Section: Surgery

Systematic Review Article

POST-SURGICAL COMPLICATIONS AND MANAGEMENT IN BREAST CANCER PATIENTS: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Breast cancer is the most common malignancy among women worldwide, with surgery serving as the primary treatment. Despite advances in surgical techniques, postoperative complications such as surgical site infection, seroma, hematoma, lymphedema, chronic pain, and shoulder dysfunction remain frequent and may adversely affect recovery and quality of life. Although various preventive and management strategies have been introduced, their effectiveness remains variable. Therefore, this systematic review evaluates the incidence, risk factors, and management of post-surgical complications in breast cancer patients to support evidence-based clinical practice. This systematic review aims to identify the incidence and spectrum of postoperative complications among patients who underwent breast cancer surgery, evaluate the associated risk factors, assess the effectiveness of perioperative preventive measures, summarize current medical, surgical, and rehabilitative management strategies, compare outcomes of different management approaches, and identify gaps in the existing literature to guide future research.

Materials and Methods: This systematic review was conducted in accordance with the PRISMA guidelines. Electronic databases (PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar) were searched for studies using the keywords breast cancer, mastectomy, axillary dissection, postoperative complications, and management. Studies published from year 2008 included in results. Eligible studies included original research articles, randomized controlled trials, observational studies, case-control studies, cohort studies and comparative studies involving patients underwent breast cancer surgery and reported postoperative complications or their management. Studies lacking relevant outcome data, conference abstracts, editorials, letters were excluded. Owing to heterogeneity in study designs and reported outcomes, the findings were synthesized narratively.

Results: Postoperative complications following breast cancer surgery were frequent and included wound infection, seroma, hematoma, lymphedema, flap loss, chronic pain, and reconstruction failure. Major risk factors were prolonged operative time, mastectomy, axillary lymph node dissection, radiotherapy, implant-based reconstruction, obesity, smoking, hypertension, and inadequate antibiotic prophylaxis. Wound complications were associated with poorer oncological outcomes, while enhanced recovery after surgery (ERAS) protocols reduced hospital stay without increasing complications. Although skin-sparing mastectomy with immediate reconstruction demonstrated favorable short-term outcomes, persistent pain, sensory disturbances, and quality-of-life impairment remained common. Overall, optimizing perioperative management, patient selection, and preventive strategies is essential to improve surgical and long-term patient outcomes.

Conclusion: Postoperative complications remain common after breast cancer surgery, with prolonged operative time, surgical site infection, lymphedema, chronic pain, and reconstruction failure being major contributors to morbidity. Although skin-sparing mastectomy with immediate reconstruction shows favorable short-term outcomes, optimized perioperative care and preventive strategies are essential. Further large-scale prospective studies with long-term follow-up are needed to improve postoperative and patient-reported outcomes.
Keywords: breast cancer, mastectomy, axillary dissection, postoperative complications, management.

INTRODUCTION

In 2018, an estimated 18.1 million new cancer cases and 9.6 million cancer deaths occurred worldwide. Lung cancer was the most commonly diagnosed cancer and the leading cause of cancer-related mortality overall, while breast cancer was the most common cancer among women (Bray F et al., 2020).[1]

Postoperative radiotherapy after lumpectomy significantly reduced ipsilateral breast recurrence (14.3% vs. 39.2%; P<0.001) without improving overall survival, supporting breast-conserving surgery with radiotherapy for patients with tumor-free margins (Fisher B et al., 2002).[2]

Adwall L et al. (2024) reported that, in a nationwide cohort of 82,102 breast cancer patients, surgical site infection occurred in 15.7% within 90 days after surgery but was not associated with systemic or locoregional recurrence or breast cancer-specific survival after adjustment. These findings suggest that surgical site infection does not significantly affect breast cancer recurrence, although minimizing postoperative complications remains important.[3]

de Boniface J et al. (2022) reported that, in a population-based cohort of 57,152 women, major postoperative surgical complications were associated with poorer overall and breast cancer-specific survival, particularly after mastectomy without reconstruction. These findings emphasize the importance of minimizing surgical complications and support less extensive surgical approaches when appropriate.[4]

