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# *Lateral window maxillary sinus lift surgery: case report*

# *Cirurgia de levantamento de seio maxilar pela técnica da janela lateral: relato de caso*

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## ABSTRACT

The loss in height of the alveolar bone crest after tooth extraction makes rehabilitation of the posterior maxilla challenging due to low bone density and atrophy, in addition to pneumatization of the maxillary sinus. Maxillary sinus lift surgery prior to implant placement makes implant-supported rehabilitation feasible. This study aimed to describe a case report of maxillary sinus surgery using the side window technique prior to rehabilitation with a prosthesis supported by dental implants, highlighting the importance of planning to minimize intraoperative complications. This is a clinical case report of a 59-year-old male patient who was assisted at a private higher education institution complaining of edentulous spaces and the desire for rehabilitation with implants. He underwent rehabilitation planning, including the surgical treatment of maxillary sinus lifting using the side window technique. Bone gain was confirmed using cone beam computed tomography six months after the surgical approach to the maxillary sinus. The planning of rehabilitation of the posterior maxilla and careful sinus lift surgery using the side window technique is a predictable therapeutic option for clinical cases with bone gain in height of the posterior region of the maxilla prior to the installation of dental implants. The clinical case presented demonstrated success in the gain of bone volume in the posterior region of the maxilla, without postoperative complications, and the patient was still satisfied with the proposed treatment, awaiting complete implant-supported rehabilitation.

**Indexing terms**: Dentistry. Maxillary sinus. Sinus floor augmentation.

## RESUMO

*A perda em altura da crista óssea alveolar pós extração dentária torna a reabilitação da maxila posterior desafiadora devido à baixa densidade e atrofia ósseas, além da pneumatização do seio maxilar. A cirurgia sinusal previamente à instalação de implantes viabiliza a reabilitação implantossuportada. Esse estudo teve como objetivo apresentar um relato de caso clínico submetido à cirurgia de levantamento de seio maxilar pela técnica da janela lateral previamente à reabilitação com prótese suportada por implantes dentários,*

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*destacando a importância do planejamento para minimizar complicações transoperatórias. Esse é um relato de caso clínico de um paciente do sexo masculino, 59 anos de idade, assistido em uma Instituição de Ensino Superior Privada, com queixa de espaços edêntulos e desejo de reabilitação com implantes. Foi submetido ao planejamento reabilitador incluindo o tratamento cirúrgico de levantamento de seio maxilar bilateral pela técnica da janela lateral. O ganho ósseo foi confirmado pela tomografia computadorizada de feixe cônico após seis meses da abordagem cirúrgica do seio maxilar bilateralmente. O planejamento reabilitador da região posterior da maxila e a execução da cirurgia de levantamento de seio pela técnica da janela lateral de maneira criteriosa consiste em uma opção terapêutica previsível para os casos clínicos com necessidade de ganho ósseo em altura previamente à instalação de implantes dentários. O caso clínico apresentado demonstrou sucesso no ganho de volume ósseo na região posterior de maxila, sem complicações pós-operatórias e o paciente segue satisfeito com o tratamento proposto, aguardando conclusão da reabilitação implantossuportada.*

***Termos de indexação***: *Odontologia. Seio maxilar. Levantamento do assoalho do seio maxilar.*

## INTRODUCTION

Oral rehabilitation of edentulous areas has shown promising results. However, implant insertion in the posterior maxilla is challenging because of low bone density and atrophy, in addition to the pneumatization of the maxillary sinus resulting from tooth loss [1]. In these situations, it is necessary to perform surgical procedures prior to implant insertion, such as lifting the floor of the maxillary sinus to enable implant-supported rehabilitation [1-3].

The maxillary sinus is defined as a pyramid-shaped air space that occupies most of the maxilla, with an average height of 33 mm [4,5]. Pathologies such as rhinosinusitis, in addition to anatomical variations such as asymmetry, hypoplasia, presence of a sinus septum, pneumatization, and exostosis, may be present in the maxillary sinus [4-6].

