

Radiofrequency ablation of common atrial flutter via right subclavian/jugular vein access in a patient with bilateral lower limb venous obstruction: Importance of contact force monitoring during mapping and ablation



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Introduction

Catheter ablation is usually performed via femoral vein and inferior vena cava to the right heart. For some reason, it may be difficult or unsuccessful when the inferior venous access is obstructed or lacking. We present a case of typical atrial flutter (AFL) in a patient with a history of endocardial cushion defect repair. The AFL was successfully ablated through the right subclavian/jugular veins because the right femoral vein and the left iliac vein were obstructed. Our case supports the concept that ablation guided by contact force monitoring might be useful, especially when the inferior venous access cannot be used.

Case report

A 30-year-old man who presented to his primary care physician with palpitation was found to be in AFL. In spite of medical therapy, AFL persisted. He was admitted to our hospital for radiofrequency ablation of refractory AFL. He had a history of endocardial cushion defect repair as a newborn infant. A 12-lead electrocardiogram revealed AFL with a cycle length of 256 ms and a saw-tooth pattern of flutter waves in leads II, III, and aVF, and a positive P-wave morphology in lead V1 ([Supplementary Figure available online](#)). The chest radiograph was normal, and a transthoracic echocardiography revealed no structural heart disease, no atrial or ventricular dilatation, no myocardial hypertrophy, and preserved left ventricular function.

KEYWORDS Catheter ablation; Subclavian and jugular vein; Atrial flutter; Contact force; Endocardial cushion defect repair; Bilateral lower limb venous obstruction

ABBREVIATION AFL = atrial flutter
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The transesophageal echocardiography excluded an intracardiac thrombus.

After written informed consent was obtained, a standard diagnostic electrophysiological study was performed. A guide wire was inserted in the right femoral vein, but it was not possible to advance it into the inferior vena cava. A subsequent venography documented an obstruction at the right femoral vein ([Figure 1A](#)), the left iliac vein ([Figure 1B](#)), and the left subclavian vein ([Figure 1C](#)). A deflectable decapolar catheter was inserted into the coronary sinus via the right jugular vein, and a deflectable ablation catheter with a 3.5-mm-tip electrode (Thermocool Smart Touch; Biosense Webster, Inc, Diamond Bar, CA) was advanced through the right subclavian vein ([Figures 2A and B](#)). A heparin bolus (100 U/kg) was administered and afterward a continuous infusion of heparin was provided, maintaining an activated clotting time value between 250 and 300 seconds. Surface electrocardiogram and bipolar endocardial electrograms were continuously monitored and stored on a computer-based digital amplifier/recorder system for offline analysis (LabSystem PRO; Boston Scientific Corporation, Marlborough, MA). Intracardiac electrograms were filtered from 30 to 500 Hz and measured at a sweep speed of 100 mm/s.

The electrograms from the coronary sinus were recorded with a tachycardia cycle length of 256 ms ([Figure 3A](#)). Endocardial mapping of the right atrium was performed under the guidance of an electroanatomical mapping system (CARTO 3 System; Biosense Webster, Inc). The activation mapping revealed a counterclockwise reentrant wavefront around the tricuspid annulus ([Figure 3B](#)). Entrainment pacing performed from the isthmus between the tricuspid annulus and the inferior vena cava during tachycardia showed concealed fusion (same P wave and activation sequence), and a postpacing interval was equal to the tachycardia cycle length. The tachycardia was diagnosed as an isthmus-dependent AFL.

KEY TEACHING POINTS

- Atrial flutter sometimes develops after cardiac surgery.
- Bilateral femoral vein obstruction is rare but should be suspected after cardiac catheterization.
- Catheter ablation guided by contact force monitoring is useful when the catheter stability is poor via the superior approach.

The tachycardia was successfully ablated through the creation of a linear lesion to the cavotricuspid isthmus, using a contact force monitoring more than 10g for each point (maximum tip temperature set at 43°C, maximum output 30 watts) (Figure 3B). The tachycardia could no longer be induced either by atrial extrastimulation or by rapid atrial pacing (up to 300 min⁻¹). The patient remained free of arrhythmias over a 12-month follow-up period.

Discussion

Here we describe the case of a patient with typical AFL, which was mapped and successfully ablated with the assistance of the electroanatomical mapping system and contact force monitoring.

