“Graded” epidural anesthesia for renal transplant in a patient with dilated cardiomyopathy and severe left ventricle systolic dysfunction

ABSTRACT
Dilated cardiomyopathy with decreased contractility of left or both ventricles impose a serious risk to patient posted for major surgery. Even after best medical optimization, careful perioperative management with risk and benefit of general and regional anesthesia should be discussed beforehand. We here reporting a case of successful management of a patient with dilated cardiomyopathy with ejection fraction of 15% posted for renal transplant surgery under graded epidural anesthesia.

Key words: Cardiomyopathy; renal; transplantation

Introduction
An enlarged one or both ventricles with decreased systolic function are characteristic of dilated cardiomyopathy (DCMP). Incidence of DCMP is 5–8 cases per 100,000 of the population. Etiology is multifactorial including infective or noninfective myocarditis, toxins, familial, and idiopathic. Management of a patient with DCMP is quite challenging for anesthetist due to impending risk of progressive congestive heart failure and malignant arrhythmias. We report a case of DCMP with left ventricular ejection fraction (LVEF) of 15% undergone renal transplant surgery under epidural anesthesia uneventfully.

Case Report
A 46-year-old and 60 kg weight male patient was admitted in kidney transplant unit with a history of end-stage renal disease (ESRD) and on maintenance hemodialysis twice weekly since 21 months. He was having type 2 diabetes mellitus since 7 years and was on oral hypoglycemics. He was also hypertensive since 18 months and was on nifedipine retard 20 mg TID, clonidine 100 µg TID, metoprolol 50 mg OD, and furosemide 40 mg BID. During preoperative evaluation, the patient was New York Heart Association Class III having a history of breathlessness and dyspnea on exertion. Jugular venous pressure was raised. Mild ascites was present without evidence of organomegaly. His daily urine output was around 500 ml. His 12-lead electrocardiogram (ECG) showed left ventricular hypertrophy with strain pattern. Two-dimensional echocardiography revealed moderate mitral regurgitation, moderate tricuspid regurgitation, dilated left ventricle with global hypokinesia, and LVEF of 15% with moderate pulmonary artery hypertension (right ventricular systolic pressure = right atrial pressure + 44). Coronary angiography was normal. His routine blood investigations were within normal limits.
normal limits except hemoglobin of 8.7 g% and a serum creatinine of 6.9 mg/dl on preoperative visit. His creatinine value before starting of dialysis 21 months earlier was 9.4 mg/dl. His chest radiograph showed cardiomegaly with cardiothoracic ratio of 0.7. On airway examination, his mouth opening was 3 cm with normal dentition. He was Mallampati Class 2 with a full range of neck movements and a thyromental distance of 7 cm. All antihypertensive medications were continued as prescribed. Heparin-free hemodialysis was done 24 h before surgery. A written informed consent for surgery and anesthesia was obtained along with high risk of cardiovascular events and postoperative mechanical ventilation.

In the operating room, an 18-gauge intravenous (IV) cannula was secured in the right upper limb and 5-lead ECG, noninvasive blood pressure (NIBP), and pulse oximetry were attached, and baseline hemodynamic parameters were noted. A 20-gauge arterial cannula was secured in right radial artery under local anesthesia (LA), and FloTrac™ monitor for cardiac output monitoring was attached. A functioning brachiocephalic arteriovenous (AV) fistula was present in the left upper limb. Right internal jugular vein was cannulated under ultrasound guidance, after adequate LA infiltration for continuous central venous pressure (CVP) monitoring and vasopressor administration if required. His baseline IBP was 155/92 mmHg, heart rate (HR) of 64/min, oxygen saturation of 98% on room air, and CVP was 23 mmHg. Dobutamine and epinephrine infusions were kept ready for use. Under strict aseptic precaution, epidural was placed in left lateral position at T10–T11 interspace after adequate LA infiltration, with a 16-gauge Tuohy epidural needle using the loss of resistance technique. Correct placement of epidural catheter was confirmed by a negative test dose of 3 ml lignocaine 2% with 15 µg of epinephrine. A total of 15 ml of bupivacaine 0.5% with 50 µg fentanyl was given in epidural space in “graded” doses of 5 ml every 10 min while assessing the pulse, blood pressure changes, respiration, and keeping constant verbal command to the patient. IV dobutamine was started at the rate of 5 µg/kg/min after giving the first bolus of epidural and titrated according to IBP response. After 30 min of bolus doses, sensory level was T8 with adequate motor paralysis. A continuous epidural infusion at rate of 6 ml/h of 0.5% bupivacaine with 2 µg/ml was started for maintenance. Surgery was allowed to start, and IV infusion of propofol was started at the rate of 50 mg/h for sedation. Supplemental oxygen was given by Venturi mask (FiO₂ 0.5). Goal-directed fluid therapy was given based on pulse pressure variation. Cardiac output, cardiac index, and stroke volume variation were also considered during fluid therapy and inotropes titration. A total of 2 L of crystalloid and 200 ml of 20% albumin were given intraoperatively. One unit of packed red blood cell and 2 units of fresh frozen plasma were also given. Surgery lasted for 6 h and total loss was around 800 ml including 500 ml of ascites and 350 ml blood. At the time of release of cross-clamp, his IBP was 157/94 mmHg, HR was 67/min, and CVP was 12 mmHg. Urine output was adequate after release of cross-clamp. All vital parameters, blood gases, blood sugar, and electrolytes remained within normal range throughout surgery. Epidural infusion was stopped on starting on skin closure. Renal transplant was completed uneventfully. Patient was shifted to postanesthesia care unit with vital near baseline and urine output at 250–300 ml/h. Postoperative analgesia was maintained by continuous epidural infusion of 0.125% bupivacaine with 2 µg/ml fentanyl at the rate of 6 ml/h along with IV paracetamol 1 g TID.

