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INCREASE IN BONE HEIGHT FOLLOWING MAXILLARY SINUS AUGMENTATION USING INDIRECT TECHNIQUE

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ABSTRACT

Aim: The present study was undertaken to evaluate increase in bone height following maxillary sinus augmentation using indirect technique. **Material and method**: It is a randomized study comprised of 10 patients having crestal bone <7 mm in maxillary posterior region. Following the standard surgical protocol, under local anesthesia the osteotomy in the proposed edentulous site of implant placement was done indirect sinus augmentation technique (ISAT). Post-operatively various variables like bone height, pain, sinus discomfort etc. was notified. **Results**: Bone gain was 4.65±0.19 mm. Pain at 5th day was 1±0.2. Sinus discomfort was found in 30% of the subjects at 3rd day. **Conclusion**: The results of the study need to be validated with a larger sample size.

KEYWORDS: Bone Height, Techniques, Maxillary Sinus, Augmentation.

INTRODUCTION

Implant success in posterior maxilla is frequently challenged by unfavorable post-extraction resorptive patterns, pneumatization of the maxillary sinus, and the often poor quality of the remaining alveolar bone. Hence, sinus floor elevation has become an important procedure in peri-implant grafting.[1,2]

The sinus-lift technique was introduced by Dr. Oscar Hilt Tatum Jr.[3] in 1975, and was first published by Drs. Philip Boyne and R. A. James[4] in 1980. The literature has indicated the maxillary sinus lift procedure as an excellent treatment option for posterior maxillary edentulism and, when performed well, sinus graft procedures produce a significant amount of bone, allowing the installation of implants in an anatomical and proteic position proper. In order to improve the bone height it is possible, besides the sinusal survey, to perform onlay grafts; however, this type of procedure usually does not offer noticeable changes.[5,6]

There are two main ways of reaching sinus membrane; a direct one and an indirect method of sinus augmentation. Lateral Antrostomy or direct sinus augmentation technique (DSAT) involves direct visualization and manipulations of Schneiderian membrane while the other method Osteotome or indirectly sinus augmentation technique (ISAT) manipulates the membrane. Both these method have delineated indication and contraindication. The factors that contribute to survival rate of sinus augmentation and dental implant placement are still the subject of discussion.[7,8]

Hence, the present clinical and radiographic study was undertaken for evaluation of increase in bone height following maxillary sinus augmentation using indirect technique.

MATERIALS AND METHOD

The present study comprised of 10 patients reporting to the Department of Oral & Maxillofacial Surgery, Maulana Azaad Dental College & Hospital, having crestal bone <7 mm in maxillary posterior region were selected randomly irrespective of their gender, cast, colour, creed, religion or socio-economic status based on the following inclusion and exclusion criteria. Preoperatively detailed medical history of the patients was recorded. Patients were diagnosed on the basis of clinical examination and radiographic interpretation. Informed consent was taken to participate in the study.

Inclusion criteria

1. Patients seeking implant options for oral rehabilitation.
2. Patients presenting with edentulous, atrophic maxillary arch either due to physiological aging, trauma, or periodontal conditions.
3. Patients presenting with one or more missing teeth in the posterior maxillary arch, either unilaterally or bilaterally with pre-operative bone height of <7 mm in the posterior maxilla.

Exclusion criteria

1. Patients with systemic illness/systemic drugs that would affect postoperative healing.
2. Patients with poor oral hygiene, chronic smokers, psychiatric illness, pre- existing sinus problem or unwilling for the follow-up.

Methodology

For each patient, a pre-surgical radiographic examination was performed with OPG/IOPAR taken with standardized technique which formed a standard baseline. All the cases were carried out by the same operating surgeon, an observing assistant and under strict aseptic environment. Following the standard surgical protocol, under local anesthesia the osteotomy in the proposed edentulous site of implant placement was done via the appropriate mucoperiosteal flap through the crest of the ridge. Then by drills in consecutive, progressive manner the sinus floor and membrane was elevated to the requirement of the individual case. Now, the integrity of the Schneiderian membrane was checked visually, with irrigation and valsalva procedure. Subsequently, the graft requirement was assessed, if required the graft was placed in the height of the sinus lift following the completion of the osteotomy and suturing the tissues. An IOPAR was taken before the patient is given postoperative instructions and sent home. At the end of 12th week postoperatively, radiographs was repeated. The quality of bone was assessed and the implants were placed accordingly. The parameters to be assessed include.

a. Intraoperative

1) Time taken for sinus lift: the time elapsed from the time of entry though the crestal bone till the lifting of the sinus floor and membrane.
2) Integrity of the Schneiderian membrane: assessed visually, with irrigation and valsalva procedure.
3) Any intraoperative complications like bleeding / perforation or any limitations in the sinus lift achieved.

b. Postoperative

The following parameters were assessed on 3rd, 5th and 7th day.

