ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

Estimation of crestal bone loss in single posterior implant assessed at different post operative follow ups: A cone beam computed tomography based original research study

AmitBLall[1]

[1]Professor & Head, Department of Oral and Maxillofacial Surgery, Santosh Dental College and Hospitals, SantoshDeemed to be University, Ghaziabad, Delhi-NCR, India

Corresponding Author:
Dr. AmitBLall
Email: dr_abl@yahoo.com

ABSTRACT

Aim: The ultimate aim of this study was to assess crestal bone loss in single posterior implant assessed at different post operative follow ups using cone beam computed tomography.

Materials & Methods: The study was conducted in the department of oral and maxillofacial surgery wherein cone beam computed tomography was used as standard radiography to determine exact bone levels at two post osteotomy phases. Total twelve subjects were selected by randomized sampling procedure which included both male and females in the age range of 26-41 years. Actual bone loss evaluations were completed by comparative estimation of cone beam computed tomography records (of one month and six month post operative follow up). It was attempted at all four surfaces (mesial, distal, buccal and lingual) at mandibular first molar region. All data was entered in master chart and sent for basic statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

Statistical Analysis and Results: Statistical software i.e., Statistical Package for the Social Sciences version 21.0was utilized for analysis. Maximum 5 participants were reported in first age group of 26-29 years whereas minimum one participant was reported in fourth age group of 38-41 years. Maximum mean crestal bone loss was confirmed at lingual surface and minimum mean bone loss was recognized at buccal surface at second follow-up stage. Level of significance (p value) was highly significance for distal and lingual surfaces. 95% coefficient interval was measured maximum and minimum at distal and mesial surfaces. Pearson chi-square value was maximum at buccal surface and minimum at distal surface.

Conclusion: Within the limitations of the study, authorconcluded few very striking assumptions.Considerablecrestal bone loss was noticed in all patients.Maximum mean bone loss was confirmed at lingual sides while minimum bone loss was seen at buccal sides. Because the implant crestalbone loss is very subjective and depends on several host related factors, inferences of this study should be clinically correlated.

Key words: Cone Beam Computed Tomography; Bone Loss, Implant, Osteotomy

I. INTRODUCTION

The ultimate fate of any dental illness is generally characterized by loss of partial or complete dentition. Literature has evidenced several techniques and ways to replace missing teeth by

ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

removable or fixed ideology.[1,2,3]Worldwide, there is a shifting trend towards fixed therapy for tooth rehabilitation. Since the conservation of tooth is also a critical factor, a clear inclination towards implant therapy has been noticed in developing as well as developed countries.[4,5]Moreover, traditional fixed crown and bridges jeopardize the existing tooth exposure with increased risk of pulpal exposure especially in younger patients.[6,7,8,9] Implant dentistry have been extremely popular these days since it does not involve unnecessary tooth preparation. It is also considered safe in terms of pulpal involvements of abutment teeth.[10,11,12] However, implant therapy has its own limitations and surgery related risks. Many studies have evaluated short term and long term success of implant. Most of the studies are focused around the evaluations of bone loss around the implant in post operative phases.[13,14,15]Albrektsson and associates were in the initial researchers who presented implant success criteria. They stated that crestal bone loss up to one mm in the first year is clinically accepted.[16,30] Additionally, they mentioned that these bone losses are because of the normal bony physiology and remodeling processes hence cannot be avoided. Therefore, implant designs, techniques and other prosthetic measures must be directed to limit bone losses within these ranges.[17]The ultimate aim of this study was to assess crestal bone loss in single posterior implant assessed at different post operative follow ups using cone beam computed tomography.

