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# Magnetostymulacja w leczeniu przewlekłej rany po usunięciu mięśnia strzałkowego jako konsekwencji wypadku komunikacyjnego – opis przypadku

*Magnetostimulation in the treatment of chronic wound after removal of muscle peroneus longus as a traffic accident consequence – case report*

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## Streszczenie

Nie budzi obecnie wątpliwości coraz częstsze wykorzystywanie metod medycyny fizycznej w licznych działach medycyny. Szeroki wachlarz zabiegów umożliwia wdrażanie odpowiedniego leczenia, jego skracanie oraz zmniejszanie kosztów społeczno-ekonomicznych. Dotyczy to schorzeń i urazów narządu ruchu, tkanek miękkich oraz przewlekłych ran. Stosowane leczenie farmakologiczne w wielu przypadkach jest niewystarczające i kosztowne. W artykule przedstawiono korzystny wynik leczenia 17-letniego pacjenta z utrzymującą się przewlekłą raną po usunięciu mięśnia strzałkowego długiego (w związku z jego martwicą) kończyny prawej w wyniku doznanego wypadku komunikacyjnego. W leczeniu zastosowano zabiegi magnetostymulacji (zmienne pole magnetyczne) przez 12 tygodni doprowadzając do całkowitego wygojenia się rany po uprzednio przeprowadzonym zabiegu operacyjnym. Wygojenie rany umożliwiło pacjentowi samodzielne poruszanie się (bez asekuracji kul łokciowych, bez odczuwania dolegliwości bólowych), a korzystny wynik leczenia wpłynął na poprawę jakości życia leczonego pacjenta.

## Słowa kluczowe:

wypadek komunikacyjny, pola magnetyczne, leczenie, magnetostymulacja

## Abstract

Undoubtedly, the ever frequent use of physical medicine methods in many fields of medicine is a fact. A wide spectrum of procedures enables instituting suitable treatment, reducing treatment time, as well as social and economic costs of treatment. The above applies to pathological states and injuries of the locomotor system, soft tissues, as well as chronic wounds. The pharmacological treatment applied proves to be insufficient, costly, and lengthy in many cases. The paper reports positive result of treatment of a 17-year old patient with persistent chronic wound after removal of long fibular muscle (due to its necrosis) in the right leg, as consequence of a traffic accident. In the treatment, magnetostimulation (variable magnetic field) procedures were applied for 12 weeks, leading to complete healing of the surgical wound. The wound healing allowed the patient to move about unaided (without elbow crutches, feeling no pain), while the positive outcome of treatment enhanced the patient's quality of life. Physiotherapeutic methods commenced on admission to the complex treatment in patients on dermatology ward conduct to total healing wound.

## Key words:

traffic accident, magnetic fields, treatment, magnetostimulation

## Introduction

Therapeutic management of patients being victims of traffic accidents poses a serious problem for diagnostics, treatment, and therapy, due to the highly probable loss of health and life [1]. The most common consequences of traffic accidents are multiple injuries, co-occurring with head injury and fractures of extremity bones. Injuries of extremities are the second most common reason for hospitalisation, which in many cases also entails surgical intervention [1, 2]. A consequence of every surgery is a wound, which should heal by itself. Some wounds, however do not heal properly (for various reasons). In addition, the continuous piercing and cumbersome post-surgery pain significantly deteriorate the patient's well-being and life quality. The disrupted tissues may experience independent vasospasms, slowing of blood flow, also oedemas and inflammations may develop, along with gathering of exudates, which are toxic for tissues. All that results in the wound not healing as it should, while the process of treatment gets prolonged. Local tissue defects or extensive necrosis are most often the causes of numerous complications, often life threatening, exerting substantial influence upon all the subsequent life of the patient [3, 4].

So far, medicine does not have panacea, which could be administered in treatment of wounds that are hard to heal. In accordance with CEAP (Clinical Etiologic, Anatomic, Pathophysiologic) Classification, correct treatment of chronic wounds calls for interdisciplinary approach, and should take into consideration surgical and local treatment, connected with pharmacotherapy, compression therapy, and properly selected kinesiotherapy exercises [5, 6]. In all the planning and process of treatment, an indispensable element, in accordance with the state-of-the-art knowledge, non-invasive physical medicine procedures should be put to use, as they speed up the process of treatment many times, reduce pain sensation and suffering of patients undergoing treatment [7, 8].

For a few years now, clinical experiments have been carried out to determine the effectiveness of magnetic field application in wound treatment [7, 8, 9]. Wounds, having heterogeneous etiology, pose an enormous treatment problem for physicians specialising in many different fields [10]. The beneficial profile of magnetic field activities in wound treatment stems from their biological effects, among which there are: intensification of oxygen utilisation and tissues respiration, intensification of anaerobic respiration in ischaemic tissues, vasodilative and angiogenic activity, causing the development of collateral circulation in areas of wound formation. In addition, magnetic fields intensify the processes of regeneration and repair, stimulate the epidermization process, as well as inhibit infections [7, 8, 11].

