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# Sequential Abolition of Antegrade and Retrograde Conduction in Wolff-Parkinson-White Syndrome: A Case Series

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Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
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**Conflict of interest:** None declared

## Case series

**Patients:** Male, 15-year-old • Female, 19-year-old

**Final Diagnosis:** Wolff-Parkinson-White (WPW) syndrome

**Symptoms:** Palpitation

**Medication:** —

**Clinical Procedure:** —

**Specialty:** Anatomy • Cardiology

**Objective:** Unknown etiology

**Background:** Radiofrequency ablation in cases of Wolff-Parkinson-White (WPW) syndrome is a relatively safe procedure that yields good results. However, the electrical characteristics of WPW syndrome have not yet been fully elucidated. Herein, we report 2 cases of WPW syndrome, wherein antegrade conduction was abolished first, followed by retrograde conduction.

**Case Reports:** Case 1: A 15-year-old boy who recently reported experiencing frequent palpitations was diagnosed with type A WPW syndrome by electrocardiography (ECG). Radiofrequency energy was delivered to the earliest activation site using an ablation catheter. This procedure abolished antegrade accessory pathway conduction in 6 seconds, and then the ablation was continued for 60 seconds; however, retrograde accessory pathway conduction remained intact. Hence, radiofrequency ablation was performed to further deliver radiofrequency energy to abolish the retrograde accessory pathway conduction.

Case 2: A 19-year-old woman with palpitations since elementary school was diagnosed with type A WPW syndrome by ECG. Radiofrequency energy was delivered to the earliest activation site through an ablation catheter to abolish antegrade accessory pathway conduction in approximately 1 second, and then the ablation was continued for 60 seconds. Retrograde accessory pathway conduction was preserved, and further radiofrequency ablation performed multiple times in the same vicinity abolished retrograde accessory pathway conduction.

**Conclusions:** We managed 2 cases of WPW syndrome wherein antegrade and retrograde accessory pathway conduction were individually abolished. This phenomenon may have been caused by an incomplete lesion that resulted in a functional block.

**Keywords:** Accessory Atrioventricular Bundle • Catheter Ablation • Wolff-Parkinson-White Syndrome

**Full-text PDF:** <https://www.amjcaserep.com/abstract/index/idArt/932381>



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## Background

Radiofrequency ablation in cases of Wolff-Parkinson-White (WPW) syndrome is a relatively safe procedure that yields good results [1]. This procedure has been widely performed as a well-established treatment for WPW syndrome. It is believed that an accessory pathway allows both antegrade and retrograde conduction; however, the electrical characteristics of WPW syndrome have not yet been fully elucidated. Herein, we report 2 cases of WPW syndrome wherein antegrade conduction was abolished first, followed by retrograde conduction.

