

Intrapulmonary vein “echo” beats



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Introduction

We report a unique case of intrapulmonary vein (PV) echo beats in the context of radiofrequency atrial fibrillation (AF) ablation.

Case report

A 55-year-old female patient was referred for drug-refractory paroxysmal AF ablation. AF was known for at least 3 years, and the patient developed amiodarone-induced hypothyroidism. She underwent an ablation procedure under general anesthesia (point-by-point contact force-guided radiofrequency ablation).

After finishing the left PV encirclement, residual potentials were recorded on the duodecapolar circular mapping catheter (CMC) within the left superior PV during sinus rhythm.

On [Figure 1A](#) (from the top), 2 surface electrocardiographic leads (I and V₁) are shown as well as the bipolar recordings on the CMC and of the proximal coronary sinus. PV automaticity was demonstrated (cycle length 2470 ms), but with a delayed second component suggesting “echo” beats within this PV. This second component had a fixed coupling interval with the first component (176 ms). Some entrainment maneuvers were performed: pacing at a cycle length of 1880 ms on the bipole 11-12 of the CMC could elicit capture of the first component with persistence of the second component ([Figure 1B](#)). Different pacing cycle lengths were used for entrainment: 2080, 1880, 1600, and 1390 ms. Of note, the refractory period of the “echo” beat was reached at 1390 ms.

PV automaticity was targeted until complete abolition of both intra-PV potentials. No dormant conduction was revealed by intravenous adenosine injection after PV automaticity elimination.

KEYWORDS Atrial fibrillation ablation; Automaticity; Echo beats; Intrapulmonary vein reentry; Pulmonary vein potentials (Heart Rhythm Case Reports 2018;4:464-465)

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KEY TEACHING POINTS

- “Echo” beats may be recorded within the pulmonary veins.
- They may be related to the presence of a small reentry within this vein.
- Intrapulmonary vein “echo” beats may be radiofrequency induced with the creation of a zone of slow conduction.

After a follow-up period of 24 months, the patient was free of any atrial arrhythmia without antiarrhythmic drug.

Discussion

This phenomenon may be related to a small reentry within the vein ([Figure 2A](#)), with the catheter-induced creation of a zone of slow conduction. To our knowledge, PV echo beats (intra-PV reentry) have been reported and recorded only in rat PV myocardium.¹

Nevertheless, 2 other possible mechanisms for this phenomenon may be discussed. The first could be the presence of 2 distinct sleeves within the vein, with an electrical connection in between, the activity of the second one being transmitted by the first one ([Figure 2B](#)). Second, these potentials may also be interpreted as the presence of bradycardia-dependent afterdepolarizations within the vein ([Figure 2C](#)).

Conclusion

We describe here a rare case of reentrant phenomenon, giving rise to an “echo” beat within a PV during an AF ablation procedure.

Reference

1. Egorov YV, Kuz'min VS, Glukhov AV, Rosenshtraukh LV. Electrophysiological characteristics, rhythm, disturbances and conduction discontinuities under autonomic stimulation in the rat pulmonary vein myocardium. *J Cardiovasc Electro-physiol* 2015;26:1130-1139.

