



DOI: 10.32768/abc.6027491830-572



A Systematic Scoping Review on the Effect of Oncoplastic Surgery on Arm Lymphedema

Cecilie Mullerup Laustsen-Kiel^{a,b}, Laura Hansen^b, Sahar Vanessa Amiri^b, Tove Holst Filtenborg Tvedskov^{c,d}, Tine Engberg Damsgaard^{e,f}

^aDepartment of Plastic and Breast Surgery, Roskilde, Zealand University Hospital, Roskilde, Denmark

^bDepartment of Plastic Surgery and Burns Treatment, Copenhagen University Hospital, Copenhagen, Denmark

^cFaculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark

^dDepartment of Breast Surgery, Gentofte Hospital, Gentofte, Denmark

^eDepartment of Plastic Surgery, Odense University Hospital, Odense 5000 and University Hospital of Southern Denmark, SLB-Vejle, Denmark

^fDepartment of Regional Health Research, University of Southern Denmark, Vejle, Denmark

ARTICLE INFO

ABSTRACT

Received:
5 July 2025
Revised:
23 July 2025
Accepted:
23 July 2025

Keywords:
oncoplastic surgery,
breast neoplasms,
lymphedema, scoping
review, long-term adverse
effects

Background: With 2.3 million new breast cancer cases globally in 2020 and advances in treatment, the focus has shifted to managing long-term complications such as arm lymphedema. While oncoplastic breast surgery is increasingly used to enhance cosmetic outcomes, its effect on arm lymphedema remains unclear. However, the manipulation of breast tissue and increased vascular and lymphatic disruption raise concerns about an elevated risk of postoperative lymphedema. This scoping review explores the existing literature on oncoplastic breast surgery and arm lymphedema.

Methods: This review is part of a systematic review registered in PROSPERO, focusing on lymphedema outcomes. The systematic search identified 4185 publications, with 4 studies meeting the inclusion criteria for oncoplastic surgery and arm lymphedema. Transforming to a scoping review, an additional study was included, totaling 5 studies. Data were extracted on study design, population, type of surgery, lymphedema measurement, and risk factors. Citations and screening were managed using Covidence.

Results: The 5 studies included 1532 patients with follow-up periods ranging from 12 months to 7.4 years. Lymphedema rates for oncoplastic breast-conserving surgery (OBCS) varied between 0% and 11%, with an overall rate of 6.7%.

Conclusion: Due to inconsistent reporting and a lack of long-term follow-up data, no definitive conclusions regarding the risk of arm lymphedema related to oncoplastic breast surgery could be drawn. Future prospective studies with standardized lymphedema measurements and specific evaluations of oncoplastic breast surgery techniques are needed. Addressing these gaps is crucial for improving patient outcomes and guiding clinical decisions.

Copyright © 2025. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non-Commercial 4.0](https://creativecommons.org/licenses/by-nc/4.0/) International License, which permits copy and redistribution of the material in any medium or format or adapt, remix, transform, and build upon the material for any purpose, except for commercial purposes.

INTRODUCTION

One in 10 Danish women have breast cancer during their lifetime^{1, 2}, with 2.3 million new cases globally in 2020³, making breast cancer the most frequent cancer among women. Advances in treatment have significantly improved survival rates⁴, shifting attention toward managing long-term complications

*Address for correspondence:

Mrs. Cecilie Mullerup Laustsen-Kiel,
Department of Plastic Surgery and Burns Treatment,
Copenhagen University Hospital, Inge Lehmannsvej 8,
2100, Denmark.
Email: Cecilie.mullerup.laustsen-kiel@regionh.dk



such as arm lymphedema.^{5,6} Various factors influence the incidence of arm lymphedema, including the type of surgery, body mass index (BMI), and adjuvant therapy.⁷ Furthermore, lymphedema is linked to chronic pain, fatigue, heaviness, and functional impairments, which profoundly impact the patient's quality of life and sleep quality.⁸⁻¹²

A recent systematic review including 2 343 878 patients found that breast-conserving surgery combined with radiotherapy is associated with improved survival compared to mastectomy.¹³ Specifically, the findings indicate that breast-conserving surgery for patients with early-stage breast cancer remains consistent, regardless of whether mastectomy is performed with or without radiotherapy. Consequently, this recent advancement may increase the demand for oncoplastic reconstruction as patients and clinicians aim to optimize oncologic outcomes in breast cancer treatment.

Although a study found aesthetic outcomes to be significantly higher for breast-conserving surgery than the modified radical mastectomy group¹⁴, not all patients have satisfactory aesthetic results. Consequently, oncoplastic breast-conserving surgery (OBCS) has been increasingly adopted to enhance aesthetic outcomes following breast cancer surgery.^{15,16} OBCS integrates oncologic and reconstructive techniques and involves volume replacement, reduction, and displacement following breast-conserving surgery.¹⁷ However, despite the rising popularity and demonstrated aesthetic benefits of OBCS¹⁸, the impact of this approach on the development of arm lymphedema remains unclear.

