Case Report

Value of SPECT in Liver-Spleen Imaging

Barbara Brown, Bridget Czerwinski, Joseph Lacny, and Nihal Gooneratne

Christ Hospital, Oak Lawn, Illinois

Many diagnostic imaging procedures such as nuclear medicine, ultrasound, and computerized tomography (CT) are available to the clinician for the evaluation of liver diseases. No single modality has emerged as the best method for detection of liver pathology. Lesions of significant size can escape detection by CT due to similarity in attenuation between normal and abnormal liver tissues, leading to insufficient contrast for visual detection. Similarly, a great number of patients may present with poor ultrasound scans due to the presence of fat, air, and inaccessibility of lesions. In contrast, radionuclide liver-spleen imaging remains an attractive screening procedure. Until recently, only planar radionuclide imaging techniques were available. The introduction of computers and cameras equipped with rotating heads capable of performing SPECT has added new dimension to the diagnostic value in detection of liver pathology. This report describes our experience with such a system and presents three illustrative cases. Two of them had been confirmed surgically, whereas the third had been confirmed histologically by needle biopsy.

MATERIALS AND METHODS

Over a 12-mo period, 1,395 patients had planar liver-spleen scans performed. Sixty-four patients had suspicious planar scans and were selected for SPECT scans on the same day. Planar liver-spleen images were obtained 10–20 min following the injection of 5–6 mCi Tc-99m sulfur colloid. Images were obtained from the anterior, posterior, right and left lateral, RAO, and LPO projections. Anterior inspiration and expiration were also obtained with lead markers on the costal margin. Images were reviewed by a physician, and, when necessary, SPECT imaging was also performed. One hundred and twenty images for tomographic reconstruction were obtained* for 10 sec at 3° increments. Image data were reconstructed into transverse, coronal, and sagittal images.

For reprints contact: Barbara Brown, Division of Nuclear Medicine, Christ Hospital, 4440 W. 95th St., Oak Lawn, IL 60453.

CASE REPORTS

Case 1:

A 48-yr-old female presented with a history of vague, intermittent, right upper quadrant pain for a 6-mo period. On physical examination she had no organomegaly or mass. Because her liver function tests were abnormal, a planar liver-spleen scan was performed (Fig. 1) which was interpreted as normal. In view of the abnormal liver function tests, SPECT was performed (Fig. 2). A single filling defect was seen. On hepatic angiography, a diagnosis of hemangioma was made which confirmed the findings of a space-occupying lesion on SPECT. This would have been a false negative study had SPECT not been used. The filling defect was faintly visible only in retrospect on the planar images (Fig. 3).

Case 2:

A 67-yr-old female was admitted to the emergency room with a history of a fall. X-rays of the left ribs showed fractures of the seventh, eighth, and ninth ribs. She was anemic, but her hematocrit was stable. A planar liver-spleen scan was performed as an emergency procedure to rule out splenic injury (Fig. 4). The study did not show linear defects or distortion of the spleen to suspect injury. Due to the history and multiple rib fractures, SPECT was performed (Fig. 5A). It showed the loss of the normal convex posterolateral contour of the spleen due to a subcapsular hematoma (Fig. 5B). At surgery, findings compatible with the SPECT study were confirmed. No abnormality was seen in retrospect on the planar image.

Case 3:

An 85-yr-old male presented with a history of trauma on the day of admission. X-rays of the ribs showed no fractures. His hematocrit was stable. A liver-spleen scan showed a single filling defect in the right lobe of the liver near the dome that was suspicious of a space-occupying lesion (Fig. 6). The spleen was normal. Two filling defects were seen on SPECT (Fig. 7). One corresponded to that seen on planar images, whereas the other was in the right lobe located more posteriorly. Hepatic

metastasis was suspected and a skinny needle biopsy was performed. The histologic diagnosis was adenocarcinoma. Because SPECT showed two lesions, the possibility of metastatic disease was raised.

