Pak Armed Forces Med J 2006; 56(2): 157-166

TO CORRELATE THE CLINICAL PICTURE WITH COMPUTED TOMOGRAPHY SCAN FINDINGS IN 200 CASES OF STROKE

Ali Nawaz Khan, Asif Hashmi

AK Combined Military Hospital Rawalakot, Combined Military Hospital Lahore

ABSTRACT

Objective: To study the accuracy of clinical data (history and physical examination) in distinguishing the ischaemic from haemorrhagic stroke.

Study Design: A prospective cross sectional case control study.

Patients and Methods: Two hundred patients male and female patients between ages of 16 to 85 years visiting CMH Lahore with acute neurological deficits were included in the study.

Results: Out of 200 patients, 144 were males and 56 were females. One hundred seventy five patients were diagnosed as ischaemic and twenty five patients were diagnosed as haemorrhagic clinically.

Conclusion(s): The males suffered from stroke more than females and ischaemic stroke is more common than haemorrhagic stroke.

Keywords: Cerebral infarction, cerebral haemorrhage. - computed tomography scan

INTRODUCTION

Stroke is characterized by rapidly developing clinical symptoms and signs of focal, and at times global, loss of cerebral function lasting more than 24 hours [1]. Cerebral infarction and primary intracerebral haemorrhage are most common forms of stroke, accounting for approximately 85-95%of all cases [2]. The differentiation between cerebral infarction and haemorrhage is important because clinical management of these two differs. Ischaemic and haemorrhagic stroke cannot be differentiated with certainty on clinical grounds. Imaging techniques, like computed tomography and magnetic resonance imaging are required for this purpose [3].

Computed tomography represents the primary non-invasive imaging modality for evaluation of brain parenchyma, cerebrospinal fluid spaces and bones [4]. Computed tomography is the most accurate method of distinguishing cerebral infarction from haemorrhage [5]. It is helpful in locating the lesion exactly, determining the shifts of brain contents and oedema associated with primary lesion.

C T scan has its own limitations as (i) it may not detect cortical infarcts and infarcts less than 5 mm (ii) it is not useful for imaging brainstem (iii) CT findings are negative in 25-50% of cases of ischaemic stroke during the first 24-48 hours, thus a definite diagnosis of infarction often can not be made by means of CT in the acute phase [6].

Stroke is the second most common cause of death worldwide [7]. There are approximately 500,000 cases of stroke each year in United States, of these, 200,000 are fatal [8]. Stroke can occur at any age, but half of all strokes occur in people over 70 years old [1]. Mortality increases with the advancement of age [9].

Stroke is also common in this part of the world. Imaging techniques, to differentiate between haemorrhagic and ischaemic stroke, are available only in few big centers. So the

Correspondence: Maj Ali Nawaz Khan, Medical Specialist, AK CMH Rawalakot.

physicians, that have no access to imaging facilities, have to distinguish ischaemic from haemorrhagic stroke on the clinical grounds. This study will evaluate the accuracy of clinical data (history and physical examination) in distinguishing the ischaemic from haemorrhagic stroke. This study would help the clinicians to adopt a better approach towards treating patients with stroke, based on clinical grounds, at places where facility of CT scan is not available.

PATIENTS AND METHODS

Study Design

This was a prospective study and was conducted in the Department of Medicine; CMH Lahore. The identification of risk factors was a cross sectional case control study (i.e. the status of an individual with respect to the presence or absence of both exposure and disease is assessed at the same point in time).

The comparison of clinical features and C T Scan findings was a co relational study (study conducted to determine the relationship between two or more variables.)

Setting

I conducted this study in CMH Lahore, which is a referral centre with a vast catchments area .It lasted for about 18 months. Two hundreds patients were included in the study.

Inclusion Criteria

Following patients were included in the study: -

a. Patients having the age range from 16 to 85 years
b. Both the males and females were included in the study
c. Patients suffering from acute neurological deficit with in last 72 hours
d. Patients suffering from acute neurological deficit, which has no apparent, cause other than that of vascular in origin
e. Patient's lesion was confirmed by computed tomography. When computed tomography showed a hypo dense area corresponding to clinical diagnosis, cerebral infarction was diagnosed and when computed tomography showed a hyperdense area corresponding to clinical diagnosis, intracranial haemorrhage was diagnosed.

