Bilateral Breast Metastases from Rectal Carcinoma: A Rare Case of Rapid Dissemination in a Young Female Detected by FDG PET-CT

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ABSTRACT

Background: Breast metastases from rectal carcinoma are incredibly uncommon. Here we describe a patient with metastatic deposits in the breast from rectal carcinoma and the pattern of disseminated metastases within one year after the initial diagnosis.

Case Summary: A 28-year-old female patient was diagnosed with rectal carcinoma in February 2023 and underwent surgery in the following March followed by radiotherapy in June and completed chemotherapy in November 2023. Her first PET-CT scan was done in November 2023, due to the rising tumor marker (CEA), which showed two suspicious, ill-defined, soft tissue density hypermetabolic areas in the left breast along with a hypermetabolic right lower cervical lymph node. A focal hypermetabolic intercostal muscle nodule was noted in the right tenth intercostal region. Histopathology and immunohistochemistry from the left breast mass showed metastatic, poorly differentiated carcinoma. Two weeks after the PET-CT scan, the patient suddenly developed chest pain, breathing difficulty, and a hard lump in both breasts. To assess the disease progression, another PET-CT scan was done in January 2024. The second PET-CT scan showed morpho-metabolic progression of prior left breast mass lesions along with newly developed hypermetabolic mass lesions in the right breast & right chest wall. Metastatic right lower cervical, left axillary, and abdominal lymph nodes with metabolic progression were also noted. Metabolic progression of the prior intercostal muscle nodule in the right tenth intercostal region with a newly developed hypermetabolic subcutaneous nodule was seen in the right posterior chest wall. Newly developed metastatic hypermetabolic peritoneal deposits and hepatic metastases were also evident along with bilateral moderate pleural effusions and mild ascites. The patient succumbed to the disease a few months after receiving palliative chemotherapy along with conservative and symptomatic management.

Conclusion: Metastatic rectal carcinoma to the breast indicates a highly aggressive tumor. In this case report, the FDG PET-CT scan showed an unusual metastatic pattern and rapid aggressive dissemination within a short period.

Keywords: Breast metastases, Carcinoma rectum, FDG PET-CT

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CASE REPORT

Breast metastases from extramammary malignancies are rare, accounting for less than 0.5% of all breast cancers (1). Among extramammary cancers, colorectal carcinoma (CRC) is an uncommon cause of breast metastasis, with rectal carcinoma rarely associated with such involvement (2). Metastatic breast lesions usually indicate advanced disease and present a diagnostic challenge, as they can mimic primary breast cancers both clinically and radiologically. Patients with breast metastases from colorectal carcinoma often have poor prognosis, as these lesions signal aggressive disease progression (3).

Diagnosing metastatic breast lesions requires a comprehensive approach using imaging techniques like mammography, ultrasound, and FDG PET-CT. FDG PET-CT, in particular, helps detect these rare deposits by identifying metabolically active areas, aiding in staging and identifying other metastases (4). Immunohistochemistry (IHC) is also essential in confirming the origin of the metastatic lesion, with markers like CK20 and CDX2 helping to distinguish colorectal carcinoma from primary breast cancer.

Histopathological evaluation, combined with imaging, is crucial for assessing the extent of disease spread and confirming the metastatic nature of the lesion (5).

Breast metastasis from rectal carcinoma is rare, but case reports, including Singh et al. (2009), describe its occurrence and the diagnostic challenges it poses (1). Studies by Lal and Joffe (1999) further emphasize the need for careful evaluation in patients with known colorectal cancer (2). Advanced imaging like FDG PET-CT provides both anatomical and functional data, improving the detection of these unusual metastases. IHC profiling with markers like CK20, CDX2, and SATB2 is critical in confirming the metastatic nature of the lesion, distinguishing it from primary breast cancers (6).

Despite advances in imaging, the prognosis for patients with rectal carcinoma metastasis to the breast remains poor due to the aggressive nature of the disease, especially in younger patients. Newer treatments, such as immune checkpoint inhibitors, are being explored but have limited success in improving survival outcomes for these patients (7).

The metastasis of rectal carcinoma to the breast is a rare but aggressive manifestation of disseminated disease. Accurate diagnosis through a combination of imaging techniques, IHC, and clinical evaluation is critical for optimizing treatment strategies and improving patient outcomes.

