Radiographic Evaluation of Marginal Bone Levels of Implant – A Cross Sectional Study

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Abstract: Background: Bone loss is normally seen after the dental implant placement that extends to the first thread of the implant body or till the first contact of the bone with the roughness of implant surface. Such type of bone loss is dependent on the site of the crest of implant in association with the alveolar crest, the formation of the interface between the implant parts and bone. The present study was conducted to determine the prevalence of marginal bone loss amongst two different implant groups.

Materials and methods: The cross sectional study was conducted at our center. Patients with implant supported prosthesis functioning for more than 2 year were called for follow up visit. Clinical examination pertaining to implant and prosthesis was done. Intraoral periapical radiographs of all subjects were obtained with paralleling technique using Rinn XCP (extension cone paralleling) device (Dentsply sironaltd). Radiographic evaluation of marginal bone loss was done with help of Adobe Photoshop software (CS3 version9).

Results: The mean marginal bone loss on mesial side of group 1 was 0.22 while for group 2 was 0.5. mean marginal bone loss on distal side was 0.16 for group1 and 0.42 for group 2.

P value shows statistically significant difference between mesial and distal marginal bone loss of both groups indicating less amount of bone loss in group 1.

Conclusion: The study showed better maintenance of bone levels in group 1 implants after 2 year follow up period compared to bone loss observed in group 2 implants. Further studies are still required to support the inference of our study results also other factors like patient factors, implant related factors must be considered for future analysis.

Keywords: implant, marginal bone, Osstem, Dentium, radiographs, bone loss.

Introduction: Bone loss is normally seen after the dental implant placement that extends to the first thread of the implant body or till the first contact of the bone with the roughness of implant surface.[1] Marginal bone loss is assessed radiographically and is normally no more than 1.5 mm in the first year.[2] A retrospective cross-sectional study by Cecchinato showed that the vast majority (70%) of the subjects included in study exhibited no bone loss during a follow-up period of close to 5 years. Further, in the same interval, the majority of the implant sites (>80%) remained without signs of marginal bone loss. Only 8% of subjects and 4% of implant sites presented with marginal bone loss >2 mm. In the "diseased"subjects that returned for a clinical examination,the prevalence of sites with

advanced bone and deep pockets was small.[3] The timing of radiographic assessment is crucial. In some researches the first X-ray was obtained on placing the prosthesis, while in other researches it is taken on placement of the implant.[4] Longitudinal researches with initial radiographs obtained at implant positioning showed significant bone loss before placement of the definitive restoration.[5] Such type of bone loss is dependent on the site of the upper part of the implant in association with the alveolar crest, the formation of the interface between the implant parts, and the type of neck and platform of implant. The present study was conducted to determine the prevalence of marginal bone loss levels amongst two different implant groups which were placed at our center.

Materials and methods: The Cross sectional study was conducted at Government Dental Hospital, Ahmedabad. Sample of 80 patients with implant supported prosthesis in function for more than 2 year were called for follow up visit. Total of 110 implants in 80 patients, placed in maxillary and mandibular posterior region were considered for evaluation based on selection criteria. From the 110 implants two groups were made, group 1 included 53 implants of Osstemand group 2 included 57 implants of Dentium.

Inclusion criteria: Absence of any local or systemic disease. Implants that had been placed at least 3 months after healing of extraction socket. 1–3 missing teeth in posterior region of the maxilla or mandible. Implantplaced according to delayed loading protocol.

Exclusion criteria:- General health conditions that counter indicated implant surgery. Patients having parafunctional habits. Subjects that required bone augmentation and unconventional procedure during implant procedures.Habit of smoking, metabolic disorders and poor oral hygiene.

All the subjects were informed about the study and a written consent was obtained from them.

Clinical examination pertaining to implant and prosthesis was done.Intraoral periapical radiographs of all subjects were obtained with paralleling technique with Rinn XCP (extension cone paralleling) device (Dentsply Sirona ltd). Radiographic assessment of marginal bone loss was done with help of Adobe photoshop software(CS 3 version9). Implant shoulder was taken as reference for assessing the bone levels and evaluating amount of bone loss(figure1). All the radiographs were taken by experienced oral radiologist. Allthe data thus obtained was arranged in a tabulated form and analysed using Microsoft excel.

