

EX VIVO STUDY: ABSORPTION OF A 645 NM DIODE LASER ON SWINE HARD TISSUES SAMPLES

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Background: Mesenchymal derived stem cells have emerged as a popular and versatile tool in the field of regenerative medicine.

Objective: The present preliminary ex vivo study aims to assess the possible interaction between complex biological systems and laser light, through irradiation of different hard tissue's samples.

Methods: A 645 nm wavelength diode laser was adopted to perform the present evaluation (Raffaello, DentalMedicalTechnologies, DMT srl. Lissone-MB, Italy). Swine mandible tissue samples were used. Chosen power output value was 220 mW, measurements were performed with a power-meter located underneath irradiated tissues. Emission was performed perpendicularly to the power-meter at approximately 2 cm of distance. Irradiation was performed for 113 sec; chosen laser tip measured 0.337 cm² of area. Two samples of spongy bone of 4.45 mm and 2.9 mm of thickness, and two samples of cortical bone measuring 4.4 mm and 4.7 mm were used.

Irradiation was performed with and without plastic protection.

Results: After 10 cycles of irradiation, data-log were converted into graphics: laser light was never completely absorbed by bone samples.

For each sample values of mean absorption and standard deviation were calculated.

Conclusions: Red-light laser with 645 nm wavelength has the ability to reach cells in each layer of measured tissues. Since thickness of swine samples are comparable to human tissues, protocols based on such laser features can allow to reach deeper targets and lead to possible interactions (photobiomodulation) of human cells. Also sterile and non-sterile devices can be used to isolate the laser tip without interfering.

HISTOPATHOLOGICAL FEATURES RELATED TO AUTO-FLUORESCENCE ALTERATIONS INDUCED BY A 430 NM-WAVELENGTH: CLINICAL-HISTOMORPHOMETRIC ANALYSIS ON 20 CASES OF ORAL CARCINOMAS

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Background: Some malignant and potentially malignant lesions may induce AF variations (hypo- and hyper-fluorescence). This feature can be useful for diagnostic purposes.

Objective: To analyze a series of histopathological variables in relation to AF alterations.

Methods: Twenty oral lesions with histological diagnosis of squamous cell or verrucous carcinoma were included. AF was evaluated before biopsy using a blue-violet light (410–30 nm wavelength, Velscope® system - LED Medical Diagnostics, Inc, Barnaby, BC, Canada).

Eight histological categories were investigated: (a) mean depth of the entire epithelium (MDE); (b) mean depth of the keratin layer (MDK); (c) mean depth of the epithelium without keratin; (d) overall area of the epithelium (OAE); (e) mean depth of inflammatory infiltration (MDI); (f) overall area of blood vessels (OAV); (g) mean area of blood vessels (MAV) and (h) mean diameter of blood vessels (MDV). Data analysis was performed using IBM-SPSS statistical package version 22.

Results: Among hypofluorescent lesions, mean MLK was 41.3 μm while it was 197 μm for hyperfluorescent cancers ($p < 0.001$). Analysis of MDE, MDK and OAV through binomial logistic regression showed that, when the three variables are pooled, they have a prediction value of 100% with regard to the typology of fluorescence (accuracy, sensitivity and specificity of 1.00).

Conclusions: The strongest indicator of AF alteration seems to be keratin, A model which includes MDE, MDK and OAV may potentially be able to indicate the type of AF alteration in 100% of cases.

CO₂ LASER MANAGEMENT OF IDIOPATHIC FIBROUS HYPERPLASIA OF THE PALATE

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Background: Idiopathic Fibrous Hyperplasia (IFH) is a rare benign oral lesion affecting connective tissue. It is characterized by fibrous, slow and progressive increase in gingival volume in posterior lateral hard palate. There are two forms: generalized form has a genetic predisposition; localized form appears from second decade. IFH clinically appears as an increase in swelling of consistency covered by smooth and normal mucosa. IFH treatment is surgical excision. The scalpel surgery was preferred but, with laser devices introduction, carbon dioxide (CO₂) laser has become "gold standard" for surgery of oral benign fibrous lesions, thanks to its affinity with water molecules; it allows a better excision than neodymium and diode lasers that work better in vascular lesions.

Methods: Three IFH cases were treated and diagnosis was based on clinical history, intra-oral examination and histological analysis. After local anesthesia and lesion immobilization with an Ellis clamp, excision was performed by CO₂ laser (SmartUS20D, DEKA, Italy), at 100 Hz and 4 W. No sutures were applied. Follow-up was performed after one and three weeks.

Results: During and after surgery, neither bleeding or pain was observed and follow-up showed complete tissues healing.

Conclusions: CO₂ laser is an optimal device to approach this kind of lesion. Traditional scalpel surgery causes irregular wounds, copious bleeding and a periodontal wrap is necessary to avoid pain and bleeding in patients. CO₂ laser surgery showed minimal bloodless operative field thanks to superficial vessels cauterization, speed, easy and high precision surgical technique, no suture, second intention healing, minimal postoperative pain and edema.

