

**Topic:** Peri-implantitis

**Authors:** Rodriguez JC, Koticha T, Eubanks DL, Rudek I, Molz FJ, Chiavaccini L, Claude A, Elder S, Wang HL

**Title:** Influence of Microtextured Implant Surfaces on Peri-implantitis and Its Treatment: A Preclinical Trial.

**Source:** Int J Oral Maxillofac Implants. 2018 January/February;33(1):51–57.

**Type:** Clinical

**Rating:** Good

**Keywords:** implant surface, microtextured implant surface, peri-implantitis

**Purpose:** To examine the clinical, radiographic, and histologic features of ligature-induced peri-implantitis, as well as the effect of surgical treatment of these induced peri-implantitis lesions on laser-microtextured implants in a controlled animal model.

**Material and methods:** Six mini-pigs (three males/three females) received 6 implants each (3 resorbable blast textured [RBT] implants and 3 laser-microtextured [LM] implants) in mandibular premolar sites, for a total of 36 implants. Two groups were identified based on the time point of sample analysis. After osseointegration was achieved, metal wire ligatures were placed and left for 12 weeks. Group 1 samples were then obtained, and group 2 samples received rescue therapy following a guided bone regeneration (GBR) protocol. Sample collection in group 2 was completed 12 weeks after the samples were submerged and treated. All samples were analyzed histologically and measurements were taken.

**Results:** Four implants (three RBT, one LM) were lost at early time points because of implant instability. Interimplant distances and soft tissue thicknesses varied subtly between groups. More notable was the mean ( $\pm$  standard error of the mean) crestal bone loss (group 1:  $1.860 \pm 1.618$  mm [LM] and  $2.440 \pm 2.691$  mm [RBT]; group 2:  $2.04 \pm 1.613$  mm [LM] and  $3.00 \pm 2.196$  mm [RBT]) ( $P < .05$ ), as demonstrated by a paired t test. Histologic pocket depth was also greater at RBT sites than at LM sites ( $4.448 \pm 2.839$  mm and  $4.121 \pm 2.251$  mm, respectively, in group 1; and  $3.537 \pm 2.719$  mm and  $2.339 \pm 1.852$  mm, respectively [ $P < .005$ ] in group 2).

**Conclusion:** LM implants had less crestal bone loss and shallower histologic pocket depth compared with their RBT counterparts. Also, LM implants had higher bone fill when a rescue therapy (GBR) was performed.

**Comment:** resorbable blast textured [RBT] implants and laser-microtextured [LM] implants are surfaces available on BioHorizons implants. BioHorizons sponsored the study.

**Topic:** GBR

**Authors:** Wessing B, Lettner S, Zechner W.

**Title:** Guided Bone Regeneration with Collagen Membranes and Particulate Graft Materials: A Systematic Review and Meta-Analysis.

**Source:** Int J Oral Maxillofac Implants 2018;33:87–100.

**Type:** Systematic Review

**Rating:** Good

**Keywords:** alveolar ridge augmentation, barrier membranes, collagen membranes, decortication, guided bone regeneration, membrane fixation

**Purpose:** The aim of this meta-analysis was to evaluate different methods for guided bone regeneration using collagen membranes and particulate grafting materials in implant dentistry.

**Material and methods:** An electronic database search and hand search were performed for all relevant articles dealing with guided bone regeneration in implant dentistry published between 1980 and 2014. Only randomized clinical trials and prospective controlled studies were included. The primary outcomes of interest were survival rates, membrane exposure rates, bone gain/defect reduction, and vertical bone loss at follow-up. A meta-analysis was performed to determine the effects of presence of membrane cross-linking, timing of implant placement, membrane fixation, and decortication.

**Results:** Twenty studies met the inclusion criteria. Implant survival rates were similar between simultaneous and subsequent implant placement. The membrane exposure rate of cross-linked membranes was approximately 30% higher than that of non-cross-linked membranes. The use of anorganic bovine bone mineral led to sufficient newly regenerated bone and high implant survival rates. Membrane fixation was weakly associated with increased vertical bone gain, and decortication led to higher horizontal bone gain (defect depth).

**Conclusion:** Guided bone regeneration with particulate graft materials and resorbable collagen membranes is an effective technique for lateral alveolar ridge augmentation. Because implant survival rates for simultaneous and subsequent implant placement were similar, simultaneous implant placement is recommended when possible. Additional techniques like membrane fixation and decortication may represent beneficial implications for the practice.

**Topic:** Ridge Preservation

**Authors:** Zadeh, H., et al

**Title:** An open randomized controlled clinical trial to evaluate ridge preservation and repair using SocketKAP and SocketKAGE: part 1-three-dimensional volumetric soft tissue analysis of study casts

**Source:** Clin. Oral Impl. Res. 27, 2016, 640–649 doi: 10.1111/clr.12714.

**Type:** RCT

**Rating:** Good

**Keywords:** ridge preservation, alveolar bone grafting, bone substitute, tooth extraction

**Purpose:** The aims of this study were to evaluate the efficacy of ridge preservation and repair involving SocketKAP and SocketKAGE devices following tooth removal and the ridge contour changes at 6 months post-extraction in intact sockets and sockets with dehiscence defects.

**Material and methods:** Thirty-six patients required a total of 61 teeth to be extracted. Five groups were established with A–C involving intact sockets and groups D and E involving facial dehiscence: (A) Negative Control; (B) SocketKAP alone; (C) Anorganic Bovine Bone Mineral (ABBM) + SocketKAP; (D) Negative Control; and (E) ABBM + SocketKAP with SocketKAGE.

Preoperative CBCT and laser-scanned casts were obtained. Teeth segmented from preoperative CBCT were merged with study cast images to allow for digital removal of teeth from the casts. Volumetric measurements of ridge contour were performed. Images of preoperative and 6 months post-operative casts were superimposed to measure ridge

contour changes.

