

Effect of Physiotherapy in the Prevention and Relief of Secondary Lymphoedema in Subjects with Postoperative Breast Cancer- A Systematic Review of Randomised Controlled Trials

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ABSTRACT

Introduction: Breast Cancer is the most common type of cancer in women and the 2nd leading cause of death. The treatment of breast cancer includes surgery, chemotherapy, radiation therapy, hormone therapy or combination of these treatments. One of the most important complications which occurs in one out of four women is lymphoedema. Physiotherapy plays an important role in creating awareness, prevention, early diagnosis and treatment of secondary lymphoedema. The systematic reviews which were already done focused on only one intervention or combination of two or more interventions for lymphoedema with or without other complication related to breast cancer.

Aim: To systematically review the randomised controlled trials to evaluate the effect of various physiotherapy interventions that are used in the prevention and relief of secondary lymphoedema in postoperative breast cancer patients.

Materials and Methods: Relevant studies were retrieved through PubMed, Cochrane, EMBASE and Google Scholar databases ranging from the year 2004 (January) to 2020 (March). The language of search was English. The keywords used for the search were breast cancer, interventions, physiotherapy,

postoperative, secondary lymphoedema, treatment, prevention. Total 14 randomised controlled trials were included in this study according to the inclusion criteria. The trials included interventions like Manual Lymphatic Drainage (MLD), compression therapy, Range of Motion (ROM) exercises and massage.

Results: A total of 244 relevant articles were found out of which 14 Randomised Controlled Trials (RCTs) were included in this study. MLD showed positive effects on lymphoedema prevention and treatment as an individual intervention or in combination with other interventions. Compression sleeves/corsets also showed positive effect on lymphoedema. Resistance exercises showed no risk of precipitating or increasing lymphoedema. Shoulder programs showed that delayed mobilisation of shoulder after one week is beneficial for reduction of lymphoedema. Physiotherapeutic stimulation showed positive effects on lymphoedema by increasing the lymphatic flow and velocity.

Conclusion: Physiotherapy interventions like MLD, compression garments, stretching and strengthening, resistance exercises and ROM exercises have a potential effect in the treatment and prevention of secondary lymphoedema.

Keywords: Interventions, Management, Meta-regression model, Prevalence of premenstrual syndrome, Risk reduction, Symptom

INTRODUCTION

Breast cancer is the most common type of cancer in women [1]. It is the 2nd leading cause of death in women [2]. Breast cancer treatments include individual or combination treatments like surgery, chemotherapy, radiation therapy, hormone therapy [3]. There are postoperative complications which include pain, reduced shoulder ROM, lymphoedema or lymphatic cording, wound complications reduces muscle force, postural changes and lack of sensibility [4]. One of the most important complications which occur, in one out of four women, is lymphoedema [5].

Physiotherapy plays an important role in creating awareness, prevention, early diagnosis and treatment of secondary lymphoedema [6]. There were several systematic reviews which studied the effect of only exercise programs on shoulder mobility, lymphoedema, strength and pain [7-11]. Some studies investigated the effect of MLD and compression therapy on breast cancer related lymphoedema [12-14]. Studies also investigated the effect of exercise on health-related outcomes and pre-operative exercises on upper extremity recovery in Breast cancer patients [15,16]. Postoperative physiotherapy interventions which include general exercises, stretching, joint and tissue

mobilisations for shoulder pain and ROM were studied [17,18]. Effect of physiotherapy interventions like combined physiotherapy, intermittent pneumatic compression, arm elevation, Manual Lymphatic Drainage (MLD) was also studied [19-21].

The previous systematic reviews focused on a single intervention or combination of two or more interventions for lymphoedema with or without other complications related to breast cancer [7-21]. Thus, the aim of this study was to evaluate the overall effect of various interventions used in physiotherapy for the prevention and treatment of secondary lymphoedema.

