

Puerperal Cerebrovascular Complications of Preeclampsia with Severe Features: Insights from a Case Series on Anesthetic Management

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Background

- Puerperal cerebrovascular disease (PCD) is a rare, life-threatening complication occurring in ~0.33% of patients with preeclampsia with severe features during delivery hospitalization.
- Blood pressure fluctuations during general endotracheal anesthesia (GETA) for cesarean delivery (CD) have been proposed as a contributor to cerebrovascular injury.

Aim

To conduct a chart review of patients with preeclampsia with severe features who experienced a CDC-defined Severe Maternal Morbidity (SMM) PCD event to examine intrapartum hemodynamic patterns with PCD.

Hypothesis

Hypertension during the peridelivery period will be present in birthing people with preeclampsia with severe features who experience PCD.

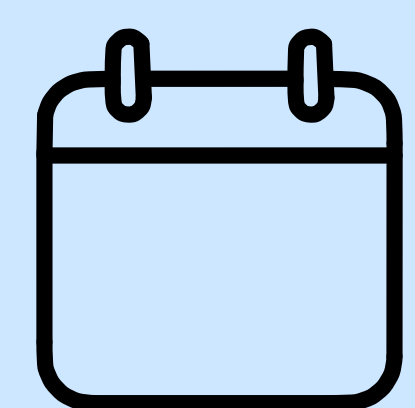


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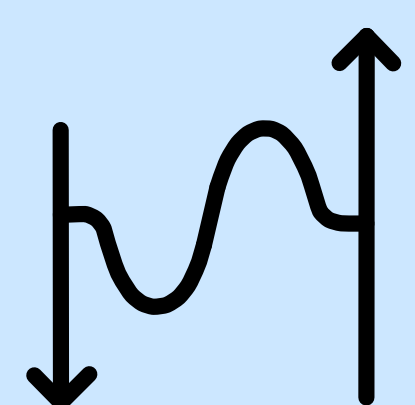


Study Design & Methods



Study Period

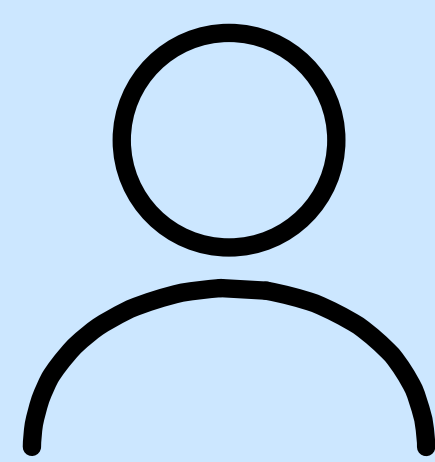
Delivery hospitalizations from **2016–2020** were reviewed.



Hemodynamic Definitions

Significant anesthesia-related hemodynamic changes were defined as:

- (1) severe pre-induction hypertension (SBP ≥ 160 mm Hg and/or DBP ≥ 110 mm Hg)
- (2) intraoperative hypotension (25–50% reduction from baseline SBP)
- (3) severe rebound hypertension on emergence (SBP ≥ 160 mm Hg and/or DBP ≥ 110 mm Hg)



Inclusion Criteria

Patients with **preeclampsia with severe features** and an ICD-10-CM code for a CDC SMM PCD event.

