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ANAESTHESIA MANAGEMENT IN PARTURIENT WITH PERIPARTUM CARDIOMYOPATHY: A CASE REPORT

Joseph Nelson Leo[1], Tjahya Aryasa[2], Tjokorda Gde Agung Senapathi[3]
Universitas Udayana, Denpasar, Indonesia[1,2,3]
Email: nelson_leo88@yahoo.com[1]

Abstract

Peripartum cardiomyopathy (PPCM) is an idiopathic cardiomyopathy secondary to left ventricle systolic dysfunction towards the end of pregnancy or in the months following delivery. Generally, the clinical presentation and anaesthetic management principle are similar to heart failure due to other causes. We report a case of a 27-year-old woman with a diagnosis of first pregnancy, 34 weeks, single and viable fetus, with preeclampsia with severe presentation and lung oedema et causa PPCM planned to have an emergency cesarean section. Pre-anesthesia evaluation revealed physical status ASA III E with lung edema (SpO2 96% with NRM 10 lpm) and EF 38% from echocardiography. The surgery was done with a regional anaesthesia epidural on L1-L2 using bupivacaine 0.25% with lidocaine 1% volume 10 ml caudally and bupivacaine 0.25% volume 10 ml via the epidural catheter. During surgery, blood pressure drops and is manageable with vasopressor. After surgery, the mother and baby were stable. The patient was treated in intensive care for three days and then transferred to a general ward. PPCM is relatively rare. This case could be used as a reference in managing future PPCM cases.

Keywords: ejection fraction, prolactin, cathepsin D, epidural, regional anaesthesia

Introduction

Heart failure on the eve of birth has been recognised since the 19th century. This was later known as peripartum cardiomyopathy (PPCM). PPCM is not a worsening of a previous heart disease (e.g. idiopathic dilated cardiomyopathy) but a separate type of heart failure (Abboud et al., 2007; Goland & Elkayam, 2019; Hilfiker-Kleiner et al., 2015). Although clinically similar to other heart failures, the course of the disease can worsen within a matter of days. On the other hand, complete recovery is possible, which is not shared with other cardiomyopathies (Carvalho et al., 2016).

PPCM is a challenge for anesthesiologists. An anesthesiologist plays a crucial role in managing PPCM because most cases will undergo birth and require anaesthesia services (Abir & Mhyre, 2017; Metzger et al., 2021). Some of the complications are that if the patient is still pregnant, then all interventions must consider the safety of the mother and baby. PPCM can also deteriorate quickly and require inotropic support and mechanical ventilation. Currently, various anaesthesia techniques, both regional and general, can be performed in these cases, considering the clinical condition of the patient.

Case Report

The patient was a 27-year-old with G1P0000, 34 weeks, with preeclampsia and acute lung oedema due to PPCM. The patient complained of shortness of breath one day before admission to the hospital in the afternoon. In addition, complaints of shortness of breath had only been present three days before admission to the hospital. She could not

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sleep on her back and had to be half-sitting. She has no known previous systemic disease. Hypertension in this pregnancy was only known one day before admission. The seizure history on the day of admission was denied.

The physical examinations showed that she was fully awake. Her BMI status was overweight (27.6 kg/m2). The cardiovascular examination showed an elevation of 160/95 mmHg blood pressure and heart rate of 130 bpm with regular heart sounds 1 and 2 single without murmurs. The respiratory examination showed normal breathing frequency with vesicular in both lung fields and rhonchi in the left lung field. The obstetric examination showed pregnancy with uterine fundus height two fingers below the xiphoid process and a fetal heartbeat of 155 bpm. The musculoskeletal examination showed normal neck flexion and deflexion, intact dentition, palpable interspinous fissure with no sign of infection, and oedema on both legs. The Mallampati score of this patient was 2.

The patient's laboratory results showed elevated white blood cells, low haemoglobin and hematocrit, indicating anaemia, and normal platelet levels. Hemostasis tests revealed a shortened prothrombin time and low INR, suggesting hypercoagulability. Clinical chemistry showed normal liver enzymes, low blood urea nitrogen, and low-normal serum creatinine. Electrolytes indicated mild hypokalemia and slightly elevated chloride. Arterial blood gases were pointed to compensate for metabolic acidosis with low oxygen saturation. The echocardiogram examination revealed a dilated left atrium and ventricle, left ventricular hypertrophy, reduced systolic and diastolic function, and mild regurgitations with overall global hypokinesis.

The preoperative management included administering oxygen via a non-rebreather mask at 10 litres per minute and installing a large bore IV line size 18G. Additionally, a dextrose in potassium solution and furosemide will be administered at 20 mg/hour per the cardiology fellow's recommendation. The patient will complete informed consent procedures, and preparations for STATICS, anaesthetic drugs, emergency drugs, an arterial line, a norepinephrine drip, and an epidural kit will be made.

