Annals of Clinical and Medical Case Reports

Review Article

ISSN 2639-8109 Volume 6

Exercise Prescription for Hypertension

Allen DO TW*

Department of Internal Medicine, Oklahoma State University Health Science, USA

***Corresponding author:**

Thomas Wesley Allen DO, MPH, Department of Internal Medicine, Oklahoma State University Health Science, USA, E-mail: allen@twallen.com

Received: 10 Apr 2021

Accepted: 29 Apr 2021

Published: 07 May 2021

Keywords:

Cardiorespiratory; Hypertension; Pheochromocytoma

Citation:

Allen DO TW. Exercise Prescription for Hypertension. Ann Clin Med Case Rep. 2021; V6(13): 1-3.

1. Abstract

The importance of physical exercise in preventing, treating and controlling hypertension has been the subject of enormous attention during the past several decades. Nearly one third of American adults have been diagnosed with high blood pressure and millions more have pre-hypertension. Cardiorespiratory fitness has an important non-pharmacologic role in hypertension treatment and prevention, yet one in three Americans does not engage in leisure-time physical activity.

2. Introduction

As early as 1925 elevated blood pressure was associated with higher mortality [1].

Hypertension is a major risk factor for cardiovascular death in every region of the world [2] and is the most common, costly, but preventable cardiovascular risk factor [3].

The American Heart Association estimates that about 103 million US adults (45.6%) have high blood pressure as defined as equal to or greater than 130/80 mmHg [4]. Another 87 million have prehypertension ≥120-130 systolic and/or diastolic ≥80-<90.

Continuous improvements in cardio-respiratory fitness provide the lowest risk of hypertension [5]. High levels of muscular strength appear to protect hypertensive men against all-cause mortality, and this is in addition to the benefit provided by cardiorespiratory fitness [6].

In 18 years of follow-up of 2,346 men without hypertension initially, both physical activity and CRF were associated with lower risk of developing hypertension [7]. The principal finding of this report is that both higher CRF and participating in sport or walking/jogging/running decrease the risk of developing hypertension in comparison with low fitness or a sedentary lifestyle, respectively. Yet, one in three Americans does not engage in leisure-time physical activity [8].

3. What is Hypertension?

Essential hypertension The most common type, is high blood pressure with no known secondary cause. It is also referred to as primary hypertension to differentiate it from secondary hypertension.

Common causes of **secondary hypertension** include renal parenchymal disease, renovascular disease, primary aldosteronism, and obstructive sleep apnea. Less common causes are hyperthyroidism, hypothyroidism, primary hyprerparathyroidism, hypercortisolism (Cushing's syndrome), pheochromocytoma, acromegaly, and aortic coarctation [9,10].

4. Early Studies and Historical Landmarks

According to Chrysant [11], the term essential hypertension was coined by Eberhard Frank (1911) to describe elevated blood pressure for which no cause could be found. Quoting Frank, "Because in this disease the increase in tone of the small arteries in the whole body (which leads to an increase in blood pressure) is the primary event . . . I will, in the following, name this disease, essential hypertension (Essentielle Hypertonie)."

5. Natural History of Hypertension

Essential hypertension is characterized by an increase in peripheral resistance to blood flow, a result of vascular - structure remodeling accompanied by increasing stiffness or the aorta and large arteries [12].

Arterial blood pressure rises with age. Pickering [13] observed that "in the general population, arterial pressure rises with age".

6. Co-morbidities

Hypertension is associated with several co-morbidities of which the most prevalent are obesity, dyslipidemia, and impaired fasting glucose.

7. Sequellae of Hypertension

As described by Schiffrin [12], hypertensive vascular disease involves both large and small arteries as well as arterioles and is characterized by thickening of the intima and media with luminal narrowing. Moreover, hypertension appears to increase the susceptibility of the small and large arteries to atherosclerosis. Thus, hypertension is a major risk factor for all clinical manifestations of atherosclerosis e.g., heart failure, coronary artery disease, stroke, renal disease and peripheral vascular disease.

According to the CDC [14] coronary artery heart disease accounts for 1 in 7 deaths in the U.S. annually. Further, stroke is a leading cause of long-term disability and accounts for 1 of 19 deaths in the U. S.

