ORIGINAL ARTICLE

Comparing complex decongestive therapy in patients with lymphedema of different causes by measuring: extremity volume, quality of life, and functionality

Comparación de la terapia descongestiva compleja en pacientes con linfedema de diferentes causas mediante la medición del volumen de las extremidades, la calidad de vida y la funcionalidad

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Abstract

Objective: *This study aimed to investigate the effects of complex decongestive therapy (CDT) applied to the lower extremities of patients with lymphedema of different causes on the extremity volume, quality of life (QoL), and functionality.* **Materials and method:** *The study included 90 patients, of whom 28 had primary lymphedema, 30 had secondary lymphedema, 18 had phlebolymphedema, and 14 had lipolymphedema. A total of 137 extremities were treated with CDT. The patients who received CDT for 5 days a week for 3 weeks (15 sessions in total) were included in the sample. Extremity volume was measured using a tape measure. The lymphedema QoL-Leg Questionnaire was used to evaluate QoL, and the lower extremity functional scale (LEFS) was administered to assess lower extremity functionality.* **Results:** *The changes in QoL before and after treatment significantly differed in the primary lymphedema, phlebolymphedema, and lipolymphedema groups ($p < 0.05$). The post-treatment LEFS scores indicated a significant decrease in the phlebolymphedema and lipolymphedema groups compared to the pre-treatment scores ($p < 0.05$).* **Conclusions:** *The difference in appearance, which is one of the sub-parameters of QoL, significantly decreased in the comparisons performed between the groups, whereas the changes in the remaining parameters were not significant.*

Keywords: *Lymphedema. Phlebolymphedema. Lipolymphedema.*

Resumen

Objetivo: *Investigar los efectos de la terapia descongestiva compleja (TDC) aplicada a las extremidades inferiores de pacientes con linfedema de diferentes causas sobre el volumen de la extremidad, la calidad de vida y la funcionalidad.* **Materiales y método:** *Se incluyeron en el estudio 90 pacientes, de los cuales 28 tenían linfedema primario, 30 linfedema secundario, 18 flebolinfedema y 14 lipolinfedema. Un total de 137 extremidades fueron tratadas con TDC. Se incluyeron en la muestra pacientes que recibieron TDC durante 5 días a la semana durante 3 semanas (15 sesiones en total). El volumen de las extremidades se midió con una cinta métrica. Se utilizó el Cuestionario de calidad de vida (QoL) de las piernas para el linfedema para evaluar la calidad de vida, y se administró la Escala funcional de las extremidades inferiores (LEFS) para evaluar la funcionalidad de estas.*

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Resultados: *Los cambios en la calidad de vida antes y después del tratamiento difirieron significativamente en los grupos de linfedema primario, flebolinfedema y lipolinfedema (p < 0.05). Las puntuaciones LEFS posteriores al tratamiento indicaron una disminución significativa en los grupos de flebolinfedema y lipolinfedema en comparación con las puntuaciones previas al tratamiento (p < 0.05).* **Conclusiones:** *La diferencia de apariencia, que es uno de los subparámetros de la calidad de vida, disminuyó significativamente en las comparaciones realizadas entre los grupos, mientras que los cambios en los demás parámetros no fueron significativos.*

Palabras clave: *Linfedema. Flebolinfedema. Lipolinfedema.*

Introduction

Lymphedema is a chronic condition that occurs as a result of the accumulation of protein-rich fluid in the interstitial space[1]. It often appears in the upper and lower extremities. Although upper extremity lymphedema is frequently encountered in lymphedema clinics, lower extremity lymphedema also has a very high density[2,3]. Lower extremity lymphedema may develop due to four causes classified as primary lymphedema (congenital anomalies), secondary lymphedema (secondary to any surgery for any condition, such as cancer in the upper extremity or lower extremity), phlebolymphedema (resulting from venous insufficiency), and lipolymphedema (as a result of damage to the lymphatic system in patients with advanced lipedema)[3]. The lower extremity lymphedema negatively affects patients' functionality, quality of life (QoL), activities of daily living (especially ironing and cleaning), and climbing, sports, and walking activities[4].

