Risk factors in Implant Placement: A Retrospective Analysis

Thilak Shetty[1], Shobha Rodrigues[2], Sharon Saldanha[3], Umesh Pai[3], Mahesh M[3], Puneeth Hegde[3], Manawar Ahmad[4]

[1]Professor, [2]Professor& Head, [3]Associate Professor, Department of Prosthodontics, Manipal College of Dental Sciences, Mangalore, Manipal Academy of Higher Education, [4]Assistant Professor, Department of Prosthetic Dental Sciences,Jazan University, Jazan, Saudi Arabia..

Abstract

Purpose: The aim of this retrospective study was to determine the prevalence of implant failure and its associated risk factors using a single implant system in our clinical setting

Method: Patients who received implant treatment with a single implant system (MIS, Confident India) at Manipal College of Dental Sciences, Mangalore from 2010 to 2016 were enrolled. The following data were collected for analysis: patient details, field of expertise to which the surgeon belonged ,diameter and length of the implant, The outcomes assessed were early or delayed failure on the basis of operator , implant, anatomy and patient related factors .

Results: This study analyzed 363 implants in 327 patients, who comprised 136 females and 191 males and were followed up until failure was reported after implant placement. 22 implants failed prior to final prosthesis delivery (early implant failure), and 5 implants were lost after prosthesis delivery. Out of 363 implants 206 (57%) implants were placed by the Department of Prosthodontics, 77(21%) by the Department of Periodontics and 69 (19%) by the Department of Oral surgery and remaining were placed by a single Endodontist (3%) specialized in Implantology.. (9/206=4%) failures were reported from Prosthodontics and 18 (18/69=26%) failures from Oral Surgery No failures were reported from Periodontics and Endodontics.

Conclusions: Prospective studies are warranted to further elucidate the factors contributing to implant failure. In the meantime, surgeons should receive appropriate training and carefully select the bone bed in order to minimize the risk of implant failure.

Key words: *Early implant failure, overload, risk factors*

Introduction

Dental implants have been considered to be a highly predictable treatment modality for replacing lost teeth in both partially and completely edentulous patients. Buser et al. retrospectively evaluated 511 implants with a sandblasted, large-grit, and acid-etched (SLA) surface, and reported a high 10-year success rate of 97%.[1] However, not all implants are expected to show successful results, and adverse results that lead to implant removal are inevitable in routine practice due to the potential presence of many contributing factors.

Implant failure has been categorized as early and late in retrospective studies according to the time of prosthesis connection and time of loading .[2] Recent studies have found that the prevalence of implant failure is higher in the early phase than in the late phase regardless of the loading time. [3] This might be largely attributed to the vulnerability of the early phase, during which the primary stability decreases while the secondary stability gradually increases .[4] Therefore, considerable interest has emerged in investigating the mechanism of early implant failure and the management interventions that are required to minimize the rate of implant failure.

Corresponding Author:
Dr. Shobha J Rodrigues
Email ID- shobha.j@manipal.edu
Contact No- +91-9448100464
Address: Department No. 7, Manipal College of Dental Sciences, Lighthouse Hill road, Mangalore 575001

Early failure arises from a lack of osseointegration and that the clinically discernible mobility of an implant is a clear sign of early failure.[5]

Considering that dental implants are placed in a complex biological environment, multiple factors could contribute to implant failure. Numerous retrospective studies have shown that several patient-related, surgeon-related, and biomaterial-related factors can contribute to implant failure.[6] However, many of these studies used diverse implant systems with different designs, which could have greatly affected the results.

Therefore, the aim of this retrospective study was to identify the factors influencing early implant failure at a single center using a single implant system.

Materials and Method

Inclusion of participants

This study recruited patients who received an implant-supported prosthesis using a single bone-level implant system (MIS, Confident India) with internal hex design and an SLA surface from 2010 to 2016 at this Instituition. Patients with systemic disease were included if their condition was not a contraindication for implant surgery. Patients who were lost to follow-up and contact after implant placement were excluded from the study.

Clinical procedures

All implant placement procedures were mainly carried out by 18 residents supervised by 4 faculty members except those performed by the Endodontist. Sinus-floor elevation (SFE) and/or guided bone regeneration (GBR) was performed in patients with insufficient vertical bone height and/or width of the ridge crest either prior to or combined with the implant placement procedure. Either a 1-stage or 2-stage protocol of implant placement was selected according to the primary stability of the implant or the necessity for a bone augmentation procedure. In the 2-stage protocol, the second-stage surgery for implant exposure was performed after 3–4 months of healing.

