

**Consequences of Traumatic Brain Injury as a Cause Of Disability:****Problems of Expertise****State Establishment “Dnipropetrovsk Medical Academy of Health Ministry of Ukraine” (Dnipropetrovsk)****\*State Establishment “Ukrainian State Research Institute of Medical and Social Problems of Disability of Health Ministry of Ukraine” (Dnipropetrovsk)****\*\*Kherson Regional center of medical-social expertise (Kherson)**

Current work is a fragment of the research: “Developing of the criteria for medical and social expertise and rehabilitation potential in patients and disabled with the consequences of musculoskeletal system injuries, combined with somatic pathology” (State registration number – 0112U000541, registration code IH. 01.12) that is carried out at the Department of Medical-Social Expertise and Rehabilitation.

**Introduction.** Traumatic brain injury (TBI) is a complex and, unfortunately, very common medical and social problem. Prevalence of TBI, especially of such forms as the brain contusion and concussion, has been aptly called “epidemic”. Thus, according to WHO reports, the incidence of TBI is 1,8-5,4 cases per 100 000 population per year and increases annually by 2,0%. In Ukraine about 100-200 thousands of people sustain TBI each year, including 11,5-13,5 thousands of children aged under 15 years; these numbers, unfortunately, also have a strong tendency to increase. The situation becomes even more complicated, because of the young and middle age of the injured persons which comprise the most socially active and hard-working category of the population [3, 4].

According to the foreign authors, craniocerebral injury, among the overall neurological disorders, is the cause of 12,1% of hospitalizations and of 22,4% of deaths [6]. Even mild TBI is responsible for the reduction of brain reserve and “resistance” to various pathologies with the delayed onset [2]. A separate problem among patients with consequences of TBI is the post-traumatic epilepsy, with the incidence ranging from 2,1% to 16,7%, depending on the severity of the injury and the duration of observation [1].

In 50% of patients with TBI, the progression of existing consequences or the onset of new syndromes is observed [7]. The course of traumatic disease of the brain largely depends on the effectiveness of rehabilitation programs, which are carried out for certain consequences of TBI.

Medical-social expertise of patients after TBI is based on a comprehensive examination with determination of the extent of loss of health, degree of disability caused by persistent dysfunction of the body. Disability is characterized by the following categories: ability to move, to self-service, the learning ability, the ability to work, ability to

communicate, ability for orientation, the ability to control ones behavior. The criteria for establishing the degree of disability is the loss of health, causing the mild to severe restriction in one or more categories listed above.

Thus the main objective of the “medical” part of the medical-social expertise is to determine the fact of sustained disturbance of any body function firstly, and secondly, the degree of deviation from the norm; founding the basis for the establishment of the degree of disability and the corresponding disability group or ascertainment of the disability percent.

Average indices of primary disability due to TBI make from 0,84 and 1,17 per 10000 for adult and working population in Ukraine respectively [5]. T90.5 code, which is commonly used to encrypt this diagnosis, does not reveal the type of primary head injury that led to the development of disabling consequences. Thus, taking into account the prevalence and very high rates of disability, the analysis of accumulated disability due to head trauma is important.

**Aim:** to perform a detailed analysis of accumulated disability due to head trauma in the Kherson region according to the data of the Regional Center of Medical-Social Expertise.

**Materials and methods.** 45 case histories of patients, recognized as disabled by the medical expert committee at the Kherson regional center under the ICD-10 code T 90.5 “Consequences of intracranial injury” has been analyzed, including 11 (24,4%) patients with the first time acknowledgment of the disability group, and 34 (75,6%) patients with redefined group of disability. Gender composition: 37 (82,2%) male and 8 (17,8%) female persons. The average age at the time of injury was  $32,0 \pm 13,69$  years, at the time of examination at the medical expert committee in 2013 –  $43,36 \pm 9,13$  years.

Distribution of patients by disability group: 1 (2,1%) patient with the group I; 4 (8,9%) patients with group II, 1 (25,0%) of which with permanent II group; 40 (88,9%) patients with group III, 4 (8,9%) of which with permanent III group.

