



Effect of Physical Therapy on Circumference Measurement and Extremity Volume in Patients Suffering from Lipedema with Secondary Lymphedema

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Abstract

Background: Lipedema is a chronic and progressive disease. Many complications can occur if the disease is not treated. The most important of these complications is lipedema with secondary lymphedema. There are very few publications about lipedema with secondary lymphedema. The aim of this study is to investigate the effect of physical therapy on lower extremity circumference and volume in patients suffering from lipedema with secondary lymphedema.

Methods and Results: All patients received pneumatic compression and complex decongestive therapy (CDT). Perometer measurement was made at five distinct points. Fifteen patients were included in the study. It was seen that significant reduction was found in the circumference of three of the five points of measurements performed in the left leg, whereas significant reduction was found in the circumference of four of the five points of measurements performed in the right leg. Also, there was a decrease in the extremity volume in both legs.

Conclusion: Combined application of CDT and pneumatic compression in patients suffering from lipedema with secondary lymphedema is an effective treatment method in reducing lower extremity volume and circumference measurement.

Keywords: lipo-lymphedema, lympho-lipedema, perometer

Introduction

LIPDEMA IS A chronic poorly understood disease that occurs with excessive accumulation of adipose tissue in the subcutaneous tissue of the extremities.^{1,2} The etiology of lipedema is unknown, although clinical observations suggest genetic inheritance, hormonal influences, dilated blood vessels and lymphatics, and inflammation.³ It is known that the lymph transport capacity deteriorates with duration of symptoms of the disease, but there are no major anatomical lymphatic changes.⁴ Since lipedema is a chronic disease, various complications can occur if left untreated.⁵

The most important complication that can occur due to lipedema is lipedema with secondary lymphedema.⁶ If lipedema is not treated, bilateral lymphedema may develop, since the load of the lymphatic system exceeds the capacity of the

lymphatic system. Normally, edema is not seen in the dorsum of the foot in pure lipedema, whereas edema is seen in the dorsum of the patients suffering from lipedema with secondary lymphedema. The coexistence of lymphatic insufficiency and lipedema is called lipo-lymphedema or lympho-lipedema.^{7,8}

Although there is no known cure for lipedema, complications that may arise due to this disease can be prevented by surgery or conservative treatment. One of the conservative treatment approaches is physical therapy.⁹ Complex decongestive therapy (CDT), which is one of the physical therapy approaches, is accepted as the gold standard in the treatment of lymphedema and lipedema.^{10,11} CDT consists of five key components: manual lymph drainage, skin care, compression therapy, therapeutic exercise, and self-management.⁸

It is known that the physical therapy approach is effective in reducing the extremity volume in patients with lower

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TABLE 1. CIRCUMFERENCE MEASUREMENT CHANGE BEFORE AND AFTER TREATMENT

		<i>Before treatment</i>	<i>After treatment</i>	p
Left leg	cB (cm)	32.96 ± 5.72	30.87 ± 4.71	< 0.001
	cC (cm)	52.78 ± 9.04	50.82 ± 7.69	0.006
	cD (cm)	51.78 ± 9.30	49.86 ± 7.50	0.052
	cE (cm)	55.66 ± 9.61	56.28 ± 9.95	0.626
	cF (cm)	71.87 ± 10.92	69.71 ± 11.22	0.038
Right leg	cB (cm)	31.21 ± 5.02	29.64 ± 4.05	0.002
	cC (cm)	51.90 ± 7.75	49.72 ± 6.31	0.017
	cD (cm)	51.80 ± 8.56	50.04 ± 7.07	0.023
	cE (cm)	56.62 ± 9.65	56.51 ± 8.77	0.921
	cF (cm)	72.40 ± 10.36	70.20 ± 10.47	0.039

Values in bold are statistically significant.

extremity¹² and upper extremity lipedema.¹³ However, as far as known, there is no study investigating the effectiveness of physical therapy in patients suffering from lipedema with secondary lymphedema. The aim of this study is to examine the effect of physical therapy approach on lower extremity circumference measurement and volume in patients suffering from lipedema with secondary lymphedema.

Materials and Methods

Patients

Patients admitted to the Lmpho-opt/Germany clinic and diagnosed with lipedema with lymphedema by a specialist lymphologist were included in the study. Patients with edematous disease such as primary lymphedema and venous insufficiency in the lower extremities were excluded. The data of this study were collected by the retrospective analysis of regular patient records.

The ethical approval was obtained from the Gazi University ethics committee and the authors conformed to the ethical guidelines of the 1975 Declaration of Helsinki.

Evaluation

The lower extremity circumference and extremity volume of the patients were evaluated with a perometer. The Perometer 400NT (Pero-Systems) takes circumference measurements every 4.7 mm and uses these to calculate leg volume. It is known that perometer gives more reliable and faster results in extremity volume measurement than manual circumferential measurement (tape).¹⁴ At baseline and discharge, the circumference and volume measurements of the legs were evaluated with a perometer.

