



## Risk factors for early implant failure: A retrospective study

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#### ABSTRACT

**Background:** The early implant failure occurs due to the development of fibrous tissue between implant and the surrounding bone in the early healing period. The present study was conducted to assess early dental implant failures.

**Materials & Methods:** 128 patients who received 175 dental implants of both genders were selected. Patients were clinically and radiographically evaluated and early dental failure was recorded.

**Results:** Age group <40 years had 63 patients with 84 dental implants, 40-60 years had 38 with 51 implants, >60 years had 27 with 40 dental implants. Dental implant failure occurred in anterior maxilla in 10, anterior mandible in 6, posterior maxilla in 32 and posterior mandible in 14 cases. Maximum failures was seen among males (42) as compared to females (20). Experience of surgeon <5 years had 44, >5 years had 18 implant failures. Implant shape cylindrical had 23 and tapered had 39 failures. Implant neck design without machined collar had 32 and with machined collar had 30 failures. Implant length (mm) >10 mm had 6, 8-10 mm had 20 and <8 mm had 36 failures. Implant diameter (mm) <3.5 had 34, 3.6-4.5 had 17 and >4.5 had 11 failures. Bone augmentation simultaneously had 20 and staged had 38 dental implant failures. The difference was significant ( $P < 0.05$ ).

**Conclusion:** The maximum failure rates were seen in patients with posterior maxillary and posterior mandibular implants. Other risk factors were male gender, experience of surgeon <5 years, implant length <8 mm, implant diameter <3.5 mm and implant placed in previously augmented site.

**Keywords:** Dental implant, Diameter, Failure

## INTRODUCTION

The use of titanium implants to support dental prosthesis in edentulous jaws has been extensively investigated in literature by multiple evidence-based scientific articles since Brånemark characterized the osteointegration process of implants in 1960.<sup>1</sup> Several long-term studies that followed participants for over ten years assessed how implants supported the rehabilitation of full arch prosthesis in individuals who were edentulous. To improve the aesthetics and oral function of individuals who are fully edentulous, a variety of implant procedures have been employed, including full-arch fixed implant supported prostheses, overdentures, and implant-supported prostheses.<sup>2</sup>

The improved phonetics and mastication functions as well as aesthetics are among the benefits of dental implants. Endosseous dental implants are successfully used to replace the missing teeth. Despite the predictability of success of dental implants, a small group of patients may experience implant failure. Success of dental implants depends on the site of implant placement, the patient's conditions, surgeon's experience, the precision of surgical technique, and type of implants. Failure of endosseous dental implants may occur prior to occlusal loading with a prosthetic superstructure or later after loading.<sup>3</sup>

Implant failure has been classified as early and late according to different cutoff time points, such as at the time of abutment connection, at the time of loading, within several weeks after placement of the final prosthesis, or at the time of first year after loading. The percentage of early implants failure in literature varies from 1% to 6% of implants placed and the incidence can be higher in a specific risk population. The early implant failure occurs due to the development of fibrous tissue between implant and the surrounding bone in the early healing period.<sup>4</sup>

Numerous studies have determined that various risk variables, such as endpoints, abutment connection, occlusal loads, one year after insertion, etc., may contribute to early implant failure.<sup>5</sup> Potential risk factors for early implant failure include smoking, co-morbidities including as metabolic illnesses and periodontitis, poor oral hygiene, the requirement for bone augmentation treatments, implant site, implant healing type, and usage of short implants. Fewer researches have looked at factors influencing the early stages of osteointegration using the same implant system, despite the fact that numerous studies have demonstrated the importance of local and systemic factors in the long-term prognosis of dental implants.<sup>6</sup> The present study was conducted to assess early dental implant failures.

## MATERIALS & METHODS

The present study was conducted on 128 patients who received 175 dental implants of both genders. Patients were informed regarding the study and written consent was obtained. Patients who were lost to follow-up before the placement of final prosthesis were excluded.

