International Journal of the Cardiovascular Academy 2 (2016) 137–139

Contents lists available at ScienceDirect

International Journal of the Cardiovascular Academy

journal homepage: www.elsevier.com/locate/ijcac

Case report

Anomalous origin of the right coronary artery from the left anterior descending artery: A rare variant of single coronary artery☆

Mutlu Gungor [a], Erkan Yıldırım [b], Baris Bugan [c,*]

[a] Cardiology Service, Memorial Sisli Hospital, Istanbul, Turkey
[b] Department of Cardiology, Gulhane Military Medical Academy, Ankara, Turkey
[c] Cardiology Service, Girne Military Hospital, Girne, Turkish Republic of Northern Cyprus

ARTICLE INFO

Article history:
Received 24 May 2016
Received in revised form 20 June 2016
Accepted 22 June 2016
Available online 1 July 2016

Keywords:
Coronary anomaly
Ischemia
Single coronary artery

ABSTRACT

Anomalous origin of the right coronary artery (RCA) arising from the left anterior descending artery (LAD) is a very rare coronary anomaly and discovered incidentally during a coronary angiography. We, herein, experienced two cases with anomalous origin of the RCA from the LAD.

Introduction

Congenital coronary artery anomalies (CAA) are present at birth but are usually asymptomatic and are found incidentally during coronary angiography. Their prevalence is less than 1.3% based on published series.[1–2] Of the benign anomalies, the three most common are 1) separate origination of the left anterior descending artery (LAD) and left circumflex (CX) arteries from the left sinus of Valsalva (LSV), 2) origination of the CX artery from the right coronary artery (RCA) or right sinus of Valsalva (RSV), and 3) ectopic origin of RCA from the aorta.[1] Of the malignant abnormalities, the most common anomaly, by a wide margin, is the ectopic origin of RCA from the LSV. Single coronary artery (SCA) is a rare CAA where only one coronary artery arises from the aortic trunk by a single coronary ostium, supplying the entire heart and has different subtypes depending on the course of anomaly artery. We present here a rare type of SCA with the anomalous origin of the RCA from mid-LAD in two patients.

Case report

Case 1. A 46-year-old female with hypertension, hyperlipidemia, and obstructive sleep apnea was evaluated for worsening shortness of breath. She had a strongly positive family history of premature coronary heart disease. Physical examination was unremarkable and resting electrocardiogram (ECG) was normal. The patient was referred for a stress testing that revealed the suspicious stress-induced ST changes. Coronary angiography was performed through the right femoral artery using the Judkin's technique. Cannulation of the left main coronary artery (LMCA) displayed normal courses of the left main, CX, and LAD (Fig. 1). An anomalous RCA as a separate small branch arose from the mid-LAD just after the first diagonal branch, then coursed anteriorly down the right atrioventricular groove. There was no significant coronary narrowing, and the patient was discharged with medical therapy.

Case 2. A 57-year-old male with a subacute anterolateral myocardial infarction referred to our clinic for coronary angiography due to worsening angina. He had a history of systemic hypertension, type 2 diabetes, and current smoking as coronary risk factors. Physical examination was unremarkable. Coronary angiography demonstrated that all three major coronary arteries were originating from the same ostium in the LSV (Fig. 2). An anomalous RCA as a separate small branch arose from the mid-LAD just after the first diagonal branch, then coursed anteriorly down the right atrioventricular groove. There was a high-grade 90% stenosis in the proximal first diagonal branch and thrombosed total functional occlusion at the level of mid-LAD (Fig. 2). The patient underwent successful coronary artery bypass operation and was discharged with conventional medical therapy.

Discussion

The coronary circulation arising from a single coronary ostium has little clinical significance, except for cases in which a coronary artery

☆ There is no conflict of interest.

* Corresponding author at: Cardiology Service, Girne Military Hospital, 99300 Girne, Turkish Republic of Northern Cyprus. Tel.: +90 548 830 93 45; fax: +90 392 815 63 67.
E-mail address: bbugan@hotmail.com (B. Bugan).

