

Direct Sinus Lift using PRF Alone as a Grafting Material with Simultaneous Implant Placement: A Case Report

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Abstract

Deficient vertical bone height (VBH), increased pneumatization of the maxillary sinus, and close approximation of the sinus to the crestal bone are often the impediments in the rehabilitation of posterior maxilla with dental implants. Severe resorption of bone is seen in the posterior maxillary region subsequent to tooth loss or extraction which leads to inferior expansion of the sinus. This process is called as “pneumatization”. To overcome this, sinus lift technique has been introduced which is executed in two ways: (1) Direct sinus lift or lateral window approach and (2) indirect sinus lift or axial approach depending on the VBH. The lateral approach offers a better control of the surgical site and is considered to be the best technique, particularly in a severely resorbed maxilla. Platelet-rich fibrin (PRF), a second-generation platelet concentrate has revolutionized the field of implantology since its introduction owing to its versatility and diverse nature. This paper reports a case of a 45-year-old female patient who is partially edentulous in relation to 15 and 16 treated by direct sinus lift using PRF alone as a grafting material with simultaneous implant placement.

Keywords: Direct sinus lift, Implants, Lateral window approach, Platelet-rich fibrin, Vertical bone height.

INTRODUCTION

Atrophic posterior maxilla is a constant challenge faced by clinicians in the field of implantology. A sinus lift is contemplated as one of the most foreseeable procedures for bone augmentation in the maxilla. Several approaches have been developed and are currently used. The Caldwell-Luc operation is historically the first technique described for lifting the maxillary sinus floor with a lateral approach, using bone graft material to provide sufficient bone for dental implant placement.^[1] Boyne and James reported on the elevation of the maxillary sinus floor in patients with large, pneumatized sinus cavities in preparation for the placement of blade implants.^[2] Tatum first suggested dental implant placement in sites with bone graft for sinus floor elevation through the lateral window approach technique.^[3]

Various graft materials such as autogenous bone grafts, allogenic, xenogenic, alloplastic materials, or combinations of different graft materials have been introduced for sinus augmentation. Nevertheless, these graft materials have their own constraints. Later, platelet-rich fibrin (PRF), a second-generation platelet concentrate, has gained its reputation and is widely used till date. This novel formulation is completely

autologous, prepared without any anticoagulants, and contains high concentrations of host immune cells.^[4] Its biological advantages, easy availability, and cost-effectiveness prompted many clinicians to use PRF for sinus augmentation.

The current report presents a case of edentulous posterior maxilla with decreased vertical bone height (VBH) treated by lateral sinus lift technique with simultaneous implant placement using PRF alone as a grafting material.

CASE REPORT

A 45-year-old systemically healthy female patient presented with a chief complaint of missing teeth in the upper right back tooth region. The patient gave a history of extraction

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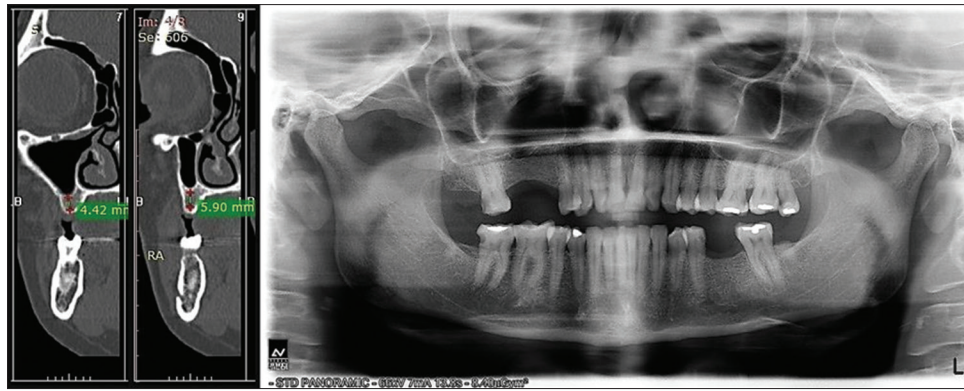


Figure 1: Pre-operative OPG and 0.6-mm paraxial CT sections in relation to 16 and 15

of 15 and 16 five years ago. Furthermore, the patient complained of pain in 17 which is decayed and tender on percussion. Sinus lift procedure and its possible risks were explained in detail to the patient and a written consent was acquired. Necessary blood tests such as complete blood picture, bleeding time, clotting time, and random blood sugar were done along with CT scans and OPG (Figure 1) pre-operatively.

