

Neuropsychiatric Profile of a Case of Post Traumatic Stress Disorder Following an Electric Shock

R Jr Laforce, Ph.D.*, B Gibson, M.A.*, R Morehouse, M.D.**, P A B Bailey, FRCP***, V V MacLaren, M.A.*, *Department of Psychology, University of New Brunswick, P.O. Box 5050, Saint John (NB), Canada, E2L 4L5, ** Sleep Disorders Clinic and Laboratory, Saint John Regional Hospital, P.O. Box 2100, 400 University Avenue, Saint John (NB), Canada, E2L 4L2, ***Department of Neurology, Saint John Regional Hospital

Summary

Exposure to extraordinary stressors or life-threatening events has been shown to result in negative cognitive, behavioural and emotional outcomes including the cluster of symptoms constituting Post Traumatic Stress Disorder (PTSD). This disorder has most often been studied in military veterans and victims of abuse who also show high rates of comorbid conditions. We report a case of PTSD following an electrical injury in a patient with no past psychiatric history. Implications for a full range of examinations including comprehensive neuropsychiatric testing are discussed. Results suggest that such approach addresses the complexity of a differential diagnosis between organic and psychiatric dysfunctions.

Key Words: Post traumatic stress disorder, Electrical injury, Neuropsychology

Introduction

Severe trauma has been linked to a wide range of psychiatric and somatic problems over the last centuries, including a cluster of symptoms now known as Post Traumatic Stress Disorder (PTSD). This disorder is conceptualized as encompassing three broad categories of symptoms: (a) re-experiencing phenomena, (b) avoidance behaviour and numbing of general responsiveness, and (c) increased arousal. In addition to these adverse emotional sequelae, recent studies have identified subtle neuropsychological changes associated with PTSD¹.

Most investigations of PTSD to this date have focused on combat veterans or victims of abuse, which are typical for high rates of comorbid diagnoses. The goal of this paper is to report

a patient with no past psychiatric history who developed PTSD following an electrical accident. Moreover, it aspires to follow-up on Premalatha's (1994)² recommendations by illustrating the clinical usefulness of a comprehensive neuropsychiatric examination in PTSD following electric shock.

Case Report

A 50 year old Canadian electrician was admitted to the Saint John Regional Hospital (New Brunswick, Canada), after he was involved in a severe electrical explosion in an occupational accident. He was working on an overhead crane repairing a 600 V electrical panel when he was reportedly hit by a fireball. He sustained severe burns on his hands and face. He did not

lose consciousness. There was no anterograde or retrograde amnesia. He was alert and oriented upon arrival at the Regional Hospital. He was kept for observation and, similar to Premalatha's (1994) case, treated only for his burns and not for possible trauma-related issues.

He returned to work five months later but could not function adequately, often forgetting to perform critical tasks. He complained of being unable to handle anything electrical. He also reported recurrent nightmares and flashbacks of fireball, visual and burning sensations of fire-flashes when awake. He also showed increased irritability and anger outbursts, episodes of extreme anxiety, and diminished short-term memory and concentration all of which were reported by his family to be a significant change from previous level of functioning. He reported difficulty initiating and maintaining sleep, and that his sleep was very non-restorative.

His wife noted that he was far different than the husband she had known prior to the accident. More specifically, she described severe memory and personality changes. For instance, she mentioned that he could watch the same movie 5-6 times while denying having seen it before. He was more irritable and had temper tantrums. She also witnessed a lack of hygiene. She claimed that her husband seemed "in a different reality", often "out of context".

There was nothing significant in his past medical or psychiatric history. He had been an excellent student, finishing a University degree in education. He had worked in a number of occupations including as a teacher at a local Community College, A construction worker and an electrician. He lived with his wife and 23 year old son and claimed there were no marital or family difficulties. He had smoked cigarettes for 10-12 years, but had no history of alcohol or drug abuse.

