LETTERS TO THE EDITOR

Re: The Exercise Renogram. A New Approach Documents Renal Involvement in Systemic Hypertension

The work reported by Clorius and Schmidlin appears to have great significance for the diagnosis of renal disease in hypertensive patients (*1*). However, there are serious problems in the data that do not support their conclusions. They state that the hippurate renogram of normal volunteers was not affected by standing or exercise. Very little quantitative data are given to support this conclusion. In fact, their Fig. 3 shows the renograms of one 29-yr-old volunteer, and it is supposed to show no change between studies done in the prone position, standing, or during exercise. Simple inspection of the curves and images in this figure shows an obvious flattening of the third phase of the renogram during exercise and a delay in appearance of the tracer in the urinary bladder.

Their control of exercise seems inadequate, since they state that ergometric resistance was adjusted to the wishes of the patients and that the heart rate had increased at least 20 beats per min. There are no data indicating whether exercise was comparable in each of their groups.

Furthermore, they state that "antihypertensive therapy was noted," but made no note of such therapy in their report. They admit they did not document which drugs were being given to the patients. This is a very important point, because antihypertensive drugs can have marked effects on renal blood flow, either increasing or decreasing it. Alterations in renal blood flow are most likely the explanation for their results. It has been known for many years that marked sympathetic stimulation, e.g., during severe exercise, can decrease renal blood flow almost to zero (*2*). Since hippurate clearance provides a good estimate of renal plasma flow, one would expect abnormalities in the renogram even in normal individuals during exercise (*2*). Standing, exercise, anesthesia, decreased cardiac output, etc., all evoke renal vasoconstriction and decreased renal blood flow, and thus would be expected to reduce hippurate clearance (*3*).

The authors make the astonishing statement that exercise renography is a powerful new tool to study transient tubular dysfunction in the kidney. Most likely the changes they observed were related to changes in renal blood flow, as they later discuss in their paper. Renal blood flow in the normal individual is known to vary greatly from 10% to 30% of the cardiac output, and is different even in the same individual at different times (*2*).

Another problem with the data of Clorius and Schmidlin is that there appears to be a relationship to the ages of the patients, so that abnormal renograms were found in patients with an average age of 44.5. Those hypertensives with normal renograms had an average age of 40.8, and their normal controls averaged 35.9. It is common knowledge that renal function diminishes with age.

One would be well advised to avoid using the exercise renogram as a test for renal dysfunction in systemic hypertension until much more work has been accomplished. The authors' results suggest that renal dysfunction or renal blood flow may be altered by exercise in some hypertensive patients more than in normotensive subjects, but their data are far from convincing. More accurate quantitative measurements of hippurate excretion and renal blood flow must be obtained.

REFERENCES

1. CLORIUS JH, SCHMIDLIN P: The exercise renogram. A new approach documents renal involvement in systemic hypertension. *J Nucl Med* 24:104–109, 1983
2. GUYTON AC: *Textbook of Medical Physiology*, 2nd ed, W. B. Saunders Co., 1961, Chap. 8
3. SODEMAN WA: Pathologic Physiology, Mechanisms of Disease, Third Edition, W. B. Saunders Co., 1961, Chap. 27

D. P. SHREINER
Veterans Administration Medical Center
Pittsburgh, Pennsylvania

Reply

We believe that the data we presented support the conclusions drawn (*1*). We felt justified to suggest: (a) that exercise renography appears to be a powerful new approach to study transient tubular dysfunction of the kidney; (b) that initial results with the exercise renogram suggest renal involvement in essential hypertension; and (c) that our results may help to explain the contradictory reports on the value of renography in evaluating patients with hypertension.

The lack of quantitative data is criticized. Clearance examinations would have been most helpful and would have given us the opportunity to assess the extent of the perfusion abnormality. However, the results of clearance examinations, or of computer-generated numerical data, are not needed to demonstrate the existence of the phenomenon itself. The appearance of tracer in the bladder offers an acceptable estimate for the tissue transit time of the tracer, barring obstruction or dehydration (*2*). The parenchymal tracer retention will also permit the demonstration of a hippurate transport disturbance.

We do not agree with Dr. Shreiner that our normals demonstrated exercise-mediated shifts in hippurate transport. I assume, of course, that posture- or exercise-induced change refers to alterations that progress from normal to abnormal. The reproduction of the sequential images, shown in Fig. 3 of our paper, may have caused confusion. The reproduced images do not clearly show tracer in the bladder in the 4th minute during the exercise examination. The tracer appearance in the bladder was not delayed, and was unchanged between the prone and standing examinations. We also believe that most nuclear medicine specialists would classify the three renograms of Fig. 3 as normal.

We have carried out a computer classification of the renograms using discriminant analysis. This evaluation has shown that the computer classified practically all renograms in agreement with the previous evaluation.

The adequacy of our control of exercise is questioned. We tried to avoid the pitfalls of selection, and chose to examine all patients referred for evaluation of hypertension if they were hypertensive at the time of presentation. We thus adjusted exercise to achieve