# Magnetostimulation in the treatment of crural vein ulceration

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## ABSTRACT

Chronic venous insufficiency, as well as crural vein ulceration, developing at its background, poses a serious clinical problem. Treatment is costly and lengthy. Intense development of physical medicine allows to reduce the time of treatment, as well as to improve the life quality in numerous soft tissue ailments, including wounds that are hard to heal. This article presents the beneficial results of treatment of a 67-year-old woman patient with a diagnosis of crural vein ulceration in the right limb. The applied physiotherapeutic method, in the form of magnetostimulation, contributed to complete healing of the lesion, subsidence of symptoms, as well as improved life quality of the treated patient.

**Key words:** Crural vein ulceration • Magnetic fields • Magnetostimulation • Treatment

## INTRODUCTION

The treatment of wounds that are difficult to heal poses a serious, interdisciplinary medical problem. So far, medicine has not had any effective means of treatment of lower limb ulcerations (1). The assessment is that the problem of ulcer formation may affect up to 5% of the population above 65 years of age (2). The range of ailments, which such patients complain about, is broad indeed, and comprises sensation of heaviness in lower limbs, pushing out, scorching, burning, with acute pain that precludes walking (3).

In accordance to CEAP (*Clinical Ethiologic, Anathomic, Pathophysiologic)* classification and the Polish Wound Treatment Association, the treatment of crural vein ulceration comprises surgical and local treatment, connected with pharmacotherapy, treatment by compression and properly selected kinesitherapy exercises (4–6). According to the present knowledge, an indispensable element in the entire programming and treatment process should be physical medicine procedures, which speed up the treatment process several times, reduce the pain sensations and suffering of patients, thus also reducing the socio-economic costs (7,8).

For a few years now, clinical experiments have been carried out to determine the efficiency of magnetic fields in the treatment of venous ulcers (9–11). That aetiologically non homogeneous ailment poses not only a severe treatment problem for physicians of various specialties, but also a psychological problem for the patient. Advantageous profile of the magnetic field activity in the treatment of crural ulceration results from its biological

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### Key Points

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effects, among which there are: intensification of oxygen utilization processes and tissue respiration, intensification of anaerobic respiration processes in ischaemic tissues, vasodilatation and angiogenetic action, resulting in the development of collateral circulation in the vicinity of wounds being formed. In addition, magnetic fields intensify the processes of regeneration and reparation, stimulate the epidermisation process and inhibit infection processes (8,12). The aim of the study has been to present the beneficial results of treatment of a 67-year-old woman patient with crural vein ulceration, on whom the procedures of magnetostimulation have been used with good results.

## CASE REPORTS

The woman patient, 67-year-old, has been admitted to the Chair and Clinical Ward of Internal Diseases, Angiology and Physical Medicine of the Silesian Medical University in Katowice, Poland with the diagnosis of crural vein ulceration, established several months earlier. Until the time of admission, the patient had been treated with various effects, yet her leg never healed completely. On admission to the Clinic, the patient complained of severe pain of encompassing and pushing out nature in the right crural area. Preliminary examination showed vast and massive necrotic and trophic skin lesions, discharge of purulent secretion, as well as characteristic putrid smell of the lesion (Figure 1).

The patient also had the USG Doppler examination of lower limb veins performed, with the following findings: ''Numerous haemostases in venous system, lesions of perforator valves, lengthening and tortuosity of dermal capillary vessels, with dilated pericapillary space. Numerous lesions of capillary vessels and pericapillary tissues are visible''. Before starting the therapy, the patient filled a concise pain intensification assessment questionnaire, which applied the visual analogue scale (VAS) scale (10 *most intense*, 1 *least intense*). The assessment concerned initial pain sensations experienced over the previous 3 weeks. The result obtained has been assessed as very intense, according to the scale (10 points).

