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An Intricate Estimation of Bone Levels After Immediate Dental Implant Therapy with Bone Graft at Various Time Periods: An in Vivo Study

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***Abstract*---**Aim: This in vivo study was conducted to estimate bone levels after immediate dental implant therapy with autogenous bone graft at various time periods. Materials & Methods: Total 10 male and 6 female patients in the range of 27-47 years were included in the study. Patients those reported for immediate rehabilitation of existing single posterior teeth were included. After immediate implant placement with graft, alveolar bone loss was checked by cone beam computed tomography. All participating patients were recalled in post operative phases to see bone losses at all studied sites at all four surfaces mesial, distal, buccal and lingual. Results were 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:

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All statistical analysis was completed by using statistical software Statistical Package for the Social Sciences. In the age range of 27-29 years, there was one male and one female patient. P value was highly significant for that (0.01). For bone losses seen in two month post operative phase, maximum mean bone loss was there on buccal and distal surfaces. p value was highly significant for mean loss noticed at distal (0.01) and buccal surface (0.02).

***Keywords*---**autogenous bone grafts, bone loss, computed tomography, cone beam, immediate implant.

Introduction

Alveolar bone loss is a severe clinical dilemma in the dental practice since decades. Many of the pioneer researchers have proposed various methodologies to minimize these bony losses. Majority of the measures were primarily focused on infection control and hygiene practices.[1,2,3] In oral implantology, crestal bone loss is an unavoidable phenomenon. As per the standard guidelines of dental implants, there must be controlled alveolar bone loss after osteotomy procedures. However, literature has confirmed many patterns of crestal bone losses in post operative phases of implant therapy.[4,5] Many of the clinician believes that crestal bone loss can be successfully managed by placing autogenous bone grafts at surgical sites.[6,7] Most of the studies are seems to be conducted on the evaluation of crestal bone loss after traditional implant therapy. However in the immediate implant therapy, bone remodeling behaviors is somewhat unexpected especially in mandibular arches.[8,9,10] These days, the positioning of dental implants instantaneously after tooth extraction has become a burning topic. Immediate implant therapy is a successful modality and has the benefits of lessening time and increasing patient satisfaction. Literature has well evidenced about usage of Cone Beam Computed Tomography for quantitative assessment of bone levels.[11,12] This three dimensional radiological technique enable clinicians to describe detailed information of the bone and associated structures at implant site. Therefore considering all these factors this vivo study was conducted to estimate bone levels after immediate dental implant therapy with autogenous bone graft at various time periods.

Materials and Methods

The present study was designed and performed in the department of Prosthodontics of the institute wherein total 16 patients have been studied in detail. Study objectives were explained in detail to all participating patients. Informed consent was obtained from the patients those were ready for participation. Firstly, study proposal was prepared and presented to institutional ethical committee for clearance. Following approval, methodology initiated. 10 male and 6 female patients in the range of 27-47 years were included in the study. Exclusion criteria were a) congenital defect associated with head and neck region b) patients with underlying systemic disease like hypertension, diabetes, connective tissue disorders, hematological disorders, leukemia, and titanium allergy. All patients with any underlying systemic diseases were also taken as

