Outcome in Treatment of Intracranial Aneurysm 10 Years Retrospective Study at King Chulalongkorn Memorial Hospital

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Abstract

The authors retrospectively reviewed 477 patients who were diagnosed with intracranial aneurysm and treated between 1987 and 1997 to evaluate the outcome of treatment. On admission, the patients were graded according to the scale of Hunt and Hess : 96 patients (20.1%) were classified in Grade I, 161 (33.8%) in Grade II, 162 (34.0%) in Grade III, 46 (9.6%) in Grade IV, and 12 (2.5%) in Grade V. At follow-up examination 6 months after SAH, 280 patients (58.7%) were classified as having made a good recovery, 80 patients (16.8%) suffered some morbidity, and 117 patients (24.5%) had died. Surgery was performed in 380 (79.7%) of the patients. Of 124 patients who had surgery within 72 hours, 79 (63.7%) patients made a good recovery. It is concluded that, among patients with all clinical grades, almost six of 10 intracranial aneurysm victims can be saved and can recover to a normal life.

Key word : Intracranial Aneurysm, Subarachnoid Hemorrhage, Treatment

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Any survivor of aneurysm subarachnoid hemorrhage (SAH) has the potential for a return to normal life, forcing neurosurgeons to constantly re-evaluate available therapeutic approaches. Management has passed through a phase of rapid evolution and modification in the past two decades. However, a more uniform management strategy is gradually emerging, especially focusing on early surgical prevention of rebleeding[1,2]. Furthermore, this approach enables aggressive postoperative anti-

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ischemic treatment with nimodipine and/or hypertensive hypervolumic hemodilution to minimize delayed deterioration due to ischemia.

The present retrospective study was conducted to evaluate our overall management outcome in cerebral aneurysms over the past 10 years. A uniform management protocol was adopted including earliest possible surgery and aggressive anti-ischemic treatment[3,4].

CLINICAL MATERIAL AND METHOD

Patients eligible for this study included those who were admitted to the King Chulalongkorn Memorial Hospital between 1987 and 1997 following their symptoms of ruptured intracranial aneurysm confirmed by lumbar puncture or, computerized tomography (CT) scan. The status of the aneurysm was confirmed by angiography. Accidentally-found unruptured aneurysm patients or patients presenting with the mass effect of an aneurysm were also included in this study. Patients who had symptoms due to traumatic intracranial aneurysm and mycotic aneurysm were excluded.

A total of 477 patients were admitted to the neurosurgical unit during the study period. The Hunt and Hess grades[5] upon admission of all patients are given in Table 1 and the age and sex distribution is shown in Fig.1. The mean age was 54.4 years (range 13 to 88 year) and the female : male ratio was 1.6 : 1. A clinical follow-up examination was conducted 6 months after initial SAH.

RESULT

Overall Outcome

At follow-up examination 6 months after SAH, 280 patients (58.7%) were classified as having a good neurological recovery, 80 patients (16.8%) suffered some morbidity, and 117 patients (24.5%) had died. Patients without neurological deficits (with the exception of cranial nerve palsies) were assigned to the first group, and those with a neurological deficit of any degree were assigned to the morbidity group. Overall outcome in relation to grade on admission and related to age is shown in Table 2 and Fig 2. 163 patients (34.2%) had a history of hypertension ; the outcome for normotensive *versus* hypertensive individual is given in Fig. 3.

Table 1. Grade upon admission in the 477 patients*.

Clinical grade	Cases	
	No.	Per cent
I	96	20.1
II	161	33.8
III	162	34.0
IV	46	9.6
V	12	2.5
Totals	477	100.0

* Grading according to the Hunt and Hess classification[5].

