

Comparison of the Siriraj Stroke Score and the Guy's Hospital Score in South India

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ABSTRACT

Background: CT scan is an important tool in stroke management. Due to its poor availability, we need to look for a simple but reliable scoring system to differentiate the ischaemic from the haemorrhagic strokes in our country.

Aim: To compare the effectiveness of the Siriraj stroke score and the Guy's hospital score for differentiating the ischaemic from the haemorrhagic strokes.

Settings and Design: This study was conducted in a tertiary care centre in south India. This was a cross-sectional study.

Methods and Material: The Siriraj stroke score and Guy's hospital score were applied to 100 stroke patients and their results were compared with the CT scan results.

Statistics: The sensitivity, specificity and the positive and the negative predictive values for both the scores were calculated separately. The Mc Nemar test was then used to compare both the scores.

Results: The Siriraj stroke score had a sensitivity and a specificity of 87.93% and 77.27% for ischaemic strokes and for the haemorrhagic strokes, they were 77.27% and 87.93%. The Guy's hospital score had a sensitivity and a specificity of 94.54% and 80% for ischaemic strokes and for the haemorrhagic strokes, they were 80% and 94.54%. The Mc Nemar test which was used to compare both the scores gave a value of $X^2=0.25$ ($p=0.61$). This showed that there was no significant difference between the two scores in differentiating the ischaemic from the haemorrhagic strokes.

Conclusion: There were no significant differences between the two scores when it came to differentiating the type of stroke. However, both the scores lacked the accuracy which was required for them to be applied and for guiding the physicians in stroke management.

Key Words: Acute Stroke, Cerebrovascular Accident, Diagnosis, India

INTRODUCTION

Distinguishing intra-cerebral haemorrhage from infarction on the basis of the clinical features alone is not reliable [1]. It is important to make this distinction since the management of these two disorders is entirely different. CT scan is considered as the ideal investigative tool for stroke patients, to make the distinction between an infarct and a haemorrhage [2]. But in developing countries like India, due to issues like cost and availability, its use has not been possible universally. Clinical scores for this purpose, like the Siriraj stroke score (SSS), was developed in Thailand [3]. The Guy's hospital score (GHS) was another score that was developed in 1984 [4]. When these scores were applied on stroke patients in various populations, the results of these studies were found to vary from place to place. In a study which was done in western India, these two scores were not found to be accurate enough to differentiate the ischaemic from the haemorrhagic strokes [5]. Whereas a study which was done by Ozeren *et al.*, on Turkish patients reached a conclusion that these two scores could be used as screening tools in the epidemiological studies on strokes [6]. One of the reasons for the inconsistent results may be that these scores were developed initially on one group of patients in one location. Hence, there is a need to validate these scores on various populations to check their reliability and usefulness in the management of stroke cases in that population. As these scores had not been studied in the population of southern India, we planned this study. We planned to compare these two different scores in differentiating the ischaemic from the haemorrhagic strokes.

AIM

To compare the effectiveness of the Siriraj stroke score and the Guy's hospital score in differentiating the ischaemic from the haemorrhagic strokes.

OBJECTIVES

To find the sensitivity, specificity and the positive and the negative predictive values of these two scoring systems in stroke patients.

MATERIALS AND METHODS

100 consecutive patients who presented with acute neurological deficit and who fulfilled the inclusion and exclusion criteria were included in the study after obtaining an informed consent from them. Approval for the study was also obtained from the institutional ethics committee.

Inclusion criteria

1. Diagnosed cases of stroke who fulfilled the WHO criteria [7].

Exclusion criteria

1. Patients who presented after 24 hours of the onset of neurological events.
2. Patients with subarachnoid haemorrhage.
3. Neurological deficit with an associated space occupying lesion in the brain and a head injury.
4. Infratentorial strokes.

All the patients underwent detailed medical and neurological examinations at admission and at the end of 24 hours. All the subjects underwent evaluation to check the status of haemoglobin, fasting and post prandial sugars, serum creatinine, routine urine, lipid profile, ECG and X-ray of the chest. All the patients were subjected to CT scan of the brain immediately. It was repeated again after 48 hours if it was deemed necessary for the diagnosis of an infarction or a haemorrhage. The Siriraj stroke score was calculated immediately after the admission of the patients, as per the original method by Pongvarin *et al.*, [3]. The interpretation of the score was done as: scores which were > 1- intracerebral haemorrhage, those which were < - 1- infarction, and those which were between - 1 to + 1- equivocal. The Guy's hospital score was calculated 24 hours after the onset of the symptoms, according to the method which was described by Allen [4]. The scores which were < +4 were taken as infarction, those which were > +24 were taken as haemorrhage and those which were between + 4 to + 24 were taken as equivocal.

