

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

Lesion	n	0 [†]	1 [†]	2 [‡]	3 [§]	4 [¶]
FNH	72	1	62	7	2	—
Adenoma	5	—	—	3	1	1
HCC	67	1	1	1	15	49

[†] No change detected scintigraphically.

[‡] Hyperperfusion, normal, or increased uptake in the early phase, marked retention in the late phase.

[§] No hyperperfusion or uptake not possible to assess or only little retention.

[¶] Markedly decreased uptake in the early phase.

[¶] 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.

References

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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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Alternate R-Wave Gating of Radionuclide Angiograms

TO THE EDITOR: We find the article by Juni and Chen (1) most interesting. It codifies the errors in measurement of diastolic filling from time-activity curves generated by using a number of methods based on standard R-wave gated acquisition. These methods involved several reformatting techniques including forward and backward gating. We would like to point out that time-activity curves generated by forward R-wave gating on every other R-wave² yield diastolic filling curves from which all aspects of ventricular filling can be studied, including early rapid and later atrial filling. This technique eliminates the errors identified by Juni and Chen in standard methods.

In addition, we would like to point out one error in measurement of filling not identified by Juni and Chen. This involves the temporal difference between the onset of electrical and mechanical systole. Since the onset of electrical systole (R-wave) normally precedes mechanical systole by up to 100 msec³, in many patients formation of the time-activity curve by backward gating not only includes the distortion of the systolic portion of the curve as noted by Juni and Chen, but often excludes much of the atrial filling portion of diastole. The alternate R-wave method also overcomes this difficulty.

Thus, we concur with Juni and Chen that forward gating yields the most accurate method of studying diastole but would add that the use of alternate R-wave gating has the

additional benefit of allowing accurate study of the whole of diastole including atrial filling by gated radionuclide ventriculography.

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REPLY: The article by Dr. Clements and co-workers (1) was not published until after completion of our paper. Their report describes a simple but elegant means of reducing "count drop-off" in the latter frames of a gated radionuclide ventriculogram by gating off of every other R-wave trigger. This permits counts from the following cycle to contribute to the final frames of short cycles. While this method does not eliminate the effects of arrhythmias, it does appear to substantially reduce distortion in the latter points of the left ventricular time activity curve. Also the alternate R-wave gating technique requires relatively little in the way of hardware.

We agree with the writers' statement that the time delay between electrical and mechanical systole contributes to count drop-off. Both the alternate R-wave and list mode acquisition techniques will help to overcome this.

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