MEDICAL FORUM

ACUTE MYOCARDIAL INFARCTION IN PATIENT WITH SINGLE CORONARY ARTERY: A CASE REPORT

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SUMMARY

A single coronary artery (SCA) is a rare congenital anomaly. In most cases, it is an incidental finding on coronary angiography and has no clinical significance. However, it can cause angina, myocardial infarction, or even sudden death. Reports of SCA with acute myocardial infarction are very rare in the medical literature. This case study presents a patient with SCA from the right aortic sinus with severe stenosis proximal and distal part of right coronary artery was made using cardiac angiography and cardiac multidetector computed tomography (MDCT) with acute myocardial infarction.

Key Words: *coronary artery, anomalies, coronary angiography, cardiac MDCT*

INTRODUCTION

Congenital coronary artery anomalies are an uncommon angiographic finding. One of the rarest of these variants is the single coronary artery (SCA), in which the entire coronary system originates from a single coronary ostium [1]. In most cases, a single coronary artery is an incidental finding on coronary angiography and has no clinical symptom; nonetheless, it can cause angina, myocardial infarction, or even sudden death [2]. In this article, we report a case of a 71-year-old man who developed acute myocardial infarction with a single coronary artery was classified as Lipton RII-A [3].

PATIENT INFORMATION

A retired 71-year-old man with heavy smoking and hypertension presented typical chest pain and dysnea for 3 days

The electrocardiograms showed ST depression and negative T waves in leads DII, DIII and aVF, V5, V6 which was suggestive of acute posterior wall injury. Troponin T level increased (5359 ng/L). Echocardiography showed hypokinesia of the inferior-septum and inferior wall of left ventricular (LV) with LV ejection fraction of 44%.

The patient was diagnosed with acute myocardial infarction on day 3.He underwent coronary angiography that demonstrated a large single coronary artery originating from the right coronary sinus, an absence of the left coronary ostium in the left coronary cusp.An aberrant vessel arises from the proximal portion of RCA and courses to the left heart. The proximal and distal segments of RCA were severe stenosis (figure 1).

Percutaneous coronary intervention (PCI) was carried out, which implantation of two drug-eluting stents in the proximal and distal segments of RCA (Abaris 4.0 * 34mm and Euca 4.0 * 28mm drug-eluting stent) with subsequent TIMI 3 flow distal after stenting (figure 1)

The patient successfully recovered after the intervention and was discharged in stable condition after several days.To further evaluate the origin and course of the SCA and stent condition, cardiac MDCT angiography (Somatome Definition Flash, Siemens, Germany) was performed later.Figure 2 showed a SCA arising from the right coronary sinus with two patent stentsin the proximal and distal segments of RCA. Immediately after the origin of this main trunk, it gave off a small vessel that reached theanterior interventricular sulcus

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anteriorly to the aorta and pulmonary artery (proximal left anterior desending(LAD) territory). A large left posterolateral branch followed the left atrioventricular groove supplying the nominal circumflex (CX) territory. Finally, the SCA gave rise to a distal branch on the distal anterior wall of the left ventricle, completing the irrigation of the LAD territory. Giving these findings, the SCA was classified as RII-A subtype according to Lipton's classification.

DISCUSSION

Anomalies of the coronary arteriesmay be found incidentally in 0.3%–1% of healthyindividuals [4]. One of the rarest variants of these coronary anomalies is SCA. The prevalence ofSCA has been reported to be 0.0024% to 0.044% of the population [5]. Rashid Al Umairi et alresearched a study on 4445 coronary angiograms, with only 12 patients having a SCA,accounting for 0.27% [6].

Lipton et al introduced a valuable classification system for SCAs in 1979: it describedtheir origins and courses of these anomalies.[3] Lipton based on ten SCA angiographic analysesaccording to their sites of origin and the anatomical distribution of their branches.

The classification of SCAs is as follows:

- Group I: A solitary vessel arises from the left or right coronary cusp, following the course of either a normal right or left coronary artery.

- Group II: The SCA arises from the right or left aortic sinus. This group is divided into three types depending on the relationship between the aberrant vessel and the great vessels. Type A: The aberrant vessel courses anterior to the pulmonary trunk. Type B: The aberrant vessel travels between the aorta and the pulmonary artery. Type P: The aberrant vessel travels posterior to the aorta.

- Group III: An absent left coronary artery. The LAD and LCx arise separately from the common trunk with a normal RCA.

