

## CORRELATIONS OF THE CEREBRAL EVOKED POTENTIALS PARAMETERS WITH AGE, CLINICAL AND SOCIAL CHARACTERISTICS OF PATIENTS WITH THE FIRST EPISODE OF PSYCHOSIS

<sup>1</sup>*Osokina O.I.*, <sup>2</sup>*Ivnev B.B.*

<sup>1</sup>*M. Gorky Donetsk National Medical University, Krasny Lyman, Ukraine*

<sup>2</sup>*Kyiv medical university of UAFM, Kyiv, Ukraine*

*oosokina@mail.ru*

Рецензенти: PhD C.C. Casula, проф. Напрєєнко О.К.

**Actuality.** Schizophrenia is characterized by changes of profile of the cerebral evoked potentials.

**Aim** of this study was to research correlation between the auditory and visual EPs, aging and social/demographic characteristics of the patients and clinical symptoms of psychosis.

**Materials and methods.** Correlations of the cerebral visual and auditory evoked potentials with clinical, pathopsychological, clinical/social, demographic and organizational factors that characterized the disease course and personalities of patients were studied in 46 patients with the first-episode of psychosis (code number F2 according to DSM-IV). Amplitudes and latent periods of early components (P100, N100, and P200) and late components (N200, P300 and N400) of EPs as well as sensorimotor reaction time were analyzed. Clinical and neuropsychological studies were performed using Positive and Negative Syndrome Scale (PANS) and Scale «Global Assessment of Cognition Function» (GACF-CogFu).

**Results.** We found the significant correlations of P100, P300, and N400 with the patient's age of start and duration of psychosis's prodromal period, the patient's age of the moment of prodromal period manifestation, the duration of inpatient treatment, and with the level of premorbid functioning. Extended duration and late onset of prodromal period as well as the time of psychosis manifestation and low level of premorbid functioning were correlated with disorder of sensory registration related to attention impairment. Early onset of schizophrenia prodromal period and early age of psychosis manifestation as well as short-duration of in-patient treatment were correlated with disfunction of the memory and associative processes. The changing of visual modality EPs was established as markers of clinical condition in patients with the first episode of psychosis. Severity of psychopathologic symptomatology of schizophrenia (intensity of positive symptoms) was reflected in N200, N400, P300 characteristics and sensorimotor reaction duration whereas intensity of negative symptoms – in characteristics of P2N2 complex.

**Conclusion.** Therefore, the most important factors, which affect on cognitive functioning of the patients with FEP are: age of the prodromal period start, duration of the prodromal period, age of FEP manifestation, duration of the outpatient treatment and level of the premorbid functioning.

**Keywords:** first episode of psychosis, cerebral evoked potentials, cognitive functioning, sensorimotor reaction.

**Actuality.** The positive and negative symptoms as well as the cognitive dysfunctions were found in patients with schizophrenia and schizophrenic psychosis.

Cognitive dysfunctions always takes place at these diseases and change social functioning of the patients, therefore these mental disorders may be classified as diseases of the neurocognitive spectrum [20].

Recently, a definition of the first-episode of psychosis (FEP) was proposed. It can be as start of different mental disorders, such as schizophrenia, acute schizophrenic psychosis, schizoaffective disorder, bipolar affective disorder, and organic, vascular or toxic psychosis [5].

Dysfunctions of the cognitive sphere are a component of pathological changes in patients with FEP and have a significant influence on psychosocial adaptation of the patients. The importance of disturbance level in the cognitive processes for forecast the possibility for achievement of satisfactory level of patients function-

ing and continuation of their professional/labor activity was proved [1, 12, 23]. The investigations of cognitive processes in patients with FEP are based on clinical, psychological [9], and neuropsychological [2] methods. These methods, however, don't allow investigating objectively the phenomenology and mechanisms of cognitive functioning such as perception of the stimulus and it's transmission to the cerebral cortex, processing of information in the brain and behavior reaction of patient on the specific stimulus [3].

We found many studies of cerebral evoked potentials (EPs) in patients with schizophrenia and schizophrenic psychosis for last 20 years. We estimated, that results of these investigations are rather contradictory [15, 17]. According to some data a decrease amplitude of auditory wave P300 of EPs to 54-58 % [19] in the left temporal [24] or parietotemporal [14, 25] zones is the main marker of these diseases. This phenomenon indicates failure in processing of information in auditory cortex

of the brain during processes of thinking, attention and memory at these patients. Other authors [16] reported that the specified changes were observed not at all patients and depended on severity of pathological process and the level of cognitive disorders.

