A Case Report of Obsessive-Compulsive Disorder Following Acute Disseminated Encephalomyelitis

abstract

We present a case of a boy who developed obsessive-compulsive disorder (OCD) shortly after an episode of acute disseminated encephalomyelitis (ADEM). To our knowledge, this is the first report of the development of OCD in a child who has had ADEM. This presentation is consistent with our understanding of OCD as a complex genetic disease involving the cerebral white matter tracts, and may indicate a potential pathway for the development of OCD in genetically vulnerable individuals or a shared trigger for the development of pediatric acute-onset neuropsychiatric syndrome and ADEM. Pediatrics 2013;132:e771–e774
There is an increasing body of literature implicating structural white matter abnormalities in obsessive-compulsive disorder (OCD). Diffusion tensor imaging studies in OCD-affected adults and children have demonstrated white matter composition abnormalities, albeit with some variability of findings. Candidate gene studies have implicated genes involved in both the development and structural integrity of the myelin sheath. Moreover, a growing body of research provides evidence that OCD is a complex genetic disorder in which both inborn genetic vulnerability and environmental factors play important etiologic roles.

The variability of OCD neuroimaging findings may be at least partially accounted for by the fact that this is a phenotypically heterogeneous disorder. A recent imaging study has demonstrated that different symptom dimensions within OCD may be associated with distinct neural networks. It is likely that the etiology of OCD is also multifactorial. The new clinical criteria developed for pediatric acute-onset neuropsychiatric syndrome (PANS) address some of this etiologic heterogeneity by defining a distinct group of children who have an abrupt onset of OCD after either an infectious trigger or an environmental trigger.

Acute disseminated encephalomyelitis (ADEM) is a disorder that shares some similar features with PANS. Consensus definition describes ADEM as a clinical event of presumed inflammatory or demyelinating etiology with acute or subacute onset that affects multiple areas of the central nervous system. Patients have encephalopathy, variable neurologic deficits, and MRI features compatible with inflammatory demyelination.

Here we describe a case that, to the best of our knowledge, is the first report of subacute-onset OCD in a child with ADEM.

**CASE REPORT**

A 12-year-old boy was referred to a pediatric OCD subspecialty clinic for evaluation of obsessive compulsive symptoms. He was born after an uncomplicated pregnancy at full term. He was delivered via forceps due to fetal distress and a nuchal cord. He was initially cyanosed but did not require resuscitation or demonstrate symptoms of neurologic dysfunction. He was developmentally normal except for mild fine motor and articulation difficulties and advanced language skills. There were no notable concerns related to attention, behavior, anxiety, mood, or learning previous to the illness described below. With respect to family history, a maternal great uncle and the maternal grandmother had OCD, both parents had reading difficulties, a maternal cousin had schizophrenia, and a paternal grandfather had bipolar disorder.

At 6 years of age, he presented with diplopia, headache, irritability, lethargy, and sleep disturbance that was preceded by a 2-week history of conjunctivitis and pain and joint swelling, diagnosed as postinfectious arthritis. The neurologic examination at presentation demonstrated an altered level of consciousness with alternating drowsiness and irritability, bilateral sixth nerve palsies, and bilateral papilledema. He was afebrile and the systemic examination was normal.

MRI of the brain initially showed no abnormalities. At lumbar puncture, the opening pressure of cerebrospinal fluid (CSF) was elevated at 45 cm H2O. CSF examination showed 31 white blood cells (82% lymphocytes), 16 red blood cells, protein 0.46 g/L, glucose 2.8 mmol/L, and lactate 1.3 mmol/L. Gram stain and culture of CSF were negative. An extensive infectious and rheumatologic work-up was negative. Repeat brain MRI 1 month later demonstrated an area of increased T2-weighted signal in the white matter of the left frontal lobe near the genu of the corpus callosum and a smaller area of increased T2 signal in the white matter of the right frontal lobe (Fig 1). There was no enhancement with gadolinium.

A diagnosis of ADEM was made, he was treated with high-dose methylprednisone, and his neurologic symptoms resolved. An MRI 1 year later showed that the white matter lesions were both smaller.

This patient was closely followed neurologically and had no recurrence of symptoms indicating demyelination. After his illness, he had poor attention, distractibility, and worsening of his fine motor difficulties. Neuropsychological testing performed 8 months after diagnosis using the Wechsler Intelligence Scale for Children, 4th edition, demonstrated average intellectual function overall, but with coding and symbol search subtests and processing speed index on the second percentile. The Wechsler Individual Achievement test, 2nd edition, identified below average scores in word reading, reading comprehension, math reasoning, and spelling. The Behavior Rating Inventory of Executive Function revealed more executive problems. His language and visual spatial skills were in the average range, but fine motor skills using the Purdue Pegboard were reduced. Given the absence of cognitive difficulties before his illness, no formal baseline neuropsychological testing results are available for comparison.

