Management of Breast Cancer-Related Lymphedema

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SUMMARY

Lymphedema is one of the most common complications to occur after breast cancer treatment. It is an important problem that affects individuals’ lifestyles and activities, causing physical and psychosocial problems, and negatively affecting quality of life. Treatment of lymphedema was thought to be impossible in the past, but it has now become possible to manage the condition more effectively with current treatment methods. Nurses, who are important members of the healthcare team, play a key role in helping patients to take responsibility and play an active part in the prevention, management, and follow-up of lymphedema. Nurses should be able to identify patients at high risk for developing lymphedema, provide the necessary training for lymphedema prevention, evaluate lymphedema, and plan for appropriate nursing interventions in the early stages. This literature review aims to inform nurses and other healthcare professionals about lymphedema management.

Keywords: Breast cancer; lymphedema; lymphedema management; nursing.

Introduction

Breast cancer (BC) is one of the most common types of cancer among women in the world and it is held responsible for 25% of all cancer and 15% cancer-related deaths.[1] In parallel with this increase in its incidence, pathogenesis of BC has been understood at the present time and under favor of advanced technology highly effective improvements have been made progress in BC treatment. Treatment methods of BC are surgery, chemotherapy, radiotherapy and hormonal therapy. One or more these treatment methods can be used in the treatment of patients according to their individual characteristics and status of disease. While these methods extend life span, they bring along some complications that negatively affect quality of life.[2–4] Lymphedema is one of the most common postoperative complication, especially after BC surgery, it has been defined as an abnormal accumulation of protein-rich fluid in the interstitial space as a result of impaired lymphatic function due to axillary lymph node dissection, radiotherapy, fibrosis or inflammation.[2–6] Due to the differences in the diagnostic and assessment methods and the range of follow-up of patients, the incidence of breast cancer-related lymphedema (BCRL) is not known precisely.[7–11] While the exact incidence of lymphedema is unknown, the incidence of lymphedema is reported in the studies that show a wide range, such as 6–83%.[2,12–14] The reason of this wide range is due to the fact different grading scales and symptom assessment tools were being used. Further, because the use of patient-reported outcome measures and/or objective assessments result in a higher severity of BCRL as compared to clinician examination, it is thought that BCRL is typically underreported. Also lymphedema is an important complication that may ensue BC treatment in one out of every four women (25%).[12,13,15]


**Classification and Staging of Lymphedema**

Although there are numerous international classification and staging initiatives for lymphedema, there is no single method that provides a comprehensive view of the etiopathogenesis of lymphedema or important overlaps between lymphedema grades.[16]

**Classification**

Lymphedema classification is not a staging technique. Classification is divided into two groups according to lymphedema etiology; idiopathic/primary or acquired/secondary lymphedema.[16–21]

Primary lymphedema develops due to congenital dysfunction or malformation of the lymphatic system and it is not associated with any injury, trauma, illness and treatment.[17–21] Primary lymphedema is divided into different groups according to clinical indications which are age-related situations:

1. Congenital lymphedema; occurs present at or shortly after birth
2. Lymphedema praecox; develops during puberty shortly thereafter in most individuals.
3. Lymphedema tarda; occurs after the age of 35 [20, 22–24]

Secondary lymphedema occurs as a result of obstruction and/or loss of normal lymphatic flow and obstruction of lymphatic channels due to surgical intervention, radiation therapy, trauma, infection, inflammation (Table 1).[19,23–25] Secondary lymphedema is more common than primary lymphedema and ensues BC treatment in the majority of developed countries.[16–24]

**Staging**

After classification according to the etiology of lymphedema, staging is necessary based on clinical findings. [16,24] Staging allows an objective assessment to record deviations from the normal state. At the same time the staging system plays an essential role in planning the appropriate medical intervention and evaluating the effectiveness of the intervention.[16] Although not yet a single staging system, most researchers use the criteria set out in the International Society of Lymphology (ISL) consensus report.[16,26]

According to this report, ISL has staged lymphedema in 4 steps (Table 2):[16,19,20,24,26–30]

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.</td>
<td>Minimal</td>
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<tr>
<td>2.</td>
<td>Moderate</td>
</tr>
<tr>
<td>3.</td>
<td>Severe</td>
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The severity of each stage is based on the volume differences between the extremities. It is stated that an increase of less than 20% in the extremity volume is minimal, an increase of 20% to 40% is moderate, and an increase of 40% is severe lymphedema. All these stages only indicate the physical condition of the extremities.[16,19,20,24,26–29]

**Lymphedema Risk Factors**

In general, lymphedema risk factors are classified into three categories: treatment, disease, and patient-related factors (Table 3).

