

ARGUMENTS REGARDING THE MANAGEMENT OF POST-MASTECTOMY SEQUELAE

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Abstract. *The purpose of this paper is to highlight a less illustrated topic in Romanian bibliographic resources. According to the World Health Organization reports, breast cancer is one of the most common types of cancer worldwide. The sequelae of mastectomy are systematised as follows: conditions secondary to the application of local radiotherapy, systemic conditions after oncological treatment and psychosocial conditions. The most common side effect of the treatment applied for breast cancer is lymphoedema and, according to a study carried out in Pennsylvania, 42% of patients develop lymphoedema. Some authors classify it into mild, moderate and severe, but others highlight four stages of lymphoedema development. Physiotherapy has a major role in post-mastectomy recovery and requires various kinetic means, which can be both specific (physical exercise, hydrokinetic therapy, massage, posture) and non-specific (multilayer compression bandage and wearing a compression sleeve). Over time, a lot of clinical studies have been conducted on the implications of physical therapy for post-mastectomy functional recovery. Thus, physical exercise performed during the kinetic programme improves muscle strength, the activity of the cardiorespiratory system and self-esteem. Several authors recommend the practice of aerobic exercise and moderate-intensity exercise twice a week during chemotherapy treatment to prevent the development of lymphoedema.*

Keywords: *breast cancer, mastectomy sequelae, lymphoedema, physiotherapy, hydrokinetic therapy.*

Introduction

The present paper addresses a less illustrated topic from a scientific point of view and tries to bring arguments for the importance of post-mastectomy recovery.

Breast cancer is an abnormal multiplication of epithelial cells in the mammary ducts and lobules; it clinically manifests with the appearance of a tumour that, if not treated in time, develops both locally and far from the tissue concerned. The factors leading to the appearance and development of neoplastic cells are external, endocrine and genetic. The treatment of breast cancer is surgical and consists of mastectomy or sectorectomy, which is associated with chemotherapy and radiotherapy.

The main reason for choosing this research topic is represented by the worrying reports about the increased incidence of breast cancer at younger and younger ages and the late detection of this disease. This paper is based on both an extensive study of national and international bibliographic resources and the WHO reports (World Health Organization, 2021) on the incidence of breast cancer worldwide and health policies regarding its detection and treatment. The latest reports in Romania date from 2018, when 9,629 cases of breast cancer were registered and the mortality rate was 6.6%. According to WHO statistics, our country has an upward trend in this respect, given that 8,981 cases were reported in 2012.

Each patient diagnosed with breast cancer comes to the attention of a multidisciplinary commission made up of: oncologist, physiotherapist, psychologist, nutritionist, radiotherapist,

immunologist, infectious disease specialist, plastic surgeon, radiologist and anatomopathologist. In the Anglo-Saxon countries, this team of specialists is called the Commission for Diagnosis and Therapeutic Indication in Oncology (CDTIO); in the U.S., it is known as the Hospital Tumor Board, and in France, it is called Réunion de Concentration Pluridisciplinaire. The CDTIO activity is carried out in the following stages: presentation of the newly diagnosed case, analysis of the patient's file in the plenary of the commission, issuing the therapeutic decision, completing the decision in the institutional register of the patient with cancer, completing the oncological file-2 and communicating the commission's decision to the patient.

The European Union recommends the following screening programme for early detection of breast cancer: annual breast ultrasound and mammography, with a frequency of one every 2 years for women aged between 45 and 69 years and one every 3 years for women aged between 70 and 74 years. The recommendations apply to asymptomatic people.

The major risk factors that contribute to the development of breast cancer are: smoking, sedentary lifestyle, unhealthy diet and chronic infections with viruses such as helicobacter virus, human papillomavirus, hepatitis B virus, hepatitis C virus and Epstein-Barr virus.

Ewertz and Jensen (2011) systematise the long-term adverse effects of breast cancer treatment as follows:

- conditions secondary to the application of local radiotherapy: pain, lymphoedema, decreased mobility of the shoulder joint;
- systemic conditions after oncological treatment: peripheral neuropathy, premature menopause, infertility, weight gain, cardiovascular disease;
- psychosocial conditions: anxiety, depression, insomnia, fatigue, cognitive disorders, fear of recurrence.

Harris et al. (2001) provide guidance and recommendations for the care and treatment of patients with secondary lymphoedema. These recommendations help physiotherapists and patients to:

- measure the circumference of the upper limbs before and after surgery;
- assess lymphoedema: lymphoscintigraphy, MRI, CT, soft-tissue ultrasound;
- perform the kinetic programme and manual lymphatic drainage both during and after the application of adjuvant treatment;
- use compression sleeves;
- perform psychotherapy sessions to reduce mental disorders (anxiety, depression) following treatment.

