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Case Report

Combination of autologous bone, xenograft with hyaluronate and Plasma Rich in Growth Factors in horizontal bone augmentation and sinus lift

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Abstract: Sufficient bone volume is important to allow proper implants installation and survival. The aim of this case report was to observe a combination of autologous bone, xenograft with hyaluronate and Plasma Rich in Growth Factors in horizontal bone augmentation and sinus lift. Upon re-entry after 8 months, a stable new bone volume was recorded, and implants were successful installed. Then 4 months later, sufficient implants stability, bone volume and xenograft granules osteointegration into newly formed bone was recorded.

Keywords: Autologous bone, bovine xenograft, hyaluronate, Plasma Rich in Growth Factors, PRGF, horizontal bone augmentation, sinus lift

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Introduction

Dental implants require sufficient soft and hard tissue volume for successful long-term survival rate [1]. Several treatment strategies have been suggested, such as early, immediate and delayed dental implant placement protocols [2]. Two stage approach is sometimes the only option for successful implants osseointegration [3]. More specifically, in some cases it might be the only option when horizontal augmentation and sinus lift is needed [4], [5].

Autologous bone is a gold standard grafting material, mainly because of the genetics and fast remodeling into patient's new bone [6]. However, bovine xenografts and porcine resorbable collagen membranes are the mostly used biomaterials for guided bone regeneration (GBR) [7]. While bovine bone supports the long-term volume at the grafted site, the pericardium derived membrane has a long-term barrier function, which is important for successful GBR treatment [8]–[10]. Hyaluronate has been widely used for various purposes and recently finds a great use when combined with xenograft granules [11]. Plasma Rich in Growth Factors (PRGF) is a concentrated blood derivative that is rich in growth factors and complements the regeneration [12]. The above-mentioned biomaterials have been used many times separately or combined. However, no such combination exists in the literature where all of them are combined together in one mix.

The aim of this case report was to observe a combination mix of autologous bone, xenograft with hyaluronate and PRGF in horizontal bone augmentation and sinus lift. The situation was assessed 8 and 12 months after surgical procedure.

Materials and Methods

A 52-year-old female patient, nonsmoker, with missing teeth #36, #37 and lack of bone volume was presented (Figure 1).