## Case Reports

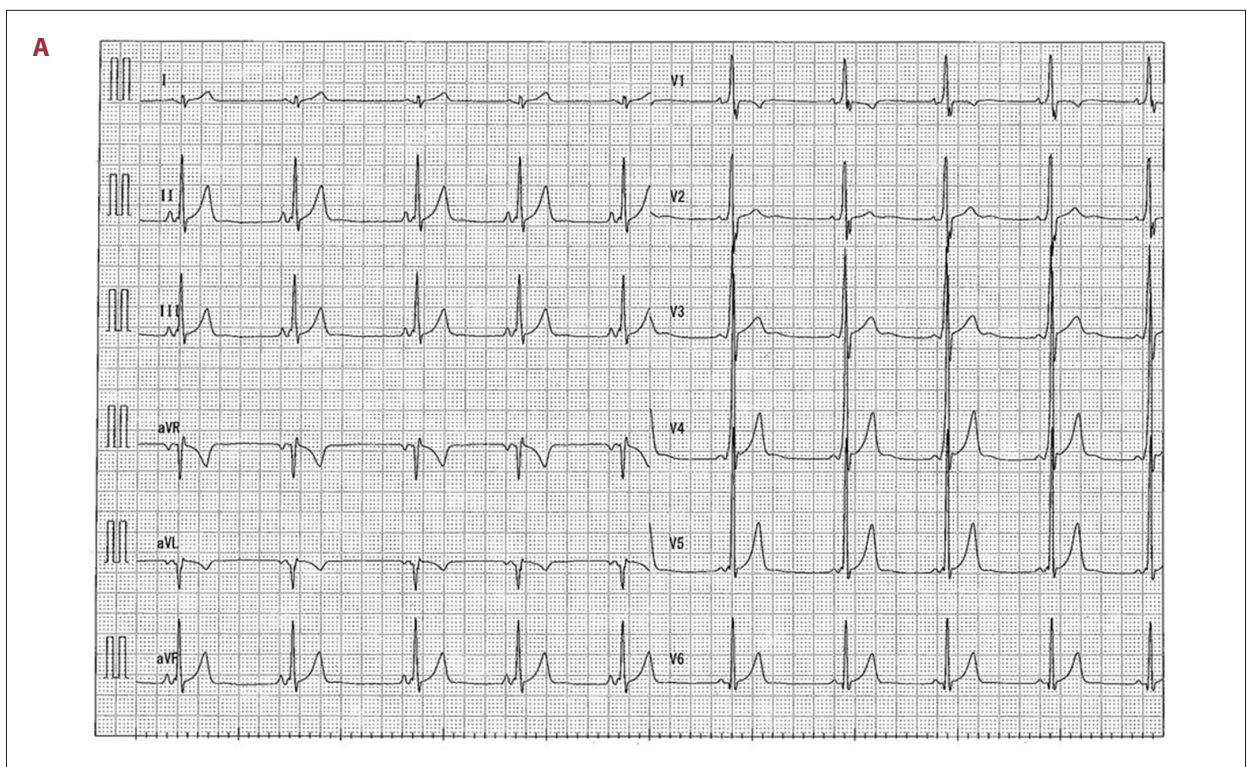
### Case Presentation 1

A 15-year-old boy, who recently reported experiencing frequent palpitations, was diagnosed with type A WPW syndrome by electrocardiography (ECG) performed during a medical checkup and was referred to our hospital for radical treatment. We performed catheter ablation and an electrophysiology study (EPS). Electrode catheters inserted from the right femoral vein were placed at the His bundle electrogram, high right atrium, right ventricular apex, and coronary sinus (CS). Mapping of intracardiac potentials identified the site of earliest activation to be adjacent to the lateral mitral annulus in an accessory pathway with both antegrade and retrograde conduction. Atrioventricular

reciprocating tachycardia was easily induced by programmed stimulation (Figure 1A-1C). This approach was retrograded from the femoral artery. An ablation catheter (Blazer™ II large curve 4-mm tip; Boston Scientific) was used to deliver radiofrequency energy to the earliest activation site in 6 seconds, and the ablation was continued for 60 seconds, which abolished antegrade accessory pathway conduction. However, retrograde accessory pathway conduction remained intact (Figure 2). Next, the ablation catheter was moved slightly to the posterior mitral annulus, and radiofrequency energy was delivered to abolish retrograde accessory pathway conduction. After this procedure, retrograde conduction via the atrioventricular node was observed. Since then, satisfactory progress has been observed, with no recurrence of tachycardia.