In some studies researchers have reported about inverse dependence between the amplitude of auditory wave P300 and the severity of positive symptoms, as well as independence of electrophysiological indices from level of negative symptoms [8, 21] in patients with schizophrenia. At the same time, other authors found the inverse correlation between the amplitude of auditory wave P300 and the severity of negative symptoms of this disease [28]. It seems possible that reasons of these differences are: duration of the disease, different paradigms of investigation, peculiarities of electrodes localization and different tasks in the experiments. In most studies of EPs in patients with FEP [21, 25], auditory EPs were examined. All authors estimated abnormalities of late EPs (decrease the amplitudes and increase the latent period of waves N200 and P300). However, the same changes were found in persons with other mental disorders and in healthy relatives of patients, because we made a conclusion, that changes of EPs in schizophrenic psychosis are not specific.

We believed that comparative examination of auditory and visual EPs in patients with FEP can help to find the components that will be specific markers and can be used for early diagnostics and forecast of the course of schizophrenic psychosis [10].

Studies of cerebral EPs in patients with FEP are not numerous. The peculiarities of EPs in patients with the first attack of juvenile psychosis (affective-delirious, hallucinatory-delirious, and catatonic types of attacks) were estimated. So, clinical symptoms correlated with EPs parameters [3]. In another study, the dynamic changes of waves N100, P200, and P300 were compared in persons of a high-risk of psychosis development, patients with psychosis and healthy persons. There was found that only in persons with high-risk of psychosis development and patients with psychosis wave N100 of auditory EPs was reduced [18]. No other changes in components of EPs in these groups. One more recent study confirmed that the wave P300 could be a selective marker of possibility development of psychosis, because it was reduced in persons with high-risk of psychosis development and in chronic patients [26].

**The aim** of the study is to found correlation between the auditory and visual EPs, aging and social/demographic characteristics of the patients with FEP and clinical symptoms of psychosis.

## MATERIALS AND METHODS

The cognitive functions in patients with FEP were estimated using clinical/case historical, clinical/

psychopathological, neuropsychological, and neurophysiological approaches before discharge from a psychiatric department. This complex approach was providing more complete and qualitative examination of the cognitive processes in patients with FEP. We used the Positive and Negative Syndrome Scale, PANSS for estimation the severity of psychopathological symptoms [22]. Neurocognitive dysfunctions in patients with FEP were estimated using the GACF-CogFu Scale ("Global Assessment of Cognition Function") [23].

Neurophysiological investigation was carried out on the Department of Physiology of the Donetsk National Medical University using a diagnostic complex Amplaid MK-15 (Italy). We examined 46 patients with FEP. These persons have been hospitalized for the first time in a life according to section F2 DSM-IV [6]. Diagnostic categories of patients: paranoid schizophrenia, period of monitoring below a year (F20,09), 9 subjects (19,6 %); acute psychosis without symptoms of schizophrenia (F23) 9 patients (19,6 %); acute psychosis with symptoms of schizophrenia (F23,1) – 15 patients (32,6 %); acute schizophrenic psychotic disorder (F23,2) – 3 patients (6,5 %) and schizoaffective psychosis (F25), 10 subjects (21,7 %). At the moment of EPs recording all patients had PANSS < 50 points and received an antipsychotic drug in a supporting dose. Some patients combined a neuroleptic with Cyclodol (2 mg, 2-3 times per day), as well as an antidepressant or Lithium. The mean age of patients was 26,1±0,8 year. There were 16 women (34,8 %) and 30 men (65,2 %).

Complex examination of auditory and visual EPs at the same patient, evaluation of the peculiarities of these EPs reflecting the generality and differences of processing information by the brain, allowed us to determine electrophysiological markers of schizophrenia and markers of patient's clinical state. Also we can find correlations between parameters of EPs and features of psychosis current and social functioning of the patients with FEP and patients with prodromal period of the disease. In addition, we included a factor of various waiting level of significant stimulus (SS) using two variants of pseudorandom arising of these stimuli (probability of SS appearance 20 % or 50 %). We also analyzed the latent period of patient's sensorimotor reaction (SMR). Auditory and visual EPs were recorded according to the oddball paradigm. The patient should press a button at SS and ignore insignificant stimuli. The total number of the presented stimuli was 100 for each variant of stimulation. The duration of EPs registration was 45-60 minutes. The obtained data have been processed using specialized software. We measured values of the amplitudes ( $\mu\text{V}$ ) and latent periods (mSec) of waves P100, N100, P200, N200, P300 and N400) in leads Cz and Oz. We used statistical package «MedStat» for mathematical analysis of data [4].

