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Clinical and Microbiological Study about Efficacy of Air-polishing and Scaling and Root-planing

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The efficacy of air-polishing on subgingival debridement, as compared to scaling and root planning (SRP), was evaluated clinically and microbiologically. Fifteen patients diagnosed as chronic periodontitis, and having single-root tooth over 5 mm of pocket depth symmetrically in the left and right quadrant, were investigated. Subgingival debridement was performed by SRP and air-polishing. The results were evaluated and compared clinically and microbiologically. Probing pocket depth (PPD), bleeding on probing (BOP), relative attachment level (RAL) and change of gingival crevicular fluid (GCF) were assessed before treatment, and at 14 and 60 days after treatment. Microbial analysis was done pre-treatment, post-treatment, and at 14 and 60 days after treatment. Results of air polishing showed that post treatment, the PPD and BOP decreased, and attachment gain was observed. There was no clinical difference when compared to SRP. The volume of GCF decreased at 14 days, and increased again at 60 days. Compared to SRP, there was a statistical significance of the volume of GCF at 60 days in air-polishing. In the microbial analysis, high-risk bacteria that cause periodontal disease were remarkably reduced. They decreased immediately after treatment, but increased again with the passage of time. Thus, our results show that subgingival debridement by air-polishing was effective for decrease of pocket depth, attachment gain, decrease of GCF and inhibition of pathogens. Further studies are required to compare air-polishing and SRP, considering factors such as degree of pocket depth and calculus existence.

Key words: bacteria, gingival crevicular fluid, periodontal debridement, root planing, scaling

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Introduction

As a chronically infectious disease, periodontal disease occurs due to biofilms of bacteria present in the supragingival and subgingival regions of teeth. A biofilm is an aggregate of bacterial colonies attached onto tooth surfaces, and its removal is essential in inhibiting the progression of periodontal disease and preventing the formation of periodontal disease [1,2].

Scaling and root planing (SRP) is typically used to get rid of biofilms. In this cleaning procedure, a manual tool such as a Gracey curette and an ultrasonic scaler are used to mechanically remove biofilms. Supragingival and subgingival biofilms recover within several months from their removal [3,4], and therefore, the removal on a regular basis is crucial in maintaining a long-term health of the periodontium [5].

Although SRP is effective in the removal of supragingival and subgingival biofilms, the procedure may be uncomfortable

to the patient [6,7], requires the practitioner to have the correct technique, and takes much time [8-10]. Furthermore, inappropriate tool usage can lead to gingival recession and root surface injury, and ultimately produce hyperesthesia and other complications [11,12].

As one of the methods developed to avoid the complications from SRP, air polishing uses a mixture of a polishing powder and water, which is sprayed onto tooth surfaces through compressed air to mechanically remove biofilms. It was reported that this procedure makes a quick and effective removal of biofilms possible, minimizes tool-induced root surface abrasion [13,14], and reduces patient discomfort [15,16]. The most common abrasive powder used in the past for this procedure was sodium bicarbonate ($NaHCO_3$). This non-toxic soluble compound was proven to be effective in removing supragingival plaque and tooth discoloration without damages to enamel [17-19]. However, it can damage the filling materials used for tooth restoration [20,21] as well as exposed dentin when in direct contact; thus, $NaHCO_3$ is not suitable for the removal of biofilms in a recessed gum or subgingival areas [19].

Glycine, the main component of the polishing powder used in this study, is a type of non-essential amino acids that is also a major component of most polypeptides. This highly water-soluble and non-toxic compound has no color or no odor and is known to be non-allergenic. Moreover, it is known to be safe for medical purposes so it would be safe to be used in the mouth, particularly because of its anti-inflammatory as well as immunomodulatory and cytoprotective properties [22].

The average particle size of glycine powder used commercially for air polishing is under 45 μm, which is about 4 fold smaller than $NaHCO_3$ particles and is less abrasive, so glycine powder is suitable for removing biofilms present in dentin and subgingival regions [23]. As for research on the effectiveness of air polishing using glycine powder, a previous study [23] on patients under supportive periodontal therapy reported that air polishing was effective in reducing PPD, BOP and subgingival bacteria in high risk groups. This research was conducted in patients diagnosed with chronic periodontitis to examine the effectiveness of air polishing in not only those under supportive periodontal therapy but also those with periodontal disease.