On psychiatric examination, he presented as a pleasant and cooperative man. He reported his mood to be sad and acknowledged high levels of anxiety. Receptive speech was slow and effortful, and suggested reduced information processing abilities. Although the neurological examination and computerized tomography (CT) were normal, a number of complaints appeared organic in nature (e.g. significant memory and personality changes, reduced speed of information processing, complaints of inability to carry out and/or remember a simple conversation, and lack of hygiene). A provisional diagnosis of PTSD was made. He was treated

with antidepressant medications (Paxil). In light of the increasing features of organic brain damage, however, further examinations including polysomnography, comprehensive neuropsychological testing, and event-related potentials (ERPs) were conducted.

Results of the polysomnographic study were interesting. The patient was studied while on an antidepressant. Although he reported obtaining about three hours of total sleep during the laboratory night, the technologist recorded 382 minutes of sleep (more than six hours). This examination further indicated rapid sleep onset but a lack of slow wave sleep (NREM stages). REM latency was measured at 79.5 minutes. There was no evidence of sleep disordered breathing other than occasional snoring. There was no excessive movement during sleep. There were many arousals of unknown cause and his overall sleep efficiency was somewhat compromised at 82%. He was diagnosed with sleep state misperception. This is a sleep disorder in which a complaint of insomnia occurs without objective evidence of sleep disturbance³.

The neuropsychological battery of tests (see Table I for a summary of findings and measures used) documented the intractness of most of his higher mental functions including basic attentional abilities (i.e. auditory and visual attention span), sensory-motor skills (i.e., visual fields, sensory attention, stereognosis, graphesthesia, praxis, right-left orientation, fine motor coordination, finger-tapping speed and grip strength), language abilities (i.e. conversational speech, comprehension, naming, fluency, basic reading and writing), general intellectual functioning (i.e. vocabulary, verbal abstract conceptualization, written arithmetic, and attention to details), visuospatial and visuconstruction skills, executive functions (i.e. visuomotor planning, conceptual flexibility, and deductive reasoning), basic memory abilities (i.e. verbal and visual memory), and complex verbal and visual learning. At the same time, however, he displayed impaired performance on measures of complex attentional functioning (e.g. tasks requiring mental control, divided attention, and resistance to distraction). Speed, accuracy, and depth of information processing were also reduced. These latter findings were believed to best explain his reports of diminished memory functioning and are further consistent with recent hypotheses on attention and memory dysfunctions in PTSD⁴. Finally it is important to note that this patient appeared to put effort into testing and therefore, test results are considered valid.

To examine the possibility of cortical hypersensitivity, ERPs

CASE REPORT

were measured using a computerized attentional paradigm. All P3 amplitude changes (i.e. frontal, parietal, and occipital) to the target stimuli were significantly smaller than normative data.

Discussion

This case report of a 50 year old electrician who developed psychiatric/organic features following a severe electrical explosion in an occupational accident provides further support for using a comprehensive neuropsychological assessment for assistance in diagnosis of disturbances from unclear origin (organic vs psychiatric syndromes). The neurophysiological sequelae of electrical injuries are not well understood³, and the possibility remains that subtle cortical and/or subcortical changes may have occurred as a result of the strong electrical discharge he received (other scientists have indeed reported intracranial haematomas, cerebral vein thromboses, or basal ganglia hemorrhages as a result of an electrical injury). In the absence of an organic-like profile from either formal neuropsychological testing or from imaging and polysomnographic studies, this man's psychiatric features weigh towards a non-organic etiology. The resulting management strategy emphasized psychological services for the intensely traumatic nature of the explosion this man survived. Although he is presently showing persistent

treatment-resistant PTSD symptomatology, recent therapeutic efforts using exposure with response prevention combined with antidepressant medication have slightly improved his condition. Interestingly, findings reported in this case study are consistent with recent neurobiological models of PTSD suggesting involvement of Neurotransmitter systems related to arousal and frontal lobe functions (complex attention for example)⁴. In these studies, it has been shown that specific neurochemical systems, including the corticotropin-releasing hormone and the hypothalamic pituitary adrenal axis as well as brain noradrenergic, GABA-ergic, serotonin, dopamine, and opiate systems, play an important role in the neurobehavioural dysfunctions associated with prolonged anxiety-producing stimuli such as those associated with PTSD. Future studies are necessary to determine IF the neuropsychiatric profile observed in PTSD is reversible or permanent in nature.

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