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Case Report

New Maxillary Sinus Lift Technique 'Thin Wall Technique' Using Lateral Approach: A Technical and Case Report

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Abstract

Background

The maxillary sinus lift procedure via a lateral approach is considered an invasive surgery with potential morbidity for patients. Simplifying the surgical technique can lead to better outcomes for both operators and patients. The Thin Wall Technique (TWT) involves creating a thin lateral wall of the maxillary sinus before bone osteotomy and fenestration.

Case presentation

The TWT aims to achieve this by, first, thinning the lateral wall of the maxillary sinus with a rotary bur, creating a circular osteotomy. Second, performing bone perforation with a blind instrument that leave thin bone attached to the sinus membrane. The sinus membrane is then lifted, and bone augmentation proceeds as in the classical lateral sinus approach. A resorbable collagen membrane was placed to close the lateral wall opening. Flap closure with double layer closure to prevent dehiscence. The time of sinus lift procedures were estimated and ranged between 45-60 minutes. The healing period for the graft material ranged between 6 and 9 months. Post-operative radiograph was taken to evaluate the bone graft augmentation. All cases experience no major complications and bone graft intake was successful. Implant placed with decent stability (35Ncm) and left to heal for 3 months before prosthetic delivery.

Conclusion

Thin Wall Technique has shown promise in maintaining sinus membrane integrity during osteotomy and lifting. However, further long-term studies are necessary to confirm these findings.

Key words: sinus augmentation; pneumatization; bone graft; schneiderian membrane; oral rehabilitation; case report; dental implant

Introduction

The maxillary sinus, the largest of the four paranasal sinuses, has an average volume of 12.5cc [1]. However, its volume can change due **to** various factors, including pneumatization[2]. Pneumatization refers to the expansion of the maxillary sinus inferiorly and laterally after the extraction of maxillary posterior teeth [2]. This expansion can limit the availability of alveolar bone, often necessitating a sinus lift procedure prior to implant placement [3].

The lateral window approach, first described by Boyne and James [4], is a common method for lifting and augmenting the maxillary sinus. This approach aims to increase bone height beneath the sinus floor, allowing for implant placement in a prosthetically driven position [5]. It is typically indicated when the residual bone height is ≤5mm [3]. While the lateral window approach has shown good long-term results [5,6], it carries risks of peri- and postoperative complications, such as sinus membrane perforation and intraoperative bleeding [7].

To address these challenges, the author has developed the Thin Wall Technique (TWT), a novel approach that aims to simplify sinus lift treatment and reduce complications. This technique may offer an alternative to traditional methods, potentially making the procedure more accessible to clinicians and patients.

Case report

Case presentation

Two patients underwent the Thin Wall Technique (TWT) procedure. Both patients reported functional needs to replace missing maxillary molars and had no history of systemic diseases or medication use.

Patient 1:

A 60-year-old female patient had undergone extraction of the upper left first molar four months prior and presented to our facility seeking replacement. The treatment plan involved sinus grafting, removal of the unsalvageable upper left first and second molars, and immediate implant placement in the upper left first premolar region. The patient agreed to the treatment plan and provided informed consent.

Patient 2:

A 31-year-old male patient had undergone extraction of the upper right first and second molars six years prior and sought treatment to replace the missing teeth. The treatment plan involved a lateral approach sinus lift followed by delayed implant placement. The patient agreed to the treatment plan and provided informed consent.

Surgical technique

The Thin Wall Technique involves creating a thin lateral wall of the maxillary sinus before bone osteotomy, utilizing special tools to achieve optimal results. Preoperative radiograph was taken to evaluate the sinus condition (figure1)

Surgical procedures were done under local anesthesia, a palatal incision just below the top of the alveolar crest with vertical releasing incisions was made, and a mucoperiosteal flap was raised to expose the alveolar crest and the lateral aspect of the maxilla (figure 2).

Autogenous bone can be collected with a bone scraper to collect the bone and thinning the lateral maxillary wall simultaneously (Figure 3). A disk bur with slow speed handpiece was used for further bone osteotomy of the lateral wall until sinus shadow appears to the operator, at this stage operator should stop using the rotary bur (figure 4).

The lateral wall of the maxillary sinus was subsequently fenestrated with a special design blind osteotome, by gentle tapping with a hammer will break the margin of thin wall leaving bone shield attached to the sinus membrane (figure 5). The sinus membrane was raised and the mobilized part of the thin lateral sinus wall, together with the raised sinus membrane, was rotated medially and upwards (figure 6).