Kuroi K et al. (2005) reported that the definition of seroma varies considerably across studies, and its underlying mechanism remains unclear, although dead space is considered a likely contributing factor.[5]

DiSipio T et al. (2013) reported a pooled arm lymphedema incidence of 16.6% (95% Confidence Interval [CI]: 13.6–20.2), increasing to 21.4% (95% CI: 14.9–29.8) in prospective studies. The risk was substantially higher after mastectomy and axillary lymph node dissection (19.9% vs. 5.6% after sentinel lymph node biopsy), identifying extensive surgery as a major risk factor.[6]

Lee KT et al. (2016) reported that acellular dermal matrix (ADM) use in implant-based breast reconstruction increased the risks of infection, seroma, and mastectomy flap necrosis, but reduced capsular contracture and implant malposition while improving tissue expander expansion.[7]

Srivastava V et al. (2012) reported that seroma is a common complication after mastectomy and axillary surgery. Higher body mass index, use of electrocautery, and surgical dead space increase the risk, while no preventive strategy has consistently reduced seroma formation; repeated aspiration remains the standard management.[8]

This systematic review aims to analyze the incidence, risk factors, and management of post-surgical complications in breast cancer patients based on evidence from published literature from 2008.

Objectives

This systematic review aims to determine the incidence and types of postoperative complications following breast cancer surgery, identify associated risk factors, evaluate the effectiveness of perioperative preventive interventions, summarize current medical, surgical, and rehabilitative management strategies, compare the outcomes of different treatment approaches, and highlight gaps in the existing evidence to inform future research and clinical practice.

MATERIALS AND METHODS

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive search of PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar was performed to identify studies published using combinations of the keywords breast cancer, mastectomy, axillary dissection, postoperative complications, and management. Studies published from year 2008 included in results. Eligible studies included original research articles, randomized controlled trials, prospective and retrospective observational studies, case-control studies, cohort studies and comparative studies involving patients who underwent breast cancer surgery and reported postoperative complications or their management. Studies lacking relevant outcome data, non-extractable data, conference abstracts, editorials, letters were excluded.

Titles, abstracts, and full-text articles were independently screened by two reviewers, with disagreements resolved through discussion. Data extraction and quality assessment were performed independently using standardized tools appropriate for each study design. Due to heterogeneity in study designs and outcome reporting, the findings were synthesized narratively.



Figure 1: PRISMA Flow chart of Study Selection Process

RESULTS & DISCUSSION

Montazeri A et al. (2008) reported that among 167 breast cancer patients, 82.6% underwent mastectomy. Quality of life changed significantly over 18 months (P<0.001). Although breast symptoms, treatment side effects, and future outlook improved (P<0.05), patients continued to experience complications including impaired body image, pain, arm symptoms, and reduced sexual functioning after treatment.[9]

Wu SS et al. (2023) reported that among 524 patients (802 Deep Inferior Epigastric Perforator flap [DIEP] flaps), postoperative complications occurred in 15.5%, including venous congestion (3.4%), hematoma (3.6%), infection (3.6%), partial flap loss (3.2%), total flap loss (2.3%), and arterial thrombosis (1.3%). Prolonged operative time (Odds Ratio [OR] 1.16; P=0.001) and immediate reconstruction (OR 1.92; P=0.013) independently predicted complications, with each additional operative hour increasing the overall complication risk by 16%.[10]

Beecher SM et al. (2016) reported that among 229 patients undergoing immediate breast reconstruction, 23.1% developed wound complications, including wound infection (19.2%). Patients with wound complications had a significantly higher risk of systemic recurrence (Hazard Ratio [HR] 4.94, 95% CI 2.72–8.95; P<0.001) and lower 5-year recurrence-free survival (64.0% vs. 89.2%; P<0.001) compared with those without complications.[11]

Olsen MA et al. (2008) reported that surgical site infection (SSI) risk after breast surgery was significantly increased with breast implant/tissue expander (OR 5.3; 95% CI 2.5–11.1), suboptimal antibiotic prophylaxis (OR 5.1; 95% CI 2.5–10.2), transfusion (OR 3.4; 95% CI 1.3–9.0), mastectomy (OR 3.3; 95% CI 1.4–7.7), previous chest irradiation (OR 2.8; 95% CI 1.2–6.5), and smoking (OR 2.1; 95% CI 0.9–4.9). In contrast, local anesthetic infiltration reduced SSI risk (OR 0.4; 95% CI 0.1–0.9).[12]

