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Breast Cancer and Exercise

Deniz Kocamaz and Tülin Düger

Abstract

Breast cancer is the most common type of cancer and the leading cause of death in women. Chemotherapy drugs, which are used to suppress growth and proliferation of cancer cells, prevent or minimize treatment-related symptoms, and improve the quality of life, lead to the destruction of normal cells with therapeutic effects as well as toxic effects. In response, symptoms such as pain, nausea, vomiting, fatigue, anorexia, anxiety, and depression occur in patients. Chemotherapy and its side effects adversely affect the physical and functional capacity of patients with cancer. In particular, the decrease in aerobic capacity affects muscle strength, endurance body awareness, and the quality of life. The practice of aerobic exercise programs during the treatment of breast cancer is important for reducing the side effects, improving physiological health, improving physical functions, preventing weight gain, and maintaining muscle strength. When the rehabilitation programs for breast cancer are individualized, become specific, and realistic goals are set, the positive effects of exercise can be seen.

Keywords: breast cancer, exercise, aerobic exercise, physiotherapy, rehabilitation

1. Introduction

Breast cancer is the most common type of cancer in women. The incidence of breast cancer is increasing all over the world. The mortality rate of breast cancer decreases in developed countries in parallel with the methods used for diagnosis and treatment, but the rate of breast cancer mortality increases in developing countries [1].

Different treatment methods can be used in breast cancer treatment. Treatment protocols, which are suitable for surgical, radiotherapy, and systematic, can be practiced individually or after one another. While the treatment programs are being developed, the importance of improving the survivability and the quality of life as well as the control of cancer-related symptoms are increasing [2, 3].

Chemotherapy drugs are used in cancer cells to suppress growth and proliferation, to prevent or minimize treatment-related symptoms, and to improve quality of life. However, these drugs, along with their therapeutic and toxic effects, destroy normal cells. Fatigue, loss of appetite, nausea, vomiting, pain, weakness, hair loss, bone marrow suppression, insomnia, mucosal and skin problems, pain, neurological problems, and sexual problems may occur depending on the medication taken after chemotherapy and the tolerance of the individual [4].

During chemotherapy and rehabilitation process of patients, systemic problems, laboratory values, and high fever should be evaluated before and after each treatment session. The patient can continue the exercise program, if the fever is below 38°C, the platelet count is 50,000 and above, the leukocyte count is 5000-10,000,

and the hemoglobin is 8 or above. Besides, symptoms such as nausea, vomiting, and diarrhea should be taken into consideration regarding the quality of the exercise program. The minimal changes in these values lead to differences in the type, severity, and duration of the exercise program [3].

Radiotherapy is one of the preferred methods for the treatment of breast cancer. In the radiotherapy process, skin damage, sensory problems, loss of joint mobility, and bone fracture risk should be taken into consideration, while planning rehabilitation programs. In addition, changes in normal tissue exposed to radiation cause some side effects. Some of these side effects are as follows: fatigue, bone marrow depression, erythema in the skin, pigmentation, burns, hair loss, central nervous system effects, bone growth retardation, radiation pneumonia, pain, and ulcers. When planning rehabilitation programs in patients receiving radiotherapy, it should be aimed to minimize the possible side effects of the treatment and to increase the functionality level of individuals [5].

Patients admitted to oncology outpatient clinics, hormone therapy, chemotherapy, and radiotherapy can experience problems depending on the side effects of drugs. Increasing the quality of life of individuals and minimizing the side effects of treatment is one of the priorities of the health care members working in the field of oncology.

2. Breast cancer and quality of life

Cancer is a chronic disease that has physical, psychological, and cognitive recovery and aggravation periods. About 33% of cancer survivors reported that the obvious cause of deterioration in the quality of life is fatigue. The primary goal of women with breast cancer and survivors of breast cancer is the improvement of functions affected by cancer-related treatments [6].

The period after diagnosis and treatment means the important adaptations concerning physical, social, cognitive, emotional, and economic aspects for the patients with breast cancer and their immediate circle. The activity participation levels, interests, and quality of life of individuals are reshaped, especially for the survivors. The goals of rehabilitation vary in cancer patients at different stages of the disease. The primary goal is to continue and maintain the quality of life and functionality in the diagnosis phase. It is in the forefront to support improvement in the treatment stage and to prevent the quality of life to be adversely affected. The inclusion of individual submaximal aerobic exercise programs to maintain and enhance the quality of life is the first step in oncologic rehabilitation.

