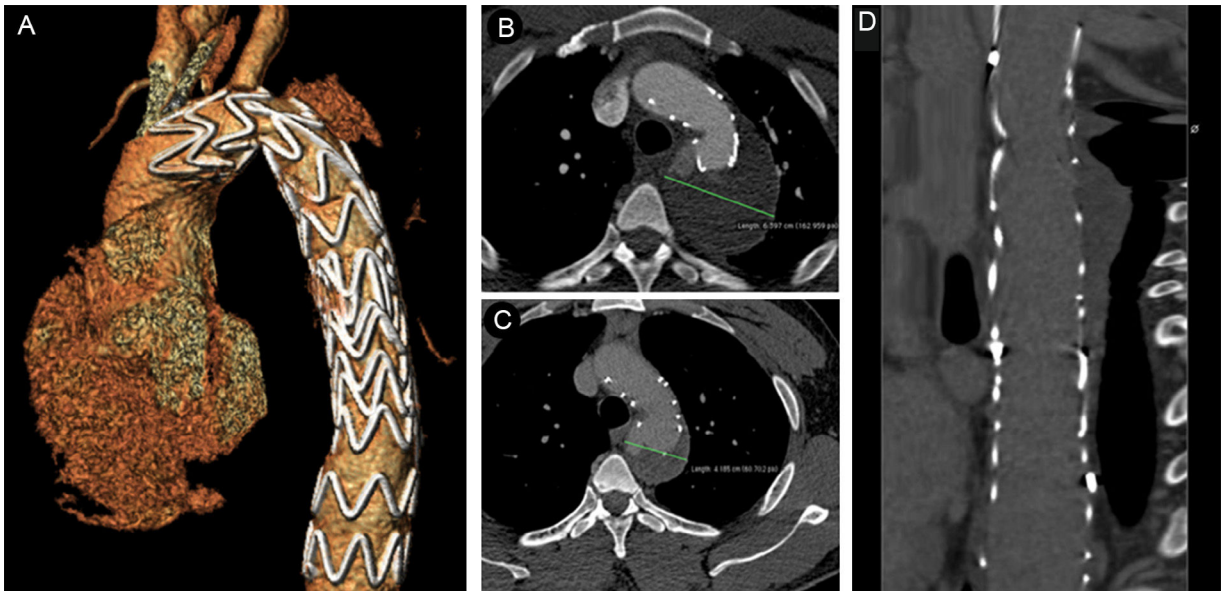

Figure 2. Postprocedural and follow-up computed tomography scan images. A: 3-Dimensional reconstruction after surgery. B: Cross-section at 1 month, showing stable aortic dilation (63 mm). C: Cross-section at 6 months, showing decreased diameter to 41 mm. D: Center-lumen line at 6 months.

Julián Rodríguez-García,[a] Marvin Ernesto García Reyes,[b] Antonia Sambola,[a,*] Edgar Cortés Sánchez,[c] Valentín Fernández-Valenzuela,[b] and David García-Dorado[a]

[a]*Servicio de Cardiología, Hospital Universitari Vall d'Hebron, Barcelona, Spain*
[b]*Servicio de Angiología y Cirugía Vascular, Hospital Universitari Vall d'Hebron, Barcelona, Spain*
[c]*Servicio de Medicina Intensiva, Corporació Sanitària Parc Taulí, Sabadell, Spain*

* Corresponding author:
E-mail address: asambola@vhebron.net (A. Sambola).

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ST-elevation Myocardial Infarction in Anomalous Origin of Right Coronary Artery From the Left Sinus of Valsalva and Interarterial Course

Infarto con elevación del ST en pacientes con origen anómalo de coronaria derecha en el seno de Valsalva izquierdo y trayecto interarterial

To the Editor,

An anomalous origin of the right coronary artery (RCA) in the left sinus of Valsalva is an anatomic variant associated with ischemia, infarction, and sudden cardiac death in young patients.[1] The prevalence of this anomaly ranges from 0.026% to 0.92% in analyzed series, typically invasive and noninvasive coronary angiography registries. This type of coronary anomaly is related to an increased presence of anatomical characteristics associated with worse prognosis, such as an interarterial or intramural course, smaller ostial diameter, and acute takeoff angle.[2] However, there have been few cases of acute coronary syndrome related to an anomalous RCA. We present 2 such patients treated in our center (Table).

