Clinical application of ABCD^2 score system

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Abstract

Objective. Using ABCD^2 score system to assess the risk of stroke after transient ischemic attack (TIA). *Methods*. By using ABCD^2 score to the prognosis analysis for TIA patients. *Results*. We prospectively studied 136 TIA patients. Nine patients with ischemic stroke at 2-day follow-up and sixteen patients at 7-day follow-up were recorded. The risk of stroke increases with the increasing of the score. 2-day and 7-day area under receiver operating characteristic curve (AUROCC) of ABCD^2 score is 0.804 and 0.764 respectively. The cut-off point is at 4. The sensitivity of ABCD^2 score at 2-day and 7-day was 88.9% and 87.5% respectively. The specificity of ABCD^2 score at 2-day and 7-day was 55.9% and 58.3%. Multivariate Logistic regression analyses demonstrated that ABCD^2 score of 4 to 7 was the independent predictive factor of stroke after TIA (2-day multivariate Logistic regression analyses and 7-day multivariate Logistic regression analyses). *Conclusions*. ABCD^2 score values can validate in identifying patients at high risk of stroke after TIA. [Life Science Journal. 2009; 6(2): 90 – 92] (ISSN: 1097 – 8135).

Keywords: ABCD^2 score; transient ischemic attack; AUROCC; stroke

1 Introduction

High early risk of stroke after a transient ischemic attack (TIA)[1–3] has been reported. Johnston et al proposed a new unified ABCD^2 Score to predict well of the risk of stroke in 2 days after TIA[4]. Since the ABCD^2 Score was published in January 2007, validation for different groups of patients is still not completed yet. No relative data has been published in China so far. To validate ABCD^2 score in identifying high early risk of stroke in China, we studied the patients prospectively with ABCD^2 score by 2-day and 7-day follow-up after TIA being registrated outpatient and inpatient in neurology department of the First Affiliated Hospital of Zhengzhou University.

2 Material and Method

The TIA diagnosis is based on the TIA diagnostic criteria of World Health Organization (WHO) (1976)[5] including TIA patients defined by WHO definition. The elapsed time from last episode to registry was less than 48 hours. Exclusively, patients who could not describe the situation of the attack or provide the past history due to cognition impairment or other causes and patients who rejected participating in the research as well as patients who could not cooperate to accomplish the follow-up were also documented.

Consecutive TIA patients were registered prospectively. ABCD^2 scores were first documented. Meanwhile, TIA registry forms were filled by neurological physicians with unified training. ABCD^2 score is graded by the following: Age ($\geq$ 60 years = 1, < 60 years = 0); blood pressure (systolic $\geq$ 140 mmHg and/or diastolic $\geq$ 90 mmHg = 1, systolic < 140 mmHg and diastolic 90 mmHg = 0); clinical manifestation (unilateral weakness = 2, speech impairment without weaknes s = 1, other symptom = 0); duration of symptom ($\geq$ 60 minutes = 2, 10 to 59 minutes = 1, 60 minutes = 0); diabetes (yes = 1, no = 0). Patients were followed-up to document subsequent stroke and medication at 2 and 7 days respectively.

Differences in stroke-free survival between groups stratified by ABCD^2 score were assessed for statistical significance with the log-rank test. Sensitivities and specificities of prediction were determined at each cut-off of the score and the receiver operating characteristic curve (ROC) was plotted. Logistic regression analysis was used

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to identify factors that increased the risk of subsequent stroke after TIA. Factors that contributed to the outcome in the initial univariate analyses at $P < 0.1$ were included in the multivariate model. In the final multivariate analyses, statistical significance was achieved if $P < 0.05$. The Statistic Package for Social Science version 10.0 was used for statistical analyses.

3 Results

136 TIA patients participated in the Database. The distribution of the ABCD^2 score was shown in Table 1. Within 2 days of TIA, 9 (6.6%) patients had a subsequent ischemic stroke and within 7 days of TIA, 16 (11.8%) patients had a subsequent ischemic stroke.

The 2-day and 7-day risk of stroke stratified according to ABCD^2 score were presented in Table 1. The risk of stroke increased according to the increase of the score.

Table 1. 2-day and 7-day risk of stroke stratified according to ABCD^2 score

ABCD^2 score	Patients	2 days		7 days	
		Strokes	Risk* (%, 95%CI)	Strokes	Risk** (%, 95%CI)
0	4	0	0	0	0
1	12	0	0	0	0
2	20	0	0	1	5.0 (0 – 25.0)
3	36	1	2.8 (0 – 15.0)	1	2.8 (0 – 15.0)
4	40	3	7.5 (2.0 – 21.0)	8	20.0 (9.0 – 35.0)
5	18	3	16.7 (4.0 – 41.0)	4	22.2 (6.0 – 48.0)
6	4	1	25.0 (1.0 – 81.0)	1	25.0 (1.0 – 81.0)
7	2	1	50.0 (1.0 – 99.0)	1	50.0 (1.0 – 99.0)
Total	136	9	6.6 (2.4 – 10.8)	16	11.8 (6.4 – 17.2)

*: Log-rank test = 16.57, df = 7, $P = 0.0204$; **: Log-rank test = 15.87, df = 7, $P = 0.0263$.

