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

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Department of Oral Implantology, Faculty of Dentistry, Istanbul University, Istanbul, Turkey.

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.

Allum SR, Tomlinson RA, Joshi R.


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

Zinsli B, Sägesser T, Mericske E, Mericske-Stern R.


Department of Prosthodontics, University of Bern, School of Dental Medicine, Bern, Switzerland.

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.

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.

Abstract

Retrospective evaluation of mandibular incisor replacement with narrow neck implants.

Cordaro L, Torsello F, Mirisola Di Torresanto V, Rossini C.


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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.

De Boever AL, De Boever JA.


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.

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

Piattelli A, Scarano A, Piattelli M, Vaia E, Matarasso S.


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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.**

Degidi M, Piattelli A, Carinci F.


Dental School, University of Bologna, Bologna, Italy.

**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.
Dental School, University of Chieti-Pescara, Chieti, Italy.

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.**


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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.

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

Romeo E, Lops D, Amorfini L, Chiapasco M, Ghisolfi M, Vogel G.


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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.


Oral Surgery and Implantology, School of Dentistry of the University of Barcelona, Spain.

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.

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


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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 ≥ 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.

Clinical evaluation of single-tooth mini-implant restorations: a five-year retrospective study.
Vigolo P, Givani A.

STATEMENT OF PROBLEM:
Placement of small diameter implants often provides a solution to space problems in implant restoration. Analysis of the success of this type of implant restoration has not been clearly determined.

PURPOSE:
This 5-year retrospective study presents results from 52 mini-implants for single-tooth restorations placed in 44 patients from 1992 to 1994.

MATERIAL AND METHODS:
Dental records of 44 patients with 52 mini-implants placed during 1992-94 were reviewed. The implants were all placed by the same surgeon and the single-tooth custom screwed posts with cemented crowns were positioned on the implants by the same prosthodontist.

RESULTS:
The results achieved by the mini-implant rehabilitation were similar to those reported for standard single-tooth implant restoration. Total implant survival rate was 94.2%. Two implants were lost at second stage surgery, and another was lost after temporary loading.

CONCLUSION:
The results suggest that single-tooth mini-implant restoration can be a successful treatment alternative to solve both functional and esthetic problems. They may represent the preferred choice in cases where space problems limit the use of standard or wide diameter implants.
Clinical evaluation of small-diameter implants in single-tooth and multiple-implant restorations: a 7-year retrospective study.

Vigolo P, Givani A, Majzoub Z, Cordioli G.


PURPOSE:

Placement of small-diameter implants often provides a solution to space-related problems in implant restoration. This 7-year retrospective study presents results from 192 small-diameter implants placed in 165 patients from 1992 to 1996.

MATERIALS AND METHODS:

The dental records of each patient were reviewed. The implants, which were either 2.9 mm or 3.25 mm in diameter, were placed by 2 different surgeons. All prosthetic appliances were fabricated by the same prosthodontist. Ninety-four implants supported single-tooth cemented restorations; the remaining 98 implants supported cemented or screw-retained partial prostheses.

RESULTS:

The total implant survival rate was 95.3%. Four implants were lost at second-stage surgery, and 5 more were lost after loading.

DISCUSSION:

Small-diameter implants demonstrated a survival rate similar to those reported in previous studies of standard-size implants.

CONCLUSIONS:

The results suggest that small-diameter implants can be successfully included in implant treatment. They may be preferable in cases where space is limited.
Success rates of microimplants in edentulous patients with residual ridge resorption.

Morneburg TR, Pröschel PA.


PURPOSE:

Restorative therapy of edentulous mandibles with residual ridge resorption is still a great challenge. Even though implant-supported stabilization of dentures has proved to be of value in these cases, treatment is sometimes problematic, not only due to narrow width of the denture-bearing areas but also because elderly patients are often averse to surgery. Implants with a normal length but a reduced diameter might facilitate therapy in patients with implant-supported dentures. The aim of the present study was to evaluate the clinical success of implants with a small diameter.

MATERIALS AND METHODS:

In a prospective study, patients were provided with 2 implants 2.5 mm in diameter (MicroPlant; Brasseler, Lemgo, Germany) in a 2-stage procedure in the intraforaminal area of the edentulous mandible. Subsequently, the patients were monitored in periodic recalls. Periotest value, Gingival Index, and attachment level were monitored at these recall evaluations. Peri-implant bone loss was measured using panoramic radiographs. Patients rated the functionality of their denture using questionnaires administered before and after treatment.

RESULTS:

Sixty-seven patients were monitored during an average observation time of 6 years (SD 2.7). The cumulative survival rate of the implants was 95.5%. Clinical and radiographic parameters yielded results comparable to those of implants with a larger diameter. The questionnaire revealed sharp and significant improvement in denture retention and chewing ability after denture stabilization with the implants.

CONCLUSION:

The clinical data and the results of the questionnaire clearly indicated that the patients were satisfied with the concept of stabilization of complete mandibular dentures with small-diameter implants.
Mini dental implants for long-term fixed and removable prosthetics: a retrospective analysis of 2514 implants placed over a five-year period.

Shatkin TE, Shatkin S, Oppenheimer BD, Oppenheimer AJ.

Compend Contin Educ Dent. 2007 Feb;28(2):92-9; quiz 100-1.

Abstract

Over the past decade, endosseous implants of increasingly smaller diameters have been introduced into the field of dentistry. Small diameter implants (SDIs) are generally 2.75 mm to 3.3 mm in diameter. They are frequently used in cases of limited alveolar anatomy. Mini dental implants (MDIs) are smaller than their SDI counterparts, with diameters ranging from 1.8 mm to 2.4 mm. They are suitable for long-term use—a task for which the device was approved by the Food and Drug Administration. The following study describes the authors’ experience with MDIs under this indication. Over a 5-year period, 2514 MDIs were placed in 531 patients. The mean duration of follow-up was 2.9 years. The implants supported fixed (1278) and removable prostheses (1236), with nearly equal placement in the mandible and maxilla (1256 and 1258, respectively). The overall implant survival was 94.2%. Based on a Cox proportional hazards model, statistically significant predictors of failure include use in removable prostheses (hazard ratio = 4.28), the posterior maxilla (3.37), atrophic bone (3.32), and cigarette smokers (2.28). Implant failures (145) were attributed to mobility with or without suppuration (19% vs 81%, respectively). The mean failure time for these implants was approximately 6.4 months (193+/−42 days). This temporally correlates with the osseointegration period. A learning curve was established for this procedure, and implant survival improved with placement experience. Based on these results, the authors have devised treatment guidelines for the use of MDIs in long-term fixed and removable prostheses. MDIs are not a panacea; however, proper training enables the general dentist to successfully implement MDIs into clinical practice.

The effect of maximum bite force on marginal bone loss of mini-implants supporting a mandibular overdenture: a randomized controlled trial.

Jofré J, Hamada T, Nishimura M, Klattenhoff C.


OBJECTIVES:

To evaluate the effect of maximum bite force (mBF) on marginal bone loss (MBL) around mini-implants in edentulous patients wearing mandibular overdentures with two retention systems: ball and bar.

MATERIAL AND METHODS:
Forty-five totally edentulous patients were selected from a public health center. All of them received two mini-implants (1.8 x 15 mm; Sendax) in the anterior mandible using a minimally invasive technique. A single randomization was performed to allocate the patients in two groups. Group I (n=22) received two single ball-type mini-implants and Group II (n=23) received two mini-implants splinted with a prefabricated bar. The mBF was recorded using a press-sensitive sheet Dental Prescale (Fuji) and MBL using standardized radiographs of each mini-implant at the baseline and 5, 7, 10, and 15 months after surgery; the values were compared between groups.

RESULTS:

Two members of Group I failed to complete the study, decreasing the number of participants to 20. There was no relationship between the mBF and the MBL of the mini-implants (Spearman's rhor(s)=0.147; P=0.378). At the 15-month follow-up, the average mBF for Group I (ball) was 247.53 +/- 132.91 N and that of Group II (bar) only 203.23 +/- 76.85 N (Mann-Whitney test; P=0.586). The MBL values were also higher for Group I (1.40 +/- 1.02 mm) than Group II (0.84 +/- 0.66 mm) during the entire 15-month follow-up period (Mann-Whitney test; P=0.077).

CONCLUSIONS:

No relationship was found between mBF and MBL for patients wearing overdentures retained on mini-implants using bar or ball attachment systems.

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**Implant survival to 36 months as related to length and diameter.**

Winkler S, Morris HF, Ochi S.


**BACKGROUND:**

It is generally accepted that diameter and length of an endosseous dental implant and its stability at placement are critical factors in achieving and maintaining osseointegration. In the event of slight implant mobility at placement, the conventional or accepted treatment is to place a longer implant and/or one of wider diameter. This manuscript presents stability and survival/failure data for implants of different diameters and lengths following 36 months post-placement, as well as crestal bone loss data between placement and uncovering.

**METHODS:**

A subset of the Dental Implant Clinical Research Group's database was used to study the 3-year survival and stability of various implant lengths (7 mm, 8 mm, 10 mm, 13 mm, and 16 mm) and diameters (3 mm+ and 4 mm+). Placement to uncovering crestal bone loss was also determined. The implants were generally representative of those available for clinical use (screws, basket, grooved, hydroxy-apatite-coated, CP-Ti, Ti-alloy). The study protocol specified that the implants be randomized to various jaw regions to accomplish the primary goals of the study—the comparison of each implant design's overall survival. A total of 2,917 implants were placed, restored, and followed. Data for all 3 mm to 3.9 mm diameter implants
were pooled into a "3+" group, and the 4 mm to 4.9 mm diameter implants into a "4+" mm group. No attempt was made to look at the influence of any other variables on survival outcomes. The possible influence of clustering on survival was taken into consideration.

RESULTS:

The 3+ mm group had a mean stability (PTV) of -3.8 (SD = 2.9), and the 4+ group had a mean PTV of -4.4 (SD = 2.7) (P < 0.05). The PTVs for implant lengths ranged from -2.9 (SD = 2.8) for 7 mm lengths to -3.9 (SD = 2.9) for 16 mm lengths (P < 0.05). Survival to 36 months was 90.7% for the 3+ diameter and 94.6% for the 4+ group (P = 0.01). Survival ranged from 66.7% for the 7 mm implants to 96.4% for 16 mm implants (P = 0.001). Outcomes did not change when clustering was considered, although the P value decreased slightly.

