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ORIGINAL RESEARCH

Assessment of outcome of intentional perforation of maxillary sinus during implant placement

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ABSTRACT:

Background: Reduced crestal bone height at the edentulous posterior maxilla results from atrophy of alveolar ridge and pneumatization of the maxillary sinus. The present study was conducted to assess outcome of intentional perforation of maxillary sinus during implant placement. **Materials & Methods:** The present study was conducted on 65 patients (80 implants) with missing maxillary posterior teeth of both genders. Based on the ratio of IO and IS compartment, implants were divided into 3 groups. Group 1 (G1): IO: IS is 5:1, Group 2 (G2): IO: IS is 4:2, and Group 3 (G3): IO: IS is 3:3. Parameters such as torque, bone fill and bone density was assessed at baseline and after 6 months. **Results:** There were 30, 26 and 24 dental implants in group I, II and III respectively. The mean torque in group I was 39.1 N/cm, in group II was 35.2 N/cm and in group III was 38.5 N/cm. The difference was non- significant ($P > 0.05$). The mean bone fill in group I was 1.58 mm², in group II was 1.72 mm² and in group III was 1.95 mm². The difference was non- significant ($P > 0.05$). The mean bone density on day 0 in group I was 172.4 HU, in group II was 146.8 HU and in group III was 184.2 HU. On day 180, mean bone density was 472.1 HU, 394.6 HU and 462.8 HU in group I, II and group III respectively. The difference was non- significant ($P > 0.05$). **Conclusion:** Authors found that survival rate of implants were not influenced either by torque or by the depth of penetration of implant into the maxillary sinus.

Key words: Maxillary sinus, Implants, Torque

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INTRODUCTION

The posterior edentulous maxilla is composed of spongy bone which poses challenges the dentist for the normal placement of the implant when compared with other areas mainly due to the presence of the maxillary

sinus.¹ Numerous treatment options such as the use of short implants, zygomatic implants, tilted implants, ridge augmentation with various grafting materials had been proposed to overcome these challenges. Placement of short implants in the region of

inadequate bone height and in the area with poor bone quality often leads to the failure of implants.²

It has been found that reduced crestal bone height at the edentulous posterior maxilla results from atrophy of alveolar ridge and pneumatization of the maxillary sinus. The incidence of the sinus membrane perforation during implant surgeries ranges from 7% to 35%. Sinus membrane perforation is associated with 25% of all sinus lift and augmentation procedures.³ Few researchers found that no sinus complication was observed following implant penetration into the maxillary sinus. Furthermore, the absence of occurrence of such complications is related to the maintenance of successful osseointegration.⁴

Intentional perforation of the Schneiderian membrane during implant placement has shown that the success rate of penetrated implants in the maxillary sinus is high, without any kind of complications, especially in the cases where the sinus intrusion is <3 mm.⁵ The present study was conducted to assess outcome of intentional perforation of maxillary sinus during implant placement.

MATERIALS & METHODS

The present study was conducted in the department of Oral and maxillofacial surgery. It comprised of 65 patients (80 implants) with missing maxillary posterior teeth of both genders. The study was approved from ethical committee. All patients were informed regarding the study and written consent was obtained.

Patient data such as name, age, gender etc. was recorded. Implants of varying dimensions were placed by intentional perforation of maxillary sinus floor during implant placement in all patients. Diagnosis of sinus penetration was confirmed during implant bed preparation and the membrane perforation was confirmed with a gauge. The final position of implant was evaluated by the radiograph. This was followed by the placement of cover screw and primary closure was obtained over the implant. On the radiograph, in the area of implant placement, two horizontal lines were drawn one at the crest of alveolar ridge and other at floor of maxillary sinus. Joining these two lines a vertical line was drawn along the long axis of implant. The two ends of this vertical line were represented as point A and point B and the implant apex is represented as Point C. The distance from Point A to Point B represents intraosseous (IO) compartment and distance from point B to point C represents intrasinus (IS) compartment.

Based on the ratio of IO and IS compartment, implants were divided into 3 groups. Group 1 (G1): IO: IS is 5:1, Group 2 (G2): IO: IS is 4:2, and Group 3 (G3): IO: IS is 3:3. Parameters such as torque, bone fill and bone density was assessed at baseline and after 6 months. Complications at the end of 1 week, 2 weeks, 1 month, 3 months, and 6 months were recorded. Results were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Assessment of Torque

Groups	Number	Mean	P value
Group I	30	39.1	0.92
Group II	26	35.2	
Group III	24	38.5	

Table I shows that there were 30, 26 and 24 dental implants in group I, II and III respectively. The mean torque in group I was 39.1 N/cm, in group II was 35.2 N/cm and in group III was 38.5 N/cm. The difference was non-significant (P> 0.05).

