

IMAGING GAMUT

The value of "breast silhouette image" in the identification of a lactation artefact on SPECT myocardial perfusion scintigraphy

Qaisar H Siraj^{1,*}, Eiman Al-Awadi¹, Anwar Al-Banna¹, Rasha M Al-Shammeri², Uzma Afzal¹, Sarah F Al-Bughaili¹

¹Department of Nuclear Medicine, Farwania Hospital, Kuwait

²Dasman Clinic Sharq, Kuwait

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Background A 36-year-old woman with atypical chest pain and no risk factors for ischaemic heart disease, was referred to the nuclear medicine department for myocardial perfusion scintigraphy.

Procedure The patient underwent treadmill stress according to the Bruce protocol for 6.1 minutes achieving 88% of maximum predicted heart rate, with no adverse effects or ECG changes seen. ^{99m}Tc-Tetrofosmin (806 MBq) was injected intravenously at peak stress. Tomographic imaging was performed 2.5 hours postinjection using a double-headed gamma camera (GE Infinia) equipped with a low-energy high-resolution collimator. The images were reconstructed using the standard iterative reconstruction algorithm. As per the departmental protocol, a planar 60-sec image (256x256 matrix) of the chest was additionally acquired in the 70° left-anterior-oblique (LAO) projection. A cobalt-57 flood phantom was placed on the collimator opposite to the imaging

camera head to delineate the breast silhouette. The resting myocardial perfusion scan was performed a week later.

Findings The myocardial perfusion SPECT scan images showed relatively poor uptake in the LV myocardium at stress compared with rest. Extracardiac background activity in the upper lateral chest was noted in the short and the vertical long axes (Figures 1 & 2). A review of the raw data images showed this activity to be localised to the breast soft-tissue causing interference with the cardiac uptake on the stress scan, but not on rest due to positioning of the breast away from the heart with chest strapping during image acquisition (Figures 3 & 4). The 60-sec LAO 70° static "breast silhouette image" (Figure 5) acquired immediately after the stress SPECT, showed a clear-cut lactation artefact, with intense uptake in the breast and relatively less intense cardiac uptake, which was further compromised by extracardiac background activity emanating from the lactating breast.

Conclusion After careful comparison of the stress, the stress images reconstructed after masking the background and the rest scan images, and taking into account the overlying lactation artefact, it was concluded that there was no evidence of inducible myocardial ischaemia seen on the perfusion SPECT scan.

*Correspondence

Dr Qaisar H Siraj
Department of Nuclear Medicine
Farwania Hospital
PO Box 18373, Kuwait 81004
Email: Farwanianucmed@gmail.com

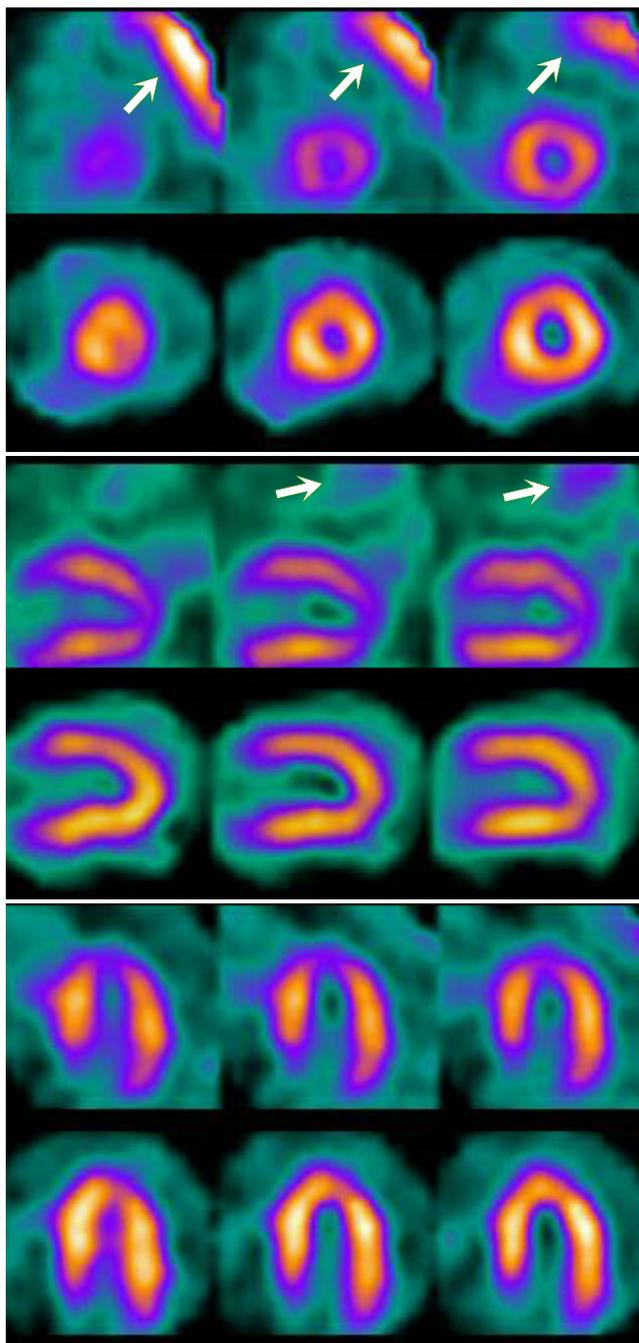


Figure 1 ^{99m}Tc -Tetrofosmin SPECT stress (upper rows) and rest (lower rows) scans in the short axis (top), in the vertical long axis (middle) and in the horizontal long long axis (bottom). There is apparent reduction of uptake in the myocardium seen on the stress images compared with rest and extracardiac activity is noted on the SA and the VLA images (arrows)