Tan RZF et al. (2020) reported a 9% prevalence of surgical wound infection (SWI) after breast cancer surgery. Postoperative seroma, discharge with surgical drains, and surgeon department were identified as independent predictors of SWI, whereas demographic and comorbidity factors showed no significant association.[13]

Salhab M et al. (2006) reported that after skin-sparing mastectomy with immediate breast reconstruction, flap necrosis/loss (0%), implant loss (0%), wound infection (0%), and hematoma requiring surgical evacuation (0%) were not observed, while capsular contracture requiring capsulotomy occurred in 14% of patients. During a mean follow-up of 13.5 months, there was no locoregional recurrence, 5% systemic recurrence, and 100% overall survival, with a median patient satisfaction score of 10/10.[14]

McLaughlin SA et al. (2008) reported that after breast cancer surgery (including mastectomy when performed), lymphedema occurred in 5% of patients undergoing sentinel lymph node biopsy (SLNB) alone versus 16% after SLNB with axillary lymph node dissection (ALND) (P<0.0001). Higher body weight (P<0.0001), higher BMI (P<0.0001), ipsilateral arm infection (P<0.0001), and arm injury (P=0.02) were significant risk factors for lymphedema.[15]

Vilholm OJ et al. (2009) reported that patients with chronic postoperative pain after breast cancer surgery had greater warmth detection threshold differences (3.8°C vs. 1.1°C; P=0.01), a higher frequency of cold allodynia (15/53 vs. 1/25; P=0.01), and increased temporal summation (23/53 vs. 2/25; P=0.0009) compared with pain-free patients, while dynamic mechanical allodynia did not differ significantly.[16]

Gärtner R et al. (2009) reported that 47% of women experienced persistent pain after breast cancer surgery, including 13% severe, 39% moderate, and 48% mild pain. Young age (OR 3.62; 95% CI 2.25–5.82; P<0.001), radiotherapy (OR 1.50; 95% CI 1.08–2.07; P=0.03), and axillary lymph node dissection (ALND) (OR 1.77; 95% CI 1.43–2.19; P<0.001) increased the risk of persistent pain, while sensory disturbances were strongly associated with young age (OR 5.00; 95% CI 2.87–8.69; P<0.001) and ALND (OR 4.97; 95% CI 3.92–6.30; P<0.001).[17]

Hirsch EM et al. (2012) reported that overall complications occurred in 70% of immediate expander/implant reconstructions (37% first stage, 45% second stage) and 50% of delayed reconstructions (20% first stage, 38% second stage). Approximately 60% of patients in both groups successfully completed two-stage reconstruction, with no significant differences in complication rates according to age, smoking status, BMI, or interval between radiotherapy and surgery (P>0.05).[18]

Linder S et al. (2022) reported that Enhanced Recovery After Surgery (ERAS) significantly reduced the length of hospital stay after DIEP flap breast reconstruction (4.51 vs. 6.32 days; P<0.001).

No systemic complications, flap-related complications, or flap loss occurred in either group. In the ERAS group, operative duration influenced hospital stay, whereas higher BMI prolonged hospital stay only in the non-ERAS group.[19]

Kähkönen O et al. (2025) reported that among 377 breast cancer patients receiving neoadjuvant chemotherapy, 57% developed 314 postoperative complications, most commonly seroma (65%), wound/seroma infection (13%), and wound-healing problems (6%). Higher age (OR 1.03; P=0.003), mastectomy (OR 6.45; P<0.001), and axillary lymph node dissection (ALND) (OR 2.54; P<0.001) independently increased the risk of overall complications, while hypertension was associated with chronic seroma (OR 2.26; P=0.035) and overweight with hematoma or infection (OR 1.06; P=0.012).[20]

Zhu M et al. (2024) reported that severe complications occurred in 17 of 240 breasts (7.08%) after direct-to-implant immediate breast reconstruction. Only 5 cases were successfully salvaged surgically, while the remainder required implant removal. Mesh use (OR 4.054; 95% CI 1.376–11.945; P=0.011) and post-mastectomy radiotherapy (OR 4.383; 95% CI 1.142–16.819; P=0.031) were independent predictors of severe complications.[21]

