

ISRG JOURNAL OF CLINICAL MEDICINE AND MEDICAL RESEARCH [ISRGJCMR]



OPEN ACCESS



ISRG PUBLISHERS

Abbreviated Key Title: ISRG J Clinic.Medici.Medica.Res.

ISSN: 3048-8850 (Online)

Journal homepage: <https://isrgpublishers.com/cmmr/>

Volume – III, Issue - V (September-October) 2026

Frequency: Bimonthly



Giant Mucinous Breast Carcinoma With Axillary Metastasis: A Case Report on Diagnostic Challenges, MRI-Informed Biopsy Targeting, and Neoadjuvant Treatment Response

Caner Yıldız¹, Demet Doğan^{2*}, Erce Güler³, Serdar Arıcı⁴

¹ Department of Radiology, Division of Interventional Radiology, Faculty of Medicine, Istanbul Okan University Hospital, Istanbul.

^{2,3} Department of Radiology, Faculty of Medicine, Istanbul Okan University Hospital, Istanbul.

⁴ Department of Medical Oncology, Faculty of Medicine, Istanbul Okan University Hospital, Istanbul.

| Received: 22.09.2026 | Accepted: 23.09.2026 | Published: 26.09.2026

*Corresponding author: Demet Doğan

Abstract

Mucinous breast carcinoma (MBC) is an uncommon breast cancer subtype usually associated with favorable biology and infrequent nodal involvement, although giant heterogeneous tumors may create diagnostic and therapeutic challenges. We report a 63-year-old woman with a giant left-breast mucinous carcinoma and biopsy-proven axillary metastasis. Initial sampling was nondiagnostic, yielding only blood and fibrin. Contrast-enhanced MRI demonstrated extensive cystic-necrotic and hemorrhagic components with a discrete enhancing solid region, which was targeted during repeat ultrasound-guided core-needle biopsy and established the diagnosis. Neoadjuvant chemotherapy produced an initial partial response followed by limited further regression. Modified radical mastectomy with axillary dissection revealed substantial residual mucinous carcinoma with metastatic nodal involvement. At approximately 1 year after surgery, there was no imaging evidence of recurrence or distant metastasis. This case highlights the value of MRI-informed biopsy targeting and multimodality imaging for diagnosis and treatment-response assessment in giant heterogeneous MBC.

Keywords: mucinous breast carcinoma; giant breast tumor; breast MRI; ultrasound-guided biopsy; axillary metastasis; neoadjuvant chemotherapy

Introduction

Mucinous breast carcinoma (MBC) is an uncommon histologic subtype of invasive breast cancer, accounting for approximately 1–6% of breast malignancies and occurring predominantly in postmenopausal women [1]. It is generally associated with favorable biological characteristics, including frequent estrogen and progesterone receptor positivity, low HER2 positivity, relatively infrequent lymph node involvement, and better outcomes than invasive ductal carcinoma [1]. Nevertheless, large primary tumors with nodal metastases may occur.

The imaging appearance of MBC varies according to extracellular mucin content and tumor cellularity. Mucin-rich tumors often demonstrate high T2 signal intensity on MRI, while differences in cellularity and mucin content influence morphology and enhancement characteristics [2]. In markedly heterogeneous tumors, these features may complicate lesion characterization and representative tissue sampling. Treatment-response assessment may also be challenging because persistent mucin pools can remain after neoadjuvant therapy despite a reduction in viable tumor cellularity [3].

We present a giant, heterogeneous, node-positive MBC in which contrast-enhanced MRI identified a representative solid component for repeat ultrasound-guided biopsy after nondiagnostic initial sampling. The case also illustrates the challenges of assessing residual disease after neoadjuvant chemotherapy.

Case presentation

A 63-year-old woman presented with a hard palpable left-breast mass first noticed approximately one year earlier and gradually enlarging with marked increase in breast volume. Examination showed pronounced breast asymmetry, with a large firm mass occupying most of the breast, predominantly the upper outer quadrant, and focal ecchymotic-violaceous skin discoloration. An approximately 3-cm left axillary lymph node was palpable. Her history included surgically treated Graves disease, postoperative hypocalcemia, type 2 diabetes mellitus, asthma, and previous cholecystectomy. She had no history of smoking or alcohol use.

Mammography and ultrasonography showed a large heterogeneous solid-cystic mass occupying most of the left breast, categorized as BI-RADS 4. Initial cytologic sampling was nondiagnostic, yielding only blood and fibrin. Breast MRI was therefore performed to characterize the heterogeneous lesion and identify a suitable repeat-biopsy target.

MRI demonstrated a 119 × 73 mm macrolobulated mass with extensive cystic-necrotic components, predominant T2 hyperintensity, intrinsic T1-hyperintense areas compatible with hemorrhage, and perilesional edema. A central 36 × 25 mm solid area with polypoid projections showed avid enhancement and a type II kinetic curve. The remaining lesion was predominantly cystic-necrotic with thin peripheral and interstitial enhancement (Figure 1A). Four to five left axillary lymph nodes showed central cystic-necrotic changes; the largest measured approximately 25 mm (Figure 1B).

Targeted ultrasonography showed the heterogeneous breast mass with internal cystic/degenerative areas, measuring approximately 148 × 89 mm (Figure 1C). Abnormal left axillary nodes showed cortical thickening and internal degenerative changes; one measured approximately 35 × 18 mm (Figure 1D).

The MRI-identified enhancing solid component was targeted for repeat ultrasound-guided core-needle biopsy. Six cores were obtained using an 18-gauge needle, and two suspicious axillary nodes were sampled. Breast biopsy revealed mucinous carcinoma, while axillary-node biopsy demonstrated metastatic carcinoma consistent with the breast primary. Immunohistochemistry showed estrogen and progesterone receptor positivity (100% for both), HER2 score 0, and a Ki-67 index of approximately 20%.

Staging ¹⁸F-FDG PET/CT showed moderate uptake in the primary tumor (SUVmax 4.9) (Figure 2A) and biopsy-proven metastatic left axillary nodes (SUVmax 5.9) (Figure 2B). The largest axillary node measured approximately 2.5 cm. No distant metastases were identified. Indeterminate non-FDG-avid osseous foci were further evaluated with spinal and sacral MRI, which showed no osseous metastatic disease.

