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Case Report

Masquerading bundle branch block

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ARTICLE INFORMATION

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Competing interests
The authors declare no competing interests.

Figures
Images from complementary tests are shown with patient's consent.

Abbreviations
ECG: electrocardiogram
LAFB: left anterior fascicular block
LBBB: left bundle branch block
MBBB: masquerading bundle branch block
RBBB: right bundle branch block

ABSTRACT

Masquerading bundle branch block is a rare form of bifascicular block, whose exact mechanism is unknown. It is more frequently found in elderly patients or those with structural heart disease such as: coronary artery disease, ventricular hypertrophy, cardiomyopathies, Chagas myocarditis and idiopathic degeneration of the cardiac conduction system. Its electrocardiographic diagnosis is obtained by the presence of high and wide R waves in V_1 (right bundle branch block pattern), left axis deviation (between -80 and -120 degrees) and an S wave of less than 1 mm or absent in I and aVL leads. Its presence denotes a poor prognostic factor in patients.

Keywords: Bundle branch block, Left anterior hemiblock, Masquerading bundle branch block, Diagnosis

Bloqueo de rama enmascarado

RESUMEN

El bloqueo de rama enmascarado es una forma poco frecuente de bloqueo bifascicular de la cual se desconoce su mecanismo con exactitud. Es más frecuente encontrarlo en pacientes de edad avanzada o aquellos con una cardiopatía estructural como: enfermedad coronaria, hipertrofia ventricular, miocardiopatías, miocarditis chagásica y degeneración idiopática del sistema excitoconductor del corazón. Su diagnóstico electrocardiográfico se obtiene por la presencia de ondas R altas y anchas en V_1 (patrón de bloqueo de rama derecha), desviación del eje eléctrico a la izquierda (entre -80 y -120 grados) y una onda S inferior a 1 mm o ausente en D_I y aVL. Su presencia denota un factor de mal pronóstico en los pacientes.

Palabras clave: *Bloqueo de rama, Hemibloqueo anterior izquierdo, Bloqueo de rama enmascarado, Diagnóstico*

INTRODUCTION

Much has been written about the complex depolarization of the heart, the transmission of impulse from the sinus node to the ventricular myocardium and the main disorders of stimulus conduction. From the beginning of the 20th century to the present, a number of studies have been carried out, and many findings have been made to aid in the understanding of complex

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cardiac stimulation and depolarization. The term "masquerading" left bundle branch block was first coined by Richman and Wolff[1] in 1954 when they referred in their papers to those patients who presented left bundle branch block (LBBB) pattern in limb leads and right bundle branch block (RBBB) morphology in the right precordial leads, with small or absent S wave amplitude in D_I on the electrocardiogram (ECG). This electrocardiographic pattern was initially described this way because it was mistakenly assumed to be a variant of the typical LBBB; but in 1968, Rosembaum *et al*[2] proposed that it was instead a LBBB with high-degree left anterior fascicular block (LAFB).

Masquerading bundle branch block (MBBB) is therefore a rare form of bifascicular block whose exact mechanism is unknown. Bayes de Luna *et al*[3] found this electrocardiographic pattern in 16 patients after reviewing 100.000 ECGs accumulated over 12 years. Its prevalence, however, may be slightly higher since Gómez Barrado *et al*[4] discovered this same electrocardiographic pattern in 22 patients when reviewing the records of all those hospitalized in cardiology wards over a 32-month period. Its real prevalence is still unknown, but it is suggested to be found more frequently in elderly patients or those with advanced structural heart disease such as: coronary artery disease, ventricular hypertrophy, cardiomyopathies, Chagas myocarditis and idiopathic degeneration of the cardiac conduction system[1,5,6]. Its presence on the ECG is considered a marker of poor prognosis since it indicates aberrant or delayed intraventricular conduction.

CASE REPORT 1

We present the case of a 72-year-old man with a history of chronic alcoholism without regular treatment, dilated cardiomyopathy and liver cirrhosis, who was brought to the hospital emergency department by his relatives due to impaired level of consciousness.

