



IJCRR

Section: Healthcare

ISI Impact Factor
(2019-20): 1.628

IC Value (2019): 90.81

SJIF (2020) = 7.893



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Evaluation of Risk Factors for Dental Implants Failure

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ABSTRACT

Introduction: Patient-related factors and dental implant-related factors play an important role in deciding the outcome of treatment. A bone quantity such as sufficient width, length and bone quality is patient-related factors whereas dental implant size such as length, width, prosthetic part and implant design is dental implant-related factors.

Objectives: The objective was to evaluate the risk factors for dental implant failure.

Materials and Method: This retrospective study was conducted on 200 patients with 252 implants placed in both genders. Factors such as implant diameter, length and bone quality were detailed. The existence of mobility of dental implant, pain or discomfort, peri-implant radiolucency, >2 mm bone loss around the dental implant was regarded as implant failure.

Results: Out of 200 patients, 112 (56 %) were males with 135(53.6%) implants and 88 (44 %) were female with 117 (46.4%) dental implants. There were 34 (13.4%) dental implant failure of which 18 (7.1 %) were in male and 16 (6.3 %) in the female. The difference found to be significant (P< 0.05). Maximum dental implant failure was seen in with <10 mm in 7 (20.6 %) length and lowest with >10 mm length (3, 8.9%). The difference found to be significant (P< 0.05). Maximum dental implant failure was seen in dental implant with <3.75 mm width in 6 (17.6 %) and least with > 3.5 mm diameter 3 (8.9%). Maximum dental implant failure was seen with type IV bone was 7 (20.6%) followed by Type III of 4 (11.8%), Type II with 3 (8.9%) and least with Type I with 1 (2.9%).

Conclusion: It was observed that dental implant failure was maximum with implant length less than 10.0 mm, with lesser than 3.75 mm diameter and type IV bone.

Key Words: Bone quality, Dental implant, Diameter, Risk factors

INTRODUCTION

With the advancement in modern dentistry, there are adequate choices for replacing missing teeth. Patient with missing few or multiple teeth can be accomplished well with either fixed prosthesis or removable prosthesis.¹

Removable prosthesis either removable partial denture (RPD) or complete denture are treatment choices for elderly patients.² Dental implants have been showing useful in providing improved treatment modality. Today implant-supported complete denture has attained importance. These are chosen in patients with resorbed ridges where retention is compromised and hence with dental implants patient can

easily eat and function properly subject to sufficient bone quality and quality at the implant site.³

A dental implant that lasts for at least 5 years is regarded as successful treatment. Studies have revealed that the survival rate of 95% of dental implants in 5 years. Dental implant treatment in partially and completely edentulous patients is considered the best option. Dental implants need to be placed where they have a high success rate. A survival rate of 95% in 5 years has been considered successful implant therapy.⁴

Patient-related factors and dental implant-related factors play an important role in deciding the outcome of treatment.⁵ Mechanical, biological or iatrogenic factors are considered to be aetiology for the early or late failure of dental implants.

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ISSN: 2231-2196 (Print)

ISSN: 0975-5241 (Online)

Received: 20.09.2020

Revised: 26.10.2020

Accepted: 28.11.2020

Published: 10.03.2021

A bone quantity such as sufficient width, length and bone quality is patient-related factors whereas dental implant size such as length, width, prosthetic part and implant design is dental implant-related factors.⁶ The present study was conducted to assess risk factors for dental implant failures about implant length, diameter and bone type.

MATERIALS & METHODS

This retrospective study was conducted in the Department of Prosthodontics, and oral implantology. The study consisted of 200 patients with 252 dental implants placed in both genders. The institutional ethical committee approval was obtained before the commencement of study. All patients who received dental implants in the last 5 years irrespective of gender were included in the study. Exclusion criteria were pregnant women, drug abusers, patients with periodontal pathology and alcoholics and smokers.

Patient demographic data were noted. Patients records were retrieved from the department about implant length diameter, and bone quality was recorded. The presence of mobility of dental implant, discomfort or pain, peri-implant radiolucency, >2 mm bone loss around the dental implant was regarded as implant failure.

Statistical analysis

Data was entered in MS Excel sheet and was assessed using SPSS version 20 (IBM, Chicago, USA). Chi-square test was applied for the study. P-value <0.05 was measured as statistical significant.

Results

Out of 200 patients, 112 (56 %) were males with 135(53.6%) implants and 88 (44 %) were female with 117 (46.4%) dental implants (**Table-1**). There were 34 (13.4%) dental implant failure of which 18 (7.1 %) were in male and 16 (6.3 %) in female (**Table-2**). The difference found to be significant ($P < 0.05$).

