



CASE REPORT

General Anesthesia for the Gravid Patient in the Emergency Operating Room at Sanglah General Hospital

Achmad Munif¹, Kadek Intan Jelita², I Nyoman Santa Wijaya¹ and Pontisomaya Parami^{1*}

¹Department of Anesthesiology, Pain Management, and Intensive Care, Faculty of Medicine, Udayana University, Sanglah General Hospital, Denpasar-Bali, Indonesia

²Medical Education Program, Faculty of Medicine, Udayana University, Denpasar-Bali, Indonesia



*Corresponding author: Pontisomaya Parami, Department of Anesthesiology, Pain Management, and Intensive Care, Faculty of Medicine, Udayana University, Sanglah General Hospital, Denpasar-Bali, Jalan Diponegoro, Denpasar, Indonesia

Abstract

General anesthesia and regional anesthesia are the anesthetic techniques of choice for caesarian delivery. Anesthetic technique of choice is determined by several factors such as the safety of the parturient (evaluation of the airway and risk of aspiration), technical problems, the well-being of the fetus, and the experience of the anesthesiologist. Superimposed preeclampsia is defined as chronic hypertension in pregnant women with gestational age > 20 weeks. When neurological manifestations arises, this condition becomes an emergency and requires immediate pregnancy termination by caesarian section. We report a case of a 42-year-old woman, 38-39 weeks pregnant, with a history of hypertension and ADHF Profile B, in an intubated state has undergone a green code caesarean section with general anesthesia using propofol 200 mg, fentanyl 100 mcg, rocuronium 50 mg. The operation lasted 50 minutes, and the patient maintained stable hemodynamics, with 300 ml blood loss. The baby was a male, born with APGAR score of 8/9, weighted 2410g. The patient was observed in the intensive care unit post-operatively. Pregnancy with superimposed preeclampsia carries a high risk of morbidity and mortality, for both the parturient and the fetus. Caesarean section with general anesthesia is preferred in superimposed preeclampsia with neurologic complications because it can achieve rapid induction, optimal airway control, and lower risk of hypotension and cardiovascular instability.

Keywords

Superimposed preeclampsia, General anesthesia, Caesarian section, Neurological manifestations

Introduction

General and regional anesthesia are commonly used for pregnancy termination by caesarian section. The selection of the anesthetic techniques is based on the patient's clinical condition which includes hemodynamic status, history of heart diseases, history of medications and the type of surgery (elective or emergency). In emergency cases such as pregnancy with fetal distress, general anesthesia is the method of choice because it can achieve rapid anesthesia. Contraindications for regional anesthesia are increased intracranial pressure, hypovolemic shock, sepsis, coagulopathy, utero-placental insufficiency, and infection or inflammation at the injection site.

In 2019, here are 1,066 cases of maternal death due to hypertension in pregnancy [1]. Chronic hypertension in pregnancy is defined as hypertension (blood pressure $\geq 140/90$ mmHg) that is already present before pregnancy. About 1-5% of cases of chronic hypertension occur in all pregnancies worldwide. Superimposed preeclampsia is defined as chronic hypertension that occurs in pregnant women with gestational age > 20 weeks with manifestations of preeclampsia such as thrombocytopenia, impaired liver function, renal insufficiency or other manifestations of preeclampsia [2]. Superimposed preeclampsia carries a higher risk of morbidity and mortality compared to chronic hypertension alone [3]. When seizures are present, the condition is referred as eclampsia [2].

The main treatment for superimposed preeclampsia is termination of pregnancy, with fetal maturity and maternal morbidity taken into consideration. Vaginal delivery is still the method of choice for delivery, but if neurological symptoms (such as decreased level of consciousness, seizures, blurred vision, severe headache, nausea and vomiting accompanied by intracerebral bleeding, pulmonary edema, and proteinuria > 4-5 grams/day) are present, vaginal delivery cannot be done [2,4]. Neurological symptoms that arise in preeclampsia are associated with the presence of encephalopathy posterior syndrome, which can be caused by failure of autoregulation, blood-brain barrier leakage, and influx of serum protein to the brain tissue [5]. In this condition, termination of pregnancy is required as soon as possible by caesarean section [5,6].

