

Accuracy of Clinical Sub-typing of Stroke in Comparison to Radiological Evidence

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Abstract

Cerebro-vascular Accident or stroke is a mystery. In addition to the fact, it is one of the major causes of morbidity and mortality worldwide. Survivors usually suffer from long life disability. Early management could save or at least ameliorate the disability among survivors. For initial therapy; it is important to recognize whether we are dealing with a bleed or an infarct. Lack of cerebral imaging facility is still considered a major obstacle in the early management of cerebro-vascular strokes in most of Egyptian hospitals where diagnosis is based mainly on clinical basis. The present study undertaken at Cairo and Zagazig based university hospitals aimed to compare the clinical diagnosis of stroke with computerized tomography scan(CT) findings in determining the type of stroke (hemorrhagic or ischemic). **Methods:** Fifty consecutive patients presenting with stroke were included. Clinical diagnosis was mainly based on *Greek stroke score*. CT scan brain was carried out in all patients to confirm the diagnosis. The results were compared on case to case basis with CT diagnosis. **Results:** The patients included 31 males and 19 females, with an age range of 26-79 years. Clinically, 56% were suspected to have cerebral infarction, 24% intra-cerebral bleed and 20% indeterminate. CT scan brain showed 72% cerebral infarction, 16% intra-cerebral hemorrhages, 8 % Space Occupying Lesion and 4% hemorrhagic infarct. **Conclusion:** our findings emphasize the need for cerebral imaging at least CT scanning in stroke patients as this remains the most accurate method for differentiating between ischemic and hemorrhagic stroke. It is however an expensive test and not easily available in most of the District Headquarters Hospitals in Egypt. **Further large scale studies** are recommended either to reach to better clinical scoring system (depended on a lot of clinical signs and clues from history such as presence of underlying cardiac lesions especially AF.) or wide cost/benefit studies to decide possible availability of CT scan in all hospitals.

Keywords: *Cerebro-vascular Accident, CT Scan, Ischemic stroke, Hemorrhagic stroke*

INTRODUCTION

In certain situations time is critical to the limit that early, rapid and correct decision making could save many lives. One of the best examples is cerebro-vascular Accident (CVA) or stroke which is one of the major cause of morbidity and mortality worldwide. Despite new post-stroke management strategies it remains a serious disease affecting not only to the patient but his family as well and the community as whole because even survivals suffer from long life disability^{1,2}. Stroke is defined as an acute focal neurological deficit resulting from cerebro-vascular disease. In majority of cases stroke is due to cerebral infarction (85%) followed by cerebral hemorrhage³. Despite the presence of long list of minor causes but still the major types are either ischemic stroke or hemorrhagic form². One of the major duties of doctors is to differentiate between both types because the management is completely different. No specific differentiating feature and so it is difficult to be sure clinically about the type of stroke (Hemorrhagic or ischemic) in majority of cases³. The only confirmatory test is radiological imaging by computed tomography

(CT) scan or magnetic resonance image (MRI) of brain. The latter is preferable because CT scan could not diagnose cerebral infarction accurately except after 48 hours and even more in small lacunar or deeply seated brain stem infarction⁴ and so its role in acute setting is to exclude hemorrhagic stroke. However, determination of size and site of infarct of utmost importance especially in prognosis predictability⁵. However, CT scan is not available in most of the hospital in rural and poor areas and the situation is much worse with MRI. In such situation, the entire burden will be thrown in the shoulder of doctor clinical sense. Some features like sudden onset of coma or changing state of consciousness with severe headache, vomiting and meningeal irritation suggest intracranial bleed. Similarly in cerebral infarction patient usually presents with sudden onset of stroke with lateralizing neurological deficit (hemiparesis, aphasia, homonymous hemianopia) usually with clinically detectable risk factors (hypertension, diabetes recent myocardial infarction).⁶ One of most important underlying conditions is the presence of atrial fibrillation especially if stroke occurred in young persons with past history of rheumatic fever. In this case the diagnosis of embolic infarction takes an outstanding shape⁶.

We carried out this study to compare clinical sub-typing of strokes using the most recent clinical score (Greek stroke score)⁷ with CT scan in accurately identifying the type of cerebro-vascular accident.

