The Effect of Glycine-Powder Airflow and Hand Instrumentation on Peri-implant Soft Tissues: A Split-Mouth Pilot Study

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Fifteen edentulous patients with overdentures supported by two implants in the mandibular canine regions received periodontal therapy using both hand instrumentation with Teflon curettes and a glycine-based airflow system. Periodontal probing depth (PPD), bleeding on probing (BOP), and bacterial content (BC) within the gingival sulcus were analyzed. A significant effect modification of the glycine airflow with respect to time was found for PPD ($P = .01$), BOP ($P < .001$), and BC ($P = .004$), which were treated as ordered categorical variables. Glycine airflow may be more effective than Teflon curettes for the maintenance of peri-implant soft tissues. *Int J Prosthodont 2013;26:42–44. doi: 10.11607/ijp.3063*

Healthy soft tissues surrounding dental implants are essential to long-term restorative success. It has been suggested that, if left untreated, peri-implant mucositis may lead to progressive destruction of the implant-supporting tissues and eventually to implant failure.[1] However, scaling and root planing procedures can lead to wear and tear and are more likely to alter the implant abutment surface,[2] thus increasing plaque deposition and bacterial colonization. In contrast, a glycine-powder airflow system is capable of removing biofilm from a root surface within 5 seconds.[3] The aim of this split-mouth clinical study was to compare the efficacy of traditional plastic curettes and glycine-based air polishing in the periodontal therapy of dental implant abutments.

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Materials and Methods

Patients and Interventions

Fifteen edentulous patients with overdentures supported by two implants in the mandibular canine regions were treated between April and July 2010. Each patient randomly received hand instrumentation using Teflon curettes at one implant site and glycine-based airflow treatment at the other (Table 1). The air-polishing device (EMS Air-Flow, Perio) was used for 5 seconds, according to the manufacturer's protocol. Hand instrumentation was carried out with Teflon curettes (Universal Implant Deplaquer, Hawe Neos) for the subgingival deposits and a scaler (I H6/7 Scaler, Hu-Friedy) to remove plaque from the abutments. The patients provided informed consent before treatment.

Outcomes

Patients were evaluated before treatment (T0) and 1 hour (T1), 1 week (T2), and 4 weeks (T3) after treatment. The following parameters were considered: periodontal probing depth (PPD), bleeding on probing (BOP), and bacterial content (BC) within the gingival sulcus. Probing was performed using a plastic probe (PerioWise, Premier) at T0, T2, and T3. Regarding the microbiologic samples, plaque was harvested (at all time points) from the peri-implant sulcus with a sterile adsorbent paper point, which was kept in a sterile microtube at 4°C until extraction with the DNA Tissue Kit (QIAGEN). The bacterial semiquantitative analysis was performed with a broad-range polymerase chain reaction (PCR) in the conserved 16S ribosomal

Table 1 Treatment Allocation

Patient	Left canine	Right canine
1	Glycine	Curettes
2	Glycine	Curettes
3	Curettes	Glycine
4	Curettes	Glycine
5	Curettes	Glycine
6	Curettes	Glycine
7	Glycine	Curettes
8	Curettes	Glycine
9	Glycine	Curettes
10	Curettes	Glycine
11	Glycine	Curettes
12	Curettes	Glycine
13	Glycine	Curettes
14	Glycine	Curettes
15	Glycine	Curettes

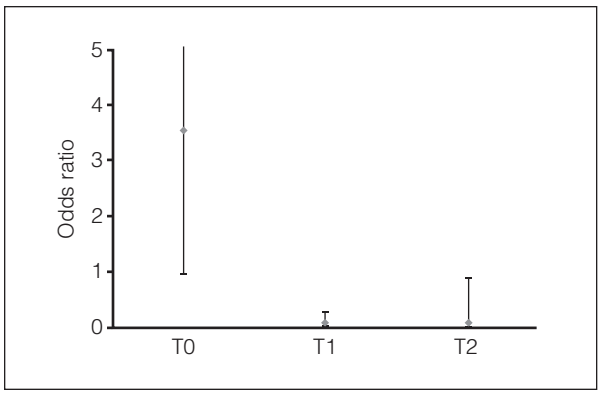

Fig 1 BOP analysis (glycine vs curettes). Among patients treated with glycine, the odds ratio (OR) of being in a higher category of bleeding score at T0 is 3.55 times the OR of those treated with curette (95% confidence interval: 0.98–12.9, P = .054). This OR reduces to 0.08 (P < .001) and 0.1 (P = .04) as time increases.

