Epidemiological and evolutionary characteristics of heart failure in patients with left bundle branch block – A Moroccan center-based study

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Background: In patients with heart failure, left bundle branch block (LBBB) seems to be associated with an increased risk of cardiovascular mortality.

Purpose: The purpose of this study is to determine the in-hospital outcome of congestive heart failure patients with LBBB versus those without.

Methods: We conducted a prospective observational study at the Department of Intensive Care and Rhythmology at the Mohammed V Military Hospital of Rabat, where 330 patients were admitted for heart failure between January 2008 and September 2012. Screening out patients with missing data yielded a cohort of 274 patients. Among the 274 patients, only 110 had LBBB and a left ventricular ejection fraction lower than 50%. We randomly selected a subset of 110 patients diagnosed as non-LBBB to ensure a significant statistical comparison between LBBB and non-LBBB patients. We therefore considered two groups in our analysis: 110 heart failure (HF) patients with LBBB and 110 HF patients without LBBB. Patients with incomplete records were excluded.

Results: Male gender was dominant in both groups (82.7% vs. 66.7%, \( p = 0.005 \)). Patients with LBBB had a higher prevalence of idiopathic dilated cardiomyopathy (39.1% vs. 4.8%, \( p < 0.001 \)); and a higher prevalence of previous hospitalization for heart failure (64.5% vs. 23.3%, \( p < 0.001 \)). The left ventricular ejection fraction was significantly lower in the group with LBBB (25.49% vs. 39.53%, \( p < 0.001 \)). Age, cardiovascular risk factors, rhythmic and thromboembolic complications did not significantly differ. In patients with LBBB, 61.8% received cardiac resynchronization therapy performed both during the index hospital stay (50.9%) and previously (10.9%). Hospital outcome was marked by 20 in-hospital deaths in the group with LBBB and eight deaths in the group without LBBB (\( p = 0.008 \)).

Conclusion: Our analysis emphasizes increased in-hospital mortality and higher disease severity, over a short period of stay, in heart failure patients with left bundle branch block.

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Keywords: Heart failure, Left bundle branch block, Treatment, Evolution, Morocco
Introduction

The prevalence of heart failure (HF) in the western world is known to be 1–2% [1,2], and the incidence approaches 5–10 per 1000 persons per year [3]. However, due to the lack of a national or regional registry of heart failure, this incidence is not valid for Africa [4], especially North Africa. Morocco features only one published monocentric study that included 1578 patients admitted for heart failure [5].

Approximately one-third of patients with heart failure present with conduction disturbances that result in a QRS greater than 120 ms. Most commonly (in approximately 25% of HF patients), this disturbance is exhibited as a left bundle branch block (LBBB) pattern [6]. This percentage is significantly higher than the estimated 1.5% prevalence of LBBB in the general patient population [7]. LBBB is associated with an increased risk of cardiovascular morbidity and mortality in patients with heart failure. The electrical dispersion of ventricular depolarization and conduction delay, which is manifested by QRS elongation, reflects the severity of the electrical, structural and mechanical dysfunction of the left ventricle. LBBB can be mitigated by cardiac resynchronization therapy (CRT) in patients with moderate to severe HF and left ventricular systolic dysfunction function (LVSD). Many studies have shown left ventricular reverse remodeling after cardiac resynchronization therapy for heart failure, particularly in non-ischemic dilated cardiomyopathy.

The aim of the present study was to estimate the morbidity and mortality of congestive HF patients with LBBB versus those without LBBB on an in-hospital basis.

Methods

Study design

We conducted a prospective observational study at the Department of Intensive Care and Rhythmology of the Mohammed V Military Hospital in Rabat, where 330 patients were admitted for heart failure between January 2008 and September 2012. However, the data for many patients were incomplete. After excluding patients with missing data, we obtained a cohort of 274 patients. Among these, only 110 presented with LBBB and a left ventricular ejection fraction lower than 50%. We randomly selected a subset of 110 patients diagnosed with non-LBBB to ensure a significant statistical comparison between LBBB and non-LBBB patients. Therefore, the two groups in our analysis consisted of 110 patients with LBBB and 110 patients without LBBB. Thus, we eliminated the need for normalizing our two groups, while still preserving the soundness of our study.

This study only included patients aged 35 years or older with clinical or echocardiographic manifestations of heart failure. Patients with a left ventricular ejection fraction (LVEF) ≥50% or incomplete records were not included in this study.