The first patient was a 40-year-old man who had been resuscitated after out-of-hospital sudden cardiac arrest due to ventricular fibrillation. He received basic and advanced resuscitation for 1 hour and had inferior ST-elevation on electrocardiography. Coronary angiography failed to identify obstructive lesions in the left coronary system. The RCA was not visualized, even after multiple contrast agent injections into the right sinus, ventriculography, and aortography. The origin of the artery was finally located in the left sinus and imaging revealed complete proximal thrombotic obstruction (Figure 1A). Implantation of 2 bare-metal stents achieved a good angiographic result. After therapeutic hypothermia, the patient showed no neurological sequelae. Computed tomography (CT) showed an interarterial course (Figure 1B and Figure 1C). At discharge, the patient was enrolled in a cardiac rehabilitation program and underwent repeat

Table
Patient Characteristics

	Patient 1	Patient 2
Age, y	40	49
Sex	Male	Male
CVRFs	Smoker	Smoker, family history
Presentation	Sudden cardiac death	Syncope and chest pain
Clinical symptoms prior to the event	No	No
Arrhythmias	Primary VF, NSVTs	Complete AVB
Damage to the RV	Yes	Yes
LVEF at discharge (%)	52	62
Damaged territory	Inferoposterior	Inferoseptal
Other coronary lesions	None	D_1 and first septal
Collateral circulation	Yes	No
Right dominance	Yes	Yes
Guide catheter	AL2	AL2
Contrast agent used (mL)	769	445
Stent	BMS 3 × 20 and 3 × 16 mm	DES 3 × 33 mm
In-hospital complications	Pneumonia	Femoral AV fistula

AV, arteriovenous; AVB, atrioventricular block; BMS, bare-metal stent; CVRFs, cardiovascular risk factors; D_1, first diagonal; DES, drug-eluting stent; LVEF, left ventricular ejection fraction; NSVTs, nonsustained monomorphic ventricular tachycardias; RV, right ventricle; VF, ventricular fibrillation.

definitive and negative ischemic stress tests. Surgical correction of the coronary anomaly was rejected due to the absence of symptoms prior to the event and subsequent ischemia induction.

The second patient was a 49-year-old man who was transferred to our center due to chest pain and syncope. An electrocardiogram showed complete atrioventricular block with a narrow QRS escape rhythm and ST-segment elevation in inferior and right leads. Coronary angiography showed no obstructive lesions in the left coronary system. Because the RCA could not be identified with multiple contrast agent injections and aortography, intravenous thrombolysis was performed in the catheterization laboratory. After successful coronary reperfusion, repeat contrast agent injection revealed a RCA with a high origin outside of the right sinus (Figure 1D). The patient had a severe residual lesion at the proximal-medial area (Figure 1E) that was treated with a drug-eluting stent. Computed tomography confirmed the origin of the RCA in the left sinus, as well as an interarterial course (Figure 1F). Stress echocardiography was performed. Although inconclusive, it

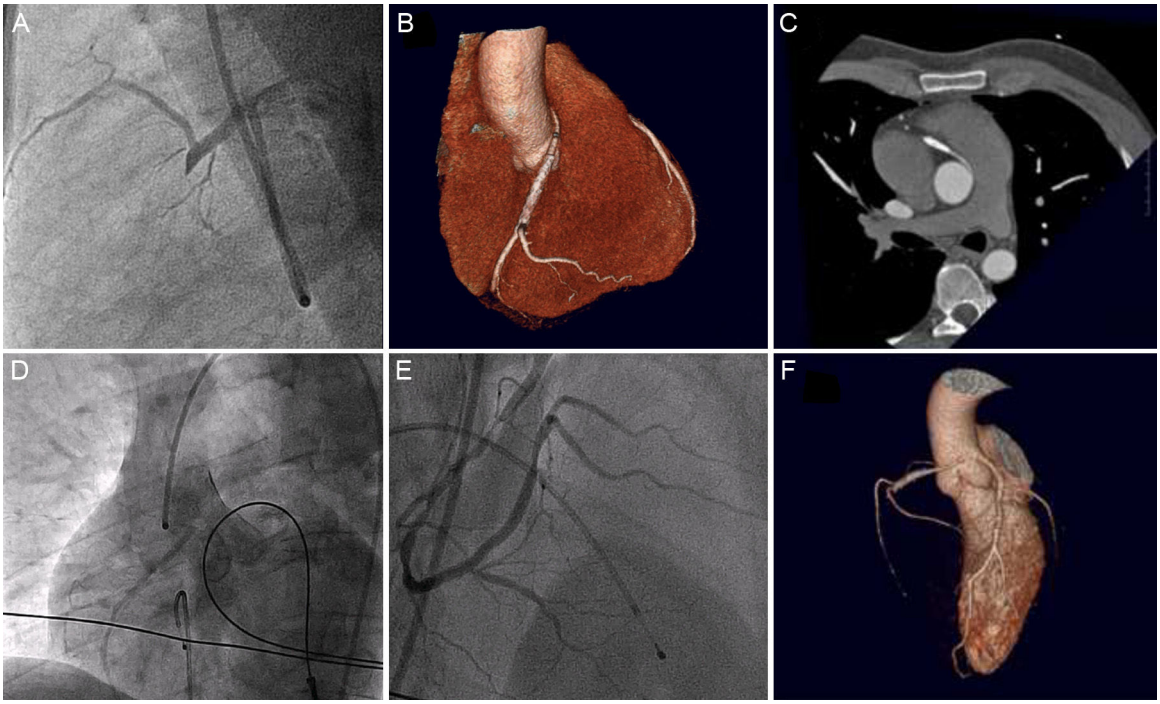

Figure. A: catheterization of the right coronary artery in the left sinus in a lateral projection. B: three-dimensional reconstruction showing the interarterial course of the anomalous right coronary artery. C: detail of the origin of the right coronary artery in an axial plane. D: nonselective angiography after successful thrombolysis. E: selective catheterization with a severe residual lesion. F: three-dimensional reconstruction showing the vessel origin in the left sinus.

was negative, even at very high intensities, and surgery was ruled out for the same reasons as in the first patient.

