Abstract

Aim: To detect echocardiographic abnormalities in persons without cardiovascular risk factors and BP of 120/80 mm Hg or less.

Method: Detailed echocardiographic evaluation was done in 65 persons fulfilling above mentioned criteria.

Results: Nearly 50% persons had cardiac remodeling and/or diastolic dysfunction. Pulmonary vein flow systolic velocity/diastolic velocity had significant negative correlation with systemic diastolic BP (P < .002) and mean arterial pressure (P < .05).

Conclusion: Some persons with BP of 120/80 mm Hg or less and not having conventional cardiovascular risk factors have subclinical LV remodeling and/or evidence of diastolic dysfunction. These findings could be for e-runner of established cardiovascular risk factors and should be evaluated periodically.

Introduction

JNC-7 has defined BP less than 120/80 mm of Hg as normal. BP between 120-139/80-89 has been classified as prehypertension. Pre-hypertension is associated with increased cardiovascular risk. We performed detailed echocardiographic study of persons not having any cardiovascular risk factor and clinic BP of 120/80 mm Hg or less.

Material and Methods

Inclusion criteria: Asymptomatic, no drug therapy, not performing isometric exercise, no family history of hypertension, diabetes or premature coronary artery disease, non smoker, age 20-40 years, normal clinical examination, BMI 25 or less, BP ≤ 120/80 mm Hg, normal electrocardiogram, sinus rhythm, no intraventricular conduction defect, negative treadmill stress test at target heart rate, 2 hr post prandrial blood sugar <120mg%, normal lipid profile and normal routine echocardiogram. Clinic BP measurement was done as per JNC-7 guideline. 65 persons qualified. Detailed M-Mode, 2-Dimensional, pulsed Doppler and tissue Doppler evaluation was performed according to standard recommendations.

Statistics

Data are presented as mean ± SD. Comparison was done by “unpaired ’t-test. Linear correlations were determined by “Karl Pearson’s” direct method. P< 0.05 was considered as significant.

Results

They are shown in Table 1. Nearly 20% of persons had echocardiographic evidence of concentric remodeling or concentric LVH. Nearly 60% patients had abnormality in one or more echocardiographic parameters of diastolic function. Incidence of individual diastolic function abnormality in decreasing order was PV flow D>S, Vp <450cm/sec, DTI-MMA-ea/Aa <1, IVRT >100 m sec, MPI >0.6, IVRT of Medial mitral annulus >0.6, Medial mitral annulus >100m sec.

We further analyzed our data to find if an individual...
diabetes mellitus, smoking, and obesity. Prehypertension, Further most of the previous studies have included persons with hypertension. Diastolic) and diastolic and mean systemic arterial blood correlation between pulmonary vein flow ratio (Systolic/ Diastolic) and diastolic and mean systemic arterial blood pressure. echocardiographic abnormality had any relation with any demographic variable. There was significant negative linear correlation between pulmonary vein flow ratio (Systolic/ Diastolic) and diastolic and mean systemic arterial blood pressure.

DBP v/s PV S/D ratio- \( r = -0.3562, t = -2.4407, P < 0.02 \) (Figure 1)

MAP v/s PV S/D ratio- \( r = -0.3212, t = -2.1716, P < 0.05 \) (Figure 2)

**Fig. 2:** Showing significant negative correlation between MAP and pulmonary vein flow S/D ratio.

Discussion

This study makes few important observations. Firstly nearly 50% of persons with BP of 120/80 or less and no other commonly considered cardiovascular risk factors, have LV remodeling or abnormalities of 3 or more diastolic function parameters. Secondly, in these “normal” persons, abnormalities in diastolic function parameters have significant relation with DBP and MAP.

All previous studies on “normals” have included persons with BP of 140/90 mm Hg or less. Thus they included “prehypertensives” as defined by JNC-7. Further most of the previous studies have included persons with diabetes mellitus, smoking, and obesity. Prehypertension, diabetes, obesity and smoking have independent effect on left ventricular function. Therefore these studies do not represent truly normal population. We could not find any study on “normal persons” which has excluded pre-hypertension, smoking, diabetes and obesity and all other cardiovascular risk factors.

Our study shows that some persons with BP of 120/80 mm Hg or less also develop abnormal cardiac remodeling and/or diastolic dysfunction of LV. Reason for cardiac remodeling and diastolic dysfunction in these persons with truly “normal” BP and no other cardiovascular risk factors is not clear. We found significant correlation of diastolic function abnormalities with DBP and MAP. Changes at cellular or interstitial level could be responsible for diastolic function abnormalities even in absence of clear cardiac remodeling. A meta analysis of prospective studies has revealed continuous positive relationship between the risk of vascular events with systolic and diastolic BP down to values as low as 115/75 mm of Hg. In patients with established coronary artery disease, a continuous relationship has been shown between systolic BP and rate of progression of coronary atherosclerosis being as low as SBP of 100 mmHg. Previous studies in hypertensives have also shown correlation of diastolic and mean pressure with cardiovascular risk.

Thus it is clear that BP of 120/80 mm of Hg or less may also not be truly “normal” from cardiovascular risk evaluation point in some sub group of apparently “normal” persons. It is possible that these persons have inherent cardiovascular risk factors which may become manifest in years to come. 5% of persons with BP of <120/80 develop hypertension over next four years. Similarly some of these persons could be prediabetics. Large number of persons with documented atherosclerosis do not have established conventional or unconventional risk factors.

They could have some yet unexplored risk factors. Concentric remodeling with normal LV mass has been shown to be an independent predictor of increased cardiovascular risk in hypertensives. It therefore, appears justified that persons without cardiovascular risk factors but having echocardiographic abnormalities should have periodic re-evaluation. It is not clear if isolated presence of these echocardiographic abnormalities could help in decision regarding lowering threshold for pharmacotherapy in selected subgroup of persons. Pharmacotherapy of prehypertensive persons and genetically predisposed rats have been shown to delay onset of hypertension. However, long term follow up study of such normal persons with isolated echocardiographic abnormalities is needed to find clinical implications of our observations.

**Conclusion**

Echocardiography with special attention to cardiac remodeling and diastolic functions should be considered an important part of cardiovascular risk assessment even in absence of other cardiovascular risk factors. Those with echocardiographic abnormalities should be followed regularly for any new appearance of cardiovascular risk factors.

**Acknowledgments**

- Mokshda Singariya, Yasin Chouhan, Gayatri Anand, Nazeen Khan technician of the department.
- Varun Choudhary for statistical analysis.

**Conflict of interest** : Nil

**Abbreviations**: RWT- Relative wall thickness, LVM- LV Mass index, MV- Mitral valve, E deact- E wave deacceleration time, E- Mitral flow E wave velocity, D- Diastolic velocity, PV- pulmonary vein, Vp- velocity of propagation of mitral flow on colour M-Mode, DTI- Doppler tissue imaging, MMA-Medial Mitral annulus, LMA- Lateral Mitral annulus, Ea- Early relaxation velocity, Aa- Late relaxation velocity, IVRT- Isovolumic relaxation time, MPI-Myocardial performance index.

**References**

4. Quinones MA, Otto CM, Stoddard M, Waggoner A, Zoghbi WA. Recommendations for quantification of Doppler echocardiography: A report from the Doppler quantification task force of the


