ANEURYSMS ARE MORE COMMON THAN ARTERIOVENOUS MALFORMATIONS AS THE CAUSE OF SUBARACHNOID HAERMORRHAGE IN THE MALAYSIAN POPULATION

C P Chee, T. G. Loh

SYNOPSIS

A retrospective prospective study of 84 cases of subarachnoid haemorrhage, 24 intracranial aneurysms and 18 arteriovenous malformations (AVM's) treated in the University Hospital, Kuala Lumpur, during the post CT-scan era was carried out to verify the relative frequencies of these clinical entities in the Malaysian population.

Our results show that aneurysms are commoner than arteriovenous malformations as a cause of subarachnoid haemorrhage and also the most frequent as a whole, thus refuting the previous claims that AVM's are 4 to 10 times more common than aneurysms in this part of the world. Of interest was the internal carotid artery aneurysms accounted for half of the anterior circulation aneurysms and that 2/3 of the AVM's presented with intracranial haemorrhage.

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INTRODUCTION

In the western community, the epidemiology of subarachnoid haemorrhage (SAH), berry aneurysms and arteriovenous malformations (AVM's) has been established to a larger extent. The incidence of subarachnoid haemorrhage is between 6 to 10.9 per 100,000 population per year out of which 76% were aneurysms (1,2). Many series based on autopsy studies reviewed an incidence of 1.4 to 1.6% of intracranial aneurysms (3.4). The relative frequency of berry aneurysms to AVM's is about 5:1(5).

On the other hand, there have been claims by several authors without any convincing data that in the Malaysian, Singaporean and Thai populations, the spectrum of subarachnoid haemorrhage, aneurysms and AVM's is vastly different. It was further pointed out that AVM's were several times more common than aneurysms in this part of the world (6,7). Although there was one paper from the authors' centre in 1977 refuting this conclusion, it has largely gone unnoticed (8). It is necessary to clarify the epidemiology of SAH, aneurysms and AVM's again in the Malaysian population. This retrospective prospective study of cases treated since 1979 was carried out to try to resolve the controversy.

University Hospital/University of Malaya
Departments of Surgery and Medicine
59100 Kuala Lumpur
Malaysia

C P Chee, MBBS, MRCS, LRCP, FRCS(ED), FRCS (GLASG), FICS. NEUROSURGEON

T G LOH, MBBS, MRCP(ED), MRCP(GLASG), MRCP(LON), NEUROLOGIST/PROFESSOR OF MEDICINE

Address for Correspondence: Dr Chee

The University Hospital in Kuala Lumpur is a modern teaching hospital with neurologists, neurosurgeons and radiologists. It accepts referrals from all parts of Peninsula Malaysia. CT-scan first became available in Kuala Lumpur in 1979 and the University Hospital acquired the Pfizer 0450 fourth generation scan in 1981. It was the usual practice to have CT-scan for patients suspected of intracranial haemorrhage, presenting with lateralising signs, altered consciousness or meningism. Angiography was usually performed for cases of subarachnoid haemorrhage and lobar harmatomas unless the patient was regarded to be too ill for contemplation of any intracranial surgery.

MATERIAL AND METHOD

This study involved all cases diagnosed and treated in the University Hospital, Kuala Lumpur, as subarachnoid harmorrhage, intracranial aneurysms or AVM's between April 1979 to April 1987. Case detection was by information recorded in the Medical Record Department and the Neuro-surgical Operation Registry of the University Hospital.

A total of 88 cases of SAH was treated within the 8 year period but 4 cases could not be traced despite all efforts. There were 24 aneurysms and 18 AVM's treated within the same period. The case records were scrutinized using a standard protocol with regards to the validity of diagnosis, age, sex, clinical presentation, neurological grading, under-lying pathology as revealed by angiography and operation, reasons for not having angiography in certaing cases and the outcome after treatment. Th neurological grading was according to Hess and Hunt for SAH(9).

RESULTS

Out of the 84 cases of SAH, 48 cases had angiography 22 (26%) had no aneurysms, AVM's or any other pathological cause (Table 1). This surprisingly formed 46% of all those with angiography. 14 cases had panangiography while 8 had carotid angiograms alone. Anerysms and AVM's were the

causes in 20 and 7 cases respectively. Two patients had 2 and 3 aneurysms each and another, an AVM associated with aneurysm. In addition, one other aneurysm presented only with third nerve palsy while 10 other AVM's did not have subarachnoid harmorrhage. Over the period of study, the University Hospital had an average of 29,200 admissions per year. Hence, the incidence of aneurysms was 9 cases per 100,000 hospital admissions whereas there were 8 AVM's per 100,000 hospital admissions. The incidence for subarachnoid haemorrhage was 37 per 100,000 hospital admissions.

