# Physical therapy after total mastectomy surgery in breast cancer

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## Abstract

*Introduction:* Breast cancer is the most common type of cancer among women in the whole world. It is caused by the development of malignant cells in the breast. In cancer patients, physical therapy has resulted in improved physical functioning, cardiovascular fitness, sleep, quality of life, psychological and social well-being, and self esteem, and significant decreases in fatigue, anxiety and depression. *Aim*: The aim of this study is to underline the importance of physical therapy in the rehabilitation of patients after total mastectomy surgery in breast cancer. *Material and methods:* We investigated 14 women aged between 45 and 75 years old, diagnosed with breast cancer (stages I–III), having a total mastectomy surgery 6 months ago. At the beginning and after 2 weeks of intervention, the subject`s evaluations consisted in: each patient was evaluated in regard to shoulder flexibility (from Test 1 to Test 8); on the other hand, we measured the upper limb circumferences on the surgery side. The physical therapy programme consisted in 10 sessions of 20 minutes lymphatic drainage and 10 minutes individualized physical therapy programmes. *Results:* At the end of intervention, it was observed a score improvement at Test 2 (from 1.28±0.99 to 1.85±0.53, p=0.041), Test 3 (from 0.42±0.85 to 1.57±0.85, p=0.001), Test 7 (from 0.5±0.51 to 0.85±0.36, p=0.019) and Test 8 (from 1.28±0.99 to 1.85±0.53, p=0.041). In terms of total score (Total), the improvement was also significant increased (from 13.25±9.08 to 18.13±10.12, p=0.044). Circumference values significantly improved at arm (from 30.36±4.25 to 29.79±4.41, p=0.001), forearm (from 23±2.18 to 22.04±2.26, p=0.001) and wrist level (from 17.46±1.74 to 17.11±1.67, p=0.012). Despite the intervention, elbow circumference didn`t reached the statistical significance (p<0.05). *Conclusions*: After 2 weeks of intervention we noticed a significant improvement at most of the parameters which means a life quality increase in patients with breast cancer.


***Key words:*** *breast cancer, physical therapy, lymphatic drainage, lymphoedema prophylaxis.*


## Rezumat

*Introducere:* Neoplasmul mamar este cel mai comun tip de cancer în rândul femeilor din întreaga lume. Acesta este cauzat de dezvoltarea celulelor maligne care îşi au originea în epiteliului ductal. La pacientele cu neoplasm mamar, kinetoterapia a avut ca rezultat îmbunătăţirea stării fizice generale, fitness-ului cardiovascular, somnului, calităţii vieţii, bunăstării psihologice şi sociale, stimei de sine şi scăderea semnificativă a oboselii, anxietăţii şi depresiei. *Scop:* Scopul acestui studiu este de a


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sublinia importanța kinetoterapiei în reabilitarea pacientelor cu neoplasm mamar în urma mastectomiei totale. *Material şi metode:* Au fost investigate 14 paciente cu vârsta cuprinsă între 45 şi 75 de ani, diagnosticate cu neoplasm mamar (stadiile I-III), având o intervenție chirurgicală de mastectomie totală cu 6 luni în urmă. La începutul şi după cele 2 săptămâni de intervenție, evaluarea pacientelor a constat în: evaluarea mobilității umărului, aplicându-se 8 teste de mobilitate (de la Test 1 la Test 8); pe de altă parte, am măsurat perimetrele membrului superior ipsilateral. Fiecare şedință a constat în 20 de minute de drenaj limfatic şi 10 minute de program de kinetoterapie individualizat. *Rezultate:* La sfârşitul perioadei de intervenție, s-a observat o îmbunătățire a scorului la Test 2 (de la 1.28 ± 0.99 la1.85 ± 0.53, p = 0.041), Test 3 (de la 0,42 ± 0.85 la 1.57 ± 0,85, p = 0,001), Test 7 (de la 0,5 ± 0.51 la 0.85 ± 0.36, p = 0,019) şi Test 8 (de la 1.28 ± 0.99 la 1.85 ± 0.53, p = 0.041). În ceea ce priveste scorul total (Total), a fost, de asemenea, înregistrată o creştere semnificativă (de la 13.25 ± 9.08 la 18.13 ± 10.12, p = 0.044). Valorile perimetrelor s-au îmbunătățit semnificativ la nivelul brațului (de la 30.36 ± 4.25 la 29.79 ± 4.41, p = 0,001), la nivelul antebrațului (de la 23 ± 2.18 la 22.04 ± 2.26, p = 0,001) şi la nivelul articulației radio-carpiene (de la 17.46±1.74 la 17.11±1.67, p=0.012). În ciuda intervenției, perimetrul măsurat la 2 cm superior de plica cotului nu a cunoscut o modificare statistică semnificativă (p<0.05). *Concluzii:* După 2 săptămâni de intervenție, am observat o îmbunătățire semnificativă la majoritatea parametrilor, ceea ce înseamnă o creştere a calității vietii la pacientele cu neoplasm mamar.

