

Complete Decongestive Therapy in Management of Lymphedema Associated with Breast Cancer: A Narrative Review

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Abstract: *This narrative review examines the role of Complete Decongestive Therapy CDT in managing lymphedema associated with breast cancer. The review synthesises findings from ten studies involving 752 women with unilateral breast cancer related lymphedema BCRL post-surgery, chemotherapy or radiation. The effects of CDT on lymphedema, including patient reported outcomes such as pain, heaviness, functional status and health related quality of life HRQoL were explored. Additionally, the review discusses barriers and facilitators to CDT implementation, highlighting the need for early intervention to prevent the progression of lymphedema and improve patient outcomes.*

Keywords: Breast cancer, Lymphedema, Complete Decongestive Therapy, Patient Outcomes, Health Related Quality of Life

1. Introduction

Lymphedema is an abnormal accumulation of protein-rich fluid in the subcutaneous spaces resulting from impaired lymphatic drainage⁽¹⁾. It is a chronic and progressive condition with serious physical and psychosocial implications⁽²⁾. Breast Cancer-Related Lymphedema (BCRL), characterized by arm swelling, is an acquired form of lymphedema caused by the accumulation of lymphatic fluid in the interstitial spaces that fails to drain back into the bloodstream^(3,4). This occurs due to damage to the lymphatic drainage of the upper limb, most commonly after breast-conserving surgery, mastectomy with axillary node dissection, or adjuvant radiation therapy. It can also result from tumor compression or lymphatic vessel obstruction^(5,6). In 2020, 2.3 million women were diagnosed with breast carcinoma, and by the end of the year, 7.8 million were alive with the condition for the past 5 years, making it the most prevalent cancer globally⁽⁷⁾. Since BCRL remains a common sequela of breast surgery or radiation and can be debilitating, early intervention is crucial.

Complete Decongestive Therapy (CDT), also known as Complex Decongestive Therapy, is a two-stage program that has proven effective in treating BCRL. It reduces volume, alleviates clinical symptoms such as heaviness, tightness, and discomfort in the affected limb, and improves the function of the affected extremity, thereby enhancing the quality of life^(8,9,10). CDT is biphasic: Phase one is the intensive phase, involving education, Manual Lymphatic Drainage (MLD) massage, skin care, specific exercises, and multi-layered compression bandaging, usually lasting between two and four weeks. Phase two, the maintenance phase, focuses on preserving the changes achieved in the intensive phase using compression garments, self-MLD, skin care, and a home exercise regimen⁽¹¹⁾. Current research indicates that this therapy is commonly used in stage one and progressive stages of lymphedema^(11,3). However, there is limited knowledge about initiating CDT as early as stage 0 or subclinical BCRL, when evidence of lymphatic channel damage post-radiation or during axilla-related surgery is present, to prevent the complication. Research is also

exploring alternative factors that positively influence CDT, making it more cost-effective, less time-consuming, and feasible for early initiation and long-term compliance. This article reviews the literature on the efficacy of CDT in treating and preventing breast cancer-related lymphedema and examines the facilitators and barriers for patients seeking and undergoing CDT.

2. Background

Lymphedema secondary to breast cancer cannot be completely cured and requires continuous management⁽¹²⁾. CDT is recognized as the gold standard for treatment⁽¹³⁾. Lymphedema is classified into stages by the International Society of Lymphology: Stage 0 is the subclinical stage with impaired lymph transport but no visible swelling; Stage 1 involves onset of pitting edema that decreases with limb elevation; early stage 2 features persistent pitting edema that may not reduce with limb elevation alone; late stage 2 shows persistent swelling with or without pitting, along with tissue fibrosis and stage 3 features tissue hardening due to fibrosis, skin changes like darkening and thickening, enlarged skin folds, overgrown warts, and fat deposits and absence of pitting oedema. The most severe form is known as elephantiasis⁽¹⁴⁾. Research has shown that CDT is most successful in achieving significant reductions in limb swelling and asymmetry, improving pain, discomfort, and functional ability of affected extremity, allowing speedy return to activities of daily living, when addressed early^(11,15). This is achieved by unclogging damaged lymphatic pathways, encouraging collateral pathway development, and stimulating the function of remaining patent routes⁽¹³⁾. Literature documents that CDT has been initiated as early as stage 1, but there is limited research on starting this intervention or its components in stage 0 or subclinical stages, where swelling is not yet evident. Mandatory screening of women who have undergone breast cancer-related surgeries or treatments, with appropriate diagnostic tools could be beneficial. Understanding the facilitators and barriers to initiating CDT and ensuring long-term compliance is crucial, as addressing these barriers could reduce hospital admissions related to BCRL and its

