pool assumption), ($Cl_f$), we used the equation derived from the correlation of the two methods, and not the one for [$^{51}$Cr] EDTA by Brøchner-Mortensen. We found the parabolic equation to have a better correlation coefficient ($Cl_p = 2.46 + 0.85\ Cl_f - 0.0005\ Cl_f^2$, $r = 0.987$, $p < 0.001$) with a s.e.e. ± 4.71 but for simplicity in the daily routine we use the linear one $Cl_p = 6.14 + 0.75\ Cl_f$, $r = 0.986$ $p < 0.001$ with a s.e.e. ± 4.72.

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2. Psarrakos KP, Gotzamani-Psarrakos A. Measurement of separate kidney clearance of Tc-99m DTPA by means of a proposed SKF index and a simplified total clearance method. In: Schmidt HAE, Adam WE, eds. *Nuklearmedizin.* New York: F. K. Schattauer Verlag Stuttgart, 1984: 550–553.



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**REPLY:** We would like to thank Drs. Gotzamani-Psarrakos and Psarrakos for their comments and apologise for the lack of recognition of their work (*1*) of which we were unaware. We would further like to comment on the comparison between the regression equations derived for the correction of one-pool estimation of glomerular filtration rate (GFR) using EDTA (*2*) and diethylenetriaminepentaacetic acid (DTPA) (*1*). These equations provide an empirical estimate of true GFR ($C_t$) from the values obtained using the simplified one-pool technique ($C_o$). The comparison between the estimated true values from a range of one-pool values using the two quadratic regression equations is illustrated in Figure 1. The correction equations are shown to be similar, the r.m.s. difference between the estimated true GFR values over the range $C_t = 0$ to 150 ml/min being 2.73 ml/min. It is not immediately obvious whether this small difference is statistically significant. Using graphical estimation of the DTPA data values from reference (*1*), the residual errors given by the two curves shown in Figure 1 were compared using the chi-squared statistic. The EDTA equation gave a significantly higher residual error ($p < 0.001$), indicating that the two equations are different. There are two possible explanations for this difference: (a) that the compartmental dynamics of EDTA and DTPA differ slightly or (b) that differences in radiopharmaceutical purity or experimental technique have affected the results. In either case, for practical purposes, the difference between the two equations is considerably smaller than the experimental error on individual GFR measurements. Therefore, no important practical difference results from assuming the EDTA equation as we have done in the paper under discussion.

We note that neither the linear nor the quadratic correction equation proposed by Drs Gotzamani-Psarrakos and Psarrakos passes through the origin. Since it seems physically reasonable to constrain the correction equation to pass through the origin, we tried fitting their data to an equation of the form:

$$C_t = a\ C_o + b\ C_o^2.$$

Application of the chi-squared statistic showed that this fit gave residual errors that were not significantly different from the equations given by Drs Gotzamani-Psarrakos and Psarrakos, showing that a fitting equation with a non-zero intercept is not demanded by their data.

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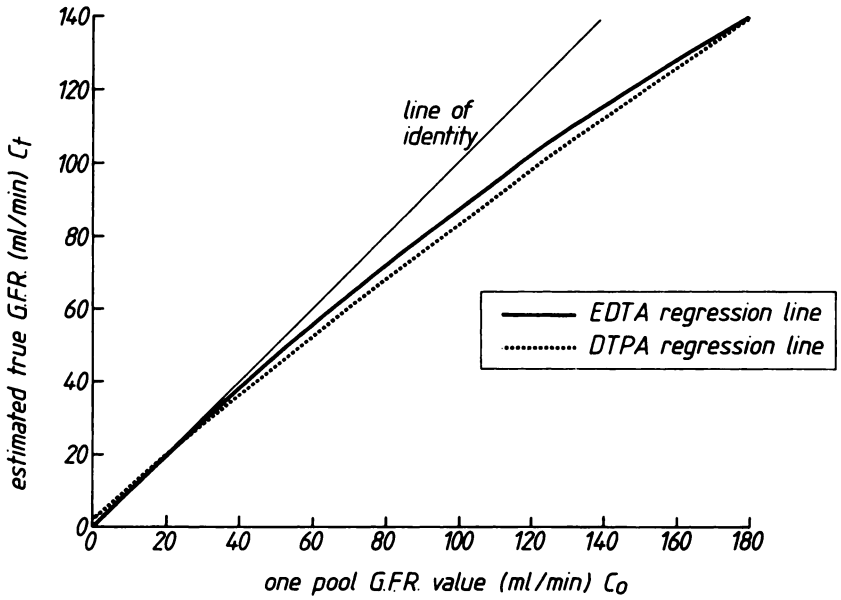


**FIGURE 1**
Graph showing the regression lines for the estimation of true GFR from the one-pool value for EDTA and DTPA

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## Gallium-67 Lung Index Computerization in Interstitial Pneumonitis

**TO THE EDITOR:** In the December 1987 issue of the Journal, Specht(*1*) et al describe an automated, computer assisted method for calculating the Gallium index.

