

A Comparative Evaluation of Endosseous Dental Implants – Immediate Versus Delayed

Annant Choubey¹, Ajay K. Pillai², Neha Jain^{1*}, Puja Sankla², Pushpraj Singh¹, Lokendra Sankla³

¹Department of Oral and Maxillofacial Surgery, People Dental Academy, Bhopal, Madhya Pradesh, India.

²Department of Oral and Maxillofacial Surgery, RKDF Dental College and Research Center, Bhopal, Madhya Pradesh, India.

³Department of Periodontology and Implantology, RKDF Dental College and Research Center, Bhopal, Madhya Pradesh, India.

Abstract

Restoration of form and function is the goal of a surgeon; therefore, tooth loss is replaced by dental implant from time immortal but still the controversy exist whether immediate placement is better than delayed implants. Therefore, in order to draw a conclusion, we conducted a study to compare the efficacy of immediate implant versus delayed implants.

Keywords: Delayed implant, Immediate implants, Implants.

INTRODUCTION

Tooth loss is not unusual and results in loss of function and esthetics which, in turn, leads to difficulty in mastication and low self-esteem. Loss of tooth may be because of trauma, pathology, periodontitis, caries, or congenital absence and rehabilitation becomes important as it ultimately effects the quality of life of the patient. Dental implants are one of the many treatment modalities available to replace the lost tooth. Placing of the implants can be done as a one stage or a two-stage process. In the former, healing abutment is placed at the time of implant placement itself whereas in the latter, the head of implant is covered by a cover screw and the implant is left buried to heal until the completion of integration period, after which a second procedure is planned to expose the implant and to attach the abutment and place the final prosthesis. This procedure is performed when the existing bone quality is subpar to accept the implant.

Aim

The aim of the study was to study and compare the postoperative results of implants placed immediately in freshly extracted socket versus the implants placed 2–3 months later following osseointegration and under delayed loading condition.

MATERIALS AND METHODS

An experimental study was planned which was conducted from January 2019 to August 2020, in the department of oral and maxillofacial surgery, People's Dental Academy after clearing

all the required ethical clearance protocols. The patients were selected from the out-patient clinic of the department of oral and maxillofacial surgery, People's Dental Academy (PU).

Thorough clinical examination of the patients was performed. Case history was recorded followed by complete clinical examination to rule out any systemic ailment that may unfavorably influence bone and soft-tissue healing. Radiographic assessment was accompanied along with a cone-beam computed tomography in some cases to evaluate the bone quality at the potential recipient site.

Eligibility criteria includes patients with no systemic diseases and good health of the surrounding tissues without any significant pathology at the planned site of surgery, sufficient inter arch distance, absence of para functional habits, absence of any neurological/cognitive/psychomotor disability, availability of minimal 4–5 mm of healthy bone apical to the teeth planned to be extracted in immediate implant placement cases, adequate bucco-lingual width with acceptable thickness of cortical plate proportionate with the functional requirements of the site being

Address for correspondence: Dr. Neha Jain,
Department of Oral and Maxillofacial Surgery, People
Dental Academy, Bhopal, Madhya Pradesh, India.
Email: nehamds26aug@yahoo.in

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restored, and absence of periodontal bone disease. Exclusion criteria includes patient with known systemic disease which will affect the surgical procedure and healing of the surgical site, insufficient bone height and width, presence of acute infection, or periodontal bone disease.

A total of 20 implant placing sites were identified and divided into two categories that is Group I – patients with immediate implant placement following extraction and Group II – patients with delayed implant placement. The study variables are of two types, independent variables – implant insertion in fresh extraction socket and implant insertion in healed extraction site and dependent variables – Pain on functional loading, implant mobility, probing depth, radiographic evidence of bone loss, pus discharge, and loss of implant.

