e-ISSN (online): 2745-9497

Journal of Anesthesiology and Clinical Research (JACR)

Journal website: https://hmpublisher.com/index.php/jacr

Epidural Anaesthesia Technique in Caesarean Section Operation in Pregnant Patients with Rheumatic Heart Disease and Severe Mitral Stenosis

Aditya Wangsa[1*], FX Adinda Putra Pradhana[1], Tjahya Aryasa EM[1], Cynthia Dewi Sinardja[1]

[1]Department of Anesthesiology and Intensive Therapy, Faculty of Medicine, Universitas Udayana, Denpasar, Indonesia

ARTICLE INFO

Keywords:
Caesarean section
Epidural anaesthesia
Mitral stenosis

***Corresponding author:**
Aditya Wangsa

E-mail address:
boybius2021@gmail.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/jacr.v4i2.324

A B S T R A C T

Introduction: Mitral stenosis (MS) is the most common form of rheumatic heart disease (RHD). Pregnant women with moderate/severe MS are more prone to heart failure and pulmonary edema than normal pregnant women. It is very important to prevent the potential for maternal heart failure before delivery. This study aimed to present a case report on the epidural anaesthesia technique in caesarean section in pregnant patients with rheumatic heart disease and severe mitral stenosis. **Case presentation:** A 31-year-old pregnant woman patient came to the hospital with complaints of shortness of breath and found rheumatic heart disease and severe mitral stenosis. The patient was premedicated with fentanyl 50 mcg and midazolam 1 mg intravenously, followed by oxygen supplementation with a 2 lpm nasal cannula. Anaesthesia was performed using a lumbar epidural technique, with the insertion of an epidural catheter in the L1-L2 intervertebral space, targeting the T10-L1 dermatome and T6-L1 target of the viscerotome. The local anaesthesia agent chosen was plain bupivacaine with a concentration of 0.5% and a volume of 25 ml. The onset of action of epidural anaesthesia is achieved within 15 minutes as long as the operation is reached a total blockade as high as T6. During surgery, the patient is monitored with standard monitors and an artery line. There were no complaints of shortness of breath felt by the patient during the operation. **Conclusion:** Epidural anaesthesia technique can be performed safely in pregnant women with comorbid mitral regurgitation and atrial fibrillation, with good intraoperative hemodynamic stability.

1. Introduction

The number of pregnant women suffering from heart disease continues to increase. In the UK, it is known that the number of maternal deaths in women with heart disease increased sharply from 7.6 per million pregnancies in 1980 to 22 per million in 2000-2002. Currently, heart disease is the most common indirect cause of death and overall maternal mortality.[1] In the United States and Canada, less than 25% of pregnant women with heart disease have rheumatic heart disease, the most common of which is MS. In a study involving 2966 women with heart disease from around the world, 390 of them had rheumatic mitral valve disease, and of these, 9 percent, or as many as 273 women, had MS.[2]

It is known that changes in the cardiovascular system during pregnancy can increase the load on the heart. Circulating blood volume has increased by an average of 50% by the end of pregnancy, and hemodilution, increased tissue fluid, and decreased uterine and systemic vascular resistance result in increased cardiac output and heart rate (HR).[3,4,5] Mitral stenosis often worsens during pregnancy because of increased maternal blood volume and heart rate. An increase in blood volume with a decrease in diastolic filling time can cause pulmonary edema. Medical treatment recommendations during pregnancy include activity desensitization, beta-adrenergic antagonists, and diuretics.[6] In addition,

mitral stenosis predisposes patients to develop atrial tachyarrhythmias (atrial fibrillation, atrial flutter) as well as thromboembolic complications, with or without atrial arrhythmias. The hypercoagulable state underlying pregnancy also increases the risk of thromboembolic complications in patients with mitral stenosis. Therefore, systemic anticoagulation is recommended during pregnancy and postpartum.[7]

Women with severe mitral stenosis are often unable to meet cardiovascular demands during pregnancy. Increases in blood volume and heart rate may worsen the patient's condition by hastening the patient's transfer to a worse NYHA class. The increased heart rate during pregnancy can limit the time available for left ventricular filling, thereby increasing left atrial and pulmonary pressures, and can precipitate pulmonary edema if pulmonary capillary pressure exceeds plasma oncotic pressure. Atrial fibrillation can exacerbate this condition, and 80% of cases of systemic embolism occur in patients with atrial fibrillation.[6] The risk of maternal death is greatest during labor and the postpartum period. Sudden increase preload after delivery because autotransfusion from the uterus can cause severe pulmonary oedema. In addition, autotransfusion continues for 24-72 hours postpartum, so the risk of pulmonary edema increases for several days after delivery. The risk is greatest during the peripartum period, and most deaths occur between the second and ninth days after delivery.[8]

Caesarean section operation with the right indications and at the right time is very important to ensure the safety of the mother and baby. However, pregnant women with RHD and MS are at a very high risk of having anesthesia for these surgeries. Obstetric anesthesia requires adequate analgesia and muscle relaxation and must avoid compromising maternal and fetal circulation and respiration.[3]

2. Case Presentation

A 31-year-old woman came to the emergency room at Prof Ngoerah General Hospital with complaints of shortness of breath that had been felt for 5 days before entering the hospital. Shortness is felt even when the patient is sitting at rest and gets worse when the patient is doing activities. Shortness of breath is not accompanied by complaints of cough or fever. Patients also complain of chest palpitations. There are complaints of chest pain or swelling in both legs. The patient is currently pregnant with her third child at 36 weeks gestation, without any complaints of shortness of breath prior to the current episode.