CASE REPORT

A 28-year-old female presented in February 2023 with rectal bleeding and altered bowel habits. Colonoscopy revealed a rectal mass, and biopsy confirmed poorly differentiated adenocarcinoma. Imaging studies showed localized disease, and the patient underwent abdominoperineal resection in March 2023. Postoperative management included radiotherapy in June and chemotherapy (FOLFOX regimen), completed in November 2023.

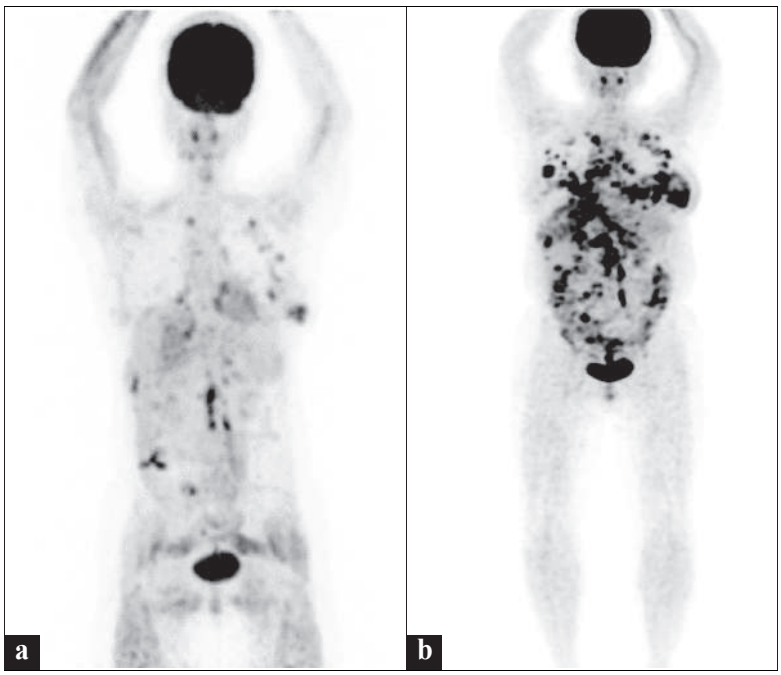

Figure 1: FDG PET-CT MIP image of a 28-year-old female patient with rectal carcinoma. (a) MIP image showed hyper-metabolic focus in the left breast which was later confirmed as metastatic adenocarcinoma of rectal origin by histopathology. Multiple hypermetabolic right lower cervical, right intercostal nodule and abdominal lymph nodes were also noted.

(b) FDG PET-CT MIP image of same patient two weeks after the first PET-CT scan due to chest pain, breathing difficulty, and a hard lump in both breasts. MIP PET-CT imaging, there was Morpho-metabolic progression of prior left breast mass lesions along with newly developed hypermetabolic mass lesions in the right breast & right chest wall and multiple new sites in the whole body.

Rising carcinoembryonic antigen (CEA) levels in November 2023 prompted an FDG PET-CT scan, which revealed two hypermetabolic, ill-defined soft tissue masses in the left breast, a hypermetabolic cervical lymph node, and a nodule in the right tenth intercostal muscle. Histopathological and immunohistochemical analyses of the left breast lesion confirmed metastatic poorly differentiated carcinoma of rectal origin, with CK20 and CDX2 positivity.

