J Clin Periodontol 2005; 32: 1007–1010 doi: 10.1111/j.1600-051X.2005.00815.x

Journal of Clinical Periodontology

Open flap debridement with or without intentional cementum removal: a 4-month follow-up

Antonio Wilson Sallum[1], Renato Vasconcelos Alves[1], Lúcio Flávio Teixeira Damis[1], Patricia Fernanda Roesler Bertolini[1], Francisco Humberto Nociti Jr[1] and Enilson Antonio Sallum[1]

[1]Department of Prosthodontics and Periodontics, Division of Periodontics, School of Dentistry at Piracicaba (UNICAMP), São Paulo, Brazil

Sallum AW, Alves RV, Damis LFT, Bertolini PFR, Nociti Jr FH, Sallum EA. Open flap debridement with or without intentional cementum removal: a 4-month follow-up. J Clin Periodontol 2005; 32: 1007–1010. doi: 10.1111/j.1600-051X.2005.00815.x.

Abstract

Objectives: The aim of this study was to investigate the influence of cementum removal on periodontal repair.

Material and Methods: Forty subjects with chronic periodontitis and presenting, at least, two proximal sites in anterior teeth (upper or lower) with probing depth $\geqslant 5$ mm were selected. After oral hygiene instructions and ultrasonic supragingival instrumentation, the subjects were randomly assigned for one of the following groups: CIC, scaled with Gracey curettes; CIUS, scaled with ultrasonic device; CDC, calculus deattachment with Gracey curettes and brushing with saline solution; and CDUS, calculus deattachment with ultrasonic device and brushing with saline solution. Full-thickness flaps were reflected and the instrumentation was performed with a clinical microscope. Probing depth (PD), relative gingival margin level (RGML) and relative attachment level (RAL) were registered at five experimental periods: baseline and 30, 60, 90 and 120 days postoperative.

Results: All the approaches were able to markedly reduce the PD values from the baseline to the other evaluation periods ($p < 0.0001$). The increase in RGML values was statistically significant only for the CDUS group. There were no statistically significant differences between the baseline and postoperative values in all groups for the RAL changes. The changes in RAL were statistically significant only among the groups CDC and CDUS ($p < 0.0001$).

Conclusion: The conventional scaling and root planing and the calculus deattachment were effective in reducing the probing depth values, regardless of the instrumentation method.

Key words: cementum removal; hand instrumentation; periodontal therapy; ultrasonic instrumentation

Accepted for publication 31 May 2005

For several years, the intentional cementum removal during mechanical instrumentation of root surfaces was based on the ability of bacterial endotoxins to invade the deep layers of the cementum and its consequent contamination (Aleo et al. 1974, 1975, Fine et al. 1978, Daly et al. 1982). However, studies showed that these endotoxins had a superficial, weak binding to the cementum surface (Hughes & Smales 1986, 1990, Hughes et al. 1988), and about 99% of the endotoxins may be removed with a simple irrigation or root surface brushing (Nakib et al. 1982, Moore et al. 1986, Nyman et al. 1986, 1988). In addition, evidences that periodontal repair occurs even with the presence of residual calculus (Listgarten & Ellegaard 1973) may also suggest that intentional cementum removal might not be necessary to treat periodontitis.

The use of manual or ultrasonic instrumentation in periodontal therapy has been discussed for a long time, and the results of the studies showed that both methods are effective to improve periodontal conditions (Badersten et al. 1981).

In order to contribute to the investigation concerning the influence of cementum maintenance on clinical parameters, this study clinically compares conventional instrumentation (with intentional cementum removal) with the no intentional cementum removal technique (calculus deattachment and brushing on root surface with saline solution).

Material and Methods

Sample selection

Forty patients (19 men and 21 women), 35–60 years old, who referred to the

Dental Clinic of School of Dentistry at Piracicaba (UNICAMP) were selected. The inclusion criteria were presence of chronic periodontitis (probing depth $\geqslant 5$ mm) diagnosed at the initial examination in, at least, two proximal sites in anterior teeth (maxillary or mandibular) supraosseous defects radiographically identified in proximal sites, no previous periodontal treatment, no use of drugs that might have some influence on periodontal status, and systemically healthy. Pregnant women, lactants and smokers were not included in the sample. This protocol was previously approved by the Institutional Committee for Ethics of School of Dentistry at Piracicaba.