Complex decongestive therapy (CDT) is a gold-standard conservative treatment for patients with lymphedema. CDT contains two treatment phases: the first (intensive) phase consists of manual lymph drainage (MLD), skin care, compression bandage, and exercises, and the second (maintenance) phase includes self-drainage, compression stockings, skin care, and exercises[5]. The efficacy of CDT has been shown in studies conducted with patients who developed lymphedema in the lower extremities. There are studies comparing the effects of CDT on QoL and functionality in patients with primary and secondary lymphedema[6-8]. However, studies in the literature are limited to those investigating the efficacy of CDT in patients with primary and secondary lower extremity lymphedema. The purpose of our study was to investigate the effects of CDT on edema, QoL, and functionality in patients who developed different types of lower extremity lymphedema (primary lymphedema, secondary lymphedema, phlebolymphedema, and lipolymphedema).

Materials and methods

Study design and patients

A total of 90 patients who received CDT for 5 days a week for 3 weeks due to lymphedema at the oncological rehabilitation lymphedema laboratory of Ankara City Hospital were divided into primary lymphedema (n = 28), secondary lymphedema (n = 30), phlebolymphedema (n = 18), and lipolymphedema (n = 14) groups, and their data were retrospectively analyzed. Lymphedema was present in 39 extremities of the 28 patients in the primary lymphedema group, 34 extremities of the 30 patients in the secondary lymphedema group, 36 extremities of the 18 patients in the phlebolymphedema group, 28 extremities of the 14 patients in the lipolymphedema group. Before commencing the study, ethical approval was obtained from the Non-Invasive Ethics Committee of Ankara City Hospital (E2-21-906). The patients' demographic (age, weight, length, body mass index [BMI], and gender) and clinical data (lymphedema stage and affected limb) were recorded before treatment, and the data on lower extremity volume, lower extremity functionality, and QoL were recorded both before and after treatment. Lymphedema types were diagnosed by a Physical Medicine and Rehabilitation doctor and the classification of the disease stages of the participants was made according to the International Society of Lymphology[9].

For each group, the criteria for participation in the study were as follows: being aged 18-65 years, not having any orthopedic disease in the lower extremities, not having undergone any surgery due to orthopedic disorder/discomfort, having received CDT treatment for the 1st time, not having a non-regulated chronic disease. The exclusion criteria were as follows: patients with acute infections, uncontrollable heart failure, deep vein thrombosis, orthopedic

disorders that would prevent exercising, mental and cognitive problems, uncooperative patients, not completed chemotherapy/radiotherapy treatments, renal insufficiency, active rheumatic disease, and uncontrolled hypertension were excluded.

Intervention

CDT was applied to the patients for 5 days a week for 3 weeks (15 sessions). The first phase of CDT (MLD, skin care, compression bandage, and exercise) took an average of 45 min for each patient. The CDT technique was applied by the physiotherapist who has a certificate (Foeldi College, Germany).

In primary lymphedema, phlebolymphedema, and lipolymphedema groups, MLD was applied first to the neck and then to the abdominal region. Subsequently, axilla-inguinal anastomoses on the affected side were treated.

MLD treatment was applied to the affected extremity from proximal to distal by stimulating the inguinal lymph node. If edema was present in the contralateral extremity of the patient, axilla-inguinal anastomoses were also treated for the contralateral side, and MLD treatment was applied to the affected leg[5,10].

For the patients with secondary lymphedema, MLD was applied first to the neck and then to the abdominal region. Subsequently, axilla-inguinal anastomoses were treated. MLD was applied to the affected extremity from proximal to distal. If edema was present in the other extremities of the patient, axilla-inguinal anastomoses were treated on the contralateral side, and MLD was applied to the affected leg. The inguinal lymph nodes of these patients were not stimulated by treatment[5,10].

