CASE REPORT

Late Onset of Severe Symptoms in a Patient with Wolff-Parkinson-White Syndrome with Misleading ECG Pattern of the Accessory Pathway Origin Undergoing Successful Ablation

Antonis S. Manolis, MD,* Christos-Konstantinos Antoniou, MD, Antonios Karanasos, MD, George Agelopoulos, MD, George Lazaros, MD

Third & First Departments of Cardiology, Athens University School of Medicine, Athens, Greece;
* e-mail: asm@otenet.gr

Abstract

The case of a female patient with symptomatic Wolff-Parkinson-White syndrome is presented with very late onset of symptoms at the age of 65 years, who had an apparent left-sided posteroseptal accessory pathway, which was ablated via a right-sided approach. A subepicardial location was strongly suspected within the coronary sinus ostium at the origin of the middle cardiac vein by applying both ECG and fluoroscopic criteria.
Rhythmos 2016;11(3):73-75.

Key words: preexcitation syndrome; posteroseptal accessory pathway; Wolff-Parkinson-White syndrome; electrophysiology study; radiofrequency catheter ablation

Abbreviations: AP = accessory pathway; EP = electrophysiology; RF = radiofrequency; WPW = Wolff-Parkinson-White (syndrome)

Introduction

Patients with manifest preexcitation or Wolff-Parkinson-White (WPW) syndrome may be asymptomatic or develop symptoms at some point of their course in life, commonly at a young age. They carry a small (<1%), albeit real, risk of sudden cardiac death, usually attributable to atrial fibrillation or flutter with rapid ventricular response by bypassing the atrioventricular node and degenerating into ventricular fibrillation.[1] Potentially life-threatening arrhythmias may occasionally be the first manifestation of the syndrome. Catheter ablation is first-line therapy for symptomatic patients, while such therapy is selectively applied to asymptomatic patients.[2, 3]

Localization of the accessory pathway (AP) starts with examination of the surface ECG and gets more accurate during electrophysiological mapping that precedes the ablation procedure.[4] A number of ECG algorithms have provided initial guidance,[5-7] but several limitations have been pointed out.[8] One such limitation relates to identifying the location of a posteroseptal accessory pathway. A negative delta wave is registered in the inferior leads of patients with such pathways. However, ablation of an accessory pathway located in the posteroseptal region can be challenging, as either a right- or left- sided approach may be required.[9] When a positive delta wave is recorded in lead V1, all algorithms suggest a left-sided location.[6, 7] We herein present a case of late presentation of symptoms in a WPW patient with an apparent left-sided posteroseptal AP, which was ablated via a right-sided approach.

Case presentation

A 65-year-old lady with a history of brief episodes of palpitations over the past 6 years, recently sustained a prolonged episode of intense symptoms of palpitations for which she presented to the emergency room of her local hospital. She was found to be in a borderline hemodynamic status (blood pressure 95/60 mmHg). The 12-lead ECG showed an irregular wide-QRS complex tachycardia with a ventricular rate of approximately 210 bpm, consistent with preexcited atrial fibrillation (Fig. 1, panel A). She was managed with intravenous administration of amiodarone which led to conversion of the arrhythmia into sinus rhythm, and in a following ECG manifest preexcitation was apparent (Fig. 1, panel B). She was subsequently started on antiarrhythmic and anticoagulation therapy and a radiofrequency ablation procedure was recommended.

At one and a half month later, the patient was submitted to an electrophysiology (EP) study followed by radiofrequency (RF) ablation. During the EP study, there was no induction of orthodromic AV reentrant or other tachycardia. The AP anterograde refractory period was determined to be 290 ms, while the retrograde refractory period was measured at 240 ms. The shortest atrio-ventricular (AV) interval was recorded in the proximal pole of the coronary sinus (CS) catheter. Due to ECG recording during maximal preexcitation indicating a left-sided AP (positive delta wave in lead V1), an attempt was initially made to proceed with a transseptal approach to the mitral annulus. However, there were technical difficulties during the transseptal puncture with excessive tenting of the interatrial septum and further mapping of the right posteroseptal region was entertained before resorting to a transaortic approach. Indeed, just upon entering the CS ostium with the mapping catheter (Figure 1, panel C), a very promising local electrogram was recorded with a very short AV interval (Fig. 1, panel D). Delivery of RF current at this location successfully eliminated preexcitation with the second RF application (see ECG recording in Fig. 1, panel E). An EP study immediately after the last RF application and half an hour later confirmed the absence of AP conduction in either direction.

