International Journal of Medical Anesthesiology

E-ISSN: 2664-3774
P-ISSN: 2664-3766
www.anesthesiologypaper.com
IJMA 2025; 8(1): 28-31
Received: 26-10-2024
Accepted: 29-11-2024

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Anaesthetic management in peripartum cardiomyopathy: Case Series

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DOI: https://www.doi.org/10.33545/26643766.2025.v8.i1a.543

Abstract
Peripartum cardiomyopathy (PPCM) presents a unique challenge to clinicians due to its unpredictable onset and potentially life-threatening complications during the peripartum period. The choice of anaesthetic technique should prioritize hemodynamic stability, avoiding agents that depress myocardial contractility or cause systemic vasodilation. We have documented 4 patients with peripartum cardiomyopathy with various signs and symptoms such as fatigue, dyspnoea, chest pain, or severe left ventricular (LV) dysfunction. Depending on the patients' condition, we have chosen epidural anaesthesia in 3 patients and combined spinal and epidural anaesthesia (CSEA) in 1 patient. Incremental doses of 10-12 mL of 0.75% Ropivicaine with 50mcg Fentanyl as 3-4 mL boluses were given. Intra-operative procedures were uneventful. Monitoring was done post-operatively. As per theoretical concern, this group of patients are at risk and so proper choice of anaesthesia, intra-operative management, post-operative care along with multi-disciplinary approach is crucial that too most importantly in third trimester.

Keywords: Intranasal, dexmedetomidine, premedication, adenotonsillectomy, URTI

Introduction
Cardiomyopathy is the medical condition that can adversely affect pregnancy outcomes for women and the fetus. Approximately 1% of pregnancies are complicated by cardiac diseases [1]. Some of these women may not have been known to have an underlying cardiovascular problem and may die from an acute event during the pregnancy. Others have an underlying, pre-existing heart condition, which deteriorates with the increased demands of pregnancy [2].
Peripartum cardiomyopathy (PCM) is a syndrome with symptoms of heart failure and signs of left ventricular systolic dysfunction, manifesting between the last month of pregnancy and the first 5 months-4postpartum [3]. Its incidence varies from 0.2% to 3% live births [5-6] and also from region to region worldwide. The prognosis is generally good in the majority of cases although some patients progress to irreversible heart failure, heart transplantation or death [6, 7]. The diagnosis of PCM is made in the presence of symptoms and signs of heart failure strictly associated with partum and in the absence of other possible causes of dilated cardiomyopathy. The presence of ventricular systolic dysfunction is essential for diagnosis. Some echocardiographic parameters like an ejection fraction (EF) of less than 45% and an end-diastolic dimension index of greater than 2.7 cm/m^2 have been proposed to better classify the dysfunction [10].
Anaesthetic management is crucial to guarantee maximum safety, since peripartum cardiomyopathy has the capacity to alter hemodynamic events and put the patient's life at risk. It is important for anaesthesiologist to know the complete history for preoperative optimization and so, they must be prepared to anticipate any difficulty. The goals of anaesthetic management are prevention of myocardial depression, maintaining normovolemia, avoiding over dosage of drugs in the perioperative period as the circulation time is slow and to also avoid sudden hypotension when regional anaesthesia is the choice.

Case 1: A 23-year-old female Primigravida who is a known case of dilated cardiomyopathy was admitted to our institute at 35 weeks of gestation for safe confinement, had been planned for elective caesarean section.

Pre-operative evaluation revealed

A previously asymptomatic patient with history of episodic giddiness and fatigue starting from her 5th month (22 weeks) of gestation which aggravated gradually.

On examination patient had a normal airway and heart rate 100 bpm, blood pressure 100/70 mmHg, ECG showed prolongation of p wave, all lab investigations noted under normal range and 2D-ECHO showing Severe left ventricle (LV) dysfunction with ejection fraction- 30%, global hypokinesia of LV, LVR dilated, Grade-I MR. Patient was informed to continue Tab. Torasemide 5 mg and Tab. Carvedilol 3.125 mg.

