Clinical evaluation of small-diameter ITI implants: a prospective study.

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Abstract

PURPOSE: Dental implants with a reduced diameter are designed for specific clinical situations, such as placement of implants where bone width is narrow or between adjacent teeth that have only a narrow space between them. They are particularly useful when replacing small teeth such as lateral maxillary and mandibular incisors. The aim of the present study was the clinical evaluation of 2-part ITI implants (full-body screws with a 3.3-mm diameter).

MATERIALS AND METHODS: One hundred forty-nine partially or completely edentulous patients received a total of 298 2-part ITI implants over a 10-year period. After a standard healing period (3 to 6 months), the implants were restored with fixed restorations such as single crowns or fixed partial or complete prostheses or overdentures. Complete prosthesis or overdenture in the edentulous jaw was the predominant type of restoration. All patients followed a strict maintenance program, with regular recalls at least once a year. The survival rate of the implants was analyzed, and prosthetic complications were assessed.

RESULTS: Three implants were lost during the healing phase on account of peri-implant infection. Two implant body fractures with an osseous length of 8 mm were observed (one after 2 years of observation, the other after 6 years). Four implants exhibited transient peri-implant inflammation that was treated successfully by interceptive therapy. The cumulative 5-year survival rate of the implants was 98.7% (96.6% after 6 years). Prosthetic complications were mostly limited to loose occlusal screws and sore spots caused by the denture base.

DISCUSSION: Within the limited observation period, failures of small-diameter implants were infrequent. Prosthetic complications were not dependent on the use of small-diameter implants.

CONCLUSION: The use of 3.3-mm ITI implants appears to be predictable if clinical guidelines are followed and appropriate prosthetic restorations are provided. However, fatigue fracture may occur after a long period of function.
The impact of loads on standard diameter, small diameter and mini implants: a comparative laboratory study.

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Abstract

OBJECTIVES: While caution in the use of small-diameter (< or = 3.5 mm) implants has been advocated in view of an increased risk of fatigue fracture under clinical loading conditions, a variety of implant designs with diameters < 3 mm are currently offered in the market for reconstructions including fixed restorations. There is an absence of reported laboratory studies and randomized-controlled clinical trials to demonstrate clinical efficacy for implant designs with small diameters. This laboratory study aimed to provide comparative data on the mechanical performance of a number of narrow commercially marketed implants.

MATERIALS AND METHODS: Implants of varying designs were investigated under a standardized test set-up similar to that recommended for standardized ISO laboratory testing. Implant assemblies were mounted in acrylic blocks supporting laboratory cast crowns and subjected to 30 degrees off-axis loading on an LRX Tensometer. Continuous output data were collected using Nexygen software.

RESULTS: Load/displacement curves demonstrated good grouping of samples for each design with elastic deformation up to a point of failure approximating the maximum load value for each sample. The maximum loads for Straumann (control) implants were 989 N (+/-107 N) for the 4.1 mm RN design, and 619 N (+/-50 N) for the 3.3 mm RN implant (an implant known to have a risk of fracture in clinical use). Values for mini implants were recorded as 261 N (+/-31 N) for the HiTec 2.4 mm implant, 237 N (+/-37 N) for the Osteocare 2.8 mm mini and 147 N (+/-25 N) for the Osteocare mini design. Other implant designs were also tested.

CONCLUSIONS: The diameters of the commercially available implants tested demonstrated a major impact on their ability to withstand load, with those below 3 mm diameter yielding results significantly below a value representing a risk of fracture in clinical practice. The results therefore advocate caution when considering the applicability of implants < or = 3 mm diameter. Standardized fatigue testing is recommended for all commercially available implants.

Hollow implants retrieved for fracture: a light and scanning electron microscope analysis of 4 cases.

