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Epidural Anesthesia in Management of Pregnant Eisenmenger's Syndrome Patient Undergoing Caesarean Section

I Gusti Ngurah Bagus Jayantha Ananda^{1*}, Tjahya Aryasa², Tjokorda Gde Agung Senapathi³

¹Resident of Department of Anesthesiology, Pain Management, and Intensive Care, Universitas Udayana/Sanglah General Hospital, Denpasar, Indonesia

²Lecturer of Department of Anesthesiology, Pain Management, and Intensive Care, Universitas Udayana/Sanglah General Hospital, Denpasar, Indonesia

³Associated Professor of Department of Anesthesiology, Pain Management, and Intensive Care, Universitas Udayana/Sanglah General Hospital, Denpasar, Indonesia

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*Corresponding author:

I Gusti Ngurah Bagus Jayantha Ananda

E-mail address:

jayanthaananda@student.unud.ac.id

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ABSTRACT

Background: Eisenmenger syndrome is very rare in pregnant women. Debates remain concerning the management of Eisenmenger syndrome in this patient population, and the prognosis is unclear in terms of maternal and fetoneonatal outcomes. Managing anesthesia in maternal patients with a cardiac abnormality might be particularly difficult because these individuals have inadequate circulatory reserves and altered maternal cardiovascular physiology. **Case presentation:** We present a 26-year-old 34 weeks pregnant woman with Eisenmenger's syndrome (ES) scheduled for an elective caesarean section. The clinical findings reveal slight tachypnea with peripheral oxygen saturation of 82% with oxygen supplementation using a cannula at 3 lpm. The patient's baseline hemodynamics are stable, but a third-degree murmur is heard in the 3rd and 4th left intercostal space. The patient was managed with epidural anesthesia using bupivacaine 0.5% 20 ml without adjuvant. The epidural catheter was inserted in an interspinous process between L3-L4. The surgery was done in 90 minutes with stable hemodynamics, and postoperatively, the patient was monitored in the intensive cardiac care unit (ICCU). **Conclusion:** Epidural anesthesia has been shown to provide favorable outcomes due to its slow onset and reducing the likelihood of abrupt hemodynamic changes.

1. Introduction

During a normal pregnancy, parturients undergo dramatic physiological changes in multiple organ systems. Changes in the cardiovascular system include decreased systemic vascular resistance (SVR), increased blood volume, and increased cardiac output (CO) secondary to increased heart rate (HR) and stroke volume (SV). Cardiac disease is a major cause of maternal death, and approximately 25% of maternal cardiac deaths in the last 30 years have been due to congenital heart disease. Eisenmenger's syndrome is classified in the high-risk category, with potentially severe cardiac and neonatal complications.¹

Eisenmenger's syndrome (ES) is caused by an untreated congenital cardiac defect with the presence of a reversed or bidirectional shunt at the aortopulmonary, interatrial, or interventricular level, along with pulmonary hypertension and cyanosis. Maternal mortality in females with ES can reach 30-50% of cases. The anesthesia management in this patient is challenging and difficult due to the complex physiology of pregnancy and cardiovascular. The goal of anesthesia is to maintain basal hemodynamic intraoperatively by ensuring adequate preload for maintaining cardiac output, avoiding a profound decrease in systemic vascular resistance, and avoiding

an increase in pulmonary vascular resistance while closely monitoring the signs of thromboembolism.

2. Case Presentation

A 26-year-old in her first pregnancy of 34 weeks was admitted to the hospital for an elective caesarean section. The patient was diagnosed with ES due to atrial septal defect (ASD) with bidirectional shunt and tricuspid regurgitation moderate with probability of pulmonary hypertension. She had taken bisoprolol and beraprost sodium since she was 15 years old when she was first diagnosed with ASD. The patient started to feel shortness of breath and extreme fatigue, which progressively worsened at 28 weeks of pregnancy. No history of allergies and other past illnesses. The transthoracic echocardiography showed left atrium (LA), right atrium (RA), right ventricle (RV) dilatation, left ventricle hypertrophy (LVH) -, ejection fraction (EF) 75.3%, tricuspid annular plane systolic excursion (TAPSE) 16 mm, normal left ventricle (LV) systolic function, left ventricle (LV) diastolic undetermined due to shunt, decrease right ventricle (RV) systolic function, secundum atrial septal defect (ASD) bidirectional shunt, moderate tricuspid regurgitation (TR), with high probability of Pulmonary hypertension (PH), mild pulmonary regurgitation (PR), global normokinetic, elevated mean right atrial pressure (eRAP) 8 mmHg. An electrocardiogram (ECG) tracing showed a normal sinus rhythm with an inverted T wave in lead II, III, and V2-V6 with a heart rate of 80 bpm. The laboratory result was within normal limits.