The ROC were plotted (Figure 1). 2-day and 7-day area under receiver operating characteristic curve (AUROCC) of ABCD^2 score is 0.804 and 0.764 respectively. The cut-off point was determined by presetting the sensitivity (low limit is 80%) and the cut-off point is 4. Validation of the cut-off point was seen in Table 2.

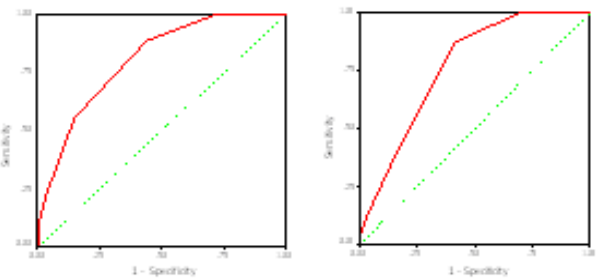

Figure 1. The ROC were plotted. a: 2-day ROC; b: 7-day ROC.

Table 2. Validation of the cut-off point

	2-day	7-day
sensetivity (%)	88.9	87.5
false negative rate (%)	11.1	12.5
specifity (%)	55.9	58.3
false positive rate (%)	44.1	41.7

The gender, ABCD^2 score (4 – 7 *vs.* 0 – 3), stroke risk factors and secondary prevention therapies with the risk of subsequent stroke was evaluated using univariate Logistic regression analyses. The variables which were significantly ($P < 0.1$) related to stroke recurrence were selected for entry into the final multiple-variable model. The results of multivariate Logistic regression analyses were seen in Table 3 and 4.

Table 3. 2-day Logistic regression analyses

	B	SE	Wald	Sig	Exp(B)	95%CI for Exp(B)	
						Lower	Upper
ABCD^2 score	2.259	1.083	4.350	0.037	9.578	11.46	80.059

Table 4. 7-day Logistic regression analyses

	B	SE	Wald	Sig	Exp (B)	95%CI for Exp(B)	
						Lower	Upper
ABCD^2 score	2.600	0.856	9.233	0.002	13.458	2.516	71.978
hypertension	1.531	0.719	4.536	0.033	4.624	1.130	18.921
hyperlipidemia	1.739	0.804	4.683	0.030	5.691	1.178	27.487

4 Discussion

The short-term stroke risk after a TIA is very high. The research of the Oxfordshire Community Stroke Project reported a 7-day stroke risk of 8.6% and a 30-day stroke risk of 12.0% in patients following TIA. Analyses of the Greater Cincinnati/Northern Kentucky stroke study found the risk of stroke after TIA was 3.9% at 2 days, 7.0% at 7 days, and 14.6% at 90 days. This study showed a 6.6% risk of stroke at 2 days and an 11.8% risk at 7 days, revealing a high early risk of stroke after a TIA. Therefore TIA should be considered as "minor stroke, high risk".

The risk of stroke was higher according to the increase of the score. 2-day and 7-day AUROCC of $ABCD^2$ score was in the range from 0.7 to 0.9 which indicated moderate predictive value of $ABCD^2$ score. The sensitivity and specificity was about 85% and 56% respectively, and the high sensitivity met the principle of screening test. After adjustment for the other factors, an $ABCD^2$ score of 4 to 7 was independently associated with 9.5-fold and 13-fold greater 2-day and 7-day risk of stroke respectively.

Guideline recommendations for hospital admission are vague and practice is highly variable[6]. Some investigations and interventions are expensive and may not be cost effective if used in all TIA patients. $ABCD^2$ score might help clinicians to stratify TIA patients and determine which patients should be admitted, assessed and treated as soon as possible. A cost-utility analyses showed an $ABCD^2$ score of 4 to7 might justify 24 h hospital admission on the basis of a greater chance to administer thrombolysis given the subsequent stroke[7]. Cut-off points of different interventions might vary between specific intervention and regions. But high risk TIA patients ($ABCD^2$ score: 6 – 7) benefit from urgent assessment and treatment. Low risk patients ($ABCD^2$ score: 0 – 3) are not need for hospital admission. And the need of admission for moderate risk patients ($ABCD^2$ score: 4 – 5) depends on specific individual conditions and medical system[4]. The stratification of TIA patients can decrease stroke risk and abuse of medical resources. $ABCD^2$ score is easy for clinical practice and helpful to identify the high risk TIA patients.

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