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Study of clinical and neurological changes in patients with consequences of traumatic brain injury after endolumbal and intracystal ozone therapy

Mansur Abdukholikovich Aliev, Abdurakhmon Mamatkulovich Mamadaliev

Neurosurgery Department of Samarkand State Medical Institute

Abstract
State of neurological disorders patients evaluated by the Glasgow Outcome Scale extended. Thus, it may be noted positive clinical and neurological changes of patients who were treated according to our suggested methods – endolumbal introductions of nootropic ozone mixture and endocystal introductions of ozone.

Keywords: GOSE, consequences, TBI, neurological.

1. Introduction

Traumatic brain injury (TBI) for a long time is one of the most actual and complex problem of modern neurosurgery, that many domestic and foreign authors noted in their publications [2, 7, 8, 10, 12]. This is stipulated not only by a high frequency of occurrence, the complexity of the pathogenesis, clinical manifestations and high mortality, but also by an enormous economic damage. One of the most important circumstances stipulating the actuality of the problem is the frequent victims' disability, which arises due to the development of various pathological conditions, persistent symptom complex, united under the name of the consequences of TBI. Just their formation, in the most cases stipulated economic damage caused by cranial injuries [7, 8, 10, 12].

Ozonated saline solution has been successfully used by intravenous introduction in patients with severe TBI in the acute period [1-4, 6, 11]. One of the first endolumbal introductions of ozone-oxygen mixture has been carried out in 1967, by A.B. Bolgaev in patients with post-traumatic epilepsy. S.D. Madiyarov [5] has been used once endolumbal introduction of ozone-oxygen mixture as the prevention of cerebral arachnoiditis in patients with severe TBI in the volume of 15 cm^3. In 1994, M.K. Agzamov has been carried out scientific researchers on the application of nootropic-ozone mixture in the complex treatment of severe TBI [1, 3, 11]. In 2007, 25 patients with meningitis of different etiologies have been successfully treated by V.M. Belopukhov and his colleagues with the use of endolumbal introduction of ozone-oxygen mixture in the complex treatment [6].

The aim of the study: The aim of this research is to investigate the study of clinical and neurological changes with Glasgow Outcome Scale Extended before and after treatment endolyumbal insufflation of ozone and nootrop and intracystal introduction of ozone in dynamics.

Materials and methods: The data of 83 patients with various consequences of TBI in age from 1 year to 60 years old (63 men and 20 women) have been included in the investigation who were hospitalized in neurosurgical clinic of Samarkand Medical Institute from 2009 to 2014. All patients equally with clinical and neurological X-ray investigations (MRI, CT) were carried out laboratory investigations. Among the examined patients in 31 patients (37,3%) it has been diagnosed with post-traumatic cerebral arachnoiditis (PTCA), in 21 patients (25,3%) it has been diagnosed post-traumatic chronic subdural hematoma (PCSH), in 15 patients (18,1%) it has been diagnosed post-traumatic epilepsy (PE), in 13 patients (15,7%) it has been diagnosed post-traumatic arachnoid cyst (PTAC) and in 3 patients (3,6%) it has been diagnosed chronic vegetative status (CVS) (Figures 1, 2).

For the treatment of patients with consequences of TBI we offered the new methods endocystal introduction of ozone and endolumbal introduction ozone with nootropics (certificates of priority № IAP 2011 0419 and 2011 0148 № IAP).

The method of treatment of arachnoid liquor cysts is that after the imposition of milling holes it has been made dissection and excision of the cyst walls and connection it with subarachnoid and subdural spaces and then vinyl chloride or silicone catheter has been introduced into the cystic cavity and through this catheter with the use of medical syringe it has been injected ozone in the amount of 10-30 cm^3 depending on the cyst size, the catheter is left for 3-5 days for the re-introduction of ozone.