MATERIAL AND METHODS

This study was carried out at Department of Medicine and neurology Cairo and Zagazig University hospitals. Fifty consecutive patients (mean age \pm SD: 59.8 \pm 16.3), of both genders (31 were males and the rest were females) presenting with stroke were included in the study. Amongst these 29 patients were above 60 years (mean age \pm SD : 65.3 \pm 11.4), 16 patients between 50-60 years (mean age \pm SD: 55.9 \pm 9.3), 3 patients between 40-50 years (mean age \pm SD : 43.8 \pm 6.3) and 2 patients between 20-40 years (mean age \pm SD : 27.4 \pm 10.2).

Patients with history of head injury in the past 6 months, those on anticoagulant drugs or those who refused CT scan or consent were excluded. In addition minor stroke and transient ischemic strokes were also excluded.

On admission detailed history and thorough clinical examination including neurological assessment was carried out. Special emphasis was made on risk factors especially hypertension, coronary artery disease, rheumatic heart disease, peripheral vascular disease, smoking and diabetes mellitus etc.

The clinical diagnosis of type of stroke was made on the basis of Greek stroke score⁷ (table 1)

<i>Parameters</i>	<i>Points</i>
<i>Neurological deterioration within 3 hours of admission</i>	<i>6</i>
<i>Vomiting</i>	<i>4</i>
<i>WBCs >12000</i>	<i>4</i>
<i>Decreased level of consciousness</i>	<i>3</i>

If the patient score \leq 3 (Infarction)

If the patient score \geq 11 (Hemorrhage)

If the patient score from >3-<11(Equivocal)

In addition to routine investigation blood sugar, lipid profile, ECG and in some selected patient echocardiography was performed.

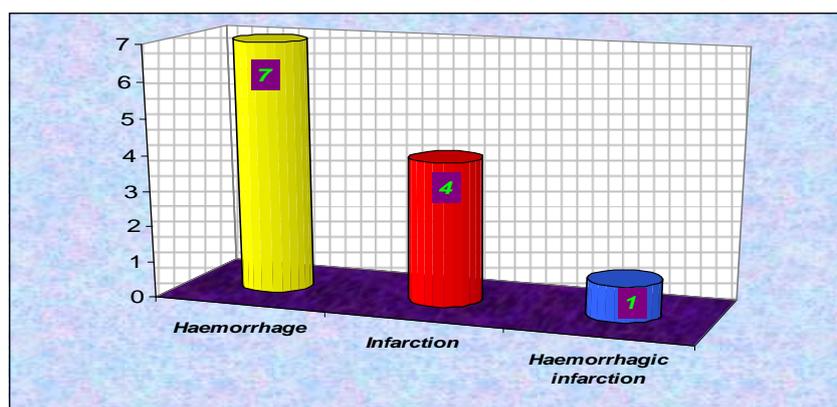
All patients had CT scan brain. The results of CT scan were compared with clinical diagnosis on case to case basis and precision of clinical diagnosis was ascertained.

RESULTS

Out of 50 cases (mean age \pm SD: 59.8 ± 16.3), 31 were males and the rest females. Amongst these 29 patients were above 60 years (mean age \pm SD: 65.3 ± 11.4), 16 patients between 50-60 years (mean age \pm SD: 55.9 ± 9.3), 3 patients between 40-50 years (mean age \pm SD: 43.8 ± 6.3) and 2 patients between 20-40 years (mean age \pm SD: 27.4 ± 10.2).

