

Editor's Page

Risk Stratification for Stroke: Do We Need New Tools?

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Despite the rise in lifestyle modifications, cardiovascular diseases remain the leading cause of death in North America and Europe. The concept of “vulnerable” or unstable plaque has emerged during recent years to explain how stable atherosclerotic lesions evolve to cause clinical events. During the natural course of atherosclerosis, inflammation plays a major role in the development of vulnerable plaque: it actually initiates and maintains the process of vulnerability. When a plaque becomes unstable due to intense inflammation, the thin fibrous cap can rupture, causing a thrombotic vessel occlusion and leading to the clinical expression of a stroke or a myocardial infarction. The early identification of local inflammation is not only able to identify patients at high risk for an event, but can also be used as a tool for therapy monitoring.

Risk stratification for cardiovascular diseases based on the early detection of local inflammation has attracted a great deal of interest during the last years, and has resulted in the development of non-invasive or invasive techniques for the assessment of the inflammatory component of vulnerable plaque. These techniques, mainly applied and tested in the coronary arteries, can detect either anatomical or functional characteristics of the plaque. Intravascular thermography, the gold standard for the identification of local inflammation, can detect local thermal heterogeneity and identify an inflammatory process, in both carotid and coronary arteries. However, it can only be performed invasively and not in a routine fashion. Regarding the non-invasive techniques, the prognostic role of intima-media thickness (IMT)

for early identification of patients with increased risk for stroke is widely accepted. Nevertheless, it is characterised by a divergence in its methodology, its correlation with stroke is weaker in the elderly, but most importantly it estimates anatomical alterations that appear much later than the early inflammatory activation. Carotid plaque evaluation seems to be a better predictor of cardiovascular events than IMT. The prognostic role, however, of ultrasonographic plaque texture evaluation (echogenicity, density, shadow) requires further research. Moreover, limited data exist regarding the association between plaque thickness and the vulnerability of the carotid plaque. Recently, nuclear cardiology, with the use of positron emission tomography, proved that 18F-fluorodeoxyglucose uptake (thought to represent macrophage activity in inflamed intimal atherosclerotic plaques) is observed in the early stages of atherosclerosis and correlates with cardiovascular risk factors such as diabetes mellitus. This method allows the direct *in vivo* visualisation of the inflammatory process of the disease, offering the opportunity for early identification of a group of patients at high risk for stroke.

Risk stratification for stroke on the basis of inflammatory activation should be based on a method that is safe, with no exposure to radiation, is non-invasive, and can be applied easily. Microwave radiometry (MR), has been proved to detect early inflammation in carotid arteries, can be applied easily and safely, and can easily be repeated for treatment evaluation. The prognostic role of MR for stroke and other cardiovascular events remains to be proven in prospective studies.