The American Journal of Medical Sciences and Pharmaceutical Research (ISSN – 2689-1026)
VOLUME 05 ISSUE 05 Pages: 42-48
SJIF IMPACT FACTOR (2020: 5. 286) (2021: 5. 64) (2022: 6. 319) (2023: 7. 396)
OCLC – 1121105510
Publisher: The USA Journals

Journal Website: https://theamericanjournals.com/index.php/tajmspr

Research Article

DIAGNOSTICS AND TREATMENT OF CHRONIC CEREBRAL CIRCULATORY DISORDERS AGAINST THE BACKGROUND OF DIABETES MELLITUS

Submission Date: May 14, 2023, Accepted Date: May 19, 2023,
Published Date: May 24, 2023 |
Crossref doi: https://doi.org/10.37547/TAJMSPR/Volume05Issue05-10

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ABSTRACT

Diabetes mellitus is undoubtedly due to the high medical and social significance of diabetes, which affects mostly young people and causes complications of the nervous system, both central and peripheral. The leading complication of diabetes is diabetic encephalopathies (DEC), forming cognitive impairment, reducing the quality of life (QOL) of patients, leading to disability and as the most fatal manifestation - death.

KEYWORDS

Diabetes mellitus, chronic cerebral circulatory disorders, diabetic encephalopathy

INTRODUCTION

In 2013, there were 239.3 million people with diabetes worldwide. By 2025 their number will be 380 million and 435 million in 2030. It is important to note that the rate of increase in the incidence of the disease is significantly ahead of the depressing forecasts of statisticians. The search for diagnostic methods for early detection of diabetic complications and allows analysis of the results of rehabilitation therapy. The results of recent scientific research, point to the fact that early restorative therapy can change the course of the disease and prevent complications that occur with DM. However, there have been no studies to fully characterize the effect of pathogenetic therapy on pathophysiological changes in cognitive dysfunction, where the basis may be disorders associated with demyelination processes. In many literary sources,

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there is little information about scientific studies using objective neurophysiological diagnostic methods to study the results of restorative therapy in patients with DM, it is not specified at which cognitive changes the use of restorative therapy can be most effective, and at which stage of the disease with CNS lesions, the implementation of restorative pharmacotherapy is most effective. In this regard, despite the growing relevance of this problem, there are still quite a few questions that need to be detailed. Physiotherapeutic treatment is an additional element of the complex therapy of diabetes mellitus, in turn, contributes to the normalization of metabolism, sugar concentration, increasing the level of insulin in the blood. Modern search for new methods of physical therapy, contribute to a favorable effect on the nervous system and the quality of sleep, and also allows you to prevent or reduce the manifestations of diabetic complications. The method of Transcranial Magnetic Stimulation is of great interest at the present time. Thus, it should be noted the need for further research of cognitive disorders, pathological changes in which lead to a sharp decrease in QOL of patients, the issues raised are relevant and require evidence base, the implementation of which will solve a number of problems associated with the problem of diabetes mellitus.

Purpose of the study: To study the clinical and neurophysiological study of cognitive impairment and complications in patients with diabetes mellitus before and after complex metabolic therapy.

Material and Methods: patients with CHF against the background of diabetes mellitus were examined and treated at the Department of Neurology of MKSAMSU during the period of 2021-2023. The number of patients (after exclusion criteria) was 49, the age of patients was from 51-65 years. The data were collected on the basis of patients' interview, signed voluntary informed consent, thoroughly detailed anamnesis of the in-patient, results of clinical, laboratory and neurophysiological methods of investigation. A control group of 28 conditionally healthy subjects (of identical age) was used as a comparison; this group was formed to compare the results of the study. The distribution of patients by sex, age, and duration of type 1 diabetes mellitus is shown in Table 1.

Table 1

Distribution of patients examined

Indicators	OH=49	KG=28
Age	51-65 years old	55-63 years old
Men	20	11
Women	29	17
Duration of diabetes mellitus disease	9.5±2 years	9.3±2 years

Patients underwent a comprehensive clinical examination, thoroughly collected complaints, medical history, and evaluation of neurological status; neurophysiological examination was performed using the techniques of cognitive evoked potentials, cognitive questionnaire scales, and assessment of the severity of CV in DM patients was given. In a detailed study of patients suffering from diabetes, we focused on the following items, such as the debut, duration of the disease, details of complaints, possible comorbid

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conditions in the history, blood glucose level during the day, glycated hemoglobin, the presence of various diabetic complications of the disease. Patients undergoing examination were also comprehensively examined by the following physicians: (except for a neurologist), endocrinologist, ophthalmologist, and cardiologist. To assess cognitive impairment in CHD patients, brain function was simultaneously analyzed by neurophysiological examination, cognitive evoked potentials (CEP), and neuropsychological questionnaires. The studied method of cognitive evoked potentials (CEP), allowing to analyze cognitive processes in the brain (this study was conducted on the EEG device). The complex of negative-positive oscillations, the evoked potential, is investigated when interpreting the P300 results. The most widespread and easy-to-use cognitive scales and questionnaires were used to study the neuropsychological status: Mosa-test, 10-word memory test (A.R. Luria, 1995). Statistical processing of the material was performed on an individual computer using standard Student's test. Correlation analysis was performed on the basis of nonparametric Spearman rank correlation, where $p<0.05.9$.

