Medical Xpress

Molecular imaging can improve effectiveness of novel therapy for advanced heart disease

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Molecular imaging may improve the success rate of a new therapy for patients with advanced heart disease, according to a study unveiled at SNM's 57th Annual Meeting. Researchers used a hybrid form of molecular imaging to review patients who have undergone cardiac resynchronization therapy (CRT), which regulates electrical impulses within different chambers of the heart that are not properly synchronized. Molecular imaging improved physicians' ability to identify risk factors that could impact the effectiveness of therapy.

"Our vision was to devise a way to perform a single, non-invasive investigation before CRT implantation," said Christopher Uebleis, M.D., principal investigator of the study and a member of the department of nuclear medicine, Ludwig-Maximilians University, Munich, Germany. "This investigation used modern three-dimensional fused images with anatomical information from computed tomography and functional information from positron emission tomography. Combined, this molecular imaging could help to guide the work of cardiovascular surgeons and ensure patients' response to therapy."

When the heart muscle is weakened, also known as cardiomyopathy, the body responds naturally by "remodeling," or reshaping heart tissues in an attempt to improve blood flow. This irregularity of shape can cause the electrical impulses between the heart's chambers to fall out of phase. CRT works by employing a pulse-emitter within the left ventricle to resynchronize these chambers. CRT has been shown to be effective in 70 percent of cases, but the other 30 percent of patients implanted with the device do not show significant improvement. For this study, investigators used a hybrid imaging technique that unites both X-ray computed tomography (CT) and positron emission tomography (PET) and positively identified three major factors that determined whether CRT had been effective and how to evaluate future patients for the procedure.

Patients who were both responsive and non-responsive to CRT after implantation were chosen for this study, 14 in all, including 8 with ischemic cardiomyopathy (obstructed blood flow and weakening of the heart). Half of the subjects had shown response to therapy with signs of clinical improvement and reverse remodeling, and the other half showed little or no improvement after implantation. Patients underwent PET/CT imaging, and researchers used PET to conduct a phase analysis of the movement of the heart muscle's walls, which determined if the left ventricle was out of phase and to evaluate the amount of scar tissue within the patient's left ventricle. Proper placement for the device's lead wires in relation to scar tissue was also determined by 3D image fusion of PET and CT. The site where device leads were implanted in relation to scar tissue was found to be the most important factor in determining response to CRT. Now that clinicians have been able to evaluate patients after CRT, the next step is to evaluate patients prior to therapy to select those who would benefit from implantation and to conduct treatment planning in order to optimize lead-wire location within the left ventricle on viable, unscarred myocardium. A clinical trial is planned to begin later this year.

According to 2010 data from the American Heart Association, more than 81 million Americans—or more than one in three—have some form of cardiovascular disease. Major modifiable risk factors for heart disease include high blood-cholesterol levels, hypertension, diabetes, smoking and sedentary lifestyle.

Provided by Society of Nuclear Medicine