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USE OF LASER IRRADIATION IN THE COMPLEX TREATMENT OF ULCUS CRURIS VENOSUM

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ABSTRACT

The effectiveness of 980 nm laser irradiation used in the treatment of patients with venous ulcers was studied.

The venous ulcers were irradiated by the laser system Cerelas 25, produced by Biolitec (Germany), in accordance with the techniques described. Laser irradiation was combined with identical local and per oral therapy and permanent elastic compression.

The effectiveness of 980 nm laser irradiation is discussed and the results obtained are evaluated as good.

Key words: laser irradiation, venous ulcers, Chronic Venous Insufficiency (CVI)

The Chronic Venous Insufficiency (CVI) of the extremities is a progressive disease where in the most severe class 6 (the CEAP system) active ulceration is formed – ulcus cruris venosum. The venous ulcerations are located most often above the medial malleolus, are extremely hard to heal and are with distinct pain syndrome. When the disease is not adequately treated, the patients may obtain various degrees of disability (1-6). The complex approach combining medicament and local treatment, limb elevation and elastic compression is the only method that has proven its effect in solving the problem because the presence of an active ulcus is a contra-indication against surgical intervention (2, 5, 6-8). The process of healing is lengthy, unfortunately, and calls for new methods to support and accelerate the healing processes of the venous ulcers. The experimental and clinical trials on laser treatment at various wavelengths (He-Ne, CO2) have proven the anti-inflammatory, vasodilator and biostimulating effect (7, 9-12). A number of authors have reported the positive results of that therapy for hypotrophic wounds of various origin (diabetes, atherosclerosis, Buerger's disease, venous ulcers) (7, 9-13).

These are the reasons to assess the effect of 980 nm wavelength laser therapy on the regeneration process of ulcus cruris venosum in patients with CVI of the extremities Class 6.

CLINICAL MATERIAL AND METHODS

Seventeen patients with CVI of the extremities Class 6 (CEAP) (5, 6) were treated on ambulatory basis over a period of 4 months, with a total of 21 venous ulcerations localized typically over the medial malleolus.

All ulcerations were treated identically – the wounds were cleaned with physiological serum and Braunol solution (Povidon, iodinated); then they were dressed with Intra Site gel, sterile dressing and elastic band covering the foot and shank. The dressing was changed every third day. All patients received identical peroral phlebotonic therapy – Detralex 2 x 1 tablets daily – for the CVI.

Ten of the patients (12 venous ulcers) were treated with 980 nm laser, using a Cerelas 25 appliance, made by Biolitec (Germany). The procedure included 3 venous ulcer wound surface irradiations over a period of 7 days. 6 W power was applied with a 0.6 mm thick laser beam positioned 6 cm from the wound surface during the procedure. The energy

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released during irradiation was 270 J. The other 7 patients (9 venous ulcers) had an identical peroral and local therapy without the laser treatment – they were the control group. All patients had a 4 week follow-up.

RESULTS

The patients fell into 4 groups based on the results:

Group 1 – good results – new granulation appeared, initial epithelisation of the wounds.

Group 2 – satisfactory results – new granulation.

Group 3 – unsatisfactory results – weak granulation.

Group 4 – not responding to the treatment during the follow-up period.

During the laser therapy the wounds of Group 1 patients got clear of the fibrin accretion, gradually formed fine pink granulation and developed peripheral epithelisation. Measurement of the wound area was done together with the patients' regenerative process assessment. The average reduction of the wound area established for the irradiated patients was 1.3 sq. cm. versus 0.6 sq. cm. in the control group. The initial epithelisation was observed on Day 12-13 on the average versus Day 18-19 in the control group. Group 2 patients had some fresh granulation but no epithelisation. The granulation process was present in Group 3 parients after the third procedure but it was not well expressed. During the follow-up period only one control group patient did not respond to the treatment. The end result with the above mentioned patient was the presence of granulation in the venous ulcer but on Day 34 of the treatment. The results from the treatment are presented in **Table 1.**

Table 1. *Clinical results of the 980 nm laser therapy and control group.*

Results	Laser therapy			Control group		
	Patients	**Venous ulcers**	**%**	**Patients**	**Venous ulcers**	**%**
Group 1	4	5	41,7	2	2	22,2
Group 2	4	5	41,7	2	3	33,3
Group 3	2	2	16,6	2	3	33,3
Group 4	-	-	-	1	1	11,2
Total	10	12	100	7	9	100

DISCUSSION

A positive biostimulating effect of the laser treatment (He-Ne, CO2) is observed in experimental conditions. Procollagen increase and accelerated granulation and epidermis proliferation of the irradiated tissues (2, 3, 8, 10) are noted. The clinical practice has described some good results from different wavelength laser therapy of patients with hard to heal lower extremity wounds of various origin (CVI, diabetes, atherosclerosis, Buerger's disease) (5, 7, 8, 10, 14).

The positive effect of laser therapy on the regenerative process of the venous ulcers is most probably due to the following:

- Vasodilatation in the lesion area. The increased blood flow enhances the damaged tissue oxygenation and together with the stimulating effect of the laser beams on the cell mitochondria and the functional activation of the cells, that result in an increase in the local regenerative processes (7,8,15).
- The decrease of serotonin and histamine liberation in combination with the analgesic

effect result in reducing the damaged tissue swelling (2,7,15).
- The increase of the lymphocyte and macrophage quantity in the irradiated tissue stimulates the local safeguard mechanisms in the lesion areas (2,7,8,15).
- The wound pH alternation from acid into alkaline probably also has a positive effect on the healing process (2,15).

Despite the described positive effect of laser therapy on the venous ulcers regenerative processes, the other elements of the complex treatment should not be ignored. The adequate local handling and treatment, and the regular phlebotonic therapy combined with elastic compression are the key to the wound surface epithelisation and the improvement of the patients' quality of life (4,6,10,14,17). Combining it with 980 nm laser therapy is physiologically well-grounded, which is proven not only by our data but by other sources as well. Comparing the results obtained from the irradiated and control groups we discover a significant difference between the results in Group 1 patients and the sum of good and satisfactory results in Group 1 and 2, in proof of the positive effect of laser therapy. **(Table 1).**

We note the fact that the granulation processes and epithelisation in the different patient groups take different periods of time. The different degree of venous reflux in the deep and surface venous system of the patients both from the laser treatment and the control groups can be considered a probable reason for the delay of regenerative processes and the noticeable differences in their quality and rate.

CONCLUSIONS

1. The 980 nm wave length laser therapy stimulates the formation of granulation tissue and the epithelisation of the venous ulcers resulting from the CVI.
2. The irradiation shortens the period of the regenerative process and reduces the length and cost of treatment.
3. A significant advantage of the laser therapy is its intensity which is of importance when we come to the positive attitude of patients.
4. The laser therapy can be one of the main elements of the complex treatment of ulcus cruris venosum patients.

Undoubtedly, the patient group subjected to the treatment is not a large one but the results obtained are encouraging and we would recommend a broader utilisation of the laser therapy in the complex treatment of that disease.

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