



Comparative analysis of peri - implant bone levels in immediate and delayed implants - A retrospective study

¹Dr. Nitin Gorwade, ²Dr. Sankey Kumar Baidya, ³Dr. Astha Timothy, ⁴Dr. Priya Patel, ⁵Dr. Ravindra Soni, ⁶Dr. Bharat Gupta, ⁷Dr. Ramanpal Singh Makkad

¹Associate Professor, Bharati Vidyapeeth (Deemed to be University) Dental College and Hospital, Sangli, Maharashtra, India

²Senior Lecturer, Department of Prosthodontics and Crown & Bridge, Hazaribag College of Dental Sciences & Hospital, Hazaribag, Jharkhand, India

³Post Graduate Student, ⁵Assistant Professor, Department of Periodontology, New Horizon Dental College & Research Institute, Bilaspur, Chhattisgarh, India

⁴Senior Lecturer, Department of Periodontology, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India

⁶Associate Professor, Department of Periodontics, MGM dental College, Navi Mumbai, India

⁷Professor, Department of Oral Medicine and Radiology, New Horizon Dental College and Research Institute, Sakri, Bilaspur Chhattisgarh, India

Corresponding author: Dr. Nitin Gorwade, Associate Professor, Bharati Vidyapeeth (Deemed to be University) Dental College and Hospital, Sangli, Maharashtra, India

Abstract

Introduction: The first known use of dental implants dates all the way back to history. The term "osseointegrated implants" was coined by Branemark, who also provided its definition: "osseointegration is the direct structural and functional connection between living bone and the surface of a load-bearing implant." Before placing a dental implant, he recommended that the patient wait until the alveolar bone had completely healed. In 1976, Schulte and Heimke were the first to propose the idea of immediately placing implants in freshly extracted tooth sockets. **Aim & Objectives:** Radiographically analyzing and contrasting the peri implant bone levels of immediate versus delayed implants was the purpose of this investigation.

Materials and Method: This was a retrospective study that was performed at the department of oral and maxillofacial surgery using radiographs from a total of 80 patients. There were 40 patients who received immediate implants and 40 patients who received delayed implants.

Result: According to the findings of this investigation, immediately placing implants in fresh extraction sockets can produce positive results that are comparable to those obtained using the conventional delayed approach. **Conclusion:** However, additional research with bigger sample numbers is required to analyze peri implant bone loss, the health of soft tissue, and success rates in order to substantiate the basis for selection of the optimum implant protocol for long term success. This research should be done as soon as possible.

Key Words: Dental Implants, Immediate Implants, Delayed Implants, Peri- Implant Bone Loss.

INTRODUCTION

The term "implant" refers to "any object or material, such as an alloplastic substance or other tissue, which is partially or completely inserted into the body for therapeutic, diagnostic,

