

REVIEW ARTICLE

Benefits of physical conditioning in the treatment of intermittent claudication

Benefícios do condicionamento físico como tratamento da claudicação intermitente

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ABSTRACT

Intermittent Claudication (IC) is a pathognomonic symptom of obstructive peripheral arterial disease, characterized by muscle pain during physical exercise that ceases at rest. IC has a potentially benign nature, due to the low risk of progression to severe ischemia and limb loss, as well as a good chance of symptom improvement. Thus, the clinical treatment is considered appropriate and usually employed as the first therapeutic alternative; the treatment should be based on the control of the modifiable risk factors of arteriosclerosis, especially the habit of smoking. Treatment consists of the association of a pharmacological treatment and a non-pharmacological one, and the primary non-pharmacological treatment for intermittent claudication is a formal exercise program that can be performed by the patient based only on medical guidance (without supervision) or under the supervision of a professional. The mechanism by which the patient improves claudication through physical activity is yet to be fully clarified, and several factors are attributed to symptom improvement, such as the formation of new blood vessels, release of nitric oxide and action on the lipoprotein, among others.

KEYWORDS

intermittent claudication, peripheral vascular diseases, exercise

RESUMO

Claudicação Intermitente (CI) é um sintoma patognomônico da doença arterial obstrutiva periférica, caracterizado por dor muscular ao exercício físico que cessa ao repouso. A Claudicação Intermitente tem um caráter potencialmente benigno, devido ao baixo risco de evolução para isquemia grave e perda do membro, e também por uma boa possibilidade de melhora dos sintomas. Assim, o tratamento clínico é considerado adequado e normalmente empregado como primeira alternativa terapêutica, sendo que esse tratamento deve ser baseado no controle dos fatores de risco modificáveis da arteriosclerose, principalmente o fumo. Associa-se ainda um tratamento farmacológico e um não farmacológico, onde o tratamento não farmacológico primário para a claudicação intermitente é um programa formal de exercícios físicos que pode ser realizado pelo paciente baseado apenas na orientação médica (sem supervisão) ou sob a orientação de um profissional. O mecanismo pelo qual o paciente melhora da claudicação com a atividade física ainda não está totalmente esclarecido, e vários fatores são atribuídos à melhora dos sintomas, como a formação de novos vasos, liberação de óxido nítrico, ação sobre as lipoproteínas, entre outros.

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claudicação intermitente, doenças vasculares periféricas, exercício

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INTRODUCTION

Intermittent Claudication (IC) is a pathognomonic symptom of peripheral obstructive arterial disease (POAD), characterized by muscular pain at physical exercise that ceases at rest. It is described as a sensation of tiredness or fatigue or even a cramp-like pain and it occurs more frequently in the posterior thigh muscle.

The most important characteristic of IC-like pain is its regular frequency with certain muscular exercises, different from the so-called pseudoclaudication, which can manifest, for instance, as vertebral canal stenosis, presence of intervertebral disc herniation of the lumbar column, where the complaint is not directly associated with the muscular activity.¹

The IC is not an exclusive event of POAD and can occur in the lower limbs of normal individuals, after they practice physical exercises or in situations of deep anemia. Thus, the symptom appears in any situation where the amount of oxygen available for muscle undergoing activity is decreased, and consequently, is insufficient for the tissue metabolic necessities. This ischemia would lead then to the release of some chemical agent in the muscular mass undergoing activity, called by Lewis "factor p", and its accumulation would cause the stimulation of the nervous terminations free of pain. The interruption of the activity would cause the blood flow to be restored and the painful stimulus would cease.²

The prevalence and severity of the symptom onset among different individuals is related to several factors, of which some are constitutional (or non-modifiable) and others are acquired and potentially controllable (or modifiable). Therefore, among the risk factors classified as non-modifiable are: age, sex, family history of atherosclerosis, and ethnicity,³ and among the modifiable ones are: habit of smoking, sedentary lifestyle, arterial hypertension, hyperlipidemia,^{4,5,6} cholesterol- and saturated-fat-rich diet, arterial hypertension, obesity, hyperlipidemia, antioxidant-poor diet, elevated levels of homocysteine, blood coagulation disorders, hyperuricemia, infectious agents, excess iron, alcohol³ and decreased brachial-ankle pressure gradient.^{2,5}

The IC has a potentially benign character, due to the low risk of evolution into severe ischemia and limb loss as well as due to a good possibility of symptom improvement. Thus, the clinical treatment is considered adequate and it is normally employed as the first therapeutic alternative⁵ and this treatment must be based on the control of the modifiable risk factors of atherosclerosis, mainly smoking, and the implementation of physical training, complemented by drug therapy.²

