and three layers of pressed concentrated growth factors (CGF) derived from centrifuged venous blood (Figs. 7 & 8).

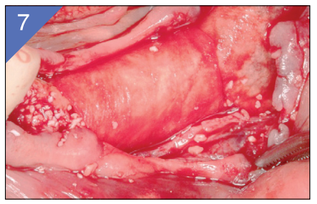

Figure 7. Resorbable collagen membrane was adapted over "sticky bone".

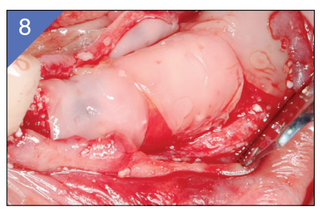

Figure 8. Three pieces of concentrated growth factor (CGF) was pressed to flat configuration and layered over the bone graft material and collagen membrane.

Flap was repositioned for primary closure using non-resorbable teflon monofilament (3.0 Cytoplast PTFE, Osteogenics Biomedical, Lubbock TX) suture material (Fig. 9).

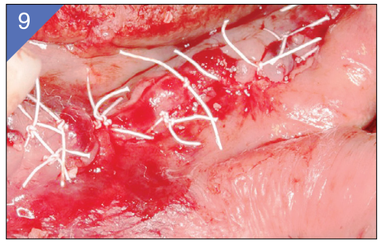

Figure 9. Primary closure was achieved with non-resorbable, long-lasting teflon sutures.

A second surgery was performed under local anesthesia, 6-months after the initial graft surgery. Adequate ridge width was observed, where three dental implants of at least Ø3.7mm diameter could be placed with 2mm bone thickness remaining on the facial and lingual aspects. Implants used were Ø4.8 x10mm in #19 site, and Ø3.7 x10mm in #21 and #22 sites (Cleanlant s-Clean™, DENTIS USA, La Palma, CA) (Figs. 10 – 13). Density of regenerated bone was appraised for density using a variety of hand instruments, as see in the video link.

Scan this QR code to see the video.

Although the overall width of alveolar ridge was adequate, further contour grafting was carried out with inorganic xenograft in sticky bone form (OCS-B™, NIBEC, Korea) on the facial aspect of the implants, after installing of the healing abutments (Fig. 14).

Three CGF membranes were placed over the healing abutments, in what is descried as the "Poncho technique"[5], to enhance further regeneration of the delicate soft and hard tissue immediately around the implant in the alveolar bone crest (Figs.15 & 16).

Figure 14. Additional grafting was carried out on the facial aspect of the dental implants to assure adequate facial bone contour.

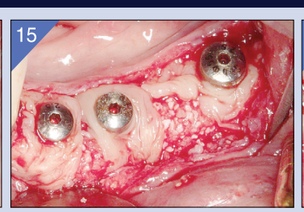

Figure 15. The Poncho Technique utilizing pressed CGF/PRF. This assures rapid and predictable soft and hard tissue healing around the healing abutments.

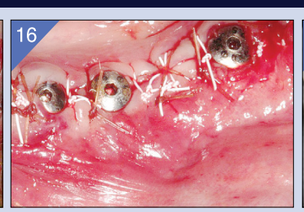

Figure 16. Immediate post-surgical clinical view. Soft tissue flap is tightly adapted around the three healing abutments.

Figure 17. Radiographic view of post implant placement.

Discussion and Conclusion

Platelets are known to release several growth factors that upregulate tissue regeneration.[2,3] Platelet concentrates have been used in surgical field to prevent hemorrhage and to accelerate tissue regeneration. Platelet rich plasma (PRP) and plasma rich in growth factors (PRGF) belong to the first generation of platelet concentrates. These protocols require chemical additives such as anticoagulants and thrombin or calcium chloride to induce fibrin polymerization. Platelet rich fibrin (PRF) and concentrated growth factors (CGF), as second generation of platelet concentrates, utilize patient's venous blood alone, with no additives to trigger platelet activation and polymerization of fibrin.

Platelet rich fibrin and concentrated growth factors in pressed "membrane" forms can be used as alternatives to traditional barrier membrane over bone graft since these biological modifiers can accelerate both soft and hard tissue differentiation and regeneration. "Sticky bone" provides stabilization of bone graft in the defect, and therefore, accelerates tissue healing and minimizes bone loss during healing period. The mechanisms of ASAP lines up with the principles of bone regeneration, as described in the PASS principles[9].

The PASS principles include,
(1) primary closure of the wound to promote undisturbed and uninterrupted healing,
(2) angiogenesis to provide necessary blood supply and undifferentiated mesenchymal cells,
(3) space creation and maintenance to facilitate space for bone in-growth, and
(4) stability of the wound to induce blood clot formation and allow uneventful healing.

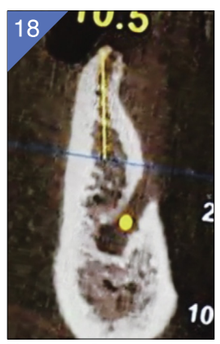

Figure 18. Pre-operative CBCT. Cross-sectional section of the first premolar region.

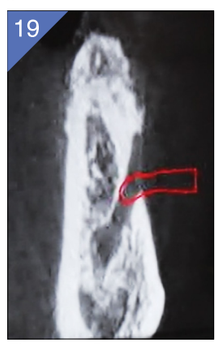

Figure 19. Post-operative CBCT. Cross-sectional section of the first premolar region.

The protocol according to ASAP fits all of these principles. In fact, even when primary closure may not be achieved, the ASAP approach does not manifest in negative outcome, as epithelium tends to rapidly close over the exposed PRF or CGF. ASAP also shows equal potential in the lack of traditional barrier membrane. This may be a challenge to long held views in the field of GBR as described by Dahlin and coworkers from 1989.

