Dr. Ruben Davo Rodriguez – The zygoma quad concept

Bone augmentation procedures in implant dentistry.
Chiapasco M1, Casentini P, Zaninoni M.

@ Author information

Abstract
PURPOSE: This review evaluated (1) the success of different surgical techniques for the reconstruction of edentulous deficient alveolar ridges and (2) the survival/success rates of implants placed in the augmented areas.

MATERIALS AND METHODS: Clinical investigations published in English involving more than 10 consecutively treated patients and mean follow-up of at least 12 months after commencement of prosthetic loading were included. The following procedures were considered: onlay bone grafts, sinus floor elevation via a lateral approach, Le Fort I osteotomy with interpositional grafts, split ridge/ridge expansion techniques, and alveolar distraction osteogenesis. Full-text articles were identified using computerized and hand searches by key words. Success and related morbidity of augmentation procedures and survival/success rates of implants placed in the augmented sites were analyzed.

RESULTS AND CONCLUSION: A wide range of surgical procedures were identified. However, it was difficult to demonstrate that one surgical procedure offered better outcomes than another. Moreover, it is not yet known if some surgical procedures, eg, reconstruction of atrophic edentulous mandibles with onlay autogenous bone grafts or maxillary sinus grafting procedures in case of limited/moderate sinus pneumatization, improve long-term implant survival. Every surgical procedure presents advantages and disadvantages. Priority should be given to those procedures which are simpler and less invasive, involve less risk of complications, and reach their goals within the shortest time frame. The main limit encountered in this literature review was the overall poor methodological quality of the published articles. Larger well-designed long-term trials are needed.

Which hard tissue augmentation techniques are the most successful in furnishing bony support for implant placement?
Anthoas IO1, May PK

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Erratum in

Abstract
PURPOSE: A variety of techniques and materials have been used to establish the structural base of osseous tissue for supporting dental implants. The aim of this systematic review was to identify the most successful technique(s) to provide the necessary alveolar bone to place a dental implant and support long-term survival.

METHODS: A systematic online review of a main database and manual search of relevant articles from refereed journals were performed between 1980 and 2005. Updates and additions were made from September 2004 to May 2005. The hard tissue augmentation techniques were separated into 2 anatomic sites, the maxillary sinus and alveolar ridge. Within the alveolar ridge augmentation technique, different surgical approaches were identified and categorized, including guided bone regeneration (GBR), onlay/veneer grafting (OVG), combinations of onlay, veneer, interpositional inlay grafting (COG), distraction osteogenesis (DO), ridge splitting (RS), free and vascularized autografts for discontinuity defects (DD), mandibular interpositional grafting (MI), and socket preservation (SP). All identified articles were evaluated and screened by 2 independent reviewers to meet strict inclusion criteria. Articles meeting the inclusion criteria were further evaluated for data extraction. The initial search identified a total of 526 articles from the electronic database and manual search. Of these, 335 articles met the inclusion criteria after a review of the titles and abstracts. From the 335 articles, further review of the full text of the articles produced 90 articles that provided sufficient data for extraction and analysis.

RESULTS: For the maxillary sinus grafting (SG) technique, the results showed a total of 5,128 implants placed, with follow-up times ranging from 12 to 102 months. Implant survival was 92% for implants placed into autogenous and autogenous/composite grafts, 93.3% for implants placed into allogeneic/noneutogenous composite grafts, 81% for implants placed into alloplast and alloplast/xenograft materials, and 95.6% for implants placed into xenograft materials alone. For alveolar ridge augmentation, a total of 2,620 implants were placed, with follow-up ranging from 5 to 74 months. The implant survival rate was 95.5% for GBR, 90.4% for OVG, 94.7% for DD, and 93.6% for COG. Other techniques, such as DD, RS, SP, and MI, were difficult to analyze because of the small sample size and data heterogeneity within and across studies.

CONCLUSIONS: The maxillary sinus augmentation procedure has been well documented, and the long-term clinical success/survival (> 5 years) of implants placed, regardless of graft material(s) used, compares favorably to implants placed conventionally, with no grafting procedure, as reported in other systematic reviews. Alveolar ridge augmentation techniques do not have detailed documentation or long-term follow-up studies, with the exception of GBR. However, studies that met the inclusion criteria seemed to be comparable and yielded favorable results in supporting dental implants. The alveolar ridge augmentation procedures may be more technique- and operator-experience-sensitive, and implant survival may be a function of residual bone supporting the dental implant rather than grafted bone. More in-depth, long-term, multicenter studies are required to provide further insight into augmentation procedures to support dental implant survival.
Interventions for replacing missing teeth: horizontal and vertical bone augmentation techniques for dental implant treatment.

Esposito M, Stroffolini M, Falci P, Karatzopoulos G, Worthington HV, Coulthard P.

Abstract

BACKGROUND: Dental implants require sufficient bone to be adequately stabilised. For some patients implant treatment would not be an option without horizontal or vertical bone augmentation. A variety of materials and surgical techniques are available for bone augmentation.

OBJECTIVES: To test whether and when augmentation procedures are necessary and which is the most effective technique for horizontal and vertical bone augmentation.

SEARCH STRATEGY: The Cochrane Oral Health Group’s Trials Register, CENTRAL, MEDLINE and EMBASE were searched. 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. Last electronic search was conducted on 11 June 2008.

SELECTION CRITERIA: Randomised controlled trials (RCTs) of different techniques and materials for augmenting bone horizontally or vertically or both for implant treatment reporting the outcome of implant therapy at least to abutment connection. Trials were divided into two broad categories: horizontal augmentation and vertical augmentation techniques.

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 odd ratios for dichotomous outcomes with 95% confidence intervals. The statistical unit of the analysis was the patient.

MAIN RESULTS: Thirteen RCTs out of 18 potentially eligible trials were suitable for inclusion. Three RCTs (106 patients) dealt with horizontal and 10 trials (218 patients) with vertical augmentation. Since different techniques were evaluated in different trials, only one meta-analysis could be performed. When comparing whether vertical augmentation procedures are advantageous over short implants, a meta-analysis of two trials resulted in more implant failures odds ratio (OR) = 0.54 (95% confidence interval CI) 0.92 to 35.82; borderline significance, P = 0.06) and statistically more complications OR = 4.97 (95% CI 1.10 to 22.40) in the vertically augmented group. When comparing various horizontal augmentation techniques (three trials) no statistically significant differences were observed. When comparing various vertical bone augmentation techniques (eight trials) no statistically significant differences were observed with the exception of three trials which showed that more vertical bone gain could be obtained with osteodistraction than with inlay autogenous grafts (mean difference 3.25 mm; 95% CI 1.66 to 4.84), and with a bone substitute rather than autogenous bone in guided bone regeneration (mean difference 0.60 mm; 95% CI 0.21 to 0.99) in posterior atrophic mandibles, and that patients preferred a bone substitute block than a block of autogenous bone taken from the iliac crest (OR = 0.03, 95% CI 0.00 to 0.64; P = 0.02).

