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Case Report

Management of Sinus Floor Perforation Using Platelets Rich Fibrin "PRF": A Case Report

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Abstract

Schneiderian membrane perforation is one of the most common complications that occur at the posterior maxilla during implant placement. Various repairs have been developed for managing sinus membrane perforations. We described a new technique of Schneiderian membrane repair using platelets rich fibrin (PRF) that makes it possible to complete an implant placement procedure that otherwise might have been aborted in the sinus cavity and secondary complications, such as sinusitis.

Keywords: *Schneiderian Membrane; PRF; Pneumatization*

Introduction

The maxillary sinus is of important concern when implant pacement is considered for posterior edentulous areas because pneumatization of the sinuses frequently minimizes or completely eliminates vertical bone availability for implants. If there is inadequate alveolar bone height and only partial pneumatization of the sinus, bone grafting and implant placement can be performed. The implant can be placed through the crestal bone into the graft material provided there is at least 5 mm of alveolus present to stabilize the implant during the healing period [1].

Perforation of the Schneiderian membrane has been reported as a complication occurring 10% to 60% of the time during implant placement and sinus augmentation [2-4]. Different methods of treating the perforation have been investigated. One key question that remains is to define the best repairing material for the sinus membrane perforation after lifting the sinus membrane or implant placement. The consensual approach is to consider that most materials are efficient for this surgery, considering the high osteogenic potential of the Schneiderian membrane and its periosteum-like behavior [4,5]. However, the choice of material or association of materials will affect the waiting period before adequate healing and remodeling of the grafted material, implant placement, and functional loading. Many materials are potentially usable in this clinical situation [6].

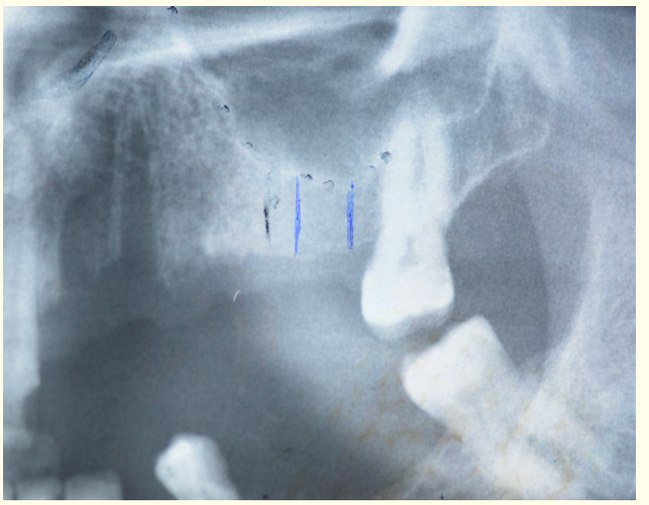
Choukroun's platelet-rich fibrin (PRF) is actually the simpler and inexpensive technique available in the field of platelet concentrate technologies [7]. It was first described by Choukroun., *et al*. in 2001 in France and was classified as a leukocyte- and platelet rich fibrin (L-PRF) concentrate [8]. In this simple technique, blood is collected without anticoagulant and immediately centrifuged with low forces. Three layers appear in the tube then: a red blood cell base at the bottom, an acellular plasma as supernatant (platelet-poor plasma), and a PRF clot in the middle [9]. The protocol being very inexpensive and easy, many PRF clots can be produced simultaneously: a very

significant volume of biomaterial can be produced in less than 20 minutes. The clots can then be transformed into fibrin membranes by compression between sterile gauzes or by using the PRF Box, a surgical box especially designed to collect and standardize PRF clots and membranes [10]. Each PRF membrane concentrates most platelets and more than the half of the leukocytes from a blood harvest, merged or enmeshed into a dense fibrin network [11,12]. This fibrin biomaterial releases high amounts of growth factors (such as transforming growth factor -1, platelet-derived growth factor AB, and vascular endothelial growth factor) and matrix glycoproteins (such as thrombospondin-1) during at least 7 days *in vitro* [13].

