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Predictive Value of the ABCD3-I for Short- and Long-Term Stroke after TIA with or without sICAS

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Aims: We aimed to validate the predictive value of the ABCD3-I score for short-term and long-term stroke risk after transient ischemic attack (TIA) and to evaluate the influence of symptomatic intracranial artery stenosis (sICAS) on the performance of ABCD3-I.

Methods: We recruited TIA patients from the Third China National Stroke Registry study. Outcome parameters were stroke events during the 14-day, 3-month, 6-month, and 12-month points. The area under the curve (AUC) was calculated as a measure of predictive ability. A multivariable-adjusted Cox proportional hazards model was used to assess the hazard ratio of risk factors for stroke.

Results: Among 986 patients, 3.9%, 5.1%, 6.5 %, and 8.2% of participants experienced a stroke event during the 14-day, 3-month, 6-month, and 12-month points post TIA, respectively. The AUCs of ABCD3-I score for the prediction of stroke were 0.786, 0.732, 0.715, and 0.699 at the 14-day, 3-month, 6-month, and 12-month points, respectively. The AUCs were 0.774, 0.690, 0.617, and 0.611 in patients with sICAS, 0.789, 0.748, and 0.758 and 0.734 in those without sICAS. P values of the interaction between ABCD3-I categories and sICAS were 0.0618 for 14-day, 0.0098 for 3-month, 0.0318 for 6-month, and 0.0294 for 12-month.

Conclusions: ABCD3-I score performed well in predicting short-term risk of a stroke after an index TIA in patients with or without sICAS. However, the predictive power decayed with the prolonged period, and the decayed extent was more pronounced among those with sICAS. The assessment of sICAS is a non-ignorable item when using the ABCD3-I score for long-term stroke risk prediction in patients with TIA.

Key words: Transient ischemic attack, Intracranial artery stenosis, Risk prediction, ABCD3-I, Stroke incidence

Introduction

Symptoms of a transient ischemic attack (TIA) are typically temporary-lasting but with a high risk of a subsequent stroke event in the subsequent short-term and long-term period[1-4]. The ABCD system is a prognostic tool developed to predict stroke risk in the short-term after onset of TIA, and it is used in primary and emergency care settings for identifying high-risk individuals to facilitate triage to specialist care and target secondary prevention[5-7]. The ABCD2 score was the most widely used in patients with a TIA, and it is recommended by guidelines for aiding clinical management of patients in community and emergency department settings[8-10]. However, the ABCD2 score is mainly based on clinical features

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identifiable at the time of initial and does not fulfill the purpose of guiding risk-based treatment decisions after a stroke specialist assessment[11, 12]. In order to improve the prediction value of the ABCD2 score, a imaging-based score- ABCD3-I score was established with a better predictive performance[7, 13-16], and it was validated by several studies[17-19]. The 13-points ABCD3-I score is calculated by evaluating medical records as follows: age, blood pressure, clinical features, duration of symptoms, diabetes, and dual TIA, as well as imaging criteria including ipsilateral ≥ 50% ICA stenosis and an acute brain lesion.

Although the ABCD3-I score exhibits an excellent predictive value for short-term stroke recurrence in patients with TIA, two other important issues remain to be clarified. First, monitoring high long-term risk of cardiovascular in patients with TIA would be necessary. However, few studies analyzed performance of ABCD3-I at long-term stroke risk prediction after TIA[15, 20]. Whether ABCD3-I score exhibits the same excellent predictive value for long-term stroke risk as short-term in patients with TIA is unclear. Second, intracranial atherosclerosis is associated with a high risk of stroke event in patients with TIA[21-24]. Unlike carotid stenosis that is the most common cause for large vessel occlusion in Caucasians, intracranial stenosis (ICAS) is more prevalent in Asians[25-27], Hispanics, and African-Americans[28]. The presence of stenosis of extracranial carotid was included in the ABCD3-I score as an imaging parameter, but assessments of intracranial findings are not incorporated. Whether symptomatic intracranial stenosis (sICAS) affects the predictive value of ABCD3-I score is unknown, especially in the Asian population.