Data such as name, age, gender etc. was recorded. Prior to surgery, all the patients received thorough clinical and radiographic examinations. After surgery, all the patients were instructed to maintain proper oral hygiene and to take postoperative antibiotics (500 mg amoxicillin q.8.h., or for patients allergic to penicillin, 150 mg clindamycin q.6.h.) orally or intravenously for at least 3 days. The healing period for maxillary implants and mandibular implants without simultaneous bone augmentation procedure were 6 and 4 months, respectively. After the healing period, patients were recalled for rehabilitation procedures and the clinical performance of implants was recorded. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

**Table I Age wise distribution**

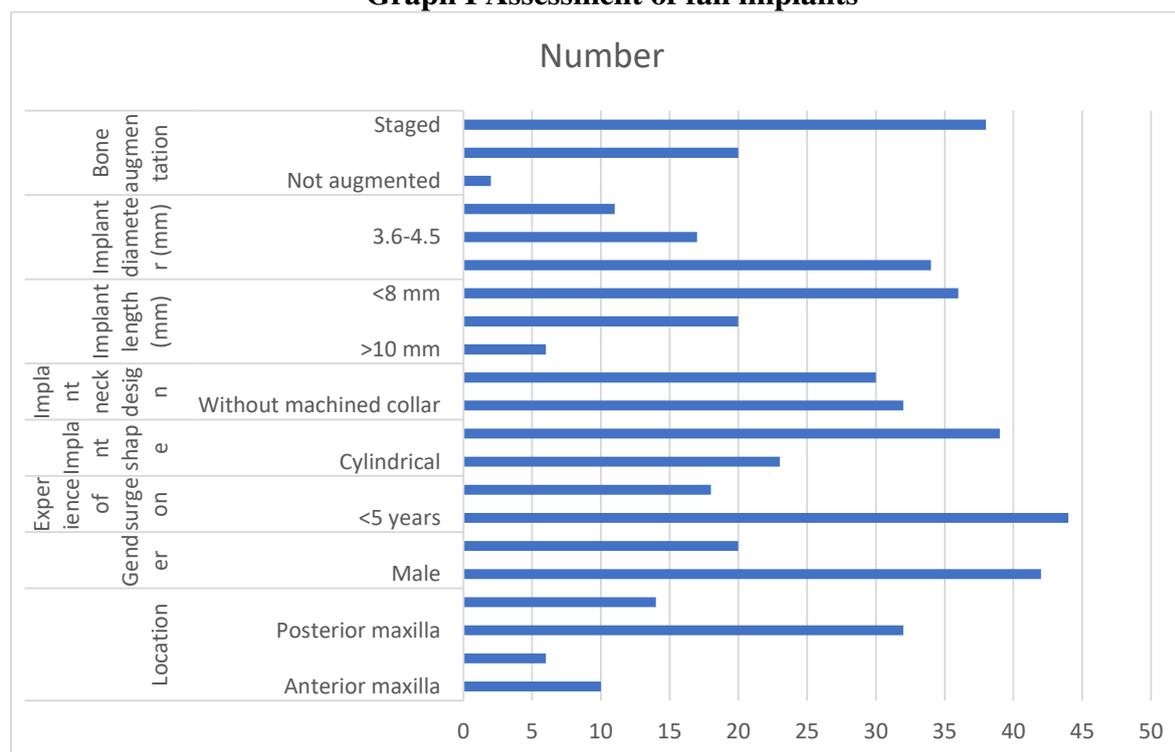
Age group (years)	Patient number	Dental implant
<40	63	84
40-60	38	51
>60	27	40

Table I shows that age group <40 years had 63 patients with 84 dental implants, 40-60 years had 38 with 51 implants, >60 years had 27 with 40 dental implants.

**Table II Assessment of fail implants**

Parameters	Variables	Number	P value
Location	Anterior maxilla	10	0.05
	Anterior mandible	6	
	Posterior maxilla	32	
	Posterior mandible	14	
Gender	Male	42	0.01
	Female	20	
Experience of surgeon	<5 years	44	0.01
	>5 years	18	
Implant shape	Cylindrical	23	0.05
	Tapered	39	
Implant neck design	Without machined collar	32	0.94
	With machined collar	30	
Implant length (mm)	>10 mm	6	0.04
	8-10 mm	20	
	<8 mm	36	
Implant diameter (mm)	<3.5	34	0.05
	3.6-4.5	17	
	>4.5	11	
Bone augmentation	Not augmented	2	0.03
	Simultaneously	20	
	Staged	38	

Table II, graph I shows that dental implant failure occurred in anterior maxilla in 10, anterior mandible in 6, posterior maxilla in 32 and posterior mandible in 14 cases. Maximum failures was seen among males (42) as compared to females (20). Experience of surgeon <5 years had 44, >5 years had 18 implant failures. Implant shape cylindrical had 23 and tapered had 39 failures. Implant neck design without machined collar had 32 and with machined collar had 30 failures. Implant length (mm) >10 mm had 6, 8-10 mm had 20 and <8 mm had 36 failures. Implant diameter (mm) <3.5 had 34, 3.6-4.5 had 17 and >4.5 had 11 failures. Bone augmentation simultaneously had 20 and staged had 38 dental implant failures. The difference was significant ( $P < 0.05$ ).

