

Case Report

Bone augmentation to enhance esthetics for anterior fixed partial denture – Case report

¹Noopur Rathi, ²Tanuj Minocha, ³Parul Gupta, ⁴Shuchi Tripathi, ⁵Harsh Takkar

¹Department of Prosthodontics, D.J. College of Dental Sciences, Modinagar, Uttar Pradesh, India;

²Department of Periodontics, D.J. College of Dental Sciences, Modinagar, Uttar Pradesh, India;

³Department of Prosthodontics, RUHS College of Dental Sciences (GDC), Jaipur, Rajasthan, India;

⁴Department of Prosthodontics and Crown & Bridges, King George's Medical University, Lucknow, Uttar Pradesh, India;

⁵Department of Conservative and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, Punjab, India

ABSTRACT:

Traumatic loss of anterior teeth can be accompanied by loss of the labial cortical plate. In such cases, the restoration and replacement of lost facial contours can be challenging due to the loss of supporting teeth and alveolar bone. Autogenous bone grafting with barrier membranes provides an ideal surgical treatment option for such cases if a bony defect is to be filled with bone. Depending upon the location, extent, and abutment tooth health, one can then plan either an implant-supported prosthesis or a fixed partial denture. We present a case of a young boy, aged 20 years, who suffered the loss of maxillary right central incisor due to an accident. The patient had also developed spaces in anterior teeth for which he was undergoing orthodontic treatment. Particulate bone grafts were first tried, which failed, while autogenous block bone grafts from the mandibular region separated by a barrier membrane proved to be an ideal treatment. The patient was then successfully treated with a fixed partial denture replacing the maxillary right central incisor.

Keywords: autogenous bone graft, fixed partial denture, periodontal surgery, alveolar bone defects, interdental crater

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Corresponding author: Noopur Rathi, Department of Prosthodontics, D.J. College of Dental Sciences, Modinagar, Uttar Pradesh, India

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INTRODUCTION

The anatomy of an alveolar bone, which accommodates the roots of natural teeth, significantly influences an individual's facial aesthetics. Due to eruption of the teeth in a vertical direction, there is expansion of the labial and lingual cortical plates with concomitant changes in the facial architecture of the face.¹ As growth progresses, the expansion within the maxilla and the mandible continues to allow erupting teeth to take their final position in the oral cavity.² Similarly, when teeth are lost or extracted, the three-dimensional alveolar bone begins to resorb irreversibly for a period of three to six months, depending upon the location, and after undergoing bone remodelling changes, it stabilises eventually in the form of an edentulous state.³

The bone volume after loss of teeth under ideal conditions remains sufficient enough so as not to impair facial esthetics.⁴ However, the same may not be applicable in case of trauma, where the bone along with tooth can get damaged to extent beyond repair. The ideal treatment option for replacing a lost anterior tooth or teeth is an implant-supported prosthesis,⁵ provided the adjacent abutments are free of caries and restorations. In such cases, a fixed partial denture or any of its different designs are the second choice depending upon the size of the edentulous space. While one of the advantages of a removable partial denture is that it can replace missing or altered soft tissues,⁶ in a fixed partial denture, such replacement is achieved by adding gingival-coloured porcelain.⁷ However, such addition is possible only if the extension of the metal is possible gingivally;

otherwise, a combination of the two can also be used to hide the unaesthetic influence of lost bone tissue. Since implants are the most preferred and popular choice among patients, research has been directed towards the objective of reconstructing resorbed alveolar ridges.⁸ It has been thought that distraction osteogenesis (DO), onlay or particulate bone grafts with or without membranes, and other surgical methods could be used to increase the amount of alveolar bone.⁹⁻¹² The osseointegrative, osseoconductive, and osteogenic characteristics of autogenous bone have led to its widespread usage.¹³ Both intraoral and extraoral donor sites can provide this type of bone.¹⁴ However, a high resorption rate may compromise the therapeutic results of autogenous bone transplants. Since implant-supported restorations are essentially a multidisciplinary approach, all related specialities have their respective solutions to excessive loss of bone replacement in relation to replacing the bone and the concerned tooth. For any multidisciplinary treatment, synchronisation between team members is essential for devising a simple treatment plan that suits best for the concerned patient.¹⁵ Failures in bone grafting also do occur if one chooses the wrong graft type and overlooks the role of surrounding soft tissue around the defect.¹⁶ This article in the form of clinical report presents a case of a loss of maxillary right central incisor due to trauma, successfully restored by combining bone graft surgery and fixed partial denture.

