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Dental implants
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**PURPOSE:** To assess the influence of several factors on the prevalence of dental implant failure, with special consideration of the placement of implants by different dental surgeons.

**MATERIALS AND METHODS:** This retrospective study is based on 2,670 patients who received 10,096 implants at one specialist clinic. Only the data of patients and implants treated by surgeons who had inserted a minimum of 200 implants at the clinic were included. Kaplan-Meier curves were stratified with respect to the individual surgeon. A generalized estimating equation (GEE) method was used to account for the fact that repeated observations (several implants) were placed in a single patient. The factors bone quantity, bone quality, implant location, implant surface, and implant system were analyzed with descriptive statistics separately for each individual surgeon.

**RESULTS:** A total of 10 surgeons were eligible. The differences between the survival curves of each individual were statistically significant. The multivariate GEE model showed the following variables to be statistically significant: surgeon, bruxism, intake of antidepressants, location, implant length, and implant system. The surgeon with the highest absolute number of failures was also the one who inserted the most implants in sites of poor bone and used turned implants in most cases, whereas the surgeon with the lowest absolute number of failures used mainly modern implants. Separate survival analyses of turned and modern implants stratified for the individual surgeon showed statistically significant differences in cumulative survival.

**CONCLUSION:** Different levels of failure incidence could be observed between the surgeons, occasionally reaching significant levels. Although a direct causal relationship could not be ascertained, the results of the present study suggest that the surgeons' technique, skills, and/or judgment may negatively influence implant survival rates.


**PURPOSE:** Implant fracture is a serious complication, which leads to treatment failure. The purpose of this study is to estimate the incidence of implant fractures and identify factors associated with them.

**MATERIALS AND METHODS:** In this retrospective cohort study, the sample was derived from 2 implant centers. The predictors were grouped into the following categories: demographic, location of implant, physical characteristic of implant, implant-abutment connection, type of prosthesis, type of retention, and outcome variable (time to implant fracture). The Kaplan-Meier test was used to estimate implant survival. A Cox regression model was applied to evaluate the time-to-event effect of variables on implant fracture.

**RESULTS:** Of 18,700 implants, 37 (0.002%) had fractures. The 1- and 5-year risk of implant fracture was 0.38 per 1,000 and 1.46 per 1,000, respectively. Implant fractures more often occurred in the premolar and molar area (94.6%) than in the anterior of the jaws. The Pearson correlation test did not show any correlation between age, implant diameter, or implant length and time of fracture (P > .05). Analysis of the data by the log-rank test showed a significant difference for survival between cemented and screw-retained crowns (P = .001). The Cox regression model showed a hazard ratio of 0.23 for tapered implants versus cylindrical fixtures and for screw-retained crowns (hazard ratio, 296.54) versus cemented crowns.

**CONCLUSIONS:** According to this study, conical implants and screw-retained prostheses may have lower survival rates due to implant fracture.
Verweij JP, Anssari Moin D, Wismeijer D, van Merkesteyn JPR. 
Replacing Heavily Damaged Teeth by Third Molar Autotransplantation With the Use of Cone-Beam Computed Tomography and Rapid Prototyping. 

This article describes the autotransplantation of third molars to replace heavily damaged premolars and molars. Specifically, this article reports on the use of preoperative cone-beam computed tomographic planning and 3-dimensional (3D) printed replicas of donor teeth to prepare artificial tooth sockets. In the present case, an 18-year-old patient underwent autotransplantation of 3 third molars to replace 1 premolar and 2 molars that were heavily damaged after trauma. Approximately 1 year after the traumatic incident, autotransplantation with the help of 3D planning and rapid prototyping was performed. The right maxillary third molar replaced the right maxillary first premolar. The 2 mandibular wisdom teeth replaced the left mandibular first and second molars. During the surgical procedure, artificial tooth sockets were prepared with the help of 3D printed donor tooth copies to prevent iatrogenic damage to the actual donor teeth. These replicas of the donor teeth were designed based on the preoperative cone-beam computed tomogram and manufactured with the help of 3D printing techniques. The use of a replica of the donor tooth resulted in a predictable and straightforward procedure, with extra-alveolar times shorter than 2 minutes for all transplantations. The transplanted teeth were placed in infraocclusion and fixed with a suture splint. Postoperative follow-up showed physiologic integration of the transplanted teeth and a successful outcome for all transplants. In conclusion, this technique facilitates a straightforward and predictable procedure for autotransplantation of third molars. The use of printed analogues of the donor teeth decreases the risk of iatrogenic damage and the extra-alveolar time of the transplanted tooth is minimized. This facilitates a successful outcome.

Hickin MP, Shariff JA, Jennette PJ, Finkelstein J, Papapanou PN.

