British Biotechnology Journal
11(3): 1-7, 2016, Article no.BBJ.23453
ISSN: 2231–2927, NLM ID: 101616695

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Immediate Versus Delayed Dental Implants

Wamiq Musheer Fareed[1*]

[1]*Department of Oral and Maxillofacial Surgery, College of Dentistry, Taibah University, Saudi Arabia.*

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/BBJ/2016/23453
Editor(s):
(1) Sukesh Voruganti, Department of Pharmaceutical Sciences, Texas Tech University Health Sciences Center, USA.
Reviewers:
(1) Rodrigo Lorenzi Poluha, State University of Maringa, Brazil.
(2) Sara Bernardi, University of L'Aquila, Italy.
Complete Peer review History: http://sciencedomain.org/review-history/12758

Original Research Article

Received 1st December 2015
Accepted 14th December 2015
Published 22nd December 2015

ABSTRACT

Objective: The main aim of this study was to compare immediate and delayed implants for the placement and postoperative assessment. For this purpose, dental implant were placed using the set criteria and patients were recalled for follow up for postoperative assessment.
Methods: This is a clinical study comparing the outcome of immediate placement versus delayed placement of Osseointegrated dental implants. Patients were divided in to two study groups (Group I and Group II) using the set criteria. Group I (n=12) Immediate Dental Implant and Group II (n=12) Delayed Dental Implant All patients were assessed preoperatively for complete medical and dental history and clinical examination. Surgically placement of dental implant was performed under local anesthesia. Patients were recalled for postoperative follow up for six month.
Results: Implant mobility was not reported in any case under investigation during the follow up period. Bone loss was higher in Group II at all the instances. For group I bone loss was 0.24±0.26 mm, 0.18±0.16 mm, 0.08±0.09 mm for 1st, 2nd, and 3rd weeks respectively. The higher bone loss ~0.5 mm/week was observed for the same period in group II patients. Regarding pain assessment, at 1 week, in both the groups the mean pain score was 0.63, at 2nd week in Group I the pain score was 0.13±0.35 while in Group II it was 0.06±0.25.
Conclusion: Immediate and delayed dental implants provide excellent stability. Immediate type of implantations was comparatively better in controlling the peri-implant radiolucency, postoperative infection and inflammation. Excessive bone drilling required for delayed implants result in exaggerated bone reaction and leading to higher rate of bone resorption.

**Corresponding author: Email: drsohail_78@hotmail.com*;

Keywords: Osseointegration; Implant assessment; tooth prosthesis.

1. INTRODUCTION

Teeth are vital organs required to perform certain functions such as mastication, speech and cosmetics. Teeth perform in the harsh oral environment and subject to wear and tear [1]. In order to maintain normal physiological functioning, the lost or damaged parts of teeth or even whole teeth need replacement using a variety of dental materials [2]. The concept of using artificial materials in dentistry is not new. Utilizing gold within the shape of a tooth root was reported as early as 1809. Later in 1887, Harris reported the utilization of teeth made of porcelain into which lead-covered platinum posts were fitted [3]. In later time's metal thought to have been presented as an implantable material. A lot of efforts have been put in understanding the dental tissues and various dental materials at nanoscale [4,5]. Natural materials such as oral antimicrobial peptides and natural silk have been reported to be a potentials candidate for dental applications such as implant coating [6,7].

An implant can be defined as "a therapeutic gadget/device produced out of one or more biomaterials i.e. at first placed inside the body either completely or in part buried underneath an epithelial surface" [8]. The modern concept of dental implants is dependent on using metals and alloys [9]. Regarding current dental implants, osseointegration is crucial and responsible for the foundation, maintenance and support of the direct bone to the implant contact [10]. In the clinical prospective, implant sites can be classified using criteria such as extraction time and bone condition of the encompassing area (Immediate site, recent site or delayed site). Immediate site represents tooth extraction, implant positioning and regenerative treatment planned at the same stage. For recent site category, Implant insertion and bone regeneration are accomplished after 30¬60 days from tooth extraction. Delayed site implants are placed after complete socket bone healing (after two months or more after tooth extraction). The delayed implants are considered when the post-extraction socket conditions are not suitable for primary stability or for a predictable success of the implant [11]. According to Mathew et al. [12], clinicians need to take into concern the vicinity of structures for instance the maxillary sinuses, the mental foramina, mandibular sublingual concavities, and the inferior alveolar neurovascular bundle.

