Aneurysm Surgery in Asia

—Japanese Situation—

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Abstract

This report is based on the results of the questionnaires conducted for the Japan Stroke Surgery Meeting 1996 (President: S. Kobayashi). The questionnaires were sent to all neurosurgical training institutions approved by The Japan Neurosurgical Society, numbering 959. The response rate was 54.2% (520 institutions). All statistics dealt with cases from January 1995 to December 1995. The total number of aneurysm surgery performed was 13,166. The average operative case number per institution during the year was 25. About 20% of the institutions exceeded 35 cases. Of all operative cases, 76.3% were ruptured aneurysms and 23.7% were nonruptured. Giant aneurysms were 2.9%; dissecting aneurysms 2.4%. Surgical procedures performed were clipping in 90.3%, wrapping in 5.2%, proximal ligation 1.6%, and bypass in 0.7%. Intravascular surgery was performed for 2.3% of the cases. Sugita clips were mainly used in 80.5% of the institutions, Yasargil clips in 6.6%, and both in 12.9%. For anterior communicating artery aneurysms pterional approach was mainly used in 81.0% of the institutions, interhemispheric in 7.2%, and both in 11.7%. For basilar terminal aneurysms, pterional approach was mainly used in 88.3% of the institutions, subtemporal approach in 6.6%, and both in 5.1%. The nonoperative cases included 24.9% of the ruptured aneurysms, 31.7% of the unruptured aneurysms, 38.4% of the giant aneurysms, and 52.1% of the dissecting aneurysms. The above statistics suggest that aneurysms are treated in Japan in most training institutions and that open surgical treatment is still the main procedure of choice.

Key words: aneurysm surgery, statistics, aneurysm clips, surgical approach

Introduction

Treatment of intracranial aneurysms has undergone various changes due to the introduction of new diagnostic techniques and surgical instruments. In recent years, in particular, intravascular surgery has made another therapeutic challenge for aneurysms. An increasing number of unruptured intracranial aneurysms are detected by noninvasive diagnostic tools such as magnetic resonance angiography and three-dimensional computed tomography scanning. With these new innovations, forming more effective treatment regimens is needed for the treatment. In order to do this, we considered it important to grasp the current status of treatment of intracranial aneurysms. This report is based on the results of the questionnaires conducted for the Japan Stroke Surgery Meeting in 1996 (President: S. Kobayashi) (some of the results were reported previously,³⁾ data in this paper are cited with permission).

Methods

The questionnaires were sent to all neurosurgical training institutions approved by The Japan Neurosurgical Society, numbering 959 as of 1997. The questionnaires were consisted of 17 items concerning operative and nonoperative cases treated at these institutions between January and December of 1995 (Table 1).³⁾ The institutions where the questionnaires were sent were classified into Group I: national university hospitals (prefectural or city university hospitals included), Group II: private university hospitals, Group III: other category A (independent training) hospitals, and Group IV: category C (affiliated training) hospitals.

Results

Effective response was obtained from 520 of the 959 institutions (response rate 54.2%). 13,166 operative

Table 1 Questionnaire**Operative cases**

1. Total number of operative cases of aneurysms
2. Number of patients with ruptured aneurysm
3. Number of patients with unruptured aneurysm (excluding cases associated with ruptured aneurysms)
4. Number of patients with giant aneurysm
5. Number of patients with dissecting aneurysm
6. Operative procedures (number of aneurysms)
 - a. clipping
 - b. wrapping (or coating) only
 - c. proximal ligation (or trapping) only
 - d. vascular reconstruction such as bypass
 - e. intravascular surgery
7. Kinds of mainly used clips: Sugita, Yasargil, Heifetz, others
8. Approaches to anterior communicating artery aneurysms: pterional, interhemispheric, both
9. Approaches to basilar terminal aneurysms: pterional, subtemporal, both

Nonoperative cases

1. Number of patients with ruptured aneurysm
2. Number of patients with unruptured aneurysm (excluding cases associated with ruptured aneurysms)
3. Number of patients with giant aneurysm
4. Number of patients with dissecting aneurysm

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patients and 4788 nonoperative patients were submitted for analysis. 76.3% of the patients who had undergone surgical procedures had ruptured aneurysms while 23.7% nonruptured aneurysms (Fig. 1).³⁾ Of the nonoperative cases, 69.7% were for ruptured aneurysms while 30.3% unruptured aneurysms. Of all the ruptured aneurysms, 75.1% were operated and 24.9% not operated. Of all the nonruptured aneurysms, 68.3% were operated and 31.7% not operated.

The average operated cases per institution was 25 during the one year period. Figure 2 shows the numbers of the operative cases at the institutions in the increasing order.³⁾ The top ten institutions included five private hospitals and two public hospitals in local cities (both Group III), and two private university hospitals (Group II) and one public hospital (Group III) in the metropolitan area. Six institutions operated on more than 100 operative cases a year, where unruptured aneurysm cases occupied 43% on average. 437 of the 520 institutions (84%) operated on more than 10 cases a year; in 53 of those institutions unruptured aneurysm numbered more than 50% of the entire operative cases.

