CLINICAL IMAGE

^{99m}Tc-MIBI scintigraphy in the diagnosis of multiple myeloma

Olgierd Chrabański^{1,2}, Tomasz Gołąb¹, Małgorzata Derejczyk³, Katarzyna Pacwa-Bracik³

1 Division of Nuclear Medicine, Clinica Medica, Tychy, Poland

2 Department of Radiology and Radiodiagnostics, SMDZ in Zabrze, Medical University of Silesia, Katowice, Poland

3 Department of Internal Medicine, Megrez Hospital, Tychy, Poland

A 59-year-old patient was admitted to an internal medicine department because of osteolytic lesions in the cervical and thoracic spine, identified on computed tomography (CT) and magnetic resonance imaging and suspected to be a metastasis (FIGURE 1A). The patient underwent chest, abdominal, and pelvic CT, bone scintigraphy with technetium-99m methylene diphosphonate, gastroscopy, and colonoscopy. None of the tests showed the primary focus of the tumor. Laboratory tests revealed increased erythrocyte sedimentation rate (47 mm/h; reference range, 3-8 mm/h) and total prostate-specific antigen levels (9.24 ng/ml; reference range, 0.00-4.00 ng/ml). Other possible causes of osteolysis were excluded. Multiple myeloma (MM) was suggested but protein electrophoresis showed no abnormalities, and urine samples were negative for Bence–Jones protein. β_2 microglobulin levels were increased (2.41 mg/l; reference range, 0.80-2.20 mg/l), and immunofixation of serum proteins revealed equivocal results. The patient underwent whole-body scintigraphy after an intravenous administration of methoxyisobutylisonitrile labeled with ^{99m}Tc (^{99m}Tc-MIBI). Accumulation of ^{99m}Tc-MIBI in the sternum and thoracic spine, and partially in the lumbar spine, suggested plasmocytic infiltration in the area (FIGURE 1B). A consulting hematologist considered MM as an unlikely final diagnosis until the results of bone marrow biopsy were received. However, in bone-marrow preparation collected from the sternum, the infiltration of plasma cells was found (23%), which confirmed MM. The patient was transferred to a hematology department for treatment, where after some additional tests, the final diagnosis of MM, lambda light chain disease stage IIIA according to the International Staging System, was established. The patient was referred for treatment with bortezomib and autologous hematopoietic cell transplantation.

Correspondence to:

Olgierd Chrabański, MD, Clinica Medica – Zakład Medycyny Nuklearnej, ul. Edukacji 102, 43-100 Tychy, Poland, phone: +48 32 218 21 21. e-mail: olgierdchrabanski@gmail.com Received: November 8, 2016 Revision accepted: January 22, 2016 Published online: February 12, 2016. Conflict of interests: none declared Pol Arch Med Wewn. 2016; 126 (3): 190-192 doi: 10.20452/pamw.3290 Copyright by Medycyna Praktyczna, Kraków 2016

MM is characterized by malignant proliferation of clonal plasma cells and excessive formation of monoclonal immunoglobulin.^{1 99m}Tc-MIBI is a radiotracer commonly used in myocardial perfusion imaging (FIGURE 1C). In literature, there have been reports on the use of ^{99m}Tc-MIBI in the diagnosis of MM since 1996.² In a multicenter study conducted in Italy between the years 2001 and 2005 on a group of 397 patients, sensitivity to detect changes in MM using ^{99m}Tc-MIBI was assessed as 77% compared with 45% using radiographic images.² Guang-Uei et al¹ compared the sensitivity to detect changes in MM using radiography, ^{99m}Tc-MIBI scintigraphy, and fluorodeoxyglucose positron emission tomography (PET-FDG). In terms of abnormalities in the skeletal system, the sensitivity of radiography was 80%; of 99mTc-MIBI, 80%; and of PET-FDG, 93.3%; in terms of abnormalities in soft tissue, the sensitivity of radiography was 21.1%; of 99mTc-MIBI, 68.4%; and of PET-FDG, 89.5%; and in terms of bone marrow infiltration, the sensitivity of radiography was 0%; of ^{99m}Tc-MIBI, 80%;







and of PET-FDG, 100%. This indicates particular usefulness of ^{99m}Tc-MIBI in detecting abnormalities in bone marrow and soft tissues.¹

According to recent studies, single-photon emission computed tomography/computed tomography imaging has a considerably increased sensitivity owing to attenuation correction. In

FIGURE 1 A – A computed tomography scan (CT) showing osteolytic lesions in the cervical spine. The size of the biggest osteolytic lesion in the Th1 vertebra is 22 imes 30×17 mm (arrow). Morphological imaging techniques, such as radiography, CT, and magnetic resonance imaging show osteolytic lesions but not their activity; thus, they are limited in terms of assessing active plasmocytic infiltration or treatment response. B - A whole-body 99mTc-MIBI scan showing a radiotracer accumulated in the sternum and thoracic spine, and partially in the lumbar spine, suggesting plasmocytic infiltration in the area. In our case, the ^{99m}Tc-MIBI scan provided information on the site of an active lesion, which helped identify the site for bone marrow biopsy. C – A whole-body ^{99m}Tc-MIBI scan showing a physiological radiotracer accumulated in the myocardium, liver, small intestine, salivary gland, and thyroid gland. The scan also shows the kidney during filtration and radioactive urine in the bladder.

addition, an image from an inbuilt CT scanner increases its specificity by distinguishing abnormal uptake and allowing further characterization of the lesion.³ Future diagnostic imaging of MM may be new PET radiotracers: ¹¹C-4'thiothymidine and ¹¹C-methionine. They were compared to ¹⁸F-FDG and confirmed to be even more useful in the detection of active lesions, especially during early disease stages. Another advantage of ¹¹C-labeled radiopharmaceuticals is much lower radiation exposure than that of ¹⁸F-labeled radiopharmaceuticals.⁴

^{99m}Tc-MIBI is rarely used in the diagnosis of MM despite evidence on its usefulness. The above advantages, including a relatively low cost and better accessibility compared with PET, should incline physicians to consider the use of ^{99m}Tc-MIBI scintigraphy as a diagnostic procedure when access to PET is limited.

REFERENCES

1 Guang-Uei H, Chien-Chung T, Shih-Chuan T, et al. Comparison of Tc-99m sestamibi and F-18 FDG-PET in the assessment of multiple myeloma. Anticancer Res. 2005; 25: 4737-4742.

2 Mele A, Offidani M, Visani G, et al. Technetium-99m sestamibi scintigraphy is sensitive and specific for the staging and the follow-up of patients with multiple myeloma: a multicentre study on 397 scans. Br J Haematol. 2007; 136: 729-735.

3 Luthra K, Bhave A, Lele RD. Tc 99m sestamibi scanning in multiple myeloma – a new look with SPECT-CT. J Assoc Physicians India. 2014; 62: 801-812.

4 Okasaki M, Kubota K, Minamimoto R, et al. Comparison of ¹¹C-40-thiothymidine, ¹¹C-methionine, and ¹⁸F-FDG PET/CT for the detection of active lesions of multiple myeloma. Ann Nucl Med. 2015; 29: 224-232.