



## **SURGICAL STRATEGY IN MULTICENTRIC BREAST CANCER: A COMPARATIVE ANALYSIS OF MASTECTOMY VS MASTECTOMY ON DEMAND FOLLOWING NEOADJUVANT CHEMOTHERAPY**

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### **ABSTRACT**

The management of multicentric breast cancer (MBC) has traditionally relied on total mastectomy to ensure comprehensive local control. However, the use of neoadjuvant chemotherapy (NAC) has transformed this approach by frequently achieving significant tumor downstaging or even a pathological complete response (pCR). This has spurred a critical re-evaluation of surgical strategies, moving from a standard, one-size-fits-all mastectomy to a more personalized approach. To evaluate the effectiveness of neoadjuvant chemotherapy (NAC) in downstaging multicentric breast cancer and to assess the feasibility of breast-conserving surgery compared to total mastectomy, based on pathological response and tumor characteristics. This literature review provides a comparative analysis of standard mastectomy versus a mastectomy on demand strategy for MBC patients following NAC. The review synthesizes findings from existing observational and retrospective studies to highlight key differences in oncological outcomes, cosmetic results, and patient quality of life. It also critically evaluates the current literature to identify major research gaps and areas for future investigation. The literature review draws upon a diverse selection of peer-reviewed international journals, including *Clinical Breast Cancer*, *BMC Cancer*, *NPJ Breast Cancer*, *Annals of Surgical Oncology*, and *British Journal of Surgery*. A total of 26 references were cited, with approximately 20 forming the core foundation for comparative analysis between standard mastectomy and mastectomy-on-demand strategies following neoadjuvant chemotherapy in multicentric breast cancer (MBC). References span from 2022 to 2025, reflecting reliance on recent and clinically pertinent sources. Studies were critically appraised using a narrative synthesis approach, emphasizing thematic relevance to oncological outcomes, cosmetic considerations, patient quality of life, and clinical decision-making. The review identifies key differences in surgical strategies, evaluates the role of post-NAC imaging and pathological assessment, and underscores gaps in standardized patient selection protocols and prospective clinical trials. A standard mastectomy, while a cornerstone for local control, is increasingly recognized as a maximalist approach that may be unnecessarily extensive for some patients, leading to significant psychosocial and physical morbidity. In contrast, the mastectomy-on-demand strategy leverages a favorable response to NAC to allow for less radical, aesthetically-sparing procedures. The primary challenge for this approach is the need for highly accurate post-NAC imaging and pathological assessment to ensure oncological safety and clear surgical margins. The literature reveals a notable lack of large-scale prospective trials and standardized protocols to guide patient selection for this personalized strategy. The evolving management of MBC reflects a fundamental shift towards a patient-centered approach that balances local disease control with quality of life.

Keywords: mastectomy; multicentric breast cancer; neoadjuvant chemotherapy

### **How to Cite (in APA Style)**

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## **INTRODUCTION**

Multicentric breast cancer (MBC), defined by two or more primary tumor foci in different breast quadrants, has traditionally been managed with total mastectomy to ensure complete local control and minimize recurrence risk.(Civil et al., 2025a; Rosenkranz & Boughey, 2024) However, the advent of neoadjuvant chemotherapy (NAC) has fundamentally altered this paradigm by significantly reducing tumor size or even achieving a pathological complete response (pCR).(Civil et al., 2025b; Liu, 2025) This has opened a crucial clinical question: is a radical surgical approach still the only viable option, or can the favorable response to NAC allow for a more personalized,

conservative strategy?(Zhang et al., 2022) This review will analyze two distinct post NAC surgical approaches standard mastectomy and mastectomy on demand to evaluate their respective oncological outcomes, cosmetic results, and impact on patient quality of life.(Abdelfattah & Elzohery, 2024; Civil et al., 2025c)

