ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 9, pp. 20128-20132, September, 2017

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

GRAFT USED IN DIRECT SINUS LIFT TECHNIQUE FOLLOWED BY DENTAL IMPLANT

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DOI: http://dx.doi.org/10.24327/ijrsr.2017.0809.0833

ARTICLE INFO

Article History:

Received 17th June, 2017
Received in revised form 21st July, 2017
Accepted 05th August, 2017
Published online 28th September, 2017

Key Words:

Implant, Schneiderian membrane elevation, sinus lift, bone graft

ABSTRACT

Implant is the best alternative option nowadays for missing tooth replacement. Lack of bone height poses a significant difficulty for its placement. Bone augmentation is an option to counter this problem. In maxilla, to treat this local physiological as well as anatomical limitation, maxillary sinus floor elevation has become an important pre-placement procedure. Various methodologies have evolved to increase the thickness of maxillary sinus floor. One of the techniques involve simple and minimal elevation of maxillary sinus membrane, Schneiderian membrane, while other include placement of various type of grafts including allografts, autografts, bone morphogenetic proteins, and hydroxyapatite crystals. This review deals with the bone substitutes used in sinus lift.

INTRODUCTION

Patients suffering from tooth loss in the posterior maxilla are often subject to esthetic, functional, and psychological complications.1 Maxillary sinus augmentation (also known as sinus lift) procedures have become increasingly popular procedures prior to placement of dental implants in posterior maxillae that have suffered severe bone loss due to sinus pneumatization, alveolar bone atrophy, or trauma.

This article will discuss different sinus augmentation technique, including elevation procedures, regenerative materials, possible complications and postoperative instructions will also be reviewed.

Direct Sinus Augmentation Technique (DSAT)

Those cases that has residual alveolar bone (RAB) height 5 mm or below was considered for the direct technique. Autogenous bone grafts was harvested by shaving the mandibular bone from external oblique ridge area or chin area. A bone mill was used to grind the bone shaving into fine particles. After adequate local anesthesia and preparation, a surgical incision was placed on the crest of the RAB at most appropriate area, with vertical releasing curvilinear incisions flaring into the vestibule. Fullthickness, subperiosteal labial, and palatal flaps were raised, reflected. Care was taken to keep the base of flap broad as well as adequate buccal and palatal tissue for closure. After elevation, the anterolateral wall of maxillary sinus was visualized. Care was taken to identify and protect infraorbital nerve, if encountered. The dimension of osteotomy was determined based on clinical and radiographic examinations as well as the extent of edentulous span. A buccal bone window was made on exposed wall of maxillary sinus using a postage stamp method. The bony wall was gently manipulated with sinus membrane elevators without damaging Schneiderian membrane. The previously obtained graft material was then placed and packed. The implant was placed on same sitting with help of a stent which was positioned, then removed, and the site was checked for appropriate faciolingual and mesiodistal positioning . Any obvious abnormal crestal defects required slight modification of the position. [4]

Indirect Sinus Augmentation Technique (ISAT)

Indirect sinus augmentation is done for cases with RAB height of 6-8 mm. The RAB to receive the implant was given local anesthesia and perforated using a small rounded drill. A pilot drill was placed in marked implant site to establish the axis of implant recipient site. Following the pilot drill, subsequently increasing diameter of drills were used to enlarge implant recipient site till the desired diameter corresponding to implant diameter was reached. The height of drill was maintained 2 mm short of sinus floor. The indirect sinus lift was done by insertion of correct caliber osteotome and working up through successively greater instrument diameters, until the sinus floor was fractured and elevated up. The sinus floor was carefully fractured, separated from the Schneiderian membrane avoiding

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damage to membrane using a surgical mallet with controlled force. If required, autogenous graft material was inserted within the socket. The material was displaced apically with help of larger-diameter instruments, thereby lifting the membrane and condensing graft material between the latter and sinus floor. The implant was then placed immediately in the prepared site. 3-0 Vicryl sutures were used to close the surgical wound. Antibiotic coverage, pain killers, and nasal decongestants were prescribed for 5 days. The patients were monitored on a periodic basis both clinically and radiologically.[4]

