

Researchers using excimer laser angioplasty to blast arterial blockages in heart and kidneys

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(PhysOrg.com) -- Using an excimer laser to widen narrowed or obstructed blood vessels in hard-to-reach areas of heart and kidney arteries may be feasible and safe, according to a study by a team of researchers from the Virginia Commonwealth University Pauley Heart Center and the Hunter Holmes McGuire Veterans Affairs Medical Center.

Team leader On Topaz, M.D., a professor of medicine and pathology in the VCU School of Medicine, and director of interventional cardiology at the Hunter Holmes McGuire Veterans Affairs Medical Center, has been investigating the clinical applications and basic research pertaining to laser-tissue interaction in the [cardiovascular system](#), focusing on how lasers could be used to facilitate angioplasty, a procedure to widen narrowed or obstructed blood vessels.

In a study, published in the November issue of the journal Lasers in Medical Science, the team reported on its experience using an excimer laser to widen narrowed or obstructed blood vessels in select patients with left main [coronary artery disease](#), a dangerous atherosclerotic blockage with potential to cause massive [heart attack](#) or sudden death.

The traditionally recommended treatment for blockages of the left main coronary artery has been bypass surgery. However, a surgical approach is not feasible in many patients.

“In the past several years, a percutaneous method that includes balloons and stents had been successfully implemented in leading centers such as the teaching hospitals of VCU. Yet we recognize that in some patients the target plaque in the left main coronary artery is so tight that there is a need to first modulate the morphology of the blockage and remove its burden before balloon and stent can be safely inserted,” said Topaz.

In cardiovascular applications, laser pulses are absorbed within atherosclerotic plaques, vaporizing them into [microparticles](#) that are swept out by the blood flow.

“Previously, the use of a laser-facilitated method to mechanically remove the plaques in the left main coronary artery was not explored. Our work describes a safe and efficient strategy of using the laser and potentially other debulking tools to enhance stent placement in carefully selected patients. Ultimately, our hope is to offer a broader range of percutaneous treatment options for our patients with challenging and risky arterial blockages who cannot undergo the traditional bypass operation for various reasons,” said Topaz.

In this study, the team treated 20 patients who presented with severe cardiac symptoms. Most of these patients previously had undergone bypass surgery for coronary artery disease, but their bypass grafts either failed over time or no longer provided adequate protection for the heart. These symptomatic patients were deemed non-candidates for a repeat open heart operation.

Topaz explained that the cardiac symptoms of the patients were related to the development of new and severely threatening obstructive left main coronary artery plaque.

The patients underwent groundbreaking excimer laser coronary angioplasty for the debulking of a spectrum of morphologic atherosclerotic plaques in the left main coronary artery. According to

Topaz, this was a first time for such laser applications. Nineteen of the 20 patients had a successful left main coronary artery laser and stenting.

In one patient the laser could not penetrate the plaque and the patient was sent for successful bypass surgery performed by Szabolcs Szentpetery, M.D., associate professor of surgery in the Department of Cardiothoracic Surgery at VCU and chief of cardiothoracic surgery at the McGuire VA, and Gundars Katlaps, M.D., assistant professor of surgery at VCU. All patients survived the high risk intervention.

According to Topaz, the excimer laser is a precise technology that emits laser pulses within the ultraviolet wave length and is avidly absorbed within atherosclerotic plaques and their associated clots.

The laser can be used for similar purposes in other important arteries of the body. In another study published online in the Oct. 13 issue of the journal *Lasers in Surgery and Medicine*, the same team reported the first-ever successful utilization of laser in the treatment of critically narrowed kidney arteries. The technology was applied to treat 12 patients who had uncontrolled hypertension, congestive heart failure and impaired kidney function because of atherosclerotic plaques obstructing flow to the kidney's arteries.

“Once again the laser technology was used to facilitate plaque removal and enable safe delivery of stents in order to gain adequate, long-term patency of the target arteries,” said Topaz.

The patients were closely followed by a team of nephrologists at McGuire VA Center, led by George Feldman, M.D., professor of medicine at VCU, and the director of the division of Nephrology. The clinicians reported complete eradication of the occlusive plaques accompanied by normal flow in the arteries and marked immediate and follow up improvement in systolic and diastolic blood pressures. They

observed improvement in kidney function following the intervention. The laser utilization and adjunct stent implantation were not associated with major kidney or heart adverse events.

“This approach potentially can open the door for a new, carefully planned treatment strategy for select patients with atherosclerotic obstructions in the renal arteries who require revascularization,” said Topaz.

The VCU Medical Center’s relationship with the Hunter Holmes McGuire Veterans Hospital in Richmond spans all components of its mission, including patient care, research and education. The partnership, particularly in cardiothoracic surgery, neurology, physical medicine and rehabilitation and nephrology, enables physicians across multiple disciplines and both institutions to provide outstanding medical care to more patients in the region.

Provided by Virginia Commonwealth University ([news](#) : [web](#))

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