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Minimally Invasive Maxillary Sinus Elevation with Implant Placement: The Indirect Approach

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Abstract:

- ***Introduction:***

Pneumatization of the maxillary sinus following tooth extraction is a common phenomenon in the posterior maxilla, often leading to considerable loss of alveolar bone height. To address this limitation, sinus lift procedures are employed. Sinus floor elevation may be carried out using either the indirect (transcrestal) or direct (lateral) approach.

- ***Case Report:***

A 35-year-old female patient presented to the Department of Prosthodontics, Crown and Bridge at Jaipur Dental College with a chief complaint of missing teeth in the upper left back tooth region for 7 months and sought a fixed treatment. The buccal and palatal flaps were adequately mobilized to provide a clear field of the alveolar crest. First drill was made till 5mm depth followed by osteotome hammering till 10mm and continued till 4.3mm of last drill till 5mm and osteotome hammering till 10mm. Implant placement done of size 4.5mm*10mm followed by placement of cover screw.

- ***Discussion:***

The indirect sinus lift shows high implant survival rates and predictable outcomes when applied in appropriately selected cases.

Keywords: *Maxillary Sinus, Indircet Sinus Lift, Dental Implant Surgery, Pneumatization.*

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I. INTRODUCTION

The maxillary sinuses are air-filled cavities situated posterior to the cheeks and superior to the upper dentition. Each sinus, also referred to as the antrum of Highmore, is a paired, pyramidal paranasal sinus housed within the maxillary bone. Drainage occurs via the maxillary ostium into the infundibulum and subsequently through the hiatus semilunaris into the middle meatus. These sinuses are present at birth and continue to develop until approximately 14 years of age. Among the paranasal sinuses, they are the largest, with an average volume of about 12.5 ml. Their lining consists of a delicate bilaminar mucoperiosteal layer, known as the Schneiderian membrane. Following tooth extraction, pneumatization of the maxillary sinus commonly occurs in the posterior region, frequently leading to a marked reduction in alveolar bone height. This anatomical change presents a major obstacle for implant placement, as adequate bone height is essential for osseointegration. To address this issue, sinus lift procedures have been established as key surgical interventions, designed to elevate the Schneiderian membrane, enhance vertical bone height, and thereby support successful dental rehabilitation. [1][2]

Studies indicate that post-extraction bone resorption is generally greater in females, likely due to differences in bone density and hormonal factors (Saglam, 2002). Resorption is more severe after molar extractions compared to premolars (Wehrbein & Diedrich, 1992) and increases when multiple adjacent teeth are removed (Sharan & Madjar, 2008). Traumatic or repeated extractions, which delay healing, further accelerate bone atrophy. In addition, improper extraction techniques may damage the thin bony lamina or rupture the sinus membrane, thereby aggravating physiological ridge resorption. [3]

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In the edentulous posterior maxilla, the vertical bone height is often compromised due to maxillary sinus pneumatization or the close proximity of the sinus floor to the alveolar crest. To address this limitation, the sinus lift procedure was first introduced in the mid-1970s. Since then, numerous modifications and techniques have been developed within implant dentistry. The fundamental objective of these approaches is to elevate the sinus membrane, thereby creating a sub-antral space to enhance vertical bone height. At present, reconstruction of the atrophic maxilla is achieved using a variety of grafting materials, including autogenous, allogenic, xenogenic, and synthetic substitutes. [1]

➢ *Indications for Sinus Augmentation [5]*

- Absence of sinus pathology
- Residual bone height less than 10 mm
- Severely resorbed maxilla
- Inadequate bone quality and quantity in the posterior maxilla

➢ *Contraindications for Sinus Augmentation [5]*

- Recent radiation therapy in the maxilla
- Uncontrolled systemic diseases (e.g., diabetes mellitus)
- Acute or chronic maxillary sinusitis
- Heavy smoking
- Alcohol abuse
- Psychotic disorders
- Severe allergic rhinitis
- Tumour or large cyst in the maxillary sinus
- Oroantral fistula.

There are many techniques that are available for sinus lifting. Basically, the Sinus augmentation techniques are broadly classified into two categories: [1]

✓ The direct method, performed through a lateral antrostomy in one or two stages, and the indirect method, which uses the osteotome technique via a crestal approach. The indirect sinus lift is also referred to as subantral sinus augmentation, subcrestal augmentation, sinus floor elevation, or the trans crestal approach.

The choice between sinus lift techniques depends on factors such as residual alveolar ridge height and sinus floor morphology. The indirect approach is preferred when at least 4 mm of ridge height is present and the sinus floor is flat and free of septa, allowing for minimally invasive access. This technique may be performed using Densah burs or osteotomes, either alone or in combination with grafting materials. [2]

The indirect sinus lift is considered a conservative, minimally invasive technique, best suited for moderate deficiencies in bone height. Several factors—including heredity, craniofacial anatomy, nasal mucosal pneumatization, prior sinus surgeries, bone density, intra-sinus air pressure, and growth hormones—can influence the extent of maxillary sinus pneumatization. [4]

II. CASE REPORT

A 35-year-old female patient reported to the Department of Prosthodontics, Crown and Bridge, Jaipur Dental College, with a chief complaint of missing teeth in the upper left posterior region for the past 7 months, seeking a fixed prosthetic solution. The dental history revealed extraction of the upper left second molar (27) seven months earlier. The patient was medically healthy, and routine blood investigations showed no abnormalities.