## RESULTS AND DISCUSSION

We have analyzed archival case histories of 305 patients with FEP hospitalized for the first time in their life in the Donetsk regional clinical psychiatric hospital (Ukraine) from 2005 to 2008. It has allowed studying the generality and specificity of clinical, social-demographical and personal-psychological features of patients. The analysis of the medical documentation has allowed to estimate following groups of factors, which change the forecast of disease: clinical (symptoms in the prodromal period of psychosis, clinical type of the prodromal period, clinical features of the course of psychosis and reactions on treatment by medicines and the diagnosis), psychological (level of cognitive functioning, insight, defense mechanisms tension and copying-strategy), social (level of premorbid functioning, quality of life, social functioning in different spheres of life, self-stigmatization, existential fulfillment and meaning of life), demographic (sex, age,

married or unmarried and relationship with members of the family), organizational (the characteristic of treatment before hospitalization, the duration of hospitalization and medical-rehabilitation tactics), social status (educational level, presence/absence of work, heredity and addictions). Then, among these factors we selected the most significant. There are (i) clinical (symptoms in prodromal period of psychosis, features of treatment before hospitalization, features of the course of psychosis and reactions to medicines), (ii) psychological (level of cognitive functioning and medical-rehabilitation tactics); (iii) social (the relationship with members of the family, social status and heredity), (iv) demographic (sex, age, married or unmarried), and (v) organizational (duration of hospitalization and the diagnosis).

The correlation analysis was carried out for reveal correlations between significant factors and electrophysiological parameters. Results of this analysis are presented in Tables 1 and 2.

**Table 1**

**Significant Correlations of the Parameters of Evoked Potentials (EPs) and Sensotimotor Reactions (SMR) with Some Age-Related and Clinical/Social Characteristics of Patients with First-Episode Psychosis (FEP)**

Parameters	age of the FEP prodrome onset	duration of the FEP prodrome	age of FEP manifestation	duration of in-patient treatment	level of premorbid functioning
Ampl. of vis. P200 (50%)				0,331	
Ampl. of aud. P100 (20%)	-0,303		-0,368		
LP of vis. P100 (20%)	0,394				
LP of vis. P300 (20%)				-0,311	
LP of vis. N400 (50%)				-0,303	
Time of the aud. SMR (50%)			-0,327		
Time of the aud. SMR (20%)			-0,33		
Ampl. of aud. N400 (50%)	0,352		0,313	0,35	
LP of aud. P100 (20%)		0,406			0,366
LP of aud. P300 (50%)			0,333		
LP of aud. P300 (20%)			0,379		

Footnotes: Values of the Pearson criterion  $r$  are presented. In the graph "Parameters", Ampl. is amplitude, and LP is latent period; vis. and aud. are visual and auditory; probabilities of presentation of the significant stimuli, %, are given in parentheses.

**Table 2**

**Significant Correlations of the Parameters of Evoked Potentials (EPs) and Sensotimotor Reactions (SMR) with Clinical Indices by the PANSS Scale in Patients with First-Episode Psychosis (FEP)**

Parameters	Total estimate by the positive scale, points	Total estimate by the negative scale, points	Total index of expression of psychopathological symptomatology
Ampl. of vis. N200 (20%)	0,342		
Ampl. of vis. N200 (50%)		0,36	0,317
Ampl. of vis. N400 (50%)			-0,292
LP of vis. P200 (20%)		0,356	
LP of vis. N200 (20%)		0,292	
LP of vis. P300 (50%)	0,352		
Time of the vis. SMR (50%)	0,354		
LP of vis. N400 (20%)	0,291		
LP of vis. N400 (50%)	0,49		0,388
LP of aud. N400 (50%)	-0,305		

Footnote. Designations in the graph of "Parameters" are the same as in Table 1.

The mean patient's age of the start of prodromal period and the mean age of the first admission to the hospital were correlated with the amplitudes and latent periods of visual wave P100 EPs (20 % probability of SS). Increasing of age corresponded to decreasing of amplitudes of wave P100 ( $r = -0,303$  and  $r = -0,368$ ; in both cases,  $P < 0,05$ ), while the latent period of this EPs component correlated ( $r = 0,394$ ) with the mean age of the start of prodromal period of psychosis. In addition, latent period of wave P100 of auditory EPs (20 % stimulation) had positive correlations ( $r = 0,406$ ) with the duration of FEP prodromal period and low levels of premorbid functioning of the patients ( $r = 0,366$ ). Therefore, low amplitudes and long latent periods of wave P100 EPs were confirmed some distortions in processing of auditory and visual information in patients with FEP. These changes of EPs were increased in the next cases: increasing of age when prodromal period of disease began, increasing of age when typical symptoms arose, increasing of prodromal period of FEP and lower level of patient's premorbid functioning. It was reported that the reticular formation and the cerebral cholinergic system play significant roles in the perception of sensory information and, therefore, in the formation of wave P100 EPs [11]. It seems possible that decreasing of velocity transmission impulses between neurons leads to delay of interaction between different cerebral cortical areas. It is not excluded also, that, in patients with FEP, the longer pathways of information transmission are formed due to involvement of new cerebral neuronal networks. These hypotheses are in accordance with the results of neuropsychological examination of these patients that has revealed decrease of information processing. It was confirmed by increasing of time for carry out of some tasks.