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complications. The purpose of this narrative review is to examine current evidence for CDT as a treatment for BCRL, along with its facilitators and barriers.

3. Methodology

Green et al.⁽¹⁶⁾ described narrative reviews as comprehensive analyses of existing information, allowing authors to present detailed findings and offer a broad perspective on a topic succinctly. Criteria for article selection included: (a) Articles from the past 5 years to identify recent approaches; (b) Peer-reviewed scholarly articles for credibility; (c) Articles written in English due to the majority of literature being in this language. Literature reviews were excluded due to their broad scope.

A detailed search was conducted using terms and keywords such as Breast Cancer-Related Lymphedema, Complete

Decongestive Therapy, Lymphedema, Breast Cancer, and Complex Decongestive Therapy. Databases used were WorldCat, Gale Academic OneFile, and ProQuest Ebook Central, which provided substantial health-related literature on CDT and BCRL.

An initial search produced 79 articles. After removing 13 duplicates, 66 articles were screened, and 15 were selected based on title and abstract. After full-text review, 5 articles were excluded: 3 used other treatments in conjunction with or complementing CDT without comparing them to a control group, and 2 used alternative modalities without comparing them with standard CDT. Thus, 10 articles were included in this review, as shown in Figure 1. Ethical clearance was not required as the paper reviewed publicly available information. However, the process was transparent, with researchers critically analyzing the credibility of the articles.

