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# Influence on clinical parameters of depressomassage (part I): The effects of depressomassage on color and transepidermal water loss rate in burn scars: A pilot comparative controlled study

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## ABSTRACT

**Objective:** Depressomassage is a non-invasive massage technique using a mechanical suction device that is used in the treatment of traumatic or burn scars. Since color and transepidermal water loss (TEWL) are respectively the most important physical and physiological characteristic of hypertrophic scar formation, we wanted to investigate the effects of depressomassage on the recovery of color and TEWL in burn scars compared to the traditional physiotherapy.

**Methods:** In this pilot comparative controlled study a total 43 burn patients were included and allocated into 2 groups. All patients received standard physical therapy, and the test group received additional depressomassage during 6 months. Color was assessed using the POSAS questionnaire (for color, vascularity and pigmentation) and the Minolta Chromameter. TEWL was measured using DermaLab.

**Results:** Patients of both groups were evaluated at baseline, after 1, 3 and 6 months and after 1 year. The evidence for a difference in evolution of color and TEWL between both groups in our study was minimal.

**Conclusions:** In practice, precise indications to begin depressomassage have to be kept in mind. Perhaps other scar abnormalities such as decreased elasticity, increased thickness, excessive pain or itching could be sufficient reasons to begin depressomassage and should be assessed.

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## 1. Introduction

One of the main problems after burn injury is hypertrophic scar formation, which leads to an array of functional, aesthetical and psychological problems. It can also affect the quality of life of the patient [1]. A variety of non-invasive treatments exist, such as pressure therapy, silicone gels, hydration, massage therapy, mobilization, stretching, rehabilitation, splinting and casting [2].

Massage therapy has shown some effects in the reduction of pain [3,4] and itching in burn scars [3-5]. Improvements of patient's perspectives on scar related characteristics, such as pruritus, pigmentation, pliability, vascularity and height, were found in the study of Roh et al. in 2007 [5], but they could not reconfirm these findings in 2010 [6]. These results were based on subjective rating scales. Cho et al. found promising results for thickness, melanin, erythema, TEWL and elasticity after massage therapy on scar tissue using objective scar assessment tools [4]. However these results were again not confirmed in the second study of Roh et al. [6]. In all these studies massage therapy was performed manually [3-6], nevertheless different treatment protocols were presented and the depth and effects of the different scar massage techniques could be dissimilar.

Depressomassage is a non-invasive massage technique using a mechanical device that lifts the skin by means of negative pressure and creates and mobilizes a skin fold [7-10]. In the past depressomassage was used to improve the aesthetic appearance of healthy skin e.g. cellulite [11]. Currently depressomassage is also used in the treatment of traumatic or burn scars [12]. However at present, there is no comparative trial investigating the effects of mechanical massage therapy after a burn injury.

One of the major features of hypertrophic scarring is the red to deep purple color [13]. The amount of erythema (or redness or vascularity) and pigmentation contribute to scar color. Erythema is caused by neovascularization and pigmentation disorders resulting from differences in melanocytes concentration and melanin production after a burn injury. Erythema usually diminishes after several months or sometimes years and is considered to be the most important feature in the assessment of scar evolution. Pigmentation disorders often remain to some extent in burn scars [14]. Due to the disruption of the skin barrier after a burn the amount of transepidermal water loss (TEWL) is considered to be the most important physiological characteristic of scars [15]. Since color and TEWL are two important characteristics of hypertrophic scar formation, to investigate the effects of massage therapy using a mechanical suction device (depressomassage) in a comparative controlled trial. The aim of this study was to examine the added value of depressomassage on the recovery of color and TEWL in burn scars compared to usual care therapy.

## 2. Material and methods

### 2.1. Study design

The study design was a non-randomized controlled trial. Data were collected between February 2009 and May 2014 in Oscare,

organisation for burns, scar after-care & research, Antwerp, Belgium. Patients were allocated into 2 groups, a test group and a usual care group, based on the possibility to come to our center (allocation criteria). The treatment of all patients consisted of standard physical therapy (manual physiotherapeutic techniques, massage therapy, pressure garments, silicone gels, hydration). The test group additionally received depressomassage (massage therapy using a mechanical suction device) during 6 months. Therapists and assessors were aware of treatment allocation.

### 2.2. Study population

Burn patients eligible for this study had to meet the following inclusion criteria: (1) at least 18 years of age; (2) scars with a 40% difference of erythema and/or TEWL between the scar site and the contralateral or adjacent healthy skin (based on retrospective data). This study was approved by the Ethics Committee of ZNA campus, Antwerp (4130). Informed consent was obtained from all patients.

In total 43 Caucasian burn patients with 56 scar sites were recruited from Oscare. All patients agreed to participate in this comparative clinical trial and completed the intervention (no drop out or missed sessions). Thirty scar sites were allocated to the test group and 26 scar sites formed the usual care group.

### 2.3. Scar sites

In total 56 scar sites were measured. The boundaries of the test sites were carefully measured, written down in the patient chart, captured on a digital picture and referred to during each visit for defining exact (re)location for assessment.

In accordance to the inclusion criteria of 40% difference between scarred skin and healthy skin, scar sites were exclusively included in the subgroup of erythema, or exclusively included in the subgroup of TEWL or included in both subgroups. Forty-seven scar sites were included in the evaluation of erythema, with 26 scar sites in the test group and with 21 scar sites in the usual care group. In the evaluation of TEWL, 37 scar sites were included, with 20 scar sites and with 17 scar sites in respectively the test group and usual care group.

### 2.4. Intervention

Patients of the test group were treated during a period of 6 months with the PRUS<sup>®</sup> depressomassage device manufactured by F Care Systems in Belgium (presented in Fig. 1). The principle of depressomassage or vacuum therapy is to create a skinfold in a treatment head with negative pressure. The created skinfold can be manipulated in accordance with established defibrosis techniques [16]. The treatment frequency during the first 3 months was 2-3 times a week (10 treatments per month), the following 3-6 months only once a week. The applied negative pressure can vary between 250 and 900mbar depending on location and scar thickness. The duration of a treatment was approximately 5 min per 10cm<sup>2</sup>. The treatment protocol is presented in Table 1. All patients

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