Depressive Disorders After 20 Months in Elderly Stroke Patients
A Case-Control Study

Thomas Lindén, MD, PhD; Christian Blomstrand, MD, PhD; Ingmar Skoog, MD, PhD

Background and Purpose—Depression is common after stroke. Reported frequencies vary widely between studies because of differences in patient selection, time from stroke to assessment, evaluation methods and diagnostic criteria. Poststroke depression is related to increased mortality and poorer rehabilitation outcome. Few studies have been done in the elderly, and there is a lack of studies with population-based controls. We aimed to examine the risk of depression in elderly patients one and a half years after stroke and to compare the risk with a population-based control sample.

Methods—We examined 149 elderly stroke survivors and 745 age- and sex-matched controls from the general population with semistructured psychiatric examinations and cognitive assessments. Diagnoses were made according to DSM-III-R. Independent samples t test and χ² test were used to test for significance, Mantel-Haenszel odds ratios with 95% CI for relative risk and Tarone statistics for risk differences between groups.

Results—The frequency of depression was 34% in stroke patients and 13% in population controls (odds ratio, 3.4; 95% CI, 2.3 to 5.0). The risk of depression was increased in both men and women and in all age groups but not related to the predominant side of stroke symptoms.

Conclusion—Depression is common after stroke. It is therefore important to identify depression in stroke patients because it is a treatable condition that may have implications for poorer outcome in relation to rehabilitation and mortality.

Key Words: behavioural/psychosocial, stroke ▪ cerebrovascular disorders ▪ depression ▪ epidemiology ▪ rehabilitation

Among the unresolved issues regarding stroke patients’ recovery and rehabilitation is poststroke depression in the elderly. A systematic review of 51 observational studies found a pooled estimate of 33% for depression after stroke. Patient selection, time from stroke, assessment instruments and diagnostic systems, however, varied widely between studies, making the results difficult to interpret. Most studies were done in younger patients and few studies examined the risk of depression in elderly stroke patients. Furthermore, few studies compared depression frequency with age- and sex-matched population-based controls.

The recognition and diagnosis of depression in stroke patients are important because depression has been associated in numerous studies with poorer outcome. Depressed stroke patients have more cognitive impairments and more days in hospital, use more care and are more often institutionalized than the nondepressed. Nevertheless, depression after stroke is often underdiagnosed despite the existence of effective treatment.

We aimed to examine the frequency of depressive disorders in the elderly one and a half years after stroke and to compare these to a sex- and age-matched population-based control sample.

Materials and Methods

Patients
The patients were recruited from the Göteborg 70+ Stroke Study, which included patients admitted to the emergency room at Sahlgrenska University Hospital in Göteborg, Sweden, a secondary care and regional hospital. Patients were eligible for inclusion if they lived in the catchment area and presented with an acute focal neurological deficit of no other apparent cause than cerebrovascular, were aged 70 years or more, and were willing to participate in the study. Exclusion criteria were onset of symptoms >7 days before admission, known cerebral lesion with recognized need of care, extracerebral or subarachnoid hemorrhage or cerebral tumor, coma, indication for specialized neurological care, residence in a nursing home, and no available bed in the stroke units. The physician on call diagnosed the stroke, and the diagnosis was supported by routine investigations including an acute CT. The selection of patients to the study has been described in more detail previously.

The patients were contacted by letter 1 year after the stroke. This was followed by a telephone call to arrange a hospital appointment. If the patient was not able or declined to come to the hospital, the investigation took place in his/her place of residence (n=15, 10%).

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Controls
Controls were selected from the Gerontological and Geriatric Population Studies in Göteborg, Sweden\(^{15}\) and the Prospective Population Study on Women,\(^{16}\) based on samples that are representative of the general population of Göteborg. The same exclusion criteria were applied to the sex- and age-matched control group as to the stroke patients. For each stroke patient, we selected 5 controls of the same sex. They were age-matched by selecting 5 persons as close as possible in age to minimize the difference between the age of the patient and the mean age of the controls.

All subjects (or their nearest relatives) gave their informed consent to participate after receiving verbal and written information. The Ethics Committee for Medical Research at Göteborg University approved the study.

