CEREBROVASCULAR DISEASE—EPIDEMIOLOGICAL AND CLINICAL CONSIDERATIONS

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In all developing countries, the control of easily preventible diseases like infectious fevers, malaria, and malnutrition easily changes the pattern of mortality, and certainly also of morbidity of a country. Hence the place of cerebrovascular disease in mortality is often an underestimate. Furthermore, the morbidity is far greater in cerebrovascular disease than the others, because of the relatively longer survival of affected cases, and the greater inadequacy in physical ability that follows. Besides, the present mode of population planning is towards the creation of an aging society with increasing proportion of old people at the expense of the young, and hence it is safe to say that cerebrovascular disease must become inevitably the most important cause apart from accidents both from the point of mortality and morbidity.

Although much has been done, and a number of new techniques have appeared, the diagnosis of the different kinds of cerebrovascular disorders remain inexact in many instances. This has led to a nihilistic approach of grouping the lot as cerebrovascular catastrophe on the main pretext that many thrombotic infarcts are haemorrhagic, and a good number of cerebral haemorrhages have clear cerebrospinal fluid especially if only one spinal tap is done. However, it must be evident that discriminatory efforts can only be intensified if attempts at division are made, and our relative inadequacy should make us more keen to classify and divide rather than to combine and group together. Hence, we have in spite of the well-known shortcomings, continued to make distinction of cerebral and subarachnoid haemorrhages, cerebral thrombosis, and cerebral vascular insufficiency including transient ischaemic attacks. Clearly as we know more, the definition will change, but for the time these defined groups will facilitate study and comparison.

Incidence represents a major interest in epidemiology, and in Singapore the important question is what proportion of C.V.A. is seen as the hospital population. It has been observed that the hospital utilisation rate varies from race to race (Gwee, 1964). This rate varies also for sex and for individual disease. In general, an acute illness with severe pain such as tetanus or a lot of nursing problems such as comatose states is likely to be sent to the hospital irrespective of race, sex and disease-bias, provided that the patient will survive for at least a few days. Where the survival is of a short duration, Chinese and Malays are apt to keep the case at home. On the other hand, where the disability is not too great, and the demand for care not too exacting, the utilisation rate is likely also to be very different. Hence, when considering hospital figures, one must accept that whereas cerebral and subarachnoid haemorrhages are likely to be close to true incidence of the population and be relatively free from utilisation bias, cerebral thrombosis, and worse still so-called transient ischaemic attacks must be very different from the true incidence. An attempt was made to show locally that the racial breakdown of C.V.A. has some resemblance to and is therefore a reflection of the racial breakdown of the population (Toh and Khoo, 1963), but since C.V.A. affects principally the 5th and 6th decades, the comparison should in fact be with the same group in the population, and when this is done, it will be seen that the racial proportion of 7.5:1:1.5 = Chinese : Indian: Malay no longer holds (Figs. 1 and 2). In fact taking age group 50-69, the ratio is 21: 1:7.5. The fall in Indian figure is chiefly because of the fact that when the Indians retire from active work, they generally return to India. Some of the Chinese also do that but the figure is small. However, the adult Chinese population is less stable than Malays as it is apt to migrate to Malaysia in search of employment, whereas the Malays, being mostly public service employees of fishermen, are less liable to move out. Surveys in other countries show varying figures, (Stallones, 1965). It is likely that the figure is lower in Singapore in view of the fact that we are having a younger population and hence fewer similar cases, and secondly, our doctors are less aware of the entity of transient ischaemic attacks.

