VALIDATION OF SIRIRAJ STROKE SCORE IN PATIENTS PRESENTING WITH ACUTE CEREBROVASCULAR ACCIDENTS

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ABSTRACT

BACKGROUND
Acute Cerebrovascular Accidents are very common presentations in majority of hospitals. There may be many instances where CT scans may not be available, especially in rural settings in developing countries. Siriraj stroke score can be used as a safe diagnostic tool where CT scans are not available or affordable. A score >1 indicates cerebral haemorrhage, while <-1 indicates cerebral infarction. A score between 1 and -1 represents an equivocal result needing a CT scan. This study was undertaken to know the accuracy of Siriraj score in patients of acute Cerebrovascular accidents in a tertiary care hospital.
The aim of this study was validation of Siriraj stroke score in patients presenting with acute Cerebro Vascular Accidents.

MATERIALS AND METHODS
Siriraj stroke score recorded for 53 subjects. It is a cross sectional study and presumptive diagnosis of acute ischemia or haemorrhage was made and the findings were compared with CT scan brain-plain.

RESULTS
The sensitivity and specificity of Siriraj stroke score were 100% and 37.5% for infarction and 37.5% and 100% for haemorrhage respectively. The overall accuracy of the Siriraj stroke score is 75.4%.

CONCLUSION
According to present study, the overall accuracy of Siriraj stroke score by cross sectional study is 75.4%. There were many limitations in the study and the study design was retrospective. Further prospective studies may be conducted to know the exact accuracy of the Siriraj stroke score.

KEYWORDS
Siriraj Score, Cerebro-Vascular Accident, Thrombosis, CT Scan.

BACKGROUND
Developing countries like India have been burdened not only with infectious diseases, but also with non-communicable diseases such as hypertension, diabetes mellitus, heart disease, cancer and most important in this study is stroke.[1]

A stroke/ Cerebro Vascular Accident (CVA) is a rapid loss of brain function due to disturbance in the blood supply. This can be due to ischemia caused by blockage or haemorrhage.[2] There are 90-222 strokes/1,00,000 and 0.63 Million deaths in India.[2] CT scans plays a key role in brain imaging in determining a stroke and a type of stroke one is experiencing. With the rising demands of CT scans, it is difficult to meet the requirements or to afford, especially in resource limited settings[3,4] Siriraj stroke score can be a safe diagnostic tool where CT scans are not available and not affordable. It was developed and has been used in Thailand since 1986. (1 Calculated as ((2.5*level of consciousness) + (2*vomiting) + (2*headache) + (0.1*diastolic blood pressure) – (3*atheroma markers)) -12 *=multiplication.

Consciousness
Alert=0, Drowsy, Stupor=1, Semi coma, coma=2 Vomiting (within 2 hours):   No=0, Yes=1, Head ache (within 2 hours): No=0, Yes=1 Atheroma markers: None=0, One or more=1.

A score above 1 indicates cerebral haemorrhage, while a below -1 indicates cerebral infarction. A score between 1 and -1 represents an equivocal result needing a computerized brain scan to verify the diagnosis.[1]

This study is an attempt to provide a diagnosis tool for acute strokes based on clinical variables at the bedside; and to develop a simple, reliable, and safe diagnostic tool as compared with other, highly elaborate instruments in

biomedical sciences.[1] Siriraj stroke score can be used in faster diagnosis and in settings where CT scans are not available.[5] A stroke is a medical emergency and can cause permanent neurological damage or death. In 1970 WHO defined stroke as "Neurological disease of cerebro vascular cause that persists beyond 24 hours or interrupted by death within 24 hours".[6,7] Risk factors for stroke include old age, high blood pressure, previous stroke or transient ischemic attack (TIA), diabetes mellitus, high cholesterol, tobacco smoking, and atrial fibrillation. High blood pressure is the most important modifiable risk factor of stroke.[8] About 87% of strokes are ischemic, the remainder being caused by haemorrhage. Some haemorrhages develop inside areas of ischemia ("haemorrhagic transformation"). It is unknown how many haemorrhagic strokes actually start as ischemic stroke.[8]