MATERIALS AND METHODS

Search Strategy

Total 244 studies which included systematic reviews with or without meta-analysis, literature reviews, randomised controlled trials were retrieved by means of computerised comprehensive search in the following databases from the year 2004 (January) to 2020 (March): PubMed, Cochrane, EMBASE and Google scholar. Key words used were physiotherapy, prevention, treatment, intervention relief and breast cancer, postoperative, secondary lymphoedema.

Study Selection and Data Extraction

Studies included in the review were based on the following-

Inclusion criteria: Randomised controlled trials, published in English language, study population must be postoperative breast cancer patients with secondary lymphoedema or those undergoing physiotherapy treatment for prevention of secondary lymphoedema with or without other complications were included.

Exclusion criteria: Non-randomised controlled trials, case reviews, systematic reviews, literature reviews, case reports and abstracts of posters, randomised controlled trials not related to lymphoedema as a complication with physiotherapy intervention, studies with lymphoedema as a complication without physiotherapy interventions were excluded.

Primary outcome measures were the effect of physiotherapy in the prevention and treatment of secondary lymphoedema in postoperative breast cancer patients. Secondary outcome measures were other upper extremity impairments related to shoulder ROM, quality of life, strength. The quality of each study was assessed using the PEDRO scale [22].

The computerized search found 244 potentially relevant articles out of which 217 non-randomized controlled trials were excluded and 27 randomized controlled trials were included in the study. Out of the 27, 1 non-English study was excluded. From the remaining 26 articles, 3 studies not relevant to physiotherapy but breast cancer, 1 study relevant to physiotherapy but not breast cancer, 6 studies relevant to breast cancer but without lymphedema and 2 studies neither relevant to breast cancer nor physiotherapy were excluded. Finally, 14 studies were included in the systematic review based on the inclusion criteria [5,6,23-34] [Table/Fig-1].

RESULTS

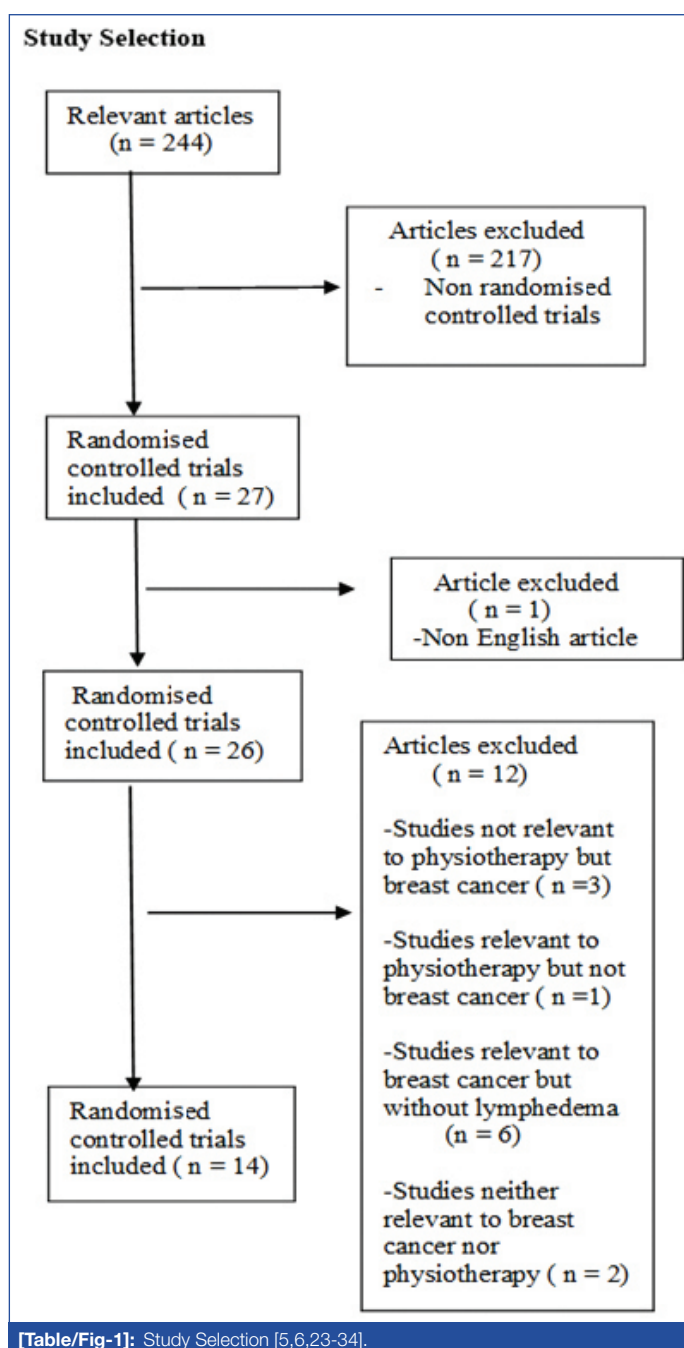
A total of 14 studies (RCTs) were included in this systematic review [5,6,23-34]. The PEDro Scale was used to assess the quality of each study which has a total score ranging from 0 to 11 [22]. Twelve studies had a PEDro score in the range of 6-8 and 2 studies with a score in the range of 9-10. Thus, the overall score reflects that the quality of the studies included was good [Table/Fig-2].