Clinical examination confirmed the absence of tooth 27, with an edentulous space measuring 8.3 mm mesiodistally and an inter-arch distance of 10 mm. CBCT evaluation of the region revealed a mesiodistal width of 8.7 mm, buccolingual width of 12.5 mm, and a residual bone height of 7.0 mm from the alveolar crest to the maxillary sinus floor. Based on these findings, an indirect sinus lift with simultaneous implant placement (4.5 × 10 mm) was planned.

The patient was prepared for surgery, and prophylactic antibiotic coverage was given (2 g amoxicillin, 1 hour before surgery) as recommended by Esposito et al. Left Posterior superior alveolar and Greater palatine nerve block was administered with local infiltration. A crestal incision was placed, and a-full-thickness mucoperiosteal flap was elevated, with adequate mobilization of buccal and palatal flaps for clear access to the alveolar crest. The initial osteotomy was prepared to 5 mm depth, followed by osteotome tapping up to 10 mm. Sequential drilling was performed up to 4.3 mm diameter at 5 mm depth, and osteotome hammering continued to 10 mm to achieve sinus membrane elevation. A 4.5 × 10 mm implant was placed, and a cover screw was secured. The site was closed with two simple interrupted sutures, and the patient was recalled after 7 days. At 5 months post-implant placement, second-stage surgery was performed. Two weeks later, an impression was made, and a PFM screw-retained crown was fabricated and placed with respect to 27. Postoperative instructions were provided, and the patient was kept under regular follow-up.

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Fig 1 Pre-Operative Intraoral View