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Abstract
One of the possible complications of implant treatment is the occurrence of an implant fracture. Metal fatigue and biomechanical overload seem to be the most common causes of fractured implants. This study evaluated 4 implants (3 hollow cylinders and 1 hollow screw) which fractured after a mean loading period of 2.8 years. All implants had a 4 mm diameter and had been inserted in a posterior location. In 3 cases parafunctional habits were present. In all cases a vertical resorption of the peri-implant bone was present. The endosseous portion of the implant presented always a very high bone-implant contact percentage. Scanning electron microscopic examination showed that at least one of the implant holes was involved in the fracture line; no porosities or material defects were observed on the fractured surface of the implant. In hollow implants the holes could represent a site of less resistance.

Clinical outcome of narrow diameter implants: a retrospective study of 510 implants.

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Abstract

BACKGROUND: Narrow diameter implants ([NDIs]; diameter <3.75 mm) are a potential solution for specific clinical situations such as reduced interradicular bone, thin alveolar crest, and replacement of teeth with small cervical diameter. NDIs have been available in clinical practice since the 1990s, but only a few studies have analyzed their clinical outcome.

METHODS: From November 1996 to February 2004, 237 patients were selected, and 510 NDIs were inserted. Implant diameter ranged from 3.0 to 3.5 mm, multiple implant systems were used, and 255 implants were restored immediately without loading (IRWL). No statistical differences were detected among the studied variables. Consequently, marginal bone loss (MBL) was considered an indicator of the success rate (SCR) to evaluate the effect of several host-, surgery-, and implant-related factors. A general linear model (GLM) was used to detect those variables statistically associated with MBL.

RESULTS: Only three of 510 implants were lost (survival rate [SRR] = 99.4%), and no differences were detected among the studied variables. On the contrary, the GLM showed that delayed loading and longer (>13 mm) and larger (3.4 and 3.5 mm) NDIs reduced MBL.

CONCLUSIONS: NDIs have a high SRR and SCR, similar to those reported in previous studies of regular diameter implants. Moreover, IRWL of NDIs is a reliable procedure, although a slightly higher bone resorption is reported compared to delayed loading. No implant fractures were detected in the present series.
Clinical outcome of root-shaped dental implants of various diameters: 5-year results.


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Abstract

PURPOSE: The aim of this retrospective study was to evaluate the long-term survival and success rates of screw-type root-shaped (Camlog) implants of various diameters and their implant-prosthetic reconstructions for more than 5 years of clinical use.

MATERIALS AND METHODS: A retrospective study of patients receiving root-shaped screw-type dental implants placed between May 2001 and July 2003 was conducted. 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.

RESULTS: In all, 541 implants (3.8 mm: 237 implants; 4.3 mm: 211 implants, 5/6 mm: 93 implants) were placed and restored for implant prosthodontic rehabilitation in 216 patients (134 women, 82 men; mean age 54.3 +/- 9.1 years). Of the original 216 patients enrolled, 198 (91.6%; 510/541 implants [94.2%]) were available for a follow-up evaluation after 5 to 7 years (mean follow-up, 68.8 +/- 7.4 months). The overall cumulative 5-year survival and success rates were 98.3% and 97.3%, respectively. A failure rate of 3.7% (9/237) was seen for 3.8-mm-diameter implants; the corresponding figures for the 4.3-mm and wide-diameter (5.0/6.0-mm) implants were 1.4% (3/211) and 1.0% (1/93), respectively. For implants classified as successful, the average peri-implant marginal bone resorption value was 1.8 +/- 0.4 mm, with no differences among the different implant diameters 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.

CONCLUSION: The root-shaped implants and the associated prosthetic constructions used in this study showed excellent survival and success rates.

Immediate versus one-stage restoration of small-diameter implants for a single missing maxillary lateral incisor: a 3-year randomized clinical trial.

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J Periodontol. 2009 Sep;80(9):1393-8.

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Abstract

BACKGROUND: The aim of this study was to compare the bone loss pattern and soft tissue healing of immediately versus one-stage loaded 3.0-mm-diameter implants in cases involving a single missing lateral maxillary incisor.

