Use of GaAlAs Laser in the Treatment of Necrotizing Ulcerative Periodontitis in Patients Seropositive for HIV/AIDS

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Purpose: To verify the efficacy of low level laser application, GaAlAs, in oral manifestations of Necrotizing Ulcerative Periodontitis (NUP) in HIV seropositive patients. The initial aim was to reduce the use of systemic analgesic and anti-inflammatory medications.

Materials and Methods: Fourteen HIV-positive patients with NUP were divided into two groups as follows: Group A, control: no laser but conventional periodontal treatment. Group B, laser: conventional periodontal treatment with reduced systemic medications plus therapeutic laser application.

Results: The patients from group B exhibited better results in terms of pain control and tissue recovery when compared with patients from group A.

Conclusion: Laser application resulted in better pain relief and tissue healing, and it is recommended that it be included in the clinical treatment of NUP.

Keywords: oral manifestations, HIV/AIDS patients, low level laser therapy, medication therapy.


Almost 40 million people are world-wide currently infected by HIV. In addition, 16 thousand new infections occur daily. A significant and relevant number of oral manifestations are the first entities to appear in these infected patients and therefore they have been useful for diagnosis of HIV/AIDS since the early eighties when the first reports on AIDS appeared.

Periodontal lesions related to the immunosuppressed state of the patient seropositive for HIV/AIDS have been widely reported in the literature. Necrotizing ulcerative periodontitis (NUP) consists of a series of manifestations such as intense pain, severe inflammation and rapid tissue destruction, which yield necrotic lesions that devastate the gingival mucosa, alveolar bone and the periodontium as a whole.

Dental treatment for the HIV/AIDS patient is critical when a manifestation as severe as NUP is detected. The use of systemic medication that may interact with the Highly Active Antiretroviral Therapy (HAART) drugs gives rise to additional oral or systemic manifestations.

The present study shows the results obtained with the use of low level laser (GaAlAs) as additional therapy in the treatment of NUP in HIV-positive individuals, in an attempt to reduce the quantity and use of antibiotic, analgesic and anti-inflammatory drugs, and
as an accelerator of healing, with the purpose to improve the quality of life of these patients.

**REVIEW OF THE LITERATURE**

Although the oral cavity normally presents a heterogeneous population of microorganisms, the proportion and number of them constantly change in response to many factors, among them, the host’s immune system.1-3

Bacterial plaque is the main etiological factor of periodontal disease.3 Destruction of the immunological system in HIV infected patients enables some microorganisms to grow opportunistically,4 provoking serious complications such as severe periodontal diseases.5-8,12

The classification of periodontal diseases associated with the seropositive response for the human immunodeficiency virus (HIV) includes linear gingival erythema (LGE), necrotizing ulcerative gingivitis (NUG), necrotizing ulcerative periodontitis (NUP) and necrotizing stomatitis.13-15 Although it is unknown whether there is a relationship between them, some authors believe that NUP represents an extension of NUG due to the similarity of the clinical symptoms and the reported correlation between NUG and NUP with immunosuppression. In addition, their microbiological characteristics appear to be similar.9,10,16

The characteristics of NUP include acute and intense pain, abundant gingival hemorrhage, halitosis, loss of periodontal insertion, and occasional bone exposure. Crater-like lesions are formed in the gingival tissue, while necrosis and ulcerations are seen in interproximal papillas, which are directly associated with the regions of bone loss.11,17 Although NUP occasionally appears to be generalized, it is more frequently seen as a localized lesion, with areas of serious gingival tissue necrosis, surrounded by areas of normal tissue. The formation of periodontal pockets is almost nonexistent, while the loss of bone crest coincides with gingival necrosis, leading to the exposure of alveolar bone and areas of intraseptal bone sequestration.18,19 Pain is often described as a “profound tooth ache” or as “pain in the bones of the mouth” that does not yield to analgesics.18,19 Spontaneous nocturnal hemorrhage is another characteristic of the disease.3,11,19

The clinical appearance of NUP can be very variable. The first lesions show little or no radiographic evidence of bone loss and minimum tooth mobility. Moderate NUP generally involves the entire attached gingiva with partial bone exposure and sequestration to the mucogingival junction. Severe NUP is manifested as extensive necrosis of gingival tissue and alveolar bone that extends beyond the mucogingival junction, with obvious bone loss and significant tooth mobility that generally leads to loss of the involved teeth.11,12,19,20

