

## A STUDY OF LEFT VENTRICULAR DIASTOLIC DYSFUNCTION IN HYPERTENSION

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**ABSTRACT: INTRTODUCTION:** Hypertension is one of the major non communicable disease among the adult population. Hypertension is the leading cause of morbidity and mortality in both developed and developing countries. Hypertension is the leading cause of ischemic heart disease, heart failure and stroke.<sup>(1)</sup> In spite of having target organ damage, hypertension remains asymptomatic in majority of population. Diastolic dysfunction and left ventricular hypertrophy are the early evidence of hypertensive heart disease, both of which may remain silent.<sup>(2)</sup> Heart failure is a common and often lethal complication of chronic hypertension. Based on extensive research, it has become possible to focus on individual factors that cause or contribute to the syndrome of chronic heart failure.

**OBJECTIVE:** Main objective of the study of to find out the incidence of left ventricular diastolic dysfunction. **METERIALS AND METHODS:** All hypertensive patient with systolic blood pressure of more than 140 and or diastolic blood pressure of more than 90 are included in the study. Data was collected from history, clinical examination, ECG, Echo. Coronary angiogram was done in few patients to rule out ischemic heart disease. LV dimensions were obtained by M-mode echo from apical and parasternal windows. Diastolic dysfunction was measured by Doppler echo. **RESULTS:** 85 patients were considered for the study. 62 patients had diastolic dysfunction, 40 patients had LVH. Of the 62 patients, 28 had isolated diastolic dysfunction and 34 patients had both systolic and diastolic dysfunction. Ejection fraction was ranging from 50-77%. Early peak velocity ranged from 40cms/sec to 120cms/sec with a mean of 71. 21+/-16. 81cms/sec in patients with diastolic dysfunction, late atrial velocity ranged from 50cms/sec to 150cms/sec with a mean of 102. 66cmd/sec +/- 19. 13cms/sec. E/A ratio ranged from 0. 41 to 1. 8 with a mean of 0. 69+/-0. 14. **CONCLUSION:** Since in the introduction of non-invasive methods such as radionuclide ventriculogram and doppler echocardiography, these techniques have become the modalities of choice for the assessment of left ventricular diastolic dysfunction. These have advantages of ease of performance repeatability<sup>(4,5,6,7,8)</sup> It was concluded from the study that incidence of diastolic dysfunction is 72%. 32% had isolated Diastolic dysfunction and the rest had LVH along with diastolic dysfunction. LV diastolic dysfunction can manifest both as backward failure and forward failure. Diastolic dysfunction correlated well with the severity of diastolic blood pressure as well as with the duration of hypertension. Doppler echocardiography is an easily available non-invasive technique today, can utilized for early detection of LV diastolic dysfunction. Early detection and more aggressive management of hypertension prevents the long term complications.

**KEYWORDS:** Hypertension, Left ventricle, Diastolic, Dysfunction, Hypertrophy.

**INTRODUCTION:** Hypertension is one of the major non communicable disease among the adult population throughout the world. Nearly 50% of population above 60 years suffer from this. Hypertension is the leading cause of morbidity and mortality in both developed and developing

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countries. Hyper tension is the leading cause of ischemic heart disease, heart failure and stroke. In spite of having target organ damage, hypertension remains asymptomatic in majority of population.<sup>(1)</sup> Traditionally left ventricular function in hypertension has been examined in terms of pumping ability of the heart and its systolic function. However Diastolic dysfunction and left ventricular hypertrophy are the early evidence of hypertensive heart disease, both of which may remain silent.<sup>(2,)</sup> Heart failure is a common and often lethal complication of chronic hypertension.

Based on extensive research, it has become possible to focus on individual factors that cause or contribute to the syndrome of chronic heart failure. These factors include the effects of ischemia, hypertrophic changes in peripheral circulation, alteration in the reflex and neuro hormonal function, Interdependent function of right and left ventricles. Left ventricular diastolic dysfunction is the most important contributory factor to the development of chronic heart failure in hypertensive patients, appearance of left ventricular hypertrophy may be ominous sign of presaying the evaluation of chronic heart failure.<sup>(3)</sup>

**OBJECTIVES:** Main objective of the study of to find out the incidence of left ventricular diastolic dysfunction.

**MATERIALS AND METHODS:** All hypertensive patient with systolic blood pressure of more than 140 and or diastolic blood pressure of more than 90 are included in the study. Patients with secondary hypertension, gross heart failure, valvular lesions, diabetes and ischemic heart disease were excluded from the study. Data was collected from history, clinical examination, ECG, Echo.

Coronary angiogram was done in few patients to rule out ischemic heart disease. LV dimensions were obtained by M-mode echo from apical and parasternal windows. Diastolic dysfunction was measured by Doppler echo. Flow velocities across the mitral valve gives ventricular diastolic dysfunction. Early filling (E) and atrial contraction (A) are velocities measured. E/A ratio was calculated by dividing peak early velocity with late ventricular velocity. LV mass index and relative wall thickness were calculated using Pen's formula.

