CLINICAL EVALUATION OF EARLY LOADING OF SINGLE UNIT IMMEDIATE DENTAL IMPLANTS

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Aim: The main aim of the study is to achieve aesthetically and functionally stable, harmonious and pleasing dental arches using immediately placed implants with early loading.

Materials & Method: Twenty-five stepped screw implants were evaluated clinically following immediate placement in anterior region of the jaws to study the effects of early loading over a period of 1.5 years.

Result: All the implants were clinically stable except one implant, which got avulsed. Periodic recordings of gingival index, sulcus bleeding index and pocket probing depth were within normal limits.

Conclusion & Clinical Significance: Clinical and radiographic evaluation in 25 patients revealed highly satisfactory result with good aesthetic and functional rehabilitation.

Key words: Dental implant, immediate loading, osseointegration, case series.

INTRODUCTION

Loss of natural teeth is a significant cause of impaired masticatory ability and facial appearance. Replacing missing teeth with implants has become an accepted and routinely performed clinical procedure with high predictability. The correct positioning and angulation of the implants are important prerequisites for achieving the objective of a functional, aesthetic and maintainable implant supported restoration.

Implant supported prosthesis has given a new dimension to comprehensive oro-dental rehabilitation. It avoids the sacrifice of adjacent natural tooth material as in conventional therapy like fixed partial dentures (FPD). Immediate implantation enables preservation of maximum available hard and soft tissue anatomy (both in form and function) so that a near natural emergence profile can be achieved with the restoration/prosthesis.

Standard implant supported prosthesis invariably requires two surgical procedures separated by 4-6 months healing period. This is in addition to the 6-9 months of time required for healing, repair and reconstruction of residual bone. Although success rates with conventional methods like FPD and standard implant supported prosthesis are high and therapeutic outcomes are predictable, patients are sometimes reluctant to undergo these procedures. This is due to the need for reduction of healthy tooth structure in FPD and a wait of several months for placement of prosthesis in standard implant supported prosthesis. Immediate implantation involves placement of implant at the time of extraction of a compromised tooth, which offers a number of advantages - better aesthetics, preservation of bone loss and reduced treatment time.

By definition, the immediate loading (placement of a functional prosthesis on the implant) of dental implants requires that the implants be loaded at the time of placement. Early loading is done within eight weeks of implant placement. Stepped screw immediate dental implants, are screw type with a graded increase in diameter of the implant along its length, indicated for immediate implantation.

A study was undertaken to evaluate the critical effects of early loading (after 6-8 weeks) of the stepped screw immediate dental implant clinically.

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Material and Methods

25 implants (Table 1) were placed in 21 subjects between 19 years to 56 years. The criteria for selection of cases were: [Fig 1(a)]

i) Non-restorable teeth.

ii) Traumatic fracture of tooth below gingival margin.

iii) Tooth with failed endodontic therapy.

iv) Patient's availability for review study.

v) Individuals with compromised medical history, advanced periodontal pathology or with compromised oral hygiene and/or with smoking habits were not included in the study.

vi) Written consent for the use of the implant was taken after explaining to the patients the material to be used and the surgical and prosthodontic procedure.

The following clinical parameters were used during clinical evaluation of early loading of single unit immediate dental implants.

a) Implant mobility.

b) Peri-implant soft tissue was evaluated using Gingival index, Sulcus bleeding index and Probing depth.

A detailed history was recorded for all the patients included in the study. Their chief complaint or primary point of concern was noted. The family history was taken to note any hereditary predisposition to medical problems. Past medical history was also recorded to evaluate whether the patient presented a poor surgical risk. Detailed personal history was taken to rule out cases having para functional or objectionable habits like smoking etc. that have a detrimental effect on implant survival.