The aim of this study was to use electronic health care records (EHRs) to examine retrospectively the incidence of and attributes associated with dental implant failures necessitating implant removal in a large cohort of patients treated in the student clinics of a U.S. dental school over three and a half years. EHRs were searched for all patients who received dental implants between July 1, 2011, and December 31, 2014. Characteristics of patients and implants that were actively removed due to irrevocable failure of any etiology ("failure cohort") during this period were compared to those of all other patients who received dental implants during the same time frame ("reference cohort"). Differences in the frequency distribution of various characteristics between the failure and reference cohorts were compared. Of a total 6,129 implants placed in 2,127 patients during the study period, 179 implants (2.9%) in 120 patients (5.6%) were removed. In the multivariate analysis, presence of a removable (OR=2.86) or fixed temporary prosthesis (OR=3.71) was statistically significantly associated with increased risk for implant failure. In contrast, antibiotic coverage (pre- and post-surgery OR=0.16; post-surgery only OR=0.38) and implants of certain manufacturers were associated with lower risk of implant failure. In this sizeable cohort of patients receiving care in dental student clinics, the review of EHRs facilitated identification of multiple variables associated with implant failure resulting in removal; however, these findings do not suggest causative relationships. The adopted analytical approach can enhance quality assurance measures and may contribute to the identification of true risk factors for dental implant failure.
Comparison of Dental Implant Performance Following Vertical Alveolar Bone Augmentation With Alveolar Distraction Osteogenesis or Autogenous Onlay Bone Grafts: A Retrospective Cohort Study.

PURPOSE: The aim of this retrospective study was to compare the performance of implants placed after alveolar distraction osteogenesis (ADO) or autogenous onlay bone grafting (AOBG) based on implant survival, peri-implant bone resorption, and clinical parameters.

MATERIALS AND METHODS: From February 2008 to July 2012, 17 patients (6 women and 11 men) with implant placement after ADO (group 1, n = 8) or AOBG (group 2, n = 9) were included in this retrospective study. In all, 37 implants were placed in group 1 and 22 implants were placed in group 2. Implant survival rate, peri-implant bone resorption, probe depth (PD), modified plaque index (mPI), and modified sulcus bleeding index (mSBI) were analyzed to evaluate implant prognosis.

RESULTS: Successful reconstruction of vertical alveolar defects and uneventful implant placement were achieved in all patients in the 2 groups. After a mean follow-up of 47.9 +/- 13.3 months, implant survival was 97.3% (36 of 37) in group 1 and 95.5% (21 of 22) in group 2. No statistically relevant differences were observed. Peri-implant bone resorption was 1.29 +/- 0.59 mm in group 1, which was slightly higher than 1.24 +/- 0.87 mm in group 2 at last follow-up. The difference was not statistically relevant. Favorable peri-implant conditions were indicated by PD, mPI, and mSBI in the 2 groups.

CONCLUSIONS: ADO and AOBG can be used for correction of vertical alveolar defects with a reliable implant prognosis. Comparably high implant survival rates and favorable peri-implant conditions were attained.

Chrcanovic BR, Albrektsson T, Wennerberg A.
Bone Quality and Quantity and Dental Implant Failure: A Systematic Review and Meta-analysis.

PURPOSE: The aim of this study was to test the null hypothesis that there is no difference in implant failure rates, marginal bone loss, and postoperative infection for implants inserted in bone with different qualities and quantities according to the classification of Lekholm and Zarb.

MATERIALS AND METHODS: An electronic search was undertaken in January 2015 for randomized and nonrandomized human clinical studies.

RESULTS: A total of 94 publications were included. When bone sites of different qualities were considered, the results suggested the following comparative implant failure rates: 1 > 2, 1 > 3, 3 > 1, 4 > 1, 4 > 2, and 4 > 3. Sensitivity analyses suggested that when implants inserted in bone qualities 1 and 2 and 1 and 3 were compared, oxidized and sandblasted/acid-etched surfaces showed a decrease in significant difference in failures compared with turned implants. The same is not true for failure of implants inserted in bone quality 4 compared to failure of implants in all other bone qualities. When bone sites of different quantities were considered, the following comparative implant failure rates were observed: A > B, A > C, A < D, B < C, B < D, C < D, E > A, E > B, E > C, E > D. Due to insufficient information, meta-analyses for the outcomes postoperative infection and marginal bone loss were not performed.

CONCLUSION: Sites with poorer bone quality and lack of bone volume may statistically affect implant failure rates. Implant surfaces may play a role in failure of implants in different bone qualities.

McDermott P, Allan W.
Thread-Skip: An Undefined Common Observation.
When a screw-retained implant prosthesis is removed, a click is heard and a slight axial shift is felt, indicating the screw has been fully removed from the retaining thread. This common observation has never been described in the literature. This article describes the click, and it is proposed it be termed thread-skip.


PURPOSE: This systematic review evaluated treatment outcomes for mandibular mini-implant-retained overdentures (MMIOs) in terms of (1) implant survival rate, (2) peri-implant marginal bone loss, (3) prosthodontic maintenance and complication occurrence, and (4) patient satisfaction.

MATERIALS AND METHODS: Pertinent literature published in English before October 12, 2015 was identified using a MEDLINE and EMBASE search strategy and hand searching of relevant journals. Inclusion and exclusion criteria were applied to the titles and abstracts and subsequently to the full text of included studies. A total of 16 articles were included, from which qualitative and quantitative data were extracted for analysis.

RESULTS: Of the 16 evaluated articles, 5 were randomized controlled trials, 8 were prospective studies, and 3 were retrospective studies. The follow-up time range from implant placement was 1 to 6 years, and only four studies included more than 3 years of follow-up. The mini-implant survival rate ranged from 86.9% to 100%. Mean marginal bone resorption was 0.28 to 1.2 mm after 1 year of loading. Of the 16 studies, 5 reported prosthodontic maintenance and complications, and all included studies showed significant improvement in patient satisfaction.

CONCLUSION: Despite the limitations of this systematic review, particularly the short follow-up periods, the results suggest that MMIOs showed predictable results regarding implant survival rates, marginal bone resorption, and patient satisfaction.


