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Reply

We have reanalyzed the patient data from our left-ventricular volume study (*1*) using the method of Hutton et al. (*2,3*) and have made the following observations:

1. In eight of the 12 patients, a well-defined end point to the volume-time curve obtained from the gated phase of the study could not be found. This is presumably due to fluctuations in heart rate occurring during the gated phase of the study. We were thus unable to determine the mean transit time needed to apply their method.

2. In the four patients in which a well-defined end point was found, the two methods yielded values for left-ventricular volume that differed by no more than 5%. The mean deviation was 2.8%.

In 16 additional patients, we have obtained similar results, which were not included in our original study.

Our model assumes that the time-averaged left-ventricular activity is the average of systolic and diastolic activities. While this may not be theorically justified, experience has shown that in practice the two averages are very nearly equal.

The use of RBCs labeled in vitro has a distinct advantage over in-vivo-labeled cells in that left-ventricular volumes and cardiac outputs may be found as percentages of total blood volume when this has not been determined. We have found a strong correlation between the cardiac output expressed as a percent of total blood volume and the conventional cardiac index. It may thus be possible to obtain an index of cardiac output without any wet-lab procedures.

While our model may not be theoretically perfect, it presents a conceptually and computationally simpler method for obtaining useful clinical information.

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Re: Normal Appearance and Reproducibility of Liver-Spleen Studies with Tc-99m Sulfur Colloid and Tc-99m Microalbumin Colloid

An ample and occasionally excellent literature documents the significance of specific imaging patterns in diagnosing hepatocellular disease (*1,2*). Inhomogeneity, bone-marrow uptake, enhanced splenic uptake, and lung uptake all have certain discriminant value in detecting disease. As expected, normal individuals imaged by Klingensmith et al. with sulfur colloid and with albumin colloid showed no such findings, except "normal" variability (*3*). Nevertheless, the authors reached a general conclusion about the relative clinical utility of these two RES-imaging agents. The process of inference demands more, and such a conclusion appears premature.

The work of Kloiber et al.—cited to support conclusions on differences in background—was performed with an agent quite different in character from that used by the authors (*4*). Further, the reference to higher background in albumin colloid images is not borne out by the authors' own data. They show comparable blood levels for the two agents at 30 min after injection, slightly faster hepatic extraction of albumin colloid, and essentially similar regional ratios otherwise (*3,5*). Finally, as indicated by labeling efficiency of 99%, any thyroid uptake seen over unmarked overexposed albumin colloid images is negligible. Such activity reflects the biodegradable nature of the new imaging agent and does not significantly enter dosimetry considerations.

Nonetheless, this technically well-performed trial is important to clinicians in re-emphasizing the wide variability in normal spleen-to-liver (S:L) uptake ratios of colloidal imaging agents. The S:L ratios of 0.97 ± 0.29 and 0.98 ± 0.33 obtained from sulfur colloid and albumin colloid, respectively, confirm earlier data of Wasnick et al. showing normal sulfur colloid S:L ratio and variability of 0.77 ± 0.2 (*6*).

As to the clinical utility of the albumin colloid kit, the article omits mention of the two technical reasons it was developed. First, the kit is "instant," requiring only the addition of technetium generator eluate. This eliminates the need for boiling or multiple chemical additions and reduces radiation exposure incurred in preparation. Second, unlike sulfur colloid, albumin colloid is biodegradable.

The agent was designed to simplify current clinical practice, not to change it. Indeed, the clinical studies of Klingensmith et al. confirm the essential equivalence of biodistribution of the two colloids. Data collected during clinical trials of albumin colloid in patients, in which the authors participated, document the utility of the new agent in detecting hepatocellular disease as well as space-occupying lesions.*

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FOOTNOTE

* Data on file, New England Nuclear Corp.