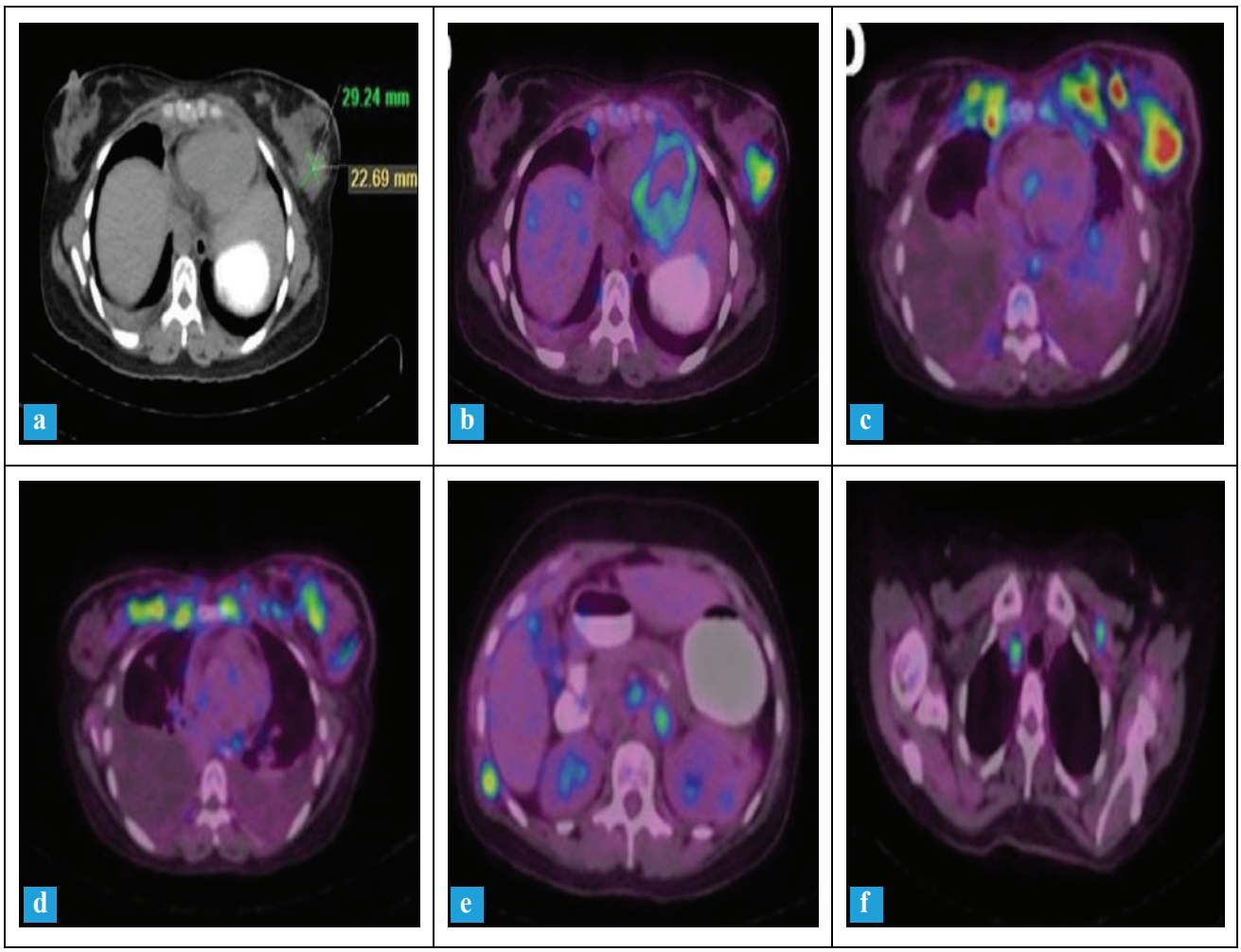

Figure 2: FDG PET-CT MIP image of a 28-year-old female patient with rectal carcinoma showed CT (a) and fusion (b) images. Suspicious, ill-defined soft tissue density hypermetabolic (SUVmax ~ 4.5) areas in the left breast. The histopathology examination revealed a metastatic adenocarcinoma of rectal origin.

FDG PET-CT MIP image of same patient two weeks after the first PET-CT scan, There was a morpho-metabolic progression of prior left breast mass lesions along with newly developed hypermetabolic mass lesions in the right breast & right chest wall (c,d). The newly developed hypermetabolic subcutaneous nodule was seen in the right posterior chest wall (e) and hypermetabolic right lower cervical & left sub-pectoral lymph nodes (f).

In January 2024, the patient developed chest pain, dyspnea, and bilateral breast lumps. A repeat FDG PET-CT scan demonstrated progression, with new hypermetabolic lesions in the right breast and chest wall, metastatic right lower cervical, left axillary, and abdominal lymph nodes, and liver and peritoneal metastases. Bilateral pleural effusions and ascites were also observed. The patient succumbed to her illness five months after commencing symptomatic and palliative chemotherapy.