Data collection

Entry into the database required that patients have a diagnosis of HF, which is clinically defined as a syndrome in which patients have typical symptoms (breathlessness, ankle swelling, and fatigue) and signs (elevated jugular venous pressure, pulmonary crackles, and displaced apex beat) resulting from an abnormality in the cardiac structure or function [8]. The main terminology used to describe HF is historical and is based on the measurement of LVEF.

Collected variables included demographic and clinical characteristics (breathlessness, orthopnea, paroxysmal nocturnal dyspnea, and peripheral edema), electrocardiographic and echocardiographic variables, nature of the underlying heart disease, information on therapy and previous hospitalizations for congestive heart failure (CHF). The main outcome was the occurrence of major adverse cardiac events. These events are defined as death (while determining the mechanism of death in each group), serious arrhythmia (ventricular tachycardia, ventricular fibrillation), thromboembolic complications, cardiogenic shock (systolic arterial pressure <90 mmHg, persistent hypotension of at least 30 min, tissue hypoperfusion: oliguria, cold extremities, confusion).

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>LBBB</td>
<td>left bundle branch block</td>
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<tr>
<td>CRT</td>
<td>cardiac resynchronization therapy</td>
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<tr>
<td>LVSD</td>
<td>left ventricular systolic dysfunction function</td>
</tr>
<tr>
<td>LVEF</td>
<td>left ventricular ejection fraction</td>
</tr>
<tr>
<td>CHF</td>
<td>congestive heart failure</td>
</tr>
<tr>
<td>DCM</td>
<td>dilated cardiomyopathy</td>
</tr>
<tr>
<td>EDD</td>
<td>end-diastolic diameter</td>
</tr>
<tr>
<td>CAD</td>
<td>coronary artery disease</td>
</tr>
<tr>
<td>ACE</td>
<td>angiotensin converting enzyme</td>
</tr>
<tr>
<td>ACEI</td>
<td>angiotensin converting enzyme inhibitors</td>
</tr>
<tr>
<td>CRT-D</td>
<td>CRT-defibrillator</td>
</tr>
<tr>
<td>EFICA</td>
<td>Etude Française de l’Insuffisance Cardiaque Aigue</td>
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</table>
At the time of patient enrollment, standard baseline 12-lead electrocardiograms (ECGs) were obtained at a paper speed of 25 mm/s. Three cardiologists measured QRS duration using manual calipers. The durations of three consecutive QRS complexes were averaged to obtain the final QRS duration for this analysis. LBBB was defined as a QRS duration of \( \geq 120 \text{ ms} \) with the following criteria: broad notched or slurred R wave in leads I, aVL, V5, and V6 (an occasional RS pattern in V5 and V6 may occur due to displaced transition of the QRS complex); absent q waves in leads I, V5, and V6; normal R peak time in leads V1, V2, and V3 (if R waves are present), and \( >60 \text{ ms} \) leads V5 and V6 [9].

All patients had standard two-dimensional and Doppler echocardiographic examinations using a GE Vivid 7 Ultrasound machine. LVEF was determined via the biplane Simpson method. Anatomic measurements, valvular lesions, and LV filling pressure were assessed using standard echocardiographic criteria [10]. Analysis of left ventricular dyssynchrony was not performed in this study.

Coronary angiography was performed every time we suspected coronary artery disease based on the electrocardiogram or echocardiography. Selection criteria for CRT were New York Heart Association (NYHA) functional class II, III, and IV heart failure, QRS duration \( \geq 120 \text{ ms} \), and a persistently reduced ejection fraction \( \leq 35\% \), despite optimal pharmacological therapy [11].

Table 1. General, clinical, laboratory and etiological data of both groups with and without LBBB.

