STUDY ON CORRELATION BETWEEN POST STROKE DEPRESSION AND COGNITIVE IMPAIRMENT

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ABSTRACT

Objective. Our study was designed to assess the cognitive impairment after ischemic stroke and to study its correlation with poststroke depression.
Methods. We studied a series of 94 consecutive patients (45 men and 49 women, mean age 68,9 years) with acute first-ever ischemic stroke. The patients underwent a neurological and neuropsychological examination at baseline, after 6 months and after 12 months. For the cognitive assessment we used Mini Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA) and for the evaluation of depression we used Hamilton Depression Rating Scale (HDRS).
Results. Depression was diagnosed in 48 patients (49%) at 6 months and in 55 of the patients (54%) at 12 months after ischemic stroke. The cognitive impairment was higher at 12 months than at 6 months; the depressive patients had more severe cognitive impairment than the nondepressive patients.
Conclusions. A lot of patients suffer from depression after stroke, and the frequency of depression seems to increase during the first year. The post stroke depression (PSD) is correlated with the cognitive impairment. We emphasize the importance of psychiatric assessment of stroke patients.
Key words: ischemic stroke, cognitive impairment, depression

INTRODUCTION

Despite a steady decline in the incidence of stroke over the last 50 years, due to improvement in the treatment of diseases such as hypertension, diabetes mellitus and hypercholesterolemia, this disorder continues to represent a major health problem. Stroke is the second leading cause of death worldwide. Depression is the most frequently occurring psychiatric disorder after stroke. The vast majority of the literature has studied depression after ischemic stroke only, not hemorrhagic stroke; therefore the term "poststroke depression" (PSD) will be used here to indicate depression related to ischemic stroke. Depression has been consistently associated with poor cognitive status and functional outcome in stroke survivors.[1,2] Deficits in one or more domains of cognitive functioning are along with motor impairment the most common complications after stroke. After stroke a lot of disturbances appear in the various cognitive domains such as attention, language, executive functions affecting the ability to analyse, interpret, organize, plan and execute complex informations.

Evaluation of the cognitive impairment is important because it can enable early medical management in order to prevent severe dementia. There are numerous scales for neuropsychological assessment. Mini Mental State Examination (MMSE)[3] is still the most widely used in the assessment of patients with memory complaints, although it lacks sensitivity in detecting mild cognitive impairment or early stages of dementia. Montreal Cognitive Assessment (MoCA) is an easy to administer and brief screening tool with high sensitivity and specificity for mild cognitive impairment after stroke.[4] MoCA was designed as a rapid screening instrument for mild cognitive impairment. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculation, orientation. The

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short term memory recall task (5 points) involves two learning trials of five nouns and delayed recall after approximately 5 minutes. Visuospatial abilities are assessed using a clock drawing task (3 points) and three-dimensional cube copy (1 point). Multiple aspects of executive functions are assessed using an alteration task adapted from the Trial Making B task (1 point), a phonemic fluency task (1 point), and a two item verbal abstraction task (2 points). Attention, concentration and working memory are evaluated using a sustained alteration task(target detection using tapping, 1 point), serial substraction task (3 points) and digits forward and backward (1 point each). Language is assessed using a three-item confrontation naming task with low-familiarity animals (3 points), repetition of two syntactically complex sentences (2 points) and the above mentioned fluency task. The orientation to time and place is evaluated with 6 points. A previous study indicated that the subjects with 12 years of education or less had worse performance on MoCA, so 1 point was added to total MoCA score (if total score was < 30 points). The total possible score is 30 points; a score of 26 or above is considered normal.

HDRS is a scale that attempts to determine the severity of the depression. It evaluates 17 different items. Its range of results is 0-55 points; the more points, the more severe the depression.[5]

OBJECTIVE

Our study was designed to assess the cognitive impairment after ischemic stroke and to study its correlation with poststroke depression.

