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CASE REPORT

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Posterior reversible encephalopathy syndrome (PRES) on the second postpartum day: learning experience from a case report and literature review

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Abstract

Background Posterior reversible encephalopathy syndrome (PRES) is an uncommon neurological disorder which is characterised by variable symptoms. The transient clinical condition may be underestimated and misdiagnosed as other conditions, especially, among pregnant women with severe preeclampsia, eclampsia, and HELLP (hemolysis, elevated liver enzymes, and low platelets) syndrome in the puerperium. We hereby contribute to the literature this rare complication and hightlight the appropriate management of PRES .

Presentation case A pregnant woman (gravida 3, parity 2) had a normal antenatal course. However, she was diagnosed with severe preeclampsia and HELLP syndrome at 29 weeks and 5 days of gestation. Therefore, she was indicated for a medical termination of pregnancy following a patient's consent at our tertiary referral hospital. Severely, the patient developed rapidly with altered mental health in early puerperium. In result, PRES was diagnosed based on a brain magnetic resonance imaging (MRI) evidence with typical findings. After a strict multidisciplinary management, the clinical condition improved after 5 days of onset and recovered completely after a 4-month follow-up without any sequelae.

Conclusion In summary, despite its rarity, clinicians ought to be knowledgeable and raise an aware of PRES during pregnancy. Importantly, a brain imaging modalities should be taken into account among pregnant women with neurological symptoms subsequent to severe preeclampsia. In addition to early diagnosis, a timely appropriate treatment with multidisciplinary team is strongly indicated. Further studies with a large case series are required for this uncommon entity.

Keywords HELLP syndrome, Maternal mortality, MRI, Neurology, Preeclampsia, PRES

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Introduction

Posterior reversible encephalopathy syndrome (PRES), also known as reversible posterior leukoencephalopathy syndrome defined as the clinical-neuro-radiological disorder of the brain [1, 2]. This rare syndrome may be observed in pregnant women and non-pregnant women. In general, the pathology develops with pregnancy-related hypertensive disorders during the antepartum or postpartum course. The incidence of PRES during pregnancy has not yet been documented. This syndrome was noted in young women and the primigravida is more related to PRES [3].

Among severe forms of preeclampsia, PRES relates to endothelial dysfunction accompanying with disruption in the blood-brain barrier resulting in cerebral edema, vasogenic edema, and cerebrovascular autoregulatory dysfunction [1]. Nevertheless, among patients without preeclampsia, underlying pathophysiology remains unknown. Other conditions could induce the onset of PRES including systemic lupus erythematosus, chronic renal failure, rheumatoid arthritis, immune suppressive medications, anti-neoplastic agents, severe hypercalcemia, thrombocytopenic syndromes, Henoch-Schonlein purpura, hemolytic uremic syndrome, amyloid angiopathy, various causes of renal failure, regional anesthesia, sepsis, toxic agents, especially chemotherapy, and drugs such as cocaine, methamphetamine [4, 5].

The clinical manifestations of PRES develop secondary to cerebral edema and is associated with various clinical conditions [6]. According to Wen et al., the common symptoms were headache (81%), generalized tonic-clonic seizures (73%), altered mental status (57%), nausea/vomiting (47%) and visual disturbance (33%) [7].

According to hallmark signs, cranial radiologic evidence shows cerebral edema in the posterior parts of the brain. The lesions encounter parieto-occipital white matter changes with vasogenic edema. Computed tomography scan (CT scan) and magnetic resonance imaging (MRI) plays a potential role in assessing this syndrome [8, 9]. Typical findings include reversible, symmetrical, posterior subcortical vasogenic edema [10]. An early diagnosis helps in a timely treatment. An appropriate management facilitates the favorable outcomes and reduces the recovery time without a sequelae [1]. However, the data concerning PRES among pregnant women in postpatum course are still limited [7, 11]. Herein, we report a rare case of PRES in a pregnant woman after an early termination of pregnancy with a successful management.

