Case Report
Volume 7:2, 2021

Epilepsy Journal

ISSN: 2472-0895 Open Access

Cognitive Impairments in Patients with Treatment Resistant Epilepsy and Complex Rehabilitation

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Introduction

Epilepsy is a chronic, poly etiological neuropsychiatric disorder characterized by a persistent predisposition to epileptic seizures, as well as the neurobiological, cognitive, psychological, and social consequences of this condition. Epilepsy is one of the most common neuropsychiatric disorders, affecting about 65 million people worldwide. Epilepsy prevalence increases with age. Thus, 25% of the first detected of this pathology is diagnosed at the age of over 65 years. Various neuropsychiatric and somatic conditions, such as traumatic brain injury, cerebrovascular disorders, Alzheimer disease, increase the incidence of epilepsy exponentially [1]. The disease is characterized by heterogeneity of clinical manifestations. In all the variety of mental pathology, there are cognitive disorders, epileptic psychoses, depressive, anxiety and obsessive-compulsive disorders, behavioural disorders, epileptic encephalopathies. Mental disorders in epilepsy occur more often than in the general population. According to some researchers, about a third of people with epilepsy suffer from comorbid psychiatric disorders: depression, anxiety, dysphoria, which greatly complicate the course of the underlying disease and impair quality of life. Some researchers believe that mental and behavioural disorders are consequences of epilepsy [2], while others admit the two-way causal relationship between them [3,4]. Patients with comorbid disorders are more prone to seek medical assistance, including a higher suicide rate, lower adherence to treatment recommendations, lower quality of life, and lower control of epileptic seizures [5]. Cognitive dysfunction in epilepsy significantly deteriorates the quality of patient life, their social functioning and adherence to treatment. The main cognitive functions include perception, attention, memory, praxis, language, executive functions, and social intelligence. Pathogenetically, epileptic system is forming with the presence of several functionally different zones and determinant foci, the formation of secondary and tertiary foci, including mirror foci, which leads to a pronounced rearrangement of cytoarchitectonics of the brain with the establishment of new pathological interneuronal relationships. Cognitive impairment depends on the lesion of the hippocampus. Thus, lesions of the left hippocampus cause a much more pronounced decrease in the level of verbal learning, while atrophy of the right hippocampus is characterized by a lack of nonverbal learning and memory. The cognitive functions of patients with epilepsy are affected by heredity, organic damage to the brain, the presence of the epileptic process, treatment with antiepileptic drugs, the particular patient condition and personality traits. The active interaction of mentioned above factors leads to impairment of the cognitive function of each patient [6]. Differences in the cognitive status of the patient directly depends on the form of epilepsy and the type of seizures. Generalized tonic-clonic seizures provoke more significant cognitive impairment [7]. Thus, a generalized tonic-clonic attack can lead to decreased attention lasting up to 24 hours [8]. In patients with complex partial seizures, such changes are likely to last less time than in generalized tonic-clonic seizures, but it is clear that in patients with frequent seizures, this phenomenon significantly affects cognitive functioning [6]. The presence of psychiatric comorbidity is another important factor that influences the cognitive functioning of patients. Firstly, some mental disorders, such as associated with neuropsychological deficits, for example [9]. Several studies have found dysfunction in the contour of the orbitofrontal loop in patients with mood disorders, which leads to a specific picture of impaired executive function and attention [10]. Second, in some cases, patients with mental disorders may have a poor understanding of their cognitive abilities, especially in mood disorders and anxiety disorders, for which cognitive complaints are an integral part [11]. There is no doubt about the effect on the cognitive functions of patients with epilepsy of some anticonvulsants, which effectiveness is directly proportional to the dose of the drug.According to the outcome of a cohort study of a large sample of patients, cognitive disorders observed in adults with epilepsy reflect the cumulative effect of epileptic processes and low premorbid cognitive ability [12]. Researchers distinguish four clinical variants of moderate cognitive impairment [13,14] amnestic monofunctional type - with selective memory impairment with relative preservation of other cognitive functions;- amnestic multifunctional type, which is characterized by a combination of memory impairment and other cognitive impairments;- multifunctional type without memory impairment, characterized by multiple cognitive impairments with relatively preserved memory; - the monofunctional non-amnestic type is characterized by the presence of a deficiency of one of the cognitive functions without memory impairment.Cognitive impairment may manifest itself in varying degrees, depending on which it can be divided into mild, moderate, severe and subjective cognitive impairments that are precursors to the further development of cognitive decline. Simultaneously, it may not be objectively confirmed during testing of patients. Most often, drugs are used to treat epilepsy, and if it is ineffective - other therapies, including surgery, which reduce the activity of epileptic foci. But they are not always effective. According to the statistics, the number of people who do not receive the proper effect of therapy has not changed over the past two decades, and its about 30% of all patients.

