

## The Prevalence of CAD in Patients with Left Bundle Branch Block (LBBB) Attending Cardiac Catheterization in Hilla

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### Abstract

**Background:** Left Bundle Branch Block (LBBB) results from conduction delay or block in any of several sites in the intraventricular conduction system, The incidence of LBBB increases with age<sup>(2)</sup>. It is infrequent in young healthy subjects. LBBB Usually appears in patients with underlying heart disease, Even among persons without overt heart disease, LBBB is associated with a higher than normal risk of cardiovascular and all-cause mortality, . Among patients with coronary artery disease, the presence of LBBB correlates with more extensive disease, more severe left ventricular dysfunction, and reduced survival rates.

**Objectives:** Is to determine the prevalence of coronary artery disease in patients with left bundle branch block in Babylon district.

**Method and results:** we studied 45 patients referred to the cardiac catheterization laboratory for various indications, significant percentage of patients were labeled with the diagnosis of coronary artery disease (CAD), the prevalence of CAD in the studied population was 44.2%, Male gender, diabetes, smoking, echocardiographic finding of LV dysfunction or regional wall motion abnormalities were a risk factors that are significantly associated with a higher prevalence of angiographically documented coronary artery disease.

**Conclusion:** significant number of patients with LBBB has a normal coronary angiography, consequently unnecessarily consumes anti anginal drugs and admitted to coronary care units .using the predictors of existence of CAD, and multi detector 64 slice cardiac CT angiography would help much to rule out CAD in this population.

### الخلاصة

**الاهداف :** لتحديد نسبة وجود تصلب الشرايين التاجية في المرضى المصابين بعطب الحزمة الكهربية اليسرى في محافظة بابل .

**الطريقة والنتائج :** اجريت هذه الدراسة على خمسة واربعين مريضاً مصابين بعطب الحزمة اليسرى احيوا لاجراء عمليات قسطره لدواعي مختلفة .اظهرت الدراسة خلو النسبة الاكبر من هؤلاء المرضى من تصلب الشرايين التاجية وان نسبة حدوثه تقارب ال 44.2% . كانت الذكوره ,العمر ,الاصابه بالسكري ,التدخين ,انخفاض قذف القلب وقصور الحركه الاقشاري في جدران القلب مؤشرات قويه الى احتمال وجود تصلب الشرايين التاجية .

**الاستنتاج :**اظهرت الدراسة ان النسبة الاكبر من مرضى عطب الحزمة اليسرى تخلوا من تصلب الشرايين التاجية وان عددا كبيرا منهم يستعمل ادويه الذبحه الصدريه ويدخل ردهات الانعاش بدون مسوغات كافيه ,يمكن استعمال العوامل التي تعضد تواجد تصلب الشرايين والمفراس الحلزوني ذو الاربع وستون مقطعا كوسائل لحل هذه المشكله .

### Introduction

Left Bundle Branch Block (LBBB) results from conduction delay or block

in any of several sites in the intraventricular conduction system, including the main left bundle branch, each of the two fascicles, the distal conduction system of the left ventricle

or, less commonly, the fibers of the bundle of His that become the main left bundle branch resulting in extensive reorganization of the activation and recovery patterns of the left ventricle that produces extensive changes in the QRS complex and the ST-T wave<sup>(1)</sup>

Electrocardiographically LBBB produces a prolonged QRS duration, abnormal QRS patterns, and ST-T wave abnormalities. The Commonly accepted diagnostic criteria for LBBB include a prolonged QRS duration to 120 milliseconds or beyond; broad and commonly notched R waves in leads I, aVL, and the left precordial leads; narrow r waves followed by deep S waves in the right precordial leads; and absent septal q waves. The mean QRS axis with LBBB is highly variable; it can be normal, deviated to the left or, less often, deviated to the right.<sup>(1)</sup>

The incidence of LBBB increases with age<sup>(2)</sup>. It is infrequent in young healthy subjects. As an example, a study of 237,000 airmen under age 30 found only 125 cases of LBBB, representing an incidence of 0.05 percent. Ninety percent of these subjects had no apparent heart disease. The prognosis of isolated LBBB in young men is generally benign<sup>(2)</sup>.

The increase in incidence with age was illustrated in a prospective study of 855 Swedish men in the general population who were 50 years of age and followed for 30 years: the incidence was 0.4 percent in at age 50, 2.3 percent by age 75, and 5.7 percent by age 80<sup>(2)</sup>. In this otherwise healthy population, there was no significant association with risk factors for or the presence of ischemic heart disease, myocardial infarction or cardiovascular deaths, suggesting that LBBB is usually a marker of a slowly progressive degenerative disease of the conduction system<sup>(2)</sup>.

