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# THE RELATIONSHIP BETWEEN COGNITIVE AND LOCOMOTOR IMPAIRMENTS IN PATIENTS WITH CHRONIC CEREBRAL ISCHEMIA

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## Abstract

This article presents an analysis of internal correlations between locomotor and cognitive impairments in men and women suffering from moderate cognitive impairment of vascular origin. 96 patients (50 men and 46 women) were examined using the MMSE, Frontal Dysfunction Battery and Tinetti test.

**Keywords** Chronic cerebral ischemia, cognitive functions, gender.

## INTRODUCTION

Until recently, in the diagnosis and treatment of many diseases, including neurological ones, the gender factor was not given much importance. Studies on the effects of new drugs have often been conducted only on male volunteers, and the specific effects of their effects on the female body have been overlooked (4). Many publications did not indicate the gender of the subjects, while others deliberately excluded women to maintain the “purity of the experiment” (8). At the same time, experience shows that some diseases are more common in men, while others are more common in women (1,6). The severity of the disease, its

outcome, and response to treatment also in many cases depend on the gender of the patient (2,7).

The real boom in the study of the problem of sex differences began about 10 years ago, after the widespread introduction of magnetic resonance imaging into practice, when morphological differences in the brain were discovered in men and women. Physicians, scientists, psychologists and sociologists have presented a general picture that points to clear sexual differentiation (3). However, there is very little research on this problem in neurological diseases.

It is known that there are initial characteristics of

cognitive and psy-chological functions in men and women. The psychological profile of men and women is different. Accordingly, there are behavioral differences be-tween men and women. These differences result in men and women perceiv-ing the same influences and reacting differently to the same situation (1,6). This is also reflected in neuroscience. A general pattern is that higher levels of anxiety and depression are found in women across a range of illnesses (9,10).

From the point of view of the problem of sexual dimorphism, chronic cerebral ischemia (CCI) is of particular interest. It is known that with CCI, the so-called “triad of frontal dysfunction” (FTD) develops, including cog-nitive, locomotor and emotional disorders (depression). The clinical signs of FTD are interrelated, and common mechanisms of vascular and degener-ative brain damage, mainly the frontal lobes and their connections with the deep structures of the brain, play a role in their genesis. Considering the numerous morphofunctional differences in the brain between men and women, it can be assumed that the structure within the FTD has its own gender characteristics in CCI. This is important both from the point of view of further understanding the differences between the male and female brain, and for the development of differentiated approaches to the treatment of CCI

depending on gender. This problem remains completely undeveloped.

**The purpose of our study** was to analyze the relationship between the nature of cognitive impairment, balance and walking disorders in patients with CCI in terms of sexual dimorphism.

## METHODS

We examined 96 patients with CCI due to cerebral atherosclerosis, who were divided into male (50 patients) and fe-male (46 patients) groups. The groups were comparable in age (mean age 66.4 years), all patients had moderate cognitive impairment. They were as-sessed using the MMSE scales and the Frontal Dysfunction (FTD) Battery (5). Motor abnormalities were assessed using the Tinetti test (10). The ob-tained data were processed using mathematical cross-correlation analysis. Statistical differences between groups were assessed using the Wilcoxon test.

The average results for the tests studied are presented in Table 1, from which it can be seen that there are significant differences between men and women with CCI. First of all, attention is drawn to the presence of sig-nificant differences between the sexes on all three scales, with greater preservation of cognitive and locomotor functions in females.

Table 1. Indicators of tests of cognitive and locomotor impairments in CCI in men and women

Tests	Whole group	M	F	$R \leq (M:F)$
Tinetti:				
- total score	19,45	17,5	21,4	0,05
- balance	11,6	10,4	12,8	-
- walking	7,85	7,1	8,6	0,05
FTD	13,45	12,9	14,0	0,01
MMSE:				

- total score	26,0	25,1	26,9	0,01
- verbal functions	6,05	5,1	7,0	0,05
- non-verbal functions		20,0	19,9	-

Against this background, some features of the results were revealed when compared by subtests within the tests used. In particular, no significant differences were found in the “balance” subtests of the Tinetti test and “non-verbal functions” of the MMSE test. With the exception of these differences, in general, unidirectional changes in locomotor and cognitive functions were revealed in patients of both sexes during CCI.

Very informative data were obtained by studying the structure of correlations between the studied indicators in people of different sexes.

There are significant differences between the sexes. Arrows indicate statistically significant positive correlations.

In the general group of patients with CCI, the existing positive, reliable correlations are quite logical. In particular, there is a close correlation between the general indicators of the MMSE test, the Tinetti test and the FTD test. In addition, there are positive correlations between the verbal and nonverbal subtests of the MMSE test and between walking and balance indicators according to the Tinetti test. Positive correlations were also revealed between the verbal component of the MMSE test and walking indicators according to the Tinetti test, and between walking indicators according to the Tinetti tests and FTD.

Analysis within subgroups depending on gender showed significant differences in the structure of correlations. What was common to both groups, men and women, was a positive correlation between the overall scores of the MMSE test and the FTD test, but at the same time there is a difference, which is characterized by the fact that, firstly, the structure of internal correlations in the group of men is significantly poorer in terms of quantity compared to the group of women and,

secondly, there are differences in the nature of the relationships between the tests studied and their subtests. They consist in the fact that in the group of men, positive correlations between the Tinetti test and the verbal component of the MMSE test, as well as between the balance subtest within the Tinetti test and the verbal component of the MMSE test, were distinctive. In addition, a positive correlation was established between the Tinetti test and the FTD test indicators. In the group of women, correlations are more diverse. In particular, the presence of a positive correlation between the verbal component of the MMSE test and the FTD test is noteworthy. In addition, nonverbal functions on the MMSE test are positively correlated with both walking and balance performance. A close positive correlation was also revealed between the balance indicator and the overall score of the FTD test.

Thus, with CCI, cognitive and locomotor impairments have certain differences in groups of men and women. In general, taking into account the identified correlations, we can say that in case of CCI, balance disorders, cognitive dysfunctions, and all locomotor dynamics are closely related to each other. At the same time, in the group of men there is a closer connection between locomotor disorders and the verbal component of the MMSE test, while in the group of women closer connections are formed around the non-verbal component of the MMSE test, i.e. nonverbal functions are more closely related to locomotor functions.

## CONCLUSION

Based on the data obtained, we can come to the conclusion that during the formation of the main symptoms of CCI, at the very beginning there is intersystem dissociation in the group of men and women. Moreover, global control over locomotor

functions is more typical for the group of men, while nonverbal control is more typical for the group of women.

The data obtained should be taken into account when choosing both drug and non-drug approaches to the correction of cognitive and motor impairments in CCI depending on gender.

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