PURPOSE: The aim of this study was to determine the optimal number and location of mini-implants retaining an overdenture to resist lateral forces.

MATERIALS AND METHODS: A strain gauge was attached to a mini-implant and placed in an edentulous mandible model. The following different implant locations were evaluated: one mini-implant at the midline, two mini-implants in the lateral incisor regions, two mini-implants in the canine regions, and four mini-implants.

RESULTS: Lateral forces on mandibular overdentures retained by one mini-implant at the midline or two mini-implants in the lateral incisor regions appeared to be advantageous when compared with placing two mini-implants in the canine regions or four mini-implants.

CONCLUSION: Fewer mini-implants resulted in less lateral stress, while four were associated with an unequal stress distribution.

This study evaluated the effect of implant number and location on strain around the implant and force transferred to the palate in maxillary implant overdentures (IODs), including two locators attached bilaterally in the canine region (IOD 2), four locators attached bilaterally in the canine and premolar regions (IOD 4CP), four locators attached bilaterally in the canine and molar regions (IOD 4CM), and six locators attached bilaterally in the canine, premolar, and molar regions (IOD 6). As the implant number increased, strain around the implant regions increased, whereas force transferred to the palate decreased under loading. However, the differences were small between IOD 4CM and IOD 6, suggesting identical biomechanical effectiveness.

This is the second paper in a two-part series discussing the management of common restorative dental emergencies. The first paper focussed upon problems relating to conventional fixed and removable restorations, and this paper discusses the management of common dental implant related emergencies. With dental implant treatment becoming an increasingly popular method of replacing missing teeth, it is very likely that dentists working in general practice will routinely come across patients who have previously undergone this form of treatment, even if they themselves are not directly involved in placing or restoring dental implants. This paper is aimed at general dental practitioners (GDPs) who have some experience in managing dental implants, and those who want to gain further insight into how such situations may be managed.

This clinical case report presents the nonsurgical orthodontic treatment of a patient with skeletal Class II malocclusion, posterior crossbite, anterior open bite, accentuated dental discrepancies in both arches, and an odontoma. The proposed treatment involved maxillary expansion, extraction of atypical maxillary lateral incisors and mandibular first molars, and intrusion of maxillary teeth with the aid of mini-implants. The results obtained with these procedures included good tooth alignment, normal overbite and overjet, removal of the odontoma, and a harmonious smile. In complex cases, an accurate diagnosis is the key to a favorable outcome.


Frameworks made of carbon fibre-reinforced composites (CFRC) provide stiffness, rigidity and optimal biocompatibility. The aim of the present prospective study was to compare carbon fibre frameworks versus metal frameworks used to rigidly splint implants in full-arch immediate loading rehabilitations. Forty-two patients (test group) were rehabilitated with full-arch immediate loading rehabilitations of the upper jaw (total: 170 implants) following the Columbus Bridge Protocol with four to six implants with distal tilted implants. All patients were treated with resin screw-retained full-arch prostheses endowed with carbon fibre frameworks. The mean follow-up was 22 months (range: 18-24). Differences in the absolute change of bone resorption over time between the two implant sides (mesial and distal) were assessed performing a Mann-Whitney U-test. The outcomes were statistically compared with those of patients rehabilitated following the same protocol but using metal frameworks (control group: 34 patients with 163 implants - data reported in Tealdo, Menini, Bevilacqua, Pera, Pesce, Signori, Pera, Int J Prosthodont, 27, 2014, 207). Ten implants failed in the control group (6.1%); none failed in the test group (P = 0.002). A statistically significant difference in the absolute change of bone resorption around the implants was found between the two groups (P = 0.004), with greater mean peri-implant bone resorption in the control group (1 mm) compared to the test group (0.8 mm). Carbon fibre frameworks may be considered as a viable alternative to the metal ones and showed less marginal bone loss around implants and a greater implant survival rate during the observation period.


The aim of this systematic review was to evaluate implant loss in younger and older patients. An electronic search of four databases (MEDLINE, EMBASE, SCOPUS and the Cochrane Library) was undertaken until May 2016 without time restriction and was supplemented by manual searching. Prospective cohorts were included if they met the following criteria: (i) presence of an exposed group (older subjects) with a minimum age of 60 years; (ii) presence of a control group (younger subjects) with a maximum age of 59 years; and (iii) outcome data considering implant survival or loss. Meta-analyses were performed to evaluate the impact of ageing on implant failure. Of 4152 potentially eligible articles, four were included in the qualitative analysis and quantitative synthesis. The pooled estimates suggest that the risk of implant loss in older patients is not significantly higher (RR = 0.92; 95% CI 0.43-1.96, P = 0.83) when compared to younger subjects. This systematic review suggests that age is not a limiting factor for dental implant therapy.


