A Comparative Assessment of Peri-implant Soft and Hard Tissues with Immediate and Delayed Implants

Srinivasan Bhuvaneshwari[1], Priyaranjan[2], Singh Jyotirmay[3], Baburajan Kandasamy[4], Sumit Dash[5], Mohammed A Razi[6]

Abstract

Aim and objective: This study was done to assess peri-implant soft tissues and hard tissues in immediate and delayed titanium implants cases.

Materials and methods: This study was conducted on 84 patients who were randomly divided into two groups. Group I was immediate implant group (42 patients) and group II was delayed implant group (42 patients). Parameters such as peri-implant esthetic score, crestal bone defect, and densitometry of peri-implant were evaluated after 1 week, 1 month, 3 months, and 6 months.

Results: The mean peri-implant esthetic score at first week in group I was 7.4 and in group II was 5.8, at first month in group I was 6.8 and in group II was 4.6, at third month in group I was 6.7 and in group II was 4.5 and at sixth month in group I was 6.4 and in group II was 4.4. The difference was significant (p value < 0.05). The mean peri-implant crestal bone loss (mm) after 1 week, 1 month, 3 months, and 6 months in group I was 0.24, 0.64, 0.86, and 1.04 and in group II was 0.28, 0.70, 0.94, and 1.14, respectively. The difference was nonsignificant (p value > 0.05). The mean peri-implant bone densitometry after 1 week, 1 month, 3 months, and 6 months in group I was 52.4, 45.6, 42.4, and 40.2 and in group II was 64.2, 60.5, 55.2, and 47.6, respectively. The difference was significant (p value < 0.05).

Conclusion: Instantaneous implants exhibited enhanced esthetic and purposeful result such as healing of peri-implant bone and peri-implant soft tissues when compared to delayed implants.

Clinical significance: Immediate implants can be used to improve esthetic and determined result in healing of peri-implant bone and peri-implant soft tissues.

Keywords: Bone loss, Delayed implants, Immediate implants.

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Introduction

Dental implants are the best invention in the field of dentistry for replacing missing teeth. A good-quality bone allows better anchorage of dental implant.[1] Dental implant insertion in well-healed socket ensures success rate.[2] Sufficient bone maturation following tooth extraction minimizes the risk of infection, ensures steady base for the implant, and enhances the width of keratinized part of gingiva.[3]

Short treatment procedure is always desirable. This allows patients to restore function and to maintain the soft and hard tissue. Immediate dental implants are inserted immediately following tooth extraction.[4] Delayed implants are inserted after 3 months of extraction, and staged implants are inserted 8 weeks after extraction. The insertion of dental implants is based on timing of placement.[5] According to Gomez-Roman et al.,[6] implant insertion from zero to 7 days following tooth extraction is called immediate implants.

Hämmerle et al.[7] suggested new classification of dental implants according to timing of insertion. They proposed type I implant as immediate placement in which dental implant is instantly placed as part of the same procedure following tooth extraction without bone or soft tissues healing. Type II was early implant position, where a healing period of 4–8 weeks is considered, and during this, there is partial healing of socket with soft tissue coverage of the alveolus. Type III was early placement in which a healing period of 12–16 weeks is given, and there is significant healing of socket with sufficient soft tissue coverage. Type IV was late placement in which a healing period of 6 months is given, and during this period there is fully healed edentulous site.

[1]Department of Oral Medicine and Radiology, Kalinga Institute of Dental Sciences, KIIT University, Bhubaneswar, Odisha, India

[2]Department of Public Health Dentistry, Kalinga Institute of Dental Sciences, KIIT University, Bhubaneswar, Orissa, India

[3]Department of Orthodontics and Dentofacial Orthopedics, Patna Dental College and Hospital, Patna, Bihar, India

[4]Department of Prosthodontics, RVS Dental College and Hospital, Coimbatore, Tamil Nadu, India

[5]Department of Conservative Dentistry and Endodontics, Institute of Dental Science, Siksha O' Anusandhan, Deemed to be University, Bhubaneswar, Odisha, India

[6]Department of Periodontology, Hazaribag College of Dental Sciences and Hospital, Hazaribag, Jharkand, India

Corresponding Author: Singh Jyotirmay, Department of Orthodontics and Dentofacial Orthopedics, Patna Dental College and Hospital, Patna, Bihar, India, Phone: +919334115000, e-mail: drjyothirmaysingh@gmail.com

With the advent of immediate implants, treatment period and number of surgical procedures have diminished significantly.[8] Factors such as steady support of bone, limited amount of inflammation, and practical implant sustained crowns are

considered to be successful dental implant therapy. It is evident that within first year of implant insertion, there is maximum bone loss around the implant. Peri-implant mucosa and esthetic outcome can be affected by marginal peri-implant bone failure.[9] The present study was conducted to assess soft and hard tissues of peri-implant in immediate and delayed titanium implants cases.

