

Case Report

Management of a patient with severe pulmonary hypertension for urgent orthopaedic surgery

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ABSTRACT

Pulmonary hypertension represents an important risk factor for increased peri-operative morbidity and mortality. Although pulmonary hypertension is a rare disease, there are special considerations to the anesthetic management in patients with severe pulmonary hypertension. Anesthetic aims in pulmonary hypertension are to avoid increased pulmonary vascular resistance, to avoid marked decrease in venous return or systemic vascular resistance, to avoid myocardial depression and to maintain normal heart rate. We present a case of 85 year old male patient having severe pulmonary hypertension, with reported pulmonary artery pressure of 72 mmHg, posted for proximal femoral nailing. We want to stress on the importance of pre-operative evaluation and careful anesthesia planning for successful peri-operative and post-operative outcomes.

Keywords: Functional status assessment, Geriatric patient, Right ventricular failure, Severe pulmonary hypertension, Systemic vascular resistance, Urgent orthopaedic surgery

INTRODUCTION

Pulmonary hypertension is the manifestation of a disorder of the pulmonary vascular bed, which results in obstruction of pulmonary blood flow. More patients with pulmonary hypertension are now presenting for surgery, and this poses a challenge to the anaesthetist. Knowledge of the underlying physiology is paramount in preventing the feared complication of right heart failure.^{1,2}

Although mild pulmonary hypertension rarely impacts anesthetic management, severe or moderate pulmonary hypertension can lead to acute right heart failure and cardiogenic shock. The perioperative management of patients with pulmonary hypertension varies depending upon the pathological features present, functional clinical classification, hemodynamics, and success of current

medical therapy. In our case we focused on functional status assessment as the core in planning anesthesia management for intraoperative and perioperative successful outcomes.³

CASE REPORT

85 years old male patient was presented to anesthesia preoperative checkup for proximal femoral nailing. He had 1 day old history of fall from bus. He had pain and swelling associated to right hip joint. He was a social worker with a very good effort tolerance for his age and it was of 2 flights.

He did not have any known co-morbidities. He had long standing breathlessness on exertion and long standing dry cough. On general examination, his pulse rate was 70 per

minute, regular; blood pressure was 150/100mmHg and respiratory rate was 15 per minute. Room air SpO₂ was 92%. He had pallor and bilateral pitting edema. On systemic examination under cardiovascular system he had pansystolic murmur of grade II/VI over tricuspid area along with the normal heart sounds S1 and S2. Under respiratory system, he had bilaterally decreased breath sounds. Rhonchi and few crepts were also present bilaterally. Other systems were within normal limits. Haematological and biochemical investigations were within normal limits. Haemoglobin was 9.2gm%.



Figure 1: X-ray chest PA view.

ECG was suggestive of right ventricular hypertrophy and clockwise rotation of heart. His chest X-ray was suggestive of aortic knuckle calcification, loss of pulmonary bay, cardiomegaly with right ventricular type along with prominent bronchovascular markings.

His ABG was within normal limits. CT thorax was suggestive of bronchitis and cardiomegaly with dilated right atrium, dilated right ventricle and dilated pulmonary arteries. 2D echo was also suggestive of dimensions of right atrium and right ventricle dilated with no regional wall motion abnormality. Ejection fraction was 59% and pulmonary artery pressure of 72mmHg. Diagnosis of pulmonary hypertension with pulmonary emphysema was confirmed.

Senior physician consultation was taken. Tablet sildenafil 20mg in TDS dose was started.¹ Bronchodilators were also started. Considering his effort tolerance which was very good, we accepted him for urgent surgery without optimisation. Delaying the time of surgery would further worsen the pulmonary hypertension because of pain and hypoxia. He was posted as first case on the next day.

Risk was explained to patient and relatives. High risk consent was obtained. Patient was kept starved orally for

6 hours. On the day of surgery, patient was taken inside the operation theatre. Ecg, pulsoxymetre, NIBP were attached. Oxygenation was started with simple oxygen mask. Intravenous line of 18G was taken and fluids were started crucially.

Under all aseptic precautions epidural catheter was inserted at the level of L2-L3. Confirmation of placement of catheter was done. 1st dose of 0.5% bupivacaine was given in graded manner of 4ml followed by 2 ml along with 25mcg of fentanyl. Adequate time (20-25min) given to achieve the expected sensory level of T12. Crepe bandage was applied to non-operated limb. Left lateral position was given and all the bony prominences were secured with cotton pads. Patient was covered and warm air blower was introduced under the blanket.¹

Fluids were given in a restrictive and targeted manner. Intra-operative heart rate variation was 65-70/min. SBP variation of 116-128mmHg. DBP variation was between 80-90mmHg. There was a single episode of hypotension where BP was 90/38mmHg, inj. Phenylephrine (200 mcg bolus) was given and another bolus of 200mcg was repeated after 15min along with fluid bolus of 200ml.

