The Result of Surgical Treatment in Patients with Cerebral Aneurysms in Maharaj Nakorn Chiang Mai Hospital: A Report of 225 Cases

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Objective: Evaluate the result of intracranial aneurysm surgery in Maharaj Nakorn Chiang Mai Hospital.
Material and Method: A retrospective study of patients who underwent surgery for intracranial aneurysms between 2003 and 2007. The patients' age, gender, signs and symptoms, CT brain findings, Subarachnoid hemorrhage (SAH), World Federation of Neurosurgical Society grading (WFNS), and aneurysm location were studied and correlated with outcome after surgery.
Results: Two hundred twenty five patients of intracranial aneurysm were operated on between 2003 and 2007. Two hundred nine patients (92%) had anterior circulation aneurysms and 18 (8%) had posterior circulation aneurysms. The outcome, as evaluated by Glasgow Outcome Scale (GOS), showed good recovery and moderate disability patients (142, 62.9%) were classified as favorable outcome group whereas patients with severe disability, vegetative state, and dead (83, 36.9%) were classified as unfavorable outcome. According to WFNS grading, the patients with unruptured aneurysm and WFNS grade 1-2 had favorable outcome in 116 patients (78.37%) and unfavorable outcome in 32 patients (21.62%). Whereas the patients with WFNS grade 3-5 had favorable outcome in 32 patients (33.76%) and unfavorable outcome in 51 patients (66.23%).
Conclusion: This study of 225 cases revealed 142 cases with favorable outcome and 83 cases with unfavorable outcome. Factors that affected the outcome were WFNS grading and age.

Keywords: Aneurysm grading subarachnoid hemorrhage outcome

The result of surgical treatment of intracranial aneurysms, in terms of morbidity and mortality, are very important. In accordance with many reports about the outcome of aneurysms treatment, the improvement was due to the development of microsurgical techniques, the advanced radiological techniques, and intensive care management. The present report reviewed the information regarding current microsurgical treatment and presents our experience between 2002 and 2007.

Material and Method

The authors studied 225 consecutive cases with 251 intracranial aneurysms admitted between 2003 and 2007 with the initial diagnosis of subarachnoid hemorrhage. The patient's gender, age, pre-operative clinical symptoms, CT finding, grading by WFNS grading, location of aneurysm, timing of operation, result of treatment were studied and evaluated by Glasgow Outcome Scale. The diagnosis was based on four vessels angiography and some cases with CT angiography (CTA). All patients were treated by microsurgical technique and such treatment was completed by nimodipine and intensive care management. Good recovery and moderate disability were classified under the favorable outcome group whereas patients with severe disability and death were classified under the unfavorable outcome group. Approval for the present study was obtained from Ethical Committee of Faculty of Medicine, Chiang Mai University.

Results

The present study included 225 cases of intracranial aneurysms. The proportion of female to male was approximately 1.7:1. Mean age of patients was 54.6 years. The youngest was 21 years and the oldest was 82 years. The most common symptom was

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headache (76%) and 84 cases (37.3%) presented with sudden loss of consciousness. The aneurysm signs and symptoms are shown in Table 1. The data of aneurysm grading (WFNS) was shown in Table 2. The patients with good grade were 148 (65.8%) and poor grade were 77 (34.3%). CT finding showed subarachnoid hemorrhage in 174 patients (77%) and other findings such as intracerebral hemorrhage, intraventricular hemorrhage were 37 patients. CT scan showed normal finding in six patients. For angiographic study, conventional angiography was done in 154 patients (67.8%) and CT angiography was done in 73 patients (32.2%). Angiographic finding is shown in Table 3. Most common finding was Anterior Communicating Artery (A-com) aneurysm 76 (35.5%) and Middle Cerebral Artery (MCA) aneurysm 66 (29.1%). Average timing prior to surgery was 3.8 days (range 1-30). The outcome after surgery is shown in Table 4. The good recovery and moderate disability groups were classified to favorable outcome. The severe disability, vegetative and dead groups were classified to poor

outcome (Table 5). The favorable outcome groups were 142 patients (62.9%) and unfavorable outcome group were 83 patients (36.9%). The comparative outcome with SAH grading is shown in Table 6.

Discussion

Result of the present study based on gender and age were not different from other reports. There were more female patients than male (1.7:1). Mean age of patients was 54.6 years. There is a female preponderance for spontaneous SAH, with women outnumbering men by factor of 1.3 to 1.6. The incidence of SAH increases with age and plateaus in the sixth decade of life[1-6].