***Cuvinte cheie:*** *neoplasm mamar, kinetoterapie, drenaj limfatic, profilaxia limfedemului.*

## Introduction

Breast cancer is caused by the development of malignant cells in the breast. The malignant cells originate in the lining of the milk glands or ducts of the breast (ductal epithelium), defining this malignancy as a cancer. Cancer cells are characterized by uncontrolled division leading to abnormal growth and the ability of these cells to invade normal tissue locally or to spread throughout the body, in a process called metastasis.

Breast cancer is the most common type of cancer among women in the whole world. In Romania, breast cancer ranks first place among cancers in women, the incidence is approximately 57 cases per 100,000 population and mortality over 39 cases per 100.000 inhabitants. Regarding age, it was observed that the number of cases of breast cancer doubles every 10 years until menopause with two incidence peaks: one at 45-50 years old and another at 60 – 65 years old [1].

Women who develop breast cancer are often offered a combination of therapies, such as surgery, radiation therapy, hormonal therapy, chemotherapy and physical therapy. Thanks to the treatments that are available, more and more women are being cured of their malignancies [2].

A lot of evidence has documented the adverse mental and physical impact of cancer diagnosis in women. Chemotherapy often exacerbates symptoms such as fatigue, nausea and emotional distress with associated declines in well-being and functioning. Thus, it is important to prevent or relieve these symptoms and to improve their impact on quality of life [3].

There are some physical damages that can occur. One example of such damage is lymphoedema and other arm complications after axillary node dissection for breast cancer. Lymphoedema develops to one in four women treated for breast cancer, usually as a result of surgery, radiotherapy or advanced disease. Women who develop lymphoedema have more difficulty performing leisure activities and their jobs than women who are not affected by lymphoedema. In the same time, those women have sensitive alterations such as

discomfort and heaviness, psychological distress, difficulties with physical mobility and an increased risk of recurrent infection [4].

The intensive lymphoedema management programme, often referred to as combined decongestive therapy, aims to reduce limb volume, restore limb shape and improve skin and tissue condition. Daily treatment is commonly provided over a 2 to 4 week period using manual lymphatic drainage (MLD) [5].

MLD has been shown to have a number of physiological effects. These include an increase in the contraction rate of lymphatics, increased reabsorption of protein into lymphatics, reduced microlymphatic hypertension and improved collateral lymph drainage between the lymphatic territories of the skin. Improved drainage enables fluid to be redirected away from oedematous areas towards the functioning lymph nodes in unaffected areas, an important principle in lymphoedema management [6].

Women often require rehabilitation following breast cancer treatment. In cancer patients, physical therapy (PT) has resulted in improved physical functioning, cardiovascular fitness, sleep, quality of life, psychological and social well-being, and self esteem, and significant decreases in fatigue, anxiety, and depression [7].

There are studies that compare chemotherapy with other forms of cancer treatment (e.g., surgery and radiotherapy) and the conclusion is that the first one seems to have a greater negative impact on exercise and overall rates of daily activity. Thus, it was demonstrated that exercise during chemotherapy had reported adherence rates ranging from 20% to 98% for supervised exercise training, and 51% to 90% for home-based exercise training [8]. Moreover, studies have shown that chemotherapy patients participating in exercise programs experience less emotional distress, and better overall mental and physical, quality of life [9]. Results from other study also indicate that patients participating in exercise interventions experience less fatigue post-treatment [10].