The aim of this descriptive study was to provide an overview of the status of implementation of Commission on Dental Accreditation (CODA) Standard 4-10.2.d (Provisionalization of Dental Implants) by U.S. graduate periodontics programs since its introduction in 2013. Surveys were sent in May 2015 to 56 accredited postdoctoral periodontics program directors to ascertain program director characteristics; status of planning, implementation, and curriculum resulting from adoption of Standard 4-10.2.d; preferred clinical protocols for implant provisionalization; interdisciplinary educational collaborators; and competency assessment mechanisms. The survey response rate was 52% (N=29); the majority were male, aged 55 or older, and had held their position for
less than ten years. Among the responding programs, 93% had formal educational curricula established in implant provisionalization. Graduate periodontics (96%) and prosthodontics (63%) faculty members were predominantly involved with curriculum planning. Of these programs, 96% used immediate implant provisionalization, with direct (chairsdie) provisionalization protocols (86%) being preferred over indirect protocols (14%) and polyethyleneketone provisional abutments (75%) being preferred to titanium (25%) provisional abutments. Straight and concave transmucosal emergence profile designs (46% each) were preferred in teaching, with only 8% of programs favoring convex transmucosal profiles. A majority of responding programs (67%) lacked protocols for communicating to the restorative referral a mechanism to duplicate the mature peri-implant mucosal architecture. Regional location did not play a significant role in any educational component related to implant provisionalization for these graduate periodontal programs. Overall, this study found that a clear majority of graduate periodontics programs had established formal curricula related to implant provisionalization, with substantial clinical and philosophical consensus within the specialty.


The aim of this study was to evaluate the barrier function of platelet-induced epithelial sheets on titanium surfaces. The lack of functional peri-implant epithelial sealing with basal lamina (BL) attachment at the interface of the implant and the adjacent epithelium allows for bacterial invasion, which may lead to peri-implantitis. Although various approaches have been reported to combat bacterial infection by surface modifications to titanium, none of these have been successful in a clinical application. In our previous study, surface modification with protease-activated receptor 4-activating peptide (PAR4-AP), which induced platelet activation and aggregation, was successful in demonstrating epithelial attachment via BL and epithelial sheet formation on the titanium surface. We hypothesized that the platelet-induced epithelial sheet on PAR4-AP-modified titanium surfaces would reduce bacterial attachment, penetration, and invasion. Titanium surface was modified with PAR4-AP and incubated with platelet-rich plasma (PRP). The aggregated platelets released collagen IV, a critical BL component, onto the PAR4-AP-modified titanium surface. Then, human gingival epithelial cells were seeded on the modified titanium surface and formed epithelial sheets. Green fluorescent protein (GFP)-expressing *Escherichia coli* was cultured onto PAR4-AP-modified titanium with and without epithelial sheet formation. While *Escherichia coli* accumulated densely onto the PAR4-AP titanium lacking epithelial sheet, few *Escherichia coli* were observed on the epithelial sheet on the PAR4-AP surface. No bacterial invasion into the interface of the epithelial sheet and the titanium surface was observed. These in vitro results indicate the efficacy of a platelet-induced epithelial barrier that functions to prevent bacterial attachment, penetration, and invasion on PAR4-AP-modified titanium.


OBJECTIVES: Alveolar ridge and vertical augmentations are challenging procedures in dental implantology. Even material blocks with an interconnecting porous system are never completely resorbed. Shell techniques combined with autologous bone chips are therefore the gold standard. Using biopolymers for these techniques is well documented. We applied three-dimensional (3-D) techniques to create an individualized bending model for the adjustment of a plane biopolymer membrane made of polylactide.
STUDY DESIGN: Two cases with a vertical alveolar ridge defect in the maxilla were chosen. The cone beam computed tomography data were processed with a 3-D slicer and the Autodesk Meshmixer to generate data about the desired augmentation result. STL data were used to print a bending model. A 0.2-mm poly-D,L-lactic acid membrane (KLS Martin Inc., Tuttlingen, Germany) was bent accordingly and placed into the defect via a tunnel approach in both cases. A mesh graft of autologous bone chips and hydroxyapatite material was augmented beneath the shell, which was fixed with osteosynthesis screws.

RESULTS: The operative procedure was fast and without peri- or postoperative complications or complaints. The panoramic x-ray showed correct fitting of the material in the location. Bone quality at the time of implant placement was type II, resulting in good primary stability.

CONCLUSIONS: A custom-made 3-D model for bending confectioned biomaterial pieces is an appropriate method for individualized adjustment in shell techniques. The advantages over direct printing of the biomaterial shell and products on the market, such as the Xyoss shell (Reoss Inc., Germany), include cost-efficiency and avoidance of regulatory issues.


OBJECTIVES: To assess how often patients receive dental implants after mandibular resection for benign neoplasms and to determine barriers to completion of functional reconstruction.

STUDY DESIGN: This was a retrospective cohort study of patients who underwent resection for benign mandibular neoplasms between 2005 and 2014. Demographic variables included age, sex, and race. Outcome variables include rates of implant placement, implant restoration, and reasons for not having implants. Fisher's exact test and odds ratios were calculated.

RESULTS: In all, 52 subjects (age 47.1 +/- 19.2 years) were included. Twenty (38.6%) received dental implants. Race was associated with the likelihood of receiving implants (P = .0302). African Americans (1/11, 9.1%) were least likely compared to all other racial groups to have implants (odds ratio = 0.1158; P = .035; 95% confidence interval 0.013-0.989). Caucasians (17/35, 48.6%) were 4.41 times more likely to receive implants compared to all other races (odds ratio = 4.41; 95% confidence interval 1.073-18.093; P = .038). Of the 20 patients who received implants, 10 went on to have dental prostheses. The most common reason for not having implants was cost (37.5% overall), cited by 50% of black and 16.7% of white patients.

CONCLUSION: Patients do not typically go on to dental reconstruction after mandibular resection, with cost as a major barrier. African Americans were least likely to complete full reconstruction.


