IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 9 Ser. 11 (September. 2024), PP 10-17
www.iosrjournals.org

Sinus Lift In Dental Implants: A Review

Dr Ashwini Kuche
Dr Priyanka Darakh
Dr Kapil Bhutada
Dr Kanchan Mokashi
Dr Akansha Tambe

Mds Student, Department Of Prosthodontics, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College And Hospital, Kanchanwadi, Chhatrapati Sambhajinagar, Maharashtra.
Mds, Assistant Professor, Department Of Prosthodontics, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College And Hospital, Kanchanwadi, Chhatrapati Sambhajinagar, Maharashtra.
Mds, Assistant Professor, Department Of Prosthodontics, Dr Hsrsm Dental College & Hospital, Hingoli Maharashtra.
Mds Student, Department Of Prosthodontics, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College And Hospital, Kanchanwadi, Chhatrapati Sambhajinagar, Maharashtra.
Mds Student, Department Of Prosthodontics, Chhatrapati Shahu Maharaj Shikshan Sanstha's Dental College And Hospital, Kanchanwadi, Chhatrapati Sambhajinagar, Maharashtra

Date of Submission: 17-09-2024 Date of Acceptance: 27-09-2024

I. Introduction:

A sinus lift, also known as a sinus augmentation, is a common surgical procedure used in conjunction with dental implant placement to enhance the upper jaw's ability to support implants

When the natural teeth are lost, the surrounding bone can deteriorate, leading to inadequate bone density and height, particularly in the posterior maxilla. The sinus lift procedure involves gently lifting the sinus membrane and placing a bone graft in the resulting space, allowing for new bone growth and a more stable foundation for dental implants. This procedure has become a crucial step in ensuring the long term success of implants

Sufficient training is necessary for the successful implantation of dental implants in the non-dentate part of the maxillary posterior region. They present every difficulty that is specific to this area. The maxilla has one of the least dense bone compositions, consisting of spongy bone, within the mouth.[1]

Because of the significant resorption of alveolar bone caused by periodontal disease-stimulated tooth loss, there is an exaggerated bone shortage in both height and width. Duration of dental loss results in the lack of ongoing bone stimulation that was previously supplied by the dental arch. The area's bone remodeling is additionally compounded by pneumatization and post-extraction bone resorption of remaining alveolar bone, and abnormalities of the maxillary sinuses.[2]

Alveolar width first decreases due to resorption and/or loss of buccal bone in the early aftermath of maxillary posterior tooth extraction. Antral pneumatization increases as a result of ongoing bone remodeling, loss of height and density in the bone, and lack of stimulation. The progressive hallowing out of the apical portion of the alveolar process, mediated by osteoclasts, and the rise in positive intra-antral pressure are the causes of maxillary sinus pneumatization. Because of the reduced remaining vertical bone height in this scenario, normal implant placement is challenging.[1,2]

The impact of maxillary sinus anatomy on maxillary sinus elevation procedures
All Maxillary Sinus Floor Elevation techniques share common features:

- Dental Implant is inserted into the Maxillary Sinus through an osteotomy in the sinus floor, which is presented by the subantral alveolar ridge.
- A different amount of bone from the inferior and/or the lateral sinus wall is osteotomized, drilled, or removed.
- The Schneiderian membrane alone or kept attached to an osteotomized bone segment from the Maxillary Sinus floor and/or the lateral wall is intruded into the sinus cavity, creating the new transpositioned sinus floor.
- Under the intruded with or without osteotomized bone Schneiderian membrane an empty space ("tent effect") is created.

- The empty space is filled with bone grafts, osteoconductive or osteoinductive bone substitutes, blood cloth, different compositions with the mentioned materials or it can be left empty, to be occupied with histologically mature host bone after a corresponding healing period.
- The Maxillary Sinus Floor Elevation(MSFE) techniques may be applied alone or in combination with other techniques for bone regeneration and augmentation, including alveolar augmentation, grafting, and transposition, distraction osteogenesis, and free revascularized flaps.[9]

As seen from above, the MSFE operations use the inferior and lateral MS walls to enter the sinus cavity and to reconstruct its bottom into an alveolar ridge competent enough to accept, integrate, and keep Dental Implant capable to bear masticatory loads, and to oppose alveolar atrophy.