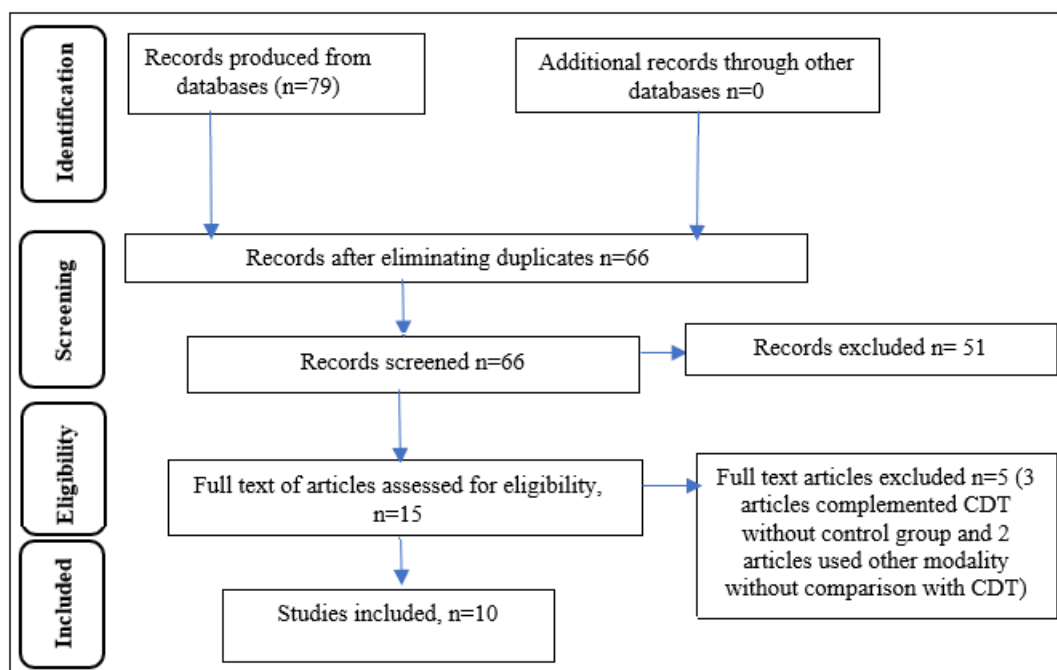


Figure 1: Flow chart presenting selection of journal articles

No	Author	Country	Purpose of Study	Type of Study, Design	Main Themes
1	Aykaç and Dizdar (2021).	Turkey	The main focus was to compare the effects of a new intervention like Extracorporeal ShockWaveTherapy (ESWT) to standard CDT in management of Breast Cancer Related Lymphedema (BCRL).	Experimental - Randomized Control Trial	Mechanism of CDT and ESWT on lymphedema, ESWT versus CDT in treatment of BCRL
2	Borman et al. (2022)	Turkey	The thesis of this paper was to assess the role of combined phase 1 CDT on decreasing volume, functional status and quality-of-life (QoL) associated with BCRL in patients with this condition.	Research- retrospective study	Role of CDT in oedema reduction and patient reported outcomes in BCR, outcome measures used for evaluating CDT effects
3	Duyur Cakıt et al. (2019)	Turkey	This prospective longitudinal research aimed to differentiate the long-term efficiency of CDT in obese and non-obese patients with BCRL.	Experimental- prospective, long term follow up study	BMI as risk factor for BCRL, Effect of BMI and obesity on CDT efficacy
4	Keskin et al. (2019)	Turkey	To evaluate the efficiency of intensive phase(phase 1) of CDT as well as understand factors including clinical and demographic features that determined the response to CDT in patients with BCRL.	Research- Retrospective cohort study	Concept of CDT, factors affecting the efficiency of intensive phase of CDT in BCRL
5	Ligabue et al. (2019)	Italy	To examine the near- and long-term efficacy of a one-month self-administered (saCDT) regime delivered after undergoing CDT with professional help and analyse it with regular care in the management of lymphedema-related arm pain, volume, and asymmetry.	Experimental- Randomized Control Trial	Efficiency of CDT and saCDT on pain and arm swelling associated with BCRL, outcome measures used
6	Mobarakeh et al. (2019)	Iran	To assess the efficacy of CDT on intensity of pain and heaviness and assess the frequency of CDT sessions required to obtain significant decline in severities of the symptoms in patients BCRL of their ipsilateral arm post breast cancer treatment.	Research- Longitudinal study	Role of CDT in the management of BCRL, Effects of CDT on pain and extremity swelling
7	Pujol-Blaya et al. (2019)	Spain	To compare the efficiency of a precast adjustable compression system with that of compression bandaging in the management of upper extremity BCRL.	Experimental - Randomized Control Trial	Significance of compression component in CDT, Effect of Precast adjustable compression in comparison with compression bandages on lymphedema and symptoms associated with breast cancer.
8	Tambour et al. (2018)	Souther Denmark	To determine whether MLD component of CDT programme contributed significantly to its effectiveness on breast cancer related lymphoedema	Experimental - Randomized Control Trial	Role of MLD in management of lymphedema and symptoms associated with breast cancer
9	Tastaban et al. (2020)	Turkey	To determine the efficiency of intermittent pneumatic compression (IPC) combined with CDT in BCRL.	Experimental - Randomized Control Trial	Effect of IPC added to CDT on BCRL and symptoms
10	Torres-Lacomba et al. (2020)	Spain	To evaluate the effects of kinesio-taping and 4 different types of bandages and researching the most efficient one among them in BCRL.	Experimental - Randomized Control Trial	Effect of the compression component in CDT on BCRL and its symptoms

4. Results

Characteristics of Studies Selected

A total of 10 articles were selected for review. Of these, 5 studies were conducted in Turkey, 2 in Spain, 1 in Italy, 1 in Southern Denmark, and 1 in Iran. Participants in these studies were women with unilateral Breast Cancer-Related Lymphedema (BCRL) following axillary lymph node dissection, lumpectomies, and radical mastectomies, with ages ranging from 18 to 65 years. Six of the studies were Randomized Controlled Trials (RCTs), two were retrospective studies, one was prospective, and one was longitudinal. Seven articles focused on the effects of Complete Decongestive Therapy (CDT) or its specific components on various concerns related to breast cancer, such as lymphedema, symptoms like pain, heaviness, and discomfort, Health-Related Quality of Life (HRQoL), and functional status^(11, 17, 15, 3, 9, 18, 19), while three articles compared alternative modalities with standard CDT in the management of BCRL^(13, 20, 21). In total, 752 women with BCRL were assessed across the included studies, with individual study sample sizes ranging from 20 to 169.