In view of aneurysm location, the common locations were at Anterior Communicating Artery (A-com), Middle Cerebral Artery (MCA), and posterior Communicating Artery (P-com) (82.4%). However,

Table 1. Data of patients classified by gender age, sign and symptom (n = 225)

Variables	Number	%
Gender		
Male	82	36.4
Female	143	63.6
Age (mean, range)	54.6	21-82
Signs & symptoms		
Headache	171	76.0
Diplopia	21	9.3
Sudden loss of consciousness	84	37.3
Alteration of consciousness	57	25.3
Focal neurological deficit	48	21.3
Nausea and vomiting	48	21.3
Stiff neck	76	33.8
Seizure	28	12.4

Table 2. The World Federation of Neurosurgeons (WFNS) classification uses Glasgow coma score (GCS) and focal neurological deficit to gauge severity of symptoms[18,19]

Grade	GCS	Focal neurological deficit
1	15	Absent
2	13-14	Absent
3	13-14	Present
4	7-12	Present or absent
5	<7	Present or absent

Table 3. Numbers of patients classified by aneurysm grading (WFNS Grading) (n = 225)

Grading (WFNS)	Number	%
0	7	3.1
1	104	46.2
2	28	12.4
3	9	4.0
4	62	27.6
5	15	6.7

WFNS = World Federation of Neurosurgical Society grading

Table 4. Location of aneurysms (n = 225)

Findings of CTA/angiogram	Number	%
Anterior site aneurysm		
A-com	76	33.5
P-com	45	19.8
ICA	22	9.7
MCA	66	29.1
Others	21	9.3
Posterior site aneurysm		
Basilar	9	4.0
PICA	6	2.6
SCA	4	1.8
Vertebral	0	0.0
Others	2	0.9

CTA = computed tomography angiography; A-com = anterior communicating artery; P-com = posterior communicating artery; ICA = internal cerebral artery; MCA = middle cerebral artery; PICA = posterior inferior cerebellar artery; SCA = superior cerebellar artery

Table 5. The Glasgow outcome scale (GOS)[20]

Level	Term	Definition
1	Dead	Self-explanatory
2	Vegetative state	Unable to interact with environment; unresponsive
3	Severe disability	Able to follow commands/unable to live independently
4	Moderate disability	Able to live independently; unable to return to work or school
5	Good recovery	Able to return to work or school

Table 6. Outcome of patients after surgery evaluated by Glasgow outcome scale (n = 225)

GOS	Number	%
1	30	13.4
2	10	4.4
3	43	19.0
4	29	12.8
5	113	50.4

GOS = Glasgow outcome scale

ACoA was the most common location reported (33.5%). Most aneurysms are located within the anterior circulation. Internal carotid aneurysms are more frequent in women than in men, whereas anterior communicating aneurysms are more frequent in men than in women[7,8].

For symptomatic presentation, headache was the most common presented symptom. This series had a high incident of patients with sudden loss of consciousness and alteration of consciousness (62.6%). Headache, nausea, and vomiting are present in approximately three quarters of patients. Consciousness is frequently altered after SAH. Confusion or lethargy is observed in 30% of cases and up to 17% of patients are comatose at presentation[1,3,9].

Angiographic study, CTA was used to detect aneurysm in 30% of patients, increased in the last two years because CTA is more convenient in an emergency. Now CTA is done to detect almost all cerebral aneurysms in Faculty of Medicine, Chiang Mai University. 3-D-CTA has the same sensitivity and specificity in diagnosis of intracranial aneurysms as cerebral angiography. The sensitivity in good quality 3-D-CTA reached 90.4% for lesions of any size[10-13].

According to WFNS grading, our series had a high proportion of poor grade patients (34%). Unruptured aneurysm was found in 3.1%.

Almost all aneurysms were clipped by aneurysm clip and treatment was completed by oral nimodipine, intensive care management, and triple H therapy (Hypertension, Hypervolemia, and Hemodilution) for suspected post operative vasospasm[14,15]. Almost all aneurysms were operated on within 72 hours. In remaining cases the surgical treatment was delayed due to poor grade or medical contraindication. The average time prior to surgery was 3.8 days.

For poor grade aneurysm, we did emergency ventriculostomy and intensive care management until clinical improved, then aneurysm clipping was done. Poor grade patients had favorable outcome 33.76%. The published data suggest that an aggressive

Table 7. Correlation between WFNS grading and outcome

Grading	GOS, n (%)					
	1	2	3	4	5	Total
0	0 (0.0)	0 (0.0)	1 (14.3)	0 (0.0)	6 (85.7)	7 (100.0)
1	6 (5.7)	2 (1.9)	8 (7.6)	11 (10.5)	78 (74.3)	105 (100.0)
2	9 (32.2)	0 (0.0)	3 (10.7)	3 (10.7)	13 (46.4)	28 (100.0)
3	1 (12.5)	0 (0.0)	2 (25.0)	2 (25.0)	3 (37.5)	8 (100.0)
4	9 (14.5)	5 (8.1)	25 (40.3)	11 (17.7)	12 (19.4)	62 (100.0)
5	5 (33.3)	3 (20.0)	4 (26.7)	2 (13.3)	1 (6.7)	15 (100.0)
Total	30 (13.3)	10 (4.4)	43 (19.1)	29 (12.9)	113 (50.2)	225 (100.0)

WFNS = World Federation of Neurosurgical Society grading; GOS = Glasgow outcome scale

management may provide the most reasonable chance of neurologic recovery. When treated aggressively, between 35% and 53% of poor grade patients experience a favorable outcome[16,17].

