ORIGINAL ARTICLE

ASSESSMENT OF VARIOUS FACTORS AFFECTING THE SURVIVAL RATE OF DENTAL IMPLANTS

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ABSTRACT:
Background: Implant treatment is regarded as a safe technique for restoring missing teeth, with high rates of success. Survival conditions for implants may have 2 different categories: satisfactory survival describes an implant with less than ideal conditions, yet does not require clinical management; and compromised survival includes implants with less than ideal conditions, which require clinical treatment to reduce the risk of implant failure. So, the present study was planned to assess the various factors responsible for the survival rate of dental implants. **Materials & methods:** The study included assessment of the data of 150 patients that got treated with dental implants during the study period was collected and analyzed. Implants were placed in the oral cavity only after consulting patients who had systemic diseases to the specialist of internal medicine. Data, such as patient age, gender, implant type and surface, diameter, length, location, bone quality, prosthesis type were collected and put in order. Statistical analysis of the data was done using SPSS software for windows. **Results:** Retrospective study of a total 150 cases was done in this study. Of the 150 implants placed totally, 106 were placed in Males and 44 were placed in females. Out of 106 implants placed in males, failure of implants was seen in 3 cases. Of the 44 implants placed in females, 1 case of implant failure was reported. This result was not statistically significant. **Conclusion:** As implant survival rate is influenced by numerous different factors, it is difficult to analyze a cause of failure objectively
Key words: Dental, Implants, Survival

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INTRODUCTION:

Implant treatment is regarded as a safe technique for restoring missing teeth, with high rates of success. Nevertheless, it has, as every surgical procedure, several complications that can occur and must be known in order to prevent or solve them. Nowadays, implants are considered as the first line of treatment almost all cases of complete or partial edentulous patients. Only by using a good work protocol, we can detect the local and systemic risk factors that could determine the success of the treatment and allow us to implement preventive measures if needed. It is mandatory to know all those clinical complications.[1, 2] Survival conditions for implants may have 2 different categories: satisfactory survival describes an implant with less than ideal conditions, yet does not require clinical management; and compromised survival includes implants with less than ideal conditions, which require clinical treatment to reduce the risk of implant failure. Implant failure is the term used for implants that require removal or have already been lost. There are many related factors affecting implant failure.7,8 First group of factors is host related, such as patient age, gender, systemic disease, smoking and oral hygiene. Second group is implant placement site related factors such as position in arch, bone quality and bone quantity. Third group is surgery related factors including an initial stability, angulation and direction of implant and the skillfulness of an operator. Fourth one is implant fixture related factors, such as surface roughness, length, diameter, macrostructure and microstructure of an implant fixture. Fifth group is implant prosthesis related factor. That is prosthesis type, retention method (screw type or cement type), and occlusal scheme and so on.[3, 4] So, the present study was planned to assess the various factors responsible for the survival rate of dental implants.

MATERIALS AND METHODS:

The study was conducted in the Department of Prosthodontics of the Dental institution. The ethical approval of the study was obtained from the ethical committee of the institute. In this retrospective study, the data of 150 patients that got treated with dental implants during the study period was collected and analyzed. Implants were placed in the oral cavity only after consulting patients who had systemic diseases to the specialist of internal medicine. Exclusion criteria for the study was patients receiving immunosuppressive treatment, radiolocal and chemical antitumor therapy, those with hormonal imbalance, osteporosis, pregnant women, the addict of alcohol or drugs, and people having psychiatric disease, intraoral chronic infectious disease, immune disease and untreated periodontal disease.

Data, such as patient age, gender, implant type and surface, diameter, length, location, bone quality, prosthesis type were collected and put in order. The guidelines used in this study were suggested by Buser and Cochran et al. Buser and Weber suggested success criteria as below.[5, 6]

a) Absence of persistent subjective complaints, such as pain, foreign body sensation, and/or dysaesthesia
b) Absence of a recurrent peri-implant with suppuration
c) Absence of mobility
d) Absence of a continuous radiolucency around implant and no rapid progressive bone loss
e) Possibility of restoration

Statistical analysis of the data was done using SPSS software for windows. Student's t-test and Chi-square test was used for comparison of data between related factors. The statistical significance was predetermined at $P<0.05$.

RESULTS:

Table 1 shows the survival rate according to patient gender and age. Retrospective study of a total 150 cases was done in this study. Of the 150 implants placed totally, 106 were placed in Males and 44 were placed in females. Out of 106 implants placed in males, failure of implants was seen in 3 cases. Of the 44 implants placed in females, 1 case of implant failure was reported. This result was not statistically significant ($P>0.05$)[Figure 1]. Based on the age, most of the cases belonged to age group 60-79 years (n=63). A total of 2 cases of implant failures were reported in this age group. 1 case of implant failure was reported in the age group 40-59 years (n=63). These results were statistically significant ($p<0.05$) [Figure 1].