prosthetic, or experimental purposes." Implants can be used for a variety of purposes, including treatment, diagnosis, prosthetics, and research. Shells, gold, platinum, stainless steel, aluminum oxide, vitallium, and other materials were utilized in various designs for dental implants as early as 600 A.D. Dental implants were first introduced during this time period. In the year 1952, a professor named Per – Ingvar Branemark made the discovery that osseointegration could occur in titanium. As a result, he postulated that titanium may be utilized in the field of dentistry¹. This event is considered to be the starting point of the period known as dental implantology. In the 1960s, Branemark and colleagues established that natural bone has the capacity to accept titanium implants during the remodelling stages that lead to osseointegration. This ability was demonstrated. In the late 1930s, an oral and maxillofacial surgeon from Boston named Dr. Alvin Strock inserted an orthopaedic screw into the immediate extraction socket of a tooth that was periodontally damaged. He discovered that the implant and its repair persisted for 18 years after the procedure. The insertion of a dental implant requires careful clinical and radiologic examination, as well as careful planning. The evaluation of the bone density is one of the most important factors in determining the success of the implant placement. Lekholm and Zarb developed a system for classifying different forms of bone depending on the density of the bone. After having a tooth extracted, it is recommended in the initial protocol for implant placement, which was outlined by Branemark, to wait until the alveolar bone has completely healed before inserting a dental implant. This typically takes between six and twelve months². A sufficient quantity and quality of osseous tissue is necessary for successful osseointegration of dental implants. This is necessary to ensure that the implant is stabilized and to allow for bone-to-implant contact over the entire surface intended for osseointegration. This process typically takes about six months after the placement of the implant. In the year 1976, Schulte and Heimke detailed the process of placing implants in new extraction sockets, which led to the creation of the term "immediate implant." In the year 2004, Hammerle et al.³ described immediate implant placement as a procedure in which the implant is placed immediately after tooth extraction, as a part of the same surgical procedure. They also compared it with delayed / conventional implant placement, in which the implant is placed after the complete healing period of the extracted tooth. According to the findings of the study, there are a number of benefits associated with immediate implants. The biggest benefit is that patients do not require a second surgical procedure and have shorter chair times overall. When taken into consideration jointly, these factors would contribute to a decrease in the total cost of therapy. It was also discovered that there was no microgap at the level of the bone crest, which led to a reduction in the amount of crestal bone resorption that occurred while the bone was mending. Therefore, a suitable crown-to-implant length ratio, optimal soft tissue esthetics, and excellent implant orientation were all attainable goals. In the field of implant dentistry, implant stability is considered to be one of the most significant factors. It is possible to define implant stability as the lack of clinical movement, which is also the suggested definition of osseointegration. Implant stability has an impact on the healing process and the ability of implants to successfully osseointegrate. To this day, the question of which method of placing dental implants offers the most potential for improved stability and success of prosthesis remains the subject of a protracted and heated dispute. According to the findings of a number of studies, the most essential factor in determining the effectiveness of immediate implants is maintaining the original crestal bone height while also ensuring that primary stability is achieved. This study aimed to radiographically analyze the peri implant bone levels, of both immediate and delayed implants, and compare them with one another.

The purpose of this research is to examine and contrast the amounts of bone around immediate and delayed implants. The following are some of the goals of this research project:

- To examine radiographically the peri implant bone loss around immediate and delayed

implants. • To evaluate the degree of bone development that has occurred surrounding the immediate or delayed implant placement. • To examine the differences in the degrees of bone loss that occur between immediate and delayed implant placement. • To determine which method of implant placement is superior in terms of the amount of bone that is lost around the implant.

MATERIALS AND METHODS

The Oral and Maxillofacial Surgery Department was responsible for carrying out the research for this study. For the purpose of carrying out the study, approval from an ethical committee was obtained. For the purpose of the study, a total of eighty patients participated. Both group A and group B were comprised of the patients who were being treated. Patients who required the immediate placement of a single implant comprised group A, while patients undergoing delayed implant placement made up group B. Both groups of patients were in need of the replacement of a single tooth.

INCLUSION CRITERIA

Patients must be between the ages of 20 and 45 in order to be included in the study. • Patients who are partially edentulous, meaning they are missing one or more teeth, but have healthy gums and teeth • Members of both sexes are welcome. • Patients who do not have diabetes. • Patients who had teeth that were so badly decayed that they needed to be extracted and then replaced. • The presence of one or more teeth that have been damaged beyond repair as a result of trauma, caries, root resorption, or endodontic failure.

EXCLUSION CRITERIA

• Patients diagnosed with diabetes. • Patients who required either autogenous or allogeneous bone grafts in order for implants to be placed in their bodies. • Patients suffering from severe conditions affecting multiple organs • Smokers • Patients who have an active infection at the site where the implant was placed in their body.

GROUP A consisted of forty patients who were immediately fitted with implants in the empty sockets left by their extracted teeth (immediate implants). GROUP B consisted of forty patients who were receiving implants in bone sockets that had already healed and matured (delayed implants). Radiographs taken both before and after surgery, known as IOPA and OPG, were analyzed and compared for each patient. After taking measurements, conducting analyses, and comparing the outcomes of the two groups, distal and mesial bone levels were deemed to be of equal importance.