Exclusion Criteria

The following patients were not included in the study: -

a. If the patient was diagnosed as case of transient Ischaemic attack.
b. If the patient was diagnosed as case of hypertensive encephalopathy.
c. If cause of lesion was other than vascular in origin.

Patients presenting with sudden onset of neurological dysfunction were admitted from emergency or OPD of CMH Lahore.

History

A detailed history with emphasis on the following points was recorded: -

a. Duration of symptoms
b Onset of Symptoms. Whether the onset was sudden (with in minutes) or gradual (over hours).
c. Progression of Symptoms. Whether the lesion was static, progressive or recovering.
d. Presence or absence of associated symptom like headache, vomiting and fits.
e. Level of consciousness. Whether the patient was conscious, drowsy or comatose
f. Previous history of hypertension, diabetes mellitus, ischaemic heart disease, transient ischaemic attack, intake of oral contraceptives, smoking and addiction.
g. Details of medicines which patient was taking.

Physical Examination

A detailed clinical examination was conducted with special emphasis on the following points: -

a. General Physical Examination.

   Blood pressure, pulse temperature and respiratory rate were recorded. Search was made for jaundice, anaemia, purpuric rash and ecchymosis.

b. Neurological Examination. Higher mental functions, level of consciousness, pupils (size & reaction), cranial nerves, motor system, sensory system, cerebellar system and signs of meningeal irritation were examined in detail.

c. Systemic Examination. Examination of respiratory system and gastrointestinal system was conducted. Special emphasis was paid to the examination of cardiovascular system particularly for detection of arrhythmias and structural abnormalities of the heart.

Investigations

a. Complete blood count and E.S.R with platelet count for thrombocythemia and polycythemia.
b. Urine complete examination
c. Blood sugar for Diabetes
d. APTT&PT for bleeding disorders
e. E.C.G
f. X-ray chest PA view
g. Fasting lipid profile for hyperlipidemia
h. Liver function tests, Urea, Creatinine and Electrolytes, Calcium to exclude metabolic causes of neurological dysfunction
j. Other tests for e.g. Autoantiboby and myeloma screen, Echocardiography & Lumber puncture when and where indicated.
k. Computed tomography of brain without contrast.

Patients who had sudden onset, onset during activity, history of headache, vomiting & fits, history of intake of anticoagulation or thrombolytic drugs, hypertension, impaired consciousness, papillary abnormalities and signs specific to site of lesion e.g. pontine haemorrhage were labeled as haemorrhagic.

Patients who had sudden/gradual onset, onset during rest or sleep, fluctuating course, history of previous transient ischaemic attack, evidence of thrombotic / embolic disease elsewhere in the body, risk factor for thromboembolic disease and signs and symptoms suggestive of involvement of specific artery were labelled as ischaemic.

Patients were then subjected to computed tomography of brain without contrast and it was then detected that how many of patients who were thought to have ischaemic lesion turned out to be haemorrhagic and vice versa.

RESULTS

Following results were obtained from the study: -

A total of two hundreds patients with stroke were evaluated.

Out of these patients, 144 were males and 56 were females. Male to female dominance was evident in both types of stroke.

Haemorrhage 2 = 1

Infarction 2.7 = 1

Male patients had the age ranging from 22 to 85 years (mean age 53.5) while the female patients had the age ranging from 25 to 88 years (mean age 56.5). The most likely stroke prone age was 50-70 years in males while 40-60 years in females.

One hundred seventy five patients were diagnosed as ischaemic and twenty-five patients were diagnosed as haemorrhagic clinically. CT results showed that twelve patients clinically diagnosed as ischaemic turned out to be haemorrhagic while four patients who were clinically diagnosed as haemorrhagic turned out to be ischaemic. So the 83.5% of cases were confirmed as

ischaemic and 16.5% as haemorrhagic. Out of thirty three (33) cases of haemorrhagic stroke, five (5) patients were diagnosed as the cases of subarachnoid haemorrhage.

For ischaemic stroke, clinical diagnosis had the following values: -

Positive predictive value = 93.1%

Sensitivity = 97.6 %

Specificity =63.6%

For the haemorrhagic stroke, clinical diagnosis had the following values.

Positive predictive value = 84%

Sensitivity = 63.6%

Specificity = 97.6%

It was evident clinically that most of the ischaemic patients (77%) had sudden onset and some had gradual onset but (97%) haemorrhagic patients had sudden onset.