Regarding the selection of anesthesia techniques for immediate pregnancy termination, anesthesiologists must first carefully understand the pathophysiology of superimposed preeclampsia. Advantages of general anesthesia include rapid induction, optimal airway control, and lower risk of hypotension and cardiovascular instability, but there are also disadvantages such as increased risk of aspiration and hyperventilation in the parturient, and fetal distress. This causes fetal hypoxemia and acidosis, as well as difficulty intubation. Therefore, multidisciplinary discussions are needed between obstetricians and anesthesiologists in order to achieve the optimal results and to successfully perform caesarian birth [7].

Case Report

History

A 42-year-old woman, G4P3A0, 38-39 weeks pregnant, was admitted to Sanglah Hospital due to decreased consciousness since morning of that day (22/10/2021). The patient was referred from a private hospital, where she was originally planned to have an elective caesarean section, but the patient suddenly experienced a loss of consciousness after coughing and shortness of breath at 10.30 A.M WITA (22/10/2021). She was then intubated and was referred to Sanglah Hospital. Complaints of headache, blurred vision, epigastric pain were absent. The patient had a history of hypertension since two years ago and was on antihypertensive medication (Lisinopril 1 × 10 mg). The patient had a history of previous at-term spontaneous deliveries. Comorbidities such as diabetes mellitus, asthma, and heart diseases were absent. History of allergies to food and drugs is absent.

Physical examination

On physical examination, the patient was unconscious under anesthesia, with GCS E_1VxM_1 . Vital signs are as follow: blood pressure 150/78 mmHg, heart rate 130 beats per minute, respiratory rate 18 times per

minute, rhonchi +/+, Wheezing +/+, peripheral oxygen saturation 90-91% on ventilator BIPAP, PIP 25, PEEP 8, 100% FiO_2 . On abdominal examination, bowel sounds were normal, uterine fundal height was 3 fingers below the xyphoid process, the fetal heart rate was 140-150 beats per minute. The patient was catheterized with a dower catheter, urine output was approximately 0.7 ml/kg/hour. On musculoskeletal examination, maximal neck flexion was possible, mallampati score was difficult to evaluate, teeth were intact, dentures were absent, CRT < 2 seconds. Laboratory investigation result was as follow: WBC $21.18 \times 10^3/\mu L$; Hb 15.20 g/dL; HCT 45.70%; PLT $367.00 \times 10^3 \mu L$; PT 9.4 seconds; aPTT 27.6 seconds; INR 0.82; SGOT 25.5 U/L; SGPT 12.60 U/L; BUN 7.40 mg/dL; SCr 0.80 mg/dL; Albumin 3.14 g/d; Na 134 mmol/L; K 3.20 mmol/L. ECG examination result was as follow: sinus rhythm 88 beats per minute, no enlargement of the heart. Oropharyngeal and nasopharyngeal swab test for SARS-CoV-2 was negative. The patient was diagnosed with G4P3A0, 38-39 weeks pregnant, advanced maternal age, superimposed preeclampsia, loss of consciousness (LOC) caused by hypertensive encephalopathy with potential complications including bleeding, hemodynamic instability, fetal distress, eclampsia, and arrhythmias. Based on ASA classification for anesthesia risk assessment, the patient status was categorized as ASA-IV.

