

Blood Pressure Changes in Normotensive Subjects With and Without Family History of Hypertension

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Abstract

Hypertension is the most common disease and it markedly increases both morbidity and mortality from cardiovascular diseases. Subjects in the upper-normal range of arterial pressure are considered to have an excess cardiovascular risk and this risk doubles in a near linear fashion for each 20/10 mm Hg increment in blood pressure levels above 115/75 mm Hg. 50 young normotensives with a positive family history of hypertension and 50 young normotensives with a negative family history of hypertension, matched for age, sex were studied. Baseline blood pressure, heart rate and blood pressure changes post exercise were recorded and compared by Student's *t*-test. The young normotensives with a positive family history of hypertension had significantly higher blood pressure ($P < 0.05$) and also increased resting heart rate ($P < 0.05$) than young normotensives with a negative family history of hypertension. The increased blood pressure and heart rate observed here in the offspring of hypertensive parents emphasizes the importance of genetic influence on hypertension. This blood pressure elevation may be considered as a permanent abnormality characterizing a prehypertensive stage early in life.

Key Words: baseline blood pressure, baseline heart rate, family history, hypertension, exercise

Hypertension is the most common disease and it markedly increases both morbidity and mortality from cardiovascular and many other diseases. Subjects in the upper-normal range of arterial pressure are considered to have an excess cardiovascular risk.¹ The risk of cardiovascular death doubles in a near linear fashion for each 20/10 mm Hg increment in blood pressure levels above 115/75 mm Hg. Although a slightly elevated blood pressure (BP) has been reported in several studies,²⁻⁴ little is known about the resting heart rate (HR) of normotensive subjects with a family history of hypertension. Heightened cardiovascular stress responsivity is associated with cardiovascular disease.⁵ The present study investigates whether disturbances in cardiovascular responsivity were evident in subjects with a family history of cardiovascular disease risk/hypertension. The study included the pattern of blood pressure, heart rate changes and the effect of dynamic/aerobic exercise on blood pressure and heart rate responsivity in normotensive subjects with and without family history of hypertension.

Methods

The study comprised of 50 subjects without family history of hypertension and 50 subjects with family history of hypertension. All subjects were normotensives (bra-

chial blood pressure $< 140/90$ mm Hg and not on drug treatment), nonobese (Body Mass Index < 25 kg/m²), non-smokers and the subjects from both groups were age and sex matched. All subjects in the study satisfied the inclusion and exclusion criteria. Subjects were recruited and examined from the 1st MBBS student population of Sree Siddhartha Medical College, Tumkur during December, 2007 to February, 2008. Subjects were screened for general physical health. A positive family history of hypertension was considered to be present when at least one of the parents was hypertensive. The parents with a positive or negative history of hypertension were identified by evidence of antihypertensive treatment in their medical history/records. All subjects gave written consent to participate in the study. The study was approved by the Institutional Ethical Committee. There was no financial burden on the subjects.

Procedures

After an overnight fast all subjects underwent non-invasive recording of baseline systolic and diastolic blood pressure (BP), heart rate in supine position. Subjects were asked to refrain from strenuous exercise or consumption of alcohol or caffeine-containing beverages for 24 h before the study. They were subjected to dynamic/aerobic exercise (3-5 min spot jogging) and blood pressure recorded immediately, 2 min and 5 min after the exercise. Blood pressure for all subjects was recorded by the same examiner using a standard mercury sphygmomanometer, two readings were taken and the average of these two recordings considered. Heart rate was counted manually aided by a timer for 3 min and averaged for 1 min.

Statistical Analysis

Two tailed independent Student's *t*-test has been used to find the significance of basic characteristics,

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blood pressure changes, heart rate changes between the subjects without family history of hypertension and subjects with family history of hypertension. The Statistical software namely SPSS 11.0 and Systat 8.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate tables.^{6,7}

Results

The study comprised of 50 subjects without family history of hypertension (Group A) and 50 subjects with family history of hypertension (Group B). Basic characteristics, blood pressure and heart rate changes of the two groups at baseline and blood pressure after aerobic exercise were compared.