In patients with an SCA and an intra-arterial course, sudden death may occur when the SCA is compressed between the aorta and pulmonary artery during vigorous exercise.

Our case belongs to the RII-A group of SCA anomalies. Turkmen et al showed that the rate of the RII-A subgroupis quite common compare with another subgroup [7].

Most patients are asymptomatic at the time of diagnosis. Most SCA cases were found incidentally during coronary angiography [8].

Moreover, the combination of an SCA with acute myocardial infarction is extremely rare, according to the Turkmen's study, only 3 patients (4.5%) included 1 patient with RIII subtype and 2 patients with RII subtype. Gur et al and Giorgi et al reported cases with the R subgroup [9], [10]. In 2015, Roman et al reported the first case in the literature describing a patient with an RII-A subtype SCA presenting with ST-segment elevation myocardial infarction and cardiac arrest.

To our knowledge, our case of PCI in acute myocardial infarction with an RII-A subtype SCA is not the first case in the literature, but this is the first case in VietNam.

Coronary angiography is the gold standard for the evaluation of coronary artery disease. However, in the case of coronary anomalies, further evaluation by MDCT or cardiac magnetic resonance imaging is recommended to determine the course of the anomaly and prognosis. The excellent spatial resolution of MDCT makes this technique very suitable to detect the relationship of the anomalous vessels with the aorta, pulmonary artery, and cardiac structures. It is a safe technique and provides detailed 3-dimensional reconstructions that may be difficult to obtain with invasive angiography. In our patient, we diagnosed the SCA by coronary angiography and further delineated the course of the anomalous coronary artery (LAD artery) in relation to the aorta and pulmonary artery by cardiac MDCT.

Many patients with SCA without associated atherosclerotic coronary artery disease were managed conservatively with medications and had good outcomes. In patients with SCA associated with significant atherosclerotic coronary artery disease and patients with SCA and an intra-arterial course, there have been several authors reporting successful treatment using percutaneous coronary angioplasty with stent insertion and coronary artery bypass graft surgery [11].

CONCLUSION

SCA is a very rare and almost benign condition. This report shows a case with SCA (RII-A subgroup) that developed myocardial infarction undergoing PCI. Cardiac MDCT further delineated the course of the anomalous coronary artery in relation to the aorta and pulmonary artery.

+ Abbreviations:

INFORMED CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

+ Competing interests

The authors declare that they have no competing interests.

+ Acknowledgements

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REFERENCES

1. Muhyieddeen K, Polsani VR, Chang SM. Single right coronary artery with apical ischaemia. Eur Heart J Cardiovasc Imaging. 2012 Jun;13(6):533.
2. De Agustin JA, Marcos-Alberca P, Manzano MC et al. Percutaneous Intervention in a Single Coronary Artery: Evaluation of Multislice Tomography and Its Feasibility. Rev Esp Cardiol. 2010;63(5):607-11.
3. Lipton MJ, Barry WH, Obrez I, et al. Isolated single coronary artery: diagnosis, angiographic classification, and clinical significance. Radiology. 1979;130(1):39–47. doi:10.1148/130.1.39.
4. Angelini P, Velasco JA, Flamm S. Coronary anomalies: incidence, pathophysiology, and clinical relevance. Circulation 2002;105:2449 –2454.
5. Desmet W, Vanhaecke J, Vrolix M, et al. Isolated single coronary artery: a review of 50,000 consecutive coronary angiographies. Eur Heart J 1992;13: 1637–1640.
6. Al Umairi R and Al-khouri M. Prevalence, Spectrum, and Outcomes of Single Coronary Artery Detected on Coronary Computed Tomography Angiography (CCTA). Radiology Research and Practice, 2019, e2940148, <https://www.hindawi.com/journals/rrp/2019/2940148/>, accessed: 04/03/2021.
7. Turkmen S, Yolcu M, Sertcelik A et al. Single coronary artery incidence in 215,140 patients undergoing coronary angiography. Folia Morphol, 2014, 73 (4), 469–474.
8. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. Cathet Cardiovasc Diagn. 1990;21(1):28–40. doi:10.1002/(ISSN)1097-0304.
9. Gür M, Demirbağ YA, Yılmaz R. Isolated single coronary artery originating from a single right coronary ostium in a patient with acute myocardial infarction. Arch Turk Soc Cardiol. 2006;34:173–176.
10. Giorgi B, Dymarkowski S, Rademakers FE, et al. Single coronary artery as cause of acute myocardial infarction in a 12-year-old girl: a comprehensive approach with MR imaging. AJR Am J Roentgenol. 2002;179(6):1535–1537. doi:10.2214/ajr.179.6.1791535.
11. Liesting C, Brugts JJ, Johannes M, et al. Acute coronary syndrome in a patient with a single coronary artery arising from the right sinus of Valsalva. World J Cardiol. 2012; 4: 264-6.