AUTHORS’ CONCLUSIONS: These conclusions are based on few trials including few patients, sometimes having short follow-up, and often being judged to be at high risk of bias. Various techniques can augment bone horizontally and vertically, but it is unclear which are the most efficient. Short implants appear to be a better alternative to vertical bone grafting of resorbed mandibles. Complications, especially for vertical augmentation, are common. Some bone substitutes could be a preferable alternative to autogenous bone. Osteodistraction osteogenesis allows for more vertical bone augmentation than other techniques which can be used on the other hand can allow for horizontal augmentation of the same time. Titanium screws may be preferable to resorbable screws to fixate onlay bone grafts.

Update of

Interventions for replacing missing teeth: bone augmentation techniques for dental implant treatment. [Cochrane Database Syst Rev. 2008]
Interventions for replacing missing teeth: augmentation procedures of the maxillary sinus.

Esposito M¹, Groswen MG, Rees J, Karagoulis D, Falace P, Alissa B, Worthington HV, Coulthard P.

Abstract

BACKGROUND: Insufficient bone volume is a common problem encountered in the rehabilitation of the edentulous posterior maxilla 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 biocomposites.

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 hand-searched. 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 6 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.

Immediate function with the zygomatic implant: a graftless solution for the patient with mild to advanced atrophy of the maxilla.

Bedrossian E¹, Rengert B, Stumpf L, Indresano T.

Abstract

PURPOSE: In many edentulous maxillae, posterior alveolar atrophy calls for bone grafting. Patient treatment acceptance is increased by eliminating grafting using tilted implants, especially the zygomatic implant in combination with immediate function. The purpose of this study was to evaluate a protocol for immediate function (within 2 hours) of 2 zygomatic and 4 standard implants (Nobel Biocare) supporting a fixed prosthesis in the completely edentulous maxilla.

MATERIALS AND METHODS: This clinical study included 14 patients with 83 immediately loaded implants (28 bilateral zygomatic and 55 premaxillary implants) supporting a complete maxillary denture converted to a fixed provisional prosthesis immediately following the surgical procedure. After 6 months of use, a new fixed metal-supported prosthesis was fabricated.

RESULTS: Fourteen patients treated with immediate loading of zygomatic implants were followed for at least 12 months. All patients reported minimalization of postoperative pain and security during speech, animation, and mastication. No failures occurred during the follow-up period.

DISCUSSION: The patients in the study could have been candidates for sinus grafting. With the present concept these patients benefited from a less invasive procedure (1 surgical procedure and no grafting) and immediate rehabilitation (prosthesis attached directly after surgery).

CONCLUSION: The high survival rate, increase in patients’ immediate functional ability, and reduction of morbidity following the surgical procedure render this procedure a viable treatment option for the completely edentulous maxilla.
Immediate function in the atrophic maxilla using zygoma implants: a preliminary study.

Davo R, Malaveve C, Rojas J.

Abstract

STatement of Problem: Oral rehabilitation of the edentulous atrophic maxilla to allow placement of a fixed dental prosthesis remains a challenge, especially if immediate function is provided.

Purpose: The aim of this retrospective, preliminary study was to evaluate, after a period of 6 to 29 months' follow-up of prosthetic loading, the survival rate of 38 immediately loaded zygomatic implants placed in 18 atrophied maxillae.

Material and Methods: Eighteen consecutive patients (6 men and 12 women), with an average age of 58 years (range of 44-74 years), were followed up to 29 months (average of 14 months). The clinical criteria included stability of the implants and the prosthesis, resonance frequency analysis (RFA), and evaluation of swelling, pain, or discomfort. Radiographic analysis was completed for conventional implants, but not for zygoma implants. All patients had a fixed prostheses screwed onto implants within 48 hours after implant placement. Descriptive statistics were used to analyze the data.

Results: No zygomatic implants were lost over the observation period. Survival rate was 100% over an average 14-month observation period. Three conventional implants were lost, resulting in a survival rate of 95.5%. All the provisional prostheses were stable, and no relevant complications were noted.

Conclusions: The use of zygoma implants, together with conventional implants, in severely resorbed maxillae, appears to be a reliable technique for providing immediate function to patients.


Immediately loaded zygomatic implants: a 5-year prospective study.

Davo R, Malaveve C, Pont D.

Abstract

Purpose: This prospective study was designed to assess the long-term outcome of immediately loaded zygomatic implants placed in atrophic maxillae.

Materials and Methods: Forty-two consecutively treated patients received 81 zygomatic implants and 140 conventional implants for oral rehabilitation and were followed for 5 years. Complete arch rehabilitation was accomplished in 37 patients and partial arch rehabilitation in 5 (one zygomatic implant in combination with two conventional implants). Outcome measures were prosthetic and implant failures, and complications.

Results: Twelve zygomatic and 22 conventional implants in 6 patients were not reviewed as patients were lost to follow-up. One zygomatic implant was removed at the 3-year follow-up visit because of lack of osseointegration and disturbances around the zygomatic region. The success rate of zygomatic implants was 98.5% (68/69). Six conventional implants were lost, with a success rate of 94.9% (112/118). One of the definitive prostheses was changed after 4 years of follow-up. Six complications occurred during the entire follow-up period.

Conclusions: The 5-year prognosis was found to be good for immediately loaded zygomatic implants together with conventional implants in severely resorbed maxillae.


Anatomic site evaluation of the zygomatic bone for dental implant placement.

Akenke E, Hahn M, Leil M, Wiffling J, Schultze-Mosgau S, Stech E, Radspieler-Tröger M, Neukam FW.

Abstract

Thirty human zygomatic bone specimens (15 females mean age 81.60 +/- 11.38 years, 15 males, mean age 78.47 +/- 6.58 years) were examined by quantitative computed tomography and histomorphometry. The aim of the study was to assess the bone mineral density, the trabecular bone volume and the trabecular bone pattern factor. Moreover, the anterior-posterior and the medio-lateral dimensions and the estimated implant length within the zygomatic bone were determined. For quantitative computed tomography, the specimens were scanned together with a bone mimicking anthropomorphic reference phantom. The bone mineral density was calculated for the specimens in the plane of the intended direction of the implant placement. Subsequently, with the sawing and grinding technique, the specimens were prepared in the same plane for histomorphometry. The trabecular bone mineral density was 366.95 +/- 168.80 mg/cm3 for the female and 398.94 +/- 99.11 mg/cm3 for the male specimens (P = 0.23). The male trabecular bone volume showed a value of 27.32 +/- 9.49%, while the female group reached a value of 19.99 +/- 7.60% (P = 0.23). The trabecular bone pattern factor was 1.2 x 10^-2 +/- 1.26 mm-1 for the male and 1.62 +/- 0.96 mm-1 for the female specimens (P = 0.05). The study revealed that the zygomatic bone consists of trabecular bone with parameters that are unfavourable for implant placement. However, the success of implants placed in the zygomatic bone is secured by the employment of at least four cortical portions.
Internal structure of zygomatic bone related to zygomatic fixture.

Kato Y, Kizu Y, Tonomi M, Ide Y, Yamane GY.

Abstract

PURPOSE: The purposes of this study were to investigate the internal structure of the edentulous zygomatic bone, which provides anchorage for the zygomatic fixture, using micro-computed tomography, and to examine the relation between the internal structure of the edentulous zygomatic bone and the zygomaticus fixture.