Depending on the anatomical variation of the sinus, there is a risk of perforation of the maxillary sinus membrane during the surgical approach to the posterior maxillary, with the possibility of failure in the graft consolidation, in addition to limitations in implant insertion for implant-supported rehabilitation [2]. Thus, preoperative evaluation using computed tomography is essential for the diagnosis and adequate surgical planning of the region to be approached to avoid complications [2,5-7].

The lifting floor maxillary sinus technique was first reported by Boyne and James in 1980 [1]. For this surgery, the literature highlights two main approaches: access through the lateral window and the crestal approach using osteotomes [2,8,9]. The osteotome technique is less invasive, was introduced by Robert Summers at the Academy of Osseointegration meeting in 1993, and is indicated for cases with residual bone height greater than 5 mm in the posterior region of the maxilla, enabling predictable gains from 3 to 5 mm in height [10]. However, this transcrestal approach has disadvantages, such as uncertainty about the possibility of sinus membrane perforation during its execution and patient discomfort during percussion of the osteotomes.

The lateral window technique for accessing the sinus cavity was described by Tatum in 1986, which is a relatively simple technique with predictability, which allows a direct view of the sinus region with better distribution of the graft material and is commonly performed in patients with residual bone height less than or equal to 6 mm [9,10]. This surgical procedure with access through the lateral window consists of performing an osteotomy with rotary or piezoelectric instruments, removing the maxillary bone window from the lateral wall to lift the sinus membrane and fill the space generated with particulate and/or biomaterial autogenous bone graft, in addition to closing the window with a resorbable collagen membrane or with the bone window itself initially removed to access the maxillary sinus membrane [10,11].

The objective of this study was to describe a clinical case of a patient who was assisted in a private higher educationinstitution and submitted to bilateral maxillary sinus lifting surgery using the lateral window technique for subsequent rehabilitation with implant-supported prostheses.

## CASE REPORT

This observational study was conducted after approval by the Ethics Committee of the Bahia School of Medicine and Public Health under CAAE 39556120.9.0000.5544. The clinical case reported was seen at the clinics of the Specialization in Implantology at EBMSP.

The patient, male, 59 years old, visited the clinic on October 18, 2017, reporting the loss of some dental units and the desire to rehabilitate the existing spaces with implants (figure 1).

**Figure 1** – A) Initial photo of the front view of the face; B) Front view of the smile.

During the anamnesis, the patient claimed to have controlled hypertension using preventative aspirin (100 mg, ½ tablet per day) and losartan potassium + hydrochlorothiazide (50 mg/12.5 mg, 01 tablet per day). He was classified according to the surgical risk, American Society of Anesthesiologists II, individuals with mild to moderate systemic pathology and able to undergo rehabilitative surgical planning and treatment.

Intraoral clinical examination revealed the absence of units 18, 17, 16, 15, 14, 25, 26, 27, 28, 36, 37, 46, and 47. The initial radiographic examination revealed significant maxillary bone resorption with the need for bilateral maxillary sinus lift surgery for bone grafting and subsequent implant insertion in the posterior maxilla, enabling implant-supported rehabilitation (figure 2). It is noteworthy that, in this clinical case, the remaining alveolar bone height was insufficient (less than 05 mm) for simultaneous implant insertion, and the chosen therapeutic option was the execution of the surgical technique in two stages: bilateral maxillary sinus graft in the first moment and implant insertion in the second surgical moment 06 months after the first surgery.

