TO STUDY THE EFFICACY OF THE ASPOS SCORING SYSTEM IN PREDICTING POSTERIOR CIRCULATION STROKE IN EMERGENCY DEPARTMENTS IN THE INDIAN POPULATION

Original Research Article

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Abstract

Background: Due to the variety of symptoms, assessing the severity of posterior circulation strokes (PCS) is a significant clinical problem. The present study aims to test the efficacy of the ASPOS scoring system in predicting PCS in the emergency department in the Indian population. **Materials and Methods:** One hundred patients presenting to the hospital with symptoms suggestive of PCS within 24 hours were included in the study. Detailed history regarding the patient's onset, duration and other associated symptoms were collected. The patient's vital parameters were measured when presenting to the ED. Then, subjective scores on Adam's scale will be measured. The clinicians will treat the patient according to their clinical judgments and not the set protocol. **Results:** Male dominance was reported in our study, with a mean age of 60.83±11.61 years. Most patients were observed with comorbidity of HTN (9%) and HTN with DM (9%). ASPOS score < 3 was observed in 64% of the cases, and > 3 was observed among 36% of patients. PCS was reported among (54%) of the study cases. There was no significant association of ASPOS score with patient age, gender and comorbidity. In 36 patients having ASPOS score >3, 34 cases were positive for PCS, which was statistically significant (p<0.0001). **Conclusion:** Performing the ASPOS is a good strategy for identifying PCS patients in the field, assessing their severity, and determining the likelihood of accelerating the interventions by permitting early mobilization by the emergency team.

INTRODUCTION

Acute stroke is also commonly called a cerebrovascular accident. Acute stroke is the acute onset of focal neurological findings in a vascular territory due to underlying cerebrovascular disease. Stroke is the 5th leading cause of death and the first leading cause of disability. There are two main types of strokes. The common type is an ischemic stroke, caused by an interruption of blood flow to a certain brain area. Ischemic stroke accounts for 85% of all acute strokes. 15% of acute strokes are hemorrhagic strokes caused by the bursting of a blood vessel,i.e., acute bleeding. There are two main types of hemorrhagic strokes: intracerebral haemorrhage (ICH) and subarachnoid haemorrhage, accounting for about 5% of strokes.[1] The risk factors and etiology of strokes in this vascular territory are largely the same as for the other principal cerebral arteries, including hypertension, dyslipidemias, diabetes mellitus, smoking, atherosclerosis, and cardioembolism. However, the peculiar manifestations of its clinical syndromes and the suspicion that many infarcts in the arterial territory are silent could result in the underdiagnosis of strokes involving the ACA or its branches.[2]

Posterior circulation strokes account for 20–40% of all ischemic strokes.[1] Compared to anterior circulation strokes, this type is characterized by the greater complexity of clinical symptoms, greater unpredictability, and clinical variability. Ischemia of various areas supplied by the posterior circulation, including the occipital region, brainstem, and cerebellum, leads to diverse clinical manifestations that often pose a great diagnostic challenge for physicians.[2] The National Institutes of Health Stroke

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International Journal of Academic Medicine and Pharmacy (www.academicmed.org)
ISSN (O): 2687-5365; ISSN (P): 2753-6556

Scale (NIHSS) is the scale most widely used to assess stroke severity. It is much more accurate when capturing the course of a stroke in anterior circulation as it does not include clinical elements typical of the posterior circulation, such as nystagmus or gait disturbances, leading to underestimating stroke severity in these cases.[3-5] There are still doubts regarding whether the NIHSS can be used for posterior strokes, as reflected, for example, in the qualification of thrombectomy. In patients with anterior stroke, there is a general agreement regarding the significant risk of large intracerebral vessel occlusion (i.e., 6 points on the NIHSS scale). However, there is no such limit and consensus for posterior stroke.[6]

Moreover, assessing the indications for extended vascular diagnostics is normally left to the physician's discretion. The heterogeneity and complexity of clinical symptoms are the main reasons for lacking a clinimetric tool dedicated to this group of strokes. Numerous reports have signalled the need to unify and standardize these stroke groups. Unfortunately, only a few authors have presented the development of such a dedicated scale [the Israeli Vertebrobasilar Stroke Scale (IVBSS)] based on a small population of patients or have attempted to make an extended version of NIHSS.[7-8] Ultimately, however, they have not found practical and widespread application, mainly due to the lack of attempts aimed at validation, modification, or improvement to create a common, recognized, and accepted clinimetric instrument. This study aimed to assess the reliability and reproducibility of a clinimetric tool [Adam's Scale of Posterior Stroke (ASPOS)] dedicated to exclusively assessing stroke severity in posterior circulation with additional predictive properties in the Emergency Department.