The patient then underwent a series of examinations. The electrocardiography (ECG) found atrial fibrillation rhythm with a fast response, and from the echocardiography examination found severe stenosis of the mitral valve accompanied by right atrial and ventricular dilatation, with left ventricular systolic function, an ejection fraction of 58.6%. The patient was treated together by the cardiology department with intravenous Digoxin therapy, subcutaneous Enoxaparin, oral Propranolol, intravenous Furosemide, and intramuscular Benzathine Penicillin G, and was treated in a room with high-care obstetric unit care. After 1 day of therapy, the patient felt a change where the tightness was said to have reduced. The obstetrician then held a team meeting with the cardiology and anesthesia departments. Based on the results of the team meeting, it was decided to terminate the pregnancy by elective caesarean section. Preoperative examination found the patient's vital signs with GCS E4V5M6, blood pressure 102/62 mmHg, pulse 87-95 times per minute irregular, respiratory rate 22 times per minute, there, SpO2 98% room water. Physical examination heard fine crackles, especially at the bases of both lungs and systolic murmurs at the apex of the heart. Pitting edema was also seen on both legs.

There are several preparations in the operating room in addition to standard monitoring devices, namely NIBP, EKG, and pulse oximetry, installation of invasive blood pressure monitoring (artery line), preparation of vasopressor and inotropic drugs, as well as antiarrhythmic drugs. Upon arrival to the operating room, the patient was premedicated with Fentanyl 50 mcg and Midazolam 1 mg intravenously, followed by oxygen supplementation with a 2 lpm nasal cannula. Anesthesia was performed using a lumbar epidural technique, with the insertion of an epidural catheter in the L1-L2 intervertebral space, targeting the T10-L1 dermatome and T6-L1 target of

the viscerotome. The local anesthetic agent chosen was plain bupivacaine with a concentration of 0.5% and a volume of 25 ml. The onset of action of epidural anesthesia is achieved within 15 minutes. As long as the operation is reached total blockade as high as T6

During surgery, the patient is monitored with standard monitors and an artery line. There were no complaints of shortness of breath felt by the patient during the operation. Heart rhythm in atrial fibrillation patients with pulse fluctuations of 68-93 beats per minute, mean arterial pressure 65-88 mmHg, and monitored oxygen saturation of 99-100%. Caesarean section can be performed by the operator in the supine position. The baby was delivered successfully in the 10th minute after the incision, with a birth weight of 2480 grams and an APGAR score of 7-8. The operation took 45 minutes with 300 ml of bleeding. Postoperatively the patient was treated in the ICU for 1 day, followed by treatment in the room high care unit obstetrics. On the fourth day of postoperative care, the patient was discharged.

3. Discussion

The management of anesthesia in pregnant patients with heart problems has its own challenges, where there is an additional burden on the cardiovascular system that has experienced problems before.[9] In this case, a patient with heart failure due to rheumatic heart disease and mitral stenosis. The patient was planned to undergo caesarean section under epidural anesthesia. Perioperative goals, in this case, include: (1) maintaining normal or low heart rate, (2) aggressive management of atrial fibrillation, (3) prevention of aortocaval compression to maintain venous return, (4) maintaining adequate SVR, and (5) preventing an increase in PVR by preventing pain, hypoxemia, hypercarbia, and acidosis.[6,7] Preoperative management must involve multi-discipline, including obstetricians, cardiologists, and anesthetists, to be able to deal with complications that may occur.[3]

In the preoperative period, the patient received treatment from a cardiology colleague in the form of digitalis, beta-blockers, anticoagulants, and diuretics. The patient is also educated to sleep on her left side. Before anesthesia begins, the patient is subjected to standard and invasive monitoring, as well as preparation of vasopressor drugs, inotropic drugs, and antiarrhythmic drugs. Invasive monitoring in the intrapartum and postpartum period is very helpful in carrying out close monitoring of the patient's hemodynamic condition.[6,8]

The choice of anesthetic technique must take into account the patient's hemodynamic status at arrival, type of heart disease, previous drug use, and whether the surgery performed is elective or emergency. Regional anesthesia is contraindicated in patients with severe stenosis and hemodynamic instability, and severe hypoxia. Patients with NYHA class III and IV are not recommended for spinal anesthesia because of the possibility of severe hemodynamic disturbances. In hemodynamically stable patients, epidural anesthesia or a combination of low-dose epidural-spinal anesthesia, according to several studies, is more recommended than general anaesthesia.[6]