All MSFE procedures insert Dental Implant through the inferior sinus wall. The transcrestal approach with its variations uses the sinus floor to approach and elevate the Schneiderian membrane. Thus, the inferior Maxillary Sinus wall is assigned a key role in Maxillary Sinus Floor Elevation.

The floor of the antrum in dentate adults is approximately 1 cm below the nasal floor. Anteriorly the sinus extends in general to the canine and the premolar region. There is, however, a large variety in size and shape of the sinuses even within the same person. The convex sinus floor usually reaches its deepest point at the first molar region. Roots of the maxillary teeth frequently cause convolutions in the floor of the sinus.

Primary alveolar bone height and width. It is believed that the concomitant actions of AA and MSP determine the bone quality and quantity of the subantral ridge. The subantral alveolar dimensions should be examined before MSFE to assure that the conditions are suitable for Dental Implant accommodation and primary stability. The prerequisites are enough height, width, bone thickness, and intermaxillary relations that permit adequate functional loading and biomechanics. These features are of crucial importance to decide whether Dental Implant can be inserted in one or a two-stage procedure. The ridge dimensions necessary for conventional Dental Implant placement are 1.5 mm of intact bone on the buccal and the palatal side to resist the horizontal AA and tension, and 2 mm above the apical tip of the implant to withstand functional loads and spare neighboring anatomical structures, if any. When planning a one-stage MSFE for an implant with a 4 mm diameter the recommended ridge dimensions must be at least 4 mm bone height and 5 mm width. The bone density must also be considered. Soft bone cannot guarantee primary stability. Otherwise, when bone quality and quantity cannot meet the needed osseous environment for a one-stage procedure, the Dental Implant should be placed in a second stage 4 to 6 months after sinus floor grafting. In conclusion, when sufficient alveolar height (±4 mm) for primary stability is present, the Dental Implant can be inserted simultaneously with the MSFE. In cases with doubtful primary stability (bone height < 4 mm), the Dental Implant is inserted in a second procedure when bone-remodeling of the graft has taken place.[9]

Subantral dimensions as indications for MSFE procedures. The decision concerning Dental Implant size and number should rest not only on the available bone volume but should also take into consideration the prosthetic and biomechanical aspects. The classification of the International Team of Implantology categorizes the atrophic maxilla into groups, and each group requires a different surgical approach to achieve ideal bone volume and three-dimensional interarch relations. These groups are:

Group 1: Insufficient subantral bone height, adequate alveolar width, acceptable vertical and horizontal interarch relations. *Surgical approach*: MSFE with bone substitute and/or autogenous bone from intraoral bone sight.

Group 2: Insufficient subantral bone height, inadequate alveolar width, acceptable vertical and horizontal interarch relations. *Surgical approach*: MSFE with horizontal ridge augmentation. Autogenous horizontal block graft (from intra- or extraoral site according to the extent of AA) may be combined with a bone substitute and barrier membrane.

Group 3. Insufficient subantral bone height, adequate alveolar width, acceptable horizontal but unfavorable vertical interarch relations due to advanced crestal resorption. *Surgical approach*: MSFE and vertical ridge augmentation. Autogenous vertical block graft (from intra- or extraoral site according to the extent of AA) may be combined with a bone substitute and barrier membrane.

Group 4. Insufficient subantral bone height, unfavorable interarch relations due to advanced horizontal and vertical crestal resorption. *Surgical approach*: MSFE with vertical and horizontal ridge augmentation. Autogenous vertical block graft (from intra- or extraoral site according to the extent of AA) may be combined with a bone substitute and barrier membrane.[9]

