EFFICACY OF MULTI-LAYER BANDAGING WITH AN ADDITIONAL PADDING DURING INTENSIVE PHASE OF DECONGESTIVE LYMPHATIC THERAPY ON LYMPHEDEMA POST MASTECTOMY

Esraa Hany Rostom, PhD, PT, CLT¹,²,³

¹ Department of Physical Therapy for Surgery, Physical Therapy Faculty, Cairo University, Egypt
² Physical Therapy Department, Medical Rehabilitation Sciences Faculty, Taibah University, Medina, KSA
³ Certified Lymphatic Therapist

Corresponding Author: Esraa Hany Rostom
Email: esraarostom@gmail.com

ABSTRACT

Introduction: lymphedema has an extensive effect on everyday activities, self-image, and overall quality of life. Treatment of lymphedema is centered on volume reduction, skin condition stabilization, lowering complications and increasing the mobility. Objective: The current study was done so as to measure the efficacy of Multi-layer Bandaging with an additional padding during intensive phase of Decongestive Lymphatic Therapy on Lymphedema post Mastectomy. Methods: Thirty female patients with lymphedema post mastectomy participated within the current study, they have been divided into two identical groups using random method. Group (A) received multi-layer bandaging with an additional padding during intensive phase of Decongestive lymphatic Therapy (DLT). Group (B) received traditional multi-layer bandaging during intensive phase of Decongestive lymphatic Therapy (DLT). The timing and duration of the interventions lasted for four weeks for each of the selected participants and every patient has obtained five sessions each week. Results: The findings of the study found out that there has been an extensive distinction in upper limb circumference in each group (A) and (B) post-treatment (p < 0.05) altogether with significant improvement in group (A). Conclusion: The additional padding with multi-layer bandaging is more significant and more efficient than the traditional multi-layer bandaging in reducing volume of the limb during intensive phase of DLT in lymphedema post mastectomy.

Key words: Decongestive Lymphatic Therapy, Multi-layer Bandaging with an additional Padding, Lymphedema, Mastectomy.

1-INTRODUCTION

Lymphedema has been used to describe edema which is a result of a problem with the lymphatic development or it is a damage related to the lymphatics after tumors medication (1,2). Mastectomy with axillary lymph node dissection is the repeated and noticeable risk factor for lymphedema. Lymphedema has detrimental impact on how people could lead their life peacefully due to postural changes, arm function problems, and complications such as infection and cellulitis. (3)

Lymphedema is best defined to be a medical condition that is featured by the excess accumulation of protein rich tissue fluid in interstitial voids. The capacity to transport macromolecules including protein back into the blood vascular system is reduced by impairment of the lymphatic system. The result is edema with a wide range of additional symptoms like heaviness, tightness, tingling and pain. (4)

Treatment of lymphedema is centered on reduction of the volume, skin condition stabilization, lessen the various problems like cellulitis, and enhancing mobility through decongestive lymphatic therapy (DLT) (4,5). DLT is done through two stages. The first stage or the intensive phase or decongestion phase (Phase I) and the second stage or the maintenance stage (Phase II). The first stage’s main goal is to mobilize and reduce the congested protein-enriched fluid, as well as soften and minimize any enlarged connective tissue that may be present. The major goal of the second stage is to optimize and maintain the results gained in the previous stage. (6)
The intensive phase of DLT entails multilayer bandaging, manual lymphatic drainage (MLD), skin care and exercise. Following this, the participants experience the second phase which is a maintenance phase wherein they engage in self-management measures in order to control the swelling. (7)

Applying pressure on the influenced area of the body is required to be on lymphedematous limb especially that with additional fibrotic tissues. Subsequently, it is typically, padding is applied to the affected area initially, followed by multilayer lymphedema bandaging. The resting pressure rises as a result of this, altogether with the working pressure on the affected area of the body and reducing arm volume. (8)

Compression of the extremities via bandaging is used to treat lymphedema and it is a crucial step in all medication processes (9). Using short stretch bandages is highly recommended and effective in the initial control of arm lymphedema. Short stretch compression bandage can maintain pressure well for the limb. (10, 11)

