

# Alveolar ridge augmentation with lateral approach maxillary sinus lifting: a case report\*

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## ABSTRACT

In the maxillary posterior region, increased sinus pneumatization, decreased density and residual alveolar bone height create difficulty in placing dental implants. Therefore, it is necessary to surgically increase the bone height to obtain sufficient bone height for implantation. The aim of this case was to perform a two-stage lateral approach sinus surgery to create an adequate amount of residual crest for rehabilitation of the severely resorbed posterior maxillary bone and then to allow the use of dental implants of adequate length. A 2-stage lateral approach sinus lifting operation was planned for a patient with insufficient vertical crest height in the region of tooth #26. The patient waited 6 months after the lateral approach sinus lifting operation and Adequate vertical crest height was obtained for implant placement. External sinus lifting is a highly effective technique for increasing vertical bone height in atrophic maxillary crests.

**Keywords:** Sinus lifting, dental implant, PRF

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## INTRODUCTION

Sinus lifting is a predictable surgical technique for reshaping the highly resorbed posterior maxillary bone in patients with missing teeth so that they can be rehabilitated with implant placement and prosthetic restoration.<sup>1-4</sup> Long time after tooth loss and pneumatization of the maxillary sinus leads to the need for bone grafting. Lateral approach sinus floor augmentation (LASFA) involves raising the Schneiderian membrane by creating a lateral window in the alveolar bone followed by bone grafting.<sup>4,5</sup> LASFA is an effective technique that is safely preferred when the residual crest height is <5 mm.<sup>6-8</sup> A bone graft with optimum properties should be biocompatible, osteoconductive, osteoinductive, preserve graft volume, have good mechanical properties, be non-allergenic, sterile and have appropriate handling properties.<sup>9-11</sup> The gold standard imaging for accurately assessing sinus anatomy is considered to be cone beam computed tomography (CBCT).<sup>12,13</sup> CBCT provides valuable and important information in the examination of anatomical formations such as the wall thickness of the lateral bone, the thickness of the Schneiderian membrane and septa.<sup>13</sup>

## CASE

A 51-year-old male patient was admitted to the Periodontology Department of Dicle University Faculty of Dentistry with the claim of missing tooth number 26. No systemic disease was found in the anamnesis of the patient. It was learned that he had

his tooth extracted 2 years ago due to deep caries. For implant planning, CBCT image was obtained and measurements were taken. Measurements were made mesio-distally from ten equally spaced sections separately. The numerical average of these ten values was then taken. The measurements showed that the residual bone height (RBH) was <5 mm (3.95 mm). Bucco-lingually width, 6.8 mm bone was measured. The residual bone density was measured using the Hounsfield unit (HU) and it was observed that the bone density was very low and had a spongy bone structure. HU value was found between 300-400. The course of the PSAA was found to be in a position that would not jeopardize the operation. In the light of these findings, a two-stage LASFA was planned.

Before the operation, the patient was informed about the procedure and a written consent was obtained. The surgical field was anesthetized with adrenaline local anesthetic. The flap was lifted to provide adequate access to the surgical field. An oval lateral entry window was prepared using a piezotome. The membrane was carefully elevated starting from the sinus floor. It was extended to the anterior and posterior walls with the sinus curettes. The final elevation was up to the medial wall, allowing the expected graft placement. The bone in the middle of the lateral window was elevated together with the Schneiderian membrane. To ensure sinus membrane integrity, the patient was asked to breathe deeply and membrane

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mobility was observed. Injectable platelet-rich fibrin (iPRF) and advanced platelet-rich fibrin (aPRF) were obtained from the patient's blood. Medium thickness Cerabone® (Botis, Berlin, Germany) bovine xenograft was used. iPRF was mixed with xenograft and placed into the cavity created after membrane elevation. The resulting aPRF was made into a membrane and the anrostomy window was closed. The flap was closed primary without tension by providing sufficient elasticity. Postoperative medications included oxymetazoline hydrochloride spray and chlorhexidine mouthwash twice a day, analgesics (aceclofenac 100 mg, paracetamol 325 mg) and antibiotics (amoxicillin 500 mg) three times a day for one week to aid healing. After 10 days, sutures were removed. A panoramic image taken at 6 months post-op showed sufficient vertical height. A crestal incision was made in the relevant area under anesthesia. The socket was prepared using implant drills. Bilimplant® (İstanbul, Türkiye) 4.1 diameter and 12 mm long implant was placed. The flap was closed primarily. Chlorhexidine mouthwash, analgesics (aceclofenac 100 mg, paracetamol 325 mg) and antibiotics (amoxicillin 1000 mg) were administered twice daily for one week to aid healing. Sutures were removed after one week (Figure 1-10).

