Renal Cell Carcinoma Mimicking with Peritoneal Carcinomatosis and Krukenberg Tumor: Diagnosis Seen on Fluorodeoxyglucose Positron Emission Tomography-Computed Tomography

Abstract

Krukenberg tumor (KT) is a rare clinical entity with a mysterious origin. It originates most commonly from adenocarcinoma of the stomach. We present an interestingly rare case of this entity in renal cell carcinoma, revealed by ^{18}F-fluorodeoxyglucose-positron emission tomography/computed tomography (PET/CT) scan. Ovarian cancers with diffuse peritoneal metastasis were considered the differential diagnosis of the disease, based on PET/CT. The potential efficacy of this functional imaging for KT is still in the exploratory phase, but its applications in diagnosis, disease prognostication, therapeutic response monitoring, and follow-up recurrence detection are superior than other imaging modalities.

Keywords: *^{18}F-fluorodeoxyglucose-positron emission tomography/computed tomography, Krukenberg tumor, renal cell carcinoma*

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A 14-year-old female presented with pain abdomen, evaluated and diagnosed as right renal cell carcinoma (RCC). She had no urinary symptoms such as hematuria and dysuria. In addition, no signs or symptoms of distant metastasis were evident. Abdominal ultrasonography showed a 10.0 cm × 5.6 cm, large, exophytic, lower pole heterogeneously enhancing a solid cystic lesion with bilateral adnexal mass lesions. The patient was reviewed in the multidisciplinary tumor board meeting and advised for other workups such as serum tumor markers, positron emission tomography/computed tomography (PET/CT), and image-guided biopsies of renal and adnexal mass apart from the routine hematological workup. Her serum tumor markers such as alpha-fetoprotein, beta-human chorionic gonadotropin, lactic acid dehydrogenase, and CA-125 were 2.88 ng/mL (normal: 0.89–8.78 ng/mL), <1.25 ng/mL (normal: <15 ng/mL), 509 U/L (normal: 140–280 U/L), and 65.2 U/mL (normal: <15 U/mL), respectively. Fluorodeoxyglucose (FDG)-PET/CT revealed metabolically active metastatic disease involving subcapsular liver deposits; pelvic peritoneal deposits; and bilateral ovarian avid lesions with FDG uptake in the left anterior diaphragmatic, periportal, preaortic, aortocaval, paracaval, retrocaval, bilateral internal iliac, and right external iliac lymph nodes [Figure 1a-e]. In addition, a large necrotic mass lesion with patchy calcification and multiple renal cysts was noted in the right kidney. Histopathologically, biopsy report rendered the diagnosis of papillary RCC, immunopositive for alpha-Methylacyl-CoA racemase and negative for CK7 and CK10. Biopsy from the adnexal mass showed a necrotic material with blood clots. Based on all the above investigations, the patient was designated as metastatic RCC with peritoneal carcinomatosis and Krukenberg tumor (KT). She was planned for pazopanib-based treatment.

FDG-PET/CT is useful for the staging of patients with RCC, in selected patients. In the current study, the young age of the patient does not fit for RCC demographic criteria. In addition, she had no other well-known risk factors such as cigarette smoking, obesity, and hypertension. Young age presentation is often associated with genetic alterations (e.g., point mutation of the Von Hippel–Lindau tumor suppressor

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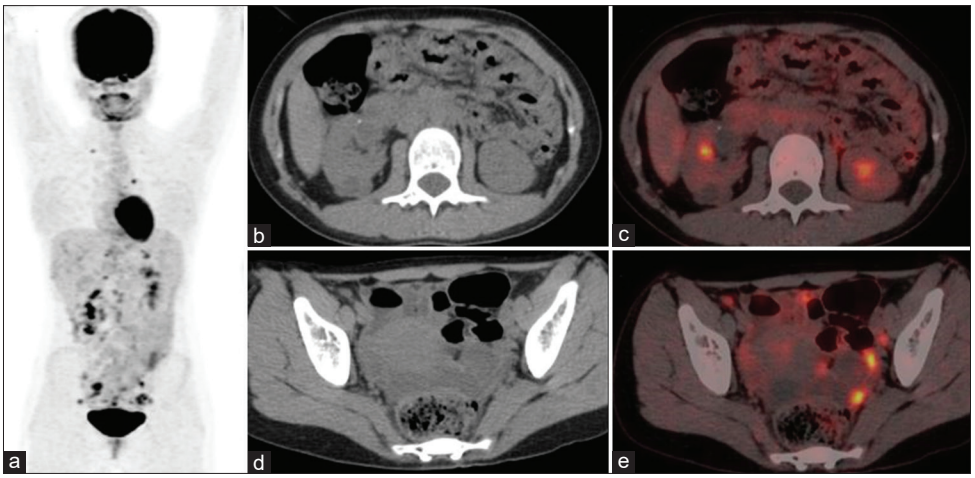

Figure 1: (a) Maximum intensity projection image fluorodeoxyglucose-positron emission tomography/computed tomography showing focal areas of tracer uptake in the pelvic region. (b) Axial computed tomography abdomen showing a mass lesion arising from the right kidney showing areas of necrosis and mild fluorodeoxyglucose uptake in the fused positron emission tomography/computed tomography image. (c and d) Axial computed tomography abdomen showing solid-cystic lesions in the bilateral adnexal region showing areas of focal fluorodeoxyglucose uptake in the fused positron emission tomography/computed tomography image (e)

gene 3p25.3 or Xp11.2 translocation). Due to logistic issues and economical constraint, additional genetic tests were not advised for this patient. RCC occurs predominantly in the seventh decade of life.[1] Only 3%–7% of all sporadic RCC patients have been found to be younger than 40 years.[2] These subgroups of patients showed aggressive disease biological behaviour and had poorer oncological outcomes.[2,3] Bulky adnexal mass with increased CA-125 level raised the suspicion of ovarian malignancy. It was a combined diagnostic armamentarium of PET/CT and tissue histopathology, which clinched the accurate diagnosis.

RCC has a very unpredictable metastasis potential with nearly all body system involvement.[4] However, the incidence of isolated metastasis is <1%.[5] Lung, bones, liver, and brain are the most common sites of metastasis in RCC. Peritoneal carcinomatosis with KT is uncommon in RCC.[6,7] Many theories have been postulated regarding KT such as transcoelomic spread, peritoneal fluid circulation, fluid redistribution secondary to gravity, and translymphatic peritoneal dissemination by lymphatic stomata.[8] However, the exact mechanism of the possible spread of peritoneal involvement is not fully understood.[9] Peritoneal carcinomatosis is an aggressive clinical entity that can occur due to hematogenous tumor embolism, lymphatic permeation, and/or direct renal capsule breakage by tumor cells. Peritoneal surface involvement leads to ascites, which further precipitates the spread due to fluid stasis at peritoneal reflections.[10] The reason for KT with RCC in the present case remains uncertain. In the majority of studies, PET-CT has shown limited sensitivity in the primary evaluation of RCC and high sensitivity for metastatic and recurrent disease.[11,12] The reason for the high false-positive rate for the initial detection of primary RCC is the presence of physiological excretion of FDG in the kidneys. It has a diagnostic accuracy of 84% for biopsy-proven malignant or benign lesions.[13]

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 her name and initial will not be published, and due efforts will be made to conceal her identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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