Bone graft particles were mixed with autogenous bone that collected from the lateral wall in the beginning of surgery, bone graft placed inside the sinus with gentle packing (figure 7). After grafting, the height of the maxillary bone had to be at least 13 mm that allowed standard implant length to be placed in the future.

A resorbable collagen membrane was placed to close the lateral wall opening (figure 8), isolate the bone graft from the soft tissue flap and secure the bone graft in place. To prevent wound dehiscence, periosteum scoring was done to assure non-tension flap closure with double layer closure. The time of sinus lift procedures were estimated and ranged between 45-60 minutes. Postoperative instructions were given and medications were prescribed; patient was recalled after two weeks for suture removal. Post-operative radiograph was taken to evaluate the bone graft augmentation (figure 9).

All the cases treated with delayed implant placement or two-stage surgery. In delayed approaches, the healing period for the graft material ranged between 6 and 9 months. After bone graft healing period elapsed, implant placed following the manufacture standard and recommendation.

After three months, submerged implant exposed in second surgery then prosthetic part start to be initiated. All cases experience no major complications, bone graft intake was successful, decent implant stability (35Ncm and above). Patients followed up clinically and radiographically after loading with implant survival rate was 100%. The patient reported positive feedback when the posterior maxillary site was rehabilitated with sinus lift and implant placement, which restored function to the site

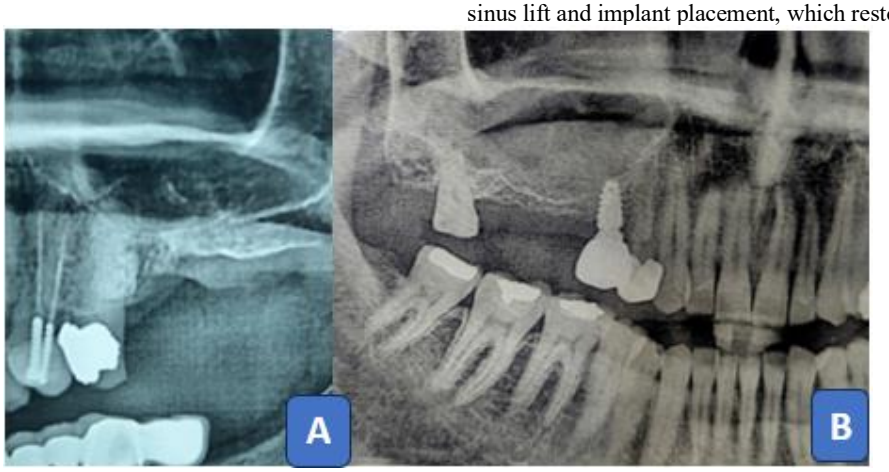

Figure 1: Preoperative orthopantomograms of two patients (A&B) demonstrate insufficient bone height beneath the maxillary sinus due to pneumatization

Figure 2: A full-thickness flap is reflected to expose the bone up to the zygomatic buttress. A vertical incision is placed distal to the canine, and a horizontal incision is made toward the palatal aspect of the ridge crest

Figure 3: Autogenous bone is harvested from the lateral wall of the sinus using a bone scraper and mixed with synthetic bone particles. The bone scraper also thins the lateral wall of the sinus

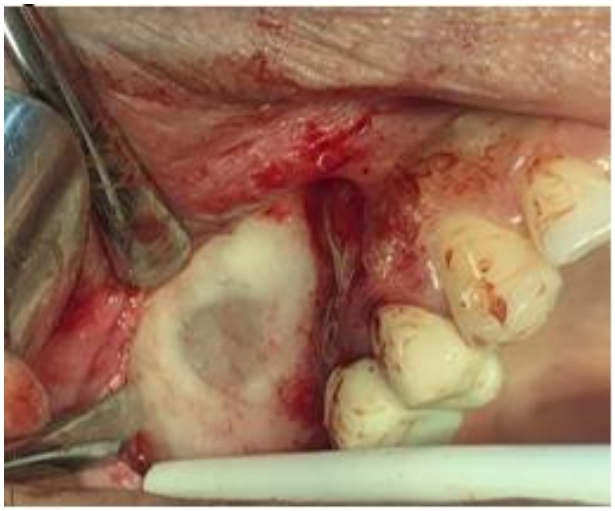

Figure 4: A circular bone osteotomy is performed on the lateral wall until the maxillary sinus shadow appears. Rotary bur osteotomy is stopped at this point to avoid over-thinning the lateral wall