Manual Lymphatic Drainage (MLD) came to light by Vodder in 1936. Applying and using the technique of specific massage is well tolerated by patients and harmless even to patients with cardiac illnesses and advanced edema. The major purpose of this exercise is to allow filling of the cutaneous primary lymphatics and augments lymphatic conduits, contractility and dilatation. MLD encourages the recruitment of watershed lymph flow channels recruitment by stimulating edema-free zones in the trunk and uninvolved extremities, as well as the creation of accessory lymph collectors. (12)

The program of active exercises is utilized to improve lymphatic flow and strength as well as the required range of motion (13). Combining of active exercises and compression therapy are very vital to upper limb lymphedema when it comes to measure the volume decrement. (14)

II- MATERIALS & METHODS

- **Design:**

  A randomized control trial done on the selected patients with lymphedema postmastectomy who were chosen carefully according to specific criteria from surgery clinics. A formal consent has been signed by all of the patients.

  The participants were divided into two identical groups; group A and group B. First Group (A) has obtained a multi-layer bandaging with an additional padding during the intensive phase of Decongestive lymphatic Therapy (DLT). Second Group (B) has gone through a traditional multi-layer bandaging during the intensive phase of DLT. As for the randomization process, it has been done through using closed cards. The therapist created thirty sealed envelopes, each containing a group A or B card. Every participant was given a closed card to choose from, which indicated which group the patient belonged to.

  The therapist has made plans for the first visit and four weeks after that in order to draw a comparison between the two groups. Moreover, the duration of the interference was four weeks for each patient. Each participant has gone through five sessions weekly.

- **Participants:**

  The clinical part of the current study was done on cases with secondary lymphedema post total mastectomies that has been treated in Surgery Clinic. Thirty female patients going through physical therapy treatments have taken part in the study. The women who were chosen for the study were free of any pathological illnesses like local or proximate malignancy, limb infection, anti-coagulated patients, deep vein thrombosis and. All the previously mentioned conditions would affect the results of the study. Their age was about forty years. Further, the study excluded patients with skin diseases.

- **Material and Measurement Techniques:**

  *Decongestive Lymphatic Therapy (DLT)*

  This technique is considerably the iconic and the most popular treatment for patients with lymphedema (15). It is called also Complex Decongestive Therapy. DLT includes two stages of treatment. The first stage, also known as intensive phase or decongestion phase (Phase I), is used to mobilize and reduce congested protein-rich fluid, as
well as soften and reduce any enlarged connective tissue that may be present. The second stage, or maintenance phase (Phase II), is completed for optimizing and preserving the first stage’s results. (6)

**Intensive Phase of Decongestive Lymphatic Therapy (Phase I)**

It is the first phase of DLT and it involves multilayer bandaging, manual lymphatic drainage, skin care, and exercises, all of which are considered part of the treatment technique (7). During the first phase of DLT, compression bandaging is required, and a variety of materials and application methods are used throughout the treatment procedure. (16)

**An additional Padding**

An additional Padding was applied for the affected limb by: Mollelast conforming extensible bandage for fingers, tg-tubular close-meshed stockinette was used as a barrier between skin and padding with bandaging layers, Cellona synthetic padding, Komprex foam rubber pads, Rosidal-K foam bandage. Using additional pads would play a crucial role in improving the effect of lymphedema management. (8)

**Multi-Layer Bandaging**

When it comes to Multi-layer Bandaging, it is done through using Cotton Tubular Bandages, Rosidal-K short-stretch compression bandage. Rosidal-K Short-stretch bandages (100% cotton fibers) with 60% extensibility of length of the original. Bandages are interwoven in a significant way. Three Rosidal-K short stretch Bandages were used (6 cm x 5 m) for the hand, (8 cm x 5 m) for forearm, (8 cm x 5 m) for arm. Short stretch bandages are considered to be significant in the initial management of arm lymphedema. Short stretch compression bandage can maintain pressure well for the limb. (10,11)

**Manual Lymphatic Drainage (MLD)**

As for the Manual Lymphatic Drainage, it was applied by Certified Lymphatic Therapists using Vodder Technique. The treatment technique is centered on using four key strokes: stationary circles, pumps, rotational, and scoop in different designs to provide very mild pressure with hand motions on the patient's skin and subcutaneous tissue (17). The pressure is applied for forty minutes, which is split between lymph nodes, anastomosis, abdomen, and the affected area. It is highly recommended to clear the proximal region of the limb before starting the treatment process. Then, the drainage is extended distally accompanied with pressure application on every part from distal to proximal.