Presentation case

A 31-year-old pregnant woman (gravida 3 parity 2) was transferred to our tertiary referral hospital due to HELLP (hemolysis, elevated liver enzymes, and low platelets) syndrome subsequent to severe preeclampsia. According to the estimated due date of ultraound in the first trimester, the gestation age was 29 weeks and 5 days. Her obstetric history was uneventful with two vaginal births. The patient denied to have a high blood pressure before and during this pregnancy as well as other diseases and the use of drugs. At the local hospital, her blood pressure was measured at 200/120 mmHg. Immediately, the patient was given with antihypertensive drug by intravenous (IV) infusion of nicardipine (10 mg/10 ml) along with 40 ml glucose 5%. A 5-ml bolus dosage was administered and IV infusion of 7.5 ml/h was maintained. Her blood pressure was checked every 30 min to avoid the pharmacological-induced hypotension. The patient was recorded with dyspnea and the respiratory frequencies were noted 23 times per minute. The peripheral oxygen saturation (SPO2) was 93% and increased to 98% by mask-delivered oxygen therapy setting at 6–8 L per minute. Her pulse rate was 90 beats per minute. Her body temperature was 37 degrees Celsius. The urine bag collected approximately 80 ml of transparent yellow urine in 3 h. The patient complained of mild headache and epigastric pain. Her vision was normal. Five days before hospitalization, the patient was recorded with cough up phlegm. The color of mucus was clearly green without blood. This symptom appeared before the new onset of hypertension. Pulmonary auscultation was noted with decreased bronchial breath sounds, crackles, and egophony. The pneumonia was initially suspected, however the pulmonary edema could not also be excluded completely.

During hospitalization, her vital signs were remarkable (Table 1). Edema was found in the lower limbs. The patient was administered extensively with nicardipine for hypertensive management and magnesium sulfate (MgSO4) for prevention of eclamptic seizures. Both continuous intravenous medicaments were administered using an electronically controlled infusion pump. At admission, the assessment of renal function test was normal, except for a serum acid uric of 509 (µmol/l). The lactate dehydrogenase (LDH) concentration was measured at 2514 U/L. Glycemia was normal. The coagulation profile showed a weakly contractile blood clot. Other laboratory tests are shown in Table 1. The transmitted disease tests including hepatitis B surface antigen (HBsAg), human immunodeficiency virus infection (HIV), and treponema pallidum test were negative. Her uterine parameters showed proteinuria of 3.0 g/l, albumin>150 mg/l, albumin/creatinine ratio≥33.9 (16.95) mg/mmol, and protein/creatinine ratio≥55 mg/mmol. Ultrasound scan showed a small-for-gestational-age fetus weighing 1180 g, percentile 5th compared to Hadlock, and decreased cerebroplacental ratio (CPR) index. Additionally, US findings revealed intra-abdominal fluid collection located at the liver-kidney cavity space of 27 mm

Table 1 Characteristics of the patient

Characteristics		Reference value	At hospitalization	Before surgery	First day after CS	Second day after CS	Third day after CS	After 4 days from the onset
Clinical symptoms	General status	Unremarkable	Remarkable	Remarkable	Average	Altered	Deteriorated	Normal
	Blood pressure at maximum (mmHg)	< 140/90	200/100	160/90	154/105	118/77	131/86	128/88
	Pulse rate (bpm/min)	< 90	90	121	99	118	100	100
	Respiratory rate (beats/min)	< 18	23		20	25	29	20
	SPO2 (%)	95–100	93	94	98	88–92	98	99
	Body temperature (degree Celsius)	36–37	37.0	37.0	36.5	37.0	37.1	37.0
	Symptoms	None.	Headache and epigastric pain.	Headache and epigastric pain.	-Gum hemorrhage -Subcutaneous hemorrhage on the right hand.	-Blurred vision -Tired.	-Confusional state. -No response to stimulation -Glassgow of 3 points.	Unremarkable.
Laboratory tests	PLT (10^9/L)	172–378	41	46	214	203	180	201
	Hemoglobin (g/L)	108–164	126	132	93	89	86	95
	Hct (L/L)	0.35–0.51	0.373	0.384	0.274	0.252	0.263	0.281
	WBC (10^9/L)	3.37–8.38	15.06	13.07	21.46	22.7	17.2	12.49
	Neu (%)	39.8–70.5	85.7	84.1	88.1	84.1	81.5	65.7
	AST (SGOT) (U/L)	< 35	1325	-	165.8	70.24	-	-
	ALT (SGPT) (U/L)	< 35	600	-	167.6	102.10	-	43.01
	Total bilirubin (µmol/L)	< 15	76.17	-	24.24	11.99	-	64.86
	Direct bilirubin (µmol/l)	< 5	34.86	-	9.19	7.80	-	
	Albumin (g/l)	35–52	30.11	-	-	27.03	27.1	28.22
	Protid		62.88					
	Na+	136–146	133.4	-	126	128.9	136	138.5
	K+	3.4–4.5	3.54	-	2.9	4.29	3.78	3.20
	Ca++	2.20–2.65	2.17	-	0.63	1.78	1.62	2.04
	$Chlorid^-$	101–109	100.7	-	-	95.9	103.8	102.9
	Mg++	0.77–1.03	2.17	-	-	2.88	2.30	0.66
Management	Obstetric indication	Monitoring.	IOL and CS due to non-assuring FHR.	Postoperative follow-up at reanimation room.	Postoperative follow-up at reanimation room.	Postoperative follow-up at reanimation room.	Consultation with a neurologist and requiring a MRI.	Postoperative follow-up at ward.
	Medical treatment	-Anticonvulsive (MgSO4) -Antihypertensive (Nicardipine) -Antibiotic (cephotaxin, vinphacin)	-Anticonvulsive (MgSO4) -Antihypertensive (Nicardipine) -Antibiotic (cephotaxin, vinphacin)	-Anticonvulsive (MgSO4) -Antihypertensive (Nicardipine) -Antibiotic (cephotaxi, vinphacin)	-Anticonvulsive (MgSO4) -Antihypertensive (Nicardipine) -Antibiotic (cephotaxin, vinphacin) -Oxygen support via cannula	-Maintenance of Anticonvulsive -Antihypertensive -Antibiotic modification (imipenem, levofloxacin) - Oxygen support via cannula	-Antiepileptic therapy including haloperidol 2 mg twice a day and levetiracetam 500 mg twice a day.	-Antiepileptic Haloperidol 2 mg twice a day -Levetiracetam 500 mg twice a day

