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J I A C D

The Journal of Implant & Advanced Clinical Dentistry

Gingival Contouring with Prepable Abutments

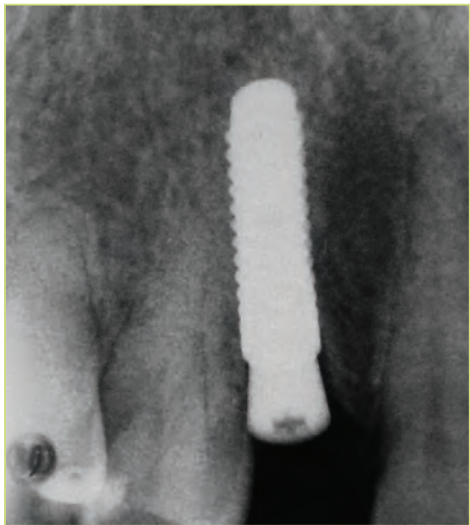


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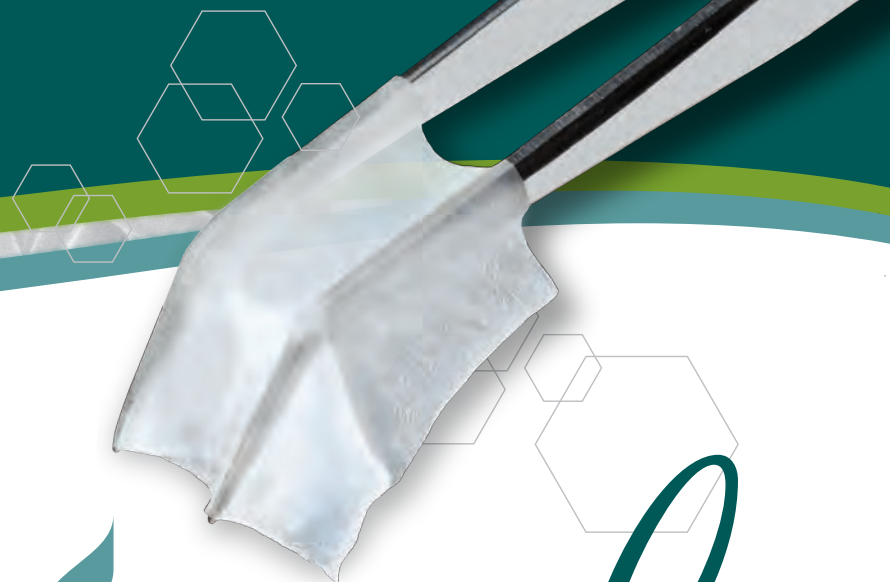
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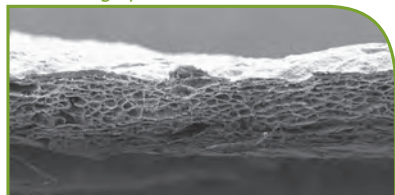
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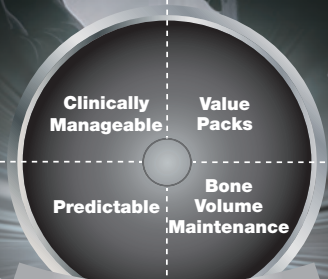
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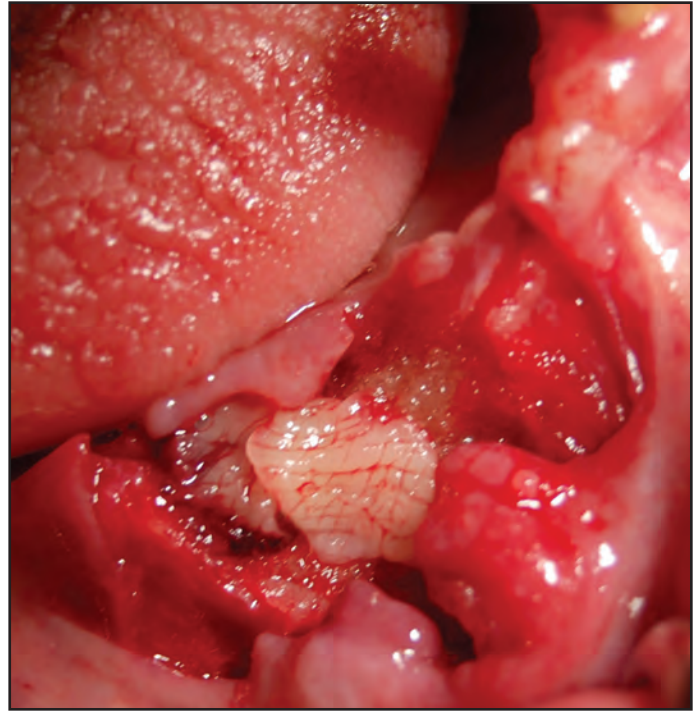
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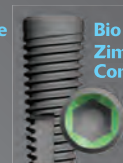
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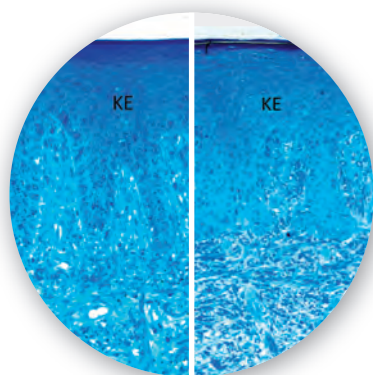
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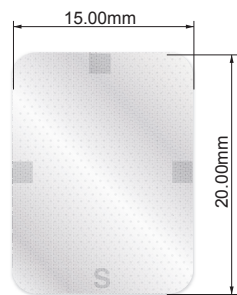
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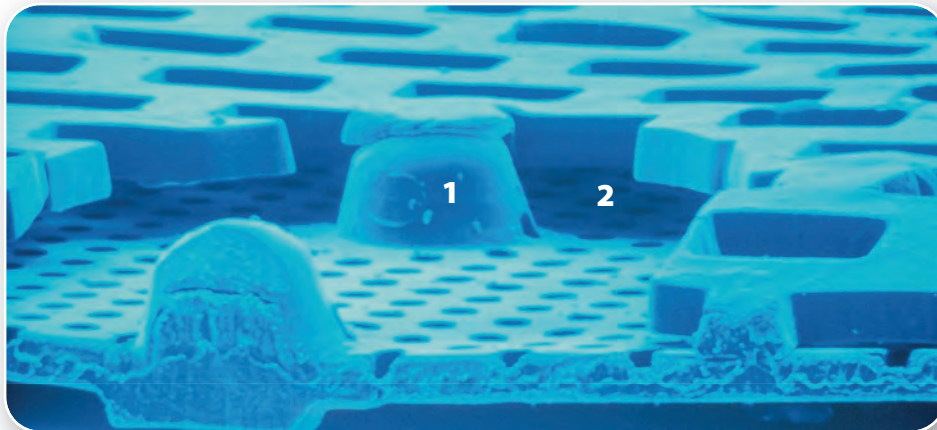
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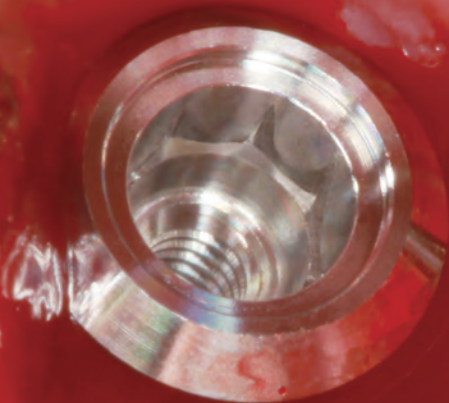
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Dr. Smith, Come on Down! You are the Next Contestant on . . .

I must admit that I am a cooking show junkie. If I were not a periodontist, I would love to become a chef. In the little free time that I do have, I just love to watch The Food Network®. One of my favorite shows on this channel is a competition called Chopped™. On this show, four chefs must compete against one another, having their food evaluated by a panel of judges. The interesting catch with this show is that the contestants have only 20-30 minutes to prepare a meal from a basket of mystery ingredients. There is no way for the contestants to prepare for the challenge. They must rely on their entire knowledge base to rapidly develop a plan of attack and execute a deliciously cooked dish from oftentimes crazy ingredients in a limited amount of time. Mind you, that all of this is being done on television in front of a panel of industry experts, so I am sure that adds just a tiny bit of additional pressure for the contestants.

As I was watching this show one day, I thought to myself, "...wouldn't be interesting if there was a dental surgery competition show like this?" If you took 4 dental surgeons, placed them in front of a judging panel of 3 of the top experts in our field, presented them with a case and asked them for a treatment plan and then to do the actual surgery and later show results...that would be a great show! Well, for me at least. I am sure that the other 99.99% of the general television audience would not like such a show.

Seriously though, something like this would be a great learning experience. To present an unknown case to 4 dental surgeons and have each present and defend a treatment plan to a panel of expert judges would be an amazing opportunity to learn. What diagnoses would be made? What surgical procedures would be proposed to treat the diagnosed conditions?

What products would the practitioners use? What type of medication and follow up protocol would be followed? I would be willing to bet that if you had 4 contestants, you would get 4 different plans of attack.

This would be a wonderful seminar at a dental convention. There are sometimes seminars presented similar to this, but in most cases, the speakers have researched the cases to be discussed well ahead of the meeting and have meticulously planned point and counterpoint discussions already scripted. But to show these same doctors some unknown cases and have them debate treatment plans on the fly, that would be completely different. Like the chef contestants on Chopped™, each practitioner would need to rely on their entire knowledge base to present and defend a treatment plan. It would almost be like taking a board exam...only it would be live in front of thousands of your colleagues. Pretty intimidating if you ask me!

I don't think that we will ever see anything like this in the near future, but if I were a periodontal post-graduate program director, you could bet your bottom dollar that my residents would be doing this type of game. It would make learning fun and interesting, not to mention fostering some friendly competition amongst the residents. The bottom line, however, is that I believe this would improve learning and prepare residents for their board exams. ●



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Case of the month

The Use of Matched Anatomical Healing and Preppable Abutments to Define Soft Tissue Contour Around Implants

Stefano Volpe, DDS¹ • Nyree Divitini² • Neil Meredith, BDS, MSc, PhD³

Abstract



Esthetics are increasingly becoming a hallmark for success for dental restorations. This article discusses use of matched anatomical healing and preppable abutments

to define the soft tissue contour around dental implants. These abutments aid the clinician in delivering a more esthetic final restoration to the patient with harmonious gingival contours.

KEY WORDS: Dental implants, prosthetics, abutment, gingiva, esthetics

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The soft tissue profile developed by the abutment between and implant fixture and crown has historically been a cylindrical design. Early osseointegrated implant supported prostheses were most commonly full arch frameworks with extensive use of acrylic to replace missing soft and hard tissues. So function rather than esthetics were the primary consideration.

However, the desire for excellent soft tissues esthetics mimicking the natural soft tissue contour of the gingival tissues has become highly sought after around implants in the last few years. A natural transition from the cylindrical implant abutment connection to the emergence profile of the crown at the gingival sulcus is highly desirable. This may be achieved by immediate replacement, soft and hard tissue grafting, or the use of customised healing abutments.

Custom healing abutments are commonly made at abutment connection or at implant placement following tooth extraction. They are often made by freehand sculpting of light cured composite or similar material around a prefabricated cylindrical temporary component. The advantage of this technique is that the gingival tissues can be formed in an individual contour specific to a single implant. This in itself carries a disadvantage in that the sculpted gingival tissue needs to be recorded with a custom impression coping. Such a procedure is also time consuming and requires skill in achieving a smooth well finished abutment. There is some current discussion about the use of resins as provisional abutment materials as they may be considered to help to maintain the gingival contour following extraction by achieving an element of fibrous attachment.

The disadvantages of a purely customised healing abutment technique can be eliminated

by the use of prefabricated components. Neoss (Harrogate, UK) has produced a range of anatomical healing abutments manufactured from a combination of resins to ensure esthetics, ease of adjustment and bonding to crown and bridge resins, and a surface finish that provides optimal soft tissue interface. Unique in the Esthetiline system is the matched design for a range of permanent abutments which will precisely fit the soft tissue profile created by the healing abutment. This appears to offer a number of advantages over traditional methods. This case report describes the use of anatomical components in the replacement of an upper canine tooth.

Disclosure

Neil Merideth is Director of Research for Neoss.

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Figure 1: Initial presentation with soft tissue deficiency.