In a multi-centre study of 183 women, persistent pain after breast cancer surgery (PPBCS) occurred in 69.4% of patients. Anesthetic technique, intraoperative opioids, and adjuvant analgesics were not associated with PPBCS. However, axillary lymph node dissection significantly increased the risk of moderate-to-severe persistent pain (OR 2.04; 95% CI 1.04–4.00) (Sakai Y et al., 2025).[22]

Table: Summary of Key Findings from Included Studies

Author (Year)	Key findings
Montazeri A et al. (2008)	Quality of life improved over 18 months, but body image, pain, arm symptoms, and sexual functioning remained impaired after mastectomy.
Wu SS et al. (2023)	Postoperative complication rate was 15.5%; prolonged operative time and immediate reconstruction independently increased complication risks.
Beecher SM et al. (2016)	Wound complications (23.1%) were associated with higher systemic recurrence and poorer 5-year recurrence-free survival.
Olsen MA et al. (2008)	Breast implant, inadequate antibiotic prophylaxis, mastectomy, transfusion, radiotherapy, and smoking increased SSI risk; local anesthetic infiltration reduced risk.
Tan RZF et al. (2020)	SWI prevalence was 9%; seroma, surgical drains, and surgeon department were independent predictors.
Salhab M et al. (2006)	Skin-sparing mastectomy with immediate reconstruction showed low morbidity, high satisfaction, and favorable short-term oncological outcomes.
McLaughlin SA et al. (2008)	Lymphedema was lower after SLNB alone than SLNB+ALND; obesity, arm infection, and arm injury increased risk.
Vilholm OJ et al. (2009)	Chronic postoperative pain was associated with altered sensory processing consistent with neuropathic pain.
Gärtner R et al. (2009)	Persistent pain affected 47% of patients; young age, radiotherapy, and ALND increased risk.
Hirsch EM et al. (2012)	Implant reconstruction after radiotherapy had high complication rates but ~60% completed two-stage reconstruction successfully.
Linder S et al. (2022)	ERAS reduced hospital stay without increasing flap-related or systemic complications.
Kähkönen O et al. (2025)	Overall complication rate was 57%; mastectomy, ALND, and higher age were major risk factors.
Zhu M et al. (2024)	Severe complications occurred in 7.08%; mesh use and post-mastectomy radiotherapy were independent predictors of severe complications.
Sakai Y et al. (2025)	Persistent pain occurred in 69.4%; ALND significantly increased moderate-to-severe persistent pain risk.

CONCLUSION

Prolonged operative time significantly increased the risk of overall complications and partial flap loss after DIEP breast reconstruction, with each additional operative hour raising complication risk by 16% (Wu SS et al., 2023).[10]

Wound complications after immediate breast reconstruction were associated with poorer oncological outcomes, highlighting the importance of preventing postoperative complications (Beecher SM et al.,2016).[11]

Inadequate prophylactic antibiotic dosing, mastectomy, and implant/tissue expander placement were key risk factors for surgical site infection, highlighting the need for optimized preventive strategies (Olsen MA et al., 2008).[12]

Skin-sparing mastectomy with immediate breast reconstruction was associated with low morbidity, high patient satisfaction, and favorable short-term oncological outcomes, although larger studies with longer follow-up are needed (Salhab M et al., 2006).[14]

Sentinel lymph node biopsy alone was associated with a lower risk of lymphedema than SLNB with axillary lymph node dissection, although lymphedema remained a clinically relevant complication. Higher body weight, infection, and arm injury were significant risk factors (McLaughlin SA et al., 2008).[15]

Chronic pain after breast cancer surgery appears to be driven by altered sensory processing and is consistent with a neuropathic pain disorder (Vilholm OJ et al., 2009).[16]

Persistent pain and sensory disturbances continue to be common and clinically important long-term complications up to 2–3 years after breast cancer surgery (Gärtner R et al., 2009).[17]

Tissue expander/implant reconstruction after prior breast radiotherapy is feasible but carries a high risk of reconstruction failure, emphasizing the need for

careful patient counseling regarding risks and expected outcomes (Hirsch EM et al., 2012).[18]

Postoperative complications following breast cancer surgery remain common and significantly affect patient outcomes. Prolonged operative time, wound complications, surgical site infections, lymphedema, chronic neuropathic pain, and reconstruction failure after radiotherapy are major concerns, while skin-sparing mastectomy with immediate reconstruction generally provides favorable short-term outcomes. Optimizing perioperative care, infection prevention, and patient selection is essential to improve surgical success. Future large-scale prospective studies with longer follow-up are needed to establish effective preventive strategies and improve both clinical and patient-reported outcomes.

