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Case Report

Left Septal Fascicular Block After Transcatheter Aortic Valve Replacement

*Madaloso BA, Balbo CP, Reis LVG, Filho HGP, Tavares CAM, Naufel MF, Mendonça E, André D'Avila, and Pastore CA**

Heart Institute (InCor), Hospital das Clínicas of the University of São Paulo Medical School (HCFMUSP), Brazil

Abstract

Atrioventricular and bundle blocks occurrence is common in postoperative period of transcatheter aortic valve replacement; however, there are just a few reports of Left Septal Fascicular Block (LSFB) in these cases.

Keywords: Atrioventricular; Transcatheter aortic valve replacement; Outpatient

Introduction

A 75-year-old male patient, indicated for TAVR due to symptomatic aortic stenosis developed a change in electrocardiographic pattern in the immediate postoperative period, presenting left anterior superior fascicular block, LSFB, and right bundle branch block.

Discussion and Take-home messages: The existence of LSFB has been extensively investigated by the medical community, but only recently a consensus has been reached regarding its existence. As it is infrequent is often overlooked, and underdiagnosed; however, with the widespread use of TARV, its occurrence may become increasingly frequent, and cardiologists should be alert to its presence in electro-vectorcardiographic analysis. It is important to be aware of changes in the conduction system in order to assess possible differential diagnoses in postoperative period.

Case Presentation

A 75-year-old man presented to an outpatient medical consultation complaining of severe chest pain on moderate exertion associated with dyspnea. He was healthy until 3 years ago, when he began to report fatigue with strenuous exertion. Two years ago, he reported the concomitant onset of chest pain, and about a year ago, squeezing pain and dyspnea triggered by moderate exertion. On physical examination, a systolic ejection murmur of intensity 4+ out of 6+ was present in the aortic area, radiating to the suprasternal notch. Outpatient investigation revealed a significant case of symptomatic aortic stenosis, and Transcatheter Aortic Valve Replacement (TAVR) was indicated. The preoperative electrocardiogram showed sinus rhythm, upward and forward deviation of the cardiac electrical axis with increased QRS duration, consistent with Left Anterior Superior Fascicular Block (LASFB) and Right Bundle Branch Block (RBBB) (Figure 1A). Due to the association of blocks, a vectorcardiography was requested, which demonstrated, in the frontal plane, upward rotation of the QRS loop, with 2/3 of it in the superior portion, compatible with LASFB, and in the transverse plane, the QRS loop rotates forward and to the right with terminal slowing of the QRS loop, corroborating the diagnosis of RBBB (Figure 1B).

Past Medical History: The patient has controlled hypertension with ACE-inhibitor. He was active, engaging in physical activity 3 times a week for 1 hour, with no history of diabetes, previous heart attack or smoking.

Differential diagnosis

Given the presentation of symptoms associated with patient's age and the past of hypertension the possible diagnoses included myocardial infarction, congestive heart failure and aortic dissection.

Investigations: TAVR was performed without complications during the procedure, and the patient was transferred to the ICU for immediate postoperative care.

Management

In the ICU, the patient presents no symptoms but a change in the electrocardiographic pattern was observed. In the preoperative ECG we can find the presence of a sinus rhythm with upward and forward axis deviation and an increased QRS duration corroborating LASFB and RBBB (Figure 1A), that are well-showed in VCG loops in Frontal and transverse planes (Figure 1B). After the procedure we can noticed that occurs an increase of QRS voltage in V1 and V2, and a subsequent drop in the other precordial leads, as well as the disappearance of the slurred S waves in V5 and V6 compared to the preoperative findings (Figure 2A). A new vectorcardiogram was performed, showing in the frontal plane the maintenance of the preoperative deviation pattern compatible with LASFB, but in the transverse plane there was a change in the direction of the QRS loop forward and to the left, allowing the diagnosis of LSFB associated with end conduction delay compatible with RBBB (Figure 2B).

Outcome and follow-up

The patient was discharged after 3 days of hospitalization with antihypertensive medication, antiplatelet aggregation therapy for 3 months, and a recommendation for outpatient cardiology follow-up.