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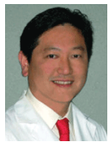
Products Used

DENTIS USA (La Palma, CA, USA)
- Cleanlant s-Clean™ implant Ø4.8 x10mm (DSFW4810S)
- Cleanlant s-Clean™ implant Ø3.7 x10mm (DSFM3710S)

Clinical Case VI

Ridge Preservation Bone Graft (RPBG) : A Simple Technique to Manage the Extraction Site to Achieve Predictable Clinical Outcome in Implant Surgery



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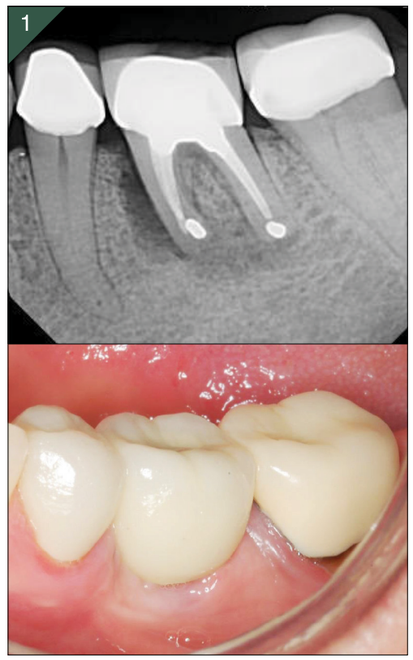

Figure 1a-b. a) Pre-Operative radiograph displaying bone loss. b) 23-month Post-Operative outcome.

Introduction

After an extraction, the surrounding alveolar bone will go through different stages of healing and remodeling, resulting in alveolar dimensional changes, which results in horizontal and vertical alveolar bone loss. Studies have showed that most of the horizontal and vertical bone resorption is from loss of bundle bone within two weeks after extraction. [1-2]

After extraction, bundle bone loses its function and resorption will occur due to osteoclastic activity, which is observed in the outer and inner surfaces of the buccal and lingual walls.

Even though autogenous bone is the gold standard for bone grafting, many bone graft substitutes, such as xenograft, allograft, alloplast, and BMP, have all been used in ridge preservation bone graft (RPBG) but there is no consensus on one bone graft material being superior to the others.[4] Among all bone grafting substitutes, bovine bone mineral is the most frequently used material in the studies for RPBG.

No matter what bone grafting materials or surgical technique is utilized, the ultimate goal of RPBG is to preserve the alveolar bone for future implant placement. The most overarching theme of RPBG studies is, after extraction, it will reduce the alveolar bone loss and, thereby, resulting in a lesser need for additional bone augmentation at the time of implant placement but it will not prevent inherent alveolar bone loss.

Therefore, after an extraction, it is imperative that an extraction site is managed properly if a delay implant surgery is planned. This case report will show how to manage the extraction site with RPBG to achieve predictable implant surgery.

Case History

The patient is a 53-years old female who presented with fractured mesial root of tooth #19 with buccal gingival recession and swelling. (Fig. 2)

Pre-operative peri-apical (PA) radiograph showed radiolucency around mesial root of #19, which indicates severe bone loss. (Fig. 3)

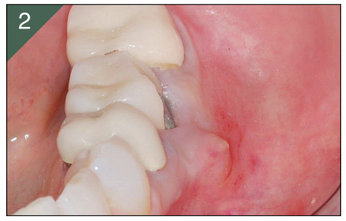

Figure 2. Pre-operative clinical view of #19 with buccal gingival recession and swelling.

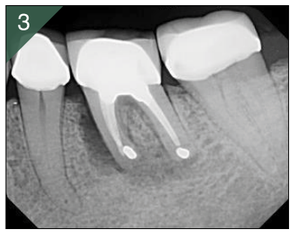

Figure 3. Pre-operative peri-apical radiograph showing bone loss around mesial root of #19.

Treatment options were discussed, including immediate vs. delay implant placement, and the patient opted for ridge preservation bone graft and delay implant placement under local anesthesia.

Ridge Preservation Bone Graft (RPBG)

Using periotomes and modified lower forcep, flapless extraction was performed without any major trauma to the soft tissue. In addition, no bone was removed during the extraction, which is one of the critical factors for achieving predictable clinical outcome in RPBG. Missing buccal plate, from the localized infection, was confirmed via clinical exam after the extraction. After the extraction, a resorbable collagen membrane (Cytoplast™ RTM Collagen) was placed, inside the socket, up against soft tissue where the buccal bone was missing. (Fig. 4)

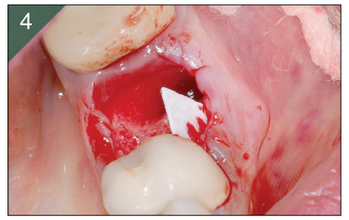

Figure 4. Flapless extraction and placing resorbable membrane up against the soft tissue in the missing mesio-buccal bone site.

The bone grafting materials were then placed in the socket (Osteokor Allograft Particulate Bone). (Fig. 5)

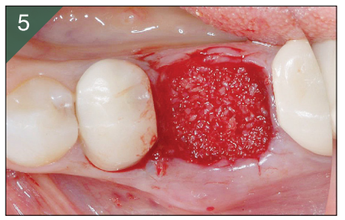

Figure 5. Bone graft in the socket.

Series of Clinical Views

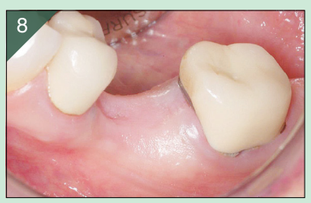

Figure 8. Six month post-operative RPBG.

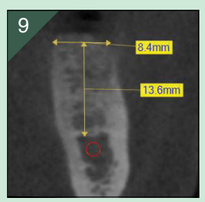

Figure 9. CBCT of six month post-operative RPBG.

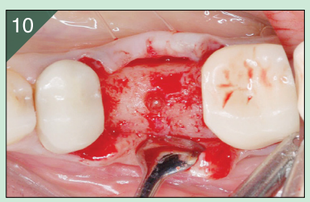

Figure 10. Adequate alveolar bone for implant surgery after RPBG

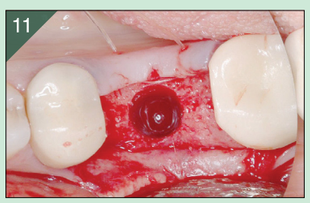

Figure 11. Final drill site.