The postoperative assessment of the dental implant is based on multiple factors and various methods have been reported for implant assessment such as radiographic evaluation, tapping the implant with a metallic instrument and assessing the emitted sound, resonance frequency measurements, stability measurement with the Periotest instrument or rotational stiffness produced upon impact, and reverse torque application. Clinical methods for monitoring are successful implant placement, osseointegration, no pathology such as peri-implatitis or mobility [13]. The main aim of this study was to compare immediate and delayed implants for the placement and postoperative assessment. For this purpose, dental implant were placed using the set criteria and patients were recalled follow up for postoperative assessment.

2. MATERIALS AND METHODS

This is a clinical study comparing the outcome of immediate placement versus delayed placement of osseointegrated dental implants. Although dental implants come with a hefty initial price tag, their long-term value is unmatched. For this purpose a total of 24 implants were missing teeth and requiring dental prosthesis. Patients were motivated and patients requiring single tooth implant only were included in this study. The causes of tooth loss in delayed dental implants were Congenital absence, trauma, dental disease (e.g. caries etc). The site of implants placement was both anterior and posterior region of maxillary and mandibular arches. All patients were divided in to two study groups (Group I and Group II) using the set inclusion and exclusion criteria as mentioned in table-I. Group I (n=12) Immediate Dental Implant and Group II (n=12) Delayed Dental Implant.

Each patient was made aware (in patient's native language) about the procedure, expected outcome, possible complications and written informed consent was obtained for the surgical procedure and six months postsurgical follow up. The research plan was reviewed and approved by the local research ethic committee at Babu Banarasi Das College of Dental Science, Lucknow. All patients were assessed preoperatively for complete medical and dental history and clinical examination. The site for implant placement was assessed in detail (for vertical bone height and bone quality)

Table 1. Description of study groups and selection criteria

	Group I (n=12) Immediate Dental Implant	Group II (n=12) Delayed Dental Implant
Description	Dental implant was placed immediately after atraumatic extraction of tooth/root.	Dental implant was placed at least ten weeks after the extraction of tooth/root.
Inclusion criteria	Mobile tooth (grade 1 or grade 2) Remaining root stumps, tooth with and fresh extraction sockets.	Edentulous ridge for about 10 weeks or older
Exclusion criteria	Systemic pathology or bone pathology Growing age (18 years or younger) Patient requiring multiple implants	

clinically and radiographically. Patient reported with systemic conditions such as uncontrolled diabetes mellitus, irradiated bone, alcohol abuse, pregnancy and psychological problems were excluded.

The dental implants [Hybrid titanium Alpha Bio Internal Hex Implant System, Israel] with acid etched surfaces [The length of implants were from 8 to 13 mm and diameter was 3.70 to 4.50 mm.] were used for both groups. The surgical procedure was performed using the local anesthesia (Septocaine® with epinephrine 1:100,000 injections; Septodont, USA). In Group I, access was gained through extraction socket and in Group II, access was gained by crestal incision followed by flap reflection. In both groups, bone cutting was performed at 700-800 rpm using progressively increasing diameter drills and a copious water spray as coolant. Manufacturer's guidelines for implant placement were followed throughout the procedure. After completion of implant socket preparation and before the insertion of selected implant, the socket was thoroughly irrigated with sterile saline solution at room temperature. The implant was then placed into the prepared socket. Hex ratchet was used to screw the implant tightly into the bone till the side of the implant came in alignment with the crest of alveolar bone. After implant placement, the flap was repositioned and sutured with 3-0 black silk suture. Verbal as well as written post-operative instructions (Such as ice-packs, soft high nutrient diet, post-operative medications thorough rinsing with antiseptic mouthwash (chlorhexidine gluconate 0.12%) were given after surgical procedure. In order to reduce postoperative pain and infection, Amoxicillin (1500 mg/day; 5 days) and Ibuprofen (1200 mg/day; 5 days) and thorough rinsing with antiseptic mouthwash (chlorhexidine gluconate 0.12%) were prescribed. Patients were recalled for follow up at regular intervals and post-operative assessment using the set criteria [Table 2] was performed (1 week, 2 weeks, 3 weeks, 1 month, 3 months and 6 months).The Stages of implant placements were as follows: Stage #1 - The implant was osseointegrated and was ready to be restored. Stage #2 - The implant's abutment were screwed into place. Stage #3 - A dental crown was fabricated and cemented over the abutment. All Ceramic or All Porcelain (Zirconia) laboratory-processed restorations were done in Babu Banarsi Das Dental College, for it is excellent for restoration of anterior and posterior teeth. All the above procedures took at least two appointments to finish. Abutment preparation, impressions, and temporary crown or bridge was done at the first appointment. Final cementation took place mostly during a second appointment.

