Depression After Stroke: An Investigation Through Catamnesis

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Background: In the early stage of stroke, depression appears to be linked to certain brain areas. The study evaluated the importance of the side of the lesion in depressed patients 3 years after their first stroke.

Method: Patients who had suffered a stroke and been discharged after rehabilitation were identified by hospital records. We interviewed 180 patients at home. Demographic as well as socioeconomic data were collected. The Northwestern University Disability Scale, the Beck Depression Inventory (BDI), the Relatives' Stress Scale, and the Social Dysfunction Rating Scale were applied. The diagnosis was confirmed for each patient by a clinical assessment according to the ICD-10 criteria. Patients with previous psychiatric treatment, comprehension problems, or severe hemi-inattention were excluded.

Results: By using a score of 14 on the BDI as a cutoff, 62 patients (34%) proved to be affected by depressive disorders. Clinical records showed that the location of the lesion was in the right hemisphere for 37 patients and in the left hemisphere for 25 patients. Statistical analysis of the mean scores obtained in this subgroup of depressed patients showed (1) no significant relation between depression and the hemispheric location of the lesion or between depression and level of education; (2) relation between BDI score and social activities; and (3) stress on the relatives that was mainly dependent on both the disability of the patients and their loss of social activities, whereas depression played a minor role.

Conclusion: A high percentage of patients have depressive disorders 3 years or more after the stroke, independent of the side. Such mood disorders worsen the relationship between the disabled patients and their relatives and worsen leisure independent of the affected hemisphere.

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Depression has been found to be a frequent psychiatric complication of stroke. The reported prevalences vary widely from 25%[1] to 50%–60%.[2] It is probable that many discrepancies in the literature are primarily due to the nonhomogeneity of the group of patients (community-based, rehabilitation center, general hospital, outpatients clinic) studied for different lengths of time after the cerebral vascular accident with different diagnostic tools.[3]

The relationship between depression and the location of brain damage is disputed. According to some authors,[4,5] there is no significant relation between the two phenomena; a direct relation exists only between depression and the extent of the brain damage. Yet, the group of Robinson[6] and others[7] maintain that the prevalence and severity of depression are positively related to lesions localized in the cortical left frontal region and in the subcortical left basal ganglia, mainly in the head of the caudate nucleus, but not to those in the thalamus.[8]

There is substantial agreement about the lack of significant relation between the degree of disability and depression,[9,10] but there have been several studies suggesting that depression may impair long-term recovery in activities of daily living after stroke,[11] can adversely affect resumption of social activities,[12,13] and can produce stress in relatives.[13] Most investigators have concerned themselves with the acute phase, while there have been only few recent and systematic studies on depression in long-term survivors of stroke.[7,11–16]

Standardized psychiatric interview schedules offer greater diagnostic accuracy, but, in large epidemiologic studies of depression outcome, they become expensive and time-consuming. We used a quick, easily administered, self-report screening scale. Those patients identified as possible cases were then interviewed using a standardized psychiatric interview.

The aim of this study was (1) to determine the incidence of depression after at least 2 years in stroke patients who had returned to the family environment and (2) to assess the relation between the location of the vascular lesion (particularly the hemispheric side) and depression, daily activities, social activities, and family stress; as well as between patients' disability and stress on their relatives and between depression and level of education.

