Positive Liver SPECT Images Correlated With Normal or Equivocal CT Studies: Two Case Studies

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Objective: The number of liver/spleen procedures has markedly decreased over the past number of years, coinciding with the advancement of computed tomography equipment. However, the development of SPECT and hepatobiliary radiopharmaceuticals has improved diagnostic ability.
Methods: Two patients were studied; one was a 64-yr-old male with possible cirrhosis and the other was a 48-yr-old female with abnormal liver function and a left-side mastectomy. Both patients were intravenously injected with ^{99m}Tc-sulfur colloid, and SPECT liver/spleen images were correlated with CT images.
Results: The SPECT scans detected abnormalities that were neither present nor differentiated from normal tissue on the CT images.
Conclusions: These case studies demonstrate that ^{99m}Tc-sulfur colloid SPECT correlated with CT can detect abnormalities that would be normal or equivocal when using CT alone.
Key Words: Technetium-99m-sulfur colloid, liver/spleen scans, SPECT, CT.

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Since the early 1980s and the advent of first-generation computed tomography (CT) equipment, we have observed a dramatic decrease nationally in the number of nuclear medicine liver/spleen procedures. CT was clearly considered to be superior in evaluation of diseases in the abdomen and pelvis, but in recent years, the development of SPECT instruments and hepatobiliary radiopharmaceuticals has enhanced our ability to aid in diagnosis (*1*). SPECT imaging of the liver has increased the accuracy and improved contrast resolution as innovative computer applications have been developed improving reconstruction techniques and providing more precise three-dimensional localization of various lesions (*2*).

The following two case studies illustrate sulfur colloid SPECT liver/spleen images correlated with CT images. Our evaluation suggests that SPECT liver/spleen scans can detect abnormalities or pathology when CT is normal or equivocal.

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CASE ONE

A 64-yr-old male with possible cirrhosis presented with an enlarged tender abdomen, an elevated serum alpha fetoprotein level and a clinical history of progressive liver dysfunction. He was referred for a liver/spleen scan followed by a CT scan. The patient was intravenously injected with 6.9 mCi of ^{99m}Tc-sulfur colloid. Liver and spleen images were obtained using SPECT in the coronal, sagittal and transaxial planes.

A CT examination was performed on a GE 9800 scanner (GE Medical Systems, Milwaukee, WI). Consecutive transaxial scans of the abdomen were performed extending from the xiphoid process to the iliac crest at 1-cm intervals. The examination was performed with and without intravenous contrast. Five-millimeter slices through the liver and spleen were obtained. Intravenous injection of nonionic contrast, Isovue 250%, ISO cc, was administered for this examination.

No focal lesion in the liver is identified on the CT scan (Fig. 1). Attenuation of the liver with respect to the spleen is normal. The spleen is mildly enlarged, measuring 13.5 cm in the AP diameter and 7.5 cm in the transverse. The liver-spleen images show patchy tracer distribution in the liver, particularly in the right lobe, with slightly decreased tracer uptake in the left lobe (Fig. 2). Mild uptake in the bone marrow is present (Fig. 3). The patient was clinically found to have a hepatoma.

CASE TWO

A 48-yr-old female with an elevated gamma-glutamyltransferase value of 278 (normal range, 0–50), elevated CEA and a history of left-side mastectomy was referred for a liver/spleen SPECT scan to rule out liver pathology. The patient was injected intravenously with 5.4 mCi of ^{99m}Tc-sulfur colloid. A large field of view camera (Sopha Medical Systems, Columbia, MD) was used to acquire planar anterior and posterior images of the lower chest and abdomen. Following this, SPECT images were obtained using a 360-degree rotation with 64 projections at 20 sec per stop. Images were processed in 64 × 64-word mode at a 1.33 zoom resulting in serial tomographic images in the transaxial, coronal and sagittal planes.

