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CASE REPORT

Feasibility of using allograft bone with resorbable collagen membrane for alveolar ridge vertical defect augmentation for dental implant placement in Patient with Aggressive Periodontitis: A case report

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KEYWORDS

Guided bone regeneration;
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Abstract *Purpose:* This case report demonstrates the feasibility of using allograft bone with a resorbable collagen membrane to correct an alveolar ridge defect and achieve a highly esthetic restoration.

Case presentation: A 30-year-old woman with generalized aggressive periodontitis and advanced periodontal vertical bone loss in periodontally hopeless upper left right premolar which required a fixed restoration. A staged surgical strategy was devised. First, a resorbable collagen membrane and allograft bone grafts were used to guide bone regeneration in the vertical alveolar defect. After 6 months, complete bone regeneration was achieved and the dental implants were submerged in the bone. Three months later, the implants were exposed and subsequently restored with a crown.

Conclusion: The vertical guided bone regeneration strategy of using allograft bone and a resorbable collagen membrane has the potential to eliminate the need for additional procedures, which are required with non-resorbable membranes, sinus lift procedures, and extensive block graft procedures.

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1. Introduction

The long-term success of dental implant therapy requires adequate bone volume at the site of implant placement (Lekholm et al. 1986). It is therefore crucial that any bone loss or defect is treated prior to or during implant placement. Bone loss in alveolar bone can result from vertical or horizontal bone loss

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or a combination of both. Several surgical techniques such as bone grafting including sinus lift, distraction osteogenesis, bone splitting, guided tissue regeneration (GTR), and guided bone regeneration (GBR) have been used to correct alveolar bone defects (Buser et al. 1993; Oda et al. 2000; Cordaro et al. 2002; Donos et al. 2002, Hammerle and Karring, 2000). In particular, GBR has shown efficacy in treating vertical resorption of the alveolar ridge by regenerating significant amounts of supracrestal bone in conjunction with autogenous particulated bone graft (Tinti et al. 1996) or allograft material (Simion et al. 1998). GBR permits both a simultaneous or staged approach for bone regeneration and implant placement, with several clinical studies showing an excellent long-term outcomes using a staged approach of placing implants in regenerated bone (Buser et al. 1996; Nevins et al. 1998).

This generalized aggressive periodontitis clinical case report describes and demonstrates the feasibility of using an allograft bone with a resorbable collagen membrane to correct vertical alveolar ridge defect, along with implant installation in the upper left first premolar to achieve a highly esthetic restoration without requiring sinus lift or non-resorbable membrane.

2. Case report

2.1. Patient profile

2.1.1. Case presentation

A 30-year-old female patient presented for periodontal evaluation. Informed consent was obtained from the patient. The patient was diagnosed with generalized aggressive periodontitis based on the presence of multiple deep pockets ranging from 4 mm to 7 mm and increased mobility in multiple teeth with lack of local factors and familial aggregation history. In particular, the upper left first premolar (tooth #24) had periodontal probing depths of up to 10 mm and mobility grade III, and a history of root canal treatment, crown application, and dentoalveolar infection. Radiographic examination revealed advanced periodontal bone loss with a predominantly vertical bone defect in both the mesial and distal aspect (Fig. 1A and G). As the patient desired a fixed restoration, a staged surgical strategy was devised to first regenerate the vertical alveolar defect and reconstruct form and esthetics, followed by implant placement.

2.1.2. Surgical procedure

After an oral rinse with 0.12% chlorhexidine for 1 min, atraumatic extraction was performed for tooth #24. To gain adequate surgical access, a divergent vertical incision was made at the mesial line angle of tooth #25 and distal line angle of tooth #23. Next, a full-thickness flap was reflected beyond the mucogingival junction and at least 5 mm beyond the bone defect using periosteal elevators (Fig. 1B). A 20 × 30 mm collagen membrane (BioMend Extend, Zimmer, Carlsbad, CA, USA) was trimmed to correspond to the defect dimension and anticipated graft volume. First, the membrane was fixated on the buccal side using 5-mm tacking pins (TruTACK, Brockton, MA, USA). After placing approximately 2 cc of the bone graft (Puros Cortical-Cancellous Particulate Allograft, Zimmer, Carlsbad, CA, USA) within the space and appositionally on the vertical alveolar defect, the membrane was folded over onto the palatal alveolus (Fig. 1C and D).

