Technologist Case Report

Unusual Flood Field Image

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Nuclear medicine is experiencing increasing implementation of quality control programs for instrumentation. No doubt nuclear medicine is benefiting from this development and will continue to do so, provided certain pitfalls are avoided. One such pitfall, an unusual cause for flood field nonuniformity, is reported.

A liver scan was performed in late afternoon and a severe motion-like artifact was identified. A flood source prepared with an unused individual dose of a technetium product was then imaged (Fig. 1). The contents of the flood phantom were mixed well to ensure uniform distribution of the radiopharmaceutical. The artifact was again demonstrated and found to originate in the multiformat circuitry. Visual inspection of the CRT display revealed what appeared to be an ac signal superimposed upon the dc signals that drive the CRT deflection plates. This electronic artifact was easily corrected. A mottling appearance, however, remained in the flood image (Fig. 2).

Electronic rotation of the flood field image revealed that the defects did rotate, indicating the problem was not the CRT phosphor or the optical-recording system. Assuming the problem was intrinsic to the detection system, phototube calibration was performed. When field uniformity did not improve, it was evident that phototube calibration would not correct the problem. Collimator contamination was also eliminated as the source of the problem when the flood source was temporarily removed. The service representative was then asked to correct the problem.

The next morning, the Nuclear Medicine Division was informed that service would be temporarily unavailable because of local weather conditions. At that time, divisional personnel decided to correct the problem themselves. A new flood source prepared with pertechnetate was imaged. These new images demonstrated uniform response with no evidence of the mottling artifacts. Further investigation revealed that the previous day's flood source had inadvertently been prepared with an unused dose of Tc-99m sulfur colloid. The mottled appearance noted was most probably due to nonuniform

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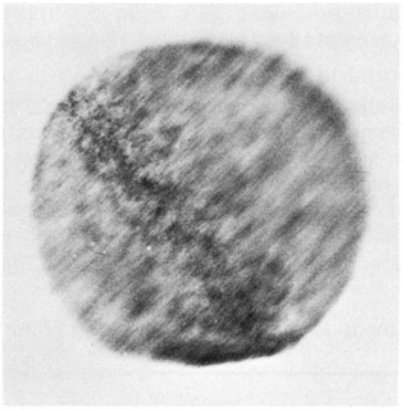

FIG. 1. Flood field image demonstrating severe motion anomaly. The artifact was found to be electronic in nature and originated in the multiformat circuitry.

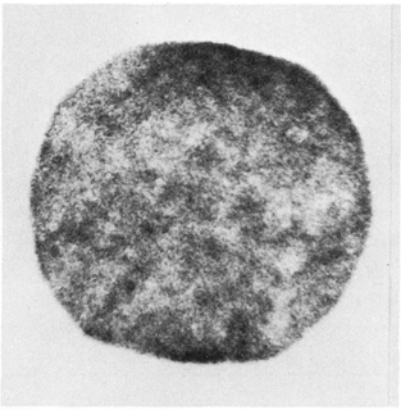

FIG. 2. Flood field image following correction of the electronic artifact. Discrepant uniformity was found to be due to poor distribution of radiopharmaceutical within the flood source.

distribution of the colloidal particles within the flood source.

Discussion

Quality control programs are unquestionably beneficial for periodic evaluation and daily operation of scintillation cameras. Because images for field uniformity assume a uniform flood source, it is essential that this condition be satisfied. We find that sulfur colloid does not consistently meet this criterion, while pertechnetate, because of its ionic nature, provides the required uniform distribution within the flood phantom.

Imaging problems almost inevitably occur and care must be taken to interpret them correctly. Frequently, the reviewer is quick to assign the blame to electronic malfunction rather than consider that the fault might be in the technique. This pitfall can be avoided simply by considering the imaging process in its entirety.

In laboratories where individual doses are purchased from an outside supplier, the temptation may sometimes be great to use "leftover" doses of various technetium products for quality control. Our experience should serve as a reminder of the dangers involved in such a practice.