Aorto-atrial fistula after operated type A dissection


Abstract

The development of a fistula between the aorta and right atrium is a rare complication of ascending aortic dissection and has a high mortality if not diagnosed and surgically treated. Clinical diagnosis is best supported by specialised imaging. In addition it may present technically very challenging problems. We report the first case which follows aortic root replacement for an acute type A dissection. Aorto-right atrial fistula (AoRAF) rarely complicates ascending aortic dissection. We report the first case to follow corrective surgery for aortic dissection.

1. Case report

A 52-year-old man presented with intermittent haemoptysis for 4 months, increasing exertional dyspnoea over 11 months and right-sided pleuritic chest pain. He was previously well for 17 years following a 31 mm Björk-Shiley composite aortic root replacement by inclusion technique at another hospital for a type A aortic dissection with acute aortic incompetence. Because of an aortic wall tear upon reimplantation of the left coronary ostium and consequent anterior wall ischaemia, an aortosaphenous vein graft was made to the first diagonal branch of the left anterior descending artery (LAD). He had no history of hypertension and denied angina and claudication.

On examination, the internal jugular venous pulse was elevated. Upper limb pulses were normal at 68 beats per minute. Both femoral pulses were weak and only the left dorsalis pedis pulse was palpable. Blood pressure was 135/70 mmHg. There was a grade 3 holosystolic murmur with a softer diastolic component at the lower left sternal edge and bilateral basal pulmonary crepitations. Electrocardiography showed sinus rhythm with left ventricular hypertrophy.

Echocardiography showed an aneurysm of the aortic root with a fistula to the roof of the right atrium. Right heart catheterisation confirmed a 2:1 left-to-right shunt. Angiography revealed persistent chronic aortic dissection. The innominate and left common carotid arteries arose from the true lumen. All other arteries, including both femoral arteries and, surprisingly, the saphenous vein graft arose from the false lumen. The only communication between the two lumina was at the level of the composite graft. Magnetic resonance imaging (MRI) confirmed a large aortic root aneurysm surrounding the valved conduit, with a communication between conduit and aneurysm and a fistula between aneurysm and right atrium (Figs. 1 and 2). The aneurysm appeared adherent to the sternum.

At operation, cardiopulmonary bypass (CPB) was established by right femorofemoral cannulation. Systemic temperature was reduced to 16°C. Satisfactory perfusion of the carotid arteries (true lumen) was confirmed by Doppler ultrasound and by comparison of arterial pressure waveforms at the left dorsalis pedis artery (false lumen) and the right radial artery (true lumen). Following redo median sternotomy, the heart was dissected from its sternal and pleural adhesions. The native aorta was clamped above the conduit and cerebral perfusion was again checked by pressure tracings and carotid Doppler ultrasound. The thickened wall of the aneurysm around the aortic root was opened longitudinally and a 5 mm-diameter fistula into the roof of the right atrium sutured closed. The coronary ostia in the aneurysmal wall were completely avulsed from the graft implantation sites. As the coronary ostia were too recessed within the heart for reimplantation, their aneurysmal openings were sutured closed. The distorted graft was replaced with a 29 mm St. Jude Medical composite aortic root graft.

Keywords: aortic dissection, aortic fistula, cardiopulmonary bypass, cardiac surgery
Fenestration of the intimal dissection flap in the aortic arch to ensure adequate flow down both lumina and the distal aortic anastomosis were then performed under 15 min of deep hypothermic circulatory arrest. Three saphenous vein grafts were applied to the LAD, obtuse marginal and right coronary arteries. The total cross-clamp time was 152 min. Myocardial protection was achieved by deep hypothermia and intermittent antegrade cold blood cardioplegia through the old and new vein grafts. After rewarming, the patient came off CPB after 315 min with sequential pacing and 7 μg/kg min of dopamine.

The patient was extubated 34 h after operation, neurologically intact. The postoperative recovery was uneventful, and he was discharged from hospital after 8 days. He made a full recovery and was asymptomatic at one year.

2. Discussion

Thoracic aortic dissection rupturing into the cardiac cavities is an unfamiliar diagnosis which, if not recognised, can be rapidly fatal. This most commonly presents as congestive cardiac failure with a continuous murmur [1]. A diastolic murmur can lead to a misdiagnosis of aortic valve incompetence. Severe chest pain indicates acute dissection, which may be further compounded by involvement of the coronary ostia and consequent myocardial ischaemia [2].

Aortography remains the ‘gold standard’ investigation in many centres, although TOE with Doppler colour-flow has been shown to have a high sensitivity for diagnosing thoracic aortic dissection. Both techniques, however, lack the specificity of MRI in assessing the ascending aorta [3]. Right heart catheterisation reveals high right atrial pressures and a ‘step-up’ in oxygen saturation at the level of the right atrium but due to the pressure gradient will not reveal the fistula with injection of contrast medium.

Operative success for aorto-right atrial fistula (AoRAF) is rare [1,2,4–7]. The fistula in this case was apparently a complication of a gradually expanding aneurysm resulting from leakage from the coronary implantation sites. This continued periprosthetic bleeding and consequent tension along suture lines is a recognised problem of the inclusion technique of root replacement [8]. The Cabrol shunt into the right atrial appendage, designed to drain this space, was not part of this patient’s original operation.

Carotid artery Doppler ultrasound and matching pedal and radial artery pressures suggested adequate cerebral blood flow while still at normothermia. Inadequate flow would have necessitated complementary carotid artery cannulation, axilloaxillary CPB or early ‘crash’ fenestration of the aortic arch. Continuous intraoperative transoesophageal echocardiography (TOE) has been used to monitor cerebral perfusion [9], but definition in aortic root rarities is questionable [10], and this has not been our practice. Coronary revascularisation with internal mammary artery (IMA) grafts were not considered as the aortic luminal origin was uncertain and free IMA grafts have no decisive advantage over saphenous vein conduits.

AoRAF has been reported following coronary artery bypass grafting [1,6], aortic valve replacement [7], and...
mitral valve replacement [1]. Our patient is the first reported to have had an aortic root replacement. Hurley et al [6] proposed the mechanism of containment of ascending aortic aneurysms by the pericardial adhesions of previous cardiac operations favouring rupture into the right atrium. The ‘subacute’ presentation of these cases probably explains the good postoperative survival. Patients who present acutely with cardiovascular collapse as described by Berman et al [7] would almost certainly not survive to reach hospital.

References