Initial phase and clinical recordings

The selected patients received oral hygiene instructions and were subjected to a single episode of full-mouth ultrasonic supragingival instrumentation in order to remove calculus deposits. Stents were prepared for the measurement of clinical parameters.

These clinical measurements were performed with a rounded-tip steel wire, with a rubber stop, individualized for each patient and evaluated with a caliper. The clinical parameters recorded were relative attachment level (RAL), i.e., the distance from the rubber stop to the most apical position of the periodontal pocket, relative gingival margin level (RGML), i.e., the distance from the rubber stop to the gingival margin and probing depth (PD), i.e., the difference between the RGML and RAL values.

Surgical phase

Following the 4 weeks biofilm control period, the surgical procedures for root descontamination were performed. The patients were anesthetized and intrasulcular incisions were made by buccal and lingual/palatal aspects in order to reflect full-thickness flaps. All the surgical procedures were carried out by two experienced operators (L. F. T. D. and P. F. R. B.), using a surgical microscope M–900 (DF Vasconcelos, São Paulo, Brazil). After the reflection of the flaps, the granulation tissue was removed with the non-cutting edge of a 5–6 Gracey curette, taking care not to damage the selected root surfaces. Following this procedure, the patients were assigned for one of the following groups:

- CIC group – conventional root instrumentation with 5–6 Gracey curettes, in order to remove calculus deposits and cementum. The scaling was carried out to obtain a hard, smooth root surface, with no calculus deposits visible by the surgical microscope.
- CIUS group – conventional root instrumentation with ultrasonic device (MultiSonic, Gnatus, São Paulo, Brazil), using an H3 tip, in the maximum power. The scaling was carried out until conditions similar to the CIC group were obtained.
- CDC group – calculus deattachment with five to six Gracey curettes only to remove calculus deposits from the root surface, and brushing with saline solution for 60 s.
- CDUS group – calculus deattachment with the same instrument of CIUS group, but only to remove calculus deposits from the root surface, and brushing with saline solution for 60 s.

Following these procedures, the flaps were sutured with silk sutures. The sutures were removed after 7 days and the patients were allowed to resume mechanical biofilm control. The patients were instructed to perform rinsing with 0.12% chlorhexidine gluconate, twice a day, for 30 days postoperative.

Postoperative follow-up

After the surgical phase, the patients were evaluated for all the clinical parameters (RGML, RAL and PD) at 30, 60, 90 and 120 days postoperative. Professional biofilm control was performed twice a month during the entire 4-month experimental period.

Statistical analysis

For intra-group analysis, the mean values for each patient were expressed by means for each parameter and compared by analysis of variance (ANOVA). Inter-group analysis was also carried out by ANOVA, with the differences between the baseline and 4-month values. The statistically significant differences were identified by Student's paired *t*-test ($\alpha = 0.05$).

Results

Intra-group analysis revealed that all the therapeutic approaches were effective to markedly reduce PD values. There were statistically significant differences when comparing the baseline PD values to those recorded in all other experimental periods ($p < 0.0001$). Comparing the values obtained at the postoperative phase (30, 60, 90 and 120 days), there was not statistically significant difference. These data are shown in Table 1.

The increase in RGML values was statistically significant only for CDUS group, when the baseline values were compared with those recorded at the 30, 60, 90 and 120 days ($p < 0.0004$). There were no statistically significant differences among the other groups in any of the evaluation periods. These data are shown in Table 2.

Table 1. Probing depth (PD) measurements in mm (mean ± SD) observed at the baseline examination and monthly during the 4-month postoperative period in the different groups

	Baseline	Day 30	Day 60	Day 90	Day 120
CIC	6.29 ± 1.53 A	2.79 ± 0.74 B	2.39 ± 0.74 B	2.49 ± 0.70 B	2.31 ± 0.72 B
CIUS	6.35 ± 1.05 A	3.32 ± 0.92 B	2.74 ± 0.55 B	2.72 ± 0.31 B	2.73 ± 0.32 B
CDC	7.31 ± 1.54 A	3.27 ± 1.18 B	2.64 ± 0.85 B	2.42 ± 0.80 B	2.44 ± 0.84 B
CDUS	6.09 ± 0.57 A	2.43 ± 0.73 B	2.13 ± 0.59 B	2.54 ± 0.93 B	2.22 ± 0.51 B

Means followed by different letters in line indicate statistically significant differences ($p < 0.05$).

