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Platelet-rich Plasma in Maxillary Sinus Augmentation, Direct Maxillary Sinus Floor Augmentation: Case Report

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***Abstract*---**The placement of endosseous implants in posterior edentulous maxilla is normally a challenging task in implant dentistry due to maxillary sinus pneumatization. Various sinus augmentation techniques have been used with impressive success rates aimed at developing these sites for implant placement. Knowledge of anatomy of maxillary sinus guides us not only in proper preoperative treatment

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planning but also helps us to avoid the possible complications that may arise during sinus augmentation procedure. This topic attracts a rising number of publications with most of them reporting results that suggest, the patients with atrophic maxilla requiring implant treatment can benefit considerably from the use of sinus augmentation. This article explains the basic technique namely direct techniques used for maxillary sinus elevation and augmentation.

***Keywords*---**Posterior maxilla, Residual bone height, Sinus lift procedure, platelet rich fibrin (PRF).

Introduction

Sufficient amount bone in the maxillary and mandibular ridge should be available to support implants. Anatomic limitations often associated with the posterior maxilla are flat palatal vault, deficient alveolar height, inadequate posterior alveolus, increased pneumatization of the maxillary sinus and close approximation of the sinus to crestal bone. Maxillary bone, primarily medullary and trabecular, has less quantity and bone density than the premaxilla or mandible.[1]

In the mid 1970s, to increase the amount of bone in the posterior maxilla, the sinus lift procedure has been developed.[2] It is well-accepted techniques to treat the loss of vertical bone height (VBH) in the posterior maxilla performed in two ways: A lateral window technique and an osteotome sinus floor elevation technique and placing bone-graft material in the maxillary sinus to increase the height and width of the available bone. The bone seems to be harvested from the iliac crest most often, [3,4,5,6] although several anatomic areas have been used.[8]

Various bone-grafting materials have been studied for use in maxillary sinus grafts to accelerate the bone healing process and prevent repneumatization of the maxillary sinus after grafting,[4,9] autogenous bone from the iliac crest or maxillary tuberosity, frozen bone, freeze-dried bone, xenogeneic bone, demineralized freeze-dried bone and hydroxyapatite.

Although these techniques are used to regenerate lost bone, the factors that contribute to the survival rate of sinus augmentation and dental implant placement are still the subject of discussion. The recent literature concerning sinus grafts has shown differing long-term results depending on which type of bone-graft material was used. [10,11,12] An ideal maxillary sinus bone-grafting material should provide biologic stability, ensure volume maintenance, and allow the occurrence of new bone infiltration and bone remodeling. Over time, bone-grafting materials and implants should achieve osseointegration. After the restoration of the upper part of the implant has been completed, there should be no bone loss and the materials should be stable; there should be a predictable success rate.[13]

In this article we performed the lateral (direct) sinus lift using platelet rich fibrin(PRF) with Demineralized Freezed Dried Bone (DFDB, Tata) and perioglass bone graft and good result were achieved.

Case report

Patient reported to department of oral and maxillofacial surgery with chief complaint of missing teeth in maxillary right posterior region. Cone beam computed tomography was advised which revealed height of alveolar ridge was very less measuring about 1.90 mm. Sinus augmentation was planned followed by implant placement after three months.

Surgical procedure was performed under local anesthesia. Preoperative antibiotic (Amoxycillin and clavulanic acid 625 mg two times a day) was started a day before surgery. An incision was made a few millimeters above the muco-gingival junction from the premolars anteriorly to the maxillary buttress posteriorly. A mucoperiosteal flap was elevated from the incision buccally and superiorly and a rectangular shape window was created with the help of 3 mm diameter round bur and surgical handpiece (Figure 1 and 2). The inferior osteotomy cut was made about 4–5 mm above the floor of the maxillary sinus, followed by anterior, posterior, and superior osteotomy cuts. With a periosteal elevator, the underlying membrane was lifted. As sinus membrane was intact, a bellows effect was observed as the patient breathed. 10 ml of whole blood was drawn from the patients antecubital fossa (Figure 3) of left/rt arm, in test tubes and placed into centrifuge, and spin it rapidly until the blood separates into layers, those layers being concentrated as the platelet rich plasma (PRP) (Figure 4) and added to the bone (Perioglass and Tata bone). The osteotomy site was exposed and elevated sinus membrane was lifted superiorly. The particulate graft mixed with PRP (Figure 5) was placed in the sinus cavity and was packed after achieving adequate elevation (Figure 6). A barrier membrane of collagen was placed over the grafted site. The site was closed with 4-0 silk. Follow-up was made after a week and 6 month. Patient had mild swelling and pain immediately followed the procedure on 2nd and 3rd postoperative day which was controlled by antibiotic and pain killer.

Figures:

Fig 1: Mucoperiosteal flap was elevated.

Fig 2: Window created.

Fig 3: Blood drawn from antecubital fossa.

Figure 4: Platelet rich plasma.

Fig 5: PRP mixed with bone graft.

Fig 6: Sinus cavity was packed with bone graft and PRP.

Discussion

Implants are placed either simultaneously with the graft (1-stage lateral antrostomy) or after a delayed period of up to 12 months to allow for graft maturation (2-stage lateral antrostomy). The initial bone thickness at the alveolar ridge seems to be a reliable indicator in deciding between these 2 methods. If the bone thickness is 4 mm or less, initial implant stability would be jeopardized. Therefore, a 2-stage lateral antrostomy should be carried out. The reverse holds true for a 1-stage procedure [14].

In 1976, Tatum introduced the technique that increased the maxillary bone height by placing the graft material under the maxillary sinus and the Schneiderian membrane. It intended to increase the vertical bone dimension in the maxilla, where access to the maxillary sinus was obtained by drilling a bony window in the lateral sinus wall using a small round bur, while ensuring that the sinus membrane remained intact.

Though autografts are widely considered the “Gold standard” for osseous reconstruction, there are some practical difficulties in clinical use like secondary surgery, morbidity of the donor site, surgery under general anesthesia etc.[15]

PRP has numerous growth factors such as PDGF, TGF, and IGF. PRP and bovine bone graft material combination may be another treatment choice to the frequently used bovine bone graft material and collagen membrane combination. PRP is effective, in particular, in the first stages of wound healing, and its efficacy may change depending on the characteristics of jointly applied graft material. The sinus cavity shows a high osteogenic potential and is a very strong model of an osteogenic chamber for bone regeneration. It offers several advantages which include promoting wound healing, bone growth and maturation, wound healing, and hemostasis.[16]

Conclusion

The lateral sinus lift, despite having some disadvantages, such as in particular high demands on both surgeon and the patient and longer healing period, is in most cases, the best available solution for insufficient quantity of the alveolar bone during implant placement in the edentulous posterior maxilla. It offers several advantages compared to the crestal approach including access through a larger window into the sinus. The bone augmentation is expected to result in primary implant stability, promote osseointegration, prevent overloading and provide long term implant success. The use of this procedure is recommended in the posterior maxilla when the residual bone height >5 mm.

It is also possible to perform direct sinus lift and augmentation along with simultaneous implant placement, but the condition is that there should be enough marginal bone to achieve primary stability of implant. In case of thin marginal bone i.e., <5 mm, a two-stage sinus lift surgery, with later placement of implant is indicated[16]. The risk of complications in the former procedure remains low.

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