Sinus Elevation Procedure

The elevation of the sinus floor is an internal augmentation of the maxillary sinus, intended to increase the vertical bony dimension of the lateral maxilla to allow placement of dental implants in sites with insufficient alveolar bone height.1 The procedure was introduced by Tatum at an Alabama dental implant conference in 1976 and was subsequently described by Boyne & James in 1980.27,28 The classic sinus lift procedure consists of the preparation of a window in the lateral maxillary sinus wall. This window is then luxated inward and upward with the schneiderian membrane to a horizontal position, thus forming a new sinus floor.1 The space underneath the membrane is filled with different graft materials according to the specific case. When bone height is sufficient to achieve primary stability (approximately 4 mm), implants can be inserted simultaneously. However, if the grafted bone has to remodel, implants should be inserted in a subsequent procedure.1 There are 2 main approaches for maxillary sinus floor elevation: the lateral antrostomy approach and the crestal approach.

Crestal Approach

This technique begins with a crestal incision.29 A full-thickness flap is then raised to expose the alveolar ridge. Next, an osteotomy is performed, starting with an osteotome of the smallest size, which is tapped in place in the bone with a mallet or drill. More osteotomes of gradually increasing size are then used to expand the alveolus and compress the bone. Once the largest osteotome has been placed, prepared bone grafting material is added to the osteotomy so that it presses on the sinus membrane. This additional pressure causes the elevation of the membrane. Additional grafting material may be used to achieve the desired amount of elevation. An implant-slightly larger in diameter than the osteotomy-is then inserted in the site.12,29 The crestal approach technique is a less invasive procedure, improves the density of the maxillary bone, and has the potential to allow the use of less autogenous grafting material. The disadvantage to this approach is an increased risk of misaligning the long axis of the osteotome during the sequential osteotomy.12

Surgical Procedure and Flap Design

The flap should be designed to minimize disturbance of the blood supply, and the surgical site needs to be securely covered.1 As previously mentioned, the incision is usually made midcrestally or paracrestally through the keratinized, attached mucosa. The infraorbital foramen should be avoided; precautions should be taken not to injure the neurovascular bundle during the preparation of the door and retraction of the flap.1 Ideally, the shape of the door should follow the inner shape of the maxillary sinus, which usually is curved. Radiographic and clinical evaluations of the extent of the maxillary sinus can be used to plan the shape. If the lateral sinus wall consists of thick bone, the whole lateral sinus wall should be thinned out. It has been suggested that rounded corners be approached with a wide cranial hinge base in order to reduce the risk of damaging the membrane.1 The door luxation is best performed with finger pressure so that the surgeon can feel resistance and avoid the use of a sharp instrument.

