European Review for Medical and Pharmacological Sciences 2012; 16: 1806-1813

Forensic aspect of late subjective complaints after traumatic brain injury

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Abstract. – BACKGROUND: The subjective complaints in patients with TBI (Traumatic Brain Injury) may persist for years. The most frequent complaints are headache, dizziness, drowsiness, mood disturbances, and memory and concentration disturbances. It is assumed that these complaints are caused by injury itself on one hand and psychological, emotional and motivation factors on the other.

AIM: Evaluation of late posttraumatic complaints in patients with TBI more than a year after the trauma, and establishing their correlations to the severity of TBI and involvement in the lawsuits for financial compensation (litigation).

MATERIALS AND METHODS: Ninety patients with the diagnosis of TBI were divided, according to the severity of the injury, in two groups: mild and with moderate-to-severe. The second classification criterion was litigation. A subjective complaints scale has been designed for the purpose of this research taking into consideration both anamnesis and hetero-anamnesis data.

RESULTS: Cognitive disturbance, aggressiveness and sleep disturbance are more frequently reported by the subgroup of moderate-to-severe TBI patients, and they have not been related to the litigation. Posttraumatic headache (PTH) turned out to be a distinctive complaint regarding both classification criteria. Vegetative disturbances are significantly related to litigation, but not to the degree of injury.

CONCLUSIONS: Predictive complaints reflecting the severity of TBI are memory deficit, concentration problems, and aggressiveness and sleep disturbance. Vegetative disturbances are predictive in relation to compensation claims. PTH is important from the forensic point of view for the patients with moderate to severe TBI.

Key Words:
Brain injury, Posttraumatic complaints, Forensic aspect, Post traumatic headache.

Introduction

Traumatic brain injuries (TBI), especially those caused by traffic accidents, can be described as an epidemic. Their consequences are related to long term therapeutic procedures and frequent work impairment in the group of the most productive society subpopulation. In the European countries, the prevalence of traumatic brain injury (TBI) varies between 229 and 1967 per 100,000, predominantly affecting the age from 15 to 24, and it is the top cause of death among people younger than 45[1,2]. From epidemiological sources, the most frequent are mild TBI varying from 80% up to 90% and even 95% of all TBI injuries[3,4]. The American Brain Injury Association proposed that TBI should be classified as mild, moderate and severe. Frowein[5] added the fourth (critical) grade, the most severe form of TBI in which there is an evidence of brain stem damage. The classification criterion for TBI has been made by combining the initial GCS (Glasgow Coma Scale) with a duration of the loss of consciousness (LOC) and a duration of the posttraumatic amnesia (PTA). Generally, the mild TBI is present among patients with 13-15 GCS score at the moment of admission to hospital, the loss of consciousness (LOC) not longer than 30 minutes and/or PTA shorter than 1 hour. Moderate TBI is characterized by GCS that ranges from 9 to 12, LOC from 1-24 hours and/or PTA from 30 minutes to 24 hours. In the group of severe TBI, GCS is 8 or lower; LOC and/or PTA are both longer than 24 hours. Some Authors[6,7] use only GCS for the distinction of the severity of TBI, while others use LOC and/or PTA. It is important to notify whether the injury is closed or not.

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There are some terminology indistinctness concerning the mild TBI since several different terms, such as minor head injury, mild head injury, traumatic head syndrome, mild concussion syndrome, and commotio cerebri ("Gehirnerschutterung") in European literature are used to describe the same degree of TBI. The review of the most recent literature in this field shows that the term 'mild TBI' has been most frequently used.

Posttraumatic complaints after TBI are numerous and persist in all the degrees of severity after 6 months with 20% to 80%[8]. There are numerous attempts to classify the posttraumatic consequences. The term "posttraumatic complaint" includes many symptoms such as headache, dizziness, drowsiness, mood disturbances, and memory and concentration disturbances. It is assumed that these complaints are caused by injury itself on one hand and psychological, emotional and motivation factors on the other. Despite many different classifications of TBI consequences, all the Authors agree that cognitive, emotional and behavioral disturbances exist from psychiatric point of view. Hinkledey and Corrigan[9], divided psychological consequences of closed TBI in two groups. The first group includes the cognitive deficit of memory and learning, language, perception and concentration, with a special emphasis on selective attention, consciousness disturbances and the speed of data processing. The second group of consequences is based on emotional and personality disturbances and consequently related to behavioral changes.