### **Clinical significance:** LBBB

Usually appears in patients with underlying heart disease, although as many as 12 percent of patients with LBBB have no demonstrable heart disease<sup>(3)</sup>. Even among persons without overt heart disease, LBBB is associated with a higher than normal risk of cardiovascular and all-cause mortality.<sup>(4)</sup> It is associated with substantially higher than expected risks of high-grade atrioventricular block and cardiac death, mostly as a result of sudden death outside the hospital setting<sup>(5)</sup>. Among patients with coronary artery disease, the presence of LBBB correlates with more extensive disease, more severe left ventricular dysfunction, and reduced survival rates<sup>(1)</sup>.

Patients with associated left or right axis deviation have more severe clinical manifestations. Left axis deviation is associated with more severe conduction system disease that includes the fascicles as well as the main left bundle, whereas right axis deviation suggests dilated cardiomyopathy with biventricular enlargement<sup>(1)</sup>.

In addition to the hemodynamic abnormalities produced by the underlying cardiovascular conditions, the abnormal ventricular activation pattern of LBBB itself induces hemodynamic changes. These include abnormal systolic function with dysfunctional contraction patterns, reduced ejection fraction and lower stroke volumes, and abnormal diastolic function, which may represent a form of cardiomyopathy<sup>(6)</sup>. In addition, functional abnormalities in phasic coronary blood flow often result in septal or anteroseptal defects on exercise perfusion scintigraphy in the absence of coronary artery disease<sup>(7)</sup>.

A major impact of LBBB lies in obscuring or simulating other electro-

cardiographic patterns. The diagnosis of LVH is complicated by the increased QRS amplitude and axis shifts intrinsic to LBBB; in addition, the very high prevalence of anatomical LVH in combination with LBBB makes defining criteria with high specificity difficult. The diagnosis of myocardial infarction may be obscured; as will be described, the emergence of abnormal Q waves with infarction is dependent on a normal initial sequence of ventricular activation, which is absent with LBBB. In addition, electrocardiographic patterns of LBBB, including low R wave amplitude in the midprecordial leads and ST-T wave changes, can simulate anterior infarct patterns.<sup>(1)</sup>

Left bundle branch block alters the sequence of conduction of the left ventricle causing characteristic wall motion abnormality seen on M mode echocardiography visualized as an early systolic downward motion of the interventricular septum. However, the separation of the wall motion abnormality due to LBBB from that which can be seen in coronary disease involving the LAD territory can be often problematic and although there are some echocardiographic features that are helpful to differentiate between the ischemic and the non ischemic LBBB, however none of these is absolute and even in the most experienced hand<sup>(8)</sup>

Exercise-induced ST segment depression is found in most patients with left bundle branch block (LBBB) and cannot be used as a diagnostic or prognostic indicator, regardless of the degree of ST segment abnormality. In patients who are referred to a tertiary center and in whom exercise testing is carried out, the new development of exercise-induced transient left hemiblock was found to be 0.3 percent and the new development of LBBB was 0.4 percent, with a slightly greater

incidence in older patients. The relative risk of death or other major cardiac events in patients with exercise-induced LBBB is increased approximately threefold over the risk in patients without this abnormality. In one series, permanent LBBB was reported in approximately 50 percent of patients who developed transient LBBB during exercise and who were monitored for an average of 6.6 years. High-grade AV block did not develop in any of the patients in this 15-patient series. The development of ischemic ST segment depression before the LBBB pattern appears or in the recovery phase after the LBBB has resolved does not attenuate the diagnostic yield of the ST segment shift. The ventricular rates at which the LBBB appears and disappears can be significantly different<sup>(1, 7, 9)</sup>.

Isolated reversible perfusion defects of the septum in patients with left bundle branch block (LBBB) may be seen in the absence of stenosis of the left anterior descending (LAD) coronary artery. This phenomenon may represent true heterogeneity of flow between the LAD and left circumflex territories, related to delayed relaxation of the septum in LBBB leading to reduced coronary flow reserve in early diastole, or reduced oxygen demand as a result of late septal contraction when wall stress is decreasing. The specificity and predictive value of a septal perfusion defect with LBBB are thus low. However, apical or anterior involvement in septal perfusion defects increases the specificity for CAD. Because a septal defect in LBBB is most commonly seen at high heart rates, pharmacological stress improves specificity, and vasodilator stress is recommended in the setting of LBBB.<sup>(7)</sup>

The scope of the problem in Iraq:

Up to our knowledge, there is no study addressing the incidence and

significance of LBBB in the Iraqi population, currently most of the physician explains the incidental finding of LBBB to their patients by having either angina or MI, less commonly to heart failure and many of those patients are taking variety of medications and more importantly do have significant physical and psychological limitations for no proven base so also for those with LBBB whose surgery been postponed for the fear of existence of significant coronary artery disease. Physicians who works in the angiographic fields do agree about the over treatment of LBBB patients however this is still based on their observations that had not been documented by any conducted study.

