

Significant Gastric Reflux of Technetium-99m-MIBI in SPECT Myocardial Imaging

Gordon W. Middleton and John H. Williams

Department of Medical Physics and Bioengineering, University Hospital of Wales, Cardiff, Wales; Department of Radiology, Princess of Wales Hospital, Bridgend, Wales

We present a case in which significant gastric reflux of ^{99m}Tc -methoxy isobutylisonitrile (MIBI) was observed in a patient who underwent stress/rest ^{99m}Tc -MIBI SPECT myocardial perfusion imaging for suspected coronary artery disease. The intense gastric activity partially obscured myocardial uptake of ^{99m}Tc MIBI, particularly in the inferolateral wall of the left ventricle. The presence of significant gastric activity should be considered when performing SPECT myocardial imaging with ^{99m}Tc MIBI, and, where necessary, steps should be taken to minimize this activity prior to commencing acquisition.

Key Words: technetium-99m-MIBI; gastric reflux; myocardial imaging; SPECT

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SPECT myocardial perfusion imaging using ^{99m}Tc -MIBI is an established investigation (1) in suspected coronary artery disease (CAD). The majority of protocols (2) include the use of a fatty meal, or intravenous Cholecystokinin (CCK), to stimulate hepatobiliary clearance. Imaging is normally performed 60–90 min postinjection, to optimize the myocardial/hepatic count ratio. We present a case in which significant gastric reflux of ^{99m}Tc -MIBI occurred following prompt hepatobiliary clearance.

CASE REPORT

SPECT myocardial imaging was performed on a 41-year-old female patient with suspected CAD, using a two-day ^{99m}Tc -MIBI protocol. The patient was exercised on a treadmill (modified Bruce protocol) and 350 MBq ^{99m}Tc -MIBI (Dupont, Cardiolite) was administered at maximal exercise, with exercise continued for another minute. The next day, 500 MBq ^{99m}Tc -MIBI was administered to the patient at rest. For both studies, SPECT imaging was commenced 90 min after administration of the radiopharmaceutical, the patient having eaten a light meal 15–30 min

before imaging commenced. Data was acquired in a 128^2 image matrix as $60 (3^\circ) \times 30$ sec projections, using an Elscint 409AG/SP1 camera/computer system with a high-resolution collimator, from a right anterior oblique to left posterior oblique projection. Tomographic transaxial slices (2 pixels thick) were reconstructed using a zoom of 3.2 and a Hanning filter. From the transaxial data, three sets of orthogonal slices (short axis (SA), horizontal and vertical long axis) were obtained for each study.

Four mid-ventricle SA slices from the stress (Fig. 1) and rest (Fig. 2) studies are shown. Significant defects can be seen in both antero-septal and inferior myocardial walls (arrowed in Fig. 1) in both studies. In the rest study, there is also a region of very high activity (arrowed in Fig. 2) inferior to and including the infero-lateral ventricular wall. Note that the display levels in Figure 2 are set to optimise display of the myocardial uptake, resulting in display level saturation of the intense activity in the region inferior to the myocardium. A selection of projection images, approximately at LAO 45° , taken from the rest study (Fig. 3) clearly demonstrate intense activity (arrowed in Fig. 3) arising from gastric reflux of bile activity. From four consecutive projection images, the mean count in a small (3×3) region of interest was 1228 over the myocardium, 1337 over the liver and 2628 over a gastric area.

DISCUSSION

Optimal myocardial perfusion imaging using ^{99m}Tc -MIBI requires adequate hepatobiliary clearance to minimise interference between myocardial and hepatic uptake. This is usually achieved by imaging 60–90 min after administration and can be aided by food intake or use of CCK. The use of SPECT will further reduce the likelihood of such interference (2) and improve the diagnostic accuracy of ^{99m}Tc -MIBI myocardial perfusion imaging.

As this case demonstrates, significant gastric reflux of ^{99m}Tc -MIBI can occur and can interfere with the myocardial uptake of ^{99m}Tc -MIBI. In addition to the problem of overlapping gastric and myocardial activity, the presence of significant gastric activity may result in reconstruction artifacts in SPECT imaging (3). This may result in areas of falsely low activity, due to the presence of a small area of high count in an otherwise fairly low-count image. While it is not possible to remove such gastric activity from the raw

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For correspondence or reprints contact: Gordon W. Middleton MSc, Department of Medical Physics and Bioengineering, University Hospital of Wales, Health Park, Cardiff, CF4 4XW, Wales, UK.