PURPOSE: The aim of this study was to describe the histologic and histomorphometric features of a retrieved, functional endosseous zirconia implant in a human subject.

MATERIALS AND METHODS: A maxillary zirconia implant (ZV3) placed in a 52-year-old man was retrieved after 2 years of uncompromised service and prepared for light microscopic evaluation.

RESULTS: Histologic examination demonstrated good osseointegration. Bone contact measurements revealed a mean percentage of bone-to-implant
contact of 55.8% (SD 3.8%).

CONCLUSION: The histologic data provide further evidence of the potential of zirconia implants to osseointegrate to a similar degree as titanium in humans.

Accuracy of linear measurements around dental implants by means of cone beam computed tomography with different exposure parameters.
OBJECTIVES: The aim of this study was to determine the accuracy of linear measurements around dental implants when using CBCT unit devices presenting different exposure parameters.
METHODS: Dental implants (n=18) were installed in the maxilla of human dry skulls, and images were obtained using two CBCT devices: G1-Care Stream 9300 (70kVp, 6.3mA, voxel size 0.18mm, field of view 8x8cm; Carestream Health, Rochester, NY) and G2-R100 Veraview<sup></sup> (75kVp, 7.0mA, voxel size 0.125mm, field of view 8x8cm; J Morita, Irvine, CA). Measurements of bone thickness were performed at three points located (A) in the most apical portion of the implant, (B) 5mm above the apical point and (C) in the implant platform. Afterwards, values were compared with real measurements obtained by an optical microscopy [control group (CG)]. Data were statistically analyzed with the significance level of p<=0.05.
RESULTS: There was no statistical difference for the mean values of bone thickness on Point A (CG: 4.85+/-.25mm, G1: 4.19+/-.168mm, G2: 4.15+/-.175mm), Point B (CG: 1.50+/-.084mm, G1: 1.61+/-.127mm; G2: 1.68+/-.082mm) and Point C (CG: 1.78+/-.133mm, G1: 1.80+/-.109mm; G2: 1.64+/-.111mm). G1 and G2 differed in bone thickness by approximately 0.76mm for Point A, 0.36mm for Point B and 0.08mm for Point C. A lower intraclass variability was identified for CG (Point A=0.20+/-.025; Point B=0.15+/-.020; Point C=0.06+/-.005mm) in comparison with G1 (Point A=0.56+/-.052; Point B=0.48+/-.050; Point C=0.47+/-.056mm) and G2 (Point A=0.57+/-.051; Point B=0.46+/-.046; Point C=0.36+/-.031mm).
CONCLUSIONS: CBCT devices showed acceptable accuracy for linear measurements around dental implants, despite the exposure parameters used.

22. Weber D, Handel S, Dunham D.
Use of Osseointegrated Implants for Orthodontic Anchorage.

Public and Patient Knowledge About Dental Implants.
PURPOSE: The more informed a patient is about a given procedure, the better the ultimate outcome. This study was designed to compare general public awareness and knowledge regarding oral implant treatment with those of patients presenting for such treatment and to determine the sources from which they may have obtained such information, as well as the accuracy of the information.
PATIENTS AND METHODS: In this cross-sectional study, 2 groups of patients were asked to complete a questionnaire containing implant knowledge questions and questions regarding any sources they may have used to obtain information about dental implants. Group I consisted of patients presenting for treatment of a dental emergency (general population group), and group II consisted of patients presenting for an implant consultation. The chi<sup></sup>2
test was used to determine whether there were differences in knowledge and information sources between the 2 groups. RESULTS: A total of 126 adult patients (76 dental emergency patients and 50 implant consultation patients) participated in the study. The general population group was less informed about dental implants, especially information relating to implant material and longevity, and received information from less reliable sources than patients presenting for implant screening (friends or relatives vs primary dentist). Both groups reported cost of the procedure as a primary barrier to receiving implants (89% and 90%). CONCLUSIONS: There is still a need for continued education of the general public regarding dental implants.


The aim of this study was to evaluate the influence of abutments with a prosthetic index on the fracture resistance of Morse taper dental implants. Morse taper implants were divided into 2 groups (n = 5 per group): a group with an indexed implant and a nonindexed abutment (solid Morse taper universal post; WIS group), and a group with an indexed implant and an indexed abutment (WIP group). Both groups were subjected to bending tests for fracture strength until 5 mm of displacement or implant fracture occurred. Statistical analysis was performed using the Student t test (alpha = 0.05). There was no statistically significant difference between the mean fracture values, which were 305.8 N and 318.6 N for the WIS group and WIP group, respectively. The presence of a prosthetic index on Morse taper abutments did not influence the resistance to fracture.


Current use of zirconium oxide (ZrO2)-based screw-retained restorations does not guarantee maximum contact of soft peri-implant tissues with ZrO2, because veneering porcelain usually covers the major subgingival part of the restoration. Ceramics preclude direct interaction between zirconia and soft tissue cells, thus reducing biocompatibility and benefit to the patient. The four case reports discussed in this article describe the new design modality of the ZrO2 screw-retained restorations, in which zirconia is exposed to the tissues and no veneering porcelain is located below the gingival margin. The article also shows the impact of this treatment on soft peri-implant tissues after 3 years of follow-up. Soft tissue recession, vestibular contour, bleeding on probing, and probing depth were evaluated.