Distribution of the patients by the cause of disability: 28 (62,2%) – a systemic disease, 5 (11,1%) – an injury while serving on duty at Ministry of Home Affairs, 4 (8,9%) – handicapped from birth, 3 (6,7%) – employment injury (average percentage of disability –  $43,33 \pm 4,17$ ), 3

(6,7%) – on duty at the army forces, 2 (4,4%) – on the performance of international military duty. The vast majority of disabled – 26 (57,8%) persons – are represented by the people of the blue-collar job. In 7 (15,6%) of the cases the craniocerebral injury was recurrent. Expert cases of patients who underwent complex or combined TBI has been excluded from the study.

**Results and discussion.** According to the expert cases, disability was ascertained from a previous mild stage TBI – in 10 (22,2%) cases, the moderate stage – in 12 (26,7%) cases, and in 23 (51,1%) cases of severe head trauma. In 7 (15,6%) cases patients had a disability caused by concussion, although, according to the current methodological recommendations of forensic medical examination, concussion is considered be the most volatile TBI at which health problems last up to 21 days.

Disorders that occur further in the course of the disease refer to neuropsychiatric conditions, and are interpreted as “post commotional syndrome”, which is examined by psychiatric medical-social expert committee. The duration of post-traumatic period at the time of initial ascertainment of disability was  $69,2 \pm 85,5$  months and only 20 (44,4%) patients had the disability group assigned in acute and intermediate period of TBI, which indicates the progressive course of traumatic brain disease. In 2 (4,4%) patients group of disability was revised over time to more severe, and only in 3 (6,6%) patients the disability group was changed to less severe.

We have analyzed the predominant syndromes that separately or in combination served as the basis for determining the disability. The frequency of these are: epileptic syndrome – 13 (28,9%), vegetative-vascular syndrome with frequent crises – 13 (28,9%), CSF-hypertensive syndrome with crises or permanent course – 10 (22,2%), bone defects of the skull, replaced or not replaced by heterogeneous transplant – 10 (22,2%), vestibular-ataxic syndrome – 8 (17,8%), various degree of central paresis – 6 (13,3%), cognitive impairment – 3 (6,7)%, syncope, hyperkinesia, gait disorders (a combination of parkinsonism and paresis), aphasia – 1 (2,2%) for each. In 3 (6,7%) cases additional concomitant chronic somatic pathology (cardiovascular disease, diabetes mellitus, surgery due to duodenal or stomach ulcer) formed the basis for the disability ascertainment, as well as in 1 (2,2%) case – due to social circumstances.

In neurological status indicated by expert neurologist on examination of disabled, cranial nerve dysfunction is the most common symptom: VII pair and/or XII pair of cerebral nerves deficiency without differentiation into peripheral and central paresis, registered in 33 (73,3%) patients.

Neuroophthalmological consequences of TBI were presented as oculomotor innervation abnormalities in 3 (6,7%) persons with disturbances of the VI (2 cases) or III (1 case) cerebral nerves, and in 5 (11,1%) patients routine ophthalmologic examination revealed partial atrophy of the optic nerves, 1 (2,2%) – heteronymous hemianopsia. In general, the difficulties that arise during the examination of patients with ophthalmological problems resulting from TBI, is that the beginning of deterioration is often delayed, and there might be no information about the state of visual function before the injury.

Additional methods of examination (MRI, CT of the orbits, orbital ultrasound and retrobulbar space ultrasound,

biomicroscopy of vessels of the conjunctiva, and optical coherence tomography) allow to identify the cause of blurred vision (and therefore its connection with TBI) more precisely. In the analyzed cases, they have not been performed (because in any case the condition was not the cause for the establishing of disability). Sensorineural hearing loss of varying severity according to ENT examination was established in 10 (22,2%) disabled, including one case in combination with conductive hearing loss, that occurs due to injury of the middle ear, such as longitudinal fractures of the pyramid; and anosmia was recorded in one (2,2%) case. On examination of motor functions in 32 (71,1%) of the disabled one or two-sided pyramidal insufficiency was described and in 9 (20,0%) patients paresis of various degrees of severity and prevalence (from mild hemiparesis to severe tetra paresis) was recorded. In the supporting documents vestibular-cerebellar syndrome was designated in the diagnosis in 27 (60,0%) patients with disabilities.

