

Applied methods of exercise based therapy for the extension of walking distance in patients with intermittent claudication

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Abstract

Intermittent claudication, according to the Fontaine Classification Scale is a symptom of 2nd degree atherosclerosis of the arteries of the lower limbs. The process of atherosclerosis involves increased narrowing of the blood vessel lumina and their eventual closure. Patients with atherosclerosis often suffer bouts of muscular pain while walking which eventually leads to restricted mobility. The treatment of those affected by furring up of the arteries of the lower limbs includes intravascular procedures, insertion of balloon devices and stents and in severe cases of atherosclerosis surgical intervention is required. The more conservative areas of treatment involve pharmacotherapy, patient participation in educational training sessions, lifestyle changes and appropriate physiotherapy referrals. If applied early on, lifestyle changes such as smoking cessation, an improved diet, as well as targeted training can help avoid the need for surgical intervention. At the moment, the goal of mainstream physiotherapy in the treatment of peripheral artery disease is to determine the most appropriate forms of exercise which can increase the walking distance of patients with intermittent claudication, improve blood-flow in particular to the lower extremities as well as improve patients' overall quality of life. The purpose of this study is to gather and analyse exercise strategies that result in increased walking distance in intermittent claudication. The best results have been observed in groups who teamed up ambulatory therapy with strength training: Nordic walking therapy along with strength training and finally walking training with upper body aerobic training on the cross-trainer. The variety of training combinations gives us the ability to cater for and accommodate individual patient needs.

Key words: intermittent claudication, ambulatory training, resistance training, cross-trainer training

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Introduction

Intermittent claudication according to the Fontaine Classification Scale is a symptom of 2nd degree atherosclerosis of the lower limbs. The main atheromatous

processes lead to narrowing and eventual closure of the arteries. Walking involves all muscles all over the body from the lower limbs to the pelvis, torso and upper limbs. Walking is accompanied by increased oxygen demand. Patients with lower limb artery furring

experience restricted blood supply to the actively working muscles. Muscles starved of their blood supply will start to produce pain as well as cause restricted movement [1].

The basic elements of treatment involve the carrying out of various forms of exercise which increase the walking distance in intermittent claudication. Various forms of exercise have been documented. Ambulatory training (supervised and unsupervised) cross-trainer training, nordic walking and resistance training.

The objective of physical training in patients with intermittent claudication is to increase the walking distance before symptoms of claudication appear, increase muscle strength, improve the functioning of the cardiovascular system as well as improving patient quality of life. The main mechanisms in effectiveness of these interventions are improved functioning of the endothelium, creation of collateral circulation, improved blood-flow, changes in ischaemic related pain perception and halting further atherosclerotic deterioration [2].

Ambulatory training

Ambulatory training in patients with atherosclerosis of the lower limbs has been found to reduce symptoms as well as to increase physical efficiency [3]. In accordance with the TransAtlantic Intersociety Consensus II (TASC II) guidelines ambulatory training should be carried out in an interval based format. The walking activity should be suspended at the first sign of moderate pain symptoms. The effort used in the activity should be regulated by increasing the gradient on the treadmill or its speed [4].

Ambulatory therapy is a popular and relatively cheap method of physiotherapy for patients with peripheral vascular disease. The exercises can be done under practitioner supervision or without supervision (at the patient's own home.) Numerous clinical trials have proven the effectiveness of supervised physiotherapy in increasing walking distance in patients with intermittent claudication as well as increasing patient quality of life [5]. An analysis of fourteen studies in which 1002 patients took part compared the effectiveness of supervised therapy against unsupervised, and showed definitive superior results in the former group. There was a clear increase in pain-free walking distance in intermittent claudication patients of approximately 180 metres that took part in supervised physiotherapy session compared to those who exercised at home [6].

A period of six months of supervised ambulatory therapy has been seen to result in improved gait as well as increased lipid metabolism and decreased oxygen consumption during submaximal exertion. Supervised

training leads to the appearance of morphological changes in the femoral artery, increased blood flow as well as the development of collateral circulation [7–10].

