Selcuk Dental Journal 11/2 (Ağustos 2024): 223-226

Case Report / Olgu Sunumu

Comparement of Two Dıfferent Graft Materıals in Lateral Sinus Augmentetion: 2 Case Reports

Lateral Sinüs Augmentasyonunda İki Farklı Greft Materyalinin Karşılaştırılması: 2 Olgu Sunumu

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ABSTRACT

The rehabilitation of the edentulous posterior maxilla can be complex, often requiring additional surgical procedures. Sinus augmentation procedures are reliable methods for addressing deficiencies in the edentulous posterior maxillary region. Various graft options, such as autogenous, xenogenous, allogenous, and alloplastic grafts, are available for these procedures. These materials have been utilized in sinus augmentation procedures in both block and particulate forms over time. Xenografts and autografts are among the most preferred materials for sinus augmentation. However, the investigation into which graft material yields the most successful results is still ongoing. In this case report, two patients with similar vertical bone deficiencies in the posterior maxillary region due to sinus pneumatization are presented. The report examines the applications and success rates of autogenous and xenogenous graft materials in these cases.

Keywords: Sinus augmentation, Autogen graft materials, Xenografts

ÖZ

Dişsiz posterior maksillada kemik defektlerinin rehabilitasyonu her zaman kolay olmayabilir. Bu nedenle implant uygulamaları için ek tedavilere ihtiyaç duyulabilir. Sinüs augmentasyonu, posterior maksiller bölgede en sık tercih edilen yöntemlerden biridir. Bu prosedür için otojen, xenojen, allojen ve alloplast gibi pek çok greft materyali blok veya partikül formunda kullanılabilir. Xenojen ve otojen greftler en çok kullanılan greft çeşitlerine örnektir. Ancak sinüs augmentasyonu için henüz ideal greft materyali kullanımıyla ilgili bir konsensusa varılamamıştır. Bu olgu sunumunda, posterior maksiller bölgede sinüs pnömatizasyonuna bağlı benzer iki vertikal kemik eksikliği olan hastada otojen ve xenojen greft materyallerinin uygulamaları karşılaştırılmıştır.

Anahtar Kelimeler: Sinüs augmentasyonu, Otojen greftler, Ksenogreft

INTRODUCTION

Rehabilitating the edentulous posterior maxilla with dental implants is a reliable treatment method, but sometimes the residual bone volume may be insufficient. Resorption of the alveolar process following tooth extraction and maxillary sinus pneumatization can adversely affect residual bone height. In such cases, augmentation surgeries may be necessary before implant placement. [1]

One of the most preferred techniques for addressing insufficient bone height in the maxillary posterior area is lateral sinus augmentation. The primary goal of sinus augmentation is to elevate and stabilize the sinus membrane, creating space to facilitate the migration of osteoprogenitor cells and enhance bone formation. Various graft materials, including autogenous, xenogenous, allogenous, and alloplastic materials, are utilized for sinus augmentation in the literature.[2, 3] These graft materials can be applied in particle or onlay block forms. [4] Autogenous grafts are considered the gold standard for augmentation due to their osteogenic, osteoinductive, and osteoconductive properties. [5] However, particulate autografts are often resorbed more rapidly than other graft types. Some literature suggests that onlay autogenous grafts may be more successful in maintaining space in the sinus cavity. Nonetheless, harvesting sufficient quantities of autogenous grafts may not always be suficient. In such cases, allografts and xenografts serve as alternative graft options for sinus augmentation. However, they lack the osteogenic properties of autografts. Despite the variety of graft materials available for sinus augmentation, there is no ideal graft material described in the literature.

In this case report, two different graft materials, autogenous onlay graft and xenograft, were used for sinus augmentation in two different patients. Radiological follow-ups were conducted at 6 months postoperatively to evaluate the outcomes.

CASE 1:

A 36-year-old female patient presented to our university clinic seeking implant rehabilitation for the edentulous posterior region of her maxilla. Upon radiological and clinical examination, it was observed that the residual bone height in the right posterior maxillary area ranged from 1-2mm (**Figure 1**).

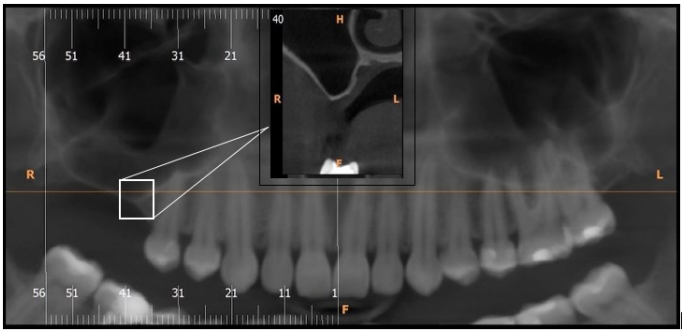

Figure 1. The radiological examination of preoperative tomography.

