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Autogenous Block Graft-Assisted Ridge Augmentation for Implant Site Development: A Case Report

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Abstract: ***The maxillary anterior region is considered to be the aesthetic zone of human dentition. Missing teeth in this area leads to severely compromised aesthetics and function. Endo-osseous implants are a viable treatment option in this scenario, but the placement of endosteal implants requires adequate bone volume for successful osseointegration. When the morphology of the bone does not allow proper implant placement, there are various bone augmentation procedures which aid in reconstruction of the residual alveolar ridge for ideal implant placement. In this case we have done horizontal ridge augmentation with respect to 11 for implant placement.***

Keywords: autogenous graft, ridge augmentation, implant, graft.

1. Introduction

The premaxilla is the most critical region of the mouth for the replacement of teeth because aesthetics, phonetics, function, occlusal pattern, all need to be considered to achieve a successful result. Loss of teeth in the anterior maxilla results in resorption of alveolar bone from the labial aspect, leaving a palatally positioned alveolar ridge. Teeth in the anterior maxilla are also at risk of traumatic loss, and there may be concomitant alveolar ridge defect. Hence, it will be necessary to augment the size of the alveolar ridge before implant placement using various grafting procedures. Without grafting, the implants may have to be placed in anatomically un-favourable positions or may have adverse angulations. This compromise can lead to un-aesthetic restorations, mechanical overload, and ultimately failure of implant. Therefore, ridge augmentation becomes necessary to achieve harmonious balance among functional, biological, and aesthetics before rehabilitation of the anterior maxillary region. For this we can use autogenous and alloplastic bone graft from mandibular symphysis, ramus region etc. Autogenous bone graft can be harvested from intraoral [2,3] sites like symphysis, ramus region of mandible, maxillary tuberosity, zygomatic buttress of maxilla and extraoral [4,5] donor sites like the tibia, fibula, iliac crest. Iliac crest is the most common donor site for maxillofacial reconstruction procedures. There are a lot of procedures of autogenous bone grafting techniques such as distraction osteogenesis, guided bone regeneration, autogenous on-lay block grafting, inlay grafting, tent pole, and vertical reconstruction using titanium mesh that can be carried to increase the available bone height for implant placement [1,2,3]. The morphology of the osseous defect, the crown–implant ratio, and the incisal edge position in relation to the implant body are factors that need to be considered when selecting an augmentation procedure However, using the mandibular symphysis as a donor for relatively small grafts offers ease of access, good bone quality for localized repair, a cortico-cancellous block graft morphology, low morbidity, and minimal graft resorption[3]. In this case we have used the mandibular ramus region obtaining the autogenous graft.

2. Case Report

A 24 years old male patient was referred from the department of Orthodontics with the chief complaint of missing left upper front tooth. Patient had lost his tooth due to trauma 4 years back. The patient presented with aesthetic complaints & there was no relevant medical history.

Clinical examination showed missing tooth with respect to 21. Pre-operative imaging with Cone Beam Computed Tomography [Fig 1B] revealed that there was a lack of alveolar ridge width(buccolingually) in relation to 21. Alveolar ridge height was 6.1mm and bone width was 2.1 mm in relation to 21. (Seibert's class 1 classification).

Labio-palatal atrophy of the edentulous alveolar ridge made it difficult to place implant in 21region. Hence, it was decided to augment the alveolar crest horizontally. The proposed treatment involved reconstruction of the anterior maxilla through block graft and placement of implant after 4 months. The mandibular ramus area was selected as the donor site for bone augmentation.

Preparation of recipient site-

Intra- and extra-oral antisepsis was maintained and local anaesthesia (2% lignocaine with 1:80,000 epinephrine,) was given. A horizontal incision was given on the ridge with no. 15 scalpel blade from the distal side of tooth 11 to the mesial side of tooth 22. Following that, a vertical releasing incision was given on the distal sides of tooth 11. Using a Molt elevator (Periosteal Elevator Molt No. 9), the full-thickness flap was reflected toward the base of the vestibule to expose the bone remnant. Next, the mesio-distal width was measured as 9 mm with William's probe and height of the alveolar bone was 12 mm measured apically from vestibule to the crest of the ridge coronally. Bucco lingually the distance was 2.3mm.