STATEMENT OF PROBLEM: Titanium implant surfaces have been modified to improve osseointegration; however, the evidence for incorporating zinc into titanium implants to improve new bone formation and osseointegration is not clear.
PURPOSE: The purpose of this systematic review was to assess the efficacy of treating titanium surfaces with zinc on the osseointegration of implants.

MATERIAL AND METHODS: The focused question addressed was, "Does incorporating zinc in titanium implant surfaces influence osseointegration?"

Indexed databases were searched up to January 2016 using the key words "Bone to implant contact"; "implant"; "zinc"; "osseointegration." Letters to the editor, case reports/case series, historic reviews, and commentaries were excluded. The pattern of the review was customized to summarize the pertinent data.

RESULTS: Ten experimental studies were included, all of which were performed in animals (5 in rabbits, 4 in rodents, and 1 in goats). The number of titanium implants placed ranged from 10 to 78. The results from all studies showed that incorporating zinc into titanium implants enhanced new bone formation and/or bone-to-implant contact around implants. One study reported that zinc enhanced the removal torque on implants.

CONCLUSIONS: The current available evidence on adding zinc to titanium implants surfaces to enhance osseointegration remains unclear. Further investigation is necessary to assess its effectiveness and safety in humans and to establish a standard methodology and ideal compound for incorporating zinc ion into titanium implant surfaces in a clinical setting.

Marginal bone loss around dental implants with and without microthreads in the neck: A systematic review and meta-analysis.

STATEMENT OF PROBLEM: Whether microthreads in the crestal portion can reduce the amount of marginal bone loss (MBL) around implants has not yet been determined.

PURPOSE: The purpose of this systematic review was to investigate the marginal bone loss around dental implants with and without microthreads in the neck.

MATERIAL AND METHODS: This review was based on the PRISMA guidelines. An electronic search with no restrictions on language was performed from inception to August 19, 2015, in PubMed, Cochrane Central Register of Controlled Trials, EMBASE, Web of Sciences, and AMED (Ovid) databases. A manual search was also performed. Randomized clinical trials (RCTs) that compared the MBL between implants with and without microthreads in the neck were included. Qualitative synthesis and meta-analysis were performed. MBL was measured by using the mean difference (MD). Review Manager v5.3 software was used for meta-analysis (alpha=.05).

RESULTS: Five articles were included in the qualitative synthesis, and 3 articles were included in the meta-analysis. Four studies found that a microthread design can significantly reduce MBL under functional loading, whereas 1 study found no significant difference. The homogeneity test of meta-analysis confirmed acceptable heterogeneity among the 3 studies (I² =0.49). A random-effects model was used. The result shows that MBL around implants with microthread design can be reduced significantly (P=.030; MD: -0.09; CI: -0.18 to -0.01).

CONCLUSIONS: Meta-analysis showed that microthread design in the implant neck can reduce the amount of MBL; however, RCTs included in the review were few and the difference was small. In clinical practice, an implant with a roughened surface and microthreaded neck could be selected to maintain bone level.

Ozkir SE, Yilmaz B, Kurkuoglu I, Culhaoglu A, Unal SM.
Surface roughness and adaptation of different materials to secure implant attachment housings.
STATEMENT OF PROBLEM: Various materials are available to secure implant attachment housings in overdentures. Surface roughness and the adaptation of these materials to the denture base and the housings may increase the microcracks and bacterial adhesion at the interfaces in the long term. The surface characteristics of the interface between the denture base orientation material and the attachment housing have not been extensively studied.

PURPOSE: The purpose of this in vitro study was to evaluate the surface roughness and the adaptation of 5 different housing orientation materials to the housings and the denture base.

MATERIAL AND METHODS: Fifty-five poly(methyl methacrylate) (PMMA) specimens (15 mm in diameter and 4 mm in height) were prepared with a clearance inside to allow the insertion of overdenture housings. Five different materials were used for housing orientation (Quick Up, Ufi Gel Hard, Tokuyama Rebase II Fast, Meliodent, and Paladent). The specimens were thermocycled 5000 times between 5degreeC and 55degreeC. The surface roughness (Ra values) of the specimens was measured with a noncontact profilometer. Scanning electron images were made in order to inspect the PMMA-orientation material-housing interfaces. The Kruskal-Wallis test was used to investigate the differences between the surface roughness values of the orientation materials, and the Iman-Conover test was used for pairwise comparisons (alpha=.05).

RESULTS: The surface roughness values significantly differed between Quick up and Ufi Gel orientation materials only, and Quick up had smaller surface roughness values than Ufi Gel (P=.009). Microcracks were observed among the groups only at the junction of the orientation material and the housing after thermocycling.

CONCLUSIONS: Ufi Gel Hard showed the roughest surfaces around the overdenture attachment housings. The adaptation between the orientation material and the housing may deteriorate, and increased surface roughness and microcrack formation may be seen around the housings.


OBJECTIVE: The aim of this study was to describe a new case series of peri-implant malignancy, review the literature, and discuss the implications of malignancies resembling peri-implantitis.

STUDY DESIGN: This study was a retrospective analysis of cases from 2000 to 2016.

RESULTS: Seven patients (two males and five females), aged 44 to 89 years, were included, representing 1.5% of oral malignancy cases. Five cases were squamous carcinoma, one of basal cell carcinoma, and one of carcinoma of metastatic origin. Six cases presented with nonulcerated overgrowth, with bone loss in three and massive osteolysis in one. Misinterpretation as peri-implantitis delayed diagnosis in six cases. Risk factors included previous oral malignancy (2), potentially malignant conditions (2), and smoking (1). Of the 47 cases in the English language literature, 85% were squamous cell carcinoma and 8.5% had distant metastasis. Most cases had one or more risk factors.