After MLD treatment, skin care was provided with creams with a pH of 5.5, followed by bandaging. First of all, stockinette was put on the patient. The toes were wrapped with elastic finger bandages. The entire lower extremity was wrapped in cotton/sponge to distribute the pressure evenly and avoid damage to the skin. Finally, lower extremity bandaging was performed with bandages with a short tension feature. The treatment was terminated by applying remedial exercises. The patient was asked to keep the bandage for 22 h and recommended to perform remedial exercises during the day[11].

Evaluation

The patient's demographic and clinical data were evaluated before treatment and extremity volume, lower extremity functionality, and QoL both before and after treatment.

Extremity volume

Extremity volume was measured using a tape measure. Measurements were made from the malleol to the groin on the affected extremity at 4-cm intervals. Extremity volume was calculated by entering the measured values into the Frustrum formula: $V = [hx (R1^2 + R1.R2 + R2^2)]/(12 \times \pi)$. The result was recorded in cm^3[3,12].

QoL

The lymphedema QoL (LYMQOL)-leg questionnaire was used to evaluate QoL. The first part of this scale consists of 20 questions under the domains of function, appearance, physical symptoms, and mood. The first 20 questions are graded on a scale of 1-4. Lower scores indicate better QoL. The last question assesses the overall QoL on a scale of 0-10. A higher score on this question indicates better QoL[13].

Lower extremity functionality

Lower extremity functionality was assessed with the lower extremity functional scale (LEFS), which consists of 20 items scored from 0 (extreme difficulty/unable to perform activity) to 4 (no difficulty). The total score is obtained by summing the score of each marked answer for each question. The total score ranges from 0 to 80, with high scores indicating good extremity function[14].

Statistical analysis

Data were analyzed using SPSS version 25.0 (IBM SPSS Statistics 25 software (Armonk, NY: IBM Corp.) software package. Continuous variables were expressed as mean ± standard deviation, median (25-75%), and categorical variables as numbers and percentages. The conformity of the data to the normal distribution was examined with the Shapiro–Wilk test. In the examination of independent groups, one-way analysis of variance (*post hoc*: Tukey test) was used when parametric test assumptions were met, and the Kruskal–Wallis analysis of variance (*post hoc*: Mann–Whitney U test with the Bonferroni correction) was used otherwise. To compare the differences between

Table 1. Demographic characteristics of the patients

Variables	Variables	Primary lymphedema	Secondary lymphedema	Phlebolymphedema	Lipolymphedema	p-value
Age (years)	Mean ± SD	49.92 ± 12.46	55.03 ± 8.75	54.75 ± 8.69	59.27 ± 8.78	0.060 (F = 2.577)
Height (cm)	Mean ± SD	165.07 ± 9.79	160.2 ± 6.76	162.58 ± 8.9	160.36 ± 5.2	0.124 (F = 1.978)
Weight (kg)	Median (25-75%)	81 (63.25-96.5)	85.25 (74-92.75)	100 (94.25-129.5)	100 (92-108)	0.0001* (kw = 20.109) (1-3, 1-4, 2-3, 2-4)
BMI (kg/m^2)	Median (25-75%)	28.51 (22.07-34.29)	32.89 (26.96-36.51)	39.41 (34.82-50.05)	41.02 (35.16-44.44)	0.0001* (kw = 20.287) (1-3, 1-4)

*p < 0.05. SD: standard deviation; BMI: body mass index; n: number of participants, F: one-way analysis of variance statistic; kw: Kruskal–Wallis test statistic.