Most of the ischaemic episodes occurred during rest (89.2%) and small percentage occurred during sleep and still smaller percentage during activity.

Most of the haemorrhagic episodes occurred during activity (75.5%) and some during rest but none during sleep.

Large number of ischaemic patients (88%) retained consciousness while most of the haemorrhagic patients (78.7%) got the impairment of consciousness.

Associated symptoms like headache, vomiting and fits were more common in haemorrhagic (87.8%) than in ischaemic (23.9%) patients (table-1). Headache alone was the most common symptoms in both ischaemic (18.5%) and haemorrhagic patients (42.4%). Headache in combination with vomiting and fits was the second most common symptom in haemorrhagic patients (24.2%)

Hypertension was the single most common risk factor that was found in 65.5% cases of stroke, 84.8% cases of haemorrhagic stroke and 61.6% cases of ischaemic stroke (table-2). In most of the cases hypertension was present alone but in some cases it was present along with other risk factors.

Smoking was the second most common risk factor that was found in 24.5% cases, 33.3% cases of haemorrhagic stroke and 22.7% cases of ischaemic stroke.

Diabetes mellitus was the third most common risk factor that was found in 21% cases, in 9% cases of haemorrhagic stroke and 23.3% cases of ischaemic stroke.

Valvular heart diseases were risk factor in 3.5% cases of ischaemic stroke. Myocardial infarction was risk in 4.7% cases of ischaemic stroke (both alone and in combination with other risk factors). Cardiomegaly was present in 1.2% cases of ischaemic stroke. Hyperlipidaemia was risk factor in 2.9% cases (in 1.7% cases alone and in 1.2% cases in combination with hypertension) of ischaemic stroke. History of previous transient ischaemic attack and stroke was present in 3.5% of ischaemic patients.

No risk factor was detected in 3.5% cases of stroke. 3.5% cases of ischaemic stroke and 3% cases of haemorrhagic stroke.

CT Scan Finding. Computed tomography is a revolutionary technique, which was introduced in the 1970',s. It has altered the diagnostic approach to intracranial disorders.

a. The most commonly affected artery in my study was left middle cerebral artery & it's Perforating Branches which was involved in 44.9% of cases followed by right middle cerebral artery & its Perforating Branches in 32.9%, vertebral, basilar artery and its branches in 10.19%. The distribution of these and other vessels is shown in (table-3)
b. The most common area of the brain involved in my study was the cortical infarct (32.33%) followed by internal capsule (25.75 %) and basal ganglion (8.38%) there distribution(table-4).
c. Out of the 33 patients with haemorrhagic stroke, 5 patients were

having subarachnoid haemorrhage i.e. 15.15% of the haemorrhagic infarct and 2.57% of the total stroke patients. Twenty eight patients were diagnosed as cases of Primary intracerebral haemorrhage.

d. In case of primary intracerebral haemorrhage the most common site of involvement was the basal ganglion (39.2%) followed by cerebral lobes in 25% of cases and brain stem in 22.32% of cases.

e. Extension of the primary intracerebral haemorrhage into the ventricles occurred in only 5 cases (17.85%). while there was no extension in the remaining 23 cases. (82.14%)

DISCUSSION

Two hundreds patients were included in the study. The mean age was 51.5 years. The risk of stroke increased with increasing age. This also had been reported by warlow [10]. The most stroke prone age in males was 50-70 years which was same as reported by Ali et al and the most strokes prone age in females was 40-60 years which was lower than that reported by Ali et al [11]. In another study most vulnerable age for stroke was 45-54 years for females and 65-74 for males, male age being higher than that in this study [12].

Male patients were affected more than females with the ratio 2.5=1. This ratio was about the same as reported by Al-Rajeh et al but higher than that reported by Ali et al [11,13].

Eighty Three and Half percent of the patients in this study suffered ischaemic stroke. This figure was slightly higher than that reported by Ali et al [11] and Niazi et al [15] but lower than that reported by Bogousslavsky et al [14]. Primary intracerebral haemorrhage account for 14% of the cases while subarachnoid haemorrhage accounts for 2.5% of all cases. Haemorrhagic stroke accounted for 16.5% of the cases. This figure was lower than that reported by Ali et al and Niazi et al but was similar to that reported by Bogousslavsky et al [11,14,15].

