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Brain Attack: The Multifaceted Potential for Action

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ABSTRACT

Background: Stroke is the number 3 killer in Singapore and a common contributor to morbidity statistics. This study was done to look at the profile of patients with acute stroke presenting to the Emergency Department, Singapore General Hospital, from 1 October to 31 November 1996. The data will help plan and guide future early interventional trials as well as look into possible areas of improvement in the multidisciplinary approach to stroke.

Method: This is a retrospective study and patients' records were traced using ICD-9 codes. A total of 309 patients were identified for the period of review; of this, the records of 240 patients were obtained (77.7%).

Results: The results revealed that local stroke patients are young (two-thirds are < 70 years) and live in high-rise accommodation (84.2%) with their families. The predominant risk factor was hypertension (80%) and weakness was the most common presentation (25%). Stroke patients are presenting at a later stage (only 16.7% presented within 6 hours of onset) and the average length of hospital stay was between 10 and 12 days.

Conclusion: This study identified the multiple measures at various stages of the stroke chain, required to build up a concerted effort against Brain Attack.

Keywords: acute stroke, cerebral infarction, stroke chain, multi-pronged approach

INTRODUCTION

Stroke is the number three killer in Singapore[1]. Well known risk factors include hypertension[2], cigarette smoking[3,4] and hyperlipidaemia[5]. Stroke is a major contributor to both mortality and morbidity statistics. It has profound social and economic impact, not only on individuals who become dependent, but also on society as a whole.

A greater understanding of stroke will open new doors to more effective ways of management and prevention. The ultimate goal of therapy in acute stroke is to prevent or limit irreversible neuronal cell death[6,7]. Optimal treatment should restore a core of cerebral tissue proximal to the obstruction containing irreversibly injured tissue (infarct zone) and a larger zone of marginally perfused but viable tissue distal to the obstruction (ischaemic penumbra)[8]. When complete restoration of cerebral blood flow is not possible, improving collateral blood flow to tissue within the ischaemic penumbra becomes the therapeutic goal.

There are many advantages of early presentation and diagnosis in stroke[9]. During trials, many treatments show some efficacy when administered either before or within several hours of a stroke[11]. Little or no efficacy is seen beyond this period. Those seen often exhibit less neurological deficit and complications. These patients who present early will also have the option of an early entry into acute therapeutic interventional studies[12]. To be able to plan for the early and optimal management of stroke patients, an understanding is required of the presentations of stroke patients in the institutional and community setting we have in Singapore.

OBJECTIVES

This study was done to look at the profile of patients with acute stroke presenting to the Emergency Department. The data obtained will help plan and guide future studies on early therapeutic interventions in acute stroke (eg. thrombolytic therapy). The results will enable us to look into the possible areas of improvement in all aspects of the management of stroke ie, a multipronged approach directed at the public, patients, pre-hospital care-givers, nurses, doctors, physiotherapists as well as social workers.

MATERIALS AND METHODS

This is a two-month retrospective study of all patients who presented with acute symptoms of stroke at the Department of Emergency Medicine, Singapore General Hospital, from 1 October till 31 November 1996. The records were traced using the ICD-9 codes for stroke and related diagnosis ie. Diagnostic Codes 430, 431, 432, 433, 434 and 435.

The Emergency Department records and inpatient admission data were then reviewed for these patients. The following data were sought; demographic data which included age, sex, ethnic group, marital status, occupational status, accommodation type, risk factors, clinical presentation and timing of presentation, CT scan findings, disposition and functional assessment.

The time of onset of the stroke is defined as the time at which the patient or relatives first noted a definite neurological abnormality[13] eg. altered speech, weakness, gait disturbance or change in mentation.

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Vague or non-specific symptoms which may accompany a stroke are not generally used to diagnose a stroke.

RESULTS

A total of 309 patients were identified to have presented with acute stroke during this period of review. Of this, we were able to trace the records of 240 patients (ie. 77.7%). The following results are based on these records:

1. Age
   67.5% of the study population was less than 70 years of age. Most of the patients affected (51.7%) were in the 61 – 70 years age group. 32.5% of the patients were older than 70 years of age.

2. Race
   One hundred and seventy (70.8%) of the patients were Chinese. There was approximately equal proportion of Indian (33) and Malay patients (34), ie. about 14% each. The proportion of these ethnic groups in the general population is as follows:

Proportion of ethnic groups in the general and study population

Race/ethnic group	% General population	% Study population
Chinese	76	71
Malay	14	14
Indian	7	14
Others	3	1

There is no statistically significant difference between the proportion of Indians in the study population and that in the general population (p=0.106).

