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Case Report

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Guided bone regeneration using titanium mesh with calium phosphosilicate alloplast in the esthetic zone – A case report

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Reconstruction of defects in the anterior part of the maxilla to enable implant placement is a challenging treatment. The alveolar ridge augmentation along with guided bone regeneration has been introduced in recent years to re-establish an appropriate alveolar ridge width. In guided bone regeneration, the quantity of bone regenerated under the membranes has been demonstrated to be directly related to the amount of the space under the membranes. This space can diminish as a result of membrane collapse. To avoid this problem, a new technique of ridge augmentation, which involves the use of a titanium mesh barrier to protect the regenerating tissues and to achieve a rigid fixation of the bone segments is been used. In this case, excellent results can be seen in which maxillary anterior defect is augmented using guided bone regeneration with simultaneous placement of implant at the site 11 using novabone graft material protected by titanium mesh.

Keywords: Guided bone regeneration; CPS Morsels; Titanium mesh

INTRODUCTION

For dental implant placement, the presence of sufficient bone volume is the most important prerequisite.[1] The early loss of teeth due to trauma or advanced periodontitis often leads to deformities of the alveolar bone. These deformities can lead to complications in attempts for the restoration of related areas. In recent years there has been an increase in the number of studies focusing on the augmentation of these atrophic ridges either before or at the time of implant surgery.[2-6] Predictable bone regeneration of large alveolar defects with complex morphology can pose a significant clinical challenge. Preservation or creation of a soft tissue scaffold needed to create the illusion of a natural tooth is often challenging and difficult to achieve.[7] A subtle mistake in the positioning of the implant or the mishandling of soft or hard tissue can lead to esthetic failure and patient dissatisfaction.[8-10]

The technique of guided bone regeneration (GBR) was evolved to augment atrophic or damaged ridges.[11] GBR employs a physical barrier to selectively allow new bone growth into the space created between the barrier and the existing bone.[12] The emergence of synthetic bone substitutes for grafting should enable today's practitioners to

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perform an almost endless variety of procedures that involve the repair or regeneration of alveolar bone around dental implants or natural teeth. Such materials must satisfy various regulatory requirements and meet clinicians expectations for safety and effectiveness.[13] It has been shown that an expanded polytetrafluoroethylene membrane can be used to improve the healing of both pathologic and experimentally created defects.[14] The rationale of using a titanium mesh is to contain and stabilize the graft, allowing maximum bone regeneration and minimizing overall loss of bone volume. Various forms of titanium mesh have been successfully used to rigidly maintain the alveolar contour with different types of grafts.

Graft materials such as alloplast in combination with membranes enhance success of the treatment of bone defects.

CASE

A 24-year-old male reported to the out patient department of KD Dental College and Hospital Mathura, with missing maxillary right central incisor and mandibular right and left central incisor. The patient gave history of trauma due to accident which resulted in loss of maxillary and mandibular right central incisor. On clinical examination, deficiency in the anterior residual alveolar ridge with loss of buccal cortical plate was noted (Fig. 1). The patient was in good health and was a non smoker with no medical contraindications for surgery, with excellent oral hygiene and a strong desire to restore the area with a fixed prosthesis. On examination there were no clinical signs of periodontitis and dental caries. Radiographically the clinical findings were verified and revealed vertical bone loss that was limited to the maxillary right central incisor.

Fig. 1. Pre-operative view.

Treatment planning

The patient was presented with different treatment options, after discussing the pros and cons of each the following treatment option was planned to receive an implant supported crown restoration after augmentation of the compromised alveolar ridge in the area of missing tooth 11 using alloplast bone graft secured with titanium membrane. Fixed partial denture was planned for replacing mandibular central incisors because of patient's economic problems. Nonetheless, he gave informed consent for the same.

Treatment procedure

A local anaesthetic was administered in the area of the

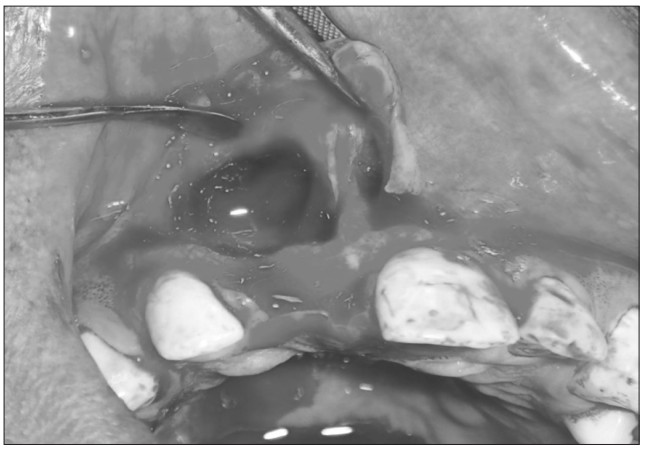

Fig. 2. Bone defect.