The incidence of arm lymphedema following breast cancer surgery is highly variable (4% to 40%) and depends on factors such as surgical technique, extent of axillary intervention, and adjuvant therapies.⁷ While the risk factors for lymphedema following conventional breast-conserving therapy and mastectomy are relatively well-documented, the incidence and contributing factors following OBCS remain poorly defined. Some studies suggest that the extensive tissue rearrangement in OBCS could disrupt lymphatic pathways, increasing the risk of arm lymphedema. For example, Oberhauser *et al.* found a higher incidence of chronic pain and lymphedema in OBCS patients compared to conventional breast-conserving surgery, highlighting a potential link between tissue manipulation and lymphatic disruption.¹⁹

Notably, OBCS allows for more extensive tumor excision with immediate volume replacement or redistribution, potentially reducing the need for mastectomy while improving cosmetic results.¹⁵ Indeed, manipulating breast tissue and the potential

for increased vascular and lymphatic disruption raise concerns about elevated risks of postoperative lymphedema. Although previous research has explored arm morbidity after oncoplastic surgery²⁰, there is a lack of comprehensive evidence regarding its effect on arm lymphedema.

Given the physiological mechanisms involved in arm lymphedema, it is plausible to hypothesize that OBCS may contribute to a different risk of lymphedema compared to other surgical techniques that involve more manipulation of breast tissue with the inherent lymphatic structures. However, various techniques are used for OBCS, where adjacent tissues (perforator flaps) reconstruct the missing part of the breast. This could perhaps alleviate the inherent risk of lymphedema as a consequence of axillary surgery/staging. An example is the latissimus dorsi flap, which has been suggested to serve as a lymphatic bridge as it traverses the axillary region²¹, where lymph node surgery and radiation impair lymphatics. With confirmed lymphedema risk after OBCS, guidelines should update preoperative counseling and lymphatic-preserving techniques. Conversely, if OBCS demonstrates reduced lymphedema risk, this would further support its adoption as a breast-conserving strategy, offering both aesthetic and psychological benefits. Because preoperative fear of lymphedema contributes to postoperative anxiety, early education may help alleviate concerns and improve patient outcomes.²² Therefore, clarifying this relationship will enhance patient counseling and guide preventive strategies.

This scoping review systematically maps existing literature to assess reported effects of OBCS on arm lymphedema, identifying knowledge gaps to guide future research.

METHODS

This scoping review was conducted as part of a systematic review focusing on lymphedema outcomes following breast cancer surgery, with the protocol registered in the Prospective Register of Systematic Reviews (PROSPERO: CRD42024506355). Two independent authors screened all titles, abstracts, and full texts. All citations and screening were handled by Covidence (www.covidence.org). Only a limited number of studies met the inclusion criteria for oncoplastic surgery. We therefore conducted a scoping review to analyze relevant studies identified through our PROSPERO-registered systematic review, allowing for a comprehensive assessment of current evidence gaps. Through collaborative discussion, the authors developed a data-charting form to establish the variables for extraction. One author performed the data extraction, which was then independently verified by a second author. The data-



charting form was continuously updated in an iterative process. The risk of bias was assessed independently by 2 authors using the Methodological Index for Non-Randomised Studies (MINORS) tool²³ (Supplementary Table 1). The MINORS is a valid instrument designed to assess the methodological

quality of nonrandomized surgical studies, whether comparative or noncomparative; any discrepancies were resolved through discussion. The search strategy and data extraction can be seen in Table 1 and Supplementary Table 2.

Table 1. Search Strategy and Data Extraction Items

Items	Specification
Data of original and updated search	December 24, 2023. August 23, 2024.
Databases and other sources searched	PubMed, Embase (through Ovid), Cochrane Central, BASE
Search terms used	Upper extremity, upper body, arm, axilla, elbow, hand, hands, wrist, shoulder, shoulders, forearm, breast cancer-related lymphedema, BCRL AND breast reconstruction, autologous reconstruction, direct-to-implant reconstruction, two-stage implant reconstruction, two-stage implant reconstruction, oncoplastic surgery, mammoplasty, mastectomy, lumpectomy AND post-mastectomy lymphedema, lymphedema, lymphoedema, arm lymphedema, upper extremity lymphedema, arm swelling post breast cancer, breast cancer-related lymphedema, BCRL, upper body morbidity
Timeframe	PubMed and Embase: from inception to August 23, 2024 Cochrane: from inception to December 24, 2023 BASE: from 2016 to August 23, 2024
Language restrictions	None
Inclusion criteria	Studies examining lymphedema after oncoplastic surgery. Studies with a mean follow-up of a minimum of 12 months.
Exclusion criteria	Narrative reviews, meta-analyses and systematic reviews, editorials, letters, and commentary; no full text available; studies where an intervention to reduce lymphedema was investigated.
Data extraction	Study characteristics: author, year, country, study design, population description, inclusion and exclusion criteria. Type of surgery and procedures, follow-up, incidence or prevalence of lymphedema. Lymphedema measurement and diagnostic criteria for lymphedema. Patient demographics: age, body mass index, smoking status. Pathology, chemotherapy, radiotherapy, and surgical axillary intervention.

