Anomalous Connection of the Coronary Artery Causing ST Segment Elevation Myocardial Infarction: A Case Report

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Authors’ contributions
This work was carried out in collaboration among all authors. Author AE did the literature review, write the manuscript and coordinate the case reporting. Author SA performed the coronary angiography and revised the discussion section. Author MEB revised the manuscript. Author HR supervised the interpretation of the data regarding the coronary ct scan and revised the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: With an angiographic prevalence approaching 1%, Anomalous connections of the Coronary arteries (ANOCOR) are rare. The term connection is preferred over origin since the coronary arteries do not grow out of the aorta but grow into the aorta from the peri truncal ring of coronary arterial vasculature. Very often these anatomical shapes are incidental findings without clinical impact; however, in some specific cases, clinical symptoms may occur arriving to sudden cardiac death (SCD), this is particularly true when there is a an interarterial course between the ascending aorta and the pulmonary.

Case Presentation: This case is about patient that we receive in emergency department presenting with an inferior ST segment elevation myocardial infarction (STEMI) which was found to be caused by compression of the proximal right coronary artery (RCA) between the aorta and the pulmonary trunk. Surgery was indicated by the heart team for the treatment of this condition.

Conclusions: This case presents a severe manifestation of proximal anomalous connection of the right coronary artery with a “malignant” course between the aorta and the pulmonary artery. This

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The patient was referred immediately to the Cath lab where a coronary angiography showed normal left coronary network and an ectopic right coronary artery connected to the left coronary sinus with no visible narrowed segment (Fig. 2). CT coronary angiography was then performed using a 64 slice CT scanner and showed the right coronary artery connected to the left coronary sinus, coursing between the aortic root and pulmonary artery with a narrowed proximal segment. (Figs. 3 and 4). Cardiac magnetic resonance imaging was performed to eliminate concomitant viral myocarditis and showed subepicardial late gadolinium enhancement suggestive of ischemic cause rather than myocarditis. Patient was informed of his congenital anomaly. Right coronary artery bypass using left mammary artery graft was indicated by the heart team, but the patient refused the intervention. The patient is until righting these words asymptomatic under betablockers with normal left ejection fraction; he was advised to avoid sports and significant efforts.

3. DISCUSSION

How can An anomalous connection of the coronary artery causes STEMI?

This case presents a severe manifestation of proximal anomalous connection of the right coronary artery with a “malignant” course between the aorta and the pulmonary artery. Different possible courses of the ectopic right coronary artery are showed in (Fig. 5). The variant has been called malignant for inducing sudden death in young asymptomatic athletes. The RCA connected to the left sinus of Valsalva as a separate vessel or as a branch of a single coronary artery has an incidence of 0.03-0.17% of patients undergoing angiography, pre-aortic course in this setting represents 90% of cases [3]. The frequency of an interarterial course is more associated with the RCA left coronary, because of its connection close to the anterior commissure of the RCA [4]. The incidence of sudden death with this anomaly is estimated at 25-40% and is associated with exercise in half of the reported cases [5]. One major differential
diagnostic in our case was viral myocarditis and this congenital anomaly is only an incidental finding, we had eliminated this diagnosis by performing an MRI study that showed an ischemic pattern of necrosis rather than myocarditis pattern. Various theories have been proposed for this association, including slit like ostium, acute angulation at the origin and compression of the vessel between the aorta and pulmonary artery [6]. Autopsy of 242 congenital coronary anomalies have showed, 49 ectopic LMCA connected to RCS and 52 RCA to the left sinus. This have leaden to sudden cardiac death in 57% of left ANOCORs and 25% of right ANOCORs, the common point was the presence of an intraarterial course in most cases [3]. The profile encountered in this anomaly is usually apparently healthy young patients under 35 years. Cardiac events like sudden death, syncope or acute myocardial infarction generally occur during or after intense sport practice which was the case for our patient.

Fig. 1. Electrocardiogram showing ST segment elevation in the inferior leads (DII,DIII,aVF)

Fig. 2. Coronary angiography showing: both right coronary artery (RCA) and left main coronary artery (LMCA) connected to the left coronary sinus (LCS)
Fig. 3. Cross section of coronary CT scan showing the right coronary artery (RCA) connected to the left coronary sinus (L.Sinus), coursing between the aortic root and pulmonary artery with a narrowed proximal segment.

Fig. 4. Cross section of coronary CT scan showing the right coronary artery (RCA) connected to the left coronary sinus (L. sinus), coursing between the aortic root and pulmonary artery with a narrowed proximal segment.
How do we manage patients with ANCOR?