Management and outcome

Neoadjuvant chemotherapy comprised four cycles of doxorubicin and cyclophosphamide followed by four cycles of paclitaxel. Approximately 2 months after treatment initiation, ultrasonography showed regression of the primary tumor to 103 × 39 mm (Figure 2C), although metastatic-appearing axillary nodes persisted.

After four cycles of doxorubicin and cyclophosphamide, PET/CT showed further regression of the primary tumor to approximately 8.5 cm. Primary-tumor SUVmax decreased from 4.9 to 3.5 and axillary SUVmax from 5.9 to 2.1, consistent with a partial response.

After paclitaxel, MRI showed an 82 × 48 mm residual enhancing mass with multiple cystic-necrotic areas extending from the upper outer quadrant toward the inferomedial breast and suspected involvement of an approximately 4-cm superior segment of overlying skin. Enlarged left axillary nodes suspicious for residual metastases persisted, the largest measuring approximately 2 cm (Figure 2D). PET/CT showed an approximately 8-cm residual breast mass with SUVmax 3.2 (Figure 2E) and metabolically active axillary nodes with SUVmax 2.2 (Figure 2F). No substantial further reduction in tumor size or metabolic activity occurred compared with the mid-treatment PET/CT, indicating stable disease at this stage but an overall partial response from baseline.

The patient underwent left modified radical mastectomy with axillary lymph-node dissection. Surgical pathology showed an 8 × 5 cm residual mucinous carcinoma with metastatic axillary involvement. Vascular invasion was present and perineural invasion absent. HER2 remained negative, Ki-67 was 15%, and the postoperative stage was pT3N1M0.

Letrozole was initiated and adjuvant radiotherapy to the left chest wall and regional axillary area was completed. Follow-up ¹⁸F-FDG PET/CT approximately 3 months later showed no FDG-avid residual, recurrent, or metastatic malignancy (Figure 3). Mild postoperative inflammatory uptake was present in the mastectomy bed and left axilla, with expected post-radiotherapy inflammatory changes in the left upper lung. Subsequent ultrasonography showed only postoperative changes, without suspicious mass or pathologic axillary lymphadenopathy. At approximately 1 year after surgery, there was no imaging evidence of locoregional recurrence or distant metastasis.

Discussion

Mucinous breast carcinoma (MBC) is generally associated with favorable biological characteristics, including hormone-receptor positivity, low HER2 positivity, infrequent lymph-node involvement, and favorable outcomes. Nevertheless, large node-positive tumors may occur. Axillary metastasis has been reported in 10.7% of pure mucinous carcinomas compared with 52.8% of mixed tumors, with nodal status representing an important prognostic factor [4]. Our patient had an exceptionally large ER- and PR-positive, HER2-negative tumor with biopsy-proven axillary metastasis, illustrating that MBC may occasionally present as locally advanced disease. The marked intratumoral heterogeneity was a distinctive feature. Imaging findings in MBC depend on extracellular mucin content and tumor cellularity; mucin-rich tumors frequently show high T2 signal intensity, while enhancement varies with the proportions of mucin and cellular tumor [5]. In our patient, most of the mass consisted of cystic-necrotic and probable hemorrhagic components, whereas avid enhancement was concentrated within a much smaller solid polypoid region.

This heterogeneity directly affected diagnosis. Initial sampling yielded only blood and fibrin and was nondiagnostic. Contrast-enhanced MRI identified the solid enhancing component, which was targeted during repeat ultrasound-guided core-needle biopsy and established the diagnosis. Extensive hemorrhagic, cystic, and necrotic components may therefore hinder representative tissue acquisition in large heterogeneous tumors, and MRI may help identify a more suitable biopsy target.

FDG uptake in MBC varies with histologic composition and cellularity, and higher SUVmax values have been associated with aggressive features, including axillary metastasis [6]. Despite the large primary tumor, FDG uptake was only moderate, whereas metastatic axillary nodes showed greater uptake, indicating that lesion size does not necessarily reflect metabolic activity.

Response assessment after neoadjuvant therapy is also challenging because persistent tumor volume may reflect residual mucin rather than viable tumor [7]. In our patient, however, the large residual mass corresponded to substantial residual mucinous carcinoma at surgery. The initial partial response to doxorubicin and cyclophosphamide was followed by little additional improvement with paclitaxel, consistent with reports of limited response of MBC to neoadjuvant chemotherapy [8]. Persistent post-treatment mass should therefore not automatically be interpreted as acellular mucin.

Giant MBCs have previously been reported. Althman et al. described a 12 × 14 cm tumor that showed no appreciable response to neoadjuvant chemotherapy and required modified radical mastectomy, but without axillary nodal metastasis [9]. The distinctive value of our case lies in the combination of marked cystic-necrotic heterogeneity, initially nondiagnostic sampling, MRI-informed biopsy targeting, biopsy-proven axillary metastasis, and longitudinal multimodality assessment of treatment response.

The main limitation is the single-case design. Nevertheless, the case illustrates two clinically relevant challenges: extensive nonsolid components may compromise representative tissue sampling, while persistent post-treatment tumor volume may represent varying proportions of mucin and viable carcinoma. MRI

and complementary multimodality imaging may therefore assist both biopsy planning and response assessment.

In conclusion, giant heterogeneous MBC may present with nodal metastasis and limited response to neoadjuvant chemotherapy. MRI can facilitate selection of an appropriate solid biopsy target, while persistent post-treatment mass should not be assumed to represent residual mucin alone. Integration of imaging and pathology remains essential for accurate diagnosis and response assessment.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

The authors confirm that the data supporting the findings of this case report are available within the article and its references.

Ethical considerations

This case report describes standard clinical management and does not involve experimental procedures or interventions. This article followed all ethical standards for research, and informed consent was obtained from the patient for data and publication.

