



Corpus Callosum Agenesis in a Child with Attention Deficit Hyperactivity Disorder with Prenatal Exposure to Sodium Valproate: A Case Report

Rahul Mathur¹, Abhishek Chakladar², Anuranjan Vishwakarma¹, Jawahar Singh³

¹Department of Psychiatry, All India Institute of Medical Sciences, New Delhi, Delhi, India.

²Department of Psychiatry, Varun Arjun Medical College and Rohilkhand Hospital Banthra, Shahjahanpur, Uttar Pradesh, India.

³Department of Psychiatry, All India Institute of Medical Sciences, Bhatinda, Punjab, India.

ARTICLE INFO

*Correspondence:

Rahul Mathur
jammyrahul17@gmail.
com

Department of
Psychiatry, All India
Institute of Medical
Sciences, New Delhi,
Delhi, India

Dates:

Received: 21-12-2022

Accepted: 03-02-2023

Published: 30-06-2023

Keywords:

Attention deficit
hyperactivity disorder,
corpus callosum

How to Cite:

Mathur R, Chakladar A,
Vishwakarma A, Singh
J. Corpus Callosum
Agenesis in a Child
with Attention Deficit
Hyperactivity Disorder
with Prenatal Exposure
to Sodium Valproate:
A Case Report. *Indian
Journal of Clinical
Psychiatry*. 2023;3(1):
49-51.

doi: 10.54169/ijocp.v3i01.66

Abstract

Neuropsychiatric manifestations are common in children with congenital abnormality in corpus callosum. Both macrostructural and microstructural anomalies of the corpus callosum can be seen in those with Attention deficit hyperactivity disorder (ADHD). We herein have described one case of a 7 year old boy who had prenatal exposure to sodium valproate with ADHD and dull normal intelligence with complete agenesis of the trunk and splenium of corpus callosum. To the best of our knowledge, this is one of the rare cases being reported from India on the morphological abnormalities of the corpus callosum in a patient suffering from ADHD.

INTRODUCTION

The corpus callosum is a large brain white matter tract connecting two cerebral hemispheres. Research has indicated that the corpus callosum is crucial in sustaining attention and dividing attention between tasks. Alterations in corpus callosum morphology have been described in those with attention deficit hyperactivity disorder. Morphometric studies using structural Magnetic Resonance Imaging (MRI) reported inconsistencies regarding the size of various corpus callosum areas and its divisions in ADHD. A meta-analysis reported that those with ADHD had a smaller splenium and anterior portion as compared with those without ADHD.^{1,2} Fractional anisotropy measures employing diffusion tensor imaging also revealed that ADHD patients have decreased area of the whole corpus callosum, anterior-middle body and isthmus. A study³ reported that, in addition to macrostructural abnormalities of the corpus callosum, microstructural anomalies were also present in the corpus callosum in ADHD patients, evidenced by a significant reduction in the fractional anisotropy value of the isthmus in ADHD patient group as compared to controls. We have here reported a case of a 7 year old boy (after taking informed consent from the parents) with ADHD and dull normal intelligence with complete agenesis of the trunk and splenium of the corpus callosum.

© IJOCP, 2023. Open Access This article is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) License, which allows users to download and share the article for non-commercial purposes, so long as the article is reproduced in the whole without changes, and the original authorship is acknowledged. If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. If your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <https://creativecommons.org/licenses/by-nc-sa/4.0/>

Case Report

Master K, a 7 year old male child, presented to the child guidance clinic with a history suggestive of inattention in class, poor scholastic performance, which included difficulty in memorizing things, easy distractibility, hitting other children during playing since the age of 3 years. There were multiple complaints from school teachers regarding this behavior of the patient. The patient lagged behind in class from other students and was still in Nursery class. Birth history revealed one episode of generalized tonic-clonic seizure to the mother two hours before childbirth and she is a known case of seizure disorder. She was on tablet sodium valproate 1000 mg from age 15 years and continued the medication during her pregnancy. The patient was born full term out of vaginal delivery with a birth cry present. There was a delay in attaining motor milestones, viz. sitting and standing without support and walking, which occurred at the age of 3 years. The speech was also delayed and the child learned to speak monosyllabic words at the age of 2.5 years. The patient received immunization as per the National Immunisation Programme Schedule. There was no significant history of psychiatric illness in the family. The routine investigations comprising of complete blood count, blood sugar levels, liver and renal functions test, thyroid assessment, vitamin B12 and folate levels were done and were within normal limits. A genetic assessment was done, which showed no significant abnormality. A diagnosis of attention deficit hyperactivity disorder was made clinically according to DSM-5 and an Intelligence Quotient (IQ) examination using Seguin Form Board Test (SFBT) was done to assess intelligence which came out to be between 82 to 84, suggesting dull normal intelligence. MRI of the brain was done to rule out any structural neurological deficits. MRI revealed dysgenesis of the corpus callosum with only the genu of the corpus callosum being seen and absent trunk and splenium of the corpus callosum as shown in Figure 1.