The anaesthesia technique was regional anaesthesia-epidural, with premedication of 0.5 mg midazolam IV and 10 mg ketamine IV. An epidural was placed at L1-L2, with 10 ml of 0.25% bupivacaine and 1% lidocaine caudally, followed by 10 ml of 0.25% bupivacaine via the epidural catheter. Additional medications included 10 IU oxytocin bolus, a 20 IU drip, and norepinephrine to maintain MAP above 65. During the operation, BP fluctuated between 72-142/40-97 mmHg, HR between 105-132 bpm, and SpO2 between 97-99%. The patient received 1000 ml crystalloid fluids, with 500 ml haemorrhage and 50 ml urine output. The 2-hour, 5-minute operation resulted in the birth of a baby girl at 18:45, weighing 2150 grams, with Apgar scores of 8.

Post-anesthesia care management included the administration of analgesics with an epidural infusion of 0.1% bupivacaine combined with 1 mg of morphine, given in a volume of 10 ml every 12 hours. Additionally, 1 gram of paracetamol was administered intravenously every 8 hours. The patient was transferred to the Intensive Care Unit for close observation and further treatment.

Results and Discussion

The patient is at 39 weeks of pregnancy and diagnosed with peripartum cardiomyopathy (PPCM); showed echocardiographic evidence of a dilated left atrium and ventricle, left ventricular hypertrophy, and reduced systolic function with a 26% ejection fraction. Mild regurgitations and global hypokinesis were also noted, as well as a blood pressure elevation of 135/75 mmHg, a pulse of 130 bpm, and normal heart sounds. The

anaesthesia administered was regional via epidural at L1-L2 with 0.25% bupivacaine and 1% lidocaine caudally and via catheter, accompanied by premedication of 0.5 mg midazolam IV and 10 mg ketamine IV, and adjunct medications including oxytocin and norepinephrine to maintain MAP above 65.

Peripartum cardiomyopathy (PPCM), defined by the Heart Failure Association of the European Society of Cardiology Working Group, is an idiopathic condition characterised by heart failure due to impaired left ventricular systolic function in late pregnancy or shortly after delivery. It typically manifests with a reduced ejection fraction (EF), often below 45%, despite the left ventricle not necessarily being dilated. It occurs when no other identifiable cause of heart failure is present (Carvalho et al., 2016). Peripartum cardiomyopathy (PPCM) presents with symptoms resembling heart failure, varying from mild to severe, often mistaken for normal pregnancy discomforts or postpartum fatigue. Typical early signs include leg swelling, shortness of breath, difficulty lying flat, nighttime coughing, and abdominal discomfort. Symptoms typically appear within four months postpartum, with a minority starting in late pregnancy or later postpartum. PPCM can manifest in NYHA functional classes I to IV, with severe cases potentially leading to arrhythmias or cardiac arrest. Clinical features may include apex shift, third heart sound, and mitral regurgitation. Patients with PPCM, particularly those with low ejection fraction, are at risk of left ventricular thrombosis and embolic events.[1,10] Based on the examinations, the patient complained of shortness of breath and difficulty sleeping on his back and had to be half-sitting. The patient also had oedema on both legs and rhonchi on the left side of the lungs. The echocardiogram revealed enlargement of both the left atrium and ventricle, thickening of the left ventricular walls, decreased ability of the heart to pump effectively during both contraction and relaxation phases, and slight leaking of valves with overall reduced movement of the heart muscle. The ejection fraction result was 26% (lower than 45%). Cardiovascular clinical features not found in this patient consisted of apex shift, third heart sound, and mitral regurgitation.

Peripartum cardiomyopathy (PPCM) poses significant challenges in both diagnosis and management, particularly in pregnant patients. This was evident in the case of a 27-year-old female who presented with preeclampsia and acute lung oedema due to PPCM, necessitating prompt intervention. Effective management of PPCM demands a coordinated effort among multiple medical specialities, including anesthesiology, obstetrics, and cardiology, to ensure comprehensive care for the mother and the unborn child. Anesthesiologists, in particular, encounter unique complexities in PPCM cases, including careful hemodynamic monitoring, precise administration of anaesthetic medications, and selecting the optimal anaesthesia technique. Despite these challenges, the patient successfully underwent an urgent cesarean section under regional anaesthesia. Following the procedure, she experienced a relatively stable postoperative course, and her baby achieved a good APGAR score, highlighting the importance of multidisciplinary collaboration in achieving favourable outcomes in PPCM cases. The anaesthesia technique that was used in this patient was regional anaesthesia-epidural. Neuroaxial anaesthesia is an option that should be considered in patients with heart disease. Spinal, epidural or combined spinal epidural (CSE) allows the mother to see her child at birth and avoids the risks of general anaesthesia and positive pressure ventilation. Neuraxial anaesthesia generally reduces venous tone (preload) and SVR (afterload) leading to hypotension. The intrathecal block is faster than the epidural block, so in cases where a sudden drop in SVR may cause decompensation in the patient, an epidural may be a better option.18 A case report of 34 cases of cesarean section in women with complex heart