In fact a more accurate idea can be obtained by comparing the annual mortality figures of the hospital and the nation as a whole. Bearing

AGE DISTRIBUTION (IN SINGLE YEARS), 1957

B. FEMALES

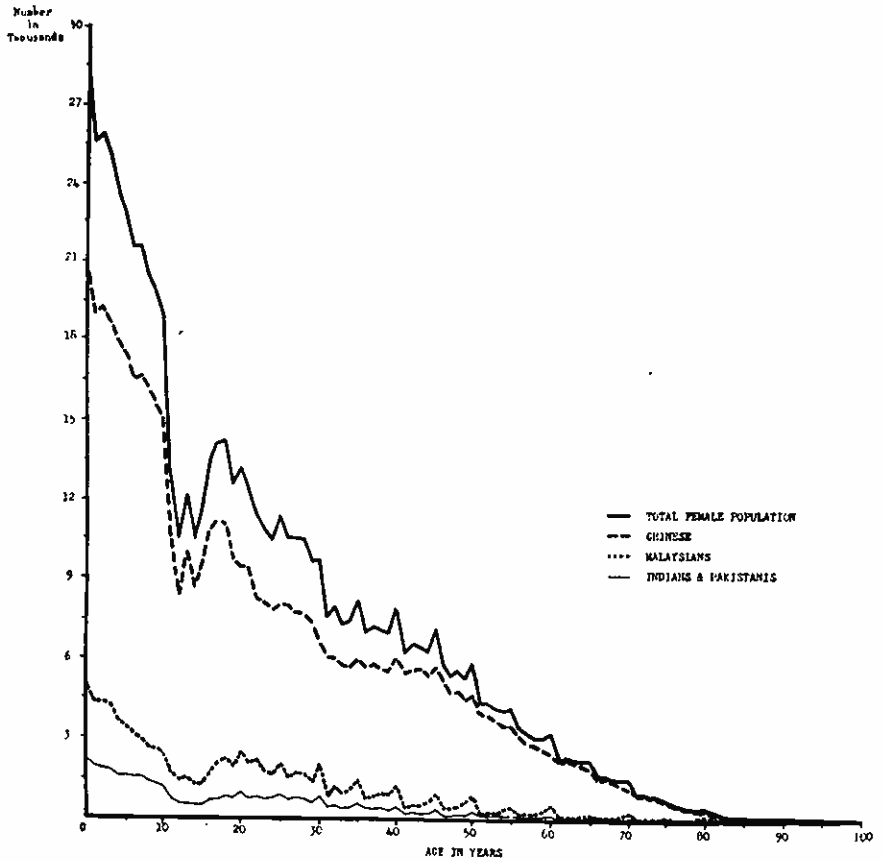
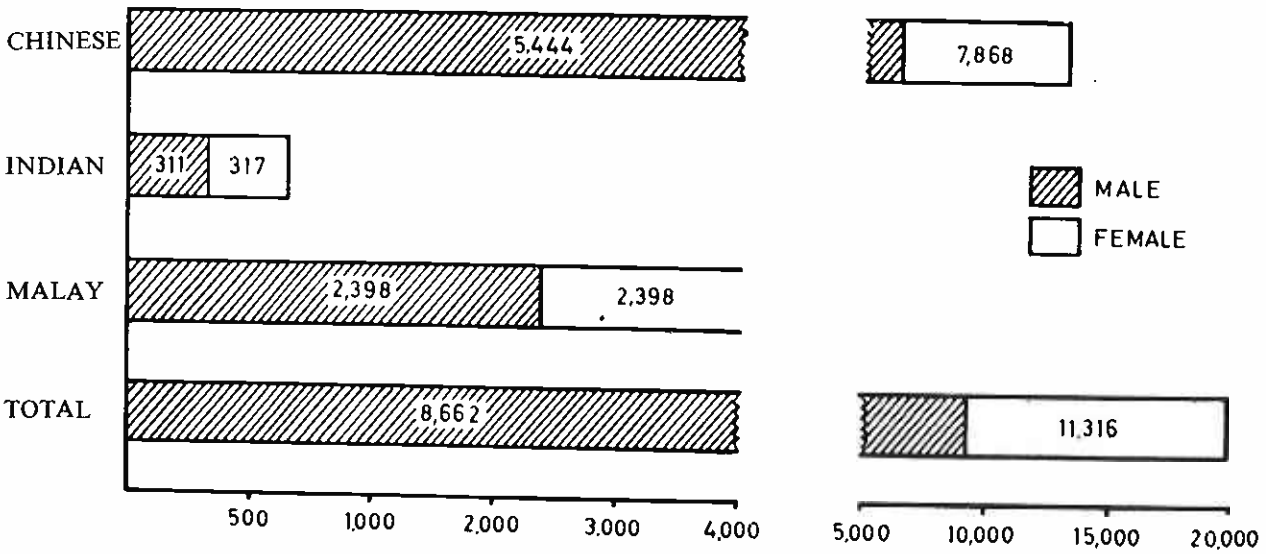