II. MATERIALS & METHODS

Crestal bone loss around dental implant is one of the most unavoidable phenomenons which take place in post operative phases. It shows different pattern depending on osteotomy, hygiene, habits and host related factors. Standard and accepted bone loss pattern had been described originally by Albrektsson. Clinicians have sought to minimize this dilemma since long time. This study was conducted in the department of oral and maxillofacial surgery of the institute in which crestal bone loss was studied around implant placed in right mandibular first molar region. Firstly, a rough draft was prepared and abstracted to finalize the objectives of the study. The study outline and planning was presented to institutional ethical committee for clearance. Case selection and other preparations were started after approval of institutional ethical committee.Cone beam computed tomography was used as standard radiography to quantifycorrect bone levels at two post osteotomy phases i.e., one month and six month. Initially, subjects were screened carefully those willing for implant therapy for missing right mandibular first molar. Total twelve subjects were selected by randomized sampling procedure. It included both male and females in the age range of 26-41 years.Subjects with any underlying systemic disease, history of smoking, mentally retarded andblood dyscrasias were excludedfrom the study. Strict sterilization protocols were ensured during implant placement procedures. Primary impressions were made and casts were retrieved to fabricate surgical template prior to surgery. It was utilized in all cases to ascertain uniform and accurate location of first drill. Procedure was completed under local anesthesia.Initial drill and other drilling sequences were followed exactly as per manufacturer's instructions and kept uniform in all twelve subjects. This was to rule out any bias related to technique and armamentarium.Author ensured to keep the angulations and other crucial specifications of implant placement constant in all twelve cases. All cone beam computed tomography records made after one month surgery was categorized under group one. Cone beam computed tomography records made after six month surgery was categorized under group two.Actual bone loss calculations were completed by comparative estimation of cone beam computed tomography records (of one month and six month post operative follow up) ofall four surfaces (mesial, distal, buccal and lingual) at mandibular first molar region. Personal

ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

identity and other demographic details of the subjects were not disclosed anywhere. All participating subjects had been informed about implication and purpose of the study. Signed informed consent was obtained and all privacy and other rights of the subjects were kept completely confidential. All data was entered in master chart and sent for basic statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

III. STATISTICAL ANALYSIS ANDRESULTS

All measured data was inserted in master chart and sent for basic statistical analysisusing statistical software Statistical Package for the Social Sciences version 21.0 (IBM Inc, NY, United States of America). P value less than 0.05 was taken as significant ($p< 0.05$).Table 1 and graph 1 show that 9 males and 3 females were included in the study and segregated into four age groups of three each. In the third age group of 34-37 years, p value was highly significant. Measured value was 0.01. Maximum 5 participants were reported in first age group of 26-29 years. Minimum one patient was seen in fourth age group of 38-41 years. Table 2 demonstrates statistical analysis with mean, standard deviation and standard error calculations for all 12 sites. Maximum mean crestal bone loss was noticed at lingual surface and minimum mean bone loss was indentified at buccal surface at second follow-up stage. Maximum standard deviation was at mesial surface while minimum standard deviation was at distal surface. Similarly, maximum and minimum standard error was noticed at buccal and distal surfaces respectively. Table 3 illustrates statistical analysis with 95% coefficient interval, Pearson chi-square value, df and level of significance (p value) calculations for all 12 sites. Level of significance (p value) was highly significance for distal and lingual surfaces. It was 0.02 for distal surface and 0.01 for lingual surface. 95% coefficient interval was measured maximum and minimum at distal and mesial surfaces. Pearson chi-square value was maximum at buccal surface and minimum at distal surface.

Table 1: Age & gender related demographics of participants

Age Group (Yrs)	Male	Female	Total	P value
26-29	4	1	5	0.50
30-33	2	1	3	0.06
34-37	2	1	3	0.01*
38-41	1	-	1	0.48
Total	9	3	12	***p<0.05 significant**

Table 2: Statistical analysis with mean, standard deviation and standard error calculations for all 12 sites

S. N.	Variables [n=12]	Mean Bone Loss mm	Standard Deviation	Standard Error
1	Mesial Surface	0.34	0.635	0.637
2	Distal Surface	0.69	0.093	0.083
3	Buccal Surface	0.21	0.425	0.820
4	Lingual Surface	0.71	0.541	0.023