<table>
<thead>
<tr>
<th></th>
<th>With LBBB ( (n = 110) )</th>
<th>Without LBBB ( (n = 110) )</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years): M ± SD</td>
<td>62.27 ± 7.26</td>
<td>60.58 ± 14.06</td>
<td>NS</td>
</tr>
<tr>
<td>Male (%)</td>
<td>82.7</td>
<td>66.7</td>
<td>0.005</td>
</tr>
<tr>
<td>Chronic co-morbidity</td>
<td>54</td>
<td>42</td>
<td>NS</td>
</tr>
<tr>
<td>CVx risk factors (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>40</td>
<td>47.5</td>
<td>NS</td>
</tr>
<tr>
<td>Hypertension</td>
<td>40.9</td>
<td>45.8</td>
<td>NS</td>
</tr>
<tr>
<td>Smoking</td>
<td>54.5</td>
<td>41.7</td>
<td>0.051</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>29.1</td>
<td>28.3</td>
<td>NS</td>
</tr>
<tr>
<td>Obesity</td>
<td>28.2</td>
<td>25.8</td>
<td>NS</td>
</tr>
<tr>
<td>Heredity</td>
<td>2.7</td>
<td>0.8</td>
<td>NS</td>
</tr>
<tr>
<td>ECG data (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinus rhythm</td>
<td>87.3</td>
<td>75.8</td>
<td>0.026</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>12.7</td>
<td>17.5</td>
<td>NS</td>
</tr>
<tr>
<td>Rx CMG (%)</td>
<td>99.1</td>
<td>80.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Echocardiography (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilated LV</td>
<td>98.2</td>
<td>41.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LVFP</td>
<td>85.3</td>
<td>58.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Coronary artery disease (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT of LCA</td>
<td>1.8</td>
<td>5.0</td>
<td>NS</td>
</tr>
<tr>
<td>1 Vessel CAD</td>
<td>10</td>
<td>23.3</td>
<td>0.007</td>
</tr>
<tr>
<td>2 Vessel CAD</td>
<td>12.7</td>
<td>13.3</td>
<td>NS</td>
</tr>
<tr>
<td>3 Vessel CAD</td>
<td>20.9</td>
<td>26.7</td>
<td>NS</td>
</tr>
<tr>
<td>Etiology of HF (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>45.5</td>
<td>70</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Idiopathic DCM</td>
<td>39.1</td>
<td>4.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Valvulopathy</td>
<td>9.1</td>
<td>15.8</td>
<td>NS</td>
</tr>
<tr>
<td>Metabolic DCM</td>
<td>2.7</td>
<td>0.8</td>
<td>NS</td>
</tr>
<tr>
<td>LV non compaction CM</td>
<td>3.6</td>
<td>0</td>
<td>0.051</td>
</tr>
</tbody>
</table>

M ± SD, mean ± standard deviation; CVx, cardiovascular; HF, heart failure; Rx CMG, radiological cardiomegaly with cardiothoracic index >0.50; LV, left ventricle; LVFP, left ventricle filling pressure; CT of LCA, common trunk of left coronary artery; CAD, coronary artery disease; DCM, dilated cardiomyopathy.

* Chronic co-morbidity, chronic obstructive pulmonary disease, renal failure (serum creatinine >200 mmol/L), malignancy, cirrhosis/liver dysfunction.

Bold values indicate difference between two groups was considered statistically significant when \( P < 0.05 \).
variables. The Mann–Whitney U test was used to compare duration of hospitalization between the two groups. The comparison between the two groups for qualitative variables was conducted using the chi-square test.

We used a multiple logistic regression in multivariate analysis. A difference was considered statistically significant when \( p < 0.05 \).

### Results

#### Patient population

The database of patients with and without LBBB is summarized in Table 1.

The average age of our patients was 61.39 ± 11.34 years; 74.3% were male (171 men, 59 women) with a statistically significant difference between patients with and without LBBB.

In the pooled group, the incidences of breathlessness, orthopnea paroxysmal nocturnal dyspnea and peripheral edema were 98.2%, 72%, 56.2%, and 23%, respectively.

The main cardiovascular risk factor in the pooled group was smoking (47.8%), followed by diabetes (43.9%), and arterial hypertension (43.5%), with no difference between the two groups.

Thirty-six patients had a prior myocardial infarction (26 in the LBBB group and 10 in the non-LBBB group). The prevalence of idiopathic dilated cardiomyopathy (DCM) (39.1% vs. 4.8%, \( p < 0.001 \)) and previous hospitalization for HF (64.5% vs. 23.3%, \( p < 0.001 \)) was higher in patients with LBBB compared with patients without LBBB.

In the LBBB group, all patients had a QRS duration \( \geq 120 \) ms; 58.18% of them had a QRS duration >150 ms, and 41.82% had a QRS duration \( \leq 150 \) ms.

In the non-LBBB group, 18% of patients had a right bundle branch block (RBBB), and the QRS duration did not exceed 120 ms.

