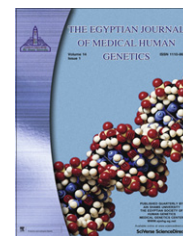




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ORIGINAL ARTICLE

Suggested physical therapy protocol for reduction of lipomatosis dolorosa of the legs

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KEYWORDS

Lipomatosis dolorosa;
Lymphedema;
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Abstract The purpose of this study was to investigate the efficacy of suggested physical therapy protocol in lipomatosis dolorosa of the legs. Twenty female patients with stage I lipomatosis dolorosa of the legs ranged in age from 30 to 45 years. They received a complete decongestive physical therapy program and diet regimen. Body Mass Index (BMI) of all patients was assessed before and after the treatment program. Lower limb volumes were assessed for all patients before and after treatment by using volumetric measurement. The patients received diet regimen plus complete decongestive physical therapy program for sixty minutes three times weekly for six months and pneumatic compression for thirty minutes three time weekly for six months. The results revealed a significant improvement ($P < 0.05$) in BMI and the lower limb volumes. It could be concluded that, suggested physical therapy protocol consisting of a complete decongestive physical therapy program and diet regimen had an effect in the treatment of lipomatosis dolorosa of the legs in females.

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1. Introduction

Lipomatosis dolorosa (lipedema) is a chronic disease of lipid metabolism marked by a bilateral and symmetrical swelling of the lower extremities caused by the impairment of symmetrical fatty tissue distribution and storage combined with hyperplasia of individual fat cells. It can be diagnosed using clinical features rather than diagnostic tests [1].

It almost exclusively affects women and 15% of the patients have a family history of lipedema. Lipedema occurs primarily in the lower extremities and is rarely accompanied by edema of the upper extremities. Edema of the lower extremities is observed between the pelvic crest and the ankle, and occurs symmetrically on both sides [2–4].

Lipomatosis dolorosa is caused by several factors. The most striking visual symptom is the disproportion between the upper and lower body due to the pathological fat deposits. It is unclear whether this is a hypertrophy of the fat cells, hyperplasia or a combination of the two. Another important factor is increased capillary permeability, which leads to the increased accumulation of fluid and protein in the interstitium, causing orthostatic edema [3,5].

The histological changes occurring in lipomatosis dolorosa are not sufficient diagnostic indicators. In addition to an

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increase in fat cells, some of which are hypertrophic, a high volume of capillary blood vessels is found in the interstitial tissue. Perivascularly there are macrophages, fibroblasts, mast cells and isolated necrotic adipose tissue. In the late stages of the disease, the fibrotic part increases. The descriptive term edematous fibrosclerotic panniculopathy is now obsolete. The histology is generally identical to that of dermatoliposclerosis. This is apparently an unspecific inflammatory reaction of the tissue similar to that which occurs in chronic venous insufficiency [6,7].

Lipomatosis dolorosa (lipedema) is frequently mistaken for lymphedema. Primary lymphedema generally occurs in women, usually in puberty, with unilateral or bilateral swelling of the lower extremities. In primary lymphedema, swelling typically begins at the toes and then reaches the thigh. With lipedema, the increase of volume usually begins in the thigh. In lymphedema patients, the Stemmer skin fold sign is positive, while in lipedema patients it is negative. Hypersensitivity of the tissue or easy bruising is not present [8].

Physical measures of limb edema include circumferential measures at various points (with bony landmarks as a reference), volumetric measures using limb submersion in fluid and skin/soft-tissue tonometry in which soft-tissue compression is quantified [9].

To establish the limb volume, each limb is submerged in a cylinder of water and the difference in the rise in water level is measured. Measuring limb volume is a clinically messy procedure that requires some training. The limbs must be submerged up to the same point and the individual must remain still during measurement. A 200-mm difference in volume might be clinically significant, although again, no standard agreement exists [10].

