

C-Section in Uncorrected Ventricular Septal Defect and Pulmonary Hypertension Management in Anesthesia Perspective

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ABSTRACT

Background: Pregnancy with cardiac defects and pulmonary hypertension happen 0.2% to 3% and is correlated with valuable hemodynamic burden due to cardiocirculatory changes which becomes a remarkable indirect cause of maternal mortality and poor fetal outcome. Ventricular septal defect (VSD) is one of the most common forms of heart disease among pregnant women, meanwhile the VSD-specific pregnancy data are insufficient. This case report addresses the anesthetics management for patient with uncorrected ventricular septal defect and pulmonary hypertension.

Case: A 30-year-old multigravida with 37 weeks of gestation weighing 52 kg referred elective cesarean section and tubal ligation. She was compos mentis with arterial oxygen saturation was 87-88% room air. A grade IV/VI systolic murmur was heard at the second intercostal space of the left midclavicular line and the punctum maximum at the fourth intercostal spaces of the left sternal border. She had cyanotic in all of her extremities and clubbing fingers. Other examination is within normal limit. Titrated epidural was given at L1-2 level with parenteral levobupivacaine and fentanyl used as an adjuvant. The patient was stable during the surgery. Both maternal and fetal had a good outcome. The patient was discharged at the 7th day after surgery.

Conclusion: To achieve a good outcome from management of the high-risk obstetric patients requires multidisciplinary approach involving anesthetist, obstetrician, and cardiologist in planning and managing the case.

Keywords: cesarean section, pregnancy, pulmonary hypertension, VSD

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INTRODUCTION

Ventricular septal defect (VSD) is a cardiac malformation characterized by the opening of the ventricular septum, occurring in approximately 3-5 in 1000 live births.¹ The developing countries' cases of cardiac defect in pregnant women range from 0.2% to 3%, and it may be higher in a developed country.² Pregnancy itself leads the parturient to have physiologic changes in the various system, including the cardiovascular system, changing the heart rate, cardiac output, and oxygen consumption. All of these changes can be tolerated in healthy pregnancies, but they may lead to an increased risk of fetal and maternal morbidity due to the cardiac anomaly.³

Pregnancy with pulmonary hypertension is correlated with a significant hemodynamic burden related to the change in the cardiocirculatory system, which is also a remarkable indirect cause of maternal mortality and poor fetal outcome.² Cesarean section provides more advantages in parturients with pulmonary hypertension due to its ability in controlling and preventing the prolonged second stage of labor which can lead

to vaginal hemorrhage and the adverse hemodynamic effects of bearing down.⁴

VSD is one of the most common forms of heart disease among pregnant women, meanwhile the VSD-specific pregnancy data are insufficient. This case report addresses the anesthetics management for a patient with uncorrected ventricular septal defect and pulmonary hypertension.

CASE

A 30-year-old multigravida with 37 weeks of gestation weighing 52 kg was referred to the obstetric and gynecologic department for an elective C-section procedure and tubal ligation. She had a history of uncorrected VSD that was diagnosed when she was children. She had no complaint of chest pain and palpitation in the recent past. She took medication with sildenafil three

times a day but stopped it within two years. She was a housewife with her daily activity limited to 15-30 minutes by dyspnea. Her antenatal care history was good.



Figure 1. Clubbing finger

From the preoperative anesthetic examination, the patient was fully awake within Glasgow Comma Scale of E4V5M6, blood pressure of 106/70 mmHg, heart rate of 83 bpm, the respiration rate of 20 breaths/min, and arterial oxygen saturation was 87-88% in room air and 90-93 using 3 lpm nasal cannula. An IV/VI-grade of systolic murmur was found at the second intercostal space of the left midclavicular line with its punctum maximum located at the fourth intercostal space of the left sternal border. The abdomen was distended typical for pregnancy with fetal movement and fetal heart rate of 133 bpm. All of her extremities appeared to be cyanotic with clubbing in her fingers as shown in Figure 1. The nutritional state is within normal limit.



Figure 2. VSD 1.5 cm

From the laboratory test result, hemoglobin content was 13.1 g%, hematocrit 42%, and leukocytes 7.100/mm³. Other blood chemistry analyses and coagulation function tests were unremarkable. Fetal ultrasonography depicts a single fetal intrauterine Estimated fetal body weight (EFBW) of 1800 g. The electrocardiograph showed a sinus rhythm within 87 bpm with right axis deviation configuration and right ventricular hypertrophy. Chest X-ray showed cardiomegaly and the prominence of the pulmonary artery. Echocardiography confirmed VSD peri-membranous outlet (PMO) bidirectional shunt with 1.5 cm diameter (figure 2), tricuspid regurgitation (TR) moderate with Vena contracta width (VCW) of 0.4 cm, high probability of pulmonary hypertension (PH), mild pulmonary regurgitation (PR) with pressure half time (PHT) of 912 m/s. The left ventricular (LV) contractility was good, with a 60% ejection fraction (EF) and a dilatation of the right atrium (RA) and right ventricle (RV).

She was moved to the operation room (OR) and the drip started on the nondominant arm. Preloading was given with NaCl

0.9% within 20 ml/kg. We administered ondansetron 8 mg intravenous before the insertion of Tuohy number 17. A titrated epidural was given at L1-2 level with parenteral levobupivacaine 0.375 mg + fentanyl 2 µg/ml. When the level reached T4, surgery was started. Norepinephrine 0.05 µg/kg/min was administered using a syringe pump thereafter. Oxygenation was given using a nasal cannula at 3 lpm. The patient's hemodynamics were well maintained during the intra-operative period (figure 3). At the 20th minute after the incision started, the 1900 g male baby was delivered with APGAR Score 6-7-8. After being warmed and wrapped in plastic to keep the temperature warm, he was transferred to the Neonatal Intensive Care Unit (NICU) to have more advanced care about temperature management and nutrition.