The objective of this case report is to evaluate the effect of PRF membrane as the solo repairing material for sinus membrane perforation during dental implants placement using radiographic examination.

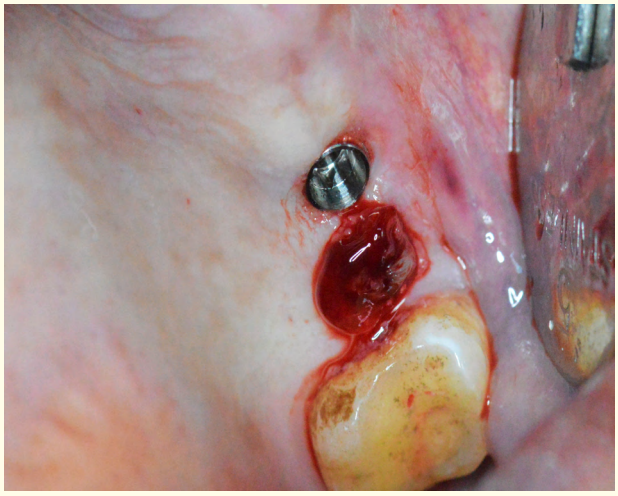
Case Description

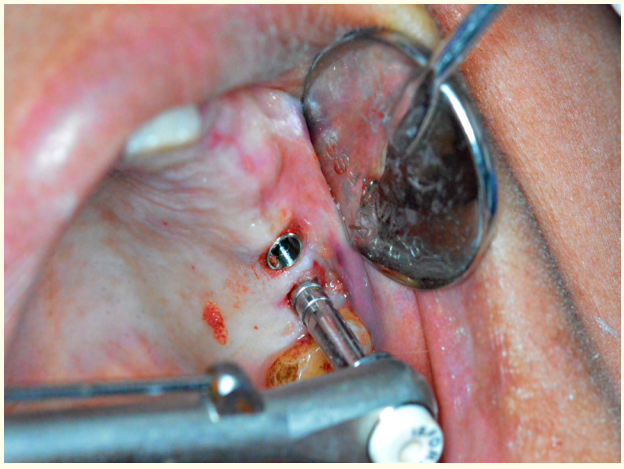
A 43 years old female patient presented with edentulous posterior area of left side. She required implant supported fixed restoration. Upon clinical and radiological examination (using panoramic x-ray) (Figure 1), we found that there was a sufficient horizontal and vertical bone for prober implant placement. During drilling and preparation of osteotomy site, perforation of the Schneiderian membrane had occurred accidently.



A suggestion of using PRF membrane as a repairing material was applied. PRF membranes were prepared as described by Choukroun., *et al*. During surgery, 200 mL whole blood was drawn in 8 glass-coated plastic tubes, without anticoagulant, and was immediately centrifuged at about 2700 RPM during 12 minutes, using a table centrifuge specifically designed for this application. Platelets were immediately activated, thus triggering a coagulation cascade. The result was a fibrin clot located in the middle of each tube. Each clot was removed from the tube and separated from the red blood cell base with pliers, then stored in metal cups before application (Figure 2).

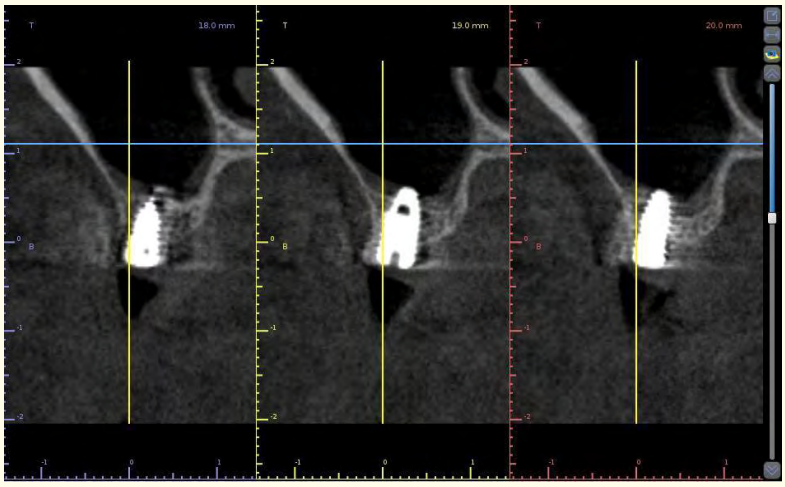
One or two PRF membranes were placed on the Schneiderian membrane to patch and heal all visible or invisible holes and tears of the sinus membrane (Figure 3). The end of the implants always touched the PRF-patched sinus membrane, and served as tent pegs (Figure 4).





