

**How to Cite:**

Goyal, M. K., Goyal, S., Garg, S. K., Mehendale, A. V., Hegde, A. V., & Kumar, N. (2022). CBCT based assessment of crestal bone loss in patients treated with mandibular implant over dentures: An original research study. *International Journal of Health Sciences*, 6(S4), 6038–6044. <https://doi.org/10.53730/ijhs.v6nS4.9851>

## **CBCT based assessment of crestal bone loss in patients treated with mandibular implant over dentures: An original research study**

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**Abstract**---Aim: The exclusive aim of this study was to assess of crestal bone loss in patients treated with mandibular implant over dentures. Authors utilized three dimensional diagnostic tool i.e. cone beam computed tomography (CBCT) for the study. Materials & Methods: The study was conducted in the department of Prosthodontics of the institute wherein systematic sampling procedure was done to select completely edentulous patients. Complete dentures were fabricated with standard manner with compression moulding technique and heat cure acrylic resin. Cone beam computed tomography was completed to assess the bone quality and quantity at

desired locations. Total 6 male and 6 female patients were included in the study. Group I has the implants of the right side of the mandible and Group II has implant placed on the left side of the mandible. The twenty four implants were studied in detail for bone losses in post operative phases. at mesial, distal, buccal and lingual sides of the dental implants. P value less than 0.05 was considered significant ( $p < 0.05$ ). Statistical Analysis and Results: Statistical analysis was completed by statistical software Statistical Package for the Social Sciences (SPSS). Out of 12 patients, males were six and females were six. 3 patients were in the age range of 41-45 years. P value was significant in age group III of age range 51-55 years. The mean bone loss at mesial surface was 0.30 and 0.31 in group I and group II respectively. P value was significant in here. The measured p value was 0.02 and 0.01 in group I and group II respectively. The mean bone loss at lingual surface was 0.25 and 0.28 in group I and group II respectively. Conclusion: Within the limitations of the study authors concluded that there were evident bone loss around studied dental implant. Nevertheless, these findings were optimal on the mesial sides of almost all implants.

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

## **Introduction**

Until the invention of osseointegrated implant-supported complete dentures, conventional dentures were the only accessible treatment option for completely edentulous patients. Total rehabilitation of the completely edentulous patients by implant supported prosthesis is very popular now days.<sup>1,2,3</sup> It is considered for anchoring the denture with the jaw bone for its long term usage. Many of the researchers have confirmed that residual bone offers support to the complete denture. Also, the overall success of implant supported overdenture depends upon the quality and extent of osseointegration.<sup>4,5,6</sup> Also, it is linked considerably with the primary stability of the dental implants. Crestal bone loss is a very common clinical problem faced by the clinician.<sup>7,8</sup> This clinical dilemma is particularly seen in the post operative phase of the implant. Researchers have tried several measures to diminish these losses. However, these can only be seems to be minimized instead of zero crestal bone loss.<sup>9,10,11</sup> Hence keeping all these interesting factors in the mind, this study was planned to assess of crestal bone loss in patients treated with mandibular implant over dentures with the help of cone beam computed tomography (CBCT).

## **Materials & Methods**

Crestal bone loss is one of the very common clinical dilemmas around the dental implants. This bone loss can be of varying degree, patterns, magnitude and multidirectional. Authors planned to include patients those wearing complete dentures supported by dental implants. Such dentures are frequently referred as mandibular implant supported overdentures. The study was planned and

designed in the department of Prosthodontics of the institute. Systematic sampling procedure was utilized to select completely edentulous patients those willing for complete dentures and later mandibular implant supported overdentures. The source of samples was regular opd footfall of the department. At first, 12 completely edentulous patients were screened and convinced for their voluntary participation in the study. Informed consent was obtained from all participants. Complete dentures were fabricated with standard manner with compression moulding technique and heat cure acrylic resin. Patients were asked to wear the new set of dentures for minimum three months. Cone beam computed tomography was completed to assess the bone quality and quantity at desired locations. Later this cone beam computed tomography was intentionally used to estimate existing crestal bone levels at different time periods in post operative phase. We studied total 6 male and 6 female patients. The inclusion criteria were; completely edentulous jaws with no gross bony anomaly. For the purpose of tabulation and data analysis, the implants were divided in two groups. Group I has the implants of the right side of the mandible and Group II has implant placed on the left side of the mandible. Lastly, the twenty four implants were explored in detail for bone losses in post operative phases. These estimations were made at mesial, distal, buccal and lingual sides of the dental implants. These measurements were attempted by cone beam computed tomography in 5 months post operative phase. Bone losses were estimated by comparing the cbct records. The privacy and other interconnected rights of the patients along with their freedom of expression were kept completely confidential. Results and data was compiled in table and sent for basic statistical analysis. P value less than 0.05 was considered significant ( $p < 0.05$ ).

### **Statistical analysis and results**

All data and details were sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 21 (IBM Inc., Armonk, New York, USA). The refined data was subjected to appropriate statistical tests to obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI. Table 1 and Graph 1 showed that out of 12 patients, males were 6 and females were 6. All willing patients were separated into 4 age groups based on their age ranges. 3 patients were in the age range of 41-45 years. P value was significant in group III of age range 51-55 years. The measured p value was 0.01. Table 2 showed basic statistical description with level of significance evaluation using Pearson chi-square test [for Group I and II]. Group I and group II demonstrated almost similar bone losses. The maximum bone loss was recognized at mesial surface of both groups. The mean bone loss at mesial surface was 0.30 and 0.31 in group I and group II respectively. P value was significant in here. The measured p value was 0.02 and 0.01 in group I and group II respectively. The mean bone loss at distal surface was 0.27 and 0.26 in group I and group II respectively. The mean bone loss at buccal surface was 0.22 and 0.25 in group I and group II respectively. The mean bone loss at lingual surface was 0.25 and 0.28 in group I and group II respectively.

