LETTERS TO THE EDITOR

Re: Single-Photon Emission Computed Tomography (SPECT) for Assessment of Hepatic Lesions: Its Role in the Diagnostic Work-Up.

In their thorough study, Strauss et al. (*1*) compared conventional liver scintigraphy (CLS), single-photon emission CT (SPECT), and transmission CT (TCT) in patients for assessing hepatic involvement in malignant disease. For liver metastases the authors reported an accurracy of 92% for SPECT and of 82% CLS, using TCT as reference (100%). However, in our opinion these data should be completed for clinical use by considering the rate of correct type-specific classification of detected lesions and the role of ultrasound (US).

We investigated 89 patients (42 with and 47 without focal alterations of the liver) to compare the results from CLS, SPECT, TCT, and US. The purpose of the study was to detect focal lesions and to assess diagnostic accurracy and the rate of type-specific diagnoses by applying either one technique alone or a combination of the above techniques (*2*). The nuclear medicine study group was not informed of the results of TCT and US. Diagnoses in these selected patients were available from autopsy, biopsy, follow-up, or from combination with various other diagnostic procedures. The findings included metastasis (in 27 patients), cyst, hemangioma, echinococcus disease, and primary liver cancer. Results are summarized in Table 1. A correct type-specific diagnosis from either radioactive method (50%) was limited to multiple metastases, since the diagnosis was based on the pattern typical for multifocal lesions.

From these results, we consider a combination of US and SPECT as a preferable diagnostic tool for the assessment of focal hepatic lesions, if a TCT examination cannot be performed. Ultrasound should be applied first, since it resulted in a correct type-specific diagnosis in 85% of cases. SPECT should be used subsequently if results of US are not conclusive. Because SPECT provides data in a reproducible form, it may be a preferable diagnostic procedure for follow-up studies of confirmed liver metastases.

TABLE 1. DIAGNOSTIC ACCURRACY (LESION DETECTION) AND RATE OF CORRECT DIAGNOSES (TYPE-SPECIFIC) IN FOCAL LIVER DISEASE* OBTAINED FROM VARIOUS IMAGING MODALITIES AND COMBINATIONS THEREOF

Imaging modality	Diagnostic accurracy (%)	Correct type-specific diagnosis (%)
Conventional liver scintigraphy	86	50†
Single-photon ECT	92	50†
Transmission CT	92	86‡
Ultrasound	92	85‡
Conv. liver scintigraphy and ultrasound	92	85
Single-photon ECT and ultrasound	95	85

* Selected patients (n = 89).
† versus ‡: $p < 0.01$.

UDALRICH BUELL
MAREIKE KESSLER
CARL-MARTIN KIRSCH
HANS DETLEV ROEDLER
Univ. of Munich and
Bundesgesundheitsamt
Federal Republic of Germany

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Reply

For the evaluation of hepatic lesions, numerous diagnostic modalities are used besides those of radiology and nuclear medicine. Ultrasound as well as other approaches such as laparascopy may achieve importance in arriving at a final diagnosis. To assess the relative importance of the different procedures, it does appear useful to compare several approaches with each other, as Buell and associates have done (*1*). It appears that the required brevity of a letter has caused the terms "diagnostic accuracy" and "correct type-specific diagnosis" to be used. To compare our results (*2*) with those of Buell would have required information about the rate of true positives, true negatives, false positives, and false negatives. Bayes' Theorem could then have been used to obtain a direct comparison of the information content of each procedure.

Furthermore, the correct type-specific diagnosis in subgroups of different sizes is not without difficulties. Metastases were found in 27 patients, whereas 15 suffered from cysts, hydatid cysts, hemangioma, or primary liver cancer. The numbers of patients contained in each subgroup were not specified. We assume that each subgroup contained three or four patients. The problem with diagnostic accuracy, type-specific diagnosis, and subgroups of different sizes is easily demonstrated. For example, if 26 of 27 metastases were correctly diagnosed with a diagnostic modality, the sensitivity, $TP = (26/27) \times 100$, would be 96%. Using the same diagnostic procedure in a small subpopulation of four patients having hemangioma, two of which were correctly diagnosed, would result in a sensitivity of 50%. Combining both groups to determine overall diagnostic accuracy would give a value of 90% [$TP = 100 \times (26 + 2)/(27 + 4)$]. This value would fail to do justice to the achieved results—indeed it would be misleading.

Lastly, we feel that "the correct type-specific diagnosis" as used may cause the value of scintigraphy to be underestimated. Cysts

and metastases will cause comparable defects in a colloid scan. However, liver scan results combined with other diagnostic procedures may be used effectively to obtain a correct diagnosis, as in the differentiation of focal nodular hyperplasia from hemangioma (*3*).