References

1. Zhou X, Zheng Z, Li Y, Zhao W, Lin Y, Zhang J, et al. The clinical features and prognosis of patients with mucinous breast carcinoma compared with those with infiltrating ductal carcinoma: a population-based study. *BMC Cancer*. 2021;21:536. doi:10.1186/s12885-021-08262-0.
2. Kuzmiak CM, Calhoun BC. Pure mucinous carcinoma of the breast: radiologic-pathologic correlation. *J Breast Imaging*. 2023;5(2):180–187. doi:10.1093/jbi/wbac084.
3. Zhan H, Fineberg S, Podany P, Zeng J, Wang Y, Harigopal M, et al. Pathological response in mucinous carcinoma of breast after neoadjuvant therapy—a multi-institutional study. *Hum Pathol*. 2023;142:15–19. doi:10.1016/j.humpath.2023.10.002.
4. Bae SY, Choi MY, Cho DH, Lee JE, Nam SJ, Yang JH. Mucinous carcinoma of the breast in comparison with invasive ductal carcinoma: clinicopathologic characteristics and prognosis. *J Breast Cancer*. 2011;14(4):308–313. doi:10.4048/jbc.2011.14.4.308.
5. Monzawa S, Yokokawa M, Sakuma T, et al. Mucinous carcinoma of the breast: MRI features of pure and mixed forms with histopathologic correlation. *AJR Am J Roentgenol*. 2009;192(3):W125–W131. doi:10.2214/AJR.07.4021.
6. Fujioka T, Kubota K, Kikuchi Y, Tsuchiya J, Tateishi U, Kasahara M, et al. The feasibility of using ¹⁸F-FDG-PET/CT in patients with mucinous breast carcinoma. *Nucl Med Commun*. 2018;39(11):1033–1038. doi:10.1097/MNM.0000000000000910.
7. DiDonato R, Shapiro N, Koenigsberg T, D'Alfonso T, Jaffer S, Fineberg S. Invasive mucinous carcinoma of the

breast and response patterns after neoadjuvant chemotherapy (NAC). *Histopathology*. 2018;72(6):965–973. doi:10.1111/his.13451.

8. Kılıç B, İlhan B. Response of mucinous breast carcinoma to neoadjuvant chemotherapy. *Turk J Med Sci*. 2024;54(6):1223–1229. doi:10.55730/1300-0144.5903.

9. Alothman S, Saeed S, Khan K, Ramcharan A, DePaz H. Giant mucinous carcinoma of the breast. *Cureus*. 2018;10(11):e3606. doi:10.7759/cureus.3606.

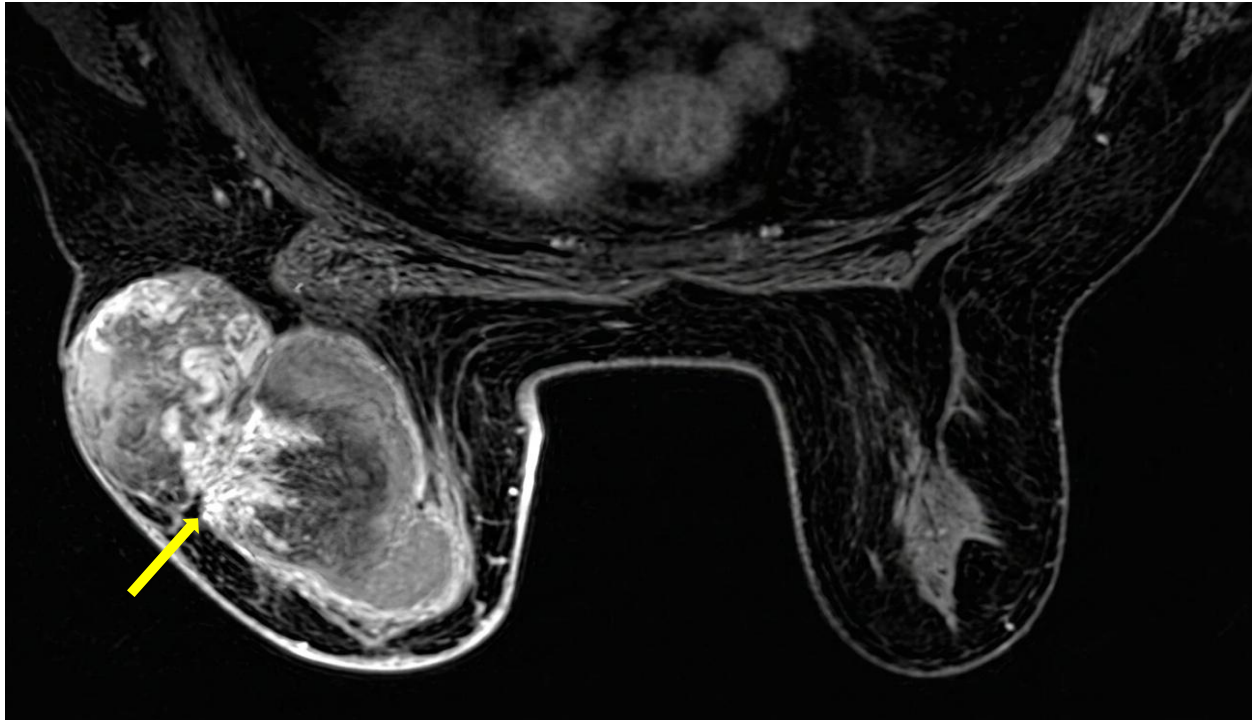


Figure 1A. Axial contrast-enhanced breast MRI demonstrates a large lobulated heterogeneous mass occupying most of the left breast, with extensive cystic-necrotic components and enhancing solid nodular areas. The solid component selected as the target for ultrasound-guided core-needle biopsy is indicated by the yellow arrow.