Another study sought to address this gap in knowledge by assessing recent exercise activity and examining the links between exercise activity and quality of life in cancer patients scheduled to undergo chemotherapy. On the basis of the findings among cancer survivors and associations between exercise and quality of life for cancer survivors (post-treatment), it was hypothesized that higher rates of pretreatment exercise would be associated with less depression and anxiety and better healthrelated quality of life [3].

Cancer and its treatment can present significant challenges to participation in PT programmes. Despite evidence that exercise is beneficial, less than half of patients are engaged in some form of PT during cancer treatment, with estimates ranging from 15% to 44% of patients [7].

## Aim

The aim of this study is to underline the importance of physical therapy in the rehabilitation of patients after total mastectomy surgery in breast cancer. The intervention on these patients suggested by this study is confined to a few main goals: to see the effects of MLD and PT on the recovery of the shoulder flexibility and to see the effects of MLD and PT on lymphoedema degree of the upper limb.

## Material and methods

This prospective study is conducted on 14 women aged between 45 and 75 years old. All patients were diagnosed with breast cancer (stages I–III) and had a total mastectomy surgery 6 months ago. The study was conducted in a public hospital where patients

did radiotherapy after total mastectomy surgery. The PT treatment was performed for 2 weeks and each patient were benefit of 10 sessions of therapy. The main criteria for inclusion were: hospitalized female with a mastectomy surgery in the past 6 month, having no contraindications to perform physical activity. Each therapy session consisted in 20 minutes lymphatic drainage and 10 minutes individualized PT programme.

At the beginning and the end of the intervention were made eight mobility tests (from Test 1 to Test 8):

- Test 1: the combing on the same side of surgery test involves shoulder and elbow flexion ($90^0$; $45^0$).
- Test 2: the combing on the opposite side of surgery test involves shoulder adduction and flexion ($45^0$; $90^0$) and elbow flexion ($75^0$).
- Test 3: bra back closure test involves shoulder internal rotation and extension ($45^0$) and elbow flexion ($45^0$).
- Test 4: reach the shoulder located on the surgery side test involves shoulder and elbow flexion ($90^0$; $20^0$ - $30^0$).
- Test 5: reach the shoulder located on the opposite surgery side test involves shoulder adduction ($45^0$) and elbow flexion ($45^0$).
- Test 6: diagonal hand to hand reaching in the back test involves, on the one hand, the shoulder and elbow flexion of the same side of surgery ($160^0$ – $180^0$; $20^0$ – $30^0$) and, on the other hand, the shoulder internal rotation and elbow flexion ($45^0$).
- Test 7: statue of liberty position involves the full extension of the upper limb on the surgery side ($180^0$).
- Test 8: removing an object from the opposite pocket of the surgery side test involves shoulder adduction ($5^0$- $10^0$) and elbow flexion ($170^0$).

Each test receives 0 points if it isn`t successfully performed; Test 1, Test 4 and Test 7 receives 1 point and Test 2, Test 3, Test 5, Test 6 and Test 8 receives 2 points if are performed successfully.

At the beginning and at the end of the intervention (10 sessions) we measured the upper limb circumferences on the surgery side (in the middle of the arm; 2 centimetre above the elbow joint; in the middle of the forearm; at the wrist - base of the styloid process of the ulna).