Nowadays, we have the following non-pharmacological methods of correction: diet, physical exercises, cognitive training including cognitive stimulation, psychological and behavioural correcting methods, psychotherapy (cognitive behavioural therapy, art therapy, music therapy etc.), meditation, yoga.

When using those methods, cognitive functions may improve thanks to neuroplasticity - the brain's ability to reorganize itself physically by forming new neural connections in response to the surrounding [15,16].

Everyday cognitive activity, in particular learning something new, promote the establishment of new neuronal connection as long as preserving the old ones, which is in itself a protection against the development of cognitive impairments [17].

Cognitive training conducted through the implementation of specific programs and methods aiming to train memory, attention and other cognitive functions so to maintain intelligence, develop particular cognitive abilities and to teach compensation and recovery strategies. There are two types of cognitive training: compensatory and recovery [18].

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Received 30 November 2020; **Accepted** 20 March 2021; **Published** 28 March 2021

Compensatory cognitive training aimed at teaching patients to learn new strategies of task resolving, enhance thereby their cognitive abilities.

The following strategies are applied: data visualization, distribution by categories, use of external hints.

As for recovery cognitive training, there we implement measures that aimed to improve impaired cognitive functions. During the training that aimed at particular task resolving, the development of needed for it abilities arise. Classical training, cognitive stimulation and computer-delivered training have been conducted both ways, individually and in groups.

According to studies, cognitive tasks such as: written and oral calculations, reading, writing, spatial construction may brake epileptiform EEG-discharges in 64% of cases and provoke them in 7,9% [1]. Those results let theoretically assume the possibility of creating specific cognitive tasks for inhibition of epileptiform activity, and also a possibility of changing those cognitive activities, that cause epileptiform discharges, so to reduce the frequency of epileptic seizures. Such cognitive and behavioural measures could also evoke long-lasting changes in excitability [19].

According to the outcome of a large randomized controlled study [20], the application of motivational interview, combined with additional behavioural correcting methods, effectively improves patients' observance of a mode of reception of medication, as compared with controls over the 3 and 6 months of observation. In the group with motivating interviewing,researcherscould also note a decrease in seizures' severity, improvement in patients' quality of life and an increase of effectiveness of medication within therapeutic and subtherapeutic range, after improvements of psychological indicators [20].

When applied modified (suitable for a group) methods of cognitive behavioural therapy in the group over 60, the frequency of epileptic seizures have shortened significantly, as compared with another group where control of relaxation was used. The result remained unchanged over even three months after treatment. Moreover, both groups witnessed an increase of psychological indicators such as depression, dysthymia, psychosocial functions and psychological adaptation.

Aims

The aims of research were detection of versatile cognitive impairments in epilepsy and studying the results of cognitive training.

Methods

We studied the features of clinical and psychopathological manifestations in patients suffering from epilepsy. The study covered 100 patients (47 men and 53 women) who were in inpatient care. The following psychodiagnostic techniques were used: the Toronto Cognitive Assessment TorCA, the test of 10 words of Luria, the MOCA test, the Münsterberg test, the quality of life scale, the Hamilton scale of depression and anxiety. In our opinion, a cure for patients with epilepsy should include not only medication and surgical treatment but also psychotherapeutic methods, namely: psychoeducation and cognitive training. Psychoeducational activities include the dissemination of knowledge about epileptic seizures, treatments, comorbid conditions and life problems. Most psychoeducational interventions involve education and training.

