

CORRELATION OF FUNCTIONAL CLASS OF DYSPNEA WITH LEFT VENTRICULAR DIASTOLIC DYSFUNCTION

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Contribution

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To correlate functional class of dyspnea with left ventricular diastolic dysfunction assessed by echocardiography.

Methodology: This was a single center descriptive study, conducted in Cardiology department Lady Reading Hospital Peshawar from March 2011 to October 2011. All male and female patients of any age with clinical diagnosis of heart failure with sinus rhythm and no to minimal mitral regurgitation were included in the study, using consecutive non-probability sampling technique. Six minute walk test was performed to place the patients in proper NYHA Class of dyspnea. Detailed echocardiographic study was performed to document left ventricular diastolic dysfunction. The data was analyzed on SPSS version 16. Spearman rank correlation coefficient was used to measure the strength of association between pairs of variables. P-value \leq 0.05 was considered significant.

Results: A total of 113 patients were included. Mean age was 58.42 ± 10.48 (35–80). Male patients were 61.9% and 38.1% were female. Most of the patients were in NYHA Class II (34.5%) and Class III (37.2%). There was not a single patient who had normal diastolic relaxation pattern and majority of the patients had pseudonormal pattern of left ventricular diastolic dysfunction (60.2%) followed by restrictive pattern, i-e; 34.5%. Mean values of Mitral inflow velocities were; E velocity 0.6 m/sec, A velocity 0.6 m/sec, E/A 1.3. It was found that with increasing dyspnea, left ventricular diastolic function was also declining (γ : -0.204, $p=0.025$).

Conclusion: In patients with heart failure there is significant correlation between functional class of dyspnea and left ventricular diastolic dysfunction.

Key Words: Functional class of dyspnea, left ventricular diastolic dysfunction, echocardiography.

INTRODUCTION

Congestive heart failure is a complex clinical syndrome characterized by effort dyspnea, fatigue, frequently by peripheral edema, and radiographic evidence of pulmonary congestion, resulting from left ventricular dysfunction.¹⁻⁴ Approximately 1 to 2% of the population in developed countries suffers from heart failure, with the prevalence rising to 10% or more among persons 70 years of age or older.^{5,6} It has been revealed that symptoms have an impact on functional capacity and quality of life; however, objective indicators of disease severity do not show a similar relationship.⁷

Certain protocols have been developed to assess the functional capacity of patients with congestive heart failure, like New York Heart Association (NYHA), Canadian Cardiovascular Society (CCS) Functional Classification, Specific Activity Scale and 6 Minute Walk Test (6MWT).⁸ The current guide lines of American College of Cardiology/American Heart Association for assessing severity of dyspnea and functional capacity of patients with congestive heart failure are based on New York Heart Association.^{9,10} The 6-minute walk test is a safe and simple clinical tool that strongly and independently predicts the severity of dyspnea.^{11,12} It's a reliable instrument to assess the severity of symptoms and the degree of left ventricular dysfunction¹³, but has not frequently been evaluated for its correlation with extent of left ventricular diastolic dysfunction.^{14,15}

Nearly half of the of asymptomatic heart failure patients will have echocardiography based evidence of heart failure i-e; left ventricular dysfunction diastolic (LVDD).¹⁶⁻¹⁹ Doppler echocardiography (pulsed, continuous, Color Doppler and Tissue Doppler Imaging) is a reliable noninvasive method for assessing left ventricular diastolic dysfunction.^{17,19,20} Mitral valve inflow assessment, pulmonary vein velocity assessment, Color M-Mode propagation velocity, Tissue Doppler velocities of Mitral annulus and estimation of filling pressure are used to assess diastolic dysfunctions of left ventricle.^{18,20,21}

With increasing class of NYHA, increases the deterioration in diastolic dysfunction of left ventricle.^{9,17} But the Correlation Coefficient (γ) is weak, i-e; +0.3 (Normal value is from -1 to +1). p-value not significant.¹⁰

The rationale of this study was to observe the relationship of severity of dyspnea-measured by the distance covered in 6 minutes, with left ventricular diastolic dysfunction to assess the severity of dyspnea more objectively, enabling the physician to anticipate the expected degree of left ventricular diastolic dysfunction of the presenting dyspnea and to treat beforehand appropriately. The aim of this study was to correlate the influence of diastolic dysfunction on functional class of dyspnea.

METHODOLOGY

This was a single center descriptive study, conducted in Cardiology department Lady Reading Hospital Peshawar from March 2011 to October 2011. All male and female patients of any age with clinical diagnosis of heart failure with sinus rhythm and no to minimal mitral regurgitation were included in the study, using consecutive non-probability sampling technique. Patients having heart failure secondary to lung pathologies, high cardiac output heart failure or heart failure due to valvular lesions, were excluded from the study.

Six minute walk test (6MWT) was performed to place the patients in proper NYHA Class of dyspnea. NYHA Class I: When distance walked more than 350 meters. NYHA Class II: When distance walked from 250 to 349 meters. NYHA Class III: When distance walked from 150 to 249 meters. NYHA Class IV: When distance walked less than 149 meters.

