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Case reports

Surgery for anomalous origin of the right coronary artery

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SUMMARY In a young man presenting with an episode of syncope and ventricular tachycardia but with no chest pain the right coronary artery was found to originate from the left aortic sinus of Valsalva. After a coronary artery bypass graft he was able to return to full activity.

Origin of the right coronary artery from the left aortic sinus of Valsalva is a rare anomaly. It has not shared the sinister reputation of the corresponding abnormality of the left coronary artery (origin from the anterior aortic sinus). We report its association with syncope and ventricular tachycardia in a patient who had prolonged remission of symptoms after coronary artery bypass grafting.

Case report

A 29 year old computer manager was admitted to hospital in July 1980 after an episode of syncope while playing touch football. He had no history of cardiac disease, was a non-smoker, and had been engaged in regular athletic activity, running up to 70 km a week. On arrival he was pale, dyspnoeic, and sweaty. He was in sinus rhythm with frequent ventricular extrasystoles, his blood pressure was 110/70 mm Hg, and there was a fourth heart sound. An electrocardiogram showed T wave inversion in leads III, aVF, and V1–4, which deepened in V3–4 over the next day. Serum creatine phosphokinase activity was slightly increased (278 U/l, normal range 20–120 U/l). He was discharged taking quinidine and referred for further evaluation.

An echocardiogram was normal. Exercise testing to beyond stage IV (Bruce protocol[1]) provoked frequent ventricular extrasystoles and short runs of ventricular tachycardia. A thallium scan after exercise showed that peak counts over the posterior wall were 30% greater than those over the basal septum. Coronary angiography showed a normal left system. The right coronary artery arose from the left coronary sinus and passed between the aorta and right ventricular outflow tract before taking its normal course to become the posterior descending artery. The abnormal portion appeared to be narrowed between the great arteries (Figure). The left ventriculogram was normal.

Surgery was advised, and at operation (February 1981) the arteriographic findings were confirmed. A single saphenous vein graft was inserted from the aorta to the right coronary artery as it emerged from behind the pulmonary artery.

He had several episodes of ventricular tachycardia in the month after surgery and was treated for six months with quinidine and disopyramide. These drugs were then withdrawn with no recurrence of his symptoms. Five months after operation he was able to exercise on a treadmill to a peak speed of 10 kph with a grade of 20% with only infrequent ventricular extrasystoles. He remained well and returned to full activity. In September 1982 he competed in a "half marathon," running within six minutes of the course record, and in May 1984 was running up to 80 km a week and competing in races of up to 20 km. A 24 hour (Holter) electrocardiogram showed resting bradycardia with frequent ventricular extrasystoles which became less frequent with exercise and during another stress test.

Discussion

Almost certainly our patient experienced some form

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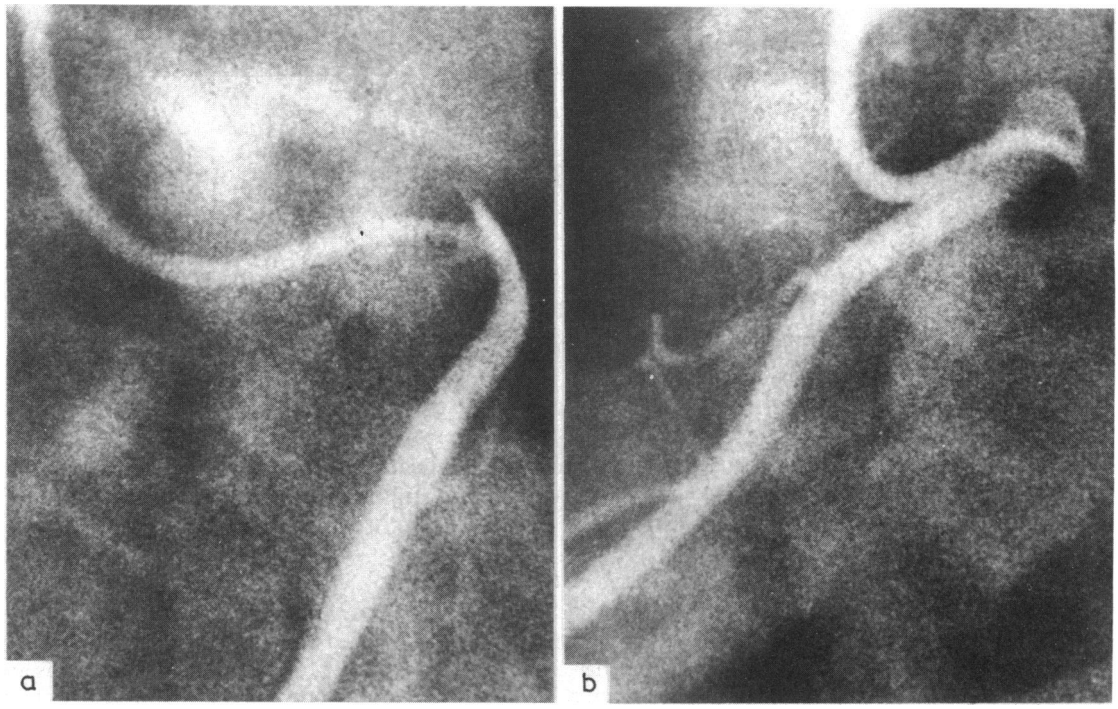

