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

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Body: Background: Muscle oxygenation correlates with systemic oxygen uptake (VO_2) 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 VO_2 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 SaO_2 . We also measured tissue oxygen saturation (StO_2) in the vastus lateralis with continuous-wave near-infrared spectroscopy. We calculated the muscle oxygen extraction rate (MOER) based on SaO_2 and StO_2 . In addition, we performed regression analysis to examine the relationships between the VO_2 obtained during exercise testing and the mean values of SaO_2 , StO_2 , 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 (VO_{2peak}) and the slopes of HR/VO_2 , SaO_2/VO_2 , StO_2/VO_2 , and $MOER/VO_2$. Results: With the increasing exercise intensity, many subjects showed a gradual decrease in StO_2 and SaO_2 , but a gradual increase in HR and MOER. VO_2 was negatively correlated with StO_2 and SaO_2 , and was positively correlated with HR and MOER. However, VO_{2peak} was not correlated with any of the slopes. Conclusions: VO_2 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 VO_{2peak} varied greatly among the patients.