CHD can cause LVH and vice versa. With CHD, the heart must work harder to eject blood and may compress the coronary arteries. According to the CDC [14], about 7 of every 10 people having their first heart attack have high blood pressure and 8 of every 10 people having their first stroke have high blood pressure. Further, about seven of those with chronic heart failure have high blood pressure and approximately 50% of deaths are a result of high blood pressure.

8. History of Exercise and Hypertension Research

Ebers papyrus, an Egyptian compilation of medical texts dated about 1550 BC, is one of the oldest known medical works. It was acquired by George Maurice Ebers a German Egyptologist and novelist,

in 1873 [15]. The 110-page scroll contains 700 magical formulas and folk remedies meant to cure afflictions ranging from crocodile bite to toenail pain and to rid the house of such pests as flies, rats, and scorpions. It also includes a surprisingly accurate description of the circulatory system, noting the existence of blood vessels throughout the body and the heart as center of the blood supply.

9. Patient Assessment

The diagnosis of hypertension is commonly made from at least three separate visits where the readings are averaged. Some have suggested readings over five separate visits with average SBP of 140 or greater and the DBP 90 or greater [16]. Ambulatory Home blood pressure is recommended to confirm office-based measurements which may be falsely elevated (white coat hypertension) [17].

10. Categories of Hypertension in Adults [18]

Blood Pressure Category	Systolic BP (mmHg) Diastolic BP (mmHg)
Normal	<120 and <80
Elevated (prehypertension)	120-129 and <80
Hypertension	
Stage 1	130-139 or 89-90
Stage 2	≥ 140 or ≥ 90

11. Evaluation of the hypertensive patient prior to initiating an exercise program

Cardiovascular risk and attendant comorbidities must be assessed to safely begin an exercise program. The presence or absence of target organ damage including peripheral vascular disease and risk factors such as smoking, dyslipidemia, and diabetes must be considered. Since many patients will be found to have comorbidities, a carefully tailored program must be developed for each patient.

12. Exercise Prescription Design

Using the physician prescription approach as a guide for the "dose" of exercises one must consider in most patients beginning an aerobic exercise program the mode, intensity, pattern, duration and frequency of exercise.

Aerobic

12.1. Mode: Exercise that involves large muscle groups (legs, arms, trunk) that is continuous and rhythmic in nature (e.g., brisk walking, jogging, running cycling, swimming, rowing, cross-country skiing, climbing stairs, active dancing).

12.2. Intensity: Moderate and/or vigorous intensity relative to the person's capacity recommended for most healthy adults: 55/65%-90% of HR_{max} (maximum heart rate determined or predicted). Light to moderate-intensity exercise is of benefit in deconditioned or older people. Higher percent effort may be needed in highly fit people to improve cardiorespiratory fitness (CRF).

12.3. Pattern: Exercise may be performed in one (continuous) session per day or in multiple sessions per day of ≥10 min each to accumulate the desired amount of exercise per day. Exercise bouts of ≤10 min may yield favorable adaptations in deconditioned individuals. High-intensity interval training can be effective in adults with good exercise tolerance

12.4. Duration: 30–60 min of continuous or intermittent (10 min bouts) throughout the day with a combination of moderate and vigorous exercise for most active adults. Moderate intensity activity of longer duration is recommended for adults with comorbidities.

12.5. Frequency: A combination of moderate and vigorous exercise on 3–5 d/wk.

12.6. Progression: A gradual progression of exercise volume by adjusting exercise duration, frequency, and/or intensity is reasonable until the desired exercise goal (maintenance) is achieved. Gradual progression may reduce risks of musculoskeletal injury and adverse CVD events.

As supervised aerobic exercise is begun, blood pressure response

should be periodically measured to ascertain the effect during and post-exercise. It is not unusual to observe dramatic increases or decreases in blood pressure measurements – a finding which may require additional cardiovascular evaluation.

12.7. Resistance training: While possibly counter intuitive, resistance (strength) training is recommended as an additional component to aerobic exercise in primary and secondary cardiovascular disease prevention programs. While resistance training does cause and increase in both systolic and diastolic blood pressure while lifting, researchers have reported a decrease in resting blood pressure for up to 10 hours following low-intensity resistance training in hypertensive patients (40% of 1 repetition maximum 3 x20. However, persons with resting blood pressure of 180/110 or higher should not perform resistance training without physician clearance [19].

