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Exercise Training and Hypertension: Ready for Prime-Time?

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Editorial

A sedentary lifestyle has been characterized as an independent risk factor for cardiovascular disease [1]. Many studies have shown the inverse association between physical activity level and the incidence of cardiovascular diseases [2-4]. Low aerobic fitness is a strong predictor for future cardiovascular disease and all-cause mortality in both healthy and cardiovascular disease patients, including those with hypertension [5-7]. Various mechanisms could be involved in the cardiovascular protective effects of physical activity, including improvement in endothelial function, a decrease in sympathetic neural activity and a reduction in arterial stiffness [8,9].

Hypertension is one of the most important risk factors for cardiovascular disease, and has been ranked as the leading cause for death and disability worldwide: therefore, adequate control of blood pressure is important for public health [10]. Lowering of blood pressure and prevention of hypertension is in first instance preferable by lifestyle changes. These include weight loss, moderation of alcohol intake, a diet with increased fresh fruit and vegetables, reduced saturated fat, reduced salt intake, reduced stress, and, finally, increased physical activity [11,12]. With regard to the latter, former guidelines predominantly recommended aerobic exercises such as walking, jogging, and cycling for lowering blood pressure.

Even if drug therapy remains the mainstay of hypertension management, on the other hand blood pressure control goes beyond adherence with drug therapy as there are other associated factors [13], and achieving adequate blood pressure control with antihypertensive medication remains an elusive goal for many patients anyway [14]. Furthermore, medical management of hypertension is often complicated by concomitant comorbid conditions such as dyslipidaemia, hyperinsulinaemia, glucose intolerance, reduced arterial compliance, sympathetic over-activity and obesity; for instance, some antihypertensive agents adversely affect other cardiovascular risk factors, and adherence to medication is often a problem. However, lifestyle changes improve multiple risk factors without any side effects [15,16], and physical exercise has been demonstrated as a positive and effective adjunct to other lifestyle measures in the prevention and management of hypertension [17]. As a consequence, physical activity is recommended as prevention, treatment, and control of all stages of hypertension [18-21], and therefore both the American Heart Association and the American College of Sports Medicine have endorsed the inclusion of resistance training as an integral part of an exercise program for promoting health and preventing cardiovascular disease [22,23], in fact, continuous exercise training is the type of physical activity most frequently recommended to hypertensive subjects [19], and in some patients regular aerobic exercise also reduces or eliminates the need for antihypertensive medication [24].

In a previous systematic review with meta-analysis provided by Cornelissen et al. [25] the authors reviewed the effect of resistance training on blood pressure and other cardiovascular risk factors in adults, and the findings suggested that both moderate-intensity dynamic resistance training and low-intensity isometric resistance training may cause a reduction in systolic and diastolic blood pressure; furthermore, dynamic resistance training favorably affected some other cardiovascular risk factors such as an increase in peak VO_2 and a reduction in body fat and plasma triglycerides. The clinical importance of these blood pressure reductions can be estimated from large, prospective intervention studies investigating morbidity and mortality outcomes that suggest that small reductions in resting systolic and diastolic blood pressure of 3 mmHg can reduce coronary heart disease risk by 5%, stroke

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by 8%, and all-cause mortality by 4% [26-28].

Moreover, given that the association between blood pressure and cardiovascular risk has no lower threshold, reductions of this magnitude in individuals with even optimal blood pressure at baseline still seem to have clinical significance [11], and this strongly underlines the potential of resistance training as adjuvant therapy for the prevention and treatment of high blood pressure. In addition, the positive effect of resistance training on other cardiovascular risk factors suggest that a better physical fitness is associated with a lower risk of all-cause mortality and cardiovascular events and is independently associated with longevity [18,29]: aerobic exercise not only reduces blood pressure, it also lowers levels of low-density lipoprotein cholesterol, reduces insulin resistance and glucose intolerance, and often is associated with reduced body weight [30]. Finally, it must be reminded that although genetic predisposition is a risk factor for hypertension, studies have shown that behavioural factors, such as sedentary lifestyle, overshadow genetic predisposition as a cause of hypertension [31].

To prescribe resistance training as a potential tool in the control of blood pressure, one should know how different training characteristics influence the blood pressure response. Aerobic or endurance exercises are dynamic physical exercises, involving large muscle groups, which increase cardio-respiratory fitness and help in weight control. They are those in which the exercising muscles make use of oxygen. Aerobic exercises are effective in lowering blood pressure or preventing hypertension [19]. These endurance activities, such as walking, swimming, cycling and low-impact aerobics (dancing or rope skipping), are the core of the exercise programme for managing hypertension. The blood pressure responses to aerobic exercises depend on the activities engaged in. Several studies have shown that high-intensity aerobic interval training improves aerobic fitness and reduces several cardiovascular risk factors more than moderate intensity continuous training [32-36]. Although a large body of evidences suggests that vigorous training compared to moderate- and low-intensity training elicits more cardiovascular benefits, also in hypertensive patients [37,38], several meta-analyses indicate little or no intensity-dependent effect of exercise training for the reduction of the blood pressure [18,19,39]. In studies where low and high intensity training programmes have been directly compared, the lower intensity programmes were either more effective [40] or as effective [41] as the higher intensity programmes, but more recent reviews [28,42] reported no influence of exercise intensity on blood pressure reduction following exercise treatment. Further, aerobic exercise training of 60–85% of age-predicted (220-age in years) maximal heart rate may be as, or more, effective as high-intensity exercise in lowering BP in hypertensive patients [43]. As a consequence, no specific guidelines delineate exercise intensity and frequency, but a recent study performed by Molmen-Hansen et al. [44] study indicates that the exercise-induced lowering effect of blood pressure is intensity dependent: in addition, high-intensity aerobic interval training was superior to moderate intensity continuous training in terms of improved cardiac and endothelial function, aerobic capacity, and heart rate recovery, and so aerobic interval training should be viewed as an effective method to lower blood pressure and improve other cardiovascular risk factors. Moreover, a growing body of evidences suggests and our results also confirm the positive impact of exercise training on both left and right ventricular systo-diastolic function, in terms of subclinical improvement, in pharmacologically treated hypertensive patients [9], and it must be reminded that given the poor blood pressure control in the general population and the enormous prevalence of hypertension the possible means and process of aerobic exercise complementing antihypertensive drug therapy in order to achieve higher blood pressure control rates would place a large number of people at decreased risk for cardiovascular morbidity and mortality and so would have enormous implications and would be of considerable and growing global public health importance.

In conclusion, there is an the ample evidence in the literature that aerobic exercise lowers blood pressure in individuals with hypertension. This is expected to encourage physicians to recommend or refer people with hypertension, especially those who require more than two antihypertensive drugs to achieve blood pressure control, for aerobic exercise. Increased attention needs to be placed on strategies to maintain or improve fitness, efforts to encourage physical activity should urgently be intensified and supported, and sedentary lifestyle should be viewed as one of several major modifiable risk factors in the prevention and management of cardiovascular disease. Considering the dearth of studies on the possible additive or complementary effect of aerobic exercise on antihypertensive drug therapy in achieving blood pressure control, more empirical studies are needed to make an assertion about the role of aerobic exercise, in conjunction with antihypertensive drug therapy, in achieving blood pressure control.

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