While the efficacy of NAC in down-staging extensive breast cancer is well-documented, a significant gap exists in the literature regarding standardized guidelines for selecting MBC patients who can safely undergo less extensive surgery.(Cardoso et al., 2024; Pawloski & Barrio, 2024a; Wang & Wu, 2023a) There is a notable lack of large-scale prospective studies that directly compare the long-term outcomes of these two surgical strategies.(Davies et al., 2024a; Iddi et al., 2025) Furthermore, a clear consensus on the specific clinical and molecular criteria needed to predict the success of a mastectomy-on-demand approach remains elusive.(Abdelfattah & Elzohery, 2024; Pawloski & Barrio, 2024a) By integrating findings from existing observational and retrospective studies, this review aims to address this research gap and establish a theoretical framework to guide future clinical trials and practice.

This article is structured to provide a comprehensive analysis of this evolving surgical landscape. We will begin with a foundational overview of MBC and the transformative role of neoadjuvant therapy. Subsequently, the core of the review will present a detailed comparative analysis of standard mastectomy versus mastectomy on demand, highlighting their respective indications, advantages, and disadvantages. The final section will discuss key clinical challenges, outline the implications for future surgical practice, and conclude with a summary of critical considerations for personalized care in MBC.

This study employed a literature review method to compare surgical strategies for multicentric breast cancer (MBC) following neoadjuvant chemotherapy (NAC). The findings indicate that standard mastectomy offers high local control but is associated with significant negative impacts on quality of life, including body image disturbance, pain, and lymphedema. In contrast, the mastectomy-on-demand approach allows for more conservative surgical options in patients who respond well to NAC, resulting in better cosmetic and psychological outcomes. However, this strategy depends heavily on the accuracy of post-NAC imaging and pathological evaluation. Notably, there is a lack of standardized patient selection protocols and large-scale prospective studies to validate this approach. The discussion highlights a paradigm shift from maximalist surgery toward personalized, response-guided strategies. While standard mastectomy remains appropriate for cases with poor NAC response or extensive residual disease, mastectomy on demand offers a balanced approach between oncological safety and quality of life. Its successful implementation requires multidisciplinary collaboration and the development of predictive algorithms based on biomarkers, imaging, and clinical data to identify suitable candidates for conservative surgery.

### **Comparative Analysis of Surgical Strategies**

The advent of neoadjuvant chemotherapy (NAC) has fundamentally altered the management of multicentric breast cancer (MBC) by creating a window of opportunity to downstage the disease and reconsider traditional surgical approaches.(Han et al., 2025; Marone, 2025) A critical analysis of the available literature reveals a paradigm shift from routine, uniform mastectomy towards a more personalized, responsive surgical strategy.(Han et al., 2025; Marone, 2025; Sun et al., 2025) This section analyzes and synthesizes current research on two key post-NAC surgical options: standard mastectomy and mastectomy-on-demand.(Altinok et al., 2025)

### **Standard Mastectomy Post NAC: The Traditional Approach**

Standard mastectomy, which involves the complete removal of all breast tissue, remains a cornerstone of treatment for MBC and primary rationale for this approach is to achieve maximal

local control, particularly in cases where the tumor size or multifocality makes breast-conserving surgery (BCS) unfeasible.(De Lorenzi et al., 2022) However, a critical evaluation of this strategy reveals a significant trade off.(Wazir & Mokbel, 2025) While it provides a high degree of oncological safety by removing all known disease foci and potentially reducing local recurrence rates, it comes at a substantial cost to the patient's quality of life.(Flindris et al., 2025) The psychological impact, body image disturbances, and potential for post-operative complications including lymphedema and chronic pain are well documented.(Wang & Wu, 2023b; Wazir & Mokbel, 2025) This approach is often considered the default for patients with limited response to NAC or extensive residual disease, but its role as the sole option is being increasingly challenged by emerging data.(Abd El-Moghny et al., 2024)

