Depression After Stroke

Results of the FINNSTROKE Study

Mervi Kotila, MD; Heikki Numminen, MD; Olli Waltimo, MD; Markku Kaste, MD

Background and Purpose—We compared the incidence and severity of depression at 3 and 12 months after stroke in patients and their chief caregivers (spouses, 63%; children, 37%) in four districts of Finland, two with and two without after-hospital-discharge interventional programs (outpatient rehabilitation and activities of the local divisions of the Finnish Heart Association [FHA]). A population-based stroke register was used, and factors influencing depression were analyzed.

Methods—A stroke register of patients recruited over 2 years in four different districts (total population, 134,804) in Finland; 594 first-ever strokes were registered. Beck’s Depression Inventory (BDI), with 10 as the cutoff point for depression, was applied to 321 of 423 survivors and 195 caregivers at 3 months and to 311 of 390 survivors and 184 caregivers at 12 months in the districts with and without interventional programs.

Results—At 3 months, fewer patients in the districts with active programs (41%) were depressed than in the control districts (54%) (odds ratio, 0.59; 95% confidence interval, 0.37 to 0.94), and the difference was maintained at 12 months (42% versus 55%) (odds ratio, 0.55; 95% confidence interval, 0.34 to 0.88). Univariate risk factors for depression at 3 months were female sex and severe prognostic score at the onset of stroke (≥14 points) on the Scandinavian Stroke Scale (SSS). Only SSS prognostic score and age emerged as significant independent contributors to depression on both linear and logistic multivariate analyses. There was no significant difference in the depression rate of caregivers between districts with active programs (42%) and those without such programs (41%) at 3 months; at 12 months the results were the same (39% in districts with active programs versus 42% in those without such programs). However, at 12 months there were significantly more severely depressed caregivers in districts without active programs than in districts with such programs (P=0.036). Poor Rankin scale score (grades III through V) and severe SSS long-term score (≥42 points) at 3 months among the patients were associated with depression of the caregivers at 3 months in the univariate analysis. Poor Rankin Scale score of the patients was independently associated with the depression of their caregivers at 3 months on multivariate logistic regression analysis.

Conclusions—Depression was common among stroke survivors and among their caregivers at 3 months, and its rate did not decrease at 1-year follow-up. The lower depression rate in districts with active programs compared to those without supports the idea that outpatient rehabilitation and support provided by local divisions of the FHA may be an effective way of decreasing the rate of depression after stroke. (Stroke. 1998;29:368-372.)

Key Words: caregivers ■ depression ■ incidence ■ rehabilitation ■ stroke

As the third leading cause of death and the most common disabling disease, stroke has an enormous emotional impact on both patients and their family members. This is especially true for Western societies with aging populations. Depression is an important consequence of stroke, and it influences stroke recovery. In spite of this, there are only a few population-based studies of the incidence and severity of depression after stroke in patients and among their caregivers.

The aim of this study was to determine in a population-based stroke register (1) the incidence and severity of depression at 3 and 12 months after stroke among patients and their chief caregivers; (2) possible differences in frequency of depression between districts with enhanced after-discharge rehabilitation programs provided by the local divisions of the FHA and those without such facilities; and (3) analysis of factors influencing the occurrence of depression and its severity.

Subjects and Methods

A stroke register was kept in four different districts in Finland from August 15, 1989 through August 14, 1991 (FHA 89–91). The study population consisted of 134,804 inhabitants. The four districts studied consisted of 21 rural municipalities, whose populations ranged from 31,975 to 35,142 inhabitants. In two of these districts there were active rehabilitation programs after discharge, together with support and social activities provided by the local divisions of the FHA; the two other districts without such programs served as comparison districts. In the latter, the stroke care was carried out according to the usual practice in Finland, which includes mainly physiotherapy and speech therapy provided at the respective health center responsible.