Table 1:

Description of implants used in the study

Implant specifications*	Number of implants
3.8mm x 11mm	04
3.8mm x 13mm	06
3.8mm x 15mm	04
4.5mm x 10mm	01
4.5mm x 13mm	08
5.5mm x 13mm	02

**Diameter x Length of implant.*

Intra and extra oral clinical examination was carried out for each patient. The amount of exposure of maxillary incisors and size of lips were carefully noted, primarily for matching dental and soft tissue midline and to evaluate facial aesthetics. The intra-oral examination was carried out in detail to assess the periodontal health, oral hygiene status, number of teeth, proclination/retroinclination of teeth especially adjacent to implant site, presence of any traumatic bite, status of occlusion etc.

Study casts were prepared to evaluate the dental occlusion, preparation of surgical stent and treatment planning. The amount of proclination/retroinclination of upper and lower anterior teeth was noted for any close bite/traumatic bite. Occlusion in the posterior teeth was examined for any cross-bite.

Intra-oral periapical view was taken to evaluate location of adjacent roots and any opaque foreign body/bodies that may be in the area being considered for implant placement and where extraction of tooth is considered caused by a lack of periodontal support, root fracture or non resolving periapical pathologic conditions.

Orthopantomographic radiograph was taken to rule out any osseous pathological conditions. Clinical photographs of the surgical procedure as well as the pre and post oral rehabilitation were taken for review, record and presentation. A pre-surgical guide splint in clear acrylic was prepared on the model for proper positioning and alignment of implant with adjacent teeth at the time of implantation. This was done to place the implant in best-suited position and to achieve near normal or natural emergence profile.

All the cases were operated under local anaesthesia and antibiotic prophylaxis was used. A two-

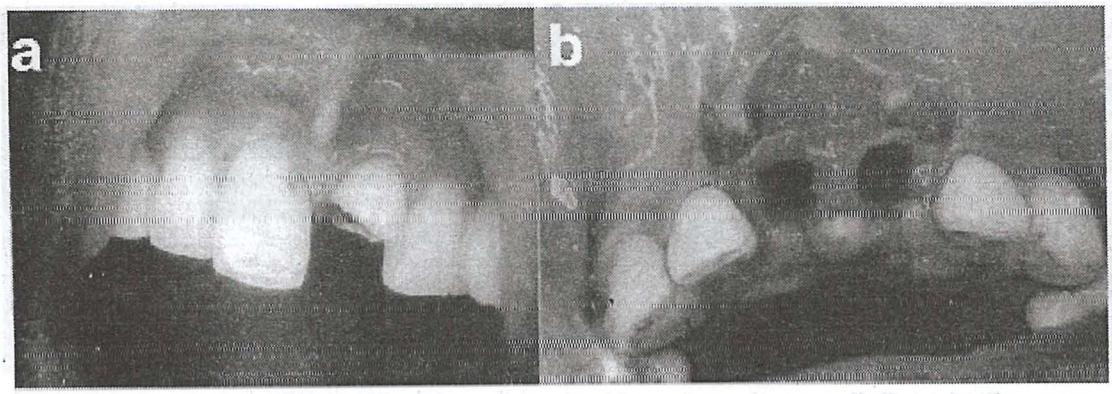


Fig 1 (a) Traumatized maxillary incisors indicated for extraction and (b) Immediately after extraction.

phase surgical procedure was followed. In Phase – I, the offending tooth, where implant is to be placed, was removed as atraumatically as possible [Fig 1(b)]. The length and neck diameter of the extracted tooth was then measured with caliper to select suitable implant of adequate diameter and length. Frialit–II stepped screw implant of 2-3mm length more than the socket depth was then selected for placement. Extra 2-3mm length was intentionally taken to provide initial stability to the immediately placed implant [Fig 2(a)]. The implant bed was prepared using various surgical drills sequentially. Xenogenic and alloplastic grafting materials (Bio-oss and Bioresorb) were placed to augment bony defects, if any and improve the quality of available bony site [Fig 2(b)]. Hemostasis was achieved; the soft tissue flap was then drawn over the implant and sutured in place with the help of 3-0 silk suture swaged into atraumatic needle [Fig 3(a)]. Pressure dressing was applied and the patient was then disposed off with adequate precautionary instructions including diet. Sutures were removed after five days in non-augmented cases and twelve days in bone augmented cases as a precautionary measure.