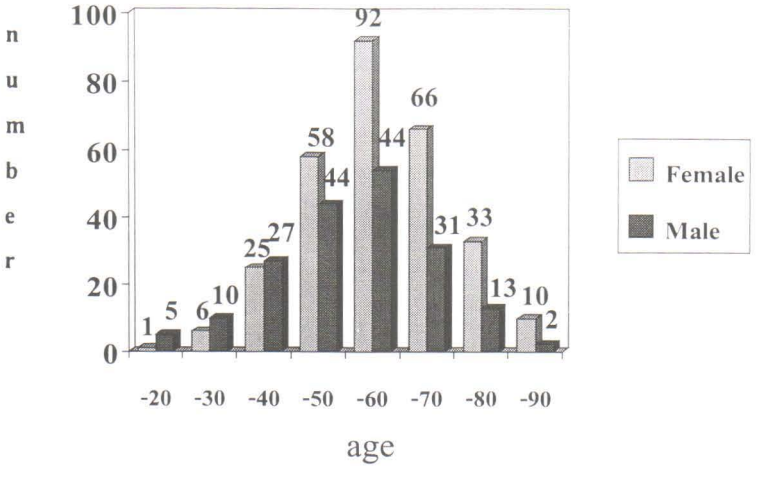

Fig. 1. Graph showing distribution of the 477 patients by age and sex. (Age by decade, Number = number of patients)

Table 2. Overall management outcome is relation to grade on admission to the Hunt and Hess classification(5).

Clinical grade	Good		Morbidity		Mortality		Total
	No.	%	No.	%	No.	%	
I	88	91.7	3	3.1	5	5.2	96
II	117	72.7	14	8.7	30	18.6	161
III	72	44.4	50	30.9	40	24.7	162
IV	3	6.5	13	28.2	30	65.3	46
V	0	0	0	0	12	100	12
Total	280	58.7	80	16.8	117	24.5	

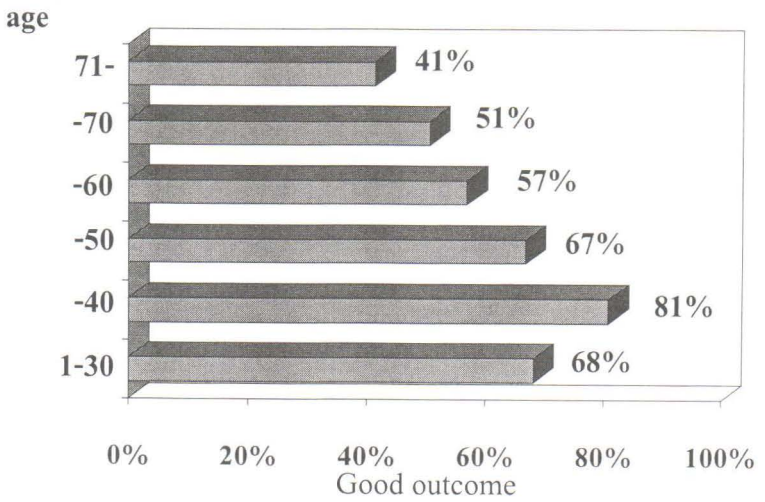

Fig. 2. Graph showing overall management outcome in relation to patient age.

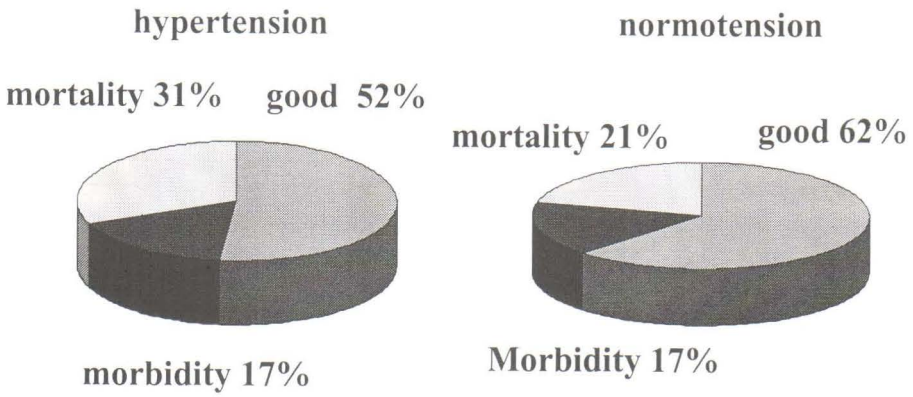

Fig. 3. Pie graphs showing overall management outcome for 163 hypertensive patients *versus* the 314 normotensive patients in the series.

