Long-Term Prognosis of Vascular Hemiballismus

Aleksandar Ristic, MD; Jelena Marinkovic, MD; Nataša Dragaševic, MD; Dejana Stanisavljevic, MD; Vladimir Kostic, MD

Background and Purpose—The aim of this study was to prospectively evaluate the long-term prognosis of hemiballismus due to first-ever ischemic strokes.

Methods—A cohort of 27 patients with hemiballismus due to first-ever ischemic strokes was followed for a mean period of 30 months (range, 5 days to 150 months).

Results—During the follow-up period there were 11 deaths (44%). The survival rate was 85% (95% CI, 71% to 99%) at 6 months, 81% (95% CI, 65% to 97%) at 15 months, 51% (95% CI, 24% to 78%) at 36 months, and only 32% (95% CI, 4% to 60%) at 150 months. The survival rate free from recurrent stroke was 96% (95% CI, 87% to 100%) at 6 months, 91% (95% CI, 79% to 100%) at 12 months, 80% (95% CI, 61% to 99%) at 24 months, and 27% (95% CI, 0% to 71%) at 150 months.

Conclusions—The long-term prognosis of patients with vascular hemiballismus is similar to that of other stroke patients, ie, it follows the etiologic pattern of hemiballismus. (Stroke. 2002;33:2109-2111.)

Key Words: dyskinesias ■ recurrence ■ stroke, ischemic ■ survival

Hemiballismus is a relatively rare hyperkinetic disorder characterized by vigorous, irregular, poorly patterned, wide-amplitude movements of the limbs.1 The most consistent neuropathological finding in hemiballismus is a vascular lesion of the contralateral subthalamic nucleus.1 However, it occasionally occurs as a result of lesions outside the subthalamic nucleus.2 Despite the existing controversies, not a single study of the long-term prognosis of vascular hemiballismus has been reported thus far. Therefore, in the present study we evaluated the long-term prognosis of hemiballismus due to first-ever ischemic infarcts with respect to stroke recurrence rate and mortality rate.

Subjects and Methods

The study included, in a prospective registry, a cohort of 27 consecutive patients with hemiballismus as a first manifestation of cerebrovascular disease, diagnosed at our department from January 1987 to December 2000 (Table).

After stroke onset, subjects were followed daily during hospitalization and afterward were examined on an outpatient basis at 3- to 4-month intervals during the first year and every 4 to 6 months thereafter. To determine the occurrence of the primary end points, ie, death and recurrent vascular events, patients or family members were asked to report immediately to our department. During the recruitment period, three CT machines were used: Somatom H and Q (Siemens), Toshiba 9000S, and Somatom Plus 4 Power UFC (Siemens). In 20 of our 27 patients, additional MRI examinations were conducted (Magnetom SP63 4000; Siemens; 1.5 T).

Kaplan-Meier curves were used to estimate survival, survival free of recurrence, and probability of recurrence of stroke or other vascular events. The univariate analysis was performed with the log-rank test. Potentially significant independent factors were evaluated with Cox proportional hazards regression analysis with a forward stepwise procedure.

Results

Right-sided hemiballismus was recorded in 12 subjects, and left-sided hemiballismus was recorded in 15 patients. Infarct foci were accompanied by periventricular white matter lesions in only 5 patients.

All patients received haloperidol (≤10 mg/d) or a combination of haloperidol and diazepam (≤30 mg/d). If a beneficial response could not be elicited for 3 to 4 weeks, the therapy was replaced by clozapine. No response to the treatment was observed in 2 patients (7%), full recovery after 3 to 15 days was found in 15 patients (56%), and in 10 patients (37%) residual choreic movements persisted.

During a mean follow-up of 30 months (range, 5 days to 150 months; median, 18 months), 2 patients were lost to follow-up during the first month after the index stroke.

During the follow-up period there were 11 deaths (44%): 3 subjects died soon after the outset of hemiballismus (the first on day 5 of hypovolemic shock after duodenal ulcer bleeding, the second on day 10 of heart failure, and the third after 45 days of treatment-resistant vigorous movements, exhaustion, and acute myocardial infarction). Of the remaining 8 patients, 6 patients died during recurrent fatal strokes, 1 died of pulmonary edema, and 1 died of myocardial infarction. The survival rate was 85% (95% CI, 71% to 99%) at 6 months,
81% (95% CI, 65% to 97%) at 15 months, 51% (95% CI, 24% to 78%) at 36 months, and only 32% (95% CI, 4% to 60%) at 150 months. The median survival period was 1110 days (37 months) (95% CI, 619 to 1601) (Figure 1). We were not able to establish relationships between the lesion size or the risk factor profile and the survival time.

