



Case Report

Epidural Anesthesia in Pregnant Women with a Total AV Block and Preeclampsia: A Case Report

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ARTICLE INFO

Article history

Receive: 2023-09-24

Received in revised: 2023-11-14

Accepted: 2023-11-19

Manuscript ID: JMCS-2310-2348

Checked for Plagiarism: Yes

Language Editor:

Dr. Fatima Ramezani

Editor who approved publication:

Dr. Ali Delpisheh

DOI:10.26655/JMCHMSCI.2024.3.4

KEYWORDS

Epidural
Anesthesia
Total AV Block
Preeclampsia
Pacemaker

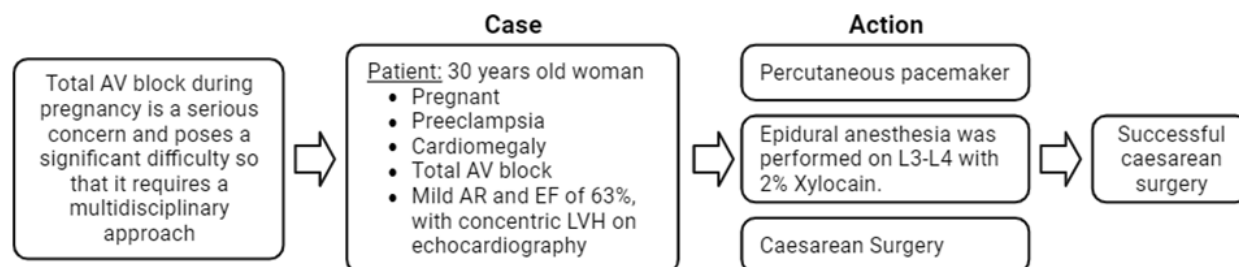
ABSTRACT

Introduction: Total atrioventricular (AV) block presents significant challenges in managing pregnancy and childbirth due to physiological changes that can lead to cardiovascular decompensation, especially when first identified during pregnancy. When noticed during pregnancy, total heart obstruction is a serious concern for obstetricians and requires a multidisciplinary approach. The method of delivery is determined based on obstetric indications.

Case Illustration: A 30-year-old woman, G2P1A0, at 37-38 weeks of pregnancy, was referred due to preeclampsia and total AV block. A preoperative evaluation revealed cardiomegaly, total AV block, mild aortic regurgitation (AR), an ejection fraction (EF) of 63%, and concentric left ventricular hypertrophy (LVH) on echocardiography, resulting in an American Society of Anesthesiologists (ASA) status of 3 (indicating severe systemic disease but not incapacitation). A percutaneous pacemaker was inserted before the surgery. Epidural anesthesia was administered at the L3-L4 level using 2% Xylocaine. A successful Cesarean Section was performed, delivering a male newborn with a birth weight of 3,100 grams, a birth length of 48 cm, and APGAR scores of 7-8. The postoperative condition was uneventful.

Conclusion: An emergency Cesarean Section with epidural anesthesia, along with a presurgery percutaneous pacemaker insertion, was successfully performed on a 30-year-old pregnant woman with preeclampsia and total AV block without any fetal or maternal complication afterward.

GRAPHICAL ABSTRACT



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Introduction

The dysfunction of cardiac electroconducting pathway results in an atrioventricular block characterized by a prolonged PR interval. These blocks are classified into three types based on the pattern and characteristics of the disruption in electrical activity: first-degree, second-degree (Mobitz type 1 or 2), and third-degree (complete AV block) [1]. Complete or total heart block is an aberrant heart rhythm with no electrical impulse conduction through the atrioventricular (AV) node, resulting in complete dissociation between the atria and ventricles. The escape rhythm can originate from lower foci, including the AV node, bundle of His, bundle branches, or Purkinje fibers. The incidence of complete heart block is estimated to be 1 in 15,000 to 20,000 live births and can be congenital or acquired. Total AV block poses a significant difficulty in terms of pregnancy and birth care for the obstetrician [2]. When noticed during pregnancy, total heart obstruction is a serious concern for obstetricians and requires a multidisciplinary approach involving cardiologists, anesthesiologists, and neonatologists [3]. High-grade heart block is associated with serious mortality and may trigger palpitations, tiredness, dyspnea, and/or syncope. Bradycardia may worsen during labor when uterine contractions displace blood into the central circulation. Serious cardiac and obstetric issues might arise, affecting both the mother and the fetus [1]. The mode of delivery was determined based on obstetric indications. Here, we present the case of a 30-year-old woman, G2P1A0, with severe preeclampsia and total AV block, who underwent an emergency Cesarean Section with epidural anesthesia.

