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Patient with dysexecutive syndrome after brain injury - case report

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ABSTRACT

Traumatic brain injury is usually caused by multiple kinds of falls, violence with head injury or traffic incidents. In this article, we describe the case of a 51-years-old patient with craniocerebral trauma, requiring the introduction into a pharmacological coma. The patient was diagnosed with a hemorrhagic contusion of the frontal lobes with numerous intracerebral hematomas, significant local cerebral edema, hematomas at the cerebral frontal and temporal lobes, subarachnoid bleeding in the cerebellar tent. After the brain injury patient demonstrates features of the dysexecutive syndrome, her disability on the Rankin's scale was rated with 5 grade. Thanks to properly selected drug therapy and conducting properly targeted rehabilitation, the patient's condition improved spectacularly, and the patient gained independence.

Keywords: DES, frontal lobe syndrome, TBI, traumatic brain injury, brain contusion, rehabilitation

INTRODUCTION

The phrase traumatic brain injury (TBI) means external brain trauma (trauma caused by force from the outside) with all their consequences - it is estimated that it affects 2.5 million Europeans per year, of which over 300,000 require hospitalization. It is often called the silent epidemic. The most common causes of TBI in Europe include traffic accidents, falls, violence and sports injuries. The incidence depends on gender and age - in the age range from age 0-44 TBI is diagnosed mostly among men (61%), while amongst people over 65 years of age, the gender ratio is reversed (1,2). This type of injury is the cause of a large number of deaths amongst young people (3). We can differ many TBI's types like concussions, skull fractures or contusions. Symptoms of mild TBI include memory loss, dizziness and headache. The consequences of TBI are burdensome for the patient and include behavioral, cognitive, physical impairment and may lead to the patient's death. Sometimes the outgoing pathological changes turn out to be irreversible (3,4,5).

Brain contusion may be caused by trauma and trigger with development of areas of focal haemorrhage from parenchyma, which may be surround by edema (somehow They are composed of focal areas of petechial hemorrhage from brain parenchyma with surrounding edema). The consequence of brain contusion includes edema formation - which is potentially reversible. (Brain contusion may be hemorrhagic. Also, a very dangerous condition for a patient is a haemorrhagic progression of the contusion (HPC) - a progression of primary haemorrhagic lesion, developing a new one. Also, a very dangerous condition for a patient is a haemorrhagic progression of the contusion (HPC) - a progression of primary hemorrhagic lesion, developing a new one. This phenomenon may affect even half of the patients with hemorrhagic traumatic lesions. The blood is extremely toxic to the brain tissues, so changes caused by HPC are irreversible, and what is important - affect brain tissues which were allegedly intact after the injury (6). On CT scans, which is an examination of choice in imaging this type of trauma, usually, the lesion is presented as a typical hemorrhagic lesion (6,7). In closed brain contusion mostly we observe damage of the frontal, temporal and occipital lobes. Types of injuries often involve distant parts of the brain from the reflection mechanism (8).

The Barthel and Rankin scale (9) are often used to measure the level of disability. Barthel Activities of Daily Living (ADL) Index consist of 10 questions about activities, which appears daily during living. In each question, depending on the patient's fitness, 0-2 points can be obtained. The maximum number of points is 20 (10). The Rankin scale reflects the degree of disability of the patient from 0 (no symptoms of disability), through 5 (several disability) to 6 (dead). (11)

The largest lobe in the brain is the frontal lobe - we distinguish in it the primary motor cortex and the prefrontal cortex. The effect of damage to the motor cortex is a weakening of the motor functions on the opposite side. In the frontal lobe there are also centers responsible for planning,

motivation or social behavior - so damage to the frontal lobe impairs higher brain functions. Among patients with damage to frontal lobes, we can observe normal motor and sensory functions with parallel personality changes (12).

The dysexecutive syndrome (DES) - formerly called frontal lobe syndrome - can be divided into 3 types depending on the location of the area of damage to the brain's nerve tissues, and includes emotional, behavioral and cognitive changes. Disorders in the case of pre-frontal brain injury may result in limited cause-and-effect reasoning, memory impairment manifested in the inability to hold information in memory and impaired abstract thinking. This syndrome usually reveals after frontal damage of both cerebral hemispheres in the trauma mechanism (13).

