Case Report

Enterogastroesophageal reflux detected on 99m-technetium sestamibi cardiac imaging as a cause of chest pain

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ABSTRACT

Myocardial perfusion imaging (MPI) with technetium-99m sestamibi (Tc-99m MIBI) is considered a diagnostic technique that is widely used for the investigation of suspected coronary artery disease. Incidental inspection of an extracardiac activity is indirect, but important marker, which can identify a potentially treatable non-coronary cause for chest pain that may mimic cardiac symptoms. Here, we present an illustrative case in which significant enterogastroesophageal reflux of Tc-99m MIBI occurred during the cardiac imaging following prompt hepatobiliary clearance. Because, there was normal myocardial perfusion on MPI, presence of gastroesophageal reflux (GER) on GER scintigraphy and detection of mild inflammation with pathologically confirmed hyperplastic polyp by endoscopy, in view of the above findings we concluded that the probable cause of chest pain was reflux.

Keywords: enterogastroesophageal reflux, myocard perfusion imaging, technetium-99m sestamibi

INTRODUCTION

Although myocardial perfusion imaging (MPI) with technetium-99m sestamibi (Tc-99m MIBI) focuses on functional assessment of the cardiovascular system, in the imaging field, the detector of a camera covers most of the thorax and abdomen. In common with other radiopharmaceutical agents, Tc-99m MIBI is distributed throughout the body and physiologically taken up by multiple tissues. It is excreted mainly into the duodenum via the hepatobiliary system and prominent activity is often present in subdiaphragmatic organs adjacent to the heart.[1-3] When interpreting studies that involve this radiopharmaceutical, the physician must be aware of its physiologic distribution for determination of cardiac or extracardiac abnormal findings. We present a patient with chest pain due to enterogastroesophageal reflux manifested as extracardiac abnormal finding, firstly detected on raw data images and cineloop views.

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CASE REPORT

A 71-year-old woman with complaints of precordial pain for 2 years was referred to our department for the evaluation of ischemic heart disease. The patient had a history of weight loss, decreased appetite, fatigue, chronic hepatitis C, and cholecystectomy. The patient underwent dipyridamole pharmacological stress test using a 4-min infusion of 0.142 mg/kg/min dipyridamole and subsequently 370 MBq (10 mCi) Tc-99m MIBI was injected intravenously. After 60 minutes, radiotracer injection, stress single photon emission tomography (SPET) imaging with a dual head gamma-camera (GE, Infinia), which was fitted with a low-energy, high resolution, parallel-hole collimator, was performed. Stress MPI showed normal perfusion findings [Figure 1]. SPET images (short-axis, horizontal, and vertical) were reconstructed using a low-pass filter, using no attenuation correction. The images were also evaluated using three-dimensional localization with the standard tomographic sections of the body (sagittal, coronal and transaxial) and then displayed in static slices for further assessment. On the raw projection images, cineloop views and reconstructed slices, radiotracer concentration was seen in the stomach secondary to enterogastric reflux and retrocardiac intense linear activity was seen throughout the esophagus in the midline of the thorax, retromedial to the cardiac activity secondary to gastroesophageal reflux (GER) [Figure 2]. In addition, hepatic clearance was considered very rapid because of there was a little hepatic accumulation during the study.

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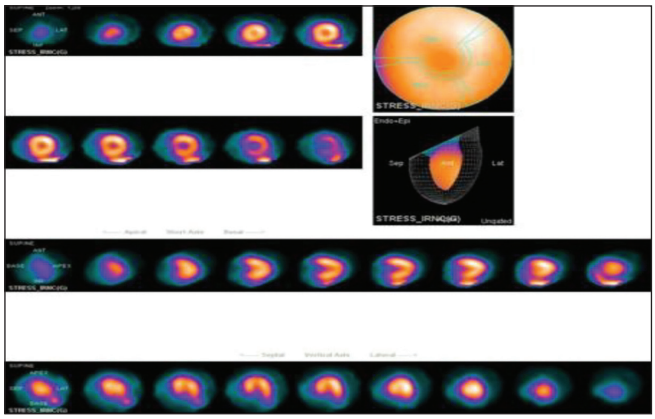