Case report

A 30-year-old woman, weighing 61 kg and measuring 150 cm in height (BMI of 27 kg/m²), was diagnosed with a pregnancy status of G2P1A0 at 37-38 weeks, carrying a single live intrauterine fetus in a head presentation. She

presented with severe preeclampsia, total atrioventricular (AV) block, and a reactive Hepatitis B surface antigen (HBsAg). The patient had been experiencing contractions since the day before admission and was brought to the Emergency Room of Soegiri Hospital, Lamongan. Upon examination, bradycardia was detected in the patient, and a subsequent ECG confirmed a total AV block. The patient had no prior medical history of total AV block. She was then referred to Dr. Soetomo Regional Public Hospital and assessed by a cardiologist. Routine laboratory tests were conducted, revealing the following results: a Hemoglobin (Hb) level of 11 g/dl, a Hematocrit level of 34.9%, a White Blood Cell (WBC) count of 9,900/ml, a platelet count of 170,000/ml, a Blood Urea Nitrogen/Creatinine (BUN/Cr) serum ratio of 24.0/0.5, a proteinuria level of +3, an Aspartate Aminotransferase (AST) level of 30 U/L, an Alanine Aminotransferase (ALT) level of 24 U/L, an Albumin level of 2.6 g/dl, a Sodium (Na) level of 131 meq/L, a Potassium (K) level of 4.1 meq/L, a Chloride (Cl) level of 109 meq/L, a Prothrombin Time (PT)/Activated Partial Thromboplastin Time (APTT) ratio of 8.8/21, and a random blood glucose level of 140 mg/dl. The cardiologist recommended that the patient consult with the Obstetrics and Gynecology (Ob/Gyn) department. She was prescribed Methyldopa 500 mg every 8 hours and Nifedipine 10 mg in case her systolic blood pressure exceeded 160 mmHg. In the following hours, the patient went into labor, prompting a consultation with the anesthesia department for an emergency Cesarean Section (CS). Prior to the procedure, the patient's assessment revealed a patent airway, a respiratory rate (RR) of 20 breaths per minute, oxygen saturation (SaO₂) of 97% on room air, warm extremities, a blood pressure of 150/90 mmHg, a pulse rate of 56 beats per minute, a Glasgow Coma Scale (GCS) score of E4M5V6, normal bladder function, soft abdomen, the absence of edema in all extremities, and a body temperature of 36.7 °C.

The patient underwent a preoperative chest x-ray, revealing cardiomegaly (Figure 1); a preoperative ECG, displaying a total atrioventricular (AV) block (Figure 2); and an echocardiography test, exhibiting mild aortic regurgitation (AR), normal cardiac dimensions, an ejection fraction (EF) of 63%, normokinetic function, and concentric left ventricular hypertrophy (LVH). The patient was deemed

suitable for Cesarean Section (CS) and intrauterine device (IUD) insertion under regional anesthesia via epidural. A percutaneous pacemaker was inserted before surgery (Figure 3). The patient's American Society of Anesthesiologists (ASA) status was 3, indicating a total AV block, pregnancy, and hypoalbuminemia (2.6 g/dl).



Figure 1: Chest x-ray (03/10/2021) revealing cardiomegaly

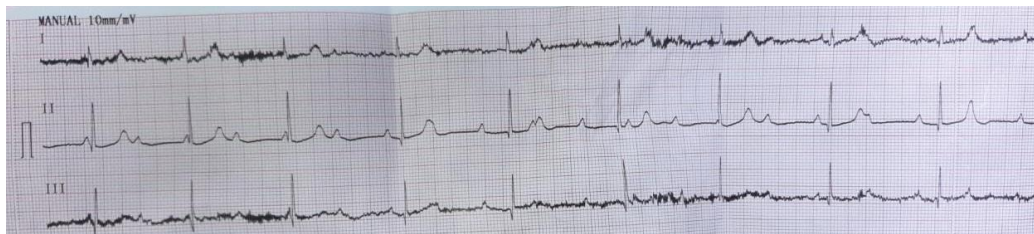


Figure 2: ECG (03/09/2021) displaying a total AV block



Figure 3: Percutaneous pacing

For induction, the patient received epidural anesthesia at the L3-L4 level using 2% Xylocaine. Her intraoperative hemodynamics remained stable with systolic blood pressure ranging from 122 to 150 mmHg, diastolic blood pressure ranging from 67 to 90 mmHg, heart rate fluctuating between 50 and 70 bpm, oxygen saturation at 99-100%, and body temperature maintained between 36.5 °C and 36.8 °C. The CS was successful, delivering a male newborn with a birth weight of 3,100 grams, a birth length of 48 cm, and APGAR scores of 7–8. The patient received 700 mL of 0.9% NaCl solution as input, produced 200 ml of urine, and experienced 300 ml of intraoperative bleeding (total output of 500 ml). Postoperatively, the patient had a patent airway, was breathing spontaneously with a respiratory rate of 18 breaths per minute, achieved 100% SaO₂ with nasal cannula at 3 liters per minute of oxygen, had warm extremities, a blood pressure of 135/78 mmHg, a pulse rate of 70 bpm, a GCS of E4M5V6, a urinary catheter inserted, an abdominal wound from the CS, and a temperature of 36.9 °C.

