

CASE REPORT

Frontal Lobe Syndrome in Childhood

Halime Hülya Özsan, M. Levent Kayaalp

Istanbul University, Cerrahpaşa Faculty of Medicine, Department of Child and Adolescent Psychiatry

Corresponding author: Dr. Halime Hülya Özsan, Department of Child and Adolescent Psychiatry, Istanbul University, Cerrahpaşa Faculty of Medicine, 34 303 Istanbul, Turkey, E-mail: hozsan@istanbul.edu.tr

Abstract

Frontal lobe syndrome was first defined in 1868 by J. M. Harlow. Harlow particularly emphasized the personality and behavior change after a frontal lobe lesion. In the DSM-IV classification system, the main category titled "Personality Change due to a General Medical Condition" includes the conditions related to head trauma. For the child, particularly cerebral injuries associated with severe head trauma cause ordinary behavior changes as well as deviations in development. Bifrontal lobe injuries in a child and related psychiatric findings will be discussed in relation to the case presented (German J Psychiatry 2005; 8: 29-32).

Keywords: Frontal lobe syndrome, personality change, children, prognosis

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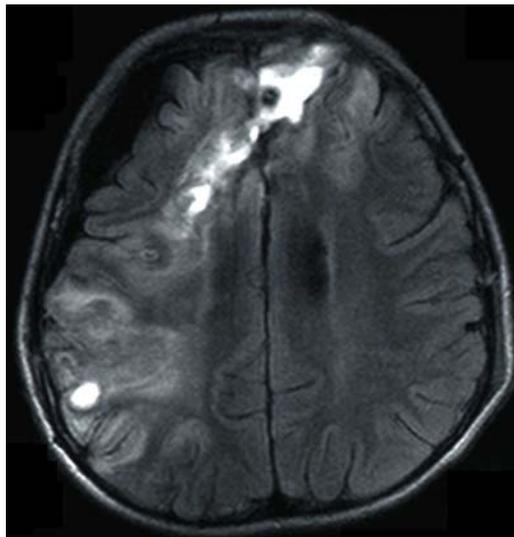
Introduction

Frontal lobe syndrome was first defined in 1868 by J.M. Harlow. Harlow emphasized the personality and behavior changes caused by frontal lobe lesion following a penetrating head trauma (Caine & Lyness, 2001). Frontal lobe lesions may cause motor abnormalities, speech and language disorders, impairment of cognitive functions, mood and behavioral as well as personality changes, bowel and urinary bladder incontinence (Adams et al., 1997). Particularly prefrontal cortex lesions are related to clinical descriptions of Harlow. Jeffrey Cummings divided the prefrontal lobe into three regions with regard to their functions and connections to subcortical areas, these being dorsolateral, orbitofrontal and anterior cingulate. According to this distribution, the sequelae associated with cognitive functions depend on dorsolateral region injuries (executive function deficits), while personality or behavioral changes depend on orbitofrontal and medial medium section injuries (Cummings, 1993). This functional neuroanatomic distribution proposed by Cummings gives a practical clinical model, although it cannot be worked out in detail.

Frontal lobe personality change syndromes are also divided into two main groups based on the neuroanatomic localiza-

tion and the clinical condition they create. Euphoria, excessive activity or socially destructive behavior (the condition characterized by disinhibition and impulsivity) may occur owing to injury of the orbitofrontal zone of the prefrontal cortex. Frontopolar injuries cause apathy, lack of interest, insensitivity, loss of motions or activities (Caine & Lyness, 2001). In the DSM-IV classification system, the section titled "Personality Change due to a General Medical Condition" includes head trauma and associated brain lesions. While making a definition for children, rather than "personality change", "an evident deviation from the ordinary development or an evident change in the ordinary behaviors of the child" were the terms appropriated by DSM-IV (APA, 1994). Some authors agree with the perspective that specific problems in cognition, mood and behaviors should not be subsumed under the broad category of personality change for all ages and recommend focusing on specific problems rather than global issues like personality (Arciniegas & Beresford, 2001). Though DSM-IV concentrates on clinical findings instead of neuroanatomic localization (aggressive type, disinhibited type, paranoid type etc.) when categorizing this change, the definition "Frontal Lobe Syndrome" has come to be more commonly used in the medical literature. Bifrontal lobe injury in childhood will be discussed within the context of this case report, along with the associated psychiatric findings.