**Active Exercises**

An individualized active exercise program lasting for twenty minutes after bandaging is crucial for all participants. Those exercises include diaphragmatic breathing exercise, pumping and active free exercises of the upper limb so as to permit the lymphatic flow, to improve the strength and to extend the range of motion. (13)

**Skin Care**

An ideal medium of the microbial growth is achieved through having protein-rich fluid (18). Skin care is one of the main pillars of treating people with lymphedema. Therapist examined the affected limb for any symptoms such as rash, redness, pain, increased skin temperature, swellings and fever. Before the application of padding and bandaging processes, a moisturizer must be applied to the skin. Advices were given to the patients for nail care and avoiding skin punctures to the skin of the affected limb such as injections.

- **Procedures:**

  All the treatment procedures were done by a certified lymphatic therapist. Participants were randomly divided into two major categories. An initial evaluation was done to all participants on the same day before starting the treatment process. All patients have gone through five sessions weekly on a period lasted for 4 weeks.

  The following ethical rules has been taken into account:

  - Receiving a full explanation concerning the treatment process is a must for all participants before starting the therapeutic process.
- A comparison has been done for all patients concerning their measurement before starting the treatment process.
- Each participant was asked to have a relaxed position that enabled her to watch out and observe the treatment process.
- The therapist has taken the measurements of the participants before and at the end of four complete weeks of treatment so as to draw a comparison between the two measurements

- **Group (A) (n=15)** has gone through a multi-layer bandaging with an additional padding during the intensive phase of Decongestive lymphatic Therapy (DLT). The therapy was applied by Certified Lymphatic Therapist (CLT) according to the following tips and steps:
  - Certified lymphatic Therapist used stationary circles, pumps, and strokes with applying mild pressure with hand motion on the patient’s skin and subcutaneous tissues. The lymph nodes, anastomosis, abdomen and affected limb were all subjected to 40 minutes of pressure. Moreover, the proximal section of the affected limb is continuously cleaned first, followed by the drainage being extended distally and pressure being applied to every part from distal to proximal.
  - An additional Padding was applied for the affected limb in the following sequence: Mollelast conforming extensible bandage was applied for fingers, tg tubular close-meshed stockinette was used as a barrier between skin and padding, Cellona synthetic padding was applied for the upper limb, Komprex foam rubber pads was applied and Finally Rosidal foam bandage was applied for the upper limb.
  - Multi-layer bandaging was applied by using three Rosidal-K short stretch using (6 cm x 5 m) for the hand, (8 cm x 5 m) for forearm, (8 cm x 5 m) for arm. Bandages were applied from distal to proximal (the utmost compression was applied at distal parts with decreasing the compression gradually when moving to proximal sites)
  - Each participant had a 20-minute personalized active exercises session supervised by a Certified Lymphatic Therapist. The exercises comprised diaphragmatic breathing, pumping, and active free exercises of upper limbs.

- **Group (B) (n=15)** has obtained a traditional multi-layer bandaging during the intensive phase of Decongestive lymphatic Therapy (DLT) in the following steps:
  - Certified lymphatic Therapist used stationary circles, pumps, and strokes with applying mild pressure with hand motion on the patient’s skin and subcutaneous tissues. The lymph nodes, anastomosis, abdomen, and affected limb were all subjected to 40 minutes of pressure. The proximal section of the diseased limb is cleansed continuously first, followed by the drainage being extended distally and pressure being applied to every part from distal to proximal.
  - Traditional multi-layer bandaging was applied in the following steps: tg- tubular close-meshed stockinette was used as a barrier between skin and bandaging. Three Rosidal-K short stretch using (6 cm x 5 m) for the hand, (8 cm x 5 m) for forearm, (8 cm x 5 m) for arm. Bandages were applied from distal to proximal (the utmost compression was applied at distal parts with decreasing the compression gradually when moving to proximal sites).
  - Each participant had a 20-minute personalized active exercises session supervised by a Certified Lymphatic Therapist. The exercises comprised diaphragmatic breathing, pumping, and active free exercises of upper limbs.