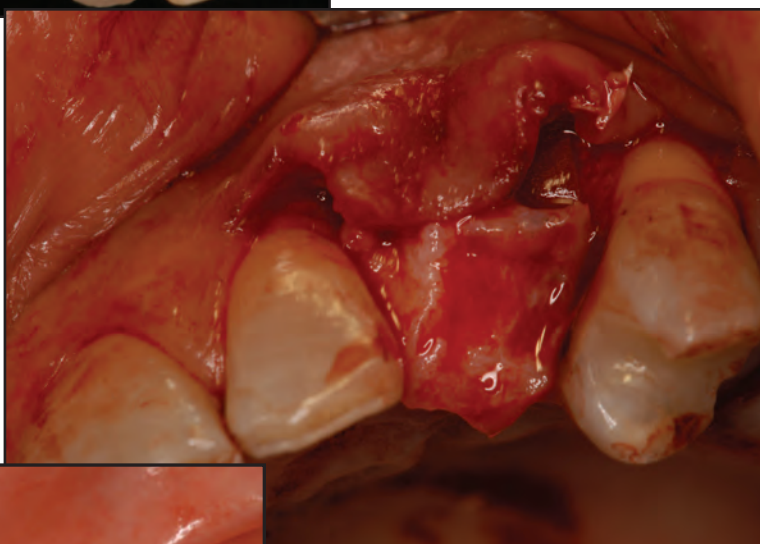


Figure 2: Gingival augmentation and Neoss implant placement.

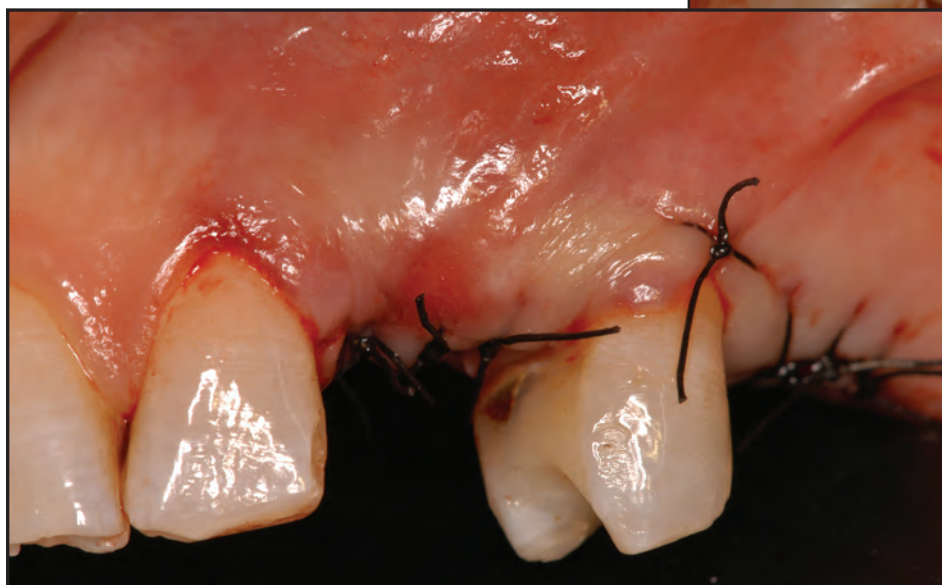


Figure 3: Closure of surgical site.



Figure 4: Four months healing.
Note improved soft tissue profile.

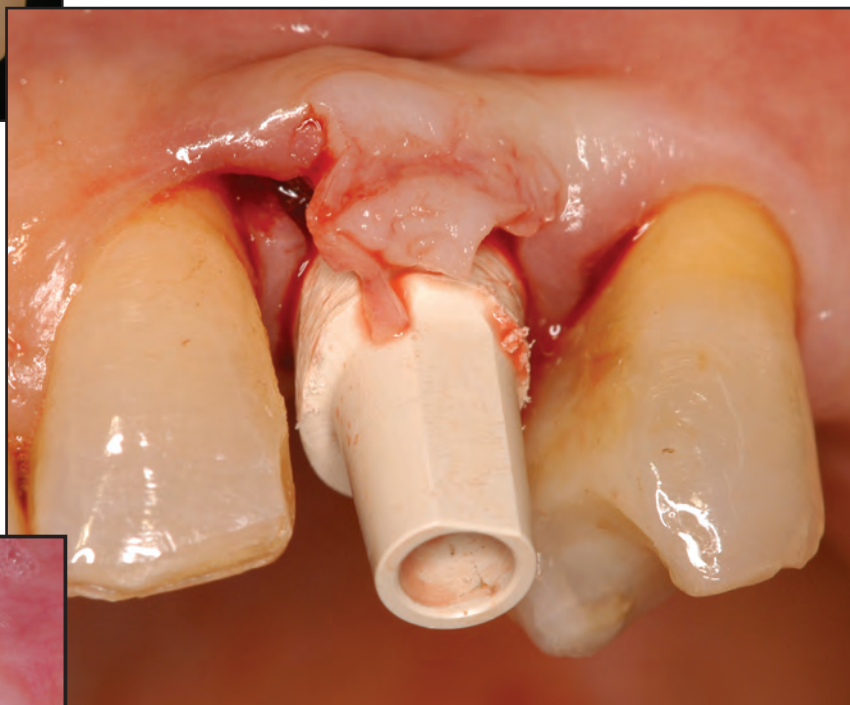


Figure 5: Esthetiline abutment placement.



Figure 6: Provisional crown on Esthetiline abutment
2 weeks after placement.

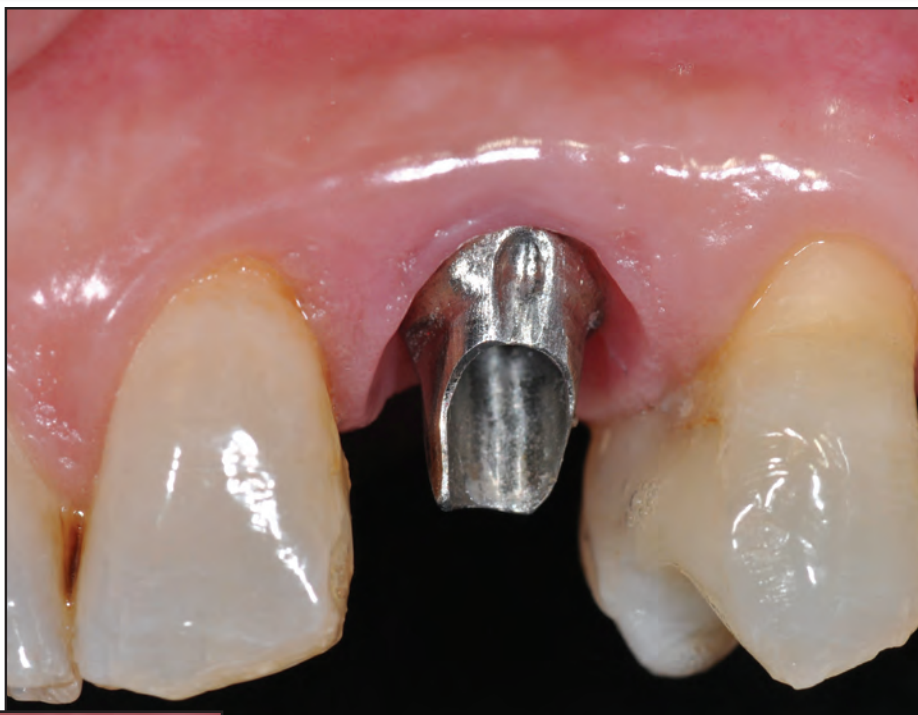


Figure 7: Placement of modified Esthetiline prepable abutment 4 weeks after temporary abutment delivery.



Figure 8: Prepable abutment in situ.



Figure 9: Final restoration.
Note well defined interproximal tissues.

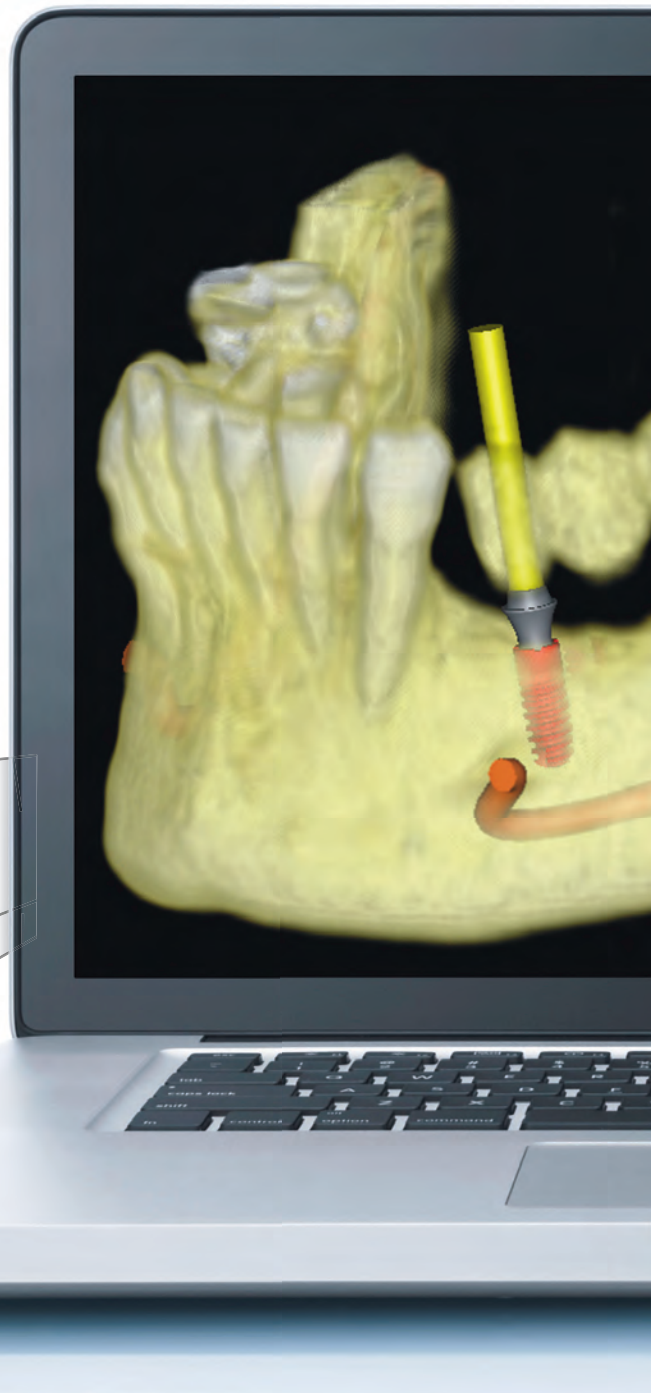
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BioXclude™

Case Courtesy of Dan Holtzclaw, DDS, MS, Austin, TX



BioXclude over grafted socket



2 weeks postoperative



5 months postoperative

Case Courtesy of Paul S. Rosen, DMD, MS, Yardley, PA



Intrabony defect



BioXclude placement



6 month postoperative radiograph



- **Composed of immunoprivileged tissue**
- **Reduces inflammation at the wound site**
- **Minimal trimming needed; can be folded onto itself**
- **Tightly adapts over bone graft and proximal walls**
- **Does not need to be secured with sutures or tacks**

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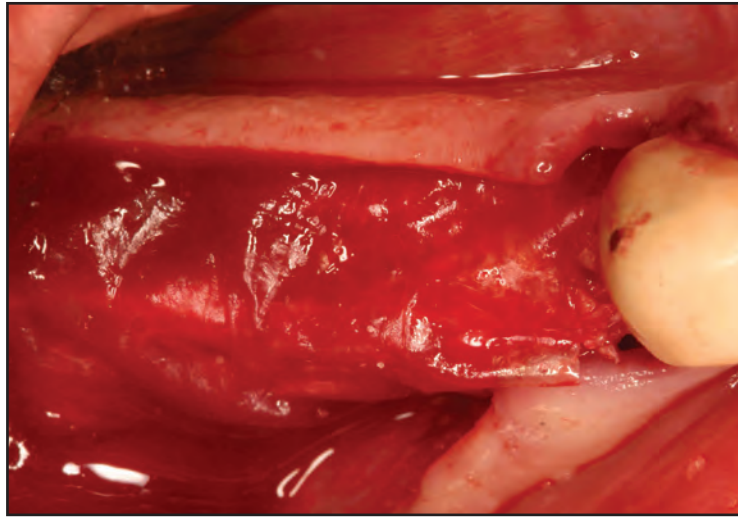
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Amnion Chorion Allograft Barrier: Indications and Techniques Update

Dan Holtzclaw, DDS, MS¹ • Nicholas Toscano, DDS, MS²

Abstract



Fetal tissues such as amnion have been used in medical procedures for nearly 100 years. As far back as 1913, medical literature reported on use of amnion in the repair of skin wounds. Over 50 years ago, amnion was used in eye surgery and is still used today for procedures such as corneal grafts. In 2007 the first use of amnion and chorion, the two fetal tissues that make up the amniotic sac was in eye surgery. Shortly thereafter, amnion chorion membranes (ACM) were introduced for use in surgical dentistry. Unique attributes such as a lack of antigenicity, antibacterial, and anti-inflammatory

properties, make ACM an ideal product for use in dental reconstructive surgery. Additionally, a number of growth factors are present in ACM which are beneficial for healing. To date, a small number of articles have been published regarding use of ACM for surgical dental procedures such as root coverage, site preservation, and guided tissue regeneration. The aim of this article is to provide insight into the appropriate indications and the unique handling of ACM in dental surgery procedures. The authors of this article have performed over 400 procedures with ACM since its approval for use in dentistry just a few years ago.