Fig. 1

POPULATION DISTRIBUTION AT 5th & 6th DECADE. SINGAPORE 1957. (CENSUS FIGURE)



CHINESE : MALAY : INDIAN

21 : 75 : 1

Fig. 2

in mind that probably almost all cerebral and subarachnoid haemorrhages are admitted, and the total mortality in G.H. is about 300 a year, then it seems likely that in the bleeding C.V.A., the hospital figure is a good and reliable index of the population incidence, being almost the bulk of the disease. The same unfortunately cannot be said for cerebral thrombosis, embolism and ischaemic diseases, and the true incidence must await a planned population survey. A sample survey done in 1966 of a population of 10,116 people showed an incidence of neurologic illness of 14% in the chronic sick population (Chronic sick report 1968). If we exclude the cases under 40 years of age (most of these cannot be C.V.A., other than embolic cases which are very few) then the figure would be 0.9% or 90/10,116 i.e. 89/10,000. This would of course represent only surviving cases, and taking into account immediate mortality of about 30%, the true incidence seems likely to be round about 120/10,000. This figure of course must await confirmation by a planned survey on a greater scale.

The relation with hypertension has been a subject of interest. It is generally agreed that cerebral haemorrhage is a frequent mode of termination of malignant hypertension. On the other hand, the place of hypertension as a contributory factor in the incidence of cerebral thrombosis is not well established. In computing figures, we must be careful of at least two things. Firstly, hypertension is not an uncommon finding in the age group we are dealing with, namely 5th and 6th decades, although because of obvious difficulty, the exact proportion of hypertensives to normotensives at this period of life is difficult to come by, especially when we are by no means agreed what constitutes the range of normal blood pressure at this period. Secondly, a large number of patients at this age grcup when hypertensive, are labile and their blood pressure readings change within wide limits. Further, it is common to have a rise of blood pressure during the acute cerebral vascular catastrophe, and also a fall with the subsequent enforced state of rest and dietetic restriction. Hence, unless the premorbid blood pressure reading is known, the figures recorded at admission, and subsequently during convalescence are suspects, and cannot be relied on implicitly.

Finally, it has always been suspected that a number of C.V.A. may have died before admission, and it is not uncommon for doctors whose series showed a higher mortality to claim that they admitted patients earlier in the acute episode, and hence they have a higher mortality. We thought it would be interesting to search our hospital records of cases brought in dead to see how many cases would in fact have died before admission especially when we found that the mortality figure we had for the present series was low by comparison with other series. Looking through the records in 1967 by the courtesy of the Pathology department—the year in question—we were able to find only 45 cases in this category, and assuming an even distribution between 3 units this would put our death up by 15 only i.e. from 72 to 87 deaths (giving an adjusted mortality of 35%) which is still a very respectable figure indeed, particularly if you bear in mind that cerebral and subarachnoid haemorrhages with high mortality accounted for 48 cases i.e. more than half of our total mortalities.

The next moot point will be the question of survival statistics after the acute episodes. This sort of study is beset with difficulties in Singapore and we have only reliable figures up to 1 year, where the death rate is about 19%. We must take this into account together with the fact that it is uncommon to get the history of previous episodes of C.V.A. in our cases (<8%). If recurrence is common among the survivors, then a significant number of patients should give an account of a previous episode. This will of course depend on the patients' awareness of illness, and minor ischaemic episodes locally are likely to be ignored and forgotten. Taking all these factors into account, the conclusion would seem to be that recurrence of C.V.A. is not locally a serious problem, either because recurrence is not common or that most of them must have perished from other causes meanwhile. It could have meant that the after care is defective, and death from bedsores, urinary infection and other results of impaired mobility could be significant.