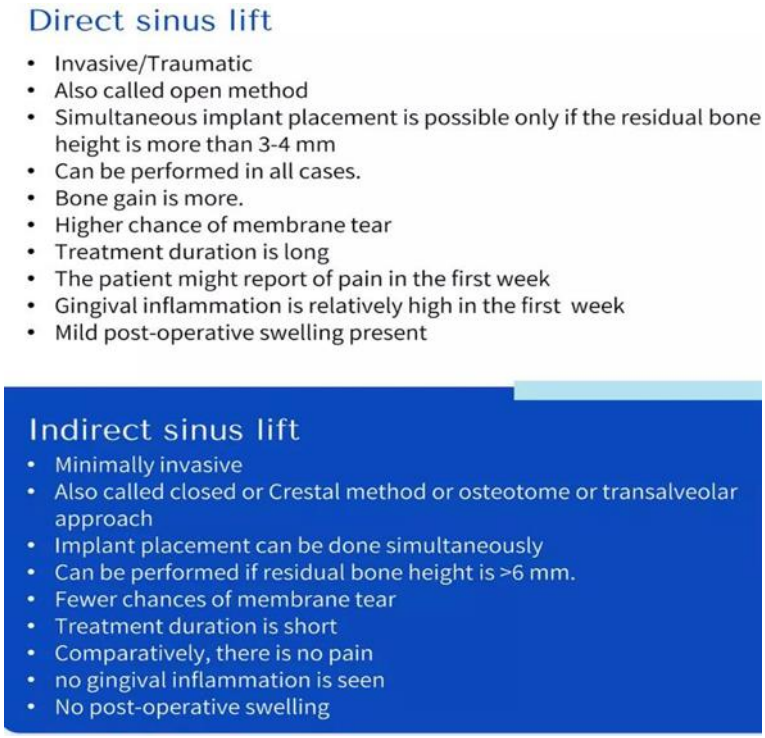
II. Contraindications:

Relative contraindications:

1) Limited anatomic/structural impairments of the sinus or nasal walls that are correctable (i.e., deviated septum)
2) Inflammatory/infectious processes that are treatable
3) Foreign bodies
4) Oroantral fistula

Absolute contraindications:
1) Anatomic/structural impairments of the sinus or nasal walls that are noncorrectable.
2) Inflammatory/infectious processes that cannot be resolved (i.e., chronic rhinosinusitis)
3) Fungal or granulomatous diseases of the nasosinus.
4) Benign/malignant neoplasms of the nasosinus

Sinus Lift Technique



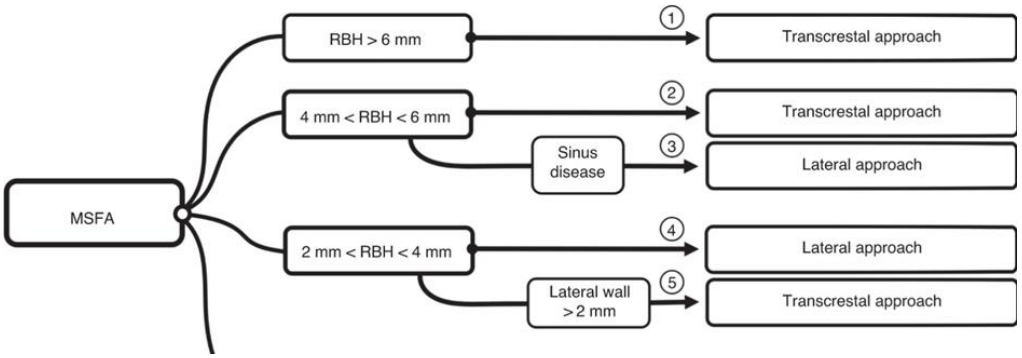
Classification According To Misch

Table 1: Subantral classification and management

Classification (subantral-SA)	Bone height and width	Management	Graft	Implant placement
SA-1	12 mm height (adequate) from crest to floor of sinus Bone width if inadequate, bone augmentation or osteoplassty recommended	Conventional implant placement Ridge splitting to increase bone width	Inter positional graft to increase width	Implant left to heal for 4-8 months
SA-2	10-12 mm remaining bone	Indirect sinus lift procedure with osteotome	Green stick fracture of sinus floor and lifted along with graft	Implant placed and loading after 6-8 months If apical bone formation could not be revealed in radiograph wait another 2 months and follow progressive loading protocol
SA-3	Atleast 5 mm of vertical bone	Direct sinus lift by lateral window technique	Autogenous or alloplast graft in sinus lifted space	Implant delayed for 2-4 months
SA-4	<5 mm of residual alveolar bone	Same as SA-3		Implant delayed for 6-10 months (6)

