TITLE: IS CONVENTIONAL VENTILATION (CV) ADEQUATE IN COPD PATIENTS DURING SINGLE-LUNG TRANSPLANTATION (SLT)?

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Although SLT has been reserved for patients with restrictive lung disease, it is now also considered for those with chronic obstructive pulmonary disease (COPD). Because of the degree of parenchymal damage in their native lungs, COPD patients ordinarily would not be candidates for thoracotomies involving single-lung ventilation (SLV). At this institution, SLT has been performed in 20 patients presenting with end-stage pulmonary disease. Out of these 20, COPD was noted to play a major role in one group of candidates. The purpose of this study was to determine if CV provided adequate oxygenation and ventilation in COPD patients undergoing SLT.

After obtaining Institutional Review Board approval, we reviewed the charts of 20 patients who underwent SLT from March 1988 to April 1990. Patients with FEV_1 /FVC ratios <60% met the criteria for having obstructive lung disease. ABG's were used to evaluate the adequacy of ventilation and oxygenation during post-induction double-lung ventilation (DLV) and during SLV. Adequate oxygenation was defined as an O_2 index >250. Adequate ventilation was defined as $PaCO_2 \leq 60$ torr with pH >7.2. The mode of ventilation or ventilation use of cardiopulmonary bypass (CPB) was also noted.

COPD criteria were met in 8 patients. $Alpha_1$ antitrypsin deficiency was the primary disease in 5 patients, emphysematous disease in 2 patients, and 1 patient had idiopathic bronchiolitis obliterans. CV was achieved with an Ohmeda Modulus 2 ventilator with tidal volumes of 12-15 cc/kg during DLV and 7.5-10 cc/kg during SLV. Ventilatory rates ranged from 6-10 during DLV and 15-20 during SLV. All patients had an O_2 index >300 intraoperatively.

As shown in the Table, CV was adequate for most patients. However, in Patients #6 and #7, CV was inadequate at the time of single-lung ventilation; requiring femoral/femoral bypass or jet ventilation at rates of 120/min, respectively. Both patients required preoperative supplemental oxygen at rest and had a $PaCO_2$ >60 on their preoperative ABG. FEV1 and FEV1/FVC ratios do not appear to be predictive of the inability to adequately ventilate these patients with CV during SLV. The need for supplemental O_2 at rest and $PaCO_2$ >60 mm Hg preoperatively may be predictive of the need for alternative ventilatory management or CPB during SLV.

Patient	1	2	3	4	5	6	7	8
Age	43	40	53	40	53	39	48	42
Sex	M	F	M	F	F	F	F	M
Lung	L	L	L	R	R	R	L	R
Height (cm)	182	170	173	160	154	167	165	185
Weight (kg)	85	62	50	56	41	56	58	53
FEV_1 (1)	0.74	0.75	0.40	0.54	0.23	0.29	0.60	0.46
FEV_1 /FVC	0.28	0.60	0.19	0.36	0.21	0.30	0.27	0.21
FiO_2	0.21	0.21	0.21	0.21	0.21	0.35	0.25	0.21
pH	7.40	7.40	7.40	7.40	7.33	7.35	7.35	7.39
PCO_2	35	40	44	33	59	70	63	42
PO_2	74	59	78	56	77	75	81	42
DLV-A								
pH	7.36	7.45	7.31	7.28	7.39	7.25	7.26	7.30
PCO_2	44	36	55	50	50	79	78	60
SLV-B								
pH	7.32	7.42	7.40	7.27	7.39	7.19	7.17	7.23
PCO_2	43	34	40	44	50	91	94	54

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CAPSAICIN AND THE PULMONARY EFFECTS OF ENDOTRACHEAL INTUBATION..

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Introduction. Endotracheal intubation during anesthesia increases the $P(A\text{-}a)O_2$ and volume of trapped gas (V_{tg}) in the lung, suggesting an airway reflex response. We therefore examined the pulmonary responses to intubation following pretreatment with capsaicin, to determine whether tracheal sensory C-fiber afferents containing neuropeptides SP, NKA and CGRP are activated by this reflex.

Method. Sprague Dawley female rats were treated with capsaicin 50 mg/kg (n=9) or solvent (n=9) during halothane anesthesia (1). Two weeks later the groups were further divided. Halothane was delivered in 50% O_2/N_2 by mask (n=4) or by endotracheal tube (n=5). The halothane concentration was varied from 0.5% to 2% in 0.5% increments. Body box FRC was measured with a glass body plethysmograph. Nitrogen (N_2) washout FRC was obtained with a Raman scattering gas analyzer (Rascal™, Albion Instruments). V_{tg} was derived from the difference between bodybox and N_2 washout FRC. Lung clearance index (LCI), the number of FRC's to reach <0.5%N_2 level in a N_2 washout, was calculated from: (minute volume • N_2 washout time) / N_2 FRC. Arterial blood gases were obtained to determine $P(A\text{-}a)O_2$. Following the experiments, spinal cord, tracheal, bronchial and lung levels of SP-, NKA- and CGRP-like immunoreactivity were determined by radioimmunoassay (RIA).

Result. SP, NKA and CGRP tissue content showed a 50% depletion in spinal cord and 75% depletion in trachea, bronchi and lung in capsaicin treated rats. LCI significantly improved in intubated rats by capsaicin pretreatment. Intubated capsaicin treated rats needed 3 FRC's to wash out the N_2, just like the mask rats, while solvent treated intubated rats needed 4 FRC's ($P<0.002$). $P(A\text{-}a)O_2$ did not improve with capsaicin but remained at approximately 100mmHg higher for the intubated rats. The FRC's were not affected and Vtg remained at 13% of bodybox FRC for 0.5% and 45% for 2% halothane anesthesia for the intubated rats.

Discussion. Capsaicin treated rats showed a significant depletion of neuropeptides (SP, NKA and CGRP) in airway and lung tissue. Capsaicin did block the ventilatory inhomogeneity seen in the solvent treated intubated rats. It did not improve either the $P(A\text{-}a)O_2$ or Vtg. We speculate this was due to either an incomplete depletion of neuropeptide mediators, or neuropeptides are not the sole mediators of this reflex.

1). Gamse et al. 1981 Neurosci 6 : 437-441.