Univariate analysis identified only 2 variables that significantly predicted death: age (log rank 31.42, \( P = 0.0499 \)) and location of ischemic lesion in the region of the subthalamic nucleus (log rank 7.31, \( P = 0.0069 \)). Cox proportional hazards analysis confirmed infarct location in the subthalamic nucleus region as a variable that significantly predicted death (hazard ratio, 6.43; 95% CI, 1.39 to 29.54; \( P = 0.017 \)).

During the follow-up, at least 1 recurrent stroke or myocardial infarction occurred in 8 and 2 patients, respectively. If we analyze only the occurrence of a recurrent stroke, the survival rate free from recurrent stroke was 96% (95% CI, 87% to 100%) at 6 months, 91% (95% CI, 79% to 100%) at 12 months, 80% (95% CI, 61% to 99%) at 24 months, and 27% (95% CI, 0% to 71%) at 150 months (Figure 2).

**Discussion**

The prognosis of hemiballismus has been a matter of controversy. In the older literature it was generally thought to be poor, with inexorable progression to death within weeks or months.\(^3,4\) However, earlier studies were heavily weighted with autopsy-proven cases and thus biased toward more severely affected patients.\(^1\) Subsequent series, particularly those focused on patients with vascular hemiballismus, have shown that the prognosis is not necessarily as poor as has been believed and that the condition may have a benign course with spontaneous recovery,\(^2,5-7\) partly as a result of improvements in general medical care and specific pharmacotherapy.\(^1\) The survival rate in our study was 85% at 6 months, 81% at 15 months, 51% at 36 months, and only 32% at 150 months. The majority of our patients had lacunar strokes (77.7%) or multiple lacunes (14.8%). Salgado and colleagues\(^8\) prospectively evaluated a cohort of 145 consecutive patients with first-ever lacunar infarcts for a median period of 39 months. In their study the survival rate decreased steadily until the third year of follow-up, when it reached 88%, and was stable at 86% until the fifth year. Prencipe and colleagues\(^9\) followed a cohort of 332 patients with first-ever minor ischemic strokes for 10 years and found a mortality rate of 32%. Therefore, it has been concluded that patients with minor or lacunar stroke have a lower cumulative mortality rate than that of stroke patients taken as a whole.\(^10,11\) Stroke is associated with a very high risk of death in the acute and subacute phases\(^12\): in our study 3 of 11 deaths occurred in the first 45 days after stroke. In a recent study of long-term survival after stroke in a geographically defined region in Copenhagen County, Bronnum-Hansen and colleagues\(^12\) estimated cumulative risks for death at 28 days, 1 year, and 5 years after onset to be 28%, 41%, and 60%, respectively. Although the vast majority of our hemiballismus patients had

### Clinical Characteristics of Patients With Hemiballismus (n=27)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean±SD (range), y</td>
<td>68±9.2 (45–82)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
</tr>
<tr>
<td>Lacunar stroke</td>
<td>21 (78%)</td>
</tr>
<tr>
<td>Nonlacunar stroke</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>Multiple lacunes</td>
<td>4 (15%)</td>
</tr>
<tr>
<td>Location of infarct</td>
<td></td>
</tr>
<tr>
<td>Subthalamic nucleus</td>
<td>4 (15%)</td>
</tr>
<tr>
<td>Outside subthalamic nucleus</td>
<td>23 (85%)</td>
</tr>
<tr>
<td>Risk factors</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>16 (59%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>7 (26%)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>6 (22%)</td>
</tr>
<tr>
<td>Cigarette smoking</td>
<td>10 (37%)</td>
</tr>
<tr>
<td>History of myocardial infarction</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>Previous transient ischemic attacks</td>
<td>5 (19%)</td>
</tr>
<tr>
<td>Intensity of ballistic movements</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>8 (30%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>12 (44%)</td>
</tr>
<tr>
<td>Severe</td>
<td>7 (26%)</td>
</tr>
</tbody>
</table>

Values are number of patients.

![Figure 1. Kaplan-Meier survival curve.](image1)

![Figure 2. Kaplan-Meier curve of survival free from stroke recurrence.](image2)
lacunar infarctions (Table), our estimates are closer to the estimates for stroke patients taken as a whole.

At least 1 recurrent stroke or myocardial infarction occurred in 8 and 2 patients, respectively. The survival rate free of recurrent stroke was 91% at 12 months and 80% at 24 months (Figure 2). Our results are in concert with reports of other authors in which the risk of recurrence was 25% to 37% in the 5 years after stroke. Salgado and colleagues focused on first-ever lacunar stroke and found a cumulative risk of stroke recurrence of 14% at 24 months and 28% at 60 months, which is lower than in our study.

In conclusion, the long-term prognosis of patients with hemiballismus due to first-ever ischemic stroke is not specifically determined by the very nature of the clinical manifestations of this rare type of involuntary movements. Instead, the long-term prognosis is similar to that of other stroke patients, ie, it follows the etiologic pattern of hemiballismus.

References
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