Myocardial scintigraphy with I-123 heptadecanoic acid as a test for coronary heart disease

R. Railton 1, J.C. Rodger 2, D.R. Small 1, and A.D.B. Harrower 2

1 Medical Physics Department, Monklands District General Hospital, Airdrie, Lanarkshire and West of Scotland Health Boards, Department of Clinical Physics and Bio-Engineering, Glasgow, UK
2 Medical Unit, Monklands District General Hospital, Airdrie, Lanarkshire, ML6 0JS, UK

Abstract. We have evaluated 123I-heptadecanoic acid for myocardial scintigraphy in the diagnosis of coronary heart disease by comparing the results obtained with it in subject groups with high and low probabilities of disease. We conclude that although some patients in the former group can be identified, the test is neither sufficiently sensitive nor specific for routine clinical use.

Key words: Coronary heart disease – Myocardial scintigraphy – Fatty acid

Free fatty acids are an important source of myocardial energy; their extraction from the blood by the myocardial cells provides an index not only of myocardial perfusion but also of myocardial metabolism (Most et al. 1969; Opie 1976). It has therefore been suggested that myocardial scintigraphy following the administration of the free fatty acid analogue (17-I) heptadecanoic acid (123I-HDA) (Freundlieb et al. 1980) can detect the ischaemic myocardium without the need for stress testing.

The aim of the present study was to evaluate the use of 123I-HDA as a test for coronary heart disease (CHD).

Materials and Methods

Patients

Two groups were investigated:

Group 1: Twelve volunteers with no symptoms of cardiovascular disease and with negative exercise electrocardiograms. There were ten males and two females all aged less than 30 years (mean 26 years).

Group 2: Twelve patients with typical angina and positive exercise electrocardiograms (greater than 2.0 mm ST depression) and no evidence of myocardial infarction. There were ten males and two females; their ages ranged between 39 years and 68 years (mean 54 years).

Myocardial scintigraphy

With the subjects at rest and following the administration of potassium iodide to block the thyroid, 40 MBq 123I-HDA (EIR Radioisotope Service) was given intravenously and images were acquired in the anterior, LAO 30, LAO 60 and left lateral projections (5 min acquisitions) with a gamma camera (Technicare 410). The images were stored on magnetic tape for subsequent computer analysis (Technicare 460).

Image analysis

After background subtraction (Watson et al. 1981) the images underwent nine point smoothing. Interpretation was both visual and quantitative (circumferential profiles) as follows:

a) Visual. All images were assessed by three observers who were first shown the normal images to get a feel for the normal variations. At a later date they looked at all 24 studies at random. Each of the subjects studied was then classified as negative or, if their images showed a defect in any view, as positive.

b) Quantitative. Using the method of Maddahi et al. (1981), circumferential profiles were plotted for all images. The images from the 12 normal subjects were used to establish mean normal profiles. Patient profiles were scored according to the number of 18° segments (ignoring the 120° segment at the base) which were more than two standard deviations below the mean normal profile. A score of two or more was taken as evidence of a defect.

Radiation dose

The whole body equivalent dose for 40 MBq 123I-HDA was 0.3 mSv. Approval for this project was obtained from the local Ethical Committee and from the Administration of Radioactive Substances Advisory Committee.

Results

The number of counts in the region of the myocardium ranged between 30k and 90k before and between 10k and 35k after background subtraction.

Visual interpretation

Some images are shown in Fig. 1. The results for the three observers are shown in Table 1. There was consensus in
only four of the volunteer group and in three of the patient group. By pooling these results and, when there was no consensus, taking the majority opinion, the sensitivity and specificity were 60% and 85% respectively.

**Quantitative interpretation**

The circumferential profiles corresponding to the images of the Group 2 subjects in Fig. 1 are shown in Fig. 2. The normal limits (± two standard deviations on profiles for all the Group 1 subjects) are also shown.

The profile results for Group 2 are shown in Table 2, six subjects were identified and the test was therefore 50% sensitive.

Combining the results of the visual (majority verdict) and quantitative assessments (Table 2), five of the patient

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