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Case Report

Managing Severe Maxillary Resorption with Crestal Approach Sinus Lifting and Immediate Dental Implants 3 Case Report

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Abstract

The posterior maxilla often presents challenges for implant placement due to limited bone height and ridge width, which may require augmentation techniques. The crestal approach sinus lift, first described by Summers (1994), is a minimally invasive alternative to the lateral window technique, reducing postoperative morbidity while maintaining successful outcomes. However, in cases with both insufficient vertical and horizontal bone dimensions, bone splitting can be combined with the crestal approach to expand the ridge and facilitate implant placement. Traditional Summers technique (internal sinus lifting) includes minimum sinus lifting of 2 to 3 mm. In our cases, the crestal approach technique was used to gain more than 5 mm height. In one of the cases, the technique is combined with ridge splitting to increase bone thickness as well.

Case Presentation: This report describes the surgical management of 3 patients presenting with severely resorbed maxillary ridges, where a combination of bone splitting and crestal sinus lift was performed in two of them. Implants are placed simultaneously, where primary stability is obtained. Clinical and radiographic follow-up demonstrated successful sinus augmentation, sufficient bone gain, and implant integration without complications and simple procedures.

Discussion: The combination of crestal approach sinus lifting and bone splitting in atrophic maxillary cases provides a minimally invasive alternative to traditional augmentation techniques. Unlike the lateral window approach, this technique minimises postoperative complications while achieving substantial vertical and horizontal bone gain. The use of Trephine burs and osteotomes allows controlled sinus elevation while preserving soft tissue integrity. Clinical follow-up demonstrated successful implant integration with no complications, reinforcing the efficacy of this approach in managing complex cases.

Conclusion: The combination of crestal sinus lift and bone splitting is a viable approach for managing atrophic posterior maxilla cases, allowing for ridge expansion and vertical bone gain in a single procedure. This minimally invasive technique preserves soft tissue integrity, reduces healing time, and enhances implant success rates. Further studies and long-term follow-ups are necessary to establish its predictability in complex cases.

Keywords: Dental Implant; Crestal Sinus Lifting; Ridge Splitting

Introduction

Dental implant placement in the posterior maxilla is often complicated by reduced bone height and thickness, mainly due to sinus pneumatization and alveolar bone resorption following tooth loss [1]. Traditional augmentation techniques include the lateral window sinus lift, which, while effective, is associated with considerable prolonged oedema and prolonged healing times [2].

The crestal approach sinus lift has gained popularity as a less invasive alternative, allowing for controlled sinus elevation with reduced surgical trauma. However, when horizontal bone deficiency coexists with inadequate vertical bone height, a crestal approach alone may not provide the necessary bone volume for implant stability. Bone splitting, a technique that increases the bone thickness through controlled osteotomies, can be used to increase ridge width simultaneously with sinus augmentation [3].

This combined technique allows for a single-stage augmentation and implant placement approach, minimising surgical interventions while optaimising bone volume. In most cases, PRF (Platelet Rich Fibrin) was used under the elevated bone before the placement of dental implants.

Aims and Objectives

This case report presents a series of clinical cases where a crestal approach sinus lift was successfully combined with bone splitting to manage severely resorbed posterior maxillary ridges.

The goal is to highlight the surgical technique, clinical outcomes, and potential complications, demonstrating the efficacy of this combined approach in implant site development.

Case Presentation (1)

A 43-year-old male patient presented with the chief complaint of replacing missing teeth #25 and #26. Clinical and radiographic examination revealed significant vertical and horizontal bone loss, particularly in tooth #26 region (Figure 1). The residual bone thickness was less than 4 mm, and the bone height measured between 4 and 5 mm, making implant placement challenging. Preoperative CBCT analysis (Figures 1b and 1c) revealed severe horizontal and vertical bone loss in tooth #26 region, confirming the need for ridge splitting and sinus lifting before implant placement.