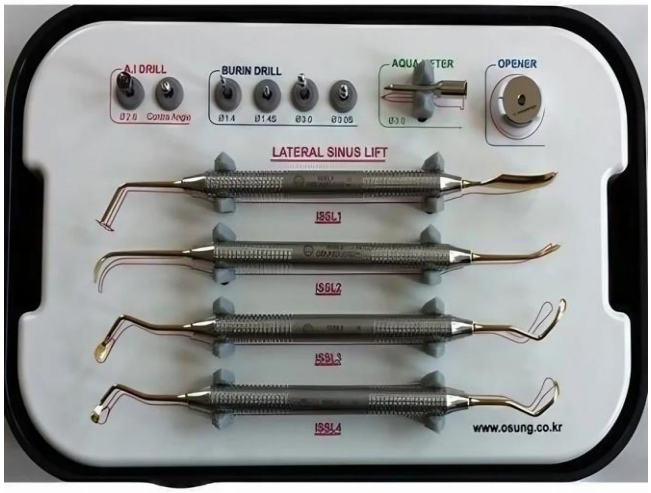
Lateral Window Technique
1) Modified Caldwell luc approach
2) Ultrasonic ostectomy
3) Peizoelectric bony window osteotomy
4) Trephine
5) Antral membrane balloon elevation
6) Hinge osteotomy
7) Elevated osteotomy
8) Crestal osteotomy

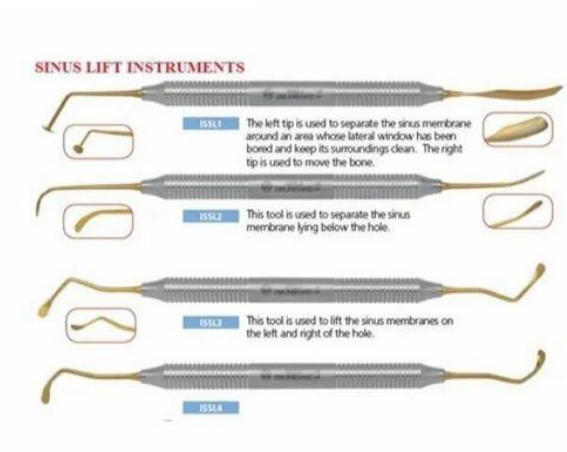
Transcrestal Approach Technique
1)Osteotome (Summers)
2)Modified osteotome
3)(Davarpanah 1996)
4)Hydraulic pressure saline (Sotirakis and Gonshor)



Maxillary Sinus Floor Augmentation: Flow Chart[10]

ARMAMENTARIUM





SA-1

Subantral Option One: Conventional Implant Placement

The first Misch SA treatment option, SA-1, occurs when sufficient bone height is available to permit the placement of endosteal implants following the usual surgical protocol, with no maxillary sinus involvement. Because the quality of bone in the posterior maxilla often is D3 or D4 bone, bone compaction or osseo

densification to prepare the implant site is common. This technique permits a more rigid initial insertion of the implant and also increases the BIC.

In the abundant bone volume (Division A),the minimum ideal bone height for the SA-1 is related to the associated force factors. Under favorable conditions, a minimum of 8 mm of bone is required from the crest of the ridge to the inferior floor of the sinus for the placement of an 8-mm implant. The literature has concluded that short implants (8 mm) have been shown to be successful in the posterior maxilla. If multiple implants are placed, then ideally the implants should be splinted for force distribution. For unfavorable conditions, greater than 10 mm of bone is required in height to allow for placement of an implant so it does not invade the maxillary sinus. This will allow an implant of 10 mm in length to be placed that will allow for a greater insertion torque and BIC. Therefore the implant will be less likely to have force-related effects that may cause micromovement during the healing phase and poorer healing.

Because the maxillary sinus proper is not invaded during an SA-1 approach, it is less critical if preexisting pathology in the sinus is present. However, if pathology is present that warrants medical referral, then this should be completed before any implant placement.

Narrower bone volume patients (Division B) in SA-1 may be treated with osteoplasty or augmentation to increase the width of bone.

