Cardiology in the Young

cambridge.org/cty

High take-off right coronary artery in a patient with tetralogy of Fallot

Semiha Terlemez[1], Serdar Kula[1] and Deniz Oğuz[1]

[1]Gazi University, Faculty of Medicine, Department of Pediatric Cardiology, Ankara, Turkey

Brief Report

Cite this article: Terlemez S, Kula S, and Oğuz D (2021) High take-off right coronary artery in a patient with tetralogy of Fallot. *Cardiology in the Young* **31**: 1876–1878. doi: 10.1017/S1047951121001761

Received: 30 September 2020
Revised: 9 April 2021
Accepted: 12 April 2021
First published online: 21 May 2021

Keywords:
Tetralogy of Fallot; surgical technique; High Take Off Right Coronary Artery

Author for correspondence: Semiha Terlemez, Gazi University, Faculty of Medicine, Department of Pediatric Cardiology, Ankara 06100, Turkey. Tel: 00905327217689. E-mail: semihaterlemez@yahoo.com

Abstract

High take-off coronary artery anomaly is a quite rare anomaly which is usually seen in isolated form and diagnosed incidentally. Association with tetralogy of Fallot is also rare and it is not one of the well-known coronary anomalies seen in this disease. Here, we describe high take-off right coronary artery in a 10-month-old female patient with tetralogy of Fallot which was diagnosed during catheter angiography. It is very important to show this anomaly sometimes with additional imaging techniques as it alters all the surgical approach including aortic cannulation.

Tetralogy of Fallot is the most common cyanotic CHD. The frequency of coronary artery anomalies in patients with tetralogy of Fallot varies between 5% and 12%.[1-3] Especially, the presence of coronary artery crossing the right ventricular outflow tract causes technical difficulties during surgical correction. Therefore, the presence of coronary artery anomaly in patients with tetralogy of Fallot must be identified in the pre-operative period. The most common coronary artery anomaly in patients with tetralogy of Fallot is the left anterior descending artery arising from the right coronary artery.[1-4] High take-off coronary artery is quite a rare anomaly among congenital coronary artery anomalies at a rate of 0.2%[5] and it is mostly (84.46%) seen in right coronary artery.[5] Generally, high take-off coronary artery anomalies do not accompany CHDs and are isolated. In this article, we present our 10-month-old patient with tetralogy of Fallot who had high take-off right coronary artery.

Case presentation

The 10-month-old female patient had been referred to our clinic because a murmur was heard on physical examination in the neonatal period and she was diagnosed as tetralogy of Fallot. She had been regularly followed by paediatric cardiology department. The patient had no history of cyanotic spell attacks, with weight 6500 g (3–10 p), height 68 cm (25–50 p), and O2 sat 78%. Echocardiography showed out a subaortic ventricular septal defect, as the origin of right coronary artery could not be demonstrated and collateral flow had been suspected between the descending aorta and the pulmonary artery catheter angiography was planned before surgical correction. In catheter angiography, aortic root injection showed normal left coronary artery originating from the left sinus, whereas the right coronary artery originated from the left lateral aspect of the aorta over 5 mm of the sinotubular junction and Video 1. In catheter angiography, it was seen that the right coronary artery was not crossing the right ventricular outflow tract, but coronary CT angiography was performed to view the anatomy in detail. CT angiography showed that the aortic sinus depth was 6.5 mm and the distance between right coronary artery and sinotubular junction was 5 mm. It was seen that right coronary artery did not have intramural course. Moreover, it was observed that the right coronary artery course did not cross right ventricular outflow tract; however, during its course, it crossed the anterior of the aorta and passed very close to the right lateral wall of the right ventricular outflow tract while reaching to the bottom of the right atrial appendage (Fig 1).

