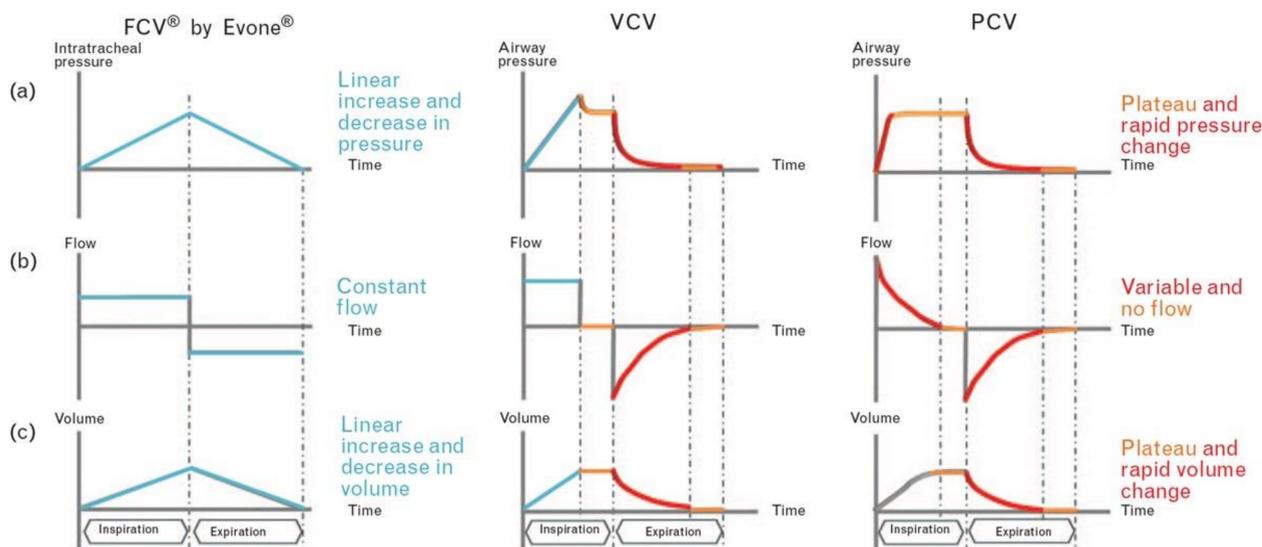


Flow Controlled Ventilation: A Promising Ventilation Strategy for Single Lung Transplantation

S. E. Guzzella¹, R. W. Schüpbach¹, G. Lang^{1,2}, I. Opitz³, M. Schläpfer¹. ¹Institute of Anaesthesiology, Universitätsspital Zürich, Zürich, Switzerland, ²University of Vienna, Vienna, Austria, ³Universitätsspital Zürich, Zürich, Switzerland,

Introduction

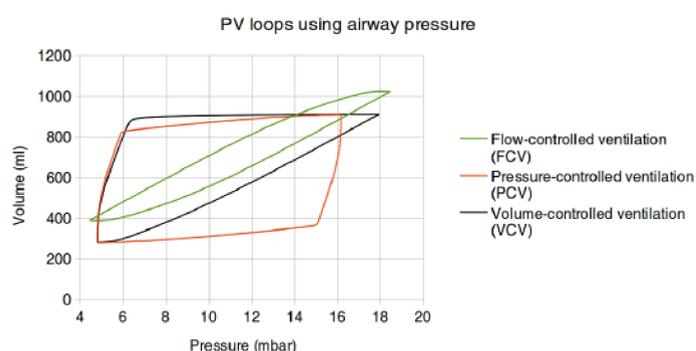
Bilateral lung transplantation (LTX) on extracorporeal membrane oxygenation (ECMO) is the standard in most centers, reducing the first lung effect, providing hemodynamic stability and reliable gas exchange. Unilateral LTX is considered where only one lung is offered or in frail patients, requiring a less stressful procedure, those under anticoagulation, or with previous unilateral talc pleurodesis or LVRS. In unilateral LTX, the risks/benefits of ECMO must be weighed. One-lung ventilation (OLV) often leads to hypercapnia, acidosis, and therefore increased pulmonary vascular resistance (PVR), jeopardizing right ventricular function. To mitigate these risks, flow-controlled ventilation (FCV) with active expiration provided by the EVONE Ventilator (Ventinova Medical) has shown improved CO₂ elimination, lung recruitment, and higher compliance compared to pressure-controlled ventilation (PCV) [1]. We explored FCV in a single LTX patient, aiming for enhanced circulatory and metabolic stability as well as reduced mechanical energy on lung tissue.



Schmidt et al. Eur J Anaesthesiol. 2019 May;36(5):327-334. doi: 10.1097/EJA.0000000000000967. PMID: 30730422

Case Report

A 73-year-old male with COPD Gold IV, previous LVRS, and pulmonary hypertension underwent right single LTX via anterolateral thoracotomy, with a high probability of need for ECMO support due to his impaired lungs. Induction and maintenance of anesthesia were performed according to the institution's standardized protocol. Initially, bilateral PCV with minute ventilation (MV) of 5.5 liters, FiO₂ of 66%, I: E 1: 2.1, dp 13 mbar was installed. Blood gas analysis showed an already elevated CO₂ value of 7.04 kPa. Thereafter, single lung FCV was performed. Optimized ventilation parameters were MV 6.1 liters, FiO₂ 55%, I:E 1:1, dp 11 mbar with a CO₂ 5.8 kPa and stable pH value of 7.43, comparable to the patient's initial pH of 7.47. After unilateral LTX, we continued OLV with FCV on the patient's own lung for 20 min to enable slow adaptation of the transplant before returning to bilateral PCV for transfer and admission to ICU.



Barnes et al. Med Hypotheses. 2018 Dec;121:167-176. doi: 10.1016/j.mehy.2018.09.038. Epub 2018 Sep 24. PMID: 30396474.



Photo by S. Guzzella

Summary

This is the first case report of FCV during OLV for single LTX. FCV provided stable CO₂ removal and unchanged pH values during OLV in a severely compromised COPD patient. Under standard ventilation, hypercapnia, concomitant acidosis, and PVR increase would have occurred, and ECMO intervention would have been performed.