CASE REPORT

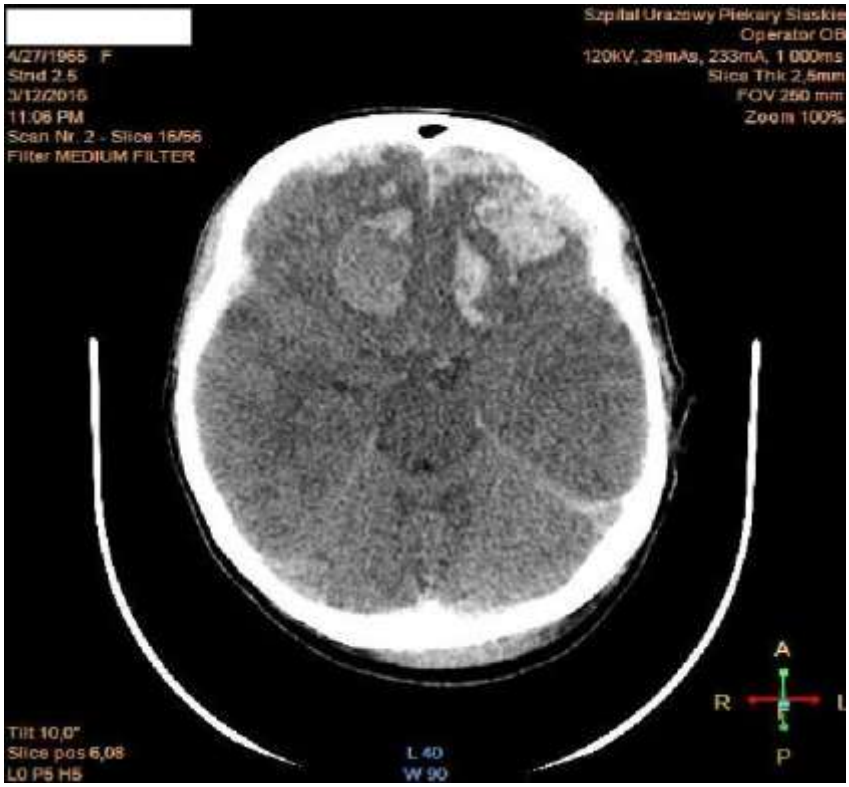
In the middle of March in 2013, 51-years-old female patient was admitted in emergency to the hospital, after fall in unclear circumstances, with craniocerebral trauma. Patient was conscious but she did not follow physican's instructions and was without logic contact. The pupils were equal with the correct response to light. Neurological examination did not show symptoms of increased intracranial pressure. The „racoon eye" on the right side of the face and large swelling of the eyelid on this side was observed. The patient underwent CT, which revealed contusion of frontal lobes with numerous intracerebral hematomas up to 30 mm in diameter, with significant local edema (Figure 1).

Cerebral hematomas were observed at the same level as the frontal and temporal lobes - on both sides and were 9 mm wide. Hematoma was near the anterior part of cerebral falx part up to 9mm - also there were blood trail on the cerebellum tent. Fractures of the skull base on the left side of the foramen magnum and occipital squama ending on the parietal bone on the left side of the skull. The patient's condition required the implementation of the neuroprotective treatment in the form of a pharmacological coma. The patient needed ventilation with a respirator. Anti-decongestant, antihemorrhagic, antibiotic and anti-decubitus therapy were introduced. The patient was disconnected from the ventilator after 15 days and extubated after another.

Then, when circulatory and respiratory were fully efficient, the patient was referred for rehabilitation to the Upper Silesian Rehabilitation Center in Tarnowskie Góry (GCR). At admission, the patient was conscious and logical. She had swallowing disorders, discreet left-sided hemiparesis. The patient presented speech and language disorders. There were also observed mild disorders of memory and attention systems. The patient was dependent on the environment and third persons - needed help in basic activities like washing, combing, brushing teeth, dressing. The patient was immobilized and needed help while using the toilet. The patient was unable to maintain a vertical position when attempting to stand up. In the physical examination of the upper and lower limbs, the range of active

and passive mobility was normal, muscle tone also. On the Barthel scale, the patient was rated 2, and on the Rankin scale 5. The patient also showed reduced resistance to distraction and a moderate decrease in concentration. The semantic memory was preserved, however, there were significant deficits of fresh memory and discrete working memory disorders. The patient's psychomotor speed was below normal, also the level of analytical skills was low. The patient learning abilities were imparied.

Figure 1. The computed tomography scan of the patient made after brain injury. Hyperdense



foci of intracerebral hematomas are visible in the right and left frontal lobe.

Rehabilitation therapy consisted of learning how to walk, exercise at the pool, balance training, atlas exercises, and general exercise with a group of other patients. The patient attended, among others, neurological therapy, vocaStim, and Bobath exercises. Psychological therapy followed by supportive psychotherapy and occupational therapy was also used.

The pharmacological treatment implemented during the rehabilitation process was comprehensive and aimed at improving the patient's neurological improvement. Pharmacotherapy included the administration of a drug increasing the metabolism of nerve cells and their function - piracetam 4800mg per day, memantine 20 mg and donepezil 10mg were also used. The patient's therapy required the use of mianserin 30mg per day and lamotrigine 50mg per day.