The LVEF was significantly lower in the group with LBBB (25.49% vs. 39.53%, \( p < 0.001 \)), with a larger end-diastolic diameter (EDD) (69.20 ± 6.307 mm vs. 55.79 ± 7.49 mm; \( p < 0.001 \)) and end-systolic diameter (ESD) (58.13 ± 7.672 mm vs. 41.03 ± 10.37 mm; \( p < 0.001 \)).

Overall, 198 patients underwent coronary angiography (110 with LBBB and 88 without LBBB).

A higher incidence of coronary artery disease (CAD), diagnosed by coronary angiography, was detected in the group of patients without LBBB. One-vessel CAD cases were found in 28.4% of patients without LBBB vs. 10% of patients with LBBB. Two-vessel CAD cases were found in 17% of patients without LBBB vs. 12.7% of patients with LBBB. Three-vessel CAD cases were found in 34.2% of patients without LBBB vs. 20.9% of patients with LBBB, and common trunk of left coronary artery stenosis was found in 6.9% of patients without LBBB vs. 1.8% of patients with LBBB. The coronary angiography was normal in 13.5% of patients without LBBB vs. 54.6% of patients with LBBB.

#### Factors of decompensated heart failure, complications, and hospitalization outcome

As shown in Table 2, the factors of decompensated heart failure including stopping treatment, not following diet, infection, arrhythmia, and ischemic recurrence, were similar in both groups.

A significantly higher proportion of patients with LBBB were undergoing treatment with furosemide and angiotensin-converting enzyme (ACE) inhibitors, while spironolactone, \( \beta \)-blockers, and Ca-antagonists were prescribed more frequently to patients without LBBB.

In patients with LBBB, 61.8% received cardiac resynchronization therapy performed during the...
Hospitalization period was longer in patients with LBBB compared to patients without LBBB (10 days [8,14] vs. 5 days [5,9], \( p < 0.001 \)).

In a multivariate analysis, significant factors associated with LBBB were left-sided HF, LV EDD, and idiopathic DCM (Table 3).

### Discussion

Morocco features only one published monocentric study evaluating the epidemiological profile of patients admitted for chronic heart failure [5]. The results of the CHU Ibn Rochd study are similar to our findings in terms of demographic and clinical characteristics, echocardiographic variables and causes of heart failure. However, the CHU Ibn Rochd study did not examine the predictive role of LBBB in congestive heart failure patients, which is the scope of our study.

The association of a wide QRS with an increased mortality rate in CHF has repeatedly been investigated, but results have been conflicting. Nevertheless, some studies showed that a wide QRS has an independent, unfavorable prognostic significance and increases the mortality rate of patients with CHF during periods of follow-up examination extended to five years [12–14]. Other studies that adopted similar multivariate approaches did not confirm this finding [15–17]. Such discrepancies may arise from the variable cutoffs adopted to define the conduction defect, ranging from a mild widening of the QRS complex above 120 ms to complete LBBB [12,14–17], and from large differences in the covariates included in multivariate analyses. A further cause of conflicting results may be represented by the variable cause of CHF in the various studies which – in most cases – only included patients with dilated cardiomyopathy [13,14,17]. Only two studies included a few patients with ischemic heart disease [12,15]. Alternatively, clinical presentation upon admission (cardiogenic shock, blood pressure, and pulmonary edema) may have influenced the results [18], and some studies included patients with BBB without distinguishing between LBBB and RBBB [19].

Our study is important for several specific reasons. First, our study population is representative of a general population hospitalized for CHF, including not only patients with cardiogenic shock but also those without cardiogenic shock presenting either with high blood pressure and pulmonary edema or with lower blood pressure. Second, our study reports the analysis of an unselected CHF population with or without previous hospitalization for CHF. Third, our study estimates

### Table 3. Multivariate analysis of factors associated with LBBB.

<table>
<thead>
<tr>
<th>CVx history</th>
<th>HR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left HF</td>
<td>2.802</td>
<td>1.081–7.262</td>
</tr>
<tr>
<td>SR</td>
<td>1.197</td>
<td>0.383–3.745</td>
</tr>
<tr>
<td>LVEDD</td>
<td>1.135</td>
<td>1.002–1.286</td>
</tr>
<tr>
<td>LVEF</td>
<td>1.029</td>
<td>0.929–1.140</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>0.285</td>
<td>0.039–2.070</td>
</tr>
<tr>
<td>Idiopathic DCM</td>
<td>4.647</td>
<td>1.094–19.738</td>
</tr>
</tbody>
</table>

CVx, cardiovascular; HF, heart failure; SR, sinus rhythm; LVEDD, left ventricular end-diastolic diameter; LVEF, left ventricular ejection fraction; DCM, dilated cardiomyopathy.

