



Straumann Scientific Highlights

SHORT OVERVIEWS ON RECENTLY PUBLISHED SCIENTIFIC EVIDENCE.

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No. 21 / 2018 – by Dr. Marcin Maj, **straumann**[®] Science

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In this issue...

1. 10 year data from 1692 Straumann tissue level implants with SLA[®] surface. 98.2% implant survival and and stable marginal bone levels (Kim et al 2018 & Kang et al. 2018).
2. 100% implant survival and no sinus complications after 10 year of performance of the Straumann tissue level implants with SLA[®] surface following sinus floor elevation without grafting. (Abi Najm S et al 2018)
3. Use of original prosthetic components to be the safest option for clinicians. Differences between the original and compatible components may lead to complications. (Fokas et al 2018).



Retrospective radiographic observational study of 1692 Straumann tissue-level dental implants over 10 years

I. Implant survival and loss pattern

Clin Implant Dent Relat Res. 2018 Oct;20(5):860-866

II. Marginal bone stability

Clin Implant Dent Relat Res. 2018 Oct;20(5):875-881

Study objectives

The purpose of this study was to determine the cumulative survival rates and the marginal bone loss around **Straumann tissue-level dental implants (SLA)** over a 10-year period and identify the patterns of implant loss at a single research institution as well as the predisposing risk factors for peri-implant marginal bone loss. In total, 1692 implants were installed in 881 patients who visited the Department of Periodontology, Dental Hospital, Yonsei University, Seoul from January 2003 to December 2009. Cases in which the implant was completely removed were defined as implant failures. The peri-implant marginal bone level was measured on periodic radiographs, and the changes in bone level were analyzed cumulatively from surgery until up to 10 years later. The log-rank test was used to select candidate critical risk factors for marginal bone loss, and multivariate analysis using Cox regression with the shared frailty model was performed.

Results and conclusions

- The 10-year cumulative survival rates were 98.23% and 95.70% at the implant and patient levels, respectively.
- The overall peri-implant bone loss was $0.07 \pm 0.21\text{mm}$, $0.09 \pm 0.26\text{mm}$, $0.14 \pm 0.41\text{mm}$, and $0.17 \pm 0.45\text{mm}$ at 3, 5, 7, and 9 years, respectively.
- Only 14 implants (0.82%) showed pathologic marginal bone loss exceeding 2mm during the follow-up period.
- The length, placement site, and insertion torque might affect implant survival.
- Multivariate analysis revealed that diameter of the implant affected the peri-implant marginal bone loss.
- Straumann tissue-level dental implants showed low failure rates and only slight peri-implant marginal bone loss, with a very low incidence of pathologic marginal bone loss exceeding 2mm; and can be considered a useful long-term treatment option.

Adapted from Kim S et al., Clin Implant Dent Relat Res. 2018 Oct;20(5):860-866 and Kang H et al., Clin Implant Dent Relat Res. 2018 Oct;20(5):875-88, for more info about this publication click [HERE](#)

Contemp Clin Dent. 2018 Sep;9(Suppl 2):S278-S282.

Assessment of Survival Rate of Dental Implants in Patients with Bruxism: A 5-year Retrospective Study.

Chitumalla R, Halini Kumari KV, Mohapatra A, Parihar AS, Anand KS, Katragadda P

Study objectives

The aim of this study was to assess complications in dental implants in bruxism patients. This 5-year retrospective study was conducted on 450 patients (640 dental implants) who received implants during the period and followed up for 5 years from June 2010 to June 2016. Among these patients, 124 had bruxism habit. Dental radiographs or patients' recalled records were evaluated for the presence of complications such as fracture of implant, fracture of ceramic, screw loosening, screw fracture, and decementation of unit.

Results and conclusions

- In 240 males and 210 females, 380 implants and 260 implants were inserted, respectively.
- A total of 145 screw-type and 130 cemented-type fixations had complications. (P = 0.5).
- Complications were seen in single crown (45), partial prostheses (125), and complete prostheses (105). (P = 0.012).
- The common complication was fracture of ceramic (70) in cemented-type fixation and fracture of ceramic (85) in screw-type fixation. (P = 0.01).
- Forty-two single crowns showed decementation, 85 partial prostheses had fracture of ceramic/porcelain, and 50 complete prostheses showed fracture of ceramic/porcelain. The failure rate was 42.9%.
- Survival rate of dental implants in males with bruxism habit was 90% after 1 year, 87% after 2 years, 85% after 3 years, 75% after 4 years, and 72% after 5 years.
- Survival rate of dental implants in females with bruxism habit was 92% after 1 year, 90% after 2 years, 85% after 3 years, 75% after 4 years, and 70% after 5 years.
- Bruxism is a parafunctional habit which affects the survival rate of dental implants. There is requirement to follow certain specific protocols in bruxism patients to prevent the developing complications.

Adapted from Chitumalla R et al., *Contemp Clin Dent*. 2018 Sep;9(Suppl 2):S278-S282, for more info about this publication click [HERE](#)

Adv Healthc Mater. 2018 Oct;7(19):e1800675

Unveiling the Mechanism of Surface Hydrophilicity-Modulated Macrophage Polarization.

