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Clinical attachment loss produced by curettes and ultrasonic scalers

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Abstract

Objectives: The aim of this study was to clinically detect the immediate effect of root instrumentation with curettes and ultrasonic scalers on clinical attachment level.

Material and Methods: Twelve subjects with moderate chronic periodontitis, presenting probing depths of 3.5–6.5 mm on anterior teeth, upper and/or lower, were selected. Teeth were randomly assigned to one of the following groups: US group – scaled with an ultrasonic scaler; and CC group – scaled and planed with 5–6 Gracey curettes. The selected teeth were probed with a computerized electronic probe, guided by an occlusal stent and subjected to scaling and root planing. Immediately following instrumentation, teeth were probed again. The difference between relative attachment level (RAL) immediately before and after instrumentation was considered trauma from instrumentation.

Results: Intra-group analysis revealed statistically significant differences between RAL immediately before and after instrumentation in both groups (0.77 ± 0.51 for US group; and 0.73 ± 0.41 for CC group, $p < 0.0001$). However, inter-group analysis did not show statistically significant difference in trauma from instrumentation caused by the two different instruments ($p = 0.816$).

Conclusions: Within the limits of this study, it was concluded that root instrumentation causes a mean immediate attachment loss of 0.75 mm, and that instrumentation with either curettes or ultrasonic scalers do not seem to reduce significantly the trauma from of instrumentation produced.

Key words: attachment loss; periodontal curettes; scaling; trauma from instrumentation; ultrasonic scalers

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The removal of bacterial deposits present on the disease-affected roots is the primary goal of periodontal treatment. Subgingival scaling is the major step to achieve this goal and it may be performed with a large variety of instruments, such as hand and ultrasonic instruments. Several reports have shown the positive results achieved with this therapeutic approach in longitudinal evaluations (Badersten et al. 1981, 1984). Despite the satisfactory results observed following subgingival scaling in longitudinal follow-up studies, the excessive penetration of the periodontal scaler into the bottom of the pocket may cause harmful effects. Claffey et al. (1988) had reported an average attachment loss of 0.5–0.6 mm immediately after a single episode of ultrasonic instrumentation. Similarly, Alves et al. (2004a, b) found a mean attachment loss of 0.76–1.06 mm immediately after scaling and root planing with hand instruments.

Curettes are the most commonly indicated tools to perform root instrumentation. However, ultrasonic scalers have been used for several years with similar effectiveness. According to Drisko (1993), in vitro and clinical studies have shown that ultrasonic instrumentation is as effective as hand instrumentation. On the other hand, as it provides less tactile sensitivity, ultrasonic instrumentation may have an influence on the degree of trauma at the bottom of the periodontal pocket.

Data concerning trauma from instrumentation are available considering ultrasonic scalers (Claffey et al. 1988) or hand instruments (Alves et al. 2004a, b). However, there is no data comparing the attachment loss produced immediately after subgingival scaling performed with these two instruments. Thus, the present study is aimed to compare the immediate attachment loss caused by instrumentation using Gracey curettes and ultrasonic scalers.

Materials and Methods

Patient sample

Twelve subjects, 33–65 years old, presenting moderate chronic periodontitis, were selected. These individuals presented a minimum of three periodontal pockets, on incisors and canines (upper

and/or lower), with probing depths (PDs) ranging from 3.5 to 6.5 mm. The protocol of the study had been previously approved by the Institutional Committee of Ethics in Clinical Research of the State University of Campinas (UNICAMP). Patients taking relevant medications, presenting any compromising medical conditions or undergoing orthodontic treatment were not included.

Initial preparation

The methodology followed by this study is according to the previous studies by Alves et al. (2004a, b). Supragingival debridement was performed by an ultrasonic device and all subjects received oral hygiene instructions on the first visit. Individual plastic occlusal stents were obtained to standardize the relative attachment level (RAL) measurements.

Clinical parameters

One week following initial preparation, the patients were probed by a previously calibrated examiner (L. M.). This procedure was performed with the use of a computerized electronic probe (Florida Probe™, Florida Probe Corporation, Gainesville, FL, USA).

PD was measured by the Florida pocket probe for qualifying the periodontal sites for the study. Measurements of RAL were obtained from a groove at the occlusal stent to the bottom of the pocket by the Florida stent probe.

The attachment loss after the root instrumentation was calculated by the difference between RAL measurements registered immediately before and immediately after scaling and root planing.

Scaling and root planing

Following the electronic probing, patients were anesthetized and subjected to subgingival scaling. The selected anterior teeth (upper and/or lower) were randomly assigned to one of the two groups:

- *US group*: Scaled with an ultrasonic scaler (9 N tip and medium intensity, Profi II Ceramic™, Dabi Atlante, Ribeirão Preto, SP, Brazil).
- *CC group*: Scaled and root planed with 5–6 Gracey curettes (Hu-Friedy™, Chicago, IL, USA).

Both upper and lower anterior teeth were equally distributed to be instrumented with either curettes or ultrasonic device. For US group, each selected site was scaled by 30 scaling movements. Similarly, in the CC group, each site also received 30 strokes. All the treatments were performed by the same operator (R. V. A.). Curettes were sharpened whenever necessary.