Osteoplasty in the SA-1 posterior maxilla may change the SA category if the height of the remaining bone is sufficient to allow for adequate bone postosteoplasty. Augmentation for width may be accomplished with bone spreading, membrane grafting, or autogenous grafts. Larger diameter implants are often required in the molar region, and bone spreading to place wider implants is the most common approach when the bone density is poor. If less than 2.5 mm of width is available in the posterior edentulous region (C–w), then the most predictable treatment option is to increase width using onlay autogenous bone grafts. After graft maturation the area is reevaluated to determine the proper treatment plan classification. Endosteal implants in the SA-1 category are left to heal in a nonfunctional environment for approximately 4 to 8 months (depending on bone density and force factors) before the abutment post(s) are added for prosthodontic reconstruction. Care is taken to ensure that the implants are not traumatized during the initial healing period. Progressive loading during the prosthetic phases of the treatment is suggested in D3 or D4 bone.[1]

SA-2

Subantral Option Two: Sinus Lift and Simultaneous Implant Placement The second SA option in the Misch SA classification, SA-2, is selected when the intended implant length is 1 to 2 mm greater than the vertical bone present. In this technique, 1 to 2 mm may be achieved via elevating the sinus membrane without bone grafting. Tatum 95 originally developed this technique in 1970, and Misch 96 first published it in 1987. Summers 97 published a similar procedure in 1994, 24 years after Tatum's first presentation. Because the SA-2 surgical approach modifies the floor of the maxillary sinus, a preexisting pathologic condition of the sinus should not be present because it may affect the implant site by retrograde infection. This technique is reserved for 8 to 10 mm of host bone below the sinus in which an implant is placed via an osteotome technique that elevates the membrane approximately 1 to 2 mm with the use of no grafting. Ideally, an 8-mm implant is used with caution in this case.[1]

Incision and Reflection

In an edentulous posterior maxilla, a full-thickness incision is made on the crest of the edentulous ridge from the tuberosity to the distal of the canine region. A vertical, lateral relief incision is made at its distal and anterior extension of the crestal incision for approximately 5 mm. A full-thickness palatal flap is first reflected because the palatal dense cortical plate facilitates soft tissue reflection.[1]

Osteotomy and Sinus Elevation (SA-2)

The depth of the osteotomy is approximately 1 to 2 mm short of the floor of the antrum. When in doubt of the height dimension, the osteotomy should err on a shorter length. The implant osteotomy is prepared to the appropriate final diameter, short of the antral floor, by approximately 1 mm. A flat-end or cupped-shape osteotome is selected for the infracture of the sinus floor. Usually in D3 bone, an osteotome of the same diameter as the final osteotomy is selected. In D4 bone, an osteotomy one to two sizes smaller than the final implant size maybe used, performing an osseodensification technique. The osteotome is inserted and tapped firmly in 0.5- to 1.0-mm increments beyond the osteotomy until reaching its final vertical position, up to 2 mm beyond the prepared implant osteotomy. A slow elevation of the sinus floor is less likely to tear the sinus mucosa. This surgical approach compresses the bone below the antrum, causes a green stick-type fracture in the antral floor, and slowly elevates the unprepared bone and sinus membrane over the broad-based osteotome. If the osteotome cannot proceed to the desired osteotomy depth after tapping, then it is removed and the osteotomy is prepared again with rotary drills an additional 1 mm in depth. The osteotome is then reinserted to attempt the greenstick fracture of the antral floor.

Once the osteotome prepares the implant site, the implant may then be threaded into the osteotomy and extended up to 2 mm above the floor of the sinus. The implant is slowly threaded into position so the membrane is less likely to tear as it is elevated. The apical portion of the implant engages the more dense bone on the cortical floor, ideally with bone over the apex, and an intact sinus membrane. The implant may extend 0 to 2 mm beyond the sinus floor, and the 1 mm of compressed bone covering over the implant apex results in as much as a 3-mm elevation of the sinus mucosa.[1]

