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MASONIC MEDICAL RESEARCH INSTITUTE DEVELOPS NEW IMAGING AGENT TO DETECT ACTIVATED PLATELETS

Tools for Clinicians in Point-of-Care Use

UTICA, NY — More than 2 million coronary artery stents are implanted each year to help protect or restore normal blood flow to the heart, to treat patients suffering from angina or a heart attack due to coronary artery disease (CAD). While stents are highly effective and safe devices, scarring or clotting of unhealed stents can occur in a small percentage of subjects, leading to complications such as stent restenosis or thrombosis, which can be life-threatening. At present, approaches to understand stent healing based on their biological clotting status is unavailable in patients.

To devise a potential solution to this problem, Dr. Jason McCarthy, an Associate Professor at the Masonic Medical Research Institute (MMRI), and his team have developed a fluorescent probe that binds to activated platelets, one of the main cell types involved in the clotting and scarring process of improperly healed stents. “By using a new platelet-targeted molecular imaging agent coupled with fluorescence imaging, in particular intravascular catheter-based imaging, we are enabling a new approach to localize and visualize platelets during or after coronary stent implantation. This tool has the potential to enable clinicians to proactively treat patients before the development of occlusive stent clotting or scarring, as opposed to reactively, when the patient is symptomatic,” said Dr. Jason McCarthy, co-senior author on the manuscript.

In a collaboration with Dr. Farouc A. Jaffer, an Interventional Cardiologist at Massachusetts General Hospital (MGH) and an Associate Professor of Medicine at Harvard Medical School, the team modified a drug called tirofiban, an FDA-approved compound known to bind to activated platelets, to enable a fluorescence-based strategy for the detection of platelet-rich clots in experimental subjects.

Stent implantation is a routine invasive procedure in which a stent is delivered over a coronary wire to the target lesion location. Given that clinicians already have intracoronary wire access during this procedure, performing imaging of platelet deposition using fluorescence-based catheters can be readily accomplished (fluorescence catheters have already been tested in patients). “Once the interventional cardiologist is ready to image platelet deposition on stents, a small amount of our new platelet-targeted imaging agent will be intravenously administered. After a few minutes, a fluorescence imaging catheter will be delivered down the coronary over

the same wire, followed by an imaging pullback to visualize whether there are any platelets adhered to the stent, which may indicate that it is prone to further development of clots. This will give the clinician the option at the point-of-care to change pharmacological or interventional management of the patient to optimize their outcomes," said Dr. McCarthy.

The manuscript details the process by which the team created and tested the novel imaging agent. "This new agent provides tools that open up numerous possibilities for translational cardiovascular imaging, especially at the point-of-care," said Dr. Khanh Ha, co-author on the paper, and postdoctoral fellow at the MMRI, "With the imaging catheters already approved for clinical use, the goal was to create an imaging agent that would hopefully also prove clinically translatable."

The manuscript was published online in ACS Sensors, but has also been recognized as an ACS Editor's Choice Article. Additional authors include Dr. Xiaoxin Zheng, a former postdoctoral fellow in Dr. Jaffer's lab at the MGH, and Dr. Chase Kessinger, an Instructor from the MMRI. The paper, titled, "*In Vivo Platelet Detection Using a Glycoprotein IIb/IIIa-Targeted Near-Infrared Fluorescence Imaging Probe*," was officially published on May 31, 2021, and can be viewed at pubs.acs.org/doi/10.1021/acssensors.1c00124.

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