Original Article

A prospective study of various anti hypertensive drugs on reversal of left ventricular hypertrophy in hypertensive Bangladeshi population

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Abstract

Regression of ventricular hypertrophy is the restoration of normal ventricular structure and physiology after the hypertrophy has developed. It has been clearly demonstrated that once left ventricular hypertrophy (LVH) is diagnosed, it represents a strong blood pressure independent risk factor for cardiovascular morbidity and mortality. This prospective observational study was carried out in Department of Cardiology, BSMMU, Dhaka to compare the effectiveness of different anti-hypertensive agents in reducing left ventricular hypertrophy (LVH) in hypertensive Bangladeshi population involving 95 patients with clinically diagnosed hypertension. The duration of study was from July 2005 to Tune 2008. Out of these 95 patients, 20 were included in beta-blocker(BB) group, 14 in angiotensin converting enzyme inhibitor(ACEi) group, 20 in beta-blocker(BB) + diuretic(DD) group, 14 in angiotensin converting enzyme inhibitor(ACEi) + diuretics(DD) group, 13 in beta-blocker(BB) and angiotensin enzyme inhibitor(ACEi) group and 14 in beta-blocker(BB) + angiotensin converting enzyme inhibitor(ACEi) + diuretic(DD) group. patients were followed-up at 8 weeks, 6 months, 1 year and at 2 years. A baseline M-mode echocardiography was done to document LVH. Among three groups of anti-hypertensive drugs, angiotensin converting enzyme inhibitor alone has been found to be most effective as compared to beta blockers when used alone than in combination groups (Beta blocker plus ACEi plus Diuretics or Beta blocker plus ACEi). Although, statistically not significant, a clear benefit has been shown in all groups in terms of LVH regression.

Key words: Hypertension, left ventricular hypertrophy, anti- hypertensive drugs.

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Introduction

Ventricular hypertrophy is defined as thickening of the left ventricular myocardium due to an adaptive process in response to increase ventricular wall stress due to pressure overload, volume overload or in hypertrophic cardiomyopathy.[1]

Regression of ventricular hypertrophy is the restoration of normal ventricular structure and physiology after the hypertrophy has developed. It has been clearly demonstrated that once left ventricular hypertrophy is diagnosed, it represents a strong blood pressure independent risk factor for cardiovascular morbidity and mortality. Increased LV mass has been shown to be an independent predictor of cardiovascular morbidity and mortality.[1-2]

More than 1000 experimental and clinical studies on regression of myocardial hypertrophy have been published during the last three decades, but no definitive conclusions have emerged from the literature. In a database of 50 studies with a double-blind, randomized, controlled clinical trial comprising a total of 1715 patients with essential hypertension, 165 patients were randomized to a placebo and 1550 subjects to one of the four hypertensive drug classes. After weighing for difference in patients number LV mass was reduced to 12% for ACEi [3,4], 11% for calcium channel blockers[5], 5% for beta –blockers[6] and 8% for diuretics[7]. However, a recent study has shown better regression of LVH with diuretics Indapamide than ACEi.[3]

The long-term effect of anti-hypertensive on echocardiography proven LVH was prospectively investigated in an unblinded, non-randomized trial over 5 years of treatment(27/28).

In 82% of all patients included in trial, almost complete regression of LVH was achieved. A variety of anti-hypertensive agents has been used in the trial prohibiting any further comparison between the anti-hypertensive agents. The question therefore remains of whether the greater ability of reducing LV mass by different anti-hypertensive agents correlate well with the combined end points of long-term morbidity and mortality of hypertension with left ventricular hypertrophy.

Moreover, most of these studies have been done in western world in mainly Caucasians and black population. Scientific data on regression of left ventricular hypertrophy with intensive blood pressure control by various anti-hypertensive therapies and their effect on LV mass with long-term effects on morbidity and mortality in South Asian population are very scanty. It is particularly relevant to investigate this as we are aware that hypertension, obesity, diabetes and coronary artery disease have been found to interact with each other and found to be more prevalent in this region possibly due to increased insulin resistance, dietary habits, genetic factors, raised homocystine and other emerging risk factors in a changing socio-economic scenario in this region.

Methods

This prospective observational study was carried out to detect the regression of left ventricular hypertrophy in hypertensive Bangladeshi population using high resolution M-mode echocardiography. The duration of study was from July 2005 to Tune 2008. Hypertensive patients attending department of Cardiology at BSMMU were screened by predefined inclusion and exclusion criteria.

A total of 110 patients with clinically diagnosed hypertension were included in this study but later 15 patients failed to attend clinic for subsequent follow up. Therefore, these patients were not included in this study. Hence, total number of patient was 95.

Out of these 95 patients, 20 were included in beta-blocker (BB) group, 14 in angiotensin converting enzyme inhibitor (ACEi) group, 20 in beta-blocker(BB) + diuretic(DD) group, 14 in angiotensin converting enzyme inhibitor (ACEi) + diuretics (DD) group, 13 in beta- blocker(BB) and angiotensin enzyme inhibitor (ACEi) group and 14 in beta-blocker (BB) + angiotensin converting enzyme inhibitor (ACEi) + diuretic(DD) group.