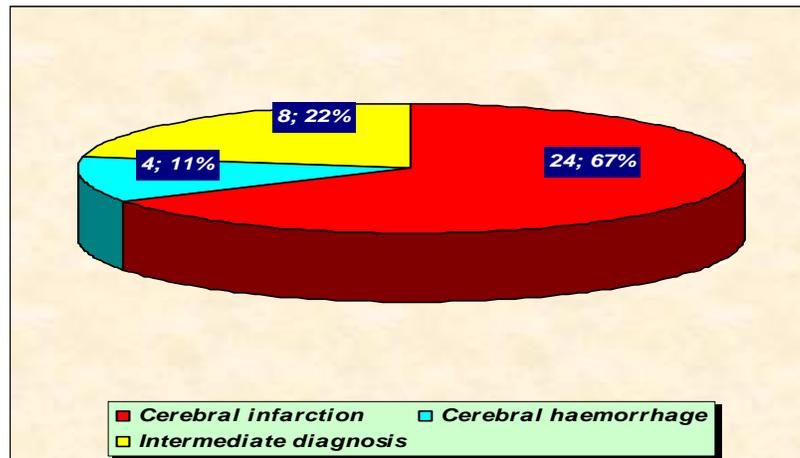
We suspected hemorrhagic stroke in 12 patients clinically. However 8 proved to have hemorrhage on CT. (7 patients originally suspected on clinical basis and one patient from clinically undiagnosed intermediate group) while the rest 5 patients had a different diagnosis (4 had cerebral infarction and one had hemorrhagic infarction) figure (1).

Figure (1): Distribution of patients clinically suspected to have cerebral hemorrhage



On the other hand we suspected cerebral infarction in 28 patients clinically, However 36 proved to have infarction on CT scan (24 patients clinically diagnosed to be infarction, 4 patients clinically diagnosed to be hemorrhage and 8 patients lying in the intermediate group) figure (2). While the rest 4 patients clinically suspected to be infarction, radiologically proved to be space occupying lesions

Figure (2):Distribution of patients with cerebral infarction proved by CT



Eight patients had AF most of them were uncontrolled. We suspected that they would suffer from cerebral infarction. The CT scanning was satisfactory; all of them had infarction mostly of embolic type. Six patients of them after taking suitable dose from anti-coagulant showed marked improvement. Out of the 10 patients in whom clinical diagnosis of type of stroke was uncertain CT scan showed infarction in 8 cases, hemorrhagic infarction in 1 case and hemorrhage in 1 case figure (3).

No case was found to be normal on CT scan.

Figure (3):Distribution of clinically undiagnosed patients (intermediate group)

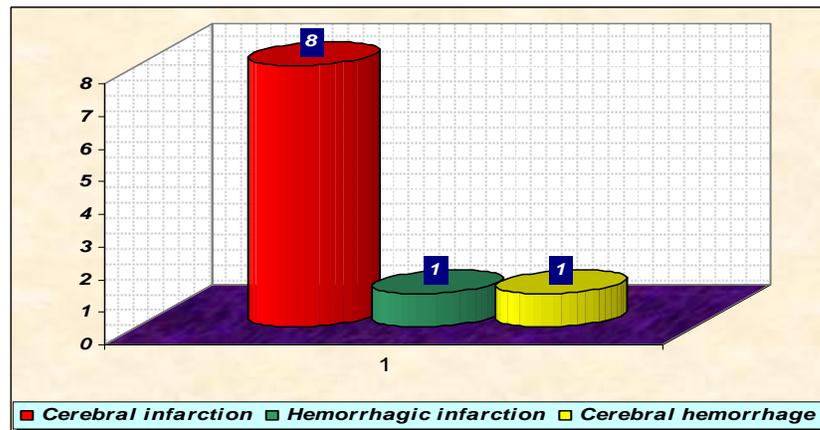


Table 2: Clinical diagnosis of type of CVA (n=50)

Cases (%)	Diagnosis
12 (24%)	Hemorrhage
28 (56%)	Infarction
10(20%)	Indeterminate

Table 3: CT scan findings in patients with CVA (n=50)

Cases (%)	Diagnosis
8 (16%)	Hemorrhage
36 (72%)	Infarction
4 (8%)	Space Occupying Lesion
2 (4%)	Hemorrhagic Infarction

Table 4: Sensitivity, specificity, positive predictive value and negative predictive value of clinical skills in diagnosing cerebral hemorrhage.

Sensitivity	specificity	positive predictive value	negative predictive value
87.5%	89.3%	58.3%	97.6%

Table 5: Sensitivity, specificity, positive predictive value and negative predictive value of clinical skills in diagnosing cerebral infarction.