Modified SA2 Techniques

Rosen and associates100,101 developed a modification to the SA-2 treatment approach for use at the time of an extraction of a maxillary molar. The technique is indicated when the maxillary molar is extracted, the surrounding walls of bone are intact, and no periapical pathologic condition is present. The crest of the ridge to the antral floor should be 7 mm or more in height. Once the tooth is extracted and the surrounding bony walls confirmed, a modification of the SA-2 technique is in order. A 5- to 6-mm trephine bur is used in the center of the extraction site and prepares the bone 1 to 2 mm below the antral floor. A 5- to 6-mm-diameter, flat-ended or cup-shaped osteotome and mallet intrudes the core of bone 2 mm above the sinus floor, creating 9 mm or more of vertical bone. A socket graft may be used within the extraction socket but is not pushed into the surgical space of the sinus because it may perforate the sinus mucosa. After 4 months, an implant may be inserted.[1]

Complications

If a sinus membrane perforation occurred during the initial implant placement procedure, then bone height growth is less likely to occur. This is the primary reason why only 0 to 2 mm of additional bone height is attempted with this technique.

Subantral Option Three: Sinus Graft with Immediate Endosteal Implant Placement

The third approach to the maxillary posterior edentulous region, SA-3, is indicated when at least 5 mm of vertical bone and sufficient width are present between the antral floor and the crest of the residual ridge in the area of the intended prosthesis abutment residual height of 5 mm for the SA-3 category has been selected for two main reasons:

(1) this height (in adequate bone width and quality) can be considered sufficient to allow primary stability of implants placed at the same time as the sinus graft procedure, and

(2) because of the amount of residual bone (5mm), greater blood supply is present, which allows for more predictable and faster healing.

Surgical Approaches There exist two options for grafting the sinus along with simultaneous implant placement

Lateral Wall. A Tatum lateral maxillary wall approach is performed by performing an osteotomy over the lateral wall of the maxillary sinus, infracturing the window, elevating the sinus membrane and window, grafting to the medial wall, and then placing the implant (SA-3).

A crestal incision is made on the palatal aspect of the maxillary posterior edentulous ridge from the tuberosity to one tooth anterior to the anterior wall of the maxillary sinus, leaving at least 2 mm of attached tissue on the facial aspect of the incision.[1]

Access Window

The outline of the Tatum lateral-access window is scored on the bone with a rotary handpiece under copious cooled sterile saline. It is often easier to perform this step at 50,000 rpm (1:1 handpiece), but it is possible even at 2000 rpm, depending on the lateral-wall bone thickness. There exist multiple techniques to score the sinus window: (1) carbide bur (No. 6 or No. 8), (2) diamond bur, (3) bone removal burs (e.g., Dask bur), or (4) Piezosurgery units. With experience, the first bur is usually a No. 8 round carbide, which scratches the bone and designs the overall window dimension. This bur is followed with a No. 8 round diamond, which "polishes" away the bone within the groove made by the carbide bur. A No. 8 round diamond bur for the entire process is of benefit for an early learning curve because carbide burs "chatter" more and may tear the sinus membrane if the bur inadvertently comes in contact with it. The inferior score line of the rectangular access window on the lateral maxilla is placed approximately 1 to 2 mm above the level of the antral floor (i.e., which in an SA-3 is >5 mm from the crest). If the inferior score line is made at or below the level of the antral floor, then infracture of the lateral wall will be impossible because the score line will be over host bone. If the inferior score line is made too high (>4 mm) above the sinus floor, then a ledge above the sinus floor will result in a blind dissection of the membrane on the floor, which may also lead to perforation. The most superior aspect of the lateral-access window should be approximately 2-3 mm above the planned implant length (i.e., 12-mm implant would require the window to be 15 mm from the ridge crest). A soft tissue retractor placed above the superior margin of the lateral-access window (i.e., always maintained on bone, not soft tissue) helps retract the facial flap and prevents the

retractor's inadvertent slip into the access window, which may damage the underlying membrane of the sinus. The anterior vertical line of the access window is scored approximately 1 to 2 mm from the anterior sinus border.

