Case Report

Incidentally detected diaphragmatic hernia mimicking angina pectoris with Tc-99m MIBI myocardial perfusion imaging

Alev Cınar, Murat Sadıc, Koray Demırel, Meliha Korkmaz

Department of Nuclear Medicine, Ministry of Health, Ankara Training and Research Hospital, Ulucanlar Street, 06340 Ankara, Turkey

ABSTRACT

In recent years ^{99m}Technetium methoxy-isobutyl-isonitrile (^{99m}Tc MIBI) is widely used in the evaluation of myocardial perfusion imaging (MPI). In this imaging protocol besides the cardiac evaluation, numerous other organs are included in the field of view. ^{99m}Technetium MIBI is taken up in all metabolically active tissue in the body except for the brain. Extracardiac uptake patterns as benign or serious conditions can be revealed during the MPI. In the imaging protocol, we should be aware of distribution of this radiotracer in order to recognize the abnormal uptake. Here in, we present a large diaphragmatic hernia, seemed as a mirror vision of myocardium that was determined incidentally during the MPI with ^{99m}Tc MIBI.

Keywords: Diaphragmatic hernia, extracardiac uptake, myocardial perfusion imaging (MPI), ^{99m}Technetium-99m methoxy-isobutyl-isonitrile

INTRODUCTION

Myocardial perfusion imaging (MPI) with single photon emission computed tomography (SPECT) is a useful non-invasive imaging method to evaluate the suspected or known coronary artery disease (CAD) and to predict the prognosis as well. ^{99m}Technetium methoxy-isobutyl-isonitrile (^{99m}Tc MIBI) is used routinely for myocardial perfusion imaging for diagnoses and evaluating prognoses in CAD. As it is a lipid soluble agent; it can diffuse from blood into the myocardial cell. The mechanism of cellular uptake is related to the concentration of mitochondrias inside the cells.

After intravenous administration, ^{99m}Tc MIBI is physiologically taken up by the salivary glands, thyroid, heart, liver, and spleen with hepatobiliary and renal clearance. Because of renal and biliary excretion, the liver and lung clear progressively, that causes improvement of the myocardium to background activity ratios with time. The field of view of unprocessed SPECT data varies, it usually includes the entire chest, upper abdomen and lower neck are also included according to the patients' size.[1-3] Therefore, the interpreting physician should be aware of the other organs and should inspect the extracardiac fields carefully, as much as cardiac images, in the raw data set while evaluating the myocardial imaging.

Diaphragmatic hernia is defined by the presence of an orifice in the diaphragm, more often to the left and posterolateral that permits the herniation of abdominal contents into the thorax.[1-3] Diaphragmatic hernias are rare in the general population; commonly classified as congenital or acquired. Congenital defects are symptomatic or even fatal since early age while acquired lesions may be asymptomatic for a long period but may mimic angina pectoris and other symptoms.[4-6]

We present a case in which areas of increased tracer activity which was seemed as a mirror vision of myocardium were noted incidentally during the evaluation of unprocessed single photon emission computed tomography.

Access this article online

Quick Response Code:

Website: www.ijnm.in

DOI: 10.4103/0972-3919.121977

CASE REPORT

A 74-year-old male patient with a history of hypertension, hypercholesterolemia, a mild transient chest pain, palpitation

Address for correspondence:
Dr. Murat Sadıc, Department of Nuclear Medicine, Ministry of Health, Ankara Training and Research Hospital, Ulucanlar Street, 06340 Ankara, Turkey. E-mail: mdmuratsadic@gmail.com

and severe dyspnea was referred to our Nuclear Medicine Department for Myocardial Imaging. Consists of a detailed medical history from the patient, characteristics of the chest pain was astringent, nonproductive, localized in the central part of the chest and occur after eating, and also cough and nausea accompanied by angina. The patient experienced severe dyspnea which was worse in supine position. All the laboratory blood biochemistry findings, complete blood count, the blood cardiac enzymes levels (troponin, creatinine phosphokinase, myocardial isoenzyme) electrocardiogram, echocardiography were in normal range. But, the chest X-ray was not performed before myocardial perfusion scan.

After written informed consent was obtained from the patient, he underwent same day stress and rest ^{99m}Tc MIBI myocardial imaging with SPECT and stress test was performed with treadmill exercise. Target heart rate was 147 beat/min, achieved heart rate was 139 beat/min (94%) with 9.7 METS in 06.00 minutes. Stress images were acquired 45 minutes after intravenous administration of 296 MBq (8 mCi) at the peak heart rate on treadmill exercise test. Subsequently, the rest images were acquired 60 minutes after the second intravenous administration of 925 MBq (25 mCi). The images, provided after motion correction but not attenuation correction, show a moderate to severely reduced perfusion in the mid and inferolateral segments. In gated SPECT process, wall motion and thickening was normal. The ejection fraction was 60%**.** A review of the unprocessed data of rest imaging revealed, an extracardiac activity localized in the left hemitorax, behind the myocardium like a mirror vision of the left ventricle myocardium in rest images. The raw data of the rest images revealed a doughnut activity in the left chest, behind of the left ventricle. On the contrary, only minimal minimal activity was seen in the raw data of the stress at this localization [Figure 1]. Localization of ^{99m}Tc MIBI within that area likely considered as a herniation, which was not mentioned in the patients' history.