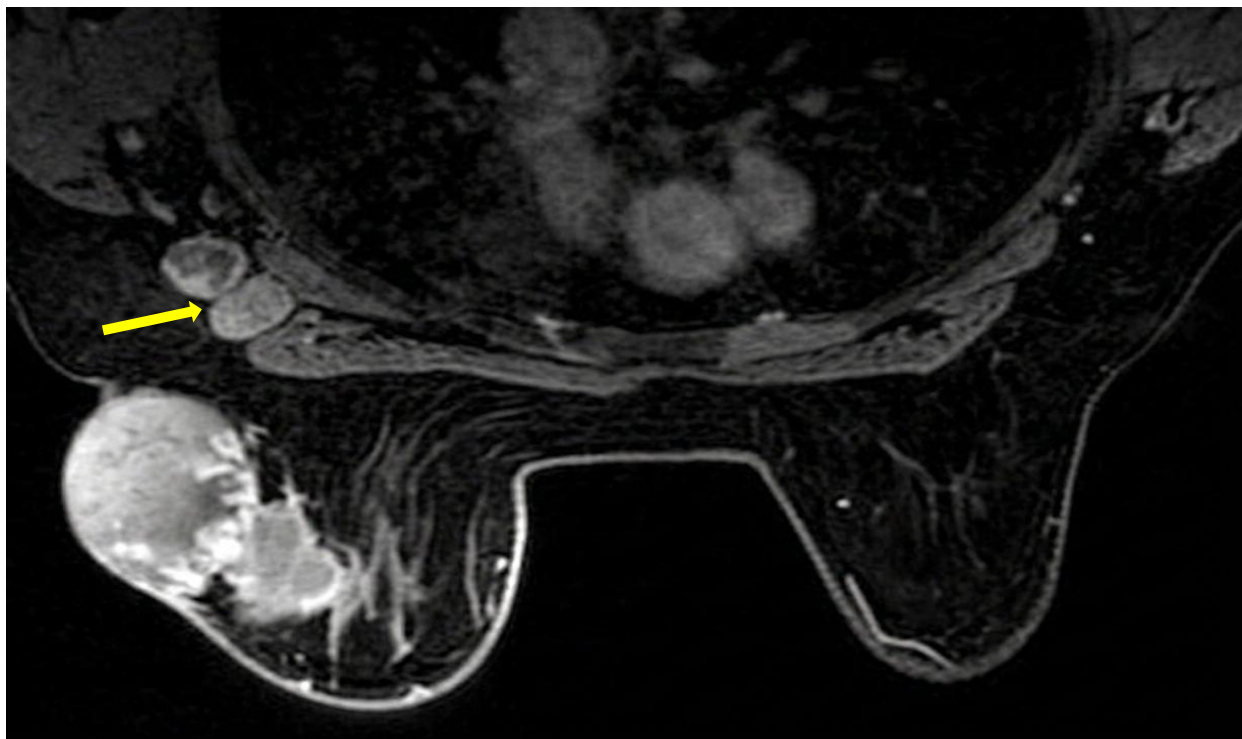


Figure 1B. Axial contrast-enhanced breast MRI demonstrates enlarged enhancing left axillary lymph nodes with cortical thickening. The abnormal lymph nodes, subsequently confirmed to contain metastatic carcinoma on ultrasound-guided biopsy, are indicated by the yellow arrows.

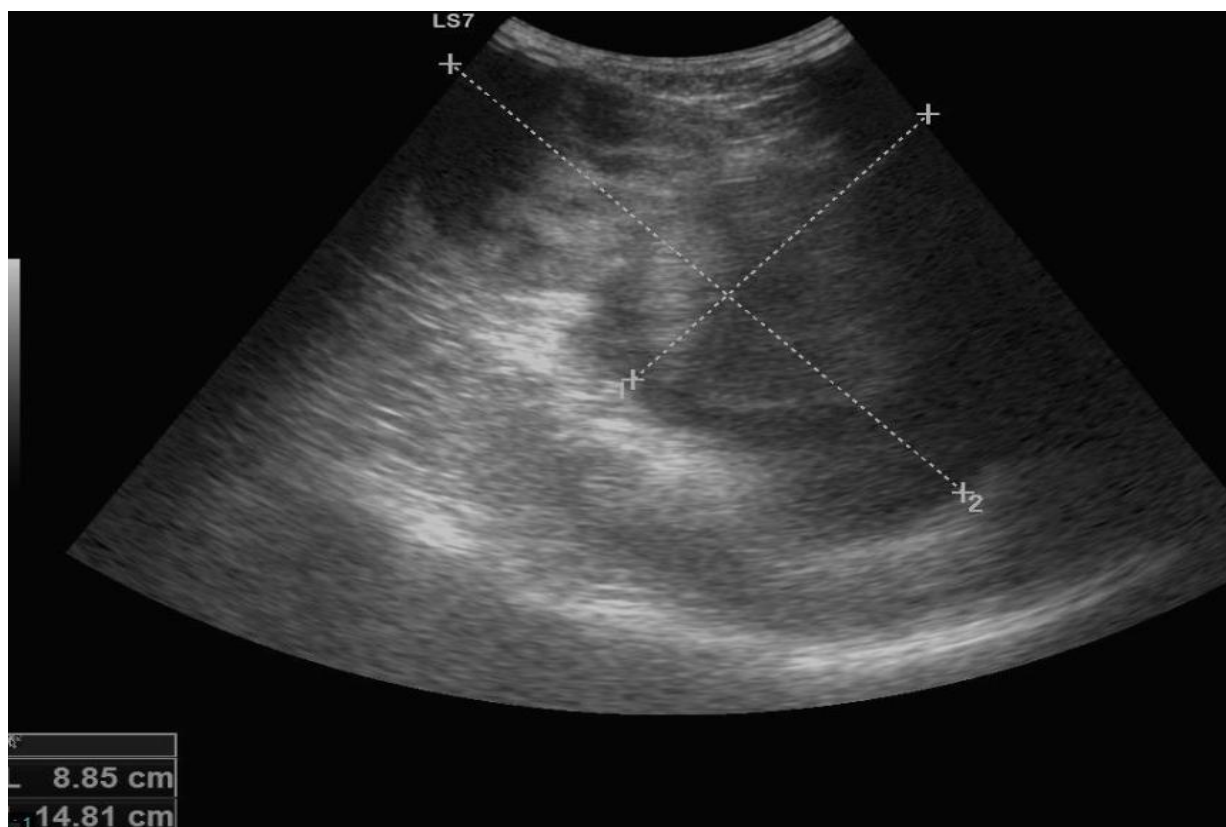


Figure 1C. Targeted ultrasonography performed before repeat biopsy demonstrates a large, irregularly margined, heterogeneous breast mass with predominantly solid components and internal cystic/degenerative areas, measuring approximately 148×89 mm.



Figure 1D. Targeted ultrasonography of the left axilla performed before repeat biopsy demonstrates a suspicious lymph node with cortical thickening and abnormal morphology, measuring approximately 35×18 mm. This lymph node was subsequently sampled under ultrasound guidance and confirmed to contain metastatic carcinoma.

