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# Importance of myocardial perfusion scintigraphy for early detection of coronary artery disease in patients with positive family history of premature CAD -case study

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## ABSTRACT

**Background:** Acute coronary syndrome refers to a spectrum of clinical presentations ranging from those for ST-segment elevation myocardial infarction (STEMI) to presentations found in non-STEMI or unstable angina.

**Case presentation:** We present a case of a 36-year-old female who visited cardiac outdoor patient department with continuous left arm pain. She was then referred to nuclear cardiology for screening of coronary artery disease (CAD). A pharmacological stress study was planned but the rest study was done instead due to the patient having persistent pain in the left arm. The rest study showed a large perfusion defect in left anterior descending artery (LAD) territory. As the patient was not having any previous history of CAD except for positive family history of premature CAD, she was immediately referred to an interventional cardiologist where her primary percutaneous coronary revascularization to LAD (3 × drug eluting stent) got done and she was saved from impending MI.

**Conclusion:** Regular follow-up and monitoring should be fine in young adults with a positive family history of premature CAD. This may help in early detection leading to time management and acute coronary events in young adults may be avoided. This will eventually reduce mortality and morbidity.

**Keywords:** Myocardial perfusion imaging, premature coronary artery disease, LAD territory, PCI, myocardial ischemia, perfusion defect.

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## Background

Myocardial perfusion imaging or scanning (also referred to as MPI or myocardial perfusion scintigraphy (MPS) is a nuclear medicine procedure used to evaluate the perfusion of the myocardium. It not only helps in the diagnosis of ischemic/coronary artery disease (CAD), but it also guides in its proper management [1,2]. Gated MPS helps in the evaluation of cardiac function and wall motion [3]. This test consists of stress and rest imaging to look for the reversibility of perfusion defect, if present in stress study, to label this defect as ischemia or myocardial infarction (MI). When myocardial ischemia is present, affected walls are viable, and the myocardium can be saved from the risk of MI in the future by restoration of blood flow either by primary percutaneous coronary revascularization (PCI) or coronary artery bypass surgery [4].

Resting myocardial perfusion scan is also used in some hospitals' emergency departments to evaluate patients

presenting with complaints of chest pain suspicious of CAD. Tc-99m methoxyisobutylisonitrile (MIBI) is injected in resting condition when the patient has active chest pain and later the patient is treated medically for chest pain. Once the patient is stable, then the patient is sent to the nuclear cardiology department for a stress myocardial perfusion study. If the stress study is normal then the patient can be sent home and referred to a cardiologist for a routine appointment. But if there is a perfusion defect in stress single photon emission computed tomography (SPECT), then the patient should be shifted to a cardiac emergency department and managed accordingly by a cardiologist [5].

## Case Presentation

A 36-year-old female was referred to the nuclear medicine department with a history of non-specific left arm and

shoulder pain, mildly relieved with muscle relaxants and analgesics. The referring physician was suspecting CAD due to positive family history as her younger brother died of MI in the recent past.

At the time of the study, the patient was having chest and left arm pain. Hence, instead of a stress study, 20 mCi of Tc-99m MIBI was given intravenously at rest, and the patient was referred to the emergency department for pain management. As the pain was mild and bearable, the patient refused to go to the emergency department. SPECT acquisition was done after 1 hour of radiopharmaceutical injection and later processed. This rest study showed perfusion defect of moderate to marked severity in the apex, anterior wall, and anteroseptal wall, favoring left anterior descending artery (LAD) territory stenosis as shown in Figure 1.

The patient was immediately referred to the emergency department for the management of his chest and left arm pain due to CAD. After the management of pain, she was sent to an interventional cardiologist for further management. The patient underwent coronary angiography, which showed 99% LAD stenosis and the patient was at a very high risk of MI. Total re-canalization was done by primary PCI to LAD (3 × drug eluting stent) and the patient was managed accordingly afterward. The patient was discharged in stable condition and regular follow-up was advised.

## Discussion

Premature CAD has a multi-factorial etiology and is most likely a mixture of genetic and environmental factors [6]. It has been observed that the occurrence of cardiovascular events is 2.5 times greater among individuals with a

family history of premature CAD with a further 10-fold increase if the first-degree relative was affected under the age of 45 [7]. Individuals with the greatest number of risk factors (genetic and environmental) likely face the highest risk at an earlier age. Many studies suggest a strong association between a family history of premature heart disease with an excess risk for an adverse cardiovascular outcome [8].

A family history of premature coronary heart disease (CHD) is a known risk factor for CAD and indicates an increased susceptibility to atherosclerotic development and progression [9]. This association favors the presence of subclinical atherosclerosis which may lead to clinical implications like angina and MI. Hence, such individuals should be considered to have subclinical diseases and should go through screening tests for Ischemic heart disease (IHD).

Many studies had suggested that positive family history of CAD is an independent non-modifiable risk factor for cardiovascular disease. Therefore, a better understanding of the background of the disease and associated risk factors can be very helpful in selecting suitable candidates for useful screening [10].

Intervention after diagnosis of CAD in patients with modifiable risk factors for IHD can be more beneficial in those with a family history of CAD [11]. This screening for IHD in patients with a positive family history of IHD can divert the focus of primary care of the patient with IHD by early diagnosis to pharmacologic treatment instead of intervention. As highlighted by Jeemon et al. [12], a shift from a reactive to a proactive approach in the preventive management of patients with a family history of premature CAD should receive more support.

