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Case Report

Anesthesia Management for Kidney Transplant Recipient in Patient with Kyphoscoliosis

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ABSTRACT

Kyphoscoliosis is one of the manifestations of renal bone disease due to End stage renal disease (ESRD). Chronic renal failure patients usually present with comorbidities like hypertension, Diabetes, Dyslipedidemias, however, the risk of renal transplant increases multifold when the patient also suffers with respiratory problems. Herein we provide a patient of ESRD with severe kyphoscoliosis having severe pulmonary and systemic hypertension posted for emergency cadaveric donor renal transplantation which was successfully performed under general anesthesia with invasive Monitoring.

Keywords: Kyphoscoliosis; End stage renal disease; Renal transplantation

INTRODUCTION

End stage renal disease (ESRD) is the last stage of chronic kidney disease when glomerular filtration rate is less than 15 mL/min/ 1.73 m^2 and renal replacement therapy is essential to sustain life. Renal transplantation is the treatment of choice [1]. Chronic Renal Insufficiency (CRI) causes numerous musculoskeletal abnormalities, and their prevalence increases as patients with CRI continues to be on hemodialysis for longer duration [2]. Kyphoscoliosis is a thoracic cage deformity that causes extra pulmonary restriction of the lungs and gives rise to impairment of pulmonary as well as cardiovascular functions. We describe successful conduction of renal transplant surgery in ESRD patients with low cardiac and respiratory reserves.

CASE PRESENTATION

A 33-year-old, 55 kg weight and 155 cms height female registered in transplant list of Jupiter Hospital for cadaveric renal transplantation. She was a case of end stage renal disease since 12 years dependent on hemodialysis which was being done thrice a week. Associated comorbidities include systemic hypertension, Dyslipidemia and severe Kyphoscoliosis.

She was hospitalized multiple times in past for signs and symptoms of fluid overload and anemia. After HLA cross-matching with cadaver she was admitted to Jupiter hospital during emergency hours for renal transplant. Preoperative examination revealed collapsing spinal deformity, truncal deviation with significant forward decompensation, limited extension of neck, needs at least 2 pillows to sleep, could not lie supine and have very low effort tolerance.

2D-echocardiography suggested dilated right Atrium and right Ventricle with severe pulmonary hypertension (PASP 75 mmHg), left ventricular hypertrophy, and grade II left ventricular diastolic dysfunction. Hematological investigation showed Hemoglobin of 7 gm and Serum Creatinine-6.5 post hemodialysis. Arterial blood gas on room air showed PCO_2-44 mmmHg and PO_2-70 mmHg. X-ray chest film showed distorted image with cardiomegaly. Pulmonary function test diagnosed her to have severe irreversible obstructive and restrictive defect with reduced lung capacities (FVC-38%, FEV1-35%, PEF-26%, MMEF-26%).

Instead of multiple Antihypertensives, Non-invasive blood pressure on admission was more than 170/110 mmHg, hence intravenous Nitroglycerin was started preoperatively in Intensive care unit. Patient and her relatives had been counseled and consented for the possible intraoperative and postoperative complication. Airway assessment revealed a Mallampatti Grade II, with intact dentition, adequate mouth opening but restricted neck extension. Continuous electrocardiogram, invasive BP and pulse pressure variation (PPV) with left radial arterial catheter before induction, central venous pressure and pulmonary artery pressure with Swan-ganz catheter (post induction), pulse oximetry and temperature monitoring were established.

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Her baseline vitals show pulse rate of 70 beats/min, regular, invasive blood pressure (BP) 160/100 mmHg with NTG at 2 mcg/kg/hr infusion , Pulse pressure variation (PPV-6), and SpO_2 96%, CVP-7 cm H_2O, PAP- 77 mmHG. We planned to proceed with general anesthesia and surgery without changing her original position which is 35 to 40 degree propped-up. After pre-oxygenation with 100% O_2 for 3 min, induction was done with intravenous (IV) injection of Etomidate 0.4 mg/kg and (IV) Injection Fentanyl 100 mcg until loss of response to verbal command. After confirmation of mask ventilation Injection Cisatracurium 0.2 mg/kg IV was given to facilitate the endotracheal intubation. Direct laryngoscopy done with Video-Laryngoscope No-3 blade showed Cormack- Lehane grade IIb laryngeal view, intubated with No-7 PVC endotracheal tube. Normal saline as Crystalloid solution used in guarded way according to PPV pressure and PAP.

