Original Article

Association of Left Bundle Branch Block with Systolic Dysfunction of Left Ventricle

Left Bundle Branch Block

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ABSTRACT

Objective: The study was conducted to know the association of left bundle branch block with systolic dysfunction of left ventricle in our population because it carries poor prognosis.

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Cardiology department of Bahawal Victoria Hospital, Bahawalpur from July 2016 to January 2017.

Materials and Methods: The study included 93 patients with both genders between ages 40-70 years. Those having the previous history of ischemic heart disease and cardiomyopathies were excluded. In all patients, severity of systolic dysfunction of left ventricle was assessed by echocardiography.

Results: Age of the patient's ranges between 58.48 ± 8.58 years. Out of the 93 patients, males and females were72 (77.42%) and 21(22.58%) with ratio of 3.4:1. Range of BMI was 28.09 ± 4.59 kg/m2.Systolic dysfunction of left ventricle was found in 41 (44.09%) patients, whereas 52 (55.91%) patients were found to have normal function.

Conclusion: This study shows a strong association of systolic dysfunction of left ventricle with left bundle branch block.

Key Words: left bundle branch block, systolic dysfunction of left ventricle, cardiomyopathy

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INTRODUCTION

Conduction delay resulting in slowing or block age of electrical impulses travelling through left bundle branch of left ventricle is the hallmark of Left Bundle Branch Block (LBBB). As a result right ventricle is stimulated first and left ventricular contraction occurs slightly later the left ventricle. This resulting LBBB causes intra and inter ventricular asynchrony leading to in effective contraction of left ventricle. The resulting impairment of systolic function of left ventricle due to asynchronous contraction in LBBB is well established fact.

LBBBis found in many cardiovascular conditions including hypertension, cardiomyopathies, valvular heart diseases and ischemic heart disease[1]. Patients with LBBB show reduced survival with increased cardiovascular morbidity and mortality[2]. Patients with LBBB showed higher than expected advanced atrioventricular blocks and mortality rates. Similarly coronary artery disease in these patients shows more aggressive disease with severe and diffusely involvement of coronary arteries, more systolic dysfunction, more mortality rates and less survival rates[3]. Some studies found the frequency of systolic dysfunction of left ventricle up to 60% patients with LBBB[4]. In addition to cardiomyopathies the LBBB bad prognostic effects of systolic dysfunction of left ventricle are also found in subjects without any known heart disease[5].

As the systolic dysfunction of left ventricle with LBBB caries poor prognosis and higher mortality[6], its recognition and early intervention is compulsory. The study was performed to find the association of LBBB and impairment of left ventricular systolic function in our local population. Changing trends of coronary artery disease have been consistently observed in our population including younger age at presentation.

Moreover, a majority of patients presenting to us with LBBB have some degree of systolic dysfunction of left ventricle. So we expect an even higher frequency of systolic dysfunction of left ventricle in this subset of patients than reported previously. Also the locally available literature on this was very scarce, so our study will help to assess the severity of the problem for management in our local population and also add up the data in the existing literature..

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MATERIALS AND METHODS

The study comprises of 93 patients, which is cross sectional descriptive study and performed at Department of Cardiology, Bahawal Victoria Hospital, Bahawalpur from 19 July 2016 to 18 January 2017.

Using Non-probability, Consecutive, sampling after approval from the ethical review committee, patients with LBBB on ECG and undergoing echocardiography were included in the study. Informed written consent was also received before study. All data was recorded on a predesigned proforma. Patients with history of previous cardiac catheterization, coronary artery bypass surgery, cardiomyopathies, hepaic and kidney diseases were excluded from study. In all patients, echocardiography was done by the consultant cardiologistto assess the LV systolic function .On echocardiography left ventricular systolic dysfunction taken when fraction was less than 40%..

SPSS version 21.0 was used to perform the statistical analysis. Quantitative variables like age, height, weight, duration of LBBB and BMI were used to calculate theMean and standard deviation. Qualitative variables like gender, ischemic heart disease, smoking, hypertension, diabetes mellitus, and systolic dysfunction of left ventricle were used to assess the Frequency and percentage. Stratifications were used to control the effect modifiers like age, gender, BMI, ischemic heart disease, smoking, hypertension and diabetes mellitus. Significant P value was considered when ≤ 0.05 .after applying post-stratification Chi square to see their effects on the systolic dysfunction of left ventricle.