Lv L, Xie Y, Li K, Hu T, Lu X, Cao Y, Zheng X

Study objectives

This paper demonstrates that modification of the surface hydrophilicity of Ti surface oxides can be utilized to control immune response by steering the macrophage polarization toward pro- or anti-inflammation phenotype. Enhanced anti-inflammatory and prohealing performance of macrophages is observed on hydrophilic surfaces compared to hydrophobic ones. Further study on the detailed mechanism demonstrates that the surface hydrophilicity controls specific proteins (fibronectin and fibrinogen) adsorption and conformation, which activate different signaling pathways (PI3K and NF- κ B) through selective expression of integrin β 1 or β 2 to influence the behaviors of macrophages. Thus, this study presents a mechanism of macrophage polarization modulated by surface hydrophilicity for the surface design of advanced implant materials with satisfactory anti-inflammatory and osteogenesis-promoting properties.

Adapted from Lv L et al., *Adv Healthc Mater.* 2018 Oct;7(19):e1800675, for more info about this publication click [HERE](#)

J Healthc Eng. 2018 Sep 3;2018:3163096.

Splinted and Nonsplinted Crowns with Different Implant Lengths in the Posterior Maxilla by Three-Dimensional Finite Element Analysis.

Lemos CAA, Verri FR, Santiago Junior JF, de Souza Batista VE, Kemmoku DT, Noritomi PY, Pellizzer EP

Study objectives

The aim of this study was to evaluate stress distribution in the implants/components and bone tissue for splinted and nonsplinted prostheses with different lengths of implants using three-dimensional finite element analysis. Six models from the posterior maxillary area were used in simulations. Each model simulated three Morse taper implants of 4.0 mm diameter with different lengths, which supported metal-ceramic crowns. An axial load of 400 N and an oblique load of 200 N were used as loading conditions.

Results and conclusions

- Splinted prostheses exhibited better stress distribution for the implants/components, whereas nonsplinted prostheses exhibited higher stress in the first molar under axial/oblique loading.
- Implant length did not influence stress distribution in the implants/components.
- In cortical bone tissue, splinted prostheses decreased the tensile stress in the first molar, whereas nonsplinted prostheses were subjected to higher tensile stress in the first molar; implant length had no influence on stress distribution.
- Within the limitations of this study, we conclude that splinted prostheses contributed to better stress distribution in the implant/abutment and cortical bone tissue; however, the reduction in the implant length did not influence the stress distribution.

Adapted from Lemos CAA et al., *Implant Dent.* 2018 Jun 28, for more info about this publication click [HERE](#)

Int J Implant Dent. 2018 Sep 27;4(1):28.

Interfacial biomechanical properties of a dual acid-etched versus a chemically modified hydrophilic dual acid-etched implant surface: an experimental study in Beagles.

de Jesus RNR, Carrilho E, Antunes PV, Ramalho A, Moura CCG, Stavropoulos A, Zanetta-Barbosa D

Study objectives

The aim of this study was to evaluate the effect of surface microtopography and chemistry on the early stages of biomechanical rigidity with a sandblasted, dual acid-etched surface, with or without an additional chemical modification (SAE-HD and SAE, respectively), in the tibia of Beagle dogs. Two pairs of implants, with the same macrogeometry but different surface technology, were installed bilaterally in the proximal tibia of six Beagle dogs. Test group: (dual acid-etched surface treatment with hydrochloric and sulfuric acid followed by microwave treatment and insertion in isotonic saline solution to increase hydrophilicity (SAE-HD) and control group (dual acid-etched surface (SAE) were compared. Maximum removal torque (in N cm) was the primary outcome measure, while connection stiffness (N cm/rad) and removal energy ($\times 10^{-2}$ J) were the secondary outcome measures and were assessed after 2 and 4 weeks in vivo.

Results and conclusions

- The removal torque values did not reveal significant statistical differences between SAE-HD and SAE implants at any observation times ($P = 0.06$).
- SAE-HD showed higher removal energy at 4 weeks ($999.35 \pm 924.94 \times 10^{-2}$ J) compared to that at 2 weeks ($421.94 \pm 450.58 \times 10^{-2}$ J), while SAE displayed lower values at the respective healing periods ($P = 0.16$).
- Regarding connection stiffness, there were no significant statistical differences neither within the groups nor over time.
- There was a strong, positive monotonic correlation between removal torque and removal energy ($r = 0.722$, $n = 19$, $P < 0.001$).
- In this study, no significant differences were observed between the specific hydrophilic (SAE-HD) and hydrophobic (SAE) surfaces evaluated, in terms of biomechanical properties during the early osseointegration period.

Adapted from de Jesus RNR et al., Int J Implant Dent. 2018 Sep 27;4(1):28, for more info about this publication click [HERE](#)

J Esthet Restor Dent. 2018 Sep 25.

Zirconia dental implants: A clinical and radiographic evaluation.

Rodriguez AE, Monzavi M, Yokoyama CL, Nowzari H

Study objectives

The aim of the present retrospective consecutive case series was to evaluate the clinical outcome of zirconia dental implants with 1 to 5 years of follow-up. The clinical outcome of 24 implants in 12 consecutive patients (male 5, female 7) with a mean age of 55 years (range 27-86) is reported. Radiographic crestal bone level was assessed by the use of "ImageJ" software program. Gingival and plaque indices were recorded at baseline and latest follow-up.

Results and conclusions

- A mean periimplant bone loss of 0.3 mm was measured in 33.3% of the implants and 66.7% were not affected by radiographic detectable periimplant bone loss.
- Low gingival and plaque indices were predominant values for both interim and final restorations.
- The apparent less affinity to plaque accumulation may favor soft tissue health around zirconia dental implants and decrease the risk of inflammation or infection. Zirconia dental implant merits further investigation.
- Within the limitations of the present clinical evaluation, zirconia implants provided excellent clinical results and esthetic outcomes.
- Zirconia dental implants are emerging as an option in clinical practice of implant dentistry providing stable clinical results and esthetic outcomes.

