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Study of vision aphasia neglect (VAN) screening tool for clinical diagnosis of emergent large vessel occlusion stroke at a tertiary hospital

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Abstract
Background:*. Patients with acute ischemic stroke and large vessel occlusion (LVO) may benefit from prehospital identification and transfer to a center offering endovascular therapy. In present study authors aimed to investigate the utility of the vision, aphasia, neglect (VAN) assessment, for clinical diagnosis of emergent large vessel occlusion stroke at a tertiary hospital.* ***Material and Methods:*** *Present study was single-center, prospective, observational study conducted patients with suspected stroke. Vision, aphasia, and neglect (VAN) assessment tool was used to identify stroke patients with emergent LVO on arrival. Residents posted in emergency ward/ casualty were trained to perform the VAN assessment screen in suspected stroke patients.* ***Results:*** *During study period 56 stroke patients were screened for emergent LVO on arrival by vision, aphasia, and neglect (VAN) assessment tool. Mean Age was 63.56 ± 11.43 years. Male (62.5 %) patients were more than female (37.5 %). 35.7 % & 57.1 % patients received Emergency mechanical thrombectomy & Intravenous tissue plasminogen activator (tPA) respectively. 14.3 % mortality was noted in present study. VAN assessment was positive in 20 patients (35.7 %). Visual disturbance (32.1 %) was most common factor noted during assessment, followed by aphasia (23.2 %) & neglect (19.6 %). CT angiography (CTA) finding were positive for EVLO in 20 patients (35.7 %). Sensitivity, specificity, PPV, NPV & accuracy of VAN assessment for EVLO when compared with CTA was 75 %, 86.11%, 75 %, 86.11 % & 82.14%.*
Conclusion: *VAN stroke assessment tool allows for early, specific emergency center notification for mobilization of appropriate teams and resources, to recognize the potential for a large vessel occlusion.*
Keywords: *LVO screen; VAN assessment; acute ischemic stroke; stroke*

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I. Introduction

Strokes due to occlusion of large arteries in the brain comprise around 1/3 of all acute ischemic strokes (AIS) and are commonly referred to as large vessel occlusion (LVO) strokes.[1] LVO strokes result in a disproportionate health burden in the population, causing three-fifths of dependency and more than nine-tenths of mortality after AIS.[1]

LVO accounts for up to 38% of acute ischemic stroke and came with devastating outcomes for patients, families and society in the pre-intervention era.[2] Efficacy of intervention in preselected patients presenting within 24 hours has been an established treatment paradigm.[3] Ischemic stroke consequences after a cerebral artery blockage principally involve an injury of oxygenation in downriver brain tissue, subsequently leading to an irrevocable neurological shortage and neuronal cell death. Patients with acute ischemic stroke and large vessel occlusion (LVO) may benefit from prehospital identification and transfer to a center offering endovascular therapy.

The vision, aphasia, and neglect (VAN) assessment, which evaluates neurovascular function without a scoring system but has been demonstrated to effectively identify stroke patients with emergent LVO on arrival and outperformed beyond a severity threshold of NIHSS ≥6 (National Institutes of health Stroke Scale), which

is one of the most commonly used measures to determine the degree of impairment caused due to stroke.[4] In present study authors aimed to investigate the utility of the vision, aphasia, neglect (VAN) assessment, for clinical diagnosis of emergent large vessel occlusion stroke at a tertiary hospital.

II. Material And Methods

Present study was single-center, prospective, observational study conducted in department of emergency medicine, at Max Superspeciality Tertiary hospital, Vaishali, Ghaziabad. India. Present study was conducted over a period of 1 year (January 2020 to December 2020).

Inclusion criteria
Patients with suspected stroke Exclusion criteria
Patients who can raise bot arms (no weakness at presentation).
In present study vision, aphasia, and neglect (VAN) assessment tool was used to identify stroke patients with emergent LVO on arrival. Emergent large vessel occlusion (ELVO) was defined as thromboembolic occlusion of an M1 segment of the middle cerebral artery (MCA), internal carotid artery, basilar artery, or M2 segment for which embolectomy was considered.
Residents posted in emergency ward/ casualty were trained to perform the VAN assessment screen (as per table 1) in suspected stroke patients by training session followed by periodic assessment.

