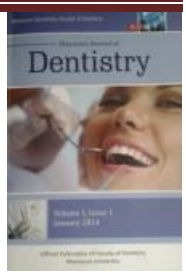


Sinus lifting with or without platelet rich fibrin using simultaneous implant placement.

Nahed Ebrahim Ghoneema, Ahmed Sobhy Mohamed Salemb,Menatalla Mohamed Abdelaziz El-Hindawyc, Zeinab Tharwat Essa Said Ahmedd

- aAssociate Professor of Oral & Maxillofacial Surgery Department, Faculty of Dentistry, Mansoura University, Egypt.
- bAssociate professor of Oral & Maxillofacial Surgery Department, Faculty of Dentistry, Mansoura University, Egypt.
- cLecturer of Oral Biology Department, Faculty of Dentistry,Mansoura University,Egypt.
- Dpost Graduate Student, Oral And Maxillofacial Surgery Department, Faculty of Dentistry, Mansoura University, Egypt.

Abstract:

Aim of the study: to compare clinically, radigraphically and histologically the application of PRF and grafless lateral sinus lift with simulatanous implant placement.

Material and methods: ten patients with missing maxillary posterior teeth to receive 20 implants underwent this lateral sinus lift technique performed using an SLA KIT. Patients divided equally into two groups. Group A; included 10 implants combined with application of PRF at the osteotomy site surface while group B; included 10 implants without PRF application. The residual bone height was 3-5 mm at least. Immediately after the implant placement, implant stability test was performed using the Osstell Monitor, Patients were recalled for follow up at 6 months. Radiographic and clinical and histological examinations were conducted .

Result: All implants were considered successful after 6 months from implantation. No significant difference in bone quality or quantity and implant stability in group A and group B .

Conclusion: There is no difference between application of PRF and graftless sinus lift in new bone formation and implant stability at 6 month from implantation.

Introduction

Placing endosseous implants in a posterior edentulous maxilla is usually a challenging task in implant dentistry due to pneumatization of the maxillary sinus. Various strategies of sinus augmentation were used with excellent success rates aimed at improving these sites for the placement of implantsKnowledge of maxillary sinus anatomy not only guides us in proper preoperative treatment planning but also helps us avoid possible complications during the sinus augmentation procedure(1)

Maxillary sinus augmentation (also known as sinus floor elevation) procedures have become increasingly popular procedures before placement of dental implants in posterior maxillae that have suffered severe bone loss due to sinus pneumatization, alveolar bone atrophy, or trauma. Maxillary sinus augmentation increase available bone using graft material, which allowed greater implant to bone contact area once the bone graft matured.(2)

Sinus lift techniques are among the most commonly performed augmentation procedures and are considered very reliable, particularly when autogenous bone is used. (3) The original technique; A lateral gap is opened in the maxillary sinus, the sinus membrane is carefully removed, autogenous bone or bone replacement is inserted in the sinus and healed for around 6 months or more before implants are inserted..(4)

This technique, with some minor modifications, is widely used nowadays and is termed the '2-stage technique', since in the first stage the sinus is augmented and in a second stage implants are placed. However, this implies a rather long time (up to 1 year) before providing the patient with a functioning implant-supported fixed partial prosthesis.(5)

The 1-stage procedure has been suggested to reduce the treatment time and to remove the need for the second operation to insert the implant, thus reducing patient morbidity and expense. Implants are implanted using this technique in combination with the sinus lift technique. (6)

Grafting of maxillary sinus can be done by several materials. We can use autogenous bone, xenograft, allograft and allopast. Now platelete rich fibrin can be used as autogenous graft with simlutanous implant placement with maxillary sinus elevation. A new protocol was introduced to concentrate platelets and fibrin in a simpler way without blood modification.(7)

Platelets and leucocytes are harvested with high efficiency and during the process, platelets are activated, resulting in significant platelet and leukocyte growth factors being incorporated into the fibrin matrix. The benefit of this approach is its low cost and the great simplicity of the procedure.(8)

Bone formation in the maxillary sinus doesn't involve the involvement of biomaterial, according to Chen et al. Maintaining space for the formation of blood clots, followed by the resorption and deposition of bone cells from the maxilla sinus periosteum or cancellous bone, would be responsible for bone formation in this area.(9).

