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Clinical and microbiological evaluation of the effectiveness of the Nd:Yap laser for the initial treatment of adult periodontitis

A randomized controlled study

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Abstract

Background: Enhancement of the results obtained by scaling and planing is most often sought by using antimicrobial therapies. Laser beams have been shown to be bactericidal and could possibly target pathogens more effectively and with fewer compliance problems than antiseptic solutions.

Methods: Thirty subjects 20–60 years old presenting periodontal pockets at least 5 mm deep in each quadrant received initial periodontal treatment. The study had a split-mouth design. The control side (SRP) only received scaling and planing, and the test side (SRP+laser) was treated by both SRP and Nd:Yap (yttrium aluminum perovskite doped with neodym) laser. Clinical conditions were evaluated at day 0 and day 90 using the plaque index, gingival index, bleeding on probing, pocket probing depth, and clinical attachment level. Microbial sampling was also performed on days 0 and 90, and the presence of *Actinobacillus actinomycetemcomitans*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Tannerella forsythensis*, and *Treponema denticola* was analysed by polymerase chain reaction in a commercial laboratory. Post-operative pain or discomfort was measured by the patient using a linear visual scale. Pearson's chi-squared test was used to compare bacterial presence.

Results: There was no statistically significant difference concerning clinical data between test and control groups at baseline. Both treatments enhanced the clinical situation compared to baseline; however, results were not significantly different between the two groups. *T. forsythensis* was the organism most numerous in both groups. Though initial treatment diminished the numbers of all the pathogens it did not do so statistically significantly. Differences between test and control groups were very small and bore no significance. Evaluation of the post-operative pain did not reveal any differences between the groups.

Conclusions: Scaling and root planing was effective in reducing levels of plaque, inflammation, and bleeding upon probing. No additional advantage was achieved by using the Nd:Yap laser.

Key words: bacteriologic analysis; laser; periodontitis; scaling and root planing

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Periodontitis is characterized by pocketing and progressive tissue loss. This destruction is the consequence of bacterial aggression and host response modified by the sustained influence of risk factors (The American Academy of Periodontology 1996). Although dental plaque harbours a great number of bacterial species, it seems that only a limited group of organisms has truly pathogenic potential. Certain studies have shown that *Porphyronomas gingivalis* and *Actinobacillus actinomycetemcomitans* are associated with severe forms of periodontitis (Dzink et al.

1985). They are both thought to be responsible for destructive disease (Takeuchi et al. 2003). Another putative pathogen is *Tannerella forsythensis* – formerly *Bacteroides forsythus*, a Gram-negative organism identified in deep periodontal pockets (Loesche et al. 1990). There seems to be an association between severity of periodontitis and the presence of *T. forsythensis* (Klein & Gonçalves 2003). These three aforementioned bacteria are not normally detectable in healthy sulci; conversely, the proportion of *T. forsythensis* and *P. gingivalis* is significantly correlated to the aggravation of the clinical parameters (Yano-Higuchi et al. 2000). *Prevotella intermedia*, a Gram-negative pathogen found in multiple forms of severe and aggressive periodontitis (Dzink et al. 1985), is an organism hard to eliminate. In addition, increased numbers of *Treponema denticola* have been demonstrated in deep pockets from adult periodontitis patients compared to healthy subjects (Riviere et al. 1992). Haffajee and Socransky (1994) suggested that these five subgingival species are periodontal pathogens. It is usually thought that therapy must greatly diminishes the bacterial load in general and the pathogens in particular.

Treatment of periodontitis aims first at debridement of the pockets by elimination of the biofilm and calculus adhering to the radicular surface and second at the suppression of the ecological niche, i.e. the periodontal pockets. Conventional therapy implies the use of hand instruments such as curettes in order to scale and root plane (SRP). More recently a number of authors have recommended adjunctive use of antibiotics or antiseptics locally to enhance mechanical treatment (The American Academy of Periodontology 1997). Chemicals like chlorhexidine have demonstrated efficacy, reducing gingival bleeding and slowing plaque formation. Certain antibiotics (tetracycline, metronidazol, amoxicillin, or an association of these) have been shown to reduce bacterial mass and eliminate periodontal pathogens (Drisco 1996). Promising results have been obtained by using these anti-bacterial molecules locally in slow releasing systems, either alone or in conjunction with SRP. However, periodontal pathogens comprise an organized biofilm that greatly limits the effects of antibiotics or antiseptics (Brown & Gilbert 1993) and this is why some authors advise to use them associated with SRP rather than alone (Tonetti 1997).