exclusion. At the start, total 16 patients were screened those reported for immediate rehabilitation of existing single posterior teeth. The diagnosis was predominantly grossly decayed teeth indicated for extraction. All prosthetic options were explained to the patients including replacement of single missing posterior teeth with immediate implants with autogenous bone graft. For immediate implants with autogenous bone graft, authors ensured to have satisfactory periodontal condition and acceptable oral hygiene with optimal bone quantity. Pre-osteotomy measures were completed including dimensional planning of implant by Cone beam computed tomography. All procedures were competed under local anesthesia with adrenaline. The carious teeth were carefully extracted with nominal strain on the supporting socket. Standard osteotomy (as per need) was attempted with strict sterilization for all cases. In case of any intra-operative delinquency, the case was not considered in the study. Soon after extraction, osseointegrated implants of appropriate dimensions were placed sensibly. Autogenous bone grafts was also placed in the required sites to fill any bony deficiency in the surgical site. Authors aimed to estimate bone levels after immediate dental implant therapy with bone graft at various time periods. For the same, any evident alveolar bone loss was checked by cone beam computed tomography. All participating patients were recalled at fixed predetermined post operative phases (2/4/6 months) to screen the bone losses. With cone beam computed tomography, actual bone losses were calculated by data comparison at all studied sites at all four surfaces i.e; mesial, distal, buccal and lingual. So, effectively one site was assessed per patient for bone loss by cone beam computed tomography. Before starting the study, authors had enlightened the relative importance of this study to all participating patients. Results were 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 the complied data and details were sent for statistical assessment using statistical software Statistical Package for the Social Sciences version 22 (IBM Inc., Armonk, New York, USA). The resultant details was subjected to right statistical tests to obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI. Initial presumptions of the study were very crucial. Table 1 and Graph 1 showed that all participating were in the age range of 27 years to 47 years. Total seven age groups were identified with 10 male and 6 female patients. In the age range of 27-29 years, there was one male and one female patient. P value was highly significant for that (0.01). Minimum one patient was seen in the age range of 42-44. Eventually, one male patient was there in this group. P value was highly significant for that (0.02). For age group 36-38 years, p value was highly significant (0.01). Table 2 show fundamental statistical descriptions showing mean, standard deviation, standard error, 95% coefficient of interval, Pearson Chi-Square Value and Level of Significance (p value) for bone losses seen in two month post operative phase. This was attempted for all 16 immediate implant sites. Maximum mean bone loss was there on buccal and distal surfaces. p value was highly significant for mean loss noticed at distal (0.01) and buccal surface (0.02). Minimum mean bone loss was there on mesial surfaces (0.384). Standard deviation was also found well within acceptable limits. It was maximum for lingual surface and minimum for buccal surface.

Table 3 show elementary statistical descriptions showing mean, standard deviation, standard error, 95% coefficient of interval, Pearson Chi-Square Value and Level of Significance (p value) for bone losses seen in four month post operative phase. This was conducted for all 16 immediate implant sites. Maximum mean bone loss was there on buccal and distal surfaces. It was 0.708 and 0.689 respectively for buccal and distal surfaces. p value was highly significant for mean loss noticed at buccal surface (0.02). Minimum mean bone loss was there on mesial surfaces (0.526). Standard deviation was also noticed within satisfactory limits. It was maximum for mesial surface and minimum for distal surface. Table 4 show simple statistical descriptions showing mean, standard deviation, standard error, 95% coefficient of interval, Pearson Chi-Square Value and Level of Significance (p value) for bone losses seen in six month post operative phase. This was conducted for all 16 immediate implant sites. Maximum mean bone loss was there on buccal and distal surfaces. It was 0.802 and 0.783 respectively for buccal and distal surfaces. p value was highly significant for mean loss noticed at buccal surface (0.01). Minimum mean bone loss was there on mesial surfaces (0.623). Standard deviation was also found within reasonable limits. It was maximum for buccal surface and minimum for mesial surface.

Table 1
Age & Gender wise allocation of patients

Age Groups (Yrs)	Male	Female	Total	P value
27-29	1	1	2	0.01*
30-32	2	0	2	0.10
33-35	1	2	3	0.09
36-38	2	1	3	0.01*
39-41	2	1	3	0.40
42-44	1	0	1	0.02*
45-47	1	1	2	0.30
Total	10	6	16	***Significant**

Table 2
Basic statistical descriptions showing mean, standard deviation, standard error, 95% coefficient of interval, Pearson Chi-Square Value and Level of Significance (p value) for bone losses seen in two month post operative phase [n=16 immediate implants]

Sides	Mean	Std. Dev.	Std. Err.	95% CI	Pearson Chi-Square Value	df	Level of Sig. (p value)
M	0.384	0.647	0.988	1.18	1.039	1.0	0.50
D	0.487	0.652	0.650	1.32	1.123	2.0	0.01*
B	0.490	0.143	0.804	1.15	2.030	1.0	0.02*
L	0.412	0.812	0.145	1.61	1.245	1.0	0.10

***p<0.05 [Sig]**

Table 3
Basic statistical descriptions showing mean, standard deviation, standard error, 95% coefficient of interval, Pearson Chi-Square Value and Level of Significance (p value) for bone losses seen in four month post operative phase [n=16 immediate implants]

Sides	Mean	Std. Dev.	Std. Err.	95% CI	Pearson Chi-Square Value	df	Level of Sig. (p value)
M	0.526	0.987	0.451	1.56	1.389	1.0	0.60
D	0.689	0.092	0.690	1.09	1.982	2.0	0.08
B	0.708	0.123	0.341	1.64	1.209	1.0	0.02*
L	0.582	0.810	0.126	1.90	1.923	1.0	0.30

