

Muscle activation during low-intensity muscle contractions with restricted blood flow

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Abstract

We examined muscle activation during low-intensity muscle contractions with a moderate restriction of blood flow and complete occlusion of blood flow. Unilateral elbow flexion muscle contractions (20% of 1-RM) were performed in Experiment 1 (30 contractions), Experiment 2 (3 sets × 10 contractions), and Experiment 3 (30 repetitive contractions followed by 3 sets × 15 contractions) with moderate restriction, complete occlusion of blood flow or unrestricted blood flow (control). Electromyography (EMG) was recorded from surface electrodes placed on the biceps brachii muscle and the integrated EMG (iEMG) and mean power frequency (MPF) obtained. During Experiments 1 and 2, muscle activation was progressively increased in complete occlusion and moderate restriction of blood flow to levels greater than in the control. The decline in maximal voluntary isometric contraction (MVC) following the bout of contractions was greater with complete occlusion (39–48%) than moderate restriction of blood flow (16–19%); control MVC did not change. In Experiment 3, changes in MVC, iEMG, and MPF were greater with moderate restriction of blood flow than in the control but comparable with complete occlusion of blood flow where less total work was performed. In conclusion, moderate restriction of blood flow results in similar neural manifestations in muscle as complete occlusion of blood flow but without the apparent contractile/metabolic impairment observed with complete occlusion. Thus, low-intensity muscle contractions, with moderate restriction of blood flow, leads to more intense activation of the muscle relative to the external load.