At the same time, the status of the vestibular apparatus was not mentioned in the results of ENT examination. In 2 (4,4%) patients, predominantly in young adults, hyperkinesia as one of the types of hemiparesis regression (which developed in the acute period) was observed. Also, in one case akinetic-rigid syndrome was observed. Graft substituted or nonsubstituted skull defects according to X-ray examination was observed in 10 (22,2%) persons with disabilities. Varying degrees of aphasia and pseudobulbar syndrome had been recorded in 4 (8,9%) cases each.

Epileptic syndrome was documented in 13 (28,9%) cases and in the majority of patients was represented by grand mal, in several cases a combination of grand mal with complex or petit mal was observed, in one case status epilepticus was recorded. Electroencephalography with functional tests has been performed in all cases for epileptic syndrome objectification and only 7 (53,8%) patients demonstrated certain epileptic phenomena.

As for determining the frequency of attacks, the expertise committee, as opposed to the clinic, determines the degree of disability by the amount of attacks documented by medical personnel. In supporting documents the attacks listed in diagnoses were predominantly of medium frequency or infrequent, but the primary documents (discharge summaries, data from outpatient case-histories), in a large proportion, had had no attacks recorded by medical personnel. On the one hand it is a logical consequence of infrequent attacks, but on the other hand in these cases, the attending physician, and the experts had to rely on patients' words in determining the disability degree, which leaves a big gap for aggravation.

In addition, for objectification of the impact of post-traumatic epilepsy on the vital activity of patients, intellectual, memory and characteristic changes should be considered. Unfortunately, none of the patients in this category were consulted by psychiatrist, and only 8 (61,5%) patients were sent to psychologist; neuropsychological scales have been used in few cases. Epileptic syndrome was detected almost in a third of all patients and became the basis for the establishment of disability, emphasizing the serious problem of objectification of the syndrome.

Liquorodynamic disturbances also cause some difficulties for medical and social expertise. According to the

expert cases in 33 (73,3%) patients CSF-hypertensive syndrome was detected. CSF-hypertensive syndrome of moderate severity alone or combined with other syndromes (vestibular-cerebellar or autonomic-vascular) served as a basis for determining disability in 10 (22,2%) patients. CSF-hypertensive syndrome was established by attending physician mainly on the basis of complaints of morning headache accompanied by nausea or vomiting, fatigue and based on available micro symptoms in 9 (20,0%) cases. Although in any case history, the presence and extent of CSF-hypertensive syndrome were not confirmed by lumbar puncture, presence of the optic nerve disc edema or absence of pulsation of the central retinal vein during the ocular fundus examination has not been established by ophthalmologist. Enlargement of lateral ventricles was observed in 6 (18,2%) patients, periventricular edema and obliteration of the subarachnoid gaps in 1 (3,0%) patient. Most often, doctors relied on signs of intracranial hypertension detected during echoencephalography in 9 (27,3%) patients with CSF-hypertensive syndrome, which is not reliable and insufficient to determine the presence and degree of CSF-hypertensive disorder.

Thus, we have a similar situation: the determination of disability group in some patients with CSF-hypertensive syndrome was based on subjective data, obtained from patients (description of headache and CSF-hypertensive crises).

A peculiar problem is the overdiagnosing of cerebral arachnoiditis. The most remarkable causes of arachnoiditis are penetrating trauma, surgery, meningitis and hemorrhages. According to the expert of cases the condition was listed as a result of TBI in 26 (57,8%) patients. According to present-day opinion, with the strict approach to diagnosis, arachnoiditis is a pretty rare problem [8]. None of the patients had the diagnosis confirmed by spinal puncture, which is in fact one of the most decisive for the diagnosis, data about the investigation is not mentioned in the discharge summaries. MRI was performed only in 6 (23,1%) patients with this diagnosis, showing the signs of moderate internal or local external hydrocephalus in all cases, and only in one case small cystic changes of subarachnoid space and atrophy of the cerebral cortex was mentioned.

In supporting documents the syndrome of autonomic disorders was present in the diagnoses of 27 (60,0%) patients. In the 15 (33,3%) cases, it was the course with frequent crises.

