

# The Great Masquerader: A successful pulmonary vein isolation with cryoablation for paroxysmal atrial fibrillation manifesting with recurrent syncopal episodes

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## SUMMARY

**Atrial fibrillation (AF) is the most common arrhythmia observed in clinical practice. Early detection of AF is paramount to prevent fatal complications such as cardiomyopathy, heart failure, and stroke. Manifestation of AF varies, including being either asymptomatic or having transient palpitation, especially for paroxysmal AF. Pulmonary vein isolation (PVI) with either radiofrequency or cryoballoon ablation is the cornerstone treatment for AF, especially for those who remain symptomatic despite being on optimal treatment. Here we report a case of successful PVI with cryoablation for symptomatic paroxysmal atrial fibrillation manifesting with recurrent syncopal episodes.**

## INTRODUCTION

Atrial fibrillation (AF) is associated with significant morbidity, especially during the later stage and manifests in various forms including being asymptomatic to debilitating decompensation state.<sup>1</sup> We reported a case of paroxysmal AF presented with recurrent syncopal episodes and successful treatment with pulmonary vein isolation (PVI).

## CASE PRESENTATION

A 59-year-old non-smoker gentleman with underlying dyslipidemia and mild coronary artery disease presented to the emergency department with recurrent syncopal episodes. He complained of multiple syncopal episodes within the last six months, preceded by giddiness and associated with progressive exertional dyspnea. Most of the symptoms were brief and lasted for a few seconds. He presented to his regular general practitioner twice for his symptoms and was subsequently referred to our emergency department. Initial electrocardiogram (ECG) showed normal sinus rhythm with no evidence of arrhythmia, axis deviation or prolonged PR/QTc intervals (Figure 1A).

On physical examination, minimal bilateral pedal oedema was observed and auscultation of the chest revealed clear lung fields with no murmur. In addition, neurological examination was unremarkable, no abnormal gaze and postural hypotension were detected. Blood investigation revealed normal counts of haemoglobin, 13.4 g/dL, and creatinine of 87 umol/L. In addition, other electrolytes

including urea, potassium and calcium, and thyroid function tests were within the normal range. Bedside echocardiogram was performed and preserved left ventricular ejection fraction was reported. There was no regional wall motion abnormality, and all heart chambers were within normal range.

He was admitted and had a non-contrast computed tomography of the brain which revealed no acute ischaemic events. Subsequently, he underwent a 24-hour holter monitor which showed paroxysmal atrial fibrillation (Figure 1B) with 33% burden. In addition, a bradycardia episode was reported with pause of 1.84 seconds and the episode happened in the afternoon (Figure 1C). In term of symptoms, he recorded transient giddiness from his diary which occurred concurrently with the bradycardia episode. He was instructed to record any symptoms while attached to the 24-hour holter monitor. From his diary, we observed another episode of symptomatic transient bradycardia episode that evening lasted 1.74 seconds.

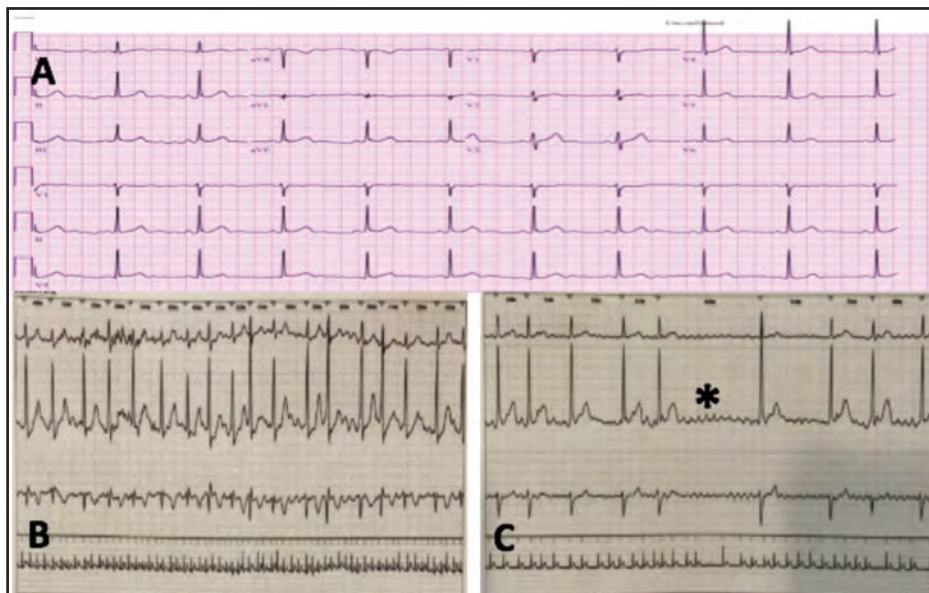
Hence, dabigatran was commenced, and he was subjected to cryoablation procedure (Medtronic, MN) with concurrent electro-anatomical mapping via Ensite High-Density Mapping System (Abbott, MN). Two punctures were made in the femoral vein, and size 7 French femoral sheaths were inserted. A steerable electrophysiology catheter was cannulated into the coronary sinus to serve as an anatomical landmark during transeptal puncture. Subsequently, the 7 French femoral sheath was replaced with an SL 1 catheter (Abbott, MN), and proceeded with trans-septal puncture using the BRK 1 needle (Abbott, MN) (Figure 2A).

