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Functional Improvement in Response to Complete Decongestive Physiotherapy After Axillary Dissection Following Breast Cancer Treatment: A Randomized Controlled Trial

[1]Marwa Esmael Hasanin and [2]Ahmed Samy

[1]Department of Physical Therapy for Woman's Health, Faculty of Physical Therapy, Cairo University, Giza, Egypt
[2]Department of Obstetrics and Gynecology Faculty of Medicine, Cairo University, Giza, Egypt

Abstract: The purpose of the study was to estimate the level of upper extremity functional improvement and lymphedema improvement in response to complete decongestive physiotherapy after axillary dissection following breast cancer treatment. Fifty females with upper extremity lymphedema after axillary dissection following breast cancer treatment, their age ranged from 40-48 years. Their body mass index (BMI) ranged from 25-30 kg/m^2. The upper extremity functional improvement estimated by upper extremity functional index and upper limb girth measurement at the level of hand and mid forearm and mid arm estimated by round measurement before and after treatment period. The patients were divided in to two equal groups group (A) received decongestive physiotherapy program and group (B) acted as a control group. Results revealed that there was significant increase in group (A) and significant reduction in group (B) ($p < 0.05$) in Upper extremity functional index in the post treatment condition compared with the pretreatment. While there was significant reduction ($p < 0.05$) in Girth measurement at hand level, mid forearm and arm in the post treatment condition compared with the pretreatment in group A only. There was a significant improvement ($p < 0.05$) in Upper extremity functional index and reduction in the Girth measurement at hand level, mid forearm and arm in favor to group A compared to group B. It was concluded that Complete decongestive physiotherapy is an effective in improving the upper extremity lymphedema and functional level after axillary dissection following breast cancer treatment.

Key words: Complete Decongestive Physiotherapy · Axillary Dissection · Breast Cancer

INTRODUCTION

In breast cancer survivors following mastectomy and ALND (axillary lymph node dissection), different forms of disability and emotional disturbances were noted [1]. As pain present in the edematous extremity [2], altered sensation within the affected arm [3], Physical function impairment [4], Lymphedema and loss of confidence [3], Lack of basic social support [2] and maladaptive coping methods [2].

Upper extremity lymphedema is among the most restrictive complications of a treatment for breast cancer. It impacts about one third of all survivors of breast cancer [5]. The physical and psychological wellbeing of affected women may be significantly impaired. Within the edematous limb, lymphedema allows deformation, functional disability, pain and recurrent infections (dermato-lymphangitis) [4, 6]. This also includes psychological mortality rates, anxiety, depression, social isolation and sexual issues [6].

Upper limb lymphedema at the operated breast side is the result of a lymph drainage area anatomically shared with the axillary nodes. Elimination of axillary lymph nodes can lead to lymphedema as well as in the upper limb and in the breast In addition, breast lymphedema can be the result of breast area operated radiation therapy. During surgery and radiotherapy, the pain in the operated breast can occur from coexisting breast lymphedema or disruption to surrounding tissue and nerves [7].

Corresponding Author: Marwa Esmael Hasanin, Department of Physical Therapy for Woman's Health, Faculty of Physical Therapy, Cairo University, Giza, Egypt.

Smoot *et al*. [8], Hypnotized that after treatment of breast cancer, women will experience physical impairment of the upper extremity will lead to limitations in activities requesting the use of the upper limb that is affected in addition, those females who developed breast cancer related lymphedema will show higher upper limb impairment than women who did not develop lymphedema.

Chronic pain was correlated with chemotherapy plus radiation therapy after axillary node dissection, especially in the ipsilateral arm [9]. Local interventions including such axillary dissection or radiation therapy following tumor excision were associated with local physical dysfunction and higher incidence of long-term morbidity of the arm, including impaired mobility of the shoulder and lymphedema [10, 11]. In order to enhance the functioning of these women, what should be viewed as a disability and a variety of therapeutic actions should be taken. The therapeutic program should generally include pain management and decrease of arm volume in combination with psychotherapy [7].

If recognized and predictable impairments occur in women after breast cancer treatment, early evaluation and rehabilitation interventions can be introduced to reduce pain, reduce flexibility and strength losses and greatly reduce activity limitations [12].

On the basis of complete (or complex) decongestive physiotherapy, effective management of chronic upper limb lymphedema is based. Foldi defined this technique in 1989, which include manual lymphatic drainage, low-stretch bandaging, exercises and skin care [13]. Complete physiotherapy with decongestion is separated into two phases. The first phase takes the form of intensive treatment and can be introduced in hospital to permit a significant reduction in the volume of lymphedema. The final phase is a home maintenance treatment [13, 14]. It is difficult to predict clinical response to complete decongestive physiotherapy and factors affecting treatment response are undetermined. The objective of this study was to analyze indicators of response to intensive decongestive therapy after treatment for breast cancer in women with upper limb lymphedema.