A sinus augmentation procedure using a lateral window approach was planned to address this deficiency. An onlay autogenous graft was chosen for augmentation due to its osteogenic potential and slow resorption rate. The patient provided informed consent for the surgery. Following administration of local anesthesia to the right maxillary posterior region, a full thickness mucoperiosteal flap was elevated. The lateral window was carefully prepared under saline irrigation, and the sinus membrane was elevated without any observed perforations. An incision was made at the mucogingival junction in the mandibular symphysis area between the mandibular canine teeth to harvest the onlay graft. Subsequently, a full-thickness mucoperiosteal flap was elevated (**Figure 2-A**). The onlay graft was harvested using a trephine burr (**Figure 2-B**), and the collected block graft was then placed beneath the sinus membrane. A screw slot was prepared at the top of the alveolar crest using a drill, and the graft was stabilized using a micro screw (**Figure 3**).

Gönderilme Tarihi/Received: 14 Kasım, 2023
Kabul Tarihi/Accepted: 27 Mart, 2024
Yayınlanma Tarihi/Published: 19 Ağustos, 2024
Atıf Bilgisi/Cite this article as: Arı Ilgın, Adiloğlu S. Comparement of Two Dıfferent Graft Materıals in Lateral Sinus Augmentetion: 2 Case Reports. Selcuk Dent J 2024;11(2): 223-226 Doi: 10.15311/ selcukdentj.1390440

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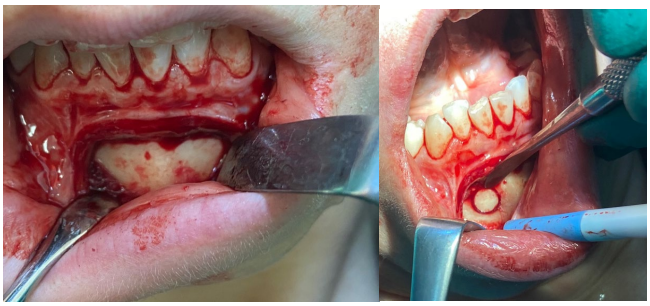

Figure 2. The view of bone block harvesting at the symphysis region.

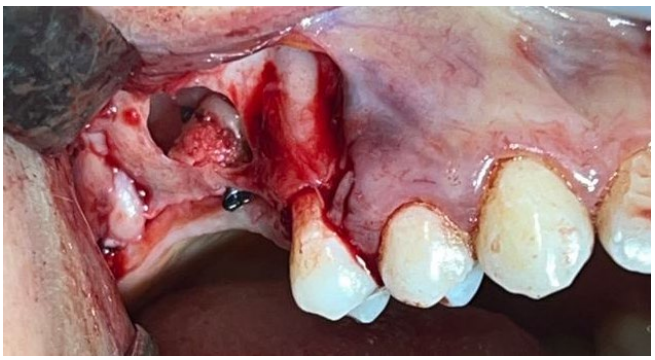

Figure 3. The view of stabilization of bone block graft with titanium screw.

Six months later, a Cone Beam Computerized Tomography (CBCT) scan was performed on the patient, revealing a residual bone height of 7.9 mm (**Figure 4**).

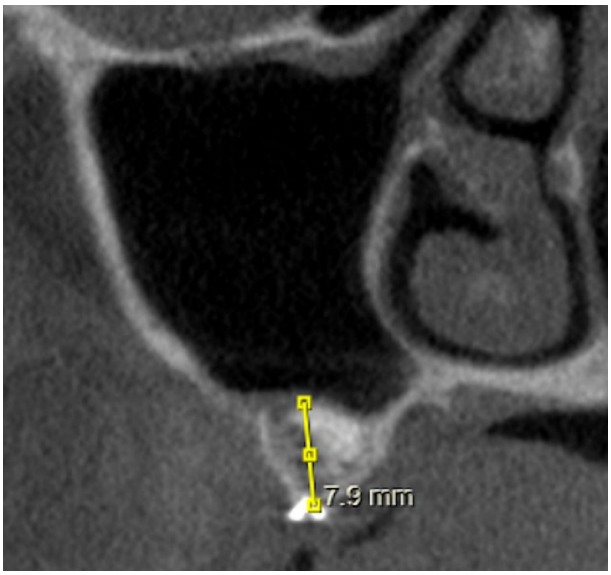

Figure 4. The radiological examination of post-operative tomography at 6 moths.