DISCUSSION

Planar radionuclide liver-spleen imaging is a valuable noninvasive screening technique. The diagnostic value is limited due to the high false positive and negative rates. Lunia et al. (*1*) reported an accuracy of 77.3%. They pointed out that in spite of the improvements in gamma camera technology, the accuracy has not changed much over the years. Oster et al. (*2*) in a smaller series came to a similar conclusion. Lesion detectability in the left lobe is poor (*3*).

Gamma cameras equipped with rotating heads have the following advantages:

a) display of cross-sectional images in different planes;
b) a three-dimensional perspective to the images which helps in better interpretation of abnormalities in regard to size and location;
c) ability to rotate images;
d) image manipulation capabilities;
e) imaging of traumatized patients performed easily because multiple position views are no longer needed;
f) little distortion of organs due to lack of varying patient positioning;
g) less camouflaging of lesions due to overlying normal liver tissue;
h) easy correlation of SPECT images with those of CT and ultrasound;
i) multiple radionuclide studies can be better utilized in the workup of multiple organ injuries (e.g., Tc-99m sulfur colloid for liver-spleen and Tc-99m DMSA for kidneys);
j) comparison of followup images is easier due to exact duplication of views because varying the patient's position is not necessary.

Imaging literature documents the use of tomographic imaging of the heart (*4*), brain (*5*), and liver. Our cases clearly present the merits of SPECT over planar imaging, especially in equivocal cases. By resorting to SPECT, one could minimize the use of CT and/or ultrasound in the evaluation of liver-spleen pathology and once again regain the clinician's confidence in the usefulness of radionuclide imaging.

FOOTNOTE

*Omega 500, Technicare Corp., U.S.

ACKNOWLEDGMENT

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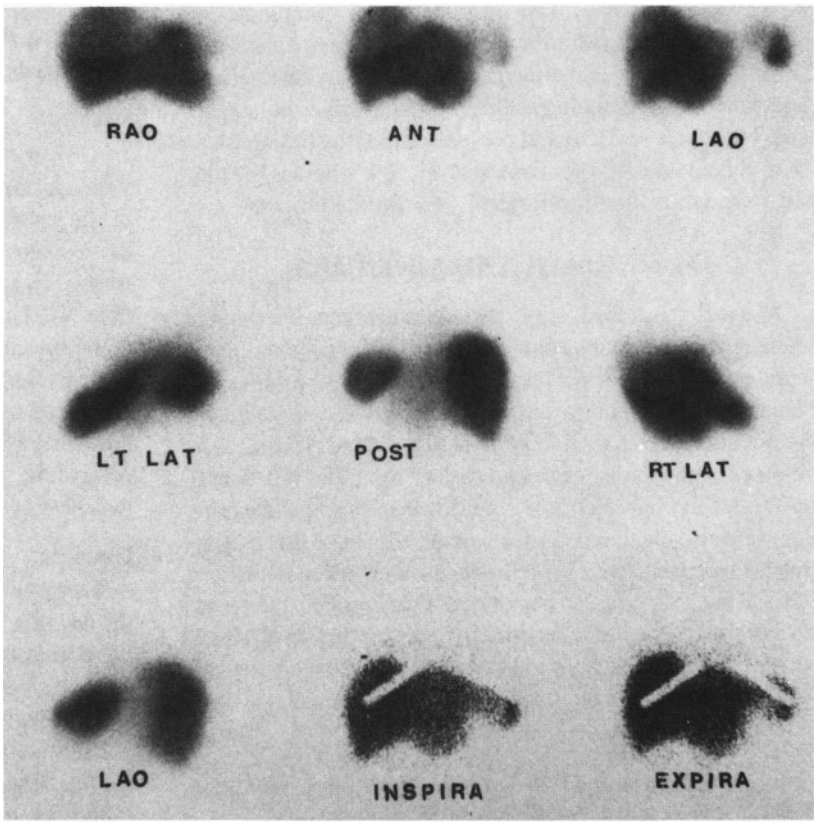

FIG. 1. Routine views of Tc-99m sulfur colloid liver-spleen scan showing normal distribution of radioactivity without filling defects.