MATERIALS AND METHODS

This prospective observational study was conducted in the Emergency Department of a tertiary-care hospital, Kovai Medical Center and Hospital, Coimbatore, India, from February 2022 to January 2023. One hundred patients presenting to the hospital with symptoms suggestive of posterior circulation stroke within 24 hours were included in the research. Institutional ethical committee approval and written informed consent were taken from all subjects before the start of the study.

Inclusion Criteria
Patients of either sex presenting to the Emergency Department (ED) with stroke symptoms within 24 hours were included.

Exclusion Criteria
Patient unable to consent and underwent thrombolysis/ thrombectomy. Patients already diagnosed with stroke were excluded.

Methodology
Detailed history regarding the patient's onset, duration and other associated symptoms were collected. The patient's vital parameters were measured when presenting to the ED. Then, subjective scores on Adam's scale were measured. The decision regarding the diagnosis was made through decision protocols. The clinicians treated the patient according to their clinical judgments and not the set protocol.

ASPOS Assessment
On the first day of the stroke, three randomly selected investigators assessed each patient using ASPOS to estimate the inter-rater reliability. The differences in the assessment did not exceed 2 hours. One researcher randomly selected each time assessed stroke subjects' clinical and functional condition with other available scales on the first day after the stroke to estimate the construct validity, and predictive validity was estimated on the 90th day after the stroke. Three hours after the ASPOS evaluation, one of the three previously selected investigators was also randomly selected for re-assessment by ASPOS (test-retest) to estimate the intra-rater reliability. The differences in the sum values of the ASPOS between two randomly selected researchers were used to assess the repeatability of the tool.

RESULTS

Male dominance was reported in our study, and maximum patients were reported in the age group of > 60 years, followed by 41 to 60 years (41%) and <40 years (8%) with a mean age of 60.83±11.61 years. Most of the patients were observed with comorbidity of HTN 9(9%) and HTN with DM 9(9%), followed by DM 8 (8%). An ASPOS score < 3 was observed in 64% of the cases, and > 3 was observed in 36 (36%). MRI diagnosis showed posterior circulation stroke among 54 (54%) of the study cases and PCS absent among 46 (46%) of the cases (Table 1).

There was no significant association of ASPOS score with patient age, gender and comorbidity. However, among 36 cases having ASPOS score >3 of them, 34 cases were positive for PCS, which was statistically significant (p<0.0001) (Table 2).
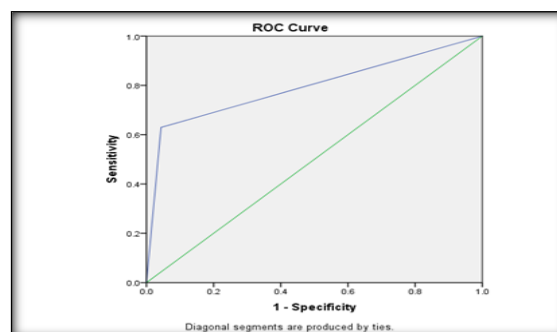

Figure 1: Observation of ROC curve analysis of ASPOS Score

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International Journal of Academic Medicine and Pharmacy (www.academicmed.org)
ISSN (O): 2687-5365; ISSN (P): 2753-6556

PCS patients' mean ASPOS score was statistically higher (p<0.0001). The ROC analysis showed ASPOS scores have a 94.4% PPV and 64.4% NPV with 63% sensitivity and 95.7% specificity in predicting the PCS among patients admitted to the emergency department (p=0.000) (Figure 1 and Table 3).