Rao and Lyketsos[10] proposed the classification of TBI neuropsychiatric consequences according to phenomenology, emphasizing the term 'behavioral discontrol disturbance' – major and minor form. The minor form describes complaints known in literature as the post-concussion syndrome. These two forms differ in the degree of symptom expression and existence of certain symptoms. The major form includes cognitive, mood and behavior disturbances, while minor form is characterized by mood, cognitive and somatic disturbances. Predominant symptoms in the major form are behavioral and somatic in the minor form.

The posttraumatic headache (PTH) is the most frequent somatic complaint. Among the patients with the mild TBI PTH is present in the range of 50% to 80%[11]. Some Authors[12] report on inverse proportionality between PTH and the severity of TBI degree. On the contrary, some other Authors do not share that opinion. PTH becomes chronic among 60% of patients[13]. Packard[14] finds that PTH persists a year after the injury in 33% and after 3 years in 15% to 20%[14]. It is worth notifying that the lawsuit and its resolution do not significantly correlate to PTH[14,15].

Patients' complaints are the starting point in the clinical evaluation of posttraumatic consequences, but the confirmation is necessary using neuropsychological, psychodiagnostic and neuroimaging procedures. However, there are some limitations, especially when the mild TBI is in question. Neuropathology can not be detected by already mentioned methods. In such cases patients' complaints and their evaluation have enormous importance for the specialists. Sbordone et al[16] proposed that additional questionary (taking heteroanamnesis from patient's significant others) should also be used as the alternative source of relevant data in the evaluation of patients' own complaints.

Many patients with TBI are involved in legal proceedings seeking a financial compensation for their injuries, making the compensation itself an important factor in the evaluation of patients' complaints, as far as their existence, duration and intensity are concerned. The term of "compensation neurosis" was defined in 1946 in the papers written by Kennedy[17]. There are many researches that support the rigid opinion of Kennedy[17] and Miller[18], that the materialization of financial compensation make the patient healthy and ready to be back at work. Concurrently, there are many other researches[19,20] with quite opposite results, proposing that the favorable resolution of lawsuits, from the patients' point of view, do not contribute in reducing their subjective complaints.

A mild TBI has the greatest forensic importance. Complaints should not be underestimated, but on the other hand, a possible simulation must be detected. Many researchers[21] warn that subjective complaints in the mild TBI patients should not be treated as insignificant.

The purpose of this study is to compare late posttraumatic patients' complaints with the TBI severity degree and their participation in legal proceedings for the purpose of the material compensation. The initial hypothesis was that TBI severity is the cause of many subjective complaints, but there are some complaints that can be connected with litigation and possible material compensation.

Materials and Methods

The subjects were 90 patients observed or hospitalized for a closed cerebral trauma at the Institute for Surgery in Novi Sad. The neurosurgery specialists evaluated a degree of the cerebral trauma severity immediately after the trauma, according to the initial GCS criteria. The intracranial lesions were testified through brain neuroimaging (computed tomography: CT).

There were formed two groups of patients – the subgroup with mild TBI (69 patients), and the subgroup with moderate to severe TBI (21 patients).

The mild TBI (MTBI) was defined as a trauma with GCS from 13-15, and the moderate to severe TBI (M-STBI) as one with GCS under 13 (moderate TBI GCS 9-12; severe TBI GCS 3-8).

The second classification criterion was involvement in litigation. Sixty subjects were not involved in litigation, and 30 of them undertook the procedure.

Our sample consisted of 68.9% of males and 31.1% of females. In the subgroups of patients with different TBI, males and females were proportionally included ($\chi^2(1)= 0,42$; $p = 0.52$) as well as in the subgroups with and without the lawsuit proceeding ($\chi^2(1)= 0,17$; $p = 0.68$).