Although local administration of antibacterial substances avoids secondary effects brought on by systemic antibiotics, their insertion into periodontal pockets usually needs to be repeated and is often fastidious should the whole-mouth be treated in this manner. It has been suggested that certain laser beams could have bactericidal effects (Ando et al. 1996). Their use could be easier than instilling antimicrobials. Besides eliminating *A. actinomycetem comitans*, *P. gingivalis*, and *P. intermedia* subgingivally (Cobb et al. 1992), it has been affirmed that lasers can enhance SRP (Tseng et al. 1991)

This clinical research was designed to determine with clinical and microbiological criteria the efficacy of a Nd:Yap (yttrium aluminum perovskite doped with neodym) laser (Laser LOKKI DT®, Vienne, France) as an adjunct to conventional SRP.

Material and Methods

Study design

This randomized single-blind split-mouth clinical study compared scaling and root planing alone (SRP, control sites) *versus* association of SRP and laser Nd:Yap (SRP+L, test sites). It was carried out in the Periodontal Clinic of the Dental School of the University of Nancy and was approved by the Consultant Committee for the Protection of Persons of the University Hospital of Nancy (CCPP-CHU Nancy) and the French Agency for the Sanitary Security of Health Products (AFSSPS).

Thirty patients consulting at the dental clinic were selected. Inclusion criteria were as follows: patients had to be aged between 20 and 65 years, presenting at least 5 conservable teeth in each half-arch, chronic periodontitis with at least 1 pocket 5 mm deep or deeper in each quadrant, no systemic disease, no pregnancy existing or anticipated in the following 6 months and the signature of a written consent. The patients were also required to state their tobacco consumption (number of cigarettes per day and number of years).

The 30 selected patients included in the clinical study received complete documentation concerning the trial. After inclusion each patient was ascribed a randomization number. The test and control sides were randomized by chance drawing of numbered envelops. Two quadrants on one side of the mouth (left or right) received the test treatment and the other side received the control treatment.

The initial periodontal situation was evaluated with the use of clinical criteria of all the conservable teeth whether mono or multi-rooted. The sub-gingival micro-flora of the deepest pocket in each quadrant was collected for analysis. The patients then received oral hygiene instructions and in particular were taught to use interproximal brushes. Scaling and root planing was performed one quadrant per week during 4 weeks, under local anaesthesia, using hand instruments. After SRP, laser was utilized on the quadrants designated by randomization. The laser source was a crystal (yttrium aluminum perovskite doped with neodym) possessing a wavelength of 1340 nm and an average power of 10 W (maximum power 2.6 kW). The beam is transducted by one of two optical fibres, either a 200 nm or a 320 nm fibre depending on the type of procedure (periodontal or endodontic) to be carried out. The laser was set at a power of 10 W and the smaller optic fibre was used. The optic fibre was oriented towards the root surface and the lasing was accomplished by gently displacing the optical fibre through the gingival crevice all around the tooth. For each tooth, the exposition to the rays was determined by a movement that started on the mesial zone, reached the distal and returned to the mesial zone of the tooth on both the buccal and lingual sides. This was done while the anaesthesia was still effective. The patient received a prescription for a 2% chlorhexidine mouth rinse and an analgesic containing 400 mg of ibuprofen. He or she came back a week later with a visual linear scale graduated from 0 to 100 upon which had been traced the level of perceived pain or discomfort caused by the treatment. All the data were entered into individual files numbered for each patient. The trial was blinded by putting aside the randomization files once the initial therapy had been provided. The patients were re-examined 6 weeks after SRP. Oral hygiene was evaluated and supplementary advice or material was furnished if deemed necessary. Visible calculus was eliminated with an ultrasonic scaler and the teeth were polished. The patients were seen once more 3 months after SRP. The periodontal clinical signs were recorded at the same sites as at

baseline. The clinical and microbiological states before and after SRP, with or without laser blasting, were compared.

