Case Report

NASAL FLOOR ELEVATION FOR REHABILITATION OF PRE-MAXILLA: A CASE REPORT

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ABSTRACT

Nasal floor elevation (NFE) is a surgical procedure performed in the maxillary region to create additional space for the successful placement of dental implants. This technique is commonly employed when there is insufficient bone height in the sub-nasal part of the maxilla, particularly in incisors and canines. During the procedure, the nasal membrane is lifted, and a bone graft material is placed in the resulting space between the periosteum and bone. This augmentation enhances bone volume, providing a stable foundation for immediate placement of dental implants. The NFE procedure aims to address limitations in bone height, ensuring that the implants can be securely anchored in the upper jaw. NFE is often recommended for individuals who have experienced bone loss due to factors such as tooth loss, periodontal disease, or trauma. Creating a more favorable environment for dental implant placement enables individuals to restore missing teeth in the pre-maxilla, ultimately improving oral function and aesthetics. NFE can be combined with pre-maxilla vestibular bone augmentation by means of guided bone regeneration. Successful integration of dental implants following NFE contributes to long-term stability and functionality in the upper jaw. Here we describe a case, and literature is discussed.

KEYWORDS: *nasal floor, elevation, augmentation, graft, implant, fixture*

INTRODUCTION

Pre-maxilla atrophy is a condition characterized by the loss of bone volume in the anterior maxillary region, presenting a significant challenge in implant dentistry. The primary cause often stems from the loss of natural teeth, leading to the resorption of alveolar bone in the pre-maxillary area. Chronic periodontal disease can contribute to bone loss, affecting the stability and volume of the maxillary bone. Facial trauma, particularly in the anterior maxilla, can result in bone loss and compromise the structure of the pre-maxillary region.

Pre-maxilla atrophy can result in facial changes and compromise facial aesthetics, impacting the patient's self-esteem and quality of life. Insufficient bone volume poses challenges for successful dental implant placement, requiring augmentation techniques to establish a stable foundation. Cone-beam computed tomography (CBCT) is a crucial tool for assessing bone volume, density, and the overall condition of the pre-maxillary region.

Thorough clinical evaluation, including assessing soft tissue quality and quantity, aids in determining the extent of pre-maxilla atrophy. Autogenous, allogeneic, or xenogeneic bone grafts may be employed to augment the pre-maxillary region, enhancing bone volume for implant placement. Membrane barriers and growth factors may be used to facilitate guided bone regeneration (GBR), enhancing the predictability of bone augmentation procedures.

Nasal floor elevation (NFE) via oral vestibulum is increasingly used in implant dentistry, explicitly addressing challenges associated with inadequate bone height in the anterior maxilla (1-8). The oral vestibulum approach leverages the anterior access point to the nasal floor. It is particularly indicated when atrophy in the pre-maxilla necessitates a

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minimally invasive yet effective means of NFE for dental implant placement. This way, fixtures are inserted bi-cortically, getting a more stable grip on the bone. Only the implant tip emerged over the bony nasal floor and under the periosteum in a space filled with bone grafts.

A precise incision in the oral vestibulum provides access to the pre-maxillary, minimizing soft tissue trauma. Dissecting the periosteum is performed to access the nasal floor. The nasal membrane is gently elevated, creating a space for bone graft material. CBCT imaging is essential for evaluating maxillary anatomy, bone density, and nerve proximity, aiding in meticulous preoperative planning. Due to the proximity to the oral cavity, infection control is paramount. Strict adherence to aseptic techniques and appropriate postoperative care protocols are implemented to minimize the risk of complications. The potential for postoperative hematoma and swelling is mitigated through meticulous hemostasis and appropriate postoperative measures.

Studies have shown promising success rates for implants placed following nasal floor elevation via the oral vestibulum, emphasizing the procedure's effectiveness in providing a stable foundation for implant integration (1-8). The minimally invasive nature of this technique contributes to reduced patient discomfort and faster recovery. Here, we describe a case, and literature is discussed.