We used a descriptive approach to synthesize the extracted data. Key study characteristics were presented in tabular format (Table 2; Supplementary Table 2), while methodological gaps, patterns, and variations were analyzed through narrative synthesis.

RESULTS

The systematic search found 4185 publications (see PRISMA chart Figure 1). Four studies adhered to the original criteria from the PROSPERO protocol.²⁴⁻²⁷ In addition, 1 study, which had been excluded due to an unspecified method of measuring lymphedema, was included in this review.¹⁹ Lauritzen *et al.* studied volume replacement methods with lateral intercostal artery perforator flaps (n = 3), muscle-sparing latissimus dorsi flaps (n = 1), and volume displacement (n = 7).²⁶ Oberhauser *et al.* used tumorectomy with replacement methods or glandular flaps (Grisotti [n = 6]), oncoplastic mastopexy (Benelli [n = 70], V-

mammoplasty [n = 21], and Hemibatwing [n = 33]), and oncoplastic reduction mammoplasty (defined by the use of glandular flaps, nononcologic skin, and tissue resection).¹⁹ In the study by Gowda *et al.*, oncoplastic reduction was used but not further specified²⁴, while 2 studies did not describe the specific type of oncoplastic surgery.^{25,27} The analysis comprised 1532 patients with 510 oncoplastic surgeries from the 5 publications, with follow-up periods ranging from 12 months to 7.4 years. Assessments by MINORS yielded an average of just 53.75% of the total possible points. Key contributing factors included the absence of prospective sample size calculations in all studies, only 1 study reporting loss to follow-up²⁶, short follow-up periods, and a lack of documented pre-established study protocols. All included studies, presented in Table 2, were published after 2019.

