

POSITRON EMISSION TOMOGRAPHY (PET) AND MYOCARDIAL PERFUSION IMAGING (MPI)

Myocardial perfusion imaging (MPI) is one of the most effective techniques used to study the left ventricular ejection function (LVEF), myocardial perfusion, wall motion, and myocardial viability. Techniques can be used to quantify the left global and regional perfusion at rest and stress.

Our research discusses the images obtained from the gamma SPECT and positron emission tomography (PET) camera of the radiotracer within the walls of the heart that are gated to the patient's electrocardiograph (ECG). These images will give us information about perfusion and wall motion. We also examined the quantification of the ejection function to determine the changes in the chamber volume. Our results demonstrated how the indices of rest and stress of myocardial performance and ejection function can be used to monitor cardiac function, and how regional impairment correlates with regional wall myocardial ischemia, or infarction. Also our results illustrated the size of the left ventricle and right ventricle. Most importantly the results provided information on how regional myocardial perfusion and function relates to coronary artery disease (CAD) as assessed by coronary angiography.

INTRODUCTION

Myocardial perfusion imaging is used to assess cardiac risk for preoperative patients who are having major surgery or may be at risk for coronary artery disease. These images show the distribution of radiopharmaceuticals, which are extracted from the coronary arteries. In order for these images to be displayed a patient must either receive a pharmacologic stress or a stress test. The images provide information about the function of the heart. The electrocardiograph (ECG) is one of the most useful instruments to diagnose coronary artery disease. It displays the electrical activity and reading of the heart. Also it reflects the function of the heart muscles and the condition of the blood supply and oxygen received by them. A process, known as gated blood pool study, labels the blood passing through the cardiac chamber. This study is used in the assessment of the left ventricular function. Once a gated blood study is performed, the myocardial perfusion will display images of the left ventricular ejection function (LVEF), wall motion, and myocardial viability.

The PET scanner is the latest non-invasive tool to ascertain coronary artery disease progress or reversal of blockage. It is used to check and diagnose the health of the coronary arteries. It produces very low rates of false positive test and can help determine the best treatment option (eg, bypass surgery balloon angioplasty with stenting or medication). It can be used to check the heart muscle if it is not working properly because of temporary damage from blood flow. Rubidium-82, a tracer used in the

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PET procedure, assesses myocardial blood flow and is particularly convenient for frequent sequential examination under rapidly changing conditions, such as ischemia.

METHODS

The PET procedure is performed with the patient lying down in the PET scanner. For the rest part of the test the patient is injected with a radioactive tracer called Rubidium-82. The scanner then takes images of the heart for about eight minutes. This procedure is repeated again.

For the stress part of the test, the patient receives an injection of a drug that increases the flow of blood through normal arteries. The patient receives another injection of the radioactive tracer Rubidium-82 in order to detect any differences in the blood flow.

The resulting myocardial perfusion imaging is reviewed and evaluated for reversible blockage in the coronary arteries or permanent scarring of the heart muscle.

RESULTS

We reviewed three images as follows. Image one displayed a cross-section of the heart into three ways views: the horizontal long axis, the vertical long axis, and short axis. Image two provided images from a patient who had received a gated, Rubidium-82, pharmacological, rest-stress/one day protocol. The patient received a PET scan to evaluate cardiac

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function. The myocardial perfusion was mildly abnormal, consistent with mild lateral wall ischemia. Transient ischemia dilation of the left ventricle was present. There was a mild improvement of the lateral wall ischemia, and the anterior wall ischemia was no longer present. Image three provided images from a patient who had received a gated, Rubidium-82, pharmacological, rest-stress/one day protocol. The PET revealed myocardial perfusion was abnormal, consistent with mild apical and lateral scarring.

CONCLUSION

By using the PET scanner stress tests with Rubidium-82, doctors were able to check the health of the coronary arteries for functionally significant obstructions (narrowing). The myocardial perfusion imaging allowed diagnoses of lateral wall ischemia, anterior wall ischemia or transient ischemia dilation of the left ventricle. By using the PET scans, doctors were able to determine if areas of the heart were alive rather than scarred due to a prior heart attack (myocardial in-

farction). Combined with a myocardial perfusion study, PET scans were able to differentiate nonfunctioning heart muscle from heart muscle that would benefit from a procedure, such as angioplasty or coronary artery bypass surgery, which would reestablish adequate blood flow and improve heart function.

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