Understanding of vulnerable plaque, together with novel diagnostic and therapeutic approaches, creates a new opportunity for prevention. Detection of vulnerable plaques by noninvasive and/or invasive methods, followed by treatments such as stenting, photodynamic therapy, and novel pharmaceutical agents might enhance both primary and secondary prevention. Issues of the focal versus systemic nature of atherosclerosis, the ability of detectors to identify their target and link such a target to clinical events, and the efficacy of specific therapy require further study. If vulnerable plaques and patients can be successfully identified and treated, immense benefits will ensue.



Atherosclerosis is a multifocal, smoldering, immunoinflammatory disease of medium-sized and large arteries fuelled by lipid. The most devastating consequences of atherosclerosis, such as heart attack and stroke, are caused by superimposed thrombosis. Approximately 76% of all fatal coronary thrombi are precipitated by plaque rupture. Ruptured plaques are characterized by a large lipid-rich core, a thin fibrous cap that contains few smooth muscle cells and many macrophages, angiogenesis, adventitial inflammation, and outward remodeling.



It is now recognized that the three main causes of coronary thrombosis are rupture, erosion, and calcified nodule. The most frequent of these is plaque rupture. The precursor lesion to acute rupture is believed to be a thin cap fibroatheroma (TCFA). Thin cap fibroatheroma are characterized by a lack of thrombus, presence of a necrotic core, and a fibrous cap $<65$ $\mu$m, which is infiltrated by macrophages. These lesions are located in proximal and mid portions of the three main coronary arteries with $<75\%$ area luminal narrowing. It is believed that if TCFA can be recognized clinically it might be possible to reduce the incidence of sudden death.

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*Sotirios Tsimikas, James T. Willerson, Paul M. Ridker*

Plasma biomarkers that reflect the clinical potential of atherothrombotic disease may allow more precise risk stratification and prognostication in high-risk populations. High-sensitivity C-reactive protein (hs-CRP) improves vascular risk prediction in primary and secondary prevention across all levels of low-density lipoprotein (LDL) cholesterol, all levels of the Framingham Risk Score, and all levels of metabolic syndrome. Several emerging plasma biomarkers, such as lipoprotein-associated lipoprotein-associated phospholipase $A_2$, myeloperoxidase, oxidized LDL, lipoprotein (a), isoprostanes, and small, dense LDL, are being evaluated for their clinical utility. This review will focus on hs-CRP and emerging risk factors and their diagnostic and prognostic ability in cardiovascular disease.

**Imaging Vulnerable Plaque by Ultrasound** **C32**
*Anthony N. DeMaria, Jagat Narula, Ehtisham Mahmud, Sotirios Tsimikas*

Recent intravascular ultrasound (IVUS) studies have suggested that patients presenting with acute coronary syndromes have an approximate 25% incidence of additional ruptured plaques in arteries other than the culprit lesion. New applications of IVUS, such as integrated backscatter, wavelet analysis, and virtual histology, can provide a color-coded representation of plaque characteristics such as lipid, fibrous tissue, calcification, and necrotic core. In addition, targeted contrast agents are being explored to more precisely image aspects of vulnerable plaques. These advances pave the way for future clinical trials to assess the ability of such techniques to diagnose vulnerable plaques and to assess the effects of both pharmacologic and mechanical therapies on plaque characteristics.

**Atherosclerotic Plaque Characterization by Multidetector Row Computed Tomography Angiography** **C40**
*Marco A. S. Cordeiro, João A. C. Lima*

Multidetector row computed tomography angiography (MDCTA) is a potential alternative to current imaging methods to assess vessel anatomy and atherosclerotic plaque composition/morphology. Multidetector row computed tomography angiography correlates well with intravascular ultrasound (IVUS) and histopathology for discrimination between soft, intermediate, and calcified plaques. Plaque area and volume tend to be underestimated by 12-detector row MDCTA and overestimated by 16-detector row MDCTA. However, 64-detector row MDCTA can measure them with greater accuracy. Plaque remodeling is overestimated in small vessels by 12-detector row MDCTA, whereas 16- and 64-detector row MDCTA correlate well with IVUS. Future characterization of atherosclerotic plaque composition and determination of plaque area, volume, and remodeling by MDCTA is quite promising.

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