Treatment

Surgery was not performed in 90 (18.9%) of the 477 patients. Thirty-seven of these individuals made a good recovery, two were dependent and 51 died. Seven of the 477 patients underwent only placement of a shunt. Three made a good recovery and four suffered morbidity. Table 3 shows the reasons for non-surgical treatment.

Table 3. Reasons for non-surgical treatment.

Reasons	Cases	
	No.	Per cent
SAH* of unknown etiology	39	8.2
Rebleed to dead before surgery	20	4.2
Poor surgical candidate	31	6.5
Totals	90	18.9

* *SAH* - subarachnoid hemorrhage

Surgery was performed in the remaining 380 patients (79.7%). The aneurysms were treated by clipping, trapping, wrapping, repairing vessels or by-pass procedure which were appropriated for pathology or intraoperative complications and were considered by surgeons during the time of the operation.

Table 4 relates the distribution of aneurysms to outcome. Early surgery (within 72 hours after SAH) was performed on 124 individuals ; intermediate surgery (between Days 4 and 6) was undertaken in 109 patients ; and late surgery (Day 7 or later after SAH) was performed on 147 individuals.

Surgical Outcome

Table 5 shows the outcome related to timing of the operation in 380 patients undergoing

Table 4. Outcome in relation to location of aneurysm.

Artery Location*	Good		Morbidity		Mortality		Total cases
	No.	%	No.	%	No.	%	
ICA	80	61.6	25	19.2	25	19.2	130
MCA	53	67.1	14	17.7	12	15.2	79
A1	2	66.7	1	33.3	0	0	3
ACoA	76	58.0	32	24.5	23	17.5	131
A2	4	80.0	1	20.0	0	0	5
PCA	5	62.5	2	25.0	1	12.5	8
BA	8	61.5	3	23.1	2	15.4	13
VA	7	63.6	1	9.1	3	27.3	11
Totals	235		79		66		380

**ICA* = internal carotid artery ; *MCA* = middle cerebral artery ; *A1* = A1 segment of the anterior cerebral artery ; *ACoA* = anterior communicating artery ; *A2* = A2 segment of the anterior cerebral artery ; *PCA* = posterior cerebral artery ; *BA* = Basilar artery ; *VA* = Vertebral artery.

Table 5. Outcome related to timing of operation in the 380 surgically treated patients.

Timing of surgery*	Good		Morbidity		Mortality		Total cases
	No.	%	No.	%	No.	%	
Early	79	63.7	26	21.0	19	15.3	124
Intermediate	66	60.6	18	16.5	25	22.9	109
Late	93	63.3	32	21.8	22	14.9	147
Total cases	238		76		66		380

Early = within 72 hours after subarachnoid hemorrhage (SAH) ;
Intermediate = between Days 4 and 6 after SAH ; and
Late = Day 7 after SAH or later.

surgery. 142 patients (37.4%) of the 380 surgically treated patients had experienced morbidity or death. Table 6 relates the outcome to preoperative Hunt and Hess status in the early surgery group. Of the 116 patients who were preoperatively classified in Hunt and Hess Grade I to III and treatment within 72 hours after SAH, 79 patients (68.1%) made a good recovery. Table 7 presents the causes of unfavorable outcome in the surgical groups.

DISCUSSION

Morley[6] stressed that the evaluation of treatment of SAH must include the outcome of all patients, regardless of whether they were treated medically or surgically. He observed that "neurosurgeons, with an interest vested in their particular skill, may not be the most detached and objective authorities on the merit of different forms of treatment"[6]. Lougheed[7] employed the term "management mortality and morbidity" for this purpose and distinguished overall results from surgical mortality and morbidity. Several authors have made the point that if the healthier patients are selected for surgery, and the sicker ones are managed medically, then surgery, whether early or late, will appear to have a better outcome. Only if overall management outcome is considered can a fair estimate of success be made.