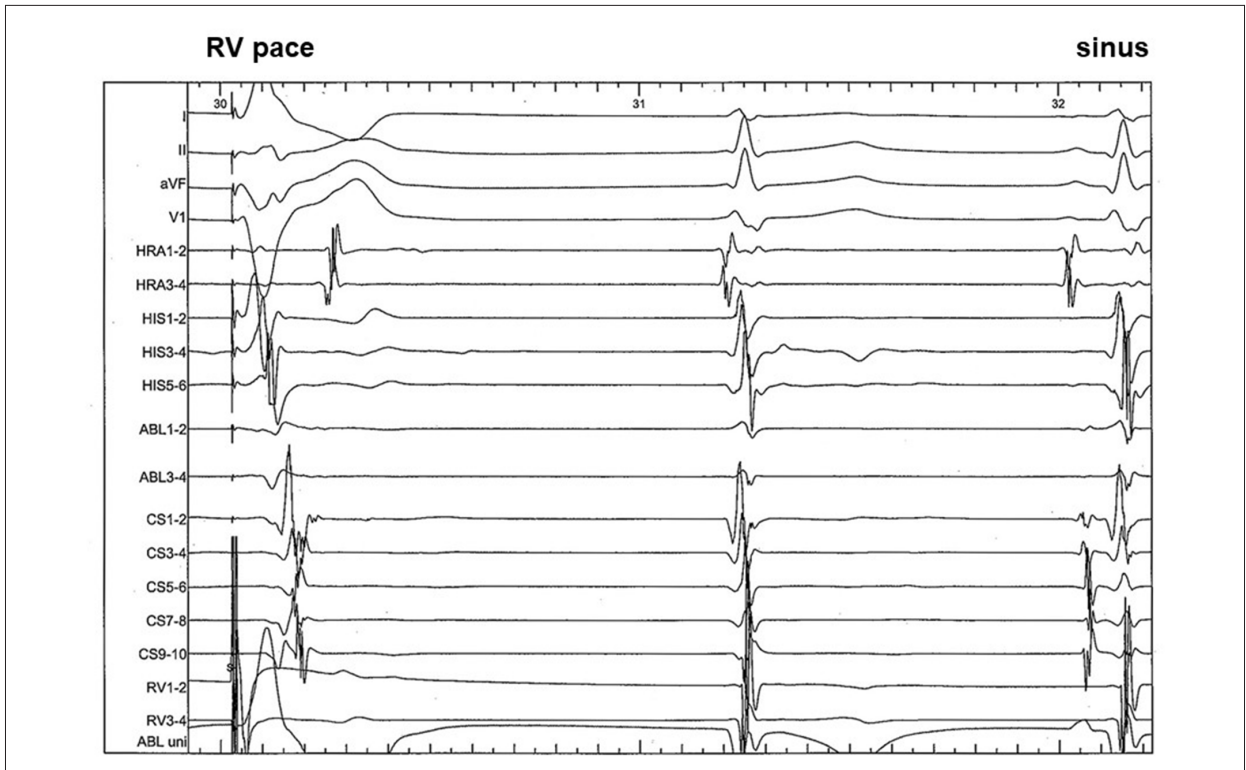
### Case Presentation 2

A 19-year-old woman with palpitations since elementary school was diagnosed with type A WPW syndrome by ECG performed during a medical checkup. She wanted to be completely cured before starting work and was referred to our hospital. We performed catheter ablation and an EPS. Mapping of intracardiac potentials revealed that the earliest activation site was located adjacent to the lateral mitral annulus in an accessory pathway, with both antegrade and retrograde conduction. Atrioventricular reciprocating tachycardia was easily induced by programmed stimulation (Figure 3A-3C). A retrograde approach from the femoral artery was used to deliver radiofrequency energy to the

