

The effects of yoga on breast-cancer-related lymphedema: a systematic review

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Abstract

Purpose – Breast-cancer-related lymphedema (BCRL) is a negative condition that affects biopsychosocial aspects of patients treated with breast cancer. Yoga has been reported as one of the complementary and alternative approaches used by patients diagnosed with BCRL. The aim of this systematic review was to explore the effectiveness of yoga on BCRL.

Design/methodology/approach – A systematic literature was performed by searching existing papers from the electronic scientific databases. Five papers were exclusively examined. Four studies were conducted in women with BCRL, and one study was conducted with women at risk for BCRL.

Findings – Four types of yoga were evaluated in relationship with BCRL, namely: the Satyananda Yoga tradition, the modified Hatha yoga, the aerobic yoga training and the Ashtanga-based yoga practices. Four of five included studies reported that decrease in arm volume was not reported for all yoga-type interventions. One study showed no significant evidence that yoga was associated with limb volume change in women at risk of BCRL. Similarly, three studies reported that the change-of-arm-volume measures were not significantly different between the yoga and the control groups or in the same group before and after the yoga program. One quasi-experimental study reported arm volume significantly decreased after attending the yoga program.

Originality/value – This review reported the importance of being aware that yoga is not shown to be an effective strategy for managing or preventing BCRL. However, quality of research methodology, small sample sizes and the limited number of related studies should be acknowledged. Until more rigorous studies are performed, yoga may continue to be used as a complement to traditional therapy under the supervision of certified trainers.

Keywords Yoga, Breast-cancer-related lymphedema, Lymphedema status, Arm volume, Breast cancer

Paper type Review

Introduction

Breast cancer patients whose cancer is treated with various methods such as surgery, chemotherapy or radiation therapy are all at risk of arm swelling known as breast-cancer-related lymphedema (BCRL). According to recent statistics, BCRL was found in about 6–30% of patients after their cancer treatment [1]. These patients experienced various symptoms, including swelling, heaviness, tightness, firmness, pain or numbness, tingling, limb fatigue or weakness and limited movement of the upper extremity (fingers through shoulder) [2].

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BCRL is a complication that can occur during or after cancer treatment, even years after the treatment is completed. More importantly, it is a chronic condition that cannot be cured. Thus, it can eventually affect the psychosocial state of the patient. Some patients may lose their positive self-image due to their having larger arms. These patients may also have negative feelings associated with arm swelling, such as anxiety, stress, fear, confusion and low self-confidence [3].

There are currently a number of treatments to help reduce swelling and prevent the accumulation of liquids that can cause swelling, such as using specialized massage techniques (manual lymphatic therapy) to enhance lymphatic drainage and reduce fluid accumulation: exercise, compression sleeves and bandaging and meticulous skin care [4].

In addition, previous studies have suggested that yoga could help the lungs to expand, resulting in more movement and stretching of muscles leading to better lymphatic circulation. As a result, arm swelling could be reduced [5]. Yoga exercise has been used as a treatment to help promote self-care of cancer patients with swollen legs [6]. This was then followed by the use of yoga for self-care of patients with swollen arms. According to relevant literature reviews, one previous systematic review reported the advantages of yoga for breast cancer survivors [7]. However, the purpose of the study was directly related to the effects of yoga on the quality of life and a person's psychological health status, not on the arm volume change of patients with breast cancer. In addition, one recent systematic review focused on the effect of yoga on BCRL. However, the papers only included patients diagnosed with BCRL, not those at risk of BCRL [8]. So, this review paper aimed to expand the scientific evidence regarding the effects of yoga on BCRL in both patients diagnosed with BCRL and patients at risk of BCRL up to 2018. We hoped that this updated review would enhance our ability to provide beneficial information regarding yoga exercise in patients with BCRL or at risk of BCRL and also to help develop nursing care plans for enhancing the quality of life for women with BCRL.

Methods

Search strategy

The following databases were searched for published studies from 2007 to 2018: ScienceDirect, Scopus, PubMed and CINAHL. Search terms included "yoga," "yoga exercise," "breast cancer survivors," "breast cancer-related lymphedema," "lymphedema" or "lymphoedema". Additionally, a manual search approach was used to retrieve further relevant articles.

Eligibility criteria

The inclusion criteria for this review included: (1) P: Participants were patients with BCRL or at risk of BCRL; (2) I: Intervention was yoga; (3) O: Outcome was BCRL; and (4) S: Study was a randomized controlled trial (RCT) or quasi-experimental research. Exclusion criteria included: cross-sectional or longitudinal studies, qualitative research, case reports, review articles and expert-opinion articles.

