Predictive Value of Modifications of the Prehospital Rapid Arterial Occlusion Evaluation Scale for Large Vessel Occlusion in Patients with Acute Stroke

David Carrera, MD,* Bruce C.V. Campbell, MD, PhD,† Jordi Cortés, BD, PhD,‡
Montse Gorchs, BD,§ Marisol Querol, BD,§ Xavier Jiménez, MD, PhD,§
Mònica Millán, MD, PhD,* Antoni Dávalos, MD, PhD,* and
Natalia Pérez de la Ossa, MD, PhD*

Background: Prehospital clinical scales to identify patients with acute stroke with a large vessel occlusion (LVO) and direct them to an endovascular-capable stroke center are needed. We evaluated whether simplification of the Rapid Arterial oCclusion Evaluation (RACE) scale, a 5-item scale previously validated in the field, could maintain its high performance to identify patients with LVO. *Methods:* Using the original prospective validation cohort of the RACE scale, 7 simpler versions of the RACE scale were designed and retrospectively recalculated for each patient. National Institutes of Health Stroke Scale score and proximal LVO were evaluated in hospital. Receiver operating characteristic analysis was performed to test performance of the simplified versions to identify LVO. For each version, the threshold with sensitivity closest to the original scale (85%) was used, and the variation in specificity and correct classification were assessed. *Results:* The study included 341 patients with suspected stroke; 20% had LVO. The 7 simpler versions of the RACE scale had slightly lower area under the curve for detecting LVO because of lower specificity at the chosen sensitivity level. Correct classification rate decreased 9% if facial palsy was simplified or if eye or gaze deviation was removed, and decreased 4.5% if the aphasia or agnosia cortical sign was removed. *Conclusions:* We recommend the original RACE scale for prehospital assessment of patients with suspected stroke for its ease of use and its high performance to predict the presence of a LVO. The use of simplified versions would reduce its predictive value. **Key Words:** Acute stroke—stroke care models—prehospital stroke care—endovascular—large vessel occlusion.
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Introduction

Mechanical thrombectomy substantially reduces disability in patients with large vessel occlusion (LVO) ischemic stroke in the anterior circulation.[1-5] However, benefit declines with increasing time after symptom onset.[6] Transferring patients from a primary stroke center to a comprehensive stroke center (CSC) commonly delays endovascular treatment.[7] A prehospital clinical tool to detect patients with LVO and facilitate rapid transport directly to a comprehensive stroke center is therefore of crucial importance.

The National Institutes of Health Stroke Scale (NIHSS) can identify patients with an LVO, but the optimal cut point is controversial, and it is too complex and time-consuming to be used by prehospital emergency medical services (EMS). Other scales may identify patients with LVO, but these scales have not been validated prospectively or in the field.[8-12] The Rapid Arterial oCclusion Evaluation (RACE) scale is simple and specifically designed to identify patients with anterior circulation LVO (Table 1). In prospective prehospital validation by EMS, a RACE scale score ≥5 had 85% sensitivity and 68% specificity for LVO.[13] The RACE scale has been externally validated as one of the most accurate clinical scales to detect LVO.[14]

Scoring RACE is easy and fast.[13] However, it could be argued that it is more complex than other scales. We evaluated whether simplification of the RACE scale would maintain its high performance to predict LVO.

Methods

The RACE scale, NIHSS, and the presence of LVO were assessed in a prospective cohort of patients admitted to the emergency department, as detailed previously.[11] RACE was assessed prehospital by EMS. NIHSS was evaluated by neurologists in hospital. LVO was defined as proximal middle cerebral artery; intracranial carotid or tandem (internal carotid and middle cerebral artery) occlusion; or basilar occlusion on transcranial ultrasound, computed tomography angiography, magnetic resonance angiography, or arteriography. Seven simpler versions of the RACE scale were designed and retrospectively recalculated for each patient. These simplifications included consolidating the "mild" and the "moderate to severe" categories for "facial palsy" (so that facial weakness was scored as absent or present) and omitting the items "head and gaze deviation" and "aphasia or agnosia" (Table 1). The capacity of these simplified versions to predict LVO was assessed using receiver operating characteristic analysis and compared with the original RACE scale. For each version of the scale, the score threshold with sensitivity closest to the original RACE scale (85%) was chosen, and the variation in specificity and correct classification rate were determined. As the primary objective of a prehospital scale is to detect as many patients with an LVO as possible while avoiding false negatives, we decided to consider a sensitivity higher than 85%.

Results

During the study period, 357 patients with suspected stroke were attended by EMS and transferred to our hospital. The RACE scale score was not detailed item by item in 16 cases; therefore, we studied 341 patients (53.4% men; age [mean ± standard deviation] 70 ± 13 years; NIHSS score at admission, median [interquartile range] 8 [3-16]). The final diagnosis was ischemic stroke in 233 patients (68.3%), transient ischemic attack in 16 patients (4.7%), hemorrhagic stroke in 49 patients (14.4%), and stroke mimic in 43 patients (12.6%); 71 patients (20.8%) had LVO.

The original RACE scale had an area under the curve (AUC) of .82 for detecting LVO. A cut point ≥5 had 85% sensitivity, 68% specificity, and correctly classified 71% patients. The RACE and NIHSS scores were strongly correlated (r = .78; *P* < .001). The 7 simpler RACE versions generated slightly lower AUC for detecting LVO (Table 2). Using the score threshold chosen to maintain sensitivity at least as high as the original scale, the specificity and correct classification rate were significantly lower for all simplified versions (Table 2 and Fig. 1). Simplifying the facial palsy scoring to 0 (absent) or 1 (present) was associated with an absolute reduction of 9% in the proportion correctly classified. Removing eye or gaze deviation also reduced the proportion (by 9%) correctly classified. Omitting the aphasia or agnosia item, with or without omitting eye or gaze deviation, had less impact on accuracy, reducing correct classification by 4.5%.

Discussion

Simplifying the original RACE scale reduces its ability to predict LVO in patients with suspected acute stroke. Although some simplified versions achieved higher

Table 1. *Simplified versions of the RACE scale*

	RACE	V1	V2	V3	V4	V5	V6	V7
Facial palsy	0	0	0	0	0	0	0	0
	1	1	1	1	1	1	1	1
	2		2		2		2	
Arm motor	0	0	0	0	0	0	0	0
function	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2
Leg motor	0	0	0	0	0	0	0	0
function	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2
Head and gaze	0	0	0	0				
deviation	1	1	1	1				
Aphasia/	0	0			0	0		
agnosia	1	1			1	1		
	2	2			2	2		

Abbreviation: RACE, Rapid Arterial oCclusion Evaluation.