

VALIDITY OF SIRIRAJ STROKE SCORE IN DIFFERENTIATING CEREBRAL INFARCT AND HAEMORRHAGE IN SOUTH INDIANS

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ABSTRACT

BACKGROUND

Siriraj Stroke Score, a clinical scoring can be used for the bedside diagnosis of the nature of the lesion in stroke patients where CT scan is not available immediately. Settings and design is of cross sectional study. Statistical analysis is Epi-info 2002. Aims of The Study- To differentiate between cerebral infarct and intra cerebral haemorrhage on the basis of Siriraj Stroke Score. To find out the sensitivity, specificity and overall accuracy of the scoring system by comparing it with the CT scan findings.

MATERIALS AND METHODS

Cross sectional study was conducted among patients from General Medicine Ward of Government Rajaji Hospital, Madurai during the period of March 2016 to August 2016. Study included 60 cases of stroke. Subjects believed to fulfil all eligibility criteria and none of the exclusion criteria were included in the study.

RESULTS

In this study, Siriraj score showed positive predictive value of 80.64% for ischaemic stroke and negative predictive value of 78.57% for haemorrhagic stroke and the P value is 0.015 (significant).

CONCLUSION

Siriraj Stroke Score, a clinical scoring can be used for the bedside diagnosis of the nature of the lesion in stroke patients where CT scan is not available immediately.

KEYWORDS

Cerebral Infarct, Cerebral Haemorrhage, Siriraj Stroke Score.

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BACKGROUND

Computed Tomography (CT) scan is an accurate, safe, non-invasive procedure routinely used as an investigative tool for stroke to distinguish between infarction and haemorrhage.¹ Computed tomography scanning of brain is expensive in both the initial investment and maintenance. In developing countries like India, cost and availability constraints prohibit its widespread use especially in rural areas. Clinical stroke scores were developed to overcome these limitations. Differential diagnosis between infarction and haemorrhage can be made on clinical grounds with aid of Siriraj Scoring

System. CT scan is not readily available in semi-urban and rural areas and the scoring systems will then come into play in differentiating the stroke subtype. This study is being done to determine the sensitivity and specificity of Siriraj score.

MATERIALS AND METHODS

Study Population- Cross sectional study was conducted among patients from General Medicine Ward of Government Rajaji Hospital, Madurai during the period of March 2016 to August 2016. Study included 60 cases of stroke.

Inclusion Criteria

1. Patients whose deficit lasted for more than 24 hours
2. CT scan showed cerebral infarction or intra-cerebral haemorrhage.
3. Patients of both sex.
4. Patients age > 18 years.

Financial or Other, Competing Interest: None.

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Exclusion Criteria

1. Age < 18 years.
2. Duration of stroke > 14 days because of the possibility of missing an ICH.
3. Causes of focal neurological deficit other than stroke (tuberculosis, tumour or trauma, transient ischemic attack).
4. Patients on anti-coagulation therapy.
5. Patients in whom CT scan could not be done.
6. Patients admitted 72 hours after the onset of neurological deficit.
7. Patients with sub-arachnoid haemorrhage.
8. Repeat or recurrent stroke.

Study Protocol- On admission detailed history and thorough clinical combination including neurological assessment was carried out. Patients were assumed to be fully conscious if they had a score of >13 on the Glasgow Coma Scale (GCS), drowsy if they had a GCS score 8-13 and unconscious if they scored <7. Siriraj stroke score was calculated and compared with the CT findings done on admission. A radiologist from the hospital, blind to the clinical features, classified the CT brain scans as either infarction or haemorrhage.

This was computed for each patient. Scores were calculated by obtaining details of each clinical value. When the variables were not available example when the patients were unconscious, information was obtained from patient's relatives. When the relatives were unaware of the variables, then the variable score was adjusted as zero. A score above 1 indicates intracranial haemorrhage, while a score below -1 indicated infarction. The score between 1 and -1 represents an equivocal result.

