

Case Report

Three coronary arteries arising from the right coronary cusp with a malignant sub-pulmonary course of the left anterior descending artery



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ABSTRACT

We describe a case of a 45-year-old man presenting with acute myocardial infarction investigated by computed tomography coronary angiography. Interestingly all three coronary arteries arose from the right coronary cusp. The left anterior descending artery (LAD) subtended an acute angle from the aortic root, associated with significant kinking and stenosis at the ostium, before passing anteriorly, taking a sub-pulmonic course and descending in the anterior interventricular groove. The distal vessel was small with an atrophic appearance. The circumflex artery followed a retro-aortic route, before trifurcating to supply the lateral and posterior walls of the left ventricle. The right coronary artery was normal. Given his unstable presentation and the potentially lethal course of the LAD, he was referred for grafting of the LAD vessel which successfully ameliorated his symptoms and has thus far prevented recurrent myocardial infarction.

<Learning objective: Computed tomography coronary angiography is becoming increasingly accessible to physicians for the investigation of patients with suspected coronary disease and the planning of surgery. As such, coronary anomalies are likely to be encountered more frequently, and it is important to appreciate their clinical significance.>

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Introduction

A 45-year-old man suffered recurrent admissions to hospital with unstable angina and subsequently a non-ST elevation myocardial infarction, confirmed by anterolateral ST segment depression, and a rise in serum troponin I concentration 12 h following his chest pain. Conventional coronary angiography was performed which identified markedly abnormal coronary anatomy (Fig. 1). The patient was evaluated further by computed tomography (CT) coronary angiography (Fig. 2). Interestingly, all three coronary arteries were found to arise from the right coronary cusp (RCC). The left anterior descending artery (LAD) subtended an acute angle from the aortic root, associated with significant kinking of the vessel and ostial stenosis before passing anteriorly, taking a sub-pulmonic course and descending in the anterior interventricular groove. The distal vessel was small with an atrophic appearance. The circumflex artery followed a retro-aortic route, before trifurcating to supply

the lateral and posterior walls of the left ventricle. The right coronary artery was large and dominant (Fig. 1 and online movie). The patient subsequently underwent exercise testing as per the Bruce protocol. This was stopped at 9 min due to cardiac chest pain and 1 mm ST segment depression in anterolateral leads.

Given the potentially lethal course of the LAD and his presentation with an acute coronary syndrome with evidence of obstructive coronary disease, he was referred for bypass grafting of the LAD vessel with an internal mammary graft. Surgery was uncomplicated, and successfully ameliorated his symptoms and has thus far avoided recurrent myocardial infarction.

Discussion

The incidence of anomalous coronary anatomy is estimated to be around 5.6%. The incidence of all three coronary arteries arising from the RCC is extremely rare, having been described only in isolated case reports. Most commonly, with an incidence of 0.7%, the circumflex arises from the RCC. Of most clinical significance are aberrations of the left anterior descending artery, which have an incidence of 0.15% and are classified anatomically as retro-aortic,

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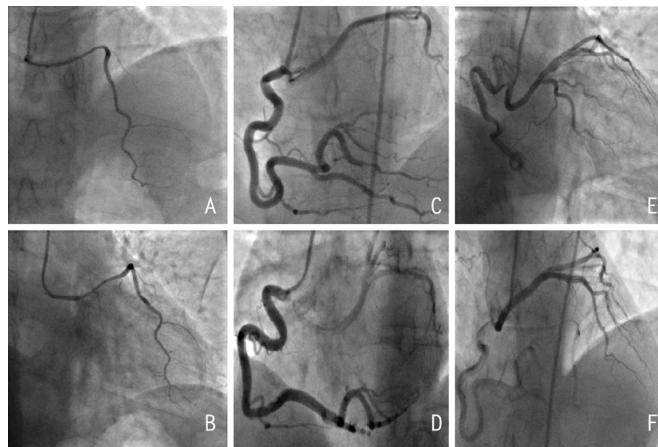


Fig. 1. Invasive coronary angiography. The left anterior descending artery (LAD) is proximally stenosed and arises from the right coronary cusp [(A) anteroposterior (AP) cranial and (B) right anterior oblique (RAO) caudal]. The right coronary artery is large and dominant with a normal distribution, and is closely associated with the ostium of the circumflex [(C) AP cranial], which passes posteriorly [(D) left anterior oblique], and supplies the postero-lateral surface of the left ventricle [(E) RAO caudal]. Partial opacification of all three vessels was only briefly achieved [(F) AP cranial].