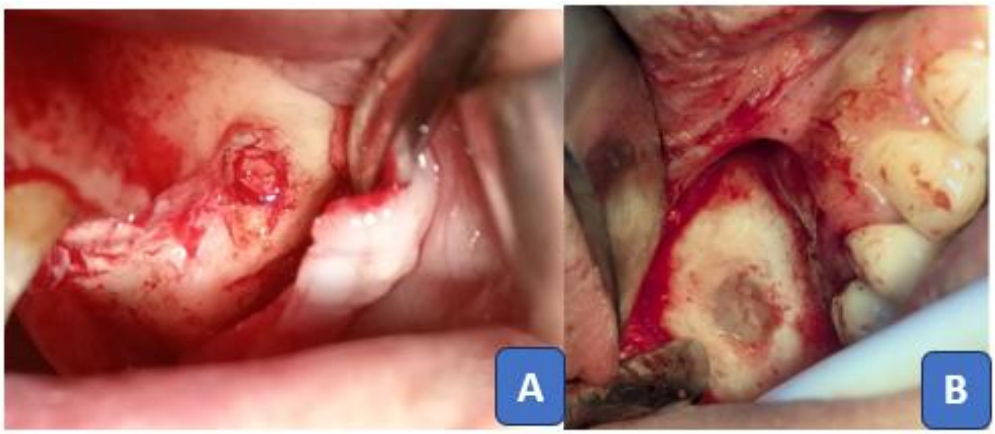

Figure 5: Lateral maxillary wall fenestration is achieved using a blind osteotome with gentle tapping, freeing the bony margins and leaving a thin bone shield attached to the sinus membrane

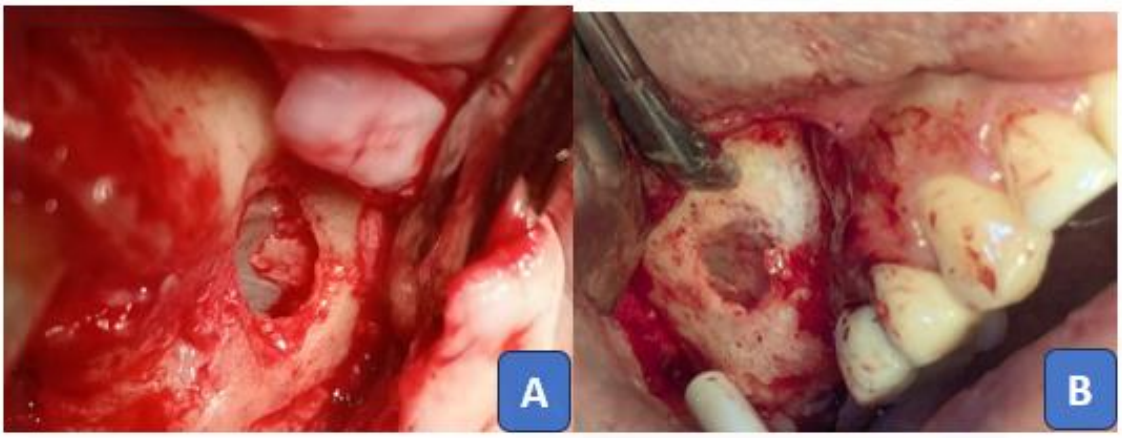

Figure 6: The sinus membrane is lifted upward and medially (A&B), with the thin bone shield still attached. The membrane remains intact without perforation and moves freely

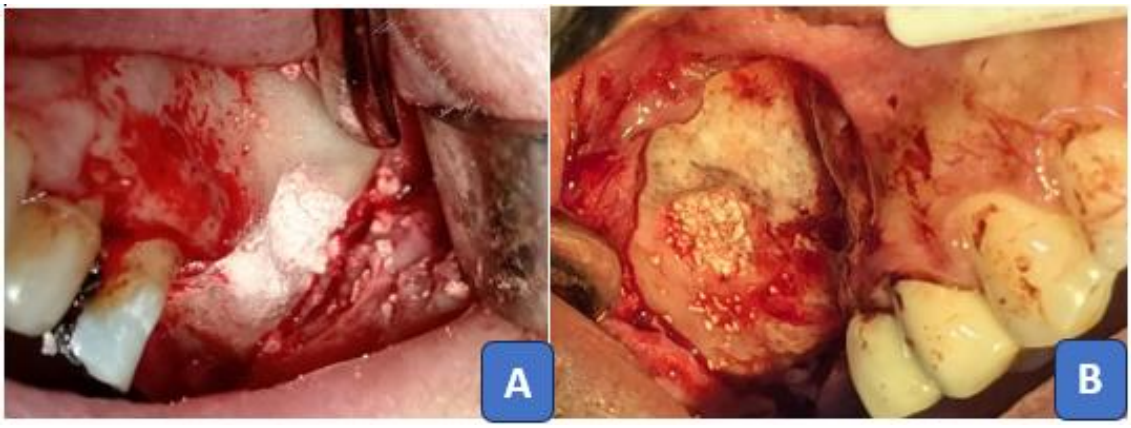

Figure 7: Bone graft particles are applied to the sinus cavity after lifting the membrane. The graft is distributed and packed gently. (A) Hydroxyapatite tricalcium phosphate bone graft substitute; (B) Xenograft bone substitute