There are few reports about the prevalence of venous occlusion after cardiac catheterization for congenital heart disease. Aiyagari et al¹ reported that, among 89 infants with single-ventricle heart disease, 16% had iliofemoral vein occlusion with umbilical venous catheter placed and 42% had iliofemoral vein occlusion with femoral venous catheter placed. Van Ommen et al² reported that partial or complete occlusion of the investigated vein was found in 17% of the lower extremities of 28 unselected children evaluated 5–10 years after their first cardiac catheterization. In our case, the obstruction of bilateral iliofemoral veins and the left subclavian vein were not congenital anomalies—these obstructions occurred after cardiac catheterization or cardiac surgery of endocardial cushion defect.

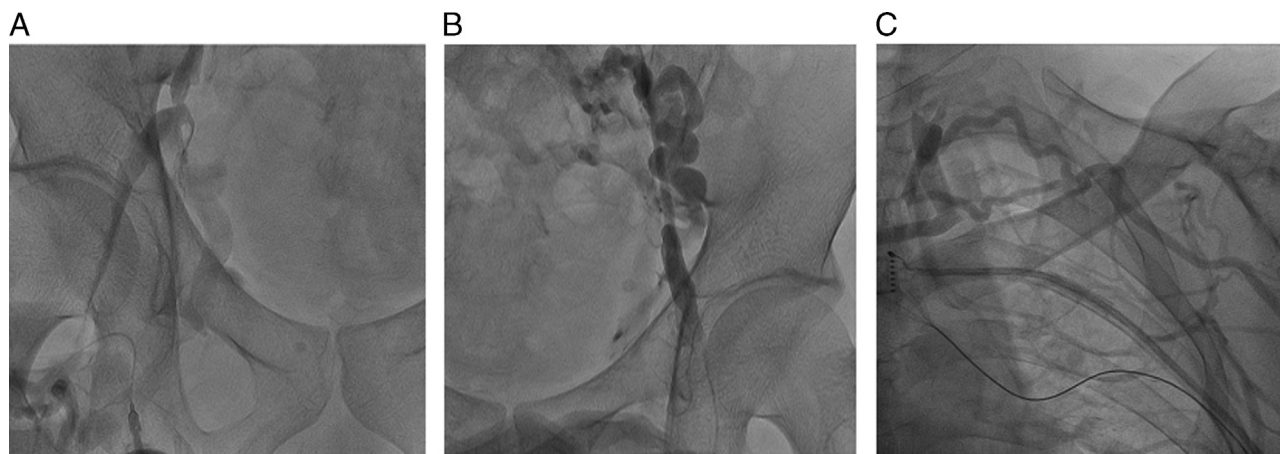


Figure 1 Venography images from 30-year-old patient. **A:** Selective venogram of the right femoral vein confirming occlusion of the right femoral vein. **B:** Selective venogram of the left femoral vein confirming occlusion of the left iliac vein. **C:** Selective venogram of the left basilic vein confirming occlusion of the left subclavian vein.

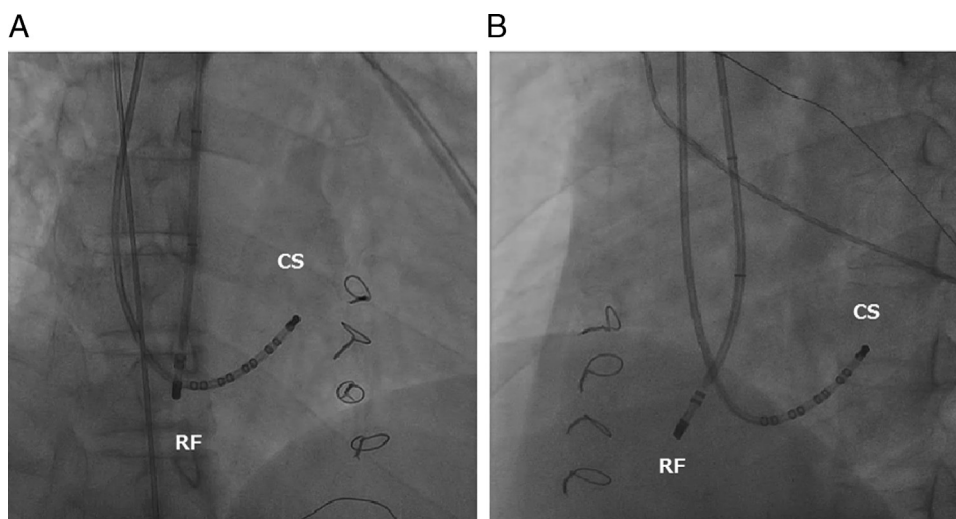


Figure 2 Electrophysiological study of 30-year-old patient. **A:** 30° right anterior oblique fluoroscopic view. **B:** 45° left anterior oblique fluoroscopic view. CS = coronary sinus; RF = radiofrequency ablation catheter.

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