

# PERI IMPLANT TISSUE EVALUATION USING TWO STAGE SURGICAL PROTOCOL

## Clinical Paper

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**ABSTRACT: Aims and objectives:** The aim of the present study was to evaluate the changes around implant both radiographically and clinically to assess the success of implants.

**Materials and method:** Twenty-four patients with 47 dental implants were examined clinically for 6 months after functional loading, 29 implants were placed 6-8 weeks after the extraction of tooth, i.e. delayed implants and 18 implants were immediately placed after tooth extraction i.e. immediate implant. Crestal bone loss and peri-implant radiolucency were checked radiographically.

**Results:** The average bone loss after 6 months following placement of implant at the crestal level in delayed implants was  $0.84 \pm 0.15$ , whereas for immediate implant it was  $0.78 \pm 0.10$ . There was more hard tissue changes in delayed implants as compared to immediate implant. There was no mobility or no peri-implant radiolucency around any of the implant and there was no significant changes in soft tissue from baseline to 6 months.

**Conclusion:** Our study clearly demonstrated that in both the group of patient's there were no periodontal disease. The survival rate of two-stage submerged implants is 100% during the follow-up period of 6 months.

### Keywords:

Two-stage submerged implants, delayed implant, immediate implant.

**Source of support:** Nil

**Conflict of interest:** None

**INTRODUCTION :** The aim of modern dentistry is to restore the patient normal contour, function, comfort, esthetics, speech, health and a beautiful smile that is supported by a functional and comfortable occlusion. There are many conditions in which extraction is the only choice of treatment. The loss of a tooth or more than one tooth is cosmetic and functional issue for patients.

In 1977 by Dr Per-Ingvar Brånemark discovered that commercially pure titanium, when placed in a suitably prepared site in the bone, could become fixed in places due to close bond that developed between the two, a phenomenon that he later described as osseointegration.<sup>[1,2]</sup> After the concept of osseointegration in relation to titanium endosseous

implants, millions of edentulous and partially dentate patients from all over the world have been treated with dental implants to provide support for prostheses replacing missing teeth. The original and conventional protocols for implant placement is that the patient have to wait for several months after tooth extraction, for the well healed alveolar bone.<sup>[3]</sup> Implants can be placed in partially or completely healed bone.<sup>[4]</sup> In this conventional protocol, which is now called “delayed placement of implant”, a long treatment period is an obvious drawback.<sup>[5]</sup> Besides, patients mostly prefer immediate implant at the site of extraction. In recent decades, in order to remove the undesirable consequences of conventional methods, this protocol has been challenged with reducing the interval between tooth extraction and placement of the

implant, so that some clinicians have used “immediate implant placement” technique. In this method dental implants are placed in fresh sockets just after tooth extraction. This procedure reduces the number of surgery, resulting in shorter treatment durations.

Knowing underlying vital anatomical structures and their variations are a must requisite for treatment planning. Dentascan is a unique new computer software program which provides computed tomographic [CT] imaging of the mandible and maxilla in three planes of reference: axial, panoramic, and oblique sagittal [or cross-sectional]. It enables the dental surgeon to visualize the bony structures pre-operatively.<sup>[6,7]</sup>

Aim of the present study for peri implant tissue evaluation around threaded implant using two stage surgical protocols are to assess the implant success of two-stage, submerged implant placement with delayed loading in the arch, to establish function and esthetics with implant restoration in the partially edentulous regions and after insertion of implant supported prosthesis, implant site was evaluated for the changes in the bone height and soft tissue at the end of 1<sup>st</sup> month, 3<sup>rd</sup> month and 6<sup>th</sup> months.

**MATERIAL AND METHODS :** Twenty four patients, who required to replace/missing single or multiple tooth/teeth were selected for the study in Department of oral and maxillofacial surgery, Institute of Dental Sciences, Bareilly, Uttar Pradesh, India. Inclusion criteria include patients within age range 18<sup>th</sup>-50<sup>th</sup> years of either sex, patients having good systemic health with no contraindications for surgery and patient with good oral hygiene. Exclusion criteria include any medical history that would complicate the outcome of the study, history of bruxism, para-functional habits and lack of stable posterior occlusion.

