Hypertensive Putaminal Hemorrhage: Treatment and Results. Is Surgical Treatment Superior to Conservative One?

SHIRO WAGA, M.D., D.M.Sc., AND YOSHIKUKI YAMAMOTO, M.D.

SUMMARY Seventy-four patients with hypertensive putaminal hemorrhage (HPH) were followed at least 6 months after treatment and estimated by ADL. They were graded according to the state of consciousness on admission. The grading consists of 6 grades: Grade 1, fully conscious; Grade 2, somnolent; Grade 3, stuporous; Grade 4, semi-comatose; and Grade 5, deeply comatose. Removal of HPH was performed in 18 patients and conservative treatment was done in 56 patients. The mortality in surgically treated group was 28% while that in conservatively treated group was 14%. The patients who returned to full work or independent life without disability and with minimal disability after surgical treatment were, 50% in Grade 1, 33% in Grade 2, and 50% in Grade 3. The patients without disability and with minimal disability after conservative treatment were; 87% in Grade 1, 80% in Grade 2, and 22% in Grade 3. None below Grade 4 returned to full work or independent life in both groups. There was good correlation between the state of consciousness and CT findings on admission. There was no correlation between good recovery and the side of HPH. Our results do not support the view that the surgical treatment is superior to the conservative one in the management of HPH.

THE OPTIMAL FORM OF TREATMENT for patients who have suffered hypertensive putaminal hemorrhage (HPH) remains controversial and undetermined even after the advent of computed tomography (CT).1-7 While some neurosurgeons consider that HPH should be treated surgically, others conclude that it should be treated conservatively. Most Japanese neurosurgeons believe that the surgical treatment gives better results.8-17 In this report we represent our experience on HPH and discuss whether the surgical treatment gives better results.

Material and Method

From 1977 to 1980, 121 patients with hypertensive intracerebral hemorrhage were admitted to Mie University Hospital. It is a referral hospital located in the rural area of the middle of Japan. According to Fisher,8 the patients with hypertensive intracerebral hemorrhage are divided into 5 groups; in our series 74 patients (61%) were putaminal hemorrhage, 21 patients (17%) were thalamic hemorrhage, 14 patients (12%) were cerebral subcortical, 10 patients (8%) were cerebellar, and 2 (2%) were pontine hemorrhage. Surgical treatment, that is, evacuation of hemorrhage, was performed in 24% of putaminal hemorrhage, 36% of cerebral subcortical, and 50% of cerebellar hemorrhage. None with thalamic and pontine hemorrhage had evacuation of hemorrhage (table 1).

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The charts of all the patients with HPH were reviewed and the follow-up results at least 6 months following treatment were obtained by direct examination of the patients, telephone call to the surviving patients and/or family, or inquiry.

Cooperative study for hypertensive intracerebral hemorrhage in Japan has proposed Neurological Grades, computed tomographic classification and ADL of HPH as in table 2.15 In table 2 we discuss only the treatment and results of HPH. There were 74 patients with HPH. Surgical treatment was performed only in 18 patients (24%) and conservative treatment was performed in 56 patients (76%). Selection of patients was as follows: those who were admitted in 1977 were all treated surgically and those who were admitted from 1978 to 1980 were all treated conservatively. In the surgically treated group the average age of patients was 52 years, ranged from 31 to 69, and 11 were male and 7 were female. In the conservatively treated group the average age was 55, ranged from 46 to 65, and 35 were male and 21 were female. Fifty-two patients (70%) were admitted to the hospital within 24 hours of the onset of the ictus and 22 patients (30%) were admitted 2 to 4 days after the onset. Sixty-seven patients (91%) were admitted and evaluated within 48 hours from the onset. All the patients were diagnosed by CT and showed typical putaminal hemorrhage. None had cerebral angiography. Atypical putaminal hemorrhage was excluded from this study. Conservative treatment does not mean "doing nothing". It includes (1) intensive care of vital signs, especially control of hypertension, (2) management of increased intracranial pressure and cerebral edema, (3) adequate care of lung, kidney and skin, and
TABLE 1  Surgical and Conservative Treatment for Hypertensive Intracerebral Hemorrhage

<table>
<thead>
<tr>
<th>Location</th>
<th>Surgical</th>
<th>Conservative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Putaminal</td>
<td>74</td>
<td>18 (24%)</td>
</tr>
<tr>
<td>Thalamic</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>Subcortical</td>
<td>14</td>
<td>5 (36%)</td>
</tr>
<tr>
<td>Cerebellar</td>
<td>10</td>
<td>5 (50%)</td>
</tr>
<tr>
<td>Pontine</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>28 (23%)</td>
</tr>
</tbody>
</table>

(4) administration of appropriate amount of fluid, electrolytes and nutrient.

