International Journal of Dental Sciences and Research, 2016, Vol. 4, No. 4, 76-78
Available online at http://pubs.sciepub.com/ijdsr/4/4/4

DOI:10.12691/ijdsr-4-4-4

Comparing Effectiveness of Two Scaling Methods: Hand and Ultrasonic Instruments in Patients with Periodontitis Disease

Ali zarandi[1,*], Younes Mostafa poor[2], Atabak Kashefi Mehr[3]

[1]Department of Periodontics, Faculty of Dentistry, Tabriz University of Medical Sciences, Tabriz, Iran
[2]Privet Practice, Sanandaj, Iran
[3]Department of Oral Medicine, Faculty of Dentistry, Tabriz University of Medical Sciences, Tabriz, Iran
*Corresponding author: dr.alizarandi@gmail.com

Abstract **Objectives**: Treatment of periodontal disease is done by removal of biofilm via two scaling methods (hand and ultrasonic instruments). This study intended to compare the effectiveness of these methods by measuring the bleeding on probing (BOP) and clinical attachment loss. **Methods**: Thirty patients were participated in the study and divided into the control (scaling by hand instruments) and test groups (scaling by ultrasonic instruments). The mean age of the participants in the control group was 32.2 ± 4.5 years and in the test group was 31.9 ± 5.2 years. Effectiveness of two scaling methods was evaluated by measurement of periodontal pocket depth (PPD) and BOP. The results were compared after treatment for two months and analyzed by descriptive statistics, Mann- Whitney U test and Wilcoxon signed-rank test. **Results**: The mean of PPD changed from 5.8 ± 0.4 to 3.1± 1.1mm (P> 0.05) in the test group and from 5.4 ± 0.3 to 4.2 ±1.5 mm (P>0.05) in the control group. The mean value of BOP decreased from 95% at baseline to 20% after two months (P>0.05) in the test group and from 95% at baseline to 40% after two months (P>0.05) in the control group. **Conclusion**: Scaling methods in two PPD ranges (1≤PPD≥ 3 and 3 < PPD < 5) had the same effect, however in PPD ≥ 5, the effect of ultrasonic treatment to reduce the amount of PPD and BOP in the test group was higher than that in the control group which manually scaled the tooth surfaces.

Keywords: *bleeding on probing, dental plaque, periodontitis, ultrasonics*

Cite This Article: Ali zarandi, Younes Mostafa poor, and Atabak Kashefi Mehr, "Comparing Effectiveness of Two Scaling Methods: Hand and Ultrasonic Instruments in Patients with Periodontitis Disease." *International Journal of Dental Sciences and Research*, vol. 4, no. 4 (2016): 76-78. doi: 10.12691/ijdsr-4-4-4.

1. Introduction

Periodontal disease is a chronic condition which involves the periodontal tissues and alveolar bone and if left untreated can lead to gingival recession and tooth loss. One of the etiological causes of periodontal disease is dental biofilm. [1] Biofilms are formed by the colonies of microorganisms that are attached to tooth surfaces [2]. These microorganisms are protected from antimicrobial agents and host immune system [3]. Treatment of periodontal disease is done when the biofilm is removed by supragingival and subgingival scaling. Moreover, the elimination of pathogens involved in the biofilm is the primary goal of treating patients which is started by the mechanical debridement of supra- and subgingival plaques [4]. Debridement was previously done by conventional methods like utilization of hand instruments (curettes and scalers) and it has been recently performed via ultrasonic instrumentation which is known as a non-surgical method. These procedures remove 90% or even higher proportions of colonized microorganisms on the tooth surface, but due to the rapid proliferation of microorganisms, choosing an efficient procedure is necessary for a better prognosis and clinical outcome [4]. After therapy, clinical indicators including bleeding on probing (BOP) and clinical attachment loss are used for evaluating the treatment [5]. The difference between two methods, namely conventional and ultrasonic instrumentations, resides in the position of instruments' head on the tooth surface. The ultrasonic instrumentation has a finger head in comparison to a scaler or a curette. For example, in working with hand instruments, the head must be placed apically as calculus and head movement is apico-coronal, while the ultrasonic instrumentation can be used in corono apical spherical movement which is easier to be done by the dentist [6]. The scaling method is chosen based on the current situation, effectiveness, safety, and patient comfort. Scaling with the ultrasonic instrumentation requires less time compared with hand instruments; however, application of hand instrument depends on the skill of the operator's hand [7,8]. Previous studies have also demonstrated that scaling by hand instruments is more accurate, complete, and effective than that using the ultrasonic instrumentation [9]. The current study aimed to compare the clinical outcomes, BOP, and clinical attachment loss, after scaling by hand instrument in four steps, and using ultrasonic instrumentation in one step.

