

Sinus rhythm restoration after atrial fibrillation plus dual-loop biatrial flutter catheter ablation



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Introduction

Dual-loop atrial flutter (AFL) is an atypical AFL, defined as coexistence of 2 simultaneously documented loops, each meeting the definition of re-entry, and usually localized within a single atrium.^{1,2}

In this case report, we describe a double-loop biatrial flutter during atrial fibrillation ablation, in which the 2 re-entry circuit loops were located around the cavotricuspid isthmus (CTI) and the mitral annulus.

Case presentation

A 71-year-old man was referred to catheter ablation of persistent symptomatic drug-refractory atrial fibrillation (AF) with left ventricular systolic dysfunction (without obstructive coronary artery disease), presumed to be tachycardia-induced cardiomyopathy.

Beyond the history of AF, diagnosed 18 months before, the patient also had history of essential hypertension, dyslipidemia, and obesity.

Before the procedure, the echocardiography revealed a dilated left atrium (LA) of 47 mm and a left ventricular ejection fraction of 40%. Cardiac computed tomographic angiography was performed to provide a 3-dimensional anatomic map of the LA and exclude intracardiac thrombus.

At the beginning of the procedure the patient was in AF, and after LA 3-dimensional electroanatomical mapping (CARTO 3 and PENTARAY catheter; Biosense Webster), pulmonary vein isolation plus LA posterior wall isolation (PWI) was performed using pulsed-field ablation (PFA) (Farapulse; Boston Scientific). After PWI, the patient's rhythm persisted on a regular narrow complex tachycardia, suggestive of AFL with a proximal-to-distal pattern at the coronary sinus (CS) catheter. The tachycardia cycle length

WHAT WE LEARNED FROM THIS CASE

- Biatrial 3-dimensional mapping could be essential for understating and clarify the mechanisms involved in each arrhythmia.
- In a variety of procedures, sinus rhythm restoration is only possible combining different ablation techniques.
- Radiofrequency ablation *is safe and effective*, even when performed in the same procedure, after pulsed-field ablation, as is mitral isthmus isolation after pulmonary vein isolation plus posterior wall isolation using pulsed-field ablation.

was 300 ms. Biatrial 3-dimensional electroanatomical mapping was performed, and the activation map indicated a macro-re-entrant circuit around the mitral annulus in the LA (clockwise rotation) and a CTI-dependent re-entry in the right atrium (counterclockwise rotation) (Figure 1A). Dual-loop isolation was performed separately: PFA was used for mitral isthmus isolation (tachycardia cycle length remained the same) (Figure 1B), with linear ablation at the CTI using radiofrequency (QDOT Micro; Biosense Webster), with termination of arrhythmia and sinus rhythm restoration.

PFA was not performed in the CTI due to risk of coronary vasospasm. No arrhythmia was inducible at the end of the procedure (Figure 1C).

After the 30-minute observation period, pulmonary vein isolation and PWI were confirmed, there was no recurrent conduction across ablation lines, and the procedure was deemed successful. The patient was discharged at the day after the procedure, maintaining oral anticoagulation and no antiarrhythmic therapy. During the follow-up of 6 months, the patient remained in sinus rhythm.

KEYWORDS Atrial fibrillation; Atrial flutter; Biatrial; Catheter ablation; Dual-loop tachycardia; Radiofrequency ablation (Heart Rhythm 02 2024;5:60–62)

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Discussion

Dual-loop re-entry AFL, often appearing in atrial scars post-open-heart surgery³ and in post-AF ablation patients,^{4,5} is

defined as 2 simultaneously loops meeting the definition of re-entry.^{1,2}

CS activation in clockwise mitral AFL usually presents a distal-to-proximal activation. However, in this case, we describe a proximal-to-distal activation pattern of the CS catheter, which is likely derived from CS activation that extends from a faster computed tomography–dependent vibration. Finally, exhaustive mapping with a 3-dimensional system is helpful to visualize the potential propagation of re-entries and understand underlying substrate.⁶ With the development with high-definition catheters and improvement of electrical signal annotation, current electroanatomical mapping systems allow for better understanding of these complex macro–re-entrant arrhythmias, without the absolute necessity of using entrainment maneuvers that can be difficult to interpret in dual-loop flutters.

Conclusion

Dual-loop biatrial flutter has been rarely reported on the literature. Biatrial 3-dimensional mapping is essential for understating this complex atypical AFL and to clarify the exact mechanisms involved. Sinus rhythm restoration was possible

in a single procedure combining different ablation techniques.

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