### **Mastectomy-on-Demand: A Personalized Surgical Paradigm**

The "mastectomy-on-demand" strategy represents a departure from the traditional model, focusing instead on re-evaluating the patient's surgical options after they have completed NAC.(Civil et al., 2025a; Zhang et al., 2022) This strategy is predicated on the principle that a favorable response to chemotherapy can transform an inoperable or mastectomy-only case into one where less radical surgery is possible.(Han et al., 2025; Marone, 2025) Research demonstrates that patients with a significant tumor response to NAC may become candidates for breast-conserving surgery or more aesthetically-sparing procedures like nipple-sparing or skin-sparing mastectomy.(Civil et al., 2025a; Davies et al., 2024b; Zhang et al., 2022)

The synthesis of current evidence on this approach highlights several key advantages.(Davies et al., 2024a; Pawloski & Barrio, 2024a; Zhang et al., 2022) It offers the potential for improved cosmetic outcomes, preserves breast integrity, and mitigates the psychological distress often associated with a complete mastectomy. However, this strategy is not without its challenges.(Abdelfattah & Elzohery, 2024; Liu, 2025) The primary concern is ensuring oncological safety, particularly in a disease characterized by multiple, spatially distinct tumor foci.(Civil et al., 2025a; Iddi et al., 2025) The success of this approach is highly dependent on the accuracy of post-NAC imaging and pathological assessment to confirm the extent of residual disease and ensure negative surgical margins.(Abdelfattah & Elzohery, 2024; Civil et al., 2025a; Iddi et al., 2025) The literature points to a need for robust, standardized protocols for patient selection and post-NAC evaluation, as the criteria for what constitutes a "good response" or an "eligible patient" are still under active investigation.(Cardoso et al., 2024; Iddi et al., 2025)

### **Critical Evaluation and Synthesis**

The comparative analysis of these two surgical strategies reveals a fundamental shift in oncological thinking.(Cortina, 2024; Pawloski & Barrio, 2024b) The standard mastectomy, while a proven method for local control, is increasingly seen as a maximalist approach that may not be necessary for all MBC patients in the modern era of targeted therapies.(Civil et al., 2025d; Rosenkranz & Boughey, 2024) In contrast, mastectomy on demand offers a more refined, patient-centered approach.(Zhang et al., 2022) It seeks to balance the imperative of oncological safety with the patient's desire for improved quality of life and preserved body image.(Davies et al., 2024a; Wang & Wu, 2023b) The literature suggests a clear need for a multidisciplinary approach in decision-making, where surgical oncologists, medical oncologists, radiologists, and pathologists collaborate closely to integrate clinical, imaging, and molecular data.(Cortina, 2024; Pawloski & Barrio, 2024a) The future of MBC surgery lies in moving beyond a binary choice and developing sophisticated algorithms that accurately predict which patients will benefit most from a personalized, conservative surgical plan, thereby maximizing both survival and quality of life.(Ahn et al., 2023; Cardoso et al., 2024; Iddi et al., 2025)

### **METHOD**

This study employed a narrative literature review design to evaluate and compare surgical strategies

in multicentric breast cancer (MBC) following neoadjuvant chemotherapy (NAC), specifically standard mastectomy versus mastectomy-on-demand approaches.

### **Search Strategy**

A comprehensive literature search was conducted using electronic databases including PubMed, Scopus, ScienceDirect, and Google Scholar. Keywords used in the search strategy included: “*multicentric breast cancer,*” “*neoadjuvant chemotherapy,*” “*mastectomy,*” “*breast-conserving surgery,*” “*oncoplastic surgery,*” and “*mastectomy on demand.*” Boolean operators (AND, OR) were applied to refine the search.

### **Inclusion and Exclusion Criteria**

Studies were included if they: were published between 2022 and 2025, were written in English, focused on multicentric or multifocal breast cancer treated with NAC, evaluated surgical outcomes, including oncological safety, recurrence, cosmetic outcomes, or quality of life. Exclusion criteria included: case reports or small case series, non-peer-reviewed articles, studies not specifically addressing post-NAC surgical strategies.

### **Data Extraction and Synthesis**

A total of 26 articles were selected, with approximately 20 key studies forming the basis of comparative analysis. Data extracted included: patient population characteristics, type of surgical intervention, oncological outcomes (local recurrence, survival), cosmetic outcomes, quality of life measures. A thematic narrative synthesis approach was used to analyze and integrate findings across studies. The analysis focused on identifying patterns, similarities, and differences between standard mastectomy and mastectomy-on-demand strategies.

