Detection of homing-in of stem cells labeled with technetium-99m hexamethylpropyleneamine oxime in infarcted myocardium after intracoronary injection

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ABSTRACT

Bone marrow stem cells having myogenic potential are promising candidates for various cell-based therapies for myocardial disease. We present here images showing homing of technetium-99m (Tc-99m) hexamethylpropyleneamine oxime (HMPAO) labeled stem cells in the infarcted myocardium from a pilot study conducted to radio-label part of the stem cells in patients enrolled in a stem cell clinical trial for recent myocardial infarction.

Keywords: Bone marrow mononuclear cells, myocardium, stem cell, technetium-99m hexamethylpropyleneamine oxime

We present here a case of 42-year-old male with a history of myocardial infarction (MI) and angioplasty 1 month back. Resting Tc-99m methoxyisobutylisonitrile (MIBI) myocardial perfusion study was done to confirm and locate the site of MI. On separate day, the patient underwent a bone marrow (BM) aspirate collection. BM derived mononuclear cells (MNCs) were isolated by Ficoll density gradient separation method.[1,2] The isolated MNCs were evaluated for viability by Trypan Blue dye exclusion test, surface marker profile for CD 34 by flow cytometry and MNC morphology by Giemsa staining.

Bone marrow-MNCs were incubated under sterile conditions for 45 min at room temperature with 10 mCi of Tc-99m HMPAO in 1 ml normal saline (NS) followed by centrifugation and decanting. Excess of unbound activity was removed by two washings of resuspended pellet in 1 ml NS followed by centrifugation. This pellet was finally diluted in NS. Freshly isolated MNCs showed 65% labeling efficiency and intact viability. A dose of 2.5 mCi of radio labeled BM-MNCs was withdrawn and intracoronary injection into the left coronary arteries was performed in cardiac catheterization laboratory. The images were acquired within 1 h postinjection on Dual head Gamma camera system (Infinia Hawkeye, GE Medical system, USA) and homing-in of radiolabel stem cells was observed [Figure 1].

Bone marrow stem cells having myogenic potential are promising candidates for various cell-based therapies for myocardial disease. Present images show homing-in of Tc-99m HMPAO labeled stem cells in the infarcted myocardium. Previous studies have reported the Technetium labeled stem cells in animal studies[3-5] and also its feasibility in humans.[6-8] A pilot study was conducted

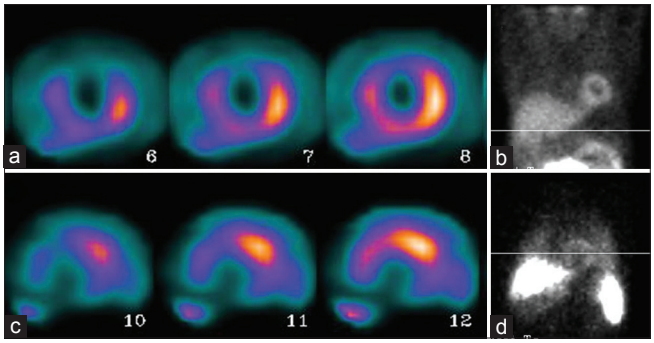

Figure 1: (a) The short axis images of technetium-99m (Tc-99m)-MIBI myocardial perfusion single-photon emission computed tomography (SPECT) performed at rest reveal perfusion defect in anterior wall and apex; consistent with scarred myocardium (upper row). (b) Planar image showing the biodistribution of Tc-99m-MIBI. (c) The corresponding short axis images of Tc-99m-HMPAO labeled stem cells SPECT study show localization of labeled stem cells in the region of infarct (lower row). (d) Planar image showing the biodistribution of Tc-99m-HMPAO labeled stem cells in liver, spleen and infarcted myocardium

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to radio-label part of the stem cells in patients enrolled in a stem cell clinical trial for recent MI.

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