Research article

The neuropsychological aspects of cognitive alterations in men and women with concussion

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(Received: June 2023 Revised: July 2023 Accepted: August 2023)

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ABSTRACT

Introduction and Aim: Traumatic brain injury (TBI) is the main cause of death and disability. The purpose of this study is to assess the neuropsychological features of cognitive alterations in men and women who have had a concussion.

Materials and Methods: Patients with moderate TBI with concussion of the brain and damage duration ranging from 1–5 years were included in the study (n=136), between 19–63 years old. The following methods were chosen for the neuropsychological phase of the study: Mini-Mental State Examination, Frontal Assessment Battery, 10 Words Test, Clock Drawing Test, Schulte Table Test, and Controlled Oral Word Association Test.

Results: In both groups, there were no difficulties in a simple choice reaction, in performing dynamic praxis, or in assessing the grasping reflex. The differences in delayed reproduction indicators were 6.5±0.19 and 6.9±0.39, significantly differing from the control group of 8.7±0.23 (P<0.001), which also indicates a cognitive deficit. During the use of the attention parameter in the Schulte Table Test, finding numbers in two groups went beyond the normal indicators of the control group.

Conclusion: The revealed features of cognitive deficits were characterized by neurodynamic disorders in the form of slowing down of mental activity and insufficient concentration of attention.

Keywords: Traumatic brain injury; cognitive deficits; concussion; Schulte Table Test; neuropsychological features.

INTRODUCTION

Traumatic brain injury (TBI) is the main cause of death and disability. Because of this, studies of the effects of TBI, which are a medical and socio-economic problem, are still important (1, 2). Long-term cognitive impairments are common in TBI survivors. These deficiencies can affect memory, attention, and motor skills, among other cognitive processes (3).

According to many studies (4–7), concussion of the brain predominates in the structure of TBI, accounting for often between 70–95% of the clinical symptoms of TBI. It is possible to link this kind of brain concussion to minor diffuse axonal injuries that have long-lasting effects since studies by a number of authors show substantial microstructural alterations in axons after brain concussion (8–10). It is inaccurate to claim that there won't be any long-term effects from a brain injury since this is a neurodynamic state rather than a temporary, reversible one that leads to full recovery without structural disease. Brain injury, on the other hand, frequently has negative neurological and psychopathological effects. Since a concussion causes generalized cerebral diffuse mechanical damage with microstructural alterations in the limbic systems, hypothalamus, and brainstem, among other deep brain regions, concussions can also affect the brain stem. These structural zones are a part of the first functional block, which controls the cerebral cortex's tone and activity. Neurodynamic cognitive problems therefore manifest in these structures along with disease.

Although many people diagnosed with TBI, particularly mild TBI, show symptoms within a few weeks, a small but important subset has symptoms that last for months or years after the accident and profoundly impact a person's quality of life. In addition to the type and mechanism of injury, other factors that contribute to a poor prognosis following a TBI include a person's age, pre-injury condition, concurrent diseases, and psychological stability (11). Some patients do not recover and may even worsen over time, resulting in chronic and severe symptoms (12, 13). Long-term moderate TBI problems may include chronic headaches, memory loss, sleeplessness, depressive mood disorders, and impaired performance (7).

Structural and functional alterations last a long period, affecting integrative brain areas that enable mental processes including attention, memory, programming, and behavior control (14). Men and women have
different outcomes following a TBI (15, 16). The purpose of this study is to assess the neuropsychological features of cognitive alterations in men and women who have had a concussion.

MATERIALS AND METHODS

Patients with moderate traumatic brain injury with concussion of the brain with damage duration ranging from 1–5 years were included in the study (n=136), between 19–63 years old. 54 (39%) are women and 82 (61%) men among them. A sample of 38 healthy, age-matched individuals without reports of memory loss, attention problems, or other cognitive decline was selected to collect control data.

