A Study on Agreeability between Clinical Stroke Scoring Systems in Diagnosis of Stroke

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Abstract: _Background: Prompt diagnosis of stroke in resource poor settings without CT/MRI can be done by stroke scoring systems. Allen's score, Siriraj score and Greek score are available scoring systems employed in distinguishing stroke subtypes. This study is done to assess the agreeability between results obtained by using these stroke scoring systems. Aim: To assess the agreeability between available clinical stroke scoring systems in diagnosing stroke subtypes. Materials and methods: This cross sectional study was done in 100 new stroke patients at G. S. L. Medical College, Rajahmundry. Clinical scoring systems were employed in all the patients. Cohen's Kappa value is calculated to find out agreebiality between clinical stroke scoring systems. Results: Cohen's kappa values are 0.862 for Allen's score and Siriraj score; 0.740 for Allen's score and Greek score; 0.664 for Siriraj score and Greek score. Conclusion: Using Allen's score or Siriraj score yields consistent results unlike Greek score which had disparity in agreeing with results of Allen's score and Siriraj score._

Keywords: Stroke, Allen's score, Siriraj score, Greek score, Agreeability

1. Introduction

The current World Health Organization definition of stroke is "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.1Allen's score[2], Siriraj score[3] and Greek score[4] are employed in diagnosing stroke subtypes clinically in resource - poor settings so treatment can be started promptly. These scores are easy and can be done at the bedside with help of clinical history, and presentation, and do not require costly and advanced laboratory tests. Thisis a study done on agreeability between various scoring systems.

Aim

To assess the agreeability between available clinical stroke scoring systems in diagnosing stroke subtypes.

2. Materials and Methods

This cross sectional study was done in 100 new stroke patients at G. S. L. Medical College, Rajahmundry. Clinical scoring systems were employed in all the patients. Allen's score was calculated at admission and after 24hrs of admission. Siriraj's score and Greek score were calculated at admission. CT or MRI scans were employed in confirming stroke subtypes. Cohen's Kappa value is calculated to find out agreebiality between clinical stroke scoring systems.

Cohen suggested kappa value to be interpreted as<0: no agreement, 0.01 - 0.20: Slight agreement, 0.21 - 0.40: Fair, 0.41 - 0.60: Moderate agreement, 0.61 - 0.80: Substantial agreement, 0.81 - 1.00: Perfect agreement.5

1) **Study duration**: Jan 2021 to August 2022
2) **Study subjects:**
3) **Inclusion criteria:**

a) All patients with acute stroke presenting within 24 hours of onset of symptoms.
b) Age 20 to 75 years
4) **Exclusion criteria:**
a) Age <20years, >75 years
b) Patients presenting after 24 hours of onset of symptoms.
c) Patient with chronic severe Neurological illness
d) Patients already on antiplatelet therapy
5) **Statistical analysis:**
All statistical analysis will be done by using SPSS software version 20.0 and MSXL 2010. Cohen's Kappa value will be calculated to analyze agreeability between scores.

3. Results

Out of 100 patients, 80% of cases were diagnosed as ischaemic stroke and 20% of cases were diagnosed as haemorrhagic stroke by either CT or MRI brain scan.

The mean age of ischemic stroke is 60.71 years while that of haemorrhagic stroke is 60.21 years.30% of ischaemic strokes occur between 61 to 70 years of age.50% of hemorrhagic strokes occur between 51 to 60 years of age.

Out of 80 ischaemic stroke cases, 56 cases (70%) are male and 24 (30%) are female. In 20 haemorrhagic cases, 17 cases (85%) are male and 3 cases (15%) are female.

No statistically significant difference between males and females in stroke incidence. In ischemic stroke, 43.8% had hypertension while in haemorrhagic stroke 85% had hypertension. It is significantly high in haemorrhagic stroke subtype. Only 20% of haemorrhagic stroke cases had no prior hypertension while 56.2% of ischaemic stroke cases

