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EPIDURAL VOLUME EXTENSION SALINE TECHNIQUE FOR ANESTHETIC MANAGEMENT OF PERIPARTUM CARDIOMYOPATHY CASES FOR EMERGENCY CAESAREAN SECTION- A CASE SERIES

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ABSTRACT: Peripartum cardiomyopathy (PPCM), a rare condition affecting women in late pregnancy and early puerperium, has high morbidity and mortality. It is characterized by impaired contractility with a low ejection fraction. Compensation occurs through the enlargement of the left ventricle with increasing end-diastolic and stroke volumes. As the compensation of the dilated ventricle fails, it leads to systolic dysfunction, progressing to congestive cardiac failure. Early recognition and aggressive management of these cases in the perioperative period is crucial to improving outcomes of both mother and child. The major anesthetic concern in managing these patients is to avoid myocardial depression and optimize cardiac output, thus maintaining myocardial perfusion with stable intraoperative hemodynamics. Neuraxial anesthesia in these cases, must be balanced with their hemodynamic effects and the ability of the patients to compensate for the physiological strains. Epidural Volume Extension (EVE) – saline technique offers the rapidity and reliability of spinal anesthesia and the flexibility of epidural anesthesia. We present a case series of five patients posted for emergency cesarean section who were managed successfully by the EVE saline technique.

INTRODUCTION: Peripartum cardiomyopathy (PPCM), a potentially life-threatening disease presents during late pregnancy or early post-partum period. It has mortality ranging from 2 to 12.6 % during six months follow up of cases [1]. It causes dilated cardiomyopathy resulting in severe ventricular systolic dysfunction and progressive congestive cardiac failure.

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These patients offer huge challenges to anesthesiologists. The major concern while managing such cases with low ejection fraction is optimizing cardiac output and maintaining myocardial perfusion while ensuring stable intraoperative hemodynamics. We present a case series of five such parturients posted for emergency cesarean section, managed successfully with the Epidural Volume Extension –saline technique.

Case Report: We present five cases of PPCM presenting to our obstetric unit for emergency caesarean section. All patients were assessed with pre-anesthetic checkups. A high-risk written informed consent was taken from the patients' attenders. The declaration of Helsinki guidelines

was followed. All the patients were administered anti-aspiration prophylaxis in the form of inj metoclopramide 10 mg and inj ranitidine 50 mg intravenously before shifting to the operation room.

The history, clinical findings, echocardiography reports, and treatment details of the cases are summarized in **Table 1.**

TABLE 1: CLINICAL DETAILS OF THE PATIENTS

S. no.	Obs. history	Age	Clinical diagnosis	2D-ECHO	Treatment
1	G3P1L1A1 36 weeks	29	CCF, Pulmonary edema	DCM, LVEF 32%	Frusemide, Dobutamine
2	G1 36 weeks of gestation	32	CCF,	DCM, PAH, LVEF 42%	Frusemide, T. Digoxin
3	G1 37 weeks of gestation	30	CCF, Pulmonary edema	DCM, PAH LVEF 40%	Frusemide, T. Digoxin
4	G3P1L1A1 37 weeks of gestation	34	CCF, Pulmonary edema	DCM, PAH LVEF 40%	Frusemide, Dobutamine
5	G2P1L1 36 weeks of gestation	30	CCF, Pulmonary edema	DCM, LVEF=36%,	Frusemide, Dobutamine

On arrival at the OT, the patient was connected to 5 electrode ECG -monitoring lead 2 and lead V5, NIBP, pulse oximeter. Under aseptic precautions, triple lumen central venous catheter and radial intra arterial line was secured. We performed the modified combined spinal epidural (epidural volume extension [EVE] saline) technique.

The patient was put in left lateral position and under aseptic precautions a modified combined spinal epidural anesthesia with Epidural volume extension technique was performed. At L2-L3 space epidural catheter was inserted, later using 27 G whitacre needle spinal tap was done at L3-L4 space and 1 ml of 0.5% Bupivacaine heavy was injected intrathecally. The patient was made to lie supine with a wedge below the right hip to minimize the aortacaval compression. Five minutes later, 8 ml of normal saline was injected via epidural catheter.

The sensory dermatomal level was assessed at 3, 5, and 10 min after administration of epidural saline by the pinprick method **Table 2**. Motor block was assessed at the end of 5 minutes with the Bromage scale. All the patients had an adequate level of anesthesia and were haemodynamically stable throughout the surgery. Intravenous fluids were administered judiciously to target CVP of 5 to 8 mmHg.