DISCUSSION

Neuropsychiatric manifestations are common in children with congenital abnormalities in the corpus callosum. Abnormalities in this region are associ-

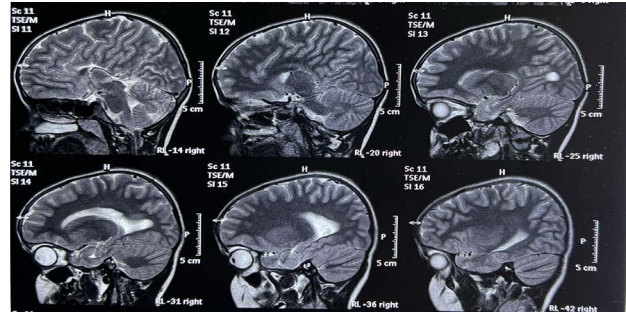


Figure 1: MRI T2-W image (red arrow) showing dysgenesis of corpus callosum with absent trunk and splenium

ated with defective cognitive functions, attention, impulse control, developmental delays, and intellectual ability.⁴ Our patient had dull normal intelligence and behavioral symptoms of poor attention and impulsivity, leading to consistent deterioration in scholastic performance. As revealed in MRI, our patient had absent splenium and trunk of the corpus callosum. This is consistent with findings from two meta-analyses which reported those with ADHD had a smaller splenium as compared with those without ADHD.^{1,2} As mentioned earlier, the patient's mother had a history of sodium valproate use during pregnancy. It is well known that sodium valproate use is associated with a wide spectrum of neural tube defects; however, the association between valproate use during pregnancy and partial or complete corpus callosum agenesis is rare and not conclusive.⁵ It is also seen that those with agenesis of corpus callosum may have very few or no neurological deficits, thus its role in prognosis is relatively guarded.⁶

This remains to be studied how much symptomatology is explained by abnormalities in the corpus callosum. In the future, more studies are required to expand understanding of agenesis of corpus callosum and behavioral symptoms in children.

REFERENCES

1. Hutchinson AD, Mathias JL, Banich MT. Corpus callosum morphology in children and adolescents with attention deficit hyperactivity disorder: a meta-analytic review. *Neuropsychology*. 2008 May;22(3):341. Available from: doi.org/10.1037/0894-4105.22.3.341
2. Valera EM, Faraone SV, Murray KE, Seidman LJ. Meta-analysis of structural imaging findings in attention-deficit/hyperactivity disorder. *Biological psychiatry*. 2007 Jun 15;61(12):1361-9. Available from: doi.org/10.1016/j.

- biopsych.2006.06.011
3. Cao Q, Sun L, Gong G, Lv Y, Cao X, Shuai L, Zhu C, Zang Y, Wang Y. The macrostructural and microstructural abnormalities of corpus callosum in children with attention deficit/hyperactivity disorder: a combined morphometric and diffusion tensor MRI study. *Brain research*. 2010 Jan 15;1310:172-80. Available from: doi.org/10.1016/j.brainres.2009.10.031
 4. Şahpolat M. Corpus Callosum Agenesis Presented With Attention Deficit Hyperactivity Disorder: Two Case Reports. *Cukurova Medical Journal (Çukurova Üniversitesi Tıp Fakültesi Dergisi)*; Yıl: 2013 Cilt: 38 Sayı: 4. 2013.
 5. Lindhout D, Omtzigt JG, Cornel MC. Spectrum of neural-tube defects in 34 infants prenatally exposed to antiepileptic drugs. *Neurology*. 1992 Apr 1;42(4 Suppl 5):111-8. Available from: PMID: 1574164
 6. Verity C, Firth H. Congenital abnormalities of the central nervous system. *Journal of Neurology, Neurosurgery & Psychiatry*. 2003 Mar 1;74(suppl 1):i3-8. Available from: doi.org/10.1136/jnnp.74.suppl_1.i3