had no prior hypertension as a risk factor.31 cases (38.7%) of ischemic stroke and 9 cases (45%) of haemorrhagic stroke have atheroma markers. No significant difference in presence of atheroma markers between ischaemic and haemorrhagic stroke. In 80 infarcts 66 cases (82.5%) had no heart disease and 14 cases (17.5%) has heart disease. None of the haemorrhagic stroke cases had heart disease. Heart disease is significant found in ischaemic stroke compared to haemorrhagic stroke. Previous history of TIA/stroke was absent in 74cases (92.5%) and present in 6 cases (7.5%) out of 80 ischemic infarcts. TIA/stroke history is present in 1 case (5%) and absent in 19 (95%) cases out of 20 hemorrhages. H/O TIA/stroke is not significantly different between stroke subtypes. Headache is present only in 7 cases (35%) of haemorrhagic stroke but absent in ischaemic stroke. Headache is absent in 13 cases (65%) of haemorrhagic strokes. Vomiting is only present in haemorrhagic stroke and absent in ischaemic stroke.15 cases (75%) of haemorrhagic stroke had vomiting while 5 cases (25%) had no vomiting.3 cases of ischaemic stroke and 16

cases of haemorrhagic stroke had apoplectic onset. Apopleptic onset is significantly high in haemorrhagic stroke cases compared to ischemic stroke. Out of all stroke cases 63 cases are alert 61 cases are ischaemic, 2 cases were haemorrhagic.15 cases were drowsy out of which 14 cases were ischaemic and 1 case was haemorrhagic.22 cases are unconscious out of which 17 cases were haemorrhagic and 5 cases are ischaemic. Poorer conscious levels are significantly high in haemorrhagic group. Out of all stroke cases 66 cases are alert 64 cases are ischaemic, 2 cases were haemorrhagic.19 cases were drowsy out of which 15 cases were ischaemic and 4 cases are haemorrhagic.

22 cases are unconscious out of which 17 cases were haemorrhagic and 5 cases are ischaemic. Poorer conscious level are significantly high in haemorrhagic group. WBC counts are more than 12000 in 1.2% i. e., 1 case in ischaemic and 10% i. e., 2 cases in haemorrhagic stroke. WBC counts are significantly high in haemorrhagic stroke when compared to ischaemic stroke.
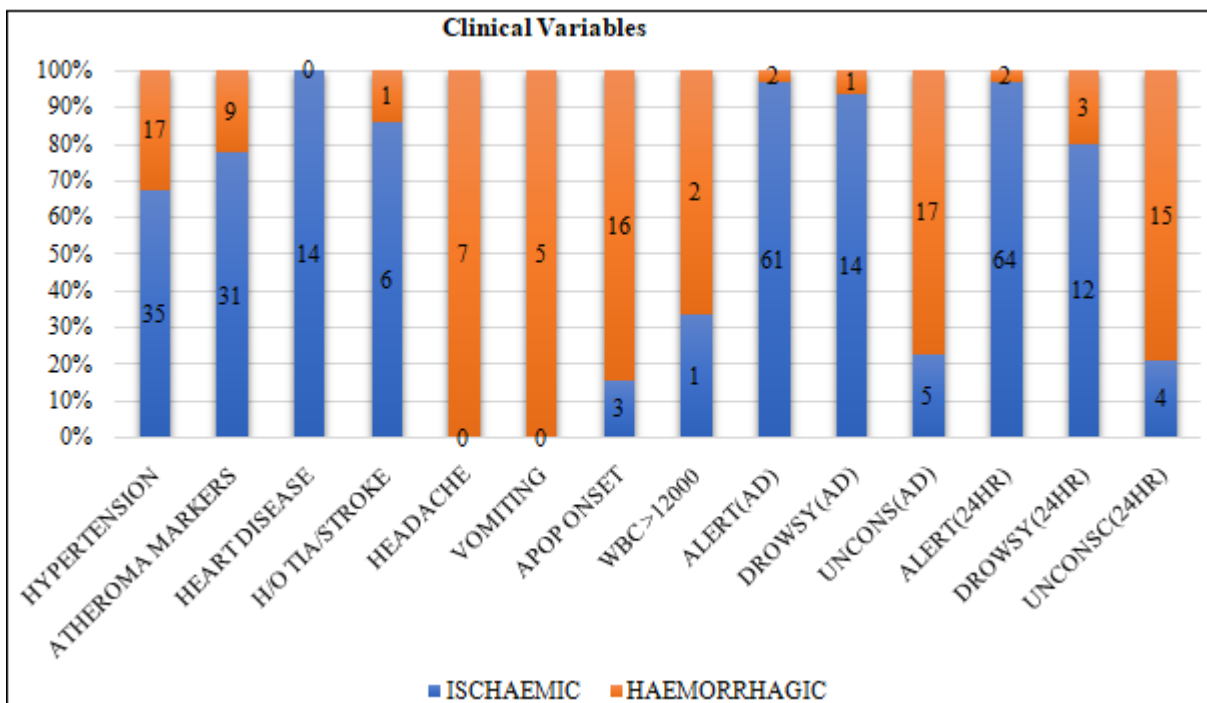

