

UC researchers use engineering equation to help treat blockages in the heart

March 16 2010

Improved care for cardiac patients and people with coronary artery disease is the goal of a new pilot study being led by engineering and medical researchers at the University of Cincinnati (UC) and the Cincinnati Department of Veterans Affairs (VA) Medical Center.

Using a formula derived from fundamental [fluid mechanics](#) principles, UC and VA investigators are evaluating the functional significance of blockages in cardiac blood vessels to provide more targeted, efficient treatment.

"We are using a single sensor wire to not only evaluate the severity of blockages in the large coronary arteries of the heart, but also to determine if there is further disease in the distant small vessels of the [heart muscle](#)," says Mohamed Effat, MD, associate professor in the division of cardiovascular diseases and co-investigator on the study.

"Sometimes we detect ambiguous blockages and we don't know if we should administer treatment or not. This could help us assess the small vessels in the heart muscle as well as large coronary vessel blockages at the same time."

Rupak Banerjee, PhD, associate professor of mechanical engineering at UC and principal investigator, says the scientific coefficients originated from pressure-flow relationship applicable to conduit flow in pipes and valves but can be modified and applied to the flow in vessels of the heart.

"The tools that are predominantly used today to determine the severity of blockages in the vessels have no fundamental scientific foundation and are really based on guesswork, which reasonably works but is not the absolute best solution," he says. "These coefficients are truly scientific and may have the ability to help physicians determine exact degrees for the severity of the blockage, creating a possible new standard of treatment."

He adds that the sensor wire has been previously validated using animal models and has produced successful results.

In addition, researchers will be comparing the new parameters discovered by this technique with positron emission tomography (PET) cardiac perfusion scans, a new test that allows physicians to take pictures of blood flow in a patient's heart muscle to determine if there is a shortage of blood supply.

"This will help in confirming the parameters we have determined and create a more specific target area," says Effat.

The study is taking place at UC Health University Hospital and the Cincinnati VA Medical Center.

Banerjee says the technology and the collaboration have the potential to impact the patient care in the VA population as well as general populations worldwide.

"In conducting interdisciplinary research with players and with expertise from two specialties—medicine and engineering—we are creating opportunities to enhance the way procedures are done and produce better outcomes for patients," he says.

Provided by University of Cincinnati

Citation: UC researchers use engineering equation to help treat blockages in the heart (2010, March 16) retrieved 23 April 2024 from <https://medicalxpress.com/news/2010-03-uc-equation-blockages-heart.html>

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