

CLINICAL AND HISTOPATHOLOGICAL CHARACTERISTICS AND SURGICAL
MANAGEMENT OF BREAST CANCER: A CASE SERIES FROM A TERTIARY
UNIVERSITY HOSPITAL IN SYRIA: CASE SERIES¹Raja Ibrahim Almousa, ²Saja Ibrahim Almousa, ^{3*}Marimar Ahd Kabalan¹Faculty of Medicine, Al-Sham Private University, Al-Tal, Rural Damascus, Syria.²Faculty of Medicine, Al-Sham Private University, Al-Tal, Rural Damascus, Syria.³Faculty of Medicine, Al-Sham Private University, Al-Tal, Rural Damascus, Syria.***Corresponding Author: Marimar Ahd Kabalan**

Faculty of Medicine, Al-Sham Private University, Al-Tal, Rural Damascus, Syria.

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ABSTRACT

Breast cancer is a heterogeneous disease with substantial variation in clinical presentation, tumor biology, treatment response, and surgical management. This case series describes five female patients with histologically confirmed invasive breast carcinoma managed at Al-Bairouni University Hospital, Damascus, Syria, during 2026. Patients ranged from 28 to 68 years and presented with breast masses of variable size and extent. Histopathology demonstrated invasive ductal carcinoma, with heterogeneous immunohistochemical profiles, including hormone receptor-positive/HER2-positive, hormone receptor-positive/HER2-negative, triple-negative, and HER2-positive/hormone receptor-negative disease. Three patients received neoadjuvant systemic therapy before definitive surgery, including HER2-directed treatment in HER2-positive tumors. Three patients underwent mastectomy and two underwent breast-conserving surgery, with axillary surgery performed in all cases. One HER2-positive patient achieved pathological complete response, with no residual invasive carcinoma and 0/19 involved lymph nodes. The cases highlight the importance of individualized treatment based on tumor biology, disease extent, treatment response, and multidisciplinary assessment.

KEYWORDS: Breast cancer; Invasive ductal carcinoma; HER2-positive breast cancer; Triple-negative breast cancer; Neoadjuvant therapy; Breast-conserving surgery; Mastectomy; Pathological complete response.**INTRODUCTION**

Breast cancer is the most commonly diagnosed cancer among women worldwide and remains a major global health problem. Despite substantial advances in screening, diagnostic techniques, systemic therapy, radiotherapy, and surgical management, considerable variation remains in clinical presentation, tumor biology, stage at diagnosis, and treatment response among individual patients.^[1]

Breast cancer is a heterogeneous disease comprising distinct histopathological and biological entities with different clinical behavior and therapeutic requirements. Invasive ductal carcinoma is the most frequently encountered invasive histological type. Immunohistochemical assessment of estrogen receptor

(ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2), together with histological grade and assessment of proliferative activity such as Ki-67, provides important information for tumor characterization and therapeutic planning. These parameters allow tumors to be broadly categorized into clinically relevant phenotypes, including hormone receptor-positive, HER2-positive, and triple-negative breast cancer, although immunohistochemical classification does not completely capture the molecular heterogeneity of the disease.^[2-4]

The management of breast cancer requires an individualized multidisciplinary approach incorporating tumor size and extent, lymph-node status, biological characteristics, patient-related factors, and response to

systemic treatment. Surgical management may include breast-conserving surgery followed by appropriate adjuvant treatment or mastectomy, with the choice determined by the extent and characteristics of the disease and the feasibility of achieving adequate local control. Evidence from randomized trials has established breast-conserving therapy with radiotherapy as an effective treatment option for appropriately selected patients with early-stage breast cancer, while mastectomy remains an important treatment option when breast conservation is not appropriate or feasible.^[5-7]