1. Pain: intensity was assessed with a visual analogue scale (VAS).[9]
2. Sinus complaints: Any discomfort, congestion or blocked nose was assessed based on pateints complaints and symptoms and was marked as Present (P) or Absent (A).
3. Oro-antral fistula: It was assessed on the basis of presence or absence of fistulous tract or any communication between the oral and nasal cavity. Valsalva manoeuvre was performed and visual and clinical assessments were made. It was marked as Present (P) and Absent (A).

4. Parasthesia over the region of supply of middle superior and posterior superior alveolar nerves.

c. Bone level assessed radiographically pre-operative and post-operatively after 1st and 3rd month. After this the implants was placed.

d. Final outcome of the implants placed was assessed at 1st and 3rd post loading months.

Preoperative care and medication**:** All the patients were undergone scaling, root planning and oral hygiene instructions to provide an oral environment more favorable to wound healing. The patients were given 0.2% chlorhexidine mouth wash to be used one day before the surgery.

Surgical Technique

Patient preparation: Draping was done for the patients covering all parts of the body exposing only area of the face around the mouth which is painted by povidone iodine antiseptic (for about two minutes). For intraoral preparation of the surgical site chlorhexidine 0.2% mouth rinse was used. All patients were operated under local anesthesia.

Incision and reflection

Flap incision was done by using No. 15 surgical blade. In the lateral osteotomy technique (open method), a full-thickness crestal incision slightly palatal to the crest of the ridge to be sure that the implant will not be in the line of incision or in the way of suture. This incision may extend from the tuberosity to the distal of canine (depending on the position and numbers of teeth to be implanted). Two vertical releasing incisions were made; one at the anterior end, the second at the posterior end of the crestal incision for approximately 1cm then the laterally based mucoperiosteal flap was reflected to expose the alveolar crest and the lateral aspect of maxilla. The anterior and posterior vertical releasing incisions should be at least l cm away from the anterior and posterior walls of the lateral osteotomy window respectively (Misch, 2008).[10]

Indirect surgical technique

The alveolar cortical bone to receive the implant was exposed under profound anaesthesia and perforated using a rounded drill. A pilot drill usually 2 mm in diameter was then drilled in the marked implant site to establish the axis of implant recipient site. Following the pilot drill, drills with gradually increasing diameters were used to enlarge the implant recipient site till the desired diameter corresponding to the implant diameter was

reached. The height was maintained 2 mm short of sinus floor. The indirect sinus lift was carried out by insertion of the correct-caliber osteotome and working up through the successively greater instrument diameters, until the sinus floor was fractured and elevated up. The sinus floor was then fractured and separated from the sinus membrane avoiding damage to the membrane using a surgical mallet. The graft material was inserted within the socket, if required. The material was displaced apically with the help of larger-diameter instruments, thereby lifting the membrane and condensing the graft material between the latter and the sinus floor. The implant was then placed immediately in the prepared site. 3-0 Vicryl sutures were placed to close the surgical wound. The patients were monitored on a periodic basis both clinically and radiologically.

Postoperative Care: Required post-operative instructions and medicament was given to the patients. The sutures were removed after 7 days. One month postoperatively, the edentulous patients were allowed to wear their dentures (partial or complete), which were relieved at the operated regions. The time required before stage II surgery and gingival former placement was not less than 3 months and is adequate for the primary bone healing around the implant.

Prosthetic rehabilitation: After an average of 4 months healing period, implants were exposed through crestal incision in the mid crestal area and healing abutments were connected (for two weeks) and then routine prosthetic procedures were done for the patients.

STATISTICAL ANALYSIS

Continuous variables were expressed as mean and standard deviation whereas nominal or categorical variables as proportions using SPSS version 22 software.

RESULTS

In the present study, 50% of the subjects were males and equivalent numbers of subjects were females. The mean age was 52.1±16.68 years (table 1). Membrane used was required in 30% of the subjects in group B (table 2).

Preoperative, 4th week post-op, 12th week post-op, 4th week post loading and 12th week post loading was 5.9±0.55, 11.24±0.51, 11.02±0.47, 10.81±0.48 and 10.72±0.49 respectively. Bone gain was 4.65±0.19 (Table 3).