Anesthetic management

Pre-operation measures include insertion of intravenous line, administration of 500 cc of Ringer's lactate solution with magnesium sulphate given 28 drops per minute, nifedipin 10 mg per oral, and insertion of a dower catheter. The patient underwent a green code caesarean section without premedication. Anesthesia was induced using propofol 200 mg, fentanyl 100 mcg, rocuronium 50 mg, with maintenance in the form of O_2 ; continuous propofol, fentanyl and intermittent rocuronium. Hemodynamic status during surgery was as follow: systolic blood pressure ranging from 90-140 mmHg, diastolic blood pressure 55-78 mmHg, pulse 86-103 x/minute, respiratory rate 17-18 x/minute, Peripheral oxygen saturation 98-99% On Ventilator PC BIPAP, PIP 25 PEEP 10, FiO_2 100%. The baby was born with normal muscle tone, immediately breathing, with APGAR score of 8/9, weighed 2,410g. The operation lasted for 50 minutes with total blood loss of 300 ml. Post-operatively, the patient was given intravenous fluid, fentanyl 300 mcg/24 hours, ondansetron 4 mg/day if nausea and vomiting occurs, post-operative antibiotics and maintenance dose of magnesium sulphate.

Discussion

Pregnancy causes a number of physiological changes that may affect anesthetic techniques such as (1) Lower minimum alveolar concentration (MAC); (2) Increased

Table 1: Indications for pregnancy termination in preeclampsia.

Maternal indications	Fetal indications
<ul style="list-style-type: none"> - Gestational age at 37 weeks; or - Gestational age at 34 weeks with: - In labor or membrane rupture - Worsening of maternal well-being - Persistent severe headache or visual changes; eclampsia - Respiratory distress; chest tightness with crackles on auscultation and/or oxygen saturation < 94 percent in room air; pulmonary edema. - Uncontrolled severe hypertension despite treatment - Oliguria < 500 mL/24 hours or serum creatinine 1.5 mg/dL - Persistent platelet count < 100,000/L, - Elevated AST or ALT concentration > 2 × upper limit with RUQ or epigastric pain, - Suspected placenta abruption, progressive labor, and/or membrane rupture [7]. 	<p>Delivery by cesarean section can be offered at 25-26 weeks of gestation with an estimated fetal weight of 600g and with normal fetal parameters (umbilical cord Doppler, cardiotocography), after complete corticosteroid administration and administration of magnesium sulphate [12].</p> <ul style="list-style-type: none"> - Severe growth restriction (< 5th percentile for EGA) - Persistent severe oligohydramnios AFI < 5 cm/DVP < 2 cm. - Biophysical profile is done 4 times with an interval of 4-6 hours - Presence of reversed end-diastolic umbilical artery flow - Presence of repeated late or severe variability of fetal heart rate with decelerations - Fetal death [7].

risk of aspiration and difficult airway; (3) Risk of maternal hypotension due to induction of anesthesia; (4) Increased anesthesia-associated risks in pre-term pregnancy. Fetal factors must also be taken into account, such as (1) Adequate uteroplacental circulation must be maintained, which depends on maternal blood pressure; (2) Potential teratogenic adverse effects from the anesthetic agents used; (3) And postoperative monitoring of the baby after anesthesia [7].

In the case we reported, the patient was diagnosed with superimposed preeclampsia with decreased level of consciousness due to hypertensive encephalopathy with ADHF profile B caused by hypertensive emergency. When the patient arrived at the emergency department, level of consciousness was already decreased, and was mechanically ventilated on PC mode BiPAP PIP 25 PEEP 10 FiO₂ 100%. Wheezing and rhonchi were heard on auscultation, which may be caused by pulmonary edema. The past medical history of the patient revealed history of uncontrolled hypertension and history of heart disease.

The importance of pre-operative evaluation is to assess risk factors that could cause complications when performing anesthesia. Complications of preeclampsia include eclampsia, HELLP syndrome (hemolysis, elevation of liver enzymes, decreased platelets), pulmonary edema, renal failure, disseminated intravascular coagulopathy (DIC), hypertensive emergency, hypertensive encephalopathy and cortical blindness. In cases of emergency cesarean section, pre-operative evaluation needs to be carried out simultaneously in the operating room of the emergency care unit because time is very limited [7].