Table 2. Clinical characteristic of the patients

Variables	Primary lymphedema (n = 28) (%)	Secondary lymphedema (n = 30) (%)	Phlebolymphedema (n = 18) (%)	Lipolymphedema (n = 14) (%)	Total (%)	p-value
Gender, n (%)						
Female	21 (75)	28 (93.3)	12 (66.7)	1 (100)	75 (83.3%)	0.019*
Male	7 (25)	2 (6.7)	6 (33.3)	0 (0)	15 (16.7)	(x^2 = 9.960)
Lymphedema stage, n (%)						
1	5 (17.9)	1 (3.3)	0 (0)	0 (0)	6 (6.7)	0.001
2	19 (67.9)	25 (83.3)	9 (50)	6 (42.9)	59 (65.6)	(x^2 = 22.761)
3	4 (14.3)	4 (13.3)	9 (50)	8 (57.1)	25 (27.8)	
Affected limb, n (%)						
Left	9 (32.1)	18 (60)	3 (16.7)	0 (0)	30 (33.3)	0.0001*
Right	8 (28.6)	8 (26.7)	0 (0)	0 (0)	16 (17.8)	(x^2 = 41.570)
Bilateral	11 (39.3)	4 (13.3)	15 (83.3)	14 (100)	44 (48.9)	

*p < 0.05. n: number of participants; x2: Chi-square test statistic.

the measurements, the t-test for dependent groups was used when parametric test assumptions were met, and the Wilcoxon paired-sample test was used otherwise. Differences between categorical variables were analyzed using the Chi-square test. $p < 0.05$ was considered significant in all the analyses.

Results

BMI significantly differed between the groups ($p < 0.05$). The characteristics of the patients are summarized in table 1.

There was a significant difference between the groups in terms of gender, lymphedema stage, and affected limb ($p < 0.05$). The clinical characteristics of the patients are shown in table 2.

Before treatment, there was a significant difference in extremity volume between the groups. The pre-treatment extremity volume value of the primary lymphedema group was significantly lower than that of the lipolymphedema group ($p < 0.05$). Similarly, there was a significant difference in the volume of examinations performed after treatment. The post-treatment extremity volume of the primary lymphedema group was significantly lower than that of the lipolymphedema group ($p < 0.05$). The extremity volume was also observed to significantly change within each group after treatment compared to the pre-treatment evaluation ($p < 0.05$). The inter-group and intra-group comparisons of the extremity volume are shown in table 3.

There was a significant difference in the pre-treatment function subscale scores of the LYMQOL questionnaire between the groups ($p < 0.05$). The pre-treatment function score of the primary lymphedema group was significantly lower than that of the lipolymphedema group ($p < 0.05$). However, there was no significant difference in the post-treatment function scores of the groups. The function subscale scores significantly decreased after treatment

in the primary and phlebolymphedema groups compared to the pre-treatment evaluation ($p < 0.05$).

The pre-treatment appearance subscale scores of the LYMQOL questionnaire significantly differed between the groups ($p < 0.05$), with the pre-treatment appearance score of the secondary group being significantly lower than that of the lipolymphedema group. There was no significant difference between the groups in relation to the post-treatment appearance scores. The analysis of changes in appearance scores from pre-treatment to post-treatment periods revealed a significant decrease in the primary lymphedema, phlebolymphedema, and lipolymphedema groups ($p < 0.05$).

No significant difference was observed in the symptom subscale scores of the LYMQOL questionnaire between the groups before or after treatment. There was a significant decrease in the post-treatment symptom scores in the secondary lymphedema and lipolymphedema groups compared to the pre-treatment evaluation ($p < 0.05$).

The mood subscale scores of the LYMQOL questionnaire did not significantly differ between the groups before or after treatment. The post-treatment mood subscale score significantly decreased in the lipolymphedema group compared to the pre-treatment value ($p < 0.05$).

No significant difference was observed in the overall QoL scores of the groups before or after treatment. The post-treatment overall QoL score indicated a significant decrease in the phlebolymphedema group compared to the pre-treatment value ($p < 0.05$).