Variable	Clinical Features	Score
Consciousness	Alert	+0 x 2.5
	Stupor/Drowsy/ Semi coma	+1 x 2.5
	Coma	+2 X 2.5
Vomiting	No	+0 X 2
	Yes	+1 X 2
Headache within two hours	No	+0 X 2
	yes	+1 X 2
Diastolic blood pressure	---mm Hg	+Diastolic B.P. (X0.1)
Atheroma markers	None	-0 X 3
(Diabetes, Angina, Intermittent Claudication)	One or more	-1 X 3
Constant		-12

>1=haemorrhage; <-1= Infarction;
-1 to +1=equivocal

Siriraj Stroke Score (SSS) was calculated using the formula

$$= (2.5 \times \text{level of consciousness}) + (2 \times \text{vomiting}) + (2 \times \text{headache}) + (0.1 \times \text{diastolic blood pressure}) - (3 \times \text{atheroma markers}) - 12.$$

Statistical Analysis

Epi-info 2002 was used to analyse parametric variables with t test, whereas chi square analysis with 95% CI was used for the nonparametric variables. Correlation and logistic regression analysis as well as odds ratio with 95% CI were done to determine significant parameters for the stroke types. $P < 0.05$ was accepted as statistically significant. The presence or absence of clinical variables in the SSS was matched against the stroke types as confirmed by CT scan. Sensitivity, specificity and positive predictive values were calculated using standard methods.

