GENERAL

anesthetic management of preeclampsia eclampsia

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Introduction

Every year, preeclampsia and its severe complication, eclampsia, affect thousands of pregnant women worldwide. These hypertensive disorders not only jeopardize maternal health but also pose significant risks to the fetus. When surgical intervention—most commonly a cesarean section—is required, anesthetic management becomes a critical determinant of outcomes. The anesthesiologist must balance the need for rapid, effective anesthesia with the unique physiological challenges posed by preeclampsia and eclampsia. This article provides a comprehensive, evidence based guide to the anesthetic management of preeclampsia and eclampsia, covering preoperative assessment, intraoperative strategies, and postoperative care. By integrating current guidelines, practical case examples, and expert recommendations, clinicians can improve both maternal and fetal outcomes in this high risk population.

Understanding Preeclampsia and Eclampsia

Definition and Pathophysiology

Preeclampsia is a multisystem disorder characterized by new onset hypertension ("e140/90 mmHg) and proteinuria or end organ dysfunction after 20 weeks of gestation. Eclampsia represents the progression to generalized seizures, often occurring when cerebral autoregulation is overwhelmed by severe hypertension. The underlying pathophysiology involves abnormal placental spiral artery remodeling, leading to placental ischemia, endothelial dysfunction, and a cascade of inflammatory mediators. The resulting systemic vasoconstriction and capillary leakage contribute to the hallmark features of edema, organ damage, and a heightened risk of thrombotic events.

Risk Factors and Clinical Presentation

Risk factors include primiparity, advanced maternal age, obesity, pre existing hypertension, diabetes mellitus, and a history of preeclampsia. Clinically, patients may present with headaches, visual disturbances, epigastric pain, edema, or sudden onset seizures. Laboratory abnormalities often reveal thrombocytopenia, elevated liver enzymes, and impaired renal function. Recognizing these signs early is essential for timely intervention and optimal anesthetic planning.

Why Anesthetic Management Matters

Maternal and Fetal Outcomes

Inadequate anesthetic management can precipitate catastrophic events such as malignant hypertension, pulmonary edema, or maternal death. Conversely, a well structured anesthetic plan can mitigate these risks, reduce operative time, and improve neonatal Apgar scores. The anesthesiologist’s role extends beyond the operating room, influencing postoperative recovery, pain control, and long term maternal health.

Challenges in the Operating Room

Key challenges include maintaining stable blood pressure, preventing seizures, managing fluid shifts, and ensuring adequate uteroplacental perfusion. The altered pharmacokinetics in pregnancy, combined with the systemic effects of preeclampsia, demand meticulous monitoring and rapid response to physiological changes.

Preoperative Assessment and Planning

Comprehensive History and Physical Examination

A thorough history should document blood pressure trends, medication use (particularly magnesium sulfate), seizure activity, and any comorbid conditions. Physical examination focuses on cardiovascular status, pulmonary assessment, and evaluation for signs of pulmonary edema or impending cardiac failure.

Laboratory and Imaging Workup

- Complete blood count and platelet count
- Serum electrolytes, creatinine, and liver function tests
- Coagulation profile (PT, aPTT, INR)
- Urinalysis for proteinuria
- Baseline arterial blood gas if indicated
- Chest X ray only if pulmonary edema is suspected

Multidisciplinary Team Coordination

Effective collaboration among obstetricians, anesthesiologists, neonatologists, and nursing staff is essential. Pre operative briefings should outline the anesthesia plan, anticipated complications, and contingency strategies, ensuring seamless communication throughout the perioperative period.

Anesthetic Techniques for Preeclampsia/Eclampsia

General Anesthesia Considerations

General anesthesia may be necessary in cases of severe eclampsia, massive hemorrhage, or when regional techniques are contraindicated. Rapid sequence induction with careful airway management reduces aspiration risk. Agents such as propofol or etomidate should be used cautiously, considering their cardiovascular effects. Neuromuscular blockade can be reversed with neostigmine and glycopyrrolate, but the patient’s baseline neuromuscular function must be evaluated.