Phase II was accomplished 6-8 weeks after phase I. The implants were re-exposed with a scalpel. Titanium sealing screw was then unscrewed from the implant and a gingiva former of a diameter equal to the implant diameter was placed for two weeks [Fig 3 (b)]. During this healing period, the gingiva former enabled the gingival margin to form properly. This ensured an esthetic emergence profile for the crown.

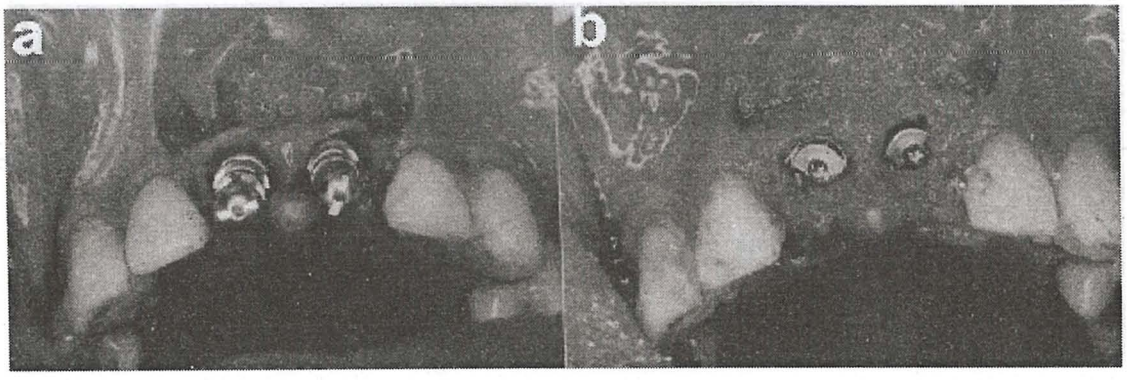


Fig 2 (a) Implants in situ and (b) Bone graft material placed in sites of deficient bone.

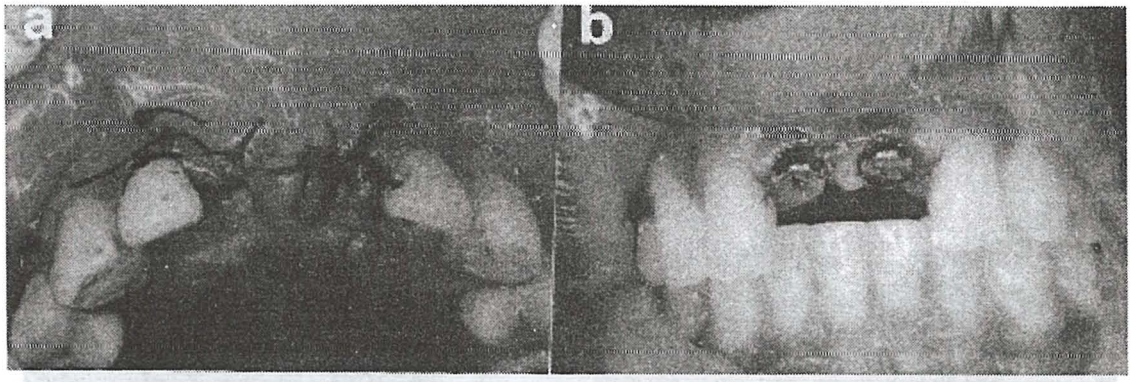


Fig 3 (a). Full mucosal coverage of implant site and (b) Gingival formers in situ.

