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Case Report

Sick sinus node syndrome ¿Pacemaker or ablation?

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ABSTRACT

The tachycardia-bradycardia syndrome is the most common presentation of sick sinus node syndrome and is commonly characterized by episodes of paroxysmal atrial fibrillation followed by significant pauses, especially in older adult. Other frequently associated tachyarrhythmias are atrial tachycardia and atrial flutter. The association between orthodromic tachycardia and significant pauses in these patients is an unusual presentation. We present the case of an older adult with bradycardia-tachycardia syndrome and syncope, who had episodes of incessant tachycardia through a concealed accessory pathway and, after its successful ablation, did not experience syncope again.

Keywords: Sick Sinus Node Syndrome; Syncope; Concealed Accessory Pathway; Catheter Ablation (source: MeSH-NLM).

Introduction

The term "alternating bradycardia-tachycardia syndrome" was introduced in 1954 by Short, who found episodes of syncope in four patients due to sinus bradycardia, which occurred after prolonged episodes of atrial tachycardia [(1)]. The treatment of this entity has undergone changes over time, ranging from surgeries such as radical thyroidectomy to the implantation of pacemakers with not always favorable results. As shown in reports where symptoms persist after pacemaker implantation and device interrogation reveals a low percentage of pacing with frequent episodes of supraventricular tachycardias [(2-3)]. Radiofrequency ablation of the associated tachyarrhythmia has emerged as the first-line treatment in most cases of tachycardia-bradycardia syndrome and has proven to be an effective technique [(3)].

Case Report

A 74-year-old male with no significant cardiovascular history presented with a two-month history of syncope preceded by palpitations. He visited a healthcare facility where a 24-hour Holter monitor was performed, revealing several episodes of paroxysmal supraventricular tachycardia followed by pauses of up to 3.4 seconds **(Figure 1)**. The patient reported dizziness and presyncope during the tachycardia episodes. Consequently, he was referred to our hospital for possible assessment and implantation of a permanent pacemaker. The baseline electrocardiogram showed sinus rhythm with a heart rate of approximately 88 beats/min without other significant abnormalities. Transthoracic echocardiography revealed normal left ventricular systolic function without valvular heart disease and the absence of structural heart disease.

During his hospitalization, the patient experienced multiple episodes of palpitations and syncope associated with incessant tachycardia, which responded to intravenous adenosine and vagal maneuvers. Therefore, an electrophysiological study was conducted, placing a decapolar catheter in the coronary sinus (CS) and a quadripolar catheter in the right ventricle (RV). During the study, clinical tachycardia was induced, which was regular with narrow QRS complexes **(Figure 2A)**, a cycle length of 366 ms, and eccentric retrograde atrial activation with a AV interval of 104 ms, consistent with orthodromic consistent with orthodromic tachycardia via a concealed left accessory pathway **(Figure 2B)**. Subsequently, a catheter ablation irrigated (ABL) was advanced through the right femoral artery using a retroaortic approach to the mitral annulus. With the catheter ABL, retrograde atrial activation was mapped during right ventricular stimulation. Earlier atrial activity with fused VA and a possible pathway potential was obtained at the anterolateral region of the mitral annulus, where controlled power radiofrequency (RF) (35 W) was applied, achieving conduction interruption through the accessory pathway within 0.7 seconds **(Figure 3A)**. After waiting for 30 minutes post-RF application and performing stimulation maneuvers, tachycardia was not reinduced, confirming the success of the ablation. During the procedure, conventional sinus node function tests were also performed [4], and the sinus node recovery time after programmed atrial stimulation was 1334 ms, within normal limits (normal value <1500 ms) **(Figure 3B)**. In the one-year follow-up, the patient has not experienced any syncopal episodes or palpitations, and Holter monitoring of 24 hours has not revealed any tachycardia episodes.

