

THE RELATIONSHIP BETWEEN LEFT BUNDLE BRANCH BLOCK AND THE PRESENCE OF CORONARY ARTERY DISEASE AND LEFT VENTRICULAR DYSFUNCTION

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ABSTRACT

Fifty patients with electrocardiographic (ECG) evidence of left Bundle Branch Block (LBBB) and fifty control group with no significant electrocardiographic findings were studied over the period from October 2004 to July 2005 for evidence of Coronary Artery Disease (CAD) and Left Ventricular (LV) dysfunction. Both groups underwent cardiac catheterization and CAD considered present if there was 70% and more lumen diameter stenosis except for Left Main Coronary Artery (LMCA) was 50% and more. LV function was assessed visually and the function was considered normal or abnormal.

The CAD was found in 37/50 (74%) of patients with LBBB, it was significantly ($P < 0.002$) higher than in control group 14/50 (28%), the percentage of LAD artery disease was significantly ($P < 0.001$) higher in patients with LBBB 36/50 (72%) than in control 5/50 (10%) and LV dysfunction was present in 30/50 (60%) of patients with LBBB it was significantly ($P < 0.001$) higher than in control 9/50 (18%)

In conclusion: the study showed that the patients with LBBB had higher incidence of CAD and LV dysfunction

INTRODUCTION

Left Bundle Branch Block

LBBB usually appears in patients with underlying heart diseases, the most frequent cause is CAD.^[1] The presence of LBBB correlates with more extensive disease, more severe left ventricular dysfunction and reduced survival rate,^[2] the abnormal activation pattern of LBBB induced haemodynamic perturbations, including abnormal systolic function with dysfunctional contraction pattern, reduction of ejection fraction and stroke volume and abnormal diastolic function.^[3,4] Sgarborra et al.^[5] developed criteria for diagnosis of Myocardial Infarction (MI) in patients with LBBB:-

1. *ST segment elevation of at least 1 mm concordant with the QRS complex.*
2. *ST segment elevation of at least 5 mm discordant with the QRS complex.*
3. *ST segment depression in leads VI-V3.*

The non invasive detection of myocardial ischaemia in patients with LBBB remains a challenge, confirming CAD has obvious implication for management.^[6]

Coronary Angiography:

Diagnostic coronary angiography has become one of the primary component of cardiac catheterization.^[7] Coronary angiography remains the clinical gold standard for the diagnosis of coronary artery disease.^[8] The objective is to examine the entire coronary tree and recording details of coronary anatomy.^[9]

Left Ventriculography:

The technique is used to define the anatomy and function of the LV and related structures. It provides valuable informations about global and segmental LV function, mitral incompetence, ventricular septal defect and hypertrophic cardiomyopathy. As a result left ventriculogram is a routine part of the diagnostic cardiac catheterization.^[10-12]

The aim of the study: Our aim is to estimate the proportion of the coronary artery disease and LV dysfunction in patients with LBBB.

PATIENTS AND METHODS

Study Population:

A case control study was conducted over the period from October 2004 to July 2005. The study population includes 50 patients with

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LBBB who underwent cardiac catheterization including those with and without history of ischaemic heart disease, myocardial infarction and heart failure. The study also includes 50 patients (control group) who had neither LBBB nor others significant electrocardiographic findings had underwent coronary angiography for suspicion of ischaemic heart disease. Both groups also were studied for evidence of risk factors including diabetes mellitus, hypertension and smoking.

Left Bundle Branch Block:

The diagnostic criteria^[13,14] used for the determination of LBBB are the following ECG changes:

1. QRS ≥ 0.12 sec.
2. Broad monophasic R wave in leads I, V5 and V6 which is usually notched or slurred.
3. Absence of Q wave in leads I, V5 and V6.
4. Delayed onset of interscoid deflection in leads V5 and V6.
5. Repolarization abnormalities like ST segment changes.

Cardiac Catheterization:

Cardiac Catheterization were performed by Judkins technique after local anaesthesia with 1% lidocaine, percutaneous entry of femoral artery was achieved by puncturing the vessel 1-3 cm below the inguinal ligement, using Seldingers technique an 18 gauge thin wall needle was inserted at 30 to 45 degree angle into the femoral artery and J tip guidewire was advanced through the needle into the artery. A sheath was inserted into the femoral artery. LMCA and Right Coronary Artery (RCA) were engaged. Coronary cineangiography was performed in multiple views. Coronary artery disease was considered present if there was 70% and more lumen diameter stenosis except for LMCA was 50% and more

Left Ventriculography:

Left ventriculography was obtained by advancing a pigtail catheter into the LV and 20 to 40 ml of contrast medium (Iodixanol) was injected into the ventricle in 30 degree Right Anterior Oblique (RAO) view. LV function was assessed qualitatively (visually) and LV function was considered as normal or abnormal. The statistical analysis of the result was done by Epi Info program Version 3.3, October, 2004.

RESULTS

The study includes 50 patients with LBBB, as shown in (Table-1), 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. 37 out of 50 patients with LBBB had CAD, 13 not (9 had Dilated Cardiomyopathy, 2 had Aortic valve diseases and 2 had Hypertension), whereas 14 patients in control group had CAD, (P<0.002).