Once access to left atrium was obtained, the SL 1 catheter (Abbott, MN) was exchanged for a cryo-delivery sheath (Medtronic, MN) using an Amplatz Super Stiff guidewire (Boston Scientific, Marlborough, MN). Subsequently, each pulmonary vein was mapped using Ensite High-Density Mapping System (Abbott, MN) while creating its geometry (Figure 3). Pulmonary vein potential was identified and the active right inferior pulmonary vein with fibrillating potentials was noted. Subsequently, a cryoballoon (Medtronic, MN) was advanced into the pulmonary vein and proceeded with ablation of the left sided pulmonary veins (Figure 2B) followed by right sided pulmonary veins (Figure

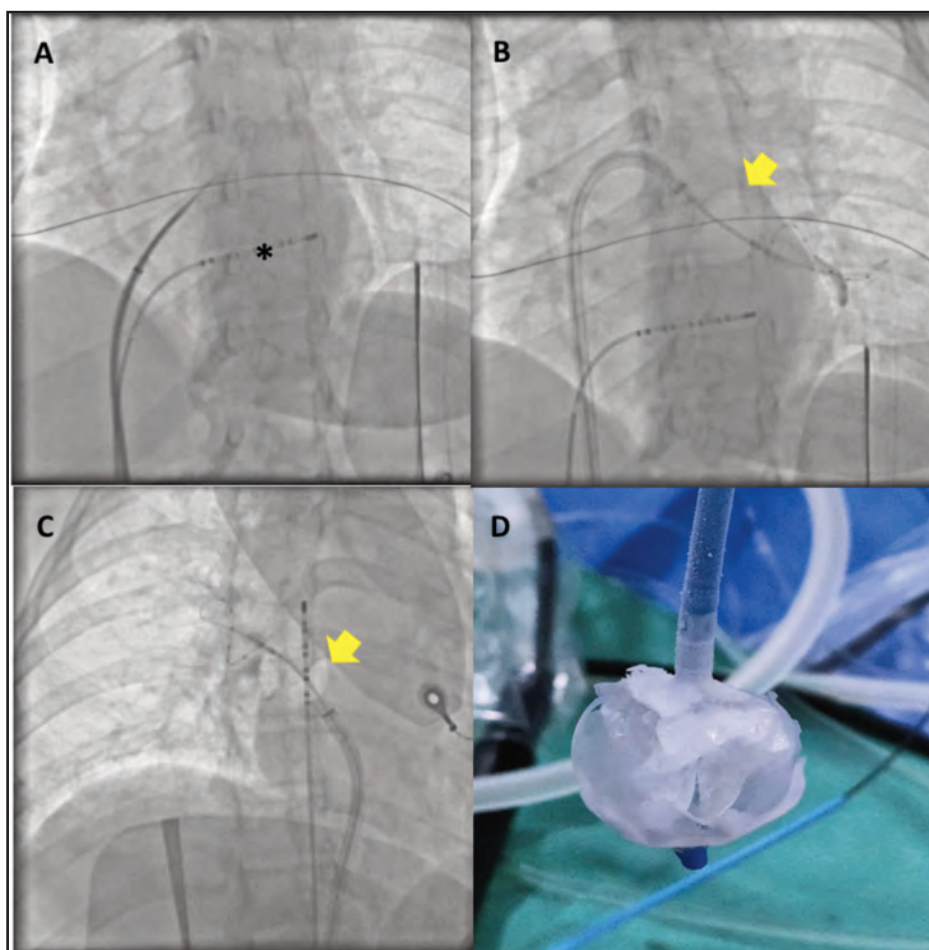
*This article was accepted: 28 December 2023*