Clinical measurements

Buccal mesial and buccal distal sites were examined on all the conservable teeth of the 30 patients by two experienced periodontists (A.P., S.G.). The practitioners were carefully calibrated for both the clinical data recording and SRP and laser techniques. The following clinical signs were recorded:

- *Plaque control*. The quantity of plaque was determined using the plaque index (PlI) (Silness & Loë 1964).
- *Gingival inflammation*. This was evaluated with the gingival index (GI) (Loë & Silness 1963).
- *Bleeding on probing* (BOP). The bleeding at each site was observed after probing. It was graded 1 if it occurred within 30 s. If not, it was graded 0.
- *Pocket probing depth* (PPD). Probing was performed with a manual probe rounded off to the lowest whole millimetre.
- *Clinical attachment level* (CAL). This was also measured with a manual probe and rounded off to the lowest whole millimetre.

Microbiological criteria

Subgingival plaque was collected with a paper point in the deepest site of each quadrant at day 0 and day 90. Supragingival plaque was first eliminated with a cotton swab. Cotton rolls were placed to isolate the area and a sterile paper point was inserted into the pocket for 30 s. Identification and quantification were obtained for Aa, Pi, *P. gingivalis*, *T. forsythensis*, and *T. denticola* using a commercial polymerase chain reaction (PCR) kit (Perio-bac®, Dentsply de Trey, Saint Quentin Yvelines, France). The kit was then mailed to the laboratory for analysis. The DNA is heated to 95° in order to separate the double helix and left to cool to 55°. When this temperature is attained, primary oligonucleotides are added that bind to the DNA. This determines the sequence to be replicated. DNA polymerase creates copies and the amplified bacterial DNA is detected by inverse hybridization. The detection threshold is approximately 10^4 CFU. The laboratory grades the amount of each bacterial species in the following way:

- 0 – the organism is not detectable,
- 1 – quantity between 10^4 and 5×10^4,
- 2 – quantity between 5×10^4 and 2×10^5,
- 3 – quantity between 2×10^5 and 10^6,
- 4 – more than 10^6.

Statistic analysis

Data were recorded on Access® database (Microsoft Corporation, Redmond, WA, USA) to which only the randomization numbers were transmitted. The statistical analysis was performed using SAS.8.2® (Microsoft Corporation). The prinicipal judgement criteria were treated in a quantitative manner, using variance analysis for repeated measures (proc glm), which enables to test the evolution through time, adjusted for the group and the interaction time × group that tests the difference of evolution throughout the time in the two groups and thus the efficacy of the treatment.

To study the microbiological results a frequency analysis was made. Homogeneity tests (Pearson's chi-squared test) were used to compare bacterial presence, site stability frequency and sites where the number of bacteria decreased or increased after SRP or SRP+laser. The significance threshold was set at 5%.

Results

Thirty patients were included in the study, 13 men (43.3%) and 17 women (56.7%). The mean age was 42 years (standard deviation 9.6 years). Five subjects were smokers. Five persons either did not complete the treatment or did not return for evaluation at day 90.

There was no statistically significant difference between test and control sites concerning clinical criteria (PlI, GI, BOP, PPD, and CAL) at baseline as shown in Table 1.

Clinical data

PlI (Table 1)

At baseline, average PlI was 1.3 for both groups. It was 0.4 at day 90 for the control sites and 0.5 for the test sites. The differences between day 0 and day 90 were highly significant ($p > 0.0001$); however, the difference between control and test sites was not statistically significant ($p = 0.57$).

GI (Table 1)

Average GI was initially 1.6 for control and test sites alike. At day 90, the average GI was 0.3 for the control sites and 0.4 for the test sites. The GI decrease was statistically significant for both treatments between day 0 and day 90 ($p > 0.005$). There was no statistically significant difference between test and control groups.

Table 1. Clinical and microbiological comparison SRP *versus* SRP+laser

	SRP		SRP+laser		*p*	
	Baseline	Final	Baseline	Final	Time*	Group*
Clinical outcomes						
Plaque index	1.3 (0.8)	0.4 (0.7)	1.3 (0.8)	0.5 (0.8)	0.000	0.570
Gingival index	1.6 (0.8)	0.3 (0.5)	1.6 (0.8)	0.4 (0.6)	0.000	0.615
Bleeding on probing	0.7 (0.4)	0.1 (0.3)	0.7 (0.4)	0.1 (0.3)	0.000	0.125
Periodontal pocket depth	4.1 (1.4)	2.8 (1.0)	4.2 (1.4)	2.7 (1.0)	0.000	0.079
Clinical attachment level	4.5 (1.6)	3.4 (1.5)	4.6 (1.7)	3.6 (1.9)	0.000	0.527
Microbiological outcomes						
Actinobacillus actinomycetemcomitans	1.1 (1.4)	0.7 (1.1)	1.2 (1.5)	0.9 (1.5)	0.432	0.715
Prevotella intermedia	1.1 (1.4)	0.9 (1.2)	1.0 (1.4)	0.8 (1.1)	0.270	0.996
Porphyromonas gingivalis	2.0 (1.6)	1.4 (1.4)	2.1 (1.6)	1.5 (1.7)	0.628	0.789
Tannerella forsythensis	2.7 (1.3)	2.1 (1.5)	2.8 (1.2)	1.8 (1.4)	0.991	0.303
Treponema denticola	2.2 (1.3)	1.1 (1.2)	1.9 (1.2)	1.2 (1.2)	0.580	0.130
Huskinson test		21.6 (18.4)		24.9 (20.0)		0.120

