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"Effect Of Prosthetic Load On Crestal Boneloss In Maxillary And Mandibular Arches Using Conebeam Computerized Tomography - An Inviv0 Study."

Author

Abstract
Purpose
To investigate the effects of prosthetic load on crestal bone loss within the maxillary and mandibular arches of single individual.
Materials and Methods
This study evaluated 10 implants from single patient 5 each from the maxillary and mandibular arches, with an follow-up of 12 months. Implants were assessed based on load that is applied by the prosthesis mesial and distal points P1 and P2. Crestal bone loss was quantified by measuring bone level changes using cone beam computerised tomography. Time T1 was defined as time 3months after implant placement, and T2 as the period from after 12 months after implant placement, follow-up visit. Group comparisons will be made using the Wilcoxon signed rank test, with significance set at $p < 0.05$*.*
Result
A statistical significant difference was present and the mean crestal bone loss after prosthetic load is higher than preload; and higher in maxillary arch when compared to that of mandibular arch in same individual.
Conclusion
In this study, crestal bone loss was higher in maxillary arch after prosthetic load rather than mandibular arch and preload.
Keywords: *Crestal bone loss, preload, postload, maxillary arch, mandibular arch*

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I. Introduction:

The amount and quality of peri-implant bone have a significant impact on osseointegration and the shape/contour of the soft tissue covering it, maintaining the peri-implant marginal bone is one of the most crucial and delicate requirements for treatment success. Since almost all implants used today are of the osseointegrated kind, which was identified in 1960, the amount and quality of peri-implant bone have an impact on implant osseointegration. The evaluation of peri-implant marginal bone is a crucial component in assessing the effectiveness of dental implants since bone stability is the key to implant success. [2] It is well known that the cortical bone has the lowest resistance to shear stress, which is greatly exacerbated by bending strain. Preoperative planning for dental implant placement is typically predicated on the availability of adequate bone height, which is impossible to confirm due to transverse limitations. Because it cannot produce cross-sectional images of the alveolar ridge, the commonly employed traditional panoramic radiography is the primary obstacle to measuring the dimensions of the alveolar bone both before and after implant implantation. Traditional panoramic radiography is the most popular approach among the various methods found in the literature for peri-implant marginal bone evaluation. [4]The alveolar bone height surrounding the implant can be assessed by panoramic radiography. Its primary drawback, is that it cannot produce cross-sectional pictures of the alveolar ridge. Therefore, the purpose of this study is to use CBCT analysis to evaluate and assess the crestal bone level at mesial and distal areas after 3 months [T1] of implant placement and after 12 months[T2] of implant placement.

II. Methodology:

10 implants are placed 5 each in maxilla and mandible in same individual.

↓

Postop cbct [T1] was taken and mesial and distal points are marked as P1 and P2.

↓

Crestal bone loss was assessed by marking the length from the crest of the ridge at mesial and distal points to crestal module.

↓

Another Postop cbct [T2] was taken and mesial and distal points are marked as P1 and P2

↓

Crestal bone loss was assessed by marking the length from the crest of the ridge at mesial and distal points to crestal module.

↓

Comparison of crestal bone loss in P1 and P2 regions at T1 and T2 both for maxilla and mandible.

↓

Intergroup comparison and intra group comparisons was done by using Wilcoxon signed rank test and statistical significance was obtained.