Armamentarium

- ADIN Touareg s Dental Implants (Adin Dental implant system Ltd. Afula, Israel)
- ADIN dental implant insertion kit
- Demineralized bone matrix with or without calcium sulfate (Osseograft, osseomold; Advanced Biotech Products Pvt. Ltd, Alathur, India)
- Novabone bioactive synthetic bone graft (Nova Bone Products LLC, Alachua. USA)
- Healiguide Guided regeneration membrane (Advanced Biotech Products Pvt. Ltd, Alathur, India)
- Physio-dispenser
- General minor surgical instruments and tooth extraction forceps.

Data collection procedure

Patients who satisfied the above-mentioned criteria for eligibility were shortlisted and separated into two groups. Group 1: The patients in this group underwent extraction of the tooth followed by curettage and immediate placement of the implant. In cases where the gap between implant and socket wall was more than 2 mm, demineralized bone matrix/CPS putty synthetic graft was placed followed by a placement of GTR membrane to secure the implant in place and primary closure was done. Group 2: Patients included in Group 2 were those who underwent extraction on a previous date and reported to the department with clinically and radiographically well healed extraction sites. The implant was placed and not followed by any grafting and primary closure was done.

All the patients regardless of their group were subjected to regular follow-ups. Observation followed by delayed loading after the period of 3 months. General investigations include complete blood count (CBC), bleeding time, and clotting time were performed to assess the overall health of the patient.

A thorough pre surgical planning was carried out for each patient before Stage I surgery which included taking impressions of both the dental arches and preparing study models, doing occlusal analysis over the study models and preparing surgical stents. Patient preparation before the planned surgery involved oral prophylaxis before implant placement

and as for pre-medication, Patients were prescribed a capsule of amoxicillin and clavulanic acid 625 mg 12 hourly 1 day before the procedure and one capsule 1 h before the procedure.

The parameters obtained were as follows –

1. The measurements of radiographic bone loss were measured from crest of alveolar bone to the deepest part of peri implant crevice using grid method
2. Probing depth were measured from peri implant gingival margin to the deepest part of peri implant crevice using a standardized probe and recorded to the nearest millimeter.

Implant mobility

Mobility (Grade 0, Grade I, Grade II, and Grade III)

- Grade 0 – Absence of clinical mobility in any direction
- Grade I – Slightly detectable horizontal movement
- Grade II – Moderate visible mobility 0.5

Pain

Visual analog scale used to assess pain and discomfort.

Surgical procedure

- a. Flap design: After administering local anesthesia, around the tooth indicated for extraction, using No.15 B.P. blade crevicular or sulcular incisions were placed around the tooth to be extracted. For delayed placement of implants, incision was taken on the buccal aspect of the cortical bone so that the surface of the implant was completely covered beneath the flap after closure
- b. Extraction of tooth: Extraction was carried out using extraction forceps, while keeping in mind that minimal trauma is being caused to the bone. Buccolingual movements were avoided so as to prevent the expansion of the cortical bone. Elevators were not used as they transfer a lot of force on the bone. Only gentle rotatory movements were used to coax the tooth out of the socket. However, there were some teeth which were previously treated endodontically or were undergoing internal resorption and were simply too brittle to be extracted with forceps alone. Such teeth were sectioned with the help of rotary instruments and removed. After extraction curettage was done to eliminate any infected soft tissue, followed by saline irrigation
- c. Deciding on length and width of implants: In Group I patients, following extraction, the dimensions of the socket were measured using a depth gauge provided in the ADIN implant surgical kit. After assessing the dimensions of the socket with depth gauge and correlating the findings with OPG, IOPA, and CBCT final decision regarding the dimensions of the implant was taken while In Group II, dimensions were decided based on the findings after reviewing OPG, IOPA, and CBCT.

Placement of the implant

Implant can be placed in one stage or a two-stage procedure.

Single stage surgery

Per mucosal extension is placed at the time of implant placement.

