



## Maxillary sinus augmentation without any graft material- A case Report

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### ABSTRACT

Restoration of lost dentition in the severely atrophic posterior maxilla has been successfully treated with various sinus augmentation techniques such as using bone grafts and bone substitutes are frequently used to enable placement of dental implants. Although the classical sinus augmentation by creating an antrostomy, lifting the maxillary sinus membrane, and grafting bone graft material is a well-established treatment, there is a growing trend of successful bone formation and osseointegration in cases of sinus membrane elevation without bone grafts. This article reports a case that showed that sinus membrane elevation without the use of bone graft material was found to be a predictable technique for bone augmentation of the maxillary sinus floor.

**KEY WORDS:** Maxillary sinus, Augmentation, Lateral window, Implants, venous blood.

### INTRODUCTION

Endosseous implants are frequently used for prosthetic reconstruction in the edentulous patient. Sufficient volume and density of the alveolar bone for good results. The posterior region of the edentulous maxilla often poses a problem because of an inadequate alveolar ridge and poor quality of bone for prosthetic rehabilitation with dental implants.<sup>[1]</sup> Various grafting procedures to reestablish an adequate bone volume to enable the placement of endosseous implants in the posterior maxilla have been described. The most commonly used technique is augmentation of the maxillary sinus floor, a technique introduced by Tatum<sup>[2]</sup> and modified by Boyne and James<sup>[3]</sup> and by Wood and Moore.<sup>[4]</sup> With this technique the maxillary sinus is accessed by creating a bone window in the lateral sinus wall with a small round bur, with the aim of leaving the sinus membrane intact. Several studies have evaluated maxillary sinus elevation surgery using a variety of bone grafting materials.<sup>[5]</sup>

Even if new bone will be obtained after placement of bone grafts in the maxillary sinus, such placement might not be a prerequisite for bone formation per se. The mere lifting of the sinus membrane, creation of a void space, and blood clot formation may result in new bone owing to the principles of guided tissue regeneration.<sup>[6]</sup> Spontaneous bone reformation in the floor of the maxillary sinus has also been found 3 months after the removal of an intrasinus cyst<sup>[7]</sup>.

The aim of this present case study was to evaluate whether sinus membrane elevation and the simultaneous insertion of titanium implants without additional grafting material constitute a valid technique for bone augmentation of the maxillary sinus floor.

