Case Reports

The Significance of Incidental Noncardiac Findings

in Tc-99m Sestamibi Myocardial Perfusion Imaging: Illustrated by a Case

Sofia N. Chatziioannou, MD, PhD
Carina Alfaro-Franco, MD
Warren H. Moore, MD
Leticia Alanis-Williams, CNMT
Ramesh D. Dhekne, MD
Patrick V. Ford, MD

Technetium 99m sestamibi is widely used in the evaluation of myocardial perfusion imaging. Although the aim of such imaging is cardiac evaluation, numerous other organs are included in the imaging field. Failure to identify incidental abnormal findings in these organs delays diagnosis and treatment. In common with other radiopharmaceutical agents, technetium 99m sestamibi is distributed throughout the body and accumulates in multiple tissues. When interpreting studies that involve this radiotracer, the physician must be aware of its physiologic distribution, in order to recognize abnormal uptake. We present an illustrative case in which areas of decreased tracer activity were noted incidentally during the evaluation of unprocessed single photon emission computed tomography data. These findings were due to metastasis of colon cancer to the liver. ***(Tex Heart Inst J 1999;26:229-31)***

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From: *The Department of Radiology, Baylor College of Medicine (Drs. Chatziioannou, Moore, Dhekne, and Ford); and the departments of Nuclear Medicine (Drs. Chatziioannou, Moore, Dhekne, and Ford; and Ms Alanis-Williams) and Cardiology (Dr. Alfaro-Franco), St. Luke's Episcopal Hospital, Houston, Texas*

Address for reprints: *Sofia N. Chatziioannou, MD, PhD, Department of Nuclear Medicine, St. Luke's Episcopal Hospital, 6720 Bertner Avenue, MC 3-261, Houston, TX 77030*

The radiopharmaceutical agent technetium 99m (Tc-99m) sestamibi is used routinely for myocardial perfusion imaging in reaching diagnoses and prognoses in coronary artery disease.[1-5] The mechanism of cellular uptake is not entirely clear, but it seems to be related to the concentration of mitochondria inside the cells and the electrochemical gradient across the cell membrane.[6] Recently, there has been increasing evidence that Tc-99m sestamibi is concentrated by a variety of tumors.[7-19]

After intravenous administration, Tc-99m sestamibi is physiologically taken up by the salivary glands, thyroid, heart, liver, and spleen. There is physiologic hepatobiliary and renal clearance.

The field of view of unprocessed single photon emission computed tomographic (SPECT) data varies, in accordance with the size of the camera crystal and the size of the patient, but it usually includes the entire chest, the liver, the spleen, and part of the bowel; occasionally, the thyroid gland and the kidneys are also included. Therefore, the interpreting physician has the opportunity to evaluate other organs and should take advantage of it.

A case with incidental abnormality in the liver is discussed below.

Case Report

In June of 1998, a 71-year-old man with a history of hypertension, hypercholesterolemia, coronary artery disease, myocardial infarction, and L4-L5 laminectomy and diskectomy presented with acute onset of severe lower back pain radiating to the left leg. Magnetic resonance imaging of the lumbar spine showed foraminal stenosis at the level L4-L5. There was no evidence of any neoplastic process involving the spine.

Physical examination revealed mild neurological findings in the distal lower extremity. The chest and abdomen were normal.

Hospital Course. The patient was admitted for ventral and left-sided decompression laminectomy of L4-L5 and L5-S1. A routine electrocardiogram revealed a "new" right bundle branch block and a left anterior fascicular block. Because

of this finding and the patient's history of coronary artery disease, stress myocardial perfusion imaging with SPECT was performed; it showed a fixed perfusion defect in the posterior wall consistent with scar tissue. A review of the unprocessed data revealed multiple photopenic defects in both lobes of the liver (Fig. 1). Subsequent ultrasonography of the abdomen demonstrated multiple hypoechoic lesions in both lobes of the liver, consistent with metastatic disease. Computed tomography (CT) of the abdomen confirmed the presence of multiple metastatic lesions in the liver (Fig. 2). A CT-guided needle biopsy of the liver was performed and metastatic adenocarcinoma, mucin positive, favoring an intestinal primary tumor, was diagnosed. Gastrointestinal evaluation, including colonoscopy, uncovered a large (4- to 7-cm) ulcerated mass in the mid-ascending colon, and biopsy confirmed adenocarcinoma.

