Top Vascular Ultrasound 2024: Carotid Plaque-RADS – A Novel Stroke Risk Classification System

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Introduction

Many vascular ultrasound articles were published in 2024, but certainly the most discussed in Brazil this year was "Carotid Plaque-RADS - A Novel Stroke Risk Classification System" by Saba et al. in *JACC: Cardiovascular Imaging*.[1] The project brought together 51 specialists in different vascular imaging modalities from 10 countries. This new proposal for categorizing carotid plaque attracted the attention of physicians from various specialties, such as cardiologists, neurologists, radiologists, ultrasound specialists, and vascular surgeons. In this section, we will discuss its main aspects, comparing them with previous classification systems.

Discussion

Although clinical treatment has progressed with respect to high-potency statins and both surgical and endovascular invasive treatment, recent reports, such as that of King's College London for the European Stroke Alliance, show that more efficient actions are required. Stroke continues to be the second most frequent cause of acute cardiovascular syndrome, second only to myocardial infarction. U.S. projections show a 34% increase in strokes by 2060, with the same projected for all European countries by 2035.[2,3]

It has long been known that ischemic events due to the progression of atherosclerosis are not entirely related to the degree of stenosis in the culprit artery. In the 1990s, several studies showed that the pathophysiological mechanisms of vascular syndromes involve erosion or rupture of unstable atherosclerotic plaques, with plaque thrombosis, culminating in vessel occlusion or distal embolization of plaque fragments and/or thrombi.[4-6]

The latest European Society of Vascular Surgery guidelines on atherosclerotic carotid artery disease recommend treatment for **symptomatic** patients with moderate stenosis (50%-69% obstruction) when clinical or imaging findings suggest a higher risk of new stroke (ie, Class IIa, level of evidence B for endarterectomy and Class IIb, level of evidence B for endovascular treatment).[7] Regarding plaque morphology, Rothwell et al.[8] demonstrated that patients with irregular or ulcerated plaque had a lower stroke risk at 5 years when treated surgically than patients with smooth plaque (17% vs. 8%; number needed to treat = 6).

For **asymptomatic** individuals with atherosclerotic carotid plaque and stenosis > 60%, decision making about interventional treatment is more challenging. In fact, approximately 20% of these individuals will have a stroke within 10 years, even with optimized clinical treatment and lifestyle change. Several recent studies on plaque characteristics have defined factors associated with a high risk of stroke. The development of multimodality noninvasive vascular imaging has contributed to this paradigm shift, indicating plaque types associated with neurological event risk.

Previous scoring systems include the American Heart Association's classification of atherosclerotic lesions according to risk of ischemic events, a modification of this system for magnetic resonance imaging, and a plaque score based on ultrasonography.[9-11] Plaque-RADS (Plaque Reporting and Data System) aims to create an intuitive, accurate, and reliable score through a standardized system that can be used with several imaging modalities (magnetic resonance imaging, computed tomography angiography, and ultrasonography) that estimates the risk of first or recurrent stroke. Such an approach would facilitate communication between different institutions, systematizing information between referring physicians, imaging specialists, and researchers.

It is important to emphasize that carotid plaque is still defined according to a recent update of the Brazilian recommendations for evaluating carotid and vertebral arteries, which is based on the well-known Mannheim consensus criteria.[12,13]

Plaque-RADS is based on morphological changes in carotid plaque, stratifying the risk of neurological ischemic events. In a publication from American Society of Echocardiography, Johri et al.[14] proposed a classification system for carotid plaque that associates plaque height with the risk of cardiovascular events. Thus, we have two distinct and complementary sources of information, since atherosclerosis is a systemic manifestation with different clinical outcomes.

Since Plaque-RADS uses the height (or thickness) of the carotid plaque to differentiate between grades 1, 2 and 3, comparison with American Society of Echocardiography carotid plaque grades 0, I, II and III is feasible. The Plaque-RADS article discusses the American Heart Association system and that of the American Heart Association modified for magnetic resonance imaging. Figure 1 compares atherosclerotic plaque findings among the 4 classification systems. In Plaque-RADS, the key findings are maximum plaque thickness; ulceration; calcification; a thin, thick, or ruptured fibrous cap; a lipid-rich necrotic core; intraplaque hemorrhage; and intraluminal thrombus. Auxiliary

Keywords

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findings include neovascularization, inflammation, positive remodeling, atherosclerotic burden, and stenosis progression.

