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Investigation of Prevalence and Associated Risk Factors of Depressive Symptoms Following Acute Ischemic Stroke (PSD) in the Aged

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Objective: The study aimed to investigate the prevalence and **associated** risk factors for post stroke depression (PSD), and their clinical correlations. **Method:** A consecutive cohort of 102 ischemic stroke patients with a mean age of 72.6 ± 7.2 years, were studied. Hamilton depression rating scale (HDRS), modified motor assessment scale (MMAS) and Barthel index (BI) were administered. Risk factors of PSD studied were gender, laterality of stroke, family history of depression and post stroke functional impairment. **Results:** From assessment with the HDRS, 71 (69.6%) of the subjects were non-depressive and the rest 31 (30.4%) had depression. Depressive symptoms (HDRS > 10) were relatively common, but the prevalence of severe depression (HDRS >17) was only 7.0%. Patients with depressive symptoms were more likely to be female($X^2 = 4.01$, $P = 0.039$), have a family history of depression($X^2 = 3.87$, $P = 0.045$), and a poor functional status(MMAS, $t = 2.18$ and $P = 0.016$; BI, $t = 3.74$ and $P = 0.009$). **Conclusion:** Our findings indicate that depressive symptoms occurred in about one third of post stroke patients. Important risk factors found for PSD included gender, family history of depression and functional impairment.

Keywords: Depression, Post-Stroke, Prevalence, Risk Factors, Investigation

Introduction

Stroke is a common neurological problem and the third leading cause of death in developed countries of the world (Katra , Dale & Crome, 1993; Warlow, 1998). Among survivors, over 50% have significant disabilities, and in clinical practice, neuro-psychiatric disturbances are also frequent (Jongbloed 1990; Hankey, 2007). Depression is an important common problem for patients who have experienced strokes, and post-stroke depression (PSD) is present in at least 30% of the survivors of strokes (Gainotti, Antonucci, Marra et al., 2001; Carson, MacHale, Allen et al., 2000). However, a consensus on the prevalence and associated factors of PSD has not been reached. Recently systematic review suggested that stroke severity or physical disability and functional impairment are important factors associated with depression (Herrmann, Black, Lawrence et al., 1998; Singh, Black, Herrmann et al., 2000). Other possible risk factors include age, gender, lack of social support, and of psychiatric family history (Andersen, Vestergaard, Ingemann-Nielsen et al., 1995). In China, the paucity of data on PSD and its associated risk factors prompted this study. This prospective study was to assess the prevalence of depressive symptoms following acute ischemic stroke in a teaching hospital in China and the associated risk factors for PSD.

Subjects and Methods

Patient Population

One hundred-two patients were selected from consecutive inpatients in the geriatric department of No.1 affiliated hospital of medical school, Zhejiang university over two year period from October, 2008, until September, 2010 for problems related to acute ischemic stroke. The diagnosis of acute stroke met the classification of cerebrovascular diseases III of the National Institute of Neurological Disorders and Stroke (Special Report, 1990). The stroke patients were studied made up of 63(61.8%) males and 39(38.2%) females. The mean age of this group was 72.6 ± 7.2 years (ranges: 68 - 82). All patients with a known history of alcohol abuse, dementia, current antidepressant treatment, or severe Parkinson's syndrome were excluded. Patients with aphasia and difficulties for interview were also excluded. The necessary socio-demographic data was obtained from each subject. Lesion location was defined by CT or MRI during the stroke onset. As part of the approved ethical clearance for the study, informed consent was also obtained from each patient.

Instruments

The subjects were studied using the following instruments:

Hamilton Depression Rating Scale (HDRS) (Carr, Shepherd, Nordholm & Lynne, 1985)

The post-stroke depressive symptoms were assessed by a neuropsychologist with the Hamilton Depression Rating Scale (HDRS). We defined patients as having depression if the HDRS score was above 10. Patients with an HDRS score between 10 - 13 were defined as having mild depression, 14 - 17 as moderate, and above 17 as severe.