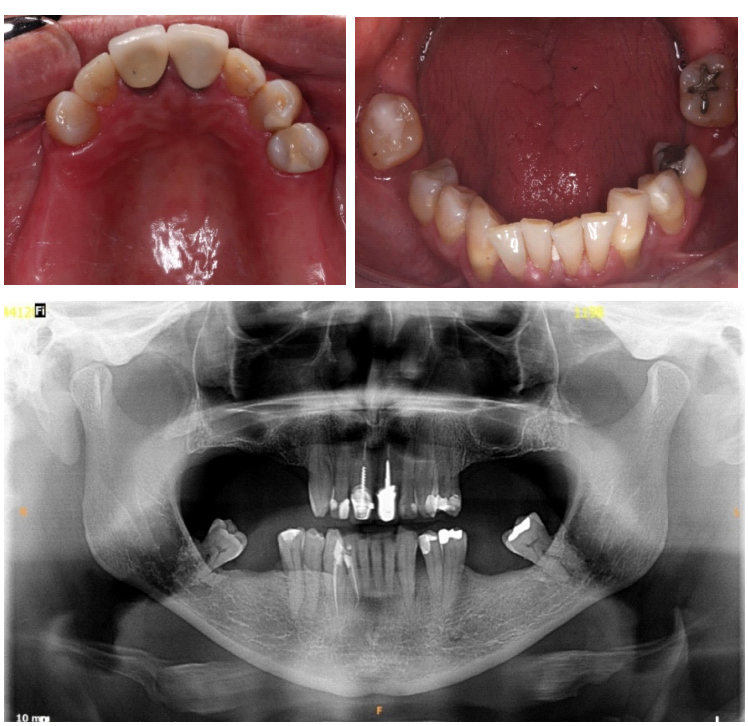

**Figure 2** – A) Occlusal view of the upper arch; B) Occlusal view of the lower arch; C) Initial panoramic radiograph.

## Surgical technique

Bilateral maxillary sinus lift surgery was performed using the lateral window technique. The patient was medicated prior to the surgical procedure with 1 g of amoxicillin and 8 mg of dexamethasone, one hour before surgery, in addition to 7.5 mg of midazolam maleate (a benzodiazepine that produces muscle relaxation and anxiolytic effect) 30 minutes before the surgical approach. Bilateral posterior superior alveolar nerve anesthesia complemented with infiltrative anesthesia was performed with four tubes of 4% articaine hydrochloride with 1:100,000 epinephrine, with two anesthetic tubes being administered on each side (right and left). First, the maxillary sinus on the right side was approached, followed by the left side. After performing the anesthetic techniques, the approach to the maxillary lateral wall was performed with a linear incision in the crest of the alveolar ridge on both the right and left sides, in addition to relaxing incisions allowing good access to the surgical sites. Complete mucoperiosteal dislocation and exposure of the operative site with a lifter periosteal were performed.

The lateral window for access to the maxillary sinus was performed using a rotary instrument (spherical diamond drill FG n. 08, KG Sorensen®) with good bone preservation (figure 3). Then, a careful elevation of the sinus floor was performed to allow the emergence of a cavity, highlighting a small sinus membrane perforation on the right side (figure 3C). A 25 × 25 mm collagen membrane (Bio-Guide®, Geistlich, Switzerland) divided into two parts was used to allow bilateral use and was positioned in contact with the sinus membrane. The wells were filled with xenogenic biomaterial (1.5 g of Bio-Oss® Large, Geistlich, Switzerland). The graft was accommodated in the created cavity, and the window was closed with the bone board removed for access to the sinus membrane. The flap was then repositioned and sutured using a 5-0 nylon thread. Surgery was continued without other complications.