Various scales have been developed to determine the quality of life in breast cancer. Nowadays, there is growing evidence that quality of life in breast cancer should be evaluated in detail. Besides being affected by many factors, the quality of life is subjective and difficult to evaluate. There are few specific questionnaire for cancer: European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire and Breast Cancer Supplement (EORTC QLQ—C 30 and QLQ—BR 23), The Functional Assessment of Chronic Illness Therapy General Questionnaire and its Breast Cancer Supplement (FACIT-G and FACIT-B), and The Breast Cancer Chemotherapy Questionnaire (BCQ) [7, 8].

3. Breast cancer and functional capacity

The long process and the side effects of cancer treatment may lead to a decrease in functional capacity. It might lead particularly to the reduction of

aerobic capacity, muscle strength reduction, flexibility, changes in body composition, and affecting patients' health-related quality of life. In recent years, breast cancer mortality is decreasing. However, the need for rehabilitation in the recovery of the reduction in functional capacity due to the side effects of the treatment is increasing [9].

Aerobic exercises, stretching, relaxation exercises, strengthening exercises, combined exercise programs, body awareness training, energy conservation techniques, dance therapy, and yoga are aimed to increase functional capacity in breast cancer patients [10].

Individualized rehabilitation programs should be planned to determine exercise capacity and increase functional capacity in cancer patients. A 6-minute walk test, bicycle ergometer, and walking band can be used under the supervision of physiotherapist with cardiologist recommendation during the evaluation and exercise training.

4. Breast cancer and rehabilitation

Cancer rehabilitation in the literature is one of the special rehabilitation approaches in physiotherapy and rehabilitation since 1940. In a study conducted in 1978, the areas where rehabilitation was needed were investigated, and problems were identified in the areas of psychological stress, pain, muscle weakness, daily life activities, ambulation, and family support. Thus, the studies aimed to support the quality of life of cancer patients have gained importance [3].

Currently, studies conducted with cancer patients indicated the impact of exercise on fatigue, pain, muscle strength, functional capacity, and quality of life. Due to cancer treatments and its side effects, changes in physical, functional, cognitive, and emotional well-being may be observed in patients. This situation affects the daily activities and role functions of the cancer patients and clearly emphasizes the need for rehabilitation programs [10].

Fatigue is the most common symptom in cancer patients. The National Comprehensive Cancer Network has expressed the relationship between fatigue and cancer as a result of the psychosocial interaction of physical, systematic, cognitive, and emotional changes due to long-term treatment. The main purpose of oncologic rehabilitation is to remove the chemicals taken by systemic treatments and radiotherapy, increase the amount of tissues oxygenation, and maintain muscle strength and endurance. Aerobic exercises have an important role in accelerating the excretion of toxic substances accumulated in the body due to the side effects of radiotherapy and chemotherapy and increasing the oxygenation of tissues in order to minimize fatigue complaints [11, 12].

4.1 Breast cancer and oncologic rehabilitation

Oncologic rehabilitation is a medical process that aims to reduce the cancer patients' complaints during the illness, to increase the level of independence, and to increase the quality of life. Studies on conservation, recovery, and development of the physical, environmental, social, cognitive, psychological, and professional functions require experience and multidisciplinary team in the field of oncological rehabilitation. The oncologic rehabilitation team consists of patients, doctors, nurses, physiotherapists, psychologists, nutritionists, dieticians, social workers, speech therapists, and relatives of the patient. Physiotherapists aim to improve the quality of life of cancer patients using individualized exercise programs in the treatment and survival periods starting from the diagnosis stage [12, 13].

While planning individual exercise training in oncologic rehabilitation, the type and stage of cancer, as well as the patient's complaints, should be considered. Progressive weighing down should be performed to increase muscle performance. This weigh principle means increasing the frequency, intensity, severity, and exercise type gradually and individually. It aims to maximize the cardiopulmonary potential with pretreatment term exercises in cancer. In the treatment term, the aim is to improve the quality of life, the functional capacity of the individual, and to develop their limited skills. In the posttreatment term, the aim of exercise training is to adapt the individual to the physical and environmental changes that may occur in daily life.