Barthel's Index (BI) (Buchanan, 1986) ***and Modified Motor Assessment Scale (MMAS)*** (Sim, Reid, Pallett &Gordon, 1975)

Functional status was measured by a neurologist in the ward

with the Barthel's Index (BI) and Modified Motor Assessment Scale (MMAS). The BI has scores between 0 and 100, with the top scores implying a complete functional independence in daily life activities. The MMAS is an instrument used to assess functional, that is motor impairment in stroke patients. It is an eight-task item instrument. The possible scores for each item task is 0 - 6, with a maximum of 48 points in overall assessment.

Testing Routine

Each subject was administered the HDRS to complete. Thirty-one patients (30.4%) had depressive symptoms from HDRS assessment. The questionnaire was completed by the first researcher in line with such subject's choice for each item. Each of the subjects was also assessed with the Modified Motor Assessment Scale (MMAS) and Barthel index (BI) to determine his/ her levels of motor functioning/ impairment for a comparison of percentage of PSD between two groups (Figure 1).

Data Analysis

Descriptive statistics were used to summarize data. Between-group comparisons were made with the t-test for continuous variables, and Chi-square test of independence for dichotomous variables. Pearson correlation was used to test the strength for the relationship between depressive symptoms (HDRS scores) and functional status (MMAS scores). Tests were two-tailed, and the results were considered significant at $P < 0.05$. Analyses were conducted using SPSS version 10.0 for Windows (SPSS Inc. U.S.A.).

Results

Clinical Characteristics of Study Subjects

One hundred-two patients admitted to the geriatric department of No.1 affiliated hospital of medical school, Zhejiang university over two year period from October, 2008, until September, 2010 for problems related to acute ischemic stroke. The stroke patients were studied made up of 69(67.8%) males and 33(32.2%) females. The mean age of the subjects was 72.6 ± 7.2 years, and age range of 68 - 82 years. All the patients received inpatient rehabilitation treatment every day after the initial medication (e.g. Cerebrolysin, neuroprotective agent, manufactured by EBEWE Pharma, Vienna, Austria and Seroxat, antidepressant, manufactured by GlaxoSmithKline Pharma, London, United Kingdom). The mean duration of hospital stay was 45 days (range 21 - 85 days). Thirty-one patients (30.4%) had depressive symptoms from Hamilton Depression Rating Scale (HDRS) assessment. There were no significant differences in the age of stroke onset and the laterality of stroke focus. In contrast, the depressed patients were more likely to be female($P < 0.05$), and to have the family histories of depression($P < 0.05$) (Table 1).

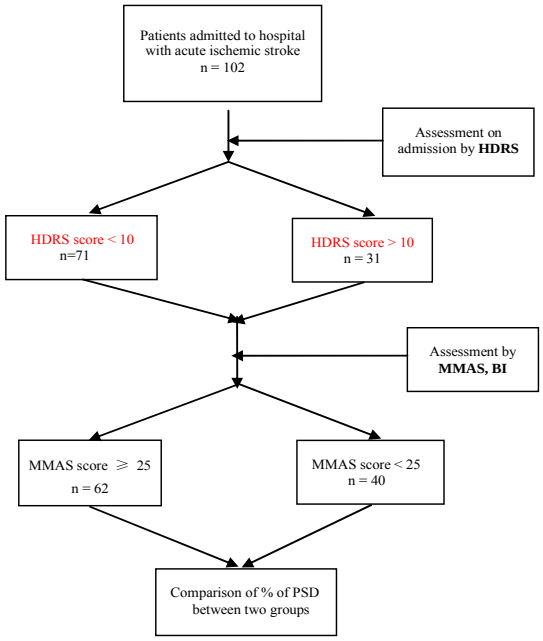

Figure 1.
Testing routine.

