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 clinical validation in prospectively performed clinical trials are optical coherence tomography (OCT), near-infrared spectroscopy (NIRS), and some form of intravascular ultrasound (IVUS). These methods of identifying vulnerable plaques are currently under investigation and represent a tremendous opportunity for cardiovascular angiography and interventions.

At least 14 noninvasive and 28 catheter-based imaging techniques are in development. 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 the most interest, entails significant exposure to radiation and nephrotoxic contrast media, Dr. Robert L. Wilensky, who heads the scientific advisory board for TopSpin Medical, the Israeli company developing intraarterial MRI, said at the annual meeting of the Society for Cardiovascular Angiography and Interventions.

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

Invasive Imaging Methods Target Vulnerable Coronary Plaques

In Chicago — Intriguing invasive methods of identifying vulnerable coronary plaques include vasovasor imaging, intravascular ultrasound (IVUS), and several variants of optical coherence tomography, according to speakers at the annual meeting of the Society for Cardiovascular Angiography and Interventions.

Vaso vasorium imaging. The vasovasor imaging modality provides great promise for detecting vulnerable plaques. The motion of plaques is different from that of the arterial wall.

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 might include drug-eluting stents for high-risk lesions, or catheter-delivered cryoplasty or photodynamic therapy for regional treatment, although all of these may require demonstration of clinical benefit in prospective trials, he continued.

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 vasovasor imaging; tools for evaluating plaque activity or composition, including thermography, spectroscopy, and intravascular MRI; and methods of studying plaque’s physical properties, such as palpography, which measures endothelial shear 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.

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