Moreover, the measurement of gingival crevicular fluid was included to evaluate its clinical effectiveness. Gingival crevicular fluid is an inflammatory exudate that has periodicity [24] and is observed in a normal gingival sulcus; however, it is known to increase in inflamed gingival regions [25,26], during pregnancy or ovulation [27], and smoking [28]. The amount and its contents are used to measure the degree of inflammation of the gingiva, so gingival crevicular fluid measurements would be suitable in evaluating the effectiveness of oral hygiene and tissue response to a periodontal procedure and the efficacy of various drugs for supportive periodontal therapy.

This study was conducted with the goal to determine the effectiveness of air polishing using low abrasive glycine powder in removing subgingival biofilms in periodontal pockets having moderate depths. With the results of air polishing, clinical and microbiological evaluation was also performed to be compared with those from SRP.

Materials and Methods

Subjects

This split-mouth study was conducted for two months in accordance with the Helsinki Declaration and with the approval of Chosun University Dental Hospital Ethics committee (CDMDIRB 121781, approved on July 2, 2012). All subjects who granted their consents were informed of the study before their participation. A total of 15 patients were selected from those outpatient dental clinic patients who had visited the periodontal department of Chosun University Dental Hospital from July 2012 to March 2013. All of the study subjects met the following criteria: 1) The presence of a single root tooth having a periodontal pocket depth of 5 mm or deeper and the presence of a periodontal pocket with its depth 5 mm or deeper in the contralateral tooth on the opposite side and 2) having undergone no periodontal or antibiotic therapy within the past three months. The following patients were excluded from the study: 1) Smoking or pregnant patients, 2) those under 18 years of age, 3) those with uncontrolled diabetics or those with HIV infection, 4) those with cardiovascular disease requiring prophylactic antibiotics, and 5) those under immunosuppressants or steroids

Experimental groups and sample collection

After the subjects were selected through a screening test

two weeks prior to debridement, they received oral hygiene education on the scrubbing method, Bass method, and how to use an interdental brush. On the day of the experiment before evaluation, measurements were made from the samples for baseline microbiological examination, the gingival crevicular fluid contents, and clinical parameters, after which subgingival debridement was performed on the treatment sites. The treatment for both the air polishing and SRP groups was performed by the same dental surgeon and performed under local anesthesia to minimize patient discomfort for the SRP groups.

In the air polishing group, subgingival debridement was performed with the air polisher (Air-Flow® handy perio; EMS, Nyon, Switzerland) connected to the handpiece using low abrasive amino acid glycine powder (Air-Flow® Perio Powder; EMS). According to the manufacture's instruction, the central powder-water jet was applied to the periodontal pockets on the buccal and lingual sides on the root surface for 5 seconds at 60 ℃ - 90 ℃ angle. For the exposed air polisher tip during the procedure, a special nozzle (Perio-Flow® Nozzle; EMS) was ordered for specifically for subgingival usage.

In the SRP group, subgingival debridement was performed using an ultrasonic scaler (Cavitron® Select™ SPS™; Dentsply, New York, U.S.A) and a Gracey curette (LM dental, Nynäshamn, Sweden) for one minute until no debris was observed on the tools.

Microbiological samples were taken using No.1-2 Gracey curette from the area close to the inferior border of pocket depth in both the air polishing and the SRP groups at the same time for each subject upon the completion of each debridement, after which distilled water was used to wash the mouth out. The patients revisited the hospital two weeks and 60 days after each procedure, at which times second and third microbiological samples were obtained without local anesthesia for the evaluation of the gingival crevicular fluid and the clinical parameters. The study was wrapped up on post-debridement day 60. Continued periodontal monitoring was performed in these patients after the completion of the study by enrolling them in the supportive periodontal therapy program.

Clinical evaluation

Before each procedure, the measurements were taken for baseline and again on post-debridement day 14 and day 60, and the following factors were evaluated in the single root teeth of the right and left sides with 5 mm or deeper periodontal pockets examined for the study: 1) At the time of probing, probing pocket depth (PPD): the distance between the gingival margin to the periodontal pocket base, measured using a periodontal probe (PCP15, Hu-Friedy, Chicago, USA), 2) relative attachment level (RAL): the distance between the base point (the cementoenamel junction or the margin of filling material) to the periodontal pocket base, and 3) bleeding on probing (BOP): bleeding within 15 seconds after periodontal pocket probing

Gingival crevicular fluid evaluation

Periotron® 8000 (Oralflow Inc., New-York, USA) was set according to the manufacturer's instruction as follows. First, the instrument was set at 0, and the buccal and palatal sides of the tooth were covered with cotton roll to separate and prevent saliva or other substances for coming in contact with the tooth. Compressed air was allowed to pass from the apex side to the coronal side by controlling the air pressure to minimize injuring the gingival sulcus wall. Upon drying, 1 min was allowed for the exudates to flow into the gingival sulcus. Then an absorbent strip was inserted carefully into the periodontal pocket for 60 sec until little resistance was felt, removed, and placed on Periotron® 8000 (Oralflow Inc.) to measure the amount of gingival crevicular fluid.