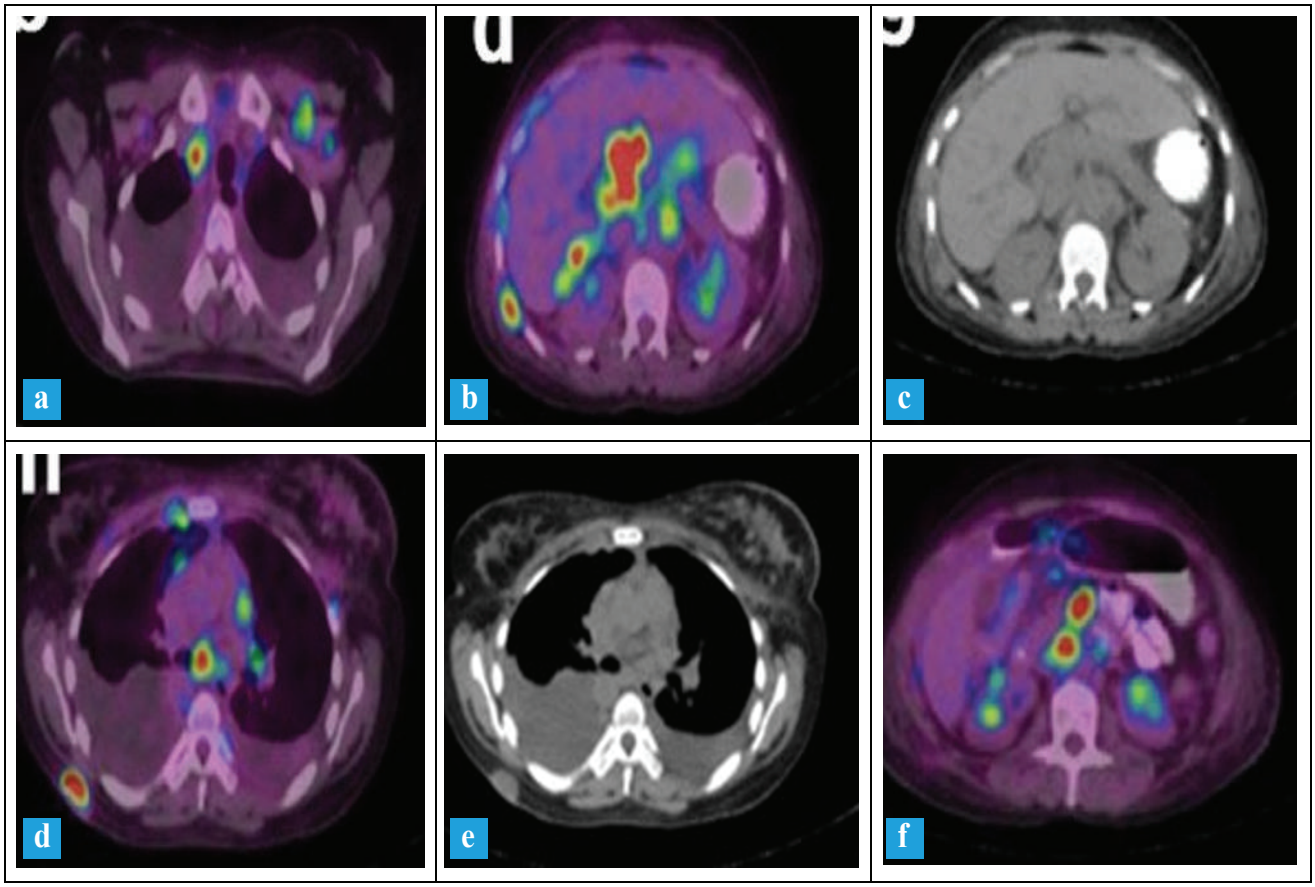

Figure-3: FDG PET-CT MIP image of a 28-year-old female patient two weeks after the first PET-CT scan; demonstrates metastatic right lower cervical (a) and abdominal lymph nodes (b) with metabolic progression. Metabolic progression of the prior intercostal nodule in the right tenth intercostal region (b) with a newly developed hypermetabolic subcutaneous nodule in the right posterior chest wall was also noted (c,d), bilateral moderate pleural effusions (d,e) were also evident. Newly developed metastatic hypermetabolic peritoneal deposits and hepatic metastases were also evident along with mild ascites (f).

