



SCIENTIFIC **HIGHLIGHTS**

Short overviews on recently
published scientific evidence.

Issue **3/2023**

Edited by Dr. Marcin Maj

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(Stephen Chen & Ivan Darby 2023)

and

Immediate placement of one-piece zirconia implants with or without xenograft into the buccal gap. Soft tissues as secondary outcomes of an experimental in vivo study

(Daniel Alves et al., 2023)

Minimally Invasive Navigation-Guided Quad Zygomatic Implant Placement: A Comparative In Vitro Study

(Shengchi Fan et al., 2023)

EDITOR'S CHOICE

Clin Oral Investig. 2023 Mar 22

Inter-implant distance and buccal bone thickness for a novel implant design: a preclinical study

Stephen Chen, Ivan Darby

STUDY OBJECTIVES AND METHODS

The aim was to assess bone height between novel tapered implants at different inter-implant thread peak (TP) distances, and the impact of TP distance from outer buccal bone (BB) on marginal bone levels (MBL). Fully tapered implants with 0.5-mm thread depth and TP diameter 1 mm wider than the shoulder diameter were placed in healed ridges of minipigs. On one side, four implants were placed with inter-implant TP distances of 1, 2, or 3 mm corresponding to inter-implant implant shoulder distances of 2, 3, and 4 mm respectively. Three implants were placed on the other side with TP distances to outer BB of > 1 mm, 0.5-1 mm, or < 0.5 mm. After 12 weeks, (a) first bone-to-implant contact (fBIC), total BIC, bone area-to-total area (BATA), and coronal bone height between implants (Bi ½ max) for inter-implant distance, and (b) fBIC, BIC, and perpendicular crest to implant shoulder (pCIS) for BB were evaluated.

RESULTS

- No significant differences in bone healing and inter-implant bone height were noted for any of the TP distances.
- BB resorption was significant when TP distance to outer BB was < 0.5 mm.
- fBIC was lowest with TP to outer BB of 1.75 mm.

CONCLUSIONS

Inter-implant bone height between adjacent implants can be maintained even at an inter-implant TP distance as low as 1 mm. A minimum TP to outer BB distance of 0.75 mm is required for predictable maintenance of MBL.

Adapted from S. Chen et al., Clin Oral Investig. 2023 Mar 22, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2023 Apr;34(4):342-350

Immediate placement of one-piece zirconia implants with or without xenograft into the buccal gap. Soft tissues as secondary outcomes of an experimental in vivo study

Daniel Alves, Ricardo Faria-Almeida, Alvaro Azevedo, Antonio Liñares, Fernando Muñoz, Juan Blanco-Carrion

STUDY OBJECTIVES AND METHODS

The aim of this study was to histologically evaluate soft tissue healing following immediately placed one-piece zirconia implant and grafting a xenograft into the buccal gap. The third and fourth premolars (PM3 and PM4) in both quadrants of the mandible of nine dogs were used for this experiment. Those teeth were removed flapless and implants were placed into the distal sockets in a lingual position. In one side of the jaw, the gap between the implant and the socket walls was grafted (test) while no grafting was performed in the contralateral side (control), randomly selected. After 6 months of healing, biopsies were obtained and prepared for histological analysis. Soft tissue measures like supracrestal soft tissue height (STH), length of barrier epithelium (BE), and connective tissue (CTC) were measured at buccal and lingual surfaces.

RESULTS

- The marginal mucosa was in a coronal position on the test side compared with the control side.
- At the buccal surface, the BE was longer in the test side than in the control side, while the CTC was longer in the control side than in the test side.
- For the STH (BE + CTC), the difference between the groups was not statistically significant

CONCLUSIONS

The placement of a xenograft into the gap between a 1-piece zirconia implant and the buccal wall in dogs modified the process of soft tissue healing, providing less soft tissue recession.