During the pandemic of COVID-19 patients have got access to the online version of cognitive training, which is extremely important for improving their cognitive functions.

Results

The Hamilton Depression Rating Scale (HDRS): 38% had symptoms ofdepression, 28% had mild situational or neurotic depression, 8% had moderate depression, 2% had severe depression.

The Hamilton Anxiety Rating Scale (HARS) showed that 20% of patients had severe anxiety, 16% had symptoms of anxiety (Figure 1).

According to the outcomes of the Toronto Cognitive Assessment (TorCA),

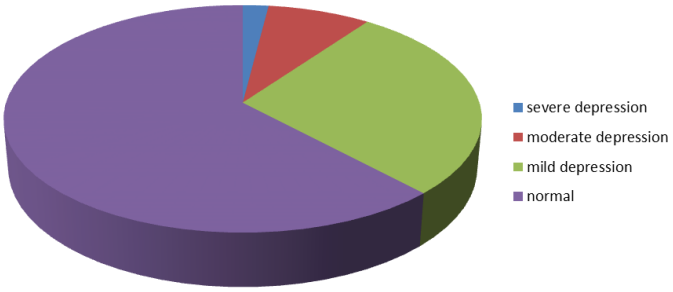

Figure 1. Affective disorders in patients with epilepsy.

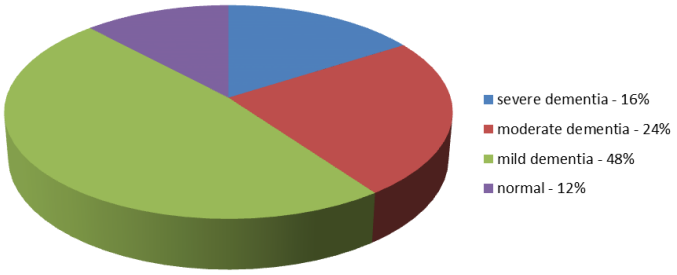

Figure 2. The results of the research of MoCA test.

conducted on 27 patients: 88.9% had cognitive impairments, 7.4% had borderlain results, only 3.7% of patientsdid't have any cognitive impairments. Overall, the advantage of aplication of the Toronto Cognitive Assessment (TorCA) are high sensitivity of the scale and possibility to study particular cognitive functions, while disadvantage is complication of the procedure.

We found cognitive dysfunction in 88% of patients, mild dementia in 48%, moderate dementia in 24% and severe dementia in 16% (Figure 2).

This study was conducted using the quality of life scale to determine the quality of life of patients. Unexpectedly a part of patients evaluated it very high, with signs of cognitive decline and an objectively reduced level of functioning. A direct correlation between the degree of cognitive decline and subjective assessment of the quality of life was found: in patients with more severe cognitive dysfunction, the highest estimation of the quality of life was observed. The average rate among all examined people was 67.5 out of 100. Preparing patients for online training, we faced some technical difficulties. It takes about two weeks to adapt to the resource. Some patients are unable to use the resource due to technical circumstances, lack of computer skills, level of education. Currently, 14 patients are undergoing cognitive training online, after which we are planning to retest their cognitive functioning. The expected result is an increase in cognitive functioning.Results of the research shows that patients require approximately two weeks of study to understand how cognitive training works. Over six weeks of training patients' memory have improved up to 12,4%, thinking up to 7,1% while attention decreased by 3,8% (Figure 3).

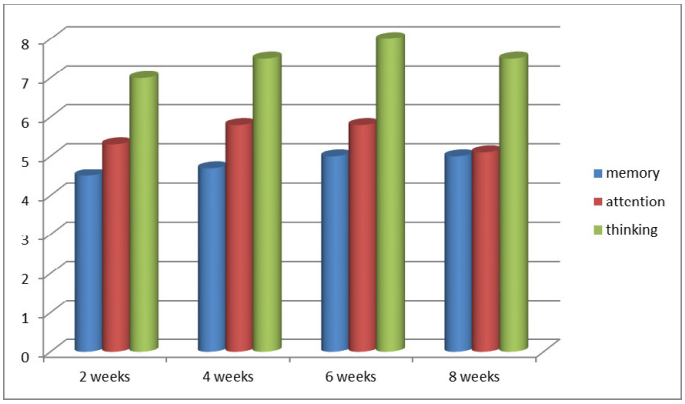

Figure 3. Intermediate outcomes of the cognitive training in patients with epilepsy.

