

REHABILITATION OF BREAST CANCER PATIENTS

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Summary

Multimodality treatment in patients with breast cancer, alike the disease progression process, results in numerous side effects that significantly affect the quality of everyday life. Studies have shown a correlation between the quality of life and survival rates. To prevent or maximally reduce these effects rehabilitation care should be considered to be part of the treatment protocol for breast cancer.

KEYWORDS: *breast cancer, multidisciplinary approach, effects of the disease and treatments, rehabilitation, quality of life, palliative care*

REHABILITACIJA BOLESNICA S RAKOM DOJKE

Sažetak

Multimodalno liječenje bolesnica s rakom dojke, kao i sama bolest u procesu progresije, rezultira brojnim nuspojavama koje znatno utječu na kvalitetu svakodnevnog života. Studije pokazuju da je kvaliteta života u korelaciji sa stopom preživljenja. Da bi se prevenirale ili maksimalno reducirale nastale posljedice nužno je uključivanje rehabilitacije u protokol liječenja bolesnica s rakom dojke.

KLJUČNE RIJEČI: *rak dojke, multidisciplinarni pristup, posljedice bolesti i liječenja, rehabilitacija, kvaliteta života, palijativna skrb*

INTRODUCTION

Breast cancer is the most common malignancy affecting women worldwide. The patients are often faced with physical, psychosocial, spiritual and occupational concerns that adversely affect the quality of their everyday life. Recognition of these complications resulting from the disease and treatment process can reduce patients' traumatic experiences. Early diagnosis and a multidisciplinary approach to the treatment increase the survival rate and life expectancy. This results in the necessity to include rehabilitation care in the complex treatment for breast cancer patients, from the moment of diagnosis through the healing and recovery process. The aim of any rehabilitation

program is to help the sick achieve maximum physical, mental, spiritual, social, professional, recreational and educational ability in relation to their physiological or anatomical impairment, environmental constraints, their desires and life plans. At the end stage of the disease, rehabilitation becomes an important part of palliative care.

Rehabilitation is provided by a team of health care professionals from different fields united towards the common goal. The team leader is a physician, a specialist in physical medicine and rehabilitation, who works closely together with other team members including physiotherapist, nurse, work therapist, social worker, spiritual counselor, art therapist, recreational therapist, prosthetist and orthotist, occupational rehabilitation thera-

pist. The physiatrist, as the rehabilitation team leader, is also a member of the oncology multidisciplinary team and plays an important role in care coordination between the teams. The patient, together with her family, is an active, central member of the rehabilitation team who, as the rehabilitation progresses, becomes more responsible for its outcome. Basic terms to describe the role of the patient in the rehabilitation process include the following: information, education, motivation, participation, responsibility. Such team approach helps them jointly identify problems, set realistic goals, plan and provide rehabilitation programs, and evaluate the results aimed at achieving the ultimate goal of improving the patient quality of life as much as possible. Models for organizing a rehabilitation team rely on multidisciplinary, interdisciplinary and transdisciplinarity. The optimal model of organization of a cancer rehabilitation team is an interdisciplinary model (1).

Rehabilitation is provided using rehabilitation procedures such as physical therapy, work therapy, psychotherapy, spiritual therapy, different types of psychosocial or complementary supportive psychotherapeutic programs. Physical therapy includes a variety of procedures of electrotherapy, kinesitherapy, massotherapy, hydrotherapy, thermotherapy, phototherapy and natural factors. Methods of physical and rehabilitation medicine and psychosocial procedures also complement each other to achieve considerable success in approaching patients with cancer. The effect of rehabilitation procedures can be observable both in *body systems* (musculoskeletal system, cardiovascular system, respiratory system, endocrine system, urinary system, digestive system, skin and subcutaneous tissue) and at *psychosocial, emotional and spiritual* levels, which may be a result of practicing a holistic approach to the patient, and not merely the disease and pathological processes.

