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Effect of complex decongestive therapy on upper extremity lymphedema

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Research Report

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Purpose: The aim of this study was to evaluate the efficacy of complex decongestive physiotherapy (CDP) in patients with upper extremity lymphedema. **Materials and methods:** One hundred-two women with lymphedema after having breast surgery and adjuvant radiotherapy were included in this study. The subjects were divided into three groups as mild lymphedema (N=31), moderate lymphedema (N=34), and severe lymphedema (N=37). They were treated with CDP applications of daily manual lymph drainage, compression bandage, remedial exercises and skin care, for five days per week, four weeks. They also received a prophylactic physiotherapy and education for self-management techniques. Lymphedema was assessed through circumference and volumetric measurements before and after the treatment. **Results**: Volume of lymphedema was found to be decreased significantly in each group after CDP ($p<0.05$). A statistically significant difference was found when volume changes among the groups were compared before and after the treatment ($p<0.05$). The mean reduction in the volume of edematous arm was 87% in the women with mild lymphedema, 56% with moderate lymphedema, and 30% with severe lymphedema. **Conclusion**: The CDP, combined with self management, is efficacious in treating patients with upper extremity lymphedema, and it was detected that the earlier the subjects receive physiotherapy, the faster they recover.

Key words: Lymphedema; Upper extremity, Complex decongestive therapy, Lymph drainage.

Üst ekstremite lenfödeminde kompleks dekonjestif tedavinin etkinliği

Amaç: Bu çalışmanın amacı, üst ekstremite lenfödemi olan hastalarda kompleks dekonjestif fizyoterapinin etkinliğini değerlendirmekti. **Gereç ve yöntem:** Meme cerrahisi ve adjuvan radyoterapi sonrası üst ekstremite lenfödemi gelişen 102 kadın, çalışmaya dahil edildi. Olgular 31'i hafif, 34'ü orta ve 37'si şiddetli lenfödem olmak üzere üç gruba ayrıldı. Hastalara dört hafta süresince, haftada beş gün manuel lenf drenajı, çok katlı bandajlama, drenaj egzersizleri ve cilt bakımını içeren kompleks dekonjestif fizyoterapi programı uygulandı. Aynı zamanda kişisel tedaviden (kişisel lenf drenajı, lenfödem çorabı, kendi bakım aktiviteleri, egzersiz) oluşan koruyucu fizyoterapi programı verildi. Lenfödem, çevre ve volumetrik ölçüm yöntemleri ile tedavi öncesi ve sonrası değerlendirildi. **Sonuçlar:** Tedavi sonrası her üç grupta da lenfödem volümü anlamlı olarak azaldı ($p<0.05$). Volüm değişiklikleri, gruplar arasında karşılaştırıldığında, istatistiksel olarak anlamlı fark bulundu ($p<0.05$). Ödem volümündeki ortalama azalma hafif lenfödemde % 87, orta şiddetli lenfödemde % 56 ve şiddetli lenfödemde % 30 olarak belirlendi. **Tartışma:** Kompleks dekonjestif fizyoterapi, self tedavi uygulamaları ile birleştirildiğinde üst ekstremite lenfödemin tedavisinde etkili bir yöntem olarak kullanılabilir ve olgular ne kadar erken dönemde fizyoterapiye başlarsa, tedaviye cevabı da o kadar hızlı ve iyi olacağı bu çalışma ile belirlendi.

Anahtar kelimeler: Lenfödem; Üst ekstremite, Kompleks dekonjestif tedavi, Lenf drenajı.

Secondary arm lymphedema currently affects approximately 30% of women who undergo breast cancer treatment.[1-6] Breast cancer-related lymphedema, a distressing adverse effect of breast cancer treatment, presents as chronic swelling of the arm which can be accompanied by pain, skin changes, decreased joint range of motion and recurrent infections. It is associated with significant functional, psychological and social morbidity, and adversely impacts on individuals' quality of life.[2,7-9] Complex decongestive physiotherapy (CDP) consisted of combination of manual lymph drainage, multi-layer bandages, remedial exercise, skin care is now recognized as an effective non-operative technique for management of lymphedema, and it is recommended by the International Society of Lymphology (Lymphology Executive Committee 1995).[10] Most studies indicate that CDP is effective in lymphedema.[1,11-15] However, it is not a well known and widely used therapy, and only a very small number of institutions in Turkey currently perform two-phase CDP. Information of the efficacy of CDP in mild to severe lymphedema is limited. Therefore, the purpose of this study was to assess the efficacy of CDP in patients different lymphedema severity.

MATERIALS AND METHODS

One hundred-two women with lymphedema after breast surgery and adjuvant therapy at a university hospital were included in the present study. The study was performed with the approval of the local ethics committee (134/2007) and informed consent was obtained from each patient. The criteria for entry in the study were as follows: 1) patients were supposed to have mild - moderate and severe lymphedema, and 2) eligible patients were required to have completed their treatment (surgery, adjuvant chemotherapy or radiotherapy) at least three months before the start of this study. The following exclusion criteria were employed: Previous contra-lateral breast disease, recurrence of cancer, disorders related to muscles or joints, severe pain in axillary region, and difficulties such as dementia.

