EsSalud
Archivos Peruanos de Cardiología y Cirugía Cardiovascular
Arch Peru Cardiol Cir Cardiovasc. 2026;7(2):142-146. doi: 10.47487/apcyccv.v7i2.599.
Instituto Nacional Cardiovascular

Case report

One patient, three arrhythmias. Case report

Angel Cueva-Parra[1,a], **Ana Cecilia Gonzales-Luna**[1,a], **Marisel Payano-Rojas**[1,a], **Mario Cabrera-Saldaña**[1,a], **Richard Soto-Becerra**[1,a], **Carolina Guevara-Caicedo**[1,a], **Pio Zelaya-Castro**[1,a].

Received: December 20, 2025
Accepted: June 01, 2026
Online: June 15, 2026

Authors' affiliation
[1] Servicio de Electrofisiología, Instituto Nacional Cardiovascular (INCOR). Lima, Peru.
[a] Cardiologist.

Correspondence
Ángel Cueva Parra
Jirón Coronel Félix Zegarra 417. Jesús María, Lima, Peru.

Email
angel.cueva.parra@gmail.com

Funding
Self-funding.

Conflicts of interest
None.

Cite as
Cueva A, Gonzales AC, Payano M, Cabrera M, Soto R, Guevara C, Zelaya P. One patient, three arrhythmias. Case report. Arch Peru Cardiol Cir Cardiovasc. 2026;7(2):142-146. doi: 10.47487/apcyccv.v7i2.599

ABSTRACT

Postoperative patients with congenital heart disease can develop more than one arrhythmia because of underlying anatomical abnormalities and postsurgical scarring. Atrial flutter is by far the most common arrhythmia in this population, and catheter ablation is the preferred treatment. After successful ablation, induction manoeuvres are important to identify additional macro-reentrant circuits. We report the case of a 55-year-old woman with a history of surgical repair of an atrial septal defect who underwent electrophysiological study and ablation of atrial flutter using a three-dimensional mapping system, with zero fluoroscopy and intracardiac echocardiography. During the procedure, three distinct arrhythmias were identified (two atrial flutters and atrioventricular nodal re-entrant tachycardia). All were successfully ablated in the same procedure.

Keywords: Atrial Flutter; Atrioventricular Nodal Reentry Tachycardia; Atrial Septal Defect; Catheter Ablation (Source: MeSH-NLM).

RESUMEN

Un paciente, tres arritmias. Reporte de caso

Los pacientes posoperados cardíacos pueden tener más de una arritmia, debido a los cambios anatómicos propios de la cardiopatía congénita, así como a las cicatrices posquirúrgicas. La arritmia más frecuente en este tipo de pacientes es, por lejos, el *flutter* auricular, siendo la ablación con catéter el tratamiento ideal. Tras la ablación exitosa de la arritmia, es importante realizar maniobras de inducción por la posibilidad de que existan más macroreentradas. Se reporta el caso de una paciente de 55 años, con antecedentes de corrección quirúrgica de comunicación interauricular, que ingresó a un estudio electrofisiológico y ablación de *flutter* auricular con sistema tridimensional, con cero fluoroscopia y ecocardiograma intracardiaco. Durante el estudio, presentó tres arritmias diferentes (dos *flutters* y una taquicardia por reentrada del nodo AV), todas ablacionadas con éxito en el mismo procedimiento.

Palabras clave: Aleteo atrial; Taquicardia por Reentrada en el Nodo Atrioventricular; Defectos del Tabique Interatrial; Ablación por Catéter (Fuente: DeCS-BIREME).

Introduction

Arrhythmias in adult patients with corrected congenital heart disease are highly prevalent and are the leading cause of hospitalisation in the late postoperative period. The most frequent mechanism underlying these arrhythmias is atrial macro-reentry, and ablation is the definitive treatment [1]. A postoperative cardiac patient may have two or more macro-reentrant circuits; the most frequently involved areas are the cavotricuspid isthmus and the surgical incision scar. By contrast, reports describing the association between atrial flutter and other supraventricular tachycardias in patients with corrected congenital heart disease are scarce.

Case report

We present the case of a 55-year-old woman with a history of ostium secundum atrial septal defect closure at 8 years of age, who presented with persistent fatigue and palpitations, as well as multiple emergency department admissions. For several months, she had been documented to have persistent atrial flutter with a rapid ventricular response. The electrocardiogram showed atrial flutter with 2:1 AV conduction **(Figure 1A)**; echocardiography showed mild dilatation of both atria, preserved biventricular function, and no residual defects.