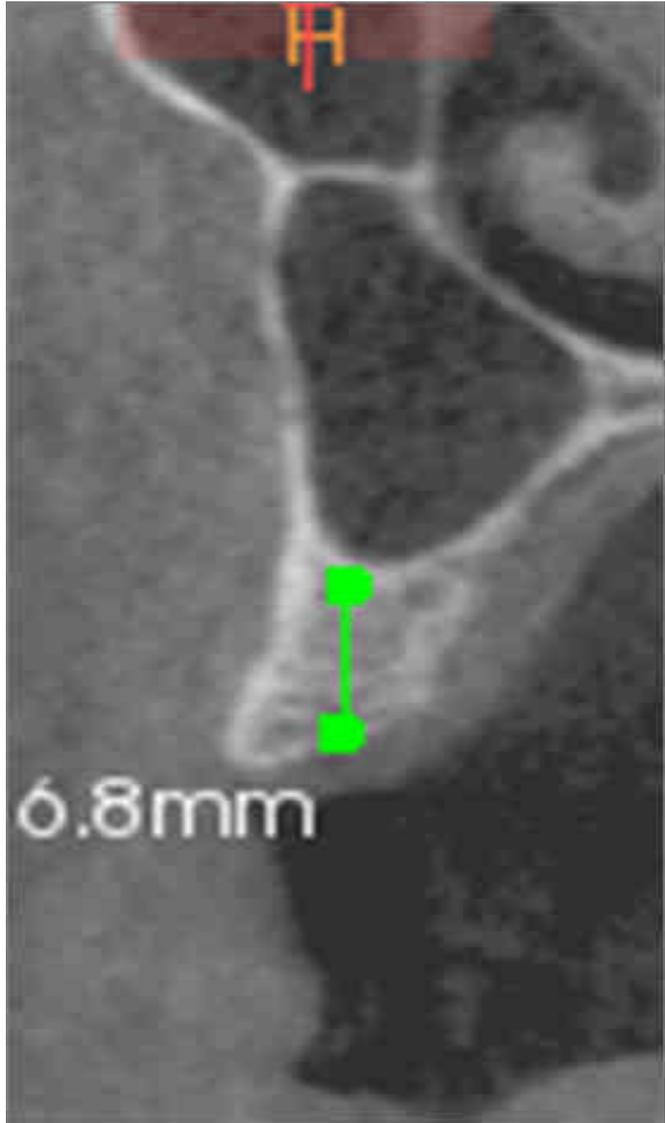
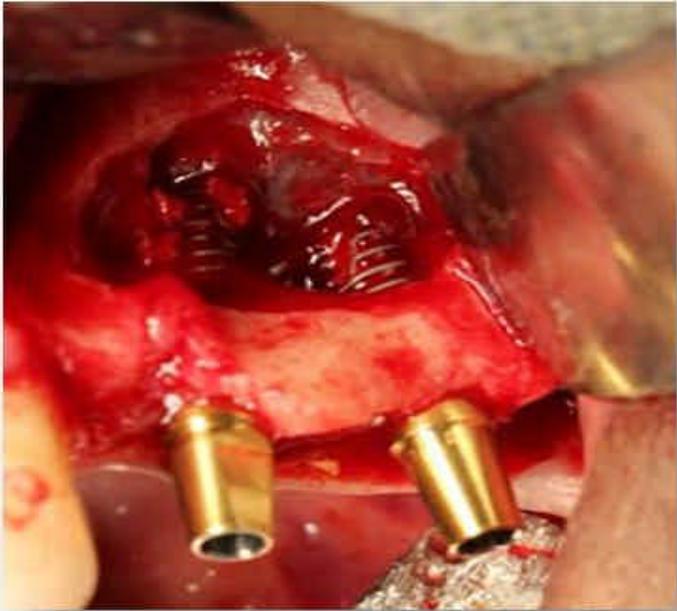
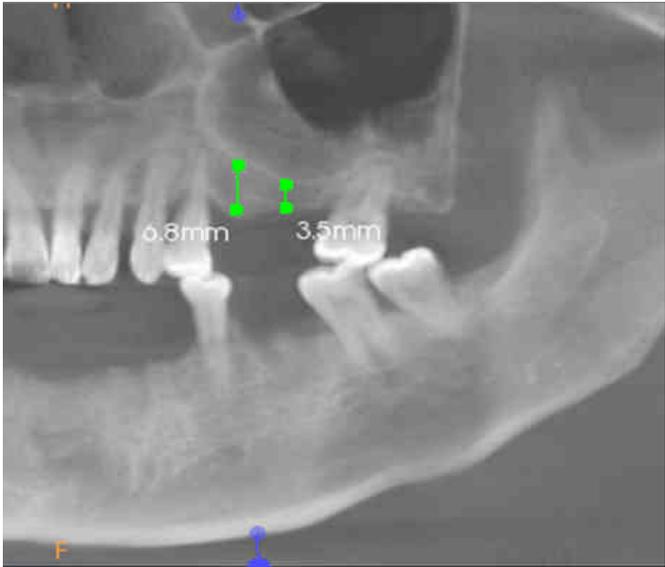
### CASE REPORT