Adapted from D. Alves et al., Clin Oral Implants Res. 2023 Apr;34(4):342-350, for more info about this publication click [HERE](#)

Int J Oral Maxillofac Implants. 2023 Mar-Apr;38(2):367-373

Minimally Invasive Navigation-Guided Quad Zygomatic Implant Placement: A Comparative In Vitro Study

Shengchi Fan, Matthias W Gielisch, Leonardo Díaz, Daniel G E Thiem, Bilal Al-Nawas, Peer W Kämmerer

STUDY OBJECTIVES AND METHODS

This study aimed to evaluate the accuracy of a new dynamic surgical navigation system with its minimally invasive registration guide for quad zygomatic implant placement in comparison with a gold standard navigation approach. A total of 40 zygomatic implants were placed in 10 3D-printed models based on the CBCT scans of edentulous patients. For registration, a surgical registration guide with a quick response plate was used for the test group, and five hemispheric cavities as registered miniscrews in the intraoral area were used for the control group. After ZI placement, a CBCT scan was performed and merged with pre-interventional planning. The deviations between planned and placed implants were calculated as offset basis, offset apical, and angular deviation and compared between the systems.

RESULTS

- The offset basis, offset apical, and angular deviation were 1.43 ± 0.55 mm, 1.81 ± 0.68 mm, and 2.32 ± 1.59 degrees in the test group, respectively.
- For the control group, values of 1.48 ± 0.57 mm, 1.76 ± 0.62 mm, and 2.57 ± 1.51 degrees were measured without significant differences between groups (all $P < .05$).
- The accuracy of ZI positions (anterior and posterior) were measured without significant differences between groups.

CONCLUSIONS

Two navigation systems with different registration techniques seem to achieve comparable acceptable accuracy for dynamic navigation of zygomatic implant placement. With the test group system, additional pre-interventional radiologic imaging and invasive fiducial marker insertion could be avoided.

Adapted from Shengchi Fan et al. Int J Oral Maxillofac Implants. 2023 Mar-Apr;38(2):367-373, for more info about this publication click [HERE](#)

Biomed Res Int. 2023 Apr 15;2023:8728499

Comparison of In Vitro Biofilm Formation on Titanium and Zirconia Implants

Lan-Lin Chiou, Beatriz H D Panariello, Yusuke Hamada, Richard L Gregory, Steven Blanchard, Simone Duarte



STUDY OBJECTIVES AND METHODS

This study aimed to compare titanium (Ti) and zirconia (Zr) implants regarding the amount of biofilm formation at different time frames and assess the distribution of biofilm on different aspects of dental implants. Biofilm was developed on Ti and Zr dental implants with a peri-implant-related multispecies model with *Streptococcus oralis*, *Actinomyces naeslundii*, *Veillonella dispar*, and *Porphyromonas gingivalis*, for 3 and 14 days. Quantitative assessment was performed with the measurement of total bacterial viability (colony forming units, CFU/mg). Scanning electron microscopy (SEM) was used to evaluate biofilm formation on different aspects of the implants.

RESULTS

- Three-day-old biofilm on Ti implants was significantly higher than that on Zr implants ($p < 0.001$).
- The Ti and Zr groups were not significantly different for 14-day-old biofilm.
- 3-day-old biofilm on Zr implants was sparse while biofilm growth was more pronounced for 3-day-old biofilm on Ti implants and 14-day-old biofilm groups.
- It appeared that less biofilm formed on the valley compared to the thread top for 3-day-old biofilm on Zr implants. Differences between the valley and the thread top became indistinguishable with the development of mature biofilm.

CONCLUSIONS

While early formed biofilms show greater accumulation on Ti implants compared to Zr implants, older biofilms between the two groups are comparable. The distribution of biofilms was not uniform on different areas of implant threads during early biofilm development.