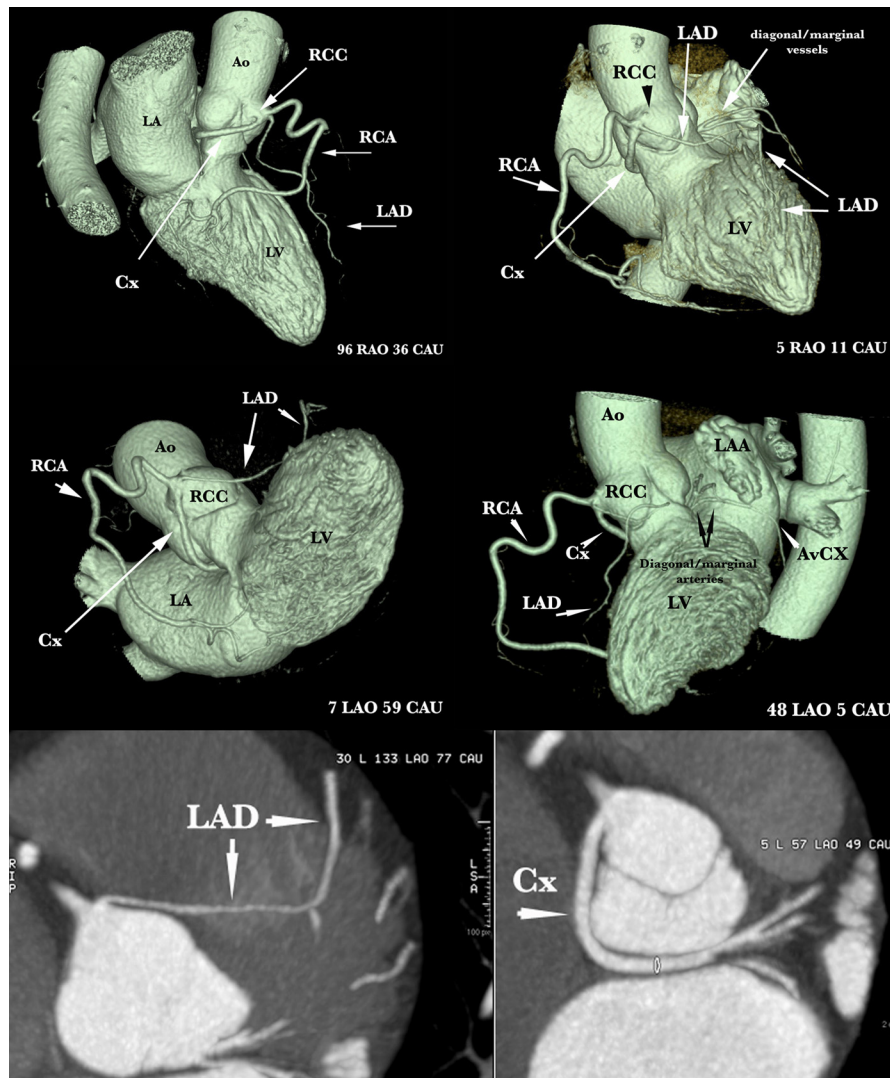


Fig. 2. Computed tomography coronary angiography. Three-dimensional reconstructions (upper and middle panels) and axial views (lower panels). The abnormalities demonstrated by conventional coronary angiography are well demonstrated in three dimensions. All three coronary arteries arise from the right coronary cusp. The LAD is small and atrophic and takes a sub-pulmonic course to the anterior interventricular groove. The proximal kinking of the LAD is well demonstrated in the axial view (lower left panel). The circumflex artery clearly passes posterior to the aorta to supply the posterolateral left ventricle. The normal anatomy of the right coronary artery is confirmed. Ao, aorta; AvCx, atrioventricular portion of circumflex artery; CAU, caudal; CRA, cranial; Cx, circumflex artery; LA, left atrium; LAD, left anterior descending artery; LAO, left anterior oblique; LV, left ventricle; RAO, right anterior oblique; RCA, right coronary artery; RCC, right coronary cusp.

inter-arterial, pre-pulmonic or sub-pulmonic [1]. An inter-arterial course of the LAD is often described as malignant, and is classically recognized as an indication for surgical revascularization, as this arterial configuration may cause symptoms such as chest pain, dyspnea, and syncope and is implicated in sudden cardiac death, particularly on exertion [2].

Management of such patients is dependent on prompt and accurate recognition of significant anatomical variance. Intervention for anomalous coronary anatomy is individualized depending on the clinical presentation and the perceived risk of sudden cardiac death. Optimal means of identifying high-risk patients who may benefit from revascularization are ill-defined, although intravascular ultrasound and pharmacological stress testing may be of use [3].

Conflict of interest

Authors declare no conflict of interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jccase.2013.11.004>.

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