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Original Article

Narrow Diameter Implants: An alternative to regular implants? – An Original Research

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ABSTRACT:
Background: We compared and clinically evaluated suppuration, bleeding on probing (B.O.P.), adverse effects such as abutment screw loosening, crown loosening, fractured abutment and compared and evaluated radiographically the difference in crestal bone loss after placement of narrow diameter implant (NDI) compared with a regular diameter implant (RDI). **Materials and methods:** A total of 20 implants were placed (10 implants per group with 16 males and 3 females) under local anaesthesia in subjects requiring placement of mandibular and maxillary implants. Selected groups were grouped on the basis of diameter of implant used. The implants were evaluated for implant suppuration using gloved finger, bleeding on probing using periodontal probe, adverse events or complication like screw loosening, crown loosening , abutment loosening and crestal bone loss measured from the shoulder of implant to the first bone implant contact. **Results:** The inter-group comparison of implant suppuration, bleeding on probing and adverse events at different time intervals showed that the results for both groups were statistically non-significant (p-value at>0.05). The intra-group comparison of the changes in the crestal bone showed that the bone loss was highly significant on the distal side from 0 to 3 months, 0 to 6 months and 3 to 6 months in regular implants. **Conclusion**: Within the limitations of this study, it was concluded that the regular diameter implants showed a greater bone loss over a period of 6 months, more in the distal aspect than mesial side compared with narrow diameter implants.
Key words: Dental implant, Diameter, Narrow

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INTRODUCTION

The concept of Osseo integration, i.e., the direct anchorage of endosseous implants made of commercially pure or titanium alloy to the bone, was a breakthrough in oral rehabilitation.[1] The use of implants for patients with alveolar ridges of limited dimensions remains a challenge. Narrow diameter implants (NDIs); diameter <3.75 mm) have specific clinical indications. A reduced bucco-lingual dimension may not allow placement of a standard-diameter implant without the risk of implant thread exposure and, due to the narrow mesiodistal width, a hazard to the neighbouring teeth or interproximal bone.[2, 3]In general, it seems that guidelines developed for the surgical placement and prosthetic restoration of regular size implants can be applied to narrow diameter implants ; however, although NDIs have been available since the 1990s, few studies have analysed the clinical outcome of such implants.[4, 5]Previously, numerous studies have been performed to clinico-radiologically compare small diameter implants with very small (mini implants) and wide diameter implants but comparison between narrow diameter implants and regular diameter taking into account suppuration and bleeding on probing has not been reported so far.[6, 7] The aim of this in vivo study was to clinically and radiographically evaluate and compare narrow diameter implants (NDI) as opposed to regular diameter implants (RDI) and record these finding and compare adverse effects such as abutment screw

loosening, crown loosening, fractured abutment and implant failure if any.

MATERIALS & METHODS

A total of 20 implants were placed (10 implants per group with 16 males and 3 females) in subjects requiring placement of mandibular and maxillary implants. Selected groups were grouped on the basis of diameter of implant used. Before starting the procedure all patients received thorough explanations and signed a written informed consent form prior to being enrolled in the trial. Pre- operative IOPA and Orthopantomogram (OPG) provided the necessary information regarding the available bone and distance of vital structures, i.e., mandibular canal from the implant site, maxillary sinus, and floor of nasal cavity. A pre-measured 3mm diameter ball bearing was used to calculate the magnification of OPG.The patients were pre-medicated with antibiotics (Amoxy-Clav-625 mg). Before anesthetizing the patient, the patients were asked to rinse the mouth with chlorhexidine mouth wash. Local anesthesia was then administered using lignocaine with adrenaline in the ratio of 1:100000 at the involved site.Surgical procedure was initiated with an intra-oral crestal incision and mucoperiosteal flaps will be elevated both buccally and lingually to expose the bone.After marking the site by custom made surgical stent, pilot drill was used, followed by subsequent drills of increasing diameter, and final drill up to the decided depth. The implant was inserted first by using hex driver, followed by torque ratchet key.

- The implants were placed slightly below or at the level of alveolar crest.
- Healing screws were screwed to the implants immediately after implant placement to close the opened implant site.
- Then the flap was closed with tight non- resorbable 3-0 black silk sutures to achieve water- tight closure.
- The patients were prescribed with antibiotics and analgesics for 1 week, post- operatively.
- Patients were being recalled after a period of 3 months after surgery.

Post-operative instruction was given to the patient regarding diet, oral hygiene maintenance and antibiotics and anti-inflammatory were prescribed. The patients were recalled for follow up for clinical and radiographic evaluation which was made at 1 week, 3 months and 6 months of implant placement for evaluation of crestal bone changes with help of radiographs.