She was scheduled for an electrophysiological study and ablation using a three-dimensional mapping system (CARTO™ 3, Biosense Webster-J&J MedTech), with a zero-fluoroscopy technique and intracardiac echocardiography (ICE) support. The electrocardiogram at the beginning of the study showed typical counter-clockwise atrial flutter **(Figure 1A)**. ICE showed no intracardiac thrombi and a prominent Eustachian valve. Electroanatomical reconstruction of the right atrium was performed using only a contact-force sensing ablation catheter (THERMOCOOL SMARTTOUCH® SF-J&J MedTech), with a decapolar catheter placed in the coronary sinus as a fixed reference. The activation map **(Video 1)** and entrainment demonstrated the presence of cavotricuspid isthmus-dependent flutter with counter-clockwise rotation and a cycle length (CL) of 260 ms. An ablation line was created at this level; completion of the line required use of the hook manoeuvre because of the prominent Eustachian valve. After completion of the line, another flutter appeared **(Figure 1B, Video 2)**, which was atypical and had a CL of 290 ms **(Figure 2)**. The new

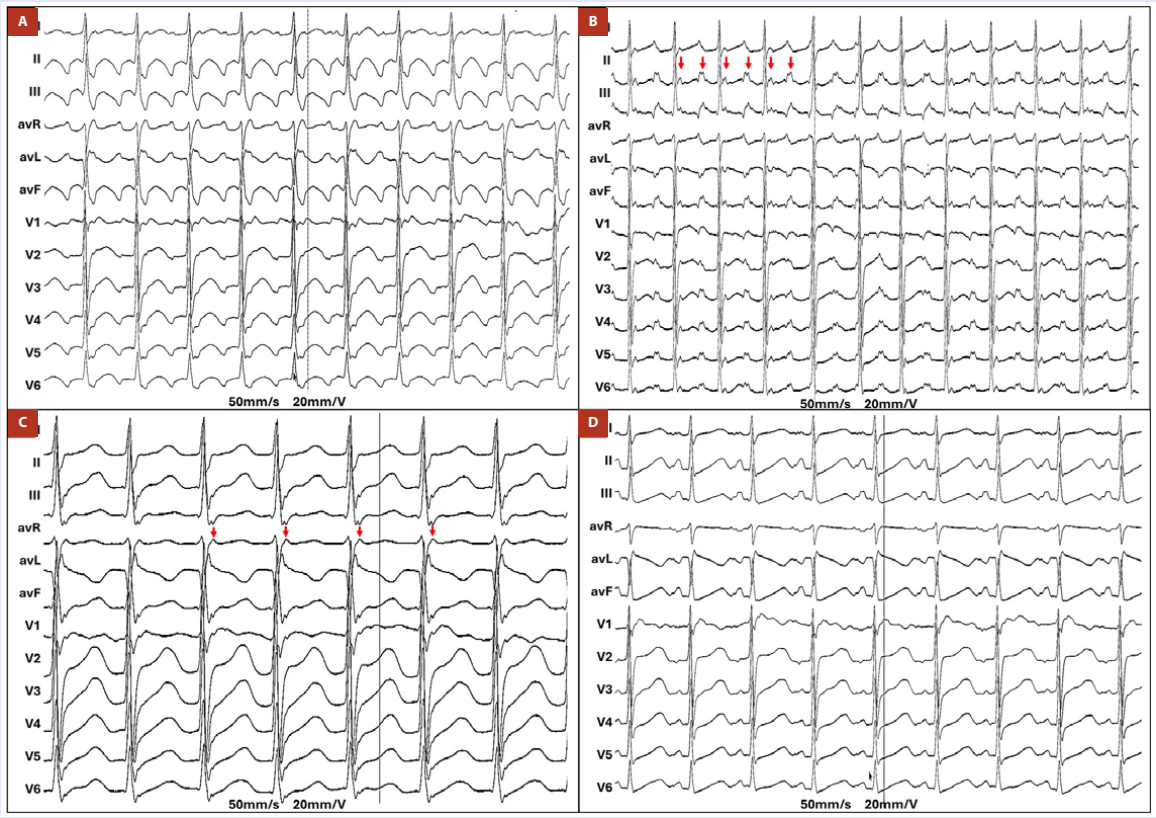

Figure 1. A. Typical atrial flutter tracing, with negative F waves in the inferior leads and a slow descending slope. **B.** Atypical atrial flutter with fragmented positive F waves in lead II (red arrows). **C.** Typical atrioventricular nodal re-entrant tachycardia with pseudo-R´ waves in lead aVR (red arrows). **D.** Final sinus rhythm.