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Reply

I thank Dr. Green for his comments. I agree with some and disagree with others. My responses to his points in order of their presentation in his letter are as follows:

(1) I agree that, strictly speaking, one cannot extrapolate from data in normal subjects to expected utility in patients.
(2) We did not realize that the microalbumin colloid supplied to Dr. Kloiber was different from that supplied to us (*1*). Consequently, comparisons between our data and his are inappropriate, and I regret this error.
(3) The statement concerning higher background relative to liver with Tc-99m microalbumin colloid is referenced to the paper by Kloiber et al (*1*). We did not directly measure background radioactivity. We did, however, find a higher liver-to-bone marrow ratio ($p < 0.05$) and a higher liver-to-heart ratio ($p < 0.05$) in delayed images with Tc-99m sulfur colloid.
(4) Our data are significantly different from those of Wasnick et al. (*2*) in that we measured inter- and intrasubject reproducibility in normals whereas Wasnick et al. measured only intersubject reproducibility.
(5) The fact that Tc-99m microalbumin colloid is an "instant" kit does make it more convenient and may reduce radiation exposure. However, the nonbiodegradability of Tc-99m sulfur colloid results in no known disadvantages, whereas the biodegradability of Tc-99m microalbumin colloid may result in increased background radioactivity, particularly if imaging is delayed.
(6) The statement that our clinical studies confirm the essential equivalence of the biodistribution of two colloids is an oversimplification, since our data demonstrate statistically significant differences in several biodistribution parameters in the delayed images.
(7) The nature of the utility of Tc-99m microalbumin colloid in hepatobiliary disease is unclear as stated. In general, a radiocolloid would not be the radiopharmaceutical of choice for evaluation of hepatobiliary disease.

In summary, in view of the currently available data, it is my feeling that the disadvantage of the small amount of free Tc-99m in microalbumin colloid will outweigh the advantage of a more convenient preparation.

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Hemiagenesis of the Thyroid: Clinical and Radiological Presentation in the Pediatric Patient

Thyroid hemiagenesis was recently reviewed (*1*). Of the 94 patients reported, six were in the pediatric age range, four of whom were diagnosed postmortem and two postoperatively. In the past 10 yr at our pediatric endocrine clinic we identified two such cases. The paucity of reports on the clinical and radiological presentation of thyroid hemiagenesis in pediatric patients, and the almost total lack of reference in standard textbooks, prompted this report of two children with hemiagenesis.

Case reports. *Case 1.* A 4¾-yr-old girl was referred for unilateral neck swelling. A soft, nontender, moveable mass, 3 × 1.5 cm, was palpable in the location of the right thyroid lobe. The isthmus and left lobe were not palpable. Thyroid imaging showed a right lobe but no trace of the left (Fig. 1, left). In response to 105 μg of TRH, the fasting TSH level rose from baseline value of 2.4 μU/ml to 16.9 at 30 min, and 9.1 μU/ml at 60 min. Daily injections of 10 units of TSH were given for 3 days. A repeat thyroid scan was unchanged. (Fig. 1 right). Concentrations of T_4 and T_3 increased to 17.3 μg/dl and 432 ng/dl, respectively, indicating that the thyroid tissue responded to TSH stimulation. Thyroid studies are summarized in Table 1.

Case 2. An 11-yr-old boy was referred for an asymptomatic right neck mass. The mass was 4 × 1.5 cm, soft and nontender, lying in the area of the right thyroid lobe. Neither the isthmus nor the left lobe was palpable. A Tc-99m scan revealed no activity in the area of the left lobe. The 24-hr I-131 uptake was 45%. After the administration of T_3, 25 μg twice daily for 10 days, the T_4 fell to 2.5 μg/dl, the TSH became undetectable, the T_3 was 220 ng/dl, and the I-131 uptake to less than 1%.

Discussion. Uncomplicated thyroid hemiagenesis in the pediatric patient has not been described previously. In addition to the six pediatric cases reported by Melnick and Stemkowski (*1*), Hopwood et al. (*2*) described an 11-yr-old girl with thyroid hemiagenesis and thyroiditis who was treated surgically.

The clinical presentation of thyroid hemiagenesis in our patients was that of unilateral thyroid enlargement with no palpable contralateral thyroid tissue. Both patients were euthyroid, asymptomatic, and had normal thyroid function, except for slightly el-

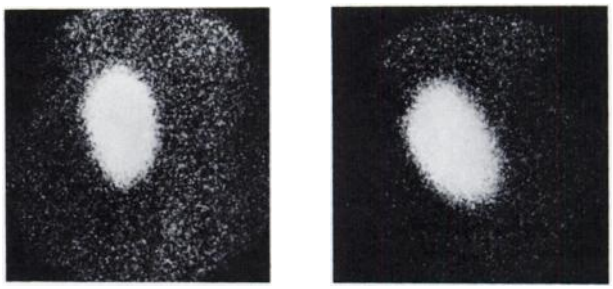

FIG. 1. Tc-99m thyroid scan in Case 1 (left). Similar scan following TSH stimulation (right).