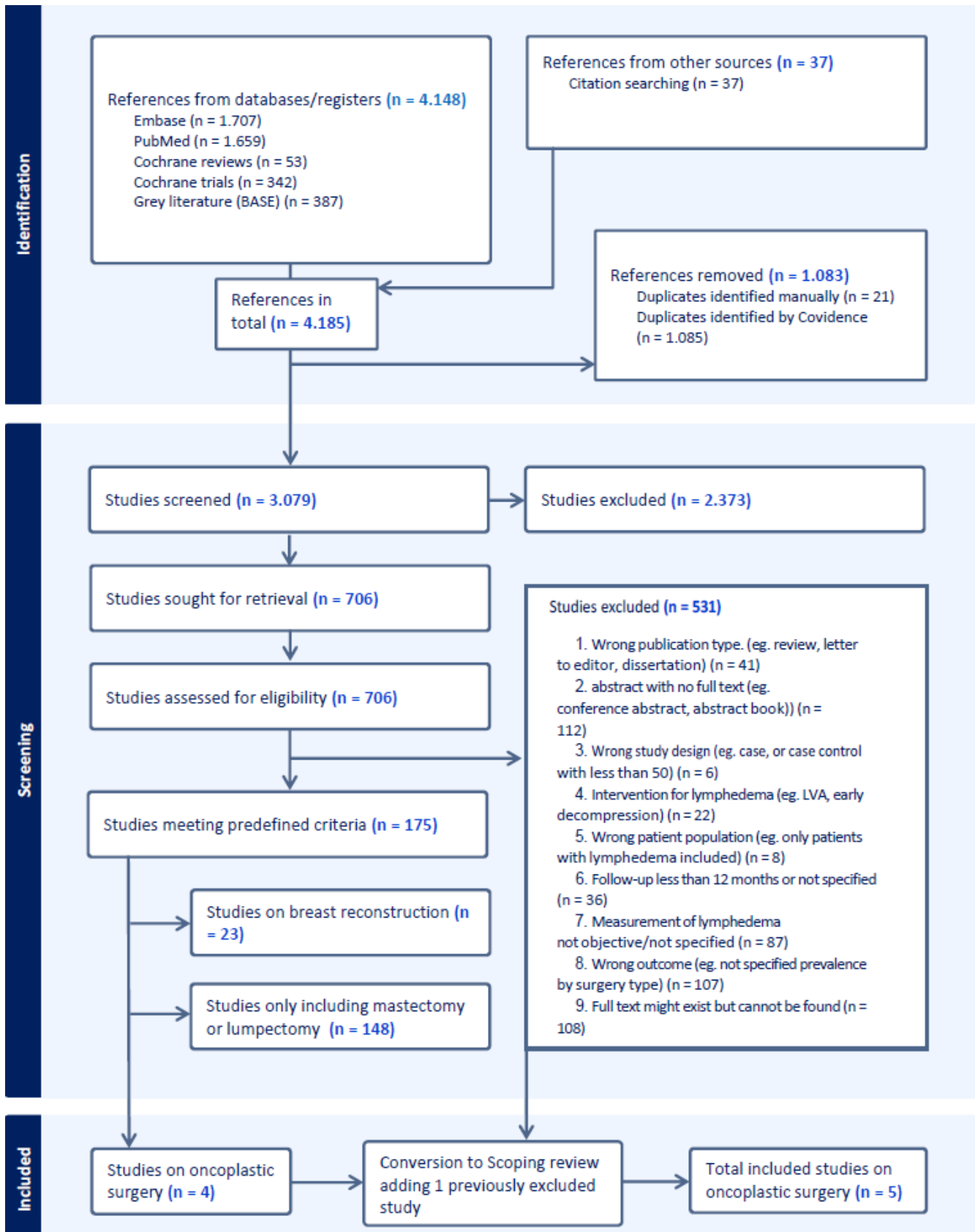


Figure 1. PRISMA Diagram

**Table 2.** Overview of Included Studies

First author, year Type of study Country	No. of participants and surgery type (patients)	Lymphedema (patients)	Follow-up	Baseline measurement	Lymphedema measurement/diagnostic criteria	MINORS score ^a and comparative study (yes/no)
Brandini da Silva <i>et al.</i> , ²⁵ 2019 Cross-sectional observational Brazil	Total: 300 OBCS: 249 BCS: 51	Total: 62 Rate: 20.7%	Mean, 7.4 y; range, 1.2–20.6 y	No	Water displacement/volume in the risk arm ≥200 mL vs nonrisk arm	8/16; no
Gowda <i>et al.</i> , ²⁴ 2021 Retrospective cohort USA	Total: 584 OBCS: 54 BCS: 529	Total: 63 Rate: 11% OBCS: 6 Rate: 11.1% BCS: 57 Rate: 10.8%	>1 y	No	If physical therapy referral was placed on clinical signs and symptoms. Multidisciplinary team (MDT) decision.	13/24; yes
Lauritzen <i>et al.</i> , ²⁶ 2023 Prospective cohort Denmark	Total: 11 OBCS: 11	Total: 0 Rate: 0%	12 mo	Yes	Bioimpedance spectroscopy (BIS) + circumference measurement/presence of lymphedema (International Society of Lymphology staging system)	11/16; no
Obi <i>et al.</i> , ²⁷ 2020 Retrospective cohort USA	Total: 201 OBCS: 8 BCS: 193	Total: 1 Rate: 0.5%	Median, 23 mo; range, 0–73 mo	Not specified	Not specified; graded according to Common Terminology Criteria for Adverse Events, version 4.0	6/16; no
Oberhauser <i>et al.</i> , ¹⁹ 2020 Retrospective cohort Switzerland	Total: 436 OBCS: 188 BCS: 95 TM: 52 NSM: 101	OBCS: 11 Rate: 5.9% BCS: 1 Rate: 1% TM: 7 Rate: 13.5% NSM: 5 Rate: 5%	Median, 22.8 mo; range, 8–40.9 mo	No	Not specified	14/24; yes

BCS, breast-conserving surgery; IORT, intraoperative radiation therapy; NSM, nipple-sparing mastectomy group; OBCS, oncoplastic breast-conserving surgery; TM, total mastectomy. BCRL, breast cancer-related lymphedema

^aMINORS score: For noncomparative studies, the maximum score is 16; for comparative studies, the maximum score is 24.



Three of the 5 studies report the rate of lymphedema related to OBCS: Gowda *et al.* report a rate of 11% (6 of 54 patients), Lauritzen *et al.* report a rate of 0% (0 of 11 patients), and Oberhauser *et al.* report a rate of 5.9% (11 of 188 patients). In total, 17 of 253 patients presented with lymphedema, resulting in an overall rate of 6.7%. Lauritzen *et al.* and Gowda *et al.* suggest that oncoplastic surgery does not significantly alter the risk of arm lymphedema compared to other surgical approaches. Oberhauser *et al.* found a potential increased long-term risk but did not describe the diagnostic criteria or measurement method of lymphedema. However, the reviewed studies did not necessarily focus on lymphedema outcomes. For example, Silva *et al.* and Obi *et al.* did not report the rate of arm lymphedema related to OBCS nor the difference between OBCS and breast-conserving surgery. Silva *et al.* aimed to validate a quality-of-life questionnaire, failing to present any lymphedema data related to oncoplastic surgery, while Obi *et al.* focused on evaluating outcomes following intraoperative radiation therapy and did not deal with lymphedema or oncoplastic surgery.