Latent period of SMR time consists of two parts: sensory part (time for perception of stimuli) and motor part (time for motor reaction). The SMR time of patients with FEP were increased by auditory stimulation, which confirmed by negative correlation between the mean age of the first admission to the hospital and the time of SMR (50 % probability  $r = -0,327$  and 20 % probability  $r = -0,33$ ).

The time of SMR includes such stages of information processing as perception of sensory signal, awareness of it and time for decision about motor reaction: to press or no press the button. The modality of the stimulus [11] that served as a trigger signal for SMR is influence on both: duration of this reaction and correctness of its realization, as well as on the cerebral EPs, that connected with it. Each stage of this process acts on the final result of the action and, undoubtedly, is modified under the influence by developing mental pathology.

Decrease the amplitude of wave P100 means that smaller intensity of excitatory and/or inhibitory influences of nonspecific cerebral systems on the cortical areas of the brain, which involved in sensory

information processing. It is likely that a decreasing of the tone of the brain reticular formation led to decrease attention. The neuropsychological examination of these patients has shown lack of attention. It was expressed in difficulty of attention focusing and concentration on the significant information, and difficulties in the switching of attention from one object to another.

Besides, mean patient's age corresponding to the start of psychotic prodromal period, the age of primary hospitalization and its duration demonstrated correlations with characteristics of late (endogenous) EPs. In particular, positive correlations has been found between the above-named indices and the amplitude of auditory EPs wave N400 (50 % probability ( $r = 0,352$ ,  $r = 0,313$ , and  $r = 0,35$ , respectively). The mean age of hospitalization positively correlated with the latent period of auditory EPs wave P300 (20 % and 50 % probability ( $r = 0,379$  and  $r = 0,333$ , respectively). Mean duration of hospitalization was correlated by negative correlation ( $r = -0,311$ ) with the latent period of visual EPs wave P300 (20 % probability). Therefore, more later beginning of prodromal period and manifestation of the first psychotic attack, as well as more long period of treatment correlated with better results of SMR in response to auditory stimuli. It determines higher probabilities of correct motor reaction, improvement of the classification processes, making decision, and also improvement of the correctness of the decision. We can't maintain, that endogenous EPs (P300 and N400) reflect some mental functions, but we have proved correlation between these indices and characteristics of cognitive activity (processes of learning, memory, and thinking). We have revealed positive correlation ( $r = 0,331$ ) between the duration of patient's hospitalization and the amplitude of visual wave P200 EPs (50 % probability of stimulation). Thus, higher values of the age-related characteristics and duration of treatment correlated with improving of cognitive functioning of patients with FEP (according to the neurophysiological study).

The correlations between the indices of the clinical state of patients with FEP at the moment of their discharge from the hospital and the EPs characteristics are shown in Table 2. This analysis was focused on detection of possible electrophysiological markers of the clinical state of these patients.

The clinical state of patients with FEP at the moment of their discharge from the hospital was performed using scale PANSS.

We have estimated the next general predictable features: 1. All electrophysiological parameters visual EPs (except wave N400 at 50 % probability of stimulation) correlated with level of clinical symptoms of FEP. It corresponded to results of our own recently study [7] carried out on a smaller group of the patients with FEP. Amount of correlations between clinical symptoms of FEP and auditory EPs were insignificant. The reason of this situation is low level of cognitive

deficiency [27]. 2. All electrophysiological parameters of endogenous visual waves N200, P300, and N400 EPs (except latent period of visual wave P200 at 20 % probability stimulation) correlated with the groups of clinical symptoms (negative and positive). These modifications of the electrophysiological parameters reflected the impairment of cognitive functioning in patients with FEP.

The total score by positive P-scale (PANSS) correlated positively ( $P < 0,05$ ) with the latent period of visual EPs wave P300 (50 % probability of stimulation ( $r = 0,352$ ), visual EPs wave N400 (50 % and 20 % probability of stimulation ( $r = 0,490$  and  $r = 0,291$ , respectively), the amplitude of visual EPs wave N200 (20 % probability of stimulation ( $r = 0,342$ ) and SMR time at visual stimulation ( $r = 0,354$ ). Considering the fact that the late EPs components are generated by multiply generators in the CNS we can demand that positive symptoms of psychosis reflect disturbance of the functioning of cerebral structures involved in the fulfill of a certain task. It is reflected in increase the latent periods of late EPs, and also in increase the SMR time. Positive symptoms in patients with FEP were relief (after treatment) but increasing of latent period of late EPs and SMR time were remained. We concluded that for recovery of synchronous functioning of cerebral areas of the brain some time is necessary.