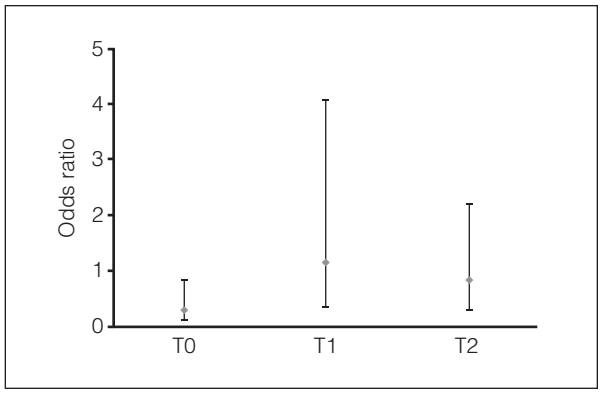

Fig 2 PPD analysis (glycine vs curettes). The odds ratio (OR) of being in a higher category at T0 (OR = 0.29; 95% confidence interval: 0.10–0.82, P = .02) is significantly lower in patients treated with glycine than in those treated with curettes.

ribonucleic acid bacteria genome region, optimizing an established protocol.[4] Briefly, the PCR conditions (Primer FW: AAG GAG GTG ATC CCG; RV: AAC GTG CCA GCA GCC GCG GTA) entailed an initial annealing step at 95°C for 10 minutes, followed by 35 cycles at 95°C for 30 seconds, 62°C for 30 seconds, 72°C for 160 seconds, and a final elongation step at 72°C for 7 minutes. The PCR products were diluted 1:10, 1:100, and 1:1000 before loading onto 2% agarose. After the electrophoretic run, the band intensity corresponding to the whole bacterial content of the sample was acquired using the Gel Doc system (Bio-rad Laboratories). The images obtained were quantified on the basis of pixel number and color saturation using ImageJ software (NIH Image). The protocol was repeated twice for each sample dilution.

Statistical Analysis

PPD and BOP scores were treated as ordered categorical variables. A robust proportional odds regression model for ordinal data was applied to PPD and BOP scores and included the time of assessment, the technique used, and an interaction term between the two as independent variables. The results were expressed as odds ratios (ORs), and each OR may be interpreted as the effect of the variable on the odds of being in a higher category of the outcome across the entire range of values. The same choice of predictors was adopted for the linear regression model for the BC outcome, with BC as the continuous and normally distributed variable. The results were expressed as the change in mean BC values in glycine- versus curette-treated patients at all time points.

Results

Figure 1 shows the analysis of BOP scores by time of assessment. A significant effect modification of the glycine airflow compared to hand instrumentation with respect to time was found (P < .001). Likewise, a significant effect modification of the glycine treatment was found for PPD (P = .01; Fig 2) and BC values (P = .004; Table 2).

Table 2 Linear Regression Model for BC Values (Glycine vs Curettes)

					95% CI	
Time	Coefficient	SE	z	*P* > |z|	Lower	Upper
T1	−427177	232609.1	−1.84	.066	−883082.4	28728.38
T2	−765605.6	404326.1	−1.89	.058	−1558070	26858.97
T3	−436688.9	322783.1	−1.35	.176	−1069332	195954.2

SE = standard error; CI = confidence interval.

Discussion and Conclusions

In agreement with previous studies of natural teeth,[5] the results of this study showed that the use of a glycine airflow system may be a viable and less-invasive supportive therapy for the maintenance of peri-implant soft tissues in edentulous patients. However, larger randomized clinical trials are needed both to confirm these results and answer other relevant questions, such as what effect glycine airflow may have on peri-implant soft tissues in partially edentulous patients with a history of periodontal disease.

Acknowledgments

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Literature Abstract

Regeneration of dental pulp by stem cells

This study investigated the angiogenic and neurogenic potential of $CD31^{-}$/CD146–SP and $CD105^{+}$ cells in a model of mouse hindlimb and rat cerebral ischemia. The regeneration of dental pulp tissues after autologous transplantation of amputated pulp in a dog model was also examined. Using flow cytometry, $CD31^{-}$/$CD146^{-}$SP and $CD105^{+}$ cells from canine dental pulp tissue were isolated. Transplantation of these cells into a model of mouse hindlimb ischemia resulted in increased blood flow and capillary formation. In the model of rat cerebral ischemia, enhanced neural regeneration and recovery of motor responses were observed. In the dog model, mature teeth with complete apical closure after pulpectomy were extracted, and the apical portion of the root was sectioned. The teeth were transplanted into alveolar bone after total pulp removal and enlargment of the apical foramen, followed by filling with autologous pulp stem and progenitor cells. After 14 days, complete regeneration of pulp tissues with vascular and neuronal processes was seen. Dentin formation along the dentinal walls was observed after 35 days. These results demonstrate the potential for complete pulp regeneration by stem and progenitor cells with high angiogenic and neurogenic potential. Further research into the refinement techniques as well as immunomodulatory and immunosuppressive effects of pulp stem cells may lead to immunocompatible stem cells for allogeneic treatment for total pulp regeneration in endodontic practice.

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