New Method for the Detection of Vulnerable Plaques in Coronary Artery Atherosclerotic Disease (CAD)

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Technology description

Researchers at UC San Diego have developed methods for the direct visualization of the dynamic molecular remodeling of atherosclerotic plaques at a functional levelin vivo. Current structural characterization of plaques is suboptimal in assessing rupture potential. Conversely, the current invention imaging strategy not only examines the expression of critical factors (MMPs and thrombin) involved in destabilizing plaques, but also interrogates their pathologic function during plaque progression.Matrix metalloproteinases (MMPs) and thrombin are enzymes that promote plaque vulnerability by degrading extracellular matrix to facilitate smooth muscle and inflammatory cell movement as well as destabilize fibrous caps of fibroatheromas to induce rupture. The major innovation of the project is the direct visualization of the dynamic molecular remodeling of atherosclerotic plaques at a functional levelin vivo.

Heart disease is a major leading cause of morbidity and mortality in the U.S. largely due to coronary artery atherosclerotic disease (CAD), which affects millions and costs billions annually. The concept of plaque vulnerability, based on likelihood of fibroatheroma rupture, has prompted many pursuits to identify high risk lesions, costing $150 million per year. However, identifying vulnerable plaques based on structure, via coronary angiograms or CT/MRI scans, has not translated to improved clinical outcome. Thus, the failure to identify and predict plaques at high risk of rupture, which may lead to myocardial infarction, heart failure and/or sudden cardiac death, is likely because structure may not optimally discern plaque vulnerability. Molecular imaging, in contrast, offers an innovative approach for discriminating the vulnerable plaque in that it not only visualizes structure, but also interrogates underlying molecular function. Based on the current methods to detect plaques, there is a need for a better method for measuring plaque rupture vulnerability.

Application area

The molecular probe is designed to analyze the activity of enzymes known to modulate the stability of atherosclerotic plaques. The probe is linked to fluorescent molecules that can be detected by intracoronary catheters.

Advantages

The invention would be of great interest due to the large population of patients with coronary artery disease, which is major leading cause of death in the U.S. The major advantage is that the invention would be able to discriminate between atherosclerotic plaques that are stable and those that are prone to rupture and cause future heart attacks and other cardiovascular events.

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