ALT: alanine aminotransferase, AST: aspartate transaminase, CS: cesarean section, FHR: fetal heart rate, IOL: induction of labor, MgSO4: magnesium sulfate, MRI: magnetic resonance imaging, PLT: platelet, Hct: hematocrit, SGOT: serum glutanic-oxaloacetic transaminase, SGPT: serum glutamic pyruvic transaminase, WBC: white blood count

and colon cavity space of 34 mm. Her electrocardiogram (ECG) showed a tachycardia. The chest X-ray revealed a pulmonary opacification without pleural effusion and fluid collection in the left lung on the first day and throughout both sides of the lung on the second day. The image suggested a pneumonia rather than an acute pulmonary edema.

In the present case, the patient was initially diagnosed with HELLP syndrome secondary to severe preeclampsia. The anticonvulsive, antihypertensive, and antibiotic therapy was immediately administered. After the first dose of fetal lung maturation therapy with corticosteroid administration, the termination of pregnancy was indicated with induction of labor using Foley balloon catheter insertion. However, due to non-reassuring fetal heart rate, the pregnant woman underwent an emergent cesarean section under general anesthesia. The patient received one packed platelet (6 units, 40 ml/unit) before surgery. The amniotic fluid collection was 100 ml and the estimated blood loss was 300 ml. IM Oxytocin 10UI was used for the uterotonic and 40UI-oxytocin-IV infusion maintenance and IM-Duratocin 100 mcg was used for the prevention of postpartum hemorrhage (PPH). The female neonate was 950 g in weight and recorded 5 points at 1 min and 7 points at 5 min. The newborn was sent to the neonatal intensive care unit (NICU).

The second day after cesarean delivery, the hemodynamic condition and laboratory tests were stable, except for low hemoglobin levels. The arterial blood gas result showed a normal acid-base balance. Procalcitonin was at 1.3 ng/ml. The patient was noted with apyrexia. Urine output was within normal limits. However, the patient developed rapidly mental disorders with headaches, altered sensorium, visual disturbances, and other focal deficits. On day postoperative 4, the patient received one unit of red blood cell packed transfusion (350 ml), the blood group of B+.