Since the clinical process encompasses diagnosis, planning, treatment and rehabilitation, at the end of this process an outcome assessment needs to be done. A variety of questionnaires not specifically designed for oncology patients may be appropriate to fulfill this purpose. The most commonly used assessment tools throughout rehabilitation include as follows: Cancer Rehabilitation Evaluation System-Short Form (CARES-SF), Functional Assessment of Cancer Therapy-General (FACT-G), European Organization for Research

and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ), Functional Living Index-Cancer (FLIC), Quality of Life Index-Cancer (QLI), Edinburg Rehabilitation Status Scale (ERSS).

Rehabilitation of breast cancer patients

The goals of rehabilitation are the following:

1. To preserve preoperative function of the musculoskeletal system, and remove or reduce potential effects of different treatment modalities (surgery, radiation therapy, chemotherapy, hormone therapy) and potential effects of disease progression
2. To provide psychological, social and spiritual support
3. To restore the physical appearance (1).

1. POTENTIAL PHYSICAL EFFECTS AND TREATMENT

Local therapy

Functional disorders showing a tendency to progression with adjuvant radiation therapy may develop immediately after surgery for breast cancer (either modified radical mastectomy or conservative surgery including axillary lymph node dissection).

The side effects are as follows: 1. Reduced shoulder and elbow movement *due to immobilization* 2. *Axillary web syndrome (AWS) or cording syndrome*: the pathophysiological substrate underlying degenerative or atrophic inflammatory processes occurring in the walls of blood vessels and lymphatic vessels of the region as a complication of axillary lymph node dissection (ALND) producing a visible thickening in the arm pit, i.e. a ropelike structure that extends down the arm past the elbow pit to the wrist and thumb. The arm movements are painful. Studies show that 6% and 95% of patients develop cording syndrome in the first week after surgery and some of the symptoms of this postoperative complication by postoperative week 8, respectively. As reported in these studies, this condition is not directly related to tumor-invaded lymph nodes but is proportional to the number of removed lymph nodes. 3. Reduced arm movements *due to lymphedema*, which is generally transient and lasts only a short time. 4. Reduced and painful chest wall movements because of the

pectoral and intercostal muscles' tendency to shortening. 5. Changes in postural balance of the shoulder and head in the horizontal and vertical plane, respectively, due to the effect of gravity on kinesthetic receptors with *consequent pain syndrome in the cervical and thoracic spine*. 6. Injury (*neurapraxia*) to the *long thoracic nerve* causes partial denervation of the serratus anterior muscle resulting in a winged scapula (*scapula alata*) and impaired arm elevation. Injury (*neurapraxia*) to the *thoracodorsal nerve* causes partial denervation of the latissimus dorsi muscle accompanied with an impairment of adduction and internal rotation of the arm. Injury to the *intercostobrachial nerves* (Th2 and Th3), which innervate a small portion of the skin on the medial side of the arm, results in paresthesia and pain which are usually transient. 7. Reduced movements of the shoulder and arm due to an exacerbation of chronic shoulder tendinopathy, usually in elderly patients. 8. Painful and limited shoulder movements may be due to *infiltration of small nerves, blood and lymph vessels*, and the surrounding tissue by a metastatic tumor. 9. A lesser percentage of patients may experience *phantom pain* as a very unpleasant sensation in the operated breast, occurring more commonly in women who feel breast pain before surgery (2, 3).

Studies show that these effects are less common and of a lesser intensity after breast-conserving surgery and SLNB followed with a less aggressive regimen of radiation therapy.

A majority of potential postoperative complications include pain which, as a rule, is of a mixed type and hence of a higher intensity since besides its organ component, such pain also includes other components of total cancer pain: psychogenic, social and spiritual components.

To prevent or obtain the maximum possible restitution of the disturbed function a rehabilitation program needs to be started by Postoperative Day 1. The most common rehabilitation techniques are kinesitherapy, massotherapy and transcutaneous electrical nerve stimulation (TENS). Kinesitherapy involves the use of movements for curative and preventive purposes. Massotherapy (different types of massage techniques) is a method that uses a series of systematic movements on the surface of the body and the manipulation of soft body tissues to exert a direct or indirect effect on the muscular and nervous systems, and increase blood circulation and lymph flow.

Transcutaneous electrical nervous stimulation (TENS) uses low-voltage electrical current to stimulate the nervous system to produce an analgesic effect.