## Materials and Methods

For the period from Jan 2009 to September 2010 , 1400 patients were referred to Shaheed Al-Mihrab Cath centre in Babylon for diagnostic coronary angiography, 45 patient included in the study were having LBBB based on their (QRS duration  $\geq$  120 msec, Broad, notched R waves in lateral precordial leads, Small or absent initial r waves in right precordial leads followed by deep S waves , Absent septal q waves in left-sided leads, Prolonged intrinsicoid

deflection ( $>60$  msec) in  $V_5$  and  $V_6$ )<sup>(1)</sup> history, risk factors notification, and physical examination and base line work up including ECG, echocardiography were performed, the indications for coronary angiography were variable including an un resolving chest pain, unexplained LV dysfunction, dyspnoea, echocardiographic diagnosis of ischemic wall motion abnormality, and others. An informed consent was obtained, full explanation of the procedure was done and the diagnostic angiography was performed in the standard technique. Data was collected and analyzed using SPSS statistical package version 17.

## Results

A total number of 45 patients were enrolled in this study presented to the cardiac catheterization lab for a variety of indications namely IHD, PAD, valvular heart diseases etc, 28 (62%) of them were male, 17(38%) were females, the mean age of the sample was  $53.1 \pm 9.8$  sd, (range 35-77yr). Thirty one (68.8%) patients were labeled clinically to have IHD, 30 (66.6%) patients were receiving anti anginal medications, diabetes was present in 31% of the study sample, smoking in 33% and hypertension 51% . table 1

**Table 1. Patients' major characteristics**

Total number	45
Male gender	28(62%)
Female gender	17 (38%)
Mean age	53.1 $\pm$ 9.8 yrs
Hypertension	51%
Smoking	33%
Diabetes	31%
Normal coronary angiogram	25(55.6%)
CAD by angiography	20 (44.2%)

Of the total 45 patients, 25 (55.6%) were with normal coronary angiogram,

the rest 20(44.2%) patients were with abnormal coronary angiogram.

Of those who were labeled with the diagnosis of IHD and those who were really treated as IHD (46.6% , 43.3% respectively were having normal coronary angiogram, versus 53.4 % and 56.7% respectively were having angiographically documented coronary artery disease.

Using an age of 50 as a cut off value, coronary angiogram was abnormal in 38.8% of those who were below 50 versus 48.1% for those above 50 yrs with significant p value <0.05.

Of those with abnormal coronary angiogram, male gender was significantly more prevalent than female gender (65% vs 35% respectively), p value <0.05.

Male gender, diabetes, smoking, echocardiographic finding of LV dysfunction or regional wall motion abnormalities were a risk factors that are significantly associated with a higher prevalence of angiographically documented coronary artery disease, while hypertension was not.

## Discussion

several studies focused on the patients with left bundle branch block as a predictor of mortality in the general population, as a predictor of outcome in patients with heart failure in structural heart disease, and as a predictor of coronary artery disease, generally these studies showed that a significant negative impact of LBBB on these studies categories<sup>(2,10,11)</sup>

This study focused on the prevalence of significant CAD in patients with LBBB aiming to clarify which subgroup of those patients who are likely to be at risk of CAD and in need of further evaluation and on the other avoid over diagnosis of CAD unnecessary hospital admissions and consumption of anti anginal medications.

This study showed a comparable prevalence of CAD with other studies (55.6% vs 51.6%), so also showed that CAD significantly higher in those subset with LBBB who were older in age, diabetic, male, smoker, with echocardiographic evidence of regional wall motion abnormality and or depressed ejection fraction<sup>(11)</sup>

We feel that it is equally important to rule out CAD as an underlying pathology behind LBBB, and not to consider LBBB in those without CAD as a totally benign condition since a significant increase in the cardiac events was noted in these population.<sup>(12)</sup>

## Conclusion and recommendation

Left bundle branch block is not an uncommon clinical situation , in this study about 3.2 % of the cases referred for the catheterization laboratory were having LBBB, this study showed that a high percent of patient were labeled unnecessarily to have CAD, un necessarily admitted to the CCU, taking antianginal medications without a solid evidence to prove ischemia with the cost burden ,and most of the patient underwent unnecessary limitations of their daily activities. using the criteria proposed by this study would limit rushing in to the diagnosis of CAD, however these criteria need to be validated by further study .the availability of non invasive imaging of the coronary arteries using 64 slice coronary CT angiography would be a good option to rule out the ischemic etiology of LBBB, the validated risk factors predicting ischemia in LBBB can be used to avoid unnecessary cost and radiation exposure.

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