MATERIALS AND METHODS: Twenty-eight zygomatic bones of edentulous maxillae from cadavers were used. The mean age of cadaver specimens was 79.6 years. The specimens were analyzed using micro-computed tomography.

RESULTS: The internal structure of edentulous maxillae had thicker trabeculae in the region at the tip of the zygomaticus fixture than in other regions.

CONCLUSIONS: The present findings suggest that the presence of wider and thicker trabeculae at the end of the fixture promotes initial fixation. Also, when the trabeculae are able to support occlusal force after successful osseointegration, this thickening greatly aids the support of the fixture at the tip of the fixture, where stress is thought to be concentrated. In addition, the occlusal force was applied to the entire zygomatic bone. This preliminary study suggests that better understanding of the internal structure of the zygomatic bone will provide further information about the direction of installation of the zygomatic fixture, the ideal position of the zygomatic fixture, and the prognosis of implant therapy.

Accuracy of drilling guides for transfer from three-dimensional CT-based planning to placement of zygoma implants in human cadavers.


Abstract

The accuracy of surgical drilling guides was assessed for placement of zygoma implants. Six zygoma fixtures of length 45 mm (Nobel Biocare, Göteborg, Sweden) were placed in three formalin-fixed human cadavers using surgical drilling guides. The fabrication of these custom-made drilling guides was based on three-dimensional computed tomography (3D-CT) data for the maxillary-zygomatic complex. The installation of the implants was simulated preoperatively using an adopted 3D-CT planning system. In addition, anatomical measurements of the zygomatic bone were performed on the 3D images. The preoperative CT images were then matched with postoperative ones in order to assess the deviation between the planned and installed implants. The angle between the planned and actually placed implants was < 3 degrees in four out of six cases. The largest deviation found at the exit point of one of the six implants was 2.7 mm. The present study showed that the use of surgical drilling guides should be encouraged for zygoma implant placement because of the lengths of the implants involved and the anatomical intricacies of the region.

Zygoma fixture in the management of advanced atrophy of the maxilla: technique and long-term results.


Abstract

Despite refinements in surgical technique, including bone grafting and sophisticated prosthetic reconstructions, there are limitations to what can be achieved with bone-anchored fixed prostheses in patients with advanced atrophy of the maxillae. A new approach was suggested by a long-term study on onlay bone grafting and simultaneous placement of a fixture based on a new design, the zygoma fixture, and the aim of this study was to assess its potential. Twenty-eight consecutive patients with severely resorbed edentulous maxillae were included, 13 of whom had previously had multiple fixture surgery in the jawbone that had failed. A total of 52 zygoma fixtures and 106 conventional fixtures were installed. Bone grafting was deemed necessary in 17 patients. All patients were followed for at least five years, and nine for up to 10 years. All patients were followed up with clinical and radiographic examinations, and in some cases rhinoscopy and sinoscopy as well. Three zygoma fixtures failed; two at the time of connection of the abutment and the third after six years. Of the conventional fixtures placed at the time of the zygoma fixture, 29 (27%) were lost. The overall prosthetic rehabilitation rate was 96% after at least five years of function. There were no signs of inflammatory reaction in the surrounding alveolar mucosa. Four patients with recurrent sinusitis recovered after inferior dental antrostomy. To conclude, the zygoma fixture seems to be a valuable addition to our repertoire in the management of the compromised maxilla.
Zygomatic implants placed with a two-stage procedure: a 5-year retrospective study.

Davide R

Author information

Abstract

AIM: The zygomatic implant represents a non-grafting alternative for the oral rehabilitation of patients with extreme resorption of the maxilla. Nevertheless, there are few studies concerning their long-term prognosis. The purpose of this retrospective study was to evaluate the prosthetic rehabilitation success rate and the survival rates of machined surface zygomatic implants and conventional implants placed using a 2-stage protocol in 21 consecutively treated patients with atrophic maxillae after a 5-year follow-up period.

MATERIALS AND METHODS: A total of 24 consecutively treated patients (6 men, 18 women), with a mean age of 51.4 years (range 36 to 72 years) were included in this study. Rehaiblizations were accomplished in 22 edentulous arches, and two partially edentulous arches. In total, 45 zygomatic and 109 conventional implants were inserted. A total of 21 patients had a screw-retained fixed implant-supported prosthesis within 6 months of implant placement and three patients had an implant-supported overdenture. Outcome measures were survival rates of the prosthetic rehabilitations.

RESULTS: Three patients dropped out, two after 1 year and one after 3 years. Continuous stability of the prostheses was achieved in 20 out of the 21 patients throughout the study. Therefore, the success rate for the prosthetic rehabilitation after 5 years was 95.8%. One overdenture supported on two zygomatic implants was removed after 1 year of function. The patient is currently waiting for the installation of two more zygomatic implants or a grafting procedure. One zygomatic implant was lost giving a survival rate 97.4% after the 5-year follow-up period. A total of 11 conventional implants were lost, resulting in a survival rate of 89.9% after 5 years of follow-up. Sinusitis was observed in five patients throughout the study, which was solved with antibiotics, meatotomy, or Caldwell-Luc antrostomy with no further consequences.

CONCLUSIONS: Zygomatic implants together with conventional implants in the atrophic maxillae appear to have an acceptable 5-year clinical outcome.


The long-term use of zygomatic implants: a 10-year clinical and radiographic report.

Anaita C, Mannega C, Francisco K, Ouazzani W, Clarion F, Polau JM, Angenica A

Author information

Abstract

BACKGROUND: The zygoma implant has been an effective option in the short-term management of the atrophic edentulous maxilla. PURPOSE: To report on long-term outcomes in the rehabilitation of the atrophic maxilla using zygomatic (ZI) and regular implants (RI).

MATERIAL AND METHOD: Twenty consecutive zygomatic patients in a maintenance program were included. Cumulative survival rate (CSR) of ZI, RI, prostheses, and complications were recorded during at least 10 years of loading. Implant mobility was tested using Periotest®. Sinus health was radiographically and clinically assessed according to Lund-Mackay (L-M) score and Lanza and Kennedy survey, respectively. A satisfaction questionnaire and anatomical measurements were also performed.

RESULTS: Patients received 22 prostheses, anchored on 172 implants. Forty-one were ZI. Three RI failed (10 years CSR = 97.17%). Two ZI were partly removed due to paraimplant infection (10 years CSR = 96.12%). All patients maintained functional prostheses. One patient fractured framework twice. Loosening or fracturing screws happened in 11 patients. Seven patients fractured occlusal material. Four ZI abutments in two patients were disconnected because of uncomfortable prostheses. Alveolar height at the ZI head level on the right and left sides was 2.64 mm and 2.25 mm, respectively. Mean distance of ZI head center to ridge center, on the right and left sides was 4.54 mm and 5.67 mm, respectively. Mean Periotest values (PTv) of ZI were -4.375 PTv and -4.941 PTv before prostheses placement and after 10 years, respectively. Six patients experienced sinusitis 14-127 months postoperatively. 54.55% of the L-M scores did not present occlusion (L-M = 0) in any sinus. Osteoelastic obstruction happened in eight patients (two bilateral). Two (9.09%) were diagnosed with sinusitis. Eighty-four percent reported satisfaction levels above 80%. 31.81% reported maximum satisfaction score (100%).