STATISTICS

Both the scores were compared with the CT scan report. The sensitivity, specificity, positive and negative predictive values were calculated for both the Siriraj stroke score and Guy's score separately. Mc Nemar test was then applied to compare both the scores.

RESULTS

Of the total 100 patients, 50 were males and 50 were females. Of the 100 stroke patients, 71 patients had infarcts and the remaining 29 had haemorrhages. The mean age of our stroke patients was 61.01±14.1 years. The youngest was 19 years old and the oldest was 95 years old. The mean age of the male patients was 61.04±12.32 years. The mean age of the female patients was 60.98±15.82 years. The mean age of the patients who presented with haemorrhages was 65.13±9.78 years. The mean age of the patients who presented with infarctions was 59.32±15.27 years.

Risk factors: As shown in [Table/Fig-1], hypertension was the most common risk factor, which was seen in 37 patients. This was followed by smoking, which was seen in 26 patients. Diabetes mellitus was seen in 18 patients, alcohol consumption was seen in 13 patients, a history of a previous transient ischaemic attack was seen in 11 patients and cardiovascular disease was seen in five patients.

The Siriraj stroke score: In the infarction group, the maximum number of patients had a score which was in the range of (-4 to - 3.1) and in the haemorrhage group, the scores were in the range of (4.1 to 5). In the infarction group, the maximum score was -7 and in the hemorrhage group, the maximum score was + 9. This score gave unequivocal results in 80 cases and equivocal results in 20 cases. Thus, it had an applicability rate of 80%. It wrongly diagnosed 5 cases of haemorrhage as infarction and 7 cases of haemorrhage as infarction, as has been shown in [Table/Fig-2]. The sensitivity of the Siriraj score for detecting infarction was 87.93%, its specificity was 77.27%, its positive predictive value was 91.07% and its negative predictive value was 70.83%. Similarly, the sensitivity of the Siriraj score for detecting haemorrhage was 77.27%, its specificity was 87.93%, its positive predictive value was 70.83% and its negative predictive value was 91.07%.

The Guy's hospital score: In the infarction group, the maximum number of patients had a score which was in the range of (-1.0 to 3.9) and in the haemorrhage group, the score was in the range of (24.1 to 29). It gave equivocal results in 25 patients. The maximum score for the infarction group was - 22.4 and for the haemorrhage group, it was + 48.0. The Guy's hospital score showed definite results in 75 cases and equivocal results in 25 cases. Thus, it had an applicability rate of 75%. It wrongly diagnosed 4 cases of haemorrhagic stroke as infarction and 3 cases of infarction as haemorrhage, as has been shown in [Table/Fig-3]. The sensitivity of the Guy's hospital score for detecting infarction was 94.54%, its specificity was 80%, its positive predictive value was 92.85%, and its negative predictive value was 84.21%. Similarly, the sensitivity of this score for detecting haemorrhage was 80%, its specificity was 94.54%, its positive predictive value was 84.21% and its negative predictive value was 92.85%.

Comparison of both the scores: As shown in [Table/Fig-4], both the scores diagnosed 45 cases as infarction. The identification of haemorrhage by both the scores was possible in 15 cases. The cases with equivocal scores were excluded and only the cases in the unequivocal range were considered and the Mc Nemar test was then applied. We got $\chi^2= 0.25$ and $p=0.61$. This shows that there was no significant difference between the Siriraj stroke score and the Guy's hospital score in differentiating between infarction and haemorrhage.

Stroke population	CT scan		Total n =100
	Infarct n =71	Haemorrhage n =29	
Male	38 (53.52)	12 (41.37)	50 (50)
Females	33 (46.47)	17 (58.62)	50 (50)
Hypertension	24 (33.80)	13 (44.82)	37 (37)
Diabetes	15 (21.12)	3 (10.34)	18 (18)
Heart disease	5 (7.04)	-	5 (5)
Smoking	23 (32.39)	3 (10.34)	26 (26)
Alcohol	11 (15.49)	2 (6.89)	13 (13)
TIA†	10 (14.08)	1 (3.44)	11 (11)

[Table/Fig-1]: Baseline characteristics of the stroke patients.

† Transient ischaemic attack

() percentage.

