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CASE REPORT

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

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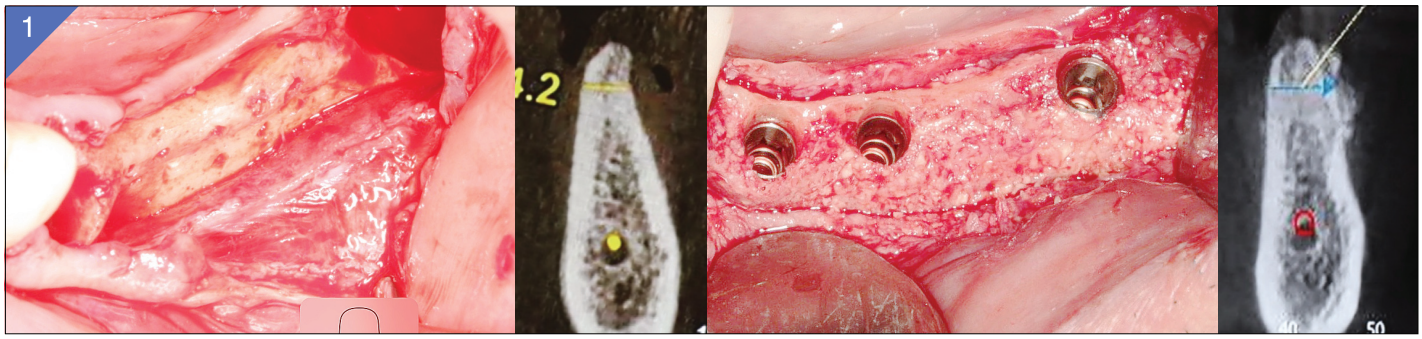

Figure 1a-d. a) Pre-operative mandibular ridge. b) Pre-operative 3D CBCT. Cross-sectional of the first molar area. c) Three DENTIS Cleanlant s-Clean™ implants placed during second surgical procedure. d) Post-operative CBCT. Cross-sectional of the first molar area.

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.

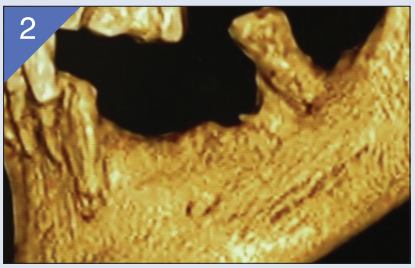

Figure 2. Pre-operative 3D CBCT view of the lower left posterior region.

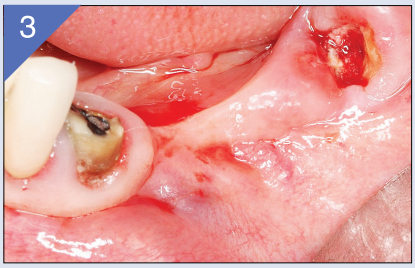

Figure 3. Clinical presentation of non-restorable teeth and moderately resorbed edentulous ridge.

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).

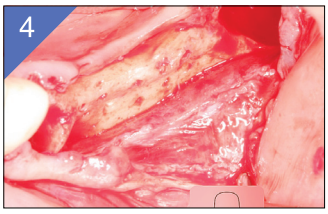

Figure 4. Crestal alveolar incision with full mucoperiosteal flap.

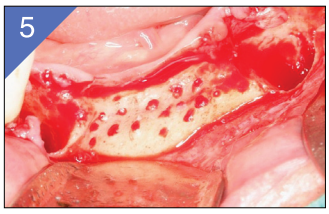

Figure 5. Decortication of the ridge for readily accessible blood flow to the wound, and therefore, regional acceleratory phenomenon (RAP).

"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

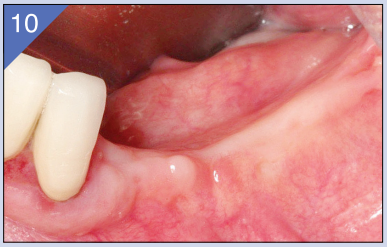

Figure 10. Clinical appearance, 6 months after the first surgery.