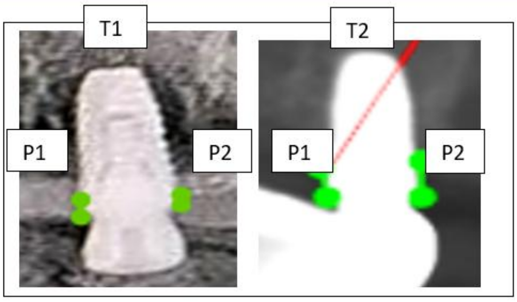

FIG:1

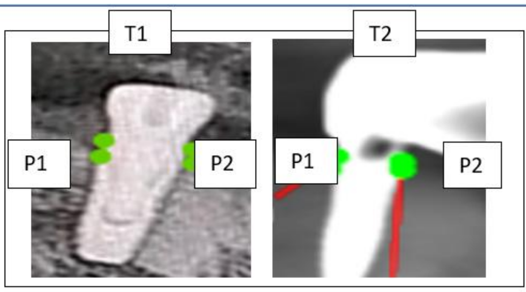

FIG:2

COMPARISON OF CRESTAL BONELOSS BEFORE AND AFTER PROSTHETIC LOAD IN MAXILLA					
		T1		T2	
MAXILLA		P1	P2	P1	P2
	1	1.0 mm	1.3mm	1.5mm	1.7 mm
	2	0.9mm	1.2mm	1.0mm	1.3 mm
	3	0.8mm	0.9 mm	1.8 mm	1.9 mm
	4	0.9mm	1.1 mm	1.0 mm	1.2 mm
	5(fig:1)	**1.2mm**	**1.4mm**	**1.8 mm**	**2.0 mm**

Table :1

COMPARISON OF CRESTAL BONELOSS BEFORE AND AFTER PROSTHETIC LOAD IN MANDIBLE					
		T1		T2	
MANDIBLE		P1	P2	P1	P2
	1	0.6mm	0.8mm	1.0 mm	1.5 mm
	2	0.5 mm	0.4 mm	O.9 mm	1.1 mm
	3	1.0mm	1.2 mm	1.0 mm	1.2 mm
	4	1.5mm	1.6 mm	1.0 mm	1.4 mm
	5(fig:2)	**0.2mm**	**0.5 mm**	**0.6 mm**	**1.0 mm**

Table :2

III. Results:

This study included 10 endo-osseous implants from single patients,5 are of maxilla 5 are of mandible which were evaluated for bone loss in the mesial and distal regions prior to and following prosthesis loading.

Table 3: comparison among mesial and distal sides and overall crestal boneloss at preload and post load

	Descriptive Statistics				**Test Statistics**	
Sno	Parameters	Range	Mean	Std. Deviation	Z-Value	Asymp. Sig. (2-tailed)
1	Preload Mesial	1.50-.20	.8600	.11566	-2.630	.009*
2	Preload Distal	1.60-.40	1.0400	.12220		
3	Postload Mesial	1.80-.60	1.1600	.12667	-2.842	.004*
4	Postload Distal	2.0-1.00	1.4300	.10755		
5	Preload total	3.10-0.70	1.9000	.23476	-2.312	.021
6	Postload total	3.80-1.60	2.5900	.23164		

A total of 10 implants (n=10) had their mesial and distal sites assessed.

The bone loss was more pronounced in distal aspect at preload and post-load state and was statistically significant. The bone loss during an early healing phase after prosthetic loading was higher in comparison to the bone loss occurred before prosthetic load and was statistically significant (Table 3 and Fig. 1&2).

Figure 1: Bone loss in maxilla and mandible at preload and post load

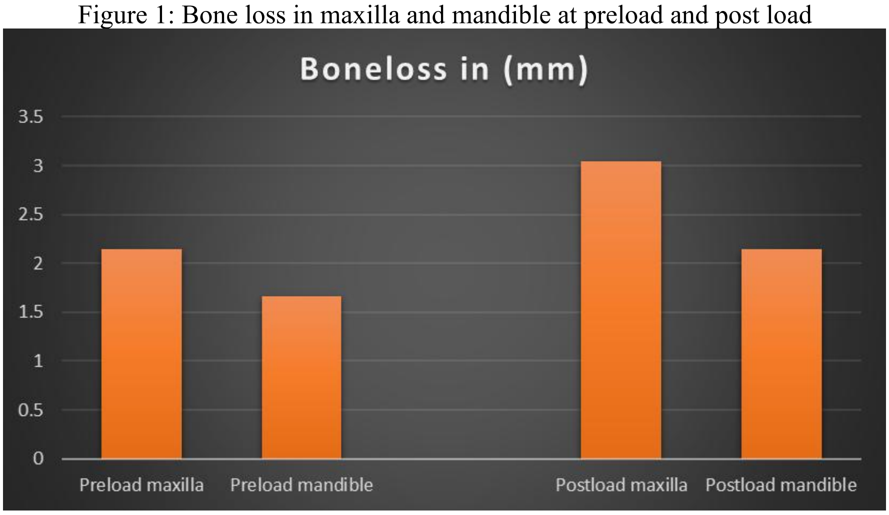

Table 4: comparison between total boneloss in maxilla and mandible

Descriptive Statistics				Test Statistics	
Parameters	Mean	Standard deviation	Standard error of mean	Z- value	Asymp. Sig. (2-tailed
Maxilla	5.18	.895	.40050	-1.576	.151
Mandible	3.80	1.25	.56214		