The lack of awareness regarding lipomatosis dolorosa continues to lead therapists to prescribe an absurd and even counterproductive treatment, including dieting, training and toning the affected body parts and drugs. Because of the extreme symptoms, nearly all patients try some sort of dieting regimen [7].

Lipomatosis dolorosa can be treated successfully by modern lipedema therapy which involves two major components, conservative treatment to eliminate edema and surgical intervention to reduce fat. Liposuction is now a standard surgical procedure for the treatment of Lipomatosis dolorosa. Complications described in the literature, including deaths, are generally the result of failure to observe internationally established guidelines and are sometimes due to the lack of basic medical skills on the part of the surgeon [7,11].

Conservative treatment includes Complex decongestive therapy (CDT), which consists of four basic steps: (1) skin and nail care, (2) manual lymphatic drainage, a non-invasive manual technique designed to stimulate the activity of certain lymph vessels, (3) compression therapy, and (4) decongestive exercises with the patient wearing compression bandages or garments [10,12].

For lipomatosis dolorosa (lipedema) patients, conservative therapy can bring about a reduction in the circumference of approximately 10% and a decrease in volume of up to three liters per leg in turn alleviating the patient's hypersensitivity to pressure [7].

So the purpose of the present study was to investigate the efficacy of suggested physical therapy protocol for the reduction of Lipomatosis dolorosa (lipedema) of the leg.

2. Subjects and methods

2.1. Subjects

Twenty female patients with bilateral stage I lipomatosis dolorosa of the legs ranged in age from 30 to 45 years. They were treated in the outpatient clinic of the Faculty of Physical Therapy, Cairo University. They received a complete decongestive physical therapy protocol and diet regimen. All patients had soft edema with negative Stemmer's sign being evident. Obvious differences in both the lower extremities were not observed and edema was not evident in the ankles or the feet. All patients received the same medications (antibiotics and diuretics). The stage of lipomatosis dolorosa for all patients was stage I: where the skin is smooth with a thickened subcutaneous layer with evenly distributed small nodules. All patients were not diabetics. Also they had no history of vascular or circulatory disorders.

2.1.1. Ethical consideration

The experimental protocol was explained in detail to each patient before the initial assessment and informed written consent was obtained from all the participants. The trial protocol was approved by the meeting of the department of surgery, faculty of physical therapy, Cairo University. There was no harm inflicted on the patients.

2.2. Methods

2.2.1. Measurement equipment

- (1) Weight and height scale (standard height and weight scale) was used for measuring height/cm and weight/kg before and after the study. BMI (Body Mass Index); this index is calculated by dividing the weight in kilogram by the height in squared meter.

$$BMI = \frac{\text{Weight in kgm}}{\text{Height (M)}^2} \quad [12]$$

- (2) Volumetric measurement was used to measure the volume of edema in both the lower limbs. One limb was immersed in a known volume of sterilized solution and the amount of displaced solution was calculated. It was done for each limb pre and post treatment [10].

2.2.2. Therapeutic equipment

- Elastic bandage: this is used to apply low compression after manual lymphatic drainage
- The mechanical pressure therapy device: it is a portable device that can be powered by cable using 220 V 50/60 Hz, 25/23 W. Rated 30 min, No 602000344. ITO Medomer, made in Japan. It has an adjustable gradient pressure [13].

2.3. Treatment

2.3.1. Complete decongestive physical therapy (CDT)

It is included in the following steps:

