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DIAGNOSTIC AND TREATMENT METHODS

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RESULTS OF THE STUDY OF COGNITIVE FUNCTIONS IN PATIENTS WITH BRAIN INJURY

In the Amur Regional Psychoneurological Dispensary of the Amur Medical Academy, a controlled, open, randomized study was conducted to study cognitive functions in 20 patients with a history of traumatic brain injury (men aged 36 to 58 years, the main group). The control group consisted of 20 practically healthy volunteers. Cognitive functions were assessed using the Montreal Cognitive Assessment (MoCA-test), the Schulte Table method, and the 10-word test. The results of the study showed that in patients in the late period of traumatic brain injury, the presence of cognitive disorders is recorded in 100% of cases. Mild and moderate cognitive impairment in patients with traumatic brain injury up to 6 years is expressed by a 3-fold decrease in work efficiency relative to healthy volunteers, mental stability, short-term and long-term memory. It was concluded that it is necessary to conduct a mandatory neuropsychological examination in patients with craniocerebral injury in the long-term period in order to timely and pathogenetically substantiated pharmacological correction of post-traumatic cognitive dysfunction.

Keywords: cognitive impairment, traumatic brain injury, remote period, work efficiency, degree of development, mental stability, memory, attention, patients.

The problem of cognitive impairment in patients with traumatic brain injury remains a priority today, taking into account the statistical increase in the number of traumatic brain injuries in modern society and the sufficient development of neurorehabilitation methods to compensate for motor deficits, which leads to a less pronounced decrease in the quality of life of patients, than the presence of a defect in cognitive functions [1, 4, 16]. The works of domestic researchers show that the severity and qualitative characteristics of the consequences of various craniocerebral injuries directly depend

on the severity and mechanism of injury: in 20% of cases, the consequences of a craniocerebral injury lead to disability, in 45% - to a decrease in working capacity, and only 25% of patients return to their previous work [3, 6, 7, 12]. At the same time, it should be noted that in the last decade, most scientists unanimously leave the prevailing positions behind cognitive impairments that form in the late period of mild and moderate traumatic brain injury [2]. This is due to the late diagnosis of cognitive disorders, since patients with traumatic brain injury, as a rule, are represented by a contingent of young people with a high potential for compensatory abilities [9]. For a long time, this category of patients is able to almost fully perform certain work, compensating for the lack of attention and concentration by additional checking of the results of work, and memory loss - by using auxiliary techniques in the form of written recording of the necessary information or repeated verbal repetition [4]. However, the use of auxiliary techniques is an additional load on the functional reserve of the central nervous system, which leads to increased fatigue, and, ultimately, to a decrease in mental performance. That is why, during the initial visit to the doctor in the late period of mild and moderate craniocerebral injury, patients present with complaints that fall into the asthenic

range (decreased performance, fatigue, decreased concentration and memory, etc.), which should focus the doctor to conduct a neuropsychological examination to assess cognitive functions, since even minimal dysfunction and mild cognitive impairment can transform into post-traumatic dementia. Moderate cognitive impairment is a decrease in cognitive abilities that goes beyond the age-related educational gender norm, which is reflected in the patient's complaints and may be noticeable to others, however, the presence of moderate cognitive impairment does not lead to significant difficulties in everyday life and is not accompanied by a change in social, household and professional activities, with the exception of the most complex activities [5]. The presence of moderate cognitive impairment in patients with a history of traumatic brain injury is an urgent problem in psychoneurology and predetermines the need for early diagnosis and adequate pathogenetically substantiated therapy in order to correct neuropsychological symptoms and maintain the habitual lifestyle of patients for the longest possible time [13].

The aim of the study was to study cognitive functions in patients in the late period of traumatic brain injury.

Material and methods. A prospective controlled open randomized study was

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conducted in accordance with the Rules of Good Clinical Practice of the Eurasian Union, approved by the decision of the Eurasian Economic Commission (No. registration of pharmaceutical products intended for humans (ICH-GCP - International Conference on Harmonization of Technical Requirements for Human Use) and with the permission of the Local Ethical Committee of the Amur State Medical Academy of the Ministry of Health of Russia.