CONCLUSIONS: The long-term rehabilitation of the severely atrophic maxillae using ZI is a predictable procedure.
Immediately loaded zygomatic implants: a 5-year prospective study.
Dario R¹, Malavez C, Pons O

Abstract
PURPOSE: This prospective study was designed to assess the long-term outcome of immediately loaded zygomatic implants placed in atrophic maxillae.

MATERIALS AND METHODS: Forty-two consecutively treated patients received 81 zygomatic implants and 140 conventional implants for oral rehabilitation and were followed for 5 years. Complete arch rehabilitation was accomplished in 37 patients and partial arch rehabilitation in 5 (one zygomatic implant in combination with two conventional implants). Outcome measures were prosthetic and implant failures, and complications.

RESULTS: Twelve zygomatic and 22 conventional implants in 6 patients were not reviewed as patients were lost to follow-up. One zygomatic implant was removed at the 3-year follow-up visit because of lack of osseointegration and disturbances around the zygomatic region. The success rate of zygomatic implants was 98.5% (68/69). Six conventional implants were lost, with a success rate of 94.9% (112/118). One of the definitive prostheses was changed after 4 years of follow-up. Six complications occurred during the entire follow-up period.

CONCLUSIONS: The 5-year prognosis was found to be good for immediately loaded zygomatic implants together with conventional implants in severely resorbed maxillae.

Rehabilitation of the edentulous maxilla with the zygoma concept: a 7-year prospective study.
Fanrossian E¹

Abstract
PURPOSE: The success of zygomatic implants following the two-stage, as well as the immediate loading, concept has been well documented. This graftless approach for the treatment of the completely edentulous resorbed maxilla allows for rehabilitation with an implant-supported fixed prosthesis. The purpose of this prospective study is to report on the 7-year follow-up of patients treated with zygomatic implants in conjunction with two to four anterior maxillary implants placed into immediate function and restored with a definitive fixed prosthesis.

MATERIALS AND METHODS: This prospective study involved 36 patients treated with 74 zygomatic implants and 98 anterior maxillary implants supporting fixed prostheses between 2003 and 2005.

RESULTS: Two zygomatic implants in two patients were identified as mobile at stage-two surgery. Replacement implants resulted in successful osseointegration. All anterior maxillary implants were determined as osseointegrated at stage two. Three patients experienced unilateral maxillary sinus infections that were refractory to oral antibiotics and were treated with functional endoscopic sinus surgery, which resolved the infections. All patients treated with the immediate loading concept were restored with definitive fixed prosthesis as planned.

CONCLUSION: The high survival rate, reduced morbidity, and high rate of patient acceptance for the zygomatic implant concept allowed the rehabilitation of the resorbed edentulous maxilla with fixed implant-supported prosthesis, rendering this procedure a viable and a predictable treatment option.
Interventions for replacing missing teeth: dental implants in zygomatic bone for the rehabilitation of the severely deficient edentulous maxilla.

Esposito M1, Worthington HV.

Abstract

BACKGROUND: Dental implants are used for replacing missing teeth. Placing dental implants is limited by the presence of adequate bone volume permitting their anchorage. Several bone augmentation procedures have been developed to solve this problem. Zygomatic implants are long screw-shaped implants developed as a partial or complete alternative to bone augmentation procedures for the severely atrophic maxilla. One to three zygomatic implants can be inserted through the posterior alveolar crest passing through the maxillary sinus, or externally to it, to engage the body of the zygomatic bone. A couple of conventional dental implants may also be needed in the frontal region of the maxilla to stabilise the prosthesis. The potential main advantages of zygomatic implants could be that bone grafting may not be needed and a fixed prosthesis could be fitted sooner. Another specific indication for zygomatic implants could be maxillary reconstruction after maxillectomy in cancer patients.

OBJECTIVES: To assess the effects of zygomatic implants with and without bone augmenting procedures in comparison with conventional dental implants in augmented bone for the rehabilitation with implant-supported prostheses of severely resorbed maxillae.

SEARCH METHODS: We searched the following electronic databases: the Cochrane Oral Health Group's Trials Register (to 17 June 2013), the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2013, Issue 5), MEDLINE via OVID (1946 to 17 June 2013) and EMBASE via OVID (1800 to 17 June 2013). Personal contacts and all known zygomatic implant manufacturers were contacted to identify unpublished trials. No restrictions were placed on the language or date of publication when searching the electronic databases.

SELECTION CRITERIA: Randomised controlled trials (RCTs) including participants with severely resorbed maxillae, who could not be rehabilitated with conventional dental implants, treated with zygomatic implants with and without bone grafts versus participants treated with bone augmentation procedures and conventional dental implants, with a follow-up of at least one year in function.

DATA COLLECTION AND ANALYSIS: Two review authors would have extracted data from eligible studies and assessed their risk of bias independently and in duplicate. The results of included studies were to be combined in meta-analyses using random-effects models where there were more than four studies, and fixed-effect models where there were less than four studies. We would have expressed the estimate of the intervention effect as mean difference for continuous outcomes and risk ratio for dichotomous outcomes, with 95% confidence intervals. Heterogeneity was to be investigated including both clinical and methodological factors.

MAIN RESULTS: We did not identify any RCTs which were eligible for inclusion in this review.

AUTHORS' CONCLUSIONS: There is a need for RCTs in this area to assess whether zygomatic implants offer some advantages over alternative bone augmentation techniques for treating atrophic maxillae.

Update of

Interventions for replacing missing teeth: dental implants in zygomatic bone for the rehabilitation of the severely deficient edentulous maxilla.
[Cochrane Database Syst Rev. 2005]

Clinical outcome of 42 patients treated with 81 immediately loaded zygomatic implants: a 12- to 42-month retrospective study.

Davies P1, Malaveiz C, Rojas J, Rodriguez J, Plegor J.

Abstract

AIM: Rehabilitation of the edentulous atrophic maxilla by implants to allow placement of a fixed dental prosthesis remains a challenge, especially if immediate function is provided. The aim of this retrospective study was to evaluate the success rate of immediately loaded zygomatic implants placed in atrophic maxillae.

MATERIALS AND METHODS: Forty-two consecutively treated patients (19 men and 23 women), with a mean age of 57 years (range: 34 to 79 years) were followed for at least one year (range: 12 to 42 months; mean: 26.5 months). Thirty-seven patients were totally edentulous and five were partially edentulous. In total, 81 zygomatic and 140 conventional implants were inserted. The success criteria for the zygomatic implants were: (1) confirmed individual implant anchorage to the zygomatic bone by means of anteroposterior cranial radiograph; (2) the implant acting as an anchor for the functional prosthesis; (3) no suppuration, pain, or ongoing pathological process at maxillary and zygomatic level; (4) confirmed individual implant stability. All patients had a fixed prosthesis screwed onto implants within 48 hours of implant placement. Descriptive statistics were used to analyse the data.

RESULTS: After one year, there was no patient drop-out. None of the zygomatic implants were lost over the observation period (100% success rate). Four conventional implants were lost, resulting in a success rate of 97%. All the prostheses were stable. Oroantral fistula and sinusitis was found in one patient, which was solved with antibiotics and mastectomy, with no further complications. Soft tissue swelling and pain at the zygomatic area were found in another patient after 10 days of surgery. This was solved with antibiotics, with no further complications.