Table 1 - Stroke VAN (vision, aphasia, and neglect) assessment[4]

Vision, aphasia, neglect emergent large vessel occlusion screening tool	
How weak is the patient? Raise both arms up	☐ Mild (minor drift) ☐ Moderate (severe drift—touches or nearly touches ground) ☐ Severe (flaccid or no antigravity) ☐ Patient shows no weakness. Patient is VAN negative
(exceptions are confused or comatose patients with dizziness, focal findings, or no reason for their altered mental status then basilar artery thrombus must be considered; CT angiography is warranted)	
Visual disturbance	☐ Field cut (which side) (4 quadrants) ☐ Double vision (ask patient to look to right then left; evaluate for uneven eyes) ☐ Blind new onset ☐ None
Aphasia	☐ Expressive (inability to speak or paraphasic errors); do not count slurring of words (repeat and name 2 objects) ☐ Receptive (not understanding or following commands) (close eyes, make fist) ☐ Mixed ☐ None
Neglect	☐ Forced gaze or inability to track to one side ☐ Unable to feel both sides at the same time, or unable to identify own arm ☐ Ignoring one side ☐ None
Patient must have weakness plus one or all of the V, A, or N to be VAN positive. VAN positive patients had 100% sensitivity, 90% specificity, positive predictive value 74%, and negative predictive value 100% for detecting large vessel occlusion.	

All patients underwent CT angiography (CTA) at the time of admission. If CTA confirmed an ELVO, the patient was triaged to the endovascular department for emergency mechanical thrombectomy. Intravenous tissue plasminogen activator (tPA) treatment was determined by the stroke team either at CT scan or immediately thereafter. Patients with intracranial hemorrhage were excluded and treated appropriately after NCCT. Patients were followed till 28 days after admission.

Data was collected and compiled using Microsoft Excel & statistical analysis was done using descriptive statistics. The VAN status of patient was used to compare sensitivity, specificity, positive predictive value, negative predictive value, and accuracy to CTA confirmed ELVO.

III. Results

During study period 56 stroke patients were screened for emergent LVO on arrival by vision, aphasia, and neglect (VAN) assessment tool. Mean Age was 63.56 ± 11.43 years. Male (62.5%) patients were more than female (37.5 %). 35.7 % & 57.1 % patients received Emergency mechanical thrombectomy & Intravenous tissue plasminogen activator (tPA) respectively. 14.3 % mortality was noted in present study.

Table 1 – General characteristics

Characteristics	Number of cases (n=56)	Percentage
Mean Age (years)	63.56 ± 11.43	
Gender		
Male	35	62.5
Female	21	37.5
Treatment		
Emergency mechanical thrombectomy	20	35.7
Intravenous tissue plasminogen activator (tPA)	32	57.1
Outcome (till 28 days after admission)		
Discharged	27	48.2
Discharged with residual paralysis	15	26.8
Left against medical advice	6	10.7
Death	8	14.3

VAN assessment was positive in 20 patients (35.7 %). Visual disturbance (32.1 %) was most common factor noted during assessment, followed by aphasia (23.2 %) & neglect (19.6 %). CT angiography (CTA) finding were positive for EVLO in 20 patients (35.7 %).

Table 2 – VAN assessment

Characteristics	Number of cases (n=56)	Percentage
VAN assessment		
Positive	20	35.7
Negative	36	64.3
Factors positive during assessment		
Visual disturbance	18	32.1
Aphasia	13	23.2
Neglect	11	19.6
CT angiography (CTA) finding for EVLO		
Positive	20	35.7
Negative	36	64.3

Sensitivity, specificity, PPV, NPV & accuracy of VAN assessment for EVLO when compared with CTA was 75 %, 86.11%, 75 %, 86.11 % & 82.14%.

Table 3- Sensitivity, specificity, and predictive values

VAN assessment	CTA findings for EVLO		Total
	POSITIVE	NEGATIVE	
POSITIVE	15	5	20
NEGATIVE	31	5	36
Sensitivity		75.00	
Specificity		86.11	
Positive Predictive Value		75.00	
Negative Predictive Value		86.11	
Accuracy		82.14	

IV. Discussion

Stroke, whether ischemic or hemorrhagic, is a debilitating and disabling condition that can impair cognition, visuospatial, language, and motor function. Recent trials of endovascular therapy (EVT) for LVO strokes have demonstrated improved patient outcomes when compared to treatment with medical treatment alone (with or without IV rt-PA). Thus, EVT has become a critical component of stroke care. As in IV rt-PA, time to treatment is a crucial factor with high impact on outcomes.[5]

Documentation is the vital first step in receiving the right patient to the right treatment more rapidly and, as the consequence is contingent on time to reperfusion, might recover consequences.[6] Thus, rapid identification of LVO stroke patients both in the prehospital setting as well as in the emergency department (ED) may be beneficial as it can lead to mobilization of necessary resources and ordering of proper investigations (CT perfusion, MRI/MRA). While there are a number of clinical scoring systems in place to identify patients with LVO, noneare ideal.