Table 1. Clinical characteristics of the patients and control.

Items	Patients N=50 (%)	Control N=50 (%)
Sex (M:F)	31/19	22/28
Age (mean ± SD)	56.68±6.8	51.88±6.8
CAD	37 (74)	14 (28)
LV Dysfunction	30 (60)	9 (18)

The patients and control groups were studied for risk factors as shown in (Table-2). The incidence of diabetes mellitus in patients with LBBB was 27/50 (54%), it was significantly (P<0.004) higher than in control 14/50(28%), also the incidence of hypertension was significantly (P<0.01) higher in patients with LBBB 20/50(40%) than in control 10/50(20%), but there was no statistically significant difference in the incidence of smoking among patients with LBBB and control 11/50 (22%)vs 8/50(16%)

Table 2. Risk factors for the patients and control.

Risk factors	Patients No. (%)	Control No. (%)	P-value
Diabetes Mellitus	27 (54)	14 (28)	0.004
Hypertension	20 (40)	10 (20)	0.01
Smoking	11 (22)	8 (16)	0.2

The cardiac catheterization findings in (Table-3), shows the incidence of LMCA disease was 8/50(16%) in group with LBBB while non in control group. The incidence of LAD artery disease was 36/50 (72%) in patients with LBBB which was highly significant (P<0.001) than in control group 5/50 (10%), also the incidence of RCA disease was significantly higher (P<0.007) in LBBB group than in control (19/50 vs 8/50), whereas Left Circumflex (Lcx) artery disease was not significantly (P<0.8) differed among two group (10/50 vs 5/50).The LV function dysfunction was present in 30 out of 50(60%) in patients with LBBB , it was significantly higher (P<0.001) than in control group (9/50).

Table 3. Cardiac catheterization findings in patients and control.

Items	Patients No. (%)	Control No. (%)	P-value
LMCA	8 (16)	0	-
LAD	36 (72)	5 (10)	0.0001
LCx	10 (20)	5 (10)	0.8
RCA	19 (38)	8 (16)	0.007
LV Dysfunction	30 (60)	9 (18)	0.001

Table-4, shows clear association between the presence of LBBB and the presence of LV dysfunction, were out of 37 patients with CAD, 21 had LV dysfunction, out of 9 patients with dilated cardiomyopathy, 8 had LV dysfunction, out of two with aortic valve disease, 1 had LV dysfunction, and out of two patients with hypertension none had LV dysfunction.

Table 4. LV Dysfunction in patients with LBBB.

LBBB	LV dysfunction		Total No. (%)
	Yes	No	
Coronary Artery Disease	21	16	37 56.75
Dilated Cardiomyopathy	8	1	9 88.88
Aortic Valve Disease	1	1	2 50
Hypertension	0	2	2 0
Total	30	20	50 60

P<0.001

Table-5, shows the association between LAD artery disease and diabetes mellitus were 22 out of 27 patients with diabetes mellitus in LBBB group (50 patients), only 4 out of 14 with diabetes mellitus had LAD disease (P<0.003).

Table 5. Association of LAD disease and DM in patients with LBBB and Control.

LAD disease	Patients		Control		Total
	DM	Non-DM	DM	Non-DM	
Yes	22	14	4	1	41
No	5	9	10	35	59
Total	27	23	14	36	100

P<0.003

P<0.01

DISCUSSION

Our study evaluated the association between the presence of LBBB and the presence of coronary artery disease and left ventricular dysfunction. The frequency of coronary artery disease was significantly higher in patients with LBBB than in control in whom cardiac catheterization were performed for suspicion of ischaemic heart disease (P<0.001). The LMCA disease was higher in patients with LBBB than in control, and LAD was the most frequently diseased artery, and to less extent RCA. This is compatible with the findings of Meric^[1] who had demonstrated that coronary artery disease was the most frequent cause of LBBB and most frequently was LAD stonosis and rarely combined with RCA stenosis. The incidence of

left ventricular dysfunction was significantly ($P < 0.001$) higher in patients with LBBB than in control. Ozdemir K^[15] in 2004 had showed similar results that the LBBB patients had significantly ($P < 0.001$) higher frequency of congestive heart failure (38.2% vs 11.8%) and cardiomegaly (63.6 vs 25.5%) compare to patients with normal ECG. Our study showed significant association between the presence of LBBB and CAD and the presence of diabetes mellitus. This is compatible with the known fact that people with diabetes have an increased prevalence of atherosclerosis and CAD, this could be explained by the presence of; Traditional CAD risk factors such as hypertension, dyslipidaemia and obesity cluster in diabetic patients. Diabetic specific risk factors such as multiple and vulnerable plaques, increased expression of GP IIb/IIIa which contributes to thrombus formation, increased plasminogen activator inhibitor type I (PAI-1) which decreases fibrinolysis, increased C-reactive protein and diabetic cardiomyopathy.

Conclusion and Recommendations

In conclusion, there is highly significant association between coronary artery disease and LBBB, and since the patients with ECG evidence of LBBB have increasing risk of left ventricular dysfunction and reduced survival rate, therefore we recommend, that cardiac catheterization should be considered in patients with evidence of LBBB who have ischaemic chest pain or who have risk factors for CAD.

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