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Ancillary Finding on Myocardial Perfusion Imaging Due to Urinary Bladder Displacement

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ABSTRACT

When imaging patients are referred for single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI) with technetium 99m (99mTc) agents, the attention is focused on the tracer activity in the myocardium. Apart from myocardial activity, the normal biodistribution of 99mTc Sestamibi and 99mTc Tetrofosmin is seen in the thyroid, liver, gastrointestinal tract, kidneys, and urinary bladder. These structures may be visualized when a large field of view (FOV) gamma camera is used for SPECT imaging. This brief report presents a serendipitous finding of a pelvic mass, which was identified because of the extended field-of-view afforded by the conventional gamma camera used for SPECT MPI and detected because of a review of the raw images by the nuclear medicine technologist (NMT). This case emphasizes the importance of the NMT training to review the raw data in the entire FOV prior to study completion.

BACKGROUND

Incidental extracardiac findings in patients who underwent Positron Emission Tomography/Computer Tomography (PET/CT) and SPECT/CT have been previously documented with the fraction of incidental findings previously reported as high as 60% (*1*). The number of incidental findings that led to potentially treatment-altering diagnoses was low with the identification of previously unknown and treatable malignancies no greater than 0.5% (*1*). It is important to review incidental findings as these will occasionally be found when the CT datasets of the hybrid SPECT/CT and PET/CT MPI studies are carefully reviewed in different imaging windows (*1*). Another published study showed that 60% of the major findings and 48% of the minor findings in SPECT/CT MPI studies were unknown at the time of nuclear imaging (*2*). This study stated that potentially significant abnormal findings on the nondiagnostic-CT portion of the cardiac SPECT/CT examination were detected in 10.5% of reported patients (*2*). These data suggest that, in addition to reviewing the emission image dataset, the CT findings should routinely be assessed for major diagnostic abnormalities (*2*). The requirement for institutional review board approval was waived as this retrospective descriptive report of observations does not attempt to answer research questions; investigators have made every attempt to protect the individual's privacy.

CASE REPORT

A 73-year-old gentleman with a past medical history of tobacco use, non-insulin dependent diabetes, hypertension, and hyperlipidemia was referred for an MPI pharmacologic stress test because of increasing dyspnea symptoms at rest and with exercise. He was unable to undergo a treadmill exercise test because of symptomatic claudication of the right leg after walking more than a short distance. A chest X-ray was unremarkable. A transthoracic echocardiogram showed normal left ventricular systolic function and mild diastolic dysfunction. Both pulmonary function tests and the ankle brachial index test were normal.

Upon arrival in the nuclear medicine department, the patient was given an intravenous injection (IVI) of 307.1 Megabecquerels (MBq) (8.3 millicuries (mCi)) of 99mTc Sestamibi and underwent ungated rest SPECT MPI 30 minutes later. The imaging was acquired on a Siemens Symbia with dual large FOV detectors (53.3 x 38.7cm detector dimensions), and parallel hole, low energy, high resolution collimation (Figure 1). Subsequently, in the stress laboratory, 0.4mg regadenoson was administered to the patient by IVI, followed by the IVI of 1172.9 MBq (31.7 mCi) 99mTc Sestamibi and a gated SPECT MPI was acquired 60 minutes later.

When reviewing the rotating raw SPECT images prior to reconstruction of the rest and stress MPI images, the NMT noticed unusual displacement of the urinary bladder to the left, which was visible due to urinary excretion of the radiotracer (Figure 2A). Before releasing the patient, the NMT brought this finding to the attention of the attending Nuclear Medicine Physician. The patient denied knowledge of a pelvic abnormality and no prior cross-sectional images of the abdomen/pelvis were found in the electronic record. It was decided that SPECT imaging with CT of the abdomen and pelvis was warranted to further characterize the finding.