***p<0.05 [Sig]**

Table 4
Basic statistical descriptions showing mean, standard deviation, standard error, 95% coefficient of interval, Pearson Chi-Square Value and Level of Significance (p value) for bone losses seen in six month post operative phase [n=16 immediate implants]

Sides	Mean	Std. Dev.	Std. Err.	95% CI	Pearson Chi-Square Value	df	Level of Sig. (p value)
M	0.623	0.097	0.045	1.10	1.637	1.0	0.40
D	0.783	0.232	0.678	1.23	1.755	1.0	0.10
B	0.802	0.863	0.236	1.56	1.029	1.0	0.01*
L	0.779	0.432	0.109	1.65	1.435	1.0	0.20

***p<0.05 [Sig]**

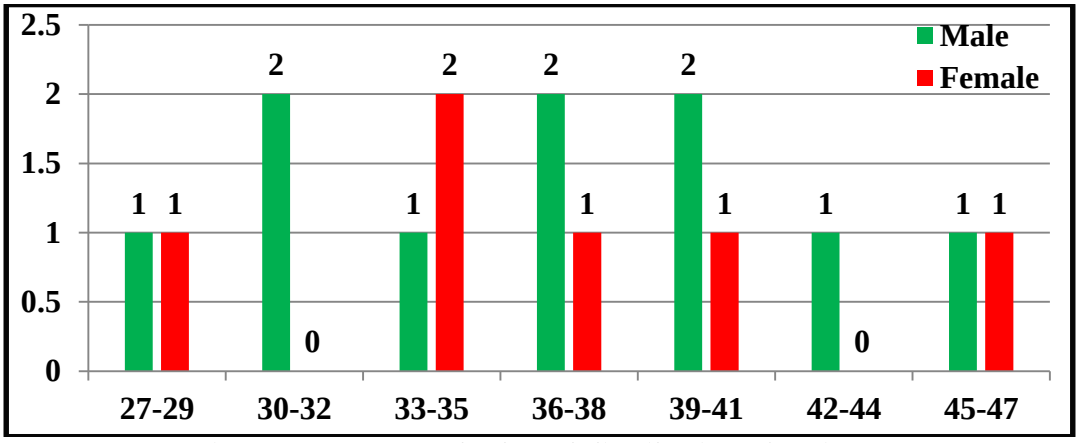

Figure 1. Age & gender based distribution of patients

Discussion

Restoration of missing teeth by dental implants is very common practice these days. Several factors play critical role in the long term survival of osseointegrated dental implants.[13,14,15] Amongst these factors, the conservation of crestal bone remains to be the most significant. Many of the practitioner felt that there is minimum 12 percent bone loss around implant. Many of the workers including Botticelli and Covani stated that an implant is considered to be failed only if it becomes mobile and exhibit bone loss of greater than 1.0mm in the first year and greater than 0.2 mm a year after.[16,17] Peri implantitis is one of the most common processes which promote bone loss surrounding implants. Researchers like Araujo, Chen & Cosyn confirmed that peri implantitis is an area specific pathology which leads to inflammatory reactions in soft tissues and subsequent bone loss nearby osseointegrated implant.[18,19,20] Mostly, the long-term clinical and aesthetic success of implant based rehabilitation depends on conservation of gingiva and bone surrounding implant. Many of the prominent studies have confirmed that there is always obvious bone loss takes place near the bone implant interface.[21,22,23] Bone loss up to 1.5 to 2 mm is usually seen during the first year of function. This much loss is usually considered a typical physiologic procedure. Additional yearly bone loss up to 0.2 mm is also seen in non pathologic situations. Kim & Stafford also agreed that all these figures cannot be refereed unanimously for all clinical circumstances.[24,25] Major things that affect bone loss around implants may be suitably divided into different factors. The local factors are primarily implant fixture, occlusal forces, dimension of implant and biological correlations. Structure associated factors of bone loss are implant-abutment connection type and the extent of microgap between the implant and abutment. Biological factors that affect bone loss are peri implantitis, bone quality, osteotomy trauma, early loading of the implant and unsatisfactory osseointegration.[26,27]

Conclusion

Authors concluded that there were evident alveolar bone loss at all four surfaces in all studied patients. At three post operative phases, these bone losses were found maximum at buccal surfaces and minimum at mesial surfaces. Additionally, distal surface also showed significant bone loss somewhat similar to buccal surface. With the increase in post operative time, authors also noticed clear rising patterns of bone losses. Study presumptions of this study must be correlated clinically while estimating clinical success of similar situations.

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Statement of conflict of interest
In the opinion of the author, there was no conflict of interests.

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