Clinico-radiographic assessment of Peri-implant tissues

1. Suppuration

2. Bleeding on Probing (BOP)

3. Evaluation of adverse events

4. Measurement of crestal bone loss

All the results were analyzed by SPSS software. Chi-square test was used for assessment of level of significance.

RESULTS

Two groups were included in the present study; Group I — Narrow diameter implant, Group II— Regular diameter implant. The basic data was collected from each group with narrow diameter implants and regular diameter implants and compared on the basis of soft tissue changes, adverse events and crestal bone loss on the mesial and distal side at 0, 3 and 6 months. In both the groups I and group II the mean values showed a decrease in crestal bone level over a period of 6 months both at mesial and distal sides of implants. However, the decrease was non- significant on the mesial side but it was significant on the distal sides. It is shown that the bone loss on the mesial side is significant when measured from 0 months to 3 months, highly significant 0 months to 6 months and highly significant from 3 month to 6 months for group I and insignificant for group II when measured from 0 to 3 months, significant from 0 months to 6 months and highly significant when measured from 3 to 6 months. The bone loss on the distal side was insignificant from 0 to 3 months, significant from 0 to 6 months and highly significant from 3 to 6 months in group I. The bone loss was highly significant on the distal side from 0 to 3 months, 0 to 6 months and 3 to 6 months.

TABLE 1: Comparison Of Implant Suppuration In Two Groups At Different Time Intervals

Time	Group I		Group II		P value
	N	%	N	%	
At 0 month	1	10.0	1	10.0	1.000; NS
At 3 months	0	0	0	0	-
At 6 months	0	0	1	10.0	0.305; NS

NS: $p > 0.05$; Not significant

TABLE 2: Comparison Of Bleeding On Probing In Two Groups At Different Time Intervals

Time	Group I		Group II		P value
	N	%	N	%	
At 0 month	0	0	0	0	-
At 3 months	1	10.0	4	40.0	0.121; NS
At 6 months	2	20.0	4	40.0	0.329; NS

NS: $p > 0.05$; Not significant

TABLE 3: Comparison Of Adverse Events In Two Groups At Different Time Intervals

Time	Group I		Group II		P value
	N	%	N	%	
At 0 month	0	0	0	0	-
At 3 months	0	0	0	0	-
At 6 months	0	0	0	0	-

NS: p > 0.05; Not significant

TABLE 4: Comparison OfCrestal Bone Loss (Mesial) In Two Group At Different Time Intervals

Time	Group I		Group II		't' value	P value
	Mean	± SD	Mean	± SD		
At 0 month	-0.306	0.052	-0.427	0.194	1.903	0.073; NS
At 3 months	-0.379	0.064	-0.485	0.180	1.752	0.097; NS
At 6 months	-0.477	0.056	-0.563	0.164	1.569	0.134; NS

NS: p > 0.05; Not significant

TABLE 5: Comparison OfCrestal Bone Loss (Distal) In Two Group At Different Time Intervals

Time	Group I		Group II		't' value	P value
	Mean	± SD	Mean	± SD		
At 0 month	-0.190	0.189	-0.426	0.156	3.042	0.007*
At 3 months	-0.304	0.082	-0.498	0.142	3.734	0.002*
At 6 months	-0.377	0.099	-0.590	0.130	4.104	0.001*

*p < 0.05; Significant

TABLE 6: Intra Group Change InCrestal Bone Loss (Mesial) At Different Time Intervals

	Group I		't' value	P value	Group II		't' value	P value
	Mean	± SD			Mean	± SD		
0 Mth to 3 Mth	0.073	0.048	4.824	0.001*	0.058	0.072	2.556	0.031*
0 Mth to 6 Mth	0.171	0.066	8.205	<0.001**	0.136	0.087	4.903	0.001*
3 Mth to 6 Mth	0.098	0.044	7.016	<0.001**	0.078	0.037	6.710	<0.001**

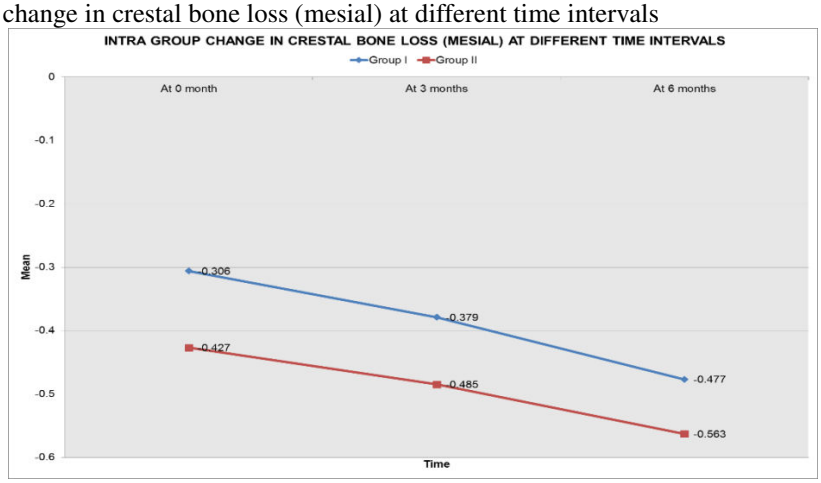
*p < 0.05; Significant; **p<0.001; Highly significant

