

which increased to an average of 0.68 (0.62–0.75) at peak exercise, a 23.6% change from the base line.

Using FROI in this group, the average and range of ejection fractions at rest and peak exercise were 0.37 (0.27–0.52) and 0.43 (0.29–0.62), respectively; this is a 16% change from the baseline. However, only four of these nine patients showed a significant rise in ejection fraction at peak exercise by this method; four gave no significant rise and one had a drop in ejection fraction. These results are consistent with the results obtained by Sorensen et al. and suggest that although both techniques have shown good reproducibility, the VROI method is more sensitive than FROI in demonstrating significant increases in ejection fraction with exercise.

In this review, 12 patients showed either no increase or a drop in ejection fraction at peak exercise with both techniques, but again the magnitude of change was greater when VROI was used, as shown in Table 1.

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Demonstration of a Left-Atrial Myxoma on the Paradox Image

The paradox image (1) is useful in the detection of left-ventricular aneurysms. We recently performed a gated heart-pool scan on a patient with a known left-atrial myxoma, and although it was well seen on the cine display, it was more convincingly demonstrated on the paradox image. We believe that this has not been reported previously.

A 51-year-old man was referred to a cardiologist 2 yr before the diagnosis of left-atrial myxoma was established. When first seen,

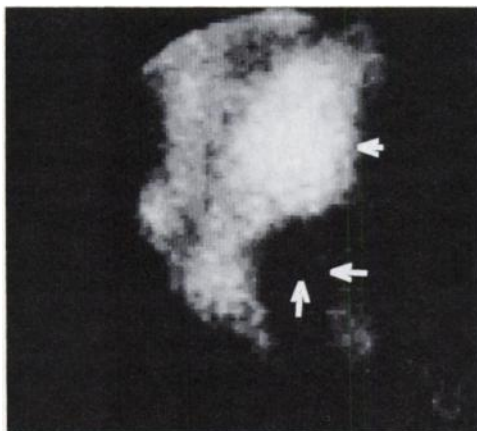


FIG. 1. LAO view (45°) of early diastole when myxoma has prolapsed into left-ventricular cavity and is seen as a photon-deficient area (large arrows). Small arrow indicates enlarged pulmonary artery.



FIG. 2. LAO view (45°) at end-systole when myxoma has returned to left atrium and no photon-deficient area is seen in left-ventricular cavity.

he complained of episodic dyspnea not related to exertion. At this stage a mitral systolic murmur was heard, and the provisional diagnosis was alcoholic cardiomyopathy with functional mitral incompetence. It was not until his third hospital admission that a mitral diastolic murmur was heard. A subsequent echocardiogram demonstrated a left-atrial myxoma.

The gated heart-pool study showed an enlarged pulmonary artery consistent with pulmonary hypertension. A photon-deficient area representing the myxoma was seen in the cine display in both the anterior and 45° LAO blood-pool scans (Figs. 1 and 2). However, the myxoma was more convincingly seen on the paradox image (Fig. 3). The tumor was subsequently removed; it had been attached by a long pedicle to the endocardium of the inferior border of the interatrial septum. A postoperative study confirmed that the area of "paradox" was no longer present (Fig. 4).

The paradox image is a computer-generated image obtained by subtracting the left-ventricular end-diastolic image from the left-ventricular end-systolic image. This option is now incorporated in many computer programs for gated heart-pool imaging. Holman et al. (1) recently reviewed the paradox image in the evaluation of regional wall dyskinesia and stressed the care needed in defining the systolic and diastolic planes of the mitral valve.

Atrial myxomas are rare but are important because they are a curable form of heart disease. Echocardiography is the preferred

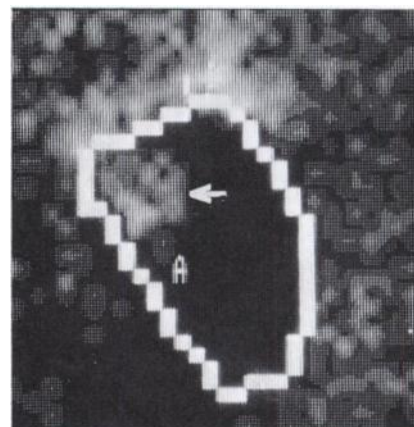


FIG. 3. Left-ventricular paradox image, in 45° LAO view, shows discrete area of positivity at base of left ventricle (arrow), which represents the myxoma.

