Successful Management of a Patient with Moderate Pulmonary Hypertension with Severe Tricuspid Regurgitation for Open Reduction and Internal FIXATION Acetabulum

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Abstract

Patients with pulmonary hypertension (PH) and consequent severe tricuspid regurgitation (TR) pose a significant risk for anesthesia and surgery due to high possibility of perioperative complications and mortality. Ideal anesthetic technique consists of maintaining right ventricular cardiac output by ensuring an adequate balance between mechanical matching of the right ventricle and pulmonary circulation. Factors such as hypoxia, hypercarbia, hypothermia, and inadequately controlled pain that lead to increase pulmonary vascular resistance must be avoided. Here, we present a case of a 70-year-old man with moderate PH and consequent moderately severe TR, with multiple rib fractures and bilateral lung contusions who successfully underwent open reduction and internal fixation of acetabulum. The patient was operated under low-dose spinal and graded epidural regional anesthesia. Inhaled nitroglycerin was given night before surgery and on the day of surgery, and a low-dose intravenous nitroglycerin infusion was used throughout the procedure. We thus conclude that moderate PH with back pressure changes can be managed safely and efficiently with combined low-dose spinal and graded epidural anesthesia.

Keywords: Primary pulmonary hypertension, regional anesthesia technique, open reduction and internal fixation acetabulum, inhaled nitroglycerin.
ventricular systolic pressure of ≈ 75 with flail tricuspid valve and a good left ventricular function (ejection fraction 52%).

Estimated pulmonary artery systolic pressure was measured as 57 mmHg. Transesophageal ECHO confirmed these findings. His stress thallium for ruling out coronary vessel involvement was done which turned out to be negative. His hemoglobin was 11.3 g% and platelet count was 150,000/mm3. Arterial blood gas (ABG) on room air revealed; pH of 7.42, PaO2 58 mmHg, PaCO2 37 mmHg, and bicarbonate 23.7 mmol/L. The arterial oxygen saturation (SaO2) was measured as 92%.

Cardiologist evaluated and opined that the patient was a high-risk case for surgical intervention with possibility of fatal outcome in the perioperative period due to moderate PH and associated severe TR.

The patient was premedicated with ranitidine 150 mg orally on the night before surgery and nitroglycerin (NTG) 2.5 µg/kg in 4 ml saline was administered through nebulizer at night and on the morning of the surgery to mitigate the pulmonary pressures [4]. The patient was classed as an American Society Anesthesiologists Grade III physical status and an informed high-risk consent was obtained. In the operation theater, standard monitoring (ECG, non-invasive BP, and pulse oximetry) was established which recorded his basal HR to be 98/min and BP was 120/65. The SpO2 on room air was 92–93%. Intravenous (IV) access was established with a wide bore 18 G cannula. A 20 G right radial arterial line and a right-sided central venous catheter in the right internal jugular vein were placed under local infiltration. The surgery was planned under internal jugular vein were placed under local anesthesia as our technique of choice in this case, patient already had fractured ribs bilaterally and pulmonary contusions compromising lung mechanics and function, therefore, we chose regional anesthesia as our technique of choice in this patient. Although central neuraxial blockade has been used safely in patients with PH, blocking cardiac sympathetic in the upper thoracic region disrupts the right ventricular function, therefore, slow-graded epidural after low-dose spinal was chosen as the plan. Patient was nebulized with inhaled NTG (iNTG) (2.5 µg/kg for 10 min) at night and on the morning of the surgery to mitigate the pulmonary arterial pressure. iNTG leads...
to selective pulmonary vasodilation unlike IV NTG which leads to systemic and pulmonary vasodilation. Oxygen was continuously administered as it is a pulmonary vasodilator which plays a pivotal role in reducing PVR[13] and avoids hypoxia. Patient was mildly sedated with low-dose dexmedetomidine (0.2 µg/kg/h) and excessive sedation was avoided to prevent hypercarbia. IV NTG @ 2.5 µg/kg/min was given to mitigate pulmonary arterial pressure and a balance was maintained between dexmedetomidine and NTG to avoid bradycardia and excessive tachycardia (HR was maintained between 89 and 95/min). It is a good practice to eliminate any air from IV syringes and lines in these cases. Hypothermia can cause pulmonary vasoconstriction and it was prevented using forced air-warming blankets and warmed IV fluids. Heat and moisture exchangers should be used if case is under general anesthesia. Hemodynamic changes can occur rapidly in these patients, and therefore, invasive ABP monitoring is almost always indicated as part of the anesthetic plan. Systemic hypotension should be managed with vasopressors rather than reducing or stopping the pulmonary vasodilator infusion [7]. Dobutamine is the most commonly used agent as it increases contractility and HR along with systemic and pulmonary vasodilation. If hypotension persists then a vasoconstrictor should also be added to restore coronary artery perfusion [7]. Norepinephrine provides both vasoconstriction and inotropic support and decreases PVR/SVR ratio at lower doses (<0.5 µg/kg/min) [7]. Used in lower doses, it can improve RV/pulmonary artery coupling and is considered the best first-line agent in patients with PH, right heart failure, and hypotension [7]. Therefore, we kept dobutamine and noradrenaline as standby. If hypotension occurred these agents would be used to increase the BP without the need for pushing the fluid to avoid increase in preload and hence leading to right heart failure. We infused fluid judiciously and with blood replacing blood, we did not have to start either dobutamine or noradrenaline infusions. Postoperatively, these patients should be monitored in SICU to ensure the adequacy of oxygenation, perfusion, pain management, and the continuation or initiation of pulmonary vasodilator therapy [15]. Post-operative pain relief is very important as pain may exacerbate the PVR and can lead to right heart failure. Therefore, we took great care of the pain by epidurally infusing 0.1% ropivacaine with fentanyl 12 µg/ml and regular 1 g IV PCM was given thrice a day round the clock. We chose multimodal analgesia so that we could reduce the concentration of ropivacaine to 0.1% to avoid any fall in BP. Therefore, the patient was observed in the hospital for 10 days postoperatively. To conclude, there have been case reports of patients with severe PAH scheduled for hip procedures who could not survive the post-operative period due to increased risk of major perioperative morbidity and mortality associated with this condition [15].

The purpose of our case report is to stress that high-risk case with moderate PH and severe TR can be managed safely if adequately optimized by a collective team of anesthesiologist, cardiologist, and pulmonologist planning of extended perioperative care.

References


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