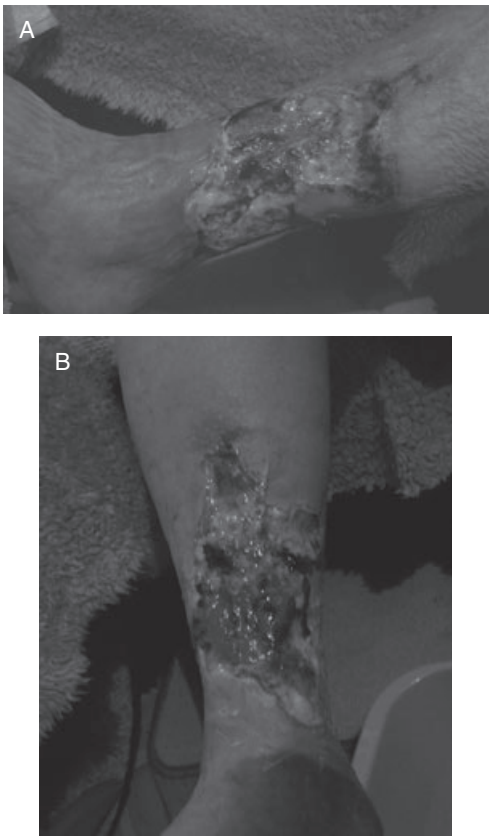


**Figure 1.** Crural venous ulceration (photographs taken before starting the therapy).

## PHYSICAL TREATMENT

The patient has been treated by means of magnetostimulation (variable magnetic filed of low frequency. For that purpose, the ring-shaped large clinical applicator by Viofor JPS Standard (Med & Life, Komorów, Poland) has been used. The ring applicator contains three pairs of coils, which generate magnetic field.

Following physical parameters have been applied: M2 P2 intensity of magnetic field – 8, throughout the course of therapy.

M2 – application with increasing intensity of magnetic field (the magnetic field intensity increases every 10 or 12 seconds to the selected value, in a cyclic manner during application), P2 – JPS system with two types of magnetic impulses, having the frequency of 180–195 Hz.

The procedures have been carried out in such a way that the limb being subject of the procedure has been held inside a ring-shaped applicator (inductor – Figure 2). The patient assumed sitting position during the procedure. Procedures were performed once daily, for 12 minutes, every day, in 6 series of

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- preliminary examination showed vast and massive necrotic and trophic skin lesions, discharge of purulent secretion, as well as characteristic putrid smell of the lesion
- the patient was treated by means of magnetostimulation (variable magnetic filed of low frequency)

**Figure 2.** Clinical ring-shaped applicator Viofor JPS Standard for magnetostimulation procedures.

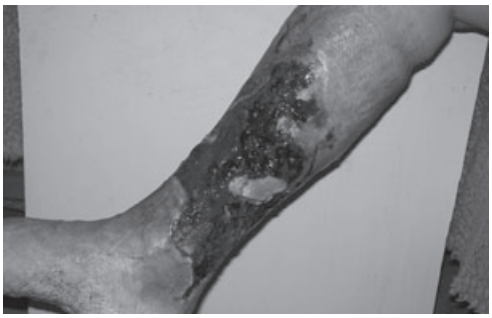

**Figure 3.** Photograph taken after completing two therapeutic sessions (30 magnetostimulation procedures).

15 procedures, with break on Saturdays and Sundays. The intermission between every two series was 3 weeks. After completion of each procedure, hydro-colloid dressing was put on the wound, followed by pressure dressing.

## RESULTS

On the last of the first and second therapeutic sessions, the patient experienced significant alleviation of the pain. Also, less purulent deposit was observed. The wound secretion changed into serous type, gradually the characteristic smell of decay disappeared. Also, fine-grain pink granulation appeared that gradually began to cover the wound with new epidermis. Very weak currents that appeared when influencing piezoelectric substances (e.g. collagen) stimulated cell activity, which promoted vasodilatation action (direct influence upon relaxation of smooth muscular coat of vessels, and activated the process of neo-angiogenesis). After the first two therapeutic sessions, a control photograph was taken (Figure 3).

