Is It Useful to Identify High-Risk Carotid Plaques before Surgery/Stenting? How Is This Best Carried Out and What Should Be Done with the Findings?

Stella S. Daskalopoulou, MD, MSc, DIC, Athens, Greece, and London, England; Marios E. Daskalopoulos, MD, MSc, DIC, Athens, Greece; Dimitri P. Mikhailidis, MD, London, England; Christos D. Liapis, MD, Athens, Greece

The beneficial effect of carotid endarterectomy (CEA) in stroke prevention in patients with high-grade symptomatic or asymptomatic internal carotid artery stenosis was demonstrated in several trials.[1] However, apart from the severity of stenosis, other components within and outside the carotid plaque may lead to plaque vulnerability and thus to the development of stroke. Several invasive and noninvasive imaging techniques could further evaluate the high-risk carotid plaque. These include duplex ultrasonography, arteriography and digital subtraction angiography, magnetic resonance angiography (MRA) and contrast-enhanced MRA, helical computed tomographic angiography, and transcranial Doppler.[2]

High-resolution duplex ultrasonography is a useful technique to study the arterial wall and atherosclerotic plaques.[3] In experienced hands, this noninvasive, real-time technique provides useful information not only on the degree of carotid stenosis but also on the morphology (eg, size and consistency) of the plaque. There is accumulating evidence that echolucent and heterogeneous carotid plaques are implicated in the development of stroke.[3] Furthermore, to overcome the subjective nature of visual classification, computer-assisted methods are being developed to assess plaque echodensity (eg, measurement of the gray scale median [GSM]) and texture. Echolucent (lower GSM) plaques are associated with silent infarcts on computerized tomography in asymptomatic patients and a larger necrotic core and increased macrophage density in carotid specimens. High-risk carotid plaques are not only associated with the development of cerebrovascular events but also mirror atherosclerosis and predict vascular events in other arterial beds.[3,4] Furthermore, high-risk plaques are associated with several inflammatory and atherogenic systemic and local factors and may predict restenosis.[5]

Ultrasonography can help with patient surveillance by assessing plaque progression, echomorphology, and restenosis after intervention. This technique can also help with selection of optimal management. There is considerable debate regarding the relative merits of CEA and carotid angioplasty and stenting (CAS). However, the Imaging in Carotid Angioplasty and Risk of Stroke study (ICAROS) showed that echolucent plaques (GSM ? 25) carry a high-risk of cerebral complications and should undergo CEA rather than CAS.[6] Further randomized trials are needed to resolve this issue.

Risk factor modification not only prevents strokes but also reduces carotid intima-media thickness and is essential in carotid disease. However, interventional trials assessing the beneficial effect of more aggressive lipid lowering, antihypertensive and antiplatelet treatment on carotid plaques are needed.

Ever-evolving technology (eg, multi-sequence, high-resolution MRI) will lead to more accurate and reproducible assessment of the atheromatous burden and the high-risk carotid plaque (eg, thickness of fibrous-cap and lipid-core components). Therefore, a combination of comprehensive non- or minimally invasive imaging techniques together with clinical and systemic blood markers of risk may facilitate the identification of the "vulnerable plaque" in the "vulnerable patient" and help the clinician to choose the best method of treatment for the individual patient.

References

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