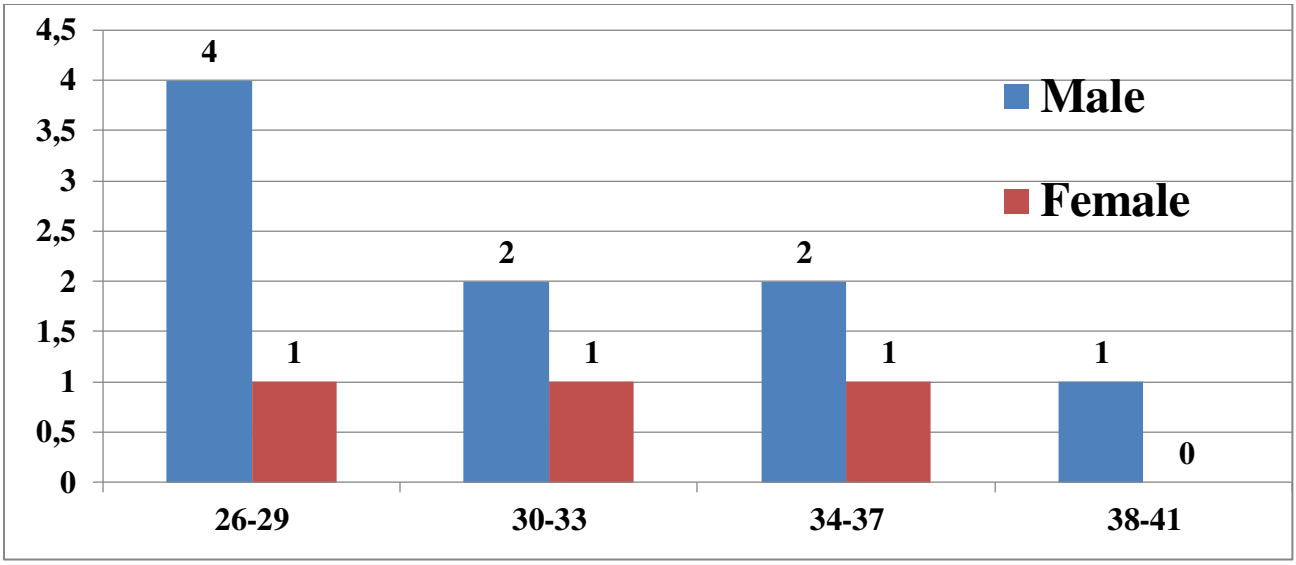
Table 3: Statistical analysis with 95% coefficient interval, Pearson chi-squarevalue, df and level of significance(p value) calculations for all 12 sites

S. N.	Variables [n=12]	95% CI	Pearson	df	Level of

ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

			Chi-Square Value		Significance (p value)
1	Mesial Surface	1.02	1.839	1.0	0.10
2	Distal Surface	1.64	1.435	2.0	0.02*
3	Buccal Surface	1.16	2.002	1.0	0.50
4	Lingual Surface	1.28	1.725	1.0	0.01*
					*p<0.05 significant

Graph 1: Age & gender related demographics of participants



IV. DISCUSSION

One of the most explored clinical dilemmas of implant therapy is crestal bone loss and their effects of implant survival.[19,20] Researchers have shown several significant factors those are directly or indirectly responsible for bone loss around implant.[22,23,24] Moreover, crestal bon loss around implant cannot be completely controlled since it is related to normal physiology and cellular changes of alveolus.[25,26] Few of the noteworthy factors of periimplant bone loss include type of graft used, amount of bacterial activity, status of underlying systemic disease, attitude towards teeth cleaning, history of tobacco habit, site of implant osteotomy and operator surgical expertise.[27,28,29,31,32] Our study result showed that maximum bone loss is seen on the lingual surface followed by distal surface. Buccal surface was least involved with this problem. However, it only explored around mandibular first molar region. Bali and associates studied about clinical and radiological inferences of dental implants in terms of surrounding bone and timing of placement.[1]They found considerable crestal bone loss in both mesial and distal sides. They evaluated bone loss in three months and six month post operative periods. There results were highly comparable with our inferences since they also noticed continued bone loss after implant placement. In a recent study conducted by Bajaj and colleagues, crestal bone loss surrounding dental implants was studied. They also evaluated the effects of using diode laser on bone loss in placement of gingival former. They found significant bone loss soon after implant

ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

placement however, they did not noticed any significant effect of diode laser on bone loss.[5]Uppala and co-workers have studied in detail about implant crestal bone loss and effects of utilizing prp on it. Their study confirmed that clinical use of prp reduces bone loss process around implant. It may be attributed to it capability to interfere with the normal bone remodeling processes around implant.[6]Prosper and associates had explored the clinical effect of the platform switching procedure for the reducing post-operative crestal bone loss. They studied total three hundred sixty dental implants in two years at different centers. They concluded that platform switching is a effective designs modification that effectively prevent crestal bone loss.[18]Annibali and coworkers had assessed long term implant survival in implants with traditional and platform switching design. They also found platform switching design very effective in reducing the rate of bone resorption around implants.[21]

V. CONCLUSION

Within the limitations of the study, authorconcluded that there were significant crestal bone losses in post operative follow up phases in the studied patients. Cone beam computed tomography has enabled us to perfectly define quality and quantity of the bone and other minute details. Inferences of present study were highly comparable and imperative. Measured crestal bone loss showed increasing pattern from one month post operative phase to six month post operative phase. Maximum mean bone loss was confirmed at lingual sides while minimum bone loss was seen at buccal sides. Since the implant crestalbone loss is very subjective and depends on several host related factors, presumptions of this study must be clinically correlated.

