

CLINICAL ASSESSMENT OF THE EFFECT OF LOW LEVEL LASER TREATMENT OF ORAL MUCOSA DECUBITUS ULCERS

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ABSTRACT

Decubitus ulcers in the oral mucosa tend to be very painful causing discomforting sensation in patients in speaking and eating. Low energy lasers can provide an alternative method for the treatment of these ulcers.

The **aim** of the present paper was to assess clinically the healing effect of low level laser irradiation on oral mucosa decubitus ulcers.

Material and methods: A total of 90 patients with decubitus ulcers were treated in the present study; they were randomly assigned to three groups: group I included 30 patients treated with low level laser (LLL) irradiation (wavelength of irradiation 658 nm); group II - 30 patients treated with laser irradiation of 904 nm; and group III (controls) - 30 patients who received a standard conventional treatment with "granofurin" and "solcoseryl".

The treatment sessions in all three groups were administered once daily. The patients in groups I and II were irradiated with focused irradiation at an angle from a distance using a conically shaped light probe 3 mm in diameter. The irradiated area was 0.5 cm². The light was focused on the oral mucosa ulcer and the surrounding inflamed mucosa at a distance of 0.5 to 1 cm. Diode lasers were used in the study. The dosage of irradiation was 1.2 J/cm².

Results and discussion: The treatment effect was evaluated by changes in the studied parameters: pain intensity, erythema, and epithelialization. They were assessed at baseline, and at days 1, 3 and 5.

Conclusions: LLLT administered with the proposed methodology manages pain rapidly and accelerates the process of epithelialization of decubitus ulcers in the soft tissues of the mouth.

Key words: oral mucosa, LLLT, treatment, decubital ulcers, oral surgery.

INTRODUCTION

Mucous membrane in the mouth is continuously subjected to mechanical irritation in eating or speaking or

from other sources. Losing some of the teeth compromises the integrity of dentition causing various malformations and defects. Restoration is realised with movable and fixed prostheses.[10] Often when the dentition functions in conditions of malformations or when the prostheses are not well fitted the patients can get mechanical injuries on the oral mucosa which are designated in the dental medicine as decubitus ulcers.[1] The mechanism of getting these lesions is similar to that of getting the superficial skin decubitus ulcers in various disorders but obviously they develop in a different environment. This accounts for the difference in the clinical picture and way they are treated.[4]

Oral mucosa decubital ulcers tend to be very painful; they cause discomforting sensations when patients eat or speak. The quality of life of these patients is seriously impaired. The respective treatment aims at managing the pain and achieving epithelialization of the wound. However, the treatment in this site of the body is encumbered because mucosa is a difficult site to apply drugs to for a long time. For this reason physical methods are more suitable to apply here.[3, 8, 11, 12]

The **aim** of the present study was to assess clinically the healing process in treating oral mucosa decubital ulcers stimulated by low level laser irradiation.

MATERIAL AND METHODS

The study included 90 patients with decubitus ulcers sustained as a result of poorly fitted fixed dentures that were made to restore the chewing function of dentition; the patients were treated between 2008 and 2012 and divided into three groups:

Group I (study group) - 30 patients with decubitus ulcers treated using low energy lasers emitting in the red spectral range with wavelength of irradiation of 658 nm by a method we developed.

Group II (study group) - 30 patients with decubitus ulcers – these received stimulating treatment with low level lasers emitting in the infrared spectral range with wavelength of the irradiation of 904 nm by the method we developed.

Group II (control group) - 30 patients with decubitus ulcers treated conventionally with granofurin and solcoseryl.

Treatment sessions was performed once daily for all patients.

Patients in groups I and II were treated with focused irradiation at an angle from a distance using a conically shaped light probe 3 mm in diameter. The area of irradiation was 0.5 cm². The impacted area was the decubitus ulcer and the surrounding inflamed mucosal tissue from a distance of 0.5 to 1 cm. We used the following diode lasers: SIX LASER TS (Atlantis), with a wavelength of 658 nm, and Prometheus laser with wavelength of 904 nm. The irradiation dosage was between 1 and 2 J/cm². (fig. 1)



Fig. 1. Picture of methodology

The parameters used in the treatment were as follows:
 $\lambda = 658 \text{ nm}$

Analgesic effect:

power P - 30 mW
 frequency $f_1 - 5.8 \text{ Hz}$
 $f_2 - 5.8 \text{ Hz}$
 duration T - 1 min 22 sec
Dosage E - 2 J/ñm²