CASE REPORT

A 46-year-old man presented at our dental clinic requesting fixed oral maxillary rehabilitation. At the dental examination, the patient showed total upper and lower edentulism. A panoramic x-ray and a CTBT scan were performed. Before surgery, the patient was informed about the operative risk and complications, and written consent was obtained from the patient for publication of this case report and accompanying images. After local anesthesia with articaine, the vestibular and palatine mucosa was incised and detached until the maxilla was completely skeletonized (Fig. 1). Four implants were inserted in the maxillary residual bone after NFE (Fig. 2).

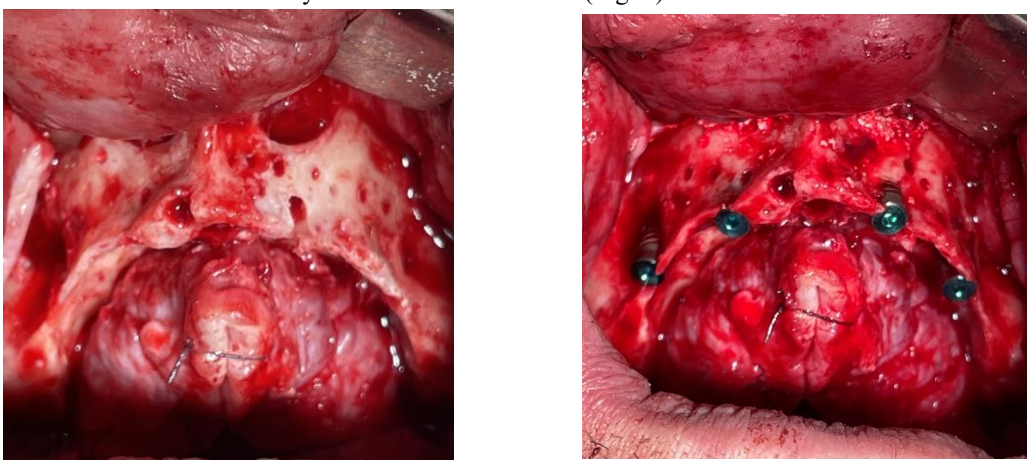

Fig. 1, 2. *Maxilla was skeletonized, and 4 implants were inserted in the maxillary residual crest after NFE with heterologous bone chips.*

NFE was performed with the placement of heterologous bone (Geistlich Bio-Oss®, Thiene VI, Italy) in both nasal cavities. In addition, a horizontal GBR was performed in the pre-maxilla region using heterologous bone, reinforced membranes, and fixed with pins (Fig. 3-5).

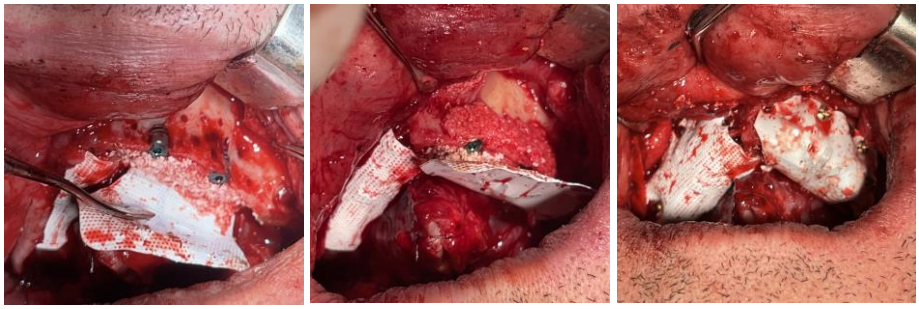

Fig. 3-5. *Horizontal GBR on the buccal side of pre-maxilla performed with heterologous bone and membranes fixed with pins in both sides of the upper jaw.*

Finally, the mucosa was sutured (Fig. 6), and a control CTCB scan was then performed (Fig. 7, 8). The CT scan highlights the NFE with the implants inserted into the heterologous bone (Fig. 8).

