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CASE REPORT

Just Because You Don't See Something Doesn't Mean It Isn't There: A Case of Intermittent Multiple Accessory Pathways

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Summary

The presence of multiple accessory pathways is an independent risk factor for supraventricular tachycardia due to the potential for rapid conduction of the accessory pathway during atrial fibrillation. Conversely, intermittent pre-excitation during sinus rhythm is a presentation of accessory pathways with poor conduction, and the subsequent development of ventricular fibrillation during atrial fibrillation is very rare. In this case, we demonstrate that even multiple accessory pathways can exhibit intermittency on surface ECG.

Keywords: ablation; accessory pathway; preexcitation; WPW

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The prevalence of a WPW pattern on the surface ECG is estimated at 0.13 to 0.25% in the general population.[1] ECG signs of WPW include a short PR interval, a slurred upstroke of the QRS complex, and prolonged QRS duration. Although rarely life-threatening, there is a small risk of sudden cardiac death in patients with an accessory pathway due to preexcitation. Intermittent preexcitation, loss of preexcitation during exercise, and the shortest R–R interval during induced atrial fibrillation of more than 220 ms during an electrophysiology study (EPS) are considered low-risk predictors of sudden cardiac death. According to a study by Klein et al., 50% of patients with WPW syndrome exhibit intermittent conduction through the accessory pathway.[2] On the contrary, multiple accessory pathways, which can be identified in 3-13% of patients undergoing electrophysiological studies for tachycardia related to accessory pathways, carry a higher risk of supraventricular tachycardia and rapid conduction during atrial fibrillation with the possibility of degeneration into ventricular fibrillation.[3]

Case Report

A 19-year-old male was admitted to our clinic for an electrophysiological study referred from another center. He reported experiencing palpitations with a sudden onset once a week. A 48-hour ECG rhythm Holter recorded an episode of narrow QRS complex tachycardia. On the 12-lead ECG, a short PR interval and wide QRS complexes with delta waves were observed. A negative delta wave in lead V_1, a positive delta wave in lead V_2, and predominantly negative delta waves in inferior leads suggested posterior septal accessory pathway localization (Panel A). However, another ECG of the same patient, without delta waves and with a normal PR interval, was also available. Transthoracic echocardiography revealed normal cardiac function, and he was not taking any medication.

During an electrophysiological study performed under local anesthesia without premedication, a decapolar deflectible catheter was inserted into the coronary sinus, and a diagnostic quadripolar catheter was placed in the right ventricle. The use of his catheter was limited for economic reasons. At the start of the study, sinus rhythm without preexcitation was observed (Panel B). Right ventricular apical

programmed pacing revealed non-decremental ventriculo-atrial conduction with an effective refractory period of 370 ms. No tachycardia could be induced. Dual atrioventricular node physiology was not detected during atrial burst and programmed pacing. Additionally, during atrial pacing from the coronary sinus proximal pole at a cycle length of 500 ms, intermittent preexcitation with the same pattern as seen in the presented ECG was noted (Panel C). Preexcitation disappeared at a pacing cycle length of 350 ms. The Wenckebach period of the atrioventricular node was measured at 280 ms. An isoproterenol infusion could not be administered due to its unavailability at the time of the study. The location of the accessory pathway was determined through activation mapping during atrial pacing, and successful ablation was carried out at the posterior septal area, where ventricular activation occurred earliest (Panel D). Just before the radiofrequency ablation, a new QRS morphology consistent with the previous preexcited morphology was observed during pacing from the proximal coronary sinus (Panel E). Following the ablation of the posterior septal pathway, a new intermittent preexcitation pattern persisted. The transition of the delta wave in lead V_5 and positive delta waves in the inferior leads indicated a right lateral accessory pathway location. After remapping under atrial pacing with a cycle length of 500 ms, the second accessory pathway was identified, with the earliest ventricular activation occurring at the anterolateral tricuspid annulus (Panel F). Before the ablation procedure, a 7F short sheath was replaced with an SL1 long sheath for catheter stability. Radiofrequency ablation was performed by applying 50 Watts of power at 55ºC to the anterolateral tricuspid annulus. The second pathway was successfully eliminated with RF pulses. Administration of 10mg adenosine resulted in complete atrioventricular block. Programmed ventricular stimulation revealed decremental VA conduction with concentric atrial activation on the CS catheter. No complications were observed during or after the procedure.