Topic Addressed

According to the WHO reports (World Health Organization, 2021), breast and lung cancers are the most common types of cancer, each one affecting about 2.09 million people worldwide (Table 1). In terms of neoplastic mortality rates, the latest reports from 2018 reveal that cancer ranks fifth in the world with 627,000 cases. About 70% of these deaths occur in low- and middle-income countries.

Table 1. *Incidence of cancer types*

Cancer types	Number of cases
Breast	2.09 million
Pulmonary	2.09 million
Colorectal	1.80 million
Prostate	1.28 million
Skin	1.04 million

The incidence of breast cancer differs by region. In 2020, the WHO created a regional profile for all countries in the world; it put forward the presence of a growing trend in breast cancer. The comparative regional profile of the number of cases registered in 2012 and 2018 is shown in Table 2. Although the trend is generally upward worldwide, there are a number of 18 states where a downward trend in the number of cases of breast cancer can be observed (Table 3). (World Health Organization, 2021)

Table 2. *Number of cases by region in 2012 and 2018*

Name of the region	Number of cases 2012	Number of cases 2018
Global	1,655,589	2,069,792
Africa	100,834	124,119
America	405,745	458,539
South-East Asia	239,612	270,401
North-West Asia	318,111	535,059
Europe	493,695	562,568
Australia	14,710	18,558
Mediterranean Region	97,592	119,106

Table 3. *States with downward trends*

State	Number of cases 2012	Number of cases 2018
Afghanistan	3,108	3,062
Albania	1,022	973
Armenia	1,704	1,054
Bahamas	213	166
Bangladesh	14,836	12,764
Barbados	207	164
Burundi	696	634
Cape Verde	59	48
Congo	424	394
Denmark	5,224	4,628
Georgia	1,541	1,141
Kazakhstan	6,252	4,211
Madagascar	1,799	1,335
Nigeria	27,304	26,310
Macedonia	1,152	1,000
Sri Lanka	3,955	3,091
East Timor	108	99
Uganda	2,420	2,318

Mastectomy and axillary lymphadenectomy surgery causes pain and keloid scars that lead to decreased mobility of the scapulohumeral joint and the presence of lymphoedema. Hormone therapy contributes to premature menopause, leading to infertility and weight gain.

Oncological treatment consisting of chemotherapy and radiation therapy causes peripheral neuropathy but also cardiovascular and gastric disorders. As a consequence of the application of surgical, oncological and hormone treatment, various dysfunctions appear, affecting the quality of daily life and contributing to the appearance of anxiety, depression and insomnia.

Lymphoedema is one of the most common side effects of breast cancer treatment, for which kinetic means are used.

According to Norman et al. (2009), who conducted a 5-year study in Pennsylvania, lymphoedema secondary to mastectomy occurs in many patients. The study included 631 randomly selected patients who were periodically evaluated at intervals of 7 to 9 months throughout the study period. The evaluation was performed by measuring the arm and forearm circumference and through a questionnaire on quality of life. 238 patients (42%) developed lymphoedema and, for 80% of them, lymphoedema occurred in the first two years after surgery.

The National Cancer Institute (n.d.) states that there is no criterion for diagnosing lymphoedema; however, a difference of 2 cm compared to previous measurements or a comparison with the contralateral limb suggests the onset of oedema.

Norman et al. (2009) classify the forms of lymphoedema into mild, moderate and severe, while Tretbar et al. (2008) highlight four stages of lymphoedema development:

- Stage 0 - This is the initial stage; it occurs during or at the end of the day after physical exertion and decreases after some rest because it is reversible.
- Stage 1 - The volume of the limb does not decrease after rest but, if properly treated, can regress. It may be associated with erysipelas and eczema.
- Stage 2 - Tissue fibrosis occurs; lymphoedema persists even after treatment. Complications such as erysipelas, eczema and lymphatic fistulas often arise.
- Stage 3 - It is also called elephantiasis. This is an irreversible form with serious complications; due to the large size of the lymphoedema, the nerves are compressed and the mobilisation of the affected limb is difficult.

Somato-functional evaluation adapted to patients with breast cancer is performed globally using activities of daily living and analytically through the muscular and articular evaluation of the scapulohumeral joint. According to Magee (2014), each person needs a minimum range of motion in the scapulohumeral joint to be able to perform activities of daily living, which ensure an independent life (Table 4).

