ORIGINAL ARTICLE

# Etiology and Left Ventricular Function in Right Bundle Branch Block: A Prospective Observational Study

Rajeev Bhardwaj[1*], Rajesh Nandal[2], Subeg Singh[3], Pramod Rawat[4], Jaskiran Kaur[5]

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## Abstract

**Purpose of study:** Right bundle branch block (RBBB) is a common ECG finding. It may be caused by coronary artery disease, dilated cardiomyopathy, chronic obstructive lung disease, or degenerative disease of the conduction system of the heart. The purpose of the study was to find out the etiology and left ventricular function in patients with RBBB coming to a tertiary care hospital.

**Materials and methods:** All consecutive patients coming to our hospital on an outdoor or inpatient basis with ECG showing RBBB were studied. Detailed history and physical examination were done. All patients were subjected to echocardiography.

**Results:** 201 patients with RBBB were studied. Mean age was 61.01 ± 12.92 years. 157 were male (78.11%), and 44 (21.89%) were female. The most Common symptom was dyspnea in 81 patients (40.29%) and chest pain in 15 patients(7.46%). Four patients presented with syncope and were proved to have intermittent complete heart block. 95 persons (47.26%) with RBBB had no symptoms, 43 out of which had come for clearance for noncardiac surgery. On echocardiography, left ventricular hypertrophy was present in 32 patients (15.92%), regional wall motion abnormality in 45 patients (22.38%), and left ventricular global hypokinesia in 13 patients (6.46%). LV systolic dysfunction was present in 43 patients (21.39%), and 85 (42.28%) patients had a normal study.

**Conclusion:** The most common presentation in patients was dyspnea. About half of the patients were asymptomatic. Around 20% were detected to have RBBB when they came for clearance for noncardiac surgery. Common causes were coronary artery disease, dilated cardiomyopathy, and cor pulmonale.


**Keywords:** Echocardiography, Myocardial infarction, Right bundle branch block, Systolic dysfunction.

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## Introduction

Right bundle branch block (RBBB) is an ECG diagnosis, and its true incidence in the population is difficult to find. It is caused by anatomical or functional conduction abnormality in the conduction through the RBB of the conduction system. So, conduction from the Bundle of His occurs through the left bundle branch (LBB) to the left ventricle (LV), and from there, the conduction occurs through the heart muscle to the right ventricle, thereby causing delayed activation of the right ventricle (RV). This results in abnormal and prolonged QRS duration. Criteria for diagnosis of RBBB are QRS duration more than 120 ms, a large R' wave in V1 and V2, and a broad and deep S wave in V5 and V6. We studied the LV functions in patients with ECG evidence of RBBB coming to a tertiary care unit.

## Materials and Methods

A total of 201 consecutive patients with ECG evidence of RBBB coming to our hospital on OPD or IPD basis were studied. The presenting symptoms were studied in detail. History of angina, dyspnea, wheeze, syncope, cyanosis, hypertension, diabetes, and chest infection was taken. Special attention was given to ECG evidence of acute or old myocardial infarction, right ventricular volume or pressure overload. All patients were subjected to detailed echocardiography, with special attention to wall motion abnormalities, rheumatic heart disease, congenital heart disease, pulmonary artery hypertension, and ejection fraction. Acute myocardial infarction was diagnosed when there was a history suggestive of ischemic chest pain, ST changes, with typical rise and fall in biomarkers. Old MI was diagnosed when there was chest pain suggestive of MI in the past, abnormal Q waves, and regional wall motion abnormality on echocardiography. If required, coronary angiography and angioplasty were done.

### Statistical Analysis

Descriptive statistics were used to present categorical variables as frequency (percentage), and continuous variables were described as mean with standard deviation (SD).

## Results

A total of 201 patients with RBBB were studied. Table 1 shows the clinical characteristics of the patients. Mean age was 61.01 ± 12.92 years. 154 were male, and 47 were female. 61 were hypertensive, and 18 were diabetic. The most common symptom was dyspnea in 81 patients and chest pain in 15 patients. 4 patients presented with syncope and were proved to have intermittent complete heart block (CHB) and were implanted with a permanent pacemaker. 95 patients had no symptoms, out of which 43 had been referred to us for clearance for noncardiac surgery.

Table 2 shows the echocardiographic findings in patients with RBBB. Left ventricular hypertrophy was present in 32 patients, regional wall motion abnormality (RWMA) in 45 patients, and left ventricular global hypokinesia in 13 patients. Rheumatic heart disease (RHD) was present in 3 patients and congenital heart disease in 3 patients.

**Table 1:** Clinical characteristics of the patients

| | |
|---|---|
| Total patients | 201 |
| Male | 157 (78.11%) |
| Female | 44 (21.89%) |
| Mean age (YEARS) | 61.01±12.92 |
| Hypertensive | 61 (30.34%) |
| Diabetic | 18 (8.95%) |
| CKD | 2 (0.99%) |
| Hypothyroidism | 1 (0.49%) |
| *Symptoms* | |
| Dyspnea | 81 (42.29%) |
| Chest pain | 15 (7.46%) |
| Palpitation | 6 (2.98%) |
| Syncope | 4 (1.99%) |
| Asymptomatic | 95 (47,26%) |
| Clearance for noncardiac surgery | 43 |

[1]Professor and Head; [2]Associate Professor; [3–5]Senior Residents, Department of Cardiology, MM Institute of Medical Sciences and Research, Ambala, Haryana, India; *Corresponding Author

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8 patients had cor pulmonale. LV systolic dysfunction was present in 43 patients (21.39%), mild in 8 patients, moderate in 19 patients, and severe in 16 patients. Out of 43 patients with LV systolic dysfunction, 31 had CAD, 11 had dilated cardiomyopathy (DCM), and one patient had chemotherapy-induced LV dysfunction. 41 patients had diastolic dysfunction. 85(42.28%) patients had a normal study.