Adapted from Rodriguez AE et al., J Esthet Restor Dent. 2018 Sep 25, for more info about this publication click [HERE](#)

StatPearls Publishing; 2018 Sep 16

Dental Materials, Hydroxyapatite

Habibah TU, Salisbury HG

Study objectives

There is a need to reconstruct damaged hard tissue for several reasons that include traumatic or non-traumatic events, congenital abnormalities, or disease. Damaged tissues stemming from these events can become a major issue in orthopedic, dental, and maxillofacial surgery. A study on numerous biomaterials revealed that calcium phosphates had been used in hard tissues reconstruction for more than 6 decades. Hydroxyapatite (HA) was the primary material used in orthopedics and dentistry. Hydroxyapatite (HA) is an inorganic mineral that has a typical apatite lattice structure as $(A_{10}(BO_4)_6C_2)$ where A, B, and C are defined by Ca, PO_4 , and OH. Pure HA contains 39.68% by weight calcium and 18% by weight phosphorus resulting in a Ca/P mole ratio of 1.67.

Adapted from Habibah TU et al., StatPearls Publishing; 2018 Sep 16, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Oct;29(10):963-972.

Analysis of osseointegration of implants with hydrophilic surfaces in grafted areas: A Preclinical study.

Pinotti FE, de Oliveira GJPL, Aroni MAT, Marcantonio RAC, Marcantonio E Jr

Study objectives

The aim of this study was to evaluate the effect of a hydrophilic surface on the osseointegration in grafted areas with deproteinized bovine bone (DBB) and with biphasic ceramics of hydroxyapatite/ β -tricalcium phosphate (HA/TCP). Fifty-six rats were randomly allocated to four groups with 14 animals each: DBB: DBB + Machined surface; HA/TCP: HA/TCP + Machined surface; DBB-H: DBB + Hydrophilic surface; HA/TCP-H: HA/TCP + Hydrophilic surface. The bone defects were performed at the proximal epiphysis of the tibia. Then, the defects were filled with the biomaterials. After 60 days, the implants were placed in the grafted areas. The animals were submitted to euthanasia at periods of 15 and 45 days after the implants' placement. The osseointegration was assessed by biomechanical, microtomographic, and histometric analyses. In addition, the expression of bone morphogenetic protein-2 (BMP-2), alkaline phosphatase (ALP), and osteocalcin (OCN) was evaluated by immunohistochemistry.

Results and conclusions

- The HA/TCP-H group presented higher removal torque values and more mineralized tissue in the vicinity of the implants compared with the HA/TCP group.
- The DBB-H and HA/TCP-H groups presented higher values of bone-implant contact (at 15 and 45 days), of bone between the threads (45 days), and expression of BMP-2 (45 days) than the DBB and HA/TCP groups.
- Furthermore, the DBB-H group presented a higher expression of ALP than the DBB group (15 days).
- In conclusion, implants with a hydrophilic surface improve osseointegration in grafted areas compared to implants with machined surfaces

Adapted from Pinotti FE et al., Clin Oral Implants Res. 2018 Oct;29(10):963-972, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Oct;29(10):996-1006.

Early histological, microbiological, radiological, and clinical response to cemented and screw-retained all-ceramic single crowns.

Thoma DS, Wolleb K, Bienz SP, Wiedemeier D, Hämmerle CHF, Sailer I

Study objectives

The aim of this study was to assess the early histological, microbiological, radiological, and clinical response to cemented and screw-retained all-ceramic single-tooth implant-supported reconstructions. Patients with single-tooth implants were randomly allocated to receive a cemented lithium disilicate crown on a customized zirconia abutment (CEM) or a screw-retained crown with a directly veneered zirconia abutment (SCREW). At the screening visit, at crown insertion and at the 6-month follow-up, clinical parameters were measured at the implant and the contralateral tooth. Marginal bone levels, technical parameters, and esthetic outcomes were measured at the implants. At the 6-month follow-up, a microbiological test was performed and a soft tissue biopsy was harvested at the implants for histological analysis.

Results and conclusions

- Thirty-three patients completed the study, and implant and crown survival rates were 100% at 6 months.
- Histologically, the number of inflammatory cells tended to be higher in group CEM ($p > 0.05$). Moreover, significantly less inflammatory cells and fibroblasts/-cytes were found in the sulcular epithelium compared to the junctional epithelium and supracrestal connective tissue ($p < 0.001$).
- Four patients were tested positive for periodontal marker pathogens at the 6-month follow-up, and three of them belonged to group CEM.
- From crown insertion to the 6-month follow-up, median marginal bone levels changed only minimally and measured 0.31 and 0.32 mm in group CEM and 0.47 and 0.36 mm in group SCREW, respectively.
- Clinical and esthetic parameters remained stable over time and were comparable between natural teeth and implants as well as between the groups.
- Cemented reconstructions were associated with more inflammatory cells, and more patients were diagnosed with periodonto-pathogens.
- Both types of reconstructions resulted in similar radiological (marginal bone levels) and clinical outcomes (bleeding on probing and probing depth).

Adapted from Thoma DS et al., Clin Oral Implants Res. 2018 Oct;29(10):996-1006, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Sep;29(9):954-961

Patient Reported Outcome Measures (PROMs) of posterior single-implant crowns using digital workflows: A randomized controlled trial with a three-year follow-up.