On the basis of the Amur Regional Psychoneurological Dispensary (Blagoveshchensk), 20 patients aged 36 to 58 years with a history of traumatic brain injury were under observation.

Criteria for inclusion of patients in the study: age over 18 years; cognitive dysfunctions established on the basis of complaints and neuropsychological examination in patients with a history of documented traumatic brain injury of varying severity (S06 according to ICD-10); age-appropriate indicators of the activity of the cardiovascular, respiratory and urinary systems; written voluntary informed consent.

Criteria for exclusion from the study: refusal to sign informed consent; acute infections, including hepatitis B and C, HIV; severe concomitant diseases of internal organs; inability to perform tasks included in the neuropsychological examination (psycho-emotional state of patients).

The number of patients included in the study, depending on the severity of a history of traumatic brain injury and the duration of the disease, is shown in Fig. 1, 2. At admission, all patients complained of decreased performance, fatigue, general weakness, impaired memory and concentration, and recurrent headaches. Standard therapy was prescribed in accordance with the Clinical Guidelines for the Management of Patients with Organic, Including Symptomatic, Mental Disorders in Adults (2016): pathogenetic therapy with the inclusion of dehydration, detoxification, normalizing brain hemodynamics and metabolism of drugs; symptomatic therapy aimed at eliminating the existing productive psychopathological symptoms.

The control group consisted of 20 practically healthy volunteers who, in parallel with the patients of the main group, performed tasks included in the minimum neuropsychological examination to assess cognitive functions. The choice of methods for assessing cognitive functions was based on the studies we performed and described earlier [8, 10, 14, 15].

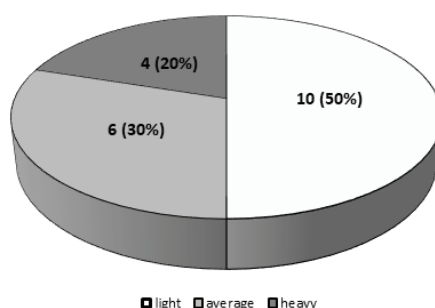


Fig. 1. The number of patients included in the study, depending on the severity of traumatic brain injury in history (%)

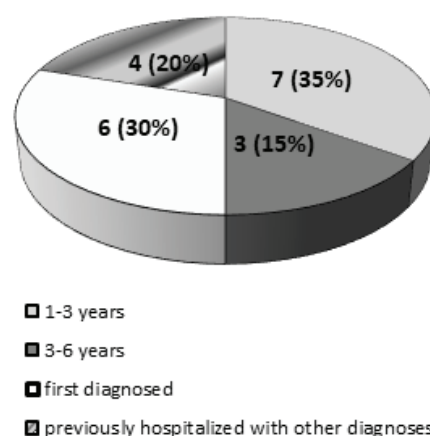


Fig. 2. Number of patients included in the study, depending on the duration of the disease (%)

Before treatment and on the 11th day of therapy, a neuropsychological examination of patients was performed with an analysis of cognitive impairment according to The Montreal Cognitive Assessment (MoCA-test), which was developed as a means of rapid assessment of moderate cognitive impairment. detection (screening) and assessment of the severity of cognitive impairment, allows you to assess visual-constructive / performing skills, memory, attention, speech, the ability to name and abstract, delayed reproduction and orientation. The time for the MoCA test is ± 10 minutes. The maximum score for performance of all tasks is 30; ≥ 26 points is within the normal range; ≤ 25 points indicates the presence of cognitive impairment [5].

Diagnostics of the properties of switching and distribution of attention, tempo and sensorimotor reactions was carried out according to the method of "Schulte's Table". Schulte's technique allows you to explore voluntary attention. Schulte tables are tables with randomly arranged numbers, 5×5 elements in size. The subject was presented with the first table, voicing the instruction: "This table con-

tains numbers from 1 to 25. Show and name all the numbers in order." Simultaneously with the start of the task, a stopwatch was turned on. Subsequent tables were presented without any instructions. A total of 5 tables were shown. When processing the results, the following indicators were evaluated: work efficiency, degree of workability, mental stability.

