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Case Report

Implant placement in localized ridge defects using autogenous block graft and GBR: A report of Two Cases

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ABSTRACT:
Anterior teeth esthetics are of prime concern for a charming smile and psychological well-being of an individual. However, unfortunately, this is the most frequently affected site during accidents/trauma and also the most prone site for alveolar resorption once the tooth is lost following extraction thus affecting the esthetics and psychological well-being of a person. In this modern era of dentistry with many alternatives for restoration of the lost tooth, dental implants stand out to be the best treatment options available for replacement. However, not all cases are ideal for implant placement, and some require bone augmentation procedures. Here in this article, we have reported two cases where an implant placement is managed successfully using a combination of the autogenous bone block graft obtained from the mandibular symphysis region and guided bone regeneration (GBR) procedures achieving predictable osseointegration.
Key-words: Ridge augmentation, symphysis blockgraft, GBR, Implants.

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INTRODUCTION:
A smile plays a significant role in dental as well as facial esthetics. Anterior teeth are of prime concern for a charming smile but also the most affected sites in the form of dental trauma and alveolar resorption which may lead to anatomical deficiencies in both soft and hard tissues of facial structures making it difficult for replacement.

Few studies support the concept of common involvement of anterior teeth in TDIs (Traumatic dental injuries). Glendor, in a 12-year systematic review of literature about prevalence and incidence of TDIs, stated, TDIs mainly involve single anterior tooth, maxillary incisors in particular. In another 16-year-old cohort study in northern Sweden, Borssen and Holm's report shows that 75% of the traumatized teeth were upper incisors. [1] The other parameter which accounts for the loss of facial esthetics is bone resorption which has been an inevitable result of tooth extraction. It is estimated that within 12 months, 50% of alveolar bone width is lost after extraction whereas 30% occurs within the first 12 weeks. [2] A further delay in the replacement of prosthesis causes more severe bone loss.

In this modern era of dentistry, with many treatment options available for tooth replacement in traumatized areas, dental implants stand out to be the best treatment option available. But unfortunately, not all cases are ideal for implant placement due to deficient alveolar ridges, and implant placement with uncorrected poor alveolar ridges is a challenging task. It may incur several problems esthetically as well as functionally.

A wide range of techniques have been practiced to alter the width of a deficient alveolar ridge. These include block bone grafting, guided bone regeneration (GBR),

distraction osteogenesis, ridge splitting, etc. Regularly used bone graft materials include autogenous bone, allografts, xenografts, and alloplasts. Typically, autogenous bone is regarded as the gold standard among bone graft materials in the origin-based classification system. The rationale for the gold standard status is that only autogenous bone inherently contains osteogenic cells (cell) on or within the bone matrix. Mesenchymal stem cells within the bone marrow are believed to survive ischemia during grafting, which causes changes in oxygen tension, pH, and cytokine environment. [3]

Autogenous bone grafting can be obtained from extraoral and intraoral sites. Iliac crest and calvarium stand out to be frequently used extraoral donor sites whereas intraoral donor sites include symphysis, retromolar, and maxillary tuberosity areas. The grafts obtained from Intraoral areas surpassed the use of extraoral areas due to its ease of performing under Local anesthesia with less discomfort to the patient. Moreover, the proximity between donor and recipient sites with a low resorption potential made the oral surgeons to choose intraoral sites over extraoral areas. Of all the intraoral sites available, the symphysis region is most widely used due to the availability of both cortical and medullary bone types which is essential for rapid revascularization and good incorporation with little loss of grafted bone volume. [4]

On the other hand, the main disadvantage of using intra-oral donor areas is the limited quantity of bone tissue available. [5]Therefore, it is often recommended to combine with bovine bone particles to expand the volume. The hydrophilicity and osteoconductive properties of these particles allow them to become an integral part of the newly formed bone framework and preserve volume over the long term. The cases discussed here are of horizontal ridge augmentation with bone blocks from intraoral sites coupled with bovine bone particles (Geistlich Bio-Oss®) covered with bioabsorbable collagen barrier (Periocol® - GTR).

