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Case Report

Socket preservation, sinus lift and lateral augmentation by using natural bovine bone substitute with hyaluronate

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Abstract: It is very important to have sufficient bone volume that allows proper implants osseointegration. The aim of this case report was to observe a socket preservation and sinus lift with lateral augmentation by using xenograft granules with hyaluronate and pericardium collagen membrane. The sufficient granules osteointegration into newly formed bone after six months enabled proper implants placement due obvious bone volume increase. The implants were completely integrated into the regenerated bone after four months and then were loaded. The use of xenograft granules with hyaluronate led to successful treatment in combination with pericardium collagen membrane in socket preservation and sinus lift with lateral augmentation.

Keywords: Two-stage implant placement, xenograft granules, hyaluronate, pericardium collagen membrane, socket preservation, sinus lift, lateral augmentation

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Introduction

Nowadays, the use of dental implants to replace missing teeth is a daily routine [1]. Here it is a crucial requirement to have appropriate bone and soft tissue and to achieve proper aesthetical and functional result [2]. Therefore, different ways such as immediate, early, or delayed implant placement have been proposed [3].

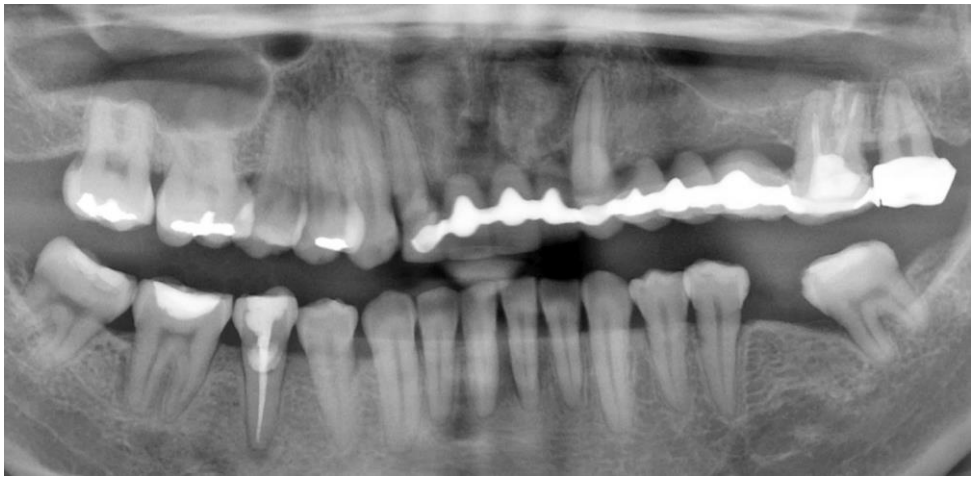
The two-stage delayed implant placement takes longer time and is supported by strong evidence in regards of long-term results [4]. However, these post-extraction sites require grafting materials that support volume stability [5]. Bovine derived xenograft granules in combination with hyaluronate have been created to achieve faster cells proliferation, vascularization, and better clinical outcomes [6]–[8]. Also, the use of long-term Guided Bone Regeneration (GBR) barrier membrane is of crucial importance to prevent the faster proliferating soft tissue into the grafted area [9].

The aim of this clinical case was augmentation with xenograft granules / hyaluronate combination in socket preservation and sinus lift with lateral augmentation. The patient had the grafted area stabilized with GBR collagen membrane and three implants were installed after six months.

Materials and Methods

A 45-year-old female patient, nonsmoker and in good general health, presented the with complain of partial edentulism in the 2nd quadrant and pain in the area #27. There were no contra-indications for a surgical treatment, such as pregnancy, systemic diseases (e.g., diabetes, xerostomia, epilepsy) or consumption of any prescription medications or recreational drugs. In the maxilla, a metal-composite fixed partial denture (FPD) was temporarily fixed on the teeth #13,

23, 27 and 28 (Figure 1a, 1b, 1c). Tooth #27 had advanced root caries and was not vital, also tooth #28 had occlusal caries. Therefore, both teeth were scheduled for extraction.