Although it is always commendable to improve the quantitation and objectivity of studies, the completely automated approach seems to raise a problem in this instance. It is well known that the lower angles of the scapulae may show up on the posterior $^{67}$Ga scans as foci of increased uptake. It is not always possible to move them out of the field of view by scanning the patients with the arms up. Neither is it always possible to exclude from the field of view the breasts which may have variable amounts of $^{67}$Ga. In determining the $^{67}$Ga index with manual drawing of ROI's these areas can easily be excluded from the calculations. How can these areas of extrapulmonary $^{67}$Ga uptake be excluded when using the method proposed by Specht?

### References

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**REPLY:** In our experience the scapular tip interference problem posed by Dr. Oster has not been a major concern for the following reasons: In more than 98 imaging studies performed for this purpose we have not seen sufficient uptake in this area to cause concern. In contrast, shoulder joint uptake was a potential problem which, as pointed out in the paper, was dealt with by outline regions of interest (ROI) which were drawn on an anatomic basis to exclude them.

Should a problem case like this arise that could not, in our opinion, be ignored, we would draw the lung region with a dip in it to avoid it. Either way, we would expect little effect on the index value because, as pointed out in the paper, the method was found to be relatively insensitive to lung margin errors. This insensitivity is partly due to the small numbers of pixels generally involved, and partly due to low differential count gradients in the normal chest between such areas and the lung parenchyma. In addition, the index of 50 as the normal/abnormal cutoff takes care of these problems in both methods to some extent. As with Line's method, we obtain the Indices by using only the posterior lung view. Should sufficient breast uptake be present to shine through to this view, our computer program permits the anterior view to be used for index generation. Again, ROI's could be drawn to exclude these areas in either view.

In conclusion, it should be remembered that the test using either method is designed predominantly to assess diffuse disease.

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## First-Pass Radionuclide Determination of Cardiac Output: An Improved Gamma Camera Method

**TO THE EDITOR:** It was encouraging to read the recent article by Kelbaek et al. (*1*) describing their first-pass method for determining cardiac output. Cardiac first-pass techniques are greatly underutilized in many areas where equilibrium gated techniques are more widely employed. As the authors pointed out, first-pass studies provide truly different information about cardiovascular function, such as forward flow and valvular regurgitation (*2,3*) that is not available or that is less readily available from equilibrium gated blood-pool studies. It is thus encouraging to see more information and experience accumulating on these methods. A principal impediment to their use however, has been the general unavailability of software suitable for performing first-pass curve analyses.

In their paper, Kelbaek et al. present as a principal thesis that equilibrium, but not first-pass, background subtraction is necessary to avoid overestimating cardiac output by the radionuclide external indicator dilution approach. This assertion may not be generally applicable for the technique however, for several reasons.

First, no reference is made to the problem of count losses resulting from camera deadtime. Using the camera, collimator, and doses they employed, deadtime losses are considerable. Furthermore, count losses are greater during first-pass than during equilibrium counting. As a result, if corrections for deadtime are not employed, flow will be overestimated (*2,4*) via the equation.

$$\text{Flow} = \frac{\text{Qeq} \times \text{Vd}}{\text{Area}}$$

where Qeq is equilibrium count rate, Vd is dilution volume during equilibrium counting, and Area is area under the first-pass time-activity curve.

Second, in processing the first-pass time-activity curve from the left ventricle, they excluded the initial "hump" of activity in the right heart, coronary sinus, lungs, and other structures. This is an incorrect maneuver since Eq. (1) assumes that identical sources and sites of radiation are counted during both equilibrium and first-pass counting. Activity continues to scatter into the left ventricular region of interest during equilibrium counting, just as it did during the first-pass study. As a result of this exclusion, curve area is smaller, and flow is overestimated by Eq. (1). One might assume that the authors excluded this initial hump as a result of a lack of software to access functions other than the gamma variate for fitting the left ventricular time-activity curve.