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ORIGINAL ARTICLE

Dental Implant Survival after Postoperative Infection

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ABSTRACT

Aim: Dental implant failure might be brought on by an early postoperative infection. The purpose of this study was to assess the prevalence of acute postoperative infection in survived and failed implants and the associated factors.

Methods: This cohort cross-sectional study held in the Oral surgery department of Altamash Institute of Dental Medicine, Karachi for two-years duration from January 2021 to December 2022 and evaluate early postoperative infection after dental implant surgery. The location of the implant, the patients' ages and genders, smoking, postoperative antibiotic therapy, bone augmentation and the time of infection development or diagnosis were among the study variables. The study's results showed which implants failed and which survived. Two groups of patients; those who survived implants included in Group A and those who had failed implants were included in group B.

Results: Out of 190 patients, 12 (6.3%) patients, including 8 men and 4 women, experienced a postoperative infection after implant insertion. In group A of implant survival, 5 implants (41.7%) acquired post-operative infection while 7 implants (58.3%) in the failed group experience infections. The significant variations among the both groups were noted in terms of the smoker patients, the timing of diagnosis, patients who got bone transplant and fresh socket versus delayed implant placement. Relating to the variables, the Kaplan-Meier analysis revealed that when infection developed 4 days after surgical procedure in subjects not given antibiotic treatment postoperatively, the probability of implant failure increased by 1.1 times (hazard ratio). If the infection developed after six days in people who smoked and after nine days in people who do not smoked and were given antibiotics postoperatively, the likelihood of failure rose.

Conclusion: In light of the study's findings, it appears that smoking, early infection, implants placement in newly created sockets, and implants placement in conjunction with bone substitutes may all enhance the failure ratio of dental implants following acute infection.

Keywords: antibiotic, implant, infection, and bone

INTRODUCTION

The conventional method of replacing missing or lost teeth is with dental implants. Dental implants have a high success rate, yet mistakes can happen[1-2]. An implant failure is distinguished by the increasing supporting bone loss with the clinically immobile implant. Failed implants must be removed, although failing implants that are detected early and treated quickly may still be salvageable[3-4]. There are two types of implant failure: early and late. While late failures frequently happen after loading, early failures happen before prosthesis restoration and osseointegration[5]. Systemic health issues with the patient, bad habits like smoking, insufficient bone quality and quantity, technical issues like overheating of bone during drilling due to compromised surgical sterility, insufficient irrigation and bad oral health are all factors that contribute to early implant failure[6-7]. Contrary to peri-implantitis, early failure which is described as " tissues inflammation around an Osseo integrated dental implant in function and result in gradual loss of bone[8]. Contaminated gloves, polluted operating room air, contaminated surgical instruments, and oral cavity saliva are some of the potential sources of direct bacterial contamination during implant surgery. Such infections can cause abscesses to grow around fittings, which could ultimately result in the development of fistulas[9-10]. A critical element that may cause dental implant loss is acute postsurgical infection. The dental implants survival following an acute infection after surgery has, however, received little research attention.[11] The purpose of this study was to assess the prevalence of acute postoperative infection in survived and failed implants and the associated factors.

METHODS

This cohort cross-sectional study held in the Oral surgery department of Altamash Institute of Dental Medicine, Karachi for two-years duration from January 2021 to December 2022 and evaluate early postoperative infection after dental implant surgery. After dental implants placement, the study's participants developed infections was the inclusion criteria. Individuals who took particular medications with negative impact on healing of bone, such as steroids and parafunctional behaviors, diabetes or systemic disorders affecting bone metabolism, were excluded from the research. The location of the implant, the patients' ages and genders, smoking, postoperative antibiotic treatment, bone augmentation and the time of infection development or diagnosis were among the study variables. All subjects were directed preventative antibiotics (amoxicillin 2g one hour prior to surgical procedure). Based on patient complaints, the occurrence time of infection was identified, and oral and maxillofacial surgeon confirms the diagnosis. Clinical signs of infection, such as localized redness, pain and discharge near the fixture, were used to make the diagnosis. The study's conclusion was whether the implants failed or survived Two groups of patients; those who survived implants included in Group A and those who had failed implants were included in group B. All implants that survived were monitored for at least two years. During the diagnostic period, cultures and sensitivity tests were performed on each participant. The patients were given amoxicillin 500 mg every eight hours as an empirical antibiotic for the infection. A suitable antibiotic was recommended based on the results of the sensitivity test. During the course of the treatment, the subjects used mouthwash with 0.2% chlorhexidine. To remove any potential foreign objects, the implant site underwent surgical exploration and saline irrigation. In order to facilitate the release of any pus or discharge, cover screws on implants were placed using a two-stage process and were replaced by healing abutments. The removal of dental implants was done that did not respond to the aforementioned treatment options. Infection that persisted, radiographic assessment that revealed lucency around fixtures, had mobility were the criteria for implant removal.

