

The Reduction in Upper Extremity Volume and Improved Quality of Life in Women With Post-Mastectomy Lymphedema by Complex Decongestive Therapy

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Abstract

Background: Breast cancer is one of the most common malignancies all over the world. The rate of survival of the patients with cancer has increased due to developing diverse treatment methods, as a result of which the treatment-related side effects have become the focus of attention more than before. Lymphedema related to breast cancer is one of the frequent side effects which has significantly affected the patient's quality of life.

Objectives: The purpose of this research was to assess the effect of complete or complex decongestive therapy on breast cancer-related lymphedema and the patients' quality of life.

Patients and Methods: The present study was conducted from January 2013 to January 2014 and comprised 119 patients with breast cancer, related lymphedema, who had undergone complete or complex decongestive therapy (CDT). The patients' volume and grade of lymphedema were measured and determined before and after treatment, using the direct volumeter device to measure the lymphedema volume. To determine the quality of life, the European organization for research and treatment of cancer quality of life questionnaire (EQRTC BR-23) was completed before and after the treatment.

Result: The volume of lymphedema was significantly reduced after CDT ($P < 0.001$). The scores of quality of life were significantly increased regarding body image (BI) ($P < 0.001$), future prospective (FP) ($P = 0.008$), sexual functioning (SF) ($P = 0.006$), systemic therapy side effect (STSE) ($P = 0.008$) and arm symptoms (AS) ($P < 0.001$) which was clear indication of improved quality of life.

Conclusions: It is concluded that not only CDT causes reduction in lymph edema volume but also it improves the life quality of patients with breast cancer-related lymphedema

Keywords: Lymphedema, Quality of Life, Breast Cancer, Complex Decongestive Therapy

1. Background

Breast cancer is the malignant proliferation of the epithelial cells that can involve the ducts or lobules of the breast (1). It is one of the most common malignancies throughout the world with great diversity in different countries of the world. It seems that the cause of this geographical large diversity is the differences between lifestyles and races (2). The disease is most frequent in women. Annually, about 1.4 million people are afflicted with this type of cancer worldwide (3). In Iran also breast cancer accounts for 21.4% of all the reported cases of cancer and has the highest incidence in Iranian women since 1999 (4).

One of the serious and long term side effects of breast cancer treatment is lymphedema of the upper limb (5).

The lymphedema related to breast cancer is the most common cause of morbidity in these patients (6), where only one-fifth of them survive (7, 8).

Lymphedema is a chronic and progressive disorder resulting from the injury or abnormality of lymphatic system (9), where accumulation of protein-rich interstitial water leads to swelling of the affected tissue (10). Several factors such as mastectomy, the size of auxiliary dissection, radiotherapy and presence of lymph node can increase the risk of developing lymphedema (11).

Lymphedema and its related signs may cause more than 80% individual malfunctions (12) and limits patient's activities. Studies have shown that lymphedema causes a

wide range of disorders and disabilities and can affect different aspects of patient's life (13).

The diversified breast cancer and subsequent increase in the survival rate of breast cancer patients and the related side effects such as lymphedema is also growing which affects the quality of patient's life more significantly than ever (7,14).

Numerous methods have been applied for the treatment of chronic lymphedema that reduce the size of the organs using medical and physical techniques, but have not resulted in definitive cure of lymphedema. These include placing the limb in elevated position, massage, and exercises, singly or in combination (15).

One the most promising non-drug and rehabilitation treatments in reducing the rate of edema is complete or complex decongestive therapy (CDT). This method was introduced in 1995 by executive international committee of swollen lymph in U.S.A. This method includes manual lymph drainage (MLD), skin and nail care, motion, and compression exercises where hand is commonly coated by a multilayer band (16-19). The main purpose of this treatment method is moving the lymph liquid from the swollen limb, reducing and controlling the swell, softening the skin through removing fibrous texture, training the ways to prevent swell increase and providing the necessary cares for the patient (19). This plan includes treatment phase and maintenance phase.

The treatment phase consists of skin and nail care, a daily exercise period and MLD for lymphatic drainage in addition to coating hand by stretch bandages. Most patients are able to follow a self-management program at their homes after implementing a scheduled plan with 1 - 2 week duration which has been started in the clinic. The maintenance phase includes long term care from his or her own sides, using stretch cloths (6, 20).