After confirming Nil by Mouth (NBM) status, counselling of procedure and obtaining written informed and high risk consent, patient was shifted to OT.

Intra-operative

Standard monitors, continuous ECG, non-invasive blood pressure (NIBP), SpO2 were attached. An invasive arterial blood pressure monitoring was established and 7F triple lumen central venous catheter (CVC) line was inserted in right internal jugular vein (IJV) and urethral catheterization for urine output. Epidural anaesthesia was given with 18G Tuohy's needle, at L2-L3 space by loss of resistance technique (LORT) with air and 5cm catheter was left in epidural space. Epidural Anaesthesia was given with incremental doses of 12 mL of 0.75% Ropivicaine with 50mcg Fentanyl as 3-4 mL boluses. Sensory block till T6 was achieved and patient was haemodynamically stable. Oxygen was administered via face mask at 5L/min. After the delivery of baby, 10 units of Oxytocin was administered I.M. Baby cried immediately and Apgar score was 9 at 1min and 10 at 5 min. Throughout the surgery, total fluid administration was 1 L. Intra-operative procedure was uneventful. Post-operative monitoring was done in PACU for 2 hours and then patient was shifted to cardiac ICCU. For post-operative analgesia 0.2% of Ropivacaine infusion was started at rate of 4-5 mL/hr later tapered to 3mL/hr and on Post-operative day (POD)-3 epidural catheter was removed. POD-4 patient was shifted to labour ward.

Case 2

A 24-year-old female, thin built, multi-para with known case of peripartum cardiomyopathy and gestational hypertension came to our institute at 36 weeks of gestation, presented with breathlessness and was planned for emergency caesarean section in view of her above-mentioned condition. On detailed examination, patient gave history of, dyspnoea (NYAH-II), orthopnoea, chest pain and palpitation from her 6th month (26 weeks) of gestation which was progressive in nature. She was taking Tab. Bisoprolol fumarate 5 mg twice daily and Tab. Furosemide 20 mg once daily. No similar history in past following vaginal delivery.

Cardiovascular system examination revealed, a pansystolic murmur, heart rate 115 bpm, blood pressure 170/100 mmHg, ECG noted ST Segment depression in V1-V4 lead, laboratory findings were under normal range, and 2DEcho showed peripartum cardiomyopathy, severe encentric Mitral regurgitation (MR), Rheumatic heart disease (RHD) global hypokinesia of LV, severe LV dysfunction with Left ventricular ejection fraction (LVEF) of 20%.

After confirming NBM status, counselling of procedure and obtaining written and high risk informed consents, patient was shifted to OT. Standard monitors, continuous ECG, non-invasive blood pressure (NIBP), SpO2 were attached. An invasive arterial blood pressure monitoring was established and 7F triple lumen CVC line was inserted in right IJV and urethral catheterization for urine output. Epidural anaesthesia was given with 18G Tuohy's needle, at L2-L3 space by loss of resistance technique (LORT) with air and 4cm catheter was left in epidural space. Epidural Anaesthesia was given with incremental doses of 12mL of 0.75% Ropivicaine with 50 mcg Fentanyl as 3-4mL boluses. Sensory block till T6 was achieved and patient was haemodynamically stable. Oxygen was administered via face mask at 5L/min. After the delivery of baby, baby cried well and apgar score was 8 at 1 minute and 10 after 10minute. Immediately within 1 min, 10 units of Oxytocin was administered I.V in 500 mL NS. Throughout the surgery, total fluid administration was less than 750mL. Intra-operative procedure was uneventful. Post-operative monitoring was done in PACU for 2 hours and then patient was shifted to cardiac ICCU. For post-operative pain 0.2% of Ropivacaine infusion with 2 mcg/mL Fentanyl was started at rate of 4-5 mL/hr later tapered to 3 mL/hr and POD-3 epidural catheter was removed. On POD-4 patient was shifted to labour ward.

Case 3

A 28-year-old female, obese primigravida, a known case of dilated cardiomyopathy, was admitted to our institute at 34 weeks of gestation for safe confinement, had been planned for elective caesarean section in view of her heart disease.

