

REVIEW ARTICLES

Subarachnoid Haemorrhage, aneurysm and arteriovenous malformation: a review of the Malaysian and South East Asian populations

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Abstract

For many years, subarachnoid haemorrhage (SAH) from ruptured aneurysm was thought to be uncommon and arteriovenous malformation (AVM) was believed to be many times more common than aneurysms in South East Asia. Recent data have refuted these claims. The annual incidence of SAH was estimated to be about 3-4 per 100,000 population, and aneurysm at 1.1-1.7 per 100,000 population in Malaysia. The annual incidence of aneurysm was estimated to be 2.5 per 100,000 population in Hong Kong. These figures showed that SAH and aneurysm are by no mean uncommon in South East Asia. However, they are still lower than that in the West, with SAH at 6-12 per 100,000 population, and aneurysm accounted for 76% of all SAH. The difference is likely to be due to the younger mean age in the Asian populations. The ratio of aneurysm to AVM was estimated to be 2-3:1 in Malaysia, Thailand, Philippine and Singapore. This is lower than the ratio of 5:1 in the West. This difference is again likely to be due to the younger South East Asian population. The absolute number of aneurysm cases is likely to increase with the ageing population trend in these countries. The Malaysian and Hong Kong series showed that most patients with SAH presented in good grades. A disproportionately high incidence of aneurysm in the anterior communicating artery has been reported from Hong Kong.

Key words: aneurysm, arteriovenous malformation, epidemiology, Malaysia, South East Asia, subarachnoid haemorrhage

WESTERN AND JAPANESE POPULATIONS

In the Western community, subarachnoid haemorrhage (SAH) from ruptured saccular aneurysms causes 6-8% of all strokes.¹ The incidence of SAH ranged from 6-12 per 100,000 population.^{2,3} It did not decrease over several decades while other forms of cerebrovascular disease did.^{3,4} Aneurysms accounted for about 76% of all SAH while 6% were due to arteriovenous malformations (AVM).^{2,3}

The incidence of unruptured intracranial aneurysms is low in the general population but peaks in the seventh decade.^{5,6} Big autopsy series revealed the prevalence of 1.4-1.6%.^{7,8} Inagawa found no intracranial aneurysms in 903 patients of age 0-29 years and a 1.24% prevalence for age 60-69 years.⁵ The ratio of aneurysms to AVM was 5:1.^{9,10}

SOUTH EAST ASIAN POPULATION

For many years, there have been claims by

several authors without any convincing data, that in the Malaysian, Singaporean and Thai populations, the spectrum of SAH, aneurysms and AVM's is vastly different from established Western studies. It was further pointed out that AVM's were 4-10 times more common than aneurysms in these South East Asian countries.^{11,12} This claim has gone largely unchallenged until our data refuting this misconception.¹³

MALAYSIAN POPULATION

As early as in 1977,¹⁴ there has been attempts to determine the actual incidence of SAH, aneurysms and AVM's in Malaysia. This controversy has not attracted much attention until Chee & Loh published their data in 1988.¹³ Based on retrospective review of all cases which were admitted into the University Hospital, Kuala Lumpur from 1979 to 1987, SAH was found to account for 37 per 100,000 hospital admissions whereas aneurysms accounted for 9

per 100,000 and AVM's 8 per 100,000 hospital admissions. The angiograms revealed 42% of SAH to have aneurysms and 15% AVM. The results showed that aneurysm was more common than AVM as a cause of SAH and more frequent than AVM as a whole. This refuted the previous claim that AVM is 4-10 times more common than aneurysm.^{11,12} This data by Chee & Loh¹³ is likely to have underestimated the occurrence of aneurysm. For as high as 43% of the SAH did not have angiograms due to various reasons which included poor neurological status, refusal by patients, advanced age (more than 65 years) and failed angiography. Some of these reasons might not be valid by today's criteria especially the rejection of those aged between 65-70 and those with poor neurological status. Lack of confidence in the investigatory techniques and doubts in the benefits of surgery and surgical skills by patients and relatives might also account for certain cases who did not undergo angiography in the study. A breakdown according to age groups revealed that 80% of those cases who did not have angiography were above 40 years old. Yet the incidence of aneurysm rises with advancing age.^{5,6}

