Integrated Traditional Chinese and Western Medicine Treatment and Nursing Care for Cerebral Venous Sinus Thrombosis Secondary to Acute Cytomegalovirus Infection: A Case Report

Authors: Wu Jincan, Li Shiju, Li Shiju

Date: 2024-06-05T00:00:00+00:00

Abstract

We summarize and analyze a case of cerebral venous sinus thrombosis secondary to cytomegalovirus infection. The patient presented with headache as the main clinical manifestation, accompanied by vomiting and diaphoresis, without fever or cough. After admission, relevant examinations were completed, and treatments including intracranial pressure reduction, anticoagulation, and antiviral therapy were administered. Lumbar puncture and intracranial angiography were performed. Vital signs were closely monitored, and basic nursing care including positioning, diet, and bowel/bladder management was implemented to prevent cerebral herniation. Medication use and postoperative signs were monitored. Through comprehensive treatment and nursing care, patient recovery was promoted.

Full Text

A Case Report of Integrated Traditional Chinese and Western Medicine Treatment and Nursing for Acute Cytomegalovirus Infection Secondary to Intracranial Venous Sinus Thrombosis

Wu Jincan[1], Li Shiju[1], Pan Xiaoming[1], Wang Yanxu[2], Tang Jiaqian[1], Wang Yicheng[1], Chen Xinyi[1], Liang Ruixin[1]

[1]Department of Neurology, The Second People's Hospital Affiliated to Fujian University of Chinese Medicine, Fuzhou 350003, China

[2]Department of Neurology, Affiliated People's Hospital of Fujian University of Chinese Medicine, Fuzhou 350004, China

Abstract

This case report summarizes and analyzes a patient with intracranial venous sinus thrombosis (CVST) secondary to cytomegalovirus infection. The patient presented with headache as the main clinical manifestation, accompanied by vomiting and cold sweats, but without fever or cough. After admission, relevant examinations were completed, and treatments including intracranial pressure reduction, anticoagulation, and antiviral therapy were administered. Lumbar puncture and intracranial angiography were performed, with vital signs closely monitored. Basic nursing care involving positioning, diet, and bowel management was implemented to prevent cerebral herniation. Medication administration and postoperative monitoring were carefully managed through multifaceted therapeutic and nursing interventions to promote patient recovery.

Keywords: Intracranial venous sinus thrombosis; Cytomegalovirus; Increased intracranial pressure; Integrated traditional Chinese and Western medicine treatment; Nursing care

Funding: Fujian Provincial Natural Science Foundation Project (2022J01826)

Corresponding author: Li Shiju, E-mail: 1417167086@qq.com

Cerebral venous sinus thrombosis (CVST) is a rare and life-threatening condition caused by complete or partial occlusion of major cerebral venous sinuses or smaller cortical veins, with an extremely low incidence rate. It predominantly affects young and middle-aged adults, and if left untreated, can lead to severe neurological complications such as stroke, seizures, or coma. Various factors contribute to its pathogenesis, including viral infections. Cytomegalovirus (CMV) is a ubiquitous virus that can manifest as a nonspecific febrile illness or various organ dysfunctions. It may trigger or exacerbate intravascular inflammatory responses, promote thrombosis formation, and participate in the pathological process of CVST. Acute CMV infection secondary to intracranial venous sinus thrombosis is relatively uncommon in clinical practice. This article reports one such case, reviewing the diagnostic and treatment process with relevant literature to enhance understanding of this disease.

1.1 Patient Information

A 38-year-old male patient presented to the Department of Neurology at The Second People's Hospital Affiliated to Fujian University of Chinese Medicine on February 15, 2023, with a one-week history of headache. The headache began on February 8, 2023, without apparent cause, manifesting as persistent, diffuse, intolerable pulsating pain throughout the entire head. The patient self-administered "acetaminophen-caffeine tablets" for temporary relief, requiring

analgesics to sleep at night due to pain. Symptoms were accompanied by generalized cold sweats, nausea, and a single episode of vomiting gastric contents in moderate volume. There was no chills, fever, dizziness, sudden collapse, loss of consciousness, cold extremities, nasal congestion, rhinorrhea, cough, sputum production, or limb numbness or weakness. On February 13, the headache location changed to persistent, hammer-like throbbing pain in the left occipital region, accompanied by posterior neck pain that was unbearable. The pain could be relieved by "acetaminophen-caffeine tablets" and was associated with bilateral tinnitus, occasional blurred vision, and diplopia. The patient visited our hospital's stroke center outpatient clinic, where cervical MRI showed no obvious abnormalities. For further diagnosis and treatment, he was admitted with a preliminary diagnosis of "headache (phlegm-stasis obstructing collaterals syndrome) in traditional Chinese medicine; headache (etiology to be determined?) in Western medicine." The patient had no significant past medical history, and personal and family histories were unremarkable.