RADIOGRAPHIC ANALYSIS

In the department of oral and maxillofacial surgery standardized intraoral radiographs or orthopantomograms of the immediate and delayed implants that were placed were obtained and were analysed at 6 months and 12 months. On the basis of digital radiographs, the length of the implants was determined by determining the distance between the implant abutment interface and the apex of the implant. At both the mesial and the distal implant surfaces, the distance that was observed to exist between the crestal bone level and the shoulder of the implant was measured. The actual length of the implant was determined using the standards set by the manufacturer. The following formula, which was obtained from a study that was carried out by Bhattacharya et al., was used to calculate the actual bone loss that occurred. 4 The correct crestal bone level can be calculated by multiplying the measured bone level by the actual implant length divided by the measured implant length.

STATISTICAL ANALYSIS

The SPSS version 16.0 statistical software was utilized throughout the process of carrying out the necessary statistical analysis.

RESULTS

A total of 80 patients participated in the study. Forty patients in Group A had implants placed in fresh extraction sockets while the remaining patients in Group B did not have any implants placed. Group B consisted of forty patients, all of whom had previously healed or mature sockets in which implants were inserted. The placement of the implant was carried out in accordance with the manufacturer's stipulated protocol and instructions.

DEMOGRAPHIC DATA

The following pie charts present the detailed characteristics of the subjects whose radiographs were used for the study. These subjects' radiographs were used for the study. After conducting a comprehensive analysis of the case records, the radiographs of forty patients who satisfied the study's inclusion criteria were collected for the investigation.

The peri implant bone loss in the mesial and distal aspects of both groups was evaluated with the help of preoperative and postoperative IOPAs and OPGs.

Table 1: Mean values of bone loss at 6 months

	Delayed [Mean(SD)]	Immediate [Mean(SD)]	p value	Significant
MESIAL	1.21 (0.21)	0.90 (0.34)	0.03	Yes
DISTAL	0.87 (0.44)	0.57 (0.58)	0.01	Yes

Table 2: Mean values of bone loss at 12 months

	Delayed [Mean(SD)]	Immediate [Mean(SD)]	p value	Significant
MESIAL	1.33 (0.22)	0.76 (0.23)	0.04	Yes
DISTAL	1.21 (0.56)	0.65 (0.34)	0.02	Yes

It was discovered that the immediate group experienced a mean bone loss of 0.87 millimeters, while the delayed group experienced a mean bone loss of 1.21 millimeters. The immediate implant group had a mean value of 0.57 millimeters for distal bone loss, while the delayed implant group had a mean value of 0.90 millimeters for distal bone loss. If the p value is less than 0.05, there is a statistically significant difference in the amount of bone loss. It was determined to be statistically insignificant after it was discovered that the p values for both the immediate and the delayed groups were not found to be within this range.

DISCUSSION

In recent years, there has been a significant shift in the perspective taken toward dental care as well as the treatment modalities that are made use of. Because dental implants offer such a comprehensive range of advantages, they are widely regarded as a significant step forward in the process of replacing teeth that have been lost or extracted. When the implant should be placed after the tooth is extracted is a topic that has been debated extensively in the field of dental implant treatment. The "gold standard" procedure has always called for a waiting period of at least a year to pass in order to permit socket healing. To cut down on the amount of time spent waiting for treatment or being seen, various alternatives to this method could be considered. It has been discovered that the healing process for implants that are placed in extraction sockets is comparable to the healing process for an extracted socket. Mauricio⁵ demonstrated, by means of a number of histomorphometric studies, that the healing of an extraction socket with immediate implants can take place in conjunction with the formation

