

THE IMPACT OF NEUROPSYCHOLOGICAL ASSESSMENT IN EPILEPTIC FOCUS LOCALIZATION

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SUMMARY

Introduction: Epilepsy that takes place in the temporal lobe is manifested through three symptoms: aura, temporal pseudoabsence and automatism, while right-sided temporal lobe epilepsy had been also linked with visual or image learning and memory deficits.

Case outline: Patient 24 years old in 2020. In July 2020 had complex partial seizures with an unordinary psychomotoric reactions and verbalization, followed by qualitative conscience change in the form of confusion and amnesia. Therapy with paroxetine showed no result. Neuropsychological evaluation showed no other cognitive deficit than severe visuconstruction dyspraxia and discrete decrease in complex attention. In behavioral aspect prodromal symptoms of tension, anxiety and depression were occurred.

Conclusion: Neuropsychological assessment is, along the magnetic resonance imaging and electroencephalographic, the most important method for indicating cognitive deficit in epilepsy and determining the epileptic focus.

Key words: temporal lobe epilepsy; complex partial epilepsy; neuropsychological assessment; visuconstruction dyspraxia

SRPSKI

ZNAČAJ NEUROPSIHOLOŠKOG TESTIRANJA U LOKALIZACIJI EPILEPTIČKOG FOKUSA

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SAŽETAK

Uvod: Epilepsija sa sedištem u temporalnom režnju se manifestuje kroz 3 simptoma: auru, temporalni pseudoapsens i automatizme, dok se epilepsija sa fokusom u desnom temporalnom režnju povezuje i sa vizualnim deficitom, kao i učenjem slika i vizuelnim pamćenjem.

Prikaz slučaja: Pacijent starosti 24 godine u julu 2020. godine doživljava kompleksni parcijalni napad sa neobičnim psihomotornim ispoljavanjem i verbalizacijom, praćenom kvalitativnom izmenom svesti u pravcu konfuzije i amnezijom. Terapija paroxetinom nije dala rezultate. Neuropsihološka evaluacija je pokazala tešku vizuokonstrukcionu dispraksiju i diskretni pad u domenu kompleksne pažnje. U aspektu ponašanja se evidentiraju prodromalni simptomi tenzije, anksioznosti i depresije.

Zaključak: Neuropsihološka evaluacija je, pored magnetne resonance i elektroencefalografije, najvažnija metoda za indicaciju kognitivnog deficit kod epilepsija i utvrđivanje epileptičkog fokusa

Ključne reči: temporalna epilepsija; kompleksni parcijalni napadi; neuropsihološko testiranje; vizuokonstrukciona dispraksija

INTRODUCTION

Complex partial epilepsy (CPA) taking place in the temporal lobe is manifested through three symptoms: aura, temporal pseudo absence characterized by impaired awareness, confusion, fear and oroalimentary automatisms [1]. In MTLE (mesial temporal lobe epilepsy) dysmnestic aura is also characteristic - a feeling of having experienced the new situation (Déjà vu), or never seen (Jamais vu), affective aura as surprising feel of fear [2], as an autonomic and psychic aura [3]. The type of aura, when the data is based on the valid anamnesis, can provide useful information about the localization [4]. Automatisms in temporal epilepsy can be dyspraxic (postictal, postconfusion) and they are usually an extension of a previous activity [5]. They can include movements of hands and arms, like fumbling fingers, picking and rubbing movements of the hands and arms[6]. Patients with temporal epilepsy have short-term postictal state that is characterized by confusion and disorientation [7].

Epilepsy with focal seizures is related to more specific cognitive deficit than primarily generalized epilepsy [8]. Thus research shows that spatial and visual function impairments are originet by epileptic focus in the non-dominant hemisphere [9]. Neuropsychological evaluation and the lateralization zone of functional deficit are reflected in the assessment of cognitive domains - attention, inteligency, memory, language, visuospatial domain, praxis and executive functions [10]. The report of neuropsychological assessment along with the neurophysiological technices and NMR make a defined diagnostic protocol in the presurgical evaluation for farmacoresistence epilepsy [2].

This assessment included assessment of the gestual hand and eye lateralisation (Edinburgh Handedness Inventory and Lateralization Test), Graphesthesia, stereognosis, acoustic gnosis for non-verbal sounds (LNNB), dynamic praxis (Luria 3-step), ideomotor, oral and pose praxis, visuoconstructive abilities and visual memory (ROCF and CDS), visuoconstructive abilities in 3D (Block Design Task), letter and category fluency (verbal and category fluency task), auditive verbal learning and memory(RAVLT), registration (WMS-R), verbal attention (Digit span), visual span (Visual span), attention simple modalities (TMT-A), complex modalities of attention (TMT-B), object naming (BNT), command understanding (BDAE), complex ideation material (CIM), repetition, body scheme (auto, left-right orientation, finger gnosis) (BDAE), Visual organization and synthesis (HVOT), executive function (WCST), depression (BDI-II), anxiety (GAD-7).

