CORRESPONDENCE

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18F-flouro-2-deoxyglucose positron emission tomography/computed tomography imaging of solitary prostatic and pulmonary tuberculosis mimicking metastatic prostate cancer

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> Abstract

Genitourinary tuberculosis (TB) is a common type of extrathoracic TB and can be found in isolation or associated with pulmonary TB. It contributes to 10-14% of extrapulmonary TB. Prostate TB is rare and usually found incidentally following transurethral resection of the prostate for treatment of benign prostatic obstruction as an isolated lesion in immunocompetant patient. The authors report a case of prostatic and pulmonary TB in an immunocompetant patient investigating for the positive positron emission tomography in lung and prostate. To our knowledge, this is the first case reported in the literature presenting with simultaneous hypermetabolic lesions in the prostate and lung.

Keywords: Adenocarcinoma, lung, lung, positron emission tomography/computed tomography, prostate, tuberculosis

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> Introduction

Tuberculosis (TB) is a common infection with approximately one-third of the world's population. Genitourinary TB is rare, but its incidence has increased in human immunodeficiency virus (HIV)-infected patients and those using immunosuppressant agents. [1] Granulomatous prostatitis is an uncommon inflammation of the prostate and mimics prostatic adenocarcinoma. ^{18}F-flouro-2-deoxyglucose positron emission tomography/computed

tomography (FDG-PET/CT) is a preferred modality for real time assessment of the activity of TB, because FDG accumulates in inflammatory cells such as neutrophils and activated macrophages at the site of inflammation. [2] It was presented that FDG-PET/CT was significantly more efficient when compared with CT, respectively, in over half of patients for the identification of sites of lymph node involvement that were missed by CT and often the only sites of extrapulmonary TB identified. [3] But availability of FDG-PET/CT for differential diagnosis of malignant lymph node involvement from lymph node involvement by TB is not enough for routine practice. [3]

The authors report herein a case of simultaneous prostate and lung TB presenting as hypermetabolic lesions in the prostate and lung on FDG-PET/CT, in an immunocompetent patient. This is the first case presenting with lesions in the prostate and lung.

> Case report

A 65-year-old heterosexual, married, Caucasian male patient was seen in the outpatient department with a 1-month history of cough, sputum production, malaise, weight loss, and night sweats. His family history was significant for lung cancer in his father and brother; however, none of the members of his family had evidence of TB. Clinical examination was unremarkable. Laboratory data were within normal limits, and HIV testing was negative. Three separate sputum samples were negative for acid-fast bacilli. Chest X-ray showed a right upper lobe heterogeneous infiltration. Contrast-enhanced chest CT showed a dense lesion, in the anterior apical zone of upper right lobe measuring approximately 36.5 mm × 21.5 mm. Pleural thickening to 14 mm was observed adjacent to the lesion. No mediastinal adenopathy or other significant abnormality was detected. The patient then underwent FDG-PET/CT using a Siemens Biograph Duo (Siemens CTI, Knoxville, Tennessee). The maximum standardized uptake value (SUV) of the mass in the posterior segment of right upper lobe measuring 4 cm × 2 cm was 1.9 [Figure 1]. There were no mediastinal lymph nodes detected; however, on the posterior of this mass, PET revealed a high accumulation of FDG in another mass with a maximum SUV of 3.9 during the early phase and 5 during the late phase. This metabolic behavior was consistent with carcinoma according to the nuclear medicine report, and associated with thickening of pleura adjacent to the mass. Incidentally, FDG-PET/CT demonstrated two areas of high-intensity FDG uptake of varying size within the prostate, with maximum SUV of 8.9 [Figure 1].

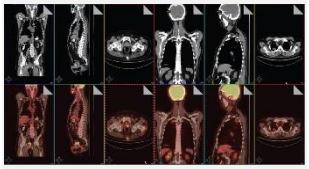

Figure 1: Whole body positron emission tomography/computed tomography (PET/CT) coronal and lateral images and transaxial images of pelvis show abnormal focal flouro-2-deoxyglucose (FDG) uptake in prostate. PET/CT coronal images of thorax show abnormal focal FDG uptake in right upper pole of lung. (The image above is contrast enhanced CT and the one below is corresponding fused PET/CT)

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The patient reported hesitancy, incomplete evacuation, urgency and intermittency. On digital rectal examination (DRE), the prostate was found to be hard and nodular. The patient's serum total prostate specific antigen (PSA) level was elevated at 5.4 ng/ml. Routine urine examinations and culture were normal. Transrectal ultrasound (TRUS) examination and biopsy were performed with a Sonoline Elegra Ultrasonograph (Siemens Ultrasound Division, Mountain View, CA) equipped with a 6.5-MHz endorectal probe. TRUS showed increased prostate volume and a diffuse hypoechoic lesion within the peripheral region of the left prostatic lobe deforming the capsule that was thought to be a tumor. TRUS guided biopsy of prostate (TRUS-Bx) was performed. In addition to 12 standard systematic TRUS-Bx, the diffuse hypoechoic lesions were specifically targeted. Pathology revealed a granulomatous inflammation with multiple caseous epithelioid granulomas containing Langhans' and foreign-body type giant cells and central amorphous, eosinophilic necrotic material [Figure 2].