CONCLUSIONS:

The results indicate that: 1) shorter implants had statistically lower survival rates as compared with longer implants; 2) 3+ mm diameter implants had a lower survival rate as compared with 4+ mm implants; 3) 3+ mm diameter implants are less stable (more positive PTVs) than 4+ mm implants; and 4) there was no significant difference in crestal bone loss for the two different implant diameters between placement and uncovering.

A 5-year prospective study on small diameter screw-shaped oral implants.

Comfort MB, Chu FC, Chai J, Wat PY, Chow TW.


Alveolar ridges of limited dimensions could preclude the placement of dental implants of the regular dimension. Smaller diameter implants - narrow platform (NP) implants were commercially available to address this issue. The aim of the study was to determine the 5-year clinical performance of 3.3 mm diameter NP implants. Twenty-three machined screw-shaped NP implants were placed in nine patients (six males; three females) between 18 and 70 years of age. Clinical and radiographic examinations were performed annually for 5 years. Recognized implant success criteria was used. The criteria were based on the mean marginal alveolar bone loss, the placement of prosthesis of satisfactory appearance, and the absence of implant mobility, peri-implant radiolucency, pain, discomfort or infection. One implant failed at abutment connection. The remaining 22 implants were restored and functioned successfully according to the criteria. The mean marginal alveolar bone loss during the first year was 0.41 +/- 0.17 mm. The mean marginal alveolar bone loss between the second and fifth year was 0.03 +/- 0.06 mm. The success rate of NP implants according to a well-established set of criteria was 96%.
Early loading of single crowns supported by 6-mm-long implants with a moderately rough surface: a prospective 2-year follow-up cohort study.

Rossi F, Ricci E, Marchetti C, Lang NP, Botticelli D.


AIM:

To evaluate prospectively the clinical and radiographic outcomes after 2 years of loading of 6 mm long moderately rough implants supporting single crowns in the posterior regions.

MATERIAL AND METHODS:

Forty SLActive Straumann short (6 mm) implants were placed in 35 consecutively treated patients. Nineteen implants, 4.1 mm in diameter, and 21 implants, 4.8 mm in diameter, were installed. Implants were loaded after 6 weeks of healing. Implant survival rate, marginal bone loss and resonance frequency analysis (RFA) were evaluated at different intervals. The clinical crown/implant ratio was also calculated.

RESULTS:

Two out of 40 implants were lost before loading. Hence, the survival rate before loading was 95%. No further technical or biological complications were encountered during the 2-year follow-up. The mean marginal bone loss before loading was 0.34+/−0.38 mm. After loading, the mean marginal bone loss was 0.23+/−0.33 and 0.21+/−0.39 mm at the 1- and 2-year follow-ups. The RFA values increased between insertion (70.2+/−9) and the 6-week evaluation (74.8+/−6.1). The clinical crown/implant ratio increased with time from 1.5 at the delivery of the prosthesis to 1.8 after 2 years of loading.

CONCLUSION:

Short implants (6 mm) with a moderately rough surface loaded early (after 6 weeks) during healing yielded high implant survival rates and moderate loss of bone after 2 years of loading. Longer observation periods are needed to draw more definite conclusions on the reliability of short implants supporting single crowns.
Rehabilitation of posterior atrophic edentulous jaws: prostheses supported by 5 mm short implants or by longer implants in augmented bone? One-year results from a pilot randomised clinical trial.

Esposito M, Pellegrino G, Pistilli R, Felice P.


PURPOSE:
To evaluate whether 5 mm short dental implants could be an alternative to augmentation with anorganic bovine bone and placement of at least 10 mm long implants in posterior atrophic jaws.

MATERIALS AND METHODS:
Fifteen patients with bilateral atrophic mandibles (5-7 mm bone height above the mandibular canal), and 15 patients with bilateral atrophic maxillae (4-6 mm bone height below the maxillary sinus) and bone thickness of at least 8 mm, were randomised according to a splitmouth design to receive one to three 5 mm short implants or at least 10 mm long implants in augmented bone. Mandibles were vertically augmented with interpositional bone blocks and maxillary sinuses with particulated bone via a lateral window. Implants were placed after 4 months, submerged and loaded, after 4 months, with provisional prostheses. Four months later, definitive provisionally cemented prostheses were delivered. Outcome measures were: prosthesis and implant failures, any complication and peri-implant marginal bone level changes.

RESULTS:
In 5 augmented mandibles, the planned 10 mm long implants could not be placed and shorter implants (7 and 8.5 mm) had to be used instead. One year after loading no patient dropped out. Two long (8.5 mm in the mandible and 13 mm in the maxilla) implants and one 5 mm short maxillary implant failed. There were no statistically significant differences in failures or complications. Patients with short implants lost on average 1 mm of peri-implant bone and patients with longer implants lost 1.2 mm. This difference was statistically significant.

CONCLUSIONS:
This pilot study suggests that 1 year after loading, 5 mm short implants achieve similar if not better results than longer implants placed in augmented bone. Short implants might be a preferable choice to bone augmentation since the treatment is faster, cheaper and associated with less morbidity, however their long-term prognosis is unknown.
**Vertical augmentation with interpositional blocks of anorganic bovine bone vs. 7-mm-long implants in posterior mandibles: 1-year results of a randomized clinical trial.**

Felice P, Pellegrino G, Checchi L, Pistilli R, Esposito M.


**OBJECTIVES:**

To evaluate whether 7-mm-long implants could be an alternative to longer implants placed in vertically augmented posterior mandibles.

**MATERIALS AND METHODS:**

Sixty patients with posterior mandibular edentulism with 7-8 mm bone height above the mandibular canal were randomized to either vertical augmentation with anorganic bovine bone blocks and delayed 5-month placement of ≥10 mm implants or to receive 7-mm-long implants. Four months after implant placement, provisional prostheses were delivered, replaced after 4 months, by definitive prostheses. The outcome measures were prosthesis and implant failures, any complications and peri-implant marginal bone levels. All patients were followed to 1 year after loading.

**RESULTS:**

One patient dropped out from the short implant group. In two augmented mandibles, there was not sufficient bone to place 10-mm-long implants possibly because the blocks had broken apart during insertion. One prosthesis could not be placed when planned in the 7 mm group vs. three prostheses in the augmented group, because of early failure of one implant in each patient. Four complications (wound dehiscence) occurred during graft healing in the augmented group vs. none in the 7 mm group. No complications occurred after implant placement. These differences were not statistically significant. One year after loading, patients of both groups lost an average of 1 mm of peri-implant bone. There no statistically significant differences in bone loss between groups.

**CONCLUSIONS:**

When residual bone height over the mandibular canal is between 7 and 8 mm, 7 mm short implants might be a preferable choice than vertical augmentation, reducing the chair time, expenses and morbidity. These 1-year preliminary results need to be confirmed by follow-up of at least 5 years.

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Short dental implants as a treatment option: results from an observational study in a single private practice.

Arlin ML.


PURPOSE:

The purpose was to evaluate clinical outcome of short (6- and 8-mm) dental implants placed in sites with low bone availability (7 to 11 mm) in a single private practice and to compare their survival with that of longer implants.

MATERIALS AND METHODS:

Implants were placed by a single private practitioner in a variety of clinical indications. Exclusion criteria included uncontrolled diabetes mellitus, alcoholism, and systemic immune disorders. Clinical data relating to implant placement and follow-up appointments, including adverse events, were entered into an electronic database. Two-year survival rates were calculated and life table analyses undertaken for implants measuring 6, 8, and 10 to 16 mm.

RESULTS:

A total of 630 Straumann implants were placed in 264 patients between April 1994 and December 2003. Of these, 35 implants were 6 mm long, 141 were 8 mm long, and 454 were 10 to 16 mm long. Maximum follow-up was 64.6 months, 83.7 months, and 102 months for implants measuring 6 mm, 8 mm, and 10 to 16 mm, respectively. Two-year survival rates were 94.3%, 99.3%, and 97.4% for 6-mm, 8-mm, and 10- to 16-mm implants, respectively.

DISCUSSION:

The results indicated that the 2-year outcome for 6-mm and 8-mm implants was comparable to that for longer (10- to 16-mm) implants in this patient population.

CONCLUSION:

In this study, short (6- or 8-mm) implants were used with good reliability in patients with limited bone availability, without the need for ridge augmentation. Shorter implant length was not associated with reduced survival at 2 years, compared with longer implants.
State of the Art of Short Dental Implants: A Systematic Review of the Literature.

Neldam CA, Pinholt EM.


Background: Short implants (≤8 mm) are manufactured for use in atrophic regions of the jaws. As implant length in many studies has been proven to play a major role in implant survival it is indicated to evaluate survival of short implants in the present literature. Purpose: The purpose of this study was systematically to evaluate publications concerning short dental implants defined as an implant with a length of ≤8 mm installed in the maxilla or in the mandible with special reference to implant type, survival rate, location of implant site, and observation time. Materials and Methods: A Medline and a hand search were conducted to identify studies concerning short dental implants of length ≤8 mm published between 1992 and October 2009. The articles included in this study report data on implant length ≤8 mm, implant surface, registered region of installment, observation time, single tooth restorations, supporting overdentures, splinted implants, and implants used for prostheses. Results: The 27 included studies represent zero randomized clinical trial studies, 15 prospective nonrandomized, noncontrolled clinical trials, 11 retrospective nonrandomized, noncontrolled clinical trials, and one review. Data on 6-mm implants were few and most frequent represented was manufactured Straumann implants representing 441 out of 549 implants. Brånemark implants, 7 mm in length, comprised 1607 implants out of 1808. Straumann implants, 8 mm in length, comprised 2040 out of 2352 implants. Failures varied between 0 and 14.5%, 0 and 37.5% and 0 and 22.9% of the 6-, 7-, and 8-mm-long implants, respectively. Conclusion: Short implant length was not related to observation time, installment region, failures, and dropouts were not specified, subsequently a meta-analysis was not possible to perform.

Guided bone regeneration around non-submerged implants in narrow alveolar ridges: a prospective long-term clinical study.

De Boever AL, De Boever JA.

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.

The impact of loads on standard diameter, small diameter and mini implants: a comparative laboratory study.

Allum SR, Tomlinson RA, Joshi R.


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.

Radiographic Evaluation of Narrow Diameter Implants after 5 years of clinical function: a Retrospective Study.

Geckili O, Mumcu E, Bilhan H.