CASE REPORT

Patient P.M., 24 years old, with a high school degree, works as a salesman, right-handed gesturally and by use. He is a smoker (smokes approximately 20 cigarettes per day) and he does not drink alcohol. When he was 17 years old, he had his first seizure that he describes as "I felt something was happening, but I did not know what it was." which was characterized as a panic attack by a psychiatrist. According to the heteroanamnesic and anamnesic data, for the past few years, during sleep, he wakes up and starts talking incoherently and faster than usual, sometimes making unpurposeful movements of his left hand (turning his hand around), sometimes holding his left leg bend in the knee. All

of that lasts for two minutes, and he has no recollection whatsoever or for most part of the action. After his father passed away (from a heart attack, at age of 53), seizures have increased coincidently, and he started going to the psychiatrist with a diagnosis of episodic paroxysmal anxiety and the therapy received was Seroxat 20mg ½+0+0. He was treated by a psychiatrist but there was no significant reduction of the difficulties experienced.

A month and a half before being hospitalized in July, the seizures occurred frequently during the night and the day, with an unordinary psychomotor reactions and verbalization, followed by qualitative conscience change in the form of confusion and amnesia for the duration period of the attack. He stated that the seizure is preceded by a „déjà vu“ phenomenon and that he has a feeling as if his skin is peeling off his body, he feels awkwardness which he cannot clearly describe and, afterwards, he has disconnected speech and starts turning around himself and wipes his noes and sometimes he spits. This lasts for a couple of minutes. He does not remember the period during the critical event. The stated behaviours occur several times during the week. His partner made a video recording of tens of attacks of various intensities. His mother alleges that he was sleepwalking when he was younger; he would get up out of his bed, walk around his room, go back to bed and in the morning he would not remember anything regarding the previous event. This was his first hospitalization. He had a regular mental, somatic and neurological state. On the reception day, he had three described seizures. The last seizure initializing hospitalization occurred the night before it, with neck and arms cramping and a behavior change towards verbal and physical aggressiveness, followed by confusion and amnesia about the event. Computerized tomography of endocardium was performed at reception and it is described as normal. Laboratory analysis indicated high cholesterol levels. Other parameters had no significant deviations from the reference values. A diet was recommended.

During the first morning at the clinic, he has another seizure when during taking medical history in the middle of the conversation he gets off the bed and throws out the other patient and the doctors from the room, raising his voice. The seizure lasted for around a minute and a half, after which he sat down on the bed and asked whether it had occurred again and he indicated that he has no memories of what had occurred. An epileptologist introduces sodium valproate into the therapy (VPA). Neuropsychological assessment was performed. During assessment, the patient was conscious, correctly temporally and spatially oriented, and appropriately oriented towards himself and towards others. None of the depersonalization and derealization experiences were recorded, as well as delusions of reference, or visual or auditory hallucinations. He experienced mild anxiety and mild depressive disorder.

Cognitive screening was normal with the maximum number of points. Further neuropsychological exploration indicated that it was a patient of average intellectual capacity, based on the value of the scaled score on stable subtests of intelligence. A discrete decrease in complex attention was recorded, while attention in other modalities was preserved, executive functions were preserved in all domains except for the expressed tendency towards perseverance. Phonemic and categorical fluency was preserved with preserved cognitive reserve for his age. Speech was preserved, fluency and grammar were preserved. Understanding and executing an oral order at the multiple order level. Repetition was preserved in both high and low

probability phrases. Spontaneous writing and dictated writing was preserved. Calculation was normal for simpler arithmetic problems. The patient had the most significant decline in the examination of construction practice in two dimensions, where he showed a severe decline. He was using poor copying strategy with a fragmentary approach. Construction practice in three dimensions was preserved at a high level. The ability of visual organization and synthesis indicated a borderline decline, with minimum presence of fragmentary observation. Visual perception was normal. All modalities of gnosis were preserved. The body scheme, the left-right orientation and the finger gnosis, ideomotor and dynamic practice were normal, whereas the practice of posture was disturbed by mirror errors he corrected upon suggestion. Declarative memory was preserved, verbal learning curve was productive, with preserved immediate memory. Retention, evocation and recognition were preserved, as well as visual memory. This neuropsychological finding indicated probable right temporal dysfunction. After testing, during further hospital treatment, 2 more partial complex attacks occurred. The day before EEG recording after sleep deprivation, withdrawal of medication was made and he had another partial complex seizure during electroencephalography.

