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An in Vivo Assessment of Effects of Smoking on Alveolar Bone Loss in Implants in Post Operative Phases: A Clinical (Original Research) Study

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KEYWORDS

Smoking, Bone loss, Implant, Osteotomy, Cone Beam Computed Tomography, Surgery

ABSTRACT:

Aim: The ultimate aim of this in vivo study was to evaluate the effects of smoking on alveolar bone loss in implants in post operative phases.

Materials & Methods: The present study was conducted on 24 patients those selected from the department. Both male and female patients were included in the study in the age range of 24-40 years. After successful placement of the implant, the alveolar bone around implants was assessed. This evaluation was performed on the basis of radiological details created by Cone Beam Computed Tomography after 30 days. Group one has assessment conducted after 30 days on 12 smoker patients. Group two has assessment conducted after 30 days on 12 non-smoker patients. Presented bone heights were noticed and compared to calculate actual crestal bone loss. P value less than 0.05 was considered significant ($p< 0.05$).

Statistical Analysis and Results: Statistical analysis was completed by using statistical software Statistical Package for the Social Sciences version 22. 8 patients were in the age range of 24-28 years. Therefore we can believe that most of the participating patients were in younger age groups. P value was noticed to be very significant here. The calculated value was 0.01. P value was also highly significant for the participants of the age range 34-37 years. In group 1, maximum bone heights were seen at distal side while minimum bone height was seen at buccal side of implants. P value was noticed to be very significant at mesial side. The calculated value was 0.01. For One-Way ANOVA, p value was very significant.

Conclusion: Within the limitations of the study, authors concluded that smoking has deleterious effects on overall mean bone levels around implants. The overall mean bony levels were high in non-smokers when compared with smokers. Maximum bone level was seen at distal surface and minimum bone level at lingual surface.

INTRODUCTION

Since decades, removable or fixed partial denture has been the typical restorative protocol in partially edentulous patients.[1] nonetheless; it is a great challenge to achieve acceptable results, predominantly in the case of maxillary arch where severe resorption of the alveolar ridge is seen and documented by several researchers in the literature. With the introduction of the concept of osseointegration by Branemark, implant-supported prosthesis; implant has become a

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standard treatment option for partially edentulous patients. Partial edentulism has two major problems disability because it limits a patient's ability to perform two essential tasks in life: speaking and eating.[2-3] Treatment for partial edentulism includes conventional partial complete dentures, implant-retained prosthesis. Conversely, partial edentulism causes progressive bone loss. Improving the retention and the stability by using dental implants is a well known fact documented in the literature.[4-7] Bone loss around dental implants is generally measured by monitoring changes in marginal bone level using radiographs. After the first year of implantation, an implant should have <0.2 mm annual loss of marginal bone level to satisfy the criteria of success.[8-11] However, the process of measuring marginal bone level on radiographs has a precision of 0.2 mm owing to variations in exposure geometry, exposure time and observer perception. Consequently, clinicians are principally focused to lessen the marginal bone loss so as to decrease the overall failure rate. Therefore; this vivo study was conducted to evaluate the effects of smoking on alveolar bone loss in implants in post operative phases.

