



Esthetic treatment of anterior implants: A case report

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ABSTRACT

Aesthetic implant treatment in the maxillary anterior area can be challenging, especially in case of insufficient bone volume. In this clinical report, a guided bone regeneration procedure using the combination of xenograft and allograft with non-resorbable membrane was applied in the atrophic edentulous alveolar crest to reconstruct a proper implant bed. Moreover, Prosthetic tissue molding was performed to improve success and optimize aesthetics. This article provides information relevant to treatment plans, surgical procedures, and prosthetic management in aesthetically important areas.

Keywords: Dental implants; Alveolar ridge augmentation; Membranes; Dental prosthesis; Implant-supported.

Introduction

The dental implant is a successful method to replace teeth and restore aesthetics and function [1]. Congenital missing of permanent teeth is usually seen with the absence of the supporting bone. On the other hand, ideal dimensions of the width and the height of the ridge are among the surgical prerequisites to gain opti-

mal three-dimensional guided implant placement [2]. Besides the bone quality and quantity, attaining a pertinent peri-implant soft tissue is another criterion to provide a successful implant treatment especially in the aesthetic zone. Gingival characteristics such as color, contour, bio-type, marginal level, and inter implant papillae fill are all

included in soft tissue profile around dental implants [3]. Considering the harmonious peri-implant structures, there are hard and soft tissue engineering processes [4]. Bone augmentation procedures are one of the stages exploited in atrophic areas to attain long-term functional and predictable esthetical outcomes before considering the next step, which is prosthetic restoration placement [4]. Bone augmentation procedures could be performed applying Autogenous bone grafts, bone substitute materials, or a combination of both as composite grafts. The Autogenous bone graft procedure is considered as the gold standard in bone regeneration techniques [5]. Despite its benefits, it also includes some complications such as wound exposure, risk of infection, hematomas, wound problem, reoperation, pain, sensory loss, and scar [5].

Guided Bone Regeneration (GBR) is a practical technique that efficiently allows implant placement in atrophic areas. It is primarily based on the concept of applying a resorbable or a non-resorbable barrier membrane to stabilize the blood clot and to create space into which cells originating from bone tissue can grow without the interference of the faster proliferating soft tissue cells [6]. Delayed positioning of implants in GBR grafted areas should be considered more predictable than immediate positioning [1]. According to literature procedures such as staged GBR are proven to be more effective especially in partially edentulous ridges, when a horizontal defect is present [7]. Soft tissue management and preservation around dental implants starts before extracting the tooth, continues during the surgical procedures, and consists of soft tissue grafts and provisional restorations [3,4].

The provisional restoration plays a great role in mold and shapes the soft tissue geometry around implants before definitive prosthesis. This is a clinical report of a periodontally involved patient, with remained deciduous teeth and alveolar bone defect in the anterior maxilla. The case was managed through a multidisciplinary treatment, including the hard and soft tissue augmentation procedures, provisional and definitive implant restorations.

Case Description

A 31-year-old woman with a non-contributory medical history and chief complaint of gingival bleeding, spacing, and tooth mobility was referred to Periodontology Department. The patient was diagnosed with generalized moderate chronic periodontitis. A retained deciduous canine and advance root resorption of incisors were observed in the anterior right upper

segment (Figure 1). Oral and periodontal health was established through scaling and root planing. Moreover, a pocket reduction flap surgery was performed in posterior segments. A surgical stent was made to guide the 3D placement of implants in optimum position. Based on cone-beam-computed tomography (CBCT), bone augmentation of osseous defects was proposed.



Figure 1. Pre OP. documents A) intra oral view B) radiographic view.

Esthetic crown lengthening was performed in the maxillary anterior segment for gingival leveling. Three months later, the atraumatic extraction procedure was carried out with a full-thickness surgical flap approach including papilla preservation, crestal and vertical releasing incisions. After the socket curettage, GBR was performed using Cytoplast (GBR200, Osteogenic Biomedical, Lubbock) (Figure 2A). Decortication was performed using a round bur to access the blood supply from the cancellous bone. Horizontal bone augmentation was performed using particulate allograft material (Sureoss FDBA, HansGBR) and xenograft (Compact Bone, Dentegris Deutschland GmbH) on top for slower resorption. With the graft in place, the membrane was fixed with screws from the buccal and palatal (2×7mm; Medicon GmbH) (Figure 2B). This barrier provided space for tissue regeneration against the pressure from the soft tissue and avoided the migration of epithelial cells [8]. Within 14 days after surgery, the provisional resin-bonded fixed partial denture was delivered.

