

MGH and CIMIT Researchers Use Laser Light To Identify Atherosclerotic Plaques That Cause Heart Attacks

BOSTON--(BUSINESS WIRE)--Aug. 1, 2005--Researchers at Massachusetts General Hospital (MGH) have developed a new technique that uses laser light, called Laser Speckle Imaging, to identify atherosclerotic plaques that cause heart attacks, according to a report that will appear in the August issue of *Circulation*.

Senior author Guillermo Tearney, MD, PhD, of the MGH Pathology Department, noted: "Certain types of coronary plaques, often referred to as vulnerable plaques, are thought to cause acute heart attacks, a leading cause of death in industrialized nations."

Supported by CIMIT, a not-for-profit consortium dedicated to solving complex medical problems, the study was conducted at the Wellman Center of Photomedicine at MGH by Seemantini Nadkarni, PhD, first author and a post-doctoral fellow, Dr. Tearney, associate professor of pathology and Brett Bouma, PhD, associate professor of dermatology, all from Harvard Medical School.

Plaques that Cause Heart Attacks

Vulnerable plaques are fatty-buildups within the coronary artery wall that are commonly isolated from arterial blood by a thin fibrous layer termed a "cap." Activated inflammatory cells can eat away the cap, leaving the plaque mechanically unstable. When the stability of the cap is compromised, it becomes weak and may tear, exposing the lipid contents of the plaque to blood. At this point, a clot may occur, which in turn fills the lumen of the artery, blocking the flow of blood to the heart. If the blood flow is blocked for a prolonged period of time, the heart muscle dies, causing a myocardial infarction or heart attack.

LSI Uses an Inexpensive Laser

The team with Drs. Tearney and Bouma, at the Wellman Center, took images from 118 atherosclerotic plaques. Their analysis demonstrated that laser speckle imaging (LSI) is capable of providing information correlated with plaque type, collagen content, lipid pool area, and fibrous cap thickness -- all thought to be important indicators of plaque vulnerability.

"In addition to providing structural information, LSI also provides data on the biomechanical properties of the plaque, which is the final common link between plaque composition and plaque rupture," says Dr. Nadkarni.

LSI also has the advantage that it can be done with simple technology. "One unique aspect about this technique is that it measures both biomechanical and structural features with a relatively uncomplicated device," says Dr. Tearney. "The light source is an inexpensive laser that can be found in every day laser printers or laser pointers."

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A Goal: Target Therapeutic Interventions

Their team at Wellman is currently working on implementing the LSI technique in patients by incorporating the device in a small diameter intracoronary catheter.

Dr. Bouma noted: "In the near future, we will obtain LSI information in patients, which will enable us to improve our understanding of the biomechanical properties of vulnerable plaques and eventually allow us to target therapeutic interventions to the highest risk lesions."

Along with Drs. Nadkarni, Bouma, and Tearney, additional co-authors are Tina Helg, PhD; Raymond Chan, PhD; Alexandra Chau, MS; Milan Singh Minsky, PhD; and Jason T. Motz, PhD of the Wellman Center; Stuart Houser, MD, MGH Department of Pathology; and Elkan Halpern, MGH Department of Radiology.

About the Wellman Center

Wellman Center for Photomedicine at MGH, which houses the research team, is the largest medical research facility for photomedicine and is widely recognized as a leader in the field. Research activities span fundamental research, translational studies, development of novel therapeutics, and diagnostics, all based on the interaction of light with biomolecules and tissue. In 2004, Wellman was designated as one of the five Thematic Centers that MGH established to promote interdisciplinary research in biomedicine.

CIMIT® Team

Through early awards from CIMIT, Drs. Tearney and Bouma began working with this and other optical imaging techniques in the late 1990s. In 2004 they received the CIMIT Edward M. Kennedy Award for Healthcare Innovation. CIMIT is a consortium of physicians from the MGH and the Harvard teaching hospitals with scientists and engineers from Massachusetts Institute of Technology and Charles Stark Draper Laboratory. CIMIT teams use novel technologies - from minimally invasive diagnosis and therapy to medical education simulation - to dramatically improve patient care. Further information is available at www.cimit.org

About Massachusetts General Hospital

Massachusetts General Hospital, established in 1811, is the original and largest teaching hospital of Harvard Medical School. MGH conducts the largest hospital-based research program in the United States, with an annual research budget of more than \$450 million and major research centers in AIDS, cardiovascular research, cancer, cutaneous biology, medical imaging, neurodegenerative disorders, transplantation biology and photomedicine. In 1994, MGH and Brigham and Women's Hospital joined to form Partners HealthCare System, an integrated health care delivery system comprising the two academic medical centers, specialty and community hospitals, a network of physician groups, and nonacute and home health services.