Figure 1: Forms of consequences of TBI (MRI and CT examples). a). Posttraumatic cystic cerebral arachnoidit. CT of patient K. Is determined by a small arachnoid cysts in the left frontal region and cystic-adhesive changes of convexital areas of the brain. b). Posttraumatic epilepsy. MRI of patient R. Determined by the seat of epilepsy - posttraumatic cystic-glial degeneration in the right frontal region of the brain. c). Posttraumatic arachnoidal cyst. MRI of patient B. Is determined by an arachnoid cysts in the right temporal-basal region of the brain. d). Posttraumatic chronic subdural hematoma. MRI (axial, coronar scans) of patient A. Determined by chronic subdural hematoma in the left hemisphere of the brain. e). Chronic vegetative status. MRI of patient J. Determined by bilateral subdural hydroma fronto-temporal-parietal lobes and post-traumatic atrophic processes of the brain.

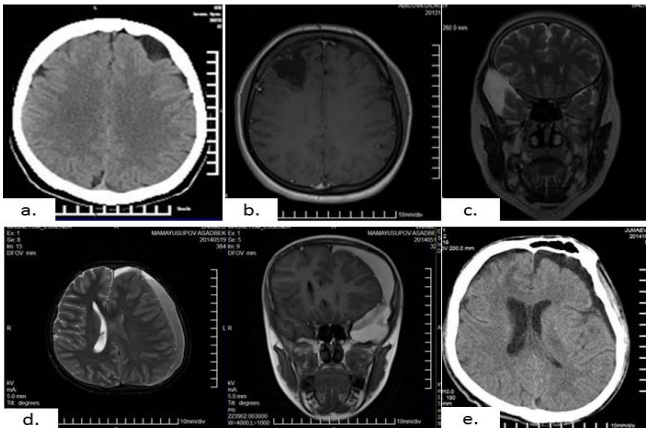

Fig 1: Forms of consequences of TBI (MRI and CT examples)

The next method is the way endolumbal insufflation of ozone and pyracetam in patients with different consequences of TBI, as mentioned above. These patients under sterile conditions after premedication and local anesthesia by the use of novocain solution 0, 5% – 10,0 ml, a lumbar puncture was performed between the 3rd and 4th lumbar vertebrae, and then it has been evacuated liquor (20-40 ml depending on the liquor pressure) and endolumbal injected first ozone (10-30 cm^3), and then pyracetam 2,5% – 3% from 200 mg to 1000 mg depending on the age of the patient.

Patients were carried out the following methods of treatment: in patients with PCSH it has been carried out mini-invasive removal of hematomas and endolumbal insufflation of ozone and pyracetam on 7-8 days after surgery; in patients with PTAC it has been carried out mini-invasive cysts emptying and endocystal introduction of ozone in the day of surgery and for 3-4 days after surgery. In PCA, PTE and in patients with CVS after severe TBI it has been conducted endolumbal insufflation ozone and 2-3% solution of pyracetam (doubly per treatment course).

In order to assess the general condition and neurological changes in patients it has been used Glasgow Outcome Scale Extended – GOSE [9, 13-15] (Table 1.).