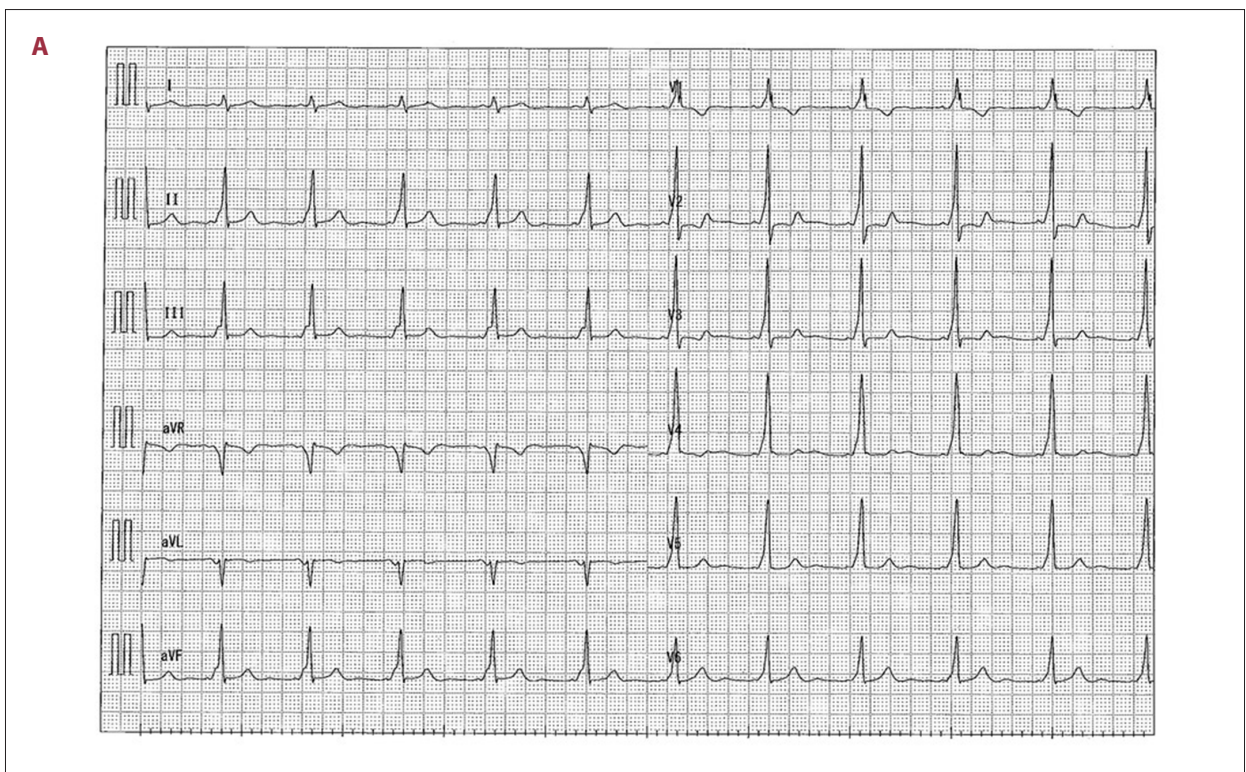


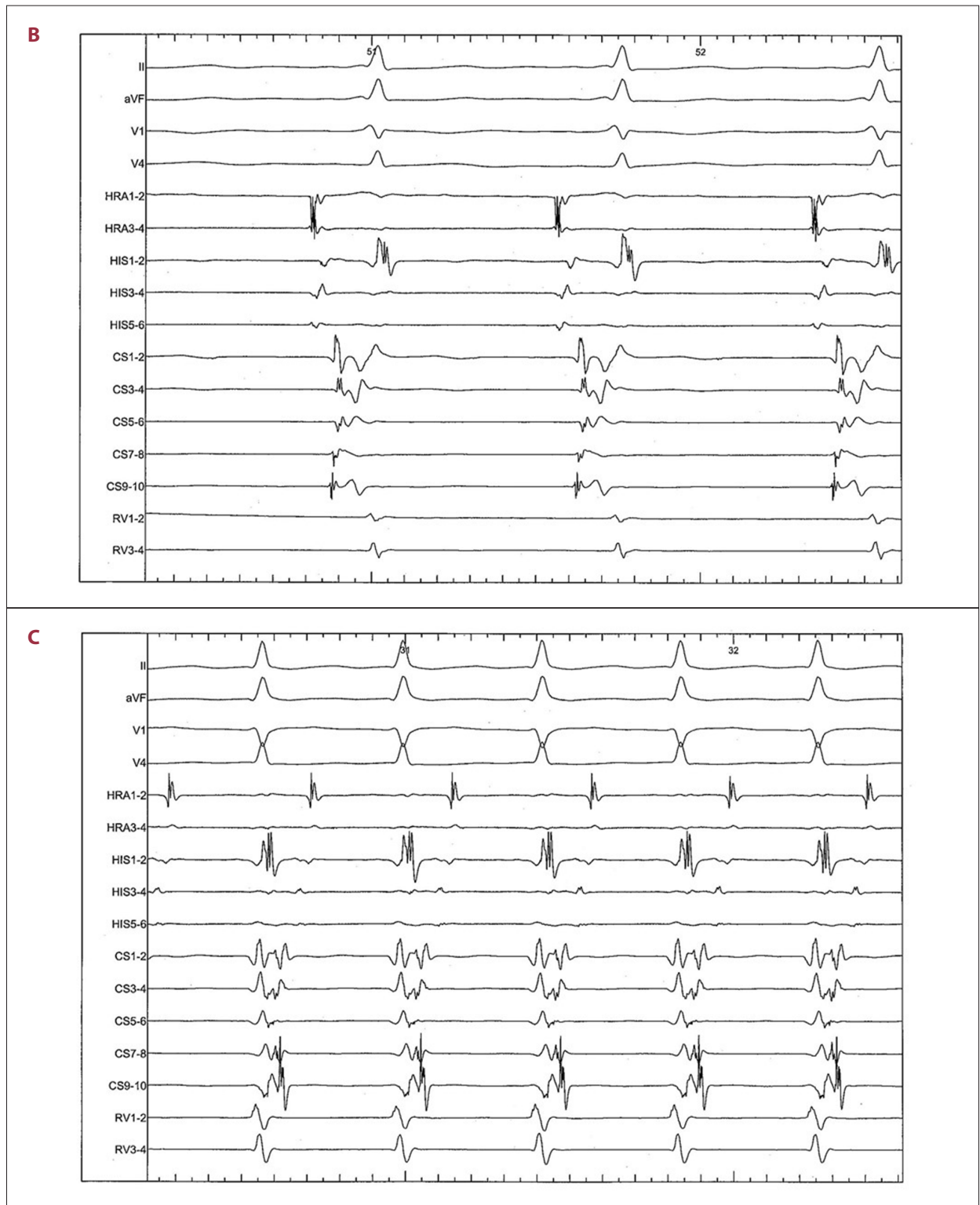


**Figure 1.** Type A Wolff-Parkinson-White (WPW) syndrome in Case 1. (A) Twelve-lead surface electrocardiogram (ECG) findings consistent with type A WPW syndrome. (B) Mapping of intracardiac potentials revealed that the site of earliest activation was adjacent to the lateral mitral annulus in an accessory pathway with both antegrade and