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Discordant vs. concordant left bundle branch block: A potential clinical significance

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Abstract

Aim: LBBB in heart failure patients has prognostic significance. Subtypes of LBBB (concordant and discordant) have not been considered when considering management. The aim of this study is to explore the clinical difference between the two subtypes.

Methods: 216 patients with LBBB were included and categorized into concordant ($LBBB_C$) and discordant ($LBBB_D$) groups.

Results: Of the 216 patients (age 69.13 ± 11.7; 56% male 44% female), 133 (61.5%) were $LBBB_D$ and 83 (38.5%) were $LBBB_C$. $LBBB_D$ patients presented with lower LVEF (mean 36% vs 51%; $P < 0.001$), wider QRS (mean 160 ms vs 151 ms; $P < 0.001$), larger LA (mean 45 cm^2 vs 40 cm^2; $P < 0.001$), moderate to severe mitral and tricuspid regurgitation (17% vs 3%; $P < 0.05$, 10% vs 1%; $P < 0.05$ respectively), CKD (41% vs 18%; $P < 0.001$), COPD (4.6% vs 0%; $P < 0.01$), CAD (67% vs 36%; $P < 0.001$), and CABG (39% vs 16%; $P < 0.001$).

Conclusion: $LBBB_D$ is significantly associated with worse cardiac function and clinical characteristics.

Keywords: Heart failure; Left bundle branch block; CRT; Dyssynchrony

Introduction

Defects in left ventricular function due to abnormal activation patterns have been well-documented. In 1974, Abbasi et al described the paradoxical movement of the interventricular septum in left bundle branch block (LBBB) [1]. Later, van Oosterhout et al described the effect of asynchronous electrical activation of the ventricles on workload differences that may possibly result in ventricular dilation or hypertrophy [2]. The prevalence of LBBB strongly correlates with age and the presence of cardiovascular disease. LBBB usually indicates an underlying progressive degenerative disease of the ventricular myocardium [3,4]. In HF patients the prevalence of LBBB reported to be approximately 11–25% [5–7]. Since the beginning of the 21st century, heart failure (HF) has become a pandemic. Despite the progress in the pharmacological management, hospitalization rates and mortality are still high. In addition most of HF patients remain symptomatic imposing significant socioeconomic burden. LBBB and QRS duration have been linked to HF as their presence increases the risk of mortality and disease progression [8]. This has led to the emergence of an appealing intervention that corrects the mechanical left ventricular dyssynchrony due to the presence of LBBB through changing the sequence of electrical activation [9–11]. Cardiac resynchronization therapy (CRT) as a means of optimizing synchrony has shown to have great impact on HF patient's symptoms, re-hospitalization rates, mortality, and affected reverse remodeling and was successful in 70% of patients leaving around 30% failure rate [9,10,12]. The significant failure led physicians to regain interest in LBBB diagnostic criteria and different morphological patterns [13,14]. One of the old definitions of LBBB has looked at two different subtypes [15] and these subtypes (concordant vs. discordant) have been revisited lately and proved to be clinically different with potential future clinical implications [13]. The aim of this study is to determine the prevalence of the two subtypes while screening for LBBB with the new criteria, assess whether there exists a correlation between the two different morphological subtypes and various clinical scenarios or categories of cardiac

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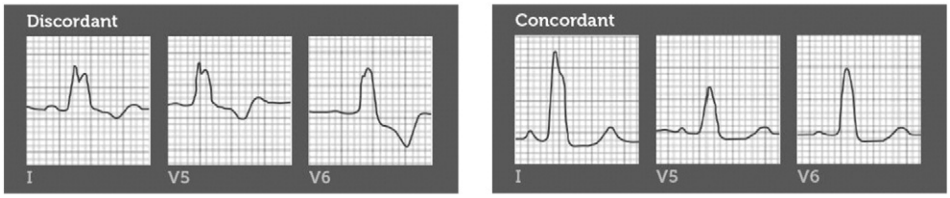

Fig. 1. LBBB subtypes.

diseases, and determine whether it can provide us with any potential prognostic implications especially HF-related.

Design and methods

Patient population

This is a retrospective single center study. All patients more than 18 years of age with an LBBB on an ECG done at the American University of Beirut Medical center (AUBMC) and stored in the ECG department from April 2004 till December 2012 were included. Patients were excluded if they have paced rhythm, had an acute coronary syndrome within the last 6 months, had inter-operator variability in ECG diagnosis, and had missing clinical and echocardiographic data from the medical record.