The perometer circumference measurements were performed in the certain five reference points. Point “cB” is the smallest circumference of the ankle. Point “cC” is the largest

circumference of the calf. Point “cD” is the smallest circumference below the knee but above the calf. Point “cE” is at the mid-patella level. Point “cF” is at the middle of the thigh.¹²

Intervention

CDT was applied to all patients 5 days a week. Manual lymph drainage, one of the components of the CDT, was applied to the lower extremity for 45 minutes. The patients received pneumatic compression therapy (30–60 mmHg) for 30 minutes. Before the multilayer bandage, skin care was given to the patients. Multilayer bandage was applied six times per week from the toes to the groin. In addition, patients were advised to exercise (walk) every day.

Statistical analysis

All the analyses were conducted using the SPSS software version 21 (SPSS, Inc., Chicago, IL). The normality of data and homogeneity of variance were assessed through a Shapiro–Wilk test. Visual (histogram, probability graphs) and analytical methods (Shapiro–Wilk test) were used to define whether the variables were normally distributed or not. Variables that were determined by measurement and showed normal distribution were indicated as mean ± standard deviation, and those that did not show normal distribution were indicated by median (interquartile range) and minimum–maximum. If the normality assumption enabled pre- and posttreatment comparison, the paired *t*-test was used and if not, the Wilcoxon test statistic was used. The significance level was set at $p < 0.05$ for the analyses.

Results

The study was concluded with a total of 15 patients suffering from lipedema with secondary lymphedema. The mean age of the patients was 56.26 ± 13.47 years. The patients underwent an average of 28.2 ± 5.8 days of treatment.

It was seen that significant reduction was found in the circumference of three (cB, cC, and cF) of the five points of measurements performed in the left leg, whereas significant reduction was found in the circumference of four (cB, cC, cD, and cF) of the five points of measurement performed in the right leg (Table 1). Significant results are shown in bold.

It was seen that statistically significant reduction was found in the volume of both legs (Table 2).

Discussion

To the best of our knowledge, this is the first study to investigate the effect of physical therapy in patients suffering from lipedema with secondary lymphedema. Lipedema affects both legs the same, whereas lymphedema always affects one extremity more than the other. As a result of the study, it

TABLE 2. EXTREMITY VOLUME CHANGE BEFORE AND AFTER TREATMENT

	<i>Before treatment</i>	<i>After treatment</i>	p
Left leg volume (mL)	15,958 (11,949/16,132)	15,110 (10,642/13,565)	0.011
Right leg volume (mL)	16,132 (11,583/26,830)	14,779 (10,170/26,807)	0.001

Values in bold are statistically significant.

was observed that there was a decrease in the circumference and volume of the lower extremities of the patients. It is seen that there are very few studies about lipedema with secondary lymphedema, and this makes it difficult to discuss the results of the study.

CDT is known to be effective in reducing limb volume and circumference measurement in patients with lipedema¹² and lymphedema.¹⁵ Therefore, it is not surprising that the leg volume and circumference measurement decreased in patients suffering from lipedema with secondary lymphedema as a result of the study.

In the study, many different physical therapy modalities were applied to the patients. Manual lymph drainage, which is one of these modalities, accelerates lymphatic circulation by increasing lymphangiogenic activity.¹⁶ The application of a multilayered bandage, which does not stretch, contributes to the drainage by stimulating the rhythmic pulsations of the lymph collectors.¹⁷ Walking increases the activity of skeletal muscles and facilitates the return of fluid in the lymphatic system. Together with the supporting mechanisms of muscle contraction, it sends the lymphatic fluid back to the heart and thus provides an uninterrupted circulation.¹⁸ Pneumatic compression therapy facilitates the liquid outflow.⁸ Considering the effects of these treatments on the lymphatic system, it is thought that each of them may have contributed to reducing the extremity volume in patients suffering from lipedema with secondary lymphedema.

It was shown that sodium in leg skin and subcutaneous adipose tissue increases in patients with lipedema. Multimodal manual therapy, compression, exercise, and education interventions were applied to the patients participating in this study for 6 weeks. At baseline and discharge, the patients were scanned with three Tesla sodium and water magnetic resonance imaging. Leg skin sodium and subcutaneous adipose tissue sodium reduced after physical therapy.¹⁹ This study provides that patients with lipedema can benefit from physical therapy.

It is known that the amount of extracellular fluid increases in patients with lipedema²⁰ and lymphedema.²¹ The reason for the decrease in circumference measurement and volume after physical therapy in this study may be the decreased amount of extracellular fluid. In future studies, the effect of physical therapy on the amount of extracellular fluid should be examined.

Conclusions

CDT applied together with pneumatic compression is effective in reducing the lower extremity volume in patients suffering from lipedema with secondary lymphedema. This combined therapy may be beneficial in preventing the development of other complications related to lipedema. In future studies, it will be beneficial to focus on treatment approaches that will prevent the development of secondary lymphedema in patients with lipedema.

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