

Reversible Posterior Leukoencephalopathy Syndrome Caused by Blood Transfusion: A Case Report

Yung-Chuan Huang^{1,2}, Pei-Lin Tsai¹, Jiann-Horng Yeh^{1,3}, and Wei-Hung Chen^{1,4}

Abstract- This is a case report of a 32-year-old woman with chronic severe anemia who developed headaches and seizures 5 days after receiving a blood transfusion of eight units (1600 ml) of packed red blood cells. Magnetic resonance imaging indicated vasogenic edematous lesions bilaterally over the occipital lobes that were consistent with reversible posterior leukoencephalopathy syndrome (RPLS). Her blood pressure was normal, and no other contributing factors for RPLS were found. It is likely that the initiator was the large volume of transfused blood, which disrupted cerebral autoregulation and damaged the vasculoendothelial system. Similar cases of RPLS following transfusion have been reported, and all reports involved middle-aged females with chronic severe anemia who received large volumes of transfused blood within a short period of time. Although blood transfusion is a common procedure with rare neurological complications, great caution should be taken with chronic severely anemic patients because a rapid elevation in hemoglobin may precipitate RPLS.

Key Words: Posterior leukoencephalopathy, Hyperperfusion syndrome, Transfusion complication, Cerebral autoregulation

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INTRODUCTION

Reversible posterior leukoencephalopathy syndrome (RPLS), first described by Hinchey et al. in 1996⁽¹⁾, is characterized by headache, confusion, seizures and visual disturbance. Edema of the posterior cerebral regions in RPLS has been suggested by imaging studies, which often reveal extensive bilateral white-matter lesions⁽²⁾. The syndrome has been associated with hypertensive encephalopathy, eclampsia and chronic renal disease^(1,3).

Recently, other conditions have been reported to cause RPLS, including connective tissue disease⁽⁴⁾, cytotoxic or immunosuppressant agents⁽⁵⁾, infection⁽⁶⁾, malignancy⁽⁷⁾ and blood transfusion⁽⁸⁻¹⁰⁾. Inclusion of the term “reversible” in the name of the disorder has been challenged because the condition is not always reversible. Likewise, lesions are not always confined to the posterior regions of the brain and can affect both white and grey matter, thus challenging the term “posterior”⁽¹¹⁾. Herein, we report a case of RPLS following blood trans-

From the ¹Department of Neurology, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan; ²Keelung Hospital, Department of Health, Executive Yuan, Taiwan; ³College of Medicine, Fu-Jen Catholic University, Taipei, Taiwan; ⁴College of Medicine, Taipei Medical University, Taipei, Taiwan.
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Reprint requests and correspondence to: Wei-Hung Chen, MD. Department of Neurology Shin Kong Wu Ho-Su Memorial Hospital, No. 95, Wen-Chang Road, Shih-Lin, Taipei, Taiwan.
E-mail: M000735@ms.skh.org.tw

fusion and review similar cases in the literature.

CASE REPORT

A 32-year-old female with hypermenorrhea for the past ten years and exertional dyspnea in the past two years was admitted for excision of a uterine myoma. Hemogram analysis revealed severe anemia (hemoglobin: 5.7 g/dl). She received a blood transfusion of eight units (1600 ml total) of packed red blood cells before the operation, and her hemoglobin increased to 12.5 g/dl in twenty hours. The myomectomy was uneventful, and she was discharged in stable condition 3 days later. She was prescribed oral ergonovine by the gynecologist for 6 days to enhance uterine contraction. Five days after the preoperative transfusion, she experienced an acute left

temporal headache extending bilaterally to the occipital areas. The headache increased in intensity progressively and was accompanied by nausea, vomiting and blurred vision in the following days. She was brought to the emergency room and subsequently developed a generalized seizure while in the computer tomography (CT) room. A neurological examination revealed neck stiffness and central scotoma. A brain CT (Fig. 1A) showed hypodense lesions bilaterally in the occipital regions, and a magnetic resonance image (MRI) of her brain revealed hyperintense lesions over corresponding areas, as indicated by FLAIR (fluid-attenuated inversion recovery MRI) images (Fig. 1B). The lesions were bright on both the diffusion weighted image (DWI) and the apparent diffusion coefficients (ADC) map (Figs. 1C-D) suggesting vasogenic edema and not cytotoxic edema.

