Novel PET tracer successfully images cardiovascular infections

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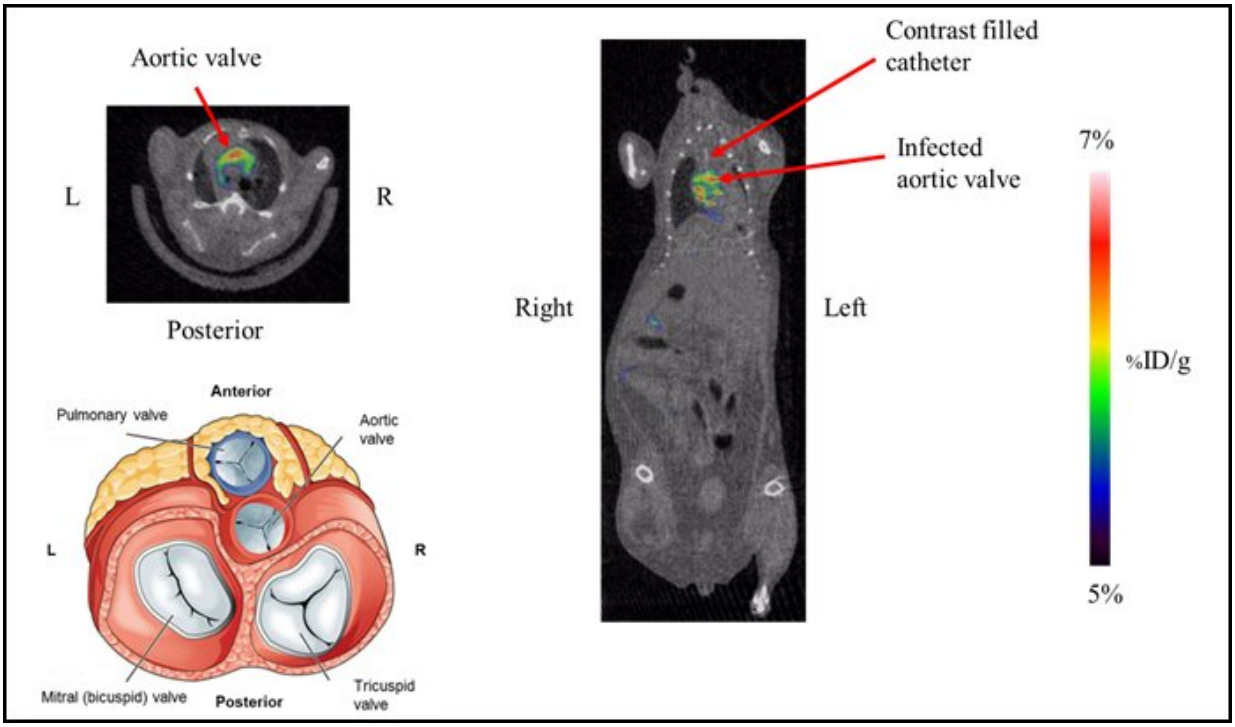

PET/CT imaging of a Staphylococcus aureus-induced endocarditis mouse model with 6 inch-[^{18}F]Fluoromaltotriose showed that the heart had the highest PET signal above the diaphragm (as it was the source of infection), while the kidneys had the highest signal below the diaphragm. Within the heart, the PET signal from the infected aortic valve had the highest uptake and could be clearly seen; in some cases, the tricuspid valve was also infected (similar to what is seen for intravenous drug users). Credit: Sanjiv Sam Gambhir, MD, PhD, Stanford University School of Medicine, Stanford, CA.

A novel positron emission tomography (PET) tracer has been developed that can accurately image cardiovascular infections, which are extremely dangerous and have a high fatality rate. The research was presented at the 2018 Annual Meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI).

"Early diagnosis is crucial for proper patient management, as early treatment can improve prognosis and patient outcome," Mirwais Wardak, Ph.D., at Stanford University School of Medicine in Stanford, California, points out. "In the clinic right now, we really lack the tools to be able to specifically image bacterial infections. To address this problem, we developed a novel PET tracer called 6"-[^{18}F]Fluoromaltotriose, which is transported into bacterial cells by the maltodextrin transporter, a membrane transport system that is exclusive to bacteria and not present on mammalian cells. To our knowledge, this is the first time that a fluorine-18 based PET tracer specific to bacteria has been used to image bacterial infection of the heart."

For this study, the diagnostic accuracy of 6"-[^{18}F]Fluoromaltotriose PET/CT imaging was conducted in a Staphylococcus aureus-induced endocarditis mouse model. Wardak explains, "Endocarditis is an infection of the endocardium, which is the inner lining of the heart chambers and heart valves. Staphylococci bacteria are the most common causing agents of endocarditis."

6"-[^{18}F]Fluoromaltotriose was able to image valvular infection with high sensitivity and specificity. Results showed an approximate 2.5-fold higher mean tracer uptake in the aortic valves of the infected mice when compared to the control mice.

Wardak states, "The results of this research overcome several fundamental limitations of current methods and promise to significantly impact the clinical management of patients suffering from infectious

diseases of bacterial origin." He adds, "We believe that 6"-[^{18}F]Fluoromaltotriose PET/CT will play a vital role in the detection and monitoring of bacterial infection in patients (e.g., as a result of cardiovascular infection, infection after surgery, medical device related infections, fever of unknown origin, etc.). We also believe that PET imaging with 6"-[^{18}F]Fluoromaltotriose will be helpful in the assessment of antibiotic therapy."

Plans are currently underway to have this PET radiotracer translated into the clinic.

Looking ahead, Wardak and his colleagues also envision that 6"-[^{18}F]Fluoromaltotriose will be useful in other clinical settings beyond infectious disease. He explains, "For example, this tracer could be used to image the homing of bacteria against tumors, and could, therefore, be used to monitor bacteria that have been trained to kill tumors (e.g., Clostridium novyi engineered against glioblastoma cells)."

More information: Abstract 36: "Molecular Imaging of Cardiovascular Infections with 6"-[18F]-Fluoromaltotriose PET/CT," Mirwais Wardak, PhD, Gayatri Gowrishankar, PhD, Xin Zhao, MD PhD, Mohammad Namavari, PhD, Yonggang Liu, MD PhD, Evgenios Neofytou, MD, Tom Haywood, PhD, Joseph C. Wu, MD PhD, and Sanjiv S. Gambhir, MD PhD, Stanford University School of Medicine, Stanford, CA. SNMMI's 65th Annual Meeting, June 23-26, Philadelphia. jnm.snmjournals.org/content/59 … b4-84ab-4e616cc86773

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