MATERIALS AND METHODS

Study Design: The study was designed as a prospective, randomized, controlled trial. The study was followed the Guidelines of Declaration of Helsinki on the conduct of human research.

Participants: This study was carried out on fifty females with upper extremity lymphedema after axillary dissection following breast cancer treatment, they were selected from out-patient clinics of Cairo university hospitals. Their age ranged from 40-48 years. Their body mass index (BMI) ranged from 25-30 kg/m2. Any participant was excluded if she meets one of the following criteria: active stage of cancer, acute disease, acute stage of inflammation (cellulitis, lymphangitis, erysipelas, acute deep venous thrombosis (DVT), open wounds, active skin ulcers, dermatitis or cellulites. The patients were divided in to two groups equal in number group (A) acted as a study group and received decongestive physiotherapy program and group (B) did not receive any physical therapy treatment and acted as a control group.

Randomization: Each patient was notified of the nature, significance and advantages of the study, the right at any time to refuse or withdraw, plus keeping the confidentiality of any data obtained. . With the use of a computer-based randomization program, women were randomly selected to 2 equal groups (group A and group B). No dropout of study subjects after randomization was reported.

Interventions

Instrumentation: Upper extremity functional index Upper extremity functional index is a valid and reliable measure. It measures the functional disabilities; the participant responded to a certain questionnaire with zero complete disable and four expressing no disability. Therefore, maximum total score equal 80 points that was indicating maximum upper extremity functional disability. Minimum level of detectable change is nine points [15]. Assessment done at the starting and after treatment period for both groups (A&B).

Tape measurement used for measuring circumferential measurements taken along the hand and mid forearm and mid arm at regular intervals those taken in the same places every time at the starting and after treatment period for both groups (A&B).

Treatment Procedure: All group (A) patients were treated with decongestive physiotherapy which is a combination of manual lymphatic drainage [13], Bandages, exercise, skin care as recommended by consensus of the International Lymphology Society and guidelines of Canada [16]. Treatment for lymphedema was given five times a week. Manual drainage is done for 30 minutes. After covering the affected limb with foam or cotton

batting bandages, a low stretch compressive bandage was then wrapped in multiple layers (2-4) applied 24 hours daily throughout the therapy course. After the application of compressive bandages, exercises were carried out to improve the lymphatic flow from peripheral to central compartments. The technique of self-bandaging was taught to the patient or to family members. Also integrated meticulous skin care was produced to the patient. The dryness of the sky was treated with moisturizer and the Patients were advised to avoid skin breaks (e.g. cutting, burning, bites of insects, cat scratch, cracks in dry skin) and to protect their skin during daily activities.

Group (B) did not receive any physiotherapy treatment and acted as a control group.

Outcome Measures:

- The upper extremity functional improvement estimated by Upper extremity functional index
- Upper limb girth measurement at the level of hand, mid forearm and mid arm estimated by round measurement

Statistical Analysis: All statistical measures were performed using the Statistical Package for Social science (SPSS) program version 22 for windows. The current test involved two independent variables. The first one was the (tested group); between subject factor which had two levels (group A and group B). The second one was the (measuring periods); within subject factor which had two levels (Pre-treatment, Post-treatment). In addition, this test involved four tested dependent variables (Upper extremity functional index and Girth measurement at hand level, mid forearm and arm). All dependent variables were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There was homogeneity of variances, as assessed by Levene's ($p > .05$). So, 2×2 mixed design MANOVA was used to compare the tested variables of interest at different tested groups and measuring periods. The alpha level was set at 0.05.

RESULTS

The age and BMI groups were similar at baseline ($p>0.05$) (Tables 1). Analysis of the data using MANOVA mixed design reported that the subject effect ($F = 86.026$, $p = 0.0001$) and treatment*time effect ($F = 133.825$, $p = 0.0001$) were significant. , while there was significance between subject effect ($F= 7.583$, $p = 0.0001$). Table (2 and 3) presents descriptive statistics (mean ± SD) and multiple pairwise comparison tests (Post hoc tests) for the all dependent variables respectively. In almost the same context, the multiple pair comparison tests revealed that group (A) increased significantly and group (B) decreased significantly ($p <0.05$) in Upper extremity functional index in the post treatment condition compared with the pretreatment. There was a significant decrease ($p <0.05$) in Girth measurement at the level of hand, mid forearm and arm in the post treatment condition compared with the pretreatment in group A only. With regard to the subject effects, multiple pairwise comparisons revealed significant improvement ($p < 0.05$) in the functional index of the upper extremity and decrease of the girth measurement at the hand level, the mid forearm and arm in favor of group A compared to group B.

