ORIGINAL RESEARCH ARTICLE

THE INFLUENCE OF LOCAL FACTORS ON EARLY DENTAL IMPLANT FAILURE - FIVE YEAR RETROSPECTIVE STUDY

Authors

Alhamdani Faaiz Y.[1]
Abdulla Emad H.[2]

Assistant Professor
Clinical Sciences Department
College of Dentistry
Ibn Sina University of Medical and Pharmaceutical Sciences
Iraq, Baghdad

Assistant Professor
Clinical Sciences Department
College of Dentistry
Ibn Sina University of Medical and Pharmaceutical Sciences
Iraq, Baghdad

Address for correspondence:
Faaiz Alhamdan
Assistant Professor
Clinical Sciences Department
College of Dentistry
Ibn Sina University of Medical and Pharmaceutical Sciences
Al-Qadisiyah, Baghdad, Iraq
Email: faaiz68@gmail.com

ABSTRACT

Background: In the last decade, dental implant treatment is becoming more popular in middle East countries. The reasonable cost of dental implants, a wide range of dental implant products, and the competitiveness of private dental centers have played a role in this positive attitude toward dental implant treatment. This resulted in a relatively high turnover of dental implant patients in the private dental sector. More data are now becoming available to study different aspects of dental implant treatment in both governmental and private sectors. One of the important areas of dental implant research is the study of dental implant failure (DIF).

Objective: To identify local factors, which might contribute to early dental implant failure

Materials and methods: Information from 196 Iraqi patients who attended Basamat Private Dental Center in Baghdad from 7.1.2016 to 30.4.2020 were recorded. Biographic and clinical data were reviewed. The judgment on early failure is based on implant mobility at the second-step surgery or the prosthetic part delivery visit.

Results: The highest level of failure is noticed in immediate implant cases. Out of 67 cases in the upper anterior region. It was not statistically significant, though (p= 0.052). Chi-Square Test, also, did not show a statistically significant relationship between early dental implant failure and the dental implant zone (p=0.369 respectively).

Conclusion: It appears that there is no stand-alone local factor that causes early implant failure. Human error could be considered a contributing factor. More technically challenging cases increase the likelihood of early dental implant failure.

Keywords: dental implant, dental implant failure, early dental implant failure, local factors.

J Odontol Res 2021;9(1)5-10.

INTRODUCTION

As dental implant treatment gained popularity, several studies were published regarding the possible contributing factors for dental implant failures. Dental implant failure can be early or late. Generally, failure of osseointegration, which is discovered at the second stage surgery is considered an early failure. The reported causes are It Implant placement in an infected socket, pathological lesion, or immature bone previously augmented contaminated implant, or infection [1].

In the last decade, dental implant treatment is becoming more popular in middle East countries [2-4]. The reasonable cost of dental implants, a wide range of dental implant products, and the competitiveness of private dental centers have played a role in this positive attitude toward dental implant treatment. This resulted in a relatively high turnover of dental implant patients in the private dental sector.

This means that more data are now becoming available to study different aspects of dental implant treatment in both governmental and private sectors. One of the important areas of dental implant research is the study of dental implant failure (DIF). This study aims to identify the local factors more likely to contribute to early dental implant failure.

MATERIALS AND METHODS

The study was approved by the Scientific Committee, Ibn Sina University of Medical and Pharmaceutical Sciences 2021. Information from 196 Iraqi patients who attended Basamat Private Dental Center in Baghdad from 7.1.2016 to 30.4.2020 was recorded. During this period 348 dental implant procedures were completed.

The dental implant procedures were performed by the same surgeon (FA). The following protocol was adopted for the treatment; following history taking a thorough extra and intraoral examination was carried out. Digital OPG and/or intraoral digital periapical views were examined and analyzed for the implant site. The dental implants were inserted under local anesthesia (LA). All implants were placed using flapless surgery. Preoperative Chlorhexidine mouth wash was given after LA administration and before the actual surgery. The patients were asked to keep the chlorhexidine inside their mouth for 2 minutes. No antibiotics were prescribed for all the dental implant procedures. Postoperative Ibuprofen 200 mg tablets were prescribed for pain relief. Patients were advised to continue Chlorhexidine mouth wash for at least one week to ensure uneventful wound closure of the dental implant site.

Biographic and clinical data were reviewed. The relevant information was recorded in an Excel sheet. The recorded data included: patient age, gender, implant site (missing tooth), the timing of implant insertion (immediate or delayed implant); implant side, dental implant system, implant length, and implant diameter, and whether sinus lift and/or bone augmentation was performed. The judgment on early failure is based on implant mobility at the second step surgery or the prosthetic part delivery visit.

Inclusion criteria: patients whose data are available and finished their treatment.

Exclusion criteria: diabetic patients, smokers, patients with uncontrolled hypertensive or TMD (which might influence the treatment outcome), patients with incomplete data, and patients who did not finish their treatment.