Table 2. Relative gingival margin level (GML) measurements in mm (mean ± SD) observed at the baseline examination and monthly during the 4-month postoperative period in the different groups

	Baseline	Day 30	Day 60	Day 90	Day 120
CIC	10.36 ± 1.96 A	12.43 ± 2.13 A	12.27 ± 2.11 A	12.21 ± 2.11 A	12.19 ± 2.22 A
CIUS	10.37 ± 1.86 A	12.57 ± 2.56 A	12.53 ± 2.18 A	12.68 ± 2.24 A	12.53 ± 2.28 A
CDC	9.95 ± 2.25 A	11.94 ± 2.70 A	12.13 ± 2.48 A	12.26 ± 2.50 A	12.03 ± 2.47 A
CDUS	8.83 ± 3.21 A	13.11 ± 2.09 B	13.12 ± 1.85 B	12.75 ± 1.74 B	12.68 ± 1.87 B

Means followed by different letters in line indicate statistically significant differences ($p < 0.05$).

Table 3. AL measurements in mm (mean ± SD) observed at the baseline examination and monthly during the 4-month postoperative period in the different groups

	Baseline	Day 30	Day 60	Day 90	Day 120
CIC	16.65 ± 2.37 A	15.21 ± 2.17 A	14.69 ± 2.07 A	14.69 ± 2.07 A	14.50 ± 1.98 A
CIUS	16.72 ± 2.21 A	15.89 ± 2.15 A	15.26 ± 2.07 A	15.39 ± 2.03 A	15.24 ± 2.18 A
CDC	17.26 ± 2.91 A	15.22 ± 2.31 A	14.75 ± 2.23 A	14.66 ± 2.43 A	14.46 ± 2.18 A
CDUS	15.79 ± 1.85 A	15.54 ± 2.34 A	15.25 ± 2.26 A	15.24 ± 2.20 A	14.90 ± 1.98 A

Means followed by equal letters in line indicate no statistically significant differences ($p < 0.05$).

Table 4. Alterations in the clinical parameters (RAL, RGML and PD) detected between the baseline and 4-month period measurements in mm (mean ± SD) in the different groups

	PD reduction	RGML increase	RAL alteration
CIC	3.98 ± 0.81	1.83 ± 0.26*	2.15 ± 0.39§
CIUS	3.62 ± 0.73	2.16 ± 0.41†	1.48 ± 0.30¶
CDC	4.86 ± 0.70	2.79 ± 0.73*‡	2.79 ± 0.73‖
CDUS	3.86 ± 0.05	3.85 ± 1.34†‡	0.89 ± 0.13§¶‖

Means followed by the same symbols in column indicate statistically significant differences ($p < 0.05$). (*$p = 0.006$; †$p = 0.0037$; ‡$p = 0.0025$; §$p < 0.0001$; ¶$p < 0.0001$; ‖ $p < 0.0001$)
RAL, relative attachment level; RGML, relative gingival margin level; PD, probing depth.

There was no statistically significant difference in RAL values in any of the experimental groups, in any of the evaluation periods (Table 3).

Inter-group analysis showed that the CDUS group had the higher value for increase in RGML values, and this value was statistically different from that of the CIUS group ($p = 0.0037$) and the CDC groups ($p = 0.0025$).

There was a statistically significant difference between the CDC and CDUS groups in changes in RAL values ($p < 0.0001$). The PD reduction was not statistically different among the groups. These data are shown in Table 4.

Discussion

The aim of this study was to compare the changes on clinical parameters following OFD or only calculus deattachment with no intentional cementum removal, in association with brushing of the root surface with a saline solution. The results demonstrated that the conventional instrumentation (hand or ultrasonic) and the calculus deattachment were effective in reducing the PD values after 4-month follow-up.