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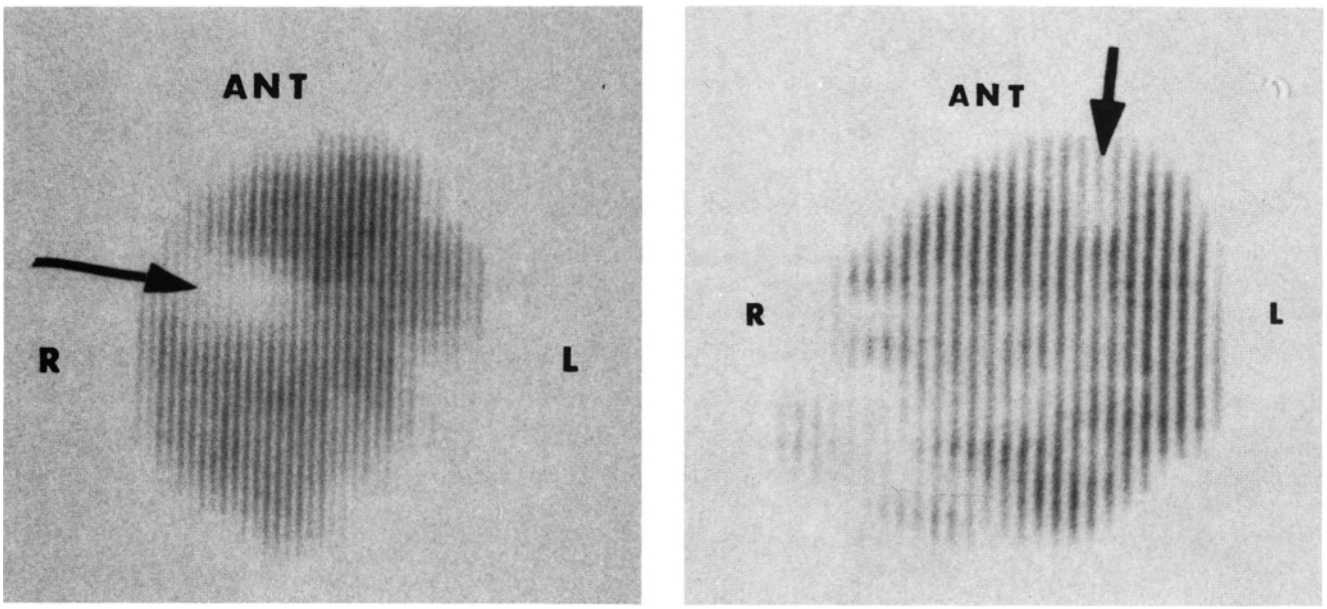

FIG. 2. The left image is a transaxial SPECT image of the liver showing a filling defect near the dome of the right lobe (arrow). The image on the right is a sagittal section also showing the right lobe defect (arrow).

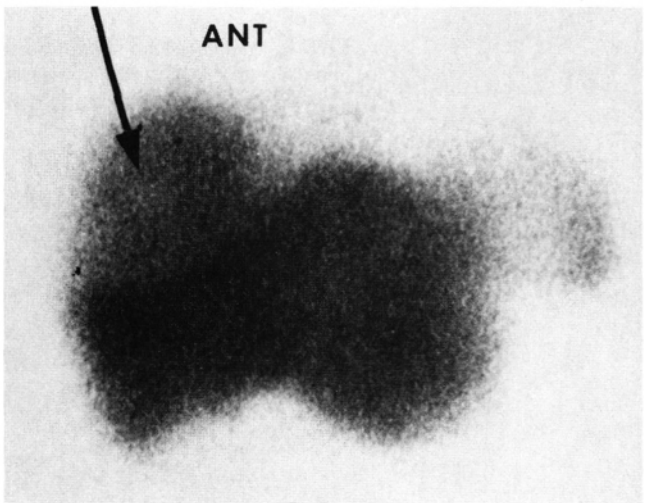

FIG. 3. In retrospect, a faint filling defect (arrow) can be faintly seen in the right lobe on the anterior planar image.

