CASE REPORTS

False aneurysm of the right ventricular outflow tract after total correction of tetralogy of Fallot: diagnosis by echocardiography and successful repair by neck cannulation for cardiopulmonary bypass

M Sadiq, A C Fenton, R K Firmin

Abstract

A case of false aneurysm related to the left side of the heart with a connection to the right ventricular outflow tract was found by echocardiography after complete repair of tetralogy of Fallot. Cardiopulmonary bypass was established by cannulating the right internal jugular vein and the ipsilateral common carotid artery. The aneurysm was then excised and the right ventricular outflow tract reconstructed by direct sutures.

(*Br Heart J* 1994;71:566-568)

False aneurysms of the right ventricular outflow tract may occur after primary repair of tetralogy of Fallot.¹ We describe such a case in a child that was diagnosed by echocardiography and successfully repaired with cannulation of the neck vessels for cardiopulmonary bypass.

Case report

The patient was born at term. A heart murmur was noticed at 6 weeks of age and echocardiography showed tetralogy of Fallot. He developed cyanotic spells at 9 months of age. Cardiac catheterisation confirmed the diagnosis with suitable anatomy for a one stage repair, which was performed at 11 months of age. The right ventricular outflow tract was augmented by an autologous pericardial patch that did not extend across the pulmonary annulus. The right ventricular pressure was only 30 mm Hg on completion of the procedure.

The postoperative course was uneventful and a cardiac ultrasound performed seven days after operation showed no pericardial effusion, well contracting ventricles, a small residual ventricular septal defect, mild pulmonary regurgitation, and a widely patent right ventricular outflow tract.

He remained well for three months before developing breathlessness on exertion. Initial echocardiographic investigations at the local hospital showed cardiomegaly on chest x ray

film and a large echo free space surrounding the heart and extending laterally to the left and posteriorly. Computed tomography with contrast enhancement suggested continuity between the echo free space and the heart. He was therefore transferred for further assessment.

On examination, he was tachypneic with intercostal recession and prominent Harrison's sulci. The precordium was prominent with increased cardiac dullness on percussion. First and second heart sounds were normal with a pulmonary ejection systolic murmur and a soft early diastolic murmur. The liver was palpable 1 cm below the costal margin. Chest x ray film showed an area of increased radiodensity behind the left heart with loss of diaphragmatic outline. The lung fields seemed normal. Echocardiography showed a large echo free space extending laterally and posteriorly to the left atrium and left ventricle and compressing the heart (fig 1(A)). The posterolateral extension of this space gave an impression of a large pericardial effusion (fig 1 (A and B)). Superior angulation from a subcostal view showed communication between the echo free space and right ventricular outflow tract (fig 1(C)). Saline contrast injection confirmed this communication, with rapid appearance of microbubbles in the space after opacification of the right ventricle (Fig 1(D and E)). There was a small residual ventricular septal defect but no important narrowing or regurgitation across the right ventricular outflow tract. A diagnosis of aneurysm of the right ventricular outflow tract was made and the patient was referred for surgery without cardiac catheterisation.

In view of the potential risk of bisecting the aneurysm during sternotomy, cardiopulmonary bypass was established by cannulating the right internal jugular vein and ipsilateral common carotid artery before sternotomy. A suture line false aneurysm related to the left side of heart was found with a communication to the right ventricular outflow tract (fig 2). This was dissected free and opened during a period of fibrillation. The aneurysm was excised and the right ventricu-

Department of
Paediatric Cardiology,
Groby Road Hospital,
Leicester
M Sadiq

Department of
Cardiothoracic
Surgery
R K Firmin

Department of Child
Health, University of
Leicester, Leicester
A C Fenton

Correspondence to:
Dr Masood Sadiq,
Department of Paediatric
Cardiology, Groby Road
Hospital, Leicester
LE3 9QE.

Figure 1 Cross sectional echocardiography of aneurysm confirmed by contrast injection. (A) Apical four chamber view showing a large echo free space (aneurysm) extending laterally to left atrium and left ventricle. (B) Parasternal long axis view showing posterior extension giving a false impression of a large pericardial effusion. (C) Subcostal view with superior angulation showing communication between aneurysm and the right ventricular outflow tract (arrow). (D) Saline contrast injection in the subcostal view with superior angulation showing appearance of microbubbles in the aneurysm after appearance in the right ventricle. (E) Subcostal left ventricular outflow tract view showing the contrast in the aneurysm without its appearance in the left ventricle. A, aneurysm; AO, aorta; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

lar outflow tract reconstructed by direct sutures. The postoperative course was uneventful and review at six weeks showed no recurrence of the aneurysm.