The following methods were chosen for the neuropsychological phase of the study: Mini-Mental State Examination, Frontal Assessment Battery, 10 Words Test, Clock Drawing Test, Schulte Table Test, and Controlled Oral Word Association Test. The mean ± standard deviation of the data is collected. Statistical analysis was carried out using Excel, XLSTAT v2020.1 (Microsoft, Addinsoft, France). The I.K. Akhunbaev Kyrgyz State Medical Academy Bioethics Committee approved the study and maintained the confidentiality of the collected data (Protocol No. 3, dated October 7, 2013).

RESULTS

In the main group, according to the results of the test of a brief study of mental status, the index of cognitive functions with an average total score was 26.3±0.21 lower in men than in women 27.6±0.59 and significantly lower than in the control group of healthy 29.3±0.23 (P<0.001). Mistakes were made when naming dates or days of the week, and with the delayed reproduction of three unrelated words, many could not remember them. When performing serial counting, there were repeated questions, repeated subtraction, and forgetting the intermediate result, which led to counting errors.

The Frontal Assessment Battery test was performed with an average total score of 16.3±0.13 in men, not particularly different from 16.5±0.43 in women. In both groups, there were no difficulties in a simple choice reaction, in performing dynamic praxis, or in assessing the grasping reflex; however, there were minor difficulties in conceptualization and difficulties in finding similarities between objects where generalization was required. There was no significant difference in the test of categorical associations; however, in the test of literal associations in women, the indicators were significantly higher than in men (P<0.001). In the test of drawing a clock and two geometric figures between groups, no gross changes in the functions of optical-spatial relations were detected.

In comparison to memory indicators, lower indicators are observed at all stages of memorizing words. The differences in delayed reproduction indicators were 6.5±0.19 and 6.9±0.39, significantly differing from the control group of 8.7±0.23 (P<0.001), which also indicates a cognitive deficit (Fig. 1).

During the use of attention parameter in the Schulte Table Test, finding numbers in two groups went beyond the normal indicators of the control group. In the time spent searching for the numbers in the first table and in the subsequent tables, men coped worse with the task than women (P<0.001). In two groups with each subsequent table, fluctuations in the results of time were observed when counting the numbers in each of the tables, which indicates instability of attention, decreased concentration of attention, exhaustion of attention, and decreased efficiency. By the end of the task, the time spent searching for numbers was significantly increased in men 55.7±1.43 and women 51.6±3.04 than in the control group of healthy 36.4±1.06 (P<0.001), which indicates the exhaustion of the nervous system with a gradual lengthening of the time interval for each subsequent table (Fig. 2).

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Fig. 1: Comparison of memory indicators of the 10 Words test in men and women with concussion
DISCUSSION

In this study, the median age was 32.8±3.6 years, and according to epidemiological studies, where the proportion of men ranged from 70–81% (7, 16), most of the patients were men, which explains the vulnerability to damage and higher incidence.

Studies on mild TBI demonstrate that a large proportion of individuals suffer long-term neurocognitive and neurobehavioral effects that lead to impairment. They involve relatively low levels of neuron damage detectable by advanced neuroimaging. For patients with TBI, however, advanced imaging is not commonly incorporated into clinical treatment (17). Patients frequently return to work after being discharged from the hospital while feeling distracted, moderate mental illnesses, and slowness of mental activity, all of which influence the quality of the work accomplished. The acute phase following a concussion of the brain is commonly thought to conclude with recovery; however, in most cases, only temporary compensation of the body occurs in patients due to adaptation of the body.

As a result, cognitive, emotional, behavioral, and physical impairments may continue in patients even after they have recovered from their injuries (18, 19). According to studies, patients with mild TBI would likely face psychosocial challenges, post-traumatic stress disorder, and depression three years after the injury (6) and a decline in their overall health and quality of life ten years after the injury (7, 20). Cognitive problems caused by a minor TBI may not be obvious, but they can seriously affect a person’s ability to reach their life goals (21).

CONCLUSION

Neuropsychological assessment of higher mental functions in men and women with the consequences of concussion of the brain shows a mild cognitive deficit, more pronounced among men. The revealed features of cognitive deficits were characterized by neurodynamic disorders in the form of slowing down of mental activity and insufficient concentration of attention. The results support the idea that mild TBI can have lasting effects through cognitive changes.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

REFERENCES


