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Third attempt to place implants in sites where previous surgeries have failed

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Abstract

Background: A lower survival rate for re-implantation in previously failed sites was reported. A third implant attempt in sites where previous implants have failed twice is rare; however, it may be necessary where other treatment alternatives are unacceptable. The aim of the present report is to explore the survival of implants placed three times at the same site.

Methods: Patients in whom a third attempt of implant placement at sites where two implants failed previously were evaluated. Medical history and smoking were recorded. The implant dimension, characteristics and survival were documented. The same implant and surgeon were involved in all three attempts.

Results: Fifteen third attempt implants in 12 patients were evaluated. The average age of the patients at first implantation was 48.8 ± 14.1 years. Six of the 15 second re-do implants have failed (60.0% survival rate). Smoking was reported by two patients. The implants that survived were followed for 44.1 ± 35 months (range 4–86). The mean implant length and diameter did not vary between attempts: the mean implant width/lengths were 3.6 ± 0.3/12.2 ± 1.4, 3.7 ± 0.3/12.6 ± 1.5 and 3.80 ± 0.3/12.4 ± 1.6 mm for the first, second and third attempts, respectively ($p > 0.05$).

Conclusions: A third attempt to place implants in sites where two implants had failed previously results in significantly lower survival rates compared with similar procedures in pristine sites.

Key words: dental implants; implant failure; implant replacement; implant success; re-implantation; survival

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Failed implants present a challenging therapeutic dilemma to the clinician, and is a source of frustration to both the patient and the clinician. Replacement of implants in sites where previous implants have failed is often the prime treatment alternative for the vast majority of implants.

Nonetheless, limited information is available regarding the survival of these replacement implants. Alsaadi et al. (2006) compared the failure rates of implants with either a machined surface or a TiUnite surface used to replace failing implants. Six out of 29 machined-surface implants that were replaced by implants with the same surface failed (79.4% survival rate), whereas, of the 19 machined-surface implants that were replaced by TiUnite surface implants, only one failed. Of the 10 TiUnite-surface implants that were replaced by implants with the same surface, none failed. The difference in the failure rate between machined-surface replacement implants and TiUnite replacement implants was statistically significant.

Grossmann & Levin (2007) reported an overall survival rate of 71% for single dental implants that were placed in sites of previously failed single implants. All the original implants have failed during the early healing period (mean 3.2 ± 2.3 months survival time).

More recently, Machtei et al. (2008), in a similar study, have reported an overall survival rate of 83.5% for re-do dental implants. They concluded that replacing a failed implant resulted in a lower survival rate compared with implants in pristine sites, which was not related to any of the common implant- or patient-related factors. Thus, they have suggested a possible site-specific negative effect that might be associated with this phenomenon.

A third attempt to place an implant is sites with earlier two failures is seldom made; however, in some patients, the placement of an implant in a particular

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location is critical for the prosthetic rehabilitation scheme and therefore warrants such a third attempt. Nonetheless, the evidence to support such a procedure is not available.

The purpose of the present retrospective case series was to evaluate the survival rate of dental implants that were performed in sites that previously had two failing attempts to place dental implants.

Materials and Methods

This case series provided an analysis of the survival of dental implants in healthy patients who underwent a third attempt for implant placement in the same sites where two previous attempts had resulted in biological failures.

To be included in this study, subjects who had a third attempt for implant placement in the same site had to be 20 years of age or older at the time of the first implant insertion; also, both implants (original and re-do fixtures) had to be placed by the same operator (all operators were certified periodontists with more than 5 years of experience in implant dentistry).

Patients were excluded from this study in cases of a systemic condition that is likely to affect bone metabolism (unbalanced hormonal condition, previous irradiation in the head and neck region and uncontrolled diabetes mellitus) or in cases of non-biological implant failure (such as implant fracture and/or prosthetic failure) that was the reason for its removal.

Following initial screening, which included a review of the systemic condition, environmental and oral habits of these patients, those who met the above criteria were included in this analysis.

Data on the failed implants' characteristics and placement mode were collected. The time intervals between implant placement and removal (first and second implant survival time) were also recorded along with implant length and diameter. These same parameters, along with the interval between retrieval and re-implantation, were recorded again for the third set of implants.