Based on a hospital based study, The Third China National Stroke Registry (CNSR-III)[29], we aimed to validate the predictive value of the ABCD3-I score to predict short-term and long-term stroke risk after TIA and to evaluate the influence of sICAS on the performance of ABCD3-I score.

Methods

Study Participants

The CNSR-III is a nationwide prospective registry for patients presented to hospitals with acute ischemic cerebrovascular events[29]. From August 2015 to March 2018, 15,166 stroke patients with a primary diagnosis of ischemic stroke or TIA within 7 days after symptom onset were enrolled from 201 participating hospitals. In CNSR-III, TIA was primary diagnosed according to time-based definitions on admission (acute onset of neurologic deficit ≤ 24h as TIA, after assessment by stroke specialists on admission)[30]. In the present study, 986 patients with a definite TIA were analyzed. The study was approved by the central institutional review board at Beijing Tiantan Hospital.

Data Collection

The baseline data were collected after admission through face-to-face interviews by neurologists at participating hospitals, following a standard data collection protocol developed by the steering committee. Pre-hospital care information, pre-stroke modified Rankin scale (mRS) score, in-hospital variables including demographics, medical history, ABCD2 score, family history, previous medication, physical examination, primary diagnosis, laboratory tests, and risk factor assessment were collected at baseline. Risk factors included history of stroke or TIA, hypertension, diabetes, dyslipidemia, atrial fibrillation, heart disease, and previous or current smoking. Next, height and weight were measured with participants wearing a scrub suit and no shoes, and then, body-mass index was calculated by dividing weight in kilograms by the square of height in meters. Hypertension was defined as systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg, any use of antihypertensive drug continuously for more than 2 weeks before index cerebrovascular diseases, or self-reported history of hypertension. Dyslipidemia was defined as serum triglyceride ≥ 150 mg/dL, low-density lipoprotein cholesterol ≥ 130 mg/dL, high-density lipoprotein cholesterol ≤ 40 mg/dL, any use of lipid-lowering drugs, or any self-reported history of dyslipidemia. Diabetes mellitus was defined as fasting glucose level ≥ 7.0 mmol/L (126 mg/dL), the nonfasting glucose concentration ≥ 11.1 mmol/L (200 mg/dL) with classic symptoms of hyperglycemia or hyperglycemic crisis, any use of glucose-lowering drugs, or any self-reported history of diabetes mellitus. Atrial fibrillation was diagnosed based on electrocardiographic findings on admission or during hospitalization or a previous history of atrial fibrillation. ABCD3-I score range from 0 to 13, with higher scores indicating a greater risk of stroke; an age of 60 years or older, a blood-pressure level of 140/90 mm Hg or higher, a clinical feature with unilateral weakness or speech impairment, a duration of symptoms of 10 to 59 minutes, and diabetes are each assigned 1 point; and a duration of symptoms of 60 minutes or more, dual TIA in the preceding 7 days, ipsilateral ≥ 50% stenosis of internal carotid artery, acute diffusion-weighted imaging hyperintensity are assigned 2 points. Then, dual TIA was defined as the occurrence of ≥ 2 TIAs (i.e., the index TIA and one other TIA) within 7 days. The ABCD3-I scores were

analyzed as ordinal variables and classified into low-, moderate-, and high-risk categories (0–3, 4–7, and 8–13).

Neuroimaging Findings

All patients received standard imaging exams during hospitalization, including brain MR imaging (MRI) with DWI (3.0T or 1.5T), intracranial artery imaging (TOF-MRA, CT angiography or digital subtraction angiography), and extracranial artery imaging (carotid ultrasound, CT/MR angiography or digital subtraction angiography). All image data were collected and analyzed centrally at Tiantan Neuroimaging Center of Excellence (T-NICE), Beijing Tiantan Hospital. DWI findings on MRI on admission or during hospitalization were considered abnormal if there was ≥ 1 hyperintense area consistent with the presence of an infarcted lesion. Presence of sICAS and symptomatic extracranial arterial stenosis (sECAS) was defined as 50%–99% stenosis or occlusion of any intra- and extracranial artery, which was responsible for the acute infarction lesion and neurological symptoms, and respectively by the Warfarin-Aspirin Symptomatic Intracranial Disease trial (WASID)[31] and the North American Symptomatic Carotid Endarterectomy Trial criteria[32]. The intracranial artery included bilateral intracranial internal carotid artery, anterior cerebral artery A1/A2, middle cerebral artery M1/M2, bilateral intracranial vertebral artery, posterior cerebral artery P1/P2, and basilar artery, while the extracranial artery included the extracranial internal carotid artery and bilateral extracranial vertebral artery.