J Oral Implantol. 2011 Feb 5. [Epub ahead of print]

The use of regular sized dental implants is generally recommended to ensure adequate bone to implant contact. However when the width of the edentulous crest is insufficient for the placement of a regular sized implant, the use of a narrow diameter implant (NDI) should be considered to prevent the use of invasive reconstruction techniques such as grafting procedures. The aim of the present study was to evaluate the survival and marginal bone levels of NDIs five years after prosthetic loading. One hundred and fifty-nine NDIs belonging to four brands (Straumann, Astra Tech, Biolok, Xive) in 71 patients were evaluated. Clinical and radiographic evaluations using digital panoramic radiography were carried out. Two implants failed and no progressive bone loss or periapical lesions were detected in the remaining 157 implants which brings an overall success rate of 98.74%. The mean marginal bone loss (MBL) was found as 1 mm on mesial and 0.98 mm on distal side of the implants. No statistically significant relationship was detected between patient age, gender, implant location, implant length, type of the prosthesis and MBL (P > 0.05). Among the 4 brands used, the MBL around Biolok implants were detected as the highest; but significantly higher than the MBL around only the Astra Tech implants (P < 0.05). The results of the present study indicated that NDIs can be a good solution for specific clinical situations where regular sized implants are not suitable.
The use of short, wide implants in posterior areas with reduced bone height: a retrospective investigation.

Griffin TJ, Cheung WS.

J Prosthet Dent. 2004 Aug;92(2):139-44.

Abstract

STATEMENT OF PROBLEM: Reduced bone height frequently presents a challenge for implant-assisted tooth replacement in partially edentulous patients. PURPOSE: This retrospective study evaluated the success rate of short, wide hydroxyapatite (HA)-coated implants placed in mandibular and maxillary molar areas with reduced bone height.

MATERIAL AND METHODS: A total of 168 HA-coated implants (6-mm diameter x 8-mm length) were placed in 167 patients in a private-practice setting. A minimal 6-mm workable ridge height and 8-mm ridge width was available in all situations. Patients were referred back to 1 of 7 referring restorative dentists for restoration of the implants. No attempt was made to standardize the restoration of the implants except to avoid working and nonworking contacts in lateral excursions. Implant success was evaluated according to the following criteria: (1) absence of complaints, (2) absence of recurring peri-implant infection or suppuration, (3) absence of perceptible implant mobility, and (4) absence of radiolucencies at implant-bone junction. The data were analyzed with descriptive statistics.

RESULTS: Fifty-four (32.1%), 35 (20.8%), 36 (21.4%), and 42 (25.0%) implants replaced maxillary first and second and mandibular first and second molars, respectively. There were 128 implant-supported single crowns. Thirty-eight implants served as abutments for fixed partial dentures connected to other implants of various sizes. Two implants were involved in cantilevered fixed partial dentures. Patients were followed for up to 68 months (mean=34.9 months) after loading of implants. The overall cumulative success rate was found to be 100%.

CONCLUSIONS: For residual ridges with minimal height but adequate width, the use of short, wide HA-coated implants may offer a simple and predictable treatment alternative in posterior areas.

Outcomes of placing short dental implants in the posterior mandible: a retrospective study of 124 cases.

Grant BT, Pancko FX, Kraut RA.


Abstract

PURPOSE: The purpose of this retrospective study was to determine the overall success of short dental implants (8 mm in length) placed in the partially or completely edentulous
posterior mandible restored with fixed and removable prostheses. PATIENTS AND METHODS: A total of 124 patients had 335 8-mm-long implants placed from May 2005 until June 2007. Of the 124 total patients, 35 were men and 89 were women, with a median age of 56 years and an age range of 18 to 80 years at the time of implant surgery. There were 112 patients who were partially edentulous and 12 who were completely edentulous. Of the patients, 32 had a single implant placed whereas the other 92 had multiple implants placed. One patient had the implants immediately provisionally loaded. All of the implants were restored by use of fixed prostheses. Of these fixed prostheses, 245 were splinted together whereas 75 were restored individually. RESULTS: A total of 335 short dental implants were placed in 124 patients. Of the 335 implants placed, 331 integrated successfully. In the 2 cases that failed, the sites were grafted with porous hydroxyapatite and platelet-rich plasma. The implants were replaced at 5 months after the initial failure in the first patient and at 7 months in the second patient. These replacement implants integrated and have been restored and in function for more than 16 months. There was 1 fracture of an implant with a restoration. The implant had been restored with an individually fabricated fixed restoration, with the fracture occurring at the head of the implant, requiring removal. The implant and restoration had been in function for 10 months before fracture. There were no other fractures of implants or restorative hardware noted in this study. The survival rate for 8-mm implants placed in the mandible was 99% from stage I surgery to a functional prosthesis for up to 2 years. CONCLUSIONS: Placement of short dental implants is a predictable treatment method for patients with decreased posterior mandibular bone height.

Short implants in maxillae and mandibles: a retrospective study with 1 to 8 years of follow-up.

Anitua E, Orive G.


Abstract

BACKGROUND: The aims of this study are to evaluate the long-term survival rates of short dental implants in posterior areas in both jaws and analyze the influence of different factors on implant survival.

METHODS: A retrospective cohort study design was used. Six hundred and sixty-one patients received 1,287 short implants (<8.5 mm) between 2001 to 2008 in Vitoria, Spain. All implant installations were performed by two experienced surgeons and rehabilitations were done by three prosthodontists. Each implant failure was carefully analyzed. The potential influence of demographic factors, clinical factors, surgery-depending factors, and prosthetic variables on implant survival was studied. Implant survival was analyzed using a life table analysis (Wilcoxon [Gehan] test).

RESULTS: The overall survival rates of short implants were 99.3% and 98.8% for the implant and subject-based analysis, respectively. The mean follow-up period for the implants was 47.9 +/- 24.46 months. A total of 9 out of 1,287 implants were lost during the observation period. None of the variables studied resulted in statistical association with implant failure because of the low number of failures.
CONCLUSION: Results of the present retrospective study show that treatment with short implants can be considered safe and predictable if used under strict clinical protocols.

**Short implants placed one-stage in maxillae and mandibles: a retrospective clinical study with 1 to 9 years of follow-up.**

Maló P, de Araújo Nobre M, Rangert B.


**Abstract**

**BACKGROUND:** The use of short implants (7-8.5 mm) has historically been associated with lower survival rates than for longer implants. However, recent clinical studies indicate that short implants may support most prosthetic restorations quite adequately, but still clinical documentation is sparse.

**PURPOSE:** The purpose of this study was to report on the placement of short Brånemark implants, testing the hypothesis that short implants in atrophied jaws might give similar long-term implant survival rates as longer implants used in larger bone volumes.

**MATERIALS AND METHODS:** This retrospective clinical study included 237 consecutively treated patients with 408 short Brånemark implants supporting 151 fixed prostheses. One hundred thirty-one of the implants were 7-mm long, and 277 were 8.5-mm long. Final abutments were delivered at the time of surgery, and final prostheses were delivered 4 to 6 months later.

**RESULTS:** One hundred and twenty six of the 7-mm implants (96%) have passed the 1-year follow-up; 110 (84%), the 2-year follow-up; and 88 (67%), the 5-year follow-up. Five implants failed in four patients before the 6-month follow-up, giving a cumulative survival rate of 96.2% at 5 years. The average bone resorption was 1 mm (SD=0.6 mm) after the first year and 1.8 mm (SD=0.8 mm) after the fifth year of function. Two hundred sixty nine of the 8.5-mm implants (97%) have passed the 1-year follow-up; 220 (79%), the 2-year follow-up; and 142 (51%), the 5-year follow-up. Eight implants failed in seven patients before the 6-month follow-up, giving a cumulative survival rate of 97.1% at 5 years. The average bone resorption was 1.3 mm (SD=0.8 mm) after the first year and 2.2 mm (SD=0.9 mm) after the fifth year of function.

**CONCLUSIONS:** The cumulative survival rates of 96.2 and 97.1% at 5 years for implants of 7.0- and 8.5-mm length, respectively, indicate that one-stage short Brånemark implants used in both jaws is a viable concept.

**Five-year clinical evaluation of short dental implants placed in posterior areas: a retrospective study.**

Anitua E, Orive G, Aguirre JJ, Andía I.

Abstract

BACKGROUND: The aims of this study were to evaluate the long-term survival rates of short dental implants in posterior areas and to analyze the influence of different factors on implant survival.

METHODS: A retrospective cohort study design was used. A total of 293 subjects received 532 short implants between 2001 and 2004. All implants were placed by two experienced surgeons, and rehabilitations were done by three prosthodontists. Each implant failure was analyzed carefully. The potential influence of demographic factors, clinical factors, surgery-dependent factors, and prosthetic variables on implant survival was studied. Implant survival was analyzed using a life-table analysis (Wilcoxon [Gehan] test).

RESULTS: The overall survival rates of short implants were 99.2% and 98.7% for the implant- and subject-based analyses, respectively. The mean follow-up period was 31 +/- 12.3 months. Two of 532 implants were lost during the observation period. None of the variables studied were statistically associated with implant failure.

CONCLUSION: Treatment with short implants can be considered safe and predictable if used under strict clinical protocols.

Short (8-mm) dental implants in the rehabilitation of partial and complete edentulism: a 3- to 14-year longitudinal study.


Romeo E, Ghisolfi M, Rozza R, Chiapasco M, Lops D.

Abstract

PURPOSE: This study aimed to evaluate the clinical effectiveness of different implant sizes (8- and 10-mm lengths with 3.75-, 4.1-, and 4.8-mm diameters) in diverse host bone sites in a selected sample of partially and completely edentulous patients.

MATERIALS AND METHODS: Over a 14-year period, 129 patients (68 women and 61 men) were consecutively treated with a fixed prosthesis (single or multiunit, screw or cement retained) supported by 265 different-sized implants (154 standard 10-mm; 111 shorter 8-mm). Two types of implants were used (141 titanium plasma-sprayed and 124 Sand-blasted, large-grit, acid-etched).

RESULTS: Dropouts were recorded for 23 patients with 23 prostheses supported by 42 implants. In the remaining 106 patients (223 implants), 8 implants failed (4 standard and 4 shorter), in type 3 or 4 bone. Mean marginal bone loss and gingival crevice probing depth associated with either implant length were statistically comparable (P > .05). The 14-year cumulative survival rates for all short and standard implants were 97.9% and 97.1%, respectively. Survival rates were 92.3% and 95.9% for titanium plasma-sprayed short and standard implants, respectively, and 100% and 98.5% for the Sand-blasted, large-grit, acid-etched short and standard implants, respectively. Six of the 8 lost implants required implant replacement after the host sites' healing period. The remaining 2 lost implants were managed by converting the distal unit of the fixed partial prosthesis to a cantilever.
CONCLUSION: Within the limits of the study design and observation period, a mix of implant sizes did not appear to compromise the effectiveness of implant therapy in this particular population group.