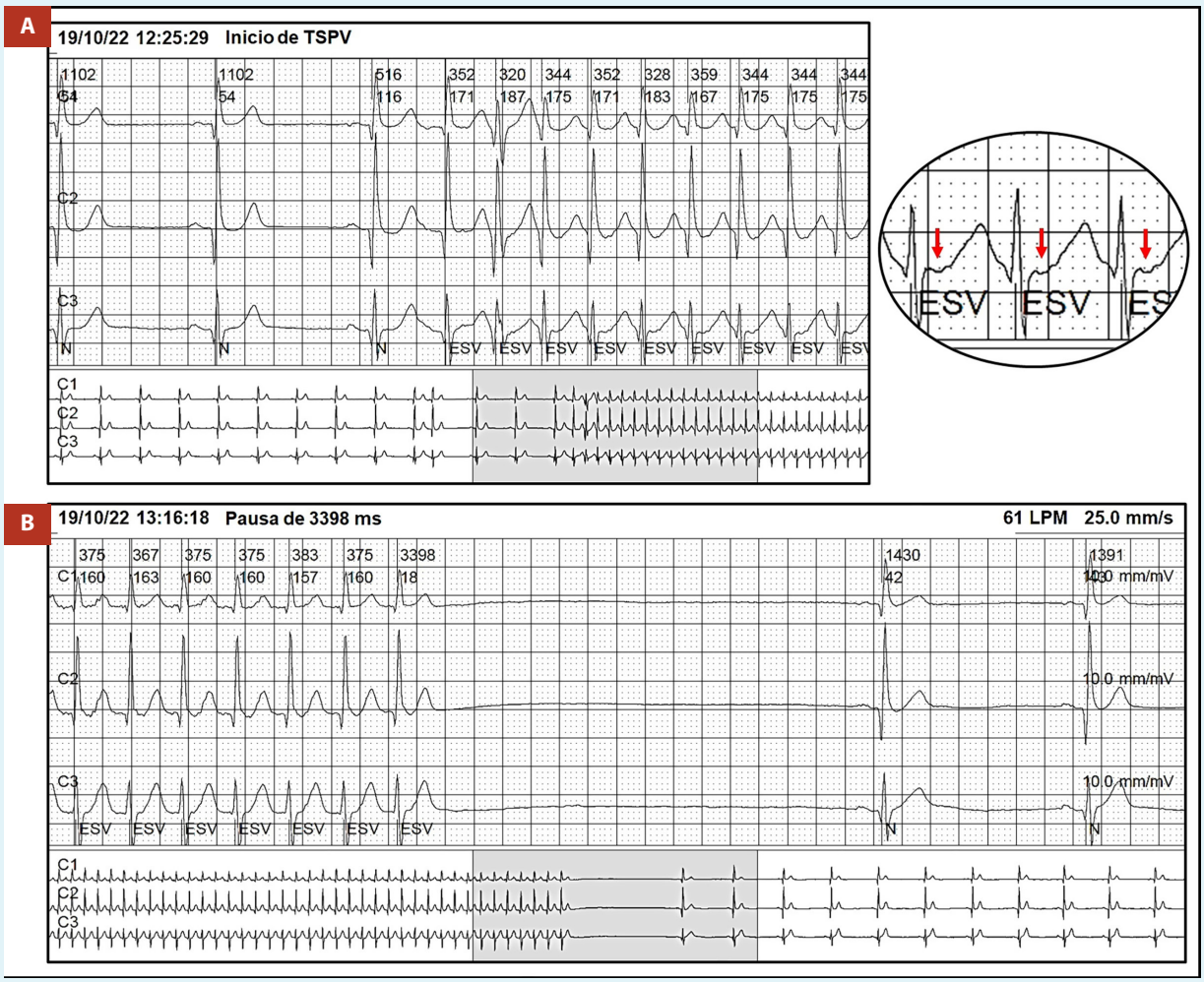

Figure 1. A. Onset of paroxysmal supraventricular tachycardia (PSVT) with regular RR intervals, a rate of 170 bpm, and PR interval greater than 90 ms. Red arrows indicate retrograde P waves. **B.** Sinus pause of 3.4 seconds following an episode of PSVT.

Discussion

The successful ablation of tachyarrhythmias such as atrial fibrillation in the context of tachycardia-bradycardia syndrome has shown benefits that, in certain cases, outweigh pacemaker implantation. These benefits include maintaining the patient in sinus rhythm for a longer period, preventing the progression to heart failure, and even eliminating the arrhythmia itself [5]. Other types of tachycardia, such as atrioventricular nodal reentrant tachycardia and orthodromic tachycardia mediated by a concealed accessory pathway followed by significant pauses, in elderly patients, constitute a rare presentation of tachycardia-bradycardia syndrome [6]. In this context, catheter radiofrequency ablation of the tachycardia has proven to be a procedure that avoids the need for cardiac pacing devices [3,7,8].

It is assumed that sinus node dysfunction in patients with tachycardia-bradycardia syndrome occurs through