CONCLUSIONS: Peri-implant malignancy may represent up to 1.5% of oral malignancy cases. Clinical features imitating peri-implantitis may delay diagnosis. Lesions failing to respond to treatment, especially in patients with pre-existing risk factors, should significantly increase suspicion. Histopathology is crucial for diagnosis.

30. Greenstein G, Cavallaro J.
Compendium of Continuing Education in Dentistry 2017 Feb;38(2):88-95; quiz 96.
A literature review was conducted to determine the role of insertion torque in attaining primary stability of dental implants. The review is comprised of articles that discussed the amount of torque needed to achieve primary implant stability in healed ridges and fresh extraction sockets prior to immediate implant loading. Studies were appraised that addressed the effects of minimum and maximum forces that can be used to successfully place implants. The minimum torque that can be employed to attain primary stability is undefined. Forces >=30 Ncm are routinely used to place implants into healed ridges and fresh extraction sockets prior to immediate loading of implants. Increased insertion torque (>=50 Ncm) reduces micromotion and does not appear to damage bone. In general, the healing process after implant insertion provides a degree of biologic stability that is similar whether implants are placed with high or low initial insertion torque. Primary stability is desirable when placing implants, but the absence of micromotion is what facilitates predictable implant osseointegration. Increased insertion torque helps achieve primary stability by reducing implant micromotion. Furthermore, tactile information provided by the first surgical twist drill can aid in selecting the initial insertion torque to achieve predictable stability of inserted dental implants.

31.
Amini F, Alipanahi M, Rakhshan V, Shahab S, Niktash A.
Facial Growth Patterns and Insertion Sites of Miniscrew Implants.
Implant Dentistry 2017 Feb;26(1):112-120.
INTRODUCTION: We aimed to evaluate the associations between the craniofacial growth pattern with interradicular distances (IRDs), cortical widths (CWs), and jaw heights (JHs). Also, we mapped safe zones for miniscrew implantation.
METHODS: Cone-beam computerized tomography data pertaining to 60 Class-I patients were divided into 3 growth groups: normal, horizontal, and vertical. IRDs and CWs were measured for bimaxillary canines to second molars, on buccal and lingual sides, at 3 transverse planes (1, 3, and 5 mm apically to the alveolar crest). JHs were measured in both jaws, between canines and second molars. The role of growth patterns and other variables were analyzed; also, safe zones were mapped with statistical substantiation.
RESULTS: IRDs were greater in the mandible, males, at points more distant from the ridge crest, and on the lingual side. Cortexes were thicker in the horizontal growth pattern, mandible, males, older patients, and lingual sides. JHs were greater in vertical growth pattern, mandible, and males.
CONCLUSIONS: The cortex might be thicker in patients with a horizontal growth pattern. The height might be greater in vertical growth pattern. IRDs might not be affected by growth pattern.

32.
Luchinskaya D, Du R, Owens DM, Tarnow D, Bittner N.
Various Surface Treatments to Implant Provisional Restorations and Their Effect on Epithelial Cell Adhesion: A Comparative In Vitro Study.
PURPOSE AND OBJECTIVE: The aim of this in vitro study was to investigate the ability of epithelial cells to attach to or proliferate on various mechanical or chemical surface treatments of an implant provisional material.
MATERIALS AND METHODS: Polyethyl methacrylate discs 10 mm in diameter and ~0.2 to 0.75 mm in width were used in the study. Experimental discs were treated with either a mechanical (pumice, varnish for shine, or high polishing) or a chemical agent (alcohol, chlorhexidine, or steam) to provide cleaning and/or polishing. Using primary human epidermal keratinocytes, experiments were performed to test the adhesion or proliferation of cells on the discs with
various surface treatments.

RESULTS: Scanning electron microscope analysis, rhodamine staining, and cell counting using a hemocytometer corroborated all findings and illustrated that the highest cell adhesion was found to be in the smooth surface treatment groups and the poorest adhesion was found to be in the rough surface groups and chemical treatment group.

CONCLUSION: Within the limitations of this study, the following clinical protocol is recommended for finishing, polishing, and disinfecting implant provisional restorations: coarse, medium, fine pumice -> high polishing (if desired) -> steam. It is recommended to avoid applying varnish in the perimucosal area near the epithelium. This study could establish the most appropriate way to handle provisional restorations in the peri-implant sulcus for improved soft tissue health, esthetics, and long-term stability.


PURPOSE: To investigate the effect of implant diameter on fatigue strength using static and cyclic load test.

MATERIALS AND METHODS: Four different implant systems-SuperLine (PHI4.0), NRLine (PHI3.1), SlimLine (PHI2.8, PHI2.3), and (Dentium)-were grouped by implant diameter. A static load test was conducted with 5 specimens for each group using a universal testing machine to measure the ultimate failure load (UFL). With 80% of the UFL in the weakest group, the starting load for a cyclic load test was determined and the test was performed with 8 specimens for each group. All tests were conducted according to ISO14801 (2007) until implant failure occurred. After dynamically loaded, each specimen was sectioned and stereo-microscopically examined. The failure modes of each implant system were classified. Static and cyclic load test data were respectively analyzed after the test of normality, with the level of significance at P = 0.05.

