

Evaluation of immediate loading of single dental implants in the maxillary esthetic zone: Clinical and radiographical comparative study

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Abstract

Background and objective: Loading an implant right after placement has been attempted and has gained popularity among clinicians. The aim of this study was to evaluate the clinical and radiographical outcomes of immediate loading of single dental implant placed in healed and in fresh extraction sockets.

Methods: In a prospective, comparative, clinical study, 40 patients underwent single dental implant procedure in the maxillary esthetic zone. Twenty implants were placed into fresh extraction sockets (Group A), and the other 20 implants were placed into healed extraction sockets (Group B). Placement of the permanent crown was done within two weeks after implant placement.

Results: From a total of 40 implants only two failed to survive giving a cumulative survival rate of 95%. Both failures occurred in fresh extraction sockets resulting in a survival rate of 90%, while no implant failed in healed sites achieving 100% survival rate. The difference in marginal bone loss between two groups was statistically significant.

Conclusion: The immediate loading of single dental implant in maxillary esthetic zone is a viable clinical concept and lead to favorable treatment outcomes.

Keywords: Dental, Implants, Maxilla, Esthetic zone.

Introduction

In the early 1990s, the concept of "immediate loading" was introduced. Today, more than 15 years of clinical and histological investigations have demonstrated its virtues.^{1,2} There is growing scientific evidence showing that osseointegration can be achieved even at implants placed in fresh extraction sockets³. Another breakthrough in implant dentistry is the possibility of immediate loading of implants in freshly extracted tooth sockets.^{4,5} The *immediate occlusal-loading* protocol is an implant-supported temporary or definitive restoration in occlusal contact within two weeks of the implant insertion.⁶ Immediate loading of dental implant has gained popularity due to less tissue trauma, reduced overall treatment time, decreased patient's anxiety and discomfort, high patient acceptance and better function and aesthetics.⁷

Therefore, this study could fill in gaps in knowledge about important subject concerning the clinical and radiographical outcomes of immediate loading of single dental implants placed in healed alveolar ridges and fresh extraction sockets in the maxillary esthetic zone.

Methods

In a prospective, comparative, clinical study 40 patients underwent single dental implant procedure in the maxillary esthetic zone. Twenty implants were placed into fresh extraction sockets (Group A), and the other 20 implants were placed into healed extraction sockets (Group B). All the procedures were carried out in the Department of Oral and Maxillofacial Surgery/College of Dentistry/Hawler Medical University in Erbil, from March 2012 to March 2013.

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Inclusion criteria were as follow:

1. Single missing tooth (of at least 6 months post extraction) in maxillary esthetic zone with sufficient residual bone volume (height and width) to receive implants of at least 4.2 mm in diameter and 12 mm in length.
2. Presence of a single unrestorable tooth in the maxillary esthetic zone with adequate bone height apically (≥ 5 mm) to ensure good primary implant stability.
3. Mesial–distal width of inter-dental space at least 7.5 mm
4. Good oral hygiene.
5. Patients with no any systemic disease or active oral disease that might compromise healing or osseointegration.
6. Patient consent.
7. Primary implant stability (insertion torque) should be at least 35 N cm.

Surgical technique:

Group A (Implant placement in fresh extraction socket):

The tooth was gently extracted by extraction forceps, with minimum surgical trauma and without any damage to the adjacent

soft or hard tissues. Implant placement was performed in the palatal wall of the socket so as to improve primary implant stability and to preserve the labial plate from damage. Drills were used according to the manufacturer’s recommendations. In order to obtain primary implant stability of at least 35 N cm, which was considered to be a pre requisite for immediate loading in this study, surgical sites were frequently underprepared, then the osteotomy socket was irrigated with normal saline. After that, the implant was manually screwed into osteotomy with the implant driver, until there was a resistance, then the final seating of implant was achieved by torque wrench which was set previously at value (35 Ncm). If the wrench bent before the final seating of the implant, this means the insertion torque reached the value (35 Ncm). At that time, we increased the torque value of the wrench into subsequent higher value(s), and then the insertion of the implant was continued and the final torque value was recorded. After that the gingival former was inserted (Figure 1A-B).

