



# **SCIENTIFIC** **HIGHLIGHTS**

Short overviews on recently  
published scientific evidence.

Issue **4**/2024

*Edited by Dr. Marcin Maj*

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### EDITOR'S CHOICE

**Round and flat zygomatic implants: effectiveness after a 3 year follow up non interventional study**

*(Carlos Aparicio et al. 2024)*

and

**Primary stability and osseointegration comparing a novel tapered design tissue-level implant with a parallel design tissue-level implant. An experimental in vivo study**

*(Thomas Gill et al., 2024)*

**Influence of mucosal tissue height on implant crestal bone: A 10-year follow-up of a controlled clinical trial**

*(Algirdas Puisys et al., 2024)*

## EDITOR'S CHOICE

Int J Implant Dent. 2024 Jun 10;10(1):30

### Round and flat zygomatic implants: effectiveness after a 3 year follow up non interventional study

Carlos Aparicio, Waldemar D Polido, Antoine Chehade, Marc Shenouda, Madalina Simon, Peter Simon, Bilal Al-Nawas



#### STUDY OBJECTIVES AND METHODS

This non-interventional study investigates variations in the type and frequency of late complications linked to novel zygomatic implant designs, installed adhering to the Zygoma Anatomy-Guided Approach (ZAGA) concept, over an extended follow-up period of at least 3 years. Consecutive patients presenting indications for treatment with ZIs were treated according to ZAGA recommendations. Implants were immediately loaded. The ORIS success criteria for prosthetic offset, stability, sinus changes and soft-tissue status were used to evaluate the outcome.

#### RESULTS

- Twenty patients were treated. Ten patients received two ZIs and regular implants; one received three ZIs plus regular implants, and nine received four ZIs. Fifty-nine ZIs were placed: thirty-six (61%) Straumann ZAGA-Flat implants and twenty-three (39%) Straumann ZAGA-Round implants.
- Four patients (20%) presented earlier sinus floor discontinuities. Fifteen patients (75%) had prior sinus opacities. Nineteen patients were followed for between 38 and 53 months (mean 46.5 months). One patient dropped out after 20 months.
- When comparing pre-surgical CBCT with post-surgical CBCT, 84.7% of the sites presented identical or less sinus opacity; nine locations (15%) showed decreased, and another nine increased (15%) post-surgical sinus opacity.
- Fifty-three ZIs (89.8%) maintained stable soft tissue. Six ZIs had recessions with no signs of infection.
- ZIs and prosthesis survival rate was 100%.

#### CONCLUSIONS

The study highlights the effectiveness of ZAGA-based zygomatic implant rehabilitations using Round and Flat designs. Despite patient number constraints, minimal changes in the frequency of late complications from the 1-year follow-up were observed. 100% implant and prosthesis survival rate over a mean follow-up of 46.5 months is reported.

Adapted from C Aparicio et al., Int J Implant Dent. 2024 Jun 10;10(1):30, for more info about this publication, click [HERE](#)

J Dent. 2024 Jun 30;148:105224

## Influence of mucosal tissue height on implant crestal bone: A 10-year follow-up of a controlled clinical trial

Algirdas Puisys, Egle Vindasiute-Narbutė, Danius Razukevicius, Samuel Akhondi, German O Gallucci, Ignacio Pedrinaci



### STUDY OBJECTIVES AND METHODS

The purpose of this study was to evaluate the 10-year influence of soft tissue height (STH) on crestal bone level changes (CBC) in bone-level implants with non-matching internal conical connections. From the initial 97 patients, 59 (19 men, 40 women, age  $55.86 \pm 9.5$  years) returned for the recall visit. Based on baseline STH, they were categorized into T1 (thin STH  $\leq 2$  mm,  $n = 33$ ), T2 (thin STH augmented with allogenic tissue matrix (ATM),  $n = 32$ ), and C (thick STH  $> 2$  mm,  $n = 32$ ). Implants were placed in the posterior mandible using a one-stage approach and received single screw-retained restorations. Clinical (PPD, BOP, PI) and radiographic examinations were conducted after 10 years, with CBC calculated mesial and distal to each implant.

