

Application of A Novel CT Angiographic Method to Measure Myocardial Blood Flow in Chest Pain with Normal Coronary Arteries



Cardiovascular disease (CVD) is the leading cause of global mortality. Nationwide, thousands of patients present to the emergency room (ER) with chest pain daily. However, in those without acute myocardial infarction, it can be difficult to determine the cause of pain and whether it is due to heart disease. While Coronary CT Angiography can help with diagnosis, many patients with chest pain are found to have no coronary disease. A subset of these patients has endothelial dysfunction, which causes reduced myocardial blood flow (MBF) and ischemia, a condition termed microvascular angina (MVA). This condition is more common in women, diabetic and obese patients and is difficult to

diagnose because there is no simple noninvasive test to measure MBF. For this reason, MVA patients often have multiple ER visits, and are delayed in their referral to cardiology because they are not given a clear diagnosis.

To address this diagnostic void, physicians Timothy Fitzgibbons, MD, PhD, Associate Professor of Medicine, Cardiovascular Division; Jeffrey Rade, MD, Professor of Medicine, Cardiovascular Division; Sneha A. Chinai, MD, Assistant Professor of Emergency Medicine; David S. Gerson, MD, Assistant Professor of Radiology; and Hao S. Lo, MD, MBA, Associate Professor of Radiology, came up with the notion that additional answers may lay in data accessible through the cardiac CT – an idea that would expedite the diagnostic process by effectively triaging chest pain patients, reducing ED length of stay and increasing patient satisfaction. So, when the opportunity presented itself to apply for the \$100,000 PACE Prize, they knew it was a chance they couldn't miss.

The team hypothesized that patients with MVA will have a reduced volume/mass (V/M) ratio, which correlates with endothelial dysfunction and poorer patient outcome. With the understanding that the V/M ratio is an obtainable parameter for a normal cardiac CT, the team investigated the possibility of using the ratio as a noninvasive measure of MBF and a way to identify patients with MVA. Utilization of this method would allow for the more accurate identification of MVA and provide an objective endpoint that can be used in interventional trials to reduce morbidity and mortality of this challenging condition.

“Our project is pretty cutting edge, helping to bridge a gap in our understanding of atypical presentations of chest pain that have a clear impact on risk stratification in the ED and outpatient,” said Dr. Chinai. Dr. Lo added, “Our team felt that the PACE prize was an opportunity to showcase the work we have already done and, more importantly, our plans for future research. The monetary support will be critical for jump-starting academic research careers for our co-investigators.”

The team hopes that the project will lead to improved outcomes for ER patients presenting with acute chest pain and ultimately will reduce health care costs and improve patient outcomes. “We want to make the process more efficient and effective,” said Dr. Fitzgibbons.

Grateful for the unique opportunity to be recognized for their work, Dr. Chinai expressed her gratitude by noting, “One of the things that impressed me the most about the PACE prize is that it is the Medical Group's investment in its own talented faculty. All of the projects are excellent, reflecting the creativity and collaboration that is present in institution. I'm proud to be here, supported by the hospital system and my colleagues.”