Title: Skeletal muscle oxygenation during exercise in patients with chronic respiratory failure

Mr. Kazuyuki 16331 Tabira k.tabira@kio.ac.jp 1, Mr. Jun 16332 Horie horie@kobe-kiu.ac.jp 2, Mr. Hiromasa 16333 Fujii insightpt5@gmail.com 3 and Mr. Toshio 16334 Aida black-pt@wombat.zaq.ne.jp 3. 1 Department of Physical Therapy, Faculty of Health Science, Kio University, Kitakatsuragi-gun, Nara, Japan, 635-0832 ; 2 Department of Rehabilitation Science, Kobe International University, Kobe, Hyogo, Japan and 3 Department of Respiratory Medicine, Osaka Prefectural Medical Center of Respiratory and Allergic Disease, Osaka, Japan.

Body: Background: Muscle oxygenation correlates with systemic oxygen uptake (VO₂) in normal subjects, however whether this relationship exists chronic respiratory failure (CRF) patients remains unclear.

Objectives: The purpose of this study was to investigate the influence of skeletal muscle oxygenation on VO₂ during exercise in CRF patients.

Methods: Ten chronic obstructive pulmonary disease and two sequelae of pulmonary tuberculosis patients performed an incremental cycle ergometer exercise test. We measured ventilation, pulmonary gas exchange and SaO₂. We also measured tissue oxygen saturation (StO₂) in the vastus lateralis with continuous-wave near-infrared spectroscopy. We calculated the muscle oxygen extraction rate (MOER) based on SaO₂ and StO₂. In addition, we performed regression analysis to examine the relationships between the VO₂ obtained during exercise testing and the mean values of SaO₂, StO₂, heart rate (HR), and MOER for each 30-second interval of the tests. Finally, we analysed the relationships between the peak value of oxygen uptake (VO₂peak) and the slopes of HR/VO₂, SaO₂/VO₂, StO₂/VO₂, and MOER/VO₂.

Results: With the increasing exercise intensity, many subjects showed a gradual decrease in StO₂ and SaO₂, but a gradual increase in HR and MOER. VO₂ was negatively correlated with StO₂ and SaO₂, and was positively correlated with HR and MOER. However, VO₂peak was not correlated with any of the slopes.

Conclusions: VO₂ is highly influenced by oxygen utilization in exercising muscles, as well as by blood oxygenation levels and cardiac function. However, the impact of skeletal muscle utilization during exercise on VO₂peak varied greatly among the patients.