KEY WORDS: Guided tissue regeneration, guided bone regeneration, amnion chorion allograft, bone graft

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BACKGROUND OF FETAL TISSUES

Fetal tissues have been used in surgical procedures for nearly 100 years. The unique attributes of amnion were recognized as far back as 1913, when use of amnion was first reported in the literature as a temporary biologic dressing for large skin wounds.¹ The use of amnion tissues have been a mainstay of ophthalmic surgery since the 1990's and the material continues to be used today for a variety of ocular procedures such as corneal grafts.² Fetal allografts which utilized the entire amniotic sac, composed of amnion and chorion tissue, were first introduced for use in ophthalmic surgery in 2007. The first reports of the use of amnion in the practice of dentistry surfaced in the mid-2000's, with pre-clinical animal research involving rats and rabbits.^{3,4} The first reported clinical use of an amnion laminate, composed of five layers of amnion tissue, was first reported in 2009 by Gurinsky in a case series on the treatment of mucogingival defects.⁵ Currently, the only fetal tissue membrane available for dental surgical procedures is BioXclude™ (Snoasis Medical, Denver, Colorado, USA). BioXclude™ is composed of amnion chorion tissue that is prepared for use in humans, following American Association of Tissue Bank (AATB) standards, and subsequently terminally sterilized. The fetal allograft membrane comes dehydrated and is stored at room temperature. Since its introduction in 2010, a few human studies have since been published evaluating healing attributes of this material.⁶⁻⁸

Amnion tissue, the inner layer of the amniotic sac, contains collagen types III, IV, V, while chorion, the outer layer of the amniotic sac,

contains collagen types I, III, IV, V, VI.⁹ Amnion has many unique characteristics including a lack of antigenicity, antibacterial, and anti-inflammatory properties.¹⁰⁻¹² Chorionic tissue is found external to amnion and forms the interface between the maternal placenta and the developing fetus. Chorionic villi and maternal spiral arteries from the placenta allow for the exchange of nutrients and oxygen between the mother and the fetus. The amnion-chorion complex serves a number of other important functions for both the mother and developing fetus.

First and foremost, the amnion-chorion complex lacks antigenicity.¹³ This is extremely important as it protects the fetus from foreign body reactions of the mother's immune system. Another important function of the amnion-chorion complex is bacterial inhibition.¹¹ As the developing fetus relies completely on the mother for immunologic protection, bacterial inhibition by the amnion-chorion provides additional protection. From the first documented use of fetal tissue in the early 1900s and continuing today, there has never been a reported incidence of graft rejection, immune response, or disease transmission with amnion based membranes.

AMNION CHORION MEMBRANE (ACM) IN DENTAL SURGERY

When used in surgical dentistry for procedures such as guided tissue regeneration or site preservation, amnion chorion membrane (ACM) possesses many unique features which make it different from materials historically used for these procedures.

Traditional guided tissue regeneration (GTR) materials act as inert, bioabsorbable barriers which selectively prevent epithelial cells from pop-

ulating intrabony defects. With the exclusion of epithelial cells, slower developing cells from bone and periodontal ligament are allowed to populate the periodontal defect.¹⁴ ACM acts in a different manner from traditional GTR barriers in the fact that it encourages rapid epithelial cell growth rather than epithelial exclusion. As epithelial cells quickly migrate across the ACM barrier, they form a seal over the underlying bone graft and do not apically migrate into the defect. Histologic studies by Wallace and Cobb¹⁵ demonstrated this concept by the fact that when ACM was used as a barrier in site preservation, trephined bone core samples from healed surgical sites demonstrated new bone, residual bone graft, and connective tissue percentages comparable to those found in prior studies utilizing traditional GTR barriers. Additionally, this study found no events of adverse healing or epithelial invasion of the grafted sites.

Unlike traditional GTR barriers, which essentially have a single function of allowing for selective cell repopulation; amnion-chorion allografts have numerous other attributes. In addition to encouraging rapid epithelial cell growth, ACM have antibacterial and anti-inflammatory properties.¹⁰⁻¹³ ACM barriers also contain a multitude of noncollagenous proteins, including cell adhesion factors and cytokines, commonly referred to as “growth factors.” Immunohistochemical (IHC) staining analysis of ACM membranes shows intense concentrations of laminin and laminin-5 throughout the barrier, while showing none in traditional xenograft collagen barriers.¹⁶ Laminin-5 is of particular importance due to its high affinity for binding gingival epithelia cells.¹⁷ Other growth factors such as fibroblast growth factor (FGF) and platelet derived growth factors alpha and beta (PDGF- α ,



Figure 1: BioXclude™ dehydrated amnion chorion allograft.

PDGF- β) were also identified. Furthermore, IHC analysis of ACM barriers from multiple donors demonstrated repeatable consistency in the concentrations of growth factors.¹⁸

When primary closure is not obtained, traditional collagen barriers often degrade. One reason for this is the presence of matrix metalloproteinases (MMPs) present in saliva. Amnion chorion tissue contains tissue inhibitor of metalloproteinases (TIMPs) which suppress MMPs and transforming growth factor beta (TGF- β) which stimulates the production of TIMPs from the surrounding tissue.^{19,20} Collectively, these proteins suppress inflammation and collagenous degradation. Also, unlike traditional barriers which are essentially inert scaffolds, ACM provides a protein enriched matrix which naturally hastens cellular migration across the exposed portion of the barrier. These unique biologic attributes allow ACM to be left exposed to the oral environment in situations such as site preservation, or in GTR when primary close cannot be obtained leaving the barrier exposed in the col area.

Amnion-chorion barriers have different han-

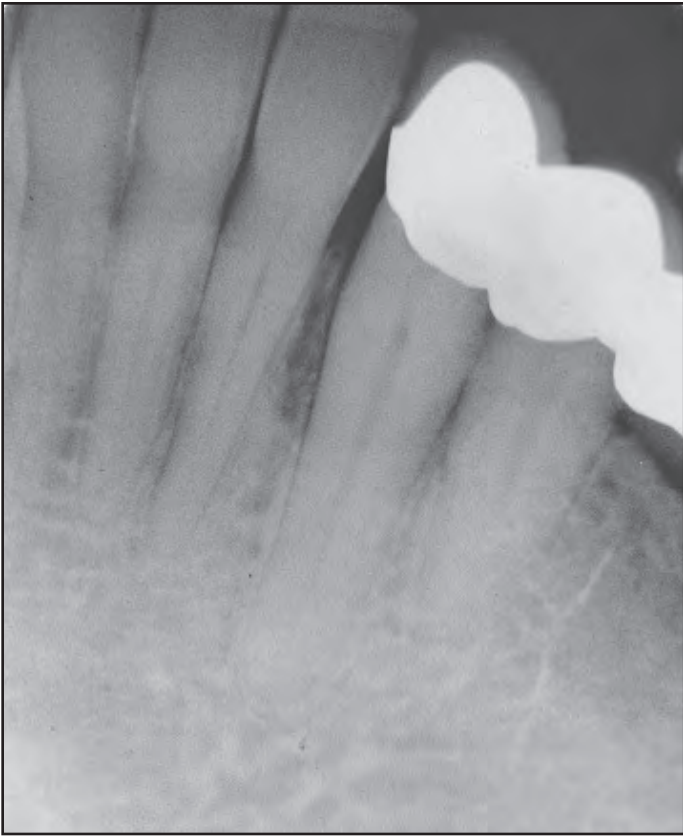


Figure 2: Preoperative radiograph suggestive of deep intrabony periodontal defect around tooth #22. Initial probing depth at this location was 9mm.

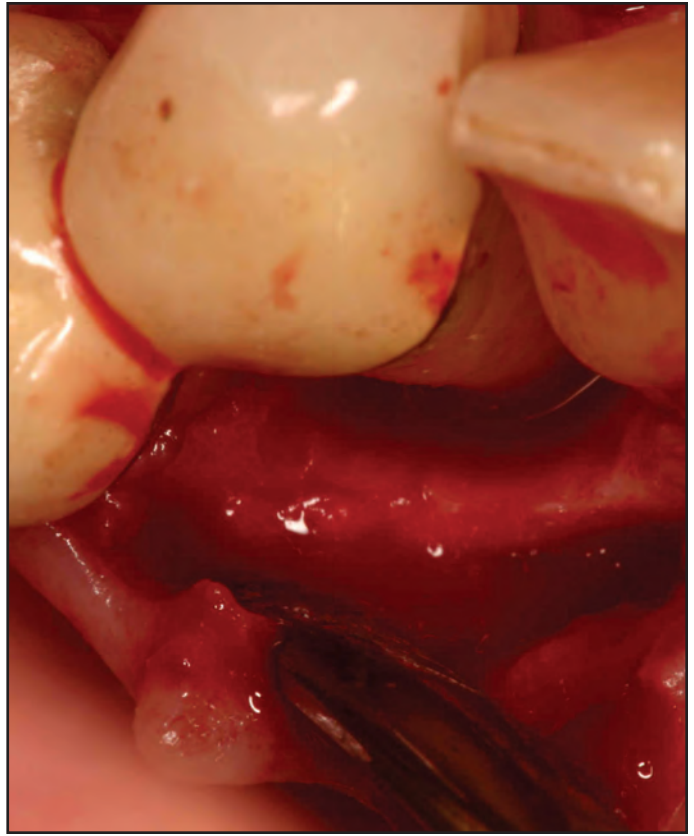


Figure 3: Degranulated intrabony defect at tooth #22.

dling properties as well. Traditional GTR barriers such as resorbable collagen have a typical thickness of 700-800 micrometers.²¹ ACM, on the other hand, has a thickness of 300 micrometers (fig. 1).²² The barrier is placed dry and quickly hydrates with blood, becomes very pliable, and closely adapts to the contours of the underlying surface. It's thin, self-adherent nature allows ACM to be bunched together and / or folded onto itself during placement without compromising blood flow. Unlike stiffer collagen barriers, once placed, ACM will not easily displace from underneath the over laying flap and does not need to be

fixed into place using sutures or tacks. Collectively, ACM's unique biologic and physical attributes reduce the complexity of trimming and placement of barriers, minimizing the chances of post-operative complications.

APPLICATIONS FOR USING AMNION CHORION BARRIERS

The cases below are intended to highlight and illustrate ACM's unique handling characteristics and the application of the barrier over bony defects, ridge augmentations, and the ability for the barrier to be left exposed to the oral environment.

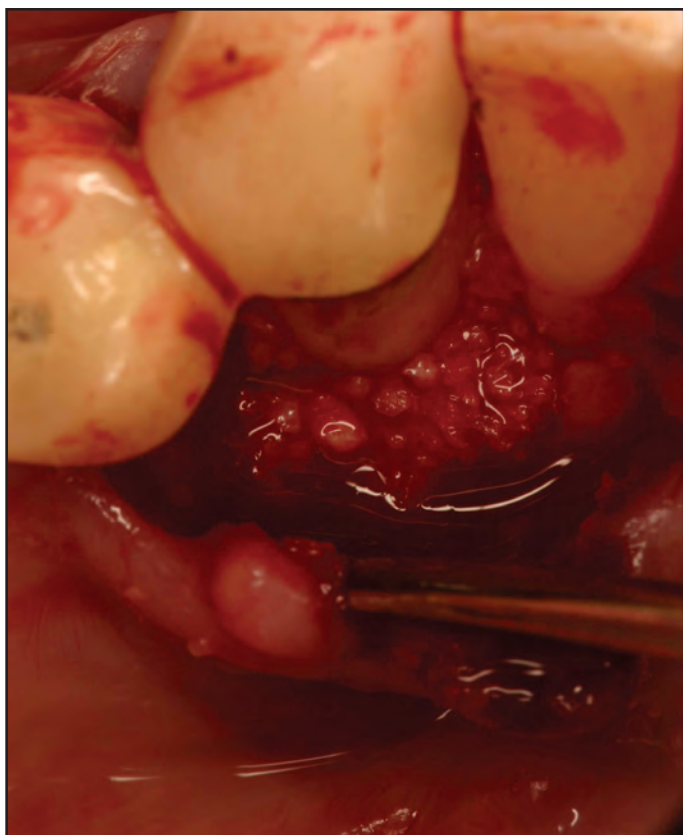


Figure 4: Intrabony defect grafted with FDBA.

