Use of Technetium-99m-MIBI in Peripheral Vascular Disease

TO THE EDITOR: In a recent issue of *The Journal of Nuclear Medicine*, Drs. Sayman and Urgancioglu reported that ^{99m}Tc-methoxy-isobutyl-isonitrile can be used to evaluate peripheral vascular disease (*1*). The technique is a very promising application of nuclear medicine to a common clinical problem and deserves further investigation. Their quantitative method of measuring the increase in flow between resting and exercise studies is proposed as a way to avoid the problem of false-negative results due to bilateral disease. However, their data shows a normal range that varies by 50%–90%, depending on the region being analyzed and the formula being used. This variability is a potential limitation of the method but probably could be avoided by better definition of the control population. We have demonstrated that the amount of ^{201}Tl uptake in the leg during exercise is dependent on age (*2*). This is partly due to exercise tolerance. Younger subjects have a greater capacity for exercise than older individuals whose exercise capacity may be limited by nonvascular disorders or simple deconditioning. Others have recommended postocclusive hyperemia as a more standardized measure of maximum flow for this reason (*3,4*). Although the sample is small, it would be interesting to know if there was any correlation between the duration of exercise or maximum heart rate and amount of flow increase between rest and exercise studies in the control group.

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REPLY: It is clear that age and sex differences were important factors in the assessment of normal values in the study with ^{201}Tl of Segall et al. (*1*).

In our study, the normal population demonstrated a perfusion increase range, varying roughly between 40% to 80%, depending on the region examined. This heterogeneity, I believe, comes from the different ages in this small sized group. However, if the first, third and fourth cases are considered, as they are very close in age and durations of exercise (57, 59, and 58 and 6.5, 7, and 6.5 min, respectively), a correlation is found between these factors and the amount of flow increase (Table 1 in Reference 2).

Because there was no significant difference between the mean age of the normal and patient population in our study, we accepted that the values for normals were comparable with the pathological results for patients. We also agree, however, that to obtain more accurate results, it would be wise to establish new normal data for different groups of age and sex in each laboratory, as Segall et al. stated.

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Plasma Concentrations Under Consideration of Body Dimensions: A General Requirement for Single-Sample Clearance Determinations

TO THE EDITOR: Congratulations to Dr. Russell on the first publication of algorithms that seem to allow renal clearance calculations in children with only one blood withdrawal (*1*). This has until now only been possible in adults, but the demand for application in children has increased, particularly after the introduction of ^{99m}Tc-MAG$_3$ (*2*), which is well-suited for pediatric investigations due to its availability and the favorable physical properties of ^{99m}Tc.

The problem is that the plasma concentration of a clearance agent at a specific time postinjection depends not only on the patient's renal function but also on his plasma and distribution volume, respectively. Therefore, we started studies on the assumption that if plasma concentrations are corrected for body dimensions—a requirement for the application of this simplified clearance technique in children—this would also lead to an improvement in results for adults (*3*).

Most recently, we normalized both the calculated clearance value as well as the patient's plasma concentration (prior to the calculation) to the mean body surface of 1.73 m^2. As a result, we were able to prove that our previous algorithms for clearance determination using ^{99m}Tc-MAG$_3$ in adults were thus also applicable in children and infants (*4*). However, it must be noted that considerable errors may occur in clearance calculations for adults with impaired renal function dependent on their body dimensions if the plasma concentration is not corrected correspondingly (Fig. 1A), whereas this influence is negligible in adults with normal renal function (Fig. 1B: ±5% at body surface between 1.4 and 2.0 m^2). The lines in the figures show the clearance calculated for

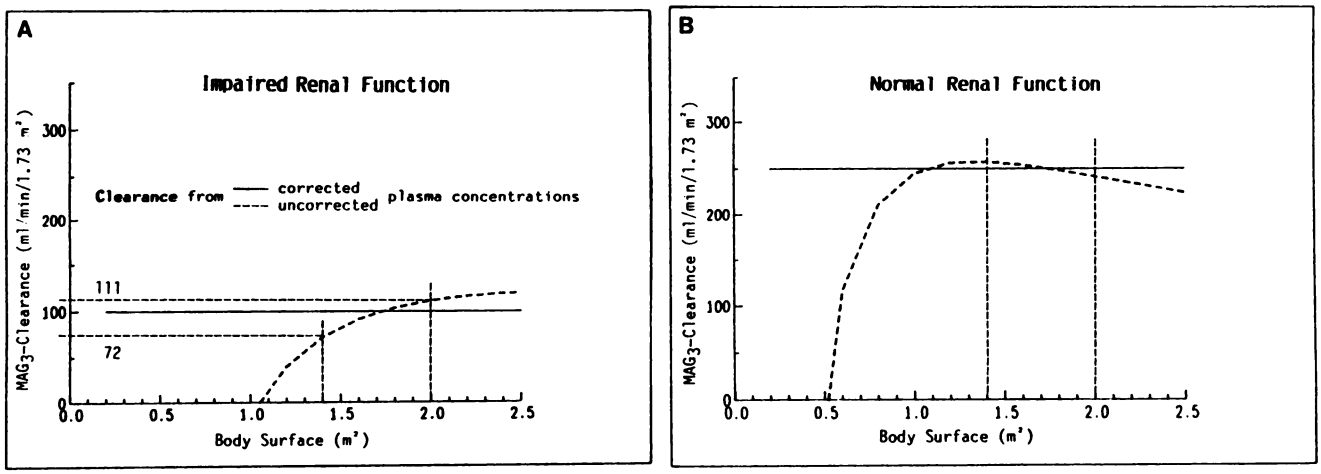

FIGURE 1. (A) Considerable dependency of calculated clearance values to the body surface of patients with impaired renal function, whereas this influence is negligible in adults with normal renal function (B).

100 and 250 ml/min/1.73 m^2, respectively, if the plasma concentration was normalized to 1.73 m^2 body surface. When this was not done, a considerable error (using identical algorithms!) resulted for patients with impaired renal function: actual clearance = 100 ml/min/1.73 m^2, calculated clearance at patient's body surface of 1.4 m^2 = 72 ml/min/1.73 m^2, and at patient's body surface of 2.0 m^2 = 111 ml/min/1.73 m^2.

We conclude that for simplified clearance determinations requiring only one blood sample, the plasma concentration should principally be "scaled" in accordance with the patient's body dimensions. We agree with Russell et al. (*1*) that all algorithms used up till now (e.g., for OIH, DTPA, MAG_3) are then applicable to all patients, from infant to adult. This is based, however, on the requirement that the basic algorithms were determined from a population with an average body surface that did not deviate considerably from 1.73 m^2.

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