In elderly population, watershed infarctions can occur due to postural hypotension, cardiac arrhythmias and overmedication. Amyloid angiopathy can cause spontaneous intracerebral haemorrhage.[9]

Thrombosis of cerebral veins and sinuses can cause stroke in young adults.[10]

Most of the haemorrhagic stroke syndromes have specific symptoms (e.g., headache, vomiting, previous head injury).[11,12,13] There is an intensive reduction and control of haemorrhagic stroke in the group of people who received antithrombotic medication.[14] People who are on thrombolytic therapy for ischemic stroke have increased risk of haemorrhagic stroke.[8] CT scans acts as a gold standard in detection of stroke as ischemic (Infarct) or haemorrhagic.

Original Version of Siriraj Stroke Score-
(0.8*consciousness) + (0.66*vomiting) + (0.66*head ache) + (0.03*diastolic blood pressure) – (0.99* atheroma) – 3.71

Simplified Version of Siriraj Stroke Score-
(2.5*consciousness) + (2*vomiting) + (2*head ache) + (0.1* diastolic blood pressure) – (3*atheroma markers) – 12.[1]

Now in this study Siriraj stroke score was validated using specificity and sensitivity. Siriraj stroke score can provide faster interpretation for physician to give thrombolytic therapy in ischemic patients and not to give in haemorrhagic patient.

Aims and Objectives
Validation of Siriraj stroke score in patients presented with acute Cerebro Vascular Accidents.

MATERIALS AND METHODS
Findings calculated using Siriraj stroke score and presumptive diagnosis of acute ischemia or haemorrhage was made, and the findings were compared with CT scan brain plain.

Study Sample- Case files of Patients presented to M S Ramaiah hospital with features suggestive of acute stroke.

Study Design- Cross-sectional study Sample size- 53.

Rationale for Sample Size- Siriraj Hospital Medical School, Mahidol University, Bangkok, study has observed that accuracy of Siriraj stroke score in detection of acute strokes is 90.3%. In the present study, expected the similar results and to get a precision of 95% confidence level and 8% relative precision in the result, the study required a minimum of 53 subjects.

Study Period- Two months.

Inclusion Criteria
All patients presented with features suggestive of acute stroke.

Exclusion Criteria
-Patients less than age of 16 years.
-CT scan findings suggestive of space occupying lesions.

Tests Used- CT scan brain plain, fasting blood sugar level, post prandial blood sugar level, lipid profile, complete blood count.

Statistical Analysis-
- Descriptive statistics of cerebral haemorrhage and cerebral ischemia were analysed and presented in terms of percentage.
- Validation of Siriraj stroke score for detection of strokes was done using sensitivity and specificity.
- P value of less than 0.05 was considered statistically significant.
- SPSS version 20.0 was used to analyse the data.

RESULTS
Study was done using the data collected from case files of the patients who presented to M. S. Ramaiah hospital with features suggestive of acute Cerebro Vascular Accidents. Among 53 subjects of mean age was 58 years and mean diastolic blood pressure was 91 mm Hg, 36(67.9%) had one/more atheroma marker positive. Siriraj stroke score was applied using data collected from case files of 53 subjects out which 42(79.2%) showed as infarct, 3(5.7%) showed as haemorrhage and 8(15.1%) showed as equivocal result which needed CT scan for interpretation. (Table-1)

Siriraj Stroke Score	Frequency	Percent (%)
Infarct	42	79.2
Haemorrhage	03	5.7
Equivocal	08	15.1
Total	**53**	**100.0**
Table 1		

CT scan reading of 53 subjects showed 43(81.1%) as infarct and remaining 10(18.9%) subjects as haemorrhagic stroke. (Table-1.1)

CT Scan	Frequency	Percent (%)
Infarct	43	81.1
Haemorrhage	10	18.9
Total	**53**	**100.0**

Table 1.1

Among 8(15.1%) equivocal result CT scan showed 6(11.3%) as infarct and 2(3.8%) as haemorrhagic stroke. Out of remaining 45, Siriraj stroke score showed 42 as infarct and 3 as haemorrhage, but CT scan showed 37 as infarct and 8 as haemorrhage. (Table-2)

