

### IN VITRO EVALUATION OF EXTERNAL ROOT TEMPERATURE CHANGES DURING Er:YAG LASER APPLICATION WITH FIVE DIFFERENT FIBEROPTIC TIP WITHDRAWAL TECHNIQUES

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The use of techniques that produce or transmit heat from the root canal interior to the surrounding tissue, such as occurs with laser irradiation, has made research necessary to quantify these values to prevent tissue damage. There is no consensus among researchers on how the fiberoptic tip should be withdrawn from the root canal apex to the cervical region in order to clean and not generate excessive heat. This study evaluated in vitro the external temperature increase at the three root thirds using five different fiberoptic tip withdrawal techniques in 50 human canines obtained from laboratory stock. The teeth were instrumented with the step-back technique and irrigated with 2.5% sodium hypochlorite, with a final irrigation of distilled and deionized water. Er:YAG laser was applied with a 50/28 fiberoptic tip at the following parameters: 250 mJ input, 112 mJ output, 10 Hz, 1 mm from the apical foramen. The withdrawal techniques were as follows: group 1: each third was irradiated starting at the apex for 1 s on each wall, with the irradiation turned off between thirds; group 2: apical third irradiated without movement for 2 s and tip withdrawn with continuous radiation up to the cervical third for a total of 12 s; group 3: tip activated at the apex and removed slowly from the apex to the canal entrance in a straight line for a total of 12 s; group 4: tip activated at the apex and removed slowly from the apex to the canal entrance with circular movements touching all walls for a total of 12 s; group 5: tip activated at the apex and removed slowly from the apex to the canal entrance with clockwise circular movements for 6 s and then reinserting and removing with counter-clockwise circular movements for another 6 s, touching all walls for a total of 12 s. Group 1 had significantly lower external temperature ( $p < 0.01$ ) than the other 4 groups. The root thirds were statistically different ( $p < 0.01$ ), and the middle third had the greatest temperature increase perhaps due to heat dissipation. We conclude that the five withdrawal techniques caused an increase in external root temperature that would not damage adjacent tissues.

### IN VITRO EVALUATION OF SMEAR LAYER REMOVAL BY Er:YAG LASER APPLICATION WITH FIVE DIFFERENT FIBEROPTIC TIP WITHDRAWAL TECHNIQUES

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Recently, Er:YAG laser irradiation of the root canal walls for removing the smear layer produced during endodontic instrumentation is being researched. However, the kinematics of application is still a controversial issue. This study evaluated in vitro the smear layer removal in apical and middle root thirds

using five different fiberoptic tip withdrawal techniques. Fifty human canines were instrumented and irrigated with 2.5% sodium hypochlorite, with a final irrigation of distilled and deionized water. Er:YAG laser was applied with a 50/28 fiberoptic tip at the following parameters: 250 mJ input, 112 mJ output, 10 Hz, 1 mm from the apical foramen. The withdrawal techniques were as follows: group 1: each third was irradiated starting at the apex for 1 s on each wall, with the irradiation turned off between thirds; group 2: apical third irradiated without movement for 2 s and tip withdrawn with continuous radiation up to the cervical third for a total of 12 s; group 3: tip activated at the apex and removed from the apex to the canal entrance in a straight line for a total of 12 s; group 4: tip activated at the apex and removed from the apex to the canal entrance with circular movements touching all walls for a total of 12 s; group 5: tip activated at the apex and removed from the apex to the canal entrance with clockwise circular movements for 6 s and then reinserting and removing with counter-clockwise circular movements for another 6 s, touching all walls for a total of 12 s. Samples were sectioned longitudinally and processed for SEM evaluation. Two pictures of each root canal were obtained (middle and apical thirds) with a 350x magnification. Images were analyzed for the amount of smear layer. Results showed no statistical differences ( $p > 0.05$ ) between treatments and significant differences ( $p < 0.05$ ) between radicular thirds. It can be concluded that 1) all withdrawal techniques produced the same results on smear layer removal and 2) the middle third presented less smear layer than the apical third after Er:YAG laser irradiation.

### CLINICAL EVALUATION OF THE LOW INTENSITY LASER ANTIALGIC ACTION OF GaAlAs ( $\lambda = 785 \text{ nm}$ ) IN THE TREATMENT OF THE TEMPOROMANDIBULAR DISORDERS

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The therapy with laser emitting low intensity has been currently used in the most diverse fields of medicine as therapeutic conduct for pain. It is a non-invasive, painless, non-thermal and aseptic type therapy, without any collateral effects, having a good cost/benefit relationship. However, for the therapy with low-intensity laser to result in positive effects, a correct diagnosis is fundamental, as well as a protocol of adequate application. In odontology, the majority of patients diagnosed with temporomandibular disorders (TMD), present pain and limitations in the movements of the jaw. In this work, a GaAlAs laser emitting low intensity, was used,  $\lambda = 785 \text{ nm}$ , in patients having a disfunction of the temporomandibular joint with a complaint of pain. Ethical approval was granted by the University of São Paulo, Dentistry School's Research Ethics Committee. Twenty patients were divided into two groups. The group treated received laser therapy in the temporal-mandibular articulations and in the muscles affected. The dose applied was  $45 \text{ J/cm}^2$ , while the ten patients in the control group received  $0 \text{ J/cm}^2$ , in a total of nine applications, carried out three times a week, during three weeks. The evaluation of the patients was made through clinical examinations of manual palpation of the masseter, temporal, cervical, posterior neck and sternocleidomastoid muscles, and measurements of opening and laterality of the mouth. The results obtained showed a diminishing of the pain and an increase of the mandibular mobility in the patients treated, when compared to the control group. These results point to this therapy as being an important tool in the treatment of pain in patients with a disfunction in the TMJ, indicating this therapeutic modality as a co-adjuvant in these treatments.