Patients were followed-up at 8 weeks, 6 months, 1 year and 2 years after starting treatment. A baseline M-mode echocardiography was done to document LVH. During this follow up, we have measured IVSd, PWd, LVIDd and LVIDs and statistically analyzed SD and P-value for each group by using SPSS software.

The study was funded by University Grants Commission of Bangladesh and undertaken by Department of Cardiology, BSMMU. Written informed consent was taken from each patient. Study protocol was approved by the institutional review board of BSMMU. Data were statistically analyzed by using SPSS software. All descriptive data are expressed as mean ± SD.

Results

A total of 110 patients with clinically diagnosed hypertension were included in this study but later 15 patients were lost to follow-up. Therefore, these patients were not included in this study. Hence, results results were prepared for 95 patients. Mean age (±SD) of these patients were 42 ± 5 and male-female ratio was 8.5:1.5.

Among three groups of anti-hypertensive drugs, angiotensin converting enzyme inhibitor(ACEi) alone has been found to be most effective as compared to Beta blockers when used alone than in combination groups (Beta blocker plus ACEi plus Diuretics or Beta blocker plus ACEi). (Table-I, Table-II & Table-III) Although, these figure was not found statistically significant a clear benefit has been shown in all groups in terms of LVH regression.

Table-I: Regression of LVH by BB and ACEI groups.

Echo measurements	Beta blocker (BB) (Mean ±SD) (n=20)		ACE inhibitor(ACEI) (Mean ±SD) (n=14)	
	Before	After 6m	Before	After 6m
IVSd	13.00±0.82	12.00±0.71	13.33±1.03	12.55±0.91
PWd	13.00±0.82	11.83±0.57	13.33±1.03	12.58±0.80
LVIDd	37.50±5.06	39.75±6.85	45.33±2.65	46.00±2.97
LVIDs	21.00±3.55	23.00±4.32	29.50±3.51	29.33±3.27

P value between Betablocker and ACEi group for LVH regression was 0.59.

Table-II: Regression of LVH by BB+ diuretic and ACEI+ diuretic groups.

Echo measurements	BB+Diuretic (Mean ±SD) (n=20)		ACEI +Diuretic (Mean ±SD) (n=14)	
	Before	After	Before	After
IVSd	13.50±0.71	12.75±0.35	13.67±1.15	12.00±0.00
PWd	13.50±0.71	12.90±0.14	13.33±0.58	11.83±0.29
LVIDd	47.50±0.71	49.00±0.00	47.67±5.51	50.33±4.93
LVIDs	25.50±3.54	26.00±1.41	34.33±9.45	32.00±9.54

P value between BB plus DD group and ACEi plus DD for LVH regression was 0.85.

Table-III: Regression of LVH by (BB+ACEI) and (BB+ACEI+ diuretic) groups.

Echo measurements:	BB+ACEI group (Mean±SD) (n=13)		BB+ACEI+diuretic group (Mean±SD) (n=14)	
	Before	After	Before	After
IVSd	15.00±3.61	13.67±3.06	14.33±1.53	12.83±0.76
PWd	15.67±2.08	14.33±2.31	13.33±0.58	12.60±0.79
LVIDd	49.00±11.53	48.00±10.82	39.67±4.04	43.33±4.16
LVIDs	34.67±15.57	35.00±15.00	27.00±2.00	29.33±2.52

P value between BB plus ACEi group and BB plus ACEi plus DD for LVH regression was 0.79

Discussion

One "strict" meta-analysis, including only double-blind, randomized, controlled clinical studies with parallel-group design (39 trials) found that more LVH regression occurred with greater blood pressure reduction and a longer duration of therapy.[8] Specifically, LVH regression occurred in 13% of patients treated with the ACE inhibitors, 9% treated with calcium channel blockers, 6% treated with β-blockers, and 7% treated with diuretics, suggesting that overall, the ACE inhibitors were probably the best drugs for LVH regression.[8] This study has proved and is consistent with all previous randomized trial which showed ACEi as the most effective anti hypertensive agent for LVH regression when used alone. Comparison of Beta blocker alone and ACEi alone group for LVH regression showed a P value of 0.59. Although this figure did not show a statistically significant value if we increase number of patients in both group we would expect a statistically significant P value in favour of ACEi. BB plus diuretics was compared with ACEi plus Diuretics which showed P value of 0.85.We also compared BB plus ACEi group with BB plus ACEi plus DD for LVH regression which showed a P value of 0.79. Although, these was not statistically significant a clear benefit has been shown in all groups in terms of LVH regression. If the power or size is increased a statistically significant value of LVH regression value may be observed in all these groups. Among three groups of anti-hypertensive drugs, angiotensin converting enzyme inhibitor(ACEi) alone has been found to be most effective as compared to Beta blockers when used alone than in combination groups with (Beta blocker plus ACEi plus Diuretics or Beta blocker plus ACEi).

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