### RESULTS

- After 10 years, implants in surgically thickened (T2) or naturally thick STH (C) showed bone gains of  $0.57 \pm 0.55$  mm and  $0.56 \pm 0.40$  mm, respectively ( $p < 0.0001$ ) shifting from an initial CBC of  $-0.21 \pm 0.33$  mm to  $0.36 \pm 0.29$  mm in the thick STH group and  $-0.2 \pm 0.35$  mm to  $0.37 \pm 0.29$  mm in the surgically thickened STH group.
- Implants in naturally thin STH yielded a non-significant trend of bone loss ( $-0.12 \pm 0.41$  mm;  $p > 0.05$ ).

### CONCLUSIONS

Implants in thin STH ( $\leq 2$  mm) exhibited greater CBC over the study period. Significant bone gains were observed in thick STH cases, indicating that naturally thick STH or STH augmentation with ATM may contribute to maintain CBC in long-term around implants.

Adapted from A Puisys et al., J Dent. 2024 Jun 30;148:105224, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2024 Jul 20

## Comparative osseointegration of hydrophobic tissue-level tapered implants-A preclinical in vivo study

Jean-Claude Imber, Azita Khandanpour, Andrea Rocuzzo, Delia R Irani, Dieter D Bosshardt, Anton Sculean, Benjamin E Pippenger

### STUDY OBJECTIVES AND METHODS

The purpose of this study was to histometrically compare the osseointegration and crestal bone healing of a novel tapered, self-cutting tissue-level test implant with a standard tissue-level control implant in a submerged healing regimen. In a mandibular minipig model, implants were inserted and evaluated histometrically after a healing period of 3, 6, and 12 weeks. The primary outcome was the evaluation of bone-to-implant contact (BIC) and secondary outcomes were primary stability as per insertion torque and first BIC (fBIC). Outcomes for the test and control implants were compared using Wilcoxon signed-rank tests and mixed linear regression models.

### RESULTS

- Insertion torque values were significantly higher for the test ( $50.0 \pm 26.4$  Ncm) compared to the control implants ( $35.2 \pm 19.7$  Ncm,  $p = .0071$ ).
- BIC values of test implants were non-inferior to those of control implants over the investigated study period. After 12 weeks, the corresponding values measured were  $81.62 \pm 11.12\%$  and  $90.41 \pm 4.81\%$  ( $p = .1763$ ) for test and control implants, respectively.
- Similarly, no statistical difference was found for fBIC values, except for the 12 weeks outcome that showed statistically lower values for the test ( $-675.58 \pm 590.88$   $\mu\text{m}$ ) compared to control implants ( $-182.75 \pm 197.40$   $\mu\text{m}$ ,  $p = .0068$ ).

### CONCLUSIONS

Novel self-cutting tissue-level implants demonstrated noninferior osseointegration and crestal bone height maintenance to the tissue-level implants. Histometric outcomes between both implants demonstrated test implants were statistically noninferior to control implants, despite substantial differences in the bone engagement mechanism and resulting differences in insertion torque and qualitative bone healing patterns.

Adapted from JC Imber et al., Clin Oral Implants Res. 2024 Jul 20, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2024 Jul 30

## Alveolar ridge bone changes in patients treated with the split-crest technique with simultaneous implant placement: A retrospective longitudinal observational study

João Garcez-Filho, Débora de Almeida Bianco, André Barbisan de Souza, Ricardo Puziol de Oliveira, Flávia Matarazzo, Maurício G Araújo

### STUDY OBJECTIVES AND METHODS

The aim of this study was to investigate long-term alveolar ridge bone changes in patients treated with the split-crest technique (SCT) with simultaneous implant placement. Alveolar ridge width (ARW) was measured with a caliper immediately before (ARW1) and after SCT (ARW2) with a caliper. Existing CBCT scans taken at least 5 years postoperatively were used to assess the healed ARW (ARWF), buccal bone thickness (BBT), and lingual/palatal bone thickness (L/PBT) at 0, 3, and 5 mm apically from implant platform level (IPL). The distance between IPL and buccal bone crest (IPL-BBC) was also measured. Findings were compared with Wilcoxon and Student's t tests ( $p < .05$ ).