- **Edema assessment**
  - At the initial visit and after 4 weeks of treatment, the researcher made group comparisons. at olecranon level, 5 Cm above olecranon and 5 Cm below the same reference point for both groups using (Tap Measurement). According to earlier research, circumferential measurements in those with Breast Cancer Related Lymphedema are consistent with the perometer. (19)

- **Data analysis:**
  - The age of the groups was compared using an unpaired t-test. To ensure that the data had a normal distribution, the Shapiro-Wilk test was utilized. Levene's test for homogeneity of variances was used to determine group homogeneity. To investigate within and between groups effects on limb circumference at the olecranon level, above elbow 5 cm, and below elbow 5 cm, mixed design MANOVA with repeated Measures was used. Post-hoc testing using the Bonferroni correction for subsequent multiple comparisons. The significance level for all statistical tests was set at p < 0.05. The statistical program for social studies (SPSS) version 24 was used for all statistical analysis.
III- RESULTS

- **Group A (15)** received multi-layer bandaging with an additional padding during intensive phase of Decongestive lymphatic Therapy (DLT).
- **Group B (15)** received traditional multi-layer bandaging during intensive phase of Decongestive lymphatic Therapy (DLT).

- **Participants Characteristics**

  This study included 30 females with upper limb lymphedema. Group A had mean ± SD age of 40 ± 3.4 years while group B had mean ± SD age of 39.9± 2.7 years. There was no discernible age difference between the groups. (p > 0.05).

*Within group comparison*

  The upper limb circumference at the olecranon level, above elbow 5 cm, and below elbow 5 cm for both groups A and B decreased significantly after therapy in comparison to pre-treatment (p <0.05), (Figure 1).

*Between groups comparison*

  There was no significant difference in upper limb circumference at olecranon level, above elbow 5 cm, and below elbow 5 cm between groups A and B pre-treatment (p > 0.05), but there was a significant difference in upper limb circumference at olecranon level, above elbow 5 cm, and below elbow 5 cm between groups A and B post-treatment (p < 0.05), with group (A) showed better improvement (Figure 1).

![Limb Circumference Pretreatment and Posttreatment](image)

**Figure 1.** Mean limb circumference at olecranon level, above elbow 5 cm and below elbow 5 cm pre and post treatment of group A and group B

IV- DISCUSSION

Decongestive lymphatic therapy (DLT), also known as complex decongestive therapy (CDT) or Complete decongestive therapy (CDT), is a lymphedema treatment (6). Multilayer bandaging, manual lymphatic drainage (MLD), skin care, and exercise are all part of first stage of DLT. After that, the patients progress to stage two, where they engage in self-management efforts to keep the swelling under control. (7)

Compression therapy is the most common treatment option for lymphedema and associated consequences. Various elastic and non-elastic bandages are used for compression therapy. The type of bandage to use is determined on the stage of lymphedema. The pressures beneath the bandage are determined not only by the material, but also by the compression force used, the number of layers and coverage of certain bandages, and the bandage procedure. (20)
The capillary dynamics of veins, lymph vessels, and tissues are altered by compression therapy with a multilayer bandage. It raises interstitial pressure and increases muscle and joint pumping power. Additional padding raises both the resting and working pressures on the area while also lowering the arm's volume. The area is usually padded first, then wrapped by multilayer bandaging (8). According to Foldi, a decongestive program would fail if patients were unable to participate with compression therapy. (21)

Few studies have been done previously so as to evaluate the efficiency of the multi-layer bandaging and additional Padding. Within the frame of the present study, the researcher evaluated the efficacy of multi-layer bandaging with additional Padding during phase I of DLT. On the other hand, the researcher performed comparison between two groups to detect the best application that can improve post mastectomy lymphedema, the results proved that multi-layer bandaging with additional Padding was more effective and superior to traditional multi-layer bandaging during phase I of DLT.

