

Effectiveness of Manual Lymphatic Drainage in Patients with Breast Cancer: A Review of the Literature

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Submitted: 2025-04-18; **Accepted:** 2025-08-21; **Doi:** <https://doi.org/10.22037/jcpr.v10i1.47720>

Abstract

Introduction: One of the treatment methods for people suffering from secondary lymphedema is manual lymph drainage (MLD). Considering the importance and high impact of manual lymph drainage on reducing the volume of lymphedema in people with secondary lymphedema, the purpose of this systematic review is to analyze the results of previous studies about MLD on patients with breast cancer. **Methods:** A search was performed in the PubMed, Google Scholar, PEDro, Science Direct, and Scopus databases using the keywords 'physiotherapy, lymphedema, manual lymph drainage, and breast cancer' for studies published between 2002 and 2024. **Results:** Among the retrieved articles, only the articles that investigated MLD in the treatment of patients with lymphedema were included in the study. As a result, 9 out of 3390 articles were included in this study. **Conclusion:** The review of the selected articles shows that MLD is a non-invasive and acceptable treatment method for lymphedema. Considering the safety and high effectiveness of MLD, along with its ease of use and potential for combination with exercise therapy, it is recognized as a therapeutic modality for lymphedema.

Keywords: Lymphedema, breast cancer, manual lymph massage, exercise

Please cite this paper as: Ataeikamal F, mohsen Roostayi M, Rahbar S, Roostaei H. Effectiveness of Manual Lymphatic Drainage in Patients with Breast Cancer: A Review of the Literature. J Clin Physio Res. 2025; 10(1): e100. Doi: <https://doi.org/10.22037/jcpr.v10i1.47720>

Introduction

Breast cancer is the most common cancer among women worldwide (1). In our country, breast cancer constitutes 21.4% of all reported cancer cases, ranking as the leading cause of cancer diagnosis since 2008 (2). Studies indicate that the average age of women with breast cancer ranges from 45 to 69 years. However, in Iran, statistics show a significantly lower incidence age, ranging from 35 to 44 years (4).

Lymphedema occurs as a result of damage or blockage of the lymphatic system, causing protein and fluid to remain in the interstitial space. The accumulation of protein in this space leads to edema and predisposes the patient to infections, exacerbating their condition (5). If acute lymphedema is left untreated, it may increase suddenly or gradually and eventually become chronic (6). Severe lymphedema can cause limb volume increase, pain, decreased skin elasticity, numbness, heaviness, reduced mobility and putting the individual at risk of cellulitis (7), functional loss and reduced health-related quality of life. In addition to its physical and functional limitations, lymphedema also imposes a substantial financial burden on the patients. Treatment for

lymphedema includes surgical and non-surgical methods (8). Non-surgical treatment encompasses decongestive therapies and serves as the primary approach for managing lymphedema (9).

Decongestive therapy includes manual lymph drainage (MLD), compression therapy, skin care, exercise, and compression garments (10). The first phase of decongestive therapy aims to reduce swelling, while the second phase focuses on maintaining this reduction (11). Manual lymph drainage, by mimicking the pumping action of lymphatic vessels, helps to stimulate the reflux of excess fluid (12). Studies have demonstrated that MLD is effective in reducing lymphedema (13). The duration of treatment is directly related to the severity and duration of lymphedema (14). MLD is a gentle, specialized manual massage technique intended to stimulate lymphatic flow and redirect lymph toward functioning lymphatic pathways and regional lymph nodes. It is frequently used either alone or as part of complex decongestive therapy. Recent guidance emphasizes early detection and individualized, risk-based prevention/management of lymphedema.

MLD consists of slow, rhythmic, low-pressure strokes (sessions typically 20–60 minutes) performed by trained therapists. Mechanistically, MLD aims to (1) increase interstitial pressure gradients, (2) promote uptake of protein-rich interstitial fluid into initial lymphatics, and (3) encourage fluid transport toward patent lymphatic basins. Physiological evidence comes mainly from small mechanistic and imaging studies rather than large RCTs, but the proposed mechanism is plausible and widely accepted in lymphedema practice.

