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Hypertensive encephalopathy with atypical MRI leukoencephalopathy affecting brain stem and cerebellum

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Abstract

Reversible posterior leukoencephalopathy syndrome associated with hypertension rarely presents with predominant involvement of the brainstem and sparing of the supratentorial regions. In this study, the clinical and neuroimaging features of a 39-year-old woman with hypertensive encephalopathy and magnetic resonance imaging (MRI) findings localized to pons and bilateral middle cerebellar peduncles were described. Reversible posterior leukoencephalopathy syndrome associated with hypertension rarely shows isolated brainstem and cerebellum involvement, and it is important to be familiar with the lack of correlation between the severity of the radiological abnormality and the clinical status.

Key words: Hypertensive encephaloapthy; Brainstem involvement; MRI; Reversible posterior leukoencephalopathy.

Introduction

Hypertensive encephalopathy is an acute neurological syndrome characterized by severe arterial hypertension, headache, confusion, convulsion, visual disturbances and focal neurological signs. It is included in reversible posterior leukoencephaloapthy syndrome (RPLS) (Thambisetty *et al.*, 2003; Ono *et al.*, 2005). RPLS describes a potentially reversible imaging appearance and symptomatology, and is associated with various causes including hypertension, eclampsia and preeclampsia, immunosuppressive drugs, thrombocytopenic syndromes, and renal failure (Thambisetty *et al.*, 2003; McKinney *et al.*, 2007; Yerdelen *et al.*, 2006; Alehan *et al.*, 2007). The most common abnormality on neuroimaging in this syndrome involves the white matter in the posterior regions of the cerebral hemispheres, especially bilaterally in the parieto-occipital areas. Less commonly, brainstem, basal ganglia, and cerebellum are involved besides the supratentorial white matter areas (Chang & Keane, 1999; de Seze *et al.*, 2000; Morello *et al.*, 2001; Kumai *et al.*, 2002, Thambisetty *et al.*, 2003; Ahn *et al.*, 2004; Cruz-Flores *et al.*, 2004; Karampekios *et al.*, 2004; Ono *et al.*, 2005; Kitaguchi *et al.*, 2005; Fujiwara *et al.*, 2005; Gamanagatti & Subramanian, 2006; Doi *et al.*, 2006). However, isolated brainstem and cerebellum involvement is comparatively rare (Chang & Keane, 1999; Thambisetty *et al.*, 2003; Ono *et al.*, 2005; Gamanagatti & Subramanian, 2006). In the present study, a patient with neurological signs and symptoms and magnetic resonance imaging (MRI) findings localized to pons and bilateral middle cerebellar peduncles was described.

Case report

A 39-year-old woman was admitted to the emergency department with complaints of diplopia, speech disorder, and difficulty in swallowing and walking, once one week. Increased blood pressure (190/110 mmHg), headache, nausea and vomiting had preceded these complaints. The progression of the clinical findings was not described. The patient had a history of arterial hypertension and chronic renal disease (membranoproliferative glomerulonephritis) for 7 years and was treated with an ACE inhibitor 10 mg/day, dipyridamole 225 mg/day, and prednisolone 4 mg every 10 days. On admission, she was conscious and her vital signs included a temperature of 36°C, pulse 86 beats/min, and blood pressure 150/90 mmHg. Neurological examination revealed dysarthria, right sided peripheral facial palsy, minimally limited lateral gaze bilaterally, hyperactive deep tendon reflexes prominent in the lower limbs and severe trunk ataxia. Walking was only possible with help due to severe gait ataxia.

On laboratory tests, the complete blood cell count, erythrocyte sedimentation rate, and C reactive

protein were normal. She had serum blood urea nitrogen of 33 mg/dL, and a creatinine of 2.8 mg/dL. Blood glucose, sodium, potassium, chlorine, calcium, liver function tests, lipid prophile, vitamin B12, folic acid, thyroid function tests were within normal limits. Urine analysis showed 0.9 g/L protein. Hepatitis markers, herpes simplex virus type 1 and 2, Lyme, Ebstein-Barr virus, cytomegalovirus, toxoplasma, HIV, and antinuclear antibody, anti-dsDNA, rheumatic factor and lupus erythematosus cell were negative. Antithrombin III, fibrinogen, protein C, anticardiolipin antibody IgM-G, compleman C3-C4 were within normal limits. The cerebrospinal fluid (CSF) pressure was 230 mmH_2O and biochemical findings of CSF were normal. Oligoclonal band, Brucella, and cytology were negative in CSF.

