Graded Epidural Anaesthesia for Caesarean Section in a Parturient With Severe Left Ventricular Dysfunction From Dilated Cardiomyopathy: A Case Report

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Abstract

Dilated cardiomyopathy (DCM) is a primary disorder of heart muscle characterised by left ventricular (LV) or biventricular dilatation and impaired ventricular contractility. During pregnancy, women with DCM have a higher incidence of cardiac events than the non-pregnant patient. When DCM is associated with severe LV dysfunction, anaesthetic management is particularly challenging, because severe LV dysfunction is a predictor of sudden cardiac death and poor quality of life. The goals of anaesthetic management in DCM consist of maintaining normovolaemia, and avoiding myocardial depression and drug overdose during induction (as circulation time is slow). It also includes preventing increases in ventricular afterload and sudden hypotension when regional anaesthesia is a choice. This case report describes the successful anaesthetic management of a parturient with DCM and a severely low LV ejection fraction of 20%, wherein the child was delivered via caesarean section using a graded epidural anaesthesia technique.

Keywords: Dilated cardiomyopathy, graded epidural anaesthesia, severe left ventricular dysfunction

Introduction

Dilated cardiomyopathy (DCM) is a primary disorder of heart muscle characterised by left ventricular (LV) or biventricular dilatation and impaired ventricular contractility. During pregnancy, parturients with DCM have a higher incidence of cardiac events than the non-pregnant patient.[1] There is an increased risk of malignant arrhythmias, thromboembolism and even sudden death.[2] This case report describes the successful anaesthetic management of a parturient with DCM and a severely low LV ejection fraction of 20%, wherein the child was delivered via caesarean section using a graded epidural anaesthesia technique.

Case Presentation

A 39-year-old pregnant woman, now Para 4+3 (3A), presented to the gynaecology emergency of the University of Ilorin Teaching Hospital, Ilorin, with a 3-month history of generalised body swelling, difficulty in breathing, orthopnea, paroxysmal nocturnal dyspnoea and cough productive of sputum. Antenatal care was at a peripheral health centre that did not have the facilities to make the diagnosis and manage the patient. Her three previous pregnancies were delivered by caesarean section. Thyroidectomy had been done several years earlier, and she was now biochemically euthyroid.

She was in respiratory distress, clinically pale, with cold extremities, bilateral pitting pedal oedema up to the thighs and varicose veins. Her pulse was small volume with a rate of 130 beats/min; the jugular venous pressure was elevated, apex beat was displaced and the first, second and third heart sounds were present. She also had a respiratory rate of 36 cycles/min and fine crepitations in the lower lung fields. SpO_2 was 67% on room air and 81% on supplemental oxygen.

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The 39-year-old woman was diagnosed as being G4P2+1 (2 alive) at 30-weeks gestation with biventricular failure from DCM.

Electrocardiogram (ECG) revealed LV hypertrophy and sinus tachycardia, whilst echocardiography revealed ejection fraction of 20% and biventricular failure secondary to DCM. The packed cell volume was 40%, and thyroid function tests were within normal limits. Obstetric scan confirmed a live intrauterine foetus at estimated gestational age of 30 ± 2 weeks.

Despite medical therapy, the cardiac dysfunction progressed with increasing pulmonary oedema and cyanosis. An urgent caesarean section with bilateral tubal ligation under epidural anaesthesia was planned 12 days into hospital admission.

In the operating theatre, the baseline blood pressure was 127/74 mmHg and pulse was 113 bpm. An intravenous infusion of dobutamine was started at a dose of 5 µg/kg/min by a syringe pump. An epidural catheter was inserted at the L3–L4 intervertebral space. She was positioned supine with left lateral uterine displacement. Epidural anaesthesia was induced using a graded epidural technique of 3–5 ml aliquots of plain bupivacaine until a total of 13 ml was given. The patient was monitored by measuring non-invasive blood pressure every 3 min, continuous heart rate, pulse oxymetry and ECG using a multi-parameter patient monitor. Fluid preload was not used, but blood pressure was maintained with dobutamine infusion intraoperatively. Blood pressure ranged from 106 to 120 mmHg systolic and 70 to 80 mmHg diastolic throughout surgery, which lasted about 80 min. A live male neonate with a weight of 1.3 kg and Apgar scores 6 and 8 in 1 and 5 min, respectively, was delivered. The estimated blood loss was 600 ml.