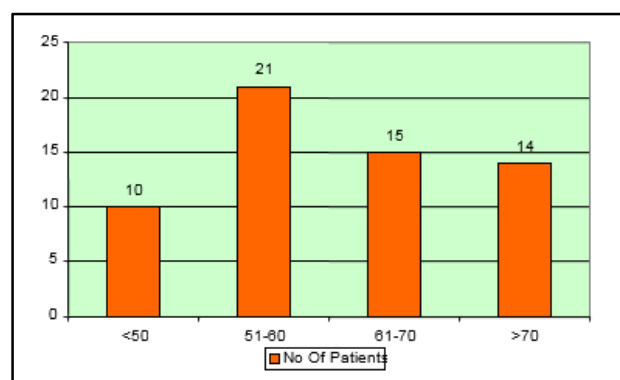
RESULTS

Chart 1. Age Distribution

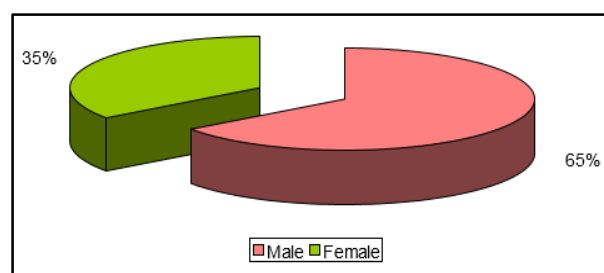


Chart 2. Sex Distribution

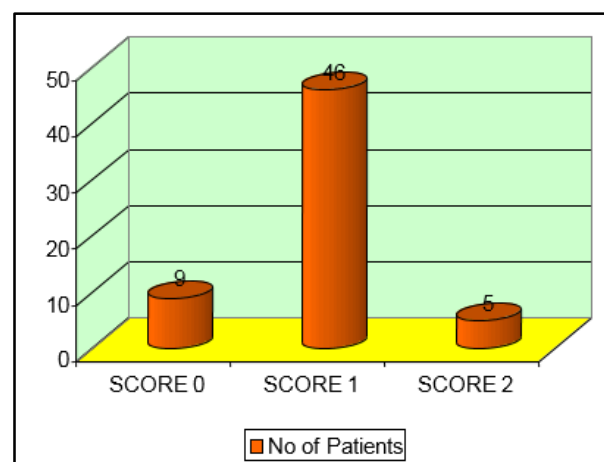
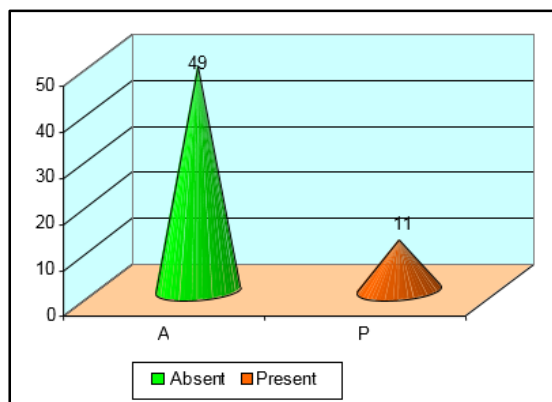
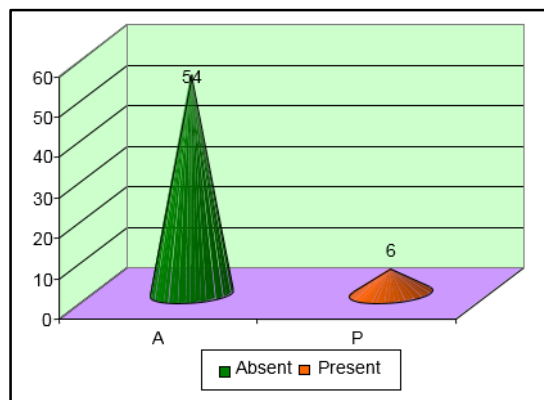
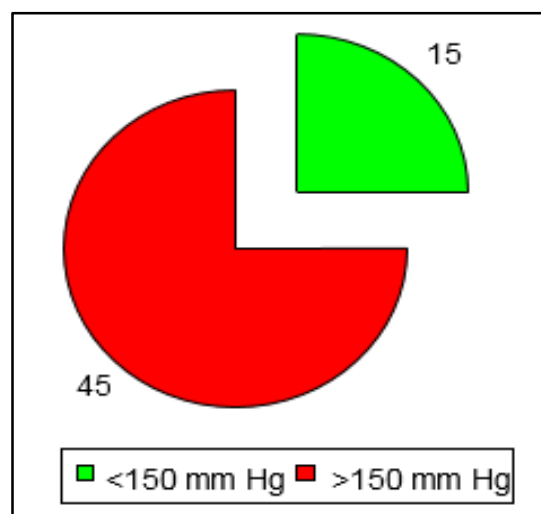
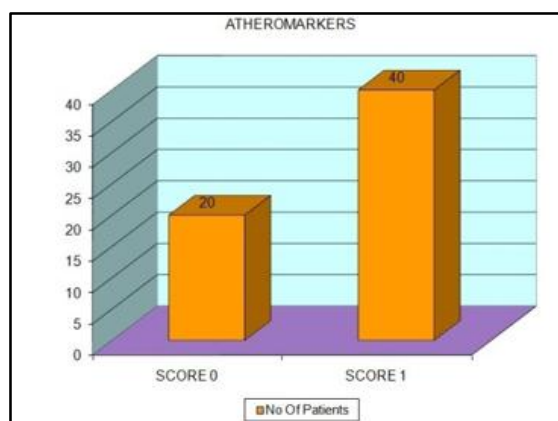
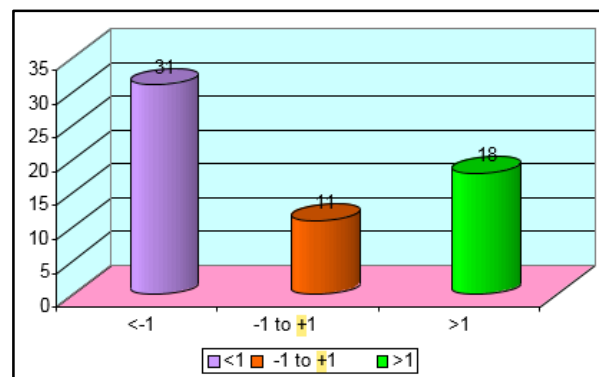
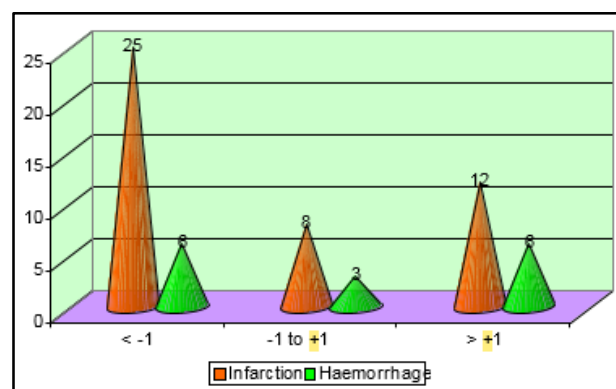


