Renal Cell Carcinoma with Paraneoplastic Manifestations: Imaging with CT and F-18 FDG PET/CT

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We present a case of renal cell carcinoma with prominent inflammatory and paraneoplastic manifestations. The initial CT detection of renal malignancy and subsequent post-therapeutic F-18 FDG PET/CT diagnosis of occult osseous metastasis were based on the patient’s anemia, thrombocytosis and abnormally increased levels of serum C-reactive protein.

Introduction

Renal cell carcinoma is one of the most common malignant neoplasms of the genitourinary system. It is more frequently detected as an incidental finding during cross-sectional imaging evaluation of unrelated pathology than diagnosed at advanced and disseminated stages of the disease. Awareness of paraneoplastic manifestations such as anemia, thrombocytosis and elevated serum C-reactive protein may prompt clinicians to use various anatomic and functional imaging modalities for diagnosis and post-operative monitoring of renal cell carcinoma.

Case Report

A 67-year-old man presented with unexplained mild anemia (hemoglobin level: 9.9 g/dl), elevated serum C-reactive protein (57 mg/l), thrombocytosis (platelet count: 533,000/mm3), elevated sedimentation rate (77 mm/h) and low grade fever ranging from 99 to 100 degrees Fahrenheit. Clinical and laboratory evaluation detected no in-

Figure 1. 67-year-old man with renal cell carcinoma with paraneoplastic manifestations. Axial CT image of the abdomen shows a lobulated and heterogeneously enhancing mass arising from the lower aspect of the left kidney (arrows).
Renal Cell Carcinoma (RCC) is the third most common genitourinary malignant tumor and the sixth leading cause of cancer death in the United States [1, 2]. With the advent of rapid and efficient cross-sectional imaging, RCC is frequently diagnosed as a fortuitous finding during assessment of unrelated diseases. Nowadays, the classic triad of gross hematuria, flank pain and flank mass is rarely the initial clinical presentation leading to the detection of this malignancy [1, 2]. During the pre-diagnosis phase of RCC, patients may present with non-specific paraneoplastic manifestations, which represent valuable diagnostic clues for renal malignancy. These paraneoplastic syndromes are probably induced by substances released from the neoplasm itself or the patient’s immune system in reaction to the malignancy. Anemia, weight loss and fever are the most commonly encountered paraneoplastic syndromes of RCC in 30-50%, 20-33% and 7-25% of all cases respectively [1, 2]. In addition, thrombocytosis and elevated serum C-
reactive protein (CRP) have been established as prognostic indicators for renal malignancy with good correlation with tumor size, stage and progression [3-5]. CRP, an acute phase reactant encountered in infection, trauma and malignancy, is produced by hepatocytes and other tissues including RCC under the control of serum interleukin 6 (IL-6) [6, 7]. The complex IL-6/CRP has been established as the cause of the paraneoplastic inflammatory syndrome linked to RCC [8]. Awareness of these useful RCC biomarkers along with related paraneoplastic manifestations should prompt clinicians to order imaging studies in the search for renal malignancy.

Multidetector CT is the main imaging modality to evaluate such neoplasms. With negative or doubtful CT results and persistence of unexplained paraneoplastic inflammatory symptoms, functional imaging with F-18 FDG PET may be indicated for whole-body assessment [9-11]. PET imaging is based on the high glucose metabolism of malignant tumors. The radiotracer F-18 FDG, a glucose analog, is incorporated and remains in glucose-avid malignant cells due to improper intra-cellular catabolism providing a high tumor-to-background activity ratio. Even though PET performs poorly compared to CT in the anatomic detection of renal cancer due in part to high physiologic activity of normal renal parenchyma and adjacent collecting system activity, PET is more accurate than CT in the detection of distant and extra-urinary RCC metastases as illustrated in this case [12, 13]. The combined anatomic and functional imaging of PET/CT with image fusion further provides exact localization of hypermetabolic lesions for safe, diagnostic tissue sampling.

This case illustrates the importance paraneoplastic syndromes and C-reactive protein serum levels in prompting the search for clinically occult renal cell carcinoma and its subsequent recurrences and metastases. CT is the main imaging modality for dedicated evaluation of the genitourinary system. In cases of negative or inconclusive CT assessment, F-18 FDG PET/CT may be a valid functional and anatomic imaging modality for detection of hypermetabolic extra-urinary metastases.

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