

# **<sup>99m</sup>Tc-MDP uptake in SPECT/CT by a bladder hernia simulating inguinal metastasis: A case report**

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**Abstract.** A 72-year-old male with a history of prostate cancer and high prostate specific antigen levels underwent <sup>99m</sup>technetium-methylene diphosphonate (<sup>99m</sup>Tc-MDP) single-photon emission computed tomography/computed tomography (SPECT/CT), to identify bone metastasis. The patient possessed no previous history of serious illnesses or surgical procedures and no family history of malignancies. A whole-body CT scan revealed an intense MDP uptake in the right inguinal region on the anterior view, but not in the posterior view, which was suspected to be a metastatic lesion. However, there was no evidence of bone metastasis on the CT scan. In addition, an increased <sup>99m</sup>Tc-MDP uptake was indicated on the SPECT images in the right inguinal region, which appeared to be separate from the main bladder activity. CT images of the pelvis revealed an inferior tongue-like extension of the bladder into the right inguinal region. Fused SPECT/CT axial images indicated the circular accumulation of the <sup>99m</sup>Tc-MDP in the medial right groin, with well-defined walls that connected the accumulation to the bladder. The final diagnosis was a bladder hernia (T2N0M0), which may have been responsible for the misdiagnosis of bone metastasis due to the use of radiopharmaceuticals (<sup>99m</sup>Tc-MDP) that were mainly excreted through urination. Considering the comprehensive situation of the patient, radical prostatectomy was performed. The bladder hernia was subsequently monitored by follow-up examination every 3 months, and remains alive and under follow-up to date.

## **Introduction**

Inguinal bladder hernias (IBHs) were originally described by Levine in 1951 (1), and occur when the bladder herniates into

the inguinal canal. The majority of patients have no evident symptoms, but require pressure on the groin to aid urination (2). Generally, the preoperative diagnosis of IBH is challenging. Therefore, injury is often caused to the bladder during the procedure (3). The majority of information available with regards to bladder hernias is based on case reports and a few reviews (4,5). The majority of patients with bladder hernias are asymptomatic and are usually diagnosed incidentally in imaging studies or during inguinal hernia repair (6-8). Bladder angiography is important in the diagnosis of the disease. CT scans may also provide a reliable reference for surgery.

<sup>99m</sup>Technetium-methylene diphosphonate (<sup>99m</sup>Tc-MDP) single-photon emission computed tomography/computed tomography (SPECT/CT) has been widely used in the diagnosis, staging and therapeutic monitoring of bone disease, and has a prominent role in the diagnosis of osseous metastasis. The present study reports the incidental identification of a bladder hernia in a patient with prostate cancer, high prostate specific antigen (PSA) levels and suspected bone metastasis. Written informed consent was obtained from the patient.

## **Case report**

The present study reports the case of a 72-year-old male who presented at the China-Japan Union Hospital of Jilin University (Changchun, China) with high PSA levels (20.72 ng/ml; normal range, 0-4.0 ng/ml) and a normal level of free PSA (1.16 ng/ml; normal range, 0.01-1.00 ng/ml), indicating a ratio of 0.06 (normal ratio, >0.25), upon routine physical examination in June 2014. The patient's previous medical history was normal, including no history of serious illnesses or surgical procedures, and no family history of malignancies. The patient exhibited no clinical symptoms, however, ultrasound identified several abnormal echoes in the prostate. Subsequently, the patient was diagnosed with prostate cancer by biopsy and hematoxylin and eosin immunohistochemical staining in July 2014. For accurate TNM staging, the patient underwent <sup>99m</sup>Tc-MDP SPECT/CT for examination of bone metastasis. Routine whole-body SPECT images were acquired between the top of the skull and the feet 120 min subsequent to an intravenous injection of 765.9 MBq <sup>99m</sup>Tc-MDP. A CT scan was performed on the region that contained the suspicious lesions. An intense MDP uptake was observed in the right inguinal region and there appeared to be a metastatic lesion on the whole-body anterior view, but not on the posterior