TABLE 7: Intra Group Change InCrestal Bone Loss (Distal) At Different Time Intervals

	Group I		't' value	P value	Group II		't' value	P value
	Mean	± SD			Mean	± SD		
0 Mth to 3 Mth	0.114	0.176	2.047	0.071	0.072	0.026	8.565	<0.001**
0 Mth to 6 Mth	0.187	0.188	3.144	0.012*	0.164	0.054	9.568	<0.001**
3 Mth to 6 Mth	0.073	0.035	6.541	<0.001**	0.092	0.038	7.551	<0.001**

*p < 0.05; Significant; **p<0.001; Highly significant

Graph 1: Intragroup change in crestal bone loss (mesial) at different time intervals



DISCUSSION

Narrow diameter implants are used to describe implants with diameters less than 4 mm. They were first introduced commercially in the dental field in 1990.Since that time, several studies have been carried out using these implants.[8] The stresses were concentrated around the neck of the implant, and the majority of the stress was distributed around the first six threads of the implant. The current study was conducted to examine the hypothesis that narrow diameter implants show greater bone loss and complications over time because of increased stress distribution in the bony tissue around these implants.

The mean change in marginal bone height from the time of implant placement to prosthesis placement was 0.14 mm ± 0.67 mm (range 0 to 6 mm).[9] For all implant systems, an increase in vertical bone loss with time could be seen which was further substantiated by clearly positive correlation coefficients. A good comparison of clinical and radiographic parameters remains difficult because of variation in the clinical and radiographic parameters. In addition, discussions of marginal bone loss rarely distinguish between narrow and regular implants. The present observations are presented irrespective of implant length.

The present study analysed narrow diameter implants and regular diameter implants placed in a partially or fully edentulous patients over a follow-up period of 6 months Crestal bone loss Marginal bone measurements revealed that marginal bone loss using digimizer software version 4.5.0 predominantly occurred during the first 6 months.

In the present study it was shown that none of the implants in group I and group II showed suppuration, bleeding on probing was seen in both groups but it was non-significant, no adverse events were seen in either groups, overall, statistically insignificant. Crestal bone loss measured from implant shoulder to the first visible implant contact in both groups over different time intervals , from implant placement to 6 months showed results which were insignificant to highly statistically significant RDIs were associated with greater bone loss over a 6 month period compared with NDI. At the site level, a greater loss was observed at the distal side of both implant groups.

The results showed that the bone loss on the mesial side is significant when measured from 0 months to 3 months, highly significant when measured from 0 months to 6 months and highly significant from 3 to 6 months for group I and insignificant for group II when measured from 0 months to 3 months, significant from 0 to 6months and highly significant when measured from 3 months to 6 months.

Bone loss on the distal side was found to be insignificant when measured from 0 months to 3 months, significant when measured from 0 months to 6 months and highly significant from 3 to 6 months for group I and highly significant for group II when measured from 0 months to 3 months, highly significant from 0 to 6months and highly significant when measured from 3 months to 6 months.

The fact that the stress and strain gradients around narrow-diameter implants were higher than those around 4.1-mm-diameter implants does not imply that the use of narrow- diameter implants should be avoided and ridge augmentation procedures should be performed to place wider implants. It is well-known that for most patients, occlusal forces are somewhat decreased because of age-related deterioration of the dentition. Hence, narrow-diameter implants may have high survival rates when opposed to removable partial or complete dentures. The survival (probability) of small-diameter implants is shown to be higher in the mandible than in the maxilla[10]Arisan et al., although Degidi et al. (2008)[9] did not find any difference between the maxilla and mandible in the long-term survival rate of 510 narrow-diameter implants[11]. A possible explanation could be the relatively short median follow-up period of 6 months and small sample size.

CONCLUSION

The regular diameter implants showed a greater bone loss over a period of 6 months, more in the distal aspect than mesial side compared with narrow diameter implants. Although different implants of different lengths were taken into consideration in this study, a lower annual bone loss was reported with the narrow diameter implants compared with the regular diameter implants. Hence, it was concluded that narrow diameter implants can be placed in deficient areas taking into consideration volume of the residual bone, the amount of space available for the prosthetic reconstruction, the emergence profile and the type of occlusion.

