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Right Ventricular Basal Aneurysm as a Substrate for Ventricular Tachycardia in Tetralogy of Fallot

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A 35-year-old man with surgically repaired tetralogy of Fallot (TOF) and subsequent pulmonary valve replacement was resuscitated from cardiac arrest. He was referred for ablation in the context of recurrent drug refractory monomorphic ventricular tachycardia (VT) that prompted appropriate defibrillator therapies. Coronary angiography was unrevealing. A voltage map in sinus rhythm is shown in **Figure 1A**. The right ventricle (RV) was globally enlarged, with an unusual lateral basal free wall aneurysm between the tricuspid annulus and sternum (asterisk). Voltage amplitudes are color coded from red (scar; <0.5 mV) to orange, yellow, green, light blue, dark blue, and purple (normal; >1.5 mV). Note the extensive scar within the RV aneurysm. A 12-lead recording of the clinical VT (213 beats/min; left bundle branch block morphology with an atypical left axis) is shown in **Figure 1B**. Because hemodynamic instability precluded activation mapping, pace mapping was performed. The best pace map (**Figure 1B**) was along the anterior border of the RV basal aneurysm, with a stimulation-to-QRS interval of 35 ms. At this site, radiofrequency ablation rendered the VT noninducible (**Figure 1A**; brown circles). Ablation was extended linearly along the scar border, targeting sites with low amplitude and diastolic potentials. The aneurysm is further seen in axial (**Figure 1C**) and 3-dimensional right anterior oblique (**Figure 1D**) computed tomographic views. The patient remains arrhythmia-free at 3 months of follow-up.

In patients with tetralogy of Fallot, most monomorphic VTs are macro–re-entrant and involve a critical isthmus between an annulus (i.e., tricuspid or pulmonary) and surgical scar (i.e., ventriculotomy or ventricular septal defect patch) (1,2). To our knowledge, this is the first description of VT arising from an RV basal aneurysm. A review of pre-operative imaging studies revealed that the RV aneurysm was present before pulmonary valve replacement surgery 19 years previously. It unlikely represents a pseudoaneurysm from previous surgery because the only ventriculotomy incision was limited to the RV outflow tract. In general, severe chronic pulmonary regurgitation leads to global RV enlargement due to diastolic overload. We hypothesize that, in TOF, RV dilation can be asymmetric, in part due to the mechanical constraints of a sternum that limits mid-RV dilation. RV geometric distortion can be further compounded by the compressive effect of pectus excavatum (3), as seen in this patient, and perhaps also by a competent tricuspid valve that restricts annular dilation and right atrial enlargement.

