

## CLINICAL AND PSYCHOPATHOLOGICAL CHARACTERISTICS OF PSYCHOTIC DISORDERS OF SENILE AGE, OCCURRING IN THE POSTOPERATIVE PERIOD

Andrii Skrypnikov<sup>1</sup>, Larysa Herasymenko<sup>1</sup>, Pavlo Kydon<sup>1</sup> & Andrii Sheffel<sup>2</sup>

<sup>1</sup>Department of Psychiatry, Narcology and Medical Psychology, Poltava State Medical University, Poltava, Ukraine

<sup>2</sup>Gerontopsychiatric department of palliative care of Communal Enterprise "Regional Institution of Mental Psychiatric Care of the Poltava Regional Council", Poltava, Ukraine

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### SUMMARY

**Background:** The course of the postoperative period in patients who underwent surgical interventions is often complicated by cerebral disorders. The aim of the research was to examine the clinical and psychopathological, pathopsychological, clinical and dynamic features of psychotic disorders, occurring after surgical interventions conducted using general anesthesia in patients of senile age with concomitant psychiatric pathology of the defect and organ register.

**Subjects and methods:** The study relied on examination of 67 subjects who had psychotic disorders after surgical interventions conducted using inhalation anesthesia. Depending on the etiological factor of cognitive impairment, the examined patients were divided into two groups. Group I included 33 people in whom the vascular component was the leading etiological factor for cognitive impairment. Group II included 34 patients (22 women and 12 men, average age –  $75.3 \pm 1.8$  years), in whom cognitive disorders were due to atrophic processes. The study applied clinical and psychopathological, psychodiagnostic and statistical methods of research.

**Results:** The concomitant defect and organic symptoms caused by vascular diseases of the brain are a risk factor for psychotic disorders in the postoperative period as compared to atrophic processes ( $p < 0.05$ ). Delirium syndrome, observed in the subjects of Group I, had signs of hyperactive subtype ( $p < 0.05$ ). At the same time, delirium syndrome, which occurred in the postoperative period in patients of Group II, had signs of the hypoactive subtype. Patients were more likely to be drowsy or sedative ( $p < 0.05$ ). Patients of Group II, the recovery time was longer ( $p < 0.05$ ), and the concomitant atrophic pathology of the brain caused a certain therapeutic resistance to psychotic disorders that occurred in the postoperative period.

**Conclusions:** The obtained results indicate the heterogeneity of symptoms of postoperative psychotic disorders of senile age, depending on various concomitant psychiatric and neurological pathologies.

**Key words:** postoperative period – psychotic disorders – senile age – postoperative delirium

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### INTRODUCTION

The course of the postoperative period in patients who underwent surgical interventions is often complicated by cerebral disorders. Their spectrum varies from postoperative cognitive dysfunction to delirium (Pasechnik et al. 2015). The incidence ranges from 9-87% depending on sex, age of patients and the degree of operative stress (Kireev et al. 2019). The incidence of postoperative delirium in the EU ranges from 5 to 15%. In some high-risk groups, which include

patients with hip fractures, the incidence of delirium ranges from 16 to 62% (Pavlov & Lutsyk 2016). These postoperative complications in elderly patients are associated with increased morbidity and mortality and can lead to longer hospital stays, additional studies and increased cost of treatment (Kireev et al. 2019). Management of such patients with psychotic disorders requires significant economic costs, since intensive care is by 39% more expensive as compared to similar populations of patients without psychosis (Bokeriia et al. 2009, Mikirtumov et al. 2008).