Results

Overall, 12 patients with 15 implants placed at the same site ($\times 3$) are included in this report (Table 1). The mean age of the patients at first implantation was 48.8 ± 14.1 years. Smoking was reported by only two patients. Overall, the mean implant length and diameter did not vary statistically between the three sets. The mean implant width (3.6 ± 0.3 mm) and length (12.2 ± 1.4 mm) at first attempt were not different from the values for the second (3.7 ± 0.3 mm; 12.6 ± 1.5 mm) and third (3.80 ± 0.3 mm; 12.4 ± 1.6 mm) attempts ($p > 0.05$). Implants were of various brands; however, they all had a surface of medium roughness. The same implant type was used in all three attempts at the same site. Also, the same experienced operator performed all three implants in the same individual and site.

The first implant loss occurred after a mean period of 7.6 ± 14.9 months (range 0.5–60 months; median 3.0 months). The time interval between the first and the second implantations was 10.0 ± 9.2 months (range 0–30 months). The second implant loss occurred after a mean period of 7.4 ± 9.5 months (range 1–39 months; median 5 months). The time interval between the second and the third implantations was 12.5 ± 9.3 months, range 2–31 months, median 11 months.

Six out of the 15 second re-implantation implants failed, resulting in an overall survival rate of 60.0%. All failures occurred during the first year after implant insertion (mean 5.8 ± 2.6 months, range 1–8 months, median 6.0 months). Surviving implants were followed for an average of 44.1 ± 35 months (range 4–86). None of these implants were lost after the first year.

No difference was observed between failed and survived implants with regard to implant coating, implants' prosthetic connection, placement mode (submerged *versus* non-submerged), premature exposure of submerged implants and smoking habits.

Discussion

The placement of dental implants in sites where two previous attempts have failed resulted in a poor survival rate (60.0% first-year survival). This outcome represents a further diminished prognosis compared with implants in pristine sites (den Hartog et al. 2008) or even the first re-do attempt (Machtei et al. 2008).

The problem of re-do surgery in general is one of greater complications in most settings. Maganti et al. (2009) reported greater mortality following re-do valvular surgery compared with the first-time surgery. They related this diminished 5-year survival to the older age of this group of patients. To the contrary, Ali et al. (2010) have reported an acceptable short- and long-term prognosis for re-do of coronary bypass surgery in a younger population. Total hip replacement (THR) was reported by Calin & Elswood (1989) to have a similar success for primary and revised surgery, while Davis et al. (2003) reported much greater loosening of the prosthesis following revised cemented THR. More recently, Springer et al. (2009) reported an 87% survival rate for first time revised THR and much poorer results (<70% survival) for second time revised THR surgery.

Re-treatment of endodontically failed root canal therapy (RCT) was also studied extensively. Fonzar et al. (2009) reported on the survival of 1086 teeth that had RCT either for pulpal pathology or because of failed previous RCT. An overall survival rate of 93% after 10 years was observed, with no difference between groups. Likewise, Torabinejad et al. (2009) compared the surgical and non-surgical retreatment of failed RCT. In this systematic review, a meta-analysis of the data revealed that in the short term, surgical retreatment yielded significantly greater success (77.8%) compared with non-surgical retreatment (70.9%). However, the long-term results (4–6 years) showed the reverse relationship, with surgical retreatment yielding a lower success rate (71.8%) compared with non-surgical retreatment RCT (83%, $p < 0.05$).

The overall mean survival rates of first time re-do range between 71 and 88.3% (Grossmann & Levin 2007, Machtei et al. 2008, Kim et al. 2010). However, Alsaadi et al. (2006) showed a higher survival rate for re-do of rough surface TiUnite® (Nobel Biocare, Gotenborg, Sweden) dental implants. The present study is the first research to specifically address the issue of second re-do of dental implants. Kim et al. (2010) in their study of first re-do dental implants reported that few failed second time implants were replaced with a third implant, this time with good results; however, these were only a few implants, which were only followed for a short period of time. In contrast,