Pathophysiological basis of early kinesitherapy

In the surgical and radiation field, i.e. in the shoulder joint and axilla, and soft structures (loose connective tissue), conditions for the development of dense connective tissues are created resulting in a decreased range of motion (shoulder, cervical and thoracic spine), motor and sensory disturbances of the brachial plexus innervation field and disturbed lymph flow. In newly developed conditions of traumatized soft tissue including disturbed and impaired circulation, aggravated metabolism, accumulation of metabolic waste products, hypoxia, decreased levels of edematous tissue pH, the deposition of collagen and reticulin, precursors of collagen and reticulin fibers, takes place very quickly, which can be detected by electron microscopy by the very next day. If the shoulder is not mobilized as of postoperative Day 1, restriction of movements will occur by Day 4, and the longer the immobilization period, the more progressive the movement restriction. To prevent the development of adhesions and their potential sequelae, joint and soft tissue flexibility is maintained through physiological movements of body parts (including the joint capsule, muscles, ligaments, subcutaneous connective tissue and skin) according to a predefined kinesitherapy program.

Importance of proprioception for normal shoulder function

Joints and joint structures, muscles and connective structures of the shoulder girdle are well supplied with neural mechanoreceptors that are disturbed or impaired by aggressive treatments. An engram of the impaired peripheral function (painful shoulder, poor posture) is created by the CNS.

Facilitation through the afferent and efferent pathways restores or repairs the CNS engram of the body part or function that has been changed by surgery, injury or poor posture. Different physiotherapy techniques use the proprioceptive sensitivity to restore normal function. Sensory feedback and feedforward are achieved through

maintenance of joint positions, control of different resistance mechanisms, performance of targeted motor tasks and use of appropriate aids.

Kinesitherapy after breast surgery

Kinesitherapy is a scientific discipline based on the application of movements carried out for curative purposes. In postsurgery breast cancer patients, the kinesitherapy program is aimed at preventing contractures of the shoulder joint, cervical and thoracic spine, and improving muscle mobility, flexibility, strength and endurance, as well as posture, coordination and balance. The shoulder and the arm form the most mobile functional unit of the human body. The shoulder mobility is considered normal when the patient is able to perform arm movement from the side of the body to 180° and return the arm to the starting position. Functionally, the motion segment of the shoulder comprises the shoulder joint and the shoulder girdle. The costosternal and costoclavicular joints, although to a small extent, also play a role in achieving full shoulder mobility.

Muscles that take an active part in movements of the shoulder joint and the shoulder girdle are divided into three groups:

- a) Superficial thoracic muscles that arise from the anterior and lateral thoracic wall and insert into the bones of the shoulder girdle or the humerus
- b) Superficial lumbar muscles that arise from the spinous processes of vertebrae and insert into the bones of the shoulder girdle or the humerus
- c) Muscles of free part of the upper limb that act on the shoulder joint.

The shoulder range of motion is tested on both sides simultaneously. The obtained results are entered into an appropriate test form – the shoulder mobility and muscle strength test form. Shoulder motion kinetics has a diagnostic value, and the test parameters are important for the long-term functional assessment of the shoulder. The first test is performed before surgery, and further tests are done in accordance with the evaluation protocol design. An important parameter measured in the mobility and strength test refers to anamnestic information about shoulder pain, and the shoulder postural position in both the horizontal and vertical plane of the head. There are

many conditions that can also restrict range of motion and muscle strength of the shoulder and the upper trunk preoperatively (trauma, degenerative and inflammatory diseases of the shoulder joint, joint capsule, cervical and thoracic spine). The range of reduced motion may vary from a several degree reduction to a higher degree contracture (4).

Kinesitherapy program from postoperative Day 1

On postoperative Day 1, the arm on the operated side must be kept in a slightly elevated position. This may be achieved by placing a pillow under the arm to a comfortable height. In this position, the patient may occasionally squeeze a soft ball or a gauze roll in her hand. This helps lymphatic drainage and prevents arm swelling. Exercises should be done as long as there is a tendency to arm swelling and a heavy, leaden feeling in the arm. On postoperative Day 1, breathing, circulation improving and relaxation exercises are started, too, as well as prevention of respiratory and thromboembolic complications, and reduction of painful chest muscle hypertonicity.