Results of the study: Thus, the study involved patients with CVD with diabetes mellitus type 2, and a comparison group of relatively healthy, identical age (this group was sampled in polyclinics in Samarkand, during a preventive examination). At the current moment of the primary examination, the following complaints were found to be dominant in the patients: general and muscle weakness (85%), increased fatigability (90%) arising after minor physical and mental exertion, feeling of dry mouth at night (75%), irritability (79%), decreased appetite (67%), frequent urination (63.1%), diffuse headaches of compressive nature (54.4%) arising for no apparent reason, sleep disturbance (43.7%), numbness, feeling of "creeping goosebumps", "electric current" in the extremities (38.3%). The most significant were complaints of the cognitive sphere, impaired concentration (66%), memory of both past and current events (68%). In all cases, clinical symptomatology included cognitive deficits, asthenia, and focal neurological deficits. The asthenic syndrome was manifested by general weakness, increased fatigability after physical and mental exertion, decreased work capacity, appetite, and sleep disturbances. At the same time, dyssomnia was more often manifested as daytime sleepiness, difficulty falling asleep, and frequent nocturnal awakenings. Decreased background mood with depression and depression, narrowing of interests, sleepiness, attacks of angry and melancholy moods, and lability of emotional reactions were also characteristic (Fig. 1). Analysis of the results of neurological examination in patients of the main group, among the focal symptoms in the study of cranial nerves were revealed convergence insufficiency (79%), anisocoria (35%) mild pseudobulbar manifestations (27%). When assessing the tendon reflexes, insignificant animation and indistinct anisoreflexia (58.5%) were recorded. In the study of coordinator tests, there was a decrease in stability and uncertainty in performance (42.1%).

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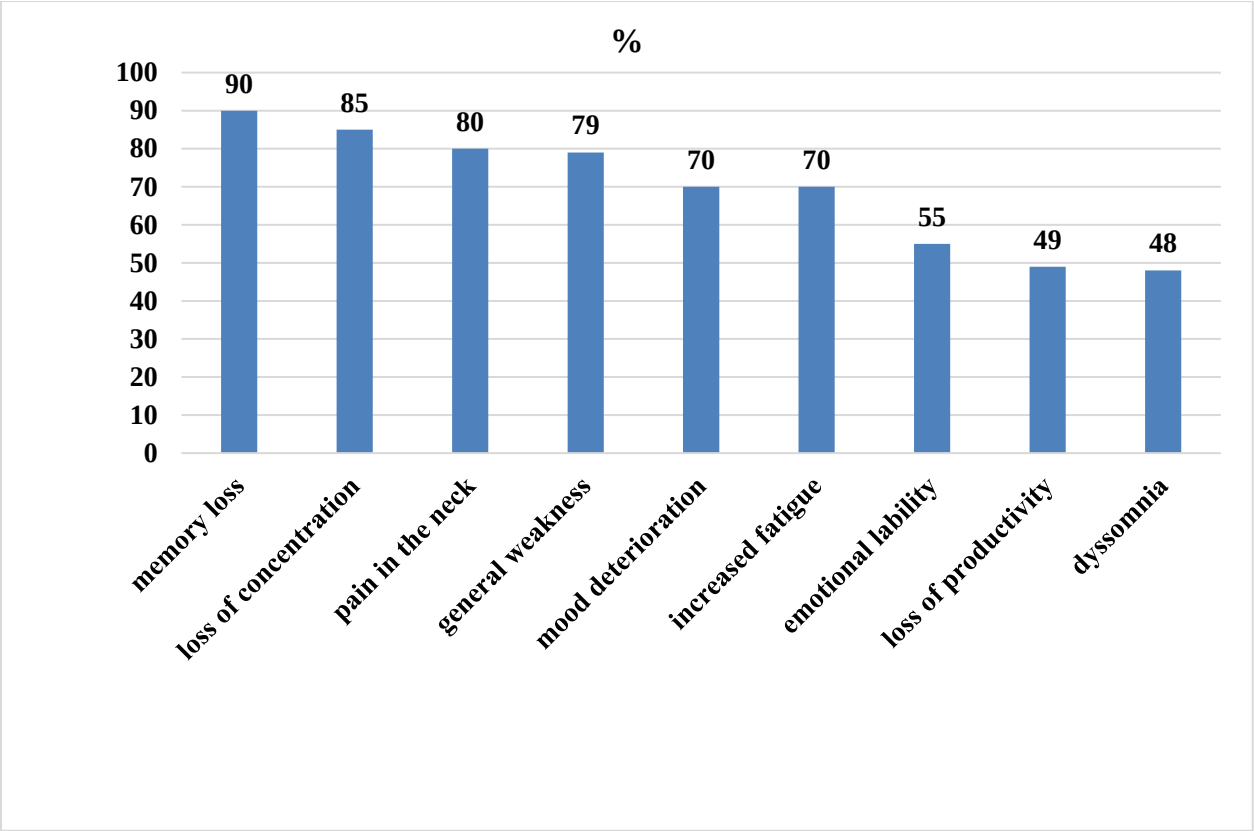