There was no episode of hypotension associated with hypoxia intraoperatively which is suggestive of raised pulmonary hypertension. Surgery lasted for 50minutes. Intraoperative fluid loss and blood loss of 150ml was replaced with 900ml of warm crystalloid Ringer lactate. Urine output was 225ml.

Patient was shifted to SICU for monitoring and further care. Analgesia via epidural catheter was maintained. After uneventful monitoring for 4 days in SICU, patient was shifted to ward and later on discharged to home on 14th day. At present patient can walk with support and can perform his routine activity.

DISCUSSION

Pulmonary hypertension is a medical zebra. It has a very rare incidence of 15-50 cases per million.² Also literature available on the cases of PH is very scarce.³ Coronary perfusion during both systole and diastole depends upon gradient of aortic and right ventricular pressure.⁴ Pulmonary circulation is a high flow, low resistance circuit capable of accommodating the entire right ventricular output at one-fifth the pressure of the systemic circulation.⁴

In pulmonary hypertension, right ventricular hypertrophy occurs gradually to overcome high pulmonary vascular resistance. Right ventricle may not sustain prolong volume or pressure overload. Decrease in coronary perfusion pressure may lead to right ventricular ischemia and failure.⁴ Patient was having pulmonary hypertension secondary to pulmonary emphysema. Pansystolic murmur was because of tricuspid regurgitation developed because of dilated right atrium and right ventricle.

Although the patient was having severe pulmonary hypertension, but he comes under functional class I of WHO classification of pulmonary hypertension correlated with symptoms. We considered his very good effort tolerance with moderate functional status assessment of score 4-7 MET and accepted the case under emergency basis without optimisation of the patient. Patient was not having clinical predictor of increased risk for perioperative cardiac complications except increased age which is a minor predictor.

And according to ACC/AHA guidelines, patients with minor clinical predictors of cardiac risk do not require further testing unless their functional status is poor.⁵ Factors aggravating pulmonary hypertension like pain, systemic hypotension, hypercarbia, hypoxia was avoided.² Oxygen in itself is a pulmonary vasodilator; hence preoxygenation was started. Hypertrophied RV is 'preload dependent' it may not tolerate even small volume depletion such as bleeding. Excessive volume overload may also cause RV failure. Hence titrated fluid infusion was given.

We plan to perform the case exclusively under epidural anesthesia weighing against all the pros and cons of spinal and general anesthesia. Advantages of general anesthesia are safe oxygenation, secured airway and inhalants for selective pulmonary vasodilatation can be easily administered. But, stimulation due to laryngoscopy and intubation may aggravate pulmonary hypertension.

Also, it is very crucial to balance between sympatholysis and hypotension due to anesthetic drugs and hypertension due to surgical stimulus. As both the factors have the potential to hamper right ventricular coronary perfusion and right ventricular failure. General anesthesia is considered the technique of choice though it can cause rise in PVR due to hypoxia, hypercarbia, acidosis, hyperthermia & IPPV; a decrease in SVR due to various drugs & thereby increasing risk.⁶

Advantages of regional anesthesia are patient can maintain spontaneous breathing, elevated PA pressures can be avoided due to mechanical ventilation and postoperative analgesia is maintained. The use of spinal anesthesia is considered to be relatively contraindicated due to the rapid fluctuations in systemic blood pressure, and hence afterload and preload changes that this technique will generally cause at the onset of anesthesia.⁷

Epidural anesthesia is slow in onset, which allows for hemodynamic stability to be maintained homeostatically. Administration and dosing of local anesthetics was performed carefully and fractionated in order to avoid significant decrease in systemic vascular resistance, reduction of coronary perfusion, and right-heart failure.⁷

Single episode of hypotension occurred which was not associated hypoxia which rules out possibility of raised PA pressure, hence hypotension was treated with fluid challenge along with phenylephrine.

PH patients require a well-planned pain management strategy to minimize sympathetic activation and increases in PVR and immediate post-operative monitoring in an intensive care unit.⁸ Analgesia was maintained with 6cc of 0.125% bupivacaine 8 hourly.

CONCLUSION

In conclusion, functional status assessment is the core in planning anesthesia management for intraoperative and perioperative successful outcomes.

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