The survival duration of breast cancer patients increased due to the developments in cancer treatments. It is important to decrease the treatment-related complications and improve the quality of life during the survival period. Upper extremity limitations, pain, fatigue, sensory problems, the decrease in functional capacity, and loss of muscle strength are common complications in breast cancer patients. In the studies conducted in the field of oncologic rehabilitation with breast cancer patients, it was stated that aerobic exercise programs had an important role in increasing the quality of life and functionality. Furthermore, in the literature, the effects of various physiotherapy applications such as pilates and yoga exercises, complex decongestive physiotherapy applications, strengthening exercises, relaxation exercises, and banding techniques have been shown within the scope of oncologic rehabilitation programs for individuals with breast cancer [14].

4.2 Stretching and relaxation exercises in breast cancer

Stretching exercises are frequently preferred in physiotherapy and rehabilitation programs, and they are a simple but effective component of treatment when applied correctly. Although the literature on stretching exercises is constantly being updated, physiotherapists are used to improve normal joint movement and physical fitness to reduce muscular fatigue and to improve proprioception and body perception.

Exercises consisting of active stretching and relaxation techniques such as pilates, yoga, and dance therapy can be used in rehabilitation programs in breast cancer patients. These exercises are preferred to support the body image of the individual during the treatment and posttreatment periods, to increase awareness, and to improve the physical fitness of the patient. It is aimed to accelerate the excretion of toxic substances and reduce fatigue complaints by increasing the circulation and muscle feeding with stretching and relaxation exercises [10, 15].

4.3 Aerobic exercise in breast cancer

Aerobic capacity refers to the measurement of the functional capacity of the cardiopulmonary system. It is associated with the ability to perform dynamic, medium/high-intensity exercise, which includes the use of long-term, large muscle groups. Aerobic exercises contribute to increase the quality of life by decreasing the fatigue level due to cancer treatment and insulin resistance due to the metabolic structure of the individual with breast cancer [16].

Aerobic exercise training means increasing the energy capacity of the muscle with exercise. Exercise programs are usually prepared considering the frequency, duration, density, and type parameters. The intensity of aerobic exercise progresses from low to medium in breast cancer patients. The heart rate should be 65–80%, and the exercise program should continue for at least 20–30 minutes for the minimum effect [10, 16].

Increasing the level of physical activity in cancer contributes to increase survival rates and quality of life. It has been shown that the mortality rate decreases with regular exercise programs in individuals with breast cancer. Increasing physical activity during breast cancer treatment has an important role in minimizing the side effects of chemotherapy and radiotherapy, providing body awareness, and increasing muscle strength [17, 18].

Physiological responses following aerobic exercise training result in changes in the cardiovascular system and peripheral muscles. With regular aerobic exercise, the capacity to use oxygen in peripheral muscles increases. In addition to endurance exercises, change in oxidative enzyme capacity, fiber type, and capillary density is observed. Lactate accumulation in muscle is reduced, and less carbon dioxide production is achieved during the exercise process. Maximal oxygen consumption, one of the side effects of cancer treatments, decreased, and accumulation of toxic substances causing fatigue complaints increased.

In studies on the effectiveness of aerobic exercise in breast cancer patients and survivors, it was stated that myoglobin levels increased, immune system functions improved, fat destruction was accelerated, functional capacity and quality of life improved, and body composition improved, besides the reduction of fatigue complaints and acceleration of the excretion of toxic substances. In addition, red blood cell counts may decrease in cancer patients as one of the side effects of treatment. This leads to a reduction in physical performance and fatigue, as oxygen requirements cannot be fully met in activities requiring low effort. For this reason, the exercise programs must be personal. The severity of the exercise must be adjusted according to personal needs and the physiological responses. These details are important for cancer rehabilitation [18, 19].