CASE REPORT

A male patient aged 20 years reported to the department of prosthodontics with a chief complaint of poor facial aesthetics due to loss of maxillary right central incisor. The concerned tooth was lost after a blunt trauma during a vehicle accident, resulting in tooth and alveolar bone loss. The patient was undergoing orthodontic treatment during the time of reporting for correction of anterior tooth spacing, suggesting that the patient was extremely concerned about aesthetics. Personal and social histories were insignificant, while medical and dental histories also did not reveal any significant negative findings. Extraoral examination revealed a depressed maxillary lip, while all other parameters were within the normal ranges. Intraoral examination showed missing maxillary right central incisor with left maxillary incisor having pronounced alveolar bone loss on the labial side (Figure 1A). The patient's occlusion was mutually protected occlusion with canine guiding in right and left lateral movements (Figure 1B). Orthopantomograph showed erupting molars in both arches while there was minor rotation of individual teeth in both maxillary and mandibular arches (Figure 1C). Diagnostic impressions using irreversible hydrocolloid (CA 37; Cavex, Haarlem, Holland) and diagnostic casts (Elite Model; Zhermack, Badia Polesine, Rovigo, Italy) were mounted on a semi-adjustable articulator (Artex; Girschbach Dental)

face bow (Artex Rotofix-Facebow; Girschbach Dental, Pforzheim, Germany) and interocclusal records (Take 1, Kerr, Romulus, MI, USA), followed by analysis of occlusion and devising of a treatment plan. The treatment plan presented to the patient included a replacement of a single tooth with an implant supported single crown combined with bone augmentation of the region, a three-unit fixed partial denture after bone grafting, or a removable partial denture. Since the patient did not want to wait for the time that implant treatment would take, he opted for fixed partial denture treatment.

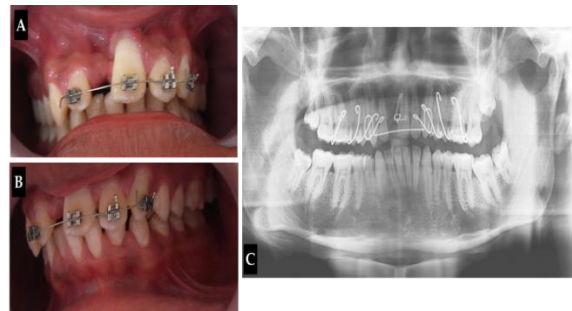


Figure 1: (A) Intra oral view of the bony defect and denudation of adjacent root (B) Lateral view showing canine guidance (C) Orthopantomograph showing unerupted molars and the status of the existing teeth

The patient was also convinced that his treatment should start once the orthodontic treatment brackets were removed. During the first surgical intervention, an oral prophylaxis was carried out prior to surgery (Figure 2A), followed by raising a full thickness flap and debridement of bone in the interdental area between the maxillary right lateral and left central incisor (Figure 2B). A particulate mixture of bone graft, BioOss (Osteohealth Co., Shirley, NY), was placed in the region (Figure 2 C,D), after which the flap was closed and a periodontal dressing (Pulpdent Corp., Watertown, MA, USA) was given. This intervention failed, and after one month, the crater between the incisors was the same as before the intervention. The second surgery was planned, which included taking a full-thickness autogenous block bone graft from the anterior mandible (Figure 3A) and placing the same in the maxillary area (Figure 3B). After suturing the respective recipient (Figure 3C) and donor sites (Figure 3D) and placement of a barrier membrane over the graft, the patient was given instructions regarding post-surgical care and was put on anti-inflammatory and antibiotic drugs. Months later, the area was examined, and once the success of the bone graft was ensured, the treatment for a fixed partial denture was initiated, which included the tooth preparation of the respective abutments (Figure 4A), metal framework trial (Figure 4B), porcelain trial (Figure 4C), and final cementation (Figure 4D). With a successful bone graft and fixed partial denture, the patient was comprehensively satisfied with the overall

treatment and continued to be satisfactorily reporting to the concerned department at follow-ups.