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After bone grafting, resorbable (Cytoplast RTM Collagen) and non-resorbable membranes (Cytoplast™ TXT-200) were passively placed over the grating materials, without detaching any periosteum from the buccal or lingual bone. Non-resorbable sutures (Cytoplast™ PTFE) were then placed over the socket to prevent membranes from dislodging too easily. (Fig. 6)

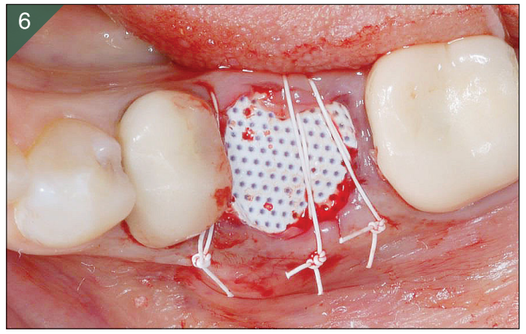

Figure 6. Non-resorbable membrane and sutures.

Non-resorbable membranes and sutures will be removed within one to four weeks, depending on the patient's healing. (Fig. 7)

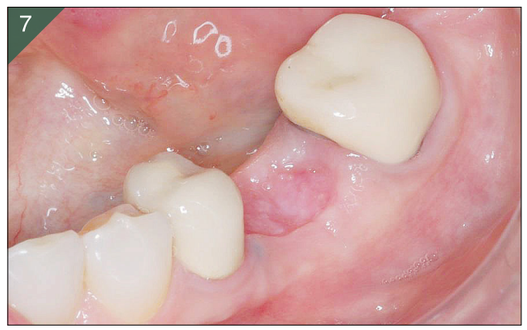

Figure 7. Non-resorbable membrane is removed 1 month post-operative RPBG. Thin granulation tissue seen after the removal.

During this time, granulation tissue will generate underneath the non-resorable membrane, which will prevent bone grafting materials from dislodging. One of the main objectives of RPBG is to maintain the bone graft in the socket to allow adequate time for native bone to form by osteoconductive process.

Implant Surgery

Approximately four to six months after RPBG, the socket should be adequately healed for the implant surgery. (Figs. 8 & 9)

In most of the cases, there should be adequate bone for an implant placement without the need for additional bone grafting. At six months after RPBG, implant surgery was performed. (Figs. 10 –13)

Implant surgery was simple due to adequate alveolar bone, which was achieved by RPBG. At four months after implant placement, ISQ (Implant Stability Quotient, Osstell) was recorded at 86-87. (Fig.14)

Implant was now ready for the abutment and final restoration. Predictable clinical outcome is seen 23 months post-operative implant surgery. (Fig. 15)

Conclusion

No matter what bone grafting materials or surgical technique is utilized, the ultimate goal of RPBG is to preserve the alveolar bone for future implant placement. The most overarching theme of RPBG studies is, after extraction, it will reduce the alveolar bone loss, thereby resulting in a lesser need for additional bone augmentation at the time of implant placement but it will not prevent inherent alveolar bone loss.[3]

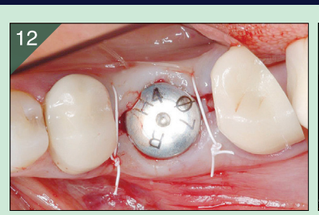

Figure 12. Immediate post-operative implant surgery (Ø5.0 x 11.5 mm).

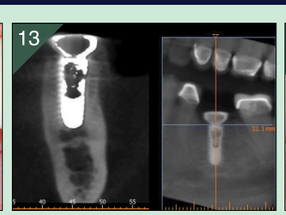

Figure 13. Immediate post-operative CBCT.

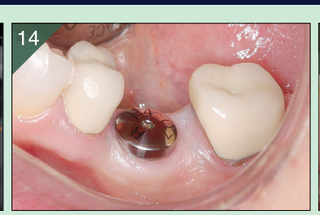

Figure 14. Four month post-operative implant placement.

Figure 15. Final restoration after 23 month post-operative implant surgery.

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Products Used

1. Cytoplast RTM Collagen, Osteogenics Biomedical (Lubbock, TX, USA)
Resorbable membrane

2. Cytoplast TXT-200, Osteogenics Biomedical (Lubbock, TX, USA)
Non-resorbable membrane

3. Osteokor, Surgikor (Los Angeles, CA, USA)
Allograft

4. Cytoplast PTFE, Osteogenics Biomedical (Lubbock, TX, USA)
Non-resorbable suture

Clinical Case VII

Improving the Outcome of Removable Partial Denture Treatment with the Use of Implants

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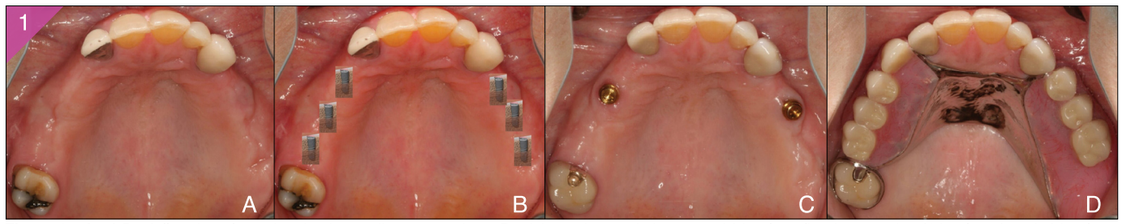

Figure 1a-d. a) Partially edentulous situation is needing restorations. Decision to be made between b) implant fixed restoration (6 implants) and c) implant removable restoration using 2 implants placed in the residual ridges rendering this option economical and affordable by some patients. d) the outcome of this RPD treatment is improved with the use of implants that helped the support and the retention of the prosthesis by turning the prosthesis from a tooth-tissue borne to a tooth-implant prosthesis. This will improve the outcome of the RPD treatment and it will render it affordable by the patient.