The three patients (1%) in the "others" category of the study population included a Korean, a Thai and an Indonesian. All three were male patients.

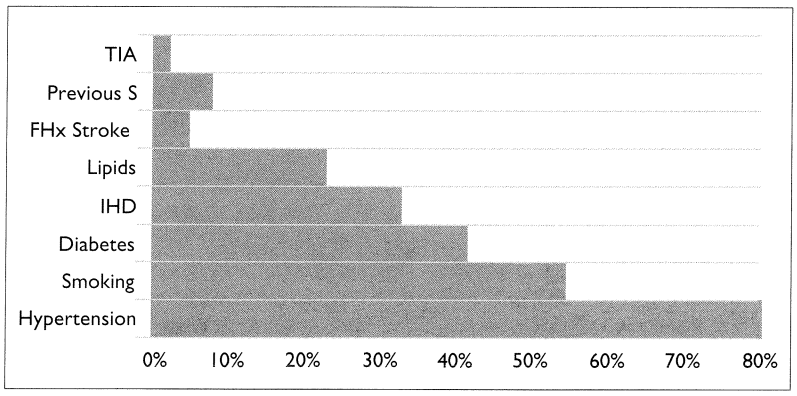


Fig 1 – Risk factors

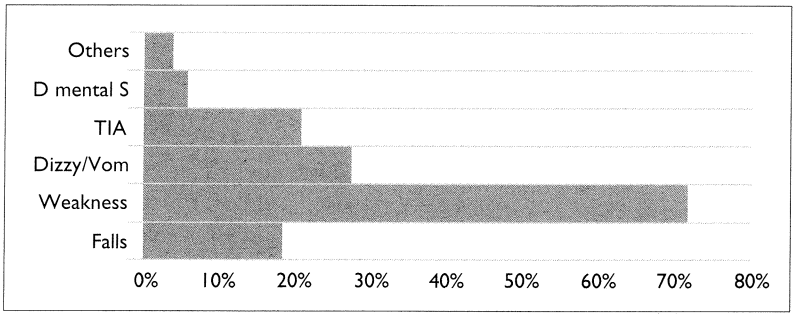


Fig 2 – Presentation

3. Sex
   There was 59% (141) male and 41% (99) female patients in the study cohort.

4. Occupation
   Half the patients (ie. 120 out of 240) were retired of active employment at the time of the stroke. Thirty-one (12.9%) were still gainfully employed and 89 (37.1%) were housewives.

5. Marital status
   One hundred and seventy-four (72.5%) of the stroke patients were married and living with their families at the onset of the stroke. Seventeen patients (7.1%) were single. The marital status was not recorded for 18 (7.5%) of the patients. Thirteen percent were widowed or divorced.

6. Accommodation
   Two hundred and two (84.2%) of the stroke patients lived in high rise apartments. Six (2.5%) were residents of nursing homes and about 12% lived in houses.

7. Risk factors (Fig 1)
   Hypertension was the commonest risk factor present in 192 (80%) of the patients. This was followed by cigarette smoking (56.3%) and diabetes mellitus (43%). About 24% of the patients were known to have hyperlipidaemia and only 3 (1.3%) had prior warning, in terms of a TIA.

8. Presentation (Fig 2)
   Almost three quarters of the patients (177 or 73.7%) presented with some form of weakness. The distribution of the pattern of weakness is shown in Table I. Thirty-nine (16.2%) suffered injuries from falls occurring soon after the onset of symptoms. Other non-specific symptoms were present in about 26% of the patients. The patients with depressed mental state usually had a grave prognosis (eg. subarachnoid haemorrhage, large intra-cerebral or brain stem haemorrhage). All the early deaths (4 or 2%) were from this group of patients.

Table I – Pattern of weakness (177 patients)

Pattern of Weakness	Number	%
Hemiparesis/hemiplegia	149	84.2
Monoparesis/monoplegia	21	11.8
Quadriparesis/quadriplegia	7	4.0
Facial nerve weakness	38	21.5
Dysphasia	26	14.7

9. Time of presentation (Fig 3)
   Only 9 (3.8%) patients presented within three hours of the onset of stroke. Forty (16.7%) patients presented within 6 hours and 99 (41.3%) within 12 hours of onset. Most patients presented between 12 – 24 hours (about 48%), and 10.8% came after 24 hours of the onset.