The assessment of mnemonic disorders was carried out using the test "10 words". The technique allows to evaluate such memory processes as memorization, preservation and reproduction, was first proposed by A.R. Luria. The test was carried out in a quiet environment, without additional sources of noise. The subjects were asked to memorize 10 monosyllabic words that did not have associative links among themselves (for example: umbrella, whale, ruble, mustache, pain, mole, lie, cube, rum, hedgehog). The instruction was read out: "Now we will check your memory. I will tell you the words, you will listen to them, and then repeat as many words as you can, in any order. Then a series of words were read. At the end of the reading, the words memorized by the subjects were recorded in the protocol. Then the instruction was read again: "Now I will sound the words to you again, then you must repeat all the words that you remember." After fixing the data in the protocol, the experiment was repeated without instructions. The material was presented 5 times. Before the next readings, the instruction was not repeated. At each stage of the study, a protocol was filled out, which indicated the number of words reproduced, the words duplicated during reproduction and superfluous were noted. After the end of the repetition of words, the subject was told that the same words should be repeated after 30 minutes. The results were recorded in the protocol. Based on the results, a memory curve was built. Miller's rule was used to estimate the amount of memory. The number of words reproduced in the first series is the volume of auditory short-term memory. The norm is the volume equal to 7 ± 2 words (information units). The volume of short-term memory was assessed by the number of correctly reproduced words after the first presentation.

Statistical processing of the obtained results was carried out using the program Statistica. Data are presented as median (Me) and 95% confidence interval (CI). To check the normality of the distribution, the Shapiro-Wilk W test and the Kolmogorov-Smirnov test with the Lilliefors correction were used for data that do not follow a normal distribution. Signif-

ificance of differences was assessed using the Mann–Whitney test (for unrelated groups) and the Wilcoxon test (for related groups). Differences were considered significant at $p < 0.05$.

Results and discussion. The results of the study showed that in patients with a history of traumatic brain injury, when assessing cognitive disorders on the MoCA scale, both at the beginning of the observation and by the 11th day of standard therapy, none of the patients (0%) scored the corresponding normal range of 26 - 30 points, which differed from similar indicators in healthy volunteers who effortlessly completed the tasks included in screening testing, gaining more than 26 points (Fig. 3). Patients with post-traumatic CI experienced the greatest difficulties in passing the MoCA test in tasks for memorizing and reproducing information, including delayed, concentration, and abstract thinking.

Considering that the time to complete the tasks of the "Schulte Tables" test is normally 40-50 seconds, it should be noted that in patients with a history of traumatic brain injury (main group), the average time spent on one table and indicated by the indicator of work efficiency, in The 1st day of observation was 3.1 times higher than the similar parameter in healthy volunteers, by the 11th day of observation - 3.2 times (Table 1, Fig. 4). However, it should be noted that the value of the index of the degree of workability in the main group throughout the entire observation (days 1 and 11) was less than one, which indicates a good degree of workability, in contrast to healthy volunteers, whose workability was 1.00 (1st day) and 1.02 (11th day) conventional units, which requires additional research and appropriate justification. At the same time, the fact of a sufficiently high ability of healthy volunteers to concentrate on any activity for a long time is obvious already in this observation, since the indicator of mental stability was below one, which could not be registered in patients with cognitive impairment due to traumatic brain injury - the amount of time spent to work with the fifth (last) table exceeded the efficiency of work and testified to the impossibility of the subjects to concentrate on a specific search task for a long time.