Barely 500 ml normal saline solution used before the anastomosis of donor kidney. After anastomosis of recipient kidney adequate fluids and diuretic agents were given. One and half to two liter crystalloid solution used for the whole procedure and 400 ml urine output achieved at the end of surgery. On conclusion of surgery, after confirming normal arterial blood gas analysis and clinical confirmation of adequate breathing efforts, patient was extubated on OR itself and shifted to Intensive care unit.

Post-operatively fluid management for next three days was managed based on urine output, daily weight of patient, Pulmonary artery pressure and clinical status of hydration. Surgical pain was managed with intravenous Paracetamol and Fentanyl infusion, incentive spirometry efforts increased gradually. Patient was shifted out of Intensive care unit on day 5 and discharged subsequently.

DISCUSSION

The primary focus in kidney transplant surgery is the optimum fluid management and maintain good central venous pressure to achieve optimum allograft function. Scoliosis is a complex deformity of the spine and anesthesia for any surgery can be challenging, with several aspects to be kept in mind simultaneously [3]. When the vascular clamps are removed, good perfusion of the new kidney is essential to give the best chance of immediate function; this is dependent on adequate intravascular volume and the avoidance of hypotension.

Central venous pressure (CVP)-guided volume infusion is the traditional approach in renal transplantation [4,5] and involves intraoperative infusion of large volumes of fluid. In a recent meta-analysis of the correlation between CVP and changes in cardiac performance, Marik and Cavallazzi [6] showed that only 57% of high-risk patients in the intensive care unit and operating room who appeared to be hypovolemic based on CVP were fluid responders, whereas the other half were unnecessarily loaded with fluids.

However, Dynamic variation of arterial waveform-derived parameters i.e. pulse pressure variation (PPV) in mechanically ventilated (Tidal volume-8 ml/kg) patients provides a precise indication of fluid responsiveness [7], in this case PPV was maintained in the range of 4-6 and guarded fluids were given to patient before anastomosis of recipient kidney. In Kyphoscoliotic patient, pulmonary hypertension is the natural evolution from chronic hypoxemia, hypercapnea (chronic respiratory insufficiency) and the structural changes of the mediastinum. Other factors contributing to pulmonary hypertension are that the number of vascular units per unit volume of lung is lesser than in normal lungs [8].

Also in the compressed lung regions, the alveoli become smaller than at residual volume, leading to blood flow in extra alveolar vessels which have a higher resistance [9]. The already elevated pulmonary artery pressure due to thoracic deformity may not allow an increase in stroke volume necessary during anesthesia [10]. Eventually right ventricular strain and failure will evolve from increased work of right sided cardiac output, hence preventative measures further worsening PAP like trendlenburg position, hypoxia, acidosis, hypervolemia, hypothermia were avoided. This patient was having severe irreversible restrictive and obstructive lung disease (which involves decreased vital capacity, functional residual capacity, tidal volume, and increased respiratory rate), severe pulmonary hypertension and restricted neck extension which suggests involvement of more than 7 vertebrae including thoracolumbar and lower cervical vertebra as per the severity grade of Kyphoscoliosis [11].

Hence preparation of difficult airway and video laryngoscope was used to facilitate anticipated difficult endotracheal intubation. Based on arterial blood gas analysis in intraoperative period, ventilator parameters were managed to keep normocapnea and adequate oxygenation. Patient was assessed clinically for adequate breathing attempt and complete neuromuscular block reversal. Arterial Blood Gas revealed PH-7.34 PCO_2- 36 mmHg, PaO_2-170 mmHg, HCO_3-20 mmol/ Lit, Lactate-1.2 mmol/Lit prior to extubation. Contemplating all the parameters, extubation was conducted in OR.

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