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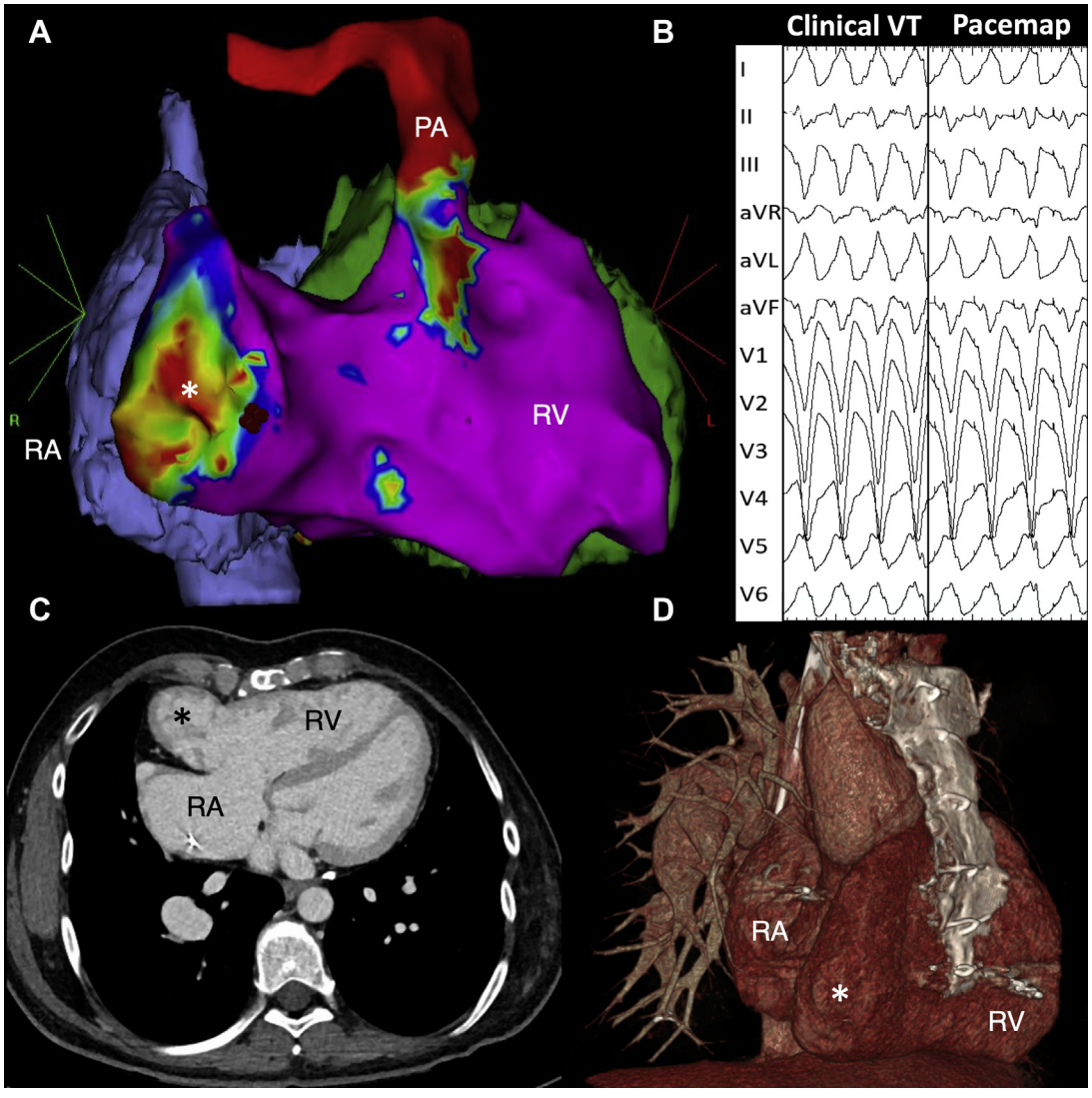
FIGURE 1 Ventricular Tachycardia Arising From a Right Ventricular Basal Aneurysm



A voltage map in sinus rhythm is shown in **(A)**. The right ventricle (RV) was globally enlarged, with an unusual lateral basal free wall aneurysm between the tricuspid annulus and sternum **(asterisk)**. Voltage amplitudes are color coded from **red** (scar; <0.5 mV) to **orange, yellow, green, light blue, dark blue,** and **purple** (normal; >1.5 mV). Note the extensive scar within the RV aneurysm. A 12-lead recording of the clinical VT (213 beats/min; left bundle branch block morphology with an atypical left axis) is shown in **(B)**. Because hemodynamic instability precluded activation mapping, pace mapping was performed. The best pace map **(B)** was along the anterior border of the RV basal aneurysm, with a stimulation-to-QRS interval of 35 ms. At this site, radiofrequency ablation rendered the VT noninducible **(B, brown circles)**. Ablation was extended linearly along the scar border, targeting sites with low amplitude and diastolic potentials. The aneurysm is further seen in axial **(C)** and 3-dimensional right anterior oblique **(D)** computed tomographic views. PA = pulmonary artery; RA = right atrium; VT = ventricular tachycardia.

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