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Evaluation of crestal bone loss around implants at different time periods in mandibular implant overdenture patients: One year follow up (original research) study

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***Abstract*---**Background and Aim: Crestal bone loss around dental implants is an inadvertent phenomenon. Many clinical measures have been proposed for this dilemma. This study was conducted to evaluate the crestal bone loss around implants at different time periods in mandibular implant overdenture patients. The study was completed in one year follow up timing. Materials & Methods: Total 15 patients were selected for implant overdenture rehabilitation therapy including male and female patients. Complete dentures were fabricated by standard manner and delivered. Two implants were placed in each patient bilaterally. Group I consist of the implants placed in the right side of mandible while and Group II consist of implants placed in the left side of mandible. The mesial, distal, buccal and lingual bone level around the dental implants was evaluated in detail by advanced radiographic technique CBCT. These CBCT assessments were performed after 3 months, 6 months, 9 months and 12 months timings. P value less than 0.05 was considered significant ($p< 0.05$). Statistical Analysis and Results: Statistical analysis was conducted by using statistical software Statistical Package for the Social Sciences. Out of 15 patients, males were 10 and females were 5. P value was significant in age group III of age range 51-60 years. On comparison among the 2 study groups using one-way ANOVA, p value was highly significant (0.001). Two sample t- test assessment of mean score and standard deviation in both the study groups confirmed highly significant p value for group I and non significant p value for group II. The overall mean score of the crestal bone loss was higher in group one than group two. Conclusion: In the present study, the mean crestal bone losses were high at mesial surfaces followed by distal surface, buccal surface and lingual. The mean crestal bone losses were slightly greater in group I when compared with group II.

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Keywords---cone beam computed tomography, bone loss, implant, overdenture, prosthodontics.

Introduction

Crestal bone loss is a very common clinical dilemma in dental implantology. This problem is apparently unavoidable and very cumbersome in clinical settings. The crestal bone loss in jaw bone is frequently associated with underlying systemic diseases like diabetes mellitus and high blood pressure.[1,2] Literature has well evidenced that crestal bone losses of the jaws are common in females. Literature also proposed various schools of thoughts in its support.[3] Albrektsson and associates have researched alveolar crestal bone loss very extensively in their several studies.[4] They have also given universally accepted implant successful criteria. These criteria clearly indicated about the patterns and minimally accepted amount of bone loss after implant placement. Furthermore, they stated that these bone losses are high in the first year of osteotomy.[5,6] After first year of implant placement there is a clear declining pattern of bone loss. Nevertheless, crestal bone loss is dependent on several other local and systemic factors. These factors can further worsen the extent and amount of bone loss. Bone loss is inversely proportional to the success of the implant therapy.[7,8,9] The higher the bone loss, the lower the success rate of implant. Clinicians must take care and employ significant precautionary measures to minimize bone loss. This study was conducted to evaluate the crestal bone loss around implants at different time periods in mandibular implant overdenture patients. The study was completed in one year follow up timing.

Materials & Methods

This study was planned and finalized to evaluate the crestal bone loss around implants at different time periods in mandibular implant overdenture patients. The study was solely conducted in the department of Prosthodontics of the institute. Author endeavored to see the pattern of crestal bone loss in one year post osteotomy period. Initially completely edentulous patients were convinced for implant overdenture therapy. Patients were originally screened form the opd of the department. After explaining the treatment procedure in detail, total 15 patients were ready for implant overdenture rehabilitation regime. Both male and female patients were entertained for the study with no selection bias. Inclusion criteria included patients without any underlying systemic disease and bleeding disorder. Malnourished patients, patients on some other medication and patents with follow up issues were excluded from the study. Informed consent was obtained from all willing patients. Complete dentures were constructed by usual manner and delivered with all related instructions. All patents were recalled after four months of their denture delivery for the purpose of implant placement in the lower arch. Two implants were placed in each patient bilaterally in the canine region. The osteotomy was performed under strict sterilization. Cover screws were positioned and sutures were closed by standard manner. Following osteotomy, the osteotomy sites were allowed to heal for minimum one month. Group I consist of the implants placed in the right side of mandible while and Group II consist of implants placed in the left side of mandible. So, total 30 implants or implant sites

were studied efficiently in 15 patients. The mesial, distal, buccal and lingual bone level around the dental implants was assessed comprehensively. This was assisted by three dimensional advanced radiographic technique CBCT. The scans were made in all patients at four different time periods in post operative phase. These assessments were performed after 3 months, 6 months, 9 months and 12 months timings. Actual bone losses were estimated by comparing radio-graphical data. Results hence received was entered in table and sent for basic statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