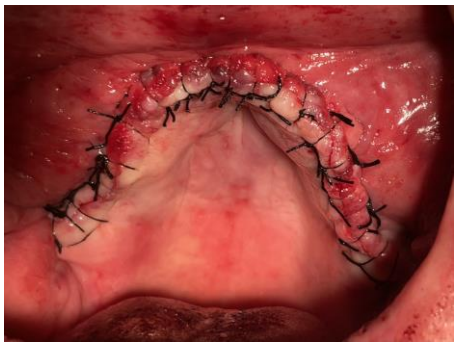

Fig. 6. *The upper oral mucosa is sutured.*

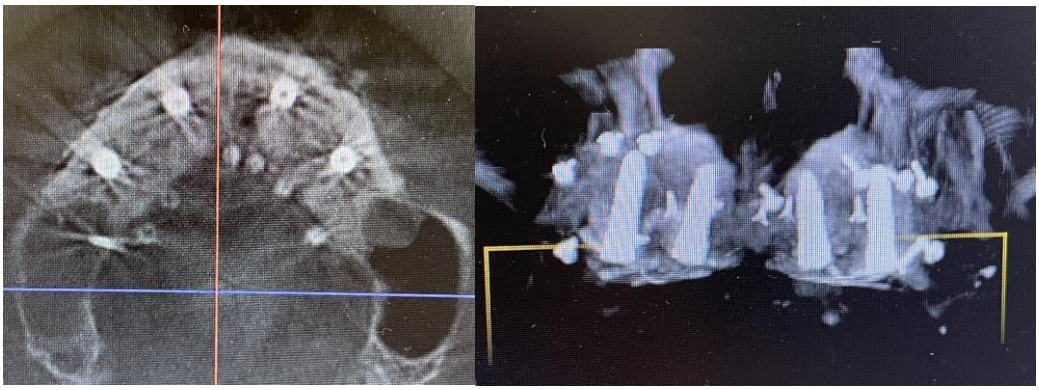

Fig. 7, 8. *Axial and vertical sections of CT scan. The vertical section of the CT scan highlights the NFE by inserting the implants into the heterologous bone.*

Six months after surgery, the maxillary mucosa was again incised and dissected, reinforced membranes removed, implants were uncovered by excess bone, and the healing screws screwed onto the implants (Fig. 9-12).

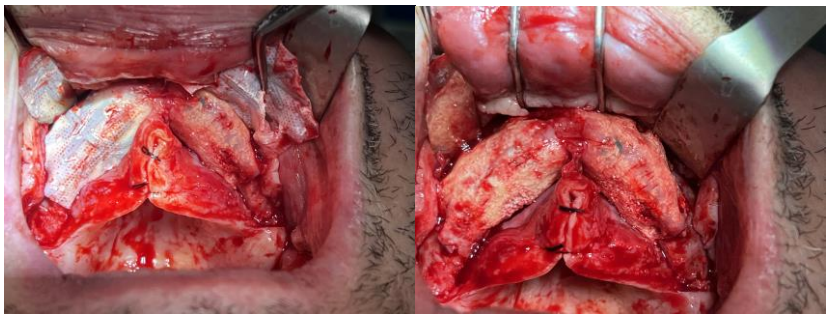

Fig. 9, 10. *Maxillary mucosa is incised and dissected, and reinforced membranes are removed.*

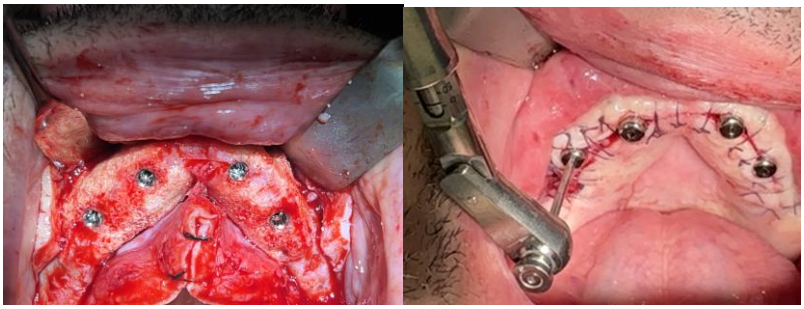

Fig. 11, 12. *Implants were uncovered by bone excess, and healing screws were inserted into the fixtures.*

In the following month, the mucosa appeared completely healed, and the implants could be loaded for prosthetic rehabilitation (Fig. 13-15).

