A Case of Urethral Metastasis from Sigmoid Colon Cancer Diagnostically and Prognostically Indicated by F-18 FDG PET/CT

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Abstract Urethral metastasis from colorectal cancer is rare and is known to have a poor prognosis. A 72-year-old man with a history of colectomy and colostomy due to sigmoid colon cancer was admitted to the emergency room with bowel distension, rectal bleeding and urinary symptoms. Computed tomography of the abdominopelvis showed sigmoid colon cancer with multiple metastases involving the liver. Positron emission tomography with F-18 fluorodeoxyglucose (FDG) showed multiple hypermetabolic foci in the liver, penis and pubic bone, which otherwise could not be diagnosed. The lesions revealed no improvement with chemotherapy and urological surgery on follow-up F-18 FDG PET/CT. We present a case of urethral metastasis of sigmoid colon cancer diagnostically and prognostically indicated by F-18 FDG PET/CT.

Keywords Sigmoid colon cancer · Urethral metastasis · F-18 FDG PET/CT

Introduction

Urethral metastases from other primary sites are a rare clinical entity. The primary tumors that metastasize to the urethra originate from colon, lung, kidney and prostate cancer [1–5]. About ten cases of urethral metastasis from a primary colorectal cancer have been reported in the

literature [3, 6–11]. It is frequently associated with widespread metastatic disease and poor prognosis clinically. In this article, we present a case of adenocarcinoma of the sigmoid colon with multiple metastases, especially to the urethra, diagnostically and prognostically indicated by F-18 fluorodeoxyglucose positron emission tomography (F-18 FDG PET/CT).

Case Report

A 72-year-old male was admitted to the emergency room with urological complaints such as urinary retention, incontinence and voiding dysfunction, which he had had for the past several months. He had a history of colectomy and colostomy 7 months ago due to sigmoid colon cancer with lymph node involvement and pericolic fat tissue metastasis.

Computed tomography of the abdominopelvis showed recurrent sigmoid colon cancer with multiple metastases involving the liver. Despite medical treatment, the urological complaints continued. F-18 FDG PET/CT was performed for restaging and treatment planning using a PET/CT scanner (Discovery ST, General Electric Medical Systems, Milwaukee, WI). After fasting for at least 8 h, the approximate blood glucose level was checked (<140 mg/dl). Then the patient was injected with 5.18 MBq of FDG per kilogram of body weight, and images were acquired 50 min later. CT was performed for attenuation correction, and subsequently, emission scanning was performed from the skull base to the proximal thigh. Images were reconstructed using an iterative algorithm (ordered-subset expectation maximization). To quantify FDG uptakes, standardized uptake values (SUVs) were calculated as follows: $SUV =$

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Fig. 1 Prechemotherapy F-18 FDG PET/CT shows multiple hypermetabolic foci at the liver (arrowheads, large; SUVmax=9.0, small SUVmax=6.8), right pubic ramus (curved arrow, SUVmax=4.9) and penis (arrow, SUVmax=9.0). Reactive FDG uptakes are noted in the left neck, both hilar and mediastinal lymph nodes, right upper lung and lateral aspect of the right proximal femur. The maximum intensity projection images of PET (A) and fused PET/CT (a–d) are demonstrated

Fig. 2 Immunohistochemical staining of resected urethral specimen showed tumor cells strongly positive for CK-20 (A, arrow) and scattered pattern for CK-7 (B, arrow)

[decay-corrected activity (kBq) per milliliter of tissue volume]/[injected FDG activity (kBq) per body mass (g)]. F-18 FDG PET/CT showed multiple metastases with hypermetabolic foci in the liver (large SUVmax = 9.0, small SUVmax = 6.8), right pubic ramus (SUVmax = 4.9) and penis (SUVmax = 9.0) (Fig. 1). A transurethral resection (TUR) and urethral dilation were performed, and the resected specimen from the urethra showed tubular type adenocarcinoma. Further immunohistochemical staining demonstrated that the tumor cells were moderately to strongly positive for cytokeratin 20 (CK 20) and showed a scattered pattern for cytokeratin 7 (CK7), suggestive of a metastatic lesion from the colonic adenocarcinoma (Fig. 2). The tumor stage was T4N1M1, and a tumor marker assay showed a normal level of carcinoembryonic antigen (CEA), prostate-specific antigen (PSA), alpha-fetoprotein (AFP) and carbohydrate antigen 19–9 (CA 19–9). He had received adjuvant chemotherapy, and a follow-up F-18 FDG PET/CT was performed after 7 months. Intense FDG uptakes were noted

in the liver (SUVmax = 9.9, small SUVmax = 8.3), the right obturator muscle including the adjacent pubic ramus (SUVmax = 12.7) and penis (SUVmax = 11.3) (Fig. 3). The tumor was thought to be refractory to the chemotherapy regimen compared to prechemotherapy PET/CT (Fig. 4), and so we changed the chemotherapy regimen.