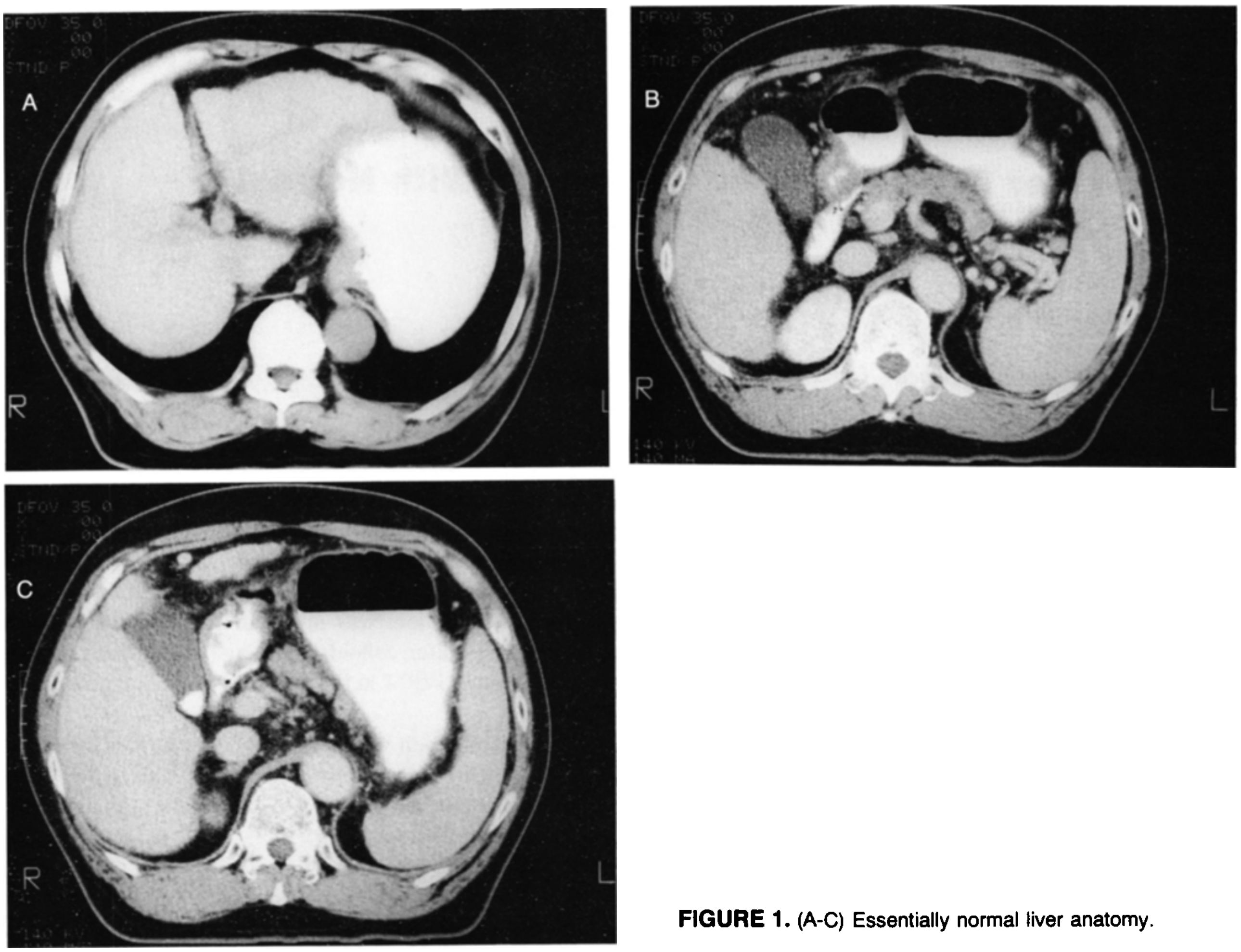

FIGURE 1. (A-C) Essentially normal liver anatomy.

A CT examination was performed by obtaining consecutive transaxial scans of the abdomen extending from the xiphoid process to the iliac crest at 1-cm intervals. The examination was performed with oral contrast and without intravenous contrast.