Two weeks later, the gingiva former was removed and replaced with suitable abutment head (angular or straight depending upon the dictate of the case) [Fig 4(a)]. An impression was made using rubber base impression material. Die stone cast was prepared; an acrylic temporary crown was initially provided which was replaced by porcelain fused to metal (PFM) crown a week later [Fig 4(b)].

Patient was then explained the importance of maintaining good oral hygiene and regular follow up was done at an interval of three months, six months, nine months, twelve months and eighteen months. Relevant data were recorded during each visit.

RESULTS

All these implants were used as immediate implants following either extraction of root stumps or traumatic fracture of the teeth. Twenty implants were evaluated for eighteen months. Three implants were evaluated for twelve months and two implants were evaluated for nine months. Fourteen implants of 3.8 mm diameter, nine implants of 4.5 mm diameter and two implants of 5.5 mm diameter were used in the study.

All the implants were clinically stable except one implant, which got avulsed. The case was managed successfully by providing a PFM bridge. The gingival index (GI) of '0' was recorded in the first year in 84% cases and 80% at the end of 1.5 years. GI of '3' was never recorded during the course of study.

Sulcus bleeding index (SBI) was recorded at an interval of every three months till 1.5 year. SBI of '0' was recorded in 76% cases in the first year and in 72% cases at the end of 1.5 years. SBI of '3' & '4' was

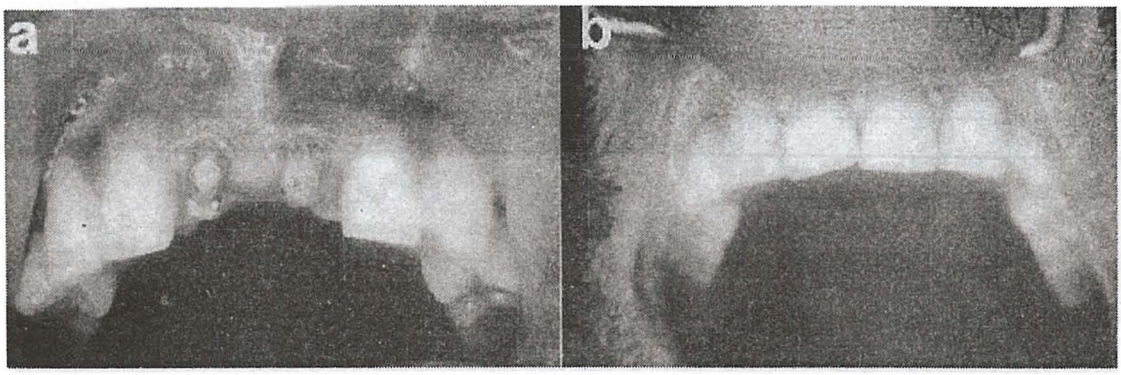


Fig 4 (a). Abutments in situ and (b) Final implant retained PFM prosthesis.

recorded at no point of time. Pocket probing depth was clinically evaluated at a regular interval of three months. Up to 3 mm was recorded in 68% cases in the first year and 60% at the end of 1.5-year period (Table 2)

Table 2

Pocket Depth

Pocket Depth	12 Months	18 Months
<3mm	68%	60%
3.5mm	16%	20%
4.0mm	12%	16%
>4mm	04%	8%

Periodontal probing of natural teeth is an important part of any dental examination. It is well established that the probe penetrates the junctional epithelium to some degree in health and that this penetration increases in the presence of inflammation. Under these latter circumstances, the most coronal intact gingival fibres, about 2mm from the bone, stop the probe. The situation around the implants is different and the sulcus depth is very much dependent upon the thickness of soft tissue cuff. Probing depths around implants are generally deeper than around teeth, but the penetration of soft tissue at the base of the sulcus occurs to a similar degree with the probe tip finishing short of bone margin by about 2mm (1). Hence probing depth around an implant gives an indication of health of peri-implant tissues.

DISCUSSION

The effects of early loading were evaluated for stepped screw single unit immediate dental implants.