**Short implants in the severely resorbed maxilla: a 2-year retrospective clinical study.**

Renouard F, Nisand D.


Department of Periodontology, Paris VII University, Paris, France. frenouard@aol.com

**Abstract**

**BACKGROUND:** Although the predictability of endosseous dental implants is well documented, the restoration of the posterior region of the maxilla remains a challenge. The placement of short implants is one therapeutic option that reduces the need for augmentation therapy.

**PURPOSE:** The purpose of this retrospective study was to assess the survival rates of 6 to 8.5 mm-long implants in the severely resorbed maxilla following a surgical protocol for optimized initial implant stability.

**MATERIALS AND METHODS:** The study included 85 patients with 96 short (6-8.5 mm) implants (Brånemark System, Nobel Biocare AB, Göteborg, Sweden) supporting single-tooth and partial reconstructions. The implants had a machined (54) or an oxidized (TiUnite, Nobel Biocare AB) (42) surface. A one-stage surgical protocol with delayed loading was used. The patients were followed for at least 2 years after loading (average follow-up period 37.6 months). The marginal bone resorption was assessed by radiographic readings.

**RESULTS:** Five implants were lost during the first 9 months, and four implants were lost to follow-up. The cumulative survival rate was 94.6%. Four of the failed implants had a machined surface, and one had an oxidized surface. The mean marginal bone resorption after 2 years in function was 0.44 +/- 0.52 mm.

**CONCLUSION:** This study demonstrates that the use of short implants may be considered for prosthetic rehabilitation of the severely resorbed maxilla as an alternative to more complicated surgical techniques.

**The challenge of implant therapy in the posterior maxilla: providing a rationale for the use of short implants.**

Morand M, Irinakis T.


University of British Columbia, Vancouver, British Columbia, Canada.

**Abstract**
Rehabilitating patients with a resorbed maxilla presents several challenges when the desired treatment plan involves the placement of endosseous implants. Correct diagnosis requires knowledge on jaw healing patterns, systemic effects, and the impact of bone quality changes on implant success rates. Appropriate treatment planning requires an in-depth understanding of the materials and methods available to the contemporary implant surgeon. The clinician must be able to persist on evidence-based techniques and adhere to those proven methods. Successful surgical placement requires correct use of the available armamentarium and acceptance of the limitations that implant dentistry still presents. Especially challenging is the implant treatment of maxillary molars due to the plethora of complicating factors such as limited bone availability, interarch space challenges, sinus problems, etc. These are just a few of the factors that may lead us to placement of short implants in these sites. An extensive review of the literature that is available for short implants (implants < 10 mm in length) indicates that although they are commonly used in areas of the mouth under increased stress (posterior region), their success rates mimic those of longer implants when careful case selection criteria have been used. The available studies and case-series offer a valid rationale for placement of short implants so long as one understands the limitations, indications, risk factors, and limited studies that actually follow-up success rates of short implants for over 5 years. This review of the literature will provide the reader an in-depth view of the evidence in using short implants as an alternative treatment modality for the maxillary molar region.

Comparative clinical results after implant placement in the posterior maxilla with and without sinus augmentation.

Schlegel A, Hamel J, Wichmann M, Eitner S.


Friedrich-Alexander-University Erlangen-Nuremberg, Department of Oral and Maxillofacial Surgery, Erlangen, Germany.

Abstract

PURPOSE: The objective was to compare implants in the posterior maxilla with or without sinus floor augmentation.

MATERIALS AND METHODS: A retrospective study was conducted of patients who received implants in the posterior maxilla. All patients received solitary, implant-retained fixed partial dentures or crowns. A standardized form for implant treatment was used to document the follow-up examination. The different parameters were initially analyzed descriptively by frequency distribution, measure of central tendency, and statistical spread. A 95% level of significance was set for all tests.

RESULTS: A total of 76 patients with 141 dental implants in the posterior region of the maxilla were evaluated. Fifty-one patients with 71 implants received prior no augmentation (sinus floor elevation) and composed the control group. Twenty-five patients with 70 implants received an additional bone transfer prior to implant placement. The mean age of the patients at time of the follow-up examination was 49.7 years in the overall group, 52.6 years for men and 46.7 years for women. The implants inserted in an augmented area had similar
implant stability and implant loss results after a mean functional observation period of 1.6 years (range, 0.5 to 4.7 years) compared to those inserted without augmentation. Augmented implants exhibited less peri-implant bone resorption.

CONCLUSIONS: The outcomes for implants with augmentation were similar to those without augmentation.

Shorter implants in clinical practice: rationale and treatment results.
Fugazzotto PA.
progressiveperio@aol.com

Abstract
INTRODUCTION: The use of shorter implants offers a number of potential advantages if such utilization yields the same level of treatment success as the use of longer implants. The purpose of this retrospective study was to assess the survival of short implants in various clinical situations in function over time.

MATERIALS AND METHODS: A retrospective study was conducted of all patients treated between May 2000 and May 2007 who received endosseous implants that were less than 10 mm in length. Patient age, gender, location of implants, type of prosthesis, time in function, and stability of peri-implant crestal bone were assessed.

RESULTS: The retrospective analysis identified 2,073 implants of 6 mm, 7 mm, 8 mm, or 9 mm in length placed in a variety of clinical situations in 1,774 patients. Cumulative implant survival rates for implants in function in various areas of the mouth supporting single crowns or short-span fixed prostheses ranged from 98.1% to 99.7%. Each indication was examined with regard to individual success and failure rates and mean time in function.

CONCLUSIONS: When utilized appropriately, implants of 6 to 9 mm in length demonstrate cumulative survival rates under function comparable to those reported for longer implants.

Ultrashort sintered porous-surfaced dental implants used to replace posterior teeth.
Deporter D, Ogiso B, Sohn DS, Ruljancich K, Pharoah M.

discipline of periodontics, faculty of dentistry, university of toronto, toronto, on, canada.
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Abstract
BACKGROUND: This retrospective multicenter report provides data from a case series of partially edentulous subjects treated with an ultrashort (5-mm-long) sintered porous-surfaced (SPS) dental implant.

METHODS: The implant used had a tapered truncated cone shape, was 5-mm long, and had a maximal coronal diameter of 5 mm. Twenty-six implants were placed in 20 subjects to replace primarily maxillary and mandibular molar teeth. Submerged primary healing was used. Nine implants were restored with single crowns, one carried a single cantilever, and the remaining 16 implants were part of fixed implant-supported bridges, generally as the most distal abutment.

RESULTS: After functional periods of 1 to 8 years, two maxillary implants failed, giving maxillary and mandibular failure rates of 14.3% and 0%, respectively.

CONCLUSION: The results of this case series suggest that an SPS, press-fit, tapered dental implant with a length of 5 mm and a maximal coronal diameter of 5 mm should be investigated further as a solution for the management of highly resorbed posterior sites in partial edentulism, particularly in the mandible.


Zarone F, Sorrentino R, Vaccaro F, Russo S.


Department of Fixed Prosthodontics, University of Naples Federico II, Naples, Italy.
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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.

Cordaro L, Torsello F, Mirisola Di Torresanto V, Rossini C.


Department of Periodontology and Implant Dentistry, Eastman Dental Hospital, Rome, Italy. lucacordaro@usa.net

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.

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.

**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.

⇒ Artikel frei einsehbar auf der Internetseite des Journals (Archiv)

**Short implants--an analysis of longitudinal studies.**

das Neves FD, Fones D, Bernardes SR, do Prado CJ, Neto AJ.


**Abstract**

PURPOSE: The purpose of this study was to consider the therapeutic decision whether to use advanced surgery or short implants based on data concerning the use of these implants found in follow-up studies.

MATERIALS AND METHODS: The MEDLINE database was consulted for follow-up studies published between the years 1980 and 2004. For those studies that met the inclusion and exclusion criteria, data concerning the number of implants 7, 8.5, or 10 mm long placed and lost, the time at which the failure occurred, and related risk factors were gathered for 33 studies arranged in tables and subjected to analysis. The studies included 16,344 implant placements with 786 failures (4.8%). Implants were analyzed according to the time of failure (i.e., before or after prosthesis seating) and risk factors implicated in the failures.
RESULTS: The total rate of failures was 4.8%. Implants 3.75 mm wide and 7 mm long failed at a rate of 9.7%, compared to 6.3% for 3.75 x 10-mm implants. It was found that 54.9% of failures occurred before the prosthesis connection. Finally, 66.7% of all failures were attributed to poor bone quality, 45.4% to the location (maxilla or mandible), 27.2% to occlusal overload, 24.2% to location within the jaw, and 15.1% to infections (an implant could be associated with multiple risk factors).

DISCUSSION: The analysis revealed that among the risk factors, poor bone quality in association with short implants seemed to be relevant to failure. The use of implants 4 mm in diameter appeared to minimize failure in these situations. The 3.75 x 7-mm implant presented the highest failure rate (9.7%) of 1894 implants analyzed (excluding implant designs with higher failure rates but few total implants).

CONCLUSION: Short implants should be considered as an alternative to advanced bone augmentation surgeries, since surgeries can involve higher morbidity, require extended clinical periods, and involve higher costs to the patient.

Impact of implant length and diameter on survival rates.

Renouard F, Nisand D.

Abstract

INTRODUCTION: Despite the high success rates of endosseous oral implants, restrictions have been advocated to their placement with regard to the bone available in height and volume. The use of short or nonstandard-diameter implants could be one way to overcome this limitation.

MATERIAL AND METHODS: In order to explore the relationship between implant survival rates and their length and diameter, a Medline and a hand search was conducted covering the period 1990-2005. Papers were included which reported: (1) relevant data on implant length and diameter, (2) implant survival rates; either clearly indicated or calculable from data in the paper, (3) clearly defined criteria for implant failure, and in which (4) implants were placed in healed sites and (5) studies were in human subjects.

RESULTS: A total of 53 human studies fulfilled the inclusion criteria. Concerning implant length, a relatively high number of published studies (12) indicated an increased failure rate with short implants which was associated with operators’ learning curves, a routine surgical preparation (independent of the bone density), the use of machined-surfaced implants, and the placement in sites with poor bone density. Recent publications (22) reporting an adapted surgical preparation and the use of textured-surfaced implants have indicated survival rates of short implants comparable with those obtained with longer ones. Considering implant diameter, a few publications on wide-diameter implants have reported an increased failure rate, which was mainly associated with the operators’ learning curves, poor bone density, implant design and site preparation, and the use of a wide implant when primary stability had not been achieved with a standard-diameter implant. More recent publications with an adapted surgical preparation, new implant designs and adequate indications have demonstrated that implant survival rate and diameter have no relationship.
DISCUSSION: When surgical preparation is related to bone density, textured-surfaced implants are employed, operators’ surgical skills are developed, and indications for implant treatment duly considered, the survival rates for short and for wide-diameter implants has been found to be comparable with those obtained with longer implants and those of a standard diameter. The use of a short or wide implant may be considered in sites thought unfavourable for implant success, such as those associated with bone resorption or previous injury and trauma. While in these situations implant failure rates may be increased, outcomes should be compared with those associated with advanced surgical procedure such as bone grafting, sinus lifting, and the transposition of the alveolar nerve.

