

血流阻止および非血流阻止中の静的掌握運動時組織酸素動態

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抄 録

Previous studies have reported that the endurance time was the same between ischemic and nonischemic isometric handgrip exercises at over 50%MVC. However it is not clear whether the results were explained by decreased oxygen supply elicited by increased intra-muscular pressure. There is also little information available about muscle tissue oxygenation kinetics during such exercises at lower intensities. To further investigate these details we observed tissue oxygenation kinetics during ischemic and nonischemic isometric handgrip exercises by using near infrared spectroscopy.

A total of 15 healthy subjects performed isometric handgrip exercises at 20, 30, 40, 50%MVC both under nonischemic (Free) and ischemic (Occl) conditions until exhaustion. In Occl, a tourniquet on the upper arm was inflated to 200mmHg before exercises started, and no cuff inflation was performed in Free. Changes in Oxy- and Deoxy- hemoglobin/myoglobin (Hb/Mb) in the superficial flexor muscle were measured with spatially resolved near-infrared spectroscopy.

At 40 and 50%MVC, the endurance time was the same in the two conditions, however it was longer in Free than in Occl at 20 and 30%MVC. On the other hand OxyHb/Mb in Free was higher than Occl at all intensities. At exhaustion, OxyHb/Mb did not reach the lowest level even in Occl except at 20%MVC, and DeoxyHb/Mb had plateaued in Free and continued to increase in Occl at all intensities.

Our results indicated that the same endurance time in the two conditions at 40 and 50%MVC was not explained by decreased oxygen supply, and suggested that oxygen was supplied to the exercising muscles and consumed there even at exhaustion. We conclude that oxygen supply and utilization is not a limiting factor of isometric handgrip exercises at any intensity.

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