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Heart Failure with Reduced Ejection Fraction and Left Bundle Branch Block in a Moroccan Center

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Abstract

Background: Some studies have reported left bundle branch block as an independent predictor of outcome in heart failure with reduced ejection fraction patients. The aim of this study is to compare clinical, echocardiographic and prognostic features of heart failure with reduced ejection fraction patients with and without complete left bundle branch block.

Results: We collected 3412 patients. 693 patients (20.31%) in group 1 and 2719 patients (79.69%) in group 2. The underlying structural heart disease was ischemic heart disease in 50.1% versus 59.4%, dilated cardiomyopathy in 9.3% versus 5.9%, valvular heart disease in 3% versus 3.8%, chemotherapy induced cardiomyopathy in 2.8% versus 2.1% ($p<0.001$). Class I New York Heart Association in 9.3% versus 16.2%, class II in 59.8% versus 61.2%, class III in 27.1% versus 20.7%, class IV in 3.8% versus 1.9% ($p<0.001$). Echocardiographic features: Left ventricular end-diastolic diameter was 61.29±9.24mm versus 57.06±8.99mm ($p<0.001$), mean left ventricular ejection fraction was 32.24±13.15% versus 35.87±12.98% ($p=0.022$), elevated left ventricular filling pressures in 29.4% versus 21.6% ($p<0.001$), severe secondary mitral regurgitation in 9.6% versus 5.8% ($p<0.001$). Hospitalization for HF rate in 22.7% versus 16.5% ($p<0.001$).

Conclusions: Patients with LBBB are more symptomatic, have lower left ventricular ejection fraction, more severe secondary mitral regurgitation, higher hospitalization for heart failure rate. These results are important to consider in order to justify the importance of cardiac resynchronization therapy in Moroccan heart failure patients with reduced ejection fraction.

Keywords: Left bundle branch block; Heart failure with reduced ejection fraction; Outcomes

Abreviations: LBBB: Left Bundle Branch Block; HF: Heart Failure; HFrEF: Heart Failure with Reduced Ejection Fraction; CRT: Cardiac Resynchronization Therapy; NYHA: New York Heart Association; LVEDD: Left Ventricular End-Diastolic Diameter; LVEF: Left Ventricular Ejection Fraction; LV: Left Ventricle; RV: Right Ventricle

Background

Left bundle branch block (LBBB) occurs in up to 30% of patients with heart failure (HF) [1,2]. The detrimental effect of LBBB on left ventricular systolic and diastolic function caused by regional delays of electrical activity leads to dyssynchronous left ventricular function and has been established in HF patients [3,4]. Some studies have reported LBBB as an independent

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predictor of outcome in HF patients [5] and cardiac resynchronization therapy (CRT) is recommended in order to improve symptoms and ventricular function in HF patients with LBBB [6].

The aim of this study is to compare clinical, echocardiographic and prognostic features of heart failure with reduced ejection fraction (HFrEF) patients with and without complete LBBB.

Methods

This is a transversal retrospective study conducted between May 2006 and June 2019 including all Moroccan patients beyond the age of 14 with HFrEF, followed-up in the therapeutic unit of HF of our department.

Exclusion criteria: patients aged more than 18 years old, left ventricular ejection fraction (LVEF) > 40%.

Informed consent to participate was obtained from all subjects.

The cause of hospital admission in all patients was heart failure.

We studied 2 groups of patients: group 1 with complete LBBB and group 2 without complete LBBB.

We compared clinical, echocardiographic and prognostic features.

Regarding echocardiographic features:

-The systolic function was measured using left ventricular end-diastolic diameter (LVEDD) and LVEF calculated by Simpson biplane method.

-The diastolic function was estimated using the recommandations for the evaluation of Left Ventricular Diastolic Function by Echocardiography published in European Heart Journal Cardiovascular Imaging in December 2016 [7].

- The severity of mitral regurgitation was assessed using proximal isovelocity surface area (PISA) method.

Patients were followed-up for 36 months.

Data were collected on Excel and analyzed using SPSS 2.0 software.

Differences were considered statistically significant when p value < 0.05.

Results

We collected 3412 patients. 693 patients (20.31%) in group 1 and 2719 patients (79.69%) in group 2. Male gender was represented in 63 versus 63.7 % (p=0.857). Mean age was 68.82±12.47 years versus 64.79±12.88 years (p<0.001).

Cardiovascular risk factors: hypertension in 41% versus 39.8% (p=0.746), diabetes mellitus in 29.4% versus 32.2% (p=0.036), dyslipidemia in 12.3% versus 11.3% (p=0.041), tobacco use in 28.1% versus 34.2% (p<0.001).

Comorbidities: stroke in 16.3% versus 11.6% (p<0.001), thyroid dysfunction in 2.1% versus 1.5% (p<0.001), end stage chronic kidney disease in 8.9% versus 5.6% (p<0.001).

Underlying structural heart disease: ischemic heart disease in 50.1% versus 59.4%, dilated cardiomyopathy in 9.3% versus 5.9%, valvular heart disease in 3% versus 3.8%, chemotherapy induced cardiomyopathy in 2.8% versus 2.1% (p<0.001).