RESULTS: In the static load test, the higher maximum load of the standard-diameter implant was significant compared with the recorded narrow or mini-implants (P < 0.05). The yield strengths of the PHI2.8 and PHI3.1 implants were significantly greater than that of the PHI2.3 implant (P < 0.05). In a cyclic load test, the mean number of cycles until implant failure occurred was recorded for each specimen. The value for the PHI4.0 implant was significantly greater (P < 0.001).

CONCLUSION: Implant diameter has an effect on the ability to withstand both static and cyclic loads within Dentium implant systems. The UFLs and fatigue cycles decreased as the implants diameter became smaller.


OBJECTIVE: The present prospective study aimed to more precisely identify the time points of bone changes around hybrid titanium implants up to 30 months of follow-up.

MATERIALS AND METHODS: Twelve hybrid T3 implants (Biomat 3i) were placed in 9 healthy patients with the 2-stage surgical approach. Standardized digital Rx were taken at implant insertion (T0); healing-abutment connection after 3.1 +/- 0.2 weeks (TX); loading stage after 7.5 +/- 0.6 weeks (T1); after 12 months (T2); and after 30 months (T3) of functional loading. The marginal bone loss was digitally measured.
RESULTS: The mean marginal bone loss was 0.76 +/- 0.37 mm after 30 months. More than 60% (0.42 +/- 0.29 mm) of the bone loss took place at healing-abutment connection (TX-T1). No statistically significant bone loss was found between T1-T2 and T2-T3, after 12 and 30 months, respectively. Approximately 40% of bone loss (0.34 mm) was noted between T1 and T3 (P < 0.05), which corresponds to the loading period.

CONCLUSIONS: The implant-oral environment connection represents a critical step point in crestal bone loss. The amount of marginal bone loss, measured after 30 months of loading (T1-T3), was much less than that reported in the literature, showing that correct loading has a minor impact on the periimplant bone remodeling as compared to surgical implant reopening.


When the patient cannot be rehabilitated with a fixed denture, or when he does not succeed in adapting to a traditional removable denture, a possible alternative solution consists in the use of a limited number of implants, placed in strategic positions in the arches of the patient, and subsequently connected to their residual teeth. The aim of this review is to evaluate the progress made on connections between teeth and implants in removable denture, to analyze their advantages and disadvantages and to compare the survival rate, both of the teeth and of the implants used as abutments, present in the various studies taken into examination, with the aim of being able to evaluate the effectiveness of this rehabilitative option. The concept of preserving residual teeth, even if these are unfavorably distributed, and inserting a minimum number of implants in strategic positions, thanks to which an area of favorable support for the denture can be created, seems reasonable; this will guarantee a better adaptation of the patient to the denture, as well as an improvement in the quality of life. The study of articles present in literature suggests that the survival rate of the implants in removable dentures, supported by teeth and implants through traditional systems of anchorage, appears to be quite high. However, further studies with a higher level of evidence, more representative test subjects and a longer follow-up period are necessary, in order to confirm the validity of this rehabilitative solution.


OBJECTIVES: Metal artefacts present challenges to both radiologists and clinicians during post-operative imaging. Such artefacts reduce the diagnostic effectiveness of CT scans and mask findings that could be vital for patient management. Thus, a powerful artefact reduction tool is necessary when imaging patients with metal implants. Our aim was to test the recently introduced iterative metal artefact reduction (iMAR) algorithm in patients with maxillofacial implants.

METHODS: Images from 17 patients with diverse maxillofacial metal implants who had undergone CT scans were qualitatively and quantitatively analyzed before and after metal artefact reduction with iMAR.

RESULTS: After iMAR application, images exhibited decreased artefacts and improved image quality, leading to detection of lesions that were previously masked by artefacts. The application of iMAR did not affect image quality in regions distant from the metal implants.

CONCLUSIONS: The application of iMAR to CT examinations of patients with maxillofacial metal implants leads to artefact reduction, improvement of image quality and increased diagnostic utility. Routine implementation of iMAR during imaging of patients with metal hardware implants could add diagnostic value.
to their CT examinations.


OBJECTIVE: The purpose of the study was to assess the clinical accuracy of a novel open-lattice-frame implant positioning system by evaluating the deviation between planned and actual implant positions on pre- and postoperative cone beam computed tomography (CBCT) images of patients treated with dental implants. Secondary aims were to record surgical time from first incision to end of implant surgery and start of suturing, and to record patient and surgeon satisfaction from the implant surgical procedure. Pre- and postoperative CBCT of 10 patients receiving 18 dental implants were used to generate implant angular deviations and implant shoulder and apex deviations. Mean angular deviation was 2.96+/-1.31 degrees (range 0.75 to 5.60 degrees). Mean
shoulder and apex deviations were 1.07 +/- 0.49 mm (range 0.38 to 1.85 mm) and 1.35 +/- 0.57 mm (range 0.52 to 2.19 mm), respectively. Mean time from first incision to start of suturing was 24 +/- 7 minutes. Patient satisfaction ranged between 8 and 10, and surgeon satisfaction regarding the procedure ranged between 9 and 10, on a scale of 1 to 10. The open-lattice-frame implant positioning system provided adequate accuracy, and may aid in improving patient-related and surgeon-related outcomes by improving surgical accuracy and shortening surgical treatment duration.