LETTER TO THE EDITOR

Resolution of Positive Symptoms of Schizophrenia After Traumatic Brain Injury

To the Editor: Recent advances in imaging technology have improved our understanding of schizophrenia but have fallen short of providing a definitive etiology. We describe a patient with persistent and debilitating psychotic symptoms that drastically improved after he was struck by a car and suffered massive head trauma.

Case report: Mr A is a 51-year-old black man with a long history of schizophrenia with severe and persistent symptoms including delusions of reference and persecution, paranoia, and disorganized speech. During exacerbations, he also experienced command auditory hallucinations and visual phenomena. His symptoms were remarkably consistent throughout hospital records that date back to 1989, including extended stays at a state mental facility. Available toxicology screens are negative, and there is no recorded history of alcohol or illicit drug abuse. A computed tomography (CT) scan of his head was normal in 2008. From 2008 to 2013, Mr A was treated in the authors' community primary care clinic for comorbid hypertension and gastroesophageal reflux disease. Unfortunately, Mr A had very poor insight into his psychiatric disease and was chronically nonadherent to medication. During all visits, he was floridly psychotic with prominent delusions, rapid derailment, and paranoia. Attempts to convince him to accept antipsychotic medication were unsuccessful. While Mr A was not judged to be an imminent danger to himself or others, his untreated functional status was poor.

In June of 2012, Mr A was struck by a car while walking in the street near his home. He was transported to a local academic trauma center, where an initial CT scan of the head was consistent with massive parenchymal brain injury and cranial trauma. Findings included diffuse subarachnoid hemorrhage, diffuse axonal injury, a small left frontal subdural hematoma, and a right paratentorial subdural hematoma. Over the next week, his intracranial injuries evolved. Worsening cerebral edema on the right eventually caused a right to left midline shift and compression of the ventricles. Due to concern about evolving uncal herniation, a craniectomy was performed, leaving a large right frontal cranial defect. Pressure was successfully relieved, with midline structures and ventricles returning to their appropriate positions. After a prolonged hospital and rehabilitation stay, Mr A underwent a reconstruction in March of 2013 with bone flap of the cranial vault. Postoperative magnetic resonance imaging showed significant encephalomalacia, which was most prominent in the right temporal and left frontal lobes. He has since returned to the community under the care of his mother and family.

Mr A returned to the primary care clinic in April of 2013. At that time, he was wheelchair bound with significant leftsided weakness. He exhibited spasticity of the upper extremities, along with ankylosis of the shoulders and elbows. His affect had flattened, and he had some delays in spontaneous speech. However, the delusional and paranoid content of his speech had essentially disappeared. Despite his profound motor sequelae, his speech was more coherent than prior to the accident. Both his mother and brother confirmed that there was a vast improvement in his psychosis and that many members of the community had noted the change as well. No evidence of hallucinations or delusions of reference had been reported since the accident. At that time, his only potentially psychoactive medication was levetiracetam given for seizures associated with the brain injury.

To further assess the improvement in his psychotic symptoms, Mr A and his mother were interviewed using items from the Scale for the Assessment of Positive Symptoms (SAPS).¹ This scale is divided into 4 categories of hallucinations, delusions, bizarre behavior, and positive formal thought disorder. The symptoms within each domain are rated from 0 (none) to 5 (severe). Mr A denied ever having any of the symptoms and scored all items on the SAPS as 0/5. His mother reported that the item for persecutory delusions had decreased from a 5/5 to 0/5. Her ratings of derailment decreased from 5/5 to 2/5 and illogicality from 4/5 to 2/5. Distractible speech decreased from 4/5 to 1/5.

MEDLINE searches using MeSH terms *schizophrenia*, *traumatic brain injury* revealed no cases of improvement in psychotic symptoms following closed head trauma. In fact, all of the literature we found, including a case review,² a meta-analysis of case-controlled studies,³ and a chart-based case-control study,⁴ found a positive association between head trauma and the diagnosis of schizophrenia. There is also evidence that early injury during childhood has been related to the severity of psychotic symptoms of schizophrenia.^{5,6}

Multiple studies have attempted to correlate anatomy with psychotic illness. The most consistent findings are enlargement of the lateral and third ventricles, along with general reduction in brain volume in the temporal and prefrontal lobes.^{7,8} More recently, a meta-analysis of neuroimaging studies identified hypoactivation of the dorsolateral prefrontal cortex and hyperactivation of anterior cingulate gyrus in patients with schizophrenia.⁹ Other areas of study have included the superior temporal gyrus, the mediodorsal nucleus of the thalamus, and the hippocampus.¹⁰

It is unclear what aspect of the traumatic brain injury was responsible for Mr A's reduced positive symptoms of schizophrenia. The improved linear thought and reduction in delusional thinking in this case may be a unique observation based on our literature search. Due to the severe and extensive nature of his head injury, no specific assertions can be made regarding neuroanatomy and the positive symptoms of schizophrenia. However, the damage to Mr A's left prefrontal cortex combined with the resolution of symptoms might suggest continued investigation in the future.

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