Four months following surgery, the cytoplast was removed and a flap closure was achieved to maintain the periosteum in close contact with the bone, leading to better bone remodeling and tissue forming (Figure 2C) [Office 1]. To have optimal implant position and papilla preservation, the provisional prosthesis remained until the time of implant placement [9]. CBCT was taken 2 months following the membrane removal, showed significant bone gain with an increase in the horizontal dimension (Figure 2D). Three implants (Dentium; 4mm in diameter and 12mm in length)

were placed in the edentulous area using a surgical stent with the papilla preservation technique [10] (Figure 3). Implants were submerged beneath the soft tissue to facilitate osseointegration and bone maturation.

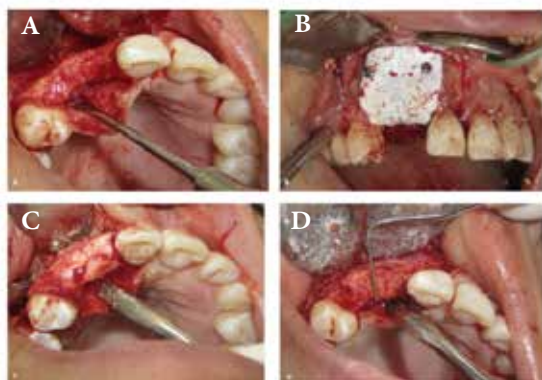


Figure 2. A) Intra oral view of defect before GBR B) GBR and membrane fixation C) Membrane removal after 6 months D) Ideal bone contour and volume ready for implant insertion.

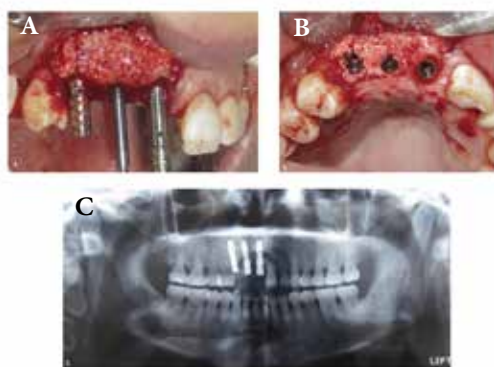


Figure 3. Implant inserted through surgical guide A) Frontal view B) Occlusal view C) Radiographic view.

Three months later, the implants were exposed and a subepithelial connective tissue graft was placed to increase the height of the papilla [11]. The soft tissue was allowed to heal for two months before restorative procedures. A fixed implant-supported provisional restoration was fabricated for tissue molding and optimizing the health of soft tissue. As it is shown in figure 4A, there was no interdental papilla at baseline, when the provisional restoration was delivered. (Figure 4A) By forming the contour of the gingival part of the restoration in several appointments, the scalloped architecture was created through the interdental papilla growth into the embrasures.

The emergence profile consists of two contours: 1) Critical contour, which is placed 1mm below the gingival margin and its modification alters the marginal level. 2) Subcritical contour which is below the critical

contour and should be concave to provide enough soft tissue volume [12]. After finalizing the position and contour of the soft tissue gradually in 6months (Figure 4B, C, D), the final restoration was delivered (Figure 5). In permanent cemented restoration, a distance of 5mm or less from the base of the proximal contact to the crest of the bone had been considered for assuring the presence of a proximal papilla [13].



Figure 4. A) Provisional restoration at the time of insertion B) Papilla and gingiva forming gradually with provisional 1month later C) 3 months later D) 6 months later.



Figure 5. Final restoration with good gingival contour and papilla.

