EARLY FAILURES OF IMPLANT DENTISTRY

Sami khalaf Jabar
University of Misan-College of Medicine
sami_khalaf2006@yahoo.com

ABSTRACT

Dental implants have been considered to be a highly consequential treatment modality for replacing missing teeth in both partially and completely edentulous patients. The aim of study was to determine the prevalence of early implant failures using one implant system and to identify the contributing factors of early implant failures.

Key word/ dental implant, early failures, osseointegration

Methods: Patients who received implant treatment with same implant system (Dentuim, Seoul, Korea) at multiple private centers in Misan city/ Iraq during period from February 2018 to February 2021 were enrolled. The following data were collected for analysis: sex and age of the patient, size of the implant, type of surgery one or two stage and prophylactic antibiotics used.

Results: This study comprised 463 patients, 242 females and 221 males with a median age of 51 years. 1150 implant was evaluated 85(7.3%) was failed. The females showed more early failures rate than males (8.8%, 5.4%) respectively. The age group more than 60 year would have more failures (13%) than other age groups. Two step surgery more reliable and less failures than one step surgery (4.9%, 14.3%) respectively. The implant diameter 3.1mm and length 7mm showed more failures than other sizes (18%, 20%) respectively. The study showed reduce failures of implants in group used preoperative antibiotic (6%) in comparison with group no preoperative antibiotic used (8.7%).

Conclusions: The early implant failure has multifactorial etiology, females, age group over 60, one step surgery and small size implant was more risk to early failures. There is none significant relationship between used prophylactic antibiotic and success rate of implant.

I. INTRODUCTION

The survival rate of dental implant depends on successful osseointegration following placement. The outcome of biological process of osseointegration affected by excessive surgical trauma, infection, or metabolic disorders (1). As an implant is restored and placed in function, the remodeling of bone began and becomes a parlous aspect of implant survival in response to the functional demands placed on the implant restoration and supporting bone.

The inability of oral tissue to establish osseointegration named biological process failures. These failures are classified into early (failure to establish osseointegration) and late (failure to maintain osseointegration). The method to differentiate early and late failures is to define the early group as implants removed before prosthetic restoration, while those occurring after prosthetic rehabilitation are classified as late. Early failures are characterized by minimal bone loss and predomination in females and younger patients. According to a study by Manor et al., the most common reasons of the failures in late stages were periimplantitis, implant overloading and fractures. However, the principal causes of early failure was the lack of osseointegration(3). Early failures are caused by the inability to establish a close contact between bone and implant due to the absence of bone apposition and the formation of scar tissue between the surface of the implant and surrounding bone. Esposito et al. noted that surgical trauma and bone quality and quantity were the most important etiological factors involved in early implant failures(2).
In many reviewed literatures there was a higher percentage of early than late failures; The causes and mechanisms of early implant failure are unclear, different studies have found a variety of statistically significant factors associated with early implant failure, these are: age and sex, systemic diseases, smoking, type of edentulism, maxillary implant location , quantity and quality of bone , and implant length and diameter . Immunological, and genetic factors have also been associated with early implant failure  

Aim of study

The study was assess the possible factors responsible for early failure of dental implants such as age, gender, size of fixture, type of surgery (one-stage or two-stage) and prophylactic antibiotics may be associated with failure rate of dental implants.  

II. MATERIALS AND METHOD

This retrospective study from the population of patients presenting in many private clinics in Misan city/ Iraq between 2018 and 2021.  

The subjects eligible for the study had a missing tooth or teeth and received dental implant treatment.  

The dental implants were studied in patients who received an implant shorter than 9 mm and of patients who received implants of ≥10-mm length. Dentium system superline and NR line were used in this study.  

The two types of implant surgery were studied as one-stage in patients who received a tissue level implant ( none-merged ) and two-stage in patients who received a bone level implant (submerged ). The patients were studied in two groups as those who received prophylactic antibiotic therapy and those who did not receive prophylactic antibiotic therapy.

Regarding the age range, the patients were evaluated in age groups of 20-40, 41-60 and over 60 years.  

All recruited patients who involved in this study received delayed type surgical placement of the implant . All implant placement procedures were carried out by three skilled hand oral surgeons. The successful or failures of the implants was the outcome of this study. The statistical analyses were performed by using SPSS software, version 20 (SPSS Inc.; IL, USA). Percentage, Chi-Square test were used to compare the variables between the two groups.