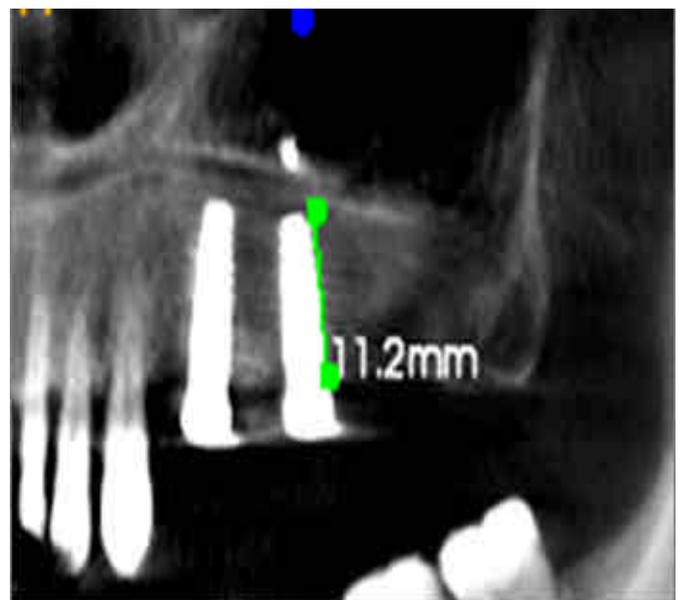
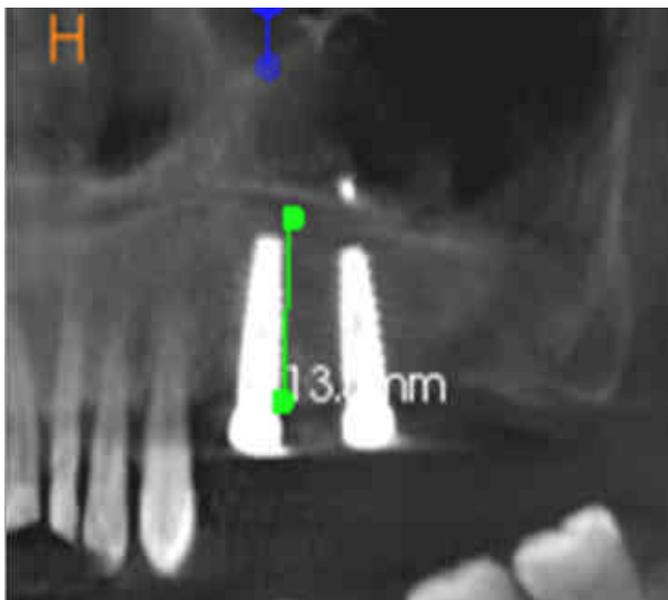
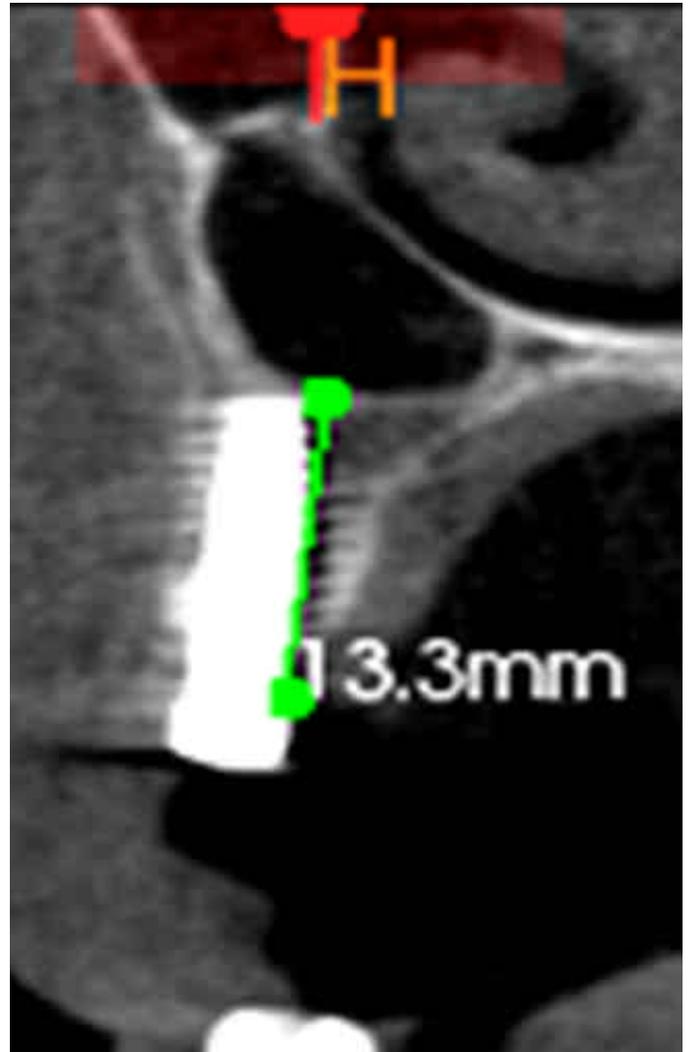
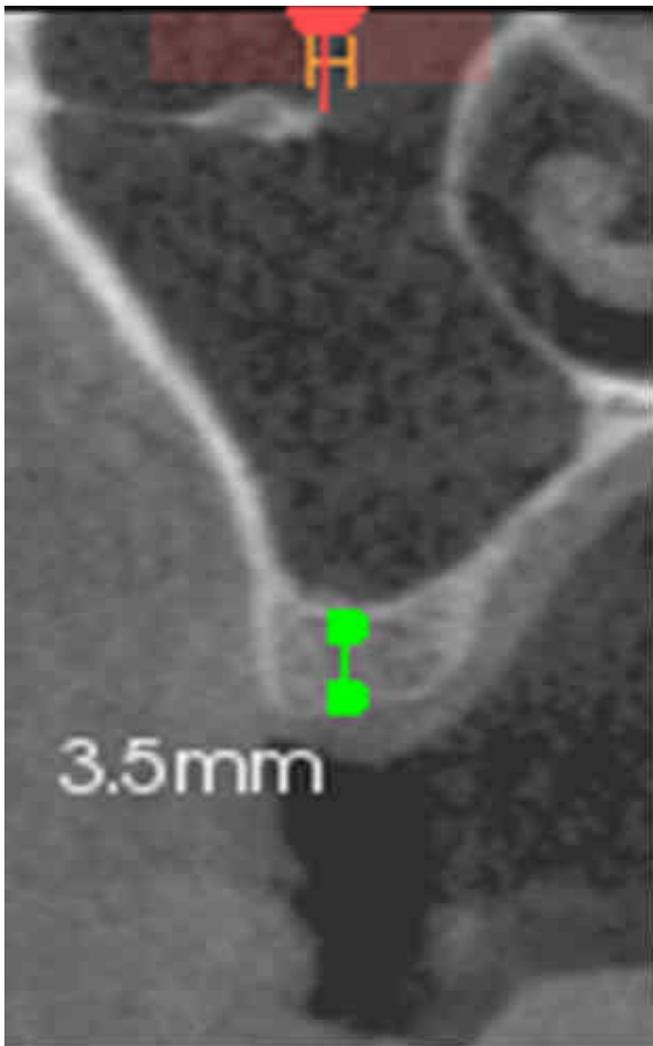
We present a case of a 45 year old female patient attended the Saveetha Dental College, Saveetha University, India for implant and crown treatment due to the loss of a left maxillary second premolar and first molar. First pre molar and second molar were extracted due to mobility (GradeII). A clinical history was completed, an intraoral examination made, and extraoral and intraoral registers (study cast, frontal and lateral pictures in maxim intercuspitation, excursive movements and panoramic radiography) were performed at the first visit. The patient did not have any medical nor surgical contraindication to maxillary subantral augmentation. In a radiographic test, we observed a left maxillary sinus pneumatized with a low bone height. To insert an implant in position 24, 26 a computerized tomography (CT) was requested to determine with greater accuracy the quantity of residual crestal bone. It showed a height of 6.8mm and 3.5mm in relation to 24 and 26 respectively Fig [1(a),1(b),1(c)]. The treatment plan , merits and demerits were explained to the patient. Patient informed consent was obtained. Ethical approval was obtained from institutional ethical committee , Saveetha University. We carried out a sinus lift and the implant insertion in position 24 and 26 at the same time to minimize the number of operations on the patient.