Interventions for replacing missing teeth: augmentation procedures of the maxillary sinus.


Abstract

BACKGROUND: Insufficient bone volume is a common problem encountered in the rehabilitation of the edentulous posterior maxillae with implant-supported prostheses. Bone volume is limited by the presence of the maxillary sinus together with loss of alveolar bone height. Sinus lift procedures increase bone volume by augmenting the sinus cavity with autogenous bone and/or commercially available biomaterials.

OBJECTIVES: To determine whether and when augmentation of the maxillary sinus are necessary and which are the most effective augmentation techniques for rehabilitating patients with implant-supported prostheses.

SEARCH STRATEGY: The Cochrane Oral Health Group's Trials Register, CENTRAL, MEDLINE and EMBASE were searched on 7th January 2010. Several dental journals were handsearched. The bibliographies of review articles were checked, and personal references were searched. More than 55 implant manufacturing companies were also contacted.

SELECTION CRITERIA: Randomised controlled trials (RCTs) of different techniques and materials for augmenting the maxillary sinus for rehabilitation with dental implants reporting the outcome of implant success/failure at least to abutment connection.

DATA COLLECTION AND ANALYSIS: Screening of eligible studies, assessment of the methodological quality of the trials and data extraction were conducted independently and in duplicate. Authors were contacted for any missing information. Results were expressed as random-effects models using mean differences for continuous outcomes and odds ratios for dichotomous outcomes with 95% confidence intervals. The statistical unit of the analysis was the patient.

MAIN RESULTS: Ten RCTs out of 29 met the inclusion criteria. One trial of 15 patients evaluated implants 5 mm long with 6 mm diameter as an alternative to sinus lift in bone with a residual height of 4 to 6 mm. Nine trials with 235 patients compared different sinus lift techniques; of these four trials (114 patients) evaluated the efficacy of platelet-rich plasma
(PRP). Due to the variety of techniques evaluated, meta-analysis was only possible of use of PRP for implant failure (two trials) and complications (three trials). No statistically significant difference was observed.

AUTHORS’ CONCLUSIONS: Conclusions are based on few small trials, with short follow-up, and judged to be at high risk of bias. Therefore conclusions should be viewed as preliminary and interpreted with great caution. It is still unclear when sinus lift procedures are needed. 5 mm short implants can be successfully loaded in maxillary bone with a residual height of 4 to 6 mm but their long-term prognosis is unknown. Elevating the sinus lining in presence of 1 to 5 mm of residual bone height without the addition of a bone graft may be sufficient to regenerate new bone to allow rehabilitation with implant-supported prostheses. Bone substitutes might be successfully used as replacements for autogenous bone. If the residual alveolar bone height is 3 to 6 mm a crestal approach to lift the sinus lining, to place 8 mm implants may lead to fewer complications than a lateral window approach, to place implants at least 10 mm long. There is no evidence that PRP treatment improves the clinical outcome of sinus lift procedures with autogenous bone or bone substitutes.

Bone augmentation versus 5-mm dental implants in posterior atrophic jaws. Four-month post-loading results from a randomised controlled clinical trial.
Felice P, Checci V, Pistilli R, Scarano A, Pellegrino G, Esposito M.

Abstract

PURPOSE: To evaluate whether short (5 mm) dental implants could be a suitable alternative to augmentation and placement of longer implants (10 mm) in posterior atrophic jaws.

MATERIALS AND METHODS: Thirty partially edentulous patients with bilateral posterior edentulism were included: 15 patients having 5 to 7 mm of residual crestal height above the mandibular canal, and 15 patients having 4 to 6 mm of residual crestal height below the maxillary sinus and bone thickness of at least 8 mm measured on a CT scan. The patients were randomised either to receive one to three submerged 5-mm-long Rescue implants (Megagen) or 10-mm-long implants placed in augmented bone according to a split-mouth design. Mandibles were augmented with interpositional anorganic bovine bone blocks (Bio-Oss) and maxillae with granular Bio-Oss placed through a lateral window under the lifted sinus membrane. Resorbable barriers were used to cover the grafted sites. Grafts were left to heal for 4 months before placing the implants using a submerged technique. Four months after implant placement, provisional reinforced acrylic prostheses were delivered and replaced 4 months later by definitive screw-retained metal-ceramic prostheses. Outcome measures were: prosthesis and implant failures, any complications, time needed to fully recover mental nerve function (only for mandibular implants) and patient preference assessed 1 month after loading. All patients were followed up to delivery of the final restorations (4 months after loading).

RESULTS: A systematic deviation from the research protocol occurred: the operator used another implant system (EZ Plus, Megagen) for implants 10 mm or longer with a diameter of 4 mm at the augmented sites. No patients dropped out. In 5 patients of the augmented group
(all mandibles), there was not enough height to place 10-mm-long implants as planned and shorter implants (7 and 8.5 mm) were used instead. In each group, one prosthesis could not be placed when planned because an implant was found to be mobile at abutment connection: one 5 mm maxillary implant and one 8.5 mm mandibular implant in the augmented group. Five complications occurred: two in the augmented group (one maxillary sinus perforation and one mandibular wound dehiscence after implant placement possibly associated with the failure of one implant) versus three maxillary sinus perforations in the 5-mm-long implant group. The difference was not statistically significant. No patient suffered from permanent disruption of alveolar inferior nerve function, however, significantly more patients had paraesthesia for up to 3 days in the augmented group. There was no statistically significant difference in patient preference with the majority of patients expressing no preference for which treatment they received, finding both of them acceptable.

**Short (6-mm) nonsubmerged dental implants: results of a Multicenter clinical trial of 1 to 7 years.**

ten Bruggenkate CM, Asikainen P, Foitzik C, Krekel G, Sutter F.


**Abstract**

Limited bone height restricts the use of long dental implants, so short implants may be selected in these situations. Recent reports on clinical results with short implants have been negative, however, and have suggested that indications for the use of these implants are limited. To verify these findings, a multicenter study of short ITI implants was carried out. In a 6-year period 253 short implants with a length of 6 mm were placed into 126 patients, who were followed up from 1 to 7 years. Altogether 7 implants were removed; 6 of these were located in the maxilla and 1 in the mandible. The quality of survival was comparable with the clinical results of longer implants from the same implant system. Although the clinical results of these short implants were favorable, it is recommended that they be used in combination with longer implants, especially when used in the less dense bone that is often seen in the maxilla.

**The use of short, wide implants in posterior areas with reduced bone height: a retrospective investigation.**

Griffin TJ, Cheung WS.

J Prosthet Dent. 2004 Aug;92(2):139-44.

**Abstract**

STATEMENT OF PROBLEM: Reduced bone height frequently presents a challenge for implant-assisted tooth replacement in partially edentulous patients. PURPOSE: This retrospective study evaluated the success rate of short, wide hydroxyapatite (HA)-coated implants placed in mandibular and maxillary molar areas with reduced bone height.
MATERIAL AND METHODS: A total of 168 HA-coated implants (6-mm diameter x 8-mm length) were placed in 167 patients in a private-practice setting. A minimal 6-mm workable ridge height and 8-mm ridge width was available in all situations. Patients were referred back to 1 of 7 referring restorative dentists for restoration of the implants. No attempt was made to standardize the restoration of the implants except to avoid working and nonworking contacts in lateral excursions. Implant success was evaluated according to the following criteria: (1) absence of complaints, (2) absence of recurring peri-implant infection or suppuration, (3) absence of perceptible implant mobility, and (4) absence of radiolucencies at implant-bone junction. The data were analyzed with descriptive statistics.

RESULTS: Fifty-four (32.1%), 35 (20.8%), 36 (21.4%), and 42 (25.0%) implants replaced maxillary first and second and mandibular first and second molars, respectively. There were 128 implant-supported single crowns. Thirty-eight implants served as abutments for fixed partial dentures connected to other implants of various sizes. Two implants were involved in cantilevered fixed partial dentures. Patients were followed for up to 68 months (mean=34.9 months) after loading of implants. The overall cumulative success rate was found to be 100%.

CONCLUSIONS: For residual ridges with minimal height but adequate width, the use of short, wide HA-coated implants may offer a simple and predictable treatment alternative in posterior areas.

Outcomes of placing short dental implants in the posterior mandible: a retrospective study of 124 cases.

Grant BT, Pancko FX, Kraut RA.


Abstract

PURPOSE: The purpose of this retrospective study was to determine the overall success of short dental implants (8 mm in length) placed in the partially or completely edentulous posterior mandible restored with fixed and removable prostheses. PATIENTS AND METHODS: A total of 124 patients had 335 8-mm-long implants placed from May 2005 until June 2007. Of the 124 total patients, 35 were men and 89 were women, with a median age of 56 years and an age range of 18 to 80 years at the time of implant surgery. There were 112 patients who were partially edentulous and 12 who were completely edentulous. Of the patients, 32 had a single implant placed whereas the other 92 had multiple implants placed. One patient had the implants immediately provisionally loaded. All of the implants were restored by use of fixed prostheses. Of these fixed prostheses, 245 were splinted together whereas 75 were restored individually. RESULTS: A total of 335 short dental implants were placed in 124 patients. Of the 335 implants placed, 331 integrated successfully. In the 2 cases that failed, the sites were grafted with porous hydroxyapatite and platelet-rich plasma. The implants were replaced at 5 months after the initial failure in the first patient and at 7 months in the second patient. These replacement implants integrated and have been restored and in function for more than 16 months. There was 1 fracture of an implant with a
restoration. The implant had been restored with an individually fabricated fixed restoration, with the fracture occurring at the head of the implant, requiring removal. The implant and restoration had been in function for 10 months before fracture. There were no other fractures of implants or restorative hardware noted in this study. The survival rate for 8-mm implants placed in the mandible was 99% from stage I surgery to a functional prosthesis for up to 2 years. CONCLUSIONS: Placement of short dental implants is a predictable treatment method for patients with decreased posterior mandibular bone height.