NUP is usually reported as being more aggressive in HIV positive individuals, while the number of T-CD4 cells is less (< 200) than in non-infected subjects.8-11,19-25 It is interesting that NUP is sometimes seen in the absence of other immunosuppression-associated diseases, suggesting that this oral lesion may be an independent marker for progression of AIDS disease.9,10

Another characteristic of NUP is that it does not respond to conventional treatment.3 The treatment of NUP in HIV individuals must be done in stages. In the first session, severe pain symptoms must be eliminated, proceeding with irrigation with 10% povidone-iodine, or 2% sodium iodide mixed in equal proportions with 10 volumes of oxygenated water.1,11,19,24 These substances have antimicrobial activity and immediately reduce discomfort. The patient must be instructed about oral hygiene and must be medicated with chemotherapeutic agents that must be administered in case of fever, necrosis, bone exposure, or severe pain. The antibiotic of choice is metronidazole (500 mg every 12 h, or 250 mg every 6 h, for 7 days).19,26,27 Analgesics of the paracetamol type (500 mg every 4 h) may be prescribed in cases of severe pain and acute inflammation. Mouth washes with 0.12% chlorhexidine gluconate every 8 h must also be recommended to prevent and control plaque formation, and to inhibit and reduce the development of other oral manifestations.19 In case antibiotic use results in candidiasis, antifungal agents are necessary.11 From the second session, mechanical debridement must be done to remove calculus and necrotic tissues.3,11 The third stage consists of maintenance, when patients must receive guidance about the importance of oral hygiene conditions and frequent visits to the dentist for supporting periodontal therapy. Initially, monthly visits are recommended, followed by three-monthly visits, when the periodontal condition has stabilized.19

Nowadays, lasers are used in dentistry as an adjunct to new therapies in order to obtain better results, improved treatments and consequently faster healing of injured tissues.27,42 GaAs and GaAlAs lasers are those with continuous emission, mostly used in the medical area, both with wavelengths of 780 to 830 nm. They are postoperatively used in surgeries as biostimulators to treat angular chelitis, trismus, paresthesias, dentinal hypersensitivity, and tissue repairs, such as in aphthous ulcers and herpetic lesions.28-33
Some studies indicate that the potential of low level laser irradiation applied directly on the injured tissues enhances a number of biological processes, such as photobiostimulation of the cicatrization process, favoring increased cell resistance and vitality, leading to their functional normality more quickly, and accelerating the repair process.

According to some authors, the systemic influence of laser irradiation consists of transmission of effects from the irradiated zone to the central nervous system, resulting in analgesia and anti-inflammatory effects. Other authors attribute the analgesic effect to increased stimulation of the β-endorphins by irradiation.

The use of laser for treating oral lesions in HIV patients has been described as an enormous success. Many oral manifestations are secondarily caused by immunosuppression and the treatments with analgesic, antibiotic and antineoplastic drugs that may interact with the antiretroviral agents (HAART) routinely used by these patients. Thus, due to immunosuppression that occurs in AIDS patients, the probability of infections increases. Because of these characteristics, studies with laser in seropositive individuals have shown promising results.

Cobb et al reported the efficacy of GaAAs laser application in tissue healing and regeneration, in addition to effects such as analgesia, anti-inflammatory and bactericidal action in postsurgical events in individuals with AIDS, highlighting the antimicrobial activity of lasers, thus preventing and controlling postsurgical infections in these patients. There are studies regarding the effects of low level laser irradiation as coadjuvant treatment for periodontal diseases, showing that the additional treatment with laser reduced periodontal inflammation.

The aim of this study was to verify the efficacy of GaAIs laser on tissue repair, besides analgesic and anti-inflammatory effects, in the treatment of necrotizing ulcerative periodontitis (NUP) in HIV-positive/AIDS individuals.