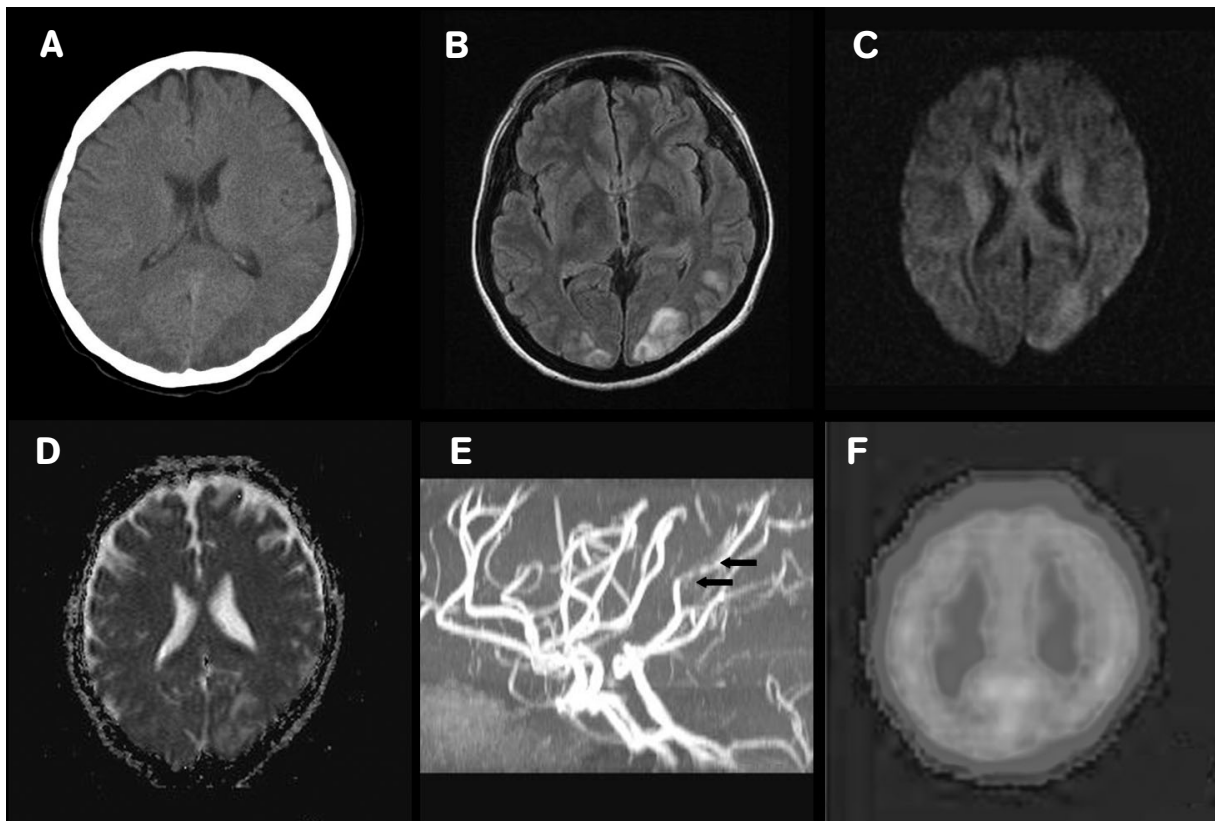


Figure 1. (A) Hypodense lesions were noted over bilateral occipital areas, especially left side. (B) Hyperintense lesions distributed over bilateral occipital white and gray matter (FLAIR). (C) and (D) Vasogenic edema was confirmed by DWI and ADC map. (E) Segmented vasoconstrictions (arrows) were noted over the left posterior cerebral artery as measured by MRA. (F) SPECT showed hypoperfusion over corresponding regions of the occipital cortex.

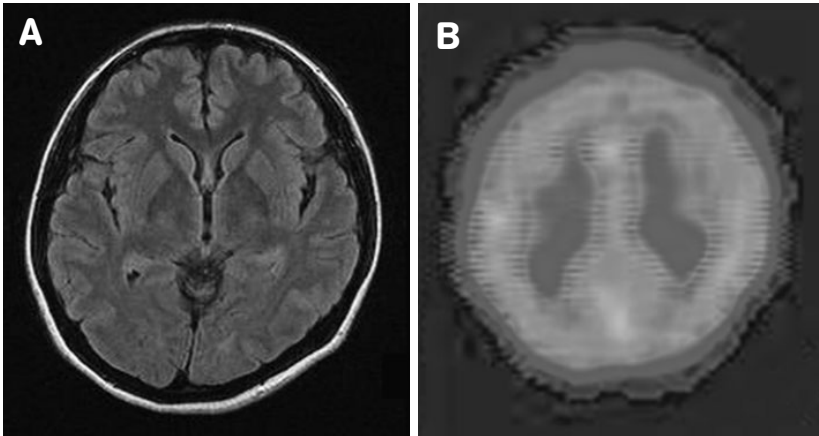


Figure 2. (A) FLAIR MRI demonstrated nearly complete resolution of vasogenic edema one month later. (B) Hypoperfusion on the SPECT also improved over the corresponding area.