Cognitive disorders of varying degrees were indicated in the diagnosis in 23 (51,1%) patients; general characteristics of memory, attention and cognitive function in neurological status were present in 27 (60,0%) cases. However, after the examination of 33 patients by psychologist using neuropsychological approach (MMSE scale, Schulte tables, and Luria 10 words test), impaired memory and attention were found in 32 (96,7%) cases.

### Conclusions.

1. Analysis of accumulated disability coded as T90. 5 revealed significant portion of disabled (15,6%) with the consequences of concussion, which does not coincide with the concept of this clinical form of mild TBI without any structural changes in the brain.

2. The most common problem of medical-social assessment of patients with the consequences of TBI is overdiagnosis of several conditions and lack of objectification of existing neurological syndromes by attending physician. According to our study, expert evaluation of liquorodynamic posttraumatic disorders, cerebral arachnoiditis, post-traumatic epilepsy, vestibular and cognitive disorders should be performed only after a comprehensive examination. The evaluation, regardless of the severity, should include liquor testing, neuroophthalmological investigation, MRI or CT scan, clinical and psychophysiological study. It is necessary for the physician to perform the objectification of seizures, as well as a detailed study of intellectual, mental and personality disorders, which are unfortunately neglected, in patients with post-traumatic epilepsy before the referral to Medical-Social Expert Committee to determine the degree of disability. Additional methods of examination (MRI, CT of the orbits, orbital ultrasound and retrobulbar space ultrasound, biomicroscopy of vessels of the conjunctiva, and optical coherence tomography) should be used to establish more precise reasons for neuroophthalmologic consequences and their relationship with TBI. The widespread implementation of ENT examination of patients with consequences of TBI for objective evaluation of vestibular function is relevant nowadays.

3. The occasional cases of disability change to mild group and presence of patients with downgrading group urges the need for more active rehabilitation measures in disabled with consequences of TBI, and requires attention and concentration of efforts by primary care physicians and Medical-Social Expert Commissions.

**Future prospective.** Analysis of accumulated disability and rehabilitation efficiency in the group of patients after TBI is an urgent problem and requires further investigations.

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### **НАСЛІДКИ ЧЕРЕПНО-МОЗКОВОЇ ТРАВМИ ЯК ПРИЧИНА ІНВАЛІДНОСТІ: ПРОБЛЕМИ ЕКСПЕРТИЗИ**

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**Резюме.** Черепно-мозкова травма є складною медико-соціальною проблемою, внаслідок своєї розповсюженості, травмування переважно працездатної частини населення та різноманітності можливих наслідків. В статті наведений докладний аналіз накопиченої інвалідності за наслідками ЧМТ на основі експертних справ обласного центру медико-соціальної експертизи Херсонської області. Аналіз експертних справ за шифром Т90. 5 виявив значну долю інвалідів (15,6%) з наслідками стусу головного мозку, що не співпадає з уявленням про цю клінічну форму ЧМТ, як про найлегшу, та таку, при якій не спостерігається структурних змін головного мозку. Наступною проблемою медико-соціальної експертизи вхворих з наслідками ЧМТ є об'єктивізація наявних неврологічних синдромів. Це стосується, насамперед, експертної оцінки посттравматичних ліквородинамічних розладів, церебрального арахнідиту, посттравматичної епілепсії, вестибулярних та когнітивних розладів. Оцінка цих синдромів, як причин для визначення обмеження життєдіяльності за однією з категорій, повинна проводитись лише після комплексного дослідження. Показана рідкість зміни групи інвалідності на більш легку (6,6%) та виявлені випадки обтяження інвалідності зі зміною групи на більш важку (4,4%). Це є свідченням необхідності більш активних реабілітаційних заходів у інвалідів з наслідками ЧМТ.

