CASE REPORT

Maxillary Sinus Elevation Using Simple Dental Instruments with Subsequent Implant Placement and Prosthetic Rehabilitation

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ABSTRACT:

One of the biggest challenges in placing implants in the posterior maxilla is poor bone volume. Loss of posterior maxillary teeth results in volumetric resorption of the alveolar bone. Moreover, pneumatization of the maxillary sinus in absence of maxillary teeth further compromises the residual bone from the superior aspect. The continued bone volume loss sometimes becomes so extensive that maxillary sinus elevation becomes inevitable for any implant based reconstruction to be planned. Various techniques have been advocated in the literature for maxillary sinus elevation and bone augmentation. The following case report describes a conservative way of elevating the maxillary sinus from lateral approach using conventional instruments and subsequent full mouth rehabilitation of a patient.

KEYWORDS: Sinus elevation; bone graft; dental implants; prosthodontic rehabilitation.

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INTRODUCTION

When the maxillary posterior teeth have been extracted for an extended period of time, very minimum bone is left in the upper posterior region for the placement of implants.[1] This is the result of pneumatization of the maxillary sinus and simultaneous bone loss in the edentulous area because of disuse atrophy.[2] In such cases, patients can be given the choice of replacement of missing teeth by a removable cast partial denture or a bridge (given abutment teeth for adequate support of the prosthesis is present). If implant supported prosthesis is the preferred treatment option at that site then sinus lift with bone augmentation becomes mandatory. [3, 4] Various techniques have been advocated in the literature for maxillary sinus elevation and bone augmentation.[5] The two most predictable techniques used for gaining vertical height of the maxillary alveolar bone are the sinus intrusion osteotomy (crestal approach) and the window technique (lateral approach).[6]

The following case report describes a conservative way of elevating the maxillary sinus from lateral approach using conventional instruments and subsequent full mouth rehabilitation of a patient.

CASE PRESENTATION

A 39 year old male presented to the dental clinics of Aga Khan University Hospital, Karachi with the primary complaint of poor esthetics of his upper front teeth and requested replacement of his dislodged fillings. He expressed his interest in getting a fixed solution for replacement of his missing teeth. The patient these complaints for the past 3-4 years but had been deferring treatment because of the time constraints. The patient had already undergone extensive dental treatment over the past few years but was not satisfied with the quality of previous treatment.

Extra-oral examination revealed no obvious swelling or asymmetry. Intraoral clinical examination revealed calculus deposits and staining. Surveyed crowns were present on # 13 and # 17 as the patient had previously been provided with a cast partial denture for the missing teeth in the upper arch. Multiple

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broken fillings and recurrent carious lesions in the upper dentition were also observed (Fig. **1a-e**). Radiographically, complete pneumatization of the right maxillary sinus was observed with only about 2 mm of residual ridge seen on the panoramic radiograph (Fig. **6a**). Tooth # 36 was diagnosed as having post treatment periapical disease and advised for extraction. Multiple teeth with carious lesions were advised root canal treatments; followed by replacement of faulty crown and bridge work. As the patient expressed his interest in receiving a fixed prosthetic solution for missing teeth in the right upper arch; implant supported fixed partial denture was recommended as the best treatment option along with sinus elevation and bone augmentation in that area.

Fig. (1). Preoperative intraoral images. (a). Frontal View, (b) Right laternal view (c) Left laternal view (d) Maxillary occlusal view, (e) Mandibular occlusal view.

After discussing the treatment plan thoroughly with the patient and obtaining the written informed consent, treatment was initiated. The treatment was divided into 3 phases. Phase I included Maxillary sinus elevation with bone augmentation in the right upper quadrant. Phase II included endodontic treatments of multiple teeth, restoration of carious teeth, followed by replacement of faulty crown and bridge work. Phase III included placement of implant supported prosthesis in the right upper quadrant three months after phase I, and the final prosthesis delivery three months after implant placement.

Impressions were made with alginate for obtaining study casts and to form vacuum formed stents to help in fabrication of temporary fixed prosthesis once faulty crown and bridge work was removed. In the first visit, full mouth scaling and polishing was done.

