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.


Abstract

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.
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, Krekeler 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 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.

---

**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. 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 FDPs, angled/angulated abutments, bruxism, crown/implant ratio, length of the suprastructure, 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) >=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)


Department of Prosthetic Dentistry, Universidad Complutense de Madrid, Madrid, Spain.

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.


Private Practice, Clinica Pronova, Palma de Mallorca, Spain. rafael.blanes@clinicapronova.com

**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.


rabah.nedir@medicine.unige.ch

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 \(\leq\)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 of 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.

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

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


Department of Periodontology, Temple University, Philadelphia, PA, USA. info@misch.com

**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 split-mouth 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.