### RESULTS

- Records of thirty patients with 85 implants were included. Eleven patients (31 implants) presented CBCT scans taken in two separate occasions, resulting in 116 measurements.
- Tomographic follow-up ranged from 5 to 18 years ( $11.5 \pm 4.18$  years).
- Mean ARW increased from  $3.2 \pm 0.6$  to  $6.6 \pm 0.48$  mm after SCT, but significantly reduced overtime to  $4.46 \pm 0.83$  mm (ARWF) ( $p < .0001$ ).
- Mean BBT was  $0.5 \pm 0.9$ ,  $1.3 \pm 0.9$ , and  $2.0 \pm 1.2$  mm, while mean L/PBT was  $0.9 \pm 0.7$ ,  $1.6 \pm 0.9$ , and  $2.1 \pm 1.0$  mm at 0, 3, and 5 mm from IPL, respectively.
- IPL-BBC distance varied up to 8.7 mm ( $1.4 \pm 2.0$  mm), with 56/116 measurements (51/85 implants) showing IPL-BBC = 0 mm.

### CONCLUSIONS

Although SCT with simultaneous implant placement can predictably increase ARW postoperatively, ARW tended to significantly reduce over time, due to reductions in BBT and L/PBT, especially coronally. Nonetheless, 60% of the implants still presented some buccal bone at IPL.

Adapted from JG Filho et al., Clin Oral Implants Res. 2024 Jul 30, for more info about this publication, click [HERE](#)



J Periodontal Res. 2024 Jun 3

## Cementum and enamel surface mimicry influences soft tissue cell behavior

Benjamin Bellon, Benjamin Pippenger, Alexandra Stähl, Martin Dege, Ludovica Parisi



### STUDY OBJECTIVES AND METHODS

The aim of this study was to test whether titanium surface roughness disparity might be used to specifically guide the behavior of gingiva fibroblasts and keratinocytes, thereby improving the quality of soft tissue (ST) integration around abutments. Titanium discs resembling the roughness of enamel (M) or cementum (MA) were created with normal or increased hydrophilicity and used as substrates for human fibroblasts and keratinocytes. Adhesion and proliferation assays were performed to assess cell-type specific responses upon encountering the different surfaces. Additionally, immunofluorescence and qPCR analyses were performed to study more in depth the behavior of fibroblasts and keratinocytes on MA and M surfaces, respectively.

### RESULTS

- While enamel-like M surfaces supported adhesion, growth and a normal differentiation potential of keratinocytes, cementum-emulating MA surfaces specifically impaired the growth of keratinocytes.
- Vice versa, MA surfaces sustained regular adhesion and proliferation of fibroblasts. Yet, a more intimate adhesion between fibroblasts and titanium was achieved by an increased hydrophilicity of MA surfaces, which was associated with an increased expression of elastin.

### CONCLUSIONS

The optimal titanium implant abutment might be achieved by a bimodal roughness design, mimicking the roughness of enamel (M) and cementum with increased hydrophilicity (hMA), respectively. These surfaces can selectively elicit cell responses favoring proper ST barrier by impairing epithelial downgrowth and promoting firm adhesion of fibroblasts.

Adapted from B Bellon et al., J Periodontal Res. 2024 Jun 3, for more info about this publication, click [HERE](#)



Clin Oral Implants Res. 2024 Jul 26.

## Clinical, radiographic and patient-reported outcomes of zirconia and titanium implants in the posterior zone after 1 year of loading-A randomized controlled trial

Anina N Zuercher, Marc Balmer, Lily V Brügger, Daniel S Thoma, Ronald E Jung, Stefan P Bienz

### STUDY OBJECTIVES AND METHODS

The purpose of this study was to assess the clinical, radiographic and patient-reported outcomes (PROMs) of posterior zirconia and titanium implants at 1 year of implant loading. Forty-two patients with two adjacent missing teeth were enrolled in a randomized controlled trial with a within-subject controlled design. Each patient received one zirconia (Zr) and one titanium (Ti) implant, with the mesial and distal positions randomized. Examinations were performed following restoration delivery at baseline (BL) and at 1 year. Measurements included clinical parameters, radiographic outcomes (MBL) and PROMs.

