



Posterior Reversible Encephalopathy Syndrome and Pre-Eclampsia/Eclampsia: Anesthetic Implications and Management



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Introduction

Posterior Reversible Encephalopathy Syndrome (PRES)

Hypertension
Acute onset of neurologic symptoms
Focal subcortical vasogenic edema on neuroimaging
Reversibility of imaging findings [1]

- Rare (<1% incidence in specific susceptible population subsets) [2].
- Conditions associated with PRES: hypertension, sepsis, renal insufficiency, cytotoxic medications, immunosuppressive therapy, & autoimmune disorders [3].
- Emerging evidence that pre-eclampsia & eclampsia with neurological symptoms associated with PRES[2,4]..
- Case reports suggest anesthetic technique as the cause of PRES in healthy surgical patients [5-7].
- More information is needed on these overlap syndromes in order to determine optimal anesthetic care.

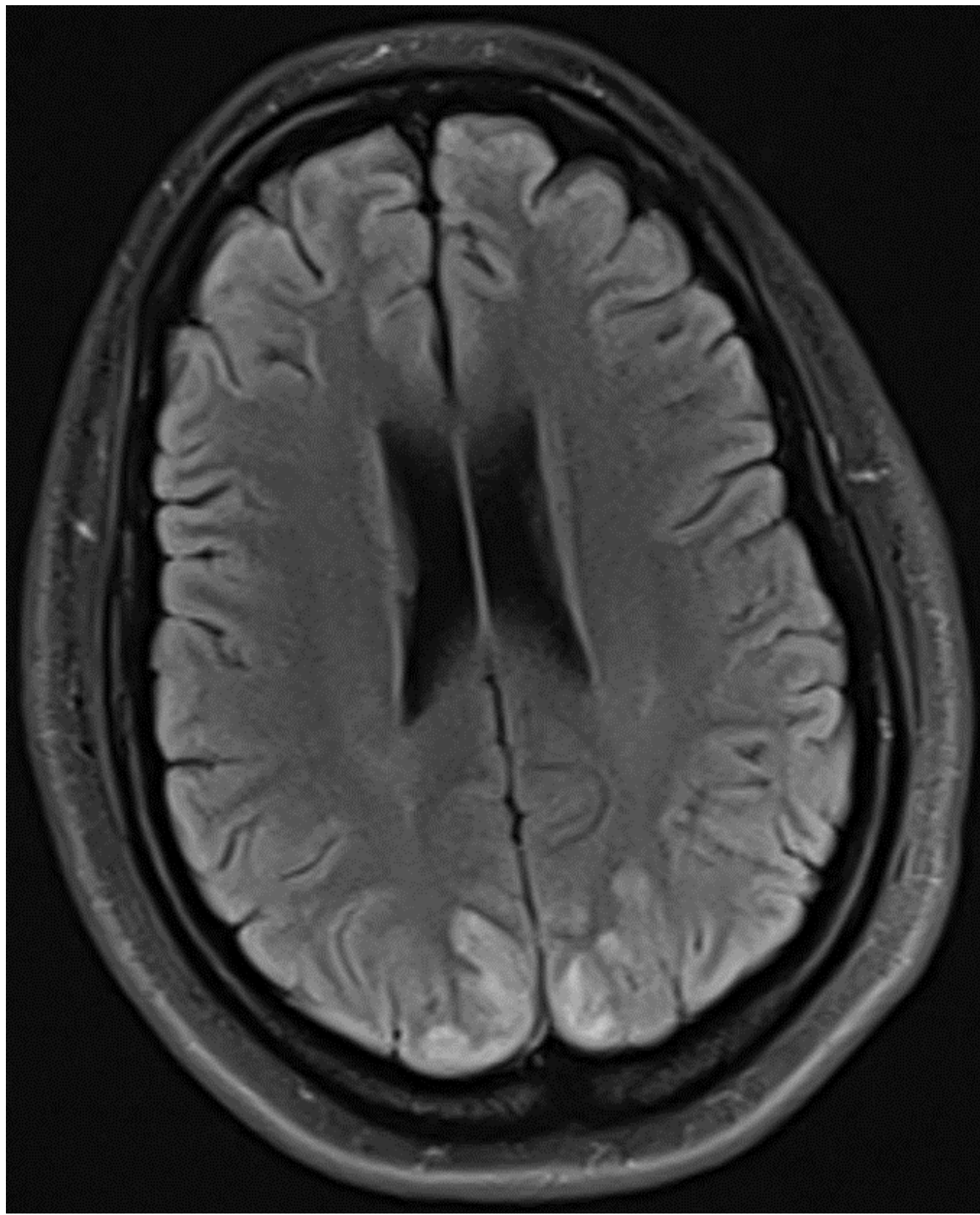


Figure 1. **MRI demonstrating increased T2 and FLAIR signal in cortical and subcortical regions of the parietal and occipital lobes.**