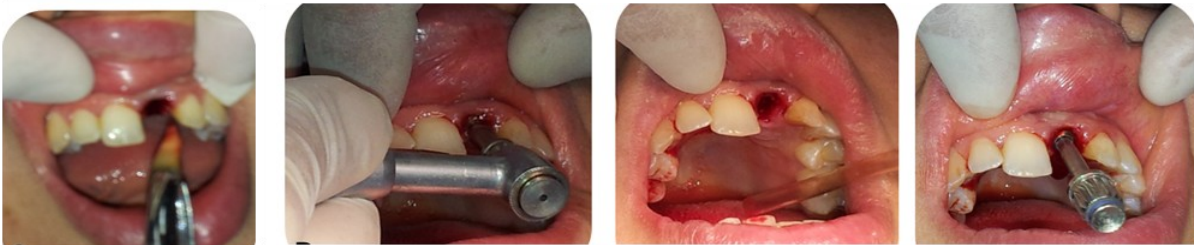


Figure 1A: Unrestorable tooth removed. Implant bed prepared in palatal direction. Implant placed in the prepared bed.



Figure 1 B: Showing implant torque measurement and gingival former placement

Group B (Implant placement in healed site):

A slightly palatally positioned mini crestal incision was used in order to achieve an optimal soft tissue adaptation and

subsequent healing. After that, the same surgical protocol was used as in the group B (Figure 2). Placement of the permanent crown was done within two weeks after implant placement.

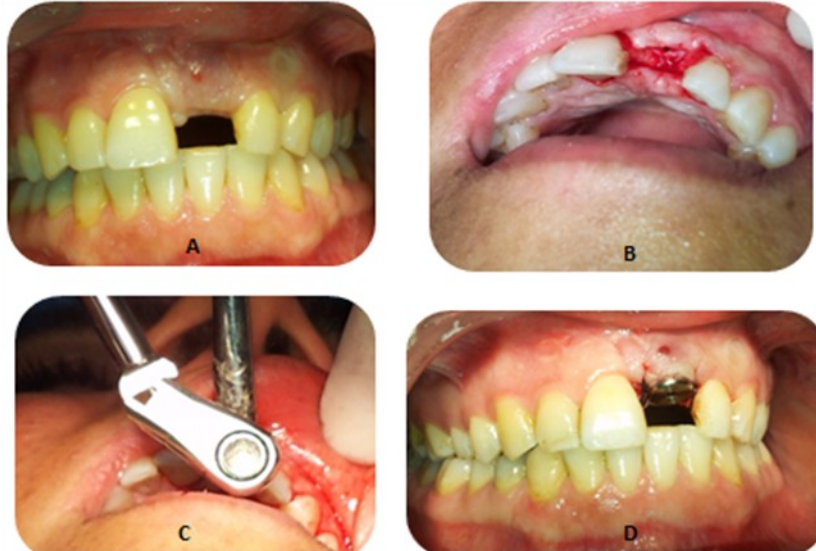


Figure 2: Implant placed in healed alveolus.

Follow up phase**Clinical Evaluation :**

1. All the patients were examined immediately after surgery and during the first week for the presence of pain, discomfort, swelling or infection.
2. Implant stability was assessed at the delivery of the crown and at 3, 6 and 12 months post loading by using two dental instrument handles placed on the buccal and palatal aspect of the crown.⁸
3. Implant survival (defined as the existence of an implant in the oral cavity),⁹ was registered at every follow up.
4. Evaluation of soft tissue around the single tooth implant crown at the end of follow up by using Implant Esthetic Score.¹⁰

Radiographic Evaluation :

Direct digital standardized peri-apical radiograph was taken immediately after implant placement, after 3 and 6 months postoperatively. All radiographs were taken using digital system (Planmeca Intra X-ray unit, Finland).

Statistical analysis:

Data were analyzed using the statistical package for social sciences (SPSS, version 19). Student's t-test was used to compare between two means. Fisher's exact test was used instead of the Chi square test of association when the expected count of more than 20% of the cells of the row X column table was less than 5. A 'P' value of ≤ 0.05 was considered as statistically significant.

Results

Forty patients participated in the present study. The age of the patients ranged between 19-52 years, with mean age of 32.4 years. Table 1 shows age distribution of the patients. Twenty three patients were males (57.5%) and 17 (42.5%) were females. Distribution of implants according to position has been shown in Table 2. Table 3 shows implant survival rates in both groups. The difference in survival rate between the two groups was not significant

($p=0.487$). The Implant Esthetic Score (IES) showed a significant difference between both groups, Table 4.

