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Respiratory endurance training by means of a Spirotiger in extending intermittent claudication distance — a case study

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Abstract

According to Fontaine's classification, intermittent claudication is a symptom of the 2nd stage of peripheral arterial occlusive disease. Intermittent claudication is described as muscle pain that occurs during walking. Patients experiencing it observe major reduction of exercise tolerance. Rehabilitation of patients with peripheral arterial occlusive disease uses many different training programs which lead to extension of intermittent claudication distance. Respiratory training is one of them and it is the training of the respiratory muscles that improves their endurance, force, speed, coordination, and elasticity. Respiration therapy causes delayed metaboreflex, which in turn the blood flow in lower limbs increases..

We present a case of a patient who underwent percutaneous balloon angioplasty of iliac artery and then conducted respiratory training by means of Spirotiger what resulted in further increase of claudication distance.

Key words: intermittent claudication, respiratory training by means of a Spirotiger

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Introduction

According to Fontaine's classification, intermittent claudication is a symptom of the 2nd stage of peripheral arterial occlusive disease. Intermittent claudication is described as a muscle pain that occurs during walking. Patients experiencing it observe major reduction of exercise tolerance. Rehabilitation of patients with peripheral occlusive disease uses many different training programs which lead to the extension of intermittent claudication distance. Training methods that improve blood flow in the arteries of lower limbs are constantly being sought [1]. Respiratory training is a training of the respiratory muscles that improves their endurance, force, speed, coordination, and elasticity. Conducted research show that respiratory muscles can be trained, and the fatigue of respiratory muscles reduce body's exertion efficiency. Respiratory training can greatly increase physical ability. Respiration therapy causes delayed metaboreflex which

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Figure 1. Walking test on treadmill

Figure 2. Spirotiger equipment used for respiratory training

in turn increases the blood flow in lower limbs and thus provides higher inflow of the blood. Past research show that fatigue respiratory muscles causes reduction of body's exertion efficiency and reduces blood flow in muscles of upper and lower limbs. Fatigue diaphragm encourages retention of lactic acid which activates type IV nerve ending and thus causing narrowing of peripheral vessels. Weak respiratory muscles influence efficiency of lower limbs during exercise.

We present a case of a patient who underwent an angioplasty treatment and conducted respiratory training by means of a Spirotiger [2–6]. 69-year-old male was treated in Vascular Surgery and Angiology Clinic due to occlusion of right common iliac artery intermittent claudication distance of 150 m. He underwent percutaneous balloon angioplasty with stent implantation.

Ruffier's test is classified as one of the easiest functional tests of oxygen efficiency.

It evaluates efficiency using index measuring heart rate after performing 30 squats. Subject is resting for 5 minutes lying. During that time a resting heart rate (HR) is measured. Then, patient stands up and performs 30 squats in 1 minute. After the test patient is returning to lying position.

- Heart rate (HR) measurements are taken at 1 minute of restitution (0–60s) and at 2 minutes of restitution (60–120 s);
- HR1 — value just before the exercise;
- HR2 — value at 1 minute of restitution (just after the exercise finished);
- HR3 — value at 2 minutes of restitution.

RI = (HR1 + HR2 + HR3) – 200/10 Value of the Ruffier's Index (RI)

Evaluation of efficiency levels:
0 — very good
1–5 — good
6–10 —average
> 10 — poor

Case study

69-year-old male was treated in Vascular Surgery and Angiology Clinic due to occlusion of right common iliac artery intermittent claudication distance of 150 m. He underwent percutaneous balloon angioplasty with stent implantation, with his intermittent claudication distance to 250 m.

Two weeks after the treatment he has been qualified for Spirotiger respiratory therapy. Training programming was preceded by medical and physiotherapeutic examination. Both interview and physical examinations were carried out. Interview took into account the discomfort and pain of lower limbs. Physical examination involved evaluation of intermittent claudication distance based on a treadmill test. Ruffier's test was also conducted and blood pressure was measured. Ruffier's index was 6.4 (Fig. 1). Training program was conducted for a month, with training sessions three times per week. Respiratory training was performed in accordance to didactics of Spirotiger method (Fig. 2). At the beginning calculations were done using the following formula:
VC (male) litre = (0.0576 × height in cm) — (0.026 × age) — 4.34
where:
VC — vital capacity
The result from the above formula was substituted by another formula, which helped to
calculate the capacity of the respiratory sac used for training.
VS = VC × 60–70%

The first 6 training units were conducted in sitting position. Training session lasted between 8 to 10 minutes, with breath frequency of 24–25 breaths per minute. From the 7th training unit patient was breathing standing. Time of the training was 15–30 minutes, with breath frequency of 24–28 breaths per minute. Before and after each training the patient had his blood pressure measured (Figs 3, 4).

Figure 3. Respiratory training in standing position

Figure 4. Respiratory training in sitting position

Summary

The rehabilitation of patients with peripheral artery diseases is seeking training methods, which would increase the intermittent claudication distance and thus improving blood flow in lower limbs, and improvement of patient's quality of life. There are many training methods that help to increase the intermittent claudication distance and improve patient's quality of life. After the completion of the training program, patient has done second treadmill test and Ruffier's test. Intermittent claudication was 300 m and Ruffier's index was 5.2. We believe that the respiratory training with Spirotiger may elongate the claudication distance and improve patient's quality of life.

Conflict of interest

None.

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