CASE REPORT

Anesthesia Management in a Case of Restrictive Lung Disease

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Abstract

Anesthesia management in a case of restrictive lung disease especially interstitial lung disease (ILD) poses many challenges to anesthesiologists as these patients have decreased lung compliance and volumes with preservation of expiratory flow rates. These patients present with rapid and shallow breathing patterns with alteration in respiratory gas exchange and V/Q mismatch which causes an increase in perioperative complications.

Case description: An 86-year-old man weighing 106 kg k/c/o diabetes and hypertension controlled on medications was posted for bilateral hernioplasty. He had been operated on for CABG and spine surgery with instrumentation at the lumbar region. The patient had shallow and rapid breathing. SpO_2 on room air 92%. PFT revealed severe restrictive pattern; chest X-ray pa view showed hazy opacities over both lung fields CT scan suggestive of interstitial pneumonia. 2D echo showed LVEF 50–55% and hypokinetic distal interventricular septum. Due to huge inguinoscrotal swelling, the inguinal block was not feasible, spine surgery was a contraindication for neuraxial block, hence general anesthesia was the technique of choice. The patient was optimized by nebulization with duolin and budecort, antiplatelets stopped as per the cardiologist's opinion. Premedication with midazolam 0.5 mg iv and fentanyl 100 µg iv. Propofol was used for induction. Intubation was done with an 8 mm ID endotracheal tube using 40 mg iv atracurium and maintained on oxygen, air, and isofluorane. The patient was converted to pressure control with pressure settings between 20 and 25 cmH_2O which delivered 300 mL tidal volume approximately. Saturation was maintained to 100% and end-tidal CO_2 remained between 32 and 35 intraoperatively. The patient was electively ventilated to reduce work of breathing in a k/c/o ILD with prolonged exposure to anesthesia, hypothermia, electrolyte imbalance as the gradual weaning process is beneficial for such patients. The anesthesia management of ILD cases requires proper preoperative assessment and optimization and proper choice of anesthesia.

Keywords: High BMI, Inguinal hernia, Interstitial lung disease, Post CABG, Restrictive lung disease.

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Introduction

Restrictive lung diseases are a heterogeneous set of pulmonary disorders defined by restrictive patterns on spirometry.[1]

Restrictive lung diseases are characterized by reduced lung volumes, either because of an alteration in lung parenchyma or because of a disease of the pleura, chest wall, or neuromuscular apparatus. Unlike obstructive lung diseases, such as asthma and chronic obstructive pulmonary disease (COPD), which show a normal or increased total lung capacity (TLC), restrictive diseases are associated with a decreased TLC.

Restrictive lung diseases may be caused by the destruction of distal lung parenchyma due to infiltrates from inflammation, toxins, and mechanisms yet to be elucidated (intrinsic conditions) as well as extra parenchymal conditions (extrinsic causes).[1]

Anesthesia management in a case of restrictive lung disease especially interstitial lung disease (ILD) poses many challenges to anesthesiologists as these patients have decreased lung compliance and volumes with preservation of expiratory flow rates. These patients present with rapid and shallow breathing patterns with alteration in respiratory gas exchange and V/Q mismatch which causes an increase in perioperative complications (Fig. 1).

The anesthesia management of ILD cases requires proper preoperative assessment and optimization and proper choice of anesthesia.

We described successful anesthetic management of a patient operated for bilateral hernioplasty with DM, HTN as comorbidities.

Case Description

An 86-year-old man weighing 106 kg k/c/o diabetes and hypertension controlled on medications was posted for bilateral hernioplasty. He had been operated on for CABG and spine surgery

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Fig. 1: Large bilateral inguinal hernia

with instrumentation at the lumbar region. The patient had shallow and rapid breathing.

SpO_2 on room air 92%. HR–98 bpm, regular, BP–140–90 mm Hg, RR 24 per minute.

Bilateral fine crackles on chest auscultation.

PFT revealed severe restrictive pattern; chest X-ray pa view showed hazy opacities over both lung fields CT scan suggestive of interstitial pneumonia. 2D echo showed LVEF 50–55% and hypokinetic distal Interventricular septum.

Anesthetic Management

The patient was optimized by nebulization with duolin and budecort, antiplatelets stopped as per the cardiologist's opinion, and reservation of ICU and ventilator, the patient was planned for general anesthesia due to huge inguinoscrotal swelling, the inguinal block was not feasible, spine surgery was a contraindication for neuraxial block, hence general anesthesia was the technique of choice.

Premedication with midazolam 0.5 mg iv and fentanyl 100 µg iv.

Propofol was used for induction.

Intubation was done with an 8 mm ID endotracheal tube using 40 mg iv atracurium and maintained on oxygen, air, and isofluorane.

Volume control mode at tv-480 mL, PEEP-5, RR-16 increased the peak pressures up to 38 cmH_2O.

So, the ventilator settings were changed and converted to pressure control with pressure settings between 28 cmH_2O which delivered 300 mL tidal volume approximately.

Saturation was maintained to 100% and end-tidal CO_2 remained between 32 and 35 intraoperatively.

Postoperative

The patient was electively ventilated to reduce work of breathing in a k/c/o ILD with prolonged exposure to anesthesia, hypothermia, electrolyte imbalance as the gradual weaning process is beneficial for such patients.

Discussion

Patients with restrictive respiratory disorders are at high risk for perioperative morbidity and mortality. It is not uncommon for patients with chronic restrictive respiratory disorders to present for a surgical procedure. In one study, the prevalence of a restrictive spirometric pattern on pulmonary function testing was approximately 7–11%, similar to the prevalence of a spirometric pattern indicating COPD.

Conditions that may cause such restriction to include:

- Intrinsic disorders such as ILDs (also called diffuse parenchymal lung diseases) that cause diffuse inflammation or scarring of the lung tissue.
- Extrinsic disorders such as abnormalities of the chest wall (e.g., pectus excavatum, kyphoscoliosis), pleura (e.g., effusion, trapped lung), or abdomen (e.g., ascites, obesity, masses) that mechanically compress the lungs or limit their expansion.
- Neuromuscular diseases affecting chest wall nerves and muscles to decrease the ability of the respiratory muscles to inflate and deflate the lungs, resulting in chronically reduced lung volumes and restrictive physiology.

The lung-protective strategy was used in patients with pulmonary fibrosis, which include limiting the inspiratory pressure to not >30 mm Hg, limit the tidal volume to not >8 mL/kg to avoid barotrauma and volutrauma.[2,3]

We chose to do intubation with ETT over supraglottic device because the disadvantages of supraglottic devices with inflatable cuff include, tissue distortion, venous compression, nerve injury, and increased incidence of postoperative morbidity.[4] The causes of postoperative morbidity of supraglottic devices with inflatable cuff include, trauma during insertion, multiple attempts, the pressure exerted by cuff against the pharyngeal mucosa, cuff volumes, and cuff pressure.[5–7]

Conclusion

The anesthesia management of ILD cases requires proper preoperative assessment and optimization and proper choice of anesthesia along with intraoperative vigilance and postoperative intensive care management.

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