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Each health center has a chief physician in charge and a variable number of family doctors. In interventional districts, the backbone of extra rehabilitation was physiotherapy organized for a group of stroke patients. Stroke patients and their family members were actively encouraged to participate in the social activities of the local divisions of the FHA. The patients were also provided any help they needed for adapting to life after stroke. A total of 594 patients with first-ever stroke aged 15 and older were registered. The details of the register have been published previously. The total 3- and 12-month mortality rates were 28.5% and 34.1% in districts with and without programs, respectively.

The evaluation of the patients took place upon their admission to the hospital after the onset and at 3- and 12-month follow-ups. The same trained study coordinator in each district interviewed both the patient and the chief caregiver and applied the SSS, Speech scale, BI, and RS at onset and at 3 and 12 months; the Mini-Mental State Exam, Albert’s test, and BDI at 3 and 12 months; and quality of life assessment at onset and at 12 months. The closest relative (spouse, females and 67 males in the comparison group. The mean age in the active districts was 66.6 13.0 years for females and 66.6 13.0 years for males; in the control districts was 67.0 11.5 years for females and 66.5 12.1 years for males. The proportions of stroke types in active and control districts were: infarct (85.1%, 79.3%), intracerebral hemorrhage (8.8%, 15.0%), subarachnoid hemorrhage (4.4%, 5.0%) and nonspecified stroke (1.7%, 0.7%). At hospital admission, the patients did not differ according to the SSS score, BI score, or side of hemiparesis.

In analyzing the effects of risk factors, we took into consideration whether cardiovascular disease was present, whether the patients had received a diagnosis of coronary artery disease or heart failure from a physician, and whether the patients had received drug treatment for those disorders. Patients considered hypertensive were medically treated.

The categorical variables were compared with use of the χ² test, and ORs were calculated for risk factors of depression. Both multivariate linear and logistic regression were used for analyzing the independence of these risk factors. For linear regression analyses a logarithmic transformation of the dependent variable was used, whereas for logistic regression the continuous variables were dichotomized as follows. A cutoff point of ≤70 was used for age. Scandinavian prognostic score (maximum of 22) was dichotomized into patients with severe symptoms (≤14 points) and those with mild-to-moderate symptoms (>14 points). In the SSS long-term score (maximum, 48), a cutoff point of >42 was used on the above basis. The RS was dichotomized into patients with a good outcome and independent activities of daily living (grades I and II) and those with a less favorable outcome and dependent activities of daily living (grades III through V [poor RS]). A cutoff point of ≥17 was used in the BI for independent patients. The subtype of stroke was dichotomized into brain infarcts and other strokes. Data from active and control districts were pooled in analyzing both the variables associated with depression in patients and the patients’ variables associated with caregivers’ depression.

We used the original version of the BDI, which has been validated in stroke patients. The cutoff point for depression was ≥10 points, which has been used in the evaluation of patients with somatic illnesses. The depression was categorized as follows: 0 to 9 points, null to minimal; 10 to 18, mild to moderate; 19 to 29, moderate to severe; and 30 to 63, severe. The latter three categories (from 10 through 63 points) were used in assessing the severity of depression.

### Results

The frequency and severity of depression of the patients and their caregivers at 3 and 12 months in districts with active after-hospital-discharge programs and in those without such programs is shown in Table 1. At 3 months, fewer patients with active programs (41%) were depressed than without such programs (54%) (OR, 0.59; 95% CI, 0.37 to 0.94, after adjustment for age, sex, and SSS score). This difference was maintained at 12 months (42% versus 55%) (OR, 0.55; 95%

### Table 1. The Frequency and Severity of Depression of Patients and Caregivers at 3 and 12 Months After Stroke in Districts With and Without Active After-Hospital Discharge Programs