disease using the Braun Spinocath 24G spinal catheter. Spinal anaesthesia was successful in 33 cases, with one change to the epidural technique. Mild hypotension occurred in 6 cases; there was 1 case with vasovagal syncope, and 3 cases had post-dural puncture headache (PDPH) and required a blood patch. In this case, continuous spinal anaesthesia can provide adequate anaesthesia and reasonable hemodynamic control; only complications such as PDPH are still found (Dutt et al., 2013).

Epidural techniques, however, may not provide spinal anaesthesia's density, symmetry and consistency. If the anesthesiologist estimates that the patient can tolerate spinal anaesthesia, he/she may perform spinal anaesthesia with intraarterial blood pressure monitoring and prophylactic vasopressor infusion. Some experts argue that CSE is better for cardiac patients, combining the symmetry and reliability of spinal anaesthesia with the graduality of epidural. In this technique, intrathecal hyperbaric bupivacaine 2.5 - 5 mg and fentanyl 15-25 mcg are followed by an epidural bolus of 2-3 ml with bupivacaine 0.5% or lidocaine 2% 15-30 minutes after intrathecal injection. Anesthesia with a spinal catheter has also been performed for cesarean section (Tiwari et al., 2012).

A case series by Tiwari et al. 21 used the *epidural volume extension* (EVE) technique for cesarean section in PPCM patients. In all patients, an epidural catheter was first placed at L2-L3, and ropivacaine 0.25% and fentanyl 25 mcg were given to reduce contraction pain. On the eve of surgery, 0.5% bupivacaine 1 ml intrathecal volume was provided using a 25G quincke needle at L3-L4. Then, the patient was positioned supine, and 5 minutes later; normal saline was given, as much as 8 ml from the epidural catheter. All operations went well using this technique (Carvalho et al., 2016; Desai et al., 1995). Another case report used ropivacaine 0.75% epidural technique 12 ml with 4 ml titration until it reached the T6 dermatome. After entry of epidural medication, blood pressure dropped to 80/50 mmHg and dopamine infusion was given (Desai et al., 1995).

A review shows various regional techniques in anaesthesia management in PPCM. The review discussed 6 cases using CSE, 2 cases using continuous spinal anaesthesia (CSA), and 2 cases using continuous epidural anaesthesia (CEA). Some experts prefer CSE over CEA because it has a lower failure rate, higher patient satisfaction and better hemodynamic profile. In the 2 cases using CSA, they used a 19G intrathecal catheter and administered a small bolus of bupivacaine with fentanyl. In the two instances using CEA, they used a regimen of fentanyl and bupivacaine that was titrated slowly over 6 hours until the desired level of anaesthesia was achieved (Bauersachs et al., 2016).

In this case, it was decided to perform *an urgent cesarean section with RA Epidural anaesthesia* technique. It is recommended that neuraxial anaesthesia be provided in PPCM patients whenever possible. The RA technique is not the most superior between RA CSE, CSA, or pure epidural (Arendt & Lindley, 2019; Dresner & Pinder, 2009; Eerdekens et al., 2023; Hamlyn et al., 2005). An arterial line was also placed before induction. This is per the recommendations (Arendt & Lindley, 2019; Ibrahim & Sharma, 2017). Epidural techniques, as in this case, have the disadvantage of lacking spinal anaesthesia's density, symmetry, and consistency (Hamlyn et al., 2005). This was resolved with norepinephrine titration, and the patient was relatively stable until postoperatively. This can be a consideration for the following case: giving more gradual epidural titration or using CSE techniques with small spinal doses may be considered. The baby born has a fairly good APGAR score, and this is an advantage of regional techniques because it uses less systemic drugs (Dickstein et al., 2008).

Conclusion

Peripartum cardiomyopathy (PPCM) is a rare but significant condition that anesthesiologists may encounter, requiring comprehensive treatment and collaboration across medical fields. Effective care demands a deep understanding of PPCM's pathophysiology and current treatment guidelines. Anesthesiologists face challenges due to the dual concern for both mother and baby, necessitating meticulous preoperative evaluation, intraoperative management, and postoperative care. Hemodynamic monitoring and precise dosing of anaesthetic drugs are critical, with various techniques available depending on the patient's condition. Generally, the outcomes for mothers and babies in PPCM cases are stable and satisfactory, and the presented cases aim to enhance future patient care.

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