Systemic treatment has also become increasingly individualized according to tumor biology and disease stage. Neoadjuvant chemotherapy, with or without targeted therapy, is an important component of treatment for selected patients with HER2-positive or triple-negative breast cancer and may facilitate tumor downstaging while providing an opportunity to assess treatment response. Pathological complete response following neoadjuvant treatment has particular prognostic relevance in several breast cancer subtypes.^[8-10]

In this context, case series can provide clinically relevant descriptions of the diversity of breast cancer presentations and the relationship between pathological characteristics, treatment strategies, surgical approaches, and early postoperative outcomes in real-world clinical settings. The present case series describes five patients with breast cancer managed at Al-Bairouni University Hospital, Damascus, Syria, highlighting differences in clinical presentation, radiological findings, histopathological and immunohistochemical characteristics, neoadjuvant or adjuvant treatment, surgical management, and early postoperative course.

Case Time Series Data Structure

The case series was structured chronologically according to the patients' clinical presentation, diagnostic evaluation, treatment course, surgical management, and early postoperative follow-up. For each case, data were organized into sequential clinical time points, including initial presentation, diagnostic imaging and tissue sampling, histopathological and immunohistochemical assessment, multidisciplinary treatment planning, neoadjuvant or adjuvant therapy when applicable, surgical intervention, and postoperative assessment. This structure allowed the clinical course and management pathway of each patient to be described consistently and enabled descriptive comparison of the five cases according to tumor characteristics, treatment strategy, type of surgery, pathological findings, and early postoperative outcomes. Case Time Series Data Structure.

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Linking High-Resolution Exposure Data

For each case, detailed clinical and treatment-related information was linked to the corresponding diagnostic, pathological, radiological, surgical, and postoperative records. The available data were reviewed chronologically to establish the relationship between tumor characteristics, treatment exposure, surgical intervention, pathological response, and early postoperative findings. Exposure-related variables included neoadjuvant systemic therapy, adjuvant therapy when applicable, and the type and extent of surgical treatment. This linkage was performed at the individual case level to provide a detailed description of each patient's clinical course while maintaining patient confidentiality.

Main Analysis

The main analysis was descriptive and was performed at the individual-case level. Clinical, radiological, pathological, immunohistochemical, treatment, surgical, and early postoperative findings were summarized for each patient. Continuous variables, including age and tumor size, were reported using individual values, whereas categorical variables, including tumor laterality, histological grade, hormone receptor status, HER2 status, treatment strategy, type of surgery, axillary management, pathological response, and early postoperative findings, were presented as frequencies and proportions where applicable. Given the small sample size and descriptive case-series design, no inferential statistical testing, hypothesis testing, or multivariable analysis was performed. The analysis focused on describing patterns in tumor characteristics, treatment pathways, surgical management, and early pathological and postoperative outcomes across the five cases.

Assessing Differences in Vulnerability

Differences in clinical vulnerability among the five patients were assessed descriptively based on age, comorbidities, tumor burden, lymph-node involvement, presence or absence of distant metastases, tumor biology, and treatment-related factors. Particular attention was given to features that could potentially influence diagnostic complexity, treatment selection, surgical management, or early postoperative recovery. These characteristics were reviewed at the individual-case level to identify clinically relevant differences across the

cases. Because of the small sample size and descriptive nature of the case series, no formal statistical comparison of vulnerability between patients was performed.

DISCUSSION

This case series illustrates the clinical and biological heterogeneity of breast cancer and the resulting variation in diagnostic and therapeutic pathways among patients managed at Al-Bairouni University Hospital. The five cases differed substantially in age, tumor size, receptor profile, clinical extent, response to systemic therapy, and type of definitive surgery. This heterogeneity is consistent with the contemporary understanding of breast cancer as a biologically diverse disease in which treatment decisions are guided by clinicopathological characteristics, tumor stage, receptor status, and treatment response rather than by tumor location or size alone.^[11,12]