The average patients' age at the time of injury was 38.18 ranging from the age of 18 to 65. The subgroups with different severity of the injury did not differ in the average age ($t(88)=0.24$; $p = 0.81$). The same situation was found in the subgroups with and without the lawsuit ($t(88)=0.16$; $p = 0.87$).

Most subjects had secondary school education level (68%), 21% of elementary school level, and 11% of university or higher education level. Significant differences in education were not found between the groups with MTBI and M-STBI groups ($\chi^2(2)=0.17$; $p = 0.92$), neither between the subgroups with and without the lawsuit ($\chi^2(2)=0,65$; $p = 0.72$).

The average duration of the posttrauma period (time interval between the trauma and evaluation of the symptoms) was 28.34 months ranging from 12 months to 10 years. The subgroups related to both criteria (severity of the trauma and the lawsuit) were equalized regarding the time passed after the trauma (for severity of the trauma $t(88)=0.84$; $p = 0.75$; for the lawsuit groups $t(88)=0.85$; $p = 0.39$).

The criterion for the exclusion from the sample was the history of neurological or psychiatric disorders or alcohol or drug abuse.

Instruments

Subjective complaints scale (SCS) has been designed for the purpose of this research. It consists of 11 items which refer to common complaints after TBI. The psychiatrist administers the scale after the standardized interview with (to) a patient and his relatives. He integrates anamnesis and heteroanamnesis data about a patient's complaints and evaluates them on the 3 degree scale from 0 (no complaint) through 1 (mild complaint intensity) to 2 (severe complaint intensity). Reliability of the scale on this sample was the following: Cronbach alpha = 0.84, and average. Item-total correlation was 0.33.

Procedure

The patients were selected from the register of The Institute for Surgery, The Clinic for Neurosurgery, where the information about injury and other relevant data were stored. The patients were invited to psychiatric research by mail. The information consent was obtained from all patients included in the study.

Results

The two-way ANOVA was performed with severity of injury (MTBI vs M-STBI) and the legal proceeding (with and without the lawsuit) as independent factors, and items of SCS, e.g. subjective complaints, as dependent measures.

Since the level of measurement for dependent variables was less than interval, the variables were quantified through the analysis procedure of categorical variables (CATPCA), in the SPSS statistical program (SPSS Inc., Chicago, IL, USA).

The results of the two-way ANOVA suggest that severity of TBI had a significant main effect to the intensity of complaints ($F(12.75)=4.83$, $p = 0.00$). The lawsuit procedure did not significantly contribute to the severity of subjective complaints ($F(12.75)=1.76$, $p = 0.07$), although the p-level for this factor was near the common limit of 0.05. Severity/lawsuit interaction relationship was not a significant factor of influence on the subjective complaints ($F(12.75)=0.88$, $p = 0.57$).

Univariate ANOVA tests for each dependent variable indicate that patients with mild and moderate to severe trauma can be differentiated by intensity of their headache ($F(1.86)=14.09$, $p = 0.00$), vegetative symptoms ($F(1.86)=5.52$, $p = 0.02$), memory $F(1.86)=5.89$, $p = 0.02$) and concentration problems $F(1.86)=8.02$, $p = 0.01$) ag-

gressive behavior (F(1.86)=5.68, p = 0.02), and sleep problems (F(1.86)=4.38, p = 0.04).

The patients involved in the lawsuit proceeding differ from those without the lawsuit in the intensity of their headache (F(1,86)=8,78, p = 0.00) and vegetative symptoms (F(1,86)=12.01, p = 0.00). Interaction effect for severity of trauma based on the compensation request is significant only for vegetative symptoms (F(1.86)=5.61, p = 0.02).

Post-hoc comparisons (Scheffe procedure) for dependent variables, for which significant F-test on univariate ANOVA tests have been obtained, together with means in subgroups, are presented in Table I. The group with MTBI and without the lawsuit proceeding reported the lowest headache intensity. This group has significantly lower average headache score from both MTBI groups (with and without the lawsuit). The difference between the average headache score of MTBI group without the lawsuit, and the group with the same level of trauma severity in the lawsuit proceeding, was insignificant, but p-level is near to 0.05 criterion (p = 0.07).