In general, a larger access window offers many advantages, including easier access, less stress on the membrane during initial elevation, and ease of additional membrane elevation with instruments because of the direct access that facilitates graft placement. The corners of the access window should always be rounded, not right or acute angles. If the corner angles are too sharp, then membrane perforation may occur from the use of a surgical curette at the corner or during the infracture of the lateral wall. Once the lateral-access window is delineated, the rotary bur continues to scratch the outline with a paintbrush stroke approach under cooled sterile saline irrigation, until a bluish hue is observed below the bur or hemorrhage from the site is observed. The expansion of the maxillary sinus after tooth loss pushes the arteries of the membrane to the outside of the structure and just below the surrounding bone.[1]

Sinus Membrane Elevation. The first step in elevating the window is to ensure that the lateral window is completely "free" from the host bone. A flat-ended metal punch (or mirror handle) and mallet may be used to gently in fracture the lateral-access window from the surrounding bone while still attached to the thin sinus membrane. The flat-ended punch is first positioned in the center of the window. If light tapping does not greenstick fracture the bone, then the flat-ended punch is placed along the periphery of the access window and tapped again. If the window does not separate easily, then the punch is rotated so that only an edge comes in contact with the scored line. This decreases the surface area of the punch against the score line of the window and increases the stress against the bone. Another light tap with the mallet will most likely cause greenstick fracture of the bone along the scored line. If this still does not free the window, then further scoring of the bone with the handpiece and diamond bur is indicated, and the tapping procedure is repeated. A short-bladed soft tissue curette designed with two right-angle bends is introduced along the margin of the window (i.e., Salvin Sinus Curette No. 1). The curved portion is placed against the window, whereas the sharp edge is placed between the sinus membrane and the margin of the inner wall of the antrum for a depth of 2 to 4 mm. The curette should always stay on the bone and be used in a scraping motion. If any sharp edges of bone remain on the bone's margin, then they may be flicked off with the curette. The curette is slid along the bone margin 360 degrees around the access window. This ensures the release of the membrane from the surrounding walls of the sinus without tearing from the sharp bony access margins. The sinus membrane may be elevated from the antral walls easily because it has few elastic fibers and is not attached to the cortical wall. Specially designed and shaped curettes are available to facilitate this surgical maneuver. A larger curved periosteal or sinus membrane elevator is then introduced through the lateral-access window along the inferior border (i.e., Salvin Sinus Curette No. 2). Once again, the curved portion is placed against the window, and the sharp margin of the curette is dragged along the floor of the antrum while elevating the sinus membrane. The curette should always be maintained on the bony floor to avoid a membrane perforation. The curette is never blindly placed into the access window.

It is easier to gain direct vision and access to the distal portions of the antrum than the anterior portions when the sinus area expands beyond the access window. Therefore whenever the periosteal elevator or curette cannot stay against the bone with good access in the anterior area, the access window should be increased in size toward the anterior. A Kerrison rongeur or a second window similar to the initial score-and-fracture technique may be used to expand the size of the access window. The periosteal elevators and curettes further reflect the membrane off the anterior vertical wall, floor, and medial vertical wall. It is better to err on the high side to ensure that ideal implant height may be placed without compromise (i.e., always maintaining a patent ostium). The lateral-access window is positioned as part of the superior wall of the graft site, once in final position. The SA space has the original sinus floor as the base; the posterior antral wall, medial antral wall, and anterior antral wall as its sides; and the lateral-access window and elevated sinus mucosa as its superior wall.[1]

Postoperative Instructions:

1. Do not blow your nose.
2. Do not smoke or use smokeless tobacco.
3. Do not take in liquids through a straw.
4. Do not lift or pull on lip to look at sutures (stitches).
5. If you must sneeze, then do so with your mouth open to avoid any unnecessary pressure on the sinus area.
6. Take your medication as directed.
7. Bleeding from the nostril may be present for the first 24 hours after surgery

Refrences:

[1] Misch Ce. Maxillary Sinus Augmentation For Endosteal Implants: Organized Alternative Treatment Plans. Int J Oral Implantol. 1987;4:49–58. 26. American Academy Of Otolaryngology—Head And Neck Surgery. Fact Sheet: 20 Questions About Your Sinuses.

[2] Zinreich Sj, Kennedy Dw, Rosenbaum Ae, Et Al. Paranasal Sinuses: Ct Imaging Requirements For Endoscopic Surgery. Radiology. 1987;163:769–775. 28. Mcgowan Da, Baxter Pw, James J. The Maxillary Sinus And Its Dental Implications. Oxford: Butterworth-Heinemann; 1993.