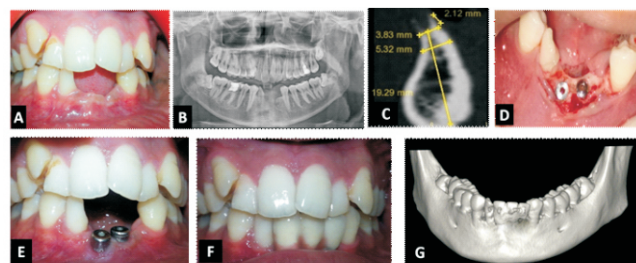
Pretreatment record of the patient include detailed dental and medical history, written and verbal consent, diagnostic cast, intraoral peri apical radiographs [IOPAR], Orthopantomograms [OPG] and dentascan were taken. Dentascan were taken before implant placement, the facial-lingual/palatal distance was calculated at the crest, 3mm apical to the crest and 6 mm apical to the crest [Fig-1C]. The bone density, distance from the vital structure were calculated.

In delayed implant cases capsule amoxicillin 500mg was given 1hr prior to procedure, after achieving adequate local anesthesia, the crestal incision was made and a mucoperiosteal flap was reflected. The implant sites were prepared with standard drill using a surgical stent. Once the osteotomy site was prepared implants were placed with primary stability, later cover screw was placed and final suturing was done [Fig 1].

In immediate implant cases capsule amoxicillin 500mg was given 1hr prior to procedure, after achieving adequate local anesthesia, the tooth scheduled was carefully removed. The Implant placement was performed only when there is labial cortical plate is present. The osteotomy procedure was extended at least 3-4 mm beyond the apex of the socket, implants were placed with primary stability and a cover screw was placed. Bone grafts, was placed when the defect dimension was noted to be more than 2 mm vertically or horizontally and primary closure was done [Fig 2].

Post-operative instruction were given to the patient which include ice pack and soft diet. Antibiotics and analgesics were given for 3 days. Patient was recalled after 1 week for suture removal.

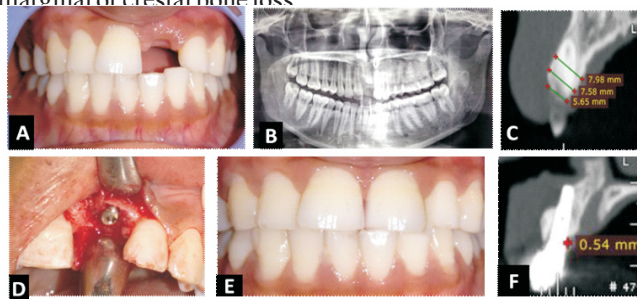
After 3 to 4 months of implant placement patient were recalled, IOPAR X-ray were taken to evaluate peri-implant bone loss. During second stage surgery cover screw was removed and implant mobility was checked before placement of gingival former. Later gingival former was removed after 15 days [Fig-1E] and abutment was placed over the implant and impression were taken and send to laboratory. Finally metal fused with porcelain crown is cemented over the abutment [Fig-1G and 2H].



**Fig-1:-** Delayed implant A- missing teeth; B- pre operative OPG; C- dentascan; D- implant placement; E- healing cap placement; F- crown cemented over the abutment of implant;

H- post operative dentascan after 6<sup>th</sup> month of functional loading.

Patients were reviewed at 1<sup>st</sup> month, 3<sup>rd</sup> month and 6<sup>th</sup> month following functional loading to evaluate clinical and radiographical changes in the bone height and soft tissues around implant. To evaluate clinical changes, bleeding index [MOMBLI and LANG], gingival index [SILNES and LOE] and implant mobility index [MISCH and SILC] were used. Dentascan were taken at the end of 6<sup>th</sup> months after the implant prosthesis placement. The parameters evaluated were marginal or crestal bone loss.