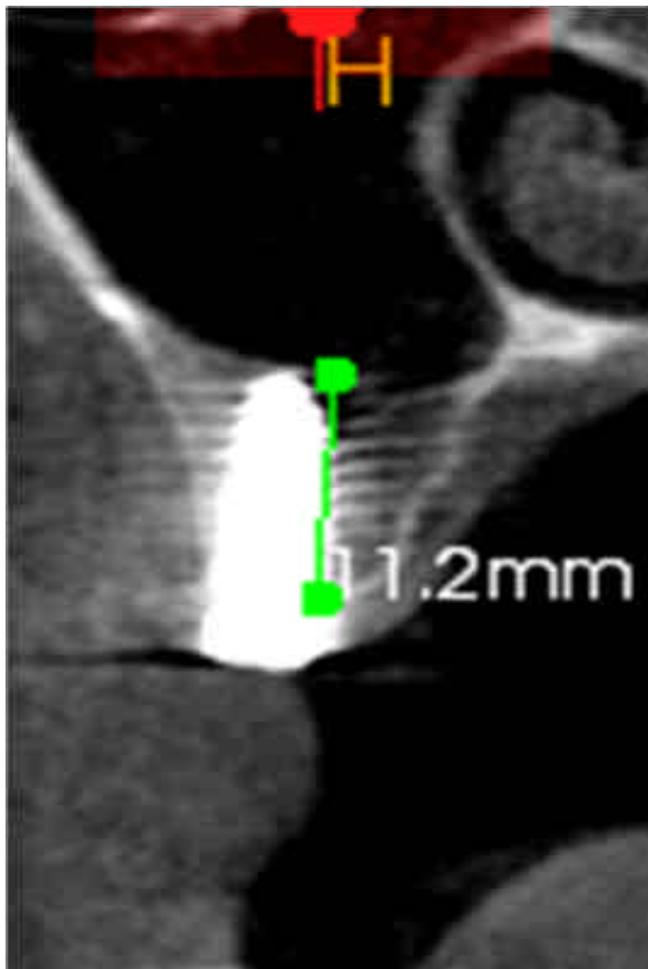
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#### SURGICAL TECHNIQUE

Prophylactic oral premedication was used routinely. Augmentin 625mg (Amoxicillin plus clavulanic acid) and aceclofenac were used 1 hour before the operation, as well as mouth rinsing with 0.2% chlorhexidine for 2 minutes. Local anesthesia (infiltration of posterior superior alveolar nerve and greater palatine nerve) was executed with 2% lidocaine that included 1:80,000 epinephrine.

