Neuroimaging Highlight

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Preservation of Language in the Ataxic Infant in a Case of Cerebellar Agenesis

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An eight-month-old male Caucasian infant presented with ataxia and titubations, which had been noticed shortly after birth. He was born to healthy non-consanguineous parents after an unremarkable pregnancy. There was no maternal use of drugs, alcohol or tobacco. A prenatal ultrasound at 36 weeks conceptual age (performed at the request of the parents since the 20 week ultrasound had not been performed) revealed an enlarged posterior fossa, no cerebellar tissue, a normal corpus callosum and no evidence of hydrocephalus. He was delivered via spontaneous vaginal delivery at 37 weeks gestation without complications. Birth weight was 3630g and the neonatal course was unremarkable. Developmentally, at eight months-of-age he could not sit. A formal developmental assessment at 19 months-of-age revealed gross and fine motor delay. He was pulling to stand and was cruising but was not walking independently. He was able to stack two cubes. He was very social, highly imitative and used over 50 words. His words were clear and there was no dysarthria. His receptive and expressive language skills were deemed to be at the 18-21 month level. Family history was non-contributory. Physical examination at 19 months-of-age revealed weight and height between the 10-25 percentiles and head circumference at the 25th percentile. Head titubation was present throughout the examination. Extraocular movements were full, with bilateral intermittent esotropia. Upon fixing of the head, horizontal nystagmus and saccadic intrusions on smooth pursuit exam were noted. Fundoscopic examination was normal. He had mild truncal hypotonia, with appropriate strength for his age. Truncal ataxia as well as dysmetria were present bilaterally and symmetrically. Magnetic resonance imaging (Figure) was performed at eight months-of-age and revealed complete cerebellar agenesis with an otherwise normal structural brain. Serum studies revealed a normal complete blood count and differential, electrolytes, liver and renal function. A metabolic screen revealed normal quantitative serum amino acids and urine organic acids as well as normal transferrin isoelectric focusing analysis. A karyotype revealed 46 XY chromosomes.

In summary, we present the case of a 19-month-old boy with cerebellar agenesis, significant truncal and appendicular ataxia and developmentally appropriate language skills. Primary cerebellar agenesis is defined as total or subtotal agenesis of the cerebellum.[1] It is a rare disorder of unknown etiology first described by Combettes in 1831, with most cases being reported as sporadic.[2] In some rare instances it has been reported in the context of complex syndromes, notably X-linked hydrocephalus, and autosomal recessive neonatal diabetes mellitus with

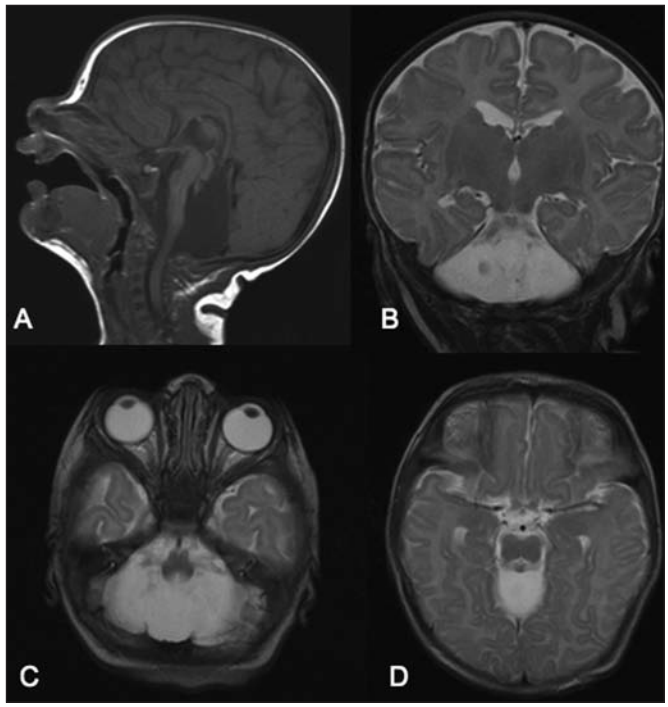

Figure: *Head MRI performed at eight months-of-age A) Midline sagittal T1 weighted image B) Coronal T2 weighted image, C) Axial T2 weighted image at the level of the medulla, D) Axial T2 weighted image at the level of the midbrain, revealing complete cerebellar agenesis with a normal structural brain and brainstem. Myelination level was appropriate for age.*

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microcephaly.[3,4] Complete cerebellar agenesis has been associated with other central nervous system abnormalities such as arrhinenephaly, microcephaly, agenesis of the corpus callosum, and holoprosencephaly.[2,4,5] In the current case, no etiology was identified, there was no associated central nervous system malformation, and the karyotype and metabolic work-up were normal. There are many cases in the literature of subtotal or incomplete cerebellar agenesis, but total agenesis is rare. In his review, Velioglu identified ten cases.[6] Since then at least seven cases have been reported.[4,6-12] Although cases have been reported of completely absent cerebellum, in the majority of reports considerable amounts of ''rudimentary cerebellum'' were documented by neuroimaging or post-mortem examination.[13,14] Reported cases range from prenatal diagnosis up to 74 years-of-age, and have variable phenotypes ranging from early death to cerebellar dysfunction and developmental delay. Affected individuals classically exhibit non-progressive syndrome characterized by inability to coordinate movements. Glickstein, reported that although some cases were believed to be asymptomatic, in every well-documented case a profound deficit of motor development was noted.[13] A recent report by Boyd has brought this statement into question.[15] In general, patients with total or subtotal cerebellar agenesis usually have a high degree of neurobehavioral, mental and physical abnormality.[2]

Interestingly in the presented case the receptive and expressive language skills were noted to be age-appropriate. In reported cases, language is delayed and often dysarthric. For instance, Timmann et al performed a neuropsychological evaluation of a 59 year-old woman cerebellar agenesis which revealed an impaired IQ with mild to moderate speech disturbance and cerebellar ataxia. Historically she had had a slow language development of speech, with a slow and stuttered speech.[5] The cerebellum has been found to play an important role in higher cognitive functions such as learning, memory and language.[16] However, a recent review has brought into question the validity of these studies in children and adolescents with focal cerebellar lesions. Many reports have not been replicated; effects of extracerebellar lesions as well as factors such as increased intracerebral pressure are frequently not considered.[17] In light of the current age of the presented case, he may still show some emerging deficits in cognition and trained abilities of language such as reading and writing, and also in other performance skills, such as verbal working memory. This case highlights the clinical variability of cerebellar agenesis and adds to the clinical phenotype of this rare condition.

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