1.2 Physical Examination and Laboratory Findings

Admission Examination: Temperature 36.5°C, pulse 74 beats/min, respiration 20 breaths/min, blood pressure 134/74 mmHg (1 mmHg = 0.133 kPa). The patient was conscious and cooperative. Tongue was pale and dark, with a thin white coating; pulse was wiry and slippery. No neck resistance. Cranial nerve examination was negative. Cardiopulmonary auscultation revealed no obvious abnormalities. Abdomen was soft without tenderness; liver and spleen were not enlarged. No other positive cranial nerve signs were observed. Muscle strength and tone in all four limbs were normal, with reflexes elicitable. Coordination and sensory system examinations were unremarkable. Pathological signs and meningeal irritation signs were both negative.

Laboratory Results (February 15, 2023): Blood routine + CRP + IL-6 showed neutrophil percentage 81.2%↑, lymphocyte percentage 13.5%↓, neutrophil count 7.12$×10^{9}$/L↑, eosinophil percentage 0.2%↓; other parameters were normal. Coagulation profile (PT+APTT+TT+FIB), D-dimer, and fibrin degradation products (FDP) showed FDP 12.82 g/ml↑ and D-dimer 5.42 g/ml↑; other values were normal. Cardiac enzymes, electrolytes, and renal function showed chloride 98.8 mmol/L↓; other parameters were normal. Troponin I and NT-proBNP were normal.

Laboratory Results (February 16, 2023): Comprehensive metabolic panel showed GGT 133 U/L↑, Apo-A1 0.93 g/L↓, calcium 2.04 mmol/L↓; other parameters were normal. Stool occult blood and routine stool examination showed positive mucus (+); other parameters were normal. ASO+RF and humoral immune function (IgG/IgA/IgM/C3/C4) showed IgA 4.55 g/L↑; other values were normal. Erythrocyte sedimentation rate, preoperative four-item panel, automated urine sediment, cellular immune function (3 items), HbA1c, and tumor markers [male panel] including tPSA, fPSA, AFP, CEA, CA-199, and squamous cell carcinoma antigen were all normal.

Imaging Studies: Chest and brain CT scan with 3D reconstruction showed: (1) slightly increased density in the straight sinus (CTV examination recommended if clinically indicated); no obvious abnormalities in brain parenchyma on plain CT scan. (2) Mild chronic inflammation in the medial segment of the right middle lobe; ground-glass density lesion in the left upper lobe (approximately 8$×$7 cm), recommended close follow-up; multiple tiny nodules in the right lung, follow-up recommended.

High-field Brain MRI + Enhanced MRV + MRA (February 17, 2023): (1) Brain MRV showed extensive thrombosis in the superior sagittal sinus, straight sinus, left transverse sinus, and left sigmoid sinus. (2) Left fetal-type posterior cerebral artery (developmental variant); brain MRA showed no abnormalities. (3) No intracranial abnormalities.

ECG: Sinus rhythm, normal ECG.

Ophthalmology Consultation: (1) Preliminary diagnosis: bilateral optic nerve edema; right superior oblique muscle palsy. (2) Recommendations: Visual evoked potential, brain and orbital MRI; Acupuncture therapy; Traditional Chinese medicine for blood stasis resolution as appropriate.

1.3 Diagnosis

Traditional Chinese Medicine Diagnosis: Based on comprehensive analysis of tongue, pulse, and symptoms, the condition belongs to the category of "headache disease" in traditional Chinese medicine, with a pattern of phlegm-stasis obstructing the collaterals. The disease location is in the brain orifices, involving the spleen and kidney, with a nature of root deficiency and branch excess. Differential diagnosis: The patient showed no mental abnormalities, facial deviation, or hemiplegia/numbness, which distinguishes it from "stroke."