Cerebral magnetic resonance imaging in axial plan, Flair and T2-weighted images showed hyperintense lesion including pons and bilateral middle cerebellar peduncles. In diffusion-weighted imaging (DWI), minimal hyperintensity was noted, while apparent, and diffusion coefficient (ADC) map was normal ($0.78 \pm 0.13 \times 10^{-3}$ mm2/s) (Fig. 1). MR spectroscopy didn't show any changes compatible with a neoplasm. Cerebral MR angiography, SPECT and carotis/vertebral doppler ultrasongraphy were normal. Echocardiography showed left ventricular hypertrophy and 1/4 mitral and aort deficiency. Ultrasonography of the kidney showed bilateral grade I-II renal disease.

The patient was treated with antihypertensive agents (a combination of an ACE inhibitor and a diuretic) for six days, however, without prominent improvement. Therefore, methylprednisolone pulse therapy (1000 mg/day for 5 days) followed by oral prednisolone (60 mg/day) and decreased gradually was added to the antihypertensive therapy. On the seventh day of these therapies, the neurological findings started to regress. Two weeks later, when she came for control, the neurological examination was

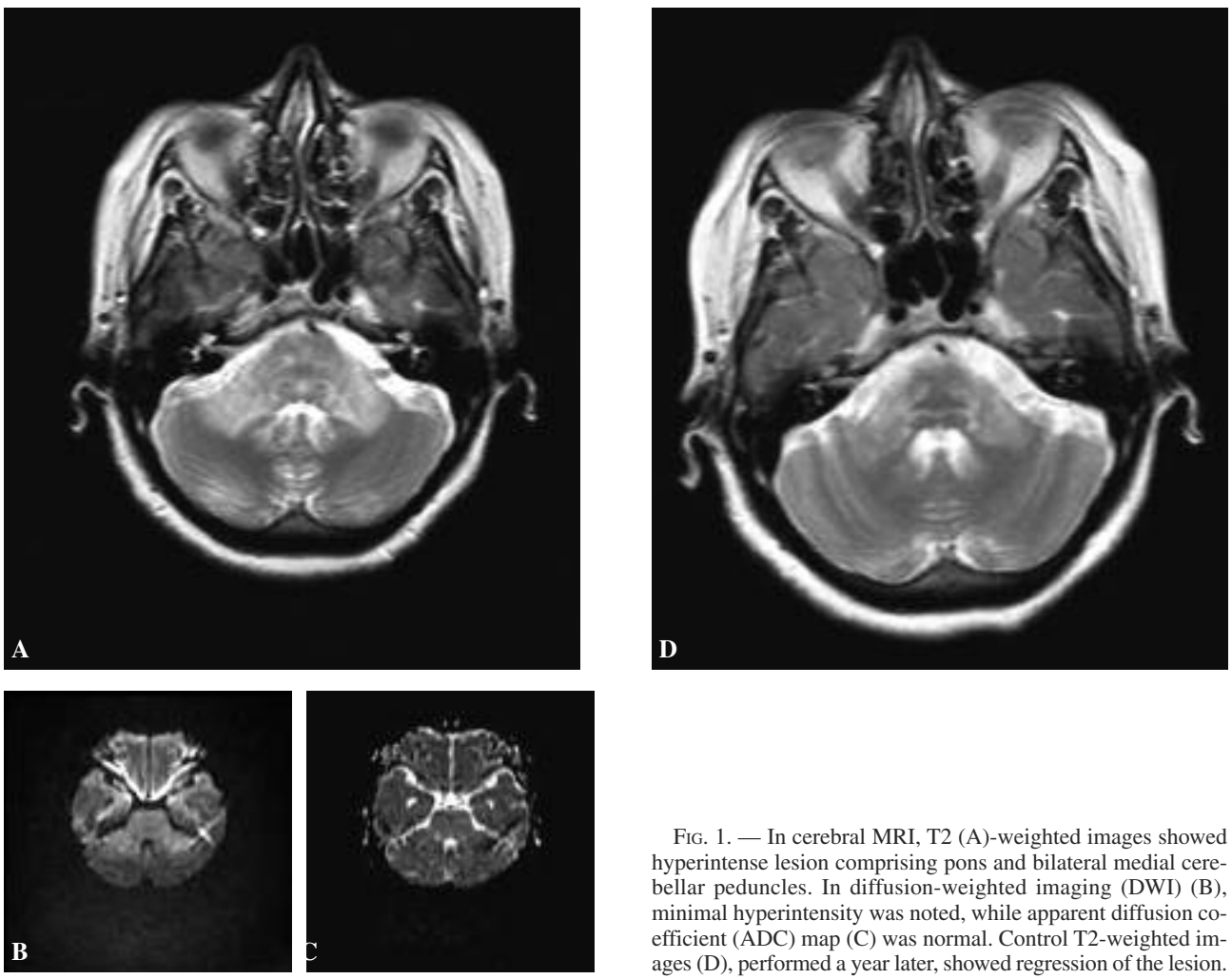

FIG. 1. — In cerebral MRI, T2 (A)-weighted images showed hyperintense lesion comprising pons and bilateral medial cerebellar peduncles. In diffusion-weighted imaging (DWI) (B), minimal hyperintensity was noted, while apparent diffusion coefficient (ADC) map (C) was normal. Control T2-weighted images (D), performed a year later, showed regression of the lesion.

normal. On MRI, repeated 3 months and 1 year later, lesions including pons and bilateral middle cerebellar peduncles showed partial regression.

Discussion

Reversible posterior leukoencephaloapthy syndrome (RPLS) is usually described as reversible leukoencephaloapthy clinically manifested by headache, altered mental status, visual loss and seizure, and it primarily involves the parieto-occipital lobes (Kumai *et al.*, 2002). Main lesions in areas of the brain other than the parieto-occipital lobes have also been reported as atypical manifestations of RPLS (McKinney *et al.*, 2007).

The pathophysiology of RPLS is not entirely understood, but disordered cerebral autoregulation and endothelial damage, and a hyperperfusion state, with blood-brain barrier breakthrough, extravasation of fluid potentially containing blood or macromolecules, and resulting cortical or subcortical edema is suggested for the underlying mechanism (Hinchey *et al.*, 1996; McKinney *et al.*, 2007). Rapidly developing and fluctuating or intermittent hypertension carries a risk for the encephalopathy. Hypertensive encephalopathy is described as an acute condition characterized by headache, visual and consciousness disturbances associated with severe systemic hypertension (Doi *et al.*, 2006).

