Effect of complete decongestive therapy and a home program for patients with post mastectomy lymphedema

Syamala Buragadda1), Adel A Alhusaini1), Ganeswara Rao Melam1)*, Nisha Arora2)

1) Department of Rehabilitation Sciences, College of Applied Medical Sciences, King Saud University: P.O. Box 10219, Riyadh 11433, Saudi Arabia
2) Department of Physical Therapy, Maharishi Markendeshwar Institute of Physiotherapy and Rehabilitation, Maharishi Markendeshwar University, India

Abstract. [Purpose] Post mastectomy lymphedema is common among breast cancer survivors. It leads to physical discomfort and functional impairment. Rehabilitation forms the mainstay of treatment and is multidisciplinary. [Subjects and Methods] Sixty post mastectomy patients were allocated randomly and assigned to either a conventional treatment group (n=30) or a complete decongestive therapy (CDT) group (n=30). The conventional treatment group received manual lymphatic drainage, wore a low elastic compression garment, received glenohumeral mobilization, and performed deep breathing exercises, and the complete decongestive therapy group received CDT from a trained physiotherapist and a daily home program along with the conventional treatment, 5 days a week for 6 weeks. [Results] Arm circumference measurements were taken at five levels: the wrist, mid forearm, elbow, mid upper arm, and axilla. The upper extremity function was evaluated using the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, and pain was assessed using the visual analogue scale. Measurements were taken at baseline, and at 4th and 6th weeks after the start of intervention. Within and between group comparisons showed significant improvements in the CDT group. [Conclusion] Complete decongestive therapy and a home program assists breast cancer related lymphedema survivors in regaining their lost functions. It also helps to improve their independence in daily activities, reduce their need for caregivers, and thereby improving their quality of life. Therefore, the results of this study showed that the CDT with a home program is an effective treatment for reducing post mastectomy lymphedema.

Key words: Breast cancer, Manual lymphatic drainage, Post mastectomy lymphedema

INTRODUCTION

Post mastectomy lymphedema (PML) is a condition that can develop early or years after mastectomy. It develops due to the physical trauma of surgery and radiotherapy, which can interrupt the lymphatic system to varying degrees1). Secondary lymphedema can cause disfigurement, physical discomfort, and functional impairment, and results in poor functional recovery, chronic disability and, impaired quality of life2) 3). Anxiety, depression, and emotional distress are more common among patients with secondary lymphedema3) 4). The incidence of breast cancer has increased globally, and the greatest increases are being in Asian countries with a very wide range from 2% to 40% of women5) 6). Different factors such as the level of nodal dissection, the number of nodes removed, the number of involved nodes, the presence of extra capsular spread, the size and grade of the primary tumor, co-morbid conditions, chemotherapy, axillary irradiation, experience of the surgeon, dominant limb and body mass index can influence the incidence of lymphedema7) 8). Unfortunately, some survivors experience long-term complications that include physical impairments, psychological distress and suboptimal health-related quality of life9) 10). Consequently appropriate measures are important for reducing complications that can impair the function and quality of life. The treatment of post mastectomy lymphedema is multidisciplinary, and includes medical, surgical, palliative and physical therapy approaches. The physical therapy treatment for post mastectomy lymphedema involves upper limb elevation and exercises, a compression sleeve, massage therapy, complete decongestive therapy (CDT), manual lymphatic drainage (MLD) and pneumatic compression pump11). Rehabilitation interventions are considered the mainstay of treatment for the post mastectomy lymphedema12) 13). Manual lymph drainage is a specialized manual (hands-on) technique designed to improve fluid removal from congested areas and helps to drain the lymph into functioning lymph vessels and lymph nodes14) 15). CDT is considered as
standard care for lymphedema management but the level of evidence for each component used to improve hand function and quality of life needs to be established (25–28). Commonly used patient reported outcome measures for breast cancer survivors have been identified and validated. Measures such as the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Breast Cancer Module (EORTC QLQ BR23), FACT-B, and the BREAST-Q have been designed to measure overall function (29). A number of reported outcome measures have been developed to assess the effects of cancer disease on upper limb function. Kwan’s Arm Problem Scale (KAPS) was developed to identify arm problems such as arm stiffness, pain and function during breast cancer treatment (30). The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire (31) and the Upper Extremity Functional Index (UEFI) are also commonly used to measure the general upper extremity function of breast cancer survivors (32). The Visual Analogue Scale (VAS) is a reliable and valid scale for the evaluation of pain intensity. It is a 10 cm line marked with 0 at one end, representing no pain, and 10 at the other end, representing the worst pain imaginable. The patient is asked to mark a point on the scale representing their intensity of pain (33).