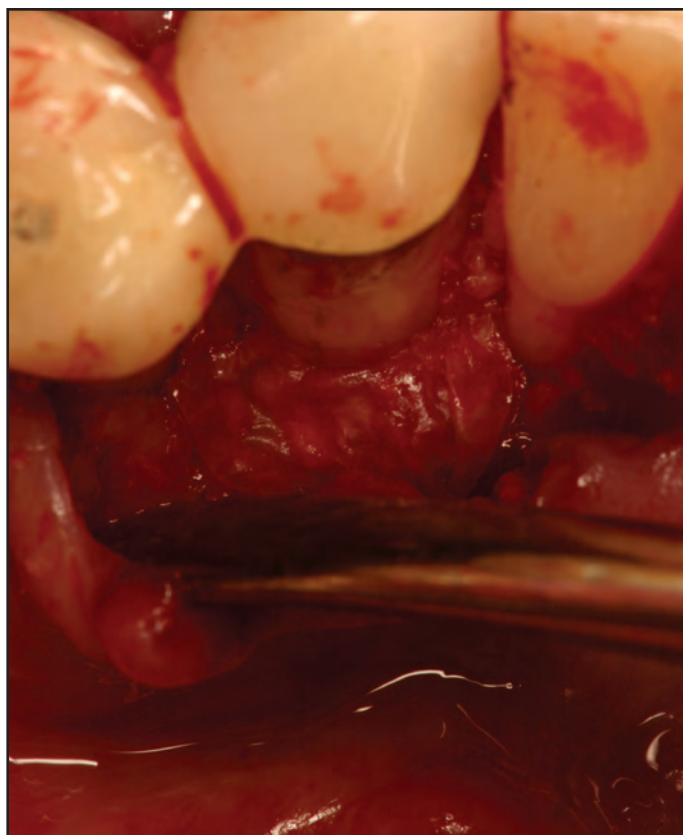


Figure 5: ACM intimately adapted to cover grafted defect.

Periodontal Intrabony Defects

This case demonstrates the ability for ACM to intimately adapt to the contours of grafted bony defects found around teeth and dental implants. A 46 year old Caucasian male presented for treatment of intrabony defects probing 9 mm circumferentially on the lingual aspect of tooth #22. Presurgical radiographs suggested a deep intrabony defect at the mesial aspect of the mandibular canine with possible extension to the lingual surface (fig. 2). One day prior to surgery, the patient began a course of Amoxicillin 500mg, three capsules per day, for 10 days. Full thickness mucoperiosteal flaps were reflected and

defects were degranulated with hand and ultrasonic instruments (fig. 3). Copious amounts of sterile saline were used to irrigate the surgical sites and inspection for tissue tags and residual calculus was performed. Tooth #22 had a large “wrap around” circumferential intrabony periodontal defect on the lingual surface. The defect was grafted with particulate mineralized freeze dried bone allograft (FDBA) (Maxxeus™, Community Tissue Services, Dayton, Ohio, USA) (fig. 4). ACM was trimmed using dry scissors and placed dry over the grafted intrabony defect. As the barrier hydrated it closely adapted over the graft material and extended

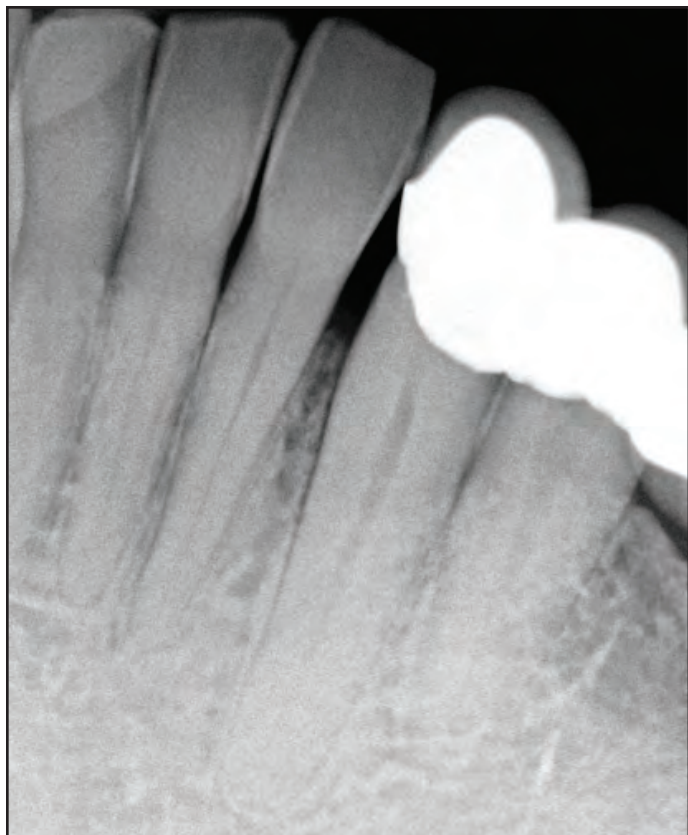


Figure 6: Postsurgical radiograph at 12 months suggesting significant improvement of intrabony defect at tooth #22.

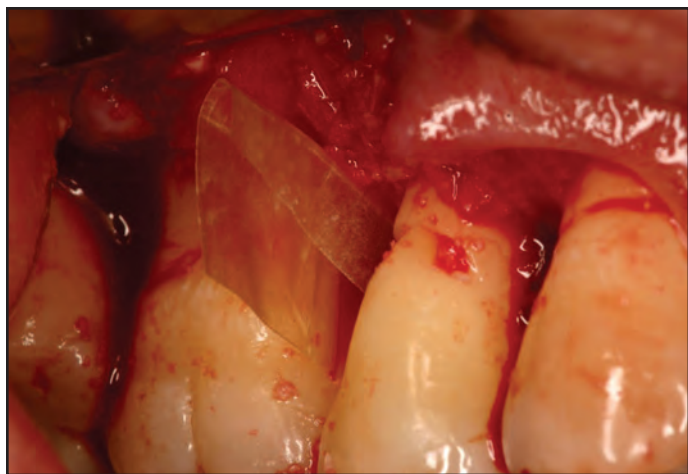


Figure 8: BioXclude™ folded during placement interproximally between teeth. During placement BioXclude™ can touch root surfaces adjacent to the grafted defect.

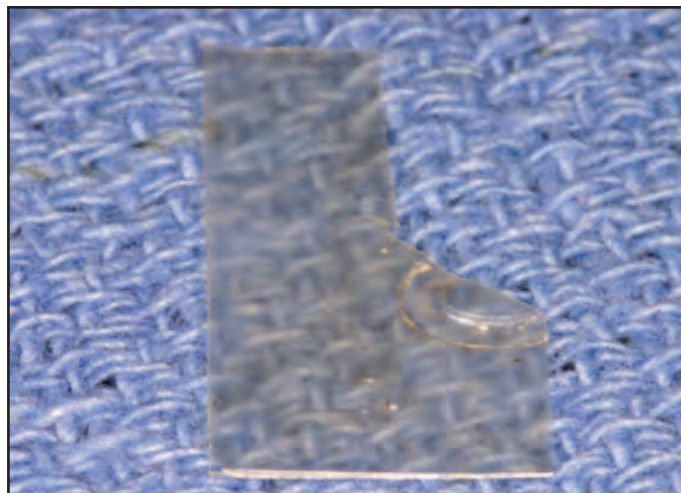


Figure 7: Trimmed piece of BioXclude™ prior to placement.



Figure 9: BioXclude™ is placed dry over the grafted defect to ensure ease of placement.

3 mm beyond the proximal bony walls (fig. 5.) Flaps were replaced with 5-0 Nylon sutures and pressure was applied to surgical sites for one minute with moist gauze. Ibuprofen and tramadol were prescribed for pain control following surgery. The patient was instructed not to brush the surgical site until the first postsurgical visit and 0.12% chlorhexidine gluconate was prescribed as a post-surgical antibacterial rinse. Ten days following surgery, sutures were



Figure 10a: Once hydrated with blood, the BioXclude™ membrane becomes pliable and easily adapts over grafted sites.



Figure 10b: Note the intimate adaptation of the BioXclude™ barrier to the interproximal root contours.

removed and the surgical sites were deplaqued with hand instruments and cotton swabs soaked in 0.12% chlorhexidine gluconate. An additional postsurgical visit was performed 20 days after surgery and patients were then appointed for periodontal maintenance at 3 month intervals. At 12 months, post-operative radiographs suggested complete resolution of the periodontal defect (fig. 6) and probing improved from 9mm presurgically to 3mm postsurgically.

On other cases, when placing ACM interproximally between adjacent teeth for the treatment of periodontal intrabony defects, BioXclude™ may be trimmed with dry scissors (fig. 7) and folded (fig. 8) if necessary. When placing ACM between teeth, it is important to keep the material dry for ease of placement (fig. 9). Once placed, use dry instruments to adapt the ACM into position. As ACM hydrates with blood, it will become supple and will intimately adapt around the teeth and grafted defect (figs. 10a, b). The self adherent nature of ACM precludes the need for suturing or tacking the material.

Guided Bone Regeneration

This case demonstrates the ability for ACM to be used in bone augmentation procedures when a barrier is required to contain the bone graft, but not provide primary stability for the grafted area. A 38 year old Caucasian female was presented with an edentulous posterior mandible (fig. 11). Due to insufficient horizontal bone width for proper dental implant placement, the treatment plan called for a ridge split to increase the width of alveolar bone, especially in the posterior aspect. After obtaining block anesthesia, a crestal horizontal incision and vertical incisions were employed at the mesial and distal aspects of the edentulous area and a full thickness flap was elevated (fig. 12). A Piezo-electric surgical cutting tip (Acteon, France) was used to make a trans-crestal corticotomy and terminated 1mm distal to tooth #28. At the terminus of the horizontal corticotomy, vertical cuts were made approximating the length and depth of the crestal horizontal cuts completely transecting the buccal cortical plate into the marrow space. An apical hinge cut connected



Figure 11: Pre-surgical photo of edentulous mandibular ridge with Siebert Class 1 defect.

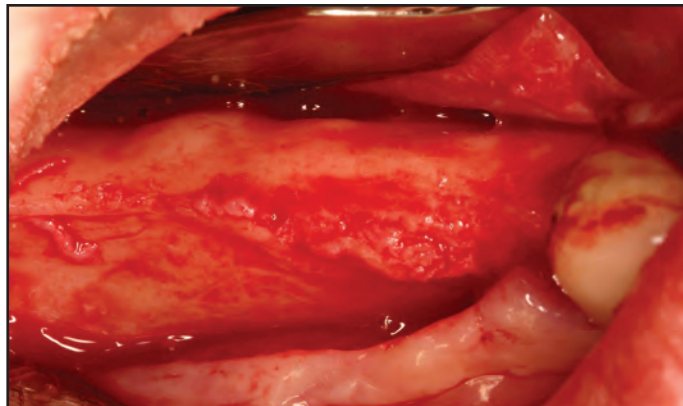


Figure 12: Full thickness mucoperiosteal flap elevation.

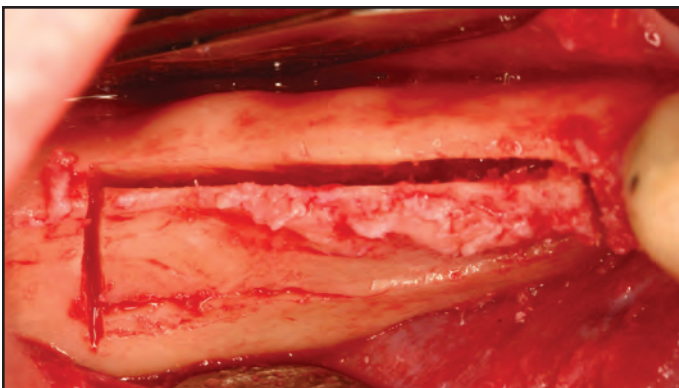


Figure 13: Final piezoelectric ridge split corticotomies.

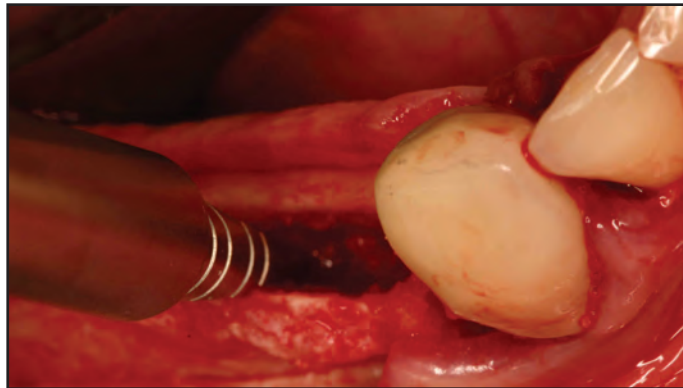


Figure 14: Expansion of edentulous ridge with ridge splitting chisels.



Figure 15: Ridge split and all corticotomies grafted with FDBA.

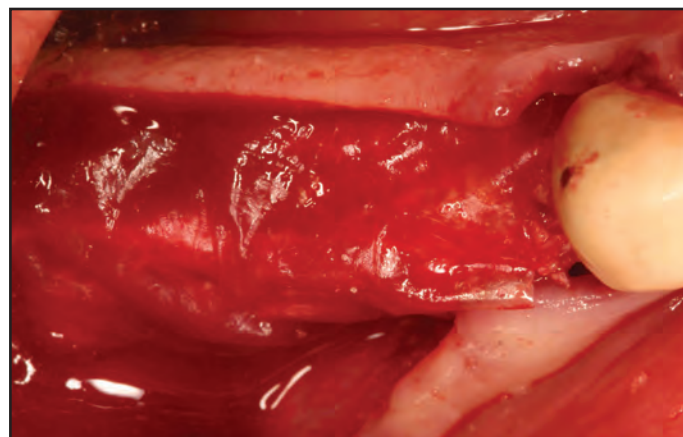


Figure 16: Surgical site covered with a single piece of BioXclude™ membrane.

