A Case of Atypical Wernicke’s Encephalopathy Showing Symmetric Cortical Lesions on MRI

Sook Young Roh, MD, PhD, Hyun-Jeung Yu, MD, Ku-Eun Lee, MD and Hyun Seok Kang, MD
Department of Neurology, Bundang Jesaeng General Hospital, Seongnam, Korea

Background: Magnetic resonance imaging (MRI) is currently considered the gold standard in confirming the diagnosis of Wernicke encephalopathy (WE), with classic findings including symmetric involvement of medial thalami, mammillary bodies and periaqueductal gray matter. MRI revealed symmetric hyperintense lesions in the bilateral frontal cortex on fluid attenuated inversion recovery. A follow up MRI of the brain obtained 13 days after thiamine supplementation showed regression of these signal hyperintensities that involved cerebral cortex. Clinically, the patient’s symptoms recovered rapidly.

Conclusion: The spectrum of MRI changes was broader than those of classic WE. We believe that clinicians should remain aware that WE may present with both typical and atypical findings on MRI.

KEY WORDS: Wernicke encephalopathy · Atypical MRI finding · Cerebral cortex.

Introduction

Wernicke encephalopathy (WE) is a medical emergency resulting from thiamine deficiency, characterized by the clinical triad of mental status changes, ataxia and ocular abnormalities. However, this classical triad occurs in only a minority of WE patients. Magnetic resonance imaging (MRI) represents an important tool in the early diagnosis of WE and may also help distinguish this disease from other neurologic disorders.

In WE, typical MRI findings include the symmetrical involvement of the bilateral medial thalami, mammillary bodies and periaqueductal gray matter, though atypical lesions may also be seen. Atypical MRI findings including involvement of the cerebellum, including the vermis, cranial nerve nuclei, red nuclei, dentate nuclei, splenium and cerebral cortex, almost exclusively occur in nonalcoholic patients and in association with other typical manifestations of the disease. However, several recent studies have suggested that MRI findings may not differ between alcoholic and nonalcoholic patients. Herein we describe an alcoholic WE patient who presented with symmetric frontal cortex signal changes and without any other typical radiologic findings on MRI.

Case Report

A 54-year-old male with a history of chronic alcoholism presented to our hospital with mental status change. He had a very limited oral intake of food due to denture problems for four months. One day ago, generalized tonic clonic seizure was developed suddenly and was followed by postictal aphasia. At the time of initial presentation, the patient’s blood pressure was 146/83 mm Hg, and heart rate was 115 beats/min. No fever, stiff neck, headache or vomiting was noted on the history and physical examination, and no toxin or medication exposure was identified. On subsequent neurologic examination, the patient was markedly confused and demonstrated gait unsteadiness and dysmetria. His pupils were isocoric with prompt light reflex. No focal weakness, sensory changes or abnormal ocular movements were noted. A complete blood count and blood chemistry analysis from that time revealed no abnormalities, with a blood glucose of 98 mg/dL (HbA1c 5.8%). In his nasopharyngeal EEG, normal background rhythm on posterior head was observed and slow waves or epileptiform discharge were not demonstrated. Cerebrospinal fluid analysis revealed no abnormal finding. Nerve conduction velocity and evoked potential study including median and posterior tibial nerve showed normal findings.

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Address for correspondence: Sook Young Roh, MD, PhD
Department of Neurology, Bundang Jesaeng General Hospital, 20 Seohyeon-ro 180beon-gil, Bundang-gu, Seongnam 463-774, Korea
Tel: +82-31-779-0216, Fax: +82-31-779-0897
E-mail: syrohnu@dmc.or.kr
normal finding. Subsequent computed tomography of the brain was unremarkable. Diffusion weighted imaging (DWI) showed symmetric high signal intensities in frontal cortex (Fig. 1A). Fluid attenuated inversion recovery and T2 weighted MRI revealed symmetrical hyperintense lesions involving bilateral frontal cortex and subcortical white matter, especially in precentral gyrus (Fig. 1B), though no enhancement of the mammillary bodies or signal alterations in the medial thalami were observed (Fig. 1C). Given the clinical presentation, history of chronic alcoholism, long-standing malnutrition and neurologic examinations, a diagnosis of WE was reached. The patient was then immediately treated with daily intravenous supplementation with 100 mg of thiamine. Blood thiamine level was taken not until 5 days after treatment and showed within normal range (62.34 ug/L). A follow-up MRI of the brain obtained after 13 days of treatment showed regression of the symmetric T2 high signal alterations previously noted in the frontal cortex and subcortical white matter (Fig. 2). Additionally, the previously noted alterations in mental status and ataxia recovered rapidly and the patient was able to walk unassisted at the time of discharge.