For postoperative management, medications were prescribed, including chlorhexidine rinses twice a day, 1g amoxicillin (2 times daily for 6 days, ibuprofen (400 mg) 4 times daily unless medically contraindicated, and pain medication as needed for pain. Patients were not allowed to use any removable prosthesis.

After four month, clinical and radiographic evaluation was carried out, which revealed excellent soft tissue healing and fully keratinized and radiographic evidence of bone fill were recorded above the augmented implant at the apical region evaluated by CBCT (Figure 5).



Discussion

Perforation of the sinus membrane may cause further complications such as increased risk of infection due to communication with other sinuses or risk of migration of graft particles into the sinus where they induce polyps or other sinus diseases [13,14]. There are many options for treating perforation of the Schneiderian membrane. The most common method is the placement of resorbable membrane under the perforated Schneiderian membrane [14-17]. Other methods for treating perforation include folding the membrane up against itself [18], using sutures [13], or using fibrin glue [19,20] to close the perforation. Others use Surgicel to cover small to moderate size perforations. Surgicel is an absorbable hemostatic agent made of an oxidized cellulose polymer, and it is usually used to control bleeding.

Factors that can influence the chance of Schneiderian membrane perforation include anatomical variations, surgeon's experience, and previous sinus infection or surgery. Anatomical factors consist of thickness of the lateral maxillary sinus wall, convex lateral sinus wall, connection between Schneiderian membrane and oral mucosa, narrow and wide sinus, maxillary sinus septa, longitudinal septum, and root-shape configuration [21-23]. It is also suggested that previous sinus surgery and absence of alveolar bone are risk factors for a higher chance of Schneiderian membrane perforation [19]. Therefore, imaging studies such as CT scan may be required to reveal sinus anatomy to further assist in recognizing possible variations.

Consequence of the applications of PRF membranes on the Schneiderian membrane, indeed, a PRF cover on the sinus membrane can potentially improve the healing of the membrane, induce a stimulation of the periosteum, and perhaps stabilize a new bone volume at the end of the implant [24,25]. This effect may be both related to the platelet and fibrin content of the PRF membrane [26-28]. From a practical standpoint, the use of PRF membranes on the Schneiderian membrane is a simple mechanical and biological protection that can be used in daily practice.

Several publications discussed the role of PRF in sinus lifting, it was assessed that a sinus grafting material built with allograft and PRF in equal volume was suitable for implantation after only 4 months and potentially even more mature than a sole allograft after 8 months [29]. Another study showed that PRF membranes were easy to use during Summers osteotomy and offered a good compromise as filling material, shock absorber during sinus floor elevation, and healing support for the damaged Schneiderian membrane [30].

This point is very interesting, because PRF is an inexpensive autologous biomaterial with a significant slow release of growth factors and could easily replace expensive collagen membranes in this application [31].

Conclusion

The use of PRF as sole grafting material for repairing sinus membrane perforation is a secure and reliable option. This autologous and inexpensive material can be considered as an optimized blood clot, and this L-PRF matrix seems a relevant biomaterial for natural bone regeneration. However, in this technique, the experience of the surgeon and the choice of the implant profile are also significant parameters, because implant stability in the residual alveolar ridge is the key condition to the firm support of the implants as tent pegs on the Schneiderian membrane.

Finally, the systematic use of PRF during sinus membrane perforation, may be beneficial and should be analyzed in further studies.

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