

# Anesthetic management for nephroureterectomy surgery in a patient with dilated cardiomyopathy: A Case Report

M Daabiss, A Hasanin

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## Abstract

Dilated cardiomyopathy is characterized by dilatation and impaired systolic function of one or both ventricles. Five to eight people per 100,000 develop this disorder each year(1). It can develop at any age and is more common in men. Dilated cardiomyopathy conveys a 50% risk of mortality within two years from onset of symptom. Sudden cardiac death resulting from malignant arrhythmias is the most common cause of death in dilated cardiomyopathy. It is the most common indication for cardiac transplant. Around 50% of cases of nonischemic dilated cardiomyopathy are idiopathic. While other causes could be familial, infectious causes of myocarditis, toxins (for example alcohol or chemotherapeutic agents), infiltrative disorders, nutritional deficiencies, connective tissue diseases(2).

We report our experience of a successful anesthetic management of nephroureterectomy in a patient with dilated cardiomyopathy (DCM) using combined thoracic epidural analgesia (TEA) and general anesthesia (GA).

## CASE REPORT

A 68 year old Saudi male patient of 60 kilogram and 161 cm height was diagnosed as malignant tumour in the left kidney and was scheduled for nephroureterectomy. He was complaining of shortness of breath with mild exertion, paroxysmal nocturnal dyspnea, orthopnea and palpitation but there was no chest pain (New York Heart Association functional class III). Two weeks prior to surgery he was admitted to the emergency medical department with an attack of palpitation followed by loss of consciousness (VT, VF ?) and he was diagnosed as a case of congestive heart failure (CHF). Cardiologist investigated him thoroughly by 12 lead ECG and 24 hours Holters' monitoring which revealed normal sinus rhythm with significant ventricular ectopic activities with bigemini and trigemini. Chest radiography showed cardiomegaly and pulmonary congestion. Echocardiography showed severely dilated left ventricle with global hypokinesia and severe reduction of left ventricular systolic function (Ejection Fraction 20%). Echocardiography showed also moderate reduction in systolic function of the right ventricle, mild mitral and aortic valves regurgitation. The cardiologist put him on tab carvedilol 6.5 mg OD, tab amiodarone 200 mg OD, tab captopril 6.25 mg OD, tab lasix 40 mg OD, tab aldactone 12.5 mg OD.

Preoperatively, his cardiac condition was optimized, and the

patient was not in distress and afebrile. By auscultation: chest was clear, audible first and second heart sounds with dropped beats. His hemoglobin was 11.2 g/dl. Renal, liver functions, electrolytes and coagulation profile are all within normal values.

The original plan was to do two stages surgery at the same setting: endoscopic laser ureteric orifice avulsion with a urinary bladder cuff around it and the second part is laparoscopic nephrectomy with CO<sub>2</sub> pneumoperitoneum applying pressure around 15 mmHg. The expected operative time for both procedures was around 8-9 hours. Based on the patient's critical cardiac condition, we agreed with the surgeon that he should do conventional open rather than laparoscopic technique to avoid compromising the cardiovascular and respiratory functions.

I ordered oral lorazepam 1 mg to be given 2 hours preoperatively as premedication. Upon arrival of the patient to the operating theatre, routine monitoring was established. The non invasive measured blood pressure was 120/70 mmHg, heart rate (HR) 66/min and oxygen saturation (SaO<sub>2</sub>) of 99% while the patient was on oxygen (O<sub>2</sub>) 5 L/min via face mask. A 14G intravenous (IV) cannula and 20G radial arterial cannulation were established under local anesthesia. A triple lumen catheter was inserted under local anesthesia infiltration in the right internal jugular vein for central

venous pressure (CVP) monitoring and for injecting resuscitation drugs when required. Then the patient was placed on the right lateral side and a thoracic epidural catheter at D10-11 was inserted under complete aseptic technique. Bupivacaine 0.25% 10ml with 50 mcg fentanyl titrated over 2-3 minutes through the catheter after that the patient was kept supine, head and shoulder up 30° with O<sub>2</sub> face mask 5L/min, with sensory loss up to T10 dermatome. Dopamine infusion drip started of 3-5mcg/kg/min through the central venous line.