Western Medicine Diagnosis: Based on comprehensive history, laboratory, and imaging examinations, the preliminary diagnosis was "intracranial venous sinus thrombosis." Differential diagnosis: Intracranial space-occupying lesions typically present with headache and severe projectile vomiting, with imaging showing space-occupying manifestations, which could be ruled out based on MRI findings.

1.4 Treatment Intervention

Treatment Approach: Laboratory examinations indicated a hypercoagulable state. Western medicine treatment primarily consisted of low-molecular-weight heparin sodium injection for anticoagulation, supplemented with antiplatelet aggregation, analgesia, gastroprotection, neurotrophic support, circulation improvement, dehydration for intracranial pressure reduction, and hepatoprotection. Traditional Chinese medicine treatment addressed both root and branch aspects, employing phlegm-resolving and stasis-eliminating methods. The prescribed formula was a modified Wendan Decoction combined with Taohong

Siwu Decoction, composed of: Pinellia (processed) 9g, Bamboo shavings 12g, Aurantium fruit (immature) 12g, Tangerine peel 12g, Poria 15g, Peach kernel (processed) 12g, Safflower 9g, Chuanxiong rhizome 12g, Red peony root 12g, Bupleurum root 12g, Angelica dahurica 12g, Atractylodes (white) 15g, Coix seed (stir-fried) 10g × 3 doses, decocted in water, one dose daily, taken warm 30 minutes after breakfast and dinner.

Clinical Course:

On February 23, the patient's headache symptoms had improved compared with admission, though occasional nocturnal pain episodes still occurred. Laboratory results showed total IgE: 297 IU/ml; HSV1-IgG: positive/3.93 s/co; rubella IgG: 13.4 IU/ml; CMV IgG: 166.1 AU/ml↑; CMV IgM: 1.49 AU/ml. Ganciclovir 250 mg was administered for antiviral therapy, and heparin anticoagulation was continued. The patient underwent lumbar puncture today, with vital signs closely monitored. Cerebrospinal fluid pressure was 320 mm H_2O (0.0098 kPa). CSF routine examination showed WBC: 2$×10^{6}$/L, glucose: 3.74 mmol/L, protein: 35.20 mg/L, chloride: 121.20 mmol/L, ADA: 0.30 U/L, LDH: 25.00 U/L. Gram stain, acid-fast stain, and cryptococcal antigen tests were all negative.

On March 10, the frequency of headache episodes had decreased and pain intensity was reduced. Enhanced cerebral MRV showed re-examination of venous sinus thrombosis with partial thrombus absorption compared with previous imaging. The patient was scheduled for "aortic arch angiography + cerebral angiography" tomorrow to evaluate intracranial vascular status.

On March 11, headache frequency remained decreased with reduced pain intensity. Aortic arch angiography showed Type I aortic arch. Left common carotid artery (LCCA) angiography showed good visualization of the left internal carotid artery (LICA) without significant sinus stenosis, though the C1 segment was tortuous; left middle cerebral artery (LMCA) and left anterior cerebral artery (LACA) were well visualized. Right common carotid artery (RCCA) angiography showed proximal tortuosity, with good visualization of the right internal carotid artery (RICA) without sinus stenosis; right middle cerebral artery (RMCA) and right anterior cerebral artery (RACA) were well visualized, with open anterior communicating artery (AcomA) and right posterior communicating artery (RPComA). Right subclavian artery (RSCA) angiography showed proximal tortuosity, with good visualization of the right vertebral artery (RVA) opening and no significant distal stenosis; basilar artery (BA), right posterior inferior cerebellar artery (RPICA), bilateral anterior inferior cerebellar arteries (AICA), and posterior cerebral arteries (PCA) were well visualized. Left subclavian artery (LSCA) angiography showed good visualization of the left vertebral artery (LVA) opening without significant distal stenosis; BA, left posterior inferior cerebellar artery (LPICA), bilateral AICA, and PCA were well visualized. No abnormal vascular clusters or staining were observed in the parenchymal phase. Venous phase imaging showed no obvious abnormalities in the course or visualization of the superior sagittal sinus, inferior sagittal sinus, straight sinus, transverse sinus, and sigmoid sinus. A ProGlide suture device was used for su-

turing, with compression fixation in place. The patient returned safely to the ward, with observation of the angiography site to avoid bleeding. The patient was instructed to rest quietly, with compression removal after 24 hours.