DISCUSSION

This clinical report presents a case of a failed bone augmentation with particulate bone graft (Xenograft) in the first attempt, which was later successfully managed with a block bone autogenous graft and a bone barrier membrane. Surgical failures are not uncommon in the oral cavity; most of them occur as a result of post-surgical infection, but many failures have been attributed to treatment plans and poor choices of grafts.¹⁷ Research on both animals and humans has shown that autologous cortical bone grafts may

experience resorption of up to 56% after four months. Also, depending on the harvest location, these grafts might cause morbidity.^{18,19} When compared to using bone grafts alone, guided bone regeneration has proven to be a highly successful method for augmenting the height and width of an atrophic jaw before implant placement.²⁰ This is achieved by applying cell occlusive membranes, which mechanically exclude nonosteogenic cell populations from the surrounding soft tissues.²¹ The particulate bone graft did not manage to cover the defect, with most of it being resorbed immediately after surgery. The graft used was a derivative taken from other species and known as xenografts. Because of their osteoconductive properties, these bone transplants promote bone growth. They are cancellous bone that has been spontaneously deproteinised.²² The biological component of the bone transplant is removed during processing, which reduces the likelihood of disease transmission.²³ The remaining inorganic structure, which is abundant in calcium, gives the graft matrix its form.²⁴ Bone from cattle and natural coral are the two main types of xenografts. The mineral composition of bovine-derived graft is comparable to that of human bone, facilitating its integration with human bone.²⁵

In regard to the fabrication of the fixed partial denture, the only challenging aspect was to establish an anterior guidance that was compatible with the existing one and design the metal-ceramic junction at a place that will not be conducive to causing stress and related porcelain fracture. This was achieved by preparing a semifunctional anterior guidance as mentioned in the literature.²⁶ The anterior guidance plays a major role in determining the extent of ceramic in metal ceramic and all ceramic restorations.²⁷ Besides, it plays a major role in determining the cuspal anatomy of the posterior teeth in either fixed partial dentures or removable complete and partial dentures.^{28,29} with lateral incisor being a poor abutment for retaining a fixed partial denture, the decision to use lateral incisor exclusively without including canine was based on the overjet and overbite present between the maxillary and mandibular teeth. The patient had corrected his occlusion recently, and provision of the fixed partial denture was considered a permanent retainer, which demanded that the space between the anterior maxillary teeth was to be closed and that contact be provided with the adjacent teeth on either side of the bridge. Improper overjet and overbite during orthodontic treatment, especially where crowding or spacing are present, has been reported with high failures if some sort of permanent retention is not provided after orthodontic correction.³⁰ A proper overjet and overbite is also essential for any fixed partial denture or cases where fixed and removable are given in combination.³¹ Its association with temporomandibular disorders has also been established.³² Therefore, it is imperative that all fixed partial dentures involving anterior teeth keep in consideration their respective tive roles. We considered and discussed with the patient the use of a

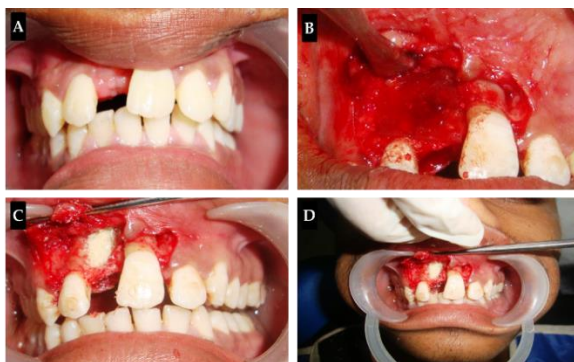


Figure 2: (A) Oral prophylaxis prior to first surgery (B) Area of interest showing crater like bony defect (C) particulate bone graft (D) Bone graft with reflected mucosa

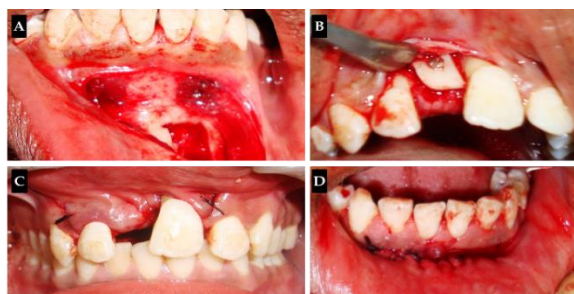


Figure 3: (A) Donor site in mandible (B) Block autogenous bone graft carried to the recipient site (C) Suturing of recipient site (D) Suturing of donor site



Figure 4: (A) Prepared abutment teeth for fixed partial denture (B) Metal trial (C) Porcelain trial (D) Definitive cementation

cantilever bridge and a spring bridge as additional treatment options within fixed partial denture designs.^{33,34} The cantilever extension from the left central incisor would have placed excessive stresses on the abutment teeth, which would have, with the passage of time, developed periodontal issues.

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Conflict Of Interest: None As Declared

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