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Bundle branch block after ablation for Wolff–Parkinson–White syndrome

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ABSTRACT

Background: Bundle branch block (BBB) is a difficult diagnosis in the Wolff–Parkinson–White syndrome (WPW). We investigated the clinical implications of BBB that appears after performing an accessory pathway (AP) ablation.
Methods: We studied 199 patients with WPW who were submitted to AP ablation. Thirty (15%) exhibited BBB after the ablation. Twenty-two patients had right BBB and 8 had left BBB. Thirteen patients had right-sided AP and 17 had left-sided AP. They were compared with 82 similar patients without BBB after the AP ablation.
Results: Among the patients with BBB, 86.66% showed delays in the middle part of the QRS in the ECG recorded before ablation vs. 18.29% of the patients without BBB ($p<0.05$) (sensitivity 86%, specificity 81%, positive predictive value 67% and negative predictive value 93%). Forty-four percent of the patients with BBB had BBB morphology during orthodromic tachycardia vs. 10% of the patients without BBB ($p<0.05$) (sensitivity 44%, specificity 89%, positive predictive value 57% and negative predictive value 82%). No relationship was found between AP location and the site of the BBB. Ejection fraction was normal before (0.61 ± 0.03) and upon completion of follow-up (0.61 ± 0.07). BBB disappeared in 95.3% of the patients.
Conclusions: Delays in the middle portion of the QRS may predict BBB after AP ablation. BBB after performing AP ablation is frequent, transient, benign, and not related to either the ablation lesion location or progression to structural heart disease. BBB after AP ablation may be related to cardiac memory.

1. Introduction

In patients affected by the Wolff–Parkinson–White (WPW) syndrome, the QRS complex is a fusion of the slow activation that occurs through the ventricular muscle activated by the accessory pathway and the fast activation that takes place through the normal conducting system (AV node, bundle branches and Purkinje network). As a consequence, the PR interval is short (i.e. less than 0.12 s) and the initial part of the QRS complex is slow (i.e. wide) and slurred. This initial portion resembles the delta Greek character. This is why it has been named "delta wave". The middle and final portion of ventricular activation will occur through the faster specialized conduction system and should not show delays [1] (see Fig. 1A). In the very first description of the syndrome, Wolff, Parkinson and White reported patients who suffered episodes of paroxysmal tachycardia with an abnormal ECG that the authors interpreted as the one that is observed in patients who suffer from bundle branch block (BBB) [2]. The prevalence of the WPW syndrome in the general population is estimated to be between 0.15 and 0.25% [1].

In patients affected with BBB, the initial part of ventricular activation occurs through the contralateral (not-blocked) bundle and is not delayed. The middle and terminal portions of the QRS complex are delayed because, at those stages, ventricular activation proceeds through the ventricular myocardium which is slower than the specialized conduction system [3] (see Fig. 1B).

In a classic study about the clinical significance of the BBB, Rotman and Triebwasser reviewed 237.000 ECGs of asymptomatic individuals and found 394 (0.13%) patients with right BBB (RBBB) and 125 (0.05%) with left BBB (LBBB) [3]. In the follow-up of the RBBB patients, 3% developed coronary artery disease and 2% hypertension. In the LBBB patients, the corresponding percentages were 9 and 7% [4].

The above cited prevalence of the WPW syndrome and BBB in the general population implies that some patients could present both BBB and WPW without any other associated structural heart disease.

In the modern era, ablation is the treatment of choice for the WPW syndrome patient [5]. Indeed, catheter ablation allows the definite cure of the syndrome by eliminating the bypass tract connection. When this happens, the ECG should recover its normal shape, i.e., the PR interval and QRS should become normal. In the Electrophysiology Section of the Cardiovascular Research Institute of the University of The Andes (Mérida, Venezuela), we have been performing catheter ablation for WPW syndrome for several years. After performing the ablation, some patients sometimes develop a BBB (see Fig. 2). In such cases, we could speculate that, if before performing the ablation the patient had both BBB and WPW syndrome, the BBB morphology would become apparent in the ECG after ablation. The BBB could also be the result of damage to the conducting system induced by the ablation procedure. As far as we know, there are no clear guidelines