A number of treatment modalities, such as the more extensive and aggressive treatments, are reported to pose a risk in the development of lymphedema. Within these factors, axillary lymph node dissection (ALND) is one of the most important risk factor. Compared to sentinel lymph node dissection, it increases the risk of lymphedema fourfold. In addition to these factors it is indicated that especially large breast surgery, combined radiotherapy and chemotherapy regimens also increase the risk of lymphedema.[11,13,30–34]

Patient-related factors include age, overweight or obesity, hypertension, physical activity level, comorbid conditions.[35–37]
It is indicated that factors associated with the disease are tumor progression, localization, size, and lymph node involvement.\cite{38,39}

**Signs and Symptoms of Lymphedema**

Different signs and symptoms may arise in the extremity where lymphedema develops. These symptoms and findings include following:

- Sensation of heaviness and tightness on the affected extremity
- Pain or discomfort
- Restricted movement
- Feeling of weakness in the affected extremity
- Swelling in all or a specific region of the extremity
- Narrow clothing, underwear or jewellery
- Feeling of numbness and tingling on the affected extremity.\cite{8,19,40–42}

Sackey et al. (2014) found that 74.2% of patients with invasive breast cancer, pathologic lymph node involvement and ALND had early signs of lymphatic insufficiency (heaviness, pain, fatigue and tightness) after one year of surgery.\cite{43}

**Lymphedema Diagnosis and Assessment Methods**

Anamnesis (patient history), physical examination, limb circumference measurement, volumetric measurements, imaging methods are used in the diagnosis and assessment of lymphedema.\cite{44}

**Anamnesis (Patient History)**

Each patient with a risk of lymphedema or have lymphedema should be assessed in terms of age, body mass index, lifestyle, past medical history, health status; etiology, duration, localization, prognosis of edema; condition of the skin and tissues, presence of infection, wounds or lymphorrhea; applied medical treatment, effect of lymphedema on the quality of life and the patient's/family's expectation from the treatment.\cite{26,40,44,45} This information acquired from the patient and his/her family will be a helpful guide to health staff on how to effectively treat the problem of lymphedema.\cite{40}

For the health condition, data such as time of BC diagnosis, the presence of the disease on the same side as the active arm, infection history, applied surgical method, axillary dissection, number of excised lymph nodes, axillary radiotherapy postoperative period and cardiovascular diseases should be taken.\cite{3,5,45}

**Physical Examination**

In the physical examination, the condition of the skin and tissues are considered using the methods of inspection and palpation.

With inspection; skin color, folds and tags, scar and incision trace, moisture, integrity are assessed. In
palpation; skin temperature, thickness, moisture, mobility, pitting edema, pulse and senses are also considered.[46,47]

**Upper Extremity Circumference Measurements**

Measurements of the upper extremity circumference could be performed from bone prominences (ulnar styloid, olecranon, metacarpophalangeal joint), as well as with equal spacing (2 cm, 4 cm, 5 cm or 10 cm) from the anatomical point of the arm, such as the antecubital fossa, to axillary. Lymphedema is clinically diagnosed when a 2 cm difference or more in arm circumference at least one anatomic point measured between the affected and nonaffected limbs.[5,45] Circumference measurements are preferred because they are simpler, lower cost and easier to use than volumetric measurements.

**Volumetric Measurements**

In volumetric measurements, the patient’s extremities are immersed in a cylindrical container filled with water and the amount of outflow is measured in milliliters. The difference between the healthy extremity and the affected extremity determines the amount of edema. A difference of more than 200 ml between the arms or a volume difference of 20% or more according to the normal extremity is accepted as lymphedema.[46,48,49]

**Imaging Methods**

When the diagnosis of lymphedema is uncertain after clinical evaluation and physical examination, or when better prognostic factors are needed; imaging methods such as lymphoscintigraphy, lymphangiography, ultrasonography (USG), color doppler USG, lymphatic capillaroscopy, magnetic resonance imaging, computed tomography, bioimpedance are utilized.[19,26,44,46]

