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Case Report

Myocardial Ischaemia Secondary to Anomalous Aortic Origin of the Left Main Coronary Artery

Eng-Frost J[1,2]* and Choo WK[2]

[1]Department of Cardiology, Flinders Medical Centre, Bedford Park, Australia

[2]Department of Cardiology, Royal Darwin Hospital, Tiwi, Northern Territory, Australia

***Corresponding author:** Joanne Eng-Frost, Department of Cardiology, Flinders Medical Centre, Level 6, Bedford Park, Australia

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Abstract

Coronary Artery Anomalies (CAAs) are a heterogenous group of congenital disorders with an increasing incidence. Affected patients may present with a spectrum of symptoms reflective of myocardial ischaemia, depending on blood flow through the anomalous coronary artery and therefore myocardial supply. We present a case of a positive echocardiographic stress test in a patient with significant cardiovascular disease risk factors, who was subsequently found to have anomalous origin of the left main coronary artery arising from the right coronary cusp and running a malignant course between the aorta and the main pulmonary trunk. She later underwent re-diversion of the left main coronary artery to the left coronary sinus, and autologous pericardial patch to remnant stump of LMCA with symptom resolution.

Keywords: Anomalous origin; Coronary anomalies; Chest pain; Myocardial ischaemia; Non-atherosclerotic

Introduction

Hospital presentation for chest pain is very common and requires consideration of a wide range of differential diagnoses. Exclusion of myocardial ischaemia arising from an underlying atherosclerotic process is critical especially in patients presenting with multiple cardiovascular disease risk factors however non-atherosclerotic causes including coronary anomalies can also disrupt normal coronary flow and result in myocardial ischaemia. Here we present a case of typical angina due to anomalous left main coronary artery origin.

Case Presentation

A 52-year-old lady with a medical history significant for hypothyroidism only underwent an elective exercise stress test to investigate a 2-month history of exertional substernal chest tightness and exertional dyspnoea. She also reported associated reduction in exercise tolerance to two hundred metres from a previously unlimited baseline.

Cardiovascular risk factors included being a reformed smoker with a 40-pack year history after cessation 25 years ago, and a strong maternal family history of early ischaemic heart disease, with her mother undergoing coronary bypass grafting aged in her 30s, her aunt undergoing multiple percutaneous coronary interventions aged in her 50s, and two uncles suffering fatal myocardial infarctions before age 40 years.

Admission electrocardiogram showed normal sinus rhythm with no ischaemic changes. Bruce-protocol Exercise Stress Testing (EST) was profoundly positive at 3 minutes both subjectively with the recurrence of chest discomfort, and objectively with the development of widespread ST segment depression persisting until 11 minutes into recovery. There were no arrhythmias. She was admitted to Cardiology for further workup.

Cardiorespiratory examinations and investigations including full blood count, electrolytes, troponin and lipid studies were unremarkable. Transthoracic echocardiogram showed normal biventricular size and function.

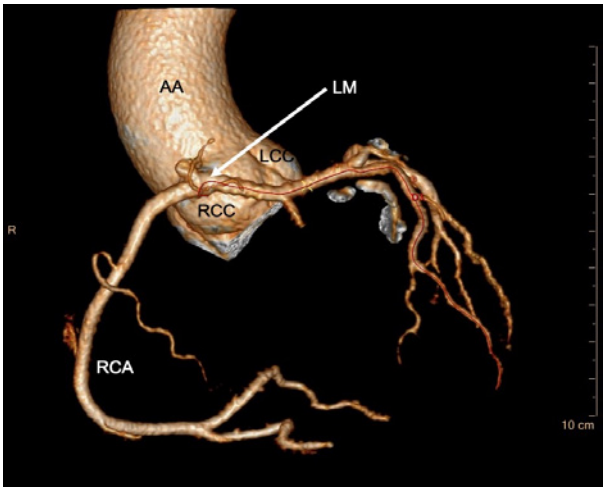

Figure 1:

Invasive coronary angiography demonstrated angiographically smooth coronary arteries but revealed aberrant origin of the left main coronary artery (LMCA).