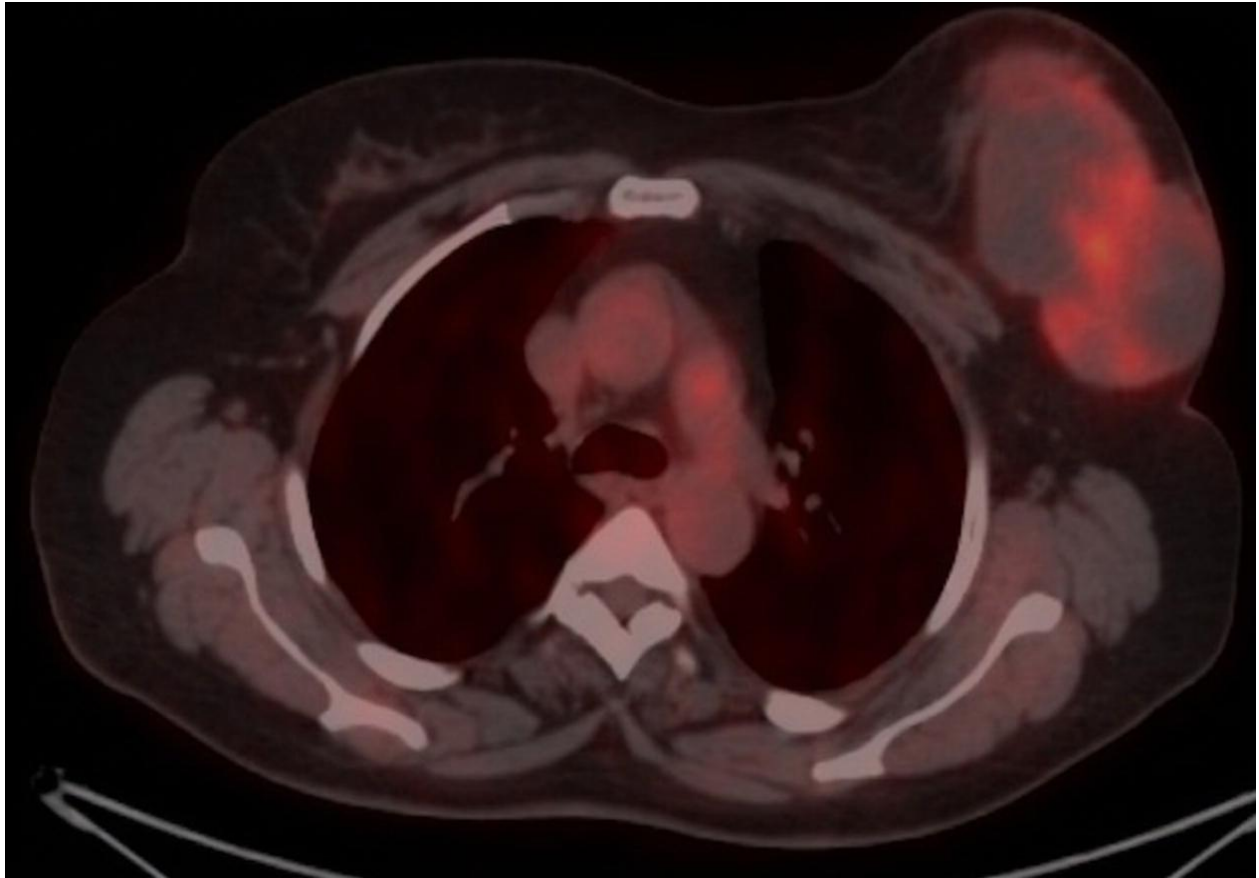


Figure 2A. Baseline ^{18}F -FDG PET/CT demonstrates moderate FDG uptake within the large left breast mass (SUVmax, 4.9).

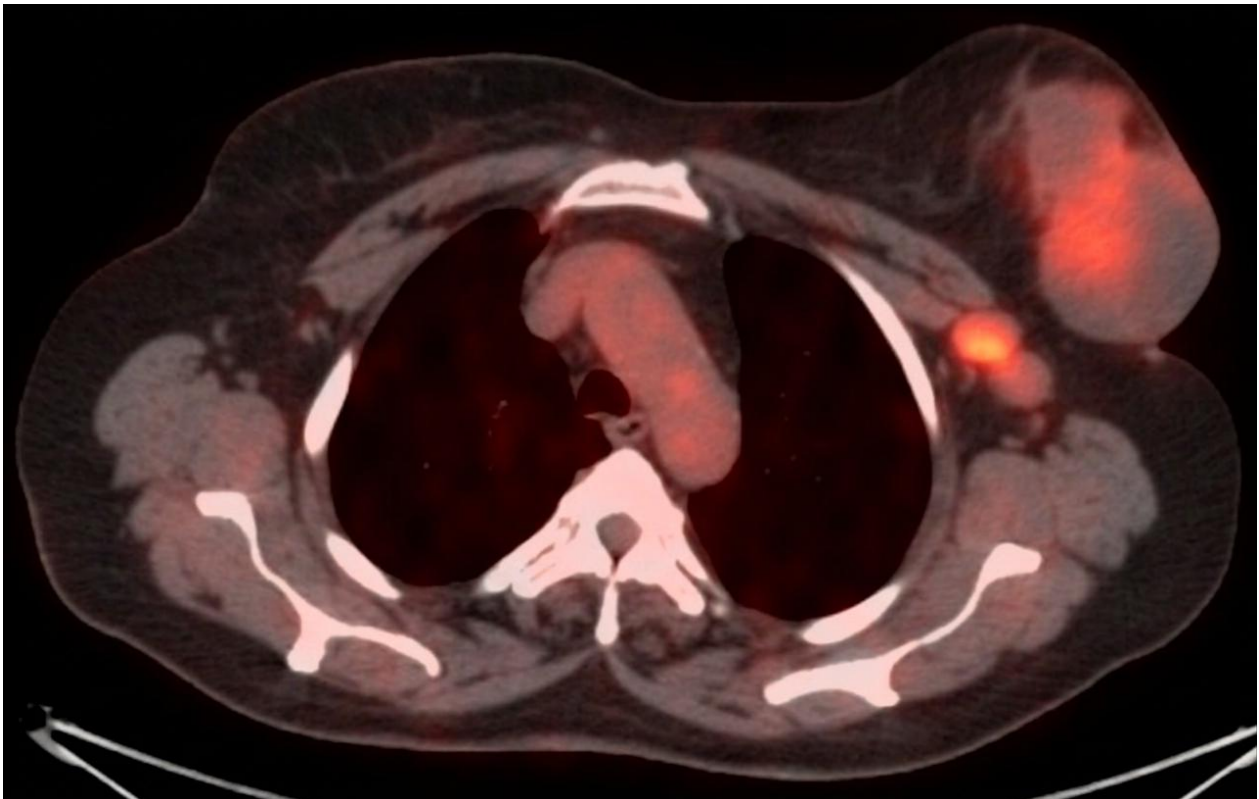


Figure 2B. Baseline ^{18}F -FDG PET/CT performed before neoadjuvant chemotherapy demonstrates an FDG-avid left axillary lymph node, consistent with metastatic nodal involvement (SUVmax, 5.9).

