

Video Article

# Vascular Occlusion Training for Inclusion Body Myositis: A Novel Therapeutic Approach

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## Abstract

Inclusion body myositis (IBM) is a rare idiopathic inflammatory myopathy. It is known to produce remarkable muscle weakness and to greatly compromise function and quality of life. Moreover, clinical practice suggests that, unlike other inflammatory myopathies, the majority of IBM patients are not responsive to treatment with immunosuppressive or immunomodulatory drugs to counteract disease progression<sup>1</sup>. Additionally, conventional resistance training programs have been proven ineffective in restoring muscle function and muscle mass in these patients<sup>2,3</sup>. Nevertheless, we have recently observed that restricting muscle blood flow using tourniquet cuffs in association with moderate intensity resistance training in an IBM patient produced a significant gain in muscle mass and function, along with substantial benefits in quality of life<sup>4</sup>. Thus, a new non-pharmacological approach for IBM patients has been proposed. Herein, we describe the details of a proposed protocol for vascular occlusion associated with a resistance training program for this population.

## Video Link

The video component of this article can be found at <https://www.jove.com/video/1894/>

## Protocol

### 1. Determination of full vascular occlusion pressure

1. In order to determine the blood pressure of vascular occlusion, in mmHg, a vascular Doppler is used
2. The patient lies in a supine position while a customized blood pressure cuff (180mm length x 80mm width) is fixed on his thigh.
3. After detection of the tibial artery location, the Doppler's probe is then placed over the determined spot in the patient's leg.
4. A sound signal is generated by the Doppler machine as it captures the artery pulse.
5. The customized blood pressure cuff is then inflated until it interrupts the auscultatory pulse of the tibial artery.
6. The pressure required for full vascular occlusion is registered for future use during training.
7. For safety reasons, arterial blood pressure is also monitored.

### 2. Resistance training with vascular occlusion

1. A brief warm-up on a treadmill (5 min walk at a comfortable pace) is recommended prior to exercise
2. The patient is then positioned on the strength training equipment. A conventional leg press machine is used
3. Two pressure cuffs are now positioned near the inguinal fold region on each thigh and inflated to the correspondent training pressure (50% of full vascular occlusion pressure).
4. At this time, it is important to keep the manometers facing forward, for fine tuning of the appropriate pressure.
5. The patient performs 3 sets of 15 repetitions, with 30 seconds rest periods between sets.
6. Note that training pressure is maintained during the whole exercise session, including resting intervals.
7. A conventional leg extension machine is also part of our exercise program. The same protocol is used on this equipment, and again, occlusion pressure is kept constant at all times.
8. The last exercise is the half squat. A chair may be used for safety reasons, since the impaired strength ability of the IBM patient. Blood flow occlusion procedure follows the same pattern as the previous exercises
9. Training intensity is adjusted according to the gradual increase in strength so the patient would be able to perform no more than 15 repetitions. We recommend that training sessions are monitored by at least two investigators, each one controlling the occlusion pressure on each leg.

## Discussion

We presented a novel, and likely the first, non pharmacological therapeutic tool able to counteract the muscle atrophy and decline of strength that usually occurs in patients with IBM under conventional treatment. Resistance training with vascular occlusion is a relatively novel training method, but results are very encouraging. We have found that after a 12-wk training program, an IBM patient's leg press one-repetition maximum, balance and mobility function, and thigh cross-sectional area increased 15.9%, 60%, and 4.7%, respectively. Health Survey Questionnaire subscales demonstrated improvements ranging from 18% to 600% and mRNA expression of mechanogrowth factor increased 3.97-fold, whereas that of atrogin-1 decreased 0.62-fold<sup>4,5</sup>. This video describes in details the protocol of a resistance training program with vascular occlusion for this population. The appropriate determination of full vascular occlusion pressure is essential for the correct implementation of this training modality and it may be applied to any patient undergoing regular resistance exercise program. Equipments required consist of a vascular Doppler, two customized tourniquets cuffs with pressure manometers and a regular training facility. Moreover, we recommend that each training session is supervised by at least one physical trainer in order to ensure the safety and efficacy of the proposed method.

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