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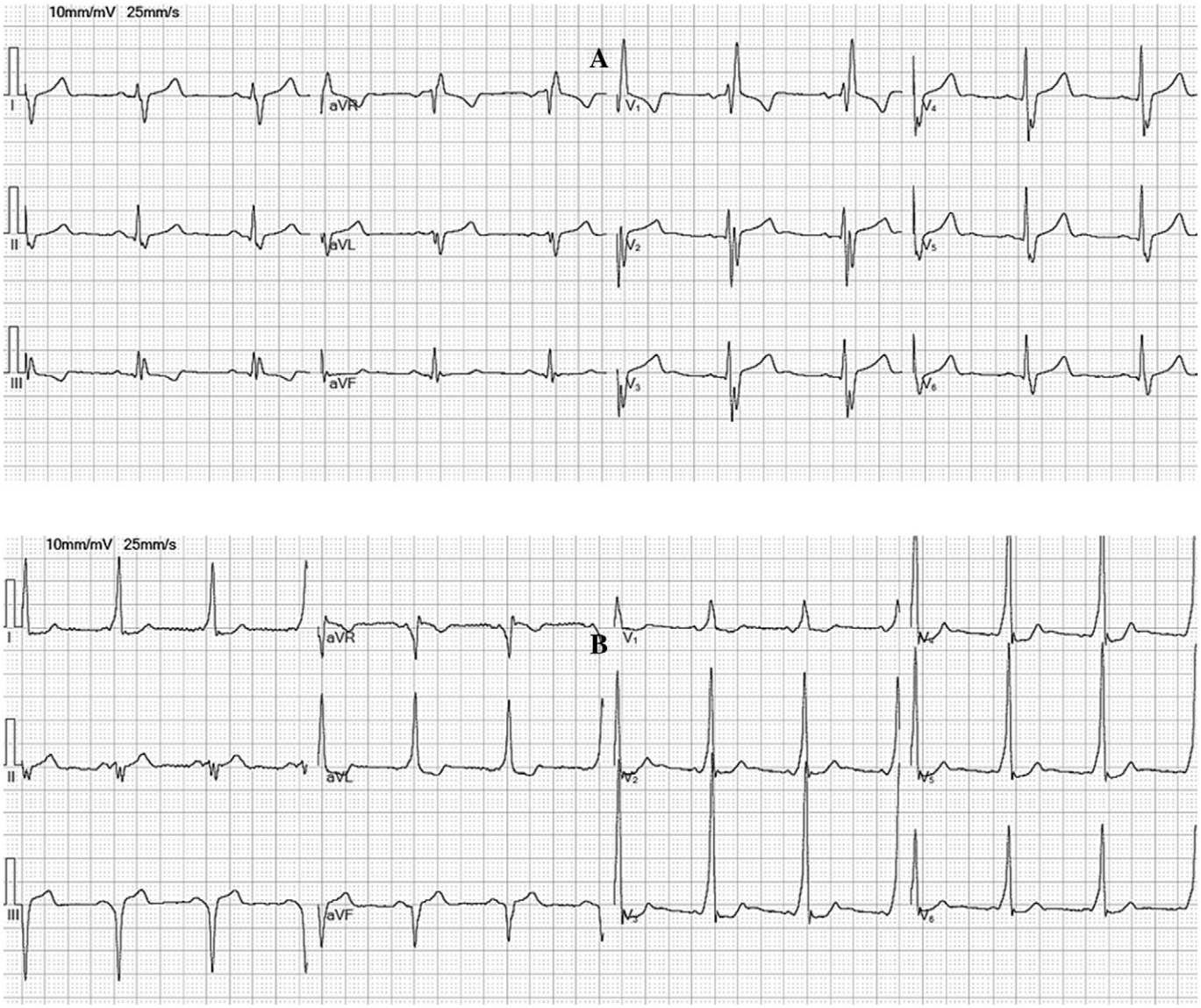

Fig. 1. Twelve lead ECG recordings. A: from a patient with right BBB showing middle and late delays in the QRS complex. B: from a patient with WPW syndrome showing initial delays (delta wave) in the QRS complex.

for the diagnosis of BBB coexisting with the WPW, and the clinical significance of BBB that appears in patients with the WPW syndrome after performing the ablation is not known. We thus decided to study the characteristics and evolution of the BBB that appear in patients with the WPW syndrome after performing catheter ablation.

2. Methods

The authors of this manuscript certify that they complied with the Principles of Ethical Publishing in the International Journal of Cardiology. The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in an a priori approval by the Institution's human research committee.

2.1. Population

Written informed consent was obtained from all the patients. To select the patients we retrospectively reviewed the data base of the Electrophysiology Section. Patients were included if they had an ECG documenting the presence of short PR interval, delta waves and widened QRS, and have suffered from paroxystic tachycardia (i.e. the WPW syndrome) [1–3]. Patient also had to be admitted for ablation because of the WPW syndrome. Patients who suffered from associated congenital or structural heart disease at the moment of performing the ablation were excluded. From the above described group of patients, we selected those whose ECG displayed a BBB after the successful ablation of the accessory pathway. The electrocardiographic diagnoses of BBB were performed according to the recommendations of AHA/ACCF/HRS [6]. Delays in the middle portion of the QRS were diagnosed if there were notches or irregularities in the inscription of the QRS complex beyond the first 40 ms.

2.2. Electrophysiological procedure

Antiarrhythmic drugs were withdrawn for at least 5 half-lives before ablation. The patients were in a fasting and sedated state. Venous introducers were placed in the femoral and subclavian veins and, if needed, in the femoral artery. Tetra- and decapolar catheters were placed in the right atrium, His recording position, right ventricular apex and the coronary sinus. In cases of left-sided accessory pathway, a 4 mm-tip catheter for recording, stimulation and ablation was advanced through the aorta into the left ventricle. Programmed atrial and ventricular stimulation was performed in order to induce arrhythmia and to assess the electrophysiological properties, as described elsewhere [7]. The ablation was qualified as successful if pre-excitation disappeared and arrhythmia was no longer inducible.

2.3. Statistical analyses

Numerical data were expressed as means ± standard deviations. Comparisons were performed by means of a T or Fisher exact test according to the type of data (numerical or categorical). Alpha value was set at $p<0.05$.