Using SPSS version 19, the statistical analyses were carried out (SPSS Inc., IL, USA). Chi-square test was utilised for comparing the implant site, gender, age, postoperative use of antibiotics and bone augmentation among both groups. The age of

the patients and the onset of infection time were compared among the two groups with independent t test. The variables' hazard ratios were compared with Kaplan-Meier analysis.

RESULTS

Out of 190 patients, 12 (6.3%) patients, including 8 men and 4 women, experienced a postoperative infection after implant insertion. In group A of implant survival, 5 implants (41.7%) acquired post-operative infection while 7 implants (58.3%) in the failed group experience infections.

Table-1: shows the patients demographic features

Variables	Description
Gender	8 males (80%), 4 females (20%)
Age	40.5 ± 10.51 years
Smoking	7 smokers, 5 non-smokers
Implant removal time in failed group	15.02 ± 3.19 days after insertion of implant (minimum 10 days, maximum 20 days)
Delay implant placement or Fresh socket	7 fresh socket, 5 delayed placements
Antibiotic given Postoperatively	5 without post AB and 7 post AB

After implant insertion, the early postoperative infection lasted an average of 4.44 ± 1.52 days. After 15.02 ± 3.19 days following implant placement in group (the failure group); failed implants were removed. Patients in groups A and B had mean ages of 41.6+ 10.12 and 39.40+ 10.9 years, respectively. Between the two groups, there was no significantly difference in patient ages and gender (P = 0.90, 0.17). (Table 2).

Table 2: Numerical variables comparison with normal distribution (age and the mean time of diagnosis) among the both groups

Variables	Group A	Group B	Independent t test
Age (years)	41.6+ 10.12	39.40+ 10.9	P = 0.84
Diagnosis time (days)	3.1 ± 0.60	3.1 ± 0.60	P = 0.004

Group A comprised 4 males and 1 female, whereas group B had 5 males and 2 females who acquire infection. There were 2 smokers in group A and 5 in group B, respectively. The data analysis revealed a significantly difference among both groups in terms of the proportion of smokers and non-smokers (P = 0.010).

In group A, there were 2 implants at the site of the mandibular molars, 1 implant at the mandibular premolars site, 1 implant at the mandibular incisor site, and 1 implant at the maxillary premolars site. In group B, there were 4 implants in the area of the mandibular molars, 2 implants near the mandibular incisors, 1 implant near the mandibular premolars, and 1 implant near the maxillary premolars. After the data were assessed, there was no discernible difference between the two groups for the site (P = 0.58). No patients in group A received bone transplants. Three patients in group B receive bone grafts, while 9 did not receive. The number of implants with bone grafts varied significantly between the two groups (P = 0.031). Antibiotics were given to 3 patients in group A after surgery, compared to 4 in group B with no difference significantly (P = 0.49). (Table 3).

Table-3: shows the Comparison of nominal (categorical) variables between the 2 groups

Variables	Group A	Group B	Chi-square test
Gender	4 males, 1 female	5 males, 2 females	P = 0.21
Postsurgical antibiotic	3 AB, 2 WAB	4 AB, 3 WAB	P = 0.49
Smoking	2 smoker, 3 non-smokers	5 smokers, 2 non-smokers	P = 0.010
Bone graft	0 BG, 5 WBG	3 BG, 4 WBG	P = 0.031

Group A had 2 implants inserted in the newly created socket and 3 implants in the healed bone group. IN group B; 5 implants were placed in the newly created socket and 2 implants in the bone that had already healed (3 months after removal of tooth) with statically significant difference (P = 0.01). In the both groups, there was no socket preservation for the delayed implant insertion.