MATERIAL AND METHODS

94 consecutive patients (45 men and 49 women, mean age 68,9± 8,5 years) with first-ever brain infarction admitted to the Clinic of Neurology Craiova were included in our study. Patients with transient ischemic attack as well as patients with previous psychiatric illnesses or central nervous system disorders and alcoholism were excluded. 74 (78,72%) of the patients had neurological deficits attributable to a hemisferic brain infarction located in the internal carotid artery territory, 39 in the left hemisphere (52,70%), and 35 (47,30%) in the right hemisfere. 16 of the patients (17,02%) had clinical signs of brain stem infarction and 4 of them, signs of cerebellar infarction. We performed to all patients CT scan or IRM of the brain on admission to the hospital for a correct diagnosis. Upon giving an informed consent, the patients were neuropsychologicaly tested. The cognitive assessment was made using MMSE and MoCA. We have also used Hamilton Depression Rating Scale (HDRS) to evaluate the depression after stroke. We divided patients in two groups: group A composed of depressive stroke patients (48 of the patients at 6 months and 55 of them at 12 months) and the group B composed of the nondepressive stroke patients (46 of the patients at 6 months and 39 at 12 months). The assessment was made at baseline, after 6 months and 12 months later. For the statistical analysis we used the Student test ($p < 0,05$ statistically considerable).

RESULTS

Depression was diagnosed in 48 patients (49%) at 6 months and in 55 of the patients (54%) at 12 months after ischemic stroke (Fig1).

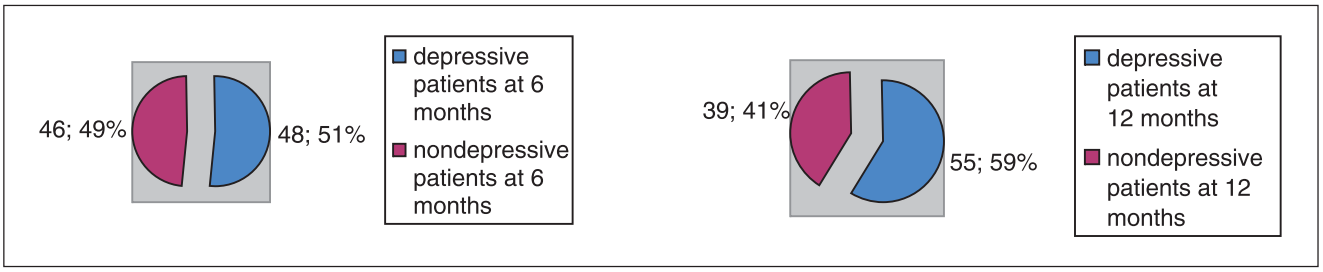

Figure 1. *Depressive disorders after 6 months and 12 months*

In group A, using HDRS we obtained the next mean scores: at baseline 14,7; after 6 months 16,9 and after 12 months a mean value of 18,9. In the group B, the mean scores on HDRS were: 7,9 at baseline; 8,7 after 6 months and 9,6 at 12 months. (Fig. 2).