Table 1: Demographic characteristics of patients in both groups

Characteristics	Group A	Group B	t-value	P-value
Age (years)	45±3.2	45.1±3	-0.06	0.95
BMI (Kg/m^2)	28.99±1.12	29.7±0.2	-2.418	0.61

*Significant level is set at alpha level <0.05.

Table 2: Descriptive statistics for the all dependent variables for both groups at different training periods

	Group A		Group B	
Variables	Pre	Post	Pre	Post
Upper extremity functional index	31.64±6.09	51.04±8.58	33.8±7.85	30.4±7.56
Girth measurement at hand level	25.6±2.1	22.24±1.98	25.44±1.98	25.52±1.93
Girth measurement at mid forearm	32.12±2.38	28.72±2.05	31.2±2.88	31.32±2.8
Girth measurement at mid arm	38.96±2.54	35.48±3.13	37.84±3.1	37.92±2.98

Values of all dependent variables are expressed as mean±SD.

Table 3: Comparison tests for the all dependent variables at both groups

Within groups (Pre Vs. Post)				
p-value	Upper extremity functional index	Girth measurement at hand level	Girth measurement at mid forearm	Girth measurement at mid arm
Study group	0.0001*	0.0001*	0.005*	0.003*
Control group	0.014*	0.768	0.671	0.863
Between groups (Group AVs. Group B)				
p-value	Upper extremity functional index	Girth measurement at hand level	Girth measurement at mid forearm	Girth measurement at mid arm
Pre treatment	0.283	0.783	0.225	0.169
Post treatment	0.0001*	0.0001*	0.0001*	0.007*

*Significant at the alpha level ($p < 0.05$)

DISCUSSION

The results of the study revealed that there was significant increase in group (A) and significant reduction in group (B) ($p < 0.05$) in Upper extremity functional index in the post treatment condition compared with the pretreatment. While there was significant reduction ($p < 0.05$) in Girth measurement at hand level, mid forearm and arm in the post treatment condition compared with the pretreatment in group A only. There was a significant improvement ($p < 0.05$) in Upper extremity functional index and reduction in the Girth measurement at hand level, mid forearm and arm in favor to group A compared to group B.

Patients with breast cancer are considered to be the main groups of patients with lymphoedema. Complete decongestive CDT physiotherapy such as manual lymphatic drainage MLD and bandaging was shown to be helpful in reducing the volume of lymphoedema [17], which was also supported by other review [18, 19].

A prior systematic review of MLD's positive effect on the quality of life of patients with lymphedema directly linked to breast cancer [20]. Adjustments in certain areas such as pain, weight, emotional function, dyspnoea and sleep disorders have been reported [21]

The study results also coincide with Vignes *et al*. 2006 which claimed that intensive decongestive physiotherapy was extremely effective after breast cancer in the management of secondary upper limb lymphedema [22].

Johansson *et al*., also supported using Low Stretch Compression Bandaging to Manual Lymph Drainage adds a beneficial effective treatment that reduces the volume of lymphedema in women treated for breast cancer [23]. Compression increases interstitial pressure, reduces capillary filtration of the blood and increases lymph flow. [13, 24]

This outcome is also supported by Ko *et al*. [14] In a research of 149 patients with upper-extremity compression, manual drainage and exercise lymphedema. After an average of 16 days of treatment, they discovered a volume significant decrease of 59 %, while in another research, Boris *et al*. [25] found a similar reduction in edema (62.6 %) over a 30-day period, already using the same strategies on 56 patients. The results of two studies highlight the clinical assumption of this combination of lymphedema-related treatments (MLD, CB, exercises and skin care).

The mechanisms of action of MLD is common to all patients. The stress on the tissues decreases microlymphatic hypertension and stretches the lymph collector, continuing to increase the lymph transport capacity, leading in lower volume of the impacted part of the body. Reduction in volume can reduce discomfort (e.g., pain, tightness and weight) and enhance the function of the impacted body region [20]. In addition to the impact on lymphatic vessels, the blood flow in superficial arteries and veins increases, enhancing wound healing and reducing inflammatory processes [26]. Additionally, MLD is usually combined with skin care, exercise, which have additional positive effect [27].

It is suggested that MLD can 'assist nature ' by inducing the lymphangion's natural peristaltic contractions. Thereby, MLD decreases swelling by enhancing pumping action, lowering hydrostatic lymph flow resistance and shifting lymph away from areas of stasis and then into viable lymph vessels. MLD's ability to reduce lymph swelling has been well proved [26].

CONCLUSION

Complete decongestive physiotherapy is an effective in improving the upper extremity lymphedema and functional level after axillary dissection following breast cancer treatment.

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