In fatty infiltration the density values of TCT fall, which results in a smaller contast difference between the liver parenchyma and metastases. Circumscribed solid tumors may thus appear iso- or even hyperdense when compared with normal liver tissue. In these patients SPECT appears to be the diagnostic modality of choice, even being superior to TCT.

We do agree with Buell that the combination of ultrasound and SPECT should be assessed to determine whether a major information gain can be obtained when results of the two procedures are combined.

In summary, we feel that SPECT should be used in the following situations: 1. In patients with fatty infiltration of the liver; 2. when the results of TCT or ultrasound are equivocal and when the suspected lesion has a diameter above 1.5 cm; 3. for follow-up of known hepatic metastases, where SPECT has the advantage over ultrasound in obtaining reproducible, standard cross sections; and 4. in combination with ultrasound, especially when TCT is not available.

LUDWIG STRAUSS
FRANK BOSTEL
JOHN H. CLORIUS
Klinikum Mannheim
Mannheim, West-Germany

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3. KÖNIG R, HERTER M: Differential diagnosis of benign intrahepatic tumours. *Fortschr Roentgenstr* 1:1-7, 1983

Re: Uptake of Tc-99m MAA by the Liver During a Lung Scan

In patients with iliac vein or inferior vena cava occlusion the uptake of lung imaging agents by the liver following injection in the lower extremities has been documented previously (*1*,*2*). In contrast to the recent report by Marcus and colleagues (*3*) where there appeared to be uniform distribution in the liver, the earlier cases show preferential uptake in the left lobe, suggesting shunting through the umbilical vein.

E. P. WRAIGHT
Addenbrookes Hospital
Cambridge, England

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2. BENTLEY PG, HILL PL: Scan-demonstrated ilioportal shunt with resolution. *Brit Med J* 1:721, 1978
3. MARCUS CS, PARKER LS, ROSE JG, et al: Uptake of Tc-99m MAA by the liver during a thromboscintigram/lung scan. *J Nucl Med* 24:36-38, 1983

Reply

We appreciate Dr. Wraight's bringing these omissions to our attention. Although an extensive Medline search was performed, the two references were not found. Had we known of the work, we would, of course, have cited these papers.

CAROL S. MARCUS
Harbor-UCLA Medical Center
Torrance, California

Re: Tc-99m IDA Cholescintigraphy in Acute Pancreatitis

In the October issue of the Journal, Ali et al. present a retrospective review of the results they obtained from Tc-99m IDA cholescintigraphy in acute pancreatitis (*1*). Declaring cholescintigraphy to be "useful for detecting acute cholecystitis in patients with acute pancreatitis" they take us to task for having observed transient nonvisualization in such patients (*2*).

First, let us have a look at the design of their study. In their files Ali et al. came across 21 patients with symptoms and signs suggestive of acute pancreatitis. They analyzed the "interpretations of the cholescintigrams by an experienced observer" but do not present any images. In none of the 21 patients was the examination repeated or cholecystography performed, but the findings at operation are given in nine patients who were subjected to surgery.

Now for a look at the results in the 21 patients. Visualization occurred in 16 patients. Five were operated on and "all five were found to have . . . chronic cholecystitis." Nonvisualization occurred in five patients. Four were operated on and "all were found to have acute cholecystitis." Thus, five out of the nine cases with proven gallbladder disease showed normal visualization.

Judging by these figures, the technique of Ali et al. does not appear to be very helpful in excluding gallbladder disease. Admittedly, the technique appears capable of differentiating between the acute and the chronic stage of cholecystitis but most surgeons prefer to get such information from a glance at the temperature chart.

Where did their technique go wrong? Again, since this retrospective study does not present any images, we have to look at the figures, and these clearly suggest that Ali et al. tend to overlook cases of cholecystitis. No less than five of their 16 patients with normal visualization were later cholecystectomized. Why were these patients operated on? Not because they had acute pancreatitis. Pancreatitis per se is not an indication for surgery. We must assume that the surgeons eventually chose to ignore Ali et al.'s assertions that the cholescintigram was normal. When first told that visualization was normal, the surgeons of course abstained from operation. Why ask for a scintigram if you intend to operate anyway? Thus, the operation was delayed. When they finally operated, "all five (patients) were found to have . . . chronic cholecystitis." In view of the delay it is not surprising that the disease had reached its "chronic" stage. Given time, any acute cholecystitis will subside and become "chronic" (*3*).

As for the 11 nonoperated patients with normal visualization, no one can be certain how many had cholecystitis and how many had not. For the sake of the argument let us assume that Ali et al. are correct when they claim that all 11 patients had normal gallbladders. It is this claim that leads them to conclude that cholescintigraphy is ". . as useful . . in patients with acute pancreatitis as it is in patients without . . ." They did not have one single case of nonvisualization in a sample of 11 patients with acute pancreatitis and gallbladders presumed to be normal. But, what about chance? From a table of 95% confidence limits (*4*) we learn that if a sample of 11 patients does not contain one single case of a