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**Key words:** <sup>99m</sup>technetium-methylene diphosphonate, single-photon emission computed tomography/computed tomography, bone scan, bladder hernia, metastasis

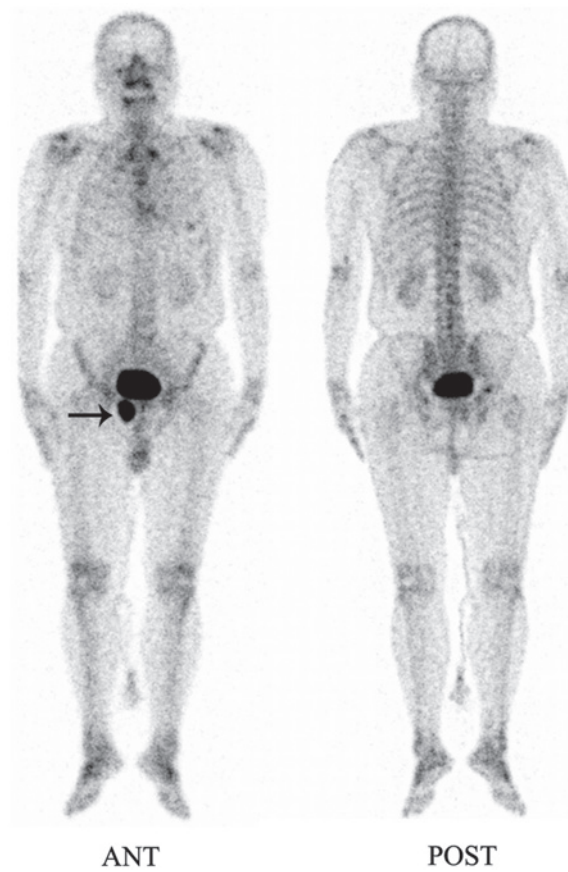


Figure 1. Whole-body single-photon emission computed tomography scan. Intense methylene diphosphonate uptake was revealed in the right inguinal region on the Ant view, but not on the Post view, which was suspected to be a metastatic lesion (arrow). Ant, anterior; Post, posterior.