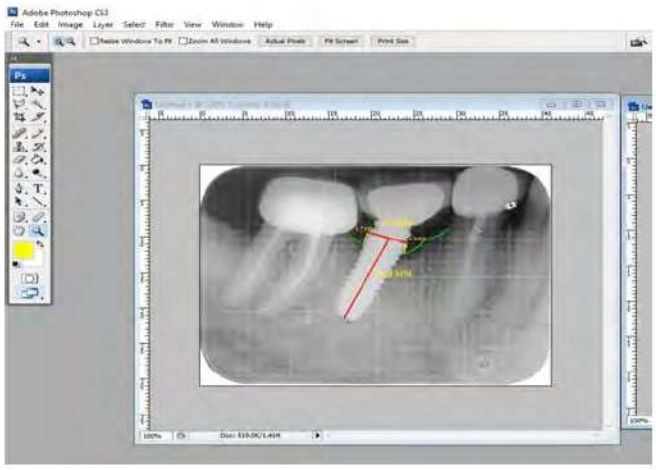


Figure 1: Evaluation of marginal bone loss in adobe photoshop software.

Results: Statistical analysis include descriptive analysis (mean±SD) and unpaired 'T' test. As the number of subjects included in the clinical examination was small, no attempts were made to analyse the effect of risk indicators such as oral hygiene levels, smoking, history of periodontitis and diabetes, presence and severity of bone loss and peri-implantitis.

Total of 78 patients with 110 implants (53 implant in group 1and 57 implant in group 2) were assessed radiographically to evaluate the amount of bone

loss. The mean age of the 78 subjects included in the study was 45 ± 10 years. Table 1 shows mean value of the bone loss on mesial and distal side, their standard deviation and P-value.

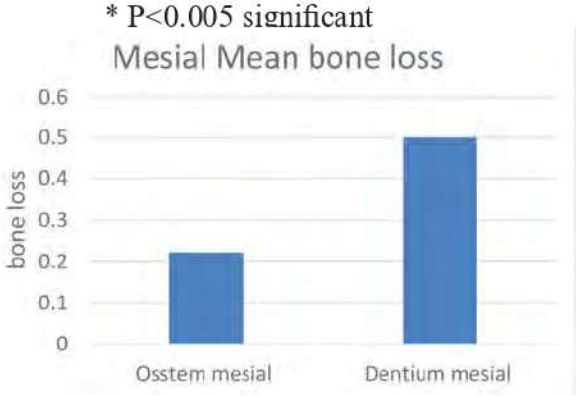
Results show that difference in mean marginal bone loss on mesial is statistically between group 1 and group 2 with a P-value of 0.0018.

Also difference in mean marginal bone loss of distal side is statistically significant with a P-value of 0.0047.

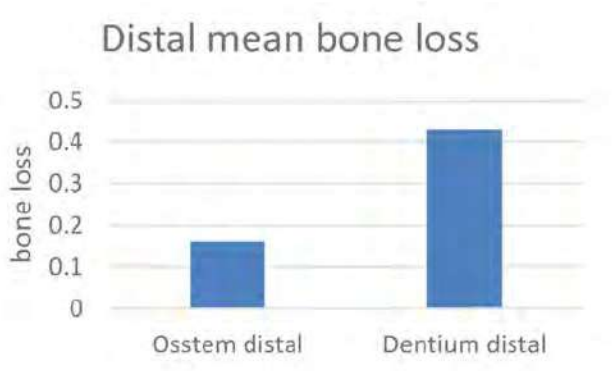
Table 1: Descriptive statistics showing mean, standard deviation and P value.

Group	Site	Mean	Standard deviation	P value
1 (Osstem)	Mesial marginal bone loss	0.22	0.28	0.0018 *
2 (Dentium)	Mesial marginal bone loss	0.5	0.57	
1 (Osstem)	Distal marginal bone loss	0.16	0.22	0.0047 *
2 (Dentium)	Distal marginal bone loss	0.42	0.63	

* P<0.005 significant



Graph 1:- Mean marginal bone loss of mesial side of group 1 and group 2



Graph 2:- Mean marginal bone loss of distal side of group 1 and group 2

Its signifies that group 1 implants shows better bone level maintenance and less amount of bone loss after 2 year of functioning, however this statistical difference may be attributable to patient related factors, implant related factors and demographic conditions.

Discussion: In the present study, subjects from only one center were included for the study. The patients were recalled for regular follow up visit upto1 year. The overall mean amount of radiographic marginal bone loss that had occurred after the 2 year interval, starting from post-loading was analysed during the study. It shows that group 1 implants shows less marginal bone loss in comparison to group 2 implants but due to certain factors not selected in our study demands more research in this area to support results of our study. Other factors related to implant and surrounding environment, host factors, bio mechanical aspects must be taken in to consideration in future studies to minimize the bias in study. Many implants systems in research field are evolving everyday. Every implant manufacturing company established till now claims their implant system to be (superior) in the competing field of implant dentistry. The general/overall design of root form implant remains the same, however there are minor modifications in implant design, material and surface treatment of each system are done. For long term success and survival of implant, good

