Case report

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Choice of anaesthesia in patient with severe pulmonary hypertension scheduled for orthopaedic surgery - A case report

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ABSTRACT

Anaesthesia in surgical patient with severe pulmonary hypertension is very challenging. It needs to weigh pros and cons of choice of anaesthetic technique. A little pendulum shift on either side can prove catastrophic. A 45 years male with severe pulmonary hypertension scheduled for internal fixation of fracture of neck of femur was managed successfully under graded epidural anaesthesia. We discuss pros and cons of anaesthetic technique and importance of invasive monitoring and meticulous intraoperative fluid and paus management to achieve desirable outcome.

Keywords: Anaesthetic, Epidural Anaesthesia, Pulmonary Hypertension

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[2]. 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.

CASE REPORT

45 years old male, average built patient was presented to anesthesia preoperative checkup for close reduction internal fixation with cortical cancellous screw fixation of fracture neck of femur, left side (Figure 1). He had 4-day old history of fall from motorbike with no associated major injuries to any other organ system. He had pain, swelling and difficulty in weight bearing associated to left hip joint. He was a farmer with MET score of 3. He was a chronic beedi smoker (20 pack year history) and known systemic hypertensive with on and off treatment history. On general examination, his pulse rate was 72 beats per minute respiratory rate was 15 per minute, blood pressure 156/100 mm of mercury. Room air SpO_2 was 94%. He was not pale with any signs of icterus, cyanosis, generalised 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. Respiratory system, exam revealed rhonchi and few crepts bilaterally decreased breath sound bilaterally at bases. Other systems were within normal limits. Haematological and biochemical investigations were within normal limits. Haemoglobin was 10.6 gm%.

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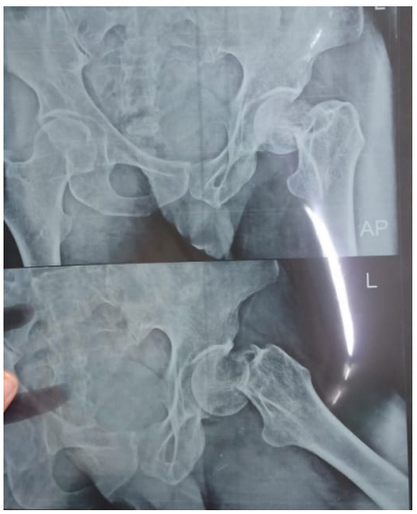


Figure 1. Fracture neck of femur (Lt.)

X-ray chest (AP view) revealed emphysematous changes with accentuated brocho-vascular markings (Figure 2). Pulmonary function test revealed moderate-severe restriction with no significant brochodilation with salbutamol. ECG was suggestive of right ventricular hypertrophy. ABG was within normal limits. 2D echocardiography and color Doppler was also suggestive of dimensions of right atrium and right ventricle dilated, normal dimesions of left atrium and ventricle with paradoxical septal movements. Pulmonary artery was dilated with increased pulmonary blood flow. Left ventricular ejection fraction was 74% and Right Ventricular Systolic Pressure (RVSP) was recorded to be 104.86 mmHg (Table 1). Color flow imaging revealed trivial tricuspid and trivial mitral regurgitation. Further evaluation with pulmonary CT angiography revealed eccentric thrombus in segmental branch of inferior left pulmonary vein Diagnosis of pulmonary hypertension was confirmed secondary to thrombus obstructing pulmonary blood flow (Figure 3).

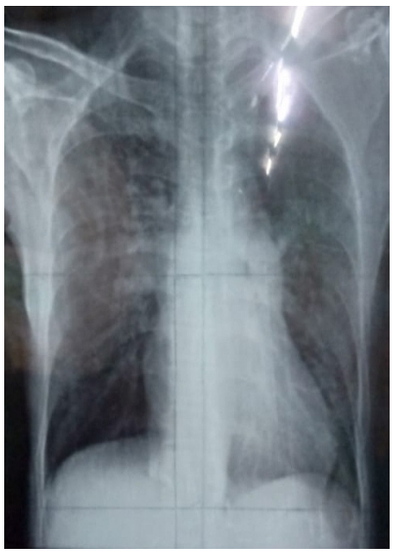
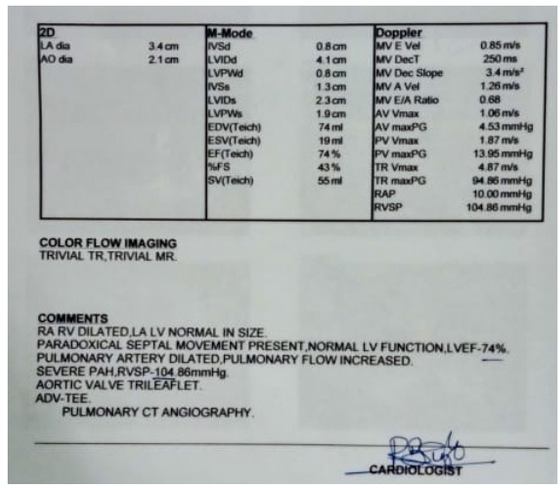