Hypertensive emergency is a complication of both preeclampsia and chronic hypertension. The central

nervous system compensate by dilating cerebral arterioles in order to maintain adequate perfusion, whereas the cerebral vascular resistance is increased following the systemic increase of vascular resistance. Hypertensive encephalopathy is a subacute neurologic syndrome caused by increased cerebral arterial pressure, characterized by headaches, seizures, decreased vision and other neurologic disturbances (changes in mental status, focal neurological symptoms) [8].

The only definitive treatment for preeclampsia is delivery, but delivery must be immediate, taking into account the important prognostic factors including gestational age, severity of maternal disease and fetal well-being [9] (Table 1).

A green code caesarian section is a procedure to manage pregnancies that threatens the safety of the parturient, and also carries a high risk of fetal death. General anesthesia was done, induced with propofol and other anesthetic agents such as rocuronium and fentanyl as muscle relaxant and analgesic, accordingly. Perioperative measures include oxygenation, diuretics, fluid restriction to decrease preload and afterload and intermittent positive pressure ventilation. Noninvasive positive pressure ventilation (NPPV) consists of continuous positive airway pressure (CPAP) and bilevel positive airway pressure (BiPAP). NPPV is widely used in patients with respiratory failure. The goals of using NPPV are to improve gas exchange, reduce breathing effort, and avoid endotracheal intubation and its associated complications. NPPV may contribute to prolongation of pregnancy in patients with poor oxygenation due to preeclampsia-induced pulmonary edema. However, the patient should be monitored closely, and the decision to intubate or terminate the pregnancy should be made without delay when the condition of the mother or

fetus deteriorates. Pulmonary edema can be suspected in patients who complain of shortness of breath and the presence of wheezing or rales on auscultation [10].

Pharmacological agents that were administered include nifedipine 10 mg orally, and intravenous MgSO₄ 40% 6 grams in 500 ml Ringer's lactate given in 6 hours for seizure prevention. Hypertensive emergency in pregnancy presents a clinical challenge. The crucial first step in the management of hypertensive crises is reduction of blood pressure, but sudden and drastic lowering of blood pressure should be avoided. Ideally, the goal of blood pressure reduction is 20% of the original blood pressure, with targets systolic 140-150 mmHg and diastolic 90-100 mmHg. Refractory hypertension is an important indication for pregnancy termination. Administration of nifedipine 10 mg orally in 30 minutes × 2 doses: then 10-20 mg orally every 4-6 hours is one of the main pharmacological treatments in overcoming acute hypertensive crisis in pregnancy. If hypertensive encephalopathy develops, management must be carried out using ICU facilities [6,7]. Magnesium sulphate is the preferred antiseizure medication in eclampsia. When magnesium sulphate is given, serum magnesium level must be monitored [6].

The choice of anesthetic technique in certain cases for cesarean section is very individualized, considering the anesthetic, obstetric and fetal risk factors. Neuraxial anesthesia more commonly performed in caesarean section compared to general anesthesia. Insertion of epidural catheter can provide anesthesia with onset equivalent to spinal anesthesia in emergency cesarean delivery setting. Spinal anesthesia can be done with pencil point needle combined with the spinal bevel cutting needle. However, general anesthesia may also be used in some conditions (e.g. severe fetal bradycardia, uterine rupture, severe bleeding, severe placental abruption). Displacement of the uterus (usually to the left) is maintained until delivery, regardless of the anesthetic technique used [4,11].

Caesarian section requires effective anesthesia, namely regional or general anesthesia. The regional anesthetic technique recommended for caesarean section is epidural anesthesia, but sub-arachnoid anesthesia can also be used if there are no contraindications (Table 2).

General anesthesia was done on the patient in this case due to increased mean arterial pressure (MAP) in hypertensive encephalopathy which causes cerebral edema, increased intracranial pressure and neurological deficits such as altered mental status, visual disturbances, and seizures. Therefore, regional anesthesia was not chosen [8]. Advantages of general anesthesia include (1) Rapid onset; (2) Optimal airway and ventilation control; (3) Able to provide optimal comfort for patients in extreme anxiety; (4) Lower risk of hypotension compared to regional anesthesia. In addition, general anesthesia also facilitates immediate management if severe hemorrhage occurs such as placenta accreta [5].