In ischaemic patients, the deficit was sudden in onset in most of cases (77.8%) and it mainly (89.2%) occurred during rest and most of the patients (88.2%) retained consciousness.

In haemorrhagic patients, the deficit was sudden in onset in (96.9%) cases and mostly (75.5%) occurred during activity and 78.7% of the patients had impaired consciousness.

Headache was more common in haemorrhagic patients than in ischaemic patients (table-1). In the ischaemic patients, headache was mainly associated with large infarcts but no association was found between cause of infarct and headache. This observation had also been reported by Castillo J et al who found headache in 28% cases of middle cerebral artery infarction [21].

Fits were present in 6.5% cases, in 1.2% cases of ischaemic stroke and 33.3% cases of haemorrhagic stroke (in 6% cases alone and 27.2% cases in combination with other associated symptoms). Lo YK et al studied the incidence of early fits in stroke patients in Chinese population. They found early fits in 2.5% cases of stroke, 2.8% cases of haemorrhagic stroke and 2.3% cases of ischaemic stroke. These figures were lower than those found in the present study.

Hypertension was the most common risk factor that was found in 65.5% of the patients with stroke which was higher than that reported by Ali et al (56%), Khawaja et at (56.8%) and Al Rajeh et at (56.4%). Hypertension was present in 61.6% cases of ischaemic stroke, which was higher than reported by Ali et al (51%) and Sandercok (52%). Hypertension was present in 84.8% cases of haemorrhagic stroke which is higher than that reported by Ali et at (68%) and Al-Rajeh et al (67%) [11-13,16].

Smoking was the second most common risk factor that was found in 24.5% cases. Most of the patients were chronic smokers

and had been smoking 15-20 cigarettes per day for at least 15-20 years. Ali et al also had found smoking in 21% cases of stroke, which was comparable to this study. But Khawaja et al reported smoking in 11.3% cases of stroke [11,12].

Diabetes mellitus was present in 21 % cases which is lower than that reported by Ali et al (27%). Diabetes mellitus was present in 23.3% cases of ischaemic stroke and 9.1% cases of haemorrhagic stroke, which was lower to reports from Ali et al (Ischaemic 31% and Haemorrhagic l8%) and Jorgensen et al (Ischaemic 42% and haemorrhagic 15%) [11,17].

About 6.06% of the diabetics having haemorrhagic stroke also had hypertension, which possibly was responsible for increased incidence of haemorrhagic stroke in diabetic population (table-2).

Various types of heart diseases such as ischaemic heart disease, valvular heart disease and cardiomyopathy were present in 9.5% of cases of ischaemic stroke. Hornig et al reported the results from three prospective stroke registries (Berlin, Giessen, and Klosterneuburg) and found that cardiogenic embolism was responsible for (17%) cases of ischaemic stroke. However Ali et al found the cardiac abnormalities in 30% cases of ischaemic stroke [18,11].

Hyperlipidaemia was found as a risk factor in 2.9% cases of ischaemic stroke while none of the haemorrhagic patient had hyperlipidaemia. This figure is lower than that reported by Ali et al who found hyperlipidaemia as risk factor in 27% of ischaemic and 11 % of haemorrhagic stroke (cerebral haemorrhage). The findings of the present study were supported by those of Benfante et al who reported the cholesterol as risk factor in ischaemic stroke and Jacobs et al who observed the inverse relation between serum cholesterol and haemorrhagic stroke [11,22,23].

Regarding time of occurrence of stroke in my study 49% were early in the morning mostly between 6:00 AM to 8.00 AM, 21% were in the evening and remaining 30% stroke occurred at different times of the day. History of use of alcohol, illicit drugs, oral contraceptives, migraine was nil in my study.

Left middle cerebral artery & its Perforating Branches, which was involved, in 44.9% of cases followed by right middle cerebral artery& its Perforating Branches in32.9%, and vertebral, basilar artery and its branches in 10.19%.

The cortex was the most common area of the brain involved in ischaemic stroke (32.33%) followed by internal capsule (25.75%) and basal ganglion (8.38%).

Out of the 33 patients with haemorrhagic stroke, 5 patients were having sub arachnoid haemorrhage i.e.; 15.15% of the haemorrhagic infarct and 2.57% of the total stroke patients. Twenty eight patients were diagnosed as cases of Primary intracerebral haemorrhage.