Figure 2. X-ray chest

Table 1. Pulmonary CT Angiography

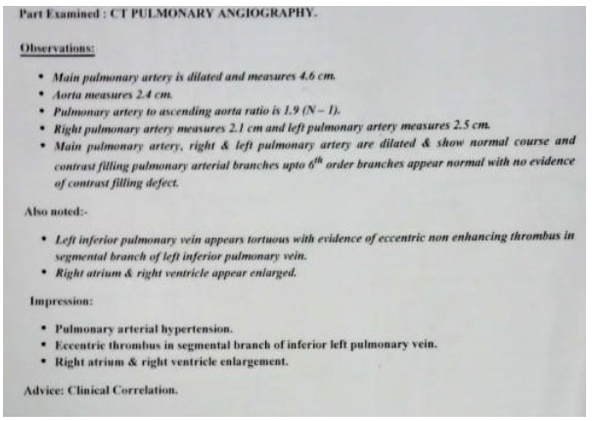


2D		M-Mode		Doppler	
LA dia	3.4 cm	IVSd	0.8 cm	MV E Vel	0.85 m/s
AO dia	2.1 cm	LVIDd	4.1 cm	MV DecT	250 ms
		LVPWd	0.8 cm	MV Dec Slope	3.4 m/s²
		IVSs	1.3 cm	MV A Vel	1.26 m/s
		LVIDs	2.3 cm	MV E/A Ratio	0.68
		LVPWs	1.9 cm	AV Vmax	1.06 m/s
		EDV(Teich)	74 ml	AV maxPG	4.53 mmHg
		ESV(Teich)	19 ml	PV Vmax	1.87 m/s
		EF(Teich)	74 %	PV maxPG	13.95 mmHg
		%FS	43 %	TR Vmax	4.87 m/s
		SV(Teich)	55 ml	TR maxPG	94.86 mmHg
				RAP	10.00 mmHg
				RVSP	104.86 mmHg

COLOR FLOW IMAGING
TRIVIAL TR,TRIVIAL MR.

COMMENTS
RA RV DILATED,LA LV NORMAL IN SIZE.
PARADOXICAL SEPTAL MOVEMENT PRESENT,NORMAL LV FUNCTION,LVEF-74%.
PULMONARY ARTERY DILATED,PULMONARY FLOW INCREASED.
SEVERE PAH,RVSP-104.86mmHg.
AORTIC VALVE TRILEAFLET.
ADV-TEE.
PULMONARY CT ANGIOGRAPHY.

CARDIOLOGIST



Part Examined : CT PULMONARY ANGIOGRAPHY.

Observations:

- *Main pulmonary artery is dilated and measures 4.6 cm.*
- *Aorta measures 2.4 cm.*
- *Pulmonary artery to ascending aorta ratio is 1.9 (N – 1).*
- *Right pulmonary artery measures 2.1 cm and left pulmonary artery measures 2.5 cm.*
- *Main pulmonary artery, right & left pulmonary artery are dilated & show normal course and contrast filling pulmonary arterial branches upto 6th order branches appear normal with no evidence of contrast filling defect.*

Also noted:-

- *Left inferior pulmonary vein appears tortuous with evidence of eccentric non enhancing thrombus in segmental branch of left inferior pulmonary vein.*
- *Right atrium & right ventricle appear enlarged.*

Impression:

- Pulmonary arterial hypertension.
- Eccentric thrombus in segmental branch of inferior left pulmonary vein.
- Right atrium & right ventricle enlargement.

Advice: Clinical Correlation.

Figure 3. Part examined: CT pulmonary angiography

Cardiology consultation was taken, unfractionated heparin 5000 IU intravenously, 8 hourly (in divided doses) and tablet amlodipine 10mg once daily. Nebulization with salbutamol was also started. Patient was conservatively managed for 10 days and after optimization of chest condition, blood pressures and cardiology consultation, patient was taken up for surgery.

On the day of surgery, patient was taken inside the operation theatre and standard monitoring with ECG, pulse oxymeter, NIBP was done. Oxygenation was started with simple oxygen mask. Central venous cannulation was done (ultrasound guided) along with invasive blood pressure monitoring. Under all aseptic precautions epidural catheter was inserted at the level of L2–L3. After confirming placement of catheter, 1st dose of inj 0.75% ropivacaine 7 ml was given followed by 2 ml along with 50 mcg of fentanyl. Adequate time (20–25 min) 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. Fluids were given in a restrictive and targeted

manner +2 of baseline CVP pressure. Intra-operative heart rate variation was 65-80/min. There was no episode of hypotension or hypoxia intraoperatively. Surgery lasted for 2 hours 15 minutes. Intraoperative fluid loss and blood loss of 150 ml was replaced with total 900 ml of warm crystalloid Ringer lactate. Urine output was 225 ml. Patient was shifted to Surgical ICU (SICU) for monitoring and further care. Epidural catheter was removed in PACU prior to shifting of patient to SICU. After uneventful monitoring for 2 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 (PH) has a very rare incidence of 15–50 cases per million[1]. Also, literature available on the cases of PH is very scarce[6]. Coronary perfusion during both systole and diastole depends upon gradient of aortic and right ventricular pressure. 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. 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 ischemic and failure[3]. Patient was having pulmonary hypertension secondary to pulmonary thrombus in the segmental branch of inferior left pulmonary vein suggestive of fat embolism?. Pansystolic murmur was because of tricuspid regurgitation developed because of dilated right atrium and right ventricle.

Factors aggravating pulmonary hypertension like pain, systemic hypotension, hypercarbia, hypoxia was avoided[1]. 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 planned 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 and IPPV; a decrease in SVR due to various drugs and thereby increasing risk[4].

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[5,7].

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[5].

CONCLUSION

In conclusion, meticulous pre-operative functional status assessment and optimum intra operative fluid management with invasive monitoring is the core in planning anesthesia management for intraoperative and perioperative successful outcomes.

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