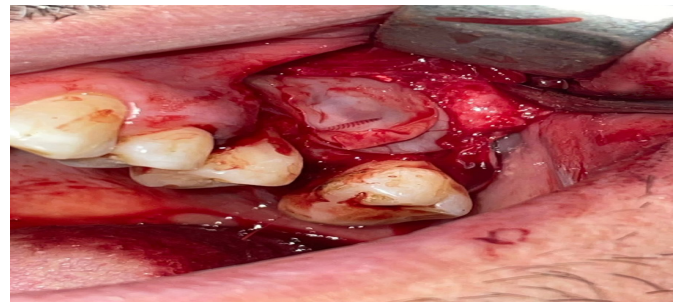


Figure 4. Covering the lateral window with prf membrane after removal of the Schneiderian membrane and grafting

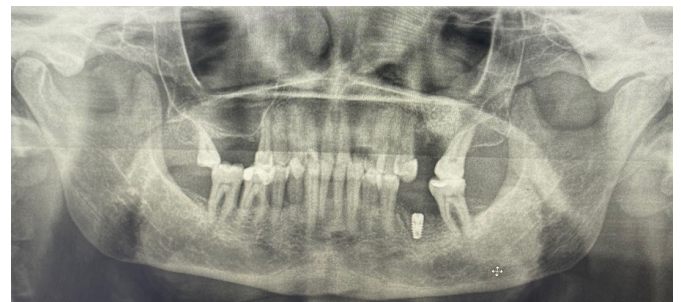


Figure 5. Postop 1 months panoramic image

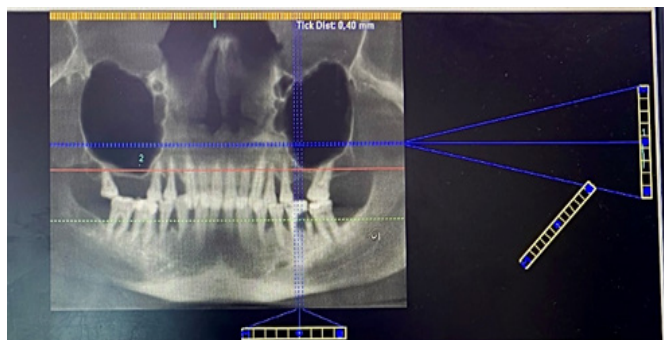


Figure 1. Preop cone beam computed tomography image



Figure 6. Postop 6 months panoramic image

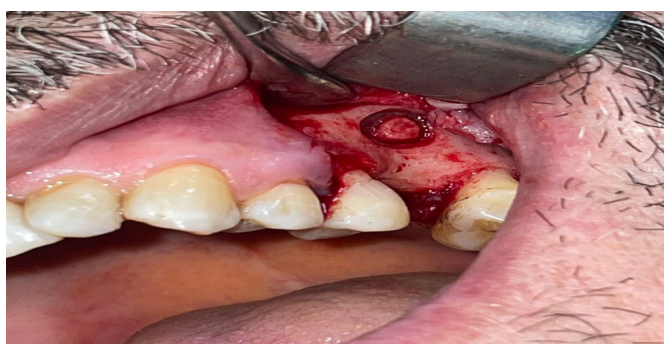


Figure 2. Lateral window prepared with piezotome



Figure 7. Alveolar cleft at the operation



Figure 3. Valsalva maneuvers

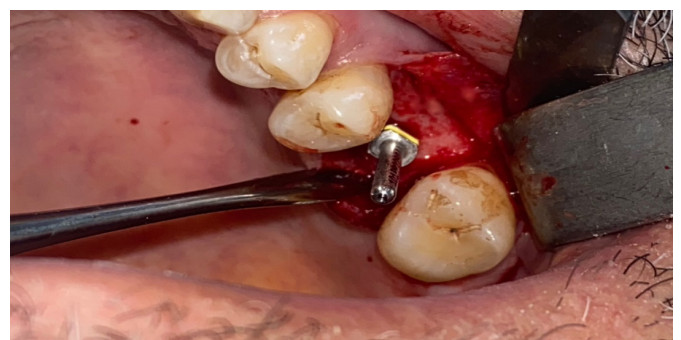


Figure 8. Control of angulation



Figure 9. Subcrestal placement of the implant

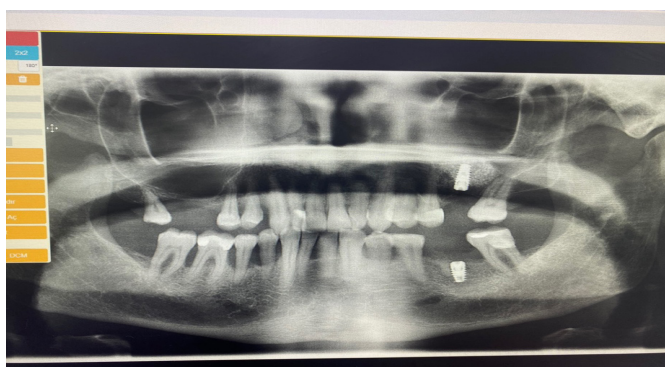


Figure 10. Postop panoramik image

## DISCUSSION

The use of dental implants to restore aesthetics, function and phonation has become widespread.<sup>14</sup> The maxillary sinus is the largest of the 4 paranasal sinuses. When teeth are lost in the maxillary posterior region, resorption is observed both due to the normal bone remodelling process and due to sinus pneumatization.<sup>15</sup> Increased sinus pneumatization, low bone density and decreased RBH in the maxillary posterior pose difficulties in the application of dental implants. Therefore, in order to be able to implant dental implants in the over-resorbed maxillary posterior region, the RBH in the sinus area must be increased by a surgical technique.<sup>14</sup> CBCT imaging before maxillary sinus lift allows a more detailed examination of the surgical field, It allows the detection of pathologies and helps to plan the technique more precisely.<sup>16,17</sup> In this case, the surgical technique was decided using CBCT images. It's effectiveness has been documented in studies that have upgraded LASFA. LASFA is a safe and highly predictable technique.