

The Small Cardiac Vein as an Unrecognized Substrate for Atrial Tachycardia



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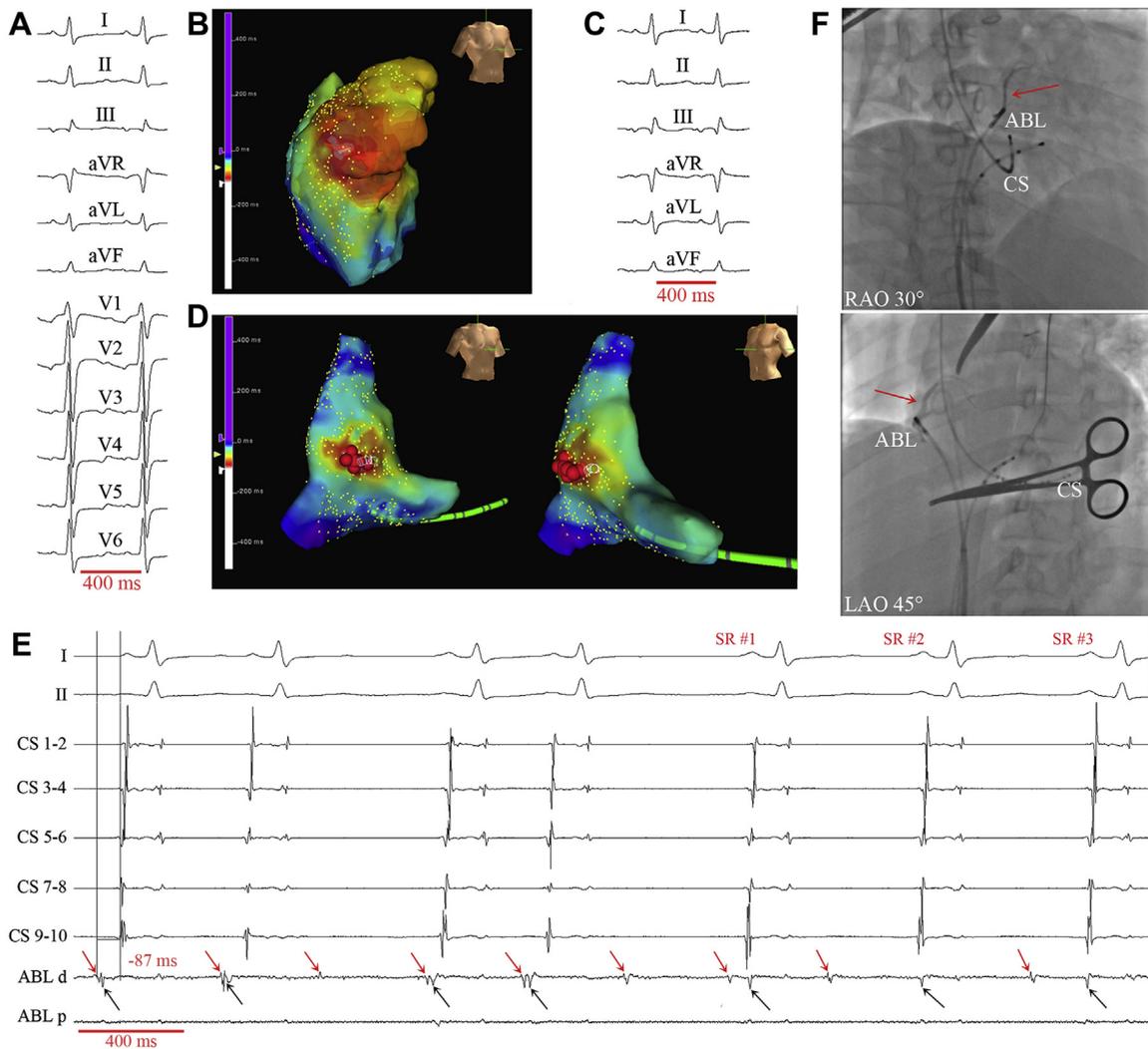
A 29-year-old Chinese male with palpitations was referred to our hospital. The 12-lead electrocardiography demonstrated incessant atrial tachycardia with negative P waves in leads V₁ to V₂ (Figure 1A). The patient had twice undergone unsuccessful attempts at ablation of right atrial appendage (RAA) tachycardia 2 years prior. High-density endocardial activation mapping with computed tomographic image integration demonstrated the earliest atrial activity at the base of giant RAA (Figure 1B). Subsequently, the appendage was completely excised via the thoracoscopic surgical approach, but the tachycardia could not be terminated. The P-wave morphology in the inferior leads after RAA excision was slightly different from the P-wave before surgical excision (Figure 1C). Endocardial remapping localized the origin of tachycardia to the anterolateral wall of the right atrium (Figure 1D). The earliest atrial activation preceded the surface P-wave by 87 ms (Figure 1E). Radiofrequency applications at this site (30 W at 43°C with 17 ml/min flow) led to termination of tachycardia with the early sharp potential (red arrows in

Figure 1E) dissociated from far-field atrial activation (black arrows in Figure 1E). At the successful ablation target, the catheter was noted to become displaced into a chamber located lateral to the right atrial border. Post-procedural angiography performed through the ablation catheter documented catheter placement into the small cardiac vein (red arrows in Figure 1F).

The small cardiac vein is most usually observed as a tributary of the coronary sinus, but it can drain directly to the right atrium in 2% of cases (1). To the best of our knowledge, this is the first description of the small cardiac vein with right atrial orifice as atrial tachycardia origin. Although scanty, the presence of a small cardiac vein opening into the right atrium may provide an anatomical substrate to generate atrial tachyarrhythmias.

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FIGURE 1 Electrophysiological Characteristics and Fluoroscopic Location of the Atrial Tachycardia



(A) Surface 12-lead ECG before surgery. **(B)** Three-dimensional activation maps of the right atrium during tachycardia showing the earliest atrial activity at the base of giant RAA. **(C)** Surface ECG after RAA excision. Precordial Leads were removed due to surgical requirement. **(D)** Three-dimensional activation maps after RAA excision. The earliest signal was recorded in the anterolateral wall of the right atrium. **(E)** Intracardiac recording during tachycardia with the earliest atrial activation recorded by the ablation catheter preceding the surface P-wave by 87 ms. Ablation performed at this site led to prolongation of the interval between the early sharp potential (**red arrows**) and far-field atrial activation (**black arrows**), then dissociation from each other and termination of atrial tachycardia. The last 3 beats were in sinus rhythm. **(F)** Fluoroscopic images of the successful ablation site by injection of a nonionic contrast via the irrigated ablation catheter. **Red arrows** indicated the small cardiac vein. ABL = ablation catheter; CS = coronary sinus; LAO = left anterior oblique projection; RAA = right atrial appendage; RAO = right anterior oblique projection; SR = sinus rhythm.

REFERENCE

1. Cendrowska-Pinkosz M. The variability of the small cardiac vein in the adult human heart. *Folia Morphol* 2004;63:159-62.

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