Clinical and Echocardiographic Evaluation in Patients with Newly Detected Right Bundle Branch Block

Jayaprakash Kesavapillai¹, Raju George², V.L. Jayaprakash³, Raihanathul Misiriya⁴

¹Additional Professor, Department of Cardiology, Government Medical College, Kottayam, Kerala, India.
²Professor, Department of Cardiology, Government Medical College, Kottayam, Kerala, India.
³Professor, Department of Cardiology, Government Medical College, Kottayam, Kerala, India.
⁴Additional Professor, Department of Cardiology, Government Medical College, Kottayam, Kerala, India.

ABSTRACT

BACKGROUND
Right bundle branch block in the ECG is often incidentally detected during routine cardiac evaluation. It can occur as a normal variant or in association with cardiovascular disorders. Evaluation of patients with incidental detection of RBBB in ECG may give information regarding the clinical relevance of this electrocardiographic abnormality.

METHODS
100 consecutive patients without previously known cardiac disease attending cardiology outpatient department whose ECG showed a right bundle branch block pattern with a QRS width >100 msec were included in the study. After detailed clinical evaluation including history and physical examination, these patients were subjected to echocardiographic evaluation in the standard transthoracic windows using Philips Envisor Colour Doppler Echocardiography machine. Two dimensional and M-mode examination and colour Doppler echocardiographic evaluation were carried out, specifically looking for any structural abnormalities of the heart.

RESULTS
Echocardiographic evaluation revealed structurally normal heart in 74% patients. 26% had cardiac involvement which was either primary or secondary. 62% had predominant right heart disease, either congenital or acquired. Congenital heart disease was observed in 11% cases- atrial septal defect in 9%, patent foramen ovale in 1% and Ebstein’s anomaly in 2%. Other associations were idiopathic dilated cardiomyopathy in 4%, rheumatic heart disease in 2%, degenerative aortic valve disease in 2%, and pericardial effusion in 2% cases.

CONCLUSIONS
This study underscores the importance of echocardiographic evaluation to identify underlying structural heart disease in patients presenting with RBBB in the ECG.

KEYWORDS
Bundle Branch Block, Electrocardiogram, Echocardiography
BACKGROUND

Description of the pattern of right bundle branch block in the electrocardiogram dates back to the early 20th century. Typical appearances include prolongation >0.12 s of the QRS complex, RR' or rR' or Rr' appearances in V1 and widened S waves in the leads exploring the left ventricle (LI, aVL, V5 and V6). A delay in the appearance of the intrinsic deflection >0.08 s may also be observed in the right precordial leads and negative T waves with ST depression may be seen in V1 and sometimes in V2.

The criteria for the diagnosis of RBBB were outlined by the New York Heart Association1 and the Minnesota Code.2 The criteria include QRS duration of >0.12 sec with rSR', qR, or a tall R wave in V1. Incomplete right bundle branch block is perceived as this classic rSR' configuration and a duration of less than 0.12 sec. This presentation reflects the early development of right bundle branch block which manifests initially as diminution of the S wave amplitude in lead V2. Further progression of the right bundle branch block leads to slurring or notching of the upstroke of the S wave in lead V1 followed by the development of a r' deflection. With further progression, the r' deflection becomes increasingly taller until the advent of complete right bundle branch block which is characterized by a widening of a very tall R' deflection with an apical notch or plateau.

Right bundle branch block in the ECG is often incidentally detected during routine cardiac evaluation. It can occur as a normal variant or in association with cardiovascular disorders like coronary artery disease, hypertension, cardiomyopathy or congenital heart disease.

Three types of RBBB have been identified in electrophysiologic studies. Proximal, or central, RBBB occurs when a conduction block is present just distal to the bundle of His in the superior aspect of the right bundle branch. This generally occurs when the proximal bundle is injured during surgery for lesions with an inlet or membranous ventricular septal defect (VSD). Another type of RBBB occurs when the impulse is interrupted between the proximal and distal aspects of the right bundle branch; this type is most commonly observed after surgical division of the moderator band. Distal type of right bundle branch block is observed due to disruption of distal ramifications of the right bundle as that occur during right ventriculotomy. Regardless of the type of RBBB, the ECG patterns remain similar.

