Recurrent Gastric Cancer Metastasizing to the Bone Marrow Detected on ^{18}F-Fluorodeoxyglucose Positron Emission Tomography/ Contrast-Enhanced Computed Tomography Scan

Abstract

Gastric cancer is one of the important causes of cancer-related mortality worldwide, with significantly low median survival in metastatic gastric cancer. Thus, when planning treatment for gastric cancer, it becomes important to determine whether or not there is metastasis. Bone marrow is a rare region for metastasis in cases of gastric carcinoma, as suggested by the literature. We are herewith presenting the case of a 56-year-old patient of recurrent gastric carcinoma who showed a rare site of metastasis involving marrow on fluorodeoxyglucose positron emission tomography/computed tomography (FDG PET/CT) scan.

Keywords: *^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography, gastric carcinoma, marrow metastasis, signet ring cell*

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A 56 year old female was diagnosed with gastric carcinoma of signet ring cell variant adenocarcinoma in 2013 with local and distant metastases involving regional lymph nodes, adrenals, and bilateral adnexa. In view of multiple metastases, she was treated with chemotherapy with three cycles of CAPOX followed by four cycles of DOX. ^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography (F18-FDG PET/CT) scan done after completion of chemotherapy suggested complete resolution of gastric primary with response in nodal and adrenal metastases too. The patient had a progression-free interval of 2 years 3 months following which the patient developed disease progression in 2015. She underwent eight cycles DOX followed by eight cycles of docetaxel and then underwent distal gastrectomy and bilateral salpingo-oophorectomy in 2017 which was followed by eight cycles of CAPOX. Post surgery and chemotherapy, ^{18}F-FDG PET/CT scan revealed no evidence of any metabolically active disease to suggest residual primary or any metastatic disease. Thereafter, she remained disease free until January 2020 when she presented with raised serum CA 19.9 from 78 U/mL to 99.26 U/mL. However, the patient had no other complaints which would hint at any recurrence. Hence, an ^{18}F-FDG PET/contrast-enhanced CT was advised with a strong clinical suspicion of disease recurrence. Maximum intensity projection image revealed the focus of FDG at the shaft of the left femur [Figure 1a]. Axial and sagittal fused (PET/CT) and CT images showed focal increased FDG uptake in marrow lesion involving left proximal femur with SUVmax 14.06 [Figure 1b-e]. Magnetic resonance demonstrates short tau inversion recovery hyperintensity [Figure 1f] and bone marrow biopsy suggested poorly differentiated gastric carcinoma, notice signet ring cells [arrows in Figure 1f]. The rest of the skeletal system and scan did not show any active disease pathology.

Discussion

Gastric cancer is one of the most common causes of cancer morbidity and mortality worldwide. Gastric cancer typically metastasizes to visceral and peritoneal surfaces, with liver and distant nodes among the most common sites.[1] Systemic disease recurrence after curative surgical resection is estimated at 60%.[2]

Bone metastasis is common in patients with breast, lung, renal, and prostate cancers,

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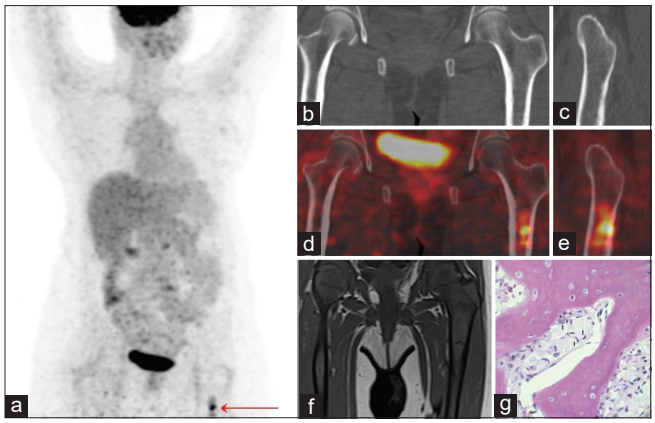

Figure 1: On maximum intensity projection image, focus of FDG at the shaft of the left femur (a). Axial and sagittal fused (PET/CT) and CT images showed focal increased fluorodeoxyglucose uptake in marrow lesion involving left proximal femur with SUVmax 14.06. (b-e) Magnetic resonance demonstrates short tau inversion recovery hyperintensity (image f) and bone marrow biopsy suggested poorly differentiated gastric carcinoma, notice signet ring cells (arrows in image g)

and it is fairly uncommon in malignant tumors of the gastrointestinal tract. A 39-patient series by Kim *et al*. reported the bone marrow metastasis incidence of as less as 0.024% in gastric carcinoma patients.[3] And thus, it can be said that bone marrow is one of the rare and unusual sites of metastasis in gastric cancer.

Bone marrow involvement in gastric cancer as in all solid tumors is associated with worse prognosis warranting prompt and adequate treatment.[4] Fluoropyrimidine, taxanes, and platinum-based regimens are the most commonly used chemotherapeutic drugs, providing response rates of 30%50% and a median overall survival of around 1 year.[5]

^{18}F-FDG PET/CT detects BM lesions, mainly on the basis of increased metabolism instead of any anatomical alterations. According to one study, estimated fused PET/CT sensitivities and specificities for detection of bone marrow metastases ranged from 95.2% to 99.6% and from 75% to 100%, respectively.[6] Thus, F18-FDG PET/CT surely has significantly higher value in detection of marrow metastases as compared to CT scan and thus can be used for early detection of these lesions.

The prognosis of marrow metastasis caused by gastric cancer is very poor and thus prognosis of patients may become poorer if diagnosis and treatment are delayed. It is important that imaging to assess rare sites of recurrence like marrow metastasis needs to be done at the time of initial staging and post treatment follow-up. In our case, the patient was routinely followed up with ^{18}F-FDG PET/CT scan, and if such protocols are followed, early detection about skeletal involvement can be made and patients may get benefit from early treatment measures, thus improving the quality of life and overall survival of the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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