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Mini-Review

Trends in Maxillary Sinus Filling Using a Lateral Surgical Approach

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Abstract

Dental rehabilitation using osseointegrated implants is a routine for dentists. Maxillary sinus lift surgery is essential in expanding the indications for dental implants, as it re-establishes adequate bone volume for the installation of implants in the ideal areas in the middle posterior portion of maxillae that have undergone the physiological process of pneumatization. This article describes the chronology of this technique and its increase over time.

***Keywords:** Dental implants; Maxillary sinus; Bone grafts; Biomaterial; Maxillary sinus lift.*

Introduction

A maxillary sinus lift (MSL) is a dental procedure aimed at recovering or increasing the thickness of the mid-posterior portion of the maxillary bone, which would stabilize the dental implant. This procedure is intended to reverse the pneumatization process that occurs in the maxillary sinus, in edentulous areas and therefore without dissipation of masticatory forces. Originally, the procedure would create space for the insertion of grafting material or a synthetic implant and this inserted material would be wrapped and incorporated by bone matrix, mineralizing itself. Recently, mucosal lifting techniques have become popular without the insertion of a graft or synthetic implant, and bone tissue would still be formed[1]. Outpatient surgery has been well described, but still has variable complication rates, ranging from 7 to almost 60%[1], the most common of which is perforation of the sinus membrane, which, when it occurs, requires a specific procedure or even forces the dentist to postpone the surgery.

There are other techniques, such as the crestal approach[2,4,7], the use of a balloon[3] and the use of piezoelectric systems[1], which are beyond the scope of this article; those interested are advised to read the specific texts.

Described in the 1970s by Tatum[1] and popularized by Boyne and James[5] in the 1980s, lateral sinus lift surgery, which consists of opening the buccal wall of the maxillary sinus and gently lifting the sinus mucosa (Schneiderian membrane) (Figure 1) and inserting a bone graft or biomaterial implant (Figure 2), is the most widespread form of MSL.

Cone beam computed tomography is the standard imaging test for assessing and indicating sinus lift. The presence of a bony septum and sinus or periapical infection in adjacent teeth should be noted. If there is sinus pathology, the patient should be assessed and cleared by an otorhinolaryngologist and then this procedure should be carried out.

Figure 1: *Lateral access and visualization of the Schneiderian membrane. Note: We suggest removing the sharp edge (knife blade) of the maxillary bone resulting from the diamond drill access, as the repeated movement of expansion and relaxation of the membrane can cause fenestration of the membrane.*

Figure 2: *Insertion of synthetic implant (Cerasorb™ - Curasan™, Cerasorb-Curasan Inc USA) mixed with crushed autogenous cortical bone. Once the filling is complete, the surgical site is covered with a collagen membrane and a mucosal suture is completed.*

When the lateral wall is opened, the sinus membrane is gently manipulated and its inferior, posterior and anterior portions are raised at first, remembering to make delicate and short movements, and gradually increase the depth, and always do so in a straight line, without lateral manipulation, like a car windshield. Last but not least, the portion of the lateral wall of the nostril is lifted, i.e. the deep portion (from the lateral opening) that would be behind/medial to the implants. We chose to make smaller accesses in the lateral wall of the maxillary sinus, because reduced accesses preserve osteogenic cells, which would stimulate the neoformation of bone tissue[13]. The standard material for filling the cavity formed by the elevation of the membrane would be crushed autogenous bone[1,14], but the literature has long established that biomaterials have the same dimensional stability and biocompatibility as autogenous bone[10]. This fact is reaffirmed in the literature[15].

This lateral access technique, like all surgical techniques, requires a learning curve, but the main factor in its popularity was the visualization of the sinus membrane, and it is also called the *direct sinus lift* technique[1]. Crestal access techniques, on the other hand, are called *indirect*[1]. The authors use carbide/diamond drills to perform the surgical access. The main complication is laceration of the Schneiderian membrane, which, when it occurs, needs to be repaired using resorbable membranes. For beginner surgeons the introduction of the piezoelectric technique has brought a significant advantage[1,12] in the risk of perforation of the mucosa, but it does not eliminate the risk and perforation can still occur.

Lundgren et al[8] proposed the revolutionary idea that there would be bone neoformation just by lifting the mucosa without inserting a bone graft or implant. These authors based themselves on clinical studies and proved bone formation, with X-rays and stabilization of implants in this newly formed bone. A few years later, the same group presented histological results that reaffirmed this result, based on animal experiments[9]. The literature recommends the concomitant installation of dental implants at the same time as augmentation, as long as there is at least 4 mm of bone and primary stability is achieved in these implants[16].