**Lymphedema Management**

Lymphedema can develop immediately after a month or years, as it can occur immediately in a group at risk. In some patients at risk, lymphedema never develops. Lymphedema negatively affects functional capacity, psychosocial well-being and quality of life.[50] Individuals at risk for lymphedema should be careful in their daily life activities throughout their life. The aims of the lymphedema management are to prevent the progression of the clinical picture and development of cellulitis and other infections, to reduce and maintain the size of the extremities, to alleviate the disturbance caused by excessive fluid and protein accumulation, and to train the patient about self-management.[51]

Lymphedema, which is thought to be impossible in the past, can be treated more effectively with some methods currently developed.[52] Nevertheless, the prevention of lymphedema development is easier, more effective and more important than treatment after it has developed. The recommended treatment modalities for controlling symptoms of lymphedema, increasing functional capacity, reducing complications, and treating lymphedema when it develops can be treated under the title of conservative (non-surgical) and surgical treatment.[50,53] Conservative treatment consists of physical therapy and medical treatment. Physical therapy includes implementations such as complete decongestive therapy (CDT), pneumatic compression pumps, low level laser therapy, kinesio taping.[2,53–56] With the report of the ISL (2001), CDT has been accepted as the international standard current treatment for lymphedema.[57] CDT is a special manual approach that allows for the reduction of volume in the patient with lymphedema.[48] CDT is a two-phase treatment program. Phase I is a phase of lymphedema reduction that lasts for 4 weeks or more and consist of 4 components. These components include skin and nail care, manual lymphatic drainage (MLD), compression bandages, therapeutic exercises with bandages. With this phase, the second phase, which is the protection phase, is passed when a volume reduction is achieved in the lymphedema. In this phase, there are skin care, compression garments, exercise programs with compression bandages and garments (Table 4).[44,54]

**Skin and Nail Care**

Skin and nail care is an important part of CDT. Skin healing and protective approaches are also important in both phases of CDT. While phase-I focuses on the repair and maintenance of damaged skin, it is important to maintain skin care in phase-II.[58] The pur-
poses of skin care in patients with lymphedema are to control bacterial and fungal colonization, reduce microbial colonization in skin folds, provide skin hydration to prevent dryness and fissure formation, provide patient comfort and reduce infection risk.\[40,59\]

Patients who are at risk for lymphedema should be thoroughly informed of their proper cleaning and moisturizing methods.\[15,60\] In the course of patient education, methods of evaluation of infection and inflammation should be explained in detail. At the beginning of the treatment, the patient should be given a checklist to indicate the activities that should be avoided, which may lead to lymphedema.\[60\]

**Compression Treatment**

Compression therapy is performed in three different ways to facilitate the circulation of the lymph fluid. These are compression bandages, compression garments and compression devices.\[3\]

**Compression bandages**

Compression bandages are systematic implementation of various types of filling material and short stretch bandages. Bandages are applied with moderate pressure in the distal parts of the affected extremities/limbs and a lower compression is applied by decreasing the pressure toward the proximal parts. In the bandaged extremity, the pressure on the interstitial area increases and the flow of the lymph fluid is facilitated.\[61,62\] Bandages also reduce the volume and help maintaining skin integrity and protect the skin from trauma.\[62\] While bandages are used 24 hours a day during the intensive treatment phase; they are used in conjunction with compression garments at nights. It is recommended that compression bandages should be worn every day; removed only when patients are asleep at night.\[45,63\]

**Compression garments**

Compression garments are often used in clinical practice to manage symptoms of lymphedema and require careful patient assessment, patient compliance and patient monitoring by the trainer. The compression garment should be tailor-made and apply 20–60 mmHg pressure according to the severity of the lymphedema. They should be replaced with the new one every three to six months when they lose their elasticity.\[2,63\] It is recommended that compression garments should be worn daily, 24 hours a day.\[2\] Compression garments should not be used in the presence of arterial insufficiency, acute heart failure, extreme deformity of the limbs, skin ulceration, severe peripheral neuropathy and lymphorrhea.\[2,63\]

**Compression devices**

Compression devices are also called pneumatic pumps. Compression devices work by giving constant or intermittent pressure to the extremity during an adjustable time period.\[5\] The duration of treatment with compression devices can last up to 30 minutes to several hours depending on the severity of the lymphedema and the condition of the patient.\[3\] Studies on the physiological effects of these devices have shown that they direct lymph fluid from distal to proximal.\[5,16\]

