Maxillary Sinus Lift Procedure Efficacy and Adversities: A Review Article

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Abstract

Sinus lift procedure is a procedure used to augment bone thickness of the maxillary sinus for better survivability of dental implants. The maxillary sinus floor augmentation was 1st done by Oscar Hilt Tatum Jr, in 1974. Since then the procedure has been refined and revised over the years. Yet it has a few adverse effects such as perforation, tearing of the antral lining and haemosinus. In this article we see that sinus lift surgery is as versatile as the surgeon is and in some cases if not done properly, can result in severe morbidity.

Keywords: *Sinus lift, maxillary sinus augmentation*

Introduction

Sinus lift procedure is a procedure used to augment bone thickness of the maxillary sinus for better survivability of dental implants. The maxillary sinus floor augmentation was 1st done by Oscar Hilt Tatum Jr, in 1974. Sinus lift procedure was 1st performed by Dr Hilt in 1974. 1st sinus grafting was done by him in 1975. Since then the procedure has been refined and revised over the years to make as versatile as it is today.Yet it has a few adverse effects such as perforation, tearing of the antral lining and haemosinus. In this article we shall see the various aspects of a sinus lift procedure[1].

Methodology

The search protocol used the electronic database PUBMED, with a time limit from 1995 to 2019. The search strategy utilized a combination of MeSH terms and text words as indicated in and kept updated until 2019. The reference lists of each article completed the database. We decided not to use any inclusion or exclusion criteria to ensure the sensitivity of our database. Only peer-reviewed articles written in English were selected.

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Discussion

Justine Loin, Jean-Daniel Kün-Darbois, Bernard Guillaume, SmailBadja, Hélène Libouban, Daniel Chappard in early 2019 did a study on Beta-tricalcium Phosphate (Beta TCP) vs xenogenic bone as grafts for the sinus augment. Beta TCP is a synthetic biomaterial and the xenogenic bone graft taken was that of extensively deproteinized bovine bone. CB-CT and Sinus membrane thickness analysis was done for all patients. 20 patients were taken between the ages of 40 to 80 years. In this study, there was no difference in the degree of oedema was seen. Sinus augmentation can be seriously compromised due to inflammatory reactions due to cytokines that accelerate bone resorption. Although the gold standard for grafting is autogenous graft (parietal, mandibular or iliac), yet it cannot be used on every case because of the associated morbidity. Thus, alloplastic materials with very high biocompatibility like Beta TCP are the better choice[2].

As discussed earlier Maxillary Sinus Lift procedure is associated with a few adverse outcomes, such as intra sinus bleeding, perforation of the mucosa membrane.

So, we shall discuss on how to prevent and manage such outcomes.

(1) Bleeding- Intraoperative bleeding results from severing or damaging branches of the vascular supply to the lateral wall of the sinus and the surrounding soft tissues. This bleeding is usually minor and of relatively short duration, but in some instances, it can be profuse and difficult to control. Solar et al described the blood supply to the lateral wall of the maxillary sinus in cadaver specimens. Blood is supplied through the intraosseous and extraosseous branches of the posterior superior alveolar artery, which form a double arterial arcade by anastomosing with the infraorbital artery. Bleeding may occur either from the soft tissue (the extraosseous branch) during flap elevation or directly from the lateral bony wall (the intraosseous branch) during preparation of the lateral window via rotary instrumentation. There is also the possibility of bleeding from the medial wall of the sinus if the posterior lateral nasal artery is damaged. The posterior superior alveolar, infraorbital, and posterior lateral nasal arteries are all branches of the maxillary artery that provides a source of blood for vascularization of the sinus graft[1,2]. Although bleeding does not occur on every occasion that this artery is damaged, it seems prudent to use 3-dimensional planning as a means of avoiding, if possible, an encounter with the artery. In some cases, the artery can be visualized within the lateral wall after elevation of the flap. In many instances, a window can be made coronal to the location of the artery and the superior portion of the membrane elevation can be performed internally to the required height. Again, it should be recognized that the artery is not always located within the lateral wall. The artery can be located just internal to the lateral wall and may pass in and out of the bony wall throughout its antero-posterior course in the lateral sinus wall. When located outside the lateral wall, it is susceptible to damage from both rotary and hand instruments. The external branch of the posterior superior alveolar artery may also be damaged when making vertical releasing incisions for flap elevation. Once it is anticipated that the possibility of a bleeding complication exists, it is prudent to locate the position of the artery on the cross-sectional computed tomography images and then use antrostomy instruments that can respect the integrity of vascular and other soft tissues while still creating the window in the ideal location for access to and elevation of the sinus membrane.