Follow-up neuropsychological evaluation at the age of 10 years revealed improved overall intellectual function, increasing to the 63rd percentile from the 32nd percentile. However, he had significant persisting deficits in processing speed and working memory. Academically, he continued to meet diagnostic criteria for a mathematics learning disorder. He had intermittent motor tics and also met clinical criteria...
for diagnoses of generalized anxiety disorder and attention deficit hyperactivity disorder.

In addition to the above, the patient experienced a subacute onset of OCD symptoms within 1 month of being hospitalized for ADEM. At that time, the school expressed concern that he was spending excessive time washing his hands. He expressed a fear of germs and becoming sick, which was decreased by hand-washing. The OCD symptoms continued for 2 months, then decreased somewhat and waxed and waned until 11 years of age, when they worsened significantly. His contamination fears, focused on contracting a serious illness such as *Salmonella*, led to food intake restriction at school and contributed to a 30-pound weight loss. He re-engaged in excessive hand washing, doing so up to 18 times daily, which resulted in skin irritation and chronic redness. Moreover, he did not want to swallow his saliva.

At the time of initial assessment for OCD, the patient presented as a cooperative 12-year-old. He was casually dressed and there were no noted movement abnormalities. His speech was normal in rate and rhythm, and mood was somewhat anxious with a congruent affect. His thought content was notable for obsessions. He had difficulty in maintaining attention throughout the assessment. On the Children’s Yale-Brown Obsessive Compulsive Scale, he scored in the moderate range with scores of 8/20 for obsessions and 14/20 for compulsions for a total score of 22/40. This patient was started on a selective serotonin reuptake inhibitor and scheduled for cognitive behavioral therapy, the 2 evidence-based therapies for children with OCD. Currently, his obsessive compulsive symptoms are significantly improved on sertraline and by using cognitive behavioral strategies.

This presentation of new-onset obsessive compulsive symptoms meeting criteria for OCD after an episode of ADEM raises important questions about the etiology of both of these disorders. It is possible that the findings observed in our patient are an example of a previously unreported pathophysiological pathway to developing OCD. This is consistent with current research demonstrating structural white matter changes in patients with OCD. The etiology of white matter changes is likely to be multifactorial, with evidence from a recent twin study finding that different white matter abnormality regions are associated with environmental versus genetic risk loading for obsessive compulsive symptoms. This patient had neuroimaging findings demonstrating focal white matter changes in his anterior frontal lobes, regions that have been implicated in OCD in the orbitofrontal striatal model.

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This patient’s symptom presentation provides suggestive evidence that demyelinating injury may lead to the development of OCD. This theory is supported by an additional line of research, in which increased OCD risk has been reported in patients with multiple sclerosis, another disorder involving demyelination. A recent Canadian study estimated the lifetime prevalence of OCD in patients with multiple sclerosis to be 8.6%, which is significantly higher than general population lifetime prevalence rates of 1% to 2%.

It is also possible that this presentation satisfies diagnostic criteria for PANS. The family gave a history of a subacute rather than an abrupt onset of symptoms, given that the OCD symptoms were not noticed during hospitalization. To fulfill the diagnostic criteria for PANS, there should be an abrupt, dramatic onset of symptoms. There should also be concurrent presence of additional neuropsychiatric symptoms. The patient’s school difficulties and behavioral changes such as being...
irritable and easily frustrated could satisfy this second criterion, however these features are also commonly seen in patients after ADEM. If this is a case of PANS, it would seem that PANS and ADEM had a unitary trigger in this patient. Because both PANS and ADEM are presumed to have a precipitant causative agent, it is possible that similar environmental, or, as in this case, infectious triggers could produce these similar phenomena.

Despite the suggestive evidence that ADEM and OCD onset were not independent of each other, there are alternate explanations that require consideration. This patient has a family history of OCD, thus increasing his vulnerability to OCD. It is possible that this patient's OCD is unrelated to the ADEM episode and is simply due to his genetic predisposition, given the heritability estimates of 45% to 65% for the child-onset form of the disorder. However, it more likely supports the model of OCD as a complex genetic disorder in which an environmental trigger, in the context of genetic vulnerability, results in the onset of illness.

This case is important because it is the first report of OCD occurring after ADEM. This presentation is consistent with our understanding of OCD as a disease involving the frontal cortical white matter tracts and may indicate a potential pathway for the development of OCD or a shared trigger for the development of PANS and ADEM.

REFERENCES

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