According to Miller's rule, the number of words reproduced in the first series and characterizing the volume of auditory short-term memory should normally be 7 ± 2 words, which was clearly demonstrated by healthy volunteers both at the beginning of the observation and after 10 days (Fig. 5). In turn, patients with a

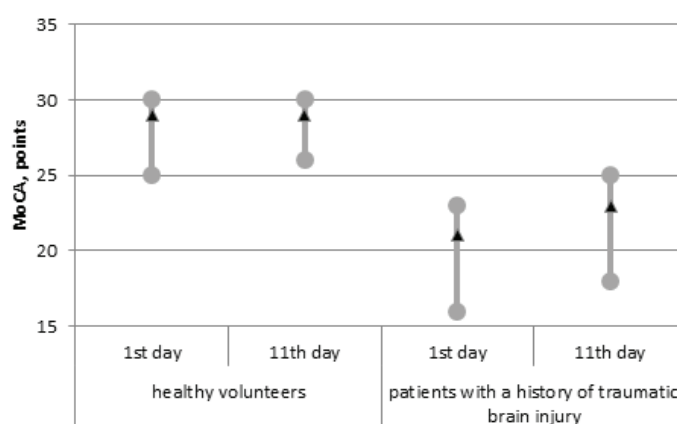


Fig. 3. Dynamics of indicators on the MoCA scale in healthy volunteers and patients with a history of traumatic brain injury

Indicators of neuropsychological status in healthy volunteers and patients with a history of traumatic brain injury

Parameters	Healthy volunteers			Patients with a history of traumatic brain injury		
	Me (95% ДИ)	Me ₂ (95% ДИ)	P*	Me (95% ДИ)	Me ₂ (95% ДИ)	P*
MoCA, points	29 (25 – 30)	29 (26 – 30)	0.001	21 (16 – 23)	23 (18 – 25)	0.059
Schulte ₁ , seconds	46 (39 – 54)	44 (40 – 49)	0.008	136 (122 – 140)	136 (120 – 143)	0.829
Schulte ₂ , seconds	45 (38 – 52)	44 (38 – 49)	0.001	140 (128 – 149)	130 (109 – 141)	0.733
Schulte ₃ , seconds	48 (40 – 51)	42 (39 – 46)	0.011	144 (122 – 140)	138 (118 – 154)	0.007
Schulte ₄ , seconds	45 (41 – 51)	42 (38 – 48)	0.005	145 (116 – 151)	145 (122 – 159)	0.511
Schulte ₅ , seconds	44 (39 – 50)	43 (40 – 51)	0.003	144 (124 – 149)	139 (110 – 148)	0.051
Efficiency, seconds	45.6 (39.4–51.6)	43.0 (39.0–48.6)	0.001	141.8 (122.4–145.8)	137.6 (115.8–149.0)	0.009
Degree of workability	1.00 (0.98–1.05)	1.02 (1.01–1.03)	0.382	0.96 (0.96 – 1.00)	0.99 (0.96–1.04)	0.368
Mental stability	0.96 (0.96–0.99)	1.00 (1.02–1.05)	0.063	1.02 (1.01–1.02)	1.01 (0.99–1.03)	0.082
test 10 words ₁	7 (6 – 10)	8 (7 – 10)	0.374	3 (1 – 5)	4 (2 – 6)	0.789
test 10 words ₂	8 (6 – 10)	9 (8 – 10)	0.051	3 (2 – 5)	4 (3 – 6)	0.158
test 10 words ₃	9 (7 – 10)	9 (8 – 10)	0.001	4 (3 – 6)	5 (4 – 8)	0.011
test 10 words ₄	9 (8 – 10)	10 (9 – 10)	0.018	4 (3 – 5)	6 (4 – 8)	0.369
test 10 words ₅	9 (8 – 10)	10 (9 – 10)	0.009	5 (4 – 8)	8 (6 – 9)	0.072

Note: * Wilcoxon test; Me₁ and Me₂ are the median values at the beginning of the observation and on the 11th day, respectively; test 10 words_{1,2,3,4,5} - test "10 words" after the 1st, 2nd, 3rd, 4th and 5th presentation, respectively.

history of traumatic brain injury on the 1st day reproduced on average 3 words, which corresponds to moderate disorders of short-term memory, on the 11th day - 4 words, which corresponds to mild disorders of short-term memory. It is nec-

essary to note the positive dynamics of the "memorization curve" from presentation to presentation in the main group during standard therapy, however, by 4-5 presentations, all 10 words (normal) were not reproduced by any patient (0%).