Augmentation Materials

Various grafting materials have been used for sinus elevation procedures. Based on their source, grafting materials can be categorized as autograft, xenograft, allograft, or alloplastic. These types may be used alone or in any combination for sinus augmentation. The biological rationale for using bone grafts is based on 3 different healing mechanisms: osteogenesis, the capacity of the graft to bring new bone-forming vital cells into the defect; osteoconduction, the capacity of the graft to serve as a scaffold for bone formation; and osteoinduction, the capacity of the graft contents to induce an osteoblastic differentiation of the host's undifferentiated cells.44 Osteoconductivity is an essential mechanism in any grafting material, as it provides biomechanical support and stabilization to the coagulum in the first healing phase and a scaffold for the new bone that will form in the later phase.45 Autogenous bone (also known as autologous bone or autograft) is considered the gold standard graft material for sinus augmentation, because it has osteogenetic, osteoinductive, and osteoconductive properties in addition to its high biocompatibility. The main disadvantage of this bone type is the need for a second surgical site, which can cause donor site morbidity. Donor sites are either extraoral (such as the ilium, tibia, or cranium) or intraoral (such as the mandibular ramus, mandibular symphysis, and maxillary tuberosity).46 Complications at donor sites include pain, gait disturbance, hernia, paresthesia, infection, antral perforation, dental injury, and fracture of the site.46Allogeneic graft material can be obtained from tissue banks as either mineralized or demineralized bone.46 Mineralized bone is less commonly used in sinus elevation procedures because of its lengthy process of bone formation. Demineralized bone is more commonly used due to the presence of bone morphogenetic protein that stimulates osteoinduction in adjacent undifferentiated cells to form new bone tissue.46 However, the main concerns about use of this type of material include the high cost and the risk (albeit low) of disease transmission.46 Xenografts, especially deproteinized bovine bone (such as Bio-Oss, Geistlich Pharma North America, Inc.), are widely used and have been studied extensively both in vitro and in vivo.46 Deproteinized bovine bone possesses osteoconductivity and can be used alone or in combination with other grafting materials. Bio-Oss is a bovine bone derivative that undergoes a low-heat (300°C) chemical extraction process by which all organic components are removed while the natural architecture of bone is maintained.44 Alloplastic grafting materials are easy to use and relatively less expensive than the cost of bone harvesting.46 The most common alloplastic grafting materials are those composed of some form of hydroxyapatite, mainly calcium phosphate ceramics.46 Mesenchymal stem cells have recently been implemented in maxillary sinus augmentations

with clinically promising results.47 Mangano *et al* evaluated the literature pertaining to the effectiveness of cell-based approaches in maxillary sinus augmentation in humans.47 The authors reviewed studies with at least 3-4 months' follow-up. They documented the potential for cell-based approaches in maxillary sinus augmentation and suggested further randomized control trials to clearly demonstrate the benefits of this approach.47

Postoperative Instructions

The patient should be provided with both printed and oral instructions postoperatively.48 These instructions should include application of ice and pressure to the site, elevation of the head, and rest for the patient.49 Although smoking is not an absolute contraindication, it is recommended that the patient cease the habit before, during, and after sinus augmentation and implant insertion because it has the potential to affect healing; several studies have shown higher failure rates among smokers.49-53. Actions that create negative pressure (such as blowing the nose or sucking through a straw) must be avoided by the patient during the first week after surgery.49 If the patient does sneeze, he or she must keep the mouth open, so pressure is not exerted within the sinus.48,49 Also, the patient should be warned against pulling back the lips to observe the surgical site, which could open the surgical incision line.49 The patient should be informed about which symptoms to expect shortly after surgery, including slight bleeding from the incision line the day of surgery and soreness, swelling, and bruising for several days postsurgery.48 The presence of small bone particles or granules in the mouth or from the nose (with some bleeding) is not unusual.49 In addition, the patient should be advised to take medications (such as anti-inflammatory drugs, antibiotics, and nasal decongestants) as prescribed by the surgeon.49