### RESULTS

- Bleeding on probing showed an increase from BL to 1 year ( $34 \pm 30\%$  for Zr;  $25 \pm 21\%$  for Ti).
- MBL remained stable with minimal changes from BL to 1 year, measuring  $0.1 \pm 0.4$  mm (mean  $\pm$  SD) for Zr and  $-0.1 \pm 0.7$  mm for Ti.
- Veneering fractures were the most frequent technical complication and amounted to 17.5% in group Zr and 5% in group Ti ( $p = .100$ ).
- Patients preferred Zr implants for their soft tissue color, with a significant difference in perception between patients and clinicians ( $p < .017$ ).

### CONCLUSIONS

The study showed that both Zr and Ti implants had similar clinical outcomes, despite a high prevalence of mucositis and a few technical complications. Both implant types demonstrated stable marginal bone levels and similar patient-reported outcome measures.

Adapted from AN Zuercher et al., Clin Oral Implants Res. 2024 Jul 26., for more info about this publication, click [HERE](#)

Oral Maxillofac Surg. 2024 Jun 25

## Influence of clinical expertise and practical experience on transfer accuracy in guided dental implant placement - an in vitro study

Florian Sebastian Reiff, Charlotte Bischoff, Henriette Woelfler, Stefan Roehling

### STUDY OBJECTIVES AND METHODS

The aim of this study was to investigate whether inexperienced users applying a static navigation system can perform in-vitro a fully guided implant placement protocol and achieve similar results in terms of accuracy compared to experienced clinicians. Based on 36 identical resin models, a computer-assisted implant planning was performed and a surgical guide was produced accordingly. Three study groups were composed with 12 operators, each: control group with experienced surgeons (DOC), test group 1 with dental technicians (TEC) and test group 2 with non-specialists (OFC). Using a fully guided drilling protocol, two implants were placed into each of the 36 models. Subsequently, the differences between the virtually planned and final implant positions were determined and the transfer accuracy was evaluated.

### RESULTS

- For the control group DOC, the mean value of axial deviation was  $1.90 \pm 1.15$  degrees, for 3-dimensional deviation at the implant base  $0.52 \pm 0.33$  mm, for 3-dimensional deviation at the implant tip  $0.76 \pm 0.39$  mm and for vertical deviation at the implant tip  $-0.11 \pm 0.51$  mm.
- For corresponding parameters, the mean values of test group TEC were  $1.99 \pm 0.87$  degrees,  $0.42 \pm 0.21$  mm,  $0.68 \pm 0.30$  mm and  $-0.03 \pm 0.33$  mm and for test group OFC  $2.29 \pm 1.17$  degrees,  $0.63 \pm 0.35$  mm,  $0.89 \pm 0.43$  mm and  $-0.24 \pm 0.57$  mm, respectively.
- The results did not reveal any statistically significant differences between the control and the 2 test groups ( $p > 0.05$ ).

### CONCLUSIONS

The results of the present in-vitro study demonstrated that inexperienced users applying a static navigation system can perform a fully guided implant placement protocol and achieve similar results in terms of accuracy compared to experienced clinicians in this specific in vitro setup.

Adapted from FS Reiff et al., Oral Maxillofac Surg. 2024 Jun 25, for more info about this publication, click [HERE](#)

Clin Implant Dent Relat Res. 2024 Jun 11

## Clinical, radiographic, and aesthetic outcomes at two narrow-diameter implants to replace congenital missing maxillary lateral incisors: A 3-year prospective, clinical study

Andrea Rocuzzo, Jean-Claude Imber, Jakob Lempert, Simon Storgård Jensen

### STUDY OBJECTIVES AND METHODS

The aim of this study was to present the 3-year clinical, radiographic, and aesthetic outcomes in patients with congenitally missing lateral incisors rehabilitated with two narrow-diameter implants (NDIs). The original population consisted of 100 patients rehabilitated with a cement-retained bi-layered zirconia single-unit crown supported by either a Ø2.9 mm (Test) or a Ø3.3 mm (Control) NDI (n = 50). At the 1- and 3-year follow-up (T2, T3), implant survival rate, crestal bone level (CBL) changes, biological, and technical complications were recorded, while the assessment of the aesthetic outcomes was performed using the Copenhagen Index Score.