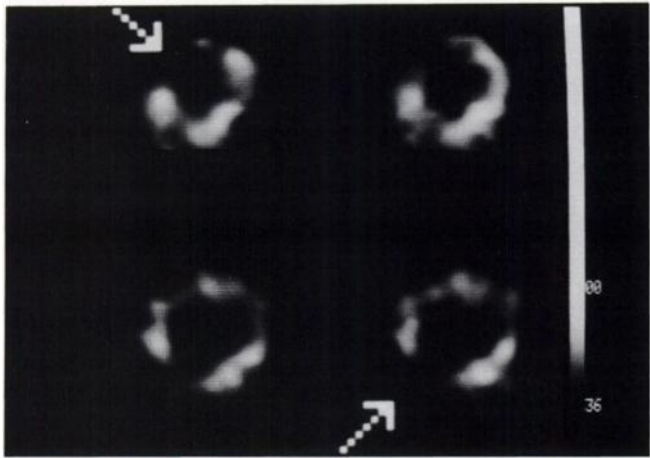


FIGURE 1. Short-axis slices from ^{99m}Tc -MIBI stress study show antero-septal and inferior perfusion defects.

projection data, it may be possible to mask out the activity on the transaxial slices, prior to reconstructing the orthogonal slices. In this case, such an approach did enable easier display level adjustment on the final orthogonal slices, but important parts of the myocardium were removed by the masking procedure. A more satisfactory approach would be to prevent or minimise any gastric activity prior to the

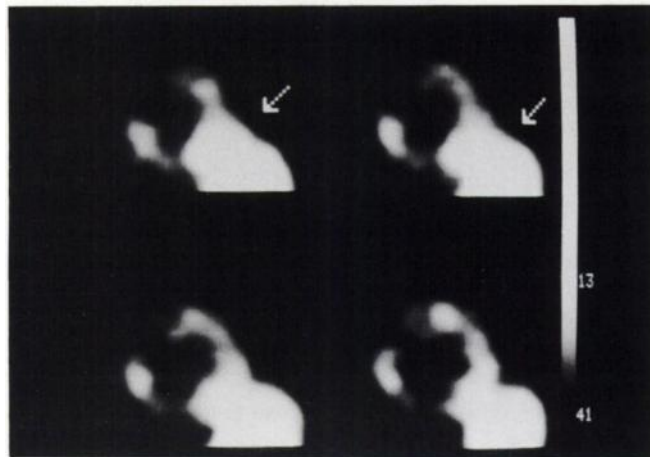


FIGURE 2. Short-axis slices from ^{99m}Tc -MIBI rest study show intense activity overlying the infero-lateral myocardial wall.

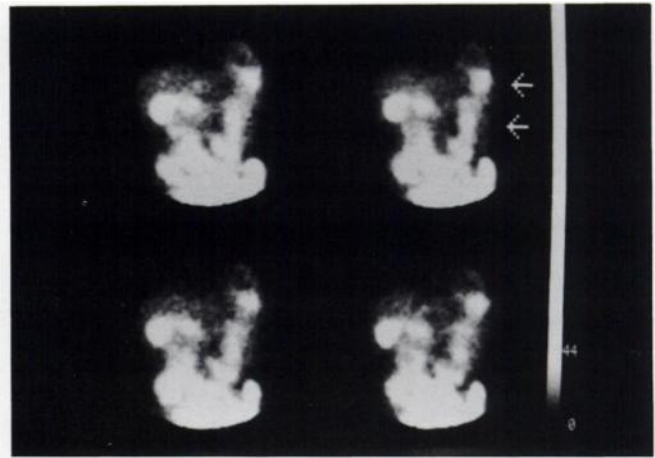


FIGURE 3. Projection images from ^{99m}Tc -MIBI rest study demonstrate reflux of bile activity into the stomach.

data acquisition. This should at least involve a check for the presence of gastric activity during the patient setup procedure. If significant activity is seen, steps to reduce this should be considered; e.g., further food or fluid intake, lying the patient on their right side to improve gastric emptying or imaging the patient prone.

In this case, the patient had left the department before the presence or significance of this activity was noted and repeat images could not be obtained. However, the diagnosis was not significantly affected because the region of the myocardial wall obscured by gastric activity showed normal uptake on the stress study. Had this region been underperfused on the stress study, or had the gastric reflux occurred during the stress study, diagnostic accuracy would have been significantly compromised.

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