LBBB diagnosis

LBBB was diagnosed during the above mentioned period using the old criteria: QRS interval >120 ms; slurred/notched wide and predominant R waves in leads I, aVL, V5, and V6; slurred/notched and broad S waves in V1 and V2 with absent or small R waves; mid-conduction delay defined as notching or a plateau in the mid-QRS wave; ventricular activation time >50 ms at the onset of the QRS interval; M-shaped QRS variants with occasionally wide R waves in V5 and V6; no initial Q wave over the left precordium; and absence of pre-excitation [16]. These patients' ECGs were further analyzed by applying the new criteria suggested by Strauss et al [14] that consist of: QRS duration 140 ms (men) or 130 ms (women) or wider, QS or rS in leads V1 and V2, and mid-QRS notching or slurring in 2 of leads V1, V2, V5, V6, I, and aVL. Applying the new criteria has yielded to further classification of the LBBB into two categories: true LBBB as per the new (Strauss) definition and a category labeled as non-specific intra ventricular conduction delays (IVCDs) for ECGs that did not comply with the new definition nor with the definition of RBBB (QRS duration greater than or equal to 120 ms in adults, rsr′, rsR′, or rSR′ in leads V1 or V2; S wave of greater duration than R wave or greater than 40 ms in leads I and V6 in adults; normal R peak time in leads V5 and V6 but greater than 50 ms in lead V1 [16]).

LBBB was further subdivided into two subtypes: concordant LBBB ($LBBB_C$) where the ECGs have their T-wave orientation concordant with QRS complex in leads I, V5 and V6 and discordant LBBB ($LBBB_D$) where the ECGs have their T-wave orientation discordant with the QRS complex in leads I, V5, and V6 (see Figs. 1 and 2) [15].

Data collection

An extensive chart review was performed with data collection on demographics, cardiac risk factors, comorbidities, cardiac interventional data, electrocardiographic data including rhythm and QRS duration, and echocardiographic data. Electrographic recordings and echocardiographic data were first screened by a cardiology fellow and then independently re-examined by an electrophysiology specialist and a heart failure specialist. Echocardiographic parameters were measured in the AUBMC core laboratory. Left ventricular volumes were measured by Simpson's method of discs in the apical 4 and 2 chamber views and averaged. Left ventricular ejection fractions were calculated according to standard methods. Left atrial volumes were measured using Simpson's method of discs in the apical 4 and 2 chamber views and averaged. Valvular abnormalities and its grades as well as assessment of systolic pulmonary artery pressure

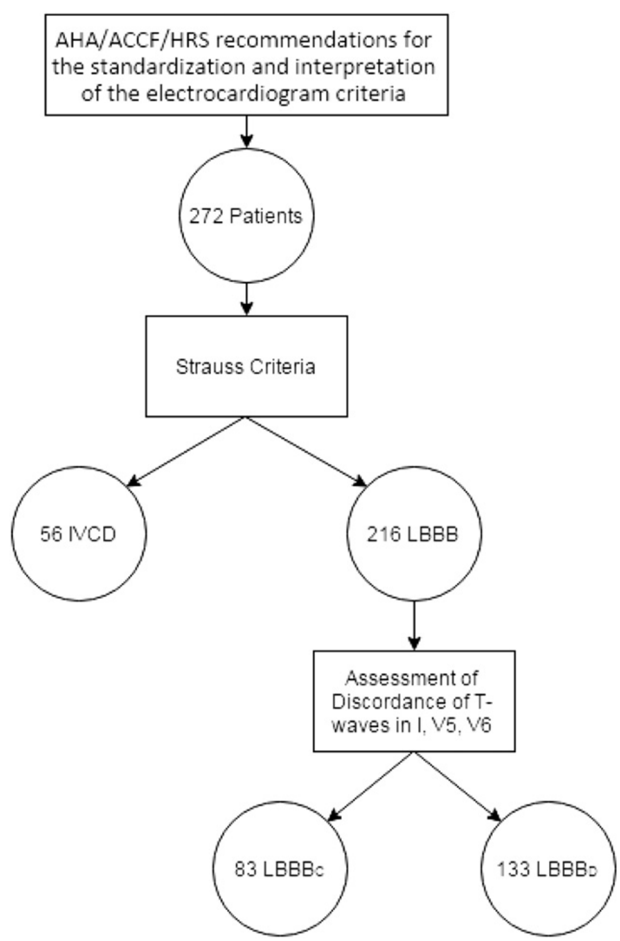

Fig. 2. Inclusion criteria.