Fig.1. clinical manifestations of CNMI with type 2 DM (main group)

Cognitive functions were studied using evoked potentials (P300), and the results were compared with cognitive questionnaires (MoCA test, 10-word memory test). (tab. 2). The neurophysiological findings clarified that in (73%) cases the P300 wave analysis before the treatment indicated an increase in PL, which was 344.0 (342.0; 347.0) ms (control group - 312.0 (311.0; 313.0) ms). The amplitude of the P300 wave on the presented stimulus (53%) cases was reduced and averaged 6.9 (6.6; 7.1) μV (control - 7.5 (7.3; 7.6) μV). Statistical analysis of the cognitive sphere depending on the presence of complications in patients with CNMI type 2 diabetes mellitus revealed a statistically significant difference in the MoCA test, delayed word playback, and peak latency P300. The results of the study on the indicators of cognitive evoked potentials allow us to note that in patients with CNMI and a long-term course of type 2 DM, dysmetabolic disorders increase, leading to the spread of demyelination processes, thereby manifesting itself by an increase in the latent period, and this, in turn, leads to a decrease in the cortical response to the presented stimulus, which is expressed in a decrease in the amplitude of the peaks of evoked potential waves. Combined therapy included basal therapy (established standard of care) and sessions of trascranial magnetic therapy (10 sessions, 20 days apart, 2 courses of TMS in total). The treatment efficacy was evaluated only for the patients in the main group according to the same indices as before the treatment (in 3 months), the dynamics of laboratory, clinical and neurophysiological, neuropsychological indices were studied. The main group was divided into

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two subgroups, A-treated with basic therapy (23), B-combined therapy (26). As a result of the treatment, the general well-being of the patients improved, the number of patients complaining of decreased memory and attention, slowed thinking, information processing speed, and visual perception decreased. As a result of the MoCA test, it was established that after the performed combined therapy with use of TMS, cognitive sphere scores increased from 23.0 (25.0) to 25.0 (26.0); scores of the 10-word memory test, a statistically significant improvement of delayed word playback was revealed. Accordingly, the conducted treatment with the use of TMS improved the indicators of peak latency P300 in patients with CNMI with type 2 diabetes, decreased to 329.0 ms, and the amplitude of P300 statistically significantly increased to 7.1 μV.

Table 2

Peculiarities of neurophysiological and psychological data of studies of OH and CG CNMI with type 2 diabetes

	figures	Main group (n=49)	Control group (n=28)	p
1	Peak latency of P-300	345	313	0,001
2	P-300 amplitude	7	7,6	0,012
3	MoCA (number of points)	220	27	0,013
4	10 word memory test			
	1 attempt	2,0	8,0	0,000
	2 attempt	3,0	9,0	

CONCLUSIONS

Thus, the study showed that the use of TMS as part of the complex treatment for initial signs of cognitive dysfunction provides a favorable outcome. Analysis of the indices obtained with the help of the evoked potentials technique in comparison with the indices of the questionnaire scales revealed the following pattern indicating cognitive insufficiency in patients with CNMI with type 2 DM. A statistical correlation indicated a low score on the MoCA test relative to an increase in the latent period of the P300 wave of cognitive evoked potentials. The results indicate that the more significant the neurophysiological changes in terms of cognitive potentials, the more significant are the changes in the CNS structures leading to cognitive impairment. Thus, the course of CNMI with concomitant type 2 diabetes leads to the processes of chronic demyelination of the central nervous system, which correlate with the increased values of peak latency P300. Accordingly, the data obtained allow us to assess the severity of demyelination processes and the effectiveness of the therapy, as well as can be an additional diagnostic criterion in the diagnosis of complications of CHFD with type 2 diabetes and the possibility to assess the dynamics of recovery processes in the study of pathology against the background of treatment. Today, it is advisable to introduce pathogenetic-oriented methods of

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treatment of neurological disorders in patients with CHEMI on the basis of predominant use of non-medicinal therapeutic factors, the effectiveness of which is determined by the ability to have a targeted impact on necroplastic properties and processes of cortical damage, with comorbid backgrounds such as diabetes mellitus. The therapeutic value as TMS, is based on neuroplasticity, promotes the development of new synaptic connections, restores interhemispheric balance; in addition, the use of this method is expedient, the effectiveness of obtaining treatment results takes place in a short time, increases cerebral metabolism and regeneration of cerebral blood flow, which quickly compensates for cognitive deficits. Positive results can be seen not only during the sessions, but also at the end.

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