Study selection

Based on a review of the abstracts, when the articles seemed to comply with the inclusion criteria, we acquired the full-text papers and two researchers autonomously examined them. If there was a discrepancy, it was settled by review from a third reviewer.

Quality appraisal

The quality of the included studies was examined using the Downs and Black quality tool [9] and included the following subscales: report, internal and external validity, bias and

confounding factors. For the total quality index, a maximum score of 30 was possible. Also, the evidence level was graded based on the Putting Evidence into Practice (PEP®) level of evidence guidelines: (1) recommended for practice, (2) likely to be effective, (3) benefits balanced with harms, (4) effectiveness not established, (5) effectiveness unlikely and (6) not recommended for practice [10]. To be noted here, this study did not involve any human interview/research subjects. So, an ethics review for research involving human subjects was not relevant.

Results

The list items yielded 424 articles and 19 additional papers from the reference lists of included papers. These 443 articles were included for initial screening. After checking for duplication, 377 articles were excluded, as participants were not women with or at risk of BCRL or were duplicate publications. A total of 66 articles were checked for meeting inclusion and exclusion criteria. Of these, 33 articles were excluded, as they did not measure limb volume difference; 27 papers were not RCTs or quasi-experimental research; and one paper was excluded, as it was a protocol paper. Five articles remained for the final round (Figure 1). The extraction and synthesizing contents are reported in Table 1.