activation map **(Video 3)** and entrainment demonstrated that the critical isthmus of this new circuit was located on the lateral wall, in the atriotomy area. An ablation line was therefore created at this level, restoring sinus rhythm **(Figure 3A, Video 4)**. During confirmation with pacing manoeuvres under dobutamine infusion, no further flutter was induced; however, dual AV nodal physiology was demonstrated and typical AV nodal re-entrant tachycardia was induced, with a CL of 400 ms and a ventriculoatrial (VA) interval of 0 ms **(Figure 3B, Video 5)**. Slow-pathway ablation was therefore performed at 25 W, with slow junctional beats observed during radiofrequency application **(Figure 3C, Video 6)**. With repeat induction manoeuvres, no further arrhythmia was observed; the nodal refractory period was reached without a jump. The procedure was completed without complications. At the 6-month follow-up, the patient had had no recurrence.

Discussion

The association between congenital heart disease and cardiac rhythm disturbances is frequent; the latter may be due to intrinsic abnormalities of the conduction system or may be secondary to scars from corrective cardiac surgery, the presence of patches, or chronic haemodynamic abnormalities caused by pressure and volume overload [1]. Most congenital heart defects can be surgically repaired through the right atrium, including atrial septal defect (ASD) closure and ventricular septal defect (VSD) closure through a transtricuspid approach, among others; this necessarily requires the surgeon to perform an atriotomy. This explains why the most frequent arrhythmia in the late postoperative period is usually atrial flutter arising from the right atrium, reported in 40-90% of cases across different series [2,3].

The presence of arrhythmias in patients with congenital heart disease significantly increases morbidity and mortality and worsens the prognosis of the underlying heart disease. In patients with surgically corrected congenital heart disease, cardiac arrhythmias are the leading cause of hospitalisation, accounting for 31% of admissions [2,3]. The expert consensus of the European Heart Rhythm Association states that catheter ablation is the ideal and definitive treatment for atrial macro-reentry in postoperative cardiac patients; it should be performed at least 3 months after cardiac surgery and ideally with the support of an electroanatomical mapping system [1,3]. In patients after surgical repair of ostium secundum ASD, the classic approach involves an atriotomy in the right atrium, performed on the posterior or lateral wall. During long-term follow-up, macro-reentrant circuits related to this scar are the most frequent, although cavotricuspid isthmus-dependent circuits may also occur [2,4]. The patient had both types of macro-reentry; one became evident after elimination of the first.

Typical, or slow-fast, atrioventricular nodal re-entrant tachycardia (AVNRT) is the most common tachycardia in the

