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Is It Possible to Diagnose Parkinsonism with The Help of Neurosteroids?

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Abstract

This article presents information and results of studies on the role of the hormones cortisol and dehydroepiandrosterone sulfate (DHEAS) in the diagnosis of cognitive impairment and dementia in Parkinson's disease. The reasons for the relationship of cognitive impairment in Parkinson's disease are described in detail in comparison with the results of neuropsychological tests. We examined 40 patients with PD, who were divided into 20 patients depending on the presence or absence of cognitive impairment and dementia. As a control, we also examined on a voluntary basis 20 healthy persons recognized as such by a special commission. The diagnostic efficacy of neurosteroids has been established, including the level of dehydroepiandrosterone sulfate and cortisol in the blood serum of patients for early diagnosis of cognitive impairment and monitoring the effectiveness of therapy, identifying a risk group in PD.

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INTRODUCTION

Parkinson's disease (PD) is one of the most common neurological diseases, which is very common in the elderly. According to epidemiological data, this disease develops in at least 1% of people over 65 years of age [9].

The classic hallmarks of PD are movement disorders such as hypokinesia, muscle rigidity, and trembling that is most noticeable at rest. The severity of these disorders largely determines the severity of the patient's condition.

To date, the basic concept of the clinical picture of PD has expanded significantly. Cognitive impairments often come to the fore in the clinical picture of PD among non-motor manifestations and become the main cause of maladjustment in patients [1,2]. Patients with cognitive impairments experience psychological, social and professional maladaptation. In the early stages of PD, there are cognitive impairments associated with a limited ability to memorize and a slowdown in mental processes. Patients due to limited attention resources are not able to solve complex problems despite the fact that thinking and intelligence remain intact. These disorders do not lead to a change in the social adaptation of patients, but may adversely affect their quality of life [1,3].

According to population studies, dementia occurs in 20-40% of patients with PD [3]. The strongest risk factor for dementia in PD is the elderly and senile age of the patient. According to recently published data from a Scandinavian study, the risk of dementia when patients reach elderly and senile age approaches 80% [2,7].

Increased anxiety, decreased initiative and activity, including household, physical and intellectual, are considered one of the early signs of dementia. It is known that dementia not only worsens the quality of life of both the patients themselves and their relatives, but also increases the mortality of patients with PD. Based on this, effective research results aimed at timely diagnosis and treatment of cognitive functions in patients with PD are very important. This, in turn, will reduce both disability and financial costs of caring for such patients, but will also improve the quality of life of the patients themselves.

The aim of our study was to compare plasma levels of cortisol and dehydroepiandrosterone sulfate (DHEA-S) in patients with PD without cognitive impairment and with dementia in the advanced

stages of this disease.

MATERIAL AND METHODS

We examined 40 patients with PD, who were divided into 20 depending on the presence or absence of cognitive impairment and dementia. As a control, we also examined on a voluntary basis 20 healthy individuals, recognized as such by a special commission. Thus, we defined patients with cognitive impairment as the main group, and in the absence of non-motor manifestations of PD, in particular, cognitive impairment and dementia, as a comparison group.

Parkinson's disease was diagnosed in accordance with the criteria of the UK Parkinson's Disease Society Brain Bank, and we used the Hoehn-Yar scale to assess the severity of the disease [9].

In general, the diagnosis was established on the basis of a detailed examination of the neurological status and additional research methods: MRI of the brain, EEG, and biochemical blood tests were performed. The values of dehydroepiandrosterone sulfate and cortisol in the blood serum were obtained, taking into account its level varying depending on the time of day, measured in the early morning between 7:00 and 7:30 on an empty stomach. The state of cognitive function was assessed using the following scales:

- MMSE. With mild impairments 29-28 points, with moderate impairments of cognitive function - 27 -25 points and dementia - 24< points;
- (Frontal Assessment Battery, FAB). Light violations - 16–18 points; moderate impairment of cognitive functions - 12-15 points and dementia - 11< points;
- Montreal Cognitive Asseesmet (MoCA). The maximum score is 30. A final overall score of 26 or more is considered normal.

The average age of volunteers (women and men) was about 55.6 years. The results obtained were adjusted for a number of factors, including age, gender, smoking experience, and body mass index (table 1).

Table 1

Distribution of patients by sex and age

Group	**Sex**	**Age** (year)			**Total**
		41-50	51-60	61-75	
Basic	women	-	2	5	7
	men	2	4	7	13
Comparative	women	2	3	4	9
	men	1	5	5	11
Total		5	11	24	40

RESULTS & DISCUSSION

According to the Hoehn-Yar scale, patients had stages 2–3 of the disease, of which 26 patients had an akinetic-rigid form of the disease (65%), the remaining patients had a mixed form of PD (35%).