SUBJECTS AND METHODS

Subjects

Recruitment conducted at the Physiotherapy Department of Maharishi Markendeshwar University hospital. The participants were aged between 50 and 70 years, and had unilateral mastectomy for stage I and II breast cancer. They had completed the radiotherapy and chemotherapy sessions. Subjects who developed lymphedema of more than 3 cm compared to the contralateral extremity were included. Participants' with primary lymphedema, bilateral lymphedema, pulmonary edema, congestive heart failure or any contraindications limiting therapy were excluded. For the sample size calculation, a power analysis was done with an alpha risk of 0.05 and a power of 0.80. The sample required was 27 patients in each group. Anticipating a 10% dropout rate in each group, the corrected sample size was increased to 60. The literature available concerning CDT and the results of randomized controlled trials conducted are limited and contradictory (17, 34–40). Therefore this study investigated the effect of complex decongestive therapy (CDT) and a home program for post mastectomy lymphedema on pain and arm function.

Table 1. Descriptive statistics of the sample

| Variables                  | Group A       | Group B       |
|----------------------------|---------------|---------------|
| Age (years)                | 56.3±3.3      | 56±3.5        |
| Educational Literate       | 25 (42%)      | 27 (45%)      |
| level                      | Illiterate    | 5 (8%)        | 3 (5%)        |
| Marital status             | Single        | 4 (7%)        | 5 (8%)        |
| status                     | Married       | 26 (43%)      | 25 (42%)      |
| Type of surgery            | Radical       | 17 (43%)      | 18 (45%)      |
|                           | Mastectomy    | 3 (8%)        | 2 (5%)        |
| Affected Arm               | Dominant      | 15 (38%)      | 14 (35%)      |
| Arm                        | Non Dominant  | 5 (13%)       | 6 (15%)       |

Fig. 1. Flow chart for the sample recruitment
wore a compression garment for 23 hrs daily, and performed remedial exercises and a home program. Both groups received treatment 5 times a week for 6 weeks. CDT group individuals and occasionally family members received training in self-massage. They were encouraged to perform self-lymph drainage by themselves at least once daily. Remedial exercises were given with diaphragmatic breathing exercises in between. The patients sat comfortably, relaxed, placed their hands over their abdominal muscles and took deep breaths through the nose followed by prolonged expiration through the mouth without any strenuous effort. The following order was adopted for remedial exercises were conducted by a trained physiotherapist: 1) warm up activity of active mobilization of the large joints at a moderate pace for 5 min; 2) shoulder girdle mobilization-scapular retraction, protraction, depression, shoulder extension, elbow flexion and extension, wrist flexion and extension and ball squeeze; and 3) pectorals and trapezius muscles stretching. The one-hour home program involved self lymphatic drainage, skin care and remedial exercises. Participants received initial education and training about the home exercises, and once their understanding was found to be satisfactory they were given the booklets on the home program.

Arm circumferences were measured using a cloth measuring tape at four levels: the metacarpophalangeal joints, wrist joint, 15 cm distal to the lateral epicondyle, and 10 cm proximal to the lateral epicondyle. The patients were positioned prone with their upper limbs at their sides and their elbows straight while the circumference measurements were taken. Two measurements were taken and their mean was used. The calculated difference between each circumference (in centimeters) was calculated at all four levels. The final volume was determined by adding the separate volumes of the sections together. Every calculation was squared, and then all measurements for that arm were totaled and divided by π (3.1416). The recorded values were used to calculate arm volume using the following formula:

\[
V = \frac{h}{12\pi^2} (C_1^2+C_2^2-C_1C_2)
\]

Where \(V\) is the volume of the segment, \(C_1\) and \(C_2\) are the circumferences at the ends of the segment, and \(h\) is the distance between them. The DASH questionnaire was used to measure upper limb function. The questionnaire is a self-administered region specific outcome instrument. It consists of 30 core items and 8 optional items, which generate a disability score, ranging from 0 (no disability) to 100 (the most severe disability). Pain was measured using a VAS.

RESULTS

The data were analyzed using the SPSS 16 software package and a 95% confidence interval. Descriptive statistics were used for subject’s demographic characteristics. The level of significance used was 0.05. Repeated measures of ANOVA was used for within and between group comparisons. For post Hoc analysis, Tukey’s test was used to test for significant interactions between groups. Table 2 shows the arm circumference measurements at the five levels: wrist, mid-forearm, elbow, mid-arm and axilla. Mean and standard deviations were calculated. The within and between groups comparison revealed there were significant improvement in the circumferences. The circumference of the proximal part of the arm at post-test was significantly reduced compared to its value at pre-test. The CDT group showed significant improvements in pain, DASH scores and arm volume (\(p \leq 0.05\) (Table 3).