**MATERIALS AND METHODS**

Fourteen HIV/AIDS patients, with confirmed ELISA or Western Blot serologic tests, presented at the Attendance Center for Handicapped Patients (“Centro de Atendimento para Pacientes Especiais – CAPE”) of the Paulista University, UNIP, São Paulo, Brazil. All patients were fully informed about the procedures and their written consent was obtained. The study was authorized by the Ethics Committee of the Paulista University (Protocol # 11/05 CEP/ICS/UNIP).

These patients were divided into two groups, a control group (group A, nonlaser) and an experimental group (group B, laser) in which low level gallium-aluminum-arsenide (GaAlAs) laser irradiation of 790 nm, 30 mW fixed power was directly applied to the injured area (marginal and attached gingiva) perpendicularly to the long axis of the teeth for a period of 2 min and 20 s, totaling 4 J/cm² per application point.

The patients were randomly distributed into the groups as follows: the first patient was put into group A, the second into group B, and so on successively.

In anamnesis, the following data were obtained: demographic, gender, age, exposure category, ethnicity, T-CD4 lymphocyte cell count, viral load measurement, antiretroviral therapy in use, bacterial plaque index, gingival bleeding index, and assessment of bone resorption by taking periapical and panoramic radiographs of each patient (Figs 1 to 4).

At the first consultation, all the patients (groups A and B) received emergency treatment to minimize the exacerbated pain condition. For this purpose, abundant irrigations were performed using Luer syringes (40 ml) with 2% sodium iodide and oxygenated water at 10 volumes, mixed in equal parts (Figs 5 and 6). The following medications were prescribed: 500 mg of metronidazole administered orally every 12 h for 8 days; 500 mg of paracetamol every 4 h (orally) for 8 days, and also mouth washes with chlorhexidine gluconate 0.12% every 8 h for 8 days.

Group B (experimental, laser), in addition to the above-mentioned emergency treatment, received low level laser application in accordance with the parameters described above.

All the patients were reassessed 8 days after this first emergency intervention.

- **Group A – non-laser:** All the patients received debridement and coronal-root scaling treatment, and were instructed to continue with the prescribed medication for a further 8 days (Figs 7 and 8).
- **Group B – laser:** All the patients received debridement and coronal-root scaling treatment, followed by the second application of low level laser under the same parameters (Figs 7 and 8). These patients were instructed to suspend any and all prescribed medication, except the HAART therapy.

Eight days after the second consultation, all the patients were clinically reassessed and given questionnaires, in which they replied about the presence and intensity of pain, and whether there was any need to use medication in addition to those that had been rec-
**Fig 1** Initial panoramic radiography.

**Fig 2** NUP diagnostics, initial clinical aspect.

**Fig 3** NUP diagnostics, initial clinical aspect of the upper dental arch.

**Fig 4** NUP diagnostics, initial clinical aspect of the lower dental arch.

**Fig 5** First appointment – therapy laser application after sodium iodine irrigation in the upper dental arch.

**Fig 6** First appointment – therapy laser application after sodium iodine irrigation in the lower dental arch.
commended for each group in the previous session (Figs 9 and 10).
For the conditions of pain, presence of exudate and secretion, edema, presence of necrotic tissue and acceleration in the tissue repair process, the following scores were used as criterion: absent = 0, light = 1, intense = 2. For the use of supplementary medication: yes = 3, no = 4.
All the patients were followed up for 6 months, during which control consisted of monthly clinical and radiographic exams during this period.
To verify whether differences between the obtained results from both groups are significant, the Mann-Whitney U-test was applied.

RESULTS
The results obtained are shown in Tables 1 to 6.

Figures 11 and 12 demonstrate the number of patients in each group regard pain and the presence of exudate, secretion, edema, and necrosis in Groups A and B.

DISCUSSION
Although the HAART currently used by HIV virus carriers has achieved a significant reduction in opportunistic infections, adverse reactions such as oral manifestations usually appear due to the multiple and high therapeutic doses used daily by patients.
### Table 1: Group A: Patients under regular treatment for periodontitis

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity</th>
<th>Exp. Cat.</th>
<th>T-CD4</th>
<th>Viral Load</th>
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<tr>
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<td>European descent</td>
<td>HET</td>
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<td>Up to 50 thousand</td>
</tr>
<tr>
<td>F</td>
<td>43</td>
<td>African descent</td>
<td>HET</td>
<td>500</td>
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<tr>
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<tr>
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<tr>
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### Table 2: Group B: Patients under regular treatment plus low intensity laser in periodontitis treatment