<table>
<thead>
<tr>
<th>Severity of Depression (BDI Points)*</th>
<th>Patients</th>
<th></th>
<th></th>
<th>Caregivers</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Active</td>
<td>Control</td>
<td>Active</td>
<td>Control</td>
<td>Active</td>
<td>Control</td>
<td>Active</td>
<td>Control</td>
<td>Active</td>
<td>Control</td>
</tr>
<tr>
<td>0-9</td>
<td>106</td>
<td>(58.6)</td>
<td>64</td>
<td>(45.7)</td>
<td>73</td>
<td>(58.4)</td>
<td>41</td>
<td>(58.5)</td>
<td>107</td>
<td>(58.4)</td>
<td>57</td>
</tr>
<tr>
<td>10-18</td>
<td>51</td>
<td>(28.2)</td>
<td>43</td>
<td>(30.7)</td>
<td>41</td>
<td>(32.8)</td>
<td>20</td>
<td>(28.6)</td>
<td>46</td>
<td>(25.3)</td>
<td>53</td>
</tr>
<tr>
<td>19-29</td>
<td>19</td>
<td>(10.5)</td>
<td>24</td>
<td>(17.2)</td>
<td>11</td>
<td>(8.8)</td>
<td>7</td>
<td>(10.0)</td>
<td>27</td>
<td>(14.7)</td>
<td>15</td>
</tr>
<tr>
<td>30-63</td>
<td>5</td>
<td>(2.7)</td>
<td>9</td>
<td>(6.4)</td>
<td>0</td>
<td>(0)</td>
<td>2</td>
<td>(2.9)</td>
<td>3</td>
<td>(1.6)</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>181</td>
<td>(100)</td>
<td>140</td>
<td>(100)</td>
<td>125</td>
<td>(100)</td>
<td>70</td>
<td>(100)</td>
<td>183</td>
<td>(100)</td>
<td>128</td>
</tr>
</tbody>
</table>

* Beck Depression Index: 0-9 indicates null to minimal; 10-18, mild to moderate; 19-29, moderate to severe; and 30-63, severe.
CI, 0.34 to 0.88, after adjustment for age, sex, and SSS score), whereas no difference was found in regard to severity of depression between districts with active programs versus without such programs.

Depressed caregivers were equally common in the districts with active programs (42%) and in those without (41%) at 3 months, and the results were the same at 12 months (39% in active versus 42% in control districts) (Table 1). When depressed caregivers (BDI score of 10 to 63) were compared between districts with active and no active programs, there were significantly more severely depressed caregivers in the latter group than in the former at 12 months (Table 1) ($P<.036$). There was no difference in frequency and severity of depression between patients and caregivers.

Factors at stroke onset associated with depression at 3 months are shown in Table 2. Of these, ORs for females and those with a severe prognostic score on the SSS were significant. Other tested variables (age, diagnosis, side of hemiparesis, living alone, RS score, cardiovascular disease, diabetes, and musculoskeletal disease) did not reach significance, as can be seen in Table 2. Only age and the SSS prognostic score emerged as significant contributors to depression on both linear and logistic multivariate analyses (Table 2).

Patient characteristics at 3 months associated with depression of the caregivers at the same point are shown in Table 3. Poor RS score and severe SSS long-term score of the patients at 3 months were associated with depression of the caregivers at 3 months after stroke onset. Other tested variables (BDI and BI scores of the patients at 3 months) did not reach significance as can be seen in Table 3. However, the severity of patients’ depression at 3 months (BDI score of 19 to 63) was positively associated with the severity of depression among caregivers at 3 months (BDI score of 10 to 63) (OR, 2.57; 95% CI, 1.29 to 5.11). On multivariate logistic regression analysis poor RS score (III to V) of the patients was independently associated with depression of the caregivers at 3 months (Table 3). However, on multivariate linear regression the significance of patients’ depression as the most important risk factor could be seen ($P<.028$), whereas the other factors were no more significant.

Only 25 of 143 depressed patients (17.4%) were undergoing antidepressant drug treatment at 12 months after stroke onset. In terms of frequency of antidepressant therapy, there was no difference between districts with active programs and those without.

### Discussion

The population in this study is the largest unselected stroke population in which the occurrence of depression has systematically been examined. The first major result was the high rate of depression among patients and their caregivers and its persistence. Almost half of the patients and their caregivers were depressed at 3 months after the stroke; although this number had not decreased at 12 months, depression was diagnosed and treated in only a minority.