Sensitivity	specificity	positive predictive value	negative predictive value
66.7%	77.8	85.7%	53.8%

DISCUSSION

Stroke is a disaster with all meanings of the word not only to the patient but also to his family and community as a whole. All efforts must be done for prevention, treatment and at least amelioration of disability produced by this fatal disease. When we face a case of stroke; many questions raised first of which is it necessary to make correct identification of the exact pathologic process causing stroke? The answer is yes because this can enable us to benefit from new developments in the management of acute stroke.⁸ It has been observed that low molecular weight heparin when given in acute ischemic stroke showed better results than placebo.⁸ Nimodipine, a calcium blocker is being used with better outcome in patients with sub-arachnoid hemorrhage to prevent spasm hence preventing further deterioration.⁹ A neurotoxin glutamate is released after ischemic stroke, which activates a number of biochemical cascades resulting in neuronal dysfunction and death. Recent advances are in progress to develop novel compounds which could effectively block the toxic effects of glutamate on brain cells.¹⁰ It sound reasonably that differentiation of cerebral infarction and cerebral hemorrhage is the most important first step in the management of acute stroke as clinical management of the two disorders differs substantially. In most developed countries, diagnosis is easily obtained by CT or CT scanning, which allows the accurate distinction of hemorrhagic and ischemic types. However, quick access to CT scanning is not available in every country and hospital. In our study we try to subtype acute strokes on the basis of clinical background however, we documented that less than two third of cases clinically diagnosed as hemorrhagic stroke truly had cerebral hemorrhage and the rest was infarction. If we depended on clinical sense in these cases we lose the chance of thrombolytic, anticoagulant and at least anti-platelet therapy which could treat or ameliorate the condition. On the other hand; some clinicians still depend on coagulant in management of hemorrhagic cases. If these drugs was taken wrongly; we can imagine what will happen to those miserable patients. Unfortunately, the diagnosis of cerebral infarction had no bitter luck because many cases were missed with lost chances of treatment and also many cases were wrongly diagnosed with possible

exposure to bad wrong medications which could end the patient's life. Moreover in about 20% of cases, clinical sub typing failed to clarify the exact pathologic process causing stroke. A study very similar to ours was carried out in the Emergency Ward of a Brazilian University Hospital where patients were examined by emergency physicians and CT scan. They reported that clinical diagnosis (made by emergency physicians) very unable to confidently discriminate between the stroke subtypes.¹¹ Another study done in Pakistan by Jehangir et al. They faced by the same discrepancy between clinical judgment and radiological evidence using CT scan as a confirmatory test.¹²

A number of scoring systems based on clinical data determining the relative likelihood of infarction or hemorrhage were developed and tested over the last decade. The Allen score (also referred to as the Guy's Hospital score)¹³ and the Siriraj score,¹⁴ .A study compared the Guy's Hospital and Siriraj stroke diagnostic scores. The Guy's Hospital score had a sensitivity of 70% for the diagnosis of hemorrhage and specificity of 64%. The corresponding figures for the Siriraj score were 68% sensitivity and 64% specificity. This validation study concluded that neither score is useful for exclusion of hemorrhage before anticoagulant treatment is initiated.¹⁵ Similar studies were carried out in Nigeria and Ethiopia for validation of Siriraj score and the results were not different than the previous one^{1,16} . In our study we choose the most recent clinical score (Greek stroke score)⁷ which did not extremely different from the previous two old clinical scores (Siriraj score and Allen score^{13,14}) mainly depended on level of consciousness and early neurological deterioration (table 1). The results of sensitivity and specificity may be better slightly but this improvement mostly related to smaller sample size and not due to better clinical judgment .Recently Siriraj stroke score and Guy's hospital score was tested by Badam et al¹⁷ in an Indian setting. It was found that both scores are not sufficiently accurate to identify infarct from hemorrhage. Another study using Greek stroke score is conducted in Ethiopia¹⁸ and again same results were obtained and recommendations were clearly that we cannot depend on clinical score for accurate clinical sub typing of acute stroke

In conclusion; our findings emphasize the need for cerebral imaging at least CT scanning in stroke patients as this remains the most accurate method for differentiating between ischemic and hemorrhagic stroke. It is however an expensive test and not easily available in most of the District Headquarters Hospitals in Egypt.**Further large scale studies** are recommended either to reach to better clinical scoring system (depended on a lot of clinical signs and clues from history such as presence of underlying cardiac lesions especially AF.) or wide cost/benefit studies to decide possible availability of CT scan in all hospitals.

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