The group with M-STBI and without the lawsuit also had the mildest vegetative symptoms, significantly milder than both MTBI subgroups, and M-STBI with the lawsuit. That again means that both the severity of the trauma and the lawsuit proceeding, as well as their interaction, was significant factors for differentiation of this complaint.

Memory problems are significantly different only with regard to TBI severity. Patients with M-STBI together have more intensive memory problems than MTBI group. However, the significant difference has been identified between MTBI with the lawsuit and M-STBI with the lawsuit groups.

Similarly, TBI severity significantly affects the concentration problems, unlike the lawsuit procedure. The significant difference on the post-hoc comparison exists between MTBI and M-STBI with the lawsuit.

The severity of trauma is the only factor of the differentiation with respect to aggressiveness as a complaint. The patients with MTBI are more aggressive, but neither a difference on the post-hoc comparison of subgroups, reached the significant p-value.

The relation between severity of trauma and sleep problems is inverted again. The group with the mild injury has more severe problems. Four subgroups, however, do not significantly differentiate in the intensity of the problem.

Table I. Scheffe test of post-hoc comparisons for variables were univariate test reached significance.

Complaints	Severity/lawsuit	Means***	MTBI/ lawsuit p-value	M-STBI/ no lawsuit p-value	M-STBI/ lawsuit p-value
Headache	MTBI/no lawsuit	-0.00	0.68	0.01*	0.96
	MTBI/lawsuit	0.30		0.00**	0.47
	M-STBI/no lawsuit	-1.25			0.07
	M-STBI/lawsuit	-0.18			
Vegetative symptoms	MTBI/no lawsuit	-0.05	0.77	0.03*	0.90
	MTBI/lawsuit	0.21		0.00**	0.99
	M-STBI/no lawsuit	-1.17			0.01*
	M-STBI/lawsuit	0.21			
Memory	MTBI/no lawsuit	-0.12	0.99	0.72	0.08
	MTBI/lawsuit	-0.15		0.53	0.02*
	M-STBI/no lawsuit	0.27			0.66
	M-STBI/lawsuit	0.66			
Concentration	MTBI/no lawsuit	-0.13	0.99	0.68	0.06
	MTBI/lawsuit	-0.18		0.53	0.02*
	M-STBI/no lawsuit	0.34			0.63
	M-STBI/lawsuit	0.75			
Aggressiveness	MTBI/no lawsuit	-0.04	0.99	0.67	0.17
	MTBI/lawsuit	-0.19		0.46	0.06
	M-STBI/no lawsuit	0.28			0.88
	M-STBI/lawsuit	0.68			
Sleep problems	MTBI/no lawsuit	0.41	0.42	0.14	0.47
	MTBI/lawsuit	-0.03		0.61	0.97
	M-STBI/no lawsuit	-0.49			0.91
	M-STBI/lawsuit	-0.18			

*p < 0,05; **p < 0,01; *** Means are presented in z-values.

Discussion

In this research, the subjective complaints on memory and concentration disturbances are significantly present more often in the group with moderate to severe TBI. Many researches based on evaluation of the cognitive deficit support this opinion. Cognitive deficit can be reliably detected by neuropsychological methods in the group with moderate to severe TBI. Among the mild TBI patients, the cognitive deficit is evident in many cases during the acute phase, but it tends to decrease in 1 to 3 months, more precisely in 94-96% of cases there are no more symptoms after 3 months[22,23].

It is interesting that legal proceedings have no influence on complaints expression based on TBI severity in none of the groups of our research. On the contrary, Binder and Rholing[24] report that, according to the results of the meta-analysis, the existence of cognitive deficit among mild TBI patients is closely related to their involvement in the legal proceedings. Larrabee[25] emphasizes forensic importance on the differential diagnosis of persistent cognitive symptoms. In medico-legal examination of the patients with mild head injuries, a determination of patient's pre-morbid cognitive characteristics is important. Advanced age and repeated head trauma makes a causal relationship between subsequent mild TBI and cognitive reduction more likely. Cognitive disturbances must be evaluated by taking into consideration frequent emotional disturbances caused by a head injury. The forensic practice suggests that the possibility of cognitive symptoms simulation must not be neglected, having in mind that 33% to 47% patients, claiming the material compensation, try to simulate cognitive disturbances[26].