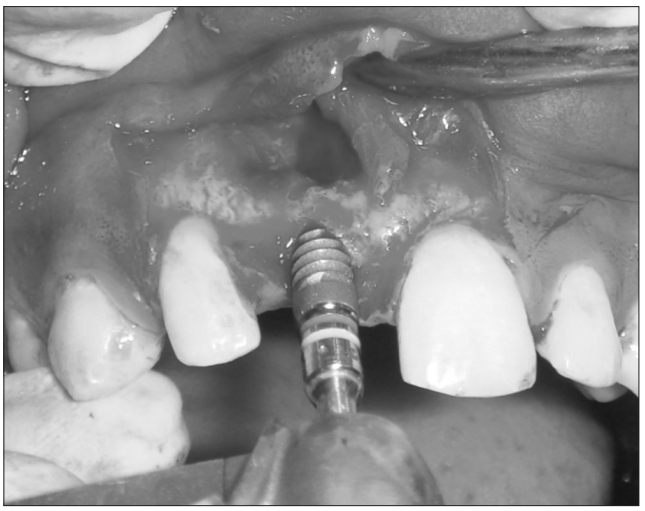

Fig. 3. Surgical placement of implant.

maxillary right upper central incisor. An incision was made on the buccal and palatal aspect of the involved edentulous ridge and a full thickness flap was reflected from tooth 12 to tooth 21 and bone defect was found deficient both horizontally and vertically (Fig. 2).

The Osteotomy was created under copious irrigation on surgical site. A tapered internal implant (Biohorizons, Birmingham, AL, USA) was inserted at 35 Ncm (Fig. 3). Approximately 1 mL of calcium phosphosilicate (CPS) Morsels (NovaBone, Alachua, FL, USA) (Fig. 4) was mixed with sterile saline and allowed to hydrate before being placed and packed into the defect and positioned to fill all void areas (Fig. 5).

A titanium mesh (CTi-mem; NeoBiotech, Seoul, Korea) (Fig. 6) was trimmed to size and placed under the facial flap following the GBR protocol to secure the bone graft in its place and was fixated with the cover screw of the implant (Fig. 7).

Extensive periosteal releasing incisions were made in the facial flap and permit complete coverage of the membrane. Primary wound closure was obtained by horizontal mattress and interrupted cytoplast 4 - 0 sutures (Osteogenics, Lubbok, TX, USA) (Fig. 8). Oral hygiene instructions were given to the patient.

The patient was seen post surgically after two weeks for suture removal; no untoward post operative symptoms were noted. The patient was put on a two week, one month, three month and six month recall ensuring the proper management of implant site,an interim fixed Maryland bridge was

Fig. 4. Bone graft.

Fig. 5. Placement of bone graft.

Fig. 6. Titanium mesh membrane.

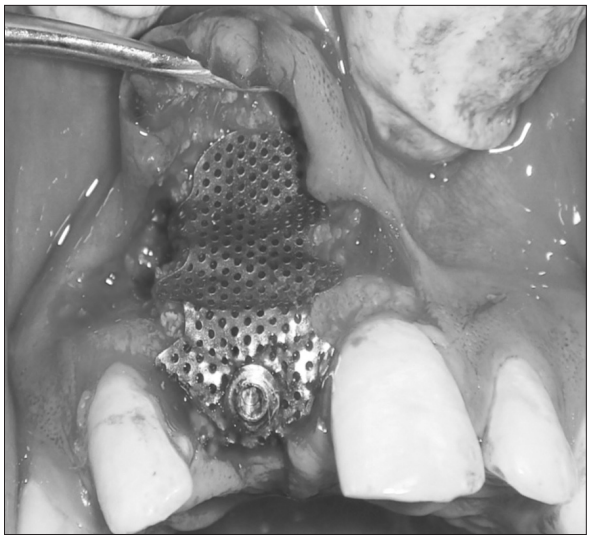

Fig. 7. Securing of with titanium mesh.

resin bonded during the healing phase.

After 5 months, prior to second stage surgery a cone-beam computed tomography was performed and a horizontal bone gain of 5.3 mm was noted, the patient was recalled for second stage surgery where the titanium membrane was removed and the healing collar placed (Fig. 9, 10).

