Archivos de Cardiología de México

PERMANYER

Check for updates

IMAGES IN CARDIOLOGY

Dual left anterior descending artery in Tetralogy of Fallot

Arteria descendente anterior dual en Tetralogía de Fallot

José M. Alanís-Naranjo, Javier de la Cruz-Pelayo, Moisés Jimenéz-Santos, Regina de la Mora-Cervantes, and Ana Ma. Rosas-Vázquez*

Cardiovascular Imaging Department, Instituto Nacional de Cardiología Ignacio Chávez, Mexico City, Mexico

A 13-year-old patient presented with mid-effort dyspnea and recurrent syncope over a 4-month period. The patient had a history of Tetralogy of Fallot (ToF) diagnosed at approximately 1 year of age and underwent a Blalock-Taussig shunt procedure at 2 years of age. As part of the pre-operative assessment, cardiac computed tomography angiography (CCTA) identified a dual left anterior descending artery (LAD), consisting of a long LAD originating from the right coronary artery (RCA) and coursing anterior to the right ventricular outflow tract (RVOT), and a short LAD arising from the left main coronary artery (LMCA) (Fig. 1). Based on these findings, the patient underwent successful complete surgical repair of ToF, including a Rastelli procedure and clipping of the systemic-to-pulmonary shunt.

Coronary artery anomalies (CAAs) are more frequently observed in patients with ToF than in the general population, with reported prevalence rates ranging from 2 to 14%[1]. The most common and significant CAA involves an LAD originating from the RCA and crossing anterior to the subepicardial surface of the RVOT just below the pulmonary annulus, reaching the anterior interventricular groove (AIVG)[1,2]. The term "dual" or "double" LAD refers to an anatomical variant in which the LAD territory is supplied by two distinct arterial branches. This anomaly is characterized by the presence of both a short and a long LAD within the AIVG[3]. Dual LAD has been reported in 1.36% of patients with ToF, with 61.5% of these cases exhibiting an anterior course to the RVOT[1]. Although multiple classification systems have been proposed, many dual LAD variants remain unclassified, leading to inconsistencies in their anatomical description. Jariwala et al. proposed a simplified classification based on three common distribution patterns[3]:

- Group I ("split" dual LAD): Both the LAD and its major branches originate from the left coronary sinus (LCS).
- Group II ("true" dual LAD): (a) The LAD arises partially from the LCS and the right coronary sinus (RCS); (b) the LMCA gives rise to the short LAD and the circumflex artery; (c) the short left-sided LAD terminates in the proximal AIVG, following a relatively typical course; and (d) the long right-sided LAD originates from the RCS or RCA.
- Group III ("anomalous" dual LAD): The entire LAD originates from the RCS and exhibits no consistent morphological pattern.

Accurate delineation of coronary anatomy is essential before surgical correction of ToF due to the potential risk of coronary artery injury, which may result in myocardial ischemia, heart failure, or sudden death[1,2]. The high

***Correspondence:**
José M. Alanís-Naranjo
E-mail: martin.alanis.n@gmail.com

Date of reception: 02-04-2025
Date of acceptance: 04-07-2025
DOI: 10.24875/ACM.25000073

Available online: 31-07-2025
Arch Cardiol Mex. 2025;95(4):390-391
www.archivoscardiologia.com

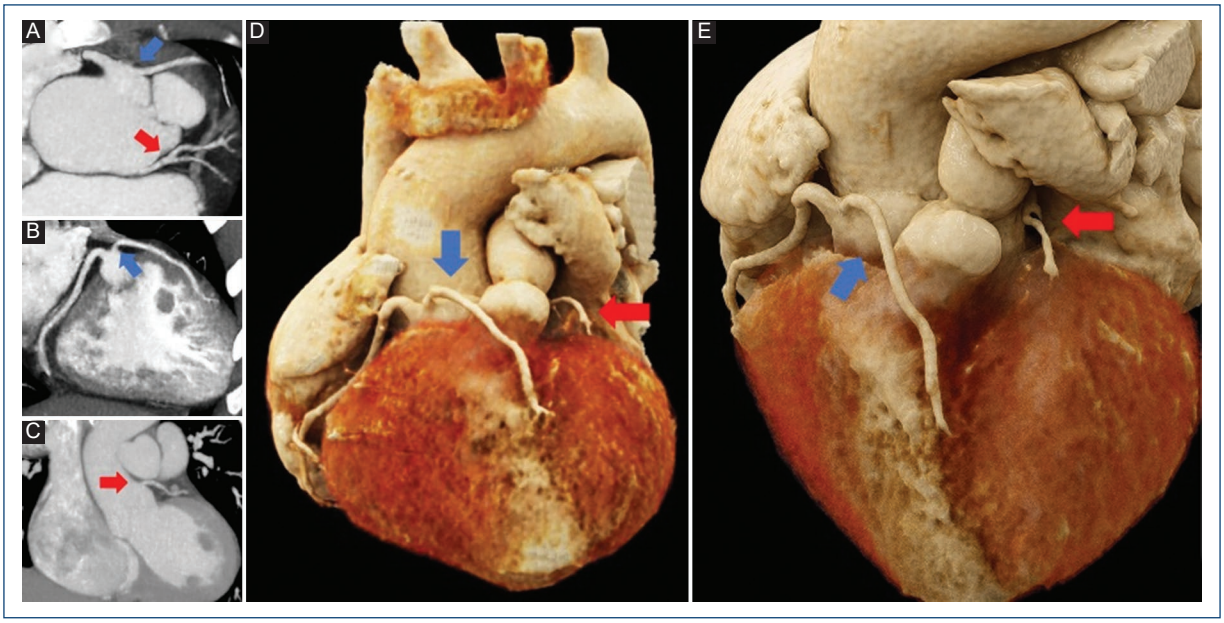

Figure 1. Cardiac computed tomography angiography showing Tetralogy of Fallot with a double LAD. The long LAD originates from the RCA and courses anterior to the RVOT (blue arrow), while the short LAD arises from the LMCA and courses along the proximal segment of the anterior interventricular groove (red arrow). **A:** axial view, **B** and **C:** coronal views, **D** and **E:** volume-rendered reconstructions. LAD: left anterior descending artery, LMCA: left main coronary artery, RCA: right coronary artery, RVOT: right ventricular outflow tract.

spatial and temporal resolution of CCTA makes it an effective modality for identifying CAAs and planning the optimal surgical approach in patients with ToF[2,3].

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

References

1. Pandey NN, Bhambri K, Verma M, Jagia P, Kothari SS, Saxena A. Anomalies of coronary arteries in Tetralogy of Fallot: evaluation on multidetector CT angiography using dual-source scanner. J Card Surg. 2021;36:2373-80.
2. Shaaban M, Tantawy S, Elkafrawy F, Haroun D, Romeih S, Elmozy W. Multi-detector computed tomography in the assessment of tetralogy of fallot patients: is it a must? Egypt Heart J. 2020;72:17.
3. Jariwala P, Jadhav KP, Koduganti S. Dual left anterior descending artery: diagnostic criteria and novel classification. Indian J Thorac Cardiovasc Surg. 2021;37:285-94.