Case Report

Urinary bladder carcinoma associated with Paget's disease of skull: Imaging findings on Tc99m-MDP bone scintigraphy, F18-Fluoride PET/CT and F18-FDG PET/CT

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ABSTRACT

We report the imaging findings of a patient with Paget's disease in metastatic carcinoma bladder evaluated by Tc99m-Methylene diphosphonate (MDP) bone scintigraphy, F18-Fluoride positron emission tomography/computed tomography (PET/CT) and F18-fluorodeoxy glucose (FDG) PET/CT. Tc99m-MDP bone scan showed intense uptake in the skull bones without any other abnormal tracer distribution. F18-Fluoride PET/CT revealed intense uptake in the pelvic bones along with skull bones, but F18-FDG PET/CT showed intense multifocal FDG uptake in the bladder and bilateral inguinal lymph nodes, with no abnormal uptake in the skull bones. CT images showed thickening of skull bones.

Keywords: F18-Fluoride PET/CT, Paget's disease, Tc99m-MDP bone scan, urinary bladder carcinoma

INTRODUCTION

Paget's disease is a chronic bone disorder characterized by focal areas of excessive osteoclastic resorption accompanied by a secondary increase in osteoblastic activity, resulting in abnormal bone structure, bone expansion, and deformity.[1,2] Scintigraphy using either Tc99m-Methylene diphosphonate (MDP) or F18-Fluoride is the most useful method of detecting Pagetic lesions. Additional plain radiographs are obtained to characterize lesions detected by scintigraphy. Paget's disease when associated with malignancy may pose diagnostic dilemma. Intense tracer uptake is noted in the Pagetic lesions in the bone scintigraphy using either Tc99m-MDP or F18-Fluoride. We report the imaging findings of a patient with Paget's disease in carcinoma bladder evaluated by 99mTc MDP bone scintigraphy, F18-Fluoride positron emission tomography/computed tomography (PET/CT) and F18-fluorodeoxy glucose (FDG) PET/CT.

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CASE REPORT

A 65-year-old male patient diagnosed to have high-grade transitional cell carcinoma of urinary bladder presented with back pain. Transurethral resection of the bladder tumor (TURBT) was done three times in 4 years. The level of alkaline phosphatase (ALP) was 373 IU/l. Whole body bone scintigraphy [Figure 1a] using Tc99m-MDP showed intense tracer uptake in the skull bones. F18-Fluoride bone scan [Figure 1b] showed additional foci of increased tracer uptake in the right superior pubic ramus, left ilium near sacroiliac joint, along with intense uptake in the skull bones. CT images showed the characteristic thickening of the skull bones, suggesting the mixed phase of Paget's disease. F18-FDG PET/CT [Figure 1c] showed intense FDG uptake in the irregularly thickened urinary bladder wall at multiple sites (SUV_{max} = 20.1) and bilateral iliac nodes (SUV_{max} = 13.5).

DISCUSSION

Urinary bladder carcinoma is the second most common malignancy of the genitourinary tract. Nearly 20–25% of newly diagnosed bladder cancers are muscle invasive and 5–10% are metastatic at initial presentation.[3] Radical cystectomy is the standard treatment for localized muscle invasive bladder cancer.[4,5] About 10–15% of patients are already metastatic at diagnosis and up to 27% of muscle invasive transitional cell

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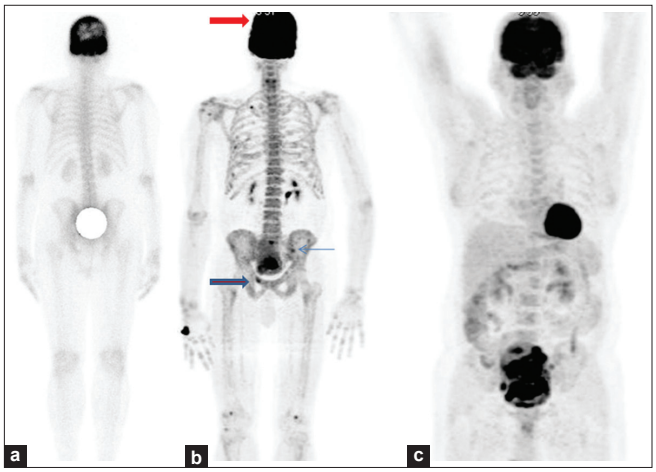

Figure 1: (a) Tc99m-MDP bone scintigraphy whole body images show intense tracer uptake in the skull bone. No abnormally increased tracer uptake is noted anywhere. (b) F18-Fluoride PET/CT MIP image shows increased tracer uptake in the skull bones (red arrow), right superior pubic ramus (brown thick arrow) and left ilium near sacroiliac (SI) joint (blue thin arrow). (c) F18-FDG PET/CT MIP image shows physiological tracer uptake in the brain and myocardium. Skull bones show no abnormal FDG uptake. Intense FDG uptake is seen in the urinary bladder wall at multiple sites

carcinoma presents with bone metastases.[6] Metastatic work up is thus of utmost importance prior to radical surgery to prevent morbidity from the surgery and to decide for systemic therapy with chemotherapeutic agents. F18-FDG PET/CT in our case helped in the treatment planning by showing no evidence of distant disease beyond the bladder. However, bone scan is required to detect bony metastases. As F18-fluoride has double the bone uptake and faster blood clearance than Tc99m labeled phosphonate compounds, it provides better image quality.[7]

Paget's disease is an old age disease occurring usually after 50 years. Bone scintigraphy has high sensitivity in revealing the sites of Paget's disease, even in the lytic phase before they are apparent by plain radiography. Unrecognized additional sites have been found in 5–30%.[8] The skull base is an area where plain radiographs are often inadequate and additional imaging studies (especially CT) are needed. Occasionally, fibrous dysplasia will enter the differential diagnosis, although this disease typically appears much earlier in life and frequently affects facial structures.

The possibility of coexistent metastatic or primary neoplastic disease can be a critical question in the initial evaluation and ongoing care of symptomatic patients with Paget's disease. Modern imaging can make important diagnostic contributions, limiting the need for biopsy. We report a case of coexistent Paget's disease with urinary bladder carcinoma in which three scintigraphic procedures including Tc99m-MDP, F18-Fluoride and F18-FDG PET/CT were used for imaging. 99mTc MDP images were not conclusive of metastatic disease but showed intense uptake in the Pagetic skull. F18-Fluoride images revealed tracer uptake in lytic and sclerotic lesions in pelvic bone, with intense uptake in the Pagetic skull. CT images showed the characteristic thickening of the skull bones, suggesting the mixed phase of Paget's disease. The mixed phase of Paget's disease involves both osteoclastic and osteoblastic activities, creating a mosaic appearance of typical Paget's disease.[9] F18-FDG PET/CT images showed metabolically active multifocal disease in the urinary bladder with involvement of bilateral iliac nodes. Absence of abnormal FDG uptake in the skull bones suggested no relationship between increased osteoblastic or osteoclastic activity and increased use of glucose. The finding of F18-FDG PET/CT was crucial for the differential diagnosis of Pagetic lesion from metastases in our case, as majority of patients with Paget's disease show no abnormal F18-FDG uptake helping in differentiating benign Paget's disease from metastatic lesions.[10]

CONCLUSION

The appearance of Paget's disease on bone scan is characteristic intense uptake in the flat bones. In differentiating incidental Paget's disease from metastatic involvement, the findings of above-mentioned imaging modalities suggest that they have complementary role in metastatic work up.

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