**OBSERVATIONS:** Initially 515 hypertensive patients were considered. Out of these 194 were with Diabetes, 129 were with proven IHD, 48 had secondary hypertension, 49 had valvular lesions and 10 had gross CCF and hence they were excluded from the study. Remaining 85 patients were considered

For the study. The patient's age ranged from 30 years to 75 years with mean age of 54. 42. Of the 60 were male and 25 were females. Duration of symptoms ranged from 1 day to 4 years. 41 were asymptomatic, 10 had exertional dyspnea, 5 had fatigue and 31 patients had chest pain. Out of 41 patients, only 4 had clinically detectable cardiomegaly and 3 had clinical evidence of diastolic dysfunction. The patients average blood pressure was 155mmhg systolic 94. 8mmhg of diastolic.

The range was 140/90 to 210/120. Duration of hypertension ranged from 1 month to 20 years and there were 12 new cases.

62 patients had diastolic dysfunction, 40 patients had LVH. Left ventricular end diastolic dimension.

In patients with LVH and without LVH are 4. 23+/-0. 48cms and 3. 75+/-0. 67cms respectively. Of the 62 patients, 28 had isolated diastolic dysfunction and 34 patients had both

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systolic and diastolic dysfunction. Ejection fraction was ranging from 50-77%. Early peak velocity ranged from 40cms/sec to 120cms/sec with a mean of 71. 21+/-16. 81cms/sec in patients with diastolic dysfunction, late atrial velocity ranged from 50cms/sec to 150cms/sec with a mean of 102. 66cmd/sec+/-19. 13cms/sec. E/Aratio ranged from 0. 41 to 1. 8 with a mean of 0. 69+/-0. 14. Table 1

**DISCUSSION:** Since in the introduction of non-invasive methods such as radionuclide ventriculogram and doppler echocardiography, these techniques have become the modalities of choice for the Assessment of left ventricular diastolic dysfunction. These have advantages of ease of performance and repeatability.<sup>(4,5,6,7,8)</sup>

10patients had exertional breathlessness in the range of grade II to grade III, all these had normal systolic dysfunction. Normally presence of exertional dyspnea implies poor systolic function. Presence of exertional dyspnea with normal systolic function could be explained by diastolic dysfunction. Arise in the LV filling pressure due to diastolic dysfunction increases the left atrial pressure and this in turn get transmitted to the pulmonary circulation causing congested state and the symptoms of dyspnea.<sup>(9)</sup> 5 patients had easy fatigability and it usually indicate reduced cardiac Output. Depression of systolic contractile state may results in clinical manifestation on limited cardiac output. Regardless of the systolic contractile state, the heart can pump only the blood itreceives. Thus diastolic filling of LV is primary determinant of cardiac output. In the presence of LV diastolic dysfunction, left ventricular filling is impaired and hence a decreased cardiac output.<sup>(10)</sup> In the present study all patients with easy fatigability had normal systolic function. Therefore left ventricular diastolic dysfunction can thus cause symptoms of both backward failure (dyspnea) as well as forward failure (easy fatigability).

In the current study incidence of LV diastolic dysfunction is 72%. Incidence of isolated diastolic dysfunction is 32. 9% (by Echocardiography). According to the published literature, the incidence of diastolic dysfunction is varies and is said to account for 13-74% of all hospitalized patients.<sup>(9)</sup> Isao Inouye et al<sup>(11)</sup> conducted a study to assess the prevalence and significance of diastolic dysfunction in mild to moderate hypertension. It was found that the prevalence was 85%.

The incidence of LV diastolic dysfunction is directly proportional to the levels of diastolic blood pressure LV mass is directly proportional to the systolic blood pressure.<sup>(12)</sup> Incidence of LV diastolic dysfunction increased with the increase in diastolic blood pressure from 67.9% in mild diastolic hypertension to 100% in severe diastolic hypertension. These values are clinically significant but statistically not as P value is more than 0. 05. It was concluded from the study that incidence of diastolic dysfunction is 72%. 32% had isolated diastolic dysfunction and the rest had LVH along with diastolic dysfunction. LV diastolic dysfunction can manifest both as backward failure and forward failure. Diastolic dysfunction correlated well with the severity of diastolic blood pressure as well as with the duration of hypertension. Doppler echocardiography is an easily available non-invasive technique today, can utilized for early detection of LV diastolic dysfunction.<sup>(9)</sup> Early detection and more aggressive management of hypertension prevents the long term complications.

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Fig. 1

Table showing LV Diastolic filling indices in hypertension

Sl No.	Particulars	Patients with diastolic dysfunction	Patients without diastolic dysfunction
1.	Ejection fraction in percentage	64.13 + 6.09	65.91 + 6.49
2.	End diastolic volume in ml	79.81 + 20.91	70.56 + 9.92
3.	End systolic volume in ml	27.98 + 5.69	25.26 + 7.53
4.	Peak early velocity in cms/sec.	71.21 + 16.81	93.04 + 13.63
5.	Late atrial velocity in cms/sec.	102.66 + 19.13	64.35 + 11.21
6.	E/A ratio	0.69 + 0.14	1.5 + 0.22
7.	Peak filling rate in ml/sec	302.24 + 65.58	380.43 + 50.49

TABLE 1

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