2. Methods

The study was designed as a clinical, controlled trial and was done on patients who had referred to Department of Periodontics, Faculty of Dentistry, Tabriz University of Medical Sciences, Tabriz, Iran. Patients with mild chronic condition diagnosed by periodontitis after clinical examination and radiography were selected for this study. The examination and radiography were done in the Department of periodontics, Faculty of dentistry, Tabriz University of Medical Sciences.

The criteria for each of the patients in the study were as follows:

1. Patients aged between 25-40
2. Minimum 12 maintainable teeth
3. Having at least four teeth which had minimum 4 mm probing depth and 3-4 mm clinical attachment loss.

Furthermore, the patients who presented contra indication for scaling and root planning or anesthesia, and patients with systemic problems like diabetes, cancer, AIDS, metabolic disorders, patients with the history of any periodontal intervention in the last one year, pregnant patients, and smokers were excluded from the study. A written consent was obtained from each patient. The study was approved by Ethics Committee of the University.

Sample size was determined using t-test and 30 patients were included. At the baseline visit, the patients diagnosed with chronic periodontitis according to the demographic information, medical, and dental history were collected and the exclusion criteria were reviewed. Probing depth, BOP, and clinical attachment loss were measured for all teeth. Subjects were randomly assigned by a computer-generated table to receive one of the two treatments. Fifteen patients in the control group were scaled by a periodontist using hand instruments like sickle scaler and different curettes. Scaling with hand instruments was done in four sessions and one quadrant was scaled in each session. Other 15 patients in this study were included in the second group, and scaled with an ultrasonic scaler by the same periodontist. Oral hygiene instructions were educated for all of the patients to assure that the patients could maintain a proper level of oral hygiene during the treatment. After two months, the effectiveness of two scaling methods was evaluated by measuring the periodontal pocket depth and bleeding gums during the scaling and compared with the previous measurement. The results were compared through the descriptive statistics, Mann-Whitney test and Wilcoxon ranking test. The *P*value less than 0.05 was considered statistically significant.

3. Results

The mean age of the participants in the control group was 32.2 ± 4.5 years and that in the test group was 31.9 ± 5.2 years. The difference between two groups was statistically non-significant ($P > 0.05$) (Table 1).

Table 1. The mean and standard deviation of ages between two study groups

Groups	Mean ± SD*	Minimum age	Maximum age
Control	32.2 ± 4.5	25	38
Test	31.9 ± 5.2	25	37

*SD: standard deviation.

In the control group, 60% (9) of the patients were female and 40 % (6) were male, while in the test group 33.4% (5) were female and 66.6 % (10) were male There was statistically non- significant difference between gender of the groups ($P > 0.05$). In addition, difference among types of teeth (molar, premolar, and incisors) for two groups was statistically non- significant ($P > 0.05$) (Table 2).

Table 2. Percentage of types of teeth in two control and test groups

Groups	Molar	Premolar	Incisors
Control	44.4	30.2	25.4
Test	45.3	29.5	25

Evaluation of effectiveness of two scaling methods on the clinical parameters of BOP and probing pocket depth (PPD) was done by Wilcoxon test. And comparison of effectiveness of two treatment methods on BOP and PPD was performed by Mann Whitney U- test. According to the Wilcoxon rank test and comparison of value of basic pocket depth in two months after treatment in all three types of PPD, the results were acceptable and statistically significant ($P>0.05$). Furthermore, based on the Mann whitney U test, two scaling methods in two PPD ranges ($1 \leq PPD \geq 3$ and $3 < PPD < 5$) had the same effect. However, in PPD ≥ 5 the effect of ultrasonic treatment to reduce the amount of PPD and BOP in the experimental group was higher than that in the control group which manually scaled the tooth surfaces (Table 3-Table 4).

