##  FUTURISTIC TRENDS IN PHYSIOTHERAPY MANAGEMENT OF BREAST CANCER RELATED LYMPHEDEMA

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**ABSTRACT-**

Breast cancer-related lymphedema is a chronic condition characterized by the accumulation of lymphatic fluid in the affected limb following breast cancer treatment. Physiotherapy plays a crucial role in the comprehensive management of lymphedema, focusing on reducing swelling, improving limb function, and enhancing quality of life for patients. Recent advancements in physiotherapy techniques have shown promising results in the management of this condition. These include complex decongestive therapy, manual lymphatic drainage, compression therapy, exercise programs, and patient education.

Additionally, emerging technologies such as pneumatic compression devices and laser therapy are being explored as potential adjunctive treatments. Evidence-based research has demonstrated the effectiveness of these interventions in reducing lymphedema volume, improving range of motion, and alleviating symptoms. Furthermore, advancements in tele- rehabilitation have expanded access to physiotherapy services, allowing patients to receive remote guidance and support. Overall, these recent advances in physiotherapy management hold great potential for optimizing outcomes and improving the quality of life. This chapter includes the appropriate or expected treatment for breast cancer related lymphedema and also highlights the effectiveness of various physiotherapeutic interventions on preventing post-operative complications.

## Introduction

Breast cancer is the second greatest cause of cancer-related fatalities among women and it is the most prevalent malignancy among women worldwide. Breast cancer refers to cancers originating from breast tissue, most commonly from the inner lining of milk ducts or the lobules that supply the ducts with milk. Breast cancer is a metastatic cancer which commonly transfers to distant organs such as the bone, liver, lung and brain.

The causes of breast cancer are as follows- previous history of breast cancer, significant

family history, genetic causes, hormonal, environmental cause, lifestyle and dietary cause.

The major complications involved in breast cancer are arm lymphedema, axillary web syndrome, radiotherapy, neurological, coagulopathic and hepatic complications.

Lymphedema is the most dreaded complication related to breast cancer surgery, commonly resulting in upper limb functional, esthetic and psychological impairment. Lymphedema is the accumulation of fluid under the skin as a result of insufficient lymphatic system drainage, which causes swelling in the affected area. Based on its timing. lymphedema can also be classified as acute or chronic. During breast cancer therapy, upper extremity lymphedema is a common medical consequence marked by abnormal tissue swelling in the extremity.

The sign and symptoms usually seen in breast cancer lymphedema are swelling in limbs, persistent inflammation, limited range of motion, tenderness, edema and stiffness. There are various factors that increase the risk of lymphedema such as lack of reconstruction, age and family, high BMI, obesity or reproductive factors.

Routinely screening allows for subclinical detection and therefore early treatment of lymphedema, which can aid in preventing further progression of edema. Physicians need to have a thorough understanding of the diagnosis and severity of upper limb lymphedema in order to treat patients effectively. Clinical diagnoses of BCRL have historically been made by medical practitioners based on their subjective assessments of edema. Various methods included in diagnosis of lymphedema are water displacement, perometry, bioimpedence spectroscopy and computed tomography. A patient’s quality of life may be improved by early detection and prevention. There are several precautionary guidelines for lymphedema patients are avoidance of needle sticks, avoid limb constriction, elevate the limb, maintain normal body weight and avoid vigorous exercises.

The major goal of lymphedema treatment is to reduce edema volume and thus improve the patient’s functions and quality of life. Conservative and surgical treatments are currently available for BCRL. It can be difficult to decide which approach is appropriate for individual patient.

In physiotherapy management of BCRL, several methods have been used with varying results. Compression garments, active resistive exercises with complex decongestive physiotherapy, physical exercises, low level laser therapy (LLLT) and pneumatic compression are used to treat BCRL effectively. This chapter will highlight the effectiveness of a variety of treatments available for BCRL.

