

10.2478/tperj-2022-0008

## The importance of physical assessment in post-mastectomy rehabilitation

Oana Maria BALTAG<sup>1</sup>, Mariana CORDUN<sup>2</sup>, Mihael APOSTU<sup>3</sup>

### Abstract

*Introduction.* The application of surgical, oncological and hormonal treatment causes the appearance of various dysfunctions at the somatic level: decreased joint mobility and muscle strength, lymphedema, pain, peripheral neuropathy, cardiovascular and gastrocecal conditions, and at the psychological level: insomnia, fear of relapse, anxiety and depression.

*Aim of the study.* This study highlights the main methods of evaluating the sequelae of breast cancer treatment, which are of particular importance in physical recovery. As well, we want to spotlight the main physical activities that can be performed.

*Methods.* In order to identify the adverse effects of the treatment as well as their assessment methods, we studied the national and international specialized literature.

*Results.* The physical assessment of patients after mastectomy includes: assessment of functional level, manual muscle testing, active range of motion, evaluation of lymphedema, quality of life and pain assessment.

*Conclusions.* Evaluation in physical therapy is of particular importance because it helps to create an appropriate recovery protocol, but also to appreciate the evolution of patients and the efficiency of the applied program.

**Key words:** *breast cancer - side effects, assessment, range of motion, lymphedema, quality of life*

### Rezumat

*Introducere.* Aplicarea tratamentului chirurgical, oncologic și hormonal determină apariția unor disfuncții la nivel somatic: diminuarea mobilității articulare și a forței musculare, limfedem, durere, neuropatie periferică, afecțiuni cardiovasculare și gastrice și la nivel psihic: insomnii, teamă de recidivă, anxietate și depresie.

*Scop.* Acest studiu scoate în evidență principalele metode de evaluare a sechelelor tratamentului aplicat cancerului de sân, ce au o importanță deosebită în recuperarea fizică. De asemenea, vrem să evidențiem principalele tipuri de activități fizice care pot fi efectuate.

*Metode.* Pentru a identifica efectele adverse ale tratamentului precum și metodele de evaluare ale acestora, am studiat literatura națională și internațională de specialitate.

*Rezultate.* Evaluarea fizică a pacienților după mastectomie include: evaluarea nivelului funcțional, testarea manuală a mușchilor, amplitudinea activă de mișcare, evaluarea limfedemului, evaluarea calității vieții și a durerii.

*Concluzii.* Evaluarea în kinetoterapie are o importanță deosebită deoarece prin intermediul acesteia putem să alcătuim un protocol de recuperare adecvat dar, putem să apreciem evoluția pacienților și eficiența programului aplicat.

**Cuvinte cheie:** *cancer de sân - efecte secundare, evaluare, amplitudine de mișcare, limfedem, calitatea vieții*

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<sup>1</sup> Assistant PhD Student, National University of Physical Education and Sports, Faculty of Kinetotherapy, Bucharest, Romania, *e-mail:* oanamaria9995@gamil.com

<sup>2</sup> Professor PhD, National University of Physical Education and Sports, Faculty of Kinetotherapy, Bucharest, Romania

<sup>3</sup> Professor PhD, National University of Physical Education and Sports, Faculty of Kinetotherapy, Bucharest, Romania

## Introduction

Following the application of surgical, oncological and hormonal treatment, there are various dysfunctions that may appear and that affect the quality of everyday life (Ewertz, M., Jensen, A., B. 2011) and contribute to the appearance of anxiety, depression and insomnia (Alsharif, F. et al 2022). The role of physical activity is to enable patients to reach, and maintain, the optimal level of functionality from a physical, intellectual, psychosocial and spiritual point of view.

The surgical intervention of mastectomy and axillary lymphodissection generates decreased range of motion at the level of the scapulo-humeral joint and the appearance of lymphedema.

Hormonal therapy contributes to premature menopause, leading to infertility and weight gain.

Oncological treatment consisting of chemotherapy and radiotherapy causes pain, lymphedema, peripheral neuropathy, cardiovascular and gastric disorders. Over time, studies have shown that cardio-respiratory capacity (Klassen O. et al., 2014) and muscle strength have been substantially reduced following the administration of chemotherapy (Klassen O. et al., 2016).

The psycho-social conditions that appear are: anxiety, depression, fatigue, cognitive problems and fear of relapse.

We highlight these complications because physiotherapists participate in the patient's therapeutic approach.

Lymphedema is one of the most common side effects of the treatment applied to the breast neoplasm, on which we act by kinetic means.