TABLE 2a  Neurological Grades for Hypertensive Intracerebral Hemorrhage

<table>
<thead>
<tr>
<th>Neurological grade</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>alertness or confusion</td>
</tr>
<tr>
<td>2</td>
<td>somnolence</td>
</tr>
<tr>
<td>3</td>
<td>stupor</td>
</tr>
<tr>
<td>4-a</td>
<td>semicoma without herniation signs*</td>
</tr>
<tr>
<td>4-b</td>
<td>semicoma with herniation signs</td>
</tr>
<tr>
<td>5</td>
<td>deep coma</td>
</tr>
</tbody>
</table>

*Herniation signs include uni- or bilateral mydriasis, no reaction to light and decorticate or decerebrate rigidity.

TABLE 2b  CT Classification for Putaminal Hemorrhage

<table>
<thead>
<tr>
<th>Type</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>extra-capsular localized</td>
</tr>
<tr>
<td>II</td>
<td>Ca extended to the anterior limb</td>
</tr>
<tr>
<td>III-a</td>
<td>Ca without V extended to the posterior limb</td>
</tr>
<tr>
<td>III-b</td>
<td>Ca with V extended to the anterior and posterior limbs</td>
</tr>
<tr>
<td>IV-a</td>
<td>Ca + p without V extended to the anterior and posterior limbs</td>
</tr>
<tr>
<td>IV-b</td>
<td>Ca + p with V</td>
</tr>
<tr>
<td>V</td>
<td>Th extended to the thalamus or subthalamus</td>
</tr>
</tbody>
</table>

TABLE 3  Mortality in Surgically and Conservative Treated Groups of Hypertensive Putaminal Hemorrhage

<table>
<thead>
<tr>
<th>Neurological grade</th>
<th>Surgical</th>
<th>Conservative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>10 (1) (10%)</td>
</tr>
<tr>
<td>4-a</td>
<td>4 (2) (50%)</td>
<td>5 (3) (60%)</td>
</tr>
<tr>
<td>4-b</td>
<td>3 (2) (67%)</td>
<td>5 (3) (60%)</td>
</tr>
<tr>
<td>5</td>
<td>1 (1) (100%)</td>
<td>1 (1) (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>18 (5) (28%)</td>
<td>56 (8) (14%)</td>
</tr>
</tbody>
</table>

P = 0.0132.

Results

The mortality, death within a month, after surgical treatment was 28%. There was no operative death in patients with Neurological Grade 1 to 3. The mortality was 50% in patients with Grade 4-a, and 67% in those with Grade 4-b. The mortality after conservative treatment was 14%. There was no mortality in patients with Grade 1 and 2. The mortality in patients with Grade 3 was 10%; it was 60% in those with Grade 4-a and 4-b. In Grade 5 all the patients died within a month (table 3). The mortality after conservative treatment was statistically significantly less than that after surgical treatment (P < 0.05). Causes of death included brain death, gastrointestinal hemorrhage, pulmonary complications, and cardiac and renal failure.

The follow-up results 6 months after treatment were analyzed (tables 4 and 5). In the group of conservatively treated patients (table 4), 34% of patients was in full work or lived independently without disability and 26% was in full work or lived independently with minimal disability. Fourteen percent of patients was partially disabled; 8% was totally disabled. The patients who belonged to these subgroups required constant assistance in living whether partial or total. And 18% was dead. Good recovery means that the patients get to ADL 1 and 11, that is, coping with independent daily lives. The results depended upon the Neurological Grade on admission. In Grade 1 patients 87% showed good recovery. In Grade 2 patients 80% showed good recovery. In Grade 3 patients only 22% showed good recovery, and in those below Grade 4 there was none with good recovery.

TABLE 4  Correlation Between Neurological Grading at Admission and ADL. Six months Following Conservative Treatment (n = 50).

<table>
<thead>
<tr>
<th>Neurological grade</th>
<th>ADL</th>
<th>Died</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I (12) (52%)</td>
<td>II (8) (35%)</td>
<td>III (2) (9%)</td>
</tr>
<tr>
<td>2</td>
<td>3 (30%)</td>
<td>5 (50%)</td>
<td>1 (10%)</td>
</tr>
<tr>
<td>3</td>
<td>2 (22%)</td>
<td>3 (33%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td>4-a</td>
<td>4 (25%)</td>
<td>3* (75%)</td>
<td>4</td>
</tr>
<tr>
<td>4-b</td>
<td>3* (100%)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1 (100%)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17 (34%)</td>
<td>13 (26%)</td>
<td>7 (14%)</td>
</tr>
</tbody>
</table>
Table 5 shows the 6 months follow-up results after surgical treatment. Although the number of patients was few, it shows that only 23% of patients got back to full work or independent life without disability and only 8% to full work or independent life with minimal disability. Forty-six percent of patients was partially disabled, 8% was totally disabled, and 15% was dead. Fifty percent of patients with Neurological Grade 1 on admission showed good recovery. Only 33% in those with Grade 2 and 50% in those with Grade 3 gained good recovery. In patients below Grade 4 on admission none showed good recovery.