Although Saba et al. cited intraplaque neovascularization as an auxiliary finding for atherosclerotic plaque, we know that two-dimensional ultrasound is limited regarding such evaluations. The ultrasound contrast agent available in Brazil, associated with adequate equipment adjustment, can detect intraplaque neovascularization and was included in the Brazilian recommendation as a Class I, level of evidence B recommendation.[12]

Conclusions

The new classification system for carotid atherosclerotic plaque proposed in "Carotid Plaque-RADS: A Novel Stroke Risk Classification System"[1] can standardize terminology across imaging modalities and grade the risk of neurological events. Imaging findings consistent with vulnerable plaque, detected by vascular ultrasonography, computed tomography, and magnetic resonance imaging, are increasingly recognized as associated with a higher risk of events, regardless of the degree of carotid stenosis.

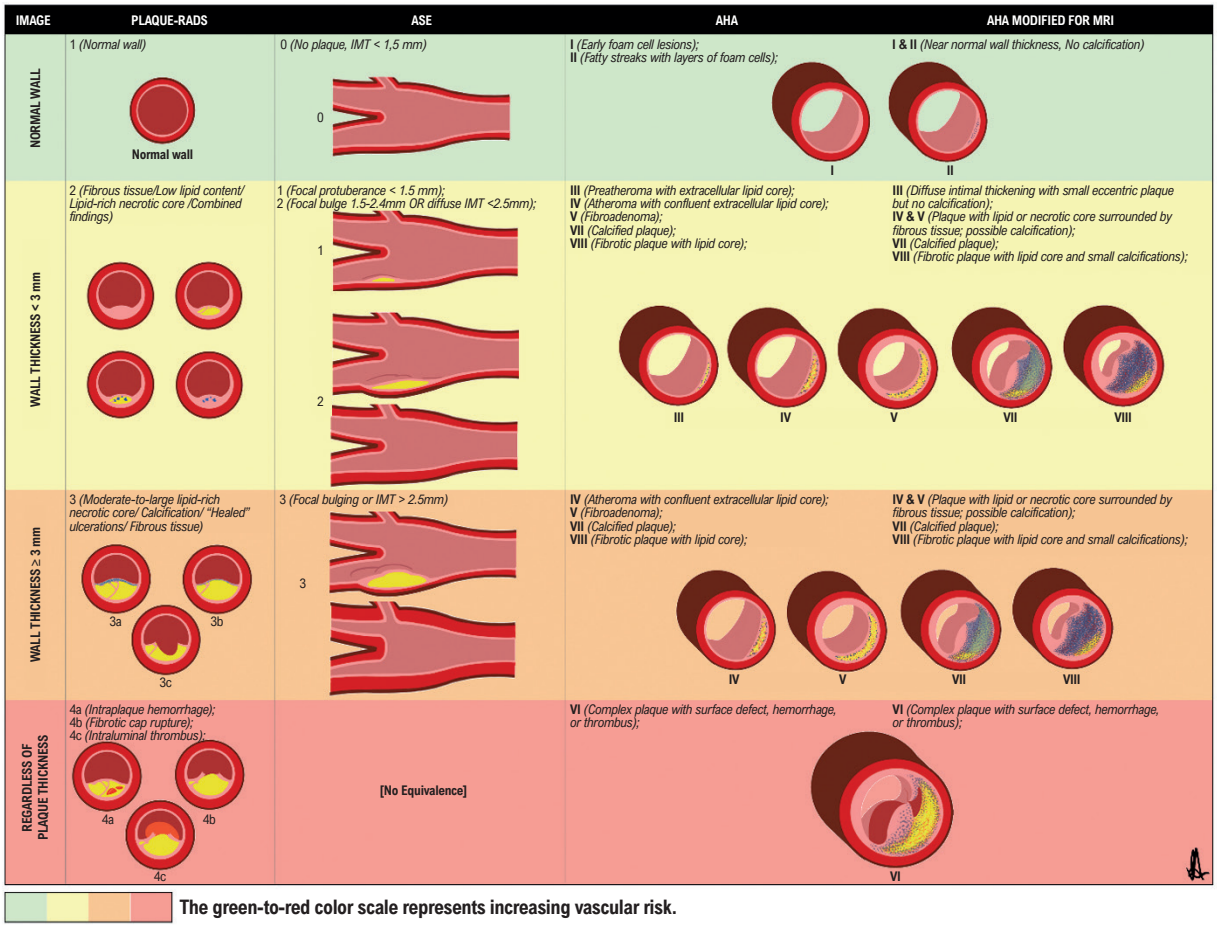

Figure 1 – *Equivalence between classification systems for atherosclerotic carotid plaque (*Figure adapted from Saba et al.,[1], Johri et al.,[14] Stary et al.[9] and Cai et al.[10]). AHA: American Heart Association; ASE: American Society of Echocardiography; IMT: intima-media thickness; MRI: magnetic resonance imaging.*

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