Results

A total of 1150 implants were evaluated in this study, out of which, 85 cases failed in early stage (7.3%). All implants were removed before prosthesis applied.  

Table (1) presents the distributions for all the placed implants and for the cases of early failure of each categorical variable in terms of the sex and age group of the patient, surgical protocol (one or two stage surgery), implant dimensions ( length ,diameter ) and the prophylaxis antibiotic .

Regarding gender the comparison of the early failure rate showed that 26 (5.4%) of 480 implant in males and 59(8.8%) of 670 implant in females. However, the two genders had no significant difference in failure rate (P=0.65).

Regarding the age range, the patients were evaluated in age groups of 20-40, 41-60 and over 60 years. The higher early failure rate was 34(13%) from total 256 implant seen in group age >60 year. The implant failure rate was not significantly different among different age groups (p= 0.88)

The implants early failures were evaluated based on the types of protocol surgery. The results represented that 46(14.3%) implant of 320 one-stage implants and 41(4.9%) implant of 830 two-stage implants were early failed. The difference between the failure rate of one-stage and two-stage implants was significant ( p= 0.05).

Regarding implant size (Diameter, Length ) the diameter 4 and length 10 were most numerous used but early failures with diameter 3.1 was 18 (14.3%) of 150 implant placed higher than other diameter and according to
implant length the table (1) showed 7mm implant length was failed 12(20%) of 60 implant placed higher than other length.

In patients who received prophylactic antibiotic therapy, 36(6%) of 590 implants was failed and in the group who did not receive prophylactic antibiotic therapy, 49(8.6%) of 560 implants was failed. As was mentioned, implant failure rate was higher in the patients who did not receive prophylactic antibiotic therapy.

Table 1. Distributions of data

<table>
<thead>
<tr>
<th>Variables</th>
<th>Implants Total (N=1150)</th>
<th>Early failures (N=85)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Male</td>
<td>480</td>
<td>26 (5.4%)</td>
<td>0.03 Sig.</td>
</tr>
<tr>
<td>Female</td>
<td>670</td>
<td>59 (8.8%)</td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>20-40</td>
<td>476</td>
<td>21 (4.4%)</td>
<td>0.0006 Sig.</td>
</tr>
<tr>
<td>41-60</td>
<td>418</td>
<td>30 (7.1%)</td>
<td></td>
</tr>
<tr>
<td>&gt;60</td>
<td>256</td>
<td>34 (13%)</td>
<td></td>
</tr>
<tr>
<td>Protocol</td>
<td></td>
<td></td>
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<tr>
<td>One-stage</td>
<td>320</td>
<td>46 (14.3%)</td>
<td>0.001 Sig.</td>
</tr>
<tr>
<td>Two-stage</td>
<td>830</td>
<td>41 (4.9%)</td>
<td></td>
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<tr>
<td>Implant Diameter</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3.1</td>
<td>150</td>
<td>18 (12%)</td>
<td>0.018 Sig.</td>
</tr>
<tr>
<td>3.6</td>
<td>366</td>
<td>33 (9%)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>487</td>
<td>27 (5.5%)</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>147</td>
<td>7 (4.7%)</td>
<td></td>
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<tr>
<td>Implant length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7mm</td>
<td>60</td>
<td>12 (20%)</td>
<td></td>
</tr>
<tr>
<td>9mm</td>
<td>278</td>
<td>33 (11.8%)</td>
<td></td>
</tr>
<tr>
<td>10mm</td>
<td>510</td>
<td>26 (5%)</td>
<td>0.0006 Sig.</td>
</tr>
<tr>
<td>12mm</td>
<td>165</td>
<td>8 (4.8%)</td>
<td></td>
</tr>
<tr>
<td>14mm</td>
<td>137</td>
<td>6 (4.3%)</td>
<td></td>
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<tr>
<td>Prophylactic Antibiotics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No preoperative AB.</td>
<td>560</td>
<td>49 (8.7%)</td>
<td>0.08 (NS)</td>
</tr>
<tr>
<td>Preoperative AB.</td>
<td>590</td>
<td>36 (6%)</td>
<td></td>
</tr>
</tbody>
</table>

III. DISCUSSIONS

The current study focused on the sum of variable factors that might be considered as risk factors of early failures. The included patients who received implant treatment using onetype implant system at a multiple centers in order to minimize the possible disturbing effects of the different implant system. In addition, the present study focused on implant failure only during the early phase, during which the incidence of failure is reportedly higher than during the late phase, so the recognition of the potential risk factors in early implant failure may help decreasing the frequency of failure and prevent early implant loss. The retrospective assessment of the factors contributing to early implant failure in this study found that the early failure rate was 7.3%.

