

## **Evaluation of Changes in Crestal Bone Height around Immediately Loaded One Piece Implant- A Prospective Study**

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**Citation of this Article:** Dr. Vikas Sarowa, Dr. P P Singh, Dr. D.K. Gupta, Dr. Anjali Dave Tiwari, Dr Sankalp Mital, "Evaluation of Changes in Crestal Bone Height around Immediately Loaded One Piece Implant- A Prospective Study", IJDSIR- October - 2020, Vol. – 3, Issue - 5, P. No. 26 -31

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

### **Abstract**

**Background:** Aim of the present study was to prospectively evaluate the 6-month survival and crestal bone level changes around of immediate loaded one-piece dental implants in partially edentulous patients.

**Methods:** The present study "Evaluation of changes in Crestal bone height around immediately loaded one piece Implant. A Prospective Study" was conducted in the Post-graduate clinic of the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Jaipur, Criteria for selection of patients.

**Results:** Long term preservation of crestal bone height around osseointegrated implants is often used as primary success criteria for different implant systems. In the present study, crestal bone height changes on proximal aspects of immediate loaded one piece implants and their survival rate were evaluated. A total of 20 implants placed (14 in mandible and 6 in maxilla) were evaluated for duration of 6months. 2 implants failed within 1 month of

placement and loading. Hence, the survival rate of immediate loading implants was 90% and only 18 implants were then subjected to statistical analysis.

**Conclusion:** Within the limitations, it can be concluded that survival outcome was in more favor of mandible than maxilla. however, there are no indications that immediate or early loading of dental implants cannot be a safe procedure. This study was of short duration of 6 months with small sample size. Larger sample size with homogeneity and longer follow up is required for definitive results.

**Keywords:** Mandible, Maxilla, Survival.

### **Introduction**

Dental implants have provided a viable alternative treatment to the traditional fixed or removable prosthesis in partial or complete edentulism since last few decades.<sup>1</sup> High clinical success rates with the original implant protocols have given clinicians and researchers confidence to further develop and refine the osseointegrated technique

and, consequently, implants are used in increasingly more challenging situations and on broader indications. Most dentists have become familiar with the conventional two piece implant design which is made out of two components: a surgical implant and a prosthetic abutment. The surface irregularities also create a strong interlock between the implant and bone, which explains the high resistance to removal torque forces. Anodic oxidation of titanium results in an increased thickness of the native oxide layer and the formation of a porous surface structure. Animal research and histology of clinically retrieved microimplants have demonstrated a more rapid and stronger bone response to oxidized implants than to machined control implants. Predictable results for immediate function are believed to depend on good initial implant stability, controlled load conditions, and an osseointegrated implant surface.<sup>2</sup> Long term preservation of crestal bone height around osseointegrated implants is often used as primary success criteria for different implant systems. Conventional radiography (intraoral periapical radiographs and external panoramic radiographs) represents a widely accepted technique to evaluation of marginal bone change at interproximal sites of osseointegrated implants<sup>3,4</sup>. Radiography proved to be a more sensitive method of determining peri-cervical bone loss; therefore, periapical radiographs in addition to the clinical parameters (mobility, peri-implant radiolucency, mucosal condition, and suppuration) were found to offer the most reliable assessment of an implant's status.

Hence, the aim of the present study was to prospectively evaluate the 6-month survival and crestal bone level changes around of immediate loaded one-piece dental implants in partially edentulous patients.

#### **Material and Methods**

The present study "Evolution of changes in Crestal bone height around immediately loaded one piece Implant. A

Prospective Study" was conducted in the Post-graduate clinic of the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Jaipur, Criteria for selection of patients:

#### **Inclusion Criteria**

1. Partially edentulous patients (male or female) in an age group of 18-60 years.
2. Good oral hygiene
3. Adequate bone volume to accommodate an implant of appropriate dimension.

#### **Exclusion Criteria**

1. Presence of active infection in the area intended for implant placement.
2. A significant medical history such as poorly controlled diabetes mellitus, bleeding disorders, cardiovascular abnormalities and osteoporosis.
3. Patients irradiated in the head and neck area within a year prior to surgery,
4. Lack of motivation, substance abusers, and psychiatric problems.
5. Lack of opposing occluding dentition in the area intended for implant placement, severe bruxism or clenching,
6. Habits such as alcohol intake and smoking.
7. Perforation and/or loss of labial bony plate following tooth removal.
8. Insufficient bone quantity as determined by pre-extraction radiographs and clinical inspection before implant placement (E.g.: Local cysts, soft tissue ulceration, insufficient healing of previous extraction site).
9. Insufficient vertical inter-arch space to accommodate the prosthodontic components available, together with a proposed pontic and occasional gingival analog designs.