Three factors that anesthesiologists need to consider when performing general anesthesia are possible difficult intubation, hemodynamic instability during intubation and extubation, and magnesium sulphate effect on neuromuscular functions and uterus muscle tone. Recommendations for general anesthesia procedures in severe eclampsia are:

1. Insert large-bore intravenous lines to anticipate post-partum hemorrhage.
2. Prepare for difficult intubation.
3. Administer intravenous H₂ receptor antagonist and metoclopramide 30-60 minutes before induction of anesthesia.
4. Administer pre-anesthesia oxygenation.
5. Control blood pressure and maintain at 140/80 mmHg. Choice of antihypertensive agents include nifedipine, nicardipine, sodium nitroprusside(SNP), and nitroglycerine.

Table 2: Contraindications of various types of anesthesia.

Epidural anesthesia contraindications	Subarachnoid anesthesia contraindications	Spinal anesthesia contraindications
Absolute contraindications: Patient refuses, clinically in shock, presence of infection at injection site.	Absolute contraindications: patient refuses, clinically in shock, presence of infection at injection site. Relative contraindications: coagulation disorders, spine disorders, increased intracranial pressure, uncooperative patient.	Absolute contraindications: patient refuses, clinically in shock, presence of infection at injection site, coagulopathy, currently on anticoagulants, increased intracranial pressure, severe aortic stenosis, severe mitral stenosis. Relative: sepsis, bacteremia, uncooperative patient, presence of neurological deficits, aortic valve stenosis, spine disorders. Controversial: Presence of infection at injection site, patient is unable to communicate, prolonged surgery, patient has a high risk of major haemorrhage.

6. Monitor heart rate.
7. Perform rapid sequence induction (RSI) with propofol and muscle relaxants before laryngoscopy [8,9].

The patient in this case was already intubated when admitted to the hospital. The goal of propofol treatment in this patient is to maintain or induce deeper sedation. Propofol dose for induction is 1.5-2.5 mg/kgBW intravenously, while dose for sedation maintenance is 25-75 mcg/kgBW/minute, and for hypnosis is 100-200 mcg/minute. After birth, dosage of propofol and volatile agents are lowered to prevent uterine atonia. Opioid with or without benzodiazepine was given instead.

Muscle relaxants, particularly rocuronium, was given in this patient because rocuronium is a monoquaternary steroid, a vecuronium analog with rapid onset and low risk of hypersensitivity. Based on patient's behavioral pain score (BPS, 7) the patient was experiencing moderate pain, which was treated with fentanyl. Administration of fentanyl rapidly decreases BPS in 10 minutes.

The patient was given 500 mL of Ringer's lactate, with total blood loss of 300 mL. Preeclamptic patients need to undergo fluid restriction, except when hemorrhage occurs, in order to prevent fluid overload and pulmonary edema. In accordance with NICE guidelines, total fluid administration should not be more than 80 ml/hour in severe preeclampsia. Input-output graphs and fluid balance should be monitored and maintained at normal values. In addition, pre-eclamptic patients are at risk of developing pharyngolaryngeal edema. Therefore, airway assessment is of important value. Cardiopulmonary status should be assessed at the same time with evaluation of renal and coagulation functions [9].

Even after birth, patients with severe preeclampsia are still at risk of pulmonary edema, hypertension, stroke, thromboemboli, airway obstruction, seizure, eclampsia and HELLP syndrome [11]. Therefore, the patient in this case was admitted to the intensive care unit for 3 days in order to observe the patient's hemodynamic status and presence of deterioration. Prognosis of superimposed preeclampsia is similar to preeclampsia. Family members need to be informed before any medical treatments are done [12-15].