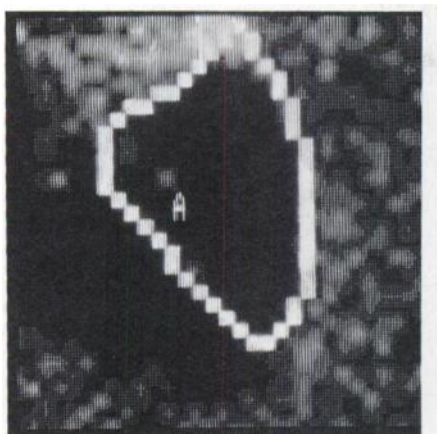


FIG. 4. Paradox image obtained in same projection postoperatively, showing no trace of myxoma.

noninvasive investigation for their diagnosis (2). Gated heart-pool scanning is now being requested more frequently as a noninvasive screening test for the patient with atypical cardiac symptoms, and it is likely that atrial myxomas may be demonstrated first in the nuclear medicine departments. Pohost et al. (3) have previously described the sensitivity and patterns of movement of left-atrial myxomas as seen on gated heart-pool scans.

A positive area in the paradox image indicates a region where the end-systolic blood volume exceeds that at end-diastole. This is usually a dyskinetic area in the left ventricle but could also represent a space-occupying lesion that is present in the left ventricular cavity only during diastole.

We suggest that the elusive prolapsing left-atrial myxoma be considered if a discrete area is seen on the paradox image near the base of the left ventricle.

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Pulmonary Bleeding Diagnosed as an Incidental Finding during a Gated Cardiac Scan

The purpose of this report is to describe a case in which a diagnosis of pulmonary bleeding was made in the course of a gated cardiac blood-pool scan. In vivo labeling using Tc-99m PPI has provided a simple, noninvasive, and high-efficiency means of red cell labeling and has proved to be an effective means of blood-pool visualization (1,2). It has permitted demonstration of bleeding into such sites as the limb and gastrointestinal tract (3,4). In this pa-

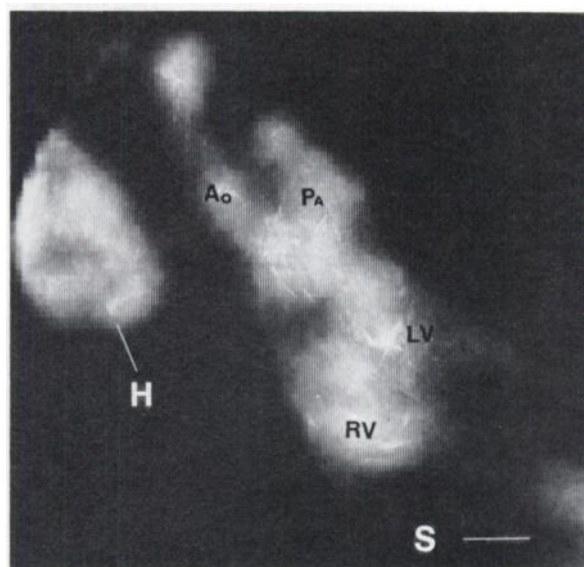


FIG. 1. Summed anterior gated blood-pool image showing right ventricle (RV), left ventricle (LV), pulmonary artery (Pa), aorta (Ao), spleen (S), and hemorrhage (H) within right lung field.

tient it revealed intrapulmonary bleeding.

The patient, a middle-aged male, was admitted following a motor vehicle accident. On examination he was confused, hypotensive, and tachypnoeic. He had a flail chest and subcutaneous emphysema was apparent. Radiographs revealed several fractured ribs and hemopneumothorax. Intercostal tubes were inserted. Continued hypotension and abdominal distension prompted a laparotomy. A lacerated left lobe of the liver and a retroperitoneal hematoma were found. The patient continued to deteriorate and developed signs suggestive of cardiac tamponade. To exclude this possibility, first-pass and gated studies were performed in the intensive care unit using a mobile gamma camera on line to a computer located two hundred meters distant.

The study was performed after the patient had received 0.7 mg of stannous chloride intravenously followed 30 min later by 22mCi (800 MBq) of [^{99m}Tc] pertechnetate as a bolus. The first-pass study was performed at five frames per second. Gated cardiac blood-pool images were obtained in the anterior projection and in the LAO projection with 15° of caudal tilt.

The first-pass study indicated displacement of the right pulmonary artery. During the gated study an area of increasing activity was found within the right lung field (Fig. 1) confirmed by a time-activity curve plotted over this region of interest, indicating the presence of intrathoracic bleeding. An emergency thoracotomy was performed and revealed active bleeding from the right middle lobe and adjacent upper lobe. The bleeding segments were resected and additional intercostal drains inserted. Postoperatively the patient's condition improved and he made an uneventful recovery.

Occult hemorrhage is a major and often fatal complication of motor vehicle accidents. Superficial bleeding and administration of intravenous fluids in the emergency situation often masks the diagnosis. Furthermore, the extent of body trauma makes the detection of the bleeding site difficult. Several methods for the location of bleeding have been evaluated (5-9). These can be performed with minimal patient discomfort in the acute situation, often at the bedside. Technetium sulfur colloid is rapidly cleared from circulation by the liver and spleen and appears to be helpful in evaluation of intra-abdominal bleeding located away from the liver and splenic uptake. In vivo technetium labeling of red blood cells has provided an effective means of screening patients for