According to the *US National Cancer Institute*, there is no criterion for diagnosing lymphedema, but a difference of 2 cm from previous measurements or compared to the contralateral limb suggests edema. Lymphedema evolves in 4 stages (Tretbar, L.L., et al. 2008) (fig.1):

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

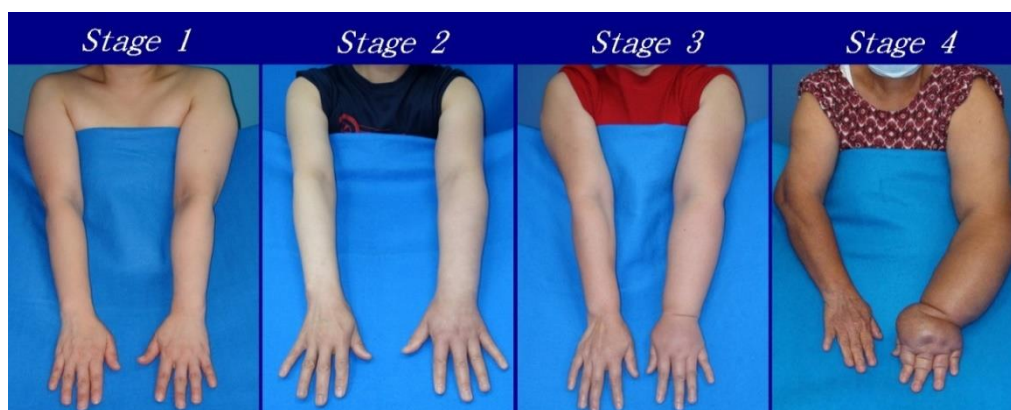


Figure 1. Stages of lymphedema (Romedic, 2019)

### *Aim and purpose of the study*

The purpose of this paper is to highlight the main assessment methods that are applicable to patients with breast neoplasms who present sequelae after the application of the treatment.

### Methods

Following the study of the specialized literature, we identified several evaluation methods that have

applicability to the adverse effects that appear after treatment.

The somatofunctional assessment, adapted to patients with breast neoplasm, is performed globally with the help of ADLs and analytically through the muscle and joint balance of the joints that make up the upper limb.

We identified a number of studies that spotlight various physical activities that breast cancer survivors can perform.

**Assessment of functional level**

The decrease in the functionality of the upper limb is directly influenced by the existence of lymphedema (Smoot et al., 2010). Patients with lymphedema have an increased Body Mass Index, a high score in the *Disabilities of the arm, shoulder and hand* questionnaire, decreased range of motion in the shoulder, elbow and hand, decreased muscle strength and tactile sensitivity. The authors believe that the early diagnosis of lymphedema and the remaining functional is essential in the social and professional reintegration of patients.

According to Magee J. D. (2014), in order to be able to carry out the activities of daily life, which ensure an independent life, each person needs a minimum range of motion at the level of the scapulo-humeral joint, elbow and hand (Table I.).

In this sense, the author proposes three tests for the functional assessment of the shoulder: bringing the

hand to the back of the neck, touching the scapula with the hand through flexion, adduction and internal rotation, touching the scapula with the hand through extension, adduction and external rotation. These tests are quantified on a scale from 0 to 4, where 0 corresponds to the correct execution of the movement and 4 corresponds to the impossibility to execute the movement. For the elbow joint, we have identified four tests: bringing the hand to the mouth with a weight held in the hand, standing in front of a wall, palms resting on the wall, flexion and extension of the elbows, opening a door with the forearm in supination, opening a door with the forearm in pronation. These tests are quantified from 0 to 3, where 0 represents the impossibility to execute the movement and 3 the correct execution of the movement.

Table I. Minimum amplitude required for daily activities

Activity	Range of motion required - shoulder joint
Eating	70 <sup>0</sup> -100 <sup>0</sup> horizontal abduction 45 <sup>0</sup> -60 <sup>0</sup> abduction
Combing	30 <sup>0</sup> -70 <sup>0</sup> horizontal abduction 105 <sup>0</sup> -120 <sup>0</sup> abduction 90 <sup>0</sup> external rotation
Arranging of shirt in pants	50 <sup>0</sup> -60 <sup>0</sup> horizontal abduction 55 <sup>0</sup> -65 <sup>0</sup> abduction 90 <sup>0</sup> internal rotation
Intimate hygiene	75 <sup>0</sup> -90 <sup>0</sup> horizontal abduction 30 <sup>0</sup> -45 <sup>0</sup> abduction 90 <sup>0</sup> internal rotation
Bringing the hand behind the head	10 <sup>0</sup> -15 <sup>0</sup> horizontal adduction 110 <sup>0</sup> -125 <sup>0</sup> flexion 90 <sup>0</sup> external rotation
Dressing	70 <sup>0</sup> -80 <sup>0</sup> horizontal adduction 70 <sup>0</sup> -80 <sup>0</sup> flexion 45 <sup>0</sup> external rotation
Washing the opposite shoulder	60 <sup>0</sup> -90 <sup>0</sup> flexion 60 <sup>0</sup> -120 <sup>0</sup> horizontal adduction