On March 14, the patient's headache had resolved, and discharge procedures were completed with instructions for outpatient follow-up.

2.1 Nursing Assessment

Physical examination revealed conscious and cooperative patient with pale dark tongue, thin white coating, and wiry slippery pulse. Muscle strength and tone in all four limbs were normal with elicitable reflexes. Braden score: 23; Fall risk score: 2; Self-care ability score: 100; Lower extremity venous thrombosis risk score: 3; Pain score: 4.

2.2 Nursing Diagnosis

The patient's risk factors included hypercoagulable state, positive CMV status, intracranial venous hypertension, and history of invasive interventional procedure. Based on clinical assessment, nursing diagnoses included: (1) Knowledge deficit regarding postoperative care; (2) Pain related to intracranial venous hypertension; (3) Anxiety due to fear of surgery and concern about residual sequelae; (4) Potential complication: risk of intracranial hemorrhage.

2.3 Nursing Plan

The nursing plan for this patient included: (1) Health education for the patient and accompanying family members regarding relevant knowledge; (2) Application of traditional Chinese nursing techniques such as auricular point therapy and topical plasters for blood circulation and pain relief; (3) Activation of social support systems including spouse and parents to provide psychological support and counseling to alleviate anxiety; (4) Close monitoring of mental status to prevent complications such as intracranial hemorrhage, with appropriate interventions implemented as ordered.

2.4.1 Nursing Care for Increased Intracranial Pressure

Headache is the main clinical manifestation of increased intracranial pressure. The patient experienced vomiting, and imaging studies suggested intracranial hypertension. Reducing intracranial pressure is crucial for treatment and preventing cerebral herniation. This patient presented with persistent diffuse headache, generalized cold sweats, nausea, and a single episode of vomiting gastric contents in moderate volume, without altered consciousness. Twenty percent mannitol was administered for dehydration to reduce intracranial pressure, with prompt cleaning of vomitus and close monitoring of vital signs. The patient was instructed to rest in bed with the head of bed elevated 15°–30° to facilitate intracranial venous return and reduce cerebral edema.

2.4.2 Application and Clinical Observation of Anticoagulant Therapy

Based on laboratory diagnosis indicating a hypercoagulable state, low-molecular-weight heparin anticoagulation therapy was administered via subcutaneous injection in the abdominal wall, with gentle pressure applied to the injection site. The patient was instructed not to rub or apply heat to avoid capillary rupture and bleeding. Concurrently, close observation was maintained for gum, oral, and subcutaneous bleeding.

2.4.3 Lumbar Puncture Nursing

Lumbar puncture carries certain risks, particularly in patients with elevated intracranial pressure. Therefore, preoperative explanation of risks, hazards, and necessity was provided to the family, and the procedure was performed after obtaining informed consent. Cerebrospinal fluid pressure was measured at 320 mm H_2O, with no abnormalities in CSF culture. Postoperative care included supine positioning without a pillow and bed rest for 24 hours.

2.4.4 Post-Angiography Nursing

Intracranial angiography is the most direct method for evaluating intracranial thrombus status but carries certain invasiveness. Preoperative assessment confirmed no contraindications for angiography, and the procedure was performed after explaining potential adverse reactions and obtaining informed consent. Intraoperative observation revealed good intracranial vascular status. After returning to the ward, the angiography site was observed to avoid bleeding, with instructions for quiet rest and compression removal after 24 hours.

2.5 Nursing Evaluation

During hospitalization, the patient received postoperative care education without experiencing postoperative bleeding or other adverse reactions. No sequelae were observed, and headache was completely resolved with normal muscle strength and tone in all four limbs. Pain score: 0; Lower extremity venous thrombosis risk score: 0.

Follow-up cerebral enhanced MRV on March 10 showed partial thrombus absorption compared with previous imaging. Coagulation function, D-dimer, and CMV IgM antibody levels had all decreased compared with admission. The frequency and intensity of headache episodes were reduced, and the patient's condition was stable. Repeat angiography confirmed good vascular visualization without significant abnormalities. The patient was discharged with good recovery and remained asymptomatic during one year of outpatient follow-up.