Table 4. *Minimum range of motion needed in daily living activities*

Activity	Range of motion needed in the shoulder joint
Eating	70°-100° horizontal abduction 45°-60° abduction
Hair combing	30°-70° horizontal abduction 105°-120° abduction 90° external rotation
Tucking in the shirt, into trousers	50°-60° horizontal abduction 55°-65° abduction 90° internal rotation
Intimate hygiene	75°-90° horizontal abduction 30°-45° abduction 90° internal rotation
Bringing the hand to the back of the neck	10°-15° horizontal adduction 110°-125° flexion 90° external rotation
Getting dressed	70°-80° horizontal adduction 70°-80° flexion 45° external rotation
Washing the opposite shoulder	60°-90° flexion 60°-120° horizontal adduction

In this sense, the above-mentioned author proposes three tests for the functional evaluation of the shoulder: bringing the hand to the back of the neck, touching the scapula with the hand by flexion, adduction and internal rotation, touching the scapula with the hand by 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 perform the movement.

Muscle balance is a subjective method of assessing muscle strength, which is done by manual examination and is dependent on the physiotherapist's experience. Cordun (1999) presents muscle balance using a six-step scale that aims to assess the action of each muscle. Magee (2014) presents a method for evaluating the functionality, strength and endurance of the scapulohumeral joint by analysing the execution of movements.

These methods can be applied in the functional evaluation of the scapulohumeral joint for patients with breast cancer because, during our activity as physiotherapists, we met patients whose muscle did not perform any contraction (F0) or some contraction could be noticed only on palpation (F1), being non-functional. This situation is caused by nerve and ligament injuries during surgery.

In the case of large tumours or axillary lymphadenopathy, the nerves and ligaments are compressed and muscle tone decreases, which is why, after applying breast cancer treatment, patients can mobilise the upper limb but without gravity (F2). Also, patients with large lymphoedema cannot mobilise the affected limb against gravity.

Patients who were sedentary before diagnosis develop a pronounced fear of limb mobilisation after surgery and tend to avoid any type of physical activity. Muscle tone decreases; the limb can be mobilised against gravitational force (F3) and is poorly functional. Patients who exercised constantly before surgery can postoperatively mobilise the limb against a light resistance (F4) or with a small weight of 0.5-1 kg, which suggests that the limb is functionally correct.

One of the objectives of physical therapy is to make the limb fully functional - the movement should be performed over the entire range of motion against a high resistance (F5) or with a weight of 2.5-3 kg. After studying the national and international literature, we have identified that the most used evaluation method for the range of motion is goniometry.

The diagnosis of lymphoedema is established based on medical history, clinical signs and paraclinical investigations. During the medical history interview, the evaluator will collect information on the events that have led to the appearance of lymphoedema. The patient will be asked how long after treatment the lymphoedema has appeared, the region where the lymphoedema is present, the type of surgery and the treatment followed.

Regarding the lymphoedema status, we are interested in the following information:

- slow or accelerated onset;
- if it occurred after loading the limbs or during periods of high temperatures;
- if it decreases after rest periods;
- possible erysipelas infections.

According to Rockson (2008), the clinical signs that make the diagnosis are the pitting sign and the Stemmer sign. The pitting sign is present in the early stages, which are also called the pitting stages. The sign is positive if, following an external compression, the indentation in the swollen tissue is maintained. In the late stages of lymphoedema or non-pitting, the oedema no longer retains the tissue imprint due to skin fibrosis. The Stemmer sign identifies finger oedema. The test is done as follows: a skinfold is created at the base of the fingers/toes using two fingers or a pair of tweezers; the skinfold persists. The most common method of assessing lymphoedema is the perimeter, which is measured by the circumference of the segment with lymphoedema. This measurement is performed bilaterally to compare the affected limb with the unaffected one and to analyse the development of lymphoedema.

To obtain reliable measurements, the perimeter must be measured at the same levels. DiSipio et al. (2013) state that paraclinical investigations able to diagnose lymphoedema are:

- soft-tissue imaging examination: MRI is used to rule out other causes of lymphoedema such as cancer recurrence or venous insufficiency;
- lymph-vessel imaging examination: lymphoscintigraphy is performed with contrast substance to highlight any blockages in the lymph vessels and examine the condition of the lymph nodes;
- perometry (or optoelectronic volumetry): uses an electronic infrared scanner that calculates the volume of the limb with lymphoedema. 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 limb volume;
- bioelectrical impedance: scans the amount of lymphatic fluid accumulated in the tissues of the upper limb with lymphoedema. 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.

