Combination PET-MRI scanner expands imaging frontiers

February 16 2012, By Michael C. Purdy

(Medical Xpress) -- Scientists at Washington University School of Medicine are using a new imaging device that simultaneously performs positron-emission tomography (PET) and magnetic resonance imaging (MRI) scans, producing more detailed images than either technique alone.

Other combined PET-MRI scanners exist or are in production, but they conduct PET and MRI scans separately.

The new PET-MRI is located in the Mallinckrodt Institute of Radiology 's Center for Clinical Imaging Research, a facility in Barnes-Jewish Hospital dedicated to providing state-of-the art imaging technology to researchers in a patient-care environment.

“As far as we know, this unit is the first of its kind to be placed in a hospital in the United States,” says R. Gilbert Jost, MD, the Elizabeth E. Mallinckrodt Professor and head of Radiology and director of the Edward Mallinckrodt Institute of Radiology. “We believe the scanner’s power and versatility will enable many wonderful applications in areas ranging from cancer to neurological disorders to heart and lung disease.”

Simultaneous PET and MRI scans eliminate the need to move patients from one imaging unit to another, making it easier to combine data from both scans to produce enhanced details. The scanner also exposes patients to significantly lower radiation levels than an older combined scanning technique, PET-computed tomography (CT).

“We think PET-MRI will be particularly helpful in understanding certain types of malignancies, such as cancers of the brain, neck and pelvis,” says Robert McKinstry, MD, PhD, director of the Center for Clinical Imaging Research and professor of radiology and of pediatrics. “The anatomy is very complex in those areas, and combined PET-MRI should produce a more detailed reading of the intricate boundaries between disease and healthy tissue.”

MRI scans use a strong magnetic field to produce detailed images of soft tissues, organs, bones, and other internal structures of the body. It can also provide information on the functions of these structures. Neurologists, for example, frequently use MRI to track brain activity.

PET scans show how organs and tissues are functioning using tracers that can highlight abnormalities that indicate disease. Oncologists often use it to image tumors.

Until now, scientists could not integrate PET and MRI for simultaneous scanning because powerful MRI magnets interfered with the imaging detectors on the PET scanner.

The device is now being used for research and will eventually be used in patient care. To use the new scanner, two teams of specialists who normally work separately on MRI and PET imaging have come together to work as a single team.

“Washington University has a long history of pioneering work with PET scanners,” McKinstry says. “The first PET scanner was developed here in the 1970s by Michel Ter-Pogossian, PhD, who was on the School of Medicine faculty then. So it’s very fitting for us to have a chance to explore the many ways this new PET-MRI unit can help us better understand and treat disease and injury.”

“We love to be on the cutting edge of research, and part of the thrill will be identifying the clinical areas where this new scanner can be helpful,” Jost says. “We think there are some wonderful applications related to neuroscience, neurological disease, and other problems that affect the brain. It also has potential for cardiac imaging.”

McKinstry says PET-MRI may be able to replace the PET-CT scans now used to investigate cancers and other problems in pediatric patients. If so, PET-MRI scans will expose patients to about half of the radiation required for PET-CT scans.

“Radiation exposure is a source of concern for any patient, but it has to be watched with particular care in pediatric patients, who are still growing and developing,” McKinstry says. “An opportunity to get information essential for medical care at half the radiation exposure would be particularly welcome both in pediatric patients and in adults who need multiple scans during treatment.”

Provided by Washington University School of Medicine in St. Louis