Siriraj stroke score	CT scan		Total N=100
	Infarct(n=71)	Haemorrhage (n=29)	
< -1	51	5	56
-1 to +1	13	7	20
> +1	7	17	24
Total	71	29	100

[Table/Fig-2]: Siriraj stroke score and CT correlation

Guy's hospital score	CT scan		Total (n=100)
	Infarct (n= 71)	Haemorrhage (n= 29)	
< 4	52	4	56
4 to + 24	16	9	25
> + 24	3	16	19
Total	71	29	100

[Table/Fig-3] Guy's hospital score and CT correlation

Siriraj stroke score	Guy's hospital score		Total
	Infarct	Haemorrhage	
Infarct	45	1	46
Haemorrhage	3	15	18
Total	48	16	64

[Table/Fig-4]: Comparison between two scores after excluding equivocal cases

Study	Sensitivity	Specificity	Positive predictive value
SSS* diagnosis of haemorrhagic stroke			
Our study	0.77	0.88	0.71
Ethiopia (14)	0.48	0.75	0.67
India (9)	0.85	0.73	0.71
Malaysia (11)	0.50	0.91	0.66
GHS† diagnosis of haemorrhagic stroke			
Our study	0.80	0.94	0.84
United Kingdom (12)	0.78	0.81	0.95
India (9)	0.60	0.91	0.82
Taiwan (15)	0.67	1.00	1.00

[Table/Fig-5]: Performance of Siriraj stroke score and Guy's hospital score in diagnosing haemorrhagic stroke compared with the CT scan in various populations.

*SSS – Siriraj stroke score; †GHS – Guy's hospital score

Study	Sensitivity	Specificity	Positive predictive value
SSS* diagnosis of ischemic stroke			
Our study	0.88	0.77	0.91
Ethiopia (14)	0.40	0.86	0.73
India (9)	0.73	0.85	0.85
Malaysia (11)	0.70	0.64	0.85
GHS† diagnosis of ischemic stroke			
Our study	0.95	0.80	0.93
United Kingdom (12)	0.78	0.81	0.95
India (9)	0.91	0.60	0.77
New Zealand (16)	0.78	0.70	0.86

[Table/Fig-6]: Performance of Siriraj stroke score and Guy's hospital score in diagnosing ischemic stroke compared with the CT scan in various populations.

*SSS- Siriraj stroke score; †GHS- Guy's hospital score

DISCUSSION

Among the 100 cases, ischaemic strokes were more common as compared to the haemorrhagic strokes. The mean age of the patients who presented with stroke in our study was 61 years. Similar observations were noted by Whadhvani *et al* in a study which was done in Indore in India [8]. The Siriraj stroke score in our study had an applicability rate of 80%. The Guy's hospital score had an applicability rate of 75%. Kochar *et al.*, in their study in western India, had found an applicability rate of 66.25% for the Siriraj stroke score and of 61.25% for the Guy's hospital score [9]. Hypertension was the most common risk factor which was found in our study. Strong *et al* estimated that hypertension was the most common risk factor for stroke, which was present in 54% of the cases in their study [10]. As has been shown in the [Table/Fig-5],

the sensitivity and the positive predictive value of the Siriraj stroke score for haemorrhagic stroke in our study closely matched with that which was found in the study which was done by Kochar *et al* [9]. Whereas the specificity was more closer to that which was found in the study which was done in Malaysia by Kan *et al.*, [11]. Zenebe G *et al* in their study in Ethiopia found that sensitivity of the Siriraj stroke score was very low [12]. The sensitivity of the Guy's hospital score for detecting haemorrhagic stroke in our study was close to that which was found by Sandercock *et al.*, [13]. The specificity and the positive predictive values were similar to that which were found by Kochar *et al.*, [9]. Though the specificity and positive predictive value of the Guy's hospital score was very high in the study by Huang JA *et al.*, the sensitivity was found to be very poor [14]. As can be seen in [Table/Fig-6], the results of the Siriraj stroke score for ischaemic stroke in our study closely resembled those which were found in the study which was done by Kochar *et al.*, [9]. The sensitivity of the Guy's hospital score for ischaemic stroke in our study was close to that which was found by Kochar *et al.*, [9]. Whereas the specificity and the positive predictive values were similar to those which were found in the study which was done by Sandercock *et al.*, in the United Kingdom [13]. Hawkins GC *et al.*, concluded that both the sensitivity and specificity was low for the Guy's hospital score in ischaemic stroke [15]. The Mc Nemar test was used to compare the results of the Siriraj stroke score and the Guy's hospital score. There was no significant difference between the Siriraj stroke score results and the Guy's hospital score results in our study. This finding was consistent with the results of a study which was done by Celani *et al.*, who also did not find a significant difference between the two scores. In that study, they finally concluded that where CT was not immediately available and when the clinician wished to start antithrombotic treatment, the Siriraj score (and possibly the Allen score) could be useful in identifying the patients who were at a low risk of intracerebral haemorrhage [16].

CONCLUSION

1. We did not find any significant difference between the Siriraj stroke score and the Guy's hospital score in their ability to distinguish the ischaemic from the haemorrhagic strokes.
2. The specificity of both these scores was not good enough when it was compared to that of the CT scan.

LIMITATIONS

As our study was done only on the admitted patients in a tertiary referral hospital, these results may not necessarily be applicable to the stroke patients in primary care centres.

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