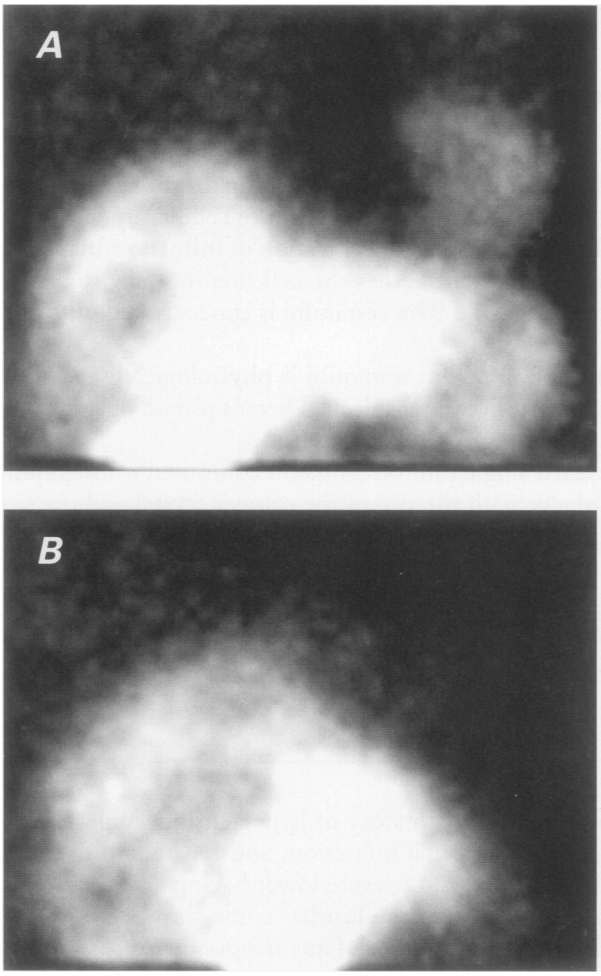

Fig. 1 *Anterior (**A**) and lateral (**B**) projections of the lower thorax and upper abdomen from the unprocessed data of single photon emission computed tomographic myocardial perfusion, which demonstrate multiple areas of photopenia in the liver. The heart is also visualized.*

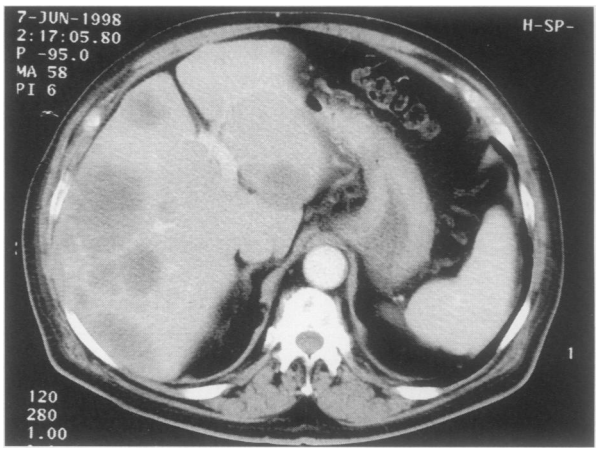

Fig. 2 *Computed tomogram of the abdomen demonstrating metastatic lesions in the liver.*

Discussion

Myocardial perfusion imaging is a diagnostic technique that is widely used in evaluating myocardial perfusion. In the case described above, we used Tc-99m sestamibi, which, in common with any other radiopharmaceutical agent, is distributed throughout the body, with increased concentration in the salivary and thyroid glands and in the heart, liver, hepatobiliary system, spleen, bowel, kidneys, and urinary tract. Its use, other than in the evaluation of myocardial perfusion, has expanded to include tumor imaging. Of course the primary aim of myocardial perfusion imaging is the evaluation of myocardial perfusion, so processed tomographic slices typically include only the heart and small parts of adjacent organs. However, because the unprocessed data include the physiologic or pathologic radiopharmaceutical uptake in the rest of the imaged body, it is important that the interpreting physician evaluate all the information available; incidental findings in the other organs may lead to an earlier diagnosis of pathologic conditions that require treatment. In the case discussed above, sestamibi led to the uncovering of metastatic cancer of the colon and to earlier treatment of this disease.

Unfortunately, there are no specific characteristics of the photopenic defects in the liver in a Tc-99m sestamibi scan that can differentiate between benign and malignant disease. Therefore, the interpreting physician should report any such findings and state the potential of their malignancy. Further investigation by clinical, laboratory, and other diagnostic means should then be undertaken. It should be pointed out that areas of increased tracer uptake in the liver are likely to represent malignancy, because cysts have decreased sestamibi uptake, and hepatocellu-

lar carcinoma has been reported to demonstrate increased uptake.[16] However, areas of increased tracer uptake in the liver can be difficult to ascertain because liver uptake of sestamibi is normally high.

The interpreting physician should also be aware that other abnormalities might be revealed in a Tc-99m sestamibi scan. Abnormalities with increased tracer uptake are: thyroid nodules (benign or malignant);[17,18] parathyroid adenomas,[7] adjacent to the thyroid gland or anywhere in the mediastinum, for which sestamibi imaging is the procedure of choice; lung malignancies;[10-11] breast malignancies,[8-9] for which sestamibi has been approved by the Food and Drug Administration both for detection and for differentiation from benign processes;[19] metastases of breast malignancies to the axillary lymph nodes;[19] lymphomas;[12,13] brain tumors;[14] sarcomas;[15] and infectious processes and granulomas.[20]

Abnormalities with decreased tracer activity are: renal photopenic defects suggestive of cysts or possible malignancy (since normal cortical uptake of sestamibi is relatively high[21]); and, finally, acute cholecystitis, in the event that the gallbladder cannot be visualized.[22]

In conclusion, the interpretation of myocardial perfusion imaging should not be limited to the heart, because it can reveal other pathologic conditions. Because the ultimate goal is the well-being of the patient, any available information should be examined and interpreted.

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