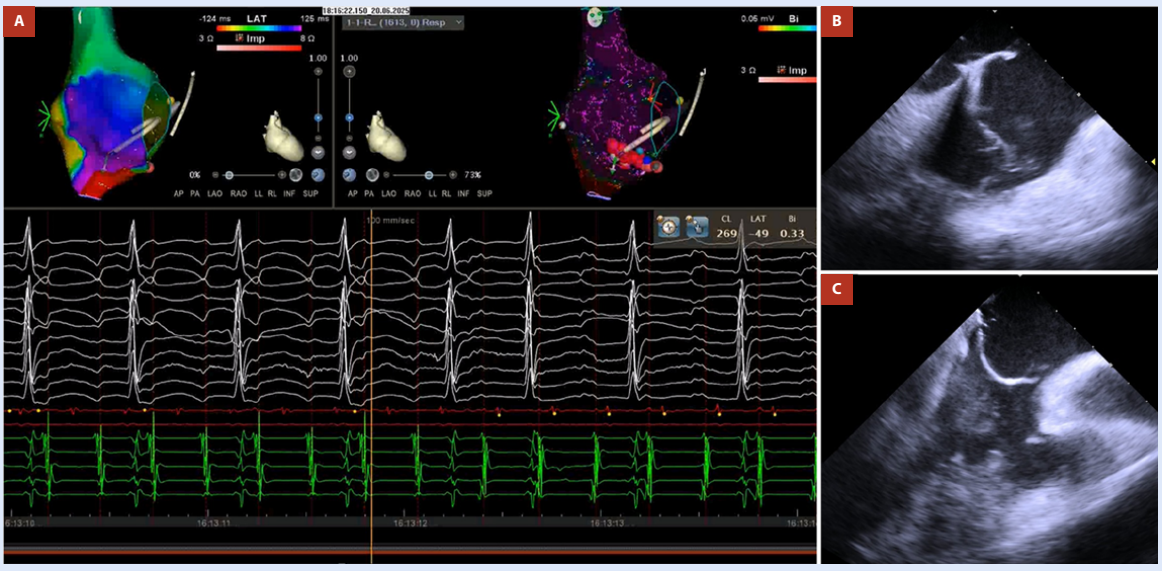

Figure 2. A. Radiofrequency application at the Eustachian ridge using a hook manoeuvre, which eliminated the typical flutter and led to the appearance of atypical flutter. Note the change in morphology on the 12-lead electrocardiogram, as well as a subtle change in activation of the decapolar catheter in the coronary sinus. **B.** Intracardiac echocardiography image showing a prominent Eustachian ridge. **C.** Intracardiac echocardiography image showing the ablation catheter supported on the Eustachian ridge using the hook manoeuvre, at the site where typical flutter was successfully eliminated.

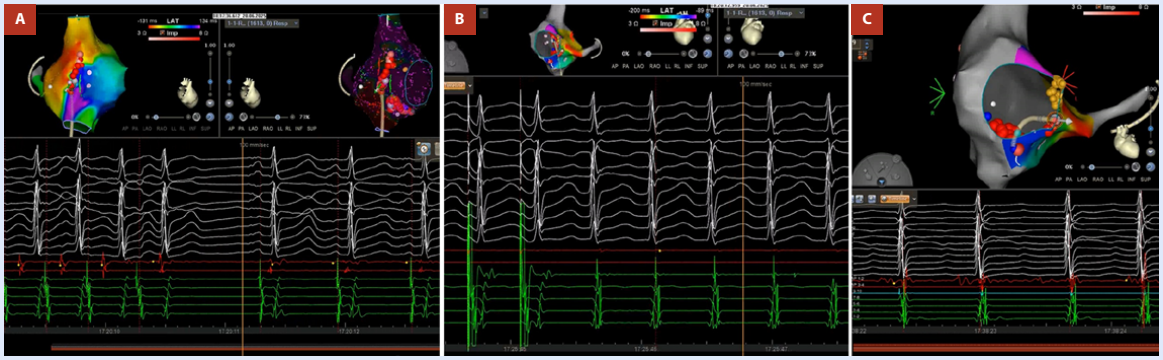

Figure 3. A. Radiofrequency application to the posterolateral wall of the right atrium, resulting in elimination of the atypical flutter and restoration of sinus rhythm. **B.** Induction of a regular narrow-QRS tachycardia with a VA interval of 0 ms, consistent with typical atrioventricular nodal re-entrant tachycardia. **C.** Controlled radiofrequency application in the slow-pathway region, generating abundant slow junctional rhythm; thereafter, AV nodal re-entry was no longer inducible.

general population; catheter ablation is highly effective and curative for this type of tachycardia [5]. The ablation target is the slow pathway, located in the most anterior part of the base of Koch's triangle, anterior and superior to the coronary sinus ostium. These anatomical landmarks may be altered in patients with congenital heart disease; some patients with atrial or ventricular septal defects may have a lower position of Koch's triangle. Therefore, this must be carefully considered during ablation because of the risk of AV block [5]. In this particular case, the anatomy of Koch's triangle and the location of the slow pathway were typical, which did not generate difficulties during ablation.

There are reports of atypical AVNRT in patients with complex congenital heart disease, particularly dextro-transposition of the great arteries (D-TGA); however, the true prevalence of this tachycardia in adults with previously corrected congenital heart disease is unknown [3]. A single-centre study from Greece reporting experience with ablation in adults with corrected congenital heart disease identified AVNRT as the third most frequent diagnosis, accounting for 14% of cases, exceeded only by atrial fibrillation and atrial flutter. No cases of coexistence between atrial flutter and AVNRT were reported [6].

For several years, studies have sought to demonstrate a relationship between AVNRT and typical atrial flutter, since in both cases the critical part of the circuit is located in the inferior region of the right atrium [7]. In a series of 1,063 patients with AVNRT undergoing ablation, 5.7% also had inducible atrial flutter before radiofrequency application; among these patients, 41% were no longer able to reproduce atrial flutter after ablation of the slow pathway, suggesting that the primary arrhythmia was probably AVNRT. Notably, in that study, patients with a continuous nodal function curve, without evidence of a jump but with inducible AVNRT, had a higher risk of developing atrial flutter. In our case, we first performed ablation of both cavotricuspid isthmus-dependent flutter and atypical flutter; subsequently, during confirmation manoeuvres, typical AVNRT was induced, prompting slow-pathway ablation. It is important to highlight that the patient had a continuous nodal function curve, which, as mentioned previously, has been associated with atrial flutter [8].

