—Case Reports—

Infantile Cerebellar Pilocytic Astrocytoma with Autism Spectrum Disorder

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Abstract

The etiology of autism remains unclear, but relationships to cerebellar factors have been reported. We report 2 cases of infantile cerebellar pilocytic astrocytoma in children with autism spectrum disorder. Cerebellar tumors may be related to the pathogenesis of autism.
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Key words: infantile pilocytic astrocytoma, autism, autism spectrum disorder

Introduction

Autism is a type of neurodevelopmental disorder involving retardation of socialization and communication abilities. The underlying cause remains largely unknown, but a close relationship may exist between autism and cerebellar lesions, with some authors reporting autistic patients with cerebellar lesions. We report herein 2 cases of cerebellar pilocytic astrocytoma arising in children with autism spectrum disorder (ASD).

Case Reports

Case 1

A 5-year-old boy was referred to our hospital because of gait disturbance. He had a history of autism diagnosed according to Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR)[1], and his intelligence quotient (IQ) was 69 on admission. Physical examination revealed a head circumference of 55 cm. Neurological examination detected cerebellar ataxia and dysmetria. Papilledema was evident bilaterally. Computed tomography (CT) of the head showed a cerebellar cyst associated with a nodular tumor and obstructive hydrocephalus. Magnetic resonance imaging (MRI) disclosed strong, homogenous enhancement of the tumor with no enhancement of the cyst wall (**Fig. 1A**). The tumor was removed surgically, and histopathological examination confirmed pilocytic astrocytoma (**Fig. 2A**). Cerebellar signs and papilledema resolved postoperatively, but the IQ and autistic behaviors remained unchanged.

Case 2

A 6-year-old girl was brought to the hospital because of headache. Asperger syndrome was diagnosed according to DSM-IV-TR, and the IQ was 92 on admission. A family history of ASD was identified. Her 15-year-old brother had received a diagnosis of autism, and her 39-year-old father had high-functioning autism. Autism-spectrum quotients[2]

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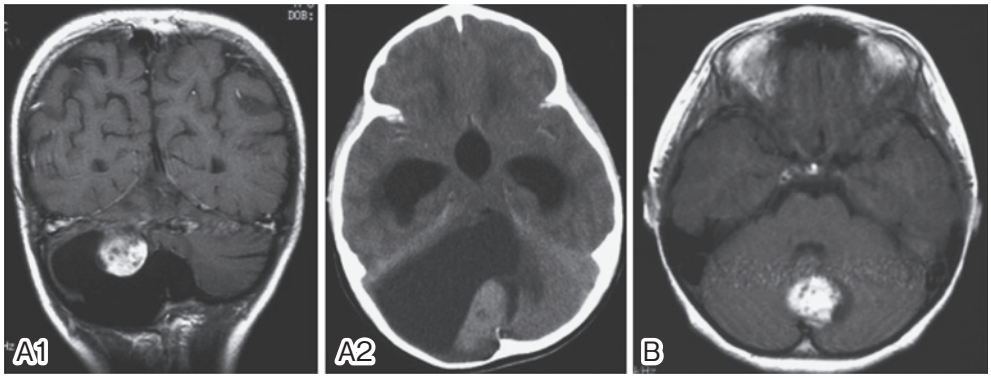

Fig. 1

A) Case 1
Magnetic resonance image (A1) and computed tomogram (A2) for a 5-year-old boy who presented with gait disturbance show an enhancing nodule with a large cyst in the cerebellum. Obstructive hydrocephalus and thinning of the occipital bone are observed.
B) Case 2
Magnetic resonance image of a 6-year-old girl showing a partially enhancing mural nodule with a peritumoral cyst in the cerebellar vermis.