All 10 studies assessed excess limb volume of the affected side, a measure of lymphedema. Six studies^(11, 17, 15, 20, 21, 19) measured swelling using limb circumference measurements, one study⁽⁹⁾ used the water displacement technique, and the remaining three studies^(13, 3, 18) used both methods.

Secondary outcomes such as pain, heaviness, tightness, and perceived discomfort were assessed using reliable methods such as the Visual Analogue Scale and Numeric Rating Scale in six studies^(3, 9, 20, 18, 21, 19). Functional status of the affected extremity was assessed using the Q-DASH (Quick Disabilities of Arm, Shoulder, and Hand) questionnaire in three studies^(13, 11, 21), and HRQoL was measured using specific questionnaires in two studies^(11, 18). Tastaban et al.⁽²¹⁾ additionally evaluated depression associated with breast cancer using the Beck Depression Inventory and documented hand grip strength with the Jamar hydraulic hand dynamometer.

5. Discussion

A review of the literature revealed two main themes regarding the effects of CDT on lymphedema secondary to breast cancer and the factors influencing its use. The main themes are as follows:

Effects of CDT on BCRL (lymphedema and patient-reported symptoms like pain, heaviness, tightness, perceived discomfort, HRQoL, and functional status of the affected upper extremity)

Borman et al.⁽¹¹⁾ studied the effects of CDT on reducing extremity swelling, HRQoL, and functional status in 50 women with unilateral BCRL. Phase 1 of the intervention,

administered five times a week for three weeks (15 sessions in total), resulted in significant reductions in limb volumes and excess percentage volumes, indicating improvement in BCRL. QoL scores improved, except for symptoms such as fatigue, appetite loss, adverse effects from systemic therapy, breast symptoms, and hair loss. Functional status measured by Q-DASH scores also improved post-CDT. A substantial negative relationship between improved volume difference and the stage, grade, and duration of edema suggested that early treatment yields better results.

Similar findings were reported by Tambour et al. ⁽¹⁸⁾ and Mobarakeh et al. ⁽⁹⁾. Tambour et al. ⁽¹⁸⁾ assessed the effects of CDT with and without the MLD component. Results showed significant decreases in extremity swelling in both groups, but no statistically significant difference in volume reduction was observed between the groups, indicating that CDT with or without MLD was equally effective. This study also highlighted a significant decrease in patient-reported outcomes such as tension in the affected shoulder and fewer complaints related to usual activities in the MLD group. Mobarakeh et al. ⁽⁹⁾ reported reductions in pain and heaviness in 98% of patients after a minimum of seven CDT sessions, suggesting better functioning of the affected upper extremity and a faster return to daily activities, which could be a facilitator in successful completion of CDT course.

Torres-Lacomba et al. ⁽¹⁹⁾ reported that the compression aspect of CDT using four types of bandages, along with other intensive CDT components such as MLD, intermittent pneumatic compression and therapeutic exercises, significantly reduced excess limb volume. Simplified multilayer and cohesive bandages were found to be the most effective and comfortable for patients. Other symptoms, such as heaviness, tightness, and perceived discomfort, also decreased substantially, regardless of the bandage type while adverse reactions were documented in the multilayer, cohesive and kinesio-taping groups. This suggests that offering various bandaging systems could provide patients with options that are both cost-effective and comfortable, potentially facilitating adherence to CDT.

A prospective study by Duyur Cakıt et al. ⁽¹⁷⁾ found that CDT effectively reduced excess limb volume in both obese and non-obese individuals with unilateral BCRL. However, the intervention was less effective in obese subjects, whose limb volumes returned to baseline after one year, while non-obese individuals maintained their post-CDT limb volumes. This suggests that obesity, as measured by the Body Mass Index (BMI), may reduce the effectiveness of CDT. The study also noted that climatic conditions, such as hot weather, could affect adherence to CDT, as patients may be less likely to use compression garments regularly during the summer. In a retrospective cohort study, Keskin et al. ⁽¹⁵⁾ reported that as lymphedema stage advanced, swelling increased, and the percentage reduction in excess volume decreased, indicating that the stage of lymphedema affects CDT efficacy.