CASE 2:

A 60-year-old male patient was referred to Selçuk University Faculty of Dentistry due to edentulism in the posterior region of the maxilla. During the patient's history, it was discovered that a previous sinus augmentation surgery in this region had been unsuccessful. Clinical and radiological evaluation revealed a defect in the lateral window area resulting from the previous sinus augmentation procedure. The residual bone height and alveolar bone width were measured at 3.4 mm and 5.6 mm, respectively, indicating the need for a lateral window sinus augmentation procedure for implant rehabilitation (**Figure 5**).

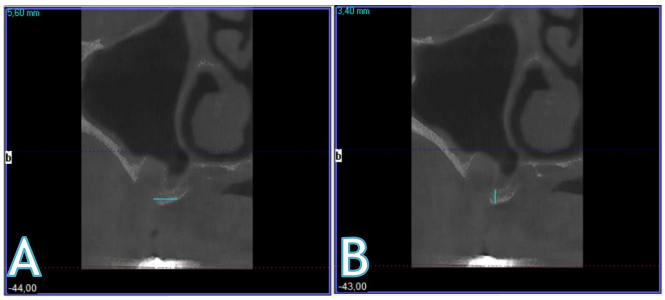

Figure 5. The radiological examination of preoperative tomography A) Horizontal width of alveolar bone B) Vertical height of alveolar crest.

The patient declined an additional graft harvesting procedure required for onlay block grafting. Consequently, xenograft material was planned for augmentation, and informed consent was obtained from the patient. Following elevation of a full-thickness mucoperiosteal flap, the lateral window was prepared using saline irrigation. The sinus membrane was elevated, and a titanium screw was horizontally applied to the medial sinus wall to create a tenting effect, increasing alveolar bone width and preventing early-stage sinus membrane collapse (**Figure 6**).

Figure 6. The view of insertion of titanium screw due to tent pole technique.

Xenograft material (Bio-Oss, Geistlich Pharma, Princeton, North America) was condensed into the elevated region (**Figure 7-A**), and a collagen membrane was used for coverage (**Figure 7-B**). After 6 months, a Cone Beam Computerized Tomography (CBCT) evaluation revealed a residual bone height of 7.8 mm and an alveolar bone width of 7.6 mm at the augmented region (**Figure 8**).

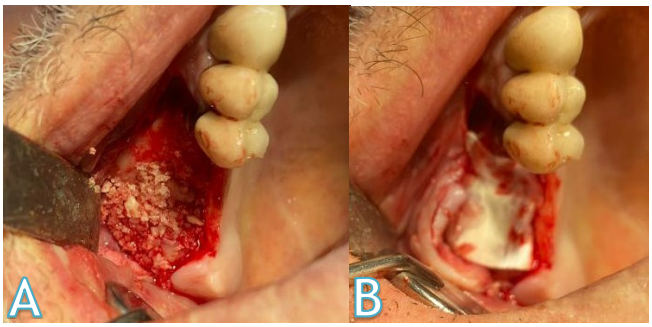

Figure 7. A) The application of xenograft to the elevated sinus membrane side B) The application of collagen membrane to the grafted area.

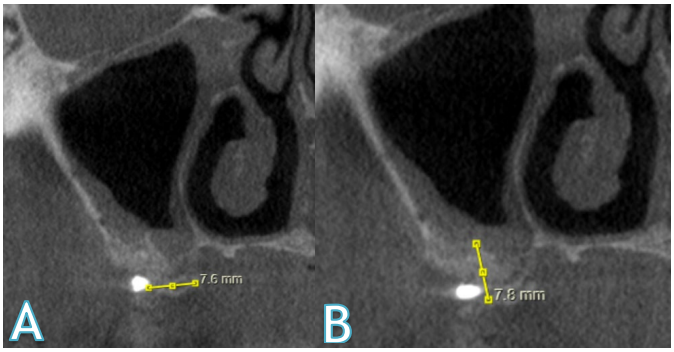

Figure 8. The radiological examination of post-operative tomography at 6 months A) Horizontal width of alveolar bone B) Vertical height of alveolar crest.

DISCUSSION

The sinus augmentation procedure is pivotal for promoting new bone formation in cases of sinus pneumatization. While various materials can be utilized in this intervention, the choice of graft type depends on several factors. This case report compares the clinical and radiological outcomes of xenogenous and autogenous graft materials used for sinus augmentation in different patients with inadequate residual bone height in the posterior maxillary region.