CALCIUM ANALYSIS OF GAMMA STERILIZED HUMAN DENTIN SUBMITTED TO Er,Cr:YSGG LASER IRRADIATION

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Studies report that gamma radiation changes the oral cavity of patients submitted to radiotherapy. These changes include xerostomia, resulting in an unsaturation of calcium and phosphate in the oral cavity. However, human enamel samples isolated from the altered oral environment when irradiated with gamma radiation at doses of up to 25 kGy (much higher than radiotherapy doses) were shown to have undergone no changes in molecular hardness or micro surface. After approval of the Research Ethics Committee, 20 human dentin samples were evaluated before and after irradiation, split randomly into control group (n = 10) and irradiated group (n = 10) treated with 25.0 kGy at the Co⁶⁰ multipurpose irradiator and irradiated with Er,Cr:YSGG laser in the parameters: 8.5 J/cm² in the Fourier Transform Infrared Spectroscopy (FTIR), % surface Microhardness loss and Scanning Electron Microscopy (SEM). At the end, acidic biopsies were performed to quantify the concentration of calcium present in the samples. In the results of FTIR analysis differences were found only in the bands of organic content and in the inorganic content, difference were not found between before and after irradiations. The EDS and % Surface Microhardness loss analysis corroborates these findings, as well as no significant loss of the Calcium content before and after their radiation with Co⁶⁰ at 25 kGy and with the Er,Cr:YSGG laser. These findings lead us to a new hypothesis of behavior of the hydroxyapatite crystal submitted to the gamma irradiation.

PLASMA CELL GINGIVITIS AND LLLT

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Plasma cell gingivitis (PCG) is a benign and chronic inflammatory condition, with an uncertain etiology. Clinical features are typically represented by well delimited red erythematous areas. The gingival lesions are usually asymptomatic. The histopathology examination is mainly characterized by a significant plasma cell infiltrate. We describe the case of a 64-year-old male patient with PCG.

Clinical examination showed a confined gingival area, from tooth 15 to 25, with severe erythema, oedema and hard bleeding, only on the vestibular side, without pathological probing. Histopathologic diagnosis confirmed PCG. The patient has been treated with periodontal therapies (PT) associated with Low Level Laser Therapy (LLLT). 635 nm wavelength and 300 mW power were selected for laser treatment. Combined treatment has been scheduled since May 2018 in two weekly sessions. Treatment was given for a month (total eight doses).

Improvements were observed in both clinical parameters (erythema, oedema, bleeding) and histopathological exam, for the amount of inflammatory cells detected in the peripheral area of lamina propria was decreased.

Our therapeutic program was intended to be an alternative to topical steroid. LLLT procedures have demonstrated adequate and stable anti-inflammatory effects. PT enhanced the anti-inflammatory effects of LLLT by eliminating bacterial contamination and the hypertrophic tissues. Stability of the results was checked in the 6 following months.

SUCCESSFUL EXCISION OF BUCCAL MUCOSA IRRITATIONAL FIBROMA USING 940 NM DIODE LASER

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Background and objective: Irritational fibroma is a common benign exophytic and reactive oral lesion that develops secondary to injury. The most common sites of irritational fibroma are the tongue, buccal mucosa and lower labial mucosa. Differential diagnosis of other lesions including benign tumors and mucocele should be ruled out by biopsy. These lesions may be excised using conventional surgery, electrosurgery or laser. Lasers have recently made tremendous progress in the field of dentistry. The diode laser device has specifications such as a relatively small size, portability, and lower cost that attracts dental practitioners to its use for various surgical procedures in comparison with other laser equipment.

Materials and methods: Twelve patients agreed to undergo surgical removal of superficial proliferative lesions of buccal mucosa under local anesthesia using a 940 nm diode laser in continuous wave mode. Bleeding was stopped using Laser Dry Bandage setting and no suturing was needed. The specimens were sent for histopathological examination. Patients were assessed for intra-operative and post-operative complications.

Results: The procedure was easy to perform with excellent precision and minimum bleeding. It was well accepted by the patients who also reported mild post-operative pain. Optimum healing was achieved with no residual ulceration or scarring. The excised specimens proved adequate for histopathological examination and all lesions were benign.

Conclusions: The 940 nm diode laser can be employed in excisional biopsy of buccal mucosa irritational fibromas with minimum bleeding, discomfort, scarring and postoperative pain and should be considered as a viable alternative to the conventional surgical technique.

AUTO-FLUORESCENCE GUIDED Er:YAG LASER SURGICAL APPROACH OF SQUAMOUS CELL CARCINOMA OF THE TONGUE: A CASE REPORT

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Objective: To present a Er:YAG laser assisted surgical approach for OSCC excision using autofluorescence (AF) for highlighting surgical margins.

Methods: A Caucasian male with an ulcerated white plaque on the left margin of the tongue was referred to the Unit of Oral Medicine and Laser Surgery of the Hospital of Parma. Reduced AF lesions (dark areas) are suspicious for epithelial dysplasia or OSCC, whereas normal mucosa appears bright green. Using VELscopeTM (LED Medical Diagnostics Inc., Barnaby, Canada) system the lesion appeared as an extensive hyper-fluorescent area with a hypo-fluorescent area inside. The diagnostic hypothesis was compatible with leukoplakia with possible dysplasia. An incisional biopsy using cold blade was performed; after the histopathological examination, the lesion was removed with an excisional biopsy using Er:YAG laser (2940 nm FidelisPlus, Fotona-Slovenia 250 mJ, 20 Hz, VSP-Fluence 60 J/cm²). After six months, two small white areas of leukoplakia were detected and they were removed with excisional biopsy using QMR lancet. The follow-up was performed after a week and every months for one year.