Outcome Assessment

The main outcome of this study was a stroke after TIA at the 14-day, 3-month, 6-month, and 12-month points. A stroke event included an ischemic or hemorrhagic stroke. Ischemic stroke was defined as new onset of focal neurological deficit that cannot be attributed to the presenting lesion and is confirmed with radiographic (CT and/or MRI) evidence. Hemorrhagic stroke was defined as new onset of focal neurological deficit and radiographic (CT and/or MRI) findings showing hemorrhagic signs.

Statistical Analysis

Participant demographics and characteristics were analyzed using descriptive statistics. Continuous variables were presented in medians (interquartile ranges) and compared between groups using the nonparametric Wilcoxon test. Categorical variables were presented as percentages and tested by the chi-square test. The incidence of stroke after TIA was compared by using a Cox proportional hazards model. The hazard ratios (HRs) and their 95% confidence intervals (CIs) for the development of stroke at 14-day, 3-month, 6-month, and 12-month after TIA were estimated by using a multivariable-adjusted Cox proportional hazards model. Next, interactions between ABCD3-I categories and sICAS were checked. A two-tailed P value <0.05 was considered to be statistically significant. All analysis was conducted with SAS version 9.4 software (SAS Institute).

Data Availability

Anonymized data will be shared by request from any qualified investigator.

Results

Study Participants and Characteristics

Of 15,166 patients participated in CNSR-III, 1,184 presented with a TIA. A total of 986 patients were included into the current study after excluding 198 with missing information on ABCD3-I items or intracranial artery imaging assessment **(Fig. 1)**. **Supplemental Table 1** showed the baseline characteristics of TIA patients included and excluded in this study. Excluded patients were slightly older, more likely to exhibit a shorter time from event to enrolment, more likely to take antiplatelet agent and clopidogrel with aspirin at discharge, and less likely to present with a medical history of diabetes. The demographic and clinical characteristics of included patients with and without sICAS was present in **Table 1**. The mean (IQR) age was 62.0 (53.0–70.0) years, and 646 patients (65.5%) were men. Patients with sICAS were older, more likely to present with a history of hypertension, diabetes, stroke, and TIA, and less likely to be smoker or drinker. Other demographic and clinical characteristics of patients can be found in **Table 1**.

Short- and Long-Term Incidence of Stroke

As shown in **Fig. 2**, the incidence of stroke was 3.9%, 5.1%, 6.5% and 8.2% at 14-day, 3-month, 6-month, and 12-month after onset of TIA. The rate of stroke event was 4.3%, 7.0%, 9.7% and 10.2% in patients with sICAS, while 3.7%, 4.4%, 5.4%, and 7.3% in patients without sICAS at four follow-up time point. A higher rate of stroke was observed in patients with sICAS. As compared to patients without sICAS, a steeper increase in stroke incidence as follow-up time longed. When stratified by the ABCD3-I score, the stroke incidence was higher in the high-risk group than in the low-risk group (2.9%,