<table>
<thead>
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<td>HET</td>
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### Table 3: Results obtained at the third session in Group A – nonlaser

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<th>Patient</th>
<th>Pain</th>
<th>Supplemental Medication</th>
<th>Type</th>
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<td>4</td>
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<td>3</td>
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### Table 4: Results obtained at the third session of Group B – laser

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<td>______</td>
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<td>3</td>
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</tr>
<tr>
<td>7</td>
<td>0</td>
<td>4</td>
<td>______</td>
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### Table 5: Clinical results obtained at the third session of Group A – nonlaser

<table>
<thead>
<tr>
<th>Patient</th>
<th>Exudate and secretion</th>
<th>Edema</th>
<th>Necrosis</th>
<th>Tissue repair</th>
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<td>1</td>
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### Table 6: Clinical Results obtained at the third session of Group B – laser

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<th>Necrosis</th>
<th>Tissue repair</th>
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The present findings showed the benefits of application of GaAlAs laser in the treatment of NUP lesions in HIV-positive individuals, as has been previously shown after tooth extractions in this type of patient. Indeed, NUP displays severe and aggressive characteristics, appearing in seropositive individuals when the T-CD4 cell markers are < 200, despite the use of HAART. Application of GaAlAs laser significantly contributes to diminishing the quantity of medication necessary for the treatment of NUP (antibiotics, analgesics and anti-inflammatory drugs), besides minimizing the adverse reactions caused by the combination of these medications with HAART.

Low level laser therapy has been shown to be efficient in cicatrization, reducing inflammatory conditions and accelerating tissue repair, and it was in search of these benefits that the authors conducted the present study, using these lasers to enhance tissue repair and to shorten the cicatrization of NUP lesions. It was concluded that GaAlAs laser was able to control pain, shorten cicatrization time, and allow the tissues to show normal aspects sooner than in the group that did not receive laser treatment.

Low level laser therapy may be an effective treatment alternative in immunosuppressed patients, in whom there is increased probability of infection and conventional treatment with antibiotics for a prolonged time could culminate in other very serious side effects, such as candidiasis, in addition to interacting with the antiretroviral drugs routinely used by these patients.

In spite of all the rapid tissue destruction resulting from NUP, the greatest difficulty in the treatment occurs because of the severe and uncontrollable pain, that according to many authors was better controlled with the use of lasers, because of its analgesic and anti-inflammatory effects.

The results suggest that application of laser therapy might improve treatment of NUP in AIDS patients, and consequently allow faster healing of the injured tissues. Healing effects of laser may be based on the improvement of local microcirculation and stimulation of fibroblast proliferation, yielding a more organized production of collagen fibers, increasing granulation tissue, and promoting a concomitant and rapid epithelial healing.

The treatment proposed does not intend to replace conventional treatments with the sole use of laser. Rather, it is proposed as an adjunct in new therapies, in order to obtain enhanced and faster results.

**CONCLUSIONS**

Control of NUP lesions is of fundamental importance in the treatment of HIV/AIDS patients, but exacerbated pain makes immediate treatment impossible, since it is first necessary to control the pain in order to provide subsequent direct clinical treatment.

Low level laser therapy appeared to be very effective in pain control, which gave the authors greater freedom to provide the due care and treatments necessary for controlling NUP. It was also noted that tissue repair with reference to cicatrization occurred in a shorter time, and tissues normalized more quickly as a
result of laser use. This is very propitious, as these patients are less susceptible to acquiring other opportunistic manifestations as a result of reducing the period of bleeding and contaminated NUP lesions in the oral cavity.

Complete success was obtained with the laser treatment as described here, as better results were obtained with less demand for medications, which suggests the action of laser also for the control of the local immunological system. Furthermore, the quantity of medications administered to treat NUP was greatly reduced, thus diminishing the risk for greater medication interactions with the HAART continuously and mandatorily used by these patients.

Low level laser therapy would, therefore, seem to be a very effective means of controlling the pain and the inflammatory process of NUP lesions in HIV/AIDS patients. Although it does not substitute conventional treatment, it is an important adjuvant in the treatment of these lesions.

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