

The effect of manual lymph drainage on breast cancer-related lymphedema

[Oana Maria Baltag, Kristo Xhardo, Andra Ioana Singuran, Mariana Cordun, Mihaela Apostu]

Abstract— Prevention of post-mastectomy complications is the major objective of physiotherapy. The prognostic benefits of lymph node dissection have been demonstrated for patients with breast cancer or gynecological malignancies; however, a complication associated with this procedure is lymphedema. Lymphedema is a common complication in patients who have undergone breast cancer surgery. Breast cancer-associated lymphedema (BCRL) is a major complication of breast cancer treatment, affects the quality of life of breast cancer survivors who develop it. Edema commonly affects the arm, leading to discomfort, decreased arm movements, pain, and decreased quality of life. We studied whether manual lymphatic drainage could manage or prevent upper limb edema in patients after breast cancer surgery. Recent studies have shown that manual lymphatic drainage has a beneficial result in combating lymphedema in patients who have undergone surgery for breast cancer. Lymphatic drainage also has a beneficial effect in preventing lymphedema in patients after breast cancer surgery. Therefore, the relationship between post-mastectomy lymphedema and quality of life has evolved as an important criterion for treating breast cancer survivors. This study aims to analyze the effectiveness of manual lymphatic drainage in the treatment of postmastectomy lymphedema in order to reduce the volume of lymphedema and to assess the improvement of concomitant symptoms. The number of patients included in the study was 15, who had breast cancer surgery. The current study verifies the effect of manual lymphatic drainage on upper limb lymphedema after anterior axillary lymphadenectomy/sentinel node biopsy in the maintenance phase of lymphedema after breast cancer surgery.

Keywords—Breast cancer, lymphedema, manual lymph drainage

I. Introduction

Lymphedema represents an accumulation of lymphatic fluid in tissues and is clinically manifested by the increase in volume of the affected area. The patient has a feeling of heaviness in the affected limb, discomfort, pain and decreased range of motion. After the treatment, patients with breast cancer have an increased risk of lymphedema in the upper limbs and chest.

There is no criterion for diagnosing lymphedema, according to the *US National Cancer Institute*. However, a difference of 2 cm from the previously made measurements or a comparison to the contralateral limb suggests the development of edema.

Norman A. et al. (2009) classify the forms of lymphedema into mild, moderate, and severe. Tretbar L. et al. (2008) distinguish four stages of evolution of the lymphedema:

- *Stage 0* - It is the initial stage; it occurs during or at the end of the day, after physical effort and decreases after some rest because it is reversible.
- *Stage 1* - The volume of the limb does not decrease after rest but, properly treated can regress. It may be associated with erysipelas and eczema.
- *Stage 2* - The tissue fibroses; lymphedema persists even after treatment. Complications such as erysipelas, eczema and lymphatic fistulas often occur.
- *Stage 3* - It is also called elephantiasis; it is an irreversible form with serious complications, because of the large size of the lymphedema, the nerves are compressed and the mobilization of the affected limb is made difficult.

The diagnosis of lymphedema is established based on the clinical signs and paraclinical investigations.

Also, it is important to know the events that led to the appearance of lymphedema. The patient will be asked at what time the lymphedema developed after treatment, the region in which the lymphedema is present, the type of surgery and the treatment followed after the surgery.

Regarding the state of the lymphedema, we are interested in the following information:

- slow or accelerated onset;
- if it occurred after plowing heavy objects or during high temperature periods;
- if it decreases after the rest periods;
- possible erysipelas infections.

The clinical signs that contribute to establishing the diagnosis are the pitting sign and the Stemmer sign.

The pitting sign is present in the incipient stage, also called the pitting stage. The sign is positive if, following an external compression, the indentation in the swollen tissue is maintained. In the late stages of lymphedema or non-pitting, the edema no longer retains the tissue imprint due to the fibrosis.

The Stemmer sign is performed to identify the edema of the fingers. The test is done as follows: we create a fold at the base of the fingers/toes, using two fingers or a pair of tweezers. If the fold persists, the test is positive.