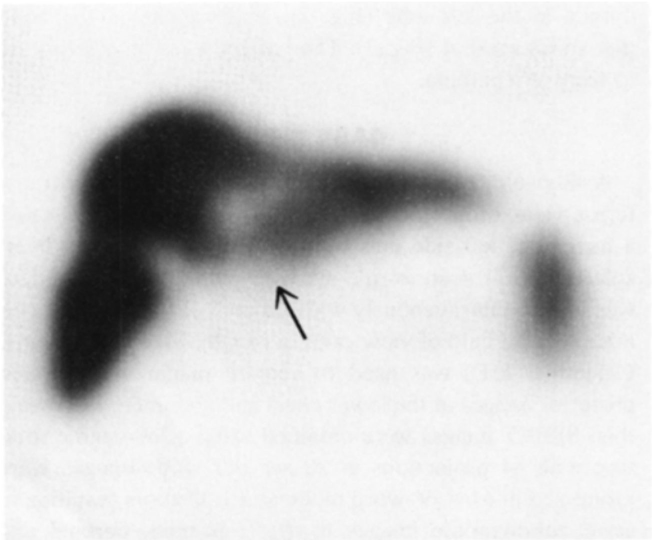

FIGURE 2. Decreased tracer uptake in the left lobe.

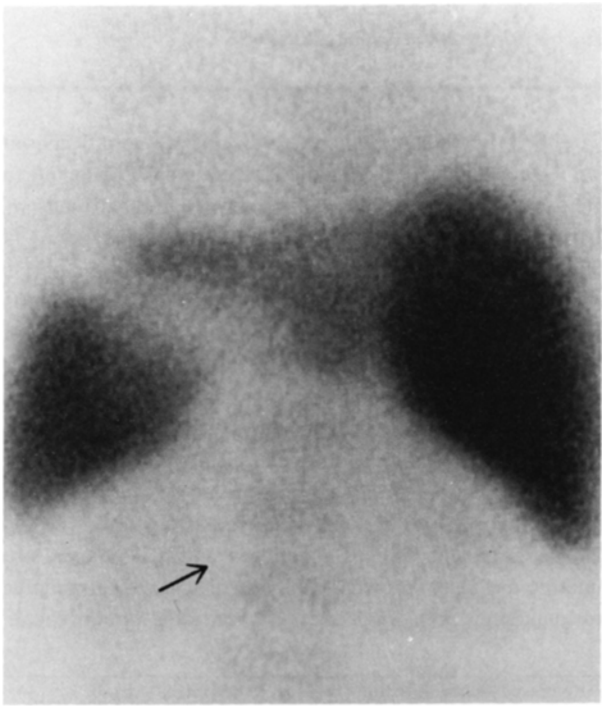

FIGURE 3. Increased bone uptake denoting liver dysfunction.

