guanfacine on drinking and ambulation in spontaneously hypertensive rats. Pharmacol Biochem Behav 17: 519-522, 1982

Nationwide Co-Operative Study of Intracranial Aneurysm Surgery in Japan

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SUMMARY A cooperative study was made of 4750 intracranial aneurysm cases collected from 133 neurosurgical clinics in Japan by letter inquiry for the period of 2 years from January 1974 to December 1975. Among them, 4124 cases (87%) had a single aneurysm, and 626 cases (13%) had multiple ones. Direct radical surgery was done in 78% of all cases, carotid ligation in 2% and non-surgical treatment in 17%. Direct surgery resulted in a mortality rate of 15% for ruptured aneurysm cases and 7% for nonruptured cases. Radical surgery within 24 hours after rupture had a mortality of 51%, while those within 1 week and 2 weeks were 39% and 30% respectively; grade I or II patients, however, showed much better surgical results even in early operations. The neurosurgical clinics included in this study were spread throughout most of Japan. Micro-surgical technic was already in use of aneurysm surgery at the time of this study in Japan.

A NATIONWIDE COOPERATIVE STUDY was made by the Research Committee for Vascular Disorders of the Central Nervous System sponsored by the Ministry of Health & Welfare of Japanese Government from April, 1974 to March, 1977. The Committee consisted of the following members: the chairman was Prof. Katsutoshi Kitamura of Kyushu University and all other members are listed at the end of this article. This first three authors were mostly engaged in a clinical statistical survey of aneurysm cases.

Clinical Materials and Methods

The study was made by letter inquiry and 4750 cases were collected from 133 neurosurgical clinics. The cases were admitted during the two years from January
TABLE 1  Sex Distribution

<table>
<thead>
<tr>
<th></th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2311</td>
</tr>
<tr>
<td>Female</td>
<td>2395</td>
</tr>
<tr>
<td>Omission</td>
<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>4750</td>
</tr>
</tbody>
</table>

Male/female = 1/1.04.

In 1974 to December 1975. Clinics included not only university clinics, but also those of training hospitals approved by the Japan Neurosurgical Society. Micro-neurosurgical technic had already been introduced in most of these clinics at the time of the study.

Results

As this survey was made by letter inquiry with forms designed by the Committee, there were some inadequate or missed descriptions, the numbers of which are shown as "omission" in the figures and tables.

The total number of the aneurysm cases was 4750. The male-female ratio was 1:1.04 (table 1), and the age distribution showed the highest peaks in the fifth and sixth decades (fig. 1). The sites of the total 5211 aneurysms were as follows: 28% at the anterior communicating artery, 24% at the middle cerebral and 22% at IC-PC junction, while only 5% were seen in the posterior circulation (table 2). Single aneurysm cases were 87% and multiple cases were 13% (table 3).

The treatment of aneurysms is shown in table 4. 3682 cases or 78% of total cases were approached by direct surgery, while 806 cases or 17% were treated non-surgically. Carotid ligation was done in 84 cases (2%), among which 73 cases underwent extracranial (cervical) ligation and 11 cases intracranial. Radical operation means various technics of aneurysmal attack by direct approach as shown in table 5.

The results of treatment in the total of 4265 cases are shown in table 6 and figure 2. The mortality rate of radical operation was 15% in ruptured aneurysm cases and 7% in non-ruptured cases. A high mortality rate was noted in cases of removal of hematoma only, ventricular drainage only and shunt only. Non-surgical cases also had a high mortality. Cases which did not receive radical surgery were considered to be poor risk patients.

The results of radical surgery and non-surgical treatment in relation to Hunt's grading are compared in figure 3. The grades were evaluated on admission in

TABLE 2  Site of Aneurysms

<table>
<thead>
<tr>
<th>Site</th>
<th>No. of cases</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AComA</td>
<td>1472</td>
<td>(28)</td>
</tr>
<tr>
<td>MCA</td>
<td>1251</td>
<td>(24)</td>
</tr>
<tr>
<td>IC-PC</td>
<td>1166</td>
<td>(22)</td>
</tr>
<tr>
<td>IC (other)</td>
<td>605</td>
<td>(12)</td>
</tr>
<tr>
<td>Distal ACA</td>
<td>440</td>
<td>(9)</td>
</tr>
<tr>
<td>V-B</td>
<td>246</td>
<td>(5)</td>
</tr>
<tr>
<td>Others</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5211</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