The basic characteristics did not show significant difference between the two groups ($P>0.05$) (Table 1). The baseline blood pressure (systolic, diastolic) and heart rate show significant difference between the two groups ($P<0.05$) (Table 2). The exercise induced blood pressure changes between the two groups show significant difference ($P<0.05$) (Table 3).

Table 1. Basic characteristics of the two groups

Basic characteristics (Mean ± SD)	Group A (n=50)	Group B (n=50)	P value
Age in years	18.13±0.83	17.76±0.59	0.101
Height in cm	152.71±8.51	153.84±3.18	0.467
Weight in kg	49.0±9.73	52.3±2.81	0.257

Table 2. Comparison of baseline blood pressure and heart rate between the two groups

Parameter (Mean ± SD)	Group A	Group B	P value	
Blood Pressure	Systolic	116.66±4.70	123.38±5.50	0.0008
	Diastolic	74.53±6.43	79.69±5.28	0.0150
Heart Rate	67±3.42	69.07±2.92	0.0495	

Table 3. Comparison of exercise induced blood pressure changes between the two groups

Blood Pressure (Mean ± SD)	Group A	Group B	P value	
Immediately	Systolic	144.0±7.5	150.6±9.0	0.020
	Diastolic	77.3±4.8	80.9±3.3	0.016
After 2 min	Systolic	123.5±7.7	131.1±6.2	0.004
	Diastolic	76.5±3.4	79.7±4.8	0.026
After 5 min	Systolic	122.9±5.9	127.7±6.4	0.026
	Diastolic	76.26±3.69	79.8±4.0	0.010

Discussion

In this study the young normotensives with a positive family history of hypertension had a higher baseline blood pressure and also increased heart rate. Elevated baseline blood pressure in young normotensives with a positive family history of hypertension is similar to earlier findings of elevated blood pressure.^{8,9} There are reports of exaggerated blood pressure responses to exercise⁵ in such subjects. But in this study such findings were not seen, probably contributing to the smaller sample size or the intensity of exercise used in the study.

The effect of vagal stimulation on the cardiac pacemaker cells is to cause hyperpolarisation and reduce the rate of depolarization. Sympathetic stimulation causes chronotropic effects by increasing the rate of pacemaker depolarisation. In young normotensive subjects, parental hypertension is associated with stiffening of the carotid artery and reduction in cardiovagal outflow and baroreflex gain.^{10,11} This dysregulation in the autonomic nervous control of the cardiovascular system associating increased sympathetic and reduced parasympathetic tone plays an important role in coronary artery disease. Studies also support the idea that regular, aerobic physical activity can attenuate the impairment of cardiovagal autonomic function and stiffening of the carotid artery in young subjects with a family history of hypertension.¹²⁻¹⁴ In this study, history of regular exercise by the subjects was not taken into consideration. This is a plausible explanation of the observed post aerobic exercise results. As such regular, physical activity may be an effective lifestyle intervention for minimizing negative effects of a family history of hypertension on autonomic circulatory control.

The increase in blood pressure during rest suggests a true sustained elevated blood pressure, characterizing a permanent abnormality in the prehypertensive stage.¹⁵

Conclusions

The increased blood pressure and heart rate observed here in the offspring of hypertensive parents, in association with previous finding¹⁶ of increased cholesterol and triglyceride levels, emphasize the importance of genetic influence on the prehypertensive phase of hypertension. Improved cardiovagal autonomic function and central arterial elasticity may contribute to the lower incidence of hypertension observed in individuals who exercise regularly.

Limitation

In this study, subjects' family history of hypertension was defined based on the presence of hypertension in only one of the two parents. Considering the complex genetic background of essential hypertension, this definition of family history of hypertension is an apparent simplification. Also considering the history of regular exercise in a larger sample might give better validated results.

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