Second stage surgery

Second stage surgery is initiated 3–6 months after the insertion of implant. Mid crestal incision was placed and flap was reflected. Cover screw was removed and per mucosal extension was placed for a period of 21 days. This resulted in formation of a gingival cuff or gingival collar. Per mucosal extension was removed with the help of hex driver and abutment was placed over the implant and top screw was tightened. Patients were recalled for follow-up on 3rd and 6th month with assessment of all clinical and radiographic parameters.

Post-surgical instructions

Standard post-operative instructions were explained to the patients. As for medication, an antibiotic and an analgesic were prescribed to the patient. Antibiotic Tab Amoxicillin clavulanic acid 500 + 125 mg was given 3 times daily for 5 days. Analgesic diclofenac sodium was prescribed twice daily for 5 days. Patients were advised to rinse their mouth with chlorhexidine gluconate mouthwash for a period of 15 days. Patients were recalled after 1 week for suture removal and follow-up was done every 15 days for the 1st month.

Follow-up and assessment of study parameter

Patients would be recalled at intervals of 1st, 3rd, 6th, and 12th month after loading and assessed for pain, mobility, radiographic alveolar bone loss, pus discharge, and probing depth. The results were entered in the assessment proforma and intergroup comparison was carried out to determine statistical significance. Statistical analysis was done by SPSS software version 20.00. Chi-square test will be applied to compare qualitative data. $P = 0.05$.

DISCUSSION

Dental implant therapy is one of the newer means for replacement of missing teeth. Patients are more contented with implant supported prosthetic rehabilitation in terms of comfort, function, stability, and esthetics compared to conventional prosthesis. Patients consider implant supported prosthesis as an integral part of their body as a result of which patients find it more acceptable. They feel confident which ultimately reflects on their lifestyle in a positive manner.

Wilson *et al.* (1993)^[1] explained osseointegration as “A direct structural and functional connection between ordered living bone and the surface of the load – covering implant.” Much of the experimental and clinical data published by the author have provided the dental profession with safe methods and predictable outcome of implant dentistry. Their tradition protocol recommends a 12-month healing period amid tooth extraction and placement of implants.

Chen *et al.* (2008)^[2] tooth retention in dentulous patients as well as the stability of implant after its placement and the guarantee for its longevity invariably depends on the amount of bone available. Bone loss after tooth extraction remains crucial. Bone resorption occurs in both buccolingual and apicocoronal directions, and the first 6 months post-extraction

the rate of resorption is at its peak. Resorption of the buccal wall of the extraction socket may lead to significant disadvantages especially in the anterior part of the maxilla. A buccal concavity in the alveolar process or an implant that is placed more lingually than the adjacent teeth can result in poor esthetics. Furthermore, with increasing resorption, the incisive canal is positioned relatively farther buccally, which forces the surgeon to place implants replacing the central incisors too close to the laterals. Ultimately, the alveolar process may become too narrow to allow implant placement.

Chen *et al.* (2008)^[2] also stated that the placement of implants immediately following tooth extraction proved to be more advantageous over alternative treatment options with whopping 95% of survival rate. Typically, a healing period of 9–12 months is observed following extraction. Although, during this time, extensive bone resorption takes place, especially of the buccal palate, ensuing in a collapse of the buccolingual bone width of the alveolar ridge. In cases with too narrow alveolar ridges, the treatment would consist of ridge augmentation and secondary placement of implants into nearly created bone. In certain cases, barrier membranes have to be applied to achieve bone growth between the implant and the bony extraction socket.^[3] This line of treatment however would demand a healing period of 6–8 months for osseointegration before a prosthetic supra structure can be accepted by the bone and hence results in unnecessary discomfort to the patient and prolongs treatment time.