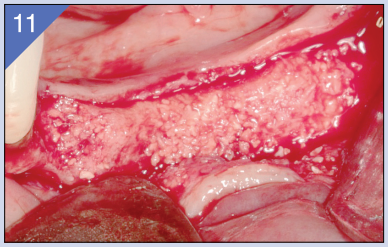

Figure 11. Clinical appearance of the exposed ridge, 6 months after ASAP surgery

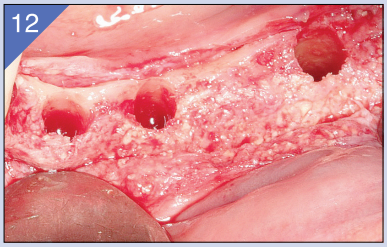

Figure 12. Clinical appearance of osteotomy in preparation for implant insertions. Bone quality was deemed excellent.

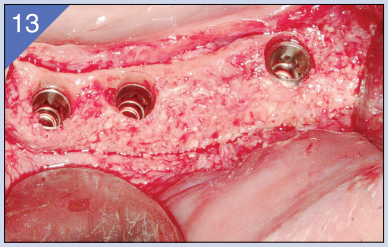

Figure 13. Implants were inserted into the prepared sites. Three DENTIS Cleanlant s-Clean™ implants were utilized.

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).

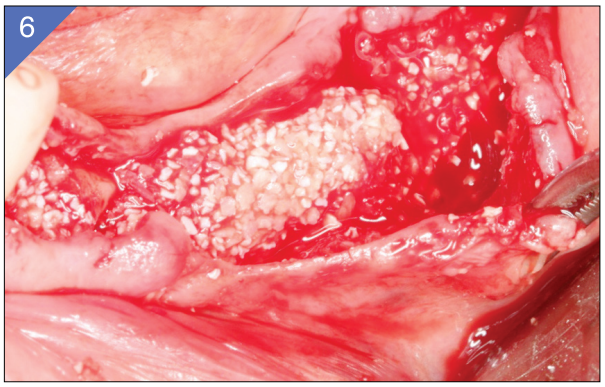

Figure 6. Adaptation of "sticky bone" over the prepared ridge defect and extraction socket defects.

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).

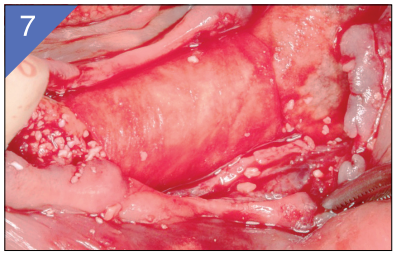

Figure 7. Resorbable collagen membrane was adapted over "sticky bone".

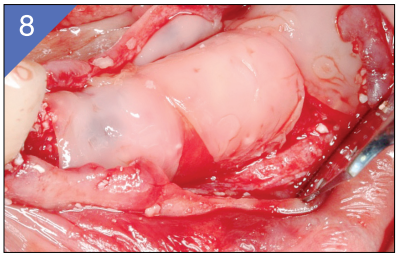

Figure 8. Three pieces of concentrated growth factor (CGF) was pressed to flat configuration and layered over the bone graft material and collagen membrane.

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

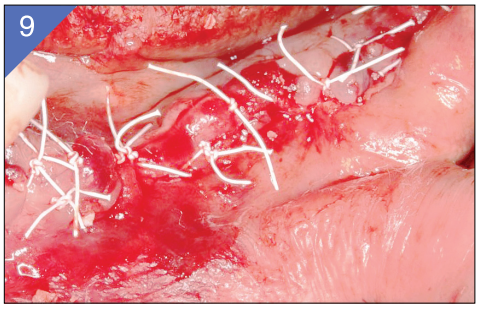

Figure 9. Primary closure was achieved with non-resorbable, long-lasting teflon sutures.

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).