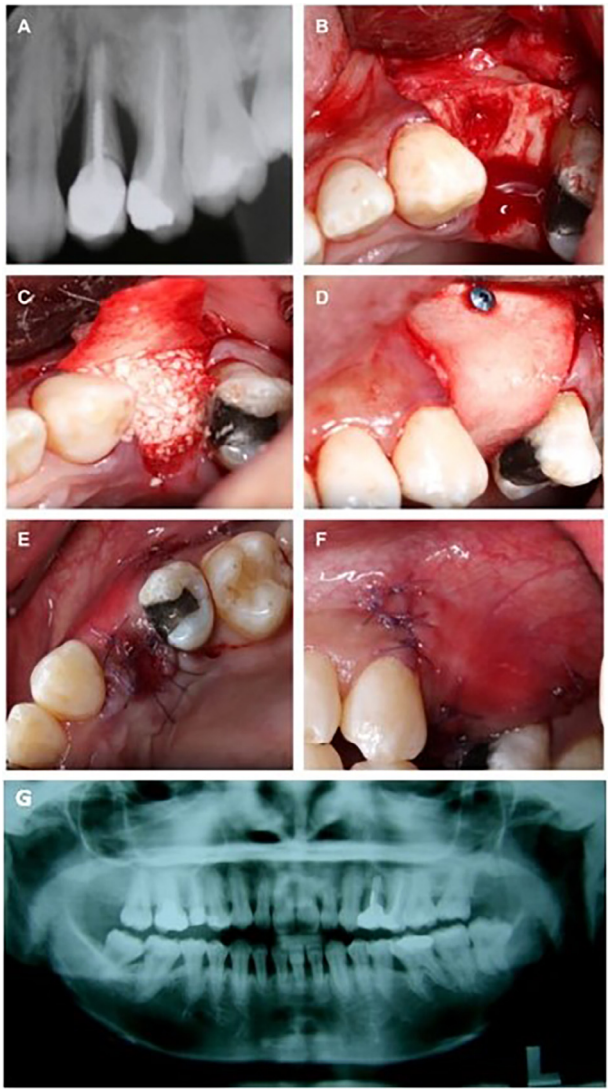

Fig. 1 A, Preoperative periapical radiograph showing a significant vertical defect corresponding to tooth #24, B–F, Intraoperative images. B, The bone defect visualized after flap reflection. C, The membrane was fixed on the buccal side by tacking pins and the defect was filled with Cortical-Cancellous Particulate Allograft. D, The membrane was adapted over the graft. E, Occlusal view after suturing the flap. F, Buccal view after suturing the flap. G, Preoperative orthopantomogram (OPJ) view showing generalized severe bone loss with vertical defect and lack of radiographic local factors.

Next, the flap was closed in two layers using horizontal mattress to stabilize the membrane and decrease tension and single interrupted absorbable 5/0 sutures (Vicryl, Ethicon, Boston, MA, USA) (Fig. 1E and F) to achieved the primary closure with tension free.

Postoperative management was comprised of oral antibiotics (Amoxicillin, 500 mg, thrice daily for 1 week) and an anti-inflammatory medication (Ibuprofen, 400 mg thrice daily for 1 week). Oral rinsing with a 0.12% chlorhexidine solution was performed daily from 24 h post-surgery to avoid clot disturabance, until the time of suture removal for chemical plaque control. Postoperative swelling was most prominent at 48 h

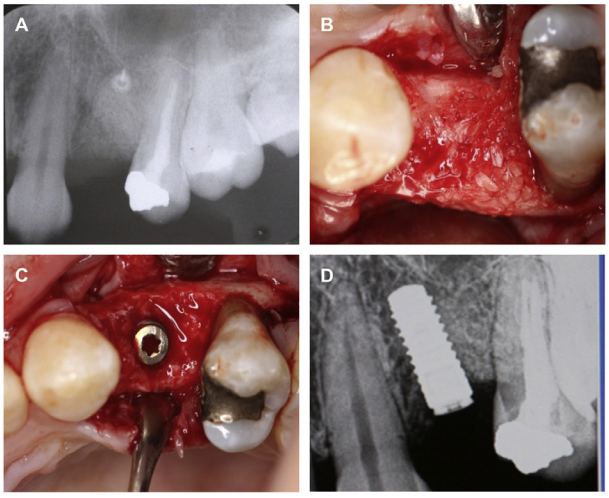

Fig. 2 Six months after the grafting procedure, a periapical radiograph was obtained (A), and the ridge crest was exposed (B) to place the implant (C). A periapical radiograph was obtained at implant loading (D).

postoperatively and gradually subsided thereafter, disappearing completely after 1 week. There was mild postoperative discomfort from the swelling and negligible pain during the postsurgical period.