HDRS scores/ post stroke depression (PSD)

From the scores obtained on HDRS by the subjects, 71(69.5%) were normal while the remainder, 31(30.4%) were depressed. According to HDRS classification, eleven (10.8%) were mildly depressed, 13 (12.7%) moderately depressed, and 7(7.0%) severely depressed (Table 2). Overall, the mean HDRS score for the depressed subjects was 14.9 ± 6.3.

Post Stroke Functional Impairment and Its Relationship to PSD

For post stroke motor functional level as assessed with MMAS, 40(39.2%, N = 102) of the subjects had poor motor functioning (that is MMAS score less than 25). Of this category, 19(15.7%) had PSD on HDRS assessment. Hence, 47.5% (19 out of 40) of those with "poor" motor functiod thus subjects with "poor" motor functioning constituted 61.3% (19 out of 31) subjects with PSD. For the rest 62(60.8%, N = 102) with "good" motor functioning (MMAS score ≥ 25), only 12, that is 19.4% of the 62 subjects with "good" MMAS scores had PSD;

Table 1.
Clinical characteristics among different groups with depressive symptoms.

Variable	Depressive Symptoms		Statistics	
	Absent	Present		
	(HDRS < 10) (n = 71)	(HDRS ≥ 10) (n = 31)	t or X^2	P
Age onset year	71.9 ± 8.2	72.4 ± 7.3	T = 0.46	NS
Gender (female)	23 (32%)	16 (53%)	$X^2 = 4.01$	0.039*
Family history (depression)	3(4%)	4 (14%)	$X^2 = 3.87$	0.045*
Right hemisphere stroke	31(44%)	14(45%)	$X^2 = 1.35$	NS
Left hemisphere stroke	29(41%)	13(44%)	$X^2 = 1.87$	NS
Modified Motor Assessment Scale	17.3 ± 6.1	11.2 ± 6.7	T = 2.18	0.016*
Barthel Index	91.8 ± 11.1	70.2 ± 9.3	T = 3.74	0.009**

* $P < 0.05$, ** $P < 0.01$, NS indicates not significant.

Table 2.
*Severity of Depressive Symptoms from HDRS Assessment** (*N* = 102).

	Number	Percentage(%)
No depression (HDRS score <10)	71	69.5
Mild depression (HDRS score 10 - 13)	11	10.8
Moderate depression (HDRS score 14 - 17)	13	12.7
Severe depression (HDRS score >17)	7	7.0
Total	102	100.0

*Mean HDRS score in the depressed subjects: 14.9 ± 6.3.

showing that subjects with "good" motor functioning constituted 38.7% (12 out of 31) subjects with PSD. Thus, the ratio of subjects with the "good MMAS score" to the "poor MMAS score" that had the complication of PSD is 1:2.4 (Table 3).

Correlations between depression rating scale scores and functional outcome measured by the MMAS and the handicap level measured by Barthel index (Table 1) were significant ($r_{MMAS} = –0.33$, $r_{BI} = –0.38$, respectively, $P < 0.01$), showing a significantly negative relationship between depressive symptoms and functional status.

Discussion

Stroke remains a major cause of death and disability in China (Wei, Huang, Wang et al., 2011), but little attention has been focused on the possible psychiatric morbidity that could complicate the problem among survivors (Fuh, Liu, Wang et al., 1997). In our study, an attempt was made to evaluate for depression with particular focus on prevalence and associated risk factors in the old patients of ischemic stroke.

The prevalence of PSD in different studies is difficult to compare because of different evaluation methods, diagnostic criteria, and patient sources. Past studies have found that depression is a frequent sequela of stroke, and the prevalence ranged from 12% to 64% (Lam, Lee & To, 2010). Most of these studies were restricted to stroke patients seen at outpatient clinics or admitted to general hospital. Those studies may have included patients with more severe and persistent handicaps. Conversely, department of geriatrics sampling methods, may include patients with more mild-moderate deficits and/or no disabilities (Burvill, Johnson, Jamrozik et al., 1995]. The rate of depressive symptoms in our study (30.4%, 31 out of 102) is almost identical to the prevalence of depressive disorder in the two studies by House et al. (1990) (32%) and Wade et al.