Methods

A literature search was undertaken to identify published research on the MLD in Patients with Breast Cancer. electronic searches were performed in Google Scholar, PubMed, Cochrane Library, Scopus, and Web of Science for English-language publications from January 2002 to December 2024 using combinations of “manual lymphatic drainage” AND “breast cancer” AND “lymphedema” AND physio-

therapy. The inclusion criteria were physiotherapy treatment, adult women post-breast cancer surgery or radiotherapy, RCTs, controlled or crossover trials, or systematic reviews, Interventions including MLD (alone or within CDT (CDT: MLD + compression + exercise + skin care) and reported outcomes: limb volume/circumference, incidence, pain, quality of life (QoL). The exclusion criteria were non-breast cancer populations, case series or observational studies without control group, and MLD used with additional nonstandard therapies (e.g., laser). This literature review is a focused, evidence-based literature review on manual lymphatic drainage (MLD) in patients with breast cancer. The initial search yielded 3390 articles. Among these, articles focusing on treatments other than inclusion criteria were excluded (3377 articles). Ultimately, 13 articles met the inclusion criteria and were included in the study.

Results

As observed in the table above, a total of 13 studies were included in the review. The sample size was adequate in most studies, with Y. Shao's study (12)

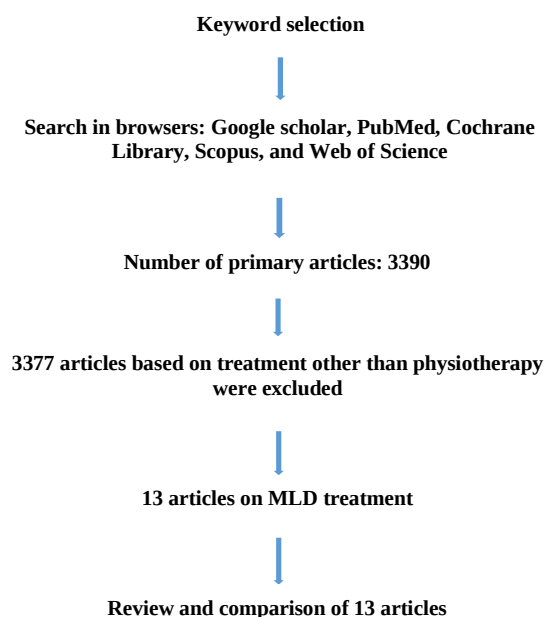


Figure 1: Flowchart illustrating the steps of the systematic review process

having the largest sample size, while Williams's study (10) had the smallest. Janavlekar's study (15)

had the longest follow-up (3 months), and limb volume was the most studied variable. While 5 studies focused solely on limb volume, 4 studies explored additional measures such as quality of life, sleep quality, BMI, age, pain, and shoulder range of motion. Studies indicated that MLD is a safe, non-invasive, and effective treatment. In the study by Zaini (16), MLD was combined with exercise, and patients were stratified by age and disease stage. Results showed more success in those under 60 years compared to those above 60 years, as well as better improvement in Stages 1 and 2 compared to Stages 3 and 4. According to this study, older patients demonstrated greater range of motion and quality of life than younger patients. The case study by Janavlekar investigated limb volume, quality of life, and sleep quality over 3 months and found that patient education improved independence. In Kasseroller's study (17), patients received MLD treatment on weekdays, twice per day. Oliveira's study (18) compared the effects of MLD and exercise, examining other factors like age and BMI, while Shao's study investigated pain, shoulder function, and quality of life. Interventions typically involved therapist-performed MLD 30–60 minutes/session, 2–5 times weekly, for 2–6 weeks, often followed by maintenance or self-MLD.

