

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.

#### References

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John B. Chawluk  
Abass Alavi  
Robert Dann  
*Hospital of the University  
of Pennsylvania  
Philadelphia, Pennsylvania*

#### 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<sup>2</sup> 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<sup>2</sup>. The intravascular volume of such a patient would be ~3.5 liters (Total body water = 60% body weight; Extra cellular fluid volume = 1/3 TBW; Plasma volume = 1/4 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.

#### References

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Kevin Donohoe  
*University of Kentucky  
Lexington, Kentucky*

**REPLY:** The letter from Dr. Donahoe 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