Examinations
The examination included a semistructured diagnostic psychiatric interview, neuropsychological tests and a neurological examination by a neurologist/psychiatrist (T.L.), who was blinded to the type, size and location of the index stroke at the time of the investigation and throughout the diagnostic procedure. The assessment instruments were identical to those in the Gerontological and Geriatric Population Studies and the Prospective Population Study on Women. They included a semistructured psychiatric diagnostic interview including the Comprehensive Psychopathological Rating Scale (CPRS).\(^{17}\)

Outcome Measures
The diagnoses of Major Depressive Episode (MDE), dysthymia (DT), depressive disorder not otherwise specified (DNOS) and dementia were made according to the criteria in the DSM-III-R.\(^{18}\) We used algorithms based on the psychiatric interview and the neuropsychiatric examination, respectively. For practical reasons we did not require evidence of 2 years’ duration for diagnosis of DT. DT and DNOS criteria were pooled and presented as “Mild Depression”. Loads of depressive symptoms were assessed with the Montgomery-Åsberg Depression Rating Scale (MADRS),\(^{19}\) which is part of the CPRS.

Statistical Methods
The SPSS version 11 package was used for statistical analysis. We used an independent samples \(t\) test for analysis of differences in continuous and a \(\chi^2\) test in categorical variables. Relative risks between patients and controls were analyzed as Mantel-Haenszel odds ratios with 95% CIs. Equality within sex and age subgroups was tested with Tarone statistics.

Results
We included 243 patients in the study. Their mean age was 79 years (SD 5.3) and 65% (n=151) were women. A CT of the brain was done in 98% (n=146) of the patients. Acute brain infarction. Three patients had no CT scan. Twenty-seven percent of the stroke patients (n=39) showed signs of previous infarcts on CT, but only half of these were clinically known (n=20).

All categories of depressive disorders were more common in stroke patients than in controls (Table). About one third of the patients (n=50, 34%) had some type of depressive disorder, almost 3 times as many as in the control group (n=97, 13%). Half of these (n=25, 16%) were diagnosed with MDE, which was double the frequency of the control group (n=61, 8.2%). The load of depressive symptoms, as assessed by the MADRS score, was also higher in the stroke patients compared with controls.

The frequency of depression was higher in the stroke patients than in the controls in both women (OR 3.2; 95% CI, 2.0 to 5.2) and men (OR 4.0; 95% CI, 1.9 to 8.3; Table). The frequency of major and mild depression tended to be higher in women than in men, both in stroke patients and in controls, but no statistically significant sex-related differences were found.

The frequency of depression was increased in both those above 80 years of age and in those aged 70 to 79. MDE tended to be more frequent in both stroke patients and controls over 80 years than in the younger group (Table). For the controls, but not the stroke patients, this was also the case for mild depression. The OR for mild depression in patients versus controls was higher in the younger group (OR, 10 versus 2.7; Tyrone \(P=0.04\)), but no other differences in depression OR between patients and controls related to age or sex were found.

Depression was not related to the predominant side of acute stroke symptoms (data not shown).

Discussion
We examined poststroke depression in a consecutive series of elderly stroke patients, one and a half years after their index stroke, and compared the frequency to a population-based control group from the same geographic area. The frequency of depressive disorders was 34% in the stroke patients, a figure similar to results of recent meta-analyses and systematic reviews\(^{20}\) and 13% in controls, similar to what other population-based studies have found.\(^{21}\) This gives an OR of 3.4 for depression in stroke patients compared with controls. The OR for depression was increased among both men and women and in both those above and below 80 years of age.

Some strengths and weaknesses of the study must be addressed. The diagnosis of depression in our study was based on a semistructured interview conducted by a neurologist/psychiatrist in the stroke patients and a psychiatrist in the controls, which probably results in more valid results than using other types of professionals, lay interviewers or self-assessment forms. One recent review of poststroke depression concluded that consistent use of semistructured or structured psychiatric interviews and standardized diagnostic criteria is important for improving comparability between studies.\(^{22}\) The diagnosis of
depression by psychiatrists probably also makes generalization
to clinical diagnosis of depression more reliable.

We aimed to minimize selection bias by not applying some of
the exclusion criteria often seen in studies on neuropsychiatric
consequences of stroke, eg, old age or cognitive performance.
There are, however, certain issues concerning selection bias that
require comment. The elderly population of Göteborg is ethni-
cally homogenous and the results are therefore only representa-
tive for industrialized Western white populations. Our study
included only hospitalized stroke patients, which generally
account for a higher frequency of severe strokes. In Sweden,
however, most cases of mild stroke are treated in hospitals. We
therefore believe that our sample well reflects the population of
elderly stroke patients.

Unlike several previous stroke studies,24–26 we did not ex-
clude patients with aphasia, which 25% (n=1100538) of the stroke
patients had—almost 6 times the frequency of the controls.
Exclusion of patients with aphasia may result in selection bias
against left-sided damage and more severely impaired patients.
Aphasic patients show a high frequency of depression.27 How-
ever, in our study, depressive disorders were not related to
lateralized symptomatologies or aphasia (data not shown). On
the other hand, depressive disorders may be difficult to diagnose
in patients with aphasia, which may lead to an underestimation.