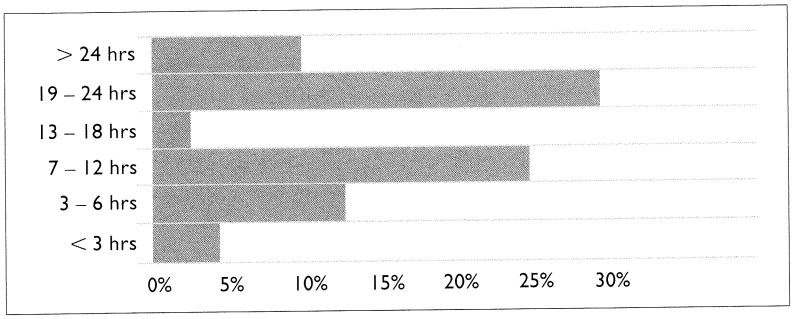


Fig 3 – Time of presentation

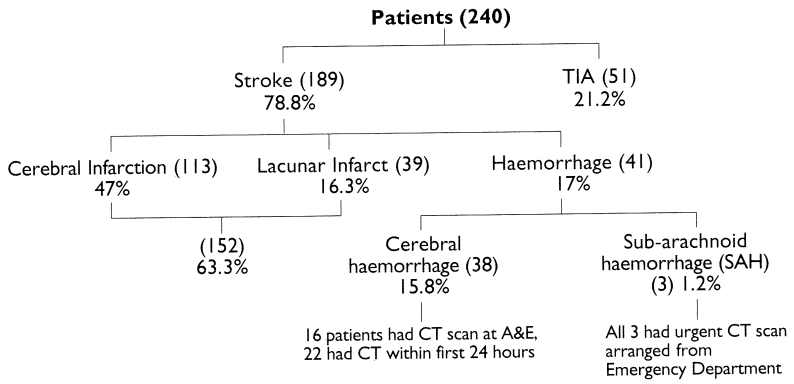
10. Transportation
Sixty-two percent of patients came with their own form of transportation. Thirty-eight percent utilised the different ambulance services to take them to hospital.

11. Blood pressure
At presentation in the Emergency Department, 80.9% (194 patients) had a systolic blood pressure over 160 mmHg and 62.5% (150 patients) had diastolic blood pressures over 120 mmHg.

12. Disposition
91.2% (219) patients were admitted. 7.1% (17) patients were discharged and given appointments for out-patient follow-up. These were mainly patients who had transient ischaemic attacks. 1.7% (4) patients suffered early mortality (ie. one had massive intra-cerebral haemorrhage with midline shift, two with brain stem haemorrhage and one had subarachnoid haemorrhage).

13. CT scan results
The radiopathological diagnosis distribution of the stroke patients in the study are as follows:

Radio pathological diagnosis in stroke patients



14. Hospital stay/Emergency Department stay
The average duration of hospital stay was between 10 to 12 days. 16.9% (52) patients stayed beyond 12 days and 3.8% (9) patients were in hospital beyond 21 days. These were mainly the elderly awaiting placement or nursing home residency. As for Emergency Department stay, 19.6% (47) of patients stayed for up to 60 minutes. Those who stayed longer did so because there were no available beds in the wards as the hospital was filled to its full capacity. For these patients, initial management and investigations were commenced in the Emergency Department.

Table II – Duration of stay in the Emergency Department

Time (mins)	Number of stroke patients	%
≤ 30	28	11.7
31 – 60	19	7.9
61 – 120	40	16.7
121 – 180	89	37.0
> 180 (3 hrs)	35	14.6
> 360 (6 hrs)	29	12.1

15. Functional assessment
The assessment of functional ability was difficult especially in a retrospective study as this. However, data obtained from the case-records showed some interesting trends:

Table III – Functional assessment of stroke patients

Activity	Before stroke	At discharge
Self-feeding	81%	31%
Self-dressing	75%	29%
Independent ambulation	74%	24%
Self-bathing	69%	22%

DISCUSSION

This study has revealed some interesting and important trends which will have an impact on the management of acute stroke, the planning of interventional programmes, as well as the structure of educational programmes for patients, relatives, ambulance personnel, nurses and doctors.

The stroke patients here are young. Over two-thirds are well below 70 years of age. This would mean that young and economically active members of society are affected, which would result in a change of lifestyle after the stroke. There would also be economic loss to the family as well as society.

There is a slight male preponderance (59% male and 41% females) and the racial distribution was almost representative of Singapore's except for a higher proportion of Indian patients (14%). The difference was however not statistically significant (p=0.106).

Almost three-quarters of the patients (72%) were living with their families at the time of stroke. This is beneficial for the emotional and physical support a stroke patient would need. This concept of living with family (or extended family) is a very Eastern cultural practice.