Immediately after scaling and root planing, selected teeth were probed again by the same initial examiner (L. M.) and new measurements of RAL were obtained.

Statistical analysis

RAL means were obtained from each patient for each of the two groups (US and CC group). The means registered before and after root instrumentation and the differences in RAL measurements between the groups were compared by the Student's paired *t*-test and Student's non-paired *t*-test, respectively ($\alpha = 0.05$).

Results

Six men and six women with a mean age of 45.7 ± 10.3 participated in the study. Figures 1 and 2 show the distribution of RAL means immediately before and after scaling with different instruments. Each subject had a mean of 4.0 ± 3.1 sites assigned for the US group, and 4.0 ± 1.76 sites for the CC group.

Periodontal sites in the US group (48 sites) showed a mean RAL of 8.65 ±

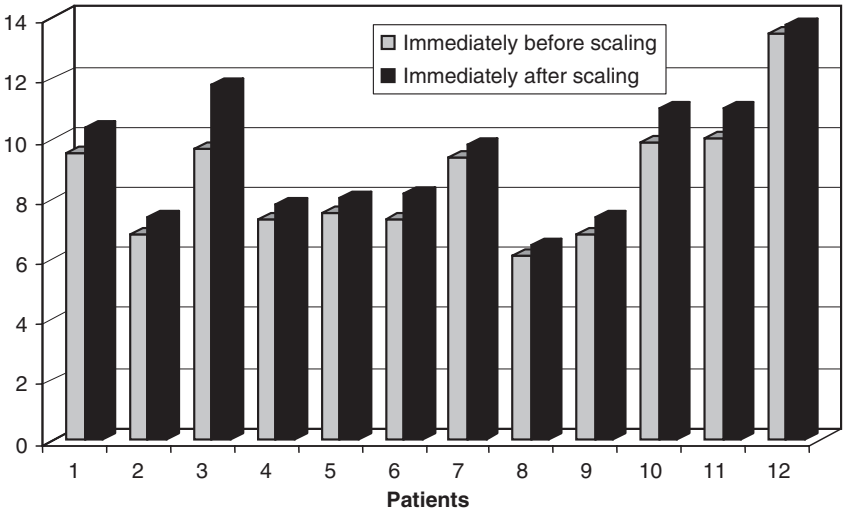

Fig 1. Mean relative attachment level variation (in mm) immediately before and after scaling using ultrasonic scalers (US group) in the different patients.

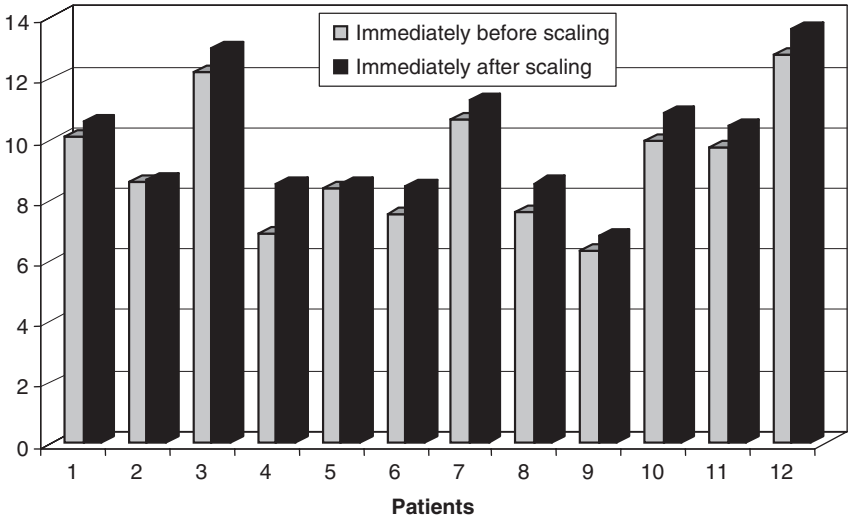

Fig 2. Mean relative attachment level variation (in mm) immediately before and after scaling and root planing using 5–6 Gracey curettes (CC group) in the different patients.

Table 1. RAL measurements in mm (mean ± SD) observed immediately before and after scaling with CC and US

	Immediately before scaling	Immediately after scaling
CC	9.22 ± 2.04 *A*	9.95 ± 2.04 *B*
US	8.65 ± 2.07 *A*	9.43 ± 2.22 *B*

Means followed by different letters in line indicate statistically significant differences ($p < 0.05$). RAL, relative attachment level; CC, Gracey curettes; US, ultrasonic scalers.

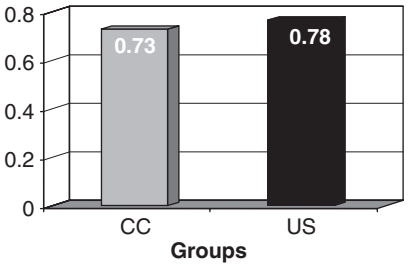

Fig 3. Trauma from instrumentation (relative attachment level loss in mm) in the different groups.