- 1- Skin and nail care, which could optimize the supple normal texture [13].
- 2- Manual lymph therapy (MLT), a delicate massage was done which stimulates lymph vessels to contract more frequently, directing and channeling fluid toward adjacent functioning lymph basins. Manual lymph drainage began with the stimulation of the lymph vessels and nodes in unaffected and opposite basins for a total duration of 45 min [14].
- 3- Multilayer low-stretch bandaging was done immediately following manual lymph drainage. The bandaged patient was next guided through exercises involving a range of active motion with the muscles and joints functioning within the closed space of the bandaging. Isometric exercise was generally avoided to prevent the effect of shearing force on the skin for a total duration of 15 min. This technique was applied three times weekly for six months [8,12].
- 4- The intermittent Mechanical Pressure Protocol: each patient was instructed that the limb treated should be completely bared. The limb was placed in a cotton gauze sleeve before putting into the compression sleeve. The sleeve was connected by a plastic or rubber tubing to the machine which was switched off. Each patient was seated in a comfortable chair with his/her back supported. The involved lower extremity was elevated by using pillows just above the level of the heart to 30°. Intermittent compression was given at a pressure of 30–40 mmHg for 30 min three times weekly for six months[10].

2.3.2. Recommended diet regimen

Patients received a low caloric diet only, with a caloric intake below 1200 cal./day. This diet regimen was administered for 3 days at a time and followed by 4 days of normal eating for six months [3].

Day 1: breakfast: black coffee or tea, ½ of a grapefruit, 1 slice of toast and 1 cup peanut butter.

Lunch: ½ cup tuna or 1 slice of cheese, 1 slice of toast and black coffee or tea.

Dinner: 2 slices of any type of meat, 1 cup of string beans and 1 small apple.

Day 2: breakfast: black coffee or tea, 1 egg, 1 slice of toast and ½ of a banana.

Lunch: 1 cup of cottage cheese or ½ cup tuna, 5 saltine crackers and black coffee or tea.

Dinner: 1 cup of broccoli or cabbage, ½ cup of carrot, ½ of a banana and 1 cup of vanilla ice cream.

Day 3: Breakfast: 5 saltine crackers, 1 slice of cheddar cheese and 1 small apple.

Lunch: 1 boiled egg, 1 slice of toast and black coffee or tea.

Dinner: 1 cup of tuna, 1 cup of carrot, 1 cup of grains, 2 cups of cantaloupe and ½ cup of vanilla ice cream [15].

2.4. Statistical analyses

The collected data were statistically analyzed using SPSS software statistical computer package version 12. For each variable, the mean and standard deviation were calculated. The difference between the two means before and after treatment was statistically analyzed using the paired student's (*t*) test. Significance was adopted at $p < 0.05$.

3. Results

Data presented in Table 1 showed the mean values of ages and height of the patients. They also showed pre and post values of body weight and body mass index as shown in Fig. 1. Their values were lower than their corresponding pre values.

Data presented in Table 2 showed the mean values of right and left lower limbs' volumes pre and post treatment. Their values were lower than their corresponding pre values. The percentages of improvement were 53.23% and 51.47% for the right and the left limbs respectively. Figs. 2 and 3 show the mean values of the right and the left lower limbs' volumes respectively before and after the end of treatment.

4. Discussion

The aim of our study was to investigate the effects of complex decongestive therapy and diet regimen in lipedema. Our results showed that there was a significant reduction in the volumes of the affected limbs that could be explained by the effects of complex decongestive therapy plus diet regimen.

Lipedema is a condition that occurs bilaterally and symmetrically in the lower extremities and arises from the deposition

Table 1 The mean values of body weight and BMI before and after treatment respectively.

Item	Variables					
	Age(Year)	Height(Cm)	Weight(kg)		BMI	
			Pre	Post	Pre	Post
Mean	39.4	156.5	81.75	74.75	31.6	28.9
SD			7.28	6.53	1.84	1.68
<i>T</i> -Value			18.92		19.96	
<i>P</i> -Value			0.001		0.001	
Significance			S		S	

Level of significance at $P < 0.05$, SD = standard deviation, *P*-Value = probability value, *t*-value = paired *T*-Test.