The patient subsequently underwent the CT scan of the thorax and upper abdomen for the determination of the nature of the mass. Subsequent computed tomography (CT) of the thorax demonstrated that a part of the bowel, stomach and mesenteric fat tissue were herniated in the left hemithorax and because of these herniated tissues, the lungs were compressed at this localization [Figure 2]. Computed tomography (CT) of the thorax confirmed that the activity in the raw data of the MPS images corresponded to the left diaphragmatic hernia (Bochdalek type). Within the CT results; as the myocardial perfusion scintigraphy was normal, the patient's symptom of dyspnea, angina and vomiting was correlated with the herniation. The patient was referred to thoracic surgery clinic for the surgery.

DISCUSSION

Concerning about the literatures on myocardial scintigraphy and diaphragmatic hernia; we found only a few case reports and interesting files. In the study by Hanson *et al.* presented a patient with hiatal hernia depicted on ^{99m}Tc MIBI images; extracardiac tracer accumulation was identified near the base of the heart on the rest study, which correlated in the location to a large hiatal hernia on radiographs.[7] The artificial perfusion defects caused by intestinal activity superimposed on myocardial uptake of ^{99m}Tc MIBI are frequently seen on myocardial perfusion studies.[8,9]

Hua Yang *et al.* reported an interesting image in which the intestinal activity in the thorax through a diaphragmatic hernia caused an artifact, mimicking ischemia of the anteroseptal ventricular wall.[10] Another case report by Özdemir *et al.* presented a patient with a diaphragmatic hernia detected incidentally by Thallium 201 myocardial perfusion scintigraphy that interestingly did not cause an important artifact in processed tomographic sections, although quite visibly masking the heart in first 10 projections.[2]

Myocardial perfusion imaging is a diagnostic technique that

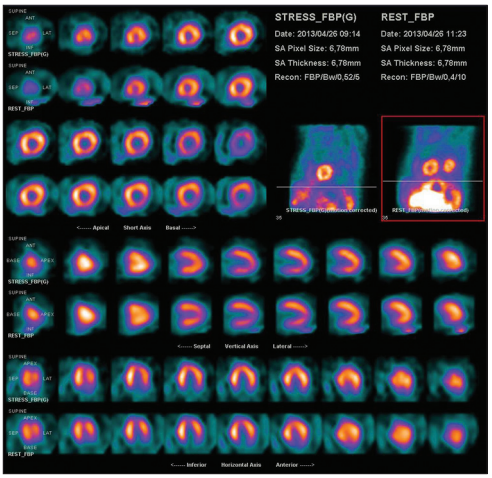

Figure 1: A same day protocol gated cardiac SPECT in a 74-year-old male patient with dyspnea. Processed, the raw data and polar map findings were imaged of stress (upper) and rest (lower). The raw data of the rest images revealed a doughnut of activity in the left chest, behind of the left ventricle where as minimal activity was seen in the raw data of the stress around the left ventricle

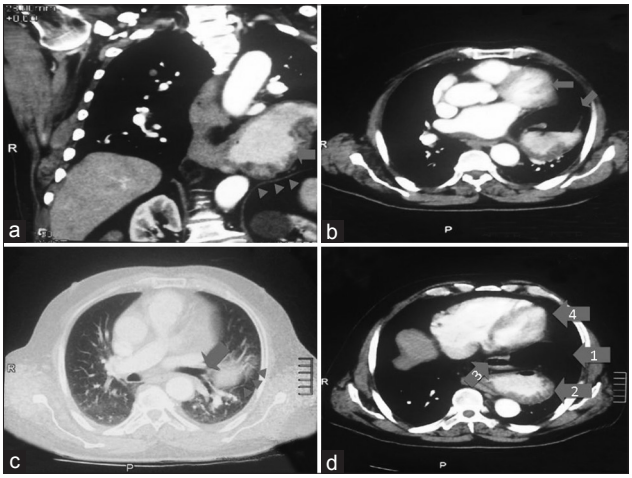

Figure 2: Transverse CT cut of the chest demonstrating a) short arrow: Diaphragma, long arrow: Fundus of stomach juggled in thorax. b) transvers arrow: Left ventricle, oblique arrow: Gas of fundus. c) arrow: Left main bronchus, arrow head: Mesenteric fat around the left main bronchus. d) 1: Fundus of stomach, 2: Corpus of stomach, 3: Esophagogastric junction, 4: Heart

is widely used in evaluation of myocardial perfusion. In the case described above, we used ^{99m}Tc MIBI, which is distributed throughout the body, with increased concentration in the heart, liver, hepatobiliary system and bowel. The aim of myocardial perfusion imaging is the evaluation of myocardial perfusion, but the unprocessed data can include the physiologic or pathologic radiopharmaceutical uptake in the part of imaged body like a diaphragmatic hernia, which may cause patients' angina and dyspnea symptoms. Incidental findings in the other organs may lead to an earlier diagnosis of pathologic conditions that require treatment.[4-6] In the case discussed above, imaging normally myocardial perfusion with ^{99m}Tc MIBI led to diagnose of the bowel herniation and earlier treatment of this situation. Therefore, the interpreting physician should report any such findings and state the evaluation of their illness.