Finally, there was no significant difference in the pre-treatment and post-treatment LEFS scores of the groups. The analysis of the changes in the LEFS scores from pre-treatment to post-treatment revealed a significant decrease in the phlebolymphedema and lipolymphedema groups ($p < 0.05$) (Table 4).

Discussion

In this study, we found that the body weight and extremity volumes were the highest in the lipolymphedema group and lowest in the primary lymphedema group. All types of lymphedema most commonly affect the female gender. The patients with stage 2 lymphedema most frequently presented to the clinic, and limb involvement was mostly bilateral in all the lymphedema groups except secondary lymphedema. The results showed that CDT reduced lymphedema volume in each group. The amount of drained lymphedema was the highest in the lipolymphedema group. Among the sub-parameters of QoL, appearance scores

Table 3. Comparison of the extremity volume

Variables	Variables	Primary lymphedema	Secondary lymphedema	Phlebolymphedema	Lipolymphedema	p-value
Before (mL)	Median (25-75%)	9.410 (7.805-12.765)	10.604.85 (8.322.75-13.030.75)	10.349.5 (8.556.25-12.402.83)	12.101.05 (10.662.75-15.208.75)	0.019* (kw = 9.908) (1-4)
After (mL)	Median (25-75%)	9.117 (6.689-11.591)	9.946.5 (8.237-11.801.25)	9.644 (7.667.75-11.780.48)	10.659.5 (9.817.45-13.559.5)	0.034* (kw = 8.674) (1-4)
Within groups	Mean ± SD	0.0001* (z = –5.387)	0.0001* (z = –4.467)	0.0001* (z = –3.823)	0.0001* (z = –3.921)	-
Dif	Median (25-75%)	1.301.48 ± 2.185.97	894.32 ± 1.283.27	1.026.91 ± 1.082.45	1.316.14 ± 1.321.53	0.416 (kw = 2.644)

*p < 0.05. SD: standard deviation; mL: milliliter; dif: difference; kw: Kruskal–Wallis test statistic; t: paired-samples t-test statistic; z: Wilcoxon signed-rank test statistic.