Prevalence and Epidemiology **of Breast Cancer**

The second greatest cause of cancer-related fatalities among women is breast cancer. It is the second most common cause of cancer death in women in the U.S and the most prevalent malignancy among women worldwide. Breast cancer refers to cancers originating from breast tissue, most commonly from the inner lining of milk ducts or the lobules that supply the ducts with milk. Cancer develops if the immune system is not working properly and or the amount of cells produced is too great for the immune system to eliminate. The development of breast cancer is a multi-step process involving multiple cell types, and its prevention remains challenging in the world. Early diagnosis of breast cancer is one of the best approaches to prevent this disease. In some developed countries, the 5-year relative survival rate of breast cancer patients is above 80% due to early prevention Breast cancer is a metastatic cancer and can commonly transfer to distant organs such as the bone, liver, lung and brain, which mainly account for its incurability.

## Pathogenesis of Breast cancer:

Breast tumor Hyper proliferation

Benign tumor/ metastatic Neoplasm

Angiogenesis Immune rejection DNA methylation Carcinogenesis

# Lymphedema

Lymphedema is the accumulation of fluid under the skin as a result of insufficient lymphatic system drainage, which causes swelling in the affected area.

Lymphedema is one of the most dreaded complications related to breast cancer surgery, commonly resulting in upper limb functional, esthetic and psychological impairment

.Lymphedema is a chronic disorder in which protein rich space. The incidence of lymphedema in breast cancer has been reported to be between 0% to 77%).. Based on its timing, lymphedema can also be classified as acute or chronic.

Acute breast cancer lymphedema generally occurs within six months after mastectomy and lasts three to six months, usually as a pitting, transient, and self-limited upper limb edema .

Chronic lymphedema is instead present for at least three months, described as a non- pitting upper limb edema associated with skin changes and high risk of developing ulcers and infections. All these observations lead to the evidence that lymphedema is a progressive condition, as described by The International Society of Lymphology Staging System.

Stage 0: latent or subclinical (despite the impaired lymph transport,swelling is not yet clinically evident)

Stage 1: early accumulation of fluid (the tissue swelling is clinically evident, it subsides with limb elevation, pitting may occur) Stage 2: advanced accumulation of fluid(limb elevation alone rarely reduces swelling, pitting is manifest, until lately tissue fibrosis supervenes)

Stage 3 - lymphostatic elephantiasis (pitting is absent and trophic skin changes such as acanthosis and adipose hypertrophy develop). Within each stage, the severity of lymphedema can be classified based on limb volume differences. During breast cancer therapy, upper extremities lymphedema is a common medical consequence marked by abnormal tissue swelling in the extremity.

## How lymphedema occurs?

Dysfunction in the axillary drainage system included by surgeries or laser therapy causes it to worsen. All lymph fluids drains to the axillary nodes from one side of the upper body( chest, ribcage, and hand).This flow is more prone to be affected when more lymph nodes and veins are removed ,and could result in lymphedema.

**Signs and symptoms**

* Tissue tearing
* Persistent swelling
* Infection
* Limited motion
* Heaviness
* Hardness
* Tenderness
* Soreness
* Numbness
* Edema
* Itching
* Stiffness
* Impaired limb functions
* Sensory impairment
* Weak Handgrip strength
* Skin issues including infections or musculoskeletal conditions like adhesive capsulitis and rotator cuff disease as well as low back pain, disc pain, osteoarthritis, rheumatoid arthritis,

pectoral muscle tightness, and acute thrombosis**.**

* Negative impact on patient’s body image and quality of life.

Difficulty in doing specific daily activities, put on bra, tie shoe laces, hair wash, hangout washing.

* During heavy doses of chemotherapy, hormone and radiation therapy: poor appetite, nausea, vomiting, weakness and hear loss.
* Physical appearance, psychological thoughts and external changes: Depression, sadness, sense of lonelineness

## Risk factors

Age

Family history

High BMI

# Risk factors

Weight fluctuations Subclinical Edema

 Cellulitis

* Lack of reconstruction
* Age
* Family history
* Estrogen
* Reproductive Factors
* radiation to the lymph nodes
* High BMI
* Weight fluctuations: obese women were more likely to develop lymphedema.
* Subclinical edema
* Cellulitis

## Management of BCRL (Breast cancer related lymphedema)

**Management of lymphedema**

|  |  |  |  |
| --- | --- | --- | --- |
| **Medical** | **Conservative** | **surgical** | **physiotherapy** |
| **NSAIDS** | **specialized exercises** | **Mastectomy** | **LLL** |
| **Skin care** | **Compression garments** | **Lumpectomy** | **MLD** |
|  | **self – education** |  | **CDT** |

## Conservative Treatments

For extremity lymphedema, CDT is usually regarded as the standard first-line treatment.

