Posterior Reversible Encephalopathy Syndrome in a Pregnant Woman

Ma-Lee Ko[1], Hun-Shan Pan[2,3], Lee-Wen Huang[2,3], Jiann-Loung Hwang[2], Su-Chee Chen[1], Jier-Zen Chang[2]*

[1]Department of Obstetrics and Gynecology, Cathay General Hospital, [2]Department of Obstetrics and Gynecology, Shin-Kong Memorial Hospital, [3]Fu-Jen Catholic University, Medical College, Taipei, Taiwan.

Posterior reversible encephalopathy syndrome (PRES) is a neurologic disorder that affects the occipital lobe and posterior parietal lobes of the brain. In 1996, Hinchey et al first described the syndrome, which is manifested clinically by headache, nausea and vomiting, seizures, visual disturbance, and altered sensorium [1]. It is most commonly associated with a number of clinical conditions, including malignant hypertension, toxemic states of pregnancy and use of immunosuppressive agents. A case of PRES occurring in a pregnant woman with no history of preeclampsia is presented. The clinical course, pathophysiology and imaging features of PRES are discussed.

A 30-year-old primigravida had an isolated incidence of elevated blood pressure (140/90 mmHg), which was measured twice with an interval of 4 hours, during her prenatal check-up at 35 weeks of gestation. Mild proteinuria (+1) was also observed. Ultrasonography revealed oligohydramnios (amniotic fluid index, 5 cm). The patient returned to the hospital at 37 and 38 weeks of gestation and had blood pressure readings within the normal range and an amniotic fluid index of 4 cm. The fetus had an estimated weight within the 10th percentile for gestational age. Persistent oligohydramnios prompted hospitalization for labor induction at 39 weeks. Blood pressure upon admission was 124/80 mmHg. Twelve hours after admission, the patient complained of severe headache. She had no known history of migraine headaches or seizures. Severe headache was then followed by generalized tonic–clonic seizure. Her blood pressure was 150/110 mmHg. The patient was treated with intravenous diazepam (10 mg), hydralazine (10 mg), and magnesium sulfate (2 g). She underwent emergency cesarean section. Placental abruption of more than one-half of the placenta was noted during surgery. Bloody amniotic fluid was also apparent. A 2,500-g female neonate was delivered with 1- and 5-minute Apgar scores of 7 and 8, respectively. Perioperative laboratory studies showed: proteinuria 1+, aspartate aminotransferase 31 U/L, alanine aminotransferase 30 U/L, lactate dehydrogenase 220 U/L, blood urea nitrogen 10 mg/dL, creatinine 1.0 g/dL, and platelet count $200{,}000 \times 10^9$/L.

The following day, the patient regained consciousness but complained of mild headache and blurred vision. Her blood cell count and electrolyte levels were normal. Cerebrospinal fluid analysis revealed a protein level of 44 mg/dL (normal range, 20–45 mg/dL), glucose level of 67 mg/dL (normal range, 50–80 mg/dL), and white blood cell count of 1/mm^3 (normal level, < 6/mm^3). Cerebrospinal fluid culture, throat smear, and blood and urine cultures were negative.

Her neurologic examination showed mild papilledema. Ophthalmologic examination showed best-corrected visual acuity on the Snellen chart of 20/100 in each eye. Compared with someone with no visual acuity impairment (having 20/20 vision on the Snellen chart), an image 20 feet away has to be enlarged five times to be recognized by a person with 20/100 visual acuity. Color vision was normal. Photomotor reflex was present in both eyes, and there was no evidence of afferent pupillary defect. Visual field testing revealed no visual field defects, but the foveal thresholds were clearly reduced, which indicated that the foveae could see only spots of high luminous intensity. Intraocular pressure and slit-lamp examination were normal. Conjunctivitis of both eyes was also diagnosed. Examination of other cranial nerves, both motor and sensory, was normal. However, there were increased tone and exaggerated deep tendon reflexes.

Electroencephalogram showed intermittent generalized slow activity. Initial magnet resonance imaging (MRI) of the brain was performed 2 days after the ictus. During this examination, bilateral hyperintense areas

*Correspondence to: Dr Jier-Zen Chang, No. 95, Wen-Chang Road, Shih-Lin, Taipei 111, Taiwan.
E-mail: M004407@ms.skh.org.tw
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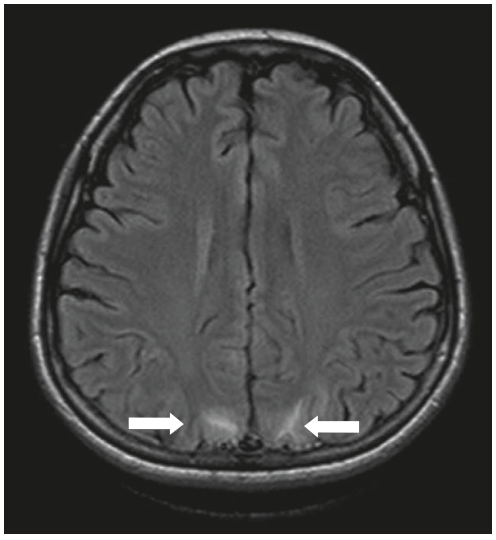