CONCLUSIONS: Zygomatic implants together with conventional implants in severely resorbed maxillae appear to be a reliable technique for providing immediate function to patients. The time of treatment can be substantially decreased in a predictable way if zygomatic implants are loaded immediately after placement.
A new approach to rehabilitate the severely atrophic maxilla using extramaxillary anchored implants in immediate function: a pilot study.

Matth P1, Nobie M, Wolfe I

Abstract

STATEMENT OF PROBLEM: There is a need to simplify implant treatment for complete arch rehabilitation of severely atrophic maxillae, as well as a desire to eliminate grafting and provide quality rehabilitation in terms of aesthetics, function, and comfort for the patient.

PURPOSE: The purpose of this study was to report on the initial results of rehabilitation of complete edentulous atrophied maxillae using a new surgical approach and a newly designed extra long implant, placed externally to the maxillary bone (implant only accommodated in the maxillary bone) and anchored in the zygomatic bone.

MATERIAL AND METHODS: The pilot study included 20 patients (21 women and 8 men), with an age range of 22-76 years (mean=52.4 years), followed between 6 and 16 months, with a mean follow-up time of 1 year. The patients presenting severe atrophy in the maxillae (Cawood and Howell classification C-VII and D-V or D-VI) were rehabilitated either by using 1-2 or 4 extra long implants (30 to 50 mm in length; Nobel Biocare AB) placed in the zygomatic bone in conjunction with standard implants (24 patients) or 4 extra long implants (5 patients), all placed in immediate function. The criteria used to evaluate implant outcome were: implants function as support for reconstruction; implants stable when individually and manually tested; no signs of infection observed; and good esthetic outcome of the rehabilitation. To evaluate the secondary objective of assessing the stability and health of the soft tissue covering the implants, the mucosal seal efficacy evaluation index (MSEE) was used. This index was modified from the probing depth for standard implants and performed with a 0.25-N calibrated plastic periodontal probe measuring the depth (mm) of the space between the implant and the mucosa. Data were analyzed with descriptive and inferential analyses.

RESULTS: The cumulative implant survival rate and prosthetic survival rate at 1 year were 98.6% and 100%, respectively. The mean and median values of the MSEE at 2 months (2.9 mm, 3 mm), 4 months (2.5 mm, 2.6 mm), 6 months (2.9 mm, 2.8 mm), and 1 year (2.8 mm, 2.5 mm) are comparable to the values of probing depths assessed for standard implants.

CONCLUSIONS: The results indicate that, within the limitations of this preliminary study, the rehabilitation of maxillae with severe atrophy can be performed using extra long implants placed external to the maxilla and anchored only in the zygomatic bone, and placed in immediate function.

Extramusosal zygomatic implants: three year experience from a new surgical approach for patients with pronounced buccal concavities in the edentulous maxilla.

Aparicio C1, Gassani W, Aparicio A, Fortes V, Muela R, Passioli A, Codina M, Berjuega N, Marte C, Franch M

Abstract

BACKGROUND: The surgical protocol for zygomatic fixtures prescribes an intramusosal approach ideally maintaining the sinus membrane intact and the implant body inside the sinus while gaining access to the zygomatic bone. In the presence of pronounced buccal concavity, the implant head has to be placed far from the alveolar crest and in a palatal direction, which results in a bulky bridge construction.

PURPOSE: The aim of this study was to report on the preliminary experiences with zygomatic implants placed with an extramusosal approach in order to place the implant head emerging at or near the top of the alveolar crest.

MATERIALS AND METHODS: Twenty consecutive patients with pronounced buccal concavities in the edentulous posterior maxilla were treated with 104 regular and 36 zygomatic implants as support of fixed dental bridges. Sixteen patients were treated bilaterally and four patients were treated unilaterally. The zygomatic implants were inserted by using an extramusosal surgical approach with the implant body passing from the alveolar crest through the buccal concavity into the zygomatic bone. This enabled placement of the implant head at or close to the alveolar crest. The patients were followed for 36 to 48 months after occlusal loadings with a mean follow-up of 41 months. The relation of the zygomatic implants to the crest was measured and compared with a control group of 20 patients treated with conventional placement of zygomatic implants.

RESULTS: No implants were lost during the study period. No pain, discomfort, or complications related to the extramusosal path of the zygomatic implants were recorded after the initial healing period and up to the 36-month checkup. The zygomatic implants emerged, on average, 3.6 mm (SD 2.6) palatal to the top of the crest compared with 11.2 mm (SD 5.3) to the conventional technique.

CONCLUSION: The present 3-year clinical study shows that an extramusosal approach can be utilized when placing zygomatic implants in patients with pronounced buccal concavities in the posterior maxilla. Moreover, the technique results in an emergence of the zygomatic fixture close to the top of the crest, which is beneficial from a cleaning and patient-comfort point of view.
A new method to eliminate the risk of maxillary sinusitis with zygomatic implants.

Chow J1, Wat E, Hui E, Lee P, Liu W

Abstract

PURPOSE: A new approach for zygomatic implant placement was proposed to eliminate the risk of maxillary sinusitis related to the procedure.

MATERIALS AND METHODS: A prospective study of this new approach was conducted, and consecutive patients treated between June 2007 and December 2008 were included. An extended sinus lift with retained bone window was performed, such that zygomatic implants were placed completely outside the displaced maxillary sinus. All patients were followed up radiologically at regular intervals using cone beam computed tomography to evaluate the status of the zygomatic implants and the condition of the maxillary sinuses.

RESULTS: Sixteen patients (9 women and 7 men with a mean age of 50) were treated with 37 zygomatic implants. Within the period of investigation from 6 months to 24 months, there were no failed zygomatic implants, and no instances of maxillary sinusitis were reported.

CONCLUSIONS: The new approach that combined the zygomatic implant placement with the extended sinus lift procedure was predictable and fulfilled the purpose of lowering the risk of maxillary sinusitis.

Restoration of the edentulous maxilla using extrasinus zygomatic implants combined with anterior conventional implants: a retrospective study.

Moriño-Máñez RM1, Coppée A, Dias Rezende RC, de Mayo T

Abstract

PURPOSE: To report on the clinical outcome of 150 extrasinus zygomatic implants placed lateral to the maxillary sinus and combined with conventional implants in the anterior maxilla for implant-supported rehabilitation of the edentulous maxilla.

MATERIALS AND METHODS: All patients included in this study, presented with completely or partially edentulous maxillae with any remaining teeth indicated for extraction. Indications for extractions in partially edentulous patients included longitudinal fractures, periodontal disease, endodontic failure, perforated roots, and prosthetic convenience. All patients showed severe resorption of the posterior maxilla. Each patient was treated with at least four implants, with a minimum of one zygomatic implant. No bone grafting was performed. The zygomatic implants were placed outside the sinus, lateral to the maxillary sinus. The patients were followed with standardized clinical and radiographic examinations.