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REFERENCES

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018 Nov;68(6):394-424. doi: 10.3322/caac.21492. Epub 2018 Sep 12. Erratum in: CA Cancer J Clin. 2020 Jul;70(4):313. doi: 10.3322/caac.21609. PMID: 30207593.
2. Fisher B, Anderson S, Bryant J, Margolese RG, Deutsch M, Fisher ER, Jeong JH, Wolmark N. Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. N Engl J Med. 2002 Oct 17;347(16):1233-41. doi: 10.1056/NEJMoa022152. PMID: 12393820.
3. Adwall L, Fredriksson I, Hultin H, Mani M, Norlén O. Postoperative complications after breast cancer surgery and effect on recurrence and survival: population-based cohort study. BJS Open. 2024 Oct 29;8(6):zrae137. doi: 10.1093/bjsopen/zrae137. PMID: 39673757; PMCID: PMC11646125.
4. de Boniface J, Szulkin R, Johansson ALV. Major surgical postoperative complications and survival in breast cancer: Swedish population-based register study in 57 152 women. Br J Surg. 2022 Sep 9;109(10):977-983. doi: 10.1093/bjs/znac275. PMID: 35929050; PMCID: PMC10364684.
5. Kuroi K, Shimozuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S, Saito S. Pathophysiology of seroma in breast cancer. Breast Cancer. 2005;12(4):288-93. doi: 10.2325/jbcs.12.288. PMID: 16286909.
6. DiSipio T, Rye S, Newman B, Hayes S. Incidence of unilateral arm lymphoedema after breast cancer: a systematic review and meta-analysis. Lancet Oncol. 2013 May;14(6):500-15. doi: 10.1016/S1470-2045(13)70076-7. Epub 2013 Mar 27. PMID: 23540561.
7. Lee KT, Mun GH. Updated Evidence of Acellular Dermal Matrix Use for Implant-Based Breast Reconstruction: A Meta-analysis. Ann Surg Oncol. 2016 Feb;23(2):600-10. doi: 10.1245/s10434-015-4873-9. Epub 2015 Oct 5. PMID: 26438439.
8. Srivastava V, Basu S, Shukla VK. Seroma formation after breast cancer surgery: what we have learned in the last two decades. J Breast Cancer. 2012 Dec;15(4):373-80. doi: 10.4048/jbc.2012.15.4.373. Epub 2012 Dec 31. PMID: 23346164; PMCID: PMC3542843.
9. Montazeri A, Vahdaninia M, Harirchi I, Ebrahimi M, Khaleghi F, Jarvandi S. Quality of life in patients with breast cancer before and after diagnosis: an eighteen months follow-up study. BMC Cancer. 2008 Nov 11;8:330. doi: 10.1186/1471-2407-8-330. PMID: 19014435; PMCID: PMC2588619.
10. Wu SS, Raymer C, Culbert A, Schafer R, Bernard S, Djohan R, Schwarz G, Bishop SN, Gurunian R. Predictors of Complications in Autologous Breast Reconstruction Using DIEP Flaps: Implications for Management. Plast Reconstr Surg. 2023 Oct 1;152(4):566e-577e. doi: 10.1097/PRS.0000000000010343. Epub 2023 Mar 3. PMID: 36862950.
11. Beecher SM, O'Leary DP, McLaughlin R, Sweeney KJ, Kerin MJ. Influence of complications following immediate breast reconstruction on breast cancer recurrence rates. Br J Surg. 2016 Mar;103(4):391-8. doi: 10.1002/bjs.10068. PMID: 26891211.
12. Olsen MA, Lefta M, Dietz JR, Brandt KE, Aft R, Matthews R, Mayfield J, Fraser VJ. Risk factors for surgical site infection after major breast operation. J Am Coll Surg. 2008 Sep;207(3):326-35. doi: 10.1016/j.jamcollsurg.2008.04.021. Epub 2008 Jun 26. PMID: 18722936; PMCID: PMC3618680.
