

Anaesthesia for Excision of Giant Bulla in COPD Patients

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1. Introduction

Emphysema is characterized by abnormal, permanent and irreversible enlargement of the air spaces distal to the terminal bronchiole and accompanied by destruction of their walls without obvious fibrosis. 1 Lung Volume Reduction Surgery (LVRS) is known to be an accepted method of treatment for severe emphysema. This treatment was first described by Brantigan in the year 1950s. 2In the perioperative period in such patients, it is essential to prevent alveolar rupture by inhibiting increased airway pressure. 3 Presence of bilateral huge bullae are rare and bears the excessive risk during the perioperative period. 1These patients invariably have underlying chronic lung diseases which further add on to peri-operative morbidity and mortality. 4 We herein present case report of successful anaesthetic management of patient with giant bullae.

2. Case Report

A 58-year-old man with a 20-year history of smoking was referred to our institution for management of huge bulla on left lower lobe of lung. He complained of difficulty in respiration, cough with expectoration and occasional dysphagia. He had chronic obstructive pulmonary disease which was treated with ipratropium and salbutamol inhalers supplemented by oral terbutaline, theophylline and antibiotics. On preoperative examination patient was conscious, cooperative sitting comfortably. Vitals were stable with pulse rate 88/min, BP 130/90 mm Hg. Respiratory examination showed bilateral rhonchi with decreased air entry at bases. Cardiac status of the patient was normal.

Preoperative investigations revealed haemoglobin to be 12.5 gm%, blood urea to be 21mg%, blood sugar 98 mg%, serum sodium 138 mg%, serum potassium 4.1 mg%. Coagulation profile of patient was normal showing Prothrombin time 12.3 sec, INR 1.05, platelet 300000, bleeding time 1min 55 sec, clotting time 5 min 58 sec. Preoperative Chest X ray showed huge bulla on both lower lobes with air fluid level on left side. ECG was normal sinus rhythm with Heart Rate 80/min. Echocardiography showed normal left ventricle

function and LVEF 55%. Lung function tests showed moderate airflow limitation and arterial blood gases showed some hypoxaemia in room air. CECT thorax confirmed giant bullae in basal portion of left lung with air fluid level seen, also present innumerable cysts of various sizes in both lungs.

Since patient was symptomatic and there was radiological evidence of compression of surrounding lung tissue, surgical bullectomy was indicated. No premedication was given. Patient was advised to take nebulised drugs before surgery. On OT table ECG, NIBP, SpO₂ were attached. Intravenous line was secured in right hand with 16 G cannula.

On the patient's arrival in the operating room, all the monitoring devices were placed, including continuous electrocardiography, O₂ saturation of arterial blood, non-invasive blood pressure cuff, and a precordial stethoscope. Baseline arterial pressure, heart rate, and room air O₂ saturation were 120/78 mmHg, 84 beats/min, and 98%, respectively. Thoracic epidural was placed at T5-6 level prior to induction of anaesthesia.

After preoxygenation, general anaesthesia was induced with propofol 120 mg, Injection vecuronium 0.1 mg/kg was given to facilitate tracheal intubation. The trachea was intubated using 39 French Gauge Left double lumen tube (DLT), following which intermittent positive pressure ventilation was initiated maintaining the peak inspiratory pressure (PIP) below 25 cm H₂O. Anaesthesia was further maintained using 100% O₂ and isoflurane. Injection fentanyl 1.5 mcg/kg was used as intraoperative analgesia. After induction, temperature probe and end-tidal CO₂ monitors were attached, the radial artery was cannulated to monitor arterial blood pressure. Right internal jugular vein was cannulated and catheter was placed to monitor CVP. Urinary bladder was also catheterised for measuring the urine output during the perioperative period.

The patient was positioned in the left lateral position. The tube position was confirmed again clinically and with fibrescope. Left lung was collapsed. During one lung ventilation, the peripheral arterial oxygen saturation (SpO₂) ranged from 80% to 89%.