Regional Anesthesia: Epidural and Spinal Options

Regional techniques are preferred when feasible, offering superior postoperative analgesia and reduced maternal morbidity. An epidural catheter allows titrated analgesia and can be combined with spinal anesthesia for a cesarean section. However, caution is required to avoid hypotension, which may compromise uteroplacental perfusion. Spinal anesthesia provides rapid onset but carries a higher risk of abrupt hypotension, necessitating pre loading with crystalloids and vasopressors such as phenylephrine or ephedrine.

Choosing the Right Technique

Selection hinges on the severity of hypertension, presence of seizures, coagulopathy status, and obstetric urgency. In patients with significant coagulopathy or thrombocytopenia (

Intraoperative Management

Hemodynamic Monitoring and Blood Pressure Control

Continuous arterial line monitoring is recommended to provide real time blood pressure data. Target systolic blood pressure should be maintained between 140–160 mmHg to ensure adequate uteroplacental flow while preventing hypertensive crises. Phenylephrine is preferred for its predictable vasoconstrictive effect, but ephedrine may be used if bradycardia is present.

Fluid Management Strategies

Balanced crystalloids are the first line, with careful titration to avoid fluid overload. Goal directed therapy using stroke volume variation or pulse pressure variation can guide fluid administration. Colloids may be considered in cases of significant blood loss, but their use should be balanced against the risk of coagulopathy.

Seizure Prophylaxis and Management

Magnesium sulfate remains the cornerstone of seizure prophylaxis. A loading dose of 4–6 g IV over 15–20 minutes followed by a maintenance infusion of 1–2 g/hr is standard. Serum magnesium levels should be monitored every 4–6 /hours, aiming for 4–7 /mg/dL. In the event of a seizure, additional magnesium or a short acting benzodiazepine may be required.

Temperature Regulation and Oxygenation

Hypothermia can precipitate coagulopathy and worsen neurologic outcomes. Active warming blankets and warmed IV fluids should be used. Oxygen saturation should be maintained above 95 % using high flow nasal cannula or face mask, especially during periods of apnea or hypotension.

Postoperative Care and Monitoring

Analgesia and Sedation

Multimodal analgesia, combining acetaminophen, non steroidal anti inflammatory drugs (if not contraindicated), and low dose opioids, reduces the need for high opioid doses. Epidural or intrathecal morphine can provide sustained analgesia while minimizing systemic side effects.

Monitoring for Postpartum Hemorrhage

Early detection of hemorrhage is vital. Serial hemoglobin/hematocrit measurements, uterine tone assessment, and continuous pulse oximetry help identify bleeding. Prompt uterotonics and, if necessary, interventional radiology or surgical procedures should be available.

Long Term Follow up and Patient Education

Patients should receive counseling on blood pressure monitoring, medication adherence, and lifestyle modifications. A scheduled follow up with the obstetrician and primary care provider within 6–12 weeks postpartum ensures resolution of hypertension and early detection of chronic conditions.

Common Complications and How to Avoid Them

Hypertensive Crisis

Rapid, uncontrolled blood pressure spikes can lead to stroke, myocardial infarction, or placental abruption. Early use of short acting antihypertensives, vigilant monitoring, and patient education on recognizing warning signs can mitigate this risk.

Pulmonary Edema

Fluid overload, myocardial dysfunction, and capillary leak contribute to pulmonary edema. Strict fluid restriction, diuretic therapy (e.g., furosemide), and careful monitoring of oxygenation status help prevent this life threatening complication.

Thromboembolic Events

Hypercoagulability in pregnancy, combined with immobility and endothelial injury, increases thrombotic risk.

Prophylactic low molecular weight heparin and early mobilization reduce incidence, especially in patients with severe preeclampsia.

Evidence Based Guidelines and Recommendations

International Society for the Study of Hypertension in Pregnancy (ISSHP)

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