False-positive results of the myocardial perfusion scintigraphy in the case of fixed or reversible perfusion defects can be reported when an intestinal activity, diaphragmatic attenuation, breast attenuation and motion artifact occur.[1-3] Hepatobiliary excretion of MIBI to the splenic area is a frequent cause of false interpretation of myocardial uptake.[7-9,11,12]

Examples of extracardiac uptake such as hernia, benign-malign lesions, pleural/pericardial effusion, bone/bone marrow uptake in anemia, hepatomegaly, splenomegaly, ascites, vascular abnormalities diagnosed incidentally during the MPI with Technectium labeled agent or Thallium have been previously reported, but incidentally the left diaphragmatic herniation like found in our patient has not been previously reported with ^{99m}Tc MIBI MPI SPECT.[2-4,6-11,13]

Raw data images may demonstrate the multiple abnormalities in the torax and/or abdomen.[12] Viewing the raw data images should be a part of the myocardial SPECT interpretation to improve the specificity of the test in such clinical settings.

CONCLUSION

The interpretation of myocardial perfusion imaging should not be limited to the heart, because it can reveal other pathologic conditions and any available information should be examined and interpreted.

REFERENCES

1. Bianchi E, Mancini P, De Vito S, Pompili E, Taurone S, Guerrisi I, *et al.* Congenital asymptomatic diaphragmatic hernias in adults: A case series. J Med Case Rep 2013;7:125.
2. Özdemir S, Erselcan T, Hasbek Z, Tandoğan İ, Gümüş C. Incidentally detected large diaphragmatic hernia in Tl-201 myocardial perfusion scintigraphy; no substantial effect on the study results. Cumhuriyet Med J 2011;33:487-91.
3. Kabasakal L, Collier BD, Shaker R, Hellman RS, Smart S, Ozker K, *et al.* Enterogastric bile reflux during technectium-99m-sestamibi cardiac imaging. J Nucl Med 1996;37:1285-8.
4. Shih WJ, Kiefer V, Gross K, Wierzbinski B, Collins J, Pulmano C, *et al.* Intrathoracic and intra-abdominal TL-201 abnormalities seen on rotating raw cine data on dual radionuclide myocardial perfusion and gated SPECT. Clin Nucl Med 2001;27:40-4.
5. Moreaux J. Diaphragmatic hernias in adults. Rev Prat 1997;47:277-81.
6. Poe RH, Schowengerdt CG. Two cases of atraumatic herniation of the liver. Am Rev Resp Dis 1972;105:959-63.
7. Hanson MW, Pagnanelli RA, Low VH. Hiatal hernia depicted on Tc-99m sestamibi images: Myocardial perfusion imaging. Clin Nucl Med 2000;25:142-4.
8. Eren S, Ciris F. Diaphragmatic hernia: Diagnostic approaches with review of the literature. Eur J Radiol 2005;54:448-59.
9. Zoghbi GJ, Heo J, Iskandrian AE. Hiatal hernia detected by Tc-99m tetrofosmin SPECT. J Nucl Cardiol 2003;10:712-3.
10. Yang H, Bathaii M, Houseni M, El-Haddad G, Zhuang H, Alavi A, *et al.* False-positive reversible septal myocardial perfusion defect caused by diaphragmatic hernia. Clin Nucl Med 2007;32:231-3.
11. Slavin JD Jr, Engin IO, Spencer RP. Retrocardiac uptake of Tc-99m sestamibi: Manifestation of hiatal hernia. Clin Nucl Med 1998;23:239-40.
12. Moss RL, Chen CM, Harrison MR. Prosthetic patch durability in congenital diaphragmatic hernia: A long-term follow-up study. J Pediatr Surg 2001;36:152-4.
13. Shih WJ, McFarland KA, Kiefer V, Wierzbinski B. Illustrations of abdominal abnormalities on ^{99m}Tc tetrofosmin gated cardiac SPECT. Nucl Med Commun. 2005;26:119-27.

How to cite this article: Cinar A, Sadic M, Demirel K, Korkmaz M. Incidentally detected diaphragmatic hernia mimicking angina pectoris with Tc-99m MIBI myocardial perfusion imaging. Indian J Nucl Med 2013;28:246-8.

Source of Support: Nil. **Conflict of Interest:** None declared.