

## Original Research

### A clinico-radiographic evaluation of crestal bone following immediate vs delayed implant placement- A comparative study

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#### ABSTRACT:

**Background:** The present study was conducted to clinically evaluate the periodontal parameters of osseointegrated immediate and delayed dental implants and to radiographically evaluate the difference in the crestal bone height after immediate and delayed placement of dental implant. **Materials & Methods:** The present study comprised of thirty implant sites, in patients age group of 18 to 65 years. The patients were randomly allocated to the immediate (Im) group (n-15) or the delayed (De) group (n-15). Periodontal assessment was done using plaque index, gingival index, probing depth and width of keratinized gingiva. Radio-Visual Graphs (RVG) with and without grid; Orthopantomogram (OPG) and intra oral peri apical radiographs (IOPAR) were taken. The periodontal status was evaluated at baseline (1st month), 3rd and 6<sup>th</sup> months for both groups. **Results:** The mean difference in plaque score from baseline to 3 months in group I was 0.09, in group II was 0.06, baseline to 6 months in group I was 0.07 and in group II was 0.00, 3 months to 6 months was 0.02 in group I and 0.06 in group II. Intergroup comparison was non- significant ( $P > 0.05$ ). A statistically non- significant difference in mean value of gingival index at baseline (p value=0.57), 3month (p value=0.74), 6 months (p value=0.62) between Group I and Group II. A statistically non- significant difference in mean value of probing depth at baseline (p value=0.34), 3month (p value=0.62), 6 months (p value=0.36) between Group I and Group II. A statistically non- significant difference in mean value of width of keratinized gingiva at baseline (p value=0.32), 3month (P-0.61), 6 months (P-0.72) between Group I and Group II. A statistically highly significant difference in mean value of bone level on mesial side at baseline (p value= $<0.001$ ), 3month (P $<0.001$ ), 6 months (P $<0.001$ ) between Group I and Group II. A statistically highly significant difference in mean value of bone level at baseline (p value= $<0.001$ ), 3month (P $<0.001$ ), 6 months (P $<0.001$ ) between group I and group II. **Conclusion:** There was significant crestal bone loss in Group II (Delayed implantation) at both mesial and distal surface during 3<sup>rd</sup> to 6<sup>th</sup> month's observation period. Also a continuous bone resorption was observed over the time in the both groups.

**Key words:** Delayed implant, Probing index, gingival index

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#### INTRODUCTION

Tooth loss reflects the ultimate outcome of the oral disease over the course of life. A number of prosthetic techniques are available over time for the rehabilitation of partial or complete loss of tooth/teeth. In order to overcome the problems associated with conventional prosthetic treatment, the dental implants came into existence.<sup>1</sup>

At a recent consensus workshop 2004, three different protocols were defined: (i) immediate or type 1 when

the implant are placed in the same surgical intervention as the dental extraction; (ii) type 2 or early implant placement when implants are placed in the early stages of healing (from 4 to 8 weeks); and (iii) type 3 or delayed implant placement when implants are placed when the ridge has healed (from 3 to 6 months).<sup>2</sup> Delayed implant placement i.e. type-3 implant placement is gold standard. This technique requires several months of waiting period before implant placement. This method allows ample time for the host

tissues to eliminate the infection post extraction, causes good healing of the alveolar bone with greater keratinized mucosal width, less recession, greater mesial and distal papilla height with greater percentage of papilla fill. Immediate implant was first introduced in 1976 and this method involves the implant placement immediately after the tooth extraction and now it has become successful, predictable and alternative treatment modality.<sup>3</sup>

Crestal bone loss has been documented as one of the important factor that affects the long term prognosis. It has been documented that following implant surgery, remodelling occurs and is characterized by a reduction in bone dimension, both horizontally and vertically.<sup>4</sup> The present study was conducted to clinically evaluate the periodontal parameters of osseointegrated immediate and delayed dental implants and to radiographically evaluate the difference in the crestal bone height after immediate and delayed placement of dental implant.

**MATERIALS AND METHODS**

The present prospective comparative study was conducted in total of thirty implant sites, in patients within the age group of 18 to 65 years, comprising of both male and female visiting the Out-Patient Department of Periodontics, Himachal Dental College, Sunder Nagar H.P. Approval for the study had been obtained from ethical committee. The patients were randomly allocated to the immediate (Im) group (n-15) or the delayed (De) group (n-15).The implants in the immediate group were placed on average immediately following tooth extraction; in the delayed group, implants were place >12 weeks post-extraction. Each patient was explained in detail about the risk and benefits of participation in this study. Only those patients who signed an informed consent were included in the study and satisfied the following inclusion and exclusion criteria.