All the patients selected in the study were with no medical contra-indications for implant surgery and were highly motivated. Standard operative procedure of immediate implantation was adopted in all the cases. Bone augmentation material was used in cases having deficient alveolar anatomy. William H Bell has advocated that prior to extracting teeth, consideration should be given to the placement of hydroxyapatite coated implants into the extraction site immediately or soon after the extraction (2). In the present study, Frios profiled Frialit-2 titanium stepped screw implants were used with excellent outcome.

Immediate post extraction placement of implants yields excellent and predictable results (3). The present study too has shown an equally good result following immediate implantation.

In order to provide an improved primary stability to immediately placed implant into the extraction socket, implants were placed about 2-3 mm apical to the extraction socket (4). The implant in each case has been placed to have the widest diameter at the cervical area (i.e. the widest diameter of the extraction socket at the opening) to prevent any soft tissue ingrowth and have an improved initial stability (5). The Frialit-2 stepped screw implants are self-tapping and by virtue of its design provide an increased primary stability even in poor quality bone at the time of placement (6). The internal hex in the implant is designed to prevent rotation of the abutments. Compared to an external hex, an internal hex allows better protection against rotation of the abutments and against gap formation at the implant-abutment interface.

During the course of this study, the non-salvageable tooth was extracted under local anaesthesia as atraumatically as possible without compromising the extraction site and to preserve the labial plate and rest of alveolar bone anatomy, muco- periosteal flap was also not raised from the labial aspect (7). Avoiding full thickness flap reflection during tooth extraction and implant placement may be advantageous where the labial bony wall is thinnest and most prone to resorption, but in cases of the present study, where there was deficient labial plate, a full thickness muco-periosteal flap was raised and the defect was augmented with graft material. In order to provide full coverage, releasing horizontal incision was given in the periosteum. According to Babbush (3) in the implant process a screw type, wide diameter implant should be used to enhance stability and maximize

use of the surrounding socket wall. Similar concept had been adopted in the present study too. Viability of early loading has now been assessed by a number of studies, some of which followed patients for up to ten years (8). Some studies have reported early loading success rate equal to standard 2-stage procedure. Martin et al in their study with twelve Frialit 2 synchro stepped screw implants in the incisal maxillary region reported survival rate of 100% up to twelve months (9). Cooper et al in their study, loaded implant three weeks after Stage I surgery and had resultant 96.2% survival rate (10).

The presented result showed promising data for immediately loaded single tooth implants in anterior maxilla. To be safe and with background concept of greater Osseo-integration in surface modified implants, in the present study implants were loaded six weeks after stage I surgery with resultant survival rate of 96%.The gingival index, sulcus bleeding index, and the pocket probing depth found in the present study for the first year showed encouraging results and was found comparable to reported finding available in the world literature (11).In the present study following loading of implants no obvious complications were noticed except in one case where instability in the crown was reported five months after its loading. Detailed evaluation delineated abutment screw loosening as the root cause of the crown mobility. During regular recall visit emphasis was given on meticulous maintenance of oral hygiene to minimize development of peri-implantitis.

CONCLUSION AND CLINICAL SIGNIFICANCE

All the implants placed immediately, in the anterior region of the jaws were clinically stable and showed no sign of mobility even after 1.5 years of its placement except in one case. In this case the implant was placed in the socket of right maxillary central incisor, which had mobility and was periodontally compromised. Failure of implant osseo-integration in the socket was due to non-compliance of the patient to follow prescribed oral hygiene measures.

It was noticed in the study that 6-8 weeks of submersion between stage I surgery and implant loading was enough to provide clinical stability to the inserted implants with 96% survival rate.

i. Gingival index, Sulcus bleeding index and Pocket probing depth of at the end of twelve months and eighteen months were encouraging and comparable to data available in literature.

ii. No major complications were observed except for a failed osseo-integration of implant in one case.

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