Table 4. Comparison of the quality of life and functionality

Variables	Variables	Primary lymphedema	Secondary lymphedema	Phlebolymphedema	Lipolymphedema	p-value
Function-BT	Median (25-75%)	2 (1.61-2.68)	2.06 (1.5-2.76)	2.23 (1.73-3.59)	3.25 (2.3-4)	0.042* (kw = 8.19) (1-4)
Function-AT	Median (25-75%)	1.8 (1.5-2.12)	1.9 (1.24-2.32)	2 (1.11-2.68)	2.5 (1.25-3.13)	0.534 (kw = 2.192)
Intra-group p		0.025* (z = −2.248)	0.124 (t = 1.583)	0.036* (t = 2.382)	0.114 (t = 1.732)	
Dif	Median (25-75%)	0.12 (−0.04-0.69)	0.11 (−0.08-0.91)	0.38 (0.02-0.97)	0.25 (0-1.9)	0.703 (kw = 1.411)
Appearance-BT	Median (25-75%)	2.85 (2.11-3.63)	2.17 (1.42-2.7)	2.9 (1.99-3.65)	3.4 (1.7-3.8)	0.01* (kw = 11.287) (2-4)
Appearance-AT	Median (25-75%)	2.39 (1.73-3.15)	1.83 (1.28-2.7)	1.93 (1-2.9)	2 (1.7-2.7)	0.187 (kw = 4.795)
Intra-group p		0.038* (z = −2.072)	0.495 (z = −0.682)	0.004* (t = 3.568)	0.002* (t = 4.240)	
Dif	Median (25-75%)	0.13 (−0.08-0.58)	0 (−0.3-0.4)	0.71 (0.21-1.72)	1.1 (0.28-2)	0.003* (kw = 13.371) (2-3, 2-4)
Symptom-BT	Mean ± SD	2.36 ± 0.87	2.21 ± 0.83	2.33 ± 0.68	2.76 ± 0.76	0.297 (F = 1.251)
Symptom-AT	Median (25-75%)	1.9 (1.3-2.8)	1.8 (1.15-2.2)	1.7 (1.2-2.2)	1.8 (1.4-2.6)	0.576 (kw = 1.981)
Intra-group p		0.25 (t = 1.177)	0.001* (z = −3.367)	0.122 (t = 1.673)	0.026* (t = 2.616)	
Dif	Median (25-75%)	0.2 (−0.35-0.6)	0.2 (0-0.8)	0.4 (−0.25-1.25)	0.6 (0-1)	0.291 (kw = 3.742)
Mood-BT	Median (25-75%)	2.35 (1.7-3.15)	1.8 (1.3-2.27)	2.05 (1.27-2.5)	2.3 (1.66-3.3)	0.105 (kw = 6.139)
Mood-AT	Median (25-75%)	1.82 (1.35-3)	1.73 (1.16-2.3)	1.17 (1-2.41)	1.8 (1-2.6)	0.229 (kw = 4.324)
Intra-group p		0.17 (t = 1.411)	0.174 (z = −1.358)	0.097 (t = 1.814)	0.012* (z = −2.521)	
Dif	Median (25-75%)	0.14 (−0.34-0.69)	0.05 (−0.12-0.38)	0.47 (0-0.83)	0.2 (0-1.06)	0.329 (kw = 3.434)
Overall-BT	Mean ± SD	6.07 ± 2.12	5.93 ± 1.87	6.08 ± 1.73	5.27 ± 1.49	0.675 (F = 0.513)
Overall-AT	Median (25-75%)	6 (6-7)	6 (5-8)	7.5 (6.25-8.75)	6 (5-7)	0.279 (kw = 3.844)
Intra-group p		0.347 (z = −0.941)	0.462 (z = −0.735)	0.003* (t = −3.767)	0.068 (z = −1.826)	
Dif	Median (25-75%)	0 (−1-0)	0 (−1-0.25)	−1 [−1.75-(−1)]	0 (−2-0)	0.061 (kw = 7.355)
LEFS-BT	Median (25-75%)	48 (26.35-67)	46 (29.75-58)	43.7 (6.5-58.6)	18 (8-46)	0.109 (kw = 6.055)
LEFT-AT	Median (25-75%)	56.5 (34.1-69.5)	51.2 (31.25-63.5)	48.8 (25.5-59.5)	23 (12-72)	0.236 (kw = 4.252)
Intra-group p		0.056 (z = −1.912)	0.056 (t = −1.987)	0.05* (t = −2.178)	0.046* (z = −1.994)	
Dif	Median (25-75%)	−4 (−11-2.85)	−4.2 (−11-3.28)	−13.1 (−20.5-1.6)	−3 (−15-0)	0.383 (kw = 3.057)

*p < 0.05. BT: before treatment; AT: after treatment; dif: difference; SD: standard deviation; F: one-way analysis of variance statistic; kw: Kruskal–Wallis test statistic; t: paired-samples t-test statistic; z: Wilcoxon signed-rank test statistic. LEFS: lower extremity functional scale

significantly decreased in the evaluation performed between the groups, whereas changes in the remaining sub-parameters were not statistically significant. Improvement in function was significant only in the phlebolymphedema and lipolymphedema groups.

Although CDT is the gold standard in primary and secondary lymphedema, there is no standardized guideline or consensus for lipolymphedema and phlebolymphedema. CDT is a conservative treatment method recommended for these types of lymphedema. The success of CDT in clinical practice is parallel to improvement in not only edema but also other clinical findings[15]. Researchers agree that compression will reduce venous reflux and increase venous pump function in patients with chronic venous insufficiency. This information supports the idea that CDT can control the volume of edema in patients with phlebolymphedema in the lower extremity[16]. Földi and Idiazabal, reporting their clinical experience, suggested that surgical treatment of veins in patients with the coexistence of lipedema and lymphedema would worsen their clinical state in the long term, and surgery was unnecessary unless there was an absolute indication for this treatment (ascending phlebitis and/or bleeding). In line with this argument, the QoL of patients with lipolymphedema can only be optimized with CDT and physiotherapy[17]. The use of CDT in the treatment of lipedema reduces not only leg volume but also hematoma due to increased capillary resistance and altered capillary fragility in this condition[18].