Discussion

Although high take-off coronary artery is defined differently in literature, the most accepted definition is the presence of coronary ostium is 1 cm above sinotubular junction in adult patients and that coronary ostium above sinotubular junction which is greater than 20% of sinus depth in children.[5] In our patient, the distance between the coronary ostium and the sinotubular junction was almost equal to the depth of the sinus. High take-off coronary artery anomaly is a rare coronary artery anomaly. There is not still consensus about its clinical significance. It is sometimes detected in asymptomatic cases incidentally by imaging methods or intraoperatively;[6,7] however, it is sometimes associated with myocardial ischemia and even sudden cardiac death.[8-10]

High take-off coronary artery anomaly is generally seen as an isolated anomaly. The prevalence of high take-off coronary artery anomaly with CHD is 2.7%.[5] In the literature, there are

CAMBRIDGE UNIVERSITY PRESS

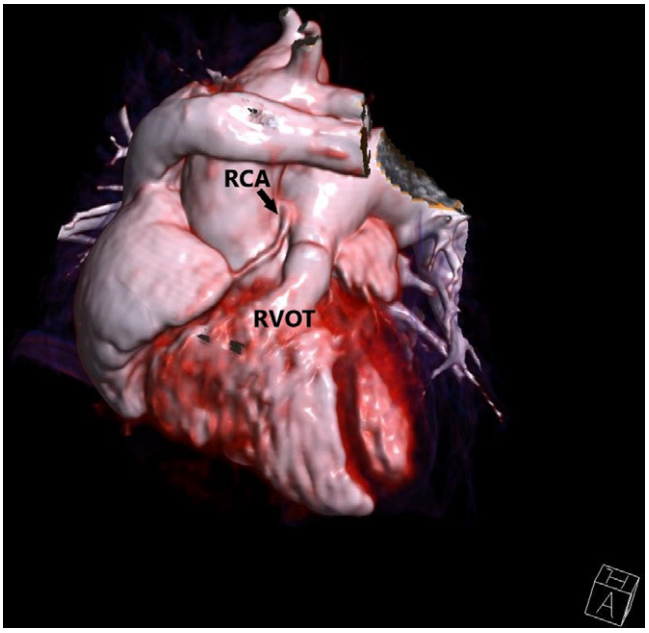

Figure 1. Three-dimensional CT image shows the course of the right coronary artery and its position relative to the right ventricular outflow tract. RCA: right coronary artery, RVOT: right ventricular outflow tract.

very few studies case reports describing the association with tetralogy of Fallot.[11,12] The prevalence of coronary artery anomalies in patients with tetralogy of Fallot ranges from 5% to 12%.[1-3,13,14] The most common coronary artery anomalies in patients with tetralogy of Fallot have been described as left anterior descending artery arising from right coronary artery, single coronary root origin, large conal branch arising from right coronary artery, and double left anterior descending artery.[2-15] In echocardiographic evaluation of our patient, right coronary artery origin could not be shown in standard sections. Only left coronary artery origin from the left coronary sinus could be demonstrated. Fortunately, we had suspected of collateral circulation between the aorta-pulmonary artery and decided for angiography. Otherwise, we would operate the patient for total correction with the diagnosis of single coronary artery. We were able to detect the coronary artery anomaly of the patient by angiography. In the presence of high take-off coronary artery anomalies, since the coronary origin cannot be seen in standard echocardiographic windows is always the risk of underdiagnose. Especially, when accompanying tetralogy of Fallot in our patient, it can easily mislead the physician since single coronary origin is one of the well-known coronary artery anomalies tetralogy of Fallot. Our patient showed us the importance of evaluating coronary arteries with advanced imaging methods. In many centres, CT angiography is performed in patients with tetralogy of Fallot in the pre-operative period for this purpose.

The importance of coronary artery anomaly in tetralogy of Fallot is mostly apparent when it is crossing right ventricular outflow tract. This prevents the reconstruction of right ventricular outflow tract during surgical correction and causes conduit to be used. In our patient, we found that a high take-off right coronary artery is arising from the left lateral surface of the ascending aorta well above the synotubular junction by catheter angiography. Angiography images showed that the right coronary artery crossed the aorta not the right ventricular outflow tract. However, we evaluated the patient with CT angiography, since high take-off coronary arteries may also have an intramural course.[5,6] It was observed that the right coronary artery did not show an intramural course; however, during its course, it was very close to the lateral aspect of the right ventricular outflow tract. Another important issue in the presence of high take-off coronary artery is aortic cannulation site. The surgeon needs to cannulate the aorta more proximally. Otherwise, coronary circulation cannot be achieved and may cause catastrophic consequences. In our patient, it was planned to perform both right ventricular outflow tract repair more laterally and aortic cannulation more proximally.

