Hemispheric lateralization of depression and attention deficit

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Abstract

Objective: There is a complex interaction among to the ischemic cerebrovascular diseases, cognition and depression. The aim of present study is to investigate the relationship between lesion side and depression and attention deficit in patients with Middle Cerebral Artery (MCA) infarction.

Methods: This study was conducted on 41 patients with right and left MCA infarction. Beck Depression Inventory (BDI) was used for determination of depression severity of patients and Montreal Cognitive Assessment (MoCA) scoring was used for evaluation of cognitive status. Attention sub-test of MoCA score was also examined.

Results: 20 patients had right MCS. The mean age of the patients was 72.21 years. 51.2% of the patients were male. BDI mean score was found to be 11.25 in patients with right MCA infarction and 16.9 in patients with left MCA infarction (p:0.04). The total MoCA scores between two groups were similar (right/left MCA infarction: 20.8/21.3). It was seen to be lower attention sub-score in patients with right hemisphere effects compared to patients with left hemispheric lesion (3.1/5.9; p:0.00).

Conclusion: According to our findings, it is understood that attention of patients with right MCA infarction is more affected and patients with left MCA infarction is more depressed. In future studies, depression and attention affects which are at risk of developing after MCA infarctions should be evaluated in detail and should be put emphasis to rehabilitation of these areas.

Key words: Cerebrovascular disorder, Cognitive Impairment, Depression, Attention Deficit

Introduction

Stroke is one of the most common neurological diseases which make life difficult in many ways. Although post-stroke depression and cognitive impairments are often seen, they can be poorly understood and not treated enough (1). Indistinguishability between cognitive findings which generated basing on post-stroke ischemic cerebral damage and depressive findings increase the diagnostic difficulties. In addition to this, in some studies which are aimed to reveal the mechanism of the formation of the disease, it was mentioned the relationship between infarct localization and depression and it was observed to be more common depression in left frontal and right posterior lesions (2, 3). Also, some in some studies, it was reported a relationship between depression severity and the proximity of the lesion to the left frontal region (4).

In the literature, it is stated a common post-stroke depression especially in patients with left hemispheric effects (1, 3). However, the recognition and treatment of depression post-stroke is fewer. In addition to depression, stroke is also a risk factor for general cognitive functions deterioration.

As a matter of fact, it is reported cognitive inefficiency is developed in about one third of the patients with stroke and the affected cognitive area is associated with lesion localization as well (5). In recent studies, it has been showed that ischemic cerebral disorders are related with depressive symptoms and cognitive functions deficits (1,5). Also, in some studies, it has been reported the emergence of neuropsychological symptoms and the affection of sub parameters of cognitive functions are at different levels according to the effected brain regions by ischemic Cerebrovascular Accident (CVA) (1).

The relationship between cognitive inefficiency and depression after stroke is still being investigated. There are different results among the studies (4, 6). In addition, there are very few studies in the literature that evaluate post-stroke depression and the affected level of cognitive functions as comprehensively. Therefore, in this study, it is aimed to investigate the relationship between cognitive function parameters and depression of patients with ischemic CVA based on right and left hemispheric Middle Cerebral Artery (MCA) infarction.

Material and Methods

This study was conducted on patients with right and left MCA infarction who were over the age of 18 years. Patients who underwent cognitive status and depression evaluation in the post-stroke third month checks were determined as a sample group. Patients who were diagnosed depression and/or dementia and being used medical treatment because of these diagnoses before the stroke, had malignity history and had B12 deficiencies were excluded the study. Patients who had dysmnesia and emotional dysregulation were also excluded from the study.

This study was approved by the Local Ethic Committee (Protocol No: 2019/003-002). According to the inclusion and exclusion criteria, 20 patients with right MCA infarction and 21 patients with left MCA infarction were included in the study. Montreal Cognitive Assessment (MoCA) Scala and Beck Depression Inventory (BDI) were performed each patient. Attention sub-test of MoCA score was also recorded.

Statistical Analysis: In the analysis of statistical data, mean ± standard deviation was used for continuous variables. Discrete variables were expressed as numbers and percentage, median, minimum and maximum values. In the comparative analysis of categorical variables, Chi-square test was performed. For the analysis of continuous data, firstly, normality distribution was investigated with Kolmogrov Smirnov. Parametric tests were used for normally distributed data and non-parametric tests were used for non-normally distributed data. Student's t test was performed to compare the differences between the dependent samples and Paired Sample T Test was used for dependent variable. The differences between groups reliability range was taken 95% and p<0.05 was considered as statistically significant. SPSS 18.0 package program was used for statistical analysis(7).