A study was conducted to see how multilayer inelastic bandaging padding affected individuals with breast cancer-related lymphedema, and whether adding more padding has an extra effect on limb volume reduction. The study comprised 48 patients with breast cancer who were starting sophisticated Lymphedema decongestive therapy. Padding was placed to the forearms of 24 individuals. The afflicted arm was wrapped in a short-stretch bandage with or without using padding. While the patients squeezed a rubber device, working pressure was measured. Before and after 2 weeks of treatment, the circumference of the forearm limb was measured. After treatment, the volume loss in the padding group was substantially higher (P < 0.05). According to the findings, addition of padding improves both resting and working pressure, and it also appears to be beneficial in enhancing limb volume reduction. (22)

Another study was done on the impact of bandaging with extra padding and tape on secondary lymphedema in a 69-year-old woman with upper-limb lymphedema. She had history of radical mastectomy including axillary lymph node dissection and extensive excision. For two weeks, she received five sessions every week. Every session began with 30 minutes of Vodder MLD, followed by the application of a short-stretch bandage pad. A stockinette was cut into a 1 x 1 cm square piece of Rosidal soft bandage was applied inside it then the stockinette's edges were stitched together. Before another Rosidal soft bandage was applied, the pad was placed over the patient's lower arm and dorsum. Kinesio Tape with 30–40% longitudinal stretch was placed for the hand, arm, and trunk. Active range of motion of upper extremity and deep breathing exercises were added. The short stretch bandage was worn for twenty-three hours before being replaced at the next day. Additional padding and taping have been found to be useful in lymphedema treatment. (8)

In addition, in women who had unilateral breast cancer-related lymphedema (BCRL), a study was conducted to examine the effects of four types of bandages that include multilayer, simplified multilayer, cohesive and adhesive and also kinesio-tape. Participants were 150 patients and were divided into five groups (n=30). MLD, pneumatic compression, bandaging, therapeutic education and vigorous exercise were all part of an intensive phase of CDT for all of the women. The only difference between the groups was whether they used bandages or tape (multilayer; simplified multilayer; cohesive; adhesive; kinesio-tape). The proportion of excess volume change, feelings of heaviness and tightness, and perceived bandage or tape comfort were also assessed. Multilayer bandage appears to be more effective and comfortable than simplified multilayer bandage. Cohesive bandage appears to be as effective as multilayer and simple multilayer bandages. The least successful method appears to be kinesio taping. (23)

Another study was done at 90 people who had unilateral lymphedema, with 54 having upper limb lymphedema and 29 having lower limb lymphedema. Thirty-eight patients received Multi-layer Bandaging for 18 days, which included a tubular stockinette with digits bound on the first layer and short stretch extensible bandages on the second and third layers. More than two layers of bandages were applied to the lower limbs in both a spiral and a figure 8 pattern. Spiral bandages were applied to the upper limbs. Bandages were worn twenty-four hours a day then replaced on a daily basis. Patients were required to wear hosiery from dawn to bedtime for the remainder of the experiment after 18 days. From the start of the trial, 52 participants were assigned to hosiery only. The percentage of surplus limb volume reduction was calculated using an electronic volumeter or manual circumference measurements. Multilayer bandaging, followed by compression hosiery, was found to reduce excess limb volume by a greater proportion than hosiery alone. (24)
V- CONCLUSION

In lymphedema after mastectomy, an additional padding with multi-layer bandaging is more effective than traditional multi-layer bandaging in decreasing volume of the limb during intensive phase of Decongestive Lymphatic Therapy.

REFERENCES

24) Badger C M, Peacock J L, Mortimer P S. “Multilayer bandaging plus compression hosiery was better than hosiery alone for unilateral lymphedema of a limb”. BMJ journal, 2000;52 (6).