The bacterial infections can occur at any time but considered the main reason of early implant failure. Surgical trauma (insufficient irrigation, overheating) and the patient’s related local and systemic factors (bone quality, uncontrolled Diabetes mellitus), which play an imperative role in dental implant failure related to impaired healing (7).

The effect of age by itself is suggested as one of the risk factors for success, but it would not be a contraindication. In this study, the success rate for older patients lower than that for younger ones because of physiological and pathological aging change (8). A strongly significant difference were found regarding jaw bone quality, jaw shape, in most cases was also indirectly or partly related to the status of the jaw bone available for implant placement. The physical, metabolic, and endocrine changes associated with aging have changes may
affect implant treatment. The human skeleton accumulates bone up to an age of approximately 30 years and then gradually starts to lose bone. generally, human bone mineral density (BMD) reaches a peak at age 25—30 years. With increasing age, bones become weaker as a consequence of a reduced amount of bone tissue (9). Moy et al. studied a relatively large group of patients who had been operated on by an experienced surgeon and found that advanced age increased the risk of implant failure; patients older than 60 years were twice as likely to have adverse outcomes. Park et al. reported that well investigated and controlled elderly patients (over 65 years) for systemic disease and well motivation to maintain good oral hygiene showed a high survival rate of implant placement. The present study similarly found significant age-related differences (P= 0.0006).

The surgical approach used one-stage surgery might be preferable in partially edentulous patients since it avoids the second surgical intervention, in addition one step surgery exhibited less pain, discomfort and shortens treatment times, while a two-stage submerged approach could be used when the primary stability of the implant was not achieved and the primary stability of dental implants highly relies on the bone density (17). Our study demonstrate significant difference between one-stage and two-stage procedures (P=0.0001).

Al Amri showed no marginal bone loss difference between one and two stage dental implants. Ramy M. et al. (2018) were found no differences between the two surgical interventions regarding implant failures and submerged implants exhibited statistically significantly more marginal bone loss, but this difference was not clinically relevant. Systematic reviews of Giuseppe T.et al. showed implants placed with a non-submerged technique have a higher risk (2%) of early failure.

Several recent studies exhibited higher survival rate and more favorable prognosis of longer implants, also these studies showed that placement of short implants was not a less efficacious treatment option compared to the placement of implants with ≥10-mm length in totally or partially edentulous patients.(12,13). The study show significant difference (P=0.018) as least success rate was associated with implant diameter 3.1mm, length 7mm, and high success rate associated with diameter 4.5mm and length 12mm, 15mm this due to the increase in implant surface that will increase osseointegration. This comes in agreement with Porter and Fraunhofer (2005). Also the result come in agreement with result of Schweiz (2003) his study found the long implants have a significantly better chance of survival than shorter implants.

Murray L. Arlin (2006) found that short implants, were used with good reliability in patients with limited bone height without the need for ridge augmentation. Short implant length was not associated reduce survival rate of two years, compared with long implants. These results disagree with results of our study.

Early implant failure is commonly associated with certain bacterial infection. The most common bacteria involved are streptococci, anaerobic Gram positive cocci, and anaerobic gram negative rods (21). The use of prophylactic antibiotics can reduce the failure rate of dental implant treatment. The studies of Sharaf et al. and Esposito et al about the using prophylactic antibiotics, the former study suggested use a single dose of prophylactic antibiotic in dental implant treatment, the later study not prove the efficacy of prophylactic antibiotics in decreasing the failure rate.

Our results showed a higher failure rate in patients who did not receive prophylactic antibiotics (8.7% versus 6% in patients who received prophylactic antibiotic) in spite of the difference was nonsignificant (P=0.08). Gyntheret al. showed unnecessary used the antibiotic prophylaxis in routine surgery of dental implant placement. Morris et al. showed a little benefit of used antibiotics coverage preoperative to surgical placement of dental implant. Many researchers found alternative methods of lowering the risk of bacterial infection include the use of a mouthwash Chlorhexidinedigluconate (CHX) in conjunction with dental implants. CHX, when rinsed preoperatively has been proven to be an effective aid in promoting healing and reducing surgical complications. CHX also has been shown to have a high substantively, with the capability to be released over an extended period of time without losing its efficacy (25).

REFERENCES