Results and Discussion

Cesarean delivery is most commonly performed for reasons such as fetal distress, cephalopelvic disproportion, malpresentation, prematurity, past cesarean delivery, and prior uterine surgery affecting the corpus. The choice of anesthesia depends on the procedure urgency, the health of both mother and fetus and maternal preferences. Neuraxial anesthesia techniques offer several advantages, including avoiding airway manipulation, reducing the risk of stomach aspiration, minimizing the use of depressant anesthetic agents, allowing the mother to remain conscious during delivery, and potentially reducing operative blood loss. There is less acute neonatal depression after neuraxial anesthesia compared to general anesthesia [4]. To execute a cesarean section without causing maternal discomfort, the T4 dermatome must be blocked. Hypotension is the most common consequence of neuraxial anesthesia, which can be prevented and treated through left uterine displacement, administration of intravenous fluids, and the

vasopressors application. Most anesthesiologists provide a non-particulate antacid before inducing anesthesia to prevent lung aspiration [5]. In contrast to spinal anesthesia, epidural anesthesia takes longer to take effect and requires more medications to provide adequate sensory suppression. One of the primary advantages of epidural anesthesia over spinal anesthesia is its capacity to titrate the extent and duration of anesthesia. For obstetric epidural anesthesia, the most widely used medications include 2% lidocaine with epinephrine, 5 mg/mL (1:200,000), and 3% 2-chloroprocaine. Lidocaine should be used in conjunction with epinephrine, as lidocaine itself does not reliably provide sufficient surgical anesthetic [6]. In our case, the patient received epidural anesthesia at the L3-L4 level with 2% Xylocaine. Preeclampsia is characterized by hypertension and proteinuria and may present various other signs and symptoms. A number of the symptoms linked to preeclampsia may be attributed to an imbalance in prostacyclin and thromboxane production in the placenta. Severe preeclampsia is characterized as the presence of any of the following: (1) Severe hypertension: Systolic blood pressure of 160 mmHg or Diastolic blood pressure of 110 mmHg; (2) Severe proteinuria of 5 g/24 h; (3) Indications of severe end-organ damage (for instance, refractory oliguria, cerebral or visual abnormalities, pulmonary edema, or cyanosis) [5]. In our case, the patient did not exhibit signs of hemolysis, and liver enzymes were within the normal range (AST 30 U/L and ALT 24 U/L), with a normal platelet count of 170,000/ml. Our patient was diagnosed with preeclampsia due to her blood pressure of 150/90 mmHg and +3 proteinuria upon admission. There is, however, no sign of severe end-organ damage. While preeclampsia results in excessive salt and water retention, an alteration in both protein and fluid from the intravascular to extravascular compartment may result in hypovolemia, hypoproteinemia, as well as hemoconcentration. Our patient had hypoalbuminemia but had no symptoms of hypovolemia or hemoconcentration. Proteinuria could exacerbate this condition. Maternal plasma and protein depletion are associated with an

increased risk of uteroplacental hypoperfusion and poor fetal outcome. The definitive treatment for preeclampsia-eclampsia involves fetal and placental delivery. Management is usually symptomatic. In our case, the patient was administered Methyldopa at a dosage of 500 mg every 8 hours and Nifedipine at a dose of 10 mg to prevent or control convulsions, enhance organ perfusion, regulate blood pressure, and address coagulation irregularities. Several commonly used vasodilators in preeclampsia are hydralazine, nitroprusside, nitroglycerin, and labetalol [5]. To cope with the increased demands, the cardiovascular system experiences several physiological changes during pregnancy. Increased atrial wall stress and structural remodeling can cause increased irritability and conduction delay of atrial musculature. This could lead to the discovery of new atrial arrhythmias, the identification of subclinical conduction abnormalities, and worsening of clinically apparent bradyarrhythmias, including various grades of heart block [5]. Total AV block (TAVB) in pregnancy has several etiologies. Congenital TAVB is the most prevalent type, in which patients are born with a disconnected cardiac electrical conduction system, with no communication between the sinoatrial (SA) and AV nodes [7]. There are several causes for the acquired AV conduction blocks, for example, fibrosis of the conduction system, ischemic heart disease, the use of certain negative chronotropic and dromotropic drugs, increased vagal tone, and many more [6]. In our case, the patient was referred due to bradycardia, and a subsequent ECG confirmed a total AV block. Those who exhibit indications and symptoms of cardiac failure are being encouraged to have pacemakers implanted. At any stage of pregnancy, a permanent pacemaker can be implanted. During labor and delivery, temporary pacing may be required [3,8]. However, the recommendations tend to be less persuasive and ambiguous among individuals who have remained asymptomatic. The American Heart Association (AHA) and the European Society of Cardiology (ESC) have revised their guidelines and now recommend permanent pacemaker placement for pregnant