The overall management morbidity and mortality rate in the present series was 41.3 per cent ; this compares favorably with other series [8,9]. Nevertheless, 85 per cent of the patients were admitted in good condition (Hunt and Hess Grade I-III), only 66 per cent returned to their premorbid state without neurological deficit and 18 per cent died. Furthermore, only 80 per cent of patients who were alert on admission (Hunt and Hess Grade I-II) had a good result, and 14 per cent died. Similarly pessimistic overall management results have been demonstrated in recent reports[9,10]. These disappointing statistics suggest that there is an opportunity for substantial additional improvement.

Pre-existing hypertension in aneurysmal SAH is well known as an unfavorable prognostic factor[11] ; this is corroborated by the overall results in the present study. Of the 314 normotensive patients, 62 per cent made a good recovery, compared to 52 per cent of 163 patients with pre-existing hypertension. Of the patients with hypertension, 14 per cent were devastated by the initial bleed compared to 10 per cent in the normotensive group ; delayed ischemia was the cause of unfavorable outcome in 5.5 per cent of patients with hypertension compared to 2.9 per cent in normotensive individuals. It was recently observed that nimodipine seems to reduce the prognostic difference between normo and hypertensive individuals with aneurysmal SAH[11,12].

In the past, timing of surgery was the subject of a major neurosurgical controversy. In recent years, the majority of reports comparing the therapeutic results in the two groups from this view point concluded that early surgery is superior[13-15]. Kassel et al[13] reported a comparison of the results between 27 cases of early surgery (within 4 days after SAH) and 24 cases of delayed surgery (on Day 7 or later) ; they found a favorable outcome in 81 per cent of the former and 42 per cent of the latter cases.

Table 6. Good recovery in relative to admission status in the early surgery group.

Clinical grade	Total cases	Good outcome	
		No.	%
I	23	21	91.3
II	39	29	74.4
III	54	29	53.7
IV	8	0	0
Total	124	79	63.7

Grading according to the Hunt and Hess classification[5]. Early surgery = within 72 hours after subarachnoid hemorrhage.

Table 7. Causes of unfavorable outcome in the surgical group.

Cause	No. of cases	Per cent
Initial bleed	24	16.9
Hematoma	24	16.9
Vasospasm	18	12.7
Infarction	51	35.9
CN. injury	2	1.4
Hydrocephalus	45	31.7
CSF infection	15	10.6
Hyponatremia	40	28.2
Pulmonary complication	15	10.6
Cardiovascular complication	20	14.1
Rebleeding after surgery	8	5.6
Miscellaneous	13	9.2

CN. injury = cranial nerve injury ; CSF = cerebrospinal fluid.

The mortality rate was 11 per cent among early-surgery cases and 42 per cent among late-surgery cases. They pointed out that there were especially high rates of rebleeding, medical complications, and symptomatic vasospasm in the late-operation group. In an international cooperative study, the overall management results revealed a mortality rate of 20 per cent for patients undergoing surgery on Days 0 to 3, 24 per cent on Day 4 to 6, 28 per cent on Days 7 to 10, 21 per cent on Day 11 to 14, and 20 per cent on Days 15 to 32. Good results were reported in 63 per cent of operations on Day 0 to 3, 60 per cent on Days 4 to 6, 56 per cent on Day 7 to 10, 62 per cent on Day 11 to 14, and 63 per cent on Days 15 to 32[8,16]. There were no significant differences among these treatment periods, similar to what was found in this present series. In Grade I-II patients, however, early surgery appears to have a beneficial effect.

There were a number of causes of unfavorable outcome but aside from direct effects of the initial hemorrhage, vasospasm and rebleeding were the leading offenders ; both of these are potentially amenable to therapeutic intervention. Vasospasm was one of the leading causes of unfavorable outcome and resulted in death or disability in 12.7 per cent of the patients studied. Recent advances in the understanding of the pathogenesis of vasospasm, early detection by using transcranial Doppler ultrasonography, and new approaches to therapy suggest that these effective means will help to prevent or reverse the arterial narrowing and management of ischemic consequences of vasospasm. If this can be accomplished, an improvement of 10 per cent to 15 per cent in overall good results can be anticipated.

