Case of the Quarter

Michael K. Kan and Deanna O'Sargent

Scripps Memorial Hospital, La Jolla, California

Case History

A 74-year-old woman was admitted for evaluation of exertional left chest pain. The pain was effectively relieved by nitroglycerin. Examination revealed a regular heart rate at 75 beats/min. No clinical evidence of cardiac enlargement was found. Auscultation revealed a grade I/IV murmur in the mitral area with radiation to the axilla. Cardiac enzymes were normal and electrocardiogram (ECG) showed mild nonspecific ST segment changes. The clinical impression was atherosclerotic heart disease with papillary muscle dysfunction. A gated cardiac blood pool study was ordered to evaluate the left ventricular function. The gated study was delayed for 2 h due to a tuneup of the Searle Radiographics Pho/Gamma III HP scintillation camera. Imaging was then performed after iv injection of 20 mCi ^{99m}Tc-human serum albumin (New England Nuclear Corp.), which was done just before the imaging procedure and after the tuneup of the scintigrams from the modified left anterior oblique (LAO) projection with 45-deg inclination and 10-deg caudal tilt *(1)* were obtained with a 20% window and a preset count of 300k. Electrocardiogram gating was performed by a Physiological Synchronizer (Brattle Instrument Corp.) with a preset window of 60 ms. A 140-keV high-resolution parallel-hole collimator was used and each scintigram took approximately 8 min. The patient was extremely cooperative and did not move appreciably during the study. The patient had no other radionuclide studies recently.

The LAO end-diastolic and end-systolic scintigrams are shown in Fig. 1. What is the first step that you should do after seeing these pictures?

1. Continue the study by proceeding to the right anterior oblique projection since these pictures look technically adequate.
2. Change to a low-energy high-sensitivity collimator in order to cut down the imaging time.
3. Check the spectrometer and window settings to ensure that the 140-keV gamma photons from ^{99m}Tc were imaged with the proper window.
4. Discontinue the study since the poor quality of the pictures indicates poor tagging of ^{99m}Tc to the albumin.
5. None of the above.

Solution and Discussion

The pictures in Fig. 1 are of poor quality because of the poor delineation of the interventricular septum, the general fuziness of the cardiac outline, and a relative high background. The first answer is wrong because the pictures are technically inadequate and one should look for possible causes of the poor quality of the images before proceeding further. The second answer will not help in this case since the patient was cooperative with no appreciable movements and a high-sensitivity collimator

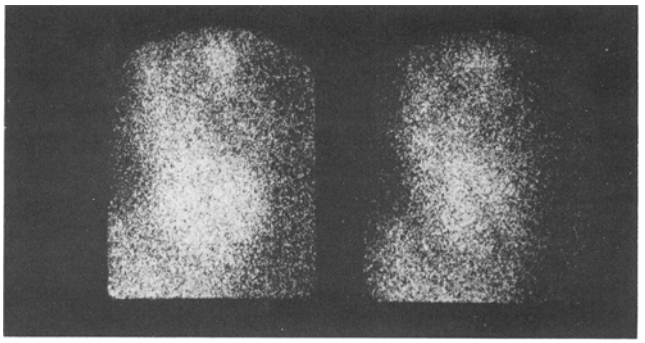

FIG. 1. End-diastolic (left) and end-systolic (right) scintigrams of heart from LAO position.

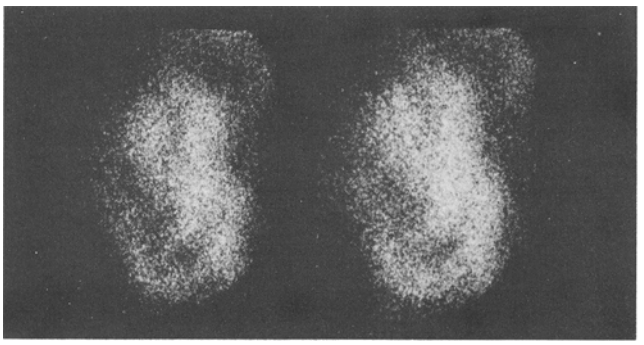

FIG. 2. Repeat end-diastolic (left) and end-systolic (right) scintigrams using correct spectrometer and window settings. Note that there is less background scatter and better delineation of septum, cardiac chambers, and great vessels.

For reprints contact: Michael K. Kan, Dept. of Pathology-Nuclear Medicine, Scripps Memorial Hospital, La Jolla, CA 90237.

will only further degrade the scintigrams *(2)*. The third choice is the correct answer, especially after any maintainence or repair work is done on the scintillation camera. In this case, the spectrometer was adjusted for the 122-keV photons from a ^{57}Co source while the scintillation camera was being tuned and, by mistake, it was not recalibrated for the 140-keV photons of ^{99m}Tc before the gated cardiac study was performed. Since the spectometer was calibrated for 122 keV, many scattered photons from ^{99m}Tc were accepted as scintillation events with consequent degradation of the end-diastolic and end-systolic images. The repeat images after proper calibration of the spectrometer are shown in Fig. 2. Note that the interventricular septum, cardiac outline, pulmonary artery, and the aortic arch are better delineated and there is less background activity. The fourth answer is incorrect because it should not be the first step to discontinue the study with the assumption that the ^{99m}Tc-albumin is poorly tagged. This decision should be made after excluding other causes of poor images as exemplified in our case.

Acknowledgment

The authors thank Lois Bennett for assistance in the preparation of the manuscripts.

References

1. Strauss HW, Zaret BL, Hurley PJ, et al: A scintiphotographic method for measuring left ventricular ejection fraction in man without cardiac catheterization. *Am J Cardiol* 28: 575-580, 1971

2. Berman DS, Salel AF, DeNardo GL, et al: Clinical assessment of left ventricular regional contraction patterns and ejection fraction by high-resolution gated scintigraphy. *J Nucl Med* 16: 865-874, 1975