In phase I; sinus elevation was planned. The patient was advised to rinse with 0.2% Chlorhexidine gluconate solution. After adequate local anesthesia was achieved by giving posterior and middle superior alveolar nerve block, and palatal infiltration local anesthetic (Lidocaine with 1:100,000 epinephrine), a full thickness mucoperiosteal flap was raised in the right upper quadrant using a no. 15 surgical blade at the mid alveolar crest. Relieving incisions were given mesial to # 13 and distal to # 17 (Fig. **2a**). Bone trephination was done using a round bur on the lateral aspect of the alveolar ridge at # 14-16 area to form a bony window in a manner that mesial, inferior and distal part of the bone is separate while superior part of bone window forms a flap that was infractured and pushed into the sinus space by rotation (Fig. **2b**). The bone was tapped gently with an osteotome so that it was still attached at its cervical part and rotated medially. This medially rotated bone served as part of the the new sinus floor (Fig. **2c**). The Schneiderian membrane was then gently elevated with the help of flat plastic instrument, mucoperiosteal elevator and convex side of the bone curette. Care was exercised to avoid any tearing of the delicate Schneiderian membrane. Bio-mend extend resorbable collagen membrane (Zimmer Dental, USA) was cut into desired shape, sharp corners trimmed, manipulated and placed at the roof of the newly formed bony cavity so that the collagen rests on the infractured and medially rotated buccal bone (Fig. **2d**). This was done to prevent any bone particles extravagating into the elevated sinus; if any inadvertent perforation of membrane had occurred. Around 2.0 grams of allogenic cortical and cancellous mix of demineralized freeze dried bone (Rocky Mountain, USA) was gently packed into the space created (Fig. **2e**). Another Bio-mend membrane was then placed on the lateral bony window to cover the bone graft. The flap was then sutured back using 3/0 vicryl in simple interrupted fashion (Fig. **2f**). The patient was advised soft diet and advised to refrain from blowing his nose and in case of coughing to keep his mouth open. This was followed by prescription of 1 gram Augmentin (Amoxicillin and Clavulanic Acid), 100 mg Ansaid (Flurbiprofen) supplemented with 1000 mg Panadol (Paracetamol), twice daily, for 6 days. An anti-allergy (Cetrizine) was also prescribed for one week.

At two weeks post-operative follow-up healing was satisfactory. Then all indicated teeth were removed, endodontic treatment completed, and fixed restorations were placed to complete stage 2 of the treatment plan. The definitive

prostheses were cemented with Glass Ionomer based adhesive (Fig. **3 a-e**). Oral hygiene instructions were reinforced, dietary counseling was done and the patient recalled after 3 months.

Fig. (2). Sinus elevation using laternal windows technique.

Fig. (3). Intraoral images at end of phase II: (a). Frontal View, (b) Right laternal view (c) Left laternal view (d) Maxillary occlusal view, (e) Mandibular occlusal view.

At three month follow-up, placement of implants in # 14 and # 16 was planned. Radiograph showed adequate bone volume for fixture placement (Fig. **6b**). After raising the flap under local anesthetic and drilling the appropriate osteotomy sites, Zimmer tapered screw vent (TSV) implant of 3.7 x 11.5 mm dimension were placed in area of # 14 whereas a Zimmer TSV Implant of dimensions 4.7 x 11.5 mm was placed in the area of # 16. After confirming primary stability of the implants (>30Nm), corresponding healing abutments were placed. Closure of the flap was done by using 3/0 vicryl in simple interrupted manner (Fig. **4 a-d**). The patient was given post-operative instructions to minimize any risk of bleeding and was advised soft diet for a week. This was followed by 6 days prescription of antibiotics and analgesics as advised earlier.

Fig. (4). Phase III: Implant and healing collar placement at # 14 and # 16.

After three months of implant placement, their osseointegration was confirmed radiographically as well as clinically using torque resistance test. Impressions were made using poly vinyl siloxane impression material (light and heavy body) for final prosthesis fabrication. Metal trial of the cement retained implant supported fixed partial denture was done, and the necessary adjustments was made in the casting. On subsequent visit, after ensuring proper fit and proximal contact of the bisque ceramic bridge, the bridge was glazed and cemented using Glass Ionomer based adhesive. Oral hygiene instructions were reinforced and the patient was advised regular follow up visits.

At a routine follow up visit at 18 months, the patient had no active complaints and was maintaining a good oral hygiene. No new carious lesions were observed (Fig. **5a-e**). Panoramic radiograph revealed no new active disease and implants serving well with crestal bone loss within normal limits (Fig. **6 c**). Dietary counselling and oral hygiene instructions were reinforced. A yearly follow up was advised for maintenance.

DISCUSSION

This case report describes the full mouth rehabilitation of a patient who had multiple operative, endodontic and prosthetic complaints. Correct sequencing of the treatment plan was important to decrease the overall treatment time, alleviate the patient's chief complaints and provide a stable, disease free dentition before prosthetic rehabilitation was carried out. To minimize the high caries risk of the patient as evident by patient's dietary history and recurrent decay, dietary counseling and oral hygiene instructions were reinforced at each appointment. Regular follow ups were also advised to monitor patient compliance to instructions.

Fig. (5). Intraoral images at 18 month follow up: (a). Frontal View, (b) Right laternal view (c) Left laternal view (d) Maxillary occlusal view, (e) Mandibular occlusal view.

Patient's demand for a fixed prosthesis necessitated implant supported prosthesis in the right upper quadrant as fixed tooth supported prosthesis was not possible because of a long edentulous span. The patient was not inclined towards a removable solution either. Thus, implants were the only choice but lack of bone volume owing to bone resorption and pneumatization of maxillary sinus made it extremely challenging.