Siriraj Stroke Score and CT Scan Cross Tabulation			
Count			
Siriraj Stroke Score	CT Scan		Total
	Infarct	Haemorrhage	
Infarct	37	5	42
Haemorrhage	00	3	03
Total	**37**	**8**	**45**

Table 2

Kappa: 0.497,   Agreement = 88.8%,   p < 0.001
For infarct: Sensitivity =100%,   specificity =37.5%   PPV =88%, NPV =100%
Hemorrhage: Sensitivity=37.5%   specificity=100%   PPV=100%, NPV=88%

Among 45 who got either infarct or haemorrhage as a result using Siriraj stroke score, 28 were male and 17 were female. Among 28 males Siriraj stroke score showed 26 as infarct and 2 as haemorrhage, but CT scan showed 23 as infarct and 5 as haemorrhage. Among 17 females Siriraj stroke score showed 16 as infarct and 1 as haemorrhage, but CT scan showed 14 as infarct and 3 as haemorrhage. (Table-3)

Sex			CT Scan		Total
			Infarct	Haemorrhage	
Male	Siriraj Stroke Score	Infarct	23	3	26
		Haemorrhage	00	2	02
	Total		23	5	28
Female	Siriraj Stroke Score	Infarct	14	2	16
		Haemorrhage	00	1	01
	Total		14	3	17

Table 3. Siriraj Stroke Score and CT Scan Cross Tabulation

Male:
Kappa=0.523, Agreement=89.2%, p<0.001
Infarct: Sensitivity =100%, specificity =40%, PPV =88%, NPV = 100%
Hemorrhage: Sensitivity =40%, specificity =100%, PPV =100%, NPV = 88%

Female:
Kappa=0.452, Agreement=88.2%, p<0.001
Infarct: Sensitivity =100%,   specificity =33%, PPV =87.5%, NPV =100%
Hemorrhage: Sensitivity =33%, specificity =100%, PPV =100%, NPV =87.5%

Data collected from 53 files out of which 40(75.47%) gave findings same as that of gold standard (CT scan brain plain), 5(9.43%) showed exactly opposite results and 8(15.09%) showed an equivocal result needing a CT scan brain plain. Therefore, the accuracy of Siriraj stroke score is 75.4%. (Table-4)

CT Scan and Siriraj Stroke Score	No. of Cases
Matched	40
Unmatched	05
Equivocal in Siriraj Stroke Score	08

Table 4

The sensitivity and specificity of Siriraj stroke score were 100% and 37.5% for infarction and 37.5% and 100% for haemorrhage respectively. The overall accuracy of the Siriraj stroke score is 75.4%.

DISCUSSION

Comparison of the Siriraj stroke score has been done in many studies. Siriraj hospital medical school, Mahidol university, Bangkok, study has observed that accuracy of Siriraj stroke score in detection of acute strokes is 90.3%. Study have concluded that the Siriraj stroke score is better than the Guy's hospital score, at the same time the sensitivity of the Siriraj score has been in the range of 80-100%. Comparing with Greek stroke score Siriraj stroke score was more specific for infarction stroke. But Greek stroke score was more specific in diagnosing haemorrhagic stroke. Recently conducted study by Wadhwani Jyoti, et al showed that the sensitivity of Siriraj stroke score was 92.54% in diagnosing infarction and 87% for haemorrhage and its overall accuracy was 91.11%.[1,15,16,17] In the present study the accuracy of the Siriraj stroke score is 75.4%, the statistical results obtained and analysed using the given rationale suggests that Siriraj stroke score is not accurate in prediction of stroke. As this is cross sectional study made using the case files which might not be having timely Blood pressure measured which should have been taken as soon as the admission of the patient, as it is a very important entity in the score to distinguish between infarction and haemorrhagic stroke. Observation of study clears that Siriraj stroke score misjudged 5 haemorrhagic strokes, which needs increased diastolic blood pressure as main entity in the Siriraj stroke score to show as haemorrhagic stroke. Also, as M. S. Ramaiah hospital is a tertiary hospital, the patients would have been given antihypertensive before approaching the hospital. Other entities of score written in the file might not be 100% correct which adds to the bias. The equivocal result obtained using Siriraj stroke score cannot classify between infarct and haemorrhage. So, CT scan is must in such conditions. Atheroma markers is one of the entity of Siriraj stroke score, if patient is unconscious or if there is absence of information regarding atheroma markers like dyslipidaemia. This score cannot be applied or if applied may give false interpretation in such situations.