As we predicted, differential diagnoses in lymphedema types do not change the necessity of CDT in treatment. When we examined the effect of CDT in these different types of lymphedema, we observed that edema reduction and improvement in extremity volume reached clinically significant levels. Contrary to our study, in the literature, some studies examining the effects of CDT in primary and secondary lymphedema reported that the change in leg volume was significant in intra-group evaluations but did not significantly differ between groups. Improvement in QoL in secondary lymphedema is considerably greater than in primary lymphedema[7,8]. Weiss and Spray reported that CDT improved both leg volume and QoL in patients with primary lymphedema, secondary lymphedema, deep vein thrombosis, and peripheral edema caused by orthopedic operations and venous insufficiency[19]. There are many studies showing that CDT increases QoL and improves extremity volume, especially in cases of secondary lymphedema due to cancer[20,21]. However, there are not a sufficient number of studies revealing the efficacy of this treatment in phlebolymphedema and lipolymphedema. German professionals recommend that the decongestive phase of CDT should be added to the treatment guidelines for phlebolymphedema to keep the venous lymphostatic status stable, while continuation with phase II should be decided according to clinical findings[22].

In light of the results of our study, we consider that CDT should be added to the treatment of not only primary and secondary lymphedema but also other lymphedema types. In particular, in lipolymphedema with a course and treatment that is very open to interpretation, the treatment we applied provided the most reduction in changes in leg volume compared to other lymphedema types. Although the treatment had a similar effect in primary and secondary lymphedema, the amount of drained edema in phlebolymphedema was very high, and the decrease in extremity volume was significant. As a result of the decrease in edema, appearance also significantly improved according to the inter-group evaluation, emphasizing the effect of CDT on all lymphedema types.

Researchers examining the effect of CDT on chronic venous insufficiency have reported significant improvement in extremity volume and function[23]. When we evaluated the effect of CDT on the function of phlebolymphedema caused by venous insufficiency, we determined that improvement was very significant. There are studies suggesting that a similar effect can be achieved with pneumatic intermittent compression for phlebolymphedema[24]. However, to our knowledge, there is no study comparing the effects of the two methods. In our study, the increase in functional status was evident in the phlebolymphedema and lipolymphedema groups. In the remaining lymphedema groups, there was improvement but not at a significant level.

Conclusion

CDT is an effective treatment modality for primary lymphedema, secondary lymphedema, phlebolymphedema, and lipolymphedema. According to our clinical experience, it would be appropriate to standardize CDT for phlebolymphedema and lipolymphedema. The decreased extremity volume and increased function of the patients also had a positive effect on their QoL.

Limitations

This study only presented the short-term outcomes of the patients. Long-term results are needed to prove the efficacy of CDT in different types of lymphedema.

In the literature, studies investigating conservative methods in the treatment of lipolymphedema and phlebolymphedema are limited. Therefore, our results are open to development and discussion. There was not a sufficient number of patients presenting to the clinic with different lymphedema diagnoses, which affected the equal distribution of sample size among the groups. This is a retrospective study. For these reasons, the number of participants in the groups is different. Prospective studies investigating the effectiveness of CDT in different groups are needed.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. Right to privacy and informed consent. The authors have obtained approval from the Ethics Committee for analysis and publication of routinely acquired clinical data and informed consent was not required for this retrospective observational study.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript nor for the creation of images, graphics, tables, or their corresponding captions.

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