Nowadays, due to the increased life expectancy of patients with breast cancer, the quality of their life has become an important issue worldwide, and the patients expect a better and higher life quality (21).

However, few studies have been carried out to highlight the effect of CDT on the quality of life in patients with breast cancer-related lymphedema, as less attention has been paid to this aspect of patients' health.

2. Objectives

Thus this study attempted to explore the efficiency of CDT to improve the quality of life in such patients and hope that it would be effective enough to alleviate the suffering in patients with breast cancer-related lymphedema.

3. Patients and Methods

This study was a quasi-experimental trial, approved by the ethics committee of Shiraz University of Medical Sciences. The subjects of this research consisted of all the patients with breast cancer-related lymphedema, who met the inclusion criteria and referred to the lymphedema center of

Shiraz Shahi Motahary clinic, Shiraz, Iran from January 2013 to January 2014.

The patients under study were diagnosed with breast cancer by surgeon, gynecologist, radiotherapist or chemotherapist. After surgery and complementary therapy and during follow up the patients were found to have lymphedema due to cancer treatment. The patients then referred to the lymph edema clinic for rehabilitation therapies.

The patients with the following criteria were excluded from the study:

- 1- Lymphedema due to other reasons such as: trauma, burn, and injury of the auxiliary zone lymph nodes.
- 2- Inability to answer the questions due to a history of mental and brain problems.
- 3- Unwillingness to participate in this study.
- 4- The breast cancer relapse.
- 5- Metastatic lesions in various body sites.
- 6- Fibrotic tissues in the affected limb
- 7- Bilateral mastectomy.

The instruments used for gathering data had two parts; the first part was a checklist including general questions and demographic data of the patient. These included the patient's name, age, and marital status, number of children, and occupation which was an open question. Based on the results obtained the patients were then divided into three groups of housewife, employee and self-employed. Other aspects considered were the degree of education, the menstrual status, the type of breast cancer, the type of surgery performed, the grade of tumor, the type of therapies done such as chemotherapy, radiotherapy and hormone therapy, volume of the hand with lymphedema, the duration of lymphedema and the number of lymphedema therapy sessions.

The second part was the Iranian version of European organization for research and treatment of cancer quality of life questionnaire (EQRTC BR-23); with confirmed reliability and validity (22).

EQRTC QOL- BR23 is the model used to evaluate life quality of the patients with breast cancer introduced by European organization for research and treatment of cancer. This questionnaire includes 23 items that evaluate the life quality regarding two aspects of functions and symptoms. The latter refers to breast symptoms (BR), systemic therapy side effect (STSE), arm symptoms (AS) and upset about hair loss (UHL). The former represented sexual functions (SF), sexual enjoyment (SE), body image (BI) and future prospective (FP) (22, 23). STSE consists of dry mouth, malaise, hot flashes, tearing, eye pain and headache. BR indicates swelling, pain, tenderness and breast skin problems. AS relates to pain, swelling and limited arm movements. The questionnaire was scored from zero to 100. Regarding function, the worst and best statuses present 0 and 100, respectively, but with regard to observed symptom, zero score refers to the least and 100 score corresponds to the most symptoms (24).

The patients gave their oral consent to participate in the re-

search project after they were fully briefed about the study. They then filled out the questionnaire and took part in a face to face interview which was done before and after doing CDT. All patients underwent two phases of CDT comprising treatment phase and maintenance phase and the average duration of CDT treatment was about 5 weeks.

The volume of lymphedema of patient's hand was measured before and after CDT and the grade of lymph edema was determined. The direct volumeter device called a water displacement tool was used to determine the volume of lymphedema, by measuring the displacement of liquid and the difference between the volume rates of two patients' hands. In this process, the patient dips his or her own normal hand in the tank of device and then does the same with affected hand. Accordingly, the difference in the height of the patient's hands is measured and read on the scale of device multiplied by the profile of the machine. This provides the difference between the volumes of both hands in cubic centimeters.