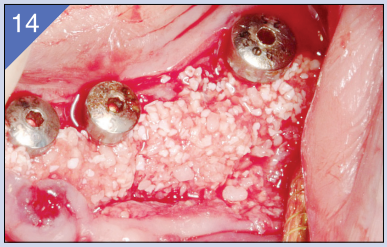

Figure 14. Additional grafting was carried out on the facial aspect of the dental implants to assure adequate facial bone contour.

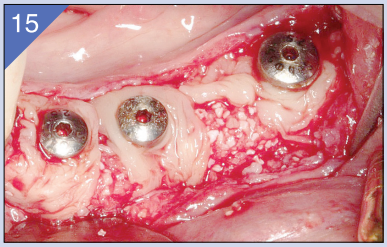

Figure 15. The Poncho Technique utilizing pressed CGF/PRF. This assures rapid and predictable soft and hard tissue healing around the healing abutments.

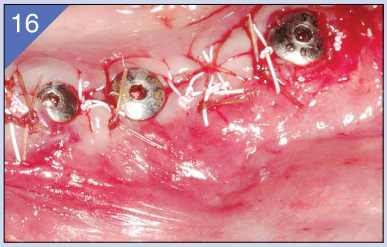

Figure 16. Immediate post-surgical clinical view. Soft tissue flap is tightly adapted around the three healing abutments.

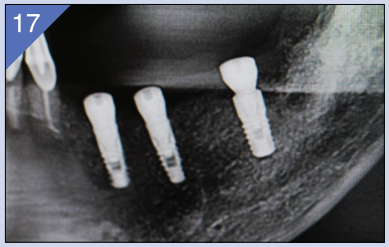

Figure 17. Radiographic view of post implant placement.

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.

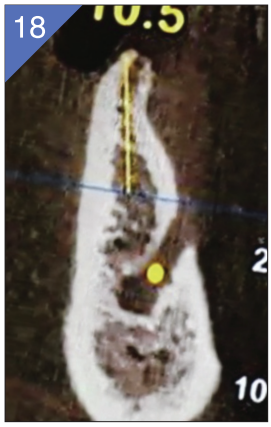

Figure 18. Pre-operative CBCT. Cross-sectional section of the first premolar region.

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.

References

1. Aghaloo TL, Moy PK. Which hard tissue augmentation techniques are the most successful in furnishing bony support for implant placement? Int J Oral Maxillofac Implants. 2007;22:49-70.

2. Rodella LF, Favero G, Boninsegna R, et al. Growth factors, CD34 positive cells, and fibrin network analysis in concentrated growth factors fraction. Microsc Res Tech. 2011;74(8):772-777.

3. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, Gogly B. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part I: technological concepts and evolution. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;101(3):e37-44.

4. Sohn D-S, Huang B, MD, Kim JY, Park WE, Park CC. Utilization of Autologous Concentrated Growth Factors (CGF) Enriched Bone Graft Matrix (Sticky Bone) and CGF-Enriched Fibrin Membrane in Implant Dentistry. J Implant & Advanced Clinical Dent. 2015; 7(10): 11-29.

5. Kim JY. Contemporary Use of Biologics, Immediate Provisionalization, and the Autologous Sticky Augmentation Procedure (ASAP) Protocol in Anterior Esthetics. Presentation at World Congress of Ultrasonic Piezoelectric Bone Surgery 2016, April 2016, Bangkok, Thailand.

6. Giffin K.M., "Providing intraosseous anesthesia with minimal invasion," J Am Dent Assoc 1994, 125:1119-1121.

7. Frost HM. The regional acceleratory phenomenon: a review. Henry Ford Hosp Med J. 1983;31:3–9.

8. Garg AK. The regional acceleratory phenomenon: an up-to-date rationale for bone decortication. Dent Implantol Update. 1997;8:63–64.

9. Wang HL, Boyapati L. "PASS" principles for predictable bone regeneration. Implant Dent. 2006 ;15(1):8-17.

10. Dahlin C, Sennerby L, Lekholm U, Linde A, Nyman S. Generation of new bone around titanium implants using a membrane technique: an experimental study in rabbits. Int J Oral Maxillofac Implants. 1989;4:19-25