Clinical features: class I NYHA in 9.3% versus 16.2%, class II NYHA in 59.8% versus 61.2%, class III in 27.1% versus 20.7%, class IV in 3.8% versus 1.9% (p<0.001), mean SBP was 126.97±25.16mmHg versus 128.55±24mmHg (p=0.182), mean DBP was 73.95±14.28mmHg versus 74.09±13.42mmHg (p=0.834), mean HR was 80.01±15.91bpm versus 77.97±17.13bpm (p=0.015).

Electrical features: atrial fibrillation in 8% versus 11.6% (p<0.001).

Echocardiographic features: LVEDD was 61.29±9.24mm versus 57.06±8.99mm (p<0.001), mean LVEF was 32.24±13.15% versus 35.87±12.98% (p=0.022), elevated left ventricular filling pressures in 29.4% versus 21.6% (p<0.001), severe secondary mitral regurgitation in 9.6% versus 5.8% (p<0.001).

Medications: All patients were prescribed angiotensin converting enzyme inhibitors, beta-blockers, mineralocorticoid receptor antagonists and doses were optimized in 53% of patients in group 1 and 55% of patients in group 2 (p=0.2). Furosemide was prescribed in 41% of patients in group 1 and 45% of patients in group 2 (p=0.2).

Revascularization: Patients in the ischemic heart disease group were completely revascularized in 79% of cases.

Outcomes: Hospitalization for HF rate in 22.7% versus 16.5% (p<0.001).

Discussion

LBBB is characterized by delayed activation of the left ventricle (LV) compared to the right ventricle (RV), disrupting normal ventricular mechanics, perfusion, and workload distribution. Prolonged dyssynchrony can promote adverse cardiac remodeling and progressive dysfunction, particularly in individuals with pre-existing structural heart disease. Thus, the higher LVEDD and lower LVEF observed in the LBBB group are not entirely surprising.

LBBB commonly arises from ischemic or mechanical damage to the left bundle branch and is frequently associated with conditions such as ischemic or valvular heart disease and cardiomyopathies, including dilated, hypertrophic, fibrotic, and infiltrative forms [8].

LBBB is believed to be associated with increased heart failure hospitalization rate as demonstrated by our study, higher mortality and a higher prevalence of cardiovascular comorbidities. However, the findings from various studies remain contradictory. While some studies suggest that the elevated mortality is primarily attributable to other cardiovascular conditions, such as myocardial infarction, and that LBBB is merely a consequence of severe underlying heart disease [9], other studies have attributed mortality to LBBB. For example, a study involving 7,000 patients concluded that both right and left bundle branch blocks are independent predictors of all-cause mortality. This association remained significant even after adjusting for potential confounding factors [10].

Another key study that examined patient with chronic coronary syndromes [11] found no significant association between LBBB at baseline and the risk of composite cardiovascular outcomes, including cardiovascular death, myocardial infarction, or stroke (HR 1.06, 95% CI [0.86–1.31], $p = 0.67$), nor with all-cause mortality (HR 1.07, 95% CI [0.87–1.32], $p = 0.52$). However, LBBB was significantly linked to an increased risk of heart failure hospitalization (HR 1.50, 95% CI [1.21–1.88], $p < 0.001$) as found in our study, and the need for permanent pacemaker implantation (HR 2.11, 95% CI [1.45–3.07], $p < 0.001$) [11].

Our study focused on patients with HFrEF, highlighting the correlation between the presence of LBBB and worse cardiac outcomes. Specifically, patients with LBBB are more symptomatic, have a more dilated left ventricle, a lower LVEF, a higher rate of elevated left ventricular filling pressures, a higher prevalence of severe secondary mitral regurgitation and higher rates of rehospitalizations for HF. These findings highlight the critical importance of identifying LBBB in patients with HFrEF to enable closer monitoring and to consider the early initiation of CRT when ESC criteria are met. However, there are many barriers to implementing CRT in Morocco, as it is underutilized despite its proven efficacy. Despite there are increasing physicians able to implant such intra-cardiac devices, financial considerations are still limiting the large-scale implementation of CRT in Morocco.

Recent studies suggest that guideline-directed medical therapy alone may be insufficient to improve LVEF functional status in patients with de novo HF and LBBB-induced cardiomyopathy [12, 13] as CRT is a highly effective treatment for HFrEF, significantly improving quality of life, reducing HF hospitalizations, and lowering all-cause mortality. However, despite its benefits, the majority of eligible patients remain underutilized and are not referred for CRT [14].

Conclusions

According to our results, patients with LBBB are more symptomatic, have lower LVEF, more severe secondary mitral regurgitation and higher hospitalization for HF rate. These results are important to consider in order to justify the importance of CRT among Moroccan heart failure patients with reduced ejection fraction.

Declarations

Consent to participate:

Informed consent to participate was obtained from all subjects.

Ethics approval:

The study was conducted ethically in accordance with the World Medical Association Declaration of Helsinki, 1975. The Ethical Committee of Faculty of Medicine, Hassan II University approved the study.

Consent for publication: Not applicable

Clinical trial number: Not applicable

Availability of data and material:

The manuscript data is available on request to the corresponding author.

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