At the same time, intensification of positive symptoms of psychosis correlated negatively with the latent period of auditory EPs wave N400 (50 % probability of stimulation ( $r = -0,305$ ). This late component of EPs reflects the activation of the plasticity mechanisms of central nervous system as compensatory reaction on manifestation of the psychopathological symptoms in patients with FEP.

The total score by negative N-scale (PANSS) correlated positively ( $P < 0,05$ ) with the latent period of visual waves P200 and N200 (20 % probability of stimulation ( $r = 0,356$  and  $r = 0,292$ , respectively). Intensification of negative symptoms correlated with the increase of duration of N2P2 complex of EPs that reflects peculiarities of primary identification and classification processes of visual stimuli and the operative memory also. In other words, there was marked the delay of information processing because we found failure of synchronization some cerebral structures. At the same time, positive correlations between the intensity of positive and negative symptoms, and the amplitude of visual Eps wave N200 ( $r = 0,342$  and  $r = 0,36$ , respectively) were confirmed the correctness of visual stimuli recognition by patients and even on some intensification of visual perception (due to activation of a selective function of attention) during psychosis. These data were confirmed the results of neuropsychological examination using the GACF-CogFu scale. The patients demonstrated some difficulties in keeping verbal information in memory,

store of oral messages, and excerpt of information from the memory, as well as difficulties at immediate mental actions.

We found medium-degree positive correlation ( $r = 0,388$ ) with the latent period of the visual Eps wave N400 (50 % probability of stimulation) and also medium-intensity negative correlation ( $r = -0,292$ ) with the amplitude of the visual Eps wave N400. In addition, the common total score of psychopathological symptoms level positively correlated with the amplitude of the visual wave N200 (50 % probability). Therefore, the severity of psychopathological symptoms of the FEP within the stage of stabilized remission correlated with the amplitude/time characteristics of late EP components N200 and N400 (50 % probability of the visual stimulus arising). Increasing level of psychopathological symptoms in patients with FEP leads to lower synchronization between cerebral structures involved in the process of task solving and to increasing neuronal load in the adaptation/compensatory mechanisms of the brain. We demanded that pathways of cerebral processing of incoming visual information in patients with psychosis are distorted and some other neuronal networks (differing from those in mentally healthy persons) are involved in the task solving in persons with pathological process. Probably, the reason of these changes is dysfunction of the cerebral mediator systems in patients with psychosis [10].

We have found the absence of significant differences from the norm in the amplitude and latent period of the auditory Eps wave P300 (both at the 50 % and 20 % probabilities of the SS;  $P > 0,05$ ). But in earlier investigations of EPs in patients with schizophrenic psychosis significant attention was focused on the auditory EPs wave P300 [27]. In some studies, decreasing of the amplitude of this component was considered as electrophysiological parameter of positive symptoms, cognitive deficit in chronic patients, a low level of social functioning, as well as to the existence of cognitive disorders within the prodromal phase of schizophrenia in untreated patients [13]. Some researchers even considered changes in the characteristics of the auditory P300 wave as a marker of schizophrenia.

We have not found correlation between amplitude of auditory wave P300 and clinical symptoms of psychosis immediately after a psychotic attack. It's may be connected with sensitivity of the auditory wave P300 to therapy by neuroleptics which decrease positive symptoms of the disease, as well as disorganization symptoms and cognitive dysfunction. Its symptoms arise in the acute phase of the disease and are reduce in the period of remission.

## CONCLUSION

Therefore, the most important factors, which acts on cognitive functioning of the patients with FEP are:

the age of the start of the prodromal period, duration of the prodromal period, age of manifestation of the FEP, duration of in-patient treatment and level of the premorbid functioning. Certain abnormalities of visual-modality EPs in condition of 50 % probability arising of the SS are objective markers of the clinical state of FEP. The severity of the FEP psychopathological symptoms (by the PANSS scale) correlated with abnormalities of waves N200 and N400. The level of the positive symptoms positively correlated with the latent period of wave P300 ( $r = 0,352$ ) and negatively with the SMR time (50 % probability of stimulation,  $r = -0,327$ ; 20 % probability of stimulation,  $r = -0,330$ ), while level of the negative symptoms correlated with increasing of the P2-N2 complex duration ( $r = 0,356$  and  $r = 0,292$ , respectively).

**Conflict of interest.** The authors declare having no conflicts of interest that may be perceived as being likely to prejudice the impartiality article.