After surgery, the mean time to diagnose was 3.1 ± 0.60 days in group A and 5.30 ± 1.70 days in group B. The results of the data analysis showed significant change in relation of the time since diagnosis among both groups (P = 0.004). The infection time when it diagnosed and unsuccessful removal of implant were correlated (P = 0.001). Relating to the variables, the Kaplan-Meier analysis revealed that when infection developed 4 days after surgical procedure in subjects not given antibiotic treatment postoperatively, the probability of implant failure increased by 1.1 times (hazard ratio) **(Fig. 1).**

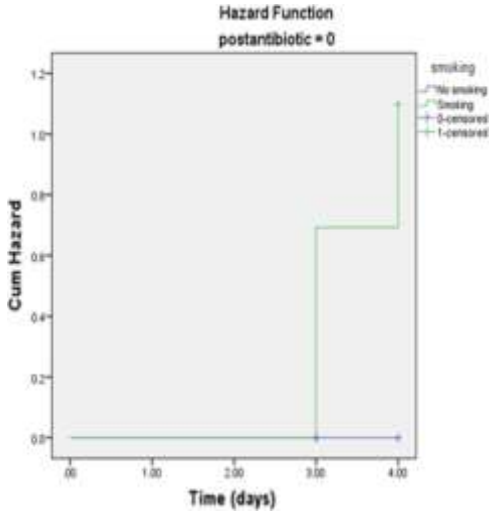

Figure 1: If the infection developed after six days in people who smoked and after nine days in people who do not smoked and were given antibiotics postoperatively, the likelihood of failure rose.

DISCUSSION

A rare complication that often happens a few days following dental surgery of implantation is infection postoperatively[12-13]. Early infection is most usually caused by trauma from an improperly relieved denture, a poorly placed cover screw, leftover suture and trauma from the opposing teeth. Since such infections are typically difficult to treat, it has been advised that the infected implant be removed. In contrast, some infected implants may survive in the clinical context with careful local and systemic therapies[14]. A postsurgical infection is said to occur between 2.4% and 10% of the time. Early postsurgical infection was prevalent in our sample at 6.3%, which was comparable to earlier research. In our study, almost 1/3rd = of dental implants which were infected survived after receiving IV antibiotics[15-16]. Although a prior study found that age was associated with a higher likelihood of complications, our study's failed and survived groups did not have significantly different mean ages[17]. It shows that the early implant failure or post-implant infection following post-implant infection was unaffected by age. Age is not a risk factor for implant failure if infection occurred after implant placement, however it may be a reason for interruption of osseointegration and delay failing[18-19]. Smoking is a significant risk factor for the bone augmentation operations and implantation of dental implants.

Many genes involved in the control of osteoblast proliferation, differentiation, apoptosis, bone formation, and remodeling are inhibited by nicotine[20-21]. Exposure to nicotine results in systemic and local vasoconstriction, which lowers O2 perfusion of blood and produces ischemia. In our study, the timing

of infection identification and the start of additional treatments had a substantial impact on implant survival[22]. According to reports, bacterial colonization begins 30 minutes after the implant is placed. According to Esposito et al., within the first two weeks following implant surgery, 75% of early infections occurred[23]. According to CampsFont et al, 66% of implants had to be withdrawn due to late-onset or detected postoperative infections, which were difficult to manage 30 days following implant placement[24]. The site of the implant has been regarded as an implant failure risk factor. In a research by Noguerol et al., the probability of early failure for implants not set in type II bone was 1.89 times greater[25]. With different implant placement sites, there were no appreciable differences in implant failure or survival afterwards acute infection. According to Figueiredo et al., mandibular implants with submerged healing were much prone to infection postoperatively[26]. After an initial infection, bone grafting plays a critical role in whether implants survive or fail. Bone grafting prior the placement of dental implants decreased their likelihood of enduring infection. In an infected environment, bone substitute materials behave like a foreign body and may make the infection worse.

CONCLUSION

In light of the study's findings, it appears that smoking, early infection, implants placement in newly created sockets, and implants placement in conjunction with bone substitutes may all enhance the failure ratio of dental implants following acute infection.

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