Risk factors for lymphedema are a BMI greater than 25, axillary surgery, pathology, chemotherapy, and radiotherapy.⁷ In 4 of the 5 studies, mean BMIs were reported to range from 25.7 to 29. All studies included data on axillary intervention, chemotherapy, and radiotherapy but were not necessarily related to either breast cancer-related lymphedema (BCRL) or oncoplastic surgery. Obi *et al.* and Brandini da Silva *et al.* did not report baseline values for either lymphedema vs. non-lymphedema or BCS vs OBCS. In contrast, Lauritzen *et al.* only included oncoplastic procedures²⁶, and as no patients developed arm lymphedema, no comparison was possible. Oberhauser *et al.* reported baseline values for OBCS vs BCS but not lymphedema vs. non-lymphedema. On the contrary, Gowda *et al.* did not report baseline values for OBCS vs BCS. Gowda *et al.* did, however, describe differences between the BCS and the OBCS group, as they found patients with OBCS had a higher BMI, larger breast mass removed, and were less likely to receive sentinel lymph node biopsy (SLNB) and boost radiation, although supraclavicular radiation was more common in this group. They also reported baseline values for lymphedema vs. non-lymphedema, where they found neoadjuvant therapy, high BMI, radiation, and large breast mass resection as risk factors;²⁴ only breast specimen mass, axillary radiation, and neoadjuvant therapy were significantly associated with lymphedema on multivariable analysis. Regardless of the type of breast surgery, 2 studies found a connection between axillary lymph node dissection and lymphedema.^{24, 25} Supplementary Table 3 summarizes

the data on known risk factors extracted from all 5 studies.

DISCUSSION

This review reveals a notable lack of evidence on the topic. Current data do not conclusively link OBCS to a higher or lower risk of lymphedema compared to other procedures.

The pathophysiology of lymphedema is highly complex; however, for BCRL, it essentially begins with the interruption of lymphatic flow in the arm²⁸. This results in an overload of protein-rich fluid in the interstitium, causing an inflammatory response, in which the deposition and remodeling of adipose tissue, depletion of growth factors such as vascular endothelial growth factor C (VEGF-C), and infiltration of CD4⁺ cells all contribute to chronic lymphedema.^{29,30} Although oncoplastic surgery generally spares the axillae, the impact of individual techniques on lymphedema prevalence remains unclear and warrants investigation. Unfortunately, not all studies included data on the level of oncoplastic surgery, and only Lauritzen *et al.* reported on the relationship between level of oncoplastic surgery and lymphedema outcome.²⁶

A few other risk factors for arm lymphedema were identified in the included studies, but the relationship between these and OBCS was not investigated. BMI and breast size may potentially confound arm lymphedema risk after OBCS, though the reviewed studies were not designed to assess this relationship. The findings by Lauritzen *et al.* suggest a risk of breast lymphedema rather than arm lymphedema, which has recently been explored in a study on the effect of oncoplastic surgery on breast lymphedema³¹, where an increased risk of breast lymphedema was found to be associated with an increased breast volume, but not with OBCS. The relationship between breast lymphedema and breast-conserving surgery has recently been explored in a review³², which found BMI, breast size, tumor size, tumor site, type of surgery (not further specified), and adjuvant therapy to be potential risk factors.

The study by Oberhauser¹⁹ was the only study that found oncoplastic surgery to be a potential risk factor for arm lymphedema. Our analysis revealed that 77.9% of patients in the BCS group received radiotherapy, compared to 85.6% in the OBCS group. Additionally, more patients with OBCS underwent chemotherapy compared to those with BCS in the study by Oberhauser. The higher lymphedema incidence rate found for OBCS could potentially be attributed to radiation and/or chemotherapy. Gowda *et al.* found that patients who received oncoplastic reduction were less likely to receive boost radiation ($P < 0.01$).²⁴ but were more likely to receive



supraclavicular radiation ($P = 0.04$). Radiotherapy administration rates varied across studies. Lauritzen *et al.* reported that 90.9% of OBCS patients underwent radiotherapy, while Obi *et al.* documented universal radiotherapy administration in their cohort. However, Silva *et al.* did not provide comparative data between surgical approaches.²⁷

BCRL imposes both clinical and financial burdens³³, requiring long-term management as a chronic condition. Complex decongestive therapy (CDT) is the standard conservative treatment consisting of compression garments combined with manual lymphatic drainage, skin care, patient education, and therapeutic exercise³⁴, which all require therapist involvement and often ongoing maintenance. Boyages *et al.* found the mean financial cost of conservative lymphedema treatment to be A\$977 per 12 months. A recent study found surgical treatment such as lymphaticovenous anastomosis (LVA) or vascularized lymph node transfer (VLNT) to be more cost-effective compared to CDT after 2 years postoperatively.³⁵ VLNT and LVA can both be combined with breast reconstruction^{36,37}, reducing the overall cost of surgery, although it is not known how often these procedures are combined with OBCS. Theoretically, minimizing the number of surgeries could lower overall costs to the patient and health system.

