Extra-cardiac multifocal lung uptake of $^{99m}$Tc-sestamibi in myocardial perfusion imaging:
An asymptomatic case with coronavirus infection features

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BACKGROUND
Incidental abnormal non-cardiac findings are not uncommon in single photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI).1 Thorough inspection of rotating raw and reconstructed images may not only lead to discovery of important non-cardiac disorder but also provide a hint of coronavirus disease 2019 (COVID-19) during its outbreak.2 We report a challenging finding of multifocal pulmonary uptake in an asymptomatic patient with typical features of pulmonary involvement with COVID-19 infection, incidentally noticed in SPECT MPI.

CASE REPORT
A 44-year-old man with past medical history of hypertension was referred to the department of nuclear medicine and molecular imaging of the Rajaie cardiovascular, medical and research center for preoperative risk stratification of renal surgery during COVID-19 epidemics. The patient’s symptom was only dyspnea on exertion (DOE) with no episode of chest pain and with normal sinus rhythm in pre-exercise phase electrocardiogram (Figure 1).The patient performed treadmill exercise stress test according to modified Bruce protocol. Fifteen mCi of $^{99m}$Tc-sestamibi was injected at the peak of stress and exercise stress continued for another minute before completion of stress test as a result of fatigue. SPECT MPI study was performed with low-energy high-resolution collimators and a non-circular body contoured 180-degree acquisition arc from right anterior oblique to left posterior oblique, accompanied by CT acquisition (16 eff—mAs, 130 kV, 512 x 512 matrix size) for CT-based non-uniform attenuation correction, using a dual-head gamma camera (Symbia T6, Siemens Healthcare). All of the acquired and reconstructed images were visually quality controlled.

The MPI was interpreted as stress-induced ischemia in the apical septal segment without regional wall motion abnormality with a left ventricular ejection fraction of 66% (Figure 2). Moreover, the reconstructed SPECT images demonstrated abnormal multifocal areas of extracardiac pulmonary uptake of $^{99m}$Tc-sestamibi in both lungs, corresponding to the ground glass opacities in concurrent CT image, which was taken for non-uniform CT-based attenuation correction (Figures 3, 4). The chest radiograph in lying position and the reconstructed CT images with three-millimeter slice thickness demonstrated multiple peripherally distributed ground-glass opacities in vicinity to the visceral pleural surfaces in both lungs, which were interpreted as typical feature for lung involvement of COVID 19 (Figures 5, 6). The patient was not tested immediately; however, he was instructed to be monitored and quarantined.

DISCUSSION
Novel Coronavirus disease demonstrates an increasing global incidence since its pandemic outbreak. Chest CT has been reported with a high sensitivity for diagnosis of COVID-19 and as a potential primary tool for diagnosis in epidemic areas.3 Presence of pulmonary ground-glass opacities in vicinity to the visceral pleural surfaces with multifocal bilateral distribution has been
Figure 1. Pre-exercise electrocardiography.

Figure 2. MPI SPECT images in short axis (upper row), vertical long axis (middle row) and horizontal long axis (lower row). (A) Stress phase; (B) rest phase.
SPECT MPI is a feasible and widely recognized diagnostic technique that plays an important role in detection of patients with ischemic heart disease. Despite the fact that non-cardiac findings occur with a relatively low incidence in myocardial perfusion SPECT studies, inspection of cinematic images is highly recommended due to potential importance of some non-cardiac findings that can alter the patient management. Focal lung increased uptake of $^{99m}$Tc-Sestamibi might arise from malignant or non-malignant processes, including tuberculosis, benign pulmonary nodules, pneumonia and pneumothorax. Be that as it may, incidental finding of COVID-19 through hybrid imaging introduced as the typical feature of pulmonary involvement with COVID-19 infection.  

Figure 3. SPECT/CT fusion (upper row), CT (middle row), and SPECT (lower row) images in transverse plane. The $^{99m}$Tc-Sestamibi-avid ground-glass opacity is shown by cross-bars.

Figure 4. SPECT/CT fusion (upper row), CT (middle row), and SPECT (lower row) images in coronal plane. The $^{99m}$Tc-Sestamibi-avid ground-glass opacity is shown by cross-bars.

Figure 5. Chest radiograph in lying position.
of asymptomatic patients in epidemic regions may not be infrequent.  

**CONCLUSION**

Multifocal pulmonary uptake of $^{99m}$Tc-sestamibi could be considered as a feature of pulmonary involvement with COVID-19 infection in the regions with expansive spread of the disease. In case of hybrid imaging, thorough inspection of concurrent CT images after appropriate reconstruction can play an important role for confirmation.

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