Detection of Docetaxel-induced Interstitial Pneumonitis on Ga-68 PSMA PET/CT Imaging

Abstract

Ga-68 labeled prostate-specific membrane antigen (PSMA) positron emission tomography–computed tomography (PET/CT) is increasingly recognized as the best imaging modality for disease staging and detection of recurrent prostate cancer. Despite its name, PSMA expression has been reported in the neovasculature of several nonprostatic benign and malignant pathologies. Docetaxel, a taxane antineoplastic agent, is the mainstay of treatment in castration-resistant prostate cancer and high-volume hormone-sensitive prostate cancer. Although the occurrence of docetaxel-related interstitial lung disease is rare, it may lead to respiratory failure if treatment is delayed. We present a case of metastatic castration-resistant prostate cancer, wherein docetaxel-induced interstitial pneumonitis was detected on Ga-68 PSMA PET/CT after docetaxel administration.

Keywords: *Docetaxel, interstitial pneumonitis, lung toxicity, positron emission tomography–computed tomography, prostate cancer, prostate-specific membrane antigen, taxane chemotherapy*

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Prostate-specific membrane antigen (PSMA) is a type II transmembrane glycoprotein extremely overexpressed in prostate cancer epithelial cells and yields images with high tumor-to-background contrast.[1,2] PSMA positron emission tomography–computed tomography (PET/CT) plays a pivotal role in staging high-risk prostate cancer as well as in biochemical recurrence by identifying oligometastatic disease and providing superior sensitivity and specificity.[3,4] Nevertheless, there are reports of unusual Ga-68 PSMA uptake in many benign lesions and malignant nonprostatic conditions.[1,5-7] Docetaxel is a taxane-based chemotherapeutic agent that has been used in the treatment of various broad range of cancers, including prostate cancer. Myelosuppression, alopecia, asthenia, and fluid retention are a few of its common adverse reactions. The likelihood of developing drug-induced interstitial lung disease (ILD) is largely idiosyncratic and unpredictable and has been reported previously.[7-9] These agents have a range of immunomodulatory effects, and docetaxel pneumonitis might result from increased capillary penetration caused by inflammation, resulting in relatively higher activity in the interstitial space.[8,10,11]

Docetaxel usage leads to direct and indirect (immunological) injury to the lung parenchyma. It induces the production of reactive oxygen species, which have been implicated as the direct mechanism of lung injury. In addition, it also disrupts the immunological balance leading to lung injury.[12] Thus, increased PSMA expression in the lungs on PSMA PET/CT warrants further evaluation because it can be due to malignant and benign lung conditions. Increased diffuse PSMA uptake [Figure 1] in the lungs in patients receiving docetaxel should be interpreted with caution as the differential diagnosis can be pulmonary metastasis, radiation-induced lung injury, atypical infections, and drug-induced ILD.[9,13]

The treatment of choice is administering systemic glucocorticoid therapy in selected patients in whom an infectious etiology is excluded with appropriate cultures. In the absence of specific treatments, it is of utmost importance to prevent the deterioration of functional activity by identifying this adverse drug toxicity as early as possible.

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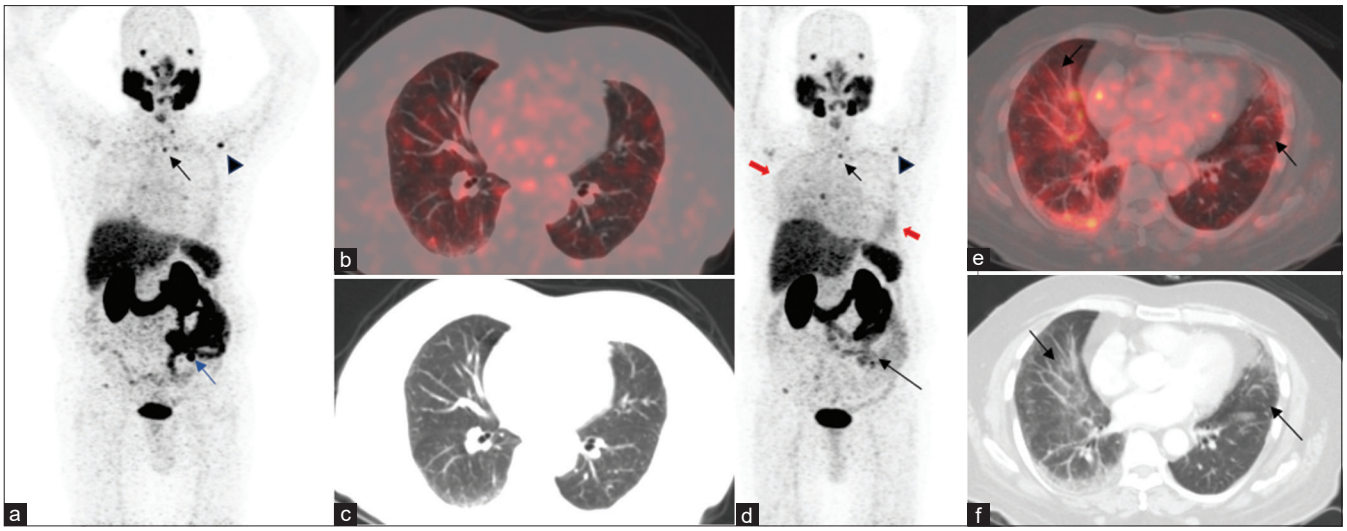

Figure 1: A 73-year-old man with metastatic castration-resistant prostate cancer, after 2 cycles of Lu-prostate-specific membrane antigen (PSMA) therapy and EBRT to the pelvis, was on enzalutamide treatment. He also complained of occasional shortness of breath. However, a pulmonary function test was not done. In view of rising serum PSA levels, the patient underwent Ga-68 PSMA positron emission tomography–computed tomography (PET/CT), which revealed PSMA expressing new skeletal lesions, with increased tracer avidity of preexisting skeletal lesions, indicating disease progression. Maximum intensity Projection (MIP) image (a) showed increased focal tracer in the left thoracic region, left shoulder region, and left pelvic region (Black arrow, left clavicle; black arrowhead, left scapula; blue arrow, left iliac bone), with no significant findings in bilateral lung fields (b and c). The patient was started on docetaxel chemotherapy, and PSMA PET/CT was repeated after 5 cycles of docetaxel for response assessment. On MIP image (d), focal tracer uptake was seen in the midline in the left thoracic, shoulder, and pelvic regions (black arrows, skeletal lesions), and diffusely increased tracer uptake (Red arrows) was seen in the thoracic region. Transaxial and coronal fused PET/CT (e) and corresponding CT image (f) show increased tracer uptake (SUVmax, 6.9) in ground-glass and reticular opacities and interstitial septal thickening, predominantly involving peripheral subpleural locations in bilateral lung fields indicating interstitial pneumonitis

Declaration of patient consent

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

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Conflicts of interest

There are no conflicts of interest.

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