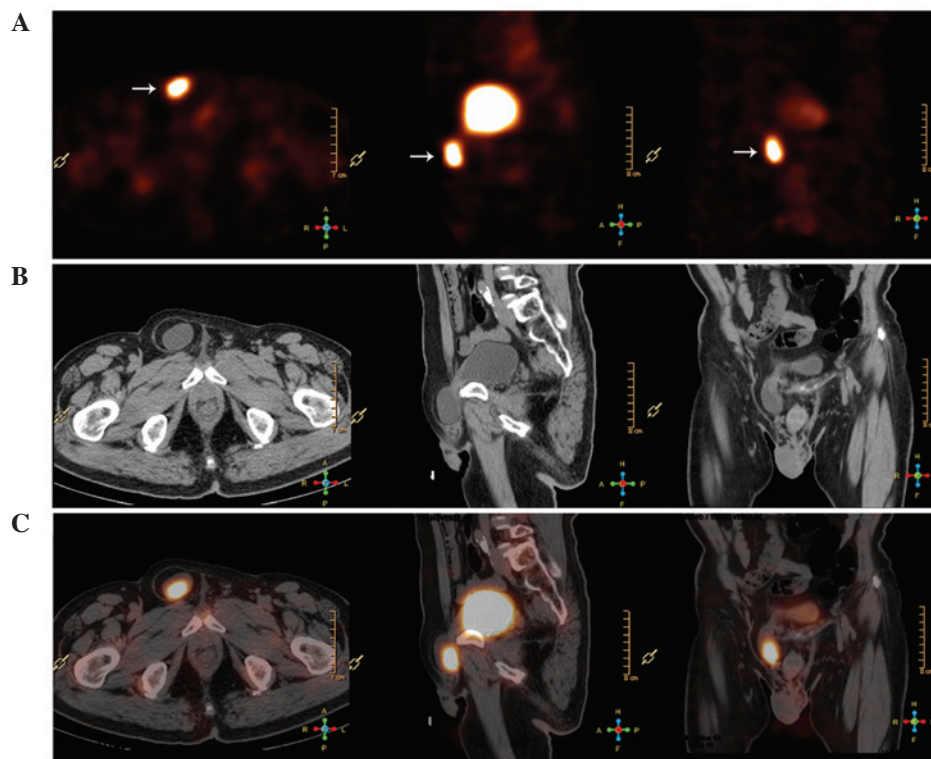


Figure 2. (A) Transaxial, coronal, sagittal SPECT tomography images indicate increased  $^{99m}\text{Tc}$ -MDP uptake in the right inguinal region, which appears separate from the main bladder activity (arrow). (B) CT images of the pelvis show an inferior tongue-like extension of the bladder into the right inguinal region. The neck of the hernial sac was relatively wide, so the hernia contained a homogeneous low-density cyst due to trapped urine. (C) Fused SPECT/CT axial images demonstrate the circular accumulation of  $^{99m}\text{Tc}$ -MDP in the medial right groin and well-defined walls that connect the accumulation to the bladder. SPECT, single-photon emission computed tomography;  $^{99m}\text{Tc}$ -MDP,  $^{99m}\text{Tc}$ -methylene diphosphonate; CT, computed tomography.

view (Fig. 1). Although the CT scan indicated an abnormal suspicious lesion, there was no sign of bone metastasis. Additionally, an increased  $^{99m}\text{Tc}$ -MDP uptake was indicated in the same region, which appeared separate from the main bladder activity in the transaxial, coronal and sagittal SPECT images. CT images of the pelvis indicated an inferior tongue-like extension of the bladder into the right inguinal region, which was diagnosed as an inguinal bladder hernia. The neck of the hernial sac was relatively wide and contained a homogeneous low-density cyst, due to trapped urine. Fused SPECT/CT axial images showed the circular accumulation of  $^{99m}\text{Tc}$ -MDP in the medial right groin and the well-defined walls that connect the accumulation to the bladder (Fig. 2). Ultimately, the patient was considered to be T2N0M0. Considering the comprehensive situation of the patient, only radical prostatectomy was performed. The patient was subsequently followed up every 3 months to monitor the bladder hernia, and remains alive and under follow-up to date.

## Discussion

A bladder hernia is formed when the bladder dislocates from the original location and enters through normal or abnormally weak tissue into another location (4). The contents of a hernia may be the whole bladder or a section of the bladder (6). Bladder hernias rarely occur in the clinic and are infrequent, occurring in  $\leq 4\%$  of inguinal hernias (7,8). The majority of patients with bladder hernias are asymptomatic and are usually diagnosed incidentally in imaging studies or during inguinal hernia repair (6-8). Patients may also demonstrate symptoms of cystitis or benign prostatic hyperplasia (9). A preoperative diagnosis of inguinal bladder hernia may be challenging (10). Cystography is valuable in the diagnosis of bladder hernias. CT scans may also provide references to the surgical methods of the disease (10,11).  $^{99m}\text{Tc}$ -MDP SPECT bone scans are important for the detection and assessment of bone metastases at a sensitivity of 62-89% (12). Diagnosis using SPECT combined with CT is often necessary (11,13,14).

In conclusion, the present study reported the case of a bladder hernia that was detected using a  $^{99m}\text{Tc}$ -MDP SPECT bone scan. A region of increased uptake in the right inguinal region, simulating pubis metastasis, was indicated. The CT scan revealed that the inguinal uptake was due to an unexpected inguinal hernia. The present study demonstrates the

possibility of misinterpreting SPECT images in the absence of the combination of relevant CT data. In addition, the current study may remind radiologists to be aware of this rare condition during the evaluation of SPECT scans. In the present study, a combined review of SPECT and CT data was confirmed to be important in any situation.

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