of coagulum. Between the fourth and sixteenth weeks after implant placement, the coagulum that is present in the marginal gap between the implants and the walls of the socket is gradually replaced by newly formed bone. This coagulum is encased in a delicate fibrin network. According to the findings of this study, the osseointegration process took a total of three months to finish in both the immediate and delayed implant groups. There will be a pause in the treatment phase because this is standard procedure according to the Branemark protocol for implant placement. When this protocol is followed, some of the additional drawbacks include a loss of volume of alveolar bone, an increased time of edentulism, a longer treatment time, an additional surgical procedure, and a negative impact on the patient's psychological state. According to the findings of this study, delayed implants were significantly more likely to experience bone resorption. Schulte et al. 6 were the ones who initially presented the idea of immediate implant placement. Since then, a number of studies have been conducted to investigate the results of immediate implant placement and the success rates associated with it. During the course of this study, there were several immediate implants placed, and each and every one of them was successful. In addition, it was found that there was no statistically significant difference between immediate and delayed implants in terms of the amount of bone loss that occurred after the placement of implants. A comparison of the clinical and radiographic outcomes of immediate versus delayed dental implant placement was carried out by Ashish Bali et al.7. This study was carried out by Ashish Bali et al.7. During the observation period of three to six months, they came to the conclusion that there was significant crestal bone loss in delayed implants at both the mesial and the distal surfaces. In this particular study, we performed radiographic examinations before and after surgery, as well as after three months. In the delayed implant group, a significantly greater amount of mesial and distal bone loss was observed than in the immediate implant group. In a study that was conducted by Major Guruprasad et al. 8 to compare the peri implant bone levels in immediate and conventionally loaded implants, it was observed that the average peri implant bone loss in immediate implants was approximately 0.69 mm, while the average peri implant bone loss in conventionally loaded implants was approximately 0.74 mm after 6 months. When the same was evaluated after one year, it was found that immediate implants had a margin of 1.09 mm and delayed implants had a margin of 1.13 mm. The difference was not found to be statistically significant, which was in consistency with the present study, where although a small difference was observed in the peri implant bone loss levels between immediate and delayed implants, on evaluation in the 3rd month, it was found to be insignificant statistically. This was the case even though a small difference was observed in the levels of peri implant bone loss between immediate and delayed implants. Kushaldeep, Amrit Tandan, and the other researchers who worked on this study used intraoral periapical radiographs to conduct a comparative evaluation of the influence of immediate versus delayed loading protocols for dental implants. In this study, intra oral peri apical radiographs with a grid were taken at 1, 3, and 6 months after implant placement in order to measure and compare the amount of bone loss that occurred around the implants. This study found that there was no statistically significant difference in the amount of crestal bone loss that occurred between the first group of immediate implants and the second group of delayed implants. This finding was in line with the findings of the study. The results of the statistical analysis showed that the difference between the two groups, while it was only slight, was not statistically significant. The following are some of the drawbacks of this study: • There was a limited sample size; • There was no selection of contra lateral sites; • There was no implant stability test. In order to properly evaluate the clinical parameter as well as the biological osseo integration, it is recommended that a larger sample size be studied over an even longer period of time. In addition to this, the clinical parameters need to be evaluated. According to the findings of this research, delayed implant placements were

associated with slightly increased levels of bone loss in both the mesial and distal regions of the jaw. It was found that the difference in bone loss levels between immediate and delayed implants was statistically insignificant, despite the fact that there was a slight difference observed between the two types of implants. In both of the groups, the values of the mesial and distal bone loss levels were found to be well within the accepted levels. This was found to be the case. In order to properly evaluate the clinical parameter as well as the biological osseous integration, it is recommended that a larger sample size be studied over an even longer period of time. In addition to this, the clinical parameters need to be evaluated. According to the findings of this research, delayed implant placements were associated with slightly increased levels of bone loss in both the mesial and distal regions of the jaw. It was found that the difference in bone loss levels between immediate and delayed implants was statistically insignificant, despite the fact that there was a slight difference observed between the two types of implants. In both of the groups, the values of the mesial and distal bone loss levels were found to be well within the accepted levels. This was found to be the case.