Six months follow-up results after surgical treatment were not better than those after conservative treatment. It seems that the conservative treatment is superior to the surgical one in patients with Grade 1 and 2. However, there was no statistically significant difference between these 2 groups (fig. 1).

Neurological Grades on admission and CT classification, proposed by Cooperative Study for hypertensive intracerebral hemorrhage in Japan, were well correlated as shown in figure 2. The worse the Neurological Grade on admission, the more advanced CT types were observed. The relationship between CT classification and ADL 6 months following treatment was not clear (fig. 3).

Correlation between good recovery and the side of HPH was studied. In conservatively treated group 64% of patients with right sided hemorrhage and 57% of those with left sided hemorrhage showed good recovery. In the surgically treated group, although the number of patients was few, 25% of patients showed good recovery in the right sided and in the left sided HPH, respectively. There was no correlation between good recovery and the side of HPH.

In figure 4, we compare our results of conservative treatment with those of Cooperative study for hypertensive intracerebral hemorrhage in Japan. The surgically treated group in the Cooperative study does not give better results than those of our conservative treatment. There is no statistically significant difference, however. Our study showed that the surgical treatment for HPH was not superior to the conservative one.

Discussion

Although hypertensive intracerebral hemorrhage may be divided into 2 groups, lobar and nuclear, or capsular and deep, or into 4 groups; nuclear, paranuclear, paraventricular and subcortical, classification of Fisher have been used by many investigators. Putaminal hemorrhage is most
common and in the clinical series the incidence of HPH ranges from 51 to 55%, \(^{1,4,15}\) while it ranges from 64 to 81% in the autopsy series. \(^{26,27}\) In our series HPH forms 61%. HPH may be further subdivided into 3 subgroups; hemorrhage in the anterior, mid-, and posterior putamen; \(^{13,28,29}\) and hemorrhage in the posterior half of the putamen or seen at the level of the bodies of the lateral ventricles on CT does not indicate good improvement. \(^{3,14,30}\) Cook et al \(^{15}\) and Benes et al \(^{31}\) divided the hemorrhage into 2 groups: Group A was defined as apoplectic event with marked neurological deficits and group B as apoplectic event with moderate or mild neurological dysfunction. The patients who belonged to group A did not improve after surgery and those who belonged to group B improved considerably. They said that the latter would continue to improve and recover without surgery. In their autopsy study, Kane and Aronson \(^{32}\) reported that in their 192 autopsy cases with spontaneous intracerebral hemorrhage, there were 147 cases with lethal form of hemorrhage (77%) and 45 cases with nonlethal prior hemorrhage (23%).

Evacuation of HPH is performed in order to remove the hemorrhage as a life-saving procedure, to lessen the increased intracranial volume, and to decrease the intracranial pressure and perifocal edema. \(^{8-17,21-23,33-37}\) Ransohoff et al \(^{33}\) and Gillingham and Satyanarayana \(^{4}\) have described that, if they look at the results of surgery in the lower conscious level, what is gained by operation with respect to reduction of mortality is lost by increased and severe morbidity. According to Janny et al, \(^{1}\) the reductions in intracranial pressure after evacuation of intracerebral hematoma were not statistically different from those in patients treated conservatively. In the Study of Papo et al, \(^{2}\) the patients suffering hypertensive intracerebral hemorrhage with no disturbance of consciousness showed normal or slightly elevated intracranial pressure, while most patients in deep coma exhibited high intracranial pressure with a tendency to rise further no matter what treatment was used, and in patients with intermediate state no definite correlation was found between intracranial pressure, clinical condition, and outcome. Duff et al \(^{3}\) suggested that intracranial pressure monitoring could improve the outcome of conservatively treated patients with intracerebral hematoma.

