Anesthetist Challenges of a Patient with the Communicating Bulla Coming for Nonthoracic Surgery

Abstract

Management of a patient with a giant bulla coming for a nonthoracic surgery is rare, and its anesthetic management is very challenging. It is imperative to isolate only the subsegmental bronchus, in which the bulla communicates to avoid respiratory morbidities such as pneumothorax, emphysema or atelectasis of the surrounding lung parenchyma, and postoperative respiratory failure. Herewith, we want to report the anesthetic challenges of a patient with giant bulla communicating into one of the subsegmental right upper lobe bronchi for splenectomy.

Keywords: Anesthesia, Arndt blocker, giant bullae, nonthoracic surgery, pneumothorax, splenectomy

Introduction

Pulmonary “bulla” is defined as pathologically dilated air spaces of more than 2-cm diameter distal to the terminal bronchiole. When the bulla occupies more than half of the lung parenchyma, is considered as “giant.”[1] Some studies define as “giant” when it occupies more than one-third of the lung volume.[2] Management of a patient with a giant bulla coming for a nonthoracic surgery is very rare, and its anesthetic management is very challenging. There is a considerable increase in the challenge when the bulla communicates into the bronchus, and the patient needs general anesthesia requiring intermittent positive-pressure ventilation (IPPV). There are only a few cases of communicating bulla/bullae coming for nonthoracic surgery has been reported in the literature.[1-6] It is paramount to isolate only the subsegmental bronchus in which the bulla communicates to avoid respiratory morbidities such as pneumothorax, emphysema or atelectasis of the surrounding lung parenchyma, and postoperative respiratory failure. Herewith, we want to report the anesthetic challenges of a patient with the giant bulla communicating into one of the subsegmental right upper lobe bronchus (ULB) coming for splenectomy.

Case Report

A 46-year-old female, known the case of nonimmune, chronic hemolytic anemia, stable for 10 years with Vitamin B12, and Folic acid supplements. She had admitted with the history of severe abdominal pain, fever, and dyspnea for 3 months. She was initially diagnosed with myeloproliferative neoplasm and was started on tablet thalidomide (50 mg/day) and prednisolone (25 mg/day) for the same for 3 weeks. Since she needed frequent transfusions (>12 in 3 weeks with Heinz body positive), she was planned for splenectomy. She was diagnosed incidentally to have a bulla involving the right upper lobe communicating into right subsegmental bronchi. Although the bulla was large enough to occupy the whole right upper lobe, it was decided not to intervene as it was noninfectious, causing no obstructive signs or symptoms to the patient, and there was no history of spontaneous pneumothorax or recurrent respiratory tract infection in the past. The potential problems of the bulla and its associated complications were discussed with the patient.

On examination, she was 47 kg, and the height was 161 cm, and she was icteric. Systemic examination revealed the absence of breath sounds in the right infraclavicular and infra-axillary area and had hepatosplenomegaly. Other systemic examinations including airway examination were discussed with the patient.

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were within normal limits. Laboratory investigation revealed severe anemia with a hemoglobin of 4.8 g/dL. Liver function test was normal except for the total bilirubin of 9.3 with the direct bilirubin of 0.9. Renal function and the coagulation workup were within normal limit. Chest X-ray showed a giant bulla over the right upper lobe [Figure 1a]. Computed tomography-thorax revealed 9 cm × 9 cm, thin-walled right upper lobe bulla communicating into right upper lobe subsegmental bronchus, with segmental atelectasis of inferior lingula [Figure 2a and b]. Spirometry revealed moderate obstructive ventilatory defect with no significant reversibility. She was transfused with two units of packed red cell during the preoperative period and taken up for surgery.

Since she had planned for splenectomy, the need for general anaesthesia with IPPV necessitates us to isolate the right upper lobe subsegmental bronchus for segregating the bulla. She was premedicated with 5 mg of diazepam and 20 mg of omeprazole 90 min before surgery. After bringing her to odds ratio, standard monitoring such as electrocardiogram, pulse oximetry, and noninvasive arterial blood pressure were established. ETCO₂ and the nasopharyngeal temperature monitoring were done after induction.

An 18-G peripheral intravenous (IV) cannula was started. Since she was on prednisolone during the preoperative period (can cause hypothalamic-pituitary axis suppression), 100 mg of hydrocortisone was given to prevent stress-induced perioperative adrenocortical insufficiency. Then, she was preoxygenated with 6 L/min of 100% oxygen for 10 min. Anesthesia induction was carried out with fentanyl 100 mcg, propofol 120 mg, and succinylcholine 100 mg. After 60 s of apneic oxygenation, a 35 F left-sided double-lumen tube (DLT) (Mallinckrodt™, USA) was introduced, and its position was confirmed by 2.5 mm fiberoptic bronchoscope (FOB) (Karl Storz, Germany). Then, the anesthesia circuit was connected to the bronchial lumen to ventilate only the left lung. While the ventilation was continued through the left lung, a FOB was introduced through the tracheal lumen of DLT then into the right ULB and into the subsegmental bronchus to study anatomy.