REFERENCES

1. Klein MO, Schiegnitz E, Al-Nawas B: Systematic review on success of narrow-diameter dental implants. Int J Oral Maxillofac Implants. 2014; 29(Suppl): 43-54.
2. Degidi M, Piattelli A, Carinci F: Clinical outcome of narrow diameter implants: a retrospective study of 510 implants. J Periodontol 2008; 79: 49-54.
3. Spiekermann H, Jansen VK, Richter EJ. A 10-year follow-up study of IMZ and TPS implants in the edentulous mandible using bar-retained overdentures. Int J Oral Maxillofac Implants 1995; 10:231–243.
4. P King, C Maiorana , R G Luthardt , K Sondell , Land J, Moreno PG, Nilsson P. Clinical and Radiographic evaluation of a Small-Diameter Dental Implant used of the restoration of patients with permanent tooth agenesis (Hypodontia) in the Maxillary Lateral Incisor and Mandibular Incisor Regions: A 36-Month Follow- up IntJProsthodont 2016; 29:147-153.
5. Zinsli B, Sagesser T, Mericske E, Mericske, Stern R. Clinical evaluation of small-diameter ITI implants a prospective study. Int J Oral Mazillofac Implants 2004; 19:92-99.
6. Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-term efficacy of currently used dental implants: A review and proposed criteria of success. Int J Oral Maxillofac Implants 1986; 1:11-25.
7. Lazzara R, Siddiqui AA, Binon P. Retrospective multicenter analysis of 3i endosseous dental implants placed over a five-year period. Clin Oral Implants Res 1996; 7:73–83.

8. Vigolo P, Givani A. Clinical evaluation of single-tooth mini-implant restorations a five-year retrospective study. J Prosthet Dent 2000; 84:50–54.
9. H allman M. A prospective study of treatment of severely resorbed maxillae with narrow nonsubmerged implants: Results after 1 year of loading. Int J Oral Maxillofac Implants 2001; 16:731–736.
10. Polizzi G, Fabbro S, Furri M, Herrmann I, Squarzoni S. Clinical application of narrow Branemark system implants for single-tooth restorations. International Journal of Oral & Maxillofacial Implants 1999; 14: 496–503.
11. V igolo P, Givani A, Majzoub, Z, Cordioli G Clinical evaluation of small-diameter implants in single-tooth and multiple-implant restorations: a 7-year retrospective study. International Journal of Oral & Maxillofacial Implants 2004; 19: 703–709.
12. A mer A. J. Al-Khazraji. Influence of dental implant diameter on implant success. Iraqi Dental Journal 2014; 36:1.
13. Davarpanah M, Martinez H, Tecucianu JF, Celletti R, Lazzara R. Small-diameter implants: indications and contraindications. J Esthet Dent. 2000; 12:186–194.
14. Comfort MB, Chu FC, Chai J, Wat PY, Chow TW. A 5-year prospective study on small diameter screw shaped oral implants. J Oral Rehabil 2005; 32:341-345.
15. Degidi M, Piattelli A, Carinci F: Clinical outcome of narrow diameter implants: a retrospective study of 510 implants. J Periodontol 2008; 79: 49-54.
16. Anitua E, Errazquin JM, de Pedro J, Barrio P, Begona L, Orive G. Clinical evaluation of Tiny 2.5- and 3.0-mm narrow-diameter implants as definitive implants in different clinical situations: A retrospective cohort study. Eur J Oral Implantol 2010; 3:315–322.
17. Spiekermann H, Jansen VK, Richter EJ. A 10-year follow-up study of IMZ and TPS implants in the edentulous mandible using bar-retained overdentures. Int J Oral Maxillofac Implants 1995; 10:231–243.
18. P King, C Maiorana , R G Luthardt , K Sondell , Land J, Moreno PG, Nilsson P. Clinical and Radiographic evaluation of a Small-Diameter Dental Implant used of the restoration of patients with permanent tooth agenesis (Hypodontia) in the Maxillary Lateral Incisor and Mandibular Incisor Regions: A 36-Month Follow- up IntJProsthodont 2016; 29:147-153.
19. Zinsli B, Sagesser T, Mericske E, Mericske, Stern R. Clinical evaluation of small-diameter ITI implants a prospective study. Int J Oral Mazillofac Implants 2004; 19:92-99.
20. Olate S, Lyrio MC, de Moraes M, Mazzonetto R, Moreira RW. Influence of diameter and length of implant on early dental implant failure. J Oral MaxillofacSurg 2010; 68:414-419.
21. C ehreli MC, Akca K. Narrow-diameter implants as terminal support for occlusal three-unit FPDs: a biomechanical analysis. Int J Periodontics Restorative Dent 2004; 24:513–519.