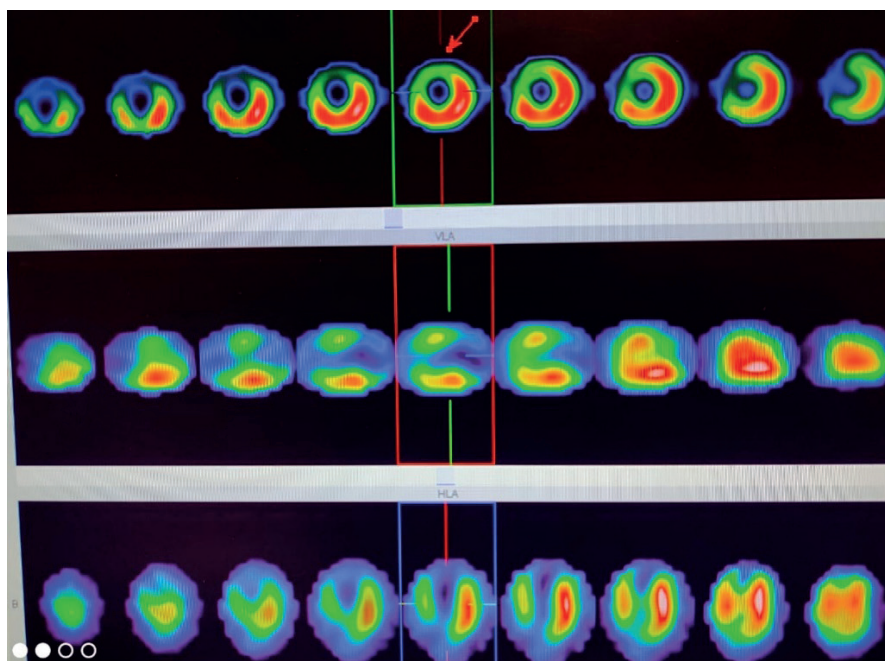


Figure 1. Decreased perfusion in apex and anterior wall on rest study.

Many screening tests are suggested for the early detection of CAD. CAD screening should begin at age 20 with a positive family history of CAD according to the American Heart Association. Asymptomatic individuals may start with basic screening which includes an annual physical examination by monitoring blood pressure, body mass index, diet, exercise, and smoking habits [13]. Adults with multiple risk factors for CAD or people with signs and symptoms suspicious of IHD may benefit from advanced screening and diagnostic tests. Advanced screening includes cardiac computed tomography (CT) for calcium scoring, exercise stress test, MPS, and angiography [14]. Exercise stress testing has an established role in the assessment of CAD. However, patients with underlying electrocardiography (ECG) abnormalities in baseline resting ECG may mask dynamic ischemic changes. Moreover, many patients referred for exercise stress have functional limitations from pulmonary, orthopedic, peripheral vascular, and neurologic conditions that prevent sufficient exercise leading to the suboptimal study. Similarly, high calcium scoring in cardiac CT can lead to false positive results [15].

Resting myocardial perfusion scan can be used in hospitals' emergency departments for patients coming with chest pain suspicious of CAD. After injection of the radiopharmaceutical to the patient during active chest pain, the patient can be treated with medication, and when stable, stress imaging can be performed. If the stress study is negative, then the patient can be sent home but if a perfusion defect is suggesting either MI or ischemia, then the patient can be shifted to a cardiac emergency department and managed accordingly by a cardiologist [5]. Thus early detection of CAD can prevent major future cardiac events. MPS provides a direct assessment of myocardial perfusion and therefore has an important role in the diagnosis of CAD in patients presenting with chest pain and intermediate pretest likelihood. MPS using SPECT allows direct assessment of the coronary atherosclerotic burden and predicts the risk for future cardiac events [16]. Thus, MPS has an important role in the diagnosis and risk stratification for CAD in asymptomatic patients [17,18]. Screening appropriate risk management and proper treatment after the early diagnosis of CAD can avoid MI or sudden cardiac death [9]. Irrespective of phenotypes and genotypes of individuals, a family history of CHD requires physicians to advise on lifestyle and appropriate management of risk in all family members. Moreover, regular follow-up of healthy family members is essential [10].

## Conclusion

Atypical presentation or presentation with vague symptoms is very common in young adults and many silent coronary events can occur in them. Acute MI in young adults can lead to premature sudden death. Regular follow-up and monitoring of dependent and independent risk factors

are needed in patients with a positive family history of premature CAD. Screening of CAD may be done by MPS in both symptomatic or asymptomatic patients. Resting MPS can be helpful in evaluating patients presenting in the emergency department with chest pain suspicious of CAD. Early management can prevent major cardiac events and may decrease mortality. MPS using SPECT is recommended as part of the investigational strategy in the management of established CAD in people who remain symptomatic following MI or reperfusion interventions.

## List of Abbreviations

CAD	Coronary artery disease
CHD	Coronary heart disease
CT	Computed tomography
ECG	Electrocardiography
IHD	Ischemic heart disease
LAD	Left anterior descending artery
MI	Myocardial infarction
MIBI	Methoxyisobutylisonitrile
MPS	Myocardial perfusion scintigraphy
SPECT	Single photon emission computed tomography

## Conflict of interests

The authors declare no conflict of interest regarding the publication of this article.

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## Consent for publication

Informed consent was obtained from the patient for the publication of this case.

## Ethical approval

Ethical approval is not required at our institution for publishing a case report in a medical journal.

## Author's contribution

All authors contributed to revising the manuscript.

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