Aerobic exercises in breast cancer patients have been proven to support body image and self-esteem, increase physical performance, weight control, and muscle strength. It is known that the aerobic exercises performed during the chemotherapy period contribute to the reduction of complaints due to side effects and to increase the functional capacity and quality of life. Nowadays, in the field of oncologic rehabilitation, the need for studies involving exercise programs during different treatments in breast cancer patients is increasing.

4.4 Calisthenic exercise in breast cancer

The word kalistenik is of Greek origin and derived from the word sthenos, which means kallos, and force, which means beauty. It is defined as the art of using your body to improve human physics. Calisthenic exercise is a useful form of exercise because the major muscle groups can be used in paced, rhythmic, different time, number, and intensity, which can be modified and can meet different physical fitness parameters. It can be applied without equipment. These aerobic exercises, which can be used for durability and flexibility, have been shaped by the modification of the Carlson Fatigue Curve test [20].

Calisthenic exercises are preferred because of objective evaluation of physical performance, compliance with home exercise programs, and safe application to individuals with chronic disease. The advantage of these exercises is that they can be modified according to the individual and contributes to balance, strength, agility, coordination, and endurance.

Calisthenic exercise practice principles

- It is recommended that these exercises be performed in a noise-free environment and accompanied by music.

- It is suitable to be rhythmic and counted in order to contribute to the aerobic capacity.
- For the 30-minute program, 1–3 exercises should be selected for each category for prone, prone and side-lying, sitting, standing categories, and 60 minutes for each category.
- The exercise program should be performed at the same time throughout the treatment, preferably in the morning.
- Calisthenic exercises can be performed individually or in groups.

Calisthenic exercises in breast cancer patients can be preferred safely in diagnosis, treatment, and survival stages. Exercise examples that can be applied in breast cancer patients are as follows. These exercises should be applied gradually with the principle of individual weighing and under the supervision of a physiotherapist.

1. Reciprocal hip flexion and extension in the supine position.
2. Lifting reciprocal flat leg in the supine lying position.
3. Setting up a bridge in the supine position.
4. Hip abduction in the lateral lying position.
5. Beck extension in the prone position.
6. Shoulder elevation in sitting position.
7. The circular movement of the shoulders from the front to the back in sitting position.
8. Scapula adduction in sitting position (hands on back).
9. Shoulder flexion in standing position.
10. Shoulder abduction in standing position.
11. Reciprocal lateral flexion of the trunk in standing position.
12. Upward movement on toes with arm up.
13. Reciprocal hip and knee flexion in standing position.
14. Half-squat in standing position [16].

4.5 Strengthening exercises in breast cancer

Muscle strength is the force that a muscle or muscle group spends against resistance with maximum effort. Strengthening exercises preferred in women with breast cancer to protect and improve the muscular force of the vertebrae and extremities, to improve endurance, increase function and develop the quality of life. Progressive resistant exercise is a method that strengthens the muscle according to

the principles of adaptation and weighing down. DeLorme and Oxford techniques are commonly used methods in progressive resistant exercise.

Reduction in bone density, fatigue, decreasing of physical activity as a result of the loss of energy, decrease in the participation of Type I muscle fibers in contraction and loss of strength, anxiety, and depression may be observed depending on the side effects of breast cancer treatments. Strengthening exercises are required to increase muscle function and exercise capacity. In the literature, the most commonly used strengthening exercises in breast cancer patients are progressive resistant exercises. Schmitz et al. reported that there was a 30–50% increase in muscle strength in breast cancer patients who participated in progressive resistance exercise programs for 2 days and 12 months [21, 22].

In oncologic rehabilitation, exercise is recommended for 12 weeks, 3 times a week, 65–80% of the maximum heart rate, and 4–6 severity on the Borg scale. It is important to not to increase the fatigue complaints and maintain the physical performance of breast cancer patients during the strengthening exercises. It is important to not to exercise more than 3 days a week and to plan 1-day exercise and 1-day rest (can be 2 day rest interval according to patient tolerance) for breast cancer patients.

5. Disease process and exercise

The World Health Organization mandates that exercise repairs physical, physiological, and mental wellbeing in general and that consistent moderate-intensity exercise decreases the risk of cardiovascular disease, diabetes, and cancer [23]. Exercise programs for breast cancer have been reported to contribute to positive outcomes with developed treatment methods [24].