CASE REPORT

TECHNIQUE DESCRIPTION:

Upon completion of diagnosis and prognosis (health history, extra- and intra-oral examination, radiographic analysis), a detailed explanation of the identified challenges for tooth replacement and alternate treatment options were given to each patient. On the patient's desire for implant treatment, it was suggested to first proceed with a Ridge augmentation procedure followed by implant placement. After obtaining a specific and detailed informed consent, the procedure started with the administration of local anesthesia at donor and recipient sites using 2% Lidocaine with 1: 100,000 epinephrine.

Later, preparation of the recipient site where the graft needs to be placed was performed, and the donor site has been exposed by placing an incision. A full-thickness mucoperiosteal flap was reflected towards the base of the mandible. Then markings were made of required dimensions, i.e. 20.0*10.0*3.0 mm following the guidelines, i.e. about 5mm away from the root tips of incisors, mental foramen on either side and from the chin of the mandible. A piezotome was used to cut the bone from the donor site. A rectangular monocortical graft block was obtained, and it was further modified into the desired shape and checked for close adaptation to the recipient site. Once, block graft was ready, decortication had been done in the recipient site to enhance the regional acceleratory phenomenon followed by placement of the block graft. The block graft is held in place using a titanium screw of diameter 1.5*10mm. Particulate Xenograft was placed to fill the voids. The entire area was covered with the help of a resorbable membrane. Following this, the flap was replaced, and the area was sutured. Post-operative and oral hygiene instructions were given to the patient, and antibiotic regimen of amoxicillin 500 mg thrice daily and Nonsteroidal anti-inflammatory drug ibuprofen 400 mg twice daily, for a period of five days was prescribed. The use of 0.2% chlorhexidine mouth rinses twice daily for two weeks was instituted. Suture removal was done after ten days. The patient was recalled the next day, after ten days, and three months which showed uneventful healing at both the surgical sites. A Maryland bridge was given to the patient provisionally all through the treatment. A 6-month re-evaluation of the site revealed significant improvement in the width of the ridge, which is followed by implant placement.

CASE 1

The patient was a 27-year-old male in good general health with no known drug allergies. The upper left anterior tooth was missing since two years. Cone-beam computed tomography (CBCT) scan evaluation of the partial edentulous area revealed a deficient buccolingual ridge of dimensions 2.76*17.09 mm. The regenerative procedure was accomplished as previously described, and healing was uneventful. [Figure 1(a-n)]. A second CBCT scan of the area was obtained six months later and revealed significantly improved dimensions in width, i.e. 5.10mm, which allowed for the ideal implant placement of 3.3*14.0 mm diameter implant (Straumann®, BLT, SLActive®). Healing was uneventful and, after uncovering, temporary restoration was given for the soft tissue molding followed by final restoration. [Figure 2 (a-h)].

