limited to larger volumes defined in one dimension by the slice thickness. Reducing the slice thickness would greatly increase the time needed to completely study the intracranial contents. A three-dimensional data acquisition routine could conceivably overcome this disadvantage. PET scanners with high resolution three-dimensional data collection are currently being built (*5*). With appropriate scaling and registering of images, PET data could be corrected for atrophy based upon MR data, on a voxel-by-voxel basis, as proposed by Condon et al.

Future efforts to quantify cerebral atrophy for whatever purposes will require proton-MR data. The careful and original work of Condon and associates has provided a valuable starting point for these endeavors.

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Caution in the Use of Volume Expansion Diuretic Renal Scan

TO THE EDITOR: In the article "Volume Expansion Diuretic Renal Scan in Urinary Tract Obstruction" (*J Nucl Med* 1987; 28:824–828) Howman-Giles et al. suggest a protocol for volume expansion that includes "An i.v. infusion of 0.9% sodium chloride at a rate of 360 ml/m^2 over 30 min prior to the scan." Although the described hydration protocol appears at first glance to be relatively benign, I believe some potential problems exist.

The study population contained only one adult yet they endorsed the protocol by stating: "No complications, in particular, cardiac failure or hypertension, were observed from the intravenous fluid load during the study". In a 70-kg, 6-ft adult, the body surface area would be ~1.9 m^2. The intravascular volume of such a patient would be ~3.5 liters (Total body water = 60% body weight; Extra cellular fluid volume = ⅓ TBW; Plasma volume = ¼ ECF) (*1*). The recommended saline load by the protocol proposed by Howman-Giles would be 684 ml, or ~20% of the intravascular volume. In an elderly patient who may already have other problems related to his renal failure, such as organic heart disease, a rapid increase of the intravascular volume by 20% may be disastrous. Although they fared well with the one adult patient, with a set hydration protocol it would only be a matter of time before a patient with a diathesis for congestive heart failure would be encountered and volume overloaded.

They also state "To obtain optimal conditions for interpretation, the study should be performed in a standardized manner. The variables, both anatomic and physiologic, need to be reduced". A set protocol for hydration, however, could only over-hydrate the normovolemic patients and may not even return severely dehydrated patients to a normovolemic state. Each patient undergoing diuretic renography should be evaluated individually, preferably by the primary care provider. The nuclear medicine consultant and the primary clinician can then coordinate any hydration orders and tailor those orders for the particular needs of the individual patient. A hydration protocol may lead to carelessness in the handling of individual patients, resulting in potentially harmful orders from a consultant who may not know the details of a particular patient's fluid status.

My last concern is the mention of "routine bladder drainage with an indwelling catheter in all patients undergoing a diuretic stress". Bladder catheterization is not a benign procedure (*2*), particularly in patients with evidence of urinary stasis and incomplete bladder emptying. A more individualized analysis of the risk/benefit ratio for each patient needs to be made before catheterization is ordered.

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REPLY: The letter from Dr. Donahue makes the important point that patients should be clinically assessed prior to the administration of intravenous saline as described in our protocol (*1*). We omitted this point in our article for the simple reason that in Australia where nuclear medicine is practiced exclusively by nuclear medicine consultant physicians trained initially in internal medicine, it is routine and prerequisite to all nuclear medicine studies that the patient be clinically assessed prior to the administration of any radiopharmaceutical. We certainly agree that this protocol should not be applied to patients with hypertension or potential cardiac failure. By far the majority of patients requiring this extension of the normal diuretic renal scan are in the pediatric group, though since first performing these scans almost 3 yrs ago, we have performed the test on now a total of six adults and 70 children and can continue to report no complications with the intravenous hydration procedure. If the protocol is to be applied in an environment where the patients are not routinely clinically assessed by the nuclear medicine physician then we would certainly recommend that a clinical assessment by the

primary care provider or the nuclear medicine consultant be a prerequisite to the performance of this study.