Figure 1: Normal myocardial distribution of technetium-99m sestamibi in static images of myocardial perfusion imaging

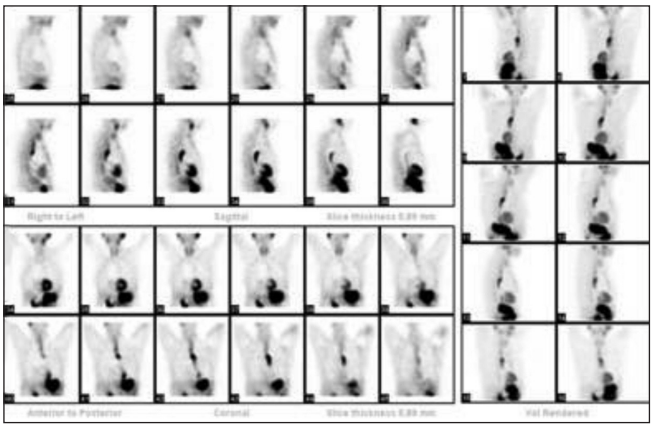

Figure 2: Single photon emission tomography images showed marked activity in the stomach due to enterogastric reflux greater in intensity than myocardial uptake and linear esophageal activity due to gastroesophageal reflux

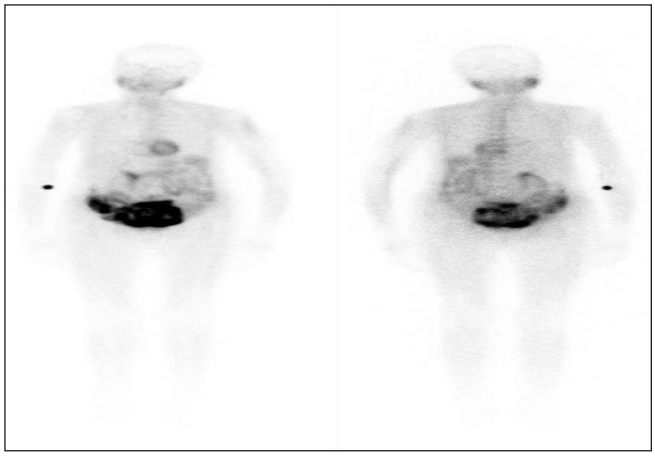

Figure 3: Technetium-99m sestamibi wholebody scan of the patient, there was no tracer retention in the esophagus and stomach and no pathologic accumulation at other parts of the body

After stress MPI, immediately, a Tc-99m MIBI whole-body scan performed, no pathologic accumulation of the radiotracer was detected and there was no tracer retention in the esophagus and stomach [Figure 3].

Following exclusion of a cardiac cause of chest pain, the patient underwent a scintigraphic evaluation for GER and GER observed on the acquired dynamic images. GER was interpreted by three methods: Visual interpretation, time activity curve and condensed image. According to the number of episodes (grade 0: No reflux, grade 1: 1-3 episodes, grade 2: ≥4 episodes) the scintigraphic findings were interpreted as grade 1, according to the location (distal, middle or proximal esophagus) GER was reached proximal 1/3 of the esophagus, and according to intensity (low, moderate or high) interpreted as high [Figure 4a-c]. Dynamic images were acquired for 16 min. The patient requested the acquisition be stopped due to patient's discomfort at 16th min and no delayed images of thorax provided. Upper gastrointestinal endoscopic examination of the patient revealed minimal inflammation in the distal part of the esophagus and hyperplastic polyp in the gastric antrum and confirmed pathologically [Figure 5a and b],