Conclusion

Vaginal birth is the delivery method of choice unless there are other obstetrical indications that need to be managed with caesarian section. Obstetrical complications are occurrence of complications due to hypertension in pregnancy, failed induction of labor, and presence of all-case fetal demise or distress. Superimposed preeclampsia needs to be managed as soon as possible if neurological symptoms are already present. General anesthesia is preferred in caesarian section delivery in an emergency setting. In this case, termination of pregnancy should be done.

Caesarean section is the anesthetic method of choice in patients with superimposed preeclampsia. Advantages of general anesthesia include (1) Rapid onset; (2) Optimal airway and ventilation control; (3) Able to provide optimal comfort for patients in extreme anxiety; (4) Lower risk of hypotension compared to regional anesthesia. In addition, general anesthesia also facilitates immediate management if severe hemorrhage occurs such as placenta accreta.

Acknowledgement

The authors report no conflict of interests.

References

1. American College of Obstetrician and Gynecologist (2020) Gestational Hypertension and Preeclampsia: ACOG Practice Bulletin, Number 222. *Obstet Gynecol* 135: 237-260.
2. Trombarapu U, Dwarampudi AD, Kodey PD (2020) Posterior reversible encephalopathy syndrome in preeclampsia. *Int J Reprod Contracept Obstet Gynecol* 9: 358-363.
3. Mylonas L, Friese K (2015) Indication for and Risk of Elective Cesarean Section. *Dtsch Arztebl Int* 112: 489-495.
4. Cipolla MJ, Kraig RP (2011) Seizures in Women with Preeclampsia: Mechanisms and Management. *Fetal Matern Med Rev* 22: 91-108.
5. Ring L, Landau R, Delgado C (2021) The Current Role of General Anesthesia for Cesarean Delivery. *Curr Anesthesiol Rep* 11: 18-27.
6. Setiawan AH, Airlangga PS, Rahardjo E (2019) Komplikasi Edema Paru pada Kasus Preeklampsia Berat dan Eklampsia. *JAI (Jurnal Anestesiologi Indonesia)* 11: 136-144.
7. Setyawati A, Widiastih R, Ermia (2018) Faktor-faktor yang Berhubungan dengan Kejadian Preeklampsia di Indonesia. *Jurnal Perawat Indonesia* 2: 32-40.
8. Potter T, Schaefer TJ (2021) Hypertensive Encephalopathy. In: *StatPearls*.
9. Carvalho MA, Bejjani L, Francisco RPV, Patino EG, Vivanti A, et al. (2021) Outcomes following medical termination versus prolonged pregnancy in women with severe preeclampsia before 26 weeks. *PLoS One* 16: e0246392.
10. Hamada K, Chigusa Y, Kondoh E, Ueda Y, Kawahara S, et al. (2018) Noninvasive Positive-Pressure Ventilation for Preeclampsia-Induced Pulmonary Edema: 3 Case Reports and a Literature Review. *Case Rep Obstet Gynecol* 2018: 7274597.
11. Queensland Clinical Guidelines (2021) Hypertension and pregnancy. Guideline No. MN21.13-V9-R26. Queensland Health.
12. Kemenkes RI. Keputusan Menteri Kesehatan RI Nomor HK.02.02/MENKES/251/2015 tentang Pedoman Nasional Pelayanan Kedokteran Anestesiologi dan Terapi Intensif.
13. Iddrisu M, Khan ZH (2021) Anesthesia for cesarean delivery: General or regional anesthesia- A systematic review. *Ain-Shams J Anesthesiol* 13.
14. Kemenkes RI (2019) Profil Kesehatan Indonesia Tahun 2019. Jakarta: Kementerian Kesehatan Republik Indonesia.
15. Kametas NA, Nzelu D, Nicolaidis KH (2021) Chronic hypertension and superimposed preeclampsia: Screening and diagnosis. *American Journal of Obstetric and Gynecology* 226: S1182-S1195.