In addition, psychological factors such as fear of lymphedema play a crucial role in patient experience and quality of life. Jammallo *et al.* found that preoperative fear, younger age at diagnosis, and axillary lymph node dissection were significantly associated with higher postoperative fear of lymphedema, profoundly affecting patients' mental health and physical activity.²² Fear of lymphedema may be an underestimated factor that impacts patient recovery and adherence to recommended rehabilitation practices, emphasizing the need for targeted psychological interventions as part of routine care. This underscores the need to investigate predisposing surgical factors like OBCS, while emphasizing the importance of preoperative education and long-term psychological support for surgical breast cancer patients.

Major limitations identified across the reviewed studies are the inconsistency in measuring lymphedema and the lack of long-term follow-up data, as reflected in the low MINORS score of only 53.75%. Additionally, most studies did not specifically differentiate between various types of oncoplastic surgery, making it difficult to conclude on specific OBCS techniques and their impact on lymphedema risk. These limitations are partly due to arm lymphedema not being the main focus of the studies. All identified studies were published after

2019, indicating that this area is a relatively new field of interest and could explain the scarcity of studies on the subject. Future research is needed with a specific focus on arm lymphedema after OBCS. In particular, prospective studies are required with a larger sample size, standardized measurements of lymphedema including objective baseline measurements, and information on known risk factors for arm lymphedema as well as oncoplastic techniques used to evaluate the association between specific OBCS techniques and arm lymphedema risk.

CONCLUSION

This review identified significant knowledge gaps in the literature regarding the long-term effects of oncoplastic surgery on arm lymphedema. The majority of the studies lack detailed analyses of specific OBCS techniques, and few have evaluated the long-term incidence of lymphedema beyond the immediate postoperative period. Addressing these gaps is crucial not only for improving patient outcomes and guiding clinical decision-making but also for improving patient information and education, which can help minimize the potential fear of long-term side effects of breast cancer treatment.

ACKNOWLEDGMENTS

There are no acknowledgments to declare.

CONFLICTS OF INTEREST

All the authors declare that there are no conflicts of interest, and that they have no relevant financial or non-financial interests to disclose.

ETHICAL CONSIDERATIONS

Not applicable.

FUNDING

This work was supported by The Vissing Foundation (Grant No. 519140 AHO/LAX) and The Region Zealand Health Scientific Research Foundation, grant number R46-A2289. The sponsors had no involvement in the study design, collection, analysis, or interpretation of the data, in writing the manuscript, or in the decision to submit the manuscript for publication.

DATA AVAILABILITY

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

AI DISCLOSURE

The authors did not use any artificial intelligence tools in the search, analysis, or writing processes of



this scoping review. All content was prepared and verified by the authors.

AUTHOR CONTRIBUTIONS

CEMK and LH contributed to the study's conception and design; acquisition, analysis, and interpretation of data; and drafting of the manuscript.

THFT and TED contributed to the study's conception and design and provided critical revision of the manuscript for important intellectual content. SVA contributed to the acquisition, analysis, and interpretation of data. All authors read and approved the final manuscript.