Joda T, Ferrari M, Bragger U, Zitzmann NU

Study objectives

The aim of this study was to analyze Patient Reported Outcome Measures (PROMs) of implant crowns processed in complete digital workflows (test) and combined analog-digital workflows (control) with a three-year follow-up. This is a second reporting from the same trial with sample size calculation based on time efficiency. Twenty participants were selected for single-tooth replacement with screw-retained crowns in posterior sites (Straumann TL Implant System). Ten patients each were treated with test or control workflows and evaluated after 1 week of prosthetic delivery (baseline) and 3 years. The subjective opinion of the patient was assessed using visual analog scales (VAS) for PROMs; the Functional Implant Prosthodontic Score (FIPS) for the objective evaluation of the dentist.

Results and conclusions

- In test and control, implant crowns showed 100% survival without technical and/or biological complications.
- Mean PROMs varied between 81.6 and 90.3 with no difference between test and control, or between baseline and after 3 years for intra-patient comparison.
- Linear regression analysis exhibited a significant correlation between FIPS and PROMs related to overall treatment satisfaction (VAS-1: coefficient 0.45; $p = 0.0472$).
- Subjective patient's perception (PROMs) of posterior implant crowns processed in complete digital and combined analog-digital workflows revealed comparable high levels of satisfaction on the overall treatment outcome including function, esthetics, and cleanability after 3 years.
- The objective evaluation of the dentist (FIPS) seems to reflect the perception of the patients.

Adapted from Joda T et al., Clin Oral Implants Res. 2018 Sep;29(9):954-961, for more info about this publication click [HERE](#)

Int J Periodontics Restorative Dent. 2018 Sep/Oct;38(5):645-652

Three-Year Results of a Randomized Controlled Clinical Trial Using Submucosally Veneered and Unveneered Zirconia Abutments Supporting All-Ceramic Single-Implant Crowns.

Eisner B, Naenni N, Hüsler J, Hämmerle C, Thoma D, Sailer I.

Study objectives

The aim of this study was to evaluate the influence of veneering of the submucosal part of zirconia abutments on biologic, radiographic, technical, and esthetic outcomes in single-tooth implant sites. A total of 20 patients each received a zirconia abutment to support an all-ceramic implant-supported crown. Patients were randomly assigned to the test group (n = 10), in which the abutment was modified with pink veneering ceramic, or to a control group (n = 10) without further submucosal customization. Patients were followed up at baseline (after the insertion of the final reconstruction) and yearly thereafter.

Results and conclusions

- The survival rates reached 100% (implant level) and 95% (restorative level). Two implant crowns experienced minor chipping, one in each group. No significant intergroup differences were observed regarding mucosa thickness between the groups.
- The width of keratinized tissue did not change significantly over time in either group. The radiographic evaluation showed no significant differences regarding the marginal bone level at any timepoint between the groups.
- Changes over time reached -0.27 mm (SD 0.41, median -0.26) for the test group and -0.21 mm (SD 0.30, median -0.31) for the control group. Statistical significance was not reached within or between the groups.
- Veneering of the submucosal part of zirconia abutments did not significantly influence biologic and technical outcomes in single-tooth implant sites up to 3 years.

Adapted from Eisner B et al., *Int J Periodontics Restorative Dent.* 2018 Sep/Oct;38(5):645-652, for more info about this publication click [HERE](#)

Biomed Res Int. 2018 Jul 18;2018:5325032

Digital versus Analog Procedures for the Prosthetic Restoration of Single Implants: A Randomized Controlled Trial with 1 Year of Follow-Up.

Mangano F, Veronesi G

Study objectives

The aim of this study was to compare the outcome of digital versus analog procedures for the restoration of single implants. Over a two-year period (2014-2016), all patients who had been treated in a dental center with a single implant were randomly assigned to receive either a monolithic zirconia crown, fabricated with digital workflow (test group), or a metal-ceramic crown, fabricated with analog workflow (control group). All patients were followed for 1 year after the delivery of the final crown. The outcomes were success, complications, peri-implant marginal bone loss (PIMBL), patient satisfaction, and time and cost of the treatment.

Results and conclusions

- 50 patients (22 males, 28 females; mean age 52.6 ± 13.4 years) were randomly assigned to one of the groups (25 per group). Both workflows showed high success (92%) and low complication rate (8%). No significant differences were found in the mean PIMBL between test (0.39 ± 0.29 mm) and control (0.54 ± 0.32 mm) groups.
- Taking the impression took half the time in the test group (20 ± 5 min) than in the control (50 ± 7 min) group. When calculating active working time, workflow in the test group was more time-efficient than in the control group, for provisional (70 ± 15 min versus 340 ± 37 min) and final crowns (29 ± 9 min versus 260 ± 26 min).
- The digital procedure presented lower costs than the analog (€277.3 versus €392.2).
- No significant clinical or radiographic differences were found between digital and analog procedures; however, the digital workflow was preferred by patients; it reduced active treatment time and costs.

Adapted from Mangano F et al., *Biomed Res Int.* 2018 Jul 18;2018:5325032, for more info about this publication click [HERE](#)

J Prosthet Dent. 2018 Jul 20.

Randomized controlled clinical trial of digital and conventional workflows for the fabrication of zirconia-ceramic posterior fixed partial dentures. Part II: Time efficiency of CAD-CAM versus conventional laboratory procedures.