Pain at 5th day was 1±0.2 (table 4). Sinus discomfort was found 30% of the subjects at 3rd day. Sinus discomfort was not reported in any of the subjects after 7th day (table 5). Paraesthesia was only found in 10% of the subjects while OAF was absent in all the subjects (table 6).

Table. 1: Demographic characteristics of the study population.

Variables	Indirect sinus augmentation	
	N	%
Gender		
Male	5	50%
Female	5	50%
Total	10	100%
Age (in years)	Mean	SD
	52.1	16.68
Intra-op procedure duration	16.11	2.93

Table. 2: Distribution of Implant, graft and membrane used in the study groups

Variables	Indirect sinus augmentation	
	N	%
Implant		
Immediate	4	40%
Delayed	6	60%
Graft		
Used	5	50%
Not required	5	50%
Membrane used		
Used	3	30%
Not required	7	70%

Table. 3: Bone height and gain at various intervals.

Variables	Indirect sinus augmentation	
	Mean	SD
Pre operative	5.9	0.55
4th week post op	11.24	0.51
12th week post op	11.02	0.47
4th weeks post loading	10.81	0.48
12th weeks post loading	10.72	0.49
Bone gain	4.65	0.19

Table. 4: Pain at various intervals.

Variables	Indirect sinus augmentation	
	Mean	SD
3rd day	1.8	2.11
5th day	1	0.2
7th day	0	0

Table. 5: Sinus discomfort at various intervals

Variables	Indirect sinus augmentation	
	N	%
3rd day		
Absent	7	70
Present	3	30
5th day		
Absent	10	100
Present	0	0
7th day		
Absent	10	100
Present	0	0

Table. 6: Paraesthesia and OAF at various intervals.

Variables	Indirect sinus augmentation	
	N	%
Paraesthesia		
Absent	9	90
Present	1	10
OAF		
Absent	10	100
Present	0	0

DISCUSSION

During the past decade, implants have become one of the most exciting and rapidly developing topics in dental practice as they provide a proper treatment alternative to conservative prosthodontics. The sinus elevation procedure has an integral invasive surgical procedure that could pose surgical morbidity as well as increase cost of treatment. In the posterior maxilla anatomical limitations (such as deficiency of maxillary alveolar bone and increased pneumatization of the maxillary sinuses) constitute a challenging problem. Because there is little available bone volume in this region, sinus floor elevation is a pre-requisite to implant placement.[11,12] Very scarce literature is available on the same in India.

In the present study success rate was reported 100% in the indirect sinus augmentation techniques. Graziani F[13] compared implant survival following sinus floor augmentation procedures with implants placed in posterior maxillary bone and demonstrated survival between 75% and 100% both for non-augmented and augmented areas. Milan Jurisic[14] and Daniel D et al[2] found 100% implant survival rates. This finding was in concurrence with the findings in the present study. In a meta-analysis of studies of cases with osteotome placement of implant by Emmerich D et al[15] and Del Fabbro M et al[16], there was a success/ survival rate of 98.7%, 98%, 95.7% and 96% after 6, 12, 24 and 36 months of loading, respectively, which are outcomes similar to conventionally placed implants.

In the present study mean bone gain was 4.65 in the indirect sinus augmentation cases. Daniel D et al[2] in his study noticed an average increase of 5.5 mm bone height from pre-operative time interval to post-operative time interval in the indirect technique. Nicola et al[17] compared the crestal and lateral approaches and the gain in bone height was comparable for the one-step (median = 10 mm) and two-step (median = 12.7 mm) procedures.

Pain was absent in all patients after 7th day of observation. On comparing both groups, pain was found to be absent after 7th day. Similar findings were observed by Kent and Block (1989).[18] Wiltfang et al[19] and U. S. Pal et al[7] observed pain reduction after sinus lift surgery with time but found 2 patients with sinusitis related pain which they found to be due to migration of cancellous bone sequestra into maxillary sinus for which they performed sinuscopy and removal of sequestrum. Our study correlates to their study in having minimal pain post-surgery.

In the present study, sinus discomfort was found to be minimal. This might be due to the fact that the crestal approach is minimally invasive.[20,21]

The limitation of present study is that due to small sample size and short duration of study, the long-term survival rate of implant and degree of resorption of bone graft could not be studied for which a long-term study and bigger sample size is warranted. Maxillary sinus floor elevation offers one of the most common pre-prosthetic procedures to solve this problem.[22,23] The crestal approach is minimally invasive but permits only a limited amount of augmentation.

CONCLUSION

In the present study, the average increase in bone height from pre-operative time interval to post-operative time interval in the indirect technique group was noted to be 4.65 mm. However, the results of the study need to be validated with a larger sample size as the outcome of the treatment may get influenced by various anatomical-, prosthetic-, surgical-, and patient-related factors.