Computer Tomography Coronary Angiogram (CT-CA) confirmed anomalous origin of the LMCA arising from the ostium of the dominant Right Coronary Artery (RCA; Figure 1), which ran a malignant course between the aorta and the main pulmonary trunk (Figure 2).

She subsequently underwent re-diversion of the left main coronary artery to the left coronary sinus, and autologous pericardial patch to remnant stump of LMCA. There were no post-operative complications.

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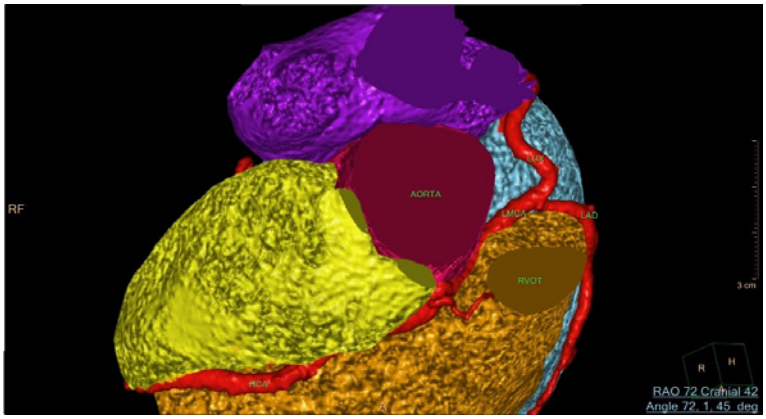

Figure 2:

Discussion

Coronary Artery Anomalies (CAAs) were previously thought to be rare disorders, however the incidence of CAAs has been reported to be as high as 5.64% in continuous series of coronary angiographies performed in 1950 patients [1]. Advances in non-invasive coronary imaging such as CT coronary angiography is likely to lead to increasing diagnoses of CAAs.

CAAs are a heterogenous group of congenital disorders encompassing ectopic arteries, coronary fistulas, absent coronary arteries, and anomalous origins of coronary arteries. The clinical significance of CAAs vary depending on the effect on coronary artery blood flow.

Anomalous aortic origin of either coronary artery from the opposite sinus remains a rare manifestation of CAAs, with an incidence of up to 1.74% [1]. Despite this, this class of CAAs carry significant risk of adverse outcomes due to myocardial supply abnormalities as a result of the resultant abnormal coronary artery course. Anomalous origin of the left coronary artery is much more uncommon than anomalous origin of the right coronary artery, with an incidence of 0.15% compared to 0.92% respectively [1]. This is similar to findings from the Congenital Heart Surgeons' Society Registry of Anomalous Aortic Origin of the Coronary Artery of 560 patients under 30 years of age at diagnosis demonstrating 128 patients with anomalous origin of left coronary artery, compared to 415 patients with anomalous origin of right coronary artery [2].

Anomalous aortic origin of the left main coronary artery arising from the right coronary sinus represents a higher risk lesion, as the anomalous coronary artery usually supplies the left ventricle by running a malignant course between the aorta and pulmonary artery. This leaves it particularly susceptible to changes in aortic pressure such as hypertension, a condition more prevalent with increasing age. Furthermore, CAAs are also associated with abnormally narrowed coronary orifices which can become severely obstructed during periods of increased cardiac output, such as exercise [3,4].

Patients may therefore present with a spectrum of symptoms reflective of myocardial ischaemia including chest pain, dyspnoea and palpitations, or in more severe cases, myocardial infarction, syncope or sudden cardiac death [5].

Due to the increased risk of sudden death, surgery is recommended for all patients with anomalous aortic origin of either coronary artery who are symptomatic, as well as patients with anomalous aortic origin of the left coronary artery due to its associated high-risk anatomy [6]. Post-operative outcomes are good with low mortality rates and resolution of myocardial ischaemia symptoms [7].

Whilst atherosclerotic heart disease remains the predominant cause of myocardial ischaemia, we present an interesting case of ischaemia that highlights the need to consider non-atherosclerotic contributors such as coronary artery anomalies especially with its increasing incidence.

Declaration

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Author contribution: JEF and WKC drafted and approved the final manuscript.

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