CVST is a rare thrombotic manifestation involving cerebral dural venous sinuses and/or cerebral veins, primarily affecting young women. It has rapid onset and commonly presents with headache, seizures, paralysis, papilledema, and altered mental status, often leading to misdiagnosis as headache, epilepsy, or transient

ischemic stroke. The nonspecific nature of these symptoms, particularly when headache is the sole manifestation, makes diagnosis challenging and delays appropriate treatment, highlighting the need for improved clinical awareness and etiological clarification. This case represents a clear example with positive IgM serology and viral positivity, demonstrating the close relationship between CMV and CVST.

4.1 Pathogenesis

CVST has diverse etiologies, and any condition causing hypercoagulable states can lead to CVST, including infection, craniocerebral trauma, and tumors. CMV infection is an important factor in cerebral venous sinus thrombosis. This patient developed CVST due to CMV infection, with positive CMV status and abnormal infection markers confirmed through imaging and laboratory examinations, showing disease improvement after antiviral and anticoagulant therapy. Human cytomegalovirus (HCMV) is a beta-herpesvirus with high global prevalence that causes significant damage to immune function, typically asymptomatic, and is associated with the development of various cancers and cardiovascular and cerebrovascular diseases. CMV infection increases the risk of cardiovascular and cerebrovascular events and all-cause mortality in patients with cardiovascular and cerebrovascular diseases through complex mechanisms including endothelial cell infection and injury, lipid metabolism alteration through lipid deposition, vascular smooth muscle cell proliferation and migration, and disruption of coagulation mechanisms and thrombosis. CMV infection elevates CRP levels, induces tissue factor expression in monocytes, initiates the coagulation process, and increases thrombosis risk. The pathophysiological mechanism of headache in this CVST patient resulted from cerebral venous sinus outflow obstruction and reduced cerebrospinal fluid reabsorption leading to increased intracranial pressure, which was relieved after anticoagulation, antiviral therapy, and circulation improvement promoted thrombus absorption.

4.2 Western Medicine Treatment

CVST diagnosis and treatment are often delayed. Diagnosis relies on imaging and laboratory examinations, with DSA being the "gold standard" for CVST diagnosis, though its invasiveness may be complemented by combined MRI and CT diagnosis to avoid missed diagnosis and delayed optimal treatment timing. Initial CVST treatment primarily involves low-molecular-weight heparin, followed by vitamin K antagonists (oral anticoagulants) in the acute phase, with concurrent D-dimer monitoring. This patient's admission brain MRV showed extensive thrombosis in the superior sagittal sinus, straight sinus, left transverse sinus, and left sigmoid sinus, with CMV IgG 166.1 AU/ml↑ and CMV IgM 1.49 AU/ml↑, confirming the diagnosis of acute CMV infection-induced CVST. Combined antiviral therapy with anticoagulation produced significant effects.

4.3 Traditional Chinese Medicine Treatment

In traditional Chinese medicine, CVST belongs to the category of "headache." The *Lingshu · Xieqi Zangfu Bingxing* states: "The twelve meridians and three hundred sixty-five collaterals all carry blood and qi upward to the face and empty orifices," suggesting that headache results from pathogenic factors invading the brain, obstructing clear yang, and causing brain orifice blockage. TCM pathogenesis involves external contraction of six exogenous pathogenic factors and internal injury by seven emotions, with phlegm-fluid, dampness, and blood stasis as pathological products. Zhang Zhongjing proposed external contraction headache in *Shanghan Lun*, advocating Gegen Decoction for wind-cold headache. Wang Qingren proposed "blood stasis headache" in *Yilin Gaicuo*, creating Xuefu Zhuyu Decoction and deriving Shentong Zhuyu Decoction and Tongqiao Huoxue Decoction, pioneering blood-activating methods for headache treatment. TCM demonstrates significant efficacy in headache treatment with a complete syndrome differentiation system. This patient presented with headache caused by thrombosis formation. Based on the four diagnostic methods, the syndrome was identified as phlegm-stasis intermingling. The treatment principle was clearing heat and resolving phlegm while activating blood and resolving stasis, using a modified combination of Wendan Decoction and Taohong Siwu Decoction. Wendan Decoction clears phlegm-heat and disperses pathogenic qi in the triple burner, while Taohong Siwu Decoction activates blood and resolves stasis. Taohong Siwu Decoction consists of peach kernel, safflower, prepared rehmannia, angelica root, white peony root, and chuanxiong rhizome. In the formula, peach kernel, safflower, and chuanxiong activate blood and resolve stasis, while prepared rehmannia, angelica root, and white peony root nourish blood and soften the liver. Clinically, it is used to treat blood deficiency and blood stasis patterns in dysmenorrhea, headache, herpes zoster, and other conditions. Modern pharmacological studies have shown that Taohong Siwu Decoction can prevent cerebral ischemia and regulate angiogenesis and neuroprotective activity.