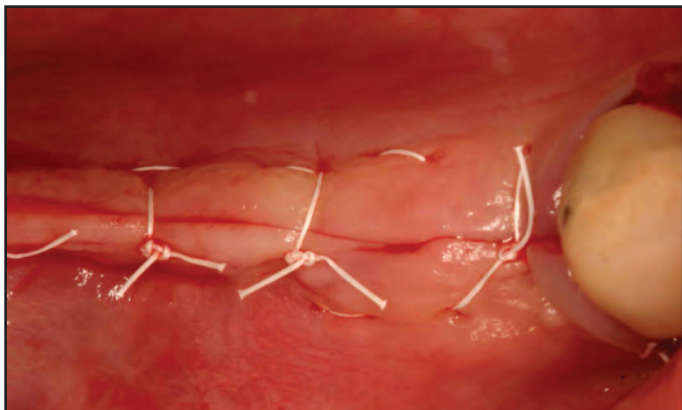


Figure 17: Tension-free primary closure of surgical site.

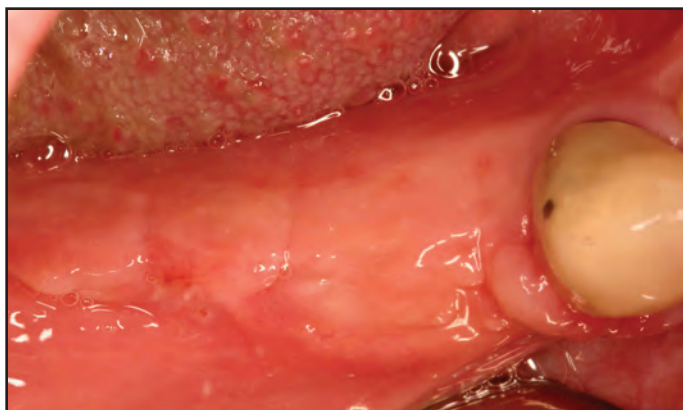


Figure 18: At 10 days after surgery, the surgical site exhibited excellent early healing allowing for suture removal .

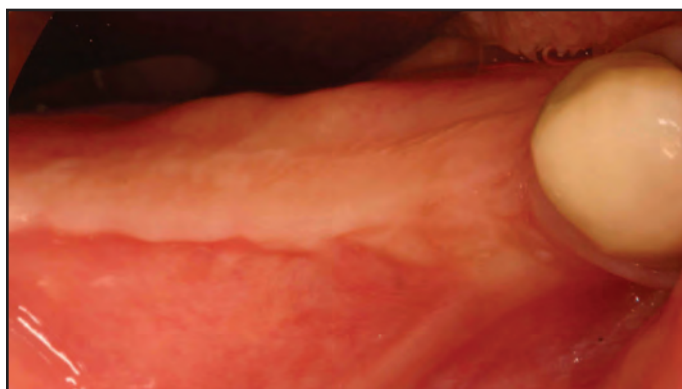


Figure 19: Four months post-operative surgical photo of the treatment site.

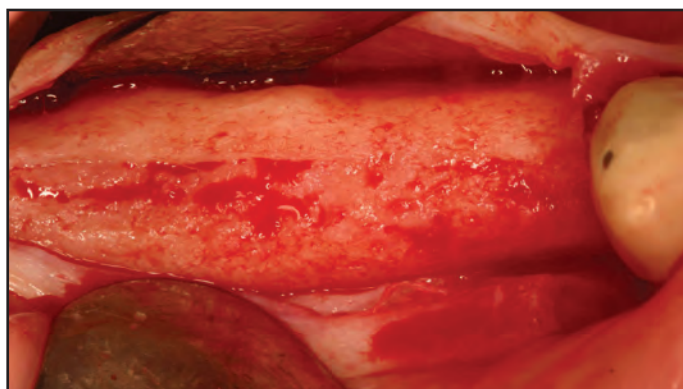


Figure 20a: Healed surgical site at 4 months. Note the significant increase in ridge width with new bone formation. Faint outlines of the corticotomies are still visible.

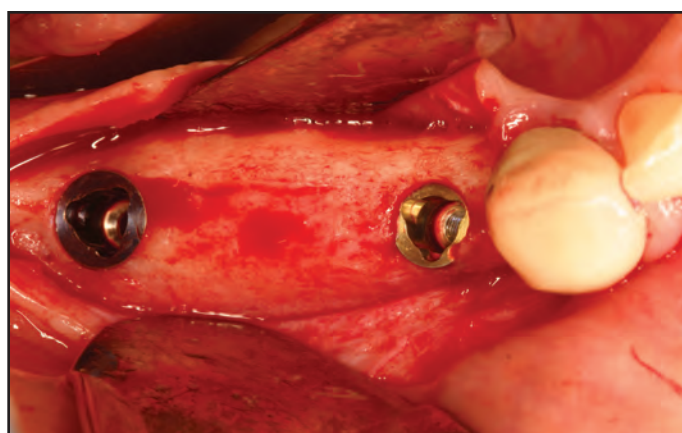


Figure 20c: Placement of dental implants.

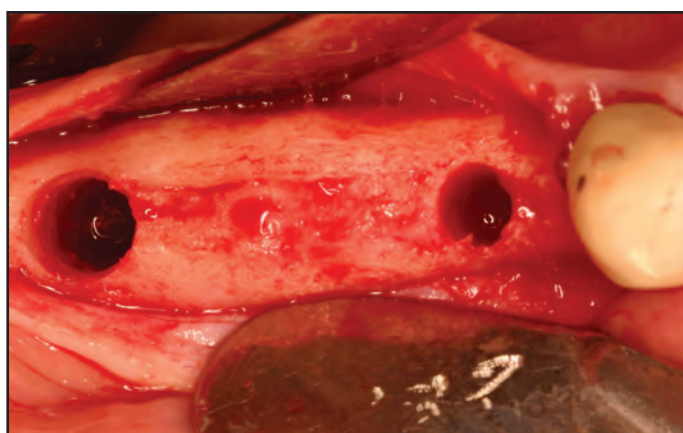


Figure 20b: Implant corticotomies prior to dental implant placement. Note excellent vascularization of the bone.

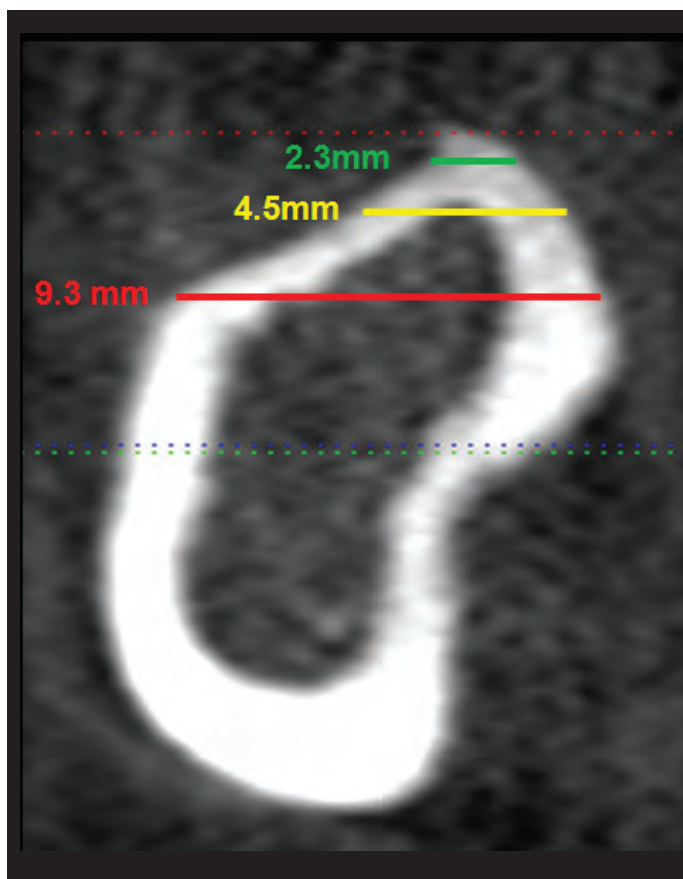


Figure 21a: Presurgical CBCT scan of ridge split surgical site.

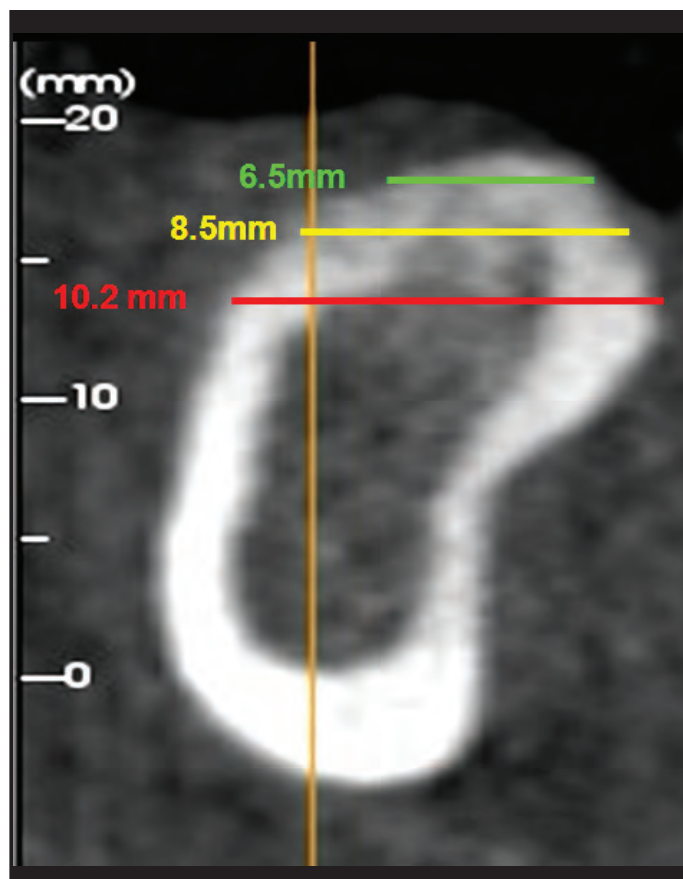


Figure 21b: Postsurgical CBCT scan of ridge split surgical site. Note significant increase in the width of the ridge.

the vertical corticotomies without fully transecting the cortical bone (fig. 13). Ridge expansion chisels were sequentially used to widen the split ridge (fig. 14). After lateralization of the buccal plate, FDBA was condensed into the gap separating the cortical plates and to fill and diffusely cover the vertical corticotomies and apical hinge cuts (fig. 15). ACM barrier was then placed dry onto the grafted area extending 3 mm beyond piezoelectric corticotomies (fig.16). Periosteal releasing incisions were used for mucoperiosteal flap mobilization to obtain tension-free primary closure (fig. 17).

The patient was then placed on amoxicillin for 10 days along with topical application of chlorhexidine mouth rise twice daily for three weeks. At ten days the sutures were removed and the treatment site exhibited excellent early healing (fig. 18). The tissue continued to show excellent color and contour up until time of implant placement at four months (fig. 19). The surgical site was reentered at 4 months for placement of dental implants (figs. 20a-c). Comparison pre- and post-surgical cone beam computer tomography (CBCT) scans confirmed horizontal bone augmentation (figs. 21a, b).



Figure 22: Presurgical photo of non-restorable tooth #3.

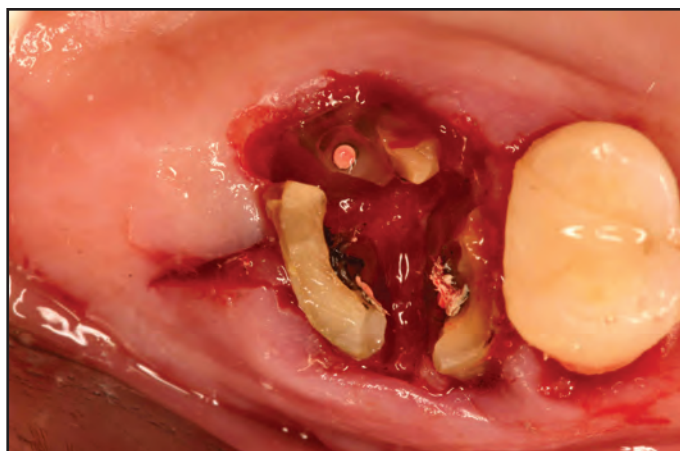


Figure 23: Sectioned roots of tooth #3 prior to extraction.