*Time × group interaction effect testing the null hypothesis of absence of difference in evolution between groups.
SRP, scale and root plane.

BOP (Table 1)

At the beginning of the experiment the average BOP value was 0.7 in both treatment and control sites. After treatment, average BOP was 0.1 for test and control sites alike. The difference between day 0 and day 90 was highly significant, but no statistical differences existed between test and control sites ($p > 0.125$).

PPD (Table 1)

The initial PPD average was 4.1 mm (standard deviation (SD) = 1.4) in the control sites and 4.2 (SD = 1.4) in the test sites. After treatment, PPD changed to 2.8 mm (SD = 1.0) in the control sites and 2.7 mm for the test sites. Both treatments demonstrated a decreased PPD ($p > 0.0001$). Differences between sites treated by SRP or SRP+laser were not statistically significant ($p = 0.079$).

CAL (Table 1)

Average CAL was initially 4.5 mm (SD = 1.6) for the control sites and 4.6 (SD = 1.7) for the test sites. Once treatment had been accomplished, the mean CAL was 3.4 (SD = 1.5) at the SRP sites and 3.6 (SD = 1.9) at the SRP+laser sites. Both treatments modified the CAL ($p > 0.0001$) but differences between groups (test and control) were not significantly different ($p = 0.527$).

Table 2. Frequency of bacterial detection at D0 and D90, in percentage of sites

	Baseline		Final		*p*
	SRP	SRP+laser	SRP	SRP+laser	
Actinobacillus actinomycetemcomitans	46	44	31	31	1
Prevotella intermedia	55	50	50	40	0.3806
Porphyromonas gingivalis	75	73	55	52	0.8268
Tannerella forsythensis	95	93	79	71	0.4497
Treponema denticola	90	17	52	62	0.3778

SRP, scale and root plane.

Table 3. Evolution of bacterial quantity between D0 and D90, in percentage of sites

	SRP	*p*	SRP+laser	*p*
Actinobacillus actinomycetemcomitans				
Stable at D90	40	0.6517	50	0.6517
Increasing at D90	34		23	
Decreasing at D90	26		27	
Prevotella intermedia				
Stable at D90	29	0.006	50	0.006
Increasing at D90	17		36	
Decreasing at D90	54		14	
Porphyromonas gingivalis				
Stable at D90	31	0.0174	25	0.0174
Increasing at D90	9		35	
Decreasing at D90	60		40	
Tannerella forsythensis				
Stable at D90	23	0.4656	27	0.4656
Increasing at D90	14		23	
Decreasing at D90	63		50	
Treponema denticola				
Stable at D90	23	0.1639	25	0.1639
Increasing at D90	11		27	
Decreasing at D90	66		48	

SRP, scale and root plane.

Microbiological data

The microbiological analysis showed that all five bacteria were present on day 0 at comparable levels in the deepest pockets of test and control quadrants. *T. forsythensis* was the organism that was most numerous and was graded a mean 2.8 on the test side and 2.7 on the control side. *P. gingivalis* (2.0) and Td (2.2) were also very numerous before treatment. Aa presented fewer organisms and the mean grade was 1.1 for the control sites *versus* 1.2 for the test sites (Table 1).

After SRP, the quantity of bacteria in every analysed pocket was diminished, but not statistically significant. For Aa, the grading changed to 0.7 in the SRP pockets and 0.9 in the SRP+laser pockets. However, neither treatment produced a statistically significant decrease in the number of Aa ($p = 0.715$). The frequency analysis (Table 2) evidences that after initial treatment the organism is still detectable in 31% of the sites submitted to bacterial analysis. For 40% of the control sites and 50% of the test sites the quantity of Aa was stable. There were no statistical differences between test and control groups concerning the presence of Aa throughout the observation period. Initial therapy decreased the number of Aa in the pockets equally whether they were treated by SRP or SRP+laser (Table 3).