Based on the [Table/Fig-3] it can be inferred that the various physiotherapy interventions including education, MLD, compression bandaging, structural resistance training program, delayed full shoulder mobilisation exercise program, early physiotherapeutic stimulation etc., can be safely used for the patients with secondary lymphoedema. The interventions used have reduced the lymphoedema and improved the lymphatic flow without any aggravation or further complications. Thus, interventions have a potential effect in the prevention and relief of secondary lymphoedema in the postoperative breast cancer patients.

DISCUSSION

Breast cancer is the most frequent type of cancer among all the other types in females [5,23-25]. The survival rate is increasing due to the evolution in the treatment and diagnostic procedures [23]. The most common complication of breast cancer is lymphoedema [5,23,24]. After axillary dissection, immediate application of MLD may prevent the development of lymphoedema as it eliminates accumulated water and proteins out of the interstitial tissue and stimulates rerouting of the lymphatic system after axillary dissection [23]. Lymphoedema manifestation at any stage can be managed by complete decongestive therapy or compression therapy as shown by many reports [5,24]. It is the most efficient treatment which can be applied in different conditions from cardiovascular diseases, kidney diseases, deep vein thrombosis, or lymphangitis [25].

The aim of this study was to systematically review the randomised controlled trials to evaluate the effect of various physiotherapy



[Table/Fig-1]: Study Selection [5,6,23-34].

interventions that are used in the prevention and relief of secondary lymphoedema in postoperative breast cancer patients. The overall finding suggests that physiotherapy interventions have a good potential to prevent secondary lymphoedema and provide relief to the patients [5,6,23-34]. Physiotherapy interventions including education, MLD, compression bandaging and exercises is included in a combined treatment program for lymphoedema which is called as Complex Physical Therapy (CPT) [32].

Case reports have been published that found reduction of lymphoedema with return of the affected limb to the normal state following CPT [6,32]. Early stage Physical activity and Simple Lymphatic Drainage (SLD) in clinical and home settings can be effective in prevention of secondary lymphoedema along with reduction in the prevalence of lymphoedema related symptoms [5].

After breast cancer surgery, the muscles on the affected side are weak and it leads to reduced elevation of the arm. The healing of the lymphatics of the operated side and the soft tissues is impeded by reduced strength of the muscles. It is hypothesised that a structural resistance training program enhances lymph flow, protein resorption and improves flexibility of soft tissues [27]. Studies have shown that resistance training does not precipitate lymphoedema in the postoperative period [27,31]. Delayed full

Author	Eligibility criteria	Random allocation	Concealed allocation	Groups similar at baseline	Participant blinding	Therapist blinding	Assessor blinding	<15% dropouts	Intention to treat analysis	Between group difference reported	Point estimate and variability reported	Total (0 to 11)
Devoogdt N et al., [23] (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
Ochalek K et al., [24] (2017)	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	7
Dönmez AA and Kapucu S. [5] (2017)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	7
Hansdorfer KR et al., [25] (2016)	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	6
Bergmann A et al., [26] (2014)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	7
Kilbreath SL et al., [27] (2012)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	7
Zimmermann A et al., [28] (2012)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	7
Devoogdt N et al., [29] (2011)	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	8
Lacomba MT et al., [6] (2010)	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	8
Todd J et al., [30] (2008)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	7
Johansson K et al., [31] (2005)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	7
Mc Neely ML et al., [32] (2009)	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	9
Cho Y et al., [33] (2015)	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	8
Sarri AJ et al., [34] (2010)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	7

[Table/Fig-2]: PEDro scale scores.