[3] Bolger We, Butzin Ca, Parsons Ds. Paranasal Sinus Bony Anatomic Variations And Mucosal Abnormalities: Ct Analysis For Endoscopic Surgery. The Laryngoscope. 1991;101:56–64.

[4] Timmenga Mn, Marius N. Maxillary Sinus Floor Elevation Surgery: Effects On Maxillary Sinus Performance [Doctoral Dissertation]. Groningen, The Netherlands: University Of Groningen; 2003.

[5] Misch Ce. Divisions Of Available Bone In Implant Dentistry. Int J Oral Implantol. 1990;7:9–17. 9. Misch Ce. Bone Character: Second Vital Implant Criterion. Dent Today. 1988;7:39–40.

[6] Goodacre Jc, Bernal G, Rungcharassaeng K, Et Al. Clinical Complications With Implants And Implant Prostheses. J Prosthet Dent. 2003;2:121–132.

[7] Misch Ce, Qu Z, Bidez Mw. Mechanical Properties Of Trabecular Bone In The Human Mandible: Implications For Dental Implants Treatment Planning And Surgical Placement. J Oral Maxillofac Surg. 1999;57:700–706.

[8] Misch Ce. Contemporary Implant Dentistry. 3rd Ed. St Louis: Mosby; 2008.

[9] Uzunov N, Bozhikova E. Maxillary Sinus In Dental Implantology. Paranasal Sinuses Anatomy And Conditions, Ed. By Sg, Balwant. London, United Kingdom: Intechopen. 2022 Apr 28:95-114.

[10] Lyu M, Xu D, Zhang X, Yuan Q. Maxillary Sinus Floor Augmentation: A Review Of Current Evidence On Anatomical Factors And A Decision Tree. International Journal Of Oral Science. 2023 Sep 15;15(1):41.

[11] Bergh Jpa, Bruggenkate Ten Cm, Disch F, Tuinzing D. Anatomical Aspects Of Sinus Floor Elevations. Clin Oral Impl Res. 2000;11(3):256-265. Doi:10.1034/J.1600-0501.2000.011003256.X 17

[12] Sharan A, Madjar D. Maxillary Sinus Pneumatization Following Extractions: A Radiographic Study. Int J Oral Maxillofac Implants. 2008;23(1):48-56.

[13] Esposito M, Felice P, Worthington H. (2014). Interventions For Replacing Missing Teeth: Augmentation Procedures Of The Maxillary Sinus. Cochrane Database Syst Rev. 2014;13(5), Cd008397. Doi:10.1002/14651858.Cd008397.Pub2.

[14] Tarun Tumar A, Anand U. Maxillary Sinus Augmentation. J Int Clin Dent Res Organ. 2015;7:81-93.

[15] Alveolar Atrophy. (N.D). In Farlex Partner Medical Dictionary. (2012). Retrieved 5 27, 2021, From Https://Medical-Dictionary.Thefreedictionary.Com/Alveolar+Atrophy

[16] Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone Healing And Soft Tissue Contour Changes Following Single-Tooth Extraction: A Clinical And Radiographic 12-Month Prospective Study. Int J Periodontics Restorative Dent. 2003;23(4):313-323.

[17] Lekovic V, Camargo Pm, Klokkevold Pr, Weinlaender M, Kenney Eb, Dimitrijevic B, Nedic M. Preservation Of Alveolar Bone In Extraction Sockets Using Bioabsorbable Membranes. J Periodontol. 1998;69:1044-9.

[18] Tallgren A. The Continuing Reduction Of The Residual Alveolar Ridges In Complete Denture Wearers: A Mixed-Longitudinal Study Covering 25 Years. 1972. J Prosthet Dent 2003;89(5):427-435.

[19] Pinho M, Roriz V, Novaes A, Taba Mj, Grisi M, De Souza S., Palioto D. Titanium Membranes In Prevention Of Alveolar Collapse After Tooth Extraction. Implant Dent. 2006;15(1):53-62.

[20] Hansson S, Halldin A. Alveolar Ridge Resorption After Tooth Extraction: A Consequence Of A Fundamental Principle Of Bone Physiology. J Dent Biomech. 2012;31. Doi:10.1177/1758736012456543 20