Table 2. Criteria for postoperative assessment on recall visits

Variable	Criteria
Pain assessment (VAS score)	No pain (0) Mild pain (1-3) Moderate pain (4-7) Severe pain (8-10)
Swelling	Present (0) Absent (1)
Gingival inflammation	No inflammation (0) Mild inflammation (1) Moderate inflammation (2) Severe inflammation (3)
Implant mobility Clinical assessment	Present (0) Absent (1)
Radiological assessment	Intraoral periapical radiograph (IOPA) at regular intervals to assess bone implant relation. Orthopentograph (O.P.G.) to assess availability and status of bone.

The sutures were removed during the first follow up visit (1 week). The collected data was analyzed statistically using SPSS (Version 19.0)

and Chi-square test for proportions. Mean pain scores were compared using Independent samples "t" test. The confidence limit of the study was kept at 95%, hence a "p" value less than 0.05 indicated statistically significant difference.

3. RESULTS

All patients were followed for six months postoperatively and recalled at regular intervals and assessed against the set criteria. In general, in group II (delayed implant) patients, the proportion of patients with higher duration of presenting complaints was significantly higher; all patients in this group had duration of complaints for more than three months. In group I, only 50% of patients had duration of complaints for more than three months and none of the patient had complaint after six months. Fig. 1 shows the comparison on both groups for postoperative assessment on recall visits; mean bone loss (Fig. 1A), postoperative pain (Fig. 1B), inflammation (Fig. 1C) and infection (Fig. 1D).

Implant mobility was not reported in any case under investigation during the follow up period. Bone loss was higher in Group II at all the instances; however, it was significant statistically at 3 weeks, 1 month and 3 months respectively (Fig. 1A). For group I bone loss was 0.09±0.03 mm, 0.18±0.16 mm, 0.08±0.09 mm for 1st, 2nd, and 3rd weeks respectively. The higher bone loss ~0.5 mm/week was observed for the same period in group II patients. After three weeks, the bone loss was reduced remarkably in group I however it continued at slower pace in group II patients. Regarding pain assessment, at 1 week, in both the groups the mean pain score was 0.63, at 2nd week in Group I the pain score was 0.13±0.35 while in Group II it was 0.06±0.25. However, no significant difference could be seen between the two groups at both the instances. From 3rd week onwards, no pain was reported in either group.

In two patients of Group II, inflammation was observed from 3 week time interval to 3 month time interval in other inflammation was seen at 6 month (Fig. 1C). However, in both the severity of inflammation decreased over the time. No statistically significant difference between two groups could be seen at any time interval ($p>0.05$). Infection was not reported in any of the Group I patients, however, in Group II, only one patient reported the existence of infection from 2nd week onwards infection was reported in one patient (Fig. 1D). Regarding postoperative complications, only one group I patient reported paresthesia of right half of lower lip after 1 day of operation which persisted till 20th day post-operatively. In Group II, only two patients reported temporary paresthesia for two weeks.