Immunohistochemical assessment played an important role in treatment stratification in the present series. The cases included hormone receptor-positive/HER2-positive disease, HER2-negative hormone receptor-positive disease, triple-negative breast cancer, and HER2-positive hormone receptor-negative tumors. Current recommendations emphasize the importance of estrogen receptor, progesterone receptor, and HER2 assessment in determining systemic treatment strategies, particularly when neoadjuvant treatment is being considered.^[11] The variation in Ki-67 expression observed across the cases further illustrates the differences in proliferative activity, although Ki-67 should be interpreted in the context of the overall clinicopathological profile rather than as an isolated determinant of treatment.^[11]

Three patients in this series received neoadjuvant systemic treatment before definitive surgery. This approach is particularly relevant in HER2-positive and triple-negative breast cancer, where neoadjuvant therapy can provide tumor downstaging and allows pathological response to become an important component of subsequent treatment planning.^[11,13] The 28-year-old patient with triple-negative breast cancer presented with a large left breast lesion measuring approximately 9.3 × 6.6 cm and subsequently underwent neoadjuvant chemotherapy before mastectomy. The marked reduction in tumor burden described before surgery demonstrates the potential of systemic treatment to facilitate definitive local treatment in patients presenting with extensive disease.

The two HER2-positive patients who received neoadjuvant therapy also demonstrate the clinical relevance of HER2-directed treatment. Current evidence supports neoadjuvant systemic therapy combined with anti-HER2 treatment for patients with high-risk HER2-positive disease, particularly when tumors are ≥2 cm and/or there is nodal involvement.^[11,14] In the present series, the patient with HER2-positive, hormone receptor-negative disease who received trastuzumab-,

pertuzumab-, docetaxel-, and carboplatin-containing therapy achieved a pathological complete response, with no residual invasive tumor and 0/19 involved axillary lymph nodes. Although this represents an individual outcome and cannot establish treatment efficacy from a five-case series, it is consistent with the recognized association between HER2-targeted neoadjuvant treatment and higher pathological complete response rates in HER2-positive breast cancer.^[14,15]

The triple-negative case also highlights the relationship between tumor biology and neoadjuvant treatment response. Triple-negative breast cancers generally demonstrate greater sensitivity to cytotoxic chemotherapy than some other breast cancer subtypes, although clinical and pathological responses vary considerably between individual patients.^[11,16] The use of a taxane- and carboplatin-containing regimen in this patient is consistent with evidence supporting platinum incorporation into selected neoadjuvant regimens for TNBC.^[11] In this case, the clinical reduction in tumor size permitted surgical resection; however, because final pathological response data were not available, the degree of pathological response could not be established.

Surgical management varied according to the clinical and pathological characteristics of the individual tumors. Three patients underwent mastectomy, whereas two underwent breast-conserving surgery with axillary surgery. This distribution should be interpreted descriptively rather than as evidence that one surgical approach was superior to another. Contemporary evidence indicates that neoadjuvant systemic therapy can downstage selected tumors and increase the feasibility of breast-conserving surgery, particularly when adequate tumor clearance can subsequently be achieved.^[12,17] The choice between breast conservation and mastectomy remains dependent on tumor extent, response to treatment, breast-to-tumor ratio, ability to obtain clear margins, axillary status, contraindications to radiotherapy, and patient preferences.

The two patients treated with breast-conserving surgery had different clinicopathological profiles. The 68-year-old patient underwent quadrantectomy with axillary dissection for a 3-cm high-grade invasive ductal carcinoma and subsequently had clear margins with no metastatic involvement in 14 axillary lymph nodes. The 36-year-old patient underwent breast-conserving surgery after neoadjuvant systemic treatment for HER2-positive disease. These cases demonstrate that breast-conserving surgery may be considered in appropriately selected patients, including selected patients who have received neoadjuvant therapy. Published evidence indicates that breast-conserving surgery after neoadjuvant treatment can provide acceptable oncological outcomes when patients are appropriately selected and adequate local control is achieved.^[12,17,18]