Introduction

When treating partially edentulous patients, several factors come to play when choosing between a fixed or removable partial denture. Greater numbers of implants and bone grafting procedures are generally required for the fixed prosthesis as compared to the removable prosthesis treatment option. Economic, treatment time, and hygiene practices tip the scale for a removable partial denture (RPD) option (Figure 1). RPDs are classified as either tooth-borne prosthesis or tooth-tissue-borne prosthesis. A tooth-borne prosthesis can be considered a "removable fixed bridge" because it is the easiest to design, most accepted by patients, and has a longer survival rate than the tooth-tissue borne prosthesis.[1]

The tooth-tissue-borne RPD is not well understood by many dentists, and its complexity depends on the span length of the edentulous area and the type of arch involved. Chewing and parafunctional forces act as destructive forces that may act on the RPD abutment teeth and the residual alveolar ridges.[2] The problem is how much support is required from teeth and how much support is required from the residual ridges. Patients tend to function and use the areas where the prosthesis is stable (for example, the tooth-borne side of a tooth-tissue-borne prosthesis). A common clinical problem confronting restorative dentists is the planning and maintenance of tooth-tissue supported Removable Partial Dentures (RPD).[3]

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Brudvick and Keltiens et al reported that dental implants can be used to resolve problems when designing tooth-tissue supported RPDs in a cost-effective manner.[4,5] Therefore, dentists can turn a tooth-tissue-borne situation into a tooth-borne situation using a dental implant on the edentulous side away from the abutment tooth,[6] or can opt to not replace the missing teeth at the extension base with a prosthesis. In addition to this previous mechanical advantage, placing an implant under the RPD distal extension base has a physiological advantage.[3] The amount of bone loss of the distal edentulous area is reduced because of its physiological stimulation by the implant.[7] Even one implant per edentulous area and a simple attachment technique can yield a stable distal extension RPD.[8]

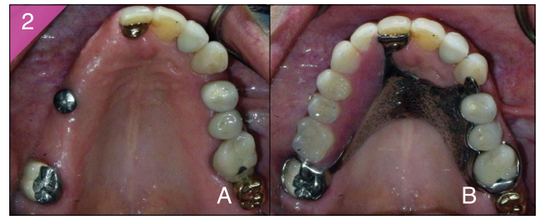

Figure 2a-b. a) Placing one implant in the middle of the edentulous ridge improve the stability of the RPD by making it a tooth-implant supported prosthesis. b) The RPD in the patient's mouth.

This case report document describes some clinical situations where implants could improve the biomechanical aspect of removable partial dentures and render the treatment affordable by many patients.

1. Case of the Mandibular RPD Opposing Maxillary Natural Teeth.

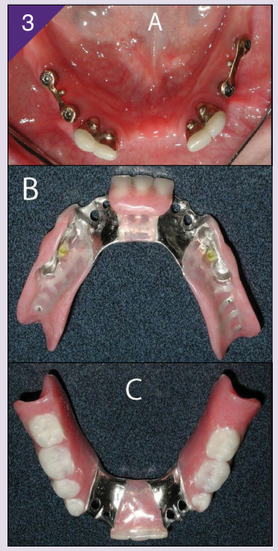

Figure 3a-c.
a) Occlusal view showing 4 implants connected with Hader bars. Patients wanted to keep all 4 remaining mandibular anterior teeth. Cingulum rests are placed on the anterior crowns to participate with the implants in the support of the prosthesis. The retention of the prosthesis is giving by the Bredent™ ball attachments placed on the lingual surface of the bars, and by the mechanical friction of the metal frame of the intaglio surface of the framework with the vertical surfaces of the bars.
b) Intaglio surface view of the RPD showing the metal frame detail where it is in contact with the implant bars.
c) Cameo surface view of the RPD. It is important to plan the inter-arch space to prevent thinning and breakage of the artificial teeth over the bars.

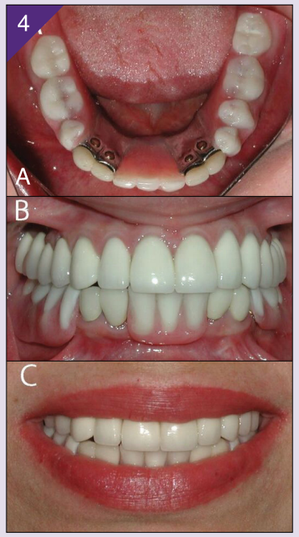

Figure 4a-c.
a) Occlusal view of the prosthesis in the mouth.
b) Frontal view of the completed mouth restoration in centric occlusion.
c) Frontal view of the final patient smile.

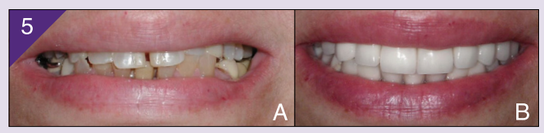

Figure 5a-b.
a) Frontal view of the smile before restoration.
b) Frontal view of the smile after restoration.

2. Case of a Mandibular RPD Opposing a Maxillary Implant Overdenture.

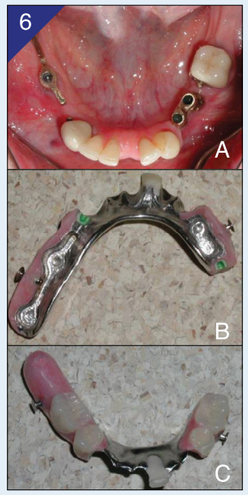

Figure 6a-c.
a) Occlusal view of 2x2 connected implants. Remaining mandibular teeth are periodontally sound. The crowns on the left molar and the right canine have Bredent™ ball type attachments. These attachments help in the support and the retention of the prosthesis. Also, the prosthesis is retained at the implant level with 2 snap pin attachment by Bredent™. The plunger of these attachments goes into a hole drilled in the bars between the two implants.
b) Intaglio surface view of the prosthesis showing the metal frame and the short flanges adequately designed to prevent any food impaction.
c) Occlusal view of the so-called "removable bridge" prosthesis.

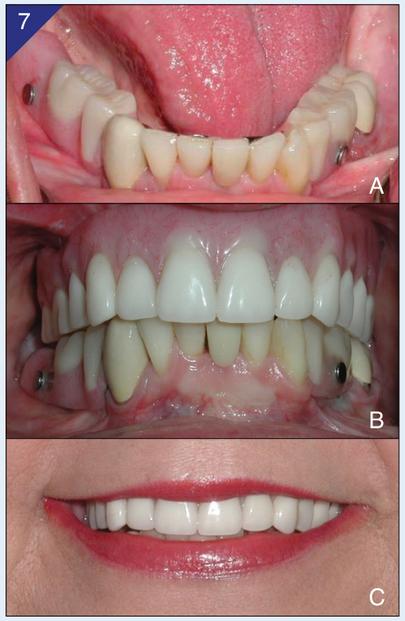

Figure 7a-c.
a) The prosthesis in the patient's mouth.
b) Frontal view of the maxillary overdenture and the mandibular prostheses in centric occlusion. Acceptable articulation for this type of situation is either group function or balanced.
c) photo of the final smile.