Results

The number of patients with MCA in this study was 41.The mean age of the patients was 72.21 ± 5.71 years. 51.2% of the patients were male. 20 patients had right MCA infarction and 21 patients had left MCA infarction. Patients with right and left MCA infarction were similar in terms of total years of education (8.4/7.7) (Table 1).

There were no statistically significant differences between patients with right and left MCA infarction in terms of MoCA test results at third month checks after stroke. However, when attention sub-scores were evaluated, it was seen to be lower scores in patients with right MCA infarction (3.15 / 5.09, p:0.00). The results of BDI scores were showed higher scores in patients with left MCA infarction compared to patients with right MCA infarction and it was statistically significant (11.25 / 16.90, p:0.04) (Table 2).

Discussion

In this study, it was investigated the results of depression and cognitive functions parameters in patients with after ischemic CVA based on right and left hemispheric MCA infarction. For this reason, three-month follow-up results of patients were evaluated as retrospectively. Our findings showed statistically similar MoCA scores in the ischemic CVA which affected the both hemispheres due to the MCA infarction. When the sub-parameters of MoCA test towards to evaluation of cognitive functions were examined, attention was more deteriorated in patients who had right hemispheric lesion compared to patients with left hemispheric lesion.

In a way that overlaps with our findings Lee and Pyun (2014) reported more cognitive dysfunction and especially increasing attention deficit in patients who had right hemispheric lesion compared to patients with left hemispheric lesion. They obtained their data from 36 patients with right hemispheric lesion and 32 patients with left hemispheric lesion (8).

Likewise, in the systematic review study which was conducted by Umorova (2017), it was highlighted an emergence of cognitive impairment and attention deficit in post-stroke patients who had right hemispheric lesion as well (9). Qazaz et al (2014) reported a cognitive impairment in patients with right hemispheric lesion. Also, they indicated the more memory dysfunction development in patients with right hemispheric lesion unlike to our findings (10).

Table 1: Demographic properties an characteristics of Patients

	Right MCA N:20	Left MCA N:21
Age [years], mean (SD)	73.1(5.9)	71.3(5.4)
Male gender [%]	50	52.3
Education [years], mean (SD)	8.4 (3.6)	7.7 (4.4)

Table 2: MoCA and BDI Scores of Patients

	Right MCA N:20	Left MCA N:21	P Value
MoCA, mean (SD)	20.8 (3.67)	21.3 (3.83)	0.65
Attention sub-score, mean (SD)	3.15 (1.3)	5.09 (1.17)	0.00
BDI, mean (SD)	11.25 (7.36)	16.90 (9.98)	0.04

Distinctly from literature and our results, in a cohort study made by Zhao et al (2018), it was found left angular gyrus, left basal ganglia structures and the white matter around the left basal ganglia as strategic structures for global cognitive impairment after stroke. In this study, authors aimed to determine strategic brain regions for post-stroke cognitive impairment by applying multivariate lesion-symptom mapping in a large cohort of 410 acute ischemic stroke patients. They used the Montreal Cognitive Assessment at three to six months after stroke for assessing the global cognitive functioning and cognitive domains (memory, language, attention, executive and visuospatial function). In their study, the relation between infarct location and cognition was assessed in multivariate analyses at the voxel-level and the level of regions of interest using support vector regression (11).

In our study it was found that depression is more common in the left hemispheric lesions related with MCA infarction than right hemispheric lesions. Indeed, in one study which was conducted by Rashid et al (2017), it was reported that depression was more common in patients with left hemispheric lesion after stroke (12). Also, in one meta-analysis study which was made by Robinson and Jorge (2016), it was indicated that post-stroke depression was mostly originated by left hemisphere lesions (13). Unlike to our findings Agrill and Dehlin (2013) stated that the prevalence of depression was 46% in patients with post-stroke in a prevalence study of 93 patients, and they found no significant relationship between right and left hemisphere lesions and depression (14). It is considered that the reason of differences between the findings may be arise from the features of sample groups.

In studies, cognitive dysfunctions related with ischemic CVA and neuropsychological influences were found at different levels (13, 14). Evaluation time, criteria and technics are not homogeneous for cognitive and psychiatric evaluations. In recent studies have focused on the side of the lesion and the importance of localization in disorders of cognitive functions related with ischemic CVA and psychological pathologies and tried to develop treatment strategies for ischemic lesions.

Conclusion

At the result of our study, depression and cognitive parameters effects that emerged after ischemic CVA were found to be associated with the side of ischemic lesion and localization. At the endpoint of the study, at the 3rd month evaluations after ischemic CVA, attention was significantly impaired in cognitive function parameters in right hemisphere lesions and depression was more common in left hemisphere lesions. It is thought that prospective, randomized, double-blind and long-term studies involving large numbers of patients are needed to be understand entirely the effects of lesions region associated with ischemic CVA on psychopathologies and cognitive functions.

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