The number of Pi was reduced to 0.9 in the SRP sites and 0.8 in the SRP+laser sites (Table 1). This reduction was far from significant ($p = 0.27$) and the comparison between therapies revealed no difference ($p = 0.996$). The frequency analysis (Table 2) shows that Pi was detectable in 50% of the control sites and 40% of the test sites undergoing analysis at day 90. The number of organisms was reduced or remained at comparable levels in 83% of the control sites and 64% of the test sites (Table 3). It increased significantly in 36% of the analysed test sites and 17% of the control sites.

The quantity of *P. gingivalis* changed from 2.0 to 1.4 in the SRP quadrants and from 2.1 to 1.5 in the SRP+Laser quadrants. However, neither treatment modified the number of *P. gingivalis* in pockets deeper than 4 mm to a degree that was statistically significant ($p = 0.789$) (Table 1). *P. gingivalis* was detected in more than 50% of the sites tested at day 90 (Table 2). Ninety per cent of the analysed pockets demonstrated constant or diminished quantities of *P. gingivalis*. After treatment by SRP only 9% of the tested pockets contained an increased number of this bacterium instead of 35% of those treated by SRP+laser (Table 3).

The numbers of *T. forsythensis* also decreased after treatment going from 2.7 to 2.1 in the control group and 2.8 to 1.8 in the test group (Table 1). The difference between these two groups is not statistically significant ($p = 0.303$). The frequency test (Table 2) shows that *T.*

forsythensis is still present in more than 70% of the tested pockets after initial treatment, whichever the treatment. Its quantity remains more or less unchanged in 84% of the sites after SRP and in 77% of the sites after SRP+laser (Table 3). Once again, the difference between groups is not statistically significant.

The presence of Td evolves from 2.2 to 1.1 after SRP and from 1.9 to 1.2 following SRP+laser (Table 1). The difference is not statistically significant ($p = 0.130$). Analysis of the frequency evidences the persistence of the organism in 62% of the sites tested after SRP+laser and 52% of the tested sites that were treated by SRP alone (Table 2). For 78% of the sites treated by scaling and planing the number of Td remained stable or decreased, compared to 73% of those treated by laser (Table 3).

Post-operative discomfort

This was evaluated by the patient using a linear scale graduated from 0 to 100. In the control quadrants the mean value was 21.6 and in the test quadrants 24.9. As was thus demonstrated, initial treatment produces more ''sensitivity'' than true pain. The use of a laser did not modify this situation and in any case, did not reduce the level of discomfort that was experienced.

Discussion

The results clearly show that both treatment modalities were effective in decreasing the values of the clinical parameters used to evaluate periodontitis. Initial mean PPD for the entire sample was 4.1 mm and changed to 2.8 (SRP) or 2.7 (SRP+laser) after treatment. These values corroborate those obtained by other authors (Hill et al. 1981, Kaldahl et al. 1988). It has been established that SRP is an efficacious therapy (Cobb 1996) and that very few pockets do not show some sign of improvement after non-surgical treatment (Badersten et al. 1984a, b). The periodontal lesions responded well without needing renewed treatment at 3 months. Manual instrumentation achieved satisfactory results with or without the use of Nd:Yap Laser. Other studies have shown that the improvements observed at 3 months endure at 6 months (Badersten et al. 1984a, b).

In this study, the microbial flora found in pockets deeper than 4 m was also modified by the initial periodontal treatment. Significant diminution of the bacterial flora due to SRP has been demonstrated by others (Slots et al. 1979, Hakkarainen et al. 1986, Van Winkelhoff et al. 1988). The modification of clinical parameters such as BOP and PPD is associated with the decreasing number of anaerobic organisms. Darby et al. (2001) evidenced a significant mean decrease of Pi, *T. forsythensis*, and Td in sites analysed using the PCR technique.