Also, according to Kaya et al. (2010) the assessment of patients can be completed by the application of the *Disabilities of the Arm, Hand and Shoulder (DASH)* questionnaire, which helps to establish the disability coefficient of the upper limb on the side of the surgical intervention. Thus, a correlation can be made between the degree of disability and the stage of lymphedema.

**Muscle balance**

Muscle balance is a subjective method of assessing muscle strength, it is performed by manual examination and is dependent on the experience of the physiotherapist.

Cordun M. (1999) elaborates the muscle balance using a 6-step scale, evaluating the action of each muscle.

Table II. Muscle balance

<b>F0 (zero)</b>	The muscle performs no obvious contraction
<b>F1 (sketched)</b>	Contraction of the muscle can be felt when palpating it or the tendon
<b>F2 (mediocre)</b>	The segment can be mobilized to full amplitude but with gravity removed
<b>F3 (acceptable)</b>	The segment can be mobilized through its full range of motion against gravity
<b>F4 (good)</b>	The segment can be mobilized through its full range of motion against moderate resistance
<b>F5 (normal)</b>	The segment can be mobilized through its full range of motion against maximal resistance, applied as distally as possible

We find a transposition of the previous data (Table II) in the concept of David Magee (2014), who proposes a method of evaluating the functionality,

strength and resistance of the scapulo-humeral joint, analyzing the way of execution of the movements (Table III).

Table III. Evaluation of strength and resistance

Patient Position	Movement performed	Assesment Scale
<b>Seated</b>	Flexion at 90°	Fully functional: the movement performed with a weight of 2.5-3 kg
		Functionally correct: Movement performed with a weight of 0.5-1 kg
		Functionally weak: Movement can be performed against the force of gravity
		Nonfunctional: unable to move upper limb
<b>Seated</b>	Extension	Fully functional: the movement performed with a weight of 2.5-3 kg
		Functionally correct: Movement performed with a weight of 0.5-1 kg
		Functionally weak: Movement can be performed against the force of gravity
		Nonfunctional: unable to move upper limb
<b>Lateral Decubitus</b>	Internal rotation	Fully functional: the movement performed with a weight of 2.5-3 kg
		Functionally correct: Movement performed with a weight of 0.5-1 kg
		Functionally weak: Movement can be performed against the force of gravity
		Nonfunctional: unable to move upper limb
<b>Lateral Decubitus</b>	External rotation	Fully functional: the movement performed with a weight of 2.5-3 kg
		Functionally correct: Movement performed with a weight of 0.5-1 kg
		Functionally weak: Movement can be performed against the force of gravity
		Nonfunctional: unable to move upper limb
<b>Seated</b>	Abduction	Fully functional: the movement performed with a weight of 2.5-3 kg
		Functionally correct: Movement performed with a weight of 0.5-1 kg
		Functionally weak: Movement can be performed against the force of gravity
		Nonfunctional: unable to move upper limb
<b>Seated</b>	Adduction (using wall pulleys)	Fully functional: the movement performed with a weight of 2.5-3 kg
		Functionally correct: Movement performed with a weight of 0.5-1 kg
		Functionally weak: Movement can be performed against the force of gravity
		Nonfunctional: unable to move upper limb

These methods have applicability in the functional assessment of the scapulo-humeral joint, elbow and forearm in patients with breast neoplasm because, there are patients in whom the muscle does not perform any contraction (F0) or it can only be felt by palpation (F1), being non-functional. This situation is caused by the occurrence of nerve and ligament damage during surgery.

In the case of large tumors or axillary adenopathy, the nerves and ligaments are compressed, the muscle tone decreases, which is why, after applying the treatment for the breast neoplasm, the patients

can mobilize the upper limb but with the elimination of gravity (F2).