Figure. Fluid attenuated inversion recovery axial image showing hyperintensity involving the cortex of the bilateral occipital areas.

symmetrically located within the occipital region were best demonstrated on coronal T2-weighted images and fluid attenuated inversion recovery (FLAIR) images (Figure).

Her blood pressure was controlled with intravenous labetalol. Seizure prophylaxis (magnesium sulfate) was continued for 48 hours. Her average blood pressure was 130/80 mmHg.

On the seventh day after delivery, the patient was discharged seizure-free, with blood pressure of 120/72 mmHg and markedly improved vision. Repeat MRI, including FLAIR, and electroencephalogram 4 weeks after discharge were unremarkable.

PRES is a recently recognized clinicoradiologic entity characterized by headache, confusion, seizure, abnormalities in visual perception, diminished spontaneity of speech, and altered consciousness [2,3]. Neuroimaging at the height of symptoms shows diffuse edema predominantly of the white matter, which selectively involves the parieto-occipital regions of the brain [4,5].

Hypertensive encephalopathy, toxemia of pregnancy, cyclosporin A toxicity, and uremic encephalopathy are the most common causes of PRES [1,2,4,5–7]. However, more recently, it has been related to pregnancy [8]. Cerebral MRI is the most appropriate method to demonstrate central nervous system abnormalities. MRI FLAIR is more sensitive than standard MRI [4,6]. Typical MRI findings are hyperintense results on T2-weighted imaging and hypointense results on T1-weighted imaging, reflecting cerebral edema [1,2,4,5,9–11]. With MRI FLAIR, the cortical parenchymal lesions are much better demonstrated because of suppression of the cerebrospinal fluid signal.

An important characteristic of PRES is the reversibility of the imaging abnormalities within days after appropriate therapy. However, if appropriate management is delayed (such as the initiation of antihypertensive treatment or discontinuation of immunosuppressive drugs), there is a high risk of permanent neurologic damage secondary to cerebral infarction or hemorrhages [4].

Essentially, the diagnosis of PRES is retrospective. Significant reversal of neuroradiologic abnormalities, along with complete clinical recovery, is suggestive of the diagnosis. As in this case, PRES became apparent only when the patient dramatically improved with antihypertensive and anticonvulsant therapy.

MRI played a decisive role in the diagnosis of PRES, since the patient presented with significant radiologic improvement within a short time. In a study performed by Pande et al, it was concluded that PRES due to eclampsia showed maximal reversibility compared with hypertension and drug-related PRES [5].

The pathophysiology of PRES has been a source of extensive debate among many investigators. Hypertension-induced uncontrolled vasospasm, coupled with autoregulatory failure, leads to hyperfusion and extravasation of fluid into the brain parenchyma because of breakdown of the blood–brain barrier [2,12]. This leakage of fluid from the vasculature is referred to as "vasogenic edema" [12]. An immunosuppressive drug, such as cyclosporin, causes vasculopathy and toxic effects on vascular endothelial cells [3]. The vulnerability of the posterior cerebral circulation compared with the anterior brain circulation may be related to differences in autonomic innervations. Sympathetically mediated vasoconstriction protects the anterior circulation from over-perfusion during acute hypertension and vasospasms secondary to sudden and severe increases in blood pressure or brain ischemia.

Notable in this case were the seizure and blurring of vision being the only major neurologic manifestations of encephalopathy. Also of interest in this patient was the moderate acute elevation in blood pressure (150/110 mmHg) that was documented during the ictus. There was no dramatic blood pressure increase that typifies hypertensive encephalopathy. Moreover, the patient had only one episode of elevated blood pressure (at 35 weeks of gestation). In 1996, Schwartz reported a case of PRES without hypertensive complications [13].

It has been proposed that the fluid accumulation often observed during pregnancy, particularly in the third trimester, may accentuate the increase in development of vascular endothelial permeability in the brain [2]. Consequently, an increase in permeability can be promoted under hypertension. Brain edema, on the other hand, might arise without difficulty in the state of eclampsia.

With appropriate therapy, the prognosis of PRES is excellent despite brain lesions. A clinician should, therefore, be aware of this syndrome, because early recognition can lead to pertinent management and, once prompt treatment is administered, the edematous process can be immediately reversed before it progresses to cause permanent brain injury.

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