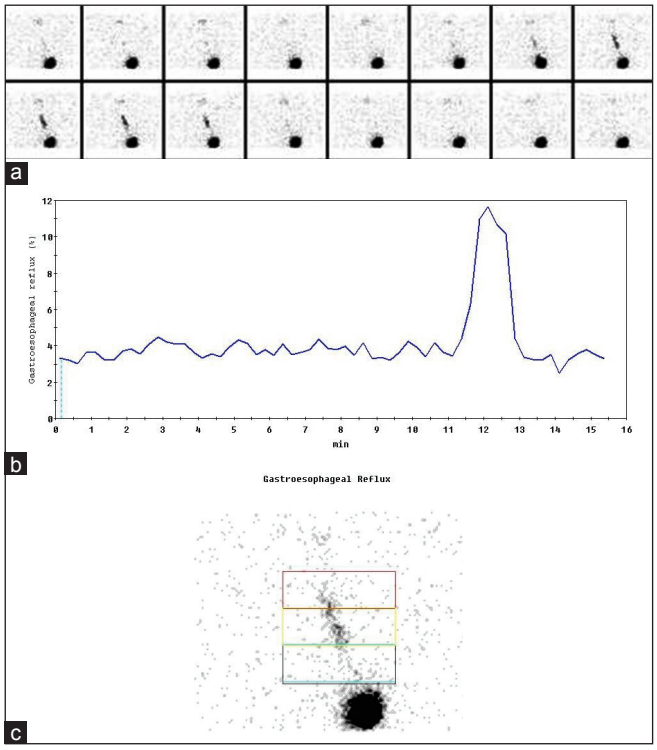

Figure 4: (a) Presence of gastroesophageal reflux (GER) detected on GER scintigraphy, (b) time activity curve, (c) the esophageal activity at the upper third of the esophagus

and there was no evidence of esophageal neoplastic pathology. Antireflux medication (lansoprazole) started by gastroenterologist and symptoms of the patient were improved.

DISCUSSION

To find the origin of chest pain, MPI is the primer noninvasive modality for the diagnosis of coronary artery disease (CAD) and for the assignment of risk for future cardiac events in patients with or without known CAD.[4] Because excretion of Tc-99m MIBI by the hepatobiliary system, activity is present in the bowel

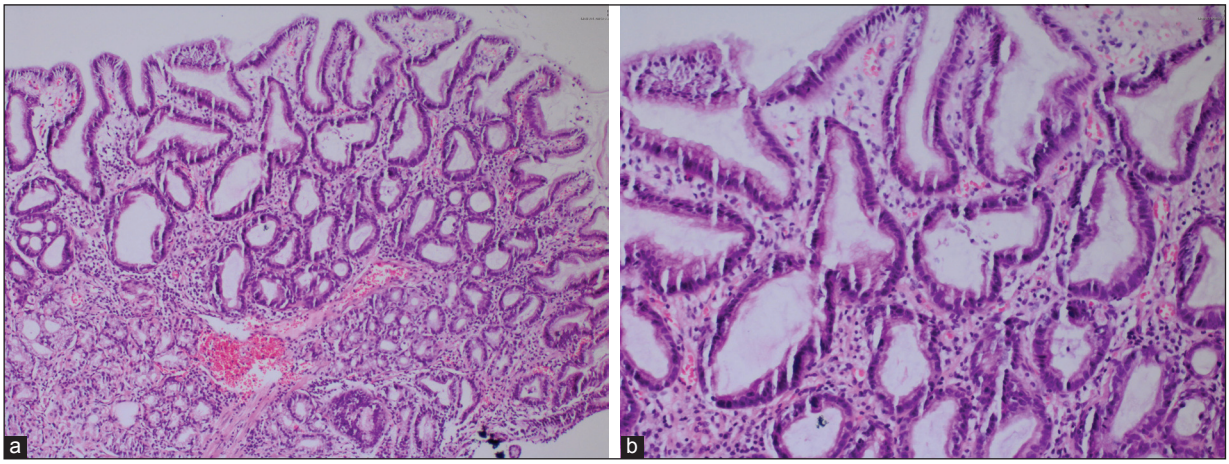

Figure 5: Hematoxylin and eosin, original magnification ×100, (a) gastric hiperplastic polyp, (b) lamina propria, surrounding cystically dilated glands

and can be present in the stomach due to reflux of radiotracer through the gastric lumen and than into the esophagus due to GER which causes angina-like chest pain.[3,5,6]