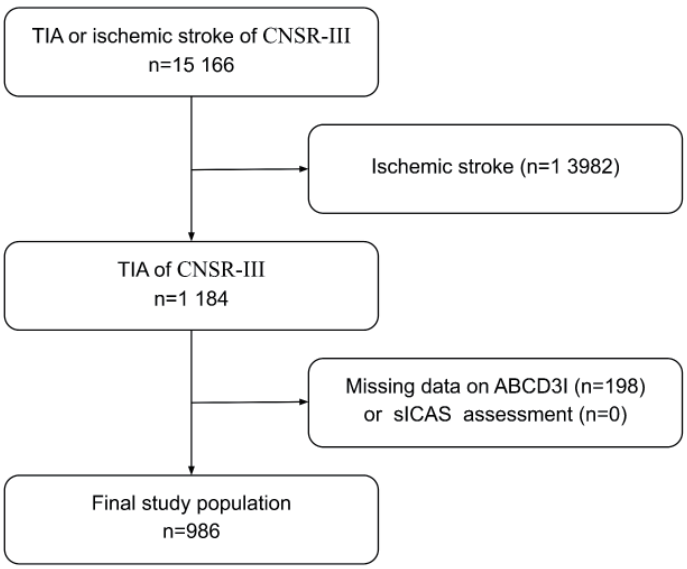

Fig. 1. Flow chart showing the patients selection from the Third China National Stroke Registry

9.6% and 22.8% for low-, moderate-, and high-risk categories at 12-month follow-up). When stratified by the ABCD3-I score and measurement of sICAS, an extremely high stroke incidence was observed in high-risk group patients with sICAS (29.4% at 14-day and 41.2% at 12-month).

Validity of and ABCD3-I Scores

Predictive ability of ABCD3-I reduced as time extends using the receiver-operating. As shown in **Table 2**, the area under the curves (AUCs) were 0.786 (95% CI, 0.718–0.855), 0.732 (95% CI, 0.658, 0.807), 0.715 (95% CI, 0.649, 0.781), and 0.699 (95% CI, 0.640, 0.758) for the prediction of 14-day, 3-month, 6-month, and 12-month occurrence, respectively. In patients with sICAS, the AUCs were 0.774 (95% CI, 0.614, 0.933), 0.690 (95% CI, 0.537, 0.844), 0.617 (95% CI, 0.488 0.747), and 0.611 (95% CI, 0.489, 0.732) for the prediction of 14-day, 3-month, 6-month, and 12-month occurrence, respectively. In patients without sICAS, the AUCs were 0.789 (95% CI, 0.710, 0.868), 0.748 (95% CI, 0.663, 0.833), 0.758 (95% CI, 0.684, 0.833), and 0.734 (95% CI, 0.669, 0.799) for the prediction of 14-day, 3-month, 6-month, and 12-month occurrence, respectively. In patients with sICAS, a clear reduction was observed in AUC value by time. However, in patients without sICAS, no noticeable decline in performance of ABCD3-I was found over time.

Stroke Risk after TIA According to ABCD3-I Categories and sICAS with Stroke Risk in Different Risk Stratification of ABCD3-I Score

Table 3 presents odds ratios with 95% CI of high-, moderate-, versus low-risk category of ABCD3-I for stroke risk in patients stratified by the presence of sICAS. In patients with sICAS, compared to low-risk category, no significant predictive effect was found for stroke risk at all time points for moderate-risk category. *P* values of the interaction between ABCD3-I categories and sICAS were 0.0618 for 14-day, 0.0098 for 3 months, 0.0318 for 6 months, and 0.0294 for 12 months stroke.

Discussion

Our data confirmed that the ABCD3-I score performed well in predicting short-term risk of stroke after an index TIA with or without sICAS. However, the predictive power of the ABCD3-I score decayed with the prolonged follow-up period and the decayed extent was more pronounced among those with sICAS.

The results of the present study indicate that early and late stroke risk after TIA in this population was similar to the previous study[3, 33, 34], In our study, we found a reliable predictive utility of the ABCD3-I score for short-term stroke risk (within 14-day) in TIA patients. The performance of ABCD3-I in predicting early stroke risk after TIA was good (0.786 for 14-day and 0.732 for 3 months), consistent with some other studies in which the AUCs fluctuated between 0.70-