The prevalence of RBBB increases with age. In one prospective study of 855 men followed for 30 years, the prevalence was 0.8 percent in subjects at age 50 and 11.3 percent by age 80. In a study of 237,000 airmen under age 30; there were 394 cases of complete RBBB, representing a prevalence of 0.2 percent. In a study of 237,000 airmen under age 30; there were 394 cases of complete RBBB, representing a prevalence of 0.2 percent.

Evaluation of patients with incidental detection of RBBB in ECG may give information regarding the clinical relevance of this electrocardiographic abnormality. This may help to identify the relative distribution of various structural abnormalities of the heart in these patients and its therapeutic implications.

We wanted to evaluate patients presenting with newly diagnosed right bundle branch block to detect presence as well as the pattern of any associated structural abnormalities of the heart.

METHODS

100 patients were included in the study of which 63 patients were males and 37 were females.

Inclusion Criteria

Patients without previously known cardiac disease attending cardiology outpatient department whose ECG showed a right bundle branch block pattern with a QRS width >100 msec were included in the study.

Exclusion Criteria

Patients with known structural heart disease or previously diagnosed right bundle branch block were excluded from the study.

Study Procedure

After detailed clinical evaluation including history and physical examination, these patients were subjected to echocardiographic evaluation in the standard transthoracic windows using Philips Envisor Colour Doppler Echocardiography machine. Two dimensional and M-mode examination and colour Doppler echocardiographic evaluation were carried out, specifically looking for any structural abnormalities of the heart.

Statistical Analysis

Data was entered in Microsoft excel and data analysis was performed using SPSS. Categorical variables were expressed as frequency and percentage. For descriptive statistics of continuous variables were analyzed and expressed in range, mean and standard deviation.

RESULTS

Figure 1. Age Distribution in Patients with RBBB

Age

The patients’ age ranged from 13 to 85 years. Maximum number of patients (37%) were in the 5th and 6th decade.
Clinical Presentation
Dyspnoea was the commonest presenting symptom, reported by 27% cases while the rest of the patients presented with other symptoms including non-cardiac chest pain (25%), effort angina (7%) and nonspecific symptoms (17%). 24% of patients were asymptomatic. Comorbid Conditions included diabetes mellitus in 17%, systemic hypertension in 19% and chronic obstructive airway disease in 18% patients.

Echocardiographic Observations
Left atrial size ranged from 22-49 mm. 7 patients had significantly dilated left atrium with size >40 mm. Left ventricular internal dimension in diastole ranged from 28-76 mm. 10 patients had dilated left ventricle with LVIDD>52 mm. Left ventricular ejection fraction was ranging from 23-86%. It was >60% in 92% cases while the value was 40-60% in 5 cases and below 40% in 3 patients. Mitral flow signal showed E/A reversal in 56% cases whereas the ratio was >1 in the remaining patients. Isovolumic relaxation time was normal in 57% cases and the value was increased above 90 msec in 43% cases. Mitral E deceleration time was normal in 54% while it was shortened (<160 msec) in 15 patients and prolonged (>210 msec) in 31% cases. Tei index was ≤0.4 in 23% cases whereas it was >0.4 in 77% cases.

Heart Disease and RBBB
Echocardiographic evidence of heart disease was observed in 26% of patients with RBBB. Of these patients, a primary structural abnormality of the heart was present in 22 cases (85%) whereas cardiac involvement secondary to disease of another system was observed in 4 cases (15%). Cardiac abnormalities included Atrial septal defect in 9 patients, patent foramen ovale (confirmed by TEE) in one patient, dilated cardiomyopathy in 4 patients, Rheumatic heart disease moderate to severe mitral stenosis and moderate aortic regurgitation in one patient and mild mitral stenosis and regurgitation in one patient, degenerative aortic valve disease (DAVD) in 2 patients, Ebstein’s anomaly in 2 patients and pericardial effusion in 2 cases. Pulmonary artery hypertension secondary to chronic obstructive airway disease was observed in 4 patients. The pulmonary artery systolic pressures ranged from 42-94 mm of Hg. Predominant right heart involvement was observed by echocardiography in 62% cases with right bundle branch block. The Right heart abnormalities observed were Atrial septal defect or patent foramen ovale in 10 patients, Ebstein’s anomaly of the tricuspid valve in 2 cases and pulmonary artery hypertension in 4 patients.

DISCUSSION
In the present study 100 patients with incidentally detected right bundle branch block were evaluated by echocardiography for the presence of structural heart disease. Echocardiographic evidence of heart disease was observed in 26% of patients with RBBB.