3. Case of Resorbed Maxillary Anterior Ridge:

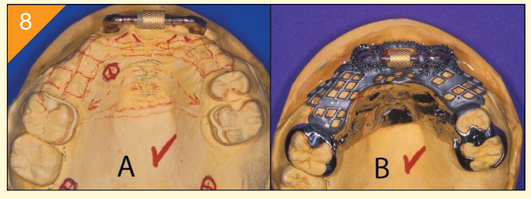

Figure 8a-b.
a) Occlusal view of a maxillary resorbed anterior ridge. 2 treatment options are available:1) fixed prosthesis using soft and hard tissues grafting and implant procedures rendering the treatment expenses and lengthy; or 2) removable overpartial prosthesis using 2 implants connected with a Hader bar.
b) RPD Metal framework is shown. The use of these implants that are connected with Hader bar, is rendering the RPD an implant-tooth supported prosthesis and can be called a "removable fixed bridge".

Please note the 2 positive rests on the teeth and the 2 metal-to-metal contacts on the bar by the RPD framework. These positive "metal-to-metal" contacts are taking the occlusal load off the plastic Hader clip.

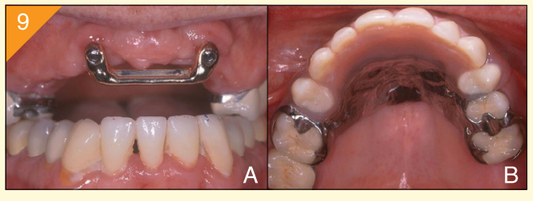

Figure 9a-b.
a) Frontal view of the implant Hader bar.
b) Occlusal view of the implant-tooth supported removable partial denture.

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Clinical Case VIII

Management of Arch Size Discrepancy due to Congenitally Missing Lateral Incisors with Combination of Orthodontic Treatment and Implant Dentistry

Dr. Stephen Kim, DDS

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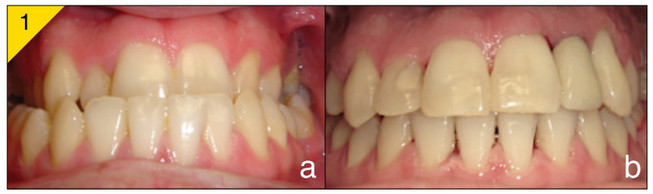

Figure 1a-b. a) Pre-operative intra-oral photograph of patient with maxillary lateral incisor agenesis (MLIA). b) Post-operative 2 year follow-up.

Case History

Maxillary lateral incisor agenesis (MLIA) is a condition where a patient may present with one or two congenitally missing maxillary lateral incisor. The objective of this case report is to present a case where orthodontics treatment is combined with implant surgery to correct severe arch size discrepancy caused by MLIA. (Fig. 1a-b)

A 28 year old Hispanic male patient presented with history of prior orthodontic treatment which did not address the congenitally missing lateral incisor. Consequently, it failed to yield favorable result. Intra-oral exam revealed the following: 1) MLIA; 2) arch size discrepancy resulting in anterior and posterior crossbite; 3) missing lower left first molar and lower-right second molar; 4) class III anterior relationship with an extensive underbite. (Fig. 2a-b)

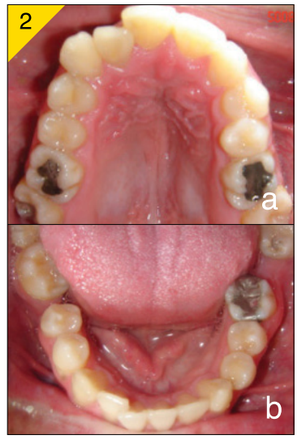

Figure 2a-b. Pre-operative intra-oral photograph of the patient. a) Maxillary occlusal view. b) Mandibular occlusal view.

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Treatment Planning & Methods

Orthodontic

When a patient presents with MLIA, a decision has to be made whether to close the lateral incisor space or to open up the space for lateral incisor restoration. Space closure may be achieved by mesial repositioning of canines (Canine Substitution), followed by teeth recontouring. Space opening followed by implant restoration is indicated for patients whose maxillary incisors need to be protruded, to correct anterior crossbite, to gain upper lip support, and to obtain Angle Class I.[1] Selecting the appropriate treatment approach is not as simple as it sounds, but rather, include many factors including: patient's age, facial growth pattern, profile, smile line, occlusal scheme, spacing, tooth anatomy, alveolar bone quality and quantity, gingival display, and biotype.[2]

There are multiple restorative options that exist for the replacement of the congenitally missing lateral incisor. The best treatment option would be space formation followed by single-tooth implant restoration due to its predictability, conservative nature, and long-term success rates compared to other restoration methods.

The amount of space required for restoration can be determined with Bolton Analysis which involves dividing the sum of the mesiodistal width of the mandibular six anterior teeth by the sum of the mesiodistal width of the maxillary six anterior teeth. The ideal ratio comes out to be 0.78 and can be used to calculate the ideal missing tooth dimension which is 5-7mm in usual cases. The diagnostic wax-pattern seems to be the most predictable means to assess the required optimal space which is also in the range of 5-7mm.[3] After determining the space needed for restoration, the space required for implant fixture must be determined. Dr. Tarnow recommends to allow between 1.5mm and 2mm of space between the implant platform and the adjacent teeth for the development of the papilla. If narrow implant is 3mm in diameter, required minimum space would be 6mm. For example, if the edentulous space measures 7mm and a minimum of 3mm is needed for papilla formation (1.5mm on each side), then that leaves the surgeon an adequate amount of space (4mm) for the implant fixture. But if the edentulous space only measures 5mm, then there would be insufficient space for both a traditional narrow platform implant and papilla formation.[4] If minimum space of 6mm is not obtained, a compromise has to be made and the patient should be properly informed. Establishing space in the interradicular area must be also addressed during the orthodontic phase. The minimum space between the roots is generally 5mm. This amount of space will allow the implant to be surrounded by 0.75mm and 1mm of bone, which is sufficient for long-term osseointegration.[5] During the space opening aspect of orthodontic treatment, it is imperative to obtain translation movement instead of tipping, since the canine root apex inevitably lags behind the crown when distalized. (Fig. 3a-h)