Also, patients with large lymphedema cannot mobilize the affected limb against gravity. Patients who, before the diagnosis, were sedentary, post-surgically develop a pronounced fear of mobilizing the limb and tend to avoid any type of physical activity. Muscle tone decreases; the limb can be mobilized against the force of gravity (F3) and is functionally weak.

Patients who, before surgery, were constantly exercising, postoperatively can mobilize the limb

against light resistance (F4) or with a weight of 0.5 – 1 kg, which suggests that the limb is functionally correct. One of the goals of physical therapy is for the limb to be fully functional, with full range of motion performed against a high resistance (F5), or with a weight of 2.5-3 kg.

### **Range of motion**

Joint range assessment or joint balance consists in assessing the degree of mobility in a joint.

Decreased mobility of the shoulder joint is considered by the authors Lauridsen et al. (2007), as a consequence of axillary lymphodissection in association with local radiotherapy. These authors applied the *Constant Shoulder Score (CSS)* questionnaire, performed joint balance at the shoulder level and perimetry at the level of both upper limbs and found that the abduction movement is the most affected movement, the amplitude being diminished by 30° to 60°. Also, patients who received post-operative local radiotherapy experienced a more pronounced decrease in joint mobility compared to those who only underwent mastectomy (Lauridsen et al. 2008).

The most used method for evaluating the amplitude of movements is goniometry, which is performed at the level of the shoulder, elbow, forearm and hand joints.

### **Evaluation of lymphedema**

Patients with breast neoplasm have an increased risk of lymphedema in the upper limbs, torax and chest, after treatment.

The diagnosis of lymphedema is established on the basis of the anamnesis, clinical signs and paraclinical investigations.

As part of the anamnesis, information will be collected regarding the events that led to the appearance of lymphedema. Thus, the patient will be asked at what time post-treatment the lymphedema appeared, the region where it is present, the type of surgery and the treatment followed.

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

- slow or accelerated onset
- if it appeared after loading the limbs or during periods with increased temperatures
- if after periods of rest it decreases
- possible erysipelas infections.

The clinical signs that establish the diagnosis are the sign of the well and the sign of Stemmer.

The sign of the well is present in the early stages, also called the pitting stage, when, following an external compression, the integumentary

impression is maintained. In the late stages of lymphedema or non-pitting, the edema no longer retains the integumentary imprint due to fibrosis of the integument (Greene, A.K., & Goss, A.J., 2018).

Stemmer's sign identifies edema in the fingers. Proceed as follows: create a fold at the level of the fingers, with the help of two fingers or a pair of pliers; the crease persists (Goss, J. A., & Greene, A. K., 2019).

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

Upper limb circumferences are measured with the tape measure at the following levels (Taylor, R., et. al. 2006):

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

In order to obtain comparable measurements, it is necessary that the perimetry be performed at the same levels.

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

- ✓ *soft tissue imaging examination*: MRI is used to exclude other causes of lymphedema such as neoplasm recurrence or venous insufficiency;
- ✓ *imaging examination of the lymphatic vessels*: lymphoscintigraphy is performed with a contrast substance to highlight possible blockages in the lymphatic vessels and to examine the state of the lymph nodes;
- ✓ *perometry* also called optoelectronic volumetry: this evaluation method uses an infrared electronic scanner, with which the volume of the limb with lymphedema is calculated (Neligan, P.C., et al. 2016). Each limb passes through a rectangular frame that transmits infrared light beams from different angles. Afterwards, a computer processes the information and calculates the limb volume;
- ✓ *bioelectrical impedance*: scans the amount of lymphatic fluid, accumulated in the tissues, at the level of the upper limb with lymphedema. The scanning device sends painless electrical current to the limb and measures the resistance of the tissue. Specialists in the field say that this method of investigation is the most useful,

because it can identify any accumulation of lymphatic fluid, even before symptoms appear.

### **Assessment of quality of life**

Dysfunctions generated by breast cancer treatment negatively impact the quality of life during and especially after treatment (Invernizzi, M., et al. 2022) and represent an important factor in the prognosis of breast cancer patients (Browall M., et al. 2018).

The Department of Mental Health and Substance Abuse, a structure of the WHO, has developed a questionnaire for the assessment of the quality of life, which is used globally. This questionnaire is available in 2 versions: the initial one consisting of 100 questions and a shortened form consisting of 26 questions, systematized in 4 domains: physical, psychological, social and environmental. Checked answers are quantified from 1 to 5 where 1 means very poor and 5 very good.