I. Cerebral Thrombosis

MATERIAL AND STUDY

All patients admitted between 1st January, 1967 and 31st December, 1967 in whom a cerebrovascular accident—thrombosis diagnosis was made are included in the study. A non-haemorrhagic spinal fluid is taken as a sine qua nor of the diagnosis.

RESULTS

The age group, sex and race distribution of the 141 patients are seen in Table I. There is an equal sex distribution—71 males and 70 females although the hospital admission has a M:F=2:1 bias. Chinese has the highest incidence but this is due to population distribution. More than half of the patients with cerebral thrombosis are in the 50-70 age group (65%).

The prognosis for life in relation to age at the time of admission is shown in Table II. A feature of this table is that a third (67%) of the patients show improvement of the hemiplegic state in spite of difference of age. The overall mortality in this series is 15% with a higher death rate in the older age group of patients. 18% of the patients showed no improvement during the initial hospitalization.

For the purpose of this study hypertension was defined as a diastolic pressure of 100 mm. Hg. or above (Table III). The table shows that 71 patients were hypertensives of whom 37 were males and 34 were females. There is no significant difference in the incidence of non-hypertensive cerebrovascular disease in men and women. There is also no increased mortality in the hypertensive (13%) over the non-hypertensive (16%) group of patients.

Tables IV and V showed some related findings. It was of interest to note that diabetes and hypertension were not uncommon, and recurrence rate was 8%.

More than half the deaths (Table VI) succumbed in the first week of admission with three patients (14%) dying within twenty-four hours of admission. These resulted from either a persistence of coma or deepening coma (55%) arising from the cerebrovascular accident.

DISCUSSION

The immediate mortality from cerebral thrombosis in this series is 15% with a higher death rate in the older age group of patients. This is comparatively lower than the 20-30% mortality stated by Marshall (1965). Among the factors which contributed mainly (55%) to the mortality of the patients were the state of consciousness on admission and its persistence or subsequent deterioration.

It is generally believed that the vast majority of cerebral thrombosis occur in patients whose blood pressure is elevated above the mean for their age group. The blood pressure of the remainder was elevated to varying degrees. 70 patients were non-hypertensive whereas 71 were regarded as hypertensives on this criteria. Furthermore the immediate mortality of the hypertensive group was not increased over that of the non-hypertensive group.

II. Cerebral Haemorrhage

MATERIAL

In 1967, 52 patients with primary intracerebral haemorrhage were seen in the Unit, accounting for 22% of all forms of cerebrovascular accidents admitted to the Unit in the same year. Table VII shows the sex, race and age of the patients. The youngest patient was 31 years old and the oldest 80.

TABLE VII

Sex:	Male = 34	Female = 18
Race:	Chinese = 48	
	Indian = 4	
Age:	40 = 1 (Female)	
	41 - 50 = 8 (Male= 7, Female= 1)	
	51 - 60 = 18 (Male=12, Female= 6)	
	>60 = 25 (Male=15, Female=10)	

MORTALITY

40 patients (77%) died in this series. The time of their deaths in relation to the time of admission is shown in Table VIII. As most of the patients were admitted soon after the onset of symptoms, this corresponds quite closely to the time of onset.

Of those who survived, 4 were alive one year after discharge, 2 alive two years after discharge and 6 were presumed dead as they could not be traced in the subsequent follow-up.

TABLE VIII

TIME OF DEATHS (IN RELATION TO TIME OF ADMISSION

Within the first 24 hours	= 14 (35%)
1 day	= 10 (25%)
2 days	= 4 (10%)
3 days	= 3
4 days	= 1
5 days	= 0
6 days	= 2
7 days	= 0
8 days to a month	= 6

TABLE I

AGE GROUP, RACE AND SEX DISTRIBUTION

Age in Years	MALES				FEMALES				Total
	Chinese	Indian	Malay	Others	Chinese	Indian	Malay	Others	
30	—	—	—	—	—	1	—	—	1
31—40	3	—	—	—	—	—	—	—	3
41—50	3	2	3	—	3	—	—	1	11
51—60	21	2	2	—	15	1	1	—	42
61—70	19	1	2	—	26	—	2	—	50
71—80	13	—	—	—	16	—	—	—	29
81	—	—	—	—	4	—	—	—	4
TOTAL	59	5	7	—	64	2	3	1	141