It comprises self-education, skin care, specialized workouts, compression clothing, and manual lymph drainage (MLD). To increase its efficacy and control costs, CDT is separated into two phases: Phase I Decongestion and Phase II Maintenance. A CDT can benefit from a number of things, including:

1) reduction of lymphedema volume, discomfort, and arm heaviness;

1. enhancement of lymphatic drainage;
2. tolerable quality of life; and
3. decreased cellulitis occurrences
4. decreased cellulitis occurrences.

Although conservative therapy alone may be able to alleviate symptoms sufficiently, its effectiveness largely depends on patient compliance and their ability to wear compression garments for the rest of their lives.

## Compression Bandages and Compression Garments

The therapeutic effects of MLD are maintained by CDT in large part by the use of compression bandages. Compression bandages apply

 (1) a resting pressure while the limb is at rest; and

(2) a working pressure when muscles contract and push the skin up against the bandages. Using multi-layered compression bandaging, low-stretch bandages create the highest working pressure.

Compressive multilayer bandaging was performed to stimulate lymphatic capillaries and increase lymphatic drainage by externally increasing tissue pressure in accordance with the principle of gradually increasing compression. Bandaging was applied after the application of MLD and the exercise program every weekday for 3 weeks. The compressive multilayer bandage consists of a stockinette sleeve, soft cotton wrap, gauze forth fingers, and two to three layers of short-stretch bandaging of different widths depending on the area to which it is applied. It was recommended that the bandage stays in place for 21–23 hours until the next session.

The goal of CDT is to maintain the volume decrease accomplished by MLD and bandaging, hence compression clothing is a crucial component. With the greatest pressure above the wrist and less pressure in the arm, compression clothing produces a two-way stretch in both the longitudinal and transverse directions. In order to move the joints, there must be longitudinal pressure. To prevent cutaneous backflow, patients with BCRL typically wear gloves and full-arm sleeves. Regarding appropriate compression levels, there is no agreement. Class 2

compression clothing with 30-40 seamless is frequently advised to be worn for at least 12 hours per day.

## Exercises and Life-Style

Exercise is an integral part of care for patients at risk for lymphedema development as well as those with a confirmed breast cancer diagnosis. This panel urges cancer patients to remain active, maintaining daily activity during adjuvant therapies as well as resuming daily activity as soon as possible following surgery.

Several exercise trials in patients with breast cancer have demonstrated that a progressive program of regular aerobic and resistance exercise is safe and does not incite BCRL.

Exercises are a crucial component of CDT with the goals of

1. promoting lymph flow,
2. mobilizing the joints, and
3. strengthening the muscles.

**Exercise program-**The exercise program consisted of diaphragmatic breathing exercises, posture and stretching (pectorals and trapezius) exercises, shoulder girdle mobilization, upper extremity range of motion exercises, shoulder abductor and flexor strengthening exercises, elbow flexor strengthening exercises, and ball squeeze exercises.

Exercise participation during and after oncological treatment is recognized to enhance physical and psychosocial conditions, hence enhancing the quality of life. Recent studies showed that compared to patients who do not exercise, a moderate weight-lifting program does not worsen the risk of BCRL.