Figure *Right coronary arteriograms in (a) left and (b) right anterior oblique projections showing proximal portion of vessel apparently compressed between aorta and pulmonary artery.*

of cardiovascular event at the time he presented, and given that we subsequently documented exercise related ventricular tachycardia we believe that this was probably an arrhythmia. He had no chest pain, but the T wave changes and fourth heart sound may have been evidence of ischaemia, although the increase in the serum creatine phosphokinase activity might be attributed to release from skeletal muscle because of his exertion, and the thallium scan did not show an exercise related perfusion defect in the distribution of the right coronary artery. Although at the time we were aware of reports attributing ventricular arrhythmias and death to anomalous origin of the left coronary artery from the anterior sinus of Valsalva,[2-4] the corresponding abnormality of the right coronary artery was reported to be without clinical importance, with only isolated instances of associated morbidity.[3 5 6] Nevertheless, there appeared to be no other explanation in this previously very fit young man. We were persuaded by the evident deformity of the proximal right coronary artery that the potential for ischaemia was present. In the circumstances we considered it appropriate to offer him a single graft to the right coronary artery, and although he required treatment for a time after surgery he is apparently no longer at risk from exercise related ventricular tachycardia.

Origin of the right coronary artery from the left sinus of Valsalva is a rare anomaly. In two unselected postmortem studies the incidence was reported as 0·6%[7] and 0·26%,[8] while in angiographic series[5 9] it was less than 0·2%. Origin of the left coronary artery from the anterior aortic sinus is commoner and has been well recognised to cause exercise related arrhythmias and sudden death in young men.[2-4] Before 1980, however, anomalous origin of the right coronary artery was regarded as generally benign[2 4] with only a few reported cases of associated chest pain or arrhythmias.[3 5] In that year Benge *et al* described heart block and posterior wall infarction in a young man with anomalous origin of the right coronary artery from the left aortic sinus,[6] and Roberts *et al* subsequently reported the necropsy findings in 10 patients, in three of whom death was sudden and related to exertion.[10]

The mechanisms that have been postulated include compression of the proximal portion of the coronary artery as it passes between the aorta and right ventricular outflow tract and stretching or distortion of the ostium. Although the latter might seem more plausible, given that the pulmonary artery is more readily compressed than a vessel perfused at systemic pressure, the proximal right coronary artery in our case and in those described by Bloomfield *et al*[11] and

Keren *et al*[12] appeared to be narrowed for some little distance beyond the ostium.

There have been several published reports of surgery for this anomaly.[11 13] One describes a young man with angina, ventricular fibrillation, and inferior infarction, in whom studies at operation showed that diminished coronary reserve in the distribution of the right coronary artery was corrected by a graft. Our patient is the first of whom we are aware who has had vein grafting for this condition and in whom a long period of subsequent good health argues for a successful result.

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