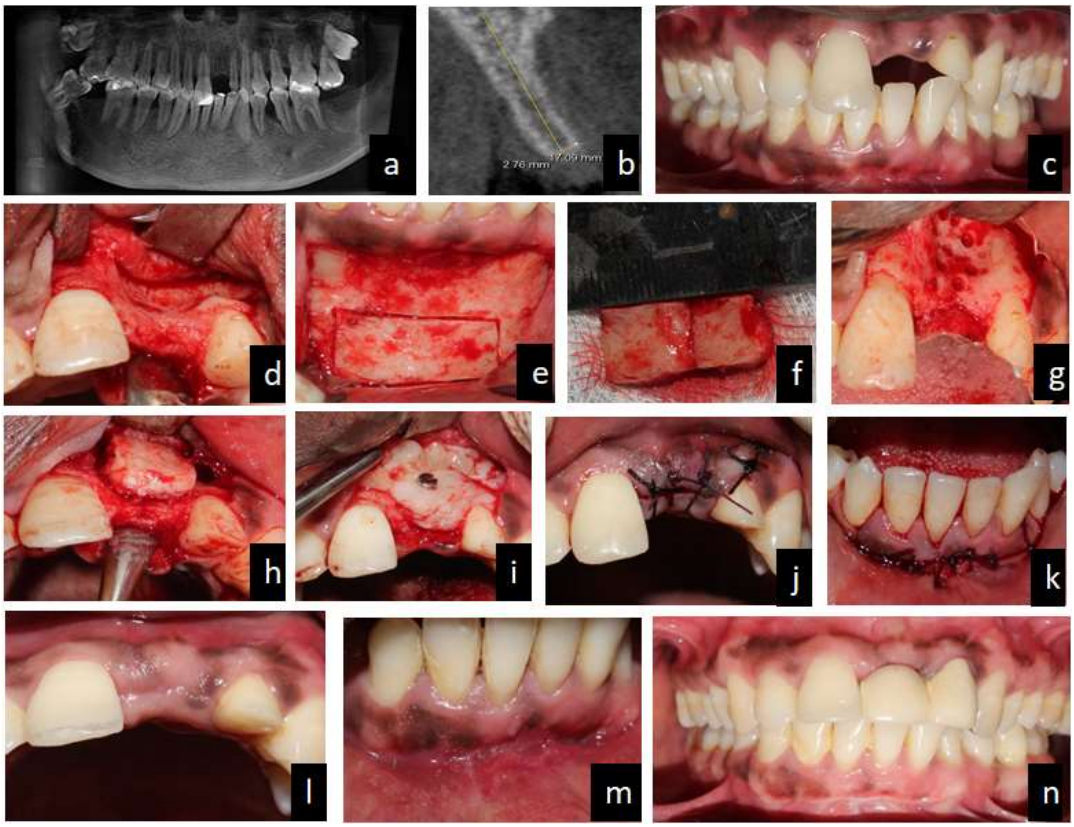

Fig. 1. Ridge augmentation on an upper anterior thin atrophic ridge.

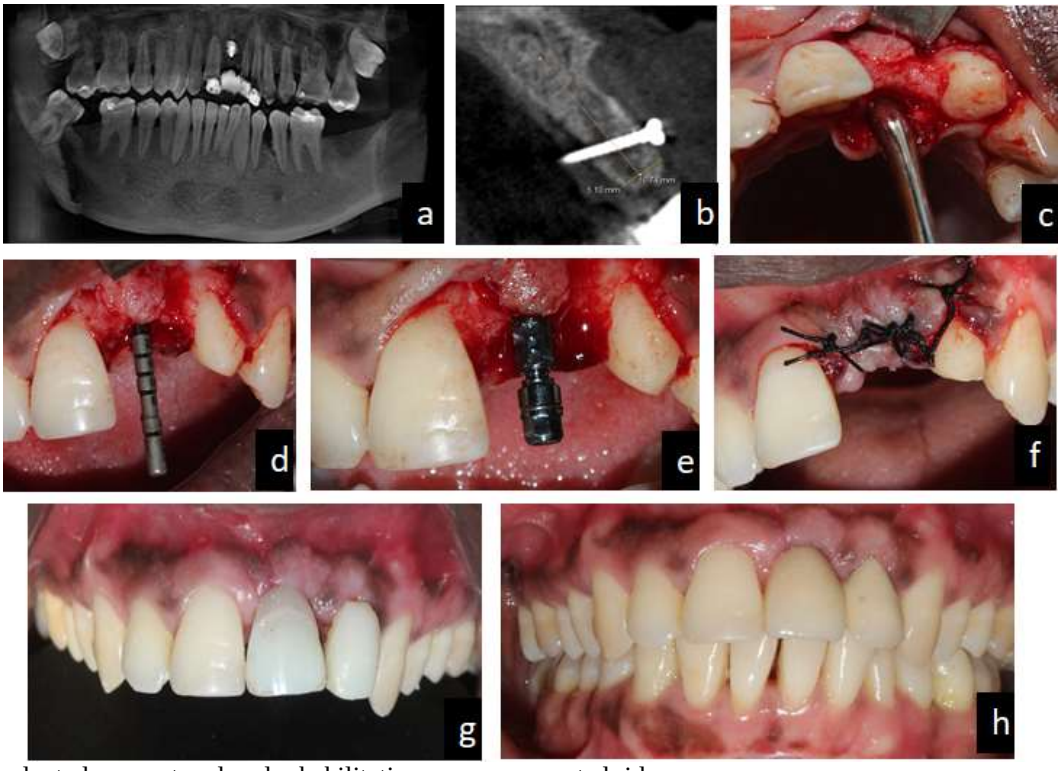

Fig. 2. Implant placement and oral rehabilitation on an augmented ridge.