Statistical Analysis and Results

Statistical analysis was conducted by using statistical software Statistical Package for the Social Sciences version 21 (IBM Inc., Armonk, New York, United States of America). The prime endeavor was to estimate and obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI. Table 1 and Graph 1 demonstrated that out of 15 patients, males were 10 and females were 5. All willing patients were studied into 3 age groups based on their ages. 5 participants were belonging to the age range of 31-40 years. P value was significant in age group III of age range 51-60 years. The measured value was 0.01. Maximum 7 patients were noticed in the age range of 41-50 years. Table 2, 3 and Graph 2 illustrates fundamental statistical description with level of significance evaluation using Pearson chi-square test. This was performed for both groups [for Group I and II]. Table 4 show comparison among the 2 study groups using one-way ANOVA [for group I, II]. P value was highly significant (0.001). Table 5 show about Two sample t- test assessment of mean score and standard deviation in both the study groups. P value was highly significant for group I and non significant for group II. The overall mean score of the crestal bone loss was higher in group one than group two. This was applicable at all four studied post operative time periods of 3,6,9 and 12 months.

Table 1: Age & gender wise allocation of patients

Age Group (Yrs)	Male	Female	Total	%	P value
31-40	3	2	5	33%	0.08
41-50	5	2	7	47%	0.20
51-60	2	1	3	20%	0.01*
Total	10	5	15	100%	*Significant
*p<0.05 significant					

Table 2: Essential statistical explanation with level of significance evaluation using pearson chi-square test [for group I]

Sides of Implant	Mean Bone Loss	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Mesial	0.98	0.532	0.930	1.63	1.033	1.0	0.01*
Distal	0.67	0.837	0.035	1.45	2.537	1.0	0.28

Buccal	0.57	0.431	0.251	1.94	2.947	2.0	0.20
Lingual	0.43	0.864	0.644	1.54	1.234	1.0	0.80
*p<0.05 significant							

Table 3: Essential statistical explanation with level of significance evaluation using pearson chi-square test [for group II]

Sides of Implant	Mean Bone Loss	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Mesial	0.93	0.492	0.345	1.49	1.537	1.0	0.02*
Distal	0.71	0.046	0.703	1.04	2.059	1.0	0.50
Buccal	0.59	0.127	0.511	1.78	2.392	2.0	0.90
Lingual	0.48	0.476	0.386	1.12	1.047	2.0	0.10
*p<0.05 significant							

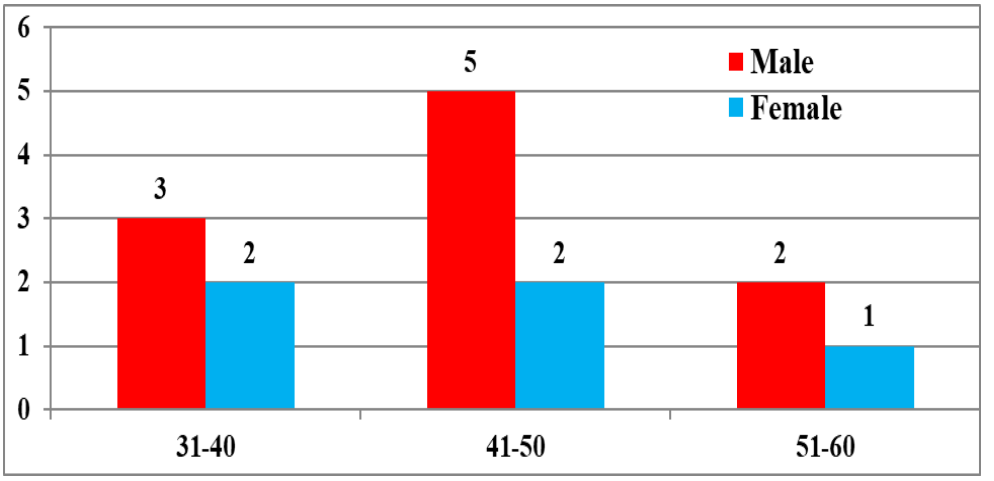
Table 4: Comparison among the 2 study groups using one-way ANOVA [for group I, II]

