Evaluation of 316 narrow diameter implants followed for 5-10 years: a clinical and radiographic retrospective study.

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Abstract

OBJECTIVES: Narrow diameter implants (NDIs; diameter >3.75 mm) are useful in replacement of missing incisor teeth and when the bucco-lingual width of the edentulous crest is insufficient. The present study evaluated the success and survival rates, peri-implant parameters, mechanical and prosthetic post-loading complications of NDIs followed over a 10-year period.

MATERIAL AND METHODS: Three hundred and sixteen NDIs were inserted into 139 patients and restored with 120 prostheses. Clinical and radiographic assessment data were collected during recall visits. Implant success (SC), cumulative survival rate (CSR), marginal bone loss (MBL), peri-implant conditions and prosthetic complications were assessed. Cox proportional hazards regression analysis, Kaplan-Meier survival curves with the log-rank test and life table analysis were used to evaluate the outcome of NDIs within comparable subgroups. MBL and peri-implant parameters measured annually were further analyzed.

RESULTS: The mean follow-up time was 9.1 years (range: 60-124 months). Twelve implants were lost in the healing phase and two during function. The mean MBL in the maxilla and the mandible was 1.32 +/- 0.13 and 1.28 +/- 0.3 mm, respectively, after 10 years. SC and CSR were 91.4% and 92.3%, respectively, after 124 months. Smoking and posterior localization were associated with an increased risk of failure. Cement loosening (16.8%) was the most common prosthetic complication. No implants were fractured.

CONCLUSIONS: NDIs can be used with confidence where a regular diameter implant is not suitable. MBL around NDIs occurred predominantly within 2 years of loading and was minimal thereafter. Further studies are required to clarify the possible risks associated with smoking and posterior placement.
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.
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.

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.

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Abstract

OBJECTIVES: The present study aimed at evaluating the marginal bone resorption and the peri-implant tissue conditions around Narrow-Neck ITI implants in the implant-prosthetic treatment of the agenesis of maxillary lateral incisors.

MATERIAL AND METHODS: Thirty patients affected by monolateral or bilateral agenesis of the maxillary lateral incisors were selected. Thirty-four ITI-SLA Narrow Neck implants were inserted and loaded about 4 months after the surgical procedure. The final restorations were realized using Aureo Galvan Crowns veneered with feldspathic ceramics. The follow-up period ranged from 24 to 39 months. Both marginal bone resorption and soft tissue quality were evaluated. The data were statistically analysed using analysis of variance (ANOVA) for repeated measures, one-way ANOVA and Tukey's post hoc test (P=0.05).

RESULTS: During the 24-39-month follow-up period, no implant showed either pain and sensitivity or mobility. After 39 months of functional loading, a cumulative survival rate of 97.06% and a cumulative success rate of 94.12% were calculated.
CONCLUSIONS: In case of maxillary lateral incisor agenesis, the implant-prosthetic approach has proved to be a reliable and predictable treatment for both re-establishment of function and aesthetics. Satisfactory values of marginal bone resorption over time and optimal conditions of peri-implant tissue around Narrow-Neck ITI implants were found.

Retrospective evaluation of mandibular incisor replacement with narrow neck implants.