Peer review under responsibility of The Society of Cardiovascular Academy.

http://dx.doi.org/10.1016/j.ijcac.2016.06.008

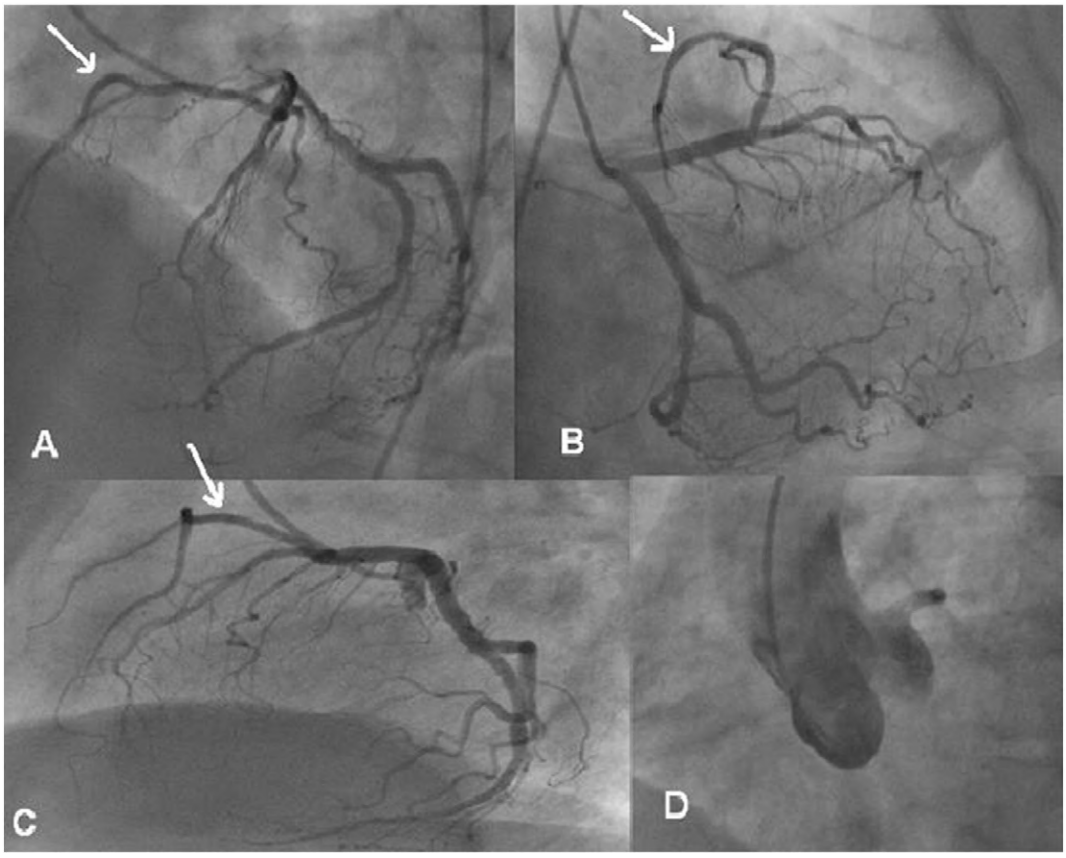

Fig. 1. LAO cranial (A), RAO caudal (B), and lateral (C) views showing the origin of the anomalous right coronary artery (white arrows). Aortography view (D) showing right coronary artery ostium was absent.

traverses between the pulmonary artery and aorta, which can cause sudden death at a young age due to extrinsic coronary arterial occlusion. The anomalous origin of the RCA as a branch of the LAD artery is a very rare variation of SCA.[3–5]

The classifications of CAA are often fragmental and difficult to remember because they combine anatomical, angiographic, and clinical elements.[6–8] Therefore, the knowledge of the common anatomic variants of CAA is of great help for their identification. The SCA has been classified according to the current classification system proposed by Lipton et al.[8] in 1979 who reorganized 2 previous systems that include the classification systems of Smith[6] and Ogden-Goodyear.[7] The Smith's system was based on three groups according to the types of the coronary arteries involved.[6] In group I, the artery follows the anatomical course of either a left or a right coronary artery. In the other words, the SCA follows the course of the RCA, continues into the CX and then as the LAD artery, or there may be a single LMCA artery that branches into the LAD and CX, the latter extending across the crux to form the RCA. In group II, after its origin, the main trunk divides into the right and left main arteries or into RCA, LAD, and CX artery. In group III, the SCA branches atypically and there is little similarity between the coursing of the three major arteries.[6]

Ogden and Goodyear's system offered five letters to classify the single coronary artery.[7] Two of them symbolized the side of the ostial origin of the SCA and three of them symbolized the anatomic course and distribution of the branches.[6]

Finally, the Lipton's classification begins with a division into the “R” (right) and the “L” (left)-type, depending upon whether the SCA originates from the right or the LSV. After that, every case is designated