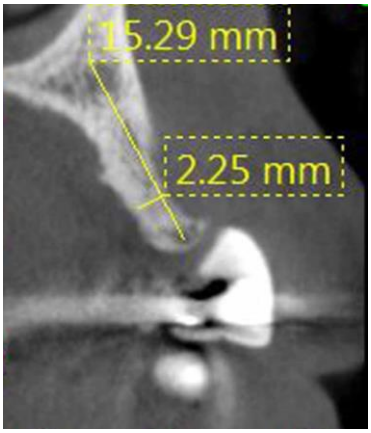
(a)

(b)

(c)

Figure 1. (a) Initial examination by Orthopantomograph; and clinical view of the: (b) Maxilla anterior; (c) Quadrants 2 and 3.

For that reason, the FPD was removed and a surgical guide with barium sulphate, cone beam computer tomography (CBCT; 3D Accuitomo MCT-1; Morita MFG Co, Kyoto, JP) and a planning software (I-Dixel, version 2.3.3.5; Morita MFG Co, Kyoto, JP) were used for the pre-implant assessment. In the target area, an advanced horizontal atrophy was diagnosed in #24-25, also short vertical residual bone in #26, and signs of a chronic sinusitis (Figure 2a, 2b).

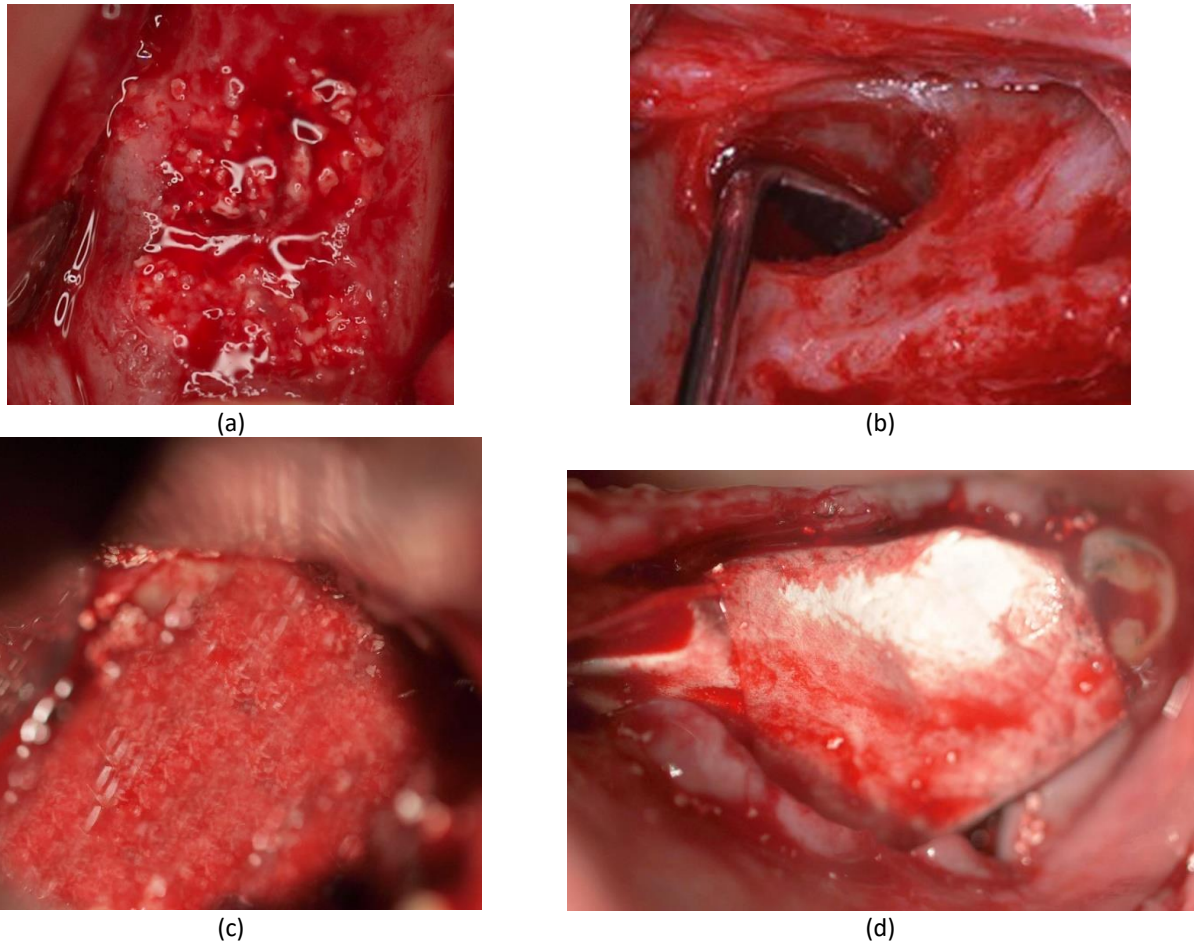


(a)

(b)

Figure 2. Implant planning and CBCT axial section showing: (a) Advanced lateral atrophy before implant placement in the area #24-25; (b) Vertical atrophy in the area #26.