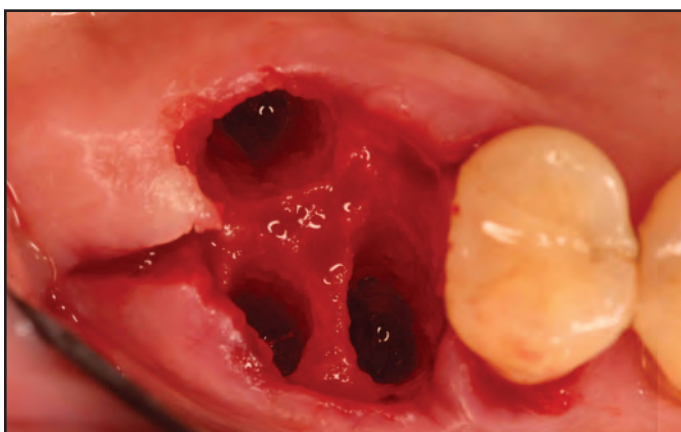


Figure 24: Intact septal bone following removal of tooth #3.



Figure 25: Extraction socket grafted with FDBA.

Site Preservation with Anticipated or Intentional Exposure to Oral Environment

This case demonstrates the ability for ACM to be left exposed to the oral environment and documents the rapid epithelization of exposed portions of the barrier. A 56 year old Caucasian female presented for treatment of hopeless maxillary right first molar (fig. 22). Following local anesthesia a sulcular full thickness mucoperiosteal flap was minimally elevated and the tooth sectioned with a high speed hand piece (fig. 23). The sections were removed leaving

an intact bony septum which was adequate for immediate implant placement (fig 24). The patient declined this treatment due to finances and elected to have site preservation performed in consideration for future implant placement. The site was grafted with FDBA (fig. 25), covered with ACM barrier (fig. 26a), and sutures were used to replace the minimal flap elevation (fig. 26b). The patient was placed on 500mg Amoxicillin three times per day for 10 days and instruction to avoid the surgical site. At 48 hours after surgery, rapid healing

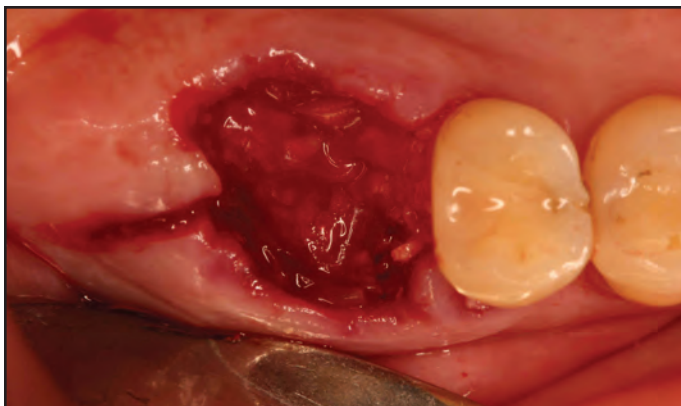


Figure 26a: Placement of BioXclude™ over the grafted socket.

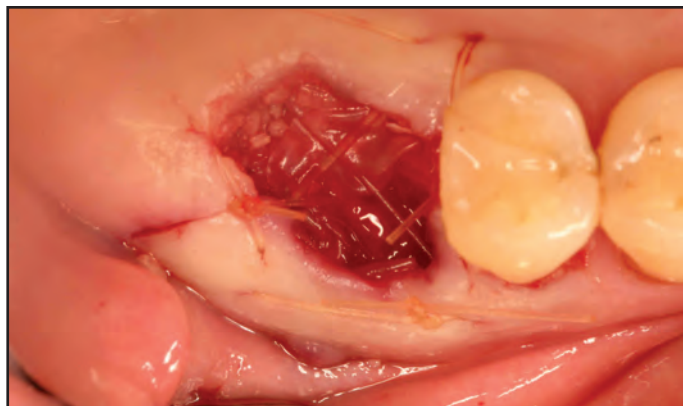


Figure 26b: Site closure. Note intentional exposure of the BioXclude™ membrane to the oral environment.



Figure 27: Opacification of the barrier and initial granulation tissue migration from the wound edges can be seen at 48 hours. Sutures were removed at this time.



Figure 28: At 96 hours after surgery, complete coverage of the grafted socket is evident with copious amounts of neovascularization.



Figure 29: At 10 days after surgery, continued maturation of gingival tissue is evident.



Figure 30: At 21 days after surgery, complete keratinization of the gingival tissue over the grafted socket is evident.



Figure 31: At 45 days after surgery, further maturation of the keratinized tissue covering the treatment site is seen.

was seen with opacification of the ACM barrier and initial granulation tissue migrating inward from the wound edges (fig 27). By 96 hours, immature complete closure of the treatment site was achieved, thus protecting the underlying site preservation bone graft (fig. 28). Note the neovascularization of the rapidly healing tissue. At 10 days, continued maturation of the tissue covering the treatment site was evident (fig. 29). By 21 days, there was complete keratinization of the gingival tissue covering the area of site preservation surgery (fig. 30) and at 45 days, further maturation of the keratinized tissue covering the site was seen (fig. 31). It is important to note that all ACM that was intentionally left exposed to the oral environment healed with keratinized epithelial tissue.

TIPS FOR USING BIOXCLUDE™

Amnion chorion barriers unique physical attributes alter traditional handling characteristics associated with collagen membranes. The use of ACM requires a new mindset and approach, which when understood, can eliminate many of the difficulties associated with placing collagen barriers. The following guidelines outline the key differences between the use of traditional barriers and ACM in dental surgery:

- Dehydrated ACM will adhere to anything with moisture. Use only dry instruments when trimming and during placement.
- ACM requires less precise trimming than traditional GTR membranes. Trimming BioXclude™ up to one third larger than the defect site allows for passive adaptation and sealing. It is not necessary to further manipulate the ACM if it folds upon itself or touches adjacent roots.
- In circumferential or other irregular defects it is easier to use individual overlapping strips of ACM rather than trim a single piece to match the contours of the grafted area.
- Excessive blood, or when used in combination with a gel like a growth factor such as Emdogain, can cause ACM to slide and not adhere once hydrated. In these incidences use damp gauze to soak up the excess blood.
- In general, the less manipulation the better, especially once ACM becomes hydrated. To prevent the barrier from rolling up on itself once the barrier becomes hydrated, do not remove and use only wetted instruments to manipulate or wet gauze to “pat” the barrier into final position.

CONCLUSION

Amnion-chorion barriers such as BioXclude™ are quite unique in terms of their composition properties, handling characteristics, and healing. Proper use of ACM requires a change of mindset, and once understood, reduces the complexity of trimming and placing of barriers in dental surgery and minimizes the chances of post-operative complications. ●

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Disclosure

Dr. Holtzclaw is a clinical advisory board member of Snoasis Medical and has a financial interest in the company.

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Removal of a Large Radicular Cyst and Simultaneous Ridge Regeneration Utilizing Alloplastic Calcium Phosphosilicate Putty in Combination with Platelet Rich Fibrin (PRF): A Case Report

George Kotsakis, DDS¹ • V. Chrepa, DDS²

Abstract



The most frequent odontogenic cyst is the radicular, also called periapical cyst, with its prevalence varying between 50.2% - 84.5% among all odontogenic cysts. Radicular cysts can occur in the periapical area of any teeth, at any age but are most commonly seen in 30-50 year old

patients. They are usually less than 1 cm in diameter and occur more frequently in the mandible than in the maxilla. This case reports documents removal of a large radicular cyst with simultaneous ridge augmentation utilizing alloplastic phosphosilicate putty in combination with a platelet rich fibrin membrane.

KEY WORDS: Radicular cyst, periapical cyst, bone graft, platelet rich fibrin, alloplast

1. Private practice, Athens, Greece

2. Private practice, Athens, Greece

INTRODUCTION

The most frequent odontogenic cyst is the radicular, also called periapical cyst, with its prevalence varying between 50.2% - 84.5% among all odontogenic cysts.¹⁻³ Radicular cysts can occur in the periapical area of any teeth, at any age but are most commonly seen in 30-50 year old patients.^{4,5} They are usually less than 1 cm in diameter and occur more frequently in the mandible than in the maxilla.^{4,6}

Enucleation of the cyst is the treatment of choice for radicular cysts that do not interfere with anatomical landmarks. Though large mandibular cysts exhibit spontaneous bone regeneration, the rate of bone in-growth is not adequate for a near term implant placement. Within 12 months of the surgical removal of the cyst the reduction of the defect's diameter is 43.5% and the increase in bone density is only 48.3%.⁷ Moreover, if the diameter of the cyst is larger than 2cm, the spontaneous healing of the cyst may result in reduced bone density in comparison with the surrounding healthy bone.⁸ In cases where the extraction of the teeth that are involved with a radicular cyst is mandatory, a larger osseous defect is created and use of a bone graft will significantly enhance the bone regeneration to facilitate an implant placement.

Traditionally a bone graft and a barrier membrane are employed in bone regeneration procedures.⁹ The types of bone grafts available include autografts, allografts, xenografts or alloplastic grafts. These types of grafts are used alone or in combination with guided bone regeneration and their success rates vary vastly in the literature, with the autografts constantly yielding the best results.¹⁰

Even though autografts have proven osteo-



Figure 1: Clinical view of the compromised teeth 27, 28.

inductive and osteoconductive effects, they are not so infrequently used in implant dentistry because of limited availability of host bone, the need for an additional donor surgical site and patient-discomfort issues. Furthermore there are reports that their use may be associated with significant resorption.¹¹

Alloplastic materials on the other hand are readily available in many sizes and shapes and their chemical consistency differs among manufacturers. Graft substitutes with a putty/paste like consistency are gaining popularity. Recently, a putty Alloplast was approved for clinical dental use (NovaBone Dental Putty, Alachua, FL, USA) (NB Putty). It is pre-mixed putty dispensed in syringes and cartridges. Its unique consistency and delivery system allows the clinician to fill large defects by injecting the putty directly into the defects eliminating the need for handling the graft substitute. The paste consistency allows uniform surface contact with the bony walls of the defect and eliminates the dilemma of over-condensation or under-condensation of the graft material.

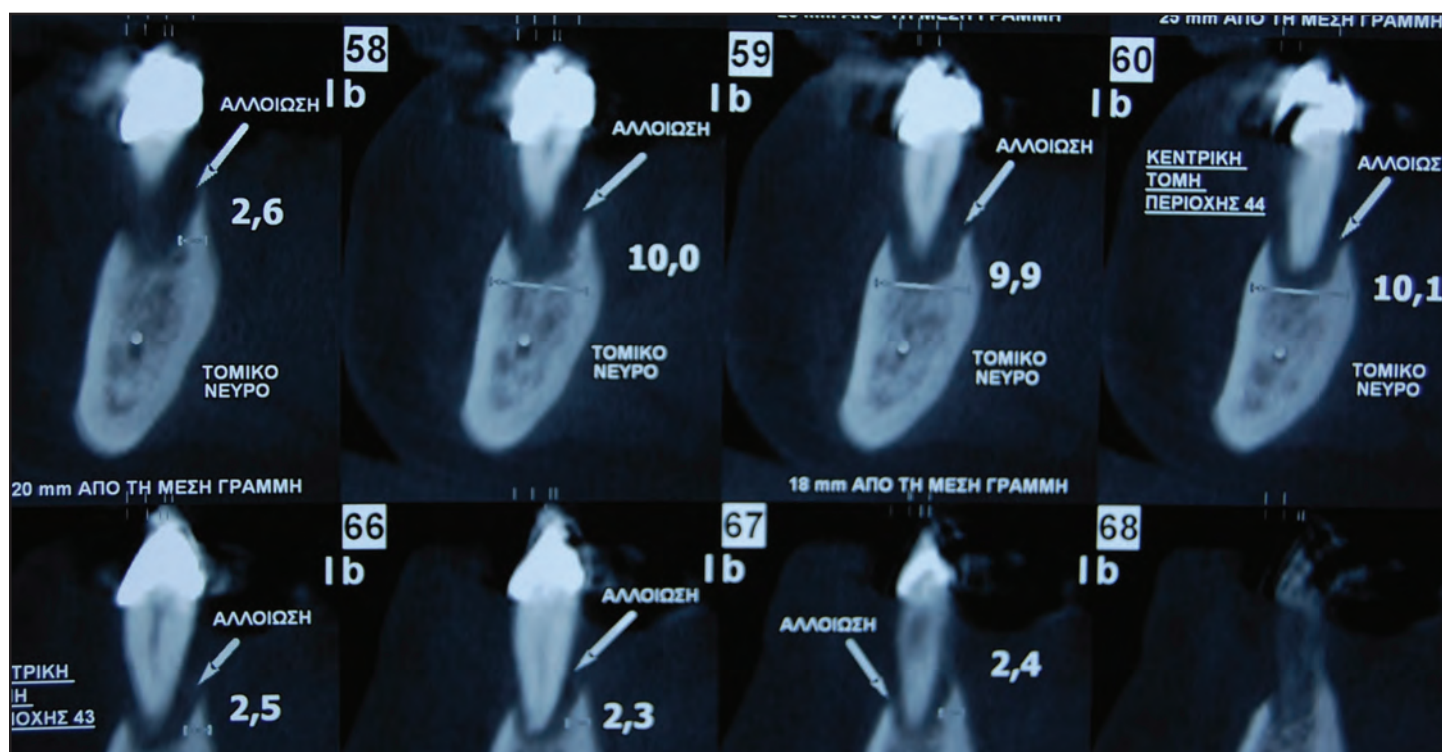


Figure 2: Pre-operative CBCT showing radiolucency in the periapical area. Notice that there is no alveolar bone support around the teeth.

