

## Review Article

### Implant Survival Rates in Sinus Lift Procedures with and Without Grafting Techniques - An Overview

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#### ABSTRACT:

Maxillary sinus is a delicate lining approaching bi aspects of oral and nasal cavities. Majority of the cases reuring maxillary posterior implants needs through estimation of sinus as the implants are in proximity post procedure. Decision making of grafting and non grafting techniques has a thin line of imagination and experience. A prevalent modality to increase the amount of available bone prior to implantation is grafting of the maxillary sinus. Multiple factors such as the surgical technique, moment of implant placement as well as grafting materials and membranes are known to affect implant survival. However, the role of different factor combinations and associated reciprocal effects remain unclear. Conventional statistical methods do not consider inconsistency of study designs and do not take covariables into account. Here by we present a review on different procedures for sinus lifting in implant placement by grafting and non-grafting methods as this line of demarcation is very important for the dentist, maxillofacial surgeon, periodontist, prosthodontists and implantologist to have complete knowledge for the same.

**Key words:** Implant, Sinus, Graft, Techniques.

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#### BACKGROUND:

A sinus-lift procedure was first performed by Dr. Hilt Tatum Jr. in 1974 during his period of preparation to begin sinus grafting. The first sinus graft was done by Tatum in February, 1975 in Lee County Hospital in Opelika, Alabama. This was followed by the placement and successful restoration of two endosteal implants. Between 1975–1979, much of the sinus lining elevation was done using inflatable catheters. After this, suitable instruments had been developed to manage the lining elevation from the different anatomical surfaces encountered in sinuses. Tatum first presented the concept at The Alabama Implant Congress in

Birmingham, Alabama in 1976 and presented the evolution of technique during multiple podium presentations each year until 1986 when he published an article describing the procedure. Dr. Philip Boyne was introduced to the procedure when he was invited, by Tatum, to be "The Discussor" of a presentation on sinus grafting given by Tatum at the annual meeting of The American Academy of Implant Dentistry in 1977 or 1978. Boyne and James authored the first publication on the technique in 1980 when they published case reports of autogenous grafts placed into the sinus and allowed to heal for 6 months, which was followed by the placement of blade implants. This sequence was

confirmed by Boyne before the attendees at The Alabama Implant Congress in 1994.

#### **INTRODUCTION:**

The maxillary sinuses are two hollow cavities located behind the cheekbones and just above the upper molar teeth in the back of the mouth. As people age, the sinuses expand and the jawbone shrinks in size. If upper molars are lost, the bone reduction is even more severe. In more than 50% of these cases, the remaining jawbone lacks sufficient volume to support a dental implant, so a sinus lift and bone graft are recommended to create bone volume prior to the implant surgery. Maxillary sinus floor augmentation is also called as sinus lift, sinus graft, sinus augmentation or sinus procedure. It is a surgical procedure which aims to increase the amount of bone in the posterior maxilla specifically in the area of the premolar and molar region by lifting the lower Schneiderian membrane or sinus membrane and placing a bone graft.[1,2] When a tooth is lost the alveolar process begins to remodel and collapse. It heals leaving an edentulous area termed as ridge. This collapse causes a loss in both height and width of the surrounding bone. In addition, when a maxillary molar or premolar is lost, the maxillary sinus pneumatizes in this region which further diminishes the thickness of the underlying bone.[3] Overall, this leads to a loss in volume of bone that is available for implantation of dental implants, which rely on osseointegration to replace missing teeth. The goal of the sinus lift is to graft extra bone into the maxillary sinus, so more bone is available to support a dental implant.[4] Sinus lifts can be a particularly unpleasant experience for patients. The procedure takes more than an hour and involves significant trauma. Patients need to rest at home for three to 10 days due to the pain, discomfort, and severe, unattractive facial swelling and bruising.

#### **SINUS LIFT SURGERY:**

A sinus lift prepares the area for the insertion of dental implants. This is positive news for patients who have previously been told they are not a good candidate for dental implants due to lack of bone height. A sinus lift is a bone grafting procedure that can create the preferred five-millimetre bone needed to place a dental implant. This is achieved by moving the sinus membrane upward and fitting additional bone between the upper jaw and maxillary sinuses. In addition, the sinus lift procedure provides more bone for patients whose teeth have been missing for long periods of time and the bone has resorbed as a result. Patients planning to undergo the Sinus Lift procedure will undergo clinical and radiographic assessment to thoroughly study their jaw and sinus anatomy. In addition, a cone beam CT (CBCT) scan is needed. This allows the measurement of the current bone, as well as to assess the overall health of the sinus.