Surgical procedure

Pre-operatively, the patient was advised to undergo endodontic treatment for 17 and oral prophylaxis. Prophylactic antibiotics were started 1 day before the sinus surgery. Local anesthesia (2% lignocaine with adrenaline 1:200000) was administered. Incision was given in the region of 15 and 16 and a full-thickness mucoperiosteal flap was reflected to expose the lateral wall of the maxillary sinus. A window was created for proper visualization and easy access. With the help of curettes, Schneiderian membrane was elevated from the floor, medial, anterior, and posterior walls of the antrum. Any membrane perforations were checked using Valsalva maneuver. Two implants were placed, achieving good primary stability (Figure 2). Patient's own blood was drawn and PRF was prepared by centrifugation and then placed (Figure 3). Closure was done using 3-0 vicryl. Collagen membrane was placed before closure. IOPA was taken to evaluate proper positioning of the implant. Post-operatively, the patient was advised strictly to avoid any strenuous activity and not to blow the nose. The patient was also instructed to visit for periodic checkups. Moreover, the patient was kept under antibiotic coverage post-operatively for 5 days.

PRF preparation

10 mL of whole venous blood was withdrawn and collected equally (5 mL each) in two sterile glass test tubes of 6 mL capacity without anticoagulant. The test tubes were then placed in a centrifugal machine at 3000 revolutions per minute for 10 min. The upper straw-colored layer was then removed using a pipette and middle fraction is collected, which was the PRF. This PRF clot was then used as a filling material for sinus floor augmentation.

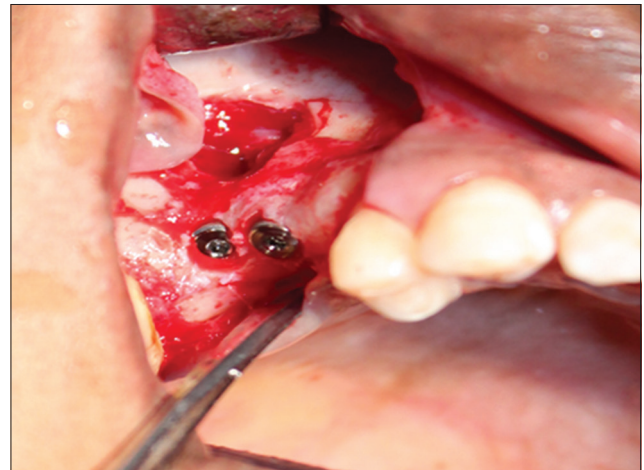


Figure 2: Buccal window preparation and implant placement in 15 and 16



Figure 3: PRF clot placement

RESULTS

Pre-operatively

VBH was 4.42 mm and 5.9 mm in relation to 16 and 15 measured on CT scans. Primary stability of implants was achieved post-operatively. The patient was advised to visit for periodic follow-ups.

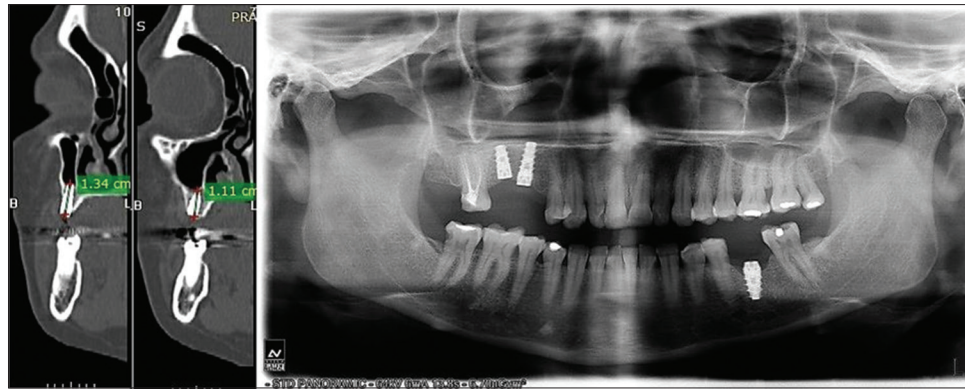


Figure 4: Six-month follow-up OPG and CT scans

Six-month follow-up

VBH was 11.1 mm and 13.4 mm in relation to 16 and 15. The vertical bone gain after direct sinus lift with PRF placement is 6.68 mm and 7.5 mm, respectively. Implants were stable and bone formed was almost equal to that of the native bone as seen on the OPG (Figure 4).

DISCUSSION

Sinus elevation is indicated in atrophic maxilla cases or cases where there is a deficiency of ridge height to place conventional implants.^[5] It is a well-accepted procedure in the management of loss of VBH in the posterior maxilla, which is performed in two ways: A lateral window approach and an axial approach also known as osteotome sinus floor elevation approach. The choice of the technique, either lateral window or osteotome sinus floor elevation, is mainly dependent on the residual bone height of the alveolar ridges. Pal *et al.*, compared direct and indirect sinus lift procedures with an initial mean bone height of 4.5 mm in direct sinus lift group and 7.39 mm pre-operative mean height in indirect sinus lift group.^[6] Direct sinus augmentation was preferred in cases with pre-operative bone height less than 5 mm according to a study conducted by Balaji.^[7]