Axillary management was another important component of treatment in the present series. All five patients underwent axillary dissection, although the available documentation differed regarding initial nodal status and pathological findings. The patient with the most extensive HER2-positive tumor achieved a complete nodal response after neoadjuvant therapy, with 0/19 nodes involved, while the 68-year-old patient had 0/14 involved nodes. Current approaches increasingly support individualized axillary staging and de-escalation in selected patients, particularly following neoadjuvant systemic therapy when appropriate criteria are fulfilled.^{L^[19]} However, the present series reflects the surgical practice documented for these individual patients and should not be interpreted as evidence supporting routine axillary dissection for all breast cancer patients.

The pathological complete response observed in the HER2-positive patient is clinically relevant because pCR has been associated with improved outcomes in several biologically aggressive breast cancer subtypes, particularly HER2-positive and triple-negative disease.^[15,16] Importantly, however, pCR should not be interpreted as equivalent to cure, and the absence of residual disease in the breast and sampled lymph nodes does not eliminate the need for appropriate postoperative systemic and local therapy. Conversely, residual invasive disease after neoadjuvant treatment may provide prognostic information and can influence subsequent systemic treatment decisions, particularly in HER2-positive and triple-negative disease.^[13,14]

The cases also demonstrate the importance of multidisciplinary management. Decisions regarding biopsy, receptor testing, systemic staging, neoadjuvant treatment, surgical approach, and axillary management were integrated into the overall treatment pathway. Multidisciplinary evaluation is recommended for patients receiving neoadjuvant therapy because treatment sequencing requires coordination between breast surgery, medical oncology, radiology, pathology, and radiation oncology.^[11,20] This coordinated approach is particularly important in patients with locally advanced disease or tumors with aggressive biological characteristics.

Several limitations should be considered when interpreting this case series. First, the sample consisted of only five patients from a single institution, limiting the generalizability of the observations. Second, the cases were heterogeneous with respect to age, tumor biology, stage, treatment, and surgical approach, preventing meaningful statistical comparison. Third, some clinical variables and final pathological details were not uniformly available for every patient. Finally, follow-up was limited, and therefore long-term outcomes such as local recurrence, distant recurrence, disease-free survival, and overall survival could not be assessed. Accordingly, the findings should be regarded as descriptive observations illustrating different breast

cancer presentations and management pathways rather than evidence of comparative treatment effectiveness.

Overall, this case series demonstrates the diversity of breast cancer presentations encountered in routine clinical practice and emphasizes the role of histopathology, immunohistochemistry, multidisciplinary assessment, neoadjuvant systemic therapy, and individualized surgical planning. The cases particularly illustrate the clinical relevance of HER2-positive and triple-negative tumor biology in treatment sequencing and pathological response assessment. Larger institutional series with standardized staging, complete pathological reporting, and longer follow-up would be required to evaluate treatment patterns and oncological outcomes more systematically.

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ABBREVIATIONS

BCS: Breast-conserving surgery, DCIS: Ductal carcinoma in situ, ER: Estrogen receptor, HER2: Human epidermal growth factor receptor 2, IHC: Immunohistochemistry, IDC: Invasive ductal carcinoma, MDT: Multidisciplinary team, pCR: Pathological complete response, PR: Progesterone receptor, TNBC: Triple-negative breast cancer.

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Availability of data and materials

The data supporting the findings of this case series are available from the corresponding author on reasonable request. Patient-identifying information is not publicly available to protect patient confidentiality.

Declarations

Ethics approval and consent to participate

Ethical approval for this case series was obtained from the relevant institutional ethics committee under approval number 12332026-155-MD. The study was conducted in accordance with applicable institutional and ethical requirements.

Consent for Publication

Written informed consent for publication of the clinical information and relevant images was obtained from the patients included in this case series.

Competing interests

The authors declare that they have no competing interests.

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