

The Impact of Risk Burden Differences between Men and Women on the Clinical Course of Ischemic Stroke

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Background: Our objective is to assess the impact of varying risk profiles in men and women on the clinical picture of ischemic stroke. *Materials and Methods:* The study involved 185 patients, 100 women and 85 men. We assessed the patients' neurological status upon admission, 1 and 2 weeks following stroke onset, using the Scandinavian Stroke Scale and the Barthel Index; stroke syndromes according to the Oxfordshire Classification; their etiology and pathogenesis according to the Trial of Org 10172 in Acute Stroke Treatment; and the prevalence of vascular risk factors. We used cranial magnetic resonance imaging to locate infarcts. *Results:* Women had more total anterior circulation infarct subtype strokes, whereas men had more posterior circulation infarct and lacunar infarct. On neuroimaging, women had more infarcts in the middle cerebral artery circulation, whereas men had more in the brain stem and/or cerebellum. Women had a higher prevalence of atrial fibrillation (AF) and coronary artery disease, whereas men were more likely to smoke and abuse alcohol. Women had more cases of cardioembolism, whereas men had more strokes caused by atherosclerosis of large vessels. *Conclusions:* In the present study, heart diseases, such as coronary artery disease and AF, were more prevalent among women. It seems that AF is a risk factor with significant impact on the epidemiological differences regarding ischemic stroke in men and women. **Key Words:** Ischemic stroke—sex—risk factors—etiology. © 2016 National Stroke Association. Published by Elsevier Inc. All rights reserved.

Introduction

Epidemiological studies suggest that incidence and mortality of stroke are different for men and women, although this depends on age. Under 65, stroke-related mortality is higher in men; above 65, that mortality is higher in women.¹ Women are frequently more disabled follow-

ing a stroke than men.² The purpose of the present study was to search for factors that could explain the observed differences. We took special notice of the patients' clinical condition, the prevalence of risk factors, location of infarcts, and their etiology.

Materials and Methods

We enrolled 185 subjects, 100 women and 85 men, hospitalized for ischemic stroke between February 2001 and April 2002 as well as between October 2006 and September 2007. The study received Ethics Committee approval. All patients were subjected to a comprehensive diagnostic workup including cranial magnetic resonance imaging (MRI), electrocardiogram, ultrasound exam of carotid and vertebral arteries, an extended panel of laboratory tests, and echocardiography in selected patients. The MRI study was performed between 2 and 72 hours following stroke onset with a 1.5-T machine by Philips (56 84 PC Best, The Netherlands). We

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Received July 2, 2015; accepted December 9, 2015.

Grant support: None.

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1052-3057/\$ - see front matter

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<http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2015.12.015>

assessed the patients' neurological status upon admission, and then 1 and 2 weeks following stroke onset with the Scandinavian Stroke Scale (SSS) and the Barthel Index (BI); the subjects' stroke syndromes clinically according to the Oxfordshire Classification; and the stroke etiology and pathogenesis according to the Trial of Org 10172 in Acute Stroke Treatment. We evaluated the cranial MRI studies with regard to infarct location in specific vascular territories: anterior cerebral artery, anterior choroidal artery, middle cerebral artery, posterior cerebral artery, brain stem, and/or cerebellum.³ The patients were also assessed for cardiovascular risk factors including age, arterial hypertension, diabetes mellitus, prior stroke or transient ischemic attack, coronary artery disease, atrial fibrillation (AF), infection preceding index stroke, smoking, alcohol abuse, and dyslipidemia.

Statistics

The results were processed statistically. Means of neurological status scores were compared by the Mann-Whitney *U*-test. The differences in the prevalence of selected parameters between subject groups were compared with Pearson's chi-square test. The statistical significance level was assumed as a *P* value less than .05. Statistical analysis was performed using the SPSS 14.0 PL for Windows software package (SPSS Inc., Chicago, IL).

Results

The overall number of subjects was 185: 100 women and 85 men. Their mean age was 72.02 (women: 75.11, men: 68.40) ($P < .0001$).