The most common method for assessing lymphedema is the perimeter, which consists of measuring the circumference of the segment with lymphedema. It is performed bilaterally to compare the affected limb with the unaffected one, and to analyze the evolution of lymphedema.

According to DiSipio T. et al. (2013), paraclinical investigations that can diagnose lymphedema are:

- ✓ soft tissue imaging examination: MRI is used to rule out other causes of lymphedema, such as cancer recurrence or venous insufficiency;
- ✓ imagistic examination of the lymph vessels: lymphoscintigraphy, is performed using contrast substance to highlight any blockages in the lymph vessels and to examine the state of the lymph nodes;
- ✓ perometry, also called optoelectronic volumetry: this method of evaluation uses an electronic infrared scanner, which calculates the volume of the limb with lymphedema. Each limb passes through a rectangular frame that transmits beams of infrared light from different angles. Subsequently, a computer processes the information and calculates the volume of the limbs;
- ✓ bioelectrical impedance: scans the amount of lymphatic fluid accumulated in the tissues in the upper limbs with lymphedema. The scanner transmits painless electrical current to the limb and measures tissue resistance. Experts in the field say that this method of investigation is the most useful because it can identify any accumulation of lymphatic fluid, even before the onset of symptoms.

Harris S. R. et al. (2001) provided guidance and recommendations for the care and treatment of patients with secondary lymphedema. These recommendations help physiotherapists and patients with the following:

- measuring the circumference of both upper limbs before and after the surgery;
- evaluation of lymphedema by: lymphoscintigraphy, MRI, CT, soft tissue ultrasound;
- performing a kinetic program and manual lymphatic drainage, during and after the application of adjuvant treatment;
- use of compression sleeves.

According to a study conducted out throughout a period of 5 years, in Pennsylvania, lymphedema secondary to mastectomy occurs in many patients. The study included 631 randomly selected patients, who were evaluated periodically at an interval of 7 to 9 months throughout the study period. 238 patients (42%) developed lymphedema, and in 80% of them, lymphedema manifested in the first 2 years postoperative.

The benefic effects of massage on lymphedema have been known ever since the 1800s. Between 1932 and 1936, the couple of doctors Emil and Estrid Vodder laid the foundations of a special form of massage with the role of stimulating the lymphatic system, also known as manual lymphatic drainage.

Initially, this type of massage was used for cosmetic purposes, but also in the treatment of sinusitis. Currently, it is applied postoperatively to patients with breast cancer and consists of applying maneuvers performed rhythmically, tenderly and gently, taking into account the directions in which the lymph flows to the lymph nodes. Its role is to facilitate the resorption of lymphatic fluid in the capillaries.

In the case of axillary-pectoral lymphodissection, the lymph nodes in the axillary and pectoral region are removed, which creates an interruption in the lymphatic circulation. Therefore, this type of massage must be applied as soon as possible.

Lymphatic drainage is essential for the prophylaxis and management of lymphedema. The maneuvers used are:

- ✓ stationary circular movements – they are applied both at the level of the ganglion stations and at the level of the limbs, with the fingers 2-5 or with the thumbs; the pressure is light and gradually increases;
- ✓ pumping technique – they are applied with the palmar face of the fingers, which is used to make light upward pressures;
- ✓ pressures made with the thumbs and index placed in a bracelet position – they are applied to the limbs, the pressure is upward, the direction is from proximal to distal.

According to Foldi M. and Strossenreuther R. (2003) specific lymphatic drainage techniques are associated with effleurage applied at the beginning of the massage and vibrations applied at the end of the massage. The authors recommend starting treatment with a series of 10 consecutive sessions; afterwards, the rhythm of the sessions will be 2 per week. The patient will also learn self-drainage techniques that he will perform daily.

Posture is the maintenance of certain positions of the body or its segments for a limited period of time, for prophylactic or therapeutic purposes. The positions have the role of preventing or correcting the installation of vicious attitudes or of facilitating a physiological process.