Two more trials of TUR and urethral dilation were performed because of recurrent urinary complaints, and the patient died of aspiration pneumonia during the chemotherapy.

Discussion

Urethral metastasis in the course of colon cancer is a rare complication. The lung, prostate, skin (malignant melanoma) and colon have been reported as primary sites of tumor that metastasize to the urethra [1–5]. Only about ten cases of urethral metastasis from a primary colorectal cancer have been reported in the literature [3, 6–11].

Fig. 3 Postchemotherapy F-18 FDG PET/CT shows multiple hypermetabolic foci at the liver (arrowheads, large; SUVmax = 9.9, small SUVmax = 8.3), right obturator muscle including the adjacent pubic ramus (curved arrow, SUVmax = 12.7) and penis (arrow, SUVmax = 11.3). Maximum intensity projection images of PET (A) and fused PET/CT (a-d) are demonstrated

Fig. 4 Postchemotherapy F-18 FDG PET/CT (B) shows aggravated regional FDG uptakes compared with prechemotherapy F-18 FDG PET/CT (A)

The most common presentations and signs of urethral metastasis are dysuria, voiding dysfunction, perineal pain, priapism, penile nodules and mass. Our patient complained of dysuria, voiding dysfunction, urgency, urinary retention and incontinence. We determined that these symptoms and signs were attributed to urethral tumor with the help of F-18 FDG PET/CT.

We performed tissue tumor marker studies and immunohistochemical studies to determine the primary site of the urethral tumor. Tissue tumor marker studies and immunohistochemical studies are useful in determining the origin of the primary tumor [12]. Our patient showed a normal value of tissue tumor marker studies such as CEA, PSA, AFP and CA 19-9. In general, primary adenocarcinoma of the colon and its metastatic lesions are strongly positive for CK 20 and negative for CK 7. Tot reported that the percentage positive for CK 20 was 93% and that positive for CK 7 was 15% in metastatic colonic adenocarcinoma, respectively [13]. However, in our case, the phenotype of the metastatic tumor was moderately to strongly positive for CK 20 and showed a scattered pattern for CK 7. These findings of tissue tumor marker studies and immunohistochemical studies made the determination of the primary site difficult.

The most beneficial diagnostic tool was imaging studies such as CT, MRI and PET/CT. Although F-18 FDG PET/CT is useful for detecting the primary site of the metastasis and silent lesions, F-18 FDG PET/CT was not performed or did not play a critical role in the detection of metastatic lesions to the urethra in previously reported cases [3, 6–11]. In our case, PET/CT revealed not only urethral metastasis, which was not detected by other diagnostic tools, but also aggravation after initial chemotherapy.

A biopsy of the urethra by TUR is useful for confirming the diagnosis. Differential diagnoses for a penile hypermetabolic lesion on F-18 FDG PET/CT include primary penile cancer, Peyronie's disease, penile tuberculosis, syphilis, inflammatory and suppurative disease, and urethral metastasis [15]. Confirmation of the diagnosis requires a biopsy of the penile urethra by TUR.

Treatment modalities are local surgery, systemic chemotherapy and local radiotherapy [14]. TUR is beneficial for urinary symptoms. However, the benefit of chemotherapy for urethral metastasis from colon cancer is controversial. Urethral metastasis from colorectal cancer is considered to be a disseminated disease, and the prognosis is known to be generally poor [14]. In our case, metastatic lesions did not

respond to chemotherapy or urological surgery, and the localized disease progressed. We could visualize the progression of the disease by the imaging modality F-18 FDG PET/CT.

In conclusion, urethral metastasis from colorectal cancer is rare and indicates poorer prognosis. It must be suspected in patients with a known neoplasm in whom urinary symptoms develop. We could easily detect the urethral metastasis from sigmoid colon cancer by F-18 FDG PET/CT, which otherwise cannot be diagnosed. F-18 FDG PET/CT allowed us to assess the effectiveness of chemotherapy and to predict the prognosis of the disease, as well as to detect metastatic lesions.

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