62% of the patients had predominant right heart involvement resulting from either congenital or acquired cardiac disorders. These included congenital lesions like atrial septal defect and Ebstein’s anomaly as well as acquired right heart abnormalities like pulmonary artery hypertension secondary to chronic obstructive airway disease.

Complete left bundle branch block (CLBBB) often accompanies organic heart diseases. It is fairly well established that there are two forms of CRBBB: one is interruption of the main right branch of the bundle of His, termed proximal block, and the other in which the terminal ramifications of the right bundle are affected, termed distal block.8,9

Brooks et al10 and Dancy et al11 speculated on the basis of the time analysis of right-sided systolic events using echophonocardiography that the proximal block is relatively isolated and benign, but the distal block is associated with diffuse myocardial disease which was likely to be more widespread and progressive. In the group thought to have proximal block, these authors found that the right-sided delay was confined to prolongation of the time interval between mitral valve closure and tricuspid valve closure on the echocardiogram. In the group thought to have distal block, the positive dp/dt of the RV pressure rise was decreased, and the delay was mainly between tricuspid valve closure and pulmonary valve opening (i.e., RVICT). In addition, Dancy et al11 described that 12 out of 13 of CRBBB with distal delay but only one out of 14 of CRBBB with proximal delay had episodes of syncope or near syncope.

A retrospective observational cohort study was undertaken by Miller et al12 in patients in Olmsted County,
Minnesota, who were evaluated between 1975 and 1999 and were incidentally diagnosed as having BBB. Out of the total 723 patients, 58.1% had LBBB and 41.9% had RBBB. Patients with BBB had higher mortality compared with controls with an absolute difference of 10% over 20 years (p=.03). Cardiac morbidity was also higher in the presence of bundle branch block, particularly LBBB.

Another group of 1,960 white men aged 40 to 56 years without initial apparent heart disease were followed in the Chicago Western Electric Company Study.13 6.8% patients showed incomplete RBBB at the time of inclusion. There was no increased risk of death due to cardiovascular diseases after the follow up period of 20 years.

Clinical presentation and prognosis in a cohort of 2983 patients with RBBB was studied by Rabkin et al.14 Cases with RBBB were observed for 936 person-years (mean 15.9 ± 1.6 years per case), showing no excess ischemic heart disease incidence, no cases of progression to advanced AV block (second- or third-degree), or sudden death.

Fleg et al15 analysed the long-term cardiac prognosis in healthy men with complete RBBB who were followed up for an average of 8.4 years. The study group was identified from the Baltimore Longitudinal Study. When compared with an age matched control group, there was no significant difference in the prevalence of antecedent coronary risk factors or obstructive lung disease. The incidence coronary artery disease, valvular heart disease, cardiac failure, advanced heart block or cardiac mortality in these men were similar to that of the control group over the follow up period. These results demonstrate the concept that the presence of RBBB in the ECG in asymptomatic men has no influence on long-term cardiac morbidity or mortality.

The long-term fate of men with bundle-branch block (BBB) from a general population sample was studied by Eriksson et al.8 Between 1970 and 1973, 7392 men without history of stroke or myocardial infarction were included in the study and were followed until 1998. 70 men with right-BBB and 46 men with left-BBB were identified at baseline. During follow-up, men with RBBB showed no increased risk of coronary death, myocardial infarction, heart failure, or all-cause mortality. Compared to men with RBBB, those having LBBB in the baseline ECG showed significantly higher risk for progression to high grade atrioventricular block (hazard ratio 3.64 vs. 12.89).

The major contribution of this large and long epidemiological study to clinical cardiology is the confirmation that left bundle branch block heralds a much more unfavourable cardiovascular prognosis than the right one. Because the risk of developing heart failure was three-fold higher in left bundle branch block than in right bundle branch block, careful examination at the time of recording of left bundle branch block and regular follow up visits are warranted. It offers the opportunity to follow the course of the relationship between the ventricular conduction delay and the possible mechanical LV asynchrony and timely detection of the onset of systolic heart failure. If right bundle block is detected in a symptomatic or asymptomatic patient, a one-time examination might suffice to rule out cardiovascular abnormalities.

**CONCLUSIONS**

Even though right bundle branch block is generally considered as a benign finding in the electrocardiogram, associated structural abnormalities of the heart is not uncommon. Echocardiographic evaluation should be done to identify underlying structural heart disease in patients presenting with RBBB in the ECG.

**REFERENCES**