Left ventricular diastolic dysfunction was defined by measuring E (Early mitral inflow velocity) to A (Late mitral inflow velocity) ratio by applying Pulse Wave Doppler at mitral inflow level and were graded as; Normal: E/A from 0.75 – 1.5 with DT > 140ms, Mild (Grade I) Impaired Relaxation Pattern: E/A \leq 0.75 with DT > 140ms, Moderate (Grade II) Pseudonormal Pattern: E/A from 0.75 – 1.5 with DT > 140ms (normal values), we asked the patient to do Valsava Maneuver (to expire against the closed glottis and nostrils), the parameters will change to E/A < 0.75 and DT < 140ms and Severe (Grade III) Restrictive Pattern: E/A > 1.5 and DT < 140ms.

The data was analyzed on SPSS version 16. Descriptive statistics were applied to analyze the data. Spearman rank correlation coefficient was used to measure the strength of association between pairs of variables. P-value \leq 0.05 was considered significant.

RESULTS

A total of 113 patients were included. Mean age was 58.42 ± 10.48 (35–80). Male patients were 61.9% (n=70) and 38.1% (n=43) were female. Most of the patients were in NYHA Class II (34.5%) and Class III (37.2%). Majority of the patients who were admitted to hospital were either in NYHA Class II and III (Table 1). For better understanding of statistics, all the four NYHA classes were grouped into I and II (Table 2). There was not a single patient who had normal diastolic relaxation pattern and majority of the patients had pseudonormal pattern of left ventricular diastolic dysfunction (60.2%, n=68) followed by restrictive pattern, i-e; 34.5% (n=39). Mean values of Mitral inflow velocities were; E velocity 0.6 m/sec (0.5-0.9 m/sec), A velocity 0.6m/sec (0.4-0.8 m/sec), E/A 1.3 (0.8-2.0). It was found that with increasing dyspnea, left ventricular diastolic function was also declining (γ : -0.204, p= 0.025) (Table 3).

Table 1: Number of Patients in Different Functional Classes of Dyspnea

NYHA Class	Normal Range (Meters)	Mean Distance Covered (Meters) \pm SD	No. of Patients (%)
I	>350	439 \pm 27	16 (14.2)
II	250 – 349	298 \pm 19	39 (34.5)
III	150 – 249	182 \pm 14	42 (37.2)
IV	<149	31 \pm 13	16 (14.2)

Table 2: Number of Patients in Different New York Heart Association Classes

	NYHA Class	No. of Patient (%)	Total (%)
Group I	NYHA Class I	16 (14.2)	55 (48.7%)
	NYHA Class II	39 (34.5)	
Group II	NYHA Class III	42 (37.2)	58 (51.3%)
	NYHA Class IV	16 (14.2)	

Table 3: Correlation of Clinical Class of Dyspnea & Left Ventricular Diastolic Dysfunction

Group I N-55		Clinical Group of Dyspnea		Total (%)
Group II N-58		I	II	
Grading of LVDD	Impaired Relaxation	0	6	6 (5.03)
	Pseudonormal	32	36	68 (60.1)
	Restrictive	23	16	39 (34.5)
Total		55 (48.6%)	58 (51.3%)	113

Spearman Rank Correlation (γ): - 0.204
P: 0.025

DISCUSSION

Congestive heart failure is associated with impairment in pumping capacity and cardiac chambers dilatation. Nearly half of the patients have normal ejection fraction and the symptoms might be because of diastolic dysfunction.^{6,7} The diastolic dysfunction is more prevalent in older age and considered to be associated with better functional class (FC) of dyspnea. Advanced the functional class of dyspnea is, more the morbidity and mortality will be.³

In this study, we found that advanced functional class of dyspnea is accompanied by worsening left ventricular diastolic parameters. This pattern is found in many previous studies and it reflects impaired relaxation of the left ventricle.^{16,19}

Majority of the patients in our study presented to hospital in functional class II (34.5%) and III (37.2%), almost similar pattern of presentation was reported by Ali et al¹⁰, Bhatia et al¹⁴ and Kamal et al¹⁶ and FC I were reported 14.2%, the reason that they were not that much symptomatic to seek medical advice but the FC IV were hardly able to lie down for echocardiographic assessment and reported 14.2% in our study, patients in FC IV were reported 8.3% by Ali et al.¹⁰

Majority of the patients in my study were in pseudonormal (60.2%) and restrictive pattern (34.5%) of Diastolic dysfunction stages and were having advanced FC of dyspnea and this correlation was statistically significant [Spearman rank correlation (γ): - 0.0 24, p= 0.025]. This finding was also reported by Kamal et al.¹⁶ Not a single patient had normal pattern of DD, as we included all the

symptomatic patients with underlying heart failure so all my patients at the time of hospital admission had some degree of DD.

Our study found that there was a positive correlation between FC of dyspnea and LVDD. The established literature (text books, guidelines) has mentioned categorically that there is no to weak correlation between FC of dyspnea and LV diastolic dysfunction but some research as done by Ali et al¹⁰ and Kamal et al¹⁶ showed significant correlation, but their sample sizes were smaller, so we think there is need of more extensive research work having larger sample sizes.

CONCLUSION

In patients with heart failure there is significant correlation between functional class of dyspnea and left ventricular diastolic dysfunction.

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