REFERENCES

1. Cancer Today - The International Agency for Research on Cancer, Available from: <https://gco.iarc.who.int/today/files/803/pie.html>
2. Larønningen S AG, Bray F, Dahl-Olsen ED, Engholm G, Ervik M, Guðmundsdóttir EM, et al. Available from: <https://nordcan.iarc.fr/>
3. Arnold M, Morgan E, Rumgay H, Mafra A, Singh D, Laversanne M, et al. Current and future burden of breast cancer: Global statistics for 2020 and 2040. *Breast* 2022; 66: 15-23. doi: 10.1016/j.breast.2022.08.010.
4. Storm HH, Engholm G, Hakulinen T, Tryggvadóttir L, Klint A, Gislum M, et al. Survival of patients diagnosed with cancer in the Nordic countries up to 1999–2003 followed to the end of 2006. A critical overview of the results. *Acta Oncologica* 2010; 49: 532-544. doi: 10.3109/02841861003801148.
5. Levangie PK and Drouin J. Magnitude of late effects of breast cancer treatments on shoulder function: a systematic review. *Breast Cancer Res Treat* 2009; 116: 1-15. 20081125. doi: 10.1007/s10549-008-0246-4.
6. Carr HM, Patel RA, Beederman MR, Maassen NH, Hanson SE. Risk Factors for Upper Extremity Impairment after Mastectomy: A Single Institution Retrospective Review. *Plast Reconstr Surg Glob Open* 2024; 12: e5684. 20240724. doi: 10.1097/gox.0000000000005684.
7. Shen A, Lu Q, Fu X, Wei X, Zhang L, Bian J, et al. Risk factors of unilateral breast cancer-related lymphedema: an updated systematic review and meta-analysis of 84 cohort studies. *Support Care Cancer* 2022; 31: 18. doi: 10.1007/s00520-022-07508-2.
8. Penha TR, Botter B, Heuts EM, Voogd AC, von Meyenfeldt MF, van der Hulst RR. Quality of Life in Patients with Breast Cancer-Related Lymphedema and Reconstructive Breast Surgery. *J Reconstr Microsurg* 2016; 32: 484-490. 20160226. doi: 10.1055/s-0036-1572538.
9. Leysen L, Beckwée D, Nijs J, Pas R, Bilterys T, Vermeir S, et al. Risk factors of pain in breast cancer survivors: a systematic review and meta-analysis. *Support Care Cancer* 2017; 25: 3607-3643. doi: 10.1007/s00520-017-3824-3.
10. Kibar S, Dalyan Aras M and Ünsal Delialioğlu S. The risk factors and prevalence of upper extremity impairments and an analysis of effects of lymphoedema and other impairments on the quality of life of breast cancer patients. *Eur J Cancer Care (Engl)* 2017; 26. doi: 10.1111/ecc.12433.
11. Soltanipur M, Yarmohammadi H, Abbasvandi F, Montazeri A, Sheikhi Z. Sleep quality and risk of obstructive sleep apnea among breast cancer survivors with and without lymphedema. *Sleep and Breathing* 2024; 29: 41. doi: 10.1007/s11325-024-03223-w.
12. Soltanipur M, Yarmohammadi H, Shahshenas S, et al. The Relationship Between Upper-Limb Lymphedema and Fatigue Among Breast Cancer Survivors. *European Journal of Cancer Care* 2024; 2024: 3452139. doi:10.1155/ecc/3452139.
13. Christiansen P, Mele M, Bodilsen A, Rocco N, Zachariae R. Breast-Conserving Surgery or Mastectomy?: Impact on Survival. *Ann Surg Open* 2022; 3: e205. 20221005. doi: 10.1097/AS9.0000000000000205.
14. Yang X, Lin Q and Wang Q. The impact of breast-conserving surgery and modified radical mastectomy on postoperative wound complications in patients with early breast cancer. *International Wound Journal* 2024; 21: e14685. doi:10.1111/iwj.14685.
15. Clough KB, Benyahi D, Nos C, et al. Oncoplastic surgery: pushing the limits of breast-conserving surgery. *Breast J* 2015; 21: 140-146. 20150212. doi: 10.1111/tbj.12372.
16. de Oliveira-Junior I, da Costa Vieira RA, Biller G, et al. Factors associated with unsatisfactory cosmetic results in oncoplastic surgery. *Front Oncol* 2023; 13: 1071127. 20230724. doi: 10.3389/fonc.2023.1071127.
17. Chatterjee A, Gass J, Patel K, et al. A Consensus Definition and Classification System of Oncoplastic Surgery Developed by the American Society of Breast Surgeons. *Ann Surg Oncol* 2019; 26: 3436-3444. 20190411. doi: 10.1245/s10434-019-07345-4.
18. Tian R, Zheng Y, Liu R, et al. Efficacy and safety of oncoplastic breast-conserving surgery versus conventional breast-conserving surgery: An updated meta-analysis. *The Breast* 2024; 77: 103784. doi: 10.1016/j.breast.2024.103784.
19. Oberhauser I, Zeindler J, Ritter M, et al. Impact of Oncoplastic Breast Surgery on Rate of Complications, Time to Adjuvant Treatment, and Risk of Recurrence. *Breast Care (Basel)* 2021; 16: 452-460. doi: 10.1159/000511728.
20. Lautrup MD, Rindom MB and Hauerslev KR. Shoulder function following oncoplastic breast conserving surgery—a narrative review. *Gland Surgery* 2024; 13: 713-721. doi: 10.21037/gs-23-530.
21. Lee KT, Kim J, Jeon BJ, et al. Association of the breast reconstruction modality with the development of



