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Primary Spontaneous Intracerebral Hemorrhage in Pregnancy: A Case Report with Literature Review

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ABSTRACT

Intracranial Hemorrhage (ICH) during pregnancy is an uncommon but life-threatening neurological emergency associated with substantial maternal and fetal morbidity and mortality. Although most cases arise from hypertensive disorders of pregnancy or underlying structural cerebrovascular lesions, spontaneous ICH without an identifiable etiology can occur and poses significant diagnostic and management challenges. We describe a 23-year-old primigravida at 23 weeks' gestation who presented with sudden loss of consciousness following a severe headache and repeated vomiting, with no history of hypertension, trauma, or pre-existing neurological disease. Cranial computed tomography demonstrated a large right frontal intracerebral hemorrhage with midline shift, accompanied by an epidural hemorrhage. Emergency craniotomy with hematoma evacuation resulted in rapid neurological recovery without residual deficits. Maternal stabilization and timely neurosurgical intervention enabled continuation of the pregnancy to term with favorable maternal and neonatal outcomes. Early recognition, prompt neuroimaging, and coordinated multidisciplinary management are essential to optimizing maternal and fetal outcomes.

Keywords: Intracerebral hemorrhage, Intracranial hemorrhage, Mid-trimester, Pregnancy, Spontaneous, Stroke

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1. Introduction

Intracranial Hemorrhage (ICH) during pregnancy is an uncommon but life-threatening neurological event associated with significant maternal and fetal morbidity and mortality. The estimated incidence is approximately 30 per 100,000 pregnancies, **(1)** with hypertensive disorders contributing to nearly 70% of pregnancy-related stroke deaths **(2)**. Most cases arise from identifiable etiologies, particularly structural cerebrovascular abnormalities such as Arteriovenous Malformations (AVMs), cerebral aneurysms, moyamoya disease, and pregnancy-related hypertension **(3,4)**. However, approximately 24% of cases occur without a detectable underlying cause and are classified as spontaneous ICH **(5)**. Pregnancy itself is recognized as an independent risk factor for stroke, with the highest incidence occurring during the third trimester and the first 12 weeks postpartum **(6)**.

Early neuroimaging, prompt multidisciplinary collaboration, and timely surgical intervention involving neurosurgery, anesthesiology, and obstetrics are essential for optimizing maternal and fetal outcomes **(5,7)**. We present a case of spontaneous intracerebral hemorrhage in a 23-year-old primigravida at mid-pregnancy, successfully managed with emergency craniotomy under general anesthesia, resulting in favorable maternal neurological recovery and preserved fetal viability.

2. Case Presentation

A 23-year-old primigravida at approximately 23 weeks' gestation presented to the emergency department with a sudden decline in consciousness following an acute-onset severe headache and subsequent vomiting that began approximately two hours prior to admission. She had no history of alcohol use, smoking, seizures, trauma, or prior neurological symptoms. Previous antenatal visits were unremarkable, with no maternal or fetal complications reported.

On arrival, the patient appeared critically ill, with a Glasgow Coma Scale (GCS) score of E2M3V1. Vital signs included blood pressure 130/80 mmHg, heart rate 130 beats/min, respiratory rate 24 breaths/min, temperature 36.5°C, and oxygen saturation 99% on 3

L/min nasal cannula. General physical examination was normal. Neurological assessment revealed no pathological reflexes and no signs of meningeal irritation, including absence of neck stiffness. Obstetric evaluation confirmed a single live intrauterine pregnancy with appropriate fundal height, absence of uterine contractions, a closed cervix, and a normal fetal heart rate of 150 beats/min. Laboratory investigations demonstrated anemia (hemoglobin 9.4 g/dL) and marked leukocytosis (29,510 cells/µL)

Emergency non-contrast cranial Computed Tomography (CT) revealed a right frontal intracerebral hemorrhage with an estimated volume of approximately 79 mL, causing compression of the left lateral and third ventricle, accompanied by leftward subfalcine herniation measuring approximately 1.34 cm (Figure 1). A right parietal Epidural Hemorrhage (EDH) with a thickness of approximately 0.7 cm and associated cerebral edema were also identified. The patient was immediately managed by a multidisciplinary team involving neurosurgery, cardiology, and obstetrics and gynecology. Due to severely depressed consciousness, emergency endotracheal intubation was performed for airway protection. She subsequently underwent urgent hematoma evacuation via right fronto-temporo-parietal craniotomy under general anesthesia. A surgical drain was placed, and duraplasty was completed without postoperative bleeding.



Figure 1. Axial cranial CT scan showing a 79-mL hyperdense mass-like lesion in the right fronto-parietal region, associated with midline shift and epidural hemorrhage

Postoperatively, the patient was admitted to the intensive care unit. On Postoperative Day (POD) 3, hemoglobin decreased to 7.9 g/dL, while leukocytosis resolved (12,240 cells/µL). She received two units of packed red blood cells, resulting in a hemoglobin increase to 11.3 g/dL. By POD 4, she demonstrated marked neurological improvement and regained full consciousness without motor or sensory deficits. Obstetric reassessment confirmed persistent fetal cardiac activity. The patient was discharged on POD 8 in good clinical condition, with stable maternal and fetal status. The pregnancy subsequently progressed without further maternal or fetal complications, and at 37 weeks' gestation she underwent cesarean delivery, resulting in the birth of a healthy neonate. Both the mother and infant remained in good health following delivery.