#### **SINUS LIFT TECHNIQUES:**

##### **Traditional Sinus Augmentation or Lateral Window Technique**

There are multiple ways to perform sinus augmentation. The procedure is performed from inside the patient's mouth where the surgeon makes an incision into the gum, or gingiva. Once the incision is made, the surgeon then pulls back the gum tissue, exposing the lateral bony wall of the sinus. The surgeon then cuts a "window" to the sinus, which is exposing the Schneiderian membrane. The membrane is separated from the bone, and bone graft material is placed into the newly created space. The gums are then sutured close and the graft is left to heal for 4–12 months.[6] The graft material used can be either an autograft, an allograft, a xenograft, an alloplast (a growth-factor infused collagen matrix), synthetic variants, or combinations thereof.[7] Studies indicate that the mere lifting of the sinus membrane, creation of a void space and blood clot formation might result in new bone owing to the principles of guided bone regeneration.[8] The long-term prognosis for the technique is estimated to 94%. [9]

##### **Osteotome Technique**

As an alternative, sinus augmentation can be performed by a less invasive osteotome technique. There are several variations of this technique and all originate from the original technique of Dr. Tatum, first published by Dr.s Boyne and James in 1980. Dr. Robert B. Summers[10] described a technique that is normally performed when the sinus floor that needs to be lifted is less than 4 mm. This technique is performed by flapping back gum tissue and making a socket in the bone within 1–2 mm short of the sinus membrane. The floor of the sinus is then lifted by tapping the sinus floor with the use of osteotomes. The amount of augmentation achieved with the osteotome technique is usually less than what can be achieved with the lateral window technique. A dental implant is normally placed in the socket formed at the time of the sinus lift procedure and left to integrate with bone. Bone integration normally lasts 4 to 8 months. The goal of this procedure is to stimulate bone growth and form a thicker sinus floor, in order to support dental implants for teeth replacement. Sinus dimensions and shape significantly influence new bone formation after transcrestal sinus floor elevation: with this technique, the regeneration of a substantial amount of new bone is a predictable outcome only in narrow sinus cavities. During presurgical planning, bucco- palatal sinus width should be regarded as a crucial parameter when choosing sinus floor elevation with transcrestal approach as a treatment option.[11] Dr. Bruschi and Scipioni[12][13] described a similar technique (Localized Management of Sinus Floor or L.M.S.F.) that is based on a partial thickness flap procedure. This technique increases the malleability of the crestal bone and uses not the bone directly below the sinus, but rather the bone on the medial wall, and thus can be used

in more extreme cases of bone resorption that would normally need to be treated with the lateral wall technique. The healing period is reduced to 1.5 to 3 months. Recently an electrical mallet[14] has been introduced to simplify the application of this and similar techniques. A major risk of a sinus augmentation is that the sinus membrane could be pierced or ripped. Remedies, should this occur, include stitching the tear or placing a patch over it; in some cases, the surgery is stopped altogether and the tear is given time to heal, usually three to six months. Often, the sinus membrane grows back thicker and stronger, making success more likely on the second operation.[citation needed] Although rarely reported, such secondary intervention can also be successful when the primary surgery is limited to elevation of the membrane without the insertion of additional material.[15] Besides tearing of the sinus membrane, there are other risks involved in sinus augmentation surgery. Most notably, the close relationship of the augmentation site with the sinonasal complex can induce sinusitis, which may chronicize and cause severe symptoms. Sinusitis resulting from maxillary sinus augmentation is considered a Class 1 sinonasal complication according to Felisati classification and should be addressed surgically with a combined endoscopic endonasal and endoral approach.[16] Beside sinusitis, among other procedure related-risks include: infection,[4] inflammation, pain, itching, allergic reaction, tissue or nerve damage,[4] scar formation, hematoma, graft failure, oro-antral communication / oro-antral fistula, tilting or loosening of implants, or bleeding,[4]