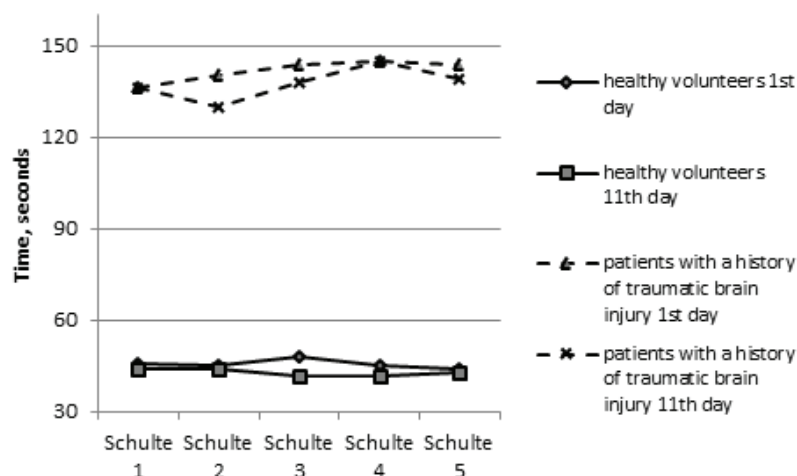


Fig. 4. Dynamics of the parameters of the "Schulte Tables" test in healthy volunteers and patients with a history of traumatic brain injury

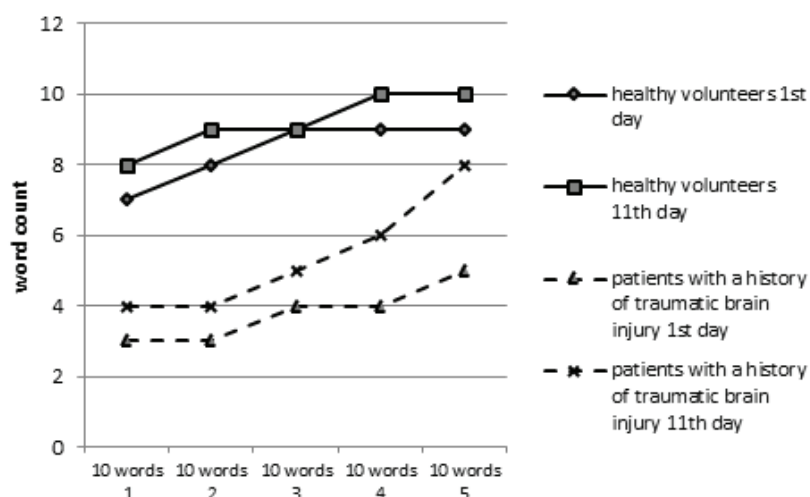


Fig. 5. Dynamics of the "10 words" test indicators in healthy volunteers and patients with a history of traumatic brain injury

Thus, the results of the study allow us to state the formation of CI in patients with TBI in the long-term period, which predetermines the need for a mandatory neuropsychological examination, regardless of the severity of the TBI, in order to timely and pathogenetically substantiated pharmacological correction of post-traumatic cognitive dysfunction.

Conclusions

1. The presence of cognitive disorders registered using the Montreal Cognitive Function Assessment Scale (MoCA-test) was confirmed in 100% of patients in the late period of traumatic brain injury with an injury duration of up to 6 years.

2. In the long-term period of traumatic brain injury in patients, a decrease in work efficiency by 3 times relative to healthy volunteers, mental stability, short-term and long-term memory volume is recorded, which corresponds to mild and moderate cognitive impairment.

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RESULTS OF THE USE OF A MODIFIED CORRECTIVE MANEUVER OF ARC ROTATION IN THE SURGICAL TREATMENT OF SEVERE SCOLIOSIS

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The aim of the study was to study the effectiveness of the method of correction of severe scoliosis with the help of a modified cantilever maneuver without osteotomies or discectomies.