TABLE 3  Multiplicity of Aneurysms

<table>
<thead>
<tr>
<th>Multiplicity</th>
<th>No. of cases</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>4124</td>
<td>(87%)</td>
</tr>
<tr>
<td>Multiple</td>
<td>626</td>
<td>(13%)</td>
</tr>
<tr>
<td>Total</td>
<td>4750</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

TABLE 4  Treatment of Aneurysms

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Radical operation</td>
<td>3682 (78%)</td>
</tr>
<tr>
<td>2) Carotid ligation</td>
<td>84 (2%)</td>
</tr>
<tr>
<td>3) Ventricular drainage only</td>
<td>123 (3%)</td>
</tr>
<tr>
<td>4) Removal of hematoma only</td>
<td>19 (—)</td>
</tr>
<tr>
<td>5) Shunt only</td>
<td>36 (—)</td>
</tr>
<tr>
<td>6) Non-surgical treatment</td>
<td>806 (17%)</td>
</tr>
<tr>
<td>Total</td>
<td>4750 (100%)</td>
</tr>
</tbody>
</table>

TABLE 5  Classification of Radical Operation

<table>
<thead>
<tr>
<th>Classification</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>I) Neck clipping or ligation</td>
<td>3330 (90%)</td>
</tr>
<tr>
<td>II) Wrapping or coating</td>
<td>522 (14%)</td>
</tr>
<tr>
<td>III) Trapping</td>
<td>69 (2%)</td>
</tr>
<tr>
<td>IV) Resection of aneurysm</td>
<td>62 (2%)</td>
</tr>
<tr>
<td>Total</td>
<td>3682 (100%)</td>
</tr>
</tbody>
</table>

In some cases, single and/or multiple aneurysms were managed by more than one approach.
Results of Treatment

<table>
<thead>
<tr>
<th>Procedure</th>
<th>%</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radical operation (ruptured aneurysm)</td>
<td>67</td>
<td>12</td>
</tr>
<tr>
<td>Radical operation (non-ruptured aneurysm)</td>
<td>53</td>
<td>35</td>
</tr>
<tr>
<td>Carotid ligation</td>
<td>71</td>
<td>15</td>
</tr>
<tr>
<td>Non-surgical treatment</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>12</td>
</tr>
</tbody>
</table>

FIGURE 2. Results of treatment of total 4265 aneurysm patients.

non-surgical cases and on the preoperative day in radical surgical cases. Non-surgical cases had a higher mortality rate even in the same grades compared with surgical cases. The authors postulate that non-surgical cases often took a downhill course after admission due to complications such as vasospasm, acute hydrocephalus and rerupture, so that surgical intervention was not possible. However, the authors could not analyse the reason for this difference due to the lack of data in this study.

The interval from the last attack of aneurysmal rupture to radical surgery is demonstrated in table 7, and the surgical results are classified by the timing of radical surgery in figure 4. The mortality rate of radical surgery within 24 hours after rupture was as high as 51% in 144 cases in all grades, and gradually decreased as the time lapsed, thus the mortality rate of within-1-week and -2-weeks surgery was 39% and 30% respectively.

Figure 5 shows the surgical results divided by grades from I to V as well as by the timing of surgery. Even in cases of early surgery within 24 hours or one week, grade I and II, or good risk patients demonstrated a not-too-high mortality. As the grade advances, the mortality becomes higher. Surprisingly, many grade IV and V, or poor risk patients, received radical surgery, some of which was combined with removal of hematoma.

Discussion

The present nation-wide cooperative study was made by letter inquiry to almost all neurosurgical clinics in Japan on intracranial aneurysm cases admitted during the two years of 1974 and 1975. Microneurosurgical technic had already been introduced to most clinics at the time of this study. Though there were a few omissions in filling the forms of inquiry, the authors believe the statistical study clarifies the reality of aneurysm surgery at that time in Japan. Analysis of a total of 4750 cases did not reveal too much difference in the male-female ratio, the age distribution, the site of aneurysms and the single-multiple ratio from those reported hitherto in the literature.