Physical examination revealed marked edema in the lower limbs and in the cardiovascular system, rhythmic heart sounds, heart rate of 72 beats per minute and blood pressure of 90/60 mmHg. The patient was admitted to the intensive care unit to be stabilized and treated. Both an ECG (**Figure 1**) and a transthoracic echocardiogram (**Figure 2**) were performed. The transthoracic echocardiogram showed a spherical left ventricular remodeling with global hypokinesia and severe systolic dysfunction (end-diastolic diameter of 60 mm and left ventricular ejection fraction (LVEF) of 31% and 30% by M-mode echocardiography and biplane Simpson method, respectively); mild right ventricular systolic dysfunction (TAPSE [tricuspid annular plane systolic excursion] 15 mm and tricuspid S wave 5.8 cm/s) with moderate tricuspid regurgitation and mild secondary mitral regurgitation.

CASE REPORT 2

We present the case of an 82-year-old man, exsmoker, with a personal history of high blood pressure and type II diabetes mellitus, who attended the

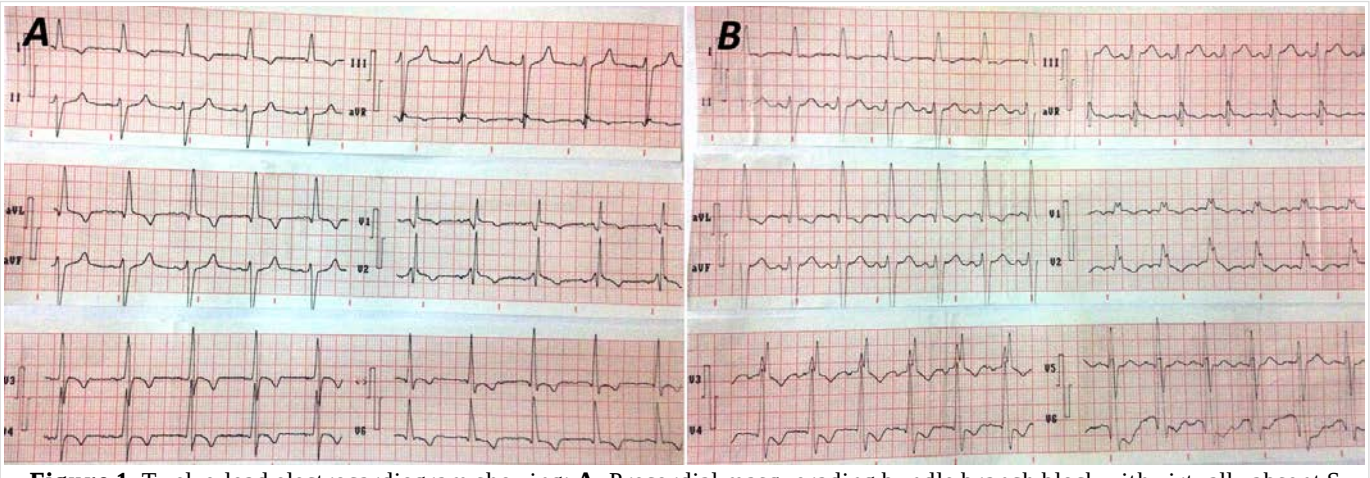

Figure 1. Twelve-lead electrocardiogram showing: **A.** Precordial masquerading bundle branch block with virtually absent S wave in V_6. **B.** The day after admission, widened QRS complexes in the precordial leads V_1 to V_3 and S wave remnant in V_6.

