七217 Relationship between oxygen uptake and muscle oxygenation on the quadriceps femoris during eccentric and concentric contraction

Takanobu OKAMOTO and Mitsuhiko MASUHARA*
Kinki Welfare University Faculty of Social Welfare
* Osaka University of Health and Sport Sciences

Purpose: The purpose of this study was to investigate relationship between oxygen uptake and muscle oxygenation on the quadriceps femoris during eccentric and concentric contraction.

Methods: Five healthy male subjects (age 23±0.4 yrs) performed eccentric and concentric contraction on the dynamic knee extension until exhaustion at angular velocity of 180 deg/sec. Changes in the muscle oxygenation on the m.quadriceps femoris were measured by near infrared spectroscopy (NIRS). The probes of NIRS were fixed on the m.rectus femoris and m.vastus lateralis. The muscle oxygenation was recorded during both eccentric and concentric contraction on the dynamic knee extension. Oxygen uptake was measured by expiratory gas analyzer.

Results and Discussion: There is a significant correlation between blood volume and VO_2 on the m.rectus femoris and m.vastus lateralis during concentric contraction ($p<0.001$). There also is a significant correlation between MO_2 level and VO_2 on the m.rectus femoris and m.vastus lateralis during concentric contraction ($p<0.001$). These results obtained that relationship between blood volume, MO_2 level and VO_2 on the m.rectus femoris and m.vastus lateralis during concentric contraction. This suggests that eccentric contraction causes less O_2 consumption in the active muscle than concentric contraction.

Keywords: Near infrared Spectroscopy(NIRS), Oxygen Uptake, Eccentric Contraction, Concentric Contraction

七218 Changes in muscle oxygenation and blood volume in a working muscle during a crank cycle

Tetsuo TAKAISHI (Nagoya City Univ.)
Keisho KATAYAMA, Yasutake SATO
(Nagoya Univ.)

<Objective>
The purpose of this study is to clarify metabolic changes during a crank cycle in a working muscle.
<Methods>
Seven healthy male subjects performed an incremental exercise test on a bicycle ergometer (Monark) while measuring NIRS signals, EMG, Pedal Force and other biomechanical and physiological parameters. The near-infrared spectroscopy (NIRS) signals sampled under stable metabolic and cadence conditions were arranged according to the crank angles at which those signals were obtained.
<Results and Discussion>
The arranged changes in the NIRS parameters (muscle oxygenation and blood volume) during a crank cycle demonstrated reasonable change patterns against changes in biomechanical measurements and EMG. In addition, a temporary increase in blood volume subsequent to pedal thrust, which might reflect blood flow restriction due to pedal thrust, suggested that circulatory and metabolic conditions in a working muscle during pedaling exercise can be easily affected by work intensity and pedal cadence.

We conclude that the present method to arrange the NIRS parameters against crank angle becomes a useful measure in providing findings for circulatory dynamics and metabolic changes in a working muscle during pedaling exercise.

NIRS; blood flow restriction, pedaling exercise