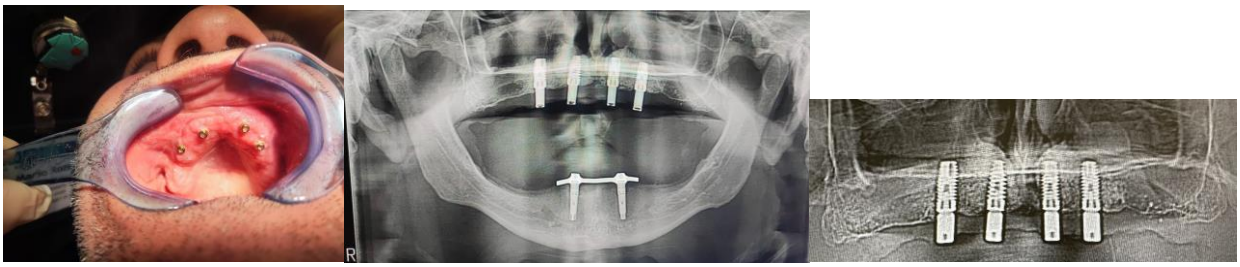

Fig. 13-15. *One month later, the mucosa appeared completely healed, and the implants were ready for prosthetic rehabilitation.*

DISCUSSION

Pre-maxilla bone augmentation is a critical aspect of implant dentistry, addressing challenges posed by bone atrophy in the anterior maxillary region. Pre-maxilla bone augmentation can be obtained with bone grafting techniques (9-12), NFE (1-8), and guided bone regeneration (13-17). Bone grafts can be autogenous (obtained from intraoral or extraoral donor sites, provide excellent osteogenic potential for augmenting the pre-maxilla region), or xenogeneic bone grafts (derived from animal sources) can offer alternatives for patients averse to autogenous grafts. In addition, allogeneic and synthetic materials are used with membranes to promote bone regeneration. Incorporating growth factors, platelet-rich plasma, and other biological adjuncts in bone grafting may accelerate healing and enhance graft integration.

Few reports regarding nasal floor augmentation (NFA) (1-8) are available. In 2012, El-Ghareeb et al. (1) evaluated the survival and success of dental implants placed in nasally grafted maxillae with osteoconductive bone substitutes. Six patients with entirely edentulous maxillae and inadequate height in the anterior to support implants underwent NFA. The nasal floor was exposed intraoral and grafted with osteoconductive bone graft substitutes. Twenty-four dental implants were placed, restored with a bar-retained implant-supported overdenture after a traditional healing period, and followed up after prosthetic loading for 14 months.

Bone levels were quantified radiographically based on a score ranging from 1 to 3, where 3 represented the highest bone support. Implants were evaluated for thread exposure and soft tissue health. They were considered successful if the following criteria were met: absence of mobility, lack of symptoms, and healthy peri-implant soft tissue without thread exposure. The implant survival rate was 100%, with no complications. Bone scores ranged from 2 to 3, with 87.5% of implants having a score of 3 and 12.5% having a score of 2. The authors concluded that osteoconductive bone substitutes for NFA are a reliable method for reconstructing the anterior atrophic maxilla for implant-supported overdentures.

Mazor et al. (2) performed a retrospective study on 32 consecutive patients in the same year. All patients presented with alveolar bone height deficiency in the anterior region, which was insufficient to place a dental implant according to a computed tomography scan before implantation. Elevation and augmentation of the nasal mucosa were performed simultaneously with dental implant placement. Patients received 100 implants inserted in conjunction with NFE. The average bone addition following NFA was 3.4 ± 0.9 mm detected by CT scan. The mean follow-up time was 27.8 ± 12.4 months, and during that follow-up period, no implant failure was recorded, resulting in 100% implant survival.