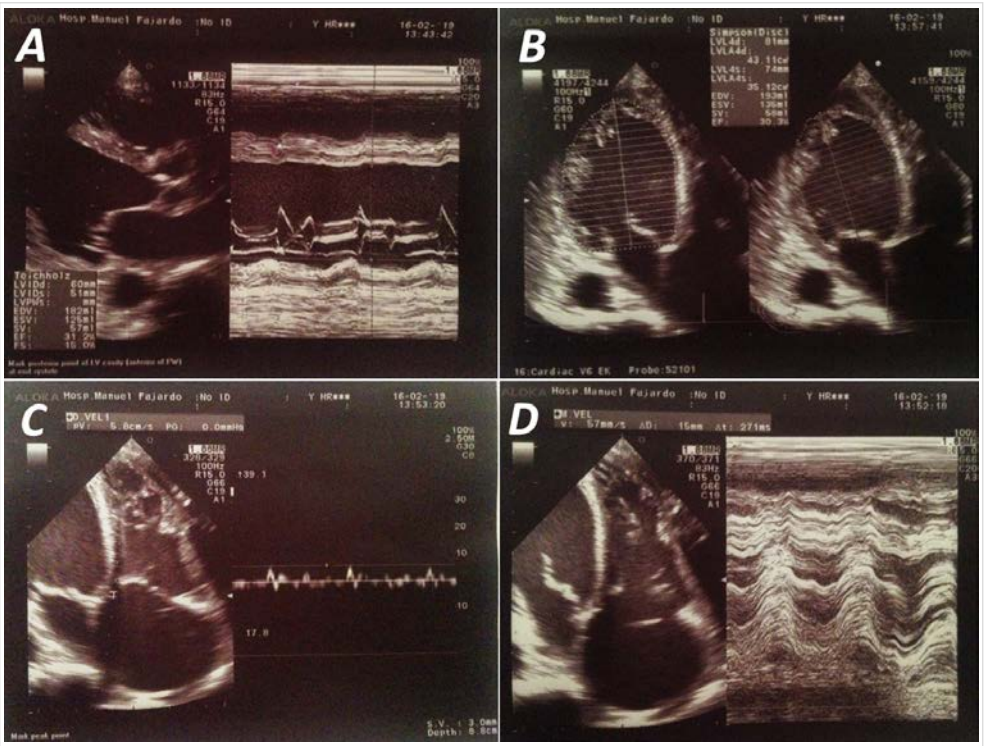

Figure 2. Transthoracic echocardiogram. **A.** Remodeled left ventricle (parasternal long axis view). **B.** Reduced left ventricular ejection fraction measured by biplane Simpson method (apical four-chamber view). **C.** Measurement of the tricuspid S wave in apical four-chamber view. **D.** Measurement of the tricuspid annular plane systolic excursion (TAPSE).

emergency department presenting with sudden dyspnea, sensation of imminent death and chest pain lasting more than 12 hours.

He was sweaty and pale during physical examination; with tachycardic heart sounds, blood pressure of 80/60 mmHg and polypnea of 32 breaths per minute; auscultation of the lung fields revealed crackling rales up to the apexes of both lung fields.

The electrocardiogram (**Figure 3**) showed a standard MBBB, with signs of myocardial injury in V_1-V_4 leads. He was therefore admitted to the coronary intensive care unit where he received specific treatment and his hemodynamic stability was finally attained.

Significant alterations in regional motility in several regions of the left ventricular walls (septal, anteroseptal, and anterolateral) and severe systolic dysfunction (LVEF 34%) were found in the transthoracic echocardiogram. The pulmonary capillary wedge pressure was high as well. The case was described as an anteroseptal and anterolateral ST-segment elevation myocardial infarction.

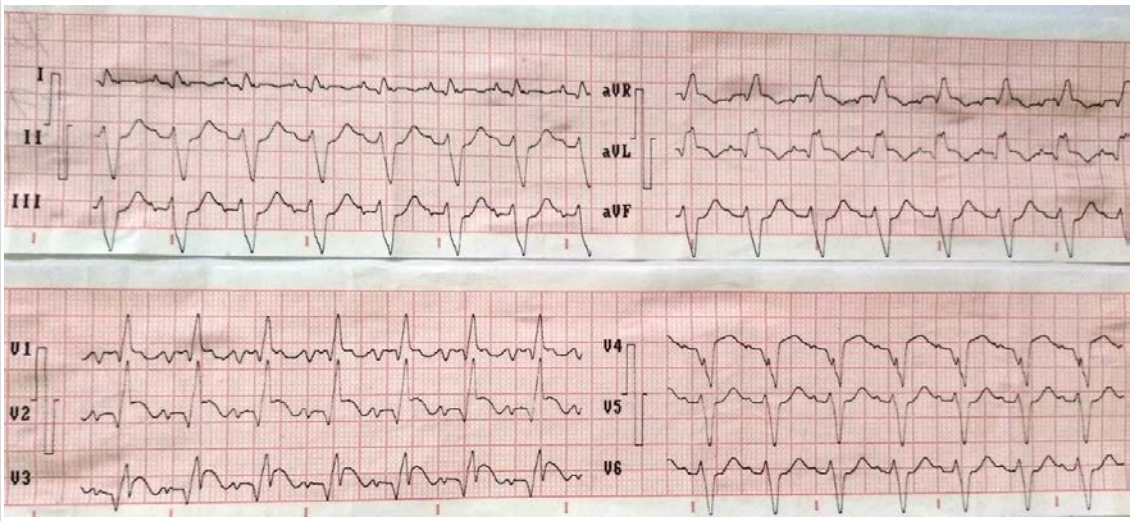

Figure 3. Twelve-lead electrocardiogram evidencing standard MBBB with ST-segment elevation in leads V_1-V_4.

