CASE REPORT

Coronary arteries from a single coronary ostium in the right coronary sinus: a previously unreported anatomy

D A H Neil, R S Bonser, J N Townend

Abstract

The coronary circulation originating from a single coronary ostium is rare. All possible anatomical variations were the basis of a recent classification. This case report describes a previously unreported IID₁ pattern, comprising a solitary coronary ostium in the right coronary sinus with an anatomical course of the right coronary artery. The left circumflex coronary artery arises from the proximal right coronary artery coursing behind the aorta to the left. The left anterior descending coronary artery arises from the proximal right coronary artery coursing to the left side anterior to the right ventricle.

(Heart 2000;83:e9)

Keywords: single coronary ostium; coronary artery anatomy

Coronary arteries originating from a single coronary ostium in the aorta are rare,¹ occurring in less than 0.03% of the general population.² The first report of a single coronary artery was by Hyrtl in 1841.³ Classifications have evolved as different anatomical variations were reported either angiographically or as necropsy findings. The most recent classification by Shirani and Roberts¹ is anatomically based, depending on the aortic sinus of origin and the pattern of distribution of the coronary arteries. In this classification, all possible anatomical variations were considered, whether or not a case had been reported. Several proposed subtypes had never been reported. An ostium originating from the left aortic sinus is type I and from the right aortic sinus, type II. Subtypes depend on the course of the coronary arteries. We describe a proposed but previously unreported IID₁ pattern: a solitary ostium in the right coronary sinus (II), the left circumflex coronary artery arising from the proximal right coronary artery arising from the proximal right coronary artery coursing behind the aorta and anterior to the atria to the left (D), and the left anterior descending coronary artery arising from the proximal right coronary artery travelling from the left side anterior to the right ventricle (A).

Case report

A 48 year old hypertensive man underwent an emergency repair of a ruptured complex type B

thoracic aortic dissection, in which the intimal tear was between the left carotid and left subclavian artery origins. The operation consisted of aortic arch and proximal descending aorta replacement with the reimplantation of the left subclavian artery. Recovery was complicated by renal failure, secondary to residual distal dissection, and prolonged ventilation, but the patient was discharged after one month.

The patient returned four months later with a three week history of shortness of breath, fever, and night sweats. He was found to be febrile, anaemic, and in heart failure with aortic regurgitation. Investigation confirmed enterococcal septicaemia because of infective endocarditis of the aortic valve, and antibiotic treatment was commenced. Surgical repair was planned, but the patient developed a sudden onset of confusion and dysphasia before this, progressing to coma. A scan showed a subarachnoid haemorrhage. He died suddenly, approximately 12 hours after the initial bleed.

At postmortem examination, the cause of death was found to be rupture of a mycotic aneurysm of the left middle cerebral artery. In addition, multiple small embolic cerebral and splenic infarcts were identified. The liver showed features of mild adult polycystic disease. It contained several small haematoma composed of von Meyenberg complexes, consisting of collections of irregularly shaped dilated bile ducts containing pink amorphous material.

The heart was enlarged (660 g) and the left ventricle was dilated. The right atrium, tricuspid valve, right ventricle, pulmonary valve, and artery; left atrium, and mitral valve were normal. The aortic valve had three symmetrical cusps with small vegetations, up to 8 mm long, on each cusp. Histology confirmed bacterial endocarditis with Gram positive cocci and showed a small area of embolic infarction in the interventricular septum.

CORONARY CIRCULATION

All three coronary arteries originated from a single ostium in the right aortic sinus (figs 1–3). The right coronary artery followed a normal course. The left anterior descending arose 1 cm from the coronary ostium and coursed anterior to the pulmonary trunk to the anterior interventricular groove where it took a sharp

Department of Pathology, University of Birmingham, Birmingham B15 2TT, UK

D A H Neil

Department of Cardiothoracic Surgery, Queen Elizabeth Hospital, Birmingham, UK
R S Bonser

Department of Cardiology, Queen Elizabeth Hospital
J N Townend

Correspondence to:
Dr Neil

Accepted 6 January 2000

Figure 1 The right coronary artery (RCA) arises from the solitary coronary ostium (arrow) and runs in the atrioventricular groove. The left anterior descending (LAD) and left circumflex (C_x) arise from the right coronary artery, 1 cm from the ostium. The right circumflex runs to the left between the aorta (A) and atria (a). The left anterior descending runs across the anterior right ventricle to reach the anterior interventricular groove.

Figure 2 Diagrammatic representation of the course of the coronary arteries from above, in the same orientation as fig 1. PT, pulmonary trunk; A, Aorta; MV, mitral valve; TV, tricuspid valve; LAD, left anterior descending artery; RCA, right coronary artery; C_x , circumflex artery.

turn to run down the interventricular groove. The left circumflex artery arose opposite the left anterior descending, coursed to the left behind the aorta, and in front of the atria to reach the atrioventricular groove on the left and then travelled the normal course.

Discussion

The coronary circulation arising from a single coronary ostium has little clinical significance, except for cases in which a coronary artery

Figure 3 Diagrammatic representation of the course of the coronary arteries from the front. AA, aortic arch; RA, right atrium; LAD, left anterior descending artery; RCA, right coronary artery; C_x , circumflex artery.

traverses between the pulmonary artery and aorta, which can cause sudden death at a young age due to extrinsic coronary arterial occlusion.^{1,4} The other clinical implications involve difficulty visualising the circulation angiographically and accidental damage to an aberrant coursing artery during cardiac surgery.⁴

This report details a further subtype, a man with a previously unreported IID₁ pattern of coronary artery anatomy originating from a single ostium in the right coronary sinus. His unusual coronary artery anatomy had no clinical impact, being diagnosed at necropsy following an unrelated death. He had survived a ruptured thoracic aortic dissection, repaired surgically with a synthetic graft, with residual distal dissection. Despite initial recovery, he succumbed to aortic valve endocarditis with embolic lesions in the brain, heart, spleen, kidneys, and a mycotic aneurysm of the cerebral circulation. Aortic dissection has not previously been described in association with a single coronary ostium. Three of 33 patients with single coronary ostia, in which the cause of death is known, died from infective endocarditis.¹ An association with congenital abnormalities of the liver has not been previously described, however von Meyenberg complexes are not an uncommon incidental finding.⁵

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