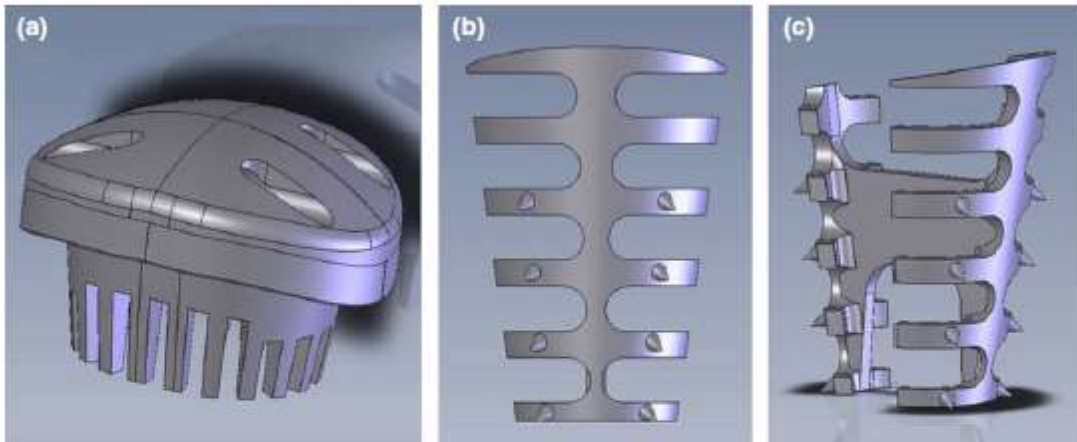


Fig. 1. Ridge preservation devices utilized in the present study. SocketKAP™ is a dome-shaped device composed of polypropylene with channels on the superior surface for the passage of sutures to aid in fixating the device to extraction socket orifice (a). The SocketKAP™ was used for obturation of the extraction socket orifice and protection from the oral environment. Facial (b) and lateral (c) views of the SocketKAGE™ illustrate a device consisting of a rigid series of interconnected ribs composed of poly-L-lactide utilized for support of sockets with facial dehiscence. The conical projections on ribs are intended for stabilization of the device inside the extraction socket, as well as spacers to prevent direct contact with facial and lingual alveolar plates, thereby allowing better blood circulation.

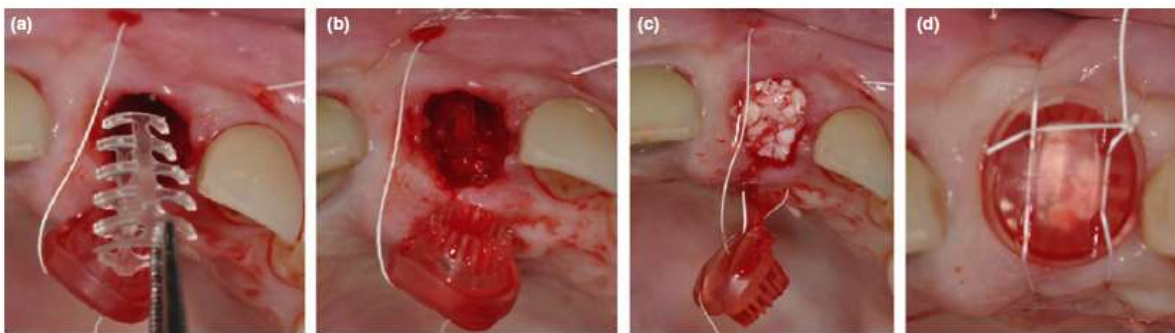


Fig. 2. Group E maxillary lateral incisor. (a) Placement of SocketKAGE™ without flap reflection. (b) SocketKAGE™ stabilized in place. (c) Site filled with ABBM following SocketKAGE™ placement. (d) SocketKAP™ secured in place with PTFE sutures.

**Results:** Post-extraction loss occurred in all sockets primarily in the crestal 3 mm but was also detected up to 6 mm from alveolar crest. For intact sockets, SocketKAP or SocketKAP + ABBM interventions led to greater percentages of remaining ridge contour when compared to controls. A significant difference favoring SocketKAP + SocketKAGE + ABBM treatment was observed for sockets with facial dehiscence when compared to controls

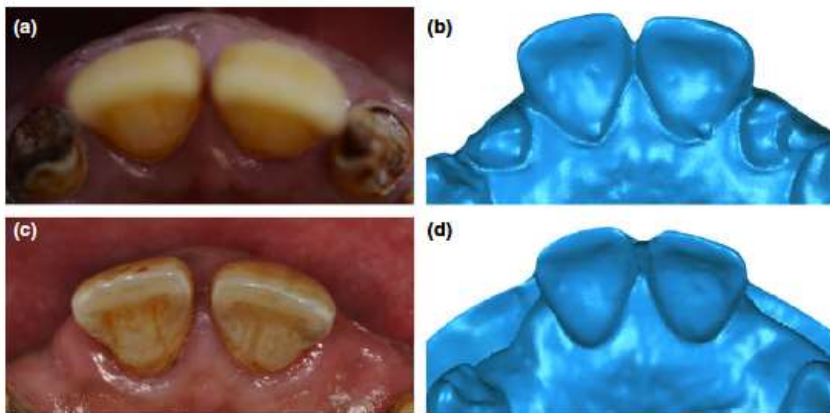
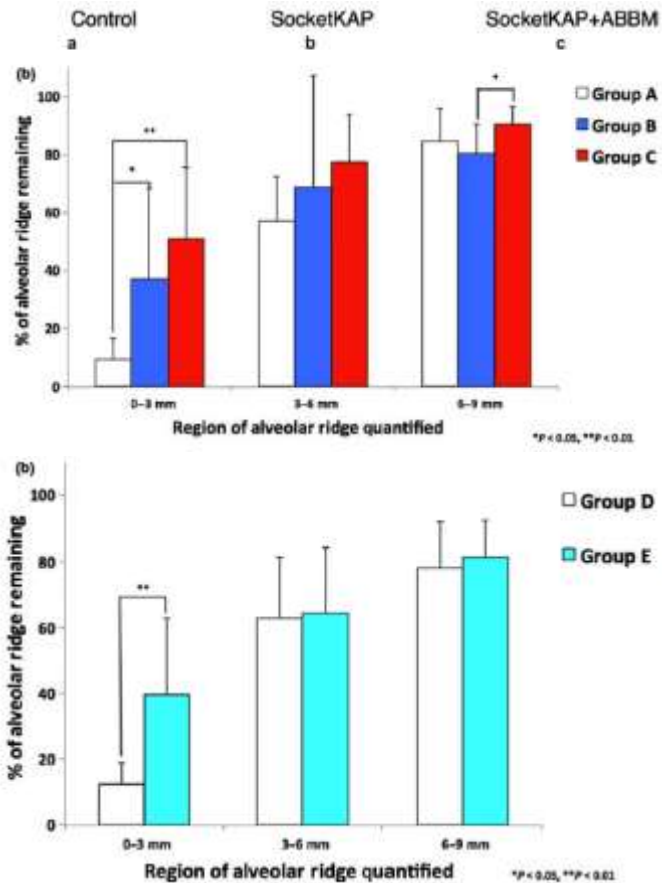


Fig. 6 Group D and group E maxillary lateral incisors. (a) Grossly decayed maxillary right & left lateral incisors. (b) Preoperative cast, right lateral incisor (facial dehiscence group D control site); left lateral incisor (facial dehiscence group E site). (c) Clinical view at 6 months post-extraction revealed narrowed labial-palatal width on the right side (control site) and retained crestal width on the left (group E site grafted with SocketKAP™ + SocketKAGE™ + ABBM). (d) Six-month clinical findings are confirmed with dental cast.