DISCUSSION

The aggressive behavior of rectal carcinoma in younger patients is a noteworthy aspect of this case. Despite undergoing multiple lines of treatment, the patient developed further metastases to the liver, peritoneum, and pleural cavities within a short time frame, which is consistent with findings in other reports of metastatic colorectal cancer (8).

The role of imaging in diagnosing breast metastases from rectal carcinoma cannot be overstated. Traditional imaging modalities like mammography and ultrasound may struggle to differentiate between primary breast cancers and metastatic lesions. In this case, FDG PET-CT was instrumental in identifying the hypermetabolic breast masses, along with lesions in distant sites such as the cervical lymph nodes and intercostal muscles. The combination of anatomical and functional imaging provided by PET-CT allowed for a more accurate assessment of the extent of the disease, particularly in detecting metastases in atypical locations like the breast. FDG PET-CT is particularly useful in monitoring metastatic colorectal carcinoma, as it highlights metabolically active areas that might be missed on conventional imaging (4, 5).

In the current case, the patient's breast metastases presented despite initial surgical resection and adjuvant treatments, highlighting the aggressive and rapid dissemination of rectal carcinoma. The initial

PET-CT scan revealed not only breast metastases but also the involvement of the intercostal muscle and regional lymph nodes signaling systemic dissemination despite prior surgical resection, radiotherapy, and chemotherapy (Figure 1 and 2).

Histopathological and immunohistochemical (IHC) analysis is critical for confirming the metastatic origin of breast lesions. In this case, the breast lesion showed positivity for CK20 and CDX2, markers typically associated with colorectal carcinomas. CK20 is frequently expressed in gastrointestinal cancers, and CDX2 is a transcription factor found in normal and malignant colorectal epithelium. These markers are helpful in distinguishing metastatic colorectal carcinoma from primary breast cancer, which typically lacks expression of CK20 and CDX2. Other studies have also emphasized the importance of IHC in differentiating primary and metastatic breast cancers, particularly when the latter involves atypical sites like the breast (9). Immunohistochemistry, combined with histopathological examination, is an essential diagnostic tool in cases of suspected breast metastasis from colorectal carcinoma.

Rapid disease progression was evident on subsequent imaging, showing the emergence of new hypermetabolic lesions in the right breast, chest wall, peritoneum, and liver, alongside worsening of previously identified metastases (Figure 3, 4, 5, 6).

This aggressive pattern, including rare intercostal muscle involvement and bilateral pleural effusions, indicates the systemic and pervasive nature of the malignancy. Despite undergoing surgery, chemotherapy, and radiotherapy, the patient in this case showed rapid progression of metastatic disease. This mirrors findings in other studies, where patients with breast metastases from colorectal carcinoma often experience aggressive disease progression and poor prognosis (10). Studies have consistently demonstrated that rectal carcinoma metastasizes to distant organs, including the breast, in an advanced stage of the disease, which is associated with a high risk of rapid dissemination and unfavorable outcomes. The clinical management of such patients is complicated, as metastases to the breast typically signal widespread disease that may not be amenable to curative treatment (11).

The prognosis for patients with metastatic colorectal carcinoma, especially when presenting in uncommon sites like the breast, is generally poor, and the disease tends to progress rapidly (12). Studies also highlight the importance of incorporating advanced therapies, such as immune checkpoint inhibitors, in the treatment of metastatic colorectal carcinoma. However, these treatments may offer limited survival benefits when metastasis is widespread (13).

Therapeutic options for metastatic rectal carcinoma are limited, particularly in cases of such aggressive progression. While systemic chemotherapy can offer temporary control, the widespread nature of the disease often limits its efficacy. In this case, despite palliative chemotherapy and symptomatic management, the disease rapidly progressed, leading to the patient's demise within months (14).

The rapid progression observed in this case emphasizes the need for early detection and the importance of tailored treatment strategies in managing such rare and aggressive metastases. Further research is needed to explore potential therapeutic options that may improve outcomes for patients with metastatic colorectal carcinoma to the breast (15).

CONCLUSION

This case underscores the aggressive nature of metastatic rectal carcinoma with an unusual presentation involving the breast and other atypical sites. FDG PET-CT played a critical role in identifying the extent of the disease and its rapid progression. Awareness of such rare metastatic patterns is essential for timely diagnosis and appropriate management in similar cases.

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