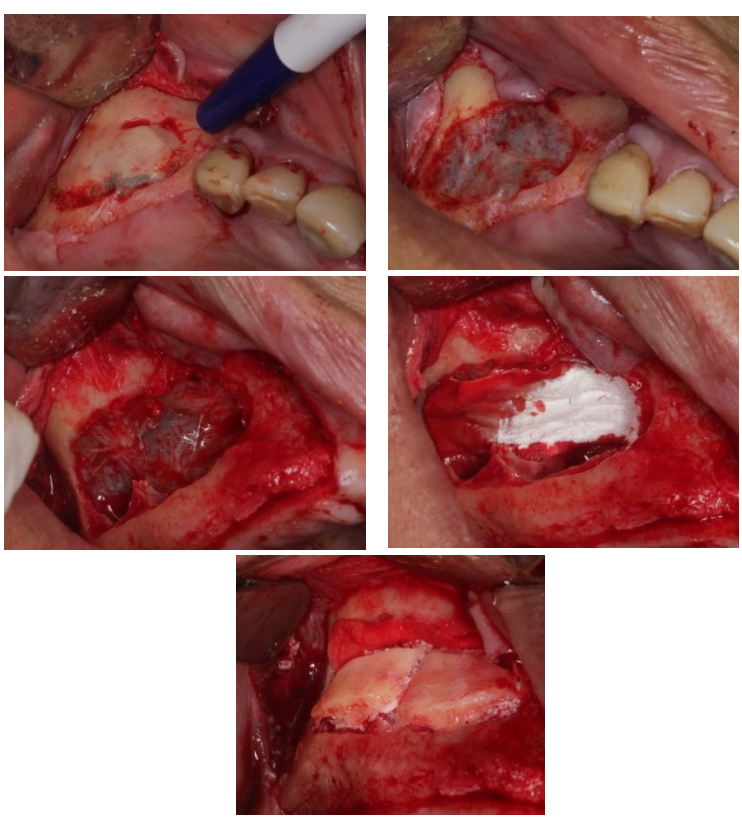

**Figure 3** – Transsurgical sequence on the right side. A) Side window osteotomy; B) Surgical appearance after bone window removal to demonstrate the integrity of the sinus membrane; C) Surgical appearance after bone window removal to demonstrate a small sinus membrane perforation; D) Collagen membrane (Bio-Guide, Geistlich®, Switzerland) in position after sinus membrane lifting; E) Surgical appearance after filling the sinus cavity with biomaterial (Bio-Oss, Geistlich®, Switzerland) and covering the lateral window with a bone board removed to access the sinus membrane.

The patient was instructed about postoperative recommendations including liquid and cold/cold diet in the first 48 h, rest, careful oral hygiene, extra-oral cold compresses, avoidance of nose blowing, and prescription of amoxicillin (500 mg every 8 h for 7 days), dexamethasone (4 mg every 8 h for 3 days), and Tylex® (São Paulo, Brazil) (30 mg every 6 h for 2 days) in case of pain. There were no postoperative complications despite the occurrence of sinus membrane perforation during the trans-operative period, and the suture was removed 2 weeks after the surgical procedure, with excellent healing.

Six months after bilateral sinus lifting surgery, the patient underwent cone beam computed tomography to verify the grafted surgical region showing bone gain in volume compatible with implant insertion, despite the existence of small radiolucent areas suggesting failure in graft union (figure 4).