INTRACRANIAL ANEURYSMS

There were 21 patients with 24 aneurysms. 14 patients were female. The mean age was 45 years with a range of 15 to 65 years. The sites of aneurysms were classified in table 2. The commonest site was at the internal carotid artery followed by middle cerebral artery. There were 3 cases of giant aneurysms, all at the internal carotid artery. Two giant aneurysms were intracavernous. The Hess and Hunt neurological grading was as follows: I(2),II(8),III(6),IV(2) and V(3).

5 patients, including the 2 patients with multiple aneurysms, refused surgery (table 3). Carotid ligation was done in the 2 cases of giant intracavernous aneurysms. 14 patients with aneurysms had surgey (table 4). Out of the 6 deaths attributable to operative mortality, 3 patients were in grade V and moribund preoperatively, 1 grade IV and 2 grade II, the later 3 cases developed severe vasospasm postoperatively. One patient with giant carotid aneurysm was moderately disabled after carotid ligations. Of 7 remaining patients who were independent postoperatively, 4 cases were in grade II, 2 grade I and 1 grade III. One patient in grade II died from pulmonary embolism 2 months later. Another 64 year old woman with giant posterior communicating artery aneurysm underwent clipping of the aneurysm uneventfully.

ARTERIOVENOUS MALFORMATIONS

13 out of th 18 patients with AVM's were male. The mean age was 23 years and none of the patients were above 41 years old. There were 8 AVM's greater than 3 cm and 10 small, less than 3 cm in the largest diameter. 3 AVM's were deep-seated. Other than the 8 patients presented with subarachnoid haemorrhage, 4 others presented with intracerebral haematomas alone. Of the 11 cases operated upon 9 were small, 7 presented with haemorrhage. 2 other large AVM's operated upon had both subarchnoid and intra cerebral haematomas.

Following surgical excision of the AVM's, 7 patients were independent at follow-up. One of the patients with large AVM was severely disabled and one cerebellar AVM died from massive intraoperative recurrent haemorrhage into the fourth vantricle. 2 patients with small AVM's were improved at follow-up but remained partially disabled.

6 out of the 7 cases not operated upon were referred back to the original hospital. The remaining one a 23-year old woman with a large AVM was independent and delivered a baby uneventfully after 9 months.

PATIENTS WITH SUBARACHNOID HAEMORRHAGE BUT NOT HAVING ANGIOGRAMS

A scrutiny of this subgroup of subarachnoid haemorrhage was done because of the skeptical opinion concerning the relative frequency of aneurysms and AVM's being missed due to the reluctance of medical practitioners to request angiography or the refusal to have it by the patients. 4 patients did not have lumbar puncture because of obvious clinical presentation with CT-scan findings.

Table I

UNDERLYING PATHOLOGY OF 84 CASES OF SUBARACHNOID HAEMORRHAGE

UNIVERSITY HOSPITAL, 1979-1987

Pathology	No. of Cases	% of all SAH	% Angiogram
Aneurysms*	20	24	42
AVM's*	7	8	15
Negative angiogram	22	26	46
No angiogram	36	43	—
Total	84	101	103

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

Table 2

CLASSIFICATION OF 24 ANEURYSMS BY SITES

Site	Number
Ant. Communicating artery	5
Middle cerebral artery	5
Internal carotid artery	11
— post communicating artery	6
— intracavernous	1
Posterior cerebral artery	2
Pericallosal artery	1
TOTAL	24

Note : 1 case had a right post-communicating and a left middle cerebral artery aneurysms. Another patient had and anterior communicating, an internal carotid syphon and a posterior cerebral artery aneurysms.

Table 3

TREATMENT OF THE 21 PATIENTS WITH ANEURYSMS

Mode Of Treatment	Number
Operation	14
— clipping	12
— carotid ligation	2
Refused Surgery	5
Transfer to other hospital	2

Table 4

OUTCOME AFTER OPERATION FOR ANEURYSMS IN 14 CASES

Outcome	Number
Independent	7
Disabled	1
Dead	6

Table 5

REASONS FOR NOT HAVING ANGIOGRAMS IN 36 CASES OF SUBARACHNOID HAEMORRHAGE

Reason	No.
Poor Neurological Status	22
Refusal by patients	5
Advanced age (>65 years)	2
Failed angiography	2
Transfer to other hospital	2
Unknown reason	3

The reasons for not having angiography in the 36 cases of subarachnoid haemorrhage were summarized in table 5. The commonest cause for not subjecting the patients to angiography was found to be poor neurological status, worse than grade III (61%). 2 patients above 65 years old were not subjected to angiography although they were in grade II status because the surgical risk of intracranial operations was thought to be unacceptable. Only 5 patients refused angiography when offered. When the age groups of the patients were considered (table 6), more than 80% of the patients were above 40 years old.

CT-scans were available in 15 cases, 8 of which revealed blood in the ventricle or the cerebral hemisphere (table 7). Non-enhancing low density lesions consistent with recent infarction were seen in 2 cases. When the 22 cases of subarachnoid haemorrhage with poor neurological status were followed up (table 8), 10 were dead within 1 to 8 days (mean 3.5 days). 11 were found to be disabled to varying degrees between 1 to 66 months. 1 patients was independent at 22 months. Of the 10 deaths, none had post-mortem examinations except for 1 in which no AVM or aneurysms was found to be the cause of intracerebral intraventricular clot.