Figure 1. Trace of the bullet, 1 month after trauma (MRI)



Case Presentation

The patient is a 9-year-old male. He was delivered by spontaneous vaginal labor and his development was normal. About 1 month before consultation at our outpatient department, he had been hospitalized in the Brain Surgery Department due to a head trauma after an accidental gun injury. The bullet found its way from the left frontal zone, leaving through the right parietal zone. Cranial MR imaging revealed hyperintense regions surrounded by suitable hemosiderin rings according to such trace as well as vascular damage on the right and left frontal lobe gyrus anterior, right cingulate gyrus, right parietal lobe subcortical white sub-

stance and also subdural collection compressing the frontal zone on the right cerebral convexity. The intracerebral and subdural hematoma was discharged, brain and dura laceration were repaired. The patient regained consciousness 1 week after the accident. He was referred for consultation, due to considerable psychiatric findings accompanying the neurologic condition, characterized by left hemiparesis, slight speech disorder, loss of bowel and bladder control (sphincter incontinence). The department where the patient was followed interpreted these psychiatric symptoms as a change in character. The patient gave the symptoms of sudden and irrelevant enraging and associated aggressiveness (aggressive outbursts), uncontrolled and increasing sexual behaviors as well as swearing. The patient threw himself from one side to the other when he was angry, bit himself and his mother, and beat his sibling. Sometimes he did not recognize his mother or sibling and denied them. His appetite increased considerably. It was reported that there was an evident change in the post-trauma ordinary behavior conduct of the patient. The patient's parents talked about the dramatic reversals of pre-injury behaviors of their child. Mental status examination revealed elevated mood, impulsive aggressiveness, impolitic speech and socially inappropriate relationship with the clinician. He had a lack of awareness of his abnormal behaviors. Before the trauma, he was described as timid, calm and a mother dependent child. Past medical and psychiatric history of the patient was unremarkable. Family history was devoid of any known psychiatric illnesses. The psychiatric clinical picture was considered as "organic behavior change" and after informing the parents and the brain surgery department on the issue, the patient was administered valproic acid at a dose of 10mg/kg twice daily. Valproic acid was preferred because of its indications for both epileptic prophylaxis and soothing the disinhibited impulsive condition. Although during the control examinations it was discovered that the first condition's severity evidently reduced, residual findings such as irritability, affective lability, and socially inappropriate behaviors were present (psychiatric sequelae) after a 9-month period.

Figure 2. Bifrontal vascular lesion, 1 month after trauma (MRI)

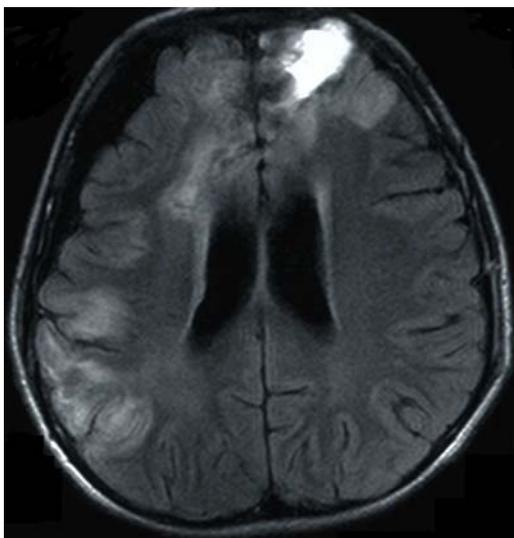


Figure 3. Sagittal plane of the frontal lesion, MRI



Discussion

The findings in our case related to the behavioral changes are generally associated with the clinical condition arising after injury of the orbitofrontal zone. The condition where "disinhibition" and "impulsivity" are evident is also described in the subtypes of the category titled "Personality changes due to a general medical condition" by DSM-IV. However, we prefer the diagnosis of "an evident change in the ordinary behaviors of the child (disinhibited type behavioral change)", as the patient is 9 years old.