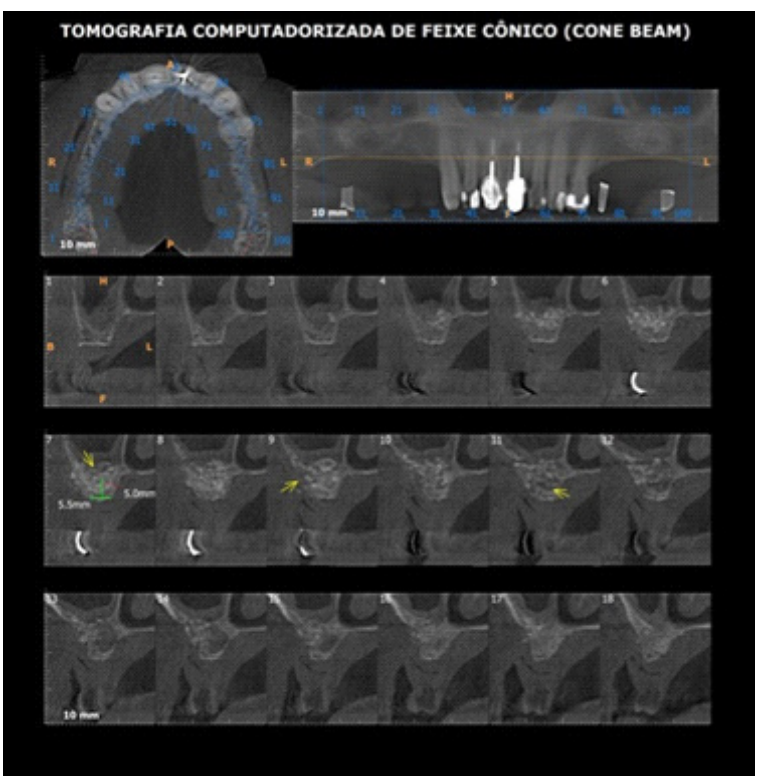


**Figure 4** – Cone Beam Computed Tomography after 06 months of the bilateral maxillary sinus lifting surgery, proving the bone increase in volume (height and thickness) in the cuts on the right side.

The implants were successfully installed, with a torque of 40 N and good primary stability, and were able to verify the osseointegration in the control panoramic radiograph performed 8 months after the maxillary implant insertion, without the occurrence of postoperative complications (figure 5).

## DISCUSSION

The evaluation of preoperative complementary examinations, including panoramic radiography and computed tomography of the region to be rehabilitated, is essential for the diagnosis and adequate surgical planning to avoid complications [2].

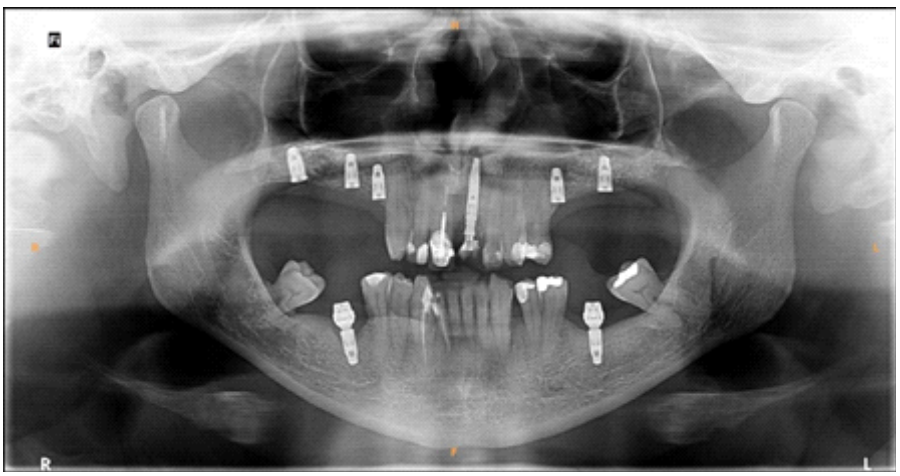

**Figure 5** – Final panoramic radiograph taken 8 months after the maxillary implants insertion.

The maxillary sinus approach with insufficient bone height in the posterior maxilla is a versatile and predictable surgical technique [2]. However, implant insertion associated with the maxillary sinus graft is not recommended when the residual bone height is less than 6 mm because of the difficulty in the primary stability of the implants [9,10], justifying the choice of therapeutic approach in this case in which the patient had alveolar bone height less than 3 mm on the right and left sides of the posterior maxilla.

A bilateral maxillary sinus graft with xenogenic biomaterial (Bio-Oss® Large, Geistlich, Switzerland) was performed instead of an autogenous graft in order to avoid morbidity at the second surgical site. In addition, Bio-Oss® (Geistlich, Switzerland) has osteoconductive properties and acts as a framework enabling the neoformation of capillaries and migration of osteoprogenitor cells from the receptor bed [3]. Graft surgery was conducted to gain bone height, and implant insertion was performed at the second surgical moment 06 months after the maxillary sinus lift surgery.