DISCUSSION

Our results show that other than the cases with negative angiography, aneurysms are still the commonest cause (43%) of subarachnoid harmorrhage in the Malaysian population. AVM's only account for 15% of those who had angiography but only 8% of all subarachnoid haemorrhages. With regards to all aneurysms and AVM's treated, anuerysms were still more common than AVM's, the ratio being 4:3. If th 7 year pre-CT scan series by Vignandra et al(8) was considered, the number of aneurysms and AVM's treated in the University Hospital over a 15 year period will be 44 and 34 respectively. These results were markedly different from those

Table 6

AGE INCIDENCE OF 22 PATIENTS WITH SUBARACHNOID HAEMORRHAGE, WITH POOR NEUROLOGY BUT NOT HAVING ANGIOGRAM

Age Groups (Years)	Number
10 –	3
20 –	0
30 –	1
40 –	4
50 –	7
60 –	2
70 –	5

Table 7

CT-SCAN FINDINGS IN 15 CASES OF SUBARACHNOID HAEMORRHAGE NOT HAVING ANGIOGRAM

Appearance	Number
Normal	1
Blood – intracerebral alone	6
– ventricle	1
– subarachnoid space and intracerebral	2
Hydrocephalus only	4
Non-enhancing low density lesion	2

Table 8

OUTCOME IN 22 CASES OF SUBARACHNOID HAEMORRHAGE WITHOUT ANGIOGRAM AND WITH POOR NEUROLOGY

Outcome	Number
Dead	10
Severely disabled	5
Partially disabled	6
Independent	1

gleamed from personal communication and unsubstantiated data by Spillane (6) and Gwee(7) in 1969 and Selby (10) in 1973 who claimed that AVM's are 4 to 10 times commoner than aneurysms in Thailand, Malaysia and Singapore. It should be noted that the relative preponderance of aneurysms over AVM's is still different from the Western data where aneurysms account for 76% of subarachnoid haemorrhage while AVM's only 2%(1). Berry aneurysms were 5 times more common than AVM's in the Western community(5).

However, the general population incidence of SAH from the Western Hemispheres cannot be compared with our results because ours were hospital based and patients were referred from all over the country with an undetermined population. Our hospital incidence of 37 subarachnoid haemorrhage per 100,000 admissions argued strongly against the theory that subarachnoid haemorrhage is uncommon in the Malaysian population.

The detailed study of those patients who did not undergo angiography revealed that the main reason was poor neurological status which is an acceptable approach even in the Western countries. A break down of the age groups of this subgroup revealed 80% of them above 40 years old which would favour the under reporting of aneurysms as a cause, since the incidence of aneurysms is higher in the older age groups. In fact none of our patients with AVM's was more than 41 year old. This failure to perform angiography leads to probable under diagnosis of aneurysms in subarachnoid haemorrhage and the previous claims of higher frequency of AVM's (6,7,10).

Our incidence of negative angiography was twice more common than Lockley's series with 20%. This is probably a true reflection of the incidence because of the good facilities for angiography and availability of technical and professional expertise. The only reservation is that 8 out of the 21 cases had carotid angiograms only usually a decision influenced by CT-scan appearances, age of patients or poor neurological grading. Nevertheless, future efforts should be made to improve the proportion and completeness of the angiograms and to increase public awareness in order to improve the case detection rates.

The age and sex incidence of aneurysms did not differ from those of the Western countries. However the internal carotid artery accounted for 50% of those aneurysms in the anterior circulation as opposed to a third in the cooperative study(12). The fact that 5 out of 21 patients refused surgery may reflect the skepticism, fear and ignorance of neurosurgical operations by the general public. The results after operation in this centre cannot be compared with the data obtained in Western centres because of the heterogenecity of the techniques employed by the various neurosurgeons over this period. Of noteworthy was the 3 out of the 6 deaths were in moribund patients who were operated mainly because of the presence of a large intracerebral clot. The remaining 3 developed severe vasospasm postoperatively.

As expected, most of the AVM's fell into younger age group and were males. In fact none exceeded 41 years old. 12(6%) out of 18 AVM's presented with intracranial haemorrhage, 2/3 of which had subarachnoid haemorrhages, which is in accordance with the findings of Tay et al(7). In the West, 30 to 60% of AVM's present as intracranial haemorrhage, most of which (85%) were subarachnoid haemorrhages (13-16). As in other series, smaller AVM's (less than 3 cm diameter) tend to bleed. In fact 8 out of our 10 small AVM's presented with both subarachnoid and intracerebral haemorrhage and were operated. Except for one death due to intraoperative massive haemorrhage and one patient becoming severely disabled after surgical removal of a large AVM, the results were good in all the other 9 cases after operative removal of the AVM's.

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