TABLE II

PROGNOSIS FOR LIFE IN RELATION TO AGE AT TIME OF ADMISSION TO HOSPITAL

Age in Years	MALES				FEMALES			
	Improved	Same	Dead	Total	Improved	Same	Dead	Total
<30	—	—	—	—	1	—	—	1
31—40	3	—	—	3	—	—	—	0
41—50	4	2	2	8	3	1	0	4
51—60	16	4	5	25	12	4	1	17
61—70	17	3	2	22	17	7	4	28
71—80	8	1	4	13	10	3	3	16
>80	—	—	—	—	4	—	—	4
TOTAL	48	10	13	71	47	15	8	70

TABLE III

COMPARISON OF DIASTOLIC BLOOD PRESSURE IN SURVIVORS AND PATIENTS WHO DIED

Age in Years	MALES				FEMALES			
	Diastolic Pressure 99 mm. Hg.		Diastolic Pressure 100 mm. Hg.		Diastolic Pressure 99 mm. Hg.		Diastolic Pressure 100 mm. Hg.	
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
30	—	—	—	—	1	0	—	—
31—40	1	0	2	0	—	—	—	—
41—50	3	2	5	0	2	0	2	0
51—60	15	3	10	2	5	1	12	0
61—70	10	2	12	0	15	2	13	2
71—80	5	1	8	1	9	0	7	3
81	—	—	—	—	4	0	—	—
TOTAL	34	8	27	3	36	3	34	5

TABLE IV

SOME CLINICAL AND LABORATORY FINDINGS ASSOCIATED WITH THIS SERIES CEREBRAL THROMBOSIS

Sex	Diabetes Mellitus		Blood Kahn Positive	Cerebrospinal Fluid		Renal Disease	Diseases		Valvular Heart Disease	P.T.B.	Others
	Treated	Poorly Untreated		Kahn Positive	Kahn Negative		Coronary Heart	Cardiac Arrhythmia			
Male	5	6	6	1	62	5	6	8	1	3	5
Female	3	6	0	0	61	11	6	0	0	1	4
TOTAL	8	12	6	1	123	16	12	8	1	4	9

TABLE V

INCIDENCE OF RECURRENT THROMBOSIS AND ITS RELATION TO AGE, SEX, BLOOD PRESSURE AND MORTALITY

Age in Years	Sex		Blood Pressure		Time Interval Between Initial and Second Thrombosis							Alive	Dead
	M.	F.	Diastolic <99 mm. Hg.	Diastolic >100 mm. Hg.	<6 mths.	>6 mths.	1 yr.	2 yrs.	3 yrs.	4 yrs.	>4 yrs.		
41—50	—	1	—	1	1	—	—	—	—	—	1	1	—
51—60	2	1	2	1	1	—	—	—	—	—	2	3	—
61—70	3	3	2	4	1	—	2	1	—	—	2	5	1
71—80	—	1	1	—	1	—	—	—	—	—	—	1	—
TOTAL	5	6	5	6	4	0	2	1	0	0	5	10	1

TABLE VI

CAUSES OF DEATH

Sex	1 Day	Time of Death			Persist Coma	Deepening Coma	Renal Failure Uraemia	Cardiac Failure	Respiratory Failure	Others
		1 week	1 mth.	>1 mth.						
Male	3	4	6	—	5	3	—	3	2	—
Female	—	6	1	1	3	—	2	—	1	2
TOTAL	3	10	7	1	8	3	2	3	3	2

CLINICAL FEATURES

The clinical features of the patients who died and of those who survived are outlined in Tables IX and X.

MANAGEMENT

All the patients were conservatively treated. Conservative management consisted of good nursing care including coma nursing, constant medical supervision, control of cerebral oedema and pulmonary complications and treatment of hypertension, if severe. No tracheostomy was performed in any of the patients.

DISCUSSION

In this series of 52 patients with primary intracerebral haemorrhage, more males than females were seen, the ratio being 2:1. The patients were mostly in the sixth decade and beyond. An interesting feature to note is the absence of Malay patients.

