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Original Article

Comparative study of immediate functional loading and immediate non-functional loading of monocortical implants

Maj Gen J.P. Singh [a,*], *Col A.K. Gupta* [b], *Col R.K. Dhiman* [c], *Col S.K. Roy Chowdhury* [d]

[a] *Commandant & Command Dental Adviser, Command Military Dental Centre (Eastern Command), Kolkata, India*
[b] *Commandant, 33 Corps Dental Unit, C/o 99 APO, India*
[c] *Commanding Officer & Corps Dental Advisor, 14 Corps Dental Unit, C/o 56 APO, India*
[d] *Dy Comdt, Armed Forces Dental Clinic, New Delhi, India*

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ABSTRACT

Background: Attempts to shorten the overall length of treatment have focused on immediate loading, subsequent to implant placement. Prosthetic rehabilitation immediately after implant placement can be either functional or non-functional in nature. There is paucity of literature on the comparative evaluation of immediate functional and immediate non-functional loading of implants. This in-vivo study was undertaken to comparatively evaluate Immediate Functional Loading and Immediate Non-Functional Loading of monocortical implants with a follow-up period of 18 months.

Methods: 50 partially edentulous cases were selected for the study. The cases were divided into two groups. In first group (Group-1), 25 implants were subjected to immediate functional loading. In second group (Group-2), 25 implants were subjected to immediate non-functional loading. The crestal bone loss, clinical stability and degree of osseointegration of these two groups were comparatively evaluated.

Results: The crestal bone loss in both groups was within acceptable limits. The implant stability, which is a reflection of the status of bone-to-implant interface, was comparable in both the groups at different time intervals. Although, the ISQ values in Group-2 were slightly higher than those in Group-1, the results were not statistically significant. Radiodensity indicating degree of osseointegration at different time intervals in both groups was also comparable.

Conclusion: Both the IFL and INFL protocols can be undertaken satisfactorily in rehabilitation using endosseous implants; however, the main factors for success in IFL and INFL are case selection, meticulous treatment planning and the precision of technique.

* *Corresponding author*. Tel.: +91 8697409479 (mobile).
E-mail address: mgjpsingh@gmail.com (J.P. Singh).

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Introduction

According to the conventional Branemark protocol, a 12-month healing period after tooth extraction is recommended before implant placement.[1] In addition, an additional healing period of 03–06 months is recommended prior to loading of implants after insertion in a conventional two-stage protocol. In most instances, this period translates to 1–2 years from the start of treatment to completion of the restoration, which renders the patient partially or completely edentulous for an extended period of time.

Attempts to shorten the overall length of treatment have focused on immediate loading, subsequent to implant placement. Initiation of prosthetic rehabilitation immediately after implant placement can be either functional or non-functional in nature.[2] In immediate functional loading, the prosthesis is fitted within 72 h after implant placement and is placed in occlusion with the opposing arch. In immediate non-functional loading, the prosthesis is fitted within 72 h but is not in occlusal contact with the opposing arch. Initiation of prosthetic treatment immediately after implant placement reduces the total treatment time considerably along with the additional benefit of further reducing alveolar bone resorption.

One of the most important factors determining the success of the implant therapy is the primary stability of the implant, when loaded immediately. Therefore, the present study was undertaken to comparatively evaluate the immediately functionally loaded and immediately non-functionally loaded implants and the clinical viability of adopting the methodology in day-to-day practice, especially in the Armed Forces.

The aim of the in-vivo study was to comparatively evaluate Immediate Functional Loading (IFL) and Immediate Non-Functional Loading (INFL) of monocortical implants with a follow-up period of 18 months with objectives to:

1. Evaluate crestal bone loss (in mm) by IOPA radiographic examination at time intervals of 03 months, 06 months, 12 months and 18 months postoperatively.
2. Evaluate the clinical stability of the implants as represented by 'Implant Stability Quotient (ISQ)' using Resonance Frequency Analysis (RFA) at time intervals of 03 months, 06 months, 12 months and 18 months postoperatively.
3. Determine the comparative degree of osseointegration as represented by radiodensity of bone in 'Hounsfield unit (HU)' of two protocols radiographically by CT scan at time intervals of 06 months and 18 months postoperatively.

Material and methods

The study was carried out at Tertiary Care Dental Centre from 2010 to 2012. A total of 50 cases were selected for the study. The patients were partially edentulous for at least one year prior to date of insertion of implants. The age of the patients ranged from 22 to 52 years. The patients were selected after a thorough screening, based on the following criteria:

Inclusion criteria

1. Absence of systemic disease.
2. Good oral hygiene.
3. Absence of chronic periodontal or periapical pathology.
4. Patients having single missing tooth (between premolar to premolar) with nil/negligible vertical and non-vertical movements of opposing teeth.
5. Patients having D1 and D2 bone in the selected edentulous area.
6. Sufficient residual bone volume to receive implants of minimum 3.5 mm in diameter and minimum 9 mm in length.
7. Appropriate crown height space to maintain favourable crown:implant ratio.

Exclusion criteria

1. Presence of para-functional habits such as bruxism.
2. Chronic smokers.
3. Patients under radiation therapy, chemotherapy, immunosuppressive drugs, corticosteroids.
4. Pregnancy.
5. Inflammatory and autoimmune conditions of the oral cavity.

The cases selected were randomly divided into two groups. Implant diameter and implant length were decided depending on the quantity and quality of available bone.

In the first group (Group-1), 25 implants were to be subjected to immediate functional loading i.e., the provisional prostheses were to be fabricated and cemented in occlusal contact with the opposing dentition within 48 h of implants placement.

In the second group (Group-2), 25 implants were to be subjected to immediate non-functional loading i.e., the provisional prostheses were to be placed out of occlusal contact (1 mm short of the opposing dentition) within 48 h of implants placement.

The materials used included standard implant surgical kit (BioHorizons), 50 dental implants (two-piece, threaded) (BioHorizons), prosthetic components (implant analogs, ball-top screws, impression kit, prosthesis fabrication and luting kit), imaging modalities (IOPA, OPG, CT scan) and Resonance Frequency Analysis (RFA) device (Osstell; Integration Diagnostics AB, Sweden).

All the cases were evaluated thoroughly by clinico-radiological assessment including chief complaint, history of present illness, past medical history, personal and family history, general examination, maxillofacial examination (extra oral and intra oral), laboratory investigations (routine haemogram, blood sugar, urine examination), radiological examination, and pre-operative intraoral photographs (Figs. 1 and 2).

Pre-operative preparation included informed written consent, oral prophylaxis, preclinical records, and preparation of templates. All the patients were pre-medicated with Tab