Six dental implant systems were used for the included patients. These were: IBS® (no=274, 73%), Dentaurum® (no=36, 10.3%), ImplantKa® (no=33, 9.5%), DeTech® (no=19, 5.5%), Easy Implant® (no=5, 1.4%), and NeoBiotech® (no=1, 0.3%).

For the aim of statistical analysis patients' age has been stratified into the following age categories; age group 1:17-30, age group 2:31-40, age group 3: 41-50, age group 4: 51-60, age group 5: 61-70, age group 6: 71 and above.

Both descriptive and inferential statistics were applied in this study. Pearson Correlation, Chi-Square, and One-way ANOVA tests were used to identify the correlations between continuous, categorical, and interval variables. The level of significance was considered at $P<0.05$. SPSS Ver. 25 was used to perform the statistical analysis.

RESULTS

Out of 347 dental implant cases included in this study, 324 (93.1%) cases were completed success-

fully. Twenty-four (6.9%) dental implant cases failed early and they were removed at the second visit or the delivery visit.

The male to female ratio was about 1:2. Sixty-six males were treated with 127 dental implants (mean age 48.80±12.70), whereas 127 females (mean age 45.54±12.10) were treated with 221 dental implants. The Chi-Square test did not show a statistically significant (p=0.276) relationship between a patient's gender and dental implant failure (Table 1).

As shown in Figure 1, the highest percentage of dental implants were reported in the upper posterior zone, followed by the lower posterior zone. The lest percentage was reported in the anterior zone. Table 1 provides the percentage of failure in each zone. The highest percentage of failure was reported in the upper anterior zone, followed by the lower posterior zone. No cases of failure were reported in the lower anterior zone. However, Chi-Square Test did not show a statistically significant relationship between early dental implant failure and the dental implant zone (p=0.369). Out of 67 cases in the upper anterior region, 14 cases (20.9%) were treated with immediate implant and bone augmentation.

Seventy-eight patients (39.7%) (31 males, and 43 females) were treated with more than one dental implant. The total number was 237 implants. 139 (58.6%), dental implants were used for female patients, whereas 98 (41.4%) dental implants were used for male patients. Chi-Square Test did not show a significant relationship between single vs multiple implant treatment and early dental implant failures.

The mean dental implant length for failed cases was 9.7 mm, whereas the mean dental implant diameter was 4.1 mm. Out of 56 cases of short implants (≤8 mm), 4 cases had an early failure. However, neither dental implant length nor dental implant diameter was found statistically related to early dental implant failure (p=0.388 and 0.976 respectively).

Immediate dental implants were performed for 62 cases (Table 1), 15 (24.2%) were performed for males, and 47 (75.8%) for female patients. The mean age range for immediate implants was 43.37 ±12.44). immediate implants were used mainly to replace upper posterior teeth (no=24, 38.7%) followed by lower posterior teeth (no=21, 33.9%). Chi-Square Test did not show a statistically significant relationship between early dental implant failure and the timing of dental implant, (p= 0.052).

Bone augmentations were used for 41 cases (mean age=45.15±11.936), whereas sinus lift procedures were performed for 17 cases (mean age=45.9± 10.395). The percentage of failures for bone aug-

Variable	Frequency of early failure cases	P-value
males	4.7	0.276
females	8.1	
upper anterior	10.4	0.369
upper posterior	5.6	
lower anterior	0	
lower posterior	7.6	
right side	8.3	0.399
left side	5.6	
17-30 age category	7	0.442
31-40 age category	4.4	
41-50 age category	10.4	
51-60 age category	7	
61-70 age category	0	
71- age category	0	
immediate implant	12.9	0.052
sinus lift	0	0.25
bone augmentation	7.3	1

Table 1: the study variables and their percentages of early implant failure

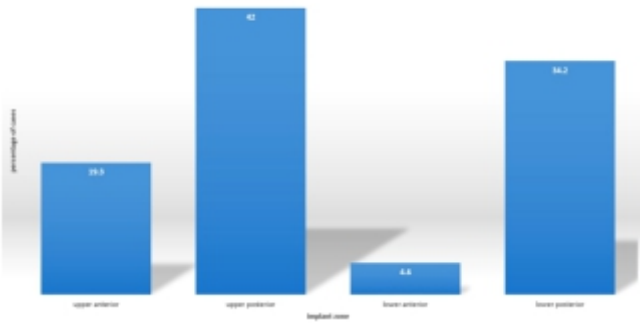

Figure 1:
Percentage of cases for each dental arch zone

mentation and sinus lift is shown in Table 1. Chi-Square Test did not show a statistically significant relationship (p=1) between bone augmentation and implant failure. No cases of sinus lift were reported with early dental implant failure.

