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Improvement of dermal burn healing by combining sodium alginate/chitosan-based films and low level laser therapy.

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Abstract

This paper aimed to evaluate the improvement of burn wounds healing by sodium alginate/chitosan-based films and laser therapy. Natural polymers with different biological activities are widely used as film dressings to improve wound healing. Lasers arrays accelerate the healing repair of soft tissue injuries. Burn procedures were performed on the backs of 60 male rats assigned into six groups: untreated (CTR), dressed with cellulose films (CL), dressed with sodium alginate/chitosan-based films (SC), laser-irradiated undressed wounds (LT), laser-irradiated wounds with cellulose (CLLT) and sodium alginate/chitosan-based films (SCLT). Laser therapy was applied for 7 days. Animals of each group were euthanised 8 and 14 days after the burn procedures. The inflammatory reaction was significantly more intense in the CTR group than in the irradiated groups after 8 and 14 days. Laser therapy stimulated myofibroblastic differentiation in 8 days, with or without dressing films. Combined laser therapy and both dressings improved epithelisation, blood vessels formation and collagenization, promoted rapid replacement of type III for type I collagen and favored the better arrangement of the newly formed collagen fibres. The combination of laser therapy and sodium alginate/chitosan-based dressing improves burn healing, apparently by modulating the epithelisation, blood vessels formation and collagenization processes.

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Effect of laser (670 nm) on healing of wounds covered with occlusive dressing: a histologic and biomechanical analysis.

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Abstract

OBJECTIVES:

To analyze the effects of low-level laser therapy (LLLT), 670 nm, with doses of 4 and 7 J/cm(2), on the repair of surgical wounds covered by occlusive dressings.

BACKGROUND DATA:

The effect of LLLT on the healing process of covered wounds is not well defined.

MATERIALS AND METHODS:

For the histologic analysis with HE staining, 50 male Wistar rats were submitted to surgical incisions and divided into 10 groups (n = 5): control; stimulated with 4 and 7 J/cm(2) daily, for 7 and 14 days, with or without occlusion. Reepithelization and the number of leukocytes, fibroblasts, and fibrocytes were obtained with an image processor. For the biomechanical analysis, 25 rats were submitted to a surgical incision and divided into five groups (n = 5): treated for 14 days with and without occlusive dressing, and the sham group. Samples of the lesions were collected and submitted to the tensile test. One-way analysis of variance was performed, followed by post hoc analysis. A Tukey test was used on the biomechanical data, and the Tamhane test on the histologic data. A significance level of 5% was chosen ($p \leq 0.05$).

RESULTS:

The 4 and 7J/cm(2) laser with and without occlusive dressing did not alter significantly the reepithelization rate of the wounds. The 7 J/cm(2) laser reduced the number of leukocytes significantly. The number of fibroblasts was higher in the groups treated with laser for 7 days, and was significant in the covered 4 J/cm(2) laser group.

CONCLUSIONS:

Greater interference of the laser-treatment procedure was noted with 7 days of stimulation, and the occlusive dressing did not alter its biostimulatory effects.

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Analysis of low-level laser radiation transmission in occlusive dressings.

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Abstract

OBJECTIVE:

The purpose of this study is to analyze the power transmitted by low-level laser therapy (LLLT) into occlusive dressings using different wavelengths for the treatment of cutaneous lesions.

BACKGROUND DATA:

LLLT has been largely used to treat several cutaneous lesions commonly associated with occlusive dressings to accelerate the healing process.

MATERIALS AND METHODS:

Radiation transmission was measured by a digital power analyzer connected to a laser emitter with wavelengths of 660, 830, and 904 nm and mean levels of 30, 30, 6.5 mW, respectively, previously calculated. Thirteen different occlusive dressings were analyzed and interposed between the laser emitter and the power analyzer sensor, with 15 measurements made for each dressing. Statistics were provided by the analysis of variance (ANOVA), followed by Student's t-test ($p < 0.05$).

RESULTS:

The power transmitted ranged between 98.6% and 0%, depending on the material and wavelength. The dressings tested were BioFill, Hydrofilm, Confeel Plus 3533, Confeel 3218, DuoDERM Extra Thin, Hydrocoll, Micropore Nexcare, CIEX tape, Emplasto Sábia, CombiDERM, Band-aid, Actisorb Plus, in addition to polyvinylchloride (PVC) film, and transmitted power higher than 40% of the incident power, independently from the wavelength indicated for the association with LLLT.

CONCLUSION:

The results showed that LLLT transmission depends on the occlusive dressing material and the wavelength irradiated.

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