The grade of lymphedema is determined by measuring the circumference of the hand at specific points and the size difference of less than 3 centimeter is considered as grade 1, size difference between 3-5 centimeter as grade 2 and more than 5 centimeter is regarded as grade 3 (25).

The data obtained were coded and statistically analyzed using SPSS version 16, and Pearson's correlation coefficient, Spearman's correlation coefficient, one way ANOVA and paired t-tests, where P value < 0.05 was considered statistically significant.

4. Results

During one year of the study, of 175 patients who referred to Shahid Motehari clinic; 140 people were included in the study considering inclusion and exclusion criteria.

Based on the collected data which were normally distributed and the cases' follow up, the study was carried out on 119 patients, the demographic data of whom are shown in Table 1.

On the average, the duration of lymph edema before CDT was 8 months and ranged from 1 to 36 ± 7.6 SD months. The average time of CDT treatment was about 5 weeks (median: 5; mode: 6; SD: 1.39 (and the lymph edema volumes before and after treatment were 6.7 cm^3 (Range: 1.6 - 25.8; SD: 3.31) and 4.38 cm^3) Range: 1.10 - 11.30; SD: 2.04), respectively, and the difference was statistically significant ($P < 0.001$). Before CDT 63.2% of patients had grade 3 lymph edema, 23.4% grade 2 and 3.4% grade 1. However after remedial action, the grades were 3, 2, and 1 in 30.3%, 50.4% and 7.6% of the patients, respectively, and the difference was statistically significant ($P < 0.001$).

4.1. The Parameters of Life Quality (Tables 2 and 3)

4.1.1. Body Image (BI)

The average of BI parameter score before and after remedial actions were 40.8 and 61.34, respectively, that

was indicative of significantly improved BI after CDT ($P < 0.001$). The analysis of the data obtained clearly showed improvement in BI ($P = 0.04$) and in both volume and grade of the lymph edema ($P = 0.005$). Also a significant relationship was found between the menstruation status ($P = 0.006$) and BI which in post-menopausal women showed a better functional improvement. However, no statistically significant relationship was observed between BI and other independent variables such as age, educational status, etc.

4.1.2. Sexual Functioning (SF)

The average of SF item score before remedial actions was 31.02 and after that it was 37; this was statistically significant ($P = 0.006$) and it showed improvement in the functional aspect. This item was in a direct relationship with the duration of lymph edema treatment ($P = 0.033$) and was also statistically significant regarding the marital status ($P = 0.041$) and exhibited a higher score among the married patients. However no statistically significant relationship was observed between SF and other studied independent variables.

4.1.3. Sexual Enjoyment (SE)

The average SE item score was 34.83 and 33.75 before and after remedial actions, respectively, and the difference was not statistically significant ($P = 0.483$). However, it showed significant relationship to the number of children ($P = 0.018$). In other words, the rate of SE functional improvement was higher in the patients with more children. There was not any statistically significant relationship between SE and other studied independent variables.

4.1.4. Future Prospective (FP)

The average FP item score before remedial actions was 29.13 and after treatment was 38.65, and the difference was statistically significant ($P = 0.008$). However there was not any statistically significant relationship between FP and other observed independent variables in this study.

4.1.5. Systemic Therapy Side Effect (STSE)

The average of STSE score before remedial action was 31.73 and after treatment was 27.53 and the difference was statistically significant ($P = 0.008$), which was indicative of reduced STSE. However, no statistically significant relationship was found between STSE and other observed independent variables.

4.1.6. Breast Symptoms (BR)

The average BR score before remedial action was 20.09 and after treatment was 18.27 and the difference was not statistically significant ($P = 0.173$). Likewise, no statistically significant relationship was found between BR and other observed independent variables.

4.1.7. Arm Symptoms (AS)

The average AS score before remedial action was 45.00 and after intervention was 25.67, which clearly showed improvement in AS ($P < 0.001$). This parameter of life quality showed a statistically significant relationship to reduction in lymph edema volume ($P = 0.007$) so that reduction in lymph edema was comparable to decreased AS. There was not any statistically significant relationship between AS and other studied independent variables.