### **Pain assessment**

The development of chronic pain following mastectomy is a complex and multifactorial process (Khan, J.S., et al. 2020). This is a common symptom (Forsythe, L.P., 2013) and is caused by muscle, ligament or nerve damage (Andersen, K.G., Kehlet, H., 2011). The administration of oncological and hormonal treatment can contribute to the amplification of pain.

For pain assessment, the most used method is the application of the analog-visual scale where the patient ticks the level of pain he feels.

Another method used in pain assessment is the application of the painDETECT questionnaire (Juhl, A.A., et al. 2016), designed to diagnose neuropathic pain. It consists of 7 questions quantified on a scale from 0 to 5, where:

- 0 – never
- 1 – very little
- 2 – a little
- 3 – moderate
- 4 – strong
- 5 – very strong

The score obtained after completing the questionnaire is classified as follows:

- 0 – 12 – nociceptive pain
- 13 – 18 – inflammatory pain
- 19 – 35 – neuropathic pain

### **Physical activity in breast cancer**

Donald C. McKenzie and Andrea L. Kalda (2003) noticed that resistive exercise has no significant beneficial effects on breast cancer related lymphedema. The authors recommend approaching a kinetic program with progressive intensity in order to increase the muscle strength and to avoid the appearance of lymphedema.

Kerry S. Courneya et al. (2007) evaluated the implications of aerobic exercise and resistive exercise during chemotherapy. At the end of this clinical study, they observed that patients completed chemotherapy treatment improved their self-esteem, muscle strength, range of motion and physical condition.

Specialists from the *European Foldi Lymphology Center* use aquatic exercises, swimming and hydrotherapy as a component of kinetic treatment and recommend that the water temperature be between 22° and 30°C. According to Tidhar D. and Katz-Leurer M. (2009), aquatic therapies has immediate benefic effects on breast cancer physical side effects.

Hamma van Waart et al. (2015) noticed that moderate-intensity exercise performed twice a week generates better results in terms of muscle strength, fatigue and activity of the cardio-respiratory system.

Schmidt, E. et al. (2017), recommend cycling, nordic walking and exercises with own body weight, in order to decrease the treatment side effects.

### **Results**

In order to improve the effects of specific and non-specific kinetic means applied, it is necessary to develop a personalized recovery program. This can only be drawn up after a complex assessment of patients.

The assessment of the functional level is carried out by evaluating the amplitude of the movements performed at the level of the upper limb on the side of the surgical intervention, functional and muscle testing. The DASH questionnaire can also be used, a method by which patients assess the degree to which the limb is affected.

Staging of lymphedema is performed by identifying the well sign, the stemmer sign, measuring the circumference of the upper limb at different levels, but also by imaging tests (MRI, lymphoscintigraphy, perometry, bioelectrical impedance).

The pain felt by the patients can be noted on the analog-visual scale and by means of the *PAINDETECT* questionnaire.

The quality of life, negatively impacted by the emerging dysfunctions, is assessed by completing the WHOQOLQ questionnaire.

### Discussions

According to the reports of the World Health Organization, breast neoplasm is the most common type of cancer that affects about 2.09 million people worldwide. It represents the 5<sup>th</sup> cause of mortality worldwide, which is why new therapeutic approaches are constantly being sought to increase life expectancy, as well as the quality of life after treatment.

Therapies applied in breast cancer generate a series of disabling complications such as: lymphedema, Axillary Web Syndrome, chronic pain, fatigue, decreased muscle strength and joint range.

Chemotherapy treatment negatively influences the function of the respiratory system, which is why Oliver Klassen et al. (2014), emphasize the importance of performing a physical exercise program during the administration of adjuvant treatment.

Thus, we want to highlight the importance of carrying out a complete assessment of patients to identify the severity of the sequelae that occur after

the treatment. This way, we can recommend the right types of physical activity that can be performed by the patients.

### Conclusions

Physical therapy assessment represents the first and last act of the recovery-reeducation process and is of particular importance in establishing an individualized and appropriate exercise program.

The most used assessment methods are: muscle balance, joint balance, perimetry, application of the DASH questionnaire and the quality of life questionnaire. Thus, post-treatment dysfunctions can be identified and an individualized therapeutic intervention protocol can be established according to the somato-functional particularities.

In advanced stages of lymphedema, an imaging assessment is also performed to determine possible blockages in the lymphatic circulation.

The main physical activities that can be practiced during and after breast cancer treatment are cycling, swimming, nordic walking, exercises with own body weight, aerobic and moderate intensity exercises.

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