

## REFERENCES

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2. BERKOWITZ JM, SHERMAN JL, HART HE: The rate of decarboxylation of mevalonic acid-1- $\text{C}^{14}$  in man. *Ann NY Acad Sci* 108: 250-258, 1963
3. SZYMENDERA J, HEANEY RP, SAVILLE PD: Intestinal calcium absorption: Concurrent use of oral and intravenous tracers and calculation by the inverse convolution method. *J Lab Clin Med* 79: 570-578, 1972
4. LATHROP KA, HARPER PV, HINN GM, et al: Biological fate of technetium in mammals. *Radiat Res* 25: 210, 1965

## THE AUTHOR'S REPLY

Szymendera and Radwan correctly point out that measurement of intestinal absorption by the isotopic ratio method leads to overestimate, particularly when the material studied has a short half-life. As stated in my paper, "This technique causes overestimate of absorption percentage because of the rapid early disposal of a portion of the intravenous dose. The ratio technique was adopted here because of its simplicity. It was felt that the systematic error introduced by this approach is small and should not affect comparative studies."

The elegant analysis which Szymendera and Radwan have applied to their data certainly improves the accuracy of estimate of intestinal absorption. However, the method used in my paper is much less cumbersome, does not require the use of a digital computer, and, I believe, adequately demonstrates the fact that intestinal absorption of pertechnetate varies markedly in extent and timing.

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## REDUCTION OF THE EFFECTS OF SCATTERED RADIATION

In their article on the reduction of the effects of scattered radiation on a sodium iodide imaging system (*J Nucl Med* 14: 67-72, 1973) Bloch and Saunders state that they obtain improvement of the modulation transfer function (MTF) of a rectilinear scanner and a gamma camera by simply subtracting the number of counts recorded in the Compton energy interval 91-102 keV from the number of events simultaneously recorded under the photopeak 125-170 keV.

Improvement of the MTF may be expected when the ratio between the number of unscattered photons

and the number of scattered photons in the observed energy interval 125-170 keV is changed in favor of the unscattered photons. This ratio does not change by simply subtracting the gross counting rate in the energy interval 91-102 keV from the gross counting rate in the interval 125-170 keV. Therefore the results of Bloch and Saunders are difficult to understand.

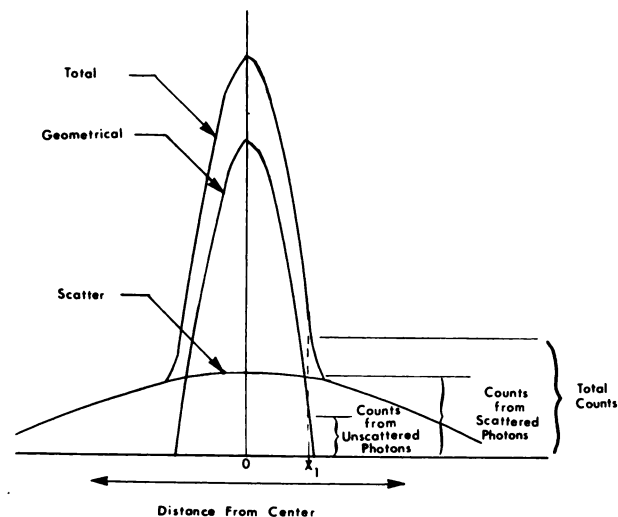
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## THE AUTHORS' REPLY

There is, we think, a simple reason why the scatter subtraction technique improves the spatial resolution. The figure (right) shows the counting rate as a function of position for a line source of  $^{99m}\text{Tc}$  surrounded with scattering material, separated into a "geometrical" component due to gamma rays emitted within the collimator field of view and a "scatter" component due to scattered photons recorded within the photopeak window 125-170 keV. At distance  $x_1$  from the line source most of the measured events are due to scattered photons. Our calculations

**FIG. 1.** Measured counting rate of line source separated into "geometrical" component due to gamma rays emitted within collimator field of view and "scatter" component due to scatter photons recorded within photopeak.



showed that the number of scattered photons with energy between 125 and 140 keV was the same as the number of scattered photons with energy between 91 and 102 keV. The effective number of recorded scattered photons in the photopeak window can therefore be reduced by subtracting from the photopeak counting rate the counting rate simultaneously recorded in the scatter interval 91–102 keV. When this is done the corrected line-spread function be-

comes nearly the same as the “geometrical” component of the line-spread function. Since the modulation transfer function is the convolution of the line-spread function, a narrower line-spread function results in an improvement in the MTF.

PETER BLOCH

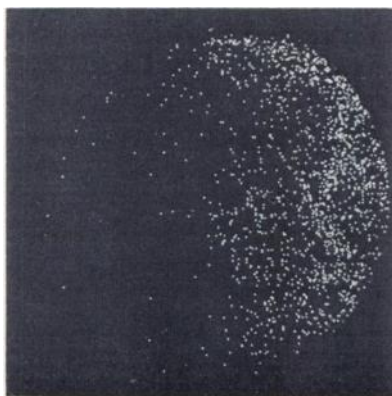
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#### ADDITIONAL DATA ON HEPATIC FLOW STUDIES

The increasing importance of hepatic flow studies with gamma camera is shown by the report of Waxman, Apau, and Siemsen (1).

Spencer had pointed out that abnormal intra-abdominal structures, other than within the liver, may be visualized during the flow study by filling of the radioisotope to an unusual area (2). It is



**FIG. 1.** Displacement of aorta to right is seen. Early flow right of aorta is due to diffusely enlarged liver with metastases.

also possible to recognize abnormal intra-abdominal masses otherwise than by filling of the radioisotope to that area.

An example is shown in Fig. 1. The examination was done after i.v. bolus injection of 10 mCi  $^{99m}\text{TcO}_4^-$  in a 60-year-old woman. A displacement of the abdominal aorta to the right is seen in the picture. The early flow of the isotope at the right of the aorta is due to a diffusely enlarged liver with metastases. The displacement of the aorta was due to a left ovarian tumor proved by laparotomy.

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1. WAXMAN AD, APAU R, SIEMSEN JK: Rapid sequential liver imaging. *J Nucl Med* 13: 522–524, 1972
2. SPENCER RP: Additional data on hepatic flow studies. *J Nucl Med* 14: 250, 1973

#### THE AUTHOR'S REPLY

We agree with the findings of Tirnakli. We have found displacement of the abdominal aorta in a variety of disorders including organomegaly, tumor, abscess, aneurysm of the aorta, and simply a tortuous aorta. We still prefer Tc-sulfur colloid as the isotope in all hepatic abdominal flows for reasons described in our reference in Tirnakli's letter.

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#### REFERENCE

1. WAXMAN AD, APAU R, SIEMSEN JK: Rapid sequential liver imaging. *J Nucl Med* 13: 522–524, 1972

#### THE AUTHOR'S REPLY

Deviation of the aorta may be due to either defects in the vessel or to extrinsic factors (such as the tumor pointed out by Tirnakli). Several groups are now at work cataloging the incidence and significance of the finding of aortic deviation on flow studies. We would suggest that  $^{99m}\text{Tc}$ -sulfur colloid is pref-

erable to pertechnetate since it allows a static image of the liver to be obtained for comparison with the flow.

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