and microsphere injection performed back-to-back in randomized order. Arterial blood gas and bicarbonate levels and pH values were monitored continuously and were ascertained to be stable prior to and during the two conjugate cerebral blood flow measurements in each individual experiment.

The authors of the letter grossly underestimate the size of a Rhesus monkey brain when they state "not more than 3 or 4 pixels span the entire width of the brain of this animal". Since the standard pixel size on Tomomatic is 6.5 mm, 3-4 pixels amount to 1.95-2.6 cm, while the average size of Rhesus monkey brains in our study was 10 cm in length by 6.5 cm in width. Hence, the number of pixels spanning the shortest diameter of the brain was more than twice the number speculated by Stokely et al. A 3-cm circular region-of-interest was selected at the exact center of each animal's cerebral perfusion image. This particular size for the region-of-interest was selected based on the results of the anterior phantom studies which showed this to be an adequate sample size. While this region predominantly comprised the basal ganglia of the animal, it undoubtedly included a sizeable portion of subcortical white matter as well. Xenon-133 derived cerebral perfusion values from this region were then correlated with two sets of independent microsphere-based perfusion estimates. Both sets were derived from the same region of the brain that was analyzed on 133Xe images, but differed with respect to their mode of sampling brain tissue. Values in the first set were representative of the mean cerebral perfusion for both the gray and the white matter, as they were derived from aggregate brain samples randomly placed over the entire 3-cm region. Values in the second set, however, were chiefly representative of the gray matter blood flow, as they were derived exclusively from the head of the caudate nucleus. As shown in Figure 6 of our paper, measurements by Tomomatic-64 were consistently higher than the microsphere-based estimates for the mixed samples of gray and white matter, but showed closer agreement with those obtained from the gray matter samples only. We therefore restate our original conclusion that measurement of cerebral blood flow with Tomomatic-64 tends to be biased towards the grey matter perfusion values when both the gray and white matter of the brain are sampled within a single unit of its spatial resolution.

Our paper addressed a complex subject matter and we thank the authors of the letter for affording us the opportunity to clarify some methodologic details that may have been unclear in the original paper. The complexity of the tomographic xenon technique merits a concerted effort by all scientists using Tomomatic-64 to investigate the accuracy of its measurements and to refine its operation and its technical design. Yet, in the course of nearly a decade since its introduction, no other group has even "attempted to evaluate the accuracy" of this instrument.

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Comparison of the Clearance of Technetium-99m MAG3 and Iodine-131 OIH

TO THE EDITOR: We read with great interest the recent article by Jafri et al. (1) in February 1988 issue. We disagree, however, with the authors on two points.

First, from the authors' data, the ratios of technetium-99m (99mTc) mercaptoacetyltriglycine (MAG3) to iodine-131 (131I) orthioiodohippurate (OIH) clearance (ml/min), volume of distribution and the rate of plasma disappearance are ~0.61, 0.65, and 1.1, respectively. The authors state that the lower clearance values of MAG3 vs. OIH are a result of smaller volume of distribution. This explanation is misleading. In fact, clearance is independent of volume of distribution, but depends on renal blood flow and extraction efficiency of substances. The rate of excretion is influenced by both clearance and volume of distribution.

Therefore, a correct statement relating the above three values might be: Although the clearance of MAG3 is lower than that of OIH, the rate of plasma disappearance of MAG3 is similar to that of OIH because of its smaller volume of distribution which results in higher plasma concentration. This observation is discussed in a previously published article (2).

Second, one of the authors' conclusions is that MAG3 is not a suitable replacement for OIH for the accurate estimation of the renal plasma flow (RPF). The authors do not explain how they reached this conclusion. We presume that they did so because of the lower clearance of MAG3 vs. OIH. Excellent correlation (r = 0.944) between clearance of two radiopharmaceuticals is obtained from the authors' Table 1. This correlation is a more important property than absolute extraction efficiency in "replacing OIH" with MAG3 for the "estimation" of RPF.

References


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REPLY: We think there are no real points of disagreement with Kim et al. It is only a matter of semantics and viewpoint.

Effective renal plasma flow, ERPF, is given by the product of the volume of distribution V and the rate of loss from the blood λ.

Thus, ERPF ml/min = V ml × λmin.

Therefore, the smaller the volume of distribution the lower is the measured ERPF. Note that ERPF is derived from the measurement of V and λ, thus clearance is not independent of the volume of distribution. In passing it may be noted that the clearance of a compound is that volume of plasma from which all compound is removed by the kidneys, hence volume has always featured as a basis of clearance. The plasma concentration P and the dose administered D are both measured variables. The volume of distribution is the ratio of D/P.

V ml = D activity/P activity/ml.