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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 <sup>67</sup>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 <sup>67</sup>Ga. In determining the <sup>67</sup>Ga index with manual drawing of ROI's these areas can easily be excluded from the calculations. How can these areas of extrapulmonary <sup>67</sup>Ga uptake be excluded when using the method proposed by Specht?

#### References

1. Specht HD, Brown PH, Haines JE, McNeill M. Gallium-67 lung index computerization in interstitial pneumonitis. *J Nucl Med* 1987; 28:1826-1830.

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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.

$$\text{Flow} = \frac{Q_{eq} \times V_d}{\text{Area}}$$

where  $Q_{eq}$  is equilibrium count rate,  $V_d$  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.