After teeth extraction a lateral sinus window was created. Then socket preservation of the tooth #27, as well as sinus augmentation with lateral augmentation in the area #24-25 was performed by using natural bovine bone substitute with hyaluronate (cerabone® plus; botiss biomaterials GmbH, Zossen, Germany) (Figure 3a, 3b, 3c). The entire area was then covered with a pericardium collagen membrane (Jason® membrane, botiss biomaterials GmbH, Zossen, Germany) (Figure 3d). In addition, tooth #28 was temporarily saved and used as an abutment of the removal temporary restoration.



(a) (b) (c) (d)

Figure 3. (a) Socket preservation #27 with cerabone® plus; (b) Lateral window for sinus augmentation #26; (c) Lateral augmentation with cerabone® plus; (d) Occlusal view of the augmentation area covered with Jason® membrane.

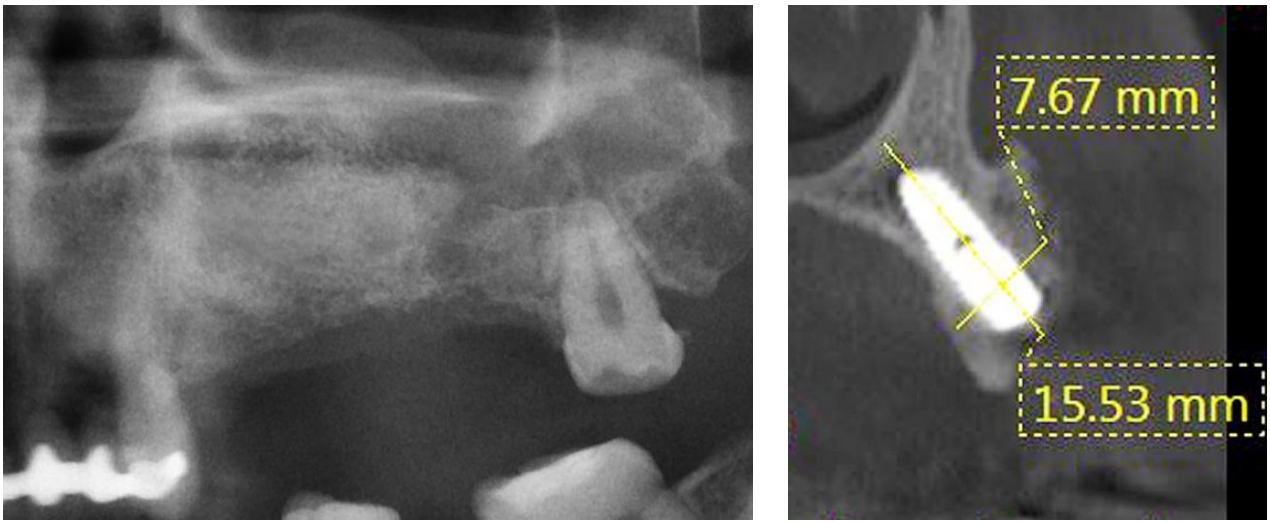
The patient had a microstomia (limited mouth opening) which resulted in limited access for surgical and prosthetic treatment, as well as intraoral photography. For that reason, a demonstration cast showing how sticky graft covered by membrane was created (Figure 4).

(a) (b)

Figure 4. Clinical step shown on a demonstration cast: (a) Lateral augmentation, sinus lift and socket preservation with cerabone® plus; (b) Coverage of the augmented area with a Jason® membrane.