REFERENCES

1. Kahnberg KE, Ekestubbe A, Grondahl K, Nilsson P, Hirsch JM. Sinus lifting procedure. I. One-stage surgery with bone transplant and implants. Clin Oral Implants Res., 2001; 12: 479-87.
2. Daniel D, Rao GS. Evaluation of increase in bone height following maxillary sinus augmentation using direct and indirect technique. J Dent Implants, 2012; 2(1): 26-31.
3. Tatum OH. Maxillary and sinus implant reconstruction. Dent Clin North Am. 1986; 30: 207–229.
4. Boyne P, James RA. Grafting of the maxillary sinus floor with autogenous marrow and bone. J Oral Maxillofac Surg, 1980; 17: 113–116.
5. Cawood JI, Howell RA. A classification of the edentulous jaws. Int J Oral Maxillofac Surg, 1988; 17(4): 232-6.
6. Chackartchi T. Sinus floor augmentation using large (1-2 mm) or small (0.25-1 mm) bovine bone mineral particles: a prospective, intra-individual controlled clinical, micro-computerized tomography and histomorphometric study. Clin Oral Implants Res., 2011; 22(5): 473-80.
7. 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.
8. Balaji SM. Direct v/s Indirect sinus lift in maxillary dental implants. Ann Maxillofac Surg, 2013; 3: 148-53.
9. DeLoach LJ, Higgins MS, Caplan, AB, Stiff JL: The visual analog scale in the immediate postoperative

period: Intrasubject variability and correlation with a numeric scale. Anesth Analg, 1998; 86: 102–6.
10. Misch CE. Contemporary Implant Dentistry.3rd edition. St. Louis, Missouri: Mosby; 2008.
11. Lundgren S, Andersson S, Gualini F, Sennerby L. Bone reformation with sinus membrane elevation: a new surgical technique for maxillary sinus floor augmentation. Clin Implant Dent Relat Res., 2004; 6: 165-73.
12. Palma VC, Magro-Filho O, Oliveira JA, Lundgren S, Salata LA, Sennerby L. Bone reformation and implant integration following maxillary sinus membran elevation: an experimental study in primates. Clin Implant Dent Relat Res., 2006; 8: 11-24.
13. Graziani F, Donos N, Needleman I, Gabriele M, Tonetti M. Comparison of implant survival following sinus fl oor augmentation procedures with implants placed in pristine posterior maxillary bone: a systematic review. Clin Oral Implants Res., 2004; 15: 677-82.
14. Jurisic M, Markovic A, Radulovic M, Brkovic BM, Sándor GK. Maxillary sinus floor augmentation: comparing osteotome with lateral window immediate and delayed implant placements: An interim report. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 2008; 106: 820-7.
15. Emmerich D, Att W, Stappert C. Sinus floor elevation using osteotomes: A systematic review and metaanalysis. J Periodontol, 2005; 76: 1237-51.
16. Del Fabbro M, Testori T, Francetti L, Weinstein R. Systematic review of survival rates for implants placed in the graft ed maxillary sinus. Int J Periodontics Restorative Dent, 2004; 24: 565-77.
17. Baldini N, D'elia C, Bianco A, Goracci C, De Sanctis M, Ferrari M. Lateral approach for sinus floor elevation: large versus small bone window–a split-mouth randomized clinical trial. Clinical oral implants research, 2017; 28(8): 974-81.
18. Kent JN, Block MS. Simultaneous maxillary sinus floor bone grafting and placement of hydroxylapatite-coated implants. J Oral Maxillofac Surg, 1989; 47: 238-42.
19. Wiltfang J, Schultze-Mosgau S, Merten HA, Kessler P, Ludwig A, Engel ke W. Endoscopic and ultrasonographic evaluation of the maxillary sinus aft er combined sinus fl oor augmentation and implant insertion. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 2000; 89: 288-91.
20. Summers RB. Sinus floor elevation with osteotomes. Journal of Esthetic Dentistry, 1998; 10: 164–171.
21. 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: 511-16.
22. Balleri P, Veltri M, Nuti N, Ferrari M. Implant placement in combination with sinus membrane elevation without Biomaterials: a 1-year study on 15 patients. Clin Implant Dent Relat Res., 2012; 14(5): 682-9.
23. Borges FL, Dias RO, Piattelli A, Onuma T, Gouveia Cardoso LA, et al. Simultaneous Sinus Membrane Elevation and Dental Implant Placement without Bone Graft: A 6-Month Follow-Up Study. J Periodontol, 2011; 82: 403-412.