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Posterior Reversible Encephalopathy Syndrome after Cesarean Section under Spinal Anesthesia

-A case report-

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A posterior reversible encephalopathy syndrome (PRES) is characterized as headache, altered mental function, seizure, and visual disturbances resulted from vasogenic edema in the brain. A 29-year-old normotensive parturient developed a postural headache two days after the cesarean section under spinal anesthesia. The headache was initially misdiagnosed as a postdural puncture headache (PDPH). The patient experienced generalized seizures four days after delivery. Her blood pressure increased to 170/100 mmHg with mild proteinuria. She developed homonymous hemianopsia two days after the seizures. MRI revealed high signal intensity areas in the posterior temporal, frontal, occipital and parietal white matter. Presuming a diagnosis of PRES, the patient was treated with magnesium sulfate, sodium valproate, and carbohydrate solutions. She was discharged without headache or neurologic deficit on postoperative day 13. When patients present a headache with focal neurological deficits or visual disturbances, the anesthesiologist must consider the possibility of PRES and aggressively treat based on the clinical presentation. **(Korean J Anesthesiol 2007; 52: S 86～90)**

Key Words: posterior reversible encephalopathy syndrome, postpartum.

Reversible posterior leukoencephalopathy syndrome (RPLS), which was described by Hinchey et al.,[1] has unique neuroradiological findings of vasogenic edema in the brain as well as clinical symptoms including headache, altered mental function, seizure, and visual disturbances. RPLS has been associated with renal insufficiency or abrupt increases in blood pressure or immunosuppression. The term RPLS is actually misleading as the condition is not always reversible and is not necessarily confined to the posterior regions of the brain and can affect both white and grey matter. It has also been described as occipital-parietal encephalopathy and alternatively posterior reversible encephalopathy syndrome (PRES).[2-4] It is important to recognize the condition early so that control of blood pressure can be instituted quickly in order to prevent further brain damage. The posterior reversible encephalopathy syndrome (PRES) is an under-recognized disorder and its incidence increases with the frequent use of magnetic resonance imaging (MRI).

We report a case that was initially misdiagnosed as a postdural puncture headache (PDPH). The patient experienced generalized seizures and left homonymous hemianopsia. The PRES was later diagnosed by magnetic resonance imaging (MRI).

CASE REPORT

A 29-year-old, primigravida parturient (weight 65 kg, height 165 cm) in labor was scheduled for an emergency cesarean section at 40 weeks and 2 days' gestation due to failure of the progress. She had no proteinuria, peripheral edema, or neurologic symptoms including seizures during pregnancy. She did

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not have chronic hypertension and the blood pressure was consistently normal throughout her pregnancy. Her preoperative biochemical and hematological investigations were all within the normal ranges.

Upon arrival in the operating room, her blood pressure was 110/70 mmHg with a heart rate of 75 beats/min. Following rapid administration of 500 ml of Ringer's lactate solution intravenously, spinal anesthesia was easily performed in the left lateral decubitus position at the L_{3-4} interspace with a midline approach using a 25-gauge Quincke needle. Bupivacaine 0.5% 2 ml was administered after confirmation of free flow of cerebrospinal fluid. The level of anesthesia was T_3 after 10 min. Oxygen 5 L/min was administered by mask.

Surgery was uneventful and a healthy infant was delivered. His weight was 3,435 g and Apgar scores at 1 and 5 min were 9 and 10, respectively. The maternal blood pressures were well controlled, and no vasopressor drug was used intraoperatively. For postoperative pain control, fentanyl was administered by intravenous patient-controlled analgesia.