Short implants placed one-stage in maxillae and mandibles: a retrospective clinical study with 1 to 9 years of follow-up.

Maló P, de Araújo Nobre M, Rangert B.


Abstract

BACKGROUND: The use of short implants (7-8.5 mm) has historically been associated with lower survival rates than for longer implants. However, recent clinical studies indicate that short implants may support most prosthetic restorations quite adequately, but still clinical documentation is sparse.

PURPOSE: The purpose of this study was to report on the placement of short Brånemark implants, testing the hypothesis that short implants in atrophied jaws might give similar long-term implant survival rates as longer implants used in larger bone volumes.

MATERIALS AND METHODS: This retrospective clinical study included 237 consecutively treated patients with 408 short Brånemark implants supporting 151 fixed prostheses. One hundred thirty-one of the implants were 7-mm long, and 277 were 8.5-mm long. Final abutments were delivered at the time of surgery, and final prostheses were delivered 4 to 6 months later.

RESULTS: One hundred and twenty six of the 7-mm implants (96%) have passed the 1-year follow-up; 110 (84%), the 2-year follow-up; and 88 (67%), the 5-year follow-up. Five implants failed in four patients before the 6-month follow-up, giving a cumulative survival rate of 96.2% at 5 years. The average bone resorption was 1 mm (SD=0.6 mm) after the first year and 1.8 mm (SD=0.8 mm) after the fifth year of function. Two hundred sixty nine of the 8.5-mm implants (97%) have passed the 1-year follow-up; 220 (79%), the 2-year follow-up; and 142 (51%), the 5-year follow-up. Eight implants failed in seven patients before the 6-month follow-up, giving a cumulative survival rate of 97.1% at 5 years. The average bone resorption was 1.3 mm (SD=0.8 mm) after the first year and 2.2 mm (SD=0.9 mm) after the fifth year of function.

CONCLUSIONS: The cumulative survival rates of 96.2 and 97.1% at 5 years for implants of 7.0- and 8.5-mm length, respectively, indicate that one-stage short Brånemark implants used in both jaws is a viable concept.
**Short (8-mm) dental implants in the rehabilitation of partial and complete edentulism: a 3- to 14-year longitudinal study.**


Romeo E, Ghisolfi M, Rozza R, Chiapasco M, Lops D.

**Abstract**

PURPOSE: This study aimed to evaluate the clinical effectiveness of different implant sizes (8- and 10-mm lengths with 3.75-, 4.1-, and 4.8-mm diameters) in diverse host bone sites in a selected sample of partially and completely edentulous patients.

MATERIALS AND METHODS: Over a 14-year period, 129 patients (68 women and 61 men) were consecutively treated with a fixed prosthesis (single or multiunit, screw or cement retained) supported by 265 different-sized implants (154 standard 10-mm; 111 shorter 8-mm). Two types of implants were used (141 titanium plasma-sprayed and 124 Sand-blasted, large-grit, acid-etched).

RESULTS: Dropouts were recorded for 23 patients with 23 prostheses supported by 42 implants. In the remaining 106 patients (223 implants), 8 implants failed (4 standard and 4 shorter), in type 3 or 4 bone. Mean marginal bone loss and gingival crevice probing depth associated with either implant length were statistically comparable (P> .05). The 14-year cumulative survival rates for all short and standard implants were 97.9% and 97.1%, respectively. Survival rates were 92.3% and 95.9% for titanium plasma-sprayed short and standard implants, respectively, and 100% and 98.5% for the Sand-blasted, large-grit, acid-etched short and standard implants, respectively. Six of the 8 lost implants required implant replacement after the host sites' healing period. The remaining 2 lost implants were managed by converting the distal unit of the fixed partial prosthesis to a cantilever.

CONCLUSION: Within the limits of the study design and observation period, a mix of implant sizes did not appear to compromise the effectiveness of implant therapy in this particular population group.

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**Short implants in the severely resorbed maxilla: a 2-year retrospective clinical study.**

Renouard F, Nisand D.


Department of Periodontology, Paris VII University, Paris, France. frenouard@aol.com

**Abstract**

BACKGROUND: Although the predictability of endosseous dental implants is well documented, the restoration of the posterior region of the maxilla remains a challenge. The placement of short implants is one therapeutic option that reduces the need for augmentation therapy.
PURPOSE: The purpose of this retrospective study was to assess the survival rates of 6 to 8.5 mm-long implants in the severely resorbed maxilla following a surgical protocol for optimized initial implant stability.

MATERIALS AND METHODS: The study included 85 patients with 96 short (6-8.5 mm) implants (Brånemark System, Nobel Biocare AB, Göteborg, Sweden) supporting single-tooth and partial reconstructions. The implants had a machined (54) or an oxidized (TiUnite, Nobel Biocare AB) (42) surface. A one-stage surgical protocol with delayed loading was used. The patients were followed for at least 2 years after loading (average follow-up period 37.6 months). The marginal bone resorption was assessed by radiographic readings.

RESULTS: Five implants were lost during the first 9 months, and four implants were lost to follow-up. The cumulative survival rate was 94.6%. Four of the failed implants had a machined surface, and one had an oxidized surface. The mean marginal bone resorption after 2 years in function was 0.44 +/- 0.52 mm.

CONCLUSION: This study demonstrates that the use of short implants may be considered for prosthetic rehabilitation of the severely resorbed maxilla as an alternative to more complicated surgical techniques.

The challenge of implant therapy in the posterior maxilla: providing a rationale for the use of short implants.

Morand M, Irinakis T.


University of British Columbia, Vancouver, British Columbia, Canada.

Abstract

Rehabilitating patients with a resorbed maxilla presents several challenges when the desired treatment plan involves the placement of endosseous implants. Correct diagnosis requires knowledge on jaw healing patterns, systemic effects, and the impact of bone quality changes on implant success rates. Appropriate treatment planning requires an in-depth understanding of the materials and methods available to the contemporary implant surgeon. The clinician must be able to persist on evidence-based techniques and adhere to those proven methods. Successful surgical placement requires correct use of the available armamentarium and acceptance of the limitations that implant dentistry still presents. Especially challenging is the implant treatment of maxillary molars due to the plethora of complicating factors such as limited bone availability, interarch space challenges, sinus problems, etc. These are just a few of the factors that may lead us to placement of short implants in these sites. An extensive review of the literature that is available for short implants (implants < 10 mm in length) indicates that although they are commonly used in areas of the mouth under increased stress (posterior region), their success rates mimic those of longer implants when careful case selection criteria have been used. The available studies and case-series offer a valid rationale for placement of short implants so long as one understands the limitations, indications, risk factors, and limited studies that actually follow-up success rates of short implants for over 5 years. This review of the literature will provide the reader an in-depth view
of the evidence in using short implants as an alternative treatment modality for the maxillary molar region.

**Shorter implants in clinical practice: rationale and treatment results.**

Fugazzotto PA.


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**Abstract**

INTRODUCTION: The use of shorter implants offers a number of potential advantages if such utilization yields the same level of treatment success as the use of longer implants. The purpose of this retrospective study was to assess the survival of short implants in various clinical situations in function over time.

MATERIALS AND METHODS: A retrospective study was conducted of all patients treated between May 2000 and May 2007 who received endosseous implants that were less than 10 mm in length. Patient age, gender, location of implants, type of prosthesis, time in function, and stability of peri-implant crestal bone were assessed.

RESULTS: The retrospective analysis identified 2,073 implants of 6 mm, 7 mm, 8 mm, or 9 mm in length placed in a variety of clinical situations in 1,774 patients. Cumulative implant survival rates for implants in function in various areas of the mouth supporting single crowns or short-span fixed prostheses ranged from 98.1% to 99.7%. Each indication was examined with regard to individual success and failure rates and mean time in function.

CONCLUSIONS: When utilized appropriately, implants of 6 to 9 mm in length demonstrate cumulative survival rates under function comparable to those reported for longer implants.

**Ultrashort sintered porous-surfaced dental implants used to replace posterior teeth.**

Deporter D, Ogiso B, Sohn DS, Ruljancich K, Pharoah M.


Discipline of Periodontics, Faculty of Dentistry, University of Toronto, Toronto, ON, Canada. douglas.deporter@dentistry.utoronto.ca

**Abstract**

BACKGROUND: This retrospective multicenter report provides data from a case series of partially edentulous subjects treated with an ultrashort (5-mm-long) sintered porous-surfaced (SPS) dental implant.

METHODS: The implant used had a tapered truncated cone shape, was 5-mm long, and had a maximal coronal diameter of 5 mm. Twenty-six implants were placed in 20 subjects to
replace primarily maxillary and mandibular molar teeth. Submerged primary healing was used. Nine implants were restored with single crowns, one carried a single cantilever, and the remaining 16 implants were part of fixed implant-supported bridges, generally as the most distal abutment.

RESULTS: After functional periods of 1 to 8 years, two maxillary implants failed, giving maxillary and mandibular failure rates of 14.3% and 0%, respectively.

CONCLUSION: The results of this case series suggest that an SPS, press-fit, tapered dental implant with a length of 5 mm and a maximal coronal diameter of 5 mm should be investigated further as a solution for the management of highly resorbed posterior sites in partial edentulism, particularly in the mandible.

Mechanical and technical risks in implant therapy.

Salvi GE, Brägger U.


Department of Periodontology, School of Dental Medicine, University of Bern, Bern CH-3010, Switzerland.

Abstract

PURPOSE: To systematically appraise the impact of mechanical/technical risk factors on implant-supported reconstructions.

MATERIAL AND METHODS: A MEDLINE (PubMed) database search from 1966 to April 2008 was conducted. The search strategy was a combination of MeSH terms and the key words: design, dental implant(s), risk, prosthodontics, fixed prosthodontics, fixed partial denture(s), fixed dental prosthesis (FDP), fixed reconstruction(s), oral rehabilitation, bridge(s), removable partial denture(s), overdenture(s). Randomized controlled trials, controlled trials, and prospective and retrospective cohort studies with a mean follow-up of at least 4 years were included. The material evaluated in each study had to include cases with/without exposure to the risk factor.

RESULTS: From 3,568 articles, 111 were selected for full text analysis. Of the 111 articles, 33 were included for data extraction after grouping the outcomes into 10 risk factors: type of retentive elements supporting overdentures, presence of cantilever extension(s), cemented versus screw-retained FPDs, angled/angulated abutments, bruxism, crown/implant ratio, length of the superstructure, prosthetic materials, number of implants supporting an FDP, and history of mechanical/technical complications.

