Use of a new method of Electrostimulation for hard-to-heal wounds

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Introduction

Electrical stimulation (ES) is a well-proven method for accelerating wound healing when suffering from chronic wounds. Numerous studies show very positive effects of ES at cellular level[1]. In addition to that clinical data confirm the benefits of ES in order to shorten the process of wound healing[2,3,4,5] and reduce the pain when suffering from chronic wounds[6]. Despite these facts, ES is widely unknown and therefore not very often used. A possible reason for the lack of popularity could be that ES is used in many different ways and therefore is not standardized yet. Also, an electrode needs to be placed directly in the wound.
The WMCS (Wireless Micro Current Stimulation) is a new method within the ES. WMCS allows a contactless treatment of the patient and is therefore very user-friendly. The aim of the following report was to present the initial clinical experience with WMCS on patients suffering from a hard-to-heal wound.

The WMCS method

ES is based upon the principle that skin offers a transepithelial potential. Intact skin builds a barrier for the negative charged surface of the epidermis and the positive charge of the dermis. By having a wound, this barrier is bypassed, so a short circuit occurs. The resulting so called "current of injury" has various positive effects for the wound healing on cellular level as for example chemotaxis of macrophages, proliferation of fibroblasts, stimulation of keratocytes as well as an improved perfusion and antiedematous and antibacterial effects[1,7]. Because the current of injury only lasts a few days, poor wound healing can result. ES may mimic the current of injury, restart and accelerate the wound healing process.
The anode of the WMCS device (Wetling EU Aps, Denmark) produces negative charged oxygen ions (fig 1). The flow of the O_2 ions from the unit is directed towards the skin of the patient, which is isolated from the ground. The patient is connected back to the WMCS device through a control box that records the charge passing through the body.
The implementation is carried out with the patient lying on a couch electrically isolated from ground. The WMCS device is placed at a distance of 10-20 cm from the wound (fig 2). The treatment lasts about 45 minutes and is carried out 3 times a week. An amperage of 1.5 µA was chosen. There were a total of approximately 18 treatment sessions on each patient.

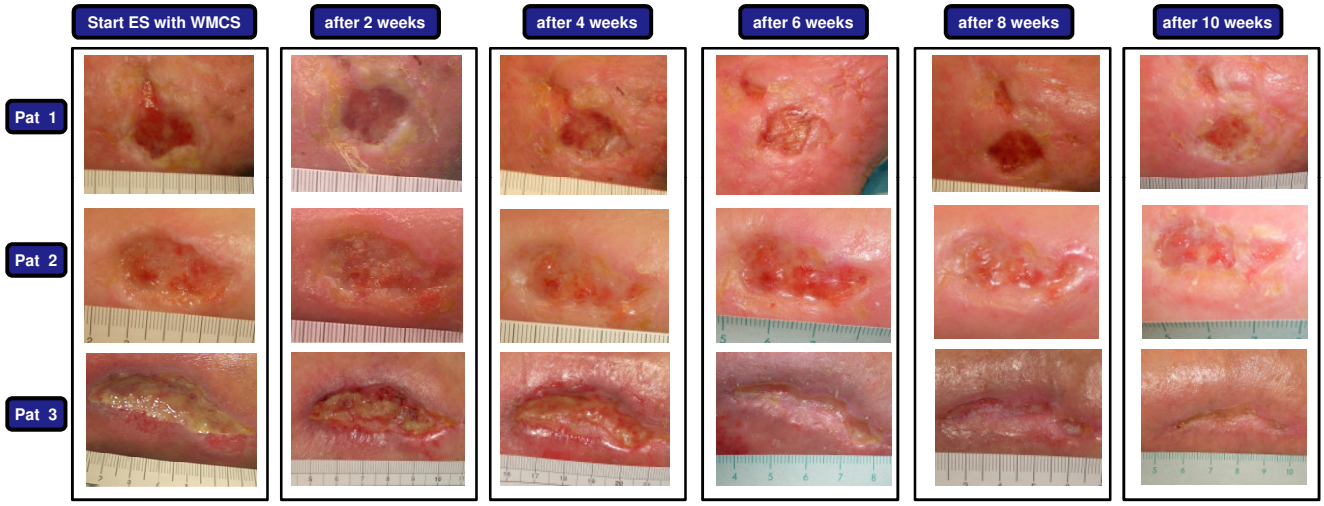
Figure 1: WMCS device (Wetling, Denmark)

