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CASE REPORT

Penile metastases from urothelial carcinoma detected on follow up [^{18}F]FDG PET/CT

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ABSTRACT

Penis is an extremely rare site of metastases despite having very rich vascularization. Penile metastasis is frequently associated with widespread metastatic disease and poor prognosis. Despite its rarity, penile metastases must be considered even in a multi-systemic disease because patients may become symptomatic requiring palliative care. Hence, we report the adding value of [^{18}F]FDG PET/CT as a valuable noninvasive tool in the detection of penile lesions.

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INTRODUCTION

Penis is an extremely rare site of metastases despite having very rich vascularization, and is often associated with very grave prognosis. Most frequently, penile metastases come from the urogenital system (bladder, prostate) or the rectum-sigmoid colon. Usually painful, penile lesions may be asymptomatic, making diagnosis more challenging. Hence, we report the adding value of ^{18}F-fludeoxyglucose-positron emission tomography/computed tomography ([^{18}F]FDG PET/CT) as a valuable method in the detection of penile metastases originating from urothelial carcinoma of the bladder.

CASE REPORT

A 62-year-old man was referred to our Nuclear Medicine department for a PET/CT scan as part of a metastatic workup for urothelial carcinoma of the urinary bladder. One year prior, he had undergone radical cystoprostatectomy and bilateral lymph node dissection with ileal conduit urinary diversion, followed by six cycles of adjuvant chemotherapy with cisplatin and gemcitabine.

Five months after completing treatment, the patient presented with swelling, pain in the penile shaft, and hematuria. Physical examination revealed an erect and swollen penis, with palpable nodules on the glans and both sides of the penile shaft.

The PET/CT scan was performed one hour after intravenous injection of 240 MBq (6.5 mCi) of[^{18}F]FDG, using a General Electric Discovery ST PET/CT scanner. Images were acquired from the skull to the mid-thigh over eight bed positions, with 3 minutes per position. The scan revealed high pathological uptake of [^{18}F]FDG in multiple bilateral pulmonary nodules, bilateral inguinal lymph nodes, and skeletal lesions in the pelvic bone. Additionally, intense [^{18}F]FDG uptake was observed in the penis (Figures 1 and 2). The findings indicated pulmonary, lymph nodal, and skeletal metastatic disease, with suspected penile involvement. The patient was subsequently referred to medical and radiation oncologists for further management.

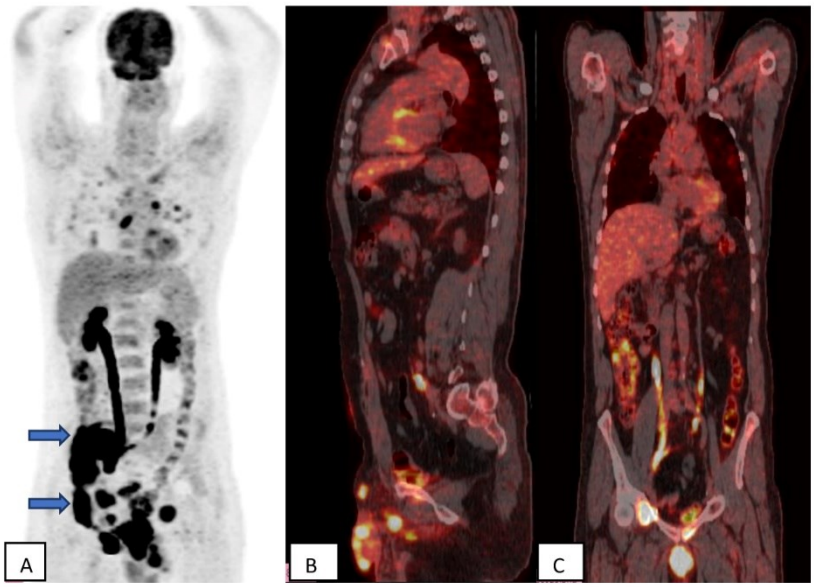

Figure 1. Positron emission tomography/computed tomography with [^{18}F]FDG, (A) MIP, (B) sagittal fusion and (C) frontal fusion images showing multiple hypermetabolic foci in the penile, the inguinal region, and in bilateral pulmonary nodules. Intense activity was noted in the neobladder (upper straight arrow) and the urine bag (lower straight arrow)

DISCUSSION

Despite the rich vascularization of the penis, metastases to the penis are very rare events, and only sporadic cases have been reported. Common primaries that metastasize to the penis include bladder, prostate, colon, rectum, and kidney [1-4] Indeed, physiopathology of metastases to the penis is still unclear. Many theories of dissemination of the tumor to the penis have been described such as retrograde venous dissemination from pudendal venous system into dorsal venous system of the penis, direct extension to the penis, retrograde

lymphatic spread into penile lymphatic channels after obstruction of inguinal and hypogastric nodes [2], and iatrogenic implantation secondary to instrumentation [4].