All surgical procedures were performed under local anesthesia induced by 2% lignocaine hydrochloride with 1:200,000 epinephrine (Lox , Neon Laboratories, Mumbai, India). Sutures were generally removed at 7 days after surgery. The patients were recalled after4-6 months, and the stability of implants checked clinically and then referred to the Department of Prosthodontics,

This study defined early implant failure as an implant showing clinical mobility before placement of a final prosthesis and late failure as clinical mobility after placement of final prosthesis with loading. Failed implants were removed after receiving consent from the patient, and the sites were restored using new implants or another prosthesis according to the modified treatment plan. Implants were categorized according to their size, the jaw in which they were placed (maxilla or mandible) and their position in the dental arch (anterior or posterior). The surgeons were dichotomized into faculty members and residents

Results

Table1: Number of Implants placed by different specialities from 2010-2016.

Year	Periodontics	Prosthodontics	**Oral Surgery**	**Conservative Dentistry**	**Total**
2010	10	8	3	1	22
2011	4	20	6	1	31
2012	4	6	7		17
2013	14	25	22	1	62
2014	18	53	21	2	94
2015	20	34	7	5	66
2016	7	60	3	1	71
Total	77	206	69	11	363

Table 2: Number of failures recorded from 2010-2016

No of failures	Periodontics	Prosthodontics	Oral Surgery	Conservative Dentistry
27/363 (7.4%)	--	9/206 (4.3%)	18/69 (26%)	--

Table 3 Number and Type of Failures

Early Failures	Late Failures
22 (6%)	5 (1%)

Table 4 : Association between size of implant . position in the the jaw

No of failures	Anterior maxilla D2/D3 Bone	Posterior maxilla D3/D4	Posterior mandible D2 Bone
27/363	13 (48%)	7 (25%)	7(25%)

Discussion

This retrospective assessment of the factors contributing to early implant failure found that the early failure rate of a single implant system was 6% and late failure rate was1% with the total implant failure rate being 7.4%.with significant number of failures associated with residents of Oral Sirgery.

Highly predictable long-term results of oral rehabilitation using dental implants have been documented in efficacy studies performed over the past 50 years .[7] Literature has assessed the effectiveness of implant therapy and analyzed risk factors for implant failure with the aim of further improving treatment outcomes. The current study also focused on the latter aspects, but only included patients who received implant treatment using a single implant system at a single center in order to minimize the possible confounding effects of the surface or system of the implant and other differences between implant brands . In addition, the present study focused on implant failure occuring between different specialites of dentistry and the incidence of early failure.

The prevalence of early failure in the present study was within the previously reported range at the implant level (1.3%–6.36%) .[8,9] Rates can vary with the cutoff time point used to divide the early and late phases. Setting the cutoff time as the time of abutment connection has the advantage of minimizing heterogeneity resulting from differences in the timing of loading and the loading methods. Meanwhile, setting the cutoff time as 1-year after final prosthesis delivery can reflect delayed failures suspected to have been initiated during implant surgery and the tendency for radiographic evaluations to be performed for evaluating marginal bone loss.

Implants placed in the anterior maxilla were found to have a higher risk of failure in this study 4 of which were on account of road traffic accidents and defeciency in premaxillary region requiring bone grafting and one was on account of immediate implant placement in an infected socket .Therefore, the higher risk of implant failure in the anterior maxilla should be interpreted in the context of the characteristics of patients as demonstrated in the present study.

This study found that the implant failure was higher for shorter 8-mm implants with most of these implants failing in the posterior maxilla(75%). It is well known that the length of an implant has less effect than its

diameter on dispersing occlusal loads. [10] In addition, it has been reported that the outcomes for short implants (less than 8 mm) appear to be as predictable as those for standard-length implants placed in augmented bone. [11] Placing a short implant will reduce the degree of invasion into surrounding anatomical structures and the need for regenerative procedures. Most of these short implants were placed by residents inorder to avoid invasive procedures of Direct as well as in some instances indirect sinus lift A retrospective study found that the survival rate of implants did not appear to be associated with the experience of the 80 included surgeons. [12] Meanwhile, another study found that a learning curve was present for implant placement, in that the early failure rate was 2-fold higher for surgeons who had previously placed fewer than 50 implants than for surgeons who had placed more than 50 implants. [13] Experience or competence of the surgeon influences the failure rate of dental implants. Therefore, the results should be interpreted in context of the characteristics of competency-based surgical skill of residents and experience necessary for successful implant placement.

Jemt et al. [14], who suggested that the individual personality or attitude of the surgeon can affect the implant outcome, based on the rate of implant failure being significantly lower for 1 surgeon who preferred a 2-stage protocol and delayed implantation after tooth extraction.This could be a possible explanation as to why most implants failed when speciality of Oral Surgery and Prosthodontics placed implants.