Discussion

This report aimed to achieve high aesthetic results in a patient with an atrophic edentulous alveolar crest. According to the “Straight forward, Advanced, and Complex” classification by International Team for Implantology, any implant to be placed in the esthetic zone must be classified as either advanced or complex case and requires more caution [14]. The important factors affecting implant aesthetics include the anatomy and volume of the available bone, the 3-dimensional positioning of the implant, and soft tissue management during the surgical and restorative phases. The quality and quantity of the facial bone affect the long-term harmonious gingival margins [9]. Compromised bone quality can inherently jeopardize aesthetic outcomes.

The presence of pertinent hard and soft tissue contour is a prerequisite for successful implant placement and gaining an emergence profile inharmonic with the adjacent dentition [15]. Bone augmentation is necessary for long-term function and predictable esthetic results, particularly in the atrophic anterior maxilla. Bone Augmentation may promote retaining sufficient bone and allowing for the later prosthetic restoration to be at less risk for bone loss [16], to have a better emergence profile, and to be easier for the patient to perform hygiene [17].

Various surgical techniques could be performed to correct facial bony defects: onlay grafting, GBR, the combination of block bone grafts and barrier membranes, and distraction osteogenesis. Bone augmentation techniques using GBR have shown excellent success rates over time and are less surgically invasive. GBR employs barrier membranes with or without particulate bone grafts or bone substitutes [18]. This procedure was performed with a titanium-reinforced expanded polytetrafluoroethylene membrane and a combination of allograft and xenograft in the anterior area of the maxillary jaw due to its narrow widths. Because of the severity of the defect in the area, it was not possible to insert implants simultaneously with the bone graft procedure. The principles of GBR require the administration of resorbable or non-resorbable membranes. Excellent and more predictable results with the use of non-resorbable membranes have been demonstrated, especially when no exposure occurs during the healing phase [19].

Minding a specific time gap before placing implants in GBR grafted areas is more predictable than immediate implant placement following the grafting procedure [1]. Four months interval between membrane removal and implant placement was considered for bone remodeling and tissue forming to provide periosteum in close contact with the bone. The implants were placed using a surgical guide to obtain successful maxillary prosthesis in the future. The preservation and regeneration of the soft tissue result in successful achieving primary wound closure, fulfilling the main principles for successful GBR, and establishing an ideal functional and aesthetical foundation before prosthetic rehabilitation occurs [17]. Soft tissue management should be taken into consideration at the earliest stages of deciding the final treatment plan, even before tooth extraction [9]. As an implant is inserted adjacent to natural teeth, the concept of biological width emphasizes that the soft tissue should consistently have a 3mm thickness and even more in interproximal areas [20]. To perform GBR and

to use the membrane with fixation, a remote flap, consisting of crestal and vertical releasing incisions, should be used. Although a proper bone quality is restored in this technique, the depth of the vestibule decreases, which should be managed through vestibular deepening techniques. Another problem could be thinning of the gingiva. The thickness of the gingival tissue may slightly decrease following the GBR procedure, which can imperil the shape uniformity of papilla. Although the GBR technique can affect the soft tissue in different manners, such as an increase in the height of gingival papilla and expansion of the keratinized tissue height and width [17].

Provisional implant restoration has a great effect on tissue preservation and modeling. It provides gingival harmony between implants and neighboring teeth. By modifying the contour of the provisional restoration, an ideal emergence profile can be formed in most cases. Using the gingival grafts can provide sufficient gingival thickness, to cover the metal shadow of implant abutments [3]. Interdental or inter-implant papilla plays an important role in the aesthetic zone and thick gingiva is the prerequisite for having a good papilla [11]. As a result, a sub-epithelial connective tissue graft was placed to promote the formation of inter implant papillae. This connective tissue acts as a keratinized tissue [21]. Provisional restoration promotes the papilla to fill in the gap between the contact points [22]. A distance of 5mm or less from the base of the proximal contact to the crest of the bone results in obtaining an intact proximal papilla [23].

Conclusion

This multidisciplinary treatment with the cooperation of periodontists and prosthodontists results in an aesthetic outcome. Exact planning and stepped procedure were the key points of healthy and aesthetically acceptable soft tissue and restorations. The procedure efficiently led to a harmonious gingival and bone architecture, refining the remnant anatomical structures, and also stability of the alveolar bone crest.

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Conflict of Interest

There is no conflict of interest to declare.

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