The statistical study was characterized by the high mortality rate of early direct surgery in poor risk patients, i.e. 51%, 39% and 30% in within-24 hours, 1 week and 2 weeks respectively. Among 2908 cases of radical surgery or ruptured aneurysms, 962 cases were operated within two weeks, 532 within one week and 144 within 24 hours after rupture, thus early surgery seems more common at this period in Japan. In addition, the number of radical surgical cases of poor risk patients also seems greater i.e. 221 cases of grade IV and 61 cases of grade V. The patients family usually ask and force neurosurgeons to do 'anything possible' for poor risk or downhill patients in Japan. The authors surmise that this is the reason why Japan neurosurgeons venture to perform early surgery in seriously ill cases. However, early surgery in good risk cases showed more favourable results.

There have been many reports of good results for...
early aneurysm surgery. However, in regard to unselected aneurysm cases and randomly chosen clinics supplying average neurosurgical treatment, the present study provides basic data for Japan during the period 1974–1975. As new statistical studies of intracranial aneurysm have been attempted recently both within Japan and overseas, the results of this statistical cooperative study are published in spite of the fact that the data is a little old.

The authors are indebted to the Japanese neurosurgical clinics included in this study for their cooperation.

Members of the Committee

Katsutoshi Kitamura: Kyushu University
Teruo Omae: Kyushu University
Fumio Goto: Keio University
Genju Ohneda: Gunma University
Hiroo Chigasaki: National Defence Medical College
Mitsuo Tsuru: Hokkaido University
Jiro Suzuki: Tohoku University
Tokuo Wada: Sendai National Hospital
Keiji Sano: Tokyo University

**Figure 5.** Surgical results divided by grades from I to V as well as by the timing of surgery.

a. Grades I and II
b. Grades III and IV
c. Grade V
### TABLE 6  Results of Treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Improved</th>
<th>Unchanged</th>
<th>Worse</th>
<th>Dead</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radical operation (ruptured)</td>
<td>2115</td>
<td>387</td>
<td>206</td>
<td>487</td>
<td>3195</td>
</tr>
<tr>
<td>Radical operation (non-ruptured)</td>
<td>116</td>
<td>76</td>
<td>10</td>
<td>15</td>
<td>217</td>
</tr>
<tr>
<td>Carotid ligation</td>
<td>42</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>59</td>
</tr>
<tr>
<td>Removal of hematoma only</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>Drainage only</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>105</td>
<td>118</td>
</tr>
<tr>
<td>Shunt only</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>Non-surgical treatment</td>
<td>66</td>
<td>89</td>
<td>7</td>
<td>290</td>
<td>452</td>
</tr>
<tr>
<td>Others</td>
<td>92</td>
<td>29</td>
<td>8</td>
<td>42</td>
<td>171</td>
</tr>
<tr>
<td>Total</td>
<td>2455</td>
<td>595</td>
<td>237</td>
<td>978</td>
<td>4265</td>
</tr>
</tbody>
</table>

Omission: 485 cases.

### TABLE 7  Interval from Last Attack to Surgery (Radical Operation)

<table>
<thead>
<tr>
<th>Interval</th>
<th>Cases</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hrs</td>
<td>144</td>
<td>(5)</td>
</tr>
<tr>
<td>24-48 hrs</td>
<td>71</td>
<td>(2)</td>
</tr>
<tr>
<td>3-7 days</td>
<td>317</td>
<td>(11)</td>
</tr>
<tr>
<td>8-14 days</td>
<td>430</td>
<td>(15)</td>
</tr>
<tr>
<td>2W-</td>
<td>815</td>
<td>(28)</td>
</tr>
<tr>
<td>1M-</td>
<td>1023</td>
<td>(35)</td>
</tr>
<tr>
<td>6M-</td>
<td>108</td>
<td>(4)</td>
</tr>
<tr>
<td>Total</td>
<td>2908</td>
<td>(100)</td>
</tr>
</tbody>
</table>

Omission: 774 cases.

### References

Nationwide co-operative study of intracranial aneurysm surgery in Japan.
A Nishimoto, K Ueta, H Onbe, K Kitamura, T Omae, F Goto, G Ohneda, H Chigasaki, M Tsuru and J Suzuki

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