**Sources of financing.** This article has not received financial support from the state, public or commercial organizations

## REFERENCES

1. Бабухадия Е.А. Клинико-социальные особенности дебютов шизофрении у женщин: дис. ... канд. мед. наук: 14.00.18 [Текст] / Е.А. Бабухадия. – Томск, 2003. – 254 с.
2. Зайцева Ю.С. Первый психотический эпизод: пятилетнее катамнестическое клинико-нейропсихологическое исследование: автореф. дис. на соискание учен. степени канд. мед. наук : спец. 14.01.06 «Психиатрия» [Текст] / Ю.С. Зайцева. – М., 2010. – 25 с.
3. Каледа В.Г. Первый приступ юношеского эндогенного психоза (клинико-психопатологическое, клинико-патогенетическое и клинико-катамнестическое исследование): дис. ... доктора мед. наук: 14.00.18 [Текст] / В.Г. Каледа. – М., 2007. – 470 с.
4. Лях Ю.Е. Анализ результатов медико-биологической исследований и клинических испытаний в специализированном статистическом пакете MEDSTAT [Текст] / Ю.Е. Лях, В.Г. Гурьянов // Вестн. гигиены и эпидемиологии. – 2004. – Т. 8. – № 1. – С. 155-167.
5. Мангуби Д.А. Первичный психотический эпизод: новые лекарственные формы как альтернатива инъекциям [Текст] / Д.А. Мангуби // Здоров'я України. – 2011. – № 4 (19). – С. 32-33.
6. Міжнародна класифікація хвороб (10 перегляд). Класифікація психічних і поведінкових розладів [Текст]. – СПб.: АДИС, 1994. – 304 с.
7. Осокина О.И. Динамика вызванных потенциалов головного мозга как показателя эффективности реабилитации больных с ранними стадиями шизофрении [Текст] / О.И. Осокина // Международный неврологический журнал. – 2014. – 4 (66). – С. 155-162.
8. P300 слуховые вызванные потенциалы при шизофрении [Текст] / И.С. Лебедева, В.А. Орлова, В.Г. Каледа [и др.] // Журн. неврологии и психиатрии им. С. С. Корсакова. – 2000. – Т. 100, № 11. – С. 47-49.
9. Ряполова Т. Л. Рання реабілітація хворих на шизофренію (біопсихосоціальна модель): автореф. дис. на здобуття наук. ступеня доктора мед. наук: спец. 14.01.16 «Психіатрія» [Текст] / Т.Л. Ряполова. – Харьков, 2010. – 35 с.
10. Связанные с событиями потенциалы головного мозга у больных, перенесших первый психотический эпизод шизофрении [Текст] / В.А. Абрамов, В.Н. Казаков, О.И. Лихолетова [и др.] // Журнал психиатрии и медицинской психологии. – 2012. – № 3. – С. 20-29.
11. Снегір А.Г. Модифікація сенсо-моторних реакцій і зв'язаних з ними викликаних потенціалів мозку при нормальному та патологічному старінні: дис. канд. мед. наук : 14.03.03 [Текст] / А.Г. Снегір. – Донецьк, 2003. – 206 с.
12. Шадрин В.Н. Адаптационные возможности и оценка качества жизни больных шизофренией (клинические и социальные аспекты): дис. канд. мед. наук: 14.00.18 [Текст] / В.Н. Шадрин. – Томск, 2006. – 232 с.
13. Abnormal P300 in people with high risk of developing psychosis [Text] / E. Bramon, M. Shaikh, M. Broome [et al.] // Neuroimage. – 2008. – Vol. 41, No. 2. – P. 553-560.
14. Abnormalities of auditory P300 cortical current density in patients with schizophrenia using high density recording [Text] / J. Wang, K. Hiramatsu, H. Hoka-ma [et al.] // Int. J. Psychophysiol. – 2003. – Vol. 47, No. 3. – P. 243-253.
15. Attentional modulation of the P50 suppression deficit in recent-onset and chronic schizophrenia [Text] / C. M. Yee, T. J. Williams, P. M. White [et al.] // J. Abnorm. Psychol. – 2010. – Vol. 119, No. 1. – P. 31-39.
16. Auditory P300 amplitude as a state marker for positive symptoms in schizophrenia: cross-sectional and retrospective longitudinal studies [Text] / M. Higashi-ma, T. Nagasawa, Y. Kawasaki [et al.] // Schizophr. Res. – 2003. – Vol. 59, No. 2-3. – P. 147-157.
17. Automatic sensory information processing abnormalities across the illness course of schizophrenia [Text] / C. Janshan, K. S. Cadenhead, A. J. Rissling [et al.] //