Not only did less SAH patients underwent angiography, the rate of negative angiography at 46% was also higher than that reported in the Western literature, such as the 20% reported in Lockley's series.⁹ This could partly be accounted by the incomplete angiography in many of the patients. In 35% of the cases, only carotid angiograms were performed. The failure to repeat angiograms in the presence of vasospasm accounted for a certain proportion of missed cases of aneurysms. Inadequate angiographic projections or poor quality films¹⁵ might account for some false-negative angiographic examinations. When the 1988 data of SAH with better neurosurgical service was included in the study, the detection rate of aneurysm increased from 42% to 46% and negative angiogram fell from 46% to 39% (Table 1). If only cases presenting in 1988 was considered¹⁶, the detection rate of aneurysm further improved to 53%. Only 11% of SAH cases did not have angiography. 29% of SAH had negative angiogram, a result closer to Lockley's series of 20%.⁹ These findings were in keeping with our suspicion of under detection of aneurysms due to underdeveloped neurosurgical services.

With recent further improvement in clinical awareness, radiological and neurosurgical services, the scenario in the Malaysian neurological and neurosurgical practices

especially in the Klang Valley (where Kuala Lumpur is located) has changed drastically over the last 5 years. CT scan is now easily available. There are 11 Magnetic Resonance Imaging Machines serving the Klang Valley population 3.5 millions with the ability to detect incidental aneurysms using MR angiography.^{17,18} All these factors have further improved the detection rate of SAH and aneurysm. Over the last 2-3 years a total of about 50-60 cases of aneurysms were operated per year in the various hospitals in the Klang Valley. The incidence of aneurysms in the population is thus 1.4-1.7 per 100,000 which is still much lower than the Western figures.^{2,3} It is of course not as rare as stated by Tay et al. and Spillane's reports.^{11,12} Based on 42% angiogram detection rate for aneurysm rate in SAH, the incidence of SAH in Malaysia can be estimated to be 3.3-4.0 per 100,000 population. The incidence is 3.0-3.7 per 100,000 population if the aneurysm detection rate in SAH is 46%. The 3-4 per 100,000 annual incidence of SAH is lower than the 6-12 per 100,000 population seen in the Western population.^{2,3} Like most of the other countries in South East Asia, Malaysia is a developing nation with lower mean age when compared with the Western countries. Since the incidence of aneurysms increases with aging^{5,6}, one may conclude that when corrected for age, aneurysms and SAH is probably just as common in Malaysia as in the West. Thus, the absolute number of cases is expected to rise with rising age of the population. The total number of the SAH cases reported by Chee & Loh over the study period constituted about 3% of the total number of stroke patients presented to the University Hospital, Kuala Lumpur. This is close to the 6-8% in the Western populations.¹ This again confirmed that when corrected for age, the incidence of aneurysm and SAH in Malaysia is probably similar to the West.

The ratio of aneurysm to AVM for SAH in our cases was 3:1 (table 1). The AVMs were seen in the younger age group and were mainly males. Only 3 out of 34 patients exceeded 40 years old.¹⁶ Over the last 2-3 years a total of 30-35 cases of AVM's underwent surgery or stereotactic radiosurgery annually in the Klang Valley. The ratio of aneurysms to AVM's for the period was thus 2:1. The ratio of aneurysm to AVM at 2-3:1 is lower than that from the West, at about 5:1.^{9,10} The difference could again be due to the younger mean age of the Malaysian population as compared to the West as discussed earlier.

TABLE 1: Underlying pathology of 103 cases of SAH, University Hospital, Kuala Lumpur 1979-1988

Pathology	No. of cases	% of all SAH	% Angiogram
Aneurysms *	30	29	46
AVM's *	10	10	15
Negative angiogram	25	24	39
No angiogram	38	37	—
Total	103	100	100

* 2 patients had 2 and 3 aneurysms each and another had an aneurysm and an AVM.

HONG KONG POPULATION

So et al.¹⁹ suggested in 1979 that the low incidence of aneurysmal subarachnoid hemorrhage of 0.6 per 100,000 population in Hong Kong might be a result of less prevalent arteriosclerosis in the Hong Kong Chinese compared with the Japanese and Westerners. Poon et al.²⁰ however in 1988 found a 3 fold increase in the incidence of aneurysms to 2.5 per 100,000 population and has attributed this increase to a better awareness of the disease and availability of neurosurgical services. This annual incidence of 2.5 is close to the Malaysian figure of 1.4-1.7. Like Malaysia, mean age of the Hong Kong population is also lower than the West.