Patient was asymptomatic, on routine examination she was diagnosed with dilated cardiomyopathy and she was taking Tab. Carvedilol 2.5 mg.

On systemic examination heart rate 90 bpm, blood pressure 110/70 mm hg, ECG was normal, all lab investigations were under normal range and 2D-ECHO showing LV dilated, ejection fraction- 50%. After confirming NBM status, counselling of procedure and obtaining written informed consent, patient was shifted to OT. Intra-operative standard monitors, continuous ECG, non-invasive blood pressure (NIBP), SpO2 were attached. An invasive arterial blood pressure monitoring was established and 7F triple lumen CVC line was inserted in right IJV and urethral catheterization for urine output. Combined Epidural Spinal anaesthesia, was given with 18G Tuohy's needle, at L2-L3 space by LORT with air and 5cm catheter was left in epidural space, a test dose with 2% Lignocaine + Adrenaline was injected, patient hemodynamically stable, then using 27G Whitacre needle 1.5 mL of 0.5% Bupivacaine heavy + 0.5 mL of Fentanyl was administered in sub-arachnoid space (SAS). The motor block was achieved till T_6 and patient was vitally stable. Oxygen was administered via face mask at 5 L/min. After the delivery of newborn, 10 units of Oxytocin was administered I.M. Throughout the surgery, total fluid administration was 1 L. Intra-operative procedure was uneventful. Post-operatively monitoring was done in OICU. For post-operative pain 0.2% of Ropivacaine infusion with 2mcg/mL Fentanyl was started at rate of 4-5mL/hr later tapered to 3mL/hr and on POD-3 epidural catheter was removed.

Case 4: A 33-year-old female, multigravida (Gravida 2, parity 1), who is a known case of pericardial effusion was admitted in our institute at 35 weeks of gestation for safe confinement, has been planned for LSCS.

Pre-operative examination revealed

Patient gave history of breathlessness and fatigue from 20weeks of gestation, without any prior coexisting medical illnesses. She was on Tab. Furosemide 40 mg and Tab. Metoprolol 10mg once daily and was informed to continue her medication. Heart rate 120 bpm, blood pressure 126/80 mmhg, SpO2 97% on room air. ECG noted sinus tachycardia, 2D-Echocardiogram showed LVEF- 45%, moderate dilation of left ventricle. Normal airway and systemic examination.

After confirming NBM, counselling of procedure and obtaining written and high risk informed consents, patient was shifted to OT.

Intra-operative

Standard monitors, continuous ECG, non-invasive blood pressure (NIBP), SpO2 were attached. An invasive arterial blood pressure monitoring was established and 7F triple lumen CVC line was inserted in right IJV and urethral catheterization for urine output. Epidural anaesthesia was given with 18G Tuohy's, at L2-L3 space by loss of resistance technique (LORT) with air and 5cm catheter was left in epidural space. Epidural Anaesthesia was given with incremental doses of 12mL of 0.75% Ropivicaine with 50mcg Fentanyl as 3-4mL boluses. Sensory block till T6 was achieved and patient was haemodynamically stable. Oxygen was administered via face mask at 5L/min. The surgeon was asked to proceed only when sensory level of T6 was achieved. After the delivery of baby, baby cried well and apgar score was 10. Immediately within 1 min, 10 units of Oxytocin was administered I.V in 500 mL NS. Throughout the surgery, total fluid administration was less than 1 L. Intra-operative procedure was uneventful. Post-operatively regular monitoring and observation was done in OICU. For post-operative pain 0.2% of ropivacaine infusion was started at rate of 4-5 mL/hr later tapered to 3 mL/hr and on POD-3 epidural catheter was removed.

Discussion

Anaesthetic management in pregnancy with cardiomyopathy posted for LSCS is a challenging scenario [9]. Even though there are multisystem physiological changes, cardiomyopathy affecting cardiac output has adverse effects on the pregnancy outcome threatening both the mother and fetus. Haemodynamic changes start to appear in the first trimester continuing into the second and third trimester [8]. These changes do not affect a healthy pregnant woman but are detrimental to pregnant woman with heart disease putting immense strain to the heart leading to life-threatening complications [8]. Hence it is utmost necessary to prevent any myocardial depression which is mostly unpredictable.