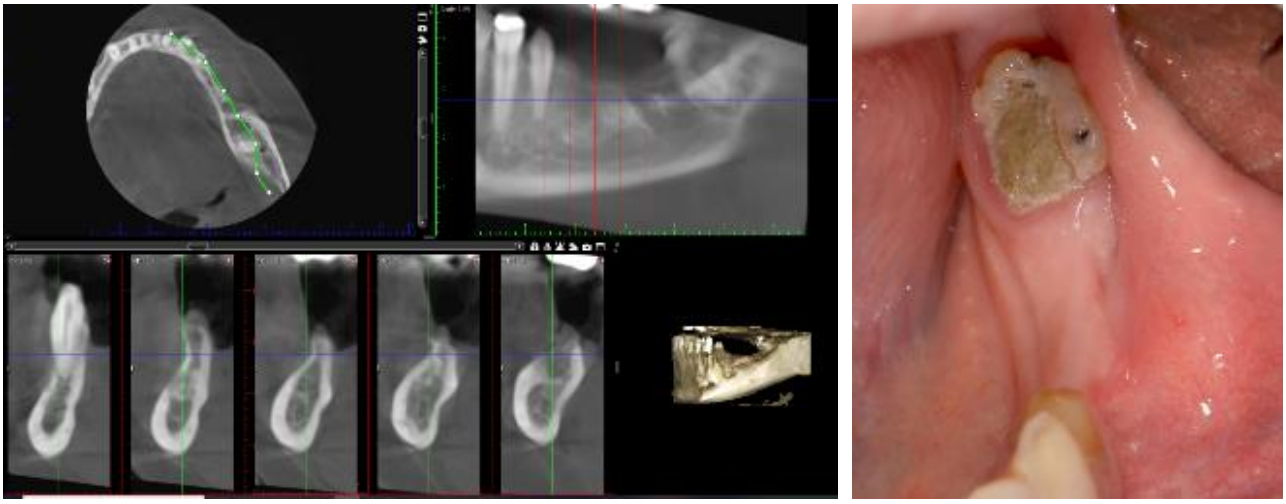
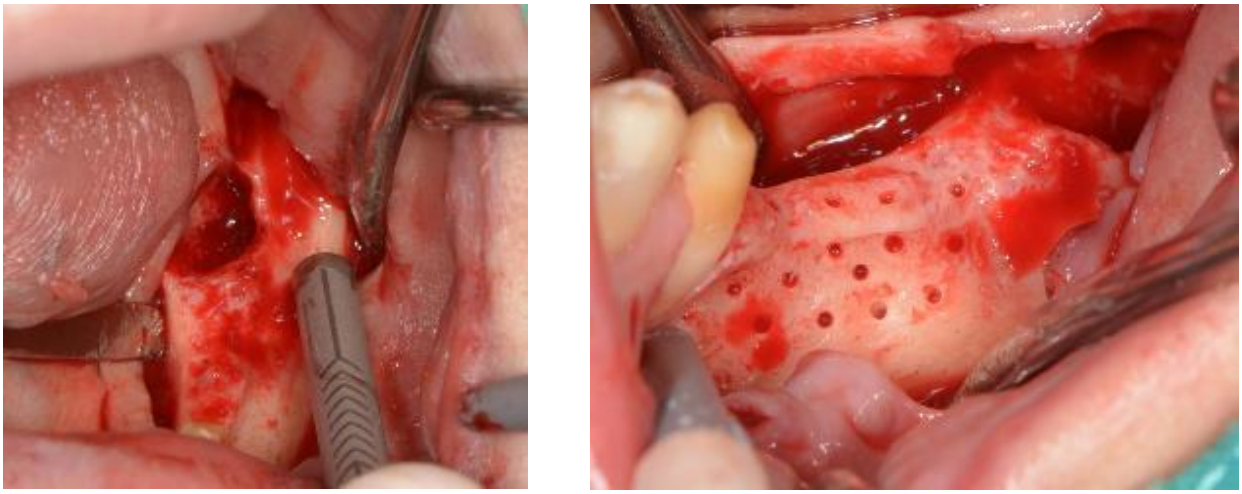


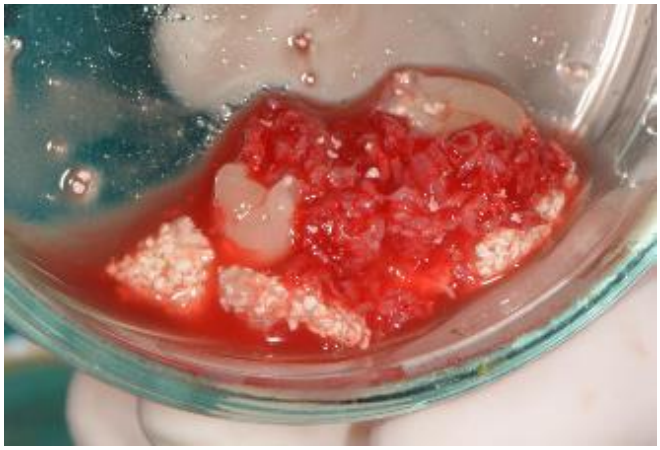
Figure 1. Missing teeth #36, #37 and lack of bone volume.

Therefore, the treatment plan consisted of strategic extraction of the tooth #38 followed by grafting procedure with the above-mentioned biomaterials combination (Figure 2). The tooth extraction was performed under local anesthesia (Ubistesin, 3M ESPE, Germany) and after raising the full thickness mucoperiosteal flap. Consequently, autologous bone was collected using a mini bone scraper (Micross, Osteogenics, USA) (Figure 2a). To improve with blood supply, the cortical bone was perforated (Figure 2b). Then a pericardium collagen membrane (Jason®membrane, botiss biomaterials GmbH, Zossen, Germany) was fixed buccally by using titanium pins (titan pin set, botiss biomaterials GmbH, Zossen, Germany) (Figure 2c). Finally, the autologous bone was added to the natural bovine bone substitute with hyaluronate (cerabone® plus; botiss biomaterials GmbH, Zossen, Germany) and PRGF (Figure 2d).