Author	Country	Participants	Experimental Group Intervention	Control Group Intervention	Outcome Measures	Results
Devoogdt N et al., [23]	Belgium	Adults undergoing unilateral dissection for Breast Cancer	Guidelines on prevention of lymphoedema, exercise therapy and manual lymphatic drainage (n=79)	Guidelines on prevention of lymphoedema and exercise therapy (n=81)	-Cumulative incidence of arm lymphoedema - Point prevalence of lymphoedema - Arm volume Shoulder range of motion -Quality of life and function	60 months after surgery, cumulative incidence rate was less in the experimental group compared to control group. Other outcomes were comparable between the groups
Ochalek K et al., [24]	Poland	Pre-operative patients of Breast Cancer	Compression with circular knit sleeves (n=22)	No compression with circular knit sleeves (n=23)	- Limb and oedema volumes - Interface pressure under the sleeves - Compliance and quality of life	Less oedema in the control group after 3, 6, 9 and 12 months. No difference between groups in health related quality of life.
Dönmez AA and Kapucu S [5]	Turkey	Breast cancer patients with training for lymphoedema	Physical activity program and simple lymphatic drainage (n=25)	No intervention (n=27)	- Lymphoedema Visual Analog Scale (VAS) - Physical activity - Upper extremity problems	Upper of upper extremity increased by 2 times in the control group at 6 th week (p<0.05). Lymphoedema symptoms severity scores reduced in the intervention group compared to baseline (p<0.01)
Hansdorfer KR et al., [25]	Poland	37 patients who had undergone mastectomy and lymphadenectomy.	- Compression corset for 1 month after surgery. - After 7 months follow-up randomly assigned again with properly fitted compression corsets.	- No physiotherapy - No physiotherapy	- Size of truncal lymphoedema - Pain	Pain reduced in both experimental and control groups. Compression corsets could treat and prevent lymphoedema and reduce pain associated with surgery.
Bergmann A et al., [26]	Brazil	Breast Cancer patients with secondary lymphoedema	Manual lymphatic drainage, skin care, bandaging, remedial exercises (n=28)	Skin care, bandaging, remedial exercises (n=29)	- Swelling - Pain - Shoulder function	Both groups showed reduction in excess limb volume and addition of manual lymphatic drainage did not have any effect.
Kilbreath SL et al., [27]	Australia	Breast cancer patients (4-6 weeks postoperative)	- Passive stretching and progressive resistance training for shoulder muscles - Weekly session of exercises and home program. (n=81)	No exercises. Only fortnightly assessments (n=27)	- Self reported arm symptoms - Shoulder range of motion - Strength - Lymphoedema	Self-reported symptoms were similar in both the groups. Range of motion and abductor strength was greater in experimental group. No precipitation of lymphoedema with resistance training.