Table 3 indicates the type of implants with the failure rate. Maximum dental implant failure was seen in with <10 mm in 7 (20.6 %) length and lowest with >10 mm length (3, 8.9%). The difference found to be significant ($P < 0.05$). Maximum dental implant failure was seen in dental implant with <3.75 mm width in 6 (17.6 %) and least with > 3.5 mm diameter 3 (8.9%). Maximum dental implant failure was seen with type IV bone was 7 (20.6%) followed by Type III of 4 (11.8%), Type II with 3 (8.9%) and least with Type I with 1 (2.9%).

DISCUSSION

Dental implants need to be positioned where they have the best success rate. Achievement rate may be judged based on

bone quantity, quality, dental implant diameter, length, design and systemic condition of patients.⁷ Osseointegration between dental implant and bone determines the survival rate. Bone quality and quantity are the limiting factors that determine the success of the dental implant. Poor quality bone such as seen in type IV and III leads to failure and thus they should be inserted after considering the bone quality.⁸ The present study was conducted to assess risk factors for dental implant failures.

Mohajerani et al.⁹ in their retrospective cohort study parameters such as implant type, surface, implant length, bone type, type of surgery and immediate (fresh socket) or delayed placement of implant were evaluated in 1,093 implants. It was observed that 73 cases (6.68%) failed in the early stages. The two groups were expressively different in terms of the implant surface, fresh socket placement, prophylactic use of antibiotics, and bone density ($p < 0.05$). Age, gender, implant height, implant type (cylindrical or tapered) and one-stage or two-stage placement were not significantly different between the two groups ($p > 0.05$).

Raikar et al.,¹⁰ in their study revealed that maximum implants failures (55) were seen in the age group > 60 years whereas 20 failed implants were seen in age group <40 years. Dental implants with length >11.5 mm (40/700) showed maximum failure rates followed by implants with <10 mm (20) and 10–11.5 mm (60). There was failure rate of 3.3% (mandibular posterior), 2.2% (maxillary posterior), 2.1% (maxillary anterior), and 1% (mandibular anterior). 0.3% implant failure was noted in type I bone followed by 1.95% in type II, 3% in type III and 0.8% in type IV bone.

Olmedo et al.,¹¹ in their study assessed the association between possible risk factors and early implant failure. Type of edentulism, localization, area, diameter, length, bone quality, expansion mechanisms, sinus augmentation techniques, bone regeneration, and implant insertion and presence of pain/inflammation at 1 week postsurgery were studied. It was found that early implant failure was significantly associated with the male sex, severe periodontal disease, short implants, expansion technique and postoperative pain/inflammation at 1-week post-surgery.

Lin et al.¹² in their study on 18,199 patients who received 30,959 dental implants. Results presented that males, subjects aged ≥ 41 years, and mandibular anterior position were risk aspects for initial implant loss. In the case of delayed implant loss, bone augmentation, male's patients aged ≥ 41 years, and short implants were associated with a significantly higher failure rate. Singh et al evaluated risk factors of dental implants failures with respect to implant length, diameter and the bone type and they observed higher implant failure with implant length of <10.0 mm, with <3.75 mm width and type IV bone.¹³ These findings are similar to our results.¹³

We found that maximum dental implant failure was seen in with <10 mm length, with <3.75 mm width and with type IV bone. Further long term studies are required on larger samples size with evaluation on multiple risk factors of patient health and oral hygiene practices.

CONCLUSION

It was observed that dental implant failure was maximum with implant length less than 10.0 mm, with lesser than 3.75 mm diameter and, type IV bone and among. Assessment of various risk factors of dental implant failure, the failure rate may be minimized. Large scale studies are required to substantiate the results.

Conflict of interest: Nil

Source of funding: self

Authors contribution

1. Dr. Shivu ME- Editing
2. Dr. Naveen Reddy- Manuscript writing
3. Dr. Swetha Vempalli- Analysis
4. Dr. Azhar Mohammed- Data collection
5. Dr. Avineet Kaur- Editing
6. Dr. Jagadeesh KN*- Investigation, Data collection

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Table 1: Distribution of patients with dental implants

Gender	Number of patients	Number of implants
Male	112 (56 %)	135(53.6%)
Female	88 (44 %)	117 (46.4%)
Total	200	252

Table 2 :Prevalence of dental implant failures

Gender	Number of implants	Failure	P value
Male	135(53.6%)	18 (7.1 %)	
Female	117 (46.4%)	16 (6.3 %)	0.001
Total	252	34 (13.4%)	

Chi square, $p < 0.05$, significant

Table 3: Dental implant failures with respect to length, diameter and bone density

Implant type	Implants	Failure	P value
Implant Length	>10 mm	3 (8.9 %)	0.001
	<10 mm	7 (20.6%)	
Implant diameter	>3.5 mm	3 (8.9%)	
	< 3.5 mm	6 (17.6%)	
Bone density	Type -I	1 (2.9%)	
	Type II	3 (8.9%)	
	Type III	4 (11.8%)	
	Type IV	7 (20.6%)	
Total		34	

Chi square, $p < 0.05$, significant