Mühlemann S, Benic GI, Fehmer V, Hämmerle CHF, Sailer I

Study objectives

The aim of this study was to compare the laboratory production time for tooth-supported, 3-unit FPDs by means of computer-aided design and computer-aided manufacturing (CAD-CAM) systems and a conventional workflow. In addition, the quality of the 3-unit framework of each treatment group was evaluated clinically. For each of 10 participants, a 3-unit FPD was fabricated. Zirconia was used as the framework material in the CAD-CAM systems and included Lava C.O.S. CAD software (3M) and centralized CAM (group L); CARES CAD software (Institut Straumann AG) and centralized CAM (group iT); and CEREC Connect CAD software (Dentsply Sirona) and centralized CAM (group C). The noble metal framework in the conventional workflow (group K) was fabricated by means of the traditional lost-wax technique. All frameworks were evaluated clinically before veneering. The time for the fabrication of the cast, the 3-unit framework, and the veneering process was recorded. In addition, chairside time during the clinical appointment for the evaluation of the framework was recorded.

Results and conclusions

- The total effective working time (mean \pm standard deviation) for the dental technician was 220 \pm 29 minutes in group L, 217 \pm 23 minutes in group iT, 262 \pm 22 minutes in group C, and 370 \pm 34 minutes in group K.
- The dental technician spent significantly more time in the conventional workflow than in the digital workflow, independent of the CAD-CAM systems used ($P < .001$).
- Irrespective of the CAD-CAM system, the overall laboratory time for the dental technician was significantly less for a digital workflow than for the conventional workflow.

Adapted from Mühlemann S et al., J Prosthet Dent. 2018 Jul 20, for more info about this publication click [HERE](#)

Int J Oral Maxillofac Implants. 2018 Jul/Aug;33(4):905-912

Long-Term Esthetic Outcome of Tissue-Level and Bone-Level Implants in the Anterior Maxilla.

Siebert C, Rieder D, Eggert J, Wichmann MG, Heckmann SM.

Study objectives

The aim of this study was to assess and compare the esthetic outcome of tissue-level (TL) and bone-level (BL) implants that had been placed as single implants in the anterior maxilla. Patients were treated using TL implants (Straumann). From 2008 until 2012, patients received the newly developed BL implant (Straumann). All patients with a single anterior maxillary implant who came to check-ups regularly were contacted and invited to take part in the study. Standardized photographs were taken to conduct the evaluation. Five observers analyzed the esthetic outcome using the pink esthetic score (PES).

Results and conclusions

- The study comprised 10 immediate (TL = 6, BL = 4), 21 early (TL = 6, BL = 15), and 15 delayed implantations (TL = 11, BL = 4).
- All implant sites were simultaneously augmented.
- The prosthetic restorations were delivered 6 to 24 weeks after implant placement in the TL group and 10 to 14 weeks after implant placement in the BL group.
- Esthetic evaluation was performed after a mean period of 9.5 years for TL implants (range: 5.5 to 12.0) and 3.7 years for BL implants (range: 2.6 to 7.1).
- The overall PES was 8.49 (SD: 2.35) for TL implants and 9.29 (SD: 1.90) for BL implants ($P = .37$). Comparison of single parameters was between $P = .24$ and $P = .83$, indicating no statistically significant difference between the two implant types.
- Within the limits of this study, it can be stated that both implant designs showed comparably satisfying esthetic results.

Adapted from Siebert C et al., *Int J Oral Maxillofac Implants*. 2018 Jul/Aug;33(4):905-912, for more info about this publication click [HERE](#)

Implant Dent. 2018 Aug;27(4):439-444

Osteotome Sinus Floor Elevation Without Grafting: A 10-Year Clinical and Cone-Beam Sinus Assessment.

Abi Najm S, Nurdin N, El Hage M, Bischof M, Nedir R

Study objectives

The aim of this study was to evaluate the thickness of the sinus membrane in contact with implants inserted 10 years before using an augmentation procedure without grafting material, and to identify adverse events correlated with implant protrusion in the sinus. Osteotome sinus floor elevations were performed without grafting material. The implants (Straumann AG, Basel, Switzerland) were placed simultaneously, all protruded into the sinus. After 10 years, implants were considered viable in the absence of mobility, pain, infection, or continued radiolucency. Sinus health was assessed using cone-beam computed tomography and by the way of a questionnaire in which patients reported symptoms of sinusitis they might have had.

Results and conclusions

- Controlled implants (21 implants, 13 patients) were osseointegrated. The membrane thickness was <2 mm in 11 patients and 2 to 3 mm with flat thickening in 2 patients.
- No patients exhibited any clinical or radiographic signs of sinusitis.
- No sinus complications were observed after 10 years. The initial protrusion of implants into the sinus did not influence long-term sinus health.
- The maintenance of successful integration is thus the key to avoiding sinus complication.

Adapted from Abi Najm S et al., *Implant Dent.* 2018 Aug;27(4):439-444, for more info about this publication click [HERE](#)

J Clin Periodontol. 2018 Sep;45(9):1118-1127

Endo-sinus bone formation after transalveolar sinus floor elevation without grafting with simultaneous implant placement: Histological and histomorphometric assessment in a dog model.