Early on postoperative day 2, the patient developed a postural headache in the frontal and occipital region. Conservative therapy for PDPH was initiated; replacement of Hartman's solution, bed rest, and oral Ibuprofen 400 mg repeated, but the symptoms were not relieved. An epidural blood patch (EBP) at L_{4-5} using 12 ml autologous venous blood was undertaken but with little effect on the headache. Twelve hours after the first EBP, the headache was aggravated and another EBP was performed with same volume at the same site. On the morning of the postoperative day 3, her blood pressure and heart rate were 120/80 mmHg and 80 beats/min, respectively. She was clearly conscious and had no neurological deficits but still complained of a severe postural headache. The epidural blood patch using 15 ml venous blood was repeated by another anesthesiologist without doing further investigation, resulting in a slight reduction in her headache.

On the postoperative day 4, generalized tonic-clonic seizures occurred for a few minutes, and she was intubated for the airway management and treated with i.v. thiopenthal sodium 200 mg, diazepam 10 mg, and midazolam 3 mg. She became alert and oriented within several minutes. Her blood pressure, heart rate and body temperature were 170/100 mmHg, 72 beats/min, and 36.8°C, respectively. The hematologic examination showed a low RBC of $3.78 \times 10^6/mm^3$, a low hemoglobin level of 11.8 g/dl, and a low hematocrit of 35.1%. The abnormal biochemical analysis findings were a low protein level of 5.4 g/dl, a low albumin of 2.8 g/dl, a high alkaline phosphatase of 124 IU/L, a high triglyceride of 566 mg/dl, and a high total lipid of 1,069 mg/dl. A routine urine examination revealed a trace of proteinuria. All neurological examinations including the higher cortical function, sensory and motor function, cerebellar function, gait and posture tests were negative at that time. The cranial nerve functions were intact, but she had mild neck stiffness. The CSF showed a normal protein (28.2 mg/dl), a normal glucose (47 mg/dl), and a normal chloride level (30.9 mEq/L). The brain computed tomography (CT) findings were normal. However, the MRI on the same day revealed high signal intensity areas in the posterior temporal, frontal, occipital and parietal white matter

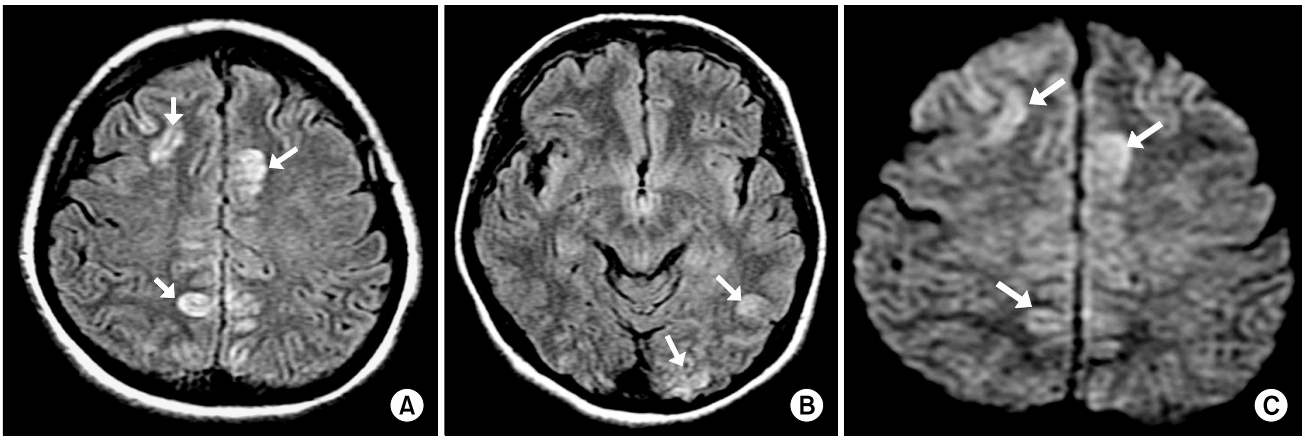

Fig. 1. Brain magnetic resonance images performed after the seizure on postoperative day 4 are presented. On FLAIR, the images of frontal-parietal (A) and temporal-occipital area (B), and the diffusion-weighted images of frontal-parietal area (C) demonstrate hyperintense lesions (arrows) of white matter.