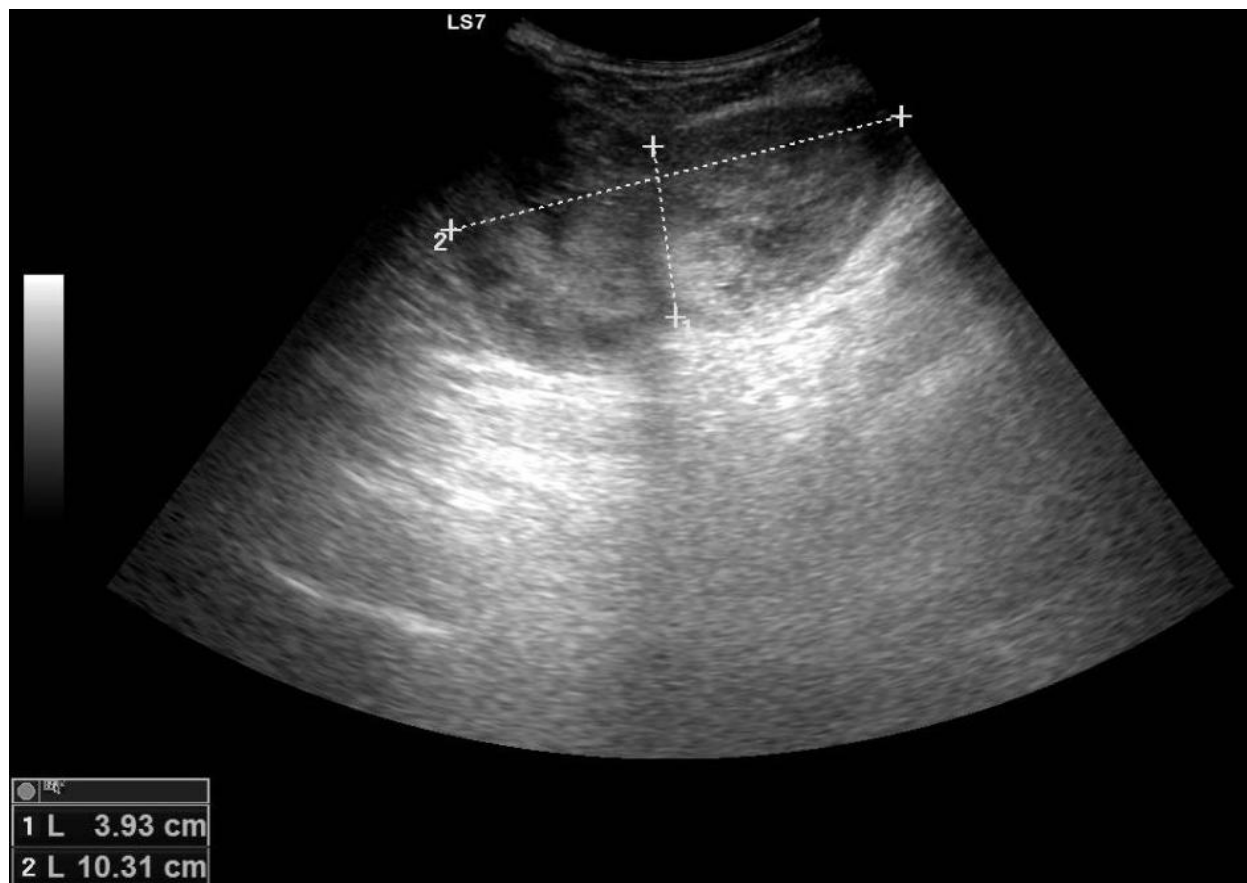


Figure 2C. Follow-up ultrasonography during neoadjuvant chemotherapy demonstrates interval regression of the left breast mass, which measures approximately 103 × 39 mm, compared with baseline ultrasonography.