Discussion

Intermittent preexcitation is defined as the loss of the delta wave with a simultaneous prolongation of the P-R interval. In the study by Klein et al., as well as in other studies, patients were classified as having intermittent preexcitation if the loss of the delta wave was observed on at least one occasion during the preablation baseline 12-lead ECG, 24-hour ambulatory ECG, or treadmill exercise test.[2,5,7]

Historically, intermittent preexcitation has been recognized as a finding that suggests the presence of an accessory pathway with poor anterograde conductivity. However, this belief is mainly based on expert opinions, and there are only a few small studies available regarding the electrophysiological properties of accessory pathways with intermittent conduction.[2,4-7] According to these studies, intermittent preexcitation does not necessarily indicate poor anterograde conduction.

In the current case, the patient had an ECG showing sinus rhythm with signs of preexcitation. However, another ECG of the same patient in sinus rhythm without delta waves and a normal PR interval was also available, indicating that preexcitation is intermittent. While this is common in patients with a single accessory pathway, it is rare to observe a normal ECG in sinus rhythm in patients with multiple accessory pathways.

During pacing from the proximal coronary sinus catheter pole at a cycle length of 500 ms, in one tracing (Panel E), we observed narrow QRS complexes simultaneously with two wide QRS complexes representing both accessory pathways. This rare phenomenon is referred to as "pre-excitation alternans".[4] This phenomenon can also appear on a normal ECG tracing and may be misinterpreted as premature ventricular complexes, potentially leading to a misdiagnosis of WPW syndrome and a delay in appropriate treatment.

In the absence of tachycardia and associated symptoms, it is crucial to measure the effective refractory period (ERP) of the accessory pathway to assess the risk of sudden cardiac death (SCD). An ERP equal to or less than 250ms indicates a high risk of SCD. The most accurate method for measuring ERP is by assessing the shortest preexcited RR interval during atrial fibrillation or isoproterenol infusion.

In this patient, the decision to perform accessory pathway ablation is based on the fact that the patient had a documented episode of narrow QRS complex tachycardia. Although tachycardia could not be induced during EPS, the absence of dual atrioventricular nodal physiology and the presence of an accessory pathway suggested that it was an orthodromic AVRT.