To decrease the cost , time and morbidity can apply single stage of lateral sinus lift with PRF grafting or without graft depend on presence of implants to elevate sinus membrane to allow new bone formation.(10)

From all the above mentioned data, the clinico-radiographic and histological correlation is necessary to evaluate the role of application of PRF versus no graft in lateral sinus lift with immediate implantation

Materials and Methods

Patients:

A ten patients seeking fixed replacement of their partial edentulism in the posterior maxilla with pneumatized maxillary sinus that required lateral sinus lifting were selected. Bone height at least 4 mm measured from the crest of alveolar ridge to the floor of the maxillary sinus at the planned implant site with wide range of age (30-50years old). The patients were be randomly divided into two equal groups first one Sinus floor elevation by lateral window with simultaneous implant placement was done using platelet rich fibrin as an augmentation material beneath the tented sinus membrane .While other group wihout grafting.

Surgical procedure

Cone beam computed tomography (CBCT) were be used to evaluate residual bone height, width of ridge and mesiodistal width of missing tooth. Also, Stent used for correct position of implant. Prophylactic antibiotic was taken in the form of one before and the day of surgery (11).All surgical procedures were done under local anesthesia Access to the buccal maxillary wall was achieved via a mucosal crestal incision, anterior and posterior releasing vestibular incisions, and full thickness flap elevation. An osteotomy made in the lateral wall of the sinus using a 5-mm-radius round drill in an oval or rectangular fashion, 5–6 mm cranial to the intended implant site. Elevation of the Schneiderian Membrane was then the membrane from the bony window. The compartment around the implants under the sinus mucosal lining in the sinus floor will be augmented with PRF in first group while other group allow to fill with blood .

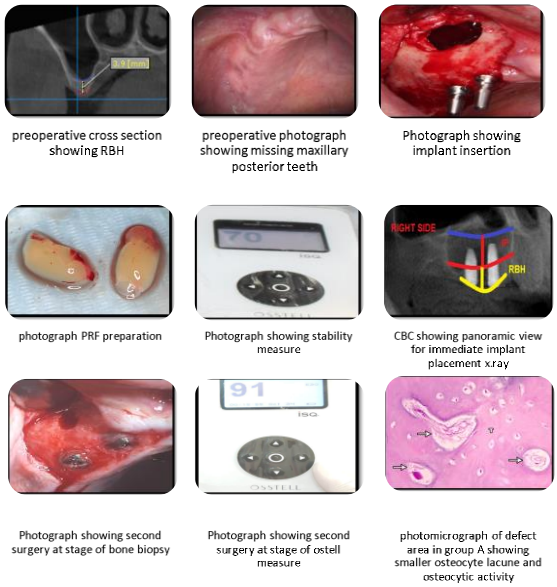
PRF Preparation: Blood collected fom patient divided to vacutainer tubes ,no material added.these tubes were put in the cnterfugal machine with three thousands revolutions each minute till ten minutes completed. The result appeared in three parts inside the tube ,first one was red blood cellswhich was red in color followed by acellular plasma that was straw in color and the middle fraction containing the fibrin clot.

Fibrin layer was dissected then the prf clot was taken into the osteotomy and pushed and condensed.implant sites were then drilled so that the osteotomy was kept narrower in diameter than the diameter of the implant to be inserted to achieve good primary stability.implant stability measured before closure by ostell .finally, the cover screws were attached to the implants and suuring using 4/0 black silk suture.