In general, the resource is easy to use. Short-term results may fluctuate, however, with long-term use of the resource there is a positive trend, in the group and particular participants.

Conclusion

The results of the conducted research show the need for further study of the factors that influence the occurrence and progression of cognitive disorders, the development and implementation of training which are aimed to improve cognitive functions and prevention of the progression of cognitive disorders. There is a need of further study of the effectiveness of cognitive training in patients with epilepsy.

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How to cite this article: Volodymyr Korostiy, Iryna Blazhina. Cognitive Impairments in Patients with Treatment Resistant Epilepsy and Complex Rehabilitation. Epilepsy J 7 (2021): 134.

Table 3. Relationship or association of understandings of epilepsy and demographic characteristics by using chi square tests.

		Understanding on epilepsy			Total	T-value
		falling down and fainting disease	losing memory disease	urinated while fainting		
Age	18-25	15	12	17	44	**1.72**
	26-35	13	6	17	36	
	36-45	12	13	12	37	
	46-55	13	14	11	38	
	56-65	10	14	8	32	
Education	non educated	10	13	14	37	
	primary school	15	12	11	38	
	o-level	12	15	14	41	
	advanced level	17	6	15	38	
	higher level	9	13	11	33	
Occupation	none employed	18	20	22	60	
	Employed	29	19	18	66	
	self employed	16	20	25	61	
Gender	Male	35	25	37	97	
	Female	28	34	28	90	
Total		63	59	65	187	

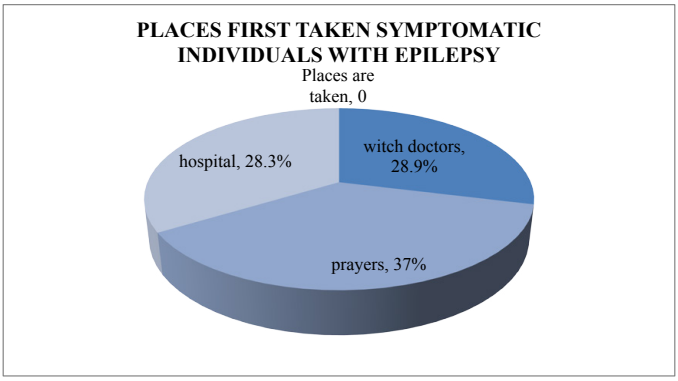

Figure 4. Places where symptomized community with epilepsy are taken.

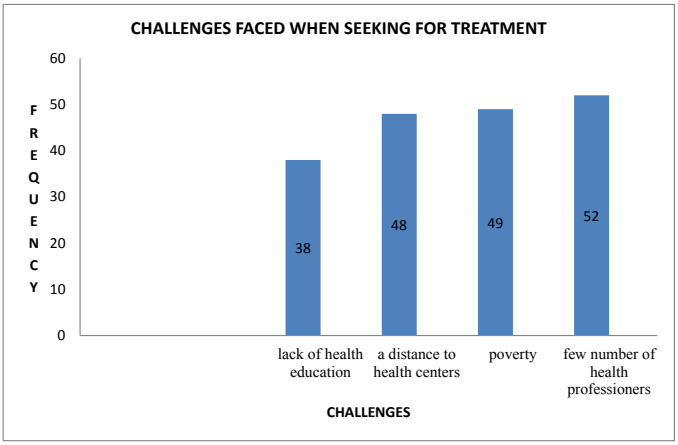

Figure 5. Challenges faced community when looking for epileptic treatments.

Table 5. Relationship between effects of epilepsy with custom and traditional perceptions towards seeking of epileptic treatment.

Effects of epilepsy	custom and tradition perceptions		P-Value
	epilepsy can be treated by hospital drugs	traditional drugs are more desirable	0.123
Poverty	24	25	
Isolated from communal participation	25	27	
Dropouts from school	20	22	
Not employment	20	24	