4.1.8. Upset About Hair Loss (UHL)

The average of UHL score before remedial action was 46.55 and was 47.7 after therapy and the difference was not statistically significant ($P = 1.00$). In this study, the age variable was significantly related to UHL ($P = 0.019$) so that UHL symptoms increased in lower ages. There was not any statistically significant relationship between SE and other studied independent variables.

Table 1. Demographic and Clinical Characteristics of Patients^a

Patient Characteristic ^b	No. (%)
Age, y	
21 - 30	1 (8)
31 - 40	11 (9.2)
41 - 50	45 (37.8)
51 - 60	43 (36.1)
61 - 70	15 (12.6)
71 - 80	4 (3.4)
Marital status	
Single	4 (3.4)
Married	97 (81.5)
Divorced	3 (2.5)
Widow	15 (12.6)
Number of children^c	
Zero	12 (10.1)
One	6 (5.0)
Two	30 (25.2)
Three	23 (19.3)
Four	14 (11.8)
Five	15 (12.6)
Six	11 (9.2)
Seven	6 (5.0)
Eight	2 (1.7)
Education	
Illiterate	22 (18.5)

Elementary school	33 (27.7)
Secondary school	18 (15.1)
Diploma	31 (26.1)
University	15 (12.6)
Profession	
Home worker	92 (77.3)
Clerk	17 (14.3)
Other	10 (8.4)
Physical activity	
Athlete	4 (3.4)
Usual exercise	14 (11.8)
Walking	55 (46.2)
Menstruation status	
Pre menopause	26 (21.8)
Post menopause	91 (76.5)
Unknown	2 (1.7)
Type of tumor	
IDC	86 (72.3)
ILC	3 (2.5)
Medullary	2 (1.7)
Other	1 (0.8)
Unknown	27 (22.7)
Grade of tumor	
1	18 (15.1)
2	56 (47.1)
3	19 (16.0)
Unknown	26 (21.8)
Type of surgery	
MRM	75 (63.0)
Conservative mastectomy	16 (13.4)
Unknown	28 (23.5)
Adjuvant treatment	
Radiotherapy (1)	1 (0.8)
Chemotherapy (2)	4 (3.4)
Hormonal therapy (3)	1 (0.8)
1 + 2	19 (16.0)
2 + 3	12 (10.1)
1 + 2 + 3	82 (68.9)

Abbreviation: IDC, invasive ductal carcinoma; ILC, invasive lobular carcinoma; MRM, modified radical mastectomy.

^aN = 119.

^bThe mean (SD) is 51.7 (9.2).

^cThe mean (SD) is 3.27(1.99).

Table 2. The Patients' EQRTC QOL-BR 23 Scores (Paired Samples Test Results)^{a,b}

Scores on EORTC QLQ-BR23	Before CDT	After CDT	P Value
Body image	40.8964 ± 29.19171	61.3445 ± 27.41901	< 0.001 ^c
Sexual functioning	31.0231 ± 12.25418	27.0000 ± 14.94096	0.006 ^c
Sexual enjoyment	34.8315 ± 8.57250	33.7553 ± 8.42881	0.483
Future prospective	29.1317 ± 29.28997	38.6555 ± 36.56205	0.008 ^c
Systemic therapy side effects	31.7327 ± 19.44972	27.5310 ± 18.54834	0.008 ^c
Breast symptoms	20.0980 ± 14.28670	18.2773 ± 14.40426	0.173
Arm symptoms	45.0047 ± 16.67286	25.6769 ± 14.94552	< 0.001 ^c
Upset by hair loss	46.5517 ± 37.94921	47.7011 ± 35.38266	1.000

Abbreviation: CDT, complex decongestive therapy.

^aValues are expressed as mean ± SD.

^bStandard scores (0 - 100) are presented for each scale of the QLQ-BR23. Higher scores represent higher/satisfactory level of health and quality of life, whereas regarding symptom, higher scores indicate deterioration.

^cStatistically significant at $P < 0.05$.