**Discussion**

DCMP is defined by the presence of dilatation and impaired contraction of one or both ventricles that is ejection fraction <40% or fractional shortening <25% and left ventricular end-diastolic size more than 115% of that calculated for age and body surface area. Symptoms of heart failure such as progressive dyspnea, low effort tolerance, orthopnea, paroxysmal nocturnal dyspnea, and peripheral edema are most common. Optimization of patient before surgery is mandatory to lessen the perioperative mortality and morbidity. Medical optimization with drugs such as angiotensin-converting enzyme inhibitors, beta-blockers, vasodilators, diuretics, or antiarrhythmics certainly helps while surgical intervention such as biventricular pacing may also be done before a major surgery. Our patient was already under supervision of a cardiologist for maximum possible optimization for surgery and anesthesia. He was taking furosemide and metoprolol. DCMP is characterized by elevated filling pressures, reduce contractile strength of heart, and an inverse relationship between afterload and stroke volume. Due care of AV fistula is required because it is the lifeline of ESRD patient on hemodialysis, and even after renal transplant, patient may require hemodialysis in the postoperative period. It should be properly padded, and fistula arm should be avoided for using NIBP or invasive monitoring. The goals of anesthetic management for a case of DCMP are avoidance of myocardial depression, maintenance of normovolemia, avoidance of excessive afterload, and avoidance of sudden hypotension. Apart from these primary goals, maintenance of acid-base and electrolyte balance and normothermia, adequate pain relief, avoidance of hypoxia, and hypercapnia are of paramount importance. General anesthesia carries a higher risk because most of the anesthetic drugs tend to depress myocardium, leading to decreased
SVR, hypotension, and bradycardia, and cause vasodilatation. If general anesthesia is mandatory, selection of drugs having minimal myocardial depressant effect such as etomidate can be used for induction of anesthesia in these patients. For maintenance of anesthesia, titrated concentration of inhalational anesthetic agent is required to prevent the further deterioration of ventricular function. Positive pressure ventilation during general anesthesia results in decreased venous return, hypoxemia, hypocarbia or hypercarbia, and acidemia. Regional anesthesia may be an alternative to general anesthesia in selected patients with DCM. Use of regional anesthesia in DCMP is a controversial issue. Single shot subarachnoid blockade is not a good option and may cause a sudden drop in SVR and fall in blood pressures. Epidural anesthesia produces very slow changes in the preload and afterload that mimic pharmacological goals in the treatment of this disease. Epidural anesthesia also helps in better postoperative pain control in these patients because of less pharmacological options available for chronic kidney disease patients. Yamaguchi et al. reported the uneventful use of total IV anesthesia with propofol and ketamine combined with continuous epidural analgesia in a 72-year-old-male patient with DCMP scheduled for a total prostatectomy. Srivastava et al. reported a case series of 8 patients with LVEF below 40% posted for renal transplant surgery. They managed all cases with combined spinal-epidural anesthesia with very low dose of spinal anesthesia followed by epidural anesthesia.

Patients undergoing renal transplant surgery require a lot of fluids to build up CVP and maintain a higher blood pressure during surgery, so as to help in immediate diuresis after transplantation of new kidney. Our patient, having a LVEF of 15% despite best optimization, may not tolerate such a huge amount of fluid during surgery. The role of goal-directed fluid therapy (use of pulse pressure variation, stroke volume variation, or esophageal Doppler) helps in guiding adequate fluids in these patients. Use of inotropes and vasopressors helps to maintain adequate contractility and perfusion pressure.

In conclusion, patient of DCMP with very low LVEF is quite challenging for anesthesia personals. Graded epidural anesthesia with slow blockade of dermatomes can be considered an option.

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Conflicts of interest
There are no conflicts of interest.

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