Complications

Several complications may arise during or after sinus augmentation. The most frequently encountered surgical complication is perforation of the schneiderian membrane, which occurs in 7%-35% of sinus augmentation procedures.59-61 Perforation of this membrane is most likely to happen at sharp edges and ridges, such as spines or maxillary sinus septa (also known as Underwood septa).2 However, when the perforation is small and located in an area where the elevated mucosa folds together when the door is lifted, there is no need for further management, although use of biological glues might be considered.1 If the perforation is larger and located in an unfavorable area, the perforation must be closed and covered to prevent loss of the graft.1 This can be achieved by covering the defect with a resorbable membrane and a surgical adhesive (such as BioGlue, Cryolife, Inc.).1 In cases where the membrane perforation is very large, further sinus lift should be abandoned and reentry might be considered.1 The second surgery should not be performed for 6 to 8 weeks.2 Hernandez-Alfaro *et al* studied the prevalence of surgical complications and sinus membrane perforations.62 They evaluated 338 patients who received 474 sinus augmentation procedures and a total of 1166 simultaneously placed dental implants. The researchers reported 104 (21.94%) perforations of the sinus membrane (19 bilateral). Of these cases, membrane perforations less than 5 mm were observed in 56 (53.85%), perforations between 5 and 10 mm were observed in 28 (26.92%), and membrane perforations more than 10 mm were observed in 20 (19.23%).62 If small vessels are found bleeding in the exposed membrane, it is best to let them stop spontaneously or to apply light gauze pressure.1 Due to the presence of arterial anastomoses of the alveolar antral artery, which branches from the posterior superior alveolar artery within the infraorbital artery on the lateral wall where an osteotomy will be performed, precaution must be taken to avoid massive bleeding. Rosano *et al* investigated the prevalence, location, size, and course of anastomoses on 30 maxillary sinuses from 15 human cadaver heads and on 100 CT scans from patients scheduled for sinus augmentation surgery.63 They found anastomoses in 100% of the cadaver maxillary sinuses by dissecting the sinus anterolateral wall. However, a well-defined bony canal was detected radiographically in 94 of 200 sinuses in the CT scans of the scheduled patients (47%). The mean vertical distance from the lowest point of this bony canal to the alveolar crest was 11.25 ± 2.99 mm in the CT scans. The canal diameter was less than 1 mm in 55.3% of the cases, 1-2 mm in 40.4%, and 2-3 mm in 4.3%. In 100% of the CT scan cases, the alveolar antral artery was found to be located between the schneiderian membrane and the lateral bony wall of the sinus, in the area selected for sinus elevation.63 Careful treatment planning, patient selection, and the appropriate sinus augmentation technique are essential to minimize the risk of implant migration into the maxillary sinus. Implant migration may occur several days postimplantation, at abutment connection surgery, or years later.64 Once the displacement is diagnosed, the implant must be removed as soon as possible.64 Other complications are related to the presence of preexisting antral pathologies, such as rhinosinusitis, odontogenic sinus diseases, pseudocysts, retention cysts, and mucoceles.64

CONCLUSION

The techniques employed in this manuscript has facilitated implant placement in areas of limited bone height, improved primary stability, high implant success in posterior maxilla, simple, and minimally invasive surgery with increased success. [4]

Since the introduction of dental implants, bone grafting has become an important procedure required for the treatment of patients with limited bone availability. Bone autograft, alone or together with other bone substitutes, has been the biomaterial of choice for clinicians worldwide. However different xenogenic, allogenic and synthetic biomaterials have shown promising results in many bone augmentation procedures. [1] The major part of success with implant placement lies in the treatment planning. It is utmost importance that the preoperative evaluations are done perfectly and the most suitable technique is decided accordingly for that particular situation, to improve the prognosis of that treatment. [24] Thus the bone substitute needed for each bone regeneration procedure must be selected based on the individual´s characteristics, and the surgical procedure itself. Factors such as the osteogenic potential of the host residual bone, systemic health of patients, and morphology of the defects, will delimit the ideal bone substitute for each situation. [4]