Bacterial DNA extraction

QIAamp® DNA mini kit (QIAGEN, Germany) was used to extract bacteria DNA from the samples. After vortexing, 1 ml sample was placed into a 1.7 ml centrifuge tube and centrifuged at 13,000 rpm for 5 min to collect the precipitate after discarding the top solution. The collected precipitate was placed in 200 ul of 1X PBS to phosphate buffered saline, vortexed, and 200 ul AL buffer and 20 ul proteinase K (10 mg/ml) were placed into the test tube, swirled, and incubated at 56 ℃ for 30 min for reaction.

Into the sample after reaction, 200 ul of ethanol (96 % - 100 %) was added and swirled. Then, this mixture was placed in QIAamp Mini spin column to extract DNAs using QIAamp DNA Mini and Blood Mini Handbook's Protocol : DNA Purification from Blood or Body Fluids (Spin Protocol). Finally, the sample was eluted in 100 ul AE buffer.

Polymerase Chain Reaction (PCR)

The target bacterial species for detection from the samples using the PCR was as follows; *Aggregatibacter actinomycetemcomitans, Campylobacter rectus, Eikenella corrodens, Fusobacterium nucleatum, Porphyromonas gingivalis, Prevotella intermedia, Peptostreptococcus, Treponema denticola, Tannerella forsythia*. The bacterial species-specific PCR primers for the nine target bacteria were used in this study were listed in Table 1.

2X Hot Taq mix kit (Bioquest, Seoul, Korea) was used for PCR solution with ABI 9700 (Thermer cycler; Applied biosystems, CA, USA) as PCR machine. As for PCR, pre-denaturation was performed at 94 ℃ for 12 min; denaturation, at 94 ℃ for 30 sec; annealing, at 60 ℃ for 30 sec; extension, at 72 ℃ for 1 min for 35 cycles; and additional extension, at 72 ℃ for 5 min. After PCR, 5 ul of PCR reactant was electrophoresed (0.5 X TBE, pH 8.0, 200 V) for 60 min in 2 % Agarose gel. Then, the PCR product sizes were confirmed using a UV detector, and the results were analyzed.

Statistical analysis

All of the test results obtained from the subjects were expressed in mean and standard deviation. Kolmogorov-Smirnov test was used to test normality, and test of significance were used on the results for test of normality and sample characteristics. Mann-Whitney test was used as the test of significance for differences in the changes of PPD and RAL with time between the air polishing group and the SRP group. Wilcoxon singed ranks test was used as the test of significance with time in each group. Chi-square test and fisher's exact test were used as the tests of significance for difference between the two groups in BOP. Mcnemer test was used to test difference with time within each group.

As for the evaluation of gingival crevicular fluid, independent t-test was used as the test of significance for differences between the two groups. Paired t test was used to verify difference within each group. Significance was determined at $P < 0.05$. SPSS (SPSS 20.0; SPSS Inc., Chicago, IL, USA) was used for statistical analysis.

Results

A total of 15 subjects (7 males and 8 females) were included in the study. Their average age was 50 years (range: 33~75 years). No smoker was included. The study period was two months. All the subjects successfully completed the study.

Table 1. The bacterial species-specific PCR primers were used in this study

Species	Oligonucleotide sequence of primers	Size of amplicon (bp)
A. actinomycetemcomitans	5'-CTTACCTACTCTTGACATCCGAA-3' 5'-ATGCAGCACCTGTCTCAAAGC-3'	77
C. rectus	5'-TTTCGGAGCGTAAACTCCTTTTC-3' 5'-TTTCTGCAAGCAGACACTCTT-3'	50
E. corrodens	5'-GGGAAGAAAAGGGAAGTGCT-3' 5'-TCTTCAGGTACCGTCAGCAAAA-3'	101
F. nucleatum	5'-CGCAGAAGGTGAAAGTCCTGTAT-3' 5'-TGGTCCTCACTGATTCACACAGA-3'	339
P. gingivalis	5'-CTTGACTTCAGTGGCGGCAG-3' 5'-AGGGAAGACGGTTTTCACCA-3'	378
P. intermedia	5'-AATACCCGATGTTGTCCACA-3' 5'-TTAGCCGGTCCTTATTCGAA-3'	598
P. micra	5'-GCCGTAAACGATGAGTGCTAGG-3' 5'-CCAGGCGGAATGCTTAGTGT-3'	74
T. denticola	5'-CCGAATGTGCTCATTTACATAAAGGT-3' 5'-GATACCCATCGTTGCCTTGGT-3'	122
T. forsythia	5'-AGCGATGGTAGCAATACCTGTC-3' 5'-TTCGCCGGGTTATCCCTC-3'	88

