The results of this small retrospective study demonstrated that of 18 patients with adenocarcinoma of the colon who had brain scans for various reasons, 4 had positive scans along with positive histologic or clinical evidence or both to support the diagnosis of metastasis. None of the group with negative scans had histories strongly suggesting false-negative brain scans. Although there is certainly not enough histologic evidence to refute the contention of Brooks, et al we believe that these data shed significant doubt on the statement that negative brain scans are the rule rather than the exception with cerebral metastasis from colonic adenocarcinoma.

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REFERENCE

1. BROOKS WH, MORTARA RH, PRESTON D: The clinical limitations of brain scanning in metastatic disease. *J Nucl Med* 15: 620–621, 1974

THE AUTHORS' REPLY

The observation that no positive brain scans were found in histologically proven colonic adenocarcinoma was indeed an unexpected finding that prompted our earlier communication. In spite of the lack of support from the University of Virginia, albeit the lack of histology to confirm negative or positive scans, the lesson in clinical practice remains valid. A negative brain scan in patients with suspected metastatic cancer does not conclusively rule out a secondary brain tumor. In our practice, the lack of a positive scan has been "the rule rather than the exception" in those patients with adenocarcinoma of the colon. Therefore, we would not consider a patient with colon carcinoma and cerebral manifestations suggesting metastatic disease "tumor-free" without additional neurodiagnostic investigations.

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BLOOD VOLUME MEASUREMENTS

I read with interest and some concern an article by Hurley (*1*) in which the author describes the technique he used for measuring blood volume. This technique (as described on page 47) is confusing. The author does not seem to have limited himself to a uniform method. I think he used dual tracers in some cases and in others a single tracer, with the assumption of a constant F_{cell} ratio. Moreover, he states that he ignored zero-time extrapolation and took a single 10–15-min postinjection sample as representative of an adequate equilibrated and mixed dilution sample. It might be valid in normal humans, but I am sure that many readers will assume that such a technique is applicable to the patient who needs a volume measurement. It is disturbing to think that such an assumption might be made. In our experience, blood volume measurements performed in this manner are not valid and should be condemned. Equilibration time varies in the pathologic condition and two tracers (labeled albumin and labeled red cells) may have totally different equilibration or mixing times (*2,3*).

What is normal, and of what significance is a blood volume measurement? Many authors have come up with different formulas and values depending on the population, habitat, and even culture of a people. Fujita (*4*), utilizing a dual-tracer measuring technique, established a different set of values based on a normal Japanese population. Standards and values are all relative and are to be used as a guide for replacement therapy, taking into account the physiologic balance of the particular individual. I certainly agree that body surface is the most reliable parameter and that the Hidalgo, Nadler, and Bloch (*5*) values serve as good guides.

We are presently reviewing 2,000 cases in which blood volume measurements were performed by a dual-tracer technique and our results confirm our earlier observations based on a study comprising 200 patients. The measurements obtained with a single tracer were compared with those obtained when each component was measured separately with its appropriate tracer. The results are valid and comparable provided the multiple sampling technique is rigidly followed and calculations take into account the F_{cell} ratio. Calculations and sources of error are clearly described in the references cited.

One can certainly amuse oneself with all kinds of mathematical exercises to establish a normal value, but how and where does this value apply in actual practice? The reliability of values obtained by the indirect measurement of blood volume depends on

methodology, and correct application of this information to the patient's case is of utmost importance.

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REFERENCES

1. HURLEY PJ, Red cell and plasma volumes in normal adults. *J Nucl Med* 16: 46–52, 1975

2. ALBERT SN: *Blood Volume and Extracellular Fluid Volume*, 2nd ed, Springfield, Ill, CC Thomas, 1971, p 209

3. ALBERT SN: Blood volume in clinical practice. In *Nuclear Medicine In Vitro*, Rothfeld B, ed, Philadelphia, Lippincott, 1974, Chap 5

4. OGA R, FUJITA T, FUKUDA G: Normal values of circulating blood volume in Japanese population. In *Blood Volume and Extracellular Fluid Volume*, Albert SN, ed, Tokyo, Shinko-Koeki, 1974, Part III, p 251

5. HIDALGO JU, NADLER SB, BLOCH T: The use of the electronic digital computer to determine best fit of blood volume formulas. *J Nucl Med* 3: 94–99, 1962

THE AUTHOR'S REPLY

The study on red cell and plasma volumes in normal adults specifically avoided "amusing mathematical exercises" in establishing normal values. The mean values presented are of actual volume measurements recorded in the literature. Predictive equations such as those listed in Table 6 (*1*) (and also, incidentally, used by Hidalgo et al) were not used except in a few instances to help in curve-fitting.

Of course, direct measurement of both red cell and plasma volumes is preferable to the use of the so-called F_{cell} ratio, but collection of sufficient data points was essential for the type of analysis used. Wherever possible, when there were enough directly measured values, F_{cell} measurements were not included. Because of obvious difficulties in collecting large numbers of normal values, the data were not my own. All this is clearly stated in the paper. As Dr. Albert admits, complete mixing and equilibration can be expected at 15 min in normal people. If he feels the situation may be different in certain patients, he can try to verify equilibration by additional measurements.

There is more to such data, particularly concerning red cell volume, than guiding replacement therapy. If Dr. Albert finds existing tables of mean normal values a "good guide," I do not see why he should reject additional information about the normal range. I cannot see much value in one without the other. I do agree that normal ranges must always be used with judgment and in context and not as an infrangible law. Nevertheless, I thought, and continue to hope, that my observations of actual mean values and a more or less constant relative standard deviation could be helpful in interpreting clinical volume measurements.

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REFERENCE

1. HURLEY PJ: Red cell and plasma volumes in normal adults. *J Nucl Med* 16: 46–52, 1975

ANATOMIC LANDMARKS ON SCINTIPHOTOS

Raikar and Ganatra (*1*) have reported a method of putting anatomic landmarks onto scintiphotos using the facilities of a Nuclear Data Med II system. Having used this technique for some time, we have now developed a method based on software written for a Med II that offers a considerable improvement in simplicity and versatility over the method described by Raikar and Ganatra.

In use and effect our method is similar to the anatomic marker facility on the Nuclear Enterprises Scinticamera V. A small active source (10 mCi of ^{241}Am), shielded to the patient, is positioned over the anatomic landmark. Operation of a "Mark" button causes a single dot of high intensity to be placed on the image currently being displayed by the computer at a position corresponding to the center of the source. After any number of marks have been placed, operation of a second button "End Mark" terminates the program.

The program is a simple one. Data from the scintillation camera (Nuclear Data Radicamera) are registered in the list mode of acquisition. The addresses stored in this manner are separated into X and Y components and the arithmetic means of the components are calculated. These means are recombined to form an address that is effectively the centroid of the activity in the small source. The contents of this address are changed to 4K giving a bright spot on the image. The number of counts registered from natural background and patient ac-