SUMMARY AND CONCLUSION

In this retrospective study that lasted for 12 months, the researchers compared the radiographic results of 40 immediate implants and 40 delayed implants, taking into account how the implants were placed. At 6 and 12 months, the intraoral periapical radiographs and orthopantomograms of each of the patients were analyzed. This allowed for an evaluation of the peri implant bone loss. A continued resorption of the crest region occurred in both immediate and delayed implants, which was an important finding that came out of this study. The study compared the two types of implants. Mesial bone loss: When assessed at the 3rd month, the crestal bone loss was nearly the same or statistically insignificant in both groups, i.e. immediate and delayed implants. Mesial bone loss was also observed. Distal bone loss: The crestal bone loss at the third month in the immediate and delayed implants was found to have a slight difference, with the delayed group having slightly more bone loss than the immediate group. This was found to be the case when comparing the immediate implants to the delayed implants. However, it was determined that the values do not have a statistically significant impact. It has been demonstrated that the immediate implant protocol has many advantages over the conventional delayed implant protocol. These advantages include a decrease in the amount of alveolar ridge resorption, a shorter overall treatment time, improved patient acceptance, a faster return to function, decreased surgical trauma, the possibility of a superior soft tissue profile, and ease of surgery. The amount of bone that is present all the way around an implant is the single most important factor that determines whether or not an implant treatment will be successful. According to the findings of the current research, there was a marginal distinction between immediate and delayed implants in terms of the levels of mesial and distal bone loss; however, this distinction did not reach the level of statistical significance. In order to obtain more precise results, the clinical parameters that must be evaluated include the probing pocket depth as well as the thickness of the peri implant mucosa. Therefore, it is possible to draw the conclusion that immediately placing implants in fresh extraction sockets can give positive results comparable to those achieved with the traditional delayed placement protocol. However, additional research with larger sample sizes is required to evaluate peri implant bone loss, the health of soft tissue, and success rates. This research must be conducted in order to substantiate the basis for selecting the implant protocol that offers the best chance of long-term success.

REFERENCES

1. Albrektsson TMD, Zarb G, FRCD, Worthington P, Eriksson AR. Ph.D. the long-term efficacy of currently used dental implants: a review and proposed criteria of success. JOMI on CD-ROM. Vol. 1(1). Quintessence Publishing Co., 1986; 1997. p. 11-25.
2. Araújo MG, Lindhe J. Ridge alterations following tooth extraction with and without flap elevation: an experimental 16921 Deepti Diwakar and Vijay Ebenezer, Comparative analysis of peri – implant bone levels in immediate and delayed implants – a retrospective study in the dog. Clin Oral Implants Res. 2009;20(6):545-9. doi: [10.1111/j.1600-0501.2008.01703.x](https://doi.org/10.1111/j.1600-0501.2008.01703.x), PMID [19515033](https://pubmed.ncbi.nlm.nih.gov/19515033/).
3. Hämmerle CH, Lang NP. Single stage surgery combining transmucosal implant placement with guided bone regeneration and bioresorbable materials. Clin Oral Implants Res. 2001 February;12(1):9-18. doi: [10.1034/j.1600-0501.2001.012001009.x](https://doi.org/10.1034/j.1600-0501.2001.012001009.x), PMID [11168266](https://pubmed.ncbi.nlm.nih.gov/11168266/).
4. Bhattacharya A, Sharma V. Radiologic evaluation of marginal bone loss in delayed vs immediately loaded implants –18 month results of a prospective comparative study. J Adv Med Res. 2015;8(2).
5. Araugao MG, Wennstrom JL. Modelling of buccal and lingual bone walls of fresh extraction sockets following implant installation. Clin Oral Implants Res. September 2006.
6. Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone healing and soft tissue contour changes following single tooth extraction: a clinical and radiographic 12 month prospective study. Int J Periodontics Restorative Dent. 2003 August;23(4):313-23. PMID [12956475](https://pubmed.ncbi.nlm.nih.gov/12956475/).
7. Bali A, Jindal M, Goel A, Gupta V, Dadwal A, Chauhan S. Comparative evaluation of clinical and radiographical outcomes of immediate versus delayed dental implant placement: A Prospective study. Indian J Dent Sci. 2019;11(3):133-7. doi: [10.4103/IJDS.IJDS_18_18](https://doi.org/10.4103/IJDS.IJDS_18_18).
8. Guruprasada M, Thapliyal GK, Pawar VR. A comparative analysis of periimplant bone levels of immediate and conventionally loaded implants. Med J Armed Forces India. 2013;69(1, January):41-7. doi: [10.1016/j.mjafi.2011.11.002](https://doi.org/10.1016/j.mjafi.2011.11.002), PMID [24532933](https://pubmed.ncbi.nlm.nih.gov/24532933/).
9. Kushaldeep AT, Upadhyaya V, Raghuvanshi M. Comparative evaluation of the influence of immediate versus delayed loading protocols of dental implants: A radiographic and clinical study. 2020;18(2).
10. Gokcen B, Rohlig UM. Clinical and radiographic outcomes of implants immediately placed in fresh extraction sockets. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010, pages;109(4, April).