Table 1: Distribution of patients according to age groups.

Age (years)	Number	Percent
< 25	12	30.0
25-29	7	17.5
30-34	5	12.5
35-39	6	15.0
≥40	10	25.0
Total	40	100.0

Table 2: Distribution of implants according to their position.

Implant position	Group				Total	
	Group A Extraction sites		Group B Healed sites		No.	%
	No.	%	No.	%		
Central incisor	7	35.0	7	35.0	14	35.0
Lateral incisor	10	50.0	4	20.0	14	35.0
Canine	2	10.0	5	25.0	7	17.5
First premolar	1	5.0	4	20.0	5	12.5
Total	20	100.0	20	100.0	40	100.0

Table 3: implant survival in both groups.

Implant outcome	Group				Total	
	Group A		Group B		No.	%
	No.	%	No.	%		
Failure	2	10.0	0	.0	2	5.0
Survival	18	90.0	20	100.0	38	95.0
Total	20	100.0	20	100.0	40	100.0

Table 4: mean of IES of both groups and p value.

	Group	N	Mean	SD	p value
IES	Group A	18	8.72	0.46	.00812
	Group B	20	8.10	0.85	

Regarding marginal bone loss, there was a significant difference between both groups

at 3 months and 6 months after implant procedure, Tables 5 and 6.

Table 5: Marginal bone loss after 3 months.

	Group	No.	Mean	SD	p value
MBL after 3 months / mm	Group A	18	1.70	0.51	< 0.001
	Group B	20	0.68	0.30	

Table 6: Marginal bone loss after 6 months.

	Group	No.	Mean	SD	p value
MBL after 6 months / mm	Group A	18	0.84	0.23	0.002
	Group B	20	0.53	0.31	



Figure 3: Group A (Implant placement in fresh extraction socket).



Figure 4: Group B (Implant placement in Healed site) .

Discussion

Based on the results of the present study, immediate single implants in the esthetic zone of maxilla may be considered to be a successful treatment strategy with a cumulative implant survival rate of 95% after 6-12 months of function. This result is comparable to other studies.¹¹⁻¹³ The high survival rate for immediately loaded implants in healed ridges in the present study was confirmed by other studies.^{9,13,14} According to the literatures, immediate loading of implants placed in fresh extraction sockets revealed survival rates from 82 to 98%, which is comparable to what was found in the present study.^{15,16} This variation may be due to several causes; among them is low bone to implant contact, possible surface contamination, occlusal overloading and low primary stability due to weakness of the buccal plate of bone during extraction. There was statistically significant difference between both groups regarding esthetic results ($P = 0.008$), this was in agreement with other studies,^{17,18} which stated that immediate loading of implants inserted into fresh extraction sockets would lead to more favorable soft tissue levels compared with healed sites. There was minimal or no recession with implants placed in fresh extraction sites which provided good esthetic results. It may be the result of placing the implants without raising a flap and leaving the periosteum intact on the bone, which provides most of the blood supply to the bone. Thereby, when a flap is raised and the periosteum is detached; gingival recession and papillae destruction becomes very prominent as was explained by many authors.^{19,20} The mean (\pm SD) of marginal bone loss in the group A (fresh extraction sites) after the third month of loading was 1.7 ± 0.51 mm and decreased to 0.84 ± 0.23 mm in the sixth months after loading. These results were also in agreement with a study,²¹ which observed the largest amount of bone loss was in the first three months. Thereafter, diminished loss was observed. In the present study,

there was a decrease in vertical marginal bone defect in group A (extraction sites) observed radiographically implying an increase in bone to implant contact. This can be explained due to the fact that healing of the extraction socket proceeds in an apicocoronal direction around the implants.²² The mean of marginal bone loss in the group B (healed sites) after the third month (post loading) was 0.68 ± 0.30 mm and after the sixth month (post loading) was 0.53 ± 0.31 mm. These values were consistent with what had been reported in other studies on immediate loading of single tooth implants in the esthetic zone.^{12,18}

Conclusion

The immediate loading of single dental implant in maxillary esthetic zone is a viable clinical concept and lead to favorable treatment outcomes.

Conflicts of interest

The authors report no conflicts of interest.

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