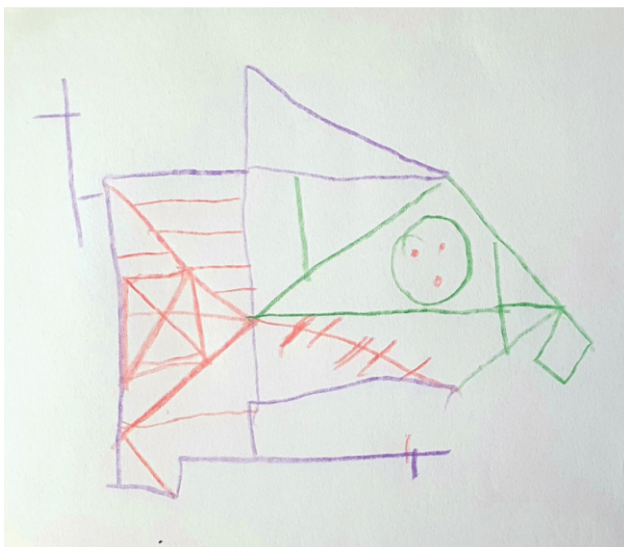


Figure 1. Visuoconstruction dyspraxia in patient with right (non-dominant) temporal epilepsy (Rey-Osterreith Complex Figure Test - copying)

EEG recording recorded during hospitalization (standard recording and after sleep deprivation - I and II sleep phase) indicated good basic activity and symmetrically expressed in the irregular Alpha rhythm 9-10Hz. During recording, bilateral anterior (FCT max) right accentuation registered slow Theta activity of sharp waves, multiple sharp waves, as well as individual decapitated spikes. This activity is emphasized by HV, especially after sleep deprivation.

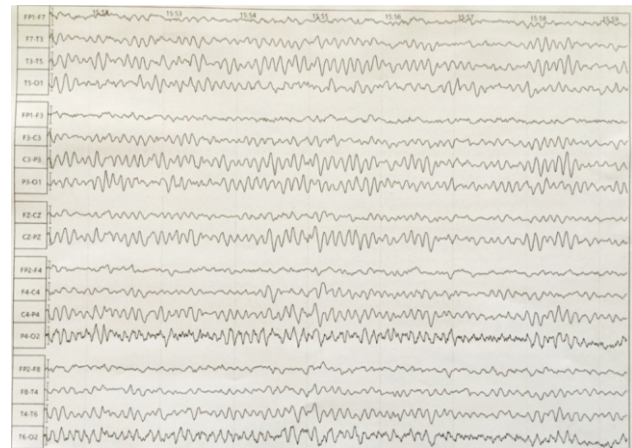


Figure 2. Scalp EEG demonstrates focal electro-cortical dysfunction over the right hemisphere

As a part of the diagnostic procedure, an MRI of the endocranium was made according to the protocol for epilepsy, which indicated that there were no detectable pathological changes endocranially and the presence of sinusitis of the maxillary and left frontal sinuses. Based on the anamnestic data, objective findings and applied diagnostic methods, it was concluded that the clinical profile corresponded to the temporal focal epilepsy, and the patient was released with AET (VPA) therapy with the recommendation of an epileptologist.

DISCUSSION

Standard neuropsychological tests are a significant instrument for the clinical localization of brain dysfunction [11]. Indications for neuropsychological examination are localization (100%) because cognition disorder can provide information about the lateralization and localization of the seizure network, or the nature of the epileptic syndrome [12], preoperative observation (100%) where the functional deficit zone is assessed [13] and postoperative (96%) because the neuropsychological testing still remains an indispensable tool for the prognosis of postoperative neuropsychological deficit and for defining the potential of postoperative neuropsychological rehabilitation [13]. Testing in the service of evaluating general cognitive performance (92%), monitoring the effect of antiepileptic therapy (68%), testing of transient cognitive impairment (TCI) due to electroencephalographic epileptic discharge (56%), as well as the assessment of ictal (20%) and postictal (12%) belongs to the indicated diagnosis procedure [14]. Neuropsychological research of patients with epilepsy has developed in the last 40 years from research on "epileptogenic intelligence" to an approach that emphasizes the specific pattern of ability and deficit in relation to the specific type of seizure or localization of epileptogenic activity [15].