## Surgical Treatments

Depending on the stage and type of the tumor, lumpectomy (removal of the lump only), or surgical removal of the entire breast (mastectomy) is performed. Standard practice requires the surgeon to establish that the tissue removed in the operation has margins clear of cancer, indicating that the cancer has been completely excised. If the removed tissue does not have clear margins, further operations to remove more tissue may be necessary 1.In breast-conserving surgery, only the tumor and an area of normal tissue surrounding it are removed. Breast conserving surgery includes the following:

**Physiotherapy Management**

Physiotherapy treatment of BCRL, several methods have been used with varying results. Compression bandage, Active resistive exercise with complex decongestive physiotherapy, Physical exercise (Aqua lymph training, swimming, yoga, aerobic), kinesiological taping,

low-level laser therapy (LLLT) and advanced pneumatic compression devices (APCD) – all are used for the management and home maintenance phase of BCRL.

**Manual lymphatic drainage:** MLD is a specialized massage technique that has been shown to have various physiological effects.

**Method:** MLD is a skin massage technique that removes interstitial fluid accumulated in tissues and softens fibrotic stiffness with specific hand movements to increase lymphatic flow without increasing capillary filtration. The gentle and rhythmic movements follow the direction of lymph flow. MLD was applied to the side of the affected limb, starting with clearing the supraclavicular and axillary lymph area. The axillo-axillary and axillo-pelvic anastomoses and the lymphatics on the lateral side of the abdomen and shoulder were stimulated and progressed to the edematous limb. The massage was always directed proximally from the upper arm to the axilla and then from finger to hand, from hand to elbow, and from elbow to shoulder. MLD was performed using a gentle, sweeping motion with just enough pressure to shift the surface of the skin.

## Low–level laser therapy

In recent years low-level laser therapy (LLLT), also known as photobiomodulation (PBM) therapy, presents as a potentially useful non-pharmacological treatment modality for BCRL. LLLT (PBM) is a non-invasive form of phototherapy. It utilizes light wavelengths (range from 650 to 1000 nm) to deliver low irradiance to the target tissue for biological process modulation. LLLT (PBM) has been found to be a safe technique. Several experimental studies have shown that LLLT (PBM) is effective in reducing inflammation, promoting lymph vessel regeneration, improving lymphatic motility, and preventing tissue fibrosis.

Low-level laser therapy is a nonionizing light-based conservative therapy that has been utilized to treat lymphedema in women with breast cancer. Photons of a specified wavelength (650 nm and 1000 nm) penetrate skin tissue to give low rays and doses to the targeted area in laser treatment or photo-biomodulation therapy (PBM). It has been implemented to help with lymphatic fluidity, redness, lymph vessel restoration, and tissue stiffness prevention.

Biochemical changes at the cellular level, on the other hand, are the critical mechanism for employing LLLT (PBM).

Fibroblasts, osteoblasts, lymphocytes, and smooth cells are all altered during the therapy.

LLLT has attracted much attention. It has been used to treat lymphedema and a variety of other ailments, including musculoskeletal issues.

## Complex decongestive therapy

The most frequent therapy, known as CDT, also includes compression therapy, manual lymphatic drainage (MLD), therapeutic exercise, and skin care.

Despite the fact that CDT is the most frequently utilized treatment for lymphedema, it has been noted that combining methods results in a more thorough and effective course of care. The quality of life for breast cancer patients who have lymphedema can be improved by effective therapy.

CDT involves two phases

The first phase of CDT includes skin care, manual lymphatic drainage (MLD), exercises, and compressive multilayer bandaging. The second phase aims to protect and optimize the gains in the first phase and consists of skincare, remedial exercise, a compression sleeve, and if necessary, mild massage. It has been shown that CDT, including MLD and bandaging can be effective in reducing lymphedema.

 **CONCLUSION-**

There are various levels of evidence supporting physiotherapy intervention for BCRL. It is possible to draw a conclusion that there is compelling evidence to justify the diminution in arm volume caused by Low level laser treatment (LLLT), Kinesiotaping Exercise and (KT). The following moderate evidence indicating Active Resistance training as an additional technique and compression bandage for the lower pressure for lymphedema lowering. Advanced Pneumatic Device for Compression (APCD, Flexi touch) system is utilised for residential phase of treatment for the arm that is ongoing lymphedema. There is substantial proof. recommending manual lymphatic drainage Intermittent pneumatic and (MLD) PC compression is effective for treatment of lymphedema.

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