According to Jung et al. (2003), after undergoing mastectomy surgery, patients complain of pain, which is caused by muscle, ligament or nerve damage. The administration of oncological and hormonal treatment can contribute to the amplification of pain. To assess

pain, the most used method is the application of the Visual Analogue Scale on which the patient rates their current level of pain.

Physiotherapy is used for patients with breast cancer in order to address the prophylactic and therapeutic complications caused by the application of surgical and oncological treatment. Kinetic treatment has the following objectives:

- prophylaxis of lymphoedema or a decrease in existing lymphoedema;
- improving the mobility of movements performed in the shoulder joint;
- improving muscle strength.

Functional recovery in surgically treated breast cancer requires different kinetic means that are partially or fully used, depending on the somato-functional characteristics of each patient and the moment of their application. Cordun (1999) classifies these means into specific and non-specific. Thus, specific kinetic means consist of physical exercise, hydrokinetic therapy, massage and posture, while non-specific kinetic means are represented by the multilayer compression bandage and the wearing of a compression sleeve.

According to Cordun (1999), physical exercise involves the systematic repetition of certain cycles of movements in order to influence an individual's physical development and ability to move and it helps to develop coordination skills.

Physical exercise for patients with cancer can be active (free active mobilisations, resistive mobilisations) or passive (passive mobilisations, passive-active mobilisations, self-passive mobilisations) and can be applied either individually or in group.

The importance of physical activity is undeniable, which is why many clinical studies have been conducted over time on the implications of exercise in the functional recovery of patients with breast cancer, these studies being systematised by Warburton et al. (2006). Thus, physical exercises for the shoulder joint performed during the kinetic programme aim at activating the muscles and improving joint mobility; hand objects can be used, for example, sticks, small balls, weights of 0.5 kg or elastic bands. Mobilisations consist of flexion/extension movements, pronation/supination movements, abduction and bilaterally performed circumduction with different range of motion (gradually increasing it from low to high). To achieve a decongestant effect, it is important to keep the upper limbs in an inclined position; low- and moderate-intensity aerobic exercise will be used. It is also important to include stretching exercises.

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

McKenzie and Kalda (2003) noticed that resistive exercise had no significant beneficial effects on lymphoedema secondary to mastectomy. The authors recommend approaching a kinetic programme with progressive intensity.

Courneya et al. (2007) examined the implications of aerobic exercise and resistive exercise on patients undergoing chemotherapy. At the end of the study, they observed that patients completed chemotherapy treatment without developing lymphoedema and improved their self-esteem and physical state.

Schmidt et al. (2017) believe that the recovery process of patients with breast cancer is easier for those who exercise compared to those who avoid physical exertion. Van Waart et al. (2015) analysed the effects of low- and moderate-intensity physical activity during the administration of chemotherapy. Patients were divided into two groups: one group performed low-intensity exercise daily, and the second group performed moderate-intensity exercise twice a week. Following the processing of the results obtained in the initial and final assessments, the above authors noticed that the second group achieved better results in terms of muscle strength, fatigue resistance and activity of the cardiorespiratory system.

Klassen et al. (2014) assessed the activity of the cardiorespiratory system in patients with breast cancer during chemotherapy treatment. These patients performed a cardio-metabolic test using a cycle ergometer, during which information on respiratory volumes and metabolic rates at rest and during exercise was collected. Following this study, it was observed that chemotherapy treatment negatively influenced the function of the respiratory system, which is why the authors emphasised the importance of performing a physical exercise programme during the administration of adjuvant treatment.

According to Murgu et al. (2007), hydrokinetic therapy involves performing exercises or movements with the body immersed, thus patients benefiting from the complex action of thermal, mechanical and chemical factors, which is why it has an important role in post-mastectomy medical recovery. Immersion can be partial or total and can be performed in tubs or pools. In patients with breast cancer, mechanical factors are the most important water factors that act on the body. The ascending force is based on Archimedes' law and generates an apparent decrease in body weight that is directly proportional to the level at which it is submerged. Thus, the biomechanics of movement is facilitated, and exercises and mobilisations can be performed even by patients who cannot exercise on land, or have contraindications in this regard. Water resistance accompanies each movement and allows performing resistance exercises in all directions. The hydrostatic pressure of the water really massages the segments, which contributes to the prophylaxis of lymphoedema and facilitates its decrease.