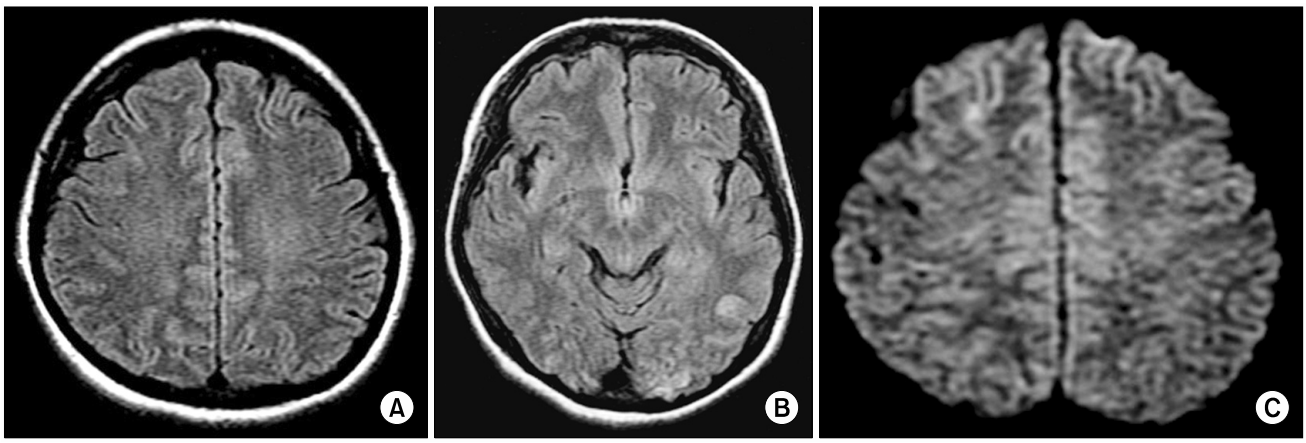

Fig. 2. MR imaging on postoperative day 10 shows dramatic improvements in the hyperintense lesions. On FLAIR, the lesions of frontal-parietal (A) and temporal-occipital area (B), and the diffusion-weighted images of frontal-parietal area (C) are nearly disappeared.

(Fig. 1). With a presumed diagnosis of hypertensive encephalopathy, magnesium sulfate and sodium valproate, as an anticonvulsant were administered.

On the postoperative day 6, she developed left side homonymous hemianopsia but her headache was slightly improved. No abnormal finding was noted on the electrocardiogram and electroencephalogram. Her blood pressure, heart rate and temperature were 130/80 mmHg, 72 beats/min, and 36.2°C, respectively.

On postoperative day 7, cisternography showed normal CSF migration without evidence of CSF leakage. The headache was significantly reduced and blood pressure was controlled. The MRI on postoperative day 10 showed dramatic improvements of the hyperintense lesions (Fig. 2). The irbesartan (Aprovel®) was replaced to magnesium sulfate to control the blood pressure. Her blood pressure was 141/93 mmHg and her headache had disappeared without any neurological deficit and she was discharged on postoperative day 13.

DISCUSSION

The headache can have many causes when presenting in the postpartum period after regional anesthesia. It may be a non-specific headache simply due to tension and anxiety following the delivery. More serious causes include meningitis, encephalitis, preeclampsia or eclampsia, PDPH, ischemic and hemorrhagic strokes, cerebral venous thrombosis, and cerebral artery dissection. Prompt diagnosis and treatment for any of these is crucial.

PRES is characterized by headache, seizures, confusion and visual disturbance.[2,5] Other focal neurologic deficits are uncommon. Seizures, which might begin focally, are usually generalized tonic-clonic and often multiple.[2] It might be associated with visual phenomena such as visual loss and hallucinations to suggest occipital lobe origin. Other visual abnormalities include hemianopia, visual neglect, blurred vision and cortical blindness. Clinical examination invariably shows normal papillary reflexes and fundoscopic findings. Deep tendon reflexes might be brisk. The particular lab findings are uncommon. In our case, there was initially no doubt that PDPH was the etiology of the postural headache. The unremarkable laboratory findings and the confusing histories might be the cause of delayed diagnosis in our case.