(a) (b)

(c)

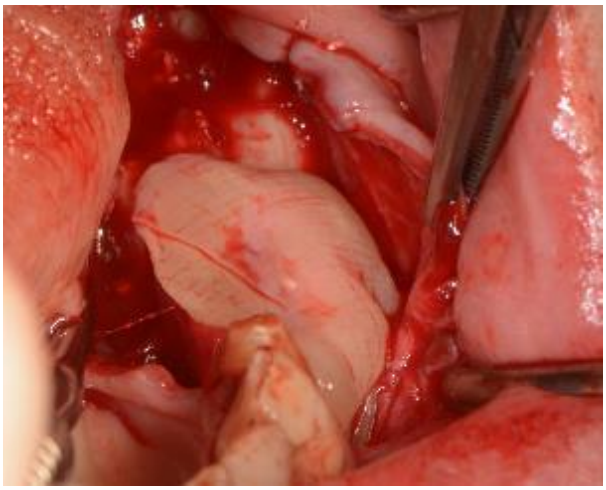


(d)

Figure 2. (a) Collecting autologous bone; (b) Bone decortication; (c) Barrier membrane fixation with titanium pins; (d) Combination mix of autologous bone, natural bovine bone substitute with hyaluronate and PRGF.

The biomaterials combination mixture was applied at the target site, and then was covered by the membrane as it was fixed with additional titanium pins to stabilize the grafted area (Figure 3a). To improve the soft tissue healing, the collagen barrier membrane was then covered by an PRGF membrane (Figure 3b). Finally, the area was sutured by horizontal mattress resorbable sutures (Novosyn, B Braun, Spain) in combination with superficial layer of non-resorbable monofilament polypropylene sutures sutures (5-0, Prolus, Lotus, India) (Figure 3c) and control CBCT was performed to verify the grafted situation (Figure 3d). Post-operative medications were amoxicillin with clavulanic acid (Klavocin bid, Pliva, Zagreb, Croatia), 1000 mg, 2 times per day for 2 weeks.

(a)



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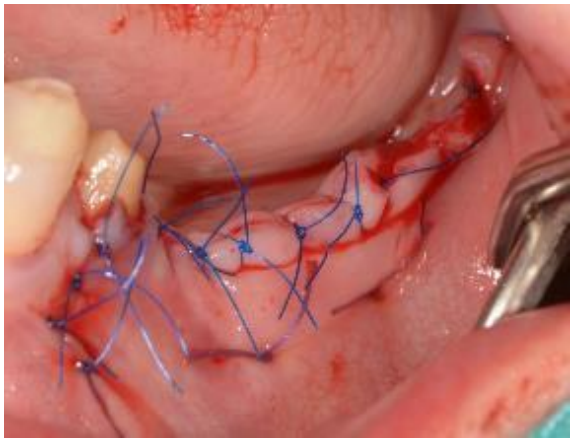

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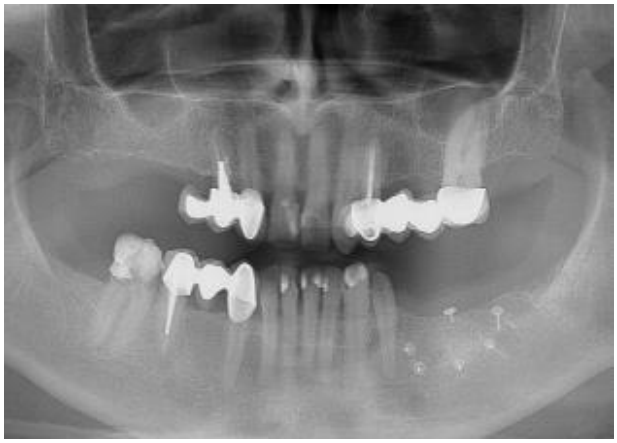
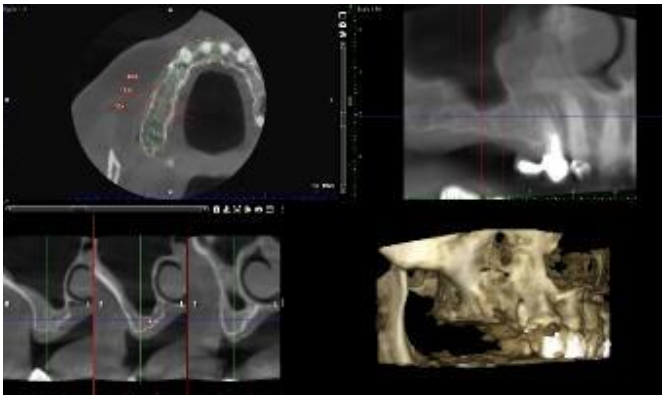