The role of lipopolysacharides (LPSs) from the dental biofilm on the root surface contamination has been discussed for a long time. Aleo et al. (1974) demonstrated in vitro that there are toxins with properties similar to those of the LPS in periodontally compromised teeth. These toxins are able to influence viability and proliferation of fibroblasts. In another study, Aleo et al. (1975) demonstrated that the total cementum removal or only the LPS removal from the root surface had similar effects on the ability of fibroblasts adhesion. These findings may justify the PD reduction in all the experimental groups in the present study.

Furthermore, the location of LPS on most superficial cementum layers (Hughes & Smales 1990) may also justify an approach that is not aimed to intentional cementum removal, such as was performed in CDC and CDUS groups. These findings confirmed the study from Nakib et al. (1982).

The choice for the open flap debridement (OFD) as standard therapy for all the experimental groups has to be discussed. Caffesse et al. (1986) stereomicroscopically evaluated calculus removal following root instrumentation with or without surgical access. There were less residual calculus deposits when OFD was performed in moderate (4–6 mm) and deep (>6 mm) pockets. Furthermore, the meticulous calculus deattachment and brushing with saline solution performed on CDC and CDUS groups may only be performed with a flap reflection.

It is important to note that a large amount of residual calculus deposits detected by microscopic examinations after root instrumentation is not accurately visible (Sherman et al. 1990). In order to minimize this bias, all the surgical procedures in the present study were performed with a surgical microscope.

There are some controversies related to the choice of hand or ultrasonic instruments for root descontamination. The hand instrument proved to be more effective in removing cementum, when compared with the ultrasonic device by scanning electronic microscopy (Kepic et al. 1990). However, Chiew et al. (1991) and Smart et al. (1990) demonstrated good results with ultrasonic instrumentation in relation to the amount of LPS on the root surface. Hunter et al. (1984) demonstrated that the OFD, performed both with hand and ultrasonic instruments, is effective to remove calculus deposits. Similarly, Checchi & Pelliccioni (1988) found that ultrasonic or hand instruments are able to remove endotoxins from the root surface, and there was no difference regarding fibroblasts adhesion after using any of the instruments. These reports may be the reasons for the similarity of the results on the four experimental groups in the present study.

The use of 0.12% chlorhexidine mouth rinse was performed during the first postoperative month. The antimicrobial properties and substantivity of chlorhexidine might have had some influence on clinical findings. However, the fine results observed after 30 days were not statistically different from the recordings at the subsequent evaluation periods, and this may suggest that the use of chlorhexidine may not have affected the clinical outcomes in the present study.

Based on the present findings, it is clear that it is the toxins removal from the cementum and calculus surfaces that is more significant than the performed technique (hand or ultrasonic, surgical or non-surgical); thus, these surfaces may become a healthy environment for fibroblasts adhesion and consequently periodontal healing. In the present study, all the used therapies were able to reduce the PD values after a 4-month follow-up. However, there were no significant differences for RAL values after the same evaluation period, and this issue might be explained by the numeric increase in RGML values in all the groups (only statistically significant in the CDUS group). The lack of statistical difference may be a result of the small sample ($n = 10$) and the employed design study (parallel study). Further studies are needed to confirm the results of the present investigation.

Therefore, within the limits of this study, it is possible to conclude that the

conventional root instrumentation techniques (with intentional cementum removal) and only calculus deattachment (in association with surface brushing with saline solution) were effective in reducing the probing depth values in subjects with chronic periodontitis, regardless of the used instrument (hand or ultrasonic).

References

Aleo, J. J., De Renzis, F. A., Farber, P. A. & Varboncoeur, A. P. (1974) The presence and biologic activity of cementum-bound endotoxin. *Journal of Periodontology* **45**, 672–675.

Aleo, J. J., De Renzis, F. A. & Farber, P. A. (1975) In vitro attachment of human gingival fibroblasts to root surfaces. *Journal of Periodontology* **46**, 639–645.

Badersten, A., Nilveus, R. & Egelberg, J. (1981) Effect of nonsurgical periodontal therapy. I Moderately advanced periodontitis. *Journal of Clinical Periodontology* **8**, 57–72.

Caffesse, R. G., Sweeney, P. L. & Smith, B. A. (1986) Scaling and root planing with and without periodontal flap surgery. *Journal of Clinical Periodontology* **13**, 205–210.

