Hyperinsulinemia and Membrane Microviscosity of Erythrocytes as Risk Factors for Stroke in Patients With Impaired Glucose Tolerance

To the Editor:

We read with great interest the recent article by Dr Vermeer and colleagues1 dealing with the impaired glucose tolerance and stroke risk in nondiabetic patients with transient ischemic attack (TIA) or minor ischemic stroke. The results of their study demonstrated that stroke risk was nearly doubled in nondiabetic patients with impaired glucose tolerance (glucose 7.8 to 11.0 mmol/L) compared with those with normal glucose levels, and nealy tripled in diabetic patients (glucose >11.1 mol/L). The authors proposed that impaired glucose tolerance is an independent risk factor for future stroke in nondiabetic patients with TIA or minor ischemic stroke.

Evidence indicates that high glucose levels may be involved in the regulation of cellular functions. It was demonstrated that hyperglycemia elevated cytosolic free calcium (Ca) in vascular smooth muscle cells, suggesting that glucose-related excess intracellular Ca might be a fundamental lesion that contributes to the elevated blood pressure and targets organ damages.2 Recently, Kernan et al3 examined the insulin sensitivity in nondiabetic patients with a recent TIA or ischemic stroke, and showed that the prevalence of impaired insulin sensitivity might be high among patients with stroke. In a study we presented earlier, a relationship between membrane fluidity (a reciprocal value of membrane microviscosity) of erythrocytes and plasma insulin levels was investigated by using an electron paramagnetic resonance method.4 It was demonstrated that the decreased membrane fluidity of erythrocytes was associated with the higher plasma insulin levels, which might indicate that hyperinsulinemia might actively participate in the regulation of membrane fluidity of erythrocytes. In an in vitro study, we showed that insulin alone and in combination with Ca strongly decreased the membrane fluidity of erythrocytes.5 The decreased membrane fluidity of erythrocytes might cause a disturbance in the blood rheologic behavior and the microcirculation, which could contribute, at least in part, to the risk factors for vascular complications. In contrast, it was shown that restoring the insulin sensitivity by thiazolidinediones might improve the morbidity and mortality of stroke attack.3

Because impaired glucose tolerance might be accompanied by high plasma insulin levels, we speculate that abnormal membrane functions associated with hyperglycemia and hyperinsulinemia might partially explain the future cerebrovascular complications in nonbiabetic patients with TIA or minor ischemic stroke. Therefore, we would like to know whether plasma insulin levels might be related to the complications in the present study of Dr Vermeer and colleagues. Further studies should be performed to assess more precisely the mechanisms by which impaired glucose tolerance could induce circulatory disorders in patients with stroke.

Disclosures

None.

Kazushi Tsuda, MD, FAHA
Division of Cardiology
Department of Medicine
Wakayama Medical University
Wakayama, Japan

Hyperinsulinemia and Membrane Microviscosity of Erythrocytes as Risk Factors for Stroke in Patients With Impaired Glucose Tolerance
Kazushi Tsuda

Stroke. 2006;37:2657; originally published online September 21, 2006;
doi: 10.1161/01.STR.0000244518.91339.fb
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2006 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/37/11/2657

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org//subscriptions/