Bold values indicate difference between two groups was considered statistically significant when \( p < 0.05 \).
the morbidity and mortality of CHF patients with LVSD and LBBB while comparing them to patients with LVSD and non-LBBB on an in-hospital basis.

The baseline clinical characteristics were compared to some studies discussing the same subject [6,20].

The mean age of our patients was 61.39 years, while in other studies, age varied between 63 and 73 years. These data suggest that our patients are younger than those examined in other studies. In the literature, the prevalence of LBBB also increases with age [21]. Our study did not show a statistically significant difference between the groups with and without LBBB.

Our study included more male patients (males = 74.3%), which is comparable with the demographics of other studies. The most encountered cardiovascular factor was smoking (54.5%) in the LBBB group, and diabetes in the non-LBBB group (47.5%).

A direct causal relationship between LBBB and smoking was not evident. This incidence can be explained by a higher presence of coronary disease in smokers. In the sub-study of the Etude Française de l’Insuffisance Cardiaque Aigue (EFICA) cohort, the cardiovascular risk factors were similar in both groups, with hypertension representing the main risk factor (60%).

A previous hospitalization for HF was found more often in our analysis (64.5%) than in other studies.

One of the primary causes of heart failure in Morocco is believed to be rheumatic valvular heart disease. However, the results of our study showed that the leading cause is ischemic heart disease. This finding is due to various factors, namely, smoking, a diet high in saturated fats, dietary habits rich in salt, and obesity.

Ischemic heart disease was the most common cause of CHF in both groups with and without LBBB. This finding is consistent with the sub-study of the EFICA cohort. In the report from the Italian Network on Congestive Heart Failure, the main cause of HF was dissimilar between the two groups, with dilated cardiomyopathy and ischemic heart disease being the most common diagnoses in patients with and without LBBB, respectively.

LVEF was significantly lower in the LBBB group compared to the non-LBBB group. Our findings are consistent with other studies.

A number of studies have noted an inverse relationship between the ejection fraction and QRS duration [22–26]. However, only one study performed a multivariate analysis to determine the predictors of LBBB [23]. In McCullough PA et al. study of patients admitted to an intensive care unit with acute heart failure, the significant independent predictors were ejection fraction ($p < 0.0001$), renal function ($p = 0.04$) and age ($p = 0.04$). In our study, left ventricular ejection fraction and age were not confirmed as independent predictors. However, renal function was not reported in our study.

The Framingham study specifically showed that 28% of patients who were free from clinical HF and who developed LBBB after the first Framingham examination also developed HF coincident with, or soon after, the onset of LBBB. The mean time interval from the onset of LBBB to the first recognition of clinical HF was 3.3 years [27,28].

While the Framingham study suggests that HF might develop as a result of LBBB, HF could also develop before the block and simply worsen with increasing conduction disturbances [21].

To the best of our knowledge, the majority of studies that analyzed the prevalence and the prognostic impact of LBBB in patients with heart failure focused on long-term mortality. On the other hand, our study emphasizes in-hospital mortality and morbidity of CHF patients with vs. without LBBB during a short period of stay (the average length of stay was 10 days in the LBBB group and five days in the non-LBBB group).

In the recent McCullough PA et al. prospective study, increased QRS duration was found to be associated with worse outcome in a population admitted for acute heart failure (AHF) [23]. Similarly, a retrospective analysis from the Efficacy of Vasopressin Antagonism in Heart Failure Outcome Study With Tolvaptan (EVEREST) study concluded that a prolonged QRS duration was an independent predictor of high post-discharge morbidity and mortality following hospitalization for AHF in patients with a history of CHF and LVSD (LVEF ≤ 40%) [29]. In our study, the death rate was significantly higher in the LBBB group (18.2% of patients with LBBB vs. 6.7% of patients without LBBB). This finding suggests that LBBB is associated with worse hospital outcome in CHF patients with LVSD, but with no significant difference between patients with a QRS duration >150 ms and patients with a QRS duration ≤150 ms. The mechanism of death was progression of heart failure in 58% of patients with LBBB vs. 62% of patients without LBBB, and sudden death in 42% of the patients with LBBB vs. 38% of the patients without LBBB. Notably, the QRS widening to >120 ms exposes HF patients to more frequent rhythmical events [30]. However, arrhythmic complications did not significantly differ between the two groups.
Because HF and LBBB share the same etiologies [31], the treatment of causative diseases, mainly diabetes, hypertension, and CAD, will be instrumental in the prevention of HF as well as the occurrence of the conduction defect. In our study, the use of angioplasty and coronary artery bypass graft (CABG) surgery was low despite a high incidence of CAD. This is due to socioeconomic levels of patients as well as advanced age or severe co-morbidities that limit performing these techniques in our social context.