Implant Surgery

When treatment planning for the implant surgery, the bone volume in the surgical site is typically deficient due to lack of development and eruption of a permanent lateral incisor. The ideal condition may be obtained when the permanent canine erupts mesially, next to the central incisor.[6] After eruption, the canine can be distalized orthodontically, and establish a proper buccopalatal alveolar ridge width.[7]

Series of Clinical Views

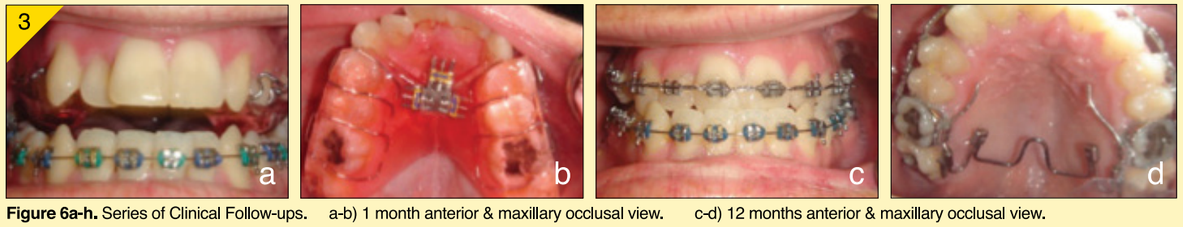


Figure 6a-h. Series of Clinical Follow-ups. a-b) 1 month anterior & maxillary occlusal view. c-d) 12 months anterior & maxillary occlusal view.

Even in this ideal condition, bone loss can occur at the implant site after space opening. *Uribe et al.* reported a 17–25% decrease in bone width at the ridge after space opening, resulting in a bone loss of approximately 1.1mm.[8] (Fig. 4)

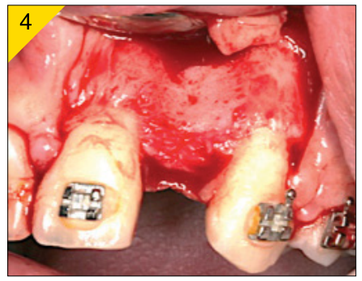


Figure 4. Deficient of bone volume in the surgical site due to lack of development of a permanent lateral incisor.

Due to inevitable nature of bone loss, horizontal ridge augmentation must be considered during implant surgery. Several horizontal ridge augmentation techniques, e.g. ridge splitting and block grafts, have been tested and proven. Although these techniques are successful, treatment time is significantly increased and patients need to endure additional surgical procedures. Therefore, this case utilized the Sandwich Technique Bone Graft during the dental implant placement surgery. After placing the dental implant ideally in a prosthetically driven position, a buccal dehiscence was observed.

The fact that dehiscence was formed within the bony envelope, the survival of the bone graft seemed favorable. Sandwich technique was utilized by placing autogenous bone graft harvested from the osteotomy site on the exposed implant surface (inner layer) followed by a outer layer of bovine xenograft.[9]

A collagen membrane was trimmed and used to contain the bone grafts as well as to exclude unwanted epithelial cells and connective tissue fibroblasts. Tension-free primary closure was subsequently obtained. Six months later, mature regenerated bone was found on the buccal surface of the implant at surgical re-entry. (Fig. 5a-c)

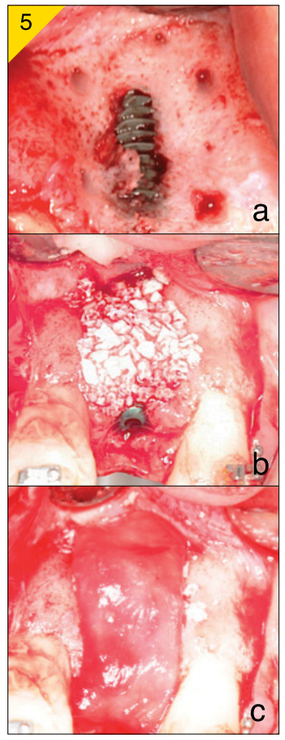
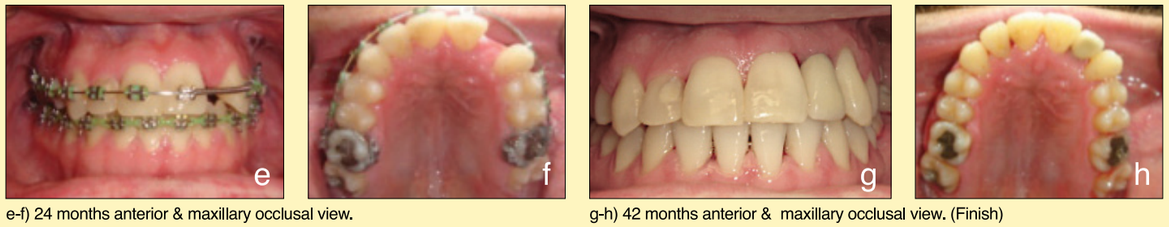


Figure 5a-c. Sandwich Technique Bone Graft. a) Implant thread exposure after prosthetically driven implant placement. b) Sandwich Technique Bone Graft using layer of autogeneous bone graft then layering bovine xenograft for volume. c) A collagen membrane layered to exclude connective tissue fibroblasts on grafted site.



e-f) 24 months anterior & maxillary occlusal view.

g-h) 42 months anterior & maxillary occlusal view. (Finish)

Conclusion

Arch size discrepancy due to MLIA can be corrected with extensive treatment planning which involves expanding the arch, opening up the space for implant site, and performing Sandwich Technique Bone Graft during implant surgery. It is safe to conclude that combination of orthodontic treatment and implant surgery is a viable option to manage patients with MLIA. (Fig. 6a-b)

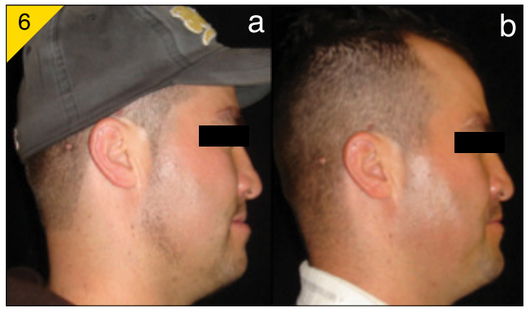


Figure 6a-b. Profile view. a) Pre-operative view. b) 2 years Post-operative view.

