Accumulated Physical Activity Improves Arterial Compliance and Pressure Load Indices in Hypertensive African-American Women

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Background: Arterial elasticity and pressure load indices serve as early markers for vascular disease. The presence of hypertension and target organ injury is disproportionately among African-American women compared to Caucasians. Therefore, this ongoing study examines the effects of a prescribed exercise program on arterial elasticity and blood pressure indices in sedentary, untreated, mildly hypertensive African-American women aged 18-45.

Methods: This single-blinded, randomized, parallel-group design in which women (n=5 to date) were randomized to an 8-week intervention program consisting of a physical activity for 10 minutes, 3-times/day, 5-days/week at 50-60% heart rate reserve. Women in the control group (n=7 to date) continued with their usual activities. Large (C1) and small artery (C2) elasticity was measured noninvasively by radial waveform analysis using a modified 2-element Windkessel model. Pressure load (the percentage of daytime measurements >140/90 mmHg and nighttime >120/80 mmHg) was measured by 24-hour ambulatory blood pressure monitoring. Mean changes in arterial compliance and pressure load indices were compared using paired t-tests.

Results: Physical activity increased C1 by 8%, from 11.3 ± 3.3 to 12.2 ± 2.9 mL/mmHg x 10 (p = .038) and C2 increased by 13.8%, from 6.0 ± 2.7 to 6.8 ± 3.3 mL/mmHg x 100, although this did not reach statistical significance. Physical activity also produced greater small reductions in pressure load indices, especially at night. Nighttime diastolic pressure load decreased by 39.8%, from 65.7 ± 15.7 to 39.5 ± 14.1% (p = .021).

Conclusions: Moderate-intensity physical activity provided a beneficial effect on arterial elasticity and pressure load indices in this study. These findings suggest potential benefits from physical activity in hypertension-prone African-American women, particularly given their excess burden of pressure-related complications and the strong correlation between arterial stiffness, pressure load and target organ injury.

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Predictors of Diastolic Hypertension: The Framingham Heart Study


Background: Diastolic hypertension (DH), defined as a diastolic blood pressure (DBP) >90 mmHg, occurs most often with systolic blood pressure (SBP) >140 mm Hg (systolic-diastolic hypertension, SDH) and occasionally with SBP <140 mm Hg (isolated-diastolic hypertension, IDH); however, factors in the development of DH are poorly understood.

Methods: Participants in the Framingham Heart Study were included in this investigation if they underwent 2 biennial examinations in 1963-1967 and were free of antihypertensive therapy and cardiovascular disease. Baseline blood pressure (BP) was the average of those recorded at both biennial examinations. The 10-year incidence of SDH and IDH in each BP category was examined.

Results: Age- and sex-adjusted incidence rates of SDH were 8.5, 25.1, 56.5, 111.4 and 80.1 per 1000-person-years for persons in optimal, normal, high-normal, BP IDH and isolated-diastolic hypertensive (IDSH) groups, respectively. Incidence rates for IDH were 6.8, 17.4, 24.9, 12.3, and 6.3 per 1000-person years for optimal, normal, and high-normal BP SDH and IDH, respectively. Compared with optimal BP, hazard ratios (HR) and 95% CI for developing SDH, after adjusting for age, sex, and other risk factors, were 3.14 (2.44-4.043) for normal, 8.25 (6.42-10.61) for high-normal, 10.76 (8.03-14.43) for IDH, and 18.01 (13.20-24.56) for IDH. 66% of persons with IDH developed SDH during the 10-year follow up. Compared with optimal BP, the HR for IDH was 2.45 (1.86-3.23) for HR and 3.52 (2.63-4.72) for high-normal, 1.57 (1.06-2.31) for IDH, and 0.82 (0.45-1.50) for ISH. In addition to BP, predictors of SDH were high body mass index (BMI) at baseline and weight gain. In addition to BP, predictors of IDH were younger age, male sex, being a non-smoker, lower body mass index at baseline and weight gain.

Conclusions: Normal and high-normal BP (prehypertension) had the highest HR for new onset of IDH. In addition to prehypertension, ISH, and especially IDH had high HRs for the new onset of SDH, which carries increased risk for future cardiovascular disease. Identification of hypertensive persons with lifestyle problems, particularly being overweight, is crucial in preventing the development of DH.

The Effect of Seasonal Variation of Blood Pressure When Analyzing Improvement and Treating Large Groups of Hypertensives Patients

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Background: The VA Computed Medical Record records all Blood Pressures (BP) measurements on both in and out patients. Hypertension was defined by at least 3 or more BP above 140/90 on 3 separate days in 10,476 patients. Methods: We measured % of hypertensives who became normal ≤90/60, the % who remained severe ≥160/100, and the number of hypertensive medication classes. This data was fed back to the individual provider. Results: 1) In 4 years the % patients returning to normal increased from 33% to 56% (p < 0.0001). Patients with BP ≤160/100 fell from 26% to 12% (p < 0.0001). When monthly data is displayed (see graphs), a repetitive pattern is present where the % returning to normal is largest in the summer and reduced in the winter (7.7 ± 7.8% vs. 0.001). Patients with severe elevations were on 2.21 ± 1.17 classes of drugs while those with mild elevations were on 1.86 ± 1.16 (p < 0.001). Diuretics were used by 42% of the patients. Conclusions: Continuous improvement has occurred with data measured by patients, % BP decreased each summer and worsens each winter. True improvement should be determined by comparing data for the same time each year for groups and individuals. Further improvement may occur by the increased use of 3 classes of drugs especially diuretics. Increasing therapy in the winter months might also improve control both for groups and individual patients.