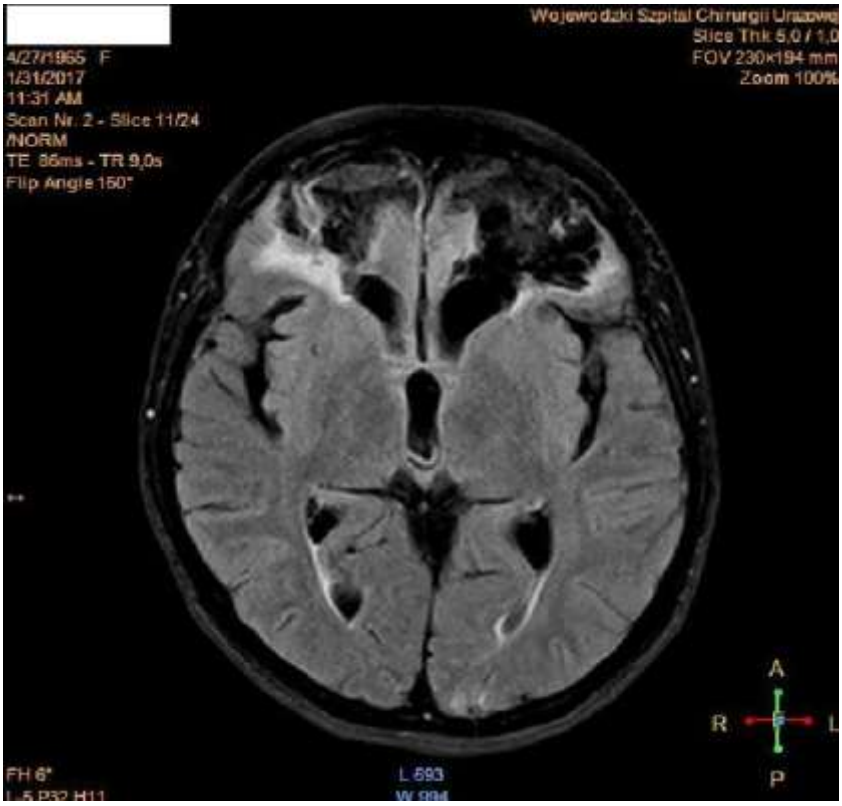
In the patient were observed a general improvement in physical fitness, increasing the muscular and strength of the left limbs. The patient was restored to the ability to walk independently, and

dexterity improved. The patient was discharged home in good condition, neurologically stable. At discharge on the Barthel scale, the patient was rated 19, and on the Rankin scale - 2.

Table 1. Results of performed rehabilitation treatment in comparison to data collected at the admission on several aspects of Barthel scale.

On admission to rehabilitation		**After the rehabilitation**	
Aspects of everyday life	**Asassment**	**Aspects of everyday life**	**Asassment**
Bowels	Occasional incidens (less than 1/week)	Bowels	Fully control
Bladder	Occasional incidens (maximum once/24 hours)	Bladder	rarely lack of control (less than once a day)
Grooming	Needs help with personal care	Grooming	Independent
Feeding	Unable	Feeding	Independent, normal food
Dressing	Dependent	Dressing	Independent including buttons, zips etc.
Toilet use	Dependent	Toilet use	Independent
Mobility indoors	Immobile	Mobility indoors	Independent (may use help)
Assessment of disability		**Assessment of disability**	
Barthel scale	2	Barthel scale	19
Rankin scale	5	Rankin scale	2

Figure 2. The CT made six month after brain contusion. Visible atrophy of the brain tissue in the



frontal lobes.

DISCUSSION

The dysexecutive syndrome is usually chronic, a condition that is inconvenient for the patient, which, unfortunately, can progress. Therapy of this disease should be multidirectional and include cognitive, pharmacological, psychodynamic and behavioral strategies. Pharmacotherapy include administration of selective acetylcholine inhibitors, in our patient donepezil, to improve memory and increase patient's attention (13). Available studies reveal the usefulness of piracetam in the treatment of patients after acute ischemic stroke (PASS) - the study *De Deyn et al.*, among patients 12 weeks after PASS, in addition to neurological improvement, also showed improvement in the patient's condition according to the Barthel scale (14). Inhibitor of N-methyl d-aspartate receptor - memantine receptors - is used in the treatment of frontotemporal dementia and ischemic hemorrhages, because it has protective effects on astrocytes at appropriate doses. *Mei et al.*, research confirms that administration of medicaments from this group of drugs after brain injury is justified, due to the fact that they prevent post-traumatic NMDA-receptors mediated exicitotoxity (15,16).

Campbell et al., also point on the individual psychotherapy and social support, which include individually matched rehabilitation program. This program should consist of social skills training and multi-task daily living activities training (13).

Baddeley described a case report of the 42-years-old patient who's frontal lobes were damage during traffic accident. Similarly like in our patient - after accident in CT scans were observed haemorrhage foci in both, and after 6 months patient presented features of frontal lobes disease (16,17).

CONCLUSIONS

During the comprehensive therapy, the patient's condition after trauma improved spectacularly. Thanks to the treatment used, the disability according to the Rankin 5 grade - severe disability, the patient requires constant help - to 2 grade - low disability - when the patient can take care of itself at her own (11). Also in the Barthel scale, patient's condition improved well. Individual care and complex rehabilitation procedures supported by properly selected pharmacotherapy are an extremely important part of the recovery of trauma patients, including those after TBI.

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