When creating rehabilitation programs, the type and stage of cancer, the needs and expectations of the individual, the progression of the disease, the status of the metastasis, the treatment protocols, and the side effects of the treatment should be considered. Physiotherapists who have an important role in the team of rehabilitation should take a holistic approach to pre/post (remission) treatment periods, active care, protection, and palliative periods.

Determining the duration and frequency of rest intervals in planning the exercise programs that include individual loading principles increases the success of physiotherapy and rehabilitation in parallel with the process of the disease in reducing the fatigue complaints [25].

5.1 Pretreatment period in breast cancer

The pretreatment period is the process in which the disease is recognized by the breast cancer patient. The patient is admitted to the hospital, the diagnosis is made, but the treatments are not started yet. It is a sensitive and anxious period for the patients, and the physiotherapist's approach to the patient is important for the effectiveness of the treatment. All body systems should be evaluated. The functional status should be determined prior to the treatments, and the effects of the treatments should be demonstrated. Patients and their relatives should be informed about the importance of the starting physiotherapy programs during treatments, survival period, and in the palliative period [3, 26]. The exercises recommended during this period are given in **Figure 1**.

Studies in recent years have shown that exercise, especially moderate-intensity aerobic exercise, has been noted to be advantageous in some studies regarding the breast cancer outcomes, decreasing the mortality rate by >30%, and decreasing recurrence rates for females following a breast cancer diagnosis [27].

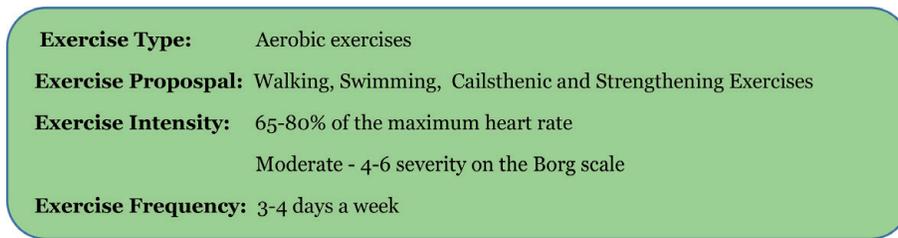


Figure 1.
Exercise recommendation in pretreatment period.

5.2 Treatment period in breast cancer (active term)

It is the period when the treatments started, continued in the breast cancer patient, and the side effects started to be observed. All systems in patients receiving chemotherapy and radiotherapy should be evaluated in detail at frequent intervals. Evaluating and recording the fatigue and pain are important in this period. Functional disability and endurance loss should be considered in planning treatment programs.

Focusing on physiotherapy and rehabilitation programs during the treatment period will enable the patients to adapt to the new period of cancer. Starting the exercise programs at the submaximal level will improve the quality of life of individuals and facilitate their adaptation to treatment by taking into account the side effects that may occur following the first dose of treatment. In the literature, it was stated that it would be effective to give aerobic exercises beginning from the active period in breast cancer patients receiving chemotherapy and radiotherapy [5, 28, 29]. The exercises recommended during this period are presented in **Figure 2**.

In the recent studies, it has been shown that respirator and functional capacity are increased, and sleeping disturbance, mood disturbance, and anxiety decreased following a 12-week aerobic exercise program in women undergoing adjuvant chemotherapy [30].

5.3 Maintenance/protection period in breast cancer

The exercise of maintenance and protection period consists of long-term exercises to keep the disease in remission. All systems and circumstances, caused by side effects, should be evaluated in detail at frequent intervals. Findings of different treatments should be noted. Complications such as muscle weakness and posture problems should be considered when planning physiotherapy and rehabilitation programs.