Qian SJ, Mo JJ, Shi JY, Gu YX, Si MS, Lai HC

Study objectives

The aim of this study was to evaluate endo-sinus new bone formation and implant osseointegration after transalveolar sinus floor elevation (TSFE) and simultaneous implant placement without any grafting materials and to investigate the influence of implant surface modification on bone healing process under this circumstance. Transalveolar sinus floor elevation and simultaneous implant placement were conducted bilaterally on 12 Labrador dogs. No grafting materials were used during surgery. Implants with two different surfaces (SLA and SLActive) were placed in a split-mouth design. The animals were sacrificed 4, 8 and 24 weeks after surgery for histological and histomorphometric assessments. Bone-to-implant contact (BIC%), alveolar bone height (ABH) and the percentages of mineralized bone (MB%) in the area of interest were analysed. The probing depth (PD) and bleeding on probing (BOP) were also assessed to describe peri-implant health conditions.

Results and conclusions

- Sprouts of new bone in direct contact with implant surface were seen in the elevated area at every time point. Newly formed woven bone under sinus membrane was visible.
- SLActive implants exhibited favourable results compared with SLA implants regarding ABH at 4 weeks and BIC% at 4 and 8 weeks. Sites with
- BOP positive could be observed in both groups at any time point.
- No newly formed bone can be found on the implant apex with either SLA or SLActive surfaces at any time point.
- Spontaneous new bone formation from the parent bone walls could be observed after TFE without any grafting materials.
- No clear evidence of bone formation from the Schneiderian membrane could be found.

Adapted from Qian SJ et al., J Clin Periodontol. 2018 Sep;45(9):1118-1127, for more info about this publication click [HERE](#)

J Oral Maxillofac Surg. 2018 Aug;76(8):1677-1687

Effect of Obesity or Metabolic Syndrome and Diabetes on Osseointegration of Dental Implants in a Miniature Swine Model: A Pilot Study.

Coelho PG, Pippenger B, Tovar N, Koopmans SJ, Plana NM, Graves DT, Engebretson S, van Beusekom HMM, Oliveira PGFP, Dard M

Study objectives

The aim of this study was to assess the effect of different abutment configurations on peri-implant soft and hard tissue healing. Two-piece dental implants, 3.5 mm in diameter and 8 mm in length, were placed in four beagle dogs. Two different transmucosal healing abutment configurations were randomly selected: one with a wide emergence profile (WE) (45° angulation with implant long axis) and the other with a narrow emergence profile (NE) (15° angulation with implant long axis). After four months of healing, the animals were sacrificed. Micro-CT scans were taken for mesio-distal analysis; subsequently, the biopsies were prepared for bucco-lingual histometric analyses. Several measurements were taken using the following reference points: marginal mucosal level (MML), apical barrier epithelium (aBE), implant shoulder (IS), marginal bone crest (BC), and first bone-to-implant contact (fBIC).

Results and conclusions

- In the micro-CT analysis, the distance from IS-fBIC was 1.11 ± 0.66 mm for WE and 0.12 ± 0.21 mm for NE ($p = 0.004$).
- The IS-BC of WE was -0.54 ± 0.80 mm, whereas NE presented 0.76 ± 0.48 mm ($p = 0.002$).
- The histometric analysis showed that both groups presented comparable dimensions of peri-implant biologic width ($p > 0.05$). However, in the distance from IS to BC, the WE showed a mean distance of -0.66 ± 0.78 mm while NE was 0.06 ± 0.42 mm ($p = 0.039$); the IS to fBIC was 0.89 ± 0.68 mm for WE while NE was 0.30 ± 0.30 mm ($p = 0.041$).
- The design of the transmucosal component can influence the establishment of the peri-implant biologic width. The flat and wide emergence profile induced an apical displacement of the peri-implant biologic width and more bone loss.

Adapted from Coelho PG et al., J Oral Maxillofac Surg. 2018 Aug;76(8):1677-1687, for more info about this publication click [HERE](#)

Clin Oral Investig. 2018 Sep 19.

Clinical evaluation of non-surgical cleaning modalities on titanium dental implants during maintenance care: a 1-year follow-up on prosthodontic superstructures.

Schmidt KE, Ausschill TM, Sculean A, Arweiler NB

Study objectives

The aim of this study was to investigate tissue health around implants with newly attached superstructures over 12 months of preventive maintenance appointments and instrumentation when necessary. In a randomized, split-mouth study 32 implants (8 participants with 4 implants each) received followed-up care every 3 months after superstructure attachment. Implants and superstructures were randomly assigned to four treatment groups and treated if necessary: (1) titanium cures (TC), (2) stainless steel ultrasonic tip (PS), (3) erythritol air-polishing powder (EP), or (4) rubber cup polishing (CON). Probing depths (PDs), bleeding on probing (BOP), modified gingival (mucosal) bleeding index (GBI) around implants, and full-mouth Plaque Control Record (PCR) were measured every 3 months. Clinical attachment levels (CALs) and height of keratinized mucosa (KM)/gingival margins (GMs) for implants/teeth and PD, BOP, and GBI for teeth were documented at baseline, 6 months, and 12 months. Matrix metalloproteinase 8 (MMP-8) and periopathogens were measured at baseline and 12 months.

Results and conclusions

- Participants exhibited minimal signs of periodontal inflammation with statistically significant PD improvement (3.0 ± 0.2 to 2.8 ± 0.3 mm; $p = 0.022$) and overall CAL (4.3 ± 0.8 to 4.0 ± 0.7 mm; $p = 0.048$) after 1 year.
- Implants showed no statistically significant differences ($p > 0.05$) between or within groups at baseline or 12 months for any parameter, except MMP-8 decreased significantly for PS (14.50 ± 17.58 to 4.63 ± 7.56 ng; $p = 0.044$), and after 12 months, PCR showed a significant difference between TC and PS ($p = 0.018$).
- Treatment was necessary as inflammation was observed around newly placed superstructures within the first year of maintenance care. All tested treatment modalities yielded comparable clinical improvements.
- Early assessment and diagnosis of mucositis and regular maintenance can promote long-lasting implant health.