Table 3. Analysis of Post Stroke Functional Impairment (N = 102).

Post Stroke Impairment	No. of PSD	% of PSD	% of MMAS Scores
MMAS ≥ 25	12	38.7	19.4 (n = 62)*
MMAS < 25	19	61.3	47.5 (n = 40)
Total	31**	100	

*"Better" Motor Functioning:"poor" Motor Impairment for PSD = 1:2.4; **Mean MMAS scores in depressed subjects: 11.2 ± 6.7; Mean BI scores: 70.2 ± 9.3.

(32%) (Wade, Legh-Smith & Hewer, 1987), but the incidence of severe depressive symptoms (7.0%, 7 out of 102) was lower than these two studies (13% and 20%, respectively). The prevalences from all three studies are considerably lower than those reported from surveys from rehabilitation units (Robinson, Kubos, Starr et al., 1984; Sinyor, Jacques, Kaloupek et al., 1986). The reason why the prevalences were so different may be because of the difference in the nature of the sample or the assessment measures utilized.

From various studies in Europe and America, a number of risk factors have been identified for PSD among stroke survivors. In a systematic review by Oumet et al. (2001), gender, family history of depression or psychiatric illness, social isolation and functional impairment were consistently identified as risk factors for PSD. In our study, gender was found to be an important risk factor of PSD that is, the female subjects were more likely to develop PSD than their male counterparts ($P < 0.05$). And the presence of family history of depression was in agreement with some previous studies where a positive family history showed a higher probability of developing PSD than none (Angelelli, Paolucci, Bivona et al., 2004). The relationship between stroke laterality and PSD is a controversial one. In a systematic review by Carson et al., 39 studies found no significant difference between stroke laterality (site of lesion) and PSD, two reported increased risk with left sided lesions and seven reported increased risk with right sided lesions (Carson, MacHale, Allen, 2000). However, in our study, subjects with PSD were not more likely to have their stroke lesions over the left or right hemisphere and the difference in laterality was not statistically significant.

Stroke survivors often suffer some degree of long term impairment such as partial or complete loss of locomotion with about 80% of patients with acute stroke presenting with weakness or paralysis of either the upper or lower extremity or both. Other possible areas of impairments include activities of daily living (ADL), cognition and communication skills (Green, Forster, Bogle & Young, 2002; Nannetti, Paci, Pasquini et al., 2005). In our study, motor impairment was found to be an important risk factor of PSD. The study demonstrated 19.4% of subjects (62) with "good" MMAS score (motor performance, MMAS ≥ 25) had PSD as compared with 47.5% of subjects (40) with "poor" MMAS score(MMAS < 25), showing that the ratio of "better" motor functioning versus "poor" motor impairment for PSD was 1:2.4.

Thus, we found a significantly negative relationship between the prevalence of depressive symptoms following ischemic stroke and their activities of daily living (functional status). These results should not be surprising, especially in view of the findings of the Medical Outcome Study which has showed that patients with depressive symptoms had poor functioning (Wells, Stewart, Hays et al., 1989).

Psychologically, early identification of depression symptoms and early initiation of aggressive treatment may prove beneficial in reducing stroke recurrence and decreasing mortality (Dafer, Rao, Shareef & Sharma, 2008). The present study emphasizes the need to screen for depressive symptoms because it is related to the prognosis. Double-blind controlled trials have documented the efficacy of tricyclic antidepressants (Lipsey, Robinson, Pearlson et al., 1984) and selective serotonin reuptake inhibitors (Dam, Tonin, De Boni et al., 1996) in treating

post-stroke depression. It is unclear whether the amelioration in depressive symptoms will be associated with improvement of functional status. Further studies are needed.

Conclusion

Our study indicates that depressive symptoms occurred in about one third of post stroke patients. Important risk factors found for PSD included gender, family history of depression and functional impairment. There is a negative correlation between depressive symptoms and functional status of the patients.

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