REFERENCES

1. Bali A, Jindal M, Goel A, Gupta V, Dadwal A,Chauhan S. Comparative evaluation of clinical and radio-graphical outcomesof immediate versus delayed dental implant placement: A prospective study.Indian J Dent Sci 2019;11:133-7.
2. Nayak R, Devanna R, Dharamsi AM,Shetty J, Mokashi R, Malhotra S. Crestal Bone Loss aroundDental Implants: Platform Switching *vs*Platform Matching—ARetrospective Study. J Contemp Dent Pract 2018;19(5):574-578
3. Yadav R, Agrawal KK, Rao J, Anwar M, Alvi HA, Singh K, Himanshu D. Crestal Bone Loss under Delayed Loading of Full Thickness Versus Flapless Surgically Placed Dental Implants in Controlled Type 2 Diabetic Patients: A Parallel Group Randomized Clinical Trial. J Prosthodont. 2018 Aug;27(7):611-617.
4. Dereci Ö, Mumcu E. The Evaluation of the Relationship between Loading Time and Crestal Bone Loss around Dental Implants at 12 Months Control Evaluation after Loading. J Long Term Eff Med Implants. 2020;30(4):295-300.
5. Bajaj S, Rani S, Issar G, Sethi U, Kumar S, Mishra S. Comparative evaluation of crestal bone levels around endosseous implants as influenced by conventional and diode laser during second-stage surgery in mandibular implant-supported overdenture: An in vivo study. J Indian Prosthodont Soc. 2020 Jan-Mar;20(1):52-60.
6. Uppala S, Parihar AS, Modipalle V, Manual L, Oommen VM, Karadiguddi P, Gupta P. Crestal bone loss around dental implants after implantation of Tricalcium phosphate and Platelet- Rich Plasma: A comparative study. J Family Med Prim Care. 2020 Jan 28;9(1):229-234.

ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

7. Krhen J, Canjuga I, Jerolimov V, Krhen T. Implant stability measurementsix weeks after implantation. ActaStomatol Croat.2009;43(1):45-51.
8. Marx RE, Ehler WJ, Peleg M. "Mandibular and facial reconstruction"rehabilitation of the head and neck cancer patient. Bone.1996 Jul;19(1 Suppl):59S-82S.
9. Živko-Babić J, Jakovac M, Carek A, Lovrić Ž. Implanto-prosthetictherapy of a missing front tooth. ActaStomatol Croat.2009;43(3):234-241.
10. Misch CE. Dental implant prosthetics; Library of Congress Catalogingin-Publication Data. St Louis: Mosby; 2005.
11. Nickenig HJ, Wichmann M, Schlegel KA, Nkenke E, Eitner S. Radiographicevaluation of marginal bone levels adjacent to parallel-screw cylinder machined-neck implants and rough-surfacedmicro-threaded implants using digitized panoramic radiographs.Clin Oral Implants Res. 2009 Jun;20(6):550-4.
12. Piao CM, Lee JE, Koak JY, Kim SK, Rhyu IC, Han CH, et al. Marginalbone loss around three different implant systems: radiographicevaluation after 1 year. J Oral Rehabil. 2010 Jul;37(7):538-44.
13. Lee SY, Piao CM, Koak JY, Kim SK, Kim YS, Ku Y, et al. A 3-year prospectiveradiographic evaluation of marginal bone level arounddifferent implant systems. J Oral Rehabil. 2010 Jul;37(7):538-44.
14. Shin YK, Han CH, Heo SJ, Kim S, Chun HJ. Radiographic evaluationof marginal bone level around implants with different neckdesigns after 1 year. Int J Oral Maxillofac Implants. Int J Oral MaxillofacImplants. 2006 Sep-Oct;21(5):789-94.
15. Canullo L, Fedele GR, Iannello G, Jepsen S. Platform switchingand marginal bone-level alterations: the results of a randomizedcontrolledtrial. Clin Oral Implants Res. 2010 Jan;21(1):115-21.
16. Albrektsson T, Chrcanovic B, Östman PO, Sennerby L. Initial and long-term crestal bone responses to modern dental implants. Periodontol 2000. 2017 Feb;73(1):41-50.
17. Fickl S, Zuhr O, Stein JM, Hürzeler MB. Peri-implant bone levelaround implants with platform-switched abutments. Int J OralMaxillofac Implants. 2010 May-Jun;25(3):577-81.
18. Prosper L, Redaelli S, Pasi M, Zarone F, Radaelli G, GherloneEF. A randomized prospective multicenter trial evaluating theplatform-switching technique for the prevention of post-restorativecrestal bone loss. Int J Oral Maxillofac Implants. 2009 Mar-Apr;24(2):299-308.
19. Patil YB, Asopa SJ, Deepa, Goel A, Jyoti D, Somayaji NS, Sabharwal R. Influence of Implant Neck Design on Crestal Bone Loss: A Comparative Study. Niger J Surg. 2020 Jan-Jun;26(1):22-27.
20. Veis A, Parissis N, Tsirlis A, Papadeli C, Marinis G, Zogakis A. Evaluationof peri-implant marginal bone loss using modified abutmentconnections at various crestal level placements. Int J PeriodonticsRestorative Dent. 2010 Dec;30(6):609-17.
21. Annibali S, Bignozzi I, Cristalli MP, Graziani F, La Monaca G, Polimeni A. Peri-implant marginal bone level: a systematic reviewand meta-analysis of studies comparing platform switching versusconventionally restored implants. J ClinPeriodontol. 2012Nov;39(11):1097-113.
22. Goswami MM. Comparison of Crestal Bone Loss along Two Implant Crest Module Designs. Med J Armed Forces India. 2009 Oct;65(4):319-22.