The main limitation of this study is that the medical histories of patients were not fully scrutinized. However, recent studies did not identify any medical conditions that significantly increased the risk of implant failure. [15] Furthermore, eliciting and recording the medical history only based on the verbal statements of patients might provide incomplete or inaccurate information. Another limitation is that parameters regarding bone quality and quantity were not analyzed objectively [16] The effect of alveolar ridge atrophy on early implant failure can vary considerably according to the implant position and dimension. Therefore, it might be helpful for avoiding bias to use postoperative parameters such as peri-implant bone wall thickness, dehiscence, or fenestration size when analyzing bone quantity.

Recently developed implants have macro-level designs and surfaces that improve the primary stability and facilitate osseointegration. Nevertheless, implant failure is still observed in routine practice.

Conclusion

The present study found that speciality and experience of the surgeon ,position of the bone bed of patients and height of the implant affected the likelihood of implant failure using a single-implant system . Considering that the characteristics of the surgeon strongly influenced early implant failure, educational programs should be developed for increasing surgical competency and performance, and further prospective studies are warranted.

Conflict of Interest : Nil

Source of Funding: Self

References

1. Buser D, Janner SF, Wittneben JG, Brägger U, Ramseier CA, Salvi GE. 10-year survival and success rates of 511 titanium implants with a sandblasted and acid-etched surface: a retrospective study in 303 partially edentulous patients. Clin Implant Dent Relat Res. 2012;14:839–851.
2. Chrcanovic BR, Kisch J, Albrektsson T, Wennerberg A. Factors influencing early dental implant failures. J Dent Res. 2016;95:995–1002.
3. Friberg B, Jemt T. Rehabilitation of edentulous mandibles by means of osseointegrated implants: a 5-year follow-up study on one or two-stage surgery, number of implants, implant surfaces, and age at surgery. Clin Implant Dent Relat Res. 2015;17:413–424.
4. Rodrigo D, Aracil L, Martin C, Sanz M. Diagnosis of implant stability and its impact on implant survival: a prospective case series study. Clin Oral Implants Res. 2010;21:255–261.
5. Esposito M, Hirsch JM, Lekholm U, Thomsen P. Biological factors contributing to failures of osseointegrated oral implants. (I). Success criteria and epidemiology. Eur J Oral Sci. 1998;106:527–551.
6. Brügger OE, Bornstein MM, Kuchler U, Janner SF, Chappuis V, Buser D. Implant therapy in a surgical specialty clinic: an analysis of patients, indications, surgical procedures, risk factors, and early failures. Int J Oral Maxillofac Implants. 2015;30:151–160.
7. Buser D, Sennerby L, De Bruyn H. Modern implant

dentistry based on osseointegration: 50 years of progress, current trends and open questions. Periodontol 2000. 2017;73:7–21.

8. Roos-Jansåker AM, Lindahl C, Renvert H, Renvert S. Nine- to fourteen-year follow-up of implant treatment. Part II: presence of peri-implant lesions. J Clin Periodontol. 2006;33:290–295.
9. Labriaga W, Hong JH, Park JH, Shin SW, Lee JY. A 5-year prospective clinical study of Neobiotech implants for partially edentulous patients. J Korean Acad Prosthodont. 2017;55:272–278.
10. Guan H, van Staden R, Loo YC, Johnson N, Ivanovski S, Meredith N. Influence of bone and dental implant parameters on stress distribution in the mandible: a finite element study. Int J Oral Maxillofac Implants. 2009;24:866–876
11. Thoma DS, Cha JK, Jung UW. Treatment concepts for the posterior maxilla and mandible: short implants versus long implants in augmented bone. J Periodontal Implant Sci. 2017;47:2–12.
12. Minsk L, Polson AM, Weisgold A, Rose LF, Sanavi F, Baumgarten H, et al. Outcome failures of endosseous implants from a clinical training center. Compend Contin Educ Dent. 1996;17:848–850. 852–844, 856.
13. Lambert PM, Morris HF, Ochi S. Positive effect of surgical experience with implants on second-stage implant survival. J Oral Maxillofac Surg. 1997;55:12–18.
14. Jemt T, Olsson M, Renouard F, Stenport V, Friberg B. Early implant failures related to individual surgeons: an analysis covering 11,074 operations performed during 28 years. Clin Implant Dent Relat Res. 2016;18:861–872.
15. Wagenberg B, Froum SJ. A retrospective study of 1925 consecutively placed immediate implants from 1988 to 2004. Int J Oral Maxillofac Implants. 2006;21:71–80.
16. Pauwels R, Jacobs R, Singer SR, Mupparapu M. CBCT-based bone quality assessment: are Hounsfield units applicable? Dentomaxillofac Radiol. 2015;44:20140238

Legends