Membranes are divided into two groups: resorbable and non-resorbable. Membranes can be fabricated from animal derived collagen, titanium or synthetic materials such as PLA/PGA.¹² Recently, platelet rich fibrin (PRF), mechanically manipulated to form membranes, has been proposed for use in GBR procedures.¹³ PRF is an autologous platelet concentrate that encapsulates growth factors, leukocytes and cytokines from a blood harvest into a fibrin matrix. According to the literature, the use of the PRF membranes may accelerate the integration and remodeling of the grafted biomaterial.^{13,14} PRF membranes have also been proven to be more suitable for in vitro cultivation of periosteal cells for bone tissue engineering compared to commercially available collagen membranes.¹⁵

In this case report an alloplastic putty graft (NB Putty) with unique handling characteristics will be combined with PRF membrane for the augmentation of a large defect that was created by the extraction of two periodontally compromised mandibular teeth that were associated with a large radicular cyst.

HISTORY

The patient, a 55-year old female, non-smoker with no adverse medical history, presented with a dull pain and tooth mobility in the mandibular right premolar area. Clinical examination in the area revealed attachment loss of 13mm & 10mm on the buccal and 11mm & 10mm on the lingual side of the right canine and

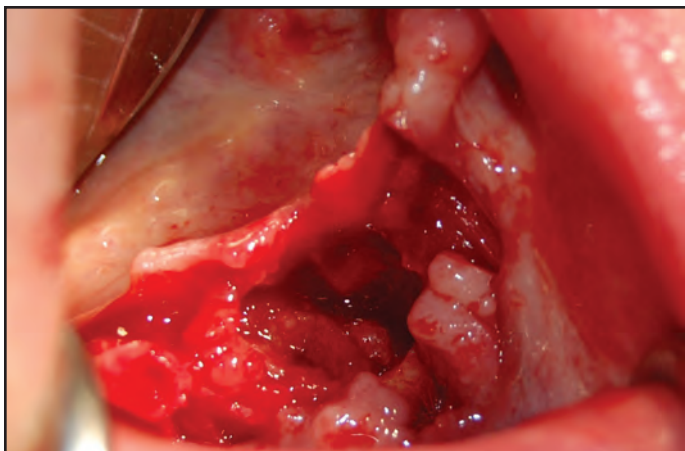


Figure 3: Clinical view directly after the extraction of the teeth.



Figure 4: Osseous defect after the enucleation of the cyst. Note that the buccal plate is completely missing.



Figure 5: Placement of NB putty directly from the syringe into the defect.

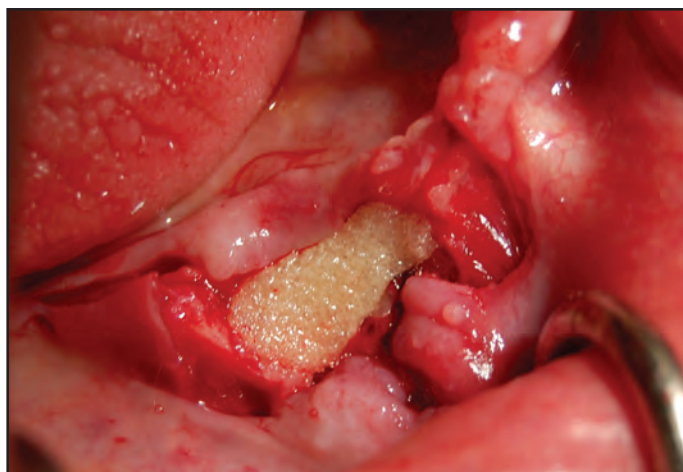


Figure 6: The defect has been filled with NB putty; the putty's handling characteristics allow it to be easily contoured with the use of a moistened gauze

first premolar respectively (figure 1). Grade 3 mobility was also recorded for the affected teeth. Pre-op Cone Beam CT (CBCT) reveals a large radiolucency in the apical area of the involved tooth as seen in (figure 2). Extraction of the teeth, enucleation of the cyst and guided bone regeneration with a bone substitute prior to implant placement presented the best prognosis.

SURGICAL PROCEDURE

A linear and crevicular incisions were made and both teeth were extracted with forceps. A flap was raised and the cyst was enucleated (figures 3, 4). A 23x9mm defect resulted with no alveolar buccal wall. NB Putty was injected directly into the defect without any prior mixing (figures 5, 6).

A PRF membrane fabricated from the patient's own blood was used as a barrier. 20ml of the

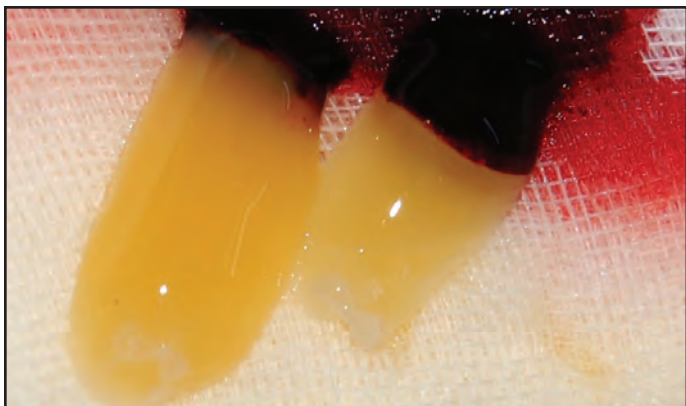


Figure 7: The PRF clots are placed between two gauzes and steady pressure is applied upon them in order to form PRF membranes.

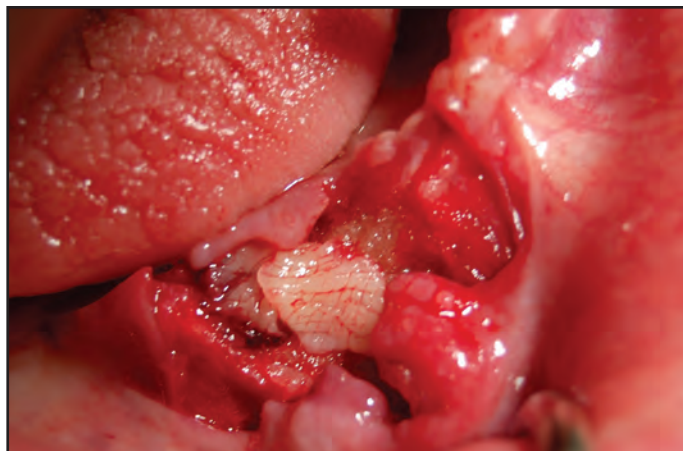


Figure 8: PRF membranes placement to cover the graft.



Figure 9: Eight month post-op clinical picture.

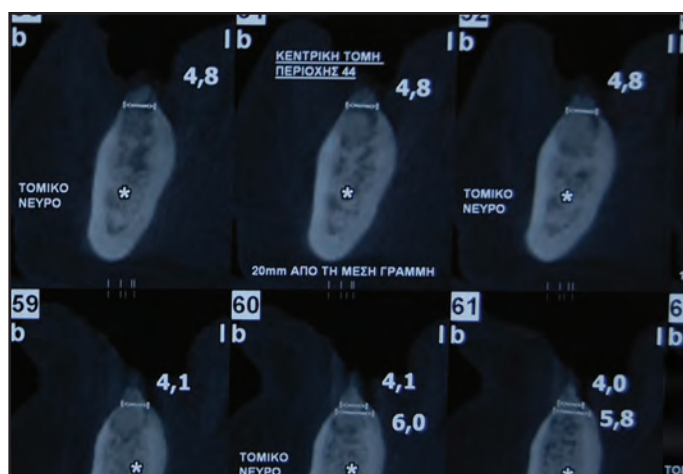


Figure 10: CBCT showing good bone regeneration.

patient's blood were centrifuged in two 10ml sterile vials at 2900rpm for 10 minutes and Platelet Rich Fibrin was extracted. Each portion of the PRF was pressured between two gauzes until it formed a membrane which was used to cover the graft (figures 7, 8). Releasing incisions were made using the superficial-layer split-thickness flap technique¹⁶ and a passive closure was achieved. Two mini dental implants were placed

in the area to prevent an interim removable partial denture from impinging upon the grafted area.

RESULTS & FOLLOW UP

The patient was recalled regularly to evaluate the healing in the area. The area was clinically evaluated at 3 and 10 days as well as 3, 5 & 7 months post operatively. The healing proceeded uneventfully and the ridge height and

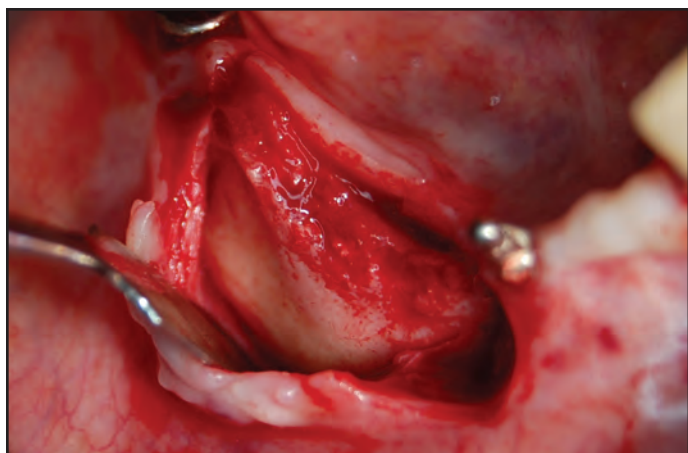


Figure 11: Clinical picture upon re-entry demonstrates buccal plate regeneration and adequate ridge width for the placement of a standard diameter implant.

width throughout the recall period (figure 9).

Seven month post-op CBCT (figure 10) shows good bone regeneration in the defect area as seen in sections 50-52. The site was reentered at 8 months post extraction. 8 month post-operative clinical picture (figure 11) shows that the crestal plate is still being regenerated while the buccal plate is completely regenerated. Clinically there was no difference between the grafted area and the native bone using visual and handling criteria. The bone dimensions were adequate for the placement of a 4.3x11 mm implant in the regenerated area, according to the restorative treatment plan, which achieved an initial stability of 45N/cm².

DISCUSSION

In the present case, both the clinical and CBCT analyses revealed good bone regeneration. Buccal plate regeneration after use of Alloplast putty without a collagen barrier is indicative of the bone regeneration potential of NB

Putty when used in combination with PRF as a barrier. As discussed before, larger cysts that require extraction of multiple teeth leaving a huge defect pose a challenge to restore hard and soft tissues for implant placement.

NB Putty in conjunction with PRF exhibited a synergistic effect that resulted in excellent soft tissue and hard tissue healing as well. Being synthetic, NB Putty also eliminated the need for an additional surgical site. NB Putty is dispensed pre-mixed and hence eliminated the need for any preparation prior to placement. The material was cohesive providing adequate graft retention in the defect even during irrigation and suction. Possibly the performance characteristics seen with the putty are a result of multiple physical & chemical interactions termed Osteostimulation. This unique phenomenon occurs in Bioglass based synthetic graft substitutes and has been shown to be superior to conventional osteoconduction.

