MediPines Summary of Ainslie Study as Published in CHEST

Title: Validation of a Non-invasive Assessment of Pulmonary Gas Exchange During Exercise in Hypoxia

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Background: Pulmonary gas exchange efficiency, determined by the alveolar-to-arterial PO_2 difference (A-aDO_2), progressively worsens during exercise at sea-level; this response is further elevated during exercise in hypoxia. Traditionally, pulmonary gas exchange efficiency is assessed through measurements of ventilation and end-tidal gases paired with direct arterial blood gas (ABG) sampling. Since these measures have a number of caveats, particularly invasive blood sampling, the development of new approaches for the non-invasive assessment of pulmonary gas exchange is needed.

Research Question: Is a non-invasive method of assessing pulmonary gas exchange (MediPines AGM100®) valid during rest and exercise in acute hypoxia?

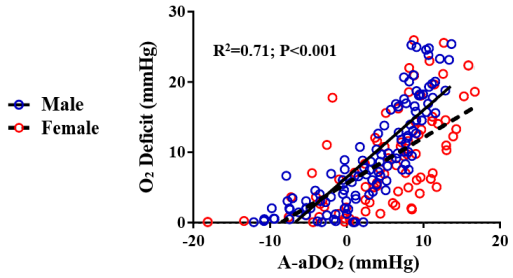
Study Design and Methods: Twenty-five healthy participants (10 female) completed a staged maximal exercise test on a cycle ergometer in a hypoxic chamber (FIO_2=0.11). Simultaneous ABGs via a radial arterial catheter and non-invasive gas-exchange measurements (AGM100) were obtained in two-minute intervals. Non-invasive gas exchange, termed the O_2 deficit, was calculated from the difference between the end-tidal and the calculated PaO_2 (via pulse oximetry and corrected for the Bohr effect by using the end-tidal PCO_2). Non-invasive O_2 deficit was compared to the traditional alveolar to arterial oxygen difference (A-aDO_2) using the traditional Riley analysis.

Results: Under combined conditions of normoxic rest, hypoxic rest and hypoxic exercise, the results revealed strong correlations between the calculated $gPaO_2$ (MediPines AGM100) and directly measured PaO_2 (arterial blood gas).

R^2=0.97 (p<0.001; mean bias =1.70 mmHg; n = 224)

Bland-Altman: 0.96±2.75 mmHg

At hypoxic rest and exercise: strong relationships between MediPines AGM100 ($gPaO_2$) and ABG PaO_2 and O_2 deficit with A-aDO_2 remained.



mean bias = 5.24 mmHg

Conclusion Summary: This study found that pulmonary gas exchange efficiency measured using a non-invasive gas exchange monitor provided a valid and reliable measure against directly measured arterial blood gasses during hypoxic exercise. Further, the non-invasive oxygen deficit was strongly correlated with A-aDO_2 values obtained from the classic A-aDO_2. These results provide promising evidence to support the use of non-invasive gas exchange assessments during hypoxic exercise which may be applicable to both laboratory and clinical patient assessments.