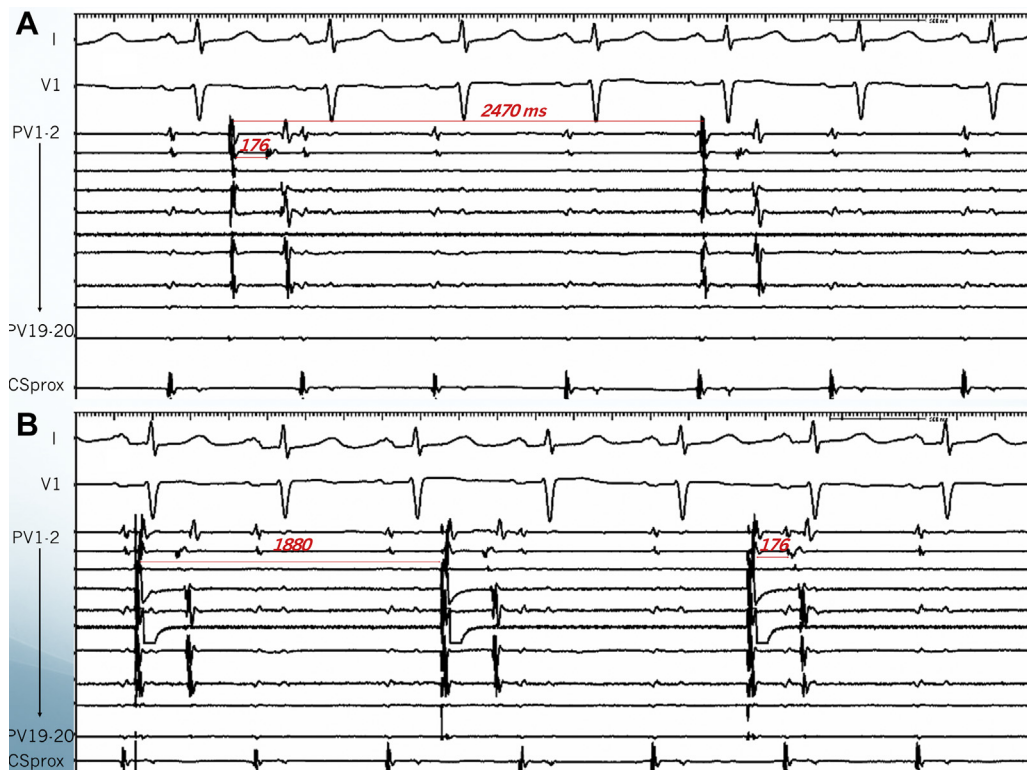


Figure 1 **A:** Intracardiac recordings showing intrapulmonary vein (PV) "echo" beats during sinus rhythm at the end of the left encirclement. Two surface electrocardiographic leads (I and V₁) are shown, as well as the bipoles on the circular mapping catheter (PV1-2 to PV19-20) positioned within the left superior PV, and finally the proximal coronary sinus recording (CSprox). PV automaticity is recorded (cycle length of 2470 ms) associated with "echo" beats. **B:** Entrainment maneuvers (pacing at 1880 ms) could be performed and elicited entrainment of the "echo" beats, suggesting an intra-PV reentry phenomenon.

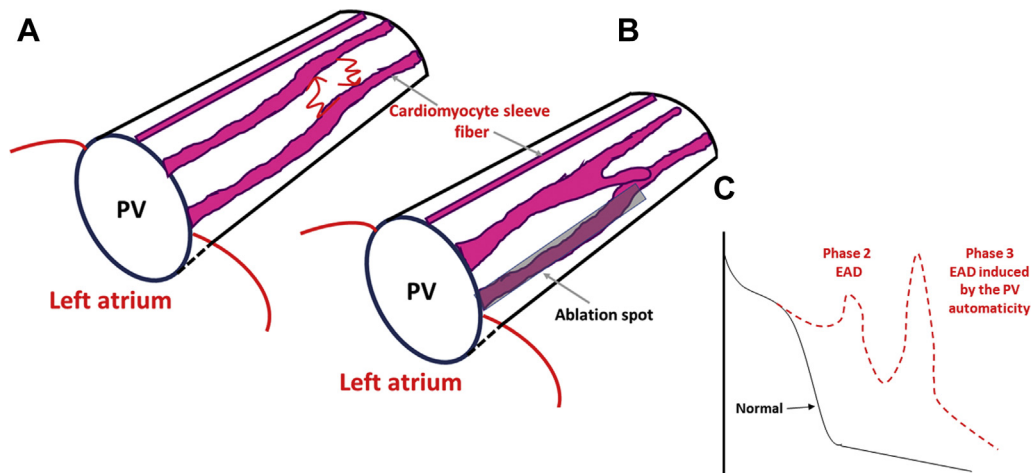


Figure 2 **A:** Scheme of a localized reentry between 2 sleeves due to the creation of a zone of slow conduction within the pulmonary vein (PV). **B:** Scheme showing a direct connection between two distinct PV myocardial sleeves. **C:** Bradycardia-dependent (phase 3) early afterdepolarizations (EADs) induced by the first component.