Stroke and myocardial infarction in Chinese patients: comparison of risk factors and in-hospital outcomes

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Background and Objective Although coronary heart disease (CHD) and stroke share important risk factors, some associations differ between these two components of cardiovascular diseases. The objective of this study was to compare vascular risk factor profiles and in-hospital outcomes in acute stroke (AS) and acute myocardial infarction (AMI) patients. Methods We evaluated 383 consecutive patients who were admitted to the 94th Hospital of Chinese PLA and the Third Hospital of Nanchang with diagnoses of AS (ischemic stroke or intracerebral hemorrhage; n = 310) or AMI (n = 73) during a 2-year period. The frequency of risk factors and in-hospital mortality rates were assessed in both groups. Results AS patients were significantly older than AMI patients (68.9 ± 9.1 years vs. 62.8 ± 11.7 years; P < 0.01). AMI was significantly more common than AS in patients younger than 65 years; 51% of this group had AMI and 26% had AS (P < 0.001). Hypertension was more common in AS patients than in AMI patients (69% vs. 58%; P = 0.042). Patients who died did not differ significantly in age between the groups. In-hospital mortality rates were significantly higher in AS than AMI cases (31% vs. 12%, P < 0.001 for all patients; 37% vs. 5%, P < 0.001 for men). Women hospitalized for AMI were more likely to die in hospital than men (28% vs. 5%; P = 0.002). Conclusions Patients with stroke and with AMI differ in their risk factor profile. Age at the time of presentation was a significant differentiating factor between patients with AS and AMI. We observed significantly higher in-hospital mortality for patients with AS (when adjusted for age) than for patients with AMI. (J Geriatr Cardiol 2008; 5:223-226)

Key words stroke; myocardial infarction; outcome; risk factor

Although coronary heart disease (CHD) and stroke share important risk factors, such as age, gender, and high blood pressure, some associations differ between these two components of cardiovascular diseases.¹² For example, blood pressure appears to have a stronger association with risk of stroke, whereas total cholesterol may have a stronger association with risk of CHD.

Unlike in most Western populations, stroke is more common than coronary heart disease (CHD) in the Chinese population, especially in rural areas. Stroke is the first and CHD is the second leading cause of death from cardiovascular diseases.³⁴ In the present study we examined the differences in demographic characteristics of acute stroke (AS) and acute myocardial infarction (AMI) patients in 2 regional urban hospitals, their common risk factors, and the uniformity of recommendations for drugs for secondary prevention of AS and AMI at the time of discharge. We also compared the in-hospital mortality rates for these two disorders.

Patients and methods

Patients

This was a retrospective study of patients admitted to the 94th Hospital of Chinese PLA and the Third Hospital of Nanchang. From October 2005 to December 2007, a total of 383 consecutive patients were admitted to the Department of Neurology with diagnosis of AS and to the Department of Heart Disease with diagnosis of AMI of these two regional urban hospitals. Demographic and clinical data, laboratory results, 12-lead ECG findings, lists of all medications and clinical outcome data were collected from medical records and stored in our computer database.

Acute stroke was defined using the World Health Organization (WHO) definition¹ as “rapidly developing clinical signs of focal (or global) disturbance of cerebral function lasting more than 24 h (unless interrupted by surgery or death) with no apparent cause other than that of vascular origin”. Patients with both ischemic stroke and intracerebral hemorrhage were included in the study.

Acute myocardial infarction was diagnosed according to the WHO definition¹ when the patients had at least two of the following three criteria: typical chest pain for myocardial ischemia, initial and serial conventional electrocardiographic changes in standard or precordial leads, and enzymatic evidence of myocardial necrosis.