The total boneloss in maxilla and mandible were also compared which were statistically significant with a mean boneloss of around 5.18 in maxilla and 3.80 in mandible (Table 4)

IV. Discussion:

In addition to indicating diminished oral function and alveolar bone loss, complete or partial edentulousness that is not properly compensated by dentures or tooth-supported permanent prostheses which is frequently associated with a decline in self-esteem. A strong, close-knit, and long-lasting bond between the implant and the essential host bone—which changes shape in response to the masticatory load—can be established by carefully positioning implants.[2]

Both preserving marginal bone height and continuing osseointegration are necessary for the anchoring function.A mean of 1.2mm of bone was lost, mostly during the healing and remodeling phase, which spanned from fixture installation to the end of the year following implant loading. Alberktsson et al said that a maximum bone loss of 0.2mm per year ,including the first year was permitted ,this was also taken inti consideration as a success criteria. [9]

In general cbct (cone beam computed tomography) is used for better study of accessible bone height , width and density without considering superimposition,little distortion,high resolution and small amounts of radiation than regular radiography .The boneloss is often all around so ot is important to determine the degree of boneloss on mesial and distal sides which offers useful details about the quantity of loss of bone around dental implants. [12]

Smith et al. suggested that one of the criteria for implant success was that less than 0.2 mm of alveolar bone loss occurred per year after the first year. Adell et al. indicated that alveolar bone loss during the first year after abutment connection averaged 1.2 mm, and annual bone loss thereafter remained at approx. 0.1 mm for both the maxilla and the mandible. According to Bryant et al., peri-implant bone loss is similar in elderly individuals and young adults. This shows that most authors agreed that patient age does not seem to be an important factor in peri-implant bone loss.

According to Hobo et al., within the first year following implant placement, there was an average bone loss of 1-1.5 mm which was almost similar to that of our study.

According to Johansson and Ekfeldt, the average bone loss during the first year was 0.4 mm.After the f irst year, Jang et al. discovered a 0.7 mm decrease in bone.The ranges for distal crestal resorption and mesial cre stal resorption were 0.3 mm to 1.3 mm and 0.4 mm to 1.2 mm, respectively.Within a year, Hürzeler et al. discov ered a 0.40 mm (± 0.12 mm) decrease in bone.

Stress can be transferred to the boneimplant interface by occlusal load provided through the implant pr osthesis and its components.The amount of stress exerted via the implant prosthesis is directly correlated with th e degree of bone strain at the bone
implant contact.When occlusal forces above the physiologic limitations of bone, the bone may experience enou gh strain to induce bone resorption.[13]Since Karolyi asserted a link between occlusal damage and bone loss surro unding natural teeth in 1901, the relationship has been contested.
At stage 2 implant surgery, the bone is weaker and less thick than it is a year after prosthetic loading.

According to Rasouli Ghahroudi et al.[14] there were no appreciable variations between the upper and lo wer implants in terms of the largest amount of bone loss that occurred in the distal and mesial sides of the mandi bular and maxillary implants which was contrary to our study where we have found greater amount of boneloss is in maxilla rather than mandible.

Lamichhane et al [15] in his study concluded that there is more boneloss in distal aspect at preload rather than on the post load which was contrary to our study in which we have seen greater loss of crestal bone in distal aspects at postload .

Implant success varies with various factors like sex,age,systemic conditions,habits etc ,thus we have done a study on same individual in order to reduce the bias,and evaluated for the crestal bone loss at mesial and distal points on implants in maxillary and mandibular regions at preload and postload and found out that there is a greater boneloss in distal point of maxilla at post load.

V. Conclusion:

Long-term implant success depends critically on the integrity of the soft and hard tissues around the implant. The surgical skills of an oral implantologist and the patients' maintenance of oral hygiene are essential to the success of an implant. According to the study's limitations, the maxilla showed a greater loss of crestal bone at postload than the mandible did during preload.

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