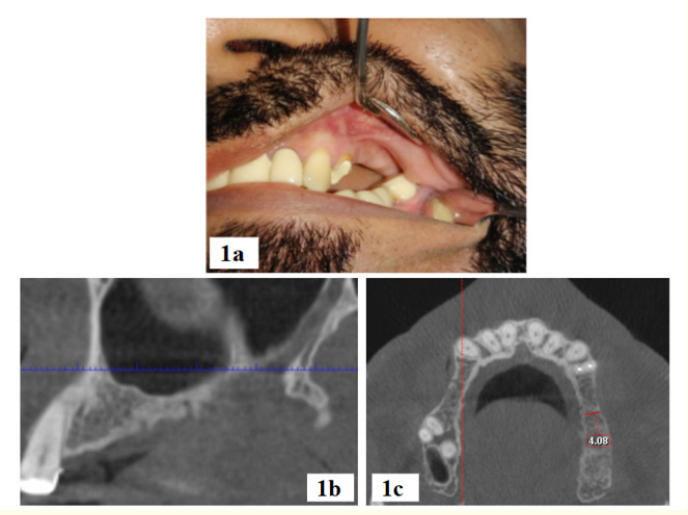

Figure 1: 1a. Preoperative intraoral clinical image showing the edentulous site with ridge atrophy. 1b. CBCT sagittal view indicating the reduced vertical bone height. 1c. Preoperative CBCT axial view demonstrating the horizontal bone deficiency, showing the thickness of the bone 4.08 mm buccolingually.

The surgical protocol involved: (Figure 2)

- Ridge expansion via ridge splitting of #26 area, as illustrated in the images, utilising discs and sequential bone expansion screws.
- Preparation of the implant site using trephine burs up to 2 mm below the Schneiderian membrane (3 mm diameter trephine bur) following ridge expansion.
- Osteotome-mediated sinus floor elevation, carefully lifting the Schneiderian membrane.
- Placement of dental implant with a 4.5 mm diameter and 10 mm length.

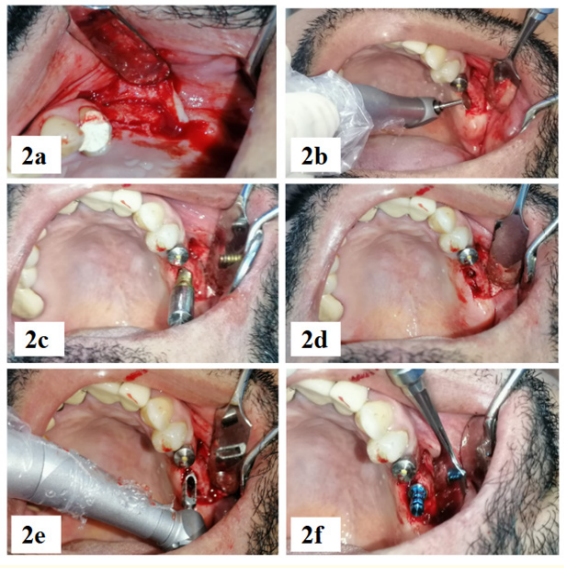

Figure 2: 2a. Intraoperative image after incision, exposing the alveolar ridge and demonstrating the extent of horizontal and vertical bone deficiency. 2b. Ridge splitting initiated using rotary discs to create a precise osteotomy. 2c. Sequential bone expansion performed using bone expansion screws to gradually widen the ridge. 2d. Completed ridge split, demonstrating the expanded alveolar ridge before implant site preparation. 2e. Trephine bur used to cut up to 2 mm below maxillary sinus. 2f. dental implant 4.5 mm Diameter placed, ensuring proper position and stability of the implant.

Notably, despite the initial bone thickness being less than the implant diameter, no bone dehiscence was observed postoperatively, confirming the success of the ridge splitting and sinus lifting techniques in achieving adequate bone volume and implant stability (Figure 3).

Case Presentation (2)

A 60-year-old female patient with a history of controlled diabetes presented for implant placement in tooth #26 region. The patient previously had a fixed dental prosthesis spanning teeth #25, #26, and #27, with #26 missing. As part of the treatment plan, the bridge was sectioned, preserving #25 as a single crown, while #27 was extracted.