References

1. van den Bergh JP, ten Bruggenkate CM, Disch FJ, Tuinzing DB. Anatomical aspects of sinus floor elevations. *Clin Oral Implant Res*. 2000; 11(3):256-265.
2. Chanavaz, M. Maxillary sinus: anatomy, physiology, surgery and bone grafting related to implantology-eleven years of surgical experience (1979-1990). *J Oral Implantol*. 1990; 16(3):199-209.
3. Pjetursson BE, Tan WC, Zwahlen M, Lang NP. A systematic review of the success of sinus floor elevation and survival of implants inserted in combination with sinus floor elevation. *J Clin Periodontol*. 2008; 35(8 Suppl):216-240.
4. Tan WC, Lang NP, Zwahlen M, Pjetursson BE. A systematic review of the success of sinus floor elevation and survival of implants inserted in combination with sinus floor elevation, II: transalveolar technique. *J Clin Periodontol.* 2008;35(8 Suppl):241-254.
5. Pal US, Sharma NK, Singh RK, Mahammad S, Mehrotra D, Singh N, Mandhyan D. Direct vs. indirect sinus lift procedure: a comparison. *Natl J Maxillofac Surg*. 2012; 3(1):31-37.
6. Witmer LM. The phylogenetic history of paranasal air sinuses. In: Koppe T, Nagai H, Alt KW, eds. The Parana sal Sinuses of Higher Primates: Development, Function and Evolution. Chicago: Quintessence; 1999:21-34.
7. Moore WJ. The Mammalian Skull. Cambridge: Cambridge University Press; 1981.
8. Nunez-Castruita A, Lopez-Serna N, Guzman-Lopez S. Prenatal development of the maxillary sinus: a perspective for paranasal sinus surgery. *Otolaryngol Head Neck Surg*. 2012;146(6):997-1003.
9. Davis WB. Anatomy of the nasal accessory sinuses in infancy and childhood. *Ann Otol Rhinol Laryngol*. 1918;27:940-967.
10. Lawson W, Patel ZM, Lin FY. The development and pathologic processes that influence maxillary sinus pneumatization. *Anat Rec (Hoboken).* 2008;291(11): 1554-1563.
11. McGowan DA, Baxter PW, James J. The Maxillary Sinus and its Dental Implications. Oxford: Wright, Butterworth-Heinemann Ltd.; 1993:1-25.
12. Woo I, Le BT. Maxillary sinus floor elevation: review of anatomy and two techniques. *Implant Dent.* 2004; 13(1):28-32.
13. Rodella LF, Buffoli B, Labanca M, Rezzani R. A review of the mandibular and maxillary nerve supplies and their clinical relevance. *Arch Oral Biol*. 2012; 57(4): 323-334.
14. Karmody CS, Carter B, Vincent ME. Developmental anomalies of the maxillary sinus. *Trans Sect Otolaryn gol Am Acad Opthalmol Otolaryngol.* 1977:84(4 Pt 1): 723-728.
15. Solar P, Geyerhofer U, Traxler H, Windisch A, Ulm C, Watzek G. Blood supply to the maxillary sinus relevant to sinus floor elevation procedures. *Clin Oral Implants Res.* 1999; 10(1):34-44.
16. Underwood AS. An inquiry into the anatomy and pathology of the maxillary sinus. *J Anat Physiol*. 1910; 44(Pt 4):354-369.
17. Maestre-Ferrin L, Galan-Gil S, Rubio-Serrano M, Penarrocha-Diago M, Penarrocha-Oltra D. Maxillary sinus septa: a systematic review. *Med Oral Patol Oral Cir Bucal*. 2010; 15(2):e383-e386.