The average assessment of the severity of Parkinson's disease on the Hohn-Yar scale was 4.5±0.7 points. The age of the patients (24 men, 16 women) ranged from 41 to 75 years (table 1). The main group was dominated by men (n = 13) aged 61 to 75 years (n = 7). In the comparison group, there were 9 women, 11 men. Most of the patients were aged from 61 to 75 years, of which 9 men were women in this age category - 11.

The duration of the disease before our examination in the clinic varied in both groups from 7 to 12 years, on average 6.3±2.5 years.

Table 2

General characteristics of the examined patients

Group	N	Average age (year)	Disease duration (year)	Test indicators of cognitive impairment		
				MMSE	FAB	MoCa
Comparative	20	60,1±7,2	6,5±2,8	29,1±1,2	17,3±1,1	24,9±1,5
Basic	20	65,4±5,2	7,3±3,2	23,4±1,4*	8,9±1,4*	18,9±1,3*

*p<0.05 significant in relation to the comparative group

As shown in table 2, the average age of patients, both in the main and in the comparative group, was almost the same and varied from 60.1±7.2 to 65.4±5.2 years. The duration of the disease also had no significant difference and averaged 6.9±4.3 years. Test indicators of cognitive impairment revealed a distinct difference in digital values, characterized by low data on MMSE, FAB and MoCa in patients of the main group. It is known that the transformation of moderate impairments of cognitive functions into dementia is facilitated by the older age of patients, male sex, visual-spatial functions according to neuropsychological testing data [2].

Analysis of the distribution of the average value of blood biomarkers in the examined patients and healthy individuals revealed the following feature (table 3). The study of cortisol revealed the presence of a tendency to its increase in the blood in patients of the main group, both in relation to the comparative and control groups. The significance of these changes is confirmed by a 2.5-fold increase in blood cortisol in PD patients with cognitive impairment and dementia. At the same time, the level of dehydroepiandresterone sulfate progressively decreased, reaching its minimum value in patients of the main group. The comparative group in this case occupied a borderline value.

Table 3

Comparative characteristics of the content of neurosteroids in the examined patients (M±m)

Group	Cortisol nmol/l	DHEA-S nmol/l
Control	437,4±13,3	15,4±0,8
Comparative	616±16,5	6,3±0,7
Basic	1053,9±39,1*(**)	2,4±0,4*(**)

*p<0.05 significant in relation to the comparative
**p<0.05 significant in relation to the control group

Thus, in PD, many neuroendocrine disorders occur, along with autonomic dysfunction and other disorders. It has long been known that cortisol has a

negative impact on cognitive functioning, hypercortisolemia and hyperactivity of the hypothalamic-pituitary-adrenal axis (HPA) is one of the important causes of cognitive impairment [4]. Elevated levels of the hormone cortisol in Parkinson's disease play an important role in cognitive impairment and during the course of the disease and affect the effectiveness of PD therapy. [5,7,10]

Dehydroepiandrosterone (DHEA), another important endogenous antiglucocorticoid, has procognitive properties [8]. According to the results of the study, it was revealed that a decrease in DHEAS by 40-50% indicated the development of chronic cerebral ischemia in a patient, a decrease in DHEAS by 10 times made it possible to establish the development of an early form of the disease, while a decrease by more than 10 times indicated advanced Alzheimer's disease [11]. The task set before us was assessed as a reflection of the neuroendocrine response that occurred secondary to the progressive neurodegeneration observed in patients with PD with cognitive impairment and dementia.

An analysis of the correlation dependence of the level of the studied hormones in relation to the clinical scales in patients with PD with cognitive impairment showed the ambiguity of the dynamics (figure 1). Two bipolar tendencies between hormones were identified in the form of a direct relationship with cortisol and an inverse relationship with dehydroepiandresterone sulfate. However, the significance of these relationships with the scales was at different levels of significance.

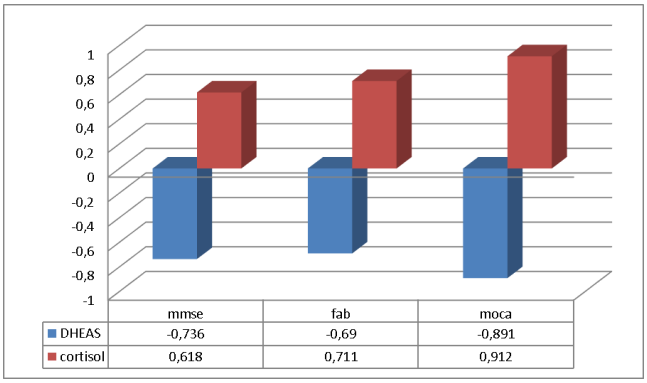

Figure 1. Correlation dependence of changes in the level of hormones in relation to the scales

So, in the case of cortisol, the inverse correlation gradually increased depending on the level of approximation of the MMSE/FAB/MoCa scales. At the same time, the level of the hormone dehydroepiandrosterone sulfate did not change unequivocally. The maximum inverse correlation was associated with MoCa (r=-0.891), the minimum with Fab (r=-0.690).

