

A Comparative Evaluation of The Marginal Bone Loss in Immediate vs Delayed Loading Dental Implants: In Vivo Study

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ABSTRACT

Background: To evaluate and compare the marginal bone loss around the immediately loading Vs delayed loading dental implants. The main objectives of this study to evaluate the clinical success rate of immediate loaded dental implants in comparison to delayed loaded dental implants in patients. To evaluate radiographic marginal/crestal bone loss around the immediate loaded and delayed loaded dental implants by using digital IOPA with parallel technique from the time of surgical placement to 1 year in function.

Keywords: Immediate loading, Delayed loading, Loading protocols.

INTRODUCTION

Enhancement of people's life span and improvement in their quality of life are the main two goals of medical profession. Contemporary concepts of health suggest that oral health should be defined in general physical, psychological and social well-being in relation to oral status. The introduction of Osseo-integration by Branemark and co-workers and replacement of lost teeth by implants have revolutionized oral rehabilitation while significantly advancing restorative dentistry¹¹. Dental implants are one of the golden landmark in modern dentistry.

Unlike previous investigations of immediate loading, this study presents a single-tooth implant protocol in posterior sites with un-splinted implants. The aim of this study was to evaluate the clinical response, peri-implant bone loss and the predictability of immediately loaded single-tooth implants as compared to the delayed implants loading protocol. Since dental implants must withstand relatively high forces and loading moments in function in the posterior¹⁴, a better understanding of in vivo bone response to immediate loading of single-tooth implants is needed.

MATERIALS AND METHODS

Patient Selection

The sample size included in the study was 10 healthy subjects. Clinically healthy, partially edentulous patients at-least two or more teeth missing within the same arch was selected.

Inclusion Criteria:

1. Healthy cooperative patients aged between 18-55 years of age irrespective of sex, caste, religion, socioeconomic status.
2. Patients with bilateral missing molars in mandibular region and requiring fixed prosthodontics rehabilitation.
3. Patients with adequate bone height and width.

Exclusion Criteria:

1. Patients with any systemic and metabolic condition which prevents surgical intervention like Uncontrolled diabetes, Hypertension, Bleeding disorder etc. and/or oral habits like smoking.

Received: Dec. 19, 2020: Accepted: Jan. 24, 2021

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2. Patients with known Titanium/any other treatment material related allergy.
3. Immuno-compromised and on systemic medication which interfere in healing (e.g. - Bisphosphonates, etc.)

METHODOLOGY

Ethical clearance was obtained by the ethical committee of Faculty of Medicine. Written consent was obtained from all the patients (Annexure III) prior to inclusion shall be obtained before proceeding with the study.

1. STUDY DESIGN

1. In 10 patients, a total of 20 implants shall be placed in bilaterally missing molars in mandible
2. This study will be carried out as split mouth design. The bilateral partial edentulous area will be designed as site -1 and site -2. Implants placed utilizing standardized and conventional technique.
3. The implants placed at site-1 will be subjected to immediate loading and implants placed at site -2 will be subjected to delayed loading.

2. Surgical protocol

A standard aseptic technique will be adhered during the surgery. Both the sites will receive single two piece implants, using full thickness muco-periosteal flap raised by appropriate incisions. For postoperative care, chlorohexidine-digluconate mouthwash is prescribed to the patients. .

3. Prosthetic protocol

Impression for prosthesis was made with Addison silicone material.

The site-1 shall receive standard abutment and final prosthesis should be placed within 2 weeks.

The Site-2 shall receive standard abutment only after the 3 months of healing period so that implant get Osseo-integrated. Final prosthesis should be placed after 03 months.

4. Follow up and assessment of implant health

All implants will be examined clinically and radiographic at different interval of time.

1. The radiographic measurement of crestal bone levels will be done at 0, 03, 06, 09 and 12 months after implant placement and loading.

5. RADIOGRAPHIC ASSESSMENT

1. The methodology of obtaining radiograph will be standardized with long cone parallel technique using X-ray film positioner and film holder customized for each patient.
2. The patient position will be standardized with the maxillary arch parallel and mid-sagittal plane perpendicular to the floor.
3. The finish line of the abutment will be taken as the reference point for every crestal bone level. The distance from the crestal line to the crest of bone on the proximal sides will be measured
4. Radiographic grid shall be used to measure the amount of crestal bone height.

RESULTS

The sample comprised of 20 subjects, of age group 18-55 years. The subjects with two and more teeth missing within the same arch were included in the study. The patients selected for present study were examined clinically and radio-graphically.

1. In the study a total number of 20 two-piece, one stage implants, i.e. 20 titanium implants with titanium collar (Osstem, SSIII) implants were placed, 10 implants with flapless technique and 10implants with conventional flap technique. Both implants were placed in the same patient and at the same point of time to remove the subjective bias. Modified sulcular bleeding index (Mombelli A in 1987)

2. Probing Depth

The soft tissue indices were carried out at the following intervals:

- 6 weeks of implant placement.
- After 3 months of implant placement.
- After 1 month of the prosthesis placement.
- After 3 month of the prosthesis placement.

The **esthetic evaluation** was done using the Visual Analog Scale (VAS) after 3 months of prosthesis placement.

Clinical Observation

Twenty implants were placed in ten subjects. All implants osseointegrated successfully and none of the implants failed during the course of study. Soft tissue healing was found to be satisfactory around all the inserted implants.