Table 2. Mean values (±SD) of clinical parameter at baseline, 14 and 60 days post-treatment in SRP and Air-polishing group

		SRP(n=15)	Air-polishing(n=15)	*P* value
	BOP (%)			
	Baseline	100	100	
	Day 14	33.3	53.3	0.269
	Day 60	13.3	26.7	1.000
P value	Baseline - Day 14	0.002*	0.016*	
	Baseline - Day 60	< 0.001*	< 0.001*	
	Day 14 - Day 60	0.687	0.219	
	PPD (mm)			
	Baseline	5.4±0.83	5.2±0.68	0.567
	Day 14	3.6±1.24	4.1±0.52	0.045*
	Day 60	3.4±0.99	3.8±1.08	0.217
P value	Baseline - Day 14	0.002*	0.016*	
	Baseline - Day 60	0.000*	0.001*	
	Day 14 - Day 60	0.687	0.219	
	RAL (mm)			
	Change Day 14§	-1.6±0.90	-0.9±0.70	0.011*
	Change Day 60§	-1.8±0.77	-1.2±0.77	0.016*

Values are presented as mean±SD.
SRP, scaling and root planing; BOP, bleeding on probing; PPD, probing pocket depth; RAL, relative attachment level
* Statistically significant difference (P<0.05).
§ Negative value : RAL gain.

Clinical evaluation

As for the results of BOP evaluation, compared to the baseline in both groups, a significant decrease was shown on the day 14 and 60 after gingival debridement (Table 2). The finding of bleeding was observed in all sites at the time of baseline evaluation before debridement. However, bleeding was decreased in 33.3 % and 13.3 % of all the sites observed in the SRP group and 53.3 % and 26.7 % in the air polishing group on post-debridement days 14 and day 60, respectively. No significance difference was seen in BOP between the two groups according to the time of measurement (P > 0.05).

Compared to the baseline measurement, PPD was significantly decreased in both groups 14 days and 60 days after debridement (Table 2). As for comparison between the two groups, PPD values were 5.4±0.8 mm and 3.4±1.0 mm in the SRP group, and were 5.4±0.8 mm and 3.8±1.1 mm in the air polishing group, at baseline and on post-debridement day 60, respectively, showing no statistically significant difference between the two groups (P > 0.05). PPD values on post-debridement day 14 was 3.6±1.2 mm and 4.1±0.5 mm in the SRP group and the air polishing group, respectively, showing a significantly low value in the SRP group (P < 0.05).

Average RAL after debridement was 1.6±1.0 mm and 1.8±0.8 mm in the SRP group and was 0.9±0.7 mm and 1.2±0.8 mm in the air polishing group on days 14 and day 60, respectively, showing attachment gain (Table 2). In all results obtained on post-debridement days 14 and 60, attachment gain was statistically significantly high in the SRP group compared to the air polishing group (P < 0.05).

Gingival crevicular fluid evaluation

Gingival crevicular fluid secretion at baseline in both groups decreased on post-debridement day 14 but increased on post-debridement day 60 (Table 3). The secretion was 146.7±33.2 and 59.7±27.4 in the SRP group and 161.1±27.4 and 80.3±35.2 in the air polishing group at baseline and post-debridement day 14, respectively, in which it dropped on post-debridement day 14 in both groups but with no statistical significance (P > 0.05).

Table 3. Mean values (±SD) of gingival crevicular fluid at baseline, 14 and 60 days post-treatment in SRP and Air-polishing group

		SRP(n=15)	Air-polishing(n=15)	*P* value
Baseline		146.7±33.15	161.1±27.39	0.207
Day 14		59.7±27.37	80.3±35.21	0.084
Day 60		103.3±42.85	158.2±39.08	< 0.001*
P value	Baseline - Day 14	< 0.001§	< 0.001§	
	Baseline - Day 60	0.002§	0.757	
	Day 14 - Day 60	< 0.001§	<0.001§	

Values are presented as mean±SD
SRP, scaling and root planing
* Statistically significant difference in group (P<0.05).
§ Statistically significant difference in time (P<0.05).

