not withhold any information from the patient or her physicians, and culture reports, which came from another institution, were not received by us until late in her terminal illness.

We feel qualified to comment on tuberculosis, but do not claim similar expertise for AIDS. One of our internal medicine residents contacted the CDC regarding this patient, and they classified her as AIDS without our knowledge. Drs. West and Tillinghast's points regarding the diagnosis of AIDS, however, do seem reasonable.

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Estimation of Absolute Ventricular Volume

To the Editor:

We have read with interest the recent article by Thomsen et al entitled "Estimation of Absolute Left Ventricular Volume from Gated Radionuclide Ventriculograms." They have improved upon the method originally proposed by Links et al by using 2D echocardiography to determine the depth to the center of the left ventricle (LV) for attenuation correction and an automated edge detection algorithm for total LV counts. However, they assume the linear attenuation coefficient of 0.15 cm⁻¹ measured in water using narrow beam geometry, which is referred to by Slutsky in his editorial as a "workable" assumption.

Since scatter is inherent in clinical nuclear medicine imaging with window settings of 15-25 percent, the assumption of a narrow beam μ for attenuation correction is incorrect. The narrow beam μ can only be used in conjunction with the buildup factor which corrects for the contribution due to scatter. We have measured the change in counts as a function of depth in tissue-equivalent material for a source of activity approximately the size of the LV. Using the equation I(d) = I₀B × e⁻μd where I(d) is the source count rate at depth d, I₀ is the source count rate in air, B is the buildup factor, and d is the source depth, the measured data can be plotted as shown in Figure 1. The slope of the straight line portion of this curve is the linear attenuation coefficient and is 0.13 cm⁻¹.

This agrees with the results of Nickoloff et al who have shown that the attenuation coefficient from the LV center to the chest wall was equal to 0.13 cm⁻¹ based on radiographic CT scans of the thorax. Thus, the assumption that the body habitus between the LV and the chest wall approximates that of water is a good one.

The puzzling aspect of this study is that accurate LV volumes could be obtained by using an automated region of interest since, according to Links, this always resulted in underestimation of true LV volume. Since the average depths were less in the Thomsen et al study (8.2 ± 0.05 cm compared to 10.2 ± 1.6 cm by Links et al) the correction factor for depth attenuation e⁻μd was higher (0.29 ± 0.02 cm⁻¹ compared to 0.23 ± 0.06 cm⁻¹). Therefore, 'Thomsen et al should also have underestimated volumes since e⁻μd appears in the denominator of the volume equation. One of the explanations for this is probably found in the method used for venous blood counting. The blood was counted in a 7 ml test tube which does not approximate the geometry of the LV and results in self-attenuation which leads to a decreased value for the venous blood counts. This lower number in the denominator of the calculation for LV volume may correct for the smaller LV counts obtained from using a tight, automated LV region of interest.

We agree with Thomsen et al that automated regions of interest should be used since they are more observer-independent and thus more reproducible. We obtained accurate LV volume measurements using automated regions of interest, but calculated volumes based on direct measurements of attenuation in each patient using an esophageal point source. A direct measurement of attenuation avoids

the need to make accurate determinations of the LV depths and to assume a value for μ.

In summary, we believe that the major error in the technique of Links et al and Thomsen et al is the assumption of a narrow beam geometry μ. A refinement in the depth measurement will not correct this. It may be that when errors cancel each other in a number of parameters needed to measure LV volume, results can appear to justify the methodology.

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REFERENCES


To the Editor:

Better methods for correcting left ventricular (LV) counts for tissue scatter and depth attenuation should and probably will soon be developed. However, to assume that a linear attenuation coefficient (μ = 0.13 cm⁻¹) and a buildup factor (1.18) determined in a uniform

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