(d)

Figure 3. (a) The biomaterials combination mix with pericardium collagen membrane coverage and additional titanium pins to stabilize the grafted area; (b) Coverage by a PRGF membrane; (c) Suturing by horizontal mattress resorbable sutures and superficial layer of non-resorbable monofilament polypropylene sutures; (d) Post-op control CBCT.

The same patient also had insufficient bone in right side of the lateral maxilla, which is why a lateral sinus lift approach was indicated (Figure 4a). Then the same biomaterials combination mix was applied into the sinus (Figure 4b). The sinus window was then covered by a PRGF membrane (Figure 4c). Finally, the area was sutured and control CBCT was performed to verify the grafted situation (Figure 4d). Post-operative medications were amoxicillin with clavulanic acid (Klavocin bid, Pliva, Zagreb, Croatia), 1000 mg, 2 times per day for 2 weeks.



(a)

(b)

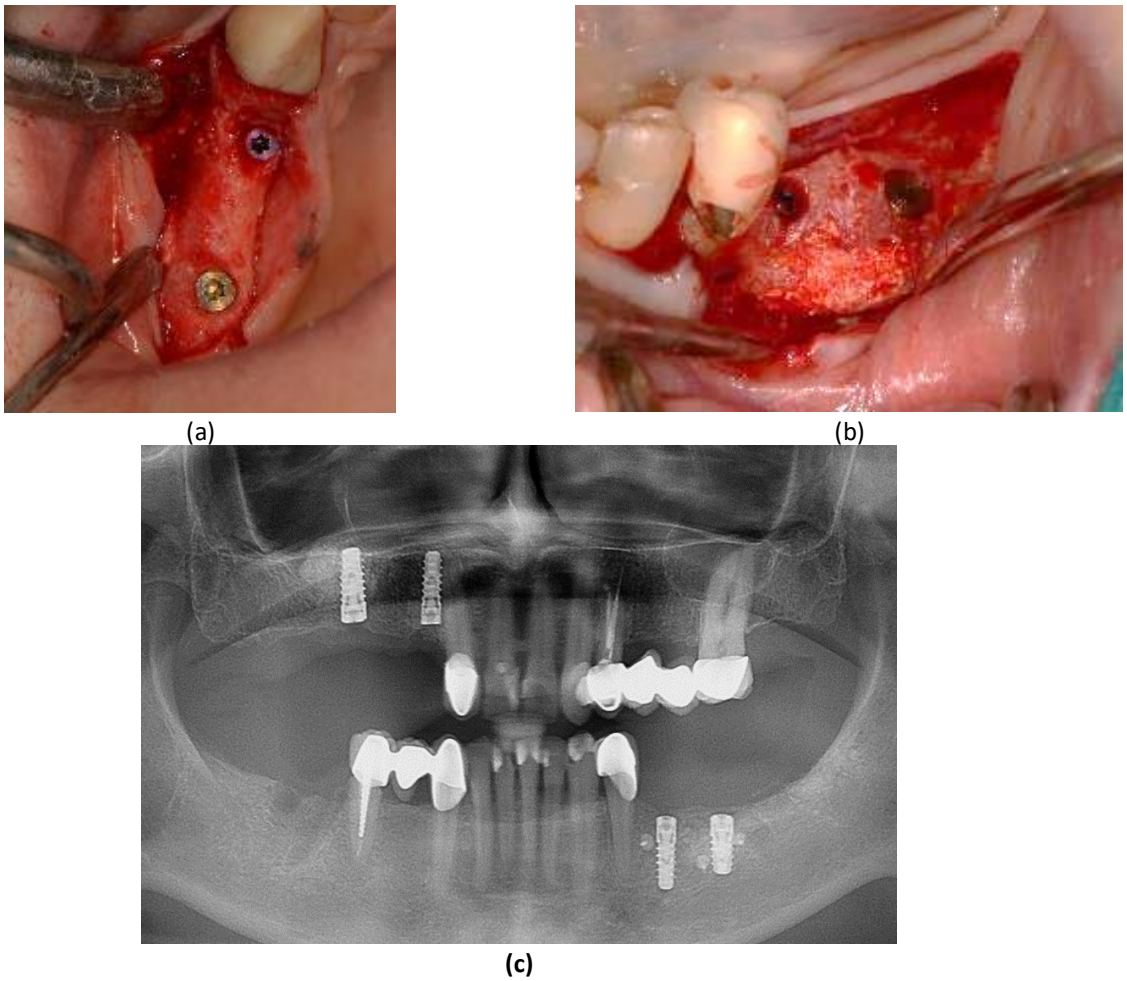
(c)