Following three weeks to achieve soft tissue at the implant site, profile, tooth preparation was done on 32 and 42 and upper and lower impressions was made in Impregum (3M ESPE, St. Paul, MN, USA). the final prosthesis on the implant (Fig. 11) and the final prosthesis on the lower anteriors was cemented with Rely-X U200 9 (3M ESPE). The post operative follow up cinical view (Fig. 12) and radiograph taken at 2 year follow up (Fig. 13) show stable peri implant soft tissue and stable crestal bone levels.

DISCUSSION

To satisfy the ideal goals of implant dentistry, the hard and soft tissues need to present ideal volumes and quality. The alveolar process is affected so often after tooth loss that augmentation is usually indicated to achieve optimum results, especially in the esthetic zones. Reconstruction of defects in the anterior part of the maxilla to enable implant placement is a challenging treatment. The alveolar ridge augmentation

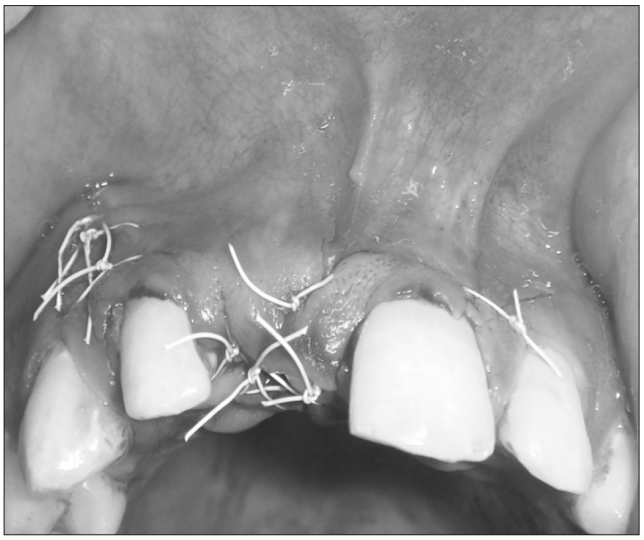

Fig. 8. Cytoplast sutures placed.

Fig. 10. Removal of titanium membrane revealing complete bone fill.

Fig. 9. Computed tomography scan after 5 months.

Fig. 11. Final prosthesis on model.

Fig. 12. Final prosthesis in place.

along with GBR has been introduced in recent years to re-establish an appropriate alveolar ridge width.

Bone regeneration in membrane protected defects, heal in a sequence of steps that stimulated bone formation after tooth extraction. After blood clot formation, bone regeneration is initiated by the formation of woven bone initially along new blood vasculature at the periphery of the defect. The woven bone is subsequently replaced by lamellar bone, which result in mature bone anatomy. Ultimately, bone remodeling occur with new, secondary osteons being formed.

Bone graft materials have been used to facilitate bone formation within a given space by occupying that space and allowing the subsequent bone growth. The biologic mechanisms that support the use of bone graft materials are osteoconduction, osteoinduction and osteogenesis.

Barrier membranes are biologically inert materials that serve to protect the blood clot and prevent soft tissues cells

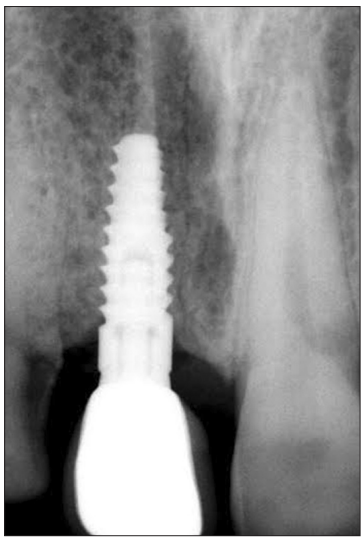

Fig. 13. Stable crestal bone level after 2 years.

(epithelium and connective tissue) from migrating into the bone defect, allowing osteogenic cells to be established. Vertical increase of a narrow alveolar crest has been shown to be possible with membranes.[15,16] Membranes have been manufactured from biocompatible materials that are both non resorbable and resorbable. The advantage of a titanium barrier membrane (non resorbable) is its ability to maintain separation of tissues over an extended time. Unless the barrier is exposed, it can remain in place for several months to years but it require a subsequent surgical procedure to remove them.

Bone augmentation and simultaneous implant surgery procedures allow clinicians to reconstruct alveolar bone deficiencies, preserve alveolar dimensions, and replace missing teeth with dental implants in a prosthetically driven position with natural appearance and function.The two year clinical results obtained in this case demonstrate calcium phosphosilicate alloplast with GBR along wiyh simultaneous implant placement to be a predictable and successful procedure to augment bone at sites exhibiting insufficient bone volume for implant placement under standard conditions and proved to be a successful strategy for anterior esthetic rehabilitation.

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