Webitt *et al.* (1992)^[4] placement of implant directly into a prepared extraction socket at the time of extraction have several advantages that have the potential to improve patient acceptance of the procedure. The advantages are elimination of the waiting period for socket ossification, lesser number of surgical sessions, shortened edentulous time period, reduced overall cost, preservation of alveolar bone height and width, decreased operatory time with less trauma to the tissues, and less discomfort to the patient, using the extraction site that follows the natural long axis of the teeth easier implant orientation and better prosthodontic rehabilitation can be achieved, crestal bone loss can be minimized while still maintaining the implant in the central region of the alveolar crest through the use of longer implant the long-term prognosis can be increased and greater support can be obtained for the guided tissue membrane in cases of bone implant deficiency to maintain or enhance the osseous width and height better.^[5,6]

Several authors reported 74–76 placements of implants into extraction socket.^[7–10] Indications for immediate placement are where extraction is advised in case of failed endodontically treated teeth, teeth with advanced periodontal diseases, root fractures, and advanced caries beneath the gingival margin. It utilizes the potential new bone formation in extraction socket to obtain osseointegration. The entire concept of immediate implants depends heavily on maintaining integrity of buccal cortical plates. Implants immediately placed into extraction sockets have predictable healing in submerged environment.

Noble bio-care implants placed immediately into extraction sockets were evaluated and showed 94% of survival rate and success rate of 92%. Pre-operative radiographic evaluation helps to determine the height and width of bone available for implant insertion. Ideally, the bone width should allow complete coverage of all the implant threads on both the buccal and lingual sites. Available bone height must be estimated from that part of the alveolar bone in which a sufficient bone width is found to site specific anatomic border in the vertical direction. Radiographically, lack of osseointegration and lack of stability of the implant are indicated by radiolucent line along the implant surface. In our study, we have made an effort to compare the survival rate of ADIN dental implants placed immediately into fresh extraction sockets and in delayed sites, in two groups of 10 patients each with the mean age of 33 ± 12 years in the age group of 18–64 years.^[11-13]

Our results of the study may be interpreted as follows:

Microbial growth at the surgical site may lead to infection hence patients were prescribed systemic antibiotic for 5–10 days and mouthwash for at least 3 weeks following placement of implants. Indicated teeth were extracted with minimal trauma to the buccal cortical plate. In Group A out of 10 cases that were treated, in two cases, the root was fractured during extraction. These were removed with the help of rotary instruments while keeping in mind to preserve the alveolar socket.

Infection might result postoperatively around the implant if adequate pre-operative and post-operative care is not provided. It should be kept in mind that the cause of infection of the diseased tooth might be endodontic, periodontal, or during surgical treatment if the basic sterilization protocols are not followed. The patient must be placed on antibiotics before the procedure and maintained for 10 days so that the bacterial contamination is eliminated or reduced. Another important part of the surgical treatment is the complete, debridement, and rinsing of the alveolus. After extraction two cases showed infected tissue in the socket. In one of the case, infected tissue was found in the palatal wall of the socket and in the another case, in the distal wall of socket. They were curetted out of the socket and saline irrigation was done. Then preparation of implant bed was carried out.

During preparation of implant bed, care was taken to prevent damage to buccal cortical plate by angulating the drill toward the palatal plate. In immediate implant cases, even though drilling was minimal care was taken to minimize the thermal damage using cool saline irrigation. Selected implants were placed into prepared sockets. After implant placement, in all the 10 cases, primary stability was achieved.^[14,15]

Peri implant probing

Pocket probing or peri implant probing is a crucial procedure in diagnosis of the periodontium and therefore evaluation of maintenance phase of periodontal therapy. Pockets 5 or more than 5 mm deep can be viewed as protected habitats, pathogens, and are sign of peri implantitis. Peri implant probing

is done on mesial, mid buccal, distal, mesiolingual, lingual, and distolingual sides. In our study, pocket depths at mesial, buccal, distal, and lingual sides increased from immediate post-loading of implants to 3, 6, and 12 months after loading of the implant. However, none of these were statistically significant, similar observation were made by researchers in earlier study wherein pocket depth has increased, due to the fact that implants have been placed 1 or 2 mm below the level of the alveolar crest. However, these results are against the studies published conducted by Atassi (2002).^[16-19]

