Child Neurology Open
Volume 9: 1-4

DOI: 10.1177/2329048X221115476
journals.sagepub.com/home/cno
SAGE

Acute Bulbar Palsy-Plus Variant of Guillain-Barré Syndrome in a 3-Year-Old Girl

Saihari S. Dukkipati, PhD[1,*], Daniel J. Zhou, MD, MS[1,*], Andria M. Powers, MD[2], Ezequiel A. Piccione, MD[1], and Sookyong Koh, MD, PhD[3]

Abstract

We present a case of a 3-year-old girl who rapidly developed bilateral facial palsy, dysphagia, dysphonia, areflexia, and ataxia soon after receiving an influenza vaccine. Brain and spine Magnetic resonance imaging (MRI) scans with and without contrast showed enhancement of cranial nerves III, V, VII, and X, as well as the anterior and posterior cervical spinal and cauda equina roots. cerebrospinal fluid (CSF) studies showed white blood cell count of 19 cells/cm^2, glucose 81 mg/dL, and protein 116 mg/dL, with negative infectious and autoimmune labs. Serum IgM and IgG antibodies against GM1, GD1a, GD1b, GM2, GT1A, GQ1b were negative. The patient was treated with intravenous immunoglobulin, which led to a full recovery. Upon three-month follow-up, her neurologic examination demonstrated normal cranial nerves, reflexes, and gait. Her presentation was most consistent with the acute bulbar palsy plus (ABPp) variant of Guillain-Barré syndrome (GBS), a rare and challenging diagnosis especially in her age group.

Keywords

inflammatory neuropathy, areflexia, influenza vaccine, cranial neuropathy, stridor, vocal cord paralysis

Received June 10, 2022. Accepted for publication June 30, 2022.

Introduction

Guillain-Barré syndrome (GBS) is an acute immune-mediated polyradiculoneuropathy that clinically manifests variably, most classically as acute inflammatory demyelinating polyneuropathy with progressive, ascending limb weakness and reduced or absent reflexes in both children and adults.[1] Less common variants include axonal, pure motor or sensory, Miller-Fisher syndrome, pharyngeal-cervical-brachial, Bickerstaff brainstem encephalitis, paraparetic, and facial diplegia.[1] The development of GBS is typically preceded by an infectious illness, though vaccine administration has also been associated with increased risk (one to 100,000 vaccinations).[1,2] The incidence of developing GBS increases exponentially with age, with cases more rarely observed in infants and toddlers.[3] Children with GBS generally recover more quickly than adults.[4]

More rare variants include the bifacial weakness with paresthesias, characterized by isolated facial diplegia with distal limb paresthesias,[5] and acute bulbar palsy-plus (ABPp) syndromes, which presents with multiple cranial neuropathies and ataxia without neck or limb weakness.[6] Here, we report a rare case of a 3-year-old girl whose clinical presentation appears consistent with the ABPp variant of GBS.

Case Presentation

A 3-year-old normally developing right-handed girl presented to the emergency department with worsening facial weakness and difficulty walking. The patient was in her usual state of health, with no known recent illnesses, until 5 days prior to presentation. A few hours after receiving her influenza vaccination, the mother noticed that, while the girl cried, her left face appeared flat and emotionless with the left eye slightly open without any tears, while the right face was creased with the

[1]Department of Neurological Sciences, University of Nebraska Medical Center, Omaha, NE, USA
[2]Department of Radiology, Children's Hospital and Medical Center, Omaha, NE, USA
[3]Division of Neurology, Department of Pediatrics, Children's Hospital and Medical Center, Omaha, NE, USA

[*]These authors contributed equally to this publication.

Corresponding Author:
Sookyong Koh, Division of Neurology, Department of Pediatrics, Children's Hospital and Medical Center, 8100 Dodge St. Omaha, NE Omaha, 68114, USA.
Email: skoh@childrensomaha.org

right eye closed and tears coming out. She was prescribed acyclovir by her pediatrician on the next day for suspected Bell's palsy. Two days later, she stopped talking and appeared as if she was gasping to breathe. She also had increased difficulty with eating and drinking and was no longer able to walk without assistance.

At the time of her presentation, her lung exam was remarkable for inspiratory stridor. On neurologic exam, she was awake and followed commands. She was nonverbal but hummed with a soft voice. Her pupils were equal and reactive to light, and gaze was conjugate in all directions. She had bilateral upper and lower facial weakness, left worse than right. When she laughed, her right lower face moved slightly up, while the left lower face did not move, and the left nasolabial fold remained absent. Her strength was full throughout, and she responded to touch in all extremities. Reflexes were absent throughout. She had dysmetria bilaterally when attempting to grab small items with each hand. She stood without assistance but displayed a staggering, cautious gait while walking.