## Results

Using the paired t test to compare the data at baseline and after each therapy session we noticed a significant differences at 4 of 8 mobility tests (Tabel I). Score improvement was observed at Test 2 (from 1.28±0.99 to 1.85±0.53, p=0.041) (Figure 1), Test 3 (from 0.42±0.85 to 1.57±0.85, p=0.001) (Figure 2), Test 7 (from 0.5±0.51 to 0.85±0.36, p=0.019) (Figure 3) and Test 8 (from 1.28±0.99 to 1.85±0.53, p=0.041) (Figure 4). In terms of total score (Total), the improvement was also significant increasing (from 13.25±9.08 to 18.13±10.12, p=0.044) (Figure 5). Circumference values significantly improved at arm (from 30.36±4.25 to 29.79±4.41, p=0.001) (Figure 6), forearm (from 23±2.18 to 22.04±2.26, p=0.001) (Figure 7) and wrist level (from 17.46±1.74 to 17.11±1.67, p=0.012) (Figure 8). Despite the intervention, elbow circumference didn´t reached the statistical significance ($p<0.05$) (Table I).

**Table I.** Arithmetic mean and standard deviation of the studied parameters

| Parameters | Baseline | After 2 weeks of intervention | p value |
|---|---|---|---|
| Test_1 | 0.92±0.26 | 1 | ns |
| Test_2 | 1.28±0.99 | 1.85±0.53 | 0.041 |
| Test_3 | 0.42±0.85 | 1.57±0.85 | 0.001 |
| Test_4 | 0.85±0.36 | 0.92±0.26 | s |
| Test_5 | 2 | 2 | ns |
| Test_6 | 0 | 0 | ns |
| Test_7 | 0.5±0.51 | 0.85±0.36 | 0.019 |
| Test_8 | 1.28±0.99 | 1.85±0.53 | 0.041 |
| Total | 13.25±9.08 | 18.13±10.12 | 0.044 |
| Arm circumference (cm) | 30.36±4.25 | 29.79±4.41 | 0.001 |
| Elbow circumference (cm) | 26.71±2.84 | 26.29±3.16 | ns |
| Forearm circumference (cm) | 23±2.18 | 22.04±2.26 | 0.001 |
| Wrist circumference (cm) | 17.46±1.74 | 17.11±1.67 | 0.012 |

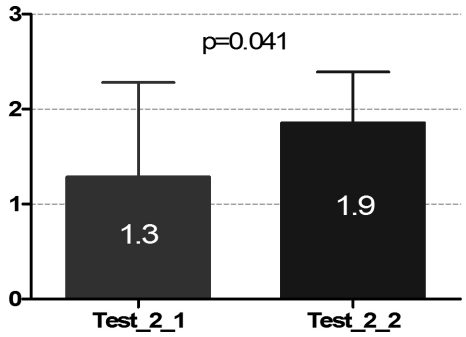


**Figure 1.** Score improvement of Test 2 before and after 2 weeks of intervention.
Test_2: The average of Test 2 score before (Test_2_1) and after 2 weeks of intervention (Test_2_2)

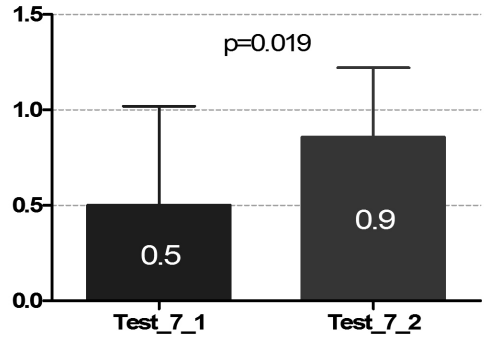


**Figure 3.** Score improvement of Test 7 before and after 2 weeks of intervention.
Test_7: The average of Test 7 score before (Test_7_1) and after 2 weeks of intervention (Test_7_2)

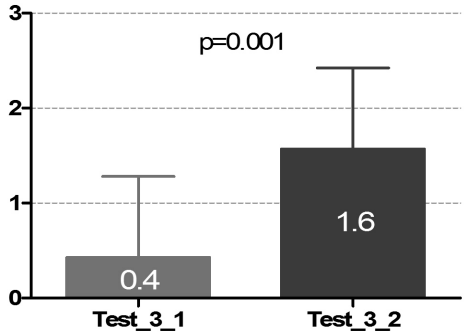


**Figure 2.** Score improvement of Test 3 before and after 2 weeks of intervention.
Test_3: The average of Test 3 score before (Test_3_1) and after 2 weeks of intervention (Test_3_2)

