Artifacts and Technical Problems in Cardiac Imaging

When interpreting nuclear cardiology images, one should always consider the possibility of artifacts or other technical problems that may interfere with image quality. Artifacts are not unexpected in conventional SPECT imaging. During the process of external detection of relative low-energy photons emanating from inside the body, tissue attenuation, non-cardiac uptake, and motion may distort images.

Key Words: Recognition and correction of artifacts, Low counts, Patient motion, Sinogram, Inferior attenuation, Attenuation correction, Misregistration, Breast attenuation, Non cardiac radiotracer uptake, Reconstruction and processing, Misalignment, Quantification errors, Filtering, ECG gating, Myocardial thickening, Misregistration PET/CT, Red blood cell labeling, Left ventricular volume curve, Calculation LVEF, LVEF and fixed and variable ROI.

Examples of artifacts and other problems and their recognition and correction are discussed in this chapter and on the computer disk that accompanies this book.

Various artifacts and problems will be addressed in a logical temporal sequence as one might encounter them in the course of interpreting nuclear cardiology images.

SPECT MYOCARDIAL PERFUSION IMAGING

Rotating Images

Inspection of the rotating planar projection images (Fig. [16-1]) is always the first step of interpretation, because these images may provide important clues for problems or artifacts to be anticipated during analysis of reconstructed SPECT images.
Fig. 16-1. Cine display of rotating planar projection images. In this, and all following movies of projection images, the stress study is on the left and the rest study on the right. The horizontal white line serves as a reference mark and is placed by the technologist approximately at the level of the left ventricular apex. The most convenient display speed for inspecting these images is at 10 frames/second. The lung/heart ratio (L/H) is displayed, as is the maximal count density/pixel within the left ventricle. Studies with less than 100 maximal counts are of suboptimal quality. The rotating projection images should always be viewed before analysis of reconstructed tomographic slices. The images should be inspected for patient motion, breast shadow, and overall quality. (movie)

Fig. 16-2. Cine display of rotating planar projection images. The count density of the rest study as measured by maximal count/pixel within the left ventricle is low (73 counts). The stress study in contrast has excellent count density. One can expect the reconstructed tomographic slices of the rest study to be of suboptimal quality. (movie)

Low Counts (Figs. 16-2 to 16-4)

One of the most important parameters affecting image quality is count density. Low-count density can be suspected readily from the visual appearance of the rotating planar projection images. Low-count