Under FOB (2.5 mm) guidance, a seven size Arndt blocker (65 cm) was passed into the RUL bronchus, and then, into the subsegmental bronchus which was communicating to the bulla. To achieve this, Arndt blocker adopter was connected to the tracheal lumen of Left DLT, the Arndt blocker was passed through the blocker port (side port), and its wire loop was kept such a way to receive the fiberoptic scope which was passed through the FOB port. Once the FOB was snared into the wire loop, both were advanced simultaneously into the RUL subsegmental bronchus. After reaching the subsegmental bronchus, the snare was loosened, and the FOB was slowly pulled out into right upper lobe bronchus. Then, the final position of Arndt blocker position was adjusted and confirmed once again with FOB and was inflated with 1 ml of air. There was no desaturation noted during the insertion of Arndt blocker. Before moving onto two lung ventilation, the position of Arndt blocker was confirmed once again using the FOB, and then, the two-lung ventilation was resumed. The patient got ventilated with pressure controlled ventilation keeping the peak inspiratory pressure <15 cm of H₂O. Respiratory rate was adjusted to maintain the ETCO₂ between 33 and 35 mmHg. The surgery lasted for 2 h with minimal blood loss of 200 ml. Adequacy of muscle relaxation was monitored, using a neuromuscular monitoring device. TOF count was maintained between 1 and 2 during surgery to avoid coughing and bucking on the tube which can lead to rupture of the bulla. The patient’s hemodynamics and body temperature were maintained within the normal limits. At the end of surgery, the muscle relaxation was reversed with neostigmine 2.5 mg and glycopyrrolate 0.4 mg. Once the patient was breathing spontaneously with adequate tidal volume, Arndt blocker was deflated and taken out. The DLT was removed when the patient was fully awake. IV Xylocaine (1.5 mg/kg) was given to facilitate smooth extubation without coughing. Postoperative pain was managed using IV morphine using the patient-controlled analgesia technique. The postoperative chest X-ray showed intact bulla [Figure 1b]. Her postoperative course was uneventful, and she got discharged from the hospital on the 10th postoperative day.

**Discussion**

The main significant concerns while managing the patient with giant bulla communicating to the bronchus are to avoid PPV induced rupture of the bulla. Patients coming for nonthoracic surgery needing PPV necessitate isolation
of the segmental/subsegmental bronchus which is in direct communication with the bulla.

In our case, we felt that placing the left DLT and then isolating the RUL subsegmental bronchus with Arndt blocker was the best method to prevent all the complications. Since the left lung was ventilated while isolating the R subsegmental ULB, there was no desaturation while placing the Arndt blocker. We had little extra time to identify the subsegmental bronchus which was communicating into the bulla. Good understanding of the subsegmental anatomy is essential for achieving the subsegmental lung isolation. This subsegmental isolation prevented the noncollapse of other subsegments of RUL. The need for re-expansion of the other segments of RUL at the end of surgery with PPV did not arise which can lead to rupture of bulla.

In a scenario, in which if there is a rupture of the bulla occurs during surgery, we had planned to institute one-lung ventilation on the left side, while placing the chest tube on the right side to relieve the tension pneumothorax. After placing the chest tube, the RUL bronchus can be blocked again using the same blocker, and the surgery can be commenced after.

If there is a difficulty in isolating the right ULB using bronchial blockers/or with a nonavailability of DLT, placing two microlaryngeal tubes (4 mm each) one on either side of the bronchus and occluding the RUL bronchus by placing the cuff over the RUL bronchial opening or a few millimeter beyond the RUL bronchus to avoid ventilation of RUL bronchus is an acceptable alternative for achieving the same result. In our case, the length of the intermediate bronchus (the length between the right ULB and the middle/lower lobe bronchus) was 19–21 mm. Hence, the cuff of the right microlaryngeal tube could have been positioned well a few millimeters below the RUL bronchus.

Apart from the proper segmental isolation, avoidance of nitrous oxide, prevention of coughing and straining during anesthesia, better intraoperative analgesia, and smooth extubation are essential principles of anesthesia for a better outcome in these patients. Vigilant monitoring of ventilatory parameters, periodic auscultation of the chest, and the availability of chest drainage tube are paramount important to detect and manage the intraoperative complications. Adequate postoperative analgesia and monitoring also aid for the quick recovery and the better outcome.

Anesthetizing these patients without proper backup plans for every anticipated potential problem may initiate a cascade of events which may quickly progress to an emergency and end in a catastrophe. From our case, we wanted to highlight the importance of preoperative evaluation, a thorough understanding of patient’s anatomy using the radiological imaging, smooth induction, extubation, proper segmental isolation, vigilant intra- and post-operative monitoring, and adequate intra- and post-operative analgesia for the better outcome in a patient with the communicating bulla coming for nonthoracic surgery.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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