Inclusion criteria were patients within the age group of 18 to 65 years, full mouth plaque scores, bleeding scores of less than 30%, patients requiring extractions in case of residual and fracture root(s); carious tooth, periodontally healthy tooth without any periapical or periodontal abscess.(Immediate implant case) and healed extraction sockets (of >3months) and residual alveolar ridge. (Delayed implant case). Exclusion criteria were patients with poor oral hygiene with no possibility of improvement, uncontrolled diabetes, osteoporosis, malignancies and blood dyscrasias etc., irradiation in the implant area and pregnant women and lactating mothers.

All the patients were subjected to detailed medical and dental history. Periodontal assessment was done using Plaque Index (Loe and Silness) and Gingival Index (Silness and Loe), Probing depth and Width of Keratinized Gingiva using UNC #12 probe. Radio-Visual Graphs (RVG) with and without grid; Orthopantomogram (OPG) and intra oral peri apical radiographs (IOPAR) were taken. All were subjected to routine blood investigations. Patients were divided into 2 groups. Group I was immediate group and group II was delayed group. Following surgeries, patients were prescribed an antibiotic and anti- inflammatory course comprising of Amoxicillin and Clavulanic acid (625mg) thrice daily for 5 days, and Ibuprofen (400mg) thrice daily for 5 days. The length and diameter of the implant was calculated for each patient based on intra oral examination, RVG, IOPAR and OPG radiographic evaluation. The periodontal status was evaluated at baseline (1st month), 3rd and 6<sup>th</sup> months for both groups. Healing had progressed and final prosthetic stage was initiated. Final impressions were made directly on the abutment, and the definitive porcelain-fused- to metal (PFM) splinted restorations were delivered. The data so collected was analyzed at 1 month, 3 month and 6 month and thereafter subjected to statistical analysis.

**RESULTS**

**Table I: Intergroup comparison of plaque index for Group I and Group II at different time intervals**

Time interval	Mean Difference ± SD		p value	z-value	Significance
	Group I	Group II			
Baseline – 3 months	0.09±0.28	0.06±0.31	0.174	-1.40	NS
Baseline – 6 months	0.07 ±0.45	0.00±0.44	0.081	-1.80	NS
3 months -6 months	0.02±0.36	0.06±0.50	0.067	-1.92	NS

Table I shows that mean difference in plaque score from baseline to 3 months in group I was 0.09, in group II was 0.06, baseline to 6 months in group I was 0.07 and in group II was 0.00, 3 months to 6 months was 0.02 in group I and 0.06 in group II. Intergroup comparison was non- significant (P> 0.05).

**Table II Intergroup comparison of gingival index for Group I and Group II at different time intervals**

Time interval	Mean Difference ± SD		p value	z-value	Significance
	Group I	Group II			
Baseline – 3 months	-0.02±0.36	0.00±0.35	0.567	-0.62	NS
Baseline – 6 months	-0.05±0.43	-0.04±0.37	0.744	-0.37	NS
3 months -6 months	-0.03±0.36	-0.04±0.33	0.624	-0.52	NS

Table II showed a statistically non- significant difference in mean value of gingival index at baseline (p value=0.57), 3month (p value=0.74), 6 months (p value=0.62) between Group I and Group II.

**Table III Intergroup comparison of Probing depth(mm) for Group I and Group II at different time intervals**

Time interval	Mean Difference ± SD		p value	z-value	Significance
	Group I	Group II			
Baseline – 3 months	0.06±0.22	0.01±0.34	0.34	-0.90	NS
Baseline – 6 months	0.03±0.39	0.01±0.38	0.62	-0.45	NS
3 months -6 months	0.09±0.27	0.02±0.26	0.36	-0.55	NS

Table III showed a statistically non- significant difference in mean value of probing depth at baseline (p value=0.34), 3month (p value=0.62), 6 months (p value=0.36) between Group I and Group II.

**Table IV Intergroup comparison of width of keratinized gingiva for group I and group II at different time intervals**

Time interval	Mean Difference ± SD		p value	z-value	Significance
	Group I	Group II			
Baseline – 3 months	0.13±0.33	0.05±0.32	0.32	-1.03	NS
Baseline – 6 months	0.17±0.34	0.05±0.46	0.61	-0.06	NS
3 months -6 months	0.03±0.28	0.00±0.35	0.72	-0.04	NS

Table IV showed a statistically non- significant difference in mean value of width of keratinized gingiva at baseline (p value=0.32), 3month (p value=0.61), 6 months (p value=0.72) between Group I and Group II.

**Table V Intergroup comparison of Mesial radiological assessment for Group I and Group II at different intervals**

Time interval	Mean Difference ± SD		p value	z-value	Significance
	Group I	Group II			
Baseline – 3 months	-0.03±0.40	-0.07±0.65	0.40	-3.69	NS
Baseline – 6 months	-0.20±0.41	-0.27±0.82	0.18	-3.87	NS
3 months -6 months	-0.17±0.31	-0.20±0.32	0.41	-3.93	NS

Table V showed a statistically highly significant difference in mean value of bone level on mesial side at baseline (p value=<0.001), 3month (p value=<0.001), 6 months (p value=<0.001) between Group I and Group II.