MATERIALS & METHODS

The present study was planed and performed in the department of Prosthodontics of the institute wherein authors tried to explore very crucial clinical aspects of implant dentistry. Here, total 24 patients were selected from the regular department OPD. All were having missing maxillary central incisors due to different reasons. A detailed case history was taken and implant retained prosthesis was finalized in all 24 selected patients. Only one implant per patients was intended to be studied. Systematic random sampling method was utilized to selects the samples. Both male and female patients were included in the study in the age range of 24-40 years. All participating patients have been explained in detail about the study and informed consent obtained from each of them accordingly. The main inclusion criterion was single missing upper central incisor with apparently healthy periodontium and other supporting apparatus. Implant prosthesis was finalized and implant placement was attempted by typical osteotomy procedure under local anesthesia. In each case, authors ensured to use single standard osseointegrated implants and identical surgical and osteotomy instrument set. To avoid any procedural bias, only single surgical operating team was employed to put the implants in all patients at their different appointments. This was also done to maintain the data quality and to reduce possible confounders. Patients with any systemic complications were excluded from the study. The personal details of all participating patients were not disclosed to sustain secrecy. Following the successful placement of the implant, the alveolar bone around implants was assessed. This evaluation was performed on the basis of radiological details created by Cone Beam Computed Tomography. This valuation was done at post operative phase i.e.; after 30 days. Therefore, all participating patients were separated and studied in the two different groups. Group one has assessment conducted after 30 days (n=12, smoker patients). Correspondingly, group two has evaluations attempted after 30 days (n=12, non-smoker patients). All four surfaces (buccal, lingual, mesial and distal) of all 24 studied patients were studied in detail for related bone loss by three dimensional cone beam computed tomography. Presented bone heights were noticed and compared to calculate actual bone loss. Results thus received was entered in table and subjected to basic statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

STATISTICAL ANALYSIS AND RESULTS

All applicable data was sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 22. Additionally it 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 I showed that out of 24 patients, males were 12 and females were 12. All participants were studied into 4 age groups. 8 patients were in the age range of 24-28 years. Therefore we can believe that most of the participating patients were in younger age groups. P value was noticed to be very significant here. The calculated value was 0.01. P value was also highly significant for the participants of the age range 34-37 years. The measured value was 0.03. Table 2 demonstrated about the Fundamental statistical representation with level of significance estimation using Pearson chi-square test. It was for Group 1 (n=12, smoker patients) where bone level evaluations were conducted after 30 days. Maximum bone heights were seen at distal side while minimum bone height was seen at buccal side of implants. P value was noticed to be very significant at mesial side. The calculated value was 0.01. P value was noticed to be very significant at buccal side. The calculated value was 0.03. Table 3 demonstrated about the Fundamental statistical representation with level of significance estimation using Pearson chi-square test. It was for Group 2 (n=12, non-smoker patients) where bone level evaluations were conducted after 30 days. Maximum bone heights were seen at distal side while minimum bone height was seen at buccal side of implants. P value was noticed to be very significant at distal side. The calculated value was 0.01. P value was noticed to be non-significant at mesial side. The calculated value was 0.50. Table 4 depicts about the Comparison among the study groups

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using One-Way ANOVA. P value was noticed to be very significant here. The calculated value was 0.001.

Table 1: Age & gender wise allocation of patients

Age Group (Yrs)	Male	Female	Total	P value
24-28	5	3	8	0.01*
29-33	2	4	6	0.40
34-37	4	3	7	0.03*
38-40	1	2	3	0.80
Total	12	12	24	*Significant
***p<0.05 significant**				

Table 2: Fundamental statistical representation with level of significance estimation using Pearson chi-square test [Group 1, n=12, smoker patients: evaluation conducted after 30 days]

Parameters	Mean Bone Level	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Mesial [For n=12]	0.52	0.132	0.1238	1.96	1.438	1.0	0.01*
Distal [For n=12]	0.69	0.688	0.355	1.13	1.147	2.0	0.10
Lingual [For n=12]	0.44	0.568	0.232	1.14	2.129	1.0	0.70
Buccal [For n=12]	0.33	0.236	0.547	1.42	1.432	1.0	0.03*
***p<0.05 significant**							

Table 3: Fundamental statistical representation with level of significance estimation using Pearson chi-square test [Group 2, n=12, non-smoker patients: evaluation conducted after 30 days]

Parameters	Mean Bone Level	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Mesial [For n=12]	0.75	0.438	0.448	1.22	1.531	1.0	0.50
Distal [For n=12]	0.86	0.132	0.132	1.27	1.912	2.0	0.01*
Lingual [For n=12]	0.69	0.328	0.343	1.16	2.329	1.0	0.20
Buccal [For n=12]	0.51	0.132	0.232	1.25	1.215	2.0	0.10
***p<0.05 significant**							