**Conclusion:** SocketKAP, with or without ABBM, significantly limited post-extraction ridge contour loss in intact sockets. In the absence of a group treated with only the SocketKAGE, it is not possible to determine its efficacy, although the combination of SocketKAGE + SocketKAP + ABBM was effective in limiting post-extraction ridge contour loss in sockets with dehiscence defects.

**Topic:** Zygomatic implants

**Authors:** Malo, Paulo

**Title:** Extramaxillary Surgical Technique: Clinical Outcome of 352 Patients Rehabilitated with 747 Zygomatic Implants with a Follow-Up between 6 Months and 7 Years

**Source:** Clinical Implant Dentistry and Related Research, Volume 17, Supplement 1, 2015

**Type:** RCT

**Rating:** Good

**Keywords:** All-on-4, completely edentulous, dental implants, immediate function, zygomatic implants

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

**Materials and Methods:** 352 consecutive edentulous patients with atrophic maxillae were rehabilitated between 2006 and 2012 with 747 zygomatic implants and 795 conventional implants. Implant and prosthetic cumulative survival and success rates were estimated through Kaplan–Meier product limit estimator. Biological and prosthetic complications were recorded after 10 days; 2, 4, and 6 months; and thereafter every 6 months.



**Figure 4** Intraoral photograph showing the "channel" created to accommodate the zygomatic implant placed via the extramaxillary technique, with preservation of the sinus membrane.

**Results:** Forty-three patients (12.2%) dropped-out, one patient lost the prosthesis (cumulative survival rate = 99.7%), and four patients lost 7 zygomatic implants, rendering an estimated cumulative survival rate of 98.2% (Kaplan–Meier). Ten patients lost 17 conventional implants (patient-specific and implant-specific cumulative survival rates of 96.7% and 97.9%, respectively). Biological complications were observed in 80 patients (22.7%) and resolved in the majority of situations, rendering an estimated cumulative success rate of 94.4% at 7 years for zygomatic implants (Kaplan–Meier). There were 26 maxillary sinus infections in 26 patients (one patient with an oral–antral communication diagnosed at the 1-year follow-up appointment); 21 of the patients with maxillary sinus infections had a previous diagnosis of sinusitis prior to implant surgery. With 8 patients, the

situation was resolved through nonsurgical treatment (removal of deposits from the implant surface and irrigation with chlorhexidine 0.2%); with 7 patients, the situation was resolved by nonsurgical treatment and antibiotics; with 5 patients, the situation was resolved after a surgical intervention (functional endoscopic sinus surgery); and in 6 patients the situation was not resolved (3 of these patients were lost to follow-up, 3 patients still pending intervention outcome; 1 of those patients, whose situation was resolved a first time via antibiotics, remained asymptomatic for 2 years and relapsed). Peri-implant pathology was observed in 54 patients and 54 implants. The situations were resolved in 43 patients: in 34 patients through nonsurgical treatment with scaling and irrigation with chlorhexidine; in 4 patients through the administration of nonsurgical treatment together with antibiotics; and in 5 patients through surgical intervention (removal of granulation tissue and decontamination of the implant surface with chlorhexidine 0.2%). In 11 patients the situation was not resolved (1 patient who was lost to follow-up, 1 patient in active chemotherapy, and 9 patients who presented an inability to maintain a minimum-standard level of oral hygiene, though the implants clinically remained stable during the follow-up period of the study). Complications occurred in 156 patients (44%), with one-third of these complications occurring in patients diagnosed with bruxism before the rehabilitation.

**TABLE 3 Estimated Patient-Specific Success of Zygomatic implants**

Time (Months)	Status*	Cumulative Percentage Surviving at the Time		Number of Cumulative Events	Number of Patients at Risk
		Estimate	Standard Error		
0	0	NA	NA	0	352
2	1	99.7	0.003	1	351
3	1	99.1	0.005	3	349
4	1	98.9	0.006	4	348
5	1	98.3	0.007	6	346
6	0				341
7	1	98.0	0.008	7	340
8	0				327
8	1	97.7	0.008	8	326
9	0				320
9	1	97.0	0.009	10	319
12	0				305
12	1	96.7	0.01	11	304
14	0				292
14	1	96.4	0.01	12	291
17	0				268
17	1	96.0	0.11	13	267
24	0				224
36	0				163
41	0				132
41	1	95.3	0.13	14	131
47	0				109
47	1	94.4	0.16	15	108
48	0				99
60	0				55
72	0				17
84	0				1

Estimated using the Kaplan–Meier product limit estimator.

\*0 = no failure; 1 = failure.

NA = not applicable.

**Conclusions:** The rehabilitation of atrophic maxillae with zygomatic implants inserted

through the extramaxillary technique in immediate function, alone or in combination with standard implants, is a viable procedure. Until the biomechanical aspects are more predictable and also because of the complexity of the surgical technique, this rehabilitation approach is not ready for every implant clinician to begin using in practice, and prior special training is recommended.

**Topic:** Osseointegration

**Authors:** Trindade R., Albrektsson T., et al

**Title:** Osseointegration and foreign body reaction: Titanium implants activate the immune system and suppress bone resorption during the first 4 weeks after implantation.

**Source:** Clin Implant Dent Relat Res. 2018 Feb;20(1):82-91. doi: 10.1111/cid.12578. Epub 2017 Dec 28.

**Type:** Animal study

**Rating:** Good

**Keywords:** animal study; bone; foreign body reaction; immunology; osseointegration; titanium

**Background:** Osseointegration mechanisms are still not entirely understood.

**Purpose:** To aim at demonstrating the involvement of the immune system in the process of osseointegration around titanium implants, comparing bone healing in the presence and absence of a titanium implant.

**Methods:** Fifteen New Zealand White rabbits had one osteotomy performed at each of the distal femurs; on one side, no implant was placed (sham) and on the other side a titanium implant was introduced. Subjects were sacrificed at 10 and 28 days for gene expression analysis (three subjects each time point) and for decalcified qualitative histology (six subjects each time point). At 10 days, the three subjects for gene expression analysis were part of the six subjects for histology.

**Results:** Gene expression analysis: at 10 days, ARG1 was significantly up-regulated around titanium, indicating an activation of M2-macrophages. At 28 days CD11b, ARG1, NCF-1, and C5aR1 were significantly up-regulated, indicating activation of the innate immune system, respectively M1-macrophages, M2-macrophages and group 2-innate lymphoid cells, neutrophils, and the complement system; on the other hand, the bone resorption markers RANKL, OPG, cathepsin K, and TRAP were significantly down-regulated around titanium.