- Psychol. Med. – 2012. – Vol. 42, No. 1. – P. 85-97.
18. Disability in people clinically at high risk of psychosis [Text] / E. Velthorst, D. H. Nieman, D. Linszen [et al.] // *British Journal of Psychiatry*. – 2010. – Vol. 197. – P. 278-284.
  19. Event-related potentials and genetic risk for schizophrenia [Text] / G. Winterer, M. F. Egan, T. Rädler [et al.] // *Biol Psychiatry*. – 2001. – Vol. 15, No. 6. – P. 407-417.
  20. Green M. F. What are the functional consequences of neurocognitive deficits in schizophrenia? [Text] / M. F. Green // *Am. J. Psychiatry*. – 1996. – Vol. 153, No. 3. – P. 321-330.
  21. Impaired P3 generation reflects high-level and progressive neurocognitive dysfunction in schizophrenia [Text] / O. van der Stelt, J. Frye, J. A. Lieberman [et al.] // *Arch. Gen. Psychiatry*. – 2004. – Vol. 61, No. 3. – P. 237-248.
  22. Kay S. The Positive and Negative Syndrome Scale (PANSS) for schizophrenia [Text] / S. Kay, A. Fiszbein, L. Opler // *Schizophr. Bul.* – 1987. – Vol. 13, No. 2. – P. 261-276.
  23. Longitudinal study of neurocognitive function in individuals at-risk for psychosis [Text] / R. Keefe, D. Perkins, H. Gu [et al.] // *Schizophrenia Research*. – 2006. – Vol. 88. – P. 26-35.
  24. Mathalon D.H. Trait and state aspects of P300 amplitude reduction in schizophrenia: a retrospective longitudinal study [Text] / D.H. Mathalon, J.M. Ford, A. Pfefferbaum // *Biol Psychiatry*. – 2000. – Vol. 47, No. 5. – P. 434-449.
  25. P300 alterations in schizophrenic patients experiencing auditory hallucinations [Text] / C. Papageorgiou, P. Oulis, C. Vasios [et al.] // *Eur. Neuropsychopharmacol.* – 2004. – Vol. 14, No. 3. – P. 227-236.
  26. Reduced P3a amplitudes in antipsychotic naïve first-episode psychosis patients and individuals at clinical high-risk for psychosis [Text] / A. Mondragón-Maya, R. Solís-Vivanco, P. León-Ortiz [et al.] // *Journal of Psychiatric Research*. – 2013. – Vol. 47, No. 6. – P. 755-761.
  27. Reduction of auditory event-related P300 amplitude in subjects with at-risk mental state for schizophrenia [Text] / S. Ozgurdal, Y. Gudlowski, H. Witthaus [et al.] // *Schizophr. Res.* – 2008. – Vol. 105, No. 1-3. – P. 272-278.
  28. Sensitivity of late-latency auditory and somatosensory evoked potentials to threat of electric shock and the sedative drugs diazepam and diphenhydramine in human volunteers [Text] / J.C. Scaife, J. Groves, R.W. Langley [et al.] // *J. Psychopharmacol.* – 2006. – Vol. 20, No. 4. – P. 485-495.

*Надійшла до редакції 22.01.15*

## АНАЛІЗ ВЗАЄМОЗВ'ЯЗКІВ ВИКЛИКАНИХ ПОТЕНЦІАЛІВ ГОЛОВНОГО МОЗКУ З ВІКОВИМИ ТА КЛІНІКО-СОЦІАЛЬНИМИ ОСОБЛИВОСТЯМИ ПАЦІЄНТІВ З ПЕРШИМ ПСИХОТИЧНИМ ЕПІЗОДОМ

<sup>1</sup>Осокіна О.І., <sup>2</sup>Івнев Б.Б.

<sup>1</sup>Донецький національний медичний університет імені М. Горького, Красний Лиман, Україна

<sup>2</sup>Київський медичний університет УАНМ, Київ, Україна

**Актуальність.** Зміна картини викликаних потенціалів головного мозку характерна для шизофренії.

**Мета:** дослідити кореляцію між слуховими і зоровими викликаними потенціалами, старінням і соціально / демографічними характеристиками пацієнтів і клінічними симптомами психозу.

**Матеріали та методи.** У 46 пацієнтів з першим психотичним епізодом (шифр F2 відповідно до критеріїв МКХ-10) вивчалися зв'язки між слуховими і зоровими викликаними потенціалами головного мозку та клінічними, патопсихологічними, клініко-соціальними, демографічними та організаційними чинниками, що впливають на пацієнтів. Аналізували амплітуди і латентні періоди ранніх (P100, N100, P200) і пізніх (N200, P300, N400) компонентів викликаних потенціалів, а також час сенсомоторної реакції. Клінічне та нейропсихологічне дослідження проводилися за допомогою шкали позитивних і негативних синдромів (PANSS) і шкали оцінки порушень нейрокогнітивних функцій (GACF-CogFu).