Cognitive impairments, such as aphasia, agnosia, apraxia,
amnesia and disturbances in abstract thinking, among others, are
common in stroke patients.28 It may be difficult to diagnose
depression in these patients.29 One solution to this problem is to
exclude individuals with cognitive impairments, which on the
other hand decreases generalizability. We therefore chose not to
exclude the cognitively impaired. However, excluding demented
patients and controls from the analysis did not change the results
(data not shown).

Some common stroke symptoms are also part of the symptom
profile in depression, eg, sleep disturbances, concentration dif-
ficulties and reduced appetite.30 Stroke symptoms might therefore
falsely be considered symptoms of depression, hence overesti-
mating depression in stroke patients.

Patients that had already been institutionalized before the
index stroke were not included in the study. This probably led to

### Depression in Stroke Patients and Controls

<table>
<thead>
<tr>
<th></th>
<th>Stroke Patients</th>
<th>Controls</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDE</td>
<td>25%</td>
<td>8.2%</td>
<td>2.3 [1.4, 3.7]</td>
</tr>
<tr>
<td>Mild depression</td>
<td>17%</td>
<td>4.8%</td>
<td>4.0 [2.3, 6.8]</td>
</tr>
<tr>
<td>Any depressive disorder</td>
<td>34%</td>
<td>13%</td>
<td>3.4 [2.3, 5.0]</td>
</tr>
<tr>
<td>Mini-Mental State Examination score</td>
<td>24 [3.7]</td>
<td>27 [4.3]</td>
<td>2.7 [1.9, 3.5]</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDE</td>
<td>17%</td>
<td>9.9%</td>
<td>1.9 [1.1, 3.5]</td>
</tr>
<tr>
<td>Mild depression</td>
<td>19%</td>
<td>5.2%</td>
<td>4.2 [2.2, 8.0]</td>
</tr>
<tr>
<td>Any depressive disorder</td>
<td>36%</td>
<td>15%</td>
<td>3.2 [2.0, 5.2]</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDE</td>
<td>8%</td>
<td>5.0%</td>
<td>3.5 [1.4, 8.8]</td>
</tr>
<tr>
<td>Mild depression</td>
<td>14%</td>
<td>4.2%</td>
<td>3.5 [1.3, 9.6]</td>
</tr>
<tr>
<td>Any depressive disorder</td>
<td>29%</td>
<td>9.2%</td>
<td>4.0 [1.9, 8.3]</td>
</tr>
<tr>
<td>Age &gt;80 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDE</td>
<td>17%</td>
<td>10%</td>
<td>2.1 [1.1, 3.9]</td>
</tr>
<tr>
<td>Mild depression</td>
<td>17%</td>
<td>6.9%</td>
<td>2.7 [1.4, 5.3]</td>
</tr>
<tr>
<td>Any depressive disorder</td>
<td>36%</td>
<td>17%</td>
<td>2.7 [1.7, 4.5]</td>
</tr>
<tr>
<td>Age ≤80 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDE</td>
<td>8%</td>
<td>5.5%</td>
<td>2.7 [1.4, 5.3]</td>
</tr>
<tr>
<td>Mild depression</td>
<td>17%</td>
<td>1.9%</td>
<td>10 [3.5, 29]</td>
</tr>
<tr>
<td>Any depressive disorder</td>
<td>30%</td>
<td>7.4%</td>
<td>5.3 [2.7, 11]</td>
</tr>
</tbody>
</table>

All are divided by sex and age.
an underestimation of depressive disorders because depression was common among the institutionalized (data not shown).

One third of the stroke patients in the study-base died before follow-up. These patients were probably more cerebrally impaired than those who survived because greater stroke severity is associated with increased mortality.31 Because depression is associated with stroke severity, this might have led to an underestimation of the frequency of depression in our stroke patients.

We found no association between the patients’ predominant side of symptoms at the time of the stroke and depressive syndromes. This adds to the evidence supporting no side effect.32 However, there is a possibility that lesion location is related to depression in the acute but not in the late stage after stroke.22

Summary
We find here that depressive disorders were more common in elderly stroke patients than in age- and sex-matched population controls and present risk estimates for age- and sex-related subgroups. We did not find evidence for differences in poststroke depression associated to age, sex or side of stroke symptoms. Because depressive disorders have an adverse effect on rehabilitation, quality of life and survival after stroke, this urges stroke clinicians to systematically assess elderly stroke patients for depressive disorders—not only in the acute stage after stroke but also at long-term follow-up. These conditions should be properly treated in order to optimize rehabilitation. Controlled treatment studies should be carried out for poststroke depression in the elderly to find the optimal regimens for this category of stroke patients.

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Disclosures
None.

References