Ligabue et al. ⁽³⁾ found that a self-administered CDT (saCDT) routine led to a substantial average decrease of 230 ml in upper limb swelling in more than half of the women with unilateral BCRL six months after completing training

when compared to women who received usual discharge advice after professional CDT. Pain values also decreased further in approximately 70% of the group that continued with saCDT, suggesting that it can positively impact limb symmetry and pain, making it a cost-effective management option for BCRL. Therefore it could facilitate initiation and compliance to this treatment regime in the early stages.

Effects of Alternative Modalities Compared to CDT on BCRL

Aykac and Dizdar ⁽¹³⁾ evaluated the effectiveness of 12 sessions of Extracorporeal Shock Wave Therapy (ESWT) given three times a week as an alternative to CDT in patients with unilateral BCRL. Results showed a statistically significant decrease in volumetric measurements and improvements in Quick DASH scores post-treatment and at one-month follow-up. However, no substantial difference was found between the two groups, indicating that ESWT is as effective as CDT and may be more cost-effective.

Another study ⁽²⁰⁾ compared the effectiveness of a precast adjustable compression system with that of compression bandaging in managing upper extremity lymphedema in 48 women with unilateral BCRL. Both treatments led to significant reductions in excess limb volume and symptoms like pain, heaviness, and hardness over time, with no significant difference between the treatments after 10 sessions and at three-month follow-up. This suggests that the precast adjustable compression system is as effective as multilayered compression bandaging and may be easier to apply, making it suitable for elderly patients or those with osteoarticular or neurological limitations.

Tastaban et al. ⁽²¹⁾ examined the effectiveness of intermittent pneumatic compression (IPC) combined with the initial phase of CDT for BCRL in 76 women. The addition of IPC did not show superiority in reducing swelling but improved sensations of tightness and heaviness in cases of pitting edema, suggesting that the benefits of adding IPC to CDT are still unclear.

Overall, CDT has demonstrated substantial positive effects on BCRL and associated symptoms, making it a promising intervention, especially when started early. Key facilitators include significant reductions in limb volumes, improvements in subjective symptoms, prevention of disability, and enhanced functional status. The use of different bandaging systems can also make CDT more cost-effective and patient-friendly.

Barriers to CDT include psychological impacts from cancer, limb asymmetry, discomfort from compression bandaging, and other complications such as skin infections. Accessibility to trained professionals and the time-consuming nature of CDT also pose challenges.

The included studies were not all RCTs, which are considered the highest level of evidence. Additionally, not all studies used the water displacement technique (the gold standard) for assessing lymphedema severity, relying instead on indirect methods like circumferential measurement. The review also included only articles published in English, potentially leading to selection bias. The limited availability

of recent literature on CDT and BCRL resulted in a smaller number of articles reviewed.

The significance of this study lies in its potential to inform clinical practice by highlighting the effectiveness of CDT in managing BCRL, especially when initiated early. Understanding the barriers and facilitators to CDT can also guide the development of more accessible and patient friendly interventions.

Recommendations include, the need of research on initiation of CDT in stage 0 or subclinical stage of lymphedema and its effects on prevention and management of BCRL. This could in turn assist in reducing hospital admissions and surgeries for lymphedema or its complications. More research exploring the effects of CDT on psychosocial aspect of BCRL should be conducted. Also, further research should be carried out on exploring more cost effective and less time consuming non-surgical options to manage BCRL which is as effective or superior in effectiveness to CDT.

6. Conclusion

Upper extremity lymphedema is a common and challenging complication following breast cancer treatment. Complete Decongestive Therapy (CDT) remains the gold standard for managing this condition, with significant evidence supporting its early implementation to prevent the progression of lymphedema and improve patient outcomes. Addressing barriers to CDT and exploring more economical alternatives will further enhance its accessibility and effectiveness.

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