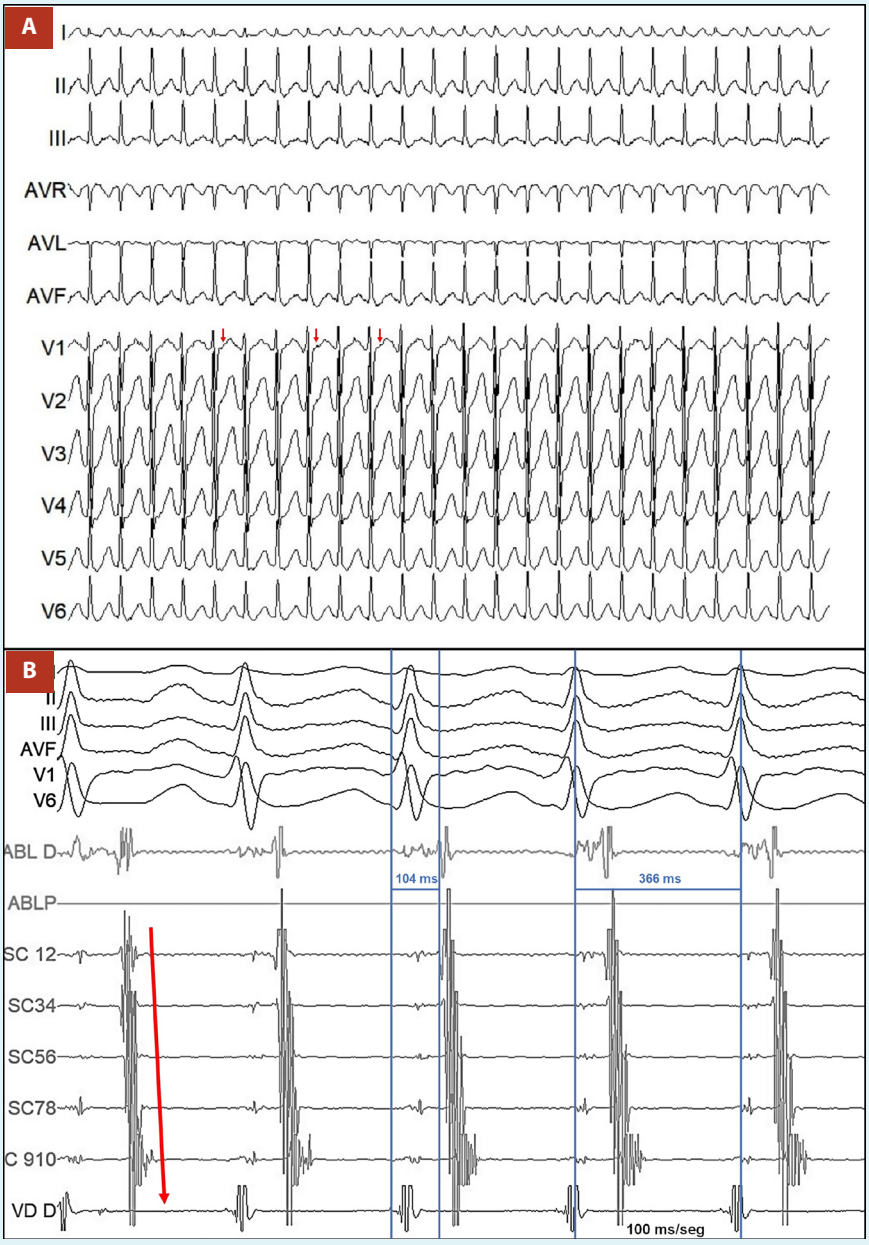

Figure 2. A. Clinical tachycardia in 12 leads with narrow QRS, regular RR intervals, RP < PR, and positive P wave in lead V1. **B.** Intracavitary recording of clinical tachycardia with a cycle length of 366 ms, AV interval of 104 ms, and eccentric retrograde atrial activation from distal to proximal (red arrow). (SC: sinus coronarius, ABL: ablation, VD: right ventricle).

Figure 3. A. Radiofrequency application during stimulation in the right ventricle. Loss of conduction through the accessory pathway is evident at 0.7 seconds. Change in atrial activation from an eccentric to concentric pattern is observed (red arrows). **B.** Sinus node recovery time of 1334 ms after programmed atrial stimulation at 500 ms. It was measured from the last stimulated P wave to the onset of the next P wave.

a mechanism called overdrive suppression; therefore, this dysfunction is secondary to the tachyarrhythmia. Consequently, it is reasonable to first treat the tachyarrhythmia before considering pacemaker implantation [3,7]. Recent studies have demonstrated the complete recovery of sinus node function after successful ablation of the primary tachyarrhythmia [7,8]. Additionally, in a series of 51 patients with atrial fibrillation and significant pauses who underwent ablation, none required pacemaker placement during follow-up [8].

This case illustrates an unusual form of tachycardia-bradycardia syndrome. It involves an elderly 74-year-old patient with a history of recurrent syncope due to episodes of orthodromic tachycardia followed by significant pauses. Thanks to the electrophysiological study and successful ablation of the concealed accessory pathway, the patient was spared the risks associated with pacemaker implantation. Additionally, the sinus node recovery time after programmed atrial stimulation was normal, objectively ruling out the need for a pacemaker in this patient. It is worth noting that, in this particular case, as orthodromic tachycardia involves both atria and ventricles in a macroreentry circuit, pacemaker stimulation would not have prevented tachycardia episodes. On the contrary, ventricular pacing by the pacemaker could have made the arrhythmia incessant [2,3].

Ethical aspects: the authors declare that the confidentiality of the patient's data is respected in this article.

Author contributions: EAL, ACP, GLP and HFP: Conceptualization. EAL, ACP and HFP: Writing - Original Draft, Writing - Review & Editing and Investigation. GLP: Supervision.

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