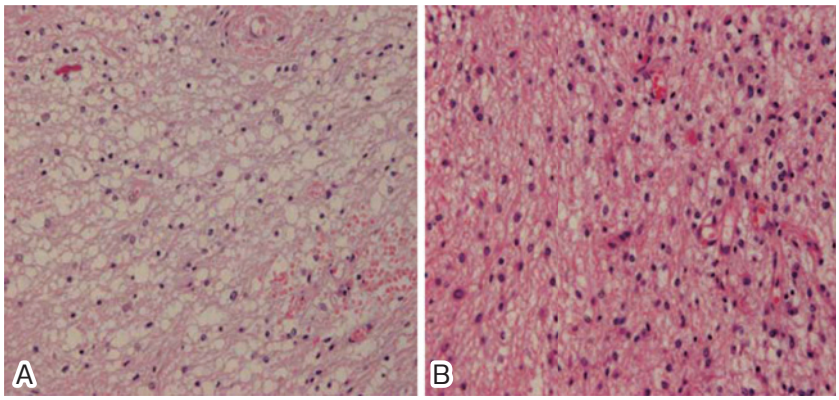

Fig. 2

A) Case 1
Vacuolated cells with small, round nuclei are present in the spongy area. A Rosenthal fiber is apparent. (H & E, ×40)
B) Case 2
Cells with small nuclei showing microcysts. Eosinophilic granular bodies are observed. Tumor cells are positive for glial fibrillary acidic protein (not shown). (H & E, ×40)

in these family members were 42 and 34, respectively. The patient showed no neurological deficits. Both CT and MRI showed a partially enhancing nodule and cyst in the cerebellar vermis **(Fig. 1B)**. No abnormalities other than the vermis lesion were identified. She underwent surgery, and the nodule was totally resected. The histological diagnosis was pilocytic astrocytoma **(Fig. 2B)**. Postoperatively, headache resolved completely, but the ASD remained unchanged.

Discussion

Autism is a neurodevelopmental disorder mainly affecting children which is characterized by language problems and communication deficits. Impaired social interactions, lack of communication skills and restricted and repetitive behaviors are key symptoms. ASD is a clinical entity that includes autism and the wide variety of conditions between

"normal" and autism.

ASD includes classical autism, Asperger syndrome, and pervasive developmental disorder not otherwise specified and is diagnosed according to the criteria of DSM-IV-TR[1]. Autism spectrum index is also used to diagnose ASD, and the cut-off value for discriminating ASD from normal is 33[2,3].

The etiology of ASD remains unclear, but strong relationships have been documented with such factors as genetic disorders (tuberous sclerosis[4], neurofibromatosis[5], and fragile X syndrome[6]), metabolic disorders (pheylketouria[7] and Lesch-Nyhan syndrome[8]), brain anomalies (congenital hydrocephalus[9]), infections (rubellavirus, cytomegalovirus, and influenzavirus)[10–13], drug-induced disorders (antiepileptic agents[14], alcohol[15], and thalidomide[16]), and perinatal disorders[17]. ASD sometimes shows physical abnormalities, such as macrocephaly[18], and high blood serotonin levels[19].

Cerebellar and brainstem hypoplasia, abnormality of the corpus callosum, and volume reduction of the cingulate gyrus have also been associated with ASD[20]. These changes have been observed during fetal development[21,22]. Other authors have reported that autism is probably caused by brain tumors and brain injuries[23–25].

In children, congenital hypoplasia of the cerebellum (particularly the vermis) is reportedly often accompanied by a wide range of neurodevelopmental disorders[26–29]. Other reports on the relationship between autism and cerebellar lesions have noted low numbers of Purkinje cells[30,31], reductions in Purkinje cell size[32], and dysregulation of Reelin and Bcl-2 proteins, which are related to Purkinje cell migration[33]. Studies of astrocytomas of the posterior fossa have revealed the presence of cognitive deficits after tumor removal[34]. ASD thus does not appear as a functional disease, but rather as an organic disorder. A relationship may exist between autism and the cerebellum.

Autism may not be a symptom resulting from tumor compression, because no changes were seen in our cases after the removal operations. Furthermore, we observed no postoperative exacerbation of autistic symptoms. No evidence of histological changes to the normal cerebellum was apparent in our cases, but we removed only neoplastic lesions and did not analyze normal tissue. Histopathological characteristics in these cases were representative of typical cerebellar pilocytic astrocytoma.

Pilocytic astrocytoma is World Health Organization grade I tumor, is characterized by slow progression, and may be a congenital tumor when found in children, as in the present cases. There may be a relationship between ASD and infantile cerebellar pilocytic astrocytoma.

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