

Etiology and Risk Factors of Posterior Circulation Infarction Compared with Anterior Circulation Infarction

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Background: Many clinicians regard posterior circulation infarction (PCI) as different from anterior circulation infarction (ACI), leading them to apply different treatments. Few studies have validated this practice by directly comparing the etiology and risk factors of PCI and ACI. **Methods:** We compared the etiology and risk factors of 2245 consecutive patients with a diagnosis of PCI or ACI confirmed by magnetic resonance imaging in the Chengdu Stroke Registry. Stroke etiology in each patient was classified according to Trial of Org 10172 in Acute Stroke Treatment (TOAST) criteria. **Results:** Our sample included 482 patients (21.5%) with PCI and 1763 (78.5%) with ACI. The most frequent etiology for both infarction types was small-artery occlusion, occurring in 37.6% of patients with PCI and 37.1% of those with ACI. Cardioembolism caused infarction in a significantly smaller proportion of patients with PCI (5.4%) than in patients with ACI (13.3%; odds ratio [OR] = .373; 95% confidence interval [CI], .245-.566). Frequencies of other stroke etiologies were similar between the 2 patient groups. Analysis of risk factor frequencies in the 2 groups showed hypertension to be the most common, occurring in 47.9% of patients in either group. Multivariable analysis identified 2 factors as conferring greater risk of PCI than ACI: male gender (OR = 1.392; 95% CI, 1.085-1.786) and diabetes mellitus (OR = 1.667; 95% CI, 1.275-2.180). The same analysis identified 2 factors as conferring greater risk of ACI: atrial fibrillation (OR = .530; 95% CI, .295-.951) and heart valve disease (OR = .433; 95% CI, .203-.922). Frequencies of other possible risk factors were similar between the 2 groups. **Conclusions:** These findings suggest that PCI and ACI are more similar than different in their etiology and risk factors and that the 2 types of infarction should be treated based more on etiology and risk factors than on their posterior or anterior localization. **Key Words:** Posterior circulation infarction—anterior circulation infarction—etiology—risk factors.

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Approximately 80% of strokes are ischemic, with posterior circulation infarction (PCI) accounting for 20% of these cases.¹ Many clinicians regard PCI as different from anterior circulation infarction (ACI) in terms of risk factors, etiology, clinical manifestations, and prognosis.²⁻⁷ As a result, they often treat the 2 conditions using different approaches, sometimes without careful consideration of specific stroke etiology and risk factors. Analysis of patient data from 3 stroke registries suggested that cardioembolism occurs less frequently among patients with PCI than among those with ACI,⁸⁻¹⁰ but other studies have failed to replicate this finding.^{6,11} In addition, several studies have failed to

identify significant differences in clinical manifestation and prognosis between the 2 stroke localizations.^{6,10,12,13} Given the specific anatomical localization of PCI, its diagnosis is more dependent on magnetic resonance imaging (MRI).^{14,15} However, previous studies have varied in their use of MRI examination. This situation highlights the need for rigorous, direct comparisons of etiology and risk factors between PCI and ACI under identical conditions of MRI-based diagnosis. Here, we retrospectively analyzed data for Chinese patients with MRI-confirmed PCI or ACI treated at a single large medical center to compare etiology and risk factors in the 2 patient groups.

Patients and Methods

Study Design

Between March 2002 and May 2014, data were collected prospectively on 6505 patients with acute ischemic stroke admitted to the Department of Neurology, West China Hospital, Chengdu, China. This is a large tertiary hospital serving a greater metropolitan area of 14 million and numerous patients from surrounding cities. Patient data were entered into the Chengdu Stroke Registry, which was approved by the Scientific Research Department of West China Hospital, as conforming to local ethics criteria for human research.

All patients received a clinical diagnosis of ischemic stroke according to World Health Organization criteria, based on the presence of an acute focal neurologic deficit with symptoms lasting longer than 24 hours and corresponding neuroimaging findings.¹⁶ We excluded patients admitted to our hospital 1 week after stroke onset ($n = 1415$), patients without an MRI-verified ischemic lesion ($n = 1143$), patients with previous stroke ($n = 862$), and patients with multiple infarcts involving both anterior and posterior circulation ($n = 840$). We analyzed the remaining 2245 patients and classified them as having infarction involving only posterior circulation or only anterior circulation. Patients were assigned to the PCI group if the infarcts involved the posterior cerebral artery territory, brainstem, cerebellum, or thalamus; they were assigned to the ACI group if the infarcts occurred in the region of the anterior cerebral artery, middle cerebral artery, or anterior choroidal artery.^{17,18}

Data Collection

Data were collected at the time of patient assessment using a standardized form^{19,20}; these data included patient demographics (age and sex), time of stroke onset, stroke severity assessed by the National Institute of Health Stroke Scale (NIHSS) and the Glasgow Coma Scale (GCS), and risk factors (hypertension, diabetes mellitus, hyperlipidemia, atrial fibrillation, myocardial infarction, heart valve disease, coronary artery disease,

current smoking, and alcohol consumption). All patients underwent a standard etiological workup, comprising the following: hematological examination, involving at least routine blood analysis, blood biochemistry, and coagulation function; 12-lead electrocardiography; transthoracic echocardiography; and carotid duplex sonography. Most patients were analyzed by computed tomography (CT) within 4 hours of admission or computed tomography angiography (CTA) within 24 hours of admission. All patients were analyzed by either conventional MRI or diffusion-weighted MRI (DWI), usually within 2 days of admission. After 2008, ischemic stroke patients admitted to our hospital were routinely analyzed using DWI and three-dimensional time-of-flight MR angiography (MRA). All MRIs were performed using 3-T devices from 2003 onward. All diagnoses were based on at least 1 cerebrovascular assessment by MRA or CTA. Digital subtraction angiography was performed if necessary. For patients who had negative findings on vascular examination and transthoracic echocardiography, transesophageal echocardiography or dynamic electrocardiography was used to determine cardiac and aortic arch sources of cardiac embolization. Stroke subtype was classified according to the TOAST categories²¹ and was obtained from clinicians based on the results of clinical findings, radiological findings, and other diagnostic tests.

Statistical Analysis

Frequencies of etiologies and of other categorical variables were compared between the PCI and ACI groups using the Pearson chi-squared test. Means of continuous variables were compared using Student *t* test. When appropriate, odds ratios (ORs) were calculated together with associated 95% confidence intervals (95% CIs). A binary logistic regression model was generated to explore potential association of the above-mentioned demographic and risk factors with risk of PCI. All variables were entered and retained in the regression model. Significance was assessed using 2-tailed *P* values, with the threshold defined as *P* less than .05. All statistical analyses were performed using SPSS 16.0 for Windows (IBM, Chicago, IL).

Results

Baseline Characteristics of PCI and ACI Patients

A total of 2245 patients (1357 men, 60.4%) with a mean age of 62.50 ± 13.94 years experiencing first-ever ischemic stroke were enrolled in this study, including 482 (21.5%) with PCI and 1763 (78.5%) with ACI. Most patients (77.3%) arrived at our hospital or were transferred there within 3 days of stroke onset. The mean NIHSS score on admission was 6.14 ± 6.00 , and mean GCS score was 13.91 ± 2.04 .

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