In the pre-operative examination, the patient's contact was adequate, and the patient felt comfortable with a 30° head-up position while supine but was able to lie flat for 10 minutes. The patient was slightly tachypnoeic with a respiratory rate of 22-24 breaths per minute, and peripheral oxygen saturation was 82% with oxygen supplementation using a cannula at 3 lpm. On auscultation, the lungs were clear. The patient's baseline hemodynamic was stable, with blood pressure (BP) of 134/75 mmHg and a heart rate of 82 beats per minute. A third-degree murmur was heard in 3rd and 4th left intercostal space. Intraoperative

monitoring included 5 leads: ECG, non-invasive blood pressure (NIBP), blood oxygen saturation (SpO₂), and invasive monitoring using an arterial line in the radial artery. We use 2 peripheral venous access with a large bore of 18 gauge (G). A central venous catheter was withheld and was planned to be inserted if the patient was using vasopressor or inotropic.

We conducted epidural anesthesia using bupivacaine 0.5% 20 ml without adjuvant. The patient was positioned in left lateral decubitus to avoid compression of the inferior vena cava, with a slight head up 15 degrees. The epidural catheter was inserted in lumbar (L) 3 – L4, and the length of the catheter inside the epidural space was 4 cm. The target tip was L1-L2. The sensory block can reach the thoracic 6. The blood pressure only slightly decreased from 130/70 mmHg pre-spinal to 90/60 mmHg after an epidural, which was observed in the arterial line. The heart rate can also be kept within the range of 85-98 bpm. The patient was positioned slightly, head up 30 degrees, and the operation was started. A minimal dose of oxytocin was given a bolus of 5 units and a drip of 20 units in 500ml of ringer lactate. The hemodynamic was stable during the operation, and we didn't use any vasopressor or inotropic. The following epidural dose was given in the recovery room 2 hours after the initial epidural injection. The surgery was done in 90 minutes, and the blood loss was 200 ml, and urine production was 200 ml. The fluid intraoperatively was given 600 ml of ringer lactate. Post-operatively, the patient was monitored in the intensive cardiac care unit (ICCU). The patient was stable during postoperative care. Postoperative pain was controlled using intermittent 10 ml of bupivacaine 0.1% bolus with adjuvant morphine 1 mg and intravenous paracetamol 1000 mg 3 times daily. Post-operative echocardiography showed unremarkable change. The patient was then discharged after 3 days.

3. Discussion

Reversed or bidirectional shunt at the aortopulmonary, ventricular, or atrial level causes pulmonary hypertension, which is pathognomonic in

ES. Eisenmenger syndrome patients present with cyanosis, hypoxia-related polycythaemia, and a higher risk of thromboembolic events. The main goal of anesthesia in the management of Eisenmenger syndrome patients is to maintain the systemic vascular resistance (SVR) stable to avoid the worsening right to left intracardiac shunt. Invasive arterial pressure monitoring is one of the most frequent monitoring techniques used in critically ill patients and in anaesthetized subjects in whom rapid changes in the haemodynamic status are anticipated during the perioperative period.^{2,3,8} Besides that, the factors that can induce pulmonary hypertension and increase pulmonary vascular resistance (PVR), such as hypoxia, hypercarbia, and acidosis, should be avoided. The increased right-to-left shunt can hence result from decreased pulmonary blood flow caused by excessive transpulmonary pressures. Monitoring for signs of thromboembolism, such as refractory hypoxemia, is also important, which could fatally interfere with an already compromised pulmonary circulation.^{3,4,9}

Epidural anesthesia was conducted in this case report. Regional anesthesia is a much-preferred technique as long as there are no contraindications, while general anesthesia and airway manipulation can worsen pulmonary hypertension, and the effect of anesthesia agents during induction can cause the falling of SVR. Epidural anesthesia was more preferred compared to spinal anesthesia due to its advantages, such as slower onset, which avoids abrupt changes in hemodynamic which led to the increase of right-to-left shunting. Epidural anesthesia is the optimal anesthetic technique for obstetric procedures in patients with severe cardiac disease because it reduces catecholamine levels, reduces PVR by sympathetic blockade, decreases SVR by sympathetic block, decreases tachycardia, myocardial oxygen consumption, and reduces the right-to-left shunting.^{2,4,6,7,10}

4. Conclusion

Epidural anesthesia has shown favorable outcomes due to its slow onset and reducing the likelihood of

abrupt hemodynamic changes, which can be safer anesthesia technique for ES patients.

5. References

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