- postmastectomy lymphedema: A long-term follow-up study. *Eur J Surg Oncol* 2023; 49: 1177-1183. doi: 10.1016/j.ejso.2023.01.027.
22. Jammallo LS, Miller CL, Horick NK, et al. Factors associated with fear of lymphedema after treatment for breast cancer. *Oncol Nurs Forum* 2014; 41: 473-483. doi: 10.1188/14.ONF.473-483.
 23. Slim K, Nini E, Forestier D, et al. Methodological index for non-randomized studies (minors): development and validation of a new instrument. *ANZ J Surg* 2003; 73: 712-716. doi: 10.1046/j.1445-2197.2003.02748.x.
 24. Gowda AU, Nie J, Mets E, et al. Risk Factors for Lymphedema After Breast Conservation Therapy and Oncoplastic Reduction. *Ann Plast Surg* 2021; 87: 248-252. doi: 10.1097/SAP.0000000000002630.
 25. Brandini da Silva FC, José da Silva J, Sarri AJ, et al. Comprehensive Validation Study of Quality-of-Life Questionnaire Using Objective Clinical Measures: Breast Cancer Treatment Outcome Scale (BCTOS), Brazilian Portuguese Version. *Clinical Breast Cancer* 2019; 19: e85-e100. doi: 10.1016/j.clbc.2018.10.004.
 26. Lauritzen E, Bredgaard R, Laustsen-Kiel CM, et al. Indocyanine green angiography in oncoplastic breast surgery, a prospective study. *J Plast Reconstr Aesthet Surg* 2023; 85: 276-286. 20230717. doi: 10.1016/j.bjps.2023.07.022.
 27. Obi E, Tom MC, Manyam BV, et al. Outcomes with intraoperative radiation therapy for early-stage breast cancer. *The Breast Journal* 2020; 26: 454-457. doi: 10.1111/tbj.13574.
 28. Executive Committee of the International Society of L. The diagnosis and treatment of peripheral lymphedema: 2020 Consensus Document of the International Society of Lymphology. *Lymphology* 2020; 53: 3-19.
 29. Ogata F, Fujiu K, Matsumoto S, et al. Excess Lymphangiogenesis Cooperatively Induced by Macrophages and CD4⁺ T Cells Drives the Pathogenesis of Lymphedema. *Journal of Investigative Dermatology* 2016; 136: 706-714. doi: 10.1016/j.jid.2015.12.001.
 30. Ghanta S, Cuzzzone DA, Torrisi JS, et al. Regulation of inflammation and fibrosis by macrophages in lymphedema. *American Journal of Physiology-Heart and Circulatory Physiology* 2015; 308: H1065-H1077. doi: 10.1152/ajpheart.00598.2014.
 31. Rama S, Atisha D, Evangelista M, et al. The Effect of Oncoplastic Reduction on The Incidence of Post-Operative Lymphedema in Breast Cancer Patients Undergoing Lumpectomy. *International Journal of Radiation Oncology, Biology, Physics* 2020; 108: e45. doi: 10.1016/j.ijrobp.2020.07.1085.
 32. Abouelazayem M, Elkorety M and Monib S. Breast Lymphedema After Conservative Breast Surgery: An Up-to-date Systematic Review. *Clinical Breast Cancer* 2021; 21: 156-161. doi: 10.1016/j.clbc.2020.11.017.
 33. Yarmohammadi H, Soltanipur M, Shahrabi Farahani M, et al. Financial burden of lymphedema among breast cancer survivors in Iran: A qualitative study. *J Med Vasc* 2024; 49: 203-210. 20240919. doi: 10.1016/j.jdmv.2024.09.001.
 34. Rafn BS, Bodilsen A, von Heymann A, et al. Examining the efficacy of treatments for arm lymphedema in breast cancer survivors: an overview of systematic reviews with meta-analyses. *EClinicalMedicine* 2024; 67: 102397. 20231222. doi: 10.1016/j.eclinm.2023.102397.
 35. Nuwayhid R, Langer S and von Dercks N. Cost comparison of conservative vs. surgical treatment of chronic lymphedema. *Chirurgie (Heidelb)* 2025; 96: 41-47. 20240628. doi: 10.1007/s00104-024-02123-9.
 36. Lilja C, Madsen CB, Damsgaard TE, et al. Surgical treatment algorithm for breast cancer lymphedema-a systematic review. *Gland Surg* 2024; 13: 722-748. 20240527. doi: 10.21037/gd-23-503.
 37. Drobot D and Zeltzer AA. Surgical treatment of breast cancer related lymphedema-the combined approach: a literature review. *Gland Surg* 2023; 12: 1746-1759. 20231222. doi: 10.21037/gd-23-247.

How to Cite This Article

Laustsen-Kiel CM, Hansen L, Amiri SV, Tvedskov THF, Damsgaard TE. A Systematic Scoping Review on the Effect of Oncoplastic Surgery on Arm Lymphedema. Arch Breast Cancer. 2025; 12(4):392-400.
Available from: <https://www.archbreastcancer.com/index.php/abc/article/view/1162>