The etiology of these disorders in surgical patients has not been fully clarified. An important role belongs to the toxic effects of anesthetics, disorders of hemodynamics, hypoxia, concomitant of diseases, anesthesia awareness, oxidative stress and others (Pasechnik et al. 2015). Stress and any circumstances that lead to activation of the sympathetic nervous system, reduced parasympathetic effects, impaired cholinergic function contribute to the development of delirium. Elderly people, especially those sensitive to reduced cholinergic transmission, have an increased risk of developing delirium. Moreover, functional disturbances of cerebral hemispheres and thalamus, as well as a decreased influence of stem activity of reticular formation, exert an impact (Pavlov & Lutsyk 2016). It is now established that pathogenesis of delirium may involve different neurotransmitters: acetylcholine, serotonin, dopamine,  $\gamma$ -aminobutyric acid, tryptophan, melatonin, glutamate and cytokines (interleukins and interferon). It is considered that one of the pathogenesis links is an imbalance between the cholinergic and dopamine neurotransmitter systems, namely – reduction of acetylcholine and increased dopamine levels (Kireev et al. 2019). The aim of the research was to examine the clinical and psychopathological, pathopsychological, clinical and dynamic features of psychotic disorders, occurring after surgical interventions conducted using general anesthesia in patients of senile age with concomitant psychiatric pathology of the defect and organ register.

## SUBJECTS AND METHODS

The study relied on examination of 67 subjects (45 women and 22 men, average age –  $77.4 \pm 2.1$  years) who had psychotic disorders after surgical interventions conducted using inhalation anesthesia. Previously, these patients had presented with cognitive disorders at the Department of Psychiatry, Narcology and Medical Psychology of UMSA in 2015-2020. In each case, relevant diagnoses had been made and a degree of cognitive decrease had been defined. Approval for the current study was obtained from the Ethical Committee of Ukrainian Medical Stomatological Academy and it conforms to the provisions of the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000). All subjects gave informed consent to participation in the study and patient anonymity was preserved.

Depending on the etiological factor of cognitive impairment, the examined patients were divided into two groups. Group I included 33 people (23 women and 10 men, average age –  $79.2 \pm 2.3$  years) in whom the vascular component was the leading etiological factor for cognitive impairment. Group I patients were diagnosed with the following psychiatric diagnoses: mild cognitive impairment (amnestic type) (F06.7) and vascular dementia (F01). Vascular dementia was in the range of mild to moderate. Concomitant neurological

diagnosis in patients of Group I was dyscirculatory encephalopathy of stage II-III. This diagnosis was consistent with the criteria of hypertensive encephalopathy (I67.4) and ischemia of the brain (the chronic one) (I67.8) of ICD-10. Verification of the vascular component as a leading etiological factor of cognitive impairment was carried out using neuroimaging techniques (CT and MRI), examination of vessels, supplying the brain (ultrasound and rheoencephalography) and the Hachinski ischemic score. CT and MRI in the examined patients revealed multiple and single infarcts and severe leukoariosis. Ultrasound and REG revealed signs of cerebral circulatory failure. The average score at the Hachinski ischemic scale was  $9.73 \pm 1.31$ .

Group II included 34 patients (22 women and 12 men, average age –  $75.3 \pm 1.8$  years), in whom cognitive disorders were due to atrophic processes. 33 people were diagnosed with dementia in Alzheimer's disease (F00), 1 – with dementia in Pick's disease (F02.0). The level of dementia ranged from mild to moderate. Atrophic process was confirmed by the results of neuroimaging studies (CT and MRI), which showed the signs of total and regional atrophy of brain matter with expansion of the ventricles, subarachnoid spaces and cerebral sulci. The study of blood vessels supplying the brain (ultrasound and REG) did not reveal clinically significant disorders. The average score at the Hachinski ischemic scale was  $2.27 \pm 0.82$ .

All examined patients underwent surgeries due to the following pathological processes: perforated ulcer, calculous cholecystitis, removal of colon polyps, kidney stones, benign hyperplasia of the prostate gland, hernia and intestinal obstruction. During the operation, inhalation anesthesia was applied using halogenated hydrocarbons – halothane, isoflurane, enflurane, desflurane, sevoflurane.