Table 1 summarizes the percentages of early failure cases for each of the study variables. The highest percentage of failure is noticed in immediate implant cases, followed by the upper anterior region and female patients. The male patient showed the lowest percentage.

DISCUSSION

The main focus of this study is to determine the most likely local factor, which could contribute to early DIF. Patients with systemic diseases, especially diabetic patients were excluded in this study.

As far as dental implant zones are concerned, there is a consensus that posterior teeth loss in both upper and lower arches is more common than anterior teeth loss[5, 6]. This could influence the distribution of dental implants. The difference between upper and lower dental implant cases in this study is comparable to Negri et al study[7]. The highest number of the upper posterior implant in this study (almost a third of the cases), can be justified by the number of implants performed for the upper premolar region. Most of which have been requested by female patients 67 cases (67%) for aesthetic purposes.

Dental implant length was not found to contribute to early dental implant failure. There is no general consensus about the influence of dental implant length, nor diameter on the early DIM. [8-12]

Early dental implant failure, as reported in this study, was not found to be influenced by the dental arch factor. There is a controversy in the literature regarding the dental arch influence on dental implant outcome[13-15]. It has been acknowledged that the dental arches by themselves do not seem to represent a risk factor[5, 6,] unless related to other variables.

Many patients seek dental implant treatment for the posterior mandibular region after a long period of extraction, which significantly jeopardizes the regional bone height and width[7]. The presence of the inferior alveolar dental canal and the lingual concavity increase the surgical challenge during implant insertion. Such limitations necessitate the use of shorter and, subsequently, wider implants. This adds to the surgical challenges of these cases due to the need for bone augmentation.

Despite it was not statistically significant, the highest percentage of DIF was recorded in immediate dental implant cases. This might explain why females, compared to males, reported a higher number of failures (Table 1). Females had more cases of immediate implants. Besides, many cases of the immediate implant in the upper anterior zone required bone augmentation. This could add to the surgical challenge in these cases. There are published studies that acknowledged the fact that bone augmentation could be a risk factor for implant failure[11,15].

As mentioned earlier, inferential statistics in this study did not identify a single factor with an obvious influence on early dental implant failure. It seems that stand-alone local factors do not significantly contribute to the outcome of the dental implant. This has been acknowledged by other studies [7,16].

It has been suggested that disagreement between different studies on DIF could be related to differences in the selected samples, samples' size, different surgical protocols[13, 17-19], different follow-up periods [20, 21], or unidentified immune-inflammatory host factors[7].

The present study, however, could suggest that absence of a single most likely contributing factor is one of the reasons for this disagreement. There is a possibility that more than one factor at the time might act as the cause of failure. Failure of these studies to consider the human error alone or in conjunction with other factor could be another reason. It seems that early dental implant factor is a multifactorial. It also implements that human error should be considered.

This study, unlike other studies, analyzed cases performed by a single surgeon in a single private center. Other studies either involved multiple centers or more than one implantologist. This might neutralize the influence of the human factor. The authors believe that anatomical and surgical challenges in cases of immediate implants (in both aesthetic and posterior mandibular zones) could increase the chance of human error. The more challenging the

implant procedure, the more possibility of error in decision making and/or procedure execution.

Not many studies acknowledged the human factor as one of the reasons for dental implant treatment outcome[22]. It has been stated, however, that surgical skills, and/or judgment[16,23,24] could influence implant success. Both surgical skill and experience might help the surgeon to take into account individual case characteristics. Each surgical case has its technical and surgical challenges. This needs to be considered in future studies on dental implant failures.

The main limitation of this study it is a retrospective study. Retrospective studies do not allow the researcher to have the full required information for each case. This could cost the study a significant number of valuable data.

CONCLUSION

It appears that there is no stand-alone local factor that causes early implant failure. Human error could be considered a contributing factor. More technically challenging cases increase the likelihood of early dental implant failure.