Study design:

All patients with one or more teeth missing reporting to the outdoor patient department were evaluated for implant insertion. 20 implants were placed in 10 patients, in the age group of 18-60 years, selected for study group for Immediate loading (IL) of One piece implants.

**Results**

The present study was conducted in the Post -graduate clinic of the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Jaipur, in year of 2013 -2014. The ADIN One Piece Implant Systems, One™ was included in this study. 20 one piece implants were immediate loaded in 10 patients (7 male and 3 female), in the age group of 18-60 years. All implant were evaluated on 1 month,3 months and 6 months postoperatively by radiographs as well as clinically. Out of 20, 2 Implants were failed post operatively within 1 month of immediate loading. Thus, the survival rate for immediate loading implants was 90%. Hence, only 18 implants were included in the statistical analysis. 40% were in the age group 28 -37 years,30% were in 38 -47 age group,20% were in18 -27 year age group and 10% were in48 -57 year age group. According to sex of 70% were male and 30% were females in study group. 70% implants loaded in mandible and 30% in maxilla. According to side 55% implants were loaded in left and 45% were in right side.

Table 1: Post-Operative crestal bone changes mesially (in mm)

	N	Mean	S D	F-value	p-value
Post-Operative -1 Month	18	-0.37	0.26	6.03	0.004
Post-Operative -1 Month	18	-0.57	0.35		
Post-Operative -1 Month	18	-0.72	0.26		

Table 1 reveals that the mean mesial side bone level at 1 month showed bone loss of 0.37 mm, 3 months showed bone loss of 0.57mm and 6 months showed 0.72mm bone loss. However, Repeated measured ANOVA with post hoc Bonferroni test found to be statistically significant (P = 0.004).

Table 2: Post-Operative crestal bone changes distally (in mm)

	N	Mean	S D	F-value	p-value
Post Operative -1 Month	18	-0.44	0.18	8.21	0.001
Post Operative -1 Month	18	-0.65	0.28		
Post Operative -1 Month	18	-0.78	0.27		

Table 2 reveals that the mean distal side bone level at 1 month showed bone loss of 0.44mm, 3 month showed bone loss of 0.65mm and 6 months showed 0.78mm bone loss. However, Repeated measured ANOVA with post hoc Bonferroni test found to be statistically significant (P = 0.001).

Table 3: Distribution of Study Participants According to tenderness (N=18)

Tenderness	Post Operative 1 Month	Post Operative 3 Month	Post Operative 6 Month
Present	18	18	18
Absent	0	0	0
Total	18	18	18

Table 3 showed that tenderness of implants (n=18) were absent in all stages i.e. 1,3 and 6 months post operative

Table 4: Distribution of Study Participants According to implant mobility (N=18)

Implant mobility	Post Operative 1 Month	Post Operative 3 Month	Post Operative 6 Month
Present	18	18	18
Absent	0	0	0
Total	18	18	18

Table 4 showed that implant mobility of implants (n=18) were absent in all stages i.e. 1,3 and 6 months post operative.

Table 5: Distribution of Study Participants According to Satisfaction of Patients (N=10)

Implant mobility	Post Operative 1 Month	Post Operative 3 Month	Post Operative 6 Month
Present	2	8	8
Absent	8	0	0
Total	10	8	8

Table no.5 showed that 8 patient were satisfy out of 10. 2 patients were unsatisfied due to loss of implant with in one month of loading.

### Discussion

The present study was conducted in the Post-graduate clinic of the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Jaipur. Dental implants have provided a viable alternative treatment to the traditional fixed or removable prosthesis in partial or complete edentulism since last few decades. <sup>1</sup>High clinical success rates with the original implant protocols<sup>2</sup> have given clinicians and researchers confidence to further develop and refine the osseointegrated technique and, consequently, implants are used in increasingly more challenging situations and on broader indications. Most dentists have become familiar with the conventional two piece implant design which is

made out of two components: a surgical implant and a prosthetic abutment.

The conventional two piece implant can be placed in two ways:

Two phase technique: The implant is placed and sealed with a cover screw, then left submerged for a healing period. Three to six months later a minor surgical procedure is undertaken to uncover the implant restorative platform, the cover screw is removed and replaced with a healing abutment. A month later the prosthetic procedure is commenced.