In 2014, Lorean et al. (3) investigated 67 patients. Two hundred and three implants were inserted in combination with NFE. The mean follow-up periods were 65.93 ± 13.2 months. The mean bone augmentation was 3.65 ± 0.9 mm with NFE. During the follow-up period, no implants were lost, resulting in a 100% survival rate.

In 2015, Garcia-Denche et al. (4) compared implants placed in augmented bone in the anterior maxilla using the NFE technique with implants placed in the maxillary sinus region using the sinus lift technique. A clinical trial was performed on 14 patients receiving 78 implants. The implants were assigned to one of two study groups based on implant location. Thirty-seven implants were placed in the nasal fossa region (NF group), and 41 implants were placed in the maxillary sinus region (MS group). Patients were followed up for 4.5 ± 2.2 years, with comparable follow-up times for implants in the NF and MS groups. The implant success rate was 89.2% in the NF group and 95.0% in the MS group, with no statistically significant difference. In addition, case reports of NFA were reported (5, 6).

Two systematic reviews are available. In 2003, Wallace et al. (7) obtained a weighted mean follow-up of 32.2 months from literature analysis and a weighted survival rate after this period of 97.64%. Authors concluded that implants placed after an NFE present a good survival and a low range of complications.

In 2012 Dasmah et al. (8) reviewed the existing scientific literature. Only nine studies fulfilled the eligibility criteria and were included in the qualitative synthesis. Of those nine studies, five were case reports, and four were comparative follow-up studies. In the included case reports, 14 implants were placed in five patients, with a survival rate of 100%. In comparison, 408 implants were placed in 130 patients, with survival rates ranging from 89% to 100% in included comparative follow-up studies. No complications were observed during follow-ups, and the patients were satisfied with the functional and aesthetic results of the treatment. The systematic review results indicate that implant placement using NFA techniques can be considered a predictable treatment modality.

Our case report shows that the surgical technique for NFE, implant insertion, and horizontal GBR using heterologous bone and reinforced membranes is a reliable technique.

CONCLUSIONS

Pre-maxilla atrophy poses significant challenges in implant dentistry, affecting the aesthetics and functional aspects of oral rehabilitation. Pre-maxilla bone augmentation involves a range of surgical techniques, each tailored to the specific needs of the patient and the complexity of the case. NFE via oral vestibulum represents a cutting-edge approach in implant dentistry. By creating a more favorable environment for dental implant placement, this procedure enables individuals to restore missing teeth in the pre-maxilla, ultimately improving oral function and aesthetics.

NFE can be combined with pre-maxilla vestibular bone augmentation by means of horizontal GBR. Successful integration of dental implants following NFE contributes to long-term stability and functionality in the upper jaw.

