Clinical Characteristics of Cardioembolic Transient Ischemic Attack: Comparison with Noncardioembolic Transient Ischemic Attack

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Background: Previous studies show that 6%-31% of transient ischemic attacks (TIA) were caused by cardiogenic cerebral embolism (cardioembolic TIA). As prompt initiation of therapy is essential in TIA to prevent subsequent strokes, determining their cause is important. In this study, we aim to determine the features of cardioembolic TIA and to compare them with those of noncardioembolic etiology. *Methods:* We retrospectively reviewed patients with a tissue-defined TIA who were admitted to our hospital from April 2007 to August 2013. The etiology was categorized according to Trial of Org 10172 in Acute Stroke Treatment, and TIA of cardioembolic origin and cervicocerebrovascular etiology (noncardioembolic TIA) were included in this study. Those with 2 or more possible causes or undetermined etiologies were excluded. Age, sex, comorbidities, ABCD2 score, and CHADS2 score were assessed and compared between the 2 groups. *Results:* There were no significant differences in the neurologic symptoms and their duration, morbidities of hypertension, diabetes, and dyslipidemia between the 2 groups. Coronary and peripheral artery diseases were more common in the cardioembolic TIA group (18.4% vs. 6.9%). Incidences of prior stroke and cerebral infarction determined by MRI were similar between the 2 groups. The ABCD2 score showed a similar distribution, but the CHADS2 score was significantly different; the cardioembolic TIA group showed a higher score ($P = .005$). *Conclusions:* Clinical features are similar in tissue-defined TIA of cardioembolic and noncardioembolic etiologies. The CHADS2 score can be useful in assessing the probability of cardioembolic TIA. **Key Words:** Cardioembolism—clinical score—etiology—transient ischemic attack.

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Received February 16, 2014; accepted April 2, 2014.

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1052-3057/$ - see front matter

http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2014.04.005

Ten to 20% of patients who experience a transient ischemic attack (TIA) will have a stroke within 3 months, and approximately 50% within 48 hours.[1-3] Moreover, a recent study revealed that more than 2% of patients with TIA experienced a stroke within 12 hours.[4] It is important to administer antithrombotic therapy immediately because prompt and appropriate therapy can help prevent more than 80% of subsequent strokes.[5,6] However, clinicians often hesitate over which treatment to choose, as the etiology of TIA is sometimes

undiagnosed when stroke-preventive therapy is initiated. The National Institute for Clinical Excellence[7] and Japanese[8] guidelines recommend that all TIA patients be promptly administered 160-300 mg of aspirin per day, even when the etiology has not yet been determined, but the optimal method to prevent subsequent strokes may vary among patients. Approximately 5% of patients with TIA received anticoagulation therapy and another 5% underwent urgent carotid revascularization in a TIA clinic.[5] As with cerebral infarction, the optimal medical treatment can differ based on TIA etiology.

Approximately 6%-31% of TIAs are caused by a cardiogenic cerebral embolism (cardioembolic TIA).[9,10] Determining TIA etiology is important before administering therapy, but it is difficult in some cases. In this study, we aimed to compare the features of a cardioembolic TIA with those of a noncardioembolic TIA. These kind of studies have been carried out previously, although a time-based definition of TIA was used.[11,12] Indeed, the present study with tissue-defined TIA presented some unique findings.

Methods

This study was approved by the Institutional Review Board at Saitama Medical University International Medical Center.

All patients who were admitted to our hospital with transient focal neurologic deficits underwent magnetic resonance imaging (MRI), unless contraindicated. If the MRI revealed no fresh lesions on diffusion-weighed imaging, a second MRI was performed 3-7 days later. Those without high-intensity lesions on both diffusion-weighed images were diagnosed with tissue-defined TIA. Patients with lasting focal neurologic deficits on admission that resolved within 24 hours were also included, if repeat MRI after resolution of the neurologic deficits showed no new lesions.[13] In total, 171 patents had tissue-defined TIA from April 2007 to August 2013. Etiology was categorized according to the Trial of Org 10172 in Acute Stroke Treatment.[14] A cardiogenic source was investigated using 12-lead electrocardiography (ECG) and transthoracic echocardiography in all cases. In certain cases, we performed 24-hour Holter ECG, bedside ECG monitoring for several days, and transesophageal echocardiography when needed. Among the 171 tissue-defined TIA patients, 38 had cardioembolic TIA and 116 had either large artery atherosclerosis or small vessel disease (noncardioembolic TIA). Patients with a TIA of 2 or more possible causes (eg, atrial fibrillation [AF] and carotid artery stenosis) or undetermined etiology were not included in this study.

We retrospectively reviewed the medical records of patients, including demographic information (age, sex), clinical history of symptomatic stroke, stroke risk factors (hypertension, diabetes mellitus, dyslipidemia), symptoms (presence of hemiparesis and/or dysarthria during the TIA), and duration of symptoms. Patients with a blood pressure of ≥140/90 mm Hg or those who were receiving antihypertensive medication were defined as having hypertension.[15] Diabetes mellitus was defined as a blood glucose level of ≥200 mg/dL and a glycated hemoglobin level of ≥6.5% on admission or treatment with antidiabetic medication.[15] Dyslipidemia was diagnosed if the patient had any of the following: low-density lipoprotein cholesterol level ≥140 mg/dL, high-density lipoprotein cholesterol level ≤40 mg/dL, triglyceride level ≥150 mg/dL, or treatment with lipid-lowering medication.[15] We investigated old cerebral infarction (including asymptomatic episodes) using MRI; high-intensity lesions on T2-weighed images and fluid-attenuated inversion recovery images were considered old infarctions.[13] We also reviewed vascular diseases other than cerebrovascular disease, such as coronary heart or peripheral artery diseases. ABCD2 and CHADS2 scores, which are stroke risk stratification tools for TIA and nonvalvular AF patients, respectively, were assessed in all cases. These variables were compared between the cardioembolic and noncardioembolic TIA groups. Statistical analysis was performed using the PASW Statistics software (version 18; SPSS Inc, Chicago, IL). Age differences between the groups were analyzed using the Wilcoxon test; differences in other variables were assessed using the chi-square test. As the CHADS2 score was found to be higher in the cardioembolic TIA group (shown in Results), the predictive value of this scale was quantified using the area under the receiver operating characteristics curve with a 95% confidence interval.

Results

Among the 171 tissue-defined TIA patients, 38 were eventually diagnosed with cardioembolic TIA, and 116 were diagnosed with either large artery atherosclerosis or small vessel disease; these were defined as the noncardioembolic TIA group. Two or more possible causes (eg, AF and carotid artery stenosis) were identified in 7 cases, and the etiology could not be determined in 14 cases; both groups were not included in our study.

The pathogenesis of cardioembolic TIA is presented in Table 1. Among 38 patients, 25 had nonvalvular AF (17 permanent and 8 paroxysmal). Five of the 25 AF patients had concurrent heart failure. Seven patients had a myocardial infarction with impaired wall contraction, 2 had overt mitral valve disease, 2 had a patent foramen ovale, 1 had dilated cardiomyopathy, and 1 had sick sinus syndrome.

The clinical characteristics of patients with cardioembolic and noncardioembolic TIA are presented in Table 2. In total, the mean age of the patients was 67.4 ± 11.7 years, and 55.2% were men. Thirty-three