According to systematic reviews and meta-analyses (19,20,21): there was no significant additional limb-volume reduction with MLD when added to compression or exercise (Ezzo et al., 2015), pooled analysis of 12 RCTs (n=556) found small, non-significant differences in limb volume (SMD -0.10, 95% CI -0.35–0.15) but moderate improvements in pain and heaviness (Liang et al., 2020), MLD improved subjective symptoms and QoL, with strongest effects in early or mild lymphedema; heterogeneity high ($I^2 > 60\%$) (Lin et al., 2022), and recent reviews (2023–2024) supported symptomatic benefit of MLD but stress poor standardization of protocols. According to randomized controlled trials (22) of Da Cuña-Carrera et al. (2024): Randomized crossover trial (n=40) showed arm volume worsened in absence of MLD-based maintenance compared with active phases (mean delta volume +4.3% vs -2.1%, $p < 0.05$).

Outcome's synthesis: For limb volume (mixed results): small or non-significant differences vs. compression/exercise alone.' For pain & heaviness: consistent short-term improvement with MLD; for quality of life: modest benefit, particularly physical well-

being subscales; for safety: MLD well tolerated; and contraindications: acute infection, DVT, metastasis, unstable cardiac disease.

Discussion

In the normal circulation, fluid exchange at the arterial side of the capillaries into the interstitial space. Most of this interstitial fluid is returned into the circulation by the venous ends of the capillaries. The remaining interstitial fluid (protein molecules, bacteria, and waste products) are picked up by small lymph vessels and becomes lymphatic fluid which is carried to larger lymph vessels, and finally is emptied back into the venous circulation. The lymphatic fluid is moved by the rhythmic contractions of the muscular walls of lymphangions under the control of the autonomic nervous system, but external stimulation on the lymphatics, such as manual lymphatic drainage (MLD) can augment these actions. Damage to the lymphatic system can lead to build up of interstitial fluid or the condition known as 'lymphedema'.

Manual lymphatic drainage (MLD) is a specialized therapy based on the anatomy of the lymph system. It is believed to work by enhancing lymph fluid movement, reducing swelling, and softening fibrosis. It works by stimulating lymphangion contractions, decreasing hydrostatic resistance to lymph flow, and rerouting fluid from stagnant areas to functional vessels. Studies have demonstrated MLD's effectiveness in reducing lymphatics welling. The objective of this systematic review was to highlight the effect of MLD treatment on patients with secondary lymphedema.

Author and Year	Sample Size	Variables	Method	Results
Williams et al. 2002 (11)	2 groups of 15	Limb volume	Group 1 received 3 weeks of MLD followed by exercise; Group 2 vice versa	MLD significantly reduced limb volume and arm skin thickness, also improved other factors such as skin thickness, quality of life, pain, and limb heaviness.
Koul et al. 2007 (15)	138, mean age 54	Limb volume	MLD alongside compression therapy and deep breathing	Surgery is a significant factor in lymphedema; MLD significantly reduced limb volume.
Martin et al. 2011 (16)	58, two groups	Limb volume	4 weeks of treatment, followed by evaluation at 1 and 3 months	Reduced volume in the affected limb after treatment, with positive effects on symptom reduction and pain.
Shao et al. 2016 (13)	334, two groups	Limb volume	Group 1: routine physiotherapy; Group 2: routine physiotherapy + MLD	MLD was effective in reducing limb volume; further studies on functionality are needed.
Cho et al. 2016 (17)	41 randomized patients	Limb volume, shoulder function, quality of life, pain	Group 1: routine physiotherapy + MLD, 4 times/week for 4 weeks; Group 2: routine physiotherapy, 3 times/week for 4 weeks	Significant improvement in patients, including limb volume and pain.
Oliveira et al. 2018 (18)	106, two groups of 58	Age, BMI, Limb volume	Group 1: MLD; Group 2: Exercise	Women under 39 with BMI > 24 are more susceptible to lymphedema; Both MLD and exercise reduced limb volume; active activity after breast cancer is effective.
Kasseroller et al. 2023 (19)	61, two groups	Limb volume	2 times a day MLD on weekdays	A significant decrease in limb volume was observed during MLD treatment days, with an increase on weekends without MLD.
Janavlekar et al. 2022 (20)	A case study	Limb volume, QOL, sleep quality	Case study, assessing daily, 5th, 10th day, 1 month, and 3 months	CDT and received education greatly assisted in patient independence, quality of life, and sleep quality.
Zaini et al. 2024 (21)	79, divided by age and stage	ROM, limb circumference, shoulder flexor strength	8 sessions of 45 min MLD + bandaging, 20-30 min exercise	Patients under 60 years showed greater reduction in limb volume; Stage 1 and 2 patients had greater improvement compared to Stages 3 and 4; Range of motion improved more in patients over 60 compared to under 60.

