Insulin and Membrane Microviscosity of Erythrocytes as Risk Factors for Stroke

To the Editor:

I read with great interest the comments by Dr Kernan and colleagues1 dealing with the insulin sensitivity in nondiabetic patients with a recent transient ischemic attack or ischemic stroke. The results of their presented study demonstrated that pioglitazone may be effective for improving insulin sensitivity with a concomitant decrease in fasting plasma insulin concentration in these patients. Kernan et al proposed that because the prevalence of impaired insulin sensitivity is high among patients with stroke, thiazolidinediones may improve the morbidity and mortality of this disease.

In a study we presented earlier, a relationship between membrane fluidity of erythrocytes and plasma insulin was investigated in patients with essential hypertension by means of an electron paramagnetic resonance method.2 Membrane fluidity (the reciprocal value of membrane microviscosity) is a physicochemical feature of biomembranes that is an important factor in modulating cell rheologic behavior.3,4

The membrane fluidity of erythrocytes was significantly lower in patients with essential hypertension than in normotensive subjects. The plasma content of insulin while fasting was significantly greater in hypertensive patients than in normotensive subjects. In addition, it was demonstrated that the higher the plasma insulin level, the lower the membrane fluidity of erythrocytes, which might indicate that hyperinsulinemia might be a determinant of membrane fluidity of erythrocytes in essential hypertension. Barbagallo et al reported that insulin significantly elevated the intracellular calcium level of human erythrocytes in hypertensive subjects. In addition, it was demonstrated that the higher the plasma insulin concentration in these patients, the lower the membrane fluidity of erythrocytes in diabetic subjects.5

The plasma content of insulin while fasting was significantly higher in patients with hyperinsulinemia than in normotensive subjects. The plasma insulin level evoked by pioglitazone might restore the rheologic behavior of erythrocytes and microcirculation in patients with stroke, thiazolidinediones may improve the morbidity and mortality of this disease.

In recently published research, pioglitazone was shown to have additional beneficial effects.6,7 Shiraishi K, Matsuzaki S, Ishida H, Nakazawa H. Impaired erythrocyte deformability and membrane fluidity in alcoholic liver disease: participation in disturbed hepatic microcirculation. Alcohol Alcohol. 1993;597:292–304.

Thiazolidinediones (TZDs), such as pioglitazone, have potent vasoprotective effects. They improve vascular reactivity, reduce monocyte adhesion to endothelial cells and migration into nascent atheroma, retard vascular smooth muscle cell proliferation, decrease concentrations of circulating inflammatory cytokines, improve fibrinolysis, and favorably alter lipid metabolism.

In this context it can be speculated that the reduced plasma insulin level evoked by pioglitazone might restore the rheologic behavior of erythrocytes and microcirculation in patients with stroke. It is possible that the effect of pioglitazone could be beneficial for the protection against repeated attacks of stroke in patients with hyperinsulinemia.

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Response

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Letters to the Editor

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