3. Discussion

Intracranial emergencies during pregnancy pose substantial challenges in diagnostic decision-making and multidisciplinary coordination. Although most pregnancy-related intracranial hemorrhages are associated with hypertensive disorders or underlying cerebrovascular abnormalities, a significant proportion occur without identifiable risk factors **(5)**. Liang et al., reported that approximately 24% of cases are spontaneous **(8)**. Kittner et al., demonstrated that the relative risk of intracerebral hemorrhage increases to 2.5 (95% CI, 1.0-6.4) during pregnancy and rises further to 18.2 (95% CI, 8.7-38.1) in the early postpartum period **(9)**. Similarly, a systematic review by Ascani et al., found that most patients with spontaneous ICH did not have hypertensive disorders of pregnancy **(5)**.

Physiological adaptations in pregnancy including increased circulating blood volume, elevated cardiac output, hypercoagulability, and hormonally mediated vascular remodeling may alter cerebral autoregulation and increase vascular fragility **(10)**. In hypertensive disorders, endothelial dysfunction further exacerbates this vulnerability. Maternal hemodynamic instability directly compromises uteroplacental perfusion and fetal oxygenation, underscoring the urgency of timely diagnosis **(11,12)**.

Severe headache, nausea/vomiting, and rapid decline in consciousness during pregnancy should prompt immediate evaluation for intracranial pathology **(13)**. In this case, neuroimaging excluded aneurysm and AVM, consistent with evidence suggesting that pregnancy does not significantly increase AVM rupture risk, despite AVMs being implicated in up to 20% of hemorrhagic cases **(14)**. The occurrence of a large spontaneous hemorrhage at 23 weeks' gestation is unusual, as most cases are reported in the third trimester or early postpartum period, often in association with hypertension **(5,6,15)**.

Rapid neurological deterioration necessitates immediate neuroimaging. Non-contrast cranial CT-ideally within 20 minutes of arrival to the emergency department remains the diagnostic modality of choice, as fetal radiation exposure from maternal head CT is minimal and outweighed by the benefits of prompt diagnosis **(16-19)**. Early imaging enables timely surgical decision-making during the critical window in which intervention may prevent irreversible neurological injury. Magnetic Resonance Imaging

(MRI) may be considered in stable patients when additional anatomical detail is required **(20)**. In this case, CT imaging revealed a massive hemorrhage with midline shift and herniation, necessitating urgent surgical evacuation.

Management prioritizes maternal stabilization, as maternal survival is the strongest determinant of fetal outcome. Indications for neurosurgical evacuation during pregnancy mirror those in non-pregnant patients and include large hematoma volume, mass effect, and declining consciousness. Emergency craniotomy in this case resulted in complete neurological recovery, consistent with evidence that timely surgical intervention improves maternal outcomes. Anesthetic management must maintain cerebral perfusion, avoid increases in intracranial pressure, and preserve uteroplacental blood flow **(15,16)**.

At previable gestational ages, conservative fetal management with close monitoring is recommended, as immediate delivery does not improve fetal outcomes. Decisions regarding delivery mode and timing should be individualized. In stable neurological cases without elevated intracranial pressure, vaginal delivery may be considered with careful management to minimize maternal strain during the second stage. Cesarean delivery is reserved for standard obstetric indications or when maternal neurological status precludes safe labor **(21)**.

Postoperative care requires meticulous obstetric-focused monitoring to maintain stable maternal hemodynamics, oxygenation, and adequate hemoglobin levels to support uteroplacental perfusion. Serial fetal assessments including fetal heart rate monitoring and ultrasound evaluation of growth and well-being are essential for ongoing pregnancy management **(22)**.

4. Conclusion

Spontaneous intracerebral hemorrhage can occur during pregnancy even in young women without identifiable risk factors and may present outside the typical late-gestation or postpartum period. This case underscores the critical importance of early recognition of acute neurological symptoms, prompt neuroimaging, and rapid multidisciplinary decision-making. Maternal stabilization and timely neurosurgical intervention remain the cornerstone of management and are essential for optimizing maternal neurological recovery and fetal outcomes. With coordinated care, emergency craniotomy can be safely performed during pregnancy and may result in favorable prognoses for both mother and fetus.

5. Declarations

Acknowledgments

Not applicable

Ethical Considerations

Ethical approval was not required, as this report describes clinical cases without experimental procedures.

Authors' Contributions

Conceptualization: H.T., F.P., E.J.N.S., A.J.; Data curation: H.T., F.P.; Formal analysis: H.T., F.P.; Investigation: H.T., F.P., E.J.N.S., A.J; Resources: F.P., E.J.N.S.; Supervision: F.P.; Validation: E.J.N.S.; Writing - original draft: H.T., F.P., A.J.; Writing - review & Editing: H.T., F.P., E.J.N.S, A.J.; All authors read and approved the final version of the article.

Conflict of Interest

The authors declare no competing interests.

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