A consultation with a neurologist was required and brain magnetic resonance imaging (MRI) was performed. The neuroimaging findings revealed chronic sinusitis and otomastoiditis. Noticely, MRI demonstrated an homogenous low- to iso-signal intensity on T1-weighted images and diffuse symmetrical high-signal intensity lesions on T2 weighted image (T2WI) and T2 Flair involving white matters of bilateral parieto-occipital lobes and lenticular nucleus suggestive of PRES (Fig. 1). No mass lesion was detected at cerebellum and brainstem on T1WI, T2WI, and T2 Flair. Using three-dimensional time-of-flight

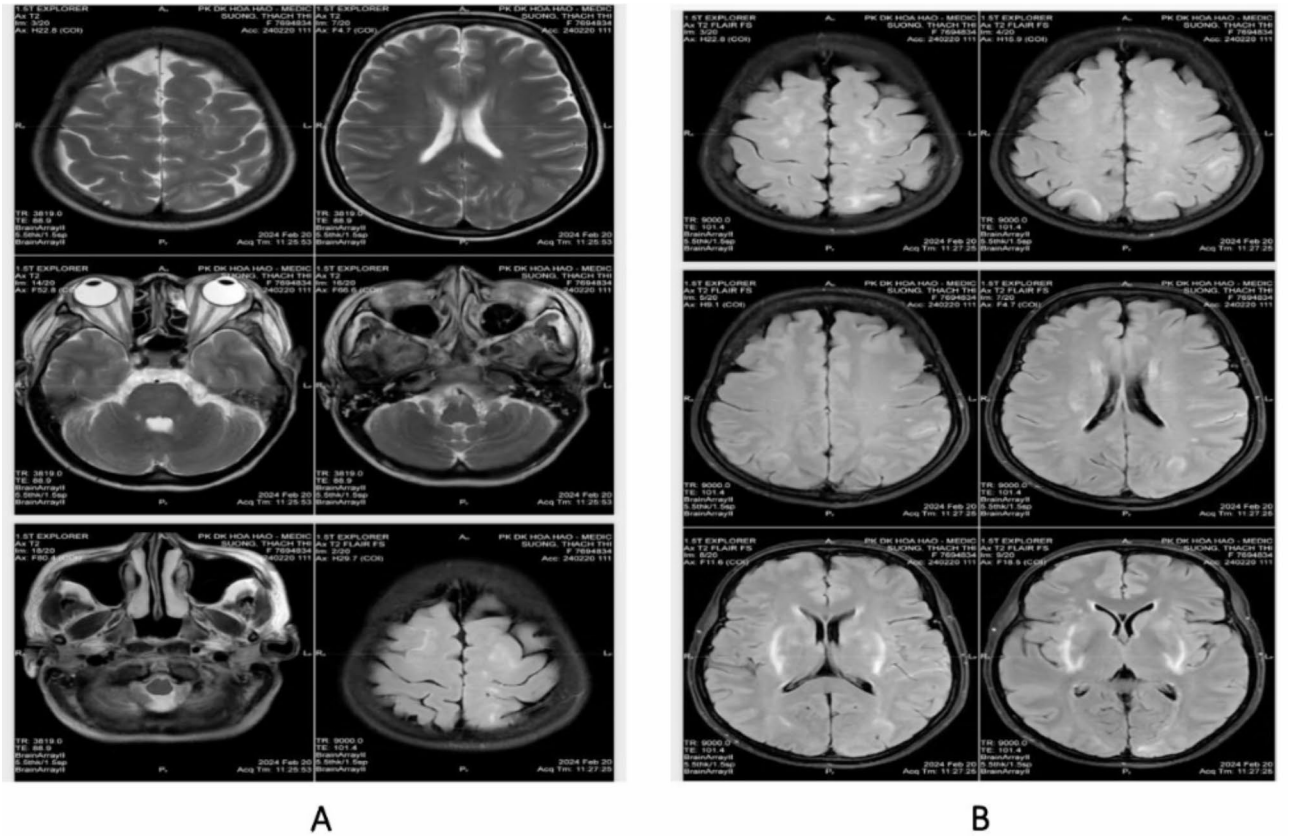

Fig. 1 The axial plane of brain MRI shows the chronic sinusitis and otomastoiditis (**A**) and the symmetrically cortical and subcortical lesions implementing the white matter structures of bilateral parieto-occipital lobes and lenticular nucleus demonstrates typical damages of PRES in the present case (**B**)

(3D-TOF) MR angiography, no arteriovenous malformation was oberved. Immediately, the treatment was started with oral antiepileptic drugs including haloperidol 2 mg twice a day and levetiracetam 500 mg twice a day. The patient recovered gradually and the clinical condition improved after 5 days of a strict managment. The patient was monitored for 3 months without neurological permanent damage.

