Formation of Left Atrial Ball Thrombus During Anticoagulation in a Case of Cerebral Embolism

To the Editor:

Pedunculate atrial thrombi can become free-floating within a short period of time after the administration of anticoagulant in cases of rheumatic mitral valve disease or mitral valve replacement.1-6

We examined a 69-year-old woman with mitral stenosis and chronic atrial fibrillation who presented with left hemiplegia and stupor of abrupt onset. Computed tomography on the fifth day after onset showed an extensive hypodense area in the whole territory of the right middle cerebral artery, including a slight hemorrhagic component. Antiedema therapy with infusions of 10% glycerol continued for 10 days. On the day of onset, two-dimensional echocardiography failed to detect atrial thrombi (Figure la). On the echocardiograms of the seventh day after onset, there could have been a thrombus formation at left atrium, retrospectively, as shown by a small arrow in Figure lb.

We started anticoagulation with warfarin to prevent further episodes of cerebral embolism, but waited one month after onset to avoid the possibility of secondary cerebral hemorrhage. The thrombo-test expressed as an International Normalized Ratio (INR) was controlled to 1.5 times the normal control range. However, as shown by a large arrow in Figure lc, two-dimensional echocardiography on the sixteenth day from the beginning of anticoagulation detected a large peduncular thrombus measuring 33x23 mm in diameter at the left atrial wall. On the twenty-second day of anticoagulation, we saw a large ball thrombus 20 mm in diameter that moved around at intervals of 1 minute. During the systolic phase, the thrombus floated in the left atrium and, during the diastolic phase, filled the orifice of the mitral valves, which showed hypertrophic change by two-dimensional echocardiography (Figure ld, i-iv). Thrombectomy was done on the same day to prevent the risk of embolism or death and detected a ball thrombus measuring 24x24x15 mm, weighing 5.6 g, and consisting of fresh fibrin clots accompanied by a proliferation of fibrinohistiocytes. Several fragments of wall thrombi at the entrance of the left atrial appendage were also found in the left atrium and removed during surgery.

It has been reported that mitral stenosis and an enlarged left atrial cavity induce blood stasis, which may result in thrombus formation.5 Our case had mitral stenosis accompanied by atrial fibrillation and a considerably enlarged left atrial cavity (49 mm in atrial dimension in the systolic phase) as measured by two-dimensional echocardiography. The beginning of the thrombus formation is still unclear in our case. It may have originated before the start of anticoagulation, based on the retrospective findings of the echocardiogram on the seventh day of cerebral embolism, or anticoagulation may have accelerated the evolution of the thrombus to a pedunculate or ball thrombus.4-6

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References

ECHOCARDIOGRAMS

Case: 69-year-old female

Figure 1. Two-dimensional echocardiograms of anterior precordial long-axis view of a 69-year-old female on day of onset (a), seventh day after cerebral embolism (b), and sixteenth day (c) and twenty-second day (d) from the beginning of anticoagulation. LA, left atrium; LV, left ventricle.

**Plasma Cortisol as a Measure of Stress Response in Acute Stroke**

To the Editor:

Mulley et al. suggest that hyperglycemia following stroke is an epiphenomenon reflecting a stress response and may not independently predict outcome. I would argue to the contrary that hyperglycemia in the acute phase of stroke indicates an underlying diabetic state, which makes the outcome worse in these patients. We can diagnose diabetes (i.e., a patient has sustained abnormal levels of blood glucose over weeks or months) by measuring glucose binding to the hemoglobin A molecule. Of the three major glycosylation sites, HbAla, HbAlb, and HbAlc, the fraction of the latter predominates. HbAlb sites are a possible source of error in the diagnosis of diabetes, which can be avoided by utilizing an isoelectric focusing chromatographic technique. This technique eliminates elevated glycosylated fractions produced by transient blood glucose elevations such as the short duration “stress” effects of hyperglycemia.

An earlier study of patients with acute myocardial infarction showed a highly significant correlation between glycosylated HbAlc measurements and frankly diabetic glucose tolerance tests obtained 3 months later. Using the isoelectric focusing technique, we studied glycosylated HbAlc levels in 100 consecutive acute stroke admissions and demonstrated a highly significant correlation between the random blood sugar and the HbAlc value (r < 0.0001). This result strongly supports the existence of diabetic glucose levels for several weeks before the stroke and not acutely in the days surrounding the event.

Of those patients with HbAlc values in the clearly diabetic range, 27% had not been previously diagnosed with the condition and 64% died within the first week, compared with 16% of the nondiabetic group (p < 0.001). The stroke scores and demographic profiles of the two groups showed no statistically significant differences. Therefore, the poorer prognosis of the high blood sugar group was more likely to depend on premorbid diabetic state than on stroke severity. This result led us to speculate that HbAlc measured by isoelectric focusing could be a useful predictor of outcome. We respectfully suggest that the concept of stress hyperglycemia has outlived its usefulness.

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**References**


**Animal Models in Stroke**

To the Editor:

In a recent editorial, Wiesbers et al. noted the failure of several pharmacologic studies to translate from the experimental cerebral ischemia model to the clinical setting. The authors suggested that deficiencies in current animal models of stroke were primarily responsible for these shortcomings. In our view, a principal and obvious deficiency in most current stroke models is that they rely on mechanical occlusion of brain arteries and therefore do not simulate the clinical condition of this disease. To model stroke per se requires the induction of thrombotic occlusions at suitable arterial sites, resulting in the generation of cerebral infarction.

Over the past several years, we have developed models of photochemically induced vascular thrombosis for the purpose of investigating the consequences of thrombotic stroke on brain structure and function. Over the past several years, we have developed models of photochemically induced vascular thrombosis for the purpose of investigating the consequences of thrombotic stroke on brain structure and function. These studies have shown that thrombotic events in cerebral vessels produce not only cerebral infarction, but also widespread hemodynamic, metabolic, and structural abnormalities, which may be absent in more conventional infarct models yet potentially important in terms of stroke outcome. For example, we have shown that thrombosis of the common carotid artery releases circulating humoral factors, which acutely alter cerebral vascular permeability and blood flow at remote sites.

These findings have recently been duplicated for the case of heat-mediated arterial thrombosis (photoaggregation), further indicating that thrombosis per se is involved intrinsically in generating remote consequences (unpublished observations). In a recent pharmacologic study, the remote hemodynamic consequences of acute cortical thrombotic infarction were inhibited without affecting infarct size. Thus, although the size of a pathological lesion is an important indicator of stroke outcome, we also need functional and behavioral probes to assess pharmacological trials adequately.

Finally, recent data demonstrate that ischemic brain injury may be enhanced when ischemia is induced by arterial thrombosis, in comparison to ischemia induced by mechanical arterial occlusion. Our findings also suggest that the temporal profile of neuronal and vascular injury may be different from that induced by ischemia alone and may help explain the current clinical inadequacy of drugs found to be protective in animal models. We therefore believe it useful to call attention to these experimental findings, inasmuch as this work demonstrates the consequences of a methodology that was invented to simulate stroke directly, thereby facilitating a direct approach to developing strategies to alleviate this widespread clinical problem.

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**References**

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