

Successful Ablation of Accessory Pathways by Radiofrequency Current Catheter Ablation during Atrial Fibrillation

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Summary. To eliminate the need for general anesthesia, radiofrequency current catheter ablation during atrial fibrillation was performed in two patients with Wolff-Parkinson-White syndrome. The first patient, a 36-year-old male, had a right anterolateral accessory pathway. A radiofrequency current of 30 watts was delivered to the site of the V- δ interval of -10 msec without abolishing the delta wave. However, application of the same current to the site of the V- δ interval of -40 msec led to the disappearance of the delta wave within 2 seconds. The second patient was a 24-year-old male with a right posteroseptal accessory pathway. Application of a radiofrequent current of 30 watts applied to the site of the V- δ interval of -40 msec led to the disappearance of the delta wave in 6.3 sec. The successful ablation of the accessory pathway was achieved by an index the V- δ interval during atrial fibrillation without the need for general anesthesia.

INTRODUCTION

Radiofrequency current catheter ablation, a new approach to treating patients with a symptomatic accessory pathway, has proven highly effective and free of major side effects.¹⁻⁹⁾ It is important to precise mapping of the site of the ablation. In the Wolff-Parkinson-White syndrome, the ablation site is usually determined during sinus rhythm.¹⁻⁹⁾ We, however, performed radiofrequency current catheter ablation of the accessory pathway during atrial fibrillation in two patients without using general anesthesia.

CASE REPORTS

Case 1

A 36-year-old male had suffered from paroxysmal palpitations since age 20. The surface electrocardio-

gram showed the delta wave characteristic of a right anterolateral accessory pathway.

Electrophysiologic study was initially conducted in February 1991, after informed consent had been obtained. A standard tripolar catheter and two quadripolar electrode catheters (USCL Inc., Division of C.R. Bard, Billerica, Mass; U.S.A.) with an inter-electrode distance of 5 mm were introduced percutaneously and positioned in the His bundle electrogram (HBE) recording site, the high right atrium (HRA) and the right ventricular apex (RVA). Electrical stimuli were delivered via programmable cardiac stimulation (BCO2, Fukuda Denshi Co. Ltd., Tokyo, Japan) at twice the diastolic threshold with a 2 msec rectangular pulse. Intracardiac electrograms were recorded (Mingograph 7, Siemens Elema Co. Ltd., Solna, Sweden) with three surface leads (I, II and V₁) at a paper speed of 100 msec. The band pass filter was set at 30 to 500 Hz and the recording sensitivity was standardized at 10 mm/1 mV. The effective refractory period of the accessory pathway was shorter than 250 msec.

A second electrophysiologic study for catheter ablation was performed in December 1991. We used a steerable 7 French quadripolar catheter with a 4-mm large-tip electrode (Mansfield/Webster, Boston Scientific Co., Watertown MA, U.S.A.). The radiofrequency current was produced by a generator (HAT200 520 KHZ, Osypka GmbH, Grenzach Wyhlen, Germany) and delivered between the tip electrode and an external patch electrode on the patient's left scapula. Atrial fibrillation was induced during endocardial mapping of the right atrium. The minimal pre-excited R-R interval was 200 msec. The administration of disopyramide, 50 mg infused intravenously, was ineffective in terminating the atrial fibrillation.

We decided to map the site of insertion of an accessory pathway to the ventricle as the earliest site of

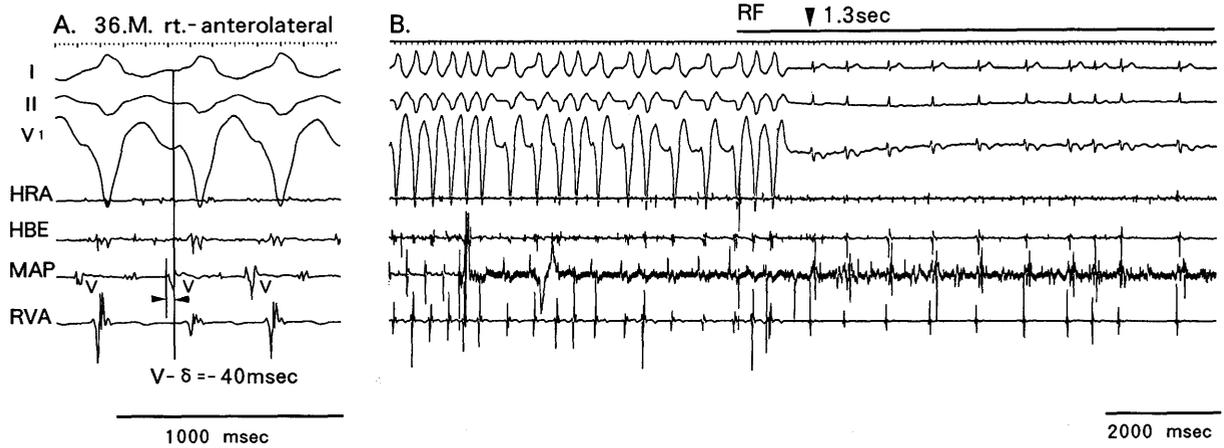


Fig. 1. Radiofrequency current catheter ablation during atrial fibrillation in Case 1. **A.** Mapping the atrioventricular ring allowed us detection of the earliest site of ventricular activation, the local electrogram preceding the QRS complex by 40 msec, as shown by arrowheads. The proximity to the atrium is reflected in the atrial activity recorded at the mapping site. **B.** Radiofrequency current at 30 watts. Antegrade conduction over the accessory pathway is abolished 1.3 seconds after its application. HRA: high right atrium, HBE: His bundle electrogram recording area, MAP: mapping site, RVA: right ventricular apex, V- δ : V- δ interval measured between delta wave and local ventricular deflection, RF: radiofrequency current.