Table 1. Demographic and clinical characteristics

	Total $n=986$	With ICAS $n=259$	Without ICAS $n=727$	P value
Median age (IQR) — yr	62.0 (53.0–70.0)	65.0 (56.0–72.0)	61.0 (52.0–68.0)	
Male sex- no. (%)	646 (65.5)	172 (66.4)	474 (65.2)	0.73
Median days event to enrolment (IQR)	1.0 (1.0–3.0)	1.0 (1.0–3.0)	1.0 (1.0–3.0)	0.4
ABCD3-I				<0.001
0 to 3	313 (31.7)	53 (20.5)	260 (35.8)	
4 to 7	616 (62.5)	189 (73.0)	427 (58.7)	
8 to 13	57 (5.8)	17 (6.6)	40 (5.5)	
Medical history - no. (%)				
Hypertension	570 (57.8)	176 (68.0)	394 (54.2)	<0.001
Diabetes	173 (17.5)	54 (20.8)	119 (16.4)	0.1
Dyslipidemia	117 (11.9)	27 (10.4)	90 (12.4)	0.4
Current smoker	267 (27.1)	63 (24.3)	204 (28.1)	0.25
Current drinker	141 (14.3)	30 (11.6)	111 (15.3)	0.15
Stroke	197 (20.0)	70 (27.0)	127 (17.5)	0.001
TIA	116 (11.8)	38 (14.7)	78 (10.7)	0.09
Coronary artery disease	118 (12.0)	39 (15.1)	79 (10.9)	0.07
Heart failure	2 (0.2)	1 (0.4)	1 (0.1)	0.46
Atrial fibrillation	46 (4.7)	15 (5.8)	31 (4.3)	0.32
Peripheral artery disease	13 (1.3)	4 (1.5)	9 (1.2)	0.75
Modified Rankin score before admission - no. (%)				0.16
0	805 (81.6)	203 (78.4)	602 (82.8)	
1	153 (15.5)	47 (18.1)	106 (14.6)	
Body-mass index (IQR)	24.6 (22.9–26.7)	24.8 (22.5–26.9)	24.6 (22.9–26.7)	0.82
Blood pressure - mm Hg				
Systolic	142.0 (130.0–157.5)	145.0 (130.0–160.0)	141.0 (130.0–156.0)	0.05
Diastolic	83.5 (77.5–91.5)	82.5 (76.5–91.0)	84.0 (78.0–92.0)	0.12
Medication use at discharge - no. (%)				
Antiplatelet agent	875 (88.7)	236 (91.1)	639 (87.9)	0.16
Lipid-lowering agent	869 (88.1)	240 (92.7)	629 (86.5)	0.009
Anticoagulant agent	26 (2.6)	8 (3.1)	18 (2.5)	0.6
Antihypertensive agent	432 (43.8)	130 (50.2)	302 (41.5)	0.02

sICAS indicates symptomatic intracranial stenosis and TIA, transient ischemic attack.

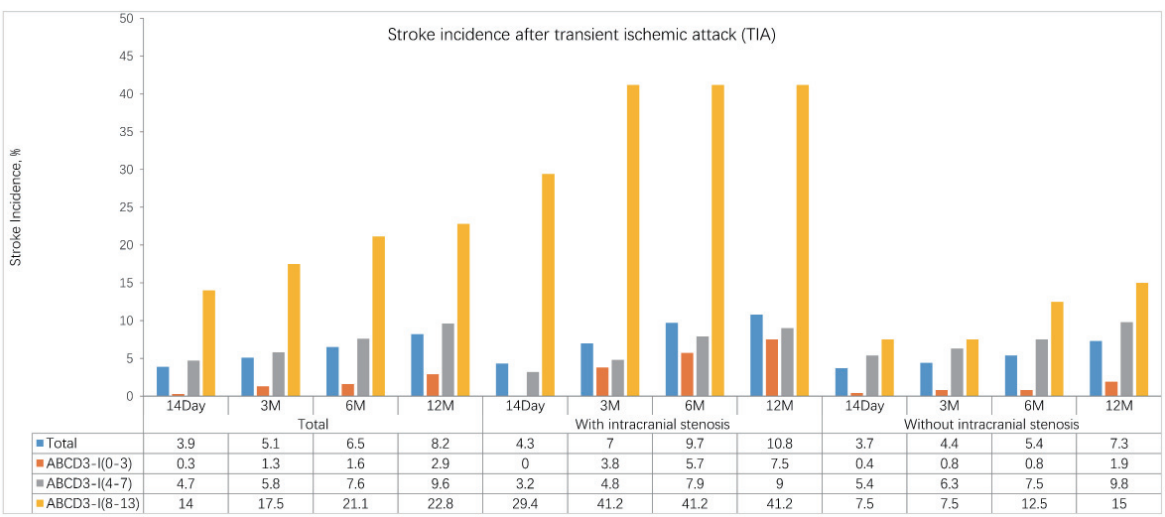

Fig. 2. Stroke incidence after transient ischemic attack (TIA)