**Histology:** At 10 days new bone formation is seen around both sham and titanium sites, separating bone marrow from the osteotomy/implant site; at 28 days no bone trabeculae is seen on the sham site, which is healing at the original cortical level, whereas around titanium implants, bone continues into organization of more mature cortical-like bone, forming a layer between the implant and the bone marrow.

**Conclusion:**

The presence of a titanium implant during bone healing activates the immune system and displays type 2 inflammation, which is likely to guide the host-biomaterial relationship. At the same time, bone resorption is suppressed around titanium sites compared to sham sites after 4 weeks of implantation, suggesting a shift to a more pronounced bone forming environment. This suggests two important steps in osseointegration: **identification of the titanium foreign body by the immune system and the development of**

**a bone forming environment that at tissue level translates into bone build-up on the titanium surface and can be perceived as an attempt to isolate the foreign body from the bone marrow space.**

The current evidence supports that:

1. Titanium activates the immune system, at least during the early period
2. Titanium suppresses bone resorption- favoring bone formation
3. Osseointegration occurs after the recognition of titanium by the immune system and the formation of a bone forming environment
4. Titanium implants are isolated from the bone marrow through surface sheath of bone build-up—resulting in osseointegration.

**Comment:** They used a turned titanium grade IV implant (Ti), with a threaded Branemark MkIII design.

**Topic:** Short dental implant vs sinus augmentation

**Authors:** Taschieri S., et al

**Title:** Short dental implants as compared to maxillary sinus augmentation procedure for the rehabilitation of edentulous posterior maxilla: Three-year results of a randomized clinical study.

**Source:** Clin Implant Dent Relat Res. 2018 Feb;20(1):9-20. doi: 10.1111/cid.12563. Epub 2017 Nov 28.

**Type:** Randomized clinical study

**Rating:** Good

**Keywords:** short implants, posterior maxilla

**Background:** Several treatment options exist for the implant-supported rehabilitation of edentulous posterior maxilla.

**Purpose:** To compare maxillary sinus floor augmentation associated to standard length implants, with direct placement of implants of reduced length in the available residual bone.

**Methods:** Patients with edentulous posterior maxilla and a residual height of 4-7 mm were randomly allocated to the test (short implants [SIs], 6.5 to 8.5mm long) or the control (sinus augmentation [SA] and implants  $\geq 10$ mm long) group. Anorganic bovine bone was the grafting material for the control group. In both groups pure platelet-rich plasma was used to bioactivate implant surface prior to insertion. Implant and prosthesis survival, clinical variables, radiographic bone level change, quality of life, and patient satisfaction were assessed.

**Results:** Twenty-five patients were treated in the control group (58 standard length implants) and 27 in the test group (42 SIs). After 3 years of follow-up no implant failure and biological or mechanical complications were recorded. Marginal bone loss, soft tissue, and oral hygiene parameters were similar in the 2 groups at both 1 and 3 years' follow-up. Postoperative pain, swelling and other symptoms and daily activities were better in the SIs group than in the SA group, while patients' satisfaction after 1 year was similar.

**Conclusion:** In spite of comparable medium-term clinical and radiographic outcomes, when the residual ridge height is sufficient for a safe placement, SIs may be preferred due to simplified protocol, less invasiveness, shorter treatment time, and reduced postoperative discomfort as compared to SA.

**Topic:** biomarkers

**Authors:** Lira-Junior R, Öztürk VÖ, Emingil G, Bostanci N, Boström EA

**Title:** Salivary and Serum Markers Related to Innate Immunity in Generalized Aggressive Periodontitis.

**Source:** J Periodontol. 2017 Dec;88(12):1339-1347.

**DOI:** 10.11607/prd.3433

**Type:** clinical

**Rating:** good

**Keywords:** Aggressive periodontitis; cytokines; immunity, innate; inflammation; saliva

**Purpose:** to evaluate levels of the innate immunity-related markers calprotectin, colony-stimulating factor (CSF)-1, macrophage migration inhibitory factor (MIF), monokine induced by interferon- $\gamma$  (MIG), and matrix metalloproteinase (MMP)-8 in serum and saliva from patients with generalized AgP and those with gingivitis or a healthy periodontium.

**Methods:** 40 patients (mean age 33 years), 15 with generalized AgP, 15 with gingivitis, and 10 periodontally healthy. clinical examinations were performed, and serum and saliva were collected. Levels of calprotectin, CSF-1, MIF, MIG, and MMP-8 were measured using enzyme-linked immunosorbent assays.

**Results:**

*In serum*, mean levels of calprotectin were 2.06-fold higher in patients with AgP than in healthy patients (SS). Serum levels of MMP-8 were significantly elevated in patients with AgP compared with both healthy patients and those with gingivitis, by 2.60-fold and 2.77-fold, respectively (SS).

*In saliva*, levels of MMP-8 were 5.66-fold higher in patients with AgP than in healthy patients (SS). CSF-1, MIF, and MIG levels in both serum and saliva did not differ significantly among the groups.

**Conclusion:** Serum levels of calprotectin and MMP-8 are elevated in patients with AgP. MMP-8 levels are also increased in saliva from patients with AgP. These results support involvement of innate immune response in the pathogenesis of AgP.

**Topic:** wide implants

**Authors:** Hattingh AC, De Bruyn H, Ackermann A, Vandeweghe S.

**Title:** Immediate Placement of Ultrawide-Diameter Implants in Molar Sockets: Description of a Recommended Technique.

**Source:** Int J Periodontics Restorative Dent. 2018 Jan/Feb;38(1):17-23.

**DOI:** 10.11607/prd.3433.

**Type:** technique

**Rating:** good

**Keywords:** immediate, implants, ultrawide diameter,

**Purpose:** to describe a practical, sequenced technique that can be used predictably for immediate implant placement in maxillary and mandibular first molar sockets, using ultra-wide diameter implants (UWDIs).

**Methods:** This detailed description is based on the experience of more than 580 clinical cases over a 10-year period. In this article, dry skulls were used to maximize the demonstration detail.

