



Evaluation of Socket Shield Technique versus Immediately Placed Dental Implants (Clinical and Radiographic Study)

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KEYWORDS

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Implants, Marginal bone level,
Implant stability quotient (ISQ),
Modified Gingival index (MGI).

ABSTRACT

Aim: The present study was designed to compare clinically and radiographically between Socket shield technique versus Immediately Placed Dental Implants. **Subjects and methods:** This study was designed as a randomized controlled clinical and radiographic study carried out on 16 patients of both sexes. The Patients selected in this study were classified randomly into two groups. Group 1: The eight patients in this group received their implants right away immediately after extraction. Group 2: Included 8 patients was receive Immediate implant with socket-shield technique. **Results:** For Probing depth correlation results, it showed positive correlation with all parameters, the strongest correlation was found with MBL while weakest correlation was found with Implant stability. For MPI correlation results, it showed positive correlation with all parameters, the strongest correlation was found with Implant stability while weakest correlation was found with MGI. For MGI correlation results, it showed positive correlation with all parameters, the strongest correlation was found with Implant stability while nearly weakest correlation was found with MBL. **Conclusion:** Socket Shield Technique is better than Immediately Placed Dental Implants and decrease marginal bone resorption and improve implant stability.

INTRODUCTION

Post extraction resorption of the alveolar ridge is a progressive and irreversible process following removal of teeth. Bone loss occurs in both the alveolar height and width and is accelerated in the first six months after extraction. Loss of alveolar ridge results in prosthetic instability and complicated esthetic tooth replacement with implants which may require extensive reconstructive surgery later on⁽¹⁾.

Immediate placement of an implant after tooth extraction has several advantages, it maintains the horizontal and vertical dimensions of the osseous tissues, keeps the implants at the same angulation as the pre-existing natural teeth, maximal soft tissue esthetics, and bone preservation at the extraction site^(2,3)

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The socket-shield technique provides a promising treatment adjunct to better manage these risks and preserve the post-extraction tissues in aesthetically challenging cases. The idea is to leave part of the root on the buccal side in the course of immediate implant placement. The desired effect is to remain the healthy periodontium, thereby maintaining the gingival tissues and keeping the crestal bone on its original level. The success or failure of this technique is still questionable.^(4,5)

PATIENTS, SUBJECTS AND METHODS

I- Study Setting and Population:

This study carried out on patients selected from those attending at the Department of Oral Medicine, Periodontology, Oral Diagnosis and Dental Radiology, Faculty of Dental Medicine, Al-Azhar University, (Assiut) and planned for extraction of one or more hopeless tooth .

II- Ethical Issues:

1. All patients participating in this thesis were fully informed of the study protocol and the associated risks of the work procedures.
2. Consent from the patients included in the present study was sought both verbally and in written form before the work.

III- Eligibility criteria of population:

Inclusion criteria:

1. Individuals in their adult years who have a single, severely decaying tooth, severe, incurable periodontitis, or other endodontic problems.
2. Patients who agreed to participate in the trial, signed a written informed permission form, and committed to showing up for the planned follow-up visits.
3. Type I extraction socket with adequate keratinized gingiva(KG) $\geq 2\text{mm}$.^(6,7)

Exclusion criteria:

1. Localized or systemic illness or condition that could impede the healing process following surgery according to the Cornell Medical Index⁽⁸⁾.
2. Patients who require systemic corticosteroids or any other medicine that may affect the healing process following surgery.
3. Type II and III extraction socket in which delayed implantation is favorable with additional soft or hard tissue augmentation .

IV- Patients grouping:

The Patients selected in this study were classified randomly into the following groups:

Group 1: The eight patients in this group had ages ranging from 33 to 45 years old, with a mean age of 37.2 ± 3.2 years. received an autogenous tooth graft and an implant right away.

Group 2: Consisting of 8 patients, the age range was 30 to 42 years old, with a mean age of 32.2 ± 3.2 years. Obtain an immediate implant using the socket-shield method.