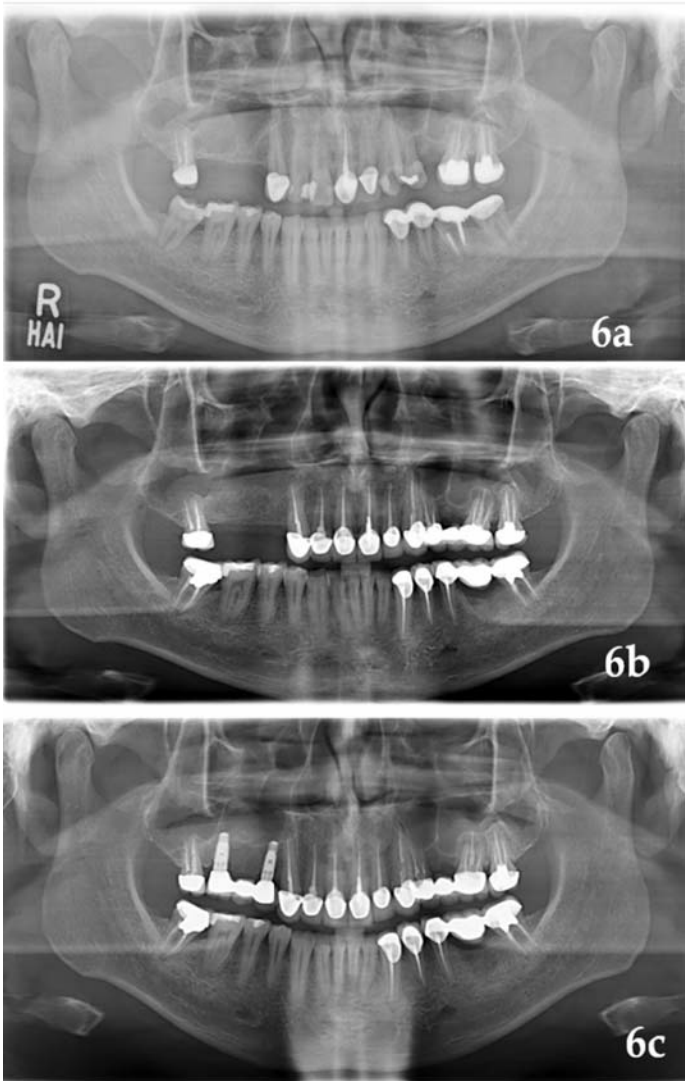

Fig. (6). Panoramic radiographs. (a) Preoperative, (b) Before implant placement, (c) 18 month follow up.

Pneumatization of the maxillary sinus is a well-documented physiological process when the maxillary posterior teeth have been lost for a long time. This coupled with maxillary residual ridge resorption results in limited bone available for implant placement. In such cases, sinus elevation has been one of the most predictable treatment options for bone augmentation and subsequent implant placement for replacement of missing teeth. The lateral window technique for sinus elevation and vertical ridge augmentation is indicated when the residual ridge is less than 4 mm.[6] Bone is augmented from a lateral window created in the maxilla for subsequent bone regeneration and implant placement. Piezoelectric instruments have been advocated in literature to carry out this sinus elevation but their high cost,

availability and technique sensitivity precludes their use in the routine dental practices. In the present case, we utilized simple instruments that are commonly available in any dental surgery. These include high speed diamond burs, hand instruments such as flat plastic composite instrument, a regular periosteal elevator, osteotome, chisel and mallet and yet got satisfactory results. A randomized control trial by Barone *et al*.[7] found no statistically significant difference in the clinical parameters of sinus floor elevation when comparing piezoelectric device with conventional diamond rotary burs; as used in the present case. A systematic review conducted by Esposito *et al*.[8] reported that the type of instruments (rotary, piezoelectric or hand malleting) used for sinus elevation had no effect on the implant survival rate placed in that area. The infracture, rather than complete removal of the buccal bone gave a firm surface to apply gentle pressure to the overlying sinus membrane to lift it, decreasing the chances of membrane perforation and subsequent complications associated along with it. It also provided a scaffold onto which demineralized freeze dried bone (an allograft) could be placed to fill in the bony defect present. Placement of membrane over the lateral window after sinus lift and bone grafting has been associated with a significantly higher implant success rate in a number of studies. [9-12] In the present case, we used a resorbable collagen membrane as used by the previous mentioned studies to provide a barrier against epithelial ingrowth and enhance bone regeneration in that area.

The present case report reiterates the importance of comprehensive treatment planning when dealing with multiple dental problems. The role of prevention of further disease by patient education at each follow up visit remains one of the most important factors in the success any treatment provided to the patient.

CONFLICT OF INTEREST

None declared.

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