The MPI scan showed normal myocardial perfusion and normal left ventricular function. The SPECT/CT of the abdomen and pelvis showed deviation of the urinary bladder anteriorly, superiorly, and to the left by a large lipoma in the pelvis (Figure 2B). The lipoma appeared

multilocular with a thin capsule, and measured approximately 10 x 15 x 9 cm. Bowel loops were deviated toward the left by the lipoma. The inferior vena cava and the infrarenal aorta were also deviated to the left, and the right iliac arteries and veins were draped over the lipoma and were stretched anteriorly and to the left of midline. These findings were confirmed on a diagnostic contrast enhanced CT of the abdomen and pelvis (Figure 3A) and a CT angiography showed displacement and stretching of the right common iliac, external and internal iliac arteries without stenosis (not pictured). The patient underwent surgical excision, with no untoward surgical complications. Dedicated CT abdomen/pelvis was completed after resection (Figure 3B). Pathology confirmed a benign lipoma and the patient reported resolution of claudication after excision.

CONCLUSION

This case highlights the unique role of the NMT who, in many clinical units, is the singular individual reviewing the raw rotating images in the entire FOV prior to image reconstruction. By virtue of such a dedicated review, unexpected findings can be further explored before the patient leaves the department. As we describe in this report, following such a protocol may reveal clinically important findings leading to appropriate investigation and diagnosis, thereby expediting patient management.

DISCLOSURES

No potential conflict of interest relevant to this article was reported.

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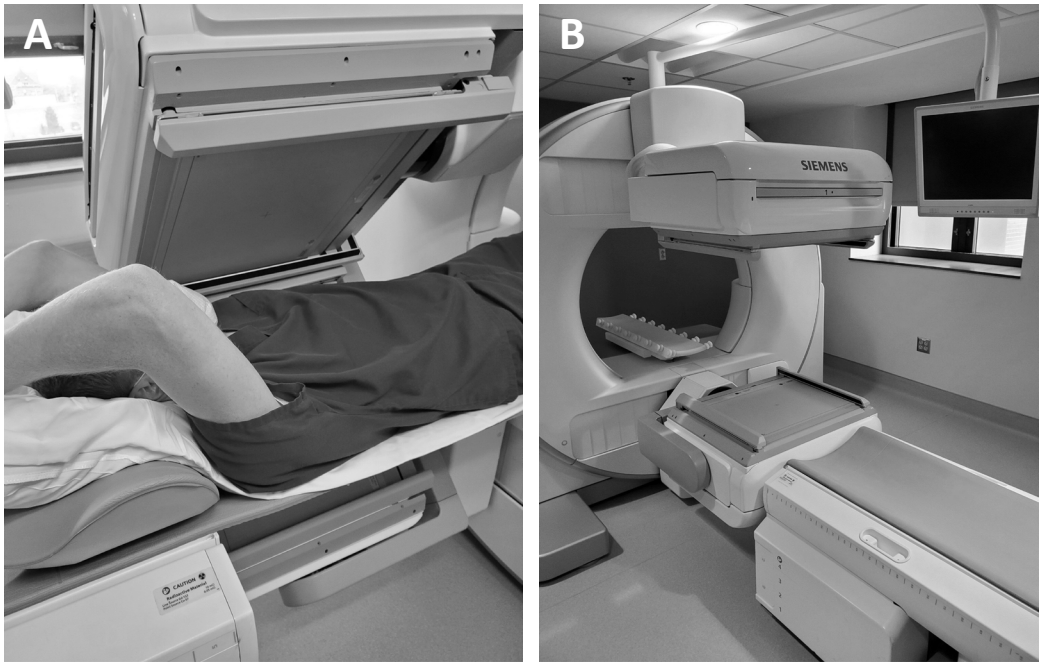

Figure 1

(A) Image showing typical patient positioning (supine with arms raised) during MPI and relative size of FOV.

(B) (B) Image of a Siemens Symbia dual head gamma camera from the VA Saint Louis Healthcare System John Cochran Division, St. Louis, MO.

