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Case report - Cardiac general

Acquired aorto-pulmonary artery fistula following proximal aortic surgery

Majid Mukadam, James Barraclough, Peter Riley, Robert Bonser*

Department of Cardiac Surgery, Queen Elizabeth Hospital & University Hospital, Edgbaston, Birmingham B15 2TH, UK

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Abstract

A 56-year-old man developed left heart failure secondary to left to right shunt due to acquired aorto-pulmonary artery (PA) fistula. He had previously undergone aortic root replacement for streptococcal aortic valve endocarditis. A modified strategy involving interventional radiology and surgical technique was employed to deal with this complex surgical challenge. A balloon catheter was placed in the right PA to enable fistula occlusion during cardiopulmonary bypass followed by repair using cardiopulmonary bypass and circulatory arrest.

Keywords: Acquired aorto-pulmonary fistula; Combined surgical and interventional radiological approach

1. Introduction

Aorto-pulmonary fistula is an exceedingly rare complication following aortic surgery. Its haemodynamic consequences can rapidly lead to cardiac decompensation necessitating prompt surgical repair. Left to right shunting during cardiopulmonary bypass poses another challenge. We report a case of acquired aorto-pulmonary fistula managed by a combined surgical and interventional radiological approach.

2. Case summary

A 56-year-old man, under follow-up following prosthetic aortic root replacement, was noted to have a large false aneurysm of the ascending aorta compressing the main and right pulmonary artery on surveillance CT scanning (Fig. 1) and was referred for surgical repair. Following referral, but prior to admission, he presented emergently with grade IV left heart failure symptoms and a four-day history of sudden onset of gross peripheral oedema and abdominal swelling. Ten years previously he had undergone replacement of a bicuspid native aortic valve for streptococcal endocarditis. This had been followed 8 months later by progressive heart failure due to para-prosthetic aortic regurgitation requiring a root replacement using a mechanical valve-graft conduit. This procedure had been complicated by chronic atrial fibrillation with complete heart block requiring a permanent VVI-mode pacemaker.

At presentation he was orthopneic, grossly oedematous and had ascites. Auscultation revealed a continuous murmur throughout the cardiac cycle and bilateral chest crackles. Chest X-ray revealed gross cardiomegaly (cardio-thoracic ratio 0.7) with a prominent pulmonary artery (PA) and pulmonary oedema. Trans-oesophageal echocardiography (TOE) demonstrated a false aneurysm of the aortic root and a left to right shunt at pulmonary arterial level (Fig. 2). Anti-failure therapy was commenced including haemofiltration but despite some fluid clearance (4 kg) his grade IV symptoms did not improve and operative repair of the false aneurysm and aorta-PA fistula was recommended.

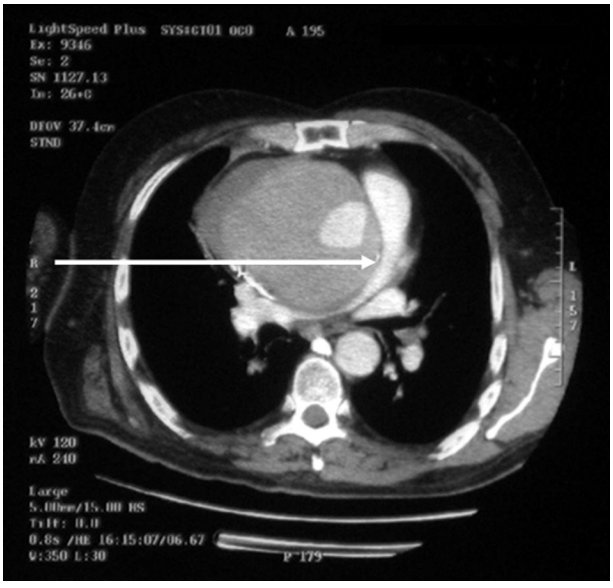

Fig. 1. Computerised tomographic scan performed prior to the development of aorto-pulmonary fistula. The large false aneurysm of the ascending aorta is seen. The arrow indicates the compressed right pulmonary artery and site at which the aorto-pulmonary artery fistula developed.

*Corresponding author. Tel.: +44 121 627 2543; fax: +44 121 627 2542.
E-mail address: Robert.Bonser@uhb.nhs.uk (R. Bonser).

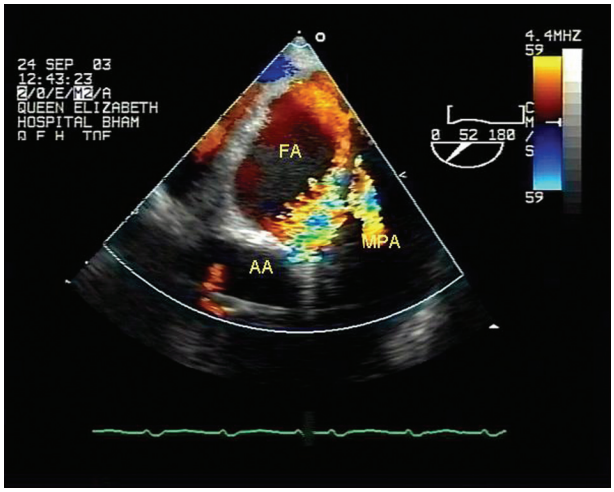

Fig. 2. Transoesophageal echocardiogram in the mid-oesophageal position demonstrating flow on colour Doppler between pseudo-aneurysm (FA) arising from ascending aorta (AA) and main pulmonary artery (MPA).