As far as PRF is concerned, its use has not yet been extensively researched since its introduction in 2000.¹⁷ The advantage that PRF yields over earlier autologous growth factor concentrates such as Platelet Rich Plasma (PRP) is that the platelet derived growth factors are trapped in a dense fibrin matrix and gradually released for a period of at least 7 days.¹⁸ Moreover, the ease of fabrication of a PRF membrane makes it convenient for use in everyday dental practice. The term Natural Bone Regeneration (NBR) has been recently introduced to describe the novel therapeutic principle that has been available for use to the dental community utilizing the regenerative potential of PRF in traditional GBR procedures as it was done successfully in this case report.¹⁹

CONCLUSION

The results suggest that Natural Bone Regeneration (NBR) utilizing bioactive calcium phosphosilicate putty in conjunction with Platelet Rich Fibrin membranes may be a reliable choice for osseous regeneration in cases of ridge preservation and implant related surgeries. Large scale controlled trials are required to confirm this result in the future. ●

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Disclosure

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

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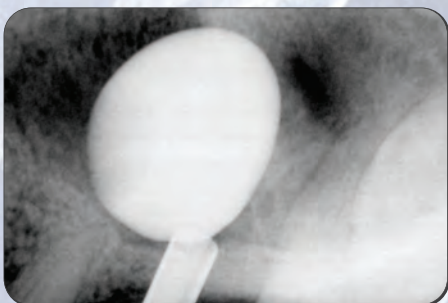
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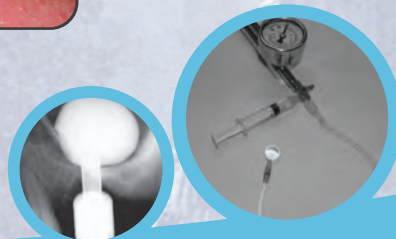
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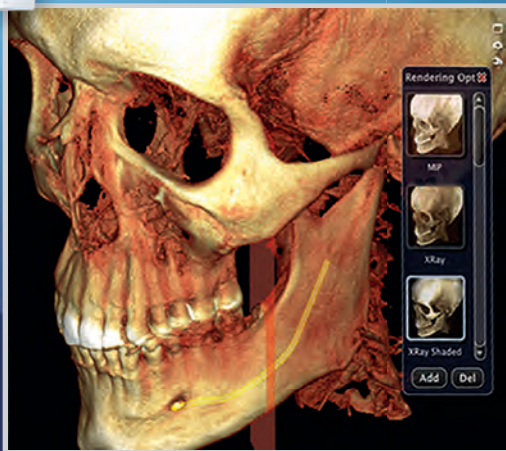
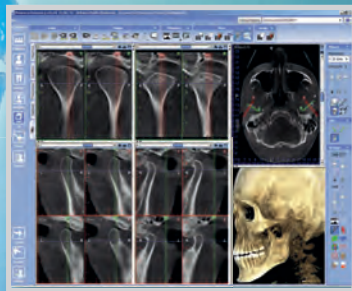
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Immediate Implants in the Anterior Maxilla with Augmentation

Jose Antonio Sanchez Caballo, DDS¹

Abstract



Background: Placement of dental implants in the anterior sector is a challenge to obtain perfect results biologically and prosthetically. Upon loss of an anterior tooth, physiologic changes in the gingival and underlying bony architecture can lead to unaesthetic outcomes and difficult implant placement. The aim of this article was to demonstrate a case in which anterior esthetics and physiologic function were preserved following maxillary anterior tooth removal and replacement with a dental implant and bone graft.

Methods: A maxillary central incisor was removed revealing a significant bony fen-

estration in the facial plate. A dental implant was placed followed by guided bone regeneration of the fenestration with xenograft and a resorbable membrane.

Results: Excellent gingival esthetics were achieved and prosthetic restoration of the dental implant has been successful both esthetically and functionally for 12 months.

Conclusions: Careful attention to detail can preserve anterior maxillary esthetics when proper regenerative techniques are combined with dental implant placement.

KEY WORDS: Dental implants, guided bone regeneration, bone graft, prosthetics

1. Private practice, Sevilla, Spain



Figure 1: Pre-operative view in occlusion.



Figure 2: Pre-operative view (facial).



Figure 3: Pre-operative view (palatal).



Figure 4: Special blade to conserve the papilla.

BACKGROUND

This article describes the clinical process and results of the surgical treatment of the immediate implants. We know that in order to make an implant to look as a natural as possible, esthetics and the function are the priorities. Therefore, the study needs to be meticulous in order to obtain success for a long period of time. The bone stability and the

soft tissue around the implant are essential.

The bone quantity and quality of the osseointegration affects gingival architecture and final esthetic results.¹ Because we know that resorption occurs following tooth extraction, efforts must be made to preserve bone. This can be achieved by immediate implant placement and bone grafting. In this case report, we will show the technique for treatment of a maxillary incisor.



Figure 5: Intrasulcular incision with two vertical discharges.



Figure 6: Cautious flap reflection.



Figure 7: Atraumatic tooth extraction.

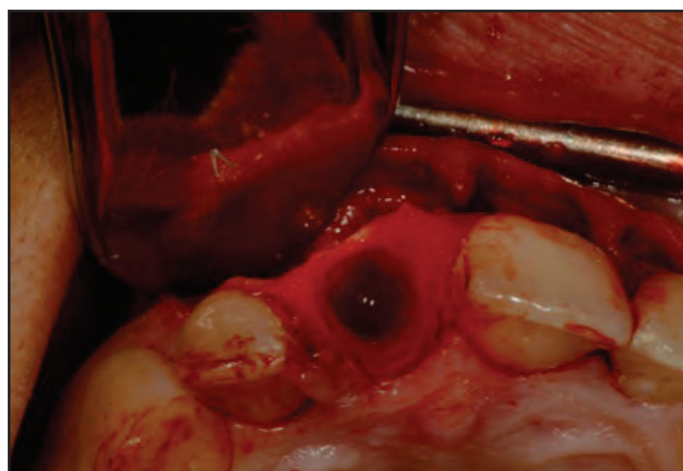


Figure 8: Preservation of the hard tissue structures.

The first three figures show the pre-operative condition of the patient (Figures 1-3). The flap design preserves papillary structures to eliminate scarring and incorporates vertical incisions for access (Figures 4, 5).² After careful flap reflection (Figure 6), the tooth was removed atraumatically (Figure 7). After the extraction of tooth #8, we can appreciate the preserved hard tissue (Figure 8). The extraction socket was

carefully degranulated (Figures 9, 10), revealing significant loss of the facial plate of bone. To facilitate immediate implant placement, a palatal groove was created to aid implant stability (Figure 11). Following placement of the dental implant (Figure 12), autogenous bone chips were placed on the implant surface (Figure 13). To facilitate ridge preservation, xenograft particulate was placed (Figure 14). The reason we

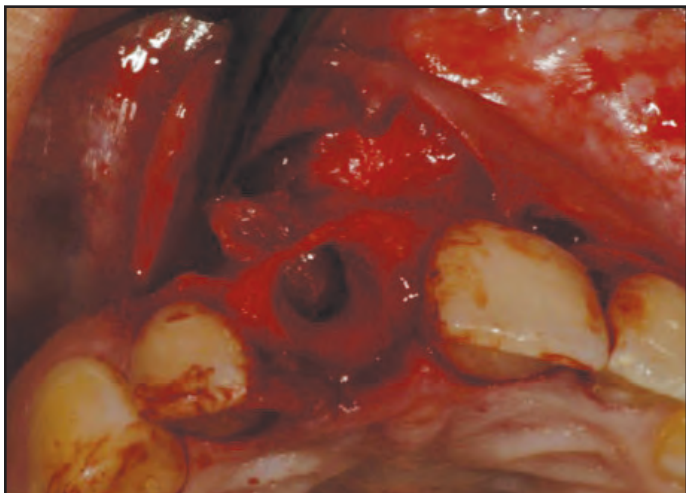


Figure 9: Degranulation.



Figure 10: Further degranulation with rotator instrument and ultrasound.



Figure 11: Palatal groove created to facilitate implant placement.



Figure 12: Insertion of the implant.

placed autogenous bone prior to xenograft particulate is explained by studies by Beglundh.⁴ In his study, xenograft was never in direct contact with the dental implant surface. Thus, we placed autogenous bone on the implant surface followed by an overlay of xenograft bone.

In determining implant placement for papilla maintenance, we need to examine the adja-

cent teeth position and bony structures. By examining anticipated contact height to bone with adjacent teeth, we desire to place the implant 1.5mm horizontally from adjacent teeth with its platform approximately 4.5mm to the future contact point.⁵ To avoid ridge resorption, we also need to examine the thickness of the bone in the implant site. Qahash noted

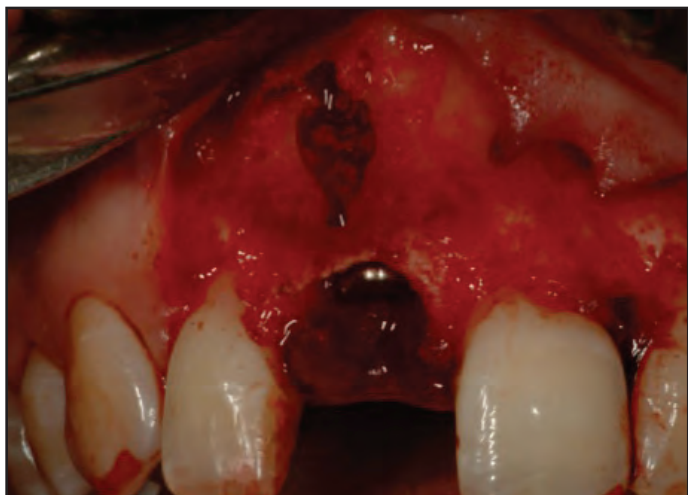


Figure 13: Autogenous bone with PRFG to facilitate osseointegration.

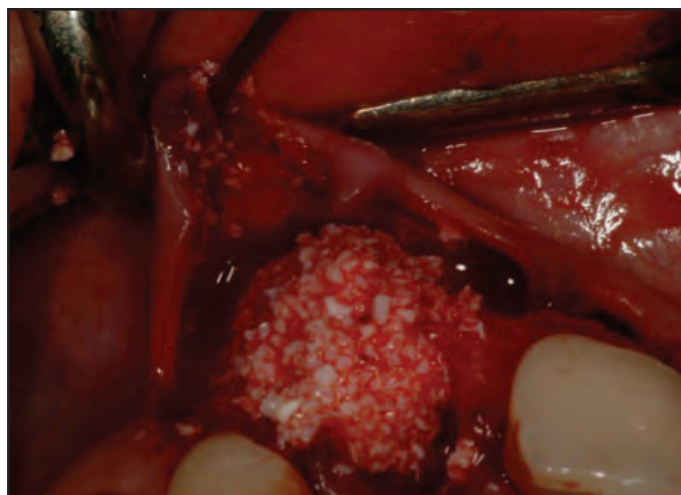


Figure 14: Bio-Oss in activated PRFG.



Figure 15: Placing membrane that has slow resorption wet in PRFG for bone regeneration.



Figure 16: Flap liberation to suture without tension.

that a thick bony wall will result in less vertical and horizontal resorption.⁶ Average bone thickness in the anterior is $\leq 1\text{mm}$ 87.2% of the time and 2mm thick only 3% of the time. Consensus from studies seems to agree that a minimum thickness of 2mm of buccal bone is ideal for implant placement tissue stability. If this minimum requirement is not met, ridge aug-

mentation should be performed prior to or at implant placement to achieve this dimension.⁷ At the same time, we have to consider Nevins' work. Nevins made a study in order to determine the destiny of the vestibular bone after the extraction of the anterior superior teeth, and he evaluated the task of xenograft such as the refill bone in order to maintain the

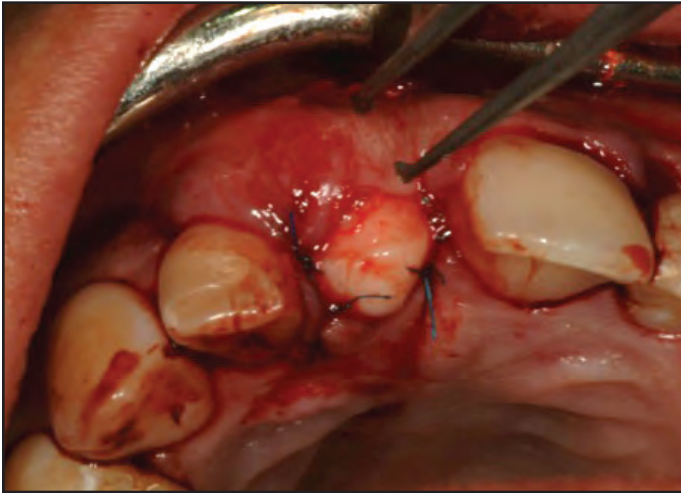


Figure 17: We place the graft in the wound that used to occupy the tooth for reposition of the flap in the same position.



Figure 18: Provisional with vacuum-palate.



Figure 19: 15 day healing (facial view).



Figure 20: 15 day healing (occlusal view).

ridge shape⁸. His conclusions were that adding xenograft could preserve ridge dimensions.⁸ Adding autologous bone over the implant threads followed by an overlay of xenograft bone is known as the “sandwich Technique.”⁹

In 2003, Schenk studied the resorption of particles of xenograft in the jawbone noting slow resorption of this material.¹¹ Placing

xenograft with autologous bone is ideal in the author’s opinion. In this manner, it will form a mass of bone that will be in a close contact with the particles, according to Young.¹² In order to maintain the xenograft,¹³ it is necessary to use a membrane (Figure 15) for wound stabilization and epithelial exclusion. Tension free closure is also necessary to obtain an ideal result (Figures



Figure 21: Final results (in occlusion).



Figure 22: Final results (palatal view).



Figure 23: Final results (right profile view).



Figure 24: Final results (left profile view).

16-18). When tension free closure is achieved, early healing is improved (Figures 19, 20).

Final healing and restoration (Figures 21-24) produced a good result in this case and the patient was very happy. After one year of healing, the implant has remained stable along with the gingival tissue (Figures 25-27). ●



Figure 25: Final radiograph.



Figure 26: Healing at one year.



Figure 27: Healing at one year (close up view).

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Disclosure

The author reports no conflicts of interest with anything mentioned in this paper.

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