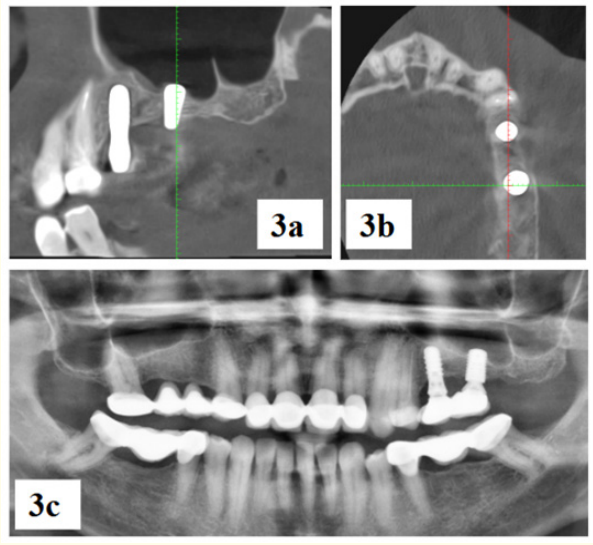

Figure 3: 3a. 1-year follow-up CBCT sagittal view, confirming implant osseointegration and stable bone regeneration following ridge splitting and sinus lifting. 3b. CBCT axial view, showing the positioning of the implants within the bone augmented in the ridge after 1 year. 3c. A 2 year-follow-up panoramic x-ray demonstrating a precise placement of the implant with the prostheses.

Preoperative radiographic assessment revealed that the residual bone height in tooth #26 region was approximately 3 to 4 mm, necessitating sinus floor elevation for successful implant placement.

The surgical approach involved

- Preparation of the implant site using a Trephine bur to create a controlled osteotomy.
- Utilisation of the cut bone collar to assist in lifting the sinus membrane by flat end osteotome and/or sequential expansion screws.
- Placement of PRF (Platelet Rich Fibrin) to enhance bone healing after sinus floor elevation.
- Placement the implant at tooth #26 region: A 11 mm long, 4.1 mm diameter implant following sinus elevation.

The procedure was completed without complications, ensuring adequate primary stability of the implant (Figure 4).

Case Presentation (3)

A 45-year-old female patient presented for implant placement in teeth #15 and #16 regions. Preoperative radiographic evaluation, including panoramic and CBCT imaging, revealed insufficient vertical bone height, necessitating internal sinus lifting and ridge splitting to facilitate implant placement. Two implants were placed, each measuring 12 mm in length and 4.1 mm in diameter, in teeth #15 and #16 regions with adequate primary stability.

Postoperative radiographic evaluation (Figure 5) confirmed the proper positioning of both implants, with successful sinus elevation and no signs of Schneiderian membrane perforation. The patient was scheduled for regular follow-up visits to monitor healing and osseointegration.

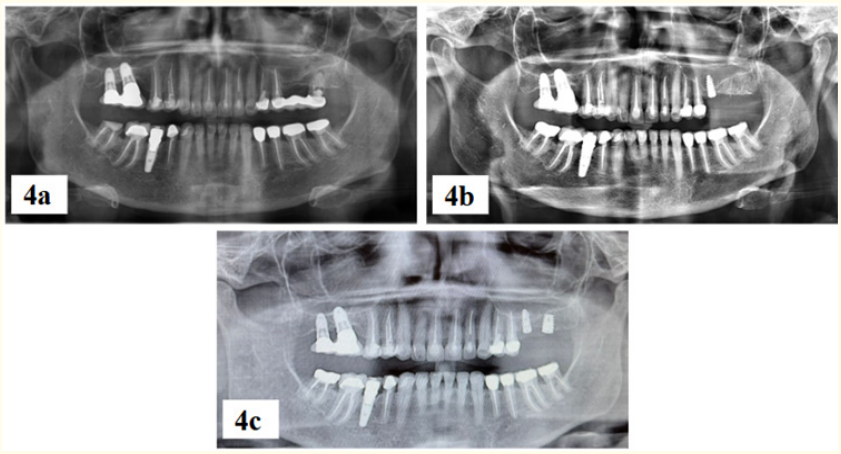

Figure 4: 4a. Preoperative panoramic radiograph showing the edentulous #26 and #27 regions with reduced vertical bone height in #26. 4b. Immediate postoperative panoramic radiograph following sinus lifting and bone grafting in tooth #26 region. The dome-shaped appearance of the substitute bone around the implant is visible indicating proper sinus floor elevation. PRF was used under the implant to enhance bone healing following sinus floor elevation. 4c. Postoperative panoramic radiograph taken after 9 months demonstrating the successfully placed implants, showing increased bone height in the #26 regions.