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II. Methodology

The aim of this study is to check the effects of manual lymph drainage on post-mastectomy lymphedema.

We included 10 subjects in this study with radical mastectomy and lymphedema at the level of the upper limb on the side of mastectomy.

We measured the circumferences of the upper limb, with the metric band, at the following levels:

- metacarpal-phalangeal joint;

- distal radio-ulnar joint;
- 10 cm distal to the lateral epicondyle;
- 5 cm proximal to the elbow joint;
- 10 cm proximal to the lateral epicondyle.

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III. Results

Primetry – metacarpo-phalangeal joints

Measurements performed for the metacarpo-phalangeal joint in the right upper limb showed a decrease of the average by 0.7 cm, from 19.3 at the initial assessment to 18.6 cm at the final assessment, the latter being 0.4 cm higher than the average values measured at the other limb which is 18.2 cm. The median decreased from 19.5 to 19. The bilateral t-test showed a statistically significant difference between the averages of the two evaluations, $p = 0.00005 < 0.05$, t value is 5.74. The effectiveness of the therapeutic protocol was observed in the value of the effect size, which is 0.66 (table 1).

Table 1. Statistical indicators on the perimetry of the metacarpo-phalangeal joints

	Initial Evaluation	Final Evaluation
Average	19.3	18.6
Median	19.5	19.0
Standard Deviation	1.06	1.03
Amplitude	4	3.5
Variation Coefficient	5%	6%
Standard Error	0.28	0.27
T test (t value)	-5.74	
p value	0.00005	
Effect size	0.66	

Perimetry - the distal radio-ulnar joint

At the level of the distal radio-ulnar joint there was a decrease of the average by 1.2 cm, from 18.5 at the initial assessment to 17.3 cm at the final assessment, the latter being lower by 0.4 cm, compared to the average of the values measured in the other limb which is 16.9 cm. The variation coefficient decreased by 4%. Also, the standard deviation decreased from 2.18 to 1.45. The t test shows a statistically

significant difference between the averages of the two evaluations, $p = 0.0067 < 0.05$, for $t = 3.18$. The progress obtained following the therapeutic protocol translates into the size of the effect (0.66), the data is presented in table 2.

Table 2. Statistical indicators on the perimetry of the distal radio-ulnar joint

	Initial Evaluation	Final Evaluation
Average	18.5	17.3
Median	17.5	17.0
Standard Deviation	2.18	1.45
Amplitude	7.5	5
Variation Coefficient	12%	8%
Standard Error	0.58	0.38
T test (t value)	-3.18	
p value	0.0067	
Effect size	0.66	

Forearm perimetry - 10 cm distal to the lateral epicondyle

Measurements performed 10 cm distally from the lateral epicondyle show a decrease in average by 2.5 cm, from 26.3 at the initial assessment to 23.8 cm at the final assessment, the average at the final assessment being 0.6 cm higher, compared to the average of the values measured in the other limb (not operated) which is 23.2 cm. The amplitude decreased from 10.5 to 7. We can also observe a change in the variation coefficient, from 11% to 9%. The bilateral t-test showed a statistically significant difference between the averages of the two evaluations, $p = 0.0038 < 0.05$, t value is 6.64. The effectiveness of the therapeutic protocol was observed in the value of the effect size, which is 0.97 (table 3).

Table 3. Statistical indicators on the perimetry of the forearm- 10 cm distal to the lateral epicondyle

	Initial Evaluation	Final Evaluation
Average	26.3	23.8
Median	26.0	23.0
Standard Deviation	2.99	2.12
Amplitude	10.5	7
Variation Coefficient	11%	9%
Standard Error	0.80	0.56
T test (t value)	-6.64	
p value	0.0038	
Effect size	0.97	

Arm perimetry - 5 cm proximal to the lateral epicondyle

Following the measurements performed 5 cm proximal to the lateral epicondyle, we noticed a decrease in the average by

2.4 cm, from 31.5 at the initial assessment to 29.1 cm at the final assessment. The average of the scores obtained in the final evaluation is 0.9 cm higher than the average of the values measured in the other limb which is 28.2 cm. The median decreased by 3 and the amplitude by 4. The standard deviation decreased from 31 to 28. The t test shows a statistically significant difference between the averages of the two evaluations, $p = 0.00023 < 0.05$, for $t = 4.92$. The progress obtained following the therapeutic protocol translates into the size of the effect (0.73), the data is presented in table 4.