All included studies utilized MLD for lymphedema treatment, while some studies added exercise. The duration and frequency of treatment varied across the studies (most used a 4-week treatment period). The Janavlekar study had a 4-month study period and showed that MLD treatment improved patient independence, quality of life, and sleep. Out of 9 studies, three (10,16,18) combined MLD with exercise, demonstrating that the combination enhances the treatment effectiveness and improves the outcomes. Upon review of the studies, only the Zaini and Oliveira studies considered patient age. Studies show that MLD is effective in reducing lymphedema (12). Given that lymph flow is minimal during rest, MLD, by mimicking lymphatic vessel pumping action, helps stimulate the reflux of excess lymphatic fluid.

According to evidence-based literatures (randomized controlled trials, systematic reviews and meta-analyses): the aggregated evidence indicates that MLD provides subjective symptomatic relief but only limited additive impact on objective limb-volume reduction. Benefits appear greatest for patients with early or mild lymphedema, possibly reflecting preserved lymphatic reserve. Preventive MLD immediately post-surgery does not significantly reduce lymphedema incidence compared with standard education and exercise programs. Nonetheless, MLD remains integral to CDT, offering comfort, relaxation, and potential improvement in skin mobility and scar flexibility—important qualitative benefits not fully captured by volume metrics. Incorporating patient-led self-MLD may sustain results and empower self-management. Methodological limitations include small sample sizes, variability in MLD techniques, inconsistency in outcome measures, and short follow-up durations. Few studies examined cost-effectiveness or long-term maintenance outcomes.

Clinical implications of MLD: 1) MLD can be safely included as part of complex decongestive therapy for symptomatic management of established breast cancer-related lymphedema. 2) Routine prophylactic use of MLD after breast cancer surgery is not currently supported by high-level evidence. 3) Optimal benefit likely arises in early intervention or maintenance

phases. 4) Standardized protocols and training are necessary to ensure consistency and reproducibility. 5) Shared decision-making should consider patient preference, symptom burden, and cost.

Conclusion

The review of the mentioned articles shows that MLD, by mimicking the lymphatic vessel pumping action, facilitates the reflux of excess lymphatic fluid, and thus can be used as an effective and acceptable non-invasive method for the treatment of lymphedema. Considering the safety, efficacy, and ease of application of MLD, it remains potentially beneficial adjunct in the multimodal management of breast cancer-related lymphedema, primarily improving symptoms and quality of life rather than objective volume reduction. It is recommended that this treatment modality be combined with bandaging and exercise for lymphedema management. Evidence does not justify routine prophylactic use in all postoperative patients. Future research should prioritize well-powered, standardized RCTs and long-term evaluations to establish cost-effectiveness, optimal timing, and protocolization of MLD within complex decongestive therapy.

Acknowledgment

None.

Ethical consideration

All ethical principles were considered in this article. The ethical principles observed in the article, such as the informed consent of the participants, the confidentiality of information, the permission of the participants to cancel their participation in the research. Ethical approval was obtained from the Research Ethics Committee of the Shahid Beheshti University of Medical Sciences/IR.SBMU.RETECH.REC.1403.055 research center. (Ethical Code)

Funding support

This research did not receive any grants from funding agencies in the public, commercial, or non-profit sectors.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' contributions

All authors contributed equally to the preparation of this article.

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