Mobility

Absence of mobility is an important criteria for success for implant therapy. Clinically, visible mobility of an implant after an appropriate healing period indicates failure to achieve osseointegration.^[20] All implant evaluated in our study at the time of surgery at the time of exposure (second stage surgery). Moreover, 3-, 6-, and 12-month post-loading of implants did not show any amount of mobility. All the implants at all stages were grouped into Grade 0 mobility. This is in accordance to the studies conducted by researchers. However, some studies^[21] have recorded mobility being observed in a study one implant (out of 32 implant) was lost and concerned patient was heavy smoker. In another study, wherein 5% of implants were lost, mobility was noted in 5% of cases at second stage surgery.

Radiographic analysis of iopa on mesial and distal sides: Radiographic evaluation of bone forms

Intraoral periapical radiograph is a viable means for detecting stability of bone around the hard tissue. Intraoral periapical radiograph were taken at baseline, during second stage surgery, 6 month, and 12 months after prosthetic loading of the implants using long cone paralleling technique. After selecting the region of interest, the bone height from a fixed reference point in the implant was assessed. Implants were evaluated at the time of exposure, 3rd, 6th and 12th months postloading, which showed nil mobility (Grade 0). The results are in accordance with the studies done in past by chan et al 2008. However in some studies mobility was observed in heavy smokers and in some mobility was observed in stage 2 surgery.^[6,7]

Radiographic analysis of IOPA on mesial and distal sides: Radiographic evaluation of bone forms

IOPAR is the ideal to evaluate bone surrounding the implants. Intraoral periapical radiograph was taken at baseline, during second stage surgery, 6 month, and 12 months after prosthetic loading of the implants using long cone paralleling technique. In Group A and Group B, this is in similar to studies conducted by researchers.^[10]

Pain, discomfort, and pus discharge: The three parameters, pain, discomfort, and pus discharge, were assessed during the surgery, 1-day postoperatively and 3, 6, and 12 months after the surgery. The assessment in both the cases during the above-mentioned periods revealed that the patient did not experience any pain, discomfort, or pus discharge.

SUMMARY AND CONCLUSION

Tooth loss is a common problem and it can happen as a result of diseases and trauma; therefore, the use of dental implants to provide support for replacement of missing teeth has a long and multifaceted history. Placing an implant immediately after tooth extractions offers several advantages, including a decrease in rehabilitation treatment time, fewer surgical sessions, ability to place the fixture in an ideal axial position, positive psychological impact on the patient, and enhanced hard- and soft-tissue maintenance. The results of our study, from the immediate implant group, were very promising as the functional outcome was acceptable and was nowhere inferior to the patients who underwent implant placement during the traditional protocol. Thus, the immediate implant placement protocol can be more promptly utilized which would finally reduce the total time of treatment. Hence to conclude, we would like to highlight the importance of reduced treatment time utilizing this protocol. At the same time, we would like to state that there is a need for further study taking into account many other variables which were not included in the study.