CVST treatment primarily involves etiological treatment, anticoagulation, and intracranial pressure reduction. This patient underwent invasive procedures including lumbar puncture and intracranial angiography, requiring close postoperative vital sign monitoring and patient education. After admission and diagnosis of CMV infection, antiviral therapy was administered with patient isolation to prevent viral spread, close temperature monitoring, and viral antigen re-examination.

Acute CMV infection secondary to intracranial venous sinus thrombosis is rare and diagnostically challenging. When imaging confirms CVST, etiological clarification and treatment of both root and branch are essential. Based on Western supportive therapy, adjuvant traditional Chinese medicine decoctions can enhance clinical efficacy. This case demonstrates significant therapeutic effects and good prognosis with integrated traditional Chinese and Western medicine treatment for acute CMV infection secondary to CVST, providing clinical diag-

nostic and therapeutic insights.

Patient Consent: Informed consent for publication of this case report was obtained from the patient and family members.

Conflict of Interest Statement: The authors declare no conflicts of interest regarding this article.

References

[1] Alimohammadi. Field Updates Cerebral Venous Thrombosis[J]. Current Cardiology Reports, 2022, 24(1): 43–50.

[2] Ropper A H, Klein J P. Cerebral Venous Thrombosis[J]. The New England journal of medicine, 2021, 385(1): 59–64.

[3] Martin. Cerebral venous sinus thrombosis secondary acute cytomegalovirus infection[J]. BMJ Neurology Open, 2023, 5(2): e000460.

[4] Capecchi, Abbattista, Martinelli. Cerebral venous sinus thrombosis[J]. Journal of thrombosis and haemostasis: JTH, 2018, 16(10).

[5] Ferro J M, Canhão P, Stam J, et al. Prognosis of cerebral vein and dural sinus thrombosis: results of the International Study on Cerebral Vein and Dural Sinus Thrombosis (ISCVT)[J]. Stroke, 2004, 35(3): 664–670.

[6] Chang Yajun, Guo Weina, Guo Qiaozhen, et al. Intracranial venous sinus thrombosis with isolated headache as the main manifestation: a case report and literature review[J]. Clinical Focus, 2022, 37(3): 271–274.

[7] Fulkerson H L, Nogalski M T, Collins-McMillen D, et al. Overview of Human Cytomegalovirus Pathogenesis[J]. Methods in molecular biology (Clifton, N.J.), 2021, 2244: 1–18.

[8] Cristescu C V, Alain S, Ruță S M. The Role of CMV Infection in Primary Lesions, Development and Clinical Expression of Atherosclerosis[J]. Journal of Clinical Medicine, 2022, 11(13): 3832.

[9] Du Y, Zhang G, Liu Z. Human cytomegalovirus infection and coronary heart disease: a systematic review[J]. Virology Journal, 2018, 15: 31.

[10] Wang Dehua. Diagnostic value of MRI combined with CT in cerebral venous sinus thrombosis[J]. Chinese and Foreign Medical Research, 2024, 22(8): 62–65.

[11] Sader N, de Lotbinière-Bassett M, Tso M K, et al. Management of Venous Sinus Thrombosis[J]. Neurosurgery clinics of North America, 2018, 29(4): 585–594.

[12] Wang Yilin, Meng Xiangguo, Ye Yuhang, et al. Exploring the molecular mechanism of Taohong Siwu Decoction against ischemic stroke based on network pharmacology and animal experiments[J]. Central South Pharmacy, 2024, 22(2): 392–398.

Note: Figure translations are in progress. See original paper for figures.