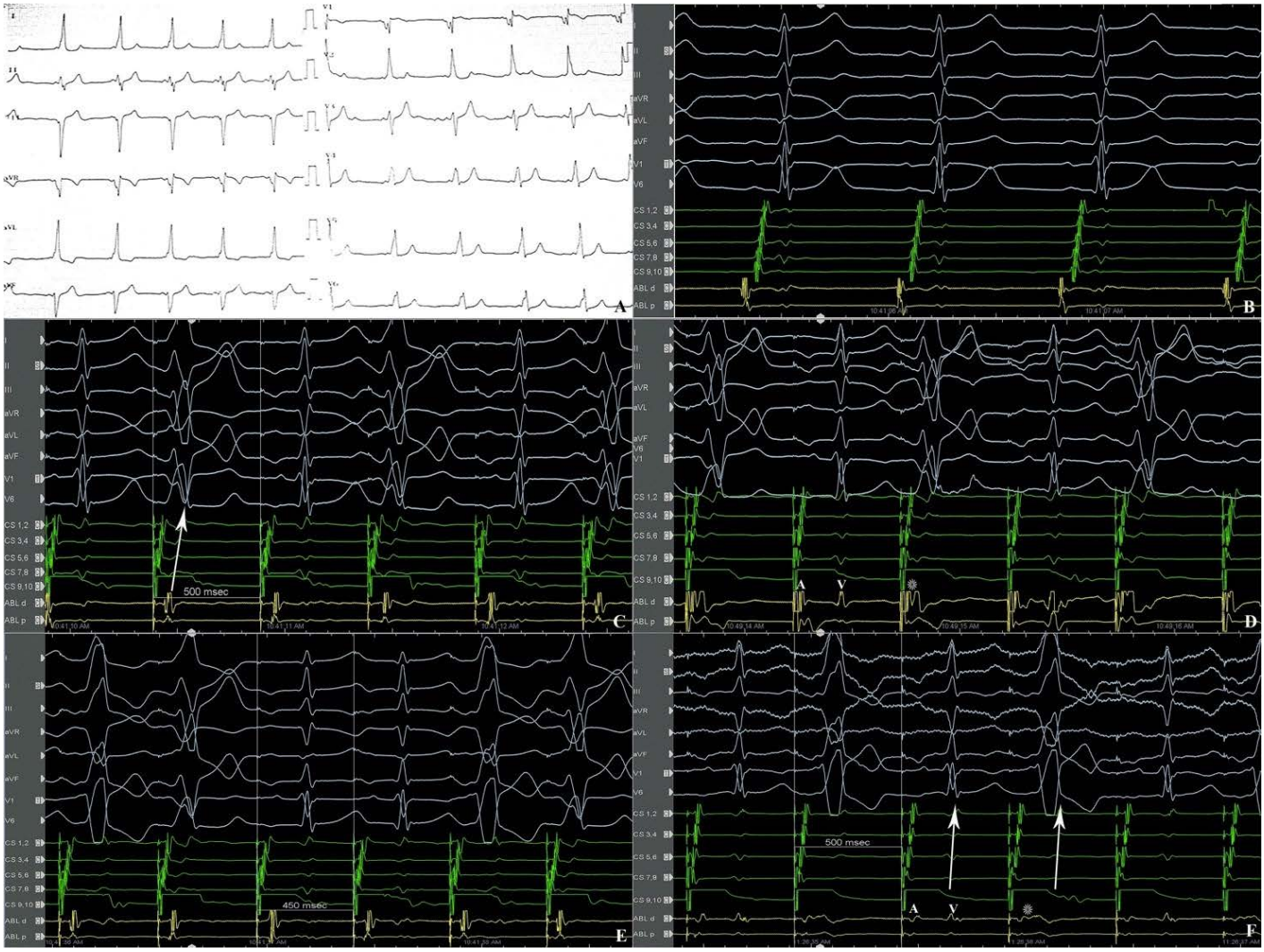

Figure. The baseline ECG with preexcitation, possibly localized in the postero-septal location (Panel A). The baseline ECG without preexcitation at the beginning of the electrophysiological study (Panel B). Pacing with a 500-ms cycle length, revealing intermittent preexcitation (with a concentric activation pattern) (arrow), similar to the baseline preexcited ECG (Panel C). The earliest site of ventricular activation (asterisk) observed in the right posteroseptal area of the ablation catheter (Panel D). Pacing with a 450-ms cycle length, uncovering a second preexcitation pattern simultaneously with the first pattern (sequential dual pathway with two distinct morphologies) (Panel E). The earliest site of ventricular activation (asterisk) observed in the right anterolateral area (with a near-normal coronary sinus activation pattern) (arrows) on the ablation catheter (Panel F).
A, atrial activation; V, ventricular activation, CS 1,2 and CS 9,10 correspond to the most distal and proximal poles of the catheter, respectively.

We have two key take-home messages from this case:

1- Just because you don't see something doesn't mean it isn't there. Intermittent preexcitation is not uncommon, and a normal ECG does not necessarily rule out anterogradely conducting accessory pathways. While quite rare, even multiple accessory pathways can exhibit intermittency.
2- Intermittent accessory pathways do not necessarily indicate poor antegrade conduction.

Conflict of Interests

None

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