In the surgical technique of maxillary sinus grafting, access to the lateral wall of the maxilla can be performed through a linear incision in the crest of the alveolar ridge, in addition to relaxing incisions in order to allow good access to the surgical site [1,2], a technique described in this clinical case. The creation of a lateral window for access to the maxillary sinus can be performed using a spherical diamond drill or a piezoelectric instrument [12]. However, Li et al. [8] and Öncü & Kaymaz [11] advocated the use of piezoelectric instruments, as they present a lower risk of Schneiderian membrane perforation during lateral window osteotomy.

It is noteworthy that, despite the precision of the osteotomy with piezoelectric ultrasonic vibration, postoperative pain and edema using a piezoelectron are similar when compared to the technique using a spherical drill [12]. In this case, the spherical diamond drill was carefully used for osteotomy of the maxillary lateral wall, highlighting the importance of this type of drill to minimize the risks of sinus membrane perforation with bone structure preservation, despite the difficulty in accessing the membrane because of the sinus septum.

When there is no membrane perforation after sinus floor elevation, the graft material is autogenous and/or the biomaterial must be accommodated in the cavity created to allow bone gain and future implant insertion [12]. In the clinical case presented, there was a small perforation of the sinus membrane at the upper anterior limit of the bone window on the right side, as shown in Figure 3-C, during detachment of the sinus membrane despite the preservation of membrane integrity during osteotomy with the rotary instrument.

Marin et al. [13] reported the influence of the maxillary sinus membrane perforation on the occurrence of postoperative complications (sinusitis, graft displacement within the sinus, difficulty in healing, and inflammation) and bone graft failure. These data corroborate the findings of Schwarz et al. [14] and Öncü & Kaymaz [11], and the latter authors highlighted other possible complications associated with membrane perforation, such as iatrogenic sinus

infections, edema, bleeding, loss of bone graft material, increased failure rate of the sinus implant, and interruption of physiological function of the normal maxillary sinus.

For cases of sinus membrane perforation, there are numerous repair techniques, including the use of collagen membranes, sinus membrane suture, use of PRF, or simple continuation without repair intervention [11,13-15]. Park et al. [15] evaluated how sinus membrane perforations during surgeries to lift the maxillary sinus through the lateral window behaved without repair and suggested the excellent regenerative potential of the sinus membrane despite the variation in sizes (03 to 30 mm in diameter) of the reported perforations by the authors and the risk of graft displacement to the sinus cavity and/or postoperative infections.

In this reported clinical case, the sinus membrane perforation was minimal, around 3 mm in diameter after the elevation of the floor of the maxillary sinus, and the chosen repair technique was the use of a collagen membrane (Bio-Guide®, Geistlich, Switzerland ) to protect the injury in order to avoid other perforations with possible extravasation of the biomaterial during its insertion in the sinus cavity. Good postoperative pain control was achieved, including absence of edema and postoperative complications, in addition to good bone healing, enabling the installation of implants 6 months after maxillary sinus lifting surgery.

## CONCLUSION

Rehabilitation planning of the posterior maxilla and careful execution of sinus lifting surgery using the lateral window technique are predictable therapeutic options for clinical cases requiring bone gain in height prior to dental implant installation in the posterior maxilla. The patient in the clinical case presented was successful in gaining bone volume in the posterior maxilla; he was still satisfied with the proposed treatment and continued to be treated to complete the implant-supported rehabilitation.

### Collaborators

IOB FARIAS, conception, design, data acquisition, analysis, interpretation and drafting. RRC BAHIA, analysis and manuscript's critical revision. MA BARRETO analysis, interpretation and manuscript's critical revision. FS PINTO, data acquisition. ACS FERNANDES, conception, design, data acquisition, analysis, interpretation and manuscript's critical revision.

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## ERRATUM

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