Figure 8: A resorbable membrane is fixed with sling sutures to close the lateral window opening

Figure 9: A &B, Postoperative radiograph (orthopantomogram) evaluates the sinus lift procedure and bone formation before implant placement

Discussion

The lateral window technique is a safe and predictable procedure for augmenting the maxillary sinus (table 1) when the residual vertical alveolar bone height is ≤6 mm [8]. Various tools, such as piezosurgery and round burs [3], are used to create and determine the borders of the lateral window. However, these tools can leave thick and hard cortical bone attached to the Schneiderian membrane, which has several disadvantages. Firstly, the incidence of sinus membrane perforation is high (32%) [9], often occurring during membrane elevation rather than lateral wall fenestration [3,9] This may be due to the presence of thick cortical bone, which does not transmit the sensation of membrane resistance during elevation and detachment. Secondly, the thick cortical bone may cause inflammation and bone resorption of the underlying bone graft after sinus lifting and bone augmentation [9].

In contrast, the Thin Wall Technique (TWT) involves lateral wall fenestration using gentle tapping with a blind osteotome, resulting in a green stick fracture of the thin wall. The piece of thin bone attached to the sinus membrane protects it from perforation during membrane lifting and provides a sensation of membrane resistance. Further research with a large sample size is needed to confirm that TWT can preserve the sinus membrane from perforation.

Sinus membrane perforation is the most common intraoperative complication in the lateral window approach, potentially leading to chronic complications [6,8,10]. Another intraoperative complication is damage to the posterior superior alveolar artery (PSA), which can occur during osteotomy procedures [3,11]. The PSA is often located within the lateral wall (64%) or inside the sinus (30%) [12]. Vertically, PSA located 16mm from the alveolar crest and 8mm from the maxillary sinus floor [12], Making it prone to injury during lateral window fenestration. While bleeding from the PSA can be managed, it can still obstruct the clinician's view and prolong surgery time [12]. TWT avoids PSA injury by using a blind instrument and partial removal of the lateral wall.

The author's experience with TWT has shown a reduction in procedure time, from 60-90 minutes using traditional methods to 46-60 minutes, depending on sinus size. A delayed approach with a healing period of 6-9 months is used to ensure adequate bone formation before implant placement [13]. However, TWT has limitations, including a small opening on the lateral wall and potential difficulties in handling large disk drills on oblique surfaces. Additionally, TWT may not address complications caused by maxillary sinus septa.

NO.	Advantages
1-	**Protection of the Schneiderian membrane:** The remaining bone shield on the lateral wall safeguards the membrane during elevation.
2-	**Vascular preservation:** Partial lateral wall osteotomy and the use of a blind osteotome instrument help protect the posterior superior alveolar artery from injury.
3-	**Tactile feedback:** Despite leaving a bone shield, clinicians can still sense membrane resistance and tension during elevation, preventing excessive force application.
4-	**Native bone coverage:** In cases of immediate implant placement with sinus augmentation, the apical part of the implant is covered by native bone.
5-	**Stable graft packing:** Bone particles can be firmly packed against the bone shield.
6-	**Decrease surgery time**

Table 1: Advantages of thin wall technique

Conclusion

This study demonstrates that the Thin Wall Technique can effectively preserve the sinus membrane from perforation and protect blood vessels from injury. However, further research is warranted to assess the long-term outcomes of this method, particularly with respect to implant stability and peri-implant bone resorption.

Authors' Contributions

The author confirms sole responsibility for the following: Study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Ethical Statement

The clinical records, radiographs, and laboratory data were obtained directly from the patient during routine care, in accordance with institutional ethical standards and with the patient's informed consent.

Consent For Publication

Informed consent was signed by the patient and is available upon request.

Standards of Reporting Care

guidelines were followed.

Availability of Data and Materials

The data supporting the findings of the article will be available from the corresponding author [M.J] upon reasonable request.

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None.

Conflict of Interest

The author declares no conflict of interest, financial or otherwise.

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Nothing to acknowledge

Disclosure

Nothing to disclose

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