Discussion

In this pregnant woman, the patient had sufficiently the criteria for early-onset preeclampsia before 34 weeks of gestation including a pregnancy-related hypertension ≥ 140/90 mmHg measuring at many timepoints and a proteinuria ≥ 300 mg/24 hour. Importantly, the HELLP syndrome was also identified with impaired liver function and thrombocytopenia [12].

Particularly, the patients was noted with abnormal lung sounds, a low saturation of peripheral oxygen (SpO2) of 93% and an imaging of patchy alveolar infiltrates on the chest X-ray. These characteristics may be overlapped with acute pulmonary edema in severe preeclampsia and should be firstly excluded. However, the SpO2 increased rapidly to 98% with oxygen support. This well-responded feature may be different from acute respiratory distress relating to pulmonary edema. The sudden manifestation of lung edema develops rapidly since alveoli filled with fluid that requires alternatively a high-flow oxygen therapy, continuous positive airway pressure delivered by face mask, even intubation and mechanical ventilation [13–15]. In severe preeclampsia, the underlying mechanism of pulmonary edema is due to increased capillary hydrostatic pressure. Therefore, hypertensive therapy and diuretic agent should be used in this hemodynamic disorder [16]. Whilst, the chest X-ray did not reveal an abnormal accumulation of fluid in the lung. Moreover, the pregnant woman had a cough symptom with green phlegm before the onset of hypertension. Although the patient was afebrile, the blood count test before surgical intervention showed a high white blood count of 15.06×10^9/L and neutrophile of 85.7%. Therefore, these changes suggested an infectious manifestation originated from the lung.

Classically, a clinical presentation with seizures and focal neurological deficit in puerperium has a wide differential diagnosis. Until 2019, the literature included 47 cases implementing on the posterior reversible encephalopathy syndrome (PRES) in pregnancy [3]. This transient clinical condition is not well known and probably underdiagnosed. The symptoms may be indistinguishable and shared with preeclampsia. In 2022, among 53 pregnant women with preeclampsia and eclampsia, Bahadur et al. found that 12 patients were diagnosed with eclampsia and developed to PRES. Among 12 patients suspected of PRES on the clinical aspect, 9 cases had evidence on the imaging tool. Eclampsia was found in the independent predictor of PRES (odds ratio, OR 20.9; 95% confidence interval, CI 3.0-147.0, $p=0.02$) [17].

In 2023, Tawati et al. found 200 cases relating to preeclampsia and eclampsia. Among 342 women with eclampsia who had neuroimaging, 176 cases (51.4%) were diagnosed with PRES. Of 121 pregnant women with severe preeclampsia, 24 cases (19.8%) had PRES [18]. Almost all cases of PRES occur predominantly among women accompanying with gestational-induced hypertension disorders. However, PRES could also be presented in a pregnant woman without hypertension [19].

In our case, the patient was initially suspected of the neurological complications after a severe preeclampsia. However, the hypertension and laboratory tests were stable after the termination of pregnancy following the context of severe preeclampsia. Therefore, a different diagnosis of brain damage was made and an MRI was indicated immediately after an interdisciplinary consultation. The diagnosis of PRES was identified by specific images in associated with posterior-circulation predominant vasogenic edema [5]. Accordingly, involving regions consists of frontal lobe (72%), temporal lobe (67%), basal ganglia (50%), cerebellum (47%), brain stem (14%), and thalamus (8%). In addition, atypical neuroimaging findings included restricted diffusion (33%), contrast enhancement (19%), and hemorrhage (19%) [7].

Although the gold standard of PRES diagnosis is brain autopsy, this is only performed after the patient's death. Some factors enhanced the development of PRES in the present case including severe preeclampsia, HELLP syndrome, and pulmonary infection. These comorbidities have been demonstrated in the literature [7].

Seriously, a permanent brain damage can occur if the diagnosis and treatment are delayed [20]. A proper management with multidisciplinary care is strongly recommended in this pathology [10]. In addition to hypertensive treatment, antiepileptic and anticonvulsive therapies are highly effective in this syndrome (Table 2).