Table 3. Mean (± SD) BOP values according to baseline and 2-month treatment as well as BOP mean alterations (Δ)

	Test group		Control group	
	BOP Baseline	Δ BOP 2-month treatment	BOP Baseline	Δ BOP 2-month treatment
$1 \leq PPD \geq 3$	32.5 ±15.5	-27±22.6	33± 18.2	-27.5 ± 13.5
$3 < PPD < 5$	75.8 ± 19.6	-62.8 ± 14.8	76.0 ± 15.2	-60.8 ± 18
$PPD \geq 5$	95 ± 10.5	-70.5 ± 30.2	96.5 ± 9.7	-60.4 ± 35

Table 4. Mean (± SD) PPD values according to baseline and 2-monthtreatment as well as PPD mean alterations (Δ)

	Test group		Control group	
	PPD Baseline	Δ PPD 2-month treatment	PPD Baseline	Δ PPD 2-month treatment
$1 \leq PPD \geq 3$	2.2 ± 0.7	0.5 ± 0.3	2.4± 0.5	0.4 ± 0.2
$3 < PPD < 5$	4.5 ± 0.6	-0.8 ± 0.6	4.2 ± 0.3	-0.8 ± 0.5
$PPD \geq 5$	5.8 ± 0.4	-2.0 ± 1.1	5.4 ± 0.3	-1.0 ± 0.5

4. Discussion

This study was designed to compare the clinical outcome of treatment through the scaling with hand and with ultrasonic instruments. The data indicated that there is no significant difference in the clinical periodontal measurements between these methods. All patients had the same condition in their oral cavity and similar periodontitis statuses. Moreover, the patients were scaled by the same periodontist and had the same post-treatment sessions of oral hygiene instructions by the same periodontist.

Previous studies have demonstrated that scaling by the dentist and suitable plaque control by the patient is the efficient method to treat the periodontitis [10]. Likewise, the present study indicated that scaling with either hand or ultrasonic instruments and educating patients about oral hygiene is efficient in the management and treatment of chronic periodontitis. These results are similar to those obtained for previous studies [11,12].

One of the main indicators in evaluating the success in periodontal treatment is BOP. It is an indicator which could demonstrate the healing status of inflammation. As results of present study indicated, there is no difference on the percentage of bleeding spots in narrow and moderate pockets ($1 \leq PPD \geq 3$ and $3 < PPD < 5$) between the scaling with hand or ultrasonic instrumentations. Whereas in deep pockets ($PPD \geq 5$), scaling with ultrasonic instrumentation is significantly better than that with hand instruments. Finger tip in the ultrasonic instrumentation gives better access in deeper pockets and is significantly more effective than hand instruments. A previous study determined the beneficial influence of both techniques (hand and ultrasonic instrumentations) in root surface planning in root treatment [13]. Another study compared the modified ultrasonic tip (MU) and hand instruments on the periodontal disease. According to the results, the effectiveness of treatment by MU was higher than that by Gracey curettes in all clinical parameters [14].

Another clinical periodontal index which was recorded in our study was PPD. The results indicated that both methods were effective, however scaling with ultrasonic instrumentation was significantly more effective than that with hand instruments in the deep pockets. In this regard, PPD was changed from 5.8±0.4 mm to 3.1±1.1mm in the test group after two months, but it changed from 5.4±0.3mm to 1.5mm±4.2 in the control group.

5. Conclusion

Although in this study, scaling with hand and ultrasonic instrumentations were compared by main clinical periodontal measurements, comparing the methods with more indicators like plaque index and microbial analysis are additionally required for further precise comparison.

Acknowledgments

The authors sincerely appreciate the sincere cooperation of all staff of Department of Periodontics at Tabriz Faculty of Dentistry.

Conflict of Interests

“No potential conflict of interests relevant to this article was reported”.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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