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CASE REPORT

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Demyelinating Sensorimotor Polyneuropathy in a Pediatric Patient with a *KIF1B* Variant: A Case Report

Armand Shehu[1], Anita Pilika[1], Aida Bushati[1], Kristi Aleksi[2*], Xhentila Doka[1], Era Kurti[1], Era Shehu[3]

[1]*Mother Teresa University Hospital, Tirane, Albania*
[2]*Faculty of Medicine, University of Medicine, Tirane, Albania*
[3]*Faculty of Medicine, Our Lady of Good Counsel University, Tirane, Albania*

Abstract

Sensorimotor polyneuropathies in childhood comprise a clinically and etiologically heterogeneous group of peripheral nerve disorders. They are commonly associated with progressive motor and sensory impairment, balance and gait disturbances, musculoskeletal deformities, reduced functional independence, and overall long-term disability. Herein, we present a diagnostically challenging case of a 13-year-old boy with a demyelinating electrophysiological profile, despite identification of a genetic variant previously associated with an axonal, non-demyelinating form of peripheral sensorimotor neuropathy. (**International Journal of Biomedicine. 2026;16(3):398-400.**)

Keywords: Charcot-Marie-Tooth • *KIF1B* • demyelinating sensorimotor polyneuropathy

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Introduction

Sensorimotor neuropathies in childhood comprise a heterogeneous group of disorders affecting peripheral motor and sensory nerves. They cause progressive weakness, sensory loss, balance and gait impairment, musculoskeletal deformities, reduced functional independence, and overall long-term disability. Their etiology is broad and includes hereditary or acquired causes, such as traumatic, metabolic, toxic, nutritional, and immune-mediated causes.[1] In clinical practice, distinguishing inherited from acquired neuropathies is essential, as this directly influences diagnostic strategy, prognosis, genetic counseling, and management.

Case Presentation

In December 2023, a 13-year-old boy was referred to our Neuropediatric Service for evaluation. On clinical assessment, his general condition was stable; he was afebrile, with no vomiting, and was responsive and appropriately oriented for his biological age. Neurological examination revealed a mild articulation disorder. Also, both gross and fine motor functions were impaired; he was unable to run or walk quickly, had difficulty climbing stairs, fatigued easily, and could not rise from the floor without support, so Gowers' sign was positive. He was unable to write and had difficulty performing tasks such as opening a bottle cap. During sensory evaluation, he reported numbness in the hands and feet, as well as difficulty distinguishing cold from warm objects by touch. At musculoskeletal examination, deformity of the right talocrural joint, hammer-toe deformity of the great toes, and reduced muscle bulk in the upper limbs, thighs, and calves were observed. Deep tendon reflexes, including patellar and Achilles reflexes, were absent bilaterally. Spinal deformities were also noticed, including thoracic kyphoscoliosis, lumbar lordosis, and leftward trunk deviation. The child had started physiotherapy approximately 1.5 years ago and had also been wearing spinal braces. No abnormalities were detected on the rest of the physical examination, including the cardiac, pulmonary, and abdominal systems.

The parents reported that symptoms began at approximately 6 years of age and had worsened over time. The pregnancy and perinatal history were uneventful, and early childhood development was reported as unremarkable. Family history was unremarkable.

Results of the complete blood count, biochemical laboratory tests, echocardiogram, and electrocardiogram were within age-appropriate limits. Head magnetic resonance imaging was also unremarkable. Spinal X-ray findings supported the physical examination. Electroneuromyography (ENMG) revealed chronic demyelinating sensorimotor polyneuropathy, with markedly reduced motor conduction velocities and amplitudes, prolonged latencies, increased motor unit potential amplitude/duration, and a sparse interference pattern. Whole-exome sequencing (WES) with copy number calling was performed and identified a heterozygous variant of uncertain significance (VUS) in the *KIF1B* gene (Table 1).

Table 1.
Variant details.

Genomic coordinate (GRCh38)	chr1:10268208C>T
HGVS nomenclature	c.665C>T
ID Transcript	NM_001365951.3
Protein change	p.Thr222Met
Location	exon 7/49
Class / ACMG classification	class 3 / VUS
Function	missense

ACMG = American College of Medical Genetics and Genomics
HGVS = Human Genome Variation Society

Discussion

This case describes a 13-year-old boy with childhood-onset, slowly progressive, chronic sensorimotor polyneuropathy.

Hereditary vs. Acquired

The combination of neurological and musculoskeletal impairment, medical history, a long-standing childhood-onset course with gradual progression over several years, the electrophysiological findings, and the absence of relevant systemic abnormalities is not suggestive of an acquired disorder. Instead, these features support a hereditary sensorimotor neuropathy, probably within the Charcot–Marie–Tooth (CMT) disease spectrum.[2]

Demyelinating vs. Axonal

CMT represents a clinically and genetically heterogeneous group of inherited peripheral neuropathies characterized by chronic motor and sensory impairment. [3,4] Although the family history in this case was unremarkable, this does not exclude genetic etiology, because de novo variants may also occur. The electrophysiological findings are central to diagnostic interpretation. In CMT, nerve conduction assessment is commonly used to distinguish demyelinating types from axonal, non-demyelinating types. A median nerve conduction velocity below approximately 35 or 38 m/s, depending on authors, is generally used to support a demyelinating classification, whereas relatively preserved velocities with reduced amplitudes favor an axonal form.[3-5] In the present patient, the markedly slow nerve conduction velocities are therefore more consistent with a demyelinating CMT-like phenotype, while the reduced amplitudes observed do not exclude such a phenotype, as in long-standing demyelinating neuropathies, secondary axonal loss may occur.[4,6]

Meanwhile, WES identified a heterozygous VUS in the *KIF1B* gene. KIF1B encodes a kinesin motor protein involved in microtubule-based intracellular transport, including axonal transport of mitochondria and other cargoes important for neuronal function. Variants in *KIF1B* have been associated with CMT type 2A1 (CMT2A1), a rare autosomal dominant disease.[7] Given that this variant is of uncertain significance, it requires cautious interpretation since, according to ACMG/AMP principles, a VUS should not be used as definitive diagnostic evidence or as the sole basis for clinical decision-making.[8,9]

Conclusion

In conclusion, this case highlights the importance of careful phenotype–genotype correlation in genetic disorders and underscores the need for cautious interpretation of variants of uncertain significance in clinical practice. In the present patient, the phenotype is most consistent with a slowly progressive, childhood-onset hereditary sensorimotor neuropathy, with ENMG findings predominantly suggestive of nerve demyelination. Despite the chronic electrophysiological changes indicating axonal loss, the overall pattern does not align well with a classic axonal phenotype. Furthermore, although a heterozygous variant of uncertain significance in *KIF1B* was identified, this finding alone is insufficient to establish a diagnosis of CMT2A1.

Ethical Statement

Informed consent was obtained from the patient's parents for the publication of this report.

Conflicts of Interest

None.

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***Corresponding author**: Kristi Aleksi. E-mail: kristialeksi1@gmail.com*