Materials and methods. The correction of progressive severe scoliosis was evaluated radiologically and clinically. The technique was performed in 24 patients with an average degree of deformation of 82.780 ± 19.890 (minimum 570, maximum 1200) according to Cobb. Of these, 2 are male and 22 are female. The age of the patients was 12-32 years. The long-term results of the 2.5-year period are presented. In all patients, the etiological factor is idiopathic scoliosis.

All patients underwent pre- and postoperative X-rays in standard positions. The Cobb angle of the frontal arc of the deformation was measured and the mobility of the deformation was calculated, which was the difference in the magnitude of the main arcs in the functional images. Surgical placement was performed by posterior access in all patients. The transpedicular screws were applied without the use of an O-arc, using the "hands-free" technique. Neuromonitoring and the wake-up test were not used.

Results. The degree of the main bend is 82.780 ± 19.890 (min. 570, max. 1200). Bending graphs and the average value $21,580 \pm 14,460$ ($26.10\% \pm 13.69\%$; minimum 2.00, maximum 40.10) are determined to measure the mobility of the curvature arc. On the other hand, the average postoperative correction of the main bends $50,080 \pm 13,230$ ($60.49\% \pm 14.14\%$; minimum 33.50, maximum 82.30).

Conclusions. The technique of arc rotation developed by us in order to correct severe rigid scoliosis makes it possible to significantly achieve correction and avoid postoperative complications associated with osteotomies and discectomies performed with the "classic" version of surgical treatment.

Keywords: scoliosis, treatment, modified maneuver.

Introduction. Today, despite the extensive development of technology and medicine, the treatment of severe scoliosis remains a challenge before surgery.

Surgical correction of this type of scoliosis is considered a risky procedure. Hirurgic correction of scoliosis at an angle of 50° - 55° can be carried out by corrective maneuvers of derotation, compression- distraction or by variable replacement of the rod.[2]

Surgeons often use special long-head screws of spondylolisthesis in all vertebrae, this helps with the adaptation of the rod in acute-angle deformities. In many cases, in order to treat persistent deformities above 550, posterior osteotomy such as PSO, VCR and Ponte is required. However, these procedures entail high neurological insufficiency and risks of bleeding, according to some authors,

complications can reach 80% not only during surgery, but also 6 months after surgery.[1]

There are many sources in the literature describing the difficulties of vertebral osteotomy and the risks of complications. Despite the risks of neurological complications, in 2017 Prataly et al. gave a report on the high clinical effect of vertebral resections, but at the same time they noted a high (60%) complication rate.[6] Trobisch et al. Pedicular osteotomy (PSO) was performed on 22 patients without neuromonitoring and an average blood loss of 2302 ml was reported. Neurological disorders were noted in two patients.[10]

Two-step correction is used in cases of curvature of more than 70° according to Cobb, while anterior discectomies are performed, followed by gallovytyazhenie for 2-3 weeks and posterior fusion.[4,6]

The Cantilever maneuver was first described by Chang in 2003, but the author himself noted the time of the first operation in 1998.[3]

The aim of the study is to study the effectiveness of the method of correction of severe scoliosis with the help of

a modified cantilever maneuver without osteotomies or discectomies.

Materials and methods. Correction of progressive severe scoliosis was evaluated radiologically and clinically.

The technique was performed in 24 patients with an average degree of deformation of 82.780 ± 19.890 (minimum 570, maximum 1200) according to Cobb. Of these, 2 are male and 22 are female. The age of the patients was 12-32 years. The long-term results of the 2.5-year period are presented. Idiopathic scoliosis is an etiological factor in all patients. The study was approved by the Ethical Council of the AMU (Minutes of the Expert Council No. 15 dated 16.10.2020 Chairman -Candidate of Medical Sciences, Associate Professor R.O. Baylarov - Vice-Recto for Scientific Work of the AMU)

All patients underwent pre- and postoperative X-rays in standard positions. The Cobb angle of the frontal arc of deformation was measured and the mobility of deformation was calculated, which was the difference in the magnitude of the main arcs in functional images. 3D CT and NMRI examinations of the spine were performed. Densitometry was per-

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