women with full heart block with high-risk features, regardless of symptom presence [9, 10]. Artificial heart pacemakers can be inserted intravenously (endocardial lead) or subcostally (epicardial or myocardial lead). Noninvasive alternatives such as transcutaneous or temporary esophageal cardiac pacing serve as emergency options for transvenous artificial cardiac pacemaker placement. When a patient with a complete AV block requires surgery, there is a concern that the stress of the surgical procedure and the anesthesia may further compromise the heart's ability to maintain an adequate heart rate [11]. To maintain a sufficient heart rate until artificial electrical cardiac pacing can be established, a continuous intravenous infusion of isoproterenol serving as a pharmacologic cardiac pacemaker may be required [12,13]. Thus, a percutaneous pacemaker was inserted prior to surgery to ensure that the heart rate remained within a safe and functional range during the procedure. The appropriate method of delivery was the next worry once the pacemaker was implanted. Women with complete heart block are unable to improve their cardiac output because of a limitation in their heart rate response, but they usually tolerate pregnancy well unless they have major cardiac disorders. Vaginal delivery is recommended, with the provision for operative vaginal delivery if necessary [14]. The second stage of the Valsalva maneuver may be worsened by syncope and convulsions due to a greater heart rate decrease. To diminish the bearing-down effect, forceps should be utilized for delivering the patient in the lateral decubitus position [15]. Cesarean section is reserved for obstetric considerations because it allows for a more controlled and predictable delivery [16], which is crucial in managing the cardiovascular challenges associated with total AV block and preeclampsia. However, routine cesarean section presents an additional risk. Spinal anesthesia during cesarean section causes hypotension, and patients with bradycardia may lack the necessary compensatory mechanisms to respond to hypotension [17,18]. Nevertheless, no fetal complications were observed, and in our case, the Cesarean Section was successfully performed, delivering a male newborn with a birth weight of

3,100 grams, a birth length of 48 cm, and APGAR scores of 7-8. A solid plan is required for future pregnancies. Every pregnancy plan should be addressed in a multidisciplinary clinic during the preconception period. There are numerous stratification scores to choose from. A history of past arrhythmia (bradyarrhythmia) placed individuals at a 7.5% risk of future cardiac issues, according to the Zwangerschap bij Aangeboren Hartafwijking (ZAHARA) scale [19]. A continual risk stratification strategy must be implemented for patients considering pregnancy. USG, fetal echocardiogram, and maternal ECG are all suggested during antenatal visits. A trained pediatric cardiologist should do fetal echocardiography throughout the second trimester. There should be a definite delivery plan in the third trimester, between 32 and 34 weeks [20]. The study has several limitations. First, the presented study is based on a single case, limiting the generalizability of the findings. Individual patient characteristics and responses to treatment can vary widely, and the outcomes observed in this case may not be representative of all cases with similar conditions. Second, the postoperative condition and outcomes of the patient are briefly mentioned without providing detailed follow-up information. A more comprehensive follow-up analysis would be beneficial in understanding the long-term effects, potential complications, and the overall success of the treatment strategy.

Conclusion

The successful management of a pregnant woman with severe preeclampsia and total AV block through emergency Cesarean Section with epidural anesthesia and percutaneous pacemaker insertion demonstrates the importance of a multidisciplinary approach in addressing complex cardiovascular and obstetric challenges during pregnancy. The case highlights the significance of individualized care, thorough preoperative evaluation, and collaborative decision-making in ensuring favorable outcomes for both the mother and newborn. Future research should include more comprehensive follow-up information, detailing the long-term

effects, potential complications, and overall success of the treatment strategy. This will contribute to a better understanding of the outcomes and guide improvements in patient care.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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HOW TO CITE THIS ARTICLE

Herry Cahya Fathani*, Fajar Perdhana, Teuku Aswin Husain, Epidural Anesthesia in Pregnant Women with a Total AV Block and Preeclampsia: A Case Report. *J. Med. Chem. Sci.*, 2024, 7(3) 492-499.

DOI: <https://doi.org/10.26655/JMCHEMSCI.2024.3.4>

URL: https://www.jmchemsci.com/article_184653.html