On admission, the neurological status of female patients was significantly more severe on the SSS, with a score of 30.86 versus 39.40 in men ($P < .002$). The degree of disability on BI was also more severe in women, with a score of 36.48 versus 50.18 in men ($P < .01$). After 1 week of hospitalization, women continued to present a more severe neurological status (SSS score 36.73 in women versus 43.39 in men, $P < .04$), which caused a higher degree of disability on BI (score 46.90 in women versus 62.07 in men, $P < .02$). After 2 weeks of hospital stay, the neurological deficit was more severe in female subjects, but the difference did not achieve statistical significance (Fig 1).

Among patients with recurrent stroke, neurological deficit was more severe in women than in men; however, the difference was statistically significant only at admission (SSS score 26.20 in women versus 36.41 in men, $P < .05$). The difference persisted after 1 and 2 weeks albeit without statistical significance. The BI rating of disability of female patients with recurrent stroke was higher both at admission and on following examinations, but this difference was statistically insignificant.

Comparison of infarction type according to the Oxfordshire Classification showed that, among lacunar infarct (LACI) cases, women had more disability (statistically non-

significant, $P < .07$), although their SSS scores did not differ in severity. After 2 weeks of hospitalization, the neurological status of men and women was comparable; however, the women remained more disabled. Among posterior circulation infarct (POCI) cases, women had a more severe neurological syndrome (SSS score 33.00 in women versus 44.77 in men, $P < .02$), but BI scores were comparable between sexes.

Assessment of respective etiology and pathogenesis groups showed that, among patients with major artery thrombosis, women were found to have a more severe neurological syndrome on admission (SSS score 29.00 in women versus 40.57 in men, $P < .03$). During follow-up, this difference lost statistical significance. The BI also showed women to be more disabled to a statistically insignificant degree. In the subset of patients with cardioembolism, women had a significantly higher severity of neurological syndrome on admission (SSS score 25.22 in women versus 39.27 in men, $P < .01$). After 1 week, this difference decreased to the level of a tendency. Despite a reduced severity of deficit, these female subjects still had more disability as measured by BI; on admission, the score was 24.69 in women versus 48.67 in men ($P < .04$); after a week, it was 34.95 versus 60.67 ($P < .05$).

Assessing groups defined by location of the ischemic focus, we found that women with infarcts in the vascular territory of the anterior choroidal artery presented more deficit on admission (SSS score 23.43 in women versus 33.50 in men, $P < .05$). After 1 week, the difference fell to the level of a tendency. The women were also more disabled on admission (BI score 18.48 in women versus 40.41 in men, $P < .02$) and after 1 week of hospitalization (27.61 versus 53.45, respectively; $P < .03$). Among patients with infarcts in the middle cerebral artery territory, women had more neurological deficit on admission (SSS score 28.60 in women versus 38.27 in men, $P < .004$), after 1 week of hospitalization (32.87 versus 43.41, respectively; $P < .004$), and after 2 weeks (37.63 versus 45.37, respectively; $P < .03$). The women were also more disabled on admission (BI score 33.88 in women versus 52.84 in men, $P < .01$). This difference persisted at week 1 with women and men scoring 41.15 versus 64.43, respectively ($P < .004$), and at week 2, with 49.51 and 68.49, respectively ($P < .03$). In patients with infarcts in the posterior cerebral artery territory, women had more neurological deficit on admission (SSS score 31.56 in women versus 47.56 in men, $P < .03$). At week 1, this difference persisted at the level of statistical tendency. The women were also more disabled on admission (BI score 39.06 in women versus 71.67 in men, $P < .05$). A week later, the difference was still present but no longer statistically significant.

We found that men and women had different prevalences of clinical signs. Women were more likely to have impaired consciousness (33.0% versus 14.1% in men, $P < .003$) and aphasia (41.0% versus 25.9% in men, $P < .03$). Conversely, men had more cerebellar syndromes (29.4%

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