

EXERCISE THERAPY AND LYMPHEDEMA

Exercise therapy can be a beneficial way to reduce lymphedema in the affected limb, as well as improve strength, function and lymphedema – related symptoms. Previous guidelines discourage exercise therapy of strenuous physical activity because of the hypothesis that this would increase interstitial fluid by an increase in capillary pressure and a diminished lymphatic capacity. This is proven to be incorrect by Singh e.a. (2016) as acute exercise and regular exercise did not increase lymphedema. An increase in interest can be found in the literature regarding the effects of exercise therapy on BCRL in BC survivors.

Exercise therapy (as a part of a rehabilitation program) can be beneficial to stabilize or reduce the accumulation of lymphedema. By remaining an active lifestyle, performing exercise therapy, survivors can **stimulate lymphatic flow by following mechanisms** (Loquet et al., 2019):

- (1) Exercise therapy increases interstitial pressure and strains on the extracellular matrix because of an increase in capillary pressure and thus capillary filtration. This results in the opening of microvalves of lymphatic capillaries and drain ECF.
- (2) Muscle contraction close the microvalves and forces lymphatic fluid in the capillaries to move proximally, as intralymphatic valves only open in proximal direction.
- (3) When systematic resistance training is applied, a decrease in mean blood pressure could lead to less filtration into the interstitial space and thus less load on the lymphatic system.
- (4) The wall of the lymphatic vessels (collectors) consists of a smooth muscle layer of which the contraction rate is regulated by pacemaker cells and influenced by the autonomic nervous system (adrenaline and noradrenaline). Exercise therapy activates the sympathetic nervous system, increasing contraction rate by which lymphatic fluids are transported more efficiently.

IMPORTANT ADDITIONAL FINDINGS IN LITERATURE

Bok, Jeon and Hwang (2016) described the physiological changes in the affected and unaffected limb after following an 8 – week progressive resistance training program additional to conventional therapy. They found that muscle mass significantly increased and that **interstitial thickness significantly decreased in the affected arm**, while the unaffected arm showed no significant changes. These changes occurring in the affected arm can be caused by a state of **deconditioning as a result of disuse**. Because of this state, **greater improvements are possible**. (Loquet et al., 2019)

Patients with lymphedema report a big **insecurity** to use their affected limb due to (1) advise post – treatment to avoid vigorous activity and (2) treatment – related side effects such as pain, fatigue and numbness in the arm. Can e.a. (2019) found that **kinesiophobia** was significantly more present in

participants diagnosed with lymphedema. These patients also showed a decrease in arm function. However, the direction of this relationship has not been established. (Loquet et al., 2019)

Singh e.a. (2016) and Hasenoehrl e.a. (2019) overviewed the literature and concluded that performance of acute or regular exercise is **no risk for development or progression of lymphedema**. Additionally, as a result of variability in study designs, Hasenoehrl e.a. (2019) found that the **results of exercise therapy are too inconsistent to confirm any effect related to the decrease of lymphedema**.

Some studies have shown **positive results regarding lymphatic volume**. Omar e.a. (2019) found that a 8 - week low intensity resistance training program **decreased not only arm volume** but also decreased pain and heaviness of the arm and an improved shoulder mobility and function. Buchan e.a. (2016) compared the effects of a progressive aerobic and a resistance exercise program over a 12 week period. **A decrease in lymphedema – associated symptoms** in combination with an increase in upper body strength was observed in both exercise programs. These **improvements were greater in the resistance exercise program**. However, the study of Cormie e.a. (2013) investigated the effects of a three month high – load and low – load resistance training in comparison to usual care. They did **not find any significant changes** between the three groups. Rogan e.a. (2016) systematically reviewed the effect of different active exercise programs and found some improvement in the amount of lymphedema. Although a variety of measurement methods are used in the literature to detect changes in lymphatic status, we can conclude that **exercise therapy stabilizes progression of lymphedema**, which is in line with our findings. **Additionally it does not cause negative side effects**. (Loquet et al., 2019)

MOST RECENT LITERATURE: IMPORTANT REVIEW OF WANCHAI ET AL., 2019 AND HE ET AL., 2020

In the past, the benefit of exercises in BCRL was described in that it improved lymph flow through repeated contraction and relaxation of muscles [8]. However, patients should be **taught and supervised by well-trained therapists and then may continue at home** [6]. The National Lymphedema Network (NLN) [15] stated that the three main types of exercise for patients with lymphedema included: **aerobic, strength, and flexibility, as exercise would be a part of a healthy lifestyle and essential for effective lymphedema management**. The NLN [15] also pointed out that patients **with or at risk of lymphedema** should perform **aerobic and weight-lifting exercise in a safe environment**. Weight-lifting exercise is also called resistance exercises. This exercise involves lifting body weight or lifting objects and it can be performed with or without moving a joint [15]. **A Cochrane systematic review 2015 by Stuiver et al. [16] reported that resistance training after breast cancer treatment did not increase the risk of developing BCRL**. Several scholars completed systematic reviews showing beneficial effects of exercise on health outcomes in women with breast cancer [[17], [18], [19]]. However, previous systematic reviews included all exercise types, included non-randomized studies, or additional types of interventions with the exercise [[17], [18], [19]]. As a result, even though the previous systematic reviews provided up-to-date findings regarding the effects exercise has on cancer patients until 2017 [19], **a body of**

knowledge more specific to the effects of weight-lifting exercise in BCRL is needed. (Wanchai et al., 2019).

It is widely known that a **sedentary lifestyle leads to being overweight or obese, factors that are associated with an increased incidence of BCRL (14)**. Participation in physical exercise during and after treatment for breast cancer can ameliorate psychosocial and physical conditions, resulting in active lifestyles with optimized survival (100). Traditionally, patients with lymphedema or who are at risk for lymphedema tend to reduce physical exercise due to concerns about disease exacerbation (100). Some preliminary studies have indicated that **exercise neither causes lymphedema nor worsens the disease (101–105)**. **A slowly progressive weight-lifting program does not increase the rate of lymphedema compared with no exercise, and aerobic exercise, resistance training, stretching, yoga, qigong and pilates are also safe (101,105)**. Under specific circumstances, **resistance training can even substantially improve the lymphedema state and may prevent the development of secondary lymphedema in patients (106)**. (He et al., 2020)

PRACTICAL APPLICATIONS BASED ON LITERATURE

Based on the findings of this review, a few preliminary recommendations can be made regarding RET (*resistance exercise training*) among those with or at risk for BRCL. It seems that 2 to 3 days of progressive RET, performed on nonconsecutive days, is an effective method to develop strength without risk of incidence or exacerbation of lymphedema among breast cancer survivors. In this review, all 6 studies reported on the safety of RET, with no evidence of serious adverse effects associated with this mode of training. Notwithstanding, there are a few safeguards that practitioners should be made aware of before initiating RET:

- Initiate RET at a low level of intensity and use a conservative model of progression.
- Be cognizant of early signs of potential injury or symptom flare-up (e.g., increased muscle soreness, excessive fatigue, redness, or heaviness in the involved arm, bone, and joint pain). –
- Select exercises that are appropriate for the breast cancer survivor's training experience and consider ROM restrictions that may result from surgery and/or radiation therapy.
- Set realistic training goals.
- Prescribe RET based on current fitness level and desires of the participant.
- All individuals with BCRL or those who are at risk for BCRL should have medical approval before beginning any exercise, particularly in the presence of cardiovascular, pulmonary, or metabolic disease. (Nelson et al., 2016)