retrograde conduction. (C) Atrioventricular reciprocating tachycardia was easily induced by programmed stimulation. HRA – high right atrium; CS – coronary sinus (1-2 distal; 9-10 proximal); paper speed 100 mm/s.

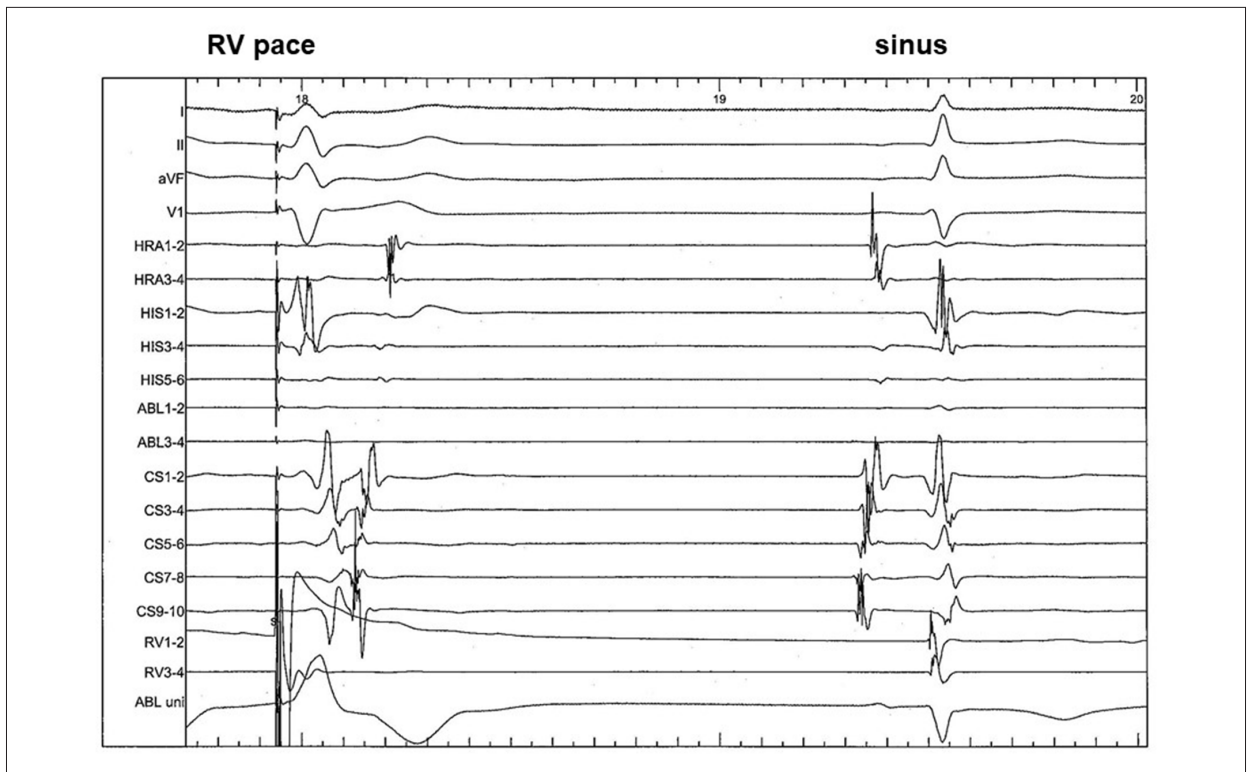


**Figure 2.** Antegrade accessory pathway conduction was abolished in Case 1 by radiofrequency energy, while preserving the retrograde accessory pathway conduction.





