CASE REPORT

Single coronary artery originating from the right sinus Valsalva presenting as typical angina pectoris

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Accepted 18 February 2016

SUMMARY

A single coronary artery (SCA) ostium is a rare finding. In the general population, the incidence of SCA is approximately 0.024%. We introduce a case of a warehouseman presenting with chest pain after a morning work. The exercise ECG showed ST segment depression in the V 1–4 leads. The coronary angiography procedure and the CT demonstrated an SCA dividing into the right coronary artery and left main coronary artery. We identified a borderline lesion in the distal left anterior descending artery with fractional flow reserve of 0.85. In our case, the coronary anomaly was considered at low risk of arrhythmia and sudden death, and the patient was, therefore, treated conservatively.

BACKGROUND

Coronary circulation anomalies are usually detected as coincidental findings during coronary angiography (CAG) or at autopsy; in the adult population, their prevalence is reported to be approximately 0.3–1.3%. Clinically, they may cause arrhythmias, syncope, myocardial infarction, or sudden death, in up to 20% of patients.^{1–3}

The normal anomaly encompasses a wide spectrum of normal variants, which are often discovered as incidental findings during CAG. A single coronary artery (SCA) ostium is a rare finding.

In the general population, the incidence of SCA is approximately 0.024%.^{1–3}

We introduce a case of a warehouseman with average energy requirement for his working activity >6 Metabolic Equivalents of Task (MET), presenting with chest pain after a morning of work.

CASE PRESENTATION

A 48-year-old man came to our department, with exertional angina and palpitations. That morning, he had worked at his job as a warehouseman for almost 4 h, carrying out various activities requiring considerable physical effort. He had a medical history of hypertension and dyslipidaemia and a family history of coronary artery disease.

Laboratory examinations were unremarkable, with no troponin change. Echocardiography revealed preserved left ventricle systolic function and concentric left ventricle hypertrophy. Exercise ECG showed dynamic changes with ST-segment depression in the V 1–4 leads. The CAG procedure demonstrated an SCA. The left main coronary artery (LMCA) originated from the right coronary artery (RCA) (figure 1 and video 1). There was a borderline lesion in the distal left anterior

Figure 1 Coronary angiography showed a single coronary artery arising from the right sinus of Valsalva, and dividing into the right coronary artery (RCA) and left main coronary artery (LMCA).

descending (LAD) artery with fractional flow reserve (FFR) of 0.85.

In order to better define the origin and course of the single vessel, we performed a multislice CT (MSCT), using a 64-detector-row scanner, which showed an SCA arising from the right sinus Valsalva, and dividing into the RCA and LMCA. The LMCA turned anteriorly in front of the right

Video 1 Coronary angiography showing a single coronary artery arising from the right sinus of Valsalva and dividing into the right coronary artery and left main coronary artery.

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To cite: Lamberti M, Ratti G, Tedeschi C, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2015-213798

Figure 2 Multislice CT volume rendering reconstruction showing a single coronary artery arising from the right sinus Valsalva and dividing into the right coronary artery (RCA) and left main coronary artery (LMCA). The LMCA turns anteriorly in front of the right ventricular outflow tract, reaching the atrioventricular groove where it divides into the left anterior descending coronary and left circumflex arteries.

ventricular outflow tract, reaching the atrioventricular groove, where it divided into the LAD and left circumflex (CX) arteries (figure 2). The MSCT confirmed the presence of a borderline lesion in the distal LAD artery (figure 3).

TREATMENT

The finding, in our case, of an LMCA that turned anteriorly in front of the right ventricular outflow tract with haemodynamically non-significant stenosis on the LAD artery, proved crucial in determining the therapeutic treatment with antihypertensive drugs (ACE inhibitors ramipril 5 mg and β -blocker bisoprolol 2.5 mg), statins (atorvastatin 40 mg) and antiplatelets (acetylsalicylic acid 100 mg).

The patient was also recommended abstinence from smoking and daily blood pressure monitoring.