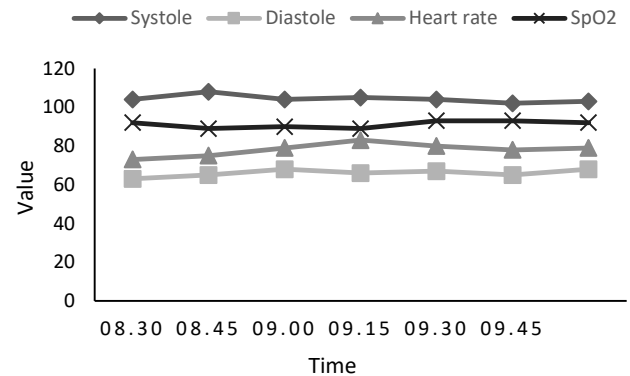


Figure 3. Intra-operative hemodynamic graph during C-section procedure

The patient was moved to the Intensive Care Unit for hemodynamic monitoring thereafter. The epidural catheter was removed 12 hours after the surgery was done. After removing the spinal catheter, postoperative intravenous analgesia was given within morphine 10 µg/kg/hours and acetaminophen 20 mg/kg every 8 hours. Both maternal and fetal outcome was good. On the second day, the patient was transferred to the ward and allowed to be outpatient on the seventh day.

DISCUSSION

A ventricular septal defect usually becomes an isolated defect. Significant defect leads to remarkable LV overload that may cause heart failure. VSD is commonly repaired in early childhood by catheterization or surgical procedures.⁵ In 28% of the cases, the ventricular septal defect can lead to pulmonary hypertension.⁶ The assessment of pulmonary hypertension can be done using echocardiography.⁷

Labor and delivery, especially during the contraction of the uterine, may lead to an increase in cardiac output and blood pressure. Following the delivery, hemodynamic instability may be occurred due to these several factors, including the decreased preload due to the blood loss and procedure of anesthesia, increasing the preload from the relief of caval obstruction, or the additional blood return from the contracting uterus, the surge increase of systemic vascular resistance (SVR) and pulmonary vascular resistance (PVR) to nonpregnancy state, and reduced ventricular contractility.⁴ The primary goals of anesthetic management in pulmonary hypertension and congenital heart defect case are to maintain adequate SVR, intravascular volume and venous return, avoidance of aortocaval compression, avoidance of myocardial depression, and the prevention of pain, hypercarbia, hypoxemia, and acidosis which may increase PVR.⁸

Anesthesia during pregnancy is related to the high probability of aspiration. The patient should be asked about oral intake, and a light meal should be given 6 hours before the surgery. Clear fluid (pulp-free juice, syrup, coffee, or tea) is given up to 2 hours before surgery.⁹

Managing the delivery and anesthetics in pregnant woman challenges the team a lot. Peripheral vasodilatation may be happened due to the spinal and general anesthesia and may worsen the patient's hemodynamics.⁴ Regional anesthesia (RA) during the cesarean section may be advantageous. However, when it is used in large dosages, it may produce a decrease in venous return due to a sympathetic block.⁴ In this patient, we used titrated epidural anesthesia. Neuraxial anesthetics provide avoidance of manipulating ventilation that can reduce pulmonary blood flow, but it can induce an extreme decrease in cardiac preload during the induction.¹

During pregnancy, aortocaval compression may reduce the preload. The neuraxial sympathetic block may also diminish it.⁸ To anticipate it, our patients were given adequate intravenous fluids before induction of anesthesia to ensure adequate fluid status in euvoledia status. Slowly titrated epidural anesthesia eliminates the undesirable effects of the sudden surge in hemodynamics. Infusions of norepinephrine in this patient were given as both prophylaxis and treatment of neuraxial-associated hypotension.²

Levobupivacaine was chosen due to its minimal cardiovascular and cerebral side effects.¹⁰ Maintaining the

temperature, acid-base balance, and oxygen and carbon dioxide levels within the normal range should be handled with care. Administering the oxytocin may cause hypotension due to the induction of systemic vasodilatation, and the increase of PVR should be avoided.^{2,11}

Postoperative pain should be managed accordingly to avoid hemodynamic changes.^{2,8} In this case, multimodal analgesia using intravenous opioids and paracetamol was chosen due to its opioid-sparing effect.

Low birth weight (LBW) is defined as a baby born with a weight of 2500 gr or less. It may be as a result of preterm birth or intrauterine growth restriction, or both.¹² Treating the low birth weight baby must be done carefully. The room temperature must be set between 23-25°C.¹³ The low birth weight is also associated with short and long-term problems affecting the pulmonary, gastrointestinal, immunology, and other systems.¹⁴ The baby is transferred to the NICU to prevent unwanted complications.

CONCLUSION

This case report discusses the anesthesia management in a patient with ventricular septal defect and pulmonary hypertension undergoing section cesarean. Titrated epidural anesthesia with careful hemodynamic monitoring could be considered the management of pulmonary hypertension in pregnant women undergoing cesarean section.

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CONFLICT OF INTEREST

None

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