A Posterior Circulation Ischemia Risk Score System to Assist the Diagnosis of Dizziness

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Background: We aimed to establish a risk score system without radio-image examination, which could help clinicians to differentiate patients with vertigo and posterior circulation ischemia (PCI) rapidly from the other dizzy patients. *Methods:* We analyzed 304 patients with vertigo (50% PCI). The attributes with more significant contributions were selected as the risk factors for the PCI risk score system, and every one of them was assigned a value according to their respective odds ratio values. We also compared the respective receiver operating characteristic curves of the 3 diagnostic methods (PCI score system, ABCD^2, and Essen score systems) to evaluate their prediction effectiveness. *Results:* Nine risk factors were ultimately selected for PCI score system, including high blood pressure (1′), diabetes mellitus (1′), ischemic stroke (1′), rotating and rocking (−1′), difficulty in speech (5′), tinnitus (−5′), limb and sensory deficit (5′), gait ataxia (1′), and limb ataxia (5′). According to their respective PCI risk scores, the patients were divided into 3 subgroups: low risk (≤0′, risk <37.4%), medium risk (1′-5′), and high risk (≥6′, risk >95.0%). When 0′ was selected as a cutoff point for differentiating the patients with PCI from patients without PCI, the sensitivity was 94.1%, with a specificity of 41.4%. The areas under the receiver operator curve value of PCI score system was .82 (*P* = .000), much higher than the areas under the receiver operator curve value of ABCD^2 (.69, *P* = .000) and that of the Essen system (.67, *P* = .000) *Conclusion:* The PCI score system could help clinicians to differentiate patients with vertigo and PCI rapidly from the other dizzy patients. **Key Words:** Dizziness or vertigo—posterior circulation ischemia—risk scores—diagnosis—physical examination. © 2017 National Stroke Association. Published by Elsevier Inc. All rights reserved.

Introduction

Dizziness or vertigo is one of the chief complaints by about 4% of the patients in the emergency department. It represents one of the top 10 complaints in an ambulatory center.[1] Remarkably, about 40% of the people in the United States seek medical attention for dizziness or vertigo at some point in their lives. The causes of dizziness or vertigo are various, and the top 4 causes of vertigo are benign paroxysmal peripheral vertigo, vestibular neuritis, vestibular migraine and Ménière's disease, whose prognoses are benign.[2] Meanwhile, malignant diseases, such as posterior circulation ischemia (PCI), have become more prominent in recent decades thanks to an increased incidence of vascular diseases.[3-6] PCI includes posterior circulation transient ischemic attacks and persisting stroke.

The investigation of the American Heart Association in 2013 in the United States (National Health and Nutrition Examination Survey 2007-2010) revealed that the prevalence rate of cerebrovascular disease in the population of more than 20 years old is 2.8%, and ischemia stroke accounted for 87% of it. It has been reported that stroke incidence in China was higher than that of the white population and was age related.[7]

However, it is not easy to recognize PCI, for its symptoms and signs could resemble those of a variety of other diseases.[8] Thus, imaging examination of brain and cerebral vascular is the only means to identify it. Nevertheless, a large number of cross-sectional studies have suggested that the proportion of acute dizziness caused by PCI was low (around 3%), and particularly low (.7%) without central nervous system signs or symptoms.[9-12] The result of abnormalities discovered by the magnetic resonance imaging (MRI) was 12.2%. Only .74% of the dizzy patients evaluated by computerized tomography who showed clinically significant pathology required intervention. However, several guidelines and studies have made specific recommendations against neuroimaging, stating that computerized tomography and MRI are largely insensitive to such a serious condition as PCI, and their costs are high.[13-16] Because no criterion or protocol is available in evaluating the potential risk, how to distinguish PCI has become a clinical as well as a public concern.

Our research was aimed at establishing an effective risk score system, which could help clinicians to make a positive diagnosis of PCI without experimental or imaging examination.

Materials and Methods

Patients

The research complied with the Declaration of Helsinki and was approved by the ethics committee of the Third Xiangya Hospital of Center South University. Information of patients was anonymized and de-identified before analysis.

We retrospectively retrieved the clinical data of inpatients in the department of neurology in our hospital from January 2010 to December 2014, and selected the patients with PCI according to the following criteria: (1) the chief complaint was dizziness, vertigo, disequilibrium, spinning, or imbalance; (2) the discharge diagnosis was PCI, which was confirmed by at least 2 senior stroke neurologists; (3) MRI of the brain found posterior circulation ischemic lesions, or the magnetic resonance artery imaging found clear vascular occlusive lesion of the posterior circulation arteries; and (4) the patient should have at least one of the following risk conditions: age ≥40 years old, hypertension, diabetes, coronary heart disease, ischemic stroke history, and smoking.

The patients who were hospitalized with the patients with PCI at the same time (the same week) were selected randomly for the control group. We required that a patient with PCI correspond to a patient without PCI in the control group. Other criteria for selecting the control group members were (1) the chief complaint was dizziness or vertigo; (2) the discharge diagnosis excluded PCI, which was confirmed by at least 2 senior stroke neurologists; (3) MRI or magnetic resonance artery imaging of head found no abnormalities; and (4) the patient should have at least one of the following risk conditions: age ≥40 years old, hypertension, diabetes, coronary heart disease, ischemic stroke history, and smoking. At the same time, the admission diagnoses of all the patients were recorded.

Clinical Assessment

Demographic attributes, medical histories, signs, symptoms, and complications were collected. The medical histories and symptoms were told by the patients and recorded by the physicians. The signs were obtained by the physicians through physical examination. The diagnoses of complications were determined by neurologic specialists. All clinical data were assigned a value of either 1 (positive) or 0 (negative) to indicate whether the patient had a certain history, symptom, sign, and complication, or not.

Simultaneously, we evaluated the risk of PCI for each participant using the $ABCD^2$ and Essen score systems, respectively. In our study, the duration of symptoms in the $ABCD^2$ system scored 0 for absence of original data.

Statistical Analyses

First, in both groups (i.e., the control and the PCI groups), categorical features were compared with a 2-tailed Fisher's exact test, and quantitative features were compared with a 2-tailed Student's *t*-test. Second, logistic regression was used to validate the contribution of each attribute. Third, we gained the receiver operating characteristic (ROC) curve of different score systems, and areas under the receiver operator curves (AUCs) were then applied to assess the clinical performance of the 3 respective score systems.

Results

Clinical Characteristics

A total of 304 patients, with a mean age of 63 years old (SD 12), who met our criteria were included in the final analysis. Half (n = 152, 50%) of them were enrolled in the control group (Table 1). In the PCI group,