Table 2 shows survival rate of implants according to bone quality. It was seen that most of the cases belonged to the Type II group (n=71) of which 1 case of implant failure was reported. Type II was followed by Type III (n=62) of which 2 cases of implant failures were reported. A total of 4 implant failure cases were reported. ($p<0.05$)[Figure 2].

Table 1: Survival rate according to patient related factor (gender and age)

	Variables	Placed implants	Failed implants	P value
Gender	Male	106	3	0.061
	Female	44	1	
Age	<40	8	0	0.034
	40-59	63	2	
	60-79	76	1	
	>79	3	0	

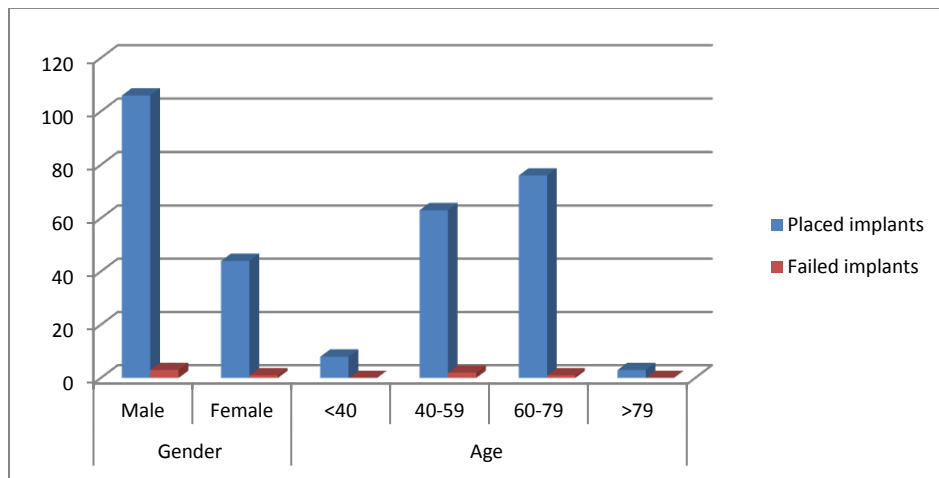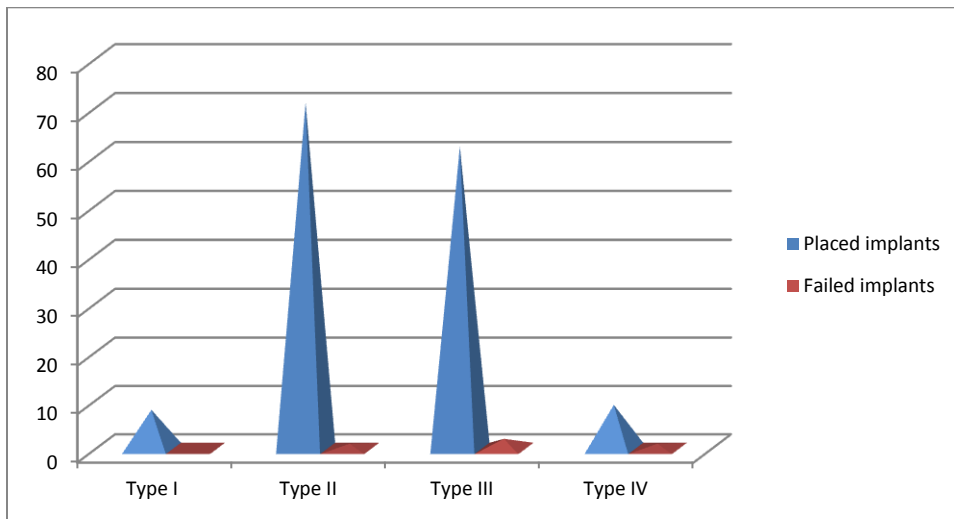Figure 1: Survival rate according to patient related factor (gender and age)

Table 2: Survival rate according to bone quality

Bone quality	Placed implants	Failed implants	P value
Type I	8	0	0.332
Type II	71	1	
Type III	62	2	
Type IV	9	1	
Total	**150**	**4**	

Figure 2: Survival rate according to bone quality

DISCUSSION:

In early development stage of dental implant, it had machined surface without any additional surface treatment. As time went by, scientists have studied and developed the surface, form and shape of implant. As a result, it showed high success rate and predictable results over 40 years and has been utilized for several decades. But also failed implants have been increased as compared with early development stage of implant.