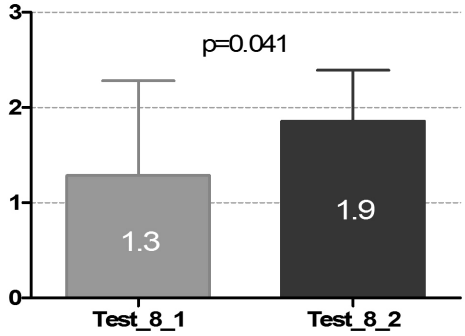


**Figure 4.** Score improvement of Test 8 before and after 2 weeks of intervention.
Test_8: The average of Test 8 score before (Test_8_1) and after 2 weeks of intervention (Test_8_2)

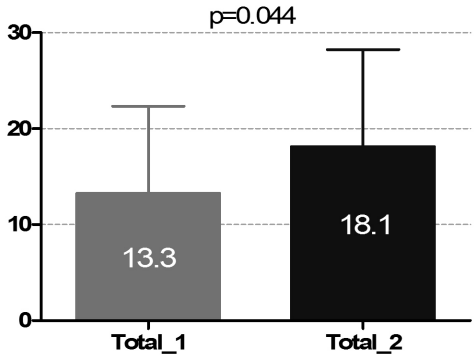


**Figure 5.** Improvement of total score before and after 2 weeks of intervention.
Total: The average of total score before (Total_1) and after 2 weeks of intervention (Total_2)

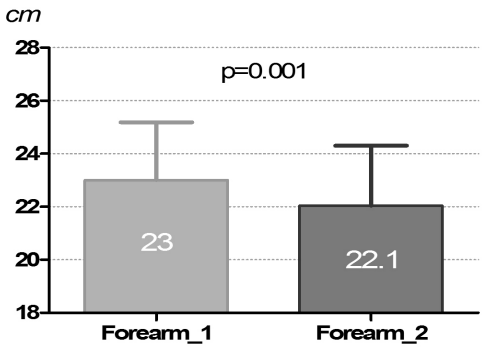


**Figure 7**. Evolution of forearm circumference before and after 2 weeks of intervention.
Forearm: The average of forearm circumference before (Forearm_1) and after 2 weeks of intervention (Forearm_2)

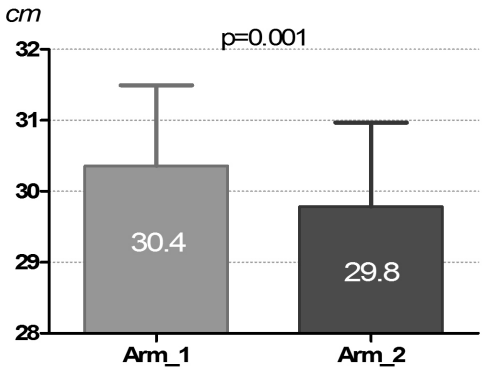


**Figure 6.** Evolution of arm circumference before and after 2 weeks of intervention.
Arm: The average of arm circumference before (Arm_1) and after 2 weeks of intervention (Arm_2)

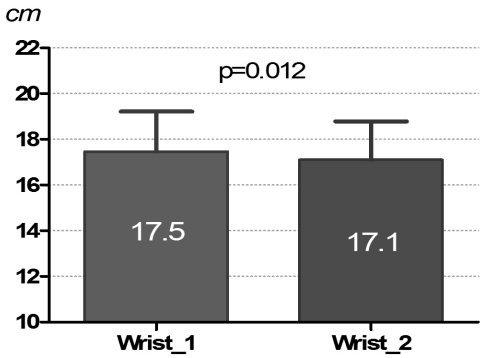


**Figure 8.** Evolution of wrist circumference before and after 2 weeks of intervention.
Wrist: The average of wrist circumference before (Wrist_1) and after 2 weeks of intervention (Wrist_2)