In primary intracerebral haemorrhage the most common area of the brain involvement was the basal ganglion (39.2%) followed by cerebral lobes in 25% of cases and brain stem in 22.32% of cases. Extension of the primary intracerebral haemorrhage into the ventricles occurred in only 5 cases (17.85%).while there was no extension in the remaining 23 cases. (82.14%)

Clinical diagnosis had the positive predictive value of 93.1%, sensitivity 97.6%, and specificity 63.6% for ischaemic stroke while positive predictive value of 84%, sensitivity 63.6%, and specificity 97.6% for haemorrhagic stroke, These positive predictive values showed that few patients diagnosed as haemorrhagic would actually have infarction and vice versa.

Various stroke scoring systems based on clinical parameters have been developed. Commonly used score systems are Allen score (sometimes called as Guy's Hospital score) and Siriraj stroke score.

The Siriraj Hospital score was developed in Bangkok, Thailand. The Siriraj stroke score

uses five variables (level of consciousness, vomiting, headache, diastolic blood pressure and atheroma markers). The higher score in this score system suggests haemorrhage. As this score system uses few clinical parameters it is easier to apply and calculations are simpler

The Allen Score was developed in 1984 in UK. The Allen score uses thirteen variables (apoplectic onset, level of consciousness, planter responses, diastolic blood pressure, atheroma markers, history of hypertension, previous transient ischaemic attack or stroke, cardiac murmurs, cardiac failure, cardiomyopathy, atrial fibrillation, cardiomegaly, and myocardial infarction during previous six months). The higher score in this score system also suggests haemorrhage. As this score system uses many parameters it is difficult to collect data and calculations are relatively difficult.

Both these score systems have been evaluated in different populations to check their validity in early differential diagnosis of acute stroke. Dega et al studied the Siriraj and Allen scores in Indian population. They first confirmed the stroke subtype with CT scan and then applied these scores. They found that Siriraj score was helpful in diagnosing haemorrhage in 80% cases and infarction in 83% of cases while Allen score diagnosed haemorrhage in 66% cases and infarction in 69% of cases. The results of the Siriraj score were comparable to those of present study while those of Allen score were lower. Dega et al were of the opinion that although clinical features are helpful in differentiating infarction from haemorrhage but the accuracy is not as high as with Siriraj score [19].

Celani et al studied the Siriraj and Allen scores in Italian population. They found that positive predictive value of Siriraj score was 63% for haemorrhagic and 93% for ischaemic stroke while positive predictive value of Allen score was 71% for haemorrhagic and 91% for ischaemic stroke. The positive predictive values of both scores for ischaemic stroke were comparable to those of present study while values for haemorrhagic stroke were lower than those of present study. Celani et al concluded that when computed tomography is not immediately available, both these

Table-1: Associated symptoms and stroke sub type (as confirmed by CT scan)

Symptom	Ischaemic Stroke		Haemorrhagic Stroke	
	Nos	%age	Nos	%age
Headache	31	18.6%	14	42.4%
Vomiting	4	2.4%	-	-
Fits	2	2.0%	2	6.1%
Headache + Vomiting + Fits	-	-	8	24.2%
Headache + vomiting	3	1.8%	4	12.1%
Vomiting + Fits	-	-	1	3.9%
No Associated Symptoms	127	76.0%	4	12.1%
Total	**167**		**33**	

Table-2: Relation of risk factors with stroke sub types (as evidenced by CT scan)

Single Risk Factor	Ischaemic Stroke		Haemorrhagic Stroke	
	Nos	%age	Nos	%age
Hypertension	44	26.3%	17	51.5%
Diabetes mellitus	4	2.4%	1	3.0%
Smoking	28	16.8%	3	9.1%
Valvular heart disease	6	3.6%	-	-
Myocardial infarction	4	2.4%	-	-
Previous stroke and TIA	6	3.6%	-	-
Cardiomyopathy	2	1.2%	-	-
Hyperlipidaemia	3	1.8%	-	-
Multiple risk factors				
Hypertension + diabetes mellitus	30	18.0%	2	6.1%
Hypertension + myocardial infarction	4	2.4%	-	-
Hypertension + smoking	10	6.0%	8	24.2%
Hypertension + hyperlipidaemia	2	1.2%	-	-
Hypertension in variable combinations	2	7.8%	1	3.0%
Diabetes mellitus in variable combinations	13	3.0%	-	-
No risk factors	5	3.6%	1	3.0%
Total	**167**		**33**	

scores could be used to identify the patients at low risk of haemorrhage [20].