MATERIALS AND METHODS

The study was done form March 2017 to November 2018 by two trained investigators in Department of Prosthodontics, Uttaranchal Dental and Medical Research Institute, Dehradun. This study was conducted on 84 patients who comprised of 40 males and 44 females in the age range 18–40 years who visited to the department of prosthodontics. There were total of 112 implant sites. The study commenced after obtaining ethical clearance from ethics committee, and consent from all patients was taken. The inclusion criteria were patients within specified age-group with missing teeth in maxillary esthetic zone. Exclusion criteria were patients' aged above 40 years, alcoholics, smokers, patients with periodontitis, and those who were not willing to participate in the study.

Patients were randomly divided into two groups based on lottery system. Group I was immediate implant group (42 patients) and group II was delayed implant group (42 patients). Two trained dentists performed all the procedures using titanium dental implants of GMI® frontier grade IV. In group I, a thorough clinical and radiographical assessment was done, and dental implants were inserted immediately following tooth extraction after following all standardized parameters.

In group II, patients with 8 week history of extraction were subjected to radiovisiography (RVG) of the site. Based on radiographic findings, bone height and width were measured, and titanium dental implants were inserted. Following implant placement, passive repositioning of mucoperiosteal flaps was done using 4–0 silk suture. All participants were put on Cap. Amoxicillin 500 mg × TDS/day, anti-inflammatory diclofenac 50 mg TDS/day, and 0.2% chlorhexidine mouthwash for 5 days. One week postoperatively, sutures were removed.

Participants were assessed postoperatively for soft tissue and hard tissue factors after 1 week, 1 month, 3 months, and 6 months. Estimation of implant esthetic score with respect to peri-implant soft tissue, and radiographic evaluation of crestal bone defect and densitometry of peri-implant was considered.

In all the cases, implant esthetic scoring was used for peri-implant soft tissue evaluation. Esthetic scoring used in this study was based on Testori classification;[10] the mesiodistal stability of papilla, peri-implant soft tissue texture, peri-implant soft tissue color, buccopalatal ridge stability, and gingival contour were calculated. In respect to stability of the mesiodistal papilla: score 0 mentioned for no papilla, score 1 mentioned when papilla does not occupy the complete space, but it is esthetically satisfactory in agreement with neighboring teeth, and score 2 indicated total fill of papilla. The vertical measurement from the apex of the distal and mesial part of papilla to the imaginary line relating the cementoenamel connection of the two adjoining teeth was considered as the dimensional stability of the papilla. The stature of the mesial and distal papilla was sporadically deliberate with respect to this line. Ridge constancy in buccopalatal direction was measured as 0 = width with ridge loss and 1 = width maintained ridge constancy. This was calculated as buccal bone resorption with reference to adjoining natural teeth from the first follow-up

to the sixth month follow-up visit. With respect to texture of the soft tissues of peri-implant, score 0 indicated complete loss of texture, score 1 when inadequate healthy tissue with presence of some texture, and score 2 when healthy gingival tissue surrounding the natural teeth appears. Based on color of the peri-implant soft tissue, score 0 was indicative of completely dissimilar in color from healthy tissue, 1 = does not appears as healthy tissue but still esthetically satisfactory, and 2 = appears as healthy gingival tissue surrounding the natural teeth. Gingival contour was measured as obvious asymmetry from the established criteria of scalloping (score 0), signs of asymmetry but esthetically suitable (score 1) and harmonious gingival contour (score 2).

Crestal bone loss was measured using RVGs of the implant at follow-up visit after 1 week, 1 month, 3 months, and 6 months. Images were noted on a gray scale for the peri-implant bone gray scale assessment using Photoshop 10. The optical density curves were regulated to a proportion of grayscale in which the most radiopaque point represented the dense implant core, and digital number zero was given to it, and the most radiolucent point represented air and number 100 was given to it. Values were taken with distance from fourth to sixth threads of the implant body, and average values were regarded as final score. Mean values of both the investigators were used for statistical analysis. Results were statistically studied using SPSS version 21.0 after entering data in MS excel sheet. Paired and Unpaired t test was used for comparison between both the groups.

RESULTS

Table 1 shows there were 21 males and 20 females in group I and 18 males and 23 females in group II. Table 2 shows that mean peri-implant esthetic score at first week in group I was 7.4 and in group II was 5.8, at first month in group I was 6.8 and in group II was 4.6, at third month in group I was 6.7 and in group II was 4.5 and at sixth month in group I was 6.4 and in group II was 4.4. The difference was significant (p value < 0.05). Table 3 shows that mean peri-implant crestal bone loss (mm) after 1 week, 1 month, 3 months, and 6 months in group I was 0.24, 0.64, 0.86, and 1.04 and in group II was 0.28, 0.70, 0.94, and 1.14, respectively. The difference was nonsignificant (p value > 0.05). Table 4 shows that mean peri-implant bone densitometry after 1 week, 1 month, 3 months, and 6 months in group I was 52.4, 45.6, 42.4, and 40.2 and in group II was 64.2, 60.5, 55.2, and 47.6, respectively. The difference was significant (p value < 0.05).