13. Summary

Hypertension is a major risk factor for death throughout the world. In the United States, approximately 70% of heart attack victims have hypertension. Hypertension has been listed on nearly 50% of death certificates as the primary cause of death. Death rates per 1,000 people are 42% higher in those with high blood pressure compared to those with normal blood pressure according to the NHANES III study [20]. Cardiorespiratory fitness (CRF) is demonstratively associated with prevention and/or control of hypertension. Unfortunately, as noted, fewer than one in three Americans engage in leisure-time physical activity and only 24% of adults fully meet physical activity guidelines for aerobic and muscle strengthening activities according to the CDC [21].

References

1. Kotchen TA. Historical trends and milestones in hypertension research. Hypertensin. 2011; 58: 522-538.
2. Fisher NDL, Curfman G. Hypertension-a public health challenge of global proportions. *JAMA.* 2018; 320(17): 1757-1759.
3. Pescatello LS, Franklin BA, Fagard R, Farquhar WB, Kelley GA, Ray CA. Exercise and hypertension. Position stand. Med Sci Sports Exerc. 2004; 36(3): 533-553.
4. Benjamin EJ, Virani SS, Callaway CW, Chung S, Chiuve SE, et al. Heart disease and stroke statistics - 2018 update: a report from the American Heart Association. Circulation. 2018; 137(12): e67-e492.
5. Sui X, Szrzynski MA, Lee DC, Lavie CJ, Zhang J, Kokkinos PF, et al. Longitudinal patterns of cardiorespiratory fitness predict the development of hypertension among men and women. Am J Med. 2017; 130: 469-476.
6. Artero EG, Lee DC, Ruiz JR, Sui X, Ortega FB, Church TS, et al. A prospective study of muscular strength and all-cause mortality in men with hypertension. J Am Coll Cardiol. 2011; 57:1831-7.
7. Chase NL, Sui X, Lee DC, Blair SN. The association of cardiorespiratory fitness and physical activity with the incidence of hypertension in men. AJH. 2009; 22: 417-424.
8. CDC. https://www.cdc.gov/physicalactivity/data/index.html. 2018.
9. Carretero OA, Oparil S. Essential hypertension part I: definition and etiology. Circulation. 2001; 101: 329-335.
10. Carretero OA, Oparil S. Essential hypertension part II: treatment. Circulation. 2001; 101: 446-453.
11. Chrysant SG. Current status of aggressive blood pressure control. *World J Cardiol.* 2011; 3(3): 65-71.
12. Schiffrin EL. Remodeling of resistance arteries in essential hypertension and the effects of antihypertensive treatment. Am J Hypertens. 2004; 17(12): 1192-1200.
13. Pickering GW. The natural history of hypertension. Brit Med Bull. 1952; 8(4): 305-309.
14. CDC. https://www.cdc.gov/heartdisease/facts.htm (2020)
15. Hallmann-Mikolajczak A. Ebers Papyrus. The book of medical knowledge of the 16th century B.C. Egyptians. Arch Hist Filoz Med. 2004; 67(1): 5-14.
16. Simces ZL, Ross SE, Rabkin SW. Diagnosis of hypertension and lifestyle modifications for its management. BCMJ. 2012; 54(8): 392-398.
17. Piper MA, Evans CV, Burda BU, et al. Screening for High Blood Pressure in Adults: A Systematic Evidence Review for the U.S. Preventive Services Task Force. Evidence synthesis 121**:** Agency for Healthcare Research and Quality (US)**;** Rockville (MD) 2014 Dec.
18. Whelton PK, Carey RM, Aronow WS, Casey DE, Collins KJ, Dennison-Himmelfarb CR, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension*. 2018; *71*(19): e127-e248.
19. Sorace P, Churilla JR, Magyari P. Resistance training for hypertension: Design safe and effective programs. ACSM Health and Fitness Journal. 2012; 16(1): 13-18.
20. Zhou J, Xi B, Zhao M, Wang L, Veeranki SP. Uncontrolled hypertension increases the risk of all-cause and cardiovascular disease mortality in US adults: the NHANES III linked mortality study. Scientific Reports 2018; 8: 1-7.
21. CDC. https://www.cdc.gov/physicalactivity/data/index.html (2018)