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***Corresponding author:** Carlos Alberto Pastore, Instituto do Coração (InCor) - HCFMUSP, Av. Dr. Enéas de Carvalho Aguiar, 44 AB- CEP 05403-000 São Paulo, Brazil, Tel: 55(11)3082-5194

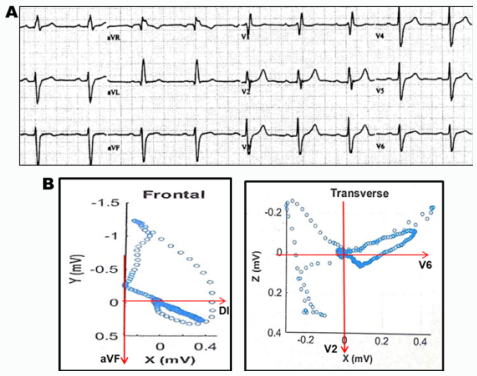

Figure 1: **(A)** Preoperative ECG **(B)** Preoperative vectorcardiogram.

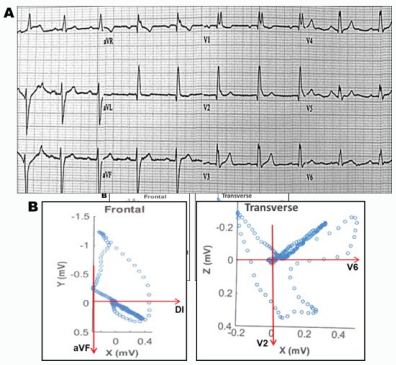

Figure 2: **(A)** Preoperative ECG **(B)** Preoperative vectorcardiogram.

Discussion

The existence of the left septal fascicular block has been extensively investigated and debated by scholars in the field since the description of the atrioventricular conduction pathway by Tawara in 1906 [1]. The anterior and posterior fascicles fibers of the left bundle were described by Rosenbaum [2] and in 1972 Demoulin [3] in histologic findings showed the presence of septal fibers as a third division of left branch.

The anatomical pathway of the atrioventricular bundle is the basis for understanding the development of blocks after surgical manipulation. The atrioventricular conduction branch originates from the atrioventricular node located in the superficial endocardial Para septal region of the lower right atrium, within Koch's triangle [4-6].

From here, the bundle penetrates the central fibrous body and passes under the membranous septum before crossing to the left side of the heart. The branched bundle emerges at the crest of the muscular ventricular septum, giving rise to the left bundle branch and its fascicles which are closely related to the base of the inter-leaflet triangle between the non-coronary and the right coronary leaflets of the aortic valve [4-6]. The anatomical proximity of this portion of the conduction system to the distal anchoring zone of the transcatheter aortic valve in the Left Ventricular Outflow Tract (LVOT) makes it vulnerable to injury during the procedure [5-6] (Figure 3).

Inter-individual variation in the penetrating bundle length and depth and variation in the location of its proximal portion determine how susceptible these structures are to injury during TAVR.

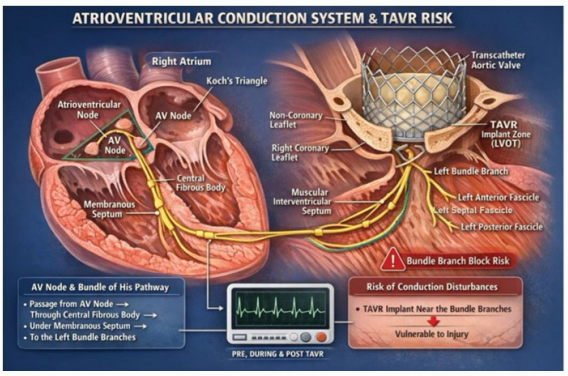

Figure 3: Anatomical diagram of physiological conduction system and anchoring site of TAVR (Anatomical diagram of the TAVR conduction system and anchoring site (author-generated content with artificial intelligence assistance).

The presence of bundle branch blocks and other conduction disturbances is an important risk mark for atrioventricular blocks development therefore the electrocardiogram is an important exam before, during and after this kind of procedure.

The majority of injuries are commonly caused by direct compression, hematoma, or ischemia and the most common electrical disturbances are device specific and include high degree atrioventricular block, left fascicles block and bundle branch blocks [6].

The appearance of fascicle block in the immediate postoperative period of TAVR in this case is consistent with literature reports but the presence of septal fascicle block is uncommon and poorly diagnosis due to its difficult electrocardiographic recognition. The vectorcardiogram rises as an important tool for differential diagnosis in cases of associated blocks [7-9].

Take-home messages

TAVR procedure is inherently associated with the occurrence of fascicle and AV blocks.

It is important to be aware of changes in the conduction system in order to assess possible differential diagnoses in the postoperative period.

With the dissemination of percutaneous valve treatment postoperative fascicle blocks may become increasingly frequent, and cardiologists should be alert to its presence in electro-vectorcardiographic analysis.

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