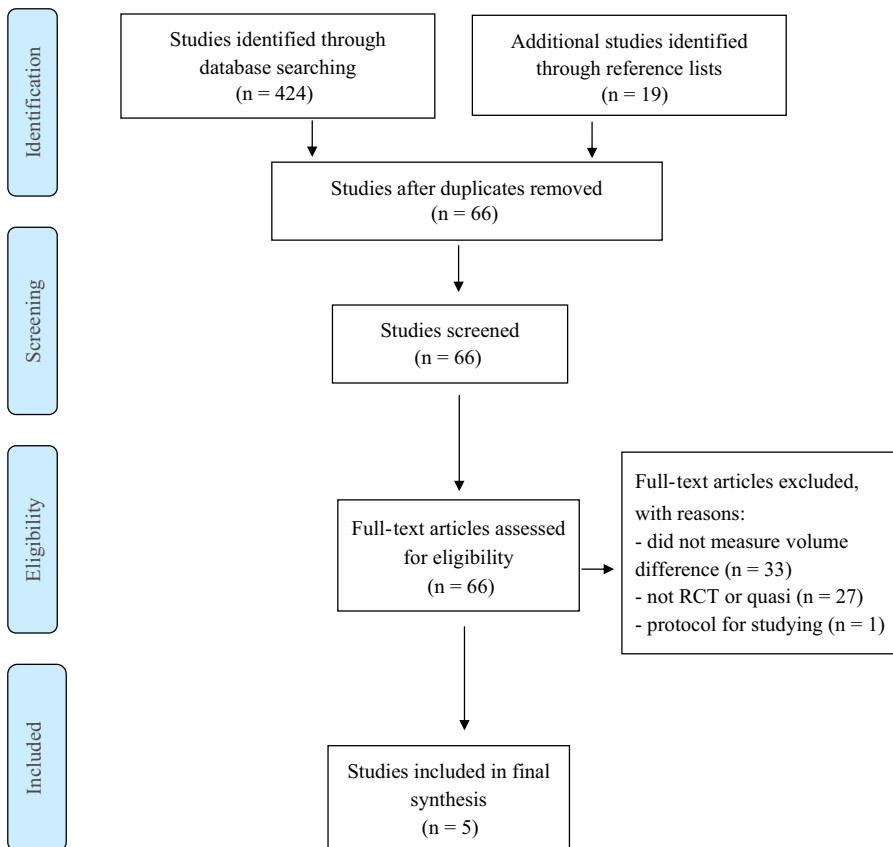


Figure 1.
Literature review flow
diagram

Table 1.
Summary of the effects
of yoga on BCRL

Study	Design and sample	Intervention	Outcome assessment	Findings	Downs and Black scores	PEP score
Douglas <i>et al.</i> , 2012 [11]	A randomized controlled trial with 35 women with BCRL	A four-week Satyananda Yoga program The 90 min weekly group classes involved three main activities: asanas, breathing exercises (pranayamas) and meditation	Lymphedema status was measured using bioimpedance spectroscopy (BIS), perometry, tonometry, and lymphedema symptoms	There were no statistically significant differences between the continued and discontinued groups at six-month follow-up	13	Effectiveness not established
Loudon <i>et al.</i> , 2014 [12]	A randomized controlled pilot trial with 28 women with BCRL	An eight-week yoga intervention, consisting of a weekly 90 min teacher-led class and a 40 min daily session delivered by DVD The yoga session included documented breathing practices, physical postures, meditation and relaxation techniques according to the Satyananda Yoga tradition	Arm volume measured by circumference and extracellular fluid measured by bioimpedance spectroscopy Secondary outcome Measures were: tissue induration measured by tonometry; levels of sensations, pain, fatigue and their limiting effects all measured by a visual analogue scale (VAS)	At Week 8, the intervention group had a greater decrease in tissue induration of the affected upper arm compared to the control group ($p = 0.050$) There was no difference in arm volume of lymphedema or extracellular fluid between groups at Week 8 At Week 12, arm volume increased more for the intervention group than the control group ($p = 0.032$)	23	Effectiveness not established

(continued)

Table 1.

Study	Design and sample	Intervention	Outcome assessment	Findings	Downs and Black scores	PEP score
Lai <i>et al.</i> , 2017 [13]	Repeated measures before and after the intervention with 15 women with breast cancer who had not previously worn elastic clothing to treat lymphedema	The program was led by a certified trainer and consisted of 60 min sessions, three times a week for 12 weeks The 12-week exercise training program was based on aerobic yoga training developed by an exercise trainer (Irene Lu) in 2001	The volumes of the affected and normal limbs were measured by water displacement method. A self-assessed edema score was also recorded	There was no significant edema after exercise. No significant differences were noted in subgroup analysis by age or the affected arm	13	Effectiveness not established
Mazor <i>et al.</i> , 2018 [14]	Single-group pretest–posttest design with 21 women who had undergone surgery	An Ashtanga yoga intervention for eight weeks. Sessions consisted of once/weekly instructor-led practice and once/weekly home practices	Volume of lymphedema measured by circumferential forearm. A self-assessed edema score was also recorded	Postintervention, mean volume in the at-risk upper extremity was slightly reduced ($p = 0.397$)	14	Effectiveness not established
Fisher <i>et al.</i> , 2014 [15]	A quasi-experimental study with six women with physician-diagnosed BCRL	Modified Hatha yoga three times/week for eight weeks. The yoga classes included a progression of low-impact, modified poses, stretching and isometric exercises and meditation Breathing and poses to drain lymphatic system were incorporated throughout yoga practice	Self-reported arm function using the disabilities of the arm, shoulder and hand (DASH), grip Strength and bilateral arm volume with water displacement	Arm volume significantly decreased from baseline to final measures ($p = 0.02$). No significant changes in self-reported arm function ($p = 0.34$) or hand grip strength ($p = 0.26$) were found	13	Likely to be effective

General characteristics of the included studies

Of the five papers inspected, as evaluated by utilizing the five quality subscales of the Downs and Black [9] tool, the average quality index was 15.20 (SD = 4.38) with scores ranging from 13 to 24. In addition, for the level of evidence as evaluated by the PEP classification, the results demonstrated that most (four of five) of the included papers met the “effectiveness not established” standard [11–14] and just one paper met the “likely to be effective” standard [15].

Among the five included studies, two studies were RCTs [11,12], whereas three studies were quasi-experimental research studies [13–15]. In addition, four studies concentrated on patients experiencing BCRL [11,12,15], whereas one research paper focused on women at risk of BCRL [14]. A total of 105 patients were examined by the included studies. Arm volumes were assessed in all five studies, and research included both subjective and objective methods. All included studies reported the yoga program delivered by a certified trainer, with intervention periods from 4 to 12 weeks. The yoga intervention from all included studies included breathing exercises, physical postures and meditation.