Statistical Analysis

Descriptive statistics including mean value and standard deviation were used to compare the gingival index, plaque index, modified bleeding index, periodontal pocket depth and esthetics of Titanium implant with titanium collar by flapless and conventional flap technique. All calculations were performed using the SPSS (Version 14) for windows (SPSS Inc., Chicago II, USA).

Gingival Index

Gingival index was measured using the method given by Loe H and Silness J in (1963). The mean values of the gingival index at different intervals of time are arranged in Table 1. The gingival index of the flapless and open flap technique was compared using the INDEPENDENT t-test. The results demonstrated statistically significant difference ($p < 0.05$, $n=10$) between both the groups at each interval of time period selected. An increase in the gingival index score was found with implant placed by Open Flap technique comparative to implant placed by Flapless technique after each follow up.

Table 1: Mean comparison of Periotest value

Group	Immediate loading technique (N=10)		Delayed loading Technique (N=10)		Sig. (p-value)
	Mean	Std. Deviation	Mean	Std. Deviation	
03 month					
06 months					
09 months					
12 months					

(p-value > 0.05 = insignificant; p-value < 0.05 = significant)

DISCUSSION

The early investigations of Branemark, which eventually led to the application of dental implants, resulted in the establishment of an Osseointegration protocol that included a submerged technique and a load free postoperative healing period of 3-4 months for the mandible and 4-6 months for the maxilla.¹ The submerged healing of the original ad modum Branemark concept has been challenged over the years¹⁸ by the introduction of the non-submerged one-stage technique.

The ultimate goal of an immediate loading protocol is to reduce the number of surgical interventions and shorten the interval between surgery and prosthesis delivery, without compromising the success rate of the procedure. These new protocols will ultimately lessen patients' reservations, resulting in increased acceptance of implants therapy.

In a general way, the protocols of immediate loading require a primary stabilization of the implants during the surgery between 35 and 60 N/cm²¹. According to Uribe et al²¹ affirm that when a primary stability and the torque equal or superior to 35N/cm is reached, a predictable Osseointegration could be expected. Primary stabilization is influenced by the surgical procedures, implants design and bone density and amount. After the primary stabilization, the bone responds to the local stimulus, thus propitiating its repair through properties of bone plasticity, resorption and apposition. Ericsson et al²² accomplished a study to evaluate if surgical procedures into 2 steps are a compulsory procedure to reach an appropriate bone anchorage when Branemark implants are used. In eleven patients partially edentulous mandible, using split mouth technique, on one side immediate loading with one step and on other side delayed loading with 2 steps surgery were done. Clinical exams (probing depth, probe bleeding index and test of stability) were made 12 and 18 months after the prosthesis installation. X-rays were taken immediately after the insertion of the prosthesis and after 12 and 18 months. The probing depth, bleeding and stability of the implants and the radiographs results were similar between the 2 experimental sites. Hence the authors concluded that the dental implants can be properly Osseointegrated in mandibular bone and successfully

used for bridge retention also when a one-step surgical procedure is used.

RESULTS

The results of the present in-vivo study will show that the marginal bone loss between immediate loading dental implants and delayed loading dental implants are comparable or not (p value >0.05).

Within the limitations of the study, following conclusions will be drawn:

1. The radiographic assessment of marginal bone level in both immediate loading and delayed loading groups are within the acceptable limits and differences between the groups are significant or not (p value > 0.05).

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Brånemark PI, Zarb GA, Albrektsson T. Tissue-Integrated Prostheses: Osseointegration in Clinical Dentistry. Chicago: Quintessence, 1985.
2. Buser D, Weber HP, Brägger U, Balsiger C. Tissue integration of one stage ITI implants: 3-Year results of a longitudinal study with hollow-cylinder and hollow screwimplants. *Int J Oral Maxillofac Implants* 1991; 6:405–412.
3. Weber HP, Buser D, Fiorellini JP, Williams RC. Radiographic evaluation of crestal bone levels adjacent to non-submerged titanium implants. *Clin Oral Implants Res* 1992; 3:181–188.
4. Buser D, Mericske-Stern R, Bernard JP, et al. Long-term evaluation of non-submerged ITI implants. 18-Year life table analysis of a prospective multi-center study with 2359 implants. *Clin Oral Implants Res* 1997; 8:161–172.
5. Bernard JP, Belser UC, Martinet JP, Borgis SA. Osseointegration of Brånemark fixtures using a single-step operating technique: A preliminary prospective one-year study in the edentulous mandible. *Clin Oral Implants Res* 1995; 6:122–129.
6. Becker W, Becker BE, Israelson H, et al. One-step surgical placement of Brånemark implants: A prospective clinical study. *Int J Oral Maxillofac Implants* 1997; 12: 454–462.
7. Lazzarra RJ, Porter SS, Testori T, Galante J, Zetterquist LA. A prospective multi-center study evaluating loading of Osseotite implants two months after placement. *J Esthet Dent* 1998; 10: 280–289.
8. Testori T, Del Fabbro M, Feldman S, et al. A multi-centre implants in the treatment of the edentulous jaw. *Int J Oral Surg* 1981; 10(6):387–416.
9. Rocuzzo M, Bunino M, Prioglio F, Bianchi SD. Early loading of sand blasted and acid etched (SLA) implants: A prospective split-mouth comparative study. *Clin Oral Implants Res* 2001; 12:572–578.
10. Cochran DL, Buser D, Ten Bruggenkate C, et al. The use of reduced healing times on ITI implants with a sand blasted and acid-etched (SLA) surface. Early results from clinical trials on SLA implants. *Clin Oral Implants Res* 2002; 13:144–153.