Chart 3. Level of Consciousness

**Chart 4. Vomiting****Chart 5. Headache within 4 hours****Chart 6. Diastolic BP****Chart 7. Atheroma Markers****Chart 8. Siriraj Stroke Score**

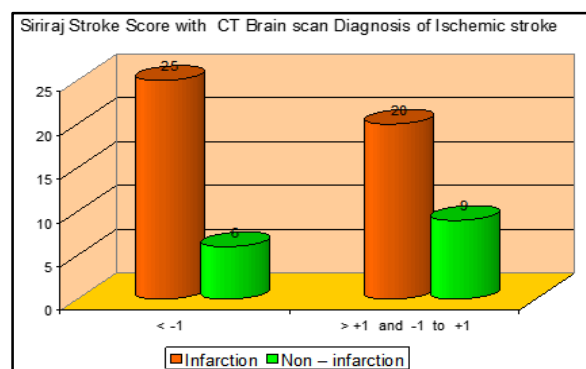
Siriraj Stroke Score	Infarction	Haemorrhage	Total
< -1	25	6	31
-1 to + +1	8	3	11
> +1	12	6	18
Total	45	15	60

Table 1. (Siriraj Stroke Score and CT comparison)**Chart 9. Siriraj Stroke Score and CT Comparison**

Siriraj Stroke Score	Infarction	Non – infarction	Total
<-1	25	6	31
>+1 and -1 to +1	20	9	29
Total	45	15	60

Table 2. Comparison of Siriraj Stroke Score (SSS) with CT Brain Scan (Diagnosis of Ischemic Stroke)

Sensitivity- 55.55%; Specificity - 60%; Positive predict value - 80.64 %; Negative predict value – 31.03%

**Chart 10. Siriraj stroke score with CT brain scan Diagnosis of Ischemic Stroke**

Siriraj Stroke Score	Hemorrhage	Non Hemorrhage	Total
> +1	6	12	18
< -1 and -1 to +1	9	33	42
Total	15	45	60

Table 3. Comparison of Siriraj Stroke Score (SSS) with CT Brain Scan (Diagnosis of Haemorrhagic Stroke)

Sensitivity-40%; Specificity - 73%; Positive predict value -33.33 %; Negative predict value -78.57 %.

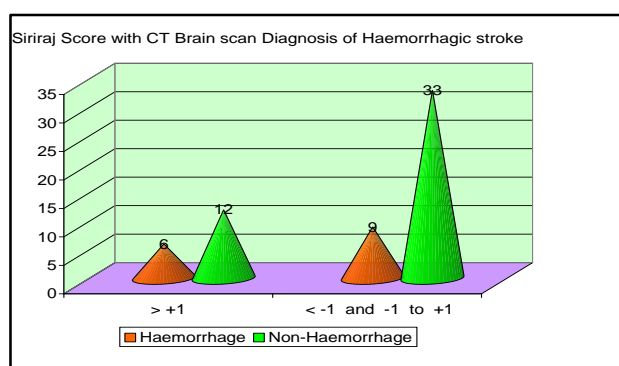


Chart 11. Siriraj Stroke Score with CT brain scan diagnosis of haemorrhagic stroke

