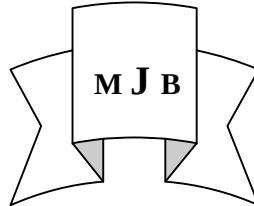


Frequency of Left Bundle Branch Block in Patients with Left Ventricular Systolic Dysfunction

Ali Razzaq AL-Hussaini Haider Sobhi al-Haddad

Colege of Medicine, University of Babylon, Iraq.



Abstract

Background: Chronic heart failure is an increasing condition with high mortality and morbidity. Left bundle branch block (LBBB) has been identified as an independent predictor of risk of cardiac morbidity or mortality.

Objective: To determine the frequency of LBBB in patients with systolic LV dysfunction.

Setting: Al-Hussein Hospital echocardiographic clinic in Karbala city.

Methods: One hundred sixty patients were divided into two groups: Group A: constituted of 80 consecutive patients who had a left ventricular (LV) ejection fraction (EF) $\leq 40\%$ and Group B: constituted of 80 consecutive patients who had a left ventricular (LV) ejection fraction (EF) $> 40\%$. Both groups were screened for LBBB using standard twelve-lead surface electrocardiogram.

Results: There were two patients (2.5%) with LBBB in group B, while the number was 16(20%) in group A. P- value was ≤ 0.0005 .

Conclusion: Left bundle branch block is more common in patients with systolic LV dysfunction. Electrocardiogram should be included in the diagnostic and evaluative process of these patients.

الخلاصة

الخلفية: يعد عجز القلب الاحتقاني مرضاً قاتلاً وهو شائع ومكلف وينتج عن القصور الانقباضي للبطين القلبي الأيسر. يعتبر انسداد فرع الحزمة الأيسر منبئاً بالمضاعفات القلبية والوفاة.

هدف البحث: تحديد مدى انتشار انسداد فرع الحزمة الأيسر في المرضى المصابين بالقصور الانقباضي للبطين القلبي الأيسر. المكان: مستشفى الحسين العام في مدينة كربلاء المقدسة.

الطرق: اشتملت الدراسة على إجراء فحص صدى القلب (الايكو) على 160 مريضاً قسموا على مجموعتين: المجموعة أ تكونت من 80 مريضاً عندهم "جزء القذف" $\geq 40\%$ و المجموعة ب تكونت من 80 مريضاً عندهم "جزء القذف" $< 40\%$. تم تسجيل وجود انسداد فرع الحزمة الأيسر في كل مجموعة باستخدام التخطيط القلبي القياسي (12 قطباً).

النتائج: كانت نسبة انسداد فرع الحزمة الأيسر في المجموعة أ (المصابين بالقصور الانقباضي للبطين القلبي الأيسر) أكثر من المجموعة ب {16(20%) مقابل 2(2.5%) قيمة $p=0.005$ }.

الاستنتاج: كان انسداد فرع الحزمة الأيسر أكثر في المرضى المصابين بالقصور الانقباضي للبطين القلبي الأيسر. يجب استخدام التخطيط القلبي في تقويم هؤلاء المرضى.

Introduction

The prevalence of chronic heart failure (CHF) has increased in the past few decades due to ageing of the population and improved survival from myocardial infarction. It remains a condition with a high

mortality rate. The Framingham study showed a 10% annual mortality rate in patients with newly diagnosed heart failure [1]. Once heart failure was detected, only 25% of men and 38% of women were alive at five years, reflecting a six-seven-times higher

mortality rate than that of the general population of same age [2].

The 12-lead electrocardiogram (ECG) is a widely available, low-cost, non-invasive test. Guidelines from the European Society of Cardiology [3, 4] and the National Institute for Clinical Excellence (UK) [5] suggest that patients with suspected heart failure (HF) should have an ECG included in the diagnostic process.

Bundle branch block (BBB), defined as evidence of intraventricular conduction delay present on the surface ECG, is a conduction abnormality observed in up to 3% of patients encountered in ambulatory patient care settings [6–17]. The incidence is lowest in young, healthy populations and increases with age or the presence of heart or renal disease [18]. LBBB is more commonly found in association with coronary artery disease and left ventricular (LV) dysfunction [6–17]. Large observational studies such as the Framingham Study, publishing comparative features of subjects with RBBB and LBBB noted a higher incidence of subsequent heart failure on exam in subjects with LBBB rather than RBBB [8]. In this setting, LBBB has consistently been identified as an independent predictor of risk of cardiac morbidity or mortality [6,8–12,16–24]. It is clear that LBBB serves both as a marker of the severity of heart disease and promotes worsened cardiac performance resulting from mechanical dyssynchrony [25].

This study was designed to determine the frequency of LBBB in patients with systolic LV dysfunction.

Patients and Methods

Study Population

One hundred sixty patients from Al-Hussain Hospital echocardiographic clinic were screened between June 2006 and August 2007. Cardiac examination was performed for each patient. Demographic data, presence of comorbidities, and physical examination data including jugular venous pressure, presence of abnormal heart sounds, and the presence of murmur were entered into the study database.

Patients were divided into two groups:

Group A: constituted of 80 consecutive patients who had a left ventricular (LV) ejection fraction (EF) $\leq 40\%$.

Group B: constituted of 80 consecutive patients who had a left ventricular (LV) ejection fraction (EF) $> 40\%$.