Adapted from Schmidt KE et al., Clin Oral Investig. 2018 Sep 19, for more info about this publication click [HERE](#)

J Prosthet Dent. 2018 Jul 10.

Differences in micromorphology of the implant-abutment junction for original and third-party abutments on a representative dental implant.

Fokas G, Ma L, Chronopoulos V, Janda M, Mattheos N.

Study objectives

The aim of this study was to evaluate the micromorphological differences among different commercial brands of zirconia, titanium, and gold abutments for dental implants in terms of tight surface contact. The following abutments (n=3 per type) were preloaded on Straumann Bone Level implants according to the manufacturer's instructions for zirconia (Zr, Zr2, Zr3), titanium (Ti and Ti2), and gold (Gold 1, Gold 2). The micromorphology of the implant-abutment units was investigated by using scanning electron microscopy (original magnification $\times 10$ to $\times 500$) after microtome sectioning. After we calibrated, the length of the areas with tight contact (TC) (discrepancy $\leq 3 \mu\text{m}$) was calculated at the level of conical connection (CC), lower internal connection (LIC), and screw threads (STs).

Results and conclusions

- Major differences were found among the different abutment types in terms of design and extent of surface contact. The TC showed significant differences among the abutments of Zr group, depending on the side and level of evaluation
- In Ti group, no significant differences were found ($P > .008$). The Gold and Gold 2 groups had significantly greater contact on the left side of CC ($P < .008$).
- A difference in design of the abutments was apparent. The tight surface contact was significantly different among the examined abutments or abutment screws and the respective area of the inner surface of the implants.

Adapted from Fokas G et al., J Prosthet Dent. 2018 Jul 10, for more info about this publication click [HERE](#)

Dent Mater. 2018 Sep 13.

Biofilm formation on restorative materials and resin composite cements.

Astasov-Frauenhoffer M, Glauser S, Fischer J, Schmidli F, Waltimo T, Rohr N.

Study objectives

The aim of this study was to determine in vitro, to what extent bacteria adhere to monolithic zirconia, polymer-infiltrated ceramic and acrylate polymer cemented with resin composite cement. Disks made of zirconia (YZ), polymer-infiltrated ceramic (VE), acrylate polymer (CT), self-adhesive cement (RUN) and of two different adhesive cements (RUL and VAF) were produced. The biofilm formation of three bacterial species (*Streptococcus sanguinis*, *Fusobacterium nucleatum*, *Porphyromonas gingivalis*) on each material was assessed over 72h using a flow chamber system. The biofilms were quantified by crystal violet staining (optical density 595nm) and visualized using SEM. The inorganic composition of the different materials was analyzed and the wettability of the specimens was measured.

Results and conclusions

- For the restorative materials lowest biofilm formation was found on CT: OD 0.5 ± 0.1 , followed by VE: OD 0.8 ± 0.1 and YZ: OD 1.4 ± 0.3 .
- The biofilm formation on resin composite cements was significantly lower on VAF: OD 0.6 ± 0.1 than for RUL: OD 0.9 ± 0.1 and RUN: OD 1.0 ± 0.1 .
- A high wettability of the specimens with saliva/serum mixture tended to result in a higher biofilm formation.
- Correlations were obtained between the organic/inorganic composition of the materials and the polar/dispersive part of the surface free energy.
- Three-species biofilm formation on restorative and cement materials strongly relies on the materials composition. If the restorative material CT and cement VAF also prevent excessive biofilm formation in a clinical situation should be further investigated.

Adapted from Astasov-Frauenhoffer M et al., Dent Mater. 2018 Sep 13, for more info about this publication click [HERE](#)

Int J Oral Maxillofac Implants. 2018 Sep/Oct;33(5):1126-1135

Pink Esthetic Score Outcomes Around Three Implant-Abutment Configurations: 3-Year Results.

Barwacz CA, Stanford CM, Diehl UA, Cooper LF, Feine J, McGuire M, Scheyer ET.

Study objectives

The aim of this study was to evaluate the influence that three different implant-abutment interface designs had on peri-implant mucosal outcomes as assessed by the pink esthetic score (PES) 3 years after delayed implant placement and immediate provisionalization. Adult subjects (n = 141) requiring replacement of a bounded single tooth in the anterior maxilla as well as first premolar sites were randomized to receive one of three unique implant-abutment interface designs (conical interface [CI]; flat-to-flat interface [FI]; or platform-switch interface [PS]). Bilateral (anterior sites) or unilateral (premolar sites) digital clinical photographs were made at 1, 3, 6, 12, 24, and 36 months post-implant placement. Five calibrated faculty evaluators who previously scored the 1-year PES image dataset scored the 24- and 36-month photographs using a digital, cloud-based tablet interface.

Results and conclusions

- Six hundred ten clinical photographs were evaluated, resulting in a total of 3,050 sum PES values and 21,350 individual PES values.
- All three implant-abutment interface groups demonstrated acceptable esthetics at 3 years (mean sum PES = 10.1 ± 1.9, 4.0 to 13.2), with no single group demonstrating significantly greater mean sum PES values than another at the 3-year follow-up or at any recall interval in between.
- No significant differences were observed in mean sum PES scores for subjects randomized to one of three different implant-abutment interface geometries.
- Within the limitations of this study thus far, the first 6 months following definitive prosthesis delivery appear to still be the most significant with regard to improvement in PES outcomes for all three treatment groups.