METHOD

Subjects

The research was carried out in the metropolitan area of Rome and in the Marche region in the following stages: (1) patients who had suffered a stroke and been discharged after a period of rehabilitation were identified from the records of San Giovanni Battista Hospital in Rome and the Neurological Clinic of the University of Ancona; (2) clinical and neuroimaging definitions of the acute, ischemic, or hemorrhagic phases of the stroke, excluding transient ischemic attacks, were arrived at by using the clinical records of the hospital stay; each patient had undergone a CT scan without enhancement for defining lesion location; (3) permission to do the interview was obtained by phone; (4) psychiatric and stress data were collected using identical systems in the two centers and evaluated statistically. One hundred eighty patients were interviewed for this research. The group was 65% men and 35% women. The mean ± SD age was 63.3 ± 23.5 years (range, 35–85). These patients had received a mean total of 148.0 ± 74.1 hours of physiotherapy (range, 5–283). They were discharged with a mean Rankin scale[17] score of 2.8 ± 4.6 (range, 1–4). The mean length of schooling was 10.0 ± 4.6 years (range, 2–19). The median time between the stroke and the interview was 37.5 months (range, 25–51). Any data relating to cases with a Beck Depression Inventory (BDI)[18] score of less than 14 were discarded. According to this scale, a score of 0 to 7 shows no depression and from 7 to 14 shows moderate depression. By using a cutoff point of 14, patients whose depression was greater than that of normal, age-matched subjects (8.5 ± 1.9 in our previous research[7]) were chosen. BDI scores were compared with the clinical psychiatric evaluation in each case. Patients suffering from severe aphasia, unable to cope with the BDI, or diagnosed with denial syndrome were not included. Patients with previous psychiatric treatment were also excluded.

CT Scan Analysis

CT scan analysis was performed with the same machine setting (slice thickness, 5 mm; increment, 6 mm). The anteroposterior location of each lesion was considered as the mean distance of the anterior and posterior borders of the lesions from the frontal pole, expressed as a percentage of the maximal distance.[6] Twenty-five depressed patients had a lesion on the left side: the location was purely subcortical in 15 cases (60%), both cortical and subcortical in 7 cases (28%), and purely cortical in 3 cases (12%). Thirty-seven depressed patients had a lesion on the right side: the location was purely subcortical in 23 cases (62%), both cortical and subcortical in 10 cases (27%), and purely cortical in 4 cases (11%). The distance of the lesion from the frontal pole ranged between 15% and 40% on the left side and from 18% to 42% on the right side, compared to the total anteroposterior distance. Lesions analyzed by CT scan in the left frontal areas were 11.1% and in the right frontal areas were 16.6% of the total. An isolated lesion in the caudate nuclei was never found in this study. However, the left caudate nucleus was affected in 11.1% of cases.

Scoring

The enquiries were made in the home. The researchers were trained psychiatrists, who applied a structured psychiatric interview. The method for assessing interrater reliability was the intraclass correlation coefficient. The research started once the researchers had attained 95% agreement in their test evaluations. The following data were collected: (1) personal details, address and telephone number, diagnosis showing the hemisphere affected, score on the Rankin scale[17] on leaving hospital, date of discharge (this information was obtained from hospital record); (2) individual socioeconomic status, manual dexterity, past and present jobs, pastimes, previous hobbies, presence of others in the household, level of housing, ease of access to the apartment, square meters of space for the patient, public transport facilities, other hospital stays for the stroke or other reasons, the number of physiotherapy sessions carried out in a public health surgery or privately (with relevant hourly cost), economic means of the patient (invalidity or old-age pensions, private insurance, etc.), return to previous job or another job; (3) the Northwestern University Disability Scale (NUDS)[19] used for activities of daily living; (4) the BDI,[18] not applied to aphasic patients; (5) the Linn Social Dysfunction Rating Scale[20] (a measurement of social activities); (6) the Greene Relatives' Stress Scale[21]; and (7) comparison between the BDI score and the clinical assessment of depression by ICD-10 criteria.