Electrocardiographic Data

The 12-lead ECGs analyzed were recorded with the patient at rest in a supine position. The recordings were calibrated at 0.1 mV/mm at a paper speed of 25 mm/s. World Health Organization criteria were used to diagnose LBBB, [26] (Table 1).

Echocardiographic Data

The study patients underwent standard echocardiogram using Philips EnVisor C machine (Philips medical systems, USA).

EF was estimated visually and by Tiecholtz formula [27] at the time of the examination.

Statistical Analysis

Statistical Analysis of data was done by chi square test (Microsoft Excel 2×2 chi square). P-value equal to or less than 0.05 was regarded the level of significance.

Table 1 WHO Criteria for BBB**A. Complete BBB (ALL of the below)**

1. QRS duration $> .12$ s (Adults)
2. Supraventricular rhythm
3. Absence of WPW pattern

B. Complete RBBB

1. R' or r' in V1 or V2 ($r < R'$)
2. S $>$ R in I and V6
3. S $> .04$ s in I and V6
4. R peak time $> .05$ seconds in V1 or V2
5. 1_2 or 2_3 or 4_2/5

C. Complete LBBB

1. Broad and notched or slurred R in I, V5, V6
2. Absence of Q in I, V5, V6
3. R peak time $> .06$ s in V5, V6
4. 1_2_3

D. Nonspecific intraventricular block

1. All cases with QRS duration $> .12$ s that do not meet the criteria for LBBB or RBBB

Results

Eighty patients were studied in group A with age range between 21-81 years and a mean age of 51 ± 30 years. Male/ female ratio was 1.9. Ejection fraction range between 20-40%. Mean ejection fraction was 30 ± 10 .

In group B, 80 patients were studied with age range of 20-80 years with a mean age of 50 ± 30 years. Male/ female ratio was 1.2. Ejection fraction range between 42-70%. Mean ejection fraction was 56 ± 14 .

Table-2 shows the distribution of patients in both groups according to age groups. Thirty five percent of patients in group A were between 60-69 years old. Patients above 50 years constituted 77.5% of all patients in this group. Ninety percent of patients in group A were above 40.

Table-3 shows the number and percentage of LBBB in patients in the two groups. There were two patients (2.5%) with LBBB in group B, while the number was 16(20%) in group A. P- value was ≤ 0.0005 .

Table 2 The distribution of patients in both groups according to age groups

Age group(year)	Group A	Group B
20-29	3(3.75%)	7(8.75%)
30-39	5(6.25%)	11(13.75%)
40-49	10(12.5%)	18(22.5%)
50-59	18(22.5%)	20(25%)
60-69	28(35%)	17(21.25%)
70-79	12(15%)	6(7.5%)
80-89	4(5%)	1(1.25%)
Total	80(100%)	80(100%)

Table 3 Number and percentage of patients who have LBBB

Group A	number	16	$p \leq 0.0005$
	percentage	20%	
Group B	number	2	
	percentage	2.5%	

Discussion

In this study, left bundle branch block is more common in patients with systolic dysfunction. Other studies have found bundle branch block on ECGs in varying numbers of subjects, depending on the screening setting and coexistence of cardiac disease. [7-19] Left bundle branch block occurred in 13.2% of patients admitted to intensive care unit with decompensated heart failure in Mc Cullough et al study [18]. Khan et al found that the prevalence of LBBB was 16.3% in patients with heart failure. [28] LBBB was present in 25.2% of outpatients with congestive heart failure in the study conducted by Baldasseroni et al [20]. Hawkins et al concluded that in patients with $LVEF \leq 40\%$, the prevalence of LBBB was 29.6% in those not receiving an ACEI, and 30.5% in those receiving ACEI treatment [22]. These data suggest that the LBBB may promote progressive LV dysfunction. LBBB both delays and alters the sequence of LV contraction. Acute hemodynamic studies performed in subjects with LV dysfunction have shown that this results in compromise of both LV systolic and diastolic performance, increasing wall stress and strain and worsening mitral regurgitation. [25,29] In patients without heart disease but with right ventricular pacing-induced LBBB, acute and chronic deleterious changes in global ventricular performance, myocardial blood flow, and LV function have been demonstrated [21, 30].

Previous studies have demonstrated that bundle branch block

patterns on ECG may predict co-existing and future cardiovascular disease [31-39]. The Framingham Heart Study demonstrated the relationship between an increased incidence of coronary artery disease and congestive heart failure in those who developed bundle branch block over time [40]. Lee et al suggested that in some instances, the bundle branch block-induced dyssynchrony of the left ventricle may itself trigger a remodeling process resulting in LV dysfunction [41]. As LBBB is an independent predictor of mortality in subjects with LV dysfunction and symptomatic heart failure, [16-24] those subjects should have an ECG included in the diagnostic and evaluative process.

Conclusions

1. Left bundle branch block is more common in patients with left ventricular systolic dysfunction.
2. As left bundle branch block is an independent predictor of mortality, patients with suspected or proved heart failure should have an ECG included in the diagnostic and evaluative process as left bundle branch block patterns on ECG may predict co-existing and future cardiovascular disease.
3. Echocardiography should be done to all patients with left bundle branch block to exclude underlying cardiac disorder such as coronary artery disease and left ventricular dysfunction.

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