Most of the reported cases of penile metastasis are metachronous [4]. The time interval between primary tumor and penile metastasis ranges from 3 to 60 months [5].

Moreover, penile metastases are usually symptomatic. In most cases penile metastases occur with a variety of symptoms, such as hard skin nodules, priapism, severe penile pain, swelling of the penis, erectile dysfunction, urethral ulceration, and local obstruction.

Penile involvement in any primary malignancy indicates very poor prognosis as it indicated disseminated disease. Differential diagnosis between primary and metastatic penile carcinoma is important, because primary tumors are mostly curable, whereas the median survival of patients with metastatic disease is 6 months [6].

[^{18}F]FDG PET/CT is helpful in primary penile cancer in detecting lymph nodal involvement. Penile metastasis usually indicates widespread metastatic disease, and hence [^{18}F]FDG PET/CT may be useful to identify other sites of disease involvement and for monitoring treatment response [7-8].

PET/CT, being a noninvasive procedure and with the luxury of analyzing the whole body in a single session, has widely gained popularity in the metastatic workup of various malignancies [9-10]. As diagnosis of any distant metastases shifts the management modality drastically from a radical approach to a palliative one, it is of immense value in detecting locoregional as well as distant metastases.

Arguably, many case reports strengthens the impact of [^{18}F]FDG /PET-CT for detecting asymptomatic penile metastasis originating from muscle-invasive urothelial carcinoma of the bladder. Detecting penile secondary lesions is important because these represent a possible metastatic site in a range of cancers.

Moreover, penile secondary lesions contribute to morbidity and portend a poor prognosis, and appropriate treatment measures must be instituted promptly. Accordingly, PET/CT is a critical instrument for assessment of the male genitalia, especially in men with advanced disease and for whom relapse is a concern [11].

Metastases to the penis mimicking priapism are exceedingly rare, particularly in cases without disseminated disease. Benign high-flow priapism should be considered in the differential diagnosis, Doppler ultrasound shows *arterial flow*; and PET/CT may show diffuse hypermetabolism without structural lesions in this case [12].

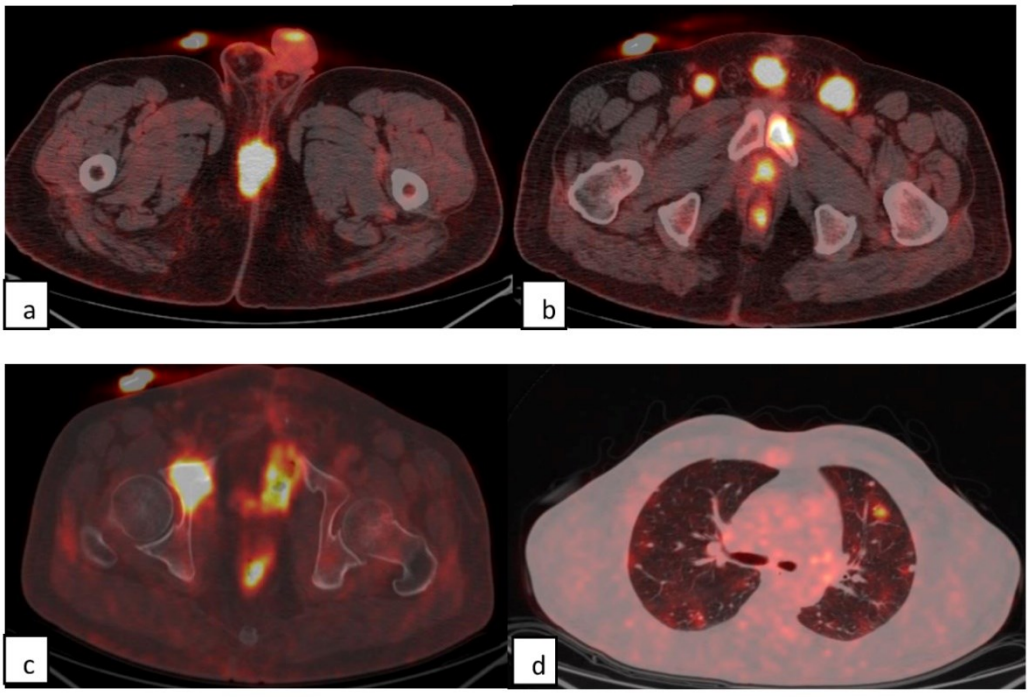

Figure 2. PET/CT axial fusion images showing high pathological uptake of [^{18}F]FDG in: (a) penile shaft, (b) bilateral inguinal lymph nodes,(c) skeletal lesion of pelvic bone(d) and multiple bilateral pulmonary nodules

CONCLUSION

Although the prognosis of patients presenting with penile metastases is poor, detecting penile lesions and discerning whether they are single or part of widely disseminated disease is important in order to establish the best treatment option, targeted at improving patient's quality of life. PET/CT is a valuable, noninvasive, and accurate tool to detect penile metastases and other sites of disease.

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