

# Multiple Intracranial Aneurysms : Incidence and Management Outcome in King Chulalongkorn Memorial Hospital

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## Abstract

We retrospectively reviewed the 380 patients on whom surgery was performed for intracranial aneurysms between January 1987 and December 1997. The incidence of multiple intracranial aneurysms (MIA) in our hospital was 8.7 per cent (33/380 cases). The management outcome of 33 patients with MIA was assessed 6 months after SAH. The outcome was poorer for patients with MIA than for those with a single intracranial aneurysm (SIA). The mortality and morbidity in all grades were 24.2 per cent in patients with MIA and 16.7 per cent and 19.6 per cent respectively in those with SIA. Delayed neurological deficit and treatment outcome of poor grade patients had significant contribution to outcome in patients with MIA, more than in patients with SIA.

**Key word :** Multiple Intracranial Aneurysm, Management, Incidence

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With the regular use of four-vessel angiography, the number of patients discovered to have multiple intracranial aneurysms (MIA) has increased. The optimal treatment of associated aneurysms is still debated. Yet, most neurosurgeons agree that associated aneurysms should be secured and that the risk of treating them is

low. An important key to this problem is knowledge about the natural history of unruptured aneurysms and management outcome of these lesions. We analyzed our experience in management of intracranial aneurysms to determine as accurately as possible the incidence of MIA and the outcome of treatment in patients with MIA.

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## PATIENTS AND METHOD

From January 1987 to December 1997, we operated on 380 cases with intracranial aneurysms. Only patients that had saccular aneurysms were included in this study. Of these, 33 patients (8.7%) had MIA, with a total of 74 aneurysms (26 patients had two aneurysms, 6 patients had 3 aneurysms and one patient had four aneurysms). The majority of patients (338, 88.9%) presented with subarachnoid hemorrhage (SAH). Of the 33 patients with MIA, 31 (93.9%) had verified SAH. One patient presented with cranial nerve compression and another presented with mass effect.

The patients were graded using the Hunt and Hess classification<sup>(1)</sup>. In the patients with MIA and SAH, the sites of rupture were predicted by CT findings, supported by angiographic signs of the site of rupture ; larger size, irregular shape, focal spasm, focal mass effect or changes in aneurysm shape<sup>(2)</sup>.

Usually, all easily reached aneurysms were clipped in the first operation. Contralateral middle cerebral and carotid artery aneurysms were usually ligated in second session. If a second operation was required, it was performed 1 to 3 weeks later.

The outcome of the treatment was assessed at 6 months after SAH. The patients who had no neurological deficits with the exception of cranial nerve palsies were classified as having a good neurological recovery and those with a neurological deficit of any degree were assigned to the morbidity group.

## RESULT

The incidence of multiple intracranial aneurysms in our series was 8.7 per cent (33/380). The baseline characteristics of the 380 patients with intracranial aneurysms are in Table 1. Ages ranged from 25 to 76 years (mean 53.1 years). A preponderance of female patients were found (F = 24, M = 9).

The mortality rate attributable to all causes 6 months after SAH was higher in patients with MIA (24.2%) compared to patients with SIA (16.7%). The management mortality among different Hunt and Hess classification<sup>(1)</sup> is presented in Table 2. In the groups of patients with grade II and IV, the mortality was significantly higher in patients with MIA than in

those with SIA. The difference became even more obvious when comparing morbidity in these patients (MIA, 24.2% : SIA 19.6%). Also, the number of aneurysms seemed to influence outcome (Table 3). The causes that influenced the outcome are shown in Table 4.

**Table 1. Baseline characteristics of 380 patients with intracranial aneurysms.**

	MIA	SIA
No. of patients	33	347
Mean age (yr.)	53.1	54.5
Female (%)	72.7	60.8
Arterial hypertension (%)	30.3	34.3
SAH (%)	93.9	88.5
Preoperative or admission grade, HH (mean)	2.5	2.3
Site of aneurysm (%)		
ICA	36.5	34.0
MCA	32.4	20.5
AcoA	17.5	35.2
Peric	6.8	1.7
VBA	6.8	8.6

SAH, subarachnoid hemorrhage ; HH, Hunt and Hess classification; ICA, internal carotid artery ; MCA, middle cerebral artery ; AcoA, anterior communicating artery ; Peric, pericallosal artery ; VBA, verterbrobasilar arteries.

**Table 2. Management mortality among different Hunt and Hess classification 6 months after SAH.**

Grade	Mortality (%) MIA	Mortality (%) SIA
1	0	1.6
2	23.1	14.9
3	20.0	22.2
4	66.7	37.5

MIA, multiple intracranial aneurysms ; SIA, single intracranial aneurysm.

**Table 3. Management outcome at 6 months and number of aneurysms.**

No. of aneurysms	Morbidity (%)	Mortality (%)
SIA	19.6	16.7
MIA	24.2	24.2
2 aneurysms	23.1	23.1
3 or more aneurysms	28.6	28.6

SIA, single intracranial aneurysm ; MIA, multiple intracranial aneurysms.