Variables	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Significance (p)
Between Groups	2	2.049	1.565	4.7	0.001*
Within Groups	23	8.039	0.349	-	
Cumulative	145.43	13.847	-		

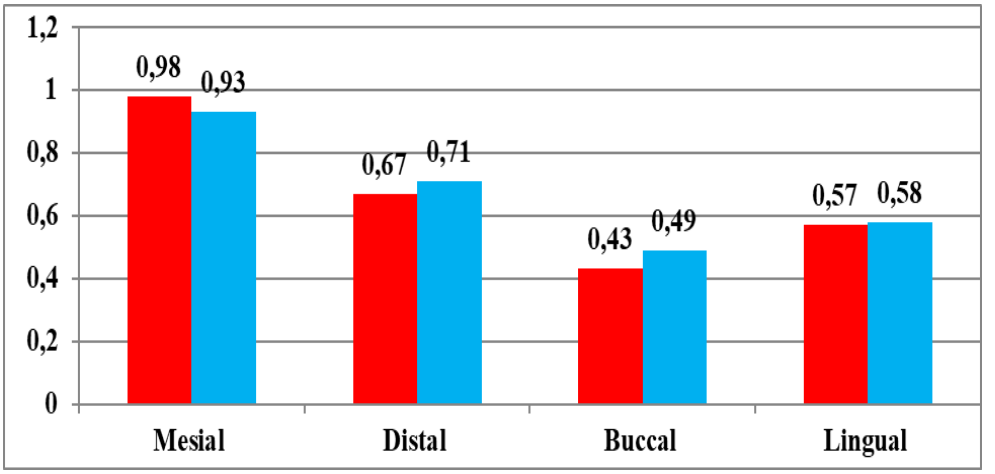
Table 5: Two sample t- test assessment of mean score and standard deviation in both the study groups

Two sample t- test	Group I		Group II	
	Mean Score	SD	Mean Score	SD
After 3 months	6.624	2.68	5.937	1.07
After 6 months	7.215	1.43	5.827	1.85
After 9 months	8.946	1.58	6.013	2.58
After 12 months	9.146	1.23	7.343	2.02
P-value	0.005 (Significant)		0.631(Non-Significant)	

Graph 1: Age & gender wise allocation of patients



Graph 2: Mean bone loss around implants in Group I AND II



Discussion

Albrektsson and coworkers in 1986 had explored efficacy factors for successful implant. They studied these factors in terms of associated crestal bone loss.[10] Since the crestal bone loss is dependent on several local and systemic factors, its amount is varying in different individuals. Various authors and searchers have experienced higher bone loss around the dental implants.[11,12,13] In most of the clinical situations, they are the baseline etiology of implant failure. The peri-implantitis is the underlying bony pathology which initiates or triggers the harmful resorption of bone. The event and development of peri-implantitis is also influenced by the patients habit like tobacco chewing or smoking.[14,15] Many researchers have conducted several studies to check the patterns of bone loss after implant placement.[16,17] The loading protocols of the prosthesis must be attempted after considering all factors of peri-implantitis and associated bone

loss. Clinicians have successfully experimented various growth factors related to minimize bone loss. Different implant surface treatment and modifications also claimed for reducing potential bone loss around dental impants.[18,19] Marx and coworkers in 1998 have introduced platelet-rich plasma growth factor for bone grafts. They stated that these combinations are very useful and efficient in the alveolar repair and healing of traumatized bone. They also stated that this platelet-rich plasma growth factor is very critical in minimizing associated peri-implantitis and crestal bone loss.[20] Clinicians have demonstrated numerous substantial factors those are directly or indirectly accountable for bone loss around implant. Additionally, crestal bone loss is associated with normal physiology and cellular alterations of alveolar bone.[21,22]

Conclusion

Within the limitations of the study author confirmed that crestal bone around the implants are an unavoidable event. It is showing a unique pattern in different post operative phases. The mean crestal bone losses were high at mesial surfaces followed by distal surface, buccal surface and lingual. The similar patterns were noticed in group two also. Additionally, the mean crestal bone losses were slightly greater in group I when compared with group II. These guidelines and information are very important for successful planning and placement of implants. Author also expects other studies to be conducted with larger sample size and wider clinical parameters which could further clarify the bone loss procedure and trigger factors.

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