**Fig 2:-**Immediate implant A-root stump of right upper central incisor; B- pre operative OPG; C- dentascan; D- implant placement; E- crown cemented over the abutment of implant; F- post operative dentascan after 6th month of functional loading.

**RESULTS :** In twenty-four patients 47 dental implant were placed, 29 implants were placed 6-8 weeks after the extraction of tooth, i.e. delayed implants and 18 implants were immediately placed after tooth extraction i.e immediate implant [Table-1].

Type of implant	No.	Percentage (%)
Delayed	29	61.7%
Immediate	18	39.3%
Total	47	100%

**Table 1:-** Details of implant placement

Measurements through dentascan was made prior to implant placement at the crest, at 3mm and at 6mm of facial–lingual/palatal bone. The mean at crest was  $4.52 \pm 1.65$  mm in delayed implant and  $7.37 \pm 1.30$  mm in immediate implant. Mean at 3mm was  $6.91 \pm 1.83$ mm in delayed implant and  $8.98 \pm 1.07$ mm in immediate implant. Mean at 6mm was

$68.75 \pm 3.28$  mm in delayed implant and  $10.39 \pm 0.93$  mm in immediate implant [Table-2].

Level	Delayed Mean $\pm$ SD	Immediate Mean $\pm$ SD
At crest	$4.52 \pm 1.65$	$7.37 \pm 1.30$
At 3mm	$6.91 \pm 1.83$	$8.98 \pm 1.07$
At 6mm	$8.75 \pm 3.28$	$10.39 \pm 0.93$

**Table 2:-** Bone available for implant placement

There was mild inflammation in all the patients at 1st day because of surgical trauma. Later on, there was no swelling at any time interval. Gingival index was measured at the end of 1st, 3rd and 6th month. There was absence of mobility, inflammation, edema, bleeding on probing or ulceration in all the cases.

Bleeding index was measured at the end of 1st, 3rd and 6th month after implant prosthesis placement. There was a significant decrease in bleeding on probing when comparing the mean at different time interval. In comparison to 1<sup>st</sup> month and 3<sup>rd</sup> month in delayed implant the mean difference was 0.198 with a p- value of 0.130 and in immediate implant the mean difference was 0.262 with a p- value of 0.0651 which was not significant. In comparison to 1<sup>st</sup> month and 6<sup>th</sup> month in delayed implant the mean difference was 0.405 with a p value of 0.002 and in immediate implant the mean difference was 0.433 with a p- value of 0.006 which was highly significant. In comparison to 3<sup>rd</sup> month and 6<sup>th</sup> month in delayed implant the mean difference was 0.207 with a p- value of 0.075 and in immediate implant the mean difference was 0.171 with a p- value of 0.248 which was not significant [Table-3].

Comparison	Mean difference of BOP in delayed implant	Mean difference of BOP in immediate implant
After 1 months vs after 3 month	0.198	0.262
After 1 months vs after 6 month	0.405	0.433
After 3 months vs after 6 month	0.207	0.171

**Table-3:-** Comparison of bleeding on probing [BOP]

The crestal or marginal bone loss was measured after the 6<sup>th</sup> month of functional loading. The mean crestal bone loss after implant placement was  $0.84 \pm 0.10$ mm in delayed implant and  $0.78 \pm 0.15$ mm in immediate implant [Table 4]. There was no significant difference in mean bone loss after implant

placement in delayed implant and immediate implant [ $p=0.1063$ ].

Type of implant	Mean $\pm$ 10
Delayed	$0.84 \pm 0.10$
Immediate	$0.78 \pm 0.15$

**Table 4:-**Bone loss after 6month of functional loading

**DISCUSSION :** Implants have been used to support dental prostheses for many decades, but clinicians have not always enjoyed a favorable reputation. This situation has changed dramaticall with the development of end osseousosseoin tegrated dental implants.

