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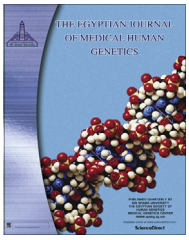

ORIGINAL ARTICLE

The response of skin hardness and pain sensation to ultrasonic treatment in lipodermatosclerosis patients

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KEYWORDS

Lipodermatosclerosis;
Pain;
Skin hardness;
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Abstract *Background:* Lipodermatosclerosis (LDS) is considered a type of panniculitis (inflammation of subcutaneous fat). Patient experiences severe pain, increased stress, swelling, walking problems and decreased quality of life. The end result of untreated LDS is ulcer formation with high incidence of delayed healing and infection. In addition to psychological problem, the financial costs can be significant.

Aim of the study: To evaluate the efficacy of ultrasonic waves (U.S.) in the treatment of lipodermatosclerosis.

Methods: Forty patients with lipodermatosclerosis from both sexes aged from 42 to 65 years were assigned into two groups of equal number. The study group (group A) received continuous U.S. three times/week at frequency of 3 MHz in addition to routine treatment which consisted of wearing grade 2 compression stocking (30–40 mmHg) during weight bearing conditions, patients were advised to try to decrease weight bearing as much as possible during the treatment period and circulatory exercise for 15 min at least 5 times/day, control group (group B) received placebo U.S. plus routine treatment. Pain sensation and skin hardness were assessed in both groups using numeric rating scale (NRS) and durometer.

Results: The results revealed a significant decrease in mean values of pain sensation and skin hardness in the study group compared to the control group after treatment.

To conclude that therapeutic ultrasound was effective in controlling of lipodermatosclerosis disease as regards, decreasing pain sensation and skin hardness.

1. Introduction

Lipodermatosclerosis (LDS) is characterized by lower leg inflammation and woody induration in patients with chronic venous or lymphatic hypertension [1]. Lipodermatosclerosis takes grade 4 on CEAP scale which is a graded scale that includes six grades and classifies venous diseases according to its severity based on clinical, etiologic, anatomic and pathologic aspects [2,3]. Lipodermatosclerosis may present as

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an acute or as a chronic (longstanding) condition. Chronic lipodermatosclerosis (CLDS) may follow an acute episodes or develop gradually [4].

Acute lipodermatosclerosis (ALDS) presents as episodes of painful inflammation in the inner leg above the ankle, resembling cellulitis [5]. The affected area is painful and inflamed, red or purple in color with poorly demarcated plaques, often with indurated and edematous skin of the medial calf. Some thickening of the skin can be felt. Patients with acute lipodermatosclerosis are mainly middle-aged [4]. Histologically, ALDS is mostly a lobular panniculitis with increased fat sclerosis, membranous necrosis and microcysts [6].

Common findings in chronic lipodermatosclerosis (CLDS) include pain, hardening of the skin, localized thickening, moderate redness, increased pigmentation, small white scarred areas (atrophie blanche), increased fluid in the leg (edema), varicose veins and leg ulcers. Chronic lipodermatosclerosis also predisposes to venous or stasis eczema [4].

Unless the underlying cause of the LDS is treated, the patient is at a high risk of developing a painful and potentially chronic venous leg ulcer [7]. Patients experience increased stress, pain, decreased quality of life and difficulty in coping with the symptoms and manifestations of the disease. In addition to the psychosocial problems, the financial costs can be significant [8].

In lipodermatosclerosis, the microvascular network is affected by the consequences of venous hypertension [9]. Several groups suggest that the subcutaneous vasculature is the first to be affected, leading to ischemic fat necrosis and panniculitis [10,11]. Whereas others propose that the papillary plexus in the upper dermis of the skin is initially affected [9,12,13].

The cellular and molecular mechanisms leading to the formation of LDS from venous hypertension are not known; it is likely to be multifactorial. Raised intravascular pressure, produced as a consequence of venous hypertension, is known to affect the capillary network of the skin in a manner as to cause enhanced filtration of fluid, leakage of plasma proteins such as fibrinogen and extravasation of erythrocytes [1,9].

Since the fibrinolytic activity of the blood and the tissues is deficient in patients with venous hypertension, any fibrinogen which is converted to fibrin in the interstitial spaces is less likely to be broken down or reabsorbed [14].

A sheet of fibrin appears to allow carbon dioxide to pass through it relatively freely but this sheet is relatively impermeable to the passage of oxygen, which leads to ischemia and destruction of tissues [15,16]. Moreover, patients with LDS may produce lower levels of plasminogen activator coupled with a simultaneous presence of elevated levels of its inhibitors in blood and tissues [17]. There is clear evidence of leukocytes' activation in venous disease and many inflammatory mechanisms are up-regulated in the skin [18].

2. Ethical consideration

The study protocol was explained in details for each patient before the initial assessment and signed informed consent was obtained from each patient before enrollment in the study (or their families)...This study was approved by the meeting of the department of Physical therapy for surgery and the ethics committee of the Faculty of Physical Therapy, Cairo University. The study is also carried out in accordance with the code of Ethics of the World Medical Association (Declaration of Helsiniki) for experiments involving humans.

3. Patients and methods

3.1. Subjects

This controlled randomized study was conducted to determine the effect of U.S. waves in controlling pain and skin durability in patients suffering from lipodermatosclerosis. Forty patients with lipodermatosclerosis had met the inclusion and exclusion criteria. The age ranged between 42 and 65 years old. They were divided randomly into two equal groups. Following the baseline evaluation of each patient, a closed envelope was randomly selected that contained the patient's group allocation. Group (A) the study group, received continuous ultrasound wave (3 MHz – 3 sessions/week), in addition to the routine treatment which consisted of grade 2 compression stocking at pressure from 30–40 mmHg. Patients wore compression stocking mainly during weight bearing conditions. Patients were advised to try to decrease weight bearing as much as possible during the treatment period, and to do circulatory exercises for 15 min at least 5 times/day. Group (B) the control group, received placebo ultrasound wave in addition to the same routine treatment. Patients were excluded if he/she had skin malignancy, open wound or ulcer at the site of treatment, skin infection at the treated area, psychological or mental problems, occupational and/or above-average recreational weight bearing requirements, dermatological condition rather than LDS at the treatment site as well as one of the ultrasound contraindications. Patients who received previous physical therapy program for LDS were also excluded from the study.

3.2. Methods of evaluation

Primary medical examination was done to every patient to get a complete medical picture of the health status of the patient and to know if the patient was able to undergo the study or if there were any contraindications.

Measurements were performed under standardized conditions taking into consideration that:

- Measurements were carried out by the same investigator.
- The same area was assessed before and after therapy for each patient.
- The patients were given 10 min. to adapt to room conditions and this constant for all patients.
- Measurements were always carried out with the patient in a resting position.

3.2.1. Pain assessment

Patients were asked to determine their degree of pain using the *numeric rating scale* (*NRS*); pre-treatment, after 4 weeks of the treatment (Post I) and after 8 weeks, at the end of the study (Post II) to determine the severity of pain. NRS is a scale with approximately ten severity grades. The NRS is graded from 0 (no pain) to 10 (maximum pain). Grades of NRS were explained for patients for more accurate expression of their pain degree.