Leon Chen's Modified Valsalva Technique (LCMVT) for Retrieval of Displaced Dental Implants: A Clinical Technique Report

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The retrieval of a displaced dental implant from the maxillary sinus—whether through an intraoral lateral window or a transnasal endoscopic route—invariably requires further surgical intervention and a subsequent healing period. For instance, in cases where a lateral window approach was not initially indicated, the accidental displacement of a dental implant into the maxillary sinus often necessitates the creation of such an access, which can lead to patient dissatisfaction. If removal through the lateral window proves unsuccessful, referral to an otolaryngologist may become necessary, and a transnasal endoscopic approach must then be employed. These additional procedures inevitably contribute to increased psychological stress for the patient. Furthermore, the waiting period associated with referrals—scheduling consultations with oral and maxillofacial surgeons or ENT specialists, and potential hospital admission—can significantly heighten patient anxiety. The enlargement of the surgical field may also prolong the healing process, particularly osseointegration, potentially delaying treatment completion by 6 months to over 1 year. Additional surgical interventions increase the psychological burden on both the patient and the original surgeon. In this context, the term "original surgeon" refers to the implantologist who initially performed the implant placement and subsequently referred the patient to the authors for management of a displaced implant in the maxillary sinus. Case 1 details the procedural steps undertaken by the authors to retrieve the displaced implant. In Case 2, the implant was inadvertently displaced into the maxillary sinus by the authors themselves during implant placement; it was subsequently retrieved using the technique described in this report. A new implant was immediately placed following removal, and the oroantral communication was successfully prevented. We introduce a simple and reproducible method for clinicians, known as Leon Chen's Modified Valsalva Technique (LCMVT). Leon Chen's Modified Valsalva Technique (LCMVT) involves seating the patient upright with a slight forward tilt, followed by deep inhalation and breath holding. Approximately 8 mL of normal saline is injected into the osteotomy site, after which the clinician occludes the patient's nostrils. The patient is then instructed to exhale forcefully against the closed airway. This maneuver is repeated several times until the displaced implant is mobilized toward the osteotomy opening. This technique significantly reduces the inconvenience of waiting for subsequent surgical interventions and yields positive feedback from patients.

Key Words: maxillary sinus, implant displacement, Schneiderian membrane, sinus lift, sinus membrane perforation, Valsalva Technique

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INTRODUCTION

Implant displacement into the maxillary sinus can lead to patient anxiety, delayed treatment, and the need for additional surgical intervention, potentially increasing morbidity and overall treatment costs. Such events may also cause distress to inexperienced clinicians, underscoring the importance of proper training and preparedness in managing surgical complications.

When placing implants in the maxillary posterior region, a sinus lift procedure is often required due to the limited bone height and width in this area. Even with meticulous surgical techniques, there remains a potential risk of implant displacement into the sinus cavity.[1] Although the likelihood of implant displacement into the sinus cavity tends to decrease with increased surgical experience, the cumulative number of cases performed by experienced clinicians also rises over time. As a result, the absolute number of displacement incidents may still increase, despite improved individual proficiency.

In contemporary review articles addressing the removal of a displaced dental implant from the sinus cavity, the documented

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approaches predominantly include the lateral window antrostomy technique or transnasal endoscopic methods.[2–5] However, both procedures are inherently and relatively invasive, leading to significant psychological and physical discomfort for patients. Additionally, these techniques often necessitate interdisciplinary collaboration, particularly with otolaryngologists, with whom clinicians must establish effective working relationships. Therefore, we present an innovative and convenient method for removing a displaced dental implant from the sinus cavity, known as Leon Chen's Modified Valsalva Technique (LCMVT). Through 2 case studies, we will demonstrate how this technique effectively closes the oroantral communication immediately, eliminating the need for referral to a hospital and avoiding the lengthy wait for oral surgeons or otolaryngologists to perform a secondary surgical intervention to remove the displaced implant.