Shoulder mobilization exercises start on postoperative Day 1 after a prior physiatrist evaluation and consultation with a surgical oncologist. Exercises are performed under the supervision of a physiotherapist and accompanied with education to assist performance of daily activities.

Early postoperative in-patient kinesitherapy of the shoulder can be divided into two parts:

From postoperative Day 1 to drain removal: Exercises are performed individually, in the hospital room, with the patient in a lying and sitting position, gradually increasing the amplitude of movement to the limits of tolerance (pain, tightening sensation, tingling sensation, discomfort) that improve day by day. Movements are both actively supported and actively unsupported. Shoulder abduction and flexion gradually increase from 45° to 90°, and external and internal rotations are performed to a tolerance limit.

From drain removal to stitch removal: Exercises are performed in a gym, individually and in a group setting. The amplitudes of movement are gradually increased to achieve full mobility that existed before surgery. Movements are both actively supported and actively unsupported. Daily recording of obtained arm elevation is a recom-

mended practice for monitoring any progress in shoulder mobilization. Exercises in standing and sitting positions are performed in front of a mirror for self-supervision and correction of the entire posture. Key posture points are the lower jaw, shoulders and pelvis.

Kinesitherapy program from radiation therapy Day 1

Considering the progressive tendency for developing contracture of the shoulder joint and its adjacent region under radiation therapy conditions, kinesitherapy is performed daily starting from the first day of radiation therapy to at least one year after radiotherapy treatment. Exercises are performed in a gym, individually and in a group setting, under supervision of a physiotherapist after a prior physiatrist evaluation and consultation with a radiation oncologist.

The patient is in a sitting and standing position. Exercises encompass all movements of the shoulder joint, shoulder girdle and upper spine aiming at preserving function of the shoulder and its adjacent region. Movements are both actively supported (by a physical therapist or by using different aids – Swedish ladders, cane, elastic slip-on band, suspension device) and actively unsupported. Exercises are recommended to be performed in front of a mirror for self-supervision and correction of the entire posture.

Along with exercises for maintaining good shoulder function, breathing, relaxation and circulation improving exercises and exercises for improving posture, coordination and balance are performed during radiation therapy.

One of serious complications following radiation therapy is *radiation plexopathy*.

This sporadically occurring complication is reported in less than 1 percent of the patients and can develop in an interval of 6 months to 20 years, but most frequently 2 to 5 years after radiation. Radiation-induced fibroses in the supraclavicular and axillary region can cause damage to the brachial plexus including sense organ and motor disorders. Differential diagnosis should help distinguish this syndrome from metastatic tumor plexopathy, using MR, CT, EMG and clinical picture. The aim of rehabilitation is to achieve optimum function in the scope of the existing damage. The most common rehabilitation techniques include kinesitherapy, TENS, electrostimulation,

proprioceptive training, work therapy, use of orthotic and other aids (5).

Although rare, *postradiation necrosis* can lead to a pathological fracture.

Systemic therapy

a) Chemotherapy

Peripheral neuropathy

Peripheral neuropathy is the most common clinical picture of nerve damage induced by chemotherapy.

First affected extremities are distal ones, and first affected nerves are small sensory afferent nerve endings transmitting sensations of touch, temperature and pain, occasionally accompanied with potential hyperesthesia and hyperalgesia. Some patients develop significantly more serious damage including coordination disorders and sensory ataxia if thicker fibers responsible for sensations of proprioception and vibration are affected. Symptoms of motor fiber damage include muscle weakness and muscle hypotrophy/atrophy, reduced muscle tone and loss of myotatic reflexes. Dysethesia (sensations of numbness, stinging, ant crawling, tingling, warmth, cold) is manifested in fine motor activities as a reduced ability to perform movements that require skills, hand skills in particular. Insufficient proprioception in the lower extremities results in walking disorder which will be reflected in the patient's posture, daily activities and overall quality of life. The disorders are treated using different types of rehabilitation therapy including: kinesitherapy, massage techniques, TENS, work therapy, use of orthotics and other aids. When neuropathy interferes with daily life activities, a work therapist will recommend an activity-based and adaptation equipment-based compensation strategy. Workplace can be and should undergo ergonomic evaluation and modifications to compensate for limb weakness. Unpleasant and painful paresthesiae sometimes require additional therapy in accordance with the guidelines for the clinical management of neuropathic pain using anticonvulsives, tricyclic antidepressants and rarely opioids. Peripheral neuropathy may be either transient or permanent, however, it is more often transient (6).

