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Review

## Breast reconstruction and risk of arm lymphedema development: A meta-analysis

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### KEYWORDS

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**Summary Background:** Lymphedema remains a significant complication following breast cancer surgery when there is axillary lymph node intervention. Previous systematic reviews have identified risk factors for breast cancer-related lymphedema, including increased BMI, number of lymph nodes dissected and radiotherapy. However, they have not examined the effect of breast reconstruction on lymphedema occurrence. In this systematic review and meta-analysis, we sought to evaluate the association between breast reconstruction (BR) and lymphedema.

**Methods:** We searched PubMed (1966–2016), Embase (1966–2016), Scopus (2004–2016) and Google Scholar (2004–2016) for studies involving breast reconstruction and upper-extremity lymphedema or breast cancer-related lymphedema. Our primary outcome was lymphedema occurrence. We performed a meta-analysis using random effects due to heterogeneity of the studies.

**Results:** Our search strategy identified 934 articles. After screening, 19 studies were included in our meta-analysis evaluating outcomes based on number of patients (7501) or number of breasts surgically treated (2063). Breast reconstruction was significantly associated with lower odds of lymphedema ( $p < 0.001$ ) compared to mastectomy only or breast-conserving surgery. Lymphedema rates were not statistically significantly different between patients undergoing implant-based or autologous BR.

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**Conclusions:** Breast reconstruction is associated with lower rates of lymphedema compared to mastectomy only or breast conserving surgery patients. Although the study does not prove causation, we hypothesize that this association is likely due to multiple factors, including a self-selecting population and mechanisms through which BR may contribute to primary or secondary prevention of lymphedema. Further prospective studies are needed to clarify this beneficial relationship between breast reconstruction and reduced lymphedema risk.

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## Introduction

Increased patient survival and longevity following breast cancer<sup>1</sup> paired with higher breast reconstruction (BR) rates<sup>2</sup> have caused physicians and researchers to become increasingly interested in the long-term consequences of breast cancer surgery and reconstruction. Breast cancer related-lymphedema (BCRL) is a significant complication following breast cancer surgery with or without axillary lymph node dissection, occurring in approximately 166 per 1000 women who undergo mastectomy or breast conserving surgery.<sup>3</sup> More than 70% of patients who develop lymphedema are diagnosed within 3 years post-breast cancer surgery,<sup>4</sup> presenting with symptoms such as pain, swelling of the upper extremity, atrophy of the arm muscles, and decreased range of motion. Furthermore, lymphedema is associated with increased healthcare expenses, lost work days,<sup>5</sup> and significantly decreased quality of life.<sup>6</sup>

Despite the advancement of medical and surgical options, there are few effective treatments for lymphedema.<sup>7</sup> Non-operative treatment is considered the mainstay, but various surgical procedures have also showed promising outcomes.<sup>8,9</sup> However, no single treatment has been identified as ideal for all breast cancer-related lymphedema.<sup>10</sup> Risk factors include increased age, increased body mass index (BMI),<sup>11</sup> having a mastectomy, having more axillary lymph nodes dissected, and receiving radiotherapy.<sup>3,12</sup> Although nowadays more than 50% of women with mastectomy undergo breast

reconstruction,<sup>13</sup> it is unclear how BR affects the development of breast cancer-related lymphedema after axillary interventions and breast surgery is unclear.

Therefore, we systematically examined the literature for studies investigating lymphedema following breast cancer surgery with or without BR. We then conducted a meta-analysis in order to evaluate the quality and magnitude of the association between BR and lymphedema rates.

## Methods

### Literature search

We conducted this systematic review and meta-analysis according to the checklist provided by the Meta-Analysis of Observational Studies in Epidemiology (MOOSE) consensus statement<sup>14</sup> and the general guidelines suggested by the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA).<sup>15</sup> We did not register a review protocol before the completion of the study. An informationist [SS] performed the database search using the following terms: "arm", "upper extremity", "upper body", "lymphedema", "breast cancer-related lymphedema", "BCRL", "swelling", "morbidity" and "breast reconstruction". The database search included PubMed, Scopus, Embase and Google Scholar and was completed on November 11, 2016. Specific search terms and searching strategies for PubMed, Scopus, and

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