RESULTS: Seventy-five patients with severely atrophic maxillae (mean age, 52 years) were treated between 2003 and 2006. In all, 436 implants (150 zygomatic implants and 286 conventional implants) were placed. Two conventional implants failed during the study period, and two zygomatic implants were removed. All the prostheses were successful. No patients presented sinusitis. No loosened or fractured screws on any implants were recorded.

CONCLUSION: Extrasinus zygomatic implants, when combined with conventional implants in the anterior maxilla, represent a predictable treatment option for the atrophic edentulous maxilla. Further studies are necessary to evaluate the long-term prognosis of these implants.

A proposed classification for zygomatic implant patient based on the zygoma anatomy guided approach (ZAGA): a cross-sectional survey.

Aparicio C1

Abstract

PURPOSE: The aim of the present cross-sectional study was to propose a classification system based on a cross-sectional survey of zygomatic implant cases.

MATERIALS AND METHODS: Cone beam computerised tomography (CBCT) preoperative images and clinical intra-surgery photographs of 200 sites corresponding to 100 patients, treated with a total of 198 zygomatic implants in the maxilla according to an anatomy-driven prosthesis approach, were reviewed with regard to anatomy and pathway of the zygomatic implant body. The patients were consecutively selected independently of the type of surgery performed, with the unique requirement of a post-surgical CBCT performed at the moment of selection. Of special interest was the morphology of the lateral sinus wall, residual alveolar crest and the zygomatic buttress. An attempt was made to divide the patients into groups, describing typical anatomies and implant pathways.

RESULTS: Five basic skeletal forms of the zygomatic buttress-alveolar crest complex and subsequent implant pathways could be identified in a sample of 100 patients. Out of them, 62% were female and 38% male, with ages varying between 36 and 83 years (mean age 59.6, SD: 9.67). The five groups were classified as ZAGA 0 to 4 representing 15%, 49%, 20.5%, 9% and 6.5% of the studied sites, respectively. Intra-individual anatomical differences affecting the zygomatic buttress-alveolar crest complex was also found in 58% of the patients.

CONCLUSIONS: Five typical anatomical and implant pathway situations could be identified. A classification system comprising five groups named ZAGA 0 to 4 is proposed. Anatomical intra-individual differences were also found in 58% of the studied population. It is believed that the proposed classification system is useful for categorising zygomatic implant cases for therapy planning and for scientific follow-up purposes.
Immediately loaded zygomatic implants: a 5-year prospective study.
Davó P1, Mateuez C, Font O.

Abstract
PURPOSE: This prospective study was designed to assess the long-term outcome of immediately loaded zygomatic implants placed in atrophic maxillae.

MATERIALS AND METHODS: Forty-two consecutively treated patients received 81 zygomatic implants and 140 conventional implants for oral rehabilitation and were followed for 5 years. Complete arch rehabilitation was accomplished in 37 patients and partial arch rehabilitation in 5 (one zygomatic implant in combination with two conventional implants). Outcome measures were prosthetic and implant failures, and complications.

RESULTS: Twelve zygomatic and 22 conventional implants in 6 patients were not reviewed as patients were lost to follow-up. One zygomatic implant was removed at the 3-year follow-up visit because of lack of osseointegration and disturbances around the zygomatic region. The success rate of zygomatic implants was 98.5% (65/66). Six conventional implants were lost, with a success rate of 94.5% (112/116). One of the definitive prostheses was changed after 4 years of follow-up. Six complications occurred during the entire follow-up period.

CONCLUSIONS: The 5-year prognosis was found to be good for immediately loaded zygomatic implants together with conventional implants in severely resorbed maxillae.


Extramaxillary surgical technique: clinical outcome of 352 patients rehabilitated with 747 zygomatic implants with a follow-up between 6 months and 7 years.
Melo P1, de Araújo Neto M, Lopes A, Ferro A, Nass G.

Abstract
BACKGROUND: The use of zygomatic implants inserted in immediate function through the extramaxillary technique needs validation.

PURPOSE: To report the outcome of rehabilitating 352 patients with complete edentulous atrophic maxillae using 747 zygomatic implants in immediate function inserted through the extramaxillary technique.

MATERIALS AND METHODS: Three hundred-fifty-two consecutive edentulous patients with atrophic maxillae were rehabilitated between 2006 and 2012 with 747 zygomatic implants and 755 conventional implants. Implant and prosthetic cumulative survival and success rates were estimated through Kaplan-Meier product limit estimator. Biological and prosthetic complications were recorded after 10 days, 2, 4, and 6 months, and thereafter every 6 months.

RESULTS: Forty-three patients (12.2%) dropped out; one patient lost the prosthesis (cumulative survival rate = 99.7%), and four patients lost 7 zygomatic implants, rendering an estimated cumulative survival rate of 98.2% (Kaplan-Meier). Ten patients lost 17 conventional implants (patient-specific and implant-specific cumulative survival rates of 96.7% and 97.9%, respectively). Biological complications were observed in 80 patients (22.7%) and resolved in the majority of situations, rendering an estimated cumulative success rate of 94.4% at 7 years for zygomatic implants (Kaplan-Meier). Mechanical complications occurred in 156 patients (44%), with one-third of these complications occurring in patients diagnosed with bruxism before the rehabilitation.

CONCLUSIONS: The rehabilitation of atrophic maxillae with zygomatic implants inserted through the extramaxillary technique in immediate function, alone or in combination with standard implants, is a viable procedure. Until the biomechanical aspects are more predictable and also because of the complexity of the surgical technique, this rehabilitation approach is not ready for every implant clinician to begin using in practice, and prior special training is recommended.
Zygomatic implants placed with a two-stage procedure: a 5-year retrospective study.

Davó R.1

Author Information

Abstract
AIM: The zygomatic implant represents a non-grafting alternative for the oral rehabilitation of patients with extreme resorption of the maxilla. Nevertheless, there are few studies concerning their long-term prognosis. The purpose of this retrospective study was to evaluate the prosthetic rehabilitation success rate and the survival rates of machined surface zygomatic implants and conventional implants placed using a 2-stage protocol in 21 consecutively treated patients with atrophic maxillae after a 5-year follow-up period.

MATERIALS AND METHODS: A total of 24 consecutively treated patients (8 men, 16 women), with a mean age of 51.4 years (range 36 to 72 years) were included in this study. Rehabilitation were accomplished in 22 edentulous arches, and two partially edentulous arches. In total, 45 zygomatic and 109 conventional implants were inserted. A total of 21 patients had a screw-retained fixed implant-supported prosthesis within 6 months of implant placement and three patients had an implant-supported overdenture. Outcome measures were survival rates of the prosthetic rehabilitations, of the zygomatic and conventional implants, as well as complications.

RESULTS: Three patients dropped out, two after 1 year and one after 3 years. Continuous stability of the prostheses was achieved in 20 out of the 21 patients throughout the study. Therefore, the success rate for the prosthetic rehabilitation after 5 years was 95.8%. One overdenture supported on two zygomatic implants was removed after 1 year of function. The patient is currently waiting for the installation of two more zygomatic implants or a grafting procedure. One zygomatic implant was lost giving a survival rate 97.4% after the 5-year follow-up period. A total of 11 conventional implants were lost, resulting in a survival rate of 89.9% after 5 years of follow-up. Sinusitis was observed in five patients throughout the study, which was solved with antibiotics, metronidazole, or Caldwell-Luc antrostomy with no further complications.