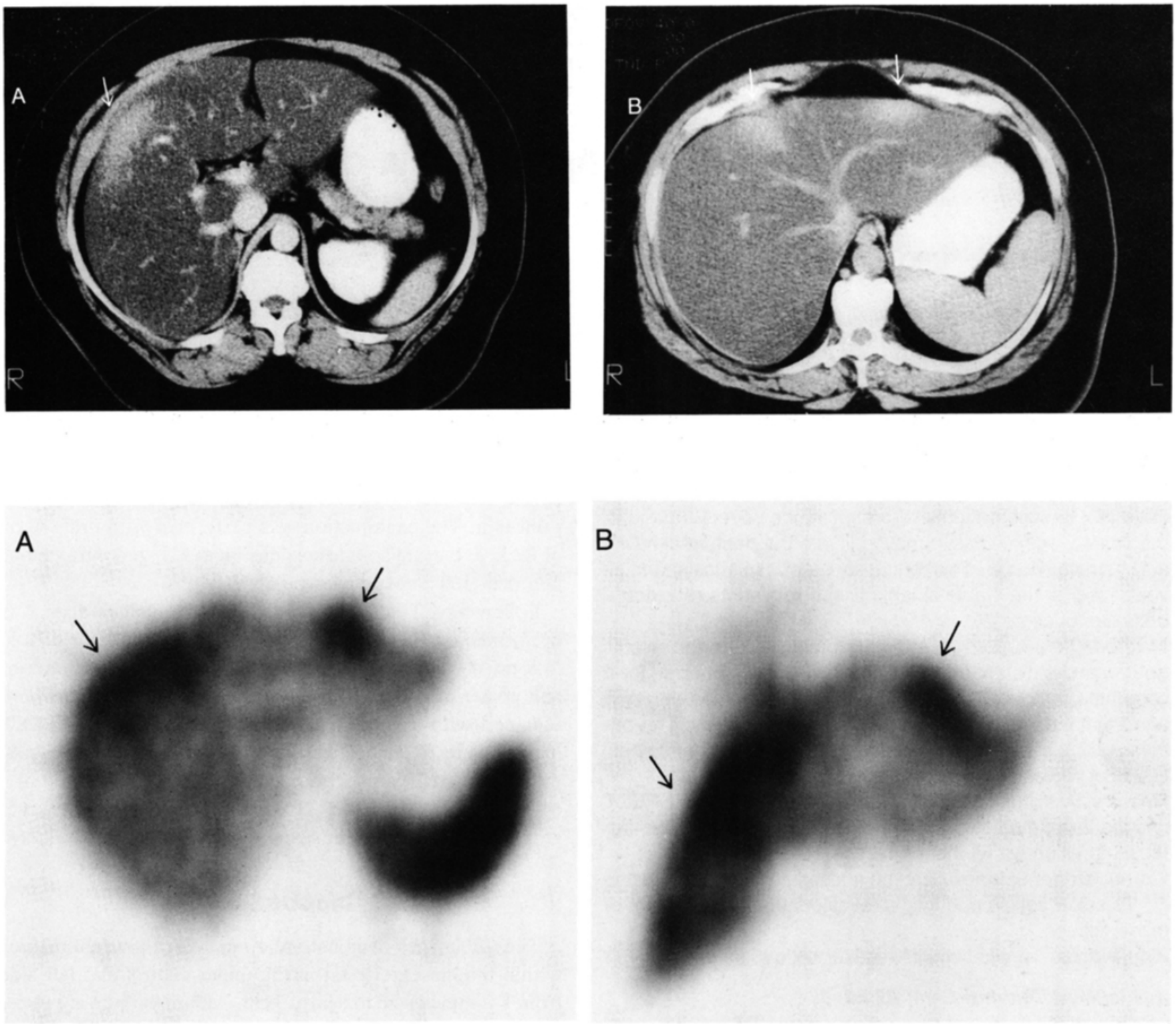

FIGURE 5. (A and B) CT images showing questionable areas as actual functioning liver tissue (arrows).

The CT scan of the liver illustrates apparent lesions within the liver. The remainder of the liver shows diffuse fatty infiltration (Fig. 4). The radiologist requested correlation with a nuclear medicine liver scan to differentiate functioning from nonfunctioning tissue. SPECT showed diffuse diminished radionuclide uptake throughout the liver, except for two small peripheral areas within the left and right hepatic lobes. These areas were identified as small islands of residual normally functioning liver tissue (Fig. 5). The diminished activity was due to fatty infiltration involving most of the liver parenchyma.

CONCLUSION

The fact that these liver/spleen scans detected functional abnormalities and/or abnormal pathology, where the CT was either normal or could not differentiate functioning liver from nonfunctioning tissue, clearly illustrates the viability of SPECT imaging. The strength of nuclear medicine is that it depicts physiology; SPECT can display images in a format similar to CT (*3*). The ability to anatomically match each axial sliced image of SPECT and CT can only enhance the radiological assessment of various liver/spleen-related pathological conditions.

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