Table 1: Observation of demographic and other evaluation parameters of patients

Parameters		Frequency (%)
Gender	Male	77(77%)
	Female	23 (23%)
Age group	<41 years	8 (8%)
	41 to 60 years	41 (41%)
	>60 years	51 (51%)
Comorbidities	Diabetes mellitus (DM)	8 (8%)
	Coronary artery disease (CAD)	3 (3%)
	Hypertension (HTN)	9 (9%)
	DM and CAD	2 (2%)
	DM and HTN	9 (9%)
	HTN and CAD	3 (3%)
	DM, HTN, CAD	3 (3%)
	No Comorbidity	62 (62%)
ASPOS score	< 3	64 (64%)
	> 3	36 (36%)
Posterior Circulation stroke (PCS)	Present	54 (54%)
	Absent	46 (46%)

Table 2: Statistical association of ASPOS score among age, gender, comorbidity and PCS of patients

		PCS		Total	P-value
		Present	**Absent**		
Gender	**Male**	44 (81.5%)	32 (69.6%)	76 (76%)	0.164
	Female	10 (18.5%)	14 (30.4%)	24 (24%)	
Comorbidities	**Present**	22 (40.7%)	16 (34.8%)	38 (38%)	0.541
	Absent	32 (59.3%)	30 (65.2%)	62 (62%)	
ASPOS Score	**> 3**	34 (63%)	2 (4.34%)	36 (36%)	<0.0001
	< 3	20 (37.03%)	44 (95.65%)	64 (64%)	
Age (Years)	**Present**	60±10	-	54	0.373
	Absent	62±13	-	46	

Table 3: ROC analysis

Area	Std. Error	P-value	95% C. I	
			Lower Bound	**Upper Bound**
0.793	0.046	0	0.703	0.883

DISCUSSION

A high level of public awareness of stroke symptoms and the need to seek immediate medical attention is crucial for effective acute stroke treatment. Although no study has specifically focused on signs of PCS, research indicates that overall, there is much room for improvement. A study focusing on temporal trends in public awareness between 1995 and 2005 in Cincinnati found that knowledge of stroke warning signs only slightly improved: those able to name three warning signs rose from 5 to 16%, while there was no improvement in the ability of the public to name at least one warning sign.[9] Not surprisingly, of typical stroke symptoms, the one named least frequently was trouble seeing/visual impairment. Interestingly, visual field abnormalities are among the most common manifestations of PCS yet constitute a symptom of which patients are often unaware.[10]

Different instruments for rapid stroke recognition have been developed, mostly predominantly intended for pre-hospital assessment by EMS personnel. The Face Arm Speech Test (FAST) is perhaps the most popular, also designed to aid stroke sign recognition by the general public. Pre-hospital stroke detection scales have been found to have similar shortcomings, with, e.g., FAST missing about half of PCS.[11,12] Furthermore, patients with stroke misdiagnosis were commonly FAST-negative with non-specific symptoms, including altered mental status, dizziness, and nausea/vomiting often associated with PCS. This finding provides a false sense of security during ED assessment.[13] In addition, recent years have seen a relative predominance of research concerning the suitability of pre-hospital stroke scales to recognize patients with large-vessel occlusion, who—as potential candidates for endovascular therapy (EVT)—require fast allocation to an EVT-capable stroke centre.[14] The primary focus here is detecting anterior circulation pathology rather than considering a subgroup of stroke patients with atypical symptoms and less clear long-term benefits from acute interventions.