A mid-crestal incision was made in the posterior maxilla, a muco-periosteal flap elevated, and the lateral wall of the maxillary sinus exposed. The sinus wall was penetrated at four points with #2 round bur to mark out a bone window. The bony window was prepared with the same round bur by connecting all the four points carefully. The bony window was then carefully removed from the underlying Schneiderian membrane with specially designed sinus elevators. The Schneiderian membrane was gently elevated using sinus elevators to make sure there was space enough for implant placement in the sinus Fig(2). The osteotomy is prepared crestally with sequential drilling at implant sites of 24 and 26, followed by placement of dental implants in 24 and 26 Fig (3). Lateral window opening of the sinus was closed using non-resorbable titanium reinforced membrane and stabilized

by tag pin Fig (4). Then, the oral mucosal flap was replaced and sutured. An antibiotics (Augmentin 625mg) three tablets per day and anti inflammatory agent aceclofenac three tablets per day were prescribed for the first 7 days to prevent postoperative infection and pain.

The sutures were removed 14 days after the surgery. The postoperative panoramic radiographs and dental cone-beam computed tomography scans were taken immediately after the surgery. A healing period of 6 to 8 months was allowed for the implants to integrate. Dental cone-beam computed tomography scans were taken before the second-stage procedure.

#### RESULTS:

Postoperative cone-beam computed tomographic scans immediately taken after surgery revealed the sinus filled with venous blood and voids under the elevated sinus membrane. After 7 months postoperatively, both the implants were clinically stable and no signs of infection in the maxillary sinus or any other complications were reported. An apparent increase in alveolar bone height in the radiographic images were recorded. An extended maxillary sinus floor elevation showed repneumatization. The new bone formation was notable, with good continuity with the naive sinus floor. The newly formed maxillary sinus floor was observed around the implants.

The height of the alveolar bone from alveolar crest to newly formed sinus floor in relation to 24 and 26 has increased to 13.3mm and 11.2mm respectively Fig [5(a),5(b), 6(a), 6(b)]. This denotes evident of new bone formation around dental implants. The net amount of bone height gained by augmentation without any bone grafts were 6.5mm and 7.7mm in relation to 24 and 26 respectively.

#### DISCUSSION:

Regardless of the bone graft material used, augmentation of the maxillary sinus with variable bone grafts has been considered a prerequisite to achieve clinical success for implants placed into the augmented maxillary sinus.<sup>[8]</sup> However, successful new bone formation and osseointegration of implants were recently reported without grafting bone substitutes<sup>[5]</sup>

The exact mechanisms behind the bone formation observed in the maxillary sinus are presently not well understood. The general knowledge about bone healing has mainly been gained from studies of fracture healing and regeneration of bone defects. The maxillary sinus situation is unique in this respect since bone ought to be formed beyond the skeletal contour and not in a fracture or defect. Irrespective of situation, bone formation and healing require the recruitment, migration, and differentiation of osteogenic cells into osteoblasts, a process that starts to synthesize and deposit a collagenous extracellular matrix for mineralization. Bone marrow tissue constitutes the most potent source of such cells,<sup>[9]</sup> and it is likely that mesenchymal stem cells migrated from the bone marrow in the underlying alveolar bone and possibly from tissue fragments displaced during surgery into the blood-filled sinus, using the fibrin network as a scaffold. The

lifting of the periosteum may have initiated a resorption process, exposure of the bone marrow, and access of stem cells to the sinus cavity, which have been observed in experimental studies<sup>[10]</sup>. Another theoretical source of bone-forming cells is the periosteum of the lifted sinus membrane, which may have contributed to bone formation. Finally, it is possible that circulating cells arrested in the blood clot played a role in the observed bone formation. Another possible mechanism was the increased thrombin generation on the surfaces of titanium implants may also stimulate proliferation and inhibit apoptosis of osteoblasts<sup>[11]</sup>. The drawback in this study was the quality of the bone formed couldn't possible to evaluate by histological and histomorphometric analysis due to ethical reasons.

#### **CONCLUSION:**

This study shows that the maxillary sinus has great potential for healing and bone formation and indicates that bone grafts or bone substitutes may not be needed to achieve augmentation of the maxillary sinus floor. We thus concluded that sinus membrane elevation without the use of bone grafts or bone substitutes predictably results in bone formation at the maxillary sinus floor.

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