One-third of the deaths occurred within the first 24 hours of admission. The majority of patients (70%) died within the first 2 days. Thereafter the mortality rate showed an appreciable decline. In the hypertensive females in the seventh decade and beyond, the mortality was observed to be somewhat higher than that of the hypertensive males of the same age group.

The study of the clinical features reveals a few factors that were important in influencing prognosis. Age had no significant effect up to the age of 70 after which the mortality rose steeply. Hypertension did not significantly affect the mortality. A very significant prognostic factor was the level of consciousness at the end of the first 24 hours. The mortality of those in deep coma (Coma IV) was 100%, coma III 84%, coma II 67% and coma I 50%. Only one (14%) of the 7 patients who were conscious died.

TABLE IX

CLINICAL FEATURES OF THOSE WHO DIED

Mortality	Hypertensive (19) 70%		Normotensive (21) 80%	
Age: 41—50	M (71%)	F (69%)	M (78%)	F (87%)
	3 (75%)	0	2 (67%)	1 (100%)
51—60	7 (88%)	2 (67%)	3 (75%)	1 (100%)
>60	2 (50%)	5 (72%)	12 (92%)	2 (67%)
Coronary disease	1		0	
Arrhythmia	0		0	
Valvular disease	0		0	
Diabetes Mellitus	1		1	
Level of Consciousness:				
Conscious	1		0	
Coma I	0		2	
Coma II	3		1	
Coma III	4		7	
Coma IV	11		11	
Unilateral signs	R=3 L=7		R=1 L=4	
Bilateral signs	9		11	
Alcohol	1		2	
Severe strain	1		0	

M = Male F = Female L = Left R = Right

TABLE X

CLINICAL FEATURES OF PATIENTS WHO SURVIVED

		Hypertensive (8)	Normotensive (4)
Age:	<40	1	0
	41 - 50	1	1
	51 - 60	2	1
	>60	4	2
Coronary disease		1	0
Arrhythmia		0	0
Valvular disease		0	0
Diabetes Mellitus		1	0
Level of Consciousness:			
	Conscious	3	3
	Coma I	1	1
	Coma II	2	0
	Coma III	2	0
	Coma IV	0	0
Unilateral signs		R=2 L=5	R=1 L=3
Bilateral signs		1	0
Alcohol		1	0
Severe strain		1	1

R=Right L=Left

III. Primary Subarachnoid Haemorrhage

INTRODUCTION

The term subarachnoid haemorrhage commonly refers to bleeding into the subarachnoid space without the involvement of the brain itself (Marshall). Sometimes it occurs in conjunction with bleeding elsewhere in the central nervous system. It is diagnosed by the detection of blood in the cerebrospinal fluid and the clinical picture of a sudden onset of symptoms and signs of meningeal irritation and increased intra-cranial pressure, and sometimes also of cerebral irritation and deficit, which is seldom severe.

MATERIAL

22 patients with subarachnoid haemorrhage were admitted to the Unit in 1967, forming 9% of all forms of cerebrovascular accidents seen in the Unit in the same year. There was a preponderance of male patients, numbering 15. 20 were Chinese, one Indian and one European. No Malay patients were encountered.

AGE

The youngest patient was 23 years old and the oldest 68. The distribution of age groups is shown in Table XI.

MORTALITY

9 patients (41%) in this series died, 6 within 24 hours and the other survived for months.

One was presumed dead 1 year after discharge as he was not traceable in the subsequent follow-up. The one who died on the 90th day had associated coronary thrombosis.

CLINICAL FEATURES

The clinical features of the patients are outlined in Table XII.

INVESTIGATIONS

Lumbar Puncture

This was performed in 21 patients. Blood was detected in all the specimens of cerebrospinal fluid, except in one which was xanthochromic. The protein content was raised in 17 patients and 4 patients had pleocytosis.

CAROTID ARTERIOGRAPHY

6 patients had carotid angiograms. No abnormality was detected in 2 patients. Berry aneurysms were shown in 2 patients, one of which subsequently developed internal hydrocephalus. Arterio-venous malformation was present in one patient. Another patient had atheroma of both carotid arteries but no detectable bleeding source.

