INTRACRANIAL ARTERIOVENOUS MALFORMATIONS IN MALAYSIAN POPULATION

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SUMMARY

Thirty-four patients with intracranial arteriovenous malformations seen in the University Hospital, Kuala Lumpur, over a 15-year period were reviewed. AVM was found to be more common in young, male patients with preponderance Chinese origin. The advent of the CT-scan has increased the detection of small AVMs and intracerebral haematomas proportionally. The majority of the lesions were situated in the posterior half of the brain unlike the distributions in patients in the West and in Singapore. On the other hand, most of the intracranial bleeding were subarachnoid haemorrhage; a presentation similar to the western community, but unlike that reported from Singapore. The treatment policy is not unlike the western community with good results in 82% of patients selected for surgery.

KEY WORDS:
ARTERIOVENOUS MALFORMATION, INTRACRANIAL HAEMORRHAGE.

INTRODUCTION

Since Luschka first described cerebral arteriovenous malformation (AVM) in 1854, Virchow, Steinhill and Krause further discussed the problems with this condition over the turn of the century. However, it was Cushing and Bailey's monograph and Dandy's report of his clinical series that defined the condition clearly.[1,2]

In the West, the epidemiology of AVM had been clearly defined as illustrated by the report on the co-operative study of intracranial aneurysms and subarachnoid haemorrhage by Locksley.[3] AVM accounted for six percent of the 5000 cases of subarachnoid haemorrhage. In the Asian population, so far as we are aware, only Tay et al had reported their series of AVMs in the Singapore population before CT-scan was available in 1971.[4] There has not been any systematic study of arteriovenous malformations in the Malaysian population. Here we present two series of patients with AVMs from the University Hospital, Kuala Lumpur, before and after computerized tomography (CT) scan became available.

PATIENTS AND METHODS

Between August 1969 and June 1976, 16 intracranial AVM's were treated in the University Hospital, Kuala Lumpur whereas between April 1979 and April 1987, another 18 cases were admitted. The hospital annual admission averaged 18,300 and 29,200 respectively in the two study periods.

CT-scans became first available in Kuala Lumpur in 1979 and in the University Hospital in 1981. It is because of this change in the facility for investigation that patients from the two periods were studied together and separately. Between 1976 and 1979, the lack of neurosurgeons in the Hospital has led to it being omitted

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from the study. This study included patients in the pre-CT-Scan era whose findings were published in a previous paper (1977).[5]

The patients were studied with respect to age, sex, race, neurological grading, site and size of the AVMs and clinical presentations for both the periods. Only patients in the post CT-scan era were studied with respect to the CT-scan appearances, treatment modalities and outcome after surgery. The outcome after surgery was assessed with the Glasgow outcome scale: dead, vegetative, severe disability moderate disability, and good recovery.[6]

RESULTS

There were 25 male and nine female patients with the same sex proportion for each period. The mean age was 24 years. None of the patients was above 55 years. Only three patients (9%) were more than 40 years old. The racial distributions of AVMs were: Chinese 72%, Malay 16% and Indian 11%. The overall hospital incidence of AVMs was nine per 100,000 admissions and 11 and 8 per 100,000 admissions respectively for the pre-CT seven-year and post-CT eight year periods. One patient had both an occipital AVM and posterior cerebral artery aneurysm.

Site and Size of AVMs

There were 15 small (less than 3 cm diameter) AVMs. When these were separated with respect to the two study periods (Table 1), there was an increase in the proportion of the small AVMs detected in the later period. The site of AVMs were listed in table 2. There were relatively more cases detected in the parietal and occipital lobes, 19 out of the 34 cases.

Clinical Presentations

Twenty-one patients (62%) presented with intracranial haemorrhage, of these 76% had subarachnoid haemorrhage. Only one patient presented in the pre CT-scan period with intracerebral haematoma (Table 1).

When those cases with subarachnoid haemorrhage were excluded (Table 3), it was found that epilepsy was the commonest presentation (50%). Headache and lateralising signs were each present in a third of the patients. A 54-year old patient with retro-orbital AVM presented with proptosis. Four patients had inappropriate behaviour.

Investigations

Ten radioindium brain scans were done for patients before 1976, out of which nine were positive. Only one patient with positive scan had AVM less than 2 cm diameter. CR-scans were available in all 13 cases diagnosed after the later part of 1980. Although 10 intracranial haemorrhage were detected, only three showed subarachnoid haemorrhage (Table 4), because of the limitations of our Pfizer scanner to detect minor degree of subarachnoid haemorrhage. Intrinsic brain lesions enhanced by contrast injections were found in six cases. Calcification was detected only in one patient while another patient showed only cerebral atrophy, although angiography demonstrated extensive AVM and EEG showing asymmetry of activity. Isotope scan was only done in two cases in the post CT-scan era, one of which gave rise to a correct localization of the left parietal AVM. The other was normal despite an extensive left cortical AVM, proven on angiography.

Treatments of 18 AVMs: 1979 – 1987

The treatment of 18 patients admitted in the post CT-scan era are summarized in Table 5. Eleven patients were operated upon, out of which nine were small AVMs and the other two between 4 to 6 cm. in diameter. All except two of these 11 cases presented with intracranial haemorrhage, seven cases were left sided. The remaining seven patients were treated conservatively, six of whom were referred back to their original hospitals. This included a young man with a deep seated AVM associated with a posterior cerebral artery aneurysm who did not want any operation.

Outcome after Surgery for 11 AVMs 1979 – 1987

One patient with cerebellar AVM died in the immediate postoperative period due to massive rebleed intraoperatively into the fourth ventricle. The other 10 patients operated upon in the post CT-scan era were followed up for a mean period

of 19.3 months (range 1 – 89 months). Seven patients were independent while two others were improved though slightly disabled (Table 6). The remaining patient was severely disabled.