<sup>18-21</sup> It is well known that a minimum RBH of 5 mm is recommended to achieve adequate implant stability and osseointegration.<sup>22,23</sup> When the RBH is  $\geq 5$  mm, the implant is placed simultaneously with the sinus elevation operation; however, in general clinical practice, if the RBH is  $< 5$  mm, a two-stage technique is applied and a LASFA is applied and implants are placed 6 months later.<sup>24</sup> In this case, RBH was found to be  $< 5$  mm. A two-stage technique was applied and implants were placed 6 months after surgery. The biological properties of PRF membranes include the proliferation of a large number of live blood cells, as well as the capacity of PRFs for cell proliferation and cell adhesion during the healing process and in general tissue engineering.<sup>25</sup> In this case, xenograft was mixed with iPRF and membrane derived from

aPRF was used for closure of aPRF lateral antrostomy. At the end of 6 months, when the panoramic film was examined, it was observed that sufficient bone was formed for implant placement ( $> 12$  mm) and the lateral window was completely filled with bone and healed.

## CONCLUSION

According to the results of this case, CBCT is one of the reliable methods to be used in the evaluation of the operation field before surgical approaches. In the patient with RBH is  $< 5$  mm, it was seen that sufficient vertical bone height for implant placement could be obtained by performing sinus lifting with a lateral approach.

## ETHICAL DECLARATIONS

### Informed Consent

The patient signed and free and informed consent form.

### Referee Evaluation Process

Externally peer-reviewed.

### Conflict of Interest Statement

The authors have no conflicts of interest to declare.

### Financial Disclosure

The authors declared that this study has received no financial support.

### Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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