Statistical Analysis

Conventional statistics and distribution function were applied. The t test was used with the significance level set

Table 1. Multiple Regression Analysis in 62 Patients With a BDI Score ≥ 14

Dependent Variable	Constant	Beck	Linn	Greene	NUDS	F (df = 3,58)	p	R^2
Beck	8.80	…	0.23[a]	0.03	– 0.09	11.18	< .0001	0.37
Linn	25.28	1.35[a]	…	0.24	0.11	11.51	< .0001	0.37
Greene	29.94	0.14	0.19	…	– 0.12	2.41	.07	0.11
NUDS	39.43	– 0.39	0.08	– 0.11	…	1.06	.38	0.05

[a]Indicates significant coefficients.

at 5%. The null hypothesis of no difference was tested against the two-sided alternatives. Because multiple comparisons were performed, the Bonferroni adjusted alpha risks statistic was used. The multiple regression was used four times, with the BDI, NUDS, Linn, and Greene scores as dependent variables. Statistical methods for comparison of two proportions was also used.

RESULTS

Incidence of depression 2 years or more after the stroke. By using the cutoff of 10 on the BDI scale, a subgroup of 90 patients (50%) with a depressive syndrome was found. By contrast, using the cutoff (criterion) of 14 on the BDI scale, a subgroup of 62 patients (34%) with a depressive syndrome was obtained. In all of these patients, the diagnosis of depression corresponded to the ICD-10 criteria. This subgroup, in its turn, was divided into two other subgroups, one with vascular lesions in the left hemisphere (25 patients; mean ± SD age = 63.4 ± 9.7 years; men, 68%), and the other one with the lesion in the right hemisphere (37 patients; mean ± SD age = 64.2 ± 11.5 years; men, 64%). None of the patients attempted suicide, even those with severe poststroke depression. Only 5 (8%) of the subgroup of 62 patients with a BDI ≥ 14 were taking antidepressant drugs. Of the patients who had a prior episode of depression, the percentage of patients with poststroke depressive symptoms was 9.7% and without poststroke depressive symptoms was 2.5% ($z = 2.11$, $p < .05$).

Lateralization of hemispheric lesion and depression. On the basis of the BDI, the patients with a left cerebral lesion were found to have a mean score of 23.3 ± 6.5 and those with a lesion on the right a mean score of 23.4 ± 6.3 ($t = 0.068$, $df = 60$, N.S.). Therefore, in our patients, delayed depression following a stroke has no relation to left or right hemispheric damage. By applying a cutoff at BDI > 25, 24 cases (13.3%) were found. In this case, 14 right-hemisphere-injured and 10 left-hemisphere-injured patients were selected, and again the difference was not significant ($t = 0.276$, $df = 22$, N.S.). In particular, the specific hemisphere locations associated with affective disorders in the early phase of stroke (i.e., left anterior and right posterior lesions) were not confirmed in these subgroups.

Lateralization of the lesion and activity of daily living (ADL). By using the NUDS for ADL, patients with damage in the left hemisphere had a mean score of 35.6 ± 10.5. Those with a lesion in the right hemisphere, 30.1 ± 10.3 ($t = –0.839$, $df = 60$, N.S.). This statistical comparison shows that the lateralization of the lesion has no significant effect on ADL in patients with poststroke depression.

Lateralization of the lesion and social activities. Depressed patients with a lesion in the left hemisphere had a mean score of 66.0 ± 15.9 on the Linn scale. Those with a lesion in the right, 74.1 ± 14.5, ($t = –2.240$, $df = 60$, N.S.).

Lateralization of the lesion and family stress. Relatives of depressed patients with a lesion in the left hemisphere had a mean score on the Greene scale of 38.6 ± 11.8; relatives of patients with a lesion in the right hemisphere 45.5 ± 11.2 ($t = –1.916$, $df = 60$, N.S.).

Depression, disability, social activity, and stress on the relatives. By applying multiple regression to the whole population, and to the two subgroups (left and right lesions), the equations were obtained for each dependent variable (Table 1). We can see that depression is mainly linked to the reduction of social activities and vice versa.

Depression and level of education. In depressed patients who had been educated for 10 years or more, the mean score on the BDI was 19.65 ± 7.15, while in the remaining patients with a shorter period of education, the mean score on the same scale was 20.89 ± 7.91 ($t = –0.581$, $df = 49$, N.S.).

