



Marginal bone assessment around dental implants: a radiological evaluation.

Dental Science

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ABSTRACT

Background: Single tooth as well as full mouth rehabilitation using implant-supported prosthesis has currently become a widely used treatment modality in dental practice. The success of implants is dependent on meticulous preoperative treatment planning as well as careful follow-up during the healing phase to evaluate the success of osseointegration.

Aim: to evaluate the changes in levels of marginal bone around single implants radiographically

Material & Methods: An in-vivo study was undertaken to evaluate the crestal bone loss on mesial and distal aspect of implants, using standardized intra-oral periapical at the end of 6 months after placing the implants, but before prosthetically loading it. Bone loss was measured and values were recorded immediately after implant placement and after 6 months. The statistical test employed was student t test.

Results: Bone loss on mesial and distal aspects of implants in both maxilla and mandible was found to be same after period of 6 months. Bone loss was found to be more in females on both mesial as well as distal aspects of implants.

Conclusion: The implant success rate and the bone loss values recorded 6 months after loading coincide with the normal values described in the literature, in the context of studies with implants of similar characteristics

KEYWORDS:

osseointegration, implant, mesial, distal, peri-implant bone loss

Introduction

Implant-supported restoration aids in functional and esthetic rehabilitation.[1] To achieve a good functional and esthetic result with implant restoration, it is important to consider the biological principles of soft and hard tissues around an implant. Adequate crestal bone level is considered as an important clinical determinant for the success of implants.[2] Marginal bone loss not only results in implant failure but also affects the esthetics due to changes in the gingival contour, thereby resulting in the loss of interdental papilla.[3] Evaluation by radiograph is considered as a method to measure crestal bone loss to facilitate a successful implant treatment.

The present study is an attempt to radiographically evaluate the level of marginal bone around implant after 6 months follow-up.

Materials and Methods

A total of 16 implants were placed in patients reporting to the Dental department in Sri Sai Hospital, Moradabad, based on the inclusion and the exclusion criteria.

Inclusion criteria

- Subjects requiring replacement of missing teeth
- Patient with good oral hygiene
- Adequate bone volume to accommodate an implant of appropriate dimension
- Co operative patient, willing for the surgery and proper follow up.

Exclusion criteria

- Medically compromised patients where surgery is contraindicated
- Patient with poor oral hygiene
- Insufficient bone quantity
- Patients having any parafunctional habit
- Patients suffering from periodontal diseases
- Patients with history of alcohol, drug dependency, smoking and poor health.

Study was divided into following groups based on the four

parameters, i.e., implant length [Group 1(13mm); Group 2(10mm), implant diameter [Group-1 (3.5 mm) ;Group-2 (4.3 mm)], implant location(Maxilla and mandible) and gender (male and female).

After seeking institutional ethical clearance and pre-informed written consent from patients, a detailed medical and dental history of each patient was taken. Edentulous area, selected for implant placement was evaluated clinically for bucco-lingual and mesio-distal width. Complete oral prophylaxis was done before the implant placement. Pre-operative Intra-oral periapical radiographs (IOPAR) and orthopantomogram was done to evaluate available bone and distance of vital structures in proximity. Intra-oral periapical radiographs were obtained by the long cone paralleling technique to minimize the distortion using the film holders (Rinn XCP, Dentsply). Crestal incision was given for full thickness flap reflection, to expose the implant site. The implants were placed at the level of alveolar crest and the flap was closed with tight sutures to achieve water tight closure. The patient was prescribed antibiotics and analgesics for 1 week, post operatively.

The radiographic evaluation was performed at 0 month and at 6 months after the implant placement. Comparative measurements of mesial and distal crestal bone levels adjacent to implants were made to the nearest 0.1 mm. A minimum of 3 readings were made for each case and the average values were used to calculate the amount of crestal bone loss. Subtracting the bone level at 0 month from the bone level at 6 months gave the bone loss.

The results obtained were subjected to statistical analysis using Student's unpaired t test.

