

CASE REPORT

**GATED MIBI MYOCARDIAL SPECT SHOWING BALANCED ISCHEMIA
AND GLOBAL HYPOKINESIA IN PATIENT HAVING THROMBUS IN
BASAL SEGMENT OF DOMINANT CIRCUMFLEX SYSTEM BLOCKING
BOTH LEFT ANTERIOR DESCENDING AND CIRCUMFLEX ARTERY**

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Myocardial perfusion imaging (MPI) is a powerful diagnostic and prognostic tool for evaluating coronary artery disease (CAD). Gating myocardial perfusion gives important diagnostic and prognostic information. This 43 years old patient was referred for cardiac scan. Exercise stress test showed > 2mm horizontal ST segment depression. Cardiac scan was normal except for left ventricular cavity dilatation on stress images. Gated images showed global hypokinesia and increased end-diastolic volume. Patient was suspected to have balanced ischemia and was referred for Angiography. Angiography showed total occlusion with no flow in proximal Left Anterior Descending Artery and distal circumflex artery. It is very important to evaluate symptomatic patients and patients with risk factors carefully with normal myocardial perfusion scan.

INTRODUCTION

Diagnosing myocardial ischemia prior to a heart attack is important because ischemic heart disease is responsible for approximately 14% of all deaths worldwide. The diagnosis of CAD can be difficult to make. The disease occurs in both the young and old, in both women and men, and in both patients with and without co-morbidities. The nuclear myocardial scan is the best initial imaging study for the detection of myocardial ischemia. The cardinal imaging product of MPI is an objective, quantifiable three dimensional map of radiotracer concentration within ventricular myocardium. The tracer intensity in any one part of the map directly reflects the adequacy of blood flow to the corresponding part of myocardium. Currently, nuclear myocardial scan includes both perfusion and gated wall motion images. ECG-gated SPECT imaging, allows assessment of global and regional LV function in addition to perfusion. Coronary artery blood flow can be assessed, and the scans can also be used to accurately determine the left ventricular ejection fraction, the end-systolic volume of the left ventricle, regional wall motion, and wall thickening.¹ This resulted in a substantial reduction of false-positive test results.² In addition, solid evidence links these findings to clinical outcomes. The value of nuclear myocardial scanning is its predictive accuracy. Integration of perfusion and systolic function by SPECT resulted in a significant reduction (from 31% to 10%) of inconclusive tests, with an increase in normalcy rate from 74% to 93%.³

Balanced ischemia refers to a false negative finding of "normal perfusion" on a SPECT myocardial perfusion imaging study. Because SPECT MPI estimates relative rather than absolute myocardial perfusion, in the presence of three-vessel CAD (3VD),

or left main trunk stenosis, global left ventricular (LV) hypo-perfusion (termed "balanced ischemia") is associated with the failure to identify perfusion abnormalities in all of the affected coronary territories in as many as 81% of patients.⁴ The result can be a stress scan with normal appearing perfusion and an erroneous 'Normal-No Ischemia' interpretation.⁵

CASE REPORT

A 43 years old male presented to the coronary care unit of Ayub Teaching Hospital on 3rd September with chest heaviness for 2 days. His Blood Pressure was 120/80 mmHg and pulse was 68/min. ECG showed T-Wave inversion in V2–V6 Figure-1. Troponin-T was negative. His blood complete picture, blood sugar, urea and creatinine were within normal limits. Triglyceride and cholesterol were also normal. Echocardiography was normal and ejection fraction was 62%. He was referred for MIBI cardiac scan which was performed on 09-09-2009. Cardiac Exercise Stress was performed on treadmill and exercise was done for eight minutes according to Bruce Protocol. ETT revealed >2 mm ST depression (horizontal) in leads V4-V6 during peak exercise (Figure-2) and changes were reverted to normal in post exercise period. ETT was concluded positive for ischemia. His blood pressure response remained stable during exercise. Patient was injected 30mCi of Tc99m MIBI at peak stress and gated SPECT images were acquired 30 minutes later with ADAC Gama Camera. Patient was injected 8mCi of Tc99m MIBI at rest and rest imaging was done with ADAC gamma camera 30 minutes later. Gated Myocardial scan showed dilated heart, however perfusion throughout left ventricle was normal (Figure-3). Polar plots showed relatively less perfusion globally (Figure-4). Gated images showed

slight global hypokinesia and EDV (end diastolic volume) was 129 ml, ESV (End systolic Volume) was 53ml and Ejection fraction was 59% (Figure-5). Cardiac Scan was concluded as dilated left ventricle with normal perfusion, however possibility of balanced ischemia (Triple Vessel Disease) could not be completely ruled out. He was referred for Angiography. Angiography on first injection showed total occlusion with no flow in proximal Left Anterior Descending Artery and distal circumflex artery (Figure-6). Urgent guided Catheter was passed to anterior circumflex artery that resulted in patency of both left anterior descending and circumflex artery. Thrombus activity was seen in proximal segment of very dominant circumflex system (Figure-7). Double bolus Integrillin used followed by infusion. Right coronary was normal and non-dominant.