After surgery, patients developed psychotic disorders, which was the main criterion for inclusion of the patient in the study. Patients of Group I accounted for 42.6% of all consulted subjects with cognitive impairment due to vascular pathology of the brain who underwent surgery using general inhalation anesthesia. Patients of Group II accounted for 19.4% of all consulted subjects with cognitive impairment due to atrophic mental illness who underwent surgery using inhalation anesthesia. The study applied clinical and psychopathological, psychodiagnostic and statistical methods of research. The clinical and psychopathological method was based on generally accepted approaches to psychiatric examination of patients through interviews and observation. Quantitative and qualitative assessment of complaints and detection of psychopathological symptoms in various mental areas were conducted. In addition to the previously mentioned Hachinski ischemic score, the following psychodiagnostic methods were used to achieve the objective of the study: Confusion Assessment Method-Intensive Care Unit (CAM-ICU)

and Richmond Agitation-Sedation Scale (RASS), for assessing psychopathological disorders – the scale of Neuropsychiatric Inventory Nursing Home Version (NPI-NH), to determine the severity of cognitive impairment – the scale of Mini-Mental State Examination (MMSE). Rating by the CAM-ICU, RASS, and NPI-NH scales was performed when the patient demonstrated the signs of psychosis. In the study of patients using the NPI-NH scale, we investigated only the prevalence of psychopathological symptoms, listed in this questionnaire, without determining the frequency, severity and occupational deformity. The MMSE rating was performed when there were no signs of psychosis. The scores obtained with the MMSE scale during the study were also compared to the scores obtained from the case history when the patient sought counseling. The scores obtained from the case history were considered by us as the initial level of cognitive functioning of the patient. Statistical processing of the obtained data with the determination of arithmetic mean (M) (arithmetic mean of the age of patients, the results of the scale MMSE and recovery time), standard deviation ( $\sigma$ ) (standard deviation of the age of patients, the results of the scale MMSE and recovery time) and Fisher's t-test (for determination statistical significance difference between compared values) was performed on an IBM PC using standard statistical Microsoft Excel programs from software package of Microsoft Office 2019. The degree of change in the sign was considered reliable at the value of the possible error ( $p$ ) less than 0.05 (Zyuzin et al. 2002).

## RESULTS

In 100% of all examined patients, psychotic disorders occurred in the early postoperative period: on the 1st day – in 67.16% of cases, on the 2nd day – in 29.86% and on the 3rd day – in 2.98% of cases without revealing the statistically significant difference between the study groups. Syndromic psychotic disorders had the following distribution. In Group I, delirium syndrome was observed in 84.85% of cases, hallucinatory syndrome – in 9.09% and paranoid – in 6.06%. In Group II, in 82.35% of cases there was delirium syndrome, in 11.77% – hallucinatory syndrome, in 2.94% – oneiroid syndrome and in 2.94% – paranoid syndrome. Nosological diagnoses had the following distribution. In Group I, 84.85% of cases were diagnosed with delirium not caused by alcohol or other psychoactive substances (F05), in 9.09% – organic hallucinosis (F06.0), in 6.06% – organic delusional disorder (F06.2). In Group II, the diagnosis of delirium not caused by alcohol or other psychoactive substances (F05) was made in 85.29% of patients, organic hallucinosis (F06.0) – in 11.77%, organic delusional disorder (F06.2) – in 2.94%. The following data were obtained using the CAM-ICU and RASS scales. In

