Julia Nekrasova[1], Mikhail Kanarskii[1], Elena Manzha[1, 2], Ilya Borisov[1], Pranil Pradhan[1], Denis Shunenkov[1], Anna Kirillova[1], Sergey Tsyganov[1, 2], Vera Pasko[1], Marina Petrova[1, 3] Igor Pryanikov[1]

[1]Federal Research and Clinical Centre of Intensive Care Medicine and Rehabilitation, Moscow, Russian Federation
[2]Konchalovsky City Clinical Hospital
[3]People's Friendship University of Russia, Moscow, Russian Federation

Neurogenic bladder dysfunction in patients emerged from chronic disorders of consciousness

Abstract

The observational study aimed to analyse the neurogenic bladder dysfunction in patients during the recovery from the chronic disorder of consciousness. We compared aetiology, level of consciousness, age with the neurogenic bladder dysfunction in these cases. The study results suggested that the increase in the consciousness level partially restores the bladder function, which significantly reduces the risk of infections and somatic disorders, thereby affecting the duration and quality of life. Recovery of the bladder function also depends on the aetiology of the disorder of consciousness: patients in the anoxic group had the least chance of bladder function recovery making global brain ischaemia an unfavourable factor. Correlations between urination dysfunctions with age and level of consciousness at admission have not been found.

Palliat Med Pract 2021; 15, 4: 299–302

Key words: chronic disorders of consciousness, hyperactive bladder, neurogenic bladder, vegetative state, anoxic brain injury, traumatic brain injury

Introduction

The post-comatose condition with a significant loss of cognitive functions is known as a chronic disorder of consciousness [1, 2]. Giacino et al. [3] considered 28 days after the injury as a chronic period. Disorders of consciousness (DOC) transit into a vegetative state (VS) and minimally conscious state (MCS). A vegetative state (VS) is a condition without any self and surrounding awareness whereas a minimally conscious state (MCS) is a condition with some level of self-recognition and interaction [4]. The causes for chronic DOC: traumatic brain injury (TBI), cerebrovascular injury, anoxic/hypoxic brain injury, and infections of the central nervous system (CNS) [5]. The life expectancy of patients in the VS ranges from 3 to 5 years [6]. One of the dominant causes of mortality in these patients is urinary tract infections (UTI). Patients frequently have an atonic bladder and later ascending pyelonephritis because of impaired physiological functions

Address for correspondence:
Denis Shunenkov
Federal Research and Clinical Centre of Intensive Care Medicine and Rehabilitation
Moscow, Russian Federation
phone: +7 (915) 833 32 53, e-mail: voksined@yandex.ru

Palliative Medicine in Practice 2021; 15, 4, 299–302

DOI: 10.5603/PMPI.2021.0023

and prolonged immobilization. The urinary catheters also exacerbate ongoing UTI [7]. A study about urinary incontinence in stroke patients [8] established the presence of neurogenic bladder dysfunctions as the main culprit for the significant adverse outcome. Several studies have found no correlation between the area of damage and subsequent neurogenic dysfunction [9–12].

Currently, we did not find any significant work on neurogenic bladder dysfunctions in chronic DOC. We searched the Web of Science, Scopus, PubMed, Google Scholar databases for the following key words in various combinations: disorders of consciousness (DOC), vegetative state (VS, UWS), minimally conscious state (MCS), traumatic brain injury (TBI), urology, neurogenic bladder, micturition, and incontinence. We aimed to compare and analyse data from other related studies but could not find any significant work. Without proper scientific research on this subject, it is quite challenging for health providers to diagnose, treat, prevent, and provide rehabilitation. We aimed to assess functions of the urinary tract in patients who emerge from VS and MCS. The aetiologies considered were TBI, anoxic injury, and cerebrovascular injury.

Patients and methods

We collected data for our observational study from the beginning of 2019 to the end of 2020 on neurogenic bladder dysfunctions in DOC patients who were admitted and discharged from the Federal Research and Clinical Centre for Intensive Care Medicine and Rehabilitation. A team of neurologists diagnosed different forms of chronic disorder of consciousness (DOC) — vegetative state (VS) and minimally conscious state +/– (MCS+/–), based on standard diagnostic criteria available currently. Also, we thoroughly interviewed other medical staff in contact with patients to know the patients' level of communication. At the time of diagnosis, electrolytes were in the normal range; infectious, metabolic, and other disorders that could lead to a change in the level of consciousness were absent.

The main inclusion criterion was the subsequent increase in the level of consciousness after VS or MCS– to the level allowing communication (MCS+, emergence from MCS, clear consciousness). The change in the level of consciousness was detected both in a hospital environment and through telephone interviews of relatives or caregivers to find whether they could communicate with patients. Since the number of patients restoring consciousness after DOC is generally small, 20 people entered the study group. The exclusion criteria comprised ongoing brain strokes, mental disorders, and acute urinary tract disorders.

The urologist performed the urological evaluation of patients with chronic DOC to determine neurogenic bladder dysfunctions. After being discharged the urological evaluation was based on the patient's urge to urinate and other physiological functions. The study also includes patients' demographic data, their level of consciousness, aetiology, and bladder dysfunction (Table 1).