Ongoing physiotherapy rehabilitation studies are needed for women with breast cancer, especially during chemotherapy. Individualized exercise programs are the

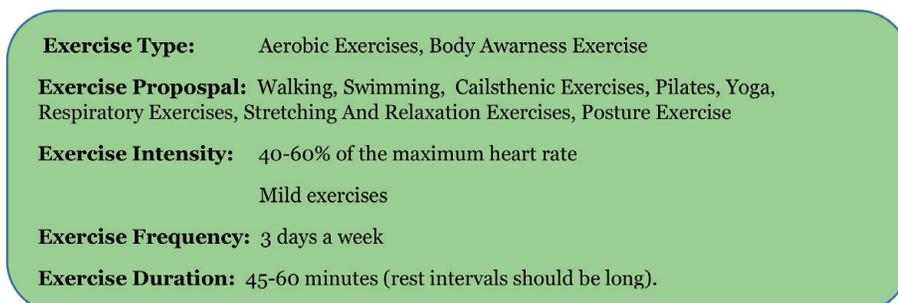


Figure 2.
Exercise recommendation in treatment period.

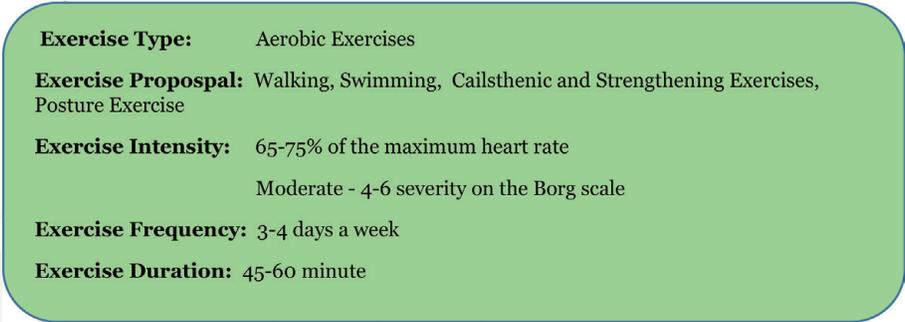
important parts of the breast cancer treatment in order to reduce the side effects of treatment, to support individuals from physical, functional, and cognitive aspects, and to improve the quality of life [25]. The exercises recommended for this period are presented in **Figure 3**.

5.4 Posttreatment period/remission period in breast cancer

Remission period refers to the survival period in which cancer treatments are completed. All systems should be evaluated in detail. Musculoskeletal problems, sensory, motor, and cognitive problems should be examined in detail. When creating physiotherapy and rehabilitation programs, the individual's specific needs and complaints should be taken into consideration. Loss of muscle strength, poor posture, loss of endurance, and decrease in quality of life are the most common complaints.

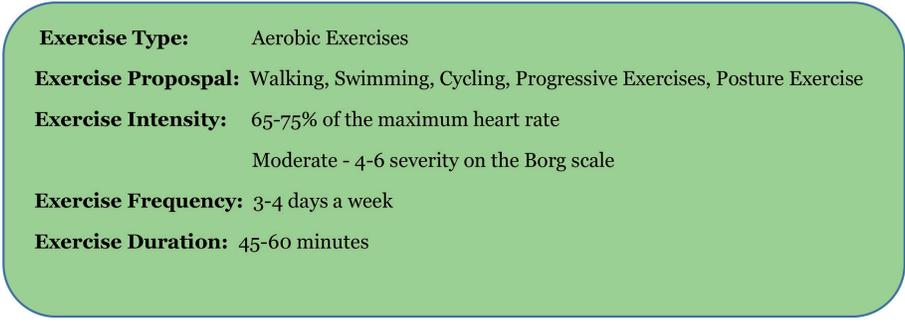
Most of the studies related to the breast cancer patients are concerned with the survival period. The effects of aerobic exercises especially on body image, sexual functions, quality of life, functional capacity, and cognitive functions have been confirmed [6, 10, 11]. The exercises recommended during this period are given in **Figure 4**.

In a cohort-longitudinal study, it was observed that fast walking (3 h/week) prior to and following a breast cancer diagnosis in postmenopausal women reduced the mortality rate by 40% [31]. Most importantly, reports in previous systematic reviews suggested that aerobic exercise with moderate-high intensity (50–85% of maximal heart rate), 3 times/week ranging between 8 and 24 weeks, to be the most frequent mode for breast cancer patients and survivors. Similarly, this program may also have a positive effect on the cardiovascular, muscular, and neurological systems. As a consequence, this can lead to improvements in quality of life, such as the ability to deal with daily tasks [32].