Magnetic resonance imaging (MRI) of the brain with and without contrast revealed abnormal smooth enhancement of the bilateral oculomotor, trigeminal, facial, and vagus nerves (Figure 1). MRI of the entire spine obtained with and without contrast showed similar smooth enhancement of spinal nerve roots at many levels, most conspicuous in the cauda equina and cervicothoracic junction (Figure 2).

Lumbar puncture with cerebrospinal fluid (CSF) studies showed white blood cell count of 19 cells/cm^2 (normal 0-10) without red blood cells, glucose 81 mg/dL (normal 45-75), and protein 116 mg/dL (normal 15-45). Meningitis panel (Children's Hospital & Medical Center, Pathology Dept.) and CSF cultures were negative (Supplemental Table 1). Multiple sclerosis panel (ARUP Laboratories) showed elevated CSF immunoglobulin G (IgG) with elevated IgG synthesis rate, without oligoclonal bands. Serum and CSF autoimmune encephalopathy panels (Mayo Clinic Laboratory) were negative (Supplemental Tables 2 and 3). Serum acute neuropathy panel (Neuromuscular Clinical Laboratory, Washington University in St. Louis) was negative for IgM and IgG antibodies against GM1, GD1a, GD1b, GM2, GT1A, and GQ1b (Supplemental Table 4).

The patient was diagnosed with GBS, most consistent with the ABPp variant. She received intravenous immunoglobulin 1 mg/kg daily for 2 days. Her respiratory status was monitored and without complication, and her symptoms steadily improved over the next 10 days. By hospital discharge, she appeared to smile with present bilateral nasolabial folds. Her cry was less hoarse, and she was able to eat soft foods. Reflexes remained absent throughout, and she continued to have mild ataxic gait requiring intermittent assistance. She was discharged to inpatient rehabilitation with ongoing physical, occupational, and speech therapy. On three-month follow-up, the patient was back to her normal self, with intact facial strength, fluent speech with normal pitch and no dysarthria, and normal reflexes. No ataxia was observed, as she was able to run, skip, and jump up and down without difficulty.

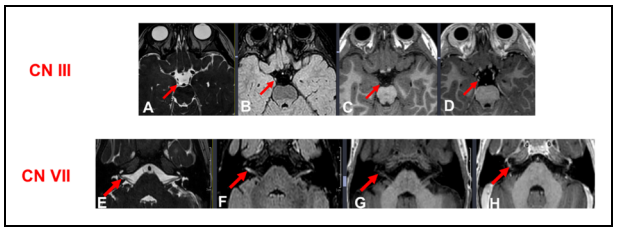

Figure 1. Axial heavily fluid weighted T2 (A), postcontrast FLAIR (B), precontrast T1 (C) and postcontrast T1 (D) weighted MR images at the pontomesencephalic junction reveal symmetric, smooth enhancement of the oculomotor nerves. Axial heavily fluid weighted T2 (E), postcontrast FLAIR (F), precontrast T1 (G) and postcontrast T1 (H) weighted MR images at the lower pons reveal symmetric, smooth enhancement of the facial nerves involving the meatal and labyrinthine segments.

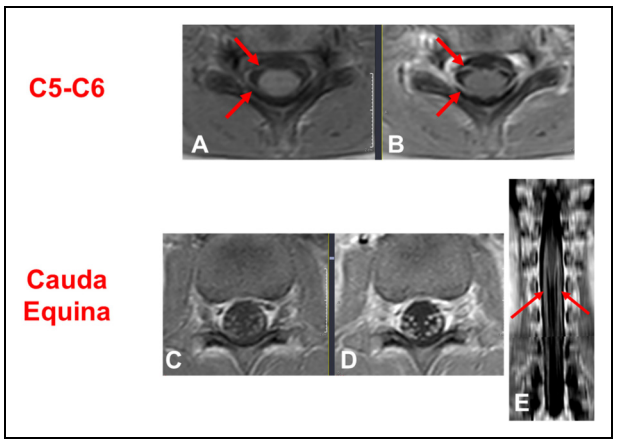

Figure 2. Axial precontrast (A) and postcontrast (B) T1-weighted MR images of the spine at the C5-6 level show symmetric, bilateral, smooth anterior and posterior nerve root enhancement. Axial precontrast (C) and postcontrast (D) T1-weighted MR images of the cauda equina reveal smooth nerve root enhancement without nodularity. Coronal T1 postcontrast reconstruction (E) of the cauda equina reveals diffuse nerve root enhancement in long axis.