V- Patients Preparation:

A- Radiographic Preparation

- i. Preoperative CBCT was obtained before surgery, as well as six months later, to evaluate bone height and width (implant treatment plan) post surgery at the time of loading to evaluate crestal bone loss and, bone density analysis, and one year later using an ultra-low-dose protocol⁽⁹⁾.
- ii- Cone beam C.T: to evaluate buccal cortical bone, sinus hight and width, planned implant size, position and angulation.

B- Periodontal preparation:

Prior to extraction, phase one periodontal therapy was administered to each patient..



- Clinical Evaluation:

- i. Site-specific modified Gingival index⁽¹⁰⁾ was used to evaluate adjacent oral mucosa and oral hygiene measures at 1, 3 and, 6 months.
- ii. Resonance frequency analysis (RFA) was used to assess implant stability at baseline and after six months.⁽¹¹⁾
- iii. Peri-implant probing depth (PPD)⁽¹²⁾ was measured after loading at 6, 9 and, 12 months.
- iv. Modified Plaque index ⁽¹³⁾was measured after loading at 1, 3 and, 6 months for evaluation of oral hygiene.

Surgical Procedures:

***In Group 'I'* Fig(1)**

Preparation and processing of the tooth graft:

Tooth extraction; was performed a traumatically using manual periostomes in order to avoid alveolar ridge alterations at the time of the extraction. A thorough alveolar curettage was subsequently carried out.

The exact diameter of titanium double threaded implant design (width of 4.2mm, 5mm and length of 12mm, 14mm) were selected according to the analysis of each case that done by cone beam computed tomography

In Group II Fig(2)

Using a bur, the hopeless tooth is divided into its buccal and palatal halves. The buccal fragment of the tooth is preserved by removing the lingual half without causing any stress.- Next, the osteotomy site is prepared by sequentially utilizing the proper drill sizes. A periapical x-ray is acquired, a paralling pin is used to ensure the implant's future position behind the root fragment, and the implant is then put into its proper location behind the fragment. Final closure of the wound was achieved with interrupted 0/3 nonresorbable sutures. After surgery, sutures were taken out between 10 and 14 days later. The final titanium abutment was implanted after the 6-month healing period, after the abutment had been positioned for two weeks to achieve a suitable emergence profile. The porcelain prosthesis was sealed with cement.



Fig. (1) Showing Immediate implant placement in group (1)



Fig. (2) Showing Immediate implant placement with socket shield technique

- i. Following surgery, post-operative CBCT was obtained to evaluate bone height and density. The procedure involved measuring implant density using the Romexis software version's density measurement tool, starting from the implant shoulder and ending at the crest of the alveolar bone*.

Statistical analysis

The statistical program for social sciences, version 20 (SPSS Inc., Chicago, Illinois, USA), was used to evaluate the recorded data. The ranges and mean \pm standard deviation were displayed for the quantitative data.

RESULTS

Clinical parametrs

- At 6 and 12 months, there was an increase in the probing depth for groups 1, 2, and there was no statistically significant difference between groups 1, 2, at 6, 9, and 12 months.
- The mean value of the implant stability quotient (ISQ) at baseline indicates that there was no statistically significant difference between any

of the tested groups. There was a statistically significant difference between Groups 1, 2, at six months, as well as a statistically significant increase from the baseline.

- The current study's results demonstrated a decrease in the mean of the modified plaque index (MPI) and modified gingival index (MGI) after three and six months, respectively, compared to one month, indicating an improvement in oral hygiene and a healthy periodontium.

Radiographic Paramers

- Using the Paired Sample t-test, it was found that, at baseline and six months, there was no statistically significant difference in marginal bone loss between Groups 1, 2,.At 12 months, Table (1) showed a statistically significant difference between Groups 1, 2, and 3.
- In terms of bone density, there was no statistically significant difference between groups at the baseline in this study; however, at 6 and 12 meters, there was a statistically significant difference between groups based on bone density (mm). Table 2 displays the mean bone density values at 6 and 12 months for groups (2,3), which differ statistically significantly from group (1)'s bone density at the same times.

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Table (1) The mean, standard deviation (SD) values of Marginal bone level (MBL) in mm of different groups.