CONCLUSIONS: The absence of a metal framework in overdentures, the presence of cantilever extension(s) > 15 mm and of bruxism, the length of the reconstruction, and a history of repeated complications were associated with increased mechanical/technical complications. The type of retention, the presence of angled abutments, the crown-implant ratio, and the number of implants supporting an FDP were not associated with increased mechanical/technical complications. None of the mechanical/technical risk factors had an impact on implant survival and success rates.
A 10-year prospective study of ITI dental implants placed in the posterior region. II: Influence of the crown-to-implant ratio and different prosthetic treatment modalities on crestal bone loss.

Blanes RJ, Bernard JP, Blanes ZM, Belser UC.


Department of Fixed Prosthodontics and Occlusion, Geneva Dental School, Geneva, Switzerland.

Abstract

OBJECTIVE: To evaluate the influence of the crown-to-implant ratio (C/I) ratio and different implant prosthetic treatment modalities on crestal bone loss around dental implants placed in the posterior region.

MATERIAL AND METHODS: A total of 192 ITI dental implants were consecutively placed in premolars and molars of 83 partially edentulous patients. All implants were restored by means of ceramic-to-metal fused fixed partial dentures or a single crown. Patients were followed as part of a prospective longitudinal study focusing on implant success. Surgical, radiographic and clinical variables were collected at the 1-year recall after implant placement and at the most recent clinical evaluation. Radiographic parameters were evaluated on periapical radiographs taken with a standardized long-cone paralleling technique. Implant restorations were divided into three groups according to their respective clinical C/I ratios: (a) 0-0.99, (b) 1-1.99 and (c) >or=2.

RESULTS: The mean clinical C/I ratio was 1.77+/-0.56 mm. A total of 51 implants (26.5%) showed a clinical C/I ratio equal to or greater than 2. In this group, three implants failed, giving a cumulative survival rate of 94.1%. Crestal bone loss was -0.34+/-0.27 mm in group a, -0.03+/-0.15 mm in group b and -0.02+/-0.26 mm in group c. Differences among groups were statistically significant (P=0.009). Mode of retention, splinting or presence of cantilever extensions did not have an effect on crestal bone loss around ITI dental implants.

CONCLUSIONS: Implant restorations with C/I ratios between 2 and 3 may be successfully used in the posterior areas of the jaw.


Urdaneta RA, Rodriguez S, McNeil DC, Weed M, Chuang SK.


Abstract

Purpose: It has been proposed that increased crown heights lead to greater crestal stresses on dental implants, crestal bone loss, and other complications. The purpose of this study was to evaluate the effect of increased crown-to-implant ratio (C/IR) on single-tooth implants.
Materials and Methods: A retrospective cohort study was conducted between July 2001 and August 2003. The cohort was composed of patients who had at least one single-tooth Bicon implant restored with a cementless restoration and attended recall examinations in 2004, 2005, and 2007, during which several clinical and radiographic variables were documented. Descriptive statistics and univariate and multivariate mixed-effects regression models, adjusted for multiple implants in the same patient, were used. Results: The cohort was composed of 81 subjects who received 326 Bicon implants. The mean duration of follow-up was 70.7 months. Mean change in the mesiodistal crestal bone levels was -0.33 mm. The mean C/IR was 1.6 (range, 0.79 to 4.95). Forty implant restorations (16%) had a C/IR =/> 2. Implant restorations with increased C/IR were significantly more likely to have increased mesiodistal crown width, larger implant diameter, larger distance to mesial and distal adjacent structures, and deeper sulcular probings. Increased C/IR had a statistically significant effect in the loosening of maxillary anterior Integrated Abutment Crowns (Bicon) as well as a significant effect in the fracture of 2-mm-wide titanium abutment posts used to restore posterior areas. A C/IR up to 4.95 did not lead to an increased risk of crestal bone loss or to an increase in implant failures, crown failures, or crown fractures. Conclusion: Larger C/IR was associated with a significant increase in prosthetic complications but had no significant effect on crestal bone levels on single-tooth locking-taper implants.

Biomechanics/risk management (Working Group 2).

Sanz M, Naert I; Working Group 2.

Collaborators (10)


Abstract

INTRODUCTION: The remit of this workgroup was to update the existing knowledge base in biomechanical factors, navigation systems and medications that may affect the outcome of implant therapy.

MATERIAL AND METHODS: The literature was systematically searched and critically reviewed. Five manuscripts were produced in five specific topics identified as areas where innovative approaches have been developed in biomechanical factors, navigation systems and medications that may affect the outcome of implant therapy.

RESULTS: The results and conclusions of the review process are presented in the following papers, together with the group consensus statements, clinical implications and directions for future research: * To what extent do cantilevers affect survival and complications of implant supported restorations in partially dentate patients? * To what extent does the crown-implant ratio affect survival and complications of implant supported restorations? * A systematic review on the accuracy and the clinical outcome of computer-guided template based implant dentistry. * What is the impact of systemic bisphosphonates on patients undergoing oral implant therapy? * What is the impact of anticoagulants on patients undergoing oral implant therapy?
To what extent does the crown-implant ratio affect the survival and complications of implant-supported reconstructions? A systematic review.

Blanes RJ.


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Abstract

OBJECTIVE: To evaluate the occurrence of biological and technical complications with respect to the crown-implant (C/I) ratio of implant-supported reconstructions.

MATERIAL AND METHODS: Electronic (MEDLINE) and hand searches were conducted for longitudinal prospective studies with a follow-up period of at least 4 years. One reviewer performed screening and data abstraction. The following complications were evaluated: implant survival, peri-implant crestal bone loss, implant fracture, and technical complications related to implant components and suprastructure.

RESULTS: The search provided 41 articles and abstracts, seven of which were selected for full-text analysis. Only two articles were finally included. A qualitative data analysis revealed that the survival rate of implant-supported reconstructions with a C/I ratio of more than 2 was 94.1%. In addition, peri-implant crestal bone loss seemed not to be influenced by the C/I ratio of the implant rehabilitation, except in one study, which noted greater crestal bone loss with lower (<1) compared with higher (>2) C/I ratios. Technical complications related to implant components and suprastructure according to different C/I ratios were not found in any of the studies.

CONCLUSIONS: Despite the diversity among studies with respect to data collection and study design, the current literature shows that the C/I ratios of implant-supported reconstructions do not influence peri-implant crestal bone loss.

A 7-year life table analysis from a prospective study on ITI implants with special emphasis on the use of short implants. Results from a private practice.


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Abstract

This paper reports on a 7-year life table analysis on ITI titanium plasma-sprayed (TPS) and sandblasted and etched (SLA) implants placed in a private practice and loaded for at least 1 year. In 236 patients, 528 (264 TPS and 264 SLA) implants were placed, 351 (66.5%) implants rehabilitated the posterior region and 71.1% implants were < or =11 mm. In the
posterior mandible and maxilla, the mean implant length was 9.90 and 9.74 mm respectively. Implant length was determined through standard radiographs only. Increase of the number of implants or reduction of the width or length of the rehabilitations was no specifically sought for the shorter implants. One hundred and twenty-two SLA implants were loaded within 63 days. All early loaded SLA implants resisted the applied 35 N cm without rotation or pain. Three implants failed, one early and two late failures, all were SLA implants placed in the mandible. Shorter implants did not fail more than longer ones. The cumulative success rate was 99.40%. The predictable use of short implants supporting single crowns and small fixed partial dentures of 2-4 units supported by two to three implants permitted (1) restricting the need for sophisticated and expensive presurgical procedures aimed to determine precisely the available bone height by computerized radiographic methods, (2) the placement of prosthetically driven restoration instead os surgically driven ones, (3) reducing the indications span for complex invasive procedures like sinus lift and bone grafting procedures, (4) facilitating the surgery, without attempting to place the longest implant and (5) avoiding the occurrence of sensation disturbance. The safe use of short implants in a private practice should make implant therapy simpler and accessible to a higher number of patients and practitioners.

Short dental implants in posterior partial edentulism: a multicenter retrospective 6-year case series study.

Misch CE, Steigna J, Barboza E, Misch-Dietsh F, Cianciola LJ, Kazor C.

Abstract

BACKGROUND: Implants <10 mm long in the posterior regions of partial edentulous patients have a higher failure rate in many clinical reports. The purpose of this case series study was to evaluate implant survival when a biomechanical approach was used to decrease stress to the bone-implant interface.

METHODS: A retrospective evaluation of 273 consecutive posterior partially edentulous patients treated with 745 implants. 7 or 9 mm long, supporting 338 restorations over a 1- to 5-year period was reviewed from four private offices. Implant survival data were collected relative to stage I to stage II healing, stage II to prosthesis delivery, and prosthesis delivery to as long as 6 years follow-up. A biomechanical approach to decrease stress to the posterior implants included splinting implants together with no cantilever load, restoring the patient with a mutually protected or canine guidance occlusion, and selecting an implant designed to increase bone-implant contact surface area.

RESULTS: Of the 745 implants inserted, there were six surgical failures from stage I to stage II healing to prosthesis delivery. No implants failed after the 338 final implant prostheses were delivered. A 98.9% survival rate was obtained from stage I surgery to prosthetic follow-up.

CONCLUSIONS: Short-length implants may predictably be used to support fixed restorations in posterior partial edentulism. Methods to decrease biomechanical stress to the bone-implant interface appear appropriate for this treatment.
Early loading of single crowns supported by 6-mm-long implants with a moderately rough surface: a prospective 2-year follow-up cohort study.

Rossi F, Ricci E, Marchetti C, Lang NP, Botticelli D.


Abstract

AIM: To evaluate prospectively the clinical and radiographic outcomes after 2 years of loading of 6 mm long moderately rough implants supporting single crowns in the posterior regions.

MATERIAL AND METHODS: Forty SLActive Straumann short (6 mm) implants were placed in 35 consecutively treated patients. Nineteen implants, 4.1 mm in diameter, and 21 implants, 4.8 mm in diameter, were installed. Implants were loaded after 6 weeks of healing. Implant survival rate, marginal bone loss and resonance frequency analysis (RFA) were evaluated at different intervals. The clinical crown/implant ratio was also calculated.

RESULTS: Two out of 40 implants were lost before loading. Hence, the survival rate before loading was 95%. No further technical or biological complications were encountered during the 2-year follow-up. The mean marginal bone loss before loading was 0.34 +/- 0.38 mm. After loading, the mean marginal bone loss was 0.23 +/- 0.33 and 0.21 +/- 0.39 mm at the 1- and 2-year follow-ups. The RFA values increased between insertion (70.2 +/- 9) and the 6-week evaluation (74.8 +/- 6.1). The clinical crown/implant ratio increased with time from 1.5 at the delivery of the prosthesis to 1.8 after 2 years of loading.

