Seizures Associated with Spontaneous Subarachnoid Hemorrhage

M.B.M. Sundaram and F. Chow

ABSTRACT: We analysed the charts of 131 consecutive cases of spontaneous subarachnoid hemorrhage — without arteriovenous malformations — for seizures. Convulsions occurred in 31 patients (24%) and most often within 24 hours of bleeding. Motor manifestations of partial seizures were of no lateralizing value to aneurysm site. Early mortality, rebleeding and intracerebral hematoma were similar in both seizure and non-seizure groups. Late seizures were infrequent in survivors who had suffered seizures in the acute stage — thus questioning the necessity for routine, long term prophylactic anticonvulsants in these patients.

METHODS

Spontaneous subarachnoid hemorrhage (SSH) is a common neurological disorder and accounts for approximately 10% of all strokes. Complications such as rebleeding, vasospasm and hydrocephalus are well recognized and there is extensive literature on these topics. However, the subject of seizures in SSH has not attracted as much attention. Pioneer monographs and more recent large studies on SSH fail to discuss seizures in detail or make only brief comments on this complication. This is particularly evident for SSH not associated with arteriovenous malformations (AVM). We are aware of only 6 reviews in world literature (4 English, 1 Serbo-Croatian and 1 Chinese), about seizures in SSH of non-AVM etiology. In this paper, we analyse the following aspects: i) incidence, type and time of seizures, ii) seizure laterlizing value for aneurysm site, iii) could intracerebral hematoma cause seizures, iv) do seizures affect early rebleeding and mortality and v) the need for long-term prophylactic anticonvulsants for patients who have suffered seizures in the acute stage.

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cerebral hematoma was ascertained from CT and autopsy findings. Data from non-seizure group were used as “control” for comparison with seizure group.

RESULTS

131 consecutive patients seen during the 67 month study period were included in the study (55 males and 76 females; mean age 49 years, range 1 to 81 years). CT scan of the brain was available in 121 cases and CSF examination was performed in 37 (of these, 31 had CT examination as well). Cerebral angiograms were done in 104 patients. In 2 patients, the diagnoses were obtained exclusively from autopsy. Aneurysmal bleeding was the most common cause of SSH (Table 1). Patients surviving 4 weeks or more after hemorrhage were followed for a mean period of 23 months (range: 2 to 70 months).

Table 1: Etiology of Subarachnoid Hemorrhage

<table>
<thead>
<tr>
<th>Non-seizure Group</th>
<th>Seizure Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aneurysms</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Unknown</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>Bleeding diatheses</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>31</td>
</tr>
</tbody>
</table>

Seizures occurred in 31 (15 males, 16 females) of the 131 patients (24%); they were partial or without secondary generalization in 16 and apparently generalized from the onset in 15. Motor manifestations of partial seizures — e.g. head turning, stiffening and clonic movements of limbs — did not always correlate with lateralization of aneurysm location. Eleven patients had a single isolated seizure and the remaining 20 each had 2 or more seizures.

Seizure onset was within 2 weeks of hemorrhage (early seizures) in 26 of 31 patients. In 19 of these, convulsions were noted within 24 hours of bleeding and in another two, between 24 and 48 hours (Table 2). Only 2 patients with early seizures continued to have attacks beyond 4 weeks.

Table 2: Time of Seizures in Relation to Subarachnoid Hemorrhage

<table>
<thead>
<tr>
<th>i. Early Seizures (within the first 2 weeks) = 26 (20%)</th>
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<tbody>
<tr>
<td>less than 24 hours of bleeding — 19</td>
</tr>
<tr>
<td>24 to 48 hours — 2</td>
</tr>
<tr>
<td>48 hours to 1 week — 3</td>
</tr>
<tr>
<td>1 to 2 weeks — 2</td>
</tr>
<tr>
<td>ii. Delayed Seizures (1st seizure more than 2 weeks after hemorrhage) = 5 (4%)</td>
</tr>
</tbody>
</table>

Of twenty-six patients with early seizures, 23 had convulsions in relation to the first bleed and 3 with rebleeding. Those who had convulsions with the first bleed did not have seizure recurrence with rebleeding.

Nine patients from the early seizure group of 26 died within 4 weeks of hemorrhage (35%) — a mortality rate similar to that for non-seizure patients (41%).