Discussion

We presented a case of late onset of symptoms in a female patient who was diagnosed with WPW syndrome at the age of 65 years. She presented with a potentially life-threatening arrhythmia with atrial fibrillation with rapid ventricular response and was subsequently submitted to a successful RF ablation procedure of a posteroseptal AP.

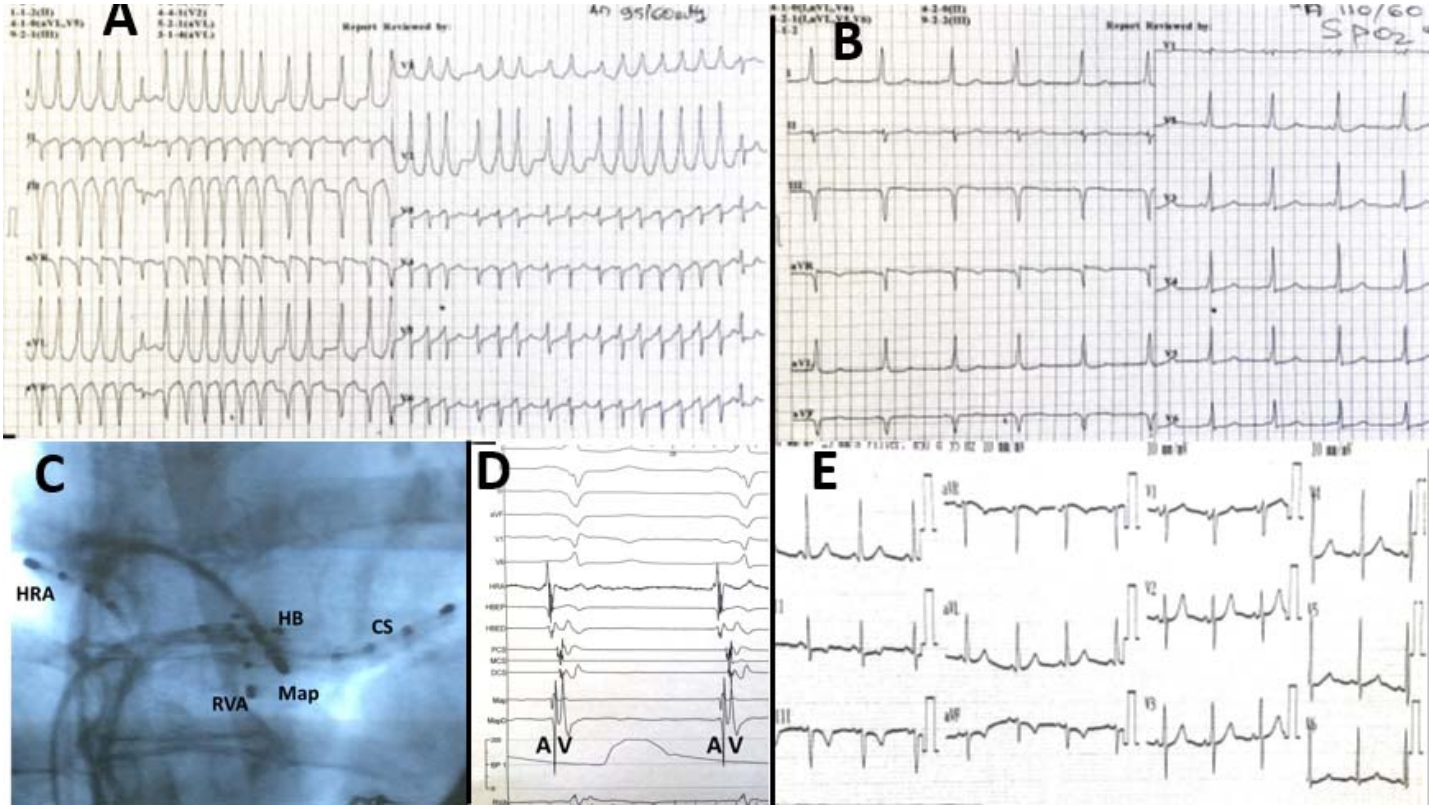

Figure 1. The presenting ECG is displayed on the upper left panel (**A**) and the ECG recorded right after cardioversion on the upper right panel (**B**). A fluoroscopic view is shown in the lower left panel (**C**), followed by ECG and intracardiac recordings in the lower mid panel (**D**) and a 12-lead ECG right after successful ablation of the accessory pathway in the lower right panel (**E**). The new ST-T wave changes in the inferior leads noted in the post-ablation ECG (panel E) are due to the well-known "memory" phenomenon, usually abating over the ensuing 2-3 months.[2] A = atrial (electrogram); CS = coronary sinus; ECG = electrocardiogram; HB = His bundle; HRA = high right atrial (catheter); Map = mapping and ablation catheter; RVA = right ventricular apex (catheter); V = ventricular (electrogram).