CASE 2

The patient was a 21-year-old female in good general health with no known drug allergies. The upper left anterior tooth was missing since three years. Cone-beam computed tomography (CBCT) scan evaluation of the partial edentulous area revealed a deficient buccolingual ridge of dimensions 2.15*16.0mm. The regenerative procedure was accomplished as previously described, and healing was uneventful. [Figure 3(a-m)]. A second CBCT scan of the area was obtained six months later and revealed significantly improved dimensions in width, i.e. 5.30mm, which allowed for the ideal implant placement of 3.3*14.0 mm diameter implant (Strauman®, BLT, SLActive®). Healing was uneventful and, after uncovering, temporary restoration was given for the soft tissue molding followed by final restoration. [Figure 4 (a-h)].

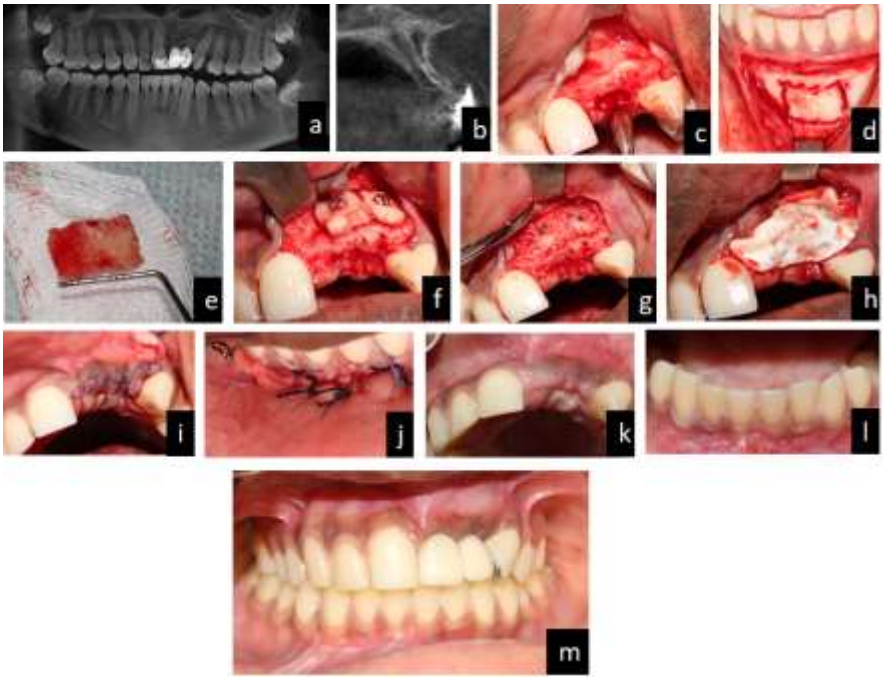

Fig. 3. Deficient maxillary alveolar ridge augmented with autogenous bone, bovine particles and resorbable membrane.