Definitions of risk factors

Patients with a history of hypertension in their medical records or with two or more successive blood pressure
measurements exceeding 140/90 mmHg during hospitalization were considered hypertensive. Patients with left-ventricular failure had symptoms of breathlessness accompanied by basal crepitations, and/or a third heart sound and radiological signs of interstitial or alveolar pulmonary edema. Diabetes mellitus was determined if a history of this disease had been documented in prior medical records or if patients required dietary sugar restriction, insulin, or oral hypoglycemic drugs during hospitalization, in addition to the positive criteria for diabetes.\(^6\)

**Treatment of patients**

Standard care for AS and AMI patients in our hospital consists of monitoring vital signs, pulmonary function support, repeated blood pressure measurement, glucose metabolism, and fluid and electrolyte evaluation. Aspirin, hemodilution therapy and neuroprotective agents were used in patients with ischemic AS. Anti-ischemic and antiplatelet agents were used in the AMI patients. Thrombolytic therapy (TT) was used only in AMI patients who had ST-segment elevation and whose onset of disease occurred in less than 12 h. Percutaneous coronary intervention (PCI) was performed in AMI patients with or without ST-segment elevation, but only for a small proportion of these patients. Standard or low-molecular-weight heparin was also used for AMI patients unless contraindications exist. TT was not used in the AS patients. Frequency of use of aspirin, beta-blockers, angiotensin converting enzyme inhibitors, calcium blockers, and statins at the time of discharge were also evaluated in both groups of patients. In general, patients with AS and AMI are hospitalized for 15 to 25 days.

**Statistical analysis**

Data were analyzed as mean ± SD for continuous variables and as frequencies for variables on a nominal scale. For group comparisons we used Student’s t-test and the \(\chi^2\) test (Yates corrected test, if indicated, and Fisher exact test for comparisons of small samples). Values of \(P<0.05\) were considered significant.

**Results**

During the study period, 310 patients were treated for AS: 214 (69%) had ischemic stroke and 96 (31%) had intracerebral hemorrhage. There was no gender difference between the two patient groups. Computerized tomography (CT) was performed on 93% of patients with AS.

During the same period, 73 patients were treated for AMI. The majority (\(n = 54, 74\%) of AMI patients were men and 19 were women; in contrast, there were no difference in sex (158 male and 142 female) in AS patients (Table 1). AS patients were significantly older than AMI patients. The mean age for AS patients was 69.1 ± 8.9 (range 30–89) years, and for AMI patients it was 61.4 ± 12.3 (range 32–85) years (\(P < 0.01\)).

**Table 1  Age (years) and gender of patients with acute stroke and acute myocardial infarction**

<table>
<thead>
<tr>
<th>Gender</th>
<th>AS ((n =310))</th>
<th>AMI ((n =73))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>158</td>
<td>54</td>
</tr>
<tr>
<td>Female</td>
<td>142</td>
<td>19</td>
</tr>
</tbody>
</table>

\(\text{Age, mean } \pm \text{ SD (range) } 70.8 \pm 8.4(39-89) 66.7 \pm 9.4\) (30-86)

AS = acute stroke; AMI = acute myocardial infarction. *\(P <0.01\), compared with AS patients

Significant differences were found between previous myocardial infarction or stroke episodes and the current disease. A history of AS was more common in patients with current ischemic AS; 31% had suffered ischemic stroke in the past compared to 19% with intracerebral hemorrhage (\(P = 0.048\)). Also, hypertension was more common in the AS than in the AMI group (Table 2). As anticipated, heart failure was more common in the AMI patients.

A significantly higher number of recommendations for aspirin, statins and beta-blocking agents was found at the time of discharge in patients with AMI than in those with AS (Table 3).

AS patients with fatal outcome were younger than AMI patients, but not significantly (AS patients were 69.1 ± 8.9 (range 30-86) years old, vs. 70.8 ± 11.4 (range 50-85) years for AMI, \(P = 0.533\)). Overall, there were no significant age differences in patients who died (Table 4).