Perifocal low density area around the HPH on CT does not always indicate cerebral edema. \(^{38-42}\) Dolinskas et al \(^{40,41}\) showed that the peak density for the hemorrhage decreased by 0.7 ± 0.3 EMI unit per day and that the dense portion of the hemorrhage decreased in size by average of 0.65 ± 0.32 mm per day. Narrow low density ring may be due to contraction of the original clot and absorption of blood. \(^{42}\) Although ventricular rupture of HPH was reported to give poor prognosis, \(^{25,43,44}\) some authors pointed out that intraventricular spread did not worsen the prognosis, which depended upon the size of the original hemorrhage. \(^{42,45,46}\)

There is no consensus of opinion on the treatment of HPH. \(^{4,7,19-23,31-37}\) While some neurosurgeons consider that HPH should be treated surgically, others conclude that it should be treated conservatively. Most Japanese neurosurgeons believe that the surgical treatment gives better results. \(^{8-17}\) The outcome of coma soon after the onset of the hemorrhage is associated with very poor prognosis in the great majority of patients, although there are some reports including satisfactory outcome of only a few patients. \(^{4,8-19,20,26,33,32}\) Some authors reported that age of the patients had little influence on the outcome. \(^{19,33,34}\) but many thought that in patients over 55 or 60 years satisfactory improvement was undoubtedly more unlikely. \(^{3,4,9,11,12,14,15,17,21-23}\) Timing of surgery has also been controversial. Some recommended early surgery, \(^{9,17}\) while others have indicated a preference for delay in evacuation for 2 to 7 days after the onset, and the patients who developed gradual onset of symptoms and gradually progressing neurological deficits have a better prognosis after surgery. \(^{4,21,22,24,31,34,47}\) Cuatico et al \(^{19}\) and Benes et al \(^{32}\) have stated that operative treatment of the hemorrhage that crushes the surrounding brain tissue does not improve the results.

The surgical removal of HPH may save the life of the patients and may give a good outcome in selected cases, while the removal may not improve the results and may only prolong existence in a vegetative state. Thus the criteria for selection of patients for surgery must be strict and must include a judgement as to whether the surgery can expect the best outcome. Surgery must be recommended only if the quality of survival is acceptable to the patients, to the family and to the society under the best circumferences. \(^{3,7}\)

Cooperative study for hypertensive intracerebral hemorrhage in Japan \(^{15}\) gave the following results as shown in figure 4; following the surgical treatment, good recovery (ADL 1 and 11) was obtained in 83% of patients with Neurological Grade 1, 59% of those with Grade 2, 33% of those with Grade 3, 47% of those with Grade 4-a and 2% of those with Grade 4-b. These results are not better than those of our conservative treatment.

Our study shows that the results of treatment of HPH
do not depend upon the surgical treatment but depend upon the size and extension of the original hemorrhage. The size and extension of the hemorrhage correlate well with Neurological Grade on admission. The larger the hemorrhage, the worse the Grade on admission and the prognosis in the follow-up study. Surgical treatment does not change the situation. The results support the conclusion report by McKissock et al.\(^1\) and others.\(^1, 6, 31, 32, 47, 49-52\)

**Conclusion**

Our study indicates that the surgical treatment is not superior to the conservative one in the management of HPH. The surgical and conservative treatment gives the same results. The larger the HPH, the worse the clinical state on admission and the prognosis in the follow-up study. The surgical treatment does not change the situation.

**Acknowledgments**

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Clinicopathological Study of Pontine Hemorrhage

KENJI NAKAJIMA, M.D.

SUMMARY This report concerns a clinicopathological study of 60 patients afflicted with primary pontine hemorrhage. The illness was fatal in 43, 17 patients survived. Ophthalmic signs, autonomic disturbances and transient visual hallucination were observed and discussed. A ruptured microaneurysm within the border of a pontine hematoma was detected in this study, and in the first report of such a finding.

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REPORTED SERIES of pontine hemorrhage published between 1951 and 1968 described its incidence as varying from 6-22% of intracerebral hemorrhage. 1-4 Most of these reported cases were fatal; recent reports utilizing the CT scan for diagnosis have indicated that some cases of pontine hemorrhage may show good recovery. 5-8 This report consists of a clinical and pathological analysis of 60 patients in whom survival occurred in 28.3%.

Clinical Material and Methods

A retrospective review of intracerebral hemorrhage was conducted in the Research Institute for Brain and Blood Vessels in Akita. The diagnosis of pontine hemorrhage was confirmed by autopsy, by evacuation of the hematoma (one patient) or by CT scanning; in the absence of this confirmatory evidence patients were not included even though strongly suggested from neurological symptoms and angiographic findings.


Clinical Manifestations

The clinical pictures are summarized in table 1 and 2. Forty-three of 60 patients died. Twenty-four were diagnosed before the availability of CT; all of these patients fell into coma within 6 hours after the onset and all died. The remaining 36 patients were diagnosed subsequent to the availability of the CT scanner; 19 patients died and the remaining 17 are alive, one patient in a state of coma vigils, while the remaining 16 surviving patients are well. In fatal cases, severe disturbance of consciousness, headache, vertigo, motor disturbance and vomiting were the main symptoms at onset. Severe disturbance of consciousness was never observed in non-fatal cases; they were featured by motor disturbance, headache and vertigo.

Ninety-three percent of fatal cases fell into coma
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