Results

The results of present study indicate the following key findings:

- The mean bone loss on mesial and distal aspect of implant in both maxilla and mandible was found to be same. However, the bone loss was found to be more in females as compared to males. (Table1)
- The bone loss was found to be same in both 13 mm and 10 mm implants on the mesial aspect of implant whereas on distal

aspect, it was more in 10 mm implants when compared with 13 mm. (Table1)

Discussion

As in other parts of the skeleton, human jaws demonstrate specific tendencies for progressive time-dependent bone loss, including regions rehabilitated with oral implants. Therefore, as bone-anchored prostheses could be sustained in the oral environment for a long time in life, it is important to measure bone loss occurring around oral implants [4] The measures of clinical oral implant success include immobility of individual implants, minimal bone loss, and no persistent morbidity. [5] Therefore, it is important to study bone loss, which has occurred after different loading times following implant insertion. The present study assessed mesial, distal, and overall bone loss of the implants following six months loading time inserted with a standard surgery protocol.

Many studies have evaluated the crestal bone changes around a one stage dental implants after placement and for a long period of time.[6-10] In these studies it was found that the bone loss ranges from 0.75 to 1 mm at the end of the first year after placement and thereafter decreased annually. Also it was reported in other studies, a crestal bone loss within the range of 1 to 1.5 mm during the first year.[11,12] Most studies demonstrate a minor bone loss around implants in general with a steady state of loss after a couple of years in function[11,13]. Lately, however, studies have been published demonstrating continuous bone loss and periimplantitis in higher frequencies than earlier demonstrated.[14,15]

The results of this study are in accordance with those of Singh et al. and Behneke et al [16,17] who found a mean bone loss of 0.6 mm on mesial and 0.9 mm on distal aspect of implant after 6 months of implant placement. In contrast, studies by Johansson and Ekfeldt [18] showed a mean bone loss amounting to 0.4 mm at the 1st year and annual following 0.1 mm rate on Branemark implants. Studies conducted by Bryant and Zarb noted that there is no difference in crestal bone loss proximal to oral implants in the complete implant prosthesis sites of older and younger adults and a mean bone levels at loading were 1.4 mm determined in the 1st year.[19]

The rapid bone loss in the initial months after implant placement may be because the fixtures are not loaded, so there is lack of physiologic stimulation and also there may be activities of remodeling which is a physiological change independent of loading and starts as soon as the implant is placed in bone. Pham et al. found that significantly more crestal bone loss was noted before functional loading than after the prosthesis was connected.[7] Jung et al.[20] found that more than 50% of the total bone loss recorded in 12 months period occurred during the first 3 months. The bone loss occurring post-operatively in the initial few months may also be attributed to bacterial invasion, the re-establishment of biologic width and the factors of stress concentration at the crestal region. Poor oral hygiene is reported to accelerate the bone loss observed around endosteal implants.

According to the results obtained from this study, more crestal bone loss was observed with 10 mm implants when compared to the 13 mm implants. This might be due to the better primary stability obtained with longer implants. However no conclusion can be drawn for more crestal bone loss observed in females because of relatively small sample size.

Conclusion

Based on the results of present research and various other similar studies, we can conclude that though some amount of post operative bone loss is inevitable but if following measures are included in treatment plan then it will lead to more successful outcome:

- Regular follow-up especially in first year of implant loading is essential.
- Patients should be counseled to maintain meticulous oral

hygiene

- Implants of preferably longer length should be selected
- Surgical trauma should be as least as possible.

Figure citations

TABLE 1: showing the details at base line and after 6months follow-up

Pati ent. no	Patient gender	Implant length	Implant diameter	Implant location	Bone loss after 6 months	
					Mesial	Distal
1	M	13	4.3	25	0.92	0.53
2	M	13	4.3	13	0.45	0.25
3	F	13	3.5	21	0.67	0.34
4	F	10	4.3	34	0.56	0.36
5	F	13	3.5	12	0.34	0.16
6	M	13	3.5	11	0.41	0.28
7	M	13	4.3	21	0.82	0.76
8	M	13	4.3	36	0.55	0.26
9	M	10	3.5	23	0.42	0.20
10	M	10	3.5	11	0.74	0.35
11	F	10	4.3	25	0.47	0.29
12	M	10	4.3	11	1.56	0.79
13	F	13	3.5	46	0.40	0.14
14	M	10	4.3	21	0.49	0.20
15	M	13	4.3	36	0.14	0.11
16	M	10	3.5	47	0.78	0.67

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