Exercise Type: Aerobic Exercises
Exercise Proposal: Walking, Swimming, Cailsthenic and Strengthening Exercises, Posture Exercise
Exercise Intensity: 65-75% of the maximum heart rate
Moderate - 4-6 severity on the Borg scale
Exercise Frequency: 3-4 days a week
Exercise Duration: 45-60 minute

Figure 3.
Exercise recommendation in maintenance/protection period.



Exercise Type: Aerobic Exercises
Exercise Proposal: Walking, Swimming, Cycling, Progressive Exercises, Posture Exercise
Exercise Intensity: 65-75% of the maximum heart rate
Moderate - 4-6 severity on the Borg scale
Exercise Frequency: 3-4 days a week
Exercise Duration: 45-60 minutes

Figure 4.
Exercise recommendation in posttreatment period.

Exercise Type:	Aerobic Exercises, Daily Life Activities
Exercise Proposal:	Normal joint motions, Daily life activities, respiratory exercise, Walking
Exercise Intensity:	40-60% of the maximum heart rate Mild exercises
Exercise Frequency:	3 days a week
Exercise Duration:	45-60 minutes (rest intervals should be long).

Figure 5.
Exercise recommendation in palliative period.

5.5 Palliative period in breast cancer

According to the definition of the World Health Organization, palliative care is the time when someone is facing a life-threatening illness. It is an approach used to improve the quality of life of patients and their relatives. In this period, rehabilitation programs should be planned considering physical, psychosocial, and mental problems, especially pain. The disability and activity limitations of the body structure and function of individuals should be focused. Improvable/curable functions and the specific needs of the patient are important. Increased muscle strength and locomotor skills should be maintained. Physiotherapy and rehabilitation programs should include daily living activities and the use of ancillary equipment during this period. For this purpose, physiotherapists should determine the need for support equipment and be involved in the adaptation process of the individual and provide the necessary training [3, 33]. The exercise recommendation for this period is given in **Figure 5**.

6. Conclusion/summary

Breast cancer is the most common type of cancer among women in the world. The increase in the average lifetime, the change in lifestyle, the spread of screening studies, and the increase in the notification of cancer cases can be considered as the main reasons for the increase in the incidence of breast cancer. Long-term treatment and side effects in breast cancer cause decreasing in the functional capacity of the individual with cancer. Particularly, the decrease in aerobic capacity negatively affects muscle strength, endurance, and body perception, leading to a decrease in quality of life. Besides, symptoms such as systemic problems, blood values results, and high fever during chemotherapy may cause change in the type, duration, severity, and mobilization status of the exercise programs. The practice of aerobic exercise programs during the treatment of breast cancer is important in reducing the side effects, improving physiological health, improving physical functions, and preventing weight gain and maintaining muscle strength. Rehabilitation in breast cancer contributes to the restoration of the problems caused by the disease and its treatment, keeping physical, psychosocial, and occupational functions at the highest level. In women with breast cancer, rehabilitation programs including aerobic exercises are in parallel with the stage of the disease and the treatment process. Also, increasing physical activity level and functional capacity is an important approach in coping with the disease process.

As a result, although there are very important developments in cancer prevention and early diagnosis and treatment methods, a breast cancer diagnosis is rapidly increasing in the world. Cancer patients at the stage of diagnosis continue their

daily life routine; they have a high functional level, and they have no side effects. For this reason, many cancer patients state that the quality of life decreases with the onset of treatments, fatigue, long-term hospitalizations, repeated scans, and the effect of drug treatment. Satisfactory and effective applications are needed to maintain the functional status and quality of life of breast cancer patients. Oncologic rehabilitation approaches should be planned and implemented as individual programs adapted to the patients following a comprehensive evaluation of breast cancer patients. Individual rehabilitation programs can be planned as aerobic exercises, pulmonary rehabilitation, body awareness training, and cognitive rehabilitation. It is aimed to maximize the quality of life, minimize complaints, and increase functional capacity with exercise programs in breast cancer patients. More specifically, studies on the appropriate exercise program for breast cancer are needed with a clearer and more comprehensive analysis of the functional capacity and quality of life that are anticipated for positive health outcomes.

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