Our patient applied to us a week after neurological findings had started. Her informed first blood pressure at the beginning of the neurological symptoms was high. Although neurological findings were severe (she could't even sit on the bed without a help because of severe truncal ataxia), her consciousness was never disturbed. On DWI, minimal hyperintensity of lesions was noted, while the ADC map was normal. Also, the lack of correlation between the severity of the radiological abnormality and the clinical status was exclusionary for infarction. Infectious brainstem encephalitis was excluded because of normal CSF findings, and absence of any other findings supporting infectious disease. There was no electrolyte abnormalities at any time during the clinical course to cause central pontine myelinolysis. MR spectroscopy didn't show any changes compatible with a neoplasm. As a result, this patient was diagnosed as hypertensive brainstem encephaloapthy because of the rapid clinical and partial radiological recovery.

The most common abnormality on neuroimaging in RPLS involves the white matter in the posterior regions of the cerebral hemispheres. Involvement of the brainstem, basal ganglia, and cerebellum besides the supratentorial white matter with a few or many periventricular hyperintensities and occipital lobe lesions has been rarely reported (Chang & Keane, 1999; de Seze *et al.*, 2000; Morello *et al.*, 2001; Kumai *et al.*, 2002, Thambisetty *et al.*, 2003; Ahn *et al.*, 2004; Cruz-Flores *et al.*, 2004; Karampekios *et al.*, 2004; Ono *et al.*, 2005; Kitaguchi *et al.*, 2005; Fujiwara *et al.*, 2005; Gamanagatti & Subramanian, 2006; Doi *et al.*, 2006). However, brainstem and cerebellum involvement sparing of the supratentorial regions is very rare (Chang & Keane, 1999; Thambisetty *et al.*, 2003; Ono *et al.*, 2005; Gamanagatti & Subramanian, 2006). The location of the lesions in these reported cases are medulla oblongata and the lower pons, pons and midbrain, pontine tegmentum, and central pons. To our knowledge, our patients's lesion location, pons and bilateral middle cerebellar peduncles, is different from the reported cases. Hypertensive encephalopathy is generally expected to improve with antihypertensive drugs. However, our case didn't show improvement with antihypertensive drugs and prednisolone therapy was given as reported by Doi *et al.* (Doi *et al.*, 2006). The clinical findings improved rapidly, but the radiological findings regressed partially.

In conclusion, we think that atypical imaging manifestations of hypertensive encephalopathy will be more frequently reported by becoming more familiar with the imaging abnormalities which are not concordant with the clinical status.

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