Weir et al studied the Siriraj and Allen score in Glasgow. They found that Siriraj score had sensitivity 68%, specificity 64% and positive predictive value 22% to diagnose haemorrhage while Allen score has sensitivity 70%, specificity 64% and positive predictive value 22% to diagnose haemorrhage. The figures of both these scores .were lower than those of present study. Weir et al were of the opinion that both the scoring systems were not useful in excluding intracerebral haemorrhage and computed tomography is essential for early detection of intracranial blood.

In my opinion Siriraj score is simple and easily applicable. The calculations are simple and results are comparable to this study. This scoring system can be used for initial differentiation of stroke subtypes.

It is evident from the results of this study that skilful history and methodical physical examination are helpful in diagnosing the type of stroke in most of the cases. However the imaging techniques like computed tomography scan or magnetic resonance imaging is required for the definitive diagnosis.

The bad prognostic factors in my study were: older age, severe hypertension, toxaemia of pregnancy, coma at the time of presentation, pontine haemorrhage intracerebral bleed with ventricular extension, multiple lesions, mass effect seen on CT scan and hyperdensed middle cereberal artery sign.

Good prognostic features were: younger, normotensive patients, hemiparetic rather than hemiplegic patients, single lesion without mass effect on CT scan.

CONCLUSIONS

It was concluded from the study that males suffered from stroke more than females and stroke prone age was 50-70 years in males and 40-60 years in females. Most common risk factors in the stroke in order of frequency were hypertension, smoking and diabetes mellitus. Middle cerebral artery was the most common artery involved in ischaemic stroke followed by vertebro-basilar system. Basal ganglion was the most common site for intracerebral bleed followed by cerebral lobes. Clinical diagnosis of stroke had the positive predictive value, sensitivity and specificity of 93.1%, 97.6% and 63.6% respectively for ischaemic stroke and 84%, 63.6% and 97.6% respectively for haemorrhagic stroke. It is evident from these figures that most of the patients suffering from stroke were diagnosed correctly but in few cases clinical diagnosis could not be made correctly on the basis of clinical data alone. It means that clinical diagnosis of patients with stroke at places where CT scan is not available is possible with a positive predictive value of 93.1% for ischaemic and 84% for haemorrhagic stroke. So if the clinician's approach is methodical, most of the cases of the stroke can be diagnosed accurately.

Table-3: Arterial territory involved in ischaemic stroke

Territory	No of Cases	%age
Left middle cerebral artery & its perforating branches	75	44.90%
Right middle cerebral artery & its perforating branches	55	32.90%
Vertebrobasilar artery and its branches	17	10.19%
Posterior cerebral artery & its perforating branches	14	8.30%
Anterior cerebral artery & its branches	6	3.59%

Table-4: Area involved in ischaemic stroke

Territory	No of Cases	%age
Cortical infarction	54	32.33%
Internal capsule infarction	43	25.74%
Lacunar infarction	23	13.77%
Basal ganglia infarction	14	8.38%
Brain stem infarction	12	7.18%
Internal capsule & basal ganglion infarction	8	4.79%
Internal capsule, basal ganglion & cortical infarction	5	2.99%
Cerebellar infarction	5	2.99%
Other combinations	3	1.79%

However it is recommended that clinical diagnosis should be used initially to differentiate between the ischaemic and haemorrhagic strokes for the purpose of epidemiological studies and to sort out the patients in whom CT scan is necessary. Clinical diagnosis should not be used as a sole guide for anticoagulant or antithrombotic therapy and for this purpose CT scan must be done that is the only confirmatory test to differentiate the two types of stroke. Further it is suggested that research may be directed toward this important aspect so that some useful score systems may be devised to help the physicians, to make accurate diagnosis of stroke, at places where CT scan is not available.

Briefly I can say that stroke is a dreadful condition the victims of which become handicap with residual stigma on one hand and socio-economic burden on family on the other hand .So efforts should be exercised to prevent its recurrence .Government should establish stroke and rehabilitation centres for stroke patients .Of course private sector should be vigilant to augment the efforts of the government in this regard.

To conclude I will say that thrombolytic therapy should not be given to any patient who present with stroke as the clinical methods can not 100% differentiate between ischaemic and haemorrhagic stroke. In all stroke patients, CT scan should be considered before thrombolytic therapy.

