# Imaging Targets Vulnerable Coronary Plaques

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CHICAGO — A furiously competitive race is on to develop new imaging methods capable of identifying vulnerable coronary plaques.

The first of these technologies to undergo evaluation in prospective clinical trials are virtual histology, palpography, thermography, and multislice CT. They are being assessed in the pioneering Providing Regional Observations to Study Predictors of Events in the Coronary Tree (PROSPECT) study, a 700-patient international trial whose initial enrollees have completed their first year of follow-up, Dr. Gregg W. Stone said in his Hildner Lecture at the annual meeting of the Society for Cardiovascular Angiography and Interventions.

But PROSPECT is only the beginning. At least 14 different noninvasive and 28 catheter-based invasive diagnostic techniques aimed at detecting vulnerable plaques are in development, according to Dr. Stone, professor of medicine at Columbia University and vice chairman of the Cardiovascular Research Foundation, New York.

The goal of this massive research and development effort is to identify asymptomatic coronary lesions that are active, inflamed, and prone to rupture so that in theory they can be preemptively treated before they cause an acute MI.

At this point, progress in vulnerable plaque imaging is well ahead of actual treatment. It is clear, however, that statins and lifestyle modification are not going to be sufficient. This was amply demonstrated in the Pravastatin or Atorvastatin Evaluation and Infection Therapy (PROVE-IT) trial, in which patients with a history of acute coronary syndrome had a 22% coronary event rate over 2.5 years despite being on 80 mg/day of atorvastatin, Dr. Stone said.

Once it's established that vulnerable plaques can reliably be identified, more aggressive interventions may include drug-eluting stents for high-risk lesions, or perhaps catheter-delivered cryoplasty or photodynamic therapy for regional treatment, although all of this will require demonstration of clinical benefit in prospective trials, the cardiologist continued.

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**DR. STONE**

Noninvasive imaging methods are most attractive as tools for population screening, since they in general pose less risk than invasive methods. That's not always true, though. Multislice CT, the noninvasive method that has garnered by far the greatest interest, entails significant exposure to radiation and nephrotoxic contrast media, Dr. Stone noted.

Invasive imaging techniques are more time-consuming. But placing a catheter next to an atheroma yields a wealth of data on structure and function.

Invasive imaging methods fall into three broad categories: those that assess plaque morphology, such as virtual histology, optical coherence tomography, and vaso vasorum imaging; tools for evaluating plaque activity or composition, including thermography, spectroscopy, and intravascular MRI; and methods of studying a plaque's physical properties, such as palpography, which measures endothelial sheer stress at the plaque's cap.

Thermography relies on the observation that inflamed, unstable coronary plaques have a consistently slightly higher temperature than indolent ones.

Virtual histology utilizes intravascular ultrasound (IVUS) spectral analysis to assess plaque composition in four colors rather than the standard IVUS gray scale. This imaging tool, which has been validated in an ex vivo histology study using autopsy specimens, is commercially available from Volcano Corp. Virtual histology permits classification of coronary lesions into four types: fibrous, fibro-fatty, densely calcified, or—what is believed to be most worrisome—plaque having a necrotic core, explained Dr. Stone, who is principal investigator of the PROSPECT study.

Dr. Stone is a consultant to Guidant, Volcano, and numerous other medical device manufacturers. ■