Choukroun's PRF was first described by Choukroun *et al.* in France in 2001.^[8] This second-generation platelet concentrate has several biological advantages. It instinctively forms a fibrin matrix gelatinous clot that releases growth factors. Furthermore, PRF aids in collagen synthesis by the proliferation of fibroblasts. This combined effect thus promotes collagenesis and tissue regeneration.^[9] Several studies have proven that PRF releases growth factors in a gradual fashion. According to a study by Kobayashi *et al.*, PRF has shown the release of growth factors up to a 10-day period post-operatively.^[10] Dohan *et al.* proved a slower release of growth factors and observed better healing properties with PRF. PRF also encourages leukocytes which secrete signaling factors and mesenchymal stem cells that further promote tissue repair. Furthermore, PRF demonstrated significant improvement in cellular behavior, including cell migration, proliferation, and differentiation. PRF secured from autologous blood by centrifugation without any

addition contains 95% of platelets.^[11] Moreover, the autologous nature of PRF reduces the risk of immunogenic reaction and disease transmission.^[12]

PRF was extensively used in conjunction with various other grafting materials such as allografts, xenografts, and alloplasts and the synergistic effects were documented. At the same time, research on PRF as a sole grafting material after sinus lift with simultaneous implant placement was done and has shown better results. Mazor *et al.* conducted a 6-month radiological and histological study using PRF alone as grafting material after sinus lift with simultaneous implant placement and proved that the newly formed bone was dense and mature and was able to stabilize a high volume of natural bone in the sub-sinus cavity up to the tip of the implants.^[13]

In the present case, PRF exhibited superior results in terms of vertical bone gain, bone formation, and implant stability at 6th-month follow-up.

CONCLUSION

Choukroun's PRF has been vastly used as an adjunct with various grafting materials in the field of implantology and has proven its role by delivering excellent results in bone formation and bone gain after sinus lift procedure. PRF as a sole grafting material has been attempted and provided finer results. In the present case, the clinical and radiographic results support the use of PRF alone as a graft material in sinus lift with simultaneous implant placement.

REFERENCES

1. Chenchev I, Ivanova V. Sinus lift by lateral approach with simultaneous implant placement using platelet-rich fibrin as sole grafting material. Case report. J IMAB 2019;25:2559-62.
2. Boyne PJ, James RA. Grafting of the maxillary sinus floor with autogenous marrow and bone. J Oral Surg 1980;38:613-6.
3. Peng W, Kim IK, Cho HY, Pae SP, Jung BS, Cho HW, *et al.* Assessment of the autogenous bone graft for sinus elevation. J Korean Assoc Oral Maxillofac Surg 2013;39:274-82.
4. Pavlovic V, Ciric M, Jovanovic V, Trandafilovic M, Stojanovic P. Platelet-rich fibrin: Basics of biological actions and protocol modifications. Open Med (Wars) 2021;16:446-54.
5. Shenoy SB, Talwar A, Thomas B, Ramesh A, Vamsi AR. Direct vs indirect sinus elevation: A literature review. MJDS 2020;5:15-21.

6. Pal US, Sharma NK, Singh RK, Mahammad S, Mehrotra D, Singh N, *et al.* Direct vs. Indirect sinus lift procedure: A comparison. *Natl J Maxillofac Surg* 2012;3:31-7.
7. Balaji SM. Direct v/s Indirect sinus lift in maxillary dental implants. *Ann Maxillofac Surg* 2013;3:148-53.
8. Choukroun J, Adda F, Schoeffler C, Vervelle A. An opportunity in perio-implantology: The PRF (in French). *Implantodontie* 2001;42:55-62.
9. Karimi K, Rockwell H. The benefits of platelet-rich fibrin. *Facial Plast Surg Clin North Am* 2019;27:331-40.
10. Kobayashi E, Flückiger L, Fujioka-Kobayashi M, Sawada K, Sculean A, Schaller B, *et al.* Comparative release of growth factors from PRP, PRF, and advanced-PRF. *Clin Oral Investig* 2016;20:2353-60.
11. Khadtare Y, Aziz A, Prashant S. Bilateral direct sinus lift with platelet rich fibrin (PRF) in combination with DFDBA and FDBA: A case report. *Int J Periodontol Implantol* 2016;1:100-4.
12. Utomo DN, Mahyudin F, Hernugrahanto KD, Suroto H, ChilmixMZ, Rantam FA. Implantation of platelet rich fibrin and allogenic mesenchymal stem cells facilitate the healing of muscle injury: An experimental study on animal. *Int J Surg Open* 2018;11:4-9.
13. Mazor Z, Horowitz RA, Del Corso M, Prasad HS, Rohrer MD, Dohan Ehrenfest DM. Sinus floor augmentation with simultaneous implant placement using Choukroun's platelet-rich fibrin as the sole grafting material: A radiologic and histologic study at 6 months. *J Periodontol* 2009;80:2056-64.