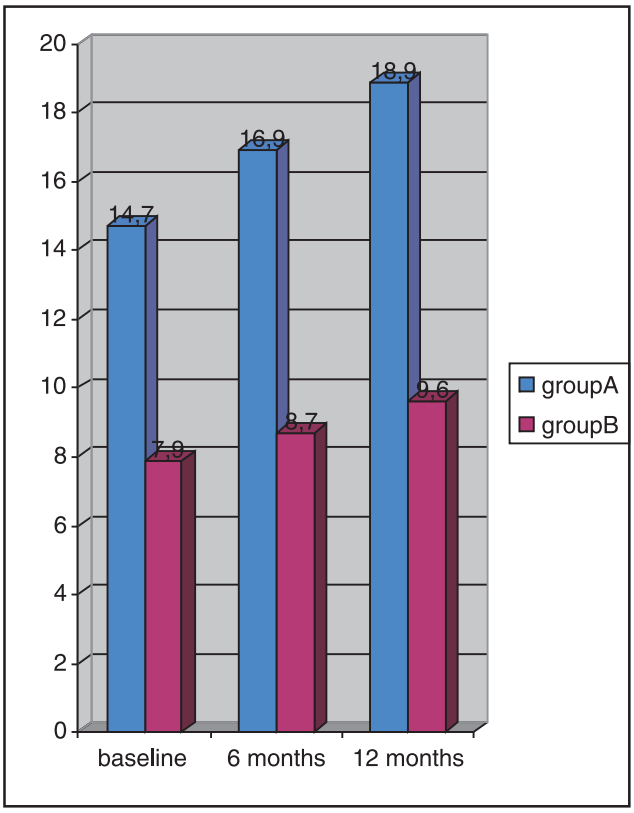

Figure 2. *Mean HDRS score in stroke patients at baseline, 6 and 12 months*

Assessing the cognitive state using MMSE, the group A showed a mean MMSE score at baseline of 27,3 points, after 6 months 25,4 points and mean value of 24,7 at the end of the study. In group B we obtained a mean MMSE score of 27,9 at the beginning of the study, at 6 months a mean value of 26,9 and 26,4 after12 months. (Fig 3)

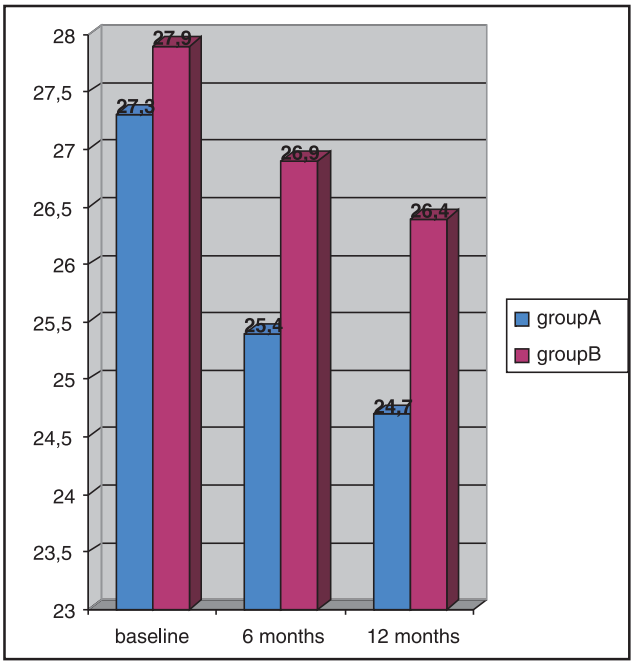

Figure 3. *Mean MMSE score in stroke patients at baseline, 6 and 12 months*

The cognitive results assessed by MoCA were for group A : 26,7 at baseline; after 6 months 21,8 and 19,9 at the end of study. The group B showed the next mean values: 27,03 at baseline; after 6 months 24,01 and 23,11 after 12 months. (Fig. 4)