Delayed seizures (onset beyond 2 weeks) were noted in 5 cases. The total number of seizures per patient during follow-up ranged from 2 to 4. There was no evidence of rebleeding at the time of seizures in any of these 5 patients.

The incidence of rebleeding and intracerebral hematoma within 4 weeks of hemorrhage did not differ between patients with and without seizures.

As will be seen from Table 3, infratentorial aneurysms were not associated with seizures; commonly occurring supratentorial aneurysms were represented in the seizure group without any particular site predilection.

Table 3: Locations of Aneurysms

<table>
<thead>
<tr>
<th>Seizure Group</th>
<th>Non-Seizure Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>An. COMM</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>M. CEREBRAL</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>P. COMMUNICATING</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>I. CAROTID</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>A. CEREBRAL</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>OPHTHALMIC</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>VERTEBROBASILAR</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>OTHERS</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Details of anticonvulsant therapy were available for 15 of the 17 survivors (beyond 1 month) in early seizure group; 8 were on prophylactic long-term anticonvulsants and one among them had single tonic-clonic seizure 8 months following bleeding; 7 were not given prophylactic long-term anticonvulsants and one of them had several partial motor seizures in a single day, 4 months after bleeding. None of the 5 cases from delayed seizure group was on prophylactic anticonvulsant at the time of first seizure.

Among the 59 survivors (beyond 1 month) of 100 non-seizure patients, 13 were placed on prophylactic anticonvulsants and the medications were continued for more than 3 months in only 5 patients (for 4 months in 1, for 5 months in 2 and for 8 months in 2).

DISCUSSION

Overall Seizure Incidence

Previous studies on aneurysmal subarachnoid hemorrhage have quoted an incidence of seizures from 3% to 26%. However, most of them included only early or late seizures and some were limited to those undergoing surgery. Hart et al. — analysing both early and late seizures in an unselected non-AVM population — observed seizures in 26% a figure similar to ours and likely represents accurate overall seizure incidence.

Early Seizures

We have shown that seizures in SSH of non-AVM etiology occur most often within the first 24 hours of hemorrhage. In contrast, convulsions in bleeding AVM are more common prior to hemorrhage and occur in approximately 10 to 31% of cases. However, patients with AVM rarely have seizures at or closely after the hemorrhage — occurring in only 2 of 549 cases studied by Perret and Nishioka.

Our findings also show that early seizures do not reliably predict long-term recurrence in survivors and such late convul-
sions are infrequent when they do occur. This has important therapeutic implications (see below).

Late Seizures

Four percent incidence of new seizures in survivors beyond 1 month in our study and that by Hart et al is lower than the 10-11% found by other authors — the difference may be explained by their longer follow-up. Rose and Harner, for example, observed that 10% incidence of late seizures noted from charts increased to 15% when survivors were brought back to a follow-up clinic.

Previous studies on late seizures do not specify the frequency of convulsions per patient. This appears to be low, totalling 2 to 4 attacks per patient with treatment during the mean 23 months follow-up in our patients.

Pathogenesis of seizures

This remains speculative and likely multifactorial. However, certain observations can be made from our study and review of previous literature. The high incidence of seizures within 24 hours of hemorrhage (19 of our 26 cases with early seizures) suggests that direct irritation of the cerebral cortex by blood could be one of the major factors responsible for early seizures. Vasospasm appears etiologically less important, as this complication occurs usually around 4 to 7 days after hemorrhage. That intracerebral hematoma occurred equally often among seizure and non-seizure patients, makes it an unlikely etiologic factor. Rose and Harner and Cabral et al observed that patients with middle cerebral artery aneurysms were more likely to suffer from seizures but we were unable to confirm this.

Late seizures are likely related to a number of factors including infarction and operative trauma. These and other factors like residual hemosiderin should be addressed further by controlled prospective clinical and autopsy studies.

Long term anticonvulsants

Seizures during follow-up are said to be “infrequent” and “easy to control”. Seizure recurrence following early seizures and number of convulsions in each patient, in our study, were low; when they did recur, there were equal numbers of cases from prophylactically treated and untreated groups. Although our numbers are small, these observations question the necessity for routine prophylactic long term anticonvulsants in patients with early seizures: we feel that such therapy could be initiated when seizures occur during follow-up and are recurrent.

REFERENCES