Bilateral ventilation was performed intermittently. Intraoperative left side bulectomy was done and bupivacaine 0.125% with fentanyl was given through the epidural catheter. Patient was extubated after reversing neuromuscular blockade with inj. Glycopyrrolate 0.4 mg and neostigmine 2.5 mg. Blood loss was minimal and surgery lasted for 3 hours 20 minutes. The patient was stable in the

postoperative period and was moved to a ward after being monitored for 24 hours in ICU. His further stay in the hospital (7days) was uneventful. The patient was discharged home after 7 days.

Figure showing large bullae in one lung



3. Discussion

In patients with chronic obstructive pulmonary disease, bullectomy is indicated if there is no response to drug therapy, if bullae suddenly enlarge, or if pneumothorax persists.^{5,6} Resection of the giant bulla with the affected surrounding lung is the surgical procedure of choice.⁵⁻⁸

LVRS in patients with severe pulmonary impairment presents a challenge for anaesthesiologist. The anaesthesia technique needs to meet a number of specific requirements¹¹. First of all problems due to severe pulmonary emphysema such as risk of tension pneumothorax, intrinsic PEEP, hyperinflation, hypercapnoea, pulmonary hypertension, right heart failure should be taken care of. Secondly problems of one lung ventilation such as increased intrapulmonary shunting and hypoxia, increased dead space ventilation and hypercapnoea, increased airway pressure which are more pronounced in patients with bilateral pulmonary impairment¹² and thirdly problems inherent to LVRS such as post-operative pain, respiratory depression, post-operative lung function impairment, air leakage etc. and also these patients have underlying pulmonary problem can be create problem while

anaesthetic management^{13,14}. In addition rupture of a bulla is a potentially life-threatening complication of general anaesthesia. The risks of expansion of a bulla during the use nitrous oxide, and of barotrauma from positive pressure ventilation, are the common problems⁴.

The use of anesthesia in patients with bilateral giant bullae and pneumothorax carries a risk of enlarging the bullae as well as causing tension pneumothorax. Prevention of increased airway pressure is therefore assigned the highest priority¹⁵.

Lung isolation is mandatory for LVRS regardless of the surgical approach¹⁵. Perfect positioning of DLT is necessary because these patients will not tolerate excessive airway pressures or ventilatory exclusion of one of the upper lobes¹⁶. As the patients are at risk of barotraumas and gas trapping, pressure controlled ventilation is preferred over volume controlled ventilation to avoid dynamic hyperinflation, simultaneously a low ventilatory rate and long inspiratory to expiratory ratio are used¹⁵.

Another treatment modality in such patients is video assisted thoracoscopic surgery (VATS). In terms of functional

improvement, as well as morbidity and mortality, VATS can be performed in selected patients but results obtained are similar to those by median sternotomy¹⁷. VATS is associated with less postoperative pain than conventional open surgery¹⁸. The recurrence of pneumothorax after VATS bullectomy procedure is significantly increased in contrast to bullectomy via thoracotomy¹⁹.

Bilateral bullae can be surgically treated by a two-stage operation, in which the bullae on each side are separately resected, or by a one stage operation, in which the bullae are simultaneously resected²⁰.

We used Intravenous induction in our patient which is commonly recommended mode of induction. Inhalational induction or awake intubation with appropriate topical anaesthesia has also been described in literature¹³. Protocol of early tracheal extubation with avoidance of coughing on the tube should be followed to minimize the risk of air leak. Good post-operative analgesia to allow best ventilatory excursions as early as possible are another requirements after LVRS¹². In our case we perform serial blood gas measurements to estimate arterial Paco₂ and did not depend on Etco₂ and kept patient warm, pain free, hemodynamically stable and maintained good respiratory pattern to facilitate early extubation¹². Thoracic epidural anaesthesia with local anaesthetic and opioid provided optimal intra and postoperative analgesia¹².

4. Conclusion

Lung volume reduction surgery carries significant morbidity and mortality. Improvements in surgical technique and anaesthetic technique aimed at minimizing air trapping, barotrauma and facilitate early extubation can contribute to a good patient outcome.

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