Checchi, L. & Pelliccioni, G. A. (1988) Hand versus ultrasonic instrumentation in the removal of endotoxins from root surfaces in vitro. *Journal of Periodontology* **59**, 398–402.

Chiew, S. Y., Wilson, M., Davies, E. H. & Kieser, J. B. (1991) Assessment of ultrasonic debridement of calculus-associated periodontally-involved root surfaces by the limulus amoebocyte lysate assay. An in vitro study. *Journal of Clinical Periodontology* **18**, 240–244.

Daly, C. G., Seymour, G. J., Kieser, J. B. & Corbet, E. F. (1982) Histological assessment of periodontally involved cementum. *Journal of Clinical Periodontology* **9**, 266–274.

Fine, D. H., Tabak, L., Oshrain, H., Salkind, A. & Siegel, K. (1978) Studies in plaque pathogenicity. I. Plaque collection and limulus lysate screening of adherent and loosely adherent plaque. *Journal of Periodontal Research* **13**, 17–23.

Hughes, F. J. & Smales, F. C. (1986) Immunohistochemical investigation of the presence and distribution of cementum-associated lipopolysaccharides in periodontal disease. *Journal of Periodontal Research* **21**, 660–667.

Hughes, F. J. & Smales, F. C. (1990) The distribution and quantitation of cementum-bound lipopolysaccharide on periodontally diseased root surfaces of human teeth. *Archives of Oral Biology* **35**, 295–299.

Hughes, F. J., Auger, D. W. & Smales, F. C. (1988) Investigation of the distribution of cementum-associated lipopolysaccharides in periodontal disease by scanning electron microscope immunohistochemistry. *Journal of Periodontal Research* **23**, 100–106.

Hunter, R. K., O'Leary, T. J. & Kafrawy, A. H. (1984) The effectiveness of hand versus ultrasonic instrumentation in open flap root planing. *Journal of Periodontology* **55**, 697–703.

Kepic, T. J., O'Leary, T. J. & Kafrawy, A. H. (1990) Total calculus removal: an attainable objective? *Journal of Periodontology* **61**, 16–20.

Listgarten, M. A. & Ellegaard, B. (1973) Electron microscopic evidence of a cellular attachment between junctional epithelium and dental calculus. *Journal of Periodontal Research* **8**, 143–150.

Moore, J., Wilson, M. & Kieser, J. B. (1986) The distribution of bacterial lipopolysaccharide (endotoxin) in relation to periodontally involved root surfaces. *Journal of Clinical Periodontology* **13**, 748–751.

Nakib, N. M., Bissada, N. F., Simmelink, J. W. & Goldstine, S. N. (1982) Endotoxin penetration into root cementum of periodontally healthy and diseased human teeth. *Journal of Periodontology* **53**, 368–378.

Nyman, S., Sarhed, G., Ericsson, I., Gottlow, J. & Karring, T. (1986) Role of ''diseased'' root cementum in healing following treatment of periodontal disease. An experimental study in the dog. *Journal of Periodontal Research* **21**, 496–503.

Nyman, S., Westfelt, E., Sarhed, G. & Karring, T. (1988) Role of ''diseased'' root cementum in healing following treatment of periodontal disease. A clinical study. *Journal of Clinical Periodontology* **15**, 464–468.

Sherman, P. R., Hutchens, L. H. Jr, Jewson, L. G., Moriarty, J. M., Greco, G. W. & McFall, W. T. Jr (1990) The effectiveness of subgingival scaling and root planning. I. Clinical detection of residual calculus. *Journal of Periodontology* **61**, 3–8.

Smart, G. J., Wilson, M., Davies, E. H. & Kieser, J. B. (1990) The assessment of ultrasonic root surface debridement by determination of residual endotoxin levels. *Journal of Clinical Periodontology* **17**, 174–178.

Address:
Antonio Wilson Sallum
Department of Prosthodontics and Periodontics
School of Dentistry at Piracicaba (UNICAMP)
Av. Limeira, 901 Areião, Piracicaba, São Paulo CEP 13414-903
Brazil
E-mail: awsallum@fop.unicamp.br