

CASE REPORT

Anaesthetic Management of Morgagni's Hernia Repair with Coronary Artery Bypass Grafting Surgery

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ABSTRACT

A 60-year-old female patient presented with breathlessness (NYHA grade II), retrosternal chest pain, and postprandial fullness, alongside heartburn symptoms. Clinical evaluation revealed prominent Q waves and ST-segment depression on ECG, while chest X-ray showed a raised right-sided hemidiaphragm with bowel loop shadows, suggesting a diaphragmatic hernia or eventration. Pulmonary function tests were unremarkable. An echocardiogram indicated a dysfunctional left ventricle with an ejection fraction of 45%, apical septal akinesia, inferior wall hypokinesia, and mild mitral regurgitation. CT imaging of the chest and abdomen confirmed a diaphragmatic defect with herniation of omental fat and a large portion of the transverse colon, causing atelectasis of the medial right middle lobe. Coronary angiography revealed lesions in the left anterior descending artery, left circumflex artery, and right coronary artery. The patient was diagnosed with both coronary artery disease and diaphragmatic hernia and was recommended for coronary artery bypass grafting (CABG) along with diaphragmatic hernia repair. Intraoperatively, the patient was managed with standard ASA monitors, rapid sequence induction, and a left-sided double-lumen tube for single-lung ventilation.

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The hernia was repaired with polypropylene mesh, and CABG was performed off-pump after achieving adequate anticoagulation. Postoperatively, the patient showed improvement with a significant reduction in airway pressure and was extubated 8 hours post-surgery. Bowel sounds were audible by postoperative day 1, and the patient was discharged on the 7th postoperative day without complications. This case highlights the complexity of managing concomitant coronary artery disease and diaphragmatic hernia, emphasizing a multidisciplinary approach to treatment and anesthesia.

KEYWORDS

- Anaesthesiology • Cardiac Anaesthesiology • Congenital diaphragmatic hernia
- Morgagnis hernia • Anaesthesia

INTRODUCTION

Congenital diaphragmatic hernia (CDH) is the outpouching of abdominal contents into the thoracic cavity through a defect in the diaphragm. CDH is considered an emergency for neonates. The abdominal contents compress upon the neonate's lungs and prevent the lung from developing, leading to lung hypoplasia. The lung hypoplasia is said to be the primary cause of pulmonary arterial hypertension and cardio-pulmonary dysfunction. CDH is said to have a high mortality rate. The survival rate of this condition depends on the severity of pulmonary hypoplasia¹. Late-onset CDH is another variant presenting with cardiopulmonary and gastrointestinal manifestations². CDH is classified as right, left, or bilateral, and a vast majority of these cases arise from the left side through a defect in the foramen of Bochdalek (95% of cases). The defects are usually posterolateral. The less common right-sided hernias arise from the defect through the foramen of Morgagni, and these types of hernias tend to have better outcomes than the left-sided hernias³. Here we report a case of congenital diaphragmatic hernia of the Morgagni type for diaphragmatic hernia repair along with coronary artery bypass grafting.

CASE REPORT

A 60-year-old female patient presented with breathlessness (NYHA grade II) along with retrosternal chest pain. The patient also gave a history of fullness after having a meal along with complaints of heartburn. On evaluating the patient, the ECG showed prominent Q waves and ST segment depression in the inferior leads, and on further evaluating the chest X-ray revealed a raised right-sided

hemidiaphragm with bowel loop shadows (Figure 1).

