Sudden cardiac arrest in a healthy young athlete

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Accepted 3 June 2015

DESCRIPTION

A 24-year-old previously healthy woman collapsed while running. This was witnessed by a pedestrian who initiated cardiopulmonary resuscitation (CPR) and called for emergency medical assistance. The patient was found to be in ventricular fibrillation, but achieved return of spontaneous circulation (ROSC) after desynchronised cardioversion. An ECG revealed ST segment depression in V4, V5 and V6 but was otherwise unremarkable, including a normal corrected QT interval. A bedside echocardiogram after the event revealed global hypokinesia with normal left ventricle thickness. She was taken to the catheterisation laboratory and underwent coronary angiography. This revealed a normal right circulation, but it was difficult to find the origin of the left main coronary artery (LMCA). The patient did not require therapeutic hypothermia as she appeared to have intact neurological functions. Further history failed to reveal previous angina, exertional dyspnoea or syncope. There was no family history of sudden cardiac death or known congenital cardiac conditions.

The differential diagnosis initially was broad and included hypertrophic cardiomyopathy, congenital long QT syndrome, and Brugada syndrome among others¹ (figure 1). All of these were ruled out with ECG and echocardiography. The difficulty faced in finding the origin of the LMCA pointed towards an

anomalous vessel as the cause of the cardiac arrest. A CT coronary angiogram confirmed the suspected diagnosis revealing a LMCA arising from the right coronary cusp and coursing between the ascending aorta and the main pulmonary artery (figure 2A), and a right coronary artery (RCA) arising adjacent to it (figure 2B). The proximal portion of vessel was compressed with 85% stenosis. The patient had an uneventful recovery. She was discharged with metoprolol succinate 25 mg daily, and a life vest for secondary prophylaxis of ventricular fibrillation and was instructed to avoid strenuous activity. A referral was made for surgical correction at a more experienced centre in cardiac surgery.

Anomalous origin of the LMCA is a rare entity with a prevalence of 0.2% on autopsy.² It is a well-recognised cause of sudden cardiac death as described by Cheitlin *et al* in their review. The suggested mechanism has to do with the angulation of the vessel as it arises from the right coronary sinus causing the entrance into the left coronary system to be slit-like. Flow becomes compromised with increased expansion of the pulmonary artery and aorta during exercise, causing further narrowing and compression of the proximal LMCA (figure 2C), as seen in the present case. Once diagnosis is confirmed, treatment is surgical correction with multiple techniques that involve forming a larger 'neo' ostium to allow for greater blood flow into the left arterial system.³

Congenital/Inherited					Acquired
Channelopathies	Conduction Abnormalities	Myocardial Disease	Valvular/Aortic Disease	Coronary Artery Disease	
Congenital long QT syndrome	Wolff-Parkinson-White syndrome	Hypertrophic cardiomyopathy (HCM)	Mitral valve prolapse	Anomalous insertion of the coronary arteries	Myocarditis
	Right ventricular outflow tachycardia (RVOT)	Arrhythmogenic right ventricular cardiomyopathy (ARVC)	Aortic stenosis		Infiltrative (e.g. sarcoid, amyloid)
Brugada syndrome	Catecholaminergic polymorphic tachycardia	Dilated cardiomyopathy	Marfan syndrome	Coronary vasospasm	Drugs (e.g. cocaine, amphetamine) Potassium disturbance (e.g. hypokalaemia, hyperkalaemia) Commotio cordis

Figure 1 Chart depicting the categories and different aetiologies for sudden cardiac death in young patients.

To cite: Hilal T. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2015-210615

Figure 2 CT coronary angiogram showing origin of the LMCA from the right sinus (A) and origin of the RCA from the same sinus (B), and a schematic showing the relationship of an anomalous LMCA to the pulmonary artery (C) (LC, left coronary; LMCA, left main coronary artery; NC, non-coronary; RC, right coronary; RCA, right coronary artery).

Learning points

- ▶ Anomalous origin of the left main coronary artery (LMCA) is a rare but important cause of sudden cardiac death, and should be considered in young patients with unexplained cardiac arrest.
- ▶ The anatomic position of the LMCA when arising from the right (anterior) coronary sinus causes compression of the vessel as it courses between the aorta and pulmonary artery, especially during exercise.
- ▶ Surgical correction is the treatment of choice and should be carried out at experienced centres due to the high risk of error.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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