

POSTER PRESENTATION

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# Artificial lung gas exchanges depend on ECMO settings

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## Introduction

Artificial membrane lung (AL) gas exchanges are usually evaluated according to  $\text{PaO}_2/\text{FiO}_2$  ratio. In addition, dead space ventilation and shunt fraction can be measured by the same equations used for native lungs [1].

## Objectives

To study the effect of AL settings - gas flow (GF), blood flow (BF) and  $\text{FiO}_2$  - on AL  $\text{PaO}_2/\text{FiO}_2$  ratio, dead space and shunt, to suggest how to properly monitor these parameters.

## Methods

We performed three different tests:

- GF changes (from 1 to 10 L/min) in 8 AL at clinically set BF and  $\text{FiO}_2$ ;
- BF changes in 6 AL at constant  $\text{FiO}_2$  (1) and GF (10 L/min);
- $\text{FiO}_2 = 1$  vs. clinically set  $\text{FiO}_2$  in 10 AL at clinically set BF and GF.

We performed pre- and post-oxygenator blood gas analysis and measured  $\text{CO}_2$  at AL exhaust port by side-stream capnography, in order to evaluate  $\text{PaO}_2/\text{FiO}_2$  ratio, dead space and shunt.

## Results

a) At clinically set BF ( $4.0 \pm 0.9$  L/min) and  $\text{FiO}_2$  ( $0.87 \pm 0.15$ ),  $\text{PaO}_2/\text{FiO}_2$  ratio did not correlate with GF, whereas dead space progressively increased with GF ( $R = 0.7904$ ,  $p < 0.0001$ ) (Figure 1).

b) Data were collected at basal ( $3.3 \pm 0.7$  L/min), increased ( $4.1 \pm 0.8$  L/min) and decreased ( $2.5 \pm 0.6$  L/min) BF. With the progressive increase of BF, dead space did not change, whereas  $\text{PaO}_2/\text{FiO}_2$  ratio decreased and shunt increased ( $p < 0.001$ ) (Figure 2).

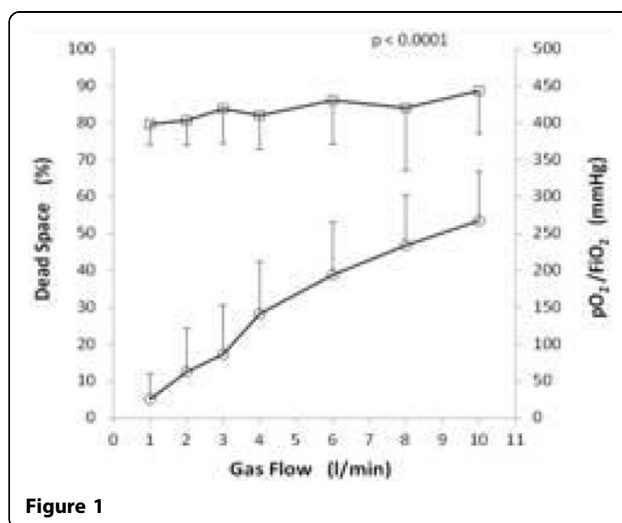


Figure 1

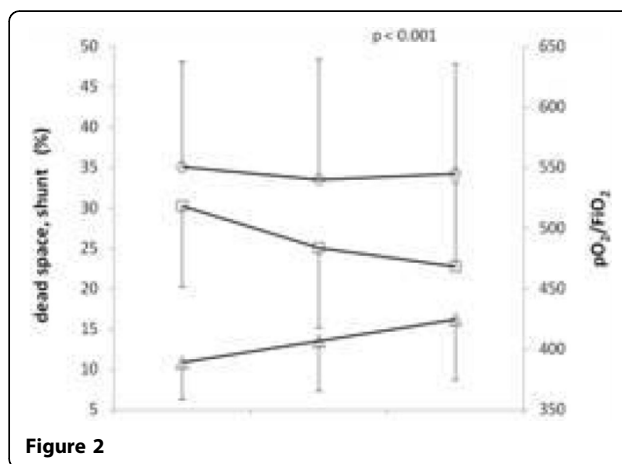


Figure 2

c) At clinically set BF ( $3.5 \pm 1.1$  L/min) and GF ( $5.1 \pm 2.4$  L/min), the mean difference  $\pm$  standard deviation of PaO<sub>2</sub>/FiO<sub>2</sub> ratio and shunt obtained at clinically set ( $0.80 \pm 0.20$ ) vs. FiO<sub>2</sub> = 1 was  $-76 \pm 109$  mmHg and  $2.1 \pm 11.6\%$ , respectively.

## Conclusions

To properly monitor AL CO<sub>2</sub> removal and oxygen transfer, evaluations should be performed at constant GF and at FiO<sub>2</sub> = 1 and constant BF, respectively.

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## Reference

1. Castagna L, Zanella A, Scaravilli V, Magni F, Deab SA, Introna M, *et al*: Effects on membrane lung gas exchange of an intermittent high gas flow recruitment maneuver: preliminary data in veno-venous ECMO patients. *J Artif Organs* 2015 Mar 26, [Epub ahead of print].

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