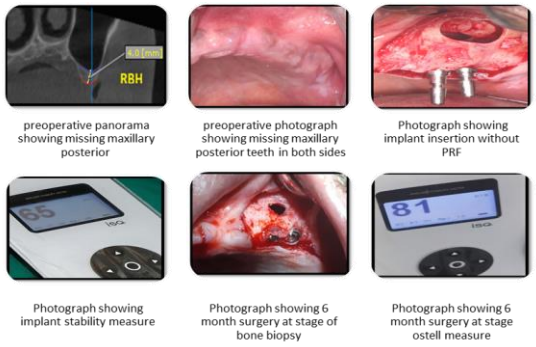
Second stage (after 6month):Dental CBCT scans were taken to evaluate residual bone height ,amount bone gain and implant protrusion ,Implant stability measured and cylindrical bone biopsies were taken.

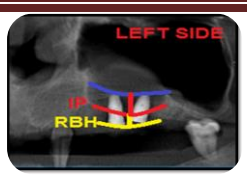
•Histological evaluation: The trephine was used with diameter 3mm with depth 4mm.Drilling was perpendicular to the bone wall in the center of the regenerated osteotomy window of the sinus lift . Preparation for histological analysis by specimens were adjusted for sections of parafin tocomplete with tissue fixation by biopsy immersre in 10% formal saline solution for2 days.Specimens were washed under running tap water .The specimens were decalcified in 10% Ethylene Diamine Tetra Acetic acid (EDTA). Dehydration of tissue occured partly by immerse it in ascending degrees of alcohol (50%, 70%, and 90% then in absolute alcohol).Biopsy was dissolved in 2 grades of xylene (clearing agent).The specimens were placed in a dish of melted, embedding paraffin and the dish was put into a constant temperature oven, regulated to about 60ºc for 2-3 hour. Then, specimens were put in the center of a box of melted hard paraffin, that were cut by microtome from the base . following step was staining Haematoxyline and Eosin stain that occurred by decalcification by xylol then Washing by differnent degrees of alcholthen by waterfor two minute for each step.staning by main stain then by acidic one for five minutes followed dy immersion in water to reach dehydration step by alchol ,Clearance in xylol and Mounting sections in Canada balsam. Statistical analysis Data was analyzed using statistical package for social science program (SPSS) version 20 (SPSS, IBM Inc., Chicago, IL). Independent samples T-test was used for parametric data and Mann-Whitney test was used for non-parametric data. Fisher's Exact test was used to compare nominal data.

First case :PRF group

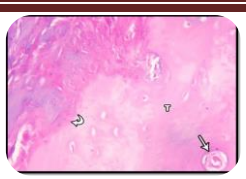


Second case: graftless group





panoramic view for immediate implant placement



Photomicrograph of defect area in group B showing newly formed trabaculae with reversal line (black arrow),large osteocyte lacunae

Result

Ten patients have been included in the study and for rehabitation of posterior maxilla by simlutanous dental implants with lateral antral lifting. The lengths of implant were 10, 11.5 and 13 mm that noted at (table 1). The implant diameters were 3.5, 4, 4.5 mm as showen in the table. the implant used was twenty in number ,eight in second premolar area , eight in first molar area and four second molar area. No statistically significant difference with respect to implant parameter was recorded when compared with both groups.

Table (1): Distribution of implant length and size of both groups.

		Group A		Group B		
		Count	%	Count	%	P value
Implant length	10	7	70	6	60	0.84
	11.5	2	20	3	30	
	13	1	10	1	10	
Implant Diameter	3.5	3	30	3	30	0.34
	4	5	50	5	50	
	4.5	2	20	2	20	

P value significant <0.05.

Table (2): Implant stability quotient (ISQ) values between two groups at T0 and T6.

Implant Stability Quotient Values (ISQ)	Groups						
	Group A (PRF)			Group B (GREFTLESS)			
	Mean	SD	(Range)	Mean	SD	(Range)	P value1
T0	50.1	7.7	39-65	47.8	11.8	35-70	0.605
T6	89.3	2.0	85-91	88.5	3.2	85-94	0.495
P value2	0.526			0.697			

P value significant <0.5

Table(3): Distribution of implant protrusion IP.