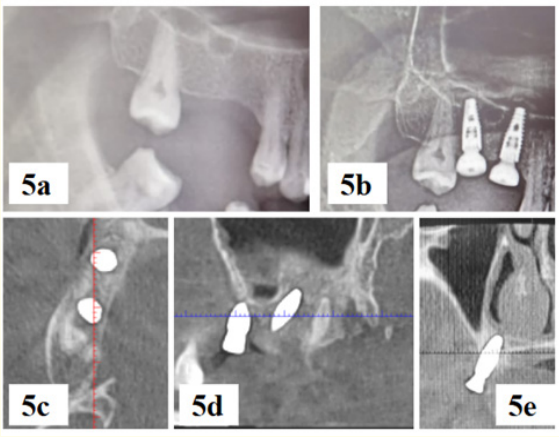

Figure 5: 5a. Preoperative panoramic radiograph, showing the edentulous #15 and #16 regions with reduced bone height. 5b. Postoperative panoramic radiograph, confirming successful implant placement following internal sinus lifting. 5c. Postoperative CBCT axial view, demonstrating the positioning of both implants within the augmented bone structure. 5d. Postoperative CBCT sagittal section, showing successful sinus elevation and implant integration. 5e. Postoperative CBCT coronal section, confirming implant stability and maintaining sinus integrity.

Discussion

The crestal approach sinus lift is a well-established technique for implant placement in the posterior maxilla when bone height is insufficient. However, when both vertical and horizontal bone deficiencies coexist, combining this technique with ridge splitting can provide an effective solution for optimising implant site development.

In this report, three clinical cases were presented where crestal sinus lift alone or in combination with bone splitting was performed to facilitate implant placement in severely resorbed ridges.

Compared to the lateral window technique, the crestal approach:

- Less invasive surgery, therefore promoting faster healing and reducing surgical trauma and postoperative discomfort
- Allows simultaneous implant placement, minimising treatment duration.

Careful patient selection, adequate surgical planning, and precise instrumentation are crucial for success.

Postoperative radiographic follow-ups demonstrated:

- Stable sinus floor elevation without membrane perforation.
- Adequate bone gain and maintained implant stability.
- Successful osseointegration at six months, confirming the long-term viability of the technique.

Conclusion

The crestal approach sinus lift, whether performed alone or in combination with ridge splitting, provides a minimally invasive and effective technique for implant placement in cases of posterior maxillary atrophy. By allowing simultaneous implant placement and reducing surgical trauma, this technique offers advantages over the lateral window approach, including shorter healing time, lower complication rates, and enhanced patient comfort [4,5].

The cases presented in this report demonstrate that adequate vertical and horizontal bone augmentation can be achieved, leading to stable implant integration and long-term success. Postoperative radiographic evaluations confirmed consistent bone regeneration, maintained sinus integrity, and proper implant stability. However, this technique requires precise case selection and careful surgical execution, as excessive ridge expansion or improper sinus manipulation may lead to complications such as Schneiderian membrane perforation or insufficient primary stability.

Current literature supports the predictability and high success rates of crestal sinus lifting, particularly when combined with bone grafting and platelet-rich fibrin (PRF) to enhance healing and bone maturation [6]. Studies have reported survival rates exceeding 95% for implants placed with this technique, emphasising its reliability as an alternative to more invasive augmentation procedures [7]. Further research and long-term clinical studies are essential to refine the technique, optimise its indications, and evaluate its long-term efficacy in patients with severe atrophic maxillae.

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