Our results show a high predictability of memory and concentration disturbances for the severity degree of TBI, while there is no significant influence of the lawsuit on it. However, the possibility of certain degree of aggravation of these complaints in the group with moderate to severe TBI is evident, especially in the subgroup of these patients involved in the lawsuit, but there is no statistical significance, consequently leading to the conclusion that rent tendencies (compensation) do not influence the mentioned disturbances. This statement is getting more importance if it is considered that regardless of the fact whether they are involved in litigation or not, the mild TBI patients have similar level of complaints.

In our research, emotional disturbances show no significant correlation either on the severity degree of TBI or on litigation.

There are many papers[10,27-30] referring to the existence of depression, generalized anxiety disorder**,** posttraumatic stress disorder (PTSD), and more rare mania after TBI. Some Authors[31,32] find a significant occurrence of depression and anxious states among mild TBI or propose the lack of a significant correlation between the TBI severity degree and later emotional disturbances. Concerning the rent tendencies, Mersky and Woodforde[33] found a significant anxious-depressive syndrome in both groups of TBI patients, with and without rent tendencies respectively.

Jacobson et al[34] emphasize that the application of clinical diagnostic procedures for affective disturbances caused by TBI is rather problematic due to the specific clinical characteristics of the emotional disturbances caused by TBI. They proposed the division of emotional disturbances in two groups – active and passive. Concerning this classification, our results emphasize that all TBI do not differ in passive emotional disturbances, where depression is the most important one, but there is a great discrepancy in aggressiveness as the active emotional disturbance.

The lawsuit does not influence on the existence and the degree of aggression. Although there is no statistical significance, aggressiveness is the most frequent in the group of moderate to severe TBI who are involved in the lawsuit. A possible explanation may be that the lawsuit proceedings are too complicated cognitive demand for them, which they are not able not resolve, conseqeuntly generating frustration and aggression. Aggressiveness as a concomitant disturbance in severe TBI has been found by many other Authors[35,36].

Sleep disturbances are more common among the mild TBI patients than among those with moderate and severe TBI. Both groups are not involved in the lawsuit. However, significant differences exist between groups when the severity of TBI is taken as a criterion. Many researches[37] report that a sleep disturbance is present among more than 50% patients and it is inversely proportional to the severity degree of TBI. We have come to the same conclusion. In our research, it may be explained by the fact that severe TBI decreases the patients' introspection capabilities. This disturbance is very common among TBI patients (found in 80%) and according to Parcell et al[38], and it is usually associated with anxiety and depression.

Sexual problems are not statistically significant complains for none of the groups in our research. It is rather rarely reported, probably because the patients are not ready to acknowledge them.

Complaints on appetite, either raised or decreased, are very rare and not distinctive as far as the tested subgroups are concerned.

Jorge et al[39] suggest that sleeping disturbances, lowered libido, apathy and appetite disturbances grouped as vegetative disturbances should be encountered when depression after TBI is evaluated. Important fact in evaluation of these disturbances is their association with affective disorders, even among the patients who have never experienced head injury. Very often these are expressions of masked depression. On the other hand, these disturbances are included in the post-concussion syndrome, making the differential diagnostics of their origin difficult among TBI patients.

Family problems have the same distribution in the subgroups, formed according either to the severity of TBI or the lawsuit involvement. This result is in collision with many other researches[40] that claim raised aggressiveness among severe TBI patients as the main factor generating family disharmony.

The posttraumatic headache (PHT) is the most common painful syndrome appearing to be unrelated with any other, after TBI. Our results emphasize the importance of PTH as a possible distinctive factor in relation to both classification criteria. Regarding the severity degree, the group of moderate to severe TBI patients who are not involved in the lawsuit, complain on PTH very rarely. It is compatible with other researches[16], and the expla-

Appendix. Subjective complaints scale (SCS).