We would like to mention also that as our experience with this technique has increased we have discovered a subset of patients in whom the VEDRS occasionally may still fail to distinguish between the dilated nonobstructed and the dilated obstructed system. These are the patients with massively dilated systems of bilateral hydronephrosis and megaureters secondary to the posterior urethral valves or the megacystis/megaureter syndrome. In these patients we have a suspicion that tracer washout may still be delayed in the absence of significant obstruction. In this subset of patients a normal washout can be safely interpreted to indicate the absence of obstruction but a delayed washout result must be interpreted with caution. We are further investigating this subset of patients in an attempt to define parameters that can make this distinction accurately.

Finally, we do not recommend routine catheterization for this study; however, we do routinely have the patient void prior to the diuretic phase. We will catheterize individual patients with neurogenic bladders or moderate to gross vesicoureteric reflux as this will alter the diuretic clearance curves.

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Method for Measurement of Differential Renal Function

TO THE EDITOR: The recent excellent publication by Chachati et al. (*J Nucl Med* 1987; 28:829–836) on a "Rapid Method for the Measurement of Differential Renal Function: Validation" compared the 1–3-min fractional uptake of technetium-99m diethylenetriaminepentaacetic acid ([^{99m}Tc] DTPA) and iodine-131 hippuran to inulin GFR and PAH ERPF measurements, respectively.

1. Like previous investigators (*1–5*), a standardized distance (20 cm in this case) was used between the dose to be injected and the camera collimator to obtain the preinjection syringe count. The rationale for this methodology eludes us; the variation in count rate between the surface of a parallel hole collimator and a small source at different distances is negligible. In fact, Gates produced experimental verification of this in one of his own publications (*5*) yet persisted in using a fixed distance (30 cm). Since renal depth in an adult is usually of the order of 6–10 cm, these arbitrary distances are even more mystifying.

Question: Why not simply do away with the fixed distance device and put the dose on the face of the collimator?

2. The use of a 3-mCi dose of [^{99m}Tc]DTPA represents a compromise between the more reasonable 10–15 mCi necessary for good imaging quality and the constraints imposed by system deadtime in measuring the preinjection syringe on the scintillation camera itself.

Question: Why not put the syringe in a lead-lined container (e.g., 1/16-in. lead that attenuates something over 98% of the incident gamma rays at 140 keV) so that adequate imaging doses may be easily quantitated? This would reduce the count rate from a 15-mCi dose to something less than 100,000 cpm. We have routinely used this methodology for 4 yr (*6*) and find it quite helpful. Simply use a stainless steel syringe carrier ("boat") with a 1/16-in. lead liner placed directly on the collimator. The postinjection syringe is imaged similarly to correct for the 5–10% residual activity left in the needle hub. The experimentally determined transmission thru this thickness of lead was 0.0178 for 140 keV.

3. The legends for Figures 2 and 3 seem to be transposed.

4. The formula relating uptake of DTPA in one kidney to inulin clearance produces a lower estimate of clearance than one-half of the global estimating equation (~9% lower). It is not clear how this formula was derived. Does it assume equal function of left and right kidneys, or does each kidney require a different equation? This might explain some of the discrepancy.

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REPLY: We agree that the solution proposed by Dr. Thomas and Dr. McAfee allows the use of a more satisfactory dose for good imaging quality.

3. The legend for Figures 2 and 3 are indeed transposed. We apologize for this oversight.

4. The formulae relating uptake of diethylenetriamine pentaacetic acid to inulin clearance (Table 1) in one or two kidneys are very similar. The number of patients in whom separate renal function could be studied by standard technique is small, but neither the slope nor the intercept of the regression equation appear to differ from those obtained in the two studies. The reason for studying separate renal function was to analyze the adequacy of kidney and background region of interest determinations without the compounding influence from the other kidney. Our limited sample size did not allow us to derive separate equations for the left and right kidneys.

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