Implant Diameter and Length Influence on Survival: Interim Results during the First Two Years of Function

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ABSTRACT (177 words)

Objectives: The aim of the present study was to evaluate the influence of implant length and diameter on implant survival.

Methods: A retrospective cohort of 787 consecutive patients from two private practices between the years 2008 and 2011 had been evaluated. Patients’ demographics, site and implant characteristics as well as time of follow-up were recorded from the medical files.

Results: Overall, 787 patients received 3043 implants during the follow-up time. Patients’ age ranged from 18 to 86 with an average of 53.7±12.8 years. Follow-up time ranged from 6 to 28 month (average 7.6±6.8). Overall survival rate was 98.7% with 39 implant failures recorded. The average time of implant failure was 10.9±8.6 months. Survival rates for narrow (<3.75mm), regular (3.75-5mm), and wide (>5mm) diameter implants were 98.2%, 98.7% and 98.5% respectively (p=0.89). Survival rates for short (<10mm) and regular (10mm and above) implants were 97% and 98.7% respectively (p=0.22).

Conclusion: Implant length and diameter were not found to be a significant factor affecting implant survival during the first two years of function. Further long-term follow-up studies are warranted.

KEYWORDS: bone width, success, survival, alveolar bone, dental implantation, maxilla, mandible

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Dental implants have become a widely accepted treatment option for both partially and complete edentulous patients.\textsuperscript{1,2} The physiological basis for the success of dental implants lies in the unique bone reaction to titanium.\textsuperscript{3} A recent review found that there is not enough evidence to demonstrate superiority of any particular type of implant or implant system.\textsuperscript{4}

The use of dental implants was initially limited to sites with substantial residual ridges. New regenerative techniques for ridge augmentation, allow implant placement in more challenging sites with deficient alveolar bone.\textsuperscript{5,6} Nonetheless, limitations in bone augmentation procedures (especially vertical bone augmentation) and limited predictability of these techniques makes the use of dental implants in extremely resorbed jaws more problematic.\textsuperscript{7}

Short and narrow dental implants could play a major role in these cases. Reduced primary stability and greater failure rate were previously reported with shorter implants. A recent pilot randomized clinical trial aimed to evaluate whether short dental implants could be an alternative to bone augmentation together with placement of longer implants in posterior atrophic jaws; results revealed that 1 year after loading, short implants achieved similar results compared with longer implants placed in augmented bone.\textsuperscript{7} The authors concluded that short implants might be a preferable choice to bone augmentation because the treatment is faster, cheaper and associated with less morbidity; further large cohort studies have been recommended to confirm the findings.

A recent systematic review of the literature indicated that there is only fair evidence that short implants can be placed successfully in the partially edentulous patient, although with a tendency towards increased survival rate per implant length.\textsuperscript{8} The aim of the present study was to evaluate the influence of implant length and diameter on implant survival.
METHODS

A retrospective cohort of 787 consecutive patients from two private practices between the years 2008 and 2011 had been evaluated. Patients’ demographics, site and implant characteristics as well as time of follow-up were recorded from the medical files. All implants were the same dental implants from a single manufacturer (Adin dental Implants, Alon Tavor, Israel). Implants’ length and width were evaluated as a potentially influencing factors on implant survival. Data was analyzed using a statistical software (SPSS 14, SPSS, Chicago, Illinois) using descriptive statistics, Kaplan-Mayer graphs and chi-square tests. P value of 0.05 was considered to be significant.

RESULTS

Overall, 787 patients received 3043 implants during the follow-up time. Patients age ranged from 18 to 86 with an average of 53.7±12.8 years. Follow-up time ranged from 6 to 28 month (average 7.6±6.8). Overall survival rate was 98.7% with 39 implant failures recorded. The average time of implant failure was 10.9±8.6 months.

Maxillary implants consisted of 49.3% of the implants with no difference in survival rates between the maxilla and mandible. Bone augmentation procedure was performed during the same operation in 25.69% of the implants with no significant influence on survival rates.

Survival rates for narrow (<3.75mm), regular (3.75-5mm), and wide (>5mm) diameter implants were 98.2%, 98.7% and 98.5% respectively (p=0.89; Fig. 1). Survival rates for short (<10mm) and regular (10mm and above) implants were 97% and 98.7% respectively (p=0.22; Fig. 2). Implant survival according to other tested variables is described in Table 1.
DISCUSSION

Short or narrow implants are increasingly used for the prosthetic solution of the extremely resorbed alveolar bone areas. However, there is still no consensus in the literature on the definition of a short implant. Some authors consider 10mm the minimal length for predictable success; thus they consider any implant <10mm in length as short. Others defined an implant length of 10mm also as a short implant. The same inconclusiveness appears also with regards to the width of the implant. In this paper it was decided to consider implants that are less than 10mm as short and implants less than 3.75mm in diameter as narrow. The present results indicate that there is no difference in initial implant survival, at the first two years of function with regards to implant diameter and length.

Two recent reviews have been published in which short implants were compared with conventional implants. Kotsovilis et al concluded from their systematic review that the placement of short rough-surface implants is not a less efficacious treatment modality compared with the placement of conventional rough surface implants. Romeo et al concluded that the recent literature has demonstrated a similar survival rate for short and standard implants.

Narrow diameter implants can be also useful in replacement of missing teeth when the bucco-lingual width of the edentulous crest is insufficient. A recent study evaluated the success and survival rates, peri-implant parameters, mechanical and prosthetic post-loading complications of narrow diameter implants followed over a 10-year period. They concluded that narrow diameter implants can be used with confidence where a regular diameter implant is not suitable. Bone loss around narrow diameter implants occurred predominantly within 2 years of loading and was minimal thereafter. This is with accordance with the findings of our recent report.
It should be remembered, however, that the long-term influence of risk factors might not be constant throughout the follow-up period.\textsuperscript{14} Thus, a long-term evaluation is of utmost important before this treatment alternative is frequently recommended.

CONCLUSIONS

Implant length and diameter were not found to be a significant factor affecting implant survival during the first two years of function. The findings from this present report add to the growing evidence that short (<10 mm) implants as well as narrow (<3.75mm) implants can be placed successfully in the partially edentulous patients. Further long-term follow-up studies are warranted.

DISCLOSURE

No funding was received for this study, and the authors report no conflicts of interest.
REFERENCES


LEGENDS

Table 1: Implant survival according to several factors

Fig. 1: Kaplan-Mayer plot for cumulative survival rates for narrow (<3.75mm), regular (3.75-5mm), and wide (>5mm) diameter implants (p=0.89)

Fig. 2: Kaplan-Mayer plot for cumulative survival rates for short (<10mm) and regular (10mm and above) implants (p=0.22).