creased and after ~3 min, it reached a value corresponding to that observed after an i.v. injection. These results suggest that ^{99m}Tc is not retained in the liver and that the heart-to-liver ratio should be determined very early after the per-rectal administration (i.e., during the first transit of the tracer). The inherent problem of this approach is related to the low absorbed radioactivity in the early period.

In order to evaluate the incidence of hepatocellular damages on the tracer uptake, we calculated the ^{201}Tl heart-to-liver ratio and the ^{123}I-HIPDM lung-to-liver ratio at the 25th min in rats previously intoxicated with CCl_4 and histologically proven to have developed hepatic necroses. The results suggested that the hepatocellular damages do not influence greatly the uptake of both tracers. Technetium-99m was not studied since it is not taken up by the liver cells.

In summary, the advantages of ^{99m}Tc due to its short half-life, low cost, and good rectal absorption are hampered by some major inconveniences such as no liver retention which can overestimate the PSS if errors in timing occur. Thallium-201 is expensive but easily available. Its low absorption compared to other tracers does not impair its potential usefulness (*7*). Iodine-123 HIPDM presents interesting advantages as far as the three parameters studied are concerned but its expensiveness and its very short half-life prevent its routine use.

References

1. Castell DI, Grace ND, Wennar MH, et al. Evaluation of portal circulation in hepatic cirrhosis: a new method using xenon-133. *Gastroenterology* 1969; 57:533–541.
2. Piga M, Satta L, Loviselli A, et al. Estimation of portal-systemic shunting by rectal infusion of radiotracer. *J Nucl Med Allied Sci* 1986; 30:197–203.
3. Tonami N, Nakajima K, Hisada K, et al. A noninvasive method for evaluating portal circulation by administration of ^{201}Tl per rectum. *J Nucl Med* 1982; 23:965–972.
4. Urbain D, Reding P, Georges B, et al. The clinical value of ^{201}Tl per rectum scintigraphy in the work-up of patients with alcoholic liver disease. *Eur J Nucl Med* 1986; 12:267–270.
5. Yen CK, Pollycove M, Crass R, et al. Portal systemic shunt fraction quantification with colonic iodine-123 iodoamphetamine. *J Nucl Med* 1986; 27:1321–1326.
6. Shiomi S, Kuroki T, Kurai O, et al. Portal circulation by ^{99m}Tc pertechnetate per-rectal portal scintigraphy. *J Nucl Med* 1988; 29:460–465.
7. Urbain D, Reding P, Verdickt X, et al. Thallium scintigraphy in the evaluation of portal systemic shunting. The problem of rectal absorption. *Nucl Med Commun* 1986; 7:25–32.

Daniel Urbain
Omer Jeghers
Hamphrey R. Ham
St. Peter's Hospital
Free University of Brussels
Brussels, Belgium

REPLY: We have read the report by Daniel Urbain and his coworkers on their comparison of three tracers used for per-rectal portal scintigraphy with much interest. We have never tried using ^{201}Tl, but when we measured portal systemic shunting (PSS) in the same patients twice, with informed consent, using ^{99m}Tc one time and ^{123}I-HIPDM the other time, correlation of the results was good ($r = 0.814$; $n = 19$; data not published).

Dr. Urbain et al. report in their letter that in experimental animals, the uptake of ^{201}TlCl or of ^{123}I-HIPDM by the liver is unaffected by the degree of hepatocellular damage. However, in some of our patients with chronic active hepatitis, PSS was significantly higher when evaluated by ^{123}I-HIPDM than with ^{99m}Tc; thus, liver damage did seem to affect the results.

Technetium-99m is not taken up by the liver, heart, or lungs, but is recycled continuously in the bloodstream. Thus, if the heart-to-liver ratio is obtained after a certain period of time, PSS will be found to be higher than it actually is. For that reason, use of the equation given in our paper (*1*) is necessary when ^{99m}Tc is used in this way; with ^{123}I-HIPDM and ^{201}Tl, the calculation of PSS is more simple and direct.

The advantages of ^{99m}Tc are its relatively low cost, its capacity to make the portal vein visible, and at times, its depiction of the portal collaterals.

The clinical practicality of these methods to measure PSS by the use of radioisotopes is most important. In the more than 500 procedures for per-rectal portal scintigraphy we have done in some 400 patients in the past ten years (*2*), we have found ^{99m}Tc to be of great use.

References

1. Shiomi S, Kuroki T, Kurai O, et al. Portal circulation by technetium-99m pertechnetate per-rectal portal scintigraphy. *J Nucl Med* 1988; 29:460–465.
2. Kuroki T, Minowa T, Kawa M, et al. Evaluation of per-rectal portal scintigraphy in hepatic cirrhosis. *Acta Hepatologica Japonica* 1978; 19:669–683.

Susumu Shiomi
Tetsuo Kuroki
Hironobu Ochi
Osaka City University Medical School
Osaka, Japan

Correction: Quantitative Measurement of Renal Perfusion Following Transplant Surgery

In the article "Quantittive Measurement of Renal Perfusion Following Transplant Surgery" (*J Nucl Med* 1988; 29:1656–1661) by Lear et al., Equation 3 is incorrect as shown on p. 1657. Equations 1, 2, and 3 are shown correctly below. The printer regrets the error and apologizes for any inconvenience to our readers.

$$F = A_k(T) \Big/ \int_0^T C_a(t)\, dt, \qquad (1)$$

where

F = blood flow to the organ,
$A_k(T)$ = organ tracer activity at time, T
$C_a(t)$ = concentration of tracer in the arterial blood entering the organ at time, t.

$$C_a(t) = A_a(t)/V_a, \qquad (2)$$

where

$A_a(t)$ = arterial activity of tracer at time, t
V_a = ultrasonically determined volume of arterial region

thus

$$F = A_k(T) \Big/ \int_0^T A_a(t)/V_a\, dt. \qquad (3)$$