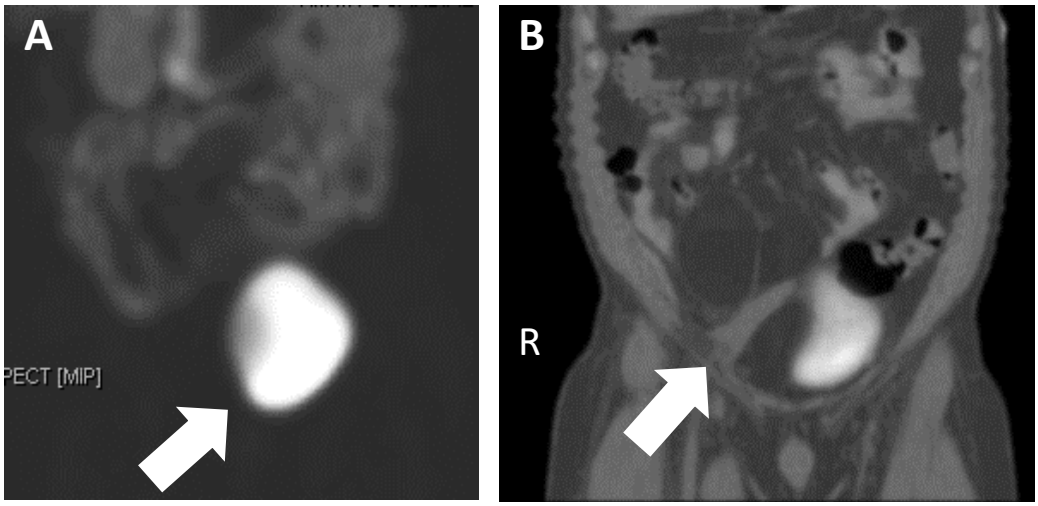

Figure 2

(A) SPECT Image of abdomen/pelvis showing deviation of urinary bladder (taken from maximum intensity projection or MIP image). White arrow shows deviation of urinary bladder in SPECT images.

(B) SPECT/CT Image of abdomen/pelvis showing deviation or urinary bladder by large mass (coronal slice). R in the image is showing the right side of the body. White arrow shows deviation of urinary bladder in CT images.

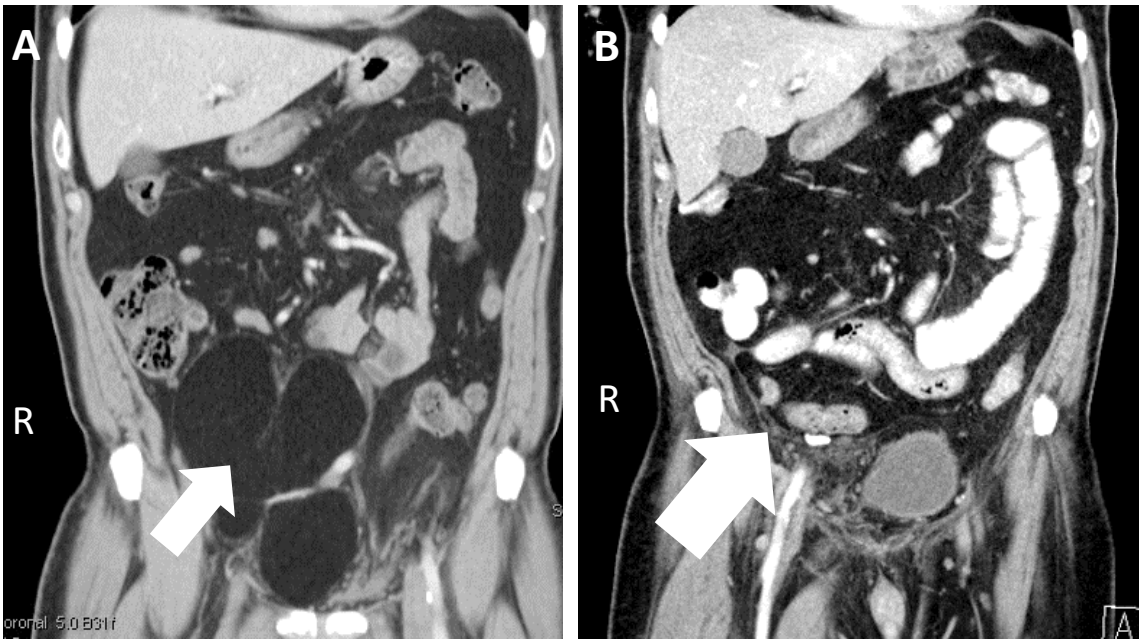

Figure 3

(A) Coronal slice of abdomen/pelvis from dedicated diagnostic CT scan showing large lipoma in pelvis. This CT was done immediately after MPI study. R in the image is showing the right side of the body. White arrow shows deviation of urinary bladder in CT images before resection.

(B) Coronal slice from dedicated CT scan after resection of lipoma. White arrow shows where lipoma was before resection. R in the image is showing the right side of the body.