**Ключові слова:** віддалені наслідки черепно-мозкової травми, інвалідність, медико-соціальна експертиза.

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### **ПОСЛЕДСТВИЯ ЧЕРЕПНО-МОЗГОВОЙ ТРАВМЫ КАК ПРИЧИНА ИНВАЛИДНОСТИ: ПРОБЛЕМЫ ЭКСПЕРТИЗЫ**

**Школьник В. М., Науменко Л. Ю., Фесенко Г. Д., Голик В. А., Коваль М. Е.**

**Резюме.** Черепно-мозговая травма является сложной медико-социальной проблемой вследствие своей распространенности, поражения преимущественно трудоспособной части населения и разнообразия возможных последствий. В статье приведен подробный анализ накопленной инвалидности по последствиям черепно-мозговой травмы на основании экспертных дел областного центра медико-социальной экспертизы Херсонской области. Анализ экспертных дел по шифру Т90. 5 выявил значительную долю инвалидов (15,6%) с последствиями сотрясения головного мозга, что не совпадает с представлениями об этой клинической форме ЧМТ, как о самой легкой и такой, которая не сопровождается структурными изменениями головного мозга. Следующей проблемой медико-социальной экспертизы больных с последствиями ЧМТ является объективизация имеющихся неврологических синдромов. Это касается, прежде всего, экспертной оценки посттравматических ликвородинамических расстройств, церебрального арахноидита, посттравматической эпилепсии, вестибулярных и когнитивных расстройств. Оценка этих синдромов, как причин для определения ограничения жизнедеятельности по одной из категорий, должна проводиться только после комплексного обследования. Показана редкость смены группы инвалидности на более легкую (6,6%) и выявлены случаи утяжеления инвалидности со сменой группы на более тяжелую (4,4%). Это является свидетельством необходимости более активных реабилитационных мероприятий у инвалидов с последствиями ЧМТ.

**Ключевые слова:** отдаленные последствия черепно-мозговой травмы, инвалидность, медико-социальная экспертиза.

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### **Consequences of Traumatic Brain Injury as a Cause Of Disability: Problems of Expertise**

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**Abstract.** Traumatic brain injury is a complex medical and social problem because of its high prevalence, involvement of predominantly working-age population and the diversity of the possible consequences. The publication presents a detailed analysis of the cumulative effects of disability due to traumatic brain injury on the basis of review of the expert case-histories in the regional center of medical-social expertise of the Kherson region. Expert analysis of the cases with code number T90. 5 revealed a significant proportion of disabled persons (15.6%) with the consequences of brain concussion, which conflicts with the concept of this clinical form of traumatic brain injury, being the lightest one, and the one that is not accompanied by any structural changes in the brain. Another problem of medical-social expertise of patients with consequences of traumatic brain injury is the objectification of the available neurological syndromes. This is especially true for the expert review of the liquorodynamic posttraumatic disorders, cerebral arachnoiditis, post-traumatic epilepsy, vestibular and cognitive disorders. Evaluation of these syndromes, as the reasons for the determination of disability category should be carried out only after thorough examination. The rare change to a

mild disability category (6.6%) has been shown, as well as the cases of switching to a more severe disability category (4.4%) have been identified. This is the evidence for the need of more active rehabilitation measures of persons with disabilities due to the consequences of traumatic brain injury.

Analysis of accumulated disability coded as T90.5 revealed significant portion of disabled (15.6%) with the consequences of concussion, which does not coincide with the concept of this clinical form of mild TBI without any structural changes in the brain.

The most common problem of medical-social assessment of patients with the consequences of TBI is overdiagnosis of several conditions and lack of objectification of existing neurological syndromes by attending physician. According to our study, expert evaluation of liquorodynamic posttraumatic disorders, cerebral arachnoiditis, post-traumatic epilepsy, vestibular and cognitive disorders should be performed only after a comprehensive examination. The evaluation, regardless of the severity, should include liquor testing, neuroophthalmological investigation, MRI or CT scan, clinical and psychophysiological study. It is necessary for the physician to perform the objectification of seizures, as well as a detailed study of intellectual, mental and personality disorders, which are unfortunately neglected, in patients with post-traumatic epilepsy before the referral to Medical-Social Expert Committee to determine the degree of disability. Additional methods of examination (MRI, CT of the orbits, orbital ultrasound and retrobulbar space ultrasound, biomicroscopy of vessels of the conjunctiva, and optical coherence tomography) should be used to establish more precise reasons for neuroophthalmologic consequences and their relationship with TBI. The widespread implementation of ENT examination of patients with consequences of TBI for objective evaluation of vestibular function is relevant nowadays.

**Keywords:** long-term effects of traumatic brain injury, disability, medical-social expertise.

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