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Case Report

A Ballooning Crisis: Three Cases of Bronchial Blocker Malfunction and A Review

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THE USE OF ENDOBRONCHIAL BLOCKERS (BB) to achieve one-lung ventilation (OLV) is increasing worldwide. In this report, 3 cases of BB malfunction are presented. In all 3 cases, the endobronchial balloon failed to deflate at the conclusion of the surgery. This placed the patients at risk since the operative lung could not be reinflated. Furthermore, the BB could not be removed from the endotracheal tube (ET) given the size mismatch between the lumen of the ET tube and the inflated BB balloon. Attempted forceful removal would have been risky given the possibility of the inflated balloon becoming wedged within the lumen of the ET tube. This would have led to the complete occlusion of the ET tube lumen with inability to ventilate, necessitating emergent tracheal extubation while on OLV in the lateral position. In this report, 3 challenging dilemmas and the ways in which they were resolved successfully are presented. The known complications of BB use also are reviewed.

Case Report

Case 1

A 74-year-old male, American Society of Anesthesiologists (ASA) functional class II, presented for a left lower lobe wedge resection of a 1.5-cm pulmonary nodule. The patient had a history of treated early-stage rectal cancer when the asymptomatic nodule was found on routine follow-up. His airway examination was a Mallampati grade II without any high-risk features that would indicate difficulties with airway management. His height was 173 cm and he weighed 76 kg.

The patient underwent placement of a thoracic level epidural catheter for postoperative analgesia. The standard ASA monitors were placed including an arterial catheter in the left radial artery. Intravenous induction of anesthesia was without complication. He was easily mask-ventilated using an oral airway and had a Cormack-Lehane grade 2 view of the glottis with a Macintosh 3 blade. The patient was intubated with an 8.0-cm diameter cuffed ET tube. In order to facilitate lung separation, a 9.0-French Uniblocker (Fuji System Corp., Tokyo, Japan), was placed though the ET tube and positioned in the left mainstem bronchus with the use of a 4.0-mm fiberoptic bronchoscope. All BB manipulations, including positioning, inflation, and deflation of the cuff were done under fiberoptic visualization.

The patient was placed in the right lateral decubitus position for the surgery. The endobronchial balloon then was inflated with air under fiberoptic visualization. Inflation was performed using a standard Luer lock syringe. Up to 5 mL of air was injected while visualizing for adequate bronchial occlusion with the fiberscope. The surgical technique was converted from the video-assisted thoracoscopic surgery (VATS) approach to an open muscle-sparing thoracotomy to better facilitate the lung resection. Lung deflation using the BB was deemed successful and the surgery was uncomplicated, with an estimated blood loss of 200 mL. Surgical time was 3 hours and 16 minutes.

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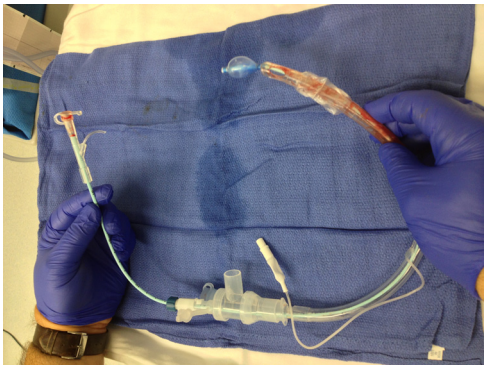

Fig 1. Image from case 1 showing failure of BB balloon cuff to deflate despite the air channel being severed. This image also demonstrates the size mismatch between the inflated balloon cuff and the endotracheal tube lumen, which led to an inability to remove the BB through the ET.

Prior to closure of the incision, despite several attempts to deflate the BB distal balloon in order to re-expand the operative lung, balloon deflation was unsuccessful. Fiberoptic examination confirmed that the BB balloon remained inflated. Cutting the air channel distal to the proximal pilot balloon valve also failed to deflate the cuff. The inflated blocker simply could not be pulled through the ET because of its size. While attempting this maneuver, neither lung was being ventilated, with the balloon positioned within the central trachea (Fig 1).