13. Tan RZF, Yong B, Aloweni FAB, Lopez V. Factors associated with postsurgical wound infections among breast cancer patients: A retrospective case-control record review. Int Wound J. 2020 Oct;17(5):1444-1452. doi: 10.1111/iwj.13421. Epub 2020 Jun 12. PMID: 32530562; PMCID: PMC7948699.
14. Salhab M, Al Sarakbi W, Joseph A, Sheards S, Travers J, Mokbel K. Skin-sparing mastectomy and immediate breast reconstruction: patient satisfaction and clinical outcome. Int J Clin Oncol. 2006 Feb;11(1):51-4. doi: 10.1007/s10147-005-0538-1. PMID: 16508729.
15. McLaughlin SA, Wright MJ, Morris KT, Giron GL, Sampson MR, Brockway JP, Hurley KE, Riedel ER, Van Zee KJ. Prevalence of lymphedema in women with breast cancer 5 years after sentinel lymph node biopsy or axillary dissection: objective measurements. J Clin Oncol. 2008 Nov 10;26(32):5213-9. doi: 10.1200/JCO.2008.16.3725. Epub 2008 Oct 6. Erratum in: J Clin Oncol. 2010 Apr 1;28(10):1808. PMID: 18838709; PMCID: PMC2652091.
16. Vilholm OJ, Cold S, Rasmussen L, Sindrup SH. Sensory function and pain in a population of patients treated for breast cancer. Acta Anaesthesiol Scand. 2009 Jul;53(6):800-6. doi: 10.1111/j.1399-6576.2009.01938.x. Epub 2009 Apr 27. PMID: 19397505.
17. Gärtner R, Jensen MB, Nielsen J, Ewertz M, Kroman N, Kehlet H. Prevalence of and factors associated with persistent pain following breast cancer surgery. JAMA. 2009 Nov 11;302(18):1985-92. doi: 10.1001/jama.2009.1568. Erratum in: JAMA. 2012 Nov 21;308(19):1973. PMID: 19903919.
18. Hirsch EM, Seth AK, Dumanian GA, Kim JYS, Mustoe TA, Galiano RD, Fine NA. Outcomes of tissue expander/implant breast reconstruction in the setting of prereconstruction radiation. Plast Reconstr Surg. 2012 Feb;129(2):354-361. doi: 10.1097/PRS.0b013e31823ae8b1. PMID: 22286418.
19. Linder S, Walle L, Loucas M, Loucas R, Frerichs O, Fansa H. Enhanced Recovery after Surgery (ERAS) in DIEP-Flap Breast Reconstructions-A Comparison of Two Reconstructive Centers with and without ERAS-Protocol. J Pers Med. 2022 Feb 25;12(3):347. doi: 10.3390/jpm12030347. PMID: 35330347; PMCID: PMC8954560.
20. Kähkönen O, Mustonen H, Utriainen M, Niinikoski L, Meretoja T, Sund M. Postoperative complications and their risk factors in breast cancer patients treated with neoadjuvant chemotherapy. Surg Oncol. 2025 Dec;63:102303. doi: 10.1016/j.suronc.2025.102303. Epub 2025 Oct 6. PMID: 41072147.
21. Zhu M, Mao J, Fang J, Chen D. Risk factors for severe complications and salvage management in direct-to-implant immediate breast reconstruction: A retrospective study. Medicine (Baltimore). 2024 Mar 8;103(10):e37365. doi: 10.1097/MD.0000000000037365. PMID: 38457600; PMCID: PMC10919468.
22. Sakai Y, Kobayashi A, Akata M, Tojo K, Mihara T, Yamada A, Narui K, Sugae S, Suganuma N, Goto T, Miyazaki T. Effects of anesthetic management on persistent pain after breast cancer surgery. PLoS One. 2025 Oct 9;20(10):e0333878. doi: 10.1371/journal.pone.0333878. PMID: 41066404; PMCID: PMC12510529.