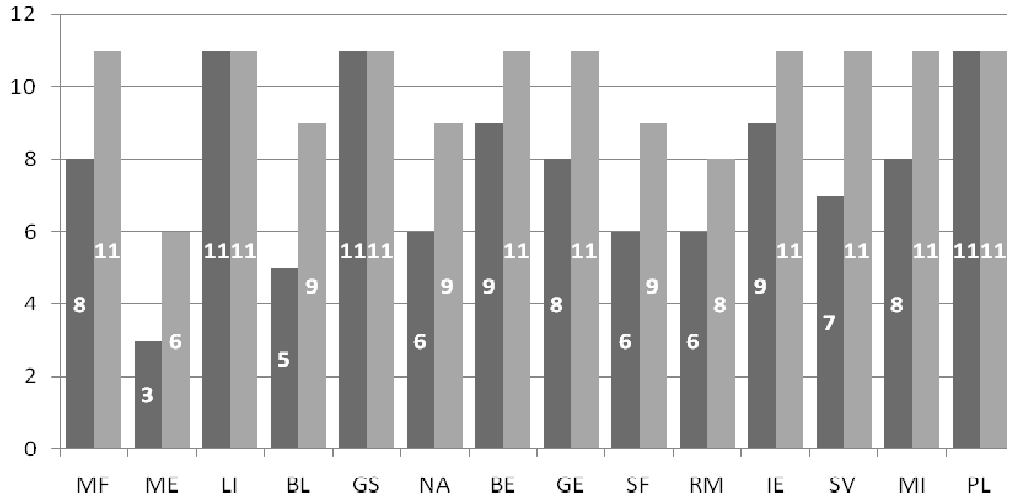


**Figure 9.** The score evolution in the mobility tests for each patient at baseline and after 2 weeks of intervention

## Discussion and conclusions

Results obtained after intervention demonstrates an improvement in patient condition after total mastectomy surgery in breast cancer.

PT exercises increased the amplitude of movement of the upper limb on the surgery side at more than 75% of patients.

The improvement of amplitude leads to a greater degree of independence which increases the patient's quality of life.

Statiscally significant results show an increase amplitude of shoulder adduction (Test 2, Test 8), flexion (Test 2), internal rotation and extension (Test 3, Test 7). Test 2, Test 3, Test 7 and Test 8 results showed an improvement of elbow flexion and extension.

These improvements comein strengthening the theory that the most effective therapy, according to the American Cancer Society, National Lymphedema Network, and medical experts in the field, consists of a combination of MLD, a program of PT, vigilant skin care and hygiene regimen [11].

MLD is known to have a positive contribution in this disease and our study has provided insight into the effects of MLD and results indicate that manual lymphatic drainage has a useful role in the management of breast cancer-related lymph edema. Thus, after 2 weeks of intervention were noted improvements in upper limb circumference (in the middle of the arm, in the middle of the forearm and at the wrist) which shows an improvement of peripheral circulation, both lymphatic and venous. This has a preventive role for subsequent complications. Williams et al. studied women in a randomized control crossover study and found that MLD significantly reduced the limb volume and dermal thickness. The quality of life and emotional functions were also improved using this technique [12].

In the same time, patients with breast cancer should do (PA) in order to decrease the level of anxiety and depression, increase quality of life and psychological well-being during the survivorship period. On the other hand, it is needed to identify the optimal frequency, intensity, and duration of exercise for improving quality of life in cancer patients undergoing chemotherapy. Thus, there are two published observational studies that examined benefits of PA on breast cancer recurrence and/or mortality (stages I - III). Holick et al. (n = 4482) demonstrated that a period of one hour to 7 hours of physical activity/week, with average-intensity walking (2–2.9 mph) or equivalent PA decrease breast cancer mortality with 35–49% and overall mortality with 42–56% (both compared to PA <1 h) (13). Irwin et al. (n = 933) demonstrated that PA equivalent to 2.5 h/week of brisk walking for the 2 years after diagnosis, with moderate-intensity recreational, occupational, and household activities has a lower risk of overall mortality compared to inactive women with 67% [14].

At the end of intervention (after 2 weeks of intervention), we encouraged and advised the patients to continue with physical activity to prevent the lymphedema and to increase their life quality.

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