Table 3. The Impact of Some Accessed Factors on Parameters of EQRTC QOL-BR23^a

	Age	Marital Status	Menstruation Status	Number of Children	Duration of CDT
Body image	0.281	0.448	0.006 ^b	0.984	0.392
Sexual functioning	0.078	0.041 ^b	0.777	0.166	0.033 ^b
Sexual enjoyment	0.253	0.254	0.492	0.018 ^b	0.093
Future prospective	0.108	0.872	0.183	0.293	0.990
Systemic therapy side effects	0.679	0.058	0.577	0.197	0.537
Breast symptoms	0.988	0.331	0.703	0.983	0.063
Arm symptoms	0.840	0.508	0.811	0.543	0.148
Upset by hair loss	0.019 ^b	0.386	0.289	0.053	0.241

Abbreviation: CDT, complex decongestive therapy.

^aStatistically significant factors.

^bStatistically significant at $P < 0.05$.

5. Discussion

This study attempted to evaluate the life quality of the patients with breast cancer-related lymphedema. According to our searches in Pubmed/Medline, science directs and Scopus, studies on this topic are very limited, other than an investigation reported by Kim et al. (26) in 2007.

Our study comprised 119 patients that was almost twice the number reported previously; 27. In the current study, the patients undergoing CDT filled out the questionnaires before and after treatment. The average time between the first and the second observation was about 5 weeks (Range: 2 to 6 weeks).

The results of CDT evaluated by paired t-test showed remarkable and statistically significant improvement in the life quality scores regarding SF, FP, STSE, AS and BI ($P < 0.001$; $P = 0.006$; $P = 0.008$; $P = 0.008$; $P < 0.001$, respectively), which was consistent with those of Kim et al. (26) They reported that "life quality significantly improved with upper limb lymphedema during the maintenance phase, which was necessarily correlated with the reduc-

tion in the limb volume".

Based on studies on the effect of CDT on the volume of lymph edema, (6, 15, 27, 28) our findings showed that according to paired t-test, CDT was highly effective on reducing lymphedema volume, and caused highly significant improvement in the grade of lymph edema ($P < 0.001$; $P < 0.001$, respectively).

Analysis by Pearson's correlation coefficient test showed that reduced breast cancer-related lymphedema increases the quality of patient's life, which is accompanied by significant improvement in BI ($P = 0.005$) and AS ($P = 0.007$). This is probably due to the reduction in the volume of lymphedema and alleviating its associated symptoms such as heaviness, pain, swelling and redness which makes the patients feel more comfortable and satisfied. However, no significant difference was found between improved lymphedema and other items of life quality based on EQRTC QOL- BR23.

In this study, the independent variable of age showed a sta-

tistically significant relationship to UHL ($P = 0.019$), which was inversely related to increasing age. This finding reflects the concerns of younger patients with their beauty, and their worries about hair loss. This finding shared similarities and differences with the report of Hopwood et al. (23).

Penelope Hopwood et al. studied the effect of age and clinical factors on the quality of life in patients with breast cancer, and believed that age had significant effect on the quality of life in older and younger subgroups 24. The statistical test of ANOVA, showed significant relationship between marital status and SF ($P = 0.041$).

The results of this study showed that SF was more improved in married women, who enjoyed a better life quality and benefited from family support.

The analysis of the results by Pearson's correlation coefficient test showed a statistically significant relationship between the number of children and SE ($P = 0.018$). In other words, there was a higher rate of SE in persons with more children.

Using ANOVA, among the variables studied, a significant relationship was only found between menstruation status and BI ($P = 0.006$). This parameter was more improved in postmenopausal women who were probably less concerned with their beauty and fitness.

Further findings obtained from data analysis was the direct relationship between SF and the duration of lymphedema treatment ($P = 0.033$). In other words, the patients undergoing more CDT had higher score regarding such treatment. Thus it can be concluded that enhancing the number of CDT treatment sessions may lead to increasing quality of life in patients with breast cancer.

According to the results of our study, chemotherapy had no significant effect on various parameters of life quality, which was contrary to the findings of Hopwood et al. (23); who reported that adjuvant chemotherapy causes reduction in life quality concerning BI, SF, and BS and AS.

It is concluded that not only CDT causes reduction in lymph edema volume but also it improves the life quality of patients with breast cancer-related lymphedema. Indeed, in regard to the follow up period, further investigations with longer follow ups are warranted considering the duration of patients' follow up in this study. Few limitations in this study include absence of control group, unavailable treatment files of some patients, and lack of longer follow ups.

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