CONCLUSIONS: Zygomatic implants together with conventional implants in the atrophic maxillae appear to have an acceptable 5-year clinical outcome.

Sinus reactions to immediately loaded zygoma implants: a clinical and radiological study.

Davó R.1 Matavez C. López-Orellana C. Pastor-Báñez F. Rejas J.

Author Information

Abstract
AIM: There are no published studies regarding sinus reactions to immediately loaded zygomatic implants. The aim of this study was to evaluate the maxillary sinus in a cohort of patients by means of clinical criteria and computerised tomography performed before surgery and after zygomatic implant placement (immediate function protocol).

MATERIALS AND METHODS: A total of 36 patients with 71 immediately loaded zygomatic implants were evaluated to find clinical criteria of maxillary sinus disturbance 13 to 42 months (average 21.9 months) after zygoma implant placement. A total of 44 implants had a machined surface and 27 had a porous titanium oxide surface. Twenty-six patients with 52 immediately loaded zygomatic implants were evaluated by means of a CT scan of the paranasal sinuses, 3 to 20 months (average 10.5 months) after zygomatic implant placement. All patients had no sinus symptoms before surgery and had a preoperative CT scan.

RESULTS: No clinical signs or symptoms of sinusitis were found. Radiological opacity of the entrum was found in two sinuses (out of 52), and minimal thickening of the Schneiderian membrane was found in 12 patients (out of 26). In eight of them, this was present in the preoperative CT scan.

CONCLUSIONS: Sinuses penetrated by zygomatic implants seem to maintain a normal physiology. However, in approximately 15 to 20% of patients, early radiological findings without clinical symptoms were observed.

Three-dimensional finite elemental analysis of zygomatic implants in craniofacial structures.

Uijigawa K.1 Kato Y. Kizu Y. Tonoqia A. Yamane NY.

Author Information

Abstract
The objective of this study was to analyse stress distribution in craniofacial structures around zygomatic osseointegrated implants. An integrated system for Digital Imaging and Communications in Medicine (DICOM) data were utilized to create a three-dimensional model of craniofacial structures. The amount and distribution of the main stresses were compared using three-dimensional finite elemental analysis. The system allowed visual confirmation and analysis of stress distribution as well as the convenient and simple construction of a digital biomechanical model that provided details of anatomical structures in the regions of interest. Zygomatic implants with or without connected implants supporting the superstructure were compared. Stresses in severely resorbed maxillae with connected implants were not concentrated around the alveolar bone supporting the zygomatic implants. Stresses where there were no connected implants tended to be generated in the zygomatic bone, at the middle part of the zygomatic implant and at the joint of the fixture-abutment. Stress due to occlusal forces is mainly supported by the zygomatic bone, is transferred predominantly through the infra-zygomatic crest, and is divided between the frontal and temporal processes of the zygomatic bone in different directions.
Interventions for replacing missing teeth: dental implants in zygomatic bone for the rehabilitation of the severely deficient edentulous maxilla.

Esposito M1, Worthington HV

Author information

Abstract

BACKGROUND: Dental implants are used for replacing missing teeth. Placing dental implants is limited by the presence of adequate bone volume permitting their anchorage. Several bone augmentation procedures have been developed to solve this problem. Zygomatic implants are long screw-shaped implants developed as a partial or complete alternative to bone augmentation procedures for the severely atrophic maxilla. One to three zygomatic implants can be inserted through the posterior alveolar crest passing through the maxillary sinus, or externally to it, to engage the body of the zygomatic bone. A couple of conventional dental implants may also be needed in the frontal region of the maxilla to stabilise the prosthesis. The potential main advantages of zygomatic implants could be that bone grafting may not be needed and a fixed prosthesis could be fitted sooner. Another specific indication for zygomatic implants could be maxillary reconstruction after maxillectomy in cancer patients.

OBJECTIVES: To assess the effects of zygomatic implants with and without bone augmenting procedures in comparison with conventional dental implants in augmented bone for the rehabilitation with implant-supported prostheses of severely resorbed maxillae.

SEARCH METHODS: We searched the following electronic databases: the Cochrane Oral Health Group's Trials Register (to 17 June 2013), the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2013, Issue 5), MEDLINE via OVID (1946 to 17 June 2013) and EMBASE via OVID (1980 to 17 June 2013). Personal contacts and all known zygomatic implant manufacturers were contacted to identify unpublished trials. No restrictions were placed on the language or date of publication when searching the electronic databases.

SELECTION CRITERIA: Randomised controlled trials (RCTs) including participants with severely resorbed maxillae, who could not be rehabilitated with conventional dental implants, treated with zygomatic implants with and without bone grafts versus participants treated with bone augmentation procedures and conventional dental implants, with a follow-up of at least one year in function.

DATA COLLECTION AND ANALYSIS: Two review authors would have extracted data from eligible studies and assessed their risk of bias independently and in duplicate. The results of included studies were to be combined in meta-analyses using random-effects models where there were more than four studies, and fixed-effect models where there were less than four studies. We would have expressed the estimate of the intervention effect as mean difference for continuous outcomes and risk ratio for dichotomous outcomes, with 95% confidence intervals. Heterogeneity was to be investigated including both clinical and methodological factors.

MAIN RESULTS: We did not identify any RCTs which were eligible for inclusion in this review.

AUTHORS’ CONCLUSIONS: There is a need for RCTs in this area to assess whether zygomatic implants offer some advantages over alternative bone augmentation techniques for treating atrophic maxillae.

Update of

Interventions for replacing missing teeth: dental implants in zygomatic bone for the rehabilitation of the severely deficient edentulous maxilla. [Cochrane Database Syst Rev 2005]


5-year outcome of cross-arch prostheses supported by four immediately loaded zygomatic implants: A prospective case series.

Davib R, Pont Q

Abstract

PURPOSE: To evaluate the clinical outcome of maxillary prostheses supported by four immediately loaded zygomatic implants in the rehabilitation of edentulous patients with severe atrophic maxillae after 5 years of function.

MATERIALS AND METHODS: Out of a total of 17 consecutive patients with severe atrophy in the maxillae (Cawood and Howell classification C-VI and D-V or D-VI) and whom were rehabilitated using four immediately loaded zygomatic implants, three were lost during follow-up. Outcome measures were success rates of the prostheses, success rates of the zygomatic implants, complications and oral health-related quality of life (OHIP-14 questionnaire).

RESULTS: In 14 patients assessed at 5 years after operation, no prosthesis or zygomatic implant failed, although one implant placed in an unfavourable position was not used. Fifty percent of the patients had complications, which included penetration of the orbital cavity during the drilling procedure (1 patient), infection followed by a fistula at one zygomatic implant (1 patient), sinusitis (2 patients), fracture of the abutment screw (1 patient) and fracture of the prostheses (2 patients). All complications were resolved without clinical consequences. At 5 years the mean score of the OHIP-14 was 3.6, which is similar to that of the general population.

CONCLUSION: Results at 5 years indicate that the use of four immediately loaded zygomatic implants is a reliable approach for successful rehabilitation of edentulous patients with severely atrophied maxillae.
Reliability of four zygomatic implant-supported prostheses for the rehabilitation of the atrophic maxilla: a systematic review.