**Результати.** Виявлено наявність кореляційних зв'язків P100, P300 і N400 з показниками віку початку і тривалості продромального періоду психозу, віку пацієнтів при його маніфестації, тривалості стаціонарного лікування та рівня преморбідного функціонування. Порушення реєстрації сенсорної інформації, що пов'язане з недостатністю функції уваги, виникало у випадку більш тривалого і пізнішого початку продромального періоду психозу і часу його маніфестації, а також низького рівня преморбідного функціонування пацієнтів. Ранній вік початку продромального періоду шизофренії і часу її маніфестації, і короткі терміни стаціонарного лікування корелювали з погіршенням функцій пам'яті та асоціативних процесів. В якості маркерів клінічного стану пацієнтів з першим психотичним епізодом виступали зміни викликаних потенціалів зорової

модальності. Тяжкість психопатологічної симптоматики шизофренії (вираженість позитивних симптомів) відбита в характеристиках N200, N400, P300 і часу сенсомоторної реакції, а вираженість негативних симптомів – в характеристиках комплексу P2N2.

**Висновки.** Найбільш важливими факторами, які впливають на когнітивні функції у хворих з FEP є: вік початку продромального періоду, тривалість від продромального періоду, вік прояву FEP, тривалість амбулаторного лікування і рівень преморбідного функціонування

**Ключові слова:** перший психотичний епізод, викликані потенціали головного мозку, когнітивне функціонування, сенсомоторна реакція.

## АНАЛИЗ ВЗАИМОСВЯЗЕЙ ВЫЗВАННЫХ ПОТЕНЦИАЛОВ ГОЛОВНОГО МОЗГА С ВОЗРАСТНЫМИ И КЛИНИКО-СОЦИАЛЬНЫМИ ОСОБЕННОСТЯМИ ПАЦИЕНТОВ С ПЕРВЫМ ПСИХОТИЧЕСКИМ ЭПИЗОДОМ

*<sup>1</sup>Осокина О.И., <sup>2</sup>Ивнев Б.Б.*

*<sup>1</sup>Донецкий национальный медицинский университет имени М. Горького, Красный Лиман, Украина  
<sup>2</sup>Киевский медицинский университет УАИМ, Киев, Украина*

**Актуальность.** Изменение картины вызванных потенциалов головного мозга характерно для шизофрении.

**Цель:** исследовать корреляцию между слуховыми и зрительными вызванными потенциалами, старением и социально-демографическими характеристиками пациентов и клиническими симптомами психоза.

**Материалы и методы.** У 46 пациентов с первым психотическим эпизодом (шифр F2 в соответствии с критериями МКБ-10) изучались связи между слуховыми и зрительными вызванными потенциалами головного мозга и клиническими, патопсихологическими, клинико-социальными, демографическими и организационными факторами, оказывающими влияние на пациентов. Анализировали амплитуды и латентные периоды ранних (P100, N100, P200) и поздних (N200, P300, N400) компонентов вызванных потенциалов, а также время сенсомоторной реакции. Клиническое и нейропсихологическое исследования проводились при помощи шкалы позитивных и негативных синдромов (PANSS) и шкалы оценки нарушений нейрокогнитивных функций (GACF-CogFu).

**Результаты.** Выявлено наличие корреляционных связей P100, P300 и N400 с показателями возраста начала и длительности продромального периода психоза, возраста пациентов при его манифестации, длительности стационарного лечения и уровня преморбидного функционирования. Нарушение регистрации сенсорной информации, связанное с недостаточностью функции внимания, возникало в случае более продолжительного и более позднего начала продромального периода психоза и времени его манифестации, а также низкого уровня преморбидного функционирования пациентов. Ранний возраст начала продромального периода шизофрении и времени ее манифестации, и короткие сроки стационарного лечения коррелировали с ухудшением функций памяти и ассоциативных процессов. В качестве маркеров клинического состояния пациентов с первым психотическим эпизодом выступали изменения вызванных потенциалов зрительной модальности. Тяжесть психопатологической симптоматики шизофрении (выраженность позитивных симптомов) отражена в характеристиках N200, N400, P300 и времени сенсомоторной реакции, а выраженность негативных симптомов – в характеристиках комплекса P2N2.

**Выводы.** Наиболее важными факторами, которые влияют на когнитивные функции у больных с FEP, являются: возраст начала продромального периода, время от продромального периода, возраст проявления FEP, продолжительность амбулаторного лечения и уровень преморбидного функционирования.

**Ключевые слова:** первый психотический эпизод, вызванные потенциалы головного мозга, когнитивное функционирование, сенсомоторная реакция.