



Case Report

High-frequency jet ventilation using the Arndt bronchial blocker for refractory hypoxemia during one-lung ventilation in a myasthenic patient with asthma ☆, ☆ ☆

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Abstract A novel method in the management of refractory severe hypoxemia during one-lung ventilation (OLV) in a patient who presented with myasthenia gravis, asthma, a symptomatic mediastinal mass, hiatal hernia, and a moderate pericardial effusion is presented. The patient was scheduled for excision of a large anterior mediastinal mass and creation of a pericardial window through a left thoracotomy. One-lung ventilation was achieved using an Arndt bronchial blocker. High-frequency jet ventilation (HFJV) was applied to the surgical nondependent lung through the lumen of the Arndt endobronchial blocker with titration of positive end-expiratory pressure to the dependent lung. Oxygenation improved significantly. The use of HFJV through the Arndt blocker offers an effective method for treatment of refractory hypoxemia during OLV.

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1. Introduction

The application of unilateral high-frequency jet ventilation (HFJV) to the nondependent lung improves oxygenation during one-lung ventilation (OLV) [1]. The use of HFJV

delivered to the nondependent lung through the lumen of an Arndt bronchial blocker (Cook Medical, Bloomington, IN, USA) to alleviate refractory life-threatening hypoxemia during OLV was used in a patient who presented with a large anterior mediastinal mass and pericardial effusion.

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2. Case report

A 66 year old, 162.5 cm, 97.5 kg woman had progressive orthopnea, dyspnea, and cough. She had a 10-year history of myasthenia gravis (Osserman class IIA), moderate bronchial asthma, diabetes mellitus, hiatal hernia, and cervical disc herniation. She was treated with pyridostigmine 360 mg/day, prednisolone 30 mg/day, insulin, metformin, as well as an inhaled steroid, ipratropium, and salbutamol. She had undergone a transsternal thymectomy 4 years earlier. On physical examination, respiratory rate (RR) was 30 breaths/min, heart rate (HR) 110 beats per min (bpm), blood pressure (BP) 70/43 mmHg; and pulse oximetric oxygen saturation (SpO₂) 92% with a Hudson face mask supplying oxygen at 10 L/min. Transthoracic echocardiography showed a large pericardial effusion along with systolic collapse of the right atrium, and diastolic collapse of the right ventricle. An electrocardiogram showed low-voltage sinus tachycardia. Computed tomographic scan demonstrated a large anterior mediastinal mass, pericardial effusion, and a large left hiatal hernia with tracheal deviation to the right. The major neck vessels and superior vena cava were patent (Fig. 1A,B). Pulmonary function testing showed a mixed obstructive and restrictive pattern (forced expiratory volume in first second [FEV₁] 48%, forced vital capacity [FVC] 71%, and FEV₁/FVC 68% of predicted). The patient was transferred to the cardiac care unit for emergency management, where her condition became complicated by worsening tachypnea (RR 46 breaths/min), decreased level of consciousness, rapid atrial fibrillation, and severe respiratory acidosis. She was intubated with a 7.0-mm endotracheal tube (ETT) with dexmedetomidine and a GlideScope videolaryngoscope

(Verathon, Bothell, WA, USA) with manual inline cervical immobilization, while a combined synchronized intermittent mandatory and pressure support ventilation was initiated with a fraction of inspired oxygen (FIO₂) of 0.6. Pericardial drainage of 400 mL was accomplished using a subxiphoid approach. Her BP increased to 109/76 mmHg, the respiratory acidosis diminished, and she regained consciousness. The ratio of arterial tension to inspired fraction of oxygen (PaO₂/FiO₂) was 96.7.

The patient was then scheduled for excision of her large anterior mediastinal mass, creation of a pericardial window, and plication of the left hemidiaphragm through a left posterolateral thoracotomy. During the operation, anesthesia was maintained with sevoflurane (0.8 - 1.2 minimum alveolar concentration) and target-controlled infusion of remifentanyl with a target effect-site concentration (C_e) of 2 - 4 ng/mL. No muscle relaxant was administered. The ETT was then changed to a larger 8.0-mm regular ETT, using a tube exchanger and GlideScope videolaryngoscopic guidance, to accommodate the placement of a 9.0-French, 78-cm Arndt wire-guided elliptical bronchial blocker (Cook Medical) into the left mainstem bronchus with direct vision using a 3.7-mm fiberoptic bronchoscope (FOB; Karl Storz Endoskope, Tuttlingen, Germany). The presence of significant cervical disc herniation with the associated need to avoid potentially harmful extreme neck extension precluded the use of a double-lumen endobronchial tube (DLT). After placing the patient in the lateral decubitus position, the position of the blocker was reconfirmed. The blocker's cuff was inflated with 8 mL of air and OLV was started. The patient's right lung was ventilated using volume-controlled ventilation (VCV) mode, with FIO₂ set at 1.0,

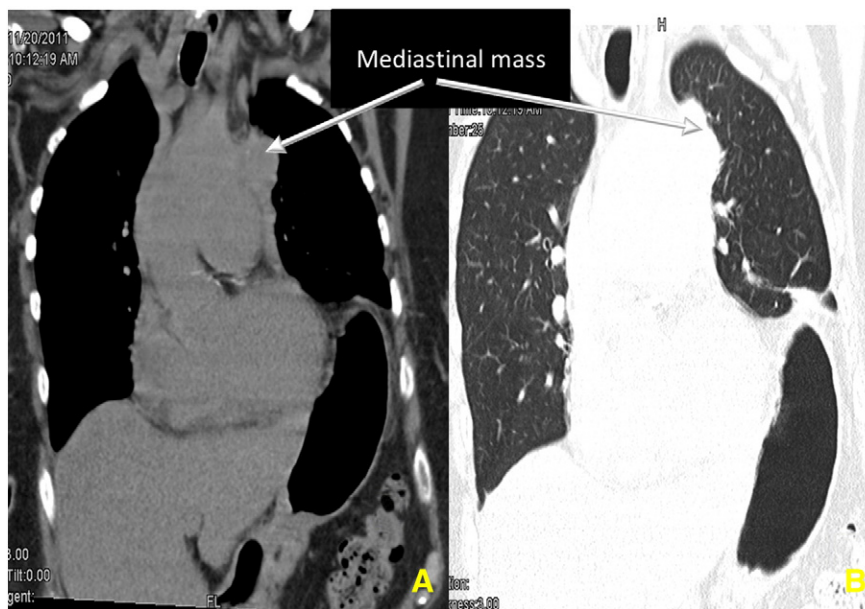


Fig. 1 Coronal computed tomographic (CT) scan showing extension of the pericardial effusion, left hiatus hernia, and mediastinal mass. (A) Non-enhanced. (B) Contrast enhanced.

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