About 20 prehospital scales occur; nearly of the greatest common scales used are the National Institutes of Health Stroke Scale (NIHSS), Los Angeles Motor Scale (LAMS), Cincinnati Prehospital Stroke Severity Scale (CPSS) and Rapid Arterial Occlusion Evaluation Scale (RACE).[7]

The National Institutes of Health Stroke Scale (NIHSS) is used in the hospital setting to determine the severity of stroke signs and to help guide stroke therapy decisions. It is an 11 item patient assessment with a maximum score of 42. A score of zero suggests no deficits, scores are labelled as minor stroke (1 to 4), moderate stroke (5 to 15), moderate to severe stroke (16 to 20) & severe stroke (21 to 42).

Numerous scales were intended originally to recognize patients with stroke as conflicting to circumstances that impersonate a stroke, but approximate values were exactly intended for documentation of patients with stroke with LVO (for instance, Aphasia, Vision,

Neglect or VAN). The vision, aphasia, and neglect (VAN) screening tool was designed as a quick evaluation of cortical function to predict ELVO.[4]

In pilot study, Teleb MS et al[4] noted that VAN was comparable in sensitivity (79% versus 80%) and NPV (88% versus 87%) to NIHSS ≥ 6. It was superior in specificity (69% versus 57%), PPV (53% versus 46%) and accuracy to NIHSS greater than or equal to 6 (72% versus 64%) with significant receiver operating curve. VAN also had comparable area under the curve when compared to RACE, FAST-ED, and CPSS however slightly lower accuracy (69%-73%) compared to RACE (76%), FAST-ED (77%), and CPSS (75%). VAN had the

highest NPV among all screening assessments (88%). In fact, while both VAN and NIHSS scale have 100% sensitivity, VAN has been shown to be superior to the NIHSS ≥6 tool, in terms of higher positive predictive value (74% vs 58% respectively) and specificity (90% vs 74%). VAN is a simple screening tool that can identify LVOs with adequate accuracy in hospital setting.

In study by Navalkele D et al.,[8] out of the 228 patients, 176 (77%) were VAN positive, 65 patients (28.5%) required any neurosurgical procedure, and 24 patients (10.5%) had open neurosurgical procedure. VAN had a sensitivity of 88% and a low specificity of 27%. Although a low PPV 32%, VAN had a high NNP 85%. Odds of neurosurgical intervention were 2.6 times higher if patients were VAN positive. For open NS procedure, the sensitivity, and NPV were 100%; specificity 25.5% and PPV 13.6%.

Nojan Valadi[9] reviewed 617 patients, 159 (25.9%) were VAN positive while 233 (37.9%) had an NIHSS ≥6. Sixty-four (64) patients (10.4%) had ELVO. The VAN score had a sensitivity of 61% and a specificity of 76.8% for predicting ELVO, while an NIHSS value ≥6 had a sensitivity of 71.7% and a specificity of 63.6%.

In meta-analysis by Ansari AJ et al.,[10] they noted considerable heterogeneity of sensitivity and specificity between studies & recommended that the National Institutes of Health Stroke Scale (NIHSS), VAN and LAMS obligated the best prognostic worth for LVO but that additional testing in dissimilar populations is required.

The VAN scale helps for rapid evaluation (within 30 seconds), no math, no checklists. VAN scale be used at Emergency Center Triage, Hospital ICUs, step down units, anywhere a patient occupies a bed or a seat and suddenly develops acute stroke like signs and symptoms.

V. Conclusion

Considering the time sensitive benefit of reperfusion therapies of acute ischemic stroke, VAN stroke assessment tool allows for early, specific emergency center notification for mobilization of appropriate teams and resources, to recognize the potential for a large vessel occlusion.

Conflict of Interest: None to declare
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