Although the ECG recordings were compatible with a left-sided location of the AP (positive preexcited QRS in lead V1), successful ablation was effected via a right-sided approach. The location appeared to be rather subepicardial than endocardial, as lead II on surface ECG might have suggested by recording a negative delta wave as proposed by Arruda et al;[7] in addition, the fluoroscopic location of the mapping catheter (Figure 1, panel C) did suggest a site in juxtaposition to the origin of the middle cardiac vein; of course, this could only have been confirmed by a coronary sinus venogram,[10] which was not performed in this case.

Although mapping and ablation of APs in symptomatic patients is a highly rewarding, successful and safe procedure, septal, especially posteroseptal, pathways remain challenging.[9, 11] Epicardial posteroseptal pathways involving the coronary sinus or middle cardiac venous myocardium in particular can be very difficult to ablate.[11, 12] Several studies have indicated the difficulty in discriminating left- from right-sided posteroseptal pathways; however, most have agreed that a positive delta wave in lead V1 can further differentiate a left-sided from a right-sided posteroseptal pathway.[10, 13] However, this may not hold true for the rare occasion of a subepicardial AP located in the middle cardiac vein.

Some investigators have even suggested to attempt ablation of posteroseptal APs from the right atrium regardless of their ECG pattern, as this may minimize or obviate the need for a left-sided heart catheterization.[14] However, other investigators suggest otherwise; specifically they propose that an rSR' pattern in lead V1 indicates a left-sided ablation approach for these APs.[9]

All the above concerns regarding the posteroseptal APs are enhanced when one considers an AP with subepicardial location that is inaccessible endocardially and can only be ablated in the middle cardiac vein as it occurred in the present case. Almost all these patients, ours included, have a negative delta wave in lead II.[7, 15]

Several algorithms have been proposed to assist with electrocardiographic localization of an AP,[5-7, 13-15] but discrepancies have been noted, mostly attributable to variable degree of preexcitation. However, when maximal