Technique:

Clinical and radiographic assessment of the molar planned for replacement is done. Thin periodontal biotypes are excluded. Tooth is carefully loosened. When minimal mobilization is accomplished, tooth is decoronized at the cervical level. A pilot hole is drilled through the base of the pulp chamber into the interradicular septum, slightly to the lingual, making sure the implant would not engage the inner aspect of the buccal socket wall. Osteotomy is continued up to 5,6 mm, then the roots are separated and removed. Osteotomy is finalized with the specially designed wide diameter drills. A custom-designed osteotome is placed into the osteotomy site, and a radiograph is taken to verify the position and depth of the osteotomy. UWDI is placed and a wide-profile healing abutment is connected to implant and any space between the abutment and soft tissue is closed with hemostatic collagen placed only at the abutment level. No attempts are made to fill any bony voids with grafting materials. Sutures are used to adapt soft tissue to healing abutment and eliminate voids.

**Conclusion:** by following this technique, immediate implant placement in molar extraction sites using UWDIs can be performed in a predictable and accurate manner, achieving optimal implant positioning and primary stability.

**Topic:** Oral Cancer

**Author:** Woo, Bok Hee, et al

**Title:** Oral cancer cells sustainedly infected with *Porphyromonas gingivalis* exhibit resistance to Taxol and have higher metastatic potential

**Source:** Oncotarget, 2017, Vol. 8, (No. 29), pp: 46981-46992; doi: 10.18632/oncotarget.16550

**Type:** In vivo study

**Rating:** Good

**Keywords:** Porphyromonas gingivalis, oral cancer, Taxol, Notch1, metastasis<sup>SEPP</sup>

**Background:** Oral squamous cell carcinoma (OSCC) is the primarily treated with surgery alone, but this sacrifices both functionality and esthetics. Surgical therapy should be minimized or replaced with other treatment modalities such as chemotherapy and radiotherapy. Chemotherapy is never a single treatment because it rarely results in a cure and has limited effectiveness. Epidemiological studies demonstrated a higher risk of oral cancer in patients with periodontal disease, and experimental studies indicated that *P. gingivalis*, increased the invasive capability of OSCC cells through the production of MMP-2 and 9. It has been suggested that inflammation contributes to the formation, maintenance, and expansion of pluripotent cancer stem cells (CSCs), a small subpopulation of tumor cells with the capability of self-renewal, dedifferentiation, and tumorigenicity

**Purpose:** To clarify whether chronic periodontitis could modify the susceptibility of OSCC to chemotherapeutic agents *in vivo*. To investigate the mechanism involved in the chemo resistance of OSCC cells that were sustainedly infected with *P. gingivalis*

**Methods:**

- To investigate whether chronic periodontitis could affect the growth of oral cancer *in vivo*, investigators compared the tumor volume induced by sustainedly *P. gingivalis*-infected OSCC cells with that of uninfected control OSCC cells in nude mice
- To determine the role of activated Notch1 with chemotherapy in oral cancers, the viability of NICD- overexpressing OSC-20 cells was assessed in the presence of Taxol
- To examine metastatic potential, the viability of OSC-20 OSCC cells with or without chronic exposure to *P. gingivalis* in a non-adherent and continuously agitated setting

**Results:**

- **Slower *in vivo* tumor growth was exhibited by OSCC cells sustainedly infected with *P. gingivalis* than non-infected OSCC cells.**
  - The slower tumor growth observed with *P. gingivalis*- infected cells indicated that chronic infection with *P. gingivalis* could slow tumor growth in an OSCC xenograft mouse model
- **Sustained infection with *P. gingivalis* activated Notch1 in OSCC cells**
  - The Notch signaling pathway is known to play a critical role in maintaining the CSC population
  - Protein levels were significantly increased over time in OSCC cells with a *P. gingivalis* infection
- **Sustained infection of OSCC cells with *P. gingivalis* caused resistance to Taxol through Notch1 activation**
  - *P. gingivalis* contributes to and induces activation of Notch1 that leads to the development of Taxol resistance in various OSCC cells
  - The suppressive effect of Taxol on the growth rate of tumors was significantly greater in control xenografts, as compared with that of *P. gingivalis*- infected OSCC, indicating lower sensitivity to Taxol in *P. gingivalis*-infected tumor
- **Sustained infection with *P. gingivalis* increased the metastatic potential of OSCC cells**
  - Cancer cells should survive in a movable and unattached state before their resettlement at metastatic sites such as the lungs, liver, or bones
  - *P. gingivalis*-infected OSC-20 cells were more resilient to mechanical agitation, as compared with uninfected controls, indicating a increased metastatic potential.
  - Mice injected with *P. gingivalis*- infected OSC-20 cells showed higher serum levels of human MMPs, which has been shown to increase the invasive nature of a tumor.

**Bottom Line:** Sustained infection with *P. gingivalis* promotes distant metastasis of oral cancer, as well as its resistance to anti-cancer agents. These results suggest that resolution of chronic periodontitis may serve as a promising therapeutic target for metastatic and chemoresistant oral cancers

**Topic:** Peri-implantitis

**Author:** Carcuac O, Derks J, Abrahamsson I, Wennstrom J, Petzold M, Berglundh T

**Title:** Surgical treatment of peri-implantitis: 3-year results from a randomized controlled clinical trial

**Source:** *J Clin Periodontol*. 2017 Dec; 44(12): 1294-1303. doi: 10.1111/jcpe.12813.

**Type:** Randomized controlled trial

**Rating:** Good

**Keywords:** dental implant, implant surface characteristics, surgical treatment

**Purpose:** To report on the 3-year follow-up of patients enrolled in a randomized controlled clinical trial on surgical treatment of advanced peri-implantitis.

**Methods:**

- Total of 100 patients with at least one implant diagnosed with advanced peri-implantitis (PD  $\geq$ 6mm, BOP/suppuration and marginal bone loss >3mm)
- Patients were randomly assigned to one of four groups:
  - Group 1: systemic abx (Amoxicillin 2x750mg)/mechanical implant surface decontamination with antiseptic agent (0.2% solution of chlorhexidine digluconate)
  - Group 2: systemic abx (Amoxicillin 2x750mg)/mechanical implant surface decontamination with saline
  - Group 3: no systemic abx/mechanical implant surface decontamination with antiseptic agent
  - Group 4: no systemic abx/mechanical implant surface decontamination with saline
- Baseline radiographs were taken and examinations were performed at 12 and 36 months (new radiographs were taken at both time intervals)

**Results:**

- 83 of the 100 implants were followed up at 3 years
- Overall mean PPD reduction at 3years was  $2.7 \pm 2.4$ mm.
- PPD reduction was more pronounced at non-modified surface implants and that adjunctive use of systemic antibiotics improved the outcome at implants with modified surfaces.
- The predicted probability of increased PPD was lower at non- modified surface implants (9%–22%) when compared to modified surface implants (34%–58%). Systemic antibiotics decreased the probability for PPD >5 mm at implants with modified surfaces from 58% to 34%
- Mean marginal bone levels were stable from radiographic baseline (2 weeks post-treatment) to 3 years (mean loss:  $0.04 \pm 1.64$  mm).