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Clinical Case IX

3D Printed Jig for Orienting Custom Abutment in Immediately Loaded Full Arch Cases: A Case Report

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- Program Coordinator, Computer Aided Implantology Research Team
- Developer, DENTIS™ Simple Guide Kit®

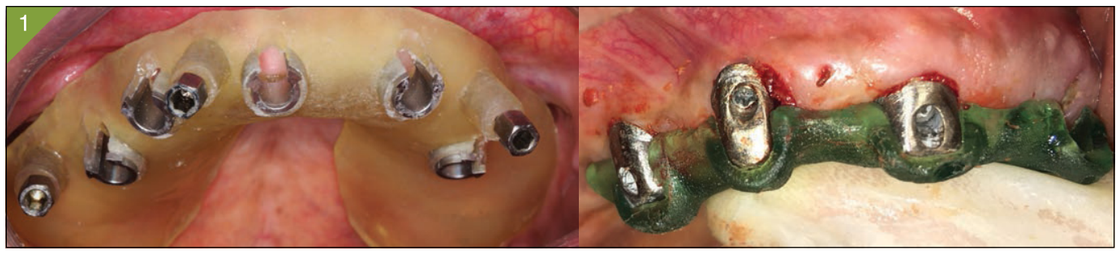

Figure 1a-b. a) Fully edentulous surgical guide with three fixation screws using Simple Guide concept. b) Custom Abutment jig using Zenith 3D Printer®.

Introduction

The procedure of immediately loading implants in full arch cases has been reported as a predictable and successful treatment option. The success of such protocol depends on the accurate implementation to sufficient initial stability while placing the implants in an ideal restorative positions.[1,2,3]

Most clinicians used to immediately load full arch cases using the conversion prosthesis technique. With the technique, the patient removable complete denture is attached to temporary pick-up abutments using auto-polymerizing acrylic resin to convert it into a screw-retained provisional fixed denture. This technique has many drawbacks including, 1) increased chairside time for finishing and fitting the prosthesis, 2) increased weakness of the restoration due to multiple voids and awkward screw access location for anteriorly tilted implants.awkward screw access location for anteriorly tilted implants.[4,5] The introduction of customized abutments can provide an easier and faster approach in cases with severely tilted anterior implants requiring immediate temporization. The problem after fabricating such abutments is to accurately reposition them intra-orally so that the designed temporary fixed denture fits accurately with minimal need of chairside adjustments. The best way to assure proper abutment orientation is to construct an abutment positional jig on the patient cast.[6]

Manually fabricated jigs are sometimes associated with technical inaccuracies that can limit their potential of correctly performing the required task. This case report will introduce a technique to fabricate a digital 3D printed abutment positional jig for completely edentulous situation to solve such a problem.

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Case Report

A 62 years old male was presented with a completely edentulous maxillary arch. After thorough examination, the patient removable complete denture was duplicated for CBCT scanning purpose. On the obtained radiograph, virtual implant placement of five maxillary DENTIS s-Clean® implant was planned on tooth number 4, 6, 8, 10, and 13. Due to anatomical limitations, the three anterior implants demonstrated obvious labial inclination that requires correction with angled abutments (Figure 2,3).

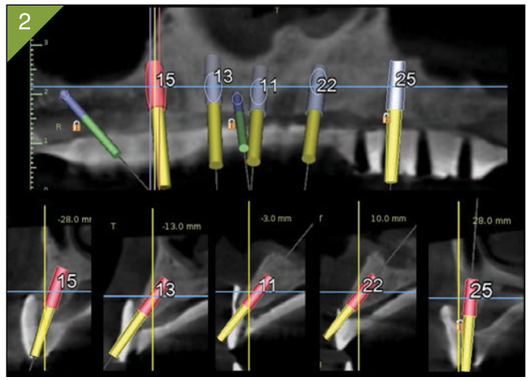


Figure 2. Virtual implant planning.

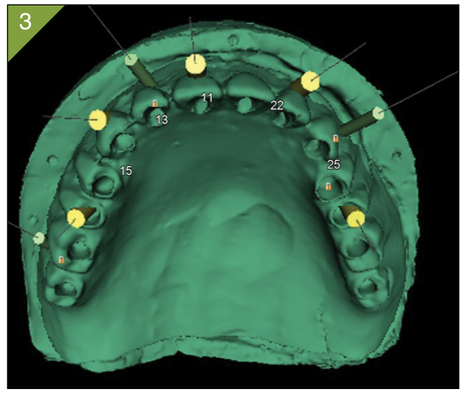


Figure 3. The abutment axis position in relation to patient setup.

A virtual mucosa supported implant guide was designed based on the Simple Guide concept (DENTIS, Daegu, Korea) with three fixation screw channels (Figure 4). The obtained virtual guide was manufactured using Zenith 3D Printer® (DENTIS, Daegu, Korea).
After finishing the guide, open metallic sleeves were attached to the surgical guide holes.

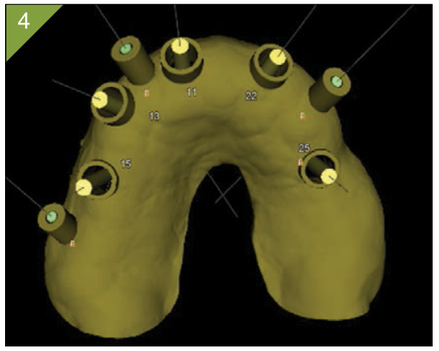


Figure 4. Virtual guide design.

The surgical guide was fixed to the edentulous maxillary using the three fixation screws (Figure 5). DENTIS s-Clean® implants were installed using the DENTIS Simple Guide Kit® (DENTIS, Daegu, Korea). The implants were placed in a flapless minimally invasive technique. After implant insertion, open tray impression was made to transfer accurate implant position the lab (Figure 6). The patient cast was scanned using Dental Wings 3 series laser scanner after attaching scan bodies to the implant analogues (Dental Wings Inc., Canada).