Table 2. Predictive accuracy of ABCD3-I for stroke risk at different time points of follow-up and in different population

Stroke Incidence	AUC value		
	Total	sICAS	sICAS free
14-Day	0.786 (0.718, 0.855)	0.774 (0.614, 0.933)	0.789 (0.710, 0.868)
3-Month	0.732 (0.658, 0.807)	0.690 (0.537, 0.844)	0.748 (0.663, 0.833)
6-Month	0.715 (0.649, 0.781)	0.617 (0.488, 0.747)	0.758 (0.684, 0.833)
12-Month	0.699 (0.640, 0.758)	0.611 (0.489, 0.732)	0.734 (0.669, 0.799)

AUC indicates area under the curve and sICAS, symptomatic intracranial stenosis

Table 3. Multivariable-adjusted odds ratios for stroke after TIA at different time points of follow-up

	Odds Ratios (95% CI)		Interaction *p* value
	sICAS	sICAS free	
Crude model			
14-day			0.0621
ABCD3-I(4–7)*	NA	14.74 (1.98, 109.83)	
ABCD3-I(8–13)*	NA	21 (2.13, 207.19)	
3-month			0.0079
ABCD3-I(4–7)*	1.28 (0.27, 6.09)	8.71 (2.05, 36.93)	
ABCD3-I(8–13)*	17.85 (3.22, 98.83)	10.46 (1.69, 64.69)	
6-month			0.0285
ABCD3-I(4–7)*	1.44 (0.4, 5.16)	10.45 (2.48, 43.98)	
ABCD3-I(8–13)*	11.67 (2.57, 52.99)	18.43 (3.44, 98.62)	
12-month			0.0294
ABCD3-I(4–7)*	1.44 (0.4, 5.16)	5.56 (2.17, 14.25)	
ABCD3-I(8–13)*	8.58 (2.11, 34.92)	9 (2.61, 31.09)	
Adjusted model			
14-day			0.0618
ABCD3-I (4–7)*	NA	16.66 (2.23, 124.5)	
ABCD3-I (8–13)*	NA	28.21 (2.8, 284.37)	
3-month			0.0098
ABCD3-I (4–7)*	1.12 (0.23, 5.45)	9.67 (2.27, 41.17)	
ABCD3-I (8–13)*	15.37 (2.71, 87.06)	13.21 (2.09, 83.39)	
6-month			0.0318
ABCD3-I (4–7)*	1.22 (0.33, 4.48)	11.52 (2.73, 48.65)	
ABCD3-I (8–13)*	10.67 (2.29, 49.83)	22.78 (4.17, 124.32)	
12-month			0.0311
ABCD3-I (4–7)*	1.01 (0.32, 3.2)	5.81 (2.26, 14.94)	
ABCD3-I (8–13)*	8.08 (1.92, 34)	9.68 (2.76, 33.89)	

*Compared with low-risk category ABCD3-I (0–3)
Age and gender were adjusted in adjusted model
CI indicates confidence interval and sICAS, symptomatic intracranial stenosis

0.76 [16-18]. In contrast, the predictive ability of the score for long-term stroke risk was limited. Also, another study reported the ability of the ABCD3-I in prediction of l3-year stroke risk after TIA was relatively low, with an AUC value of 0.61 [15].

In addition, the predictive performance of ABCD3-I for late stoke risk could be influenced by the presence of sICAS. It is well known that patients with sICAS exhibit an extremely high risk of subsequent ischemic cerebrovascular events in both Eastern and Western population[35, 36]. A major reason for the inconsistencies predictive value of ABCD3-I score between different periods is that patients with sICAS may exhibit more unstable vessel plaques, which leads to a high risk of stroke event within short-term follow-up. Previous studies showed that as the

number of risk factors increases, stroke risks increase in patients with sICAS[35]. In our study, patients with sICAS and more risk factors (ABCD3-I score 8–13) exhibited a higher risk of stroke risk when compared with low-risk factors (ABCD3-I score 0–7), and the stroke events were mostly occurred within 3 months. These may lead to the sharp AUC decay over time in patients with sICAS after TIA.