The primary non-pharmacological treatment for IC is a formal program of physical exercises. Since 1966, several controlled randomized studies have demonstrated the benefits of supervised physical training in individuals with peripheral artery disease;⁷ however, the first studies that report on physical exercises for the treatment of claudication date back from 1898.⁸ Although there is divergence regarding which type of physical exercise is more effective, walking seems to be better than the training on a treadmill. The physical training can be carried out by the patient based only on the medical advice (without supervision) or under the supervision

of a professional. The unsupervised physical training is a good and low-cost alternative; however, the supervised physical training offers even better results than the unsupervised training does and must be stimulated whenever possible, with the help of professionals from the physical education or physical therapy area, together with the guidance from angiologists and vascular surgeons.⁹

The patient with POAD that presents intermittent claudication-like pain tends to avoid walking, due to the discomfort that the muscular pain at exertion causes and the fear that the pain can result in tissue lesions. Therefore, the patient must be advised to perform regular physical exercises. Some patients resist adhering to the physical training due to the difficulty in conciliating the training with the activities of daily living.² Regarding the patient whose only symptom is the non-limiting intermittent claudication, he/she must be advised to walk daily until feeling discomfort, several times a day on a level surface, trying to progressively increase the distance walked, with the purpose of improving the anaerobic capacity.⁷

The mechanism through which the patient improves the claudication with the physical activity is not yet fully clarified and several factors are attributed to symptom improvement.

It is believed that the exercise aids the formation of new collateral vessels⁵, but the concept that the physical exercise stimulates the development of collateral circulation and, consequently, increases the blood flow to the muscles in activity is controversial and could not be confirmed in studies with muscle depuration of xenon-133 by Larssen & Larssen (1966), nor in the studies by Dahllöf et al (1976) with the use of plethymography, both cited by Kauffman.²

Other benefits would be the production and release of nitric oxide, promoting better vasodilation¹⁰ and the optimization of the muscular enzymatic metabolism and oxygen consumption.¹¹ Other studies mentioned by Filho et al⁵ state that the physical training increases the levels of HDL, reduces the levels of triglycerides, controls blood pressure levels and attenuates the inflammatory response that results in vascular endothelium lesions.

As for the isolated impact of exercise on LDL, HDL and triglycerides, literature has demonstrated variable modifications after aerobic programs lasting more than 4 weeks in individuals without overweight.¹² Additionally, according to this same author, the implementation of either high or low intensity exercises, performed at a range of 85% to 90% and around 50 to 70% of the maximum oxygen consumption, respectively, can reduce triglyceride and increase LDL levels.

Muscular enzymatic adaptations have been reported as responsible for the increase in the gait practical distance in patients with claudication. The activity of glycolytic and mitochondrial enzymes was studied in the posterior leg musculature, before and after treatment, demonstrating an increase in the activity of cytochrome-C-oxidase, synthetase citrate and 3-OH-acyl-CoA-dehydrogenase, which positively correlate with gait performance. Thus, these alterations in the muscular metabolism with the increase in the oxidative capacity could explain the beneficial effects of physical conditioning.²

Biomechanical factors, influencing the gait of patients with claudication have also been reported. With the physical training,

the patient would develop a more efficient gait strategy, consuming less energy, or would increase his or her own tolerance to pain.² Therefore, all these effects would lead to an increase in the walking capacity, with consequent improvement of the musculoskeletal metabolism, facilitating the use of oxygen and allowing a better performance capacity in physical activities, improvement in the quality of life, perception of well-being and disposition, facts that are the result of the painful symptom relief and mainly leading to the reduction in some cardiovascular risk factors.¹³

Robeer et al¹⁴ in an analysis of randomized studies on physical exercises as treatment for patients with IC, concluded that all of them showed to be positive regarding the walked distance, i.e., confirming the aforementioned benefits.

However, the physical exercise improves the cardiorespiratory capacity and body composition, reduces obesity, stress and catecholamine levels, with a beneficial effect on blood pressure, that is, it acts on the risk factors that contribute to the development of peripheral obstructive arterial disease.

It is mainly recommended to perform an aerobic physical activity with a mean duration of 40 minutes, three to six times a week, with enough intensity to reach 60 to 80% of the maximum heart rate.¹²

Although effective, the treatment with physical exercises has some limitations: it requires motivation on the part of the patient and must be carried out with regularly maintained supervision programs and it is a procedure usually not covered by health insurance policies.⁷

Therefore, based on the present review, randomized studies on the effect of exercise practice on this population should be carried out.

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