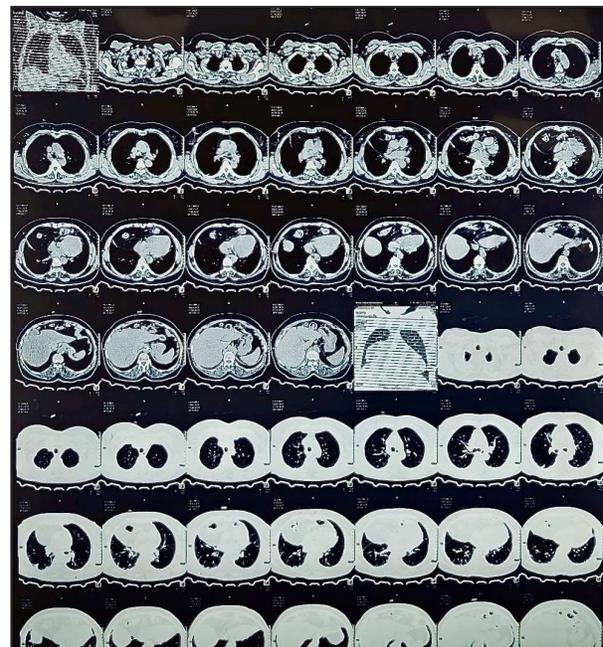


Figure 1

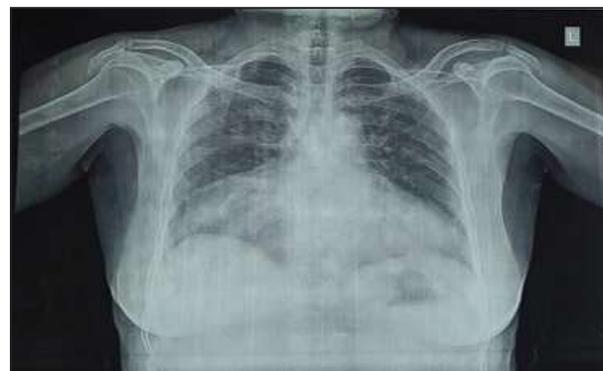


Figure 2

We suspected the patient to have a diaphragmatic hernia or an eventration. The patient was subjected to computed

tomographic scans (Figure 2) of the chest and abdomen which showed a focal defect measuring 2.6 cm along the anteromedial aspect of the right hemidiaphragm with herniation of omental fat with a large portion of the transverse colon close to the right heart border and causing atelectasis of the medial aspects of the right middle lobe of the lung. The patient also underwent pulmonary function tests which showed no significant abnormality. An echocardiogram was done and it revealed a dysfunctional left ventricle with an ejection fraction of 45% along with akinesia of the apical septum, apex, hypokinesia of the inferior wall, and mild mitral regurgitation. Hence, a coronary angiogram was performed which showed lesions in the proximal and mid left anterior descending artery, mid-portion of the left circumflex artery, and the distal portion of the right coronary artery. The patient was advised coronary artery bypass grafting with the repair of the diaphragmatic hernia.

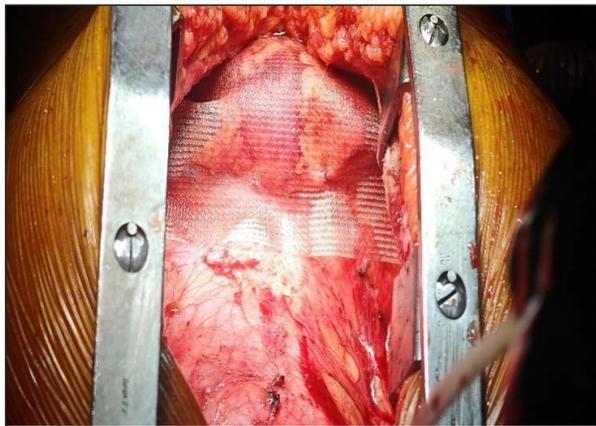


Figure 3:



Figure 4:

After shifting the patient into the operation theatre, all the American Society of Anesthesiologists standard monitors were attached and the baseline vitals were noted. An intravenous line and a right radial arterial line were secured and a baseline arterial blood gas was drawn which showed no abnormal parameters. A right-sided internal jugular vein central venous catheter, and a femoral arterial catheter were secured under ultrasound guidance. A bed-up head-end elevation position (BUHE) was used to prevent the herniated contents from compromising respiration in the supine position. 3 minutes of pre-oxygenation was performed and rapid sequence induction was chosen as the patient had gastrointestinal manifestations. The patient was induced with 3 to 5 mcg/kg of fentanyl, 1 mg/kg of propofol, 0.2 mg/kg of midazolam and 1 mg/kg of rocuronium was used for muscle relaxation. A 35-Fr left-sided double-lumen tube was used and the position was confirmed by the auscultatory method and flexible fiberoptic bronchoscope. The initial peak airway pressure was 32 cms H₂O. The patient was maintained with a combination of sevoflurane and a mixture of air-oxygen. A bilateral pecto-intercosto fascial plane block was administered (40 cc of 0.25% levobupivacaine with 2cc of sodium bicarbonate and 4 mgs of dexamethasone) with the help of ultrasound for analgesia immediately after induction and 15mg/kg of paracetamol, 20 mg/kg of magnesium was administered for analgesia. Sternotomy was done and single lung ventilation was performed to help with the repair of the hernia. A polypropylene meshplasty was performed after reducing the contents. Double lung ventilation was resumed for off-pump coronary artery bypass grafting after having achieved an ACT of more than 280 seconds by administering an appropriate dose of heparin. The left internal thoracic artery was used to graft the left anterior descending artery, saphenous vein graft was used for the distal right coronary artery. Heparin was reversed with adequate doses of protamine at a ratio of 0.8:1. An arterial blood gas along with an activated clotting time sample were drawn and necessary corrections were made. The airway pressure reduced significantly to 17 cms H₂O after the repair. The double-lumen tube was exchanged for a single-lumen tube for elective ventilation. There were a few hemodynamic alterations during the procedure