Group I, 100% of patients had changes in mental status relative to baseline parameters. In 90.91% of cases, there were wave-like changes in mental status during the last 24 hours with deterioration in the evening and at night. In Group II, similarly to all subjects, there were changes in mental status relative to baseline were, but the wave-like symptoms were observed in 41.18% of cases. In the study of attention, CAM-ICU was positive in 90.91% of patients in Group I and in 76.47% of patients in Group II. In one of the patients (2.94%) in Group II it was impossible to assess this parameter because of the lack of contact with the patient due to his mental condition (oneiroid syndrome). The change in the level of consciousness determined using the RASS scale presented the following results shown in Table 1. Table 1. In the study of disorganization of thinking, it was found that in patients of Group I, CAM-ICU was positive in 84.85% of cases, negative – in 15.15%. In patients of Group II, CAM-ICU was positive in 82.35% of patients, negative – in 14.71%, whereas in 2.94% it was impossible to rate this parameter due to the psychic state of the patient (oneiroid syndrome). Table 2. When assessing the mental status of the patient using the MMSE scale, the following results were obtained, as shown in Table 3.

## DISCUSSION

Thus, the obtained results indicate that the concomitant defect and organic symptoms caused by vascular diseases of the brain are a risk factor for psychotic disorders in the postoperative period as compared to atrophic processes ( $p < 0.05$ ). No syndromically and statistically significant differences between study groups were found. However, clinically manifested syndromes were observed in different ways. Wave-like symptoms with a predominance of manifestations in the evening and at night are a characteristic feature for patients in Group I ( $p < 0.05$ ). They had sleep and behavior disorders at night more often ( $p < 0.05$ ). Delirium syndrome, observed in the subjects of Group I, had signs of hyperactive subtype ( $p < 0.05$ ). Patients showed signs of psychomotor agitation (hallucinatory-delusional and amentive types). Such symptoms as agitation, aggression, inhibition, irritability, lability, and abnormal motor activity were the characteristic features of the condition observed in patients with concomitant vascular pathology ( $p < 0.05$ ). Abnormal motor activity, in addition to signs of psychomotor arousal, included such manifestations as jactation, removal of “specks of dust” from the clothes, twisting “ropes” or “threads” in the hands. The clinical presentation of psychotic states observed in patients of Group I is characterized by the presence of hallucinatory images ( $p < 0.05$ ). The characteristics of hallucinations as such did not reveal differences between the study groups. All patients presented with visual hallucinations. Patients saw the threads they

**Table 1.** Distribution of scores at the RASS scale

Scores	Definition	Group I (%) (N = 33)	Group II (%) (N = 34)
+4	Combative	9.09%	5.88%
+3	Very agitated	15.15%	8.82%
+2	Agitated	39.40%	14.71%
+1	Restless	27.27%	20.59%
0	Alert and calm	6.06%	8.82%
-1	Drowsy	3.03%	14.71%
-2	Light sedation	-	14.71%
-3	Moderate sedation	-	11.76%
-4	Deep sedation	-	-
-5	Unarousable	-	-

**Table 2.** Prevalence of psychopathological symptoms, represented in the NPI-NH questionnaire

Psychopathological symptom	Prevalence (%)	
	Group I (N = 33)	Group II (N = 34)
1. Delusions	66.67	41.18
2. Hallucinations	93.94	55.89
3. Agitation / aggression	90.91	50.00
4. Depression / dysphoria	12.12	32.35
5. Anxiety	100	61.76
6. Elation/euphoria	0	8.82
7. Apathy / indifference	3.03	41.18
8. Disinhibition	90.91	50.00
9. Irritability / lability	90.91	50.00
10. Aberrant motor activity	90.91	50.00
11. Sleep and nighttime behavior disorders	90.91	52.94
12. Appetite and eating changes	84.85	79.42