Abstract

PURPOSE: The reliability of oral rehabilitation by four zygomatic implants with no anterior support remains to be determined. The aim of this systematic review was to assess the predictability of this approach in regard to implant survival, technical and biologic complications, and quality of life.

MATERIALS AND METHODS: An electronic literature search was conducted from September 2000 to November 2013. Human clinical trials in which oral rehabilitation was achieved by the use of four zygomatic implants with no additional placement of standard implants were included. The primary outcome was the survival rate of the zygomatic implants. In addition, random effects meta-analyses of the selected studies were applied to avoid potential bias caused by methodologic differences among studies.

RESULTS: Zygomatic implant survival rate weighted mean (WMM) was 96.7% (range, 95.8% to 99.9%), with a 95% confidence interval (CI) of 92.5% to 98.5%. Only a limited number of surgical complications were reported, with orbital perforation the most significant. Similar results were obtained for prosthetic complications (few occurrences). Additionally, patient satisfaction levels were shown to be high, approaching that of the general population.

CONCLUSION: Data from the present systematic review suggest that maxillary rehabilitation by four zygomatic implants with no anterior support is a reliable approach.

The establishment of a protocol for the total rehabilitation of atrophic maxillae employing four zygomatic fixtures in an immediate loading system—a 30-month clinical and radiographic follow-up.

Duarte LR, Fialho HN, Francisco-Cone CE, Parejo LG, Brånemark PI.

Author information

Abstract

BACKGROUND: The existing approaches to the treatment of the atrophic maxilla are difficult and involve an element of risk.

PURPOSE: The aim of the present study was to establish a new surgical/prosthetic protocol for the treatment of extremely atrophic maxillae using four zygomatic implants (ZIs) in an immediate loading system.

MATERIALS AND METHODS: Twelve patients were treated with the surgical placement of 48 ZIs, and the totally edentulous maxillae were rehabilitated with protocol-type maxillary prostheses rigidly fixed to the ZIs in an immediate loading system. Follow-up was conducted at 6 months and again at 30 months.

RESULTS: Of the 48 ZIs inserted, one implant failed to achieve osseointegration. The prosthetic components fitted well and no sinus pathology was detected in any of the patients.

CONCLUSION: The surgical/prosthetic protocol showed that it was possible to insert four ZIs in an immediate loading system and achieve stability for up to 30 months.

Rehabilitation of totally atrophied maxillae by means of four zygomatic implants and fixed prosthesis: a 6-40-month follow-up.

Stevacart M, Malavé C.

Author information

Abstract

The zygomatic implant is an alternative to bone grafting in extremely resorbed maxillae. This study evaluates the results of a consecutive cohort of 20 patients (mean age 56 years) with extremely resorbed maxillae provided with four zygomatic implants. The first 10 patients had a two-stage procedure, the next 10 next patients benefited from a one-stage surgical procedure and one of them had flapless guided surgery with Nobelguide in development and immediate function. The same surgical drilling protocol, according to Branemark’s procedure, was applied to all the patients. Except for one patient who lost three implants, 18 patients received a fixed Procera Implant bridge and another overdenture retained by a screwed bar fixed on the four zygomatic implants. The cumulative survival rate after 40 months is 96%. Although bone augmenting procedures such as onlay grafts and sinus grafts are popular and well-documented, the four zygomatic implants procedure results in less morbidity, shorter delays between anaesthesical reconstruction and functional rehabilitation and can provide immediate or early loading with immediate function. Four zygomatic implants and a fixed bridge seem to be a valuable technique for the rehabilitation of extremely resorbed maxillae.
Immediate function of four zygomatic implants: a 1-year report of a prospective study.

Dawson R, Pons O, Rojas J, Carpio E

Abstract

PURPOSE: To evaluate the clinical outcome of maxillary prostheses supported by four immediately loaded zygomatic implants after 1 year of function.

MATERIALS AND METHODS: Seventeen patients were consecutively included and followed up to 1 year after prosthetic loading. Patients had severely atrophic maxillae (Cosmod and Howell classification C-VI and D-V or D-VI) and were rehabilitated using four immediately loaded zygomatic implants, two in each zygoma bone. Outcome measures were success rates of the prostheses, of the zygomatic implants, complications and oral health-related quality of life (OHRQoL).

RESULTS: No patients dropped out. No zygomatic implants were lost, although one implant could not be used because it was placed in an unfavourable position. The orbital cavity was penetrated during the drilling procedure in one patient with no relevant clinical consequences. One patient experienced an infection followed by a fistula in one zygomatic implant, which was successfully treated. The average score from the OHIP-14 questionnaire was 3.4, which is similar to that of the general population.

CONCLUSIONS: The present study suggests that four immediately loaded zygomatic implants can be used to rehabilitate patients with severely atrophied maxillae.

Immediately loaded zygomatic implants: a 5-year prospective study.

Dawson R, Mateo C, Pons O

Abstract

PURPOSE: This prospective study was designed to assess the long-term outcome of immediately loaded zygomatic implants placed in atrophic maxillae.

MATERIALS AND METHODS: Forty-two consecutively treated patients received 81 zygomatic implants and 140 conventional implants for oral rehabilitation and were followed for 5 years. Complete arch rehabilitation was accomplished in 37 patients and partial arch rehabilitation in 5 (one zygomatic implant in combination with two conventional implants). Outcome measures were prosthetic and implant failures, and complications.

RESULTS: Twelve zygomatic and 22 conventional implants in 6 patients were not reviewed as patients were lost to follow-up. One zygomatic implant was removed at the 3-year follow-up visit because of lack of osseointegration and disturbances around the zygomatic region. The success rate of zygomatic implants was 98.5% (68/69). Six conventional implants were lost, with a success rate of 94.9% (112/118). One of the definitive prostheses was changed after 4 years of follow-up. Six complications occurred during the entire follow-up period.

CONCLUSIONS: The 5-year prognosis was found to be good for immediately loaded zygomatic implants together with conventional implants in severely resorbed maxillae.
Interventions for replacing missing teeth: dental implants in zygomatic bone for the rehabilitation of the severely deficient edentulous maxilla.

Esposito M, Watkinson HV

Abstract

BACKGROUND: Dental implants are used for replacing missing teeth. Placing dental implants is limited by the presence of adequate bone volume permitting their anchorage. Several bone augmentation procedures have been developed to solve this problem. Zygomatic implants are long screw-shaped implants developed as a partial or complete alternative to bone augmentation procedures for the severely atrophic maxilla. One to three zygomatic implants can be inserted through the posterior alveolar crest passing through the maxillary sinus, or externally to it, to engage the body of the zygomatic bone. A couple of conventional dental implants may also be needed in the frontal region of the maxilla to stabilise the prosthesis. The potential main advantages of zygomatic implants could be that bone grafting may not be needed and a fixed prosthesis could be fitted sooner. Another specific indication for zygomatic implants could be maxillary reconstruction after maxillectomy in cancer patients.

OBJECTIVES: To assess the effects of zygomatic implants with and without bone augmenting procedures in comparison with conventional dental implants in augmented bone for the rehabilitation with implant-supported prostheses of severely resorbed maxillae.

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