CONCLUSION: Short implants (6 mm) with a moderately rough surface loaded early (after 6 weeks) during healing yielded high implant survival rates and moderate loss of bone after 2 years of loading. Longer observation periods are needed to draw more definite conclusions on the reliability of short implants supporting single crowns.

Implant survival to 36 months as related to length and diameter.

Winkler S, Morris HF, Ochi S.


Abstract

BACKGROUND: It is generally accepted that diameter and length of an endosseous dental implant and its stability at placement are critical factors in achieving and maintaining osseointegration. In the event of slight implant mobility at placement, the conventional or accepted treatment is to place a longer implant and/or one of wider diameter. This manuscript presents stability and survival/failure data for implants of different diameters and lengths following 36 months post-placement, as well as crestal bone loss data between placement and uncovering.
METHODS: A subset of the Dental Implant Clinical Research Group's database was used to study the 3-year survival and stability of various implant lengths (7 mm, 8 mm, 10 mm, 13 mm, and 16 mm) and diameters (3 mm+ and 4 mm+). Placement to uncovering crestal bone loss was also determined. The implants were generally representative of those available for clinical use (screws, basket, grooved, hydroxy-apatite-coated, CP-Ti, Ti-alloy). The study protocol specified that the implants be randomized to various jaw regions to accomplish the primary goals of the study—the comparison of each implant design's overall survival. A total of 2,917 implants were placed, restored, and followed. Data for all 3 mm to 3.9 mm diameter implants were pooled into a "3+" group, and the 4 mm to 4.9 mm diameter implants into a "4+" mm group. No attempt was made to look at the influence of any other variables on survival outcomes. The possible influence of clustering on survival was taken into consideration.

RESULTS: The 3+ mm group had a mean stability (PTV) of -3.8 (SD = 2.9), and the 4+ group had a mean PTV of -4.4 (SD = 2.7) (P < 0.05). The PTVs for implant lengths ranged from -2.9 (SD = 2.8) for 7 mm lengths to -3.9 (SD = 2.9) for 16 mm lengths (P < 0.05). Survival to 36 months was 90.7% for the 3+ diameter and 94.6% for the 4+ group (P = 0.01). Survival ranged from 66.7% for the 7 mm implants to 96.4% for 16 mm implants (P = 0.001). Outcomes did not change when clustering was considered, although the P value decreased slightly.

CONCLUSIONS: The results indicate that: 1) shorter implants had statistically lower survival rates as compared with longer implants; 2) 3+ mm diameter implants had a lower survival rate as compared with 4+ mm implants; 3) 3+ mm diameter implants are less stable (more positive PTVs) than 4+ mm implants; and 4) there was no significant difference in crestal bone loss for the two different implant diameters between placement and uncovering.

Biomechanical finite element analysis of small diameter and short dental implant.

Hasan I, Heinemann F, Aitlahrach M, Bourauel C.


Abstract

Abstract Short and mini dental implants have been widely used as treatment alternatives in certain selected clinical situations. However, a profound scientific analysis of the mechanical and biomechanical impact of the reduced length and diameter of these implant geometries has not been published until now. Using finite element analysis, a series of different experimentally designed short and mini implants have been analysed with regard to their load transfer to the alveolar bone and have been compared to respective standard commercial implants. Mini implants have been inserted in an idealised bone bed representing the anterior mandibular jaw region and loaded with a force of 150 N. An immediate loading condition was assumed and analysed using the contact analysis option of the FE package MSC.Marc/Mentat. Short implants were inserted in an idealised posterior bone segment and loaded in osseointegrated state with forces of 300 N. Clearly increased bone loading was observed for the short and mini dental implants compared with standard implants, clearly exceeding the physiological limit of 100 MPa. The determined
Biomechanical characteristics could explain the slightly increased failure rate of short and mini dental implants.

**Mini dental implants for long-term fixed and removable prosthetics: a retrospective analysis of 2514 implants placed over a five-year period.**

Shatkin TE, Shatkin S, Oppenheimer BD, Oppenheimer AJ.

Compend Contin Educ Dent. 2007 Feb;28(2):92-9; quiz 100-1.

**Abstract**

Over the past decade, endosseous implants of increasingly smaller diameters have been introduced into the field of dentistry. Small diameter implants (SDIs) are generally 2.75 mm to 3.3 mm in diameter. They are frequently used in cases of limited alveolar anatomy Mini dental implants (MDIs) are smaller than their SDI counterparts, with diameters ranging from 1.8 mm to 2.4 mm. They are suitable for long-term use—a task for which the device was approved by the Food and Drug Administration. The following study describes the authors' experience with MDIs under this indication. Over a 5-year period, 2514 MDIs were placed in 531 patients. The mean duration of follow-up was 2.9 years. The implants supported fixed (1278) and removable prostheses (1236), with nearly equal placement in the mandible and maxilla (1256 and 1258, respectively). The overall implant survival was 94.2%. Based on a Cox proportional hazards model, statistically significant predictors of failure include use in removable prostheses (hazard ratio = 4.28), the posterior maxilla (3.37), atrophic bone (3.32), and cigarette smokers (2.28). Implant failures (145) were attributed to mobility with or without suppuration (19% vs 81%, respectively). The mean failure time for these implants was approximately 6.4 months (193+/−42 days). This temporally correlates with the osseointegration period. A learning curve was established for this procedure, and implant survival improved with placement experience. Based on these results, the authors have devised treatment guidelines for the use of MDIs in long-term fixed and removable prostheses. MDIs are not a panacea; however, proper training enables the general dentist to successfully implement MDIs into clinical practice.

**Rehabilitation of posterior atrophic edentulous jaws: prostheses supported by 5 mm short implants or by longer implants in augmented bone? One-year results from a pilot randomised clinical trial**

Esposito, Marco / Pellegrino, Gerardo / Pistilli, Roberto / Felice, Pietro


**Purpose:** To evaluate whether 5 mm short dental implants could be an alternative to augmentation with anorganic bovine bone and placement of at least 10 mm long implants in posterior atrophic jaws.

**Materials and methods:** Fifteen patients with bilateral atrophic mandibles (5–7 mm bone height above the mandibular canal), and 15 patients with bilateral atrophic maxillae (4–6 mm bone height below the maxillary sinus) and bone thickness of at least 8 mm, were
randomised according to a splitmouth design to receive one to three 5 mm short implants or at least 10 mm long implants in augmented bone. Mandibles were vertically augmented with interpositional bone blocks and maxillary sinuses with particulated bone via a lateral window. Implants were placed after 4 months, submerged and loaded, after 4 months, with provisional prostheses. Four months later, definitive provisionally cemented prostheses were delivered. Outcome measures were: prosthesis and implant failures, any complication and peri-implant marginal bone level changes.

Results: In 5 augmented mandibles, the planned 10 mm long implants could not be placed and shorter implants (7 and 8.5 mm) had to be used instead. One year after loading no patient dropped out. Two long (8.5 mm in the mandible and 13 mm in the maxilla) implants and one 5 mm short maxillary implant failed. There were no statistically significant differences in failures or complications. Patients with short implants lost on average 1 mm of peri-implant bone and patients with longer implants lost 1.2 mm. This difference was statistically significant.

Conclusions: This pilot study suggests that 1 year after loading, 5 mm short implants achieve similar if not better results than longer implants placed in augmented bone. Short implants might be a preferable choice to bone augmentation since the treatment is faster, cheaper and associated with less morbidity, however their long-term prognosis is unknown.

A 10-year prospective study of ITI dental implants placed in the posterior region. II: Influence of the crown-to-implant ratio and different prosthetic treatment modalities on crestal bone loss.

Blanes RJ, Bernard JP, Blanes ZM, Belser UC.


Department of Fixed Prosthodontics and Occlusion, Geneva Dental School, Geneva, Switzerland.

Abstract

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a, -0.03±0.15 mm in group b and -0.02±0.26 mm in group c. Differences among groups were statistically significant (P=0.009). Mode of retention, splinting or presence of cantilever extensions did not have an effect on crestal bone loss around ITI dental implants.

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Clinical experience with one-stage, non-submerged dental implants.

Buser D, Mericske-Stern R, Dula K, Lang NP.


Abstract

This review article describes the scientific documentation of one-stage, non-submerged dental implants. In the past 25 years, numerous in vivo studies have demonstrated that non-
submerged titanium implants achieve osseointegration as predictable as that of submerged titanium implants. This observation was confirmed in prospective clinical studies, mostly done with the ITI Dental Implant System. ITI implants have been widely documented for up to 10 years of prospective follow-up at various centers. All studies showed success rates well above 90%. In summary, the non-submerged approach is a true alternative to the original healing modality with submerged titanium implants. The non-submerged approach offers several clinical advantages: (i) the avoidance of a second surgical procedure and less chair time per patient, resulting in overall reduced treatment cost; (ii) the lack of microgap at the bone crest level, leading to less crestal bone during healing and resulting in a more favorable crown-to-implant length ratio; and (iii) a simplified prosthetic procedure, presenting an ideal basis for cemented implant restorations. Due to these significant clinical advantages, the non-submerged approach will become more important in implant dentistry in the near future, particularly in implant sites without esthetic priority.

Artikel frei einsehbar unter: http://adr.sagepub.com/content/13/1/153.long

Therapy for Missing Lower Medial Incisor by Means of Reduced Diameter Implants.

Jurkovic R, Holly D, Siebert T, Strecha J.


Abstract

Abstract Authors describe application of Mini Dental Implants as one of the options in the case-study of a 25 year old patient with a missing right lower central incisor (#25). The tooth was lost after an extraction due to a periradicular process after a trauma 5 years ago. The patient wished to replace the missing space with an implant. During the five years he was trying to find a suitable therapy for the missing tooth but could not find any. He declined conventional prosthodontic treatment. The patient had the following problems/obstacles: reduced bone supply buccolingually after the periradicular process and as a result of a post-extraction physiological resorption, the intercoronal place supply was less than 4 mm and the soft tissue supply was reduced as well. Thus the question was whether a long-term, optimal success can be reached by using diameter reduced implants. After a thorough investigation and consideration of options, a 1.8 mm wide one-piece Mini Dental Implant made from a titanium alloy was decided for and inserted. The crown was made after 3 months by a direct method. At the time of writing this publication, the patient was 12 months after the full integration of the implant which was fully functional, esthetic and stable. X-ray image of the implant confirmed full integration into the bone, with no apparent crestal peri-implant bone resorption.