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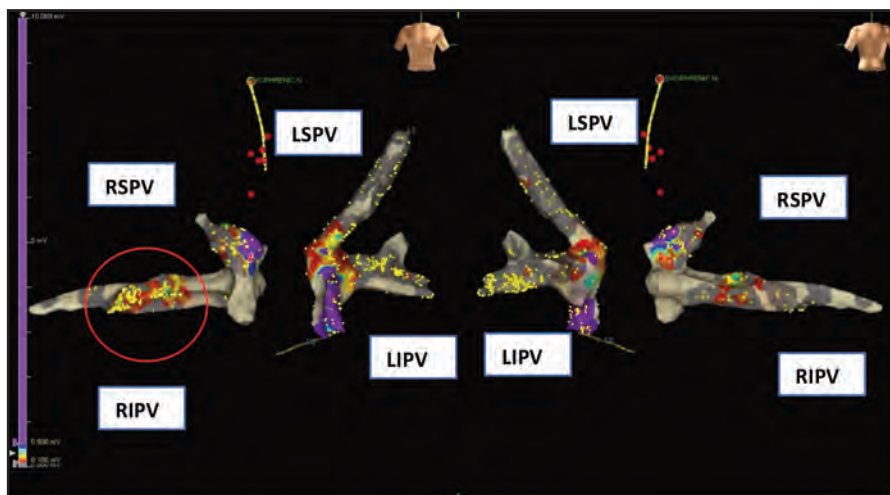
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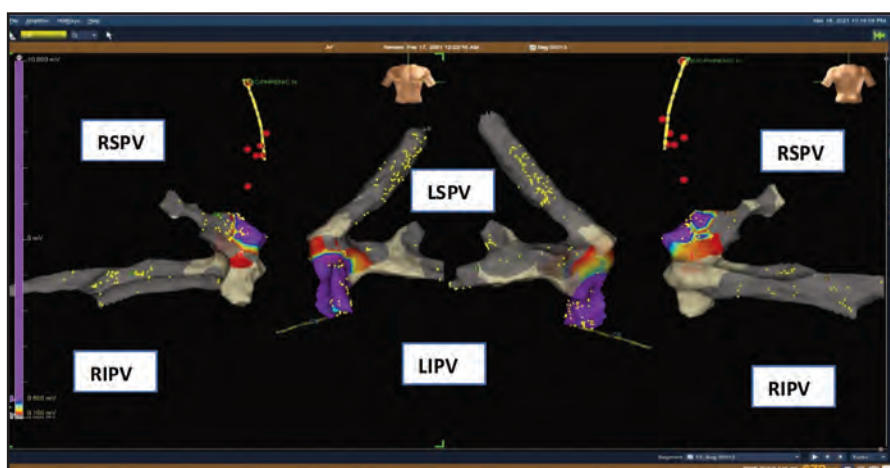
**Fig. 1:** ECG and 24-hour holter monitoring. (A) Sinus rhythm with rate of 54 beats per minute. (B) Atrial fibrillation episodes with irregularly irregular rhythm. (C) Tracing of bradycardia episode with 1.84 seconds and F wave (\*).



**Fig. 2:** Procedural steps during cryoablation. (A) Trans-septal puncture with BRK 1 needle (Abbott, MN) over SL 1 catheter (Abbott, MN) with steerable electrophysiology catheter (\*) providing anatomical landmark. (B) Inflated cryoballoon (yellow arrow) on Left Inferior Pulmonary Vein during cryoablation. (C) Inflated cryoballoon (yellow arrow) on Right Superior Pulmonary Vein during cryoablation (D) Frozen cryoballoon at  $-40^{\circ}\text{C}$ .



**Fig. 3:** Electro-anatomical mapping of each pulmonary vein. Active right inferior pulmonary vein and potentials are highlighted with red circle. RSPV: right superior pulmonary vein, RIPV: right inferior pulmonary vein, LSPV: left superior pulmonary vein, LIPV: left inferior pulmonary vein.



**Fig. 4:** Electro-anatomical mapping of each pulmonary vein post cryoablation. Grey area indicated no potential and suggests complete isolation of pulmonary vein. RSPV: right superior pulmonary vein, RIPV: right inferior pulmonary vein, LSPV: left superior pulmonary vein, LIPV: left inferior pulmonary vein.