The aim of this study is to determine the location of the cerebral dysfunction by obtaining functional information that complements the findings of other diagnostic methods [16]. So far, a large number of studies have shown a link between right-sided temporal lobe epilepsy and visual or image learning and memory deficits [11,15,17,18], while chronic left temporal lobe epilepsy has been associated with progressive verbal memory impairment [19].

Tests after resection of the right temporal lobe can be stated as support for these results, which show deficits in the non-verbal, perceptual memory task [15,20]. Hebb described a patient in 1939 [21] with posttraumatic epilepsy in whom most of the right temporal lobe was removed. Although the general intelligence remained intact, he had very low scores on the nonverbal part of the intelligence scale. Tests that measure spatial planning, visually and tactilely, indicated that the deficit present before surgery progressed after surgery [22]. Visual domain disorders related to the right temporal lobe affect both visual perception and visual memory [8,23-25], regardless of whether the patient can verbally identify the visual stimulus [26]. However, these disturbances may be so subtle so as the patient is not even aware of having them, until being tested. Also, visual and constructive abilities have shown to be impaired in the focus of right-sided temporal lobe epilepsy [24], implying the unusual and complex constructional demands are a contribution factor to DCS-R sensitivity among RTE patients.

The analysis of error categories indicated that false-positive responses (e.g. errors in the design construction) occurred equally in both epileptic patients and healthy subjects, while preservations rotated 90 or 180 degrees but good forms were more common in right-sided temporal lobe epilepsy. This is also in favor of impaired visual and spatial functions in the right hemisphere damage [27]. By comparing performance on visual memory tests (from WMS-R) among patients with LT and RT seizures, a difference is rarely seen, even when the sample is sufficient for detecting small size effects, suggesting that that the tasks from WMS-R depend on visual-perceptual and visual-structural functions more than the memory functions per se [28]. The link between visual-spatial memory and visual-constructional ability lies in the interhemispheric extension of the neural epileptic dysfunction (neural noise), and it is comparable to the link described between the verbal memory and the language use [29]. RT patients have better scores for BNT, but worse on visual reproduction tests [30]. Several studies have proved material-specific theory for verbal memory tests and drug resistant left temporal lobe epilepsy, and for RT seizures and visual memory tasks [31,32]. For the non-verbal memory function, a large number of tests are in use. The Rey-Osterrieth Complex Figure Test (ROCFT) is the most commonly used (55%), and it was used in this study as well. Diagnosticum für Cerebralschädigung (DCS-R) and Benton Visual Retention Test are used. Vogt et al, described 21 tests being used for studying visual-spatial functions, with little

overlapping [14]. ROCFT copying is used the most (35%), which is used as a figural memory test. Other tests are used in 20% of the cases (e.g. Block design, Judgment of line orientation) and 15% for visual and spatial perception and complex visual organization (Hooper's visual organization test).

Based on all of the above, it can be concluded that the diagnosis of temporal lobe epilepsy can be a challenge. Panic disorder and partial seizures may have similar symptoms [33], and patients with epilepsy may have prodromal symptoms of tension, anxiety and depression, especially those with temporal lobe epilepsy which may have accompanying affective symptoms, fear, vegetative symptomatology, including skin discoloration, blood pressure and pulse rates [34]. There is an overlap in symptoms between complex partial seizures of temporal lobe epilepsy and panic disorder which includes at least 4 of 13 symptoms on the list of the international classification of diseases. Therefore, the diagnosis may sometimes be delayed, unless a complete diagnosis is made, which includes the cooperation of a neurologist, psychiatrist, radiologist and psychologist.

Temporal lobe epilepsy is on the International League against Epilepsy (ILAE) International classification of epilepsy and epileptic syndromes (Commission on Classification and Terminology of the International League Against Epilepsy) [35], as a state that represents the biggest group of surgical epilepsies and a state that has the best seizure outcome [36,37].

CONCLUSION

Neuropsychological assessment is, along the magnetic resonance imaging and electroencephalographic, the most important method for determining the epileptic focus, which has been confirmed in a large number of previous studies. It is usually necessary to perform a complete diagnostic protocol that includes neurophysiological, neuroradiological and neuropsychological examinations, as well as clinical monitoring of the response to antiepileptic therapy. In all seizures where aura, pseudo-absence, automatisms, affective and vegetative manifestations are present, where magnetic resonance imaging, electroencephalography and neuropsychological examination indicating a deficiency in the temporal lobe were performed, the fact that it is temporal focal epilepsy should be considered.

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