Table 1: age & gender based details of participants

Age Group (Yrs)	Male	Female	Total	P value
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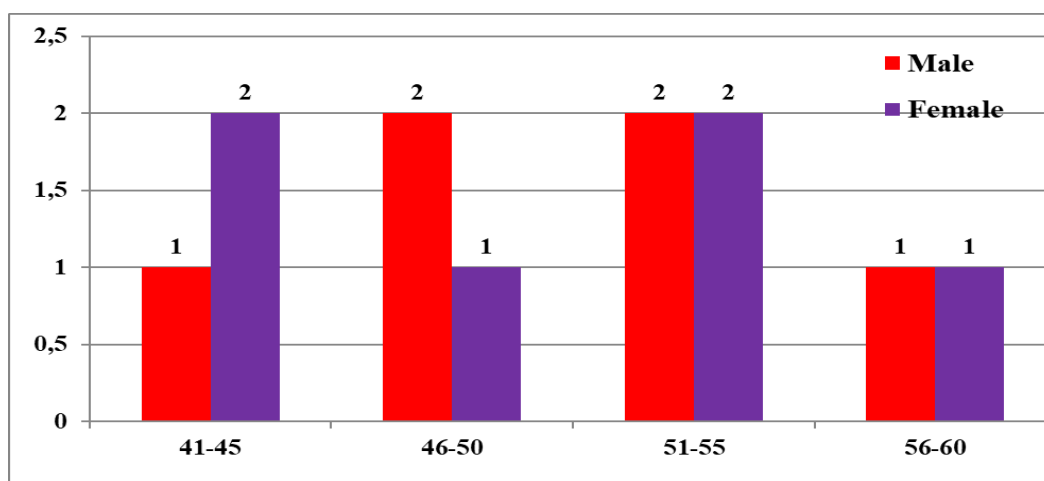
41-45	1	2	3	0.09
46-50	2	1	3	0.10
51-55	2	2	4	0.01*
56-60	1	1	2	0.50
Total	6	6	12	*Significant

\*p<0.05 significant

Table 2: fundamental statistical explanation with level of significance evaluation using pearson chi-square test [FOR GROUP I & II]

FOR GROUP I							
Sides [n=12 each]	Mean Bone Loss	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Mesial	0.30	0.948	0.647	1.96	1.324	1.0	0.02*
Distal	0.27	0.941	0.504	1.96	2.535	2.0	0.09
Buccal	0.22	0.543	0.634	1.12	2.027	1.0	0.06
Lingual	0.25	0.384	0.610	1.04	1.124	2.0	0.10
FOR GROUP II							
Mesial	0.31	0.450	0.698	1.42	1.398	1.0	0.01*
Distal	0.26	0.718	0.745	1.93	2.937	1.0	0.20
Buccal	0.25	0.404	0.503	1.12	2.462	1.0	0.08
Lingual	0.28	0.293	0.471	1.53	1.023	2.0	0.50

\*p<0.05 significant



Graph 1: age & gender wise distribution of patients

## Discussion

With the loss of teeth patients become apparently handicap as far as the oral functioning are concerned. Implant supported overdenture has been very popular these days especially in urban populations and western countries.<sup>12,13,14</sup> Nevertheless, instead an definite enhancement in denture quality with recent prosthodontic methods, reduced retention particularly in the mandibular denture,

is still a big dilemma for several completely edentulous patients. Sufficient firmness of an implant in the nearby bone is important to permit maximum healing. Primary stability is of prime importance since it is one of the prerequisite for maximum osseointegration.<sup>15,16,17</sup> Primary stability is affected by several microbial activities and salivary contents. These entire biological phenomenons could be different at different sides of the osseointegrated implant. Many of the studies have confirmed that mesial surface is mostly affected by the deleterious process hence illustrating maximum crestal bone loss. Many of the pioneer researchers have compared the bone loss around the implants placed for supporting the complete dentures.<sup>18,19,20</sup> Most of them reported that there were not any significant differences in the bone losses at all sides of right and left implants. They explained different basis and contributing factors for these findings. Bone losses around the implant are usually evident only after loading of the implant.<sup>21,22,23</sup> It is therefore very imperative to see and explore the bone loss only after fixing the complete denture with osseointegrated implants.<sup>24,25</sup> In our study the findings were very exacting and comparable with the previous studies. Here, maximum crestal bone loss was noticed at the mesial side of implants at both right and left sides.

## **Conclusion**

Within the limitations of the study authors concluded that the bone loss around dental implant is and unavoidable phenomenon which can only be minimized but not abolished. CBCT assessment of bone level revealed that there was perceptible bone loss around all aspects of the studied dental implants. However, these findings were optimal on the mesial sides of almost all implants. Such a minimal crestal bone loss can easily be identified with advanced three dimensional diagnostic too like cbct. Since bone loss around dental implants not only depends on the studied factors, authors expect some other studies to be conducted with larger samples size and wider parameter.

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