Compression devices should not be used in case of congestive heart failure, known or suspected deep vein thrombosis or pulmonary embolism, active erysipelas or cellulitis, ischemic vascular disease, severe peripheral neuropathy, edema on the proximal limb of the extremity, active metastatic disease on the affected limb, as it would increase venous return with lymphatic transport.\[3,50\]

**Manual Lymphatic Drainage (MLD)**

MLD is a massage-like technique that is applied not only to the affected area of the body but also to the lymph nodes in other areas for 30 to 60 minutes to provide lymphatic flow.\[64\] It is performed by intermittently applying light pressure directly to the superficial lymph vessels below the skin. With MLD, the smooth muscles surrounding the lymph vessels are mechanically stimulated to provide more frequent contractions of the muscles and thus the lymphatic flow rate and the forward movement of the lymph fluid are increased. The proximal part of the limb is always first drained and then advanced to the distal parts.\[5,45,46,49,62\]

The aims of treatment are to reduce lymphedema by increasing lymphatic drainage, to prevent tissue fibrosis and the development of lymphedema again.\[45\]

**Simple Lymphatic Drainage/ Self Lymphatic Drainage (SLD)**

SLD is a simplified version of MLD. After the training, it can be done by the patient or his/her relatives. It shows its effect as it is in MLD.

Points to take into consideration when performing SLD can be summarized as follows:

- Supporting the affected extremity with a pillow or roller and placement of the shoulder in a comfortable area/table
contractions, increased lymph flow in both the peripheral lymphatic system collecting ducts and skeletal muscles.[66–68]

In the literature, remedial, aerobic, strengthening, stretching, other exercises (such as pilates, Tai Chi, yoga) are recommended for lymphedema management and control.[19,69]

Therapeutic (remedial) exercises; are a type of exercise involving a specific group of repetitive movements designed to promote recurrent muscle contractions on the extremity with lymphedema. They include active, rhythmic, repetitive and unresistant movements of the extremity. It is stated that these exercises should be combined with respiratory exercises.[19,70]

These exercises lightly compress the smooth muscles of the walls of the lymph vessels with rhythmic muscle contractions and relaxation by providing contractions, as well as contractions of the smooth muscles in the walls of the lymph vessels and when this externally applied compression is sufficient, an internal pumping mechanism occurs that increases lymphatic flow along the pressure gradient, with the help of collateral drainage pathways from existing lymphatic channels.[19,70] The effect of aerobic exercises on the lymphatic system is summarized in the following Figure 1.

Aerobic exercises; are exercises that bring large muscle groups up to speed and increase the heart and respiratory rate of individuals. These types of exercises improve cardiovascular endurance by gradually increasing heart and lung capacity.[19,70]

Strengthening exercises; are based on basis of imposing burden on the muscles. The resistance created by this exercise provides stimulation of the motor units and contraction of most of the muscle fibers. Free weights are used in these exercises. To prevent muscle fatigue, it is recommended that these exercises should be started with low weights, progressing slowly and gradually.[19,70]

Stretching exercises; provide loosening of fibrous tissue, regulation of body biomechanics, and stimulation of lymph flow. These exercises minimize the complications that reduce lymph flow, such as skin scars and joint contractures and increase or maintain joint range of motion by stretching muscles and connective tissue.[19,70]

The Roles and Responsibilities of Nurses in Lymphedema Prevention and Treatment

Lymphedema is a problem that affects individuals’ lifestyles and functions, causes physical and psychoso-
cial problems, affects their quality of life in a negative way, and could be prevented or reduced by appropriate nursing interventions.[71] Nurses, who are important members of the healthcare team play a key role in helping individuals take responsibility for their own lymphedema, in the prevention, management and follow-up of lymphedema. Nurses should identify the group of patients at high risk for developing lymphedema, take necessary precautions to protect from lymphedema, intervene early by assessing lymphedema and inform the patients about their self-care.

