A 10 years retrospective study of assessment of prevalence and risk factors of dental implants failures

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Abstract

Aim: The present study was conducted to determine the prevalence rate of dental implants failure and risk factors affecting dental implant outcome. **Materials and Methods:** The present retrospective study was conducted on 826 patients who received 1420 dental implants in both genders. Length of implant, diameter of implant, location of implant, and bone quality were recorded. Risk factors such as habit of smoking, history of diabetes, hypertension, etc., were recorded. **Results:** In 516 males, 832 dental implants and in 310 females, 588 dental implants were placed. Maximum dental implant failure was seen with length <10 mm (16%), with diameter <3.75 mm, and with type IV bone (20.6%). The difference found to be significant ($P < 0.05$). Maximum dental implant failures were seen with smoking (37%) followed by hypertension (20.8%), diabetes (20.3%), and CVDs (18.7%). Healthy patients had the lowest failure rate (4.37%). **Conclusion:** Dental implant failure was high in type IV bone, dental implant with <3.75 mm diameter, dental implant with length <10.0 mm, and among smokers.

Keywords: Dental implant, failure, smoker

Introduction

Dental implants are commonly advice to replace missing teeth. A survival rate of 95% in 5 years has been considered successful implant therapy. The successful dental implant therapy depends upon various factors such as patient-related factors as well as dental implant-related factors. However, several etiologies may serve as early or late failure of dental implants such as biological, mechanical, or iatrogenic factors.[1]

Patient-related factors such as bone quantity, bone quality, and hidden pathologies play an important role. General health of patient and anatomical location are other factors affecting the outcome of therapy.[2] There are certain contraindications of dental implants. Smoking, diabetes, hypertension, CVDs, etc., are medical conditions which affect dental implant therapy outcome over years. Dental implant-related factors such as design of dental implant, length, width, prosthetic part, etc., determine the success rate of dental implants.[3]

Several studies have demonstrated various criteria to assess the survival and success rate of dental implants.[4,5] International Congress of Oral Implantologists (ICOI) Pisa Consensus Conference report suggested that dental implant with mobility, pain on function, or bone loss more than 1/2 of implant length is the sign of failure. Albrektsson *et al.*[6] suggested that dental implant without any mobility, with no peri-implant radiolucency, bone loss <0.2 mm per year after the first year of loading, and no

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persistent pain, discomfort, or infection is labeled as successful implant therapy. Considering this, the present retrospective study was conducted to determine the prevalence rate of dental implants failure placed over 10 years and risk factors affecting dental implant outcome.

Materials and Methods

The present retrospective study was conducted in the Department of Periodontics. It comprised of 826 patients who received 1420 dental implants in both genders. The study protocol was approved from institutional ethical committee. Patients with hormonal imbalance, chronic infectious disease, patients on immunosuppressive therapy, pregnant women, drug and alcohol addicts, and patients with severe periodontal diseases were excluded.

Dental records of all subjects were retrieved from the department. General information such as name, age, gender, etc., were recorded. In all patients, clinical features as well as radiographic findings from departmental records was assessed to record length of implant, diameter of implant, location of implant, and bone quality. Risk factors such as habit of smoking, history of diabetes, hypertension, etc., were recorded.

Patients' recalled data were assessed, and any mobility of dental implant, radiographic evidence of peri- implant radiolucency, any infection, pain or discomfort, and bone loss >2 mm around dental implant was considered implant failure.

The obtained data were assessed using SPSS version 21 (IBM. Chicago, USA). One-way ANOVA test was used to assess failure rate in dental implants. P value less 0.05 was considered statistical significant.

Results

Table 1 shows that in 516 males, 832 dental implants, and in 310 females, 588 dental implants were placed. In Table 2, graph I shows that there were 92 (11%) dental implant failures in males and 53 (9%) in females. Table 3 shows that maximum dental implant failure was seen with length <10 mm (16%) followed by 10–11.5 mm (9.61%) and >11.5 mm (8.57%). Table 4 shows that maximum dental implant failure was seen with diameter <3.75 mm (25%) followed by 3.75–4.5 mm (16.8%) and >4.5 mm (6.91%). The difference was found to be significant ($P < 0.05$). Table 5 shows that maximum dental implant failure was seen with type IV bone (20.6%) followed by type III (11.4%), type II (9.22%), and type I bone (8%). The difference found to be significant ($P < 0.05$). Table 6 shows that maximum dental implant failures were seen with smoking (37%) followed by hypertension (20.8%), diabetes (20.3%), and CVDs (18.7%). Healthy patients had lowest failure rate (4.37%). One-way ANOVA test showed significant difference between implant failure based on risk factors ($P < 0.05$).

