

was successfully treated by the Fogarty technique (3). Post-operatively the patient remained afebrile, while on antibiotics. He was discharged 27 days after operation in good condition. Follow-up blood cultures were negative.

The most relevant complications of left ventricular aneurysm are cardiac failure, thromboembolism, and arrhythmias. Infection of mural thrombus associated with an aneurysm is rare. To our knowledge eight cases have been reported in the literature (4-11).

The pathogenesis of these infections is hematogenous, either seeding of a ventricular mural thrombus immediately following myocardial infarction or becoming infected months to years after their formation. Venezio et al. (10) believe that new thrombi are more predisposed to bacterial attachment with resulting infection than older, endothelialized clots.

The organisms most commonly responsible for this intracardiac infection are gram-negative bacilli. The avidity of *Salmonella* for abnormal endothelialized surfaces has been emphasized (5,7,11-14). *Salmonella* arteritis may also produce inflammatory destruction of the arterial wall leading to pseudoaneurysm formation or arterial rupture (14).

The high mortality of these kinds of infections may partly be a result of difficulty in diagnosis. Cross-sectional echocardiography and [<sup>67</sup>Ga]citrate scintigraphy have been suggested for early diagnosis (10,11).

Out of the eight cases of mural thrombus infection reported in the literature, only three (8,10,11) survived after surgical resection, and in only one (11) was the infection resulting from *Salmonella*. In the latter case the value of echocardiogram for early detection of the thrombus was demonstrated but the infection was not localized preoperatively by indium-111 labeled white blood cell scan.

Venezio et al. (10) reported a case where the thrombus was demonstrated by two-dimensional echocardiography and on the basis of this finding, <sup>67</sup>Ga scan was carried out and showed uptake in the apex. In this case the infecting organism was *Proteus Mirabilis*.

In the case presented here, resection of the left ventricular aneurysm, pseudoaneurysm and associated thrombus, resulted in complete resolution of the pyrexia with progressive clinical improvement. As in the cases previously reported (9-11), culture of the removed thrombus was negative, presumably due to the previous antibiotic therapy.

In conclusion, a patient with a history of myocardial infarction in whom persistent fever and *Salmonella* bacteremia developed, proved to have an infected mural thrombus. Gallium-67 citrate scanning contributed to the detection allowing curative surgical therapy.

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#### Technetium-99m DISIDA Hepatobiliary Agent in Diagnosis of Hepatocellular Carcinoma, Adenoma, and Focal Nodular Hyperplasia

**TO THE EDITOR** In a recent paper in the *Journal of Nuclear Medicine*, Calvet et al. (1) reported on the value of cholescintigraphy for diagnosing hepatocellular carcinoma (HCC) and distinguishing it from other lesions of the liver. A correlation between the amount of DISIDA uptake and the degree of differentiation of the tumor is demonstrated and late images for the detection of distant metastases are recommended. In an earlier study (2) only three of 80 (4%) HCCs accumulated DISIDA, therefore this report is very interesting.

Unfortunately, the time at which images were obtained (20 min and 3 hr) is not well chosen, because at 20 min the peak of liver uptake has already passed (3). Hasegawa et al. (4) have shown a case of HCC accumulating less than the surrounding liver at 5 min, equal at 1 hr and more at 2 hr postinjection. It should also be considered that the histologic distinction between a highly differentiated HCC and focal nodular hyperplasia (FNH) can be very difficult and both lesions can appear in the same organ (5). Calvet et al. remark that FNH, adenoma, and metastases can demonstrate the same uptake pattern as HCC. This has been shown only in case reports (6).

We compared the uptake pattern in 72 patients with FNH, five patients with adenoma and 67 patients with HCC (7). Subgroups were defined (Table 1) with regard to perfusion,

**TABLE 1**  
Number of Patients and Uptake Pattern of FNH, Adenoma, and HCC

Lesion	n	0 <sup>†</sup>	1 <sup>†</sup>	2 <sup>‡</sup>	3 <sup>§</sup>	4 <sup>¶</sup>
FNH	72	1	62	7	2	—
Adenoma	5	—	—	3	1	1
HCC	67	1	1	1	15	49

<sup>†</sup> No change detected scintigraphically.

<sup>‡</sup> Hyperperfusion, normal, or increased uptake in the early phase, marked retention in the late phase.

<sup>§</sup> No hyperperfusion or uptake not possible to assess or only little retention.

<sup>¶</sup> Markedly decreased uptake in the early phase.

<sup>¶</sup> No or very inhomogenous uptake, evidence of distant metastases.

uptake in the early and late phase, homogeneity of the lesion and extrahepatic accumulation. The most important parameter was shown to be the uptake in the early phase. 86% of FNHs demonstrated a class 1-uptake besides hyperperfusion, a pattern which appeared in only one case of highly differentiated HCC (i.e., a specificity of 98%). A similar sensitivity and specificity has been found in an earlier study with a smaller number of cases (8). In very small or centrally located lesions the uptake could not be assessed very well, even when using oblique views (class 2). A markedly decreased uptake in the early phase was observed mainly in HCCs and adenomas (class 3). A slight (n = 11) or moderately intense (n = 18) uptake of HCC could be detected in 29 of 72 patients (40%) and was seen best in the late phase. A pronounced inhomogeneity was demonstrated in 16 cases.

Thus, a distinction of FNH and HCC is almost always possible when the examination is done as a three-phase-scintigraphy using several projections (preferably five views) when imaging between the fifth and tenth minute and after 2–3 hr. The indication for resection is very much influenced by the results of cholescintigraphy. If a FNH is demonstrated, an unnecessary operative procedure can be avoided.

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**REPLY:** We have carefully read the letter of Kotzerke et al. and there are several points that should be clarified.

1. The aim of our study was to assess the usefulness of biliary scintigraphy in the diagnosis of hepatocellular carcinoma and to ascertain the relationship between the uptake of biliary agents and the degree of hepatocellular carcinoma (HCC) differentiation. Accordingly we did not evaluate the usefulness of this technique in the differential diagnosis with other hepatic lesions as suggested by Kotzerke et al.

2. We did not recommend DISIDA scintigraphy for detection of metastasis. The last paragraph of the results states that only three out of six cases with confirmed metastasis were detected by this technique. Accordingly, in the 4th paragraph of the discussion we suggest that DISIDA scintigraphy is of limited usefulness in the screening of extrahepatic spread.

3. The time at which images were obtained was selected according to previous studies (1–4), and taking into account that liver cirrhosis frequently underlies hepatocellular carcinoma. Since patients with chronic liver disease exhibited a delayed DISIDA uptake we select images obtained at 20 min as early scans. Moreover, in the study of Hasegawa et al. (3), the authors remark the importance of delayed images, thus giving little role to the early vascular scans, despite the case report pointed by Kotzerke et al.

4. We stated in the discussion that DISIDA scintigraphy could not be highly specific since there were previous case reports showing DISIDA uptake in patients with focal nodular hyperplasia (5), hepatic adenoma (6), or liver metastasis (7). Since our study does not evaluate early vascular phase, the results of Kotzerke et al. will offer interesting data in the differential diagnosis between hepatocellular carcinoma and these space-occupying lesions.

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