Adapted from Lan-Lin Chiou et al. *Biomed Res Int.* 2023 Apr 15;2023:8728499, for more info about this publication click [HERE](#)

Dent J (Basel). 2023 Apr 10;11(4):100

Enamel Matrix Derivatives as an Adjunct to Alveolar Ridge Preservation-A Systematic Review

Omid Fakheran, Kai R Fischer, Patrick R Schmidlin



The aim was to systematically assess the current evidence regarding the adjunctive application of enamel matrix derivatives (EMDs) during alveolar ridge preservation (ARP) following tooth extraction. A comprehensive literature search was conducted in MEDLINE, Cochrane Library, PsycINFO, Web of Science, Google Scholar, and Scopus to identify relevant randomized controlled clinical trials (RCTs). The primary outcome parameters of this systematic review were histomorphometric and radiographic data; secondary outcomes were the feasibility of implant placement after ARP as well as patient-related outcomes such as postoperative discomfort.

RESULTS

- the search identified 436 eligible articles published from 2011 to 2022, but only five were ultimately included for data extraction (146 patients).
- Given the substantial heterogeneity among the included studies, no meta-analysis could be performed.
- The authors' qualitative analysis showed marginally improved outcomes regarding an increased percentage of new bone formation after tooth extraction and a reduction in postoperative discomfort.

CONCLUSIONS

Given the potential value of EMDs in other fields of regenerative dentistry, more consideration should be given to EMDs as an adjunctive treatment option in ARP. However, more well-controlled randomized clinical trials are necessary to evaluate the exact potential and impacts of EMDs.

Adapted from O. Fakheran et al. Dent J (Basel). 2023 Apr 10;11(4):100, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2023 Mar;34(3):157-176

Influence of buccal bone wall thickness on the peri-implant hard and soft tissue dimensional changes: A systematic review

H Lamia Elif Mutlu-Sağesen, E Ayça Sağesen, Mutlu Özcan

The aim was to identify clinical and preclinical studies reporting on the baseline BLD and/or buccal bone thickness (BBT) values. A secondary objective was to assess the effect of simultaneous grafting at sites with deficient or no buccal bone wall (BBW) at baseline. The primary outcome variables were BBT, BLD, and buccal vertical bone loss (VBL) at re-evaluation. Moreover, radiographic, clinical, and patient-reported outcome measures (PROMs) were evaluated.

RESULTS

- Overall, 12 clinical and four preclinical studies met the inclusion criteria. Inconsistencies were found in defining the critical BBT across the clinical and preclinical data evaluated.
- The clinical evidence demonstrated that during healing, dimensional changes occur in the alveolar bone and in the BBW that may compromise the integrity of the peri-implant bone, leading to VBL and mucosal recession (MR), particularly in scenarios exhibiting a thin BBW.
- The preclinical evidence validated the fact that implants placed in the presence of a thin BBW, are more prone to exhibit major dimensional changes and VBL.
- Moreover, the clinical data supported that, in scenarios where dehiscence-type defects occur and are left for spontaneous healing, greater VBL and MR together with the occurrence of biologic complications are expected.
- Furthermore, the augmentation of dehiscence-type defects is associated with hard and soft tissue stability. PROMs were not reported.

CONCLUSIONS

Dimensional changes occur as result of implant placement in healed ridges that may lead to instability of the peri-implant hard and soft tissues. Sites presenting a thin BBW are more prone to exhibit major changes that may compromise the integrity of the buccal bone and may lead to biologic and esthetic complications.

Adapted from A. Monje et al. Clin Oral Implants Res. 2023 Mar;34(3):157-176, for more info about this publication click [HERE](#)

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S. Chen et al., Clin Oral Investig. 2023 Mar 22 | D. Alves et al., Clin Oral Implants Res. 2023 Apr;34(4):342-350 | Shengchi Fan et al. Int J Oral Maxillofac Implants. 2023 Mar-Apr;38(2):367-373 | Lan-Lin Chiou et al. Biomed Res Int. 2023 Apr 15;2023:8728499 | O. Fakheran et al. Dent J (Basel). 2023 Apr 10;11(4):100 | A. Monje et al. Clin Oral Implants Res. 2023 Mar;34(3):157-176 | source: www.pubmed.gov | Dr. Marcin Maj holds a position of Head of Global Scientific Affairs at Institute Straumann in Basel, Switzerland