Table 2 Summary of PRES in pregnancy in the last 5-year literature

Authors, year, country	Maternal age	Gravida, Parity	GA	History of disease	Symptoms	Diagnosis on MRI/CT scan	Timepoint of onset	Interventions	Treatment time	Recovery time	Outcomes
Marcoccia et al., 2019, Italia [3]	21 yo	Primigravida.	39w.	Healthy.	Hypertension, severe headache and generalized tonic-clonic seizure, alertness, mydriasis, and decrease in visual acuity, bilateral blindness.	Bioccipital foci of high signal intensity involving the cortex and subcortical white matter with normal DWI.	On the first day after CS for breech presentation.	-Antiepileptic + Antihypertensive treatment -Mannitol	In 24 h.	On day postoperative 10.	No ophthalmological and neurological permanent damage persisted after 1-year follow-up.
	29 yo	Primigravida.	40w3d.	Healthy.	Severe headache, hypertension and a generalized tonic-clonic seizure.	Cerebellar and occipital foci of high signal intensity involving the cortex and subcortical white matter with normal DWI.	Early puerperium.	Phenytoin urapidil and alfametildopa.	In postpartum day 7.	-	Alive.
	43 yo	G1P0.	37 w.	-Gestational hypertension. -Gilbert's syndrome.	-Headaches. -Severe epigastric pain. -Generalized tonic-clonic seizure.	Cortical and subcortical hyperintense lesions in both cerebellar lobes with elevated diffusion and no angiopathy.	Five hours after delivery.	-Diazepam. -MgSO4.	In 24 h after the onset.	20th day after delivery.	Total recovery.
Zhang et al., 2022, China [19]	32 yo	Primigravida.	25w4d.	Healthy.	Intermittent headache, hearing loss, memory loss mental and behavioral disorder, and blurred vision for 1 month.	Diffuse symmetrical high-signal intensity lesions in the white matter, medulla oblongata, without enhancement.	Second trimester.	-Treatment with mannitol, dexamethasone (10 mg/d), and low molecular. -Termination of pregnancy by CS.	On the day of admission.	Complete recovery at postoperative 6 months.	Alive without any neurological sequelae.

Table 2 (continued)

Authors, year, country	Maternal age	Gravida, Parity	GA	History of disease	Symptoms	Diagnosis on MRI/CT scan	Timepoint of onset	Interventions	Treatment time	Recovery time	Outcomes
Katwall et al., 2023, Nepal [18]	30 yo	G3P2.	38w.	Gestational hypertension.	Sudden headache.	Bilateral frontoparietal white matter edema, consistent with PRES.	After vaginal delivery with IOL 1st day of postpartum.	-Analgesics. -Close monitoring.	In 24 h.	Within a week.	Recovery.
Our indexed report	31 yo	G3P2.	29 w 5 d.	None.	-Blurred vision. -Mental disorders.		After the first day of CS.	Antiepileptic.	In 24 h after onset.	After 5 days.	Alive Recovery without sequelae.

CS: cesarean section, *D: day*, *DWI: Diffusion Weighted Images*, *IOL: induction of labor*, *MgSO4: magnesium sulfate*, *MRI: magnetic resonance imaging*, *PRES: posterior reversible encephalopathy syndrome*, *Yo: years old*, *W: week*

Conclusions

In the puerperium, posterior reversible encephalopathy syndrome (PRES) is an uncommon pathology with a broad range of clinical symptoms. When eclampsia is ruled out, the presence of mental illnesses in pregnant women with predisposing-risk factors including HELLP syndrome and severe preeclampsia should be taken into consideration as PRES. The cranial imaging modalities such as MRI, CT scan are widely accepted among pregnant women diagnosed with severe preeclampsia followed by abnormally neurological manifestations. A high index of recognition with an interdisciplinary assessment facilitates substantially the rate of recovery. Future studies are necessary to report the PRES outcomes and strengthen the timely indication of radiologic imagings for pregnant women with neurological symptoms and severe preeclampsia.

Abbreviations

CT scan	computed tomography scan
MRI	Magnetic resonance imaging
HELLP	Hemolysis, elevated liver enzymes, and low platelets
PRES	Posterior reversible encephalopathy syndrome

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Author contributions

A.D.B.V. and X.T.T.P. were involved in patient care, collection of the information, and administrative procedures. P.N.N. contributed to be responsible for administrative procedures, to receiving information, collecting the data, writing, editing, and revising the manuscript. P.N.N. was the guarantor of this work. All authors read and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethical approval

Ethics approval was naturally waived for case reports by the ethics committee of Tu Du Hospital. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Consent to participate

Written informed consent was obtained from the participant.

Consent for publication

Written informed consent was obtained from the patient for publication of this study and accompanying images.

Competing interests

The authors declare no competing interests.

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