Allen's Score: Using Allen's score 69 cases could be infarcts, however 68 cases were diagnosed as infarct using CT/MRI (True positive=98.5%) and one as hemorrhage. (False positive=1.44%).22 cases were diagnosed as haemorrhage in which 19 were haemorrhage (True positive=86.36%), 3 are infarcts. (False positive=13.63%).9 are equivocal which are infarcts on CT/MRI.

Siriraj Score: Using Siriraj score 74 cases could be infarcts, however 73 cases were diagnosed as infarct using CT/MRI (True positive=98.64%) and one as hemorrhage. (False positive=1.35%).23 cases were diagnosed as haemorrhage in which 19 were haemorrhage (True positive=82.60%), 4 are infarcts. (False positive=17.39%).3 are equivocal which are infarcts on CT/MRI.
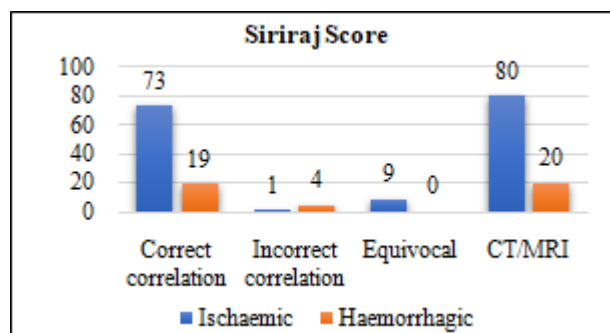
Greek Score: Using Greek score 65 cases could be infarcts, however 64 cases were diagnosed as infarct using CT/MRI

(True positive=98.46%) and one as hemorrhage. (False positive=1.53%).16 cases were diagnosed as haemorrhage in which 13 were haemorrhage (True positive=81.25%), 3 are infarcts. (False positive=18.75%).19 are equivocal in 13 are infarcts CT/MRI and 3 are haemorrhage.

Allen Score
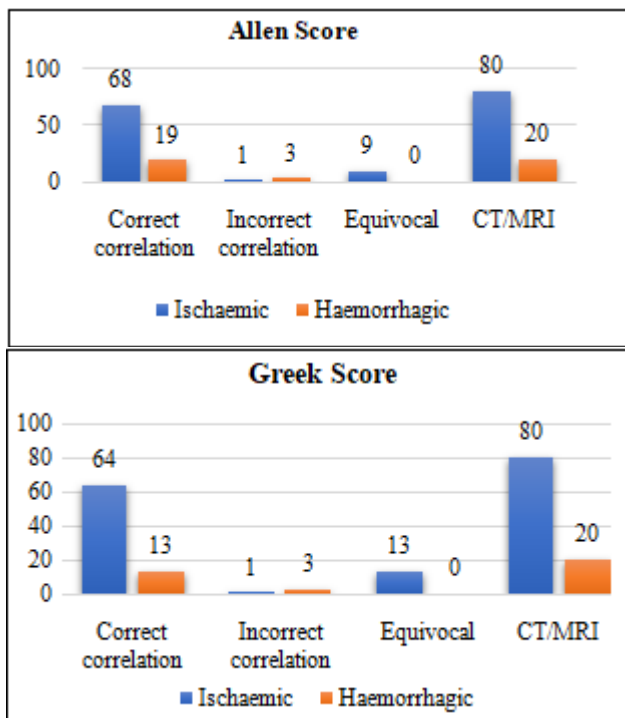
Greek Score

Allen score	Siriraj score			Total	
	Infarct	Haemorrhage	Equivocal		
Infarct	69	0	0	69	Kappa value =0.862
Haemorrhage	0	22	0	22	
Equivocal	5	1	3	9	
Total	74	23	3	100	
Siriraj score	Greek score			Total	
	Infarct	Haemorrhage	Equivocal		
Infarct	65	0	9	74	Kappa value = 0.664
Hemorrhage	0	16	7	23	
Equivocal	0	0	3	3	
Total	65	16	19	100	
Allen score	Greek score			Total	
	Infarct	Haemorrhage	Equivocal		
Infarct	62	0	7	69	Kappa value = 0.74
Haemorrhage	3	16	3	22	
Equivocal	0	0	9	9	
Total	65	16	19	100	

Cohen's Kappa values
Allen's score and Siriraj score has near perfect agreement between each other.