Adapted from Barwacz CA et al., Int J Oral Maxillofac Implants. 2018 Sep/Oct;33(5):1126-1135, for more info about this publication click [HERE](#)

Clin Oral Investig. 2018 Sep 20.

Treatment of buccal soft tissue dehiscence around single implant: 5-year results from a prospective study.

Roccuzzo M, Dalmaso P, Pittoni D, Roccuzzo A

Study objectives

The aim of this study was to report the 5-year outcomes of a coverage procedure of shallow maxillary soft tissue dehiscences, around single tissue-level implants. The original population consisted of 16 patients presenting a single maxillary buccal implant soft tissue recession. A connective tissue graft, taken from the maxillary tuberosity, was inserted underneath a split-thickness envelope flap. After treatment, patients received individually tailored supportive periodontal therapy (SPT).

Results and conclusions

- At 5 years, complete implant soft tissue coverage was depicted in 8 out of 13 cases (62%).
- Mean soft tissue dehiscence coverage was 86%.
- Patients' esthetic evaluation showed the persistency of high VAS scores.
- Treatment of buccal soft tissue dehiscence around single implant, followed by regular supportive therapy, resulted in good esthetic and functional results in the majority of patients.
- Within the limits of this study, the positive results suggest that the proposed technique may be a reliable option in selected cases.

Adapted from Roccuzzo M et al., Clin Oral Investig. 2018 Sep 20, for more info about this publication click [HERE](#)

J Clin Periodontol. 2018 Jul 4.

Efficacy of autogenous tooth roots for lateral alveolar ridge augmentation and staged implant placement. A prospective controlled clinical study.

Schwarz F, Hazar D, Becker K, Sader R, Becker J

Study objectives

The aim of this study was to assess and compare the efficacy and safety of autogenous tooth roots (TR) and autogenous bone blocks (AB) for lateral alveolar ridge augmentation and two-stage implant placement. A total of 30 patients in need of implant therapy and lateral ridge augmentation were allocated to parallel groups receiving either (a) healthy autogenous tooth roots (e.g. retained wisdom or impacted teeth) (n = 15) or (b) cortical autogenous bone blocks harvested from the retromolar area. After 26 weeks of submerged healing, the primary endpoint was defined as the crestal ridge width (mm) (CW26) being sufficient to place an adequately dimensioned titanium implant at the respective sites.

Results and conclusions

- Soft tissue healing was uneventful in both groups. CW26 at V isit 6 allowed for a successful implant placement in all patients of both TR (15/15) and AB groups (15/15).
- Mean CW26 values amounted to 10.06 ± 1.85 mm (median: 11.0) in the TR and 9.20 ± 2.09 mm (median: 8.50) in the AB group, respectively.
- The difference between both groups did not reach statistical significance ($p = 0.241$).
TR may serve as an alternative graft to support lateral alveolar ridge augmentation and two-stage implant placement.

Adapted from Schwarz F et al., J Clin Periodontol. 2018 Jul 4, for more info about this publication click [HERE](#)

References

Kim S et al., Clin Implant Dent Relat Res. 2018 Oct;20(5):860-866 | **Kang H et al.**, Clin Implant Dent Relat Res. 2018 Oct;20(5):875-88, | **Chitumalla R et al.**, Contemp Clin Dent. 2018 Sep;9(Suppl 2):S278-S282 | **Lv L et al.**, Adv Healthc Mater. 2018 Oct;7(19):e1800675 | **Lemos CAA et al.**, Implant Dent. 2018 Jun 28 | **de Jesus RNR et al.**, Int J Implant Dent. 2018 Sep 27;4(1):28 | **Rodriguez AE et al.**, J Esthet Restor Dent. 2018 Sep 25 | **Pinotti FE et al.**, Clin Oral Implants Res. 2018 Oct;29(10):963-972 | **Thoma DS et al.**, Clin Oral Implants Res. 2018 Oct;29(10):996-1006 | **Joda T et al.**, Clin Oral Implants Res. 2018 Sep;29(9):954-961 | **Eisner B et al.**, Int J Periodontics Restorative Dent. 2018 Sep/Oct;38(5):645-652 | **Mangano F et al.**, Biomed Res Int. 2018 Jul 18;2018:5325032 | **Mühlemann S et al.**, J Prosthet Dent. 2018 Jul 20 | **Siebert C et al.**, Int J Oral Maxillofac Implants. 2018 Jul/Aug;33(4):905-912 | **Abi Najm S et al.**, Implant Dent. 2018 Aug;27(4):439-444 | **Qian SJ et al.**, J Clin Periodontol. 2018 Sep;45(9):1118-1127 | **Coelho PG et al.**, J Oral Maxillofac Surg. 2018 Aug;76(8):1677-1687 | **Schmidt KE et al.**, Clin Oral Investig. 2018 Sep 19 | **Fokas G et al.**, J Prosthet Dent. 2018 Jul 10 | **Astasov-Frauenhoffer M et al.**, Dent Mater. 2018 Sep 13 | **Barwacz CA et al.**, Int J Oral Maxillofac Implants. 2018 Sep/Oct;33(5):1126-1135 | **Roccuzzo M et al.**, Clin Oral Investig. 2018 Sep 20 | **Schwarz F et al.**, J Clin Periodontol. 2018 Jul 4 | source: www.pubmed.com

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