Many studies have been carried out to assess the psychiatric findings and prognostic factors after a traumatic brain injury in both childhood and adulthood. After severe traumas, physicians come up with many findings, which in fact has a negative effect on prognosis. The intensity is related to the open or closed head trauma, results of the Glasgow coma scale and the time spent in coma (Arciniegas & Beresford, 2001). The psychiatric condition and particularly personality or behavior changes are mostly encountered in the frontal lobe lesions. But because the prefrontal cortex is connected to the other cortical and subcortical zones, some researchers avoid specifying a specific anatomic localization (Max et al., 2000). In the study carried out by Brown et. al. (1981) 14% of the children who were followed for 1 year after traumatic brain injury developed emotional disorders, 10% developed mixed emotional and conduct disorders, 5% developed conduct disorders and 24% developed a disinhibited type behavioral change similar to our case. In the group developing a disinhibited condition, the coma process was generally more than 3 weeks. In this study the development of psychiatric disorders in children with severe head injuries was also influenced by the children's pre-accident behavior, their intellectual level and their psychosocial circumstances. Max et. al. (1998) compared the ratio of psychiatric disorders that would develop depending on the severity of trauma, and the ratio after severe trauma was found to be 63%. In the group subject to mild-moderate head trauma, the ratio was 21% and the difference was significant. In this study it has been emphasized that the most common psychiatric condition after severe head trauma was "organic personality change". They also concluded that severe traumatic brain injury was associated with significant deficits in child adaptive functioning when compared with the orthopedic injury group (Max et al., 1998). In another study concerning a similar group, the permanent character of personality change due to severity of trauma was marked. Forty percent of the cases still had these changes after severe head trauma at the end of a 2-year period. Their coma process was over 100 hours. According to this study, persistent personality change was significantly associated with severity of injury, impaired consciousness over 100 hours, and adaptive and intellectual functioning decrements, but was not significantly related to any psychosocial adversity variables (Max et al., 2000). In our case, there is a severe open and penetrating head trauma and the coma process is 1 week. Cranial MR shows prevalent bifrontal lobe anterior zone injury. Although the severity of the clinical condition gradually decreases, the residual findings persist after 9 months of follow up (psychiatric sequelae). Williams

& Mateer (1992) reported two cases of frontal lobe injury in middle childhood, whose social and behavioral development were considerably influenced. According to many studies, bifrontal lobe injury in childhood produces severe social-affective deficits (Price et al., 1990) and childhood frontal lobe lesions disrupt social cognition (Dennis et al., 1998). In the clinical conditions similar to our case, the influence of anticonvulsant treatment is mentioned. Valproic acid treatment was administered to the patient considering the agent's epilepsy prophylaxis and mood stabilizer function and a partial response was obtained. But there are publications stating that such treatment would increase findings in some cases (Pleak et al., 1998).

Our case gives considerable findings on the "organic behavior and personality change" following head traumas and particularly frontal lobe injuries in childhood. The severity of trauma and coma process have become influential on the condition and its persistence. As children who sustain brain injuries are at substantially increased risk of developing subsequent behavioral and psychosocial difficulties (Roberts & Furuseth, 1997), psychiatric assessment and follow-up have special value in clinical settings. Although psychiatric findings cannot be restricted with neuroanatomic regions, frontal lobe syndrome provides us with significant information on the functional neuroanatomic structure.

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