**Discussion:** The proportion of implants demonstrating substantial additional bone loss during the 3-year follow-up in the present study was low. This finding indicates that the anti-infective treatment was successful in arresting disease progression. One of the main findings in the present study was that implants with non-modified surfaces presented with overall superior outcomes than implants with modified surfaces. The 1-year results of the present randomized trial demonstrated that the antiseptic agent used for implant decontamination during surgical therapy had no significant effect on treatment outcomes. The use of systemic antibiotics, however, had a positive effect on 1-year treatment outcomes at implants with modified surface characteristics. Analysis of the 3-year data, however, implied that this benefit was not sustained, as indicated by a predicted mean bone loss between years 1 and 3.

**Bottom Line:** surgical treatment of peri-implantitis is effective, and outcomes of therapy are affected by implant surface characteristics.

**Topic:** Alcohol consumption

**Author:** Wagner MC, Haas AN, Oppermann RV, Rosing CK, Albandar JM, Susin C  
**Title:** Effect of Alcohol Consumption on Clinical Attachment Loss Progression in an Urban Population From South Brazil: A 5-Year Longitudinal Study  
**Source:** J Periodontol. 2017 Dec;88(12):1271-1280. doi: 10.1902/jop.2017.170231  
**Type:** Longitudinal study  
**Rating:** Good  
**Keywords:** Alcohol drinking, epidemiology, longitudinal studies, periodontitis, risk factors

**Purpose:** To assess effects of alcohol consumption on clinical attachment loss (AL) progression over a period of 5 years in the same population.

**Methods:** 502 individuals with no history of diabetes, six or more teeth present, and no missing information were included. Baseline data was obtained, and a follow-up examination was completed 5 years later. Participants were interviewed via a structured questionnaire, which included questions about demographics, socioeconomic status, dental care and oral hygiene, smoking, and alcohol consumption. Questionnaires were completed at baseline and follow-up. Assessment of alcohol consumption was carried out with three questions: do you drink any alcohol-containing beverages, what beverages do you usually drink, and how many drinks do you usually have in a week. Periodontal parameters were collected by different groups of dentists at baseline and 5-year follow-up. Data collected was statistically analyzed.

**Results:** Males and heavy smokers had significantly higher alcohol consumption. Mean attachment loss was significantly higher among males, older individuals, individuals of low socioeconomic status, heavy smokers, and individuals who reported consuming more than 1 glass a day. Percentage of cases with progression was 85% among those drinking more than 1 glass a day compared to 57.5% among never-drinkers, with those in the former category having a 30% higher risk for AL progression. An overall tendency towards a protective effect for individuals drinking 1 drink or less a week was also seen.

**Discussion:** Alcohol consumption increased risk of clinical AL progression, and this effect was more evident in males and never smokers. Very low doses of alcohol may be beneficial for disease progression, but this finding should be interpreted cautiously. The impact of alcohol cessation initiative on periodontal health should be evaluated.

**Topic:** Guided bone generation

**Author:** Yamashita M, Horita S, Takei N, Sasada Y, Shibato W, Ishikawa Y, Takao K, Maki K, Funakoshi E

**Title:** Minimally Invasive Alveolar Ridge Preservation/Augmentation Procedure (Open Barrier Membrane Technique)

**Source:** Funakoshi Research Institute of Clinical Periodontology

**Type:** Retrospective study

**Rating:** Good

**Keywords:** Guided bone regeneration, e-PTFE, membrane exposure

**Background:** In 2005, Funakoshi introduced "Open Barrier Membrane Technique" as novel minimally invasive GBR technique using non-expanded, high-density PTFE (d-PTFE) membrane. A significant advantage of d-PTFE membranes is impenetrable for bacteria because of its surface characteristics (0.2µm low porosity). Because of this smooth surface, this membrane can be left intentionally exposed and primary closure is not required.

Because no primary coverage is necessary, there is no need for periosteal releasing incisions causes swelling and pain.

**Purpose:** To evaluate the clinical regeneration of alveolar ridge preservation/augmentation using d-PTFE (high density) membranes with the use of bone graft materials.

**Methods:** 129 extraction sockets and alveolar ridges post-extraction were evaluated in 111 subjects treated with open barrier membrane technique for the placement of implants. Surgical technique included reflection of full thickness flaps, combined with autogenous bone or bone substitute with Emdogain (EMD) and/or PRP. A d-PTFE membrane (Cytoplast) was used over the site. Flaps were repositioned and sutured without periosteal releasing incisions, and primary closure was not attempted (membrane intentionally left exposed). Membranes were removed 4-6 weeks after surgery without anesthesia, and implants were placed 4-6 months after membrane removal. Radiographic analysis included (1) depth of the defect (2) grafted (filled) bone height at surgery (3) bone loss at removal of membrane and (4) bone loss at implant placement. Mean values were calculated. Vertical ridge changes were evaluated during the healing stage retrospectively.

**Results:** No unusual pain or swelling was reported, nor infection or inflammation even though membranes were exposed, and plaque was adherent. After membrane removal, premature bone covered by smooth, red, non-epithelialized soft tissue was observed, which re-epithelialized completely within 1 month. KG was observed at all sites. Implant therapy was successful at all sites.

Socket and ridge types showed excellent bone gain as 100.9% and 95.8% respectively, with no significant differences between sites. A small amount of bone loss was noted at implant placement. Most sites were overfilled at the time of surgery.

**Discussion:** Overfilling is facilitated with this procedure because primary coverage is not required. The volume of bone loss corresponded approximately to the volume of overfill. Advantages of this technique included minimal invasion due to no need for primary closure, periosteal release, preservation/enhancement of keratinized gingiva, and non-surgical membrane removal. Ease of overfill was an additional benefit as well.

**Conclusion:** Non-expanded dense PTFE membranes predictably provided sufficiently regenerated ridges suitable for implant placement. Open barrier membrane technique can be a new standard for alveolar ridge preservation and augmentation.

**Topic:** zirconia implants

**Author:** Kohal RJ, Spies BC, Bauer A, Butz F

**Title:** One-piece zirconia oral implants for single-tooth replacement: three-year results from a long-term prospective cohort study

**Source:** J Clin Periodontol 2018; 45: 114-124

**Type:** prospective clinical trial

**Rating:** Good

**Keywords:** clinical investigation, oral implants, zirconia, single-tooth replacement

**Background:** Titanium implants are the gold standard for oral implants. Zirconia implants have been introduced as an alternative to manage increase aesthetic demands. The biocompatibility of zirconia as an oral implant has been proven.