THAILAND AND PHILIPPINE POPULATIONS

Bunyaratave et al.²¹ pointed out in 1987 that in Thailand, the low incidence of intracranial aneurysms is probably due to poor awareness and an underdeveloped neurological and neurosurgical services. He reported the ratio of aneurysm to AVM in Thailand to be 2:1-3:1.²² Isabela reported in 1997 that the ratio of aneurysms to AVM's in Metro Manila, Philippines to be 3:1.²³

SINGAPORE POPULATION

Tan reported 82 aneurysms and 66 AVM as the cause of SAH in Tan Tock Seng Hospital over a 2-years period in 1982-3.²⁴ The ratio of aneurysm to AVM was 4:3. Seow in an unpublished observation reported 49 cases of aneurysms clipped in 1997 in the same Hospital. The ratio of SAH to clipped aneurysm was 2:1.²⁵ Seow estimated that their SAH accounted for

half of the total seen in Singapore. The ratio of aneurysm to AVM was 2-3:1.

Thus, the ratio of aneurysm to AVM in Malaysia, Thailand, Philippine and Singapore all falls between 2-3:1. This is lower than that reported from the West. This may be explained by the younger mean age of these South East Asia countries.

CLINICAL PRESENTATION

Patients with SAH present with sudden severe headache and neck pain. Warning symptoms may occur a week or two before the catastrophic event. This may take the form of brief headache, visual symptoms, third nerve palsy, neck pain or sciatica. Poon et al.²⁰ reported such symptoms in 38% of their patients from Hong Kong.

Sudden exertion such as coitus, weight lifting and straining may predispose to aneurysm rupture.⁹ However, there remains a large proportion of patients, who developed SAH at rest or during non-strenuous activities such as watching televisions. None of the papers published from the South East Asian series addressed this clinical aspect. None of the author's personal cases of SAH admitted to sexual intercourse as the immediate precipitating cause. This may be due to different sexual behaviour among Asians. The Asians may also be more reserved in disclosing their sexual history to the doctors.

The clinical severity of SAH ranged between mild headache to death. Fits is said to be uncommon for aneurysm bleeding but can be a presenting feature for AVM.²⁶⁻³⁰ 60% of our AVM presented with intracranial haemorrhage, 2/3 of which had associated subarachnoid haemorrhages.^{13,31} This is in accordance with the findings of Tay et al from Singapore.¹¹ In the

West 30 to 60% of AVM present as intracranial haemorrhage, most of which (85%) were SAH.^{26,27,29,32} After 1979, our data showed a relative increase in the number of small AVM, as well as intracerebral hematoma from 6 to 22%.³¹ This reflected an improvement in clinical detection after computed tomography (CT) became available.

NEUROLOGICAL GRADING

Botteral³³ first put forward his neurological grading for SAH and its correlation to the outcome after surgery in 1956. The Hunt and Hess grading³⁴ has been in use widely until recent modification by the World Federation of Neurological Surgeons (Table 2).³⁵

The Malaysian¹⁶ and Hong Kong²⁰ reviews showed that 2/3 of the patients presented in good grades (Hunt and Hess grade I-III). Poon et al.²⁰ pointed out that with early referrals, 73% was able to obtain good recovery as compared to only 40% among those patients who were referred late. The importance of early referral cannot be over emphasised.

LOCATION OF ANEURYSM

The aneurysm location of the Malaysian^{13,16} and Hong Kong^{19,20} cases are summarised in Table 3. The Malaysian cases closely resemble those from the USA and Japan, i.e. anterior communicating artery (25%-28%), middle cerebral artery (20%-21%) and internal carotid (41%).^{20,36} In both the Hong Kong series, there is a disproportionately higher proportion of aneurysm at the at the anterior communicating

TABLE 2: World Federation of Neurological Surgeons (WFNS) Grading of Subarachnoid haemorrhage

WFNS grade	GCS	Major focal deficit *
0 #	-	-
I	15	absent
II	13-14	absent
III	13-14	present
IV	7-12	present/absent
V	3-6	present/absent

GCS Glasgow Coma Scale

* aphasia and/or hemiparesis or hemiplegia

intact unruptured aneurysm

artery (35-37%). Such geographical variation is interesting. Further data are necessary to confirm this finding.

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TABLE 3: Location of aneurysm (%)

Site	Chee ^{13,16} (Malaysian) n = 34	So ¹⁹ (Hong Kong) n = 37	Poon ²⁰ (Hong Kong) n = 37
ACA	20	37	35
MCA	18	24	22
IC + PCoA	50	34	32
AC	3	0	5
Posterior circulation	9	5	5

ACA = anterior communicating artery

MCA = middle cerebral artery

IC + PCoA = internal carotid/posterior communicating artery

AC = anterior cerebral/pericallosal artery

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