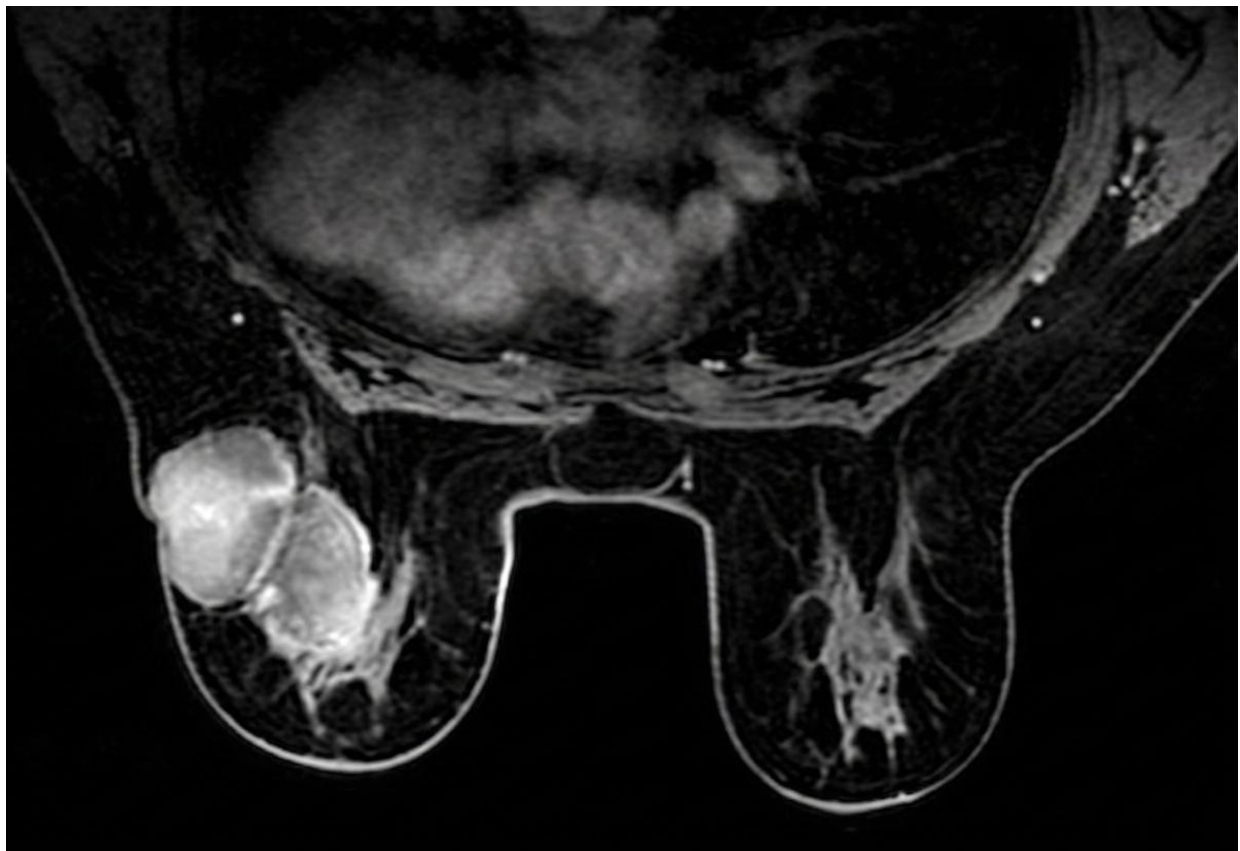


Figure 2D. Post-treatment contrast-enhanced breast MRI obtained after completion of neoadjuvant chemotherapy demonstrates interval regression in the size of the left breast mass, with a decrease in the enhancing solid nodular components. A residual enhancing mass with multiple cystic-necrotic areas remains.

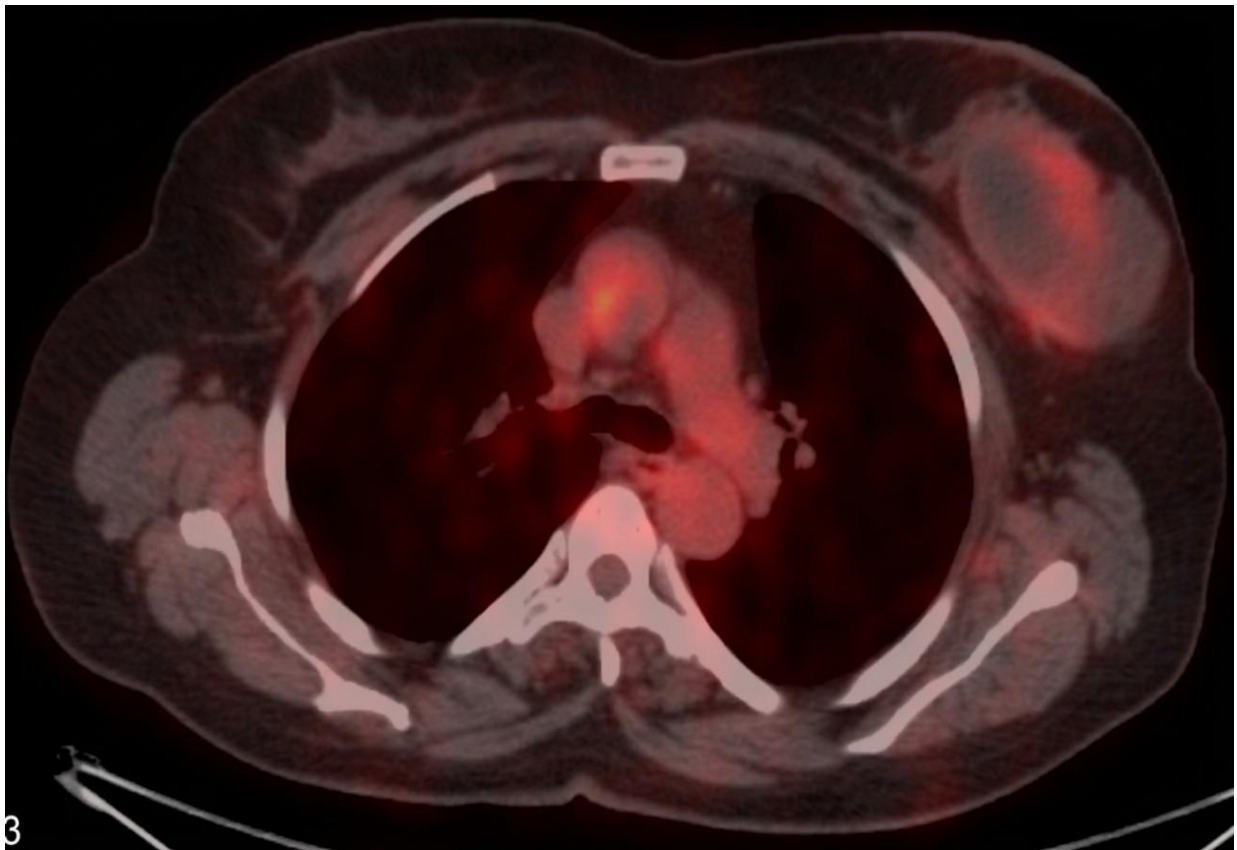


Figure 2E. Follow-up ^{18}F -FDG PET/CT obtained after completion of neoadjuvant chemotherapy demonstrates persistent but decreased FDG uptake within the residual left breast mass (SUVmax, 3.2), consistent with a partial metabolic response.