In the present study, we found a potential interaction between ABCD3-I score and the presence of sICAS for stroke recurrence after 3 months, suggesting that the association between ABCD3-I score and stroke risk were modified by sICAS. Most studies indicated Caucasians exhibited a relatively low incidence of ICAS. However, the prevalence of intracranial stenosis in Caucasians may have been underestimated. A recent UK cohort study reported that about 18% of individuals presented with 50–99% symptomatic or asymptomatic intracranial stenosis ICAS in patients with TIA or minor stroke[36]. In addition, it has been proposed that patients with ipsilateral atherosclerotic stenosis >50% (including intracranial artery) could play as an important supplementary item for screening out high risk TIA[37, 38]. Like extracranial internal carotid artery stenosis screening, it should be emphasized for the utility of routine intracranial stenosis screening after TIA for secondary prevention[39]. Furthermore, considering the inconsistent performance of ABCD3-I score in the two populations, sICAS should be taken into account for long-term stroke risk prediction in patients with TIA.

Although this is a nationwide registration study, some limitations in this study also cannot be avoided. First, 2,154 (14%) patients without a baseline MRI examination in CNSR-III were excluded. However, the baseline characteristics were similar between patients with and without MRI in CNSR-III **(Supplemental Table 2)**. Furthermore, the CNSR-III was conducted exclusively among Chinese patients in whom a high proportion of ICAS exists. Thus, whether the results of this study can generalize to other non-Asia populations and require further validation in other ethnicities remains unknown. Finally, we only reported the results of 1-year follow-up, for the study has not completed the follow-up beyond the 1-year point, and 5-year follow-up results will be released in the future.

Conclusion

ABCD3-I score performs well in predicting short-term risk of stroke after an index TIA with or without sICAS. However, the predictive power of the ABCD3-I decayed over time, and the decayed is more pronounced among TIA with sICAS. The item sICAS should not be ignored when using the ABCD3-I score for long-term stroke risk prediction in patients with TIA.

Contributors

Yongjun Wang designed the study. Xuewei Xie and Jing Jing interpreted analysis of the data and prepared the report. Zixiao Li, Yilong Wang, Yuesong Pan, Pan Chen, Liping Liu, Yong Jiang, and Hao Li contributed to comments on the draft manuscript and revised the report. Xia Meng coordinated the study and revised the report. Aoming Jin conducted the statistical analysis.

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Conflict of Interest

The authors declare no financial or other competing interests relevant to the manuscript.

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Supplemental Table 1. Demographic and clinicalcharacteristics

	Inclusion *n* = 986	Exclusion *n* = 198	*P* value
Median age (IQR) — yr	62.0 (53.0-70.0)	65.0 (56.0-72.0)	0.01
Male sex - no. (%)	646 (65.5)	172 (66.4)	0.52
Median days from event to enrolment (IQR)	1.0 (1.0-3.0)	2.0 (1.0-4.0)	0.03
Medical history - no. (%)			
Hypertension	570 (57.8)	118 (59.6)	0.64
Diabetes	173 (17.5)	53 (26.8)	0.003
Dyslipidemia	117 (11.9)	19 (9.6)	0.36
Current smoker	267 (27.1)	56 (28.3)	0.73
Current drinker	141 (14.3)	26 (13.1)	0.67
Stroke	197 (20.0)	35 (17.7)	0.46
TIA	116 (11.8)	15 (7.6)	0.09
Coronary artery disease	118 (12.0)	24 (12.1)	0.95
Heart failure	2 (0.2)	0 (0.0)	0.53
Atrial fibrillation	46 (4.7)	7 (3.5)	0.48
Peripheral artery disease	13 (1.3)	2 (1.0)	0.72
Modified Rankin score before admission - no. (%)			0.54
0	805 (81.6)	168 (84.8)	
1	153 (15.5)	25 (12.6)	
Body-mass index (IQR)	24.6 (22.9-26.7)	24.8 (23.4-26.6)	0.49
Blood pressure - mm Hg			
Systolic	142.0 (130.0-157.5)	140.0 (130.0-157.5)	0.37
Diastolic	83.5 (77.5-91.5)	81.0 (77.0-90.0)	0.35
Medication use at discharge - no. (%)			
Antiplatelet agent	875 (88.7)	165 (83.3)	0.03
Lipid-lowering agent	869 (88.1)	167 (84.3)	0.14
Anticoagulant agent	26 (2.6)	2 (1.0)	0.17
Antihypertensive agent	432 (43.8)	81 (40.9)	0.45