Figure 2: Treatment of a leg ulcer

Patients

In this report, three female patients suffering from a hard-to-heal wound (ulcer of the lower leg) were treated. They were all undergoing adequate local wound treatment over the last months, however their wound healing turned out to be refractory to treatment. In each case, ES was carried out in addition to optimized local wound management incl. compression treatment. The detailed characteristic of each case is described in Tab 1. The documentation was carried out by taking digital pictures every week. The size of the wound (in mm²) was assessed by using a specialised software (Synedra view). We analysed the monthly area reduction in percent (PAR1) before and after using WMCS during ten weeks.

	Pat 1	Pat 2	Pat 3
Age, sex	85, fem	88, fem	75, fem
Ulcer since (month)	21	9	7
Ulcer size (cm)	2.2x1.7	3.7x2.0	6.0x1.5
Ulcer area (mm²)	240	360	550
Etiology	Venous	Traumatic	Mixed
ABI	0.88	1.18	1.04
Co-Morbidity	CHD, Hypertension	Diabetes, Hypertension	Cancer, chronic ostemyelitis



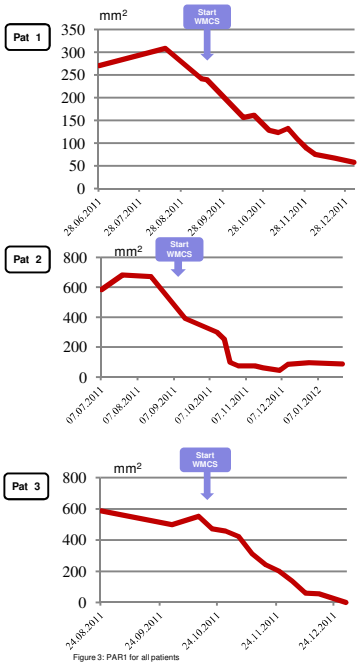


Figure 3: PAR1 for all patients

Results

We could observe an acceleration of the wound healing in all three cases. Already after 2 to 3 weeks, first signs of clinical improvement could be noticed. All images documenting the entire wound development can be seen above. In case three, the existing leg ulcer could be closed within the 10 weeks period. In the other two cases a remarkable reduction of the wound area was achieved over the same period. In both cases, the chronic wound could be reduced to less than 1 cm². The analysis (achieved by using digital area measurement) show the following values regarding reduction of the wound area during the period *before* using WMCS: 22%, 40%, 15% (mean:25.7%±10). During the first month of carrying out WMCS treatment the results were even better. The wound area could be reduced by 32%, 71% and 56% (mean: 53%±19). The diagram of all three cases over the entire period of using WMCS is presented in Fig 3.
Taking into consideration that all three cases were so called hard-to-heal wounds with an average ulcer time of 12 month, the clinical effect can be assessed as very positive. Also, the patients rated the treatment as very satisfying. No discomfort or even relevant side effects were reported. On the contrary, it could be noticed that the patients felt free of pain during the 45 minutes of treatment.

Conclusions

In all three cases electrical stimulation using the new Wireless Micro Current Stimulation (WMCS) method has proven to be very promising treating patients with lower leg ulcers refractory to the standard treatment. From the beginning of using WMCS treatment, the results confirmed that WMCS significantly accelerates the process of wound healing. We can assume that WMCS not only has huge potential to treat hard-to-heal wounds but also to heal chronic wounds generally. Chronic wounds are very time-consuming and expensive to heal, the WMCS method could be a possible way to save costs[8]. In our opinion especially important are the following benefits of WMCS:

- contactless treatment allows patient-friendly treatment
- the treatment is without risk of infection
- first positive effects can be seen already 2 weeks after starting the treatment
- the tolerability is excellent, the treatment has no side effects
- the treatment can be carried out in addition to other applied methods

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