The surgical wound was closed, a chest tube was left to suction, and the patient was placed back in the supine position. The ET, along with the BB, then were removed from the patient en bloc. A size-4 laryngeal mask airway superglottic device (AuraOnce, Ambu Inc., Glen Burnie, MD) was placed, and positive pressure was supplied to reinflate the operative lung. Emergence from anesthesia was smooth, with an uneventful postoperative course.

Case 2

A 72-year-old ASA II female presented for a VATS left lower lobectomy for resection of an adenocarcinoma. Her history included 60-pack-years smoking, systemic hypertension, hypothyroidism, tonsillectomy, a benign breast biopsy, and a foot surgery for Morton's neuroma. On examination, she demonstrated a Mallampatti grade II without high-risk features for difficult airway management. She weighed 68 kg and was 158 cm in height.

The patient had a thoracic level epidural placed for postoperative analgesia. The standard ASA monitors were used as well as a radial arterial catheter. She underwent intravenous induction of anesthesia and was mask ventilated without difficulty. Her glottic view was a Cormack-Lehane grade 1 using a Macintosh 3 laryngoscope blade, and she was intubated with an 8.0-cm cuffed ET tube. A 9.0-French Uniblocker was placed through the ET tube and positioned in the left mainstem bronchus under fiberoptic visualization. The patient was placed in the right lateral decubitus position for surgery and the BB position was reconfirmed with the 4.0-mm fiberscope. The balloon was inflated under fiberoptic visualization using no more than 5 mL of air. The operative lung was deflated, facilitating good surgical exposure. The total surgical time was 2 hours and 57 minutes.

After completion of the lobectomy, attempts to reinflate the operative lung were unsuccessful. The fiberoptic bronchoscope revealed that the BB balloon would not deflate despite proper aspiration attempts. Attempted removal of the BB through the ET tube was unsuccessful due to the size of the inflated balloon. During this retrieval attempt, the BB had to be reinserted emergently into the left mainstem bronchus because of a complete inability to ventilate when the BB was in the trachea. In this case, the BB inadvertently was positioned through the smaller Murphy eye of the ET tube rather than the end hole. This malposition had occurred inadvertently during the initial BB placement. This made removal of the inflated BB practically impossible (Fig 2). Since the Murphy eye has a smaller diameter than the end hole of the ET tube, the BB would need to be deflated completely in order to fit through.

The surgical incision was closed, leaving a chest tube to suction. The patient was returned to the supine position, and the ET tube and BB were removed together en bloc. After tracheal extubation, the patient was mask ventilated with positive pressure in order to reinflate the surgical lung. The patient was aroused from anesthesia and had an excellent postoperative course.

Case 3

A 54-year-old male, ASA III, presented for a distal esophagectomy with primary re-anastomosis for esophageal cancer. The patient had a known history of Barrett's esophagus with dysphagia and was found to have a biopsy-proven adenocarcinoma of the gastroesophageal junction. He had completed neoadjuvant chemotherapy prior to presenting for surgery because of lymphatic spread of the cancer. Other medical history included noninsulin-dependent diabetes mellitus, a C5-C7 anterior cervical discectomy and fusion for cervical spondylotic myelopathy, and a total thyroidectomy for papillary thyroid cancer. Three years prior to surgery, the patient had undergone a minimally invasive direct coronary artery bypass for an anomalous right coronary artery. The

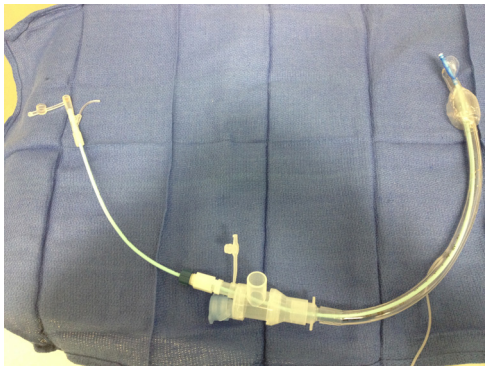

Fig 2. The BB and ET tube from case 2, demonstrating the BB being placed through the ET tube's Murphy eye. There was failure of the balloon cuff to deflate despite a cut air channel. The balloon cuff has an asymmetric shape while inflated.

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