Table 4: Comparison among the study groups using One-Way ANOVA

Variables	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Significance (p)
Between	3	1.126	1.343	1.9	0.001*

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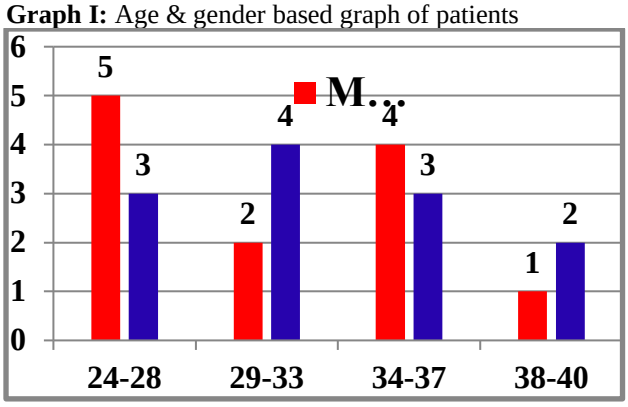
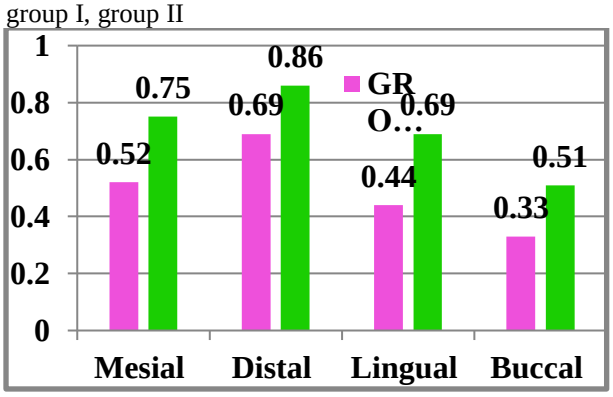
Groups					
Within Groups	42	2.221	0.349	-	
Cumulative	133.116	12.213	***p<0.05 significant**		

Graph I: Age & gender based graph of patients



Graph II: Mean bone levels at all measured surfaces in group I, group II



DISCUSSION

As per to current UN data, the growing number of elderly patients in the population, is a certain reality for the future. In India, it has been postulated that the percentage of the population over 60 years old could rise from 24% in 2011 to 40% by 2050.[12-14] An implant-supported prosthesis can be sensibly beneficial over conventional fixed denture and removable partial denture. Since it reduce bone resorption, greater prosthesis stability, improved maintenance and better esthetics. Implant supported prosthesis may reduce the amount of soft-tissue coverage and extension of the prosthesis. In general, maxillary implant-supported prosthesis may be a preferable option due to several advantages such as; possible decrease resorption of the residual ridges, may improve stability and retention, and possible additional improvement in the patient's quality of life and satisfaction.[15-18] The use of implants has dramatically improved treatment choices for most edentulous patients, but it may not be suitable for all patients particularly in less prosperous countries or for patients who are unable to afford costs associated with this treatment option. The minimum number of implants needed for the implant restoration is still debatable. The success of this treatment modality, while excellent, is unfortunately outside the financial scope of many edentulous patients. In the last two decades, the use of prosthetic retention systems in dental implants has achieved good results in edentulous patients, significantly increasing their satisfaction and prosthetic rehabilitation results. In the past five decades, titanium dental implant systems have been widely used to support crown and improve eating and speech. Success of dental implants is a concern for patients, dentists, industries, insurance companies and healthcare systems.[19-21]

CONCLUSION

Within the limitations of the study, authors concluded highly significant inferences. They stated that implant alveolar bone loss is an obvious phenomenon. This usually initiates soon after the osteotomy process nevertheless; its severity is variable and deepening on several factors. In our study, the mean bone levels were checked in smokers and non smokers. We can undoubtedly see deleterious effects of smoking on mean bone levels around implants. The overall average mean bony levels were high in non-smokers when compared with smokers. In addition, overall maximum bone level was seen at distal surface and minimum bone level at lingual surface.

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