Results

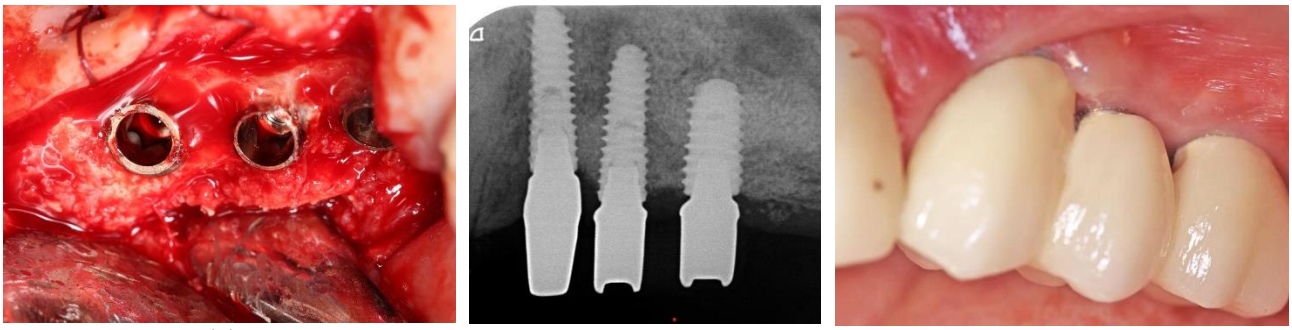
The assessment of the augmentation areas based on orthopantomography was made six months later and after implant placement (Figure 5). A sufficient granules osteointegration into newly formed bone allowed the implants placement.



(a) (b)

Figure 5. (a) Six months after augmentation of area #24 – 26; (b) CBCT axial section showing the lateral augmentation after implant placement.

A two-stage protocol for implant placement was applied, as three implants were placed in positions #24, 25 (TS line, Osstem implant, Seoul, South Korea, ROK; 4x11.5 mm) and 26 (TS line, Osstem implant, Seoul, South Korea, ROK; 5x8.5 mm). The successful implant placement was assessed using CBCT and an increase of the hard tissue from 2.25 mm to 7.67 mm was observed (Figure 2a, 5b). Four months after implants placement, they were uncovered and their total integration in regenerated bone was observed (Figure 6a). Then the implants were loaded by use of system specific customized abutments and metal ceramic FPDs (Figure 6b, 6c).



(a) (b) (c)

Figure 6. (a) Integrated implants #24-26; (b) Mounted customized abutments #24 – 26 and sinus augmentation #26; (c) FPDs in situ.

Discussion

This case report confirms successful delayed implants placement by using xenograft granules with hyaluronate and pericardium collagen membrane in socket preservation, sinus lift and lateral augmentation. Successful implant stability, aesthetics, and function were presented by the end of the treatment.

The dental regeneration biomaterials are frequently used in the implant dentistry [10]. The Guided Bone Regeneration (GBR) could be considered as a separate surgical procedure when it precedes the implant placement [11]. Also, the socket situation, location, and healing conditions play an important role in the entire process.

Different grafting materials have been used before or during implant placement to provide implant stability and augment missing bone [12]. The bovine derived xenograft granules in combination with hyaluronate provide sticky consistency and better handling at the grafted site. This eliminates any possible granulate sharpness and leads to faster cells proliferation and vascularization compared to the xenograft granules alone [6], [7]. The hyaluronate degrades in 2 weeks and then allows osteoconductive bone regeneration by the xenograft particles alone [13]. This xenograft/hyaluronate combination has already been successfully used in peri-implantitis reconstructive therapy [8]. Also, the presence of long-term degrading pericardium collagen barrier membrane prevents the soft tissue penetration into the grafted area [9].

For that reason, we performed a socket preservation, sinus lift and lateral augmentation with such biomaterials before delayed implant placement. The wetting enabled sticky and easy handling consistency of cerabone® plus and then Jason® membrane was used to cover the entire area (Figure 3). Six months later a sufficient granules osteointegration into newly formed bone allowed the implants placement (Figure 5). Here a hard tissue increase from 2.25 mm to 7.67 mm was achieved (Figure 2a, 5b) and total integration of the implants into the regenerated bone was observed after four months (Figure 6a).

Conclusions

It can be very challenging to achieve sufficient bone volume that will allow proper implants osseointegration. In this case report we achieved satisfactory socket preservation and sinus lift with lateral augmentation by using xenograft granules with hyaluronate and pericardium collagen membrane. Six months later the sufficient granules osteointegration into newly formed bone enabled proper implants placement and obvious bone volume increase was observed. Four months later the implants were completely integrated into the regenerated bone and were loaded. To verify the long-term results and success rate, more patients should be treated with the same method and materials.

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Board review and informed consent statement: The local authorities allow publication of such cases after the patient gives a written informed consent.

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