Table 3 shows the age distribution of RBBB patients. It can be seen that RBBB is uncommon in younger age. Out of 201 patients, 165 (82.08%) were more than 50 years of age, and 153 patients were between 50 and 80 years of age.

Table 4 shows the age distribution of RBBB. It can be seen that CAD was more common after 40 years of age, COPD and CHB after 60 years of age, and DCM can be seen in any age group.

## Discussion

Isolated RBBB usually does not cause any symptoms, and hence its true incidence is not known. However, the prevalence of RBBB is estimated to be 1–3% in some studies.[1,2] As the age goes on increasing, the incidence of RBBB goes on increasing.[1] In persons above the age of 80 years, the prevalence of RBBB is around 11%.

**Table 2:** Echocardiographic findings in patients with RBBB

| | |
|---|---|
| Total patients | 201 |
| Left ventricular hypertrophy | 32 (15.9%) |
| Diastolic dysfunction | 41 (20.39%) |
| Regional wall motion abnormality | 45 (22.38%) |
| Global hypokinesia of LV | 13 (6.47%) |
| Rheumatic heart disease | 3 (1.49%) |
| Mitral stenosis | 2 |
| Mitral regurgitation with PAH | 1 |
| Congenital heart disease | 3 (1.49%) |
| ASD | 2 |
| AV canal defect | 1 |
| Precapillary PAH | 8 (3.98%) |
| LV systolic dysfunction | 43 (21.39%) |
| Mild | 8 |
| Moderate | 19 |
| Severe | 16 |
| CAD | 31 |
| DCM | 11 |
| Chemotherapy-induced | 1 |

**Table 3:** Age distribution of RBBB patients

| *Age (in years)* | *Total cases* | *Male* | *Female* |
|---|---|---|---|
| 18–39 | 11 | 8 | 3 |
| 40–49 | 25 | 17 | 8 |
| 50–59 | 43 | 36 | 7 |
| 60–69 | 68 | 55 | 13 |
| 70–79 | 42 | 30 | 12 |
| >80 | 12 | 11 | 1 |

Blood supply to RBB comes mainly from left anterior descending artery. So RBBB may be seen in patients with anterior wall myocardial infarction. Due to same reason, 45 of our patients had evidence of old or acute myocardial infarction. Other causes of RBBB include DCM, myocarditis, valvular heart disease, cor pulmonale, pulmonary hypertension and congenital heart disease.[1–4] It can also be caused by fibrosis and degenerative disease of conduction system,[3] progression of which can lead to complete heart block. Four of our patients presented with syncope and were found to have intermittent CHB as a cause of syncope. Hypertension is a risk factor for RBBB. Patients with RBBB are more likely to have hypertension than those without RBBB.[5] Almost one third of our patients had evidence of hypertension. Transient RBBB may develop during right heart catheterization due to irritation of RBBB by the catheter.[5] RBBB resolves once the catheter is removed.[6] Brugada syndrome should be suspected in a patient presenting with syncope and ECG suggestive of RBBB with ST segment elevation in lead V1, V2.[7]

Right bundle branch block in a healthy person does not cause any symptoms and is an incidental finding on ECG.[1] 95 of our patients were asymptomatic, out of which 43 were detected when they came for clearance for noncardiac surgery. In others, symptoms are not due to RBBB but due to an underlying cardiac condition. When found in a healthy person, RBBB is a benign condition and does not affect the long-term prognosis. However, in patients with underlying cardiac disease, the prognosis is mainly determined by the underlying condition. But RBBB does increase mortality in these conditions, especially in patients with CAD and DCM.[1] However, some patients, especially those with a prolonged PR interval on ECG, may progress to heart block.

About 21.93% of patients with RBBB had LV systolic dysfunction. In comparison, in our study with LBBB, 56.8% patients showed LV dysfunction,[8] indicating that LBBB is a more serious condition compared to RBBB.

**Table 4:** Distribution of etiologies according to age group in patients with RBBB

| *Etiology* | *18–39* | *40–49* | *50–59* | *60–69* | *70–79* | *>80* |
|---|---|---|---|---|---|---|
| CAD | 02 | 08 | 11 | 16 | 09 | 03 |
| DCM | 03 | 03 | 02 | 04 | 02 | 00 |
| RHD | 00 | 03 | 00 | 00 | 00 | 00 |
| CHD | 01 | 01 | 01 | 00 | 00 | 00 |
| CHB | 00 | 00 | 02 | 01 | 00 | 01 |
| COPD | 00 | 00 | 00 | 04 | 03 | 01 |

Though most of the patients with ECG do not have structural heart disease, they still require evaluation, mainly focusing on cardiac and lung diseases. X-ray of the chest and echocardiogram are the initial tools of investigation. Patients presenting with syncope with RBBB may require Holter recording and elctrophysiological studies in some cases.

## Conflict of Interest

None.

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