Preparation of donor site-

After induction of anaesthesia in the ramus region by inferior alveolar nerve block/mental nerve block with local anaesthesia (block and infiltration using 2% lignocaine with 1:80,000 epinephrine), a horizontal incision was made on the ridge with a BP blade no.15, and a full-thickness flap was reflected to expose edge of the ramus region. By post stamp method outline was given with respect to 11. From there square shaped bone was harvested with piezo-surgical unit. Autogenous bone graft was harvested [Figure2(D)] from disto-molar region of 48. This autogenous bone block was 10 mm in width and 8 mm in height. The recipient site was decorticated before placement of the autogenous block graft. Then sterile Bioresorbable Demineralized Bone Matrix (DNBM xenograft) was used to fill the void [Figure3(A)]. Rigid fixation of the graft over recipient bed was done using 4hole miniplate and 2mm screws.

Post surgically the patient was prescribed amoxicillin and clavulanic acid 625mg, metronidazole 400 mg and aceclofenac 100 mg and postsurgical instructions were given to the patient. Patient was recalled after 10 days for suture removal and healing was satisfactory.

Patient was recalled every month for follow up and after 3 months CBCT was done which revealed an increase in the bone width which was 4.3mm and was favourable for implant placement.

3. Discussion

In the present case, we have demonstrated a staged approach to augment anterior maxillary alveolar ridge. At the first surgical appointment, bone augmentation was done using mandibular block obtained from ramus region.

Autogenous bone grafts have proven to be successful in terms of integration with the host bone due to their osteo-inductive potential. Intramembranous autogenous osseous grafts including the mandibular ramus, mandibular symphysis, angle of mandible, maxillary tuberosity, and intraoral exostoses are the "gold standard" for improving intraoral osseous volume to facilitate placement of implants [9]. Block grafts take longer to integrate than cancellous bone grafts. When a block graft is used, a staged surgical approach is recommended as opposed to placing the implants in conjunction with the graft [6,10]. For this case, graft was harvested from mandibular ramus, a cortical graft that provides primarily dense cortical bone and high concentration of promoter proteins (e.g., bone morphogenetic proteins [BMPs]). However, there are certain drawbacks of using ramus graft which includes donor site morbidity and intraoperative complications such as swelling, pain, hematomas, and neurosensory disturbances such as a lack of sensation in the inferior lip, soft tissue of the chin, and inferior teeth [11,12]. Necrosis of the block graft is the most undesired complication. To decrease the rate of this complication, decortication of the recipient area is recommended to enhance revascularization of the transferred bone graft [13]

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The various strategies adopted to replace bone volume loss in vertical or horizontal jaw defect have evolved over the years. Alternative treatment options for similar clinical situation could be the use of fresh frozen allografts, Khoury's cortical bone plate method, or narrow implants along with soft tissue management [16,17,18]. A question of special interest in this context is the long-term prognosis and volume stability of the augmented tissue in the vertical dimension. In aesthetically irrelevant areas, resorption processes can be tolerated to some extent, however, in the anterior zone, exposed implant components lead to relevant difficulties. Another important aspect is the technique sensitivity of all techniques and the patient morbidity involved. A thorough clinical and radiological examination should be done to diagnose the exact quantity of bone loss, and accordingly, various bone augmentation procedures should be planned. Before choosing the prolonged reconstructive surgical approach, a prosthetic solution should always be considered and discussed with the patient to evaluate which is best and which the patient prefers.

The results of the present report pointed out that, in case of agenesis of the maxillary incisors, bone grafting from the mandibular ramus and delayed implant placement may provide satisfactory functional and aesthetic outcomes in the long term. CBCT scans referring to anatomical landmarks [19] were used for reliable follow-up of the change of bone thickness in the grafted area. Despite a certain resorption of the graft that may occur, correct management of the peri-implant soft tissues and the prosthesis is pivotal to maintain the success on the long term.

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