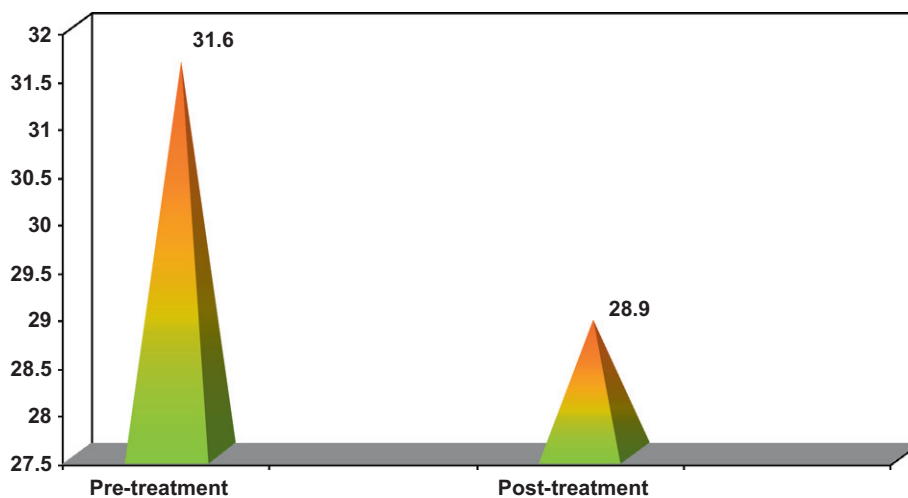


Figure 1 Pre and post values of body mass index.

Table 2 The mean values of right and left limbs' volumes (ml).

Item	Limb volumes			
	Right limb		Left limb	
	Pre	Post	Pre	Post
Mean	5569.1	2604.15	5439.6	2639.6
SD	1013.7	1023.4	981	1192.4
T-Value	55.99		17.995	
P-Value	0.001		0.001	
Significance	S		S	
% of Improvement		53.23%		51.47%

Level of significance at $P < 0.05$, SD = standard deviation, P-Value = probability value, t-value = paired T-Test.

of fat tissue starting at the hips and ending at the ankles, in a pattern that is visually similar to riding breeches [11].

Therapy for lipedema can be largely divided into conservative treatments to reduce edema and surgical treatments such as liposuction. Conservative treatment can first be performed

with complex decongestive therapy, which is usually used for patients with lymphedema [10,12,16].

Complex decongestive therapy cannot affect the fat tissue, but can contribute to the treatment by reducing interstitial edema. No bandages should be used until the pain subsides because, unlike lymphedema patients, those with lipedema report pain and hypersensitivity in the edema areas when complex decongestive therapy is performed. The use of bandages after the disappearance of pain is helpful in reducing edema [1,17].

The effects of complete or complex decongestive therapy (CDT) was consistent with some authors [2-5,7,9-11,14,18-26] who reported that, the variety of clinical treatments available for lymphedema has varying degrees of effectiveness. The most common lymphedema treatment is known as complete or complex decongestive therapy (CDT) and has been used successfully in practice for many years in Europe. Complex decongestive therapy includes compression, exercise, skin care, and manual lymph drainage (MLD), a specialized set of massage techniques that involves light pressure on the affected limb to move fluid from the end of the limb toward the abdomen. This technique has been used clinically in Europe.