To analyse data Statistica 10 program package (developed by StatSoft.Inc) was used. The tests used were: The Kolmogorov-Smirnov test — to check the nature of the distribution of interval variables, Wilcoxon test — to determine the significant difference in quantitative traits between two independent groups, Spearman's rank correlation coefficient — to study the relationship between the phenomena represented by quantitative data and the distribution differing from the normal, and Chaddock scale — to assess the direction and strength of the correlation. A p-value < 0.05 is considered statistically significant. The study follows the WMA Declaration of Helsinki Adopted by the 18th WMA General Assembly, Helsinki, Finland, June 1964 and amended by the: 59th WMA General Assembly, Seoul, Republic of Korea, October 2008; article 17 of the Principles of Public Health Legislation, orders, and instructions issued by Ministry of the health of the Russian Federation.

Results

Demographical and clinical data of all patients enrolled in the study are presented in Table 1. Out of 20 patients, TBI, subarachnoid haemorrhage (SAH), and anoxic brain injuries (ABI) cases accounted for 45%, 30%, and 25% accordingly (Fig. 1A).

At the initial level of consciousness, all patients belonged to the non-communicating group, i.e., they were in VS (11 people) or MCS– (9 people) (Fig. 1B). For such a category of patients, we considered the appearance of the ability to communicate a significant improvement (see Patients and methods chapter), therefore, according to the final level of consciousness, a group of participants was divided into patients in MCS+ (3 people) and patients in the conscious state (17 people) (Fig. 1C).

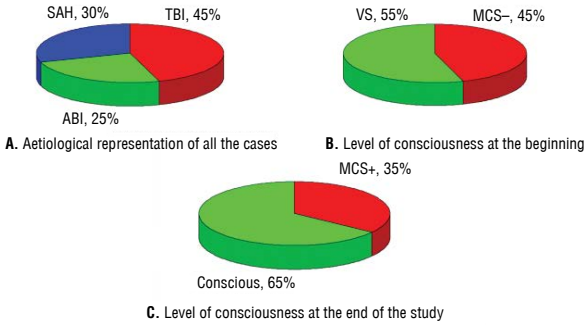
A moderate correlation was found between the final level of consciousness and aetiology in the sequence of "anoxia — traumatic brain injury — subarachnoid haemorrhage" (Spearman's rank correlation coefficient $r_s = 0.46$) but it cannot be considered a significant statistical difference between aetiological groups according to Mann-Whitney U-test. Probably, the small number of patients in nosology groups contributed to this result.

A weak positive correlation ($r_s = 0.18$) between aetiology and urination dysfunction was established.

Table 1. Patients' demographical and clinical data

No	Age	The initial level of consciousness	The final level of consciousness	Aetiology	Final urination	Final frequency of urination
1	42	VS	MCS+	ABI	Involuntary	Frequent
2	46	MCS–	MCS+	ABI	Involuntary	Frequent
3	25	MCS–	Conscious	ABI	Voluntary	Frequent
4	40	VS	MCS+	ABI	Involuntary	Frequent
5	37	VS	MCS+	ABI	Voluntary	Frequent
6	32	MCS–	Conscious	SAH	Involuntary	Frequent
7	45	VS	MCS+	SAH	Voluntary	Frequent
8	53	MCS–	Conscious	SAH	Involuntary	Frequent
9	53	VS	Conscious	SAH	Voluntary	Frequent
10	38	VS	Conscious	SAH	Voluntary	Frequent
11	28	VS	Conscious	SAH	Voluntary	Frequent
12	22	MCS–	MCS+	TBI	Voluntary	Frequent
13	29	MCS–	Conscious	TBI	Voluntary	Frequent
14	26	VS	Conscious	TBI	Voluntary	Frequent
15	45	VS	MCS+	TBI	Voluntary	Frequent
16	57	MCS–	Conscious	TBI	Voluntary	Frequent
17	61	VS	Conscious	TBI	Voluntary	Frequent
18	19	VS	Conscious	TBI	Voluntary	Frequent
19	20	MCS–	Conscious	TBI	Voluntary	Frequent
20	40	MCS–	Conscious	TBI	Voluntary	Frequent

ABI — anoxic brain injury; SAH — subarachnoid haemorrhage; TBI — traumatic brain injury; VS — vegetative state; MCS — minimally conscious state



A. Aetiological representation of all the cases

B. Level of consciousness at the beginning

C. Level of consciousness at the end of the study

Figure 1. Characteristics of the main group of research participants

The follow–up data showed us that all TBI cases had controlled bladder emptying after regaining consciousness, including 2 MCS+ cases. In anoxic patients and SAH, 2 out of 5 (40%) and 4 out of 6 (66.7%) patients respectively urinated voluntarily.

Among MCS+ 3 patients (42.8%) did not restore arbitrary urination. Urinary incontinence is noticeably lowered by 15.3% (2 people out of 13) in patients who emerged from DOC to consciousness. No correlations were found between age, urinary incontinence, and primary level of consciousness. Frequent urination was preserved in all the study cases.