Table 1: Distribution of patients

Groups	Group I	Group II
Implant group	Immediate implant	Delayed implant
Male	22	18
Female	20	24

Table 2: Assessment of peri-implant esthetic score

Time	Group I	Group II	p value
1st week	7.4	5.8	0.01
1st month	6.8	4.6	0.01
3rd month	6.7	4.5	0.01
6th month	6.4	4.4	0.02

$p < 0.05$

Table 3: Assessment of peri-implant crestal bone loss

	Group I		Group II		
Time	Mean	SD	Mean	SD	p value
1st week	0.24	0.08	0.28	0.07	0.81
1st month	0.64	0.14	0.70	0.17	0.72
3rd month	0.86	0.18	0.94	0.21	0.84
6th month	1.04	0.22	1.14	0.30	0.91

Unpaired t test, $p < 0.05$, significant

Table 4: Assessment of peri-implant bone densitometry

	Group I		Group II		
Time	Mean	SD	Mean	SD	p value
1st week	52.4	3.12	64.2	4.16	0.01
1st month	45.6	5.24	60.5	5.20	0.02
3rd month	42.4	6.32	55.2	6.12	0.01
6th month	40.2	6.74	47.6	6.17	0.01

Unpaired t test, $p < 0.05$, significant

DISCUSSION

Dental implants are routinely performed procedure, and the success of treatment depends on factors, such as amount of bone available, location, skill of operator, and gingival health.[10] The peri-implant soft tissue supposed to be healthy and in synchronization with the adjoining teeth mucosa. Interimplant papillae height should be adequate for complete closure of area; however, inadequate interimplant papilla may lead to incomplete closure, thus affecting the esthetics.[11] In the present study, soft and hard tissues of peri-implant area in immediate and delayed titanium implants cases were assessed.

In the present study, we recruited 84 patients who were divided randomly into group I which was immediate implant group (42 patients) and group II which was delayed implant group (42 patients). There were 22 males and 20 females in group I and 18 males and 24 females in group II. We found that mean peri-implant esthetic score at first week in group I was 7.4 and in group II was 5.8, at first month in group I was 6.8 and in group II was 4.6, at third month in group I was 6.7 and in group II was 4.5 and at sixth month in group I was 6.4 and in group II was 4.4. There was significant dissimilarity between both the groups (p value < 0.05). Edward et al.[12] in their study compared immediate and delayed implant and factors such as implant esthetic score, crestal bone defect, and densitometry of peri-implant were compared which were recorded after 1 week, 1 month, 3 months, and 6 months in 100 implant sites in 77 patients. Results showed significant difference in implant esthetic score and peri-implant bone densitometry, whereas a nonsignificant difference was found in peri-implant crestal bone loss between both groups (p value > 0.05) similar to our findings.

We observed that there was nonsignificant mean peri-implant crestal bone loss between both the groups. At 1 week, 1 month, 3 months, and 6 months in group I (mm) was 0.24, 0.64, 0.86, and 1.04 and in group II was 0.28, 0.70, 0.94, and 1.14, respectively. Block et al.[13] found fewer recession in instant implants (26 cases) than in delayed implants (29 cases); this is in favor to our findings. However, our results are in contrast to the results of Lindeboom et al.[14] who found no significant dissimilarity among the peri-implant soft tissue recession in instant and delayed implants in 25 patients each.

We found that mean peri-implant bone densitometry (gray scale assessment) at first week was 52.4, first month was 45.6, third month was 42.4, and sixth month was 40.2 in group I and 64.2, 60.5, 55.2, and 47.6 in group II, respectively. The dissimilarity between both groups was significant (p value < 0.05). Palattella et al.[15] included 16 patients aged 21–49 years which were divided into immediate restoration of single tooth over immediate replacement in the esthetic zone. There was nonsignificant difference in marginal bone loss, papilla index, and position of the mucosal margin.

Schropp et al.[16] compared outcome of immediate and delayed implants in 46 patients placed in incisor, canine, or premolar region of the maxilla or the mandible. The mean reductions in parallel width was from 4.4 to 2.3 mm (48%), perpendicular width from 2.2 to 0.9 mm (59%), and depth of the largest defect of each implant from 6.9 to 3.6 mm (48%) in immediate group. In delayed group, it was 39% (from 3.1 to 1.9 mm), 77% (from 1.3 to 0.3 mm), and 34% (from 4.4 to 2.9 mm), respectively. There was significant reduction in immediate group than delayed group.

Paolantonio et al.[17] found no difference in osseointegration in implants positioned concurrently in immediate extraction sockets and that in mature bone. Recent studies have shown that there is less bone resorption in immediate implant than delayed implants. This procedure allocate an improved final healing because it encourages morphological ridge contour preservation, precise installation of implant, and natural tooth angle maintainance.[18–20]

The shortcoming of the present study is small sample size. Only esthetic zone was taken into consideration. Immediate implants can be used to improve esthetic and determined result in healing of peri-implant bone and peri-implant soft tissues.

CONCLUSION

Immediate implant placement reduces bone resorption, maintains crestal anatomy, which is essential for esthetic treatment. Thus, immediate implant placement improves esthetic and functional parameters, compared to delayed implants. Favorable results can be seen with immediate implants in healthy individual with healthy bone support conditions.

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