Section: Neurology

Original Research Article

CEREBRAL VENOUS THROMBOSIS IN PREGNANCY AND PUERPERIUM: A RETROSPECTIVE OBSERVATIONAL STUDY FROM TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Cerebral venous thrombosis (CVT) is a rare but serious cause of stroke in pregnant and postpartum women. It accounts for 15–20% of strokes during pregnancy, with an incidence of 0.5–1%, and a mortality rate ranging from 5–30%. Physiological changes during pregnancy promote a hypercoagulable state, predisposing women to thrombotic events. **Objective:** To describe the clinical characteristics, imaging findings, management strategies, and outcomes of patients diagnosed with CVT during pregnancy and the puerperium at a tertiary care hospital, and to contextualize these findings with existing literature. **Materials and Methods:** A retrospective observational study was conducted involving four patients diagnosed with CVT during pregnancy or the postpartum period. Clinical records, imaging data, management protocols, and outcomes were reviewed. Relevant literature was examined to support interpretation. **Result:** All four patients presented with acute neurological symptoms—two antenatal and two postnatal. MRI/MRV confirmed thrombosis in the dural venous sinuses in all cases. Despite the presence of hemorrhagic infarctions in some patients, all were successfully treated with anticoagulation and supportive therapy. Complete neurological recovery was achieved in every case. **Conclusion:** CVT during pregnancy and the puerperium remains a diagnostic challenge due to its variable presentation. Prompt imaging and anticoagulation, even in cases with hemorrhagic infarction, are crucial for favorable outcomes. Clinician awareness is essential for timely recognition and management.

INTRODUCTION

Cerebral venous thrombosis (CVT) is a rare but potentially fatal cerebrovascular disorder characterized by thrombosis in the cerebral venous sinuses or cortical veins. Although it accounts for less than 1% of all strokes in the general population, its prevalence is significantly higher in some high-risk categories, particularly pregnant and postpartum women.[1] CVT accounts for 15-20% of all pregnancy-related strokes, making it a critical differential diagnosis in peripartum women with new-onset neurological symptoms.[2] Pregnancy and the postpartum period are physiologically prothrombotic due to increased coagulation factors (e.g., fibrinogen and factors VII, VIII, IX, and X), decreased fibrinolytic activity, decreased levels of natural anticoagulants (such as protein S), and venous stasis caused by uterine compression.[3] Furthermore, endothelial injury during delivery, particularly via cesarean section, increases the risk of thrombotic events. These characteristics contribute to Virchow's trinity of hypercoagulability, venous stasis, and endothelial dysfunction, which underpins the pathogenesis of venous thromboembolism (VTE), including CVT.[4] The estimated incidence of pregnancy-related CVT is 0.5-1 per 10,000 deliveries, albeit it may go undiagnosed due to vague clinical symptoms.[5] Symptoms such as headache, seizures, focal neurological impairments, visual disturbances, and changed mental status are commonly confused with other peripartum disorders such as eclampsia or post-dural puncture headache, which delays diagnosis.[6] Timely and precise

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diagnosis is critical for avoiding neurological sequelae and lowering death, which can reach up to 30% in untreated or late-diagnosed patients.[7] Magnetic resonance imaging (MRI) with magnetic resonance venography (MRV) is the gold standard for diagnostics, detecting venous thrombosis and other parenchymal abnormalities.[8] Although awareness and diagnostic capabilities have improved, CVT in pregnancy continues to be underrecognized. Case-based studies like this one are vital to improving early recognition and guiding effective management strategies.[9] This study presents a retrospective analysis of four cases of CVT occurring during pregnancy or the puerperium. We describe their clinical presentation, diagnostic work-up, imaging findings, treatment, and outcomes, and place our findings in context with current literature.

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted in the Department of Obstetrics and Gynaecology at Government Theni Medical College Hospital (GTMCH), Theni. The objective was to analyze the clinical presentation, diagnostic approach, treatment, and outcomes of cerebral venous thrombosis (CVT) in pregnant and postpartum women.

Study Population

The study included female patients diagnosed with CVT during any trimester of pregnancy or within six weeks postpartum. Eligible cases were identified through hospital admission records and neurology consultation logs. Inclusion criteria required a diagnosis confirmed by magnetic resonance imaging (MRI) and magnetic resonance venography (MRV).

Data Collection

Patient data were retrieved from inpatient case files and electronic medical records. Information collected included age, parity, gestational or postpartum age at presentation, clinical symptoms, laboratory findings, imaging results, management protocols (e.g., anticoagulation, antiepileptics, supportive therapy), and final outcomes. All patient data were anonymized, and ethical clearance was obtained from the Institutional Ethics Committee of GTMCH.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics Version 21.0. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were presented as frequencies and percentages. Odds ratios (OR) and 95% confidence intervals (CI) were calculated for maternal mortality and associated variables. Multivariate logistic regression was performed to determine independent predictors of adverse outcomes. A p-value < 0.05 was considered statistically significant. Due to the small sample size, results are presented descriptively and are intended to generate hypotheses for future research.