DISCUSSION

The present study shows a high incidence of depression in patients who had suffered a stroke more than 2 years before and were now reintegrated with their family. This fits with previous findings that show a high prevalence of depression 2 years or more after a stroke.[7,11,14] Our findings of high frequency were confirmed by comparison with values of an unselected population-based control group without cerebral pathology, previously reported by us.[13] The present investigation also shows that 3 years after stroke there is no correlation between the depression and the location of lesions in the right or left hemispheres. Similar results were already reported in previous studies of long-term poststroke depression.[7,15,16] The

location of the lesion does not seem to play a crucial role, at least in late depression after stroke.

Our results, as well as those of previous studies, suggest a possible role of both individual and psychosocial factors in genesis and outcome of later poststroke depression. Absence of a close personal relationship was associated with depression in the study by Sharpe et al.,[15] "few social contacts" is the most important predictor of depression 2 years after stroke, according to Astrom and colleagues,[7] and a close correlation was observed by Angeleri et al.[13] between depression, social activity, and stress on relatives. Reduced social contacts and criticism by parents can be a cause as well as a result of depression; the contribution of these factors requires further examination.

We recognize that there are some limitations in our study. The generalizability of our findings may be limited by the population studied. The patient sample was potentially biased by including only patients admitted to a rehabilitation center. This was an outpatient population of stroke patients reintegrated with their family. Most severely impaired patients needing chronic institutional care after a stroke were not examined, and depression is associated with residence in an institution.[15] We excluded dysphasic patients with severe comprehension deficit incapable of undergoing a psychiatric interview, as has been done in many studies.[4,6,11] However, Astrom et al.[7] and Sharpe et al.[15] showed that aphasia is not an independent predictor of depression 2 years after stroke.

Because our findings rely on a valuation at one time point, we could not establish the course of depression in our patients. Survival may be influenced by depression (e.g., suicide), but Astrom et al.[7] showed that mortality in their cohort of stroke patients was not associated with previous diagnosis of poststroke depression.

There is a discrepancy between the abundance of studies focusing on depression after the acute phase of stroke and the scarcity of data collected in long-term outcome. Robinson et al. found in a 2-year longitudinal study of 65 patients that 9 patients (14%) met criteria for major depression and 12 patients (18%) for minor depression.[16] Sharpe et al. found in an Oxfordshire community-based stroke project that depression (major depression and dysthymia) was present in 11 (18%) of 60 patients, interviewed 3 to 5 years after their first stroke. Depression was associated with functional dependence, lesion volume, and female sex.[14,15] Astrom et al. found that the prevalence of major depression 3 years after stroke was 29%; predictors were reduced social contacts (outside immediate family), cortical and subcortical atrophy, but not location of lesion.[7] In 47 stroke patients, no significant differences were found between depression scores in patients with left hemisphere lesions compared with patients with right hemisphere lesions. Nor was correlation between the severity of depression and the anteriority or the volume of lesion seen.[22] In that study, the only association was between lesion location and DSM-III-R diagnosis of major depression, but the crucial area in 9 patients involved the lentiform nucleus. In 20 stroke patients, results were different after 1 year[23]: within 1 month from clinical onset, the anterior border of the lesion had a lower distance from the frontal pole in depressed patients with a left hemisphere lesion, but this difference was no longer confirmed 1 year later. By contrast, depressed patients with a right hemisphere lesion showed at baseline a greater extent of lesions in dorsal areas than the other patients, and yet these findings were not confirmed after 12 months. The importance of variables other than the biological ones is supported by the finding of higher BDI scores in hemiplegic women.[13]

Social activities are impaired by depression, but this impairment is independent of the affected hemisphere and education. The rehabilitation of stroke patients is not only the recovery of movement, but the return of the patients, as much as possible, to the life they had before the stroke. Early diagnosis, attention to both biological and nonbiological variables, and adequate treatment of depression are important approaches to improve the living condition of these patients.

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