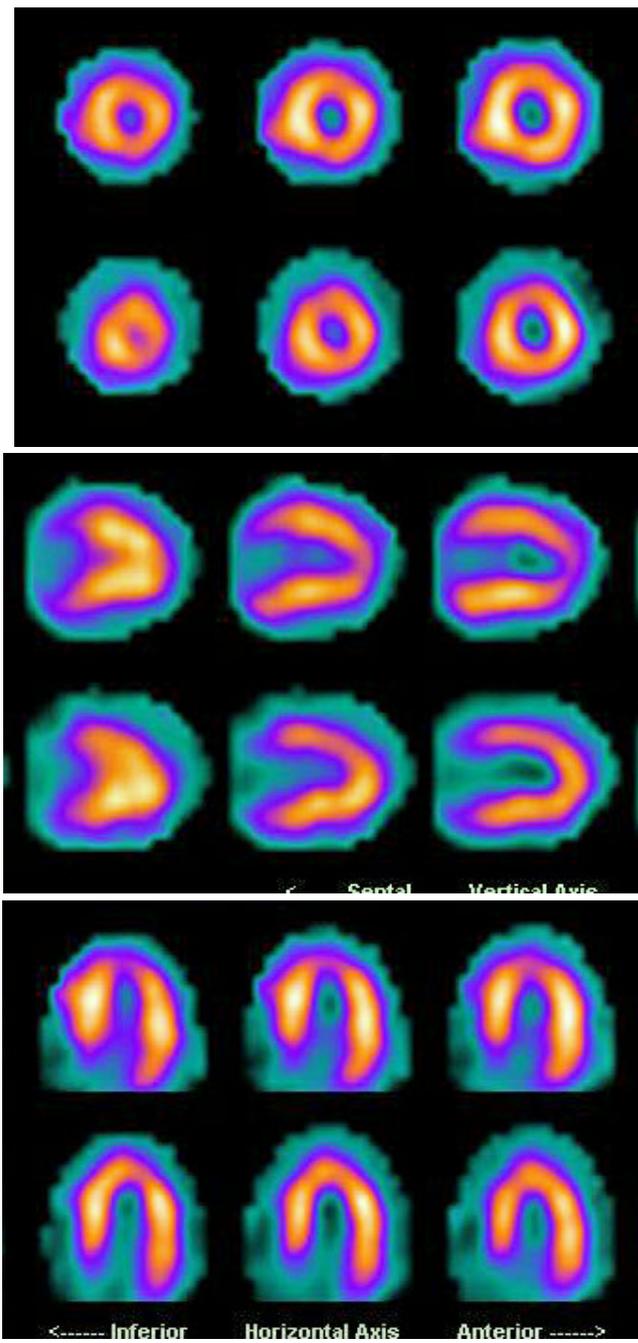


Figure 2 ^{99m}Tc -Tetrofosmin SPECT stress (upper rows) and rest (lower rows) scans in the short axis (top), in the vertical long axis (middle) and in the horizontal long long axis (bottom). The images are reconstructed masking the heart from the extracardiac activity. There is now symmetrical and normal myocardial uptake seen on the stress and rest scan images

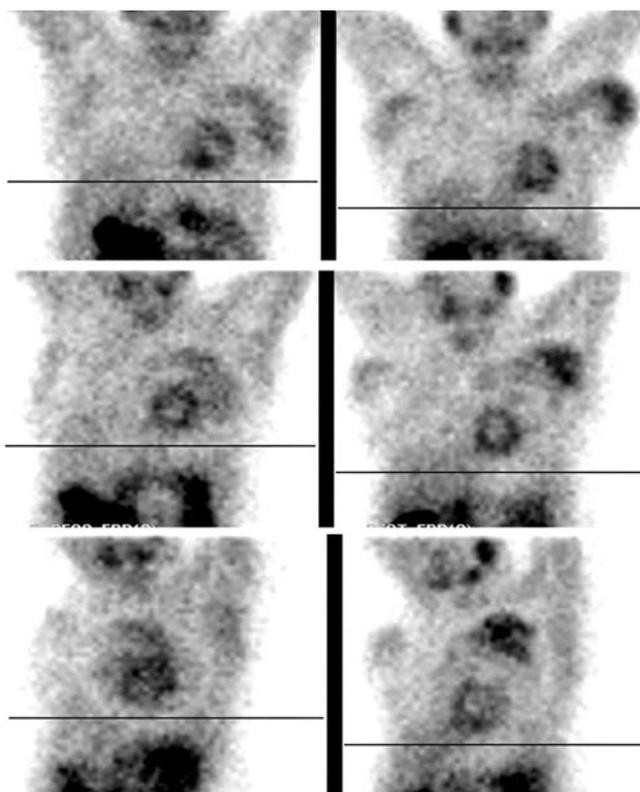


Figure 2 Tetrofosmin SPECT stress (left column) and rest (right column) rotating raw images showing interpositioning of the lactating breast activity between the cardiac activity and the camera face in the anterior-oblique projections of the tomogram. Positioning of the breast away from the heart at rest results in a good quality scan

