RISK FACTORS ASSOCIATED WITH EARLY IMPLANT FAILURE

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ABSTRACT

Objective: *To assess the possible risk factors that contribute to early dental implant failures in a teaching hospital.*

Materials and Methods: *This cross sectional study evaluated past records of the 24 patients treated with 53 dental implants and were divided into two groups, one with failed dental implants before occlusal loading and the other with successful implants. Variables such as Age, gender, location of implants (maxilla or mandible), type of implant healing (single or double stage) and timing of implant placement (fresh extraction sockets or healed sites) were assessed.*

Results: *About 4 (7.5%) out of 53 dental implants failed to osseointegrate before the prosthetic phase. The difference between the two groups was statistically significant p= 0.032 regarding the healing of dental implant (single or double stage), however, it was not significant in terms of age, gender, site and timing of implant p>0.05.*

Conclusion: *Single stage implant surgery may be an important risk factor for early Implant failure however, more studies with larger sample size should be done to investigate risk factors that contribute to early failures.*

Keywords: *dental implant, failure, risk factors*

INTRODUCTION

Currently, treatment of partial and fully edentulous ridges with dental implants is a predictable treatment modality, however treatment failures do happen despite high success rates reported in the literature(1). It is therefore, imperative that a thorough understanding of the risk factors involved in dental implant failure is required for longevity of implant therapy(2). Implant failure has been associated with peri-implantitis which is believed to be an important biological complication(3). Dental implants can be considered successful if there is absence of mobility, peri implantitis and pain on clinical examination and absence of peri implant radiolucency on radiographs(4). Following dental implant surgery, failures can occur prior to the prosthetic rehabilitation (early) or after occlusal loading (late). Implant failures during early phase of healing may result from bacterial infiltration during the surgical phase which can lead to fibrous union rather than bony union between dental implant and bone(5). Many local and systemic factors may be responsible for failure of dental implants seen clinically(6). Amongst local causes, inadequate bone quantity, decreased implant stability at the time of implant placement and wound infection are important (7). Prior to abutment connection, failure may result from inadequate bone to implant

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contact [6, 8]. Esposito et al [9] reported that the most significant risk factors for early implant loss were trauma during implant placement and compromised quality and quantity of bone. Systemic conditions such as diabetes, osteoporosis, use of steroids and bisphosphonates are important systemic factors which can influence bone healing [10]. Unsuccessful treatment with dental implants is also observed in patients with a history of tumoricidal radiation of jaws and excessive heat generation during the placement of dental implants [11].Existing literature focuses on the performance of implant after the prosthetic rehabilitation but there is a paucity of information regarding failure of dental implants before occlusal loading [12].The purpose of this retrospective study was to evaluate possible risk factors which may be involved in early dental implant failure.

MATERIALS AND METHODS

This cross sectional study included records of patients who received dental implants between April 2018 and July 2019 in the Implantology department at College of Dentistry Sharif Medical and Dental College, Lahore for replacement of single or multiple missing teeth. The exclusion criteria included a previous history of radiation of jaws, previous implant failure, uncontrolled metabolic disease, and smoking. All patients were seen by an experience oral and maxillofacial surgeon and a treatment plan was formulated after evaluation of patient's history, clinical examination, and radiographic examination. All patients underwent CBCT examination. All patients were operated by a single consultant surgeon and received implants of same company.A standard protocol was followed for all implant surgeries. 2% lignocaine with 1:100,000 adrenaline was used as local anaesthesia following which a mucoperiosteal flap was raised. All patients were prescribed an antibiotic from penicillin group and NSAID as analgesics for 5 days.Double stage implant healing was our protocol unless the patient refused to have a second stage surgery. The implants were evaluated from the time of surgery till the prosthetic phase or 2nd stage surgery. Implants which were mobile, infected, or painful with peri-implant radiolucency on radiographs were considered failed. All the patients were divided into two groups; group 1 included patients with successful implant at the time of prosthetic phase while group 2 included patient with failed implants.Patient's age and gender were recorded, and age was evaluated in groups of ≤60 years and ≥61 years.The site of dental implants (maxilla and mandible) was also recorded.Timing of dental implant surgery was evaluated in 2 groups, which consisted of placement in fresh sockets or into healed sites after at least 3 months post dental extraction. Data regarding the type of implant surgery (whether single or double stage) depending upon the time of placement of healing abutment was also recorded.All data were statistically analysed using SPSS software, version 23 (SPSS Inc.; IL, USA). Chi-Square test and Fischer's exact test were used as appropriately to compare the variables between the two groups. P value of < 0.05 was considered significant.

RESULTS

About 53 dental implants were done in 24 patients. A total of 4 implants (7.5%) failed prior to the prosthetic phase. There were 15 (62.5%) male and 9 (36.5%) female patients in the study. Male patients received 41 dental implants out of which 2 dental implants (4.9%) failed, while in the female's group, 2 out of 12 dental implants (16.7%) failed prior to the prosthetic phase (table 1). The difference between the two was not statistically significant p= 0.217.