Autogenous grafts, considered the gold standard for augmentation procedures, can be applied in both onlay block and particulate forms. Pisoni et al.[6] Pisoni et al. conducted a study comparing vertical bone gain and bone resorption following sinus augmentation procedures performed with either particulate or autogenous bone block grafts. The study included 22 patients in the first group, who underwent treatment with autogenous bone block grafts after sinus membrane elevation, and 19 patients in the second group, who received particulated autografts. Radiological examinations were conducted using CBCT after 36 months, revealing a vertical bone gain of 10.3 mm in the particulate graft group and 13 mm in the bone block group. This difference in vertical bone gain between the two groups was found to be statistically significant. The authors concluded that block graft applications may be preferable in cases of severely atrophic maxilla where substantial bone gain is required. Sbordone et al[7] described bone blocks as being more stable and requiring less remodeling in the postoperative period following sinus augmentation compared to particulated autografts. In their report, bone blocks harvested from the symphysis were preferred over particulate types due to their osteogenic potential and slow-resorbing structure. Following the procedure, the new vertical bone height was measured as 7.9 mm after 6 months, and our results align with those reported in the literature.[4,6,7]

Xenografts are among the most widely used and predictable graft materials for sinus augmentation due to their slow resorption pattern and wide availability from various sources. However, their lack of osteogenic properties can pose a disadvantage for achieving new bone formation in extensively enlarged sinuses. Correia et al[8] compared autografts with xenografts in a lateral window approach, including 12 patients in a split-mouth design. After 6 months, CBCT scans were taken from the patients, and samples were collected during implant applications for histological examination. Radiologically, new bone formation was observed as 7.8 mm in the autograft group and 8.7 mm in the xenograft group. Although both groups showed statistically significant increases in bone height, there was no significant difference in the amount of new bone formation between the two groups. The authors concluded that xenografts demonstrated similar results for the studied variables. One of the most predictable treatment options for horizontal bone deficiencies in the maxilla is the tent pole technique. Doan et al[9] investigated the effect of the tent-pole technique in horizontal ridge augmentation in six patients with an initial ridge width of less than 4 mm. The technique was applied at 9 defect sites using 1.5 mm diameter screws, particulate xenograft, and a resorbable collagen membrane. CBCT scans obtained at the sixth month revealed a mean horizontal bone gain of 3.21 ± 1.04 mm (ranging from 1.83 to 4.57 mm), with a mean reduction in dimension of 0.38 ± 0.33 mm. Healing was uneventful, with no infections or membrane exposure observed. In one of our patients, xenograft was preferred for its osteoconductive and osteoinductive features in sinus augmentation instead of autograft bone block application due to patient cooperation. Additionally, the tent-pole technique was performed in the same patient to increase alveolar bone width. The residual bone height was approximately 7.8 mm, while the alveolar bone width measured 7.6 mm in the same region.

In conclusion, despite the wide range of graft materials available for sinus augmentation, the optimal graft material has yet to be definitively identified in the literature. While each graft material offers its own set of advantages and disadvantages, the selection of material should be based on the patient's medical conditions and the experience of the operator. With appropriate use, every material has the potential to be successful in suitable cases. Therefore, a thorough assessment of patient-specific factors and careful consideration of the characteristics of each graft material are essential in achieving successful outcomes in sinus augmentation procedures.

Değerlendirme / Peer-Review

İki Dış Hakem / Çift Taraflı Körleme

Etik Beyan / Ethical statement

Bu makale, sempozyum ya da kongrede sunulan bir tebliğin içeriği geliştirilerek ve kısmen değiştirilerek üretilmemiştir.

Bu çalışma, yüksek lisans ya da doktora tezi esas alınarak hazırlanmamıştır.

Bu çalışmanın hazırlanma sürecinde bilimsel ve etik ilkelere uyulduğu ve yararlanılan tüm çalışmaların kaynakçada belirtildiği beyan olunur.

This article is not the version of a presentation.

This article has not been prepared on the basis of a master's/ doctoral thesis.

It is declared that during the preparation process of this study, scientific and ethical principles were followed and all the studies benefited are stated in the bibliography.

Benzerlik Taraması / Similarity scan

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Etik Bildirim / Ethical statement

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Finansman / Grant Support

Yazarlar bu çalışma için finansal destek almadığını beyan etmiştir. | The authors declared that this study has received no financial support.

Çıkar Çatışması / Conflict of Interest

Yazarlar çıkar çatışması bildirmemiştir. | The authors have no conflict of interest to declare.

Yazar Katkıları / Author Contributions

Çalışmanın Tasarlanması | Design of Study: IA(%80), SA (%20)
Veri Toplanması | Data Acquisition: IA(%20), SA (%80)
Veri Analizi | Data Analysis: IA(%50), SA (%50)
Makalenin Yazımı | Writing up: IA(%50), SA (%50)
Makale Gönderimi ve Revizyonu | Submission and Revision: IA(%80), SA (%20)

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