A rationale for choosing a two-stage, submerged surgical approach and delayed loading period in our study was to reduce and minimize the risk of bacterial infection, to prevent apical migration of the oral epithelium along the body of the implant, and to minimize the risk of early implant loading during bone remodeling as premature micro motion will repeatedly disrupt the normal osseous modeling processes leading to fibrous tissue encapsulation rather than direct bone apposition around the implant.

For the achievement of osseointegration primary stability at the time of implant placement is an important prerequisite. Implant mobility is an indication of lack of osseointegration. Radiographic evaluation of intraoral periapical radiograph of the implant at mesial and distal sites revealed significant decrease in bone height indicating bone remodeling around the implant. All the implants evaluated in our study were immobile, with Grade 0 mobility. There was no evidence of periimplant radiolucency or peri-implant infection in both the groups. Van Steenberghe also proposed that there should be no peri-implant radiolucency on undistorted radiograph for success of the implant.<sup>[8]</sup>

Albrektsson also quoted that the clinical symptoms of peri-implant infection is signs of failing implant during the maintenance period.<sup>[9]</sup> In the present study, there was mild inflammation in both the groups on the 1<sup>st</sup> day because of surgical trauma. Later on, there was no swelling at any time interval. The gingival status remained normal at 1<sup>st</sup>, 3<sup>rd</sup> and 6<sup>th</sup> months.<sup>[10]</sup>

Bleeding on probing is clinical parameters used to evaluate

the presence of an inflammatory process at the base of the periodontal pocket. BOP was present in some of the patients at 1<sup>st</sup> month, but there was a subsequent decrease in BOP from 1st to 3rd months and 3rd to 6<sup>th</sup> months. This can be attributed to the fact that after loading the implant, hygiene could not be well maintained in the subgingival regions but later when the repeated reinforcements of oral hygiene measures were given to the patient, there was reduction in BOP. Gingival index is also a clinical parameter for evaluation of gingiva, changes such as inflammation, redness or change in color, ulceration or bleeding on probing. There were no significant changes in the gingival index at the 1<sup>st</sup> month, 3<sup>rd</sup> month and 6<sup>th</sup> month. Similar study conducted by Blanes et al,<sup>[11]</sup> Lekholm and van Steenberghe<sup>[12]</sup> and Rismanchian and Fazel<sup>[13]</sup> which also shows that change in bleeding and gingival index at different periods remains statistically the same.

Dentascanner was used to measure the facio-palatal/lingual bone before the implant placement, and for crestal bone loss 6<sup>th</sup> month after the implant prosthesis placement. When evaluated at second stage surgery, all implants in the current study were clinically stable, asymptomatic and free of any osseous defect.

The study done by Maj Guruprasada on 'comparative analysis of peri-implant bone levels of immediate and conventionally loaded implants.' The results of study showed less amount of peri-implant bone loss in immediate implant group, as compared to delayed implant group, in 6 months after placement of the implant prosthesis placement. The average bone loss for immediate implant was 0.69 mm, whereas for delayed implants it was 0.74 mm. The difference in the bone loss between immediate and delayed was 0.05 mm.<sup>[14]</sup> In our study, the mean difference in peri-implant bone loss after 6 months at crestal level in delayed implant group was  $0.84 \pm 0.15$ , whereas for immediate implant group it was  $0.78 \pm 0.10$ . The difference in the bone loss between immediate and delayed was 0.06 mm. Our study result were in accordance with the results of Maj Guruprasada.<sup>[14]</sup>

## CONCLUSION

Our study concludes that osseointegration can be achieved if the implants are placed with a delicate surgical technique and are allowed to heal without functional loading for a period of



not less than 3-4 months. Our study clearly demonstrated that there was no periodontal disease and the survival rate of two-stage, countersunk, submerged implants in the edentulous sites is 100% during the follow-up period of 6 months. Possible explanations may be proper case selection, diagnosis, aseptic method of surgery, maintenance of sufficient cortical bone around the implant and good oral hygiene maintenance during the follow-up period. In order to increase our understanding, further studies need to be conducted with longer duration and a larger sample size.

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