Figure-1: Resting ECG

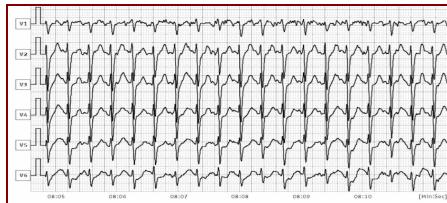


Figure-2: Peak Exercise ECG Showing ST-Segment depression (>2 mm) in lead V₂-V₆

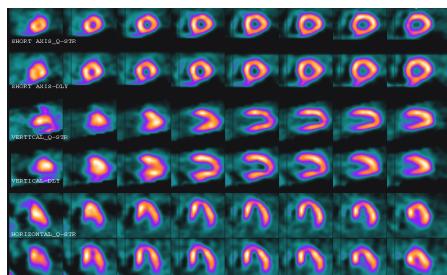


Figure-3: Myocardial perfusion scan showing normal uptake on stress and rest images

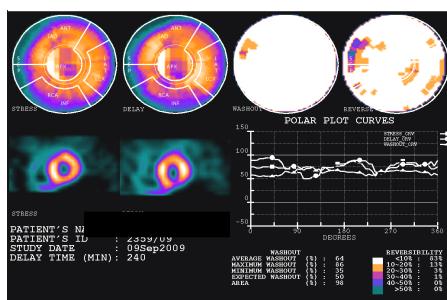


Figure 4: Polar Plots showing global Hypo-perfusion

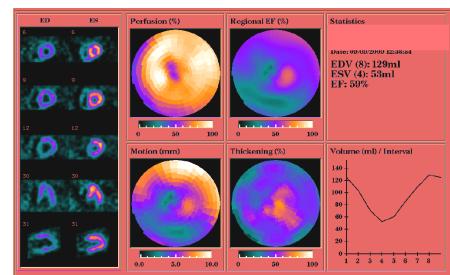


Figure-5: Gated Images showing different Left Ventricular Volumes

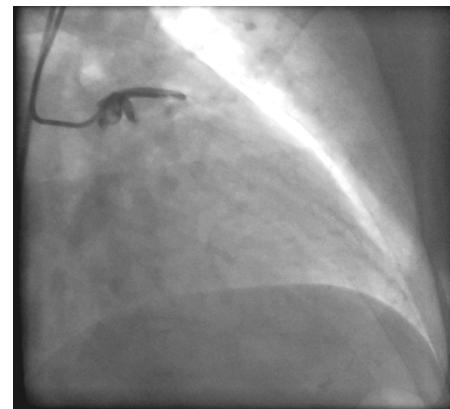


Figure 6: Angiography showing total occlusion with no flow in proximal Left Anterior Descending Artery and distal circumflex artery

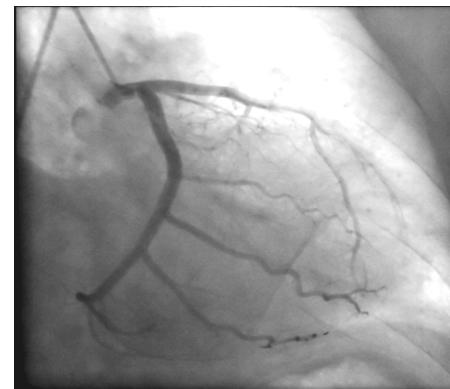


Figure-7: Patency of both Left Anterior Descending and Circumflex Artery after Guided Catheter Insertion

DISCUSSION

SPECT myocardial perfusion imaging (MPI) has been invaluable both in the non-invasive detection of CAD and in risk stratification. ECG Gated perfusion SPECT not only provides information on left ventricular function, but also helps in discrimination of true perfusion abnormality from artefact especially in inferior wall defect in men or anterior wall attenuation in women.⁶ Availability of ECG gated images have reduced the number of borderline 'normal' or abnormal' interpretations and increased the accuracy up to 90%.⁷

Triple vessel disease or obstruction in left main trunk shows reduced perfusion to all regions during stress and perfusion images appear to have similar perfusion in all regions. No evidence of reversibility is appreciated when compared to rest images. The impression is usually a normal myocardial perfusion scan. However some evidences suggest presence of balanced ischemia on exercise testing and gated myocardial perfusion SPECT.

One exercise electrocardiographic stress test development of significant chest pain or significant ischemic electrocardiographic changes during test is more likely due to ischemia.⁸ This patient showed >2 mm ST segment depression at peak exercise. Other evidences on electrocardiographic exercise test include reduced exercise capacity (<5 metabolic equivalents), abnormally low peak systolic blood pressure (<130 mmHg), fall in systolic blood pressure of more than 10 mmHg during exercise, significant ventricular ectopy (ventricular couplets, triplets sustained >30 seconds, symptomatic ventricular tachycardia and abnormal heart rate recovery.

On Myocardial Gated myocardial SPECT imaging perfusion images appeared normal. Perfusion scan of the patient was normal. In balanced ischemia, increased pulmonary activity may also be appreciated.⁹ Transient cavity dilatation of left ventricle during stress may also be seen.¹⁰ This patient showed dilatation of left ventricular cavity in stress images. Transient ischemic dilatation (TID) of the left ventricle (LV) is a marker for severe and extensive CAD which is also of significant prognostic value.¹¹ Gated SPECT show increased end-diastolic or end-systolic volume.¹² The patients showed end-diastolic volume of 129 ml (normal up to 120 ml). Decrease in post stress left systolic ejection fraction (<45%) or post stress left ventricular ejection fraction less >5% lower than that at rest. Other findings include increased right ventricular uptake on stress images, and fixed left ventricular dilatation.¹³

On the basis of presence of >2 mm ST segment depression on stress testing, normal perfusion on myocardial perfusion scan, left ventricular dilatation and end-diastolic volume of 120 ml, patient was referred for angiography. Angiography showed blockage of proximal Left Anterior Descending Artery and distal circumflex artery.

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