	Group A			Group B			
	Mean	SD	(Range)	Mean	SD	(Range)	P value
IP	6.7	0.6	6.2-7.5	7.1	0.4	6-7.5	0.432

P value significant <0.05

Discussion : The posterior maxilla has been described as the most difficult and troublesome intraoral region the implant practitioner is confronted with, requiring maximum ingerity to achieve positive results. Both anatomical features and dynamics of mastication lead to the difficulty of implant placement in this area. Recent analyzes suggest that the technique 's effectiveness is often correlated not just with repair content but also with other variables, such as the sinus membrane's osteogenic capacity and the zone 's bone characteristics. In this sense, techniques for the immediate or delayed installation of implants demonstrated that the use of autogenous bone grafting or the use of biomaterials could be equally efficient.(12, 13).

In our study , In group A; PRF released autologous growth factors gradually and expressed stronger and more durable effect on proliferation and differentiation of osteoblasts. The implants were placed immediately with sinus lifting procedure. Patients were evaluated after 6 months displaying 100% of fixture survival.(14).Increases in bone height ranged from 6.2 mm to 7.5mm with an average of 6.7mm bone gain. Space for PRF to be a sole graft material with accordance with hypothsis of dohan et al (113). that state that PRF has significant importance in decrease failure percentage and acceralate bone formation.

Where in graftless group, Two implants that elevate sinus membrane act as a tent that allow for blood clot to collect and start of bone formation with help of the innate osteogenic potential of Schneiderian Membrane.(15) This is in agreement with Chen et al. (115).

While in group B; amount of bone gain ranged from 6mm to 7.5mm which agree with Thor A, Sennerby L, Hirsch JM,et al. (16) that state on Bone formation in the maxillary sinus floor after simultaneous elevation of the mucosal lining and insertion of the implant without grafting tissue.

Achieving and maintaining integrity of the implants are prerequisites for a good dental implant. Stability of implants can be defined as lack of clinical mobility, which is also the suggested definition of osseointegration.(17) Stability of the primary implant at placement is a mechanical phenomenon which is related to the quality and quantity of the local tissue, the type of implant and the placement technique used. Secondary implant stability is the rise in bone instability due to implant / tissue interface and associated bone remodeling..(18)

In this study, Primary stability was achieved for all implants, and residual ridge implant stabilisation was obtained with a tapered profile. Implant design seemed to be a critical parameter, because implant stability is a key parameter for osseointegration and bone regeneration. The use of condensed implants may therefore be a better and easier option than the use of implants of the cylinder form.(19, 20).

Regarding to implant stability measured by Magnetic Resonance Frequency Analyzer in this study Osstell™ (Göteborg, Sweden). No important difference in implant stability in each group as compared to initial stability and stability after 6 months. ISQ results illustrated a 6 month raise after implantation (21).

In this analysis, all implants in both groups had ISQ results in the range between 39 to 65 in PRF group at the time of installation with mean 50.1±7.7, and from 58 to 92 after 6

months with mean 89.3 + 2. Change in implant stability in the same group over period revealed no statistically significant modification where P2 was equal to 0.526.
sample B ISQ values were 35 to70 with mean 47.8 at time of implant placement, and from 85 to 94 with mean 88.5+ 3.02 after recall period. Modification in implant stability in same section over period revealed no statistically significant change where P2 value was found equal 0.697 . These findings was in agreement with Kim et al (22).who studied implant stability and compare between different implant systems
In histological study, group B the bony defect filled by bone appeared with larger marrow spaces and less arranged trabaculae .this is with agreement with study of adrrone A, Ricci M, Grassi RF,et al.(126). that depend on histological analysis on maxillary sinus augmentation with and without use of collagen membranes over the osteotomy window after 6 month of surgery.(23)
Conclusion

Graftless SFE technique or using PRF as grafting material in one stage lateral SFE has high success rate with decrease cost and time needed for implantation of atrophied posterior maxilla.There was no significant difference between two techniques

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