PCR was also the method of quantifying the bacteria in this study. Other papers refer to the use of DNA probes or bacterial cultures. Detection levels are not necessarily the same when using PCR, cultures or DNA probes (Ashimoto et al. 1995, Slots et al. 1995, Riggio et al. 1996, Conrads et al. 1997). Thus, a sample that is negative using one of the other techniques can at times be positive when analysed by PCR. The oldest technique in use is bacterial culture. It presents many sources of error (Riggio et al. 1996). DNA probes offer a number of advantages compared to cultures. They are less expensive, much less sensitive to manipulation procedures and results are obtained sooner (Papapanou et al. 1997). The detection threshold is lower, which is important in revealing the presence of small quantities, particularly in severe forms of periodontitis (Papapanou et al. 1997). It has been shown that PCR is much more sensitive than bacterial culture and affords a better detection of the microorganisms (Slots et al. 1995, Wahlfors et al. 1995, Ashimoto et al. 1996, Riggio et al. 1996, Meurman et al. 1997). The use of cultures with specific media demonstrates 71% detection of Aa but only 28% of *T. forsythensis*, an organism difficult to grow (Ashimoto et al. 1996). Therefore, Riggio et al. (1996) have presented PCR as the ''gold standard'' of periodontal pathogen identification techniques. It is presently quite a suitable method and very promising for bacterial diagnosis. However, only a limited number of pathogens can be detected at a time and no further data concerning the plaque sample can be provided.

The usefulness of Nd:Yag laser has also been evaluated by associating clinical and immunological criteria (Liu et al. 1999). Interleukin 1 beta (IL-1β) is present in great quantities in periodontitis patients. The decrease in the ratio of IL-1β is proportionate to the improvement of the periodontium and can constitute a manner of evaluating the therapy. The authors (Liu et al. 1999) used the Nd:Yag laser alone, combined with SRP or SRP alone. The results with SRP were always superior to those obtained with the use or the adjunction of the laser. The effect of Nd:Yag laser is different on each bacterial species and related to the morphology of the diverse organisms (McGuff & Bell 1966). Different destruction ratios were reported following the use of Nd:Yag laser, and carbon dioxide, excimer, helium–neon or argon lasers (Martinetto et al. 1986). The nature of the pigmentation of the cell membranes was thought to be the reason for the susceptibility of various bacteria to different laser radiations (Schultz et al. 1986). In vitro, the Er:Yag laser evidenced a weak activity on periodontal pathogens such as Aa in proportion to the number of pulsations (Folwaczny et al. 2002). The Nd:Yag at a frequency of 30 Hz, resulted in total inhibition of *Streptococcus mitis* in vitro (Blum et al. 1997). Very few studies evaluate the reduction of the bacterial mass occurring after use of laser in moderate to deep pockets. Cobb et al. (1992) and Radvar et al. (1996) achieved a decrease in the number of periopathogens in pockets treated by Nd:Yag laser alone or in combination with SRP. However, the radiations used caused severe alterations of the cementum (Cobb et al. 1992, Israel et al. 1997). On the other hand, low-power lasers such as He–Ne or Nd:Yap do not eliminate subgingival calculus. Because of this the laser can only be an adjuvant to initial treatment and in no way can substitute the mechanical or manual instrumentation of the root surfaces.

The present study demonstrates that at 3 months after instrumentation, the amounts of bacteria are still at least 10 times inferior to what they were at baseline. Improvement of the clinical criteria evidences this reduction of the bacterial mass. The rebound effected has already been evidenced by others (Listgarten 1976). As time passes the same microorganisms colonize the sites again, justifying renewed professional hygiene procedures, i.e. supportive periodontal therapy. Nd:Yap laser did not modify the clinical or microbiological situations in any way at the 3-month evaluation. Whatever poten-

tial the laser beaming might have had, it did not exceed that of manual scaling and root planing. Clinical signs of inflammation had all decreased very significantly, and in spite of not achieving statistical significance, mean reduction of every analysed pathogen was constant. However, variations of quantity of pathogens in the individuals were important. Comparisons between test and control groups showed no statistical differences concerning the microbiologic impact of Nd:Yap laser at any level.

Post-operative discomfort was evaluated in this study by the patient. The mean of the grades attributed by them was relatively low demonstrating that little sensitivity or pain was perceived during the week that followed treatment by SRP or SRP+laser. Laser irradiation did not result in diminished discomfort.

Conclusion

Significant decrease in clinical parameters ensues initial treatment of chronic periodontitis by SRP with or without the adjunction of Nd:Yap laser therapy. This is due to an evident reduction of the quantity of microorganisms found in the pockets. Thus, initial treatment is effective and accomplished with little post-operative discomfort for the patient.

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