REFERENCES

1. El-Ghareeb M, Pi-Anfruns J, Khosousi M, Aghaloo T, Moy P. Nasal floor augmentation for the reconstruction of the atrophic maxilla: a case series. *J Oral Maxillofac Surg.* 2012;70(3):e235-41. doi: 10.1016/j.joms.2011.09.032.
2. Mazor Z, Lorean A, Mijiritsky E, Levin L. Nasal floor elevation combined with dental implant placement. *Clin Implant Dent Relat Res.* 2012 Oct;14(5):768-71. doi: 10.1111/j.1708-8208.2010.00312.x.
3. Lorean A, Mazor Z, Barbu H, Mijiritsky E, Levin L. Nasal floor elevation combined with dental implant placement: a long-term report of up to 86 months. *Int J Oral Maxillofac Implants.* 2014 ;29(3):705-8. doi: 10.11607/jomi.3565.
4. Garcia-Denche JT, Abbushi A, Hernández G, Fernández-Tresguerres I, Lopez-Cabarcos E, Tamimi F. Nasal Floor Elevation for Implant Treatment in the Atrophic Premaxilla: A Within-Patient Comparative Study. *Clin Implant Dent Relat Res.* 2015;17 Suppl 2:e520-30.
5. Rafael CF, Magrin GL, Morsch CS, Benfatti CAM, Volpato CÂM, Bianchini MAL. Nasal Floor Elevation with Simultaneous Implant Placement: A Case Report. *J Int Acad Periodontol.* 2016;18(3):94-100.
6. Sentineri R, Lombardi T, Celauro A, Stacchi C. Nasal Floor Elevation with Transcrestal Hydrodynamic Approach Combined with Dental Implant Placement: A Case Report. *Int J Periodontics Restorative Dent.* 2016;36(3):357-61. doi: 10.11607/prd.2540.
7. Wallace SS, Froum SJ. Effect of maxillary sinus augmentation on the survival of endosseous dental implants. A systematic review. *Ann Periodontol*. 2003;8(1):328-343. doi:10.1902/annals.2003.8.1.328
8. Dasmah A, Thor A, Ekestubbe A, Sennerby L, Rasmusson L. Particulate vs. block bone grafts: three-dimensional changes in graft volume after reconstruction of the atrophic maxilla, a 2-year radiographic follow-up. *J Craniomaxillofac Surg.* 2012;40(8):654-9.
9. Monje A, Monje F, Chan HL, Suarez F, Villanueva-Alcojol L, Garcia-Nogales A, Wang HL. Comparison of microstructures between block grafts from the mandibular ramus and calvarium for horizontal bone augmentation of the maxilla: a case series study. *Int J Periodontics Restorative Dent.* 2013;33(6):e153-61.
10. Dasmah A, Thor A, Ekestubbe A, Sennerby L, Rasmusson L. Marginal bone-level alterations at implants installed in block versus particulate onlay bone grafts mixed with platelet-rich plasma in atrophic maxilla. a prospective 5-year follow-up study of 15 patients. *Clin Implant Dent Relat Res.* 2013;15(1):7-14. doi: 10.1111/j.1708-8208.2011.00377.x.
11. Gulinelli JL, Dutra RA, Marão HF, Simeão SFP, Groli Klein GB, Santos PL. Maxilla reconstruction with autogenous bone block grafts: computed tomography evaluation and implant survival in a 5-year retrospective study. *Int J Oral Maxillofac Surg*. 2017;46(8):1045-1051.
12. Gultekin BA, Cansiz E, Borahan MO. Clinical and 3-Dimensional Radiographic Evaluation of Autogenous Iliac Block Bone Grafting and Guided Bone Regeneration in Patients With Atrophic Maxilla. *J Oral Maxillofac Surg.* 2017;75(4):709-722.
13. Tal H, Oelgiesser D, Moses O. Preimplant guided bone regeneration in the anterior maxilla. *Int J Periodontics Restorative Dent.* 1997;17(5):436-47.
14. Jiang X, Zhang Y, Di P, Lin Y. Hard tissue volume stability of guided bone regeneration during the healing stage in the anterior maxilla: A clinical and radiographic study. *Clin Implant Dent Relat Res.* 2018;20(1):68-75.

15. Li Y, Zhang XM, Qian SJ, Qiao SC, Lai HC, Shi JY. The influence of initial defect morphology of alveolar ridge on volumetric change of grafted bone following guided bone regeneration in the anterior maxilla region: an exploratory retrospective study. *Ann Transl Med.* 2020;8(23):1592.
16. Zhang L, Huang Y. Radiographic Evaluation of the Alveolar Ridge Splitting Technique Combined with Guided Bone Regeneration vs Guided Bone Regeneration Alone in the Anterior Maxilla: A Retrospective Controlled Study. *Int J Periodontics Restorative Dent.* 2021;41(5):751–759.
17. Chen H, Gu T, Lai H, Gu X. Evaluation of hard tissue 3-dimensional stability around single implants placed with guided bone regeneration in the anterior maxilla: A 3-year retrospective study. *J Prosthet Dent.* 2022 ;128(5):919-927.