Complaint	Scale	Content
Posttraumatic headache	0 – no 1 – mild 2 – severe	Headache developed or significantly intensified after the trauma, occurring more than twice in a month.
Vegetative complaints	0 – no 1 – mild 2 – severe	Sweating of palms, face and armpits, heat intolerance, unsteadiness, alcohol intolerance.
Sleep problems	0 – no 1 – mild 2 – severe	Initial insomnia, interrupted sleep, early awakening.
Sexual problems	0 – no 1 – mild 2 – severe	Erectile dysfunction in males, decreased or increased libido.
Appetite disorders	0 – no 1 – mild 2 – severe	Decreased or increased appetite.
Family problems	0 – no 1 – mild 2 – severe	Frequent conflicts both verbal and physical, introversion within the family.
Memory problems	0 – no 1 – mild 2 – severe	Problems with memorization and information retrieval.
Concentration problems	0 – no 1 – mild 2 – severe	Difficulties with intellectual activities and attention tenacity.
Mood oscillations	0 – no 1 – mild 2 – severe	Anxiety, depression and hypomania.*
General interest decrease	0 – no 1 – mild 2 – severe	Indifference to daily activities and social community.
Increased aggressiveness	0 – no 1 – mild 2 – severe	Frequent attacks of verbal and physical aggression.

0 - Not present; 1 – Present in mild degree, not interfering with daily activities; 2 – Present in severe degree interfering with daily activities. *There were no subjects with mania or hypomania.

nation is that they have a reduced capacity to recognize their own problems, caused by the cognitive deficit and social isolation. The reason of a more frequent occurrence of this complaint in the group of moderate or severe TBI patients involved in the lawsuit may be suggestions from the persons close to them, or their own idea about the consequences of TBI, marking this complaint as rent tendency. Mild TBI patients do not express any significant differences regarding PTH, either involved in the lawsuit or not. Inversely proportional relation between the severity of TBI and existence of PTH and concurrent direct proportion of the lawsuit raise a need for analysis of PTH concerning the claim for the material compensation. The same importance of the lawsuit as the reason of more frequently evidenced PTH is emphasized by Sbordone et al[16]. They have found that severe TBI patients who declare compensation claim complain only on PTH, while they do not recognize many other difficulties. Some prospective studies demonstrated that PTH persisted even after the lawsuit is concluded and the compensation paid[14].

The results of our research suggests that in the cases of moderate to severe TBI patients it would be important to consult the others due to patients' outstanding willingness not to claim this disturbance. On the other hand, the exceptional attention should be paid on all the patients who are involved in the lawsuit and who claim only PTH, having in mind a significant relation of this disturbance to the compensation claim.

Vegetative disturbances are usually described as intensified sweating, more difficult adaptation on microclimatic changes (usually as intolerance to heat), temporary instability while walking and standing are the complaints that are under significant influence of compensation claim and severity of head trauma. The same disturbances are claimed by mild TBI patients, not interested in the TBI compensation claim, and they significantly differ from all other groups. Vegetative disturbances are the most common among the groups interested in compensation claims and involved in the lawsuit, qualifying them as rent tendencies. Patient's inability to recognize their own problems may be the explanation for the smallest frequency of these complaints in the group with moderate to severe TBI.

Conclusions

Subjective complaints such as memory and concentration disturbances, sleep disturbances and the raised aggressiveness are reliable indicators of severity degree in TBI patients. Severity of TBI is inversely proportional to complaints such as PTH, sleep problems and vegetative disturbances. The explanation is that these patients have a reduced capacity for recognizing these problems due to cognitive deficit. Compensation claims are directly proportional to PTH and even more to vegetative disturbances. The results emphasize the fact that neuropsychological, neurophysiological and neuroimaging approach can determine the actual state of the patients, while heteroanamnestic data, from significant others, are very usefull source of relevant data for the estimation of pre-morbid (pre-traumatic) level of functioning, especially in group MTBI patients. It is worth to emphasize that most of the complaints claimed by the TBI patients should not be considered as rent tendencies.

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