疲労困憊に至る低強度レジスタンス運動が muscle swelling へ及ぼす影響：血流制限と非血流制限の比較

東京大学　安田智洋
（共同研究者）同　福田平
同　福村和也
同　内田祐介

Effect of Low-load Resistance Exercise to Volitional Exhaustion on Muscle Swelling: Comparison Between Blood Flow and Non-blood Flow Restriction

by

Tomohiro Yasuda, Taira Fukuda,
Kazuya Fukumura, Yusuke Uchida
Graduate School of Medicine,
University of Tokyo

ABSTRACT

Comparison of low-load resistance exercise with (BFR) and without blood flow restriction (NBFR) to volitional exhaustion on muscle swelling. Eight young men (aged 27[SD 5]years, standing height 1.74[SD 0.05]m, body mass 70.3[SD 4.3]kg) performed 20% of one repetition maximal dumbbell curl exercise to exhaustion (4 sets, rest intervals were 30-sec for BFR and or 3-min for NBFR, respectively). One arm was randomly chosen for BFR exercise and the other arm performed NBFR exercise. During the BFR exercise session, subjects placed elastic cuff proximally on testing arm at 160 mmHg. Electromyography (EMG) signals were recorded from surface electrodes placed on the biceps brachii muscle and analyzed for integrated EMG

（iEMG）. Biceps brachii muscle thickness（MTH）were measured using B-mode ultrasound. During exercise session, iEMG for biceps brachii muscles increased（$p<0.01$）progressively during BFR and NBFR（3.52 and 3.70 times of baseline value）. Immediately after the exercise, MTH acutely increased（$p<0.01$）with BFR and NBFR（1.23 and 1.19 times of baseline value）. These results demonstrate that BFR and NBFR exercises lead to pronounced muscle activation and muscle swelling, which were similar between two conditions. Thus, it can be speculated that the magnitude of increase in muscle size following low-load resistance training is similar between BFR and NBFR.

要　旨

疲労困憊に至る低強度レジスタンス運動が muscle swelling へ及ぼす影響について，血流制限（BFR）と非血流制限（NBFR）で比較した．健康な男性 8 名の両腕を無作為に BFR 側と NBFR 側に分け，低強度のアームカール運動（20% 1RM，4 セット）を疲労困憊まで実施した．血流制限には空圧式ベルトを用い，上腕基部に 160mmHg の圧を加えた．運動前後と各セット間の休息中は筋厚を測定し，運動中は上腕二頭筋の筋活動量を測定した．筋活動量は 2 条件ともに 1 セット中から漸増し，BFR では 1 セット目に運動前の 3.52 倍，NBFR では 4 セット目に 3.70 倍に達した．筋厚は 2 条件ともに 1 セット終了時点から上昇し，BFR では Post で運動前の 1.23 倍，NBFR では 3 セット終了時点で 1.19 倍に達した．いずれの項目とも条件間で違いは認められなかった．両条件とも，筋の大きな代謝変化によって各セット間の休息中および運動後は muscle swelling が顕著に増加し，それらの大きさには条件間で違いがないと判明した．そのため，通常血流の低強度レジスタンス・トレーニングを疲労困憊まで実施すると，加圧トレーニングと同様の筋肥大を引き起こす可能性があると推察された．