COMMENTS

There are different intraventricular conduction disturbances such as left or right bundle branch blocks, fascicular blocks and the association of two or more of them (bifascicular-trifascicular blocks). All with their corresponding electrocardiographic patterns, secondary to the many disorders that occur in the conduction of the electrical impulse to the ventricles.

In LAFB, the early depolarization of the posterior territory and delay of the paraseptal regions originate a typical pattern in the ECG, showing small Q waves in D_I and aVL, as well as a low-amplitude R wave in D_{II}, D_{III} and aVF, in addition to deep S waves in lower leads. When QRS width is greater than 100 ms, an association with myocardial fibrosis or left ventricular growth should be suspected. In cases of high-degree left anterior fascicular block, T waves will be negative in D_I and aVL and positive in D_{II}, D_{III}, and aVF[7].

In the particular case of LAFB's association with RBBB, the hemiblock pattern is modified. Right bundle branch block causes a delay in the terminal electrical forces of the QRS complex, which will be recorded on the ECG by a blunt S wave (especially in D_I). However, in MBBB cases, considered by many authors to be the association of a high-degree LAFB with an RBBB, S wave disappears, due to compensation of late depolarization of the anterosuperior wall of the left ventricle, resulting in a left-sided vector.

The electrocardiographic diagnosis of MBBB is obtained from the presence of prominent and wide R waves in V_1 (RBBB pattern), left axis deviation (between -80 and -120 degrees) and S wave of less than 1 mm or absent in D_I and aVL[8]. Masquerading bundle branch block is therefore classified —according to the electrical pattern— as standard or precordial[1]:

a) Standard: Right bundle branch block (typical pattern in V_1) with LAFB morphology in limb leads, mimicking an LBBB and absent or < 1 mm S wave in leads I and aVL.
b) Precordial: Same as standard, plus a practically absent S wave in V_5 and V_6.

In standard MBBB, the masked LBBB pattern in the limb leads and rR' in V_1 (RBBB) are the result of a high degree LAFB. Furthermore, according to Unger *et al*[9], electrocardiographic manifestations of left ventricular hypertrophy and focal block on the anterolateral wall of the left ventricle, caused by large prior infarctions or areas of fibrosis (as in cardiomyopathies and Chagas disease) may also be involved.

In contrast, when it is a precordial MBBB (less frequent), the typical pattern with absent S wave in V_5 and V_6 involves a number of causes. First, the focal block on the anterolateral wall of the left ventricle associated with a high-degree LAFB, with relatively high positions of the left precordial electrodes and LAFB in vertical hearts[10,11]. But today, its mechanism remains a complete mystery. What is certain is that high-degree LAFB, whether resulting from left ventricular growth or not, with areas of anterior wall blocks due to infarction or fibrosis, could be responsible for the loss of ventricular synchrony and appearance of this unusual block pattern on the ECG.

Both cases reported are in the average age found in the studies by Gómez Barrado *et al*[4]; have a history of cardiovascular disease, such as dilated cardiomyopathy, or have MBBB which occurs as the result of a large acute myocardial infarction, as in most published cases[6].

The loss of normal geometry and severe left ventricular dysfunction, associated with right ventricular dysfunction, found in the first patient, cause intraventricular conduction disorders that, coupled with signs of left ventricular growth and interventricular/intraventricular dyssynchrony, could be responsible for the precordial MBBB pattern.

In the second case, with a standard MBBB, the patient suffered a large myocardial infarction, which damaged the anterior region of the septum and the anterolateral wall of the left ventricle. Moreover, septal perforators perfusing the right bundle branch (causing the RBBB pattern) were compromised, and left ventricular remodeling and dilation appeared through the wide involved myocardial area.

CONCLUSIONS

Masquerading bundle branch block is an atypical presentation of high-degree left anterior fascicular block associated with right bundle branch block, which is responsible for significant intraventricular conduction disturbances. It occurs in elderly patients associated with other cardiovascular diseases such as: coronary artery disease, cardiomyopathies, myocarditis and idiopathic degeneration of the cardiac conduction system. Its production mechanism and prevalence are still unknown and its presence is a marker of poor prognosis.

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