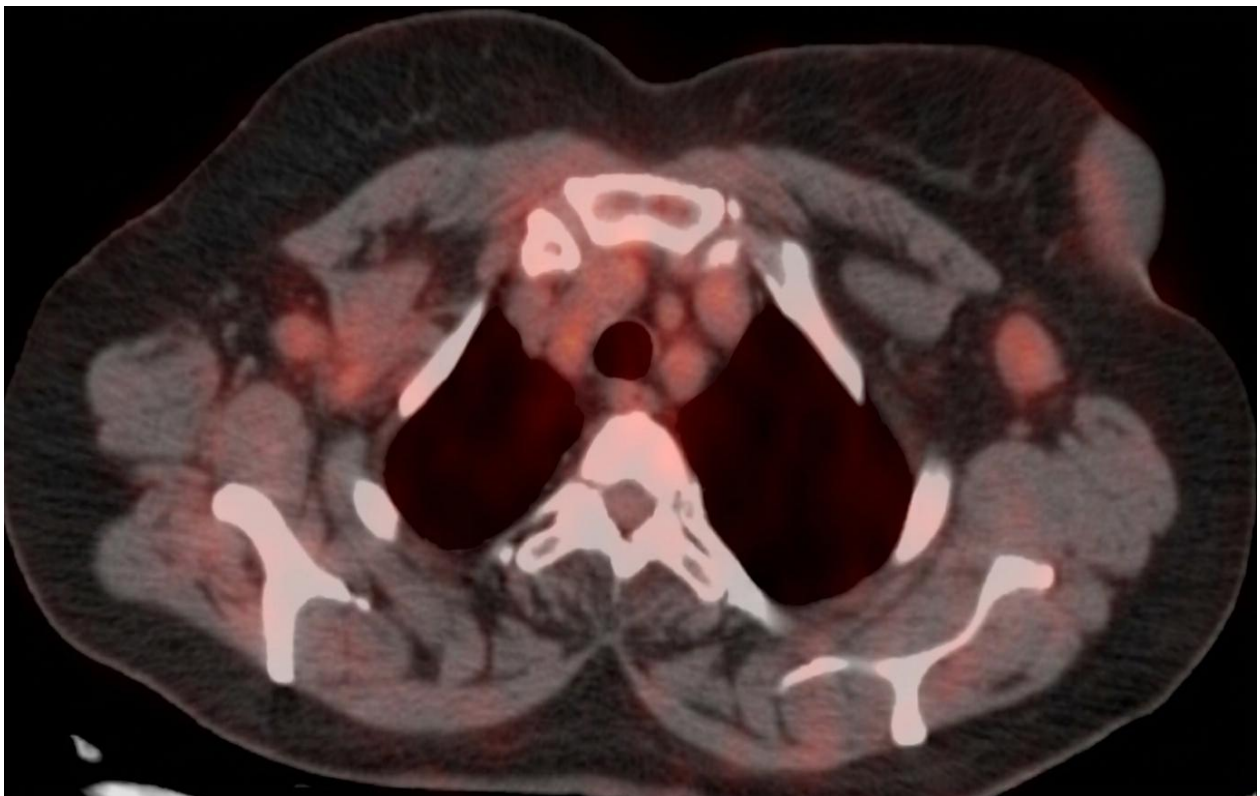


Figure 2F. Follow-up ^{18}F -FDG PET/CT obtained after completion of neoadjuvant chemotherapy demonstrates decreased FDG uptake in the residual left axillary lymph nodes (SUVmax, 2.2), consistent with a partial metabolic response.

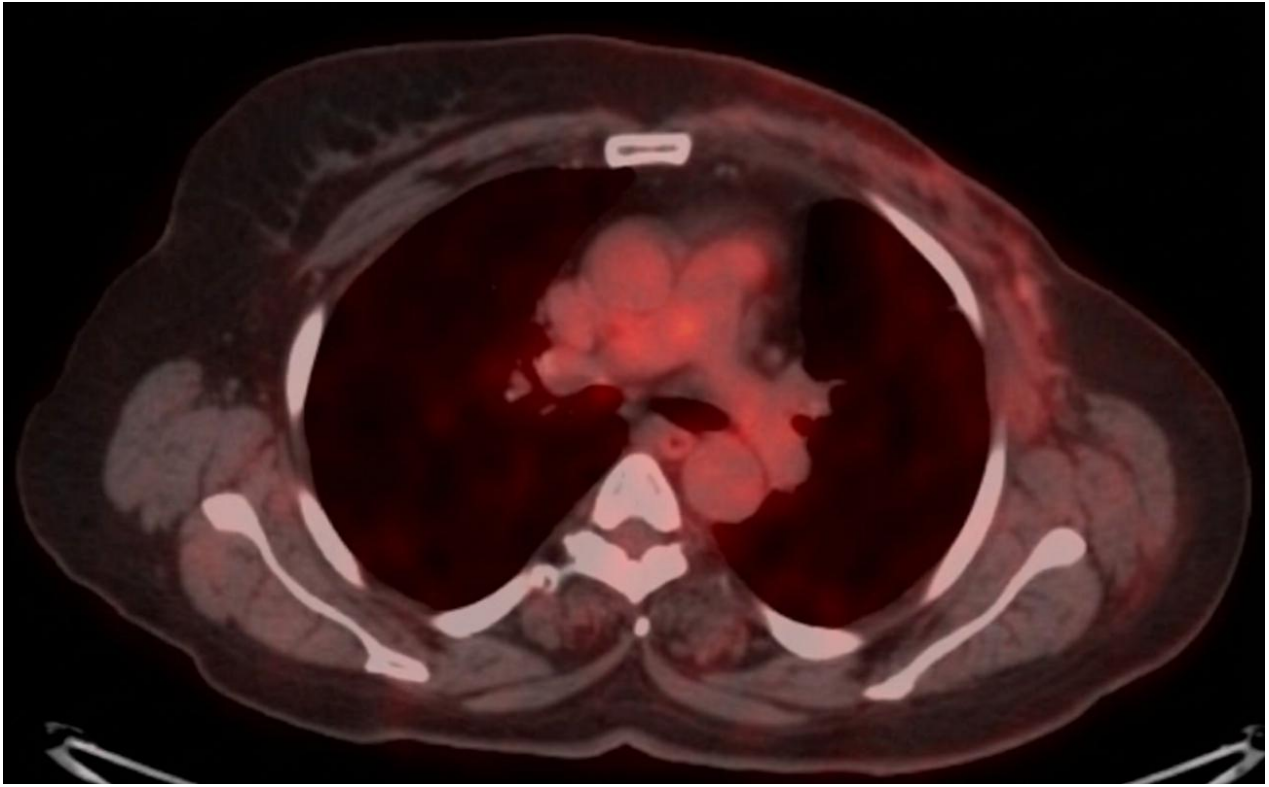


Figure 3. Follow-up ^{18}F -FDG PET/CT obtained after modified radical mastectomy and adjuvant therapy demonstrates postoperative changes in the left mastectomy bed without evidence of FDG-avid residual, recurrent, or metastatic disease.