Letters to the Editor

Uncontrolled Variables in the Measurement of Renal Function

TO THE EDITOR: Since posture, exercise, time of day, diet, and even emotional state have been reported to influence renal function (*1,2*), it has been suggested that renal function be measured only under conditions of bed rest (*3*). Ideally, clinical measurements should be made under standardized conditions. For example, pathologists know that the most reproducible blood chemistries are those drawn in bed before breakfast. Most nuclear medicine physicians have simply ignored those aspects of patient preparation that are not easily controlled. However, as the methods of measuring renal function become more accurate, one might expect problems.

We have recently encountered such a problem, which arose as follows. The routine renal function measurement in our clinic is a single-sample, single-injection effective renal plasma flow (ERPF) using hippuran. The ERPF is divided between the two kidneys in proportion to their uptake during the first 3 min to obtain separate values for each kidney. Before switching from an iodine-131 (^{131}I) radiopharmaceutical to another labeled with ^{123}I, we took the routine precaution of first comparing the new agent with the old. The results are shown in Fig. 1 (solid circles). To our surprise, there was an obvious difference between ERPF measured with [^{131}I]hippuran and that measured with [^{123}I]hippuran ($p < 0.05$, Student's t test on regression slope). We could think of only three explanations for this difference. The first was technical error, which we ruled out by having several members of the staff independently review both the procedure and the data. Another was the presence of some impurity in the [^{131}I]hippuran (other than free iodide, for which we routinely test). The last was a postural or diurnal difference, since the ^{123}I measurements were usually made before lunch with the patient supine over the gamma camera, while the ^{131}I measurements were made after lunch and ambulation. To distinguish between the latter two possibilities, we changed the protocol to a dual-isotope study in which both ^{123}I and ^{131}I measurements were made simultaneously. The results of the second protocol are shown as open circles in Fig. 1. There was no significant difference when measurements were made simultaneously. The results thus accord with what one would expect and also with what Stadalnik et al. found in dogs, using radiopharmaceuticals from another supplier (*4*). The failure of the two agents to agree in the initial protocol we attribute to diurnal variation or other uncontrolled variables.

Unlike the chemistry laboratory, we cannot send our technologists around to measure ERPF on patients in bed before breakfast. We can, however, recognize that our current methods are accurate enough to show changes in renal function due to factors that are normally ignored.

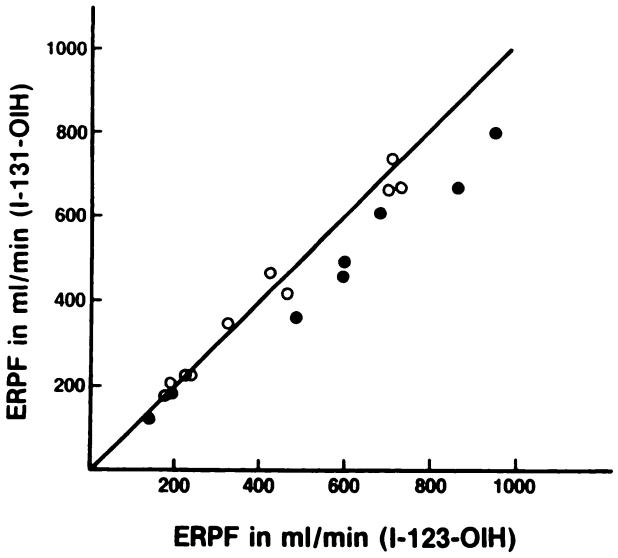

FIGURE 1
Correlation between ERPF calculated from ^{123}I-OIH clearance and that from ^{131}I-OIH clearance. (●)-Sequential measurement; (○)-Simultaneous measurement. Line of identity is plotted

References

1. Schuster VL, Seldin DW: Renal clearance. In *The Kidney, Physiology and Pathophysiology*, Vol 1, Seldin DW, Giebisch G, eds. New York, Raven Press, 1985, pp 365–395
2. Clorius JH, Schmidlin P, Raptou E, et al: Hypertension associated with massive, bilateral, posture-dependent renal dysfunction. *Radiology* 140:231–235, 1981
3. Brøchner-Mortensen J: Current status on assessment and measurement of glomerular filtration rate. *Clin Physiol* 5:1–17, 1985
4. Stadalnik RC, Vogel JM, Jansholt AL, et al: Renal clearance and extraction parameters of orthooidohippurate rate (I-123) compared with OIH (I-131) and PAH. *J Nucl Med* 21:168–173, 1980

Charles D. Russell
Eva V. Dubovsky
University of Alabama Hospitals
Birmingham, Alabama

Determination of Glomerular Filtration Rate by Gates' Method

TO THE EDITOR: The poor results reported by Ginjaume and co-workers (*1*) when correlating glomerular filtration rate (GFR) measured with the Gates' method (*2,3*) and creatinine clearance (Cr-Cl) are quite suprising.

Since 1984 we have adopted Gates' method in the routine practice either as a simple split GFR measurement or as a part of the conventional technetium-99m diethylenetriamine pentoacetic acid [^{99m}Tc]DTPA) renogram. In a series of 64 unselected adults (age range 15–64 yr) with different degrees of renal function, in whom 24-hr endogenous Cr-Cl was performed within 48 hr of DTPA-GFR measurement, we