Patients with AS had a significantly higher overall inhospital mortality rate than those with AMI (20.6% vs. 10.9%; \(P < 0.001\)). Also, we found a significant difference in

**Table 2  Risk factors and prior medical history in patients with acute stroke and acute myocardial infarction**

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Percent of patients with a risk factor</th>
<th>OR (95% CI)</th>
<th>(P) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AS</td>
<td>AMI</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>69</td>
<td>58</td>
<td>1.62 (1.02-2.58)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>29</td>
<td>25</td>
<td>1.22 (0.73-2.06)</td>
</tr>
<tr>
<td>Previous myocardial infarction</td>
<td>3</td>
<td>13</td>
<td>0.23 (0.10-0.55)</td>
</tr>
<tr>
<td>Previous stroke</td>
<td>29</td>
<td>9</td>
<td>4.39 (2.06-9.66)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>18</td>
<td>31</td>
<td>0.50 (0.30-0.84)</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>16</td>
<td>10</td>
<td>1.65 (0.80-3.47)</td>
</tr>
</tbody>
</table>

\(\text{OR (95\% CI) = Odds ratio (95\% confidence interval for OR)}\)
tality increased by 41% in men and 39% in women for the same trend was observed from the Sino-MONICA project, registration and classification system was established. The and rural areas since the 1980s, when the standard death decrease in CHD mortality has been observed in both urban

Despite the continuing decline in the incidence of CHD in developed countries, the incidence is still increasing in developing nations. In China, for example, a steady increase in CHD mortality has been observed in both urban and rural areas since the 1980s, when the standard death registration and classification system was established. The same trend was observed from the Sino-MONICA project, Beijing Centre. It reported that the age-adjusted CHD mortality increased by 41% in men and 39% in women for the age group 35-74 years, from 1984 to 1999. Although it has been reported that since 2000, CHD mortality has started to decrease in the population covered by the death registration and classification system. This decline of CHD mortality change may be contributed, at least in part, to the change in coding system from ICD-9 to ICD-10 and do not reflect the real trends.

In the current study, we assessed all patients admitted to 2 urban hospitals during a two-year period with AS (ischemic stroke or intracerebral hemorrhage) and AMI. Our data show that the number of AS patients admitted was four times greater than the number of AMI patients. Apart from the higher prevalence of CHD compared to stroke, it may also because that more AMI patients died at home; it has previously been suggested that AMI is the most common cause of sudden death.

There were well-known differences in risk factors between coronary disease and stroke: serum cholesterol being a strong risk factor for coronary events, but not for stroke, not even when only pure thrombotic strokes are analyzed, a finding that is contrary to what was published by Lawlor et al. High blood pressure and high BMI were more important risk factors for stroke than for coronary events. However, 50% of both stroke and coronary disease men died from coronary disease, suggesting similar background pathology for the two diseases.

The majority of our AMI patients were men (70%) and this is in agreement with other hospital-based registries. We found hypertension was more common in patients with AMI than those with stroke, a finding confirmed other reports. Our data also showed higher mortality rate for in-patients with AS compared those with AMI. The overall mortality rate for AMI in-patients was 12.3%, which is similar to other studies using hospital-based registries. The overall mortality rate for AS in-patients was 31.1%, which is higher than the rates observed in Western Europe, North America and Australia. We can partially explain this by the high prevalence of hypertension; also, our patients had higher rates of intracerebral hemorrhage than other groups have reported. We also observed significantly higher inpatient mortality for men (when adjusted for age) than for women with AS.

In summary, we found that age at the time of presentation was a significant factor in patients with AS and AMI. The only exception was that women were of similar ages at the onset of AS and AMI. In contrast, patients who died did not differ significantly in age. The five-fold higher inpatient mortality rate in women than in men with AMI is most likely to be the result of other factors related to treatment. We believed that the major reasons for observed geographical differences in hospital mortality are largely related to methodological differences between studies compared (e.g. local differences in approaches to hospitalization, availability of acute stroke services etc.).
References