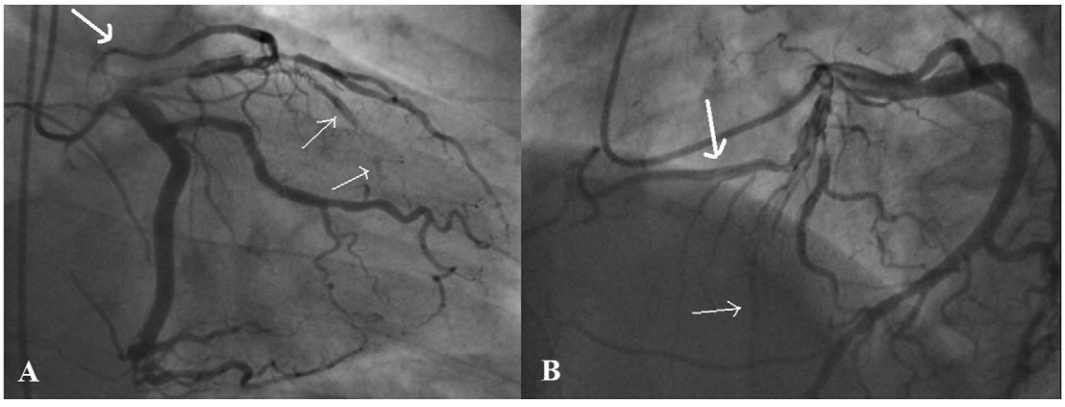

Fig. 2. RAO caudal (A) and LAO cranial (B) views are showing the origin of the anomalous right coronary artery (thick white arrows) and thrombosed total functional occlusion of the mid-left anterior descending artery (thin white arrows).

as belonging to group I, II, or III, depending on the anatomical course of the artery. The final designation describes the relationship between the anomalous artery, the aorta, and the pulmonary artery with the letters "A," "B,", and "P,", where A stands for an anterior course, P stands for a posterior course, and B represents a course between the aorta and pulmonary artery.

In groups II and III, an important characteristic of this classification is the path followed by the anomalous arteries from one side of the heart to the other. When the LMCA originates from the proximal RCA or vice versa, the anomalous artery takes 1 of 4 aberrant pathways to reach its proper vascular territory. These pathways are designated as type A (*A*nterior to the right ventricular outflow tract—"anterior or prepulmonic course"), type B (*B*etween the aorta and pulmonary trunk—"interarterial course"), type C (Cristal, coursing through the crista supraventricularis portion of the interventricular septum—"septal course"), and type D (*D*orsal or posterior to the aorta—"retroaortic course").[9] Both presented case were compatible with L2A type SCA.

Conclusion

There is no consensus regarding the risk for atherosclerosis in cases of SCA. Some reports claim that there is an increased risk of atherosclerosis in the case of a SCA, which may result from the acute takeoff angle and/or slit-like orifice, the others reported that SCA is not associated with increased risk for the development of atherosclerotic coronary artery disease.[2] Whereas the presented first case has only minimal coronary narrowing, the second case presented with acute coronary syndrome. The vast majority of previously reported anomalies demonstrated the RCA arising from the mid-LAD after the first septal perforator branch,[3–5] as did in presented cases, and only a few had RCA arising from the proximal segment of the LAD.[4,5]

References

1. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patient undergoing coronary arteriography. *Cathet Cardiovasc Diagn* 1990;**21**:28–40.
2. Gard N, Tewari S, Kapoor A, Gupta DK, Sinha N. Primary congenital anomalies of the coronary arteries: a coronary arteriographic study. *Int J Cardiol* 2000;**74**:39–46.
3. Meric M, Demircan S, Pinar M, Yuksel S. Single coronary artery: right coronary artery originated from middle of left anterior descending artery in a patient with severe mitral regurgitation. *Clin Cardiol* 2010;**33**:E48–E50.
4. Amasyali B, Kursaklioglu H, Kose S, Iyisoy A, Kilic A, Isik E. Single coronary artery with anomalous origin of the right coronary artery from the left anterior descending artery with a unique proximal course. *Jpn Heart J* 2004;**45**:521–525.
5. Wilson J, Reda H, Gurley JC. Anomalous right coronary artery originating from the left anterior descending artery: case report and review of the literature. *Int J Cardiol* 2009;**137**:195–198.
6. Smith JC. Review of single coronary artery with review of two cases. *Circulation* 1950;**1**:1168.
7. Ogden JA, Goodyear AVN. Patterns of distribution of the single coronary artery. *Yale J Biol Med* 1970;**43**:11.
8. Lipton MJ, Barry WH, Oberz I, Silverman JF, Wexler L. Isolated single coronary artery: diagnosis, angiographic classification, and clinical significance. *Radiology* 1979;**130**: 39–47.
9. Roberts WC, Shirani J. The four subtypes of anomalous origin of the left main coronary artery from the right aortic sinus (or from the right coronary artery). *Am J Cardiol* 1992;**70**:119–121.