Types of yoga and BCRL

The systematic review revealed that the five studies evaluated four types of yoga with BCRL, namely: the Satyananda Yoga tradition [11,12], an aerobic yoga training [13], the Ashtanga-based yoga practices [14] and the modified Hatha yoga [15]. With regard to the Satyananda Yoga tradition, two studies analyzed the effect of the Satyananda Yoga tradition on BCRL [11,12]. Firstly, Douglas *et al.* [11] reported the use of a yoga program based on the Satyananda Yoga tradition with BCRL ($n = 35$). The intervention was a four-week program, consisting of a 90 min session taught by a yoga teacher, followed by a 40 min home program guided by a CD recording to perform on the remaining six days. All yoga practices were adjusted to be performed either sitting or standing, instead of lying on the floor. Both the weekly group class and the home program consisted of the same main activities, including asanas (a body posture), breathing exercises (pranayamas) and meditation. The findings showed that no statistically significant differences were found between the intervention and the control groups in both subjective symptoms and objective measures. Another study by Loudon *et al.* [12] conducted a RCT to determine the effectiveness of the Satyananda Yoga tradition on BCRL of women with BCRL in Australia ($n = 28$). The eight-week yoga program was comprised of a weekly 90 min session taught by a yoga teacher and a 40 min daily session practiced alone following a DVD recording. The yoga session was composed of breathing, physical postures, meditation and relaxation techniques based on the Satyananda Yoga tradition. The outcomes of the investigation demonstrated that there were no distinctions in arm volume between the two groups at Week 8. Unfortunately, at Week 12, arm volumes of the intervention group were significantly increased in comparison to those in the control group.

For the remaining three included studies, it appeared that neither type of yoga was effective in reducing the arm volume of women with BCRL [13–15]. Firstly, the effect of the aerobic yoga program on BCRL was reported by Lai *et al.* [13] in Chinese breast cancer patients ($n = 15$). The aerobic yoga training sessions involved three 60 min sessions three times a week for 12 weeks led by a certified trainer. The program incorporated all yoga movements including aerobic exercise, resistance exercise, stretching exercises, breathing exercises and meditation. The results of the study reported that there were no significant differences in the subjectively observed edema scores and changes in arm volume.

Secondly, Mazor *et al.* [14] inspected the impact of the Ashtanga-based yoga program on arm volume of women at risk of BCRL ($n = 21$). The eight-week Ashtanga-based yoga practices involved a once per week 60 min instructor-led practice and a once per week home

practice using an outlined guide manual. The yoga was adjusted to be safe to practice alone and avoided using the upper extremities in any dependent positions. The authors revealed that the mean volume of upper extremities before and after the intervention was not significantly different.

Finally, another study, led by Fisher *et al.* [15], reported that arm volumes were decreased after attending the Hatha yoga program; however, the limitation of the quasi-experimental research design and small sample size are of concern ($n = 6$). In the Fisher *et al.* study [15], the modified Hatha yoga program comprised a weekly 60 min session taught by a yoga teacher, followed by a 45 min home program guided by a DVD for eight weeks. The activities incorporated a low-impact approach, adjusted postures, stretch yoga and meditation.

Yoga for patients with BCRL and patients at risk of BCRL

There was just one investigation that conducted a single-group pretest–posttest design to study the effectiveness of yoga on arm volume changes in patients at risk for BCRL [14]. The result of the investigation demonstrated that shoulder range of motion, shoulder strength and grip on the affected side were significantly improved ($p < 0.05$) after the yoga intervention. Unfortunately, the total volume in the at-risk upper extremities was not significantly reduced ($p = 0.397$) [14].

For women with BCRL, three of four studies reported that arm volumes between the intervention group and the control group were not significantly different [11,12]. Similarly, Lai *et al.* [13] also reported that no significant difference was found for arm volume measured before and after attending the yoga intervention. In contrast, only one study reported that yoga was likely to be effective, as arm volume significantly decreased after the yoga intervention [15].

Based on these included papers, it may be concluded that any of the four types of yoga exercise might not help in decreasing arm volume in women with BCRL or in decreasing arm swelling in women at risk of BCRL. However, with a restricted number of studies to date and small sample size, more studies with a larger sample size are required. It can be concluded that yoga under the direction of an expert in yoga practice is safe and is not associated with any increase in limb volume or other adverse effects, even if the desired outcome of decreased limb volume was not reliably seen after a yoga intervention.

Discussion

This review aimed to systematically evaluate the efficacy of yoga on altering the arm volume of patients with BCRL or patients at risk of BCRL. The results of this review indicate that none of the forms of yoga may be associated with decreased arm volume for women with BCRL. Even though one quasi-experimental study reported arm volume decreased from baseline to final measure after practicing the Modified Hatha yoga program ($p = 0.02$) [15], the non-RCT design of the study was limited in affirming results. More importantly, one previous study reported that arm volume in the experimental group decreased at Week 8 but increased at Week 12 [12]. The authors claimed that the yoga intervention in their study was composed of eight weeks of practice. That may mean yoga may be effective in reducing arm volume for BCRL patients initially or with early-stage BCRL, and yoga may need to be continuously practiced, as the benefits may diminish when yoga practice ceased [12]. Future research of longer-duration intervention with longer-term follow-up is needed to confirm these possibilities.