sICAS indicates symptomatic intracranial stenosis and TIA, transient ischemic attack.

Supplemental Table 2. Baseline characteristics of patients with and without MRI exam in CNSR-III

Characteristics	With MRI (*N*=13,012)	Without MRI (*N*=2,154)	*P* Value
Age - year	62.3 ± 11.2	61.6 ± 11.8	0.01
Male sex - no. (%)	8890 (68.3)	1474 (68.4)	0.92
Interval from onset to enrolment - day	2.3 ± 2.0	2.4 ± 2.5	0.56
ABCD2 (for TIA patients)	4.2 ± 1.3	3.1 ± 1.8	<0.001
NIHSS (for MIS patients)	4.2 ± 4.1	4.3 ± 4.6	0.50
Medical history - no. (%)			
Hypertension	8167 (62.8)	1327 (61.6)	0.30
Diabetes	2964 (22.8)	546 (25.3)	0.009
Dyslipidemia	1024 (7.9)	167 (7.8)	0.85
Current smoker	4097 (31.5)	655 (30.4)	0.32
Current drinker	1827 (14.0)	299 (13.9)	0.84
Stroke	2850 (21.9)	505 (23.4)	0.11
TIA	355 (2.7)	61 (2.8)	0.78
Coronary artery disease	1315 (10.1)	293 (13.6)	<0.001
Heart failure	80 (4.6)	14 (3.6)	0.40
Atrial fibrillation	856 (6.6)	163 (7.6)	0.09
Peripheral artery disease	98 (0.8)	20 (0.9)	0.39
mRS before admission - no. (%)			0.81
0	9647 (74.1)	1600 (74.3)	
1	2224 (17.1)	351 (16.3)	
Body-mass index	24.7 ± 3.4	24.7 ± 3.2	0.82
Blood pressure - mm Hg			
Systolic	150.2 ± 22.1	149.5 ± 22.0	0.09
Diastolic	87.4 ± 13.1	87.0 ± 13.1	0.15
TOAST classification - no. (%)			<0.001
Large-artery atherosclerosis	3431 (26.4)	425 (19.7)	
Small-artery occlusion	2968 (22.8)	197 (9.1)	
Cardioembolism	768 (5.9)	149 (6.9)	
Other determined etiology	174 (1.3)	8 (0.4)	
Undetermined etiology	5671 (43.6)	1375 (63.8)	
Medication use at discharge - no. (%)			
Antiplatelet agent	11818 (91.0)	1893 (88.4)	<0.001
Lipid-lowering agent	11908 (91.7)	1923 (89.8)	0.005
Anticoagulant agent	362 (2.8)	87 (4.1)	0.001
Antihypertensive agent	6383 (49.1)	1035 (48.3)	0.49

MRI, Magnetic Resonance Imaging; DWI, Diffusion-Weighted Imaging; TIA, transient ischemic attack; MIS, minor ischemic stroke; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); NIHSS, National Institute of Health Stroke Scale; TOAST classification: The Trial of Org 10172 in Acute Stroke Treatment classification indicates the probable cause of the index TIA/MIS, including five categories, large-artery atherosclerosis, cardioembolism, small-vessel occlusion, other determined cause, and undetermined cause; ABCD2, a score (0-7 points) to predict stroke risk following a TIA, including age ≥ 60 years (1 point), blood pressure ≥ 140/90 mm Hg (1 point), symptoms of unilateral weakness or speech impairment (1-2 points), duration of symptoms of <10 to 59 minutes or ≥ 60 minutes (1-2 points), and diabetes (1 point).

*Values are expressed as means ± SD or number (%).