Valsalva Maneuver

The Valsalva maneuver is a technique that involves increasing intrathoracic pressure by forcefully exhaling while keeping the airway closed, typically by closing the glottis. First described by the Italian anatomist Antonio Maria Valsalva,[6] this maneuver has since been widely applied in various medical examinations and treatment procedures. The Valsalva maneuver serves several key purposes, including ear pressure equalization, cardiovascular function diagnosis, and sinus function assessment. The basic principle involves the patient taking a deep breath, then forcefully exhaling while keeping the airway closed, such as by pinching the nose and closing the mouth. In dentistry, the Valsalva maneuver is typically and frequently used during sinus lift procedures to indicate whether or not the sinus membrane has been perforated.[7] To distinguish a perforation of the sinus membrane, clinicians can pinch the patient's nose and ask the patient to blow out gently; the presence of bubbles or foaming around the osteotomy site may suggest that air is escaping through a perforation in the sinus membrane. Certainly, when a dental implant becomes displaced, the clinician should distinguish whether the displaced implant is located within the sinus membrane space or the sinus cavity space.[1] When a dental implant is displaced into the maxillary sinus cavity, clinicians can effectively remove it using LCMVT. Building on the widespread use and non-invasive nature of the traditional Valsalva maneuver, this modified technique, detailed later, facilitates the removal of a migrated dental implant during the same session as the implant surgery, thereby eliminating the need for open lateral window surgeries or endoscopic procedures. This approach enhances patient trust and confidence in the treatment process.

Leon Chen's Modified Valsalva Technique (LCMVT)

In patients with insufficient maxillary bone height, particularly when the sinus membrane (ie, Schneiderian membrane) is less than 1 mm in thickness, especially in cases with a thin membrane type, the risk of membrane perforation is significantly increased.[8]

As a result, during implant placement, the implant may inadvertently become displaced into the maxillary sinus cavity.



Figure 1. A 54-year-old nonsmoking pale patient was referred to the author's office because the initial operator intended to place a healing cap after implant placement 3 weeks prior.

The authors have modified the Valsalva maneuver to assist in repositioning a displaced implant within the sinus cavity, bringing it closer to the osteotomy site. By taking panoramic or periapical radiographs while the patient is moving, the implant's movement can be tracked in various positions, indicating that the implant was displaced into the sinus cavity space.[1] Simultaneously, taking radiographs enables clinicians to locate the implant more accurately. This technique is particularly advantageous for patients who use a wheelchair or have limited mobility, as it eliminates the need to stand up and sit down. Clinicians can directly guide patients on how to perform the maneuver while seated, offering a less invasive method for implant retrieval.

The steps for performing LCMVT are as follows:

1. Instruct the patient to sit upright and lean slightly forward.
2. Ask the patient to inhale deeply and hold their breath for a moment.
3. The clinician injects approximately 8 mL of normal saline into the osteotomy site using a syringe and then pinches the patient's nose.
4. Ask the patient to blow out, exhaling forcefully with maximum effort.
5. Repeat this maneuver a few times until the displaced implant is pushed back to the opening.

Clinicians can then assess whether the displaced dental implant has moved closer to the osteotomy site. The implant may become visible, or a radiograph can be taken to confirm its position. Ensure the patient remains in an upright position throughout, which helps prevent the implant from shifting back to a posterior position.

Case Presentation

Case 1

A 54-year-old nonsmoking male patient with no significant medical history was referred to the author's office because the initial operator intended to place a healing cap after implant placement 3 weeks prior (Figure 1). The patient was administered local anesthesia. Before the author proceeded to retrieve the

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Figure 2. Before the author proceeded to retrieve the displaced implant, a panoramic radiography was taken on the day Leon Chen's Modified Valsalva Technique (LCMVT) was performed to confirm implant displacement. The differing positions of the displaced implant were evident, indicating that the implant had fallen into the sinus cavity space.

displaced implant, a panoramic radiograph was taken on the day LCMVT was performed (Figure 2). By comparing the 2 panoramic radiographs, Figures 1 and 2, the differing positions of the displaced implant were evident, indicating that the implant had fallen into the sinus cavity space.[1]

As previously described in LCMVT, the patient was instructed to sit upright and lean forward. The patient was then asked to inhale deeply and hold his breath while the author pinched the patient's nose and instructed him to exhale forcefully, ensuring that the air was expelled through the nose rather than the mouth. After a few practice attempts, the author injected normal saline into the osteotomy site using a syringe to lubricate the sinus membrane and facilitate the movement of the displaced implant (Figure 3a). The syringe was gently pressed to irrigate approximately 6 mL of normal saline sinus cavity through osteotomy site (Figure 3b). Afterward, the clinician pinched the patient's nose and instructed the patient to blow forcefully, as hard as possible. All the saline was expelled from the osteotomy site during this process (Figure 3c). After performing LCMVT, the author observed that the migrated implant was simultaneously expelled from the osteotomy site (Figure 3d). Therefore, it may take several attempts before the patient understands how to perform LCMVT properly. Sometimes, when clinicians pinch the patient's nose and instruct them to perform LCMVT, the patient may feel a sensation of drowning. As a result, clinicians should encourage and communicate with the patient to help them understand and correctly perform the LCMVT. Once the displaced implant is expelled, it can be easily removed. (Figure 3e) After successfully applying LCMVT, a panoramic radiograph was taken (Figure 4), which immediately reduced the patient's anxiety and alleviated the initial operator's concerns.