In an earlier Finnish population–based stroke register, the frequency of depressive patients at 3 months from stroke onset did not reach significance as can be seen in Table 3. However, the severity of patients’ depression at 3 months (BDI score of 19 to 63) was positively associated with the severity of depression among caregivers at 3 months (BDI score of 10 to 63) (OR, 2.57; 95% CI, 1.29 to 5.11). On multivariate logistic regression analysis poor RS score (III to V) of the patients was independently associated with depression of the caregivers at 3 months (Table 3). However, on multivariate linear regression the significance of patients’ depression as the most important risk factor could be seen ($P<.028$), whereas the other factors were no more significant.

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In an earlier Finnish population–based stroke register, the frequency of depressive patients at 3 months from stroke onset was almost the same as in the present study but decreased from 44% to 29% in 1 year. Both studies used the BDI to measure depression, but in the earlier study the cutoff point for depression was higher (≥14 points). Furthermore, the patients were, on average, younger and also had access to a more extensive systematic rehabilitation program than was possible in the present study. In a community-based study by Wad et al., 41% of stroke survivors were classified as depressed during the 1-year follow-up. In a recent study among an unselected stroke population, the incidence of poststroke depression at 1...
The second main result of the present study was that depression among stroke patients was more common in districts without active after-discharge programs than in districts with such programs. This suggests that even a reasonably modest after-discharge rehabilitation program decreases the likelihood of poststroke depression. Processes facilitating the patient’s return to society and new contacts with other people, whether professional (as in the case of group physiotherapy) or lay (as in the case of activities of local divisions of the FHA), seem to be an effective means of reducing the burden of depression in stroke victims and their caregivers.

The proportion of depressive caregivers did not differ between districts with active programs and those without such programs. The only difference verified between active and control districts was that there were more severely depressed caregivers in districts with no active programs at 12 months. Carnwath and Johnson15 studied the occurrence of depression among spouses of stroke patients 3 years after the event. Similar to our observations, they found that 39% of the spouses in the stroke group were depressed compared with 12% in the control group consisting of patients with diseases other than stroke. They also reported that depression increased with time during the 3 years. In a recent Australian study13 in which emotional distress was evaluated among the chief caregivers of 84 stroke patients who had survived 1 year with residual handicaps, half of the caregivers showed evidence of emotional distress.

An important question is which variables are associated with poststroke depression. In our series, female sex and severe SSS prognostic stroke at the onset of stroke were associated with depression at 3 months. On multivariate logistic regression analysis, severe SSS prognostic score and old age emerged as independent contributors to depression. In some earlier studies, female sex also correlated with depression,22–24 perhaps because many stroke patients are older women living alone. Severe SSS score reflects the severity of stroke, and both Wade et al10 and Sharpe et al14 have reported that physical disability and larger lesion volume are associated with depression. Contrary to some earlier reports which found that patients with left hemispheric lesions are more depressive than those with right hemispheric lesions,23,25,25 we did not find an association between depression and side of hemiparesis. This conclusion has been the subject of much controversy, and many researchers, including our team, have disagreed with it.42–48 In our series, the subtype of stroke (infarct/hemorrhage), living conditions at time of stroke (alone/with family), or preexisting diseases were not associated with depression. Living alone did not predict depression in some studies25–28 but did in another.12

In the present study, poor RS score and severe SSS long-term score of the patient at 3 months from onset of stroke were associated with depression of the caregiver at 3 months by univariate analysis. With multivariate logistic regression analysis, only poor RS score of the patient was independently associated with caregivers depression at 3 months. Anderson et al10 did not find a relation between the degree of the patients’ physical disabilities and emotional stress among caregivers, a discrepancy that is hard to understand. In our study, the more severe depression of the patients at 3 months was associated with depression in the caregivers at the same point. It would seem that in paying more attention to stroke caregivers to prevent their depression, we might thereby also achieve better emotional adjustment of the patients. Evans et al11 have reported reduced depression in patients after counseling of stroke caregivers.

In the present study, in districts with active intervention programs, depression occurred significantly less often than in districts without such programs. This supports the idea that encouraging re-establishment of social ties may reduce the risk of depression.

References

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