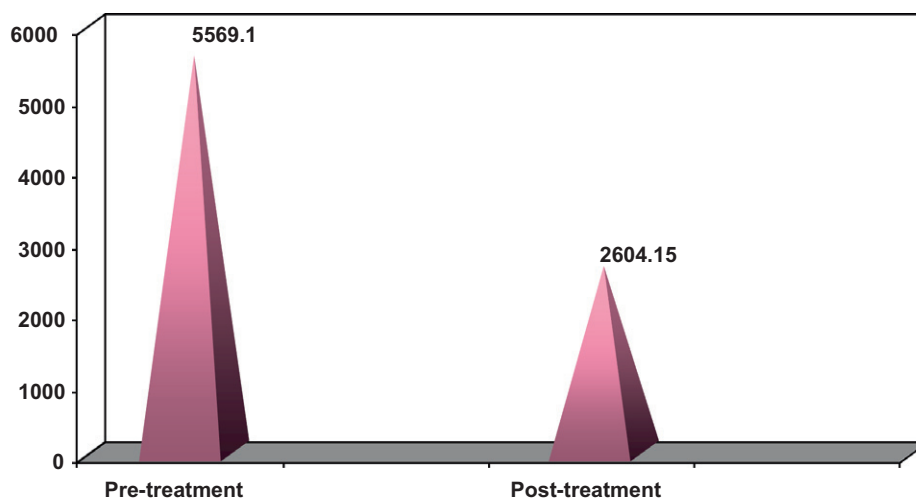


Figure 2 Pre and post values of right lower limb volumes.

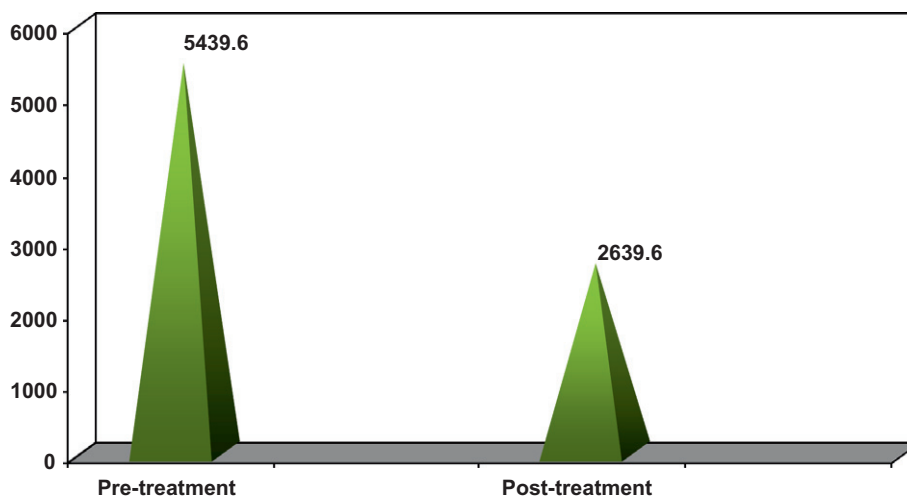


Figure 3 Pre and post values of left lower limb volumes.

The results of this study were consistent with those reported by many authors. As the study [25] reported, the results of a large ($n = 45$) randomized controlled trial that was conducted were used to determine whether exercise and weight training were effective in managing lymphedema. They found that a 6-month intervention did not increase risk or add to the symptoms of lymphedema.

Johansson et al. [10] supported that, patients with lymphedema could engage in low-intensity exercises without worsening their edema. Meticulous skin care helps to minimize infection risk and hydrate the skin, although no specific evidence-based protocols specify minimum skin care requirements to reduce or manage lymphedema-related skin complications.

In addition to Mondry et al. [24] who prospectively analyzed the results of CDT in a cohort of 20 patients enrolled in the program immediately after lymphedema diagnosis, the investigators found a median circumferential girth reduction (associated with decreased pain) of 1.5 cm and a median volume reduction of 138 ml.

Finally, Vignes et al. [26] reported on a large prospective cohort of 537 patients with secondary upper extremity lymphedema recruited from a single lymphology unit in France. Before CDT, the mean lymphedema volume was $1,054 \pm 633$ mL; after CDT the volume was 647 ± 351 ml. Subjects were followed for 12 months during the maintenance phase of therapy.

If lipedema is not treated, complications that are detrimental to mental health and are life-threatening can occur. These complications include mental problems, eating disorders and generalized complications including hypertension, diabetes, and heart failure. Furthermore, patients may develop pseudo-Bartter's syndrome, which is characterized by hypokalemia due to the excessive use of diuretics, and joint problems in the spine or lower extremities due to excessive body weight [11,26].

So, our suggested physical therapy protocol in the form of CDT plus controlling of body weight had an effect in the treatment of lipomatosis dolorosa of the legs in females.

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