**Table VI Intergroup comparison of Distal radiological assessment for Group I and Group II at different time intervals**

Time interval	Mean Difference ± SD		p value	z-value	Significance
	Group I	Group II			
Baseline – 3 months	- 0.03±0.33	-0.13±0.48	0.28	-4.58	NS
Baseline – 6 months	-0.03±0.40	-0.33±0.62	0.13	-4.33	NS
3 months -6 months	-0.07±0.18	-0.20±0.32	0.17	-4.10	NS

Table VI showed a statistically highly significant difference in mean value of bone level at baseline (p value=<0.001), 3month (p value=<0.001), 6 months (p value=<0.001) between group I and group II.

## DISCUSSION

Dental implant therapy is one of the pioneering treatment modality for replacement of missing teeth. It is understandable that, patients are more satisfied with implant supported prosthetic rehabilitation in terms of comfort, stability and aesthetics compared to conventional prosthesis. This form and type of replacement has improved dramatically in last 20 years providing a major help to secure complete dentition prosthesis in completely edentulous patients, an even more common application in periodontal practice may be to replace isolated missing teeth or a small segment of missing teeth.<sup>5</sup> The present study was conducted to clinically evaluate the periodontal parameters of osseointegrated immediate and delayed dental implants and to radiographically evaluate the difference in the crestal bone height after immediate and delayed placement of dental implant.

In the present study, plaque index described by Silness P & Loe H. (1964) was used. This parameter was recorded at 1st month (baseline), 3rd and 6th month. On intragroup comparison of mean difference of plaque index in Group I and Group II showed slightly higher plaque index in baseline to 3rd month intervals then baseline to 6<sup>th</sup> month and 3<sup>rd</sup> month to 6th month and this difference was found to be statistically non-significant. This is in accordance with Weber et al<sup>6</sup> On intergroup comparison of mean difference of plaque score between Group I and Group II showed slightly higher plaque index for Group I during the initial follow up period as compared to Group II This may be due to the lack of oral hygiene maintainance immediately after implant placement.

In the present study gingival index was assessed for the purpose of assessing the severity of gingivitis and examining the qualitative changes of the gingival soft tissue. On intragroup comparison, the mean difference of gingival index scores for Group I & Group II showed slightly higher gingival index score for baseline to 6months interval than from baseline to 3rd month and 3rd month to 6th month interval. This difference was found to be statistically non-significant. These results showed very mild inflammatory reaction, as reflected by the low gingival index scores throughout the periods of observation. This would be due to the oral hygiene instructions and measures, which the patients followed during the study periods. Results of the present study are consistent with the findings of Adell R et al (1986)<sup>7</sup> and Nakous M et al (1987).<sup>8</sup>

Clinical probing is regarded as an important and reliable diagnostic parameter in the continuous monitoring of both periodontal and peri-implant tissues as stated by Sanz M et al.<sup>9</sup> On intragroup comparison of the mean difference of probing depth for Group I & Group II showed that both the groups had slightly higher probing depth at 3<sup>rd</sup> month to 6<sup>th</sup> month's

interval than from baseline to 3rd month and baseline to 6<sup>th</sup> month interval. This difference was statistically non-significant indicating that the implant mucosa was kept in healthy condition throughout the study period.

The width of the keratinized mucosa was measured at the mid-facial aspect of each implant using UNC 12 plastic probe. In the present study, on intra-group comparison the mean difference of width of keratinized gingiva showed that in Group I the mean difference of width of keratinized gingiva was slightly higher in baseline to 3rd month and baseline to 6th month interval than 3rd month- 6th month interval and this difference was found to be statistically non-significant. This is in accordance with an observational study by Mombelli et al.<sup>10</sup>

Radiographic interpretation of alveolar bone loss has proven to be one of the most valuable means to clarify implant success. In intragroup group, comparison of the mean difference of mesial and distal radiological assessment in both Group I & Group II showed slight bone loss during baseline to 3rd month period as compared to baseline to 6th month and 3rd month to 6th month time period. Raja et al<sup>11</sup> stated that peri-implant bone loss after implant placement is more accentuated in the first 6 months after surgery.

When different graft materials are used with or without membrane, it is concluded that biomaterial, such as hydroxyapatite when used along with placement promote better healing as given by Wilson TG et al.<sup>12</sup> In the present study we have used alloplast (Biograft-HT) in both groups when-ever needed and it has shown good results. This is in accordance with the study done by Viswambaran M et al<sup>13</sup> and Wagenberg B et al.<sup>14</sup>

This loss of crestal bone could be attributed to the fact that whenever bone is stripped of its periosteum, its nutrition is affected, which could result in some amount of resorption of the crestal bone.

## CONCLUSION

There was significant crestal bone loss in Group II (Delayed implantation) at both mesial and distal surface during 3<sup>rd</sup> to 6<sup>th</sup> month's observation period. Also a continuous bone resorption was observed over the time in the both groups.

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