2C). All pulmonary veins were isolated with the freezing temperature of  $-40^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  (Figure 2D) for 180 seconds. Post ablation, all the veins were re-mapped and complete isolation was noted especially at the right inferior pulmonary vein (Figure 4).

The procedure was uneventful, and he was discharged without complications. Repeated 24-hour holter monitoring after 6 months post-procedure showed no evidence of atrial fibrillation and the patient remained asymptomatic during his follow-ups.

## DISCUSSION

Atrial fibrillation (AF) is characterised by high frequency excitation of the atrium that results in both dyssynchronous atrial contraction, irregularity of ventricular excitation and defined as recurrent AF ( $\geq$  two episodes) that terminates spontaneously within seven days.<sup>1</sup> Symptoms of AF can range

from asymptomatic to a decompensated state but approximately 1.6% of individuals with AF may experience syncopal episodes as part of their symptomatology as demonstrated in our clinical vignette.<sup>2</sup>

More than 50% patients will either progress to persistent AF or face death. Hence, early intervention is imperative as it can improve clinical outcome.<sup>1</sup> In addition, increasing age, valvular diseases including mitral regurgitation and aortic stenosis, left ventricular hypertrophy and left atrial dilatation are associated with progression to persistent AF.<sup>3</sup>

Hence, catheter ablation with pulmonary vein isolation is an essential tool for treating AF and it has been the cornerstone strategy for managing paroxysmal atrial fibrillation. Catheter ablation aims to eliminate the trigger that initiates AF, or alter the arrhythmogenic substrate.<sup>1</sup> Previously, radiofrequency ablation is used to treat AF but with current medical advancement, cryoballoon ablation with the aims of



pulmonary veins isolation (PVI) is preferred and it shows non-inferiority to radiofrequency ablation.<sup>4</sup> Moreover, arrhythmia recurrence is reported significantly reduced with an initial strategy of catheter cryoballoon ablation compared with antiarrhythmic drug therapy alone.<sup>5</sup>

Cryoablation targets complete electrical isolation of the four major pulmonary veins (PV) that is the left inferior, left superior, right inferior and right superior as confirmed by the entrance and exit block.<sup>6</sup> The combined common left PVs were likewise ablated to achieve similar blockage within the constituent PVs.<sup>6</sup> In addition, the procedure has a shorter duration with lower left atrial dwell time compared to conventional radiofrequency ablation.<sup>4</sup> Besides its efficacy, the STOP AF trial demonstrated a persistent benefit of cryoballoon-based ablation for paroxysmal AF with less serious adverse event rate.<sup>6</sup>

Back to our patient, he was diagnosed with paroxysmal AF with arrhythmia related recurrent syncopal episodes. However, the decision to proceed with rate control, rhythm control or even pacemaker for bradycardia episode is typically based on a comprehensive evaluation of the patient's overall health, and the impact of their AF. Our aim for his comprehensive management was to achieved prolonged rhythm control while eliminating his symptoms and this was achievable with cryoablation. Chemical cardioversion is a viable choice, although it comes with the potential for adverse drug effects.<sup>2</sup> Alternatively, implanting a pacemaker is another option, but it carries the risk of long-term complications such as pacemaker-mediated cardiomyopathy, infection related to cardiac implantable electronic devices, and the need for recurrent box exchanges. Right peripheral nerve palsy (PNI) is the most common complication associated with cryoballoon ablation and persistent PNI lasting after the procedure is reported to be as high as 8.3%.<sup>1,7</sup> Furthermore, oesophageal injury is also observed after cryoablation and radiofrequency ablation.<sup>1,7</sup> Thus, close observation post ablation is pivotal to avoid any complications. Fortunately, our patient had successfully undergone the procedure without any complication.

In addition, our patient presented with atypical manifestation of AF such as recurrent syncopal episode and his episodes were likely explained by transient paroxysmal AF with pauses. Therefore, holter was an essential tool for detection of paroxysmal arrhythmia. However, it offers limited detectability within designated monitoring time. With advancement of loop recorders, photoplethysmogram on smartwatch or smartphone, more arrhythmias could potentially be detected leading to early management.<sup>1</sup>

## CONCLUSION

Cryoballoon ablation is a relatively safe, effective and useful tool for the treatment of paroxysmal AF with high rate of successful PVI and long-term freedom from AF. In addition, manifestation of paroxysmal AF may vary and recurrent syncopal episodes warrant extensive investigation including holter monitoring.

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