UTILIZATION OF 940 NM WAVELENGTH DIODE LASERS AND THE MORPHO-HISTOLOGICAL MODIFICATIONS IN PERIODONTAL TISSUES

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Abstract

Introduction: Non-conventional techniques represent a more and more frequently employed alternative in medicine, firstly due to their minimally invasive character. Laser technologies represent forward-looking methods to which numerous stomatologists resort, mainly because of their multiple applications in periodontology.

The scope of the study was to identify the possible morpho-histological differences on microscopic preparations obtained by the two - conventional and non-conventional - laser-assisted techniques.

Materials and method: Gingivectomies have been realized on a mandible of freshly sacrificed pig, by the classical surgical technique, 10 tissue samples of comparable size being taken over. On the same mandible, in the opposite quadrant, gingivectomies were realized by means of a diode-type laser with a wavelength of 940 nm, followed by taking over of other 10 tissue samples. All specimens were conserved in a fixing solution and histological cups were obtained for subsequent analysis in the laboratory of pathological anatomy.

Results and discussion: Histological evaluation evidenced no significant morpho-histological differences between the two techniques applied. The clinical advantages of the photo-mecanical interactions provided by laser-assisted periodontal surgery include mainly reduction of bleeding, absence of oedema, a higher comfort for the patient (who suffers less pain) and a much more rapid healing (by a faster tissular repair).

Conclusions: Laser-assisted technologies may therefore be viewed as extremely useful alternatives in the new periodontal therapies, which recommends their application in periodontal surgery for at least three reasons: they are minimally invasive, they induce minor morpho-histological modifications and the technique of their application is simple to learn.

Keywords: diode laser, gingivectomy, surface carbonization, photo-thermic effect

INTRODUCTION

The first laser-assisted interventions performed in periodontology, initiated as early as 1985, have used a laser with CO2. Nowadays, a large range of lasers for periodontal utilizations are available, such as: Er-YAG, Er, Cr:YSGG, CO2, Nd:YAG, Diode. Apart from the cutting effect at the level of periodontal tissues, laser radiations significantly reduce the microbial populations from the region of their application. [1]

Diodes have different wavelengths, varying between 810 and 980 nm, being successfully applied in periodontal therapy for soft tissue surgery, hemostasis decontamination, pain therapy or biostimulation. They have an in-depth action, being very well absorbed by haemoglobin. [2,3]

SCOPE

The scope of the study was to identify the possible morpho-histological differences on microscopic preparations obtained by the two surgical - conventional and non-conventional - laser-assisted techniques.

MATERIALS AND METHOD

Gingivectomies have been realized on a mandible of freshly sacrificed pig, by the classical surgical technique, 10 tissue samples of comparable size being taken over. (Figs. 1.1 and 1.2)
On the same mandible, in the opposite quadrant, gingivectomies were performed by means of a diode-type laser (Biolase Epic 10) with a wavelength of 940 nm and a surgical tip with an optical fiber size of 400 μm, 10 tissue samples being also collected. The optical fiber was previously activated, a 2 W power being applied in pulsed mode. During the laser-assisted intervention, another operator assured cooling of the tissues. During the whole surgical intervention, the operators wore protection glasses specific to a wavelength of 940 cm. (Figs. 2.1 and 2.2)

The samples were stored in a saline solution and transported, over an interval of 30 min after their taking over, to the Laboratory of Pathological Anatomy, to be fixed and processed for the realization of the histological cups. (Figs. 3.1 and 3.2)
RESULTS AND DISCUSSION

No morpho-histological modifications could be observed on the cups obtained from the samples taken over through classical incision, with the exception of the microscopic aspect of the incision line. The other tissues, such as the pavimentous one, showed a normal non-modified aspect. (Fig. 4)

At the level of the histological cups realized from the samples taken over by laser incision, minor histological modifications could be observed, caused by the surface carbonization determined by the photo-thermic effect of the laser. The microscopically-examined incision line evidenced a homogeneous microscopic aspect. (Fig. 5)

Due to thermic shock, superficial necrotic tissue was identified in the cups made from the laser samples. (Fig. 6)

The carbonized tissue resulted from the laser-assisted intervention produces no significant morpho-histological modifications and has a protecting effect upon the periodontal tissues on which the intervention had been made. (Fig. 7)

The clinical advantages of laser-assisted periodontal therapy are: excellent bacterial decontamination, reduced bleeding, reduced oedemas, reduced post-surgery discomfort, higher degree of comfort for the patient. [4]

Other researches proved that the morphological differences identified at the gingival epithelium level and subjacent lamina propria support the value of laser therapy, stimulating an improved healing of the damaged tissues. [5]
CONCLUSIONS

Laser-assisted technologies may be therefore viewed as extremely useful alternatives in the new periodontal therapies, which recommends their application in periodontal surgery for at least three reasons: they are minimally invasive, they induce minor morpho-histological modifications and the technique of their application is simple to learn.

Classical periodontal therapies cannot be wholly substituted by the non-conventional ones, however the final result may be optimized by the introduction, in everyday practice, of some specific protocols which include them or associate them for reaching predictable results.

References