Table 4. Number of sites positive for the various microbial species before treatment (day 0 Pre), immediately post-treatment (day 0 Post) and at days 14 and 60

Species	SRP (n=15)				Air polishing (n=15)			
	Day 0 pre	Day 0 post	Day 14	Day 60	Day 0 pre	Day 0 post	Day 14	Day 60
A. actinomycetemcomitans	2	0	0	1	5	1	2	1
C. rectus	9	1	7	9	10	5	6	8
E. corrodens	4	1	6	3	8	3	6	4
F. nucleatum	15	4	13	12	14	12	14	13
P. gingivalis	12	2	1	2	10	3	6	5
P. intermedia	8	2	5	3	9	2	6	7
P. micra	13	3	4	6	12	4	9	9
T. denticola	14	3	3	7	11	8	9	6
T. forsythia	9	1	1	3	10	5	2	5

However, it was 103.3±42.9 in the SRP group and 158.2±39.1 in the air polishing group on post-debridement day 60 compared to post-debridement day 14, showing an increase in both groups. When the two groups were compared, the gingival crevicular fluid volume was statically significantly lower in the SRP group (P < 0.05).

Microbiological evaluation

The incidence of positive bacteria in both the SRP and the air polishing groups tended to decline immediately after debridement compared to before debridement (Table 4). Positive bacteria started to increase after debridement and recovered to pre-debridement levels with time. According to the classification based on the hypothesis suggested by Haffajee and Socransky [29], bacterial was divided into very strong periodontal pathogens, strong periodontal pathogens and moderate periodontal pathogens. The recovery rates differ in each periodontal pathogen; very strong periodontal pathogens, i.e. *A. actinomycetemcomitans, P. gingivalis, T. denticola* and *T. forsythia* were significantly decreased immediately after debridement and maintained low on post-debridement day 14 and 60. Strong periodontal pathogens, i.e, *C. rectus* and *P. intermedia,* moderate periodontal pathogens, i.e, *E. corrodens, F. nucleatum and P. micra* were decreased significantly after debridement but showed a faster rate of recovery compared to the very strong periodontal pathogens on post-debridement day 14 with no difference seen on post-debridement day 60 compared to post-debridement day 14. When compared very strong periodontal pathogens with strong, moderate pathogens, the decreasing tendency in positive bacteria with debridement was more prominent in the very strong periodontal pathogens. The positive bacteria after debridement were somewhat lower in the SRP group than in the air polishing

group, with this difference more distinct immediately after debridement but not much different on days 14 and 60 after debridement.

Discussion

This study compared the clinical and microbiological results of subgingival debridement using SRP and air polishing to evaluate the effectiveness of each procedure. The short-term results obtained during the two month study period showed that both air polishing and SRP were effective in decreasing probing pocket depth (PPD) and bleeding on probing (BOP).

As for the previous studies with similar study design, the clinical trial by Wennström et al. [16] in patients under supportive periodontal therapy found no significant difference between SRP and air polishing when the changes in PPD, BOP and RAL on pre-debridement and post-debridement days 14 and 60 was examined. Moëne et al. [15] in their short 7-day trial in patients under supportive periodontal therapy found SRP and air polishing to be effective in BOP reduction, and they found that a statistically more significant effect was seen in the SRP group.

Similar to the results found by Wennström et al., we found that PPD and BOP on post-debridement day 60 showed no significant difference between the two procedures. However, we found that PPD and BOP on post-debridement day 14 were significantly better in the SRP group than in the air polishing group, whereas changes in RAL through attachment gain was significantly higher in the SRP group than in the air polishing group at all time periods. Compared to the results found by Moëne et al., post-debridement BOP showed not much significant difference between the two procedures; however, similar to their study, BOP reduction was higher with SRP.

These differences observed in our study compared to the above studies conducted in the past were because of the two factors. First, time point of measurement is different. That is, Moëne et al. evaluated on post-debridement day 7. However, we evaluated on post-debridement day 14, 60. Second, the study subjects included those who had undergone supportive periodontal therapy as well as the first time periodontal therapy patients, in whom more subgingival calculus was observed than in those who already had supportive periodontal therapy. As a calcified substance attached to the tooth surface or other oral structure surfaces with biofilms being the major causal agent, calculus is known to be a contributing factor to periodontal disease [30]. SRP is used to remove not only subgingival biofilms but also calculus, but air-polishing can remove only biofilms on calculus but not calculus itself. Thus, we believe that in the SRP group, the periodontal pocket depth reduction was higher on post-debridement day 14 and that attachment gain was higher up until post-debridement day 60.

