

## Implant Survival Rate, Post-Operative Healing and Complications Following Dental Implant Surgery

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### ABSTRACT

The aim of this prospective clinical trial was to evaluate the post-operative healing, complications, and implant success rate following the insertion of dental implants. Eighty six consecutive patients (26 males and 60 females) aged 21 to 83 years old (mean=49.12±14.48 years) were recruited into this study. All patients received dental implants under local anaesthesia, had pre-operative oral antibiotic cover and used post-operative chlorhexidine mouth wash. Healing as well as immediate and late complications following implant surgery; including pain, swelling, trismus, paraesthesia, bleeding, infection and implant mobility; were assessed up to one year following the surgery. The most frequent immediate post operative complications included pain (96.5% of patients), swelling (54.7% of patients), infection (1.2% of patients), and numbness (2.3% of patients). Adequate healing was observed in 171 implants and healing was improved with time. Seven implants failed, resulting in a failure rate of 3.9%. Age and gender had no significant relations to implant failure, post-operative complications and healing following implant insertion ( $p>0.05$ ). Less immediate post-operative complications were associated with better healing at recall intervals ( $p<0.05$ ). Implant survival rate was very high in this report and exceeds 96%. The most frequent reported complications in this study were pain, swelling, infection and numbness. Certain factors including post-operative complications, type of implant, and number of inserted implants affected implant survival rate. This should be considered during planning for implant surgery in order to reduce post-operative complication and thus improve the outcome of the provided treatment.

**Keywords:** Dental Implant, Post-Operative Complications, Survival Rate of Implants.

### 1. INTRODUCTION

Dental implant placement is a planned predictable surgical procedure; however it might be associated with some complications. Among the surgical complications are bleeding, nerve injury and numbness, bone fractures, damage to adjacent teeth and structures, migration of implants into the maxillary sinus, dehiscence, emphysema, infection, pain and swelling (Lauc et al., 1998), (Lamas et al., 2008).

Careful pre-operative planning, adequate surgical technique and post-surgical management, timely and suitable loading, and meticulous hygiene maintenance can serve to minimize implant complications and failures (Lauc et al., 1998), (Ibbott et al., 1995).

Previous studies reported high implant survival rates

that ranged between 85 and 100%. (1,4-7) Implant survival rate might be affected by implant site, gender, use of prophylactic antibiotics, implantation protocol, loading protocol and occurrence of complications (Lauc et al., 1998), (Lamas et al., 2008) (Stietzal et al., 2004) (Komiya et al., 2008) (Balevi, 2008) (Esposito et al., 2010).

The use of antibiotic prophylaxis before oral surgical procedures is still controversial and inadequately documented in the literature (Mazzocchi et al., 2007) . Generally, antibiotics are required following the implantation of large foreign materials in the body (Esposito et al., 2010).

Nevertheless; it remains undecided whether antibiotics are useful, and which is the most efficient antibiotic. One preoperative dose of prophylactic antibiotics before dental implant insertion was recommended by previous studies (Balevi, 2008) (Esposito et al., 2010). On the other hand, others concluded that antibiotic prophylaxis was not required

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when implants were inserted in patients with bone types II and III (Anitua et al., 2009). Furthermore, Khoury et al raised doubts regarding the clinical usefulness of amoxicillin prophylaxis (Khoury et al., 2008).

The aim of this prospective clinical trial was to

evaluate survival rate and post-operative healing and complications following dental implant insertion, and the risk factors and clinical variables that are associated with the incidence of these complications.

**Table 1. Distribution of type and number of implants among the study population (n=86)**

Number of implants	Implant type (Number of patients)				Total
	Friadent	Oral Tronics	ITI	Others	
1	29	2	2	2	35
2	23	2	1	4	30
3	7	1	0	1	9
4	6	0	0	0	6
5	4	0	0	0	4
6	0	1	1	0	2
Total	69	6	4	7	86

**Table 2. Complications associated dental implant insertion (n=86)**

Complications	Frequency	Percent
Immediate post-operative pain	83	96.5
Immediate post-operative swelling	47	54.7
Immediate post-operative infection	1	1.2
Immediate post-operative numbness	2	2.3
Late complication and implant failure	7	8.1

## 2. PATIENTS AND METHODS

Eighty six consecutive patients (26 males and 60 females) aged 21 to 83 years old (mean=49.12±14.48 years) were recruited into this study from patients who attended the oral and maxillofacial Surgery department at Jordan University Hospital, Amman, Jordan for dental implant treatment. All patients received dental implants under local anaesthesia, all the patients had pre-operative oral antibiotic cover and used post-operative chlorhexidine mouth wash. Healing as well as immediate and late complications following implant surgery; including pain, swelling, trismus, paraesthesia, bleeding, infection and implant mobility; were assessed 1 week, 2 weeks, 1 month, 2-3 months, 6 months and 1 year following the surgery.

An invitation to participate in the study was extended to the patients. Each participant was provided with a full

explanation of the study and an informed consent was obtained from each participant before being recruited into the study.

One investigator conducted all the clinical and radiographic examinations and thoroughly assessed each patient before and after implant insertion. The assessment included patients' dental and medical histories, complaints, and personal information including name, age, gender, education, occupation, address and marital status. Patients with any medical problem that may affect healing were excluded from the study. Patients required bone grafting or sinus lifting were also excluded.

Intra examiner reliability was performed on 15 duplicate examinations using Kappa statistics. Kappa was 1.0 indicating substantial agreement as examination criteria were very clear and simple.