In Western societies, many retirees and elderly live alone in sheltered accommodation. Like most Singaporeans, 84% of the affected stroke patients live in high rise apartments. This would mean a need for more assistance to get around. The problems for those patients in high rise accommodations are less mobility and more assistance needed to move around as the lifts do not stop on every level. As a result of this, many turn out to become home-bound, which works against their rehabilitation.

Only 3% of the stroke patients studied were either residents of nursing or residential homes. Less problems are anticipated for them since these places are equipped with facilities, trained staff and rehabilitation programmes. There is a very limited number of such facilities and more is certainly needed with the ageing population.

The prevalent risk factor is hypertension[14-16]. Many patients presenting with stroke have significantly elevated blood pressures (80% had systolic BP > 160 mmHg and 60% had diastolic BP > 100 mmHg). A smoking history was elicited in 56% of the 240 patients and 43% had diabetes mellitus. Only 10% had prior warning in terms of a TIA. This signifies a need for greater public awareness and need for control of hypertension in the community. Such primary prevention include non-pharmacological interventions such as good dietary habits, adequate exercise and decreased stress levels. More regular follow-up and monitoring for those on anti-hypertensive therapy is needed. Compliance to therapy is also to be emphasised.

There is certainly a need to consider the usefulness of enhanced public education to increase awareness of the early symptoms of stroke so that more patients would present themselves early to the hospital for treatment. Many stroke patients are presenting late and there are many possible reasons for this:

a) The onset of a stroke is usually painless, thus, people tend to pay less attention to it.
b) The patients may not be able to take any action on their own, especially if they are alone in a high rise accommodation, until relatives return from work to take them to hospital.
c) Coming from an Eastern culture community, some patients may still have an aversion for Western forms of therapy and Western concept of medical facilities.

The commonest presentation was weakness, which was the presenting complaint in 25% of the 240 patients. Eighteen percent had falls of various nature. This formed an important group as the reason for presentation is often the fall or its consequences rather than the stroke itself.

More than 90% of the patients were admitted. The average duration of hospitalisation was about 10 to 12 days. Those who stayed longer usually had coping problems at home or were awaiting placement in nursing homes. This signifies a need to look at the in-patient stroke management programme and consider care plans that promote shorter in-hospital stay.

Eight percent of the patients had their CT scans done whilst still at the Emergency Department. This was often arranged and done less than an hour from the time of presentation at the Emergency Department. The rest had their CT scans done as in-hospital patients. Seventeen percent had haemorrhage and 63%, infarction reflected on the scans. There may also be a need to develop time targets for CT scan for all stroke patients arriving at the Emergency Department.

Finally, a simple functional assessment was done based on data from patients' inpatient records. The patient's ability to bathe, dress, feed themselves and ambulate before and after the stroke was assessed. It was found that most of them were at least partially dependent in the performance of some of these activities of daily living after the stroke. To improve their quality of life, some form of assistance is needed.

The concept of initiation of early rehabilitation of the stroke patient after the first day of the stroke and getting the involvement of the family in this program has to be considered as a means to promote better outcomes especially in terms of functional status. This may also help to shorten duration of hospital stay.

CONCLUSION

This study has revealed the multiple areas of potential action of Brain Attack Management.

- Primary prevention has to be strongly considered and the involvement of the medical community and interest-groups would be helpful. Primary prevention can be done through the "high risk approach" ie. seeking to modify the degree of risk factors in an individual identified to be at an elevated risk of the disease, or using the "mass approach" ie. attempts to make a modest adjustment of risk factors in the entire community or population.
- Secondary prevention is already in practice in our system. However, there is still room for enhancement.
- Education of the public to recognise early warning symptoms of stroke and of pre-hospital care-givers to have a high index of suspicion in recognition of early stroke symptoms and signs is important. The pre-hospital care-givers can then alert the receiving hospital's Emergency Department and this would help hasten time to definitive treatment and management.
- The Emergency Department requires a protocol for rapid and accurate assessment of stroke patients to determine the pathophysiology and to decide on the subsequent plan of management. Such a protocol must include advanced diagnostics. The Emergency Department staff would need to work closely and collaborate with the neurologist in determining this protocol and care pathways.

- There is a need also for a clear care-plan for definitive management of stroke patients. Such a care plan has to include early rehabilitation programmes and initiation as well as involvement of the family members.
- Due to the fairly large numbers of stroke patients in the community, there is a need to look into the provision of community resources for the ambulatory management of discharged stroke patients. The medical profession and especially neurologists should spearhead the development of such community facilities for stroke patients.

The aim of all these multiple measures at various stages of the stroke chain is to build up a concerted effort against Brain Attack. This retrospective study has identified the need for such an effort.

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