Discussion

Wernicke encephalopathy is important to consider on the differential diagnosis of all patients with acute mental changes, as it is both easily preventable and treatable with early recognition and intravenous thiamine. However, WE likely goes underdiagnosed, as the classic symptoms are only in 16-38% of patients. Moreover, roughly 19% of patients with WE exhibit none of the classic triad at the time of presentation. Although WE remains a clinical diagnosis, MRI is a powerful tool for early diagnosis. In our case, symmetric cortical signal changes on MRI and regression after treatment were suspected of metabolic encephalopathy such as WE.

Not only is thiamine required by the cell membranes to sustain osmotic gradients, it is also involved in both glucose metabolism and neurotransmitter synthesis. The active form of thiamine, thiamine pyrophosphate, is necessary for several biochemical pathways in the brain, as it acts as a coenzyme for a number of enzymes involved in the tricarboxylic acid cycle and the pentose-phosphate pathway. Thiamine-deficient membranes are unable to maintain osmotic gradients, resulting in the swelling of both intra- and extracellular spaces, that is typically occurs in selective, vulnerable regions within 2-3 weeks. Classically, the bilateral medial dorsal thalamic nuclei are affected in upwards of 100% of patients, while the superior vermis of the cerebellum, is involved in about a third of cases. Other affected areas include the periaqueductal region, the pontine tegmentum, the reticular formation of the midbrain, the...
posterior corpora quadrigemina, and the cerebral cortex. In the periventricular regions, not only is the blood-brain barrier physiologically less tight, but a high rate of thiamine-related glucose and oxidative metabolism also occur. The classic MRI findings that occur in WE include symmetric changes in signal intensity in the medial thalamus, mammillary body, and periaqueductal gray matter. Reversible cytotoxic edema is considered the most pathognomonic finding associated with WE. T2 high signal intensities are seen on MRI compared with T1 low signal intensity lesions. Although variable data exist regarding both the appearance of WE lesions on DWI and apparent diffusion coefficient (ADC) transformation, DWI revealed high signal intensities correlated with low signal lesions on ADC image during the acute phase of the disease. While the pathophysiologic mechanisms for the targeting of specific areas in the brain by WE are poorly understood, these areas are known to be characterized by intense thiamine metabolism. Accordingly, the characteristic MRI findings of WE may relate to the maintenance of cellular osmotic gradients that depend entirely on the concentration of the thiamine levels. Nonetheless, these typical pattern of lesions on MRI is observed in only 58% of patients.

In atypical presentations, MRI findings have been reported in the cerebellum, cerebellar vermis, cranial nerve nuclei, red nuclei, dentate nuclei, caudate nuclei, splenium of the corpus callosum, and cerebral cortex, though all of these occurred in the setting of nonalcoholic WE and in association with other classic findings. In a recent review, Zuccoli and Pipitone noted that atypical MRI findings including changes in signal intensity of the cerebral cortex have only been reported in nonalcoholic patient, leading them to conclude that different metabolic pathways may be involved in alcoholic versus nonalcoholic patients. In contrast, other studies have reported several cases of WE occurring in alcoholic patients who exhibited atypical findings of brain MRI, with most recent articles suggesting that MRI findings likely do not differ between alcoholic and nonalcoholic WE patients. Specifically, Ha et al. found that alcoholic WE patients often exhibit alterations in signal intensity in the cerebral cortex and/or contrast enhancement of the medial thalamus and mammillary bodies. Furthermore, contrast enhancement also occurs in the mammillary bodies and medial thalami in both alcoholic and nonalcoholic patients. Here, we report a case of WE in an alcoholic that was associated with secondarily generalized tonic clonic seizure and atypical MRI findings with lesions involving symmetric frontal cortex. No hyperintense lesions were observed in the classic areas such as medial thalami or mammillary bodies. The spectrum of presenting symptoms and MRI findings that occur in WE are largely diverse, as the extent and stage of thiamine deficiency and affected areas vary on an individual basis. The ultimate prognosis and variety of presenting symptoms of WE may be related to the extent of brain involvement. For instance, the cortical involvement occurring in a patient with mental status changes may forebode a poor prognosis. However, our patient’s altered mental status and ataxia resolved quickly after prompt thiamine supplementation, and the T2 high signal changes involving the symmetric frontal cortex that were noted on the initial MRI disappeared rapidly.

Wernicke encephalopathy-associated MRI findings may assist in expediting diagnosis and thus preventing and/or avoiding devastating outcomes. To the best our knowledge, the case presented here did not exhibit the classic findings on MRI, rather only atypical symmetric signal changes affecting the bilateral frontal cortex. As the MRI alterations that occur in WE is surely broader than the prototypic changes, clinicians should be aware that WE may present with both typical and atypical findings.

REFERENCES
