Wilson disease (WD) is an autosomal recessive metabolic disorder of copper accumulation, caused by defects in the gene ATP7B, a P-type ATPase, responsible for the transport of copper to the vesicles for excretion. WD manifests with hepatic and neurologic features, with or without accompanying psychiatric features. The common neurologic features are rigidity, dystonia of limbs and trunk, dysarthria, tremor, and drooling. The diagnosis of purely neurologic forms of WD is difficult, with a mean delay of 12.8 years. A T2-weighted MRI scan aids the diagnosis of cases where the accumulation of copper in the subcortical gray matter and other areas produces typical lesions as visualized by T2-weighted and fluid-attenuated inversion recovery images.

Here, we describe a patient with a neurologic WD, who failed to respond to treatment for 3 years. MRI scans of the brain show atypical changes, though the patient was not diagnosed with any other neurologic disease. The case represents a neural pathogenesis that causes higher involvement of white matter and gross and disproportionate cerebral atrophy.

**Case summary.** The 11-year-old boy was born to nonconsanguineous parents and had normal developmental milestones. He presented with an 8-month history of difficulty of movement starting from the right toes, and a 2-month history of slurring and deformity of the limbs, progressing gradually proximally and deformity of the limbs, progressing gradually proximally. He had incontinence of bowel and bladder. Three years later, the patient died of severe respiratory infections.

**Abstract**—Wilson disease (WD) produces typical lesions in the brain, which can aid in diagnosis and therapy. The authors present a drug-resistant WD case with atypical cerebral lesions with marked involvement of white matter as visualized on MRI scans. The diagnosis was confirmed by identification of mutations in the ATP7B gene. The case demonstrates an uncommon pathology-related cerebral copper accumulation and emphasizes the importance of genetic screening in the diagnosis of WD.
Discussion. In our patient, the clinical and biochemical findings at presentation suggested neurologic WD. However, the patient did not respond to the chelation therapy, which is usually of benefit to neurologic patients, improving clinical features and reversing MRI findings. MRI was undertaken to assess the course of the disease as well as to validate the diagnosis. However, the scans showed a disproportionately high involvement of white matter and gross atrophy of cortical gray matter in relation to basal ganglia, which is unusual for WD. In addition to extrapyramidal involvement, which is common in WD due to subcortical gray matter damage, we found brisk deep tendon reflexes and extensor plantar response showing pyramidal signs. This observation, though unusual, was consistent with the degeneration of white matter (internal capsule) and cortical gray matter seen on MRI. Identification of two mutations, both reported in other WD patients, confirmed the case being investigated as WD.

The exaggerated involvement of white matter might be due to copper transported from the cell body or due to the damage to the glial tissues (oligodendroglia and Schwann cells). The simultaneous involvement of the cortical neurons and the internal capsule (comprising their axons) favors the former possibility. The involvement of the cortical neuron may be due to the nonfunctioning of the copper-dependent enzymes in those regions. It has been reported that ATP7B plays an important role in development of cerebellum. Moreover, this kind of damage appears to be less amenable to reversal through chelation therapy.

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References
Brain shrinkage due to acute hypernatremia

Takeshi Machino, MD; and Toshihiro Yoshizawa, MD, PhD, Ibaraki and Tsukuba, Japan

A 73-year-old man presented with vomiting, tremor, and consciousness disturbance 12 hours after ingesting soy sauce in an attempt to commit suicide. His serum sodium was 188 mEq/L and chloride 142 mEq/L. Serum osmolarity was a high 314 mOsm/kg H₂O. T1- and T2-weighted brain MRI showed symmetric brain shrinkage and subdural fluid collection around the cerebral cortex (figure, A and B). Under a diagnosis of acute hypernatremia due to excessive NaCl intake, we corrected his hypernatremia within the next 48 hours, and his condition improved rapidly. No renal dysfunction was observed. To evaluate brain volume restoration, we repeated MRI 3 weeks after onset. Although some subdural fluid collection appeared to remain, brain volume restored (figure, C and D). Acute hypernatremia shrinks the brain by dehydrating it.¹ Our case shows that reversible brain shrinkage and compensatory widening of the subdural space are hallmarks of brain dehydration.

Disclosure: The authors report no conflicts of interest.

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Figure. (A) T1- and (B) T2-weighted MRI shortly after admission show brain shrinkage and compensatory widening of the subdural space. (B) Subdural fluid collection is clear in this T2-weighted image. (C, D) Restoration of brain volume is shown in MRI follow-up 3 weeks after onset.
Brain shrinkage due to acute hypernatremia
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