High take-off coronary artery anomaly is quite a rare and usually isolated anomaly. However, it must be considered that it can be seen in patients with tetralogy of Fallot. Echocardiography may not be sufficient for diagnosis. In the presence of a high localised coronary artery, it is very important to show the level and course of the coronary artery to determine the type of surgical repair and the location of the cannulation. Cardiac CT or catheterisation should be considered in cases where coronary anatomy is not well defined or uncertain.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S1047951121001761

Compliance with ethical standards. This research did not involve human or animal experimentation

Conflict of interest. The authors have no conflict of interest.

Financial support. This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

References

1. Gupta D, Saxena A, Kothari SS, et al. Detection of coronary artery anomalies in Tetralogy of Fallot using a specific angiographic protocol. Am J Cardiol 2001; 87: 241–244.
2. Kervancioglu M, Tokel K, Varan B, Yildirim SV Frequency, origins and courses of anomalous coronary arteries in 607 Turkish children with Tetralogy of Fallot. Cardiol J 2011; 18: 546–551.
3. Kapur S, Aeron G, Vojta CN Pictorial review of coronary anomalies in Tetralogy of Fallot. J Cardiovasc Comput Tomogr 2015; 9: 593–596.
4. Pontailler M, Bernard C, Gaudin R, et al. Tetralogy of Fallot and abnormal coronary artery: use of a prosthetic conduit is outdated. Eur J Cardiothorac Surg 2019; 56: 94–100.
5. Loukas M, Andall RG, Khan AZ, et al. The clinical anatomy of high take-off coronary arteries. Clin Anat 2016; 29: 408–419.
6. Deng X, Huang P, Chen W, et al. An incidental encounter of a rare high take-off right coronary artery: A case report. Medicine (Baltimore) 2017; 96: e8614.
7. Yeşilyurt H, Aksu U, Kalkan K, et al. The prevalence of coronary artery anomalies with coronary computed tomography. Turk J Med Sci 2017; 47: 188–193.
8. Salehi N, Abdi S, Pouraliakba HR, Vakili-Zarch A. High Take Off Left Main and Abnormal Origin of Right Coronary Artery: A Case Report. Cardiol Res 2013; 4: 82–84.
9. De Bartolo D, De Luca E, Arena V, Ausania F, Buja LM, Ricci P. Bifid cardiac apex and high take off: an unusual association in a case of sudden death. Cardiovasc Pathol 2016; 25: 512–514.
10. Priemer DS, Danon S, Guzman MA. Unexpected cardiac death due to a slit-like left coronary ostium with associated high take-off of the right coronary artery in a previously healthy child. Forensic Sci Med Pathol 2015; 11: 124–126.

11. Li J, Soukias ND, Carvalho JS, Yen Ho S Coronary arterial anatomy in Tetralogy of Fallot: orphological and clinical correlations. Heart 1998; 80: 174–183.
12. Tuzcu EM, Moodie DS, Chambers JL, Keyser P, Hobbs RE Congenital heart diseases associated with coronary artery anomalies. Cleve Clin J Med 1990; 57: 147–152.
13. Meng CC, Eckner FA, Lev M Coronary Artery Dıstrıbutıon In Tetralogy Of Fallot. Arch Surg 1965; 90: 363.
14. Dabizzi RP, Caprioli G, Aiazzi L, et al. Distribution and anomalies of coronary arteries in Tetralogy of fallot. Circulation 1980; 61: 95.
15. Freire G, Miller MS Echocardiographic evaluation of coronary arteries in congenital heart disease. Cardiol Young 2015; 25: 1504–1511.

https://doi.org/10.1017/S1047951121001761 Published online by Cambridge University Press