### Nursing Interventions for Lymphedema Prevention and Treatment

- Assessment of the patient's in preoperative and postoperative period in terms of the risk of developing lymphedema
- Performing routine extremity measurement to evaluate the changes in the volume of the patient

### Table 5  Patient control list for reducing lymphedema risk

<table>
<thead>
<tr>
<th>I. Skin care-Avoidance from trauma or injury and reducing of infection risk</th>
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<tbody>
<tr>
<td>Keeping the extremities clean and dry</td>
</tr>
<tr>
<td>• Daily evaluation of skin for scratches, infection, rash and redness</td>
</tr>
<tr>
<td>• Apply daily moisturizers to prevent cracks and scalles in the skin</td>
</tr>
<tr>
<td>• Elevation of the affected extremity</td>
</tr>
<tr>
<td>• Attention to nail care; being short of the nails, not cutting cuticles</td>
</tr>
<tr>
<td>• Protecting of the affected extremity with suncream and anti-insects</td>
</tr>
<tr>
<td>• Wearing gloves while performing activities that can cause skin injuries (gardening, working with cutting tools, using chemicals such as detergents, contact with animals)</td>
</tr>
<tr>
<td>• The use of electric machines instead of razors for axillary cleaning</td>
</tr>
<tr>
<td>• If there are scratches on the skin, washing with water and soap, implementation of antibiotics and observation of the skin in terms of infection (e.g. redness)</td>
</tr>
<tr>
<td>• Drying of the washing area thoroughly (not scrubbing, not rubbed with a towel)</td>
</tr>
<tr>
<td>• Contacting with physician immediately, if there are signs of rash, itching, redness, pain, increased skin temperature, fever or flu-like symptoms</td>
</tr>
<tr>
<td>• Avoiding from tattoos and piercings</td>
</tr>
<tr>
<td>• Using of thimble when sewing</td>
</tr>
<tr>
<td>Not getting a massage the upper part of the body (Manual lymphatic drainage should not be considered as a massage)</td>
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<tr>
<th>II. Activity/Lifestyle</th>
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<tbody>
<tr>
<td>• Avoiding extreme coercive activities</td>
</tr>
<tr>
<td>• Increasing gradually in duration and severity of any activity or exercise</td>
</tr>
<tr>
<td>• Resting frequently during the activity to allow the extremities to rest</td>
</tr>
<tr>
<td>• Monitoring of the extremity during and after the activity for any changes such as size, shape, texture, structure, pain, weight or stiffness</td>
</tr>
<tr>
<td>• Avoiding from long-term inactivity</td>
</tr>
<tr>
<td>Useful activities: Swimming, lymphedema exercise program, self-manual lymphatic drainage, yoga, walking</td>
</tr>
<tr>
<td>Medium risk activities: Jogging, running, walking band, riding, mountaineering</td>
</tr>
<tr>
<td>High risk activities: Gardening, tennis/racquet sports, golf, plowing, carrying goods, carrying suitcases, carrying heavy shopping bags (4–6 kilos more), advanced riding</td>
</tr>
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<tr>
<th>III. Nutrition</th>
</tr>
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<tbody>
<tr>
<td>• Protection of ideal body weight</td>
</tr>
<tr>
<td>• Consuming balanced, low salinity, low fat, fiber foods</td>
</tr>
<tr>
<td>• Not reducing of protein uptake (Protein restriction does not reduce the content of protein in the lymphedema)</td>
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</tbody>
</table>

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<tr>
<th>IV. Avoiding Extremity Compression</th>
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<tbody>
<tr>
<td>• Not measuring blood pressure from the arm at risk (if measurement is mandatory, blood pressure manometer should be removed up to 10 mmHg above systolic pressure)</td>
</tr>
<tr>
<td>• Using loose jewelry and clothes</td>
</tr>
</tbody>
</table>

Reference: 60,76,77
and maintenance of the individual’s home care in the post-discharge period.[72–74]

As stated in the Regulation on the Amendment of the Nursing Regulation published in the Official Gazette dated April 19, 2011 with number 27910; nurses have duties, powers and responsibilities, such as symptom management and provision of support to improve the quality of life for patients and their families, assessing the individuals with holistic view, providing communication and independent living skills necessary for daily life process, teaching, supporting and monitoring the individuals to improve their quality of life by improving self care.[75]

As a result, as mentioned in the nursing regulation, within the scope of the educational, supportive, rehabilitative roles; nurses should be informed about lymphedema, risk factors, symptoms, protective approaches and management, inform individuals and their families, have active role in preventing and reducing this problem with appropriate nursing interventions.

Disclosure Statement

The authors declare no conflicts of interest.

References