DISCUSSION

We evaluated 60 patients after 24 hours of onset of stroke. On admission, detailed history and thorough clinical examination including neurological assessment were carried out. Patient's level of consciousness was assessed by Glasgow Coma Scale (GCS). It was assigned fully conscious if they had a score of >13 on the Glasgow Coma Scale, drowsy if they had a GCS score of 8–13 and unconscious if they scored <7 and we came out with various distributions of parameters as follows; It ranged from 40 to 80 years of age with mean at 60.2 years. Males exceeded females in all the age group. Most of the patients had access to reach the hospital within 24 hours though most of them could not make it within 3–4 hours of the onset. Level of consciousness as per GCS score was low in the first 24 hours more so in haemorrhagic stroke. Atheroma markers namely diabetes, angina and intermittent claudication were found to be more as age increased and in those who had ischemic stroke. Vomiting was seen more in haemorrhagic stroke though only few cases of ischemic exhibited vomiting, indicating likelihood of vomiting more in haemorrhagic stroke. Blood pressure was found to be elevated more in haemorrhagic stroke being more in diastolic blood pressure when compared to ischemic stroke as many of ischemic stroke also were found to be associated with hypertension but did not exceed the 150 mm HG especially for diastolic blood pressure. So, it indicates more the blood pressure, haemorrhagic stroke is more likely. Headache though a common complaint was found more in cases of haemorrhage and ischemic cases exhibited less of it, thus headache is

more likely to be associated with haemorrhage. In this study Siriraj score showed positive predictive value of 80.64% for ischemic stroke and negative predictive value of 78.57% for haemorrhagic stroke and the P value is .015 (significant). Hung LY et al in their study have reported that the diagnostic sensitivities for intracranial haemorrhage and infarction were 85% and 90% respectively, with an overall predictive accuracy of 88.5%.² Pongvarin et al have shown that the sensitivity of Siriraj stroke score for cerebral haemorrhage and cerebral infarction were 89% and 93% respectively, with an overall predictive accuracy of 90%.³ Akpunonu et al reported sensitivity was 36% for haemorrhagic stroke and 90% for ischemic ones.⁴ Study in South Indians by Pavan MR et al showed that the sensitivity for detecting infarction was 87.93% and specificity was 77% whereas for haemorrhage was 77% and 88% respectively.⁵ Dr. S. Sreevani et al reported sensitivity of 88.88% for haemorrhage, 87.5% for infarction (equivocal cases were excluded); over all accuracy was 87.83%.⁶ Kehindeo. KolapoMMC et al showed positive predictive accuracy of 91% for cerebral infarction and 63% for haemorrhagic stroke with an overall predictive accuracy of 80% and the relationship between SSS diagnosis and brain CT diagnosis achieved statistical significance.⁷ The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic gain for SSS were 73%, 85%, 85%, 71% and 30% for infarction and 85%, 73%, 71%, 85% and 27% for haemorrhage respectively by Kochar DK et al.⁸ Wadhawani J et al in their study of acute stroke patients have reported that the sensitivity of the score was 92.54% for infarction and 87% for haemorrhage and its overall accuracy was 91.11%.⁹ In the Kolkata study, 32% of the patients had haemorrhagic stroke, which is the highest figure reported so far from India Efstathiou SP et al reported sensitivity, specificity, positive and negative predictive values of the score for detection of ICH were 97, 99, 97 and 99% respectively¹⁰ whereas sensitivity, specificity, positive predictive value and negative predictive value for cerebral haemorrhage were 0.35, 0.73, 0.4 and 0.68 respectively by Salawu F et al.¹¹ In meta-analysis by Connor MD et al, sensitivity and specificity were 0.69 (95% CI 0.62-0.75) and 0.83 (95% CI 0.75-0.88) for ischemic stroke and 0.65 (95% CI 0.56-0.73) and 0.88 (95% CI 0.83-0.91) for haemorrhagic stroke.¹²

CONCLUSION

Based on clinical variables such as level of consciousness, blood pressure, atheroma markers and the presence of headache and vomiting, Siriraj Stroke Score, a clinical scoring can be used for the bedside diagnosis of the nature of the lesion in stroke patients where CT scan is not available immediately.

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