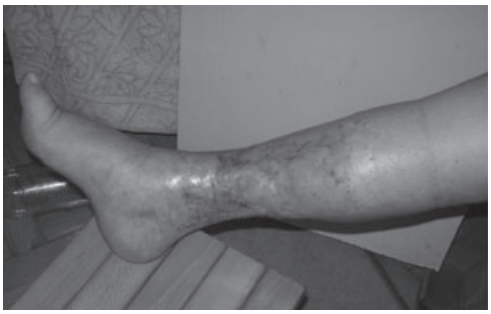

**Figure 4.** Photograph taken after completion of therapy (after the application of the total of 90 procedures).

After 8 months (33 weeks), the treatment was completed. The result obtained was a complete remission of the pain experienced, reduction of the inflammation process, as well as complete healing of the ulceration. Anti-inflammatory action is related to the stimulation of cyclic adenosine monophosphate (cAMP) and prostaglandin E formation. Prostaglandin influences the accumulation of cAMP, which reduces the release of inflammation mediators from neutrophils, basophils, mast cells and lymphocytes. In the course of treatment, dynamic and positive healing of the lesion has been observed (Figure 4). The check up by means of USG Doppler had the following result: ''Substantial progression concerning lesions in the venous system. Veins in femoral section, common veins, femoral veins, as well popliteal veins patent in comparison with the initial examination''.

## DISCUSSION OF RESULTS

The 8 months of treatment, applying the above physical method, led to complete healing of the ulceration. The mechanism of therapeutic action of magnetic fields in those cases is that of stimulation of regeneration of the destroyed vascular rete in micro-circulation, increasing of local perfusion of tissues, as well as enhancement of blood rheological properties, increased collagen production by fibroblasts and speeding up the mitosis process in cells of germinative layer of epidermis (epidermisation process stimulation). The basis of regeneration effects of magnetostimulation is, first of all, intensification of oxygen utilization processes and tissue respiration, because of increased diffusion and oxygen uptake by haemoglobin and cytochromes. Increased oxygen uptake is connected with stimulation of

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tissue breathing, DNA synthesis and speeding up the mitotic cycle. Application of magnetostimulation procedures contributed to reduction of the pain experienced, complete healing of the ulceration, as well as improvement of the patient's life quality (13,14). Analgesic activity takes place mainly through increased release of endogenous opiates, of the ß group – endorfins, substances responsible for elevated pain sensation threshold. The effect of analgesic action occurred not only during the course of therapy but also after the exposure ceased. That confirmed the biological hysteresis of magnetic fields' influence. After the completion of treatment, the patient reported that she was able to move and apply load to the limb, which substantially simplified the patient's daily activities. From that moment on, significant improvement has also been achieved in the patient's clinical condition, as well as in the psychical condition, in connection with the noted healing of the lesion.

The process of wound healing, including crural ulcerations with various aetiologies, occurs to be subject to many delaying factors, because of metabolic deficiencies and attenuation of physiological reactions. Searching for various solutions that may give beneficial results of treatment is an ambitious clinical challenge and requires profound knowledge and skills in treatment planning (2,15). Lack of consequence in further treatment of patients, or failure to follow subsequent nursing care recommendations, leads to quick recurrence of the disease. Thus patients should be informed that the physical procedures concern symptoms of the disease, not its causes.

Magnetostimulation applied in the treatment of crural vein ulceration speeds up the process of wound healing. Implemented at proper time, with parameters suitably selected, it is a useful treatment method in a complex treatment process. With minimum counter-indications for its application, that kind of therapy may in numerous cases be the only effective type of treatment (16).

## CONCLUSIONS

1. Magnetostimulation is an efficient physiotherapeutic method in the treatment of crural vein ulcers. Even a short application of the procedure is connected with significant reduction of ulcerated surface and healing of ulceration.
2. Biological effects of magnetostimulation may help millions of patients from high risk group; it may also generate enormous savings in health care.

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