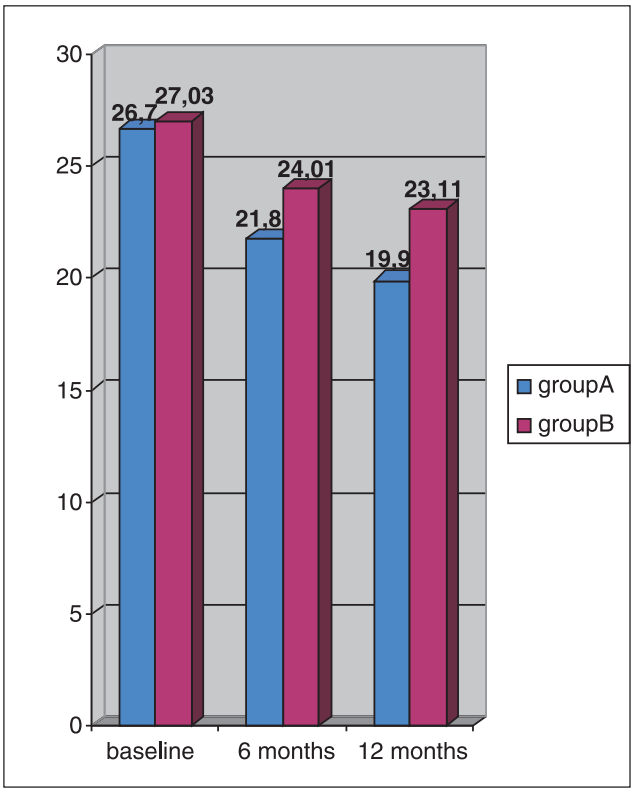

Figure 4. *Mean MoCA score in stroke patients at baseline, 6 and 12 months*

The patients with ischemic stroke in the left carotid territory showed a higher cognitive impairment and a higher disturbance mood than patients with ischemic stroke in the right carotid territory, with brain stem infarction or cerebellar infarction. The mean values are represented on Table I.

CONCLUSION AND DISCUSSIONS

Depression after stroke is common and its frequency seems to increase during the first year. Little is known about the risk factors for developing depression after stroke. It is very important to identify the post stroke dementia for its substantial impact on recovery in activities of daily living, cognitive function and survival. Antidepressive medication has been shown to effectively treat depression, although its administration may require careful clinical monitoring.[6] It was observed that

left anterior brain lesion, dysphasia and living alone were found to be the most important predictors of immediate major depression after stroke[7]. Many investigators have attempted to find a correlation between lesion location and PSD in order to delineate an organic hypothesis for the emergence of depression in a subpopulation of stroke patients. The most prevalent hypothesis of increased risk of PSD linked this disorder with left-side anterior brain lesions[8,9]. We found that patients with poststroke depression and left emisfere infarcts had greater cognitive deficit than patients with right-hemisfere infarcts, brain stem infarctions or cerebellar infarctions (Table I).

Table I . *The mean scores obtained using MMSE , MoCA and HDRS correlated with territory of the ischemic stroke*

Scales	Left carotid artery territory (mean score)			Right carotid artery territory (mean score)			Brain stem infarctions (mean score)			Cerebellar infarctions (mean score)		
	baseline	6 months	12 months	baseline baseline	6 months	12 months	baseline	6 months	12 months	baseline	6 months	12 months
MMSE	27,1	25,2	24,5	27,8	26,7	25,9	28,0	27,1	26,5	27,5	26,5	25,8
MoCA	26,3	21,2	19,7	26,8	22,7	21,6	26,5	22,5	21,7	27,1	23,6	22,6
HDRS	14,5	16,8	18,8	10,9	12,7	13,9	9,8	11,3	13,9	10,1	11,5	12,1

However, the significance of stroke lesion location for the consequent appearance of depression has been disputed by several authors[10,11].

The cognitive impairment is frequently observed after stroke. The cognitive performance has been reported to be more prevalent in stroke patients with concurrent major depressive episodes compared to non-depressed stroke patients, especially after left hemisphere lesions.[12]

In our study we found a higher cognitive impairment at 12 months comparatively with those found at baseline and 6 months.

We have also observed that the patients with post stroke depression had more cognitive impairment, as measured with the MMSE and MoCA in comparison to those nondepressive. Therefore the post stroke depression is correlated with the cognitive impairment. There are several studies which suggested that post stroke depression can produce a true dementia in its own right and that treatment of PSD might benefit cognitive function.[13] The patients with mild cognitive impairment and depression are exposed to more than twice the risk of developing dementia of Alzheimer type than to those without depression. The patients with a poor response to antidepressants are at an especially increased risk of developing dementia.[14] Our conclusion is that the post stroke depression is correlated with the cognitive impairment and we emphasize the importance of psychiatric assessment of stroke patients.

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