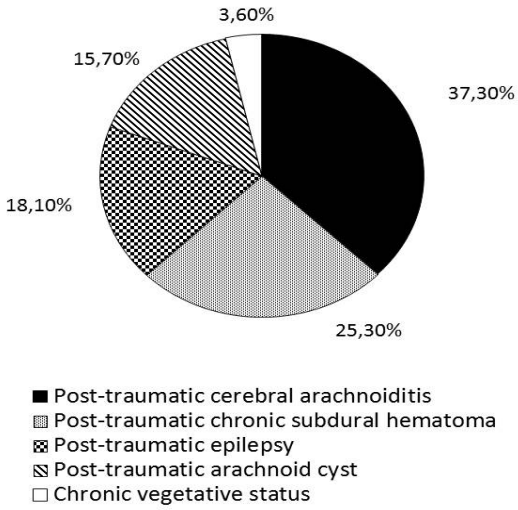

Fig 2: Distribution of patients according to the forms of consequences of TBI

Table 1: Glasgow Outcome Scale extended

1 point Death (D)	Death (D) in the first 24 hours
2 point Death (D)	The death (D) of more than 24 hours
3 point Vegetative State (VS)	Condition of unawareness with only reflex responses but with periods of spontaneous eye opening.
4 point Low Severe Disability (LSD)	Patient who is dependent for daily support for mental or physical disability, usually a combination of both. If the patient can be left alone for more than 8h at home it is upper level of SD, if not then it is low level of SD.
5 point Upper Severe Disability (USD)	
6 point Low Moderate Disability (LMD)	Patients have some disability such as aphasia, hemiparesis or epilepsy and/or deficits of memory or personality but are able to look after themselves. They are independent at home but dependent outside. If they are able to return to work even with special arrangement it is upper level of MD, if not then it is low level of MD.
7 point Upper Moderate Disability (UMD)	
8 point Low Good Recovery (LGR)	Resumption of normal life with the capacity to work even if pre-injury status has not been achieved. Some patients have minor neurological or psychological deficits. If these deficits are not disabling then it is upper level of GR, if disabling then it is lower level of GR.
9 point Upper Good Recovery (UGR)	

Results and discussion

Study and evaluation of the general condition and neurological status of patients with the use of the extended Glasgow Outcome Scale at admission to the clinic showed that in a vegetative state (VS) were 4,8% of patients, rough disability (LSD) was detected in 2,4% of patients, relatively severe disability (USD) was detected in 12,1% of patients, moderate disability (LMD) was detected in 15,7% of patients, relatively average disability (UMD) was detected in 35% of patients and relatively satisfactory restoration (LGR) was detected in 30,1% of patients (Table 2.).

Taking into consideration the above conditions, it has been used the new method of treatment – endolumbal and endocystal insufflation of ozone and pyracetam in the intermediate and distant periods of traumatic disease of the brain and the following results were obtained. On the expiry of 3-6 months after treatment the amount of macro- and microelements in the blood serum and cerebrospinal fluid were tested and the overall condition and neurological status of patients according to GOSE in dynamics were assessed.

Table 2: Distribution of the investigated patients according to the GOSE criterion

Points	Contingent	Number of observations					
		PVS	PCSH	PTAC	PE	PTCA	In total
1 point	Death (D) in the first 24 hours	-	-	-	-	-	-
2 point	The death (D) of more than 24 hours	-	-	-	-	-	-
3 point	Vegetative State (VS)	3 (3,6%)	1 (1,2%)	-	-	-	4 (4,8%)
4 point	Low Severe Disability (LSD)	-	2 (2,4%)	-	-	-	2 (2,4%)
5 point	Upper Severe Disability (USD)	-	10 (12,1%)	-	-	-	10 (12,1%)
6 point	Low Moderate Disability (LMD)	-	8 (9,6%)	3 (3,6%)	2 (2,4%)	-	13 (15,7%)
7 point	Upper Moderate Disability (UMD)	-	-	8 (9,6%)	12 (14,5%)	9 (10,9%)	29 (35%)
8 point	Low Good Recovery (LGR)	-	-	2 (2,4%)	1 (1,2%)	22 (26,5%)	25 (30,1%)
9 point	Upper Good Recovery (UGR)	-	-	-	-	-	-
	In total	3	21	13	15	31	83

The study of the general condition and neurological status of patients according to the GOSE showed that in all 4 patients who were in "vegetative status" (VS) (3 points) before treatment it has been noted positive dynamic after treatment. In 1 patient from this group of patients neurological status has been restored until "rough disabilities" (4 points) i.e. this patient had the ability to answer questions; in 1 patient with VS neurological status has been improved until the condition of "relatively severe disability" (5 points); in 2 patients this condition has been improved until "relatively moderate disability" (7 points).