REFERENCES

1. Wilson TG, Weber HP. Classification of and therapy for areas of deficient bony housing prior to dental implant placement. *Int J Periodontics Restorative Dent* 1993;13:451-9.
2. Chen S, Buser D. Implants in post-extraction sites: A literature update. In: Buser D, Belser U, Wismeijer D, editors. *ITI Treatment Guide, Implants in Extraction Sockets*. Vol. 3. Berlin: Quintessence, 2008. p. 9-15.
3. Hammerle CH, Chen ST, Wilson TG Jr. Consensus statements and recommended clinical procedures regarding the placement of implants in extraction sockets. *Int J Oral Maxillofac Implants* 2004;19(Suppl):26-8.
4. Werbitt MJ, Goldberg PV. The immediate implant: Bone preservation and bone regeneration. *Int J Periodontics Restorative Dent* 1992;12:206-17.
5. Calvo-Guirado JL, Boquete-Castro A, Negri B, Ruiz RD, Gómez-Moreno G, Iezzi G. Crestal bone reactions to immediate implants placed at different levels in relation to crestal bone. A pilot study in Foxhound dogs. *Clin Oral Implants Res* 2014;25:344-51.
6. Soydan SS, Cubuk S, Oguz Y, Uckan S. Are success and survival rates of early implant placement higher than immediate implant placement? *Int J Oral Maxillofac Surg* 2013;42:511-5.
7. Chrcanovic BR, Albrektsson T, Wennerberg A. Dental implants inserted in fresh extraction sockets versus healed sites: A systematic review and meta-analysis. *J Dent* 2015;43:16-41.
8. Albrektsson T, Jansson T, Lekholm U. Osseointegrated dental implants. *Dent Clin North Am* 1986;30:151-74.
9. Polizzi G, Grunder U, Goene R, Hatano N, Henry P, Jackson WJ, *et al.* Immediate and delayed implant placement into extraction sockets: A 5-year report. *Clin Implant Dent Relat Res* 2000;2:93-9.
10. Degidi M, Piattelli A, Carinci F. Immediate loaded dental implants: Comparison between fixtures inserted in postextractive and healed bone sites. *J Craniofac Surg* 2007;18:965-71.
11. Pieri F, Aldini NN, Fini M, Corinaldesi G. Immediate occlusal loading of immediately placed implants supporting fixed restorations in completely edentulous arches: A 1-year prospective pilot study. *J Periodontol* 2009;80:411-21.
12. Raes F, Cooper LF, Tarrida LG, Vandromme H, De Bruyn H. A case-control study assessing oral-health-related quality of life after immediately loaded single implants in healed alveolar ridges or extraction sockets. *Clin Oral Implants Res* 2012;23:602-8.
13. Cosyn J, Eghbali A, Hanselaer L, De Rouck T, Wyn I, Sabzevar MM, *et al.* Four modalities of single implant treatment in the anterior maxilla: A clinical, radiographic, and aesthetic evaluation. *Clin Implant Dent Relat Res* 2013;15:517-30.
14. Meizi E, Meir M, Laster Z. New-design dental implants: A 1-year prospective clinical study of 344 consecutively placed implants comparing immediate loading versus delayed loading and flapless versus full-thickness flap. *Int J Oral Maxillofac Implants* 2014;29:e14-21.
15. Arlin ML. Analysis of 435 screw-vent dental implants placed in 161 patients: Software enhancement of clinical evaluation. *Implant Dent* 2002;11:58-66.
16. Wolfinger GJ, Balshi TJ, Rangert B. Immediate functional loading of Branemark system implants in edentulous mandibles: Clinical report of the results of developmental and simplified protocols. *Int J Oral Maxillofac Implants* 2003;18:250-7.
17. Evian CI, Emling R, Rosenberg ES, Waasdorp JA, Halpern W, Shah S, *et al.* Retrospective analysis of implant survival and the influence of periodontal disease and immediate placement on long-term results. *Int J Oral Maxillofac Implants* 2004;19:393-8.
18. Jaffin RA, Kumar A, Berman CL. Immediate loading of dental implants in the completely edentulous maxilla: A clinical report. *Int J Oral Maxillofac Implants* 2004;19:721-30.
19. Perry J, Lenchewski E. Clinical performance and 5-year retrospective evaluation of Frialit-2 implants. *Int J Oral Maxillofac Implants* 2004;19:887-91.
20. Sennerby L, Rocci A, Becker W, Jonsson L, Johansson LA, Albrektsson T. Short-term clinical results of Nobel Direct implants: A retrospective multicentre analysis. *Clin Oral Implants Res* 2008;19:219-26.
21. Artzi Z, Kohen J, Carmeli G, Karmon B, Lor A, Ormianer Z. The efficacy of full-arch immediately restored implant-supported reconstructions in extraction and healed sites: A 36-month retrospective evaluation. *Int J Oral Maxillofac Implants* 2010;25:329-35.