Intergroup differences were more distinct through the measurements of gingival crevicular fluid. With no pre-treatment difference seen in both groups in the amount of gingival crevicular fluid secretion, this amount was lower in the SRP group on post-debridement day 14 days and days 60, but significantly different between the two groups on post-debridement day 60 ($P<0.05$). Gingival crevicular fluid was significantly reduced in both groups on post-debridement day 14 compared to the pre-debridement levels, probably because the periodontal therapy improved periodontal tissues. With time, the bacteria within the periodontal pocket recovered to the pre-procedure levels after SRP. This recovery was reported to take approximately 9 to 12 weeks depending on the patient [3,4]. We also found that the secretion of gingival crevicular fluid started increasing again on post-debridement day 60, and a significant difference was seen in the SRP group but no significant difference in the air polishing group compared to the amount of secretion at the time of the first visit. These results were probably because the existing bacteria in calculus affected the aggregation of colonies second times and the amount of gingival crevicular fluid secretion increased faster in the air polishing group.

Microbiological examination showed a similar pattern of bacteria reduction in both groups. Although we only measured positive response with no quantitative analysis, this response was reduced in both groups immediately after debridement, especially in the very strong periodontal pathogens. This result was similar to those found by Wennström et al. who reported that bacterial reduction immediately after treatment was high in the very strong periodontal pathogens with no statistical significance seen based on the methods of debridement. Particularly among very strong periodontal pathogens, *P. gingivalis* and *T. denticola* are markers for

periodontal therapy and show a correlation in the gravity of periodontal therapy; a successful periodontal therapy results in the reduction of these two pathogens with these reductions lasting up until post-debridement 3-11 weeks, according to Simonson et al. [31]. Similarly, we also found the post-debridement reductions in these two pathogens in both SRP and air polishing groups with this effect lasting until post-debridement day 60. Recovery to pre-debridement levels was faster in the strong, moderate periodontal pathogens that in very strong periodontal pathogens in which a full recovery to pre-debridement levels was seen on post-debridement day 14. Particularly, compared to other bacteria, a large quantity of *F. nucleatum* was separated, and the recovery was also faster than other bacteria. *F. nucleatum* is the most prevalent bacterium in subgingival plaque sample and is known to be seen frequently in chronic periodontitis plaque. Its relationship with gingivitis is well known. In addition, a significant amount of bacteria is substantially separated from non-active periodontitis as well as active periodontal pocket. We found that the reduction in *F. nucleatum* was distinct immediately after debridement but recovered to the pre- debridement levels on post-debridement day 14. However, based on the fact that clinical indices of periodontitis were improved up until post-debridement day 60, further examination is needed on the role of this bacterium and its relation to periodontal disease. Although intergroup comparison was difficult in this study due to a small number of samples, we found no bacteria showing a significant difference between the two groups. Further studies are required on quantitative analysis to observe the actual levels of bacterial reduction to compare differences between SRP and air polishing and to determine the presence of statistical significance.

Furthermore, a difference was also observed in patient discomfort. SRP was performed under local anesthesia due to patient discomfort whereas air polishing was performed without using anesthesia but no patient complained of discomfort. Thus, similar to the results found in the previous studies [15,16], our result suggests that air polishing can be used in place of SRP in those patients who are sensitive to or afraid of periodontal therapy. Post-debridement discomfort also differed in some patients that complained of temporary hyperesthesia at SRP sites but no complaint was reported from the air polishing sites. Complications such as gingival recession and hyperesthesia can be often observed in those patients requiring periodontal therapy. Air polishing debridement may induce less discomfort in these patients. Since we did not conduct statistical analysis on patient discomfort in this study due to the lack of objective measurement values and a small number of samples, comparison needs to be made on post-debridement discomfort in the future.

This study showed that air polishing reduced BOP, PPD and the amount of gingival crevicular fluid and increased attachment gain with RAL. Also, air polishing resulted in a distinct reduction in positive bacteria after debridement, and this effect was more prominent with very strong periodontal pathogens compared to strong, moderate periodontal pathogens. On microbiological evaluation, air polishing was effective in bacteria reduction, but investigation through quantitative analysis is required in the future.

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Conflict of interest

The authors declare that they have no competing interest.

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