Table 4. Statistical indicators of arm perimetry - 5 cm proximal to the lateral epicondyle

	Initial Evaluation	Final Evaluation
Average	31.5	29.1
Median	31.0	28.0
Standard Deviation	3.66	2.85
Amplitude	14	10
Variation Coefficient	12%	10%
Standard Error	0.97	0.76
T test (t value)	-4.92	
p value	0.00023	
Effect size	0.73	

Arm perimetry - 10 cm proximal to the lateral epicondyle

The circumference of the arm evaluated at 10 cm proximal to the lateral epicondyle shows a decrease of the average by 1.5 cm, from 35.5 at the initial assessment to 34 cm at the final assessment. The average in the final evaluation is 0.5 cm higher than the average of the values measured in the other limb which is 33.5 cm. The standard deviation increased from 4.10 to 4.60. The median decreased from 34 to 33 and the variation coefficient changed by 2%. The bilateral t-test showed a statistically significant difference between the averages of the two evaluations, $p = 0.0011 < 0.05$, t value is 4.07 (table 5).

Table 5. Statistical indicators of arm perimetry - 10 cm proximal to the lateral epicondyle

	Initial Evaluation	Final Evaluation
Average	35.5	34.0
Median	34.0	33.0
Standard Deviation	4.10	4.60
Amplitude	17	20.5
Variation Coefficient	12%	14%
Standard Error	1.09	1.23
T test (t value)	-4.07	
p value	0.0011	
Effect size	0.34	

iv. Discussion

According to Ozaslan C. and Kuru B. (2002), 28% of patients who underwent mastectomy and axillary lymphadenectomy develop lymphedema. The risk factors involved in the development of lymphedema are: age at the time of surgery, increased body mass index, treatment with tamoxifen, axillary radiotherapy, smoking, the number of axillary lymph nodes removed.

Donald C. McKenzie and Andrea L. Kalda (2003) noticed that resistive exercise had no significant beneficial effects on lymphedema secondary to mastectomy. The authors recommend approaching a kinetic program with progressive intensity.

Kerry S. Courneya et al. (2007) evaluated the implications of aerobic exercise and resistive exercise on patients who undergo chemotherapy. At the end of this study, they observed that patients completed chemotherapy treatment without developing lymphedema, they improved their self-esteem and physical state.

Although massage and posture are two different methods, they can be applied simultaneously in order to achieve a better effect. During the application of the massage, the upper limb will be kept in a proclive position, at an angle of approximately 45°, a method that promotes the resorption of edema. Special supports are made of sponge that can be used both during the application of the massage and at rest.

v. Conclusions

Lymphedema prophylaxis is a major goal, which is why, after surgery, patients are advised to keep the ipsilateral upper limb inclined at an angle of approximately 45°. When the patient resumes domestic and professional activities, it is necessary to avoid keeping the limb in a declining position for a long time during the activity program.

We consider that it is important to apply manual lymphatic drainage as early as possible, as it plays the role of stimulating the resorption of excess lymphatic fluid.

Following the measurements made at the upper limb on the surgery side, we found that the evaluated circumferences decreased. This fact demonstrates the effectiveness of the applied treatment and from a statistical perspective, the results obtained are significant, the value of the significance threshold (p) being < 0.05 .

We recommend combining light physical exercises with a role in stimulating the muscles of the upper limb that acts as a pump on the lymphatic capillaries. Also, in the management of breast cancer-related lymphedema, the lymph tape and the multilayer compression bandaging may be included.

Thus, we can say that the association of all kinetic means has a beneficial role in breast cancer survivors quality of life.

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