Thallium-201 Myocardial Imaging: Comparison of the High Sensitivity and High Resolution Collimators

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Thallium-201 myocardial images of 20 patients undergoing treadmill exercise were evaluated as to the ability of the high sensitivity collimator (HSC) to reveal perfusion defects compared to images obtained using the high resolution collimator (HRC). We acquired 200,000 count images in the anterior, 45° left anterior oblique, and left lateral projections. Average acquisition times were: HSC 3.41 min. and HRC 6.08 min. Fifteen patients who had clearly visible perfusion defects using the HRC showed degraded definition or appreciable loss of definition of the same defects when using the HSC.

Thallium-201 myocardial imaging has been established as a reliable detector of myocardial infarction (*1–4*) and ischemia (*5–9*). Optimally, we think stress Tl-201 imaging should be performed with a 10-in. field-of-view camera or a large field-of-view camera with magnification capabilities. Total image acquisition times of less than 3–4 min per image are also desirable. However, this may not be practical yet in all institutions. In order to examine the possibility of shorter image acquisition

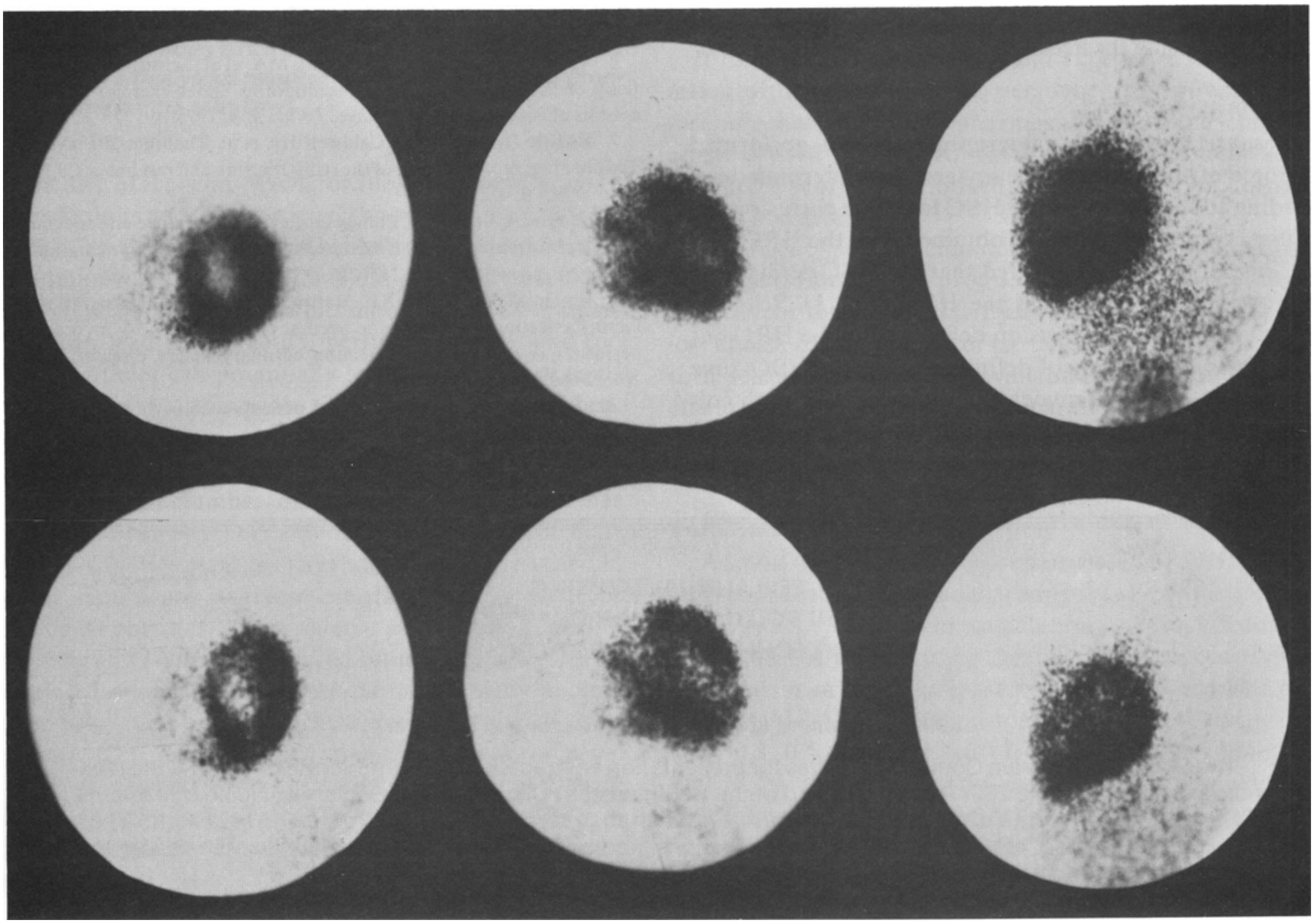

FIG. 1. Images in 45° left anterior oblique, anterior and left lateral projections (L–R) using HSC (top) and HRC (bottom). Perfusion defects using HRC are well defined but loss of definition is apparent when using HSC.

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time without loss of quality, we performed a comparison study using HSC and HRC collimators.

Methods

Twenty patients had Tl-201 stress/rest myocardial imaging. Each patient had multistage treadmill exercise testing using the Bruce protocol (*10*). Then 1.8-mCi Tl-201 chloride was injected intravenously 30–60 sec before termination of exercise and imaging was begun within 10 min. Analog images were acquired with a 10-in., ¼-in. thick crystal 37 photomultiplier tube gamma camera (Picker) and digitized by computer (ADAC), using a 256 × 256 byte mode matrix. Six 200,000 count images were obtained in the following order for both the HSC and HRC: 45° left anterior oblique, anterior and left lateral projections.

The HSC physical specifications are 4,000 holes, 3.64-cm thick, a hole size of 3.30 mm, and septal thickness of 0.305 mm. The HRC specifications are 18,000 holes, 2.54-cm thick, a hole size of 1.4 mm, and septal thickness of 0.254 mm. The extrinsic bar resolution is 4.5 mm for HSC and 2.4 mm for HRC.

At 3–4 hr after exercise, redistribution imaging was performed using the acquisition format described above.

Results

Because coronary angiography was not performed in some of the patients, the images were interpreted according to the ability of the HSC to define perfusion defects as compared to images obtained with the HRC.

None of the scans indicated that the HSC defined the perfusion defect as well as the HRC (Fig. 1). Scans of 15 patients showed perfusion defects using the HRC but poor definition or loss of definition using the HSC. Five patients had normal myocardial images using both collimators. Average image acquisition time for 200,000 count images was 3.41 min for HSC and 6.08 min for HRC.

We evaluated the ability of the HSC to define myocardial perfusion defects compared to images taken using the HRC in 20 patients. The HSC acquisition time was appreciably shorter; however, the HSC consistently showed degraded definition of myocardial perfusion defects.

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