Duodenogastric reflux was reported by Kabasakal *et al*., in 8, 3% of patients undergoing Tc-99m MIBI cardiac imaging, and the reflux was seen more commonly after pharmacologic stress testing using either dipyridamole or dobutamine than after exercise stress testing, as well as in patients older than 40 years.[7] As many as 20% of patients with angina-like chest pain undergoing cardiac catheterization are found to have angiographically-normal coronary arteries and it has been shown that up to 40% of the patients, admitted to a coronary care unit with typical angina-like chest pain have a normal coronary anatomy.[8,9] In these cases, the most frequent cause of chest pain is X syndrome and esophageal disorders.[10] In our case, MPI with dipyridamole stress test showed normal perfusion and presence of enterogastroesophageal reflux induced chest pain (mimicking angina-like chest pain). Her endoscopic evaluation determinated hyperplastic polyp, which arises as a by-product of repair to damaged mucosa. Hyperplastic polyps almost never occur in normal gastric mucosa and are most commonly associated with chronic gastritis. The importance of recognizing gastric hyperplastic polyps is that they serve as a reminder to search for associated gastric pathology and in our case associated pathology might be reflux gastritis.[11]

Since, the esophagus and the heart share their innervation, mechanical or chemical stimulation of the esophagus may evoke myocardial ischemia leading to chest pain in experimental animals and in humans. Morphological studies in rats reported that the heart receives collateral projections from the nucleus ambiguous neurons. These innervate the esophagus supporting thereby the previous physiological observation that mechanical stimulation triggered esophago-cardiac reflex circuit involves vagal afferents and efferent sympathetic preganglionic pathways.[12,13] Evidence has been provided also in humans that both electrical and mechanical stimulation of the esophagus appears to amplify respiratory-driven cardiac vagoafferent modulation while decreasing sympathetic modulation.[14,15] This shift of sympathovagal balance toward parasympathetic component might lead to diminished myocardial perfusion. In the study reported by Rosztóczy *et al*., GER was proved in 37% of patients with epicardial CAD, and in 55% in those with non-cardiac chest pain.[16] In another study designed by Howarth *et al*., to determine the role of GER scintigraphy and MPI in patients with atypical chest pain, of 105 patients, 53 (50%) had esophageal dysfunction (ED) but no CAD, 41 (39%) had both ED and CAD.[17] Therefore, we thought that MPI is an important technique for these patients to detect simultaneous myocardial ischemia and predict future cardiac events and MPI should be recommended in patients with diagnosed GER. Perhaps one of the most valuable contributions of MPI is its excellent negative predictive value for predicting low mortality and myocardial infarction rates in patients with totally normal scans. Patients with normal perfusion studies have a 0,6% per year combined mortality and non-fatal infarction rate and are thus often spared further invasive evaluation for assessment of their symptoms.[18]

In conclusion, during MPI with Tc-99m MIBI, when radiopharmaceutical accumulations in the extracardiac areas are observed, non-coronary reasons such as reflux should be taken into account as the cause of chest pain and as the cause that may evoke myocardial ischemia. Thus, the interpreting physician has the advantage to evaluate other organs in the field of the images to reveal the actual underlying disease. It is obvious that incidental abnormal findings should alert the referring physician because insufficiency to determine incidental abnormalities about extracardiac organs can delay diagnosis and treatment.

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