The mean range of blood pressure (MAP) intraoperatively was 85-105mmHg, HR ranged from 57-66 beats/min and CVP ranged from 10-17 cmH<sub>2</sub>O, SaO<sub>2</sub> 99-100%. Sedation was achieved with IV midazolam 1mg. After 2 hours an epidural top up of 5 ml bupivacaine 0.25% with 25 mcg fentanyl was titrated to maintain the level of sensory loss. Several arterial blood samples were aspirated, analyzed for blood gases (ABG) and electrolytes and all were well accepted with no significant change in its values. Total fluids received were 1200 ml of crystalloids in addition to about 500 ml of irrigation crystalloid solution was absorbed during the endoscopic procedure which lasted for 4 hours. Throughout the procedure the vital signs were stable and the patient was lightly sedated and comfortable.

After that we prepared for the 2<sup>nd</sup> stage of surgery, starting with 6ml bupivacaine 0.5% and 50mcg of fentanyl titrated through the epidural catheter in supine position resulting in analgesic level of T8, followed by induction of GA using IV etomidate 10mg, IV fentanyl 50 mcg and IV vecuronium bromide 6mg to facilitate the insertion of a cuffed endotracheal tube (8 mm ID). Anaesthesia was maintained with isoflurane (MAC of 0.5-1%) O<sub>2</sub>/Air and intermittent vecuronium bromide. Dopamine infusion still running at the same rate to maintain adequate MAP. A foleys catheter was inserted, pneumatic compression stockings applied, esophageal temperature probe was inserted and the patient was covered with surface airflow warmer. The patient was positioned in lateral loin position for nephrectomy. This stage lasted 3 hours during which MAP was 80-95 mmHg, HR 60-71 beats/min, SaO<sub>2</sub> 99-100%, CVP 9-15 cmH<sub>2</sub>O, endtidal carbon dioxide 33-37 mmHg, Temp 36.9°C, airway pressure 15-18 cmH<sub>2</sub>O. ABG and electrolytes are within normal levels. ECG tracing was normal sinus rhythm with infrequent PVCs (<6 /minute) without any ischemic changes. Total urine output was 500 ml. At the end of the operative procedure, the residual muscle relaxant effect was

reversed with IV neostigmine 2.5mg and IV glycopyrolate 0.3mg and extubated smoothly with hemodynamic stability and chest was clear. Overall the anesthetic management was uneventful.

In the PACU, the patient was fully awake and an epidural infusion of bupivacaine 0.03% with fentanyl 4mcg/ml was started for postoperative pain control with an infusion rate of 3-5ml/hour. After an hour the patient was transferred to High Dependency Care Unit (HDCU) awake with stable vital signs. On the next morning he was discharged to the surgical ward in a very good condition.

## DISCUSSION

Dilated cardiomyopathy (DCM) is a syndrome characterized by cardiac enlargement and impaired systolic function of one or both ventricles. Clinical picture of DCM may vary from asymptomatic with only cardiomegaly to severe CHF. Apart from CHF, dysrhythmias and embolism (systemic or pulmonary) are also common features of DCM patients (3).

It is well known that laparoscopy can compromise the cardiovascular and respiratory function of patients; however, major hemodynamic changes in the form of alteration of blood pressure, arrhythmia and cardiac arrest have been reported with gas insufflation. The extent of these changes depends on intra-abdominal pressure (IAP) and patient position. At IAP>15mmHg venous return decreases due to compressed inferior vena cava which leads to decreased cardiac output and hypotension (4).

The present case had two major problems, DCM with severe cardiac dysfunction and prolonged surgical procedure (7hours) with the associated hemodynamic and intravascular volume changes. Preoperatively cardiologist was consulted for optimal medical management of cardiomyopathy. Although the patient was clinically stable on drugs, GA carries a high risk as these patients may develop CHF, myocardial ischemia or arrhythmias during intraoperative period.