On the other hand, in a follow-up study of more than 500 patients who underwent catheter ablation, 343 for AVNRT and 185 for other forms of paroxysmal supraventricular tachycardia, those who underwent slow-pathway ablation were more likely to develop atrial flutter during follow-up (4.9% vs. 0%) [9]. Despite the above, reports of an association between atrial flutter and AVNRT in patients with corrected congenital heart disease are scarce; this case could be among the first reported in the literature.

In conclusion, postoperative cardiac patients have the substrate to develop different types of arrhythmias. In these patients, it is essential to rule out tachycardia mechanisms other than the clinically documented arrhythmia through stimulation manoeuvres, particularly by looking for the presence of AVNRT when atrial flutter has been documented.

Acknowledgements

The authors thank Marcos Jacome Quintero, Clinical Account Specialist, Johnson & Johnson.

Ethical aspects

Written informed consent was obtained from the patient.

Author contributions

ACP: conceptualisation and writing—original draft. **ACGL and MPR:** writing—original draft. **MCS and RSB:** visualisation and multimedia editing. **CGC and PZC:** validation and supervision.

References

1. Hernández-Madrid A, Paul T, Abrams D, Aziz PF, Blom NA, Chen J, *et al.* Arrhythmias in congenital heart disease: a position paper of the European Heart Rhythm Association (EHRA), Association for European Paediatric and Congenital Cardiology (AEPC), and the European Society of Cardiology (ESC) Working Group on Grown-up Congenital Heart Disease, endorsed by HRS, PACES, APHRS, and SOLAECE. Europace. 2018;20(11):1719-1753. doi: 10.1093/europace/eux380.
2. Francisco-Pascual J, Mallofré Vila N, Santos-Ortega A, Rivas-Gándara N. Tachyarrhythmias in congenital heart disease. Front Cardiovasc Med. 2024;11:1395210. doi: 10.3389/fcvm.2024.1395210.
3. Waldmann V, Bessière F, Raimondo C, Maltret A, Amet D, Marijon E, *et al.* Atrial flutter catheter ablation in adult congenital heart diseases. Indian Pacing Electrophysiol J. 2021;21(5):291-302. doi: 10.1016/j.ipej.2021.06.003.
4. Waldmann V, Guichard JB, Marijon E, Khairy P. Tachyarrhythmias in Congenital Heart Diseases: From Ion Channels to Catheter Ablation. J Cardiovasc Dev Dis. 2022;24;9(2):39. doi: 10.3390/jcdd9020039.
5. Waldmann V, Hebe J, Walsh EP, Khairy P, Ernst S. Catheter Ablation of Atrioventricular Nodal Reentrant Tachycardia in Patients With Congenital Heart Disease. Circ Arrhythm Electrophysiol. 2022;15(2):e010631. doi: 10.1161/CIRCEP.121.010631.
6. Soulaidopoulos S, Brili S, Drakopoulou M, Sotiropoulos I, Archontakis S, Dilaveris P, *et al*. Catheter ablation in grown-up congenital heart disease patients: A single-center experience. Int J Cardiol Congenit Heart Dis. 2022;7:100326. doi: 10.1016/j.ijcchd.2022.100326.
7. Interian A Jr, Cox MM, Jiménez RA, Duran A, Levin E, García O, *et al.* A shared pathway in atrioventricular nodal reentrant tachycardia and atrial flutter: implications for pathophysiology and therapy. Am J Cardiol. 1993;71(4):297-303. doi: 10.1016/0002-9149(93)90794-d.
8. Lin CH, Lin YJ, Chang SL, Lo LW, Huang HK, Chiang CH, *et al.* Novel electrophysiological characteristics of atrioventricular nodal continuous conduction curves in atrioventricular nodal re-entrant tachycardia with concomitant cavotricuspid isthmus-dependent atrial flutter. Europace. 2016;18(8):1259-64. doi: 10.1093/europace/euv345.
9. Varela DL, Rosenberg MA, Borne RT, Sandhu A, Zipse MM, Tzou WS, *et al.* Increased incidence of cavotricuspid isthmus atrial flutter following slow pathway ablation. J Interv Card Electrophysiol. 2022;63(3):581-589. doi: 10.1007/s10840-021-01065-0.