Segmented vasoconstriction of the left posterior cerebral artery was indicated by magnetic resonance angiography (MRA) (Fig. 1E), and single photon emission computed tomography (SPECT) revealed hypoperfusion of the bilateral occipital regions (Fig. 1F).

The patient's blood pressure was normal during hospitalization, and laboratory data for tumor markers, anti-nuclear antibodies (Ab), anti double-stranded DNA Ab, anticardiolipin Ab, antithyroglobin Ab, antimicrosomal Ab, ANCA, IgG, IgM, IgA, C3, C4, and RA factor were all within normal limits. Over the next 5 days, her headache gradually subsided and no further seizures occurred. A follow-up MRI (Fig. 2A) one month later showed nearly complete resolution of the vasogenic edema, and the hypoperfusion measured by SPECT was also improved (Fig. 2B).

DISCUSSION

The patient presented with clinical symptoms and imaging results consistent with RPLS. Her blood pressure was normal and no other contributing factors for RPLS were found. The large volume of transfused packed red cells blood seemed to be the initiator of RPLS. Although she received ergonovine for 6 days following the operation, which has been reported to induce cerebral angiopathy and stroke, her imaging results showed vasogenic edema and not cytotoxic edema. These findings were not compatible with cerebral infarct

caused by ergonovine related angiopathy⁽¹²⁾. Moreover, the symptoms developed 5 days after starting ergonovine, which is not consistent with the typical short latency of ergonovine related angiopathy^(12,13).

Blood transfusion is a common procedure, and neurological complications are uncommon. Furthermore, reports of RPLS following blood transfusion are very rare⁽⁸⁻¹⁰⁾. Previous cases of RPLS after blood transfusion are summarized in Table. All cases involved middle-aged females with chronic severe anemia who received large transfusion volumes within a short period of time, and hemoglobin levels increased by at least 5 g/dl in all cases. A similar case was also reported in a uremic patient with chronic anemia following treatment with human recombinant erythropoietin⁽¹⁴⁾. It is noteworthy that no patient receiving a blood transfusion for acute blood loss has ever been reported to have developed RPLS. Chronic anemia may be accompanied by cerebral vasodilatation to compensate for ischemic hypoxia. We hypothesize the mechanism may be similar to cerebral hyperperfusion syndrome after carotid endarterectomy or stenting in carotid stenosis^(15,16). In a previously hypoperfused area with impaired cerebral autoregulation, restoration of perfusion pressure could lead to hyperperfusion⁽¹⁷⁾. A rapid elevation of hemoglobin may therefore disrupt cerebral autoregulation and cause damage to the vasculoendothelial system. According to World Health Organization recommendations and guidelines for blood transfusion, massive blood transfusion is defined as

Table. Characteristics of patients with reversible posterior leukoencephalopathy syndrome after blood transfusion for chronic severe anemia

Author	Ito	Boughammoura	Heo	Huang
Year	1997 ⁽¹⁸⁾	2003 ⁽⁹⁾	2003 ⁽¹⁰⁾	2008/current report
Age (years)/gender	45/F	48/F	47/F	32/F
BT volume of PRBC	800 ml	1000 ml	*	1600 ml
Data before/after BT				
Hemoglobin	2.0/10.0	3.0/8.0	1.5/10.9	5.7/12.5
Hematocrit	9.0/31	13/29	4.2/31.6	22.6/43.4
Period of BT	14 days	7 hours	4 days	20 hours
Symptoms onset after BT	2 days	6 days	7 days	5 days
Angiography	Vasoconstriction	Vasoconstriction	Vasoconstriction	Vasoconstriction

*filtrated red blood cells, platelet concentrates and fresh frozen plasma; BT: blood transfusion; F: female; PRBC: packed red blood cell.

infusing more than 70 ml/Kg of blood product or the replacement of the whole blood volume of a patient⁽¹⁸⁾. According to this definition, none of the patients described in Table received a massive blood transfusion. For example, one of the patients suffered from RPLS after transfusion of only 800 ml packed red blood cells⁽⁸⁾. Therefore, we want to emphasize that RPLS can develop in patients with chronic severe anemia even after a moderate volume of blood is transfused. Furthermore, it should also be noted that the symptoms of RPLS did not occur immediately in these patients, but were delayed two to seven days following the transfusion (Table). Without a careful history review and recognition of this rare syndrome, the diagnosis may easily be overlooked.

In conclusion, rapid elevation of hemoglobin in these patients may precipitate RPLS.

Blood transfusion in patients with chronic severe anemic should be performed with caution.

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