REFERENCES

1. Gubitz G, Sandercock P.Acute ischaemic stroke. **Br Med J 2000; 320: 692-96.**
2. Osborn AG. Stroke.In :OsbonAG. Diagnostic neuroradiology. St Louis: **Mosby Year book 1994: 56.**
3. Donnan GA. Investigations of patients with stroke and transient ischaemic attacks. **Lancet 1992; 339: 473-77.**
4. Khan S, Ahmad I. Role of CT scan in posteriorfossa tumours. **Pak Armed Forces Med J 1995; 45(1): 18-21.**
5. Weir CJ, Murray GD, Adams FG, Muir KW, Grosset DG, Less KR. Poor accuracy of stroke scoring systems for differential clinical diagnosis of intracranial haemorrhage and infarction. **Lancet 1994; 344: 999-02.**
6. Hakim AV, Rynder-cooke A, Melanson D. Sequential computerized tomographic appearance of stroke. **Stroke 1983; 14: 893-97.**
7. Murray DJ, Lopez AZ. Mortality by cause for eight regions of the world: global burden of disease study. **Lancet 1997; 349: 1269-76.**
8. J.Philip Kistler, Allan H. Ropper, Joseph B. Martin. Cerebrovascular Diseases. Harrison's principles of internal medicine. **Mc Graw-hill Inc 1998; 13: 2325.**
9. Vohra EA; Ahmed WU; Ali M. Aetiology and prognostic factors of patients admitted for stroke. **J Pak Med Assoc 2000; 50(7): 234-6.**
10. Warlow C. Cerebrovascular disease. **Med International 1987; 47: 1919-27.**
11. Ali L, Jamil H, Shah MA. Risk factors in stroke. **J Coll Phys Surg Pak 1997; 7(1): 7-10.**
12. Khawaja I, Shakoor Z. Hypertension is a major risk factor for stroke in men and women of all ages. **J Pak Institute of Med Sci 1993; 4(1-2): 191-94.**
13. Al-Rajeh S, Adnan A, Gulzar N, Emmanuel L. Stroke in a Saudi Arabian national guard community Analysis of 500 consecutive cases from a population based hospital. **Stroke 1993; 24: 1635-39.**
14. Bogousslavsky J, Van-melle G, Regti F. The lausanne stroke registry: analysis of 1,000 case consecutive patients with first stroke. **Stroke 1988; 19: 1083-92.**
15. Niazi GA, Awada A, Al-.Rajeh S, Larbi E. Hematological va'ues and their assessment as risk factor in Saudi patients with stroke. **Acta Neurol Scand 1994; 89: 439-45.**

16. Sandercock PA, Warlow CP, Jones LN, Starkey IR. Predisposing factors for cerebral infarction: Oxfordshire community stroke project. **Br Med J 1989; 298: 75-80.**
17. Jorgensen H, Nakayama H, Raaschon HO, Olsen TS. Stroke in patients with diabetes. The Copenhagen Study. **Stroke 1994; 25: 1977-83.**
18. Hornig CR, Brainin M, Mast H. Crdioembolic stroke: Results from three current stroke data banks **Neuroepidemiology 1994; 13: 31 8-23.**
19. Dega MK, Sarin K, Negi VS. Comparison of Siriraj and Guy's Hospital score to differentiate supratentorial ischaemic and haemorrhagic strokes in the Indian population. **J Assoc Phys India 1994; 42: 302-3.**
20. Celani MG, Righetti E, Migliacci R, Zampolini M, Antoniutti L, Grandi FC et al. Comparability and validity of two clinical scores in the early differential diagnosis of acute stroke. **Br Med J 1994; 308: 1674-76.**
21. Castillo J, Leira R, Aidrey JM, Martinez F: Noya M. A headache and ischaemic infarction of middle cerebral artery: a prospective study of 100 patients. **Rev Nurol 1995; 23(122): 737-40.**
22. Yano K, Reed DM, MacLean CJ. Serum cholesterol and hemorrhagic stroke in the Honolulu Heart Program. **Stroke 1989; 20: 1460-65.**
23. Benfante R, Yano K, Hwang U, Curb JD, Kagan A, Ross W. Elevated serum cholesterol is a risk factor for both coronary heart disease and thromboembolic stroke in Hawaiian Japanese men: Implications of shared risk. **Stroke 1994; 25: 814-20.**