LSCS can be performed under general anaesthesia or regional anaesthesia [8]. General anaesthesia is reserved for emergency conditions or when regional anaesthesia is contraindicated [13]. General anesthesia has advantages of airway control and ventilation [13] but has disadvantages like maternal stress response to intubation, risk of aspiration and delayed induction due to slow circulation and requirement of postoperative ventilation for both mother and infant. Benzodiazepines or Nitrous Oxide can cause severe cardiovascular depression, as this technique can lead to maternofetal cardiorespiratory adverse effects [12]. There were many cases that have reported cardiac arrest while using general anaesthesia in PPCM patients [13]. As this adds to the already existing risk of thromboembolism [13], general anaesthesia is not preferred in PPCM patients. Major centro-neuraxial blockade actually improves myocardial performance by reducing the after load on the left ventricle without improving contractility which may be beneficial in a situation of poor ventricular function [12]. Single shot spinal anaesthesia is not recommended due to uncontrolled sympathetic blockade and acute haemodynamic instability which may precipitate an adverse cardiac event including arrest [13]. Epidural anaesthesia can safely and effectively be used with a carefully titrated dose of local anaesthetic, and hemodynamic monitoring in parturient with DCM [5]. The changes in preload and after load produced by epidural anaesthesia mimic the pharmacological goals [3]. It is particularly advantageous in those patients with high susceptibility to aspiration of gastric contents [12]. We prefer epidural anaesthesia or combined epidural spinal anaesthesia as it prevents major haemodynamic changes. Epidural anaesthesia has been used in majority of cases because of its haemodynamic stability [13]. Combined epidural spinal anaesthesia (CESA) with a low dose of local anaesthetic in addition to opioids minimises the haemodynamic instability associated with spinal anaesthesia [12]. CESA is also being used because of its haemodynamic stability. Both these techniques were found to have lower rate of failure, smaller drug requirement, easy titrability with fewer hypotensive episodes. Faster onset with excellent analgesia and better patient satisfaction with post-operative pain score [13]. Disadvantages such as technical difficulty and post dural puncture headache [13], but which can be minimized with 27 G whitacre needle. We used Ropivicaine as it is cardiac stable and it gives both anaesthetic and analgesic effect. We also chose Fentanyl for a few cases [13]. Ropivicaine along with Fentanyl has the advantage of differentiating sensory and motor blockade without prominent cardio and neurotoxicity. It also promotes heamodynamic stability with minimal effect on heart rate and blood pressure.

Post-operatively, this patient should be monitored in an ICU as they may require a ventilator, ionotropic agents and mechanical circulatory support due to high risk of congestive heart failure. Parental opioids or regional techniques are used to manage post-operative pain [13].

Conclusion

Pregnancy in women with DCM is a high-risk situation and presents a serious therapeutic challenge. The third trimester appears to be the most susceptible period when maternal and foetal status can decline rapidly, the risks can be minimised in women by early multidisciplinary approach (Consisting of an obstetrician, a cardiologist, and an anaesthesiologist). Proper cardiac and obstetric management is recommended in a tertiary care centre for achieving optimal maternal and fetal outcome. Patient should be properly counselled regarding morbidity and mortality [8].

Anaesthetic management of a patient with PPCM should comprise of adequate preoperative optimization using a multidisciplinary approach, careful monitoring, proper choice of anaesthetic [13] technique like epidural anaesthesia or CESA using Ropivicaine and Fentanyl and vigilant postoperative care which includes epidural infusion with Ropivicaine.

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How to Cite This Article
Chauhan BG, Kamat C, Sanikop C, Hanagandi M. Anaesthetic management in peripartum cardiomyopathy: Case Series. International Journal of Medical Anesthesiology. 2025; 8(1): 28-31.