$\lambda = 904 \text{ nm}$

Analgesic effect:

power P - 20 W
 frequency f - 600 Hz
 duration T - 1 min 10 sec
Dosage E - 1.26 J/ñm²

Analgesic/anti-inflammatory effect:

power P - 20 W
 frequency f - 600 Hz
 duration T - 1 min
Dosage E - 2 J/ñm²

Analgesic/anti-inflammatory effect:

power P - 30 mW
 frequency $f_1 - 5.8 \text{ Hz}$
 $f_2 - \text{CW}$
 duration T - 1 min 14 sec
Dosage E - 2 J/ñm²

Regenerative effect:

power P - 20 W
 frequency f - 300 Hz
 duration T - 31 min
Dosage E - 1.5 J/ñm²

The treatment effect was assessed by any changes in the studied parameters: pain, erythema, and epithelialization. The assessment was done at baseline, and at days 1, 3 and 5 of treatment.

Statistical analysis of the results was performed using SPSS v.17 and MS Office Excel 2003.

RESULTS AND DISCUSSION.

Distribution of patients by sex was 33.3% men and 66.7% women. Their mean age was 68.31±1.13 years.

Patients in all three groups reported severe pain and erythema around the decubital ulcers. The onset of symptoms was identical for all patients.

The results we obtained for the studied parameters of pain, erythema around the lesions and epithelialization are as follows:

Pain

Day 1: Severe pain was experienced by 36.75% of patients in group I, 30% - in group II, and 90% of the patients in group III.

No pain was reported by 16.7% of group I patients, by 16.7% of group II patients, and by none of the patients in group III.

Day 3: Severe pain was reported felt by 40% of the patients in group III, while group I and group II patients felt no pain.

There was no pain reported by 83.3% of the patients in group I, 83.3% of group II patients, and 3.3% of group III patients.

Day 5: Acute pain was reported by none of the patients in all three groups.

There was no pain reported in 100% of patients in group I, 93.3% of group II patients, and 60% of the patients in group III.

The intergroup differences were significant at $p < 0.01$ for group III compared with the other two groups.

Erythema

Day 1: The erythema decreased in 73.3% of patients in group I, 70% of patients in group II, and 46.7% of group III patients.

The intergroup differences were significant at $p < 0.05$ for group III compared with the other two groups.

Day 3: No erythema was found in 73.3% of group I patients, 73.3% of group II patients, and 26.7% of group III patients.

Day 5: Erythema disappeared in 100% of group I and group

II patients, and in 66.7% of group III patients.
The intergroup differences were significant at $p < 0.05$ for group III compared with the other two groups.

Epithelialization

Day 1: No epithelialization was found in the patients of all three groups.

Day 3: A process of epithelialization started in 70% of group I patients, in 73.3% of group II patients, and in 46.7% of group 3 patients.

Day 5: Epithelialization was completed in 73.3% of group I patients, in 66.7% of group II patients, and in 23.3% of group III patients.

The intergroup differences were significant at $p < 0.05$ for group III compared with the other two groups.

These results suggests that LLLT exerts some stimulating effect on the healing process of decubital ulcers in the oral mucosa.

Pain rapidly decreases as early as on day 1 in the groups where patients received laser treatment regardless of whether the lasers emitted in the red or infrared spectral ranges. The erythema around the traumatic lesions significantly decreases in groups I and II, clearly indicating

that the inflammatory response abates. Epithelialization had significant intergroup differences for group III when compared with the other two groups.

For the body as a whole the decubitus ulcers have different local and global manifestations. The changes the tissue undergoes until complete healing occur in several stages. The biostimulating effect of low energy lasers emitting irradiation in the order of mW/cm^2 is seen in accelerating the reconstruction processes and the tissue regeneration, exerting at the same time anti-inflammatory and analgesic effects.(2,5,7) The process of lesion healing has the following phases: alteration, then proliferation, and finally epithelialization. Stimulation of the growth of epithelial tissue and angiogenesis have a crucial role in stimulating the healing of decubitus ulcers.(6,9)

CONCLUSIONS

Low energy laser irradiation performed by the method we developed is an efficacious and easy means to treat decubitus ulcers in the oral mucosa. It reduces considerably the healing time. This is a method that affords the patient rapid management of pain, acceleration of the epithelialization process of the wound and restoration of the natural comfort in eating and speaking.

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