Analysis of patient's gender, age, preoperative clinical symptoms, CT finding, grading by WFNS criteria, location of aneurysm, timing of operation and result of treatment were studied by Spearman's Rank Correlation. The overall result of treatment correlate to Glasgow Outcome Scale and age of patients. Age of unfavorable outcome group was higher than favorable outcome group statistically significant ($p<0.001$). Interpretation between WFNS grading and GOS showed size of the correlation between grading and GOS = 45.87% in the opposite direction with statistical significant ($p<0.05$). Poor grade (grade 3-5) group had higher incidence of poor outcome than good grade and unruptured group. In the present study, the mortality rate was 13.3%. Factor that effect high mortality and morbidity was a high incident of poor grade patients.

Conclusion

In summary, there is improvement of outcome from early surgery within the first 72 hours from the onset of hemorrhage and improved intensive care management. Although, high percentage of poor outcome (36.7%) in the present series correlated with high percentage of high-grade patients. Factor that affected outcome were clinical grading and age of patients

Potential conflicts of interest

None.

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ผลการผ่าตัดรักษาผู้ป่วยหลอดเลือดสมองโป่งพองในโรงพยาบาลมหาราชนครเชียงใหม่: รายงานผู้ป่วย 225 ราย

วนรักษ์ วัชระศักดิ์ศิลป์, เกรียงศักดิ์ ลิ้มพัสถาน, ธัญญา นรเศรษฐ์ธาดา, ธนัฐ วานิยะพงศ์

วัตถุประสงค์: เป้าหมายของการศึกษานี้เพื่อศึกษาถึงผลการรักษาหลอดเลือดสมองโป่งพองด้วยวิธีการผ่าตัดในโรงพยาบาลมหาราช นครเชียงใหม่

วัสดุและวิธีการ: เป็นการศึกษาแบบเก็บรวบรวมข้อมูลย้อนหลังในผู้ป่วยที่เข้ารับการผ่าตัดรักษาหลอดเลือดสมองโป่งพอง ในโรงพยาบาลมหาราชนครเชียงใหม่ตั้งแต่ปี พ.ศ. 2546-2550 โดยเก็บข้อมูลเกี่ยวกับ อายุ, เพศ, อาการและอาการแสดง, เอกซเรย์คอมพิวเตอร์สมอง, ระดับความรุนแรงของเลือดออกในเยื่อหุ้มสมอง (WFNS grading), ตำแหน่งของหลอดเลือดโป่งพอง นำไปศึกษาถึงความสัมพันธ์ต่อผลการรักษาหลังการผ่าตัด

ผลการศึกษา: ผู้ป่วยหลอดเลือดสมองโป่งพอง 225 ราย ได้รับการผ่าตัดระหว่างปี พ.ศ. 2546-2550 โดยผู้ป่วย 209 ราย มี หลอดเลือดสมองโป่งพองบริเวณ anterior circulation และผู้ป่วย 18 ราย มีหลอดเลือดสมองโป่งพองบริเวณ posterior circulation ผลการรักษาศึกษาโดยใช้ Glasgow Outcome Scale (GOS) พบว่าผู้ป่วยมีผลการรักษาที่น่าพึงพอใจ 62.9% และ มีผลการรักษาที่ไม่น่าพึงพอใจ 36.9% ผลการรักษาแบ่งโดยระดับความรุนแรงของเลือดออกในชั้นเยื่อหุ้มสมองพบว่า WFNS grade 0-3 มีผลการรักษาที่น่าพึงพอใจ 78.37% และไม่น่าพึงพอใจ 21.62% ขณะที่ผู้ป่วยที่ WFNS grade 3-5 มีผลการรักษา ที่น่าพึงพอใจ 33.76% และไม่น่าพึงพอใจ 66.23%

สรุป: จากการศึกษาผู้ป่วย 225 ราย พบว่ามีผลการรักษาน่าพึงพอใจ 142 ราย และ 83 รายมีผลการรักษาไม่น่าพึงพอใจ โดย ปัจจัยที่มีผลต่อผลการรักษาคือ WFNS grading และอายุของผู้ป่วย