A complete history was obtained from each patient on the demographic information (age, sex, height, weight, body mass index, profession, dominant hand and affected hand), disease characteristics (type and side of the operation; the number of excised axillary lymph nodes; the number of tumor and positive lymph nodes; the used radiotherapy technique; adjuvant systemic treatment; the duration of lymphedema; previous episodes of infections).

Swelling of the arm was assessed through the measurement of circumference 5 cm above the bottom of fingernail to shoulder.[16-20] For the arm circumference measurements, subjects lay prone, arms relaxed by their sides and elbows were straight. Both arms were measured. All measurements were recorded in centimeters. A difference of 1 cm to 2 cm between the circumferences of the two arms was accepted as mild lymphedema; a difference of 3 cm to 5 cm was accepted as moderate, and a difference of more than 5 cm was considered as severe lymphedema.

The volume of the arm was measured with water displacement.[17-20] The arm was placed in a water-filled cylinder, and the overflowing water was measured. Then, the second arm was measured, and the difference between the overflowing water of both arms was calculated. For the measurements, subjects were instructed to lower the arm slowly into the volumeter and stop when the top of the volumeter came in contact with the axilla. At this point, a rod was placed at the level of the second and third finger web space. This rod became the stopping point that determined the depth of immersion for repeated measurements. All measurements were recorded in milliliters.

All measurements were performed by one experienced physiotherapist. The subjects were divided into three groups as 31 women having mild lymphedema, 34 women having moderate lymphedema, and 37 women having severe lymphedema. They were treated with CDP applications including four weeks of daily manual lymph drainage, compression bandage, remedial exercises and skin care for five days per week. At

the same time, they received a prophylactic regimen of education and the institution of self-management techniques (compression sleeves (30-40 mmHg), self-administered manual lymphatic drainage, exercises, and skin care). Lymphedema was assessed using circumference and volumetric measurements before and after treatment

Statistical analysis:

Data were analyzed using the SPSS 11.0 program. All values were expressed as mean ± standard deviation. A one-way analysis of variance (ANOVA) with repeated measures was employed to determine the main effect of the testing phase. Paired-samples *t* test was used to perform within group comparisons. A $p<0.05$ was considered as statistically significant.

RESULTS

The physical and demographic characteristics of 102 women are presented in Table 1. The mean age and body mass index of the group was 57.1±7.7 years (ranging from 34-72 years), and 27.3±5.9 kg/m^2, respectively. Arm circumferences of all patients having lymphedema were classified as mild, moderate and severe. The characteristics of the patients in the mild, moderate and severe groups were found to be similar ($p>0.05$). All patients developed lymphedema in the first year after surgery. The average duration of lymphedema at the time of treatment was 4 years in patients with post surgical lymphedema. Forty nine patients (48%) had no infection. Of all the women, 65 (63.7%) underwent lumpectomy, 37 (36.3%) underwent mastectomy. Radiotherapy and hormonal therapy were given to 17 patients (16.7%), radiotherapy and chemotherapy to 36 patients (35.3%) and radiotherapy, chemotherapy and hormonal therapy to 49 patients (48%). All of the patients underwent axillary dissection with a range of 5-44 nodes removed.

The mean lymphedema volume was 720±586 ml before decongestive physiotherapy and 362±288 ml after CDP. Volume of lymphedema was thus found to be decreased significantly after CDP ($p<0.05$). A statistically significant difference was found among the three groups when volume changes were compared before and after treatment ($p<0.05$) (Table 2). The mean reduction in the volume of edematous arm was 87% in the women with mild lymphedema, 56% with moderate lymphedema, and 30% with severe lymphedema. The best volume reduction in limb size within groups was obtained in the mild lymphedema group ($p<0.05$) (Table 2). The moderate lymphedema group had a significantly better reduction than the severe lymphedema group ($p<0.05$).

DISCUSSION

Breast cancer is the most commonly seen cancer type in women all around the world. [21, 22]. It is increases with aging, from 40-45 years. [23-25] In our study, the distribution of the cases were these limits.

One of the methods to measure the effectiveness of CDP is the quantitative assessment of the rate and amount of limb-volume reduction. Many researchers used circumferential measurements and volumetric measurements with the purpose of evaluating the edema and they regarded volume measurement by water displacement as a gold standard for estimating the volume of an irregular shape.[17] In our study we also used both of these measurements for determining the edema of arms. Multiple ways of describing the presence and severity of lymphedema in tissues have been published in the literature. Pezner et al described arm edema as mild, moderate or severe depending on the difference between arm circumference at various points from the elbow when the affected arm is compared with the unaffected arm.[26] Soran et al defined severity of lymphedema according to the volume difference between affected and unaffected limbs.[27] When we classified edema as mild, moderate and severe according to circumference and volumetric measurements, distribution of patients was similar in the both measurements. Therefore, one of these methods can be used to assess the patients having lymphedema.