TABLE I
COMPARISON OF THE MEAN AGE, SIZE AND MODE OF PRESENTATIONS OF THE PATIENTS FROM THE TWO STUDY PERIODS

Study Period	1969-1976	1979-1987	Both
Mean Age (yrs)	25	23	24
Size of AVM's:			
small $<$3 cm			15
medium (3–6 cm)			12
large $>$6 cm			7
Clinical presentation:			
SAH			16
Intracerebral haematoma			5
Non haemorrhage			13
Total	16(100)	18(100)	34

% in brackets

TABLE II
SITE OF 34 ARTERIOVENOUS MALFORMATIONS

Site	Frequency
Parietal	7
Occipital	6
Temporal	4
Frontal	1
Fronto-parietal	3
Parieto-temporal	1
Parieto-occipital	1
Intraventricular	3
Sylvian fissure	1
Hemispheric	3
Retroorbital	1
Cerebellar	1
Transtentorial (posterior fossa and temporal)	1
Posterior Thalamic	1

TABLE III
CLINICAL PRESENTATIONS OF 18 ARTERIO-VENOUS MALFORMATIONS WITHOUT SUBARACHNOID HAEMORRHAGE

Clinical Presentation	Number
Lateralising signs –	6
– speech disurbance	1
– weakness	6
– visual field defect	1
– sensory disturbance	1
Fits	9
Headache	6
Inappropriate behavior	4
Squint	2
Cranial nerve palsy	1
Proptosis	1
Involuntary movement	1

TABLE IV
CT-SCAN APPEARANCE OF 13 AVM'S 1980 – 1987

Findings	Number
Intracranial haemorrhage	10
– subarachnoid	3
– intracerebral	9
– intraventricular	6
Enhancing mass lesion	6
– supratentorial	5
– cerebellar	1
Cerebral atrophy	1
Calcification	1

DISCUSSION

Our results showed that the mean age of patients with intracranial AVMs in the Malaysian population was 24 years, unaltered by the availability of the CT-scan which is consistent with reports from the West[7] and Singapore.[4] The male preponderance of 74% was also similar to that in Singapore (60%)[4] and the West (2/3).[8,9,10] The

TABLE V
TREATMENT MODALITIES OF 18 ARTERIOVENOUS MALFORMATIONS 1979 – 1987

Treatment	Number
Conservative	7
intraventricular (medium size)	2
Large lobar	4
small associated with aneurysm	1
Operative	11
small	9
medium size	2

TABLE VI
OUTCOME AFTER SURGERY FOR 11 AVM'S 1979 – 1987

Outcome	Number
Independent and good recovery	7
Improved but moderately disabled	2
Severely disabled	1
Dead	1

hospital incidence of nine per 100,000 admission was lower than that in Singapore (about 15 per 100,000). In fact since CT scanning became available, there was a tendency towards decline of the incidence from 11 to 8 per 100,000 admissions, the reason for which was unknown. Over the same study period, the racial distribution of attendance at the University Hospital excluding maternity patients were as follows: Malays 27%, Chinese 45% and Indians 27% and that of the general population: Malays 56%, Chinese 33% and Indians 10%.[11] Thus, there was a striking preponderance in the Chinese ethnic group (72%) among patients with AVM's. Tay et al reported a similar Chinese preponderance in Singapore but comparison with our data is impossible because the population and hospital admissions were mainly Chinese in Singapore. There was no predisposition of any occupation to AVMs.

Since acquiring the CT-scan facility, there was an increase in the proportions of small AVMs detected from 31% to 56% and intracerebral haematomas from 6% to 22%. The distribution of locations of the lesion is different from that of Singapore in that 56% of our lesions were in the parietal and occipital lobes whereas in Singapore, there was a predominance in the frontal and parietal lobes.[4] Reports on Caucasians showed that their AVMs were mainly found in the territory of the middle cerebral artery.[12,13]

The mode of presentation of AVMs in our population is of particular interest because like the series from Singapore, more than 60% presented with intracranial haemorrhage. In Singapore only half of the intracranial haemorrhages were subarachnoid haemorrhages.[4] In the West, 35 – 55% of patients with AMVs presented with intracranial haemorrhage, 85% of which were subarachnoid in origin. Twenty-six per cent of all our AVMs presented with epilepsy – a figure similar to that reported by Tay et al.[4] Other common presenting features were lateralising signs, headache and inappropriated behaviour.

Before CT-scan was available, isotope brain scan was a reliable investigation for AVMs being positive in 90% of our cases. It should however be pointed out that only one of them was less than two cm in diameter. CT-scanning in patients with sudden ictus or neurological symptoms and signs has led to the detection of more cases with intracerebral haematomas. However, our Pfizer CT-scan with its resolution could not detect thin subarachnoid haemorrhage. Surprisingly, there were only six out of 13 cases (46%) in which contrast enhanced lesions were detected. This is probably due to the fact that most of these cases had haematomas which might mask an enhancing lesion or the feeding vessels might be in spasms or been compressed by the adjacent haematomas. Of interest is one patient who had cerebral atrophy alone on the CT-scan although angiography revealed extensive AVM.

The treatment of our AVMs over the last few years did not vary from the general approach of the West in which surgery was offered for small, superficial lesions that presented with haemorrhage. In fact, the only 2 patients who were

operated without intracranial haemorrhage had small superficial lesions situated in non-eloquent brain.[14] Those patients with large lesions were referred back to their doctors for follow up after explanation about the high unaccetapble risk of operation weighing against the smaller risk of bleeding or rebleeding. One young woman who had extensive lesion had an uneventful delivery of a baby nine months later.

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