## Case presentation

The patient A.Z. (17 years of age) was admitted to the Chair and Clinical Ward of Internal Diseases, Angiology, and Physical Medicine) and (Centre for Diagnostics and Laser Therapy) of the Silesian Medical University in Katowice, Poland, due to chronic hard to heal wound, persisting for three months, in the right lower leg area (Fig. No. 1).





**Fig. 1. Photograph taken at the admission to the Clinic (before the start of therapy)**

The wound was a surgical wound, being a consequence of a surgical procedure carried out in the orthopaedic ward, during which the long fibular muscle was removed (due to its necrosis) from the right leg, as consequence of a traffic accident. The fibular muscle necrosis was a consequence of femur fracture (Fig. No. 2).



**Fig. 2. Photograph taken before the surgery in the orthopedics department**



Due to difficulties in surgical wound healing, the patient was referred to our Clinic for further treatment. After the diagnostics (physical examination, consultation of a specialist in internal medicine, angiologist, and vascular surgeon) a cycle of magnetostimulation procedures was instituted.

### Physical procedures applied

The magnetostimulation (variable magnetic field of low frequency) procedures applied to the patient have been carried out with the use of large clinical ring-shaped applicator by Viofor JPS Standard (Med&Life, Komorów, Poland), which operates in accordance with the mechanism of ionic magnetic resonance [12]. The ring-shaped applicator contained 3 pairs of coils, which generated the magnetic field. The procedures were performed in 4 series of 15 daily procedures (3 weeks), lasting for 12 minutes (2 times a day), with interruption for the weekend (Saturday and Sunday). The break between two consecutive series was 4 weeks. The following physical parameters were used: M2, P2, the magnetic field intensity of 8, throughout the therapy.

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

The procedures have been performed in such a way that the leg subjected to procedures was located directly in the applicator (coil – Fig. No. 3). The patient was in recumbent position during the procedures.



Fig. 3. Clinical clinical applicator Viofor JPS Standard Med & Life Poland to perform magnetostimulation procedures

### Results

The treatment was completed after 6 months (24 weeks). The result of it proved that the wound healed completely. During treatment, dynamic and positive healing of the lesion was observed. In the course of treatment the patient reported no side effects of the therapy he was undergoing.

Upon the completion of therapy cycle, the region where the surgery had been performed was not painful, the scar was soft and elastic, without any blisters or excessive overgrowths (Fig. No. 4).



**Fig. 4. Photograph taken after the end of therapy (after the application of 60 magnetostimulation procedures)**

The positive result of treatment permitted the patient to stop using elbow crutches, and subsequently to gradually apply weight to the leg, which substantially simplified the patient's daily living activities, as well as allowed restoration of the patient's mobility, as much as possible.

### Discussion of results

Recent years saw a notable progress in the field studies concerning the nature of processes taking place in the course of healing of acute and chronic wounds [4,5,13]. That, in turn, provided the basis for introduction of many innovative methods, which influence faster healing and improvement of final aesthetic and functional results. Traditional treatment methods, consisting merely of daily changing of dressings and application of substances that are topically effective proves insufficient in modern times [10]. The mechanism of variable magnetic fields activity, with low induction values, confirmed also in other research, proved to have the following beneficial results, among others: improved vascularization of tissues, enhanced rheological properties in blood (anticoagulative activity), stimulation of tissue regeneration processes, intensification of epidermization processes, as well as improvement of scar quality [7, 11, 14].

Due to fact that occurrence of traffic accidents with participation of motorcycles in creases (young men are most often victims of motorcycle accidents), surgical procedures are performed ever more often [1]. Those young patients want to restore their physical skills and mobility completely, which in many cases may prove extremely difficult. The prognosis is favourable only when the post-



operative period includes multidirectional treatment, and is connected with utilisation of physical medicine methods [2, 14]. Six months of application of magnetostimulation proved effective in complete healing of a surgical wound.

Suffering, prolonged and complicated regeneration of chronic wounds remaining after surgical procedures – they can be avoided thanks to applying a simple solution, namely magnetostimulation procedures. Search for various solutions that can result in beneficial treatment effects poses a substantial clinical challenge, and requires extensive knowledge and abilities to plan treatment. [16]. In medical practice, that knowledge is often left out of account, because routine procedures prevail, or limitations occur, due to the lack of suitable appliances. Magnetostimulation, if applied in proper time, and with suitably selected parameters, is a valuable treatment method to be used in complex treatment. With minimum contraindications for its application, this type of therapy may be the only effective one in many cases. The advantages of that method make it ever more widely applicable in Polish and international centres, which specialise in the treatment of chronic wounds.

### Conclusions

Magnetostimulation is an effective method of physical therapy in the treatment of chronic wounds, which has been confirmed in the case described here. Even a short time of application of procedures results in substantial overall clinical improvement, as well as local improvement, providing beneficial cosmetic results.

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