Case 2

A 40-year-old nonsmoking male patient with no significant medical history or harmful habits presented requesting implant placement in the edentulous area of the lower left quadrant, specifically for teeth #18 and #19, and immediate implant placement for the upper left molars, teeth #14 and #15. A comprehensive assessment, including a panoramic radiograph (Figure 5), revealed compromised tooth structures in teeth #14 and #15. Both teeth #14 and #15 were deemed nonrestorable. The treatment plan recommended involved the extraction of teeth #14 and #15, followed by immediate implant placement.

The extraction of teeth #14 and #15 was performed via odontectomy using a high-speed handpiece due to the fragile nature of the tooth structures and roots. Despite the odontectomy and dissection of the 3 roots, their extended length posed a challenge during extraction, resulting in the inability to preserve the interseptal bone. During the placement of the implant in position #14, the implant accidentally displaced into the sinus cavity. The patient was immediately taken for a panoramic X ray (Figure 6a). A subsequent periapical radiograph confirmed the implant's location within the sinus cavity space (Figure 6b).

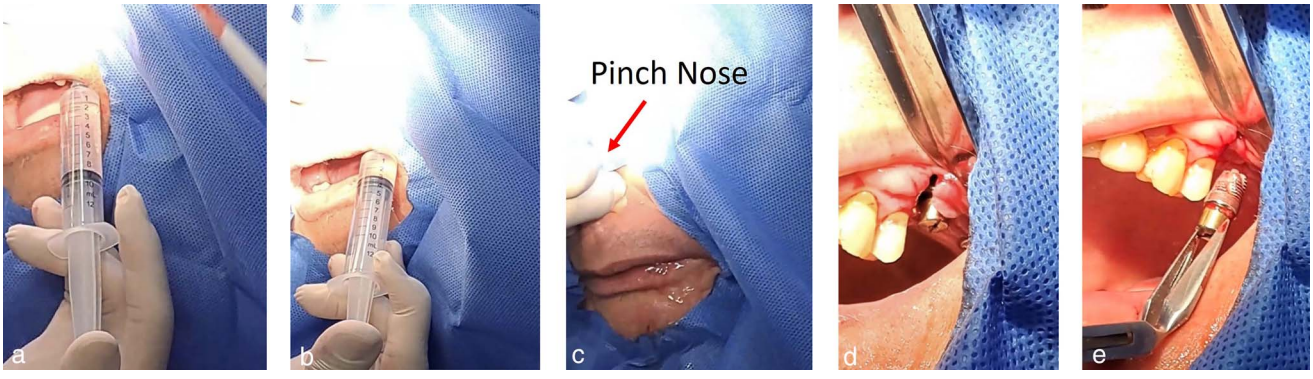


Figure 3. (a) The author began to inject normal saline into the osteotomy site using a syringe to lubricate the sinus membrane and facilitate the movement of the displaced implant. (b) The syringe was gently pressed to irrigate approximately 8 mL of normal saline into the communication of the OA (oroantral) through the osteotomy site. (c) Afterward, the author pinched the patient's nose and instructed the patient to blow forcefully, as hard as possible. All the saline was expelled from the osteotomy site during this process. (d) After performing Leon Chen's Modified Valsalva Technique (LCMVT), the author observed that the displaced implant was simultaneously expelled from the osteotomy site. (e) Once the displaced implant is expelled, it can be easily removed.

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Figure 4. After successfully applying Leon Chen's Modified Valsalva Technique (LCMVT), a panoramic radiograph was taken, which immediately reduced the patient's anxiety and alleviated the initial operator's concern.

The author employed LCMVT to facilitate the retrieval of the displaced implant. The patient was positioned upright and leaned forward. Subsequently, the patient was instructed to inhale deeply and hold their breath. At the same time, the author gently pinched the patient's nose and injected approximately 8 mL of normal saline via a syringe simultaneously. The patient was then asked to exhale forcefully, and this process was repeated several times, as the patient initially needed to understand how to perform the technique correctly. Because of the nature of the adherent sinus membrane, irrigating with normal saline helps facilitate the expulsion of the displaced implant to the opening. After applying LCMVT, which made the implant visible and accessible, the author successfully retrieved the displaced implant using a forceps, thereby avoiding the need for surgical intervention.

