The Impact of Exercise on the Arteries

Everywhere we turn we are continuously reminded of the benefits of exercising: it promotes weight loss, lowers blood pressure, improves how we feel, is good for the heart, relieves stress … the list goes on. Of course, these are all important aspects to a happy and healthy life, but one of the less touted, and just as important, benefits is the effect that regular exercise can have on the health of your arteries. In order to understand these benefits it is important to first understand why arterial health is important.

It’s fairly obvious that one critical role of the arteries is to transport oxygenated blood to all the major organs and tissues throughout the body, i.e. they act as a conduit. Their second, less obvious, vital function is to absorb the pulsatile flow generated by left ventricular ejection by expanding to accommodate the increased blood volume and transform it into a steady, continuous supply to the downstream vessels and tissues by gradually recoiling. In this same capacity they also dampen the transmission of the pulsatile pressure waves as they propagate distally, acting as a buffer for the major organs and protecting them from potentially damaging pulsatile energy.1

In the healthy young, the arteries are highly efficient at dampening the pulsatile pressure and flow waves. As age, disease, and certain lifestyle choices introduce themselves, the large elastic arteries such as the aorta become stiffer and their buffering ability is diminished.2 This is especially critical in the brain and kidney, high volume flow organs in which increased arterial stiffness can lead to increased pressure pulsations in the microcirculation and damage to both organs.3 It is well established that increased arterial stiffness also increases the risk of coronary heart disease, stroke, cardiovascular disease events, and all-cause mortality.3,4 So what role can exercise play in this pathophysiological process?

First consider how the physically active measure up to untrained and less active individuals. In a cross-sectional examination, Laurent et al. compared aortic pulse wave velocity (PWV), a direct measure of aortic stiffness, in athletes who completed four 60-minute endurance training sessions per week to sedentary men who performed less than one hour of physical activity per week. Despite being matched for blood pressure and age, the sedentary group had a significantly higher PWV, signifying a much stiffer aorta than the endurance-trained athletes.5 Similarly, regular exercise has been shown to blunt the age-associated increase in aortic stiffness in women, which may partly explain why there is a lower incidence of cardiovascular disease in those who are physically active post-menopause.6 Additional data supports that regular physical activity and higher aerobic capacity mitigates the normal arterial stiffening found with advancing age.7 However it’s possible that excessive training may negate these beneficial effects and actually be detrimental.8

To prevent the development of arterial stiffness would be preferred, but what about the ability to reverse or reduce it? The answer to this question is less clear and seems to be dependent on a number of factors. Most of the data indicates that aerobic training will promote arterial destiffening, specifically regimens lasting at least 12 weeks,9 and that these benefits even extend to those individuals with coronary artery disease and the metabolic syndrome.10,11 The effects of resistance training, however, don’t look as promising. Studies have shown that although there isn’t any improvement in arterial stiffness with resistance training, in most instances there isn’t a negative impact either.12

In summary, increased arterial stiffness is a strong predictor of future cardiovascular risk. With advancing age the large elastic arteries progressively stiffen, but this process can be mitigated, and somewhat prevented, through habitual aerobic exercise. This form of exercise can also reduce or reverse arterial stiffness, while the effects of resistance training don’t appear to be as beneficial. Regular, moderate aerobic exercise has been repeatedly shown to improve health. It now appears that one part of that health improvement is in the health of our arteries.

References


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