In the presnt study, we observed that when bone quality was poor, survival rate of implants had a tendency to decrease. However, there were no significant differences in present study. However, there was a tendency that when bone quality was poor, survival rate decreased from type I to type III. Type IV showed a different pattern. When surgeons placed in poor bone, they gave an attention to bone quality precisely and performed gentle surgical procedure with the proper implant design. This could have an effect on survival rate of type IV. Jang H-W et al conducted retrospective study to analyze the relationship between local factors and survival of dental implant which had been installed and restored in Seoul Veterans Hospital dental center for past 10 years. 6385 implants were placed in 3755 patients. The following data were collected from the dental records and radiographs: patient's age, gender, implant type and surface, length, diameter, location of implant placement, bone quality, prosthesis type. The correlations between these data and survival rate were analyzed. Statistical analysis was performed with the use of Kaplan-Meier analysis, Chi-square test and odds ratio. In all, 6385 implants were placed in 3755 patients (3120 male, 635 female; mean age 65 ± 10.58 years). 108 implants failed and the cumulative survival rate was 96.33%. There were significant differences in age, implant type and surface, length, location and prosthesis type ($P<.05$). No significant differences were found in relation to the following factors: gender, diameter and bone quality ($P>.05$).[7] Barias PA performed a retrospective clinical review to: (1) describe the demographics of implant patients, types of implant treatment and implant-supported prostheses in an Advanced Education in Prosthodontic Program, (2) evaluate the survival rate of dental implants placed by prosthodontic residents from 2006 to 2008, and (3) analyze the relationship between resident year of training and implant survival rate. All patients who received dental implants placed by prosthodontic residents from January 2006 to October of 2008 in the Advanced Prosthodontic Program at the University of Illinois at Chicago College of Dentistry were selected for this study. Age, gender, implant diameter, length, implant locations, surgical and restorative detail, and year of prosthodontic residency training were collected and analyzed. Life-table and Kaplan-Meier survival analyses were performed based on implants overall, locations, year of training, and use of a computer-generated surgical guide. A Logrank statistic was performed between implant survival and year of prosthodontic residency training, location, and use of computer-generated surgical

guide (α= 0.05). Three hundred and six implants were placed, and of these, seven failed. Life-table and Kaplan-Meier analyses computed a cumulative survival rate (CSR) of 97% for overall implants and implants placed with a computer-generated surgical guide. No statistical difference was found in implant survival rates as a function of year of training (P= 0.85). It was concluded that dental implants placed by prosthodontic residents had a CSR comparable to previously published studies by other specialties. The year of prosthodontic residency training and implant failure rate did not have any significant relationship.[7, 8]

Krennmair G et al conducted a retrospective study to evaluate the long-term survival and success rates of screw-type root-shaped (Camlog) implants of various diameters and their implant-prosthodontic reconstructions for more than 5 years of clinical use. The cumulative implant survival and success rates and peri-implant conditions (marginal bone loss, pocket depth, Plaque Index, Gingival Index, Bleeding Index) as well as the prosthodontic maintenance requirements were evaluated. Peri-implant soft tissue conditions such as plaque, bleeding, and pocket depth were also satisfactory. All prostheses were functional throughout the observation period, with no fractures of implants, abutments, or screws. Abutment screw (4.5%) or isolated crown loosening (9.8%) for single-tooth restorations requiring recementation, retightening of screws, and adaptation of removable prostheses were the most frequent prosthodontic maintenance needs. The authors concluded that the root-shaped implants and the associated prosthetic constructions used in this study showed excellent survival and success rates.[9]

Papaspyridakos P et al performed a study to report the implant and prosthodontic survival rates associated with IFCDPs for the edentulous mandible after an observation period of a minimum 5 years. An electronic MEDLINE/PubMED search was conducted to identify randomized controlled clinical trials and prospective studies with IFCDPs for the edentulous mandible. Clinical studies with at least 5-year follow-up were selected. Pooled data were statistically analyzed and cumulative implant- and prosthesis survival rates were calculated by meta-analysis, regression, and chi-square statistics. Implant-related and prosthesis-related factors were identified and their impact on survival rates was assessed. Seventeen prospective studies, including 501 patients and 2,827 implants, were selected for meta-analysis. The number of supporting implants and the antero-posterior implant distribution had no influence (p > .05) on the implant survival rate.

The prosthetic design and veneering material, the retention type, and the loading protocol (delayed, early, and immediate) had no influence (p > .05) on the prosthodontic survival rates.[10]

CONCLUSION:
As implant survival rate is influenced by various factors, it is difficult to analyze a cause of failure objectively. In this study related factors were evaluated for implant placement i.e.patient's age and gender and bone quality. Age is significantly related to success of implant.

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