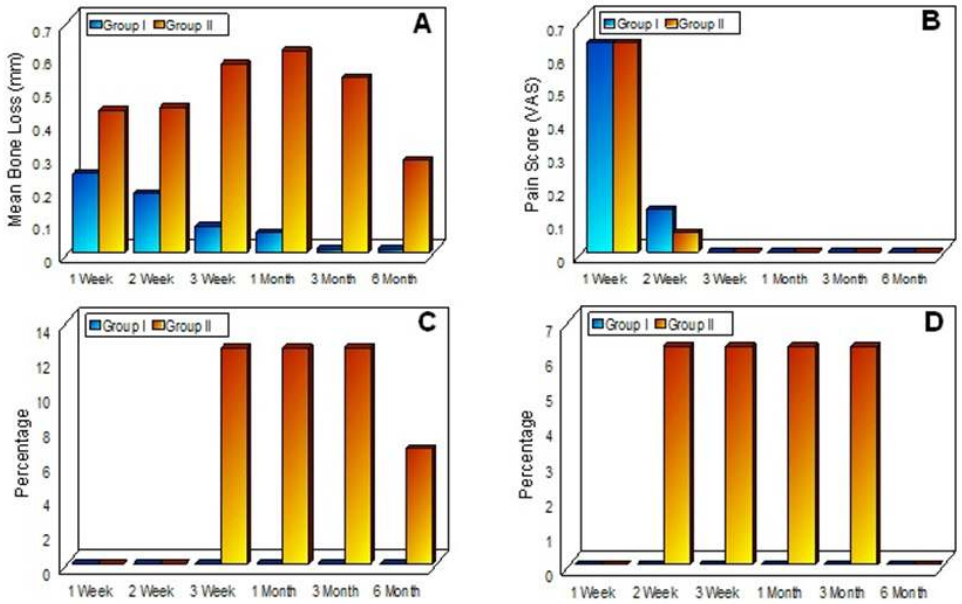

Fig. 1. Comparison for postoperative assessment of dental implants on recall visits; mean bone loss (Fig. 1A), postoperative pain (Fig. 1B), inflammation (Fig. 1C) and infection (Fig. 1D)

4. DISCUSSION

A total of twenty four dental implants were placed surgically using immediate or delayed placement approach. The implant placement immediately after extraction has few benefits such as quitting the need of recipient site preparation and reduced surgical trauma. Bonnick et al. [14] reviewed the literature regarding immediate implants and reported lower number (48.4%) of immediate dental implants. This is probably because people are less aware of merits of immediate dental implants. It is interesting to note that increasing in age is not a barrier to successful dental implants but medical condition associated with increasing age may require modification to implant treatment plan [15-19]. For example, physical or chemical surface modification of the implant surface has been proven with benefits for patient with medical conditions such as osteoporosis [20,21].

In the present study none of the cases implant mobility was seen until six months follow up. However, in last assessment, though implant mobility was not reported in any of the followed up cases. Radiographs to measure bone loss should be standard periapical films. Radiographic evaluation, tapping the implant with a metallic instrument suggested clinical methods for monitoring successful implant placement and osseointegration [13,22]. The results in this study are corroborated to the result reported by Simsek et al. [23] and Glauser et al. [24] The present study shows Bone loss was higher in Group II throughout the follow up period. It has been observed that failing dental implant exhibits a larger saucer like defect at the alveolar crest. Rapid bone loss which may be associated with initial osseous trauma, normal physiologic resorption, stress concentrated at the marginal bone by over tightening of fixtures during placement [25]. Average bone loss between implant insertion and uncovering, and between implant uncovering and 6 months post-uncovering, was 1 mm and 1.2 mm that was greater than bone loss reported by Albrektsson [26] where vertical bone loss was observed 0.3 mm on the mesial and distal aspects of the implant. The reported incidence of postoperative infection was very low as reported in the previous study [18]. The complications such as paresthesia in the lower lip or adjacent area are related to the close proximity of implant to the mandibular nerve or mental nerve. Similar complications of lip paresthesia have been reported in previous study [27]. It has been well proven that the clinically manifestations of implant failure are primarily inflammatory conditions, sinus formation, or peri-implantitis [18, 27]. Absences of such conditions during the postoperative assessment suggest the likely success of implant abutment. In addition, materials modifications and regenerative applications can improve the performance of implants [28-30].

5. CONCLUSION

Immediate and delayed dental implants provide excellent stability. Immediate type of implantations was comparatively better in controlling the peri-implant radiolucency, postoperative infection and inflammation. Excessive bone drilling required for delayed implants result in exaggerated bone reaction and leading to higher rate of bone resorption. In order to evaluate the long term prognosis of immediate and delayed types of dental implants, longer clinical studies are required.

CONSENT

Author declares that ‘written informed consent was obtained.

ETHICAL APPROVAL

Author hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/12758