Aono et al compared three anesthetic techniques: general, epidural analgesia and general anesthesia combined with epidural analgesia for laparoscopic cholecystectomy and he found that, general anesthesia with sevoflurane/N<sub>2</sub>O could not suppress stress response of both hypothalamus-pituitary-adrenocortical axis and sympathoadrenal system while epidural analgesia suppressed only the sympathoadrenal responses (5). TEA might be of advantage in patients with

limited cardiac function undergoing abdominal surgery. Gramatica et al used epidural anesthesia as a sole technique for Laparoscopic Cholecystectomy (LC) and recommended it for patients who are not good candidates for general anesthesia due to cardio respiratory problems (6).

Our choice for anesthetic management was epidural analgesia because it produces a relatively slow sympathetic blockade and decrease in peripheral vascular resistance. We assumed that an induced reduction in afterload and preload would benefit cardiac function. The epidural technique described offers potential advantages, in that it satisfies, by pharmacological means, most of the principles recommended by cardiologists for the overall management. We inserted the epidural catheter at thoracic level so it offers analgesia for both surgical stages.

El-Dawlatly et al reported uneventful anesthetic management of a patient with dilated cardiomyopathy who underwent LC under thoracic epidural analgesia but in his case surgical procedure stayed only 60 min with CO<sub>2</sub> insufflation pressure <10mmHg (7). While Hashimoto et al reported that high dose epidural fentanyl anesthesia is an anesthetic method of choice for patients with dilated cardiomyopathy (8).

Changing the surgical plan to open laparotomy instead of laparoscopic procedure reduced the risk of pneumoperitoneum and the period of surgery under GA. It was difficult to use epidural only for open nephrectomy because of insufficient sensory block of epidural analgesia for that surgical procedure as well as the patient will be positioned in lateral loin position and surgeons considered a risk of possible pleural injury during the dissection due to tumor infiltration.

Regarding our experience in such critical cases, we planed to depend on CVP monitoring and correlating its measurements with other invasive and non invasive recorded vital signs to optimize the preload keeping CVP around 12-16 cmH<sub>2</sub>O and keep mean arterial blood pressure 80-95mmHg by using low concentrations of local anesthetic agents depending on epidural opioids and support of dopamine infusion. Although we did not measure intraoperative cardiac output (CO), we believe that the circulatory effects of epidural block contributed to a relatively stable operative and postoperative course.

We did not insert a Swan Ganz catheter as we expect that the

patient positioning (lateral loin) will disrupt the tracing of pulmonary capillary wedge pressure as well as cardiac output figures so eliminates the advantage of its use in addition to its coexisting complications which could happen and might be fatal in this patient and also the controversies regarding its benefits. Amaranath et al reported that despite repeated adjustments, a satisfactory tracing of pulmonary capillary wedge pressure was not obtained during surgery; which was ascribed to the lateral position of the patient. Also they added that, because of the non-steady state induced by operative blood loss, fluid replacement, and the development of pulmonary hypertension, they were unable to obtain accurate cardiac output measurements during surgery (9).

We believe that Transesophageal Echocardiography (TEE) could be useful but we did not use due to limited expertise with TEE.

In conclusion, patients with limited cardiac reserve undergoing prolonged surgical procedure with expected changes in intravascular volume present challenges to anesthesiologists. For this particular patient and due to our familiarity with the technique we felt that TEA can provide adequate block for surgery and excellent postoperative analgesia.

This might be the first case reported on the use of TEA with GA in patient with cardiomyopathy undergoing prolonged surgery. These patients can be very well managed with preoperative optimized medical condition and well-planned perioperative care.

## CORRESPONDENCE TO

Dr. Mohamed Daabiss, Department of Anesthesia & Intensive Care, Riyadh Military Hospital, P.O.Box 7897-D186, Riyadh 11159, Kingdom of Saudi Arabia.  
Tel.+96614777714 ext 25288. Email: madaabiss@yahoo.com

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**Author Information**

**Mohamed A. Daabiss, MD**

Department of Anesthesia & Intensive Care, Riyadh Military Hospital

**Adel Hasanin, MSc**

Department of Anesthesia & Intensive Care, Riyadh Military Hospital