Table II Assessment of bone fill

Groups	Mean	P value
Group I	1.58	0.82
Group II	1.72	
Group III	1.95	

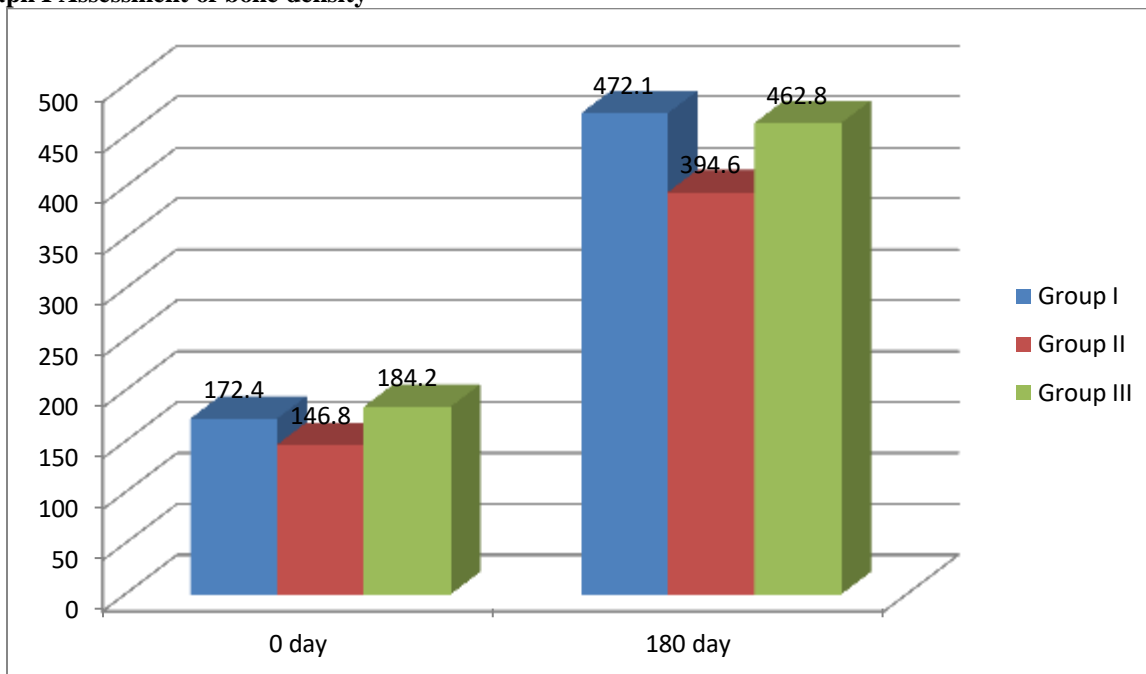
Table I shows that the mean bone fill in group I was 1.58 mm², in group II was 1.72 mm² and in group III was 1.95 mm². The difference was non-significant (P> 0.05).

Table III Assessment of bone density

Groups	Group I	Group II	Group III	P value
0 day	172.4	146.8	184.2	0.85
180 day	472.1	394.6	462.8	0.72

Table I shows that mean bone density on day 0 in group I was 172.4 HU, in group II was 146.8 HU and in group III was 184.2 HU. On day 180, mean bone density was 472.1 HU, 394.6 HU and 462.8 HU in group I, II and group III respectively. The difference was non- significant ($P > 0.05$).

Graph I Assessment of bone density



DISCUSSION

Rehabilitation of posterior maxilla using dental implants often remains as a challenge to the dentist because following tooth extraction there is an initial decrease in the bone width due to the resorption of buccal bone plate, followed by the continuing loss of bone height and density. Moreover, there is an increase in antral pneumatization due to increased osteoclastic activity of the periosteum and an increase in intra-antral pressure because of which the sinus floor is present closer to the alveolar crest. Sinus augmentation procedures are widely performed to correct vertical deficiencies encountered in the posterior maxillary region to enable optimal implant placement.⁶ Some authors recommend engaging the apex of the implant into the sinus floor to obtain increased implant stability because the sinus floor is composed of dense cortical bone. Bicortical fixation is a novel approach intended to increase implant stability in the maxillary posterior region by engaging two layers of cortical bone, i.e., alveolar crest cortical bone and apically into the sinus floor.⁷ The present study was conducted to assess outcome of intentional perforation of maxillary sinus during implant placement.

