Whole Breast Edema Following Breast Cancer Surgery: A Systematic Review of Risk Factors, Diagnosis, Management and Outcomes

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INTRODUCTION

- **Breast edema** is an often overlooked yet significant and prevalent complication of breast cancer surgery and radiotherapy.
- It manifests as **swelling**, **discomfort**, and **skin changes** that can persist long after treatment, affecting both function and quality of life.
- Despite its prevalence, there is no standardised definition, diagnostic criterion, or management pathway, resulting in inconsistent reporting and limited guidance for clinicians.

OBJECTIVES

- To **systematically review** existing literature on breast edema following breast cancer surgery.
- To identify and summarise key **risk factors**, **diagnostic methods**, and **management strategies**.
- To highlight current **gaps** and propose **directions for future research** and clinical practice.

METHODOLOGY

- A systematic review was conducted in accordance with PRISMA guidance.
- Keyword search was performed across PubMed, Embase, and the Cochrane Library, studies published between January 2000 and June 2025.
- Articles with human participants undergoing breast cancer surgery with reported outcomes related to breast edema were included.
- Titles and abstracts were screened independently by two reviewers, with disagreements resolved by consensus.
- Data on study design, patient demographics, surgical approach, adjuvant therapy, diagnostic tools, risk factors, and managements strategies were extracted.

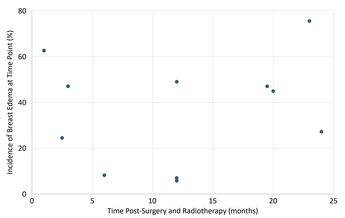
RESULTS

DEMOGRAPHICS

- 269 studies identified, **23** included.
- **3,806** female patients included.
  - Mean age: **58.5** years old.
  - Mean BMI: **27.9.**
- Incidence of breast edema: 7.1–75.5%, peaking 3–6 months post-radiotherapy.

Figure 1: Incidence of Breast Edema at Different Time Points Post-Treatment

Data collected where both incidence and mean follow-up cited in article



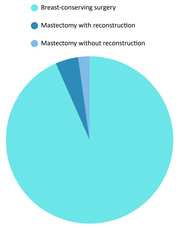
RISK FACTORS

- Breast edema is a complex manifestation of various pre-operative, peri-operative, and post-operative modifiable and non-modifiable risk factors.
- Main recognised risk factors include:
  - **High BMI,**
  - **Large breast size (>1.300 cc),**
  - **Axillary dissection,**
  - **Radiotherapy boost,**
  - **Chemotherapy.**
- These likely work synergistically, with higher BMI and large breast volume influencing impaired lymphatic drainage and increased interstitial fluid retention, whilst radiotherapy and surgical trauma increase local tissue inflammation and fibrosis.
- Additionally, patient-related factors including pre-existing lymphatic compromise, healing response and tissue composition also influence vulnerability.

Figure 2: Frequency of Reported Risk Factors



Figure 3: Surgical Interventions Undertaken



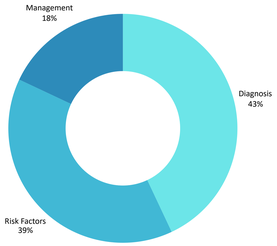
DIAGNOSIS

- **Subjective measures**: Clinical examination, Verbelen at al.'s Breast Edema Questionnaire (BrEQ)[1], Modified EORTC QLQ-BR23 questionnaire.
- **Objective measures**:
  - Dermal thickness measurements using High-Resolution Ultrasound (HRUS).
  - Tissue dielectric constant (TDC) measurements using MoistureMeterD.

MANAGEMENT

- Limited evidence to support management.
- Transient breast edema (lasting <6 months post-treatment) may not require treatment.[2]
- 12-week **structured exercise program** demonstrated no significant difference in dermal thickness, long follow-up required.[3]
- Use of **compression garments** demonstrated a 12% decrease dermal thickness.[4]
- Efficacy of **manual lymphatic drainage** massage remains unclear.

Figure 4: Distribution of Study Focus Areas



DISCUSSION

- Variable incidence of breast edema (7.1–75.5%), peaking at 3–6 months post-surgery.
- Transient edema (lasting < 6 months post-treatment) → expected post-inflammatory effect of cancer treatment, and may not require intervention.
- Persistent edema (lasting > 6 months post-treatment) → requires addressing, can negatively impact patient quality of life.
- High BMI and large breast volume consistently increase the risk of persistent breast edema.
- Radiotherapy boost and axillary dissection raise risk; mixed evidence
- Subjective diagnosis underestimates TDC and HRUS offer objective alternatives.
- Objective diagnosis → generally more reliable, TDC values >1.40 as diagnostic threshold, no global threshold for dermal thickness, some literature reports >0.3mm as diagnostic.
- Compression garments and exercise show benefit but limited long-term evidence.

AREAS OF FUTURE RESEARCH

- Future work should emphasize prospective, standardised evaluation of objective and subjective outcomes.
- Embed screening for breast edema into breast cancer follow-up protocols to enable early recognition and intervention.
- Introduction of automated ultrasound mapping and bioimpedance spectroscopy, as objective measures of breast tissue changes over time.
- Detailed investigation of biological mechanisms leading to edema including microvascular injury, lymph angiogenesis and tissue fibrosis to guide targeted interventions.

CONCLUSION

- Breast edema is a commonly overlooked yet potentially debilitating complication that may affect up to half of patients undergoing breast cancer surgery.
- When it persists, it can significantly reduce patients' emotional well-being, social functioning, physical state, and overall quality of life.
- Improved prevention, early diagnosis, and further investigation into effective treatments are essential to optimise patient outcomes.

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