MANAGEMENT

All the patients were in the first instance conservatively treated. The patients with berry aneurysm and arterio-venous malformation refused surgical treatment when this was advised. The patient with internal hydrocephalus had a Tokilsen's shunt inserted.

DISCUSSION

The mortality of 41% is about half of that of intracerebral haemorrhage. The majority of the patients died within the first 24 hours.

The source of bleeding was revealed by carotid angiography in 2 patients, one due to an aneurysm and the other due to arterio-venous malformation. In the majority of cases, the cause

of the bleeding was not known, as no carotid angiograms were performed on them. The history of a focal lesion such as a third nerve palsy prior to the haemorrhage or of a previous subarachnoid haemorrhage without a stroke may suggest the possibility of an aneurysm as the source of bleeding. There were no such helpful clues in our patients apart from one who had a previous history of subarachnoid bleeding. The age of the patient may be of some help. In the case of patients in the third and fourth decades a stroke associated with subarachnoid bleeding is likely to be due to a ruptured aneurysm. In Pakarinen's series, 76% of patients were found to have aneurysms, 2% had arterio-venous malformation and in 22% no cause was found.

9 patients (40%) in this series had hemiparesis but none had hemiplegia.

The presence of neurological deficit did not significantly affect the mortality. Hypertension was observed to have had an adverse effect on the prognosis. All those who died were hypertensive. It is well known that hypertension tends to precipitate the rupture of an aneurysm. Another significant factor influencing the prognosis was the level of consciousness on the first day of admission. None of those who were conscious or only drowsy died whereas 75% of those in coma III and IV succumbed.

All the patients were conservatively managed in the acute stage. One subsequently had a Tolkisen's shunt for internal hydrocephalus. The patients who had a berry aneurysm and arteriovenous malformation refused surgical treatment when this was advised.

IV. Transient Cerebral Ischaemia Attacks

T.I.A.s are defined as transient disturbances of neurological function, usually lasting a few minutes only. This definition is primarily based on the clinical features, which are presumed to be due to temporary interruption of part of the cerebral circulation, however caused. The main features, besides their brief duration, are spontaneous recovery without residual signs, and the tendency to recur.

In our series we have extended the arbitrary temporal criterion even further, our choice being 1 week, while fully adopting the other criteria. In defence of our amended definition we propose the following reasons. First, the time-limit is arbitrarily fixed by different authors in any case, and the difference between 1 day and 1 week is in an important sense no greater than the difference between 1 hour and 24 hours. Secondly, patients with cerebral infarcts or haemorrhages are very unlikely to recover *completely* in 1 week. Thirdly, by way of analogy, Todd's paralysis, which may well last a week, is not accompanied by any detectable histological lesion. Lastly, in our series of 26 patients, 14 recovered completely within 24 hours and 12 within 1 week, and there was no significant difference between these two groups in term of any of the parameters to be shown in Tables XIII and XIV.

The true incidence of T.I.A.s is extremely difficult if not impossible to determine, for their nature is such that a large if not the major proportion of people afflicted does not seek medical aid, and in addition they tend to be misdiagnosed by doctors as some other disorders. According to Glynn (1956), T.I.A.s constituted 6% of cerebrovascular accidents. In our series, the proportion of T.I.A.s was 10.6%.

The number of our T.I.A.s totalled 26 and from Table XIII and XIV, it can be seen that:—

1. The racial distribution of our Chinese cases corresponded closely with the local racial structure, which consists of 72% Chinese, 25% Malays and 3% Indians in the 50-69 age group (Graphs I and II), whereas there were more Indian and fewer Malay cases than would be expected.
2. Males predominated over females in a ratio of 1.6:1, which was much lower than the ratio of 3.8:1, in the series studied by Acheson and Hutchinson (1964), especially when it can be shown that our hospital admission has a M:F = 2:1 bias chiefly because of bed distribution.
3. The risk of developing T.I.A.s increased with advancing age, with the vast majority (77%) occurring after 50 years of age. The average age of the female cases was significantly higher than that of the male cases (66.0 years against 53.3 years).
4. Those who had hypertension were in the minority (27%), and hypotension played little or no part in the pathogenesis.
5. The incidence of ischaemic heart disease (15%) was exactly the same as found by Acheson and Hutchinson (1964).

