

Prognostic association of electrocardiographic findings with left ventricular ejection fraction in patients with right ventricular pacing pacemakers

Abstract.

Background: Patients with right ventricular (RV) pacing cardiac pacemakers have similar electrocardiographic patterns with patients left bundle branch block (LBBB). While the electrocardiography (ECG) criteria of LBBB in patients with reduced left ventricular ejection fraction (LVEF) have been studied well, it was not clearly elucidated concerning RV pacing cases.

Aim: This study's main goal was to define and compare the significance of chosen ECG parameters to predict left ventricular systolic dysfunction in patients with LBBB and RV pacing cardiac pacemakers by thoroughly analyzing 12 lead ECG.

Subjects and methods: A total of 193 patients were diagnosed with LBBB at Chungnam National University Hospital between January 2011 and August 2020. Out of them, 118 were included to the study. During the same period, patients with permanent cardiac pacemakers equaled to 475, and 178 of them were found as target subjects of the present research. Both groups of patients were divided into two different subgroups according to their left ventricular systolic function, as group 1 ($LVEF \geq 50\%$) and group 2 ($LVEF < 50\%$). The prognostic implication of ECG parameters to reduced LVEF was studied and compared in patients with LBBB and RV pacing permanent cardiac pacemakers.

Results: Of the LBBB group (male/female: 55/63, age: 67 ± 12) 57% patients had left ventricular systolic dysfunction ($LVEF < 50\%$) whereas pacemaker group (male/female: 93/85, age: 72 ± 11) presented only 26% patients with LVEF below 50 %. In the former group, LVEF showed association with a duration of QRS complex and the absence of q waves in leads I, V5, and V6. In detail, mean QRS duration was longer in patients with reduced LVEF against patients with normal left ventricular systolic function, 155 ± 13 , and 147 ± 12 ms, respectively ($p=0.034$). Simultaneously, the absence of q waves in lateral leads characterized by weak inverse correlation in patients with dysfunction of left ventricular systolic function, 65.7% against 84.3%. The bivariate logistic regression model predicted the odds ratio of QRS duration as 1.049 (in confidence interval 95%, 1.004-1.096). QRS duration of 143 ms was chosen as a cut-off value with 81% sensitivity and 63% specificity to predict LVEF below 50 %. In contrast, in the pacemaker group, broad notched or slurred R wave in leads I, aVL, V5, and V6 was the sole predictor of reduced LVEF, representing 67.4% of this group.

Conclusion: Although the ECG pattern of patients with RV pacing permanent cardiac pacemaker shows similarity with LBBB, it does not contribute to left ventricular dysfunction than LBBB patients. Whereas duration of QRS complex and absent q waves in leads I, V5, and V6 are predictors for low left ventricular dysfunction in patients with LBBB, broad notched or slurred R wave in leads I, aVL, V5, and V6 has a prognostic significance in patients with right ventricular permanent cardiac pacemakers.