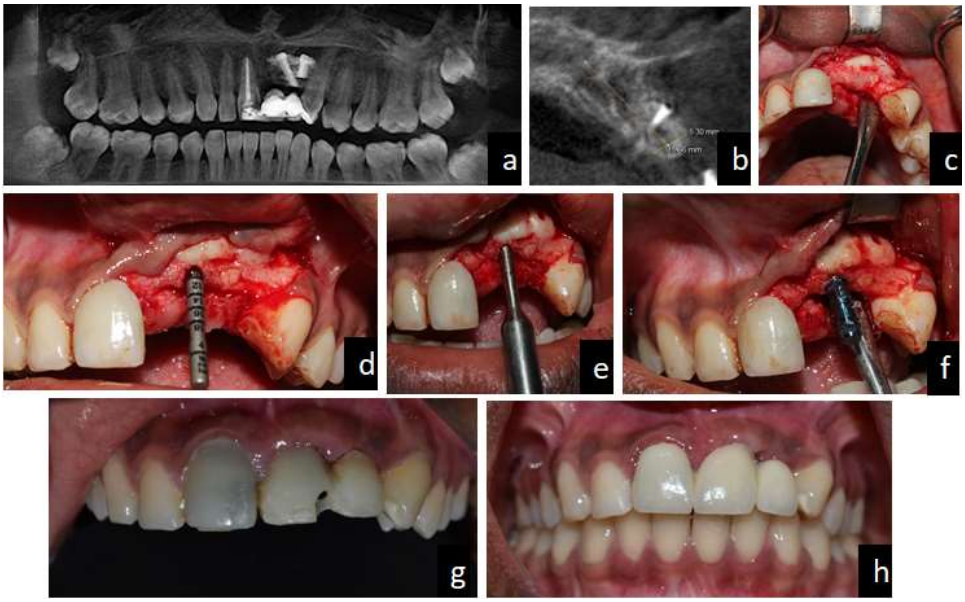

Fig. 4. Augmented ridge with implant placement and oral rehabilitation.

DISCUSSION:

Ideal Implant placement with a prosthetically favourable outcome in severe alveolar ridge deficiency cases following a dental trauma and alveolar resorption is a challenging task faced by many dental surgeons and prosthodontists. Numerous surgical procedures and techniques, such as guided bone regeneration, intra and extra-oral block grafting, ridge splitting, and distraction osteogenesis, can be used for the reconstruction of alveolar ridge deficiencies. Out of all, autogenous block bone augmentation and guided bone regeneration (GBR) are two surgical techniques that are widely used.[6] Autogenous bone is regarded as a gold standard in the fields of craniofacial bone grafting and dental implant related defects due to its inherent osteogenic potential.[7] Autogenous bone grafts can be obtained from extraoral and intraoral sites. In our case, we have obtained autogenous bone graft from the mandibular symphysis region to overcome some of the limitations of Extraoral sites like high risk of morbidity, hospitalization, cutaneous scar formation. [8] In addition, for the successful outcome of the augmentation procedures with autogenous grafts close adaptation of these block grafts to recipient bed is required. Fixation screws are of helping aid in such cases. Decortication of cortical bone which enhances RAP (Regional acceleratory phenomenon) is another crucial aspect that increases the rate of healing process 2 to 10 times faster than routine physiological healing. This is done by drilling holes of equal size 3-5 mm apart in the cortical bone which provides access for trabecular bone blood vessels to graft site enhancing revascularization, the availability of growth factors, the rate of remodelling, and also improves graft union to the host bone. However, certain limitations are associated with autografts as well, such as potential resorption, and a small volume of graft material. [9] Therefore the use of a combination approach with any one of those biomaterials that are available for GBR such as xenografts, allografts, and alloplasts is recommended.

The concept of GBR works on the principle of using various barrier membranes. There is a wide range of resorbable and non-resorbable barrier membranes available in the market each having their own advantages and limitations. [9] In cases such as bone augmentation, the role of GBR is of utmost importance for successful treatment outcomes. The primary key for regeneration lies in maintaining space over the defect necessary for blood clot stability which aids in ingrowth of osteogenic and mesenchymal cells and preventing migration of undesired connective tissue proliferation from the overlying soft tissues into the defect. Use of resorbable collagen membrane is recommended in such cases to overcome some of the limitations of non-resorbable membranes such as exposure which increases the risk of bacterial penetration. Moreover, a second surgical procedure is required for the removal of the membrane, which may sometimes involve the loss of some amount of the regenerated bone at the time of flap reflection. [10] One of the limitations of the bioabsorbable membrane is the lack of rigidity. In order to eliminate the risk of membrane getting compressed against the bony defect by overlying soft tissue during healing, the use of graft material for space maintenance is suggested in bone augmentation procedures.[9] Therefore, the combination use of monocortical block autografts and particulate graft is recommended along with the membrane. The above-reported case is free of these potential complications with predictable healing during follow up periods.

CONCLUSION:

Within the limitations of the present report, a combination of block graft obtained from the symphysis, particulate Xenograft, and an absorbable collagen membrane as a barrier is a predictable technique in augmenting deficient alveolar ridges.

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