ICD-10 Codes
A81.2 — Progressive multifocal leukoencephalopathy (PML)
G93.49 — Other encephalopathy (diffuse brain dysfunction)
G45.x — Transient ischemic attacks (TIAs) and related syndromes
G46.x — Vascular syndromes of brain (e.g., brainstem stroke syndromes)
H34.0x — Central retinal artery occlusion (ocular stroke)
I60.xx — Subarachnoid hemorrhage (aneurysm rupture)
I61.xx — Intracerebral hemorrhage
I62.xx — Other nontraumatic intracranial hemorrhage
I63.00 — Cerebral infarction due to thrombosis (unspecified artery)
I63.01x — Cerebral infarction due to thrombosis of precerebral arteries
I63.1xx — Cerebral infarction due to embolism of precerebral arteries
I63.2xx — Cerebral infarction due to unspecified occlusion/stenosis of precerebral arteries
I63.3xx — Cerebral infarction due to thrombosis of cerebral arteries
I63.4xx — Cerebral infarction due to embolism of cerebral arteries
I63.5xx — Cerebral infarction due to unspecified occlusion/stenosis of cerebral arteries
I63.6 — Cerebral infarction due to cerebral venous thrombosis (nonpyogenic)
I63.8x — Other specified cerebral infarction
I63.9 — Cerebral infarction, unspecified
I65.xx — Occlusion/stenosis of precerebral arteries (no infarction)
I66.xx — Occlusion/stenosis of cerebral arteries (no infarction)
I67.xx — Other cerebrovascular diseases (includes vasospasm, PRES, etc.)
I68.xx — Cerebrovascular disorders in diseases classified elsewhere
O22.50 — Cerebral venous thrombosis in pregnancy, unspecified trimester
O22.52 — Cerebral venous thrombosis in pregnancy, second trimester
O22.53 — Cerebral venous thrombosis in pregnancy, third trimester
O87.3 — Cerebral venous thrombosis in the puerperium
I97.810 — Intraoperative cerebrovascular infarction during cardiac surgery
I97.811 — Intraoperative cerebrovascular infarction during non-cardiac surgery
I97.820 — Postprocedural cerebrovascular infarction following cardiac surgery
I97.821 — Postprocedural cerebrovascular infarction following non-cardiac surgery

Among **24,946** deliveries, **1,365 (5.47%)** had preeclampsia with severe features. Of these patients, nine patients had a PCD diagnosis code with **seven confirmed PCD events**.

Case	ICD-10 Code	Validated PCD event	Adjudication	PPH
1	PRES (I67.83)	Y	Potential opportunity for improved BP control; preinduction HTN → intraoperative drop → emergence rebound	Y
2	PRES (I67.83) SAH (I60.9) Ischemic stroke (I63.9)	Y	Periods of severe-range BP despite interventions; preinduction HTN → intraoperative drop → emergence rebound	Y
3	PRES (I67.83)	Y	Periods of severe-range BP despite interventions; preinduction HTN → intraoperative drop → emergence rebound	Y
4	Cerebral infarction due to right vertebral artery dissection (I63.012)	Y	In the absence of an anatomic vascular variant, elevated BP alone may not have resulted in PCD	N
5	Hemorrhagic stroke (I61.9) Cortical ICH (I61.1) Subcortical ICH (I61.0)	Y	Trauma vs malignant hypertension; equivocal BP modifiability	Y
6	PRES (I67.83)	Y	Improvement needed in antenatal care	N
7	PRES (I67.83)	Y	Improvement needed in antenatal care	N
8	Bell's Palsy (G51.9)	N	N/A	N
9	Disorder of basilar artery (I77.9)	N	N/A	N

Figure 1. Overview of nine patients with PCD codes.