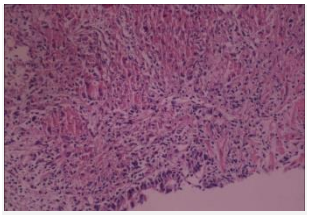

Figure 2: Granulomatous inflammation with Langhans' cells and caseous necrosis near benign prostatic glands (H and E, ×200)

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The patient was diagnosed with prostatic TB and treated with isoniazid, rifampicin, pyrazinamide and ethambutol daily for 2 months with isoniazid and rifampicin continued for an additional 6 months. Clinical findings resolved within 2 months after treatment. He did not experience any side-effects from the treatment. Six months later, the

DRE revealed that prostate gland had become soft and was decreased in size and the chest X-ray showed no abnormalities.

> Discussion

In 2010, there were 8.8 million incident cases of TB, 1.1 million deaths from TB among HIV-negative. After infection of the lung, Mycobacterium TB bacilli are carried to the regional lymph nodes and may be delivered to the venous system from the thoracic duct, resulting in hematogenous seeding of genitourinary tract. Prostatic TB has also been reported in HIV positive patients; however, this patient had a negative HIV test during workup.

Male genital TB is still a diagnostic and therapeutic challenge, because of its rarity. It was reportedly seen in <0.5% of all patients with extrapulmonary TB and 15% of all patients with pulmonary TB. [4] Involvement of prostate is usually secondary to infection from the upper urinary and genital tract through direct intracanalicular extension or hematogenous spread. Additionally, some cases have been linked to the use of BCG vaccine for superficial bladder cancer. [5] Lee *et al*. reported that half of prostatic TB is associated with TB of epididymis; however, in the patient presented here, the kidneys and genital organs were normal and the patient had no symptoms associated with upper genitourinary tract.

The clinical symptoms of prostatic TB are usually nonspecific. Common symptoms include frequency and nocturia. The patient in this presentation did have some obstructive symptoms that were previously thought to be due to benign prostatic hypertrophy. DRE findings in prostatic TB are similar to those in prostate cancer and typically include hard, non-tender nodules. TRUS presents enlargement of the gland and solitary or diffuse hypoechoic lesions of varying sizes within the peripheral zone. Tuberculous prostatitis is not easily differentiated from adenocarcinoma with PSA levels as some patients, such as the one presented here, may have elevated PSA. Urinalysis frequently shows hematuria and/or sterile pyruia, but may be normal, as in this case. [5]

Urine acid fast bacillus stain or culture is frequently positive in cases of upper genitourinary TB, but evaluation of ejaculate and prostatic secretions is often necessary to diagnose prostatic disease. It was diagnosed incidentally by the pathologist after a transurethral resection or prostate biopsy. The histopathological examination of the prostate biopsy in this case revealed Langhans cells and caseous necrosis, which led to the diagnosis.

There are several studies on TB lesions showing FDG uptake mimicking malignancy. [6],[7] Therefore FDG-PET/CT cannot be used to differentiate between malignancies and TB, because it is extremely difficult to distinguish malignancies from TB only by FDG uptake. [8] It was suggested that in some patients, dual-phase FDG-PET/CT may be useful to determine whether a site of pulmonary up take of FDG is malignant or benign. [8] But the washout rates or retention indexes of FDG measured by change in maximum SUV cannot be helpful in differentiating TB from cancer. [2] Shinohara *et al*. reported FDG-PET/CT findings in a case of primary tuberculous pleurisy presenting with pleural thickening without parenchymal lung lesions mimicking malignant mesothelioma. [9] Moreover, several case reports demonstrated FDG uptake in abdominal TB lesions mimicking peritoneal carcinomatosis. [10] A report documented tuberculous lesions in the epididymis and prostate found incidentally on follow-up PET for lymphoma. [11] In our case the intense FDG uptake in lung and prostate was initially interpreted as the prostatic carcinoma and its metastasis to the lung.

The combination of isoniazid, rifampicin and pyrazinamide, and ethambutol is first choice of pharmacological treatment. Many cases, like the one presented here, will respond to antibiotics alone, but genitourinary TB frequently requires surgery to cure. [11]

> Conclusion

Prostatic TB can show high focal FDG uptake on PET/CT, which is often difficult to distinguish from malignancy such as prostatic adenocarcinoma.

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Figures

[Figure 1], [Figure 2]