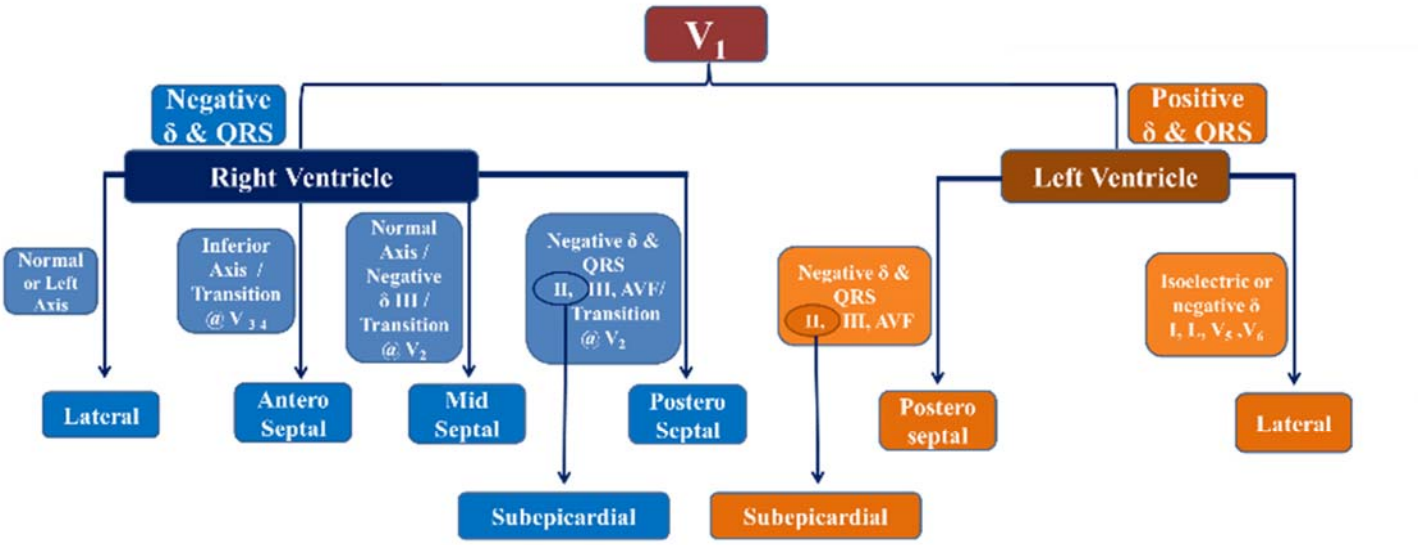

Figure 2. An algorithm for ECG localization of an accessory pathway is proposed based on both delta wave and QRS complex morphology, rather than on delta wave polarity alone, in the precordial leads V1-2, lateral and inferior leads, and on the QRS axis. It best works when maximal preexcitation is present, as shown in Figure 1A.

preexcitation is present, as was in the present case during preexcited atrial fibrillation, ECG localization may be more precise, as illustrated in the herein proposed flow chart, which constitutes an amalgamation of prior proposed algorithms (Fig. 2). However, the subepicardial location of an AP may still be missed if one does not pay attention to lead II and does not consider performing a coronary sinus venogram, which should be the next step in line if mapping and ablation are not successful via the endocardial approach.

REFERENCES

1. Klein GJ, Bashore TM, Sellers TD, et al. Ventricular fibrillation in the Wolff-Parkinson-White syndrome. *N Engl J Med*. 1979;301:1080-1085.
2. Manolis AS, Wang PJ, Estes NA. Radiofrequency catheter ablation for cardiac tachyarrhythmias. *Ann Intern Med* 1994;121:452-61.
3. Manolis AS, Wang PJ and Estes NA, 3rd. Radiofrequency ablation of left-sided accessory pathways: transaortic versus transseptal approach. *Am Heart J* 1994;128:896-902.
4. Manolis AS, Wang PJ and Estes NA, 3rd. Radiofrequency ablation of atrial insertion of left-sided accessory pathways guided by the "W Sign". *J Cardiovasc Electrophysiol* 1995;6:1068-1076.
5. Milstein S, Sharma AD, Guiraudon GM and Klein GJ. An algorithm for the electrocardiographic localization of accessory pathways in the Wolff-Parkinson-White syndrome. *Pacing Clin Electrophysiol* 1987;10:555-563.
6. Fitzpatrick AP, Gonzales RP, Lesh MD, et al. New algorithm for the localization of accessory atrioventricular connections using a baseline electrocardiogram. *J Am Coll Cardiol* 1994;23:107-116.
7. Arruda MS, McClelland JH, Wang X, et al. Development and validation of an ECG algorithm for identifying accessory pathway ablation site in Wolff-Parkinson-White syndrome. *J Cardiovasc Electrophysiol* 1998;9:2-12.
8. Fox DJ, Klein GJ, Skanes AC, et al. How to identify the location of an accessory pathway by the 12-lead ECG. *Heart Rhythm* 2008;5:1763-6.
9. Liu E, Shehata M, Swerdlow C, et al. Approach to the difficult septal atrioventricular accessory pathway: the importance of regional anatomy. *Circ Arrhythm Electrophysiol* 2012;5:e63-66.
10. Jazayeri MR, Dhala A, Deshpande S, et al. Posteroseptal accessory pathways: an overview of anatomical characteristics, electrocardiographic patterns, electrophysiological features, and ablative therapy. *J Interv Cardiol* 1995;8:89-101.
11. Macedo PG, Patel SM, Bisco SE and Asirvatham SJ. Septal accessory pathway: anatomy, causes for difficulty, and an approach to ablation. *Indian Pacing Electrophysiol J* 2010;10:292-309.
12. Schluter M, Geiger M, Siebels J, Duckeck W and Kuck KH. Catheter ablation using radiofrequency current to cure symptomatic patients with tachyarrhythmias related to an accessory atrioventricular pathway. *Circulation* 1991;84:1644-1661.
13. Diker E, Ozdemir M, Tezcan UK, et al. QRS polarity on 12-lead surface ECG. A criterion for the differentiation of right and left posteroseptal accessory AV pathways. *Cardiology* 1997;88:328-332.
14. Dhala AA, Deshpande SS, Bremner S, et al. Transcatheter ablation of posteroseptal accessory pathways using a venous approach and radiofrequency energy. *Circulation* 1994;90:1799-1810.
15. Takenaka S, Yeh SJ, Wen MS, et al. Characteristics and radiofrequency ablation in posteroseptal and left free-wall subepicardial accessory pathways. *J Electrocardiol* 2005;38:69-76.