One phase technique: The implant is placed and sealed with a transmucosal healing abutment. Three to six months later the prosthetic procedure is commenced.

The one piece implant design is unique because it incorporates the prosthetic abutment and surgical implant into one unit.<sup>3,4</sup> This eliminates the fixture abutment interphase (the microgap). As a result, all one piece implant designs fall under the one phase technique (since the prosthetic abutment is always present transmucosally).

The another innovation was the placement of dental implants in fresh extraction sockets known as immediate implant placement and immediate or early implant loading after the surgical implant placement,<sup>5,6,7</sup>.

The promising results of immediate loading with full arch applications led to its utility in partially edentulous conditions. Although immediate loading can be applied successfully, the decision on when to put implants in immediate function is still largely made empirically. Hence, the present study was conducted to prospectively evaluate the 6- month survival and crestal bone level changes of immediate loading of one piece implant in partially edentulous patients.

The results of the present study demonstrated that the survival rate of immediately loaded implants was 90%.

A total of 20 implants were placed in 10 patients. After the implant loading, following clinical parameters were recorded at 1 months, 3 months and 6 months :-

In this prospective study of 6 months duration, 90% survival of immediately loaded implants. Two immediate loading implants failed during the first month following implant loading. In each of those patients there was initial discomfort, followed by pain and mobility. The implants were removed as soon as possible, and after a 2-month waiting period traditional implantation was successfully performed.

Maj Guruprasada et al in 2013<sup>8</sup>, they selected 20 patients for study. One implant failed in immediate loading group out of 10 patient. So survival rate was 90% up to 1 year followup.

Ignacio Sanz-Sanchez et al in 2014<sup>9</sup> had retrospective study. The results from the meta-analyses have shown that the immediately loading implants demonstrated high survival rates 98.2%.

In our study the mean mesial side bone level at 1 month showed bone loss of 0.37 mm, 3 month showed bone loss of 0.57mm and 6 month showed 0.72mm bone loss. The mesial side bone level at 1 month was compared to 3 months, it was found that there was mean difference of 0.19mm. This difference was not statistically significant. (P=0.16) another comparison of 1 month to 6 months mean difference was 0.34mm and this difference was statistically significant. (p=0.003). The mean distal side bone level at 1 month showed bone loss of 0.44mm, 3 month showed bone loss of 0.65mm and 6 month showed 0.78mm bone loss. The distal side bone level at 1 month was compared to 3 months, it was found that there was mean difference of 0.21mm. This difference was statistically significant. (P=0.04) another comparison of 1 month to 6 months mean difference was 0.33mm and this difference was statistically significant. (p=0.001).

Maj Guruprasada et al in 2013<sup>8</sup>, they selected twenty patients for study. One implant failed in immediate loading group, whereas all implants survived in conventional loading group. The average periimplant bone loss after 6 months and 1 year for immediate loading group were 0.69 mm and 1.09mm respectively. So, Immediate implant loading protocol has a highly acceptable clinical success rate in partially edentulous jaw. Ignacio Sanz-Sanchez et al in 2014<sup>9</sup> had retrospective study. The results from the meta-analyses have shown that the immediately loading implants demonstrated a statistically significant higher risk of implant failure and a statistically significant lower bone loss with compared to conventional loading implant group.

Dr. Nidhin R et al in 2014<sup>10</sup> concluded during the observational period of six months that the mean crestal bone changes from month 0-1, month 1-3, month 3-6 and month 0-6 for flapless method was significantly lower than with flap method. This shows that the crestal bone loss on the implants placed with flapless method was significantly lower compared to those placed using conventional flap method.

In this study the Length of implant was : mean  $\pm$  SD: 12.6  $\pm$  1.09(mm) and Diameter was: mean  $\pm$  SD: 3.57  $\pm$  0.25(mm)

In this study tenderness and mobility of study implants were absent in all stages of follow up.

In this study, according to patient satisfaction, 2 patients were unsatisfied due to implant loss in first month of loading. Hence 80% patients were satisfied.

### Conclusion

Within the limitations, it can be concluded that survival outcome was in more favor of mandible than maxilla. However, there are no indications that immediate or early loading of dental implants cannot be a safe procedure. This study was of short duration of 6 months with small

sample size. Larger sample size with homogeneity and longer follow up is required for definitive results.

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