**Graph I Assessment of fail implants**

## DISCUSSION

Dental implant (DI) is broadly considered to be the ideal treatment of the tooth loss, which is mostly required in the aged population.<sup>7</sup> The prevalent age-range for implant therapy has been reported above 40 years or between 51 and 60 years, thus the patients who required dental implant therapy are usually associated with systemic comorbidities.<sup>8</sup> For both patients' and clinicians' benefit, systemic comorbidities of the patient should be well-diagnosed before DI therapy. Besides, treatment plan and patient selection should be carried out with reference to the clinical evidence.<sup>9</sup> The present study was conducted to assess dental implant failures.

We observed that age group <40 years had 63 patients with 84 dental implants, 40-60 years had 38 with 51 implants, >60 years had 27 with 40 dental implants. Lorenzo et al<sup>10</sup> investigated possible risk factors for early implant failure in screw retained fixed full-arch rehabilitation. 487 patients were included, 218 females ( $62.3 \pm 9.14$  of age) and 269 males ( $62.8 \pm 10.11$  of age) in 30 private institutions for a total of 2323 implants placed and a total of 526 screw retained fixed full arch rehabilitation. A total of 40 out of 2323 (1.7%) implants failed prematurely within 1 year, 32 in the maxilla 8 in the mandible. Bivariate comparison analysis and univariate mixed model analysis showed that female patient, implant placed in maxilla, age <61 years and submerged healed implants showed a statistically significant higher failure rate among the risk factors considered.

We found that dental implant failure occurred in anterior maxilla in 10, anterior mandible in 6, posterior maxilla in 32 and posterior mandible in 14 cases. Maximum failures was seen among males (42) as compared to females (20). Experience of surgeon <5 years had 44, >5 years had 18 implant failures. Implant shape cylindrical had 23 and tapered had 39 failures. Implant neck design without machined collar had 32 and with machined collar had 30 failures. Implant length (mm) >10 mm had 6, 8-10 mm had 20 and <8 mm had 36 failures. Implant diameter (mm) <3.5 had 34, 3.6-4.5 had 17 and >4.5 had 11 failures. Bone augmentation simultaneously had 20 and staged had 38 dental implant failures. The difference was significant ( $P < 0.05$ ). According to Manor et al<sup>11</sup>, the study group included 117 patients with a history of a serious medical condition, while the control group included

103 patients who disclosed no past medical history. The effectiveness of the implants in patients with impaired medical conditions was investigated in light of this data. Out of the 117 patients in the study group, known as group A, 57 were female and 60 were male. Of the 103 patients in the control group (group B), 48 were female and 55 were male. Group A achieved 83.37% implant success with 331 implants that were both intact and in good condition. Nevertheless, 16.63% of the group experienced 66 unsuccessful implants. Group B exhibited 287 undamaged implants.

Lin et al<sup>12</sup> investigated several factors that may be associated with early implant failure. The mean  $\pm$  standard deviation age of the study patients was 49.2  $\pm$  15.0 years (range 18 to 91). Ninety-nine implants (3.05%) failed during the healing period. Three factors were statistically significant regarding early implant failure: smoking (odds ratio [OR]=1.92, P=.008), implant design (tapered implants) (OR=1.84, P=.007), and implant length <10 mm (OR=2.98, P=.011). Factors including diabetes, bone grafting, anatomic location, adjacent teeth (endodontic therapy in the adjacent teeth and the distance between implant and adjacent teeth), healing method, and insertion torque did not exhibit a statistically significant higher early implant failure rate. Ninety-three sites with failed implants received new implants, and 6 of these 93 implants failed during the healing period.

The shortcoming of the study is small sample size.

## CONCLUSION

Authors found that maximum failure rates were seen in patients with posterior maxillary and posterior mandibular implants. Other risk factors were male gender, experience of surgeon <5 years, implant length <8 mm, implant diameter <3.5 mm and implant placed in previously augmented site.

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