Perforation of the Schneiderian mucosa in the trans-operative period occurs in 20 to 25% of this type of surgery[17]. However, if this complication is properly sealed, it does not pose a risk to the stabilization and clinical performance of the implants[18]. If the option is to use grafts or biomaterial implants, tomographic control is carried out and after the regeneration time described by the manufacturer, the implants are installed in the conventional manner. In this case, it was decided to use synthetic biomaterial only (Max Resorb™, Straumann Brasil Ltda, Curitiba, Brazil). If the option is to use autogenous bone mixed with biomaterial, the result is similar (Figure 5).

Figure 3: *Initial CT scan, showing alveolar extension of the maxillary sinus into the alveolar bone.*

Figure 4: *CT scan after 5 months of biomaterial deposited in the maxillary sinus lift.*

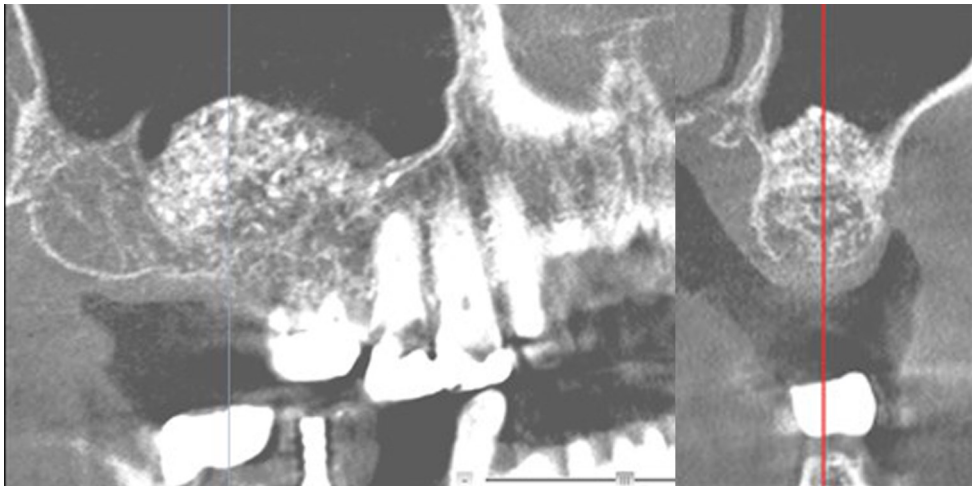

Figure 5: *CT appearance after 4 months, using Bio-Oss™ (Geistlich Pharma do Brasil, São Paulo, Brazil) + crushed autogenous cortical bone.*

Discussion

Always check that graft or implant material has been deposited in the deep portion of the lift (it looks like the side of the maxillary sinus), as this is an area that can be left unfilled with biomaterial (Figure 6).

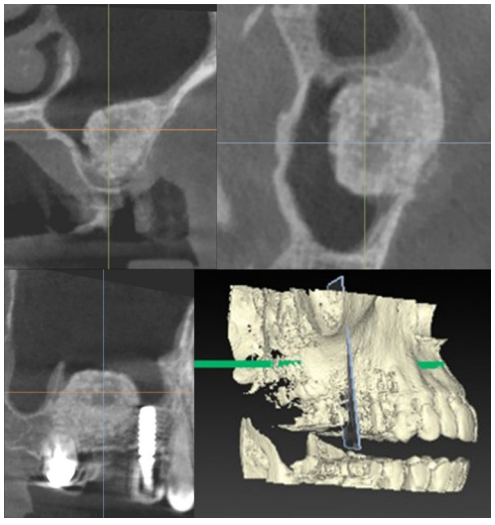

Figure 6: *CT scan of graft that did not fill the entire cavity.*

The CT scan in figure 6 shows that the entire cavity of the sinus lift was not filled, but there was no functional impairment, as the implant has already been installed and the crown is in place, with normal chewing function.

Despite solid literature showing that it is possible to install implants without the use of grafts or biomaterial implants, our option is always to graft and/or implant biomaterial and, if possible, to install the dental implant at the same time.

We reiterate that if access is made using a spherical diamond drill, the edge of the cavity must be lowered so that there is no knife-blade bone, which associated with the respiratory movements of inflating the sinus membrane, can cause a linear cut in the mucosa, which requires repair and may require additional surgical time for the installation of the implants.

Conflict of interest

The authors declare no conflict of interest.

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