During the evaluation of the patients' condition due to GOSE after endolumbal introduction of ozone and pyracetam and endocystal introduction of ozone in all left patients have been reached positive results. It should be noted that it was observed improvement in number of patients with "rough disabilities" (4 points) in 2 times after treatment, in contingent of patients with "relatively severe disability" (5 points) in 2 times, in patients with "moderate disability" (6 points) in 2,6 times, in patients with "relatively moderate disability" (7 points) in 2,6 times and in patients with "relatively satisfactory restoration" (8 points) in 1,2 times, i.e. by improving of metabolic processes and neurological status it has been noted "full restoration" of patients' condition (9 points), whose specific gravity has been reached to 48,2% (Figure 3.).

Conclusions

- Quantitative changes of points of GOSE in patients with the consequences of the traumatic brain injury could cause criterion of the metabolic disorders in the patients' organism and could be the index of the clinical-neurological pathological changes.
- Endocystal introduction of ozone and endolumbal insufflation of ozone and introduction of nootropics led to the normalization of points of GOSE, because of the metabolic improvement in the organism and it could allow us to reach the early restoration of clinical-neurological disorders in patients with the consequences of the traumatic brain injury.

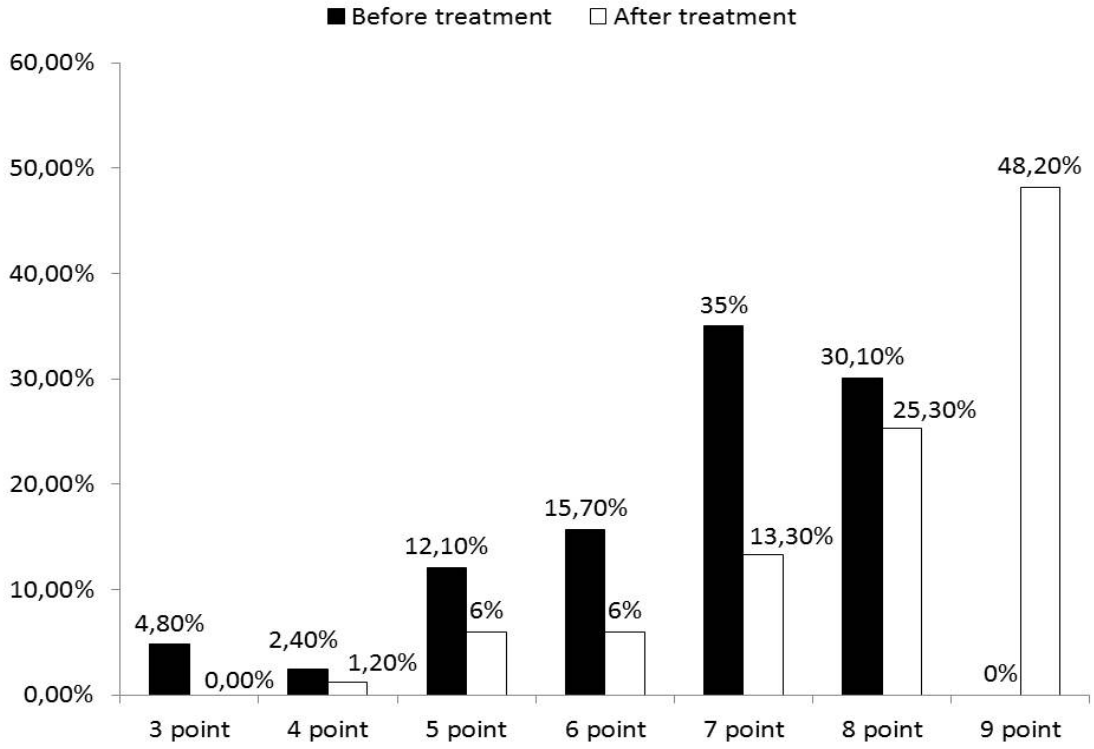

Fig 3: Dynamic changes of the neurological deficits determined according to GOSE in patients with consequences of the TBI before and after treatment

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