REFERENCES

1. Maheshwari DR, Punia DV, Dr. Meenakshi Khandelwal, et al. Implant failure and management: A review. International Journal of Applied Dental Sciences 2018; 4: 293-298.
2. Raikar S, Talukdar P, Kumari S, et al. Factors affecting the survival rate of dental implants: A retrospective study. 2017; 7: 351.
3. Gbadebo OS, Lawal FB, Sulaiman AO, et al. Dental implant as an option for tooth replacement: The awareness of patients at a tertiary hospital in a developing country. Contemporary clinical dentistry 2014; 5: 302-306. DOI: 10.4103/0976-237X.137914.
4. Alanazi SA, Alduaiji KTA, Al-Enazi AS, et al. Knowledge, Attitude, and Awareness Regarding Dental Implants among Young Patients Visiting Al-Farabi Hospital. OHDM 2017; 16.
5. Zhang Z, Meng T, Chen Q, et al. Retrospective analysis of early dental implant failure. 2018; 50: 1088-1091.
6. Schoenbaum TR, Moy PK, Aghaloo T, et al. Risk Factors for Dental Implant Failure in Private Practice: A Multicenter Survival Analysis. Int J Oral Maxillofac Implants 2021; 36: 388-394. 2021/04/29. DOI: 10.11607/jomi.8983.
7. Montes CC, Pereira FA, Thome G, et al. Failing factors associated with osseointegrated dental implant loss. Implant Dent 2007; 16: 404-412. 2007/12/20. DOI: 10.1097/ID.0b013e31815c8d31.
8. Olmedo-Gaya MV, Manzano-Moreno FJ, Cañaveral-Cavero E, et al. Risk factors associated with early implant failure: A 5-year retrospective clinical study. The Journal of prosthetic dentistry 2016; 115: 150-155. DOI: https://doi.org/10.1016/j.prosdent.2015.07.020
9. Mohajerani H, Roozbayani R, Taherian S, et al. The Risk Factors in Early Failure of Dental Implants: a Retrospective Study. J Dent (Shiraz) 2017; 18: 298-303.
10. Manzano G, Montero J, Martín-Vallejo J, et al. Risk Factors in Early Implant Failure: A Meta-Analysis. 2016; 25: 272-280. DOI: 10.1097/id.0000000000000386.
11. Krisam J, Ott L, Schmitz S, et al. Factors affecting the early failure of implants placed in a dental practice with a specialization in implantology – a retrospective study. BMC Oral Health 2019; 19: 208. DOI: 10.1186/s12903-019-0900-8.
12. Castellanos-Cosano L, Rodriguez-Perez A, Spinato S, et al. Descriptive retrospective study analyzing relevant factors related to dental implant failure. Medicina oral, patologia oral y cirugia bucal 2019; 24: e726-e738. DOI: 10.4317/medoral.23082.
13. Staedt H, Rossa M, Lehmann KM, et al. Potential risk factors for early and late dental implant failure: a retrospective clinical study on 9080 implants. International Journal of Implant Dentistry 2020; 6: 81. DOI: 10.1186/s40729-020-00276-w.
14. Kohavi D, Azran G, Shapira L, et al. Retrospective Clinical Review of Dental

Implants Placed in a University Training Program. Journal of Oral Implantology 2004; 30: 23-29. DOI: 10.1563/1548-1336(2004)030<0023:RCRODI>2.0.CO;2 %J Journal of Oral Implantology.

15. BORBA M, DELUIZ D, LOURENÇO EJV, et al. Risk factors for implant failure: a retrospective study in an educational institution using GEE analyses. Brazilian Oral Research 2017; 31.
16. Ragucci GM, Giralt-Hernando M, Méndez-Manjón I, et al. Factors Affecting Implant Failure and Marginal Bone Loss of Implants Placed by Post-Graduate Students: A 1-Year Prospective Cohort Study. 2020; 13: 4511.
17. Zygogiannis K, Aartman IH, Parsa A, et al. Implant Mandibular Overdentures Retained by Immediately Loaded Implants: A 1-Year Randomized Trial Comparing the Clinical and Radiographic Outcomes Between Mini Dental Implants and Standard-Sized Implants. 2017; 32.
18. Neves J, de Araújo Nobre M, Oliveira P, et al. Risk Factors for Implant Failure and Peri-Implant Pathology in Systemic Compromised Patients. 2018; 27: 409-415. DOI: https://doi.org/10.1111/jopr.12508.
19. Bazlia L, Khoramabadib HN, Chahardehic AM, et al. Factors influencing the failure of dental implants: A systematic review. Journal of Composites and Compounds 2020: 18-25.
20. Lazzara R, Siddiqui AA, Binon P, et al. Retrospective multicenter analysis of 3i endosseous dental implants placed over a five-year period. 1996; 7: 73-83. DOI: https://doi.org/10.1034/j.1600-0501.1996.070109.x.
21. Lai H-C, Si M-S, Zhuang L-F, et al. Long-term outcomes of short dental implants supporting single crowns in posterior region: a clinical retrospective study of 5–10 years. 2013; 24: 230-237. DOI: https://doi.org/10.1111/j.1600-0501.2012.02452.x.
22. Renouard F, Amalberti R and Renouard E. Are "Human Factors" the Primary Cause of Complications in the Field of Implant Dentistry? International Journal of Oral & Maxillofacial Implants 2017; 32: pe55-e61.
23. Kang D-Y, Kim M, Lee S-J, et al. Early implant failure: a retrospective analysis of contributing factors. Journal of periodontal & implant science 2019; 49: 287-298. DOI: 10.5051/jpis.2019.49.5.287.
24. Chrcanovic, Ramos B, Kisch J, et al. Impact of Different Surgeons on Dental ImplantFailure. International Journal of Prosthodontics 2017; 30: p445-454.