**Purpose:** The aim is to determine the survival rate and marginal bone loss of a one-piece transmucosal zirconia implant for single-tooth replacement over 3 years.

**Methods:** A prospective cohort study was performed. 66 implants were placed in 65 patients (40F, 25M). Zirconia implants were roughened with ZiUnite surface (investigational product from Nobel Biocare). Bone quality and quantity were assessed according to Lekholm and Zarb. All implants were placed and immediately temporized under light loading. Final prosthesis were delivered 2-4months later. Clinical exams were performed at 6, 12 and 36 months post-placement. Radiographs were calibrated to assess remodeling over time.

**Results:** Implants placed were either 4.3mm or 5mm diameter and varied in length from 10-16mm. 3 implants failed before delivery of the final restoration. Another 3 implants failed between the 1 and 3 yr follow up due to progressive bone loss. 3-year cumulative survival rate of 90.8% for one-piece zirconia implant. Mean marginal bone loss up to 3-years was 1.45mm, and 35% of implants had marginal bone loss of more than 2mm.



**Conclusion:** This study had a higher rate of implant loss compared to other studies of zirconia implants. In the implants that were removed, osseointegration patterns were similar to those around titanium implants. Survival rates in this study are inferior to similar titanium implants. Bone analysis revealed frequent bone loss of 2mm or more.

**Topic:** pathogenesis

**Author:** Bosshardt, DD

**Title:** The periodontal pocket: pathogenesis, histopathology and consequences

**Source:** Periodontology 2000 2018; 76: 43-50

**Type:** review

**Rating:** Good

**Keywords:** periodontal pocket, periodontal disease, pathology, pocket formation, disease progression

**Purpose:** To discuss the factors contributing to the initiation of pocket formation and progression to develop better preventive measures and improve outcomes.

## Discussion:

- Definition and classification
  - Periodontal pocket: pathologically deepened gingival sulcus
    - Suprabony or infrabony
  - Pseudopocket
    - Develops because of gingival enlargement
    - Characteristics: absence of loss of periodontal tissue, connective tissue attachment and no apical migration of epithelium
  - Gingival pocket –related to gingivitis, inflammation and coronal detachment of junctional epithelium without bone destruction
- Pathogenesis
  - Junctional epithelium defense system
    - Permeable, allows neutrophilic granulocytes to migrate to the sulcus
  - Epithelial attachment, dependent on cell-to-cell contact
    - Cell adherence is mediated by intercellular junction complexes
      - Desmosomes, adherens junctions, tight junctions, gap junctions
    - Must have proper function cell contact
    - Microorganisms and inflammation lead to disassembly of epithelial junctions
  - Microorganisms are the primary etiology
  - Why does loss of cellular continuity occur in periodontal disease?
    - Increasing number of leukocytes
    - Gingipains (cysteine proteinases produced by P.g.) are known to cleave cell adhesions which helps with immune evasion
- Histopathology
  - Pocket → gingival sulcus that is altered and lined with pocket epithelium which is unattached and extends to the junctional epithelium, has a tendency to micro-ulcerations
  - Differences in pocket from sulcus
    - Detachment of epithelium from tooth
    - Proliferation of epithelial ridges
    - Increased permeability with high infiltration of lymphocytes and plasma cells
    - Reduction in height of residual junctional epithelium
  - Pockets occur in disease around implants
    - Does not differ much from conditions around teeth
    - Host response may be more exaggerated around implants compared to teeth

**Conclusions:** In healthy periodontal site, defense mechanisms are sufficient to control microbial challenges. The destruction of cell-to-cell contacts and detachment of junctional epithelium from the tooth surface leads to pocket formation and disruption of the defense system. Further damage and ulcerations increase chances of microbial invasion, setting up a cyclical damaging environment in the pocket.

**Topic:** Tilted implants with angulated connections

**Author:** Van Weehaeghe M.V., De Bruyn H., Vandeweghe S.

**Title:** A prospective, split-mouth study comparing tilted implants with angulated connection versus conventional implants with angulated abutment

**Source:** Clin Implant Dent Relat Res. 2017;19:989–996. <https://doi.org/10.1111/cid.12544>

**Type:** Prospective clinical case series

**Rating:** Good

**Keywords:** all-on-4, angulated abutment, dental implants, edentulous, immediate loading, tilted implant

**Purpose:** To compare conventional implants with angulated abutment to tilted implants with an angulated connection.

**Methods:**

- 20 patients from Ghent University Hospital in Ghent, Belgium who were at least 18 years old
- At least 3 months edentulous in the mandible and other perio issues were treated beforehand.
- External Hex-connection, moderately rough surface tapered implants (southern implants, South Africa)
- In the posterior mandible every patient received two tilted implants: one with an angulated connection at the implant neck 24 degrees and on the contra-lateral side one straight but tilted implant with an angulated abutment of 24 degrees. Randomization scheme was used to determine which would go on either side.
- In the anterior mandible, two straight implants were placed with one receiving a standard multiunit abutment, allowing comparison of implant versus abutment-connected restoration.
- All implants were placed using an open-flap approach and a surgical guide. Also, a metal all-on-4 guide with lateral reference lines for a 24 angulation was used to allow correct implant placement. Within 24 hours, the implants were loaded with a fiber-reinforced screw-retained temporary prosthesis. Patients received postoperative antibiotics.
- After 3 months, the final restorative procedure was initiated. The definitive screw-retained prosthesis could be either full-zirconia with a microlayer of porcelain (BruxZir) or milled cobalt-chromium with veneering porcelain (PFM).
- Baseline radiographs were taken at the time of provisional bridge placement and at 4 years follow up.
- Probing depth, BOP, Bone level and plaque score were measured at baseline and follow up. Plaque was scored for the four implants sites as follows: 0 5 no visible plaque, 1 5 plaque detectable by running a probe, 2 5 visual plaque present.

**Results:** after the 4 year follow up only 17 patients were available for re-eval, two patients were deceased and 1 was unable to participate. 8 patients received full zirconia bridge and 8 patients a PFM bridge. One patient never had the final restoration placed.

**Conclusion:** The additional use of abutments had no significant positive affect on the outcome. However, the use of zirconia as a restorative lead to less biofilm formation which may be beneficial for the long-term prognosis and maintenance.

**Topic:** Sinus lift, two window vs single window.

**Author:** Yu H., He D., qiu L.

**Title:** A prospective randomized controlled trial of the two-window technique without membrane versus the solo-window technique with membrane over the osteotomy window for maxillary sinus augmentation

**Source:** Clin Implant Dent Relat Res. 2017;19:1099–1105 DOI: 10.1111/cid.12505

**Type:** Prospective RCT

**Rating:** Good

**Keywords:** Atrophic maxilla, bone formation, maxillary sinus floor elevation, randomized control trial.

**Purpose:** To compare endo-sinus histomorphometric bone formation between the solo- and two- window maxillary sinus technique with or without membrane coverage.