Variables	Group I				Group II				p-value
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Baseline	0.00 ^{cA}	0.00	0.00	0.00	0.00 ^{Ac}	0.00	0.00	0.00	Ins
After 6m	0.49 ^{bA}	0.11	0.00	1.00	0.54 ^{bA}	0.05	0.30	0.70	0.162ns
After 12m	0.93 ^{aA}	0.04	0.70	1.00	0.73 ^{aaB}	0.05	0.50	1.00	<0.001*
<i>p-value</i>	0.001*				0.001*				

Significant differences are indicated by means with different small letters in the same column and means with different capital letters in the same row. *: ns; non-significant ($p>0.05$); significant ($p<0.05$).

Table (2) The mean, standard deviation (SD) values of Bone density(HU)of different groups.

Variables	Group I				Group II				p-value
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Baseline	391.88 ^{aA}	33.49	248.00	542.00	432.50 ^{cA}	18.30	380.00	520.00	0.515ns
After 6m	481.38 ^{ab}	55.51	320.00	779.00	493.88 ^{bb}	25.42	380.00	591.00	<0.001*
After 12m	562.38 ^{ab}	87.14	267.00	994.00	572.13 ^{ab}	12.40	530.00	630.00	0.002*
<i>p-value</i>	0.158ns				<0.001*				

Significant differences are indicated by means with different small letters in the same column and means with different capital letters in the same row. ns: not significant ($p>0.05$), *: significant ($p<0.05$)

DISCUSSION

Implant placement into fresh extraction sites has shown high acceptance and good patient prospective. It permit direct bone-to-implant contact in the apical area providing the apical osseous anchorage and result in a high degree of initial mechanical stability. The surgical technique included minimal intrasulcular crestal incisions of the extracted tooth and adjacent papillae with closure over the implant without attempting to achieve primary closure⁽¹⁴⁾

Several techniques in the literature are proposed to solve the thin buccal bone resorption with or without immediate implantation in the aesthetic area.

Socket shield technique that was first introduced in 2010 aids at retaining the buccal fragment of root in place and placing the implant behind the lingual aspect of that fragment. So, the periodontal ligaments and tissues preserve its vitality and prevent the collapsing of the buccal bone.⁽¹⁵⁾

In the current study, the socket shield approach and immediately placed dental implants were compared.

The immediate implants placed using the socket shield technique were found to be more successful in minimizing horizontal, vertical, and crestal bone loss, improving esthetic outcomes, increasing

implant stability, and decreasing probing depth at different time points than the conventional approach (with or without grafting) in the current study. The socket shield technique (SST), which minimizes post-extraction bone resorption while preserving soft tissue levels, may be able to help with the difficulties associated with rapid implant insertion. Because the hard tissues around the implant were preserved, there were less soft tissue volumetric changes, which accounts for the improved esthetic results.

- Phase I periodontal therapy was administered to all of the patients in order to improve the oral environment for wound healing. Disease prevention is also a key component in maintaining the supportive tissues surrounding dental implants. Clinically quick wound healing and little discomfort following surgery were noted throughout the current investigation, with no indications of infection or inflammation.
- In the current study, the probing depth of groups(I,II) at 6&12 months showed increase in probing depth with no statistically significant difference between (Group I) and (Group II) at6,9and12months
- Regarding to the bone density in the present study, there was no statistically significant difference between groups at base line but There was a statistically significant difference between groups according to bone density “mm” at 6m and 12m. The mean value of bone density at 6&12 months respectively for groups(1,2) showing statistically significant difference between bone density at 6&12 months respectively. This increase of bone density for groups(1,2) shows improved peri-implant bone architecture as well as successful new bone production, mineralization, remodeling, and maturation at the grafted location. and mineralization which increases implant primary stability and osseointegration.
- The mean value of the implant stability quotient (ISQ) for all tested groups at baseline did not demonstrate a statistically significant difference, although There was a statistically significant difference between Groups 1and 2 at six months, as well as a statistically significant increase from the baseline.
- At baseline and six months, there was no statistically significant difference in marginal bone loss between Groups 1 and 2,.At 12 months, there was a statistically significant difference between Groups 1and 2 .
- For modified Plaque Index (mP1I) showed decrease mean of modified plaque index (MPI) and modified Gingival Index (MGI) after 3 m and after 6 m than after 1m which indicate improving of oral hygiene and healthy periodontium.

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