Patients with intermittent claudication often exhibit disturbed walking patterns, specifically disturbances in the phases of gait, the phase whereby one foot is on the ground supporting the body is shortened and the alternate phase during which both feet are in contact with the ground becomes abnormally lengthened. This could be in response to disturbances in muscular-nerve control related to the increased focussing on stability [1].

Ambulatory therapy results in improvement in the biomechanics of gait. Following a 12-week training program, longer stride length was observed, reduced number of steps taken and the gait became more regular and efficient [11, 12].

The greatest change in gait measurements are observed during the supportive phase. Patients carry out intense plantar flexion in the ankle joint as the heel is in contact with the floor/ground. An increase in plantar flexion along with correct dorsal flexion during this phase results in an increased range of movement in the ankle joint. These changes have been observed both before and after incidences of lower limb pain [13, 14].

Resistance training

Resistance training can lead to an increase in walking distance in intermittent claudication, increased muscle mass as well as improved patient quality of life [15–17]. During twelve weeks of resistance training following which increases in muscle mass were observed in the muscles of the lower limbs (quadriceps, hamstrings, the anterior tibialis, the triceps surae as well as the hip abductors and adductors). The training is carried out in three sets of 15 repetitions, the load was increased by 5% and individually adjusted to the abilities of the patient. The second group underwent ambulatory therapy. Both groups achieved similar results when it came to the maximum intermittent claudication distance.

Strength training, like ambulatory training caused a decrease in cardio-vascular incidents, improved respiratory function and increased oxygen efficiency as well as superior gait [17].

Nordic walking

Nordic walking therapy involves not only the use of the muscles of the lower limbs but also those of the torso and upper limbs. Nordic walking exercises can improve oxygen efficiency as well as cardio-vascular functioning. Tests which compared traditional ambulatory therapy with Nordic walking therapy demon-

strated that walking with sticks has a positive effect on improving intermittent claudication distance, walking speed in spite of greater loads as well as more effective cardio-vascular functioning [17–20].

Training bike exercise

Exercises using training bike can be an alternative for traditional march conducted using treadmill. Research comparing both forms of training did not show major differences in extending the walking distance in patients with intermittent claudication. The walking distance increased about the same in both groups [21]. Exercising using a training bike allows to reduce rest time required and increase the strain of the exercise. Pain-free method of exercise on a training bike does not cause the inflammation [22, 23].

Mixed exercise

In order to increase intermittent claudication distance a combination of various exercise methods can be employed. Studies in which during a 12-month period traditional ambulatory therapy was carried out alongside strength training resulted in a marked increase in intermittent claudication distance, improvements in walking speed as well as increased indicators of muscle strength [22]. Comparisons between treadmill training and Nordic walking training and strength-stamina training proved that strength and cardio training was the most effective. It leads to a greater degree of increase in intermittent claudication distance as well as increases in muscle flexor strength as well as the quadriceps femoris extensor muscles as well as the extensors and flexors of the ankle joint [17].

The aerobic cross trainer exercise program which employed the upper limbs leads to an increase in intermittent claudication distance and cardio-vascular improvements. Patients who were prescribed this form of training in conjunction with ambulatory training showed a superior tolerance to exertion as well as improvements in gait cycle performance [24–27].

Conclusion

Physiotherapy is currently looking for exercise treatment programs in cases of peripheral vascular disease which result in an increased intermittent claudication distance, lead to improvements in blood flow especially to the lower extremities as well as improving patient quality of life. Many training methods allow us to increase the intermittent claudication distance as well as increase patient quality of life. The best results have been recorded in study groups who combined

ambulatory training with strength training; Nordic walking training with strength training, ambulatory training with aerobic cross-trainer training. The variety of forms of training available give us the ability to prescribe a form which is catered to the needs of the patient. It is important that in addition to the appropriate physiotherapy treatment that the patient engages in educational programs with a view to improving their overall lifestyle.

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