Allen's score and Greek score has substantial agreement between each other while Siriraj and Greek score has least agreeability with a kappa value showing substantial agreement.

4. Discussion

The goal of the current study was to evaluate the agreeability between Allen's score, Siriraj score, and Greek score to distinguish between ischemic stroke and hemorrhagicstroke in 100 consecutive individuals suffering from acute stroke at GSL General Hospital, Rajahmundry.

In our study, there are 73 (73%) men and 27 (27%) females, for a ratio of 2.7: 1. The larger percentage of males may be a result of risk factors like smoking and dyslipidemia being more prevalent. For men and women, there was no discernible difference in the incidence of ischemic and hemorrhagic stroke subtypes.

Patients with ischemic stroke are reported to be on average 60.71years old and that of haemorrhagic stroke is 60.2 years. The patients who took part ranged in age from 41 to 80, with ischemic strokes occurring most frequently in people between the ages of 61 and 70. In the age range of 51 to 60 years, close to half of instances of hemorrhagic stroke take place. With hypertension being present in 85% of haemorrhages but only in 43.8% of ischemic infarcts, hypertension was a very important risk factor for haemorrhagic stroke. Atheroma indicators are found in both haemorrhagic (45%) and ischemic (38.7%) stroke subtypes, with no discernible difference between them. In this study, the presence of heart illness was only identified as a risk factor for ischemic stroke, which can be caused by emboli, hypoperfusion, thrombus due to AF or heart failure, among other things.95% of patients with hemorrhagic stroke and 92.5% of patients with ischemic stroke do not have a prior history of TIA or stroke. With no discernible difference between the two groups, 7.5% of patients with ischemic stroke and 5% of those with hemorrhagic stroke reported a prior TIA or stroke. If a headache is present, it is typically a sign of a hemorrhagic stroke. In this study, only 35% of patients with hemorrhagic stroke reported headache. Just 25% of haemorrhagic patients include vomiting. No patients who suffered an ischemic stroke experienced any vomiting. Just 3.8% of patients with ischaemic stroke experience an apopleptic start, compared to 80% of patients with hemorrhagic stroke. It is the most reliable predictor of haemorrhaghic stroke. Hence, the occurrence of apopleptic onset, particularly with nausea and vomiting, virtually certainly indicates a haemorrhagic stroke. In this investigation, haemorrhagic stroke patients had lower than expected aware levels, as was expected. Whereas 76.2% of patients with ischaemic stroke at admission and 80% of patients with hemorrhagic stroke after 24 hours stayed awake, 85% of hemorrhagic stroke cases at admission and 75% of hemorrhagic stroke after 24 hours remained unconscious.

Just 1.2% of ischemic strokes and 10% of hemorrhagic strokes show increased WBC counts; however this association between higher WBC counts and hemorrhagic stroke is significant.

Allen's score and Siriraj score had near perfect agreeability with a value of 0.862 and is similar to study done by Kabir et al[6] and Pavan Manibettu Raghuram et al[7].

Allen's score and Greek score had substantial agreement with a kappa value of 0.740

The lowest agreeability was between Siriraj score and Greek score where kappa value is 0.664 with substantial agreeability is similar to study by Aamod soman et al[8] and Upadhyaya et al.[9]

In this study, when scores were applied to diagnose stroke subtypes, results in both Allen's score and Siriraj score were similar but when results from application of Greek score was

compared, significant disparity in agreement between scoring systems was seen. Even though overall agreeability between scoring systems was good, application of Greek score can yield results significantly different from Allen's score and Greek score.

5. Conclusion

Prompt diagnosis of stroke subtypes and early treatment can prevent mortality and reduce morbidity in resource poor settings using stroke scoring systems. When a clinician is employing any one the three scoring systems, they have to remember than diagnosis of a stroke subtype may differ significantly using Greek score compared to Allen's score and Siriraj score. Using Siriraj score or Allen's score can yield similar results without much disparity in diagnosing stroke subtypes.

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