DISCUSSION

The findings of the present study indicated that the subjects in both the groups had showed significant improvements in the arm function and there were decreases in the pain and lymphedema as measured by aVAS and the modified truncated cone method respectively. Moreover, greater improvements were seen in the subjects receiving the home program. In the examination of the effectiveness of the above treatment strategies in subjects with post mastectomy lymphedema (PML), the CDT group had showed an
effective reduction in lymphedema, pain, and a significant improvement in function. In this study we found that CDT and remedial exercises in combination with a one hour home program can reduce the volume of lymphedema decreased pain and improved hand function.

The two groups had equal numbers of subjects and there was no significant difference with respect in their ages, which could have affected the results of the study. Manual lymphatic drainage (MLD) resulted in a significant reduction in lymphedema volume and improvement in arm parameters and symptoms related to edema. Williams et al. conducted a randomized control crossover study and found that MLD significantly reduced the limb volume and dermal thickness. Subject's quality of life and emotional status were also improved by this technique\(^{20, 51}\). Anderson et al. in a prospective randomized study compared MLD and the use of a compression garment and exercise. Their data suggested that MLD did not contribute significantly to the reduction in edema. Compression bandaging alone can sometimes yield good results\(^{17}\).

The results of the present study are supported by the study of Devoogdt et al., which concluded that the MLD in addition to conventional treatment after axillary lymph node dissection for breast cancer has a medium to large short term effect in reducing the extent of arm lymphedema\(^{44–47}\). The CDT group showed more improvement in the volume, pain and upper limb function than did the conventional group, because the remedial exercises and home program resulted in greater reduction of limb volume, allowing the subjects to gain confidence and to move the limb without fear. In conclusion the CDT in combination with a home exercise program was effective at reducing post mastectomy lymphedema. Potential benefits were gained by the persons participating in this study, who showed there was improvements in pain, volume and upper extremity function. The study assisted breast cancer related lymphedema survivors in regaining their lost functions restored, gain their confidence, and improved their physical functioning.

The results of the present study suggest the use of CDT and a home exercise program in post-mastectomy lymphedema in order to achieve the significant improvement and hasten the recovery of the breast cancer survival patients. Follow up should be performed to see the long term effects of the treatment. Region specific lymphedema reduction and quality of life should be explored in the future studies. A first limitation of the study is the volume measurement which was measured indirectly using arm circumference. Another limitation was that there was no follow up to observe the long term effects of this technique.

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### Table 3. Volume, DASH and pain scores of the groups

| Outcome          | Baseline (M±SD) | 95% CI | 4th week | 95% CI | 6th week | 95% CI |
|------------------|----------------|--------|----------|--------|----------|--------|
| Pain             | 6.9±1.1        | 4.2–8.2| 4.5±0.9  | 2.1–4.8| 2.9±0.6  | 1–1.9  |
| DASH score       | 32.6±1.5       | 30–36  | 7.9±0.8  | 5.8–9.3| 5.1±1.1  | 1.6–3.3|
| Lymphedema (cm³) | 1,974±171.3    | 1,596–2,553| 1,757.6±186.71| 1,302–2,201| 1,599.7±191.4| 1,031–2,102|
| Pain             | 6.8±0.9        | 4.2–8.5| 3.2±0.7  | 3.1–6.3| 1.4±0.2  | 2–4.7  |
| DASH score       | 32.6±1.4       | 30–35  | 6.7±0.7  | 6.6–10 | 2±0.5    | 3.3–7.5|
| Lymphedema (cm³) | 1,996.4±279.3  | 1,311–2,502| 1,657.2±254.1| 1,278–2,105| 1,412.5±219.2| 1,065–1,904|

Values are mean± SD; CI: confidence interval; cm: centimeters

\(^{18}\) study performed by Haghighat\(^{13}\) where they showed 16.9 % of mean improvement in lymphedema with an effect size of 1.05. The mean improvement of the DASH score in the present study was 175.9 % with an effect size of 27.25; this result was supported by a previous study done by Raven where they showed 170.5 % of mean improvement with an effect size of 2.284–48. Current lymphedema treatment involves using passive forces such as manual lymphatic drainage, compression bandaging, and limb elevation. Recent literature suggests that active forces from skeletal muscle contractions and thoracic movement can also be utilized to pump venous and lymphatic fluid\(^{44–47}\). The CDT group showed more improvement in the volume, pain and upper limb function than the conventional group, because the remedial exercises and home program resulted in greater reduction of limb volume, allowing the subjects to gain confidence and to move the limb without fear. In conclusion the CDT in combination with a home exercise program was effective at reducing post mastectomy lymphedema.
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