OUTCOME AND FOLLOW-UP

At 2-month follow-up, the patient reported no angina and no exertional dyspnoea.

His exercise tolerance during treadmill test was >12 METs, with the appearance of neither ECG abnormalities nor symptoms. Mean values of blood pressure were 130/95 mm Hg and low-density lipoprotein was 68 mg%.

We discussed this case in a multidisciplinary meeting to determine the best treatment option and decided to continue temporarily with medical therapy alone; the patient was also recommended to avoid strenuous work (under 6 METs) and physical stress. This decision was derived from both the FFR result (in accordance with the angiographic guidelines)⁴ and the discordance between ECG and troponin. However, we decided to refer the patient to a cardiac quarterly re-evaluation to assess any clinical changes that would require a change in therapy.

Figure 3 Curved multiplanar reconstruction (CMR) from multislice CT showing a non-calcified plaque (yellow arrow) in the left anterior descending (LAD) artery.

DISCUSSION

The incidence of an SCA is 1.3% of all anomalies.^{5–8} They are classified according to the sinus of origin and anatomical distribution, and according to their relationship with the great vessels.⁵ An SCA originating from the ostium of the RCA is one of the most rarely seen and accounts for 0.05% of all coronary anomalies.

Concerning its course, four variants have been described. In the first, the LMCA turns anteriorly in front of the right ventricular outflow tract. In the second, defined as interarterial decourse, the LMCA lies between the great vessels, aorta and pulmonary artery. In the third variant, the LMCA has an intramyocardial septal course. In the last, the LMCA presents a posterior course behind the aorta in an inferoposterior direction.^{5 9–11}

The interarterial course causes sudden cardiac death in >50% of patients by vascular compression or kinking.^{12 13} The other types of SCA courses can cause myocardial ischaemia as well, due to the impaired coronary flow reserve and also secondary to anomaly of the ostium (ostial tissue flaps and initial course of the coronary artery within the aortic wall or acute aortocoronary angulation).⁹

CAG is the gold standard for the evaluation of coronary artery disease. However, in the case of coronary anomalies, some misinterpretations of the CAG are possible.

Therefore, additional non-invasive imaging methods, with better spatial resolution, such as MSCT, are recommended to provide anatomical information that may have prognostic value.^{14–19}

MSCT can accurately visualise the coronary artery, detecting the relationship of the anomalous vessels with the great vessels and cardiac structure.

Because of the overall low number of patients with SCA, the treatment strategy has not been clearly defined.

Generally, adult patients with SCA, in the absence of coronary stenosis and an anatomical malignant course, in consideration that sudden death occurs at a young age, probably do not need surgical therapy, and medical treatment could be sufficient.^{20–22} Nevertheless, when these patients are young and symptomatic, clear guidelines have not yet been defined and the treatment is still controversial.^{19–21}

In our case, the coronary anomaly was considered at low risk of arrhythmia and sudden death, and the patient was, therefore, temporarily treated conservatively. Although the cause of angina may have been due to a coronary artery spasm associated with abnormal anatomy of the coronary vessels, we nevertheless reduced the time interval of medical follow-up and advised the patient to reduce the effort related to his professional activity to under 6 METs.^{23–25}

Learning points

- ▶ Coronary circulation anomalies are usually detected as coincidental findings during coronary angiography or at autopsy; in the adult population, they cause arrhythmias, syncope, myocardial infarction or sudden death in only 20% of patients.
- ▶ The development of new non-invasive imaging methods, with better spatial resolution, such as multislice CT, is recommended to determine the course of the anomaly.
- ▶ Single coronary artery, in absence of coronary stenosis and an anatomical malignant course, could remain silent and asymptomatic. In this case, active monitoring and primary prevention of coronary artery disease would be a reasonable management strategy in the first instance.

Acknowledgements The authors thank Maurizio Sacco for his support and assistance in CT reconstruction.

Contributors CT was responsible for the radiological assessment. GR and CC were involved in the cardiological evaluation. ML worked on the rehabilitation phase and wrote the manuscript.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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