

Case Report: Effect of Extraneous Blood Pool on Multigated Cardiac Scans

Shiv Gupta, Jonathan Alexander, and Thomas Halpin

Danbury Hospital, Danbury, Connecticut

Multigated cardiac blood pool imaging is routinely used in the assessment and characterization of ventricular performance in a variety of cardiac disorders. The information obtained may help to define the need for surgical or medical therapy, as well as to ascertain whether specific therapy has been successful in improving cardiac function. To ensure the validity of multigated studies, proper identification of regions of interest for the left ventricle and background is critical (1). We have encountered some cases in which extracardiac structures greatly influenced the performance of an adequate multigated cardiac study. To our knowledge, the effect of such extraneous sources of blood pool on gated cardiac scan has not been well defined. A brief description of three cases is presented.

Case Reports

A multigated cardiac scan was performed on a 70-year-old woman after autologous red blood cell (RBC) labeling with 20-mCi Tc-99m for assessment of left ventricular ejection fraction and ventricular wall motion. On anterior view, a large area of extracardiac blood pool was observed over the left anterior thorax, and on left anterior oblique (LAO) projection it completely overlapped the cardiac chambers, making its separation from the left ventricle impossible (Fig. 1). Clinically, the patient was found to have a breast mass, proven malignant on biopsy. Several images, including left lateral, LAO, and a steep LAO in the right lateral decubitus position, failed to provide adequate separation of the extraneous blood pool from the underlying ventricular region.

A 65-year-old man underwent a multigated cardiac scan with autologous RBC labeled with 20-mCi Tc-99m two weeks after a transverse colostomy had been performed. A highly vascular region of intense blood pool corresponding to the colostomy loop and opening was superimposed over the left ventricle in the LAO projection (Fig. 2). Separation of left ventricle from this extracardiac pool was not possible in spite of multiple projections obtained. Because of the intense uptake in the colostomy loop, further delayed images were obtained to look for the possibility of extravasation of radiotracer due to intraluminal bleeding, but no evidence was found.

The third patient was a 27-year-old nursing mother who re-

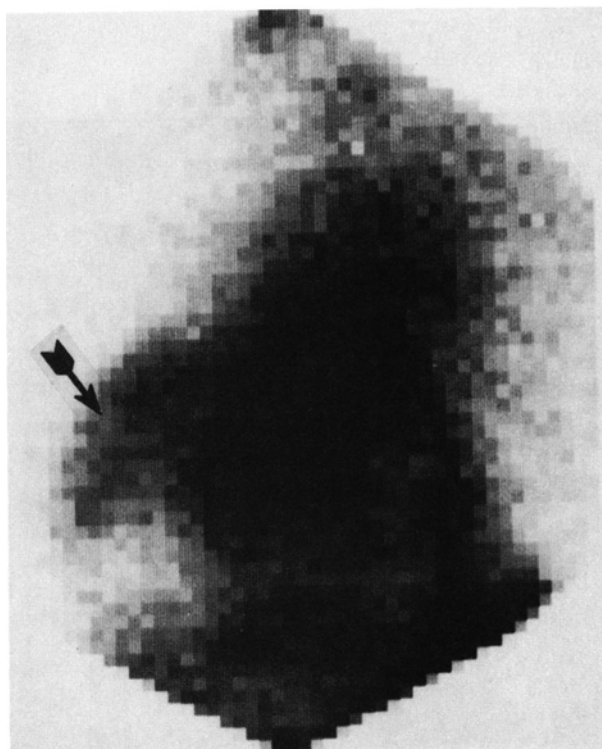


FIG. 1. Large extracardiac blood pool in breast tumor overlying left ventricle and septal region in multigated scan (LAO).

ceived a multigated cardiac scan following intravenous administration of 15-mCi [^{99m}Tc] pertechnetate for in-vivo autologous RBC labeling. She was four weeks postpartum. A greatly increased pool of activity was observed in the lactating breasts. It could not be separated from the cardiac blood pool in spite of several views obtained in different positions to avoid superimposition. Isolation of left ventricular region was not possible, thus no analysis of left ventricle function could be obtained.

Discussion

To ensure the validity of multigated cardiac studies, several factors have to be met. They include assuring the presence of relatively stable cardiac function during data acquisition, minimizing the patient's motion during imaging, maintaining a relatively constant concentration of intravascular radiotracer during data collection, and acquiring data for sufficient count density and appropriate spatial resolution (2). Difficulties in

For reprints contact: Shiv Gupta, Dept. of Nuclear Medicine, Danbury Hospital, Danbury, CT 06810.

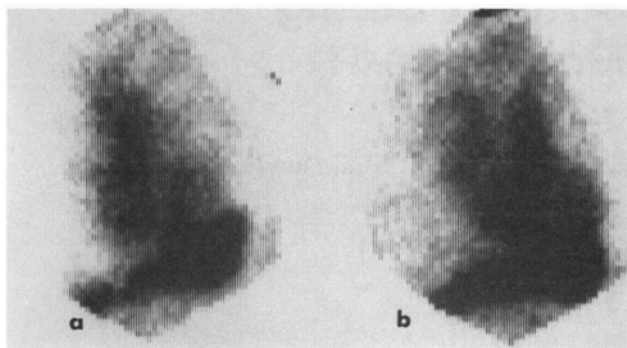


FIG. 2. Large extraneous blood pool due to transverse colostomy overlying left ventricle on LAO (A) and anterior (B) views.

radionuclide imaging in the chest due to anatomic structures, false-positive studies due to cardiac overlap by extracardiac structures such as the diaphragm during Tl-201 myocardial imaging (3), and interference by a breast mass on a perfusion lung scan have been reported. However, little is known about factors interfering with multigated cardiac imaging.

Since separation of ventricular cavity from atrial chambers and background is essential for an adequate gated functional study, cardiac overlap by extraneous structures is a serious

impediment. In the three cases we report, in spite of obtaining multiple cardiac views in several different positions, we could not obtain reliable quantitation of ventricular function or wall motion assessment.

It is crucial for the nuclear medicine technologist to be aware of and to actively look for factors capable of interfering with this study.

First-pass radionuclide angiocardiography was performed in all three patients three days following the multigated study to obtain ejection fraction data. Since first-pass technique depends on analysis of initial transit of radioactive bolus through the central circulation, the delayed accumulation of activity in the extraneous structures does not pose any problem. Cardiac performance can therefore be assessed before collection of blood pool in the extraneous source.

References

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