## **RESULT**

The findings from the reviewed literature demonstrate significant differences between standard mastectomy and mastectomy-on-demand strategies in terms of oncological outcomes, cosmetic results, and patient quality of life.

### **Oncological Outcomes**

Standard mastectomy consistently provides high local control rates due to complete removal of breast tissue, making it a reliable option in patients with extensive disease or poor response to NAC. Several studies reported low local recurrence rates, particularly in patients with residual multicentric disease.

In contrast, the mastectomy-on-demand approach, when applied to patients with good response to NAC, showed comparable oncological safety, especially in selected cases achieving partial or complete tumor regression. However, variability exists due to the lack of standardized selection criteria.

### **Tumor Response and Surgical Feasibility**

NAC was shown to significantly downstage tumors, increasing eligibility for less extensive surgical procedures. Patients achieving pathological complete response (pCR) were more likely to undergo breast-conserving strategies or limited surgery.

### **Cosmetic and Quality of Life Outcomes**

Patients undergoing mastectomy-on-demand or breast-conserving approaches demonstrated: better cosmetic outcomes, improved body image, reduced psychological distress. Conversely, standard mastectomy was associated with: higher rates of body image disturbance, increased postoperative morbidity (e.g., lymphedema, chronic pain).

## **Role of Imaging and Pathology**

Accurate post-NAC imaging (MRI, ultrasound) and pathological evaluation were identified as critical determinants in guiding surgical decisions. Limitations in imaging accuracy remain a major concern, particularly in detecting residual multifocal disease.

## **DISCUSSION**

This review highlights a significant paradigm shift in the surgical management of multicentric breast cancer, driven by the increasing effectiveness of neoadjuvant chemotherapy. Traditionally, multicentric breast cancer has been considered an absolute indication for mastectomy due to concerns regarding incomplete tumor removal and high recurrence risk; however, emerging evidence suggests that tumor biology and treatment response, rather than initial tumor distribution alone, should guide surgical decision-making. The concept of mastectomy-on-demand reflects a more dynamic and individualized treatment approach in which surgery is tailored based on response to NAC, aligning with modern oncology principles that emphasize precision medicine and patient-centered care. A key advantage of this strategy is the potential to preserve breast tissue without compromising oncological safety, particularly in patients who achieve significant tumor regression, thereby improving quality of life, which is increasingly recognized as an essential endpoint in cancer treatment. Nevertheless, several challenges remain, including the lack of standardized criteria to define a “good responder” to NAC, leading to variability in clinical practice; limitations of current imaging modalities that may underestimate residual disease, especially in multicentric tumors, posing a risk of incomplete resection; and the absence of large-scale prospective trials, as most available evidence is derived from retrospective or observational studies, thereby limiting the strength of recommendations.

Furthermore, optimal implementation requires a multidisciplinary approach involving surgical oncologists, medical oncologists, radiologists, and pathologists to ensure accurate assessment and safe clinical decision-making. Future directions should focus on the development of predictive biomarkers for NAC response, integration of advanced imaging techniques and artificial intelligence-based models, and the conduct of large-scale prospective trials to validate mastectomy-on-demand strategies. Overall, the transition from a maximalist to a personalized surgical approach represents a major advancement in the management of multicentric breast cancer.

## **CONCLUSION**

The traditional approach of universal mastectomy for multicentric breast cancer (MBC) has been significantly challenged by the evolving landscape of neoadjuvant chemotherapy (NAC) and a growing emphasis on personalized, patient-centered care. This review provided a comparative analysis of standard mastectomy versus a modern "mastectomy on demand" strategy, revealing a fundamental shift in surgical philosophy. While standard mastectomy remains a reliable method for achieving local disease control, its maximalist nature may not be necessary for all patients, often coming at a high cost to their physical and psychological well-being.

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