

# EDUCATIONAL SESSION 07

ED 07-1

## CONTRIBUTION OF CARDIOPULMONARY FITNESS IN OBESITY PHENOTYPES AND INCIDENT HYPERTENSION

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Obesity is associated with an increased risk of morbidity and mortality from cardiometabolic diseases, but not all obese individuals are at increased risk. This phenotype of obesity is referred to as “metabolically healthy obesity (MHO).” MHO describes a cohort of the obese population with relatively low risk of cardiovascular and metabolic diseases. Although MHO has favorable metabolic profiles such as insulin sensitivity, low inflammatory markers, and low body fat, there remains a substantial unexplained variance. Obesity is associated with increased prevalence of hypertension, but some obese individuals exhibit normal blood pressure. Several studies have shown the relationship between obesity and clustering of metabolic abnormalities and increased risk of incident hypertension, but there are few studies on the risk of incident hypertension among MHO. Although these studies suggested that MHO was at increased risk of incident hypertension, but this relationship has not been extensively studied, and confounding variables are not adequately accounted for in the analyses. Therefore, the association between MHO and the risk of incident hypertension still remains limited and controversial. Lifestyle factors may play a large role in why a subset of the obese individuals do not present the obesity-related cardio-metabolic outcomes. Several studies have shown that levels of physical activity and cardiopulmonary fitness increase in MHO when compared to the metabolically unhealthy obese individuals. Although previous studies have attempted to adjust for physical activity using self-report questionnaires to clarify the association between obesity phenotypes and incident hypertension, there was no direct assessment of cardiopulmonary fitness. It is well known that cardiopulmonary fitness can attenuate the increased risk of incident hypertension even after adjusted for adiposity and metabolic risk factors, but the role of cardiopulmonary fitness on the association between MHO and risk of incident hypertension has not been fully explored. In this presentation, available scientific evidence regarding the favorable influence of cardiopulmonary fitness on the incidence of hypertension in individuals with MHO will be introduced.

ED 07-2

## TO LIFT, WALK OR RUN: WHAT IS THE OPTIMAL MODE OF EXERCISE TO REDUCE HYPERTENSION AND PREVENT CARDIOVASCULAR DISEASE?

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A plethora of evidence exists supporting that structured aerobic exercise or activities that increase cardiorespiratory fitness (CRF) lower resting blood pressure (BP) in patients with hypertension (HTN). Relatively few studies have assessed the effects of anaerobic or resistance exercise on BP. Thus, its role in managing HTN is not defined. Also, possible risks related with exercise in hypertensive patients have not been adequately addressed.

In addition to lowering BP, CRF attenuates the incidence of HTN. A substantial part of the age-related progression to HTN is not an inevitable outcome of aging as once thought, but a consequence of lifestyle characterized by high-fat/salt diets and physical inactivity. In our studies, the CRF-HTN association was inverse and graded. The relative risk for developing HTN was 72% higher for low-fit com-

pared to fit individuals. We also found an independent, inverse and graded association between CRF and the risk for developing congestive heart failure (CHF). For every 1-MET increase in exercise capacity the risk for CHF was 16% lower (HR = 0.84; CI: 0.83–0.86) in 8,725 US veterans. Compared to the Least-Fit category, the risk was progressively lower, ranging from 32% for moderate fit to 70% for those in the highest fitness category. CRF and mortality risk association was also inverse and graded in hypertensive patients, independent of age, body weight, medications and additional risk factors.

Available evidence supports that dynamic resistance exercise is less effective in lowering BP than aerobic exercise. Due to a considerable degree of inconsistency in the findings of such studies, and the risk for an exaggerated BP response, resistance training exercise prescription for hypertensive patients is premature. Hypertensive patients interested in resistance training should be advised to avoid high-resistance training and prefer low-resistance, high repetitions (15–20) exercises. To avoid an exaggerated BP response, patients should be advised against holding their breath during physical exertion.

The mechanisms involved in exercise-related effects on BP are based on the principle that when a biological system is challenged repeatedly beyond its present capacity this system will undergo specific adaptation designed to overcome the challenge. Accordingly, the shear stress generated by the increased blood flow during exercise provides the stimulus for enhanced nitric oxide release, and improved endothelial function, ultimately leading to a reduction in vascular resistance and mean arterial pressure.

An elusive threshold exists for exercise intensity, duration, frequency and volume for the exercise-related effects on BP. Brisk walk most days of the week, 20–40 minutes per session meets the requirements for BP reduction. Running is not required and may even increase risk for injury.

ED 07-4

## IS EXERCISE-INDUCED HYPERTENSION ASSOCIATED WITH ADVERSE CARDIOVASCULAR OUTCOMES?

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Millions of clinical exercise stress tests are conducted annually worldwide. The fundamental rationale underlying the conduct of these tests is that cardiovascular irregularities may be revealed during an exercise bout that would otherwise remain unnoticed if testing was only conducted under resting conditions. In order to reveal electrocardiographic abnormalities indicative of cardiac disease, maximal intensity exercise may need to be undertaken, whereas the presence of hypertension can be revealed by the blood pressure response at low to moderate intensity exercise. Therefore, exercise blood pressure measured carefully under standardised conditions should be a useful tool to identify individuals at increased cardiovascular risk. Independent investigators have consistently shown that exercise blood pressure at low to moderate intensities predicts adverse cardiovascular outcomes independent from resting blood pressure and conventional cardiovascular risk factors. This talk will present evidence in support of exercise-induced hypertension as a clinical observation requiring additional follow up care. Future needs in terms of better understanding the mechanisms of exercise hypertension and determination of exercise hypertension thresholds will also be detailed.