In order to prevent gross left to right shunting during surgery, the patient was anaesthetised in the X-ray department and pulmonary angiography performed via right femoral vein. This revealed a constricted right PA at the site of the aneurysm. An 8 F balloon occlusion catheter (Reliant Stent Graft Balloon catheter; Medtronic AVE, Santa Rosa, CA 95403, USA) was then placed in the right PA origin to enable fistula occlusion during cardiopulmonary bypass. This is a compliant balloon having a maximum diameter of 46 mm.

As the aneurysm was adherent to the sternum, CPB was instated using femora-femoral bypass with LV venting via a small left anterior thoracotomy. Once full CPB was established, the PA balloon was inflated. The patient was cooled to 22 °C and sternotomy performed. The aorta was mobilised distal to the graft allowing cross-clamping. There was a huge false aneurysm around the old prosthesis, eroding the sternum and arising from a near-complete dehiscence of the left coronary button and a small (5%) dehiscence of the distal graft-aorta suture line. There was no macroscopic evidence of infection. A 1 × 0.5 cm fistulous communication was noted between the false aneurysm and the pulmonary artery on the bare aortic aspect of the distal main pulmonary artery at its junction with the right pulmonary artery through which the occlusion balloon could be visualised. Cardioplegia was administered via the coronary ostia and the old composite prosthesis excised. The coronary ostia were freed but remained in fixed positions due to previous scarring. The patient was further cooled to 15 °C, circulation arrested, aortic clamp removed and open distal anastomosis constructed to the proximal aortic arch using a 30 mm prosthetic graft. On completion, the arch was deaired, the graft clamped, bypass reinstituted and the patient rewarmed. During rewarming the aorta-PA fistula was repaired with a patch of bovine pericardium. The aortic valve was replaced with a further mechanical valve-graft conduit and the coronary arteries implanted using a Cabrol technique i.e. an 8 mm interposition graft anastomosed end-to-side to each coronary ostium and side-to-side to the main graft. Finally, the two separate grafts were anastomosed together and circulation re-established. The patient was weaned from CPB using moderate inotropic support. The duration of aortic cross-clamping, cardiopulmonary bypass and hypothermic circulatory arrest were 189 min, 301 min and 26 min, respectively.

The patient made a slow recovery with respiratory insufficiency requiring prolonged ventilator support and tracheostomy. He also had an episode of impaired consciousness at POD 10 due to a spontaneous haemorrhage into the 4th ventricle. This recovered spontaneously. At 12 months postoperatively the patient is in NYHA category 2, free of overt heart failure and living independently without neurological deficit.

3. Discussion

Acquired aorto-pulmonary artery fistulae is rare but represents a potentially life threatening complication of dissection, aneurysm or surgery. The majority of reported cases involve fistulae arising as a consequence of dissecting aortic aneurysms [1] while few have been reported following ascending aortic surgery [2]. Acquired fistulae have also been seen associated with severe aortic valve stenosis and recently a case of perforation of aortic wall of freestyle stentless valve has been published [3,4]. One report describes a case of dissecting aneurysm causing severe pulmonary stenosis leading to aorto-pulmonary artery fistula formation [5].

The operation strategy required in this case merits discussion. As the false aneurysm was adherent to sternum, sternotomy could not be performed until profound hypothermia was established using femoro-femoral bypass. We anticipated that bypass induction would potentially lead to severe left to right shunting and an inability to maintain adequate brain and corporal perfusion pressure. As cerebral autoregulation is uncoupled at profound hypothermia, an inability to maintain perfusion pressure might be expected to jeopardise cerebral perfusion. In addition, any pulmonary regurgitation would lead to right ventricular distension and injury. To counter this, we inserted a large balloon catheter across the fistula preoperatively, allowing inflation once bypass was instituted. This manoeuvre resulted in a 10 mmHg increase in perfusion pressure during the cooling phase. This strategy allowed successful operative repair and a satisfactory recovery.

In conclusion, we report a case of acquired aorto-pulmonary fistula managed by a combined surgical and interventional radiological approach.

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References

[1] Piciche M, De Paulis R, Luigi C. A review of aortopulmonary fistulas in aortic dissection. Ann Thorac Surg 1999;68:1833–1836.

[2] Kitamura T, Motomura N, Ohtsuka T, Shibata K, Takayama H, Kotsuka Y, Takamoto S. Aortopulmonary fistula in pseudoaneurysm after ascending aortic surgery. J Thorac Cardiovasc Surg 2003;126:904–905.

[3] Ferlan G, De Pasquale C, Testini M, Agnino A, Marraudini G, Castellaneta G, Bovenzi F, D'Agostino C. Acquired Aortopulmonary fistula: A case report. J Cardiovasc Surg 1998;39:821–823.

[4] Kameda Y, Mizuguchi K, Kuwata T, Mori T, Taniguchi S. Aortopulmonary fistula due to perforation of the aortic wall of a freestyle stentless valve. Ann Thorac Surg 2004;78(5):1827–1829.

[5] Imanaka K, Kyo S, Asano H, Motomura N, Takamoto S, Kato M, Ogiwara M, Kohmoto O. Severe pulmonary stenosis and aortopulmonary fistula caused by a dissecting aneurysm in the ascending aorta. J Thorac Cardiovasc Surg 2003;126:598–600.