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Novel Neuroimaging Pattern in *POLR3A*-Related Disorder on 7T MRI

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Neurol Genet 2024;10:e200125. doi:10.1212/NXG.0000000000200125

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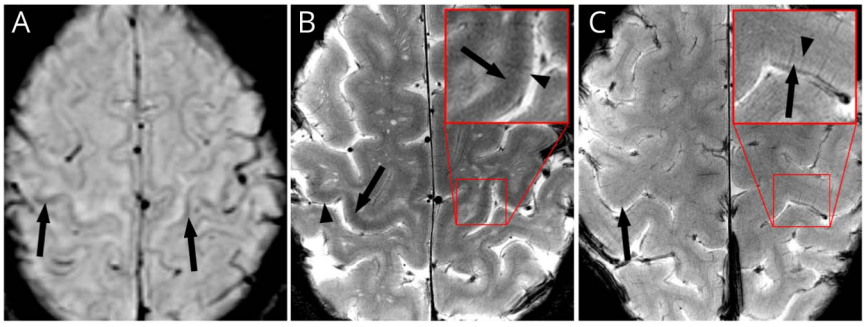
Figure 1 Motor Cortex Abnormalities



(A) Faint hypointensity in the primary motor cortex (PMC; arrows) on a 1.5T susceptibility-weighted image. (B) 7T T2*-weighted image reveals thickening and hypointensity of the middle/inner cortical layers (arrows) with sparing of the outer layers (arrowheads) in PMC and supplementary motor area. (C) Normal appearance of the outer (arrows) and inner (arrowhead) layers on 7T T2*.

A 30-year-old woman presented with progressive gait difficulty over 7 years. Neurologic examination showed short stature, ataxia, and spasticity. FLAIR MRI at 1.5 T showed white matter hyperintensities (WMHs) involving the corticospinal tracts and subtle motor cortex hypointensity on susceptibility-weighted imaging (Figure 1A). 7T MRI better depicted thickening and hypointensity of the middle and inner layers of the motor cortex with relative sparing of the outer layers (Figure 1B). The histopathologic basis is uncertain, but may reflect alterations in cortical myelination. In addition, 7T MRI refined WMHs (Figure 2, A and B) and spinal cord atrophy (Figure 2C). Genetic testing found compound heterozygous *POLR3A* variants c.1771-7C>G and c.2542T>C. Both variants are associated with a triad of childhood-onset leukodystrophy, abnormal dentition, and endocrinologic disturbances; however, milder incomplete phenotypes were also reported.[1,2] The cortical changes on 7T MRI may represent a novel, previously unrecognized neuroimaging finding in some *POLR3A*-related disorders. Future 7T MRI and histopathologic studies are warranted.

Research Ethics and Informed Consent

The institutional review boards of Mayo Clinic approved all ethical aspects of this study. Written informed consent was obtained from the patient.

Study Funding

The authors report no targeted funding.

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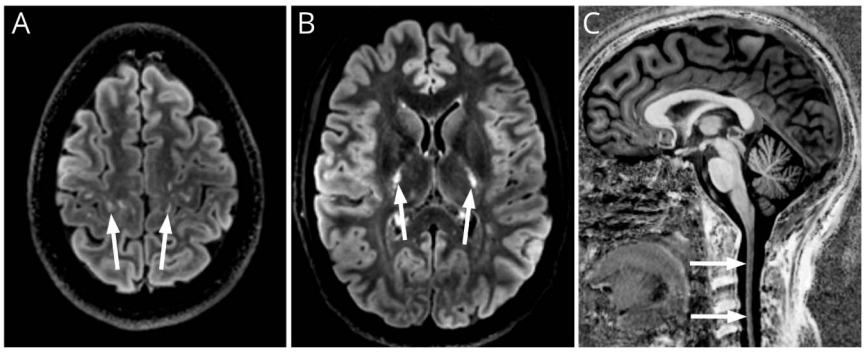
The Article Processing Charge was funded by the authors.

Figure 2 Cerebral White Matter Lesions and Spinal Cord Atrophy



Axial 7T FLAIR images show abnormal hyperintense signal in the corticospinal tracts involving the subcortical white matter (A; arrows) and the posterior limb of the internal capsule (B; arrows). (C) Sagittal T1-weighted image shows atrophy of the cervical spinal cord (arrows).

Disclosure

J. Dulski is partially supported by the Haworth Family Professorship in Neurodegenerative Diseases fund. E.H. Middlebrooks is a paid consultant for Boston Scientific Corp and Varian Medical Systems, Inc., and paid speaker for Varian Medical Systems, Inc., and Siemens Healthineers. He receives grant support from Varian Medical Systems, Inc., and Vigil Neuroscience, Inc. Z.K. Wszolek is partially supported by the NIH/NIA and NIH/NINDS (1U19AG063911, FAIN: U19AG063911), Mayo Clinic Center for Regenerative Medicine, the gifts from the Donald G. and Jodi P. Heeringa Family, the Haworth Family Professorship in Neurodegenerative Diseases fund, and The Albertson Parkinson's Research Foundation. He serves as PI or Co-PI on Biohaven Pharmaceuticals, Inc. (BHV4157-206) and Vigil Neuroscience, Inc. (VGL101-01.002, VGL101-01.201, PET tracer development protocol, Csf1r biomarker and repository project, and ultra-high field MRI in the diagnosis and management of CSF1R-related adult-onset leukoencephalopathy with axonal spheroids and pigmented glia) projects/grants. He serves as Co-PI of the Mayo Clinic APDA Center for Advanced Research and as an external advisory board member for the Vigil Neuroscience, Inc., and as a consultant on neurodegenerative medical research for Eli Lilli & Company. Go to Neurology.org/NG for full disclosure.

Author Contributions

Jaroslaw Dulski: drafting/revision of the manuscript for content, including medical writing for content; study concept or design; analysis or interpretation of data. Erik H. Middlebrooks: drafting/revision of the manuscript for content, including medical writing for content; study concept or design; analysis or interpretation of data. Zbigniew K. Wszolek: drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; study concept or design.

Publication History

Received by *Neurology: Genetics* October 20, 2023. Accepted in final form November 20, 2023. Submitted and externally peer reviewed. The handling editor was Associate Editor Raymond P. Roos, MD, FAAN.

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