Nevertheless, combining the diagnostic significance of both hormones in the diagnosis of parkinsonism with cognitive impairment according to the correlation dependence with the scales, it is necessary to single out the close direct correlation of cortisol and the inverse correlation of dehydroepiandresterone sulfate with the Moca scale.

Correlation analysis between the studied biomarkers showed their inverse correlation (r=-0.991).

CONCLUSIONS:

1. The course of Parkinson's disease with the progression of the disease leads to cognitive impairments of varying severity, which are expressed significantly ($p<0.05$) by low scores when testing patients on the MMSE, FAB and MoCa scales in patients of the main group, in relation to the comparative group.

2. The diagnostic efficacy of neurosteroids, including the level of dehydroepiandrosterone sulfate and cortisol in the blood serum of patients, was established for the early diagnosis of cognitive impairment and monitoring the effectiveness of therapy, identifying a risk group in PD. Correlation analysis between the studied biomarkers showed their inverse correlation (r=-0.991).

3. The data obtained will contribute to a better understanding of the pathophysiology of PD in the intermediate and late stages of the disease. Knowledge of the features of neurosteroid mediation can help in the creation of new effective algorithms for the treatment of patients with Parkinson's disease and cognitive impairment in the future.

Conflict of interest - The author declares no conflict of interest.

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Compliance with patient rights & principles of bioethics - All patients gave written informed consent to participate in the study.

REFERENCES:

1. Aarsland D. Prevalence and characteristics of dementia in Parkinson's disease: an 8-year prospective study / D. Aarsland [et al.] // Arch. neurol. – 2013. – Vol. 60. – P. 387–392.

2. Chui, H.C. Pathologic correlates of dementia in Parkinson's disease / H.C.

Dubois, B. The FAB: A Frontal Assessment Battery at bedside / B. Dubois [et al.] // Neurology. – 2010. – Vol. 55, № 11. – P. 1621–1626.

3. Emre, M. Rivastigmine for dementia associated with Parkinson's disease / M.

Endocrinol. 2011. 209. (2). 153–167.

4. Holland J.M., Schatzberg A.F., O'Hara R. Et al. Pretreatment cortisol levels predict posttreatment outcomes among older adults with depression in cognitive behavioral therapy // Psychiatry Res. 2013. 210. (2). 444–450.

5.Rakhimbaeva G.S., Akramova D.T/ Role Of Increasing Levels Of The Hormone Cortisol In Cognitive Impairment In Parkinson's Disease:Vascular Parkinsonism // European Journal of Molecular & Clinical Medicine/ /ISSN 2515-8260/ Volume 07, Issue 06, 2020 2987.

6.Ridgway, G.R. Early-onset Alzheimer disease clinical variants: Multivariate analyses of cortical thickness / G.R. Ridgway [et al.] // Neurology. – 2012. – Vol. 79, № 1. – P. 80–84. 16.

7.Ronchetti Simona, Ricci Erika, MiglioratiGraziella, Gentili Marco, Riccardi Carlo. How Glucocorticoids Affect the Neutrophil Life. International Journal of Molecular Sciences. 2018;19(12):4090. doi: 10.3390/ijms19124090

8.Rotter J.I., Wong F.L., Lifrak E.T.,Parker L.N. A genetic component to the variation of dehydroepiandrosterone sulfate. Metabolism 1985;34(8):731-6.

9. Zaxarov, V.V. Kognitivnie narusheniya pri bolezni Parkinsona / N.V. Yaroslavtseva, N.N. Yaxno // nevrologiya jurn. – 2003 – t 8 №2. – S. 11-16.

10. Raximbaeva G.S, Akramova D.T. Parkinson kas-

saligi, vaskulyar parkinsonizm va Altsgeymer kasalliklarda kortizol gormoni mikdorini o'zgarishi va bu o'zgarishlarning kognitiv buzilishlar rivojlanishtdagi roli // «Nevrologiya»—1(81), 2020

11. Tolibov D.S., Raximbaeva G.S. Aprobatsiya novogo diagnosticheskogo kompleksa biomarkerov dlya differentsialьnoy diagnostiki bolezni Algeymera // Jurnal Meditsieskie novosti, 2018, №6, s.65-69