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Abstract

The authors have retrospectively evaluated the clinical results of mandibular incisors replacement with narrow neck implants (NNI). Thirty-one patients treated consecutively for single or multiple lower incisor replacement with NNI with a mean follow-up of 23 months (range 18-42 months) were included in the study and were divided into three groups: single tooth, multiple unit restoration and restorations on adjacent implants. Survival and success rates and soft tissue parameters such as modified plaque index (mPI), peri-implant probing depth (PPD), bleeding on probing (BOP) and the papilla index were analyzed. Subjective evaluation was performed by patients and clinicians on visual analogue scales. The implants and prostheses showed a survival rate of 100% and an overall success rate of 94%. The distribution of mPI outcomes showed better results for the single tooth group. BOP was present in four of eight implants (50%) in the adjacent implant group, in one out of 20 implants in the single tooth group (5%) and in one out of 16 implants in the multi unit group (6%). The adjacent implant group showed a statistically significant increase in PPD. The Papilla Index showed a better outcome distribution in single tooth and multi unit groups. Patients’ evaluation of treatment outcome was satisfactory in all groups, even though the best esthetic and functional results were found in single tooth and multi unit groups. The professional evaluation showed good outcomes for the single tooth and multi unit groups and statistically significant poorer results in the adjacent implants group. With the limitations of this study, it may be concluded that the replacement of lower incisors with NNI leads to favorable functional and esthetic results in cases of single-tooth or multiple-unit replacement. Worse results are achieved if two adjacent mandibular incisors are replaced with adjacent implants.
Guided bone regeneration around non-submerged implants in narrow alveolar ridges: a prospective long-term clinical study.

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Abstract

OBJECTIVES: This prospective clinical study investigates long-term survival and clinical parameters of non-submerged implants with large buccal dehiscences treated with a deproteinized bovine bone mineral xenograft and a non-resorbable membrane in a one-stage approach.

MATERIAL AND METHODS: Sixteen consecutive non-submerged implants (ITI Straumann) were installed in narrow alveolar ridges in 13 patients (age range: 25-61 years). All patients were non-smokers. On the buccal site the bone dehiscence ranged between 3 and 9 mm. Primary stability was achieved in all but one implant. The exposed threads were covered with a xenograft (Bio-Oss) and a non-resorbable expanded polytetrafluoroethylene membrane. The flap was sutured leaving the implant head non-submerged. The membrane was removed when (1) the membrane became exposed or (2) after a maximum of 24 weeks. All implants received singular cemented crowns. The implants were followed for a period ranging from 12 to 114 months. Whole-mouth plaque index (PI), the % of bleeding on probing (BOP), probing depth and signs of peri-implantitis were recorded. Every year periapical radiographs were taken using a long cone technique.

RESULTS: All but one implant integrated successfully. At the time of membrane removal, all previously exposed threads were completely covered with richly vascularized tissue except for two implants where the coverage reached 63% and 87%, respectively. The whole-mouth plaque score and BOP remained low in all patients during the observation period. None of the implants had plaque and, except for one implant BOP never occurred. All implants were stable and in function. Swelling, redness or purulence was never observed. On the periapical radiographs no bone resorption was observed on the mesial and distal site except for one implant in one patient with a mesial and distal bone resorption of 2 and 3 mm. Probing depth was never higher than 3 mm except for one patient where the implant was placed deeply subgingival for esthetical reasons.

CONCLUSION: This prospective long-term study shows that with the use of non-submerged transmucosal implants, large bony dehiscences can be treated in a one-stage approach using a stiff non-resorbable membrane combined with a xenograft.
Clinical outcome of narrow diameter implants: a retrospective study of 510 implants.

Degidi M, Piattelli A, Carinci F.


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.

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

Degidi M, Nardi D, Piattelli A.

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

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.

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**Etiology, risk factors and management of implant fractures.**


**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.

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

Hallman M.


**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.

Chung DM, Oh TJ, Lee J, Misch CE, Wang HL.


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 [> or = 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.
The 'mini'-implant has arrived.

Christensen GJ.


Abstract

There is no question that dental implants have been the most influential change in dentistry during the last half-century. In general, they are well-proven and highly useful. However, the diameter of standard implants (approximately 3.75 mm), along with the frequent need to graft bone to allow for their placement, have limited their use for those who most need implants. The introduction, approval and continuing observation of success of smaller-diameter mini-implants have stimulated use of implants in situations in which standard-sized implants could not have been used without grafting. The result has been more patients who have been served successfully at reduced cost with minimized pain and trauma--patients who could not have been treated with implants otherwise. Continuing research is needed for further verification of the acceptability of mini-implants.

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