**Table 4. Causes that influence the poor outcome in patients with MIA and SIA.**

Causes	MIA (%)	SIA (%)
Vasospasm	9	4.3
Hydrocephalus	6	12.4
CNS infection	3	4
Rebleeding after surgery	3	2
Pulmonary complication	1.2	2.6
Cardiovascular complication	6	5.2

MIA, multiple intracranial aneurysms ; SIA, single intracranial aneurysm

## DISCUSSION

The incidence of multiple intracranial aneurysms identified by angiography was between 8 to 45 per cent<sup>(3-11)</sup>. Rinne J *et al*<sup>(12)</sup> collected from the literature a selective series of 31,886 patients with intracranial aneurysms ; of these, 4966 (16%) harbored MIA. This incidence shows that complete four-vessel angiography must be performed to avoid missing other unruptured intracranial aneurysms.

According to Nehs *et al*<sup>(2)</sup> and Østergaard and Hog<sup>(13)</sup> MIA are most often associated with female sex and hypertension. Andrews and Spiegel<sup>(14)</sup> analyzed 350 unselected patients with intracranial aneurysms and found an increasing number of aneurysms in women with advanced age and hypertonemia, and more aneurysms in both series if they were under 55 years of age and had hypertension. Inagawa,<sup>(15)</sup> however, found no correlation between MIA and sex, but patients aged 60 years old or over had more multiple aneurysms. In our series, slightly more female patients were found with MIA than SIA. The distribution of aneurysms at different sites varies between patients with MIA and SIA. Carotid and pericallosal aneurysms are frequent in MIA cases<sup>(2,10)</sup> which was also seen in this series. Furthermore, a high number of middle cerebral artery aneurysms with MIA was found in this series.

When considering surgical treatment of unruptured asymptomatic aneurysms in patients with either multiple or incidentally discovered aneurysms, one must consider the risk of bleeding

and death with the risk of surgery. Heiskanen<sup>(11)</sup> found that the mortality rate of patients with at least two intracranial artery aneurysms presenting with SAH, in whom only the ruptured aneurysm had been clipped was 11.5 per cent. In a recent study, Juvela *et al*<sup>(16)</sup> determined that the annual risk of rupture of a silent aneurysm is 1.4 per cent and that the cumulative rate for bleeding in 10 years is 10 per cent (95% confidence level, 4.8-15.3). This is higher than the risk of the microsurgical treatment of non-giant unruptured aneurysms<sup>(17,18)</sup>. The importance of detecting and treating all possible aneurysms is self-evident.

This series shows that MIA increases the risk of poor outcome. A 26 per cent frequency of poor outcome during long-term follow-up in patients with MIA was reported by Vajda *et al*<sup>(17)</sup> but most surgical series have the opposite result. In the series of Yasargil,<sup>(10)</sup> Mizoi *et al*<sup>(19)</sup> and Inagawa,<sup>(20)</sup> the postoperative results were the same whether the patients had one or more aneurysm. These figures were, however, influenced by differences in referral policy, selection of patients for surgery, and surgical skills. Delayed ischemic deficit (vasospasms) and treatment outcome of poor grade patients seem to make our outcome far behind the other series.

## SUMMARY

The incidence of 8.7 per cent for multiple intracranial aneurysms is low when compared to other series. Carotid, pericallosal and middle cerebral artery aneurysms should awaken suspicion for the presence of MIA. The management outcome was poorer in patients with MIA than in patients with SIA. Delayed neurological deficit and treatment outcome of poor grade patients were significant factors influencing the outcome of patients with MIA in our series. Diagnosis before rupture will allow treatment of all aneurysms in almost all patients and make the management outcome better.

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## หลอดเลือดโป่งพองหลายตำแหน่งภายในกะโหลกศีรษะ อุบัติการณ์และผลการรักษาในโรงพยาบาลจุฬาลงกรณ์

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ได้ทำการศึกษาย้อนหลังในผู้ป่วยที่ได้รับการผ่าตัดหลอดเลือดสมองโป่งพองภายในกะโหลกศีรษะ 380 ราย ระหว่างมกราคม 2530 ถึงธันวาคม 2540 พบอุบัติการณ์ของหลอดเลือดสมองโป่งพองหลายตำแหน่งในผู้ป่วย 33 ราย คิดเป็นร้อยละ 8.7 ของผู้ป่วยทั้งหมด ผลการรักษาผู้ป่วย 6 เดือนภายหลังจากการแตกของหลอดเลือดสมองโป่งพอง พบว่าอัตราการเสียชีวิตและอัตราการทุพพลภาพ ในผู้ป่วยที่มีหลอดเลือดสมองโป่งพองหลายตำแหน่งคิดเป็นร้อยละ 24.2 โดยที่อัตราการเสียชีวิตและอัตราการทุพพลภาพในผู้ป่วยที่มีหลอดเลือดสมองโป่งพองตำแหน่งเดียว มีเพียงร้อยละ 16.7 และ 19.6 ตามลำดับ ภาวะการสูญเสียการทำงานของระบบประสาทภายหลังและผลการรักษาผู้ป่วยที่มีสภาพแย่เป็นปัจจัยสำคัญที่มีผลต่อผลการรักษาผู้ป่วยที่มีหลอดเลือดสมองโป่งพองหลายตำแหน่ง มากกว่าในผู้ป่วยที่มีหลอดเลือดสมองโป่งพองตำแหน่งเดียว

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