The National Institutes of Health Stroke Scale (NIHSS) is the most widely used deficit rating scale

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for assessing patients with acute ischemic stroke. While it has been shown to have a significant association with vessel occlusions in patients with ACS, performance in patients with PCS is poorer.[15] Accordingly, PCS patients from the Acute Stroke Registry and Analysis of Lausanne had lower NIHSS at admission than ACS patients.[16] Most PCS patients have a baseline NIHSS score ≤4, and even a value of 0 cannot rule out the presence of stroke, a finding reported in PCS patients in particular. In those patients commonly presenting with symptoms like headache, vertigo, nausea and truncal ataxia as the most common neurologic signs, the NIHSS drastically underestimates the degree of stroke-associated functional impairment.[17,18]

Diagnostic error constitutes a substantial hazard to patient safety, and its potential consequences, such as permanent disability or death, are dire. It disproportionally affects neurological disorders and cerebrovascular events like stroke, in particular.19 As a result, time-sensitive treatments may not be administered, and established standards of stroke care or secondary preventive measures may not be implemented. These missed opportunities bear significant medical and socioeconomic ramifications like higher rates of disability and mortality, higher hospital readmission, and prolonged hospitalization.[19-20]

Some of the diagnostic challenges presented by PCS and discussed above may be linked to cognitive errors, such as diagnostic anchoring when EMS staff initially do not consider stroke, and later, it is not introduced into the spectrum of differential diagnoses. Similarly, false reassurance by a negative CT scan can be considered blind obedience. These heuristics need to be viewed in the context of two different modes of information processing and management, a Type 1 "intuitive" and a Type 2 "analytical" mode of thinking, each possessing distinct merits and weaknesses.[21]

Several strategies and interventions have been suggested to address these cognitive factors and the employment of Type 1 and Type 2 thinking, e.g., through debiasing techniques, reflective practice, or cross-checks. However, evidence for their effectiveness is limited, especially in the emergency care system.[22] No initiatives directly address cognitive errors in missed diagnoses of stroke in general and PCS in particular. Still, various solutions targeting different stages of recognizing and diagnosing stroke have been suggested, and both implicit and explicit reverberations of cognitive phenomena and corresponding corrective strategies can be identified therein. Recently, Adam Wiśniewski et al. (2021) introduced a tool, Adam's Scale of Posterior Stroke-ASPOS), to exclusively assess the severity of stroke in posterior circulation with additional predictive properties.[9]

In our study, most patients were in the age group of >60 (51%) years. The male gender (77%) was observed more in number than the female gender (23%). Among study patients, an ASPOS score < 3 was observed in 64% of the cases, and > 3 was observed in 36%. MRI diagnosis showed posterior circulation stroke in 54% of the study cases and PCS absent in 46%. The age, gender and comorbidities were not significantly correlated with the ASPOS score. Among 36 cases having ASPOS score >3 of them, 34 cases were positive for PCS, which was statistically significant.

We observed among 36 cases having ASPOS score >3, 34 cases were positive for PCS, which was statistically significant. Among 54 cases with PCS, 34 (63%) cases had ASPOS scores >3. Among 46 PCS absent cases, 44 (96.6%) had ASPOS scores<3. The mean ASPOS score of the PCS-positive (4.5±2.4) patients was significantly higher than the PCS-negative (2.48±0.8) cases. The ROC analysis showed ASPOS scores have a 94.4% PPV and 64.4% NPV with 63% sensitivity and 95.7% specificity in predicting the PCS among patients admitted to the emergency department (p=0.000).

This is the first study that assessed the ASPOS scale in PCS patients after the author introduced the scale. A wide range of clinical assessment tools for selecting subjects with acute stroke has been developed recently.[11-12] Assessment of both cortical and motor function using RACE, FAST-ED, and NIHSS showed the best diagnostic accuracy values for selecting subjects with large vessel occlusion. Our study showed that ASPOS has a better-predicting value for PCS.

CONCLUSION

Performing the ASPOS is a good strategy for identifying PCS patients in the field, assessing their severity, and determining the likelihood of accelerating the interventions by permitting early mobilization by the emergency team. ASPOS is a clinical assessment tool to evaluate the understanding of PCS patients, determine appropriate treatment, and predict patient outcomes. The scale is also designed as a simple, valid, and reliable tool that can be administered at the bedside consistently by physicians, nurses or therapists. However, future research on improving the structural and construct features of the scale and estimating a predictive value in stroke outcomes is needed.

Limitation of the Study

In our study, ASPOS was not compared with other modalities, and this is the first study to assess the PCS, so many studies are to be done to validate the ASPOS scale.

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International Journal of Academic Medicine and Pharmacy (www.academicmed.org)
ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556