

A Triple Threat at the Incision: Severe Pulmonary Hypertension, Impending Thyroid Storm, and Preeclampsia with Severe Features in Cesarean Delivery

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Introduction

- Severe pulmonary arterial hypertension (PAH) in pregnancy is associated with high maternal morbidity and mortality, largely driven by the risk of acute right ventricular failure during periods of rapid hemodynamic change.
- Obstetric delivery, particularly cesarean delivery, poses unique challenges, a physiologic “cliff”, due to abrupt alterations in preload, afterload, and pulmonary vascular resistance.
- These risks are further amplified in the presence of concurrent preeclampsia with severe features and uncontrolled hyperthyroidism with impending thyroid storm, each of which independently but synergistically contributes to cardiovascular instability and heightened sympathetic tone.
 - **Preeclampsia with severe features:** Endothelial dysfunction, ↑ SVR, risk of seizures
 - **Impending thyroid storm (Graves’ disease):** Hyperadrenergic state → tachycardia, ↑ myocardial oxygen demand
 - **Combined effect:** Markedly ↑ cardiovascular instability + High risk of perioperative decompensation
- Anesthetic management in this context demands deliberate, physiology-driven planning to optimize right ventricular preload and coronary perfusion, preserve systemic vascular resistance, and prevent acute elevations in pulmonary vascular resistance (e.g., from hypoxia, hypercarbia, acidosis, or pain). Equally critical is avoiding abrupt sympathectomy and attenuating catecholamine surges.
- These principles underscore a targeted anesthetic approach focused on minimizing the risk of cardiopulmonary decompensation in the setting of multiple intersecting high-mortality conditions.

Case Report

A 34-year-old G4P3003 at 28w3d presented for urgent cesarean delivery due to non-reassuring fetal status remote from delivery, in the setting of **preterm premature rupture of membranes** and **intraamniotic infection, chronic hypertension with superimposed preeclampsia with severe features, severe hyperthyroidism** secondary to Graves' disease with medication nonadherence and **impending thyroid storm, fetal hyperthyroidism, and severe maternal pulmonary arterial hypertension.**

- To mitigate right ventricular failure in the setting of severe pulmonary hypertension, invasive monitoring with arterial and central venous access, including pre-induction placement of a pulmonary artery catheter, was established prior to combined spinal-epidural anesthesia using low-dose intrathecal bupivacaine (7.5 mg), fentanyl (15 mcg), and morphine (0.15 mg), with sensory level titrated to T4 using 2% lidocaine.
- Vasopressin was initiated at 0.03 units/min for blood pressure support and magnesium sulfate started for pulmonary vasodilation and seizure prophylaxis.
- **Hospital Course/Outcome:** Transferred to the CICU following an uncomplicated cesarean delivery for ongoing management of pulmonary arterial hypertension, initiation of methimazole and stress-dose hydrocortisone for concern for impending thyroid storm, and continued blood pressure control.

Discussion

- The anesthetic management of cesarean delivery in patients with severe PAH is centered on the prevention of right ventricular failure through maintenance of preload, systemic blood pressure, and right ventricular coronary perfusion while minimizing increases in pulmonary vascular resistance.^{1, 2}
- Invasive hemodynamic monitoring, including pulmonary artery catheterization, can provide real-time assessment of filling pressures and cardiac output, real-time data to guide fluid management, vasopressor selection, and facilitating early recognition of right ventricular decompensation in selected high-risk patients.
- Low-dose combined spinal-epidural techniques allow for gradual onset of neuraxial sympathectomy, thereby avoiding the abrupt reductions in systemic vascular resistance and preload associated with single-shot spinal anesthesia.³
- Vasopressin utilization for hemodynamic support allows for its ability to augment systemic vascular resistance with minimal effect on pulmonary vascular resistance, preserving right ventricular afterload conditions.
- Magnesium sulfate utilization allows for not only for seizure prophylaxis in the setting of preeclampsia with severe features and but for its favorable cardiopulmonary effects, including pulmonary vasodilation, attenuation of catecholamine release, and antiarrhythmic properties.⁴
- This case illustrates the importance of individualized anesthetic planning, physiologic goal-directed management, and close multidisciplinary collaboration when multiple high-risk maternal conditions converge. Careful selection of anesthetic technique, invasive monitoring, and vasoactive agents can mitigate hemodynamic instability and support favorable maternal and fetal outcomes in an otherwise extremely high-risk obstetric population.

References

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² ACOG Practice Bulletin No. 212: Pregnancy and Heart Disease. *Obstetrics & Gynecology* 133(5):p e320-e356, May 2019.

³ Choudhury M. Neuraxial anaesthesia in parturient with cardiac disease. *Indian J Anaesth.* 2018 Sep;62(9):682-690.

⁴ Magee LA, Nicolaides KH, von Dadelszen P. Preeclampsia. *N Engl J Med.* 2022 May 12;386(19):1817-1832.



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