Characterization of Vulnerable Plaque Using Dynamic Analysis

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Technology description

Description

A stroke occurs when there is a disruption or reduction of blood flow to the brain. It is a leading cause of death and disability in the United States. Strokes are caused by clots, or plaques, that form on the inner walls of blood vessels. When a clot grows large enough to cut off blood flow, it is called thrombotic stroke. Embolic stroke occurs when a plaque ruptures and small particles, such as lipids or clots called emboli, are released into the blood. These particles can travel to smaller vessels, where they become lodged and cut off blood flow.

Softer plaques, called vulnerable plaques, do not always present an immediate threat but are at risk for rupture. A vulnerable plaque is made up of a soft, fatty interior covered by a calcified fibrous cap. When the fibrous cap is thin, it may be easily ruptured by increased blood pressure, such as occurs during exercise.

To prevent stroke, surgical procedures are used to widen vessels by removing clots. However, this technique ignores the potential for an embolic stroke and does not recognize a different standard of treatment between patients with manageable versus vulnerable plaques.

Ultrasound imaging techniques can be used to identify fibrous and calcified plaques. However, ultrasound is unable to distinguish vulnerable plaques from other types. A new method is needed to reveal plaques that are more susceptible to rupture and identify patients at higher risk for embolic stroke.

UW Madison researchers have devised a method for indicating the risk of rupture of an atherosclerotic plaque. Ultrasound imaging is used to measure the elasticity and mobility of a plaque as blood flows across it. A computer assesses the motion of the plaque relative to the arterial wall and relative to other portions of itself. This motion is analyzed to determine if there is significant axial or lateral displacement or significant shear strain. If such motion is observed, the system outputs a quantitative assessment of plaque vulnerability.

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