18. Krennmair G, Ulm CW, Lugmayr H, Solar P. The incidence, location, and height of maxillary sinus septa in the edentulous and dentate maxilla. *J Oral Maxillofac Surg.* 1999; 57(6):667-671; discussion 671-672.
19. Stammberger, H. Nasal and paranasal sinus endoscopy. A diagnostic and surgical approach to recurrent sinusitis. *Endoscopy*. 1986; 18(6):213-218.
20. Bell GW, Joshi BB, Macleod RI. Maxillary sinus disease: diagnosis and treatment. *Br Dent J.* 2011; 210(3):113118.
21. Erkan M, Aslan T, Ozcan M, Koc N. Bacteriology of antrum in adults with chronic maxillary sinusitis. *Laryn goscope.* 1994; 104(3 Pt 1):321-324.
22. Capra GG, Carbone PN, Mullin DP. Paranasal sinus mucocele. *Head Neck Pathol*. 2012; 6(3):369-372.
23. Maloney PL, Doku HC. Maxillary sinusitis of odontogenic origin. *J Can Dent Assoc*. 1968:34(11):591-603.
24. Mehra P, Murad H. Maxillary sinus disease of odontogenic origin. *Otolaryngol Clin North Am*. 2004; 37(2): 347-364.
25. Maestre-Ferrin L, Galan-Gil S, Carrillo-Garcia C, Penarrocha-Diago M. Radiographic findings in the maxillary sinus: comparison of panoramic radiography with computed tomography. *Int J Oral Maxillofac Implants.* 2011;26(2):341-346.
26. Carmeli G, Artzi Z, Kozlovsky A, Segev Y, Landsberg R. Antral computerized tomography pre-operative evaluation: relationship between mucosal thickening and maxillary sinus function. *Clin Oral Implants Res*. 2011; 22(1):78-82.
27. Tatum H Jr. Maxillary and sinus implant reconstruction. *Dent Clin North Am*. 1986; 30(2):207-229.
28. Boyne PJ, James RA. Grafting of the maxillary sinus floor with autogenous marrow and bone. *J Oral Surg.* 1980;38(8):613-616.
29. Summers RB. Sinus floor elevation with osteotomes. *J Esthet Dent.* 1998;10(3):164-171.
30. Wood RM, Moore DL. Grafting of the maxillary sinus with intraorally harvested autogenous bone prior to implant placement. *Int J Oral Maxillofac Implants.* 1988; 3(3):209-214.
31. Wallace SS, Tarnow DP, Froum SJ, *et al*. Maxillary sinus elevation by lateral window approach: evolution of technology and technique. *J Evid Based Dent Pract.* 2012;12(3 Suppl):161-171.
32. Smiler DG. The sinus lift graft: basic technique and variations. *Pract Periodontics Aesthet Dent*. 1997; 9(8):885-893; quiz 895.
33. Vercellotti T, De Paoli S, Nevins M. The piezoelectric bony window osteotomy and sinus membrane elevation: introduction of a new technique for simplification of the sinus augmentation procedure. *Int J Periodon tics Restorative Dent.* 2001; 21(6):561-567.
34. Lozada JL, Goodacre C, Al-Ardah A, Garbacea A. Lateral and crestal bone planing antrostomy: a simplified surgical procedure to reduce the incidence of membrane perforation during maxillary sinus augmentation procedures. *J Prosthet Dent*. 2011; 105(3):147-153.