RESULTS

Most of patients were above the age of 60 years with range of 58.48 ± 8.58 years. Table (I)

Ratio of males72 (77.42%) and females21 (22.58%) was 3.4:1 (Figure I).Mean duration of LBBB was 63.59 ± 15.68 hours (Figure II). Frequency of patients with status of confounding variables like ischemic heart disease, smoking, hypertension, diabetes mellitus and BMI has shown in Table 2. Mean height was 161.44 ± 11.87 cm. Mean weight was 85.34 ± 7.12 kg resulting in mean BMI of28.09 ± 4.59 kg/m^2.

Table No.I: Age of patients (n=93).

	Total	
Range of Age (Years)	Patients	%tage
40-50	19	20.43
51-60	31	33.33
61-70	43	46.24
Total	**93**	**100.0**

- **Mean ± SD = 58.48 ± 8.58**

Systolic dysfunction of left ventricleappeared in 41 (44.09%) patients, however normal systolic function was in 52 (55.91%). Figure 3.

Regarding age groups and genders on stratification, no significant difference in systolic function was noted Table 3& 4. Similarly systolic dysfunction of left ventricle and duration of LBBB showed no difference on stratification. Table 5

Table No.2: Confounding variables of Patients.

Variables of Patients		Frequency	%tage
Diabetes Mellitus	Yes	39	41.94
	No	54	58.06
Hypertension	Yes	49	52.69
	No	44	47.31
Smoking	Yes	45	48.39
	No	48	51.61
BMI	≤30 kg/m^2	62	66.67
	>30 kg/m^2	31	33.33
H/o ischemic heart disease	Yes	33	35.48
	No	60	64.52

Table No.3: Stratification according to age groups and Systolic Dysfunction of Left Ventrcle.

Age (years)	**systolic dysfunction of left ventricle**		**p-value**
	Yes	No	
40-50	07 (36.84%)	12 (63.16%)	
51-60	13 (41.94%)	18 (58.06%)	**0.652**
61-70	21 (48.84%)	22 (51.16%)	

Table No.4: Stratification according to gender and Systolic Dysfunction of Left Ventricle.

Gender	Systolic dysfunction of Left Ventricle		p-value
	Yes	No	
Male	29 (40.28%)	43 (59.72%)	0.171
Female	12 (57.14%)	09 (42.86%)	

Table No.5: Stratification of duration of symptoms and Systolic dysfunction of Left Ventricle.

Duration of LBBB	Systolic dysfunction of Left Ventricle		p-value
	Yes	No	
24-72 hours	32 (42.11%)	44 (57.89%)	0.416
>72 hours	09 (52.94%)	08 (47.06%)	

Table No.6: Stratification of Diabetes Mellitus and Systolic dysfunction of Left Ventricle.

Diabetes Mellitus	Systolic dysfunction of Left Ventricle		p-value
	Yes	No	
Yes	19 (48.72%)	20 (51.28%)	0.445
No	22 (40.74%)	32 (59.26%)	

Similarly confounding variables were also stratified with systolic dysfunction of left ventricle as shown in Table 6, 7, 8, 9 & 10 respectively and p-value was found >0.05 which is statistically insignificant.

Table No.6: Stratification of Hypertension and Systolic dysfunction of Left Ventricle.

Hypertension	Systolic dysfunction of Left Ventricle		p-value
	Yes	No	
Yes	24 (48.98%)	25 (51.02%)	0.316
No	17 (38.64%)	27 (61.36%)	

Table No.8: Stratification of Smoking and Systolic dysfunction of Left Ventricle.

Smoker	Systolic dysfunction of Left Ventricle		p-value
	Yes	No	
Yes	23 (51.11%)	22(48.89%)	0.186
No	18 (37.50%)	30 (62.50%)	

Table No.9: Stratification of BMI Systolic dysfunction of Left Ventricle.

BMI	Systolic dysfunction of Left Ventricle		p-value
	Yes	No	
≤30 kg/m^2	24 (38.78%)	38 (61.29%)	0.140
>30 kg/m^2	17(54.84%)	14 (45.16%)	

Table No.10: Stratification of ischemic heart disease with Systolic dysfunction of Left Ventricle.