An anomalous origin of the RCA with interarterial course is a known risk factor for sudden cardiac death in young patients. The most accepted theories for this association suggest that the particular anatomic structure of the artery can provoke an ischemic event that triggers ventricular arrhythmias.[3] The incidence of atherosclerosis in coronary artery anomalies is similar to or lower than that of anatomically normal arteries, and intravascular ultrasound studies have failed to identify atherosclerotic disease in the initial intramural segment of these vessels, which is generally the site of greatest stenosis.[4,5] Nonetheless, both cases demonstrate that plaque rupture or erosion with thrombus formation is one of the possible mechanisms of sudden cardiac death and cardiac events in this patient population.

An inability to visualize the RCA during coronary angiography should suggest the presence of this coronary anomaly. Systemic thrombolysis should be considered in these patients to locate the origin, as well as facilitated angioplasty (as in the second patient). If there are contraindications (such as recent traumatic resuscitation), catheterization of the contralateral sinus should be attempted, as well as atypical projections and aortography if necessary. Series detailing interventions for anomalous RCAs show that single stents can be implanted in these vessels, with promising clinical and angiographic results.[5] Nonetheless, these procedures involve prolonged and technically complex catheterizations requiring a high volume of contrast agent.

Clinical practice guidelines indicate surgical revascularization for patients with an anomalous RCA and interarterial course if there are symptoms or documented ischemia, but the treatment is controversial in other patients[6] and there is no widely accepted approach. Both in our patients and in the few previously described cases, the culprit lesions were outside the interarterial course. This situation adds another point of uncertainty regarding its further evaluation, suggesting the possible need for various surgical techniques to free the vessel course.

CONFLICTS OF INTEREST

Á. Sánchez-Recalde is an Associate Editor of *Revista Española de Cardiología*.

Juan Caro-Codón,* José Ruiz-Cantador, Ángel Sánchez-Recalde, Elena Refoyo-Salicio, Ana Elvira González García, and José Luis López-Sendón

Servicio de Cardiología, Hospital Universitario La Paz, Madrid, Spain

* Corresponding author:
E-mail address: juancarocd@gmail.com (J. Caro-Codón).

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Endoepicardial Ventricular Tachycardia Ablation With a New High-density Non-fluoroscopic Navigation System

Ablación endoepicárdica de taquicardia ventricular con un nuevo navegador no fluoroscópico de alta densidad

To the Editor,

Ablation of ventricular tachycardia (VT) is a procedure that is becoming increasingly more widespread in clinical practice.[1] It is estimated that 12% to 17% of cases of VT are of myocardial and subepicardial origin, which is a more common substrate in nonischemic heart disease.[2] Rhythmia (Boston Scientific; Marlborough, Massachusetts, United States) is a new nonfluoroscopic navigation system able to generate high-density maps combining a steerable 64-electrode catheter (IntellaMap Orion; Boston Scientific) with software able to automatically capture the recorded electrograms. Given the novelty of the system, experience with this catheter for epicardial mapping is very limited,[3] and no information has been published on the outcomes and complications of VT ablation guided by the Rhythmia system.

We present the case of a 56-year-old physician who was an endurance sports enthusiast. He started to experience frequent episodes of palpitations, generally triggered by exercise, and accompanied by nausea. On exercise testing, regular sustained broad QRS tachycardia was induced with right bundle branch block and left superior axis morphology. In the 24-hour Holter recording, 80 episodes of the same tachycardia were detected. The results of both echocardiography and coronary angiography were normal, and diagnosis of VT was confirmed in an electrophysiology study. On magnetic resonance imaging, a 30 × 7-mm area of gadolinium enhancement was observed between the myocardium and subepicardium of the inferior wall of the left ventricle.

The patient remained symptomatic despite treatment with beta-blockers and was therefore referred to our center for percutaneous ablation.

At rest, he had ventricular extrasystoles and episodes of VT. In view of the information from magnetic resonance imaging, it was decided to perform endocardial and epicardial mapping with the IntellaMap Orion catheter and the Rhythmia system.

Using percutaneous access, the Orion catheter was introduced into the pericardium through an Agilis steerable sheath. Voltage and activation mapping of the spontaneous tachyarrhythmias was performed. The system automatically selected the appropriate beats for inclusion in the map and only included those with a QRS correlation > 90% during the expiratory phase of the respiratory cycle. Voltages > 0.5 mV were considered normal and those < 0.3 mV were considered low. A 9180-point map was generated in 26 minutes. The map only included extrasystoles and episodes of VT coinciding with clinical tachycardia (Figure 1 and Video 1 of the supplementary material). The site of earliest activation (32 ms before onset of QRS) was located on the inferior wall of the left