Rebleeding was one of the most prominent causes of mortality and morbidity, producing an unfavorable outcome in 4.2 per cent of patients. While antifibrinolytic agents such as aminocaproic acid or tranexamic acid are effective in reducing rebleeding, they do not provide total protection against this complication[17]. Early operation with obliteration of the aneurysm is the best way to prevent rebleeding, and the earlier that surgery is performed, the lower the rebleeding should be.

In 1982, Kassell and Drake[18] studied the overall outcome of aneurysmal SAH in North America and found a prominent cause of morbidity and mortality was linked to the failure of early diagnosis and referral which are also problems in Thailand. These problems can be solved by close contact between neurosurgeons and referring doctors.

Further improvement in the overall management of cerebral aneurysm must rely on an array of factors. First, the management of poor-grade patients should be scrutinized. Recently, Bailes et al[19] and Petruke et al[20] showed that ultra-early referral and intensive neurosurgical care, with liberal indications for ventriculostomy, may increase the number of good recoveries in this category of patients. Second, surgical complications may be reduced ; however, with the present state of the art, further improvement in these areas would most probably only marginally affect the overall outcome. Detection of the aneurysm prior to rupture would have a major positive impact on the overall management outcome of patients with intracranial aneurysms.

SUMMARY

The present study shows that almost six of 10 people harboring this disease can be treated and achieve a normal life. The outcome clearly indicated that there is considerable room for improvement. The opportunities for improvement appear to be related to early surgery especially in good-grade patients, strategies and tactics for dealing with vasospasm and rebleeding. More accurate diagnosis and prompt referral of patients to neurosurgical attention is likely to be of benefit in improving the outcome in these patients.

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ผลการรักษาโรคหลอดเลือดโป่งพองภายในกะโหลกศีรษะการศึกษาย้อนหลัง 10 ปี ที่โรงพยาบาลจุฬาลงกรณ์

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ได้ทำการศึกษาย้อนหลังในผู้ป่วยจำนวน 447 ราย ที่ได้รับการวินิจฉัยโรคหลอดเลือดโป่งพองภายในกะโหลกศีรษะ ระหว่างปี 2530 ถึง 2540 เพื่อศึกษาผลการรักษา ผู้ป่วยได้ถูกจำแนกตามการจัดแบ่งผู้ป่วยของ Hunt และ Hess โดยพบว่าผู้ป่วย 96 รายหรือร้อยละ 20.1 ถูกจัดอยู่ขั้นหนึ่ง ผู้ป่วย 161 รายหรือร้อยละ 33.8 ถูกจัดอยู่ขั้นสอง ผู้ป่วย 162 รายหรือร้อยละ 34.0 ถูกจัดอยู่ขั้นสาม ผู้ป่วย 46 รายหรือร้อยละ 9.6 ถูกจัดอยู่ขั้นสี่ ผู้ป่วย 12 รายหรือร้อยละ 2.5 ถูกจัดอยู่ขั้นห้า เมื่อทำการตรวจผู้ป่วย 6 เดือนต่อมา พบว่าผู้ป่วย 280 รายหรือร้อยละ 58.7 มีสุขภาพปกติ ผู้ป่วย 80 รายหรือร้อยละ 16.8 มีความพิการ และผู้ป่วย 117 รายหรือร้อยละ 24.5 เสียชีวิต ผู้ป่วย 380 รายหรือร้อยละ 79.7 ทำการรักษาด้วยการผ่าตัด ในผู้ป่วย 124 รายที่ทำการผ่าตัดรักษาภายใน 72 ชั่วโมง พบว่าผู้ป่วย 79 ราย หรือร้อยละ 63.7 มีสุขภาพปกติหลังการผ่าตัด โดยสรุปผลการรักษาผู้ป่วยทั้งหมดพบว่าผู้ป่วย 6 รายจาก 10 ราย สามารถกลับไปดำเนินชีวิตได้ตามปกติ

คำสำคัญ : หลอดเลือดโป่งพองภายในกะโหลกศีรษะ, เลือดออกใต้ชั้นอะแรคนอยด์, การรักษาย้อนหลัง

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