The commonest presenting clinical feature was hemiplegia (46%), followed by cranial nerve involvement, impairment of consciousness and vertigo (27% each). By comparison in Marshall's series (1964), vertigo was the commonest feature followed by hemiparesis, hemianaesthesia and visual field disturbance.

TABLE XI

Age	No. of Patients
20 - 30	2
31 - 40	1
41 - 50	6
51 - 60	5
61 - 70	8

TABLE XIII

Total Number of Patients	**26**
Race	Chinese 19 (73%), Malay 2 (8%); Indian 3 (11%), Eurasian 2 (8%)
Sex	Male 16 (62%); Female 10 (38%)
Age incidence	31—40 yrs. = 1 (4%); 41—50 yrs. = 5 (19%); 51—60 yrs. = 9 (35%); 61 yrs. and over = 11 (42%)
Age (average)	53.3 yr. (Male); 66.0 yr. (Females)
Hypertension (BP>165/100)	7 (27%)
Hypotension (BP<100 systolic)	1 (4%)
Ischaemic heart disease	4 (15%)
Diabetes (well controlled)	1 each (4%)
Diabetes (untreated or poorly controlled)	1 each (4%)
Cardiac arrhythmia	1 each (4%)
Valvular disease of heart	1 each (4%)
Obesity (>30% overweight)	1 each (4%)
Smoking>20 cigarettes or cigars daily	1 each (4%)
Smoking 20 or less	1 each (4%)
Alcohol>2 beers daily	2 (8%)
Strenuous exercise (labourer, athlete)	2 (8%)

TABLE XII

CLINICAL FEATURES

	Alive	Dead
Level of consciousness:		
Conscious	5	0
Coma I	7	0
Coma II	1	1 (50%)
Coma III & IV	2	6 (75%)
Paralysis (hemiparesis)	7	2 (22%)
No neurological deficit	8	4 (33%)
Cranial nerve involvement	7	3 (30%)
Aphasia	2	1 (33%)
Coronary disease	1	1 (50%)
Hypertension	5	9 (64%)
Normotension	6	2 (25%)

TABLE XIV

Total Number of Patients	**26**
Hemiplegia	12 (46%)
Dysphasia	4 (15%)
Cranial nerve palsy (including dysarthria)	7 (27%)
Coma	7 (27%)
Vertigo	7 (27%)
CSF Protein>40 mg. %	10 (38%)
CSF cells>4 per c.mm.	3 (11%)
CSF KT positive	1 (4%)
Blood KT positive	4 (15%)
Previous similar attacks	3 (11%)
Carotid insufficiency	3 (11%)
Vertebro basilar insufficiency	8 (31%)
Cerebral ischaemia-site undetermined	15 (58%)
Survival for 1 year after discharge	16 (62%)
Dead (due to stroke)	1 (4%)
Presumed dead—not traceable	9 (34%)
Angiographically proved	5 (19%)

In our series the cerebrospinal fluid was normal in the majority of cases, but it may be worth noting that 38% of the cases showed a rise in protein and 11% showed a pleocytosis.

The majority (58%) of our T.I.A.s could not be definitely localised to any part of the brain. Of the rest, more occurred in the vertebrobasilar territory than in the carotid territory (31% as opposed to 11%).

Regarding prognosis, 62% of our patients remained well for at least 1 year after discharge from hospital, and 38% were dead or presumed to be dead because they could not be traced despite every effort. Acheson and Hutchinson (1964) found 52% of their patients developed strokes about 13 months on average after they were first seen, and these strokes carried a mortality of 29%. Thus our series had a somewhat lower morbidity rate but a much higher mortality rate.

CEREBRAL EMBOLISM

As we had only 3 cases in our series, 2 being due to mitral stenosis and 1 to atrial fibrillation of uncertain cause, no analysis is meaningful beyond the fact that they constituted just over 1% of our cerebrovascular accidents, compared with 2% in the series studied by Glynn (1956) and 5% in the series studied by Groch *et al* (1961).

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