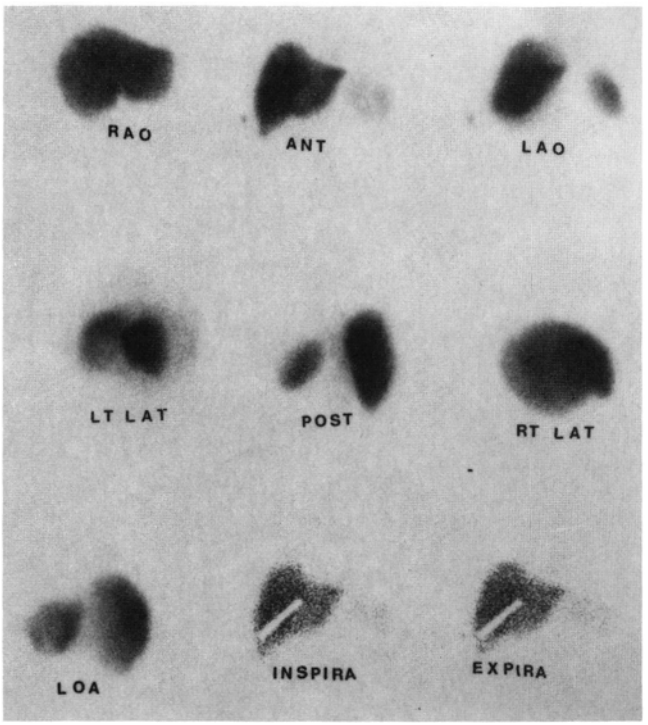

FIG. 4. Routine planar liver-spleen images showing no abnormalities in either organ.

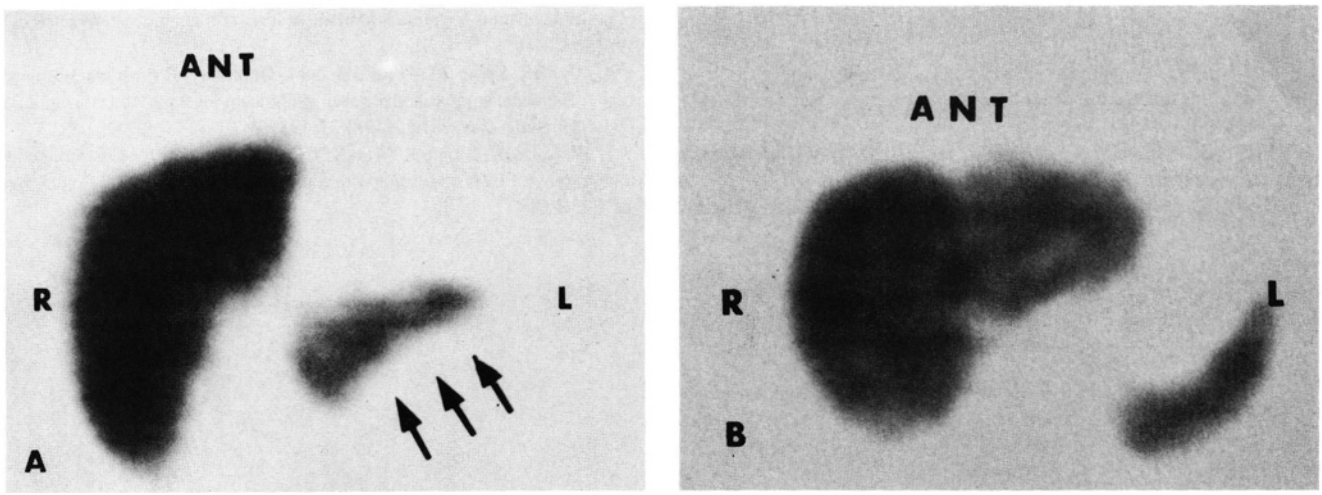

FIG. 5. A) A transverse SPECT image through the liver and spleen show a concave defect in the posterior splenic border (arrows) due to a subcapsular hematoma. No filling defects are seen within the spleen; B) A similar transverse image of the liver and spleen from a normal study shows the usual normal posterior convex border of the spleen (arrows).

