

Original article:

Assessment of left ventricular diastolic dysfunction by Doppler Echocardiography in patients of diabetes mellitus

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Abstract:

Introduction: Diabetes is associated with increased cardiovascular complications, the most common of which are ischemic cardiomyopathy and left ventricular (LV) dysfunction.

Material and methods: 100 patients of Diabetes Mellitus (Both type 1 and type 2) presenting to Padmashree Dr. D. Y. Patil Hospital and Research centre, Pimpri, Pune-18 were selected. 50 age and sex matched healthy non-diabetic controls were taken from friends and relatives of the patient.

Results: Out of 100 diabetic patients 79% had evidence of left ventricular diastolic dysfunction on Doppler echocardiography, while 18% of the controls showed abnormal diastolic parameters.

Conclusion: According to this study the incidence of LV diastolic dysfunction was more in hypertensive diabetics and in diabetics with CAD.

Keywords: Cardiovascular disorders , diabetes mellitus

Introduction:

The Framingham Heart study has shown that the incidence of congestive cardiac failure in diabetic patients occurs irrespective of coronary artery disease or hypertension. In overt heart failure, diastolic dysfunction often co-exists with systolic dysfunction as a consequence of ischemic heart disease, but diastolic dysfunction is frequently reported in diabetes mellitus without signs and symptoms of heart disease and is possibly due to diabetic cardiomyopathy.^{1,2} With this background present study was planned to study the cardiovascular involvement in patients of diabetes mellitus.

Material and methods:

100 patients of Diabetes Mellitus (Both type 1 and type 2) presenting to Padmashree Dr. D. Y. Patil Hospital and Research centre, Pimpri, Pune-18 were selected. 50 age and sex matched healthy non-diabetic controls were taken from friends and relatives of the patient.

Inclusion criteria:

Diabetic Group:

- 1) Newly diagnosed patients of Diabetes mellitus when their-
Random Capillary Blood Glucose > 200 mg/dl
- 2) Known cases of diabetes mellitus on treatment.
- 3) Isolated diabetic patients and diabetics with other co-morbid conditions like HTN, IHD, CAD.

Controls:

Age and sex matched healthy non diabetic controls from family and friends of patients were included after written and informed consent.

Exclusion criteria:

Patients and controls with age less than 18 years.

Results:

Table 1 : Incidence of left ventricular diastolic dysfunction in both diabetic and control groups

Incidence	Diabetics	Controls	Total
LVDD	79%	9 (18%)	88
Without LVDD	21%	41 (82%)	62
Total Patients	100	50	150

[Odds ratio= 17.14, (95% CI= 6.78 to 45.10); Chi Square= 50, df= 1, p < 0.001.]

Out of 100 diabetic patients 79% had evidence of left ventricular diastolic dysfunction on Doppler echocardiography, while 18% of the controls showed abnormal diastolic parameters. Twenty one diabetics out of 100 and 41 controls out of 50 did not have LVDD. This study found diabetics more prone for LVDD which is statistically significant.

Table 2 : Grading of LIDD patients with DM and controls

Grading	Cases	Control
Gradel	50 (63%)	9 (18%)
Grade II	12 (15%)	0
Grade ID	9 (12%)	0
Grade IV	8 (10%)	0
Total	79	9

Among 79 diabetic patients having left ventricular diastolic dysfunction, 63% had abnormal relaxation (Grade I diastolic dysfunction), 15% had pseudonormalization (Grade II diastolic dysfunction), 12% had reversible restrictive pattern (Grade III diastolidysfunction) and 10% had irreversible restrictive pattern (Grade IV diastolic dysfunction).

9 out of 50 controls had LVDD, amongst them 100% had Grade I dysfunction. However almost all the controls were above the age of 60 years, which again suggest the role of age in the incidence of LVDD in normal individuals. Our Findings in diabetics and controls suggest Grade I (abnormal relaxation) to be the predominant pattern of LVDD.

Discussion:

Among isolated diabetic patients 37 (77%) had evidence of LV diastolic dysfunction. Thirty out of 38 (79%) patients with diabetes and hypertension together had LVDD while 100% diabetic patients with coronary artery disease had evidence of LV diastolic dysfunction on Doppler echocardiography. According to this study the incidence of LV diastolic dysfunction was more in hypertensive diabetics and in diabetics with CAD.

However, as 77% isolated diabetic patients showed evidence of LVDD the difference was not significant ($p=0.92$). This could be because of small sample size.

Antonio Nicolino, Giancarlo Longobardi et al (1995) investigated left ventricular diastolic filling by Doppler echocardiography in 84 diabetic patients without evidence of heart disease and in 84 normotensive nondiabetic age- and sex-matched control subjects. Diabetic patients were subdivided into two groups on the basis of the presence of arterial hypertension.³ Group 1 comprised 41 normotensive diabetic patients (19 men, 22 women, mean age 63.7 ± 9.1 years); Group 2 comprised 43 hypertensive diabetics (15 men, 28 women, mean age 65.6 ± 9.6 years). Doppler measures of diastolic filling were significantly altered in the two groups as compared with control subjects. Thirteen patients in Group 1 (32%) and 17 in Group 2 (40%) had evidence of diastolic dysfunction assessed by the presence of at least two independent abnormal indices (outside age-corrected 95% confidence interval).

Another study done by Silvio Ramano et al (2010) showed a prevalence of asymptomatic diastolic dysfunction of roughly 38% in isolated cases of diabetes mellitus.⁴ They also found that the presence of hypertension along with left ventricular hypertrophy increased the prevalence of LVDD up to 61% versus 38% seen in isolated diabetic cases ($p = 0.040$). This result was confirmed by binary logistic regression ($OR=2.6$, 95%CI = 1.1-6.5, $p = 0.044$), corroborating that combination of DM and HTN has more severe impact on ventricular filling pattern. However, the diastolic function was also impaired in 42% diabetic patients without HTN, similar either in presence of HTN ($p = 0.819$). They performed two-dimensional echocardiography in 708 subjects to assess the independent and combined effects of diabetes and hypertension on LV diastolic dysfunction in a community based cohort. The population was divided into four groups: those without hypertension or diabetes (HT-/DM-), those with only hypertension (HT), only diabetes (DM), and with hypertension plus diabetes (HT+DM).⁵

Conclusion:

According to this study the incidence of LV diastolic dysfunction was more in hypertensive diabetics and in diabetics with CAD.

References:

1. Hamby RI, Zonerich S, Sherman L. Diabetic cardiomyopathy JAMA, 1974; 729:1749-54.
2. Grundy SM, Benjamin EJ, Burke GL, et al. Diabetes and cardiovascular disease: a statement for healthcare professionals from the American Heart Association. Circulation 1999; 100: 1134-46.
3. Bmbaker PH, Joo KC, Stewart KP, et al. Chronotropic incompetence and its contribution to exercise intolerance in older heart failure patients. J Cardiopulm Rehabil 2006; 26: 86.
4. Choudhury L, Gheorghide M, Bonow RO. Coronary artery disease in patients with heart failure and preserved systolic function. Am J Cardiol 2002; 89: 719.
5. Tsang TS, Gersh BJ, Appleton CP, et al. Left ventricular diastolic dysfunction as a predictor of the first diagnosed nonvalvular atrial fibrillation in 840 elderly men and women. J Am Coll Cardiol 2002; 40: 1636.