After 6 months of healing (Fig. 2A), the repair area was accessed through the same full-thickness flap to reveal bone growth (Fig. 2B). Complete vertical bone regeneration was observed radiographically and intrasurgically after removal of the TruTACK pins, and the defect also demonstrated complete bone fill. About 2 mm of the previously denuded root surface of tooth #25 was also in intimate contact with bone. The dental implants (Straumann Bone Level NC, 3.3-mm diameter Roxolid implant material, Straumann, Andover, MA, USA) were next placed in accordance with the manufacturer's protocol (Fig. 2C and D). The implants were submerged in the bone (Fig. 3A) through a 2-stage technique for 3 months and then uncovered (Fig. 3B), increasing the zone of attached gingiva with free gingival graft (FGG), and restored with a crown (Fig. 3C) one year after loading to achieve a highly esthetic restoration.

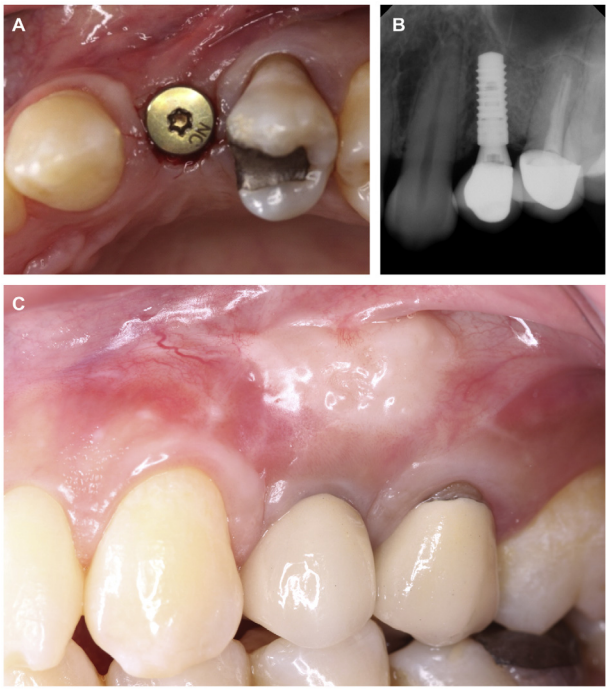

Fig. 3 A, Second-stage surgery three months after placement. B, Periapical radiograph at 1 year after loading. C, Definitive prosthesis at 1 year after loading.

3. Discussion

This limited case report demonstrates the feasibility of an allograft bone and resorbable collagen membrane for vertical guided bone regeneration (GBR). Remarkable vertical bone regeneration was induced within a critically sized alveolar defect without the need for a non-resorbable membrane. Vertical alveolar ridge augmentation was performed successfully, leading to 100% implant success (Albrektsson et al. 1986) and survival over 12 months. Further, significant gain in periodontal bone was achieved near the previously denuded root surface that facilitated subsequent implant placement.

Both non-resorbable and resorbable membranes have been used in GBR with similar rates of success in vertical ridge augmentation (Merli et al. 2014) and bone regeneration in conjunction with demineralized freeze-dried bone allograft particles (Langer et al. 2010). GBR using titanium-reinforced polytetrafluoroethylene e-PTFE membranes in posterior maxillary vertical regeneration has been performed with varying rates of implant survival and success (Albrektsson et al. 1986). While enhanced surface implants (Ti-Unite, Nobel Biocare) achieved 100% success rates after vertical GBR (Urban et al. 2009), machined surface implants achieved only 92% implant survival and 76% implant success rates (Simon et al. 2004). However, non-resorbable membranes not only require very delicate adaptation and stabilization, but are also time-consuming and require a second membrane-removal surgery, which risks exposure of the regenerated bone. Conversely, resorbable collagen membranes, as used in this case, eliminate the need for the second membrane-removal surgery and require less adjustment, thereby reducing the amount of time needed to perform the procedure, and decreasing postsurgical trauma and patient morbidity (Benic and Hämmerle, 2000).

The guided bone regeneration (GBR) strategy of using an allograft bone with resorbable collagen membrane has the potential to eliminate the need for additional procedures required with non-resorbable membranes, sinus lift procedures, and extensive block graft procedures. While preliminary results are encouraging, continued follow-up is required to investigate the stability of the newly regenerated bone and long-term implant success. Additional studies using controlled long-term, randomized, clinical trials and histological analysis are necessary to establish the superiority of this strategy over conventional strategies.

Conflict of interest

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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