ISSN:0975-3583,0976-2833 VOL12,ISSUE04,2021

23. Kahnberg KE. Implant Surgery in the Posterior Region of the Jaws.ActaStomatol Croat. 2005;39(3):245.
24. Sbordone L, Toti P, Menchini-Fabris GB, Sbordone C, GuidettiF. Implant Success in Sinus-Lifted Maxillae and Native Bone: A3-year Clinical and Computerized Tomographic Follow-up. Int JOral Maxillofac Implants. 2009 Jul-Aug;24(4):695-703.
25. Sbordone L, Levin L, Guidetti F, Sbordone C, Glikman A, Schwartz-Arad D. Apical and Marginal Bone Alterations around Implants inMaxillary Sinus Augmentation Grafted with Autogenous Bone orBovine Bone Material and Simultaneous or Delayed Dental ImplantPositioning. Clin Oral Impl Res. 2011;22:485–91.
26. Sbordone C, Toti P, Guidetti F, Califano L, Pannone G, SbordoneL. Volumetric changes after sinus augmentation using blocks ofautogenous iliac bone or freeze-dried allogeneic bone. A nonrandomizedstudy. J Craniomaxillofac Surg. 2014 Mar;42(2):113-8.
27. Sbordone C, Toti P, Ramaglia L, Guidetti F, Sbordone L, MartuscelliR. A 5-year clinical and computerized tomographic implantfollow-up in sinus-lifted maxillae and native bone. Clin Oral ImplantsRes. 2014 Sep;25(9):1056-64.
28. RasouliGhahroudi AAR, Talaeepour AR, Mesgarzadeh A, RoknAR, Khorsand A, Mesgarzadeh NN, KharaziFard MJ. RadiographicVertical Bone Loss Evaluation around Dental Implants FollowingOne Year of Functional Loading. Clin Oral Implants Res. 2014Sep;25(9):1056-64.
29. Boronat A, Penarrocha M, Carrillo C, Marti E. Marginal bone lossin dental implants subjected to early loading (6 to 8 weeks postplacement)with a retrospective short-term follow-up. J Oral MaxillofacSurg. 2008 Feb;66(2):246-50.
30. Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-termefficacy of currently used dental implants: a review and proposedcriteria of success. Int J Oral Maxillofac Implants. 1986 Summer;1(1):11-25.
31. Astrand P, Engquist B, Anzen B, Bergendal T, Hallman M, KarlssonU, et al. A three-year follow-up report of a comparative studyof ITI Dental Implants and Branemark System implants in thetreatment of the partially edentulous maxilla. Clin Implant Dent Relat Res. 2004;6(3):130-41.
32. Becker W, Becker BE, Israelson H, Lucchini JP, Handelsman M,Ammons W, et al. One-step surgical placement of Brĺnemark implants:a prospective multicenter clinical study. Int J Oral MaxillofacImplants. 1997 Jul-Aug;12(4):454-62.