Table 1. Patient and implant parameters

Patient initials	Age (years)	Smoking status	Site	First implant survival*	Interval first–second implant*	Second implant survival*	Interval second–third implant*	Final outcome	Lost third implant survival*	Follow-up survived implants*
D. V.	33	N	26	1.0	6	10	7	Failed	7	NA
G. U.	43	Y	42	3.5	4	1	11	Success	NA	52
T. D.	40	Y	42	3.5	0	7	5	Failed	5	NA
A. B.	63	N	12	7.0	9	7	8	Failed	6	NA
L. Y.	46	N	14	3.0	2	5	2	Success	NA	79
A. S.	23	N	24	60.0	12	39	14	Success	NA	55
D. M.	59	N	24	11.0	13	6	13	Failed	8	NA
D. M.	–	–	25	11.0	13	7	12	Failed	8	NA
N. A.	36	N	46	2.0	30	2.5	31	Success	NA	86
N. A.	–	–	47	2.0	30	3.5	30	Success	NA	86
B. M.	63	N	24	1.0	2	4	3	Success	NA	12
G. P.	67	N	11	6.0	3	8	6	Success	NA	18
D. A.	60	N	15	1	7	5	21	Success	NA	4
D. A.	–	–	16	1	7	5	21	Success	NA	4
I. N.	53	N	45	0.5	14	1	4	Failed	1	NA
Mean ± SD/ ratio	48.8 ± 14.1	2:10	–	7.6 ± 14.9	10.0 ± 9.2	7.4 ± 9.5	12.5 ± 9.3	6:9	5.8 ± 2.6	44.1 ± 35
Median (ranges)	56 (23–67)	–	–	3.0 (0.5–60)	7.0 (0–30)	5.0 (1–39)	11.0 (2–31)	–	6.5 (1–8)	52 (4–86)

*Months. NA, not applicable.

Grossmann & Levin (2007), in a similar re-do study, reported that two failed re-do implants were replaced with yet a third implant, one of which failed again (50% survival).

The lower survival rate for implants placed in previously failed sites suggests site- or patient-specific risk factors. Several studies have addressed this topic including differences between the maxilla and the mandible (Strietzel et al. 2004), different sites (molars, premolars and canine incisor regions; Levin et al. 2006) and poor bone quality (Jaffin & Berman 1991, Holahan et al. 2009). Site-specific factors include a previous bone graft (Lambert et al. 2009), sinus augmentation procedures (McCarthy et al. 2003), previous apical pathology (Quirynen et al. 2005) and root–implant proximity (Chuang et al. 2005). Despite the large number of publications related to the negative effect of site-specific factors, a recent meta-analysis (Martin et al. 2009) failed to support the influence on the implant success of most of these variables. Also, in a recently completed canine study, we were able to demonstrate good osteointegration for new implants placed in peri-implantitis sites (immediately following the retrieval of the old implants), despite the nature of these sites (Levin et al. 2010).

Patient-specific factors may have a major effect on the survival of repeated implants. Cluster failures were reported by Horwitz et al. (2007) and Schwartz-Arad et al. (2008), claiming that one-third of all the failed implants were part of a cluster failure pattern (two or more failures in a patient). Various systemic and environmental conditions might account for this including smoking (Anner et al. 2010), uncontrolled diabetes (Moy et al. 2005) and periodontal disease (Karoussis et al. 2003).

There is still a lack of sufficient evidence-based data regarding replacement of failed implants. The present study cohort was too small to draw definite conclusions as to the influence of different factors on osseointegration of a third implant in the same site of a failed implant. Further research with a larger cohort for a longer follow-up period is warranted.

Conclusions

Placement of implants in sites where two implants have previously failed

had significantly lower survival rates compared with the figures in pristine sites and sites with one previous failure. This information may be valuable to both clinicians and patients when considering treatment alternatives.

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Clinical Relevance

Scientific rationale for the study: A third attempt to place implants in sites where previous implants have failed twice is rare; however, it may be necessary where other treatment alternatives are unacceptable. The present retrospective case series was to evaluate the survival rate of dental implants that were performed in sites that previously had two failing attempts to place dental implants.

Principal findings: The placement of dental implants in sites where two previous attempts have failed resulted in a poor survival rate (60.0% first-year survival).

Practical implications: This information may be valuable to both clinicians and patients when considering treatment alternatives.