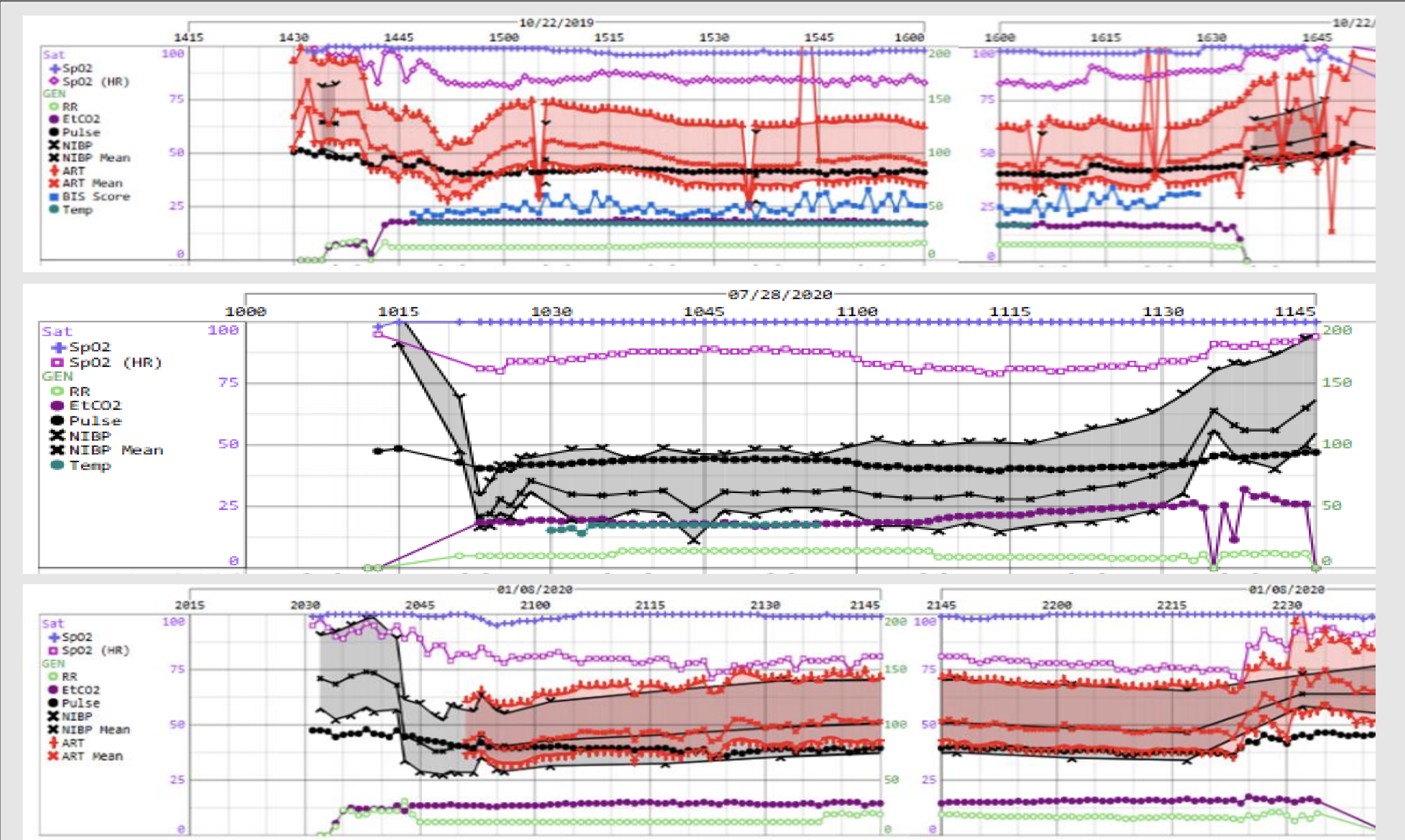


Figure 2: Anesthetic Records requiring GETA demonstrate large hemodynamic fluctuations. *Top panel:* Case 1. *Middle panel:* Case 2. *Bottom panel:* Case 3.

Conclusion & Discussion

In this case series, we identify a relationship between PCD and large blood pressure fluctuations that occurred only in patients requiring GETA.

Key Finding

Vigilant BP management, minimizing hemodynamic fluctuations, and preventing rebound hypertension are critical in this scenario. Anesthesiologists should be aware patients demonstrating large BP fluctuations are high risk for neurological complications.

Unexpected Finding

All patients with large blood pressure fluctuations who received GETA also experienced PPH.



Framework for Future Research

These findings offer a framework for studying cardiovascular vulnerability and anesthesia-related hemodynamic changes in preeclampsia. Poor coding for PCD in pregnancy—often due to misclassification or missing data—may underestimate risk. Future research should assess coding practices and evaluate absolute PCD risk through prospective and retrospective studies.