35. Sohn DS, Moon JW, Lee HW, Choi BJ, Shin IH. Comparison of two piezoelectric cutting inserts for lateral bony window osteotomy: a retrospective study of 127 consecutive sites. *Int J Oral Maxillofac Implants*. 2010; 25(3):571-576.
36. Aimetti M, Massei G, Morra M, Cardesi E, Romano F. Correlation between gingival phenotype and Schneiderian membrane thickness. *Int J Oral Maxillofac Im plants*. 2008; 23(6):1128-1132.
37. Park YB, Jeon HS, Shim JS, Lee KW, Moon HS. Analysis of the anatomy of the maxillary sinus septum using 3-dimensional computed tomography. *J Oral Maxillo fac Surg*. 2011; 69(4):1070-1078.
38. Pommer B, Ulm C, Lorenzoni M, Palmer R, Watzek G, Zechner W. Prevalence, location and morphology ofmaxillary sinus septa: systematic review and metaanalysis. *J Clin Periodontol*. 2012;39(8):769-773.
39. Rossetti PH, Bonachela WC, Rossetti LM. Relevant anatomic and biomechanical studies for implant possibilities on the atrophic maxilla: critical appraisal and literature review. *J Prosthodont.* 2010;19(6):449-457.
40. Kirmeier R, Arnetzl C, Robl T, Payer M, Lorenzoni M, Jakse N. Reproducibility of volumetric measurements on maxillary sinuses. *Int J Oral Maxillofac Surg*. 2011; 40(2):195-199.
41. Jun BC, Song SW, Park CS, Lee DH, Cho KJ, Cho JH. The analysis of maxillary sinus aeration according to aging process; volume assessment by 3-dimensional reconstruction by high-resolutional CT scanning. *Oto laryngol Head Neck Surg*. 2005;132(3):429-434.
42. Kawarai Y, Fukushima K, Ogawa T, *et al*. Volume quantification of healthy paranasal cavity by three-dimensional CT imaging. *Acta Otolaryngol Suppl*. 1999; 540:45-49.
43. Ikeda A, Ikeda M, Komatsuzaki A. A CT study of the course of growth of the maxillary sinus: normal subjects and subjects with chronic sinusitis. *ORL J Otorhi nolaryngol Relat Spec*. 1998;60(3):147-152.
44. Baldini N, De Sanctis M, Ferrari M. Deproteinized bovine bone in periodontal and implant surgery. *Dent Mater*. 2011;27(1):61-70.
45. Polimeni G, Koo KT, Qahash M, Xiropaidis AV, Albandar JM, Wikesjo UME. Prognostic factors for alveolar regeneration: effect of a space-providing biomaterial on guided tissue regeneration. *J Clin Periodontol*. 2004; 31(9):725-729.
46. Tiwana PS, Kushner GM, Haug RH. Maxillary sinus augmentation. *Dent Clin North Am*. 2006;50(3):409-424.
47. Mangano FG, Tettamanti L, Sammons RL, *et al*. Maxillary sinus augmentation with adult mesenchymal stem cells: a review of the current literature. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2013;115(6):717-723.
48. Stern A, Green J. Sinus lift procedures: an overview of current techniques. *Dent Clin North Am*. 2012;56(1): 219-233.
49. Misch CE, Resnik RR, Misch-Dietsh F. Maxillary sinus anatomy, pathology and graft surgery. In: Misch CE,ed. Contemporary Implant Dentistry. 3rd ed. St. Louis: Mosby Elsevier; 2008:905-974.
50. Strietzel FP, Reichart PA, Kale A, Kulkarni M, Wegner B, Kuchler I. Smoking interferes with the prognosis of dental implant treatment: a systematic review and meta-analysis. *J Clin Periodontol*. 2007; 34:523-544.
51. Lin TH, Chen L, Cha J, *et al*. The effect of cigarette smoking and native bone height on dental implants placed immediately in sinuses grafted by hydraulic condensation. *Int J Periodontics Restorative Dent*. 2012; 32(3):255-261.
52. Peleg M, Garg AK, Mazor Z. Healing in smokers versus nonsmokers: survival rates for sinus floor augmentation with simultaneous implant placement. *Int J Oral Maxillofac Implants*. 2006; 21(4):551-559.
53. Levin L, Schwartz-Arad D. The effect of cigarette smoking on dental implants and related surgery. *Implant Dent*. 2005; 14(4):357-361.
54. Wallace SS, Froum SJ. Effect of maxillary sinus augmentation on the survival of endosseous dental implants. A systematic review. *Ann Periodontol*. 2003; 8(1):328-343.
55. Aghaloo T, Moy PK. Which hard tissue augmentation techniques are the most successful in furnishing bony support *for implant placement?* Int J Oral Maxillofac Implants. 2007; 22(Suppl):49-70.
56. Kan JY, Rungcharassaeng K, Kim J, Lozada JL, Goodacre CJ. Factors affecting the survival of implants placed in grafted maxillary sinuses: a clinical report. *J Prosthet Dent*. 2002; 87(5):485-489.
57. Sakka S, Krenkel C. Simultaneous maxillary sinus lifting and implant placement with autogenous parietal bone graft: outcome of 17 cases. *J Craniomaxillofac Surg*. 2011; 39(3):187-191.
58. Hou CJ, Liu JL, Li X, Bi LJ. Insulin promotes bone formation in augmented maxillary sinus in diabetic rabbits. *Int J Oral Maxillofac Surg*. 2012;41(3):400-407.
59. Schwartz-Arad D, Herzberg R, Dolev E. The prevalence of surgical complications of the sinus graft procedure and their impact on implant survival. *J Periodontol*. 2004;75(4):511-516.
60. Shlomi B, Horowitz I, Kahn A, Dobriyan A, Chaushu G. The effect of sinus membrane perforation and repair with Lambone on the outcome of maxillary sinus floor augmentation: a radiographic assessment. *Int J Oral Maxillofac Implants*. 2004;19(4):559-562.

How to cite this article:

Vijay Ebenezer and Saravana Kumar.2017, Graft Used In Direct Sinus Lift Technique Followed By Dental Implant. *Int J Recent Sci Res.* 8(9), pp. 20128-20132. DOI: http://dx.doi.org/10.24327/ijrsr.2017.0809.0833

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