All implants in this study were surgically inserted by the same surgeon who was an experienced consultant in

Oral and Maxillofacial surgery. Non-traumatic surgical approach following the implant manufacturer's instructions was adopted during implant insertion. All patients received pre-operative antibiotic cover with Amoclan, Amoxicillin, or Clindamycin. Post-operative chlorhexidine mouth wash was also prescribed for all patients duration of use for the antibiotic and the mouth wash.

After surgery, the immediate and late complications of the surgery were assessed.

The assessed complications included pain, swelling, trismus, paraesthesia, bleeding, dry socket, infection and fracture of mandible. The immediate complications were assessed during the first week following the surgery and late complications were assessed 2 weeks to 1 year later.

### **Statistical Analysis**

The data were analyzed using the SPSS computer software (Statistical Package for the Social Sciences, version 11.0, SPSS Inc., Chicago, IL, USA). The association between the variables was analyzed using the Pearson correlation test. For all statistical analysis, the significance level was set at  $P \leq 0.05$ .

### **3. RESULTS**

A total of 86 patients who received 178 dental implants were included in this study. Friadent implants were the most used type of implant (69 implants). Single or two implants were inserted in most participants. Table (1) presents the distribution of type and number of implants among the study population.

Healing criteria for healing and post-operative complications were evaluated at 1 week, 2 weeks, 1 month, 2-3 months, 6 months and 1 year. The most frequent immediate post operative complications included pain, swelling, infection, and numbness. Late post-operative complications included painful exposed mobile implants with surrounding swelling and infection. Table (2) summarizes the complication among the study population.

Adequate healing was observed in 171 implants and healing was improved with time. Adhering to strict patient selection criteria and a standardized surgical protocol, seven implants failed, resulting in a failure rate of 3.9%. The majority of implants (171 dental implants) survived the entire study period giving a 96.1% implant survival rate. Failure was defined as removal of the

implant due to infection and loss of osseointegration.

### **Correlations:**

Using Pearson correlation test the following correlations were reported. Age and gender had no significant relations to implant failure, post-operative complications and healing following implant insertion ( $p > 0.05$ ). Friadent implants were associated with the least postoperative swelling ( $p = 0.015$ ,  $r = -0.261$ ) and best healing at the 2<sup>nd</sup> week recall ( $p = 0.014$ ,  $r = 0.263$ ). Also, the more the number of implants in the patient the more the chance for infection ( $p = 0.019$ ,  $r = 0.253$ ). Failed implants were associated with higher levels of late ( $p < 0.0001$ ,  $r = 1.0$ ) and immediate post-operative swelling ( $p = 0.012$ ,  $r = 0.271$ ), infection ( $p = 0.001$ ,  $r = 0.364$ ), and numbness ( $p < 0.001$ ,  $r = 0.510$ ).

Less immediate post-operative pain was associated with better healing at first week recall ( $p < 0.001$ ,  $r = 0.571$ ). Also, less immediate post-operative swelling was associated with better healing at the second week recall ( $p < 0.001$ ,  $r = 0.803$ ), 1 month recall ( $p < 0.001$ ,  $r = 0.583$ ), 2-3 months recall ( $p = 0.012$ ,  $r = 0.271$ ), and 6 months recall ( $p = 0.036$ ,  $r = 0.226$ ). Less immediate post-operative infection was associated with better healing at 2-3 months recall ( $p < 0.001$ ,  $r = 0.396$ ) and 6 months recall ( $p < 0.001$ ,  $r = 0.437$ ). Furthermore, less immediate post-operative numbness was associated with better healing at 4 week recall ( $p = 0.025$ ,  $r = 0.241$ ), 2-3 months recall ( $p < 0.001$ ,  $r = 0.563$ ), and 6 months recall ( $p < 0.001$ ,  $r = 0.621$ ).

### **4. DISCUSSION**

High implant success rates were reported in the literature; however implant therapy is still accompanied with reversible or irreversible complications that might lead to implant failure.

This study reported a high implant survival rate (96%) that concurred previous studies (Laus et al., 1998) (Strietzel et al., 2004) (Bornstein et al., 2008).

Implant failure in this study might be due to microbes resistant to the used antibiotics or inability of the antibiotic to reach implant area once bone necrosis was initiated around the implant. Although pre-operative antibiotics were used infection still occurred in some patients and this raised doubts regarding the efficiency of antibiotic prophylaxis in prevention of infection following implant surgery. The findings of this study are

consistent with established principles of implant treatment and surgical procedures.

Gender had no relation with implant failure, post-operative complications and healing following implant insertion. This disagrees with Strietzel et al. (2004).

Cultural factors and different types of implants might be the reason for this disagreement.

Increased number of implants in the same patient was associated with more infection and this might be due to the longer operation duration and larger incisions that might have bigger chance to cause infected wounds.

Less immediate post-operative complications (pain, swelling, infection and numbness) were associated with better implant success and survival rate. This concurs the results of previous studies. (Strietzel et al., 2004)

Therefore, postoperative complications after implant surgery remain a significant factor in patients' comfort and recovery. The knowledge of various methods of reducing morbidity following implant surgery would help both the surgeon and the patients during oral

rehabilitations.

Consequently, clinicians would profit from knowing what factors are associated with more post operative complications following implant surgery. Also, patients would also not sustain the risks of implant surgery. Therefore, further studies are still required in this regard.

## 5. CONCLUSIONS

Implant survival rate was very high in this report and exceeds 96%. The most frequent reported complications in this study were pain, swelling, infection and numbness. Certain factors including post-operative complications, type of implant, and number of inserted implants affected implant failure rate.

The clinicians should be mindful of the above risk indicators during planning for implant surgery in order to reduce post-operative complication and thus improve the outcome of the provided treatment.

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