#### **TRADITIONAL BONE AUGMENTATION:**

Candidates for bone augmentation, a process of rebuilding the bone, are patients with insufficient natural, healthy bone to support dental implants. Implant placement in the posterior maxilla is a challenging procedure when residual bone height is reduced. Maxillary sinus elevation technique is a common surgical procedure which allows to augment the available bone volume in posterior maxilla in order to place implants. Residual bone height is considered fundamental in deciding which augmentation technique can be used to obtain an adequate bone volume. Generally, sinus lifting through a lateral approach is a viable technique when less than 4-5 mm of residual bone height is present [1-3]. When more than 5 mm of residual bone height is available, a transalveolar approach could be indicated in order to reduce the morbidity and the invasivity of the treatment protocol [4-6]. Osteotome-mediated transcrestal sinus lift approach was first proposed by Tatum in 1986 [7]. In the original approach, implants were placed after the controlled fracture of sinus floor and were submerged during the healing phase. In 1994, Summers described a modification of this technique [8]. The author proposed the preparation of implant site through the use of conical osteotomes which allows the compression, through lateral force application, of the bone in the

posterior maxilla. The author stated that these maneuvers allow to increase the lateral bone density, preserving bone because drilling is avoided. While the transcrestal approach is considered more conservative than the lateral approach, the main drawback is that the sinus lifting procedure must be performed blindly because of the impossibility to visualize the sinus floor [5,6]. In spite of this limitation, membrane perforation was reported to be less frequent in the osteotome-mediated procedure [6] than in the lateral approach, for which such complication was described in 25-44% of cases [9-11]. Transcrestal, osteotome-mediated sinus lift surgery may be performed with or without the use of bone grafting material as allograft, autogenous bone, or heterologous bone material [6]. No significant differences in terms of implant survival and success rates were observed comparing the two methods [6]. Also, the use of platelet derivatives without any bone substitute is described in literature [12,13] with the aim of allowing a better control of forces during sinus floor elevation and reducing the incidence of complications. The goal is to provide a solid structure where implants can be placed and secured in the alveolar bone structure. The augmentation is most commonly done by a bone graft, which is placing bone graft material to the existing bone in your jaw.

#### **MODERN BONE GRAFTING:**

Modern bone grafting is generally a painless, minimally invasive procedure completed in the practice. Once the procedure has been completed, the graft material is left for 3-6 months to heal before dental implants can be placed, depending on the extent of the graft and the condition of the existing bone. Six to nine months after the procedure, new bone is generated, and a second procedure is required to insert a dental implant into the newly formed bone. This is followed by a three to five month waiting period for the dental implant to be integrated into the bone when the prosthetic tooth can finally be inserted. [8] The use of bone graft materials has been considered a mandatory requirement for maxillary sinus augmentation, allowing the successful placement of dental implants into maxillary sinuses with minimal height bone. However, previous investigations have reported loss of graft material within the sinus, leading to sinusitis in cases of sinus membrane perforation with postoperative acute maxillary sinusitis potentially causing implant failure.[2] There are new reports regarding maxillary sinus augmentation without bone graft placement as a predictable method for new bone formation, decreasing the risk of sinusitis. This method is predictable for new bone formation and consists of creating a compartment between the sinus floor and sinus membrane through a lateral or crestal approach, inserting CGF blocks with immediate implants placement, even in failed cases, the new bone formation could be observed.[17] The reported cases showed new bone formation in the new compartment of the maxillary sinus after filling it with

CGF blocks followed by immediate implant placement, demonstrating the potential benefits of the technique, especially in challenging ridges with a bone height of <3 mm. Thus, sinus floor augmentation without grafted bone materials is a natural and predictable technique, with minimal risk of sinusitis, even tearing the sinus membrane during the procedure.[16]

### CONCLUSION:

This review shows that maxillary sinus lift surgery is a safe procedure with a low complication rate and with predictable results for implant placement. Although the successful use of graft materials is reported in the literature, this procedure is feasible without graft material and very similar results can be seen with and without the use of graft material. But whenever we need to place implants it is better to go with the bone grafting material for better strength. Furthermore, maxillary sinus lift surgery without the use of graft material results in a reduced surgical time and lower total costs compared to surgery with the use of grafts. Over 90% of implants associated with non-autogenous grafts had a textured surface. Textured surfaces achieved better outcomes compared with machined surfaces, and this was independent of the graft material. Simultaneous and delayed procedures had similar outcomes. It may be concluded that bone substitutes can be successfully used for sinus augmentation, reducing donor-site morbidity. Long-term studies are needed to confirm the performance of nonautogenous grafts. The use of implants with a textured surface may improve the outcome in any graft type.

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