TABLE 2: LEVEL OF SENSORY BLOCK AND GRADE OF MOTOR BLOCK ACHIEVED

S. no.	Height (cm)	Weight (kg)	Sensory block level at 3 min	Sensory block level at 5 min	Sensory block level at10min	Bromage Scale (Grade)
1	162	70	T10	T7	T4	2
2	154	60	T8	T5	T4	2
3	165	68	T9	T6	T5	2
4	158	65	T8	T5	T4	2
5	163	69	T10	T7	T4	2

Postoperatively, the patients were shifted to the intensive care unit for monitoring and analgesia was maintained by an epidural infusion of 0.1% bupivacaine for next 24 hours.

DISCUSSION: Peripartum cardiomyopathy is a primary disorder of the heart muscle. PPCM is a diagnosis of exclusion for women in late pregnancy and in the postpartum period. Risk factors for PPCM include Maternal age >30 years, Obesity, Multiparity, Multiple gestation, pre-eclampsia, prolonged tocolysis, African race [2]

PPCM is defined as "the onset of acute heart failure in the last trimester or early postpartum period in the absence of infectious, metabolic, toxic, ischemic or valvular cause of myocardial dysfunction [3].

Diagnosis of PPCM Requires four Criteria to be Met [4]: Heart failure developing towards the end of pregnancy or up to five months post-partum. Absence of other identifiable causes of cardiac failure. Absence of cardiac symptoms or disease before late pregnancy

Left ventricular dysfunction is an ejection fraction of less than 45% or reduced fractional shortening of less than 30%. Recently added, echocardiographic criteria include an ejection fraction of less than 45%, left ventricular end-diastolic dimension greater than 2.7 cm/m^2 and fractional shortening of <30% [5].

Presenting Symptoms include dyspnoea, orthopnoea, paroxysmal nocturnal dyspnoea, palpitations, cough, chest pain, haemoptysis, and swelling of the legs. Arrhythmias and thromboembolism can also complicate them. PPCM poses a diagnostic dilemma as the symptoms of heart failure, such as dyspnea, fatigue, and pedal edema may mimic the physiological changes of pregnancy. The first line of therapy includes diuretics, vasodilators and cases with low cardiac output may need inotropic support. The optimal anesthetic technique for patients with PPCM scheduled to undergo cesarean section is controversial as both general and regional anesthesia have been described with success [6].

In general, the aim of anaesthetic management in these patients is to maintain myocardial perfusion by avoiding tachycardia or hypotension. Maintain/increase myocardial contractility to optimize cardiac output. Maintain adequate preload but avoid fluid overload, prevent increase in afterload, Maternal and fetal safety- maintaining uteroplacental adequacy.

General anesthesia can be used for urgent caesarean section. The hemodynamic stress response to laryngoscopy and intubation along with the myocardial depressant effects of anesthetics can be detrimental to these patients. A titrated neuraxial anesthesia, by incremental top-up of an epidural or a combined epidural and low-dose spinal anaesthetic technique, may achieve the goals of anesthesia in these patients. Neuraxial anesthesia, by its vasodilatory effect, reduces the afterload, improves the forward flow, and may be beneficial in a situation of poor ventricular function where no outflow tract obstruction is present [6]. Spinal anesthesia in these cases can result in precipitous hypotension, further complicating the already compromised cardiac function. These patients have been managed by the CSE technique as well [7]. There are case series where the patients have been managed by the EVE technique, where saline has been injected into the epidural space [8]. We report five patients with PPCM posted for emergency caesarean section managed by a novel EVE technique which is a modification of CSE in which the sensory level of analgesia obtained by subarachnoid block is enhanced by a small volume of saline administered epidurally. The epidural catheter also provides postoperative analgesia. Using saline instead of local anesthetic for EVE prevents the risk of total spinal anesthesia even if there is accidental migration of the epidural catheter into subarachnoid space. It also offers early sensory-motor recovery [9] and decreases the duration of post-anesthesia care unit stay.

Blumgart *et al.* [8] hypothesized that epidural injection of a local anesthetic or saline 5 min after spinal anesthesia in patients undergoing cesarean section produces significantly higher analgesia levels than spinal anesthesia alone. Combined spinal epidural with the EVE technique was found to have a dose-sparing effect, with only 55% of the bupivacaine dose required. Tiwari *et al.* [10] published the first case series of five patients of PPCM with ejection fraction ranging between 40-48% who have been managed by the EVE technique, where saline has been injected in the epidural space. Similar to the above study we managed our cases of PPCM with CSE -EVE technique by injecting just 5 ml of saline into epidural space following intrathecal injection of 1cc of bupivacaine 0.5% heavy. All the patients had adequate sensory and motor anesthesia levels as depicted in **Table 2.**

They had stable hemodynamics intraoperatively and also in the postoperative period. The main limitation of the EVE method is that it cannot be used in emergency urgent caesarean sections as the procedure is a time-consuming and adequate level of anesthesia is achieved around 5 minutes after saline injection into epidural space.

CONCLUSION: EVE with saline offers an adequate level of surgical anesthesia with minimal effect on hemodynamics in patients with PPCM undergoing emergency caesarean section.

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