Postoperative care was in the intensive care unit, wherein analgesia was provided with epidural bupivacaine. Intravenous dobutamine infusion was gradually discontinued, and on the second postoperative day, the epidural catheter was removed. She was discharged to the gynaecology emergency ward on the third postoperative day.

Discussion

DCM during pregnancy usually occurs in the setting of peripartum cardiomyopathy (PPCM). Since the clinical criteria for its diagnosis were described by Demakis *et al.*,[3] more understanding of the condition has been gained by the medical community. The risk factors associated with it include older maternal age, multiparity, multiple pregnancies, African descent and high blood pressure.[4] Apart from multiple pregnancies, our patient had all these risk factors. However, our patient developed symptoms relatively early in pregnancy. Early presentation of DCM occurring in pregnancy had been described by Elkayam *et al.*[5] It had similar features as PPCM but was referred to as pregnancy-associated cardiomyopathy.

Endocrinopathies such as thyroid dysfunctions may also cause DCM. Our patient had thyroidectomy some years ago for toxic goitre, and even though it remained euthyroid afterwards, thyroid disorder cannot be excluded at presentation. Persistent subclinical thyroid dysfunction was associated with the development of heart failure.[6]

The goals of anaesthetic management consist of maintaining normovolaemia and avoiding myocardial depression, drug overdose during induction (as circulation time is slow), increases in ventricular afterload and sudden hypotension when regional anaesthesia is a choice.[7]

When DCM is associated with severe LV dysfunction, anaesthetic management is particularly challenging because severe LV dysfunction is a predictor of sudden cardiac death[8] and poor quality of life.[9]

The choice of anaesthetic technique may be a difficult one in DCM. Hypotension complicating neuraxial blocks and the cardiac depressant effect of several anaesthetic agents make the choice between general and regional anaesthesia challenging. General anaesthesia carries a high risk of arrhythmias, and the obstetric patient will require rapid sequence induction to prevent aspiration of gastric contents. The rapid administration of anaesthetic induction agents may cause detrimental hypotension. Epidural anaesthesia can be used safely and effectively in DCM as an alternative to general anaesthesia with carefully titrated dose of local anaesthetics and haemodynamic monitoring. It avoids the myocardial depressant effects of many inhalational and intravenous anaesthetic agents, bypasses issues with slow circulation time and also avoids increases in ventricular afterload. Use of a catheter gives freedom of titrability of the local anaesthetic; thus, the level of motor and sensory block can be gradually increased so as not to cause sudden hypotension. We preferred epidural anaesthesia to subarachnoid block because it causes less severe and less sudden hypotension and has the ability to prolong the block via the indwelling catheter. However, hypotension from epidural local anaesthetic-induced sympathetic nerve block is still problematic in a patient with severely low ejection fraction.

In our centre, fluid preload is routinely used to prevent hypotension during neuraxial blocks. We considered this unadvisable in this patient, as she had already developed pulmonary oedema, which may be exacerbated by the fluid preload. Instead, the patient had 5 µg/kg/min of dobutamine delivered by syringe pump, which was started before epidural anaesthesia. Dobutamine has positive inotropic and chronotropic effects with minimal vasoconstrictive actions making it an ideal inotrope for increasing cardiac output with minimal increase in afterload. In addition, plain bupivacaine was given in aliquots instead of giving the total dose at once to limit the total dose and the hypotensive effect. Therefore, we were able to avoid fluid preload before the epidural anaesthesia. With this management, blood pressure was stabilised at systolic pressures of 106–120 mmHg and diastolic pressures of 70–80 mmHg throughout the course of anaesthesia.

Postoperatively, our challenge was how to improve cardiac function and avoid respiratory depression. Dobutamine infusion was continued at 5 µg/kg/min to maintain cardiac function. Epidural bupivacaine was given for postoperative analgesia. Opioids were avoided to prevent respiratory depression. Regional analgesia is the preferred method for postoperative analgesia as the sympathectomy associated with it causes a decrease in cardiac preload and afterload, which is beneficial in patients with PPCM.[10]

Conclusion

The graded epidural technique with the use of intravenous infusion of vasopressors permits intraoperative haemodynamic stability in patients with low ejection fraction.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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