General anaesthesia can result in decreased cardiac contractility and increased pulmonary vascular resistance through positive pressure ventilation. Laryngoscopy and intubation, and aspiration can result in hemodynamic changes in patients undergoing general anesthesia. The use of opioids during induction can cause respiratory depression in neonates, while extubation can cause delayed awakening from anesthesia and increase the likelihood of using postoperative mechanical ventilation in patients. Enhancement preload because autotransfusion after uterine contractions during delivery can result in pulmonary edema, which only occurs after extubation because intraoperative positive pressure ventilation prevents this from happening.[6,7]

Regional anesthesia has become a popular and safe option in recent years for pregnant patients with heart disease undergoing caesarean section. The problem associated with neuraxial blockade is hemodynamic compromise. Epidural anesthesia is generally preferred over spinal anesthesia. The use of a vasoconstrictor such as phenylephrine to prevent hypotension and tachycardia and the judicious administration of intravenous fluids make this technique safe for both mother and baby. However,

there is controversy over the use of neuraxial blockade in patients with severe mitral stenosis because this condition has a fixed cardiac output, so the patient may not be able to tolerate a decrease in systemic vascular resistance. In addition, patients with heart disease are also likely to use diuretics and beta-blocker, which can suppress cardiovascular compensatory mechanisms. Despite some drawbacks to epidural anesthesia, this technique is preferred for patients with severe heart disease undergoing caesarean section because the increased venous capacity can compensate for the increase in blood volume during autotransfusion.

In this case, epidural anaesthesia was performed by administering bupivacaine plain 0.5% by volume of 25 ml. Because uterine blood flow is not an autoregulation, uteroplacental perfusion directly influences maternal blood pressure. So that the decrease in maternal blood pressure may be tolerated by the mother but not by the fetus, one strategy that can be used to maintain hemodynamic stability during spinal anesthesia for caesarean section is to use low-dose bupivacaine in combination with an opioid adjuvant. In this case, there were no episodes of hypotension and desaturation. Alotaibi et al. successfully performed lumbar epidural anesthesia in pregnant women with severe mitral stenosis using Ropivacaine 0.5%, with a peak effect of block achieved in 20 minutes.[10] A larger case study was conducted by Wu et al. A 2016 report involving 48 patients with severe MS who underwent caesarean section found minimal hemodynamic disturbance in patients with epidural anesthesia technique.[3]

Epidural analgesia has the main advantage of being able to be administered in dose increments, and the total dose can be titrated to achieve the desired sensory level.[4,7] This, together with a slower onset of anesthesia, allows the maternal cardiovascular system to adapt to the development of sympathetic blockade, thereby reducing the risk of hypotension and decreasing uteroplacental perfusion. In addition, segment blockade aids in the venous return of the lower extremities and reduces the risk of thromboembolism. By conducting invasive hemodynamic monitoring, giving crystalloids carefully by intravenous infusion, and giving small bolus doses of phenylephrine, it can maintain hemodynamic stability in the mother.[4]

4. Conclusion

Epidural anaesthesia technique can be performed safely in pregnant women with comorbid mitral regurgitation and atrial fibrillation, with good intraoperative hemodynamic stability. A good understanding of the pathophysiology and anaesthetic targets in these patients, cross-specialty communication, and anticipation of possible complications that may arise perioperatively are very necessary for the success of surgery and reducing patient morbidity and mortality.

5. References

1. Langesaeter E, Dragsund M, Rosseland LA. Regional anaesthesia for a caesarean section in women with cardiac disease: a prospective study. Acta Anaesthesiol Scand. 2010; 54(1): 46–54.
2. Siu SC, Sermer M, Colman JM, Alvarez AN, Mercier LA, Morton BC, et al. Prospective multicenter study of pregnancy outcomes in women with heart disease. Circulation. 2001; 104(5): 515–21.
3. Wu W, Chen Q, Zhang L, Chen W. Epidural anesthesia for cesarean section for pregnant women with rheumatic heart disease and mitral stenosis. Arch Gynecol Obstet. 2016; 294(1): 103–8.
4. Kuczkowski KM, van Zundert A. Anesthesia for pregnant women with valvular heart disease: the state-of-the-art. J Anesth. 2007; 21(2): 252–7.
5. Blackburn ST. Physiologic changes of pregnancy. Perinatal Nursing: Fourth Edition. 2013.
6. Vidovich MI. Valvular Heart Disease. In: Chestnut DH, editor. Chestnut's obstetric anesthesia principle and practice. 6th ed. Elsevier. 2020; 988–1023.

7. Kannan M, Vijayanand G. Mitral stenosis and pregnancy: Current concepts in anaesthetic practice. Indian J Anaesth. 2010; 54(5).
8. Norrad RS, Salehian O. Management of severe mitral stenosis during pregnancy. Circulation. 2011; 124(24): 2756–60.
9. Dua S, Maurtua MA, Cywinski JB, Deogaonkar A, Waters JH, Dolak JA. Anesthetic management for emergency cesarean section in a patient with severe valvular disease and preeclampsia. Int J Obstet Anesth. 2006; 15(3): 250–3.
10. Alotaibi SG, Alamoudi DH, Alhassoun AM. Patient with mitral stenosis for caesarean section under epidural anaesthesia. IJMRP. 2021; 7(2): 53–5.