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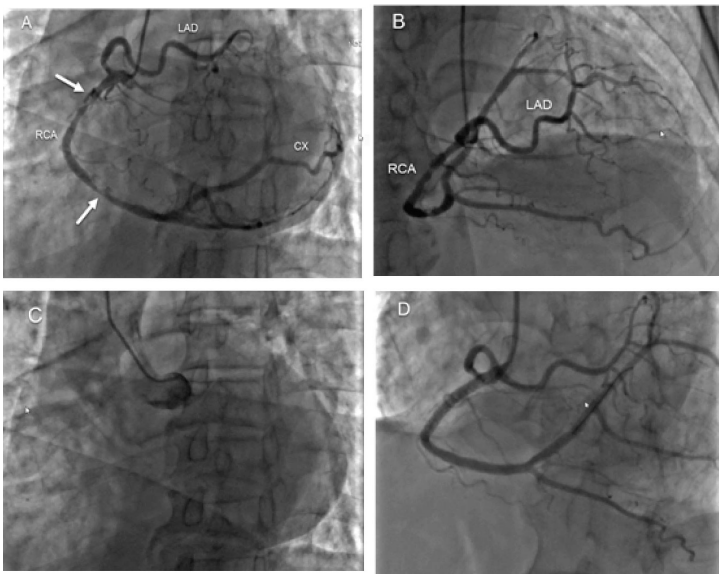

Figure 1. A and B: Coronary angiography showing a single coronary artery (SCA) originating from the right coronary sinus, also supplying the territory of the Left anterior descending (LAD) and circumflex (CX) arteries, and aberrant branch (LAD) arises from the proximal segment of the RCA and severe stenosis at the proximal and distal part of RCA (arrow in A). C: An aortic root angiographic image revealing an absent left coronary ostium. D: A primary percutaneous intervention recovering distal TIMI 3 flow in the culprit's vessel in the proximal and distal segments of RCA.

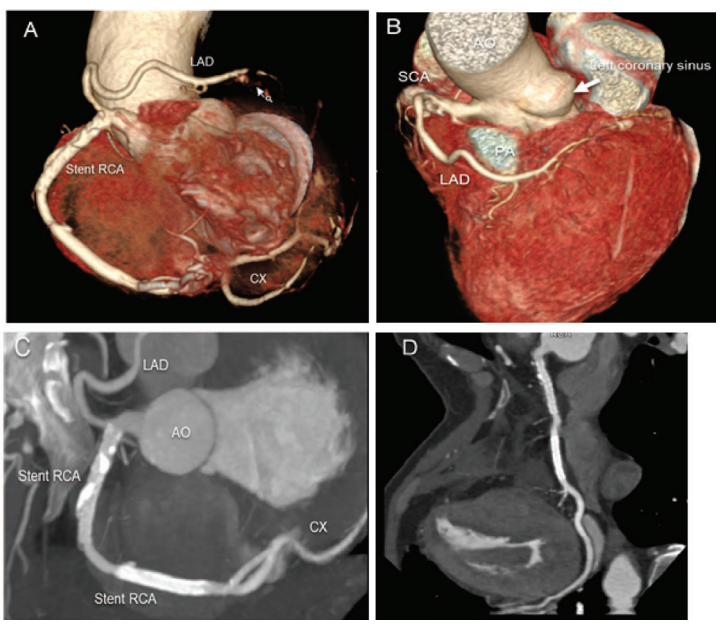

Figure 2: A-B (Volume rendering technique images) and C (coronal oblique Maximum intensity project image): Cardiac multidetector computed tomography confirm a SCA arising from the right coronary sinus. Immediately after the origin of this main trunk, it gave off a small vessel that reached the anterior interventricular sulcus anteriorly to the aorta (AO) and pulmonary artery (PA) (proximal LAD territory). A large left posterolateral branch followed the left atrioventricular groove supplying the nominal CX territory. D: curve MIP image showing the proximal and distal segments of the RCA with patency stent.