Although current drug treatments acting on neurohumoral imbalances can lead to a decrease in heart volumes and in LV hypertrophy, data suggesting that these drug treatments can cause electrical reverse remodeling and thus restore a normal conduction after LBBB are scarce [21]. On the other hand, some studies that evaluated patients treated with current drug regimens identified a progressive lengthening of QRS duration [32,33]. The Euro Heart Failure survey recently showed that in a HF population the QRS was shorter in patients treated with beta-blockers (BB), while it was longer in those treated with angiotensin converting enzyme inhibitors (ACEI), spironolactone, or digoxin [34]. These findings are consistent with our results concerning beta-blockers and ACEI, but we were limited in prescribing the BB, ACEI and angiotensin receptor blockers (ARB) given that certain patients had low blood pressure (<100/60 mmHg) or acute renal failure.

During the past 15 years, biventricular resynchronization has been validated by various multi-centric studies and is currently an integral component of the therapeutic arsenal of HF patients with LBBB [35].

Cardiac resynchronization therapy allows for significant clinical benefit, reverse remodeling, reduction of ventricular volumes, and decrease of morbidity and mortality in patients with symptomatic heart failure and wide QRS [36]. From our cohort of patients with LBBB, 61.8% received cardiac resynchronization therapy performed during the index hospital stay (50.9%) as well as previously (10.9%). Only 16 of these patients also received an ICD function, due to several reasons: the majority of our patients were in NYHA functional class III or IV heart failure, and CRT-D is preferentially implanted in asymptomatic or mildly symptomatic patients because they are younger, have fewer co-morbidities and have a higher proportion of sudden vs. non-sudden cardiac deaths; the cost-effectiveness of CRT-D remains high; and the evidence from trials remains insufficient to show the superiority of combined CRT and ICD over CRT alone [37].

Current CRT guidelines do not specify the time of CRT device implantation relative to AHF admission. The OPTIMIZE-HF trial found that CRT implantation during an AHF hospitalization was safe and associated with a decreased rate of re-admission [38]. Hospitalization for CHF may thus be a window of opportunity for possible CRT implantation. LBBB patients with no history of severe chronic HF could be a potential new target population in which the relative benefit of CRT may be higher (and the response rate greater) than in stable patients with NYHA III and IV severity.

Studies have shown a continuous relationship between broader QRS and a greater benefit from implantable cardioverter defibrillator-CRT [39]. The majority of patients who died did not receive CRT. In patients who received CRT with or without ICD function, 40% had a QRS >150 ms, and only two died.

Based on the in-hospital increased mortality observed in the non-CRT group, we support the view that CRT combined with optimal pharmacological therapy has a highly favorable and sustained impact on mortality.

**Limitations**

Our study was limited to one center in Morocco, and included a limited number of patients. This is an in-hospital based study that only describes hospital outcome with no real post-hospital follow-up as the majority of considered patients either never followed up with the center or were transferred to other private practices or centers.

To the best of our knowledge, this work is the first Moroccan in-hospital study to examine the predictive role of LBBB in CHF patients. As a result, we observed that in-hospital mortality and disease severity, recorded in a short time interval, are higher with LBBB.

**Conclusion**

In conclusion, our hospital-based study indicates that complete LBBB is unequivocally associated with higher in-hospital mortality and greater disease severity, recorded in a short time interval, in patients with CHF and reduced left ventricular systolic function. The significant factors associated with LBBB in a multivariate analysis were left-sided heart failure, LV end-diastolic diameter, and idiopathic DCM. The ECG remains an accessible and inexpensive tool in the identification of this electrical abnormality, underscoring the importance of QRS duration in the selection of patients...
for cardiac resynchronization therapy to improve prognosis and relieve symptoms.

References