Discussion

This observational study aimed to analyse the neurogenic bladder dysfunction in chronic DOC patients during and after the recovery of consciousness based on aetiology, final consciousness level, and age. The results obtained allow to conclude that after regaining consciousness, arbitrary urination is restored in 75% of cases. However, the restoration of the normal function of urination does not occur. The hyperactive bladder functions usually stand and cause several inconveniences for both patients and caregivers. The urinary bladder function is restored in the least number of anoxic brain injury cases meaning that global brain ischaemia is an unfavourable factor for the restoration of urinary function. All TBI cases in our study fully restored voluntary urination, which corresponds with another study that notes that this aetiological group has a more significant functional recovery [13].

In this paper, it was emphasized the importance of the recovery of consciousness in the process of restoring functional abilities of the urinary system, the pathology of which is a frequent cause of complications and mortality in this patient group. In turn, this allows concluding, that the realization of rehabilitation potential in terms of cognitive function may have a positive impact on the restoration and other functions of the body, which generally contributes to improving the quality of life and an increase in its duration. A multidisciplinary rehabilitation approach more targeted towards cognitive-behavioural therapy in patients with DOC is recommended.

A major limitation of the study is the small sample size, which is associated with the rarity of both DOC cases and, in particular, positive outcomes. A more comprehensive study could recognize correlations between the level of consciousness, aetiology, and urinary inconsistency. Other possible scaling methods, demographic and clinical data that are not available in this study should also be considered in future research.

Based on data obtained it can be concluded that an increase in the level of consciousness leads to a partial restoration of the urinary tract functions, which significantly reduces the risk of somatic and infectious pathologies, thereby affecting the duration and quality of life. A tendency in aetiological differentiation between anoxic and traumatic lesions is maintained in relation to the dynamics of the level of consciousness and functional recovery of the urinary system.

Declaration of conflict of interests

The authors declare that there is no conflict of interest.

Funding

None declared.

References

1. Owen AM. Detecting consciousness: a unique role for neuroimaging. Annu Rev Psychol. 2013; 64: 109–133, doi: 10.1146/annurev-psych-113011-143729, indexed in Pubmed: 23043305.
2. Laureys S, Celesia GG, Cohadon F, et al. European Task Force on Disorders of Consciousness. Unresponsive wakefulness syndrome: a new name for the vegetative state or apallic syndrome. BMC Med. 2010; 8: 68, doi: 10.1186/1741-7015-8-68, indexed in Pubmed: 21040571.
3. Giacino JT, Fins JJ, Laureys S, et al. Disorders of consciousness after acquired brain injury: the state of the science. Nat Rev Neurol. 2014; 10(2): 99–114, doi: 10.1038/nrneurol.2013.279, indexed in Pubmed: 24468878.
4. Hodelín-Tablada R. Minimally Conscious State: Evolution of Concept, Diagnosis and Treatment. MEDICC Review. 2016; 18(4): 43, doi: 10.37757/mr2016.v18.n4.9.
5. Monti MM, Laureys S, Owen AM. The vegetative state. BMJ. 2010; 341: c3765–c3765, doi: 10.1136/bmj.c3765, indexed in Pubmed: 20679291.
6. Multi-Society Task Force on PVS. Medical aspects of the persistent vegetative state (1). N Engl J Med. 1994; 330(21): 1499–1508, doi: 10.1056/NEJM199405263302107, indexed in Pubmed: 7818633.
7. McKibben MJ, Seed P, Ross SS, et al. Urinary Tract Infection and Neurogenic Bladder. Urol Clin North Am. 2015; 42(4): 527–536, doi: 10.1016/j.ucl.2015.05.006, indexed in Pubmed: 26475949.
8. Mehdi Z, Birns J, Bhalla A. Post-stroke urinary incontinence. Int J Clin Pract. 2013; 67(11): 1128–1137, doi: 10.1111/ijcp.12183, indexed in Pubmed: 23834208.
9. Pettersen R, Haig Y, Nakstad PH, et al. Subtypes of urinary incontinence after stroke: relation to size and location of cerebrovascular damage. Age Ageing. 2008; 37(3): 324–327, doi: 10.1093/ageing/afm196, indexed in Pubmed: 18250094.
10. Gelber DA, Good DC, Laven LJ, et al. Causes of urinary incontinence after acute hemispheric stroke. Stroke. 1993; 24(3): 378–382, doi: 10.1161/01.str.24.3.378, indexed in Pubmed: 8446973.
11. Badlani G, Vohra S, Motola J. Detrusor behavior in patients with dominant hemispheric strokes. Neurourology and Urodynamics. 1991; 10(1): 119–123, doi: 10.1002/nau.1930100113.
12. Feder M, Heller L, Tadmor R, et al. Urinary continence after stroke: association with cystometric profile and computerised tomography findings. Eur Neurol. 1987; 27(2): 101–105, doi: 10.1159/000116140, indexed in Pubmed: 3622579.
13. Aidinoff E, Groswasser Z, Bierman U, et al. Vegetative state outcomes improved over the last two decades. Brain Inj. 2018; 32(3): 297–302, doi: 10.1080/02699052.2017.1418535, indexed in Pubmed: 29265938.