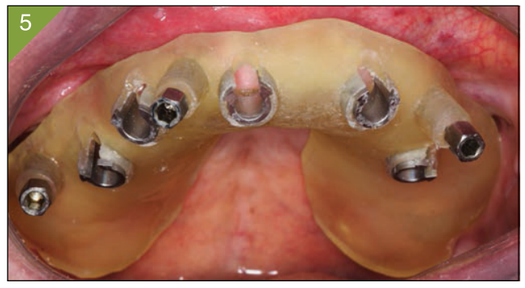


Figure 5. Surgical guide fixed intra-orally with three fixation screws.

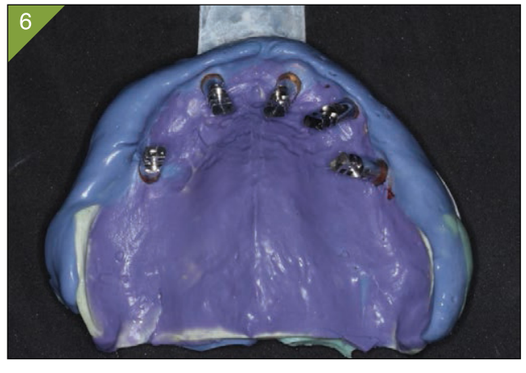


Figure 6. Pick-up impression, immediately on the surgery day.

On the CAD/CAM software, virtual design of the proposed temporary was first designed in proper alignment with the opposing dentition (Figures 7,8).

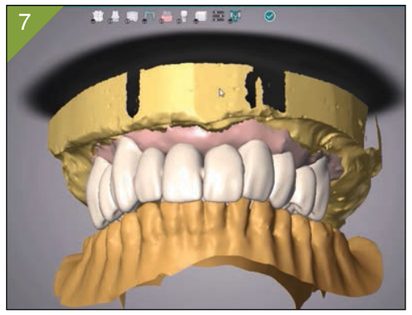


Figure 7. Virtual fixed provisional bridge setup.

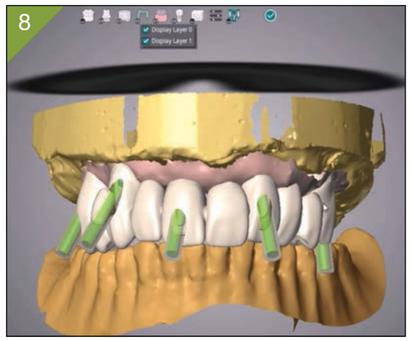


Figure 8. View of the implant long axis in relation to the bridge setup.

Custom abutments were then designed to cope with the outline of the virtual temporary. The abutments axial walls were modified to assure a common path of insertion for the prosthesis. Furthermore, the abutment finish line was designed at 0.5mm-1mm subgingival position (Figure 9).

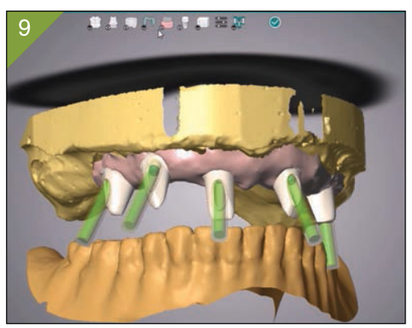


Figure 9. Customizing abutment dimension and inclination.

After finishing the abutment design, the final model was processed to the partial denture module to construct a virtual "u-shaped" abutment jig over the designed abutments. The jig extended to cover the proximal, lingual and occlusal aspect of the abutment with an opening at the screw access channels. Additionally, the jig was designed to cover the lateral palatal walls and part of the rugae area (Figure 10). The custom abutments were milled from titanium alloy blocks using a 4-axis milling machine (Yenadent, Turkey). The abutment jig and temporary bridge were printed using Zenith 3D Printer® (DENTIS, Daegu, Korea) (Figure 11).

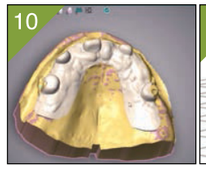


Figure 10. Abutment jig virtual design.

Figure 11. Jig positioned on the Zenith software with virtual support for printing.

Two days after implant placement, the abutments were seated onto the implants using the 3D printed positioning jig. The provisional bridge was then cemented using Zinc Oxide temporary cement (Figure 12-14).

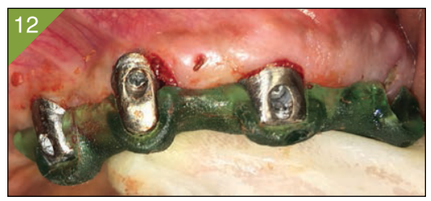


Figure 12. The abutment jig aids to accurately position the abutments.

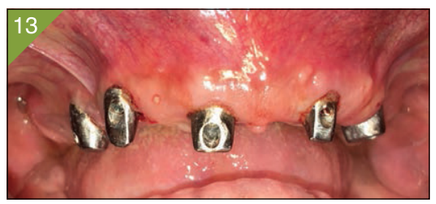


Figure 13. Clinical view of seated final abutments.

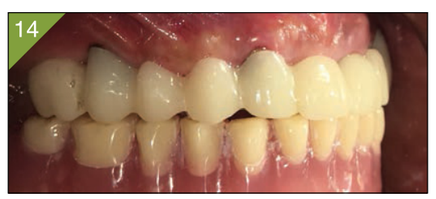


Figure 14. Lateral view of the provisional bridge in place.

Discussion

There is a growing trend in dental implant field towards digitizing all implant procedures. This report describes one of many steps to comfortably completing the digitally guided implant surgery. The technique may be minor, yet important, to position the abutment accurately in the predetermined position.

The conventional dimple method and manually fabricated positioning jig will not be possible in a complete digital workflow. Moreover, trials to locate the abutments without a jig, especially with conical implant connections, will be a lengthy procedure. The digitally designed and printed jig will offer an easy, and it is a fast tool for such purpose.

Proper design and soft tissue extension of the jig design is mandatory to assure proper seating when orienting the abutments.

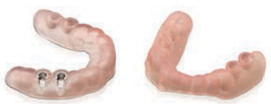
Products Used

DENTIS, Daegu, Korea
Zenith 3D Printer

3D PRINTER LEADER ZENITH

DENTIS, Daegu, Korea
Simple Guide Kit®

SIMPLE GUIDE DENTAL GUIDE SYSTEM



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