The incidence of giant aneurysms was 2.9% and that of dissecting aneurysms 2.4%. 61.6% of the giant aneurysms underwent surgery, while 38.4% did not. 47.9% of the dissecting aneurysms had surgery

Fig. 1 Each bar showing the total number of the patients with cerebral aneurysms with or without operation in 520 hospitals in Japan. The hatched column indicates unruptured aneurysms and the shaded column indicates ruptured ones. Reproduced with permission from Kobayashi et al: Recent treatment of cerebral aneurysm in Japan. *Surgery for Cerebral Stroke* 25: 91-96, 1997.³⁾

Fig. 2 A graph showing the number of patients with a cerebral aneurysm in 520 hospitals in 1995. Reproduced with permission from Kobayashi et al: Recent treatment of cerebral aneurysm in Japan. *Surgery for Cerebral Stroke* 25: 91-96, 1997.³⁾

and 52.1% did not. Giant aneurysms were operated on at 159 institutions (30.6%) and the dissecting aneurysms at 175 institutions (33.7%).

Surgical procedures performed were clipping in 90.3%, wrapping or coating in 5.2%, intravascular surgery in 2.3%, and proximal ligation or trapping in 1.6%; bypass-combined procedures in 0.7% of the cases (64 institutions). Intravascular procedures were performed in 104 institutions (20%); however, in 74 institutions, the number of intravascular procedures were less than two cases a year for aneurysm. Response to clip selection was from 513 (98.7%) institutions. Sugita clips were mainly used in 80.5%, Yasargil in 6.6%, and both in 12.9% of the institutions.

For anterior communicating artery aneurysms, 511 of the 520 institutions (98.3%) responded. Mainly pterional approach was used in 81.0% of the institutions, interhemispheric approach in 7.2%, and both approaches in 11.7%. For basilar terminal aneurysms, 316 institutions responded (60.8%). Pterional approach was mainly used in 88.3% of the

institutions, subtemporal approach in 6.6%, and both in 5.1%.

Of all the respondents, 45 institutions belonged to Group I, 24 to Group II, 117 to Group III, and 334 to Group IV. The average operative cases per institution is 19.8, 48.1, 36.0, and 19.8 for Group I, II, III, and IV institutions, respectively. Unruptured aneurysms occupied 35.7%, 22.8%, 26.8%, and 20.5% of all operated cases for Group I to IV institutions, respectively, showing that national university hospitals operate on a greater number of unruptured aneurysms than other groups (Fig. 3).³⁾

Discussion

Subarachnoid hemorrhage caused by rupture of intracranial aneurysms is known to occur in about 12 per 100,000 population. Suppose the population of Japan is 12,600,000, the incidence of subarachnoid hemorrhage would be about 13,000 per year. The statistics of the present questionnaire show that the number of the patients with subarachnoid hemorrhage was 15,000 in the year studied. Although the response rate was 54%, the responding institutions all together seem to have operated on the majority of the cases. Knowing that the number of board certified neurosurgeons in Japan was 3067 and that of all vascular surgeries performed was 23,652 in 1995, the average number of vascular surgical cases per one neurosurgeon was about eight (data provided by The Japan Neurosurgical Society); the average number of aneurysm surgery cases would be about four to five.

As to the distribution of the cases, the operative cases of aneurysm in Japan seem to be distributed widely among institutions, while a large number of cases are operated on in some hospitals. Cases are concentrated in large referral center hospitals outside the metropolis, and in private university hospitals in the metropolitan area. On the other hand, cases are scattered in smaller scaled institutions as the number of institutions and board certified neurosurgeons have increased. Surgical indications for unruptured aneurysms differ according to different hospitals but on average their number was one fourth of the total operative cases.

From the point of view of difference in institution categories, generally Group II (private university) hospitals operate more than Group I (national, prefectural, or city university) hospitals. Group I hospitals operate on more unruptured and giant aneurysms than hospitals of other groups. In the present study, questions were not asked about the timing of surgery. Generally in Japan ruptured aneurysms are operated on in acute stage unless sur-

Fig. 3 Each bar showing the averaged number of the ruptured (shaded column) and unruptured aneurysms (hatched column) which were operated on in Group I to IV hospitals. Group I: national university hospitals, II: private university hospitals, III: other category A hospitals, IV: category C hospitals. Reproduced with permission from Kobayashi et al: Recent treatment of cerebral aneurysm in Japan. *Surgery for Cerebral Stroke* 25: 91-96, 1997.³⁾

gical grades are poor. Emergency medical care system is generally well developed in private university hospitals than in national hospitals. And therefore, the former attract more acute patients.

When patients with ruptured aneurysm were admitted to the hospitals, about one fourth of them were not operated on, which corresponds to the reported ratio of 20% to 33% of inoperable ruptured aneurysm cases.^{2,4,5)} It is to be noted that despite the development of improved treatment of acute subarachnoid hemorrhage, the ratio of operability has not changed in the past decade.

As to selection of methods for surgical treatment of aneurysms, despite recent introduction of intravascular surgery, clipping was employed for 90% of the cases, indicating that this method is still the main procedure of choice. Wrapping and coating were used for about 5% of the cases, which is not a negligible percentage. Wrapping materials were not uniform and differed according to different institutions.

There have been much discussion in Japan as to the approach to the anterior communicating artery aneurysm; however, the present survey has found that the pterional approach is employed significantly more than the interhemispheric approach. The institutions employing the latter approach numbered 37 which is less than 10% of all institutions; 60 institutions selected either of the two for individual cases.

As to the approach to the basilar terminal aneurysms (basilar bifurcation and basilar-superior cerebellar artery aneurysms), the pterional approach^{6,7)} is predominantly used in Japan, contrasting to the report of the overwhelming number of cases operated on via the subtemporal approach by Drake.¹⁾ It is to be noted that 39% of the institutions did not operate on basilar terminal aneurysms, indicat-

ing the rare occurrence of this type of aneurysm and probably technical difficulty in clipping these aneurysms.

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