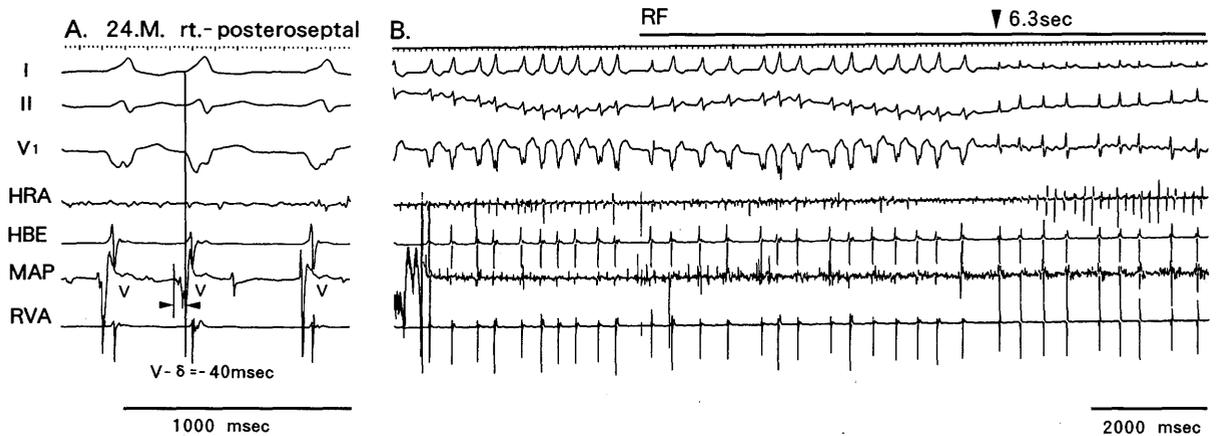


Fig. 2. Radiofrequency current catheter ablation during atrial fibrillation in Case 2. **A.** Mapping was performed as described in the previous patient. Atrial activity at the mapping site shows the proximity to the atrium. V- δ interval is -40 msec. **B.** Delivery of a radiofrequency current at 30 watts eliminated the antegrade conduction via the accessory pathway. Abbreviations are the same as those used in Fig. 1.

ventricular activation.¹⁰⁾ Using a steerable catheter, the earliest site of ventricular activation was found at the site mapped in the previous study. The local electrogram was found 40 msec prior to the delta wave (Fig. 1A). After applying a radiofrequency current of 30 watts, the delta wave disappeared within 2 seconds, and the QRS complex normalized (Fig. 1B). Atrial activity was clearly recorded at the ablation site, this observation indicating its proximity to the atrium. An additional current was then applied to the site for 30 sec at 30 watts.

Before our successful application of the radiofrequency current, application was attempted four times but terminated within 10 sec at which the local electrogram preceded the delta wave by 10 msec ($V-\delta$ interval).

No adverse effects were observed during or after the procedure. The patient's course has been uneventful during a follow-up period of 23 months.

Case 2

This patient, a 24-year-old male, developed a syncope attack at the age of 16. WPW syndrome with a right posteroseptal accessory pathway was diagnosed in the surface electrocardiogram.

We performed the initial electrophysiologic study in November 1989, and mapped an accessory pathway at the right posteroseptal area. The effective refractory period of the accessory pathway was 250 msec, and the minimal pre-excited R-R interval was 195 msec during atrial fibrillation. The administration of verapamil, 10 mg intravenously, effectively terminated the atrial fibrillation and also prevented the initiation of atrial fibrillation by programmed stimulation. The patient was then prescribed verapamil (240 mg per day orally), however, the palpitations recurred. During the second electrophysiologic study, we induced atrial fibrillation and applied a radiofrequency current of 30 watts to the right posteroseptal region with a $V-\delta$ interval of -40 msec (Fig. 2A). The delta wave disappeared 6.3 sec following the application of the radiofrequency current (Fig. 2B). An additional 30 watts was applied to the same site for 30 sec.

No adverse effects were observed during or after the procedure. The patient's course has been uneventful during a follow-up period of 7 months.

DISCUSSION

The success of ablation using radiofrequency current

requires the precise determination of the site of the accessory pathway. Recordings of the Kent potential, the A-V interval, or the $V-\delta$ interval are obtained to optimize the choice of ablation site.¹⁻⁸⁾

It would be ideal to map the restoration of sinus rhythm since it is difficult to map the optimal site during atrial fibrillation. Catheter ablation using a radiofrequency current can be possibly routinely performed without general anesthesia whereas the use of direct-current shock to restore sinus rhythm requires its administration.^{7,11)} To avoid the need to administer general anesthesia, we attempted an extensive mapping of the site of insertion of the accessory pathway during atrial fibrillation.^{7,11)} Fortunately, the accessory pathway could be successfully ablated in the two patients, although application of a radiofrequency current was ineffective in one patient.

It is not always necessary that the accessory pathway can be possibly ablated even during atrial fibrillation. Rather, we agree that mapping should be done precisely during sinus rhythm.²⁾ However, in some patients, the repeated application of direct-current shocks may make it impossible to maintain sinus rhythm during mapping. We have discussed of a possibility of the application of radiofrequency current catheter ablation during atrial fibrillation without the restoration of the sinus rhythm by direct-current shocks. The accessory pathway was successfully ablated in two patients without the use of general anesthesia by applying radiofrequency current catheter ablation at 30 watts, as previously used,^{1-6,9,10)} to the area with the $V-\delta$ interval of -40 msec.

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