Reduction of muscle mass and oxygen saturation is another complication of chemotherapy

treatment reducing also the functional capacity of the musculoskeletal system.

b) Hormone therapy / using aromatase inhibitors

Along with the benefits of hormone therapy for breast cancer in postmenopausal women, there are also side effects including *musculoskeletal symptoms* (arthralgia, arthritis, myalgia, carpal tunnel syndrome) and *increased bone resorption*, which occur in about 40% of the patients and are caused by the mechanism of action of aromatase inhibitor drugs. A lesser percentage of patients are then switched to a different drug of the same class or their AI therapy is stopped due to more severe musculoskeletal problems. The side effects are significantly more prominent in patients receiving chemotherapy with taxanes and those who had musculoskeletal problems before, while they are less prominent in patients with a body mass index higher than the normal range or who have previously received tamoxifen treatment. About 2/3 of the patients describe their symptoms soon after therapy starts, and others have symptoms during their first year of therapy. The study of Morales et al. show that in 6 of 12 patients with prominent musculoskeletal symptoms the therapy was stopped due to severe pain and stiffened joints of the arm and hand/wrist. Symptoms were corroborated by distinct radiographic changes on MRI and US showing synovial effusion in joints, connective tissue, and thickening of the hand muscle tendon sheaths. The most common sites of pain, reduced muscle strength and mobility are shoulders, hands/wrists and knees. Compressive fractures develop as a result of untreated osteoporosis. Although rarely, osteonecrosis of the jaw has also been reported. The reported effects of AI therapy are treated using usual rehabilitation techniques and medications (analgesics, NSAR, opioids, bisphosphonates, Ca + vitamin D3, Mg, glucosamine, chondroitin, omega fatty acids). Scales and questionnaires are very useful tools for monitoring also the therapy effectiveness, and not only for assessing pain and quality of life at the beginning of treatment. Scales are usually used only to measure the level of pain, while more complex questionnaires encompass the evaluation of its quality and/or impact on overall functioning. Common assessment tests include Visual Analogue Scale (VAS), Brief Pain Inventory and SF36 (7).

Metastatic breast cancer

Bone metastases arise through hematogenous spread of tumor cells. Common sites of bone metastases include bones of the shoulder girdle and pelvis, ribs, proximal part of the femur and humerus, skull base/vault and spine that is the most common site of bone metastases. Up to 1/3 of patients will develop either a pathological fracture or compression of the spinal cord or a nerve root (pressure of the tumor mass or displacement of bone segments into the spinal canal). Symptoms include pain, neurological deficit, fatigue, reduced daily life activities and self care. The therapy involves systemic or symptomatic drug treatment, irradiation, surgical stabilization, rehabilitation (physical therapy, walking aids, orthotics for stabilization and relief of the locomotor system, ergonomic adjustments to environmental factors, and psychosocial interventions).

The lungs and pleura of the lungs are the second most common site of metastases arising through hematogenous spread of tumor cells. A solitary nodule within the lung parenchyma is found in more than 50% of patients, and other intrathoracic sites include the pleura, mediastinal lymph nodes and lymph nodes along the internal mammary artery. Symptoms are as follows: visceral pain, difficulty breathing, cough, bleeding, sleeplessness, fatigue, reduced daily life activities and self care. The therapy involves systemic and symptomatic drug treatment, irradiation, surgery, and rehabilitation.

CNS metastases are most common in postmenopausal women with aggressive and advanced breast cancer, and also arise through hematogenous spread of tumor cells. Symptoms include neurological deficit, neuropathic pain, fatigue, reduced daily life activities and self care. The therapy involves systemic and symptomatic drug treatment, irradiation, surgery, and rehabilitation.