Table 1: Distribution of patients

Gender	Males	Females
Number of patients	516	310
Number of dental implants	832	588

Table 2: Prevalence of dental implant failures

Total	Number	Failure	P
Males	832	92 (11%)	0.05
Females	588	53 (9%)	

One-way ANOVA, $P<0.05$, significant

Table 3: Dental implant failure depending on implant length

Implant length (mm)	Number	Failure	P
<10	268	43 (16%)	0.05
10-11.5	312	30 (9.61%)	
>11.5	840	72 (8.57%)	

One-way ANOVA, $P<0.05$, significant

Table 4: Dental implant failure depending on implant diameter

Implant diameter (mm)	Number	Failure	P
<3.75	195	49 (25%)	0.01
3.75-4.5	415	40 (16.8%)	
>4.5	810	56 (6.91%)	

One-way ANOVA, $P<0.05$, significant

Table 5: Dental implant failure depending on bone quality

Type	Number	Failure	P
I	648	52 (8%)	0.021
II	412	38 (9.22%)	
III	210	24 (11.4%)	
IV	150	31 (20.6%)	

One-way ANOVA, $P<0.05$, significant

Table 6: Risk factors and dental implant failures

Risk factors	Number	Failure	P
Smoking	124	46 (37%)	0.001
Diabetes	108	22 (20.3%)	
Hypertension	96	20 (20.8%)	
CVDs	64	12 (18.7%)	
Healthy	1028	45 (4.37%)	

One-way ANOVA, $P<0.05$, significant

Discussion

Dental implants are now widely used for the replacement of one or more missing teeth.[7] Dental implant therapy has revolutionized the field of dentistry. The choice of dental implant varies among dental surgeons. The survival rate of therapy depends on osseointegration between dental implant and bone.[8] Bone quality and quantity are the limiting factors that determine success of dental implant. Poor quality bone such as seen in type IV and III leads to failures. However, certain conditions such as smoking, hypertension, cardiovascular diseases, and diabetes are threat to dental implants.[9]

In the present study, 588 dental implants were placed on 826 patients. Krisam *et al.*[10] found that 9 out of 186 implants (4.8%) placed in 106 patients failed before final prosthesis. Risk factor of early implant failure was shorter implants (<10 mm) and the need for augmentation procedures. It was found that for shorter implants, the risk was 5.8 times greater than that for longer implants (*P* = 0.0230). Use of augmentation procedures increased the risk by a factor of 5.5 (*P* = 0.0174).

We found that maximum dental implant failure was seen with length <10 mm (16%). Raikar *et al.*[11] found maximum implants failures (55) in age group >60 years. Age group <40 years had 20 failed implants. Dental implants with length >11.5 mm (40/700) showed maximum failure rates. There was higher failure rate in mandibular posterior and maxillary posterior compared to anterior area. 0.3% implant failure was noted in type I bone and 0.8% in type IV bone.

We observed that maximum dental implant failure was seen with diameter <3.75 mm. Jafarian *et al.*[12] found that maxillary canine area had the highest failure rate (6.8%), least with mandibular incisor region (2.0%), and the longest survival time of 3182 days. Maxillary canine areas had the shortest survival with 2996 days of survival. The longest survival time was observed in implants with 11 mm length (3179.72 days) and 3.75–4 mm diameter (3131.161 days), and the shortest survival was found in implants with 11.5 mm length (2317.79 days) and 6.5 mm diameter (2241.45 days).

In present study, we found that maximum dental implant failure was seen with type IV bone (20.6%). It was seen that maximum dental implant failures were seen with smoking (37%).

Wang *et al.*[13] found that 90 out of 100 implants showed initial early failure (0.98%). Out of 67 replacement implants, 1 failed before prosthesis delivery, and 1 implant failure occurred 20 months after prosthesis delivery, which represented a cumulative survival rate of 94.6%.

Nobre *et al.* by 5 years retrospective study concluded that the risk score for estimating peri-implant disease showed very good performance.[14] We found that smaller length and smaller diameter of implant with smoking habit have higher failure rate.

Evaluation of risk factors and implant type selection helps in the successful outcome of dental implant for the practice of primary care.

Conclusion

Dental implant failure was high in type IV bone, dental implant with <3.75 mm diameter, dental implant with length <10.0 mm, and among smokers.

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Conflicts of interest

There are no conflicts of interest.

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