Zimmermann A et al., [28]	Poland	67 women who underwent breast cancer surgery.	Manual lymphatic drainage (n=33)	No Manual lymphatic drainage	- Arm volume	Arm volume increased in the control group compared to before surgery. Manual lymphatic drainage prevented lymphoedema of the affected side.
Devoogdt N et al., [29]	Belgium	Breast cancer patients with unilateral lymph node dissection	Guidelines on lymphoedema prevention, exercise therapy and manual lymphatic drainage (n=79)	Guidelines on lymphoedema prevention and exercise therapy (n=81)	- Cumulative incidence of arm lymphoedema and time to develop it.	At 12 months after surgery cumulative incidence and time to develop lymphoedema was comparable between the groups.
Lacomba MT et al., [6]	Spain	Breast cancer patients with axillary lymph node dissection who developed secondary lymphoedema	Manual lymphatic drainage, massage of scar tissue, progressive active assisted and active range of motion shoulder exercises, education strategy (n=4)	Only educational strategy (n=14)	- Incidence of secondary lymphoedema	Incidence was higher in control group. Volume ratio increased in both groups at 12 month follow-up. More survival rate was seen in the experimental group.
Todd J et al., [30]	UK	Postoperative Breast Cancer patients	Arm exercises and shoulder movements below shoulder level only for first 7 days after surgery. (n=58)	Exercises above shoulder level within 48 hours (n=58)	- Incidence of lymphoedema - Volume difference between 2 limbs - Wound drainage volume - Shoulder range of motion - Grip strength - Health related quality of life	More women with lymphoedema and increased limb volume difference in early full shoulder mobilisation compared to delayed mobilisation group. No difference in shoulder range, grip strength and self evaluated outcomes.
Johansson K et al., [31]	Australia	Breast cancer patients with unilateral arm lymphoedema following treatment older than 70 years	Compression sleeves with low intensity resistance exercises (n=16)	Without compression sleeves with low intensity resistance exercises.	- Arm volume - Subjective sensations - Perceived exertion - Physical activity - Arm volume	Increase in arm volume of lymphoedema immediately after exercise in both the groups. At 2 weeks no volume increase and reduced lymphoedema volume. Perceived exertion was low with or without sleeves but higher with sleeves during exercise.
Mc Neeley ML et al., [32]	Canada	50 breast cancer patients with lymphoedema	4 weeks of combined manual lymphatic drainage and compression bandaging (n=25)	4 weeks of compression bandaging (n=25)	Arm volume	Experimental group showed large % reduction in volume compared to control group and also compared to individuals with moderate or severe lymphoedema with either treatment.
Cho Y et al., [33]	Berlin	41 Breast Cancer patients with visible and palpable cords on the arm and axilla	Physiotherapy, manual lymphatic drainage: 5 times/week for 4 weeks. (n=21)	Physiotherapy only: 3 times/week for 4 weeks (n=20)	- Arm volume - Shoulder function - Quality of life - Pain	Arm volume and NRS scores were lower in experimental group than the control group. Lymphoedema was seen in control group and not experimental group. Quality of life, shoulder flexor strength, DASH, NRS improved in both the groups after 4 weeks interval.
Sarri AJ et al., [34]	Brazil	22 patients who underwent lymphoscintigraphy firstly without physiotherapy stimulation and second after randomisation into 2 groups.	Physiotherapeutic stimulation using Foldi's technique. (n=12)	Without Physiotherapeutic stimulation (n=10)	-Lymphatic flow progression	There was increase in progression of lymphatic flow along with increase in number of lymph nodes and lymphatic velocity.

[Table/Fig-3]: Summary of RCTs of physiotherapy interventions in the prevention and relief of secondary lymphoedema.

shoulder mobilisation exercise program for 1 week after axillary node dissection was recommended by one study which showed more women who developed lymphoedema in the early full mobilisation group compared to the delayed full shoulder mobilisation group [30]. Early physiotherapeutic stimulation has proved to be effective in patients undergoing radical axillary dissection in prevention of lymphoedema [34].

Based on this study, it can be inferred that physiotherapy interventions have a positive effect in the prevention and relief of secondary lymphoedema.

Limitation(s)

Although, this systematic review included only the RCTs, the physiotherapy interventions used for the prevention and relief of secondary lymphoedema were not homogenous. The interventions used varied from one study to the other except for few similarities. Another limitation is that, the review has not focused on particular symptoms related to lymphoedema and the symptom-based prevention and relief for the same. The prevalence of lymphoedema as a secondary complication in postoperative breast cancer patients has also not been mentioned.

CONCLUSION(S)

The study concluded that the physiotherapy interventions have a potential effect in the treatment and prevention of secondary lymphoedema.

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