(d)

Figure 4. (a) Insufficient bone for implant installation; (b) Biomaterials combination mix applied into the sinus; (c) Sinus window coverage by a PRGF membrane; (d) Post-op control CBCT.

Results

The assessment of the augmentation areas was made 8 months later. Here a sufficient bone volume and xenograft granules osteointegration into newly formed bone allowed the implants placement (Figure 5a, 5b). Four months later, the CBCT control image confirmed successfully implant osseointegration (Figure 5c).



(a) (b)

(c)

Figure 5. (a, b) After 8 months, the xenograft granules osteointegration into newly formed bone allowed sufficient bone volume for implants placement; (c) CBCT at 4 months after implants placement.

Discussion

This case report confirmed successful use of autologous bone, xenograft with hyaluronate and PRGF combination mix in horizontal bone augmentation and sinus lift. Sufficient implants stability, bone volume and xenograft granules osteointegration into newly formed bone was recorded after 12 months.

Various grafting materials are used to compensate missing bone volume [13]. Autologous bone is a gold standard grafting material and has certain disadvantages such a limited amount and insufficient newly formed bone volume [6]. The hydrophilicity, viscoelastic, and physicochemical properties variations in bovine bone substitutes can show effect on their long-term volume at the grafted site [13]. Pericardium derived membranes have a long-term barrier function, which is important for successful GBR, because the soft tissue infiltration into the grafted area is parallel to biodegradation of the barrier collagen membranes and can be related to the collagen origin [10]. Hyaluronate has been shown that degrades in 2 weeks when combined with xenograft granules and has been successfully used in peri-implantitis reconstructive therapy [14], [15]. PRGF is a concentrated blood derivative that is rich in growth factors and very often finds its use in

regenerative therapies [12]. The above-mentioned biomaterials are regularly used in daily practice, however, no combination from all of them together exists in the literature.

For that reason, we used a combination mix of autologous bone, xenograft with hyaluronate and PRGF in horizontal bone augmentation and sinus lift. At 8 months follow-up we observed sufficient bone volume and xenograft granules osteointegration into newly formed bone which allowed the implants placement (Figure 5a, 5b). Then 4 months after, a CBCT image confirmed successful implant osseointegration and stability (Figure 5c).

Conclusions

In this case report we achieved successful horizontal bone augmentation and sinus lift by using combination mix of autologous bone, xenograft with hyaluronate and PRGF. Twelve months later, a sufficient implant stability, bone volume and xenograft granules osteointegration into newly formed bone was recorded. To verify these results, more patients should be treated with the same method and biomaterials combination.

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Board review and informed consent statement: The local authorities allow publication of such cases after a written informed consent was given by the patients.

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