Commentary

It is now well accepted that an inflammatory process contributes significantly to atherosclerosis. It may induce a prothrombotic state with altered coagulation-fibrinolysis and platelet activation that can result in acute cerebrovascular and cardiovascular events. The inflammatory process may induce plaque rupture followed by thrombosis in the atherosclerotic arteries supporting the brain, leading to acute cerebral ischemia and consequential reperfusion, initiating an inflammatory response in the brain, which is associated with the induction of several cytokines. The accompanying peripheral inflammatory response causes an increase in the proinflammatory cytokines, platelets, and acute-phase reactant proteins.[1] Elevation of acute-phase reactant proteins and fibrinogen leads to an increase in the viscosity of plasma and aggregation of erythrocytes, which reduces the microcirculating blood flow, resulting in the aggravation of cerebral ischemia.[1] When the blood flow is insufficient, increased erythrocyte aggregation and adhesiveness to the endothelium contribute to vascular damage, particularly in microcirculation.[2] The acute inflammation that develops following the ischemic episode is a major mechanism by which cells in the penumbra degenerate, and the participation of the inflammatory factors can be associated with the presence of early neurological deterioration and impact volume. Erythrocytes aggregation may also play an indirect role in arterial thrombosis through its effects on platelets.[3]

Measurement of carotid intima-media thickness (IMT) is a widely used feasible, reliable, valid, cost-effective, and non-invasive method to assess atherosclerosis. Increased carotid IMT has been found to be associated with risk factors for atherosclerosis. Severity of carotid atherosclerosis is a major predictor of future ischemic stroke events. An elevated plaque score, number of plaques, and degree of carotid stenosis are associated with a higher risk of atherosclerosis and stroke.[4] In the Atherosclerosis Risk in Communities (ARIC) study, the carotid IMT was found to be predictive of incident clinical stroke.[5]

The atherosclerotic vessel wall is a likely source of various measurable systemic inflammatory markers. Several biomarkers of inflammatory processes, such as, interleukin-1 (IL-1), IL-6, tumor necrosis factor (TNF)-a, fibrinogen, C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR), are now available in clinical practice. The ESR is a simple non-specific screening test that indirectly measures the presence of inflammation in the body. It reflects the tendency of red blood cells to settle more rapidly in the face of some disease states, usually because of an increase in the plasma fibrinogen, immunoglobulin, and other acute-phase reactant proteins. Changes in the red cell shape or numbers may also affect the ESR. Higher values of ESR in an acute-phase of stroke may indicate a greater increase in fibrinogen concentration and blood viscosity and so a more pronounced reduction in the cerebral blood flow.[6] Higher values of ESR have been reported to be associated with extent of brain damage, early clinical worsening, and poor clinical outcomes.[7] In addition, high ESR levels have also been defined as useful markers for identifying patients at risk for progression of atherosclerosis in ischemic stroke and it has also been positively correlated with carotid IMT.[8] Rincon *et al*. reported a significant linear trend for a higher carotid IMT with increasing ESR and CRP.[9]

The main advantage of ESR over other biomarkers of inflammation is that it is a simple and inexpensive test for assessing an inflammatory or acute response. Even as ESR is inexpensive and a routinely available test, its results must be evaluated carefully. As it is a non-specific marker of inflammation, several confounding factors such as, genetic and familial influence, hematocrit, plasma albumin levels, temperature, and paraproteinemia, have been reported to influence erythrocyte sedimentation.[3] In fact it is a useful test being used to gauge the severity and response to treatment of many chronic inflammatory, noninflammatory, and immune-mediated diseases.

To conclude, a higher carotid IMT is a risk factor for future cerebrovascular events. Inflammatory markers, including ESR, correlate with the severity of atherosclerosis and risk of future cerebrovascular events. In a patient with stroke, these markers may be used to assess the severity and prognosis. ESR is a simple, cost-effective, reliable, and easily available inflammatory marker, which can be used for this purpose. However, its results should be interpreted cautiously. Furthermore, large scale trials are required to assess the role of ESR in diagnostic and therapeutic strategies, when managing patients with cerebrovascular diseases.

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