Liver metastases arise through hematogenous spread of tumor cells, too. Isolated metastases in the liver are rare and usually a sign of significantly disseminated disease, and the most common cause of death from metastatic disease (20%). Symptoms are visceral pain, nausea, obstructive icterus, fatigue, reduced daily life activities and self care. The therapy involves systemic and symptomatic drug treatment, irradiation, surgery, and rehabilitation (8).

Terminal stage of the disease (incurable stage of the disease) may vary in length (days-months), and be accompanied with various symptoms. The most common ones include general weakness, pain, appetite loss, nausea and vomiting, constipation, sleep disorders, dyspnea, cough, psychological and spiritual suffering and social isolation. The palliative approach to the treatment is focused on the control and relief of pain and other symptoms, and establishing communication aimed at encouraging the patient to, with adequate support, control the disease and its consequences by herself. Along with symptomatic drug treatment and palliative cancer therapy, rehabilitation makes an unflinching part of palliative care, too.

2. POTENTIAL PSYCHOSOCIAL AND SPIRITUAL EFFECTS AND TREATMENT

There are many factors that influence psychological adjustment to malignant disease including as follows: tumor characteristics, personality traits (intrapersonal and interpersonal characteristics), social and spiritual factors.

Women's reactions to diagnosis of the disease are of the multiple meanings. These may include panic fear, obsessive-compulsive disorders, adjustment disorders, disorders characterized by physical symptoms such as shortness of breath and palpitations, grief, concern, insecurity, incertitude or social withdrawal, sense of disempowerment and remorse, low self-esteem, suicidal thoughts, lack of energy and tiredness, poor concentration, loss of interest, sleep and appetite disturbances. Each reaction has its psychophysical background and diminishes the defense mechanism and ability to heal. There is a commonly known and accepted attitude in medicine that a holistic approach to the patient, addressing care of the whole person – body, mind and spirit, produces the best therapeutic results. The ill woman needs psychological, emotional, social and spiritual support by medical staff, family, friends, and general public to accept her disease and all the changes that occurred during treatment, correct her attitude toward cancer and recognize it as a chronic disease that can be successfully treated today, and develop motivation for recovery and total adjustment to a new situation. The same support for family members is also needed. These

support methods include individual interviews, counseling, professionally guided group meetings, or self-help groups organized in a club format for women treated for breast cancer (9).

3. RESTORATION OF THE OUTWARD APPEARANCE

The outward appearance of a woman after breast cancer surgery can be restored with a temporary cotton breast form or a special bra that fits the breast form. The outward appearance can also be restored with breast reconstruction. The temporary cotton breast form is prescribed after stitches removal to be worn until the scar is healed. A silicone breast form is usually started to be worn 3-6 weeks after surgery. Due to the sensitivity of the irradiated skin during radiation therapy and 4-6 weeks after the therapy, the patient is recommended to wear the temporary cotton breast form, and only afterwards use the silicone breast form. In addition to covering up the anatomical and esthetic defect, the silicone breast form will correct the posture and balance, and prevent the development of the painful vertebral syndrome commonly occurring in women with large breasts.

The outward appearance can be restored with breast reconstruction using either silicone implants or patient's own tissue. Reconstruction with a latissimus dorsi muscle flap may produce muscle weakness and unevenly distributed strength causing pain and dysfunction. These are indications for exercises for breathing, flexibility, strengthening, posture, coordination and balance.

The outward appearance restoration helps improve the quality of life, reduce stress reactions to the loss of a breast, which besides its physiological function, is also a symbol of femininity.

CONCLUSION

Although breast cancer is the most common malignancy affecting women worldwide, it can also be considered a chronic disease showing an increase in survival rates and an increasing number of women regaining their daily routine. In our modern world, this also means the good quality of their daily life. Therefore, it is necessary to take timely steps to identify and maximally reduce or eliminate numerous complications that may not

only arise from the treatment process but be caused by the disease itself. Besides psychological, social and spiritual effects, musculoskeletal system functional disorders are among the factors that have the greatest impact on the patient quality of life. This results in the necessity to include rehabilitation programs in the complex treatment for breast cancer patients, from the moment of diagnosis through the healing and recovery processes.

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