Figure 2 Findings at operation showing the neck of the false aneurysm (small arrows) with its communication to the right ventricular outflow tract (large arrow).

Discussion

Between 1% and 2% of all cardiac aneurysms arise from the right ventricle,² but most of them are true aneurysms and false aneurysms of the right ventricular outflow tract are rare.¹

A true aneurysm is entirely a part of the heart and an injured or ischaemic part of the ventricular wall (or a patch) undergoes thinning and aneurysmal dilatation. False aneurysms of the right ventricle usually result from a leak from the right ventricle outflow tract with the wall being formed by the pericardium, adhesions, pleura, or other surrounding structures. Patch repair of the right ventricular outflow tract for tetralogy of Fallot or complex cyanotic disease with pulmonary stenosis, closed pulmonary valvotomy for pulmonary valve stenosis, correction with homograft conduit for truncus arteriosus, and Rastelli operation are the primary operations associated with false aneurysms.²

The incidence of aneurysms (both true and false) after repair of tetralogy of Fallot has been reported as between 2% and 25%,³ but most of the cases were true aneurysms. The mean interval to diagnosis of false aneurysm from the primary operation is 15 months (range eight months to three years). Whether the ventriculotomy itself or the patch dehiscence, the main aetiological factor is considered to be the raised right ventricular pressure due to the persistent obstruction of the right ventricular outflow tract.⁴ The other recognised contributing factors for formation of an aneurysm are residual left to right shunt and complete heart block, significant pulmonary regurgitation, faulty suture technique, infection, trauma, and Chagas disease.^{2,4,5} The suture line gave way to form a false aneurysm in our case but none of the other factors seemed to be present.

Although the chest x ray may suggest the

diagnosis, echocardiography and angiography remain the definitive diagnostic tests. Opacification of intracardiac structures by angiography may result in overlap and the neck of the aneurysm may not be well profiled. Echocardiography is perhaps superior to angiography in imaging the exact site of communication between the aneurysm and the heart and also showing its extent. In our case the posterolateral extension of the aneurysm gave a false echocardiographic impression of a pericardial effusion. Saline contrast injection showed nearly simultaneous appearance of microbubbles in the right heart and the aneurysm, confirming communication between the two.

As the aneurysm originates from the right ventricular outflow tract and lies just behind the sternum there is a risk of bisecting it during sternotomy. Femoral cannulation has been used to establish bypass before sternotomy,⁶ but femoral vessels are small at such a young age and it may be a problem to establish full bypass by cannulating them. We

chose to cannulate the neck vessels as used for extracorporeal membrane oxygenation,⁷ to establish full cardiopulmonary bypass for the repair.

We thank Dr KC Chan for help in the preparation of the manuscript and Dr R Leanage for permission to report this case.

- 1 Dhasmana JP, Whisheart JD. A case of false aneurysm of the right ventricle. *J Cardiovasc Surg* 1981;22:340-4.
- 2 Stansl HC Jr, Julian OC, Dye WS. Right ventricular aneurysm. A review of literature and report of a case of successful repair with the aid of temporary cardiopulmonary bypass. *J Thorac Cardiovasc Surg* 1963;46:66-76.
- 3 Rosenthal A, Gross RE, Pasternac A. Aneurysms of right ventricular outflow patches. *J Thorac Cardiovasc Surg* 1972;63:735-40.
- 4 Samarra AAR, McCloy R, Ablett MB. Bilobulate false aneurysm of the right ventricle after cardiac surgery. *Br Heart J* 1976;38:297-300.
- 5 Payne WS, Kirklin JW. Late complications after plastic reconstruction of outflow tract in tetralogy of Fallot. *Ann Surg* 1961;154:53-7.
- 6 Jacobs T, de-Leval M, Stark J. False aneurysm of right ventricle after Rastelli operation for transposition of great arteries, ventricular septal defect and pulmonary stenosis. *J Thorac Cardiovasc Surg* 1974;67:543-6.
- 7 Pearson GA, Firmin RK, Sosnowski A. Neonatal extracorporeal membrane oxygenation. *Br J Hosp Med* 1992;47:647-53.