CONCLUSION

The overall accuracy of Siriraj stroke score is 75.4%. Using the rationale, the conclusion is "Siriraj stroke score is not valid in patients presenting with Cerebro Vascular Accidents". As chances of bias were more in the present study. Study has to be done prospectively on the same topic, so that the results will be less biased due to time at which BP is measured and other entities of the Siriraj stroke score. If Siriraj stroke score is approved as clinical diagnostic tool, mortality due to score can be reduced by initiating treatment with in the golden hours.

REFERENCES

[1] Taylor FC, Kumar SK. Stroke in India factsheet. South Asia Network for Chronic Disease, IIPH Hyderabad, Public Health Foundation of India. Updated 2012.

[2] Raghuram PM, Biradar MS, Jeganathan J. Comparison of the Siriraj stroke Score and the Guy's Hospital Score in South India. Journal of Clinical and Diagnostic Research 2012;6(5):851-854.

[3] Wardlaw JM. Radiology of stroke. J Neurol Neurosurg Psychiatry 2001;70 Suppl 1:i7-i11.

[4] Poungvarin N, Viriyavejakul A, Komontri C. Siriraj stroke score and validation study to distinguish supratentorial intracerebral haemorrhage from infarction. BMJ 1991;302(6792):1565-1567.

[5] Kolapo KO, Ogun SA, Danesi MA, et al. Validation study of the Siriraj Stroke score in African Nigerians and evaluation of the discriminant values of its parameters: a preliminary prospective CT scan study. Stroke 2006;37(8):1997-2000.

[6] Kumar V, Abbas AK, Aster JC. Robbins and Cotran pathologic basis of disease. 8th edn. Philadelphia, PA: Saunders/Elsevier 2010:1290-1298.

[7] World Health Organization. Cerebrovascular disorders: a clinical and research classification. Geneva: WHO 1978.

[8] Donnan GA, Fisher M, Macleod M, et al. Stroke. Lancet 2008;371(9624):1612-1623.

[9] Shuaib A, Hachinski VC. Mechanisms and management of stroke in the elderly. CMAJ 1991;145(5):433-443.

[10] Stam J. Thrombosis of the cerebral veins and sinuses. N Engl J Med 2005;352(17):1791-1798.

[11] Kushner D. Mild traumatic brain injury: toward understanding manifestations and treatment. Arch Intern Med 1998;158(15):1617-1624.

[12] Seidenwurm DI. Introduction to brain imaging. In: Brant WE, Helms CA, eds. Fundamentals of diagnostic radiology. Philadelphia: Lippincott Williams & Wilkins 2007: p. 53.

[13] van Gijn J, Kerr RS, Rinkel GJE. Subarachnoid haemorrhage. Lancet 2007;369(9558):306-318.

[14] Hughes S. BP control more important in ICH patients on antithrombotics. Medscape Medical News. May 15 2014.

[15] Daga MK, Sarin K, Negi VS. Comparison of Siriraj and Guy's Hospital score to differentiate supratentorial ischaemic and haemorrhagic strokes in the Indian population. JAPI 1994;42(4):302-303.

[16] Soman A, Joshi SR, Tarvade S, et al. Greek stroke score, Siriraj score and Allen score in clinical diagnosis of intracerebral haemorrhage and infarct: validation and comparison study. Indian J Med Sci 2004;58(10):417-422.

[17] Wadhwani J, Hussain R, Raman PG. Nature of lesion in cerebrovascular stroke patients: clinical stroke score and computed tomography scan brain correlation. J Assoc Physicians India 2002;50;777-781.