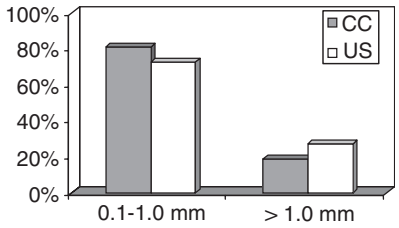

Fig 4. Percentage of sites showing attachment loss between 0.1 and 1.0 mm and superior to 1 mm in each group.

2.07 mm immediately before scaling, and 9.43 ± 2.22 mm immediately after the instrumentation. The observed mean difference in RAL for this group was 0.78 ± 0.51 mm, and this difference was statistically significant ($p < 0.0001$) (see Table 1).

In the CC group, a mean RAL value of 9.22 ± 2.04 mm was observed immediately before scaling, and 9.95 ± 2.04 mm immediately after this procedure. The mean difference in RAL measurements was 0.73 ± 0.41 mm and this difference was statistically significant ($p < 0.0001$) (see Table 1).

No statistically significant difference was observed in RAL changes between the two groups ($p = 0.816$) (see Fig. 3).

The mean attachment loss detected immediately after scaling and root planing considering both instruments was 0.75 ± 0.34 mm.

The percentage of sites that showed immediate attachment loss between 0.1 and 1.0 mm and superior to 1.0 mm is presented in Fig. 4. In the US group, 72.9% of the sites had an attachment loss inferior to 1.0 mm, and 27.1% had an attachment loss superior to 1.0 mm. The corresponding values in the CC group were 81.3% and 18.7%, respectively.

Discussion

This study was designed to quantify the attachment loss immediately after scaling with curettes and ultrasonic scalers. The results showed a mean RAL loss of 0.75 mm considering both instruments. The first study concerning trauma from instrumentation (Claffey et al. 1988) reported a mean attachment loss of 0.5–0.6 mm after instrumentation performed with ultrasonic scaler. More recent studies investigated the occurrence of this trauma after therapy with hand instruments (Alves et al. 2004a, b). Similar values for attachment loss after instrumentation were observed in the majority of these studies. Only the report from Alves et al. (2004b) showed a mean attachment loss of 1.06 mm; however, this finding may have been influenced by the high value of trauma from instrumentation caused by the Hirschfeld's periodontal files (1.28 mm).

Similarly to Alves et al. (2004a, b), the present study was carried out only in anterior teeth. On the other hand, Claffey et al. (1988) reported the changes observed on single and multi rooted teeth, immediately following a single episode of subgingival ultrasonic instrumentation. Despite this methodological difference, this last study presents similar results compared with the ones reported in the US group in the present study (0.5–0.6 and 0.78 mm, respectively). Moreover, the instrumentation was limited to 30 strokes with curettes and the same number of movements with the ultrasonic scaler. Thus, it may be suggested that under or over instrumentation of the root surface could have occurred in the present study.

A preparation period with supragingival debridement and oral hygiene instructions was conducted in the present study, in order to reduce gingival inflammation before the initial probing and subgingival instrumentation. Moreover, a blind examiner and the use of an electronic probe were included to optimize the reproducibility of periodontal probing measurements and improve the quality of the data. However, the influence of subgingival inflammation on the degree of trauma at the bottom of the pocket should be considered, since inflammed tissues are less resistant to probe penetration (Armitage et al. 1977) and, consequently, may be also less resistant to scaler penetration. Thus, clinicians should be aware that the measurements taken immediately after scaling and root planing might be overestimating pre-operative probing depths and attachment level measurements.

Also, the occurrence of sites with $\leqslant 1.00$ mm of immediate probing attachment loss in the present study could still be related to probing reproducibility errors. An electronic, pressure-controlled probe and occlusal stents were used in order to minimize these errors. However, the values of attachment loss found in the present study could provide an idea of the amount of loss it can be resulted after instrumentation with different instruments.

Considering the marked differences in shape between Gracey curettes and ultrasonic scalers, it could be expected that these instruments would cause different degree of trauma from instrumentation. In general, the ultrasonic scalers are thicker than the Gracey curettes, and also these are power-driven, which could result in a higher degree of trauma from instrumentation in the US group. However, the difference of 0.05 mm detected between the trauma caused in the two groups was not statistically significant and present little if no clinical significance.

Although trauma from instrumentation appears to be less important than proper elimination of bacterial deposits from diseased root surfaces (Izumi et al. 1999), there is little information concerning the influence of this trauma on the healing process. The conclusion from Claffey et al. (1988) suggests that the attachment levels for the majority of the sites that exhibited immediate attachment loss after therapy seem to rebound. However, they also concluded that some sites still showed probing attachment loss after a 12-month period. Therefore, longitudinal evaluation may clarify the influence of different degrees of immediate attachment loss on prob-

ing attachment levels. In addition, other studies are necessary to clarify whether a periodontal instrument presents any advantage regarding trauma at the bottom of periodontal pocket, since scaling is the major step in periodontal therapy.

In conclusion, the present findings suggest that:

(1) Scaling performed with the tested instruments produces a mean attachment loss of 0.75 mm.
(2) There is no difference between the trauma from instrumentation produced by Gracey curettes and ultrasonic scalers.

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