In this study we there were 30, 26 and 24 dental implants in group I, II and III respectively. The mean torque in group I was 39.1 N/cm, in group II was 35.2

N/cm and in group III was 38.5 N/cm. Santosh et al⁸ in 86 implants evaluated torque, bone density, and bone fill after 6 months of implant placement. Author found no significant differences among the three groups for torque, bone fill, and bone density from baseline to 6 months.

The mean bone fill in group I was 1.58 mm², in group II was 1.72 mm² and in group III was 1.95 mm². The difference was non- significant ($P > 0.05$). Shihab et al⁹ conducted a study in which the maxillary sinus was intentionally perforated for dental implant placement in 35 patients with 70 implants engaged bicortically and emerged into the sinus. Only two implants were failed; one during gingival former placement and the other after loading by one year. No patient presented with sinusitis clinically and radiographically. Three patients developed epistaxis just on the day of surgery and became well after on.

We found that the mean bone density on day 0 in group I was 172.4 HU, in group II was 146.8 HU and in group III was 184.2 HU. On day 180, mean bone density was 472.1 HU, 394.6 HU and 462.8 HU in group I, II and group III respectively. Hsu et al¹⁰ concluded that the use of bicortical fixation is simpler and economical when compared to indirect sinus elevation and allows for the placement of longer implants when compared to unicortical fixation. Zhong et al¹¹ in their study

concluded that despite the protrusion extents, penetration of dental implant into the maxillary sinus with membrane perforation does not compromise the sinus health and the implant osseointegration. The implants that were placed with a depth of 1 mm and 2 mm were fully covered with newly formed membrane and partially with new bone but implants with 3 mm penetrating depth showed no membrane or bone coverage.

Jung et al¹² reported that implants which penetrated <2 mm into the sinus floor was covered by the sinus mucosa in mongrel dogs. CT scans showed that implant protrusion of >4 mm in the maxillary sinus can cause thickening of the sinus mucosa around the implants. However, these sinuses remained asymptomatic.

CONCLUSION

Authors found that survival rate of implants were not influenced either by torque or by the depth of penetration of implant into the maxillary sinus.

REFERENCES

1. Cordioli G, Mazzocco C, Schepers E, Brugnolo E, Majzoub Z. Maxillary sinus floor augmentation using bioactive glass granules and autogenous bone with simultaneous implant placement. Clinical and histological findings. *Clin Oral Implants Res* 2001; 12:270–8.
2. Van den Berg JP, ten Ruggenkate CM, Disch FJ, Tuinzing DB. Anatomical aspects of sinus floor elevations. *Clin Oral Implants Res* 2000; 11:256–5.
3. Tatum H. Maxillary and sinus implant reconstruction. *Dent Clin North Am* 1986; 30: 207–29.
4. Chanavaz M. Maxillary sinus: anatomy, physiology, surgery, and bone grafting related to implantology - eleven years of surgical experience (1979-1990). *J Oral Implantol* 1990; 16:199–209.
4. 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; 19:559–62.
5. Barone A, Santini S, Sbordon L, Crespi R, Covani U. A clinical study of the outcomes and complications associated with maxillary sinus augmentation. *Int J Oral Maxillofac Implants* 2006; 21(1):81–5.
6. Abi Najm S, Malis D, El Hage M, Rahban S, Carrel JP, Bernard JP. Potential adverse events of endosseous dental implants penetrating the maxillary sinus: long-term clinical evaluation. *Laryngoscope* 2013; 123(12):2958–61.
7. Santosh V, Bhukya P, Medisetty B, Rampalli VC, Kumar P A. Outcomes of intentional perforation of the maxillary sinus floor during implant placement: A single-center, prospective study in 57 subjects. *J Dent Implant* 2019;9:60-5.
8. Shihab OI. Intentional penetration of dental implants into the maxillary sinus: a retrospective study. *Zanco Journal of Medical Sciences*. 2017;21(1):1536-9.
9. Hsu A, Seong WJ, Wolff R, Zhang L, Hodges J, Olin PS, et al. Comparison of initial implant stability of implants placed using bicortical fixation, indirect sinus

elevation, and unicortical fixation. *Int J Oral Maxillofac Implants* 2016;31:459-68

10. Zhong W, Chen B, Liang X, Ma G. Experimental study on penetration of dental implants into the maxillary sinus in different depths. *J Appl Oral Sci* 2013;21:560-6.
11. Jung JH, Choi BH, Zhu SJ, Lee SH, Huh JY, You TM, et al. The effects of exposing dental implants to the maxillary sinus cavity on sinus complications. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;102:602-5.