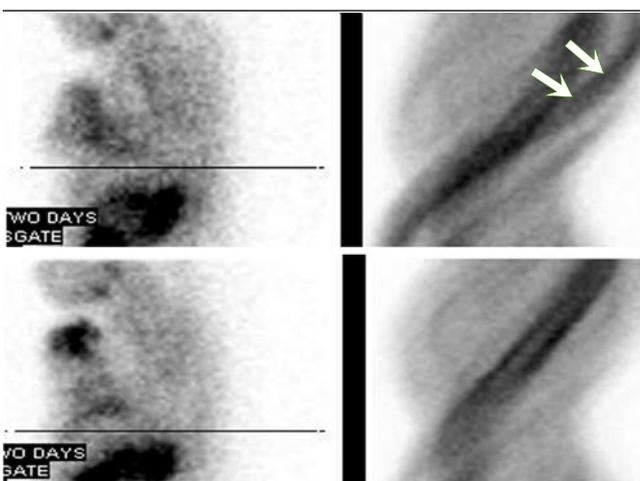


Figure 3 Sinogram images at stress (Top) and rest (Bottom) showing breast milk activity overlapping the cardiac activity at stress (arrows) and good separation of the cardiac and extracardiac activity at rest

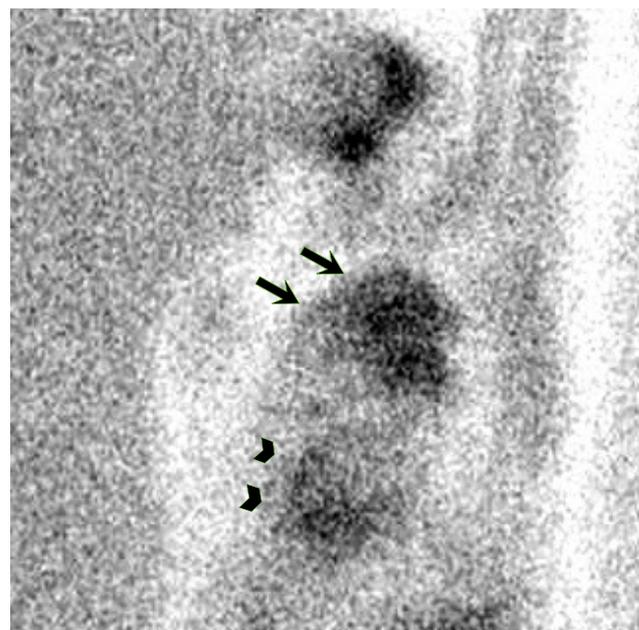


Figure 4 The 60-sec static "breast silhouette image" acquired in the LAO 70 degree projection clearly shows intense activity in the lactating breast (arrows) with relatively modest uptake in the myocardium (chevrons) and increased extracardiac background lactation activity

Comments Breast uptake seen on a myocardial perfusion SPECT scan in a post partum patient is likely to result in physiological image artefact [1, 2]. An estimated 0.03% of the of the ^{99m}Tc-Tetrofosmin dose is excreted in breast milk and the peak concentration in the breast milk is reached at 3 hours postinjection [3]. However, the lactation artefact is a composite of activity expressed in the milk and the uptake of the radiopharmaceutical by the lactating breast tissue. An awareness and identification of the lactation artefact is helpful in optimising the images and reducing the effect of the artefact by patient positioning, timing of the scan and prior expression of breast milk.

It is important to routinely undertake a systematic analysis of the raw data as a part of the MPI reporting and it forms a crucial step in image interpretation and for identifying patient-motion, attenuation and extracardiac physiological organ activity artefacts. However,

fairly occasionally, despite a careful raw data review, there are still difficulties in identifying the occasional baffling artefact which is obscurely depicted in the raw data images. In our department, a 60-sec static "breast silhouette image" is routinely performed in all female patients. This image is obtained after strapping the patient's breast for cardiac imaging with the patient lying on the imaging table and the camera gantry set for cardiac SPECT acquisition. Early and prompt identification of the lactation artefact on the static "breast silhouette image" was helpful in performance of the rest scan when the patient's breast was strapped away from the heart during acquisition.

The 60-sec static "breast silhouette image" provides valuable additional information on the size, shape and position of the breasts in females and the degree and extent of the soft-tissue attenuation overlying the cardiac image.

References

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