H/o ischemic heart disease	Systolic dysfunction of Left Ventricle		p-value
	Yes	No	
Yes	17 (51.52%)	16 (48.48%)	0.285
No	24 (40.0%)	36 (60.0%)	

DISCUSSION

Systolic dysfunction of left ventricle is found in a large number of persons with Left Bundle Block (LBBB) on their ECGs. In general population prevalence of LBBB varies a lot depending upon the population studied. Echocardiographic studies reported normal LV function only in 7% patients with LBBB and 32.5% normal LV function in patients without LBBB[7]. One old but importantstudy conducted in 2004 comparing subjects with LBBB and normal EGCs showed significantly high rates of cardiomegaly and cardiac failure symptoms due LV systolic dysfunction[8].

Many follow up studies have demonstrated that subjects with LBBB when compared to subjects with normal ECGs, behave adversely with increased morbidity and mortality, significant number having presented as sudden death[9].

Studies suggest that persons with LBBB on ECG show higher death rate, even with healthy population[10]. However sicker population like those with coronary artery disease showed more mortality rates [11, 12, 13].Evidence suggest these patients have worse long term prognosis as compared to those without LBBB, likely due to higher incidence of hypertension, cardiomyopathy[14], CAD, and valvular lesions in these patients. Even these conditions may be cause of LBBB. In many studies of heart failure patients, LBBB was found as independent marker of mortality on follow up[15].

Conduction abnormalities are very common on ECGs of patients who present with cardiac failure, while 25% of these patients have LBBB[16]which is irreversible with medications. However cardiac resynchronization therapy (CRT) may improve the ECG and heart failure, while effect on remodeling and prognosis is unknown[17, 18].

This study shows the frequency of systolic dysfunction of left ventricle in patients with left bundle branch block, because systolic function of left ventricleis the primary factor in deciding the long term survival in these patients. Most of the patients 43 (46.24%) were above 60 years of age, with mean age of 58.48 ± 8.58 years. Among study patients males were more common, 72 (77.42%) as compared to females 21 (22.58%) with ratio of 3.4:1. Left ventricular systolic dysfunction was found in 41 (44.09%) patients, whereas normal function of left ventricle was found in 52 (55.91%) patients. Similar results were shown in another study with frequency of systolic dysfunction of left ventricle up to 60% in persons having LBBB on ECG[4].In this study of 50 patients with LBBB, 31 were males and 19 were females, with a mean age of 56.68±6.8 years and a control group of 50 patients without LBBB, 22 were males and 28 were females, with a mean age of 51.88±6.8 years.

The Framingham study comprising of more than of 5,209 subjects demonstrated an important association of left bundle branch block with hypertension, cardiomyopathies and ischemic heart disease[19]. After 10 years follow up of persons with LBBB, A significant high cardiovascular mortality and morbidity was noted on ten and eighteen years follow

This large study also highlighted that male patients with new onset LBBB has higher risk of cardiovascular complications, especially sudden death is 10 times more common than those without LBBB[20]. In a study, Khalil et al proposed that isolated LBBB in young male population has benign prognosis while older patients show progressive myocardial diseases[21].Similarly many studies demonstrated the very high prevalence of cardiac morbidities and mortalities in persons with LBBB on ECG. [22]

In a coronary angiography based study[8] 55 patients evaluated for narrowing's of coronary arteries and

hemodynamics. Findings were compared with those with similar age, sex but with normal ECGs. The significant and important finding in the study was the very high frequency of heart failure finding in patient with LBBB on their ECG as compared to normal ECGs. Results of this study clearly suggest that LBBB patients also have systolic dysfunction of left ventricle in addition to significant coronary artery disease.

These evidences clearly and strongly suggest to clinical physicians to consider LBBB as an offset of patients with increases risk of cardiac anomalies especially LV systolic dysfunction and heart failure. Therefore while treating the patients with LBBB on ECG, for heart failure, MI and other cardiac conditions, must keep these patients with regular follow up, because these patients have poor prognosis with increased cardiovascular morbidity and mortality as compared to those with ECG without LBBB[22].

CONCLUSION

This study concluded that high frequency patients have the risk of heart failure resulting from systolic dysfunction of left ventricle in patients with ECG finding of left bundle branch block in our population. This can lead to poor prognosis with high morbidity and mortality and high economic Burdon due frequent hospitalization with heart failure. Therefore its recognition and early intervention is compulsory. So, we recommend that timely detection and treatment of Systolic dysfunction of left ventricle in these patients should be done community to reduce the morbidly and prolong the survival.

Author's Contribution:

Concept & Design of Study:	Muhammad Sarwar Khalid
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Revisiting Critically:	Muhammad Sarwar Khalid, Sabahat e Gull
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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