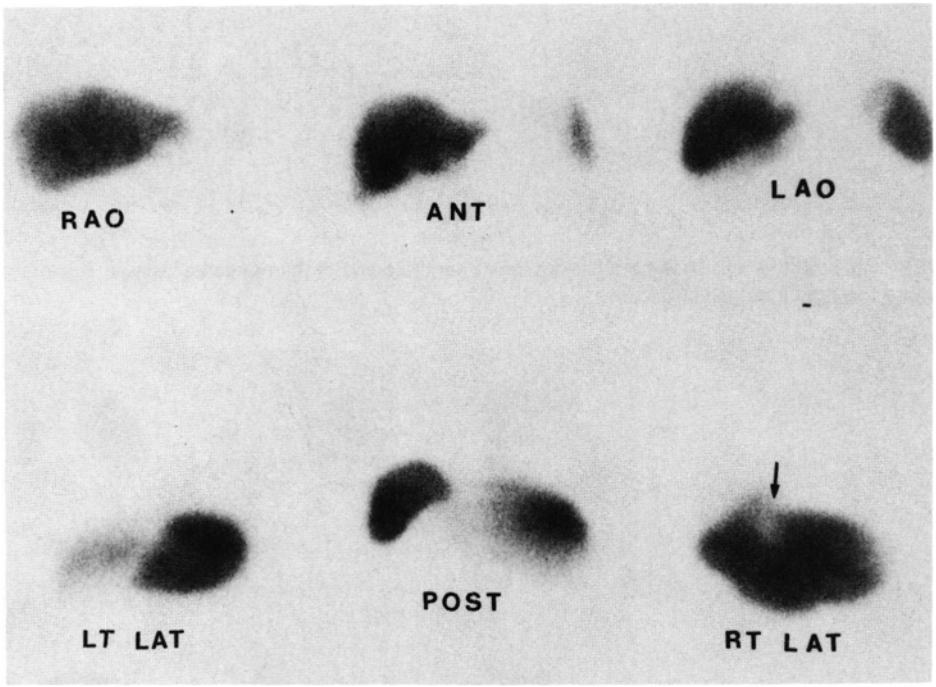

FIG. 6. Planar Tc-99m sulfur colloid images of the liver show a single filling defect near the dome of the right lobe of the liver (arrow).

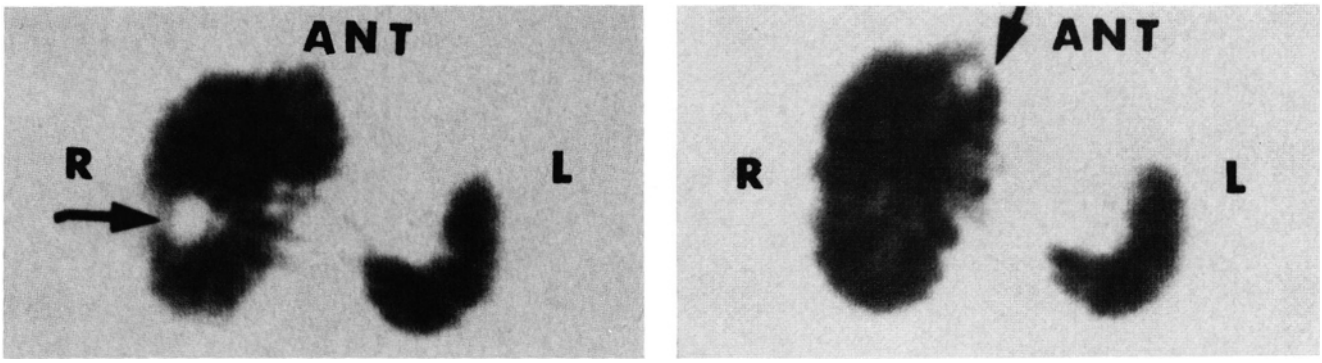

FIG. 7. Two transaxial reconstructed slices at different levels of the liver show separate filling defects in the right lobe (arrows).