Similarly, for the effectiveness of yoga on arm volume change in patients at risk of BCRL, only one study focused on this issue and the result of the study did not reach statistical

significance in terms of reducing affected limb volume [14]. However, it is interesting to note that this study reported that yoga significantly improved the shoulder range of motion in this group of patients. This meant that patients at risk of BCRL would be able to participate in more functional activities, which in turn would help them to drain lymphatic fluid. However, as this is the only paper with a quasi-experimental research approach, the summary could not conclude whether yoga is useful for patients at risk of BCRL or not. Future larger-scale research such as RCTs will be needed to confirm this finding.

The results of this systematic review are based on the comparatively small number of included studies. Our findings may help lead to more larger-scale rigorous analysis to substantiate the effectiveness of yoga interventions on arm volume changes, both in patients diagnosed with BCRL and in those at risk of BCRL. Based on the included studies, the types of yoga methods varied, but yoga intervention consisted of the same comparable main procedures including breathing exercises, postures and meditation practices. Narahari *et al.* [5] claimed that yoga plays a constant role in manual lymph drainage (one treatment for BCRL), as in Foldi's method of traditional lymphatic therapy. Loudon *et al.* [16] explained why yoga could enhance lymphedema status through its practices. Firstly, the slow and deep breaths can result in pressure changes that can help drain the lymphatic system at the lymphatic and thoracic ducts. Secondly, the posture procedure could help facilitate lymph drainage, as well. Finally, meditation practice could lead to internal awareness and help with the acceptance of the present scenario.

Although the advantages of yoga on arm volume changes have not been proven in this systematic review, previous papers reported positive effects on psychological health in patients with breast cancer [7,17]. Yoga has been accepted as a holistic approach through the combination of body, breath and mind to promote the health and well-being of patients [18]. A previous literature review by Danhauer *et al.* [19] reported that yoga may help to improve mental health, such as distress, mood and anxiety, as well as help to improve physical health, such as sleep, fatigue and quality of life. Similarly, McKivigan [20] reported that yoga has both medical and psychological advantages for patients. He pointed out that the medical advantages included improved sleep, a stronger immune system, better pain management, standardized endocrine function, increased musculoskeletal strength, attenuated pressure levels, enhanced balance and a more relaxed nervous system. The psychological advantages included self-acceptance, reduced anxiety and depression, reduced aggression, improved impulse control and healthy coping approaches.

Therefore, healthcare providers can still encourage patients to practice yoga as it has medical and psychological benefits. To ensure safety for patients with BCRL and patients at risk of BCRL while practicing yoga, yoga classes should be taught by certified yoga practitioners. Also, all yoga teachers helping BCRL patients would benefit from knowing more about lymphedema, such as a basic knowledge of the pathophysiology of BCRL, BCRL treatment and also on the precautions to help prevent the emergence or exacerbation of lymphedema [16]. Additionally, as yoga practice may be a complicated intervention with varied components and techniques, it ought to be tailored to individual needs [21]. Another concern was that yoga is a complementary intervention as a self-care tool for BCRL, not a replacement treatment for the main BCRL treatment (complete decongestive therapy). Therefore, adherence to the main treatment (CDT) ought to be maintained and any negative effects should be immediately reported to healthcare providers [16].

Finally, with regard to the duration of yoga practice in each form, it can be seen that the duration period in practicing yoga ranged from 4 to 12 weeks and was composed of a yoga class with a home program [11–15]. Unfortunately, only one of the studies, the eight weeks of the Hatha yoga program, reported a positive outcome for reducing arm volume [15]. In addition, in one study using the Ashtanga yoga method, the authors reported that arm volume increased at Week 12 in the intervention group [14]. So, future research to examine an

appropriate duration time for yoga practice in patients with BCRL and patients at risk for BCRL is needed.

Conclusion

In conclusion, based on this systematic review, it is possible that yoga alone may not be a sufficiently powerful tool for BCRL management in terms of arm volume alterations, both in patients with BCRL and in patients at risk for BCRL. However, it is difficult to determine whether yoga is an effective or ineffective management strategy for BCRL due to the small sample sizes and the limited number of studies available. In addition, the yoga programs in all the included studies were composed of both a yoga class led by a yoga teacher and then followed up by a home class. The rate of adherence to yoga practice at home might be one factor to be considered. Thus, confirmation with further rigorous study is needed. More importantly, we recommend that the yoga practice should be carried out or supervised by a certified yoga trainer and that patients should be encouraged to continue suitable self-care, such as manual lymphatic drainage, compression, skin care and exercise.

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