**Figure 3.** Type A Wolff-Parkinson-White (WPW) syndrome in Case 2. (A) Twelve-lead surface electrocardiogram (ECG) findings consistent with type A WPW syndrome. (B) Mapping of intracardiac potentials revealed that the site of earliest activation was adjacent to the lateral mitral annulus in an accessory pathway with antegrade conduction. (C) Atrioventricular reciprocating tachycardia was easily induced by programmed stimulation. HRA – high right atrium; CS – coronary sinus (1-2 distal; 9-10 proximal); paper speed 100 mm/s.



**Figure 4.** Antegrade accessory pathway conduction was abolished in Case 2 using radiofrequency energy while preserving retrograde accessory pathway conduction.

earliest activation site through an ablation catheter (Blazer™ II large curve 4-mm tip; Boston Scientific). This procedure abolished antegrade accessory pathway conduction in approximately 1 second, and the ablation was continued for 60 seconds; however, retrograde accessory pathway conduction was preserved (Figure 4). Further radiofrequency ablation was performed multiple times in the same vicinity to abolish retrograde accessory pathway conduction. Consequently, only retrograde conduction via the atrioventricular node was present. Since then, she has not experienced tachycardia and has made satisfactory progress.

## Discussion

In a typical case of WPW syndrome, both antegrade and retrograde conduction are observed; however, in some cases, only retrograde conduction is observed, the so-called “concealed WPW syndrome.” Conversely, in rare cases of WPW syndrome, only antegrade conduction is observed. In this study, 2 patients originally presented with both antegrade and retrograde conduction via an accessory pathway. However, initially, only antegrade conduction was abolished by ablation, while retrograde conduction was preserved. After additional ablation, the abolition of both antegrade and retrograde conduction was achieved. To the best of our knowledge, there have only been a few reported cases of such phenomena.

Free-wall Kent bundles, except for septal Kent bundles, are always situated on the epicardial aspect. Histologically, it has been proven that Kent bundles directly connect ventricular muscles to the atrial muscle [2]. Since the ablation is performed from the endocardial side, a distance between the endocardium and epicardium may have resulted in an incomplete lesion and created a functional block. Multiple accessory pathways are reportedly present in 4-10% of patients [3].

In Case 1, although the ablation catheter was slightly moved to the posterior side when the ablation to the retrograde conduction, the ablation sites were almost the same. In Case 2, the ablation sites were almost the same. Given no change in the sequence of intracardiac potentials in retrograde accessory pathway conduction, multiple accessory pathways are unlikely.

In this case, the ablation site was determined based on intracardiac potentials alone, without the 3-D mapping system. This may have resulted in an incomplete lesion and subsequent functional block [4].

Since an irrigation catheter and contact sensor were not used, it is possible that poor contact leads to an ineffective lesion as well as local edema and inflammation with insufficient tissue contact [5].

The sequential elimination of bidirectional conduction due to “source-sink mismatch” may be the cause of the unidirectional functional block caused by the incomplete lesion [6]. The first application resulted in an incomplete lesion and a narrow pathway, which can cause unidirectional block.

## Conclusions

We managed 2 cases of WPW syndrome, wherein antegrade and retrograde conduction via an accessory pathway were abolished sequentially. Although catheter ablation for the treatment of WPW syndrome has become common, the electrical

characteristics of WPW syndrome are not yet completely understood. The exclusive recurrence of retrograde conduction is electrophysiologically possible, even if antegrade conduction is successfully blocked. The cause of this phenomenon may be an incomplete lesion, which may have created a unidirectional functional block. It is important to consider this fact when treating patients with WPW syndrome.

## Declaration of Figures Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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