In these situations, a dedicated multidisciplinary team including cardiologists, radiologists, and surgeons is recommended for a case-by-case discussion. It is important to have an algorithm based on evidence medicine, to take optimal decision for each patient according to the clinical presentation and angiography/coronary CT scan results. Vast majority of ANCORs with a malignant course are asymptomatic, sometimes it can cause symptoms that mimicking those of coronary artery disease. The diagnosis is made usually by invasive coronary angiography or Coronary CT scan. Demonstrating myocardial ischemia by non-invasive tests in this setting is difficult, that's why it seems acceptable to consider any angina like-symptoms. This is also advised for silent myocardial ischemia and severe ventricular arrythmias [7]. According to the expert consensus guidelines from the American Association for Thoracic Surgeons (AATS), surgery take a Class 1/Level B indication for any patient with a left ANCOR at risk, with or without symptoms, or with a symptomatic right ANCOR at risk. Surgery or continued observation may be reasonable Class IIb/Level B-NR in asymptomatic right ANCOR without inducible myocardial ischemia or anatomic severity criteria [8].

What is the place of PCI in these anomalies?

The published literature of percutaneous coronary intervention (PCI) for ANCOR with an interarterial is poor [9]. In the same guidelines of AATS the place of PCI is only reserved for adults with high risk for surgery Class IIb/C). It seems reasonable that patients over 30 years old with an RCA anomaly of connection associated with symptoms or documented myocardial ischemia to be proposed for percutaneous coronary intervention (PCI). When it is indicated intravascular ultrasound (IVUS) is welcomed for the evaluation of the ectopic segment and for the control after stenting [9,10] which has to be direct [7].

4. CONCLUSIONS

In Young patients presenting with myocardial infarction; anomalous coronary artery connection with an interarterial course should always be seeking for. Coronary CT scan plays an important role in the diagnosis and the therapeutic decision which must always be supported by a heart team.

CONSENT

As per international standard or university standard, patients’ written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).
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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Angelini P, Velasco JA, Flamm S. Coronary anomalies: Incidence, pathophysiology and clinical relevance. Circulation 2002;105:2449-54.

2. Bogers AJ, Gittenberger-de Groot AC, Poelmann RE, Pault BM, Huysmans HA. Development of the origin of the coronary arteries, a matter of ingrowth or outgrowth? Anat Embryol (Berl). 1989;180(5):437-41.

3. Click RL, Holmes Jr DR, Vlietstra RE, Kosinski AS, Kronmal RA, the participants of the coronary artery surgery study (CASS). Anomalous coronary arteries: location, degree of atherosclerosis and effect on survival – a report from the coronary artery surgery study. J Am Coll Cardiol. 1989;13:531–7.

4. Wilkins CE, Betancourt B, Mathur VS, Massumi A, De Castro CM, Garcia E, Hall RJ. Coronary artery anomalies: A review of more than 10,000 patients from the Clayton Cardiovascular Laboratories. Tex Heart Inst J. 1988;15(3):166-73.

5. Frescura C, Basso C, Thiene G. Anomalous origin of coronary arteries and risk of sudden death: A study based on the autopsy population of congenital heart disease. Hum Pathol. 1998;29:689-95.

6. Satija B, Sanyal K, Katayani K. Malignant anomalous right coronary artery detected by multidetector row computed tomography coronary angiography. J Cardiovasc Dis Res 2012;3:40-2.

7. Aubry P, Halna du Fretay X, Boudvillain O, Degrell P. ANOCOR working group. Place of Angioplasty for Coronary Artery Anomalies With Interarterial Course. Front Cardiovasc Med. 2021;7:596018.

8. Brothers JA, Frommelt MA, Jaquiss RDB, Myerburg RJ, Fraser CD Jr, Tweddell JS. Expert consensus guidelines: Anomalous aortic origin of a coronary artery. J Thorac Cardiovasc Surg. 2017;153(6):1440-57.

9. Angelini P. Novel imaging of coronary artery anomalies to assess their prevalence, the causes of clinical symptoms, and the risk of sudden cardiac death. Circ Cardiovasc Imaging. 2014;7(4):747-54.

10. Stout KK, Daniels CJ, Aboulhosn JA, Bozkurt B, Broberg CS, Colman JM, et al. 2018 AHA/ACC Guideline for the management of adults with congenital heart disease: Executive summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol. 2019;73(12):1494-563.

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