**Table 3.** Results of examination of patients using the MMSE scale.

Cognitive sphere	Scores (M)			
	Group I (N = 33)		Group II (N = 34)	
	Initial level	In the course of study	Initial level	In the course of study
Orientation to time	3.42	1.78	2.97	1.26
Orientation to space	3.97	3.07	3.11	1.97
Perception	2.51	2.04	2.17	1.54
Concentration	2.74	1.31	2.41	1.05
Memory	1.97	0.98	1.46	0.41
Language functions	6.42	5.06	5.21	3.17
Total score	21.03	14.24	17.33	9.40

were trying to wind in a ball, specks of dust on the clothes, small animals – rats, snakes, frogs, etc. (microzooptic hallucinations). Occasionally there were hallucinations of a religious and mystical nature. Patients saw demons, angels, saints. Furthermore, in the clinical presentation of delirium syndrome, observed in patients of Group I, there was a predominance of anxiety as compared to patients of Group II ( $p < 0.05$ ). At the same time, delirium syndrome, which occurred in the postoperative period in patients with Alzheimer's

and Pick's disease, had signs of the hypoactive subtype. Patients were more likely to be drowsy or sedative ( $p < 0.05$ ). They were characterized by symptoms such as depression, dysphoria, apathy and indifference ( $p < 0.05$ ). Changes in appetite and eating behaviors were observed in both study groups, with no statistically significant difference in prevalence. However, this symptom had different clinical manifestations: patients from Group I were characterized exclusively by anorexia (lack of appetite),

whereas patients from Group II in 29.42% of cases had an increased appetite ( $p < 0.05$ ), and anorexia was present in 50.00% of observations. Surgery using general anesthesia adversely affected patients' cognitive function. According to the results obtained using the MMSE scale, a decrease in the mean overall score was observed in all examined patients. In Group I. it was 6.79, and in Group II – 7.93. In Group II, this decrease was greater, but it was not statistically significant ( $p > 0.05$ ). However, this difference was clinically important because the cognitive deficits present after surgery were within moderate dementia in the majority of patients in Group I, and within severe dementia in Group II. In the analysis of individual indicators of cognitive functioning, a statistically significant difference was found only in language functions: in patients with atrophic processes, the decrease was greater ( $p < 0.05$ ). This difference was due to the failure of patients to follow the 3-stage command, writing a sentence and redrawing a picture. The examined patients underwent psychopharmacological therapy of psychotic disorder according to clinical protocols of medical care. The choice of a medication was made individually in accordance with the leading psychopathological syndrome, concomitant somatic pathology, individual tolerability and pharmacological history. Patients, regardless of the study group, were prescribed the following medications from the groups of neuroleptics and tranquilizers: haloperidol, zuclopenthixol, risperidone, diazepam and phenazepam. Doses of prescribed medications in 79.10% were lower than the average ones. We analyzed the time during which the patient recovered. For recovery, we took a state in which there were no psychoproductive symptoms, except for episodic residual delusions, to which the patient was formally critical and which did not affect his/her life and social functioning. In patients of Group I, such recovery time was  $4.85 \pm 1.23$  days, and in Group II –  $7.23 \pm 1.42$  days. Thus, it was found that in patients of Group II, the recovery time was longer ( $p < 0.05$ ), and the concomitant atrophic pathology of the brain caused a certain therapeutic resistance to psychotic disorders that occurred in the postoperative period.

## CONCLUSIONS

Thus, the obtained results indicate the heterogeneity of symptoms of postoperative psychotic disorders of senile age, depending on various concomitant psychiatric and neurological pathologies. The obtained data can be used for the diagnosis of these disorders,

and should be taken into account during therapeutic and rehabilitation measures.

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**Conflict of interest:** None to declare.

### Contribution of individual authors:

Prof. Andrii Skrypnikov concept, design and supervision of the study, interpretation of data, approval of the final version

Prof. Larysa Herasymenko comments on the concept of study, statistical analyses, approval of the final version

Dr. Pavlo Kydon design of the study, literature searches and analyses, interpretation of data, statistical analyses, writing manuscript, approval of the final version

Dr. Andrii Sheffel data collection, interpretation of data, approval of the final version

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### Correspondence:

Pavlo Kydon

Department of Psychiatry, Narcology and Medical Psychology, Poltava State Medical University, Ukraine, Poltava region, Poltava, str. Medychna, 1, 36013

e-mail: pavlokydon@gmail.com