Discussion

We report the youngest patient in the literature to date who developed the acute bulbar palsy-plus (ABPp) variant of GBS. We suspect that her influenza vaccine most likely contributed to her development of GBS, given her onset of symptoms just hours after vaccine administration and lack of other known risk factors. This short latency is unusual given that the risk for GBS is expected in the 8 to 21 day window after vaccinations.[7] Our patient met the diagnostic criteria for GBS based on the combined finding of acute progression of symptoms, cranial neuropathies with ataxia and areflexia on physical examination, CSF studies showing albuminocytologic dissociation with WBCs <50 cells/cm^2, and MRI showing isolated T2 hyperintensities to multiple cranial nerves and spinal nerves.[8] Nerve conduction studies and electromyography testing were unavailable, though are recognizably challenging to obtain in toddlers due to various technical limitations and patient tolerability.[9]

The patient's clinical presentation was similar to those reported in other cases of ABPp syndrome in the literature, which most commonly but not always presented with ophthalmoplegia, bilateral facial palsy, and ataxia.[6,10–12] Although our patient's extraocular muscles appeared intact on physical examination, her oculomotor nerves, along with multiple other cranial nerves, were T2 hyperintense on MRI brain. The ABPp variant has been most commonly associated with IgG antibodies to GT1a and sometimes GQ1b, though these antibodies can also be absent, as in our case.[6,10] Other conditions such as acute myelopathy, myasthenia gravis, and botulism were less likely due to the presence of ataxia, areflexia and elevated CSF proteins in this patient.[13]

Compared to adults with GBS, children with GBS were found to have a more acute onset of symptoms, higher likelihood of developing cranial nerve palsies, and better prognosis, with >70% returning to ambulation by 1 year.[14] Our patient's clinical course also appeared to be consistent with those of other cases of GBS in children, with a more rapid onset and significant improvement following IVIg administration.[4,15] Prior to this study, we found that the youngest patient reported to develop the ABPp variant of GBS was 13 years old.[11] Additionally, in a more recent case report, the youngest patient identified to have the BFS variant was an 8-year-old boy, who also had a similar presentation of facial diplegia, dysphagia, dysphonia, ataxia, and areflexia.[5] In this age group, who present with limited cooperability on examination and testing, MRI and CSF analysis are key to the evaluation of GBS, particularly with the rare variant of ABPp.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed Consent

The authors have obtained written informed consent from the patient's mother, which is available for verification upon request.

ORCID iDs

Saihari S. Dukkipati https://orcid.org/0000-0001-7770-3853
Sookyong Koh https://orcid.org/0000-0002-2717-6888

Trial Registration

Inflammatory neuropathy, areflexia, influenza, cranial nerves, inspiratory stridor.

References

1. Shahrizaila N, Lehmann HC, Kuwabara S. Guillain-Barre syndrome. *Lancet*. 2021;397(10280):1214-1228.
2. Aladawi M, Elfil M, Abu-Esheh B, et al. Guillain barre syndrome as a complication of COVID-19: a systematic review. *Can J Neurol Sci*. 2022;49(1):38-48.
3. Sejvar JJ, Baughman AL, Wise M, Morgan OW. Population incidence of guillain-barre syndrome: a systematic review and meta-analysis. *Neuroepidemiology*. 2011;36(2):123-133.
4. Karalok ZS, Taskin BD, Yanginlar ZB, et al. Guillain-Barre syndrome in children: subtypes and outcome. *Childs Nerv Syst*. 2018;34(11):2291-2297.
5. Rubino A, Della Corte M, Bruno G, et al. Atypical clinical and neuroradiological findings in a child with bifacial weakness with paresthesias. *J Clin Neuromuscul Dis*. 2021;23(2):105-109.
6. Kim JK, Kim BJ, Shin HY, et al. Acute bulbar palsy as a variant of guillain-barre syndrome. *Neurology*. 2016;86(8):742-747.
7. Arya DP, Said MA, Izurieta HS, et al. Surveillance for guillain-barre syndrome after 2015–2016 and 2016–2017 influenza vaccination of medicare beneficiaries. *Vaccine*. 2019;37(43):6543-6549.
8. Leonhard SE, Mandarakas MR, Gondim FAA, et al. Diagnosis and management of guillain-barre syndrome in ten steps. *Nat Rev Neurol*. 2019;15(11):671-683.
9. Kang PB, McMillan HJ, Kuntz NL, et al. Utility and practice of electrodiagnostic testing in the pediatric population: an AANEM consensus statement. *Muscle Nerve*. 2020;61(2):143-155.
10. Cao Q, Chu H, Fu X, Yao J, Xiao Z, Lu Z. Case report: acute bulbar palsy Plus syndrome: a guillain-barre syndrome variant more prone to be a subtype than overlap of distinct subtypes. *Front Neurol*. 2020;11:566480.
11. Ray S, Jain PC. Acute bulbar palsy plus syndrome: a rare variant of guillain-barre syndrome. *J Pediatr Neurosci*. 2016;11(4):322-323.
12. Brun G, Graber M, Mohr S, Bejot Y. Acute bulbar palsy and ophtalmoplegia associated with anti-GT1a IgG antibodies. *Neurologist*. 2021.
13. Piccione EA, Salame K, Katirji B. Guillain-Barré syndrome and related disorders. *Neuromuscular Disord Clin Pract*. 2014:573-603.
14. Sarada C, Tharakan JK, Nair M. Guillain-Barre syndrome. A prospective clinical study in 25 children and comparison with adults. *Ann Trop Paediatr*. 1994;14(4):281-286.
15. Hicks CW, Kay B, Worley SE, Moodley M. A clinical picture of guillain-barre syndrome in children in the United States. *J Child Neurol*. 2010;25(12):1504-1510.