Subsequently, 2 dental implants[9] (SinusFuse, OsseoFuse Implant, osseofuse.com) were immediately placed in positions #14 (7.5 × 8.5 mm) and #15 (5.25 × 8.5 mm) in the maxillary right posterior arch during the same appointment. Additionally, 2 implants[10] (OsseoFuse Implant, osseofuse.com) were placed in positions #18 and #19 in the lower arch (Figure 7). The sinus implant placement also facilitated closure of the oroantral communication, thereby reducing the patient's waiting period and postoperative discomfort. Postoperative care instructions were given to the patient, including oral hygiene guidelines. These instructions included taking Augmentin 1000 mg twice daily for 7 days and avoiding forceful nose blowing and sneezing. The patient was then discharged.

Conclusion

Leon Chen's Modified Valsalva Technique (LCMVT) offers a minimally invasive and highly efficient solution for retrieving dental implants displaced into the maxillary sinus. By enabling immediate removal, this technique reduces the risk of chronic sinus inflammation and avoids the need for secondary surgeries. When performed with a clear understanding of its procedural steps, LCMVT facilitates rapid closure of oroantral communications, lowers patient anxiety, and improves surgical outcomes. This technique provides clinicians with a practical, in-office alternative to traditional endoscopic or lateral window approaches—and may redefine standard protocols for managing sinus-related implant complications.



Figure 5. The comprehensive assessment, including panoramic radiographs, revealed compromised tooth structure in #14 and #15, and #14 with an elongated tooth.

Discussion

When a displaced implant inadvertently drops into the sinus cavity, LCMVT provides a direct and efficient method for removing the displaced implant. Clinicians should instruct the patient to practice the blowing technique 2 to 3 times to ensure that they understand how to exhale through the nose rather than the mouth. This is crucial because if the patient exhales through the mouth, the displaced dental implant will not be expelled. Therefore, it is essential to emphasize that the patient must exhale through the nose.

In rare cases, the displaced implant may be fortuitously found at the osteotomy site. However, in most situations, due to the adhesive nature of the sinus membrane, clinicians may need to irrigate the sinus cavity with normal saline through the osteotomy site using a syringe to lubricate the sinus membrane.

Previous approaches to retrieving displaced implants, such as performing an open lateral antrostomy or referring the patient to an otolaryngologist for endoscopic retrieval, often resulted in extended treatment times, which could negatively impact the patient's perception of the procedure.[11–15] The clinical application of LCMVT has been associated with reduced patient anxiety and more streamlined treatment workflows. Additionally, clinicians have the option to place the implants immediately or to wait for approximately 3 to 4 weeks for healing before placing a new implant.

To prevent sinus membrane perforation—one of the most common and clinically significant complications during sinus-related procedures—several adjunctive techniques have been proposed. The use of platelet-rich fibrin (PRF) has been reported to enhance membrane integrity and promote healing, thereby reducing the risk of perforation.[16–18] Studies have shown that PRF can act as a biologically active barrier and

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Figure 6. (a) When placing the implant in position #14, the implant accidentally dropped into the sinus cavity space. The patient was immediately taken for a panoramic X ray. (b) Another periapical radiograph film was taken to make sure the displaced implant was in the sinus cavity space.

scaffold during sinus elevation procedures, improving outcomes in both primary and rescue cases. Additionally, resorbable collagen membranes[19] have been utilized to reinforce the sinus floor and protect the Schneiderian membrane, particularly in cases with thin or atrophic membranes. These materials help create a more controlled surgical environment and reduce the incidence of intraoperative perforation.

Most importantly, early removal of the displaced implant significantly reduces the risk of postoperative complications. Reviewing previous literature, some clinicians categorize the retrieval of migrated implants as either immediate or delayed.[20] Current literature supports immediate retrieval as the optimal strategy in most cases, which not only alleviates the patient's mental distress but also minimizes the possibility of complications.

Complications of a migrated dental implant have been documented, including acute or chronic sinusitis, oroantral communications, and fistula formation.[21,22] Additionally, the use of high-power suction tubes carries the risk of damaging vital tissues, and attempting to locate a migrated implant blindly can pose a risk to the orbital floor, potentially leading to unintended trauma and postoperative discomfort for the patient.[23] Consequently, from the author's perspective, it is not recommended to insert a high-power suction tube too deeply, as this may result in unnecessary damage to surrounding structures, such as the nasal surface area or orbital region.



Figure 7. Two dental implants (SinusFuse, OsseoFuse Implant, osseofuse.com) were immediately placed in positions #14 (7.5 × 8.5 mm) and #15 (5.25 × 8.5mm) in the maxillary right posterior arch during the same appointment. Additionally, 2 implants (OsseoFuse Implant, osseofuse.com) were placed in positions #18 and #19 in the lower arch.

Note

The authors declare no conflicts of interest related to this study.

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