METHODS: Sixty patients with a missing lateral incisor in the maxilla were randomized to one of the treatments: 30 patients in the immediate-restoration group and 30 patients in the one-stage group. All implants were placed in healed sites and had to be inserted with a torque >25 Ncm. The implants in the immediate-restoration group were fitted with a non-occluding temporary crown on the day of surgery. Both groups received a full occluding final crown 6 months after surgery. Mean marginal bone loss, probing depth, and bleeding on probing were assessed at 6-, 12-, 24-, and 36-month follow-up examinations by a masked examiner.

RESULTS: Sixty 3.0-mm-diameter implants were placed between July 2003 and February 2006; 27 (45.0%) were in men, and 33 (55.0%) were in women. All implants osseointegrated and were clinically stable at the 6-month follow-up. No statistically significant differences were observed for bleeding or plaque index. No implant fractures occurred. At the 36-month follow-up, the accumulated mean marginal bone loss and probing depth were 0.85 +/- 0.71 mm and 1.91 +/- 0.59 mm, respectively, for the immediate-loading group (n = 30) and 0.75 +/- 0.63 mm and 2.27 +/- 0.81 mm, respectively, for the one-stage group (n = 30). There was no statistically significant difference (P >0.05) for the tested outcome measures between the two procedures.

CONCLUSIONS: In the rehabilitation of a single missing lateral maxillary incisor, no statistically significant difference was assessed between immediately and one-stage restored small-diameter implants with regard to implant survival, mean marginal bone loss, and probing depth. Three-millimeter-diameter implants proved to be a predictable treatment option in our test and control groups if a strict clinical protocol was followed.

Etiology, risk factors and management of implant fractures.


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Abstract

Implant fracture is an infrequent and late biomechanical complication with a serious clinical outcome. In effect, such fractures pose important problems for both the patient and the dental surgeon. According to most literature sources, the prevalence of dental implant fractures is very low (approximately 2 fractures per 1000 implants in the mouth). Considering that implant placement is becoming increasingly popular, an increase in the number of failures due to late fractures is to be expected. Clearly, careful treatment can contribute to reduce the incidence of fracture. An early diagnosis of the signs alerting to implant fatigue, such as loosening, torsion or fracture of the post screws and prosthetic ceramic fracture, can
help prevent an undesirable outcome. The present literature review describes the
management options and discusses the possible causal mechanisms underlying such
failures, as well as the factors believed to contribute to implant fracture.

**Clinical and radiographic evaluation of small-diameter (3.3-mm) implants
followed for 1-7 years: a longitudinal study.**

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**Abstract**

Implants with a small diameter may be used where bone width is reduced or in single-tooth
 gaps with limited mesiodistal space, such as for the replacement of lateral maxillary or
 mandibular incisors. The purpose of the present longitudinal study was to compare the
 prognosis of narrow implants (3.3-mm-diameter) to standard (4.1-mm-diameter) implants.
 Over a 7-year period, 122 narrow implants were inserted in 68 patients to support 45 partial
 fixed prostheses (PFD) and 23 single-tooth prostheses (ST). Furthermore, 120 patients
 received 208 standard implants and were restored with 70 PFD and 50 ST, respectively.
 Clinical and radiographic assessment data were provided. Six (1.8%) out of 330 implants
 failed. Cumulative survival and success rates were calculated with life-table analyses
 processed by collecting clinical and radiographic data. For narrow implants, the cumulative
 survival rate was 98.1% in the maxilla and 96.9% in the mandible. The cumulative success
 rate was 96.1% in the maxilla and 92% in the mandible. Conversely, standard-diameter
 implants showed a cumulative survival rate of 96.8% in the maxilla and 97.9% in the
 mandible. The cumulative success rate was 97.6% in the maxilla and 93.8% in the mandible.
 Cumulative survival and success rates of small-diameter implants and standard-diameter
 implants were not statistically different (P > 0.05). Type 4 bone was a determining failure
 factor, while marginal bone loss was not influenced by the different implant diameters. The
 results suggest that small-diameter implants can be successfully used in the treatment of
 partially edentulous patients.