Appendix

Table S1. Meningitis Panel (Pathology Dept., Children's Hospital and Medical Center, Omaha, NE).

	Reference Range and Units	Result
Escherichia coli	Not detected	Not detected
Haemophilus influenzae	Not detected	Not detected
Listeria monocytogenes	Not detected	Not detected
Neisseria meningitidis	Not detected	Not detected
Streptococcus agalactiae	Not detected	Not detected
Streptococcus pneumoniae	Not detected	Not detected
Cytomegalovirus	Not detected	Not detected
Enterovirus	Not detected	Not detected
Herpes Simplex Virus 1	Not detected	Not detected
Herpes Simplex Virus 2	Not detected	Not detected
Human herpesvirus 6	Not detected	Not detected
Human parechovirus	Not detected	Not detected
Varicella zoster virus	Not detected	Not detected
Cryptococcus neoformans/ gattii	Not detected	Not detected

Table S2. Serum autoimmune panel (Mayo Clinical Laboratories, Mayo Clinic, Rochester, MN).

	Ref Range & Units	Result
Anti-Neuronal Nuclear Ab, Type 1 (ANNA-1), CSF	< 1:240	negative
Peds Autoimmune Eval Reflex Added		No
CASPR2-IgG CBA, Serum	Negative	Negative
DPPX Ab IFA, Serum	Negative	Negative
GABA-B-R Ab CBA, Serum	Negative	Negative
GAD65 Ab Assay, Serum	<= 0.02	0
GFAP IFA, Serum	Negative	Negative
LGI1-IgG CBA, Serum	Negative	Negative
mGluR1 Ab IFA, Serum	Negative	Negative
MOG FACS	Negative	negative
NMDA-R Ab CBA, Serum	Negative	Negative
NMO/AQP4 FACS, Serum	Negative	Negative
Purkinje Cell Cytoplasmic Ab Type TR (PCA-Tr), Serum	< 1:240	negative

Table S3. CNS autoimmune panel (Mayo Clinical Laboratories, Mayo Clinic, Rochester, MN).

	Ref Range & Units	Result
Anti-Neuronal Nuclear Ab, Type 1 (ANNA-1), CSF	< 1:2	Negative
Peds Autoimmune Eval Reflex Added		No
CASPR2-IgG CBA, CSF	Negative	Negative
DPPX Ab IFA, CSF	Negative	Negative
GABA-B-R Ab CBA, CSF	Negative	Negative
GAD65 Ab Assay, CSF	<= 0.02 nmol/L	0
GFAP IFA, CSF	Negative	Negative
LGI1-IgG CBA, CSF	Negative	Negative
mGluR1 Ab IFA, CSF	Negative	Negative
NMDA-R Ab CBA, CSF	Negative	Negative
NMO/AQP4 FACS, CSF		Negative
Purkinje Cell Cytoplasmic Ab Type TR (PCA-Tr), CSF	< 1:2	Negative

Table S4. Acute neuropathy panel (Neuromuscular Clinical Laboratory, Washington University St. Louis, St. Louis, MO).

	Patient Values	Normal Values
IgM versus GM1	0	<2000
IgM versus GalNAc-GD1a	0	<10,000
IgM versus GD1b	0	<3000
IgM versus GM2	0	<3000
IgG versus GT1a	0	<3000
IgG versus GM1	0	<2000
IgG versus GQ1b	0	<2000
IgG versus GD1b	0	<3000
IgG versus GalNAc-GD1a	2300	<2500
IgG versus Sulfatide	0	<3000
IgM versus β-Tubulin	0	<2500
IgG versus β-Tubulin	0	<2500
IgM versus Heparan Sulfate	0	<10,000
IgM versus Histone H3	1000	<5000
IgM versus GD1a	0	<2000
IgG versus Neurofascin-140	Negative	Negative
IgG versus Neurofascin-155	Negative	Negative
IgM versus Neurofascin-155	Negative	Negative
IgG versus Contactin-1	Negative	Negative
IgG versus Caspr1	Negative	Negative