### RESULTS

- Seventy-four patients Ø2.9 mm (n = 39) or Ø3.3 mm (n = 35) reached T3, as 24 patients were lost to follow-up and 1 implant (Ø3.3 mm) was removed.
- Throughout the observation period, minimal CBL changes (i.e., <1 mm) were detected between groups.
- Despite the positive aesthetic scores recorded (i.e., 1-2), at T3 20% of patients rehabilitated with a Ø3.3 mm versus 2.6% of patients Ø2.9 mm displayed an alveolar process deficiency (Score 3).
- No additional technical and/or mechanical complications were recorded between T2 and T3.
- Tooth vitality was maintained in all neighboring teeth. Peri-implant probing depths and plaque scores remained low in both groups ( $p > 0.05$ ).

### CONCLUSIONS

The use of 2.9 or 3.3 diameter implants showed comparable favorable mid-term results in terms of survival rate, CBL, and aesthetic outcomes. Hence, clinicians should rely on the use of such NDIs when replacing maxillary lateral incisors.

Adapted from A Rocuzzo et al., Clin Implant Dent Relat Res. 2024 Jun 11, for more info about this publication, click [HERE](#)

Int J Periodontics Restorative Dent. 2024 Jul 26;44(4):408-421

## The Use of Enamel Matrix Derivative to Modulate Wound Healing of Peri-implant Soft Tissues

Daniele Cardaropoli, Lorenzo Tamagnone, Alessandro Roffredo, Luigi Costanzo

### STUDY OBJECTIVES AND METHODS

In the present split-mouth randomized clinical trial, EMD was used to influence the early phase of soft tissue healing around dental implants placed with a single-stage approach into a completely healed ridge. A total of 60 implants were placed in 30 patients (2 implants per patient, one in the test group and one in the control group). In the test sites, EMD was administered around the healing abutment before soft tissues were sutured. Soft tissue healing index (HI) and secondary endpoints (clinical, radiographic, and patient-reported outcomes) were measured.

### RESULTS

- Better outcomes were recorded in patients receiving EMD for all parameters. The present results support the use of EMD to improve and accelerate soft tissue wound healing around implants.

### CONCLUSIONS

The present results support the use of EMD to improve and accelerate soft tissue wound healing around implants.

Adapted from D Cardaropoli et al., Int J Periodontics Restorative Dent. 2024 Jul 26;44(4):408-421, for more info about this publication, click [HERE](#)

J Oral Implantol. 2024 Jun 13

## Ceramic Implant Rehabilitation: Consensus Statements from Joint Congress for Ceramic Implantology

Etyene Schnurr, Mathias Sperlich, Amerian Sones, George E Romanos, J L Rutkowski, Dirk U Duddeck, Jörg Neugebauer, Wael Att, Markus Sperlich, Karl Ulrich Volz, Shahram Ghanaati

### STUDY OBJECTIVES AND METHODS

The objectives of the study group focused on the following main topics related to the performance of one- and two-piece ceramic implants: defining bone-implant-contact percentages and its measurement methods, evaluating the pink esthetic score as an esthetic outcome parameter after immediate implantation, recognizing the different results of ceramic implant designs, as redefined by the German Association of Oral Implantology, incorporating the patient report outcome measure to include satisfaction and improvement in oral health-related quality of life, and conducting preclinical studies to address existing gaps in ceramic implants. During the Joint Congress for Ceramic Implantology (2022), the study group evaluated 17 clinical trials published between 2015 and 2021.

### RESULTS

- After extensive discussions and multiple closed sessions, consensus statements and recommendations were developed, incorporating all approved modifications.
- A one-piece implant design features a coronal part that is fused to the implant body or interfaces with the post-abutment restoration platform, undergoing transmucosal healing.
- Long-term evaluations of this implant design have been supported by established favorable clinical evidence.
- Inaccuracies in the pink esthetic score and bone-implant-contact percentages were managed by establishing control groups for preclinical studies and randomizing clinical trials.
- The patient-reported outcome measures were adjusted to include an individual visual analog scale, collected from each clinical study, that quantified improved oral health and quality of life.
- Preclinical investigations should focus on examining the spread of ceramic debris and the impact of heat generation on tissue and cellular levels during drilling.
- Further technical advancements should prioritize wound management and developing safe drilling protocols.

Adapted from E Schnurr et al., J Oral Implantol. 2024 Jun 13, for more info about this publication, click [HERE](#)

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