**Endosseous dental implant fractures: an analysis of 21 cases.**

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**Abstract**

Implant fracture is an infrequent cause of implant failure. The present study evaluates 21
fractured implants, with an analysis of patient age and sex, the type, length and diameter of
the implant, positioning in the dental arch, the type of prosthetic rehabilitation involved, the number of abutments and pontics, the presence or absence of distal extensions or cantilevers, and loading time to fracture. Implant fracture was more common in males than in females (15:4), and the mean patient age was 56.9 years. Most cases (n = 19) corresponded to implant-supported fixed prostheses - 16 with cantilevers of different lengths - while only two fractured implants were supporting overdentures instead of fixed prostheses. The great majority of fractured implants (80.9%) were located in the molar and premolar regions, and most fractured within 3-4 years after loading. It is important to know and apply the measures required to prevent implant fracture, and to seek the best individualized solution for each case - though complete implant removal is usually the treatment of choice.

A prospective study of treatment of severely resorbed maxillae with narrow nonsubmerged implants: results after 1 year of loading.

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Abstract

The aim of the present study was to evaluate the use of reduced-diameter implants as an alternative to bone grafting for treatment of patients with severely resorbed maxillae. Forty patients (25 females, 15 males, mean age of 57 years, range 19 to 86) with insufficient bone volume for placement of standard-size implants in the maxilla (31 totally edentulous) were treated with 3.3-mm-diameter implants (ITI, titanium plasma-sprayed solid screws). Augmentation was considered for all patients because of lack of sufficient bone volume. Preoperative radiographic examination showed that in all cases, the height of the alveolar crest with a width of 4 mm was less than 10 mm. A total of 182 implants with a length of 8 to 12 mm were placed. All but 3 patients planned for overdenture treatment received fixed prostheses or single crowns (n = 3). One implant (8 mm long) was lost 1 month after placement, providing a survival rate of 99.4% after 1 year of loading. Since 4 implants with peri-implantitis were successfully treated and 1 implant left as a "sleeper" because of malposition, the cumulative success rate was 96.4%. The mean marginal bone resorption at baseline was 0.14 +/- 0.67 mm (range 0 to 6 mm). After 1 year of loading the mean resorption was 0.35 +/- 1.05 mm (range 0 to 7 mm); 4.8% of the implants had marginal bone resorption of more than 2 mm.

Factors affecting late implant bone loss: a retrospective analysis.

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Abstract

PURPOSE: Prevention of late implant bone loss is a critical component in long-term success of implants. The aim of the present study was to evaluate factors affecting late implant bone loss.

MATERIALS AND METHODS: Three hundred thirty-nine endosseous root-form dental implants placed between April 1981 and April 2002 in 69 patients were analyzed. The implants were categorized based on the following factors: (1) surface characteristics (smooth versus rough), (2) length (short [< 10 mm] versus long [≥ 10 mm]), width (narrow [< 3.75 mm], regular [3.75 to 4.0 mm], or wide [≥ 4.0 mm]), (3) the amount of keratinized mucosa (< or > or = 2 mm), (4) location (anterior versus posterior; maxilla versus mandible), (5) type of prosthesis (fixed versus removable), and (6) type of opposing dentition. The effects of these factors on clinical parameters, especially average annual bone loss (ABL), were evaluated clinically and radiographically by a blinded examiner. The parameters evaluated were modified Plaque Index, Gingival Index, modified Bleeding Index, probing depth, and ABL.

RESULTS: Shorter implants, wider implants, implants supporting fixed prostheses, and implants in smokers were found to be associated with greater ABL (P < .05). The random intercept mixed effects model showed that implant length was the most critical factor for maintenance of ABL.

CONCLUSIONS: Shorter implants, wider implants, implants supporting fixed prostheses, and implants in smokers were associated with greater ABL. Implant length was the most significant factor in the maintenance of dental implants. Randomized controlled clinical trials are needed to confirm the results obtained from this retrospective clinical study.