especially when the hernia was being reduced as the hernial contents were extremely closely aligned to the right ventricular border. These hemodynamic alterations were handled with a bolus dose of balanced crystalloid solution and 0.1 mcg/kg of phenylephrine. A transesophageal echocardiography probe was inserted at this time to assess the function of the heart which was deemed satisfactory and the patient was shifted to the intensive care unit. An intravenous fentanyl infusion at 1mcg/kg/hr was initiated for pain relief and sedation. The patient was extubated 8 hours after the surgery and the bowel sounds were heard on post-operative day 1 and was discharged by the 7th postoperative day with an uneventful stay within the hospital.

DISCUSSION

CDH occurs when the embryonic origins, which form the diaphragm, fail to fuse. The pleuroperitoneal folds form the major portion of the diaphragm; hence, it is the most common site for herniation. The majority of the cases are sporadic and the etiology can be multifactorial⁴. The prevalence is between 1:1200 and 1:12,000 live births⁵. As tested on rodent models, the dual hit hypothesis suggests that pulmonary hypoplasia is the primary disturbance, which is caused by environmental and genetic factors. All these causal factors hinder the formation of the diaphragm and promote the protrusion of abdominal contents into the thoracic cavity, thus hindering the formation of the lung on that side⁶. As a consequence of lung hypoplasia, there is insufficient gas exchange along with pulmonary arterial hypertension, which results in high mortality and morbidity. The Morgagni hernia is an incidental finding like in our case. The surgery involves reducing the hernia and repairing the defect using a mesh. The thoracotomy and the abdominal approaches have been used, while the thoracotomy approach helps to separate the adhesions from the sac, the abdominal approach offers the advantage of tackling complications like malrotation, obstruction, strangulation, and perforation⁷. Only a few cases are non-traumatic in origin⁸, and our patient did not give any history of trauma. Since these cases are rare, the anaesthetic management can be daunting. The most common intraoperative problem that shall be faced is difficult ventilation and aggressive

ventilation is not recommended, but a lung protective strategy has been suggested. Limited peak inspiratory pressure (PIP) of 25+/-2 cms H₂O, and PEEP of 3-5 cms H₂O has been suggested⁹. Since the patient also had a history of coronary artery disease, the hemodynamic management was particularly challenging considering the proximity of the hernia to the heart. Some groups of patients may present with pulmonary arterial hypertension and triggers such as hypoxia, hypercapnia, acidemia, inadequate depth of anaesthesia, and inadequate analgesia can all lead to elevated pulmonary vascular resistance and increase the pulmonary arterial hypertension, and these should be avoided in these groups of patients. Supine positioning reduces the functional residual capacity (FRC) and also promotes further herniation of abdominal contents and causes a compromise in respiration. Hence Trendelenburg, lithotomy, and supine positioning must be done with precaution¹⁰. The hernial sac occupies a portion of the thorax, the risk of aspiration, regurgitation, hypoxemia, and compromised hemodynamics can be encountered, thus choosing general anaesthesia is difficult. Tracheal deviation as a consequence of mediastinal shift can make tracheal intubation difficult. The mass effect of the hernia tends to compress the great vessels, reducing the venous return and causing a hemodynamic compromise¹¹. Anything increasing the intra-abdominal pressure, like breath stacking, coughing, and lighter plans of anaesthesia, causes the abdominal contents to herniate and compromise respiration as well as circulation¹⁰. Hence these groups of patients are a high-risk group and utmost care must be taken to avoid unwanted complications. A team-based approach involving the Surgeons, Anaesthesiologists, and Intensivists must be encouraged to formulate a plan and its execution.

CONCLUSION

Anaesthetic management of CDH is a challenge. Prophylaxis against aspiration, rapid sequence induction, hemodynamic monitoring and maintenance of hemodynamics, avoiding triggers that can increase pulmonary vascular resistance, and careful positioning are the keys to safe anaesthetic practice in this subset of patients. Thorough pre-operative evaluation and a multidisciplinary team-based approach

to plan and execute the surgery is a must to avoid any unnecessary complications and have the best possible outcome. The bed-up head-end elevation (BUHE) has recently gained popularity in emergency rooms for intubation and must be practiced whenever and wherever possible to avoid risks of aspiration. This novel technique not only avoids aspiration but also improves the laryngoscopic view, improves pre-oxygenation (by increasing FRC), and also facilitates an easier intubation compared to the “traditional sniffing” position¹².

Declaration of patient consent

The authors certify that they have obtained all necessary consents. In the form the patient has given his/her consent for his/her clinical information and Figures to be published in the journal. All efforts have been made to conceal the identity and none of the names shall be published.

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