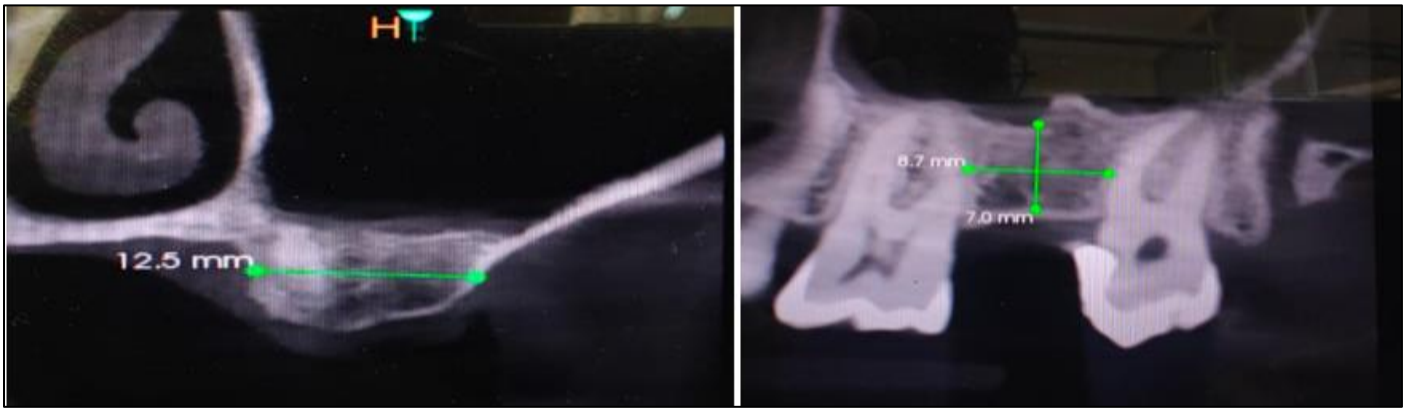

Fig 2 Pre-Operative Radiograph

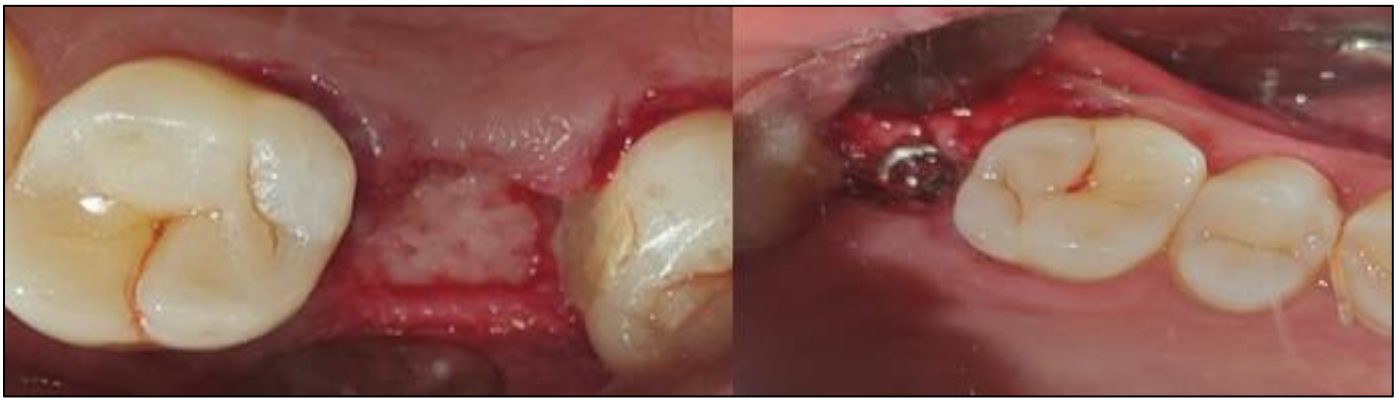

Fig 3 Incision and Implant Placement

Fig 4 Post-Operative Radiograph and Suture Placement

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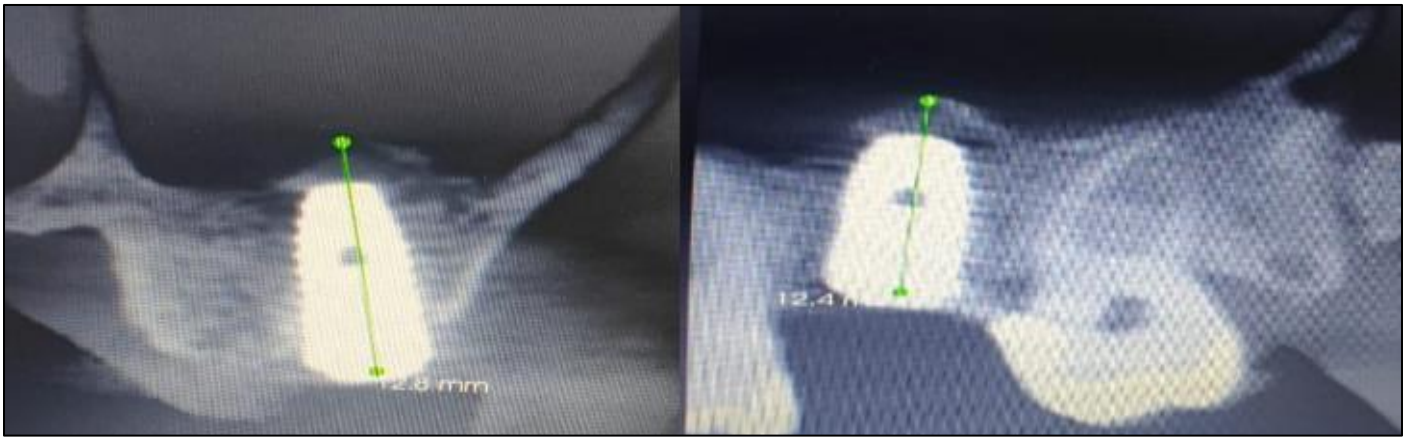

Fig 5 Post-Operative Radiograph(Cbct) After 5 Months
A. Saggital View B. Frontal View

Fig 6 Second Stage Surgery

Fig 7 Impression Using Closed Tray Technique

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Fig 8 Screw-Retained Pfm Crown Placement Irt 27

III. DISCUSSION

The indirect sinus lift, or transcrestal approach, is a minimally invasive alternative to the lateral window technique for implant placement in the posterior maxilla with moderate bone height deficits. It is indicated when residual bone height is at least 4–6 mm, allowing for both sinus membrane elevation and simultaneous implant placement.

This technique, performed using osteotomes or Densah burs, compacts bone while gently lifting the sinus floor, which not only minimizes trauma but also enhances bone density and implant stability. A major advantage is reduced morbidity, shorter treatment time, and the possibility of completing augmentation and implant placement in a single procedure.

However, careful case selection is essential. Patients with residual bone height less than 4 mm, sinus pathology, or complex anatomy (e.g., septa) are better managed with the direct lateral approach. While risks such as membrane perforation or inadequate bone gain exist, the indirect method generally demonstrates high implant survival rates and predictable outcomes in well-selected cases.

REFERENCES

[1]. Aruna Wimalarathna. Indirect Sinus Lift: An Overview of Different Techniques. Biomed J Sci & Tech Res 33(4) 2021. BJSTR. MS.ID.005447.

[2]. Stern & Green., Sinus Lift Procedures: An Overview of Current Techniques., Dent Clin N Am 56 (2012) 219–233.

[3]. Kornel Krasny • Marta Krasny • Artur Kamin´ski., Two-stage closed sinus lift: a new surgical technique for maxillary sinus floor augmentation, Cell Tissue Bank (2015) 16:579–5.

[4]. M.l Kharoufeh, R. Saleh, E. Lahham, S. Hanania, A. Shatara, C. Lahham., Indirect sinus lift in conjunction with platelet-rich fibrin: A systematic review., JOURNAL OF MEDICAL RESEARCH AND REVIEWS 2024; 2(3): 68-76.

[5]. Pai, et al.: “Autogenous core lift” technique in atrophic maxilla., Contemporary Clinical Dentistry | Volume 8 | Issue 4 | October - December 2017.

[6]. Balaji: Direct v/s indirect sinus lift in maxillary implants., Annals of Maxillofacial Surgery | July - December 2013 | Volume 3 | Issue 2.