Case 1

- 23-year-old, 24-weeks EGA presents w/ bilateral vision loss, headache, nausea, & vomiting.
- PMH: Stage-3 chronic kidney disease (FSGS)
- PE:
 - BP: 210/110 mmHg w/ bilateral pedal edema
- Studies:
 - Cr: 2.0 mg/dL (baseline) —> 3.6 mg/dL
 - Elevated liver-associated enzymes,
 - Uremia,
 - Thrombocytopenia,
 - Anemia,
 - Proteinuria
 - Brain MRI w/o contrast: symmetric cortical & subcortical signal abnormality of the posterior parietal & occipital lobes (Figure 1)
- Diagnosis: early-onset pre-eclampsia, HELLP syndrome, and PRES
- Treatment:
 - BP management: labetalol, hydralazine, & nifedipine
 - Seizure prophylaxis: magnesium sulfate
- Course:
 - BP <140/80mmHg resulted in resolution of headaches & visual sx
 - Labs demonstrated persistent renal injury & HELLP syndrome
 - Obstetric team recommend cesarean deliver to ↓ the risk of maternal/fetal complications.
 - Anesthesia team performed subarachnoid block
 - 24-week infant was delivered w/o incident & admitted to the neonatal intensive care unit
 - The patient experienced no adverse anesthetic complications
 - Renal & hepatic function returned to baseline over the following week

Case 2

- 18-year-old, 37 week EGA presents with generalized tonic- clinic seizure by ambulance
- Prodrome: days of headache, vision changes, confusion, difficulty with ADLs
- PMH: negative
- PE:
 - BP 160/100 mm Hg, nml RR and O2 sat, GCS 8
 - Fetal assessment: cephalic, FHR 140-160 bpm
- Initial management:
 - Magnesium and labetalol IV with improvement: BP: 130/80mmHg, & resolution of seizure
- Studies
 - Head CT: no acute intracranial pathology
 - Labs:
 - Severe lactic acidosis (15.5mmol/L), pH of 6.8,
 - Mild elevation of liver-associated enzymes,
 - Proteinuria.
 - CBC initially wnl but platelets : 46,000/μL 6 hours later
 - Brain MRI: cortical and subcortical signal abnormality in the bilateral parietooccipital/frontotemporal lobe
- Diagnosis: PRES
- Course
 - Magnesium therapy for seizure prophylaxis
 - Obstetric team recommended urgent cesarean delivery
 - Anesthesia team: provided general anesthesia with induction with propofol & succinylcholine & maintenance with 2.0% sevoflurane.
 - Infant: APGAR scores of 8&9 at one and five minutes of life
 - Maternal course uncomplicated with resolution of her laboratory abnormalities within five days.



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PRES and Eclampsia

Proposed Mechanisms of PRES

Acute increases in mean arterial pressure with autoregulation failure leading to blood-brain barrier dysfunction & vascular leakage into the cerebral white matter [9]

Endothelial dysfunction from endogenous or exogenous toxins creating cerebral edema [10].

- Pre-eclampsia & eclampsia are pregnancy-related hypertensive disorders presenting after 20-weeks-gestation.
- Pre-eclampsia includes hypertension with proteinuria, maternal organ dysfunction, & uteroplacental dysfunction absent other causative conditions [11].
- Eclampsia is characterized by pre-eclampsia with seizures.
- Etiology unclear, although the placenta likely plays an integral role.

The similarities in clinical and laboratory data of pre-eclampsia/eclampsia and PRES indicate a shared pathologic cause

100% prevalence of radiologic evidence of PRES in patients diagnosed with eclampsia in 110 patients [4].

92.3% of patients diagnosed with eclampsia demonstrated MRI-confirmed PRES [2]. 19.2% of patients with pre-eclampsia and concomitant neurologic symptoms had MRI findings of PRES [2]

- These studies demonstrate that PRES may be a primary component of nervous system injury in pre-eclampsia/eclampsia.

Anesthetic Management of PRES Patients

- Paucity of literature on the anesthetic implications of PRES.
- Anesthetic management of pre-eclampsia/ eclampsia include potential for coagulopathy, hemorrhage, hemodynamic instability, severe intravascular volume depletion, renal/ hepatic impairment, and airway edema [12].
- Considering the risk/benefit of neuraxial and general anesthesia, the patient’s exam, laboratory studies, and physiologic derangements determine the safest anesthetic plan.
- Additionally, multiple case reports citing temporarily relationship and lack of other identified cause directly implicate anesthesia as the sole cause of PRES.
 - Case 1:General anesthetic followed by a spinal with intrathecal morphine. The authors speculated that the intrathecal morphine was the cause of the patient’s PRES [5].
 - Case 2: General anesthesia and patient intubated for several days post-operatively due to the inability to control convulsions with speculation that the anesthetic contributed to this prolonged course of PRES & eclampsia, [6].

- Dural puncture may also be causative to the development of PRES.
- A patient undergoing thoracic spine surgery developed PRES after sustaining a dural tear [7].

These cases suggest that exposure to anesthetic agents or techniques involving dural puncture may be a risk factor for development of PRES, however, the evidence is anecdotal at this point and requires further exploration.

Conclusion

- Lack of knowledge on cause of PRES makes anesthetic management difficulty
- Advancement of technologies such as MRI have recently shed light on this conditions.
- Clinicians must be aware of PRES as a possible cause of neurological symptoms in pre-eclampsia and eclampsia.
- Careful risk/benefit analysis while considering confounding conditions, physical exam, laboratory testing, and patient physiology should guide the choice of anesthetic.
- Pathophysiology of PRES with brain injury, vasogenic edema, and the potential risk of increased intracranial pressure further complicate anesthetic planning.
- These two unique cases add to the body of information and highlight the paucity of experience managing this condition during pregnancy.

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