Age wise the patients were divided into two groups. Patients in ≤60 years group had 3 (10%) failed implants while the group ≥61 years of age had only 1 failure (4.3%) p= 0.62.

2 out of 22 (9.1%) implants failed to osseointegrate in maxilla in comparison to mandible where 2 of 31 (6.5%) implants failed. The difference between the two was not statistically significant p= 1.000.12 implants (22.6%) were done as single staged when the healing abutment was placed at the time of implant placement while 41 (77.4%) implants received healing abutment after a minimum period of 3 months (healing phase). 3 implants (25%) failed in the single stage group while only 1 implant (2.4%) failed in the double stage group. The difference between the two groups was statistically significant p=0.032. In the healed sites, 2 out of 41 (4.1%) Implants failed while 2 of 12 (16.7%) failed when the Implants were placed in fresh extraction socket. The difference was not statistically significant p= 0.217.

Table 1: Risk Factors for Early Implant Failure

	Group 1 healed implants (%)	Group 2 failed implants (%)	P value
Gender as a risk factor for early failure			
Male	39 (95.1%)	2 (4.9%)	0.217
Female	10 (83.3%)	2 (16.7%)	
Age as a risk factor for early failure			
≤ 60	27 (90%)	3 (10%)	0.624
≥ 61	22 (95.7%)	1 (4.3%)	
Location of dental implant as a risk factor for early failure			
maxilla	20 (90.9%)	2 (9.1%)	1.02
mandible	29 (93.5%)	2 (6.5%)	
Type of implant surgery as a risk factor for early failure			
Single stage	9 (75%)	3 (25%)	0.032
Double stage	40 (97.6%)	1 (2.4%)	
Timing of dental implant as a risk factor for early failure			
Delayed	39 (95.1%)	2 (4.9%)	0.217
Immediate	10 (83.3%)	2 (16.7%)	

DISCUSSION

Early failures during the course of dental implant healing may occur due to certain local and systemic factors which results in deficient bone healing around the surface of the implant leading to inadequate osseointegration and formation of scar tissue [2, 7]. In order to prevent early loss of dental implants it is important to recognise these factors [8]. Several studies have reported an early failure rate ranging from 2-6% however higher failure rates may occur in patients receiving implants with a history of radiation or chemotherapy for tumors of jaws [3, 9-12]. In this study the early failure rate (7.5%) was slightly higher as compared to the previous studies which may be partly due to small sample size.Age is one of the many risk factors that can influence the healing of dental implants as delayed wound healing, systemic conditions and compromised bone quality and quantity have been associated with old age [8]. In the present study 3 (10%) implants were lost in patients who were 60 years or less of age as compared to 1 (4.3%) implant in patient who was more than 60 years. The difference between the two age groups was not statistically significant p=0.624. These results are similar to what have been reported previously by Kang et al [13] . Successful treatment with dental implants in elderly patients has been reported in previous studies [14-16]. In contrast to our results, Moy et al [17] showed a strong association between advancing age and early implant failure.Females were associated with higher (16.7%) implant failure rates in comparison to males (4.9%), however the difference between the two groups was not statistically significant p= 0.217. In contrast Sverzut et al [18] reported a 1.255 times greater risk of early implant failure in men as compared to women. Other reports have found no association between gender and early implant loss [4, 6, 19].Regarding the location of dental implants Esposito et al [5] reported three times increased chances of maxillary implants failure in comparison to mandibular implants. Similar results have also been observed by Steenberghe et al [19]. A meta-analysis [12] also reported a statistically significant (OR = 1.27) difference between failure rates of implant placed in maxilla as compared to mandible. We have also observed increased failure rates in maxillary implants (9.1%) in comparison to mandibular implants (6.5%) but the difference was not statistically significant. In contrast to these reports, Raiker et al [20] reported significant difference in failure rates of dental implants placed in mandible and maxilla with posterior mandible being the most frequent site while, Alsaadi et al [21] found that anatomic site was not a risk factor for implant failure. Single stage implant surgery was done in twelve implants where the healing abutment was connected to the implant at the time of implant placement. 3 (25%) implants failed early in this group as compared

1 of 41 (2.4%) implant which were done as double staged. The difference between the two groups was statistically significant p- 0.032. Significant results regarding single stage surgery as a risk factor for implant failure have also been reported by Vehemente et al [22]. Our results are in contrast to other reports [2, 7] which have not found the healing method to be a significant risk factor for early failures. It is worth mentioning here that all the implants in this study were inserted at a torque of least 20Ncm and the decision for the healing method was based on whether the patient wants a second stage surgery or not.

There were more failures when implants were placed in fresh extraction sockets (16.7%) in comparison to the healed sites (4.9%), however the difference was statistically not significant p- 0.217. The results are in accordance to a previous study by Baqain et al [2].

CONCLUSION

Within limitation of the study, the early failure rates are comparable to what have been published in literature however, they are slightly towards the higher side which may be due to the small sample size. Although retrospective study has less validity as compared to randomised control trials, but it may have highlighted single stage implant surgery as an important risk factor for early implant loss. Further studies with larger sample size are required to investigate and determine risk factors that may cause implant failures so as to increase success of dental implants.

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