An abrupt and severe increase in blood pressure, usually above the limit of diastolic pressure $>$ 130 mmHg, is the leading mechanism of PRES due to hypertensive encephalopathy.[6,7] Although many researchers believe that hypertensive encephalopathy is the cause of PRES, however, there have been reports of cases of PRES without any hypertensive complications and a delay of up to 24 h between the hypertensive crisis and development of symptoms.[2,4,5,7,8] Fujiwara et al.[9] postulated two hypotheses to understand the emergence of PRES without an elevation of the systemic blood pressure. The first suggests that vasogenic edema in the brain might develop easily under immunotolerant conditions as a result of hormonal changes during peripartum or immunosuppressants. The second hypothesis suggests that an increase in blood pressure, which effectuates fluid leakage through the capillary walls into the brain interstitium, cannot be detected because it is extremely acute and transient. The

acute symptoms of this syndrome, such as seizure or syncope, are probably the result of a fluid shift to the interstitium caused by an increase in blood pressure, and the subacute symptoms, such as headache, blindness, or other neurological deficits, are due to brain edema, in which time the systemic blood pressure normalizes.

The blood pressure at the onset of PRES in eclamptic women have been also reported to be approximately 150/100 mmHg, and it was not so high.[10-12] Furthermore, the clinical signs and symptoms of preeclampsia in the postpartum period tend to be less pronounced than in the antepartum period. Mattar and Sibai[13] reported that women with eclampsia after delivery had lower blood pressures, minimal proteinuria, and a significantly higher incidence of neurological deficits than those with earlier-onset eclampsia. Our patient was normotensive without proteinuria until the time of seizure. With preeclampsia, there is insufficient time for an upper shift in the autoregulatory curve of the cerebral blood flow. In such circumstances, PRES may occur during relatively acute but modest increase in arterial pressure. Zunker et al.[14] reported that even with a moderate increase in the systemic blood pressure, the intracranial arterial blood flow velocities of preeclamptic women were pathologically increased.

Advanced MRI techniques, such as echo-planar diffusion-weighted images and apparent diffusion coefficient maps, make it possible to differentiate the edema from other pathologic states.[7,10] Unfortunately, in this case, there was no attempt to develop a differential diagnosis before the repeated blood patches for the treatment of her presumed PDPH.

Regarding therapeutic strategies, a reduction in blood pressure and seizure control are essential. Traditionally, the first line treatment for PRES and eclampsia has been magnesium sulfate, which stabilizes the neurons and relaxes the smooth muscle.[15,16] The action of magnesium will treat both seizures and hypertension. Magnesium therapy should be initiated as soon as eclampsia or PRES is considered. The serum magnesium levels and the clinical signs of hypermagnesemia, such as respiratory depression and hyporeflexia, should be closely followed. Eclamptic seizures are managed with benzodiazepines and phenytoin, but with less success than magnesium.[17] Further treatment including hydralazine, labetalol, and nitroprusside are recommended if the systolic blood pressure remains greater than 160 mmHg or the diastolic blood pressure greater than 105 mmHg.[18] The cerebral edema usually resolves with treatment for the hypertension. However, transtentorial herniation has been reported.[19] More aggressive measures may be warranted in the case of impending herniation. When patients present with a focal neurologic deficit, a CT scan must be performed in order to rule out a hemorrhagic or ischemic stroke. However, the CT scan is rarely abnormal and MRI is the imaging modality of choice.

In conclusion, when patients present a postural headache with a focal neurological deficit or a visual disturbance even without the history of hypertension, we should consider the possibility of PRES and aggressively treat based on the clinical presentation. Prompt and pertinent strategies of treatment may reverse the edematous process before it progresses to permanent brain injury.

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