Many techniques exist to control vascular bleeding in sinus elevationsurgery. These include:

- direct pressure on the bleeding point.
- use of a localized vasoconstrictor.
- bone wax.
- crushing the bone channel around the vessel (hemostat).

(2) Schneiderian membrane perforation- Perforation of the Schneiderian membrane is the most common intraoperative complication in sinus elevation surgery. The reported incidence in the literature varies from 11% to 56% when rotary window preparation is used. Most experienced clinicians estimate their perforation rate to be approximately 25% when using conventional rotary instruments. In retrospective computed tomography studies performed at the New York University Department of Periodontology and Implant Dentistry (Poster Presentation, AO Annual Meeting, 2002), the perforation rate was shown to have a close relationship to membrane thickness and, to a lesser degree, to the presence of septa. The perforation rate was 41% when the membrane thickness was <1.5 mm and 16.6% when it was ≥1.5 mm. The perforation rate in a separate study of 136 sinus elevation procedures was 44.2% when a septum was present and 35.7% when septa were absent. In a retrospective computed tomography study by Cho et al, the perforation rate was shown to be related to sinus width or, to be more specific, the angle made by the medial and lateral walls at the floor of the sinus. The perforation rates were 62.5% for the narrow anterior part of the sinus (angle < 30°), 28.6% for the wider middle part of the sinus (angle 30-60°), and 0% for the widest posterior portion (angle > 60°). A recent computed tomography study by Chan et al 66 identified another "angle," which defines the various configurations of the palatonasal recess and must be taken into consideration when elevating the Schneiderian membrane from the medial wall. It is the angle made where the alveolus meets the medial wall of the sinus[3]. If this angle is acute, and is located within approximately 10 mm from the sinus floor (an area where graft material is likely to be placed), care must be taken to keep the elevator on the bone surface while not trapping, and thus tearing, the membrane. A thorough knowledge of

the 3-dimensional anatomy of the sinus is essential if the perforation rate is to be kept to a minimum. A computed tomography analysis will provide information relating to the thickness of the crest and lateral walls, the presence of discontinuities in the bony walls, the width of the sinus, the slope of the anterior sinus wall, membrane thickness, and the presence, size, and location of septa. Clinicians will also gain information relative to sinus health and patency of the osteomeatal complex. This evaluation may indicate the need for presurgical treatment that can avoid complications, such as postoperative sinusitis and infection[1,4].

Treatment:

Elevation of the Schneiderian membrane helps to form a compartment in which the particulate graft material can be placed and confined. The elevated membrane forms the distal and superior walls of this compartment, while the bony sinus walls form the inferior (crest), anterior, medial, and lateral walls. Proussaefs et al showed that failure to contain the particulate graft as a result of membrane perforation will result in decreased bone formation (14.2% vs 33.6%) and a decreased implant survival rate (70% vs 100%)[2]. Should the sinus membrane be torn or perforated, the fragility of the remaining membrane becomes increased, and care and attention are required to complete the elevation. This is best accomplished by elevating the membrane around the perforation, thereby releasing tension on the perforated area of the membrane, as opposed to working directly in the weakened area of the perforation. It is still necessary to complete elevation of the sinus membrane from the floor, medial, and anterior bony walls to allow the blood supply from the bony walls to vascularize the graft. Some clinicians prefer to make a small repair to stabilize the damagedarea before completing the elevation. If this is done, the repairshould be evaluated for stability before placing the graft material.The most common means of repairing a perforated Schneiderianmembrane is to use a bioabsorbable collagen barrier membrane asa patch[3,4].

Conclusion

Thus we can conclude that sinus lift surgery is as versatile as the surgeon is and in some cases if not done properly, can result in severe morbidity. A surgeon should be very alert and aware, as a single wrong decision can result to surgical complications that are difficult to manage.

Ethical Clearance – Not required since it is a review article

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Conflict of Interest – Nil

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