Specialists from the European Foldi Lymphology Center use hydrokinetic therapy as a component of the kinetic treatment and recommend that the water temperature be between 22° and 30° C. According to Tidhar and Katz-Leurer (2009), hydrokinetic therapy has immediate beneficial effects on lymphoedema, but in the long run, it is necessary to use all specific and non-specific kinetic means.

Neligan et al. (2015) say that the beneficial effect of massage on inflammation and lymphoedema has been known 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 used postoperatively for patients with breast cancer and consists of applying rhythmic, tender and gentle manoeuvres, 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 pectoral axillary lymphadenectomy, the lymph nodes are removed from the pectoral and axillary areas, thus creating an interruption in the lymphatic circulation, which is why this type of massage must be applied as early as possible.

Lymphatic drainage is essential in the prophylaxis and management of lymphoedema. Foldi and Strossenreuther (2003) classify the manoeuvres used as follows:

- stationary circular movements – applied on both the ganglion stations and limbs with the fingers 2-5 or the thumbs; the pressure is light and gradually increases;
- pumping technique – applied with the palmar face of the fingers to exert light upward pressure;
- pressure exerted with the thumb and index placed in a bracelet position – applied on the limbs; the pressure is upward, and the direction is from proximal to distal.

According to Foldi and Strossenreuther (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 frequency of the sessions will be two per week. The patient will also learn self-drainage techniques that will be performed daily.

The non-specific kinetic means applied to patients with breast cancer are the multilayer compression bandage, with an important role in the management of lymphoedema, and the wearing of a compression sleeve. Applying compression bandages is the next step after performing the lymphatic drainage massage. The bandages used are: tubular bandage, orthopaedic cotton wool and non-elastic bands with strong compression. The purpose of applying this type of bandage is to prevent the accumulation of lymphatic fluid in the tissues.

At the end of treatment, when the affected limb returns to normal or as close to normal size as possible, the patient will begin to wear a stocking or compression sleeve, which is made according to the size of the limb and the degree of compression required. Getting used to the compression sleeve is done gradually. This means that the patient begins to wear the compression sleeve for 30 minutes a day, and the time gradually increases until the patient will be able to use it daily throughout the activity.

Another study by Tsai et al. (2009) analysed the effects of replacing compression bandages with kinesiological tapes as part of decongestant therapy. This study was conducted over a period of 4 weeks and included 41 patients with unilateral secondary lymphoedema, who were randomly divided into two groups:

- a group of 21 patients who benefited from decongestant therapy consisting of manual lymphatic drainage, multilayer compression bandage and intermittent pneumatic compression;
- a group of 20 patients who, after manual lymphatic drainage, benefited from the application of pneumatic compression associated with kinesiological bands (to stimulate the lymphatic system).

Following the assessment of patients, it was observed that, in the group receiving standard decongestant therapy, the circumference of the hand with lymphoedema decreased, but the circumference of the forearm and arm did not. In the group receiving decongestant therapy with kinesiological bands, lymphoedema decreased in the forearm. Patients accepted kinesiological tapes much more easily compared to the multilayer compression bandage.

Conclusion

Breast cancer is the fifth leading cause of death worldwide. For this reason, new therapeutic approaches are constantly being sought in order to increase life expectancy as well as quality of life after treatment. According to the WHO reports (World Health Organization, 2021), breast cancer is the most common type of cancer that affects about 2.09 million people worldwide. In Romania, 9,629 cases of breast cancer were registered in 2018, the mortality rate being 6.6%.

The treatment applied in breast cancer generates dysfunctions that affect quality of life, such as: anxiety, depression, insomnia, gastric disorders, premature menopause, infertility, pain, decreased mobility of the shoulder joint, decreased muscle strength and lymphoedema.

Somato-functional recovery of patients with breast cancer is a complex process that involves the use of various kinetic means, which can be both specific (physical exercise, massage, posture) and non-specific (multilayer compression bandage and wearing a compression sleeve).

Physical exercises for the shoulder joint performed during the kinetic programme aim at activating the muscles and improving joint mobility.

Although massage and posture are two different means to maximise the effects, they can be applied simultaneously. Thus, during the massage, the upper limb will be kept in an inclined position at an angle of approximately 45°.

Multilayer compression bandage has an important role in the management of lymphoedema; it is applied after the massage session and is maintained during physiotherapy.

Lymphatic drainage is essential for the prophylaxis of lymphoedema and consists in the following manoeuvres: stationary circular movements, pumping technique and pressure exerted with the thumb and index placed in a bracelet position, associated with sliding and vibration techniques.

Authors' Contribution

All authors have equally contributed to this study.

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