**Methods:** 10 patients with multiple missing maxillary posterior teeth ( two molars and one or two premolars) with residual bone height < 3mm and buccolingual width > 6.5mm. Vestibular distance of at least 12mm to the center of the lateral window site, and an absence of bony septa in the area of the augmented sinus. Patient were systemically healthy and did not smoke more than 10 cigarettes or cigar equivalents per day, and di not suffer from untreated periodontal disease and had no local inflammation.

Maxillary sinuses were allocated to either the Control (solo- window technique with membrane coverage) or Test (two-window technique without membrane coverage) Groups. The allocation of patients was randomized using computer-generated permuted block randomization with an allocation ratio of 1:1. Only one investigator, not involved in patient selection or treatment, was aware of the randomization sequence and had access to the randomization list.

All patients received prophylactic antibiotic therapy with 2 g of amoxicillin (500 mg of clarithromycin if allergic to penicillin) 1 hour before treatment. After surgery, amoxicillin (750 mg three times a day), ibuprofen (600 mg three times a day), and chlorhexidine mouthwash (0.2% three times a day) were prescribed for 7 days.

In the Test Group, two separate lateral windows were pre- pared with a 5–10-mm bone beam left between the windows. In the Control Group, a solo lateral window was pre- pared, determined by the amount of augmentation required. The inferior cut was made approximately 2–3 mm from the sinus floor, and the vertical and horizontal lengths were related to the number of missing posterior teeth. All sinuses received a graft consisting of large-particle Bio-Oss . Sinuses in the Control Group were covered with a resorbable Collagen membrane, whereas sinuses in the Test Group did not receive membrane coverage of the osteotomy window. Six months after surgery, bone biopsy specimens were obtained at a second-stage surgery before implant placement. Bone cores were obtained from the lateral aspect of the former augmentation site, 3 mm above the inferior margin of the lateral access window, and 6 mm deep from the lateral wall.

**Conclusion:** in conclusion, the two-window technique obtained comparative maturation and consolidation of the grafted volume even without membrane coverage, and is an effective

alternative for the rehabilitation of severely atrophic posterior maxillae with multiple missing posterior teeth.

**Topic:** Treatment of Peri-implantitis

**Authors:** Stein JM, Hammächer C, Michael SS.

**Title:** Combination of ultrasonic decontamination, soft tissue curettage, and submucosal air polishing with povidone-iodine application for non-surgical therapy of peri-implantitis: 12 Month clinical outcomes.

**Source:** J Periodontol. 2017 Dec 5 DOI: 10.1902/jop.2017.170362.

**Type:** clinical

**Rating:** good

**Keywords:** peri-implantitis; air polishing; decontamination

**Purpose:** To evaluate clinical outcomes of a concept for non-surgical peri-implantitis combining mechanical debridement measures with adjuvant povidone-iodine application with and without systemic antibiotics.

**Methods:** 45 patients with chronic periodontitis and 164 total screw-typed implants with peri-implantitis were included. Peri-implantitis: >2mm radiographic bone loss, PD >5mm with BOP. 24 received non-surgical therapy with antibiotics and 21 with no adjunctive antibiotics. Treatment of the implants were as followed in a stepwise manner: Ultrasonic debridement, soft tissue curettage (STC), glycine powder air polishing (GPAP), and repeated submucosal application of povidone-iodine. At sites of PD >4mm were treated the same omitting STC and in cases of severe periodontitis, amoxicillin and metronidazole were prescribed for 1 week.

**Results:** After 12 months, implants treated without systemic antibiotics showed significant reductions of PD ( $1.4 \pm 0.7\text{mm}$ ), clinical attachment level (CAL) of ( $1.3 \pm 0.8\text{mm}$ ), and BOP ( $33.4\% \pm 17.2\%$ ). In deep pockets of >6mm the changes in all parameters were more pronounced. PD ( $2.3 \pm 1.3\text{mm}$ ); CAL ( $2.0 \pm 1.6\text{mm}$ ), and BOP ( $44.0\% \pm 41.7\%$ ). The use of antibiotics did not significantly influence any changes except at implant sites with PD >4mm where BOP was reduced significantly.

**Conclusion:** This non-surgical combination therapy led to significant clinical improvements at peri-implantitis sites, however, systemic antibiotics had limited effects.

**Topic:** Soft tissue augmentation around implants

**Authors:** Rojo E, Stroppa G, Sanz-Martin I, Gonzalez-Martín O, Santos Alemany A, Nart J.

**Title:** Soft tissue volume gain around dental implants using autogenous subepithelial connective tissue grafts harvested from the lateral palate or tuberosity area. A randomized controlled clinical study.

**Source:** J Clin Periodontol. 2018 Jan 15 DOI: 10.1111/jcpe.12869

**Type:** A randomized controlled clinical study.

**Rating:** good

**Keywords:** dental implants; soft tissue augmentation; volume gain

**Purpose:** To compare the soft tissue volume gain (VG) around single tooth implants with subepithelial connective tissue grafts (SCTG) from either the lateral palate (LP) or from the tuberosity area (TA).

**Methods:** 32 patients with 36 implants with buccal volume deficiencies were randomly assigned to receive SCTG from LP (control group/CG) or TA (test group/TG). Clinical parameters were recorded and volume gain was evaluated by STL image superimposition of 2 intraoral scans. The first at baseline (BL) and the second at 3 months after surgery (FU-3). Descriptive analysis was performed for both groups and for comparisons U Mann Whitney test was used.

**Results:** In terms of VG values, no statistically significant differences were observed except for values at 6 and 7mm apically to the healing abutment which favoured the TG. Mean values were  $0.69 \pm 0.23$ mm for CG while TG obtained  $0.79 \pm 0.10$ mm ( $p=0.64$ ). Regarding Keratinized tissue width statistical significant differences were found in favor of TG, which obtained a gain of  $0.83 \pm 0.61$ mm compared with  $0.22 \pm 0.48$ mm for CG ( $p=0,009$ ). Pink esthetic scores resulted in mean values of  $10.07 \pm 2.19$  for the CG, while TG obtained  $9.15 \pm 2.34$ .

**Conclusion:** Recent studies demonstrated that SCTG from the TA may be more suitable for volume augmentation when compared with LP tissue, however there is limited scientific evidence regarding the topic. Both procedures were effective in increasing soft tissue volume with no statistically significant differences. A longer follow-up is needed to confirm or refute these results.