osseointegration of implant with the host bone and maintenance of marginal bone levels is the prime requisite. Implant success criteria, regarding marginal bone loss and other parameters, were first suggested in 1986 and today are still frequently referred to as the gold standard for implant success. However, according to the recent abundance of data on marginal bone loss and a better understanding of bone and soft tissue behaviour around the implant neck and body, these criteria are inaccurate for the wide variety of implant systems. Implant systems differ in neck configurations and lengths and micro configurations of the implant body. Moreover, implants can be classified into one- and two-piece. The recovery duration for implants is same to physiology of bone tissue healing. The researches of titanium implants have illustrated that the technique of healing can be classified in three stages: osteophilic, osteoconductive and osteoadaptive.[6] The accomplishment of therapy is primarily surgical, esthetic and functionally acceptable only if there is adequate type of bone and gums. The total amount of bone loss during the year may alter the depth sulcus and environment for the prolonged existence of the dental implant.[7]

Conclusion: Within the limitations of this study, it can be concluded that implants of the group 1 shows better maintenance of bone levels while bone loss in group 2 is comparatively more. To analyze the prevalence of bone loss in future studies, consistent case selections should be applied to large randomly selected population samples with adequate size and function time and generalize the implant related factors.

References:

1 Astrand P, Engquist B, Dahlgren S, Gröndahl K, Engquist E, Feldmann H. Astra Tech and Brånemark system implants: a 5-year prospective study of marginal bone reactions. Clin Oral Implants Res. 2004;15:413-20.

2 Weber HP, Buser D, Fiorellini JP, Williams RC. Radiographic evaluation of crestal bone levels adjacent to nonsubmerged titanium implants. Clin Oral Implants Res. 1992;3:181-8.

3 Cecchinato D, Parpaiola A, Lindhe J. A cross-sectional study on the prevalence of marginal bone loss among implant patients. Clinical oral implants research. 2013 Jan;24(1):87-90.

4 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.

5 Hermann JS, Cochran DL, Nummikoski PV, Buser D. Crestal bone changes around titanium implants. A radiographic evaluation of unloaded nonsubmerged and submerged implants in the canine mandible. J Periodontol1997;68:1117-30.

6 Brägger U, Gerber C, Joss A, Haenni S, Meier A, Hashorva E, et al. Patterns of tissue remodeling after placement of ITI Dental Implants using an osteotome technique: A longitudinal radiographic case cohort study. Clin Oral Implants Res 2004;15:158-66.

7 Misch CE. Dental implant prosthetich; Library of CongresCataloging in-Publicatioin Data. St Louis: Mosby; 2005.

8 Nickenig HJ, Wichmann M, Schlegel KA, Nkenke E, Eitner S. Radiographic evaluation of marginal bone levels adjacent to parallel-screw cylinder machined-neck implants and rough-surfaced microthreaded implants using digitized panoramic radiographs. Clin Oral Implants Res. 2009. Jun;20(6):550–4.

9 Lee SY, Piao CM, Koak JY, Kim SK, Kim YS, Ku Y, et al. A 3-year prospective radiographic evaluation of marginal bone level around different implant systems. J Oral Rehabil. 2010. Jul;37(7):538–44. 10.1111/j.1365-2842.2010.

10 Shin YK, Han CH, Heo SJ, Kim S, Chun HJ. Radiographic evaluation of marginal bone level around implants with different neck

designs after 1 year. Int J Oral Maxillofac Implants. Int J Oral Maxillofac Implants. 2006. Sep-Oct;21(5):789–94.

11 Canullo L, Fedele GR, Iannello G, Jepsen S. Platform switching and marginal bone-level alterations: the results of a randomized-controlled trial. Clin Oral Implants Res. 2010. Jan;21(1):115–21. 10.1111/j.1600-0501.2009.01867.x

12 Fickl S, Zuhr O, Stein JM, Hürzeler MB. Peri-implant bone level around implants with platform-switched abutments. Int J Oral Maxillofac Implants. 2010. May-Jun;25(3):577–81.

13 Prosper L, Redaelli S, Pasi M, Zarone F, Radaelli G, Gherlone EF. A randomized prospective multicentertrialevaluatingtheplatform-switching technique for the prevention of postrestorative crestal bone loss. Int J Oral Maxillofac Implants. 2009. Mar-Apr;24(2):299–308.

14 Annibali S, Bignozzi I, Cristalli MP, Graziani F, La Monaca G, Polimeni A. Peri-implant marginal bone level: a systematic review and meta-analysis of studies comparing platform switching versus conventionally restored implants. J Clin Periodontol. 2012. Nov;39(11):1097–113.

15 Kahnberg KE. Implant Surgery in the Posterior Region of the Jaws. Acta Stomatol Croat. 2005;39(3):245.