Table 1. Demographic characteristics of the subjects.

	Mild	Moderate	Severe
	N=31	N=34	N=37
	X±SD	X±SD	X±SD
Age (years)	51.3±9.7	55.8±9.3	59.5±4.6
BMI (kg/m^2)	24.3±8.2	28.1±11.5	31.7±13.2
Duration of lymphedema (years)	2.1±0.9	4.8±8.3	6.2±7.2
Lymph nodes removed	6.9±9.01	17.4±10.5	28.8±11.3
	n (%)	n (%)	n (%)
Dominant arm (Right / Left)	27 (87.1) / 4 (12.9)	28 (82.4) / 6 (17.6)	33 (89.2) / 4 (10.8)
Effected arm			
Dominant	21 (67.7)	19 (55.9)	28 (75.7)
Non-dominant	10 (32.3)	15 (44.1)	9 (24.3)
Type of operation			
Lumpectomy	26 (83.8)	21 (61.7)	18 (48.7)
Mastectomy	5 (16.2)	13 (38.39	19 (51.3)
Treatments			
ET+RT	5 (16.1)	7 (20.6)	5 (13.5)
CT+RT	9 (29.1)	14 (41.2)	13 (35.1)
ET+CT+RT	17 (54.8)	13 (38.2)	19 (51.4)
Recurrent cellulites (Yes / No)	- (0.0) / 31 (100.0)	9 (26.5) / 25 (73.5)	15 (40.5) / 22 (59.5)

BMI: Body mass index. ET: Endocrine therapy. RT: Radiotherapy. CT: Chemotherapy.

Table 2. The comparison of the affected arm edema before and after the treatment.

	Before Treatment			After Treatment		
	Mild	Moderate	Severe	Mild	Moderate	Severe
	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD
5 cm	5.3±7.5	7.9±9.9	8.5±1.7	4.8±2.5	6.1±8.2	7.01±3.9
10 cm	16.4±6.2	19.9±11.2	22.1±13.4	15.7±6.3	17.08±1.9	19.3±2.8 *
15 cm	15.8±3.7	21.5±5.6	24.3±4.7	14.5±9.1	19.5±6.5	22.5±12.3 *
20 cm	17.3±9.2	25.7±10.2	26.4±8.6	16.8±7.5	21.8±11.2	24.7±10.1 *
25 cm	19.01±8.1	27.8±9.8	29.2±0.7	17.6±2.1	23.2±9.3	27.03±8.7 *
30 cm	23.5±10.4	30.5±11.5	32.05±2.8	19.5±8.3	26.1±7.7	28.4±1.5 *
35 cm	24.8±5.7	30.9±10.8	34.3±7.1	21.4±0.8	27.3±0.2	31.6±3.7 *
40 cm	25.1±1.8	31.6±7.7	35.6±3.4	22.1±1.09	28.7±5.4	33.5±5.1 *
45 cm	27.3±7.6	32.3±6.5	37.3±1.9	23.3±2.7	29.2±1.3	35.2±8.5 *
50 cm	29.5±8.7	33.1±9.3	38.7± 5.2	24.5±4.7	29.8±10.4	35.8±4.9 *
VM (ml)	410.7±133.5	695.6±198.3	1050.3±968.8	230.5±96.4	347.1±112.9	508.3±120.2*

CM: Circumferential measurement, VM: Volumetric measurement, *: before treatment-after treatment among groups, p<0.05.

Management with CDP is currently a popular and widespread treatment approach, and was recently recommended by a workgroup of the American Cancer Society Lymphedema Workshop[28]. The different components of lymphedema treatment, called CDP, include low stretch bandages, manual lymph drainage, exercises, and skin care. The previous published studies showed that percentage of reduction of lymphedema volume varied 20–80%.[1,29] Casley-Smith discussed their observations in 628 swollen limbs and also showed favorable results.[30] Ko et al reported that lymphedema reduction averaged 59.1% after CDP.[31] Andersen et al found that the mean reduction in absolute lymphedema in the whole treatment group was 43% one month later.[32] This is in accordance with the absolute lymphedema reduction of 47% found in a Swedish study by Brorsan et al,[33] Wazniewski et al,[24] showed that the average decrease in lymphedema was 43% in patients with minimal edema, 33% in those with moderate edema and 19% in women with severe edema. In our present study, the mean reduction in the volume of edema was 57% with a one month treatment. At the same time, the mean reduction in the volume of edematous arm was 87% in the women with mild lymphedema, 56% with moderate lymphedema, and 30% with severe lymphedema.

All the reviewed studies demonstrated that a reduction in limb volume and/or percentage edema can be achieved with standard CDP. This study showed that CDP can effectively promote limb volume reductions in patients with upper lymphedema when combined with self-care.

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