RESULTS

A total of four cases of cerebral venous thrombosis (CVT) associated with pregnancy and the puerperium were identified during the one-year study period at the Department of Obstetrics and Gynaecology, Government Theni Medical College Hospital (GTMCH), Theni. The clinical profiles, diagnostic findings, treatment, and outcomes are summarized below.

Case 1: CVT in Late Pregnancy

A 28-year-old woman, gravida 2 para 1, at 33+3 weeks of gestation was admitted with severe anemia (hemoglobin 5.9 g/dL). On the fourth day of hospital stay, she developed acute-onset right-sided hemiparesis and slurred speech (dysarthria). MRI of the brain with MR venography revealed bilateral thalamic hemorrhagic infarctions and thrombosis involving the posterior portion of the superior sagittal sinus and the straight sinus (Fig.1). She was started on low molecular weight heparin (LMWH), with gradual neurological improvement by day 7. She underwent spontaneous vaginal delivery at 35+6 weeks of gestation and was discharged on oral anticoagulants. Follow-up showed complete neurological recovery (Table.1).

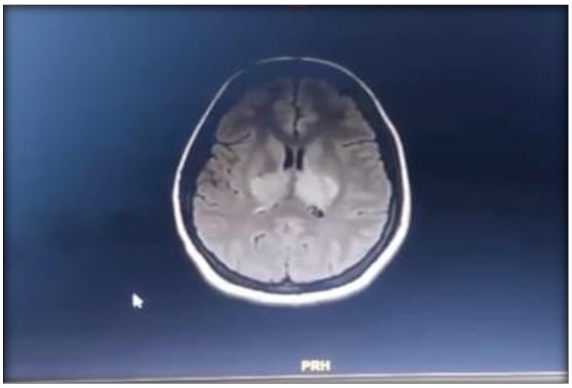

Figure 1: MRI brain with MRA & MRV

Table 1: CVT in Late Pregnancy

Parameter	Details
Age / Parity	28 years / G2P1
Gestational Age at Presentation	33+3 weeks
Presenting Symptoms	Right-sided hemiparesis, dysarthria
Comorbidity	Severe anemia (Hb 5.9 g/dL)
Imaging Findings	Bilateral thalamic hemorrhagic infarcts; thrombosis in superior sagittal sinus and straight sinus
Treatment	LMWH, supportive care
Outcome	Full neurological recovery; spontaneous vaginal delivery at 35+6 weeks

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Case 2: CVT in the Puerperium

A 24-year-old multiparous woman presented on postpartum day 17 with generalized tonic-clonic seizures. She had a prior history of gestational hypertension. Initial CT imaging revealed an 8 × 7 mm intraparenchymal hemorrhage in the right temporal lobe and associated subarachnoid hemorrhage. MRI with MRV confirmed thrombosis of the superior sagittal sinus, right transverse and sigmoid sinuses, and right internal jugular vein. The patient was managed with intravenous heparin, mannitol, and levetiracetam. On postpartum day 28, she experienced deterioration in consciousness and required ventilatory support. She was extubated by day 31, and subsequently made a full recovery. She was discharged on postpartum day 42 with oral anticoagulants and antiepileptic therapy (Table 2).

Table 2: CVT in the Puerperium

Parameter	Details
Age / Parity	24 years / P3
Timing	Postpartum Day 17
Presenting Symptoms	Generalized tonic-clonic seizures
Comorbidity	History of gestational hypertension
Imaging Findings	Intraparenchymal hemorrhage (right temporal), subarachnoid hemorrhage; thrombosis of superior sagittal sinus, right transverse/sigmoid sinuses, and right IJV
Treatment	IV heparin, mannitol, levetiracetam, ventilatory support
Outcome	Full recovery; discharged on postpartum day 42

Case 3: Early CVT in First Trimester

A 19-year-old primigravida at 9 weeks of gestation presented with complaints of persistent headache and diplopia. On examination, she had bilateral proptosis and right sixth cranial nerve palsy (lateral rectus involvement). Ophthalmologic evaluation revealed early papilledema in both eyes. MRI and MRV showed thrombosis of the superior sagittal sinus, right transverse sinus, and right sigmoid sinus (Table 3). She was managed with anticoagulation and anti-edema measures. The patient responded well to treatment and was discharged without neurological deficits.

Table 3: CVT in Early Pregnancy

Parameter	Details
Age / Parity	19 years / Primigravida
Gestational Age at Presentation	9 weeks
Presenting Symptoms	Headache, diplopia, proptosis, right sixth nerve palsy
Ophthalmic Findings	Bilateral early papilledema
Imaging Findings	Thrombosis of superior sagittal, right transverse, and sigmoid sinuses
Treatment	Anticoagulation, anti-edema measures
Outcome	Full recovery; discharged with no neurological deficits

Case 4: Postpartum CVT Following Cesarean Section

A 22-year-old woman, para 2 living 2, presented on postpartum day 11 following a lower segment cesarean section with severe headache. MRI revealed thrombosis of the superior sagittal sinus (Fig. 2). She was treated with anticoagulants and supportive physiotherapy. The patient showed good clinical recovery and was discharged with no residual neurological symptoms.

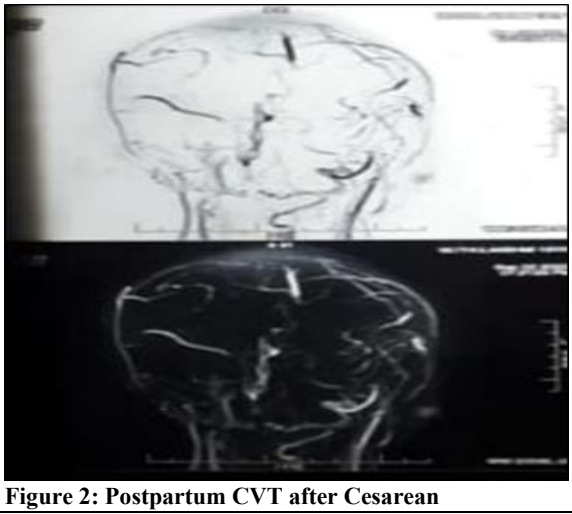

Figure 2: Postpartum CVT after Cesarean

Table 4: Postpartum CVT after Cesarean Section

Parameter	Details
Age / Parity	22 years / P2
Timing	Postpartum Day 11 (following LSCS)
Presenting Symptoms	Severe headache
Imaging Findings	Thrombosis of superior sagittal sinus
Treatment	Anticoagulation, supportive physiotherapy
Outcome	Full recovery; no residual neurological symptoms

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Overview of Cerebral Venous Thrombosis (CVT)
Cerebral venous thrombosis is characterized by acute thrombosis of cortical veins and draining dural venous sinuses, either individually or in combination. First described in the French literature by Ribes in 1825, CVT typically affects women aged between 25 and 35 years. In developing countries, cultural practices, limited access to healthcare, and socioeconomic status may further contribute to diagnostic delays.

DISCUSSION

CVT during pregnancy and the puerperium remains a diagnostic and therapeutic challenge due to its highly variable and nonspecific clinical presentation. Our study of four cases highlights the potential for full recovery when diagnosis and treatment are timely. A large cohort study from China reported a CVT case fatality rate of 11.63% during pregnancy, with higher incidence in developing countries.[10] In contrast, all patients in our study recovered completely, aligning with findings from the International Study on Cerebral Vein and Dural Sinus Thrombosis (ISCVT), which demonstrated that early anticoagulation leads to favorable outcomes, even in cases with hemorrhagic infarction.[11,12] All our patients were treated with LMWH or unfractionated heparin, followed by oral anticoagulants—consistent with American Heart Association/American Stroke Association guidelines.[13] LMWH is preferred during pregnancy due to its safety and low placental transfer.[14] Case 2 involved seizures, intracerebral hemorrhage (ICH), and gestational hypertension—features considered negative prognostic indicators.[15] Despite this, early diagnosis and intensive care resulted in full recovery. Severe anemia, present in Case 1, is another known modifiable risk factor in low-resource settings. It may exacerbate the prothrombotic state of pregnancy.[16] Other contributors include cesarean delivery, reduced mobility, and postpartum dehydration.[17] While studies from Pakistan and the Middle East identify ICH and seizures as predictors of poor prognosis,[18] our findings suggest that even patients with severe presentations can fully recover with timely management. A key strength of this case series is the demonstration of excellent outcomes despite serious presentations. However, the study's limitations include its small sample size